Diet Composition and Habitat Fidelity for Groundfish Assemblages in Hecate Strait, British Columbia

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DIET COMPOSITION AND HABITAT FIDELITY FOR GROUNDFISH ASSEMBLAGES IN HECATE STRAIT, BRITISH COLUMBIA

by

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Abstract

Pearsall, I..A., and Fargo, J.J. 2007. Diet composition and habitat fidelity for groundfish assemblages in Hecate Strait, British Columbia. Can. Tech. Rep. Fish. Aquat. Sci. 2692: vi + 141 p.

Here we present an analysis of ontogenetic, seasonal and spatial patterns in diets of groundfish species from Hecate Strait, British Columbia. A total of 6322 stomachs were collected from 30 groundfish species over three cruises carried out between 1985 and 1987. Five main feeding strategies were identified: euphausiid feeders, shrimp feeders, benthic (macrobenthic- mainly crabs and bivalves; and meiobenthic- primarily annelid) feeders, macrobenthic feeders (mainly) and piscivores. Benthic feeders showed more diet stability and habitat fidelity as compared with piscivores. In addition, ontogenetic changes were more apparent for piscivores rather than the benthivores. Diet breadth and the proportion of fish in diets was greater over the fall and winter as compared to the summer. Possible competitive and predator-prey interactions are discussed and the impact of abundant transient species such as dogfish on community structure are examined.

Resume

Pearsall, I..A., and Fargo, J.J. 2007. Diet composition and habitat fidelity for groundfish assemblages in Hecate Strait, British Columbia. Can. Tech. Rep. Fish. Aquat. Sci. 2692: vi + 141 p.

Nous présentons une analyse des profils ontogénétique, saisonnier et spatial de l'alimentation chez diverses espèces de poisson de fond trouvées dans le détroit d'Hécate, en Colombie-Britannique. Un total de 6 322 estomacs ont été prélevés chez 30 espèces lors de trois croisières de recherche effectuées entre 1985 et 1987. Ces espèces se divisent en cinq grandes catégories selon les proies consommées : euphausiacés, crevettes, organismes benthiques (macrobenthiques- principalement des crabes et des bivalves et méiobenthiques- principalement des annelidés), organismes (principalement) macrobenthiques et poissons. Les benthivores avaient un régime plus stable et ils étaient plus fidèles à leur habitat que les piscivores. De plus, les changements ontogénétiques étaient davantage évidents chez les piscivores que chez les benthivores. La variété des aliments et la proportion de poissons consommés étaient plus grandes en automne et en hiver qu'en été. Nous examinons les interactions concurrentielles et les interactions prédateur-proie possibles, ainsi que l'impact d'espèces de passage abondantes, tel l'aiguillat, sur la structure des communautés.

Introduction

Between 1984 and 1987, a number of studies were carried out to examine stomach contents of groundfish species in northern Hecate Strait, which is the body of water lying between the Queen Charlotte Islands and mainland north coast of British Columbia, Canada. The data collected on a multispecies survey during the Hecate Strait project, with goals of providing catch rate data useful for indexing the abundance of as many marine fish species as possible and the development of an ecological basis for alternative mixed-species assessment techniques (Tyler 1986, 1989; Tyler et al. 1986). Stomach contents were collected to examine species interactions, and to assess spatial and temporal differences among habitats within the study area.

More than 100 species of groundfish are resident in the Strait, including 17 of the 21 species of flatfish in British Columbia. A small mixed fishery exists in this region, landing an average of about 5000 tonnes annually. The principal commercial species are Pacific cod (*Gadus macrocephalus*), English sole (*Parophrys vetulus*) and rock sole (*Lepidopsetta bilineata*) (Fargo et al. 1990). Dover sole (*Microstomas pacificus*), petrale sole (*Eopsetta jordani*) and Pacific halibut (*Hippoglossus stenolepsis*) are also target species and several other species are also caught and landed as incidentals, including sand sole (*Psettichthys melanostictus*), starry flounder (*Platichthys stellatus*) and arrowtooth flounder (*Atheresthes stomias*). Pacific sanddab (*Citharichthys sordidus*), butter sole (*Iopsetta isolepsis*), rex sole (*Glyptochphalus zachiurus*) and flathead sole (*Hippoglossoides elassodon*) are discarded due to their small size. Long-term monitoring of these groundfish species has taken place since 1984 as part of the Hecate Strait multispecies survey (Fargo et al. 1990).

Fish communities have been previously identified in Hecate Strait. These communities are dominated by flatfish species which can be characterized by depth and bottom type (Fargo and Tyler 1991). The different bottom types and depths will affect not only the fish species present, but also the types of prey that will be available (Burd and Brinkhurst 1987). Fish diets may be affected by several factors, including 1) spatial and seasonal patterns of habitat use, which will influence the types of prey available, 2) prey preference, and 3) intra and inter-specific competition for the same prey items. We were interested in elucidating the trophic interactions among groundfish in Hecate Strait, and using the diet information to assist in the modeling this ecosystem (Walters et al. 2000).

Two cruises (June and September-October 1985) collected data on groundfish food resource division (Saunders et al. 1986). A third cruise was carried out in January 1986, to identify winter components. In 1987 the work was repeated although at a reduced rate (Foucher et al. 1988; Fargo et al. 1988). Thirty species of groundfish were collected from four sampling areas (A,B,C and D), and three of these corresponded with groundfish assemblage areas as described by Fargo and Tyler (1991).

Stomach samples were collected on board, stored in formalin, and analyzed at a later date in the laboratory. The stomach content data collected were stored as ASCII files, but no detailed statistical or exploratory analyses were performed on the resulting data sets, until this study was carried out during 2002.

The major focus of this paper is to describe the diet of marine fish in Hecate Strait including its ontogenetic, seasonal and spatial variation. We also examine the spatial and temporal overlap of the fish species to elucidate the possible competitive and predator-prey interactions that may take place in Hecate Strait. We compare the benthic organisms found within the diets of the benthivores with those species identified most commonly in sediment samples collected within the Strait (Burd and Brinkhurst 1987). Using these results, we discuss the relationships between habitat affinity and feeding preferences. We also identify transient species and use the information on feeding ecology to suggest how the food habits of these species may alter community structure.

Diet data were incorporated into an Ecopath model (Christensen and Pauly 1992a&b, 1993) for the Hecate Strait ecosystem. The Ecopath software is based on early work by Polovina (1984) and is a mass-balance approach that provides a static snapshot view of an ecosystem at steady state during a given period. It is widely used to analyze trophic interactions in fisheries resource systems as well as to determine of the trophic flows required to support the current ecosystem trophic structure. We use a balanced Hecate Strait Ecopath model to further examine the trophic relationships and associations between species that result from the diet linkages.

Methods

AREAS OF STUDY

Stomach samples were collected from four areas of Hecate Strait (A, B, C and D; Figs. 1&2), which were deemed to be representative of habitat for the four major groundfish assemblages (Fargo and Tyler 1991). The dimensions of each sampling area were 3 by 3 nautical miles except for one area (A) which was 1.6 by 6nm (this was a very narrow band because of steepness of the edge). Burd and Brinkhurst (1987) described the four sampling areas A, B,C and D. Area A, the "Butterworth" had depths of 55-166m, the bottom substrate was made up of sandy silt, and there was strong tidal movement through the area. Area B, "Reef Island" had the shallowest depths of 18-70m and substrates of fine sand and a lot of shell debris. This area had the highest sand content of the four areas. Sediment varied the most in Area C, with cobbles, gravel and pebbles, to silty sand on the western side of the area, and sandy silt on the eastern side. The sand was much coarser than in area A. Depths in this area ranged from 55-159m. In area D "Bonilla", the substrates were sandy, ranging from fine, silty sand to coarser sand. Depths here ranged from 55 to 108m. Areas A and C had the highest silt contents and areas B and D were similar with some areas of high gravel content.

In June and September 1985 three of the areas (A-C) within northern Hecate Strait were sampled and in September the fourth area (D) was added to complement area C since juvenile English sole was almost absent from this area. In 1986, and 1987, sampling was carried out in all four areas.

HAULS CARRIED OUT AND NUMBERS OF FISH PRESERVED

Diel sampling took place in area A in the June 1985 cruise and in areas B and C in the September 1985 cruise. Hauls were made every six hours starting at 0800. Except for these cruises, all fishing was done during daylight hours.

Trawls were made over a period of 30 minutes and the total catch from a minimum of two hauls in each area was sampled for species composition and stomach contents. If time permitted further hauls were carried out specifically to increase the sample sizes for infrequently occurring species such as halibut and skates.

Between 2-7 trawls were carried out in each Area during each cruise, except for June 1985, when no hauls were made in Area D. Stomachs from fish collected in the 4 sampling areas were preserved. Stratified samples of 10 stomachs, containing food, per 10 cm length interval for each species were taken. Stomachs were removed from the fish by cutting the esophagus as close as possible to the mouth and cutting the intestine just posterior to the stomach. Records of fish lengths and the incidence of empty stomachs were kept.

The numbers of stomachs processed were 2206 for cruise 1, 2675 for cruise 2, 1301 for cruise 3, and 138 from cruise 4. Although stomachs from 23 different species were stored from cruise 4, only stomachs of Pacific cod and dogfish were processed.

The total numbers of stomachs processed by area were 1728 for Area A, 1423 for Area B, 2427 for Area C and 744 from Area D (Table 1). Overall, most stomachs were processed for arrowtooth flounder (977), spiny dogfish (844), Pacific cod (573), rex sole (583), ratfish (572) and English sole (433). Only 1 curlfin sole, 3 starry flounder, 4 *Sebastes elongatus*, 6 butter sole, and 8 *Sebastes paucispinus* stomachs were processed. All the sablefish captured were juveniles.

DATA ANALYSIS

The 730 diet items were separated taxonomically and grouped as shown in Table 2. We termed these groupings "Ecopath groups" since the diets were partitioned into groupings we chose to use in the Ecopath model. However, each of these "Ecopath groups" were further subdivided into "Ecopath Sub Groups" so that diets could be analysed at a higher resolution. For example, the commercial shrimp category was made up various pandalid species, namely, the ocean shrimp (*Pandalus jordani*), dock shrimp (*P. danae*), yellowleg pandalid (*P. tridens*) and the spot shrimp (*P. platyceros*). Epibenthos included barnacles, isopods, leptostraca, mysids, shrimp (non-commercial) and tanaidaceans. The euphausiid category was made up of *Euphausia pacifica*, *E. pseudogibba*, *Thysanoessa marura*, and *T. spinifera*. Forage fish was made up of sandlance (*Ammodytes hexapterus*) and eulachon (*Thaleichthys pacificus*). The jellies/macrozooplankton included thecate hydroids, medusae, and pelagic tunicates. The "Inshore rockfish" group was comprised of various *Sebastes* species and scorpionfishes. Macrobenthos was the largest group of all, encompassing anomurans, aplacophora, ascidians, bivalves, branchiopods, chaetognaths, cnidaria, crabs, unidentified large crustacea, echinoderms, echiurans, gastropods, horseshoe crabs, lophophorans, molluscs, peanut worms, polyplacophora, priapulans, prosobranchs, reptantia and sponges. The meiobenthos found in stomachs included annelids, bryozoans, nematodes, nudibranchs and proboscis worms. The "other flatfish" grouping was made up of unidentified flounders, (e.g. flathead sole, sand sole, slender sole, yellowfin sole) and unidentified sanddabs. The predatory invertebrates included various unidentified octopus species, including the giant octopus *Octopus dofleini*. The predatory mesozooplankton category included amphipods, caprellid amphipods, arrow worms, cumaceans, gammarids, hyperid amphipods, megalops, ostracods and zoea. The shallow water benthic fish grouping included poachers (Agonidae), clingfishes, eelpout, gadids, gobies, greenlings, lamprey, lumpfishes, pacific tomcod, perch, pholididae, pricklebacks, sandfishes, sculpins, smelt, snailfishes and blennies. The squid group included various unidentified *Loligo* species, including the California market squid, *Loligo opalescens*. The transient salmon group was made up of sockeye (*Onchorynchus nerka*), chum (*O. keta*) and pink salmon (*O. gorbuscha*). When the stomach contents had been analysed in the late 1980's, taxonomic specialists for annelids, gammarids, bivalve molluscs and gastropod molluscs were employed, and thus these groups are particularly well described to the species level. However, for many of the other diet components, broader categories were employed, and often identification only took place to the genus level, resulting in substantial variation in data resolution among diet groupings.

A number of queries were performed to analyze the proportion that the different prey groups contributed to each fish diet. Mean proportion of any one prey species f in a predator species p diet ($\bar{P}_{fp}$)would be given as follows:

(1) $$\bar{P}_{fp} = \frac{W_{fp}}{W_p}$$

where weight of prey species f in all stomachs of predator species p (W_{fp}) is given as:

(2) $$W_{fp} = \sum_i W_{fpi}$$

weight of all stomach contents of predator species p (W_p) is given as:

(3) $$W_p = \sum_f W_{fp}$$

Thus, all the stomach content data for any one predator species were pooled and the proportions of each prey were determined using the pooled data.

All diet analysis was based on relative contribution by weight, with diet items with weights less than 0.0005g omitted from the analyses. Weights of internal parasites and unidentified matter were also removed from analyses.

Diet analyses for dogfish did not incorporate any prey items that were suspected to have been taken within the trawls because of the opportunistic nature of this species, which possibly results in substantial net feeding.

Diets were determined by cruise and by area within Hecate Strait so that seasonal and spatial variability in diets could be examined. Diets for some of the most important commercial species in Hecate Strait, namely, arrowtooth flounder, English sole, Dover sole, rock sole, Pacific ocean perch and Pacific cod, were analyzed for both adult and juvenile stages. Fish with total lengths below 40cm for arrowtooth flounder, 34.3cm for English sole, 39cm for Dover sole, 34.5cm for rock sole, 81 centimetres for dogfish and fork lengths of 30cm for Pacific ocean perch, 50cm for Pacific cod were considered juveniles.

Cluster analysis was employed to examine similarities in diet among the different fish species (except for butter sole, curlfin sole and starry flounder for which the number of stomachs sampled was deemed too low). We used complete linkage clustering employing the Euclidean distance (ie a hierarchical technique) and we compared fish species based on the proportion of the diet made up of the Ecopath Sub Groups (described above). Average linkage clustering was developed to avoid the extremes introduced by single linkage and complete linkage clustering. The method uses an unweighted pair-group method using arithmetic averages (UPGMA) for which the definition is: {similarity between a sample and an existing cluster} = {arithmetic mean of similarities between the sample and all the members of the cluster}.

To examine the potential competition among the species in the different clusters, the top ten dietary components by weight were compared. We also examined the spatial and seasonal variability in the diets of the different fish species sampled during the four cruises. We expected some similarities in diet among the two summer cruises but different diets during the fall and winter cruises.

Finally, the benthic organisms found within the diets of the benthivores English sole, rex sole, and Dover sole were compared with the primary benthic organisms identified as most common within each spatial area (A-D) (Burd and Brinkhurst 1987; Table 11). Habitat fidelity and diet breadth were examined with respect to feeding strategies.

In our discussion, the spatial and depth distributions of the fish were examined in relation to their diet composition to elucidate the possible competitive and predatory interactions that could occur among species.

ECOPATH MODELING

The diet data for the groundfish species covered in this report were inserted into an existing Ecopath model for the Hecate Strait ecosystem (Pearsall, Fargo & Sinclair, in prep.). Using this modelling software, the Hecate Strait ecosystem was modelled using a set of simultaneous linear equations for each of 46 functional groups (single species or groups of functionally related species) in the model:

Production by (i)- all predation on (i) – nonpredation losses of (i) – export of (i) =0 , for all (i)

The inputs for this model are estimates of biomass, production/biomass ratios, consumption/biomass ratios, export (emigration), ecotrophic efficiency, and diets for each group. Ecotrophic efficiency is the amount of production that is either that is consumed within the system or harvested (by fisheries). The equation above applies to each producer resulting in a series of linear equations which may be solved by matrix inversion. When balancing the energy flow of each box, however, another equation must also be taken into account:

Consumption = production + non-assimilated food + respiration

Note that the period for the model may be any period of time (e.g. one year, one season, one decade), so long as the biomass at the beginning and end of the period is the same. The two equations work on the principle of mass-balance, that is, all biomass is conserved or accounted for within the system (there is no net gain in biomass). This requirement sets boundaries for the series of linear equations by which all the species are interrelated, and thus, the biomass and trophic fluxes between different groups within the ecosystem can be determined.

We produced a balanced model for the Hecate Strait ecosystem and used it to examine the trophic levels of the groundfish species detailed in this report in relation to the trophic levels of other members of their ecosystem, as well as to examine the possible direct and non-direct interactions that could result in the food web based on the diet linkages. We examined mixed trophic impacts as an output from the Ecopath software: such a diagram can be used to examine the relative impacts of any one group on other functional groups. The bars in impact diagrams show relative, not absolute, impacts, but are comparable between groups (Christensen, et al., 2000). Bars pointing downwards indicate negative impacts, whereas positive impacts (beneficial predation) are shown by bars pointing upwards. In this latter case, the negative direct impact on prey may be reduced by indirect positive impacts, resulting, for example, when a predator feeds on another predator or competitor of the prey.

The final Ecopath output examined were predator and prey overlaps.

This is defined as the overlap that any two species have in their predators, whereas the prey overlap is the overlap between any two species in terms of the prey that they have in common (Christensen, et al., 2000). Prey overlap (O_{jk}) is expressed as a modified Pianka (1973) index and is given as:

$$O_{jk} = \sum_{i=1}^{n}(p_{ji} \cdot p_{ki}) / (\sum_{i=1}^{n}(p_{ji}^2 + p_{ki}^2)/2)$$

Here, P_{ji} and P_{ki} are the proportions of resource i used by species k and j, respectively. The resulting index is symmetrical, with values ranging from 0 (no overlap in the prey base) to 1 (complete overlap in prey eaten).

Using a similar approach, the amount of predation on preys m and n by all predators, l, is given by:

$$P_{mn} = \sum_{i=1}^{n} (X_{ml} \cdot X_{nl}) / (\sum_{l=1}^{n} (x_{ml}^2 + x_{nl}^2) / 2$$

This index values also range between 0 and 1, from no overlap of predators for the two prey types, to complete overlap of predators.

Results

Appendices 1 and 2 show fish diets analysed for all data combined (i.e. all cruises and areas pooled) for Ecopath groups (Appendix 1) and Ecopath subgroup levels (Appendix 2). Appendices 3 and 4 show these same results analyzed separately by cruise and area.

The most highly sampled species of fish in each area A,B,C and D were those characteristic of the fish assemblages of each of those areas (Fargo and Tyler 1991). In Area A, the most highly sampled species were arrowtooth flounder and ratfish, characteristic of the Butterworth assemblage. In Area B, the most highly sampled species were rock sole and dogfish, both characteristic of the Reef Island assemblage. In Area C, there were many different species sampled but Pacific ocean perch (*Sebastes alutus*) was more common in this area as compared to the other three areas, somewhat indicative of the Moresby Gully rockfish assemblage. Finally, English sole and Pacific cod were most commonly sampled in area D, both indicative of the Bonilla assemblage.

PRIMARY DIET COMPONENTS OF FISH SPECIES

The fish species were initially split into groups by feeding characteristics, grazers, piscivores or planktivores. The primary diet components are listed in Table 3 below. Interpretation of the diets of the piscivores was somewhat complicated by the prevalence of unidentified fish in the stomachs. The top predators (based on proportion of fish in diet) appeared to be dogfish, adult Pacific cod, adult arrowtooth flounder, petrale sole, Pacific halibut, silvergray rockfish, lingcod and sand sole (Table 4). Butter sole also showed piscivorous habits but the sample size for this species was very low so it is not included in any further analyses. Adult arrowtooth flounder and adult Pacific cod fed on a greater proportion of fishes than did juveniles of the same species. Black skate, ratfish, walleye pollock, Pacific ocean perch, yellowtail rockfish, Pacific sanddab, Dover sole and rex sole all ate minimal amounts of fish in their diet. Most of the piscivores fed on forage fish, herring, other flatfish, and shallow water benthic fish (Table 4). Petrale sole showed the highest dependence on herring.

Different *Sebastes* species did show some differences in their diets. Euphausiids made up between 58% and 90% of the diet components for Pacific ocean perch, greenstripe rockfish and yellowtail rockfish. Bocaccio rockfish was different in that it appeared to feed primarily on fish (99% of its diet was made up of fish) and the redbanded rockfish also showed differences in diet selection, feeding primarily on macrobenthos and shrimp. Silvergray rockfish (*S. brevispinis)* fed mainly on fish (74% of diet) but also fed on euphausiids.

Of the flounders, rex sole, English sole, butter sole, Dover sole, rock sole, and flathead sole all showed some similarity in diet components, feeding primarily on macrobenthos, forage fish, meiobenthos and epibenthos in varying amounts. The three skates, big skate, black skate and longnose skate, also showed similarity in diets, all feeding largely on macrobenthos, although black skate also fed on a substantial amount of non-commercial shrimp species (within the epibenthos category).

Overall Pacific cod appeared to have the most varied diet, together with arrowtooth flounder and dogfish, all piscivores. The least varied diets were exhibited by the planktivore Pacific ocean perch, and two benthivores, English sole and Dover sole.

ONTOGENETIC CHANGES IN DIET

Ontogenetic shifts in diet were apparent for most of the 6 species for which the diets of juveniles and adults were compared (Figs. 3-8). For Pacific cod, adults and juveniles both focussed primarily on forage fish, other flatfish and herring, but juveniles appeared to concentrate more on macrobenthos and shrimp than the adults (Fig. 3).

Adult Pacific ocean perch fed almost completely on euphausiids (Fig. 4). The proportion of euphausiids was reduced in the diet of juveniles, and there was greater dependence on macrobenthos and copepods.

Adult arrowtooth flounder fed primarily on fish, including forage fish and herring (Fig. 5). Juvenile arrowtooth flounder also fed primarily on fish, but fed less on forage fish than adults, and ate greater amounts of macrobenthos than adults, as well as more euphausiids and shrimp.

Adult rock sole fed largely on meiobenthos and macrobenthos, as well as forage fish (Fig. 6). Juveniles also appeared to concentrate on these same items but did also have a higher proportion of forage fish in their stomachs.

Both adult and juvenile Dover and English sole fed mainly on meiobenthos and macrobenthos (Figs. 7&8). Adult and juvenile Dover sole diets were almost identical. Juvenile English sole did have a greater proportion of forage fish in their diet than adults, but the diets were still very similar.

Adult and juvenile dogfish showed differences in diet. Juveniles concentrated less on fish (50.4% of diet made up of fish) as compared to adults (80.7% of diet made up of fish), and fed more on macrobenthos and epibenthos than did adults (Fig. 9).

CLUSTER ANALYSIS

Adult and juvenile English sole clustered closely as did adult and juvenile Dover sole, which would be expected based on the similarity of their diets (Fig. 10). Overall, the main clusters appeared to be:

1. Adult and juvenile Pacific ocean perch, eulachon, yellowtail rockfish, sablefish, Pacific sanddab and greenstriped rockfish;

2. Dover sole (adult and juvenile), English sole (adult and juvenile), rex sole, adult rock sole;

3. Big skate, longnose skate, redbanded rockfish, Pacific halibut and ratfish; with speckled sanddab and black skate grouping more loosely with this cluster;

4. Arrowtooth flounder (adult and juvenile), petrale sole, dogfish, and silvergray rockfish; and

5. Walleye pollock, speckled sanddab

6. Pacific cod (adult and juvenile), sand sole and juvenile rock sole

Fig. 11 shows the adult and juvenile Pacific ocean perch, eulachon, yellowtail rockfish, sablefish, greenstriped rockfish and Pacific sanddab cluster. We categorized this group as euphausiid feeders.

Fig. 12 shows the cluster made up of Dover sole (adult and juvenile), English sole (adult and juvenile), rex sole, adult rock sole. This group of benthic feeders focussed almost completely on macrobenthos and meiobenthos.

Fig. 13 shows the big skate, longnose skate, redbanded rockfish, Pacific halibut and ratfish cluster. This group of benthic feeders focuses primarily on macrobenthos as well as small amounts of fishes and does not appear to feed on meiobenthic components as with the previous cluster. Although Pacific halibut was earlier identified as a piscivore because of the presence of fish in its diet, the high proportion of macrobenthos taken by this species placed it together with the other macrobenthic feeders with the cluster analysis. Although speckled sanddab and black skate did cluster fairly loosely with this group, they appeared to focus more strongly on epibenthic groups. When we examined the particular epibenthic groups on which they fed, we found that they chose non-commercial shrimp, which are included in the epibenthic category. Thus we placed these two species with walleye pollock and flathead sole in Fig. 15 discussed below.

Fig. 14 shows the arrowtooth flounder (adult and juvenile), petrale sole, dogfish, lingcod and silvergray rockfish cluster. This group may be categorized as piscivores.

Fig. 15 shows the walleye pollock, flathead sole, speckled sanddab and black skate cluster. This group focuses mainly on shrimp and epibenthos, as well as lesser amounts of macrobenthos. Walleye pollock and flathead sole fed mainly on commercial shrimp, whereas speckled sanddab and black skate fed on non-commercial shrimp species. The separation of shrimp into commercial species (placed in the commercial shrimp group) and the non commercial species (into epibenthos) was not done for biological reasons, but rather for the purposes of the Ecopath model. Further discussion groups these four species as shrimp/epibenthic feeders.

Finally, Fig. 16 shows the adult and juvenile Pacific cod, sand sole and juvenile rock sole cluster. Again, these species appear to be piscivores, but they did not cluster as closely with the other piscivores (feeding on unidentified fish) since stomach contents in this case were clearly identified as forage fish.

Clusters 2 and 3 focus on benthic groups. Figs. 17-18 show the breakdown of the specific benthic groups (Macrobenthos and Meiobenthos subgroups) upon which these species feed. Clear differences are apparent among the groups. Adult rock sole, rex sole, Dover sole adults and juveniles and English sole adults and juveniles focus primarily on annelids (meiobenthos), but also on echinoderms, echiurans, and cnidaria. Big skate, longnose skate, redbanded rockfish, Pacific halibut and ratfish primarily focus on crabs as well as lesser amounts of bivalves and anomurans. In order to distinguish between these two groups, we identify the former group as "annelid feeders" and the latter group as "crab feeders".

In the case of the piscivores, herring showed up as a primary diet component for arrowtooth flounder, lingcod, Pacific cod, petrale sole and dogfish, but not for sand sole or silvergray rockfish (Table 5) . Forage fish showed up as a primary component in the stomachs of arrowtooth flounder, Pacific cod, sand sole and dogfish. Salmon (chum, pink and sockeye) was important to only petrale sole and lingcod. Predatory mesozooplankton was also important for sand sole and silvergray rockfish, and macrobenthos and euphausiids were important to several groups.

The crab feeders showed different preferences for specific macrobenthic species, with crabs of the genus *Cancer* such as the furrowed rock crab, *Cancer branneri*, the graceful rock crab, *C. gracilis* and the red rock crab, *C. productus* of greatest importance, together with gastropod and bivalve molluscs. Forage fish were also important to most of these species, with herring and various flatfish important to some (Table 6).

In the case of the annelid feeders polychaetes were the most important meiobenthic component in each case, but differences were apparent among the groundfish in terms of the species of benthic organisms taken (Table 7). Within this group, only Rock sole and English sole fed on forage fish to any extent.

In the case of the shrimp feeders, black skate focused primarily on *Crangon communis*, whereas speckled sanddab fed mainly on *Crangon alba* (Table 8). Walleye pollock and flathead sole both fed primarily on a commercial shrimp species, *Pandalus tridens*.

In the case of the euphausiid feeders, the species of euphausiids could not always be discerned (Table 9). However, the largest group of identified euphausiids in each case was *Thysanoessa spinifera*, except for eulachon and yellowtail rockfish, for which *Euphausia pacifica* was the most important identified species of euphausiid found within the stomachs.

EXAMINATION OF SEASONAL AND SPATIAL VARIANCE IN DIETS OF GROUNDFISH

Only Pacific cod and dogfish stomachs were processed from Cruise 4, thus there was a second set of summer diet data for these two species only. The seasonal comparisons for all other fish species were among cruises 1-3 (ie 1 summer, 1 fall and 1 winter cruise each). Initially, we examined mean stomach weights by area and by cruise for adult fish of all species except for sablefish, which were all juveniles, and dogfish, for which both adults and juveniles were examined (Figs. 19 &20). Pacific halibut and dogfish had the greatest weight of prey in stomachs. In general, weight of prey contents in stomachs were greater in the fall and winter than for the summer. No consistent patterns could be seen by area, however, although prey content weights were highest overall in area D for both Pacific cod and dogfish, which were the two species sampled from all four areas. Of the benthivores, only big skate, black skate and Dover sole had higher stomach contents in the northern area (A and/or B) as compared with the southern areas (C and D).

SEASONAL AND SPATIAL PATTERNS

Data for this section is in Appendices 3-4.

Benthic feeders: The following benthivores showed spatially invariant diets: Dover sole, rex sole, flathead sole, big skate, black skate, longnose skate, ratfish and redbanded rockfish. In all cases, macro and meiobenthic organisms were important in the diet for all cruise/area combinations, although the specific types of organisms did change. For example, in the case of rex sole, during the first summer cruise focus was primarily on echiurans in area A and on annelids in area C, whereas during the fall, focus was on shrimp in area A, on annelids in area C, and on crabs and annelids in area D, and during the winter, focus was on bivalves and annelids in area A, on annelids in area C and on various crustacea in area D. However, some seasonal variability was apparent. For example, big skate fed on more fish in fall and winter diets than the summer diet, and focussed on other flatfish species in winter which did not show up in the other cruises. Seasonal differences were also seen for redbanded rockfish which did not feed on in the summer but fed on a high proportion of fish in the diet in the fall of 1985.

In the case of English sole adults and juveniles, although benthic organisms were important for each cruise, forage fish ranked first for both adults and juveniles in area A during the fall of 1985. Macrobenthos was also a primary component of the diet of rock sole, although forage fish were preferred in area B in the fall of 1985 and winter of 1986. Primary diet components for walleye pollock varied from cruise to cruise, with focus varying among commercial shrimp, euphausiids, mysids, non-commercial shrimp and various other macrobenthic organisms depending on the cruise and area. Speckled sanddab focussed primarily on euphausiids, but sandlance was of primary importance in area B during the winter cruise.

Planktivores: The following planktivores showed spatial invariance in diet: Pacific ocean perch adults and juveniles, greenstripe rockfish, yellowtail rockfish and Pacific sanddab. Sablefish focused on different items during each cruise, varying from fishes in the summer cruise in 1985, to annelids in area A and euphausiids in area C of the fall cruise in the same year.

Piscivores: These species showed more spatial variability: arrowtooth flounder showed a varied diet, concentrating mainly on fish, euphausiids and macrobenthos, with euphausiids particularly favoured in area A during the summer 1985 for both adults and juveniles. When diet for all areas was pooled, it was apparent that herring was the most important component in the summer, whereas unidentified fish were most important in the fall and winter. Overall, the proportion of fish in the diet was greatest overall in the fall.

Pacific cod diet also exhibited a variable diet, and primary components varied from area to area. The focus was particularly on macrobenthos, forage fish and shrimp, but different components differed in importance during the cruises, for example, unidentified fish in the summer cruises in

1985 and 1987, forage fish in the fall of 1985 and herring in the winter cruise of 1986. Again, the proportion of fish in the diet was higher in fall and winter than summer.

Pacific halibut concentrated mainly on macrobenthos (bivalves and/or crabs) and fish, but fed primarily on fish during the fall cruise in areas A and D, and in the winter cruise in areas C and D. Thus, again seasonal changes were apparent, with more fish taken in the winter and fall diets than summer diet (primarily herring in the winter).

Dogfish concentrated primarily on fish and euphausiids, although macrobenthos was dominated in area B over all years. This species also showed more fish in the winter diet than other seasons, and herring was main diet component in cruise 3 (winter) which was not seen in the other cruises.

Petrale sole also fed mainly on benthic organisms and shrimp except for in area C in winter, where herring and other fish were the primary components. Petrale sole also showed seasonal changes with more fish (primarily herring) in the winter diet than the summer and fall diets, and no fish at all in the summer diet.

In summary, the following 8 species appeared to have a relatively spatially invariant diet: Pacific cod, Dover sole, big skate, black skate, longnose skate, ratfish, rex sole, walleye pollock, English sole. The following 7 species were found in too limited a number of locations to be able to comment on the spatial variance: Pacific ocean perch, redbanded rockfish, silvergray rockfish, yellowtail rockfish, sablefish, Pacific sanddab, petrale sole (but differences did appear to exist), and flathead sole. Finally, the diet for the following 5 species did show spatial variance: rock sole, arrowtooth flounder , dogfish, Pacific halibut, and English sole.

Seasonal differences were apparent for Pacific halibut, dogfish, big skate, Pacific cod, petrale sole, rock sole, English sole, walleye pollock, arrowtooth flounder, silvergray rockfish, and sablefish. The following 6 species showed seasonally invariant diets: black skate, ratfish, yellowtail rockfish, rex sole, flathead sole, Dover sole and there were not enough comparisons for Pacific ocean perch and longnose skate to be able to determine seasonal patterns. Overall, more species showed seasonal variability than spatial variability. In addition, the benthic species showed less seasonal and spatial variance in diets as compared to the piscivores. Spatial/seasonal diets are shown for two piscivores, arrowtooth flounder and dogfish (Figs. 21&22); as compared with a benthivore (ratfish) that shows very low spatial and seasonal variability in diet (Fig. 23).

BREADTH OF DIET

For those species that did display seasonal variation in the number of components taken in the diet, most (dogfish, big skate, redbanded rockfish, arrowtooth flounder, rex sole, flathead sole, Pacific halibut, rock sole, Dover sole) showed greatest number of components (pooled to the level in Table 2) in the diet in the fall of 1985 (Table 10). Thus overall, greatest diet breadth occurred for most fish species during the fall of 1985.

DIET OF BENTHIVORES RELATIVE TO PREY AVAILABILITY

The benthic organisms found within the diets of the benthivores English sole, rex sole, and Dover sole were compared with the primary benthic organisms identified as most common within each spatial area (A-D) (Burd and Brinkhust 1987; Table 11). We chose these three species since they fed on both macrobenthic and meiobenthic components. The comparison is hindered by the fact that often polychaetes and other groups were not identified down to the species level due to the state of digestion of the organisms within the stomachs. However, using the top diet components as a guide, and focussing on the identified species, it is apparent that in no case were the benthivores apparently favouring the most abundant species of benthic organisms available. In addition, although there is some overlap of species taken by English sole, Dover sole and rex sole, in general, there were marked differences among the groups in terms of the favoured species.

ECOPATH RESULTS

The trophic structure of the Hecate Strait food web as output from the balanced Ecopath model is shown in Figure 24. It is apparent that the Hecate Strait groundfish occupy more than one trophic level. For example, Pacific ocean perch is a planktivore (level 2-3), English sole feeds primarily on annelids (level 3-4), and Pacific cod and lingcod are piscivores (level 4). The top groundfish predators, as shown by trophic level, are Pacific cod, lingcod, dogfish, and other rockfish. In general, ontogenetic differences are clear, in that adult fish tend to occupy higher trophic levels than juveniles of the same species. The exception to this is for rock sole, where juveniles occupy a higher trophic level due to a high proportion of sandlance found within juvenile rock sole stomachs.

A further output from the model is the diagram of mixed trophic impacts (Fig. 25). We can use this to examine the relative impacts of any one group on other functional groups. The bars in this figure show relative, not absolute, impacts, but are comparable between groups (Christensen, et al., 2000). Bars pointing downwards indicate negative impacts, whereas positive impacts (beneficial predation) are shown by the bars pointing upwards. In this latter case, the negative direct impact on prey is reduced by indirect positive impacts. This may result when a predator feeds on another predator or competitor of the prey. As can be seen in the figure, phytoplankton, spring zooplankton, copepods, euphausiids, and predatory mesozooplankton all show positive impacts on a wide variety of species, since these items are the base of the food chain. Herring and forage fish also show positive impacts on a wide variety of species, due to their importance as prey items in the food chain.

Juvenile sablefish have a positive impact on ratfish and a negative impact on dogfish. The positive impact on ratfish is no doubt the result of the predation by sablefish on dogfish. This feeding on dogfish by sablefish benefits ratfish since dogfish are one of their main predators. Transient killer whales have positive impacts on benthivores and Pacific cod, probably because of the impact of feeding on their seal and sea lion predators.

Pacific cod shows negative effects on juvenile POP, Inshore rockfish, Dover sole, arrowtooth flounder, as well as on juvenile rock sole and English sole. These effects are likely due to predation, except for the interactions with Dover, English and rock sole, which are probably competition, since these fish were not prey items of Pacific cod.

Dogfish show negative impacts on ratfish, juvenile rock sole and coho salmon, all the result of predation, and also show a positive impact on juvenile sablefish, for which they are a prey item.

Finally we used the output from the Ecopath software to examine niche overlap (Table 12, Fig. 26). The table shows all the predator and prey impacts, whereas the figure plots those species that show both a high predator *and* a high prey overlap (both over 40%). It is apparent that most groundfish species were more likely to overlap in their choice of prey items rather than in their shared predators.

Predator overlaps were particularly high (>50%) for juvenile sablefish and halibut, Dover sole and juvenile POP, juvenile rock sole and both Dover sole and juvenile POP, adult English sole and adult rock sole, adult and juvenile Pacific cod, juvenile English sole and juvenile rock sole, arrowtooth flounder and juvenile POP, arrowtooth flounder and Dover sole, arrowtooth flounder and juvenile English sole, adult Pacific cod and adult rock sole, adult Pacific cod and adult English sole, and herring and forage fish (Table 12).

Prey overlap was particularly high(>50%) for dogfish and juvenile rock sole, lingcod and arrowtooth flounder, juvenile and adult rock sole and arrowtooth flounder, juvenile Pacific cod and juvenile rock sole, adult and juvenile Pacific cod and lingcod, Dover sole and ratfish, lingcod and dogfish, adult rock sole and juvenile Pacific cod, adult rock sole and ratfish, adult rock sole and dogfish, halibut and Dover sole, skates and dogfish, adult and juvenile rock sole, and lingcod and adult rock sole (Table 12).

Several species shared both a high level of prey items and were predated on by similar organisms: both predator and prey overlap were particularly high (both >40%) for adult Pacific cod and adult rock sole, juvenile rock sole and arrowtooth flounder, juvenile English sole and Dover sole, adult English sole and adult rock sole, and adult and juvenile Pacific cod, and juvenile Pacific cod and adult rock sole (Fig. 26).

Discussion

In summary, our examination of stomach content data for 30 species of groundfish caught between 1985-1987 in Hecate Strait, resulted in the identification of five major feeding strategies: piscivores, planktivores (euphausiid feeders), shrimp feeders, macrobenthivores and benthivores (macro- and meiobenthic feeders). Of these groups, it was apparent that the greatest diet breadth was exhibited by the piscivores, particularly dogfish, Pacific cod and Pacific halibut, whereas the lowest diet breadth was exhibited by benthivores such as black skate, longnose skate, Dover sole and English sole, and the planktivore, Pacific ocean perch. Flatfish were split evenly among the benthivore and piscivore classes, with Pacific halibut, petrale sole, rock sole, butter sole, lingcod, sand sole and arrowtooth flounder showing greatest reliance on various fish species, and speckled sanddab, rex sole, flathead sole, English sole and Dover sole showing greatest reliance on benthic organisms. Pacific sanddab also fed on benthic prey, but was classified as a planktivore due to the high proportion of euphausiids found in its diet. With the exception of spiny dogfish, all the elasmobranchs studied (big skate, black skate, longnose skate and ratfish) were classified as benthivores.

Ontogenetic variability in diet was most apparent for the piscivores: juveniles fed on macrobenthic groupings to a greater extent than the adults, which showed greater reliance on fish. The benthivore Dover sole did not appear to show strong ontogenetic changes in diets. Juvenile Pacific ocean perch relied on copepods and benthic organisms to a greater extent than the adults, which fed almost solely on euphausiids, but both adults and juveniles fed on euphausiids. Interestingly, two benthivores, rock sole and English sole, showed particularly high proportions of forage fish in the juvenile diets. Conversely, Lang et al. (1995) found that juvenile rock sole fed on more gammarids and fewer polychaetes and fish than adults. However, the authors also suggested that large, soft-bodied, high calorific prey such as fish may be digested much more slowly and remain in the stomach longer than smaller prey with exoskeletons, such as amphipods (Huebner and Langton 1982). Ontogenetic shifts in diet of fish have been documented by many authors (e.g. Schmitt and Holbrook 1984; Ross 1978; Grossman 1980). We would expect higher levels of fish prey in the diet of older fish, which will have higher mobility, and larger mouth gape, and this was found to be the case for most of the piscivores studied.

Seasonal/spatial comparisons of diet were made for most species and seasonal variation in diets was generally more common than spatial variation during a season. Most species showing seasonal variation in diet displayed a higher proportion of fish in their diets in the fall or winter over their summer diets. In addition, the number of components in the diet was higher in the fall of 1985 than the summer of 1985 and winter of 1986 for the majority of species.

Benthivores tended to show least spatial and temporal variability in diets as compared with piscivores. Other studies have found similar differences in diet constancy among these groups (e.g. Link et al. 2002). In their study of flatfish in the Northwest Atlantic, benthivores showed constancy in diet choice over a 20 year time series, whereas some of the piscivores showed significant changes in diet composition over the time series. We might question whether specialized benthic and plankton feeders in Hecate Strait might be at a disadvantage in the long term. However, time series of abundance of the fish species in this study from surveys done in Hecate Strait since 1984 show similar levels of temporal variability for both grazers and piscivores (Alan Sinclair DFO, pers. comm.). Such variations might be related to natural fluctuations in abundance of polychaetes, bivalves, crabs, echinoderms and echiurans, which were the most important groups taken by benthivores. Only one short-term detailed study of benthic fauna has taken place in Hecate Strait (Burd and Brinkhurst 1987), but no long term studies have been carried out in this region.

