FRI-UW-7925
December 1979

FISHERIES RESEARCH INSTITUTE
College of Fisheries
University of Washington
Seattle, Washington 98195

SEASONAL COMPOSITION AND FOOD WEB RELATIONSHIPS OF MARINE ORGANISMS IN THE NEARSHORE ZONE OF KODIAK ISLAND--INCLUDING ICHTHYOPLANKTON, MEROPLANKTON (SHELLFISH), ZOOPLANKTON, AND FISH

by

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ANNUAL REPORT

Contract: #03-5-022-67
Task Order: #15
Res. Unit: #553
Reporting Period: October 1, 1978 -
September 30, 1979

Approved

Submitted December 31, 1979

Robert L Burgner
Director
Fisheries Research Institute

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PART A: ICHTHYOPLANKTON

I. SUMMARY OF OBJECTIVES, CONCLUSIONS AND IMPLICATION WITH RESPECT TO OCS OIL AND GAS DEVELOPMENT

Objectives of this program are to provide information on the spatial and temporal relationships of zooplankton in four bays of the Kodiak Archipelago. The Fisheries Research Institute (FRI) examined ichthyoplankton and euphausids, whereas the National Marine Fisheries Service (NMFS) examined decapod larvae.

Larval forms of species of both commercial and ecological significance feed and mature in marine waters of Kodiak and nearby islands. For many species these life processes are regulated by natural abiotic and biotic phenomena such as changes in water characteristics and seasonal abundances of planktonic food resources.

Management of the exploration for and production of offshore petroleum and gas reserves necessitates complementary management of those larval forms and life processes that may be adversely affected by industrial developments in contiguous waters. This study, in coordination with related and concurrent studies within the same area, is intented to create a basis for the required management.

II. INTRODUCTION

General Nature and Scope of Study

This study relates to an examination of zooplankton populations in the nearshore waters of the Kodiak Archipelago. We conducted intensive spring and summer sampling followed by less intensive autumn and winter sampling. Gear types included a neuston sampler, bongo-arrayed plankton nets, a mechanical opening-closing Tucker trawl, and an epibenthic plankton sled. This array of sampling devices enabled both discrete and complete sampling of the water column. Sampling design, zooplankton sorting procedures, and laboratory analysis focused on the collection and identification of fish larvae, euphausids, and other zooplankton taxa.

Specific Objectives

The specific objectives of this study were to:

1) Describe seasonal composition, distribution, and relative abundance of major life stages of selected holo- and mero-plankton forms in four bays of the Kodiak Archipelago. Emphasis was placed on planktonic stages of fishes and euphausids (by FRI) and decapod larvae (by NMFS).

2) Determine seasonal development and succession of selected commercially and ecologically important fish and invertebrate species.
3) Correlate observed biological distributions with local hydrographic regimes and bathymetry.

Relevance to Problems of Petroleum Development

The development of petroleum in Kodiak's marine environment may directly or indirectly affect the life processes of larval fishes. Under natural conditions most fishes are constrained, or limited to, for example, the time of year they may reproduce, the area over which their young may be distributed, and/or the depth(s) at which the larvae may feed. These constraints of time, space, and depth determine to a certain extent the mortality rate of larval forms of many fish species. It is also assumed that one of the problems of petroleum development is the potential introduction of a pollutant that may accentuate those natural constraints already in force.

This study addresses the seasonal composition, spatial and temporal distribution of fish larvae in order to define the natural environmental limitations. With this information, we should be able to recognize whether the developmental processes of a species are likely to be put under further constraint by an oil spill incident.

III. CURRENT STATE OF KNOWLEDGE

Aside from the 1978-79 Kodiak-OCS studies, very little descriptive literature exists for ichthyoplankton in the nearshore waters of Kodiak. A general reference to this information is made below.

The egg and larval development, abundance, and distribution of the Pacific halibut, Hippoglossus stenolepsis, were examined from 1926-34 by Thompson and Van Cleve (1934). Their study included stations in areas east and southwest of Kodiak Island. Survey results indicated a relatively high concentration of late-stage halibut larvae in the Kodiak region.

Pacific ocean perch, Sebastes alutus, larvae were sampled by Lisovenko (1964) in response to the (past) importance of this rockfish to Soviet commercial fisheries. In comparison to other Gulf of Alaska regions, he found a relatively high abundance of rockfish larvae over Kodiak's continental slope during the spring.

Salmon feeding studies were conducted in 1971 in Alitak and Kiliuda bays of Kodiak Island (Gosho 1977). In several instances fish larvae were found to be an important dietary component of outmigrating juvenile salmon. Unfortunately, no information was obtained on species compostion of those larval fishes.

Ichthyoplankton research was carried out in the spring of 1972 over an extensive area of Kodiak shelf waters (Dunn and Naplin 1974). Walleye pollock, Theragra chalcogramma, eggs and larvae were dominant components of the April-May samples.

A composite study of juvenile and adult fishes in three Kodiak Island bays was conducted in 1976 (Harris and Hartt 1977). Large incidental catches of fish larvae were taken with gear types, e.g., beach seine and surface townet, designed to sample larger fishes. Larval forms of capelin, greenling, herring, ronquils, sandfish, sand lance, and pricklebacks, were reported from the inshore survey.

In comparison to the studies above, this program constitutes a much more comprehensive sampling of the abundance, spatial, and temporal characteristics of ichthyoplankton in Kodiak waters. In addition, this study has been complemented by concurrent offshore ichthyoplankton and inshore juvenile and adult fish sampling. Integration of this information should significantly enhance the knowledge of fish populations in this area.

IV. STUDY AREA

The study area includes the Izhut, Kalsin-Chiniak, Kiliuda, and Kaiugnak bays of the Kodiak Archipelago (Fig. 1, Table 1). These inshore waters are largely influenced by oceanic water conditions, mixed tides, and prevailing weather patterns. In addition, relatively deep troughs approach all bays and permit additional inflow and/or outflow of waters as dictated by oceanic and atmospheric conditions. Water temperatures range from approximately 1°C to 15°C and salinities up to 34 °/oo, depending upon season, depth monitored, and degree of freshwater influence. Bottom substrates vary considerably and include both homogeneous and heterogeneous rock, sand, and mud bottom types. Depths at the selected sampling stations ranged from approximately 30 m to 170 m. Description of the terrestrial environment is presently available (Rogers et al. 1979).

V. SOURCES, METHODS, AND RATIONALE OF DATA COLLECTION

Zooplankton were collected from the 20.4 m University of Washington fisheries research vessel Commando. Each bay was sampled once every 2 weeks from late March through August 1978 and once in November 1978 and March 1979. A total of 12 cruises (five spring, five summer, one fall, and one winter) were completed (Table 2).

Station locations were selectively arranged along the main axis of each bay and in front of the respective headlands. Several of the seaward stations were in close proximity to those of the NMFS offshore survey (RU 551). Additional sample locations were added in May 1978 along the edges and inner reaches of Izhut and Kiliuda bays. The inshore sampling program included a total of 26 standard stations.

Capture techniques included the use of four types of gear (Table 3). A Sameoto neuston sampler collected fish eggs and larvae at the air-sea interface. Bongo-arrayed plankton nets sampled the water column from near bottom to the surface. The opening-closing mechanical Tucker trawl sampled discrete depths during light and dark periods, and the epibenthic plankton sled--a Tucker trawl mounted on skis--took discrete samples close to the sea floor. Field procedures generally followed MARMAP survey guidelines (Smith and Richardson 1977).

One liter samples were preserved with 50 ml of formaldehyde and buffered with 20 ml of saturated sodium borate solution. They were then inventoried and shipped to a commercial sorting center for separation and enumeration of specified zooplankton components (Table 4). Settled plankton volumes were determined for all samples following Kramer et al. (1972), and weighing procedures for euphausids followed Weibe et al. (1975).

To integrate this program with the offshore ichthyoplankton research (RU 551), various degrees of homogeneity were incorporated into the sampling periods, station locations, gear-use procedures, and sorting options. Project leaders collaborated to insure agreement in the identification and/or typing of captured larval fishes. The closely spaced sample periods permit descriptive accounts of the appearance, residence time, and growth of selected larval fish species in the inshore zooplankton community.

VI. RESULTS

Physical Data

Physical data show seasonal trends in water temperature and salinity for the four bays (Tables 5-8). At all depths temperatures were lowest in March and highest in August. Fall and late winter surface temperatures were generally cooler than those at depth. Sharpest temperature gradients occurred between 0-25 m.

Salinity values at the surface were highest in March and lowest in June, July, and August. At 100 m lowest values occurred predominantly in July and August, whereas the more saline waters appeared in March. Salinity values generally increased with depth. The salinometer used to measure salinity was regularly calibrated; however, salinity values are suspected to be erroneously high by approximately 1 ppt. This error is assumed to be consistent between depths and cruises.

Temperature and salinity profiles are shown for stations 2 in Izhut and Kiliuda bays in Figs. 2 and 3. These profiles indicate Kiliuda Bay to be more estuarine than Izhut. This is probably due to relatively more freshwater runoff in Kiliuda than in Izhut and moderately greater mixing of Izhut and oceanic waters.

Ichthyoplankton - Introduction

In this section densities and kinds of fish eggs are first examined, followed by a general review of larval fish densities. A species by species review then follows in which select commercially and ecologically important species are considered. Euphausid and general zooplankton results conclude this section. Common and scientific names for captured larval fish taxa are listed in Table 9.

Apart from taxonomic considerations, we chose in many instances to separate results from station-groups 1-5 and 6-8. Station-groups 1-5 existed for each bay and were chosen to describe the respective bay area. Station-groups 6-8 were added to Izhut and Kiliuda bays in cruise 4 and were intended to describe major events along the margins of those bays.

A small number of samples either could not be collected or contained deteriorated specimens; consequently, we estimated missing density data using appropriate methods from Snedecor and Cochran (1971).

Several references are made to the occurrence and abundance of eggs of the family Pleuronectidae and larvae of the families Osmeridae, Cottidae (types I and L), and the genus *Myoxocephalus* (types A and B). Members of these families and generic types could not be identified at a lower taxonomic level. However, listed below are the genera and species they most likely represent.

Many pleuronectid eggs are extremely difficult to identify to genus (or species) except when fully developed. We considered captured flatfish eggs to be composed of one or more of the following species: butter sole, yellowfin sole, English sole, starry flounder, and/or sand sole. Yellowfin sole, starry flounder, and sand sole probably accounted for the majority of eggs found. Rock sole eggs are demersal and adhesive and are not included among the planktonic pleuronectid eggs.

Osmerid larvae are also difficult to identify to a sub-family level. Capelin probably accounted for the majority of the smelt larvae, but other possible species included surf smelt, eulachon, and longfin smelt.

Myoxocephalus types A and B may represent two or more of the 4 (?) local species within the genus. The great sculpin is the most abundant and ecologically important of the group and probably composed the greatest part of the type A group.

Cottidae type I is presently considered to contain the sculpin genera *Icelinus* and *Icelus*. Cottidae type L may be composed of larvae from the genera *Artedius*, *Clinocottus*, and/or *Oligocottus*.

Eggs-Density and Kinds

Fish eggs from bongo (505 μ) samples occurred in the nearshore area in all months sampled--March through August and November; however, peak densities of eggs occurred during the summer months June through August, when mean egg densities for stations 1-5 for all bays ranged from 16-4783 eggs/1000 m^3. During late winter and spring, March through May, egg densities were lower and the mean values ranged from 0-283 eggs/1000 m^3, whereas densities of eggs were lowest in November and means ranged from 0-3 eggs/1000 m^3 (Tables 10-13). Mean densities of eggs were often higher in Chiniak and Kiliuda bays than in Izhut and Kaiugnak bays.

For neuston catches, densities of eggs were higher but more variable between stations in each bay (Tables 14-17). Over all cruises, Chiniak Bay had the greatest mean density of eggs for stations 1-5. Kiliuda Bay ranked second in overall mean density, followed by Izhut and Kaiugnak bays.

In three bays, the greatest surface egg densities were at stations closest to the head of each bay (stations 1 and 2 in Chiniak and Kaiugnak bays and stations 1, 6, 7, and 8 in Izhut Bay). However, in Kiliuda Bay, the greatest densities of surface eggs occurred at stations 2 and 8 near the center of the bay. Surface egg densities were lower at the head and at the mouth of the bay (Figs. 4-5).

Pelagic eggs of the following taxa occurred most often in bongo and neuston catches: unidentified flatfish, walleye pollock, and flathead sole. Rex sole and Alaska plaice eggs were encountered less frequently and demersal eggs of greenling and smelt occurred incidentally (Tables 18-25).

Unidentified flatfish eggs ranged from .8-1.2 mm in diameter and were the most abundant eggs collected, comprising 98.7% of all eggs in the neuston for all bays and 97.4% of all eggs from bongo catches. These eggs occurred in all bays during April through August but the greatest densities were in June through August. In early March and November flatfish eggs appeared only in Kiliuda Bay and were few in number.

Walleye pollock eggs were the second most abundant eggs in bongo samples (1.7%) and third in abundance in neuston catches (.4%). Pollock eggs were collected during all months sampled although they were not found in all bays for all months. Their densities were greatest during the spring (April through May).

Flathead sole eggs comprised .7% of neuston eggs and .8% of bongo eggs. They were caught from April through August in all bays, but the greatest densities occurred in Izhut and Chiniak bays during May, in Kaiugnak Bay during April, and in Kiliuda Bay during June.

Unidentified eggs accounted for only .2% of neuston eggs and .1% of the bongo eggs.

Egg densities, by bay and cruise, for bongo and neuston catches were summed and percentages of total eggs for each gear type were calculated. In most cases, substantially more eggs were caught in neuston samples, and by taxa, neuston catches had greater densities of unidentified flatfish, walleye pollock, and flathead sole eggs (Figs. 6 and 7). However, catches in both gear types followed similar patterns of abundance. In some cases, eggs were caught in one gear but not in the other. However, this occurred only for pollock and flathead sole eggs when densities were low.

Unidentified flatfish eggs ranged from .8-1.2 mm in diameter and were collected at discrete depths with the Tucker trawl at stations 2 in Izhut and Kiliuda bays (Fig. 8). In Kiliuda Bay, eggs were commonly found at all depths sampled (10-90 m) during the day and night. Station 2 in Izhut Bay contained lower densities of eggs and patchiness probably accounted for irregular distributions over the depths sampled. Subsurface abundances of flatfish eggs between 10 and 90 m rarely exceeded surface catches in the neuston samples.

Larvae-Density

Densities of larval fishes in surface waters are presented in Tables 26-29. Larvae were present in 82, 78, 75, and 68% of the neuston samples from Izhut, Chiniak, Kiliuda and Kaiugnak bays, respectively. Without reference to species composition, mean density values from the various bay-cruise listings did not demonstrate marked seasonal trends of increasing or decreasing abundances. Depressed mean cruise densities often preceded or followed cruises with relatively high numbers, particularly in Chiniak and Kaiugnak bays. Only in the spring in Kiliuda Bay did a progressive change (decrease) in numbers appear. Nevertheless, for the bays as a group, a mode of low density appeared in June, while in August and November modes of relatively high density occurred.

Excluding marginal stations nearest to shore (Z6-Z8, L6-L8), surface waters at the entrances to Izhut and Chiniak bays (Z3 and C3) and southwest of the Kiliuda and Kaiugnak bay-headlands (L5 and G5) ranked highest in larval abundance for their respective bays. Among the marginal stations in Izhut and Kiliuda bays (Z6-Z8, L6-L8), stations closest to the mouths of the bays (Z8 and L8) represented areas of greatest mean density.

While larvae were absent from a number of surface plankton hauls, several tows represented patches of very high concentration. Among the most notable are the July density values of 40,067 and 16,565 larvae/1000 m^3 from Izhut and Kaiugnak bays, respectively.

Larval fishes were omnipresent in the subsurface waters of the four bays, inasmuch as they were present in all but 2 of 294 bongo tows (Tables 30-33, Figs. 9 and 10). In each bay there were relatively high summer and low fall and late winter densities.

Izhut Bay contained the highest subsurface density of larvae since the mean number of larvae per haul was 2-8 times greater than the densities in the other bays. Excluding the marginal stations closest to shore (Z6-Z8, L6-L8), stations closest to the heads of Izhut and Chiniak bays (Z1, C1) contained the highest mean densities of fish larvae, whereas stations located outside the headlands (Z3, C5) had the lowest mean number. Under the same station-group exclusion, the most centrally located sample site in Kiliuda Bay (L2) had the highest density, whereas in Kaiugnak Bay the easternmost station outside the headlands (G4) contained the greatest mean number of larvae per haul.

Among the marginal stations in Izhut, the one closest to the head of the bay (Z6) had the highest density, whereas the marginal station closest to the entrance (Z8) had the lowest. However, among the marginal stations in Kiliuda Bay, the one closest to the mouth (L6) had the highest density and the middle station (L7) contained the lowest mean number of larvae.

Density values from bongo samples reflect periods and locations of remarkably high densities. Most notable are those found at stations located near the head of Izhut Bay (Z1, Z6, and Z7) in late June and mid-August when the densities exceeded 40,000/1000 m^3.

Vertical distribution patterns of larval fish caught during light and dark periods were determined for Izhut and Kiliuda bays (Figs. 11-22). Seasonal spawning of various fish species caused appreciable fluctuation in larval abundance, yet in only 3 of 220 tows (Tucker trawl) were larvae absent.

In Izhut Bay there were both relatively high densities of larval fishes and the greatest numbers of taxa at 10 and 30 m during the day and between 30-70 m at night. In Kiliuda Bay densities were higher at 10 m during the day and 30 m at night, and the greatest numbers of taxa were at 10 m during the day and at 30 and 50 m at night.

Samples from discrete depths often represented unusually high concentrations of larvae. Most notable, perhaps, are those from Izhut Bay, in late June, when approximately 70,000 larvae/1000 m^3 were observed at 30 m both during the day and at night.

Larval Fish Taxa - General

The nearshore regime of the Kodiak Archipelago was populated by larval fishes of 21 families, 50 genera, 37 species and 11 species-types. Mean and relative abundances (Tables 34-41; and Fig. 23-31), vertical distribution patterns (Figs. 32-38) and growth rates (Figs.

39-45) of the more abundant and important taxa are listed and displayed by gear type, bay, and cruise. Taxa of current and potential ecological and economic importance are discussed below. Relative abundances in Figs. 23-31 were calculated by dividing the number of larvae in the 5-1000 m^3 hauls from each bay and cruise by the total caught for all bays and cruises. Vertical migration and seasonal growth patterns were considered when frequencies of occurrence and relative abundances were sufficially high.

Select Larval Fish Taxa

Sand lance (*Ammodytes hexapterus*)

Sand lance larvae were present among the plankton primarily from March through June and ranked second or third in subsurface abundance in each bay (Fig. 23). They were found predominantly in subsurface (bongo) samples, with only infrequent appearances at the surface in each bay except Kiliuda (Tables 34-41). Highest densities occurred in early April in all bays, and Chiniak Bay contained the greatest relative abundance of sand lance larvae per haul.

In Izhut Bay vertical distribution patterns indicated highest abundances at 10 and 30 m during the day (Fig. 32); whereas, at night, major abundances occurred at 30, 50, 70 and 90 m. In Kiliuda Bay highest densities occurred at 10 and 30 m during the day whereas at night there were major concentrations at 10, 30, 50, and 70 m.

Lengths ranged from approximately 5-15 mm in March and from 15 - 34 mm in late May (Fig. 39). Length modes and ranges indicate differences between bays in timing and frequency of spawning activity. In Chiniak and Kiliuda bays, March 1979, there were two length modes at approximately 6 and 12 mm. This suggests that hatching of large numbers of larvae occurred in February and again in March. However, in Izhut and Kaiugnak bays there was the one modal length at 5.5-6.0 mm so there was probably only one spawning period in these bays prior to the collection period.

Smelt (Osmeridae)

Smelt larvae were the most abundant subsurface species in each bay and accounted for more than 90% of all larvae caught (Tables 38-41). They first occurred in the plankton in the latter half of June 1978 and were present through March 1979 (Fig. 23). Periods of peak abundance were in late June-early July in Izhut and Chiniak bays and in mid-August in Kiliuda and Kaiugnak bays. Catches from Izhut Bay contained the greatest percent of smelt larvae.

Smelt larvae were also abundant in surface samples, as they ranked first in abundance in Izhut and Kaiugnak bays and fourth and fifth in

Chiniak and Kiliuda bays, respectively (Tables 34-37). Significantly more larvae were captured in night neuston tows than during the day (Table 42).

Depths at which smelt larvae were generally most abundant were 10, 30, and 50 m during both day and night (Fig. 33). However, high densities also occurred at the remaining sample depths. These larvae were also the most abundant species in (epibenthic sled) samples taken close to the sea floor (Table 43).

Larval lengths ranged from 3 to 16 mm in June and 10 to 27 mm in November (Fig. 40). The appearance of small larvae in August and associated length data suggest at least two modes of hatching activity occurred in the summer period. Most of the smelt caught in March 1979 were small juveniles.

Ronquils (Bathymasteridae)

Four ronquil species may occur in Kodiak waters; however, the identity of the larval forms is not yet known. Consequently, this review will consider them as a group. Ronquil larvae occurred in all bays and were captured from late April through August (Tables 38-41; Fig 23). They were among the seven most abundant larvae in each of the bays sampled. Peak abundances occurred in late May and the first half of June. Izhut Bay contained the highest relative abundance. Ronquil larvae represented a dominant component of the neuston ichthyoplankton as their densities at the surface usually were exceeded only by larval greenling and smelt. They were significantly more abundant at the surface at night than during the day (Table 42) and were also the third most abundant taxa in the demersal samples (Table 43).

Whitespotted greenling (*Hexagrammos stelleri*)

Whitespotted greenling larvae were present in the plankton in late March-May and November 1978, and March 1979 (Fig. 26; Tables 34-41). Greatest abundances occurred in the fall period (cruise 11), particularly in Izhut and Chiniak bays. These larvae are primarily neustonic, and occurred only incidentally in subsurface tows from Izhut, Chiniak, and Kiliuda bays.

Greenling type I (kelp greenling?)

Greenling type I could not be positively identified to the species level but may represent the kelp greenling (*Hexagrammos decagrammos*). This larval type occurred almost entirely in August, with only incidental appearances in late July and November (Fig. 26; Table 34-37). This greenling was captured only at the surface and was most abundant in Chiniak Bay. Greater numbers were caught at night than during the day at stations 2 in Izhut and Kiliuda bays (Table 42).

Greenling type D (masked greenling?)

Larval greenling type D cannot yet be positively identified but may represent the masked greenling (*Hexagrammos octogrammus*). This larval type occurred almost entirely in August, with only incidental appearances in late July and November (Fig. 26; Tables 34-37). This greenling was captured only at the surface and was most abundant in Chiniak Bay. Greater numbers were caught at night than during the day at stations 2 in Izhut and Kiliuda bays (Table 42).

Greenling type E (rock greenling?)

Greenling type E has the possible species identity of rock greenling (*Hexagrammos lagocephalus*). It was caught exclusively at the surface (Tables 34-37) and its duration in the plankton was from mid-August to November, although some appeared in late July (Fig. 27). Most the these larval greenling were caught in Izhut and Chiniak bays. Day and night catches in Izhut Bay were similar (Table 42).

Atka mackerel (*Pleurogrammus monopterygius*)

Atka mackerel larvae occurred primarily in surface samples (Fig. 27; Tables 34-37). Their appearance was limited mostly to the November and March cruises in Izhut and Kiliuda bays; however, numbers caught in Kiliuda were relatively small. A few Atka mackerel larvae were caught in subsurface tows in Izhut, Chiniak, and Kaiugnak bays (Tables 38-41).

Dwarf wrymouth (*Lyconectes aleutensis*)

Dwarf wrymouth larvae were caught primarily at the surface (Fig. 27; Tables 34-37) and in all bays; however, notable densities were limited to Kiliuda. They were present in the early spring and were most abundant in mid-April. These larvae were caught in subsurface tows but numbers were relatively small (Tables 34-41). Significantly more larvae were captured at the surface at night than during the day (Table 42).

Stout eelblenny (*Lumpenus medius*)

In bongo catches, stout eelblenny larvae were among the 15 most abundant larval species in each bay (Tables 38-41). In Kiliuda Bay, larval eelblenny were second in abundance over all cruises whereas in Chiniak, Izhut, and Kaiugnak bays, they ranked fourth, tenth, and eleventh in abundance, respectively.

Occurrence of stout eelblenny larvae was from March to July with high densities caught during April (Fig. 25). Of all stout eelblenny collected, over half occurred in Kiliuda Bay, and relatively low densities of larvae occurred in Izhut an Kaiugnak bays.

No larval stout eelblenny were collected in surface samples. The vertical distribution at station 2, Kiliuda Bay, indicated that larval stout eelbleny were distributed over 10-90 m during both day and night (Fig. 34).

Daubed shanny (*Lumpenus maculatus*)

Larval daubed shanny were present April through August in bongo catches, but the highest density was during April (Fig. 25). Daubed shanny larvae were less abundant than stout eelblenny larvae and ranked seventh, eighth, tenth, and less than fifteenth in overall abundance in Kaiugnak, Chiniak, Kiliuda, and Izhut bays, respectively (Tables 38-41).

No larval daubed shanny were collected in neuston samples.

Snake prickleback (*Lumpenus sagitta*)

Densities of larval snake prickleback in bongo samples were lower than densities for daubed shanny and stout eelblenny. Snake prickleback ranked twelfth in total abundance in Kiliuda Bay, but were not among the 15 most abundant larvae in the other bays (Tables 38-41).

Larvae occurred from March to June, with high densities in March and April (Fig. 25). Over 60% of snake prickleback larvae were found in Kiliuda Bay. Larval snake prickleback did not occur in neuston samples.

Codfish (Gadidae)

Codfish larvae (Pacific cod and walleye pollock) were low in relative abundance to other larvae caught in bongo samples in Izhut, Chiniak, and Kaiugnak bays. However, in Kiliuda Bay, they were the fifth most abundant species (Tables 38-41).

Larval codfish were present in bongo samples from March through August, with peak catches in April (Fig. 24). Relatively fewer larvae occurred in July and August and there was a low density of cod in Kiliuda Bay in November.

Codfish larvae occurred in surface samples only in Kiliuda Bay (Table 36).

Rockfish (Scorpaenidae)

Densities of rockfish (*Sebastes* spp. and *Sebastolobus* spp.) larvae in bongo and neuston samples were low in all bays (Tables 34-41). Larval rockfish ranged in occurrence from June through August with higher densities occurring in early July and late August (Fig. 24). The highest relative abundance was in Izhut Bay.

Snailfish (Cyclopteridae)

Larvae of the family Cyclopteridae occurred in all spring and summer cruises, although densities for all bays and gear types were low (Tables 34-41). Highest densities of snailfish larvae occurred in late April and early July (Fig. 24).

Sculpins

Irish lords (*Hemilepidotus* spp.) Irish lord larvae could only be identified to the generic level. In Kodiak waters two species occur: the red Irish lord (*Hemilepidotus hemilepidotus*) and yellow Irish lord (*Hemilepidotus jordani*). Larvae of one or both of these species occurred in all bays and were most abundant in Izhut and Chiniak (Fig. 29; Tables 34-41). They appeared primarily in the fall and secondarily in the late winter. Small juveniles were captured in the spring.

Myoxocephalus type A. Larval *Myoxocephalus* type A were captured in both neuston and bongo samples and the densities in surface catches were often higher than those in subsurface catches. Tucker trawl catches were highest at 10 m during the day but lowest at 10 m during the night when densities were highest at 30, 50, or 70 m (Fig. 35).

In bongo samples, larval *Myoxocephalus* type A were caught in March through June with peak catches in April (Fig. 28). Larvae in March ranged from 6.0-7.5 mm and were probably recently hatched (Blackburn 1973). In April they ranged from 6.0-14.0 mm, with most larvae between 6 and 10 mm. In late May and early June larval *Myoxocephalus* type A ranged from 12-15 mm in length (Fig. 41).

Myoxocephalus type B. Densities of larval *Myoxocephalus* type B in bongo and neuston samples were similar (Tables 34-41). The catches indicated that they are planktonic from March through June; however they were more abundant in April than in March, May, and June (Fig. 28).

In Tucker trawl catches, daytime densities of larvae were greatest at 10 m (Fig. 36). Larvae often occurred at 30-90 m, but densities were lower. At night, however, *Myoxocephalus* type B larvae were less frequently found at 10 m and the greater densities occurred at 30, 50, or 70 m.

Larval *Myoxocephalus* type B were 7.0-9.5 mm in length in bongo samples in March (Fig. 42). Larvae of approximately 7.5 mm and less are probably recently hatched (Blackburn 1973) and occurred through May. In June, only larvae longer than 10 mm were caught. The largest *Myoxocephalus* type B larvae from bongo samples were 17 mm in length.

Gymnocanthus spp. Larval *Gymnocanthus* spp. were present in bongo samples from April through June, with the greatest density during April (Fig. 28; Tables 38-41). Densities of larvae were low relative to other larval fish in bongo samples. No larval *Gymnocanthus* spp. were caught in daytime surface tows, although they appeared once at night in Izhut Bay (Table 42).

Flatfish - General

Larvae from six flatfish species were collected in bongo and neuston samples. Rock sole larvae were the most abundant flatfish followed by sand sole, butter sole, yellowfin sole, flathead sole, and starry founder. These flatfish larvae occurred primarily in spring and summer months. Only flathead sole and yellowfin sole were present in November.

Rock sole (*Lepidopsetta bilineata*). Larval rock sole occurred in bongo samples in all four bays, stations 1-5, from April through August, with peak densities in April and May (Fig. 30; Tables 38-41). Few rock sole larvae was captured in bongo samples in August and none were caught during November.

They were also taken in neuston samples in Kiliuda and Kaiugnak bays, but densities were lower than densities from bongo samples (Tables 34-37).

From discrete depth sampling during the day, larval rock sole were found primarily above 50 m with the greatest densities at 10 m (Fig. 37). In samples taken at night, rock sole larvae were distributed over all depths sampled, 10-90 m.

Larval rock sole of hatching size 3.6-5.0 mm occurred in March (1979), April, May, and June but they occurred most frequently in mid-April to early May (Fig. 43). By late May, the majority of larvae examined was greater than 5 mm. A few rock sole larvae over 15 mm were captured in late June.

Sand sole (Psettichthys melanostictus). Larval sand sole occurred in bongo catches in all bays from May to August (Fig. 30; Tables 38-41). Densities of larvae were higher in July and August than during May and June, and no major differences in abundance existed between the bays.

Surface catches of sand sole larvae occurred in Izhut and Kaiugnak bays during July and August, but densities were low (Tables 34-37).

Vertical distributions of larval sand sole in Izhut and Kiliuda bays show larvae concentrated above 50 m during the day, with highest densities at 10 and 30 m (Fig. 38). At night, high concentrations occurred at 30 and 50 m; larvae were also caught at 70 and 90 m.

In late May to early June, larvae ranged from 2.5-8.0 mm in length, with most larvae between 2.5-5-0.0 mm (Fig. 45). Larvae of hatching size, less than 3.0 mm (Hartt 1973), continued to be present through August. However, in July, larvae greater than 5.0 mm in length predominated and larvae up to 13.5 mm were caught.

Butter sole (Isopetta isolepis) . Butter sole larvae from bongo samples occurred from June to August, with maximum densities in all bays during early July, although relatively few larvae occurred in Chiniak Bay (Fig. 30; Tables 38-41). Densities of larvae decreased rapidly through late July and few larvae were collected in late August. Larval butter sole were also taken in surface samples in Kiliuda Bay; however, their catches were low (Tables 34-37).

Yellowfin sole (Limanda aspera). No yellowfin sole larvae were present in bongo catches, stations 1-5 in Izhut Bay. In the remaining bays, larvae were uniformly distributed in abundance, and they occurred from late June to August with highest densities in August (Fig. 31; Tables 38-41). They were only caught at the surface in Kiliuda Bay and were numerically insignificant (Table 36).

Larvae ranged from 3.0-8.5 mm in July and from 2.5-13.0 mm in August; however, most larvae captured were under 7.0 mm (Fig. 44).

Flathead sole (Hippoglossoides elassodon) . Larval flathead sole were present in bongo samples from April through August and in November (Fig. 31; Tables 38-41). Highest densities occurred in July; however, relatively few larvae were caught in Izhut and Kiliuda bays. Insignificant catches of flathead sole larvae were made in surface samples in Izhut Bay (Table 34).

Starry flounder (Platichthys stellatus). Relatively few starry flounder larvae were collected and these were caught only during July in bongo samples from Kiliuda Bay (Fig. 31; Table 40), and in day neuston samples from Kaiugnak Bay (Table 37) and a night surface sample from Kiliuda Bay (Table 42).

Euphausids

Seven adult species of euphausids were identified from bongo (505) samples at stations 1 and 3 in all bays (Tables 44-47). Two species, Thysanoessa inermis and T. raschii comprised 50% and 47% of all adult euphausids collected. Euphausids which contributed to the remaining 3% were T. spinifera, Euphausia pacifica, T. inspinata, T. longipes, and Tessarabrachion oculatus. Izhut Bay had the greatest abundance of euphasid adults (50%), followed by Kiliuda Bay (23%), Kaiugnak Bay (16%), and Chiniak Bay (11%).

T. inermis occurred during all months sampled in all bays. No seasonal trends in abundance were evident for this species as the mean densities overall bays were similar for spring, summer, and fall cruises.

The second dominant euphasid, T. raschii, also was caught during all months; however, mean densities for all bays were greater in spring and fall than during summer.

Two other species, T. spinifera and Euphausia pacifica, also occurred at least once during all sampling months. The remaining adult euphausid species occurred in densities that were too low to show any seasonal differences or similarities.

Juvenile and larval euphausids were most abundant during summer months, June through August. Larval euphausids were rare in all bays during November, March 1979, and early April and densities of juvenile euphausids were also low at these times.

While densities of adult euphausids were greatest in Izhut Bay, densities of larval and juvenile euphausids were lowest there. Relative abundances of larvae and juveniles were similar between the other bays.

Striking differences in the abundances of adult euphausids occurred between day and night Tucker trawl catches at 10 and 30 m (Table 48). Adult euphausids were rarely captured at 10 and 30 m during the day, while catches occurred frequently at both depths at night. Mean catches of euphausid larvae were sometimes greater during the day than at night; however, for juveniles, mean densities were always greater for night catches. For adult, juvenile, and larval euphausids combined, there were no apparent differences between densities at 10 and 30 m.

General Zooplankton

General zooplankton data are listed for 13 taxa in Tables 49-52. Information on separate life history stages is included for cirripedia and euphausiacea. Taxa Natantia, Pisces, and Reptantia are not included due to the comprehensive coverage given to Pisces in this report and to Natantia and Reptantia in the proposed final report from NMFS-RU 551. This review will consider five taxa of relative importance.

Amphipoda. Amphipods were present in the plankton in all bays and in nearly all cruises. Periods of peak abundance occurred in the summer and the highest density was in Izhut Bay in late July. Lowest numbers were in the late spring, particularly in Izhut and Kiliuda bays. Numbers for the fall and winter periods varied considerably between bays, as exemplified by the relatively high winter densities in Kaiugnak Bay and low winter densities in Chiniak Bay.

Annelida. Annelids were present in the plankton in all bays and during most cruises. Periods of low densities occurred in the spring, especially in Izhut. Periods of peak abundance occurred in the summer, particularly in Kiliuda Bay, whereas densities were relatively low in the fall and winter.

Chaetognatha. Planktonic chaetognaths occurred in all bays and in most cruises; however, mean abundances were greatest in Kaiugnak and lowest in Izhut. Season densities were highest in the summer, and typically low spring densities occurred, especially in Chiniak Bay.

Cirripedia. Barnacle nauplii and cypris were second in abundance only to copepods. There were relatively low densities in the late spring, fall, and winter periods, but early spring and summer cruises contained notable higher abundances. Izhut Bay contained relatively low mean abundances of both nauplii and cypris, whereas the other bays contained high abundances of nauplii and barnacle cypris. The latter was particularly abundant in Kaiugnak Bay.

Copepoda. Copepods were the most numerous planktonic taxa. Seasonal densities were highest in the summer, particularly in Chiniak Bay. A limited examination of copepod species was conducted with samples from station 2 in each bay for cruises 1, 3, 5, 7, and 9 (Tables 53-56). In all bays the dominant species was *Pseudocalanus* spp., and its peak abundance occurred in late June and July. The next most abundant species were *Calanus marshallae* and *Acartia longiremis*. *C. marshallae* showed no consistency in seasonal abundance between the four bays, although the abundance generally tapered off in August.

A. longiremis was most abundant in June and July, except in Kaiugnak Bay, where its greatest abundance was in August.

Acartia tumida and Metridia pacifica were infrequently caught in all bays. Centropages mcmurrichi was common in all bays, except Izhut. Chiniak Bay and the largest variety of copepod species.

VII. DISCUSSION

Sampling

Inherent in the field sampling program were several factors that limit interpretation of the results. A primary consideration is day-night differences in plankton catches. In both neuston and Tucker trawl samples, numbers of larvae caught at night usually exceeded those of day catches, probably because the larvae had more opportunity to avoid the nets during the day than at night. In addition, we observed more larval fish taxa at night than during the day. Thus, we assume that density estimates based on day (neuston, bongo, and Tucker trawl) hauls generally reflect numbers of larvae less than those actually present in the water column.

Field collections for this study were made over a one year period. While certain observations, such as kinds and seasonal succession of different species, may not vary to an appreciable extent from one year to the next, densities may vary considerably due to the general dynamics of marine fish reproductive rates. Hence, until additional research is conducted, relative abundances between species should be given greater consideration than absolute numbers.

Two popular modes of expressing densities for oblique plankton tows are number per volume of water filtered and number under a unit of sea surface. Our densities for oblique (bongo) tows were expressed in the former manner as were the horizontal neuston and Tucker trawl tows. In doing so we recognize that the relationship between the two density expressions can change for stations of different depths.

Taxonomy

Fundamental to ichthyoplankton surveys is an ability to identify individual species of larvae and eggs. While literature references and larval fish collections are available for many species, information is nonexistent for others. Intensive sampling during spring and summer in the nearshore area of Kodiak Archipelago has contributed to life history information for some previously undescribed species. For example, several larval pricklebacks and sculpins can now be separated and identified from larval series obtained from frequent nearshore plankton sampling. This information marks important additions to a growing understanding of early life history of Northeast Pacific fishes.

Nevertheless, specific identification of some larvae remains unresolved. Larval sculpin (Cottidae) types 1, 2, I, and L, larval greenling types D, E, and I, larval codfish, lumpfish, poachers, and rockfish, and flatfish eggs await further study and investigation before positive identification to species can be made. Consequently, information on the distribution and abundance for some larvae could not be determined at the species level, but were made at a generic or family level.

Eggs

Fish species with pelagic eggs are a minority in the Kodiak nearshore environment. While 37 species of larvae were identified, pelagic egg types represented only 10 possible species. The majority of fish species found in the nearshore area have demersal or littoral eggs and a few are extruded as larvae (rockfish).

Pelagic eggs may be found at the surface or in the water column below, depending on their specific gravity and the temperature and salinity of the water. Hence they are subject to transport by tidal flow as well as wind-induced surface currents. These currents, depending on their direction and magnitude, can lead to pooling or dispersing of pelagic eggs. For example, densities (neuston) of walleye pollock eggs were greater in the southeastern Kodiak bays and probably reflect, in part, heavy spawning by pollock to the south and southeast of Kodiak Island (Dunn and Naplin 1974; Dunn et al. 1979). Additionally, higher densities (neuston) of pelagic flatfish eggs in Izhut and Chiniak bays located to the north and south of a much larger bay, Marmot Bay, are probably due to heavy spawning by flatfish throughout Marmot Bay as well as within the individual bays.

While time of pelagic spawning can be closely pinpointed by noting presence or absence of eggs in the plankton, a lag time exists between spawning of demersal eggs and first appearance of larvae in the plankton. For example, larval capelin appeared in early May; however, eggs were probably deposited 2-3 weeks earlier.

Other nearshore fish species which spawn demersally include: sandlance, rock sole, greenlings, and sculpins. If demersal spawners are restricted to a specific type of habitat, newly hatched larvae may be initially concentrated near those areas. Their subsequent distribution would be dependent on hydrographic factors combined with larval behavior. These factors may lead to large catches of larvae close to shore, as occurred in Izhut Bay for beach-spawned larval capelin.

Time of spawning varies betwen species and is related to water temperature and salinity (Lagler et al. 1962). For example, spawning of flatfish, species with pelagic eggs, and capelin was heaviest when temperatures in the water column ranged from 5.2-12.6°C, and salinities ranged from 30.7-34.1°/oo (June through August). However, sand lance, rock sole, and walleye pollock spawning occurred when sea temperatures on the average were lower, 2.6-6.9°C, and salinities were higher, 34.1-34.8°/oo (March through May). It is likely that annual variations in monthly temperatures will cause annual variations in the timing of spawning for the different species.

Larvae

Fish larvae were sampled at stations located approximately 1-12 km from shore and are therefore assumed to characterize both the activities of fish spawning in inshore waters and in waters that are carried to the inshore region. Larvae originating in offshore areas represented fractions of offshore ichthyoplankton populations of currently undeterminable size. Consequently, larvae of inshore spawners such as capelin, sand lance, *Myoxocephalus* spp., and sand sole were better represented in our plankton hauls than larvae from offshore or deep water spawners such as sable fish, rockfish species (Pacific ocean perch), and Pacific halibut which were either completely absent or incidentally caught close to shore.

Hydrographic phenomena also accounted, in part, for the various degrees of patchiness seen in the inshore regime. Wide-ranging densities of fish larvae occurred in several cruise-bay-gear combinations. It was not uncommon to see eggs and/or larvae of a particular species concentrated in one station-sample for a particular bay and cruise. The concentrating mechanisms are not clearly understood, but location of spawning activity may initially account for the observed density and distribution patterns. Subsequent causes may include affinites for concentrations of food and/or avoidance of predators.

Most larval fish species were primarily in either surface or subsurface samples. Relatively few taxa, for example, were common to both surface (neuston) and 10 m (Tucker trawl) samples. Inherent in this division are larval adaptations to the environmental constraints of food, light, pressure, temperature, and salinity. Consequently, appearance and behavior modes are probably somewhat distinct for the respective vertically-segmented populations. Hence, we recognize this transition zone (0-10 m) as one of relative importance in which major larval groups show substantial sensitivity to one or more of the variables mentioned above. Further research should provide more definition of this important segment of the water column.

Vertical migration patterns of larval fishes in Izhut and Kiliuda bays were atypical. Fish larvae usually move up in the water column with the onset of darkness and down with the onset of daylight (Hardy' 1956). Our observations show the opposite to have taken place. Larvae were distributed more toward the shallower depths during the day than at night. We do not clearly understand this behavior pattern. Temperature and salinity gradients did not limit their movement inasmuch as they were often found passing through the pycnocline.