Burd and Brinkhurst (1987) examined the macrobenthic fauna during the same cruises from which stomach samples were collected and concluded that depth and geographic proximity were the most important environmental factors studied that affected benthic fauna. Polychaetes, gastropods, and echinoderms were found most commonly in the stomachs of the benthivores, which were three of the dominant groups of benthos found in Hecate Strait. However, the differences in benthic biomass among cruises (lowest during the first summer 1985 cruise) and areas (higher in areas A and B than C and D) were not generally reflected in stomach content weights or breadth of diet for the species studied. Three benthivores, English sole, Dover sole and rex sole, did show spatial differences both within and among the species in their diets. The choices of benthic organisms did not match the benthic species identified by Burd and Brinkhurst (1987) as being most common in each spatial area. Thus, the benthivores likely have distinct preferences that may possibly reduce the dietary overlap among species that are feeding on similar groups e.g. polychaetes, bivalves, crustaceans and echinoderms.

The bottom features and depths of the four sampling areas A, B, C and D in Hecate Strait were well described by Burd and Brinkhurst (1987). These differences will affect both the fish species present as well as the types of benthos and other prey items available. Fargo and Tyler (1991) found four relatively stable fish assemblages in Hecate Strait, which were dominated by flatfish species and characterized by depth and bottom type. They found persistent boundaries in the 50-60 m range and the 130-140 m range. The Butterworth assemblage (Area A) appeared to be dominated by arrowtooth flounder, Dover sole, rex sole and ratfish, the Moresby Gully assemblage (Area C) by Pacific ocean perch and other rockfish species, the Bonilla (Area D) assemblage by Pacific cod, English sole and Dogfish, and the Reef Island (Area B) assemblage by dogfish, skate, halibut and Rock sole. These authors noted that Dover sole, which prefer feeding on organisms in mud sediments, appeared to be important in the Butterworth assemblage but not in the Bonilla assemblage. The Reef Island assemblage appeared to contain fewer flatfish species as dominants than the Butterworth or Bonilla assemblages. They suggested that this may be because less of the preferred substrate, sand and mud, exists in this location. In contrast, they noted that two piscivores, rock sole and halibut, were apparently dominant in this area.

We may assess the possible competitive and predator-prey interactions by examining the spatio-temporal overlap, (assessed from catches in the B.C. trawl fishery), of species showing similar diet choices. Most species move into deeper water in the winter except for English sole, rock sole, Pacific cod, skates, flathead sole and ratfish which remain at similar depths all year. Many species are caught in much lower numbers in the winter, including lingcod, flathead sole, rex sole, sablefish, arrowtooth flounder, petrale sole and Dover sole. Some of these species, for example petrale sole, arrowtooth flounder and Dover sole tend to show a much wider spread of depth distributions in the winter than the summer, which may be the result of competition for food or predation effects. Some species show similar spatial and depth distributions all year, such as English sole, ratfish, skates and Pacific ocean perch.

In summer in the Butterworth Assemblage (Area A), the most abundant species area are arrowtooth flounder, Dover sole, English sole, rex sole and ratfish (Fargo and Tyler 1991). In the winter, Dover sole are absent and arrowtooth flounder and dogfish are less abundant. Of these species, it would appear that competition may occur between Dover sole, Rex sole and English sole and also between dogfish and Pacific cod based on our cluster analyses. However, we need to focus also on depth preferences of these species as it is possible that they could coexist, but be in very different parts of the water column. Dogfish move from shallow depths in summer to deeper depths in winter. They appear to be found at a mean depth of 150 m in the summer and 250 m in the winter, and are most common in this area during August to November. Pacific cod remains at a mean depth of around 120 m year round and are found within this area year round. These species are unlikely to interact greatly during the winter months but could impact one another during the summer months, particularly August - November.

English sole appears to remain at a mean depth of 100 m and within this area year round. Dover sole move very deep (4-500 m) in the winter, and are mostly absent from this area during December to April, but are found at a mean depth of about 150m and within this area in the summer (highest abundance is in June). Rex sole moves from a summer mean of 120 m to a winter mean depth of around 250 m and are most abundant within this area during May-December. All three species may impact one another during summer months.

Ratfish remain at shallow depths (mean of 120 m) all year. None of the species within the ratfish feeding cluster are abundant in this area. However, ratfish appeared to feed primarily on macrobenthos, which is also targeted by Dover sole, rex sole, and English sole so competitive effects are possible between ratfish and English sole year round, and between ratfish and both rex sole and Dover sole during the summer.

In the Reef Island Assemblage (Area B), we expect competition between halibut and big skate based on their diets. Halibut moves from a summer mean depth of 100 m to a winter mean of about 250-300 m. Skates tend to remain at a mean depth of 100 m year round. These two species would interact and could compete over the summer months. Dogfish apparently moves out of the area completely, but some halibut remain (Fargo and Tyler 1991). The seasonal diet variation for Pacific halibut, rock sole and big skate was examined to try to determine whether the movement of dogfish out of the environment has any impact on these other species. However, breadth of diet did not appear to increase for any of these species over the winter period.

In the Bonilla Assemblage (Area D), the summer assemblage is made up of Pacific sanddab, halibut, rex sole, English sole and dogfish (Fargo and Tyler 1991). The winter assemblage is made up of the same species but dogfish are rare. Of the above species we may expect competition between rex sole and English sole. These species are both found in this area year round, but rex sole moves to greater depths than English sole during the winter. Thus, these species may compete during the summer months.

In summary, in the deep and cool Butterworth Assemblage, it would appear that dogfish and Pacific cod are unlikely to interact greatly during the winter months but could impact one another during the summer months. English sole, Dover sole and Rex sole may impact one another during summer months. Competitive effects were also likely between ratfish and English sole year round, and between ratfish and both Rex sole and Dover sole during the summer.

In the shallow and warm Reef Island Assemblage the spatial and diet overlap suggested that competition could occur between halibut and big skate. Based on depth preferences, these two species would interact and could compete over the summer months. Finally, in the intermediate depth Bonilla Assemblage competition could occur between Pacific cod, arrowtooth flounder and dogfish, and also between Rex sole and English sole during the summer.

Burd and Brinkhurst (1987) examined the macrobenthic fauna from grab samples during the same cruises from which stomach samples were collected. They noted that the four areas (A,B,C and D) were statistically distinct in terms of species abundance of benthic organisms and that total wet weights (and possibly productivity) of benthos were much higher in the two northerly

Areas A and B than in southerly Areas C and D with lowest biomasses collected overall during the first cruise (June 1985) than in all the others. The infaunal biomass was dominated by Nemertea, Polychaeta, Gastropoda, Pelecypoda, Ophiuroidea and Echinoidea. We compare specific benthivore diets with the predominant species recorded in each area in the results section. It was apparent, using the top diet components as a guide, and focussing on the identified species, that in no case were the benthivores apparently favouring the most abundant species of benthic organisms available. In addition, although there was some overlap of species taken by English sole, Dover sole and rex sole, there were generally marked differences among the groups in terms of the favoured species.

Overall, the benthivores tend to show the least variable seasonal depth distributions, and were generally spatially sedentary. In contrast, piscivores such as petrale sole, dogfish, and arrowtooth flounder, tend to show large migrations to depth in the winter, while dogfish, arrowtooth flounder and Pacific cod also show very variable spatial distributions over the year. Like the benthivores, shrimp and euphausiid feeders tend to show more habitat fidelity, and only Walleye Pollock and sablefish display migrations to depth in the winter.

Dogfish, Dover sole, arrowtooth flounder and bocaccio show seasonal bathymetric migrations to deeper water during the winter. The transient habit of arrowtooth flounder and dogfish may be critical to community structure within the different spatial regions within Hecate Strait, since these two species have the highest biomass in Hecate Strait (Fargo and Tyler 1991). Time series of abundance for these two species for 1984-2000 survey data show that arrowtooth flounder has apparently increased since 1993, whereas trends for dogfish are fairly stable between 1984-2000. The diet breakdown suggests that dogfish could impact the abundance of herring, salmon, rock sole, and English sole in Hecate Strait. Arrowtooth flounder could impact herring and walleye pollock and inshore rockfish based on diet composition and could compete with dogfish, Pacific cod, petrale sole and halibut for herring.

Future work will incorporate more recent habitat and sediment assessments of the different areas of the Strait, and use this information to further examine the specific species preferences of the different species examined during this study with respect to habitat. However, as many authors have noted, degree of diet overlap and similarity will depend on the level of prey identification (e.g. Zhang 1988). More detailed future studies of the benthic infaunal species composition, abundance and spatial distribution, together with long-term studies of groundfish diets, would allow us to examine the relative fluctuations in abundance of benthic fauna and forage fish, temporal changes in fish diets, the effects of pulses in abundance of predators such as Pacific cod on the food web, as well as to discern the critical environmental factors shaping the species assemblages within Hecate Strait.

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Table 1. Number of predator stomachs sampled from the four different stomach sampling stations, A,B,C and D, between 1985-1987, for all four cruises pooled.

Predator Species	A	B	C	D	Totals *	No. fish with empty stomachs
Arrowtooth Flounder (Turbot) (*Atheresthes stomias*)	503		415	59	977	67
Big Skate (*Raja binoculata*)	7	110	1	16	134	
Black Skate (*Raja kincaidi*)	27		6		33	
Butter sole (*Iopsetta isolepsis*)		4		2	6	1
Curlfin sole (*Plueronichthys decurens*)				1	1	
Dover sole (*Microstomas pacificus*)	89		207	9	305	5
English sole (*Parophrys vetulus*)	73	81	79	200	433	13
Eulachon (*Thaleichthys pacificus*)	10			10	20	3
Flathead sole (*Hippoglossoides elassodon*)			100		100	3
Lingcod (*Ophiodon elongatus*)	7		16	7	30	5
Longnose skate (*Raja rhina*)	2	20	8		30	
Pacific cod (*Gadus macrocephalus*)	188	96	187	102	573	16
Pacific Halibut (*Hipploglossus stenolepsis*)	95	41	11	8	155	3
Pacific sanddab (*Citharichthys sordidus*)	1			95	96	2
Petrale sole (*Eopsetta jordani*)	2		46	58	106	2
Ratfish (*Hydrolagus colliei*)	299		257	16	572	30
Rex sole (*Errex zachirus*)	190		331	62	583	13
Rock sole (*Lepidosetta bilineata*)	2	310		39	351	1
Sablefish (*Anoplopoma fimbria*)	46		130		176	3
Sand sole (*Psettichthys melanostrictus*)		201			201	2
Pacific ocean perch (*Sebastes alutus*)	5		119		124	6
Redbanded Rockfish (*Sebastes babcocki*)	1		46		47	
Silvergray Rockfish (*Sebastes brevispinis*)	5		34		39	
Greenstripe Rockfish (*Sebastes elongatus*)			4		4	
Yellowtail Rockfish (*Sebastes flavidus*)	30		30		60	2
Bocaccio Rockfish (*Sebastes paucispinis*)	2		6		8	
Speckled Sanddab (*Citharichthys stigmaeus*)		89			89	
Spiny Dogfish (*Squalus acanthias*)	119	470	249	6	844	45
Starry Flounder (*Platichthys stellatus*)			3		3	
Walleye Pollock (*Theragra chalcogramma*)	25	1	142	54	222	4
Totals	1728	1423	2427	744	6322	226

* Includes the fish with empty stomachs

Table 2: Diet Groupings derived from the stomach data of the groundfish species collected 1985-1987**.**

Group Name	
Chinook (*Onchorhynchus tschawytscha*)	Macrobenthos
Coho (*Onchorhynchus kisutch*)	Meiobenthos
Commercial Shrimp	Other Flatfish
Copepods	Pacific Cod, Adult (*Gadus macrocephalus*)
Detritus	Pacific Cod, Juvenile
Dogfish (*Squalus acanthias*)	Pacific ocean perch, Adult (*Sebastes alutus*)
Dover sole (*Microstomas pacificus*)	Pacific ocean perch, Juvenile
Dungeness Crab (*Cancer magister*)	Phytoplankton
English Sole, Adult (*Parophyrys vetulus*)	Predatory invertebrates
English Sole, Juvenile	Predatory mesozooplankton
Epibenthos	Ratfish (*Hydrolagus colliei*)
Euphausiids	Rock Sole, Adult (*Lepidosetta bilineata*)
Forage Fish	Rock Sole, Juvenile
Halibut (*Hipploglossus stenolepsis*)	Sablefish, Juvenile (*Anoplopoma fimbria*)
Herring, Adult	Shallow water benthic fish
Herring, Juvenile	Squid
Inshore rockfish	Transient Salmon
Jellies/Macrozooplankton	Arrowtooth flounder (*Atheresthes stomias*)
Lingcod (*Ophiodon elongatus*)	

Table 3. Main diet components (all data pooled), spatial distribution (regular or irregular) and depth distribution of the groundfish species collected 1985-1987.

FEEDING GROUP	PRIMARY DIET COMPONENTS	SPATIAL DISTRIBUTION	DEPTH DISTRIBUTION
<u>Grazers</u>			
Rockfish			
Redbanded rockfish	Macrobenthos (40%), commercial shrimp (22%) and unidentified fish (17%).	Regular	Regular
Gadoids			
Walleye Pollock	Commercial shrimp (62%), epibenthos (13%), euphausiids (11%)	Irregular	Irregular: Deeper in winter
Elasmobranchs			
Big skate	Macrobenthos (63%), forage fish (17%), unidentified fish (9%)	Regular	Regular
Black skate	Epibenthos (42%), macrobenthos (40%), meiobenthos (11%).	Regular	Regular
Longnose skate	macrobenthos (72%), other flatfish (11%), forage fish (8%).	Regular	Regular
Ratfish	Macrobenthos (81%), meibenthos (8%)	Regular	Regular 97m (May)-136m (Feb)
Flatfish			
Speckled sanddab	Epibenthos (60%), macrobenthos (16%), forage fish (14%)	Regular	Regular
Rex sole	Macrobenthos (41%), meiobenthos (35%), epibenthos (21%)	Regular	Deeper in winter 150m (Sept)-193m (Feb)
Flathead sole	Commercial shrimp (62%), epibenthos (25%), macrobenthos (11%)	Regular	Regular 113m (April)-146m (Oct)
English sole	Meiobenthos (62%), macrobenthos (27%), forage fish (8%)	Regular	Regular 90m (May)-113m (Dec)
Dover sole	Meiobenthos (54%), macrobenthos (43%)	Irregular	Deeper in winter 163m (Sept)-334m (March)

Piscivores			
Rockfish			
Silvergray rockfish	Unidentified fish (64%), euphausiids (28%), Walleye pollock (9%)	Regular	Deeper in winter
Bocaccio	Walleye pollock (85%), unidentified fish (13%)	Regular	Deeper in winter
Gadoids			
Pacific cod	Forage fish (31%), unidentified fish (17%), other flatfish (16%), herring (9%)	Regular	Regular 99m (Jul)- 138m (Dec)
Elasmobranchs			
Dogfish	Unidentified fish (34%), macrobenthos, (18%), herring (16%), forage fish (12%)	Irregular	Deeper in winter 80m (Aug)- 211m (Feb)
Flatfish			
Pacific halibut	Macrobenthos (44%), unidentified fish (10%), forage fish (10%), arrowtooth flounder (10%), other flatfish (8%)	Irregular	Irregular: Deeper in winter 100m (Jul)- 257m (Jan)
Petrale sole	Herring (49%), unidentified fish (21%), epibenthos (20%)	Irregular	Irregular: Deeper in winter 108m (Jul)- 302m (March)
Rock sole	Forage fish (41%), meiobenthos (26%), macrobenthos (25%)	Regular	Regular 56m (May)- 70m(Sept)
Butter sole	Forage fish (84%), meiobenthos (11%)	Regular	Regular
Lingcod	Unidentified fish (65%), herring (10%), English sole (9%)	Irregular	Irregular: Deeper in winter 105m (July)- 172m (Feb)
Arrowtooth flounder	Unidentified fish (51%), herring (13%), macrobenthos (12%), forage fish (10%)	Irregular	Deeper in winter 133m(Aug)- 305m (Jan)
Sand sole	Forage fish (36%), unidentified fish (26%), shallow water benthic fish (15%), other flatfish (10%)	Regular	Regular

Planktivores			
Forage fish			
Eulachon	Euphausiids (57%), macrobenthos (43%)	Regular	Regular
Rockfish			
Pacific ocean perch	Euphausiids (90%), macrobenthos (7%)	Regular	Irregular 223m (Aug)-293m (Jan)
Greenstripe rockfish	Euphausiids (82%), macrobenthos (12%)		Irregular
Yellowtail rockfish	Euphausiids (58%), commercial shrimp (21%), marobenthos (14%)	Irregular	Regular
Sablefish	Euphausiids (58%), unidentified fish (16%), macrobenthos (11%)	Irregular	Irregular: Deeper in winter 168m (Jan)-288m (Jun)
Flatfish			
Pacific sanddab	Euphausiids (49%), epibenthos (42%), macrobenthos (11%)	Regular	Regular

Table 4. Percentage by weight of prey fish species in the stomachs of the piscivores collected between 1985-1987.

Diet item/ Predator species	Dogfish	Pacific cod (adult)	Pacific cod (juv)	Arrowtooth flounder (adult)	Arrowtooth flounder (juv)	Halibut	Petrale sole	Rock sole (juv)	Sand sole	Silvergray Rockfish	Lingcod
Unidfish	33.9	16.9	16.5	52.5	37.8	10.1	21.1	1.3	26.1	63.52	64.56
Forage fish	11.9	31.9	27.4	10.8	4.6	10.06		74.14	36.04		
Other flatfish	2.6	18.04	0.05	0.3		7.5	0.02		9.6		7.21
SWB*	0.8	1.5	2.5	2.2	3.3	4.1	1.4	0.03	15.0	0.16	7.73
Arrow-tooth flounder		0.9				9.8					
Herring	16.3	9.3	9.8	14.2	4.2	7.3	48.8				10.3
Salmon	1.6					1.8	0.6				1.61
Pacific cod		0.4				1.0					
Inshore rockfish		0.08	2.2	1.7							
Pollock		6.1		0.07		0.09	1.02			8.63	
Dover sole						0.1					
Ratfish	1.6										
Dogfish											
Rock sole	0.04								3.8		
Pacific ocean perch		0.7									
English sole	0.2										8.51
Total propn of fish in diet	68.94	85.82	58.45	81.77	49.9	51.85	72.94	75.47	90.54	72.31	99.91

***SWB= Shallow water benthic fish**

Table 5. Top ten species (by weight) in stomachs of the piscivores. Weight is expressed as a proportion of all diet items for all hauls pooled**.**

ARROWTOOTH FLOUNDER	LINGCOD	PACIFIC COD	PETRALE SOLE	SAND SOLE	SEBASTES BREVISPINIS	DOGFISH
44.9 % other fish OSTEICHTHYES*	14.3% other fish OSTEICHTHYES	30.2% forage fish AMMODYTES HEXAPTERUS	47.2% herring HERRING, PACIFIC	36.0% predatory mesozooplankton LYSIANASSIDAE	42.7% other fish UNID. FISH	20.9% other fish OSTEICHTHYES
12.7% herring HERRING, PACIFIC	10.3% herring HERRING, PACIFIC	14.9% other flatfish ACANTHOPTERYGII PLEURONECTIFORMES	21.1% other fish OSTEICHTHYES	16.7% forage fish AMMODYTES HEXAPTERUS	20.8% other fish OSTEICHTHYES	17.3% Herring HERRING, PACIFIC
9.8% forage fish AMMODYTES HEXAPTERUS	8.5% english sole SOLE, ENGLISH	9.6% other fish UNID. FISH	16.7% epibenthos MYSIDACEA	9.5% other fish UNID. FISH	17.5% euphausiids THYSANOESSA SPINIFERA	12.0% forage fish AMMODYTES HEXAPTERUS
7.4% macrobenthos MALACOSTRACA EUMALACOSTRACA	7.7% shallowwater benthic fish SCULPIN, GREAT	9.3% herring HERRING, PACIFIC	2.9% euphausiids EUCARIDA EUPHAUSIACEA	8.8% other fish OSTEICHTHYES	10.0% euphausiids EUCARIDA EUPHAUSIACEA	10.6% other fish UNID. FISH
5.6% euphausiids THYSANOESSA SPINIFERA	7.2% other flatfish LIMANDA ASPERA	7.2% other fish OSTEICHTHYES	2.7% epibenthos NEOMYSIS KADIAKENSIS	5.9% shallowwater benthic fish ACANTHOPTERYGII SCORPAENIFORMES COTTOIDEI	8.6% walleye pollock POLLOCK, WALLEYE	8.9% Euphausiids THYSANOESSA SPINIFERA
5.6% other fish UNID. FISH	1.6% salmon SALMON, SOCKEYE	5.3% walleye pollock POLLOCK, WALLEYE	1.6% herring CLUPEIDAE	5.4% shallowwater benthic fish COTTIDAE	0.2% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA	3.5% predatory invertebrates OCTOPUS DOFLEINI
2.3% macrobenthos EUCARIDA DECAPODA NATANTS	0.3% other fish UNID. FISH	3.5% epibenthos CRANGON ALBA	1.0% walleye pollock POLLOCK, WALLEYE	3.8% other flatfish ACANTHOPTERYGII PLEURONECTIFORMES	0.2% shallowwater benthic fish SMELT, NIGHT	2.6% Macrobenthos CARDITIDAE
1.9% commercial shrimp PANDALUS JORDANI	0.1% meiobenthos NEMATODA	1.7% macrobenthos EUCARIDA DECAPODA NATANTS	1.0% macrobenthos EUCARIDA DECAPODA NATANTS	2.9% rock sole SOLE, ROCK	<0.001% jellies/ macrozooplankton HYDROZOA HYDROIDA	2.1% Macrobenthos PAGURIDAE
1.8% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA		1.5% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA	0.8% shallowwater benthic fish AGONIDAE	2.5% epibenthos CRANGON SPP.	<0.001% meiobenthos NEMATODA	1.8% Macrobenthos PAGURUS SPP.
1.5% inshore rockfish SEBASTES SPP.		1.4% commercial shrimp PANDALUS TRIDENS	0.6% salmon PROTACANTHOPTERYGII SALMONIFORMES	2.0% other flatfish PLEURONECTIDAE	<0.001% predatory mesozooplankton HYPERIIDAE	1.3% Ratfish HYDROLAGUS COLLIEI

*the diet grouping is followed by the genus or species name.

Table 6. Top ten species (by weight) in stomachs of the crab feeders. Weight is expressed as a proportion of all diet items for all hauls pooled.

BIG SKATE	SEBASTES BABCOCKI	LONGNOSE SKATE	PACIFIC HALIBUT	RATFISH
26.3% macrobenthos EUCARIDA DECAPODA PLEOCYEMATA BRACHYURA	40.2% macrobenthos EUCARIDA DECAPODA NATANTS	24.4% macrobenthos CANCER BRANNERI	10.4% macrobenthos CARDITIDAE	28.7% macrobenthos MOLLUSCA BIVALVIA
16.5% forage fish AMMODYTES HEXAPTERUS	20.0% commercial shrimp PANDALUS JORDANI	23.0% macrobenthos CANCER GRACILIS	10.1% forage fish AMMODYTES HEXAPTERUS	10.9% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA
13.5% macrobenthos CANCER GRACILIS	17.2% other fish OSTEICHTHYES	10.8% other flatfish ACANTHOPTERYGII PLEURONECTIFORMES	9.8% turbot FLOUNDER, ARROWTOOTH	8.5% macrobenthos MOLLUSCA GASTROPODA
8.3% other fish OSTEICHTHYES	4.8% meiobenthos NEMATODA	8.4% macrobenthos REPTANTIA	8.2% other fish OSTEICHTHYES	7.1% macrobenthos OPHIUROIDEA
6.2% macrobenthos CANCER PRODUCTUS	3.1% predatory invertebrates MOLLUSCA CEPHALOPODA	6.9% macrobenthos CANCER PRODUCTUS	6.6% macrobenthos MOLLUSCA BIVALVIA	7.0% macrobenthos PAGURIDAE
5.5% macrobenthos CANCER BRANNERI	3.0% small squid ROSSIA PACIFICA	6.4% forage fish AMMODYTES HEXAPTERUS	6.3% herring HERRING, PACIFIC	5.3% macrobenthos YOLDIA SCISSURATA
3.8% macrobenthos PAGURIDAE	2.1% commercial shrimp PANDALUS SPP.	4.1% macrobenthos PAGURUS SPP.	6.3% macrobenthos CANCER BRANNERI	5.2% meiobenthos POLYCHAETA
3.5% macrobenthos EUCARIDA DECAPODA NATANTS	2.0% other flatfish PLEURONECTIDAE	3.4% epibenthos CRANGON SPP.	4.8% macrobenthos CANCER PRODUCTUS	2.4% other fish OSTEICHTHYES
2.6% other flatfish PLEURONECTIDAE	1.2% forage fish AMMODYTES HEXAPTERUS	2.8% epibenthos CRANGON ALBA	4.4% macrobenthos CANCER GRACILIS	2.2% macrobenthos EUCARIDA DECAPODA NATANTS
1.8% other flatfish ACANTHOPTERYGII PLEURONECTIFORMES	1.1% shallowwater benthic fish PRICKLEBACK, SNAKE	1.9% macrobenthos POLINICES LEWISI	3.5% other flatfish ACANTHOPTERYGII PLEURONECTIFORMES	1.9% salmon SALMON, PINK

Table 7. Top ten species (by weight) in stomachs of the annelid feeders. Weight is expressed as a proportion of all diet items for all hauls pooled**.**

DOVER SOLE	ENGLISH SOLE	REX SOLE	ROCK SOLE
24.4% meiobenthos POLYCHAETA	meiobenthos POLYCHAETA	17.4% epibenthos CRANGON ALBA	40.3% forage fish AMMODYTES HEXAPTERUS
10.9% macrobenthos CNIDARIA	8.2% forage fish AMMODYTES HEXAPTERUS	16.8% macrobenthos ECHIURA	8.2% macrobenthos MOLLUSCA BIVALVIA
6.1% macrobenthos OPHIUROIDEA	6.1% meiobenthos TRAVISIA JAPONICA	11.4% macrobenthos PINNIXA SCHMITTI	7.5% meiobenthos NEPHTYIDAE
3.4% meiobenthos ONUPHIS SPP	6.0% macrobenthos MOLLUSCA BIVALVIA	8.7% meiobenthos POLYCHAETA	7.0% meiobenthos NEPHTYS SPP.
3.0% macrobenthos MOLLUSCA BIVALVIA	3.5% macrobenthos ECHIURUS ECHIURUS	4.8% meiobenthos LUMBRINERIDAE	6.5% meiobenthos POLYCHAETA
2.6% macrobenthos OPHIURA SARSI	2.6% macrobenthos ECHIURA	4.6% macrobenthos PINNIXA SPP.	3.5% macrobenthos PAGURUS SPP.
2.3% macrobenthos PINNIXA SCHMITTI	2.4% macrobenthos OPHIUROIDEA	4.5% meiobenthos ONUPHIS SPP	3.1% other fish OSTEICHTHYES
2.3% macrobenthos OPHIURA LUETKENI	2.3% meiobenthos LUMBRINERIS BICIRRATA	3.6% macrobenthos ECHIURUS ECHIURUS	2.9% macrobenthos PAGURIDAE
2.0% meiobenthos POLYNOIDAE	1.8% macrobenthos NUCULANIDAE	2.9% meiobenthos POLYNOIDAE	1.8% macrobenthos CANCER BRANNERI
2.0% 37.2% meiobenthos PHYLLODOCE SPP	1.7% meiobenthos RHYNCHOCOELA	2.3% macrobenthos MOLLUSCA BIVALVIA	1.4% other fish UNID. FISH

Table 8. Top ten species (by weight) in stomachs of the shrimp feeders. Weight is expressed as a proportion of all diet items for all hauls pooled.

BLACK SKATE	SPECKLED SANDDAB	WALLEYE POLLOCK	FLATHEAD SOLE
12.5% epibenthos CRANGON COMMUNIS	27.9% epibenthos CRANGON ALBA	61.0% commercial shrimp PANDALUS TRIDENS	36.8% commercial shrimp PANDALUS TRIDENS
11.9% macrobenthos PAGURUS SPP.	20.1% epibenthos CRANGON SPP.	7.2% epibenthos MYSIDACEA	25.4% commercial shrimp PANDALUS SPP.
11.5% macrobenthos OREGONIA GRACILIS	13.7% forage fish AMMODYTES HEXAPTERUS	4.7% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA	12.2% epibenthos EUCARIDA DECAPODA PLEOCYEMATA CARIDEA
9.6% meiobenthos POLYCHAETA	8.0% macrobenthos MALACOSTRACA EUMALACOSTRACA	3.7% euphausiids EUCARIDA EUPHAUSIACEA	4.5% macrobenthos OPHIURA LUETKENI
7.4% macrobenthos EUCARIDA DECAPODA NATANTS	4.2% epibenthos CRANGONIDAE	3.1% euphausiids THYSANOESSA SPINIFERA	4.4% epibenthos NEOMYSIS KADIAKENSIS
7.2% epibenthos CRANGONIDAE	3.9% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA	2.8% euphausiids EUPHAUSIIDAE	3.2% epibenthos HEPTACARPUS STYLUS
6.9% epibenthos CRANGON ALBA	3.9% macrobenthos EUCARIDA DECAPODA NATANTS	2.3% other fish UNID. FISH	3.1% epibenthos CRANGON ALBA
6.7% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA	2.7% epibenthos EUCARIDA DECAPODA PLEOCYEMATA CARIDEA	2.2% epibenthos EUCARIDA DECAPODA PLEOCYEMATA CARIDEA	1.8% macrobenthos EUCARIDA DECAPODA NATANTS
4.4% epibenthos CRANGON SPP.	2.5% epibenthos EXACANTHOMYSIS ALASKENSIS	1.7% other fish OSTEICHTHYES	1.5% epibenthos CRANGON SPP.
3.5% predatory mesozooplankton ANONYX SPP.	1.7% other fish UNID. FISH	1.5% macrobenthos EUCARIDA DECAPODA NATANTS	1.3% other fish UNID. FISH

Table 9. Top ten species (by weight) in stomachs of the euphausiid feeders. Weight is expressed as a proportion of all diet items for all hauls pooled.

EULACHON	SEBASTES ELONGATUS	SEBASTES FLAVIDUS	SEBASTES ALUTUS	SABLEFISH	PACIFIC SANDDAB
52.7% euphausiids EUCARIDA EUPHAUSIACEA	82.2% euphausiids EUCARIDA EUPHAUSIACEA	31.0% euphausiids EUCARIDA EUPHAUSIACEA	71.8% euphausiids THYSANOESSA SPINIFERA	52.2% Euphausiids THYSANOESSA SPINIFERA	33.9% euphausiids EUCARIDA EUPHAUSIACEA
40.7% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA	11.1% macrobenthos EUCARIDA DECAPODA NATANTS	20.7% commercial shrimp PANDALUS TRIDENS	13.6% euphausiids EUCARIDA EUPHAUSIACEA	16.0% other fish UNID. FISH	33.9% epibenthos MYSIDACEA
5.9% euphausiids EUPHAUSIA PACIFICA	5.7% other fish OSTEICHTHYES	15.0% euphausiids THYSANOESSA SPINIFERA	4.7% macrobenthos EUCARIDA DECAPODA NATANTS	5.5% Euphausiids EUCARIDA EUPHAUSIACEA	4.5% euphausiids THYSANOESSA SPINIFERA
	0.1% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA	6.9% macrobenthos EUCARIDA DECAPODA = NATANTS	2.3% copepods COPEPODA CALANOIDA	2.9% Herring HERRING, PACIFIC	4.1% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA
	0.1% predatory mesozooplankton AMPELISCA MACROCEPHALA	6.8% euphausiids EUPHAUSIIDAE	1.4% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA	2.7% commercial shrimp PANDALUS TRIDENS	4.1% epibenthos ARGIS ALASKENSIS
	<0.001% predatory mesozooplankton PERACARIDA AMPHIPODA	4.6% euphausiids EUCARIDA	1.1% predatory mesozooplankton RHACHOTROPIS SPP.	2.6% Dogfish SQUALUS ACANTHIAS	3.3% other fish OSTEICHTHYES
		3.6% macrobenthos CLIONE LIMACINA	1.1% epibenthos EUCARIDA DECAPODA PLEOCYEMATA CARIDEA	2.6% Macrobenthos HYDROZOA HYDROIDA ANTHOMEDUSAE	2.7% epibenthos NEOMYSIS KADIAKENSIS
		2.5% macrobenthos ARTHROPODA MANDIBULATA CRUSTACEA	0.7% epibenthos CRANGON SPP.	2.0% forage fish AMMODYTES HEXAPTERUS	1.7% turbot FLOUNDER, ARROWTOOTH
		1.6% other fish UNID. FISH	0.6% macrobenthos LIMACINA HELICINA (CJL)	1.9% Macrobenthos MOLLUSCA GASTROPODA	1.7% other flatfish PLEURONECTIDAE
		1.2% forage fish AMMODYTES SPP.	0.5% epibenthos MYSIDACEA	1.4% Macrobenthos CLIONE LIMACINA	1.6% macrobenthos EUCARIDA DECAPODA NATANTS

Table 10. Diet breadth and proportion of fish in the diets of the predators for the four cruises.

PREDATOR	CRUISE							
	1 SUMMER 1985		2 FALL 1985		3 WINTER 1986		4 SUMMER 1987	
	% fish	No. items	% fish	No. items	% fish	No. items	% fish	No. items
Dogfish	0.5459	13	0.5374	17	0.9344	9	0.7582	10
Big skate	0	3	0.3052	9	0.5299	7		
Black skate	0.0008	7	0.0215	5	0	2		
Longnose skate	0.1177	6	0.3281	4				
Ratfish	0.0058	7	0.0445	7	0.0699	12		
Pacific cod	0.5066	13	0.8967	15	0.7446	19	0.6036	13
Walleye pollock	0.0283	11	0.0972	7	0	6		
Pacific ocean perch	0.0109	7	0	5				
Redbanded Rockfish	0	1	0.2391	12				
Yellowtail rockfish	0.052	13	0.0201	9	0.0458	10		
Sablefish	0.4384	11	0.1892	11				
Pacific Sanddab			0.0808	8	0.0025	9		
Arrowtooth flounder	0.5745	9	0.8678	12	0.5605	11		
Petrale sole	0	3	0.261	11	0.9633	10		
Rex sole	0	7	0.0015	9	0	6		
Flathead sole	0	3	0.0145	7	0	2		
Pacific halibut	0.122	7	0.7353	18	0.8215	8		
Rock sole	0.1875	8	0.8612	10	0.713	9		
Dover sole	0	6	0.0001	10	0	1		
English sole	0.0042	9	0.4676	8	0	7		
Sand sole	0.8235	11	0.9677	8	0.8833	4		

Table 11. Most common benthic species identified in areas A-D from grab samples taken from three cruises between June 1985 and January 1986 in Hecate Strait (Burd and Brinkhurst 1987) as compared with the most common diet components for the benthivores English sole, Dover sole, and rex sole. Adult and juvenile diets are pooled in all cases.

Area	Predominant benthic fauna identified from grab samples	English sole diet	Dover sole diet	Rex Sole diet
A	All cruises: polychaetes: *Lumbrineris luti, Prionospio steenstrupi, Spiophanes berkleyorum, Galathowenia oculata, Euchlymene zonalis, Owenia fusiformis, Polycirrus sp., Mediomastus* sp. Cruise 2&3 only: *Decamastus gracilis*; Cruise 3 only: *Polycirrus* complex. Also common: bivalve: *Axinopsida serricata* and amphipod *Rhepoxyniuis* sp.	23.6% sandlance, 14.9% polychaetes, 12% bivalves, 10% *Echiurus echiurus*, 7% Echiurans, 6% Nuculanidae bivalves, rest <3% by weight of diet	21.4% Cnidaria, 12.4% polychaetes, 6.5% *Onuphis* sp., 4.6% bivalves, 4.6% *Pinnixa schmitti*, 3,8% Phyllodoce, 3.6% Nephytidae, 3.4% Polynoidae, 3.3% Pinnixa sp. 3.2% Maldanidae, rest <3% by weight of diet	27.3% *Echiura* sp.. 26.9% Crangon alba, 6.6% *Pinnixa schmitti*, 5.2% Pinnixa sp., 4.2% *Echiura echiura*, 3.8% *Onuphis* sp., 3.5% Polynoidae, 5% polychaetes rest <3% by weight of diet
B	All cruises: polychaetes: *Spiophanes bombyx, Magelona hobsonae*, Euclymenidae, *Hemipodus borealis*: the bivalve *Tellina nuculoides*; and amphipod *Foxiphalis obtusidens*. Cruise 3 only: echinoid: *Dendraster excentricus*	54% polychaetes, 23.7% *Crangon* sp., 8% bivalves, 5.1% Spionidae, rest <3% by weight of diet	N/A	N/A
C	All cruises: polychaetes: *Spiochaetopterus costarum, Galathowenia oculata, Owenia fusiformis, Myriochele heeri* and *Odostomia* sp.; the bivalves, *Psephidia lordi* and *Azionopsida serricata*; and amphipod *Ampelisca macrocephala*.	39% polychaetes, 6.5% Ophiuroidea, 6.1% *Ophiura luetkeni*, 4.5% O. sarsi, 3.9% *Terebellides stroemii*, 3.5% *Glycera Americana*, rest <3% by weight of diet	37.1% polychaetes, 12.5% Ophiuroidea, 5.4% *Ophiura sarsi*, 3.6% *Lepidasthenia longicissata*, 3.5% *O. luetkeni*, 3.3% Holothuroidea, rest <3% by weight of diet	25.6% polychaetes, 13.6% Lumbrineridae, 5.3% Glyceridae, 4.4% *Lumbrineris bicirrata*, 3.4% *Travisia* sp., rest <3% by weight of diet
D	All cruises: polychaetes: *Spiophanes bombyx*,	52.6% polychaetes,	28.5% Paguridae,	50% *Pinnixa*

	Polycirrus complex and *Spiochaetopterus costarum*; the bivalve *A. serricata*; and amphipods *Grandifoxis* sp. and *Foxiphalus* sp. (both in cruise 3 only).	13.4% *Travisia japonica*, 4% *Lumbrineris bicirrata*, 4% Rhyncocoela, 3% bivalves, rest <3% by weight of diet	24.4% polychaetes, 15.8% *Onuphis iridescens*, 15.5% *Glycera* sp. 14.1% Eucarida decapoda, 6.8% Nereidae, rest <3% by weight of diet	*schmitti*, 8.7% *Pinnixa* sp., 4.6% *Onuphis* sp., 4.6% *Crangon alba*, 4.2% polychaetes, 3.8% Goniadidae, 3.7% *Glycera* sp., rest <3% by weight of diet

Table 12. Predator and Prey overlap indices as output from the Ecopath model. Overlaps greater than 50% are shown in bold.

Predator Overlap

	Ratfish	Dogfish	Skates	Juv POP	Ad POP	Dover sole	Arrowtooth flounder	Juv Rock sole	Ad Rock sole	Juv English sole	Ad English sole	Ling cod	Hali but	Juv Pacific cod	Ad Pacific cod	Juv Sablefish
Ratfish	1															
Dogfish		1														
Skates			1													
Juv POP				1												
Ad POP					1											
Dover sole				**0.991**		1										
Arrowtooth flounder				**0.711**		**0.736**	1									
Juv Rock sole	0.263			**0.94**		**0.95**	**0.747**	1								
Ad Rock sole									1							
Juv English sole	0.18			**0.806**		**0.83**	**0.929**	**0.887**		1						
Ad English sole									**0.914**	0.029	1					
Lingcod							0.157					1				
Halibut													1			
Juv Pacific cod				0.08		0.101	0.078	0.086	0.458	0.085	0.485			1		
Ad Pacific cod									**0.587**		**0.583**			**0.887**	1	
Juv Sablefish													1			1

Prey Overlap

	Ratfish	Dogfish	Skates	Juv POP	Ad POP	Dover sole	Arrowtooth flounder	Juv Rock sole	Ad Rock sole	Juv English sole	Ad English sole	Ling cod	Hali but	Juv Pacific cod	Ad Pacific cod	Juv Sablefish
Ratfish																
Dogfish	0.327	1														
Skates	**0.918**	0.591	1													
Juv POP	0.156	0.143	0.145	1												
Ad POP	0.005	0.086	0.002	**0.973**	1											

Dover sole	**0.679**	0.233	**0.579**	0.096	0.003	1										
Arrowtooth flounder	0.209	**0.946**	0.465	0.154	0.112	0.141	1									
Juv Rock sole	0.16	**0.825**	0.444	0.025	0.002	0.191	**0.77**	1								
Ad Rock sole	**0.623**	**0.616**	**0.695**	0.088	0.001	**0.878**	**0.507**	**0.57**	1							
Juv English sole	0.41	0.302	0.371	0.053	0.004	**0.93**	0.233	0.353	**0.886**	1						
Ad English sole	0.497	0.24	0.421	0.065	0.003	**0.969**	0.166	0.264	**0.873**	**0.989**	1					
Lingcod	0.001	**0.669**	0.18				**0.824**	**0.522**	0.262	0.109	0.05	1				
Halibut	**0.981**	0.352	**0.915**	0.152	0.001	0.599	0.264	0.146	**0.561**	0.318	0.406	0.068	1			
Juv Pacific cod	0.369	**0.889**	**0.601**	0.074	0.012	0.28	**0.873**	**0.768**	**0.625**	0.332	0.271	0.62	0.376	1		
Ad Pacific cod	0.077	**0.914**	0.375	0.018	0.005	0.061	**0.919**	**0.91**	0.478	0.226	0.13	0.7	0.101	**0.867**	1	
Juv Sablefish	0.14	0.25	0.167	**0.937**	**0.879**	0.102	0.287	0.117	0.139	0.084	0.085	0.116	0.144	0.18	0.138	1

Fig. 1. Location of the four sampling areas within Hecate Strait, British Columbia, taken from Saunders et al. (1986).