One vertical migration mechanism is light. During summer months hours of darkness are few. Consequently, the time available for feeding may be limiting if confined to those hours. However, similar day-night vertical distribution patterns were seen in other seasons when night hours outnumbered daylight hours. Therefore seasonal light patterns alone do not explain the anomaly.

Vertical migration of fish larvae often reflect the most favorable time and location for both feeding and predator avoidance. If during the day predators of larval fishes, i.e., euphausids, in shallow waters were few and if food resources were accessible during daylight hours, then the stated vertical distribution pattern could be better explained. Unfortunately, data are not presently available for correlation with the observed phenomena.

Seasonal differences in abundance were seen both for larval fishes as a group and for individual species. Implied in these differences are seasonal spawning and larval fish behavior patterns that have synchronicity with changes in food densities and abiotic conditions. These conditions can insure the success of a year class by reducing in-season competition for food and/or access to particular horizontal and vertical regimes of the water column. Larvae of the species greenling, sculpin, and flatfish families were exemplary of this mode of reproduction. Two or more seasons were characterized by the presence of one or more species from each family. Consequently, we recognize each season to be of relative importance to the reproductive activities of different ecologically and economically important species.

The outcome of the stated ontogenetic features determines subsequent growth rates and residence time in the plankton. In most cases once a particular size mode was reached the larvae would disappear somewhat abruptly from the plankton catches. Consequently, we saw an entire life history stage, varying in length from several weeks to a few months, taking place within Kodiak's bays.

Larvae of several species of ecological and economic importance were not seen or were incidental to our inshore plankton hauls. Pacific herring spawn on the northwestern side of Kodiak Island (Manthey, Malloy, and McGuire 1975). In this study one herring larva was caught in Kiliuda Bay in June. Because herring larvae are relatively susceptible to plankton gear (Eldridge 1970), we suspect little spawning activity occurred in the areas sampled. No sablefish larvae appeared in this study. However, adults occur in inshore otter trawl hauls (Blackburn 1978) and larvae were caught in the summer in an offshore plankton survey (Jean Dunn, NMFS, Seattle, personal communication). Sandfish are abundant as adults in inshore waters (Harris 1977); however, only five larvae were caught in late winter in Izhut and Kaiugnak bays. Sandfish larvae hatch at a relatively large size (ca. 10 mm) and are believed to remain close to shore and have relative ease at avoiding plankton nets. Two Pacific halibut larvae were caught in the spring in Kiliuda Bay. Pacific halibut larvae are generally caught in water deeper than those sampled (Thompson and Van Cleve 1934) and are known to occur in Kodiak waters as young juveniles. No arrowtooth flounder larvae were captured, although adults are caught in inshore otter trawl hauls and larvae were reported in the spring from the offshore plankton survey (Dunn et al. 1979).

VIII. SUMMARY CONCLUSION

The inshore habitat of the Kodiak Archipelago, from the inner margins of the bays to water 5-10 km from shore, contained larvae of at least 21 fish families. In addition, 50 genera, 37 species, and 11 species-types were recognized. Various life history patterns were described for many commercially and ecologically important species. Seasonality, horizontal and vertical distribution patterns, size (length) and/or day-night modes of occurrence were determined for eggs and/or larval forms of smelts, cod fishes, pricklebacks, sand lances, rockfishes, greenlings, sculpins, and flatfish.

Each season played an important role in the spawning and larval stages of key species. During the spring we caught codfish, sand lance, pricklebacks, Myoxocephalus spp., rock sole, and kelp greenling. Smelts, yellowfin sole, sand sole, and Hexagrammos types D and E larvae were important components of the summer ichthyoplankton. Larvae that occurred in the fall period included smelt, white-spotted greenling, Atka mackerel, and Irish lord larvae. Late winter larvae populations included sand lance, and possibly kelp greenling.

Surface and subsurface tows identified somewhat distinct communities of larval fishes. Greenling, wrymouth, and Irish lord larvae were dominant components of the surface catches, while codfish, sand lance, pricklebacks, Myoxocephalus spp., (sculpin) spp. and flatfish were abundant below the surface. Smelt larvae were common to both regimes. Several larval fishes were caught in demersal tows, but in comparatively small numbers. Discrete horizontal tows throughout the water column show pronounced vertical distribution patterns. The majority of larvae were concentrated both during the day and at night between the surface and 50 m when in water 100-160 m in depth.

Growth patterns demonstrate that larvae may enter the plankton at sizes as small as 3 mm and remain susceptible to plankton gear for up to 3 months or more, after having attained sizes in excess of 15-20 mm.

To interpret possible conflicts of OCS petroleum developments with ichthyoplankton populations, we consider, in addition to seasonality, distributional and abundance data for various species, three considerations of relative importance that address the relationship between larval fish reproduction and pollution in Kodiak waters and require further clarification. First, most fishes in the areas sampled spawn demersal eggs that are subject to sinking contaminants. Information on areas of egg deposition is at least as important as knowledge of pelagic fish egg populations but is not presently availble. Secondly, we recognize important differences in the kinds and numbers of larval fishes in the first 10 m of the water column. More attention should be focused in this area given its intimacy with near-surface conditions. Finally, and in theory only, we consider the possible changes in ichthyoplankton populations due to the results of sub-lethal and lethal contaminants to be of variable magnitude.

In other words, any impact on larval fish populations by an environmental pollutant may not be well reflected when yearly abundances vary to an unknown extent. Consequently, we anticipate that future correlation with additional hydrographic data, juvenile and adult fish community structures, and major food web moderators, such as phytoplankton, zooplankton, predatory vertebrate, avian, and mammalian taxa, will give both substantially more meaning to the results of this study and a more accurate position in anticipated events.

X. ACKNOWLEDGMENTS

Special thanks are given to Biff Bermingham, cruise leader, who had a key role in the collection of plankton samples and assisted in larval fish identification. Field work was aided by Warner Lew and Kenneth Semmens, and we are indebted to the crew of the R.V. COMMANDO whose patience and hard work facilitated sample collection. We also applaud the efforts of Warner Lew, Mark Kimbel, and Tom Nishida for assistance with laboratory work and data preparation.

In addtion, we are especially grateful to the FRI office staff, Dorothy Beall, Ingrid Pearson, and co-workers, for preparing the text of this report.

Finally, Beverly Vinter, Ann Materese, and Kenneth Waldron, of NMFS Northwest Center were enthusiastic and helpful in larval fish and egg identification, and comments and assistance throughout the project from Jean Dunn were greatly appreciated.

XI. AUXILIARY MATERIAL

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Table 1. Station locations for Kodiak Archipelago nearshore zooplankton research, 1978-79.

Bay	Station	Latitude (N)	Longitude (W)	Average Depth (m)
Izhut	Z1	58° 13'	152° 17'	105
	Z2	58 10	152 14	164
	Z3	58 06	152 10	171
	Z4	58 08	152 03	63
	Z5	58 05	152 18	152
	Z6**	58 15	152 16	43
	Z7**	58 13	152 18	31
	Z8**	58 11	152 20	33
Kalsin-Chiniak	C1	57° 37'	152° 25'	39
	C2	57 41	152 19	130
	C3	57 44	152 14	165
	C4	57 42	152 04	133
	C5	57 38	151 55	163
Kiliuda	L1	57° 19'	153° 02'	90
	L2	57 16	152 55	97
	L3	57 12	152 45	131
	L4	57 16	152 37	52
	L5	57 36	152 54	65
	L6**	57 20	153 09	38
	L7**	57 18	153 06	32
	L8**	57 20	152 55	38
Kaiugnak	G1	57° 04'	153° 36'	86
	G2	57 01	153 29	116
	G3	56 56	153 27	137
	G4	56 58	153 14	41
	G5	56 52	153 35	43

** Stations added 5/78.

Table 2. Frequency of gear use by bay, station, and cruise for inshore zooplankton research, Kodiak Archipelago, Alaska, 1978-79.[1,2]

Gear		Neuston (505μ)	Bongo (505μ & 333μ)	Tucker (505μ)	Tucker (3 mm)	Epibenthic sled (505μ)
Bay/Station						
Izhut	1	I-XII	I-XII			
	2	"	"	II-XII	II-X	II-X
	2 (night)	II-XII		II-XII	II-X	
	3	I-XII	I-XII			II-VI
	4	"	"			
	5	"	"			I
	6	IV-XII	IV-XII			
	7	"	"			
	8	"	"			
Chiniak	1	I-XII	I-XII			I
	2	"	"			I-X
	3	"	"			I-V
	4	"	"			
	5	I-X	I-X			
Kiliuda	1	I-XII	I-XII			I
	2	"	"	I-XII	I-X	II-X
	2 (night)	"		I-XII	I-X	
	3	"	I-XII			II-V
	4	"	"			
	5	"	"			
	6	IV-XII*	IV-XII			
	7	IV-XII°	"			
	8	IV-XII+	"			
Kaiugnak	1	I-XII	I-XII			
	2	"	"			II-X
	3	"	"			II-V
	4	"	"			
	5	"	"			
No. of samples collected		315	294, 294	276	38	58 = 1275

Time-scale reference

Cruise	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Month	Mar '78	Apr		May		Jun	Jul		Aug		Nov	Mar '79

* Except cruise VI.
° " " IX.
\+ " " X.

[1] All stations were occupied during daylight hours except when noted.

[2] Gear use per cruise was limited to one sample per gear-net type, station, depth interval (and time of day when appropriate).

Table 3. Gear and gear-use characteristics for inshore zooplankton research, Kodiak Archipelago, Alaska, 1978-79.

Gear Type	Opening (m^2)	Mesh (μ)	Tow characteristics	Duration (minutes)	Vessel speed (knots)
+Neuston	.15 (= .3 m x .5 m)	505	Horizontal-surface	10	2-2.5
Bongo	.28 (.6 m dia.)	505 & 333	Double oblique - near bottom to surface*	10-25	2-2.5
+Tucker (with opening-closing mechanism)	1 (with 45° side-wire angle)	505	Horizontal at 10, 30, 50, 70, 90 meters	5 per depth	2-2.5
+Tucker	1	505 & 3000	Double oblique - 90 m to surface*	10-25	2-2.5 (4 for larger mesh)
Epibenthic sled (with opening-closing mechanism)	1	505	Horizontal-bottom	10	2-2.5

*Rate of descent: 50 m of wire/min with 30 second hold at maximum depth. Rate of ascent: 20 m of wire/min.

+Procedure conducted once during daylight and repeated after dusk at stations 2 in Izhut and Kiliuda bays.

Table 4. Zooplankton sorting design, by gear type, for inshore zooplankton research, Kodiak Archipelago, Alaska, 1978-79.

Sampling device (mesh size)	Sorted component(s)	Total number of organisms removed or percent of sample sorted
Neuston (505μ)	- fish eggs and larvae	100%
Bongo (505μ)	- fish eggs and larvae - adult euphausids[1]	100% 175-225 (if present)
Bongo (333μ)	- major taxa including fish eggs and larvae, crab and shrimp larvae, euphausids, amphipods, copepods, and chaetognaths	500≃700
Tucker trawl (505μ)	- fish eggs and larvae - crab and shrimp larvae - adult euphausids[1]	100% from 500≃700 organism-aliquot 175-225 (if present)
Tucker trawl (3 mm)	- fish larvae	100% of those > 20 mm
Epibenthic sled (505μ)	- fish eggs and larvae - crab & shrimp larvae	100% from 500≃700 organism-aliquot

[1]Adult euphausids were removed from Bongo (505μ) samples taken at stations 1 and 3 for all bays and all cruises and from Tucker (505μ) samples taken in Kiliuda Bay during both day and night sampling from depths 10 m and 30 m.

Adult euphausids were identified, their lengths measured and wet weights taken by the sorting agency.

Table 5. Mean temperature and salinity data at depth for Izhut Bay, Kodiak Archipelago, Alaska, 1978-79.

		Depth												Range	
		1M			25M			50M			100M				
Cruise	Date	°C*	o/oo*	N	°C	o/oo	N	°C	o/oo	N	°C	o/oo	N	°C	o/oo
1 (78)	Mar 29-Mar 30	3.9	34.3	5	4.2	34.3	5	3.9	34.3	5	3.8	34.3	4	3.8-4.2	34.3
2	Apr 10-Apr 11	4.4	34.2	5	4.3	34.3	5	4.2	34.3	5	4.2	34.3	4	4.2-4.4	34.2-34.3
3	Apr 21-Apr 22	5.2	33.9	5	4.6	34.1	5	4.6	34.1	5	4.5	34.2	4	4.5-5.2	33.9-34.2
4	May 3-May 12	5.9	31.6	8	4.8	34.0	8	4.8	34.0	5	4.6	34.1	4	4.6-5.9	31.6-34.1
5	May 31-Jun 2	6.3	33.3	8	5.5	34.1	8	5.5	34.2	5	5.3	34.2	4	5.3-6.3	33.3-34.2
6	Jun 14-Jun 16	8.3	33.4	8	6.5	33.9	8	6.2	34.0	5	5.8	34.0	4	5.8-8.3	33.4-34.0
7	Jun 28-Jun 29	8.7	33.5	8	7.2	33.7	8	7.0	33.8	5	6.8	33.9	3	6.8-8.7	33.5-33.9
8	Jul 21-Jul 23	9.7	33.2	8	7.6	33.6	8	7.3	33.8	5	6.8	33.9	4	6.8-9.7	33.2-33.9
9	Aug 1-Aug 3	11.4	33.4	8	7.9	33.7	8	7.5	33.7	5	7.0	33.8	4	7.0-11.4	33.4-33.8
10	Aug 15-Aug 17	10.8	33.4	8	8.9	33.7	8	8.4	33.7	5	7.2	33.9	4	7.2-10.8	33.4-33.9
11	Nov 3-Nov 5	6.2	33.9	8	6.4	34.0	8	6.5	33.9	5	6.3	34.2	4	6.2-6.5	33.9-34.2
1 (79)	Mar 6-Mar 8	2.8	34.4	8	3.3	34.8	8	3.5	34.8	5	3.5	34.8	4	2.8-3.5	34.4-34.8
Range °C		2.8-11.4			3.3-8.9			3.5-8.4			3.5-7.2				
o/oo			33.2-34.4			33.6-34.8			33.7-34.8			33.8-34.8			

* each value = mean for all stations in bay.

N = number of stations.

Table 6. Mean temperature and salinity data at depth for Chiniak Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Date	Depth 1M °C*	1M o/oo*	1M N	25M °C	25M o/oo	25M N	50M °C	50M o/oo	50M N	100M °C	100M o/oo	100M N	Range °C	Range o/oo
1 (78)	Apr 1-Apr 3	3.5	34.0	5	3.5	34.4	5	3.5	34.3	4	3.6	34.5	4	3.5-3.6	34.0-34.5
2	Apr 13-Apr 14	4.5	33.8	5	3.9	34.1	5	3.9	34.1	4	3.8	34.1	4	3.8-4.5	33.8-34.1
3	Apr 22-Apr 23	4.3	34.1	5	4.0	34.3	5	4.1	34.3	4	4.0	34.3	4	4.0-4.3	34.1-34.3
4	May 5	5.2	33.2	5	4.5	34.1	5	4.4	34.2	4	4.3	34.3	4	4.3-5.2	33.2-34.3
5	Jun 3	6.8	32.1	5	5.6	34.0	5	5.5	34.0	4	5.3	34.1	4	5.3-6.8	32.0-34.1
6	Jun 17	7.1	33.5	5	5.9	34.0	5	5.8	34.0	4	5.4	34.2	4	5.4-7.1	33.5-34.2
7	Jun 29-Jun 30	9.2	33.2	5	7.3	33.7	5	6.9	33.8	4	6.5	33.8	4	6.5-9.2	33.2-33.8
8	Jul 23-Jul 24	9.0	33.1	5	7.7	33.6	5	7.3	33.8	4	6.9	33.9	4	6.9-9.0	33.1-33.9
9	Aug 3-Aug 4	10.5	33.4	5	8.3	33.6	5	7.4	33.8	4	6.7	33.9	4	6.7-10.5	33.4-33.9
10	Aug 17	11.3	33.3	5	9.3	33.6	5	8.7	33.6	4	7.1	33.8	4	7.1-11.3	33.3-33.8
11	Nov 9	6.0	34.2	5	6.0	34.2	5	6.0	34.1	4	6.1	34.2	4	6.0-6.1	34.1-34.2
1 (79)	Mar 14	2.6	34.2	4	2.7	34.4	4	2.8	34.5	3	2.8	34.6	3	2.6-2.8	34.2-34.6
Range °C		2.6-11.3			2.7-9.3			2.8-8.7			2.8-7.1				
o/oo			32.1-34.2			33.6-34.4			33.6-34.5			33.8-34.6			

* each value = mean for all stations in bay.

N = number of stations.

Table 7. Mean temperature and salinity data at depth for Kiliuda Bay, Kodiak Archipelago, Alaska, 1978-79.

		Depth												Range	
		1M			25M			50M			100M				
Cruise	Date	°C*	o/oo*	N	°C	o/oo	N	°C	o/oo	N	°C	o/oo	N	°C	o/oo
1 (78)	Apr 5-Apr 6	3.6	33.7	5	3.4	34.4	5	3.5	34.4	5	3.5	34.4	2	3.4-3.6	33.7-34.4
2	Apr 14-Apr 15	4.5	33.9	5	3.8	34.2	5	3.8	34.3	5	4.0	34.4	1	3.8-4.5	33.9-34.4
3	Apr 24-Apr 26	4.7	33.9	5	4.2	34.3	5	4.0	34.3	4	4.1	34.5	1	4.0-4.7	33.9-34.5
4	May 26-May 27	6.8	31.2	8	5.4	33.7	8	5.1	34.1	4	4.7	34.2	3	4.7-6.8	31.2-34.1
5	Jun 4-Jun 5	7.4	31.4	8	5.7	33.8	8	5.4	33.9	5	5.6	34.1	2	5.6-7.4	31.4-34.1
6	Jun 20-Jun 21	8.2	31.4	8	5.8	33.8	8	5.7	34.2	5	5.4	34.3	3	5.4-8.2	31.4-34.3
7	Jul 13-Jul 17	9.7	30.7	8	7.7	33.7	8	6.7	33.8	5	5.7	34.0	2	5.7-9.7	30.7-34.0
8	Jul 26-Jul 28	10.6	31.4	8	8.2	33.5	8	7.2	33.7	5	7.0	33.8	1	7.0-10.6	31.4-33.8
9	Aug 6-Aug 8	12.6	30.5	8	8.6	33.5	8	7.4	33.8	5	6.9	34.1	1	6.9-12.6	30.5-34.1
10	Aug 19-Aug 20	10.9	32.9	8	8.5	33.6	8	7.5	33.8	5	7.6	33.9	1	7.6-10.9	32.9-33.9
11	Nov 11	6.1	33.6	8	6.3	34.1	8	6.2	34.2	4	5.9	34.2	1	6.1-6.2	33.6-34.2
1 (79)	Mar 15	2.7	33.7	8	2.7	34.5	8	3.1	34.6	4	3.6	34.7	1	2.7-3.6	33.7-34.7
Range °C		2.7-12.6			2.7-8.6			3.1-7.5			3.6-7.6				
o/oo			30.5-33.7			33.5-34.5			33.8-34.6			33.8-34.7			

* each value = mean for all stations in bay.

N = number of stations.

Table 8. Mean temperature and salinity data at depth for Kaiugnak Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Date	Depth												Range	
		1M			25M			50M			100M				
		°C*	o/oo*	N	°C	o/oo	N	°C	o/oo	N	°C	o/oo	N	°C	o/oo
1 (78)	Apr 7-Apr 8	3.7	34.1	5	3.5	34.2	5	3.5	34.3	4	3.5	34.5	2	3.5-3.7	34.1-34.3
2	Apr 16-Apr 17	4.2	34.0	5	3.9	34.2	5	3.8	34.2	3	4.1	34.3	2	3.8-4.2	34.0-34.3
3	Apr 30-May 1	4.6	33.8	5	4.5	34.1	5	4.3	34.2	3	4.3	33.8	2	4.3-4.6	33.8-34.2
4	May 28	6.6	32.5	5	5.0	34.0	5	4.8	34.0	4	4.8	34.1	3	4.8-6.6	32.5-34.1
5	Jun 6	6.9	33.1	5	5.8	33.9	5	5.6	33.9	3	5.2	34.0	2	5.2-6.9	33.1-34.0
6	Jun 23-Jun 24	6.6	33.4	5	5.8	34.0	5	5.6	34.1	3	5.6	34.2	2	5.6-6.6	33.4-34.2
7	Jul 18	9.5	32.6	5	8.8	33.6	5	7.8	33.9	3	6.4	34.1	2	6.4-9.5	32.6-34.1
8	Jul 29	11.3	32.7	5	8.5	33.6	5	7.8	33.7	3	6.8	33.9	2	6.8-11.3	32.7-33.9
9	Aug 8-Aug 9	12.3	33.0	5	9.7	33.5	5	8.4	33.6	3	7.3	33.8	2	7.3-12.3	33.0-33.8
10	Aug 21	9.4	33.5	5	8.0	33.8	5	7.6	33.8	3	7.2	33.5	2	7.2-9.4	33.5-33.8
11	Nov 12-Nov 13	5.8	33.9	5	6.0	34.1	5	6.2	34.2	3	6.3	34.4	3	5.8-6.3	33.9-34.2
1 (79)	Mar 16	no measurements taken													
Range °C		3.7-12.3			3.5-9.7			3.5-8.4			3.5-7.3				
o/oo			32.5-34.1			33.5-34.2			33.6-34.3			33.5-34.5			

* each value = mean for all stations in bay.

N = number of stations.

Table 9. List of scientific and common names for larval fishes and fish eggs captured, Kodiak Archipelago, Alaska, 1978-79.

Clupeidae - herrings
- *Clupea Harengus pallasi* - Pacific herring

Salmonidae - trouts
- *Oncorhynchus gorbuscha* - pink salmon

Osmeridae - smelts
- *Mallotus villosus* - capelin

Bathylagidae - deep sea smelts

Myctophidae - lantern fishes

Gadidae -codfishes
- *Gadus macrocephalus* - Pacific cod
- *Microgadus proximus* - Pacific tomcod
- *Theragra chalcogramma* - walleye pollock

Zoarcidae - eelpouts
- *Lycodes* spp.

Bathymasteridae - ronquils

Gasterosteidae - sticklebacks
- *Gasterosteus aculeatus* - threespine stickleback

Cyclopteridae - lumpfishes and snailfishes

Trichodontidae - sandfishes
- *Trichodon trichodon* - Pacific sandfish

Stichaeidae - pricklebacks
- *Anoplarchus* spp.
- *Chirolophis* spp.
- *Lumpenella longirostris* - longsnout prickleback
- *Lumpenus maculatus* - daubed shanny
- *Lumpenus medius* - stout eelblenny
- *Lumpenus sagitta* - snake prickleback
- *Poroclinus rothrocki* - whitebarred prickleback
- *Stichaeus punctatus* - Arctic shanny

Pholidae - gunnels

Ptilichthyidae - quillfishes
- *Ptilichthys goodei* - quillfish

Cryptacanthodidae - wrymouths
- *Delolepis gigantea* - giant wrymouth
- *Lyconectes aleutensis* - dwarf wrymouth

Table 9. List of scientific and common names for larval fishes and fish eggs captured, Kodiak Archipelago, Alaska, 1978-79 - continued.

Ammodytidae - sand lances
- *Ammodytes hexapterus* - Pacific sand lance

Scorpaenidae - scorpionfishes
- *Sebastes* spp.
- *Sebastolobus* spp.

Hexagrammidae - greenlings
- *Hexagrammos stelleri* - whitespotted greenling
- *Ophiodon elongatus* - lingcod
- *Pleurogrammus monopterygius* - Atka mackerel
- *Hexagrammos* type D
- *Hexagrammos* type E
- *Hexagrammos* type I

Cottidae - sculpins
- *Artedius* type 1
- *Artedius* type 2
- *Blepsias* spp.
- *Clinocottus* spp.
- *Cottus* spp.
- *Dasycottus setiger* - spinyhead sculpin
- *Enophrys* spp.
- *Gymnocanthus* spp.
- *Hemilepidotus* spp.
- *Hemilepidotus hemilepidotus* - red Irish lord
- *Hemilepidotus jordani* - yellow Irish lord
- *Icelinus* spp.
- *Leptocottus armatus* - Pacific staghorn sculpin
- *Malacocottus* (?)
- *Myoxocephalus* type A
- *Myoxocephalus* type B
- *Nautichthys* spp.
- *Psychrolutes* (?)
- *Radulinus asprellus* - slim sculpin
- *Rhamphocottus richardsoni* - grunt sculpin
- *Triglops* spp.
- *Triglops pingeli* - ribbed sculpin
- Cottidae type 1
- Cottidae type 2
- Cottidae type I
- Cottidae type L

Agonidae - poachers

Table 9. List of scientific and common names for larval fishes and fish eggs captured, Kodiak Archipelago, Alaska, 1978-79 - continued.

Pleuronectidae
Glyptocephalus zachirus - rex sole
Hippoglossoides elassodon - flathead sole
Hippoglossus stenolepis - Pacific halibut
Isopsetta isolepis - butter sole
Lepidopsetta bilineata - rock sole
Limanda aspera - yellowfin sole
Platichthys stellatus - starry flounder
Pleuronectes quadrituberculatus - Alaska plaice
Psettichthys melanostictus - sand sole

Table 10. Density of fish eggs (no./1000 m^3) from bongo (505μ) samples, by cruise and station, Izhut Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	6	7	8	$\bar{X}$ (1-5)	$\bar{X}$ (6-8)
1 (78)	Mar 29-Mar 30	0	0	0	0	0	-	-	-	0	-
2	Apr 10-Apr 11	0	7	0	9	9	-	-	-	5	-
3	Apr 21-Apr 22	8	23	63	2	6	-	-	-	20	-
4	May 3-May 12	12	18	26	35	77	912	1801	130	34	948
5	May 31-Jun 2	48	29	38	74	0	1085	1263	4125	38	2158
6	Jun 14-Jun 16	87	165	30	42	3	2534	2650	8058	65	4414
7	Jun 28-Jun 29	364	131	40	9	42	2749	3450	6263	117	4154
8	Jul 21-Jul 23	412	46	34	39	375	1804	1475	2272	181	1850
9	Aug 1-Aug 3	194	172	2	71	44	1344	1582	1716	97	1547
10	Aug 15-Aug 17	284	77	4	50	22	1602	335	308	87	748
11	Nov 3-Nov 5	0	0	0	0	0	0	0	0	0	0
1 (79)	Mar 6-Mar 8	0	0	0	0	0	0	0	0	0	0
	$\bar{X}$ (all cruises)	118	56	45	26	48	-	-	-		
	$\bar{X}$ (excl. 1,2,3)	156	71	54	36	62	1337	1395	2541		

Table 11. Density of fish eggs (no./1000 m^3) from bongo (505μ) samples, by cruise and station, Chiniak Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	$\bar{X}$ (1-5)
1 (78)	Apr 1-Apr 3	0	6	9	5	0	4
2	Apr 13-Apr 14	227	14	81	13	57	78
3	Apr 22-Apr 23	166	2	78	12	113	74
4	May 5	250	23	119	439	152	197
5	Jun 3	292	25	54	374	437	236
6	Jun 17	2038	783	258	337	431	769
7	Jun 29-Jun 30	22772	852	191	84	15	4783
8	Jul 23-Jul 24	2698	596	185	43	23	709
9	Aug 3-Aug 4	6189	657	101	11	20	1396
10	Aug 17	4899	427	13	2	19	1072
11	Nov 9	0	5	6	0	(2)	3
1 (79)	Mar 14	0	0	0	0	(0)	0
	$\bar{X}$ (all cruises)	3294	282	91	110	106	

( ) = estimate; no sample taken.

Table 12. Density of fish eggs (no./1000 m^3) from bongo (505µ) samples, by cruise and station, Kiliuda Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	6	7	8	$\bar{X}$ (1-5)	$\bar{X}$ (6-8)
1 (78)	Apr 5-Apr 6	480	58	34	0	138	-	-	-	142	-
2	Apr 14-Apr 15	132	122	11	4	81	-	-	-	70	-
3	Apr 24-Apr 26	131	56	38	207	192	-	-	-	125	-
4	May 26-May 27	16	230	19	68	126	100	29	418	92	182
5	Jun 4-Jun 5	51	326	206	650	45	969	161	1760	256	963
6	Jun 20-Jun 21	54	489	49	865	449	3333	1245	4307	381	2962
7	Jul 13-Jul 17	2148	680	419	771	1130	2734	3681	4494	1030	3636
8	Jul 26-Jul 28	1884	1368	173	768	237	2557	3093	2084	886	2578
9	Aug 6-Aug 8	1437	1030	527	485	338	1736	3161	4142	763	3013
10	Aug 19-Aug 20	472	1389	63	663	425	1518	1700	2058	602	1759
11	Nov 11	0	7	0	0	4	0	0	0	2	0
1 (79)	Mar 15	0	0	0	0	3	21	10	0	1	10
	$\bar{X}$ (all cruises)	567	480	313	373	264	-	-	-		
	$\bar{X}$ (excl. 1,2,3)	674	612	408	474	306	1441	1453	2140		

Table 13. Density of fish eggs (no./1000 m^3) from bongo (505μ) samples, by cruise and station, Kaiugnak Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	$\bar{X}$ (1-5)
1 (78)	Apr 7-Apr 8	45	211	64	90	19	86
2	Apr 16-Apr 17	36	329	72	7	394	168
3	Apr 30-May 1	203	631	104	74	404	283
4	May 28	0	172	5	34	0	42
5	Jun 6	0	26	2	39	12	16
6	Jun 23-Jun 24	11	47	52	15	168	59
7	Jul 18	2648	132	14	135	7	587
8	Jul 29	78	286	278	52	50	149
9	Aug 8-Aug 9	807	438	28	1510	460	649
10	Aug 21	421	64	72	21	211	158
11	Nov 12-Nov 13	0	0	0	5	0	1
1 (79)	Mar 16	5	0	0	6	0	2
	$\bar{X}$ (all cruises)	355	195	58	166	143	

Table 14. Density of fish eggs (no./1000 m^3) from neuston (505μ) samples, by cruise and station, Izhut Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	6	7	8	$\bar{X}$ (1-5)	$\bar{X}$ (6-8)
1 (78)	Mar 29-Mar 30	0	0	0	0	0	-	-	-	0	-
2	Apr 10-Apr 11	0	1074	0	0	9	-	-	-	217	-
3	Apr 21-Apr 22	333	14	0	0	15	-	-	-	72	-
4	May 3-May 12	140	18	8223	95	64	409	386	0	1708	265
5	May 31-Jun 2	3121	313	0	143	71	3845	8000	18000	730	9948
6	Jun 14-Jun 16	14215	2636	195	360	3525	67647	43368	43238	4186	51418
7	Jun 28-Jun 29	21999	31	754	21	679	53238	29647	187253	4697	90046
8	Jul 21-Jul 23	92617	3940	714	33	525	31875	54564	30533	19566	38991
9	Aug 1-Aug 3	20865	6122	204	40	9055	45484	(28970)	641600	7257	238685
10	Aug 15-Aug 17	13167	323	587	541	774	5579	11489	(144785)	3078	53951
11	Nov 3-Nov 5	0	0	0	0	0	0	0	0	0	0
1 (79)	Mar 6-Mar 8	0	0	0	0	0	0	0	0	0	0
	$\bar{X}$ (all cruises)	13871	1206	890	103	1226	-	-	-		
	$\bar{X}$ (excl. 1,2,3)	18458	1487	1186	137	1635	23120	19603	118379		

( ) = estimate; no sample taken.

Table 15. Density of fish eggs (no./1000 m^3) from neuston (505μ) samples, by cruise and station, Chiniak Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	$\bar{X}$ (1-5)
1 (78)	Apr 1-Apr 3	23	42	10	0	13	18
2	Apr 13-Apr 14	2414	265	68	457	180	677
3	Apr 22-Apr 23	21*	29	47	129	222	90
4	May 5	160	454	579	387	4500	1216
5	Jun 3	38	179	889	804	81	398
6	Jun 17	10250	12617	2445	2548	1500	5872
7	Jun 29-Jun 30	166909	40604	18310	8109	589	46904
8	Jul 23-Jul 24	16522	91784	77511	180	510	37301
9	Aug 3-Aug 4	33216	10278	6312	590	2821	10643
10	Aug 17	335673	5088	329	262	2796	68830
11	Nov 9	0	0	0	0	(0)	0
1 (79)	Mar 14	0	0	0	0	(0)	0
	$\bar{X}$ (all cruises)	47102	13445	8875	1122	1101	

* not identified
( ) = estimate; no sample taken.

Table 16. Density of fish eggs (no./1000 m^3) from neuston (505μ) samples, by cruise and station, Kiliuda Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	6	7	8	$\bar{X}$ (1-5)	$\bar{X}$ (6-8)
1 (78)	Apr 5-Apr 6	686	1896	466	226	167	-	-	-	688	-
2	Apr 14-Apr 15	2276	1387	30	86	396	-	-	-	835	-
3	Apr 24-Apr 26	1468	151	84	387	341	-	-	-	486	-
4	May 26-May 27	27	784	20	1384	1056	12	0	239	654	84
5	Jun 4-Jun 5	0	422	417	86	95	0	4796	571	204	1789
6	Jun 20-Jun 21	1029	21389	184	22700	15056	(6320)	128	48340	12072	18263
7	Jul 13-Jul 17	4447	42000	7578	10949	18244	21	1211	30591	15844	10608
8	Jul 26-Jul 28	13853	17705	13943	29192	15436	342	5105	47821	18026	17756
9	Aug 6-Aug 8	27765	14227	24800	7656	4891	1667	1339	8512	15868	3839
10	Aug 19-Aug 20	25182	3521	1702	7000	7395	1432	822	9065	8960	3773
11	Nov 11	0	0	0	0	14	0	0	58	3	19
1 (79)	Mar 15	0	163	0	0	133	531	114	0	59	215
	$\bar{X}$ (all cruises)	6394	8637	4102	6639	5269	-	-	-		
	$\bar{X}$ (excl. 1,2,3)	8034	11135	5405	8774	6924	1147	1501	16133		

( ) = estimate; no sample taken.

Table 17. Density of fish eggs (no./1000 m^3) from neuston (505μ) samples, by cruise and station, Kaiugnak Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	$\bar{X}$ (1-5)
1 (78)	Apr 7-Apr 8	907	523	1449	678	28	717
2	Apr 16-Apr 17	95	5137	913	32	2193	1674
3	Apr 30-May 1	1846	1553	257	143	1077	975
4	May 28	0	17	56	0	0	15
5	Jun 6	113	52	122	68	60	83
6	Jun 23-Jun 24	235	3235	1000	83	590	1029
7	Jul 18	7160	969	886	1179	56	2050
8	Jul 29	37489	43539	2405	29	583	16809
9	Aug 8-Aug 9	9156	39170	776	4828	5880	11962
10	Aug 21	1848	3920	1440	151	1567	1785
11	Nov 12-Nov 13	0	0	31	43	0	15
1 (79)	Mar 16	0	0	0	0	0	0
	$\bar{X}$ (all cruises)	4904	8176	778	603	1003	

Table 18. Kinds and mean density (no./1000 m^3) of fish eggs from bongo (505μ) samples, Izhut Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Month / Cruise	1	Apr (78) 2	3	May 4	5	Jun 6	7	Jul 8	9	Aug 10	Nov 11	Mar (79) 1
Pleuronectidae		.	2	3	356	829	1692	1628	803	637	327	.	.
Theragra chalcogramma		.	3	16	7	2	2	.	2	1	.	.	.
Hippoglossoides elassodon		.	.	1	13	2	1	3	2	3	1	.	.
Osmeridae		.	.	.	.	.	.	.	.	.	7	.	.
Unidentified		.	.	1	.	.	.	.	1	+	.	.	.
Glyptocephalus zachirus		.	.	.	.	.	1	.	.	.	.	.	.

+ = < .5 egg/1,000 m^3.

Table 19. Kinds and mean density (no./1000 m^3) of fish eggs from bongo (505μ) samples, Chiniak Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Month / Cruise	1	Apr (78) 2	3	May 4	Jun 5	6	Jul 7	8	Aug 9	10	Nov 11	Mar (79) 1
Pleuronectidae		2	56	46	120	235	757	4770	707	1394	1071	.	.
Theragra chalcogramma		2	20	18	42	1	11	2	.	.	.	3	.
Hippoglossoides elassodon		.	3	7	31	.	2	10	2	2	.	.	.
Unidentified		1	.	2	2	.	.	.	.	.	1	.	.

Table 20. Kinds and mean density (no./1000 m^3) of fish eggs from bongo (505μ) samples, Kiliuda Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Month	Apr (78)			May	Jun		Jul		Aug		Nov	Mar (79)
	Cruise	1'	2	3	4	5	6	7	8	9	10	11	1
Pleuronectidae		114	57	83	125	519	1348	2006	1521	1605	1035	.	4
Theragra chalcogramma		28	12	40	1	3	1	1	.	.	.	1	+
Unidentified		.	1	1	.	.	.	.	.	2	1	.	.
Hippoglossoides elassodon		.	.	1	.	.	.	.	.	.	.	.	.
Glyptocephalus zachirus		.	.	.	+	.	.	.	.	.	.	.	.

+ = < .5 egg/1000 m^3.

Table 21. Kinds and mean density (no./1000 m^3) of fish eggs from bongo (505μ) samples, Kaiugnak Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Month Cruise	 1	Apr (78) 2	 3	May 4	Jun 5	 6	Jul 7	 8	Aug 9	 10	Nov 11	Mar (79) 1
Pleuronectidae		23	73	90	41	5	59	587	149	649	157	.	.
Theragra chalcogramma		62	89	79	+	5	.	.	.	.	.	1	2
Hippoglossoides elassodon		1	3	107	.	5	.	.	.	.	.	.	.
Unidentified		.	3	8	.	1	.	.	.	.	.	.	.
Glyptocephalus zachirus		.	.	.	1	+	.	.	.	.	.	.	.

+ = <.5 egg/1,000 m^3.

Table 22. Kinds and mean density (no./1000 m^3) of fish eggs from neuston (505μ) samples, Izhut Bay, Kodiak Archipelago, 1978-79.

Taxa	Month / Cruise		Apr (78)		May	Jun		Jul		Aug		Nov	Mar (79)
		1	2	3	4	5	6	7	8	9	10	11	1
Pleuronectidae		.	2	25	131	4177	21543	36670	26755	103292	4578	.	.
Hippoglossoides elassodon		.	.	3	992	4	297	22	77	19	10	.	.
Theragra chalcogramma		.	215	.	.	.	.	.	.	.	.	.	.
Unidentified		.	.	44	18	2	53	12	18	.	49	.	.
*Trichodon trichodon		.	.	.	26	.	4	.	.	.	.	.	.
*Hexagrammidae		.	.	.	.	.	.	.	.	27	.	.	.
Glyptocephalus zachirus		.	.	.	.	4	.	.	.	.	.	.	.

* Species spawn demersal eggs.

Table 23. Kinds and mean density (no./1000 m^3) of fish eggs from neuston (505μ) samples, Chiniak Bay, Kodiak Archipelago, 1978-79.

Taxa	Month	Apr (78)			May	Jun		Jul		Aug		Nov	Mar (79)
	Cruise	1	2	3	4	5	6	7	8	9	10	11	1
Pleuronectidae		13	636	11	87	363	5777	46861	37296	10566	68808	.	.
Hippoglossoides elassodon		.	.	54	1109	35	20	29	5	72	21	.	.
Unidentified		.	.	.	7	.	71	15	.	.	.	.	.
Theragra chalcogramma		4	41	20	13	.	3	.	.	5	.	.	.

Table 24. Kinds and mean density (no./1000 m^3) of fish eggs from neuston (505μ) samples, Kiliuda Bay, Kodiak Archipelago, 1978-79.

Taxa	Month		Apr (78)		May	Jun		Jul		Aug		Nov	Mar (79)
	Cruise	1	2	3	4	5	6	7	8	9	10	11	1
Pleuronectidae		38	812	417	410	782	15431	14380	17925	11357	7015	7	115
Theragra chalcogramma		286	17	38	17	.	20	.	.	.	.	2	3
Hippoglossoides elassodon		2	6	20	8	10	96	.	.	.	.	.	.
Unidentified		20	.	6	5	4	.	.	.	.	.	.	.
Pleuronectes quadrituberculatus		.	.	5	.	.	.	.	.	.	.	.	.
Glyptocephalus zachirus		.	.	.	.	2	.	.	.	.	.	.	.

Table 25. Kinds and mean density (no./1000 m^3) of fish eggs from neuston (505μ) samples, Kaiugnak Bay, Kodiak Archipelago, 1978-79.

Taxa	Month		Apr (78)		May	Jun		Jul		Aug		Nov	Mar (79)
	Cruise	1	2	3	4	5	6	7	8	9	10	11	1
Pleuronectidae		207	875	602	.	15	912	1631	16788	11945	1785	.	.
Theragra chalcogramma		503	771	118	.	5	.	.	.	.	.	15	.
Unidentified		2	13	36	.	20	.	419	.	.	.	.	.
Hippoglossoides elassodon		5	15	219	15	42	116	.	21	17	.	.	.

Table 26. Density of larval fish (no./1000 m^3) from neuston (505μ) samples, by cruise and station, Izhut Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	6	7	8	$\bar{X}$ (1-5)	$\bar{X}$ (6-8)
1 (78)	Mar 29-Mar 30	58	213	60	26	116	-	-	-	95	-
2	Apr 10-Apr 11	0	148	131	386	510	-	-	-	235	-
3	Apr 21-Apr 22	1963	285	75	231	154	-	-	-	542	-
4	May 3-May 12	0	18	333	95	26	46	544	408	94	333
5	May 31-Jun 2	30	0	683	58	0	0	38	0	154	13
6	Jun 14-Jun 16	1616	36	146	60	450	59	737	0	462	265
7	Jun 28-Jun 29	59	31	33	167	144	2786	59	55	319	967
8	Jul 21-Jul 23	0	0	0	0	3950	31	0	40067	790	13366
9	Aug 1-Aug 3	27	20	68	40	0	0	(0)	50	123	17
10	Aug 15-Aug 17	1778	32	63	65	60	211	327	(6831)	400	2456
11	Nov 3-Nov 5	788	3571	3626	1073	108	286	81	582	1833	316
1 (79)	Mar 6-Mar 8	188	0	2629	120	190	163	68	108	625	113
	$\bar{X}$ (all cruises)	542	363	654	193	476	-	-	-		
	$\bar{X}$ (excl. 1,2,3)	498	412	842	186	548	398	206	5344		

( ) = estimate; no sample taken

Table 27. Density of larval fish (no./1000 m^3) from neuston (505μ) samples, by cruise and station, Chiniak Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	$\bar{X}$ (1-5)
1 (78)	Apr 1-Apr 3	0	11	0	256	363	126
2	Apr 13-Apr 14	0	0	0	86	154	48
3	Apr 22-Apr 23	1	14	0	51	28	19
4	May 5	186	46	1895	1387	548	812
5	Jun 3	0	141	1978	0	122	448
6	Jun 17	15	0	0	0	210	45
7	Jun 29-Jun 30	440	226	144	65	26	180
8	Jul 23-Jul 24	11	189	22	26	20	54
9	Aug 3-Aug 4	0	14	1557	26	129	345
10	Aug 17	163	662	63	130	633	330
11	Nov 9	577	4652	1018	215	(1594)	1611
1 (79)	Mar 14	219	239	79	0	(125)	132
	$\bar{X}$ (all cruises)	134	516	563	187	329	

( ) = estimate; no sample taken.