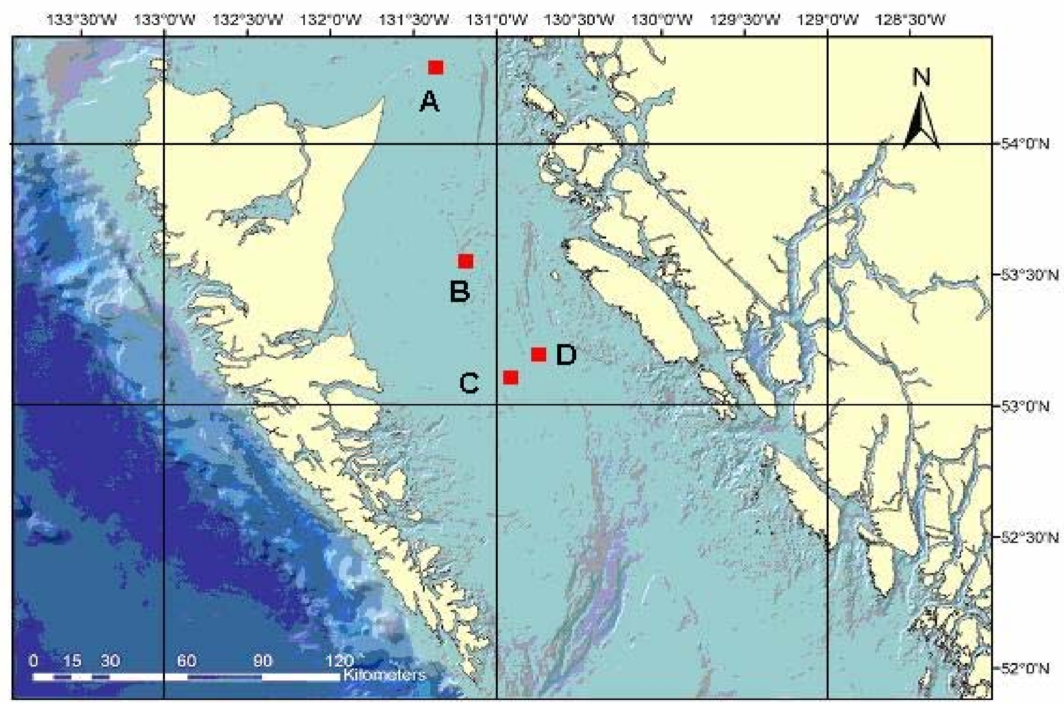


Fig. 2. Location of major assemblage areas and their approximate boundaries.

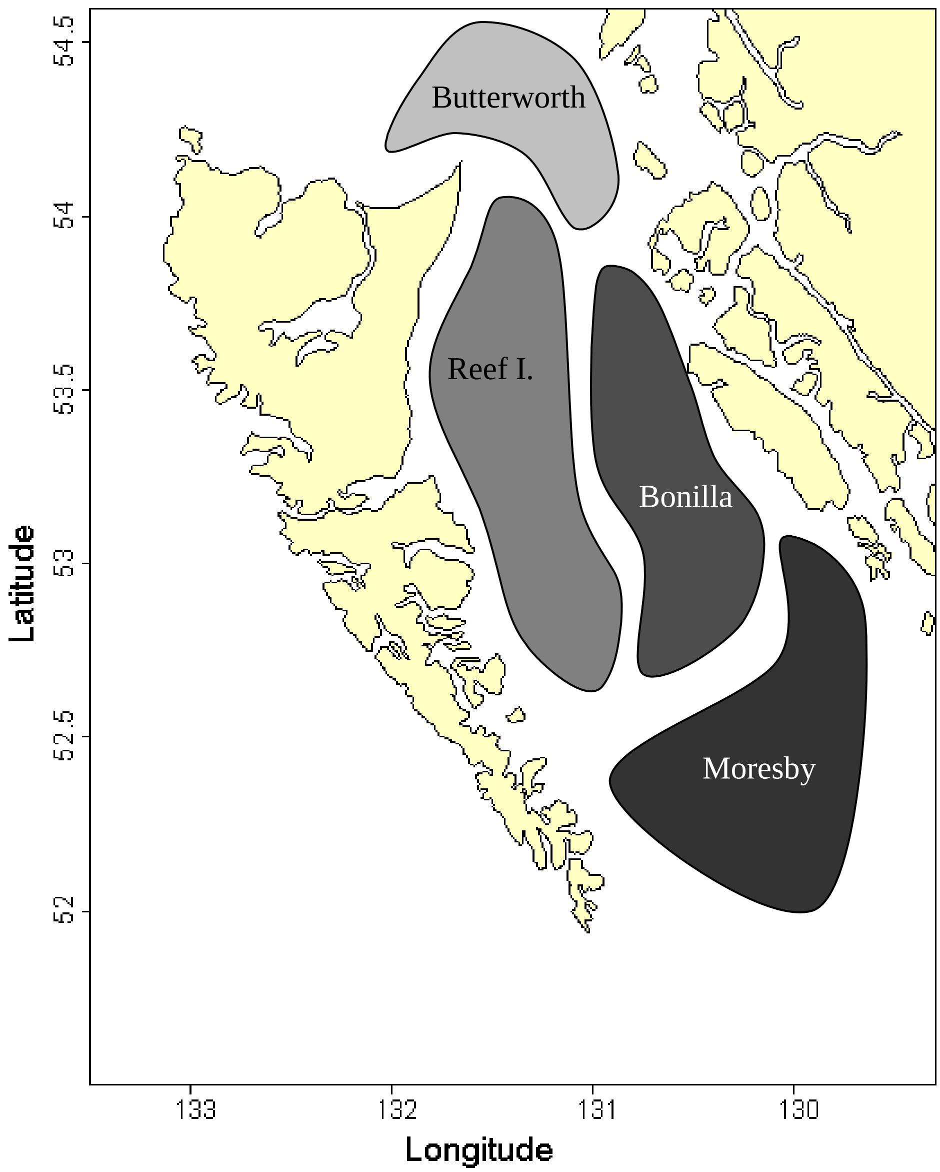


Fig. 3. Diet composition (pooled by weight) of adult and juvenile Pacific cod, 1985-1987, all cruises and areas pooled**.**

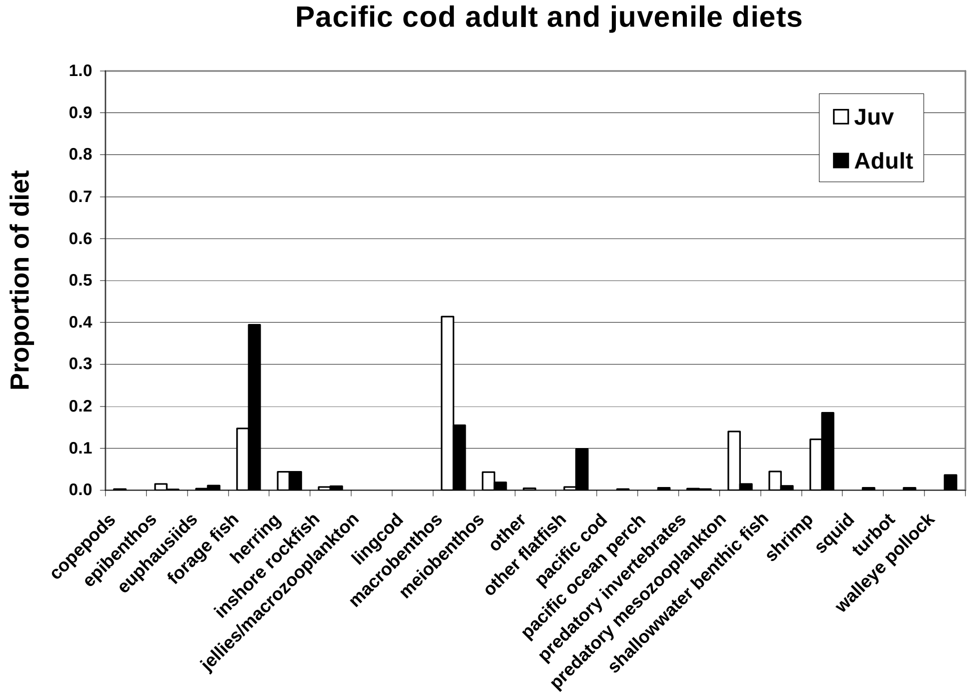


Fig. 4. Diet composition (pooled by weight) of adult and juvenile Pacific ocean perch, 1985-1987, all cruises and areas pooled**.**

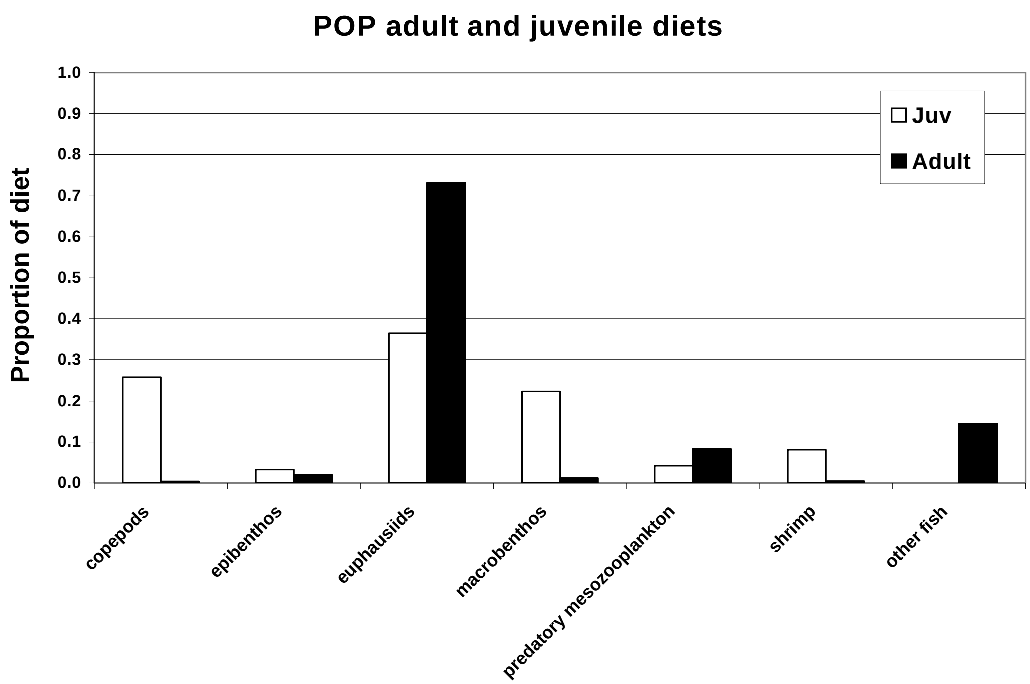


Fig. 5. Diet composition (pooled by weight) of adult and juvenile Arrowtooth flounder, 1985-1987, all cruises and areas pooled.

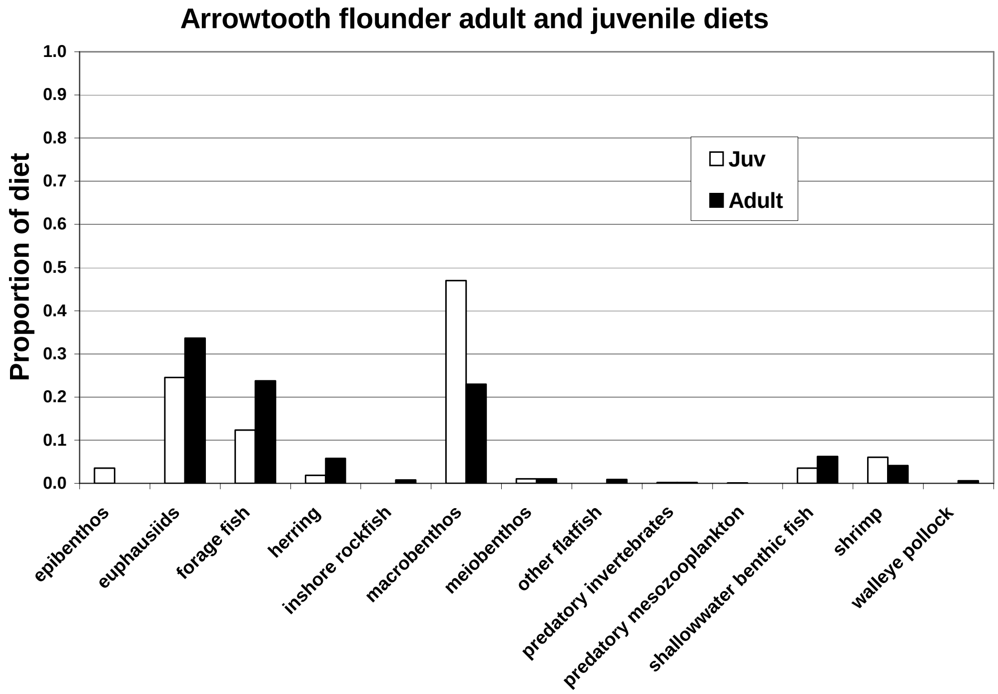


Fig. 6. Diet composition (pooled by weight) of adult and juvenile Rock sole, 1985-1987, all cruises and areas pooled.

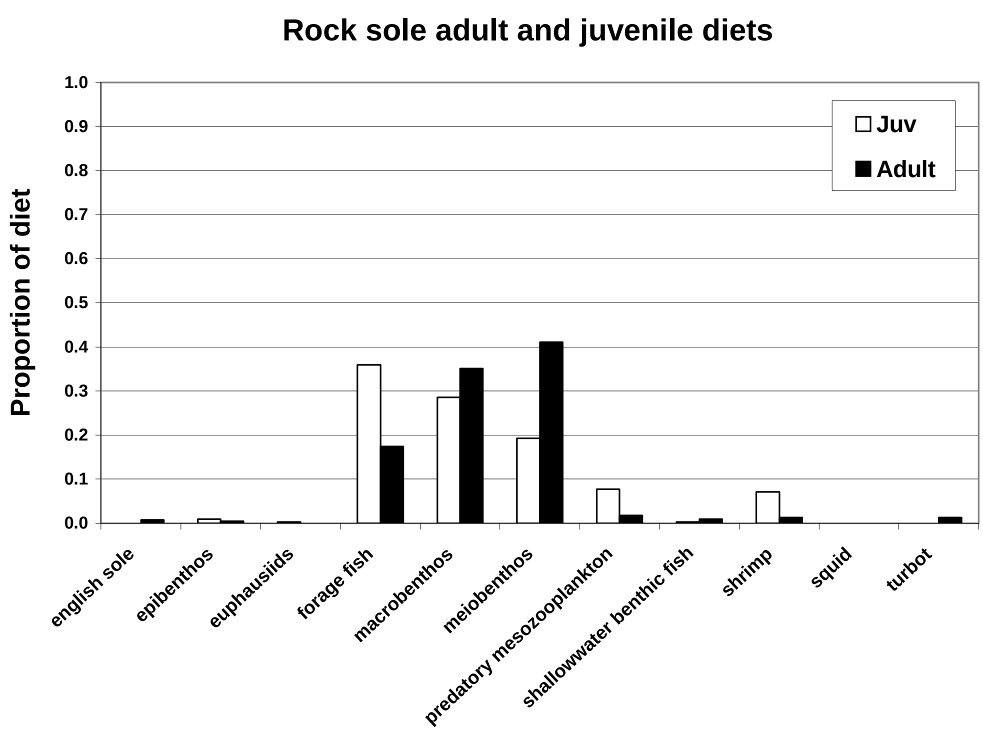


Fig. 7. Diet composition (pooled by weight) of adult and juvenile Dover sole, 1985-1987, all cruises and areas pooled.

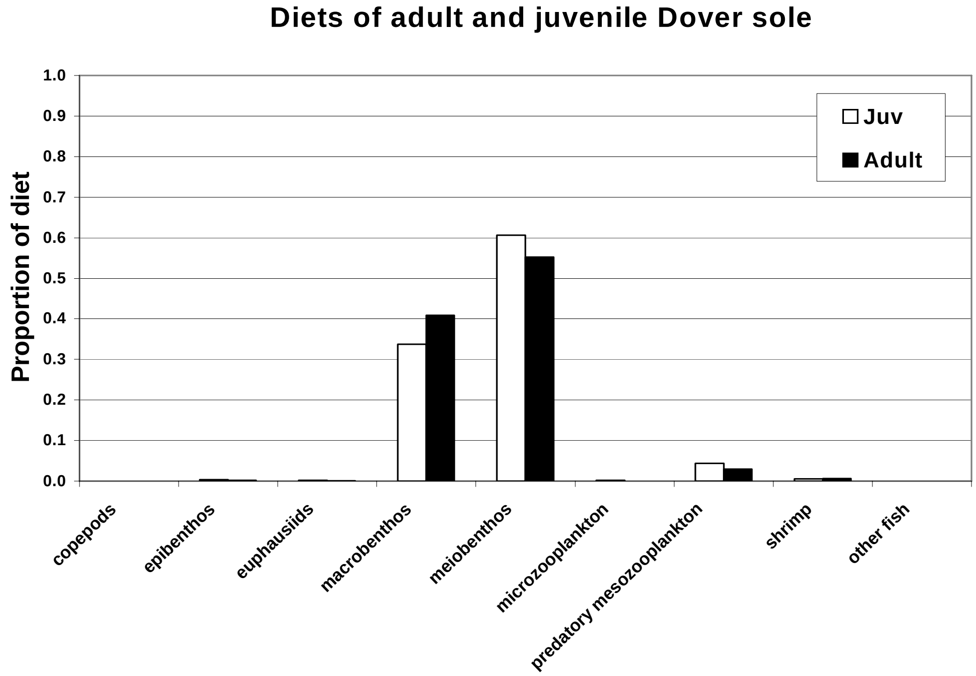


Fig. 8. Diet composition (pooled by weight) of adult and juvenile English sole, 1985-1987, all cruises and areas pooled.

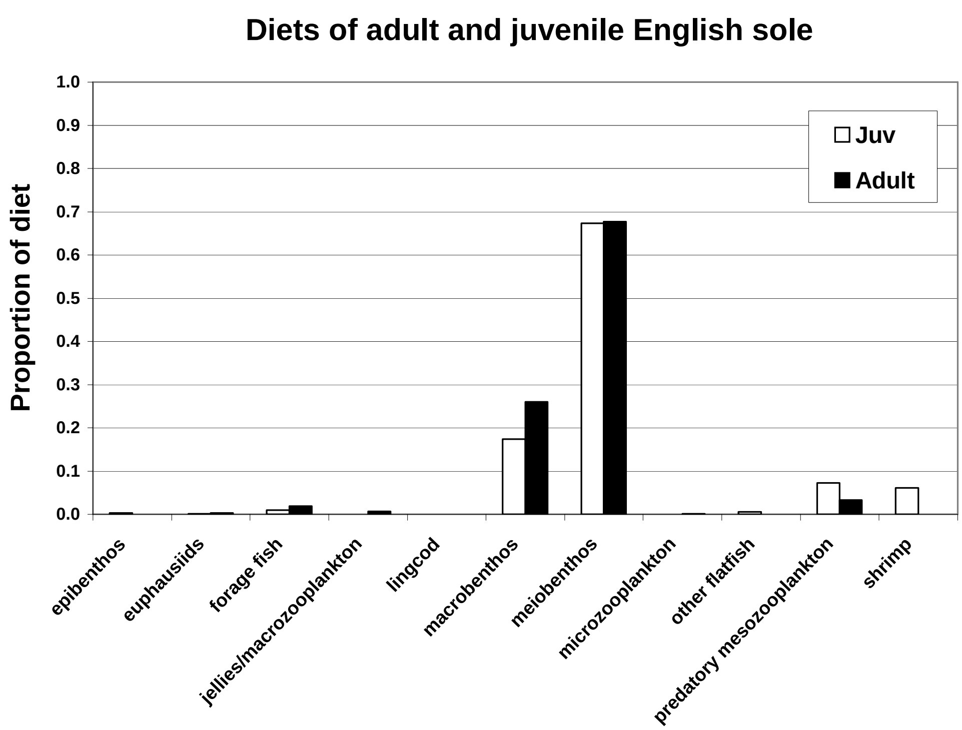


Fig. 9. Diet composition (pooled by weight) of adult and juvenile Dogfish, 1985-1987, all cruises and areas pooled.

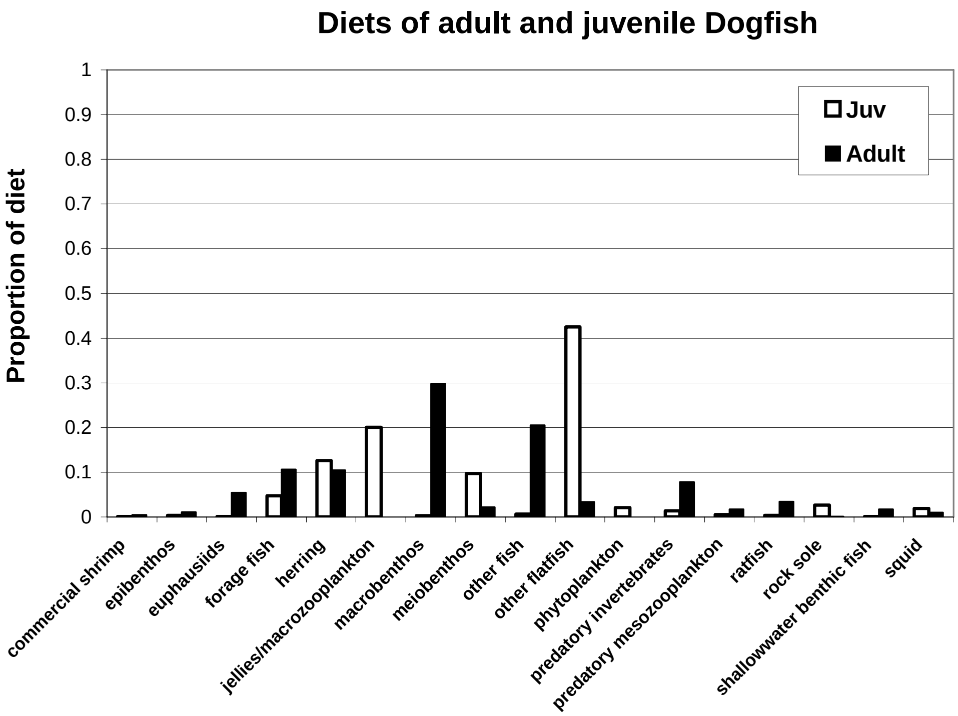


Fig. 10. Results of hierarchical cluster analysis of the diets for the species of groundfish collected from Hecate Strait for stomach sampling. Diets used were for 1985-1987, all cruises and areas pooled.

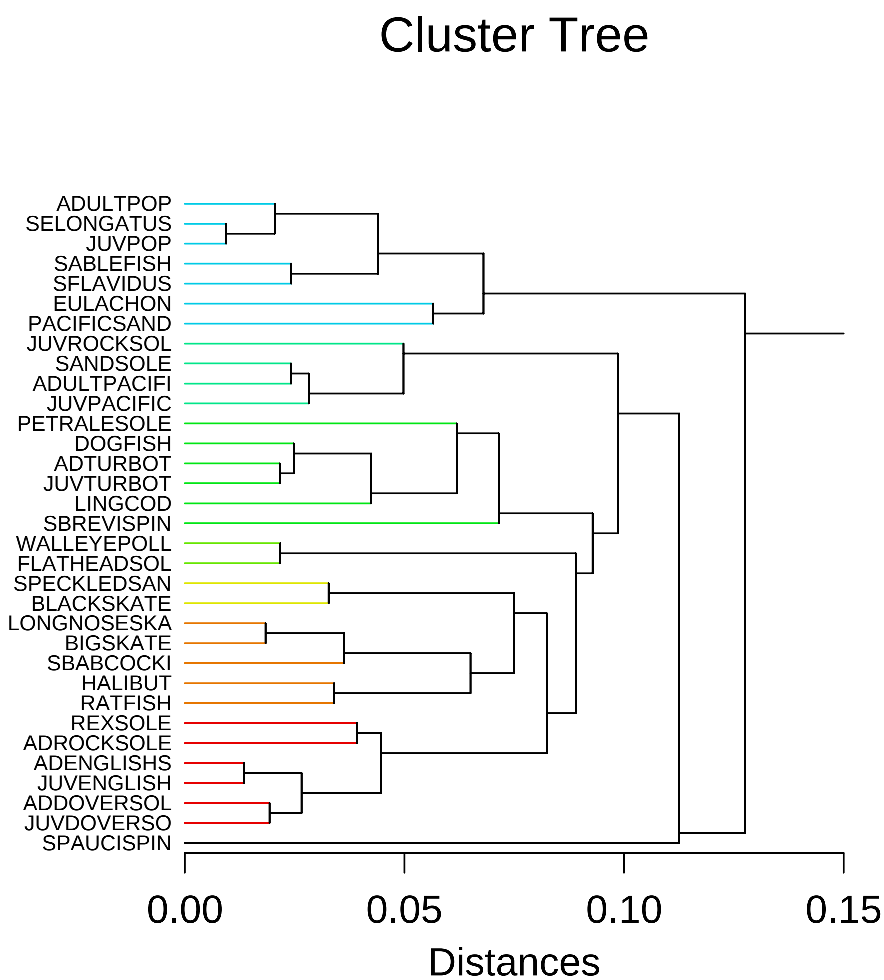


Fig. 11. Proportion of different diet groupings for the euphausiid feeders, 1985-1987.

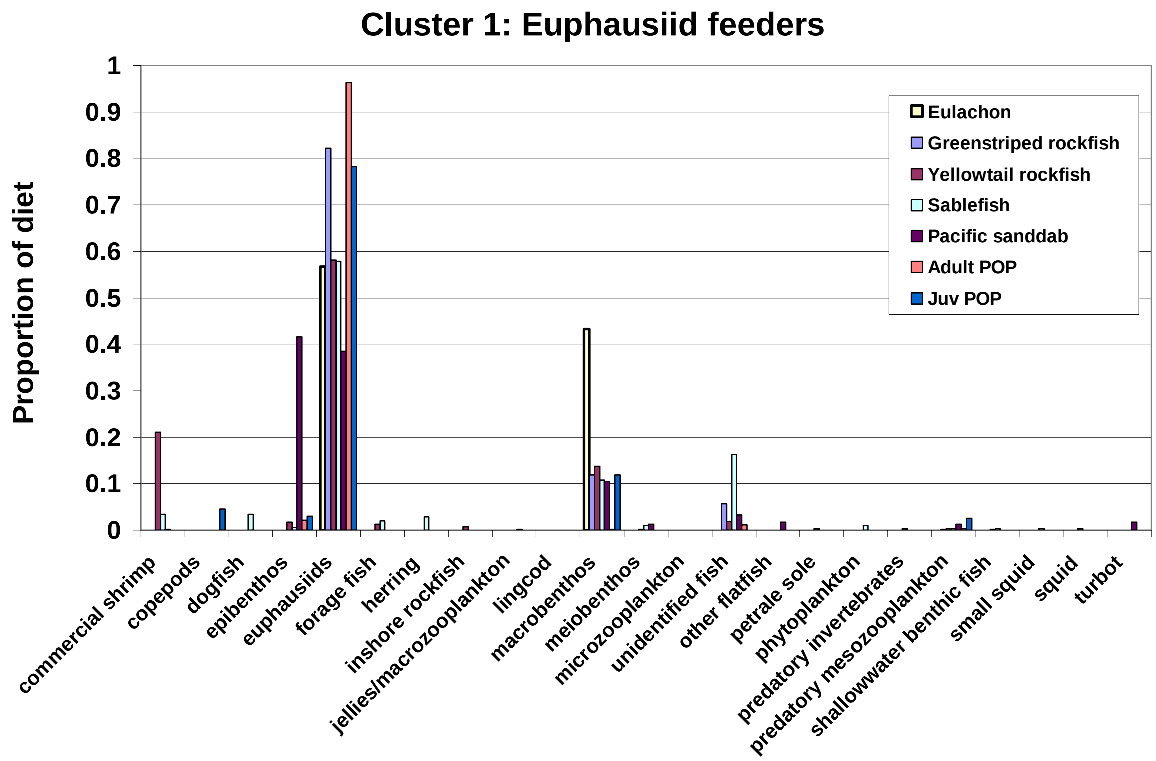


Fig. 12. Proportion of different diet groupings for the macrobenthic/meiobenthic feeders, 1985-1987.

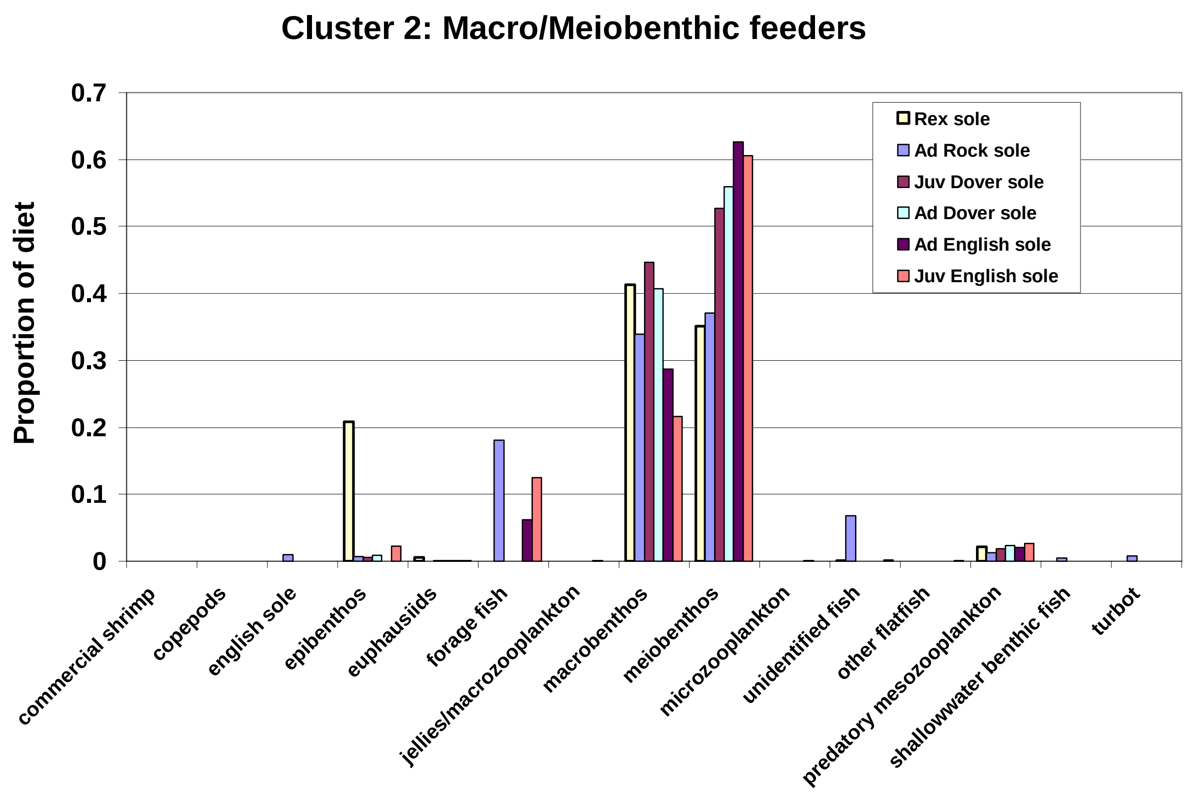


Fig. 13. Proportion of different diet groupings for the macrobenthic feeders, 1985-1987.

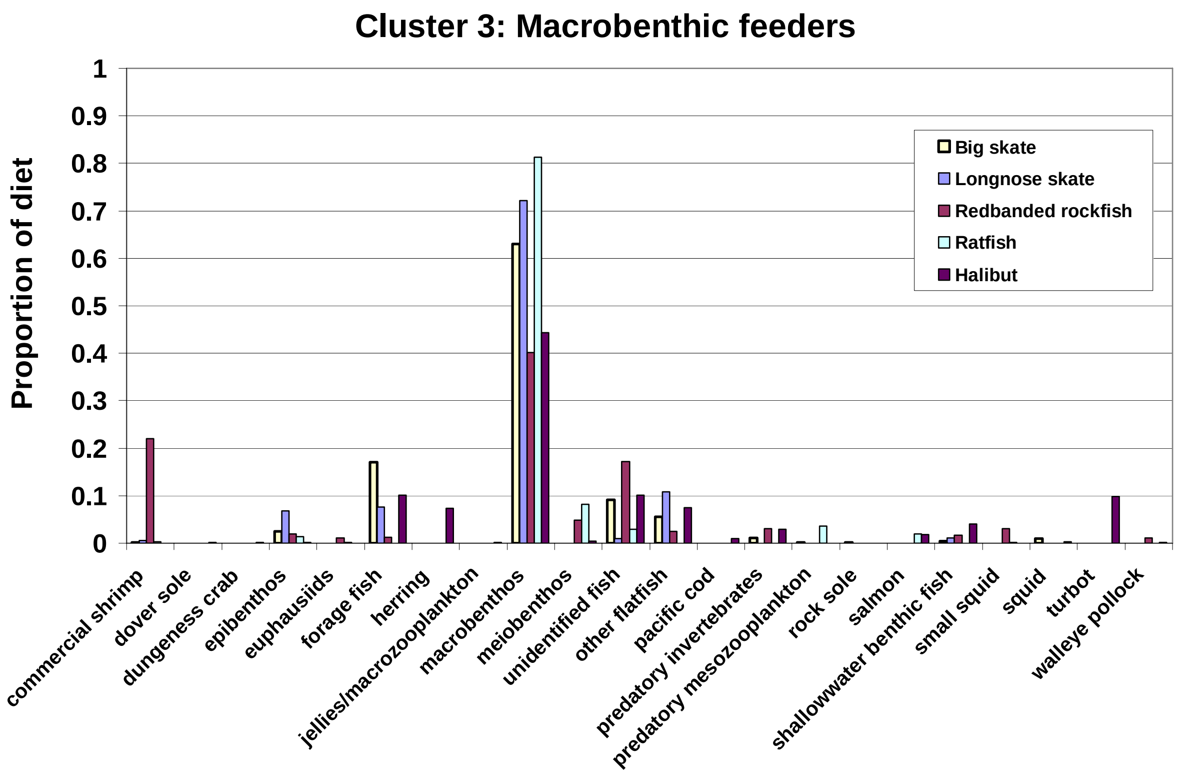


Fig. 14. Proportion of different diet groupings for the piscivores, 1985-1987.

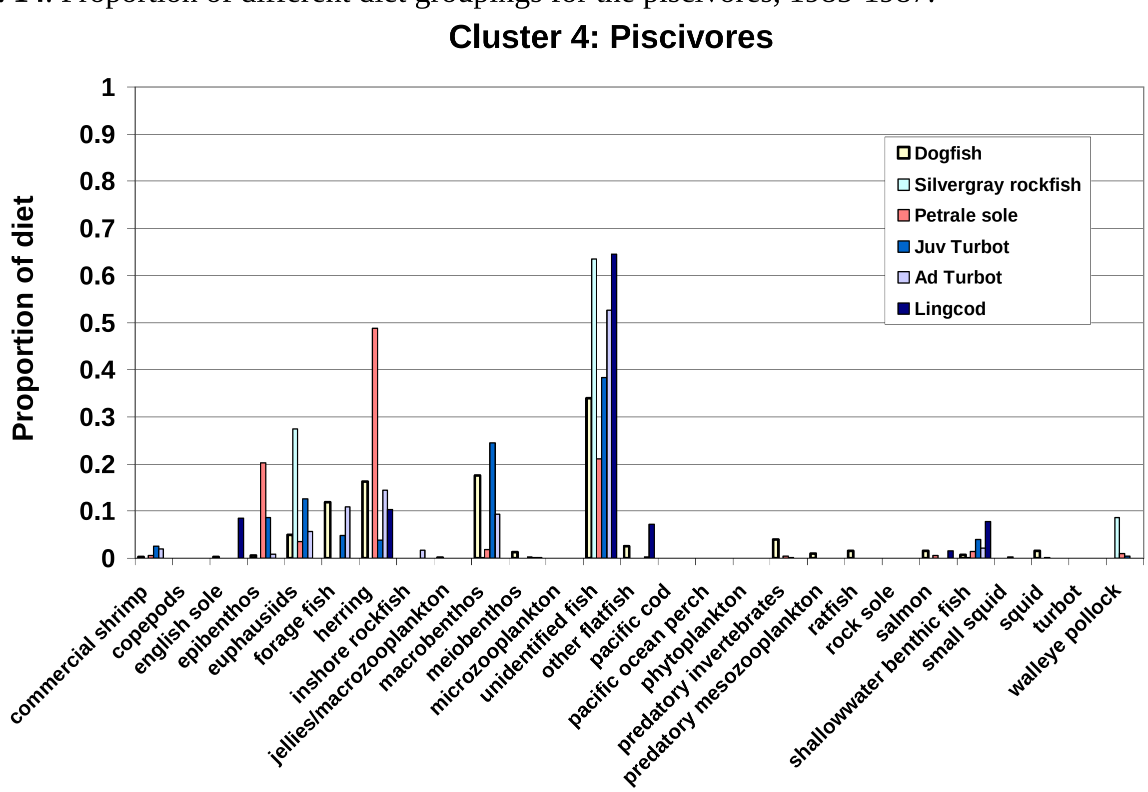


Fig. 15. Proportion of different diet groupings for the shrimp feeders, 1985-1987.

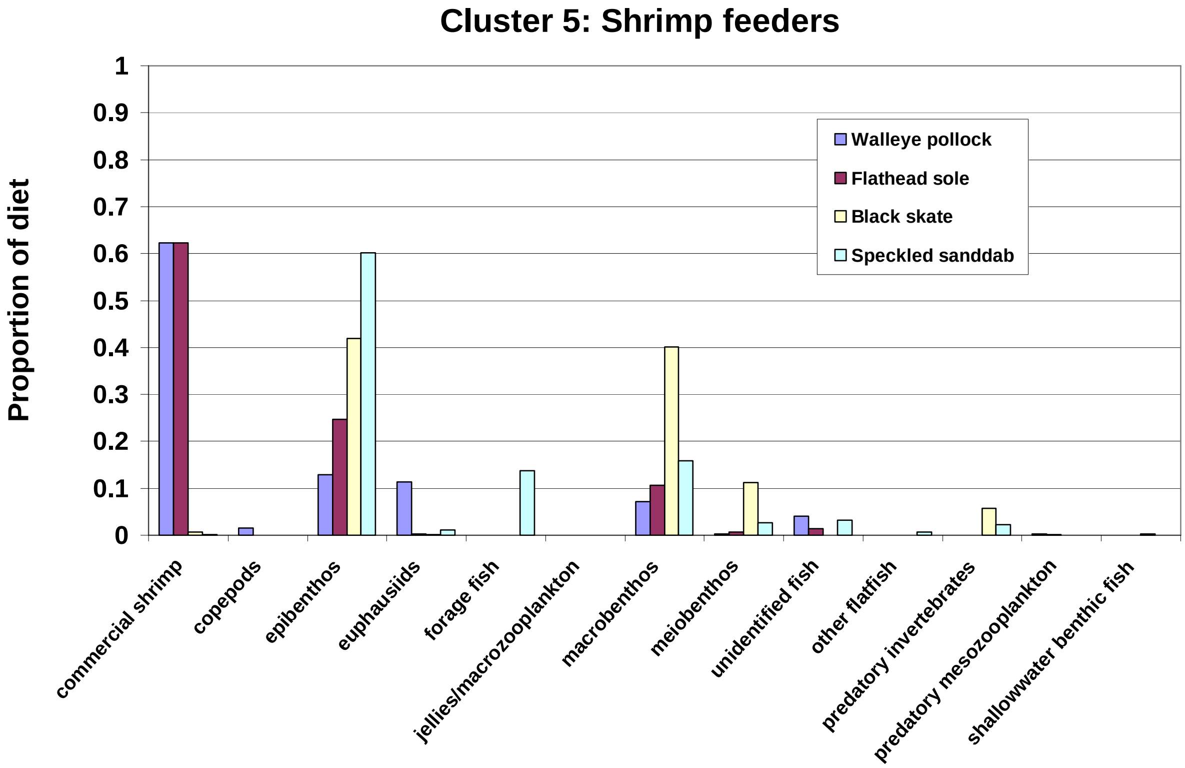


Fig. 16. Proportion of different diet groupings for the forage fish feeders, 1985-1987

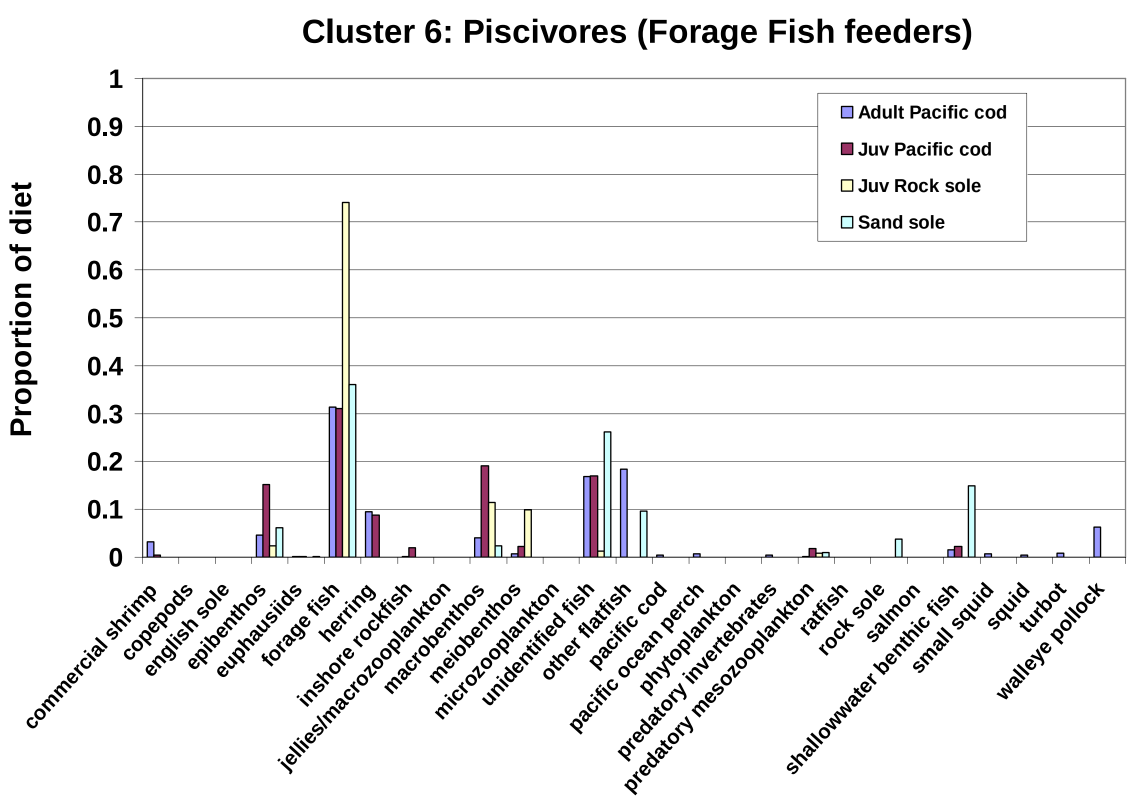


Fig. 17. Breakdown of macrobenthic and meiobenthic groupings in the diet of cluster 2, (annelid feeders) 1985-1987.