Table 28. Density of larval fish (no./1000 m^3) from neuston (505μ) samples, by cruise and station, Kiliuda Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	6	7	8	$\bar{X}$ (1-5)	$\bar{X}$ (6-8)
1 (78)	Apr 5-Apr 6	0	163	0	386	4711	-	-	-	1052	-
2	Apr 14-Apr 15	69	0	1152	4715	1023	-	-	-	1392	-
3	Apr 24-Apr 26	85	416	639	806	537	-	-	-	497	-
4	May 26-May 27	54	27	180	845	362	109	11	11	294	44
5	Jun 4-Jun 5	0	0	28	28	24	11	23	0	16	11
6	Jun 20-Jun 21	0	0	0	33	0	(0)	12	0	7	4
7	Jul 13-Jul 17	158	17	0	26	975	43	131	682	235	285
8	Jul 26-Jul 28	264	0	114	42	0	0	79	30	84	36
9	Aug 6-Aug 8	88	23	22	344	73	0	51	48	110	33
10	Aug 19-Aug 20	636	342	85	406	69	12	137	2828	308	992
11	Nov 11	58	157	154	41	28	59	1117	369	88	515
1 (79)	Mar 15	0	0	228	32	167	0	0	0	85	0
	$\bar{X}$ (all cruises)	118	95	217	642	664	-	-	-		
	$\bar{X}$ (excl. 1,2,3)	140	63	90	200	189	26	173	441		

( ) = estimate; no sample taken.

Table 29. Density of larval fish (no./1000 m^3) from neuston (505μ) samples, by cruise and station, Kaiugnak Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	$\bar{X}$ (1-5)
1 (78)	Apr 7-Apr 8	45	138	1027	99	507	363
2	Apr 16-Apr 17	0	0	0	64	97	32
3	Apr 30-May 1	155	724	1658	4116	9949	3320
4	May 28	0	17	0	0	238	51
5	Jun 6	0	0	0	34	0	7
6	Jun 23-Jun 24	0	0	0	84	0	17
7	Jul 18	0	93	943	436	16565	3607
8	Jul 29	88	0	24	1428	42	316
9	Aug 8-Aug 9	13	38	0	34	114	40
10	Aug 21	773	60	100	189	5983	1421
11	Nov 12-Nov 13	176	98	875	468	304	384
1 (79)	Mar 16	0	0	36	166	151	71
	$\bar{X}$ (all cruises)	104	97	389	593	2829	

Table 30. Density of larval fish (no./1000 m^3) from bongo (505μ) samples, by cruise and station, Izhut Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	6	7	8	$\bar{X}$ (1-5)	$\bar{X}$ (6-8)
1 (78)	Mar 29-Mar 30	172	243	31	55	268	-	-	-	154	-
2	Apr 10-Apr 11	221	151	54	116	71	-	-	-	123	-
3	Apr 21-Apr 22	275	262	78	127	50	-	-	-	158	-
4	May 3-May 12	91	87	149	296	255	217	307	417	176	314
5	May 31-Jun 2	155	117	86	187	219	379	111	199	153	230
6	Jun 14-Jun 16	1644	1882	52	128	11	4449	3197	534	743	2727
7	Jun 28-Jun 29	47867	5359	3858	14038	5719	88806	58975	22227	16112	56669
8	Jul 21-Jul 23	1147	648	408	1278	0	2239	1384	4878	696	2834
9	Aug 1-Aug 3	4127	1769	72	246	503	7277	17167	13752	1343	12732
10	Aug 15-Aug 17	48567	864	3114	7561	7864	27922	8252	3673	13594	13282
11	Nov 3-Nov 5	155	21	26	37	12	67	436	300	50	268
1 (79)	Mar 6-Mar 8	8	12	5	20	24	31	5	144	14	60
	$\bar{X}$ (all cruises)	8703	951	661	2007	1250	-	-	-		
	$\bar{X}$ (excl. 1,2,3)	11529	1195	864	2644	1624	14599	9981	5125		

Table 31. Density of larval fish (no./1000 m^3) from bongo (505μ) samples, by cruise and station, Chiniak Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations					$\bar{X}$ (1-5)
		1	2	3	4	5	
1 (78)	Apr 1-Apr 3	1382	30	75	56	41	317
2	Apr 13-Apr 14	745	87	92	19	27	194
3	Apr 22-Apr 23	1054	335	183	293	25	378
4	May 5	249	147	254	73	109	166
5	Jun 3	77	47	173	30	79	81
6	Jun 17	318	64	48	113	50	119
7	Jun 29-Jun 30	27685	4767	883	170	30	6707
8	Jul 23-Jul 24	5259	2881	677	400	424	1928
9	Aug 3-Aug 4	8442	2496	209	118	153	2284
10	Aug 17	7119	784	451	486	163	1801
11	Nov 9	97	189	33	10	(66)	79
1 (79)	Mar 14	143	184	317	93	(147)	174
	$\bar{X}$ (all cruises)	4380	1001	283	155	109	

( ) = estimate; no sample taken.

Table 32. Density of larval fish (no./1000 m^3) from bongo (505μ) samples, by cruise and station, Kiliuda Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	6	7	8	$\bar{X}$ (1-5)	$\bar{X}$ (6-8)
1 (78)	Apr 5-Apr 6	269	386	77	74	872	-	-	-	336	-
2	Apr 14-Apr 15	178	115	15	107	761	-	-	-	235	-
3	Apr 24-Apr 26	169	963	67	137	154	-	-	-	298	-
4	May 26-May 27	179	90	2	55	135	98	199	80	92	126
5	Jun 4-June 5	21	193	106	73	277	54	21	63	134	46
6	Jun 20-Jun 21	42	74	47	129	58	30	111	370	70	170
7	Jul 13-Jul 17	444	1759	615	1840	587	278	892	1601	1049	924
8	Jul 26-Jul 28	101	369	89	125	112	206	158	437	159	267
9	Aug 6-Aug 8	155	597	487	2066	919	70	114	686	845	290
10	Aug 19-Aug 20	1708	3697	1120	564	2793	392	2711	11937	1976	5013
11	Nov 11	16	8	4	52	15	137	25	285	19	149
1 (79)	Mar 15	24	83	5	118	98	398	319	425	66	381
	$\bar{X}$ (all cruises)	276	694	220	445	565	-	-	-		
	$\bar{X}$ (excl. 1,2,3)	299	763	274	558	555	937	631	1765		

Table 33. Density of larval fish (no./1000 m^3) from bongo (505μ) samples, by cruise and station, Kaiugnak Bay, Kodiak Archipelago, Alaska, 1978-79.

Cruise	Collection period	Stations 1	2	3	4	5	$\bar{X}$ (1-5)
1 (78)	Apr 7-Apr 8	132	238	89	714	286	292
2	Apr 16-Apr 17	209	168	108	143	601	246
3	Apr 30-May 1	395	376	237	358	234	320
4	May 28	24	77	65	417	145	146
5	Jun 6	17	117	47	233	130	109
6	Jun 23-Jun 24	124	23	76	230	204	131
7	Jul 18	0	191	208	444	114	191
8	Jul 29	155	115	46	161	205	136
9	Aug 8-Aug 9	436	139	126	1963	291	591
10	Aug 21	298	468	954	5389	857	1593
11	Nov 12-Nov 13	24	28	40	36	108	47
1 (79)	Mar 16	41	48	8	45	134	55
	$\bar{X}$ (all cruises)	155	166	167	844	276	

Table 34. Kinds and mean density (no./1000 m^3) of 15 most abundant larval fish taxa from neuston (505μ) samples, Izhut Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Month		Apr (78)		May		Jun		Jul		Aug	Nov	Mar (79)
	Cruise	1	2	3	4	5	6	7	8	9	10	11	1
Osmeridae		.	.	.	.	.	208	371	5303	20	334	.	8
<u>Hexagrammos stelleri</u>		50	15	3	2	.	.	.	.	.	.	970	246
<u>Hexagrammos</u> type I		42	186	506	106	91	65	.	.	.	.	8	96
Bathymasteridae		.	.	15	8	6	108	35	61	.	2	.	.
<u>Pleurogrammus monopteryginus</u>		.	.	.	.	.	.	.	.	.	.	126	18
<u>Hexagrammos</u> type E		.	.	.	.	.	.	.	.	.	.	104	.
<u>Hemilepidotus</u> spp.		.	.	.	.	.	.	.	.	.	.	47	21
<u>Icelinus</u> spp.		.	.	.	.	.	.	.	58	.	.	.	.
<u>Oncorhynchus gorbuscha</u>		.	.	5	48	.	.	.	.	.	.	.	.
Cottidae type L		.	.	.	.	.	.	.	34	.	.	.	.
<u>Psettichthys melanostictus</u>		.	.	.	.	.	.	.	28	3	.	.	.
<u>Hexagrammos</u> type D		.	.	.	.	.	.	.	.	.	15	8	.
Scorpaenidae		.	.	.	.	.	.	4	18	.	.	.	.
Hexagrammidae		.	.	.	.	.	.	.	.	.	.	.	21
Cottidae type I		.	15	.	.	.	3	.	.	.	.	.	.

Captured taxa of lesser abundance: <u>Gasterosteus aculeatus</u>, <u>Sebastes</u> spp., <u>Artedius</u> type 1, <u>Leptocottus armatus</u>, <u>Radulinus asprellus</u>, Cottidae, Cyclopteridae, <u>Trichodon trichodon</u>, <u>Chirolophis</u> spp., <u>Lyconectes aleutensis</u>, <u>Hippoglossoides elassodon</u>.

Table 35. Kinds and mean density (no./1000 m^3) of 15 most abundant larval fish taxa from neuston (505μ) samples, Chiniak Bay, Kodiak Archipelago, 1978-79.

Taxa	Month	Apr (78)			May	Jun		Jul		Aug		Nov	Mar (79)
	Cruise	1	2	3	4	5	6	7	8	9	10	11	1
Hexagrammos stelleri		10	10	.	.	.	.	.	.	.	.	1559	74
Hexagrammos type I		116	38	3	757	448	.	23	.	.	.	18	19
Hexagrammos type D		.	.	.	.	.	.	.	.	305	140	31	.
Osmeridae		.	.	.	.	.	3	123	44	.	5	3	.
Hexagrammos type E		.	.	.	.	.	.	.	.	6	151	5	.
Bathymasteridae		.	.	.	3	.	37	13	5	26	3	.	.
Oncorhynchus gorbuscha		.	.	.	35	.	.	.	.	.	.	.	.
Unidentified		.	.	16	.	.	5	12	.	.	.	.	.
Gasterosteus aculeatus		.	.	.	.	.	.	.	.	5	20	.	.
Leptocottus armatus		.	.	.	.	.	.	.	.	.	8	.	.
Lyconectes aleutensis		.	.	.	.	.	.	.	.	.	.	.	16
Myoxocephalus type B		.	.	.	4	.	.	.	.	.	.	.	8
Ammodytes hexapterus		.	.	.	.	.	.	.	.	.	.	.	12
Scorpaenidae		.	.	.	.	.	.	10	.	.	.	.	.
Myoxocephalus type A		.	.	.	10	.	.	.	.	.	.	.	.

Captured taxa of lesser abundance: Hexagrammidae, *Hemilepidotus jordani*, *Hemilepidotus* spp., Cyclopteridae.

Table 36. Kinds and mean density (no./1000 m^3) of 15 most abundant larval fish taxa from neuston (505μ) samples, Kiliuda Bay, Kodiak Archipelago, 1978-79.

Taxa	Month / Cruise	Apr (78) 1	2	3	May 4	Jun 5	6	Jul 7	8	Aug 9	10	Nov 11	Mar (79) 1
Lyconectes aleutensis		25	897	100	.	.	.	.	.	.	.	.	.
Stichaeidae		802	.	.	.	.	.	.	.	.	.	.	.
Hexagrammos type I		83	276	294	114	4	.	.	.	.	.	1	30
Hexagrammos stelleri		24	19	25	.	.	.	.	.	.	.	188	11
Osmeridae		.	.	.	.	4	2	180	6	3	365	57	.
Myoxocephalus type A		35	104	8	11	.	.	.	.	.	.	.	.
Hexagrammos type D		.	.	.	.	.	.	.	.	8	143	.	.
Bathymasteridae		.	.	9	25	4	.	25	36	21	30	.	.
Myoxocephalus type B		14	65	4	8	1	.	.	.	.	.	.	.
Gasterosteus aculeatus		.	.	.	.	.	.	.	.	43	19	.	.
Unidentified		33	5	4	.	.	.	.	10	.	3	.	.
Ammodytes hexapterus		12	14	4	1	3	.	.	.	.	.	.	13
Leptocottus armatus		.	.	.	.	.	.	37	.	4	.	.	.
Lepidopsetta bilineata		.	.	10	17	.	.	.	.	.	.	.	.
Gadus macrocephalus		.	.	26	.	.	.	.	.	.	.	.	.

Captured taxa of lesser abundance: *Oncorhynchus gorbuscha*, Gadidae, *Theragra chalcogramma*, Scorpaenidae, *Sebastes* spp., *Hexagrammos* type E, *Pleurogrammus monopterygius*, Hexagrammidae, *Hemilepidotus jordani*, Cottidae type L, Cottidae, Agonidae, *Chirolophis* spp., *Isopsetta isolepis*, *Limanda aspera*, Pleuronectidae.

Table 37. Kinds and mean density (no./1000 m^3) of 15 most abundant larval fish taxa from neuston (505μ) samples, Kaiugnak Bay, Kodiak Archipelago, 1978-79.

Taxa	Month	(78)	Apr		May	Jun		Jul		Aug		Nov	Mar (79)
	Cruise	1	2	3	4	5	6	7	8	9	10	11	1
Osmeridae		.	.	.	.	.	6	2877	283	.	1172	8	.
Hexagrammos type I		227	6	2875	5	7	.	.	.	.	.	17	27
Bathymasteridae		.	.	49	3	.	.	640	11	7	.	.	.
Hexagrammos stelleri		35	13	84	.	.	.	.	.	.	.	327	14
Hexagrammos type D		.	.	.	.	.	.	.	9	17	183	.	.
Myoxocephalus type A		12	13	144	.	.	.	.	.	.	.	.	15
Myoxocephalus type B		73	.	111	.	.	.	.	.	.	.	.	.
Hexagrammos type E		.	.	.	.	.	.	.	.	12	63	.	.
Ammodytes hexapterus		.	.	.	38	.	.	.	.	.	.	.	11
Psettichthys melanostictus		.	.	.	.	.	.	44	.	.	.	.	.
Hemilepidotus spp.		.	.	.	.	.	.	.	.	.	.	32	.
Lyconectes aleutensis		14	.	16	.	.	.	.	.	.	.	.	.
Unidentified		.	.	17	.	.	.	5	.	.	.	.	.
Pleuronectidae		.	.	.	.	.	.	17	.	.	.	.	.
Scorpaenidae		.	.	.	.	.	6	11	.	.	.	.	.

Captured taxa of lesser abundance: *Gasterosteus aculeatus*, Hexagrammidae, Cottidae type I, Cottidae type L, Cottidae, *Blepsias* spp., *Leptocottus armatus*, Stichaeidae, *Lepidopsetta bilineata*, *Platichthys stellatus*.

Table 38. Kinds and mean density (no./1000 m^3) of 15 most abundant larval fish taxa from bongo (505μ) samples, Izhut Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Month		Apr (78)		May	Jun		Jul		Aug		Nov	Mar (79)
	Cruise	1	2	3	4	5	6	7	8	9	10	11	1
Osmeridae		.	.	.	.	.	1339	30519	1459	5478	13323	122	8
Bathymasteridae		.	.	+	27	85	69	91	4	25	3	.	.
Ammodytes hexapterus		121	49	26	13	2	.	1	.	.	.	.	21
Cottidae type L		.	1	1	2	9	15	99	8	33	17	.	.
Psettichthys melanostictus		.	.	.	.	6	20	27	7	36	88	.	.
Cottidae Type I		10	13	18	9	12	10	42	1	3	.	.	.
Lepidopsetta bilineata		.	12	33	50	14	8	.	.	.	.	.	.
Icelinus spp.		.	.	.	1	5	2	17	3	27	25	+	.
Myoxocephalus type B		.	6	22	22	2	.	.	.	.	.	.	.
Lumpenus medius		1	1	1	29	8	1	.	.	.	.	.	.
Cyclopteridae		.	1	7	11	4	2	12	2	1	1	.	.
Theragra chalcogramma		.	16	14	4	.	.	.	.	.	.	.	.
Anoplarchus spp.		.	.	3	8	9	6	2	.	.	.	.	.
Myoxocephalus type A		7	4	12	5	+	.	.	.	.	.	.	.
Sebastes spp.		.	.	.	2	1	2	2	2	4	13	.	.

+ = <.5 larvae/1,000 m^3.

Captured taxa of lesser abundance: Myctophidae, Mallotus villosus (juvenile), Gadus macrocephalus, Lycodes spp., Scorpaenidae, Sebastolobus spp., Hexagrammos stelleri, Hexagrammos type I, Cottidae, Artedius type I, Artedius type 2, Clinocottus spp., Dasycottus setiger, Enophrys spp., Gymnocanthus spp., Hemilepidotus spp., Hemilepidotus hemilepidotus, Hemilepidotus jordani, Leptocottus armatus, Malacocottus spp., Radulinus asprellus, Agonidae, Stichaeidae, Chirolophis spp., Pleurogrammos monopterygius, Lumpenus sagitta, Lumpenella longirostris, Lumpenus maculatus, Stichaeus punctatus, Lyconectes aleutensis, Pholidae, Hippoglossoides elassodon, Isopsetta isolepis, Limanda aspera.

Table 39. Kinds and mean density (no./1000 m^3) of 15 most abundant larval fish taxa from bongo (505μ) samples, Chiniak Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa Month	Apr (78)			May	Jun		Jul		Aug		Nov	Mar (79)
Cruise	1	2	3	4	5	6	7	8	9	10	11	1
Osmeridae	.	.	.	1	1	16	6588	1831	2228	1709	74	10
Ammodytes hexapterus	217	57	153	29	1	.	.	.	.	.	.	155
Lepidopsetta bilineata	3	31	87	37	9	6	26	5	3	.	.	+
Lumpenus medius	44	50	51	12	1	3	.	1	.	.	.	.
Bathymasteridae	.	.	.	10	28	17	17	7	13	30	.	.
Cottidae type L	.	2	1	1	+	3	13	26	11	8	.	.
Psettichthys melanostictus	.	.	.	.	2	2	18	14	8	19	.	.
Lumpenus maculatus	20	28	10	3	1	.	.	.	.	.	.	.
Unidentified	1	1	7	.	3	49	.	.	1	1	.	.
Myoxocephalus type B	8	1	11	25	1	.	.	.	.	.	.	3
Hippoglossoides elassodon	.	.	.	5	2	1	14	8	1	+	.	.
Cottidae type I	.	2	7	2	8	7	4	1	.	1	.	.
Gadidae	.	.	14	15	1	.	.	.	.	+	.	.
Sebastes spp.	.	.	.	.	.	5	9	1	4	10	.	.
Theragra chalcogramma	2	10	15	.	1	.	.	1	.	.	.	.

+ = < .5 larvae/1000 m^3

Captured taxa of lesser abundance: Cyclopteridae, Bathylagidae, Myctophidae, Microgadus proximus, Scorpaenidae, Sebastolobus spp., Hexagrammos type I, Hexagrammos stelleri, Ophiodon elongatus, Pleurogrammus monopterigius, Cottidae, Artedius type 1, Artedius type 2, Clinocottus spp., Dasycottus setiger, Gymnocanthus spp., Hemilepidotus spp., Hemilepidotus hemilepidotus, Icelinus spp., Leptocottus armatus, Malacocottus spp., Myoxocephalus type A, Radulinus asprellus, Triglops spp., Agonidae, Ptilichthys goodei, Stichaeidae, Anoplarchus spp., Chirolophis spp., Lumpenus sagitta, Lumpenella longirostris, Lyconectes aleutensis, Pholidae, Pleuronectidae, Isopsetta isolepis, Limanda aspera.

Table 40. Kinds and mean density (no./1000 m^3) of 15 most abundant larval fish taxa from bongo (505μ) samples, Kiliuda Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Month		Apr (78)		May	Jun		Jul		Aug		Nov	Mar (79)
	Cruise	1	2	3	4	5	6	7	8	9	10	11	1
Osmeridae		.	.	.	.	.	25	889	155	592	3069	64	27
Lumpenus medius		135	79	37	5	1	1	.	.	.	.	.	30
Ammodytes hexapterus		92	45	31	24	2	.	.	.	.	.	.	113
Lepidopsetta bilineata		8	11	63	26	21	8	+	2	.	.	.	3
Theragra chalcogramma		2	5	102	.	.	.	.	.	.	.	+	.
Psettichthys melanostictus		.	.	.	1	5	20	24	8	7	7	.	.
Bathymasteridae		.	.	6	11	14	7	7	6	12	3	.	.
Myoxocephalus type B		13	18	30	.	.	+	.	.	.	.	.	1
Cottidae type L		4	.	.	2	8	13	13	4	4	11	.	.
Lumpenus maculatus		9	26	6	.	.	.	+	.	.	.	.	.
Isopsetta isolepis		.	.	.	.	+	1	34	3	2	.	.	.
Lumpenus sagitta		26	12	.	1	.	.	.	.	.	.	.	4
Cyclopteridae		1	6	4	3	9	7	1	3	1	1	.	.
Cottidae type I		4	8	5	2	6	4	6	.	.	.	.	.
Myoxocephalus type A		19	7	6	2	1	.	.	.	.	.	.	1

+ = <.5 larvae/1000 m^3

Captured taxa of lesser abundance: Mallotus villosus (juvenile), Myctophidae, Gadidae, Scorpaenidae, Sebastes spp., Hexagrammos type I, Hexagrammos stelleri, Cottidae, Artedius type 1, Artedius type 2, Clinocottus spp., Cottus spp., Dasycottus setiger, Enophrys spp., Gymnocanthus spp., Hemilepidotus spp., Hemilepidotus jordani, Icelinus spp., Leptocottus armatus, Psychrolutes type, Radulinus asprellus, Cottidae type 2, Triglops spp., Agonidae, Stichaeidae, Anoplarchus spp., Chirolophis spp., Lumpenella longirostris, Lyconectes aleutensis, Delolepis gigantea, Pholidae, Pleuronectidae, Hippoglossoides elassodon, Limanda aspera, Platichthys stellatus.

Table 41. Kinds and mean density (no./1000 m^3) of 15 most abundant larval fish taxa from bongo (505μ) samples, Kaiugnak Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa / Month	Apr (78)			May	Jun		Jul		Aug		Nov	Mar (79)
Cruise	1	2	3	4	5	6	7	8	9	10	11	1
Osmeridae	.	.	.	.	.	46	114	68	547	1551	74	5
Ammodytes hexapterus	175	96	63	15	5	3	.	.	.	.	.	38
Lepidopsetta bilineata	7	7	111	36	15	30	.	.	.	.	.	.
Bathymasteridae	.	.	5	75	53	8	16	4	7	1	.	.
Myoxocephalus type B	29	47	53	+	2	.	.	.	.	.	.	.
Cottidae type L	.	1	.	.	1	17	6	15	8	20	.	.
Lumpenus maculatus	13	34	7	1	.	.	.	.	.	1	.	.
Psettichthys melanostictus	.	.	.	.	1	1	24	11	8	4	.	.
Gadus macrocephalus	.	.	33	.	.	.	.	.	.	.	.	.
Cottidae type I	11	1	5	4	7	3	.	1	.	.	.	1
Lumpenus medius	11	12	3	.	2	1	.	1	.	.	.	.
Isopsetta isolepis	.	.	.	.	.	.	16	7	4	1	.	.
Gymnocanthus spp.	14	8	2	2	1	.	.	.	.	.	.	.
Gadidae	3	.	17	2	1	1	.	1	.	.	.	.
Hippoglossoides elassodon	.	.	1	.	1	3	9	2	4	4	.	.

+ = < .5 larvae/1000 m^3

Captured taxa of lesser abundance: Trichodon trichodon, Theragra chalcogramma, Microgadus proximus, Myctophidae, Lycodes spp., Scorpaenidae, Sebastes spp., Hexagrammos type I, Pleurogrammus monopterigius, Cottidae, Artedius type 1, Dasycottus setiger, Hemilepidotus spp., Hemilepidotus hemilepidotus, Icelinus spp., Malacocottus spp., Myoxocephalus type A, Radulinus asprellus, Triglops spp., Agonidae, Cyclopteridae, Ptilichthys goodei, Stichaeidae, Anoplarchus spp., Chirolophis spp., Lumpenus maculatus, Lumpenus medius, Lumpenus sagitta, Poroclinus rothrocki, Stichaeus punctatus, Lyconectes aleutensis, Pholidae, Pleuronectidae, Glyptocephalus zachirus, Hippoglossus stenolepis, Limanda aspera.

Table 42. Frequency of occurrence and relative abundance of larval fishes in day and night neuston (505μ) tows, station 2, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Izhut Bay Total caught* Day	Izhut Bay Total caught* Night	Izhut Bay Occurrence (Cruises) Day	Izhut Bay Occurrence (Cruises) Night	Kiliuda Bay Total caught* Day	Kiliuda Bay Total caught* Night	Kiliuda Bay Occurrence (Cruises) Day	Kiliuda Bay Occurrence (Cruises) Night
Oncorhynchus gorbuscha (juv)	27	.	1	.	.	98	.	1
Osmeridae	52	3050	1	6	41	42378	1	6
Theragra chalcogramma	.	.	.	.	.	89	.	2
Gadidae	.	.	.	.	19	0	1	.
Bathymasteridae	49	5303	1	6	.	895	.	4
Gasterosteus aculeatus	.	.	.	.	41	38	1	1
Cyclopteridae	.	16	.	1	.	78	.	2
Anoplarchus spp.	.	15	.	1	.	55	.	2
Chirolophis spp.	.	68	.	1	.	.	.	.
Stichaeus punctatus	.	48	.	2	.	.	.	.
Stichaeidae	.	.	.	.	.	29	.	1
Pholidae	.	.	.	.	.	59	.	1
Lyconectes aleutensis	.	579	.	4	264	1333	1	5
Ammodytes hexapterus	14	176	1	.	.	1726	.	5
Hexagrammos stelleri	3128	136	2	1	157	1658	1	1
Hexagrammos type D	.	73	.	2	283	349	1	1

Table 42. Frequency of occurrence and relative abundance of larval fishes in day and night neuston (505μ) tows, station 2, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79 - continued.

Taxa	Izhut Bay Total caught* Day	Izhut Bay Total caught* Night	Izhut Bay Occurrence (Cruises) Day	Izhut Bay Occurrence (Cruises) Night	Kiliuda Bay Total caught* Day	Kiliuda Bay Total caught* Night	Kiliuda Bay Occurrence (Cruises) Day	Kiliuda Bay Occurrence (Cruises) Night
Hexagrammos type E	371	320	1	1	.	.	.	.
Hexagrammos type I	295	1657	3	2	57	892	1	3
Ophidion elongatus	.	67	.	1	.	.	.	.
Pleurogrammus monopterygius	57	.	1	.	.	.	.	.
Hexagrammidae	.	15	.	1	.	65	.	1
Artedius type 2	.	.	.	.	.	39	.	1
Blepsias spp.	.	.	.	.	.	29	.	1
Clinocottus spp.	.	.	.	.	.	113	.	3
Gymnocanthus spp.	.	17	.	1	.	.	.	.
Hemilepidotus jordani	.	33	.	1	.	.	.	.
Leptocottus armatus	.	12	.	1	17	172	.	3
Myoxocephalus type A	37	53	1	2	197	45	3	1
Myoxocephalus type B	.	.	.	.	31	44	2	2
Cottidae type I	74	.	1	.	.	.	.	.
Cottidae type L	.	33	.	1	.	102	.	2
Cottidae	37	33	1	1	.	.	.	.
Lepidopsetta bilineata	.	.	.	.	19	29	1	1
Platichthys stellatus	.	.	.	.	.	46	.	1
Pleuronectidae	.	.	.	.	.	15	.	1

Table 42. Frequency of occurrence and relative abundance of larval fishes in day and night neuston (505μ) tows, station 2, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79 - continued.

	Izhut Bay					Kiliuda Bay				
		Total caught		Occurrence (Cruises)			Total caught		Occurrence (Cruises)	
	Taxa	Day	Night	Day	Night	Taxa	Day	Night	Day	Night
Totals	25	4141	11704	14	36	27	1126	50376	13	52
excluding Osmeridae										
	24	4089	8749	13	30	26	1104	8091	11	46
excluding Osmeridae and Bathymasteridae										
	23	4040	3446	12	24	25	1104	7196	11	42

*Numbers are sum of catches (no./1000 m^3) for all cruises of occurrence.

Table 43. Relative abundance and occurrence by bay and cruise for sled (505μ) catches of larval fish and eggs, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Bays*	Cruises	Relative Abundance (%)
Larvae:			
Osmeridae	Z,C,L,G	4,6,8,9,10	33.8
Lumpenella longirostris	Z,C,L,G	4,5,7,8	24.4
Bathymasteridae	Z,L,G	3,4,6	13.5
Lumpenus medius	C,L,G	2,3,4,5,6,7,8,9	7.9
Cottidae type I	Z,C,L,G	4,5,6,7	4.4
Cyclopteridae	Z,C,G	6,7,8,9	2.7
Zoarcidae	Z,C,G	3,4,5,8	1.6
Icelinus spp.	Z,L,G	2,3,7,8	1.3
Cottidae type L	Z,L	10	< 1
Psettichthys melanostictus	Z	6	"
Lepidopsetta bilineata	Z,C,L	4,5,6	"
Agonidae	C,L	2,3,5,7	"
Hippoglossoides elassodon	G	9	"
Lumpenus maculatus	L,G	3,4,7	"
Lycodes spp.	C,L	3,7	"
Scorpaenidae	Z	6	"
Anoplarchus spp.	Z	6	"
Lumpenus sagitta	C	8	"
Poroclinus rothrocki	G	7	"
Cottidae	Z	2,6	"

Table 43. Relative abundance and occurrence by bay and cruise for sled (505μ) catches of larval fish and eggs, Kodiak Archipelago, Alaska, 1978-79 - continued.

Taxa	Bays*	Cruises	Relative Abundance (%)
Larvae:			
Gadidae	Z	5,10	< 1
Myctophidae	Z	6	"
Radulinus asprellus	Z	6	"
Ammodytes hexapterus	C,G	2,3	"
Myoxocephalus type B	L,G	3	"
Gadus macrocephalus	G	3	"
Lyconectes aleutensis	L	3	"
Triglops pingeli	L	3	"
Eggs:			
Pleuronectidae	Z,C,L,G	2,3,4,5,6,7,8,9,10	67.6
Theragra chalcogramma	Z,C,L,G	2,3,4,5,7,10	22.9
Osmeridae	Z,C	7,8	5.1
Cyclopteridae	Z	2	3.4
Hippoglossoides elassodon	Z,C,L,G	2,3,4,6	< 1
Glyptocephalus zachirus	Z	6	< 1

*Z = Izhut Bay, C = Chiniak Bay, L = Kiliuda Bay, G = Kaiugnak Bay. (NOTE: Cruises 1(78), 11, 1(79) not sampled with sled.)

Table 44. Mean density (no./1000 m^3) for stations 1 and 3, by cruise, of euphausid species from bongo (505μ) samples in Izhut Bay, Kodiak Archipelago, Alaska, 1978-79.

Adult euphausids	Month / Cruise	Apr 1(78)	2	3	May 4	Jun 5	6	Jul 7	8	Aug 9	10	Nov 11	Mar 1(79)	Total
<u>Thysanoessa raschii</u>		24.5	1055.5	339.5	145	128	607.5	18	510	80	2	326	167	3403
<u>Thysanoessa inermis</u>		41	82.5	95	101	171.5	134	106	447.5	634	123	436	198.5	2570
<u>Thysanoessa spinifera</u>		4	3	31.5	3	14	8.5	27.5	.	33.5	6	26.5	85	242.5
<u>Euphausia pacifica</u>		.	.	5.5	2	1.5	19	2	3	2.5	.	23	.	58.5
<u>Thysanoessa longipes</u>		.	.	.	.	.	.	.	1.5	.	.	1.5	.	3
<u>Tessarabrachion aculatus</u>		.	.	.	.	.	.	.	.	.	.	.	3	3
Unidentified euphausids:														
unstaged		2	29.5	1	193	3.5	63.5	4.5	7	98.5	6	30	9.5	421
larvae		.	.	15.5	533.5	827.5	30.5	46.5	251	266.5	8449	.	.	10,420
juveniles		15.5	12	3	50	1736	450.5	378.5	29,714.5	6144	4429	436	133	43,502
TOTAL		87	1182.5	491	1027.5	2882	1313.5	583	30,934.5	7259	13015	1279	596	

Table 45. Mean density (no./1000 m^3) for stations 1 and 3, by cruise, of euphausid species from bongo (505μ) samples in Chiniak Bay, Kodiak Archipelago, Alaska, 1978-79.

Adult euphausids	Month / Cruise	1(78)	Apr 2	3	May 4	Jun 5	6	Jul 7	8	Aug 9	10	Nov 11	Mar 1(79)	Total
<u>Thysanoessa raschii</u>		.	2.5	571	2	50	.	5.5	.	.	1	6.5	.	638.5
<u>Thysanoessa inermis</u>		4.5	31	71	156	166.5	48.5	33	11.5	45	12.5	48	8	635.5
<u>Thysanoessa spinifera</u>		.	.	.	1	.	1.5	.	2.5	5.5	.	5	3.5	19
<u>Thysanoessa inspinata</u>		.	.	.	.	14	.	.	.	.	.	.	.	14
<u>Thysanoessa longipes</u>		.	.	.	.	.	.	.	.	.	.	6.5	1	7.5
<u>Euphausia pacifica</u>		.	.	.	.	.	.	.	.	.	.	4	.	4
Unidentified euphausids:														
Unstaged		.	3.5	66.5	.	17.5	32	.	.	.	33	5	.	157.5
larvae		.	.	107.5	3098	700	724	1234.5	9890	1386	1301	.	.	18,441
juvenile		10.5	17	28	108.5	1142	5514	18,852	36,857	21,589.5	1304.5	177	18.5	85,618.5
TOTAL		15	54	844	3365.5	2090	6320	20,125	46,761.5	23,026	2652	252	31	

Table 46. Mean density (no./1000 m^3) for stations 1 and 3, by cruise, of euphausids species from bongo (505μ) samples, Kiliuda Bay, Kodiak Archipelago, Alaska, 1978–79.

Adult euphausids	Month / Cruise	1(78)	Apr 2	3	May 4	Jun 5	6	Jul 7	8	Aug 9	10	Nov 11	Mar 1(79)	Total
Thysanoessa inermis		20.5	66.5	295.5	1	75	96.5	28.5	57.5	27.5	146.5	.	743.5	1558.5
Thysanoessa raschii		25	8	71.5	8	3	19	16	.	.	14.5	24	1065.5	1254.5
Thysanoessa spinifera		.	2	3	.	1.5	.	.	.	.	.	6	.	12.5
Euphausia pacifica		.	2	.	.	.	4.5	.	.	.	.	.	.	6.5
Thysanoessa inspinata		.	.	3	.	.	.	.	.	.	.	.	.	3
Thysanoessa longipes		.	.	.	.	.	.	.	.	1.5	.	.	.	1.5
Unidentified euphausids:														
Unstaged		2	1	16.5	.	.	.	.	.	1.5	.	12	42.5	74.5
larvae		.	.	135	588	204.5	572.5	13984	4483.5	1085.5	6539	4.5	.	27,596.5
juvenile		2	35	.	3108.5	1551	4911.5	24,781.5	21,411.5	5486	6348	150	41	67,826
TOTAL		49.5	113.5	524.5	3705.5	1835	5604	38,810	25,952.5	6602	13,048	196.5	1892.5	

Table 47. Mean density (no./1000 m^3) for stations 1 and 3, by cruise, of euphausid species from bongo (505μ) samples in Kaiugnak Bay, Kodiak Archipelago, 1978-79.

Adult euphausids	Month / Cruise	1(78)	Apr 2	Apr 3	May 4	Jun 5	Jun 6	Jul 7	Jul 8	Aug 9	Aug 10	Nov 11	Mar 1(79)	Total
Thysanoessa inermis		125.5	34	319	.	253	17	67.5	2	120	98	98	322.5	1456.5
Thysanoessa raschii		200	3.5	31.5	27	2	.	4.5	.	.	7	152	70	497.5
Thysanoessa spinifera		.	.	.	.	.	.	.	.	.	.	38.5	.	38.5
Euphausia pacifica		.	.	.	.	.	.	.	.	2	2.5	14	1.5	20
Thysanoessa inspinata		.	.	.	2	.	.	.	.	.	.	.	.	2
Unidentified euphausids:														
Unstaged		.	.	29	.	4	.	.	.	.	.	39	29.5	101.5
larvae		19.5	90.5	2936.5	.	17.5	86.5	4927	467.5	871	6317	1	1.5	15,735.5
juvenile		.	.	21	2269	507.5	579.5	51,054	1962.5	7659.5	7500.5	504.5	93.5	72,151.5
TOTAL		345	128	3337	2298	784	683	56,053	2432.5	8652.5	13,925	847	518.5	

Table 48. Comparison of day and night catches at 10m and 30m for adult, juvenile, and larval euphausids from Tucker trawl (505μ) samples, in Kiliuda Bay, Kodiak Archipelago, Alaska, 1978-79.

			no./1000 m^3			
			Day		Night	
Adult euphausids		Cruise	10m	30m	10m	30m
Thysanoessa inermis		1(78)	0	0	71	85
	Apr	2	0	0	47	717
		3	79	2522	927	1174
	May	4	0	0	571	190
	Jun	5	492	3	1050	2040
		6	0	0	49	13
	Jul	7	0	0	229	114
		8	0	0	60	34
	Aug	9	0	0	0	X
		10	0	0	0	0
	Nov	11	0	0	3236	422
	Mar	1(79)	0	0	1097	7362
Thysanoessa raschii		1(78)	0	0	4	3
		2	0	0	24	42
		3	0	29	5	0
		4	0	0	9	114
		5	0	0	62	80
		6	0	0	486	51
		7	0	0	92	43
		8	0	0	52	38
		9	0	0	49	X
		10	0	0	39	0
		11	0	4	13258	348
		1(79)	0	0	1712	3289
Thysanoessa spinifera		1(78)	4	0	0	0
		7	0	0	15	4
		8	0	0	22	3
		11	0	0	418	637
		1(79)	0	0	0	52
Euphausia pacifica		5	0	0	62	0
		8	0	0	4	0
		11	0	0	0	15

Table 48. Comparison of day and night catches at 10m and 30m for adult, juvenile, and larval euphausids from Tucker trawl (505μ) samples, in Kiliuda Bay, Kodiak Archipelago, Alaska, 1978-79 - continued.

			no./1000 m^3			
			Day		Night	
		Cruise	10m	30m	10m	30m
Euphausid larvae		1(78)	0	0	0	0
	Apr	2	706	0	0	0
		3	18810	1029	0	0
	May	4	6	0	0	379
	Jun	5	10	26	0	23
		6	16532	1427	461	3460
	Jul	7	15457	26724	29360	78740
		8	1200	6817	25653	15358
	Aug	9	556	15784	6759	X
		10	33052	13974	9845	63739
	Nov	11	7	0	0	7
	Mar	1(79)	0	0	0	0
Euphausid juveniles		1(78)	0	0	0	7
		2	0	5	0	16
		3	0	29	0	0
		4	3	287	1204	7245
		5	10	45	9079	516
		6	1603	526	3206	2328
		7	42507	15086	39342	57743
		8	233	4935	87687	320189
		9	368	23884	26306	X
		10	352	25222	11835	194051
		11	51	14	940	274
		1(79)	0	0	80	104

X = sample lost.

Table 49. Mean density (no./100 m^3) of select zooplankton taxa*from bongo (333μ) samples, stations 1-5, Izhut Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Month		Apr		May	Jun		Jul		Aug		Nov	Mar
	Cruise	1(78)	2	3	4	5	6	7	8	9	10	11	1(79)
amphipoda		110	56	43	.	9	1	103	537	132	349	180	10
annelida		.	17	284	109	27	.	.	.	109	367	6	.
cirripedia - nauplii		1309	1392	13008	7157	229	79	1589	1524	9565	25095	.	1
cirripedia - cypris		.	6	58	1017	14	+	231	51	373	18697	6	.
chaetognatha		31	40	36	34	17	25	38	63	207	140	108	14
cladocera		.	.	.	.	.	.	.	73	270	924	.	.
cnidaria		86	17	43	.	10	15	.	158	82	642	9	22
copepoda		8210	14044	16870	22387	33166	17589	99062	87347	55893	79891	13865	576
euphausiacea - larvae		.	.	1359	1812	78	77	1923	504	687	14084	.	.
euphausiacea - juveniles		.	.		30	85	31	119	797	222	143	30	+
euphausiacea - adults		.	58	15	.	.	.	.	.	.	.	4	.
euphausiacea - unstaged		.	24	8	.	.	.	.	.	.	.	11	33
gastropoda		14	73	596	916	275	26	75	253	262	1928	58	8
isopoda		.	.	.	.	.	.	27	.	9	.	.	5
larvacea		430	335	1266	62	364	46	341	392	7250	1400	86	4
mysidacea		.	.	.	.	.	.	25	.	.	.	.	.
ostracoda		7	37	29	33	.	15	.	.	.	.	29	.

* Taxa Natantia, Pisces, and Reptantia not included.

+ = <.5 organism/1000 m^3.