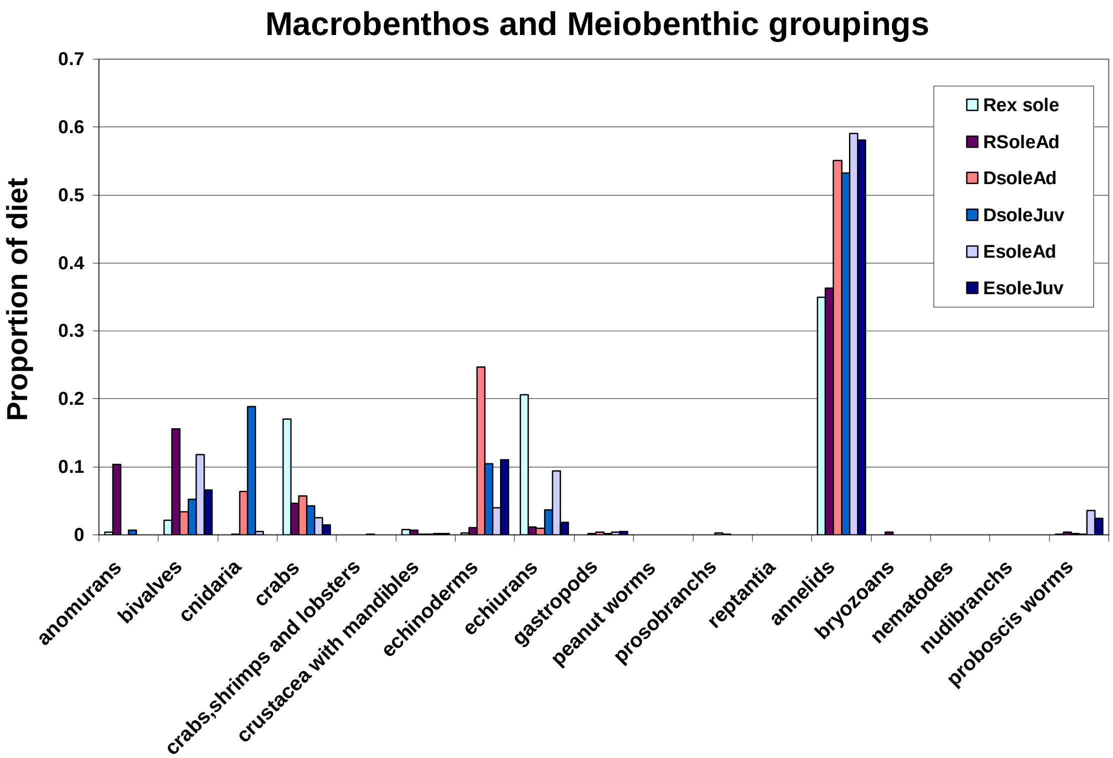


Fig. 18. Breakdown of macrobenthic and meiobenthic groupings in the diet of cluster 3, (crab feeders), 1985-1987.

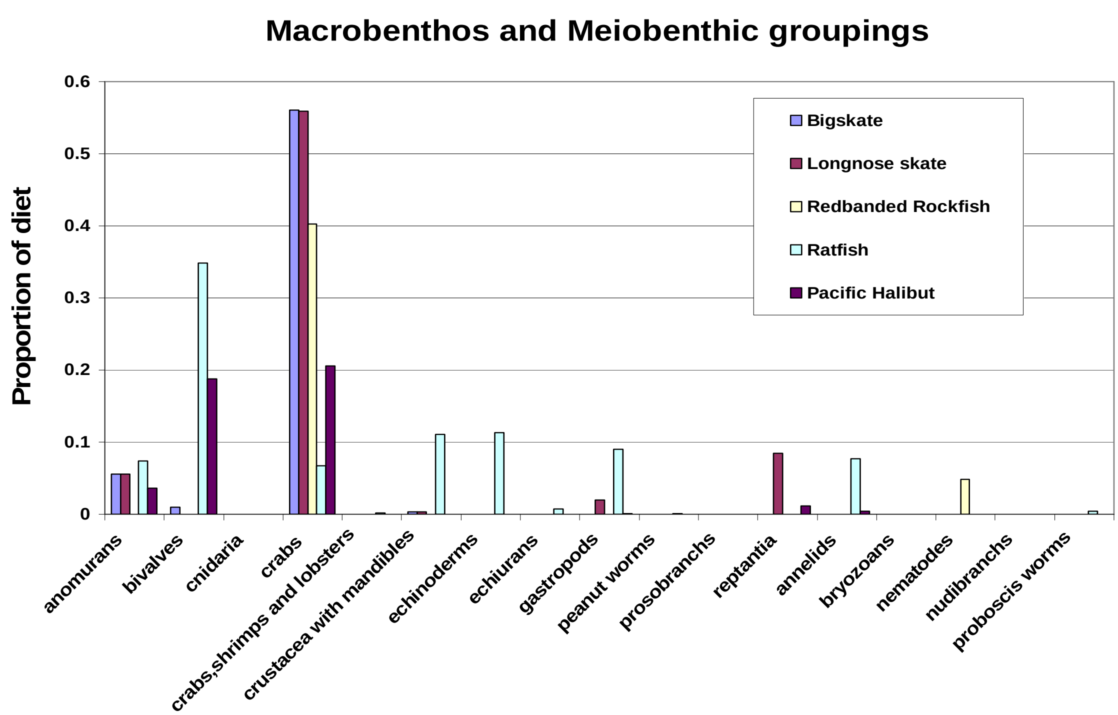


Fig. 19. Mean total prey weights by spatial area for all species taken from more than one spatial location 1985-1987 (data for all cruises pooled). In all cases, stomach weights are expressed for adults only, with the exception of sablefish (all juveniles) and dogfish (adult and juveniles).

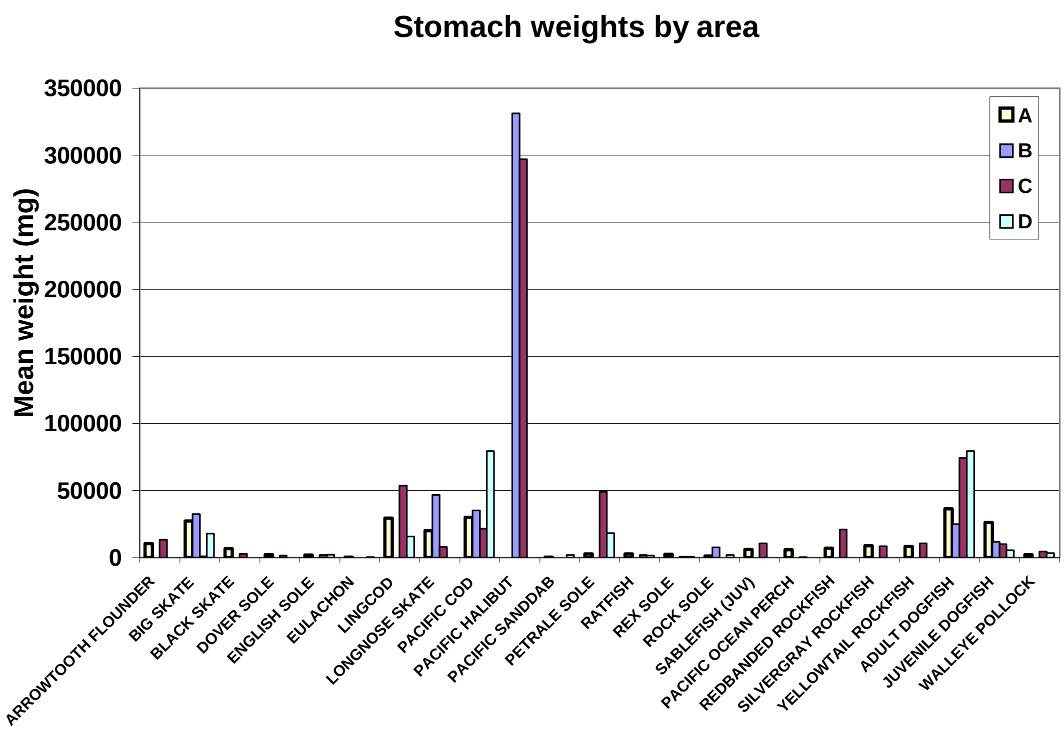


Fig. 20. Mean total prey weights by cruise for all species sampled in more than one cruise, 1985-1987, (data for all spatial areas pooled). In all cases, stomach weights are expressed for adults only, with the exception of sablefish (all juveniles) and dogfish (adult and juveniles).

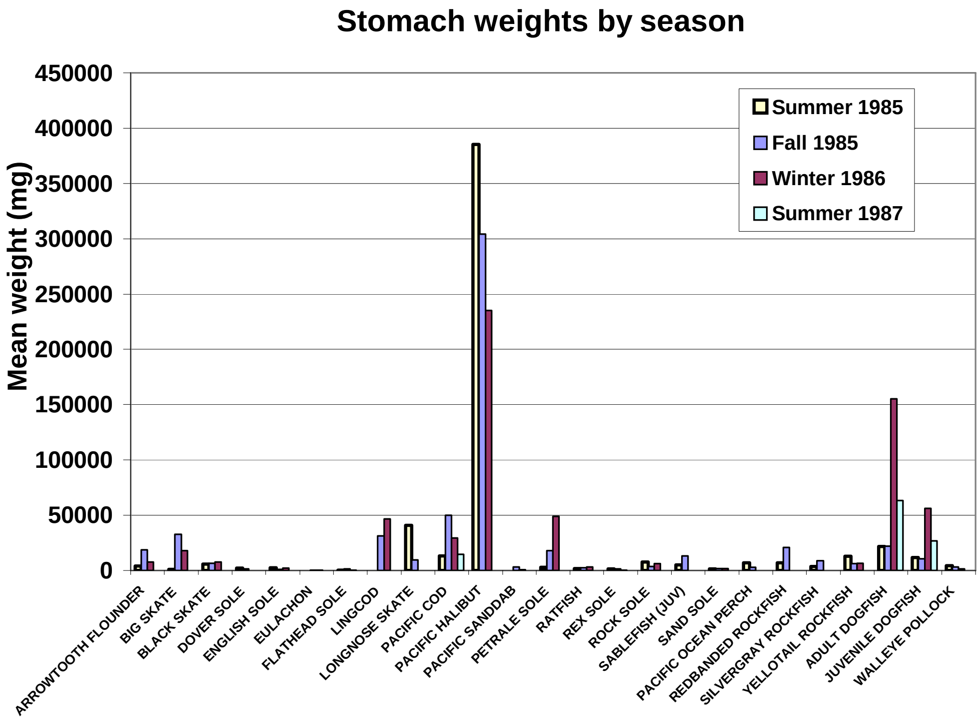


Fig. 21. Seasonal patterns in diet composition for arrowtooth flounder.

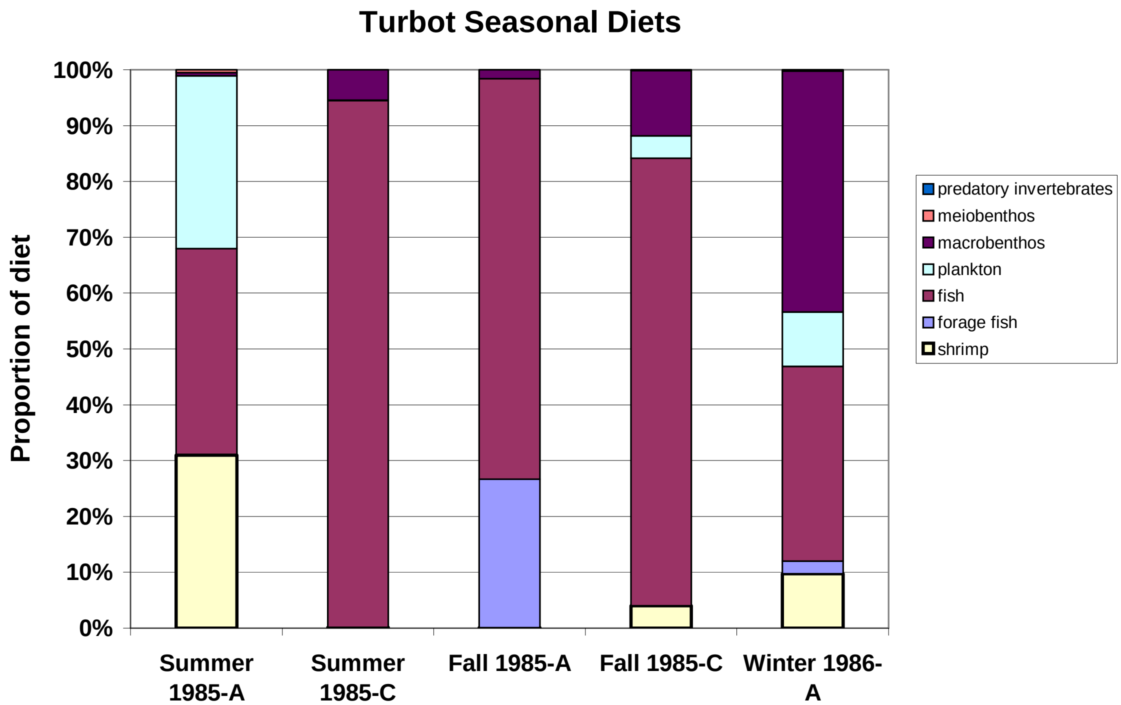


Fig. 22. Seasonal patterns in diet composition for dogfish.

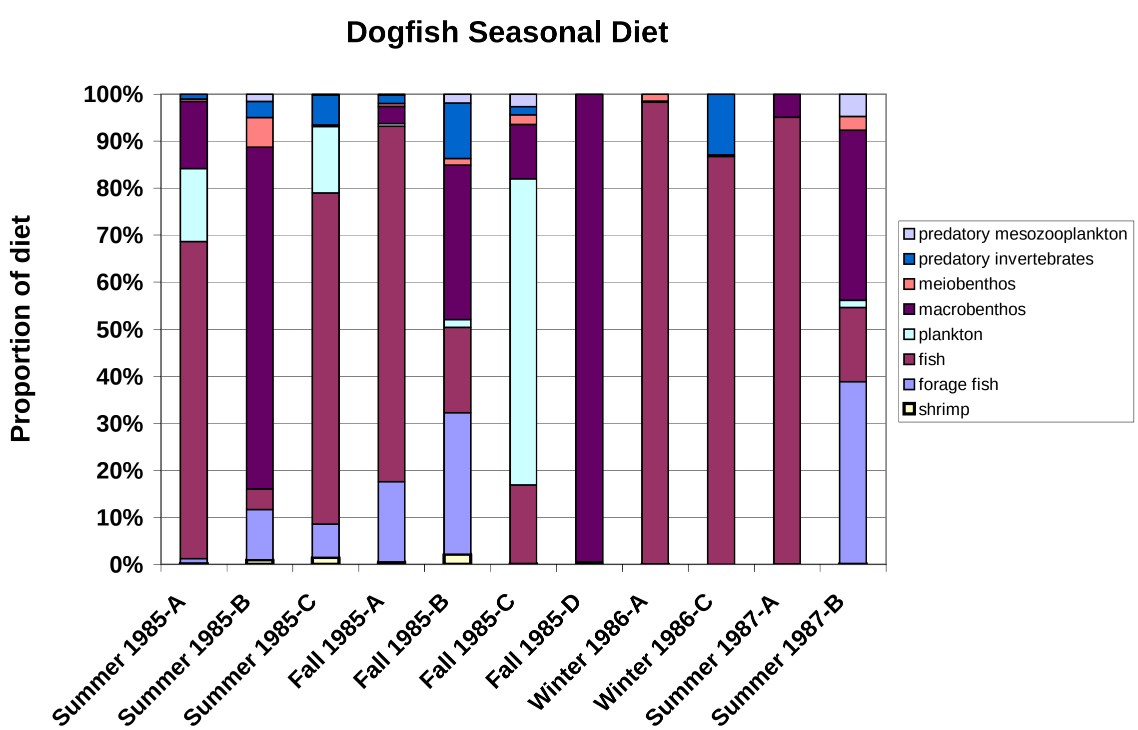


Fig. 23. Seasonal patterns in diet composition for ratfish.

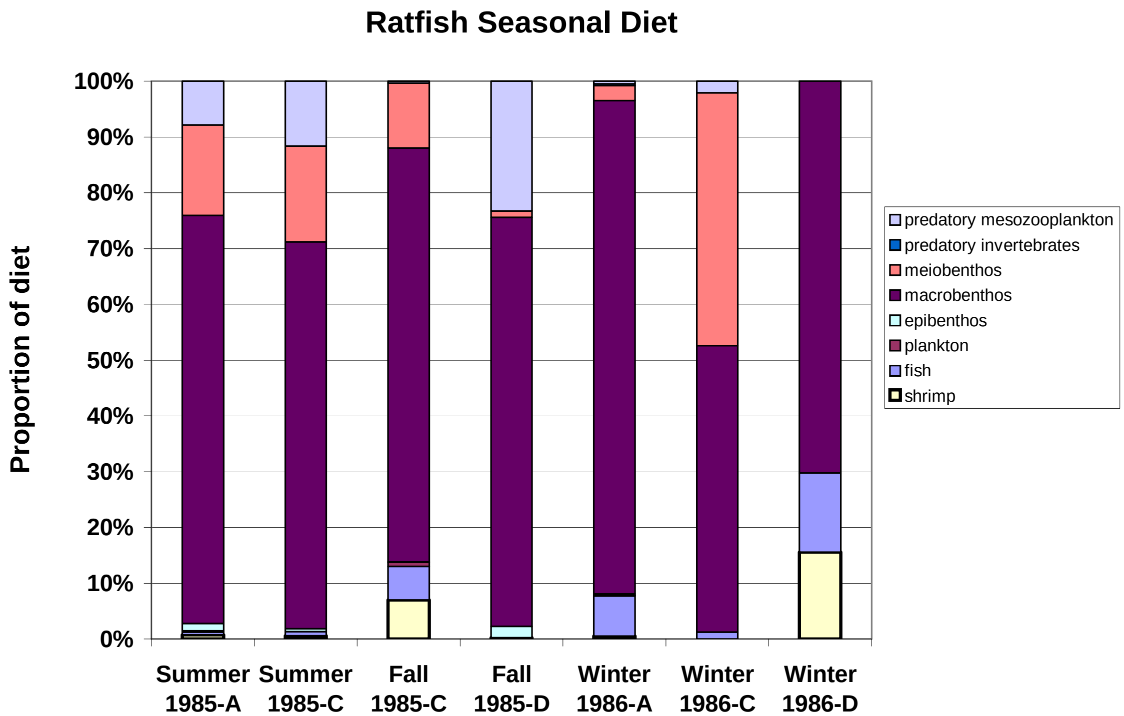


Fig. 24. Trophic structure of the Hecate Strait Ecosystem- Output from Ecopath modelling.

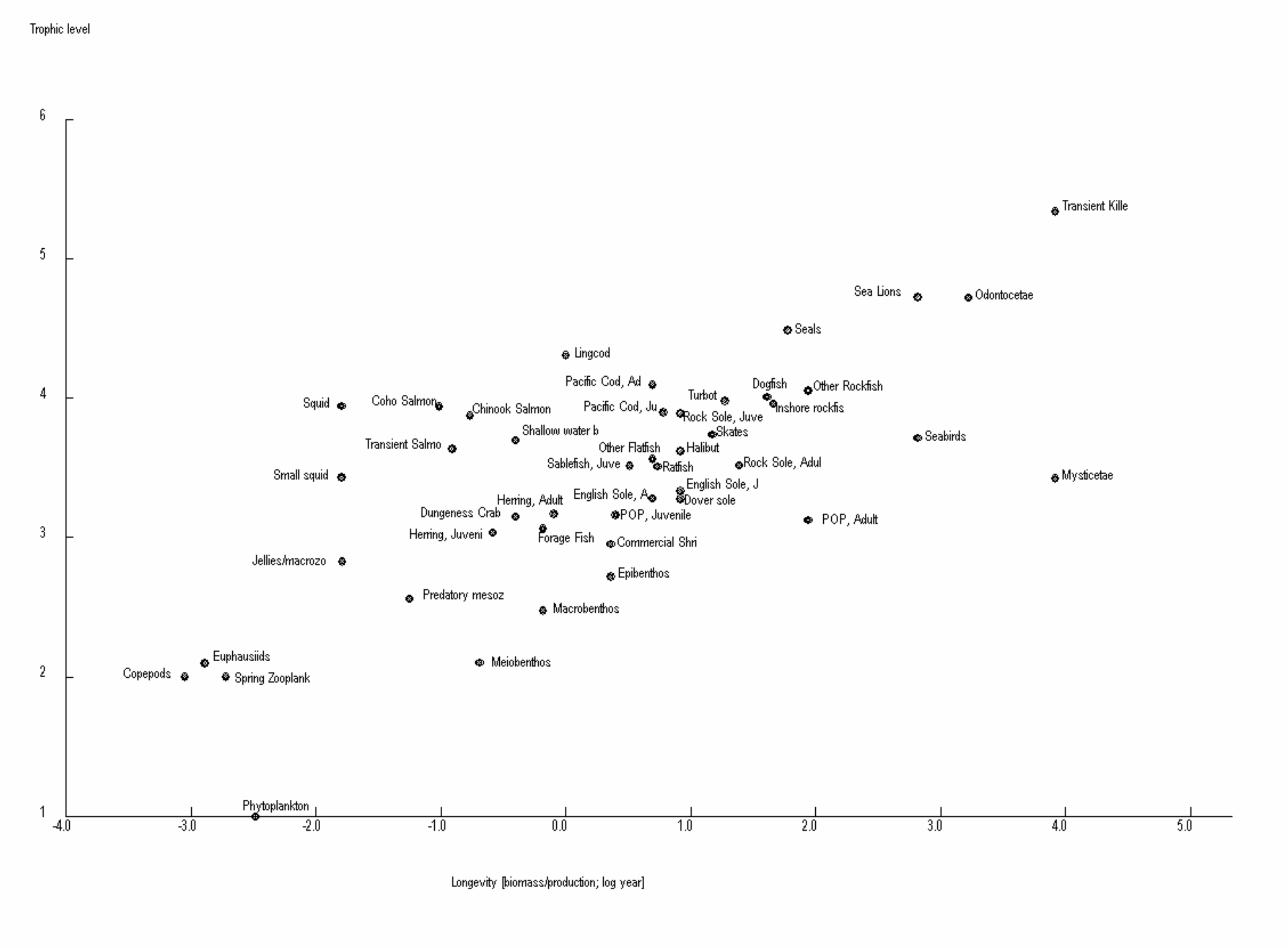


Fig. 25. Diagram of suggested impacts of the different groups in the Ecopath model on all other members of the ecosystem- output from Ecopath modelling.

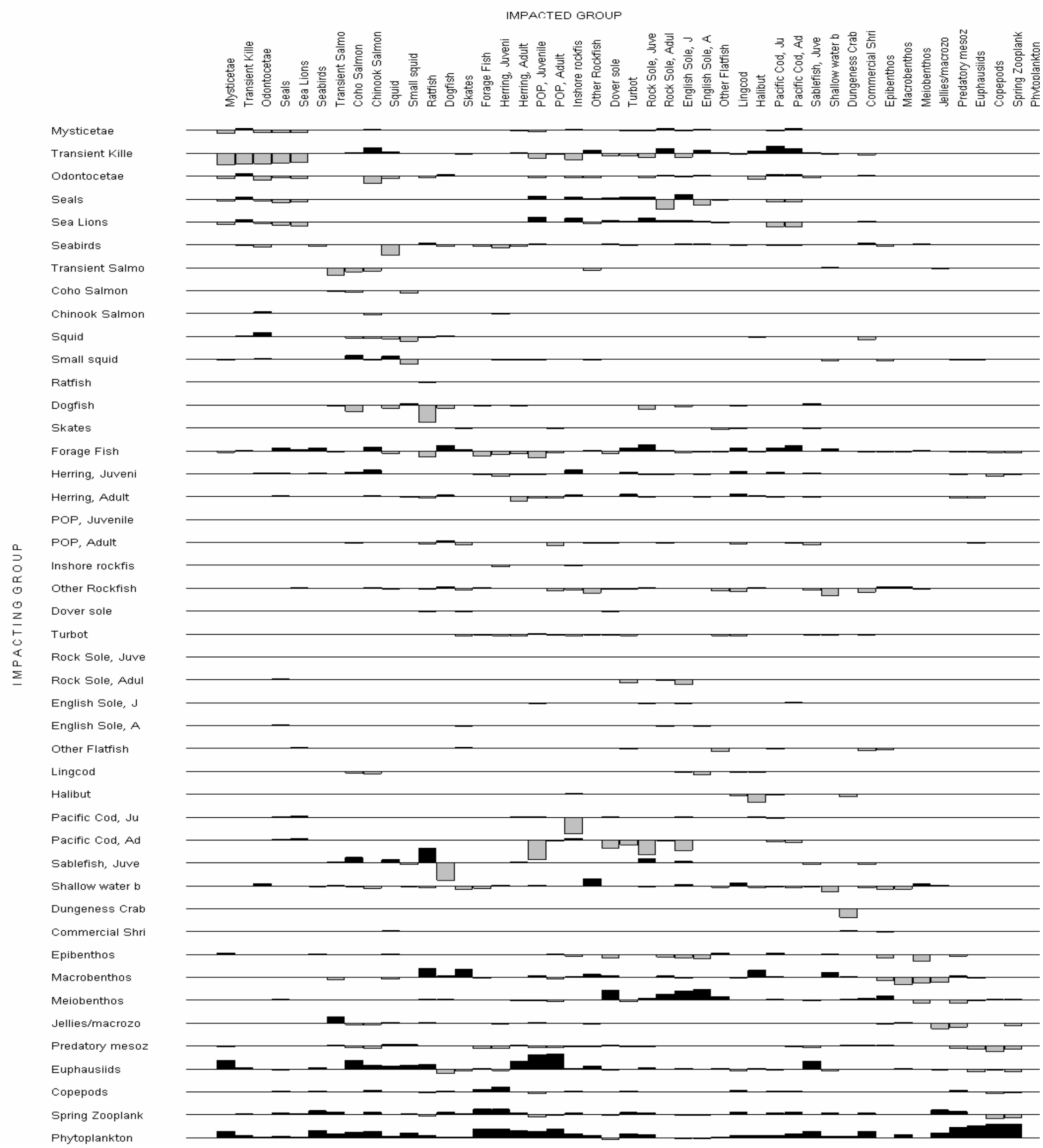
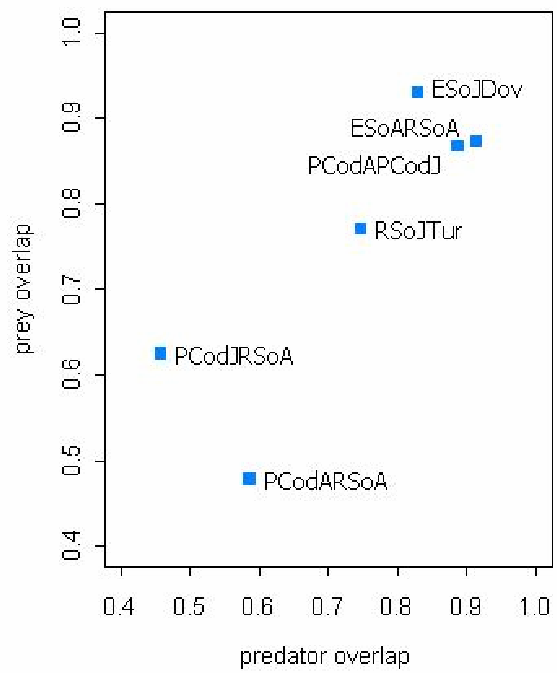


Fig. 26. Predator and prey overlap output from Ecopath model. Values plotted are for groundfish pairs with both prey and predator overlap values greater than 0.4.



Legend:

PCodJ:	Juvenile Pacific cod
PCodA:	Adult Pacific cod
EsoJ:	Juvenile English sole
EsoA:	Adult English sole
Dov:	Dover sole
RSoA:	Adult rock sole
RSoJ:	Juvenile rock sole
Tur:	Arrowtooth flounder

APPENDIX 1. DIET OF PREDATORS EXPRESSED AS ECOPATH GROUPS: DATA POOLED FOR 1985-1987, ALL HAULS.

Nstom is the sample size of stomachs for each predator species. Avg is the proportion (sum of proportions =1).

			DIETS for all Cruises and Areas
DOGFISH			
PredID	**Ecopath grouping**	**AvgP**	**nStom**
44	english sole	0.0022	756
44	epibenthos	0.0000	756
44	euphausiids	0.0499	756
44	forage fish	0.1185	756
44	herring	0.1630	756
44	jellies/macrozooplankton	0.0019	756
44	macrobenthos	0.1753	756
44	meiobenthos	0.0122	756
44	other fish	0.3393	756
44	other flatfish	0.0258	756
44	phytoplankton	0.0001	756
44	predatory invertebrates	0.0390	756
44	predatory mesozooplankton	0.0099	756
44	ratfish	0.0160	756
44	rock sole	0.0004	756
44	salmon	0.0158	756
44	shallowwater benthic fish	0.0075	756
44	shrimp	0.0073	756
44	squid	0.0157	756
BIG SKATE			
PredID	**Ecopath grouping**	**AvgP**	**nStom**
56	forage fish	0.1706	134
56	jellies/macrozooplankton	0.0000	134
56	macrobenthos	0.6307	134
56	meiobenthos	0.0003	134
56	other fish	0.0918	134
56	other flatfish	0.0555	134
56	predatory invertebrates	0.0105	134
56	predatory mesozooplankton	0.0010	134
56	rock sole	0.0008	134
56	shallowwater benthic fish	0.0040	134
56	shrimp	0.0252	134

56	squid	0.0095	134

BLACK SKATE

PredID	**Ecopath grouping**	**AvgP**	**nStom**
58	epibenthos	0.0330	32
58	euphausiids	0.0011	32
58	macrobenthos	0.4005	32
58	meiobenthos	0.1119	32
58	predatory mesozooplankton	0.0577	32
58	shallowwater benthic fish	0.0032	32
58	shrimp	0.3925	32

LONGNOSE SKATE

PredID	**Ecopath grouping**	**AvgP**	**nStom**
59	epibenthos	0.0000	30
59	forage fish	0.0766	30
59	macrobenthos	0.7212	30
59	other fish	0.0094	30
59	other flatfish	0.1079	30
59	shallowwater benthic fish	0.0113	30
59	shrimp	0.0736	30

RATFISH

PredID	Ecopath grouping	AvgP	**nStom**
66	epibenthos	0.0053	429
66	euphausiids	0.0018	429
66	jellies/macrozooplankton	0.0001	429
66	macrobenthos	0.8131	429
66	meiobenthos	0.0816	429
66	other fish	0.0297	429
66	predatory invertebrates	0.0006	429
66	predatory mesozooplankton	0.0364	429
66	salmon	0.0188	429
66	shallowwater benthic fish	0.0004	429
66	shrimp	0.0116	429
66	squid	0.0008	429

EULACHON

PredID	Ecopath grouping	AvgP	**nStom**
148	euphausiids	0.5675	16
148	macrobenthos	0.4325	16

PACIFIC COD

PredID	Ecopath grouping	AvgP	**nStom**
222	copepods	0.0000	610
222	epibenthos	0.0012	610
222	euphausiids	0.0016	610
222	forage fish	0.3127	610
222	herring	0.0932	610
222	inshore rockfish	0.0035	610
222	jellies/macrozooplankton	0.0000	610
222	macrobenthos	0.0626	610
222	meiobenthos	0.0091	610
222	microzooplankton	0.0000	610
222	other	0.0001	610
222	other fish	0.1687	610
222	other flatfish	0.1567	610
222	pacific cod	0.0033	610
222	pacific ocean perch	0.0056	610
222	predatory invertebrates	0.0040	610
222	predatory mesozooplankton	0.0039	610
222	shallowwater benthic fish	0.0159	610
222	shrimp	0.0871	610
222	squid	0.0097	610
222	turbot	0.0075	610
222	walleye pollock	0.0533	610

WALLEYE POLLOCK

PredID	Ecopath grouping	AvgP	**nStom**
228	copepods	0.0160	207
228	epibenthos	0.0862	207
228	euphausiids	0.1143	207
228	jellies/macrozooplankton	0.0001	207
228	macrobenthos	0.0710	207
228	meiobenthos	0.0032	207
228	other fish	0.0400	207
228	predatory invertebrates	0.0003	207
228	predatory mesozooplankton	0.0029	207
228	shallowwater benthic fish	0.0002	207
228	shrimp	0.6659	207

PACIFIC OCEAN PERCH

PredID	Ecopath grouping	AvgP	**nStom**
396	copepods	0.0257	112
396	epibenthos	0.0069	112
396	euphausiids	0.8595	112
396	macrobenthos	0.0690	112
396	other fish	0.0051	112
396	predatory mesozooplankton	0.0147	112
396	shrimp	0.0190	112

SEBASTES BABCOCKI

PredID	Ecopath grouping	AvgP	**nStom**
401	euphausiids	0.0113	47
401	forage fish	0.0121	47
401	macrobenthos	0.4023	47
401	meiobenthos	0.0480	47
401	other fish	0.1721	47
401	other flatfish	0.0248	47
401	predatory invertebrates	0.0311	47
401	predatory mesozooplankton	0.0006	47
401	shallowwater benthic fish	0.0170	47
401	shrimp	0.2396	47
401	squid	0.0299	47
401	walleye pollock	0.0111	47

SEBASTES BREVISPINIS

PredID	Ecopath grouping	AvgP	**nStom**
405	euphausiids	0.2744	38
405	jellies/macrozooplankton	0.0003	38
405	macrobenthos	0.0019	38
405	meiobenthos	0.0002	38
405	other fish	0.6352	38
405	predatory mesozooplankton	0.0000	38
405	shallowwater benthic fish	0.0016	38
405	walleye pollock	0.0862	38

SEBASTES ELONGATUS

PredID	Ecopath grouping	AvgP	**nStom**
414	euphausiids	0.8223	4
414	macrobenthos	0.1195	4
414	other fish	0.0566	4
414	predatory mesozooplankton	0.0016	4

SEBASTES FLAVIDUS

PredID	Ecopath grouping	AvgP	**nStom**
418	copepods	0.0000	57
418	epibenthos	0.0027	57
418	euphausiids	0.5813	57
418	forage fish	0.0134	57
418	inshore rockfish	0.0075	57
418	lingcod	0.0003	57
418	macrobenthos	0.1371	57
418	meiobenthos	0.0008	57
418	other fish	0.0189	57
418	other flatfish	0.0002	57
418	petrale sole	0.0025	57
418	predatory invertebrates	0.0034	57
418	predatory mesozooplankton	0.0028	57
418	shallowwater benthic fish	0.0011	57
418	shrimp	0.2250	57
418	squid	0.0030	57

SEBASTES PAUCISPINIS

PredID	Ecopath grouping	AvgP	**nStom**
435	meiobenthos	0.0009	8
435	other fish	0.1255	8
435	turbot	0.0228	8
435	walleye pollock	0.8508	8

SABLEFISH

PredID	Ecopath grouping	AvgP	**nStom**
455	dogfish	0.0333	170
455	epibenthos	0.0006	170
455	euphausiids	0.5782	170
455	forage fish	0.0199	170
455	herring	0.0288	170
455	jellies/macrozooplankton	0.0000	170
455	macrobenthos	0.1076	170
455	meiobenthos	0.0104	170
455	other fish	0.1623	170
455	phytoplankton	0.0104	170
455	predatory mesozooplankton	0.0033	170
455	shallowwater benthic fish	0.0035	170

455	shrimp	0.0385	170
455	squid	0.0033	170

LINGCOD

PredID	Ecopath grouping	AvgP	**nStom**
467	english sole	0.0851	25
467	herring	0.1030	25
467	meiobenthos	0.0009	25
467	other fish	0.6456	25
467	other flatfish	0.0721	25
467	salmon	0.0162	25
467	shallowwater benthic fish	0.0773	25

PACIFIC SANDDAB

PredID	Ecopath grouping	AvgP	**nStom**
596	copepods	0.0002	90
596	epibenthos	0.3665	90
596	euphausiids	0.3852	90
596	jellies/macrozooplankton	0.0010	90
596	macrobenthos	0.1061	90
596	meiobenthos	0.0124	90
596	other fish	0.0326	90
596	other flatfish	0.0169	90
596	predatory mesozooplankton	0.0114	90
596	shrimp	0.0507	90
596	turbot	0.0170	90

SPECKLED SANDDAB

PredID	Ecopath grouping	AvgP	**nStom**
598	epibenthos	0.0486	88
598	euphausiids	0.0117	88
598	forage fish	0.1371	88
598	macrobenthos	0.1589	88
598	meiobenthos	0.0266	88
598	other fish	0.0328	88
598	other flatfish	0.0075	88
598	predatory mesozooplankton	0.0226	88
598	shallowwater benthic fish	0.0004	88
598	shrimp	0.5540	88

ARROWTOOTH FLOUNDER

PredID	Ecopath grouping	AvgP	**nStom**
602	epibenthos	0.0057	903
602	euphausiids	0.0662	903
602	forage fish	0.1001	903
602	herring	0.1289	903
602	inshore rockfish	0.0150	903
602	macrobenthos	0.1153	903
602	meiobenthos	0.0014	903
602	other fish	0.5053	903
602	other flatfish	0.0028	903
602	predatory invertebrates	0.0005	903
602	predatory mesozooplankton	0.0000	903
602	shallowwater benthic fish	0.0233	903
602	shrimp	0.0350	903
602	walleye pollock	0.0006	903

PETRALE SOLE

PredID	Ecopath grouping	AvgP	**nStom**
607	epibenthos	0.1936	104
607	euphausiids	0.0355	104
607	herring	0.4879	104
607	macrobenthos	0.0179	104
607	meiobenthos	0.0002	104
607	other fish	0.2113	104
607	other flatfish	0.0002	104
607	predatory invertebrates	0.0036	104
607	predatory mesozooplankton	0.0000	104
607	salmon	0.0060	104
607	shallowwater benthic fish	0.0138	104
607	shrimp	0.0155	104
607	squid	0.0044	104
607	walleye pollock	0.0102	104

REX SOLE

PredID	Ecopath grouping	AvgP	**nStom**
610	copepods	0.0000	563
610	epibenthos	0.0027	563
610	euphausiids	0.0056	563
610	jellies/macrozooplankton	0.0000	563
610	macrobenthos	0.4125	563

610	meiobenthos	0.3514	563
610	microzooplankton	0.0000	563
610	other fish	0.0005	563
610	predatory mesozooplankton	0.0212	563
610	shallowwater benthic fish	0.0002	563
610	shrimp	0.2058	563
FLATHEAD SOLE			
PredID	Ecopath grouping	AvgP	**nStom**
612	epibenthos	0.0441	96
612	euphausiids	0.0029	96
612	macrobenthos	0.1060	96
612	meiobenthos	0.0071	96
612	other fish	0.0135	96
612	predatory mesozooplankton	0.0010	96
612	shrimp	0.8255	96
PACIFIC HALIBUT			
PredID	Ecopath grouping	AvgP	**nStom**
614	Dover sole	0.0011	152
614	dungeness crab	0.0011	152
614	epibenthos	0.0009	152
614	euphausiids	0.0000	152
614	forage fish	0.1006	152
614	herring	0.0728	152
614	jellies/macrozooplankton	0.0010	152
614	macrobenthos	0.4430	152
614	meiobenthos	0.0043	152
614	other fish	0.1009	152
614	other flatfish	0.0748	152
614	pacific cod	0.0098	152
614	predatory invertebrates	0.0289	152
614	predatory mesozooplankton	0.0000	152
614	salmon	0.0183	152
614	shallowwater benthic fish	0.0405	152
614	shrimp	0.0002	152
614	squid	0.0027	152
614	turbot	0.0982	152
614	walleye pollock	0.0009	152
BUTTER SOLE			

PredID	Ecopath grouping	AvgP	**nStom**
619	epibenthos	0.0422	5
619	forage fish	0.8351	5
619	macrobenthos	0.0090	5
619	meiobenthos	0.1086	5
619	predatory mesozooplankton	0.0051	5

ROCK SOLE

PredID	Ecopath grouping	AvgP	**nStom**
621	english sole	0.0060	347
621	epibenthos	0.0015	347
621	euphausiids	0.0003	347
621	forage fish	0.4055	347
621	macrobenthos	0.2487	347
621	meiobenthos	0.2612	347
621	other fish	0.0454	347
621	predatory mesozooplankton	0.0109	347
621	shallowwater benthic fish	0.0032	347
621	shrimp	0.0127	347
621	turbot	0.0046	347

DOVER SOLE

PredID	Ecopath grouping	AvgP	**nStom**
626	copepods	0.0000	294
626	epibenthos	0.0021	294
626	euphausiids	0.0009	294
626	jellies/macrozooplankton	0.0000	294
626	macrobenthos	0.4258	294
626	meiobenthos	0.5441	294
626	microzooplankton	0.0001	294
626	other fish	0.0000	294
626	predatory mesozooplankton	0.0213	294
626	shrimp	0.0055	294

ENGLISH SOLE

PredID	Ecopath grouping	AvgP	**nStom**
628	epibenthos	0.0002	416
628	euphausiids	0.0007	416
628	forage fish	0.0818	416
628	jellies/macrozooplankton	0.0009	416
628	macrobenthos	0.2654	416

628	meiobenthos	0.6196	416
628	microzooplankton	0.0010	416
628	other fish	0.0006	416
628	other flatfish	0.0003	416
628	predatory mesozooplankton	0.0227	416
628	shrimp	0.0068	416

STARRY FLOUNDER

PredID	Ecopath grouping	AvgP	**nStom**
631	macrobenthos	1.0000	3

CURLFIN SOLE

PredID	Ecopath grouping	AvgP	**nStom**
635	meiobenthos	1.0000	1

SAND SOLE

PredID	Ecopath grouping	AvgP	**nStom**
636	epibenthos	0.0021	199
636	euphausiids	0.0015	199
636	forage fish	0.3604	199
636	macrobenthos	0.0236	199
636	meiobenthos	0.0003	199
636	other fish	0.2613	199
636	other flatfish	0.0956	199
636	predatory mesozooplankton	0.0097	199
636	rock sole	0.0377	199
636	shallowwater benthic fish	0.1491	199
636	shrimp	0.0587	199

APPENDIX 2. DIET FOR PREDATORS EXPRESSED AS ECOPATH SUB GROUPINGS: ALL AREAS AND CRUISES COMBINED.

Nstom is the sample size of stomachs for each predator species, AvgP is the proportion (sum=1).

Predator Diet-all cruises and areas combined- by Ecopath Subgroups

DOGFISH

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
44	english sole	english sole	0.0022	756
44	epibenthos	barnacles	0.0000	756
44	euphausiids	euphausiids	0.0499	756
44	forage fish	sandlance	0.1185	756
44	herring	herring	0.1630	756
44	jellies/macrozooplankton	medusae	0.0019	756
44	macrobenthos	anomurans	0.0426	756
44	macrobenthos	ascidians	0.0002	756
44	macrobenthos	bivalves	0.0466	756
44	macrobenthos	branchiopods	0.0003	756
44	macrobenthos	cnidaria	0.0006	756
44	macrobenthos	crabs	0.0528	756
44	macrobenthos	crabs,shrimpsand lobsters	0.0046	756
44	macrobenthos	crustacea with mandibles	0.0027	756
44	macrobenthos	Echinoderms	0.0000	756
44	macrobenthos	Echiurans	0.0017	756
44	macrobenthos	Gastropods	0.0199	756
44	macrobenthos	Lophophorans	0.0001	756
44	macrobenthos	Molluscs	0.0033	756
44	macrobenthos	polyplacophora	0.0000	756
44	macrobenthos	Reptantia	0.0001	756
44	meiobenthos	Annelids	0.0115	756
44	meiobenthos	Nematodes	0.0004	756
44	meiobenthos	proboscis worms	0.0004	756
44	other fish	bony fishes	0.2779	756
44	other fish	unid fish	0.0615	756
44	other flatfish	Dabs	0.0100	756
44	other flatfish	Flatfishes	0.0154	756
44	other flatfish	flathead sole	0.0004	756
44	phytoplankton	Phytoplankton	0.0001	756
44	predatory invertebrates	Cephalopods	0.0063	756
44	predatory invertebrates	Octopus	0.0327	756
44	predatory mesozooplankton	Amphipods	0.0000	756

44	predatory mesozooplankton	Decapods	0.0099	756
44	predatory mesozooplankton	Gammarids	0.0000	756
44	predatory mesozooplankton	hyperid amphipods	0.0000	756
44	ratfish	Ratfish	0.0160	756
44	rock sole	rock sole	0.0004	756
44	salmon	Salmon	0.0158	756
44	shallowwater benthic fish	Agonidae	0.0008	756
44	shallowwater benthic fish	Lumpfishes	0.0003	756
44	shallowwater benthic fish	pacific tomcod	0.0005	756
44	shallowwater benthic fish	Perch	0.0008	756
44	shallowwater benthic fish	Sculpins	0.0049	756
44	shallowwater benthic fish	Snailfishes	0.0002	756
44	shrimp	Shrimp	0.0073	756
44	squid	Squid	0.0157	756

BIG SKATE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
56	forage fish	Sandlance	0.1706	134
56	jellies/macrozooplankton	medusae	0.0000	134
56	macrobenthos	anomurans	0.0561	134
56	macrobenthos	bivalves	0.0102	134
56	macrobenthos	crabs	0.5610	134
56	macrobenthos	crustacea with mandibles	0.0030	134
56	macrobenthos	gastropods	0.0004	134
56	meiobenthos	annelids	0.0001	134
56	meiobenthos	nematodes	0.0002	134
56	other fish	bony fishes	0.0831	134
56	other fish	unid fish	0.0087	134
56	other flatfish	dabs	0.0258	134
56	other flatfish	flatfishes	0.0181	134
56	other flatfish	sand sole	0.0116	134
56	predatory invertebrates	octopus	0.0105	134
56	predatory mesozooplankton	cumaceans	0.0000	134
56	predatory mesozooplankton	decapods	0.0009	134
56	predatory mesozooplankton	gammarids	0.0001	134
56	rock sole	rock sole	0.0008	134
56	shallowwater benthic fish	sandfishes	0.0040	134
56	shrimp	shrimp	0.0252	134
56	squid	squid	0.0095	134

BLACK SKATE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**

58	epibenthos	isopods	0.0270	32
58	epibenthos	mysids	0.0061	32
58	euphausiids	euphausiids	0.0011	32
58	macrobenthos	anomurans	0.1406	32
58	macrobenthos	crabs	0.1931	32
58	macrobenthos	crustacea with mandibles	0.0668	32
58	meiobenthos	annelids	0.1119	32
58	predatory mesozooplankton	cumaceans	0.0047	32
58	predatory mesozooplankton	gammarids	0.0530	32
58	shallowwater benthic fish	agonidae	0.0026	32
58	shallowwater benthic fish	pricklebacks	0.0006	32
58	shrimp	shrimp	0.3925	32

LONGNOSE SKATE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
59	epibenthos	mysids	0.0000	30
59	forage fish	sandlance	0.0766	30
59	macrobenthos	anomurans	0.0555	30
59	macrobenthos	bivalves	0.0004	30
59	macrobenthos	crabs	0.5589	30
59	macrobenthos	crustacea with mandibles	0.0029	30
59	macrobenthos	gastropods	0.0193	30
59	macrobenthos	reptantia	0.0843	30
59	other fish	unid fish	0.0094	30
59	other flatfish	flatfishes	0.1079	30
59	shallowwater benthic fish	sculpins	0.0113	30
59	shrimp	shrimp	0.0736	30

RATFISH

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
66	epibenthos	barnacles	0.0005	429
66	epibenthos	isopods	0.0040	429
66	epibenthos	mysids	0.0008	429
66	euphausiids	euphausiids	0.0018	429
66	jellies/macrozooplankton	medusae	0.0001	429
66	macrobenthos	anomurans	0.0738	429
66	macrobenthos	bivalves	0.3484	429
66	macrobenthos	crabs	0.0676	429
66	macrobenthos	crabs,shrimps and lobsters	0.0013	429
66	macrobenthos	crustacea with mandibles	0.1108	429
66	macrobenthos	echinoderms	0.1130	429

66	macrobenthos	echiurans	0.0070	429
66	macrobenthos	gastropods	0.0904	429
66	macrobenthos	peanut worms	0.0008	429
66	meiobenthos	annelids	0.0770	429
66	meiobenthos	nudibranchs	0.0001	429
66	meiobenthos	proboscis worms	0.0045	429
66	other fish	bony fishes	0.0242	429
66	other fish	teleosts	0.0002	429
66	other fish	unid fish	0.0053	429
66	predatory invertebrates	cephalopods	0.0006	429
66	predatory mesozooplankton	amphipods	0.0072	429
66	predatory mesozooplankton	cumaceans	0.0001	429
66	predatory mesozooplankton	decapods	0.0185	429
66	predatory mesozooplankton	gammarids	0.0105	429
66	predatory mesozooplankton	ostracods	0.0000	429
66	salmon	salmon	0.0188	429
66	shallowwater benthic fish	agonidae	0.0004	429
66	shrimp	shrimp	0.0116	429
66	squid	squid	0.0008	429

EULACHON

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
148	euphausiids	euphausiids	0.5675	16
148	macrobenthos	crustacea with mandibles	0.4325	16

PACIFIC COD

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
222	copepods	copepods	0.0000	610
222	epibenthos	barnacles	0.0001	610
222	epibenthos	isopods	0.0000	610
222	epibenthos	mysids	0.0011	610
222	euphausiids	euphausiids	0.0016	610
222	forage fish	sandlance	0.3127	610
222	herring	herring	0.0932	610
222	inshore rockfish	rockfish	0.0035	610
222	jellies/macrozooplankton	medusae	0.0000	610
222	macrobenthos	anomurans	0.0079	610
222	macrobenthos	bivalves	0.0012	610
222	macrobenthos	cnidaria	0.0000	610
222	macrobenthos	crabs	0.0257	610
222	macrobenthos	crabs,shrimps and lobsters	0.0025	610

222	macrobenthos	crustacea	0.0000	610
222	macrobenthos	crustacea with mandibles	0.0149	610
222	macrobenthos	echinoderms	0.0000	610
222	macrobenthos	echiurans	0.0027	610
222	macrobenthos	gastropods	0.0072	610
222	macrobenthos	molluscs	0.0000	610
222	macrobenthos	peanut worms	0.0000	610
222	macrobenthos	sponges	0.0004	610
222	meiobenthos	annelids	0.0077	610
222	meiobenthos	nematodes	0.0014	610
222	meiobenthos	proboscis worms	0.0000	610
222	microzooplankton	protozoa	0.0000	610
222	other	tussock moths	0.0001	610
222	other fish	bony fishes	0.0721	610
222	other fish	teleosts	0.0000	610
222	other fish	unid fish	0.0966	610
222	other flatfish	dabs	0.0066	610
222	other flatfish	flatfishes	0.1501	610
222	pacific cod	pacific cod	0.0033	610
222	pacific ocean perch	pacific ocean perch	0.0056	610
222	predatory invertebrates	cephalopods	0.0040	610
222	predatory mesozooplankton	amphipods	0.0005	610
222	predatory mesozooplankton	cumaceans	0.0000	610
222	predatory mesozooplankton	decapods	0.0009	610
222	predatory mesozooplankton	gammarids	0.0025	610
222	shallowwater benthic fish	agonidae	0.0049	610
222	shallowwater benthic fish	greenling	0.0064	610
222	shallowwater benthic fish	perch	0.0015	610
222	shallowwater benthic fish	pholididae	0.0021	610
222	shallowwater benthic fish	pricklebacks	0.0003	610
222	shallowwater benthic fish	sculpins	0.0006	610
222	shrimp	shrimp	0.0871	610
222	squid	squid	0.0097	610
222	turbot	turbot	0.0075	610
222	walleye pollock	walleye pollock	0.0533	610

WALLEYE POLLOCK

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
228	copepods	copepods	0.0160	207
228	epibenthos	isopods	0.0006	207
228	epibenthos	mysids	0.0857	207
228	euphausiids	euphausiids	0.1143	207

228	jellies/macrozooplankton	tunicates	0.0001	207
228	macrobenthos	anomurans	0.0002	207
228	macrobenthos	bivalves	0.0000	207
228	macrobenthos	chaetognaths	0.0000	207
228	macrobenthos	crabs	0.0170	207
228	macrobenthos	crustacea with mandibles	0.0466	207
228	macrobenthos	gastropods	0.0071	207
228	meiobenthos	annelids	0.0026	207
228	meiobenthos	nematodes	0.0006	207
228	other fish	bony fishes	0.0173	207
228	other fish	unid fish	0.0227	207
228	predatory invertebrates	cephalopods	0.0003	207
228	predatory mesozooplankton	amphipods	0.0000	207
228	predatory mesozooplankton	cumaceans	0.0002	207
228	predatory mesozooplankton	gammarids	0.0025	207
228	predatory mesozooplankton	hyperid amphipods	0.0001	207
228	shallowwater benthic fish	sculpins	0.0002	207
228	shrimp	shrimp	0.6659	207

SEBASTES ALUTUS -PACIFIC OCEAN PERCH

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
396	copepods	copepods	0.0257	112
396	epibenthos	mysids	0.0069	112
396	euphausiids	euphausiids	0.8595	112
396	macrobenthos	chaetognaths	0.0006	112
396	macrobenthos	crabs	0.0468	112
396	macrobenthos	crustacea with mandibles	0.0139	112
396	macrobenthos	gastropods	0.0077	112
396	other fish	unid fish	0.0051	112
396	predatory mesozooplankton	amphipods	0.0007	112
396	predatory mesozooplankton	cumaceans	0.0014	112
396	predatory mesozooplankton	gammarids	0.0117	112
396	predatory mesozooplankton	hyperid amphipods	0.0008	112
396	predatory mesozooplankton	megalops	0.0003	112
396	shrimp	shrimp	0.0190	112

SEBASTES BABCOCKI

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
401	euphausiids	euphausiids	0.0113	47
401	forage fish	sandlance	0.0121	47
401	macrobenthos	crabs	0.4023	47
401	meiobenthos	nematodes	0.0480	47

401	other fish	bony fishes	0.1721	47
401	other flatfish	dabs	0.0201	47
401	other flatfish	slender sole	0.0047	47
401	predatory invertebrates	cephalopods	0.0311	47
401	predatory mesozooplankton	amphipods	0.0004	47
401	predatory mesozooplankton	gammarids	0.0003	47
401	shallowwater benthic fish	agonidae	0.0056	47
401	shallowwater benthic fish	pricklebacks	0.0114	47
401	shrimp	shrimp	0.2396	47
401	squid	squid	0.0299	47
401	walleye pollock	walleye pollock	0.0111	47

SEBASTES BREVISPINIS

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
405	euphausiids	euphausiids	0.2744	38
405	jellies/macrozooplankton	medusae	0.0003	38
405	macrobenthos	crustacea with mandibles	0.0019	38
405	meiobenthos	nematodes	0.0002	38
405	other fish	bony fishes	0.2084	38
405	other fish	unid fish	0.4268	38
405	predatory mesozooplankton	hyperid amphipods	0.0000	38
405	shallowwater benthic fish	smelt	0.0016	38
405	walleye pollock	walleye pollock	0.0862	38

SEBASTES ELONGATUS

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
414	euphausiids	euphausiids	0.8223	4
414	macrobenthos	crabs	0.1115	4
414	macrobenthos	crustacea with mandibles	0.0080	4
414	other fish	bony fishes	0.0566	4
414	predatory mesozooplankton	amphipods	0.0005	4
414	predatory mesozooplankton	gammarids	0.0010	4

SEBASTES FLAVIDUS

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
418	copepods	copepods	0.0000	57
418	epibenthos	mysids	0.0027	57
418	euphausiids	euphausiids	0.5813	57
418	forage fish	sandlance	0.0134	57
418	inshore rockfish	rockfish	0.0075	57
418	lingcod	lingcod	0.0003	57
418	macrobenthos	anomurans	0.0000	57

418	macrobenthos	crabs	0.0686	57
418	macrobenthos	crustacea with mandibles	0.0254	57
418	macrobenthos	gastropods	0.0430	57
418	meiobenthos	annelids	0.0004	57
418	meiobenthos	nematodes	0.0005	57
418	other fish	bony fishes	0.0030	57
418	other fish	unid fish	0.0159	57
418	other flatfish	flatfishes	0.0002	57
418	petrale sole	petrale sole	0.0025	57
418	predatory invertebrates	cephalopods	0.0034	57
418	predatory mesozooplankton	amphipods	0.0003	57
418	predatory mesozooplankton	cumaceans	0.0015	57
418	predatory mesozooplankton	gammarids	0.0008	57
418	predatory mesozooplankton	hyperid amphipods	0.0002	57
418	shallowwater benthic fish	sculpins	0.0011	57
418	shrimp	shrimp	0.2250	57
418	squid	squid	0.0030	57
SEBASTES PAUCISPINIS				
PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
435	meiobenthos	nematodes	0.0009	8
435	other fish	bony fishes	0.0728	8
435	other fish	unid fish	0.0527	8
435	turbot	turbot	0.0228	8
435	walleye pollock	walleye pollock	0.8508	8
SABLEFISH				
PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
455	dogfish	dogfish	0.0263	170
455	dogfish	sharks	0.0070	170
455	epibenthos	isopods	0.0006	170
455	epibenthos	mysids	0.0000	170
455	euphausiids	euphausiids	0.5782	170
455	forage fish	sandlance	0.0199	170
455	herring	herring	0.0288	170
455	jellies/macrozooplankton	medusae	0.0000	170
455	macrobenthos	anomurans	0.0089	170
455	macrobenthos	ascidians	0.0019	170
455	macrobenthos	bivalves	0.0016	170
455	macrobenthos	cnidaria	0.0366	170
455	macrobenthos	crabs	0.0076	170
455	macrobenthos	crustacea with mandibles	0.0032	170

455	macrobenthos	echinoderms	0.0072	170
455	macrobenthos	echiurans	0.0074	170
455	macrobenthos	gastropods	0.0327	170
455	macrobenthos	reptantia	0.0004	170
455	meiobenthos	annelids	0.0104	170
455	other fish	bony fishes	0.0020	170
455	other fish	unid fish	0.1603	170
455	phytoplankton	phytoplankton	0.0104	170
455	predatory mesozooplankton	amphipods	0.0002	170
455	predatory mesozooplankton	gammarids	0.0029	170
455	predatory mesozooplankton	hyperid amphipods	0.0001	170
455	shallowwater benthic fish	sculpins	0.0035	170
455	shrimp	shrimp	0.0385	170
455	squid	squid	0.0033	170

LINGCOD

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
467	english sole	english sole	0.0851	25
467	herring	herring	0.1030	25
467	meiobenthos	annelids	0.0000	25
467	meiobenthos	nematodes	0.0009	25
467	other fish	bony fishes	0.6428	25
467	other fish	unid fish	0.0027	25
467	other flatfish	yellowfin sole	0.0721	25
467	salmon	salmon	0.0162	25
467	shallowwater benthic fish	sculpins	0.0773	25

PACIFIC SANDDAB

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
596	copepods	copepods	0.0002	90
596	epibenthos	isopods	0.0002	90
596	epibenthos	mysids	0.3663	90
596	euphausiids	euphausiids	0.3852	90
596	jellies/macrozooplankton	tunicates	0.0010	90
596	macrobenthos	anomurans	0.0227	90
596	macrobenthos	ascidians	0.0156	90
596	macrobenthos	chaetognaths	0.0010	90
596	macrobenthos	crabs	0.0248	90
596	macrobenthos	crustacea with mandibles	0.0413	90
596	macrobenthos	echinoderms	0.0006	90
596	macrobenthos	gastropods	0.0001	90
596	macrobenthos	peanut worms	0.0000	90

596	meiobenthos	annelids	0.0122	90
596	meiobenthos	nematodes	0.0002	90
596	other fish	bony fishes	0.0326	90
596	other flatfish	dabs	0.0169	90
596	predatory mesozooplankton	amphipods	0.0078	90
596	predatory mesozooplankton	cumaceans	0.0000	90
596	predatory mesozooplankton	gammarids	0.0036	90
596	shrimp	shrimp	0.0507	90
596	turbot	turbot	0.0170	90

SPECKLED SANDDAB

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
598	epibenthos	mysids	0.0486	88
598	euphausiids	euphausiids	0.0117	88
598	forage fish	sandlance	0.1371	88
598	macrobenthos	bivalves	0.0007	88
598	macrobenthos	crabs	0.0388	88
598	macrobenthos	crabs,shrimps and lobsters	0.0803	88
598	macrobenthos	crustacea with mandibles	0.0391	88
598	meiobenthos	annelids	0.0266	88
598	other fish	bony fishes	0.0154	88
598	other fish	unid fish	0.0174	88
598	other flatfish	flatfishes	0.0075	88
598	predatory mesozooplankton	amphipods	0.0022	88
598	predatory mesozooplankton	cumaceans	0.0019	88
598	predatory mesozooplankton	gammarids	0.0185	88
598	shallowwater benthic fish	clingfishes	0.0004	88
598	shrimp	shrimp	0.5540	88

ARROWTOOTH FLOUNDER

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
602	epibenthos	mysids	0.0057	903
602	euphausiids	euphausiids	0.0662	903
602	forage fish	eulachon	0.0020	903
602	forage fish	sandlance	0.0981	903
602	herring	herring	0.1289	903
602	inshore rockfish	rockfish	0.0150	903
602	macrobenthos	bivalves	0.0000	903
602	macrobenthos	cnidaria	0.0000	903
602	macrobenthos	crabs	0.0228	903
602	macrobenthos	crabs,shrimps and lobsters	0.0742	903

602	macrobenthos	crustacea	0.0000	903
602	macrobenthos	crustacea with mandibles	0.0180	903
602	macrobenthos	echinoderms	0.0003	903
602	macrobenthos	gastropods	0.0000	903
602	meiobenthos	annelids	0.0010	903
602	meiobenthos	nematodes	0.0004	903
602	meiobenthos	proboscis worms	0.0000	903
602	other fish	bony fishes	0.4494	903
602	other fish	unid fish	0.0559	903
602	other flatfish	flatfishes	0.0004	903
602	other flatfish	flathead sole	0.0024	903
602	predatory invertebrates	cephalopods	0.0005	903
602	predatory mesozooplankton	amphipods	0.0000	903
602	predatory mesozooplankton	cumaceans	0.0000	903
602	predatory mesozooplankton	decapods	0.0000	903
602	shallowwater benthic fish	eelpout	0.0017	903
602	shallowwater benthic fish	gadids	0.0139	903
602	shallowwater benthic fish	perch	0.0011	903
602	shallowwater benthic fish	sculpins	0.0066	903
602	shrimp	shrimp	0.0350	903
602	walleye pollock	walleye pollock	0.0006	903

PETRALE SOLE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
607	epibenthos	isopods	0.0000	104
607	epibenthos	mysids	0.1936	104
607	euphausiids	euphausiids	0.0355	104
607	herring	herring	0.4879	104
607	macrobenthos	anomurans	0.0002	104
607	macrobenthos	bivalves	0.0021	104
607	macrobenthos	crabs	0.0108	104
607	macrobenthos	crustacea with mandibles	0.0048	104
607	macrobenthos	echinoderms	0.0000	104
607	meiobenthos	annelids	0.0001	104
607	meiobenthos	nematodes	0.0001	104
607	other fish	bony fishes	0.2113	104
607	other flatfish	dabs	0.0002	104
607	predatory invertebrates	cephalopods	0.0036	104
607	predatory mesozooplankton	cumaceans	0.0000	104
607	salmon	salmon	0.0060	104
607	shallowwater benthic fish	agonidae	0.0078	104
607	shallowwater benthic fish	sculpins	0.0060	104

607	shrimp	shrimp	0.0155	104
607	squid	squid	0.0044	104
607	walleye pollock	walleye pollock	0.0102	104

REX SOLE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
610	copepods	copepods	0.0000	563
610	epibenthos	isopods	0.0020	563
610	epibenthos	mysids	0.0007	563
610	epibenthos	tanaidaceans	0.0000	563
610	euphausiids	euphausiids	0.0056	563
610	jellies/macrozooplankton	medusae	0.0000	563
610	macrobenthos	anomurans	0.0035	563
610	macrobenthos	ascidians	0.0000	563
610	macrobenthos	bivalves	0.0217	563
610	macrobenthos	crabs	0.1700	563
610	macrobenthos	crustacea with mandibles	0.0075	563
610	macrobenthos	echinoderms	0.0029	563
610	macrobenthos	echiurans	0.2065	563
610	macrobenthos	gastropods	0.0002	563
610	macrobenthos	reptantia	0.0002	563
610	macrobenthos	sponges	0.0000	563
610	meiobenthos	annelids	0.3498	563
610	meiobenthos	nematodes	0.0003	563
610	meiobenthos	proboscis worms	0.0014	563
610	microzooplankton	protozoa	0.0000	563
610	other fish	unid fish	0.0005	563
610	predatory mesozooplankton	amphipods	0.0007	563
610	predatory mesozooplankton	caprellid amphipods	0.0000	563
610	predatory mesozooplankton	cumaceans	0.0018	563
610	predatory mesozooplankton	decapods	0.0000	563
610	predatory mesozooplankton	gammarids	0.0187	563
610	predatory mesozooplankton	ostracods	0.0000	563
610	shallowwater benthic fish	sculpins	0.0002	563
610	shrimp	shrimp	0.2058	563

FLATHEAD SOLE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
612	epibenthos	isopods	0.0001	96
612	epibenthos	mysids	0.0440	96
612	euphausiids	euphausiids	0.0029	96
612	macrobenthos	bivalves	0.0001	96

612	macrobenthos	crabs	0.0187	96
612	macrobenthos	crustacea with mandibles	0.0054	96
612	macrobenthos	echinoderms	0.0779	96
612	macrobenthos	gastropods	0.0040	96
612	meiobenthos	annelids	0.0071	96
612	other fish	unid fish	0.0135	96
612	predatory mesozooplankton	gammarids	0.0010	96
612	shrimp	shrimp	0.8255	96

PACIFIC HALIBUT

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
614	Dover sole	Dover sole	0.0011	152
614	dungeness crab	dungeness crab	0.0011	152
614	epibenthos	mysids	0.0009	152
614	euphausiids	euphausiids	0.0000	152
614	forage fish	sandlance	0.1006	152
614	herring	herring	0.0728	152
614	jellies/macrozooplankton	medusae	0.0010	152
614	macrobenthos	anomurans	0.0360	152
614	macrobenthos	bivalves	0.1876	152
614	macrobenthos	cnidaria	0.0001	152
614	macrobenthos	crabs	0.2061	152
614	macrobenthos	crustacea with mandibles	0.0004	152
614	macrobenthos	echinoderms	0.0001	152
614	macrobenthos	echiurans	0.0001	152
614	macrobenthos	gastropods	0.0011	152
614	macrobenthos	reptantia	0.0114	152
614	meiobenthos	annelids	0.0041	152
614	meiobenthos	nematodes	0.0001	152
614	meiobenthos	proboscis worms	0.0001	152
614	other fish	bony fishes	0.0825	152
614	other fish	unid fish	0.0185	152
614	other flatfish	dabs	0.0101	152
614	other flatfish	flatfishes	0.0346	152
614	other flatfish	sand sole	0.0300	152
614	pacific cod	pacific cod	0.0098	152
614	predatory invertebrates	cephalopods	0.0020	152
614	predatory invertebrates	octopus	0.0269	152
614	predatory mesozooplankton	amphipods	0.0000	152
614	salmon	salmon	0.0183	152
614	shallowwater benthic fish	gadids	0.0182	152
614	shallowwater benthic fish	pacific tomcod	0.0165	152

614	shallowwater benthic fish	sculpins	0.0058	152
614	shrimp	shrimp	0.0002	152
614	squid	squid	0.0027	152
614	turbot	turbot	0.0982	152
614	walleye pollock	walleye pollock	0.0009	152

BUTTER SOLE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
619	epibenthos	barnacles	0.0422	5
619	forage fish	sandlance	0.8351	5
619	macrobenthos	bivalves	0.0090	5
619	meiobenthos	annelids	0.1086	5
619	predatory mesozooplankton	amphipods	0.0031	5
619	predatory mesozooplankton	gammarids	0.0020	5

ROCK SOLE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
621	english sole	english sole	0.0060	347
621	epibenthos	barnacles	0.0005	347
621	epibenthos	isopods	0.0004	347
621	epibenthos	mysids	0.0006	347
621	euphausiids	euphausiids	0.0003	347
621	forage fish	sandlance	0.4055	347
621	macrobenthos	anomurans	0.0801	347
621	macrobenthos	bivalves	0.1087	347
621	macrobenthos	cnidaria	0.0006	347
621	macrobenthos	crabs	0.0342	347
621	macrobenthos	crabs,shrimps and lobsters	0.0013	347
621	macrobenthos	crustacea with mandibles	0.0045	347
621	macrobenthos	echinoderms	0.0080	347
621	macrobenthos	echiurans	0.0073	347
621	macrobenthos	gastropods	0.0035	347
621	macrobenthos	peanut worms	0.0000	347
621	macrobenthos	reptantia	0.0005	347
621	meiobenthos	annelids	0.2507	347
621	meiobenthos	bryozoans	0.0024	347
621	meiobenthos	proboscis worms	0.0082	347
621	other fish	bony fishes	0.0313	347
621	other fish	unid fish	0.0141	347
621	predatory mesozooplankton	amphipods	0.0009	347
621	predatory mesozooplankton	cumaceans	0.0000	347

621	predatory mesozooplankton	decapods	0.0072	347
621	predatory mesozooplankton	gammarids	0.0028	347
621	predatory mesozooplankton	hyperid amphipods	0.0000	347
621	shallowwater benthic fish	agonidae	0.0000	347
621	shallowwater benthic fish	perch	0.0031	347
621	shallowwater benthic fish	sculpins	0.0001	347
621	shrimp	shrimp	0.0127	347
621	turbot	turbot	0.0046	347

DOVER SOLE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
626	copepods	copepods	0.0000	294
626	epibenthos	isopods	0.0020	294
626	epibenthos	mysids	0.0001	294
626	euphausiids	euphausiids	0.0009	294
626	jellies/macrozooplankton	medusae	0.0000	294
626	macrobenthos	anomurans	0.0032	294
626	macrobenthos	ascidians	0.0003	294
626	macrobenthos	bivalves	0.0418	294
626	macrobenthos	cnidaria	0.1188	294
626	macrobenthos	crabs	0.0508	294
626	macrobenthos	crabs,shrimps and lobsters	0.0006	294
626	macrobenthos	crustacea with mandibles	0.0009	294
626	macrobenthos	echinoderms	0.1842	294
626	macrobenthos	echiurans	0.0215	294
626	macrobenthos	gastropods	0.0031	294
626	macrobenthos	peanut worms	0.0001	294
626	macrobenthos	prosobranchs	0.0006	294
626	meiobenthos	annelids	0.5426	294
626	meiobenthos	bryozoans	0.0000	294
626	meiobenthos	nematodes	0.0001	294
626	meiobenthos	proboscis worms	0.0013	294
626	microzooplankton	protozoa	0.0001	294
626	other fish	bony fishes	0.0000	294
626	predatory mesozooplankton	amphipods	0.0065	294
626	predatory mesozooplankton	caprellid amphipods	0.0001	294
626	predatory mesozooplankton	cumaceans	0.0026	294
626	predatory mesozooplankton	decapods	0.0036	294
626	predatory mesozooplankton	gammarids	0.0084	294
626	predatory mesozooplankton	hyperid amphipods	0.0000	294
626	predatory mesozooplankton	ostracods	0.0000	294

626	shrimp	shrimp	0.0055	294

ENGLISH SOLE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
628	epibenthos	barnacles	0.0000	416
628	epibenthos	isopods	0.0001	416
628	epibenthos	leptostraca	0.0001	416
628	epibenthos	mysids	0.0001	416
628	euphausiids	euphausiids	0.0007	416
628	forage fish	sandlance	0.0818	416
628	jellies/macrozooplankton	medusae	0.0009	416
628	macrobenthos	anomurans	0.0000	416
628	macrobenthos	aplacophora	0.0000	416
628	macrobenthos	bivalves	0.1015	416
628	macrobenthos	cnidaria	0.0032	416
628	macrobenthos	crabs	0.0219	416
628	macrobenthos	crustacea with mandibles	0.0019	416
628	macrobenthos	echinoderms	0.0617	416
628	macrobenthos	echiurans	0.0706	416
628	macrobenthos	gastropods	0.0045	416
628	macrobenthos	peanut worms	0.0001	416
628	meiobenthos	annelids	0.5873	416
628	meiobenthos	nematodes	0.0001	416
628	meiobenthos	proboscis worms	0.0321	416
628	microzooplankton	protozoa	0.0010	416
628	other fish	bony fishes	0.0000	416
628	other fish	unid fish	0.0006	416
628	other flatfish	flatfishes	0.0003	416
628	predatory mesozooplankton	amphipods	0.0106	416
628	predatory mesozooplankton	cumaceans	0.0053	416
628	predatory mesozooplankton	decapods	0.0013	416
628	predatory mesozooplankton	gammarids	0.0055	416
628	predatory mesozooplankton	ostracods	0.0000	416
628	shrimp	shrimp	0.0068	416

STARRY FLOUNDER

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
631	macrobenthos	bivalves	0.9731	3
631	macrobenthos	echinoderms	0.0260	3
631	macrobenthos	gastropods	0.0009	3

CURLFIN SOLE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
635	meiobenthos	annelids	1.0000	1

SAND SOLE

PredID	Ecopath grouping	**Ecopath Sub Group**	AvgP	**nStom**
636	epibenthos	mysids	0.0021	199
636	euphausiids	euphausiids	0.0015	199
636	forage fish	sandlance	0.3604	199
636	macrobenthos	anomurans	0.0000	199
636	macrobenthos	bivalves	0.0008	199
636	macrobenthos	crabs	0.0168	199
636	macrobenthos	crustacea with mandibles	0.0034	199
636	macrobenthos	echinoderms	0.0018	199
636	macrobenthos	gastropods	0.0007	199
636	meiobenthos	annelids	0.0003	199
636	other fish	bony fishes	0.0946	199
636	other fish	unid fish	0.1667	199
636	other flatfish	dabs	0.0246	199
636	other flatfish	flatfishes	0.0541	199
636	other flatfish	sand sole	0.0127	199
636	other flatfish	yellowfin sole	0.0042	199
636	predatory mesozooplankton	amphipods	0.0014	199
636	predatory mesozooplankton	cumaceans	0.0004	199
636	predatory mesozooplankton	gammarids	0.0078	199
636	rock sole	rock sole	0.0377	199
636	shallowwater benthic fish	agonidae	0.0006	199
636	shallowwater benthic fish	pricklebacks	0.0010	199
636	shallowwater benthic fish	sculpins	0.1475	199
636	shrimp	shrimp	0.0587	199

APPENDIX 3. DIETS OF ALL PREDATOR FISH EXPRESSED AS ECOPATH GROUPINGS FOR ALL CRUISES (1-4) AND AREAS (A-D).

nStom is the total number of predator stomachs examined, AvgP is the proportion of stomach contents based on weight (sum =1)

PredID	CruiseArea	Ecopath grouping	AvgP	nStom
Dogfish				
Cruise 1				
44	1 A	euphausiids	0.1057	45
44	1 A	forage fish	0.0080	45
44	1 A	Herring	0.1555	45
44	1 A	jellies/macrozooplankton	0.0253	45
44	1 A	macrobenthos	0.1208	45
44	1 A	meiobenthos	0.0042	45
44	1 A	other fish	0.5687	45
44	1 A	other flatfish	0.0008	45
44	1 A	predatory invertebrates	0.0090	45
44	1 A	Shrimp	0.0021	45
44	1 B	forage fish	0.1074	88
44	1 B	macrobenthos	0.7270	88
44	1 B	meiobenthos	0.0631	88
44	1 B	other fish	0.0094	88
44	1 B	other flatfish	0.0295	88
44	1 B	predatory mesozooplankton	0.0156	88
44	1 B	shallowwater benthic fish	0.0045	88
44	1 B	Shrimp	0.0091	88
44	1 B	Squid	0.0343	88
44	1 C	euphausiids	0.1317	51
44	1 C	forage fish	0.0657	51
44	1 C	Herring	0.0670	51
44	1 C	macrobenthos	0.0027	51
44	1 C	other fish	0.5926	51
44	1 C	other flatfish	0.0649	51
44	1 C	predatory invertebrates	0.0598	51
44	1 C	predatory mesozooplankton	0.0015	51
44	1 C	Shrimp	0.0139	51
Cruise 2				
44	2 A	euphausiids	0.0019	32
44	2 A	forage fish	0.1582	32
44	2 A	Herring	0.0727	32
44	2 A	macrobenthos	0.0343	32
44	2 A	meiobenthos	0.0057	32
44	2 A	other fish	0.6152	32
44	2 A	other flatfish	0.0397	32

44	2 A	phytoplankton	0.0024	32
44	2 A	predatory invertebrates	0.0168	32
44	2 A	predatory mesozooplankton	0.0017	32
44	2 A	Ratfish	0.0438	32
44	2 A	shallowwater benthic fish	0.0025	32
44	2 A	Shrimp	0.0051	32
44	2 B	Epibenthos	0.0000	329
44	2 B	euphausiids	0.0151	329
44	2 B	forage fish	0.2872	329
44	2 B	Herring	0.0455	329
44	2 B	jellies/macrozooplankton	0.0003	329
44	2 B	macrobenthos	0.3140	329
44	2 B	meiobenthos	0.0135	329
44	2 B	other fish	0.1332	329
44	2 B	other flatfish	0.0142	329
44	2 B	predatory invertebrates	0.1124	329
44	2 B	predatory mesozooplankton	0.0179	329
44	2 B	rock sole	0.0015	329
44	2 B	shallowwater benthic fish	0.0248	329
44	2 B	Shrimp	0.0204	329
44	2 C	euphausiids	0.6515	118
44	2 C	macrobenthos	0.1149	118
44	2 C	meiobenthos	0.0206	118
44	2 C	other fish	0.1418	118
44	2 C	predatory mesozooplankton	0.0265	118
44	2 C	shallowwater benthic fish	0.0248	118
44	2 C	Shrimp	0.0021	118
44	2 C	Squid	0.0178	118
44	2 D	euphausiids	0.0042	2
44	2 D	macrobenthos	0.9945	2
44	2 D	other fish	0.0013	2
Cruise 3				
44	3 A	macrobenthos	0.0018	7
44	3 A	meiobenthos	0.0151	7
44	3 A	other fish	0.2669	7
44	3 A	other flatfish	0.1192	7
44	3 A	Ratfish	0.5963	7
44	3 A	Shrimp	0.0008	7
44	3 C	Herring	0.4757	35
44	3 C	macrobenthos	0.0006	35
44	3 C	meiobenthos	0.0013	35
44	3 C	other fish	0.4143	35
44	3 C	other flatfish	0.0403	35
44	3 C	predatory invertebrates	0.0214	35
44	3 C	Shrimp	0.0000	35

44	3 C	Squid	0.0464	35
Cruise 4				
44	4 A	forage fish	0.0010	7
44	4 A	macrobenthos	0.0491	7
44	4 A	other fish	0.9499	7
44	4 B	english sole	0.0336	34
44	4 B	euphausiids	0.0158	34
44	4 B	forage fish	0.3872	34
44	4 B	macrobenthos	0.3615	34
44	4 B	meiobenthos	0.0300	34
44	4 B	other fish	0.1233	34
44	4 B	predatory mesozooplankton	0.0470	34
44	4 B	Shrimp	0.0016	34
44	4 C	Herring	0.1742	5
44	4 C	macrobenthos	0.0334	5
44	4 C	other fish	0.1688	5
44	4 C	Salmon	0.6236	5
44	4 D	euphausiids	0.2411	3
44	4 D	macrobenthos	0.0073	3
44	4 D	other fish	0.7516	3
Big Skate				
Cruise 1				
56	1 C	macrobenthos	0.5745	1
56	1 C	predatory mesozooplankton	0.3191	1
56	1 C	Shrimp	0.1064	1
Cruise 2				
56	2 A	meiobenthos	0.0015	2
56	2 A	other fish	0.4141	2
56	2 A	Shrimp	0.5844	2
56	2 B	jellies/macrozooplankton	0.0000	110
56	2 B	macrobenthos	0.6800	110
56	2 B	meiobenthos	0.0003	110
56	2 B	other fish	0.0764	110
56	2 B	other flatfish	0.0324	110
56	2 B	rock sole	0.0009	110
56	2 B	shallowwater benthic fish	0.0045	110
56	2 B	Shrimp	0.0140	110
56	2 B	jellies/macrozooplankton	0.0000	110
56	2 D	macrobenthos	0.9617	1
56	2 D	Shrimp	0.0383	1
Cruise 3				
56	3 A	macrobenthos	0.8760	5
56	3 A	meiobenthos	0.0001	5
56	3 A	other fish	0.0157	5
56	3 A	other flatfish	0.0641	5

56	3 A	predatory invertebrates	0.0442	5
56	3 D	macrobenthos	0.0270	15
56	3 D	other fish	0.2370	15
56	3 D	other flatfish	0.4106	15
56	3 D	predatory invertebrates	0.1569	15
56	3 D	predatory mesozooplankton	0.0153	15
56	3 D	Squid	0.1533	15
Black Skate				
Cruise 1				
58	1 A	Epibenthos	0.0413	24
58	1 A	euphausiids	0.0014	24
58	1 A	macrobenthos	0.3793	24
58	1 A	meiobenthos	0.1404	24
58	1 A	predatory mesozooplankton	0.0684	24
58	1 A	shallowwater benthic fish	0.0008	24
58	1 A	Shrimp	0.3684	24
58	1 C	macrobenthos	0.4336	3
58	1 C	predatory mesozooplankton	0.4965	3
58	1 C	Shrimp	0.0699	3
Cruise 2				
58	2 A	Shrimp	1.0000	1
58	2 C	Epibenthos	0.0089	2
58	2 C	macrobenthos	0.3336	2
58	2 C	meiobenthos	0.0266	2
58	2 C	shallowwater benthic fish	0.0326	2
58	2 C	Shrimp	0.5984	2
Cruise 3				
58	3 A	macrobenthos	0.8337	2
58	3 A	Shrimp	0.1663	2
Longnose Skate				
Cruise 1				
59	1 A	Shrimp	1.0000	1
59	1 B	forage fish	0.0848	20
59	1 B	macrobenthos	0.7644	20
59	1 B	other fish	0.0104	20
59	1 B	other flatfish	0.1006	20
59	1 B	shallowwater benthic fish	0.0125	20
59	1 B	Shrimp	0.0274	20
59	1 C	macrobenthos	0.8227	3
59	1 C	Shrimp	0.1773	3
Cruise 2				
59	2 A	other flatfish	0.6986	1
59	2 A	Shrimp	0.3014	1
59	2 C	Epibenthos	0.0009	5
59	2 C	macrobenthos	0.1225	5

59	2 C	Shrimp	0.8766	5
Ratfish				
Cruise 1				
66	1 A	Epibenthos	0.0134	107
66	1 A	euphausiids	0.0017	107
66	1 A	macrobenthos	0.7320	107
66	1 A	meiobenthos	0.1616	107
66	1 A	other fish	0.0051	107
66	1 A	predatory mesozooplankton	0.0788	107
66	1 A	Shrimp	0.0074	107
66	1 C	Epibenthos	0.0054	81
66	1 C	macrobenthos	0.6938	81
66	1 C	meiobenthos	0.1716	81
66	1 C	other fish	0.0073	81
66	1 C	predatory mesozooplankton	0.1162	81
66	1 C	Shrimp	0.0056	81
Cruise 2				
66	2 C	Epibenthos	0.0006	70
66	2 C	euphausiids	0.0071	70
66	2 C	macrobenthos	0.7418	70
66	2 C	meiobenthos	0.1169	70
66	2 C	other fish	0.0603	70
66	2 C	predatory mesozooplankton	0.0034	70
66	2 C	Shrimp	0.0700	70
66	2 D	Epibenthos	0.0199	13
66	2 D	macrobenthos	0.7337	13
66	2 D	meiobenthos	0.0113	13
66	2 D	predatory mesozooplankton	0.2328	13
66	2 D	Shrimp	0.0023	13
Cruise 3				
66	3 A	Epibenthos	0.0026	123
66	3 A	euphausiids	0.0013	123
66	3 A	jellies/macrozooplankton	0.0001	123
66	3 A	macrobenthos	0.8842	123
66	3 A	meiobenthos	0.0269	123
66	3 A	other fish	0.0385	123
66	3 A	predatory invertebrates	0.0010	123
66	3 A	predatory mesozooplankton	0.0054	123
66	3 A	Salmon	0.0327	123
66	3 A	shallowwater benthic fish	0.0007	123
66	3 A	Shrimp	0.0052	123
66	3 A	Squid	0.0013	123
66	3 C	macrobenthos	0.5138	34
66	3 C	meiobenthos	0.4532	34
66	3 C	other fish	0.0120	34