Table 50. Mean density (no./100 m^3) of select zooplankton taxa* from bongo (333μ) samples, stations 1-5, Chiniak Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Month		Apr		May	Jun		Jul		Aug		Nov	Mar
	Cruise	1(78)	2	3	4	5	6	7	8	9	10	11	1(79)
amphipoda		86	58	62	28	43	18	163	138	96	404	10	15
annelida		.	1231	54	510	96	58	859	418	413	953	.	11
cirripedia - nauplii		3524	91375	10745	5613	184	1553	4641	26946	25357	11216	.	4
cirripedia - cypris		.	326	994	1919	22	167	1595	2805	6612	13668	28	.
chaetognatha		148	56	19	.	38	.	127	.	421	332	232	3
cladocera		.	.	.	13	.	116	.	10561	17605	13670	.	.
cnidaria		68	249	109	95	68	1675	6998	173	191	503	70	8
copepoda		12991	18173	17035	20631	28728	61666	118236	76364	143324	95313	48336	351
euphausiacea - larvae		.	73	182	4608	380	6989	34266	1999	1954	3019	.	.
euphausiacea - juveniles		.	111	+	.	66	706	439	1525	1167	227	.	.
euphausiacea - adults		.	882	1184	6	.	.	.	43	.	71	.	.
euphausiacea - unstaged		5	65	40	315	.	.	.	.	.	.	.	10
gastropoda		15	1569	559	966	111	646	181	839	756	1548	113	3
isopoda		4	38	.	25	.	.	.	43	.	.	.	3
larvacea		231	149	104	301	264	533	1101	691	4317	4460	.	2
mysidacea		.	55	.	6	22	.	.	43	68	38	.	32
ostracoda		102	85	.	.	.	.	.	.	.	.	.	7

* Taxa Natantia, Pisces, and Reptantia not included.

+ = <.5 organism/1000 m^3.

Table 51. Mean density (no./100 m^3) of select zooplankton taxa* from bongo (333μ) samples, stations 1-5, Kiliuda Bay, Kodiak Archipelago, Alaska, 1978-79.

Taxa	Month		Apr		May		Jun		Jul		Aug	Nov	Mar
	Cruise	1(78)	2	3	4	5	6	7	8	9	10	11	1(79)
amphipoda		31	19	62	.	.	32	44	131	85	109	53	27
annelida		.	196	1269	175	5	16	2222	1946	1850	1947	.	.
cirripedia - nauplii		75905	41971	21471	.	14	810	8244	25547	61048	33109	2	450
cirripedia - cypris		856	2391	16066	546	200	189	1371	2502	2140	1909	242	.
chaetognatha		31	19	32	54	51	887	339	333	450	758	269	194
cladocera		.	.	.	.	.	.	3523	4074	15639	18930	.	.
cnidaria		38	46	209	786	132	227	2373	1138	1285	2150	413	162
copepoda		25959	20219	34961	33076	11834	147635	135429	97098	56845	73375	7084	1854
euphausiacea - larvae		.	219	5496	75	29	7551	9172	3871	4655	7534	.	.
euphausiacea - juveniles		.	.	.	39	67	644	5473	1647	492	1505	6	1
euphausiacea - adults		.	3	15	.	.	.	.	.	.	30	.	67
euphausiacea - unstaged		.	.	.	304	.	.	.	.	.	.	9	7
gastropoda		12	975	2043	1094	163	145	335	531	866	3146	203	31
isopoda		.	.	.	.	5	.	.	.	.	1343	7	10
larvacea		576	402	1147	48	110	222	243	785	5842	3046	60	10
mysidacea		88	.	.	.	.	.	.	.	.	.	6	+
ostracoda		19	15	14	.	.	.	.	.	.	.	6	10

* Taxa Natantia, Pisces, and Reptantia not included.

+ = <.5 organism/1000 m^3.

Table 52. Mean density (no./100 m^3) of select zooplankton taxa* from bongo (333μ) samples, stations 1-5, Kaiugnak Bay, Kodiak Archipelago, Alaska, 1978-79.

	Month		Apr		May	Jun		Jul		Aug		Nov	Mar
Taxa	Cruise	1(78)	2	3	4	5	6	7	8	9	10	11	1(79)
amphipoda		51	137	13	4	14	18	163	127	308	54	44	401
annelida		.	34	131	7	24	39	175	65	495	914	2	.
cirripedia - nauplii		60127	44663	15151	3	20	592	945	73857	21230	30194	7	119
cirripedia - cypris		51	9822	33562	1425	360	86	367	204	120	3221	394	.
chaetognatha		43	137	78	.	31	70	131	857	944	3799	245	8
cladocera		.	.	.	.	.	.	655	1258	14112	5886	.	.
cnidaria		51	294	445	54	41	400	633	182	471	715	281	106
copepoda		37918	62938	27699	9986	13342	64592	99170	40507	89079	68802	3267	3997
euphausiacea - larvae		72	3330	5781	8	76	573	2358	505	1793	9539	2	.
euphausiacea - juveniles		.	.	.	186	134	86	7074	1357	759	1994	2	.
euphausiacea - adults		.	.	22		28	.	.	.	.	.	.	.
euphausiacea - unstaged		300	.	.	58	.	.	.	.	.	.	63	170
gastropoda		343	3045	3883	499	219	264	410	271	854	8672	186	64
isopoda		.	.	.	.	2	.	.	.	.	.	63	3
larvacea		779	2667	2227	21	495	296	195	925	5044	1328	62	36
mysidacea		.	.	.	.	.	.	.	.	.	.	5	.
ostracoda		.	.	.	.	6	.	.	.	.	.	2	32

* Taxa Natantia, Pisces, and Reptantia not included.

Table 53. Kinds and density (no./1000 m^3) of copepod species from bongo (333μ) samples, station 2, Izhut Bay, Kodiak Archipelago, Alaska, 1978.

CRUISE DATE	1 3-30	3 4-21	5 6-1	7 6-29	9 8-02	$\bar{X}$	% of Total
Psuedocalanus spp.	11504	42553	347786	1315786	324848	408496.8	80.86
Acartia longiremis	885	14313	9225	26316	145455	39238.8	7.77
Calanus marshallae	41962	20116	17528	2631	4848	17417	3.44
Metridia pacifica	3187	3868	18450	15789	6061	9471	1.87
Acartia tumida	177	9284	21218	15789	.	9293.6	1.84
Calanus plumchrus	708	.	11993	26316	.	7803.4	1.54
Oithona spp.	177	25532	6458	.	3636	7160.6	1.42
Centropages mcmurrichi	.	.	922	.	13333	2851	.56
Microcalanus pygmaeus	.	.	.	13158	.	2631.6	.52
Monstrillia spp.	.	386	.	2631	.	603.4	.12
Calanus cristatus	531	386	.	.	.	183.4	.04

Table 54. Kinds and density (no./1000 m^3) of copepod species from bongo (333μ) samples, station 2, Chiniak Bay, Kodiak Archipelago, Alaska, 1978.

CRUISE DATE	1 4-02	3 4-23	5 6-03	7 6-30	9 8-03	$\bar{X}$	% of Total
Psuedocalanus spp.	129167	158444	336207	1684615	927835	647253.6	78.15
Acartia longiremis	694	5218	17241	88462	138144	49951.8	6.03
Calanus marshallae	694	73055	8621	76923	30928	38046	4.59
Acartia tumida	2083	44592	39871	84615	.	34232.2	4.13
Metridia pacifica	33333	12808	62500	11538	26804	29396.6	3.55
Centropages mcmurrichi	694	1898	9698	57692	6186	15233.6	1.84
Calanus plumchrus	13889	949	10776	.	.	30736.8	.62
Scolecithricella minor	14583	.	.	.	.	2916.6	.35
Oithona spp.	.	949	1077	.	6186	1638.8	.20
Monstrillia spp.	694	.	7543	.	.	1647.4	.20
Scaphocalanus spp.	694	2846	3233	.	.	1354.6	.16
Eucalanus bungii	.	.	.	3846	.	1538.4	.09
Aetidius armatus	1389	.	.	.	.	269.8	.03
Metridia longa	694	474	.	.	.	584	.03
Calanus cristatus	694	.	.	.	.	138.8	.02

Table 55. Kinds and density (no./1000 m^3) of copepod species from bongo (333μ) samples, station 2, Kiliuda Bay, Kodiak Archipelago, Alaska, 1978.

CRUISE DATE	1 4-06	3 4-24	5 6-04	7 7-14	9 8-07	$\bar{X}$	% of Total
Psuedocalanus spp.	.	331218	90398	1124365	220323	353260.8	74.24
Acartia longiremis	.	21574	38062	182741	81835	64842.4	13.63
Calanus marshallae	.	59645	3893	35533	22482	24310.6	5.12
Acartia tumida	.	30457	6488	12690	.	9927	2.09
Centropages mcmurrichi	.	.	5623	93909	31475	9281.4	1.95
Eucalanus bungii	.	.	.	40609	2698	8661.4	1.82
Metridia pacifica	.	10152	1730	10152	3597	5126.2	1.08
Calanus plumchrus	.	1269	.	.	.	253.8	.05
Epilabidocera spp.	.	.	.	.	899	179.8	.04

Table 56. Kinds and density (no./1000 m^3) of copepod species from bongo (333μ) samples, station 2, Kaiugnak Bay, Kodiak Archipelago, Alaska, 1978.

CRUISE DATE	1 4-07	3 5-01	5 6-06	7 7-18	9 8-09	$\bar{X}$	% of Total
Psuedocalanus spp.	178879	177778	51282	515203	336336	251895.6	47.72
Calanus marshallae	398707	.	.	165541	69069	126663.4	23.99
Acartia longiremis	4310	19048	6114	50676	132132	42456	8.04
Centropages mcmurrichi	.	28571	1183	43919	97598	34254.2	6.49
Metridia pacifica	40948	6349	2170	55743	36036	28249.2	5.35
Acartia tumida	45259	44444	14398	8446	3003	23110	4.38
Eucalanus bungii	.	.	197	32095	19520	10362.4	1.96
Calanus plumchrus	2155	19048	9862	.	.	6213	1.18
Oithona spp.	.	3175	789	1689	9009	2932.4	.55
Scaphocalanus spp.	2155	.	.	.	3003	1031.6	.20
Monstrillia spp.	2155	.	.	.	.	431.0	.08
Calanus cristatus	.	.	.	.	1502	300.4	.06

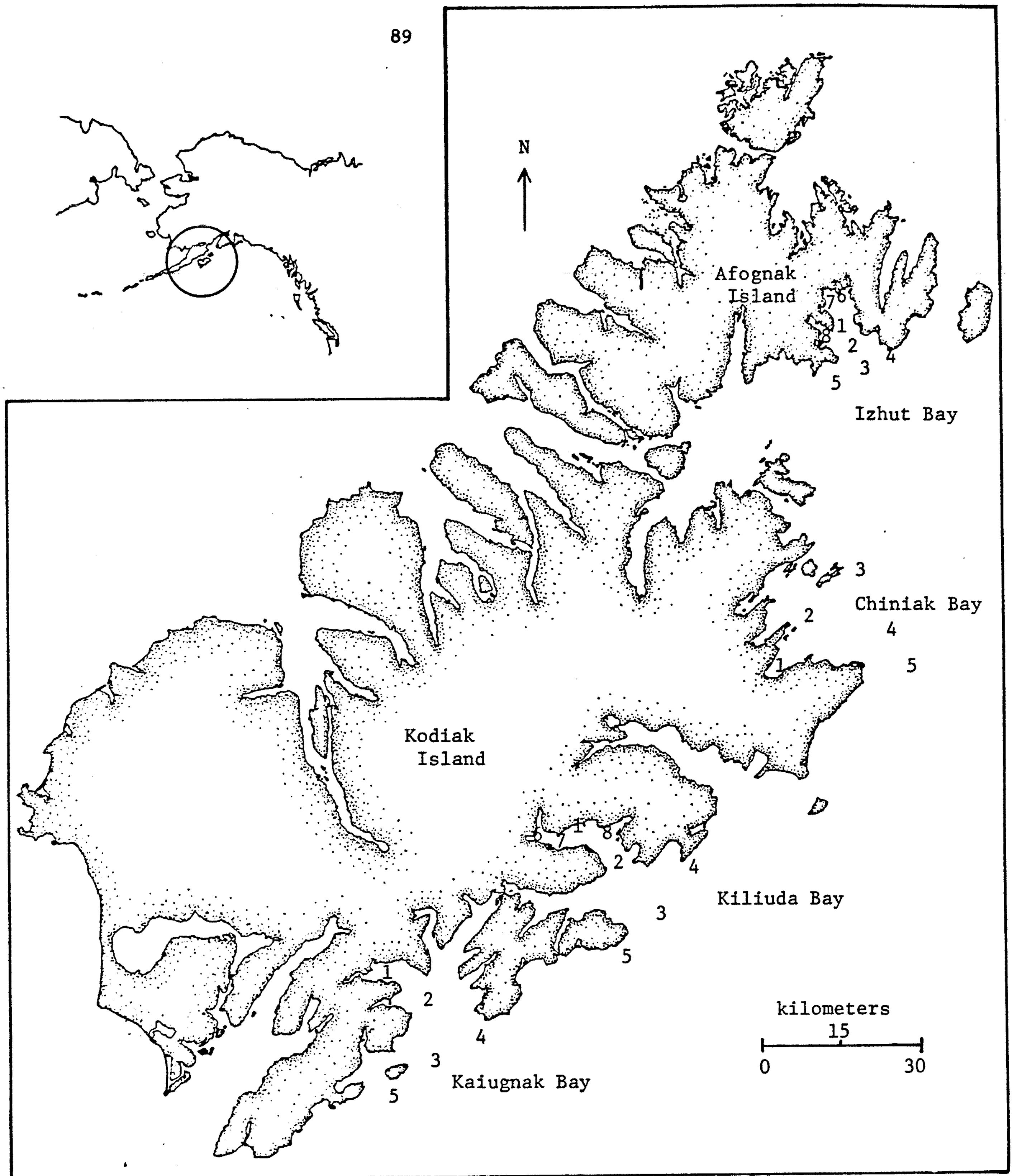

Fig. 1. Locations of bays and stations, Kodiak Archipelago nearshore zooplankton research, 1978-79.

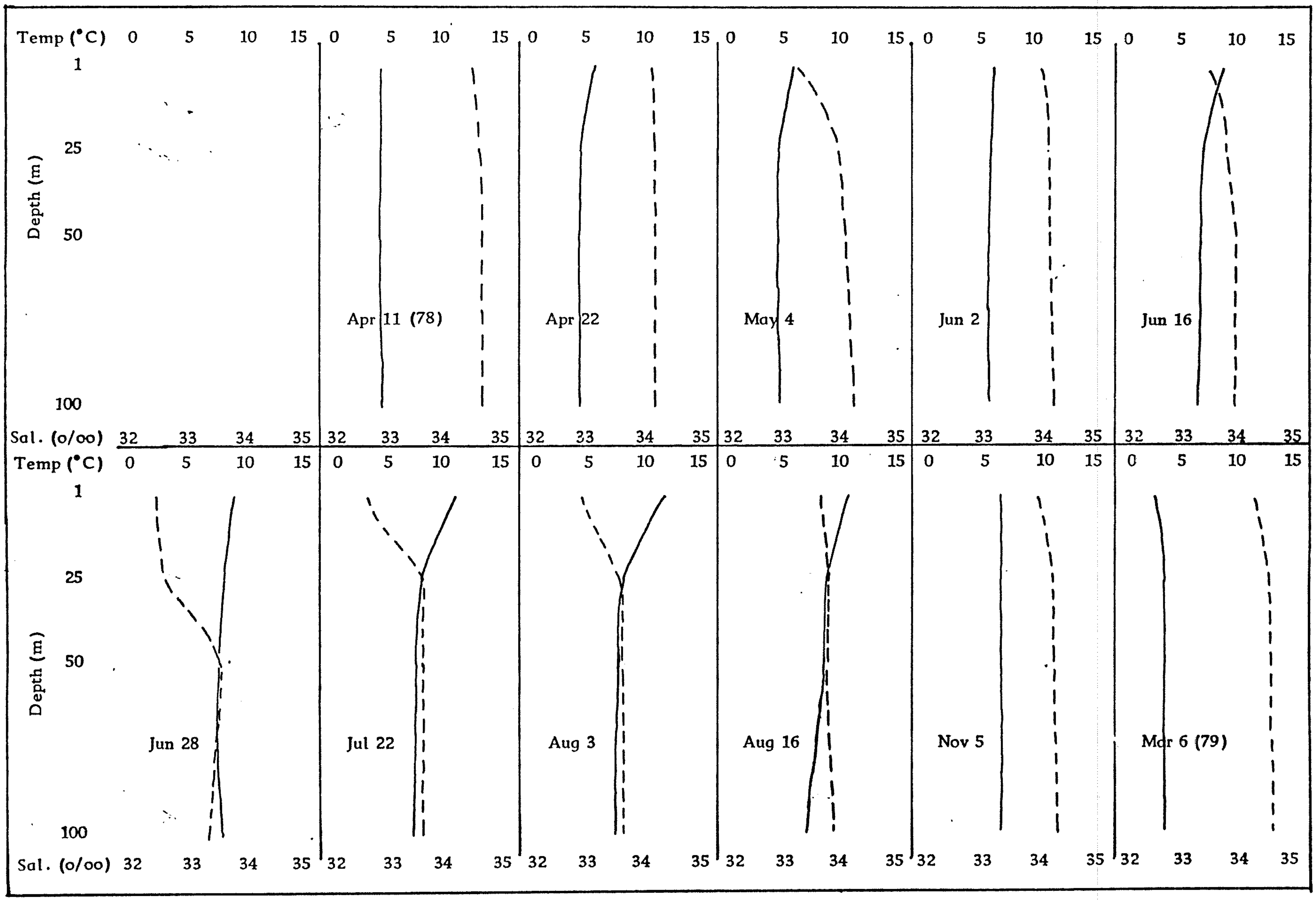

Fig. 2 . Temperature (—) and salinity (---) profiles for Izhut Bay, station 2, Kodiak Archipelago, Alaska, 1978-79.

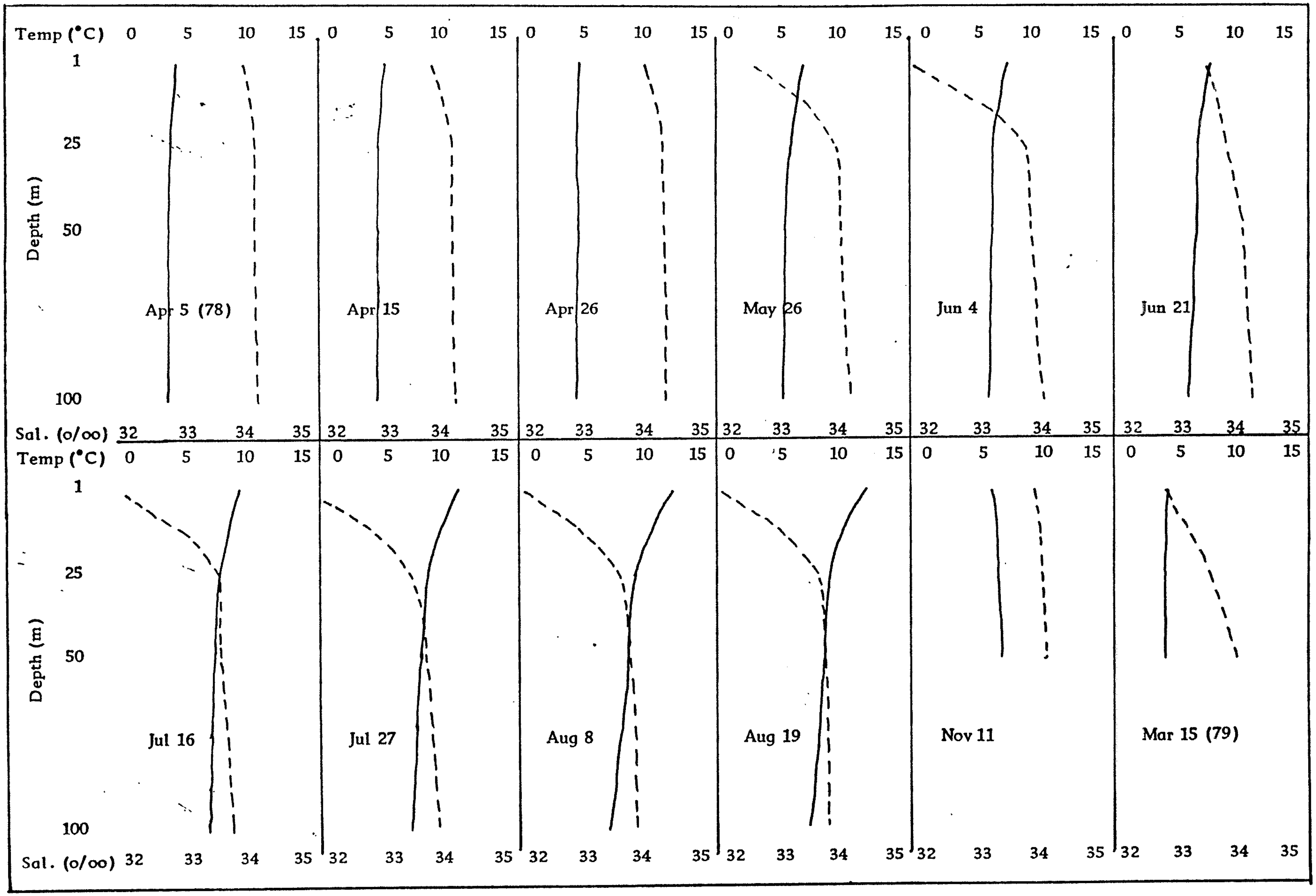

Fig. 3 . Temperature (—) and salinity (---) profiles for Kiliuda Bay, station 2, Kodiak Archipelago, Alaska, 1978-79.

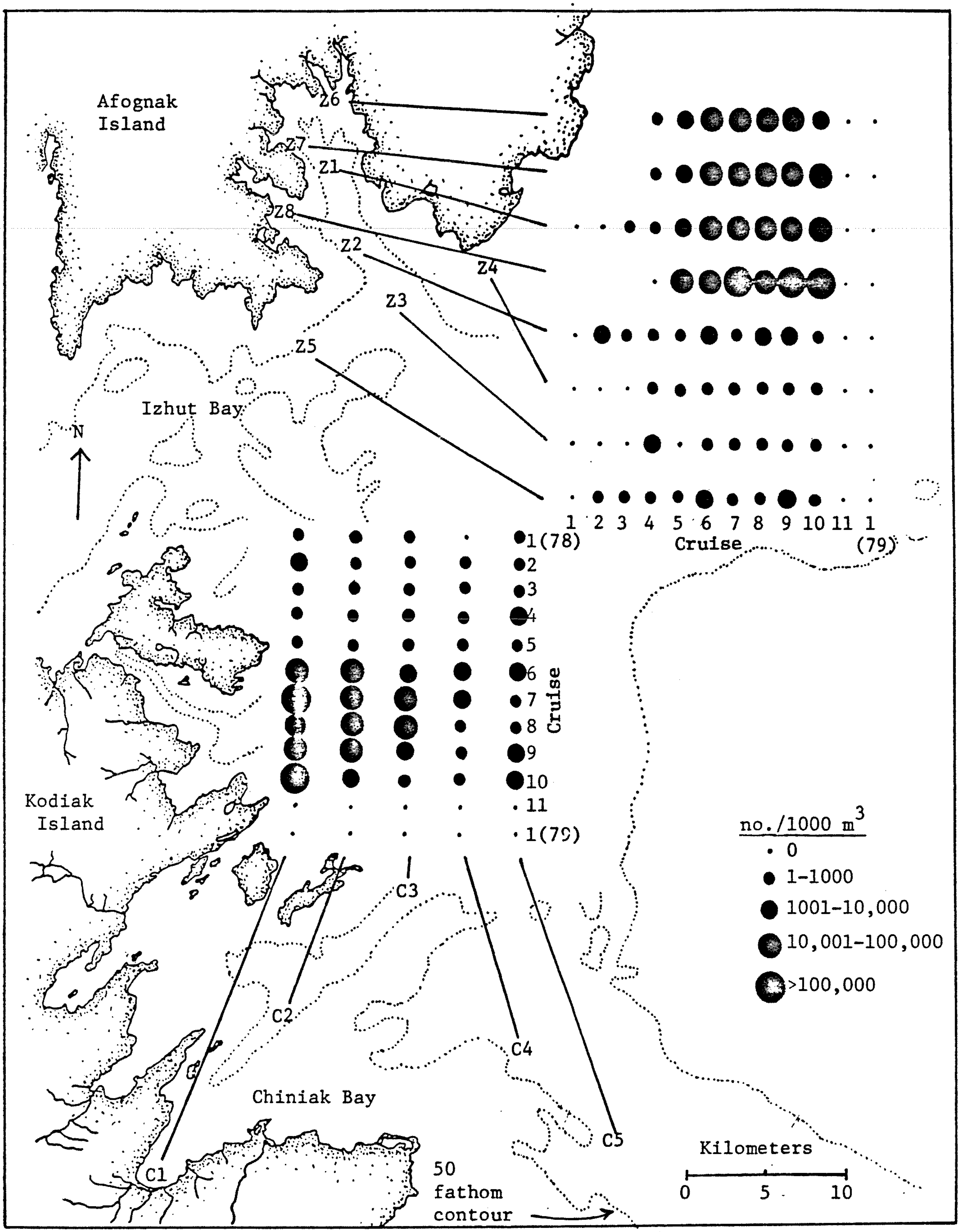

Fig. 4. Relative densities of fish eggs by cruise and station, from neuston (505μ) samples in Izhut and Chiniak bays, Kodiak Archipelago, Alaska, 1978-79.

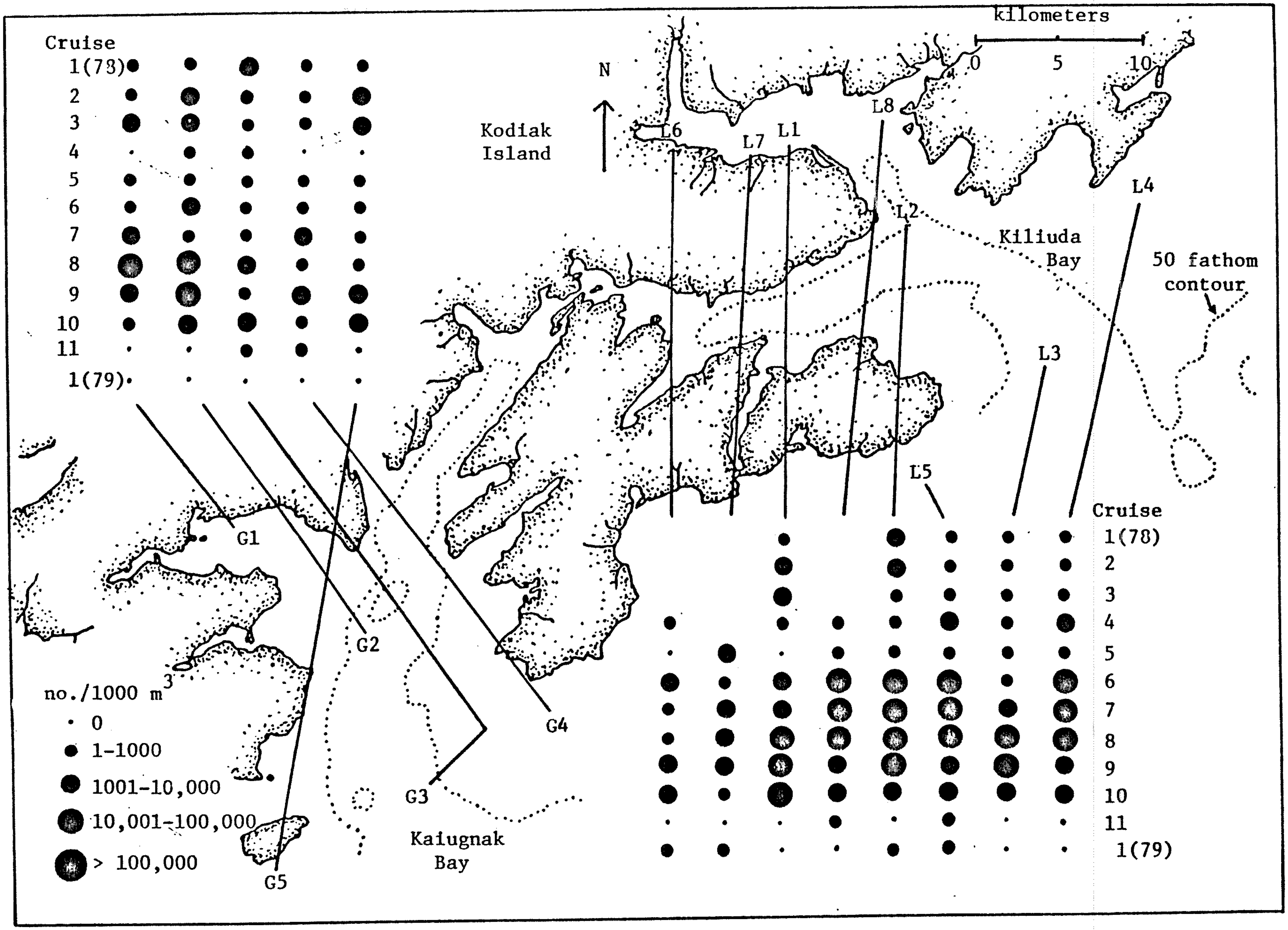

Fig. 5. Relative densities of fish eggs, by cruise and station, from neuston (505μ) samples, in Kiliuda and Kaiugnak bays, Kodiak Archipelago, Alaska, 1978-79.

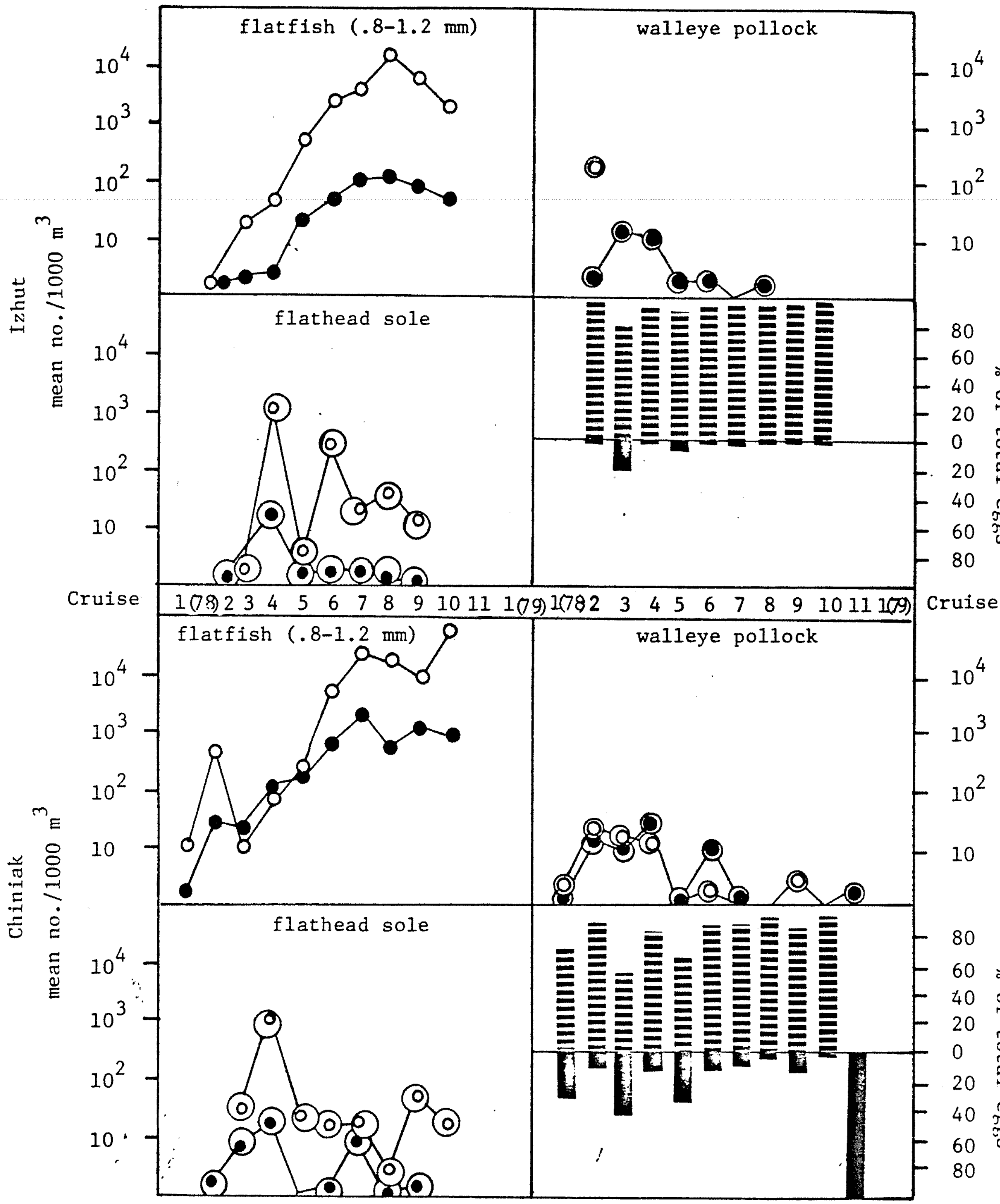

Fig. 6. Comparative mean densities and percent abundances for stations 1-5, by cruise, of .8-1.2 mm - flatfish, flathead sole, and walleye pollock eggs from 505μ - neuston (O,▤) and 505μ-bongo (●,█) samples, Izhut and Chiniak bays, Kodiak Archipelago, Alaska, 1978-79. (Sum of two bars for each cruise equals 100%)

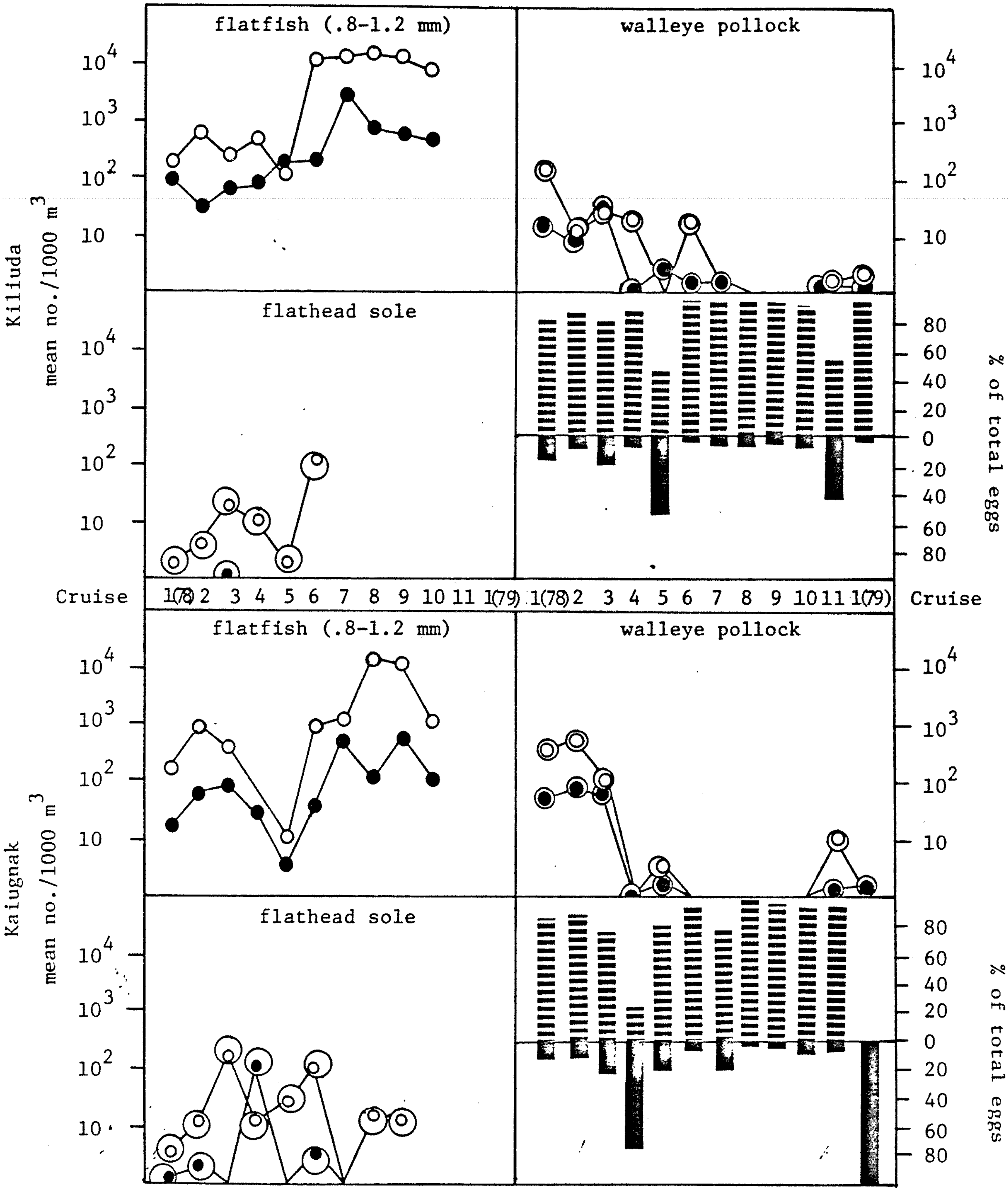

Fig. 7. Comparative mean densities and percent abundances for stations 1-5, by cruise, of .8-1.2 mm - flatfish, flathead sole and walleye pollock eggs from 505μ - neuston (O,▀) and 505μ - bongo (●,█) samples, Kiliuda and Kaiugnak bays, Kodiak Archipelago, Alaska, 1978-79. (Sum of two bars for each cruise equals 100%)

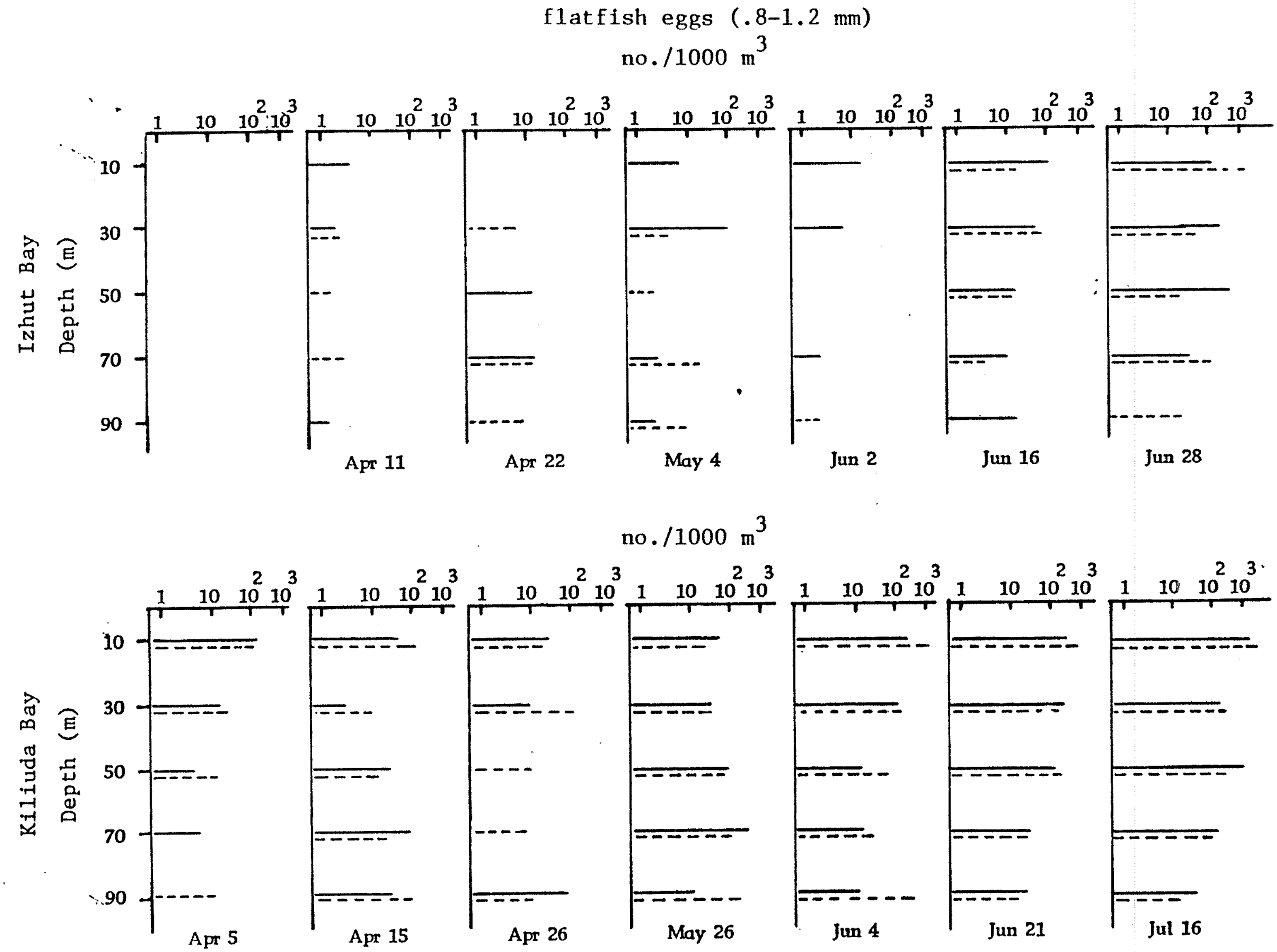

Fig. 8. Vertical distribution of flatfish eggs (.8-1.2 mm) from day (-) and night (---) Tucker trawl (505μ) catches in Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79.

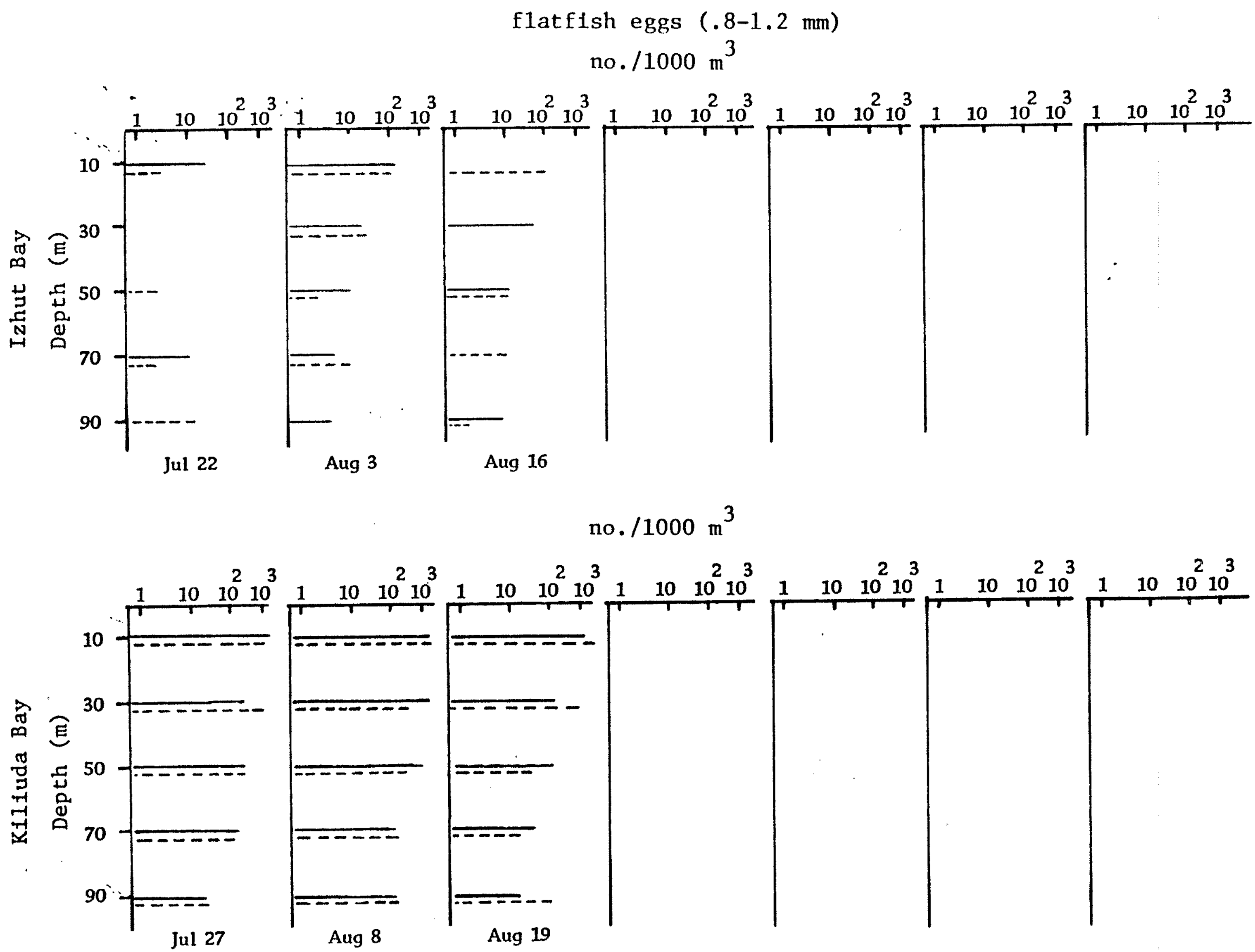

Fig. 8. Vertical distribution of flatfish eggs (.8-1.2 mm) from day (-) and night (---) Tucker trawl (505µ) catches in Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79 - continued.

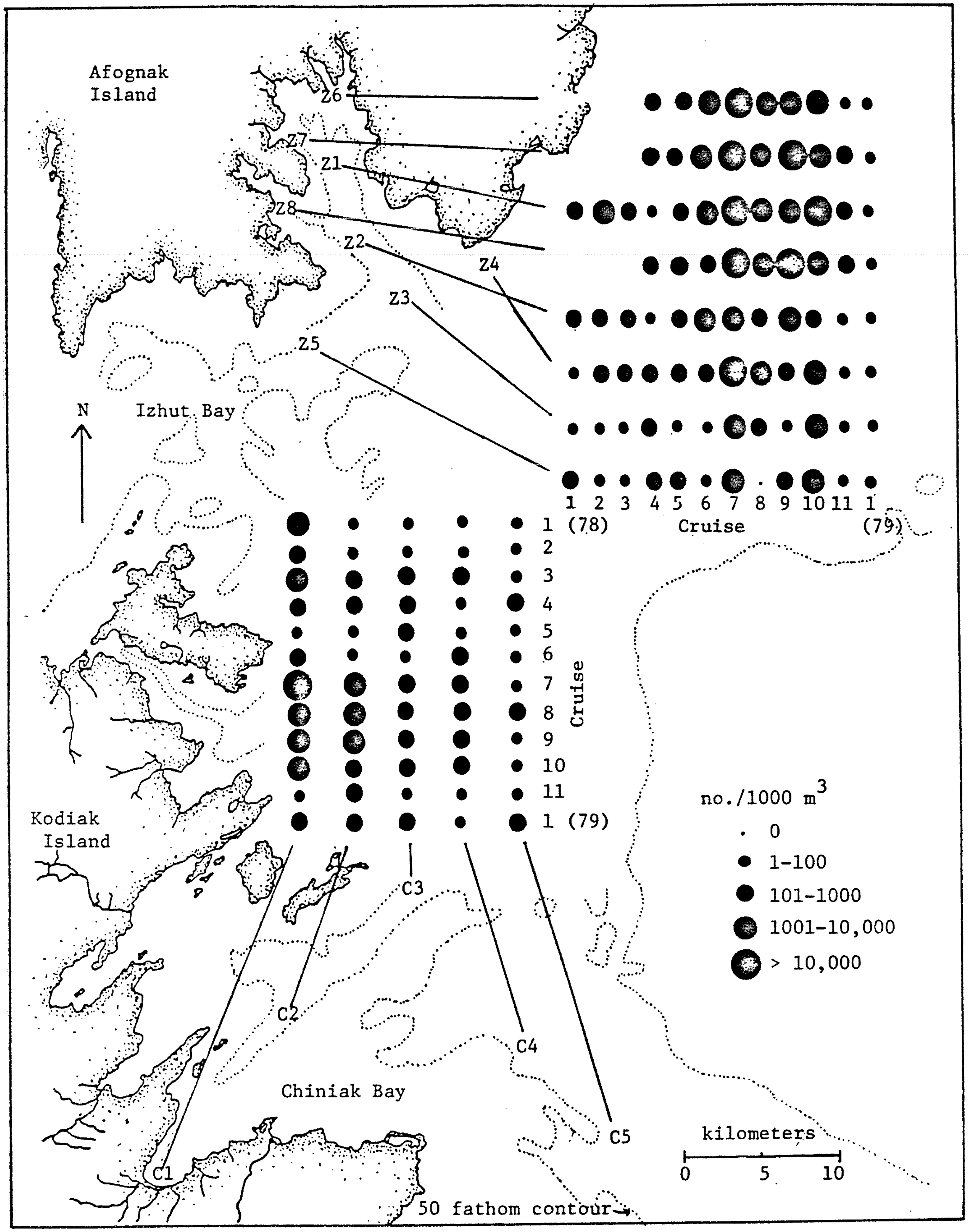

Fig. 9. Relative densities of fish larvae by cruise and station, from bongo (505μ) samples in Izhut and Chiniak bays, Kodiak Archipelago, Alaska, 1978-79.

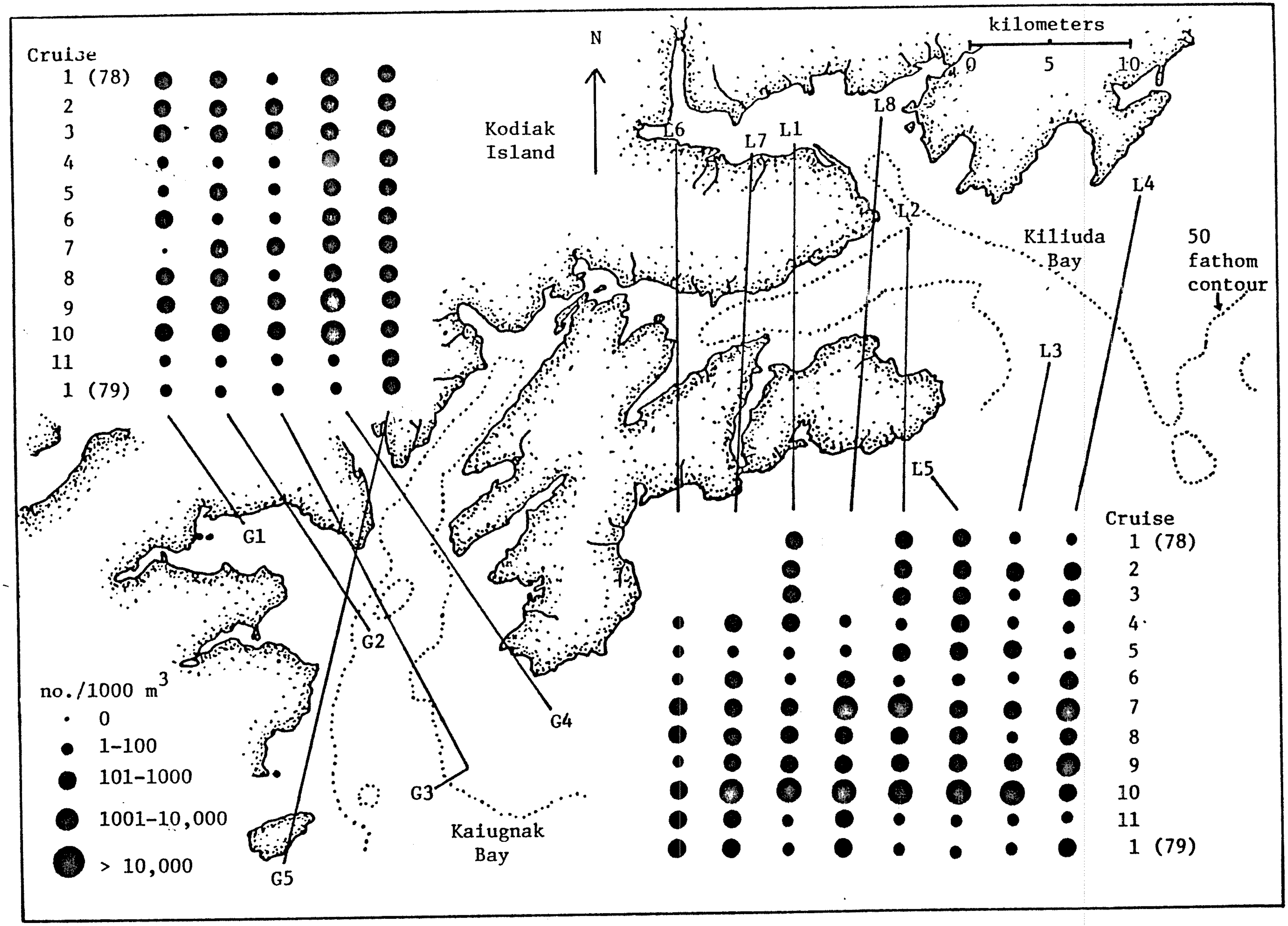

Fig. 10. Relative densities of fish larvae, by cruise and station, from bongo (505μ) samples, in Kiliuda and Kaiugnak bays, Kodiak Archipelago, Alaska, 1978–79.

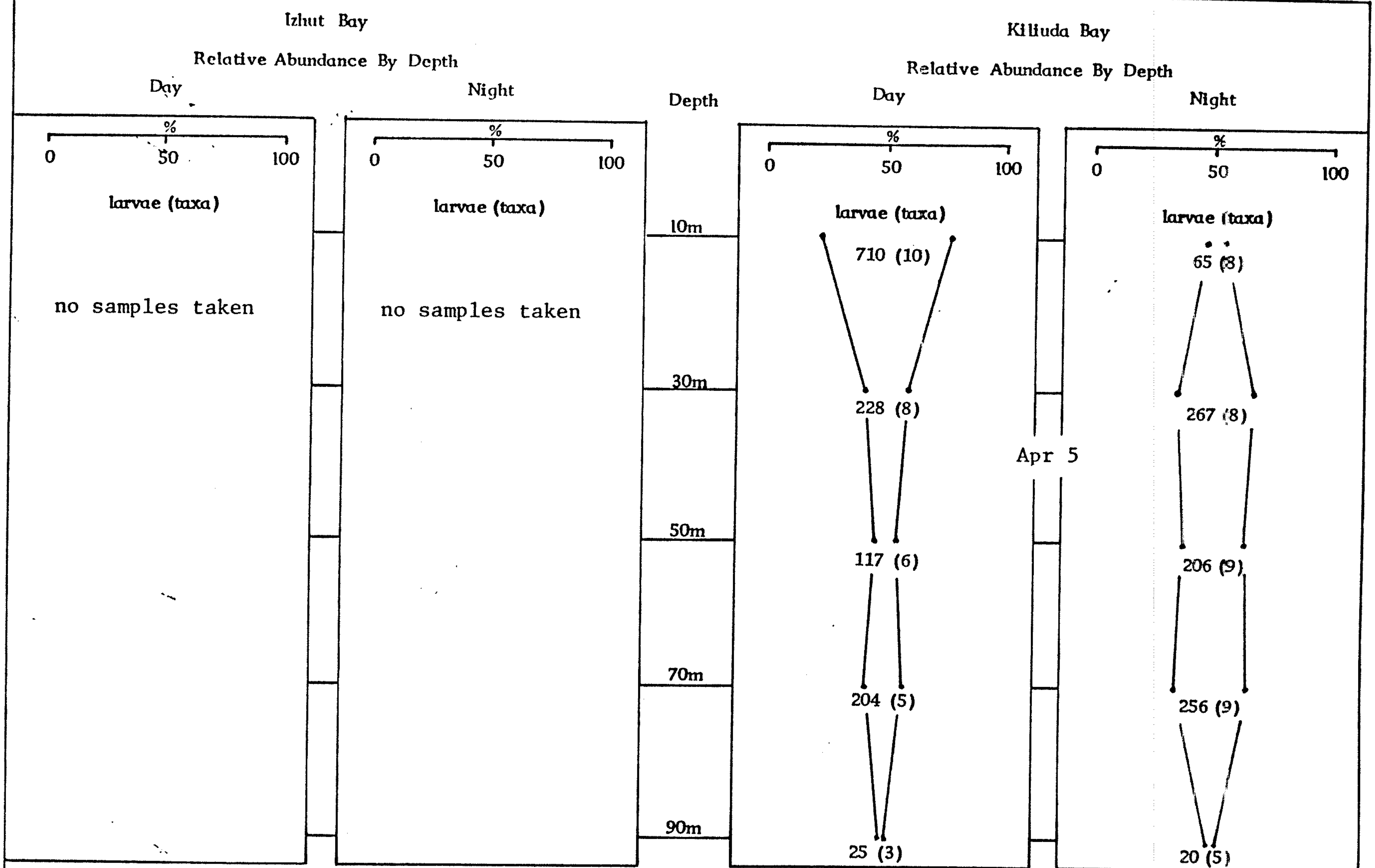

Fig. 11. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 1, 1978. Values are no./1000 m^3.

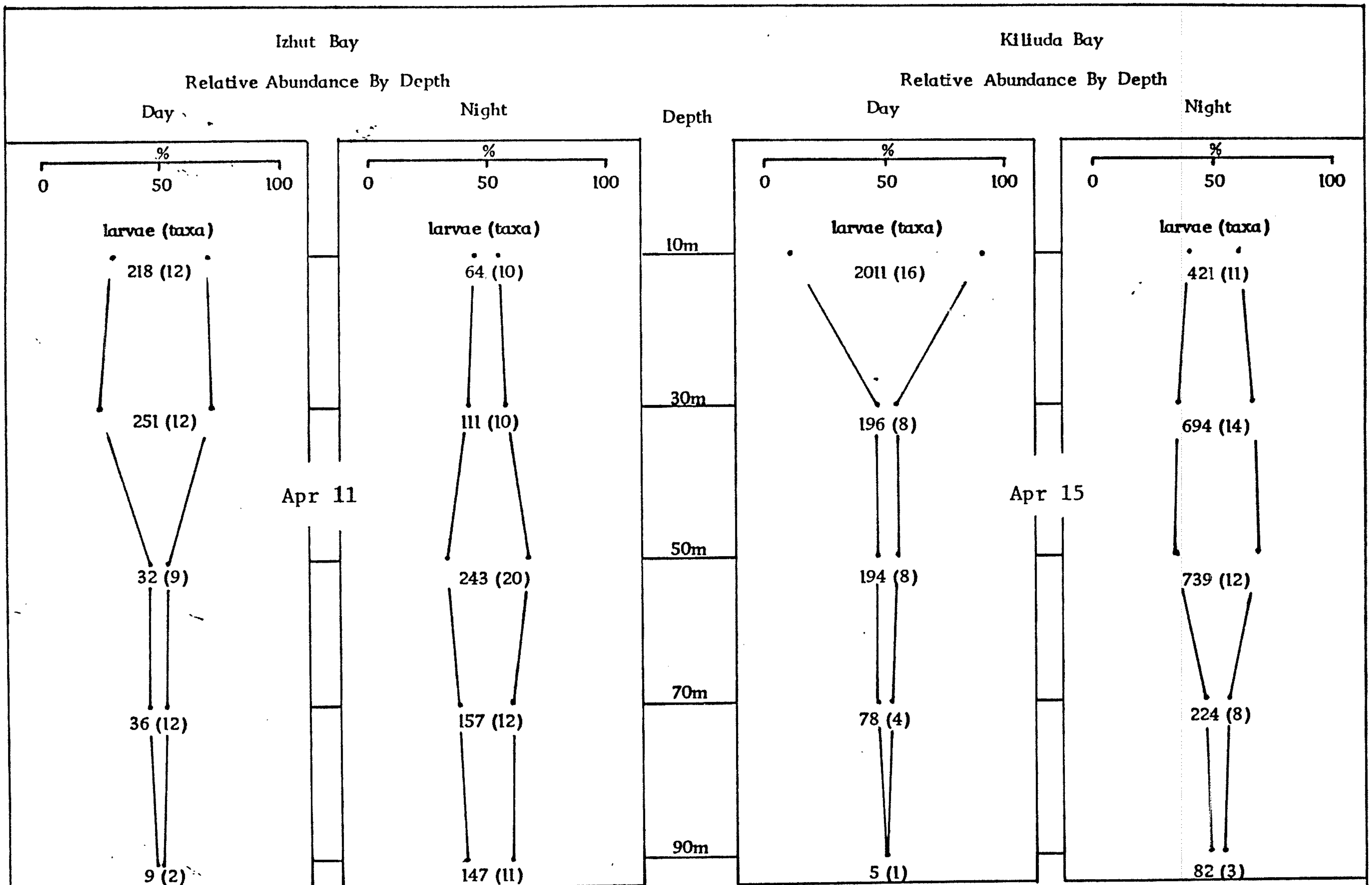

Fig. 12. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 2, 1978. Values are no./1000 m^3.

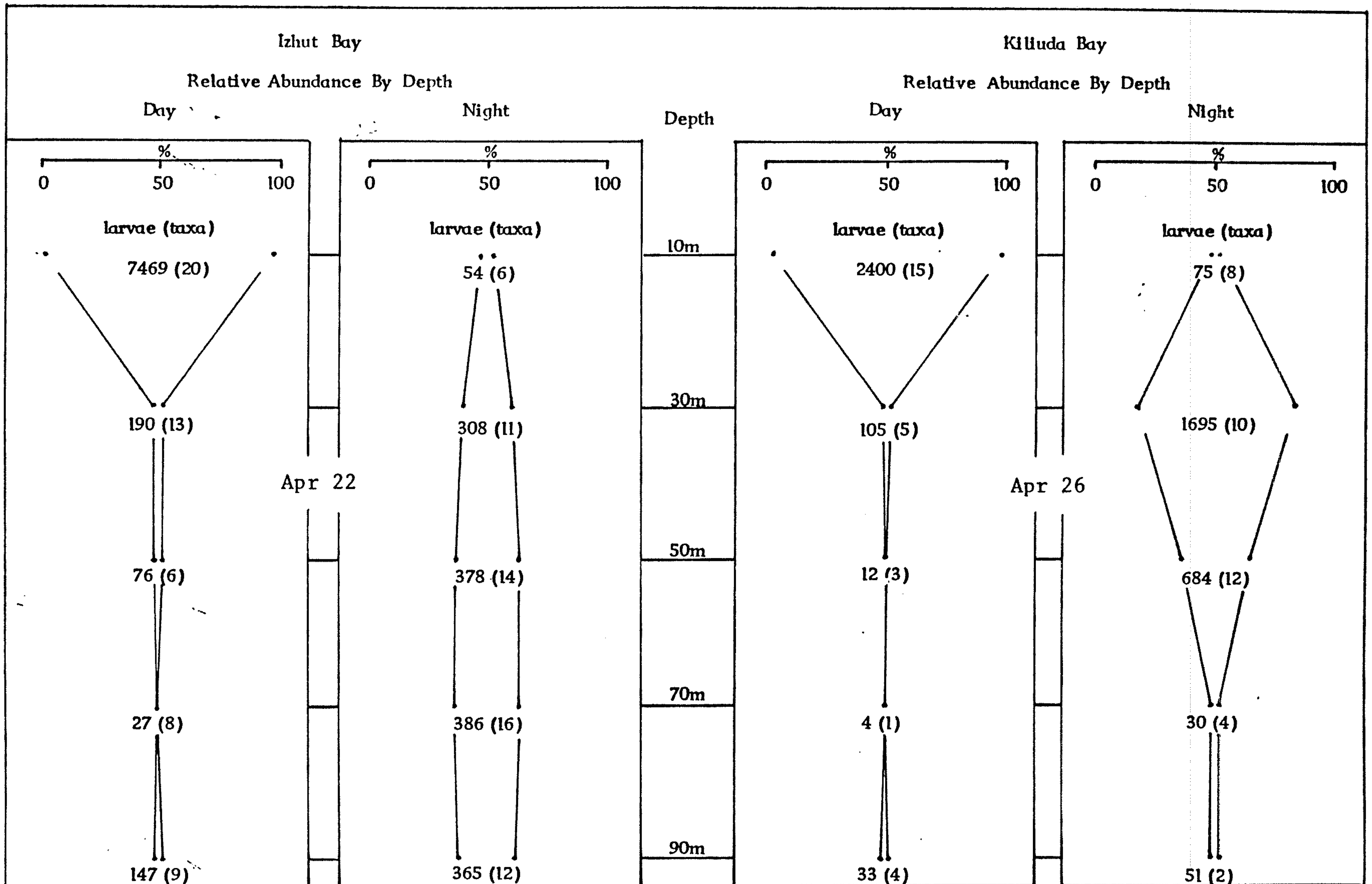

Fig. 13. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 3, 1978. Values are no./1000 m^3.

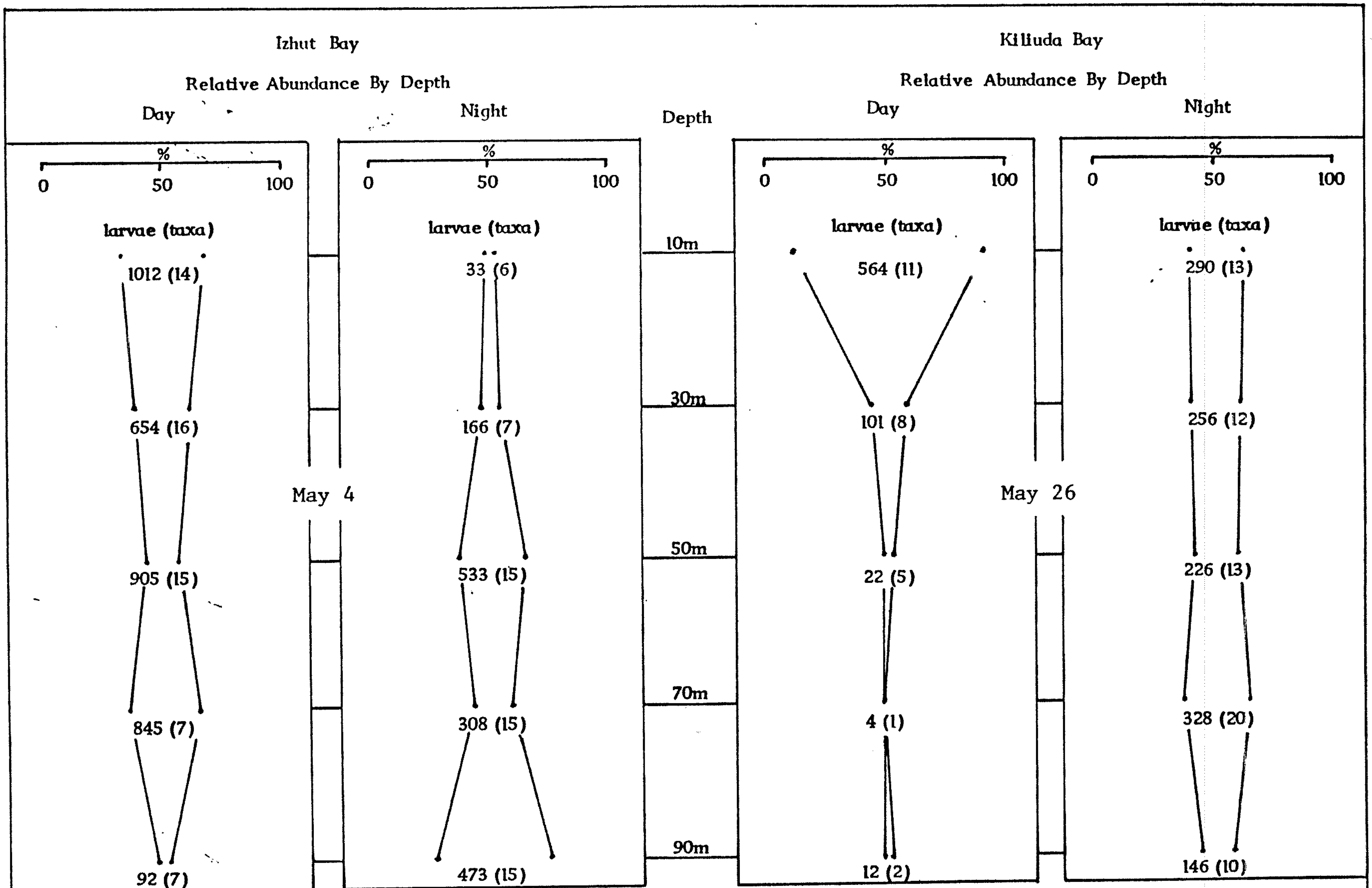

Fig. 14. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 4, 1978. Values are no./1000 m^3.

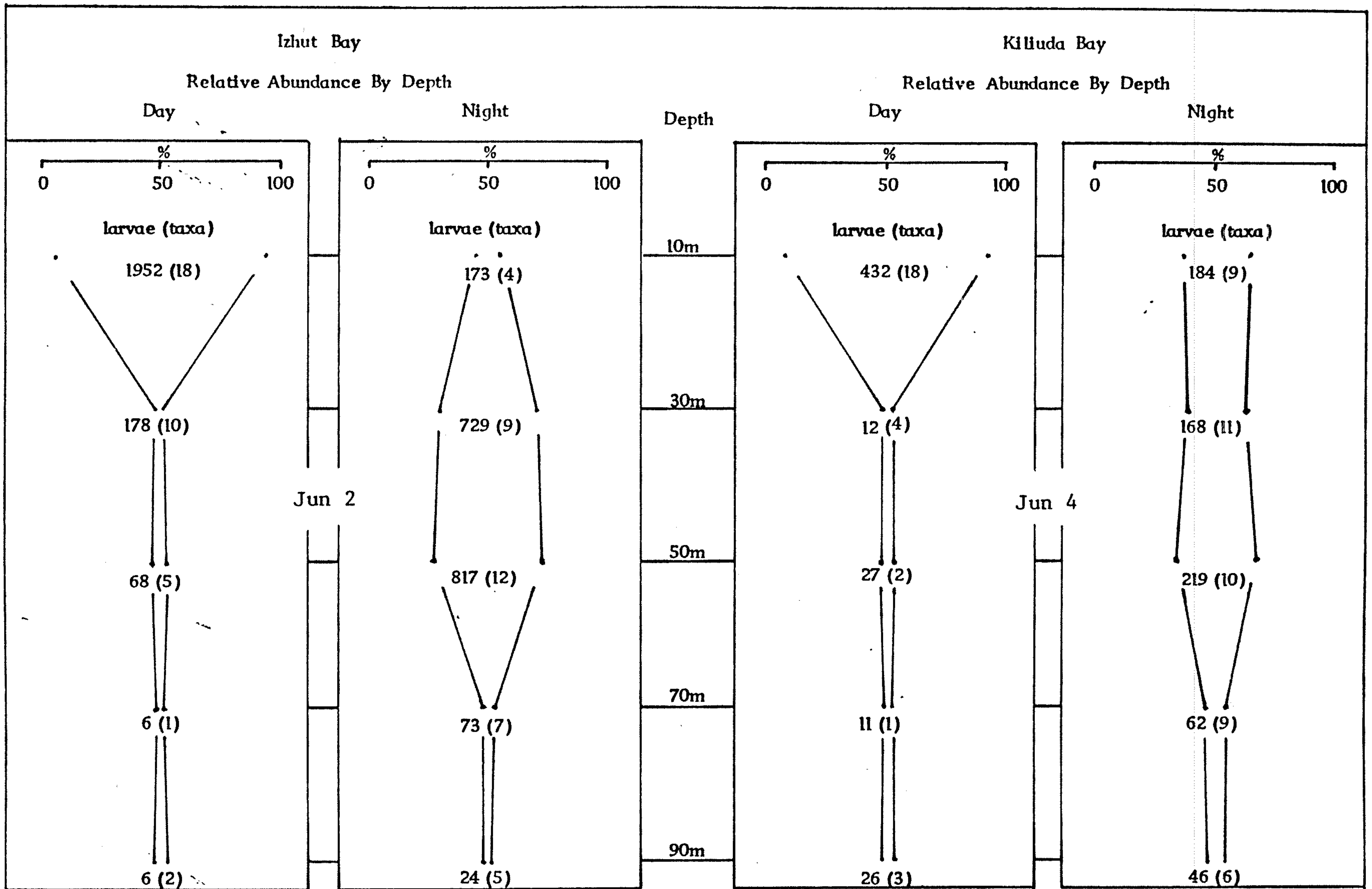

Fig. 15. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 5, 1978. Values are no./1000 m^3.

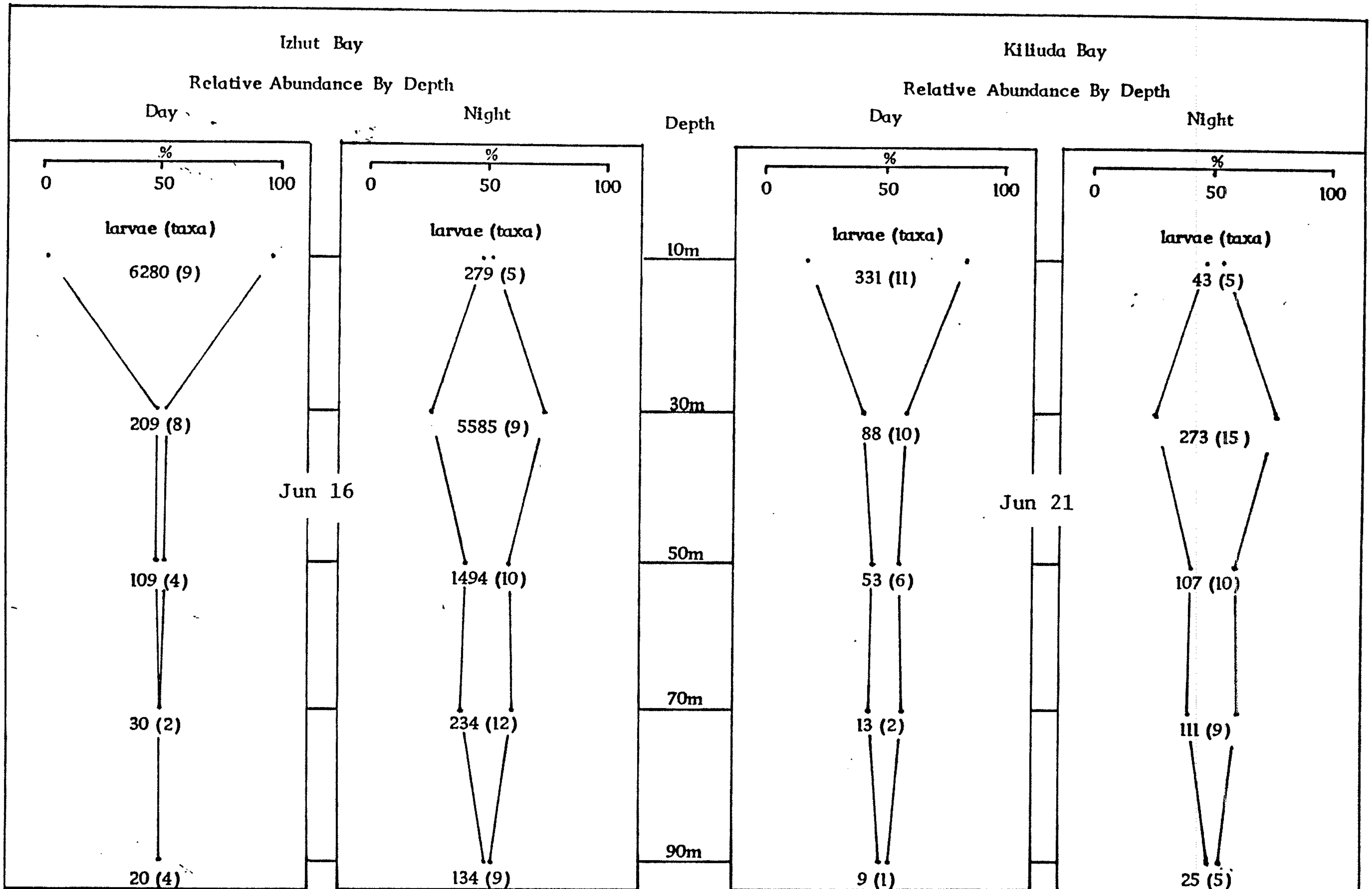

Fig. 16. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 6, 1978. Values are no./1000 m^3.

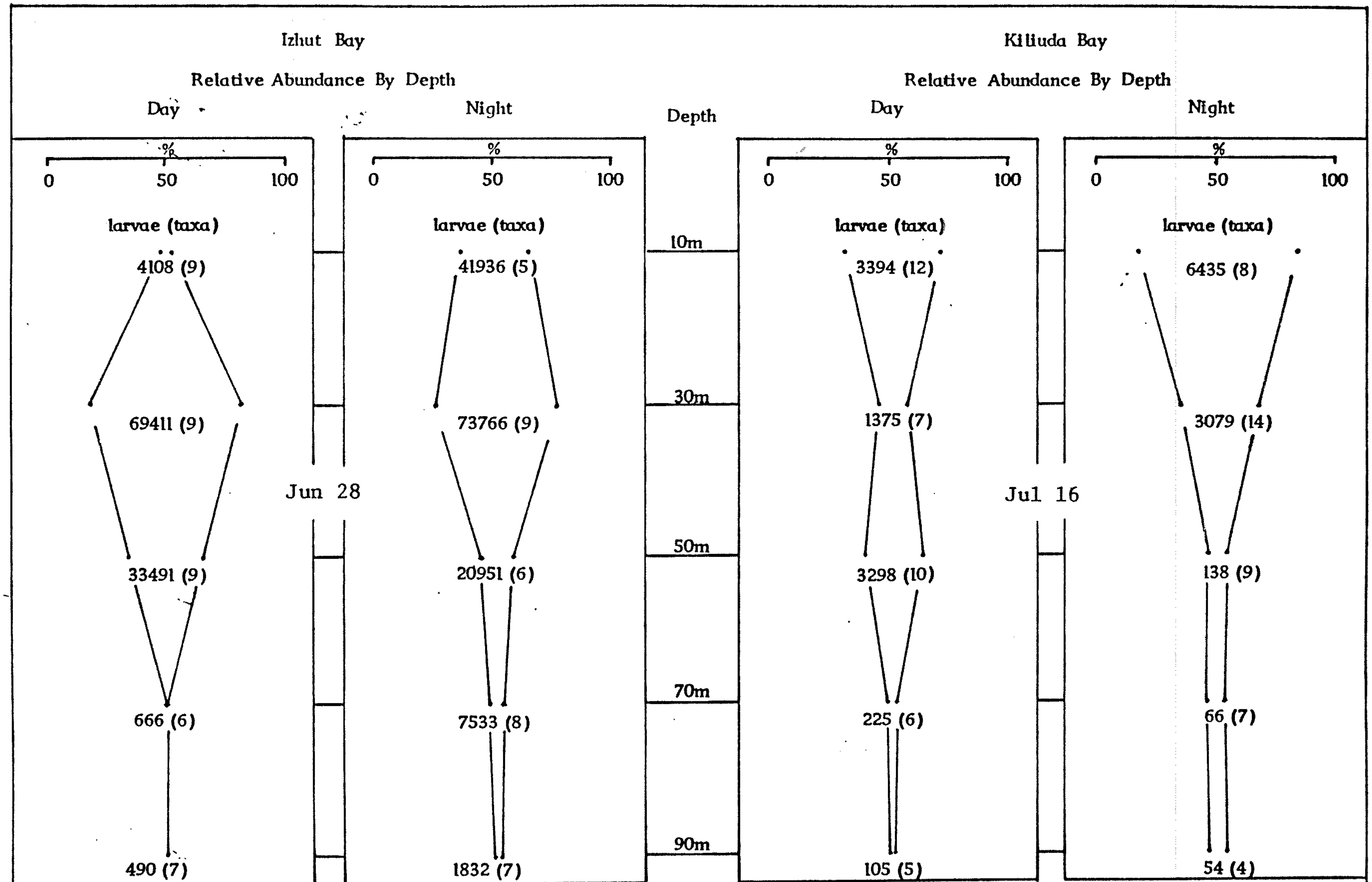

Fig. 17. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 7, 1978. Values are no./1000 m^3.

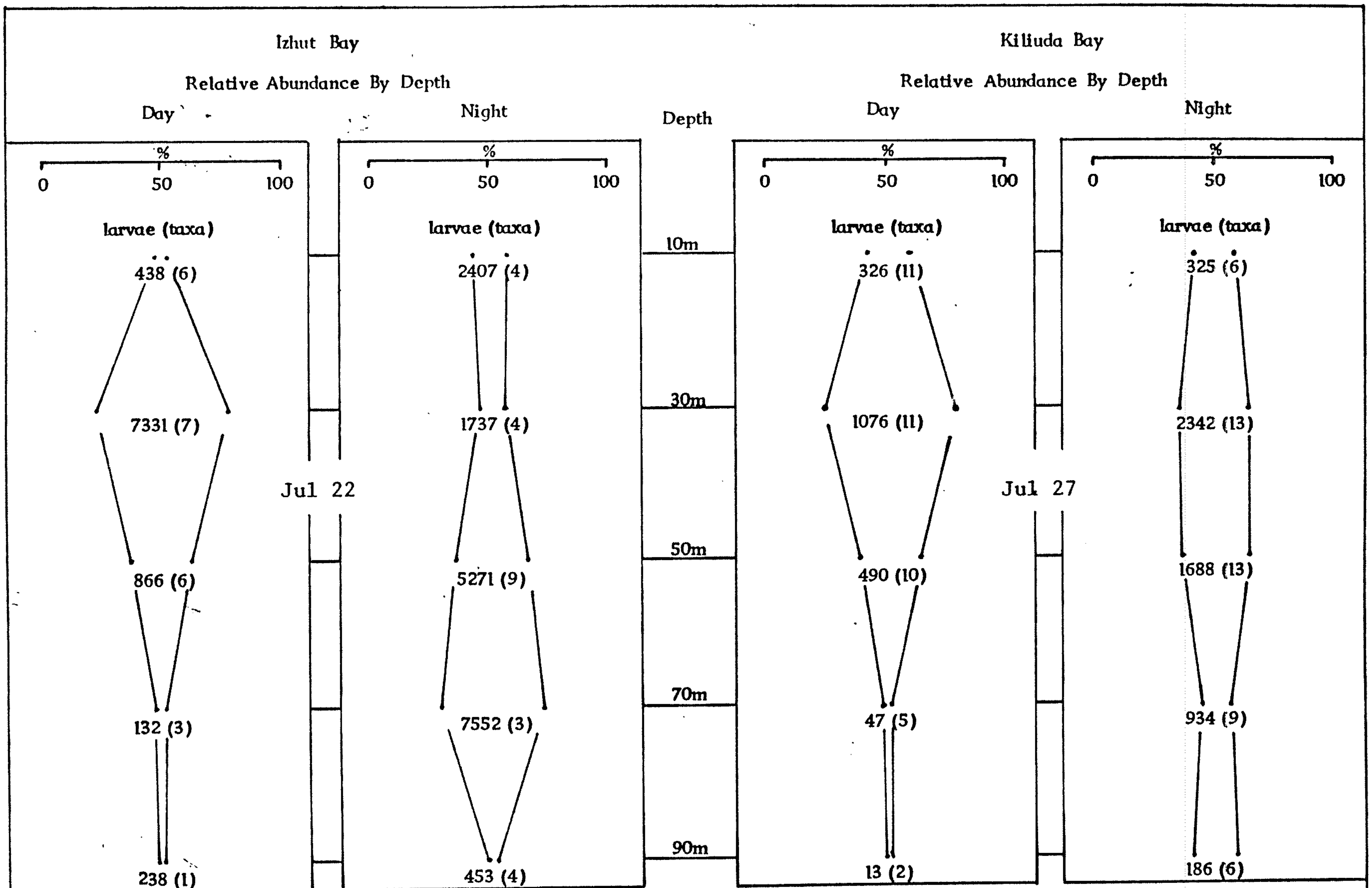

Fig. 18. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 8, 1978. Values are no./1000 m^3.

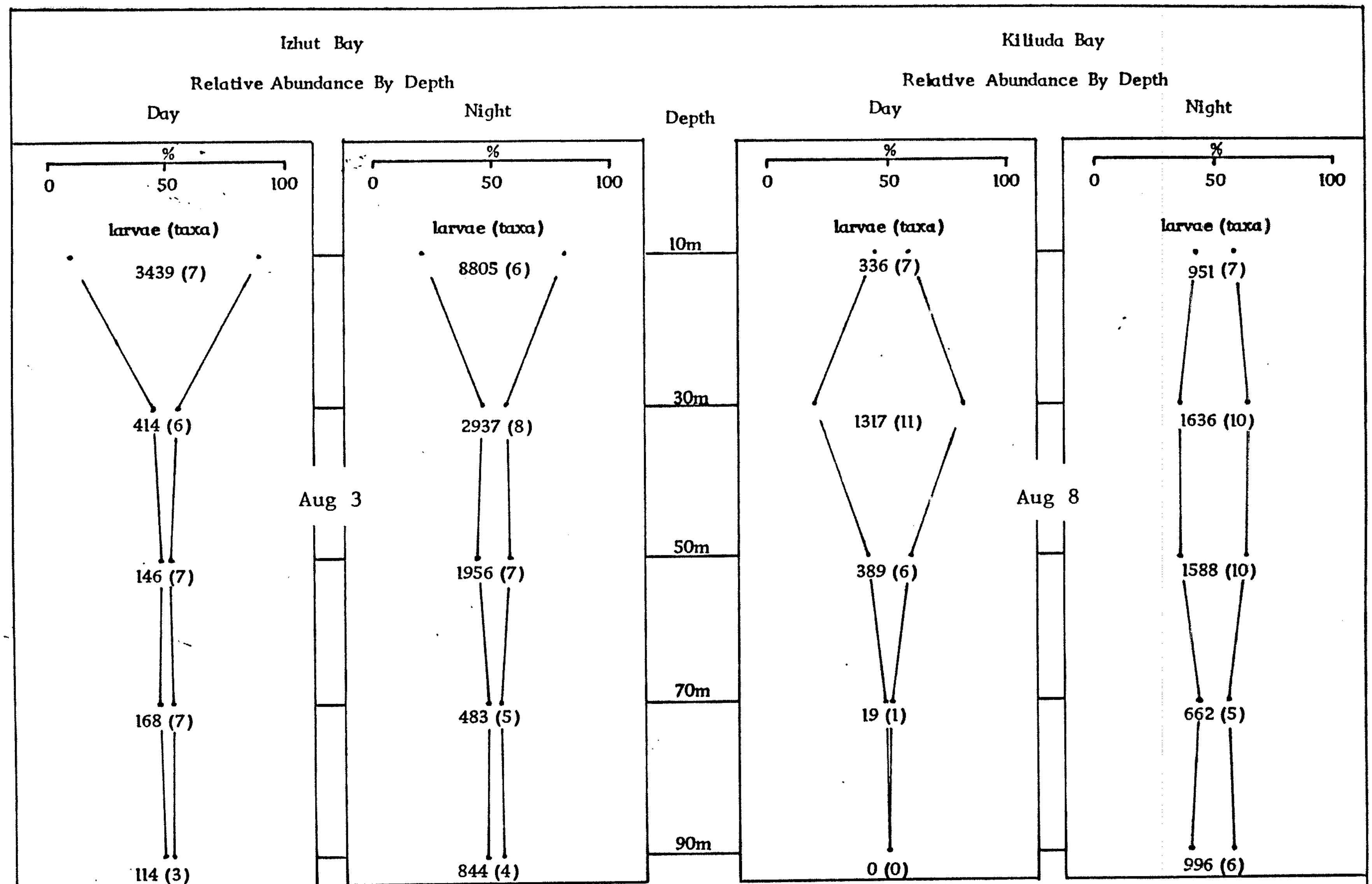

Fig. 19. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 9, 1978. Values are no./1000 m^3.