66	3 C	predatory mesozooplankton	0.0210	34
66	3 D	macrobenthos	0.7023	1
66	3 D	other fish	0.1421	1
66	3 D	Shrimp	0.1556	1
Eulachon				
Cruise 2				
148	2 D	euphausiids	0.0166	8
148	2 D	macrobenthos	0.9834	8
Cruise 3				
148	3 A	euphausiids	1.0000	8
Pacific Cod				
Cruise 1				
222	1 A	Epibenthos	0.0011	21
222	1 A	euphausiids	0.0064	21
222	1 A	macrobenthos	0.2891	21
222	1 A	meiobenthos	0.0383	21
222	1 A	other fish	0.2764	21
222	1 A	predatory invertebrates	0.0005	21
222	1 A	predatory mesozooplankton	0.0114	21
222	1 A	Shrimp	0.3768	21
222	1 B	forage fish	0.8291	1
222	1 B	macrobenthos	0.1322	1
222	1 B	meiobenthos	0.0103	1
222	1 B	Shrimp	0.0284	1
222	1 C	forage fish	0.0405	44
222	1 C	inshore rockfish	0.0102	44
222	1 C	macrobenthos	0.0276	44
222	1 C	meiobenthos	0.0359	44
222	1 C	other fish	0.3967	44
222	1 C	other flatfish	0.0090	44
222	1 C	pacific ocean perch	0.1196	44
222	1 C	predatory invertebrates	0.0004	44
222	1 C	predatory mesozooplankton	0.0085	44
222	1 C	shallowwater benthic fish	0.0026	44
222	1 C	Shrimp	0.3490	44
Cruise 2				
222	2 A	Epibenthos	0.0004	126
222	2 A	euphausiids	0.0010	126
222	2 A	forage fish	0.7655	126
222	2 A	Herring	0.0074	126
222	2 A	macrobenthos	0.0231	126
222	2 A	meiobenthos	0.0004	126
222	2 A	other fish	0.0316	126
222	2 A	other flatfish	0.0502	126
222	2 A	predatory mesozooplankton	0.0030	126

222	2 A	shallowwater benthic fish	0.0167	126
222	2 A	Shrimp	0.0920	126
222	2 A	walleye pollock	0.0088	126
222	2 B	Epibenthos	0.0132	62
222	2 B	forage fish	0.2294	62
222	2 B	macrobenthos	0.2644	62
222	2 B	meiobenthos	0.0011	62
222	2 B	other fish	0.1171	62
222	2 B	other flatfish	0.0123	62
222	2 B	predatory mesozooplankton	0.0754	62
222	2 B	Shrimp	0.2871	62
222	2 C	euphausiids	0.0205	4
222	2 C	macrobenthos	0.0078	4
222	2 C	meiobenthos	0.0036	4
222	2 C	shallowwater benthic fish	0.3681	4
222	2 C	Shrimp	0.6000	4
222	2 D	Epibenthos	0.0034	42
222	2 D	euphausiids	0.0001	42
222	2 D	Herring	0.0582	42
222	2 D	macrobenthos	0.0044	42
222	2 D	other fish	0.2145	42
222	2 D	other flatfish	0.4549	42
222	2 D	predatory invertebrates	0.0001	42
222	2 D	predatory mesozooplankton	0.0002	42
222	2 D	shallowwater benthic fish	0.0143	42
222	2 D	Shrimp	0.0294	42
222	2 D	Squid	0.0219	42
222	2 D	Turbot	0.0270	42
222	2 D	walleye pollock	0.1717	42
Cruise 3				
222	3 A	Epibenthos	0.0003	38
222	3 A	euphausiids	0.0094	38
222	3 A	jellies/macrozooplankton	0.0002	38
222	3 A	macrobenthos	0.4028	38
222	3 A	meiobenthos	0.0403	38
222	3 A	other fish	0.3508	38
222	3 A	other flatfish	0.0209	38
222	3 A	predatory mesozooplankton	0.0066	38
222	3 A	Shrimp	0.1248	38
222	3 A	walleye pollock	0.0440	38
222	3 B	forage fish	0.3984	4
222	3 B	macrobenthos	0.1564	4
222	3 B	meiobenthos	0.0203	4
222	3 B	other fish	0.2341	4
222	3 B	predatory mesozooplankton	0.0554	4

222	3 B	Shrimp	0.1354	4
222	3 C	Herring	0.6182	79
222	3 C	macrobenthos	0.0209	79
222	3 C	meiobenthos	0.0063	79
222	3 C	microzooplankton	0.0000	79
222	3 C	other fish	0.1537	79
222	3 C	other flatfish	0.0514	79
222	3 C	pacific cod	0.0278	79
222	3 C	predatory invertebrates	0.0322	79
222	3 C	predatory mesozooplankton	0.0012	79
222	3 C	shallowwater benthic fish	0.0032	79
222	3 C	Shrimp	0.0549	79
222	3 C	Squid	0.0301	79
222	3 D	Epibenthos	0.0078	53
222	3 D	macrobenthos	0.7032	53
222	3 D	meiobenthos	0.0753	53
222	3 D	Other	0.0879	53
222	3 D	other fish	0.0366	53
222	3 D	predatory mesozooplankton	0.0381	53
222	3 D	shallowwater benthic fish	0.0337	53
222	3 D	Shrimp	0.0173	53
222	3 E	euphausiids	0.0006	60
222	3 E	inshore rockfish	0.1820	60
222	3 E	macrobenthos	0.0472	60
222	3 E	meiobenthos	0.0285	60
222	3 E	other fish	0.5359	60
222	3 E	predatory mesozooplankton	0.0177	60
222	3 E	shallowwater benthic fish	0.1698	60
222	3 E	Shrimp	0.0183	60
Cruise 4				
222	4 A	euphausiids	0.1278	2
222	4 A	forage fish	0.1652	2
222	4 A	macrobenthos	0.0053	2
222	4 A	meiobenthos	0.1451	2
222	4 A	other fish	0.5567	2
222	4 B	Epibenthos	0.0000	28
222	4 B	forage fish	0.2246	28
222	4 B	macrobenthos	0.3490	28
222	4 B	meiobenthos	0.0173	28
222	4 B	other fish	0.2940	28
222	4 B	other flatfish	0.0517	28
222	4 B	predatory mesozooplankton	0.0134	28
222	4 B	Shrimp	0.0501	28
222	4 C	Copepods	0.0001	46
222	4 C	euphausiids	0.0002	46

222	4 C	inshore rockfish	0.0112	46
222	4 C	macrobenthos	0.2137	46
222	4 C	meiobenthos	0.1015	46
222	4 C	other fish	0.6436	46
222	4 C	predatory invertebrates	0.0029	46
222	4 C	predatory mesozooplankton	0.0115	46
222	4 C	shallowwater benthic fish	0.0130	46
222	4 C	Shrimp	0.0023	46
Walleye Pollock				
Cruise 1				
228	1 A	Epibenthos	0.0028	22
228	1 A	euphausiids	0.9330	22
228	1 A	macrobenthos	0.0046	22
228	1 A	other fish	0.0197	22
228	1 A	predatory mesozooplankton	0.0014	22
228	1 A	Shrimp	0.0386	22
228	1 B	Shrimp	1.0000	1
228	1 C	Copepods	0.0215	110
228	1 C	Epibenthos	0.0008	110
228	1 C	euphausiids	0.0085	110
228	1 C	jellies/macrozooplankton	0.0001	110
228	1 C	macrobenthos	0.0607	110
228	1 C	meiobenthos	0.0036	110
228	1 C	other fish	0.0288	110
228	1 C	predatory invertebrates	0.0004	110
228	1 C	predatory mesozooplankton	0.0036	110
228	1 C	shallowwater benthic fish	0.0002	110
228	1 C	Shrimp	0.8718	110
Cruise 2				
228	2 C	euphausiids	0.7010	4
228	2 C	macrobenthos	0.1168	4
228	2 C	meiobenthos	0.0080	4
228	2 C	other fish	0.0145	4
228	2 C	Shrimp	0.1597	4
228	2 D	Epibenthos	0.5308	44
228	2 D	euphausiids	0.2123	44
228	2 D	macrobenthos	0.0925	44
228	2 D	meiobenthos	0.0028	44
228	2 D	other fish	0.1060	44
228	2 D	predatory mesozooplankton	0.0001	44
228	2 D	Shrimp	0.0555	44
Cruise 3				
228	3 A	macrobenthos	1.0000	3
228	3 C	Copepods	0.0007	15
228	3 C	Epibenthos	0.0004	15

228	3 C	euphausiids	0.0912	15
228	3 C	macrobenthos	0.3483	15
228	3 C	predatory mesozooplankton	0.0179	15
228	3 C	Shrimp	0.5419	15
228	3 D	euphausiids	0.0588	8
228	3 D	macrobenthos	0.8137	8
228	3 D	Shrimp	0.1275	8
Pacific Ocean Perch				
Cruise 1				
396	1 A	euphausiids	0.9462	5
396	1 A	predatory mesozooplankton	0.0325	5
396	1 A	Shrimp	0.0213	5
396	1 C	Copepods	0.3126	64
396	1 C	Epibenthos	0.0039	64
396	1 C	euphausiids	0.2827	64
396	1 C	macrobenthos	0.2714	64
396	1 C	other fish	0.0623	64
396	1 C	predatory mesozooplankton	0.0264	64
396	1 C	Shrimp	0.0416	64
Cruise 2				
396	2 C	Copepods	0.0002	43
396	2 C	Epibenthos	0.0124	43
396	2 C	euphausiids	0.8854	43
396	2 C	macrobenthos	0.0882	43
396	2 C	Shrimp	0.0138	43
Sebastes babcocki				
Cruise 1				
401	1 A	Shrimp	1.0000	1
Cruise 2				
401	2 C	euphausiids	0.0114	46
401	2 C	forage fish	0.0122	46
401	2 C	macrobenthos	0.4056	46
401	2 C	meiobenthos	0.0484	46
401	2 C	other fish	0.1736	46
401	2 C	other flatfish	0.0250	46
401	2 C	predatory invertebrates	0.0314	46
401	2 C	predatory mesozooplankton	0.0006	46
401	2 C	shallowwater benthic fish	0.0171	46
401	2 C	Shrimp	0.2333	46
401	2 C	Squid	0.0302	46
401	2 C	walleye pollock	0.0111	46
Sebastes brevispinis				
Cruise 1				
405	1 C	euphausiids	0.3223	8
405	1 C	other fish	0.6776	8

405	1 C	predatory mesozooplankton	0.0001	8
Cruise 2				
405	2 A	jellies/macrozooplankton	0.0016	5
405	2 A	other fish	0.6734	5
405	2 A	walleye pollock	0.3250	5
405	2 C	euphausiids	0.3584	25
405	2 C	macrobenthos	0.0033	25
405	2 C	meiobenthos	0.0003	25
405	2 C	other fish	0.6066	25
405	2 C	shallowwater benthic fish	0.0028	25
405	2 C	walleye pollock	0.0286	25
Sebastes elongatus				
Cruise 2				
414	2 C	euphausiids	0.8223	4
414	2 C	macrobenthos	0.1195	4
414	2 C	other fish	0.0566	4
414	2 C	predatory mesozooplankton	0.0016	4
Sebastes flavidus				
Cruise 1				
418	1 A	Copepods	0.0000	12
418	1 A	Epibenthos	0.0004	12
418	1 A	euphausiids	0.6025	12
418	1 A	forage fish	0.0031	12
418	1 A	inshore rockfish	0.0220	12
418	1 A	Lingcod	0.0010	12
418	1 A	macrobenthos	0.1485	12
418	1 A	meiobenthos	0.0010	12
418	1 A	other fish	0.0469	12
418	1 A	other flatfish	0.0005	12
418	1 A	predatory mesozooplankton	0.0073	12
418	1 A	shallowwater benthic fish	0.0033	12
418	1 A	Shrimp	0.1636	12
418	1 C	euphausiids	0.0314	2
418	1 C	Shrimp	0.9686	2
Cruise 2				
418	2 C	Epibenthos	0.0126	26
418	2 C	euphausiids	0.6452	26
418	2 C	forage fish	0.0015	26
418	2 C	macrobenthos	0.3087	26
418	2 C	meiobenthos	0.0025	26
418	2 C	other fish	0.0056	26
418	2 C	petrale sole	0.0130	26
418	2 C	predatory mesozooplankton	0.0001	26
418	2 C	Shrimp	0.0109	26

Cruise 3				
418	3 A	Epibenthos	0.0004	17
418	3 A	euphausiids	0.8097	17
418	3 A	forage fish	0.0394	17
418	3 A	macrobenthos	0.0884	17
418	3 A	meiobenthos	0.0000	17
418	3 A	other fish	0.0064	17
418	3 A	predatory invertebrates	0.0110	17
418	3 A	predatory mesozooplankton	0.0011	17
418	3 A	Shrimp	0.0339	17
418	3 A	Squid	0.0097	17
Sebastes paucispinus				
Cruise 1				
435	1 A	walleye pollock	1.0000	1
435	1 C	other fish	1.0000	4
Cruise 2				
435	2 A	meiobenthos	0.0016	1
435	2 A	other fish	0.9984	1
435	2 C	other fish	1.0000	1
Cruise 3				
435	3 C	meiobenthos	0.0325	1
435	3 C	other fish	0.0198	1
435	3 C	Turbot	0.9477	1
Sablefish				
Cruise 1				
455	1 A	Dogfish	0.2264	42
455	1 A	Epibenthos	0.0012	42
455	1 A	euphausiids	0.0860	42
455	1 A	macrobenthos	0.3228	42
455	1 A	meiobenthos	0.0092	42
455	1 A	other fish	0.2869	42
455	1 A	phytoplankton	0.0635	42
455	1 A	predatory mesozooplankton	0.0019	42
455	1 A	Shrimp	0.0021	42
455	1 C	Epibenthos	0.0014	36
455	1 C	euphausiids	0.0019	36
455	1 C	forage fish	0.2262	36
455	1 C	macrobenthos	0.3235	36
455	1 C	meiobenthos	0.0884	36
455	1 C	other fish	0.0869	36
455	1 C	predatory mesozooplankton	0.0290	36
455	1 C	Shrimp	0.2053	36
455	1 C	Squid	0.0373	36
Cruise 2				
455	2 A	euphausiids	0.0338	2

455	2 A	jellies/macrozooplankton	0.0196	2
455	2 A	meiobenthos	0.5365	2
455	2 A	other fish	0.2748	2
455	2 A	predatory mesozooplankton	0.0709	2
455	2 A	Shrimp	0.0643	2
455	2 C	Epibenthos	0.0004	90
455	2 C	euphausiids	0.7399	90
455	2 C	Herring	0.0377	90
455	2 C	macrobenthos	0.0413	90
455	2 C	meiobenthos	0.0012	90
455	2 C	other fish	0.1469	90
455	2 C	phytoplankton	0.0013	90
455	2 C	predatory mesozooplankton	0.0005	90
455	2 C	shallowwater benthic fish	0.0045	90
455	2 C	Shrimp	0.0263	90
Lingcod				
Cruise 1				
467	1 C	other fish	1.0000	1
Cruise 2				
467	2 A	Herring	0.5351	5
467	2 A	meiobenthos	0.0011	5
467	2 A	other fish	0.4638	5
467	2 C	other fish	1.0000	2
467	2 D	english sole	0.4486	4
467	2 D	meiobenthos	0.0000	4
467	2 D	other fish	0.5514	4
Cruise 3				
467	3 C	meiobenthos	0.0002	11
467	3 C	other fish	0.6833	11
467	3 C	other flatfish	0.1378	11
467	3 C	Salmon	0.0309	11
467	3 C	shallowwater benthic fish	0.1477	11
467	3 D	meiobenthos	0.0142	2
467	3 D	other fish	0.9858	2
Pacific Sanddab				
Cruise 2				
596	2 D	Epibenthos	0.4482	27
596	2 D	euphausiids	0.4349	27
596	2 D	macrobenthos	0.0306	27
596	2 D	other fish	0.0393	27
596	2 D	other flatfish	0.0207	27
596	2 D	predatory mesozooplankton	0.0004	27
596	2 D	Shrimp	0.0051	27
596	2 D	Turbot	0.0208	27
Cruise 3				

596	3 A	euphausiids	0.5942	1
596	3 A	Shrimp	0.4058	1
596	3 D	Copepods	0.0012	62
596	3 D	Epibenthos	0.0011	62
596	3 D	euphausiids	0.1595	62
596	3 D	jellies/macrozooplankton	0.0056	62
596	3 D	macrobenthos	0.4474	62
596	3 D	meiobenthos	0.0683	62
596	3 D	other fish	0.0025	62
596	3 D	predatory mesozooplankton	0.0608	62
596	3 D	Shrimp	0.2538	62
Speckled Sanddab				
Cruise 1				
598	1 B	Epibenthos	0.0510	85
598	1 B	euphausiids	0.0138	85
598	1 B	macrobenthos	0.1856	85
598	1 B	meiobenthos	0.0314	85
598	1 B	other fish	0.0387	85
598	1 B	other flatfish	0.0088	85
598	1 B	predatory mesozooplankton	0.0266	85
598	1 B	shallowwater benthic fish	0.0004	85
598	1 B	Shrimp	0.6437	85
Cruise 2				
598	2 B	Epibenthos	0.3876	2
598	2 B	Shrimp	0.6124	2
Cruise 3				
598	3 B	forage fish	0.9882	1
598	3 B	macrobenthos	0.0118	1
Turbot				
Cruise 1				
602	1 A	euphausiids	0.4790	264
602	1 A	forage fish	0.0011	264
602	1 A	Herring	0.3572	264
602	1 A	macrobenthos	0.0397	264
602	1 A	meiobenthos	0.0096	264
602	1 A	other fish	0.0955	264
602	1 A	predatory mesozooplankton	0.0001	264
602	1 A	Shrimp	0.0178	264
602	1 C	euphausiids	0.0017	70
602	1 C	forage fish	0.0393	70
602	1 C	Herring	0.2915	70
602	1 C	macrobenthos	0.1072	70
602	1 C	other fish	0.4132	70
602	1 C	other flatfish	0.0075	70
602	1 C	Shrimp	0.1394	70

Cruise 2				
602	2 A	euphausiids	0.0004	101
602	2 A	forage fish	0.2675	101
602	2 A	Herring	0.0799	101
602	2 A	macrobenthos	0.0191	101
602	2 A	meiobenthos	0.0003	101
602	2 A	other fish	0.5846	101
602	2 A	shallowwater benthic fish	0.0302	101
602	2 A	Shrimp	0.0163	101
602	2 A	walleye pollock	0.0018	101
602	2 C	Epibenthos	0.0000	205
602	2 C	euphausiids	0.0470	205
602	2 C	Herring	0.1021	205
602	2 C	inshore rockfish	0.0490	205
602	2 C	macrobenthos	0.1496	205
602	2 C	meiobenthos	0.0016	205
602	2 C	other fish	0.6056	205
602	2 C	other flatfish	0.0077	205
602	2 C	shallowwater benthic fish	0.0055	205
602	2 C	Shrimp	0.0320	205
602	2 D	Epibenthos	0.1882	49
602	2 D	euphausiids	0.0297	49
602	2 D	Herring	0.1828	49
602	2 D	macrobenthos	0.0595	49
602	2 D	meiobenthos	0.0001	49
602	2 D	other fish	0.3982	49
602	2 D	shallowwater benthic fish	0.1415	49
Cruise 3				
602	3 A	euphausiids	0.0975	120
602	3 A	forage fish	0.0179	120
602	3 A	Herring	0.1565	120
602	3 A	macrobenthos	0.4049	120
602	3 A	other fish	0.1764	120
602	3 A	predatory invertebrates	0.0020	120
602	3 A	shallowwater benthic fish	0.0594	120
602	3 A	Shrimp	0.0853	120
602	3 C	euphausiids	0.0003	86
602	3 C	macrobenthos	0.1141	86
602	3 C	meiobenthos	0.0005	86
602	3 C	other fish	0.8715	86
602	3 C	predatory invertebrates	0.0046	86
602	3 C	predatory mesozooplankton	0.0002	86
602	3 C	Shrimp	0.0089	86
602	3 D	Epibenthos	0.0040	8
602	3 D	euphausiids	0.0712	8

602	3 D	macrobenthos	0.5405	8
602	3 D	other fish	0.3832	8
602	3 D	predatory mesozooplankton	0.0011	8
Petrale Sole				
Cruise 1				
607	1 A	Epibenthos	0.0053	2
607	1 A	macrobenthos	0.3467	2
607	1 A	Shrimp	0.6480	2
Cruise 2				
607	2 D	Epibenthos	0.5861	55
607	2 D	euphausiids	0.1028	55
607	2 D	macrobenthos	0.0292	55
607	2 D	meiobenthos	0.0000	55
607	2 D	other fish	0.2294	55
607	2 D	other flatfish	0.0006	55
607	2 D	predatory mesozooplankton	0.0000	55
607	2 D	shallowwater benthic fish	0.0003	55
607	2 D	Shrimp	0.0170	55
607	2 D	Squid	0.0037	55
607	2 D	walleye pollock	0.0308	55
Cruise 3				
607	3 C	euphausiids	0.0023	45
607	3 C	Herring	0.7310	45
607	3 C	macrobenthos	0.0110	45
607	3 C	meiobenthos	0.0002	45
607	3 C	other fish	0.2031	45
607	3 C	predatory invertebrates	0.0054	45
607	3 C	Salmon	0.0090	45
607	3 C	shallowwater benthic fish	0.0205	45
607	3 C	Shrimp	0.0129	45
607	3 C	Squid	0.0047	45
607	3 D	macrobenthos	1.0000	2
Rex Sole				
Cruise 1				
610	1 A	Epibenthos	0.0017	130
610	1 A	euphausiids	0.0005	130
610	1 A	macrobenthos	0.6958	130
610	1 A	meiobenthos	0.2693	130
610	1 A	predatory mesozooplankton	0.0126	130
610	1 A	Shrimp	0.0200	130
610	1 C	Epibenthos	0.0139	98
610	1 C	euphausiids	0.0005	98
610	1 C	macrobenthos	0.0335	98
610	1 C	meiobenthos	0.9236	98
610	1 C	microzooplankton	0.0000	98

610	1 C	predatory mesozooplankton	0.0262	98
610	1 C	Shrimp	0.0023	98
Cruise 2				
610	2 A	Epibenthos	0.0007	34
610	2 A	macrobenthos	0.0632	34
610	2 A	meiobenthos	0.1258	34
610	2 A	other fish	0.0006	34
610	2 A	predatory mesozooplankton	0.0096	34
610	2 A	Shrimp	0.8002	34
610	2 C	Epibenthos	0.0010	148
610	2 C	euphausiids	0.0018	148
610	2 C	macrobenthos	0.0435	148
610	2 C	meiobenthos	0.7541	148
610	2 C	other fish	0.0015	148
610	2 C	predatory mesozooplankton	0.0748	148
610	2 C	shallowwater benthic fish	0.0020	148
610	2 C	Shrimp	0.1213	148
610	2 D	Copepods	0.0000	46
610	2 D	Epibenthos	0.0035	46
610	2 D	macrobenthos	0.6636	46
610	2 D	meiobenthos	0.2440	46
610	2 D	other fish	0.0017	46
610	2 D	predatory mesozooplankton	0.0214	46
610	2 D	Shrimp	0.0659	46
Cruise 3				
610	3 A	euphausiids	0.1472	23
610	3 A	jellies/macrozooplankton	0.0002	23
610	3 A	macrobenthos	0.5186	23
610	3 A	meiobenthos	0.2973	23
610	3 A	predatory mesozooplankton	0.0010	23
610	3 A	Shrimp	0.0358	23
610	3 C	euphausiids	0.0039	69
610	3 C	macrobenthos	0.1454	69
610	3 C	meiobenthos	0.7486	69
610	3 C	predatory mesozooplankton	0.0667	69
610	3 C	Shrimp	0.0356	69
610	3 D	euphausiids	0.0008	15
610	3 D	macrobenthos	0.8241	15
610	3 D	meiobenthos	0.0917	15
610	3 D	predatory mesozooplankton	0.0833	15
Flathead Sole				
Cruise 1				
612	1 C	Epibenthos	0.0014	19
612	1 C	macrobenthos	0.9716	19
612	1 C	meiobenthos	0.0270	19

				Cruise 2
612	2 C	Epibenthos	0.0472	69
612	2 C	euphausiids	0.0014	69
612	2 C	macrobenthos	0.0480	69
612	2 C	meiobenthos	0.0064	69
612	2 C	other fish	0.0145	69
612	2 C	predatory mesozooplankton	0.0010	69
612	2 C	Shrimp	0.8814	69
				Cruise 3
612	3 C	euphausiids	0.0567	8
612	3 C	macrobenthos	0.7912	8
612	3 C	Shrimp	0.1521	8
Pacific Halibut				
Cruise 1				
614	1 A	macrobenthos	1.0000	2
614	1 B	dungeness crab	0.0036	30
614	1 B	forage fish	0.0265	30
614	1 B	jellies/macrozooplankton	0.0027	30
614	1 B	macrobenthos	0.8574	30
614	1 B	other fish	0.0219	30
614	1 B	other flatfish	0.0689	30
614	1 B	shallowwater benthic fish	0.0190	30
614	1 C	macrobenthos	0.9453	4
614	1 C	other fish	0.0547	4
Cruise 2				
614	2 A	Dover sole	0.0027	88
614	2 A	forage fish	0.2241	88
614	2 A	Herring	0.1085	88
614	2 A	jellies/macrozooplankton	0.0002	88
614	2 A	macrobenthos	0.0948	88
614	2 A	meiobenthos	0.0099	88
614	2 A	other fish	0.1464	88
614	2 A	other flatfish	0.0675	88
614	2 A	pacific cod	0.0113	88
614	2 A	predatory invertebrates	0.0581	88
614	2 A	predatory mesozooplankton	0.0000	88
614	2 A	shallowwater benthic fish	0.0321	88
614	2 A	Shrimp	0.0004	88
614	2 A	Turbot	0.2439	88
614	2 B	forage fish	0.0228	9
614	2 B	jellies/macrozooplankton	0.0006	9
614	2 B	macrobenthos	0.7106	9
614	2 B	other fish	0.0767	9
614	2 B	other flatfish	0.1414	9
614	2 B	predatory invertebrates	0.0197	9

614	2 B	shallowwater benthic fish	0.0196	9
614	2 B	Shrimp	0.0001	9
614	2 B	walleye pollock	0.0084	9
614	2 D	Epibenthos	0.0270	5
614	2 D	euphausiids	0.0013	5
614	2 D	other flatfish	0.3890	5
614	2 D	Salmon	0.5827	5
Cruise 3				
614	3 A	macrobenthos	0.9771	2
614	3 A	meiobenthos	0.0229	2
614	3 B	macrobenthos	1.0000	2
614	3 C	Herring	0.4495	7
614	3 C	meiobenthos	0.0041	7
614	3 C	other fish	0.3723	7
614	3 C	shallowwater benthic fish	0.1740	7
614	3 D	pacific cod	0.2608	3
614	3 D	predatory invertebrates	0.1767	3
614	3 D	shallowwater benthic fish	0.4260	3
614	3 D	Squid	0.1365	3
Butter Sole				
Cruise 2				
619	2 B	Epibenthos	0.0428	4
619	2 B	forage fish	0.8471	4
619	2 B	meiobenthos	0.1101	4
Cruise 3				
619	3 D	macrobenthos	0.6389	1
619	3 D	predatory mesozooplankton	0.3611	1
Rock Sole				
Cruise 1				
621	1 B	Epibenthos	0.0002	178
621	1 B	forage fish	0.1236	178
621	1 B	macrobenthos	0.3655	178
621	1 B	meiobenthos	0.4154	178
621	1 B	other fish	0.0585	178
621	1 B	predatory mesozooplankton	0.0174	178
621	1 B	shallowwater benthic fish	0.0055	178
621	1 B	Shrimp	0.0139	178
Cruise 2				
621	2 A	macrobenthos	1.0000	1
621	2 B	Epibenthos	0.0010	121
621	2 B	forage fish	0.9359	121
621	2 B	macrobenthos	0.0248	121
621	2 B	meiobenthos	0.0215	121
621	2 B	other fish	0.0048	121
621	2 B	predatory mesozooplankton	0.0004	121

621	2 B	Shrimp	0.0114	121
621	2 D	Epibenthos	0.0169	31
621	2 D	euphausiids	0.0061	31
621	2 D	macrobenthos	0.5596	31
621	2 D	meiobenthos	0.1907	31
621	2 D	other fish	0.0943	31
621	2 D	predatory mesozooplankton	0.0108	31
621	2 D	shallowwater benthic fish	0.0008	31
621	2 D	Shrimp	0.0091	31
621	2 D	Turbot	0.1117	31
Cruise 3				
621	3 A	other fish	1.0007	1
621	3 B	english sole	0.1912	9
621	3 B	euphausiids	0.0005	9
621	3 B	forage fish	0.4835	9
621	3 B	macrobenthos	0.1456	9
621	3 B	meiobenthos	0.0042	9
621	3 B	other fish	0.1615	9
621	3 B	predatory mesozooplankton	0.0075	9
621	3 B	Shrimp	0.0061	9
621	3 D	Epibenthos	0.0503	6
621	3 D	macrobenthos	0.0820	6
621	3 D	meiobenthos	0.8414	6
621	3 D	predatory mesozooplankton	0.0007	6
621	3 D	Shrimp	0.0259	6
Dover Sole				
Cruise 1				
626	1 A	Epibenthos	0.0038	86
626	1 A	euphausiids	0.0011	86
626	1 A	macrobenthos	0.4822	86
626	1 A	meiobenthos	0.5031	86
626	1 A	predatory mesozooplankton	0.0082	86
626	1 A	Shrimp	0.0016	86
626	1 C	macrobenthos	0.2303	27
626	1 C	meiobenthos	0.7449	27
626	1 C	predatory mesozooplankton	0.0247	27
Cruise 2				
626	2 A	macrobenthos	0.5241	3
626	2 A	meiobenthos	0.4736	3
626	2 A	predatory mesozooplankton	0.0026	3
626	2 C	Copepods	0.0001	170
626	2 C	Epibenthos	0.0005	170
626	2 C	euphausiids	0.0009	170
626	2 C	jellies/macrozooplankton	0.0001	170

626	2 C	macrobenthos	0.3775	170
626	2 C	meiobenthos	0.5739	170
626	2 C	microzooplankton	0.0003	170
626	2 C	other fish	0.0001	170
626	2 C	predatory mesozooplankton	0.0368	170
626	2 C	Shrimp	0.0104	170
626	2 D	macrobenthos	0.4264	7
626	2 D	meiobenthos	0.5682	7
626	2 D	predatory mesozooplankton	0.0062	7
Cruise 3				
626	3 C	meiobenthos	1.0000	1
English Sole				
Cruise 1				
628	1 A	Epibenthos	0.0001	23
628	1 A	jellies/macrozooplankton	0.0026	23
628	1 A	macrobenthos	0.6193	23
628	1 A	meiobenthos	0.3405	23
628	1 A	microzooplankton	0.0054	23
628	1 A	predatory mesozooplankton	0.0321	23
628	1 B	Epibenthos	0.0006	74
628	1 B	macrobenthos	0.0933	74
628	1 B	meiobenthos	0.6170	74
628	1 B	other fish	0.0206	74
628	1 B	other flatfish	0.0120	74
628	1 B	predatory mesozooplankton	0.0091	74
628	1 B	Shrimp	0.2474	74
628	1 C	macrobenthos	0.1826	7
628	1 C	meiobenthos	0.8006	7
628	1 C	predatory mesozooplankton	0.0168	7
Cruise 2				
628	2 A	Epibenthos	0.0001	11
628	2 A	forage fish	0.8408	11
628	2 A	macrobenthos	0.0562	11
628	2 A	meiobenthos	0.0869	11
628	2 A	predatory mesozooplankton	0.0159	11
628	2 B	macrobenthos	0.3617	6
628	2 B	meiobenthos	0.6543	6
628	2 B	predatory mesozooplankton	0.0053	6
628	2 C	macrobenthos	0.0578	2
628	2 C	meiobenthos	0.9056	2
628	2 C	predatory mesozooplankton	0.0365	2
628	2 D	Epibenthos	0.0010	62
628	2 D	euphausiids	0.0032	62
628	2 D	macrobenthos	0.2322	62
628	2 D	meiobenthos	0.7243	62

628	2 D	other fish	0.0001	62
628	2 D	predatory mesozooplankton	0.0401	62
628	2 D	Shrimp	0.0000	62
Cruise 3				
628	3 A	euphausiids	0.0054	39
628	3 A	jellies/macrozooplankton	0.0054	39
628	3 A	macrobenthos	0.5278	39
628	3 A	meiobenthos	0.4585	39
628	3 A	predatory mesozooplankton	0.0030	39
628	3 B	macrobenthos	0.9824	1
628	3 B	predatory mesozooplankton	0.0176	1
628	3 C	Epibenthos	0.0004	66
628	3 C	jellies/macrozooplankton	0.0001	66
628	3 C	macrobenthos	0.3139	66
628	3 C	meiobenthos	0.6703	66
628	3 C	microzooplankton	0.0008	66
628	3 C	predatory mesozooplankton	0.0149	66
628	3 D	Epibenthos	0.0001	125
628	3 D	macrobenthos	0.1128	125
628	3 D	meiobenthos	0.8615	125
628	3 D	predatory mesozooplankton	0.0258	125
Starry Flounder				
Cruise 1				
631	1 C	macrobenthos	1.0000	3
Curlfin Sole				
Cruise 3				
635	3 D	meiobenthos	1.0000	1
Sand Sole				
Cruise 1				
636	1 B	Epibenthos	0.0044	103
636	1 B	euphausiids	0.0033	103
636	1 B	forage fish	0.1311	103
636	1 B	macrobenthos	0.0398	103
636	1 B	meiobenthos	0.0007	103
636	1 B	other fish	0.2795	103
636	1 B	other flatfish	0.1970	103
636	1 B	predatory mesozooplankton	0.0204	103
636	1 B	rock sole	0.0825	103
636	1 B	shallowwater benthic fish	0.1333	103
636	1 B	Shrimp	0.1079	103
Cruise 2				
636	2 B	Epibenthos	0.0002	91
636	2 B	forage fish	0.5375	91
636	2 B	macrobenthos	0.0065	91
636	2 B	other fish	0.2572	91

636	2 B	other flatfish	0.0107	91
636	2 B	predatory mesozooplankton	0.0007	91
636	2 B	shallowwater benthic fish	0.1716	91
636	2 B	Shrimp	0.0156	91
Cruise 3				
636	3 B	forage fish	0.8383	5
636	3 B	macrobenthos	0.0707	5
636	3 B	other fish	0.0450	5
636	3 B	Shrimp	0.0460	5

APPENDIX 4. DIETS OF PREDATOR FISH EXPRESSED AS ECOPATH SUBGROUPINGS FOR ALL CRUISES (1-4) AND AREAS (A-D).

nStom is the total number of predator stomachs sampled and AvgP is the proportion of stomach contents based on weight(sum=1).

PredID	Cruise	area	Ecopath grouping	EcopathSubGroup	AvgP	nStom
44	1	A	Euphausiids	euphausiids	0.1057	45
44	1	A	forage fish	sandlance	0.0080	45
44	1	A	Herring	herring	0.1555	45
44	1	A	jellies/macrozooplankton	medusae	0.0253	45
44	1	A	Macrobenthos	anomurans	0.0068	45
44	1	A	Macrobenthos	bivalves	0.0805	45
44	1	A	Macrobenthos	crabs	0.0058	45
44	1	A	Macrobenthos	crustacea with mandibles	0.0003	45
44	1	A	Macrobenthos	echiurans	0.0013	45
44	1	A	Macrobenthos	gastropods	0.0261	45
44	1	A	Meiobenthos	annelids	0.0042	45
44	1	A	other fish	unid fish	0.5687	45
44	1	A	other flatfish	flatfishes	0.0008	45
44	1	A	predatory invertebrates	octopus	0.0090	45
44	1	A	Shrimp	shrimp	0.0021	45
44	1	B	forage fish	sandlance	0.1074	88
44	1	B	Macrobenthos	anomurans	0.1165	88
44	1	B	Macrobenthos	bivalves	0.2699	88
44	1	B	Macrobenthos	crabs	0.1937	88
44	1	B	Macrobenthos	crustacea with mandibles	0.0019	88
44	1	B	Macrobenthos	gastropods	0.1395	88
44	1	B	Macrobenthos	molluscs	0.0056	88
44	1	B	Meiobenthos	annelids	0.0631	88
44	1	B	other fish	bony fishes	0.0048	88
44	1	B	other fish	unid fish	0.0047	88
44	1	B	other flatfish	flatfishes	0.0295	88
44	1	B	predatory mesozooplankton	decapods	0.0156	88
44	1	B	predatory mesozooplankton	gammarids	0.0000	88
44	1	B	shallowwater benthic fish	sculpins	0.0017	88
44	1	B	shallowwater benthic fish	snailfishes	0.0028	88
44	1	B	Shrimp	shrimp	0.0091	88
44	1	B	Squid	squid	0.0343	88
44	1	C	Euphausiids	euphausiids	0.1317	51
44	1	C	forage fish	sandlance	0.0657	51
44	1	C	Herring	herring	0.0670	51
44	1	C	Macrobenthos	crabs	0.0026	51
44	1	C	Macrobenthos	crustacea with	0.0001	51

				mandibles		
44	1	C	other fish	bony fishes	0.5362	51
44	1	C	other fish	unid fish	0.0564	51
44	1	C	other flatfish	flatfishes	0.0594	51
44	1	C	other flatfish	flathead sole	0.0054	51
44	1	C	predatory invertebrates	cephalopods	0.0396	51
44	1	C	predatory invertebrates	octopus	0.0202	51
44	1	C	predatory mesozooplankton	decapods	0.0015	51
44	1	C	Shrimp	shrimp	0.0139	51
44	2	A	Euphausiids	euphausiids	0.0019	32
44	2	A	forage fish	sandlance	0.1582	32
44	2	A	Herring	herring	0.0727	32
44	2	A	Macrobenthos	anomurans	0.0004	32
44	2	A	Macrobenthos	bivalves	0.0009	32
44	2	A	Macrobenthos	cnidaria	0.0008	32
44	2	A	Macrobenthos	crabs	0.0054	32
44	2	A	Macrobenthos	crabs,shrimps and lobsters	0.0013	32
44	2	A	Macrobenthos	crustacea with mandibles	0.0020	32
44	2	A	Macrobenthos	echinoderms	0.0001	32
44	2	A	Macrobenthos	echiurans	0.0225	32
44	2	A	Macrobenthos	gastropods	0.0011	32
44	2	A	Macrobenthos	polyplacophora	0.0000	32
44	2	A	Meiobenthos	annelids	0.0051	32
44	2	A	Meiobenthos	nematodes	0.0001	32
44	2	A	Meiobenthos	proboscis worms	0.0004	32
44	2	A	other fish	bony fishes	0.6152	32
44	2	A	other flatfish	dabs	0.0397	32
44	2	A	Phytoplankton	phytoplankton	0.0024	32
44	2	A	predatory invertebrates	cephalopods	0.0168	32
44	2	A	predatory mesozooplankton	decapods	0.0017	32
44	2	A	Ratfish	ratfish	0.0438	32
44	2	A	shallowwater benthic fish	perch	0.0025	32
44	2	A	Shrimp	shrimp	0.0051	32
44	2	B	Epibenthos	barnacles	0.0000	329
44	2	B	Euphausiids	euphausiids	0.0151	329
44	2	B	forage fish	sandlance	0.2872	329
44	2	B	Herring	herring	0.0455	329
44	2	B	jellies/macrozooplankton	medusae	0.0003	329
44	2	B	Macrobenthos	anomurans	0.1101	329
44	2	B	Macrobenthos	ascidians	0.0006	329
44	2	B	Macrobenthos	bivalves	0.0819	329
44	2	B	Macrobenthos	branchiopods	0.0011	329
44	2	B	Macrobenthos	cnidaria	0.0013	329
44	2	B	Macrobenthos	crabs	0.0701	329

44	2	B	Macrobenthos	crabs,shrimps and lobsters	0.0006	329
44	2	B	Macrobenthos	crustacea with mandibles	0.0060	329
44	2	B	Macrobenthos	gastropods	0.0303	329
44	2	B	Macrobenthos	molluscs	0.0117	329
44	2	B	Macrobenthos	reptantia	0.0003	329
44	2	B	Meiobenthos	annelids	0.0131	329
44	2	B	Meiobenthos	proboscis worms	0.0004	329
44	2	B	other fish	bony fishes	0.0824	329
44	2	B	other fish	unid fish	0.0508	329
44	2	B	other flatfish	dabs	0.0012	329
44	2	B	other flatfish	flatfishes	0.0130	329
44	2	B	predatory invertebrates	cephalopods	0.0001	329
44	2	B	predatory invertebrates	octopus	0.1123	329
44	2	B	predatory mesozooplankton	decapods	0.0178	329
44	2	B	predatory mesozooplankton	hyperid amphipods	0.0001	329
44	2	B	rock sole	rock sole	0.0015	329
44	2	B	shallowwater benthic fish	agonidae	0.0034	329
44	2	B	shallowwater benthic fish	lumpfishes	0.0012	329
44	2	B	shallowwater benthic fish	perch	0.0029	329
44	2	B	shallowwater benthic fish	sculpins	0.0174	329
44	2	B	Shrimp	shrimp	0.0204	329
44	2	C	Euphausiids	euphausiids	0.6515	118
44	2	C	Macrobenthos	anomurans	0.0260	118
44	2	C	Macrobenthos	cnidaria	0.0062	118
44	2	C	Macrobenthos	crabs	0.0503	118
44	2	C	Macrobenthos	crabs,shrimps and lobsters	0.0189	118
44	2	C	Macrobenthos	crustacea with mandibles	0.0113	118
44	2	C	Macrobenthos	lophophorans	0.0021	118
44	2	C	Meiobenthos	annelids	0.0205	118
44	2	C	Meiobenthos	proboscis worms	0.0001	118
44	2	C	other fish	bony fishes	0.0487	118
44	2	C	other fish	unid fish	0.0932	118
44	2	C	predatory mesozooplankton	amphipods	0.0001	118
44	2	C	predatory mesozooplankton	decapods	0.0263	118
44	2	C	predatory mesozooplankton	hyperid amphipods	0.0000	118
44	2	C	shallowwater benthic fish	pacific tomcod	0.0125	118
44	2	C	shallowwater benthic fish	sculpins	0.0123	118
44	2	C	Shrimp	shrimp	0.0021	118
44	2	C	Squid	squid	0.0178	118