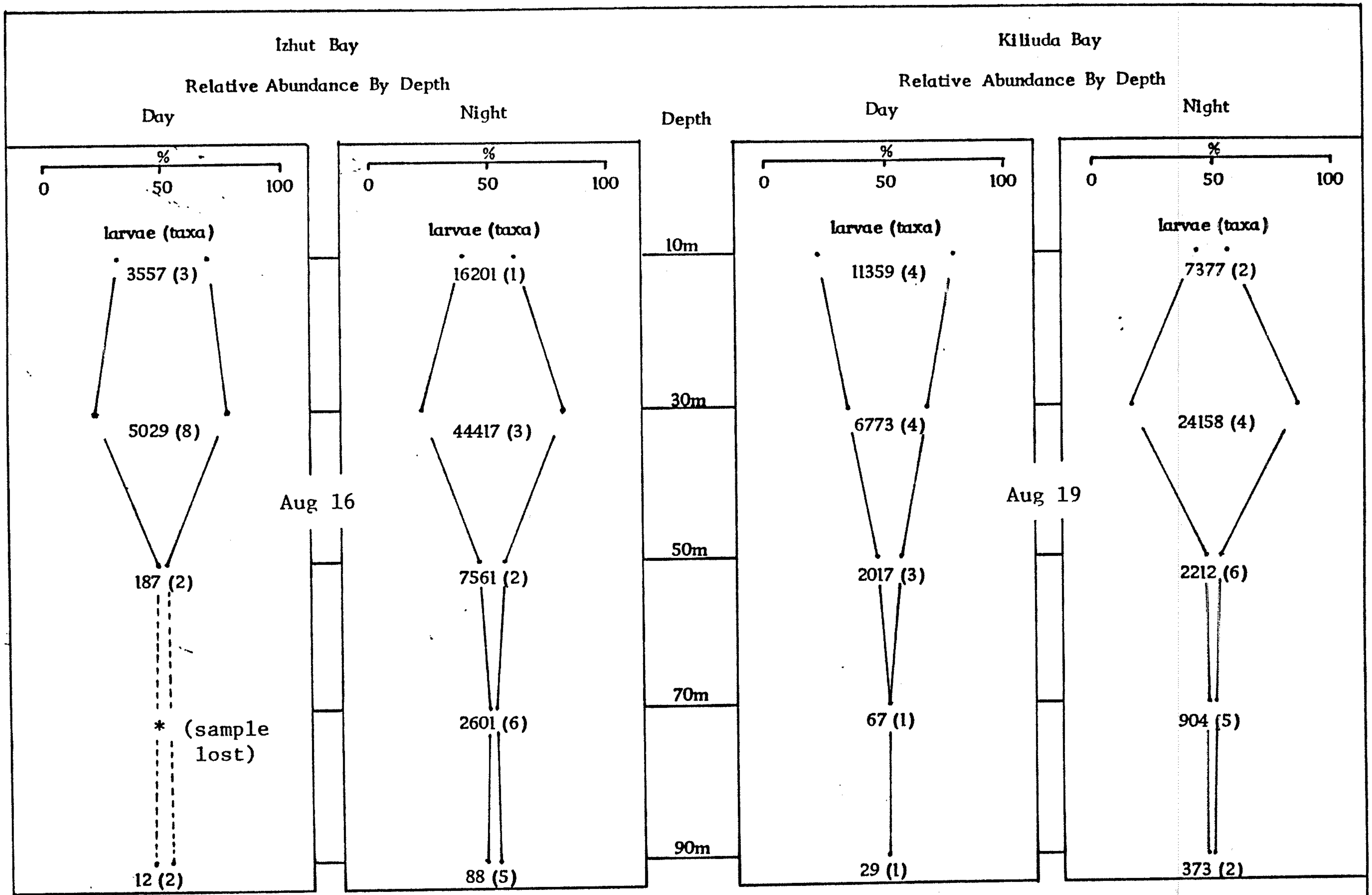

Fig. 20. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 10, 1978. Values are no./1000 m^3.

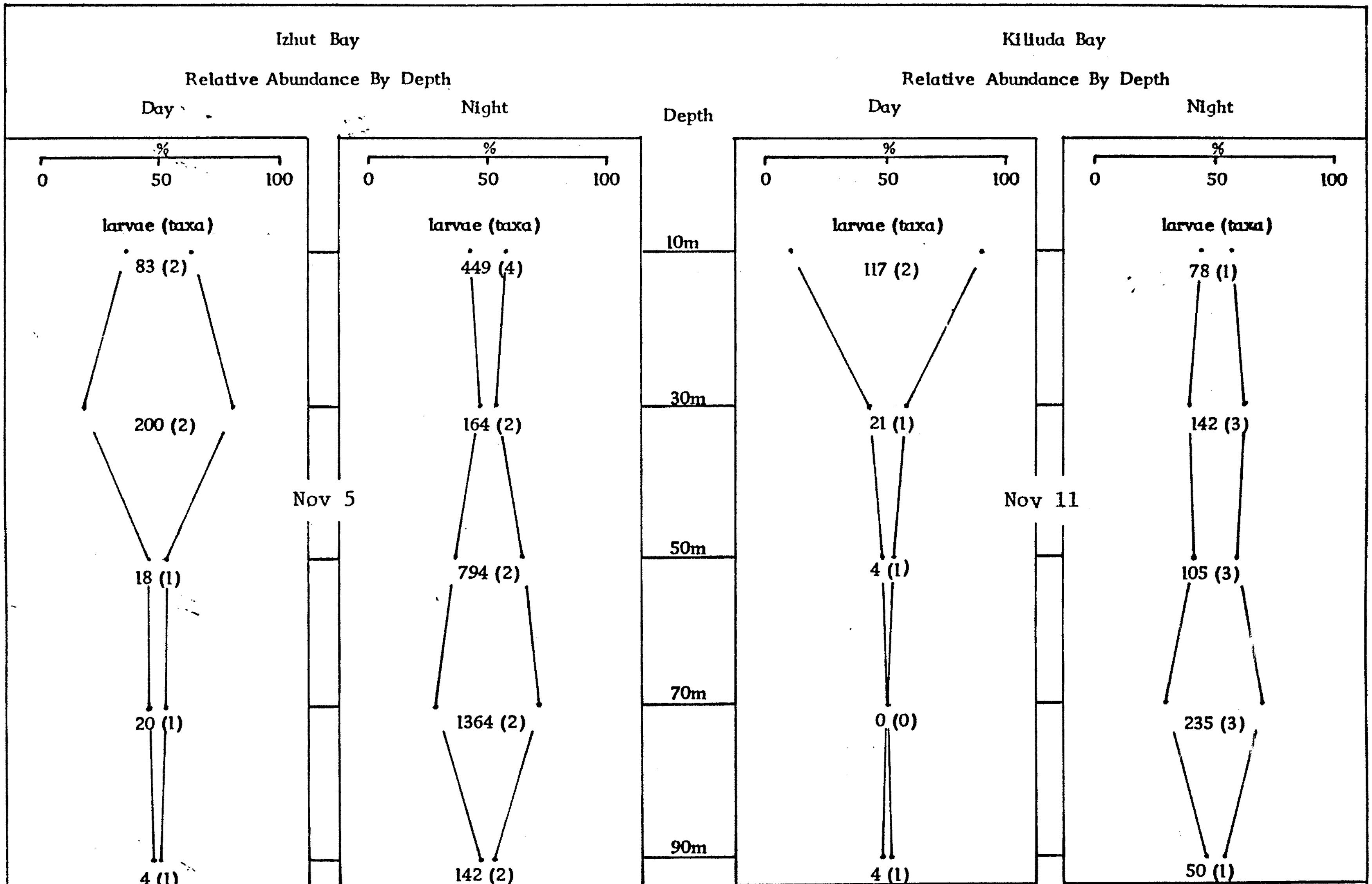

Fig. 21. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 11, 1978. Values are no./1000 m^3.

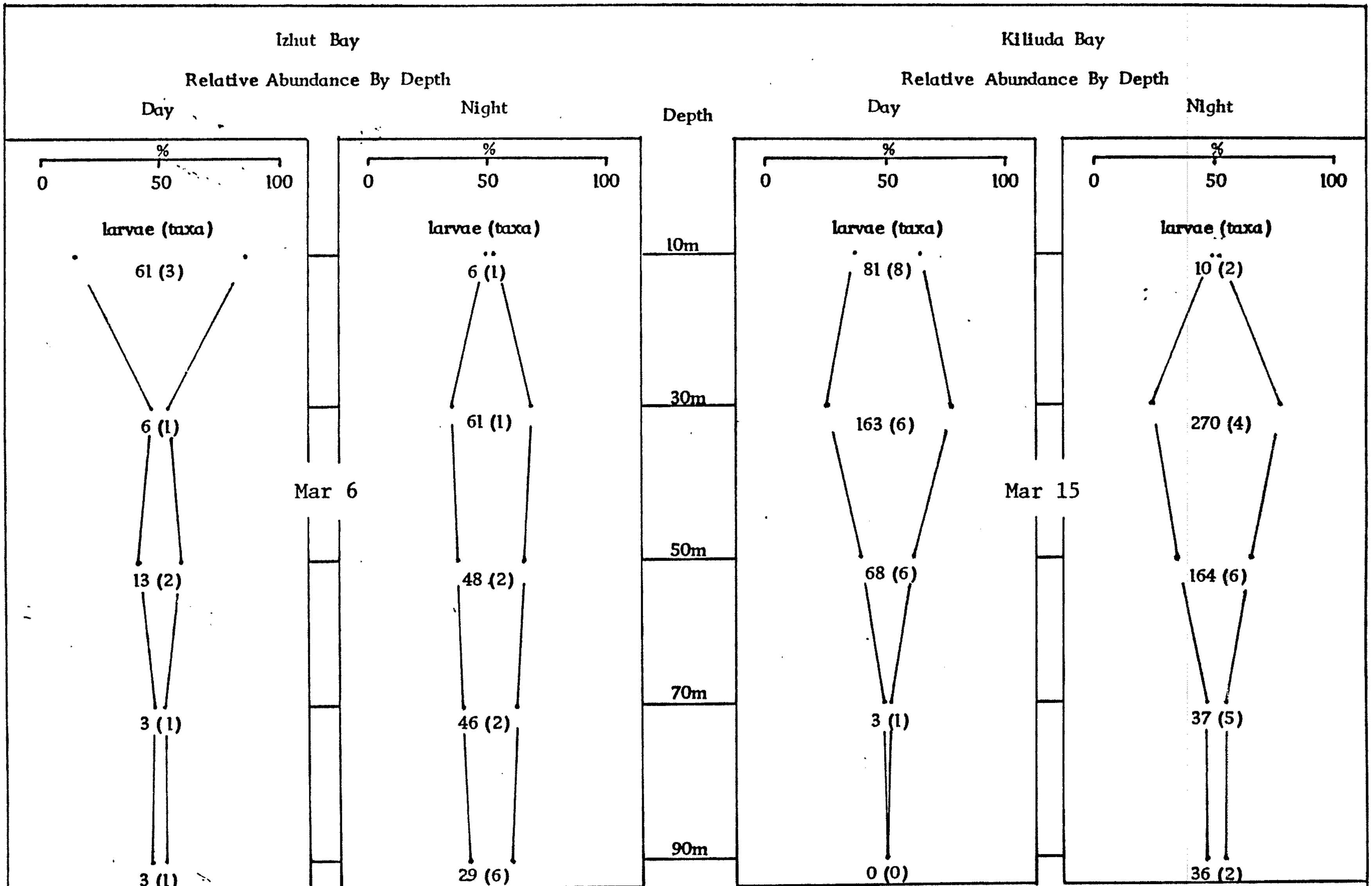

Fig. 22. Vertical distribution of larval fish from day and night Tucker trawl (505μ) catches, Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, Cruise 1, 1979. Values are no./1000 m^3.

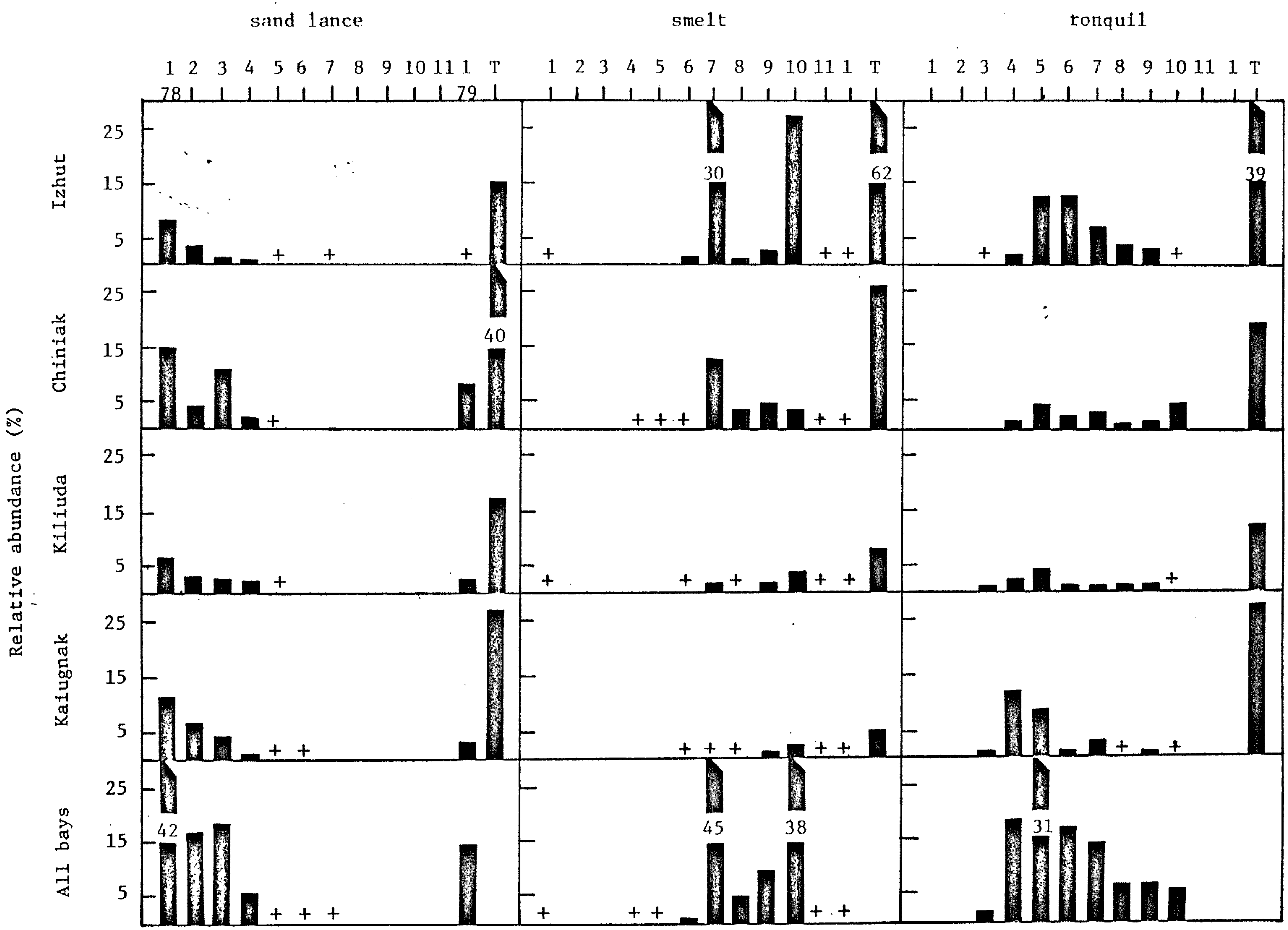

Fig. 23. Relative abundance, by bay and cruise, of sand lance, smelt and ronquil larvae, from bongo (505μ) samples, Kodiak Archipelago, Alaska, 1978-79. Percents based on values from stations 1-5.

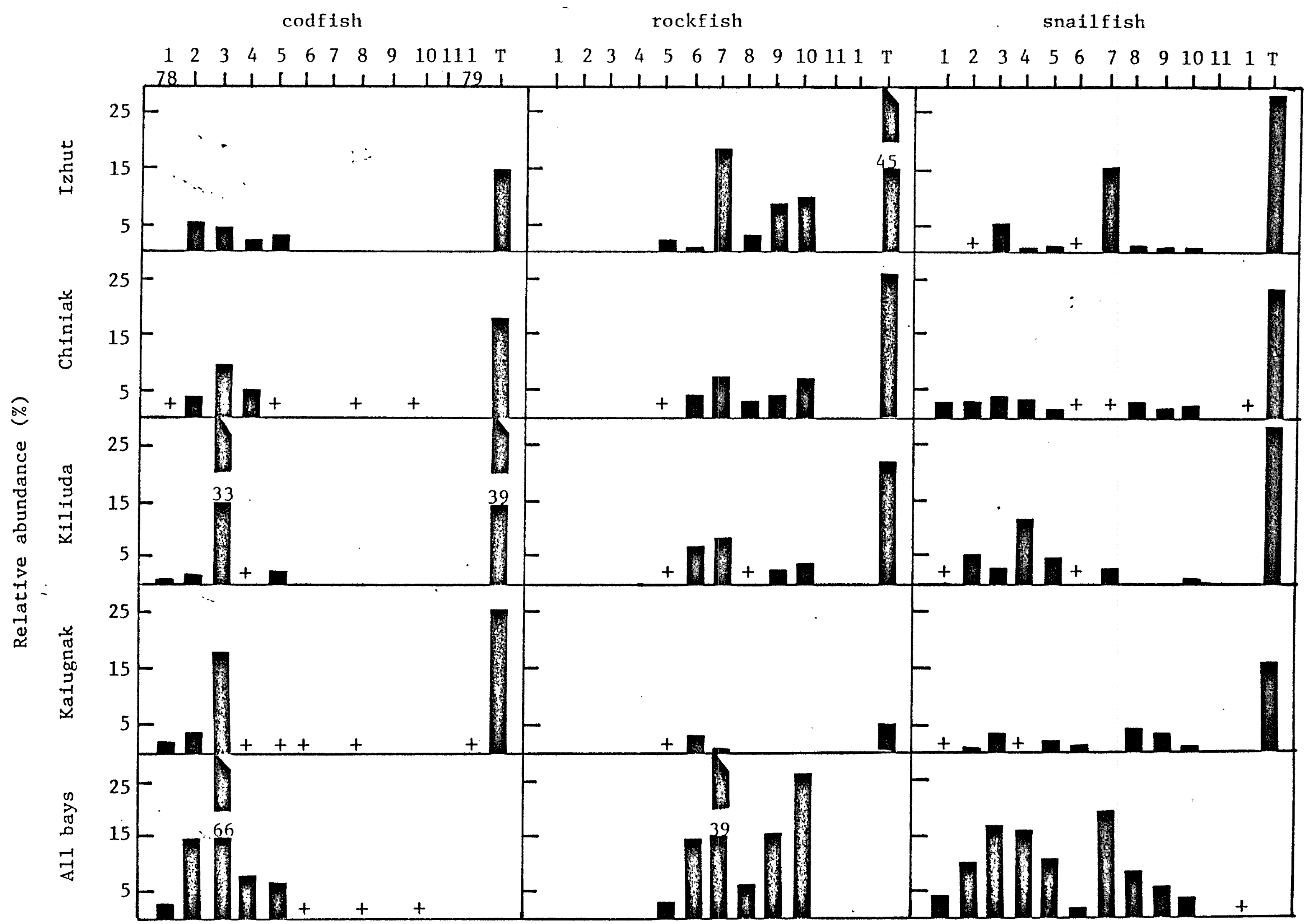

Fig. 24. Relative abundance, by bay and cruise, of larval codfish, rockfish, and snailfish from bongo (505μ) samples, Kodiak Archipelago, Alaska, 1978-79. Percents based on values from stations 1-5.

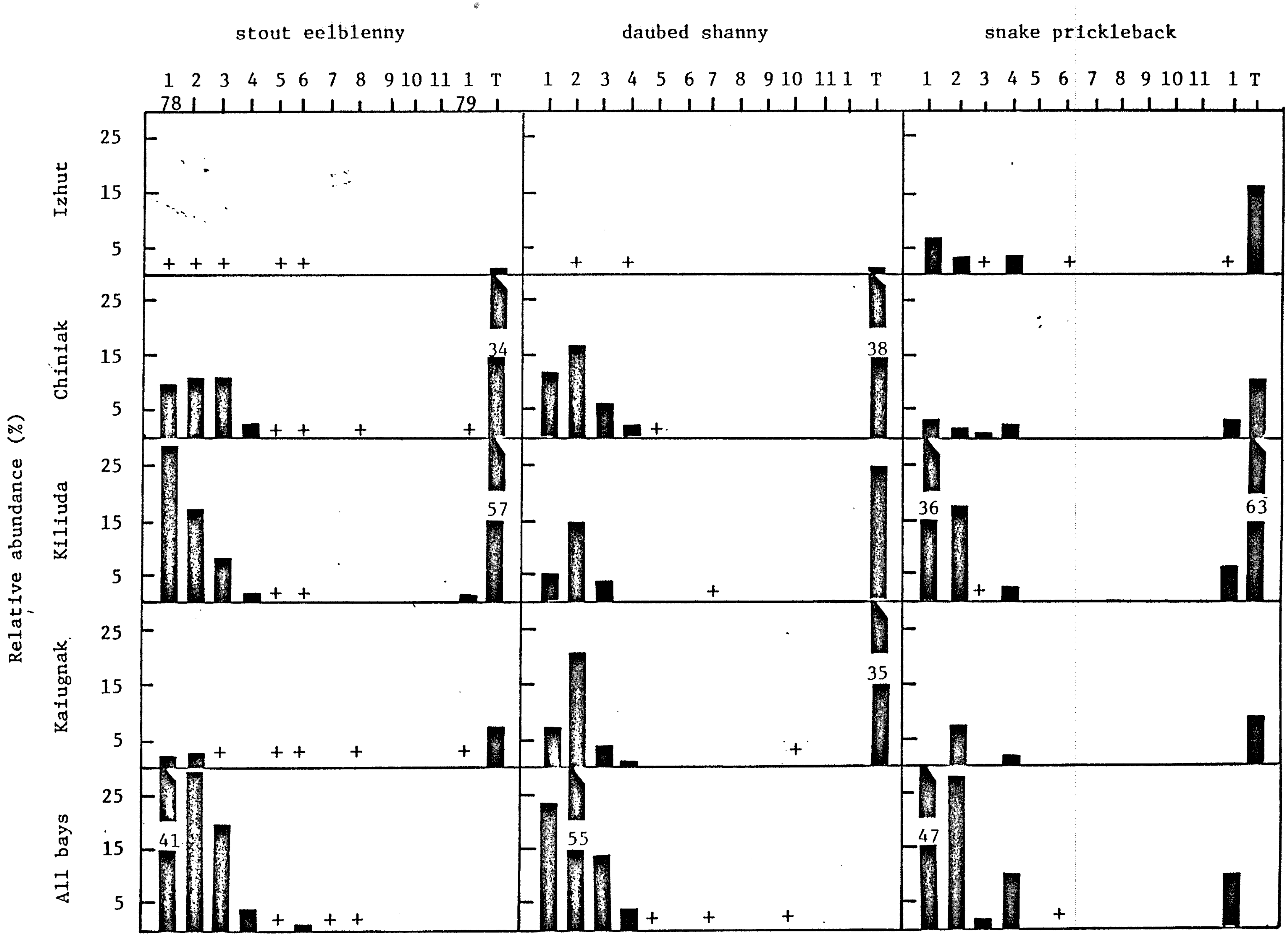

Fig. 25. Relative abundance, by bay and cruise, of stout eelblenny, daubed shanny, and snake prickleback larvae from bongo (505μ) samples, Kodiak Archipelago, Alaska, 1978-79. Percents based on values from stations 1-5.

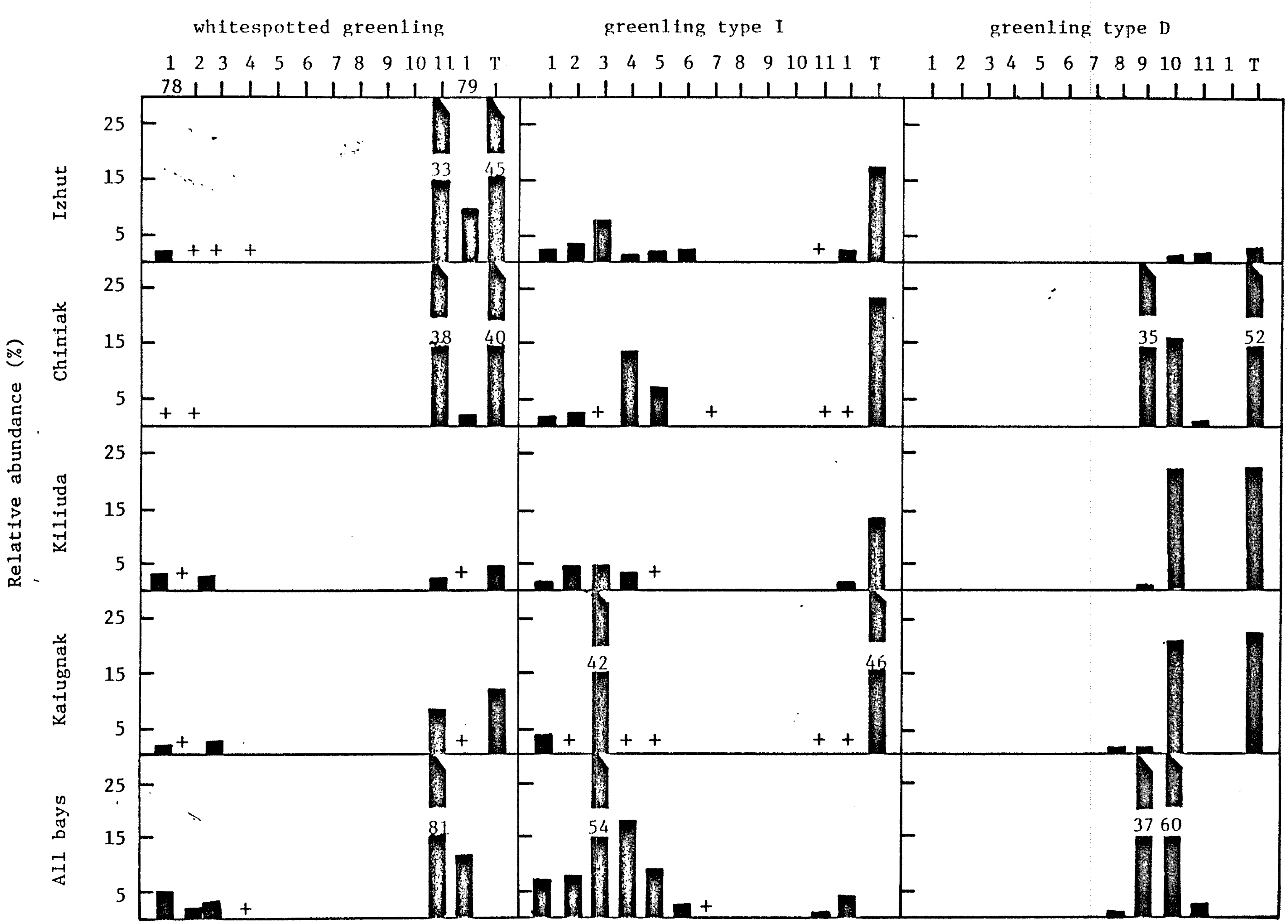

Fig. 26. Relative abundance, by bay and cruise, of larval whitespotted greenling and greenling types I and D, from neuston (505μ) samples, Kodiak Archipelago, Alaska, 1978-79. Percents based on values from stations 1-5.

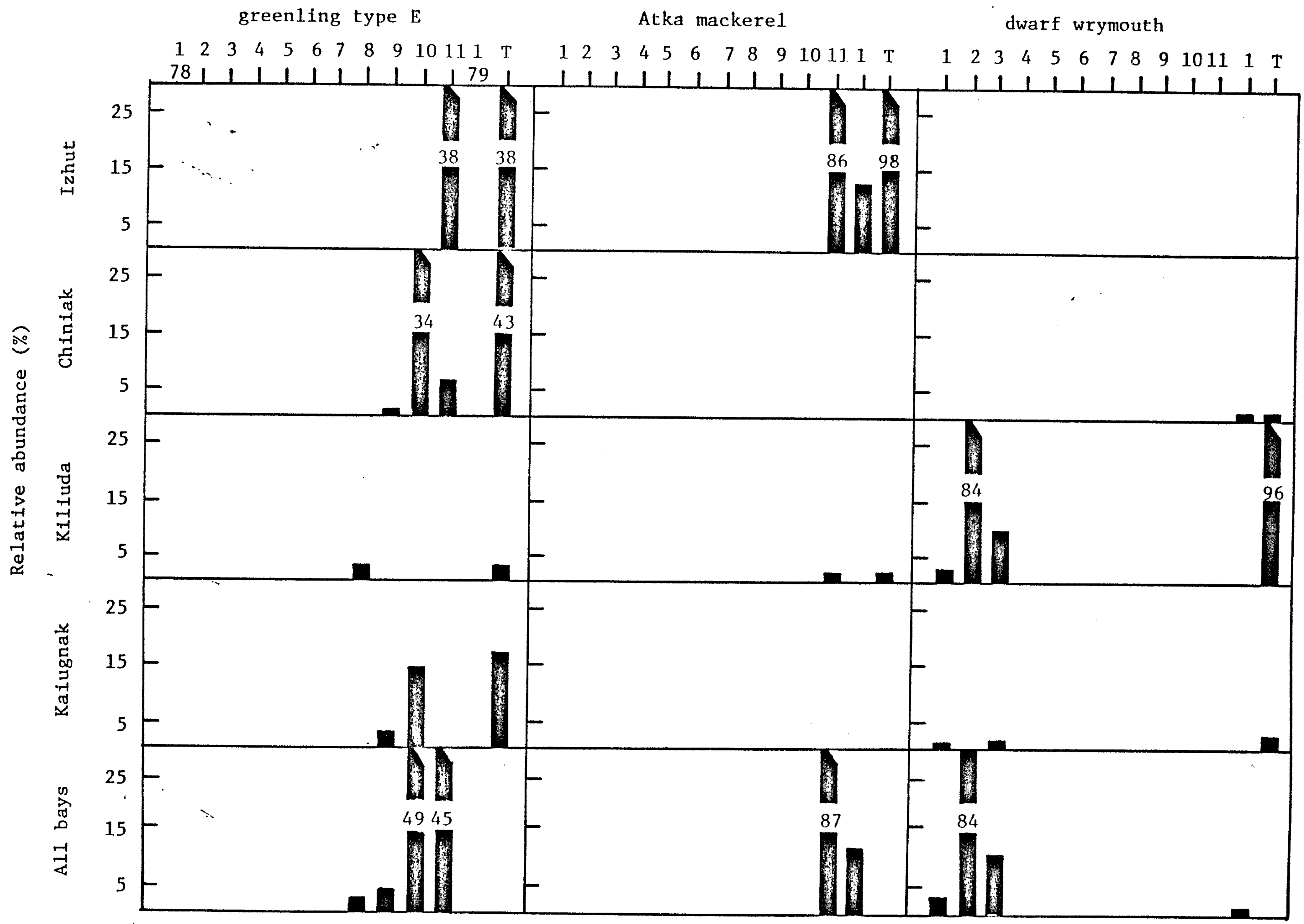

Fig. 27. Relative abundance, by bay and cruise, of larval greenling type E, Atka mackerel, and dwarf wrymouth, from neuston (505μ) samples, Kodiak Archipelago, Alaska, 1978-79. Percents based on values from stations 1-5.

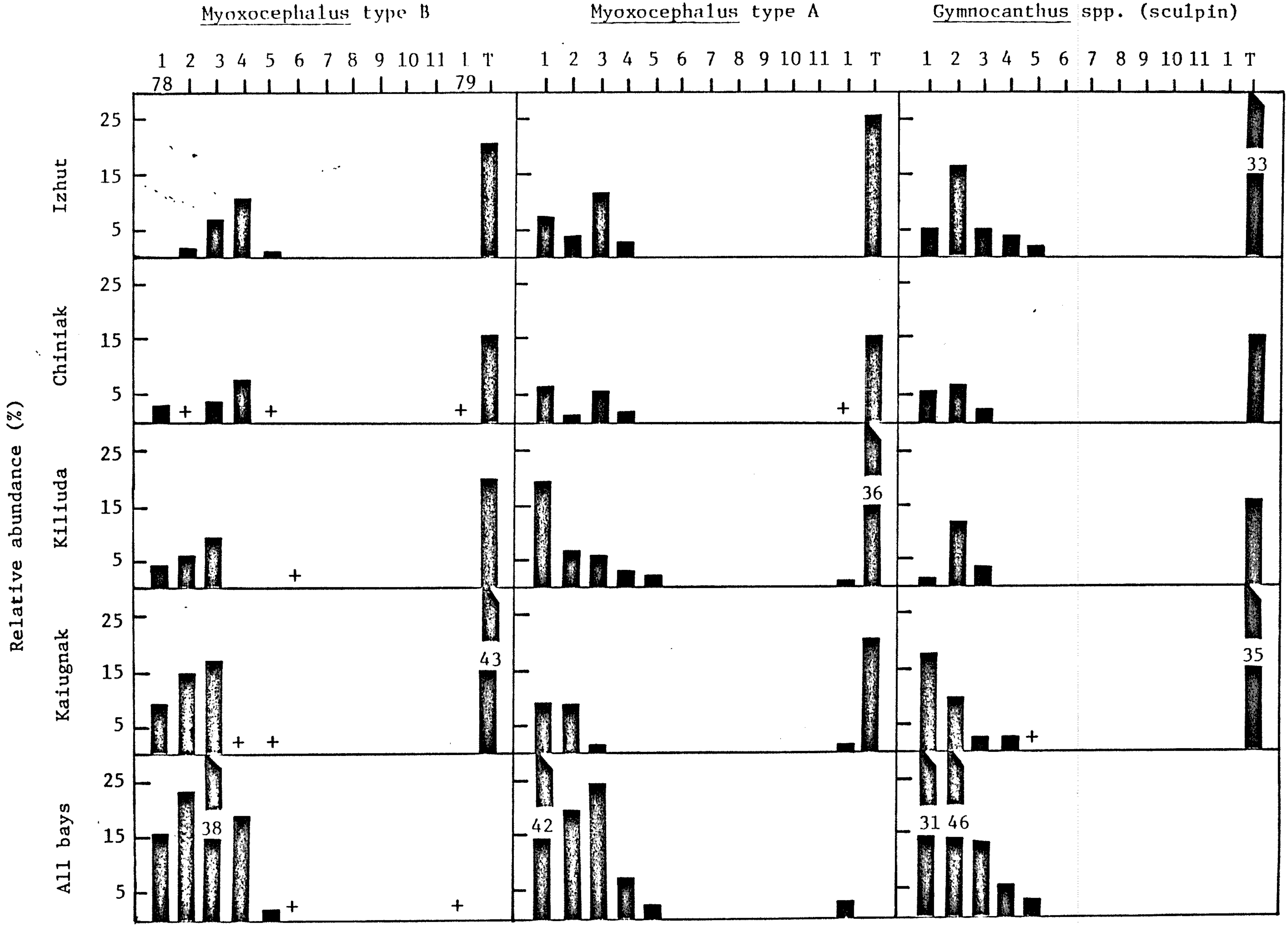

Fig. 28. Relative abundance, by bay and cruise, of *Myoxocephalus* types A and B and *Gymnocanthus* spp. larvae from bongo (505μ) samples, Kodiak Archipelago, Alaska, 1978-79. Percents based on values from stations 1-5.

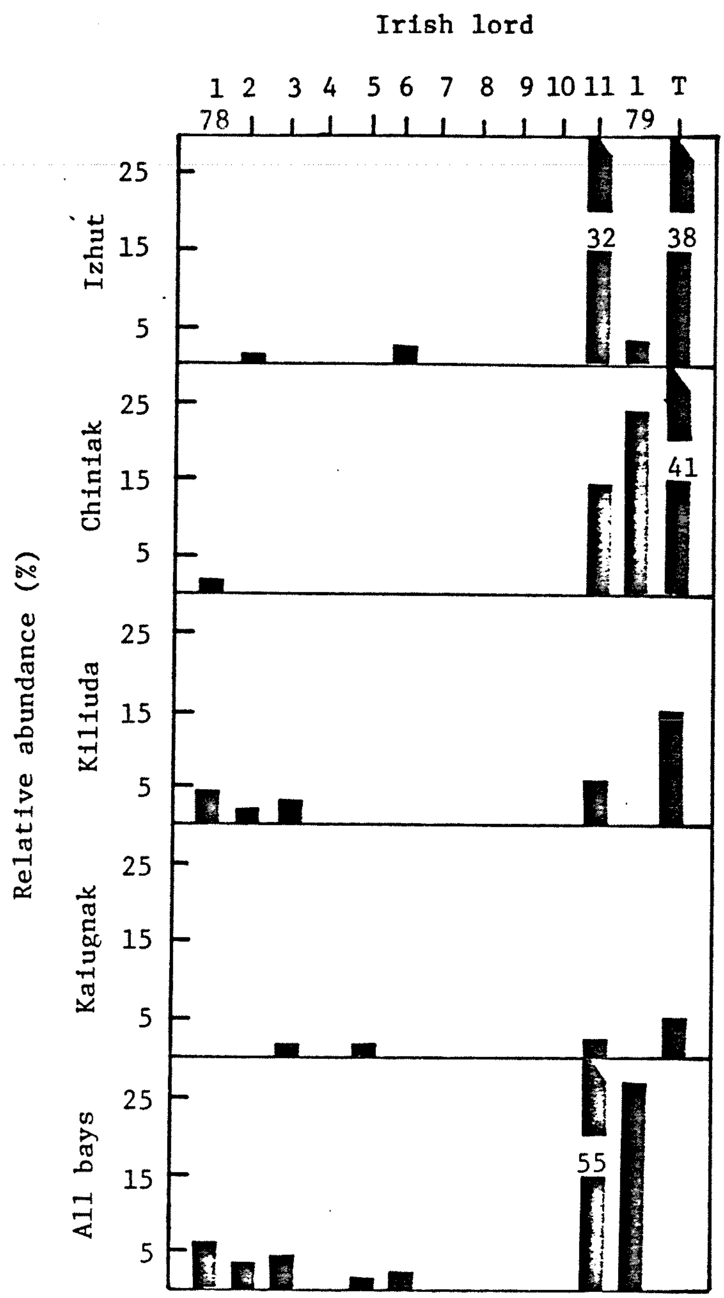

Fig. 29. Relative abundance, by bay and cruise, of Irish lord larvae, from bongo (505μ) samples, Kodiak Archipelago, Alaska, 1978-79. Percents based on values from stations 1-5.

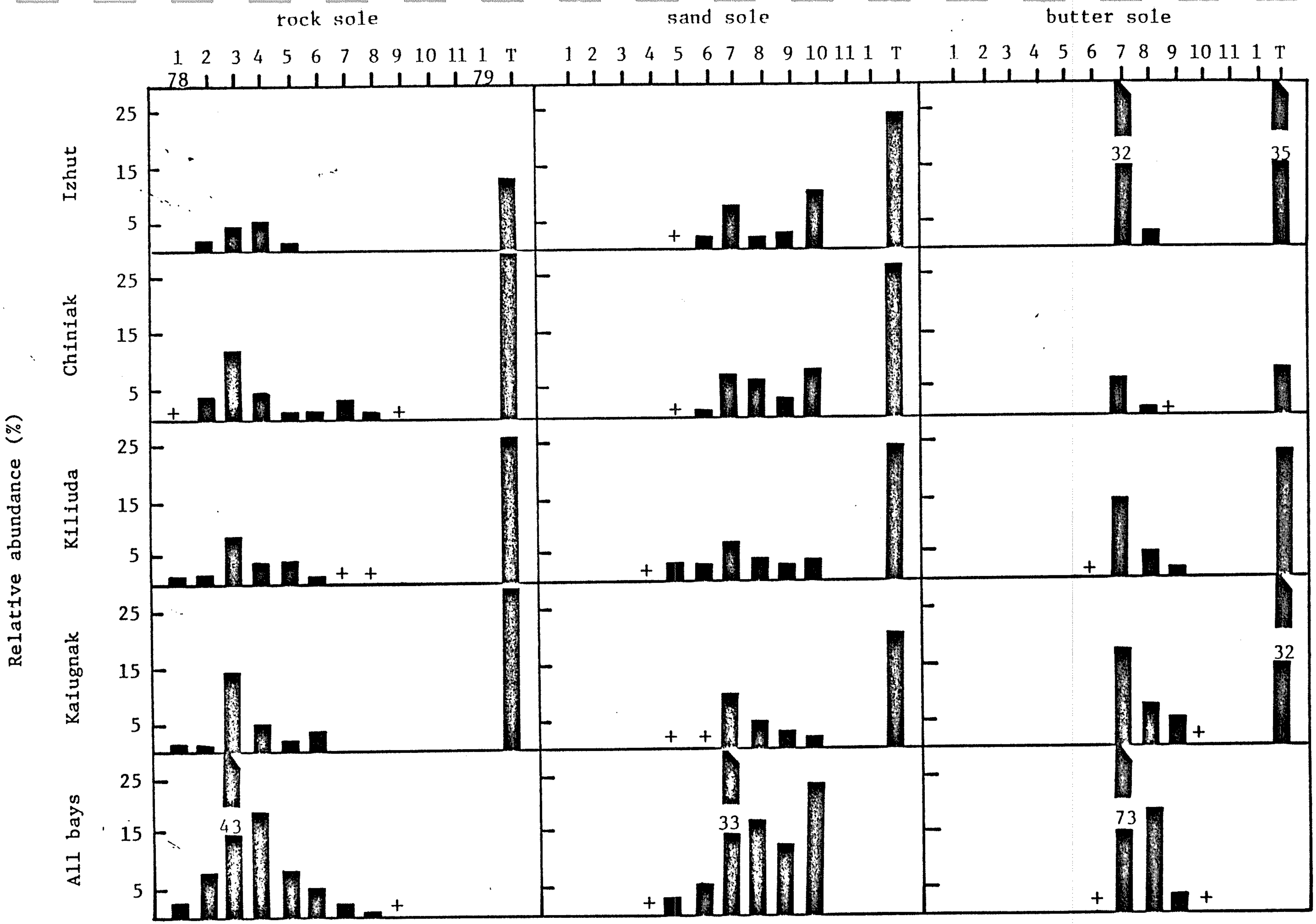

Fig. 30. Relative abundance, by bay and cruise, of rock sole, sand sole, and butter sole larvae, from bongo (505μ) samples, Kodiak Archipelago, Alaska, 1978-79. Percents based on values from stations 1-5.

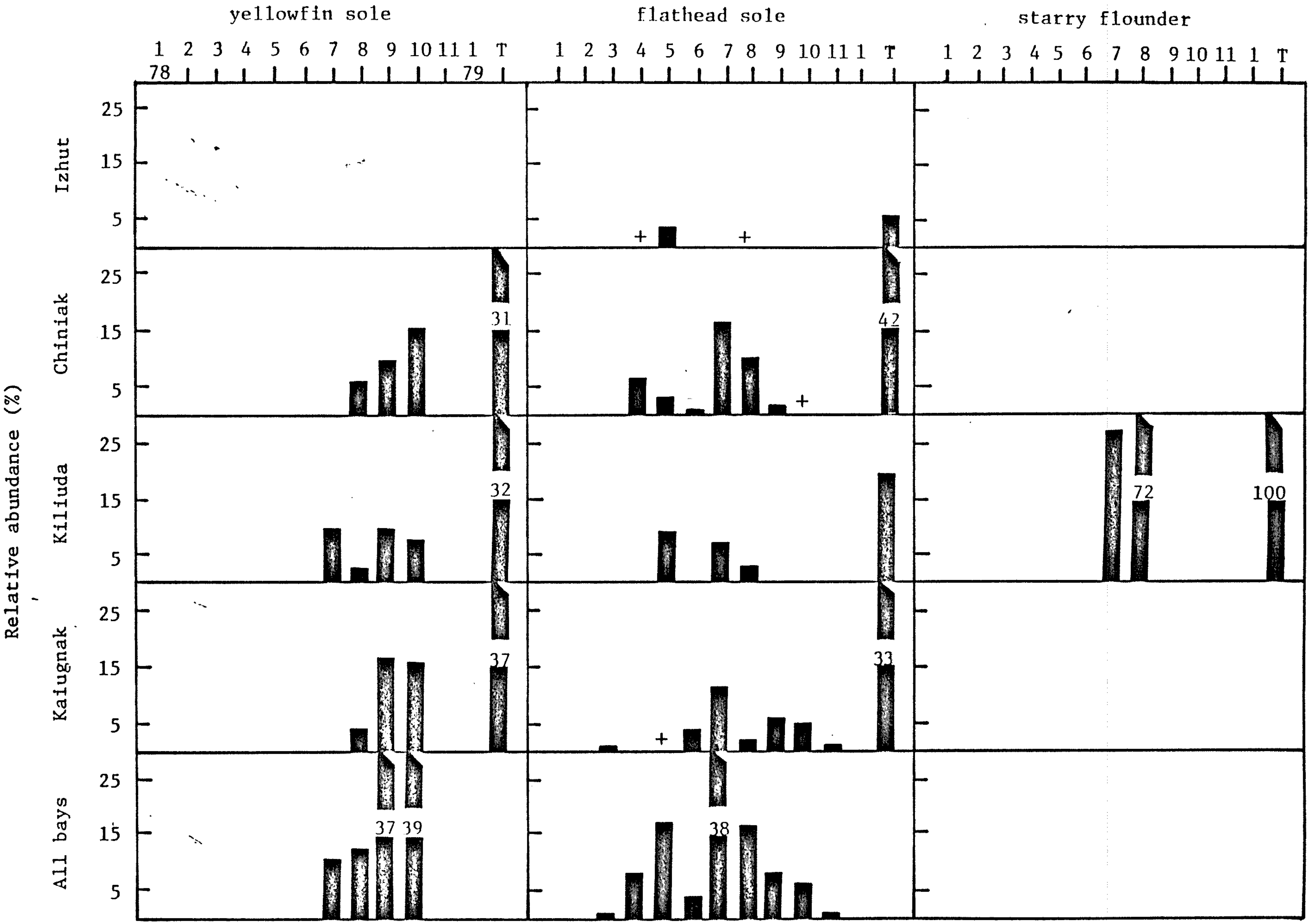

Fig. 31. Relative abundance, by bay and cruise, of yellowfin sole, flathead sole, and starry flounder larvae, from bongo (505μ) samples, Kodiak Archipelago, Alaska, 1978-79. Percents based on values from stations 1-5.

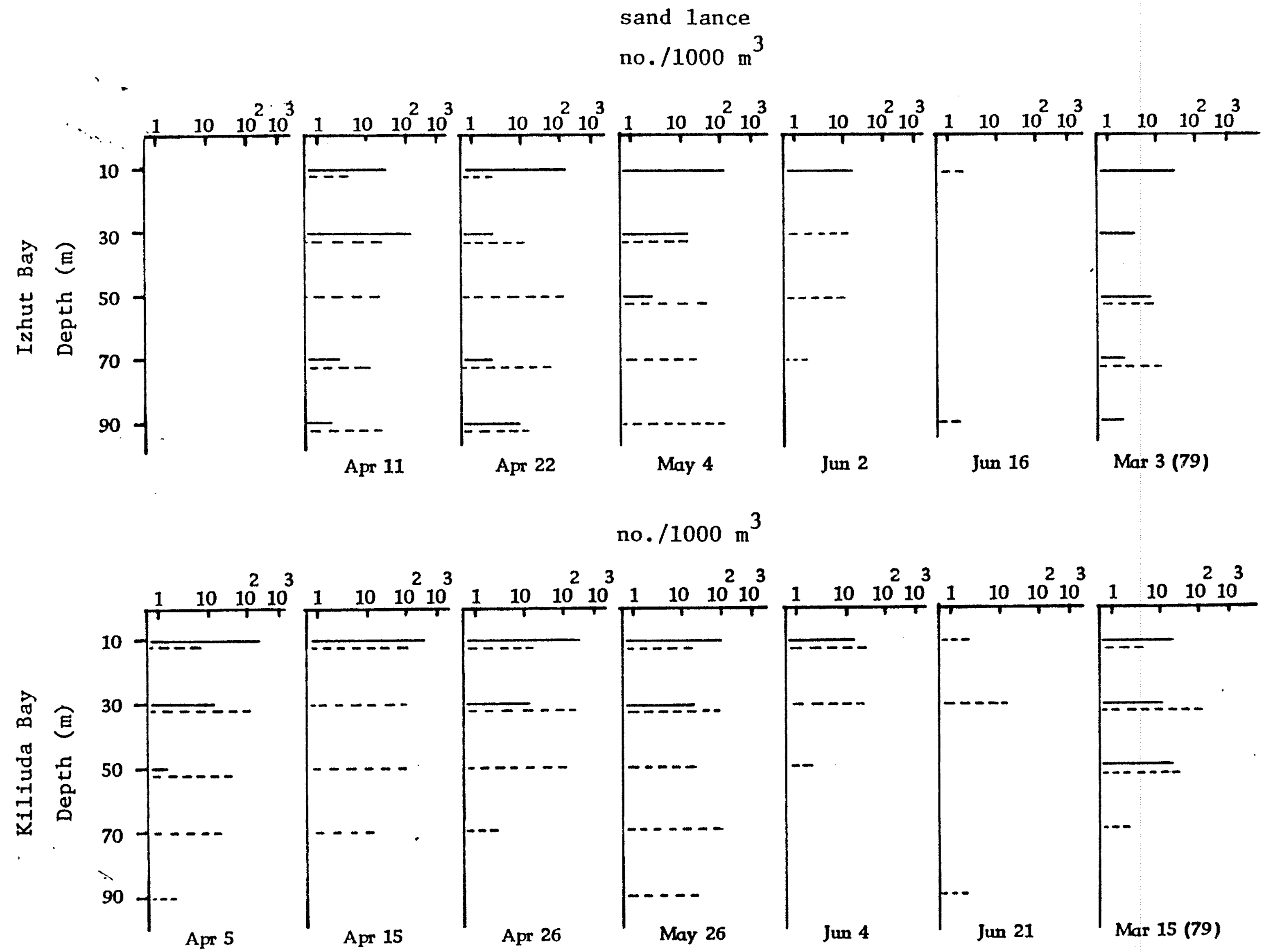

Fig. 32. Vertical distribution of sand lance larvae from day (-) and night (---) Tucker trawl (505μ) catches in Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79.

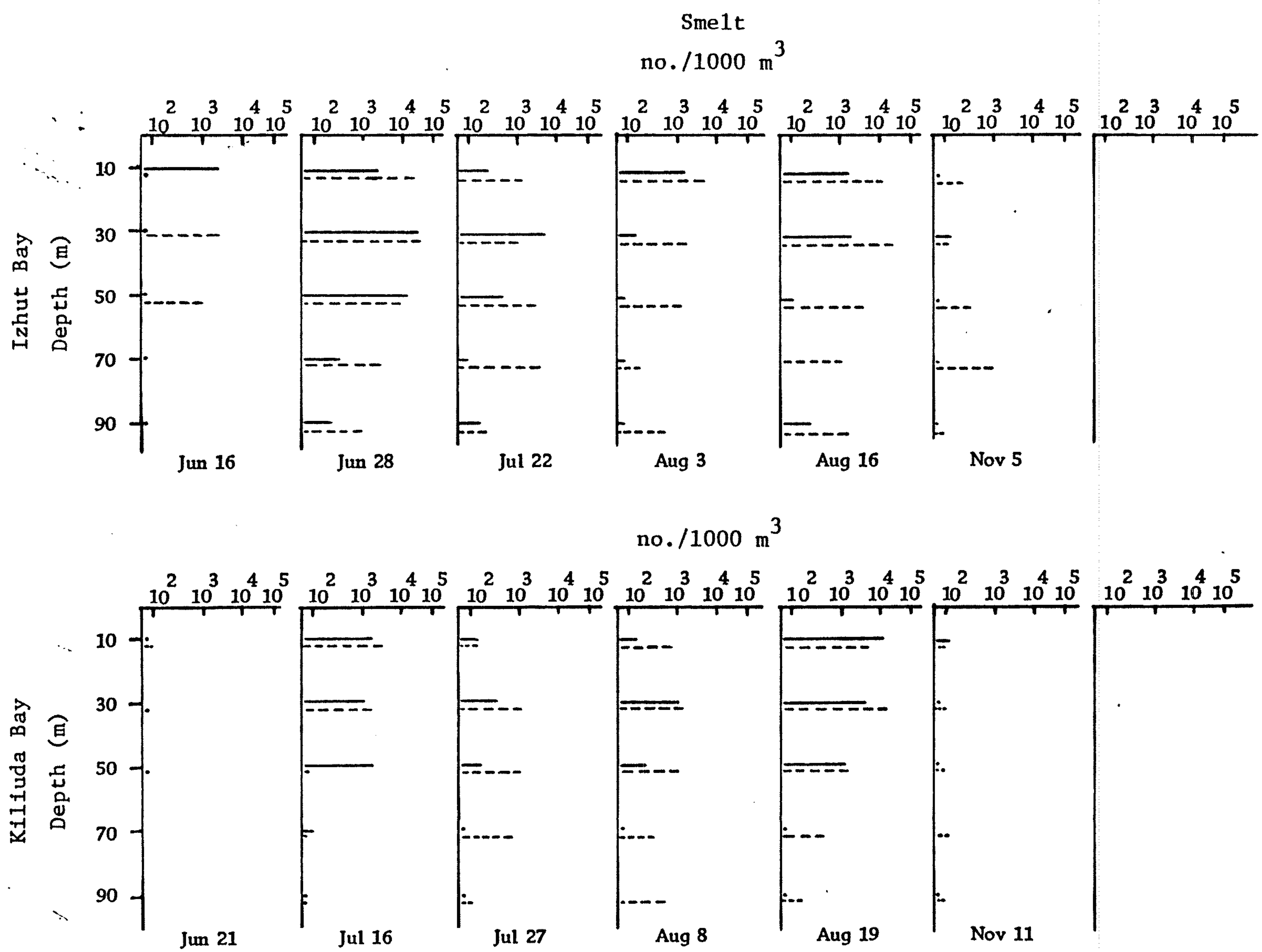

Fig. 33. Vertical distribution of smelt larvae from day (-) and night (---) Tucker trawl (505µ) catches in Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79.

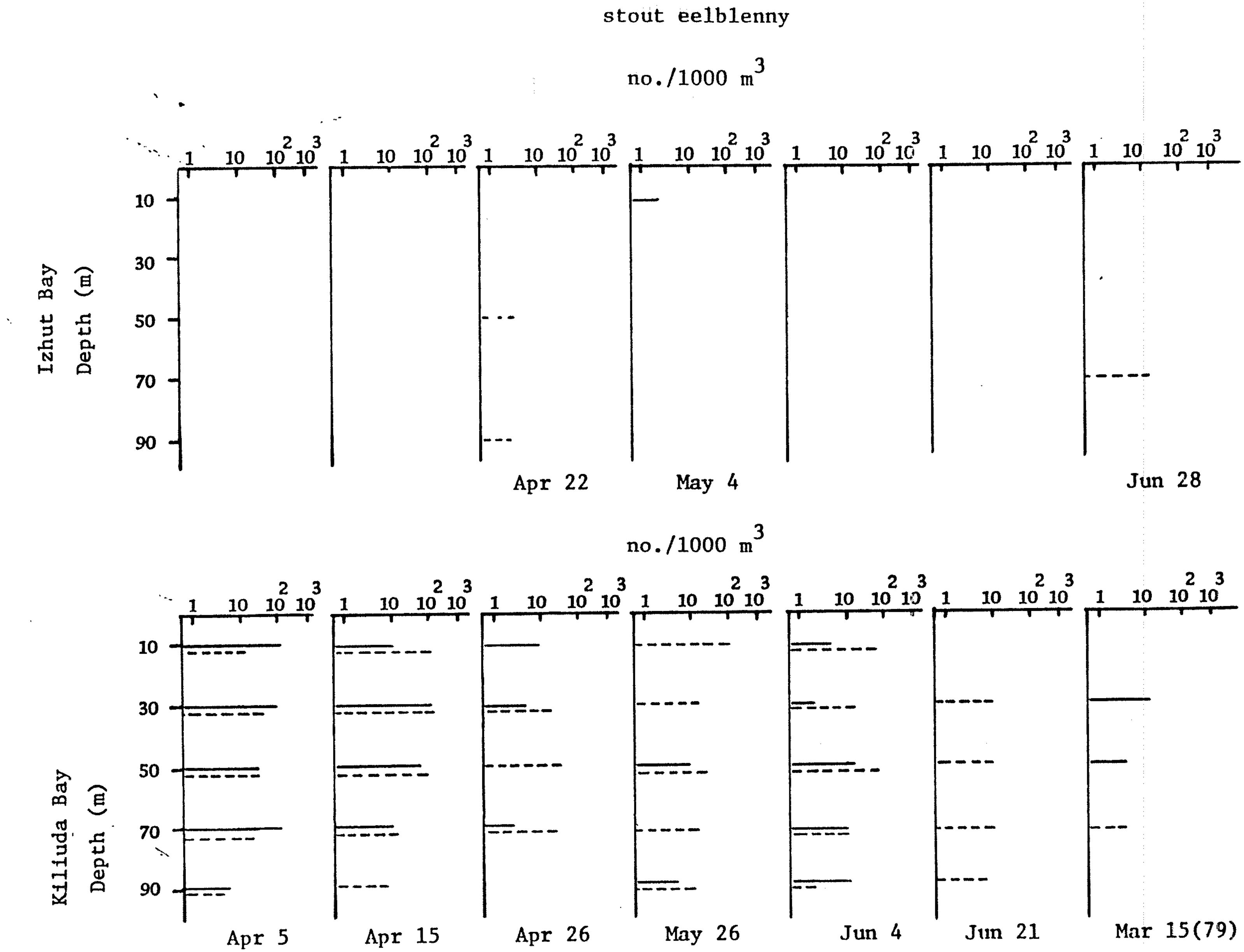

Fig. 34. Vertical distribution of stout eelblenny larvae from day (-) and night (---) Tucker trawl (505μ) catches in Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79.

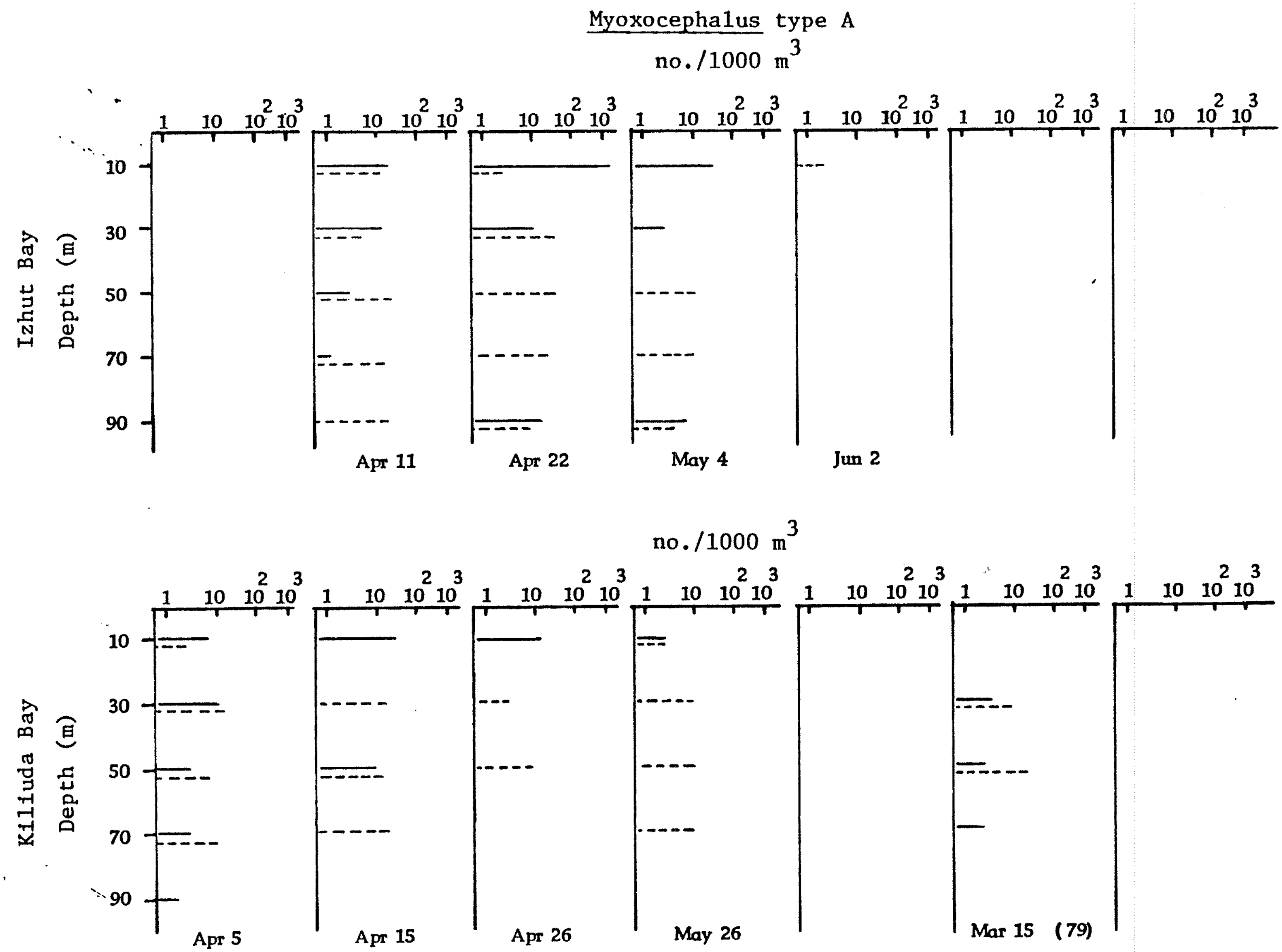

Fig. 35. Vertical distribution of <u>Myoxocephalus</u> type A larvae from day (-) and night (---) Tucker trawl (505μ) catches in Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79.

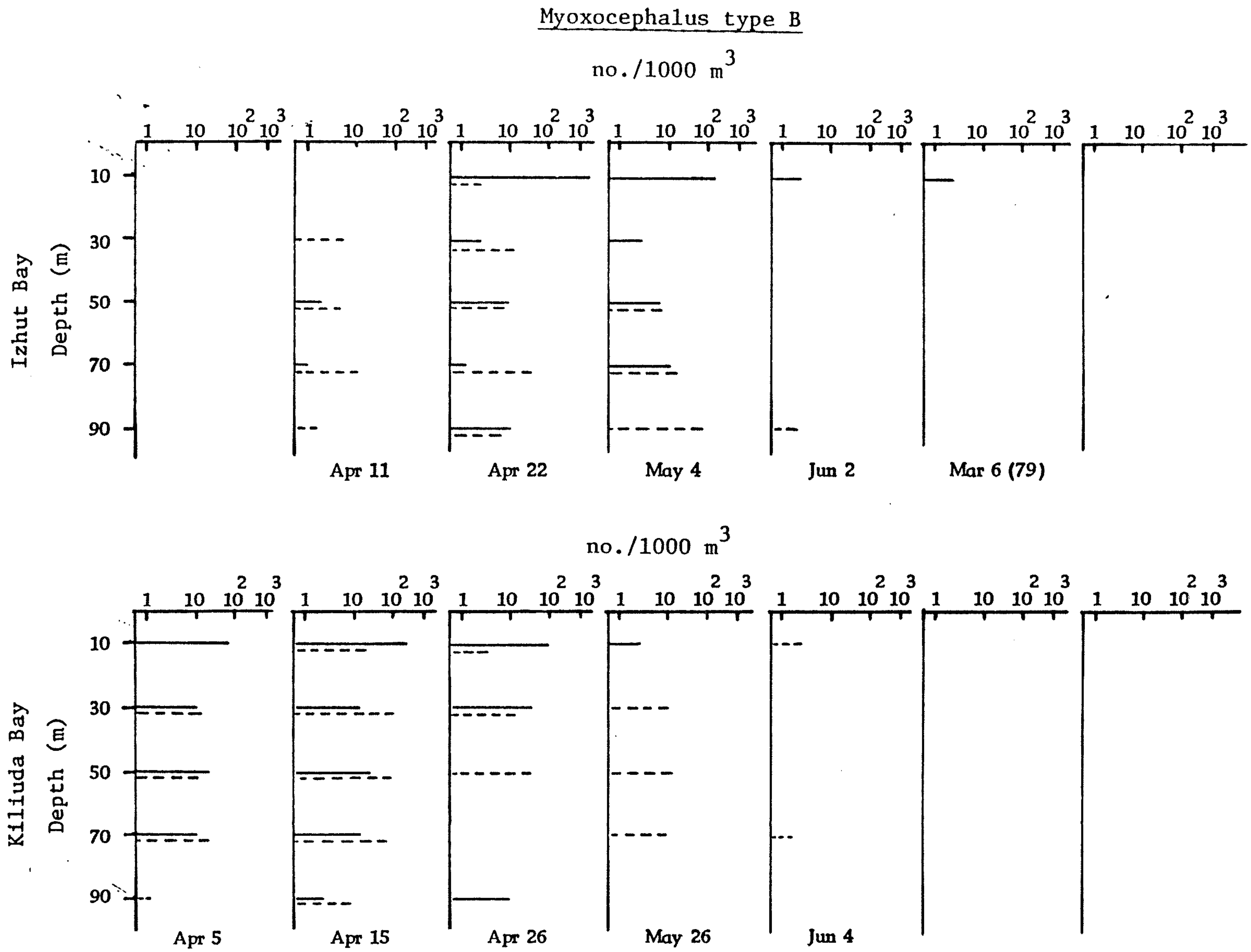

Fig. 36. Vertical distribution of Myoxocephalus type B larvae from day (-) and night (---) Tucker trawl (505μ) catches in Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79.

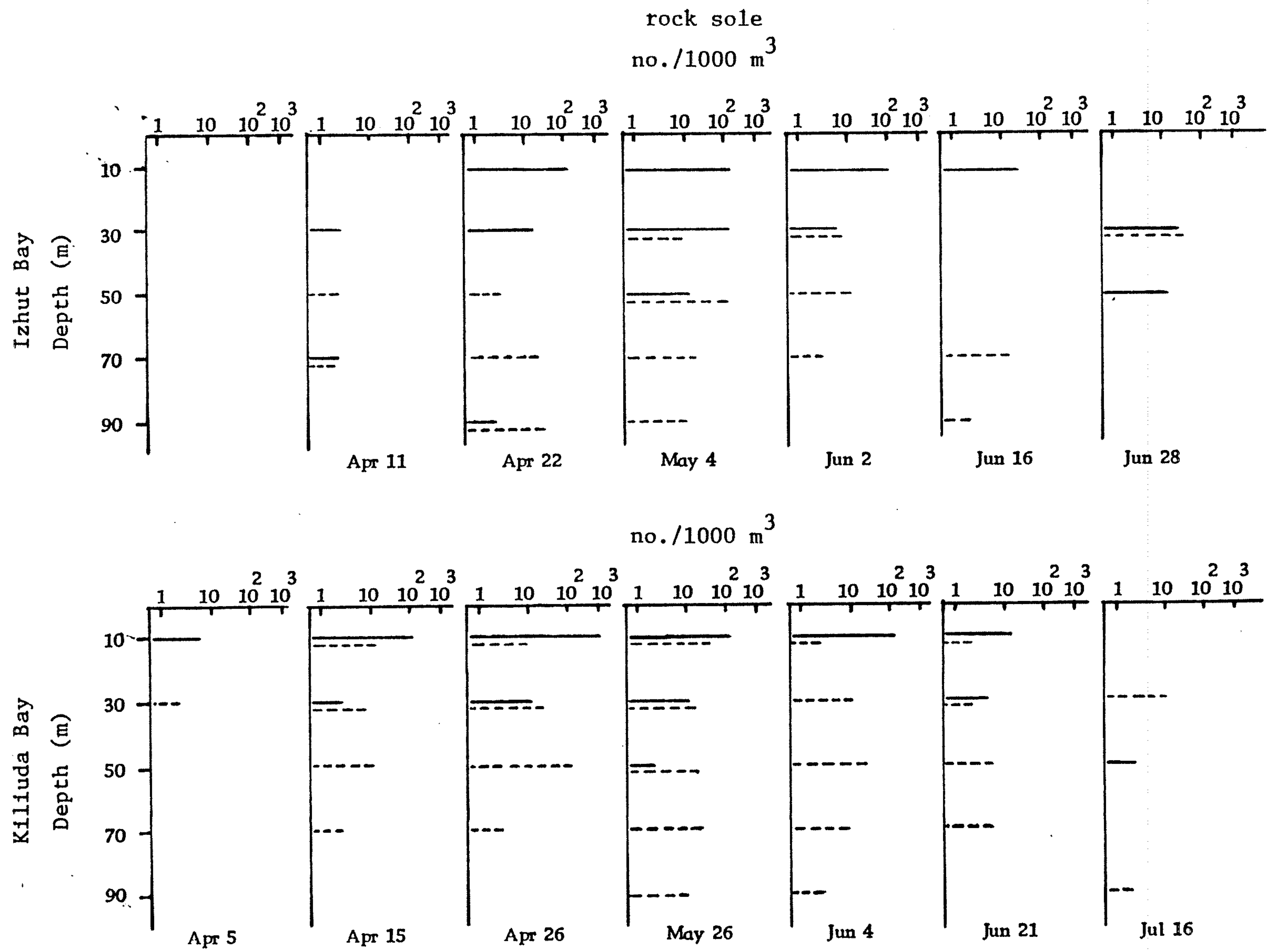

Fig. 37. Vertical distribution of rock sole larvae from day (-) and night (---) Tucker trawl (505μ) catches in Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79.

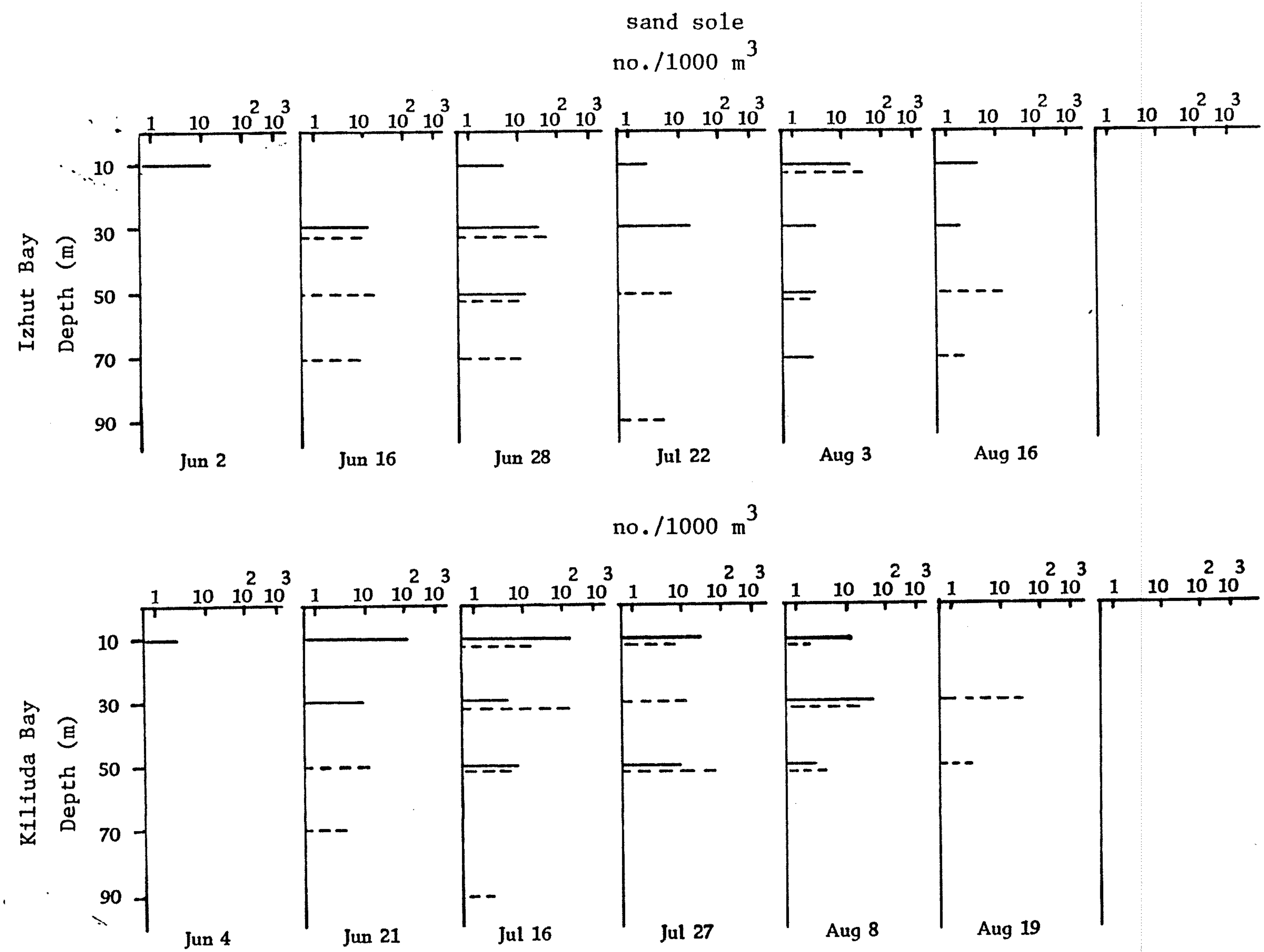

Fig. 38. Vertical distribution of sand sole larvae from day (-) and night (---) Tucker trawl (505μ) catches in Izhut and Kiliuda bays, Kodiak Archipelago, Alaska, 1978-79.

sand lance

Length (mm)

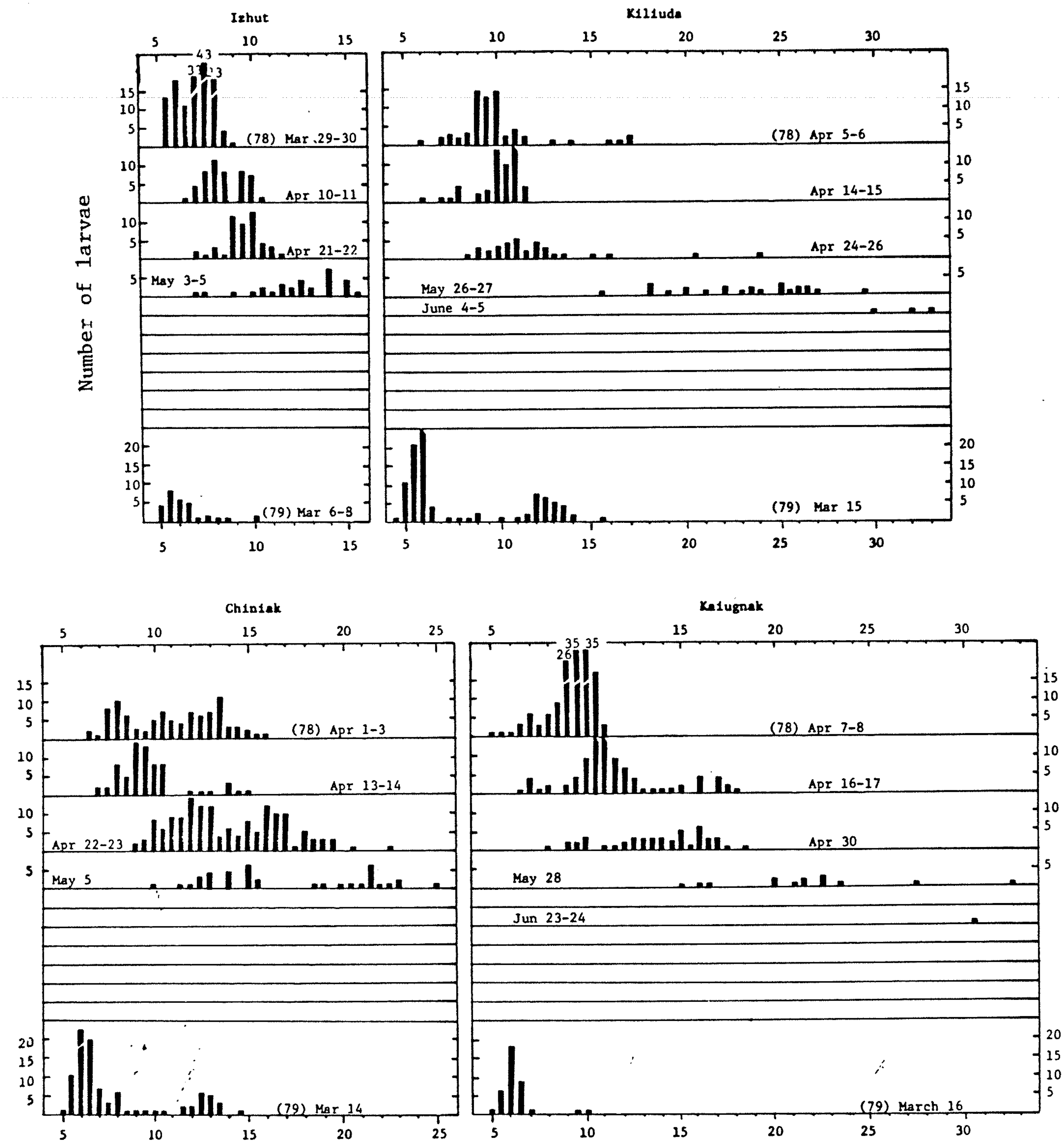

Fig. 39. Lengths of larval sand lance, by bay and cruise, for bongo (505μ) catches, Kodiak Archipelago, Alaska, 1978-79.

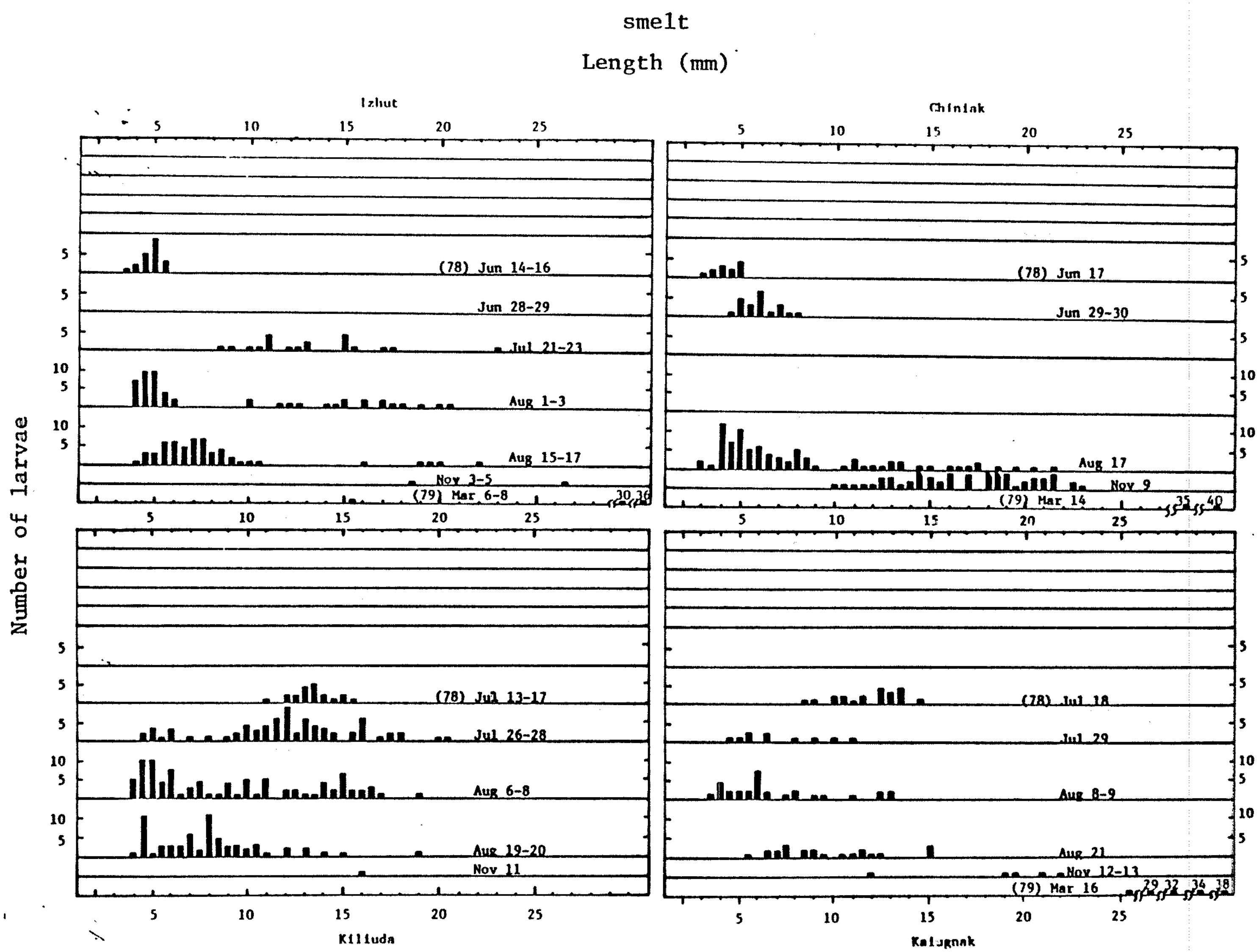

Fig. 40. Lengths of larval smelt, by bay (station 2) and cruise, from bongo (505µ) catches, Kodiak Archipelago, Alaska, 1978-79.

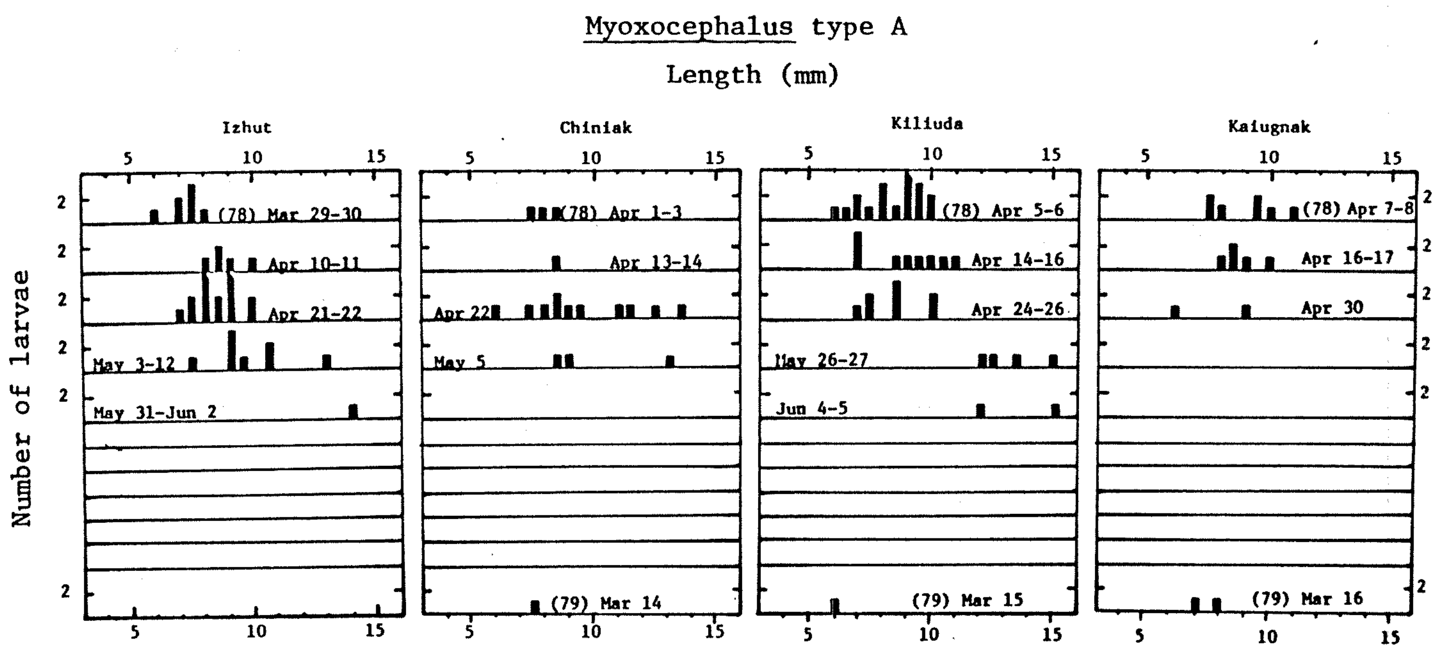

Fig. 41. Lengths of larval Myoxocephalus type A, by bay and cruise, from bongo (505μ) catches, Kodiak Archipelago, Alaska, 1978-79.