44	2	D	Euphausiids	euphausiids	0.0042	2
44	2	D	Macrobenthos	anomurans	0.1990	2
44	2	D	Macrobenthos	crabs	0.2015	2
44	2	D	Macrobenthos	echiurans	0.5939	2
44	2	D	other fish	bony fishes	0.0013	2
44	3	A	Macrobenthos	crabs,shrimps and lobsters	0.0018	7
44	3	A	Meiobenthos	annelids	0.0054	7
44	3	A	Meiobenthos	proboscis worms	0.0097	7
44	3	A	other fish	bony fishes	0.2669	7
44	3	A	other flatfish	flatfishes	0.1192	7
44	3	A	Ratfish	ratfish	0.5963	7
44	3	A	Shrimp	shrimp	0.0008	7
44	3	C	Herring	herring	0.4757	35
44	3	C	Macrobenthos	crabs	0.0005	35
44	3	C	Macrobenthos	crustacea with mandibles	0.0001	35
44	3	C	Meiobenthos	nematodes	0.0013	35
44	3	C	other fish	bony fishes	0.4143	35
44	3	C	other flatfish	dabs	0.0279	35
44	3	C	other flatfish	flatfishes	0.0124	35
44	3	C	predatory invertebrates	cephalopods	0.0102	35
44	3	C	predatory invertebrates	octopus	0.0112	35
44	3	C	Shrimp	shrimp	0.0000	35
44	3	C	Squid	squid	0.0464	35
44	4	A	forage fish	sandlance	0.0010	7
44	4	A	Macrobenthos	anomurans	0.0040	7
44	4	A	Macrobenthos	crabs	0.0451	7
44	4	A	other fish	bony fishes	0.9499	7
44	4	B	english sole	english sole	0.0336	34
44	4	B	Euphausiids	euphausiids	0.0158	34
44	4	B	forage fish	sandlance	0.3872	34
44	4	B	Macrobenthos	anomurans	0.0742	34
44	4	B	Macrobenthos	bivalves	0.0046	34
44	4	B	Macrobenthos	crabs	0.2354	34
44	4	B	Macrobenthos	crabs,shrimps and lobsters	0.0409	34
44	4	B	Macrobenthos	crustacea with mandibles	0.0065	34
44	4	B	Meiobenthos	annelids	0.0300	34
44	4	B	other fish	bony fishes	0.1233	34
44	4	B	predatory mesozooplankton	decapods	0.0470	34
44	4	B	Shrimp	shrimp	0.0016	34
44	4	C	Herring	herring	0.1742	5
44	4	C	Macrobenthos	crabs,shrimps and lobsters	0.0334	5
44	4	C	other fish	bony fishes	0.1688	5

44	4	C	Salmon	salmon	0.6236	5
44	4	D	Euphausiids	euphausiids	0.2411	3
44	4	D	Macrobenthos	crabs	0.0073	3
44	4	D	other fish	bony fishes	0.7516	1
56	1	C	Macrobenthos	crustacea with mandibles	0.5745	1
56	1	C	predatory mesozooplankton	cumaceans	0.1064	1
56	1	C	predatory mesozooplankton	gammarids	0.2128	1
56	1	C	Shrimp	shrimp	0.1064	1
56	2	A	Meiobenthos	annelids	0.0015	2
56	2	A	other fish	unid fish	0.4141	2
56	2	A	Shrimp	shrimp	0.5844	2
56	2	B	forage fish	sandlance	0.1915	110
56	2	B	jellies/macrozooplankton	medusae	0.0000	110
56	2	B	Macrobenthos	anomurans	0.0615	110
56	2	B	Macrobenthos	bivalves	0.0111	110
56	2	B	Macrobenthos	crabs	0.6039	110
56	2	B	Macrobenthos	crustacea with mandibles	0.0030	110
56	2	B	Macrobenthos	gastropods	0.0005	110
56	2	B	Meiobenthos	annelids	0.0001	110
56	2	B	Meiobenthos	nematodes	0.0002	110
56	2	B	other fish	bony fishes	0.0764	110
56	2	B	other flatfish	dabs	0.0164	110
56	2	B	other flatfish	flatfishes	0.0029	110
56	2	B	other flatfish	sand sole	0.0131	110
56	2	B	rock sole	rock sole	0.0009	110
56	2	B	shallowwater benthic fish	sandfishes	0.0045	110
56	2	B	Shrimp	shrimp	0.0140	110
56	2	D	Macrobenthos	bivalves	0.0289	1
56	2	D	Macrobenthos	crabs	0.9327	1
56	2	D	Shrimp	shrimp	0.0383	1
56	3	A	Macrobenthos	crabs	0.8760	5
56	3	A	Meiobenthos	annelids	0.0001	5
56	3	A	other fish	bony fishes	0.0157	5
56	3	A	other flatfish	flatfishes	0.0641	5
56	3	A	predatory invertebrates	octopus	0.0442	5
56	3	D	Macrobenthos	anomurans	0.0213	15
56	3	D	Macrobenthos	crabs	0.0029	15
56	3	D	Macrobenthos	crustacea with mandibles	0.0028	15
56	3	D	other fish	bony fishes	0.2370	15
56	3	D	other flatfish	dabs	0.1794	15
56	3	D	other flatfish	flatfishes	0.2312	15
56	3	D	predatory invertebrates	octopus	0.1569	15
56	3	D	predatory	decapods	0.0153	15

			mesozooplankton			
56	3	D	Squid	squid	0.1533	15
58	1	A	Epibenthos	isopods	0.0345	24
58	1	A	Epibenthos	mysids	0.0069	24
58	1	A	Euphausiids	euphausiids	0.0014	24
58	1	A	Macrobenthos	anomurans	0.1798	24
58	1	A	Macrobenthos	crabs	0.1528	24
58	1	A	Macrobenthos	crustacea with mandibles	0.0467	24
58	1	A	Meiobenthos	annelids	0.1404	24
58	1	A	predatory mesozooplankton	cumaceans	0.0060	24
58	1	A	predatory mesozooplankton	gammarids	0.0624	24
58	1	A	shallowwater benthic fish	pricklebacks	0.0008	24
58	1	A	Shrimp	shrimp	0.3684	24
58	1	C	Macrobenthos	crustacea with mandibles	0.4336	3
58	1	C	predatory mesozooplankton	gammarids	0.4965	3
58	1	C	Shrimp	shrimp	0.0699	3
58	2	A	Shrimp	shrimp	1.0000	1
58	2	C	Epibenthos	mysids	0.0089	2
58	2	C	Macrobenthos	crustacea with mandibles	0.3336	2
58	2	C	Meiobenthos	annelids	0.0266	2
58	2	C	shallowwater benthic fish	agonidae	0.0326	2
58	2	C	Shrimp	shrimp	0.5984	2
58	3	A	Macrobenthos	crabs	0.8337	2
58	3	A	Shrimp	shrimp	0.1663	2
59	1	A	Shrimp	shrimp	1.0000	1
59	1	B	forage fish	sandlance	0.0848	20
59	1	B	Macrobenthos	anomurans	0.0614	20
59	1	B	Macrobenthos	bivalves	0.0004	20
59	1	B	Macrobenthos	crabs	0.6112	20
59	1	B	Macrobenthos	gastropods	0.0213	20
59	1	B	Macrobenthos	reptantia	0.0701	20
59	1	B	other fish	unid fish	0.0104	20
59	1	B	other flatfish	flatfishes	0.1006	20
59	1	B	shallowwater benthic fish	sculpins	0.0125	20
59	1	B	Shrimp	shrimp	0.0274	20
59	1	C	Macrobenthos	crabs	0.1846	3
59	1	C	Macrobenthos	reptantia	0.6381	3
59	1	C	Shrimp	shrimp	0.1773	3
59	2	A	other flatfish	flatfishes	0.6986	1
59	2	A	Shrimp	shrimp	0.3014	1
59	2	C	Epibenthos	mysids	0.0009	5
59	2	C	Macrobenthos	crabs	0.0163	5

59	2	C	Macrobenthos	crustacea with mandibles	0.1061	5
59	2	C	Shrimp	shrimp	0.8766	5
66	1	A	Epibenthos	isopods	0.0134	107
66	1	A	Euphausiids	euphausiids	0.0017	107
66	1	A	Macrobenthos	anomurans	0.1149	107
66	1	A	Macrobenthos	bivalves	0.1749	107
66	1	A	Macrobenthos	crabs	0.0607	107
66	1	A	Macrobenthos	crabs,shrimps and lobsters	0.0009	107
66	1	A	Macrobenthos	crustacea with mandibles	0.1668	107
66	1	A	Macrobenthos	echinoderms	0.1724	107
66	1	A	Macrobenthos	gastropods	0.0414	107
66	1	A	Meiobenthos	annelids	0.1610	107
66	1	A	Meiobenthos	nudibranchs	0.0006	107
66	1	A	other fish	unid fish	0.0051	107
66	1	A	predatory mesozooplankton	amphipods	0.0033	107
66	1	A	predatory mesozooplankton	cumaceans	0.0007	107
66	1	A	predatory mesozooplankton	decapods	0.0629	107
66	1	A	predatory mesozooplankton	gammarids	0.0120	107
66	1	A	Shrimp	shrimp	0.0074	107
66	1	C	Epibenthos	barnacles	0.0054	81
66	1	C	Epibenthos	isopods	0.0000	81
66	1	C	Macrobenthos	anomurans	0.0180	81
66	1	C	Macrobenthos	bivalves	0.0068	81
66	1	C	Macrobenthos	crabs	0.0537	81
66	1	C	Macrobenthos	crabs,shrimps and lobsters	0.0146	81
66	1	C	Macrobenthos	crustacea with mandibles	0.3412	81
66	1	C	Macrobenthos	echinoderms	0.1732	81
66	1	C	Macrobenthos	gastropods	0.0770	81
66	1	C	Macrobenthos	peanut worms	0.0094	81
66	1	C	Meiobenthos	annelids	0.1716	81
66	1	C	other fish	bony fishes	0.0039	81
66	1	C	other fish	unid fish	0.0034	81
66	1	C	predatory mesozooplankton	amphipods	0.0388	81
66	1	C	predatory mesozooplankton	decapods	0.0757	81
66	1	C	predatory mesozooplankton	gammarids	0.0018	81
66	1	C	Shrimp	shrimp	0.0056	81

66	2	C	Epibenthos	mysids	0.0006	70
66	2	C	Euphausiids	euphausiids	0.0071	70
66	2	C	Macrobenthos	anomurans	0.4533	70
66	2	C	Macrobenthos	bivalves	0.0415	70
66	2	C	Macrobenthos	crabs	0.1087	70
66	2	C	Macrobenthos	crustacea with mandibles	0.1000	70
66	2	C	Macrobenthos	echinoderms	0.0246	70
66	2	C	Macrobenthos	gastropods	0.0136	70
66	2	C	Meiobenthos	annelids	0.1139	70
66	2	C	Meiobenthos	proboscis worms	0.0029	70
66	2	C	other fish	bony fishes	0.0169	70
66	2	C	other fish	unid fish	0.0434	70
66	2	C	predatory mesozooplankton	gammarids	0.0034	70
66	2	C	Shrimp	shrimp	0.0700	70
66	2	D	Epibenthos	mysids	0.0199	13
66	2	D	Macrobenthos	anomurans	0.0067	13
66	2	D	Macrobenthos	crabs	0.4982	13
66	2	D	Macrobenthos	crustacea with mandibles	0.2268	13
66	2	D	Macrobenthos	gastropods	0.0019	13
66	2	D	Meiobenthos	annelids	0.0113	13
66	2	D	predatory mesozooplankton	gammarids	0.2327	13
66	2	D	predatory mesozooplankton	ostracods	0.0001	13
66	2	D	Shrimp	shrimp	0.0023	13
66	3	A	Epibenthos	barnacles	0.0001	123
66	3	A	Epibenthos	isopods	0.0023	123
66	3	A	Epibenthos	mysids	0.0002	123
66	3	A	Euphausiids	euphausiids	0.0013	123
66	3	A	jellies/macrozooplankton	medusae	0.0001	123
66	3	A	Macrobenthos	anomurans	0.0131	123
66	3	A	Macrobenthos	bivalves	0.5307	123
66	3	A	Macrobenthos	crabs	0.0393	123
66	3	A	Macrobenthos	crustacea with mandibles	0.0559	123
66	3	A	Macrobenthos	echinoderms	0.1088	123
66	3	A	Macrobenthos	echiurans	0.0121	123
66	3	A	Macrobenthos	gastropods	0.1242	123
66	3	A	Meiobenthos	annelids	0.0196	123
66	3	A	Meiobenthos	proboscis worms	0.0073	123
66	3	A	other fish	bony fishes	0.0385	123
66	3	A	predatory invertebrates	cephalopods	0.0010	123
66	3	A	predatory mesozooplankton	amphipods	0.0053	123
66	3	A	predatory	gammarids	0.0001	123

			mesozooplankton			
66	3	A	Salmon	salmon	0.0327	123
66	3	A	shallowwater benthic fish	agonidae	0.0007	123
66	3	A	Shrimp	shrimp	0.0052	123
66	3	A	Squid	squid	0.0013	123
66	3	C	Macrobenthos	anomurans	0.0183	34
66	3	C	Macrobenthos	bivalves	0.1762	34
66	3	C	Macrobenthos	crabs	0.1242	34
66	3	C	Macrobenthos	crustacea with mandibles	0.0414	34
66	3	C	Macrobenthos	gastropods	0.1536	34
66	3	C	Meiobenthos	annelids	0.4499	34
66	3	C	Meiobenthos	proboscis worms	0.0033	34
66	3	C	other fish	teleosts	0.0120	34
66	3	C	predatory mesozooplankton	amphipods	0.0210	34
66	3	D	Macrobenthos	crustacea with mandibles	0.7023	1
66	3	D	other fish	bony fishes	0.1421	1
66	3	D	Shrimp	shrimp	0.1556	1
148	2	D	Euphausiids	euphausiids	0.0166	8
148	2	D	Macrobenthos	crustacea with mandibles	0.9834	8
148	3	A	Euphausiids	euphausiids	1.0000	8
222	1	A	Epibenthos	isopods	0.0011	21
222	1	A	Euphausiids	euphausiids	0.0064	21
222	1	A	Macrobenthos	anomurans	0.0145	21
222	1	A	Macrobenthos	bivalves	0.0240	21
222	1	A	Macrobenthos	crabs	0.0549	21
222	1	A	Macrobenthos	crustacea with mandibles	0.1585	21
222	1	A	Macrobenthos	echiurans	0.0341	21
222	1	A	Macrobenthos	gastropods	0.0032	21
222	1	A	Meiobenthos	annelids	0.0383	21
222	1	A	other fish	unid fish	0.2764	21
222	1	A	predatory invertebrates	cephalopods	0.0005	21
222	1	A	predatory mesozooplankton	cumaceans	0.0001	21
222	1	A	predatory mesozooplankton	gammarids	0.0113	21
222	1	A	Shrimp	shrimp	0.3768	21
222	1	B	forage fish	sandlance	0.8291	1
222	1	B	Macrobenthos	crabs	0.1322	1
222	1	B	Meiobenthos	annelids	0.0103	1
222	1	B	Shrimp	shrimp	0.0284	1
222	1	C	forage fish	sandlance	0.0405	44
222	1	C	inshore rockfish	rockfish	0.0102	44
222	1	C	Macrobenthos	anomurans	0.0080	44

222	1	C	Macrobenthos	bivalves	0.0019	44
222	1	C	Macrobenthos	crustacea with mandibles	0.0143	44
222	1	C	Macrobenthos	gastropods	0.0034	44
222	1	C	Meiobenthos	annelids	0.0359	44
222	1	C	other fish	unid fish	0.3967	44
222	1	C	other flatfish	flatfishes	0.0090	44
222	1	C	pacific ocean perch	pacific ocean perch	0.1196	44
222	1	C	predatory invertebrates	cephalopods	0.0004	44
222	1	C	predatory mesozooplankton	amphipods	0.0001	44
222	1	C	predatory mesozooplankton	gammarids	0.0085	44
222	1	C	shallowwater benthic fish	pholididae	0.0026	44
222	1	C	Shrimp	shrimp	0.3490	44
222	2	A	Epibenthos	mysids	0.0004	126
222	2	A	Euphausiids	euphausiids	0.0010	126
222	2	A	forage fish	sandlance	0.7655	126
222	2	A	Herring	herring	0.0074	126
222	2	A	Macrobenthos	bivalves	0.0002	126
222	2	A	Macrobenthos	crabs	0.0005	126
222	2	A	Macrobenthos	crustacea with mandibles	0.0010	126
222	2	A	Macrobenthos	echiurans	0.0045	126
222	2	A	Macrobenthos	gastropods	0.0169	126
222	2	A	Meiobenthos	annelids	0.0004	126
222	2	A	other fish	unid fish	0.0316	126
222	2	A	other flatfish	flatfishes	0.0502	126
222	2	A	predatory mesozooplankton	gammarids	0.0030	126
222	2	A	shallowwater benthic fish	greenling	0.0167	126
222	2	A	Shrimp	shrimp	0.0920	126
222	2	A	walleye pollock	walleye pollock	0.0088	126
222	2	B	Epibenthos	barnacles	0.0097	62
222	2	B	Epibenthos	isopods	0.0020	62
222	2	B	Epibenthos	mysids	0.0014	62
222	2	B	forage fish	sandlance	0.2294	62
222	2	B	Macrobenthos	anomurans	0.0267	62
222	2	B	Macrobenthos	bivalves	0.0086	62
222	2	B	Macrobenthos	crabs	0.0813	62
222	2	B	Macrobenthos	crustacea with mandibles	0.1383	62
222	2	B	Macrobenthos	gastropods	0.0019	62
222	2	B	Macrobenthos	molluscs	0.0077	62
222	2	B	Meiobenthos	annelids	0.0011	62
222	2	B	other fish	unid fish	0.1171	62
222	2	B	other flatfish	flatfishes	0.0123	62
222	2	B	predatory	gammarids	0.0754	62

			mesozooplankton			
222	2	B	Shrimp	shrimp	0.2871	62
222	2	C	Euphausiids	euphausiids	0.0205	4
222	2	C	Macrobenthos	crabs	0.0078	4
222	2	C	Meiobenthos	annelids	0.0036	4
222	2	C	shallowwater benthic fish	pholididae	0.3681	4
222	2	C	Shrimp	shrimp	0.6000	4
222	2	D	Epibenthos	mysids	0.0034	42
222	2	D	Euphausiids	euphausiids	0.0001	42
222	2	D	Herring	herring	0.0582	42
222	2	D	Macrobenthos	bivalves	0.0006	42
222	2	D	Macrobenthos	crabs	0.0002	42
222	2	D	Macrobenthos	crustacea with mandibles	0.0014	42
222	2	D	Macrobenthos	echiurans	0.0013	42
222	2	D	Macrobenthos	gastropods	0.0009	42
222	2	D	other fish	unid fish	0.2145	42
222	2	D	other flatfish	flatfishes	0.4549	42
222	2	D	predatory invertebrates	cephalopods	0.0001	42
222	2	D	predatory mesozooplankton	gammarids	0.0002	42
222	2	D	shallowwater benthic fish	agonidae	0.0143	42
222	2	D	Shrimp	shrimp	0.0294	42
222	2	D	Squid	squid	0.0219	42
222	2	D	Turbot	turbot	0.0270	42
222	2	D	walleye pollock	walleye pollock	0.1717	42
222	3	A	Epibenthos	isopods	0.0001	38
222	3	A	Epibenthos	mysids	0.0002	38
222	3	A	Euphausiids	euphausiids	0.0094	38
222	3	A	jellies/macrozooplankton	medusae	0.0002	38
222	3	A	Macrobenthos	anomurans	0.0007	38
222	3	A	Macrobenthos	bivalves	0.0002	38
222	3	A	Macrobenthos	cnidaria	0.0000	38
222	3	A	Macrobenthos	crabs	0.2811	38
222	3	A	Macrobenthos	crustacea with mandibles	0.1195	38
222	3	A	Macrobenthos	gastropods	0.0013	38
222	3	A	Meiobenthos	annelids	0.0343	38
222	3	A	Meiobenthos	nematodes	0.0059	38
222	3	A	other fish	bony fishes	0.3508	38
222	3	A	other flatfish	dabs	0.0096	38
222	3	A	other flatfish	flatfishes	0.0113	38
222	3	A	predatory mesozooplankton	amphipods	0.0039	38
222	3	A	predatory mesozooplankton	gammarids	0.0027	38
222	3	A	Shrimp	shrimp	0.1248	38
222	3	A	walleye pollock	walleye pollock	0.0440	38

222	3	B	forage fish	sandlance	0.3984	4
222	3	B	Macrobenthos	crabs	0.0107	4
222	3	B	Macrobenthos	crustacea with mandibles	0.1457	4
222	3	B	Meiobenthos	annelids	0.0203	4
222	3	B	other fish	bony fishes	0.2341	4
222	3	B	predatory mesozooplankton	amphipods	0.0554	4
222	3	B	Shrimp	shrimp	0.1354	4
222	3	C	Herring	herring	0.6182	79
222	3	C	Macrobenthos	bivalves	0.0001	79
222	3	C	Macrobenthos	crabs	0.0121	79
222	3	C	Macrobenthos	crustacea with mandibles	0.0048	79
222	3	C	Macrobenthos	echinoderms	0.0003	79
222	3	C	Macrobenthos	gastropods	0.0001	79
222	3	C	Macrobenthos	sponges	0.0035	79
222	3	C	Meiobenthos	annelids	0.0016	79
222	3	C	Meiobenthos	nematodes	0.0048	79
222	3	C	Microzooplankton	protozoa	0.0000	79
222	3	C	other fish	bony fishes	0.1537	79
222	3	C	other flatfish	dabs	0.0514	79
222	3	C	pacific cod	pacific cod	0.0278	79
222	3	C	predatory invertebrates	cephalopods	0.0322	79
222	3	C	predatory mesozooplankton	amphipods	0.0008	79
222	3	C	predatory mesozooplankton	decapods	0.0001	79
222	3	C	predatory mesozooplankton	gammarids	0.0003	79
222	3	C	shallowwater benthic fish	agonidae	0.0032	79
222	3	C	Shrimp	shrimp	0.0549	79
222	3	C	Squid	squid	0.0301	79
222	3	D	Epibenthos	isopods	0.0050	53
222	3	D	Epibenthos	mysids	0.0028	53
222	3	D	Macrobenthos	anomurans	0.0176	53
222	3	D	Macrobenthos	crabs	0.3632	53
222	3	D	Macrobenthos	crustacea	0.0011	53
222	3	D	Macrobenthos	crustacea with mandibles	0.3144	53
222	3	D	Macrobenthos	gastropods	0.0069	53
222	3	D	Meiobenthos	annelids	0.0753	53
222	3	D	Other	tussock moths	0.0879	53
222	3	D	other fish	bony fishes	0.0303	53
222	3	D	other fish	teleosts	0.0062	53
222	3	D	predatory mesozooplankton	amphipods	0.0231	53
222	3	D	predatory	decapods	0.0098	53

			mesozooplankton			
222	3	D	predatory mesozooplankton	gammarids	0.0052	53
222	3	D	shallowwater benthic fish	agonidae	0.0337	53
222	3	D	Shrimp	shrimp	0.0173	53
222	3	E	Euphausiids	euphausiids	0.0006	60
222	3	E	inshore rockfish	rockfish	0.1820	60
222	3	E	Macrobenthos	anomurans	0.0047	60
222	3	E	Macrobenthos	bivalves	0.0000	60
222	3	E	Macrobenthos	crabs	0.0322	60
222	3	E	Macrobenthos	crustacea with mandibles	0.0102	60
222	3	E	Meiobenthos	annelids	0.0259	60
222	3	E	Meiobenthos	nematodes	0.0026	60
222	3	E	other fish	bony fishes	0.5359	60
222	3	E	predatory mesozooplankton	amphipods	0.0135	60
222	3	E	predatory mesozooplankton	gammarids	0.0042	60
222	3	E	shallowwater benthic fish	agonidae	0.0158	60
222	3	E	shallowwater benthic fish	perch	0.0945	60
222	3	E	shallowwater benthic fish	pricklebacks	0.0216	60
222	3	E	shallowwater benthic fish	sculpins	0.0378	60
222	3	E	Shrimp	shrimp	0.0183	60
222	4	A	Euphausiids	euphausiids	0.1278	2
222	4	A	forage fish	sandlance	0.1652	2
222	4	A	Macrobenthos	gastropods	0.0053	2
222	4	A	Meiobenthos	annelids	0.1194	2
222	4	A	Meiobenthos	nematodes	0.0256	2
222	4	A	other fish	bony fishes	0.5567	2
222	4	B	Epibenthos	barnacles	0.0000	28
222	4	B	forage fish	sandlance	0.2246	28
222	4	B	Macrobenthos	anomurans	0.0826	28
222	4	B	Macrobenthos	bivalves	0.0069	28
222	4	B	Macrobenthos	cnidaria	0.0001	28
222	4	B	Macrobenthos	crabs	0.1587	28
222	4	B	Macrobenthos	crabs,shrimps and lobsters	0.0466	28
222	4	B	Macrobenthos	crustacea with mandibles	0.0538	28
222	4	B	Macrobenthos	gastropods	0.0002	28
222	4	B	Meiobenthos	annelids	0.0127	28
222	4	B	Meiobenthos	nematodes	0.0043	28
222	4	B	Meiobenthos	proboscis worms	0.0003	28
222	4	B	other fish	bony fishes	0.2940	28
222	4	B	other flatfish	flatfishes	0.0517	28
222	4	B	predatory mesozooplankton	amphipods	0.0001	28

222	4	B	predatory mesozooplankton	decapods	0.0133	28
222	4	B	predatory mesozooplankton	gammarids	0.0001	28
222	4	B	Shrimp	shrimp	0.0501	28
222	4	C	Copepods	copepods	0.0001	46
222	4	C	Euphausiids	euphausiids	0.0002	46
222	4	C	inshore rockfish	rockfish	0.0112	46
222	4	C	Macrobenthos	anomurans	0.1427	46
222	4	C	Macrobenthos	bivalves	0.0001	46
222	4	C	Macrobenthos	crabs	0.0327	46
222	4	C	Macrobenthos	crabs,shrimps and lobsters	0.0054	46
222	4	C	Macrobenthos	crustacea with mandibles	0.0258	46
222	4	C	Macrobenthos	echinoderms	0.0001	46
222	4	C	Macrobenthos	gastropods	0.0061	46
222	4	C	Macrobenthos	peanut worms	0.0008	46
222	4	C	Meiobenthos	annelids	0.0922	46
222	4	C	Meiobenthos	nematodes	0.0093	46
222	4	C	other fish	bony fishes	0.6436	46
222	4	C	predatory invertebrates	cephalopods	0.0029	46
222	4	C	predatory mesozooplankton	amphipods	0.0001	46
222	4	C	predatory mesozooplankton	cumaceans	0.0005	46
222	4	C	predatory mesozooplankton	decapods	0.0097	46
222	4	C	predatory mesozooplankton	gammarids	0.0012	46
222	4	C	shallowwater benthic fish	agonidae	0.0130	46
222	4	C	Shrimp	shrimp	0.0023	46
228	1	A	Epibenthos	mysids	0.0028	22
228	1	A	Euphausiids	euphausiids	0.9330	22
228	1	A	Macrobenthos	crustacea with mandibles	0.0046	22
228	1	A	other fish	unid fish	0.0197	22
228	1	A	predatory mesozooplankton	cumaceans	0.0004	22
228	1	A	predatory mesozooplankton	gammarids	0.0010	22
228	1	A	Shrimp	shrimp	0.0386	22
228	1	B	Shrimp	shrimp	1.0000	1
228	1	C	Copepods	copepods	0.0215	110
228	1	C	Epibenthos	isopods	0.0007	110
228	1	C	Epibenthos	mysids	0.0001	110
228	1	C	Euphausiids	euphausiids	0.0085	110
228	1	C	jellies/macrozooplankton	tunicates	0.0001	110

228	1	C	Macrobenthos	anomurans	0.0000	110
228	1	C	Macrobenthos	bivalves	0.0000	110
228	1	C	Macrobenthos	chaetognaths	0.0000	110
228	1	C	Macrobenthos	crabs	0.0000	110
228	1	C	Macrobenthos	crustacea with mandibles	0.0511	110
228	1	C	Macrobenthos	gastropods	0.0096	110
228	1	C	Meiobenthos	annelids	0.0036	110
228	1	C	other fish	unid fish	0.0288	110
228	1	C	predatory invertebrates	cephalopods	0.0004	110
228	1	C	predatory mesozooplankton	cumaceans	0.0002	110
228	1	C	predatory mesozooplankton	gammarids	0.0033	110
228	1	C	predatory mesozooplankton	hyperid amphipods	0.0000	110
228	1	C	shallowwater benthic fish	sculpins	0.0002	110
228	1	C	Shrimp	shrimp	0.8718	110
228	2	C	Euphausiids	euphausiids	0.7010	4
228	2	C	Macrobenthos	crabs	0.0748	4
228	2	C	Macrobenthos	crustacea with mandibles	0.0420	4
228	2	C	Meiobenthos	nematodes	0.0080	4
228	2	C	other fish	bony fishes	0.0145	4
228	2	C	Shrimp	shrimp	0.1597	4
228	2	D	Epibenthos	mysids	0.5308	44
228	2	D	Euphausiids	euphausiids	0.2123	44
228	2	D	Macrobenthos	anomurans	0.0011	44
228	2	D	Macrobenthos	crabs	0.0629	44
228	2	D	Macrobenthos	crustacea with mandibles	0.0284	44
228	2	D	Meiobenthos	nematodes	0.0028	44
228	2	D	other fish	bony fishes	0.1060	44
228	2	D	predatory mesozooplankton	amphipods	0.0001	44
228	2	D	Shrimp	shrimp	0.0555	44
228	3	A	Macrobenthos	crabs	0.8008	3
228	3	A	Macrobenthos	crustacea with mandibles	0.1992	3
228	3	C	Copepods	copepods	0.0007	15
228	3	C	Epibenthos	isopods	0.0004	15
228	3	C	Euphausiids	euphausiids	0.0911	15
228	3	C	Macrobenthos	crabs	0.2756	15
228	3	C	Macrobenthos	crustacea with mandibles	0.0725	15
228	3	C	predatory mesozooplankton	amphipods	0.0004	15
228	3	C	predatory	hyperid amphipods	0.0175	15

			mesozooplankton			
228	3	C	Shrimp	shrimp	0.5417	15
228	3	D	Euphausiids	euphausiids	0.0588	8
228	3	D	Macrobenthos	crabs	0.3427	8
228	3	D	Macrobenthos	crustacea with mandibles	0.4710	8
228	3	D	Shrimp	shrimp	0.1275	8
396	1	A	Euphausiids	euphausiids	0.9462	5
396	1	A	predatory mesozooplankton	cumaceans	0.0035	5
396	1	A	predatory mesozooplankton	gammarids	0.0290	5
396	1	A	Shrimp	shrimp	0.0213	5
396	1	C	Copepods	copepods	0.3122	64
396	1	C	Epibenthos	mysids	0.0039	64
396	1	C	Euphausiids	euphausiids	0.2824	64
396	1	C	Macrobenthos	chaetognaths	0.0072	64
396	1	C	Macrobenthos	crustacea with mandibles	0.1697	64
396	1	C	Macrobenthos	gastropods	0.0942	64
396	1	C	other fish	unid fish	0.0623	64
396	1	C	predatory mesozooplankton	amphipods	0.0082	64
396	1	C	predatory mesozooplankton	gammarids	0.0059	64
396	1	C	predatory mesozooplankton	hyperid amphipods	0.0093	64
396	1	C	predatory mesozooplankton	megalops	0.0031	64
396	1	C	Shrimp	shrimp	0.0416	64
396	2	C	Copepods	copepods	0.0002	43
396	2	C	Epibenthos	mysids	0.0124	43
396	2	C	Euphausiids	euphausiids	0.8854	43
396	2	C	Macrobenthos	crabs	0.0882	43
396	2	C	Shrimp	shrimp	0.0138	43
401	1	A	Shrimp	shrimp	1.0000	1
401	2	C	Euphausiids	euphausiids	0.0114	46
401	2	C	forage fish	sandlance	0.0122	46
401	2	C	Macrobenthos	crabs	0.4056	46
401	2	C	Meiobenthos	nematodes	0.0484	46
401	2	C	other fish	bony fishes	0.1736	46
401	2	C	other flatfish	dabs	0.0202	46
401	2	C	other flatfish	slender sole	0.0048	46
401	2	C	predatory invertebrates	cephalopods	0.0314	46
401	2	C	predatory mesozooplankton	amphipods	0.0004	46
401	2	C	predatory mesozooplankton	gammarids	0.0003	46

401	2	C	shallowwater benthic fish	agonidae	0.0056	46
401	2	C	shallowwater benthic fish	pricklebacks	0.0115	46
401	2	C	Shrimp	shrimp	0.2333	46
401	2	C	Squid	squid	0.0302	46
401	2	C	walleye pollock	walleye pollock	0.0111	46
405	1	C	Euphausiids	euphausiids	0.3223	8
405	1	C	other fish	unid fish	0.6776	8
405	1	C	predatory mesozooplankton	hyperid amphipods	0.0001	8
405	2	A	jellies/macrozooplankton	medusae	0.0016	5
405	2	A	other fish	bony fishes	0.6734	5
405	2	A	walleye pollock	walleye pollock	0.3250	5
405	2	C	Euphausiids	euphausiids	0.3584	25
405	2	C	Macrobenthos	crustacea with mandibles	0.0033	25
405	2	C	Meiobenthos	nematodes	0.0003	25
405	2	C	other fish	bony fishes	0.1101	25
405	2	C	other fish	unid fish	0.4965	25
405	2	C	shallowwater benthic fish	smelt	0.0028	25
405	2	C	walleye pollock	walleye pollock	0.0286	25
414	2	C	Euphausiids	euphausiids	0.8223	4
414	2	C	Macrobenthos	crabs	0.1115	4
414	2	C	Macrobenthos	crustacea with mandibles	0.0080	4
414	2	C	other fish	bony fishes	0.0566	4
414	2	C	predatory mesozooplankton	amphipods	0.0005	4
414	2	C	predatory mesozooplankton	gammarids	0.0010	4
418	1	A	Copepods	copepods	0.0000	12
418	1	A	Epibenthos	mysids	0.0004	12
418	1	A	Euphausiids	euphausiids	0.6025	12
418	1	A	forage fish	sandlance	0.0031	12
418	1	A	inshore rockfish	rockfish	0.0220	12
418	1	A	Lingcod	lingcod	0.0010	12
418	1	A	Macrobenthos	anomurans	0.0000	12
418	1	A	Macrobenthos	crustacea with mandibles	0.0372	12
418	1	A	Macrobenthos	gastropods	0.1112	12
418	1	A	Meiobenthos	annelids	0.0010	12
418	1	A	other fish	unid fish	0.0469	12
418	1	A	other flatfish	flatfishes	0.0005	12
418	1	A	predatory mesozooplankton	cumaceans	0.0045	12
418	1	A	predatory mesozooplankton	gammarids	0.0025	12
418	1	A	predatory mesozooplankton	hyperid amphipods	0.0003	12

418	1	A	shallowwater benthic fish	sculpins	0.0033	12
418	1	A	Shrimp	shrimp	0.1636	12
418	1	C	Euphausiids	euphausiids	0.0314	2
418	1	C	Shrimp	shrimp	0.9686	2
418	2	C	Epibenthos	mysids	0.0126	26
418	2	C	Euphausiids	euphausiids	0.6452	26
418	2	C	forage fish	sandlance	0.0015	26
418	2	C	Macrobenthos	crabs	0.3087	26
418	2	C	Meiobenthos	nematodes	0.0025	26
418	2	C	other fish	bony fishes	0.0056	26
418	2	C	petrale sole	petrale sole	0.0130	26
418	2	C	predatory mesozooplankton	hyperid amphipods	0.0001	26
418	2	C	Shrimp	shrimp	0.0109	26
418	3	A	Epibenthos	mysids	0.0004	17
418	3	A	Euphausiids	euphausiids	0.8097	17
418	3	A	forage fish	sandlance	0.0394	17
418	3	A	Macrobenthos	crabs	0.0292	17
418	3	A	Macrobenthos	crustacea with mandibles	0.0419	17
418	3	A	Macrobenthos	gastropods	0.0173	17
418	3	A	Meiobenthos	annelids	0.0000	17
418	3	A	other fish	bony fishes	0.0064	17
418	3	A	predatory invertebrates	cephalopods	0.0110	17
418	3	A	predatory mesozooplankton	amphipods	0.0009	17
418	3	A	predatory mesozooplankton	hyperid amphipods	0.0002	17
418	3	A	Shrimp	shrimp	0.0339	17
418	3	A	Squid	squid	0.0097	17
435	1	A	walleye pollock	walleye pollock	1.0000	1
435	1	C	other fish	unid fish	1.0000	4
435	2	A	Meiobenthos	nematodes	0.0016	1
435	2	A	other fish	bony fishes	0.9984	1
435	2	C	other fish	bony fishes	1.0000	1
435	3	C	Meiobenthos	nematodes	0.0325	1
435	3	C	other fish	bony fishes	0.0198	1
435	3	C	Turbot	turbot	0.9477	1
455	1	A	Dogfish	dogfish	0.1787	42
455	1	A	Dogfish	sharks	0.0477	42
455	1	A	Epibenthos	isopods	0.0012	42
455	1	A	Euphausiids	euphausiids	0.0860	42
455	1	A	Macrobenthos	anomurans	0.0513	42
455	1	A	Macrobenthos	ascidians	0.0132	42
455	1	A	Macrobenthos	bivalves	0.0110	42
455	1	A	Macrobenthos	cnidaria	0.0007	42
455	1	A	Macrobenthos	echinoderms	0.0185	42
455	1	A	Macrobenthos	echiurans	0.0494	42

455	1	A	Macrobenthos	gastropods	0.1786	42
455	1	A	Meiobenthos	annelids	0.0092	42
455	1	A	other fish	unid fish	0.2869	42
455	1	A	Phytoplankton	phytoplankton	0.0635	42
455	1	A	predatory mesozooplankton	amphipods	0.0004	42
455	1	A	predatory mesozooplankton	gammarids	0.0015	42
455	1	A	Shrimp	shrimp	0.0021	42
455	1	C	Epibenthos	isopods	0.0014	36
455	1	C	Euphausiids	euphausiids	0.0019	36
455	1	C	forage fish	sandlance	0.2262	36
455	1	C	Macrobenthos	anomurans	0.0139	36
455	1	C	Macrobenthos	cnidaria	0.1166	36
455	1	C	Macrobenthos	crabs	0.0644	36
455	1	C	Macrobenthos	crustacea with mandibles	0.0025	36
455	1	C	Macrobenthos	echinoderms	0.0495	36
455	1	C	Macrobenthos	gastropods	0.0725	36
455	1	C	Macrobenthos	reptantia	0.0042	36
455	1	C	Meiobenthos	annelids	0.0884	36
455	1	C	other fish	unid fish	0.0869	36
455	1	C	predatory mesozooplankton	gammarids	0.0290	36
455	1	C	Shrimp	shrimp	0.2053	36
455	1	C	Squid	squid	0.0373	36
455	2	A	Euphausiids	euphausiids	0.0338	2
455	2	A	jellies/macrozooplankton	medusae	0.0196	2
455	2	A	Meiobenthos	annelids	0.5365	2
455	2	A	other fish	bony fishes	0.2748	2
455	2	A	predatory mesozooplankton	amphipods	0.0589	2
455	2	A	predatory mesozooplankton	gammarids	0.0120	2
455	2	A	Shrimp	shrimp	0.0643	2
455	2	C	Epibenthos	isopods	0.0003	90
455	2	C	Epibenthos	mysids	0.0000	90
455	2	C	Euphausiids	euphausiids	0.7399	90
455	2	C	Herring	herring	0.0377	90
455	2	C	Macrobenthos	anomurans	0.0002	90
455	2	C	Macrobenthos	cnidaria	0.0343	90
455	2	C	Macrobenthos	crabs	0.0026	90
455	2	C	Macrobenthos	crustacea with mandibles	0.0039	90
455	2	C	Macrobenthos	echinoderms	0.0002	90
455	2	C	Macrobenthos	echiurans	0.0002	90
455	2	C	Macrobenthos	gastropods	0.0001	90
455	2	C	Meiobenthos	annelids	0.0012	90

455	2	C	other fish	bony fishes	0.0024	90
455	2	C	other fish	unid fish	0.1444	90
455	2	C	Phytoplankton	phytoplankton	0.0013	90
455	2	C	predatory mesozooplankton	amphipods	0.0002	90
455	2	C	predatory mesozooplankton	gammarids	0.0001	90
455	2	C	predatory mesozooplankton	hyperid amphipods	0.0002	90
455	2	C	shallowwater benthic fish	sculpins	0.0045	90
455	2	C	Shrimp	shrimp	0.0263	90
467	1	C	other fish	unid fish	1.0000	1
467	2	A	Herring	herring	0.5351	5
467	2	A	Meiobenthos	annelids	0.0001	5
467	2	A	Meiobenthos	nematodes	0.0010	5
467	2	A	other fish	bony fishes	0.4638	5
467	2	C	other fish	bony fishes	1.0000	2
467	2	D	english sole	english sole	0.4486	4
467	2	D	Meiobenthos	nematodes	0.0000	4
467	2	D	other fish	bony fishes	0.5514	4
467	3	C	Meiobenthos	nematodes	0.0002	11
467	3	C	other fish	bony fishes	0.6833	11
467	3	C	other flatfish	yellowfin sole	0.1378	11
467	3	C	Salmon	salmon	0.0309	11
467	3	C	shallowwater benthic fish	sculpins	0.1477	11
467	3	D	Meiobenthos	nematodes	0.0142	2
467	3	D	other fish	bony fishes	0.9858	2
596	2	D	Epibenthos	mysids	0.4482	27
596	2	D	Euphausiids	euphausiids	0.4349	27
596	2	D	Macrobenthos	anomurans	0.0003	27
596	2	D	Macrobenthos	crabs	0.0303	27
596	2	D	other fish	bony fishes	0.0393	27
596	2	D	other flatfish	dabs	0.0207	27
596	2	D	predatory mesozooplankton	amphipods	0.0003	27
596	2	D	predatory mesozooplankton	gammarids	0.0002	27
596	2	D	Shrimp	shrimp	0.0051	27
596	2	D	Turbot	turbot	0.0208	27
596	3	A	Euphausiids	euphausiids	0.5942	1
596	3	A	Shrimp	shrimp	0.4058	1
596	3	D	Copepods	copepods	0.0012	62
596	3	D	Epibenthos	isopods	0.0010	62
596	3	D	Epibenthos	mysids	0.0001	62
596	3	D	Euphausiids	euphausiids	0.1595	62
596	3	D	jellies/macrozooplankton	tunicates	0.0056	62
596	3	D	Macrobenthos	anomurans	0.1239	62
596	3	D	Macrobenthos	ascidians	0.0861	62

596	3	D	Macrobenthos	chaetognaths	0.0056	62
596	3	D	Macrobenthos	crustacea with mandibles	0.2275	62
596	3	D	Macrobenthos	echinoderms	0.0034	62
596	3	D	Macrobenthos	gastropods	0.0006	62
596	3	D	Macrobenthos	peanut worms	0.0000	62
596	3	D	Meiobenthos	annelids	0.0670	62
596	3	D	Meiobenthos	nematodes	0.0013	62
596	3	D	other fish	bony fishes	0.0025	62
596	3	D	predatory mesozooplankton	amphipods	0.0418	62
596	3	D	predatory mesozooplankton	cumaceans	0.0000	62
596	3	D	predatory mesozooplankton	gammarids	0.0190	62
596	3	D	Shrimp	shrimp	0.2537	62
598	1	B	Epibenthos	mysids	0.0510	85
598	1	B	Euphausiids	euphausiids	0.0138	85
598	1	B	Macrobenthos	bivalves	0.0008	85
598	1	B	Macrobenthos	crabs	0.0438	85
598	1	B	Macrobenthos	crabs,shrimps and lobsters	0.0948	85
598	1	B	Macrobenthos	crustacea with mandibles	0.0462	85
598	1	B	Meiobenthos	annelids	0.0314	85
598	1	B	other fish	bony fishes	0.0181	85
598	1	B	other fish	unid fish	0.0205	85
598	1	B	other flatfish	flatfishes	0.0088	85
598	1	B	predatory mesozooplankton	amphipods	0.0026	85
598	1	B	predatory mesozooplankton	cumaceans	0.0022	85
598	1	B	predatory mesozooplankton	gammarids	0.0218	85
598	1	B	shallowwater benthic fish	clingfishes	0.0004	85
598	1	B	Shrimp	shrimp	0.6437	85
598	2	B	Epibenthos	mysids	0.3876	2
598	2	B	Shrimp	shrimp	0.6124	2
598	3	B	forage fish	sandlance	0.9882	1
598	3	B	Macrobenthos	crabs	0.0118	1
602	1	A	Euphausiids	euphausiids	0.4790	264
602	1	A	forage fish	sandlance	0.0011	264
602	1	A	Herring	herring	0.3572	264
602	1	A	Macrobenthos	crabs	0.0397	264
602	1	A	Meiobenthos	annelids	0.0096	264
602	1	A	other fish	unid fish	0.0955	264
602	1	A	predatory mesozooplankton	cumaceans	0.0001	264

602	1	A	Shrimp	shrimp	0.0178	264
602	1	C	Euphausiids	euphausiids	0.0017	70
602	1	C	forage fish	sandlance	0.0393	70
602	1	C	Herring	herring	0.2915	70
602	1	C	Macrobenthos	crabs	0.0432	70
602	1	C	Macrobenthos	crabs,shrimps and lobsters	0.0466	70
602	1	C	Macrobenthos	crustacea with mandibles	0.0174	70
602	1	C	other fish	bony fishes	0.4040	70
602	1	C	other fish	unid fish	0.0092	70
602	1	C	other flatfish	flatfishes	0.0075	70
602	1	C	Shrimp	shrimp	0.1394	70
602	2	A	Euphausiids	euphausiids	0.0004	101
602	2	A	forage fish	sandlance	0.2675	101
602	2	A	Herring	herring	0.0799	101
602	2	A	Macrobenthos	crabs	0.0128	101
602	2	A	Macrobenthos	crabs,shrimps and lobsters	0.0049	101
602	2	A	Macrobenthos	crustacea	0.0000	101
602	2	A	Macrobenthos	crustacea with mandibles	0.0011	101
602	2	A	Macrobenthos	echinoderms	0.0003	101
602	2	A	Meiobenthos	annelids	0.0001	101
602	2	A	Meiobenthos	nematodes	0.0001	101
602	2	A	other fish	bony fishes	0.4648	101
602	2	A	other fish	unid fish	0.1198	101
602	2	A	shallowwater benthic fish	gadids	0.0270	101
602	2	A	shallowwater benthic fish	perch	0.0032	101
602	2	A	Shrimp	shrimp	0.0163	101
602	2	A	walleye pollock	walleye pollock	0.0018	101
602	2	C	Epibenthos	mysids	0.0000	205
602	2	C	Euphausiids	euphausiids	0.0470	205
602	2	C	Herring	herring	0.1021	205
602	2	C	inshore rockfish	rockfish	0.0490	205
602	2	C	Macrobenthos	cnidaria	0.0000	205
602	2	C	Macrobenthos	crabs	0.0355	205
602	2	C	Macrobenthos	crabs,shrimps and lobsters	0.0802	205
602	2	C	Macrobenthos	crustacea with mandibles	0.0338	205
602	2	C	Macrobenthos	echinoderms	0.0000	205
602	2	C	Macrobenthos	gastropods	0.0000	205
602	2	C	Meiobenthos	annelids	0.0004	205
602	2	C	Meiobenthos	nematodes	0.0012	205
602	2	C	Meiobenthos	proboscis worms	0.0000	205
602	2	C	other fish	bony fishes	0.6037	205
602	2	C	other fish	unid fish	0.0019	205

602	2	C	other flatfish	flathead sole	0.0077	205
602	2	C	shallowwater benthic fish	eelpout	0.0055	205
602	2	C	Shrimp	shrimp	0.0320	205
602	2	D	Epibenthos	mysids	0.1882	49
602	2	D	Euphausiids	euphausiids	0.0297	49
602	2	D	Herring	herring	0.1828	49
602	2	D	Macrobenthos	crabs	0.0073	49
602	2	D	Macrobenthos	crabs,shrimps and lobsters	0.0285	49
602	2	D	Macrobenthos	crustacea with mandibles	0.0236	49
602	2	D	Meiobenthos	nematodes	0.0001	49
602	2	D	other fish	bony fishes	0.2662	49
602	2	D	other fish	unid fish	0.1320	49
602	2	D	shallowwater benthic fish	gadids	0.1415	49
602	3	A	Euphausiids	euphausiids	0.0975	120
602	3	A	forage fish	eulachon	0.0179	120
602	3	A	Herring	herring	0.1565	120
602	3	A	Macrobenthos	cnidaria	0.0002	120
602	3	A	Macrobenthos	crabs	0.0094	120
602	3	A	Macrobenthos	crabs,shrimps and lobsters	0.3660	120
602	3	A	Macrobenthos	crustacea with mandibles	0.0278	120
602	3	A	Macrobenthos	echinoderms	0.0015	120
602	3	A	other fish	bony fishes	0.1764	120
602	3	A	predatory invertebrates	cephalopods	0.0020	120
602	3	A	shallowwater benthic fish	sculpins	0.0594	120
602	3	A	Shrimp	shrimp	0.0853	120
602	3	C	Euphausiids	euphausiids	0.0003	86
602	3	C	Macrobenthos	bivalves	0.0000	86
602	3	C	Macrobenthos	crabs	0.0050	86
602	3	C	Macrobenthos	crabs,shrimps and lobsters	0.0643	86
602	3	C	Macrobenthos	crustacea with mandibles	0.0445	86
602	3	C	Macrobenthos	gastropods	0.0002	86
602	3	C	Meiobenthos	annelids	0.0005	86
602	3	C	other fish	bony fishes	0.8715	86
602	3	C	predatory invertebrates	cephalopods	0.0046	86
602	3	C	predatory mesozooplankton	decapods	0.0002	86
602	3	C	Shrimp	shrimp	0.0089	86
602	3	D	Epibenthos	mysids	0.0040	8
602	3	D	Euphausiids	euphausiids	0.0712	8
602	3	D	Macrobenthos	crabs,shrimps and lobsters	0.4759	8
602	3	D	Macrobenthos	crustacea with	0.0647	8

				mandibles		
602	3	D	other fish	bony fishes	0.3832	8
602	3	D	predatory mesozooplankton	amphipods	0.0011	8
607	1	A	Epibenthos	isopods	0.0053	2
607	1	A	Macrobenthos	anomurans	0.0827	2
607	1	A	Macrobenthos	bivalves	0.0267	2
607	1	A	Macrobenthos	crabs	0.2373	2
607	1	A	Shrimp	shrimp	0.6480	2
607	2	D	Epibenthos	mysids	0.5861	55
607	2	D	Euphausiids	euphausiids	0.1028	55
607	2	D	Macrobenthos	anomurans	0.0000	55
607	2	D	Macrobenthos	bivalves	0.0062	55
607	2	D	Macrobenthos	crabs	0.0225	55
607	2	D	Macrobenthos	crustacea with mandibles	0.0005	55
607	2	D	Macrobenthos	echinoderms	0.0000	55
607	2	D	Meiobenthos	annelids	0.0000	55
607	2	D	Meiobenthos	nematodes	0.0000	55
607	2	D	other fish	bony fishes	0.2294	55
607	2	D	other flatfish	dabs	0.0006	55
607	2	D	predatory mesozooplankton	cumaceans	0.0000	55
607	2	D	shallowwater benthic fish	agonidae	0.0003	55
607	2	D	Shrimp	shrimp	0.0170	55
607	2	D	Squid	squid	0.0037	55
607	2	D	walleye pollock	walleye pollock	0.0308	55
607	3	C	Euphausiids	euphausiids	0.0023	45
607	3	C	Herring	herring	0.7310	45
607	3	C	Macrobenthos	crabs	0.0042	45
607	3	C	Macrobenthos	crustacea with mandibles	0.0068	45
607	3	C	Meiobenthos	annelids	0.0001	45
607	3	C	Meiobenthos	nematodes	0.0001	45
607	3	C	other fish	bony fishes	0.2031	45
607	3	C	predatory invertebrates	cephalopods	0.0054	45
607	3	C	Salmon	salmon	0.0090	45
607	3	C	shallowwater benthic fish	agonidae	0.0115	45
607	3	C	shallowwater benthic fish	sculpins	0.0090	45
607	3	C	Shrimp	shrimp	0.0129	45
607	3	C	Squid	squid	0.0047	45
607	3	D	Macrobenthos	crustacea with mandibles	1.0000	2
610	1	A	Epibenthos	isopods	0.0017	130
610	1	A	Euphausiids	euphausiids	0.0005	130
610	1	A	Macrobenthos	anomurans	0.0000	130
610	1	A	Macrobenthos	bivalves	0.0051	130
610	1	A	Macrobenthos	crabs	0.1723	130

610	1	A	Macrobenthos	crustacea with mandibles	0.0043	130
610	1	A	Macrobenthos	echinoderms	0.0002	130
610	1	A	Macrobenthos	echiurans	0.5135	130
610	1	A	Macrobenthos	reptantia	0.0005	130
610	1	A	Meiobenthos	annelids	0.2693	130
610	1	A	predatory mesozooplankton	cumaceans	0.0041	130
610	1	A	predatory mesozooplankton	gammarids	0.0085	130
610	1	A	Shrimp	shrimp	0.0200	130
610	1	C	Epibenthos	isopods	0.0139	98
610	1	C	Epibenthos	tanaidaceans	0.0000	98
610	1	C	Euphausiids	euphausiids	0.0005	98
610	1	C	Macrobenthos	bivalves	0.0023	98
610	1	C	Macrobenthos	crabs	0.0161	98
610	1	C	Macrobenthos	crustacea with mandibles	0.0053	98
610	1	C	Macrobenthos	echinoderms	0.0040	98
610	1	C	Macrobenthos	echiurans	0.0056	98
610	1	C	Macrobenthos	gastropods	0.0001	98
610	1	C	Meiobenthos	annelids	0.9236	98
610	1	C	Microzooplankton	protozoa	0.0000	98
610	1	C	predatory mesozooplankton	caprellid amphipods	0.0000	98
610	1	C	predatory mesozooplankton	cumaceans	0.0012	98
610	1	C	predatory mesozooplankton	gammarids	0.0249	98
610	1	C	predatory mesozooplankton	ostracods	0.0001	98
610	1	C	Shrimp	shrimp	0.0023	98
610	2	A	Epibenthos	isopods	0.0003	34
610	2	A	Epibenthos	mysids	0.0005	34
610	2	A	Macrobenthos	crabs	0.0453	34
610	2	A	Macrobenthos	echiurans	0.0178	34
610	2	A	Meiobenthos	annelids	0.1258	34
610	2	A	other fish	unid fish	0.0006	34
610	2	A	predatory mesozooplankton	cumaceans	0.0001	34
610	2	A	predatory mesozooplankton	gammarids	0.0095	34
610	2	A	Shrimp	shrimp	0.8002	34
610	2	C	Epibenthos	mysids	0.0010	148
610	2	C	Euphausiids	euphausiids	0.0018	148
610	2	C	Macrobenthos	anomurans	0.0051	148
610	2	C	Macrobenthos	bivalves	0.0114	148
610	2	C	Macrobenthos	crabs	0.0110	148

610	2	C	Macrobenthos	crustacea with mandibles	0.0009	148
610	2	C	Macrobenthos	echinoderms	0.0074	148
610	2	C	Macrobenthos	echiurans	0.0077	148
610	2	C	Meiobenthos	annelids	0.7541	148
610	2	C	other fish	unid fish	0.0015	148
610	2	C	predatory mesozooplankton	caprellid amphipods	0.0001	148
610	2	C	predatory mesozooplankton	cumaceans	0.0012	148
610	2	C	predatory mesozooplankton	gammarids	0.0735	148
610	2	C	predatory mesozooplankton	ostracods	0.0001	148
610	2	C	shallowwater benthic fish	sculpins	0.0020	148
610	2	C	Shrimp	shrimp	0.1213	148
610	2	D	Copepods	copepods	0.0000	46
610	2	D	Epibenthos	mysids	0.0035	46
610	2	D	Macrobenthos	anomurans	0.0203	46
610	2	D	Macrobenthos	bivalves	0.0154	46
610	2	D	Macrobenthos	crabs	0.5981	46
610	2	D	Macrobenthos	echiurans	0.0297	46
610	2	D	Macrobenthos	gastropods	0.0000	46
610	2	D	Meiobenthos	annelids	0.2349	46
610	2	D	Meiobenthos	proboscis worms	0.0091	46
610	2	D	other fish	unid fish	0.0017	46
610	2	D	predatory mesozooplankton	caprellid amphipods	0.0001	46
610	2	D	predatory mesozooplankton	cumaceans	0.0001	46
610	2	D	predatory mesozooplankton	gammarids	0.0212	46
610	2	D	Shrimp	shrimp	0.0659	46
610	3	A	Euphausiids	euphausiids	0.1472	23
610	3	A	jellies/macrozooplankton	medusae	0.0002	23
610	3	A	Macrobenthos	bivalves	0.4673	23
610	3	A	Macrobenthos	crabs	0.0009	23
610	3	A	Macrobenthos	crustacea with mandibles	0.0504	23
610	3	A	Meiobenthos	annelids	0.2973	23
610	3	A	predatory mesozooplankton	gammarids	0.0010	23
610	3	A	Shrimp	shrimp	0.0358	23
610	3	C	Euphausiids	euphausiids	0.0039	69
610	3	C	Macrobenthos	ascidians	0.0004	69
610	3	C	Macrobenthos	bivalves	0.0016	69
610	3	C	Macrobenthos	crabs	0.0622	69
610	3	C	Macrobenthos	crustacea with	0.0277	69

				mandibles		
610	3	C	Macrobenthos	echinoderms	0.0525	69
610	3	C	Macrobenthos	gastropods	0.0006	69
610	3	C	Macrobenthos	sponges	0.0004	69
610	3	C	Meiobenthos	annelids	0.7410	69
610	3	C	Meiobenthos	nematodes	0.0075	69
610	3	C	predatory mesozooplankton	amphipods	0.0164	69
610	3	C	predatory mesozooplankton	decapods	0.0005	69
610	3	C	predatory mesozooplankton	gammarids	0.0499	69
610	3	C	Shrimp	shrimp	0.0356	69
610	3	D	Euphausiids	euphausiids	0.0008	15
610	3	D	Macrobenthos	bivalves	0.0042	15
610	3	D	Macrobenthos	crabs	0.0105	15
610	3	D	Macrobenthos	crustacea with mandibles	0.7534	15
610	3	D	Macrobenthos	gastropods	0.0561	15
610	3	D	Meiobenthos	annelids	0.0829	15
610	3	D	Meiobenthos	nematodes	0.0088	15
610	3	D	predatory mesozooplankton	amphipods	0.0239	15
610	3	D	predatory mesozooplankton	gammarids	0.0595	15
612	1	C	Epibenthos	isopods	0.0014	19
612	1	C	Macrobenthos	bivalves	0.0016	19
612	1	C	Macrobenthos	echinoderms	0.9700	19
612	1	C	Meiobenthos	annelids	0.0270	19
612	2	C	Epibenthos	mysids	0.0472	69
612	2	C	Euphausiids	euphausiids	0.0014	69
612	2	C	Macrobenthos	crabs	0.0155	69
612	2	C	Macrobenthos	crustacea with mandibles	0.0003	69
612	2	C	Macrobenthos	echinoderms	0.0322	69
612	2	C	Meiobenthos	annelids	0.0064	69
612	2	C	other fish	unid fish	0.0145	69
612	2	C	predatory mesozooplankton	gammarids	0.0010	69
612	2	C	Shrimp	shrimp	0.8814	69
612	3	C	Euphausiids	euphausiids	0.0567	8
612	3	C	Macrobenthos	crabs	0.1511	8
612	3	C	Macrobenthos	crustacea with mandibles	0.1764	8
612	3	C	Macrobenthos	echinoderms	0.3246	8
612	3	C	Macrobenthos	gastropods	0.1391	8
612	3	C	Shrimp	shrimp	0.1521	8
614	1	A	Macrobenthos	anomurans	0.5882	2

614	1	A	Macrobenthos	crabs	0.3358	2
614	1	A	Macrobenthos	reptantia	0.0760	2
614	1	B	dungeness crab	dungeness crab	0.0036	30
614	1	B	forage fish	sandlance	0.0265	30
614	1	B	jellies/macrozooplankton	medusae	0.0027	30
614	1	B	Macrobenthos	anomurans	0.0655	30
614	1	B	Macrobenthos	bivalves	0.4658	30
614	1	B	Macrobenthos	crabs	0.2980	30
614	1	B	Macrobenthos	gastropods	0.0021	30
614	1	B	Macrobenthos	reptantia	0.0260	30
614	1	B	other fish	unid fish	0.0219	30
614	1	B	other flatfish	flatfishes	0.0689	30
614	1	B	shallowwater benthic fish	sculpins	0.0190	30
614	1	C	Macrobenthos	anomurans	0.1045	4
614	1	C	Macrobenthos	bivalves	0.0741	4
614	1	C	Macrobenthos	crabs	0.7122	4
614	1	C	Macrobenthos	reptantia	0.0545	4
614	1	C	other fish	unid fish	0.0547	4
614	2	A	Dover sole	Dover sole	0.0027	88
614	2	A	forage fish	sandlance	0.2241	88
614	2	A	Herring	herring	0.1085	88
614	2	A	jellies/macrozooplankton	medusae	0.0002	88
614	2	A	Macrobenthos	anomurans	0.0039	88
614	2	A	Macrobenthos	bivalves	0.0357	88
614	2	A	Macrobenthos	cnidaria	0.0003	88
614	2	A	Macrobenthos	crabs	0.0529	88
614	2	A	Macrobenthos	crustacea with mandibles	0.0006	88
614	2	A	Macrobenthos	echinoderms	0.0002	88
614	2	A	Macrobenthos	echiurans	0.0002	88
614	2	A	Macrobenthos	gastropods	0.0010	88
614	2	A	Meiobenthos	annelids	0.0095	88
614	2	A	Meiobenthos	nematodes	0.0000	88
614	2	A	Meiobenthos	proboscis worms	0.0004	88
614	2	A	other fish	bony fishes	0.1257	88
614	2	A	other fish	unid fish	0.0207	88
614	2	A	other flatfish	dabs	0.0227	88
614	2	A	other flatfish	sand sole	0.0448	88
614	2	A	pacific cod	pacific cod	0.0113	88
614	2	A	predatory invertebrates	octopus	0.0581	88
614	2	A	predatory mesozooplankton	amphipods	0.0000	88
614	2	A	shallowwater benthic fish	gadids	0.0321	88
614	2	A	Shrimp	shrimp	0.0004	88
614	2	A	Turbot	turbot	0.2439	88
614	2	B	forage fish	sandlance	0.0228	9
614	2	B	jellies/macrozooplankton	medusae	0.0006	9
614	2	B	Macrobenthos	anomurans	0.0689	9

614	2	B	Macrobenthos	bivalves	0.2155	9
614	2	B	Macrobenthos	crabs	0.4259	9
614	2	B	Macrobenthos	echinoderms	0.0002	9
614	2	B	other fish	bony fishes	0.0767	9
614	2	B	other flatfish	dabs	0.0100	9
614	2	B	other flatfish	flatfishes	0.0128	9
614	2	B	other flatfish	sand sole	0.1187	9
614	2	B	predatory invertebrates	cephalopods	0.0197	9
614	2	B	shallowwater benthic fish	pacific tomcod	0.0196	9
614	2	B	Shrimp	shrimp	0.0001	9
614	2	B	walleye pollock	walleye pollock	0.0084	9
614	2	D	Epibenthos	mysids	0.0270	5
614	2	D	Euphausiids	euphausiids	0.0013	5
614	2	D	other flatfish	flatfishes	0.3890	5
614	2	D	Salmon	salmon	0.5827	5
614	3	A	Macrobenthos	bivalves	0.9771	2
614	3	A	Meiobenthos	annelids	0.0229	2
614	3	B	Macrobenthos	anomurans	0.0206	2
614	3	B	Macrobenthos	crabs	0.9519	2
614	3	B	Macrobenthos	crustacea with mandibles	0.0276	2
614	3	C	Herring	herring	0.4495	7
614	3	C	Meiobenthos	annelids	0.0027	7
614	3	C	Meiobenthos	nematodes	0.0014	7
614	3	C	other fish	bony fishes	0.3723	7
614	3	C	shallowwater benthic fish	gadids	0.0022	7
614	3	C	shallowwater benthic fish	pacific tomcod	0.1718	7
614	3	D	pacific cod	pacific cod	0.2608	3
614	3	D	predatory invertebrates	octopus	0.1767	3
614	3	D	shallowwater benthic fish	gadids	0.2588	3
614	3	D	shallowwater benthic fish	pacific tomcod	0.1672	3
614	3	D	Squid	squid	0.1365	3
619	2	B	Epibenthos	barnacles	0.0428	4
619	2	B	forage fish	sandlance	0.8471	4
619	2	B	Meiobenthos	annelids	0.1101	4
619	3	D	Macrobenthos	bivalves	0.6389	1
619	3	D	predatory mesozooplankton	amphipods	0.2222	1
619	3	D	predatory mesozooplankton	gammarids	0.1389	1
621	1	B	Epibenthos	isopods	0.0002	178
621	1	B	forage fish	sandlance	0.1236	178
621	1	B	Macrobenthos	anomurans	0.1349	178
621	1	B	Macrobenthos	bivalves	0.1667	178
621	1	B	Macrobenthos	cnidaria	0.0010	178
621	1	B	Macrobenthos	crabs	0.0531	178
621	1	B	Macrobenthos	crabs,shrimps and lobsters	0.0022	178

621	1	B	Macrobenthos	crustacea with mandibles	0.0004	178
621	1	B	Macrobenthos	echinoderms	0.0010	178
621	1	B	Macrobenthos	gastropods	0.0055	178
621	1	B	Macrobenthos	reptantia	0.0008	178
621	1	B	Meiobenthos	annelids	0.4086	178
621	1	B	Meiobenthos	bryozoans	0.0041	178
621	1	B	Meiobenthos	proboscis worms	0.0028	178
621	1	B	other fish	bony fishes	0.0433	178
621	1	B	other fish	unid fish	0.0152	178
621	1	B	predatory mesozooplankton	amphipods	0.0014	178
621	1	B	predatory mesozooplankton	cumaceans	0.0000	178
621	1	B	predatory mesozooplankton	decapods	0.0121	178
621	1	B	predatory mesozooplankton	gammarids	0.0038	178
621	1	B	predatory mesozooplankton	hyperid amphipods	0.0000	178
621	1	B	shallowwater benthic fish	perch	0.0053	178
621	1	B	shallowwater benthic fish	sculpins	0.0001	178
621	1	B	Shrimp	shrimp	0.0139	178
621	2	A	Macrobenthos	crustacea with mandibles	1.0000	1
621	2	B	Epibenthos	barnacles	0.0010	121
621	2	B	Epibenthos	isopods	0.0000	121
621	2	B	forage fish	sandlance	0.9359	121
621	2	B	Macrobenthos	anomurans	0.0042	121
621	2	B	Macrobenthos	bivalves	0.0149	121
621	2	B	Macrobenthos	crabs	0.0051	121
621	2	B	Macrobenthos	crustacea with mandibles	0.0007	121
621	2	B	Meiobenthos	annelids	0.0215	121
621	2	B	other fish	bony fishes	0.0006	121
621	2	B	other fish	unid fish	0.0043	121
621	2	B	predatory mesozooplankton	amphipods	0.0001	121
621	2	B	predatory mesozooplankton	cumaceans	0.0000	121
621	2	B	predatory mesozooplankton	gammarids	0.0003	121
621	2	B	Shrimp	shrimp	0.0114	121
621	2	D	Epibenthos	barnacles	0.0030	31
621	2	D	Epibenthos	mysids	0.0139	31
621	2	D	Euphausiids	euphausiids	0.0061	31
621	2	D	Macrobenthos	anomurans	0.0094	31
621	2	D	Macrobenthos	bivalves	0.1594	31

621	2	D	Macrobenthos	crabs	0.0191	31
621	2	D	Macrobenthos	crustacea with mandibles	0.0068	31
621	2	D	Macrobenthos	echinoderms	0.1793	31
621	2	D	Macrobenthos	echiurans	0.1776	31
621	2	D	Macrobenthos	gastropods	0.0080	31
621	2	D	Meiobenthos	annelids	0.1522	31
621	2	D	Meiobenthos	proboscis worms	0.0385	31
621	2	D	other fish	unid fish	0.0943	31
621	2	D	predatory mesozooplankton	gammarids	0.0108	31
621	2	D	shallowwater benthic fish	agonidae	0.0008	31
621	2	D	Shrimp	shrimp	0.0091	31
621	2	D	Turbot	turbot	0.1117	31
621	3	A	other fish	bony fishes	1.0000	1
621	3	B	english sole	english sole	0.1912	9
621	3	B	Euphausiids	euphausiids	0.0005	9
621	3	B	forage fish	sandlance	0.4835	9
621	3	B	Macrobenthos	bivalves	0.0023	9
621	3	B	Macrobenthos	crabs	0.0225	9
621	3	B	Macrobenthos	crustacea with mandibles	0.1206	9
621	3	B	Macrobenthos	peanut worms	0.0002	9
621	3	B	Meiobenthos	proboscis worms	0.0042	9
621	3	B	other fish	bony fishes	0.1615	9
621	3	B	predatory mesozooplankton	amphipods	0.0025	9
621	3	B	predatory mesozooplankton	decapods	0.0051	9
621	3	B	Shrimp	shrimp	0.0061	9
621	3	D	Epibenthos	isopods	0.0503	6
621	3	D	Macrobenthos	bivalves	0.0478	6
621	3	D	Macrobenthos	crabs	0.0336	6
621	3	D	Macrobenthos	crustacea with mandibles	0.0005	6
621	3	D	Meiobenthos	annelids	0.0027	6
621	3	D	Meiobenthos	proboscis worms	0.8384	6
621	3	D	predatory mesozooplankton	amphipods	0.0001	6
621	3	D	predatory mesozooplankton	gammarids	0.0006	6
621	3	D	Shrimp	shrimp	0.0259	6
626	1	A	Epibenthos	isopods	0.0038	86
626	1	A	Euphausiids	euphausiids	0.0011	86
626	1	A	Macrobenthos	bivalves	0.0388	86
626	1	A	Macrobenthos	cnidaria	0.2241	86
626	1	A	Macrobenthos	crabs	0.0886	86
626	1	A	Macrobenthos	echinoderms	0.0864	86

626	1	A	Macrobenthos	echiurans	0.0407	86
626	1	A	Macrobenthos	gastropods	0.0035	86
626	1	A	Meiobenthos	annelids	0.5031	86
626	1	A	predatory mesozooplankton	cumaceans	0.0037	86
626	1	A	predatory mesozooplankton	gammarids	0.0044	86
626	1	A	predatory mesozooplankton	ostracods	0.0000	86
626	1	A	Shrimp	shrimp	0.0016	86
626	1	C	Macrobenthos	bivalves	0.0007	27
626	1	C	Macrobenthos	cnidaria	0.0029	27
626	1	C	Macrobenthos	crabs,shrimps and lobsters	0.0238	27
626	1	C	Macrobenthos	crustacea with mandibles	0.0084	27
626	1	C	Macrobenthos	echinoderms	0.1684	27
626	1	C	Macrobenthos	peanut worms	0.0008	27
626	1	C	Macrobenthos	prosobranchs	0.0254	27
626	1	C	Meiobenthos	annelids	0.7449	27
626	1	C	predatory mesozooplankton	amphipods	0.0052	27
626	1	C	predatory mesozooplankton	gammarids	0.0191	27
626	1	C	predatory mesozooplankton	hyperid amphipods	0.0004	27
626	2	A	Macrobenthos	bivalves	0.4645	3
626	2	A	Macrobenthos	echinoderms	0.0594	3
626	2	A	Meiobenthos	annelids	0.4391	3
626	2	A	Meiobenthos	proboscis worms	0.0343	3
626	2	A	predatory mesozooplankton	amphipods	0.0013	3
626	2	A	predatory mesozooplankton	gammarids	0.0013	3
626	2	C	Copepods	copepods	0.0001	170
626	2	C	Epibenthos	isopods	0.0003	170
626	2	C	Epibenthos	mysids	0.0002	170
626	2	C	Euphausiids	euphausiids	0.0009	170
626	2	C	jellies/macrozooplankton	medusae	0.0001	170
626	2	C	Macrobenthos	anomurans	0.0001	170
626	2	C	Macrobenthos	ascidians	0.0007	170
626	2	C	Macrobenthos	bivalves	0.0400	170
626	2	C	Macrobenthos	cnidaria	0.0155	170
626	2	C	Macrobenthos	crabs	0.0112	170
626	2	C	Macrobenthos	crustacea with mandibles	0.0014	170
626	2	C	Macrobenthos	echinoderms	0.3027	170
626	2	C	Macrobenthos	echiurans	0.0026	170

626	2	C	Macrobenthos	gastropods	0.0030	170
626	2	C	Macrobenthos	peanut worms	0.0003	170
626	2	C	Meiobenthos	annelids	0.5712	170
626	2	C	Meiobenthos	bryozoans	0.0001	170
626	2	C	Meiobenthos	nematodes	0.0000	170
626	2	C	Meiobenthos	proboscis worms	0.0022	170
626	2	C	Microzooplankton	protozoa	0.0003	170
626	2	C	other fish	bony fishes	0.0001	170
626	2	C	predatory mesozooplankton	amphipods	0.0141	170
626	2	C	predatory mesozooplankton	caprellid amphipods	0.0003	170
626	2	C	predatory mesozooplankton	cumaceans	0.0017	170
626	2	C	predatory mesozooplankton	decapods	0.0080	170
626	2	C	predatory mesozooplankton	gammarids	0.0125	170
626	2	C	predatory mesozooplankton	ostracods	0.0000	170
626	2	C	Shrimp	shrimp	0.0104	170
626	2	D	Macrobenthos	anomurans	0.2850	7
626	2	D	Macrobenthos	crabs	0.1405	7
626	2	D	Macrobenthos	echinoderms	0.0006	7
626	2	D	Meiobenthos	annelids	0.5677	7
626	2	D	predatory mesozooplankton	gammarids	0.0062	7
626	3	C	Meiobenthos	annelids	0.9861	1
626	3	C	Meiobenthos	nematodes	0.0139	1
628	1	A	Epibenthos	leptostraca	0.0001	23
628	1	A	jellies/macrozooplankton	medusae	0.0026	23
628	1	A	Macrobenthos	bivalves	0.3050	23
628	1	A	Macrobenthos	crabs	0.0715	23
628	1	A	Macrobenthos	echinoderms	0.0221	23
628	1	A	Macrobenthos	echiurans	0.2207	23
628	1	A	Meiobenthos	annelids	0.3403	23
628	1	A	Meiobenthos	proboscis worms	0.0002	23
628	1	A	Microzooplankton	protozoa	0.0054	23
628	1	A	predatory mesozooplankton	cumaceans	0.0301	23
628	1	A	predatory mesozooplankton	gammarids	0.0020	23
628	1	B	Epibenthos	barnacles	0.0006	74
628	1	B	Macrobenthos	bivalves	0.0921	74
628	1	B	Macrobenthos	echinoderms	0.0007	74
628	1	B	Macrobenthos	echiurans	0.0006	74
628	1	B	Meiobenthos	annelids	0.6170	74
628	1	B	other fish	unid fish	0.0206	74

628	1	B	other flatfish	flatfishes	0.0120	74
628	1	B	predatory mesozooplankton	amphipods	0.0001	74
628	1	B	predatory mesozooplankton	cumaceans	0.0039	74
628	1	B	predatory mesozooplankton	gammarids	0.0051	74
628	1	B	Shrimp	shrimp	0.2474	74
628	1	C	Macrobenthos	bivalves	0.0185	7
628	1	C	Macrobenthos	echinoderms	0.1640	7
628	1	C	Macrobenthos	gastropods	0.0001	7
628	1	C	Meiobenthos	annelids	0.8006	7
628	1	C	predatory mesozooplankton	gammarids	0.0160	7
628	1	C	predatory mesozooplankton	ostracods	0.0008	7
628	2	A	Epibenthos	leptostraca	0.0001	11
628	2	A	forage fish	sandlance	0.8408	11
628	2	A	Macrobenthos	bivalves	0.0017	11
628	2	A	Macrobenthos	crabs	0.0222	11
628	2	A	Macrobenthos	echinoderms	0.0111	11
628	2	A	Macrobenthos	echiurans	0.0213	11
628	2	A	Meiobenthos	annelids	0.0869	11
628	2	A	predatory mesozooplankton	amphipods	0.0147	11
628	2	A	predatory mesozooplankton	cumaceans	0.0007	11
628	2	A	predatory mesozooplankton	gammarids	0.0006	11
628	2	B	Macrobenthos	bivalves	0.3542	6
628	2	B	Meiobenthos	annelids	0.6406	6
628	2	B	predatory mesozooplankton	gammarids	0.0052	6
628	2	C	Macrobenthos	echinoderms	0.0578	2
628	2	C	Meiobenthos	annelids	0.9056	2
628	2	C	predatory mesozooplankton	amphipods	0.0183	2
628	2	C	predatory mesozooplankton	gammarids	0.0183	2
628	2	D	Epibenthos	leptostraca	0.0002	62
628	2	D	Epibenthos	mysids	0.0008	62
628	2	D	Euphausiids	euphausiids	0.0032	62
628	2	D	Macrobenthos	anomurans	0.0000	62
628	2	D	Macrobenthos	bivalves	0.0124	62
628	2	D	Macrobenthos	crabs	0.0552	62
628	2	D	Macrobenthos	echinoderms	0.0195	62
628	2	D	Macrobenthos	echiurans	0.1448	62
628	2	D	Meiobenthos	annelids	0.6999	62

628	2	D	Meiobenthos	nematodes	0.0000	62
628	2	D	Meiobenthos	proboscis worms	0.0237	62
628	2	D	other fish	bony fishes	0.0001	62
628	2	D	predatory mesozooplankton	amphipods	0.0239	62
628	2	D	predatory mesozooplankton	cumaceans	0.0007	62
628	2	D	predatory mesozooplankton	gammarids	0.0154	62
628	2	D	Shrimp	shrimp	0.0000	62
628	3	A	Euphausiids	euphausiids	0.0054	39
628	3	A	jellies/macrozooplankton	medusae	0.0054	39
628	3	A	Macrobenthos	bivalves	0.2322	39
628	3	A	Macrobenthos	crabs	0.0260	39
628	3	A	Macrobenthos	crustacea with mandibles	0.0072	39
628	3	A	Macrobenthos	echinoderms	0.0184	39
628	3	A	Macrobenthos	echiurans	0.2439	39
628	3	A	Meiobenthos	annelids	0.4507	39
628	3	A	Meiobenthos	nematodes	0.0011	39
628	3	A	Meiobenthos	proboscis worms	0.0067	39
628	3	A	predatory mesozooplankton	amphipods	0.0006	39
628	3	A	predatory mesozooplankton	cumaceans	0.0003	39
628	3	A	predatory mesozooplankton	gammarids	0.0021	39
628	3	B	Macrobenthos	crabs	0.9824	1
628	3	B	predatory mesozooplankton	gammarids	0.0176	1
628	3	C	Epibenthos	isopods	0.0004	66
628	3	C	jellies/macrozooplankton	medusae	0.0001	66
628	3	C	Macrobenthos	aplacophora	0.0002	66
628	3	C	Macrobenthos	bivalves	0.0688	66
628	3	C	Macrobenthos	cnidaria	0.0007	66
628	3	C	Macrobenthos	crabs	0.0001	66
628	3	C	Macrobenthos	crustacea with mandibles	0.0006	66
628	3	C	Macrobenthos	echinoderms	0.2348	66
628	3	C	Macrobenthos	echiurans	0.0021	66
628	3	C	Macrobenthos	gastropods	0.0059	66
628	3	C	Macrobenthos	peanut worms	0.0005	66
628	3	C	Meiobenthos	annelids	0.6555	66
628	3	C	Meiobenthos	nematodes	0.0000	66
628	3	C	Meiobenthos	proboscis worms	0.0145	66
628	3	C	Microzooplankton	protozoa	0.0008	66
628	3	C	predatory mesozooplankton	amphipods	0.0083	66

628	3	C	predatory mesozooplankton	cumaceans	0.0007	66
628	3	C	predatory mesozooplankton	gammarids	0.0058	66
628	3	D	Epibenthos	leptostraca	0.0001	125
628	3	D	Epibenthos	mysids	0.0000	125
628	3	D	Macrobenthos	bivalves	0.0462	125
628	3	D	Macrobenthos	cnidaria	0.0081	125
628	3	D	Macrobenthos	crabs	0.0029	125
628	3	D	Macrobenthos	crustacea with mandibles	0.0032	125
628	3	D	Macrobenthos	echinoderms	0.0430	125
628	3	D	Macrobenthos	gastropods	0.0096	125
628	3	D	Meiobenthos	annelids	0.7886	125
628	3	D	Meiobenthos	nematodes	0.0000	125
628	3	D	Meiobenthos	proboscis worms	0.0727	125
628	3	D	predatory mesozooplankton	amphipods	0.0161	125
628	3	D	predatory mesozooplankton	cumaceans	0.0000	125
628	3	D	predatory mesozooplankton	decapods	0.0033	125
628	3	D	predatory mesozooplankton	gammarids	0.0063	125
631	1	C	Macrobenthos	bivalves	0.9731	3
631	1	C	Macrobenthos	echinoderms	0.0260	3
631	1	C	Macrobenthos	gastropods	0.0009	3
635	3	D	Meiobenthos	annelids	1.0000	1
636	1	B	Epibenthos	mysids	0.0044	103
636	1	B	Euphausiids	euphausiids	0.0033	103
636	1	B	forage fish	sandlance	0.1311	103
636	1	B	Macrobenthos	bivalves	0.0001	103
636	1	B	Macrobenthos	crabs	0.0326	103
636	1	B	Macrobenthos	crustacea with mandibles	0.0071	103
636	1	B	Meiobenthos	annelids	0.0007	103
636	1	B	other fish	bony fishes	0.2041	103
636	1	B	other fish	unid fish	0.0754	103
636	1	B	other flatfish	dabs	0.0538	103
636	1	B	other flatfish	flatfishes	0.1062	103
636	1	B	other flatfish	sand sole	0.0277	103
636	1	B	other flatfish	yellowfin sole	0.0093	103
636	1	B	predatory mesozooplankton	amphipods	0.0031	103
636	1	B	predatory mesozooplankton	cumaceans	0.0010	103
636	1	B	predatory mesozooplankton	gammarids	0.0163	103

636	1	B	rock sole	rock sole	0.0825	103
636	1	B	shallowwater benthic fish	agonidae	0.0013	103
636	1	B	shallowwater benthic fish	pricklebacks	0.0022	103
636	1	B	shallowwater benthic fish	sculpins	0.1297	103
636	1	B	Shrimp	shrimp	0.1079	103
636	2	B	Epibenthos	mysids	0.0002	91
636	2	B	forage fish	sandlance	0.5375	91
636	2	B	Macrobenthos	anomurans	0.0000	91
636	2	B	Macrobenthos	bivalves	0.0015	91
636	2	B	Macrobenthos	crabs	0.0000	91
636	2	B	Macrobenthos	echinoderms	0.0036	91
636	2	B	Macrobenthos	gastropods	0.0013	91
636	2	B	other fish	unid fish	0.2572	91
636	2	B	other flatfish	flatfishes	0.0107	91
636	2	B	predatory mesozooplankton	gammarids	0.0007	91
636	2	B	shallowwater benthic fish	sculpins	0.1716	91
636	2	B	Shrimp	shrimp	0.0156	91
636	3	B	forage fish	sandlance	0.8383	5
636	3	B	Macrobenthos	crabs	0.0652	5
636	3	B	Macrobenthos	crustacea with mandibles	0.0055	5
636	3	B	other fish	bony fishes	0.0450	5
636	3	B	Shrimp	shrimp	0.0460	5