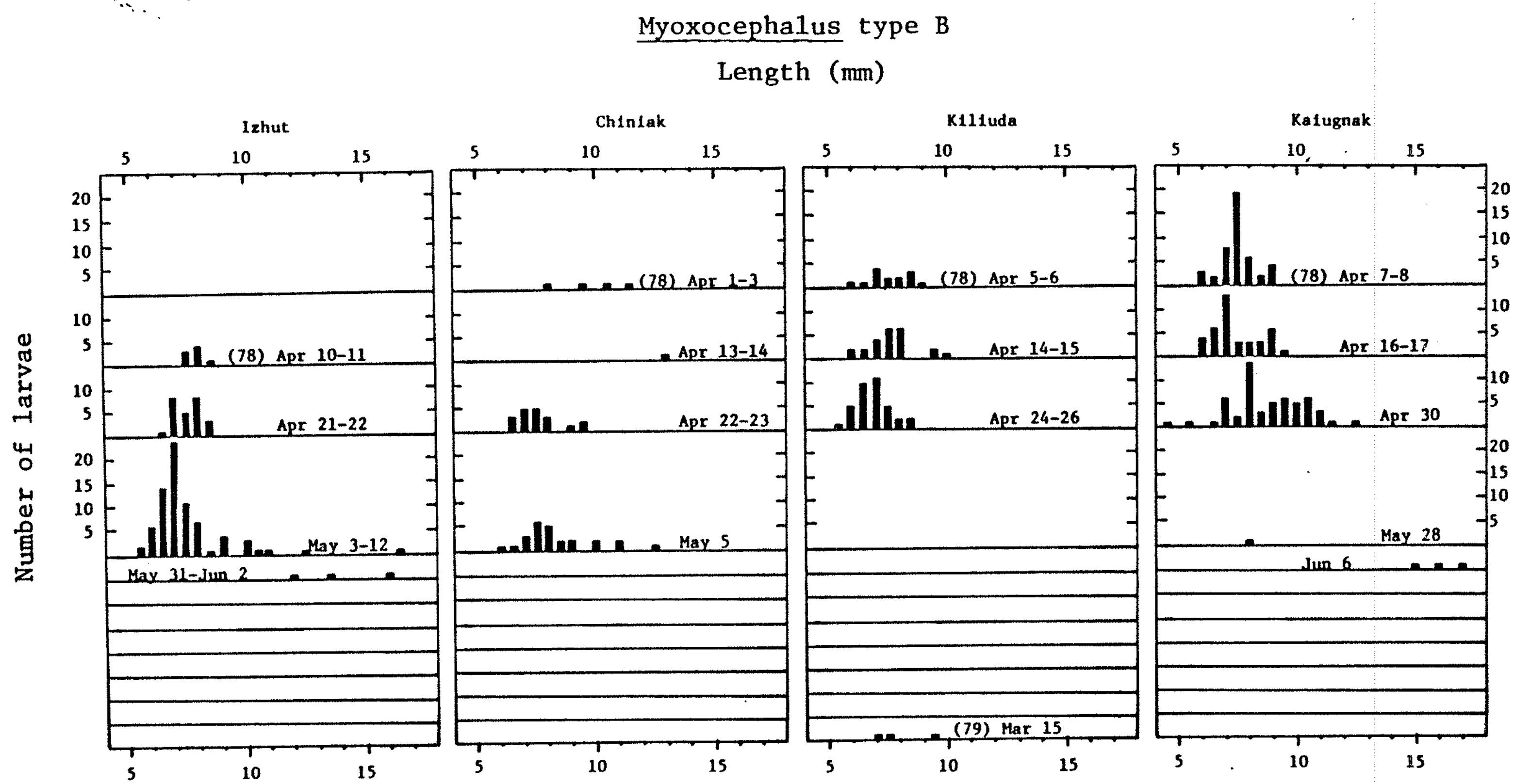

Fig. 42. Lengths of larval *Myoxocephalus* type B, by bay and cruise, from bongo (505μ) catches, Kodiak Archipelago, Alaska, 1978-79.

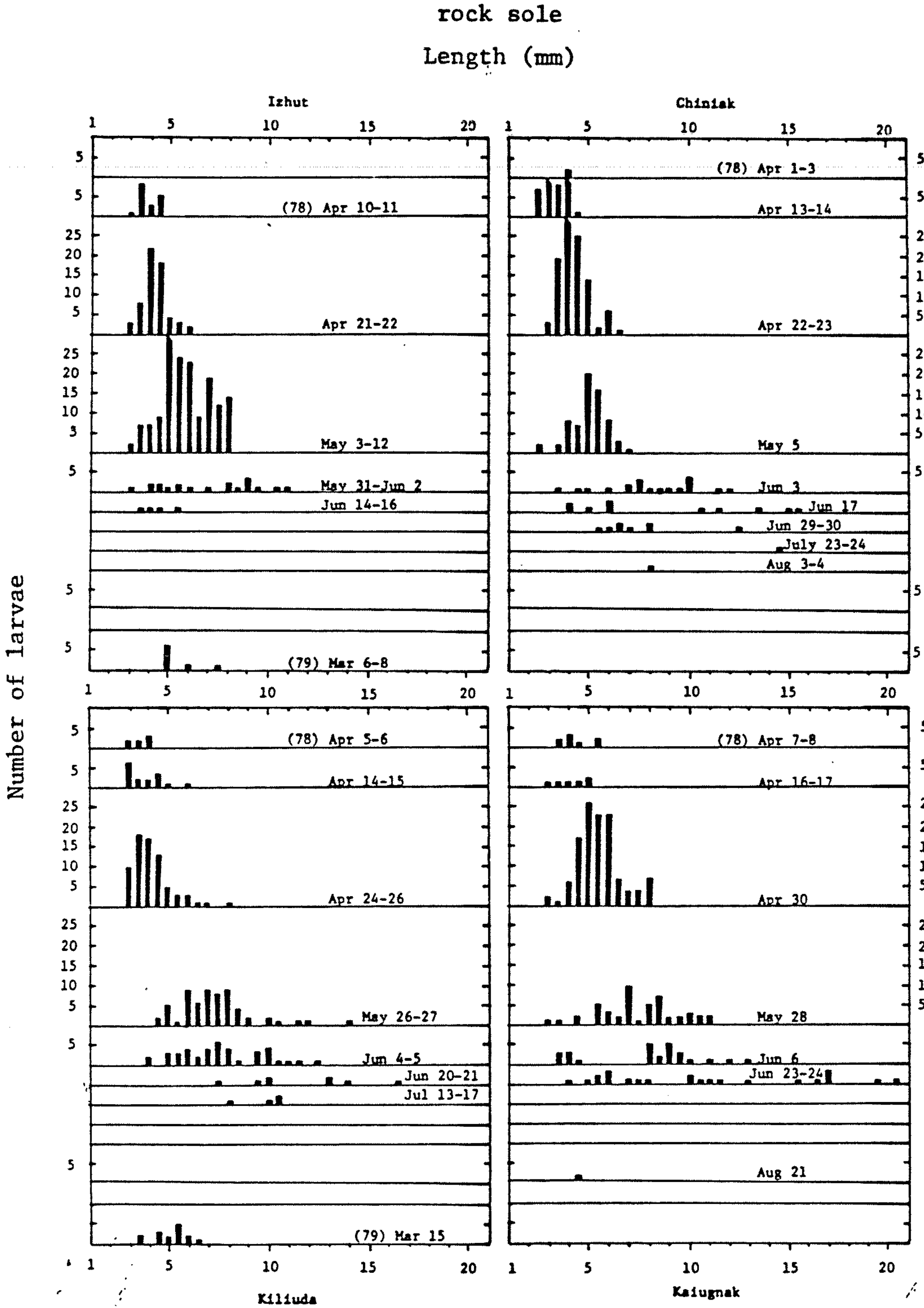

Fig. 43. Lengths of larval rock sole, by bay and cruise, from bongo (505μ) catches, Kodiak Archipelago, Alaska, 1978-79.

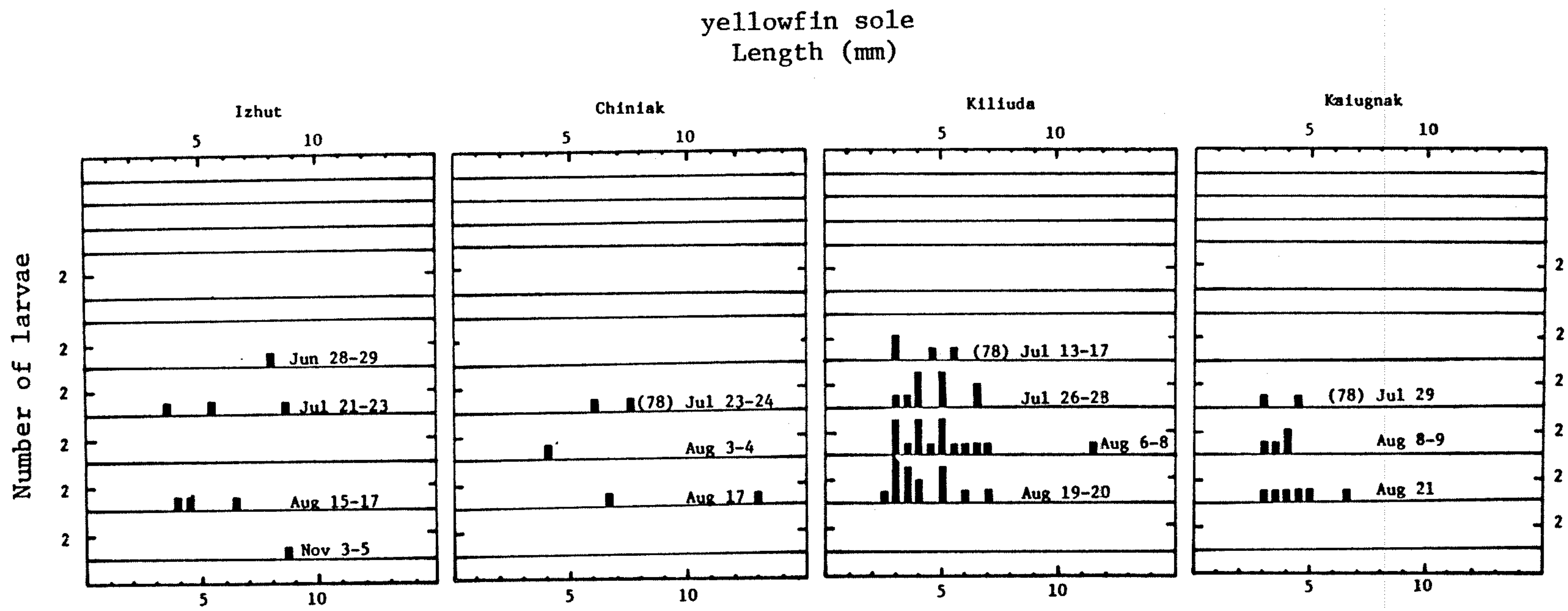

Fig. 44. Lengths of larval yellowfin sole, by bay and cruise, from bongo (505μ) catches, Kodiak Archipelago, Alaska, 1978-79.

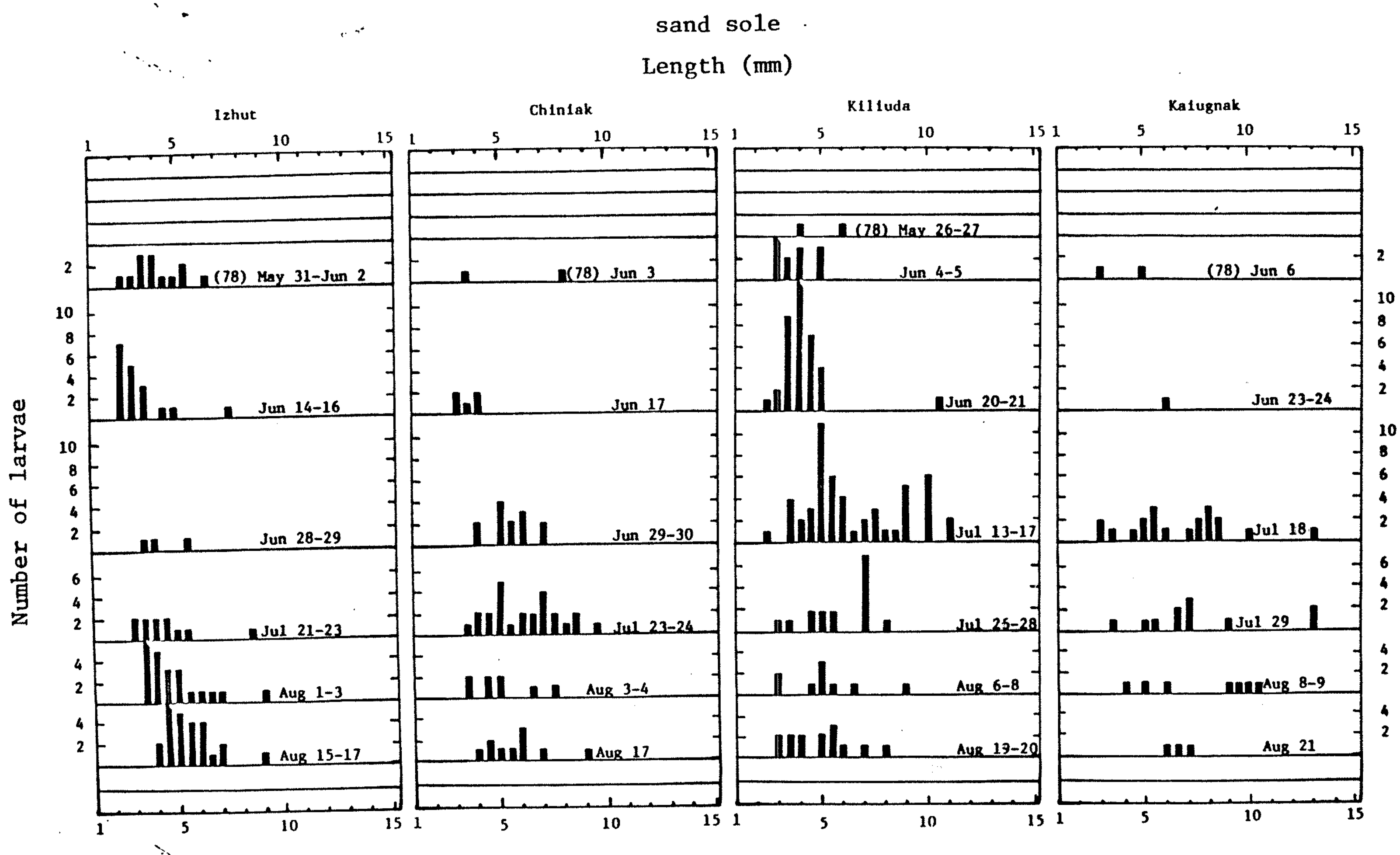

Fig. 45. Lengths of larval sand sole, by bay and cruise, from bongo (505μ) catches, Kodiak Archipelago, Alaska, 1978-79.

PART B: FOOD HABITS

I. SUMMARY OF OBJECTIVES, CONCLUSIONS, AND IMPLICATION WITH RESPECT TO OCS OIL AND GAS DEVELOPMENT

The objectives of this study were to determine the food habits of several nearshore fish species with respect to season, area, habitat, and life history stage. These data may then be used, after oil production is underway in the Kodiak area, to detect disruptions in the food webs of the fish that may be caused by petroleum contaminants.

During April-August and November 1978 and March 1979, we collected over 14,000 stomachs from approximately 40 species of fish and 13 species were represented by more than 300 stomachs each. We sampled from bays in the Kodiak Archipelago with primarily five types of gear: beach seine, trammel net, townet, try net, and otter trawl. For analysis, we divided the fish into three size classes: I-0 to 150 mm, II-151 to 300 mm, III- >300 mm long.

Differences in the weights of the stomach contents were greater among species and size classes than among months and the differences in the weight of the stomach contents was not consistent among the bays. Similarly, differences in the utilization of specific prey items were not consistent between the bays, although the composition of stomach contents from Izhut Bay tended to differ from those from the three remaining bays (Kiliuda, Kalsin, and Kaiugnak). In general, the variation in the composition of foods was much greater among species and size classes than among bays and the differences were as much related to habitat as to bays. Finally, the amount and composition of foods in March and November tended to differ from those in April through August (which were all similar).

Zooplankton and small epibenthic crustacea (especially harpacticoids, mysids, and gammarid amphipods) tended to be more important to the small fish (size class I) than to the larger ones and several of the species specialized on zooplankton and/or small epibenthic crustacea, when they were small. These included pink and chum salmon, Pacific sand lance, Pacific cod, and walleye pollock (major species) and apparently capelin, silverspotted sculpin, and tubenose poacher (which were not sampled extensively). Crab, fish, and/or shrimp sepcialists tended to be larger (i.e., size classes II and III). Included were the Pacific cod, Myoxocephalus, flathead sole, and yellow Irish lord (major species), and lingcod, sablefish, arrowtooth flounder, halibut, and sandfish (minor species). The four greenling (rock, masked, whitespotted, and kelp), roch sole, yellowfin sole, small flathead sole, Dolly Varden, Gymnocanthus, Leptocottus, red Irish lord, snake prickleback, penpoint gunnel, and starry flounder all appeared to have generalized diets.

Myoxocephalus had eaten nearly one-half (by weight) of all the fish and crab that were consumed by the fish in this study while Pacific cod had consumed nearly one-half of the shrimp. Cottids (sculpins) were the most important forage fish. Osmerids (smelt) were the predominant fish larvae by number and cottid, hexagrammid (greenling), and ammodytid (sand lance) larvae were equally important by weight. Majidae (which includes the tanner crab) was the most significant family of crabs in the diets of the fish, and these were followed by the Atelecyclidae (horse crabs). Pandalidae (including the northern pink shrimp) was the most important family of shrimp.

II. INTRODUCTION

General Nature and Scope of Study

Exploitation of oil in the lease areas east of Kodiak Island introduces potential hazards to the marine environment, especially in the vicinity of Kodiak Island. The productive waters surrounding Kodiak now support a sizable fishing industry, which could be damaged by an oil industry. The fish living in the bays and fjords of the island are especially vulnerable to an oil spill since they would probably suffer a greater exposure to the oil than would fish living in the open waters offshore.

The food web of a fish species could be disturbed by an oil spill if it caused the depletion or contamination of critical prey types. This could, in turn, result in the depletion of fish stocks in an area or in the contamination of fish with petroleum hydrocarbons. This study will greatly increase our knowledge about the food habits and trophic relationships of the inshore fish of Kodiak Island. The baseline information will be used, if oil production is initiated in the area, to quantitatively assess the effects of oil on the feeding relationships of the inshore fish.

Specific Objectives

Our objectives were to determine the food habits of several nearshore pelagic and demersal fish species with respect to season, area, habitat, and life history stage.

III. CURRENT STATE OF KNOWLEDGE

Food habits of the fish near Kodiak Island have not been widely examined. In 1971, Gosho (1977) studied the feeding habits of pink salmon juveniles from fish taken in Alitak and Kiliuda bays. Harris and Hartt (1977) examined stomachs from 18 species of fish caught by four types of gear (townet, herring trawl, beach seine, and trynet), in Kaiugnak, Alitak, and Ugak bays during late May to mid-September of 1976. Finally, Hunter (1979) studied the food habits of 12 species of demersal fish taken offshore near Kodiak Island during July 1977. Information from his sampling may be applied to our inshore work, since six of the species that he examined occur frequently inshore.

Literature from other areas on the food habits of species that we studied at Kodiak are cited in the results section of this report.

IV. STUDY AREA

The Kodiak Archipelago is located in the western Gulf of Alaska, southeast of the Alaska Peninsula. It is composed of many islands, 16 of which have an area greater than 18 km^2; Kodiak Island (9,293 km^2) and Afognak Island (1,813 km^2) are the largest. Mountains rise sharply from the ocean floor to elevations of over 1,200 m. The coastline is intricately carved by deep, narrow bays and fjords, and most of the shoreline is composed of rocky bluffs and narrow beaches. The continental shelf, which is about 120 km wide, and the nearshore waters of the archipelago are among the most productive in the world and support commercial fisheries for halibut, salmon, and crab.

There is a strong marine influence on the climate, resulting in cloudy skies, moderately heavy annual precipitation, and mild temperatures for the latitude of the islands. The average maximum air temperature during the summer is about 15°C and the average minimum temperature during the winter is about -5°C (AEIDC 1975). Ice does form in the more protected inlets during the winter months, and surface water temperatures of 1°C are not uncommon. Daylight ranges from 8.25 hr at the winter solstice to 22.50 hr at the summer solstice.

Our study areas included Izhut, Kalsin, Kiliuda, and Kaiugnak bays (Fig. 1). They are located on the east side of Afognak and Kodiak islands and represent most of the nearshore habitats of that area. Izhut Bay, which is located on Afognak Island, opens southward to the Gulf. It is 15 km long and is fringed by many protected inlets and lagoons. The mean depth at midbay is about 135 m and depths of over 200 m are found at the mouth. Izhut Bay has a fairly irregular bottom. The surrounding terrain has a moderate to low relief, and peaks reach just over 600 m. Lower-lying hills predominate at the head. Sitka spruce is the most obvious form of vegetation and some of this has been logged.

Kalsin Bay is only 11 km long and opens to the northeast into Chiniak Bay. Numerous small islands are located near the mouth. Kalsin Bay has a mean depth at midbay of about 50 m. The peaks are larger around Kalsin then around Izhut, but like Izhut, the bay head is less mountainous. Sedimentary rock predominates. Due to glaciation, there is an absence of Sitka spruce, and the principal vegetation consists of Sitka alder and willow, the latter often occurring in dense thickets in depressions such as stream basins.

Kiliuda Bay is our longest bay, reaching inland approximately 24 km. It is exposed to the southeast near the northern end of Sitkalidak Strait and has a few protected arms, bays, and small lagoons. The mean depth at midbay is about 70 m and there is a fairly irregular bottom. A sill is located off Coxcomb Point, thus making Kiliuda a true fjord. The surrounding hillsides and mountains are steep and are composed primarily of sedimentary rock with a small amount of volcanic rock. The vegetation is much like that in Kalsin Bay, but it also has some areas of moist tundra.

Kaiugnak Bay is about 15 km long and has two large protected lagoons, Kiavak and Kaiugnak. It opens to the southeast at the southern end of Sitkalidak Strait. The bottom is irregular and the mean depth at midbay is about 80 m; however, the lagoons are quite shallow. Steep hillsides and mountains with vegetation much like those in Kalsin Bay predominate.

V. SOURCES, METHODS, AND RATIONALE OF DATA COLLECTION

The stomachs were collected off the M/V YANKEE CLIPPER and the R/V COMMANDO during April, May, June, July, and August (1978) and off the R/V COMMANDO during November (1978), and March (1979) from four bays on the Kodiak Archipelago: Izhut, Kalsin, Kiliuda, and Kaiugnak. Five types of gear (beach seine, try net, trammel net, townet, and otter trawl), which sampled different habitats, were used to collect most of the fish. Gillnet sets and midwater tows were also made, but their catches were insignificant compared to those of the other gears. The stomach sampling followed the fish sampling planned by RU 552 (Alaska Department of Fish and Game, ADF&G).

Beach seine sets were made at various tide levels, and sampled a variety of intertidal and subtidal habitats. These included fine sand, cobble, mixed rock and sand, mud, and eelgrass beds. The trammel net (a tangle net) was 75 m long and was set perpendicular to the shoreline in 3-7 m of water. The area it sampled was usually rocky and often contained beds of kelps or other algae. The try net and otter trawl both sampled deeper, mainly mud-bottomed areas. Try net hauls were made in all bays at depths between 20 and 50 m, while the larger otter trawl was used only in Izhut and Kiliuda bays in about 70 to 100 m of water. The tow net sampled the pelagic zone.

As the fish were landed, they were first sorted to species. The field crew next selected specimens according to species and size: the emphasis was on both the most abundant species and on the economically important fish. Larger fish were measured and dissected in the field. Gonads were examined for level of maturity, then the stomachs were removed and placed in a Whirlpak bag along with 10% formalin. Smaller fish were preserved whole.

In the laboratory, the stomach contents of each large fish were removed, blotted dry, and then weighed to the nearest .01 g (Fig. 2, a and b). The contents were next sorted into the lowest possible taxonomic categories, and each group was then counted and weighed to the nearest .001 g (Fig. 2, c and d). If the fish were small, lengths were taken for each fish in a group and then an average length was recorded. Stomach contents were pooled and the contents from the pooled stomachs were treated as above. Average numbers and weights of prey items were then calculated.

Data were entered on NOAA-EDS forms from which it was keypunched and verified. The data were then listed and these listings were checked for accuracy. It was then run through five error-finding programs and after errors were corrected, it was ready for our food habits analysis and submission to OCSEAP.

Among the over 14,000 stomachs from about 40 species of fish that we analyzed (Table 1), 13 species contributed more than 300 stomachs each. Accordingly, we gave these 13 species (pink and chum salmon, Pacific sandlance, Pacific cod, walleye pollock, *Myoxocephalus* spp., yellow Irish lord, rock, whitespotted, and masked greenling, flathead, rock, and yellowfin sole) special attention in this report. Much of the discussion on food habits of these species is by calendar-based seasons where April, May, and June = spring, July and August = summer, November = autumn, and March = winter.

In previous reports, we presented the data in terms of juvenile and adult fish, depending on the appearance of the gonads. However, there were many instances in which fish that were too large to be considered juveniles were called juveniles because of immature-appearing gonads. Small gonads can occur during low points in the reproductive cycle and these may be very difficult to tell from immature ones. Because of the inconsistencies, we decided to re-examine our data in terms of predator lengths and, in order to make cross-species comparisons, we decided to use the same length categories for all species of fish. Since a low point in the length frequency graphs often occurred around 150 mm (Fig. 3), we decided to set the first interval (size class I) at 0-150 mm and the second (size class II) at 151-300 mm. The third category (size class III) includes all fish longer than 300 mm.

The data were stratified by species of predator, size, area, season (or month), and habitat, which allowed us to examine the effect of each variable on the food habits of the more frequently sampled fish. For each prey type, the mean number and weight per stomach and its frequency of occurrence (unless a sample contained pooled stomachs) within a sample were calculated.

We examined the frequency distributions (i.e., number of stomachs versus mean weights of foods) from selected sets of data. The distributions were typically J-shaped with high numbers of stomachs containing low amounts of food and with a long tail to the right (high amounts of food). The data were quite heterogeneous, with variances directly related to the means, and the variances frequently increased by several orders of magnitude as the means increased. These relationships held even after the data were transformed by $\ln(x + 1)$. Despite these problems, we ran some two-way ANOVA's with bay and month as the variables. However, it is possible that more sophisticated transformations would normalize variances so that parametric tests such as ANOVA could be performed with more confidence. As an alternative, we also tried the non-parametric Friedman's method for randomized blocks (Sokal and Rohlf 1969) to test the effects of bay and month on selected groups of fish. With both this test and the two-way ANOVA, only one type of food could be tested at a time, which invariably led to results which were difficult to interpret. A multivariate analysis which examines the entire arrays of food remains as one untried but promising approach to the statistical analysis of these data.

In this report, the mean numbers and weights of the food organisms are presented by family or higher taxa in tabular and graphic form. Discussions on effects of the five variables (species of predator, size, area, season, and habitat) are based on these tables and graphs.

VI. RESULTS

The results are divided into three sections as follows:

1) The first section deals with the efects of bay and month on some of the most frequently sampled species of fish.

2) The second section describes the food habits of each species of fish that we sampled (averaged over bay and gear type). Comparative literature from other studies is also cited in this section.

3) The third section provides a more detailed account of the distribution of feeding on the crab, shrimp, and fish resources.

Effects of Bay and Month

The variation in stomach contents that was associated with locations (bay) and dates (month) was examined to determine whether the diets of the fishes differed significantly among bays and months. For many species, our sample sizes were small and the stomach contents data were, of necessity, grouped by season and averaged over all bays. Even when samples of stomach contents were large, they were not equal among bays and months. If there were significant differences in bays and months, the average diets of the fish would be biased, depending on when and where the samples were collected.

Total Contents

The geometric means of the weight of identifiable stomach contents were calculated by month, bay, and size group (<150, 151-300, >300 mm) for 13 species of fish. The mean weight in March was significantly lower than the weights in other months for all size groups, averaged over all the species of fish. The mean weights for fish less than 150 mm were significantly higher in May and June than in other months; however, there was no significant difference for the larger fish (Fig. 4). The amounts of food in the flatfishes and sand lance were very low in November, but other fishes tended to have an intermediate to high amount in November. The differences between species and sizes were much greater than between months.

Averaged over all species, there was no significant difference between bays in the mean weights of total contents; however, there were a few significant differences between bays for individual species-size groups. The mean weights for small rock sole were lower in Izhut than the other bays, but the means for flathead sole were lower in Kiliuda than in Izhut and Kalsin. Thus, differences between bays were not consistent among the species of fish.

Individual Food Items

The statistical analyses of the geometric mean weights of food items were restricted to those species and size groups for which sufficient samples were available by bay and month. The analyses were also restricted to samples from a single gear to control the effect of habitat on the stomach contents. We calculated 50 two-way analysis of variances and Friedman rank tests (Table 2).

The most complete set of data available was for small and intermediate rock sole and, probably as a result, more significant differences were detected in their food items than those in the other species. Overall, only 16 significant bay-month effects were detected in the 50 two-way tests (Table 3). Differences between bays were more evident than differences between months, but data from March and April were limited from small sample sizes in most species. Had these months been included in the analyses, there likely would have been more significant month effects. The means by bay and month for rock greenling (trammel net), rock sole (try net), and flathead sole (try net) are presented in Appendix Tables 1-6.

The zooplankton diet of sand lance was much different than that of the other species (Appendix Table 7), and no statistical analysis was conducted. The average weight of copepods, their primary food, appeared significantly higher in May-June than in the other months, but a significant difference between bays was not evident.

Fish. Significantly more fish was consumed by yellow Irish lord (>300 mm) and rock sole (151-300 mm) in Izhut Bay than in the other bays (Tables 4 and 5, Fig. 5). More fish were also consumed by smaller and larger rock sole in Izhut than in the other bays, but the differences were not statistically significant. The proportions of fish in the diets of flathead sole, yellow Irish lord, and *Myoxocephalus* were all greater for those caught by otter trawl (May-August) in Izhut Bay than those from Kiliuda (Table 5). However, flathead sole caught by try net contained a higher proportion of fish in Kiliuda Bay than in Izhut and Kalsin bays and the proportions of fish in the diets of rock greenling were similar among the bays (Table 4). Thus, fish was not consistently more important in the diets of predators from Izhut Bay.

Shrimp. There were more statistically significant differences in the mean weights of shrimp than any other food item. However, differences between bays were not consistent, e.g., for flathead sole and yellow Irish lord from the otter trawl, there were higher mean weights of shrimp in Kiliuda than in Izhut, whereas there was a higher mean weight of shrimp in rock greenling from Izhut, (although shrimp was a relatively minor item in their diet, except in November). The proportion of shrimp in flathead sole (over 151 mm) from the otter trawl was lower in Izhut than Kiliuda, while the reverse occurred for flathead sole from the try net. Yellow Irish lord and flathead sole contained a higher mean weight in May than in the other months, and the amount of shrimp in the diets of all species tended to be low in March and April.

Crab. Crabs were one of the more important items in the diets of rock greenling, Myoxocephalus, and yellow Irish lord, but only for the latter species was there a significant difference between bays in the amount consumed. They contained a greater weight and proportion of crab in Izhut than in Kiliuda. There were no significant differences in weights of crab during May to November but the mean weights of crab in the diets tended to be highest in May or June.

Polychaetes. Polychaetes were the most important food item for all rock sole except the large individuals from Izhut and Kiliuda bays. There was a significantly lower mean weight of polychaetes in small rock sole from Izhut (Fig. 5). Although there were no statistically significant differences among the months, the mean weights of polychaetes were generally low in March and November and high in April and May for large fish and in June for small fish.

Clams and Siphons. Clams and clam siphons were the second most important food item in the diets of rock sole from Kiliuda, Kalsin, and Kaiugnak bays, but they ranked third in average weight in Izhut Bay. For small rock sole, the mean weight of clams and siphons was significantly lower in Izhut than in the other bays, and for intermediate rock sole the mean weight was significantly higher in Kiliuda than in Izhut and Kalsin bays. Although there was not a significant difference between months in the two-way ANOVA (largely because of an inter-action between bays and months), the mean weight of clams and siphons in rock sole less than 300 mm and in rock greenling was consistently low in November. The greatest weight of clams and clam siphons in both species occurred in June.

Gammarid Amphipods. Gammarids ranked second or third in importance in the diets of rock greenling (151-300 mm) in all bays except Izhut where they were relatively unimportant (less than 5% of the contents during June-November). The mean weights were relatively high in June and July and low in August and November. Averaged over all months, the mean weights of gammarids were also lower in rock sole from Izhut than in those from the other bays; however, during the summer months, the small rock sole from Izhut contained a higher proportion of gammarids than did those from the other bays.

Variation in the amount and composition of the stomach contents was much greater among species and size groups of fishes than among the bays. Differences between bays were as much related to the habitat (gear) within the bays as with the bays themselves. Although the differences between bays in the mean weights of the food items were seldom consistent for all species, and size groups of fish, most often the diets of the fish from Izhut (Afognak Island) differed from those from the other bays and the diets in the other (Kodiak Island) bays were similar. The amount and composition of the food was generally different in March and November, but similar during April-August.

Food Habits by Species

The breakdown of stomachs sampled by species and gear type is presented in Table 6. Within a size class and species, predators were taken by primarily one type of gear. In nine instances where there were significant numbers of stomachs from more than one type of gear, we graphically examined the effect of gear (habitat) on the food arrays. These graphs are discussed under the individual species and some of the foods commonly eaten are shown in Fig. 6.

Salmonidae

Pink Salmon (*Oncorhynchus gorbuscha*). Juvenile pink salmon with food ~~in their stomachs were sampled only~~ during the spring and summer, primarily from the beach seine catches, but also, to a lesser extent, from the townet. The fry grew from a mean length of 35 mm in April to 82 mm in August. During this time, their foods consisted mainly of calanoid and harpacticoid copepods, insects, and gammarid and caprellid amphipods (Fig. 7). They also ate several other forms of zooplankton such as cladocerans, cirripede (barnacle) larvae and euphausids and also other epibenthic forms such as cumaceans (Table 7). Similarly, Barraclough (1967a, b, c); Barraclough and Fulton (1967, 1968); Barraclough et al. (1968); and Robinson et al. (1968a, b) found, in sampling off Vancouver Island, that juvenile pink salmon relied mostly on copepods, insects, and gammarid amphipods and that they also ate many other forms of zooplankton and small epibenthic organisms.

In other studies, Bailey et al. (1975) found that calanoid and cyclopoid copepods comprised 77% by volume of the juvenile pink salmon diet, while Manzer (1969) found copepods (30% by volume) and larvaceans (40%). In both Puget Sound (Cross et al. 1979), and off Attu Island in the Aleutians (Simenstad et al. 1977), pink salmon relied on on copepods and larvaceans. Gosho (1977), who studied pink salmon off Kodiak Island, stated that their food habits were affected by such factors as area, and time of sampling. In general, copepods were the most important food.

Kaczynski et al. (1973) and Harris and Hartt (1977) reported that small pink fry caught inshore with a beach seine fed mainly on epibenthic harpacticoids. However, pelagic juveniles caught by townet fed primarily on a larger zooplankter--calanoid copepods (Harris and Hartt, 1977). In our samples, reliance on calanoids increasd with the size of the fish, whereas reliance on harpacticoids decreased with size. Pink salmon caught by beach seine were smaller than those caught by townet (48 versus 54 mm); however, fry caught by the beach seine consumed not only more harpacticoids, but also more calanoids than did the fish caught by townet (Fig.8). The pink salmon juveniles caught by townet ate far more euphausids, which are much larger than calanoid copepods, than did the juveniles caught by the beach seine.

The five adult pink salmon captured during the summer that had food in their stomachs were eating fish.

Chum Salmon (Oncorhynchus keta). Like the pink salmon, chums that contained food were only captured in the spring and summer. During this time, their mean lengths in the samples increased from 40 to 66 mm. Their main foods were calanoid and harpacticoid copepods, gammarid amphipods and insects (Fig. 7). They also ate a few other types of zooplankton and epibenthic foods (Table 8). In the summer, chum salmon juveniles fed more on gammarid amphipods and less on harpacticoid copepods than did the smaller fish sampled during the spring.

Food habits of chum salmon juveniles caught by beach seine (n = 455) are compared with those caught by townet (n = 78) in Fig. 9. The average length of fish caught by the two gears was nearly equal, and so were their stomach contents.

Kaczynski et al. (1973), Feller and Kaczynski (1975), and Harris and Hartt (1971) reported that harpacticoid copepods were usually the most important food in juvenile chum salmon caught with a beach seine. Other foods included gammarid amphipods, insects, mysids, and cladocerans. Pelagic juvenile chum salmon fed mostly on copepods, insects, and cladocera (Barraclough 1967a, b, c; Barraclough and Fulton 1967, 1968; Barraclough et al. 1968; and Robinson et al. 1968a,b).

Coho Salmon (Oncorhynchus kisutch). We took stomachs from only 27 coho salmon (22 juveniles and 5 adults) and these fish were all taken with a beach seine. The main foods of the juveniles were, in June (n = 19): euphausids and fish by weight and unidentified eggs by number and, in July (n = 3): polychaetes, harpacticoids and diptera by weight and harpacticoids by number (Table 9). The adult coho salmon contained euphausids and fish.

According to the literature, juvenile coho salmon rely on a variety of foods, depending on their size, location, and so forth. Epibenthic gammarid amphipods were the most important food found by Cross et al. (1978) and Harris and Hartt (1977). The coho sampled by Manzer (1969) and Ross (1960) were notably piscivorous, and were feeding on herring larvae, sand lance, and sockeye salmon fry. Those sampled by Synkova (1951) were feeding on pelagic zooplankton such as cladocerans and calanoid copepods. Finally, the coho studied by Barraclough and Fulton (1967) and Robinson et al. (1968b) ate an assortment of fish, amphipods, euphausids, and crab larvae.

Dolly Varden (Salvelinus malma). We examined stomachs from 11 Dolly Varden captured by beach seine in April and their main foods were calanoids, polychaetes, and gammarid amphipods (Table 10). Fish were an unimportant component of their diet. However, in general, Dolly Varden are often considered to be chiefly piscivorous (see Lagler and Wright (1962)- on capelin, Noerenberg (1960)- on pink salmon, and Townsend (1942)- on flounder post larvae).

Dolly Varden in the Sea of Japan ate euphausids and anchovies (Darda 1964). From Attu Island, Alaska, they ate gammarid amphipods (Simenstad et al. 1978), and from Chignik, Alaska, even though salmon fry and herring were abundant, they most often ate sand lance and gammarid amphipods (Narver and Dahlberg 1965). Stomachs from Kodiak Island yielded gammarid amphipods, sand lance, and other species of fish (Harris and Hartt 1977).

Osmeridae

Capelin (Mallotus villosus). The capelin that we examined were mostly caught by otter trawl and townet and they had been feeding, for the most part, on small crustaceans in the zooplankton such as calanoid copepods and Eucarida (Table 10).

According to the literature, capelin typically feed on zooplankton, especially euphausids and copepods. This has been observed near Kodiak (Harris and Hartt 1977), in the North Atlantic (Jangaard 1974), and in the Bering Sea (Andriashev 1954; Smith et al. 1978). Our samples were taken in late spring, autumn, and early winter and, in each case, the index of stomach fullness was quite low. Winters (1970), who worked near Newfoundland, and Jangaard (1974), described sharp seasonal trends in feeding, whereby feeding increases as gonads develop in late winter-early spring and then declines with the spring spawning migration. The capelin did not feed at all while spawning. Our samples were so limited that we did not detect such a pattern, although a similar one may well exist for the capelin near Kodiak.

Ammodytidae

Pacific Sand Lance (Ammodytes hexapterus). Sand lance stomachs were taken during each month of sampling and over 90% of these fish came from beach seine sets. The sand lance were feeding on zooplankton, especially calanoids and crustacean larvae, and also on some epibenthic invertebrates, especially mysids and gammarid amphipods (Fig. 7). The proportions of mysids and amphipods in the diet were high in the autumn and winter, although the total absolute weights of the stomach contents were low at those times (Table 11).

It appears that sand lance commonly relies upon calanoid copepods and other zooplanktonic forms (Barraclough 1967a, c; Barraclough and Fulton 1967, 1968; Barraclough et al. 1968; Robinson et al. 1968a, b; Cross et al. 1978; Harris and Hartt 1977; Inoue et al. 1967; Meyer et al. 1979; Richards 1963; Roessingh 1957; Scott 1973; Sekiguchi 1977; Senta 1965; Simenstad et al. 1978). Nikol'skii (1954) stated that benthic invertebrates occasionally appear in the diet of sand lance, but not often.

Only two authors who examined the food habits of this fish have found significant amounts of benthic invertebrates in their stomachs. Barraclough (1967b) found sand lance feeding mostly on fish (by weight) and copepods (by number) but he also found mysids, isopods, polychaetes and anomuran crabs. Trumble (1973) studied sand lance in the eastern North Pacific and those fish fed upon amphipods and polychaetes.

Gadidae

Pacific Cod (Gadus macrocephalus). Cod were sampled during all seven months, although the numbers of stomachs taken dropped off in early spring and winter. Cod in size class I were sampled mostly from beach seine catches, those from size class II from trammel net and otter trawl catches and those from size class III from otter trawl catches.

Cod tended to eat small epibenthic crustacea (especially gammarid amphipods) and zooplankton when they were small, but as they grew, they relied less on these organisms and more on shrimp and fish (Fig. 10). The largest size class of cod ate mostly shrimp and secondly fish but only insignificant amounts of zooplankton and small epibenthic crustacea. The pandalid shrimp, Pandalus borealis, was by far, the most important shrimp in the diet. Other foods consumed by the cod are listed in Tables 12-14.

Several authors have named shrimp as the most important food for Pacific cod. Hunter (1979), in his work off Kodiak Island, called cod a pelagic and epibenthic generalist because it seemed to feed on all possible pelagic prey and epibenthic crustacea. Even so, P. borealis was their main food. Feder (1977) found, in cod stomachs from the eastern Bering Sea, that P. borealis was eaten more frequently than any other prey and it was followed by crab, fish, amphipods, and others. Forrester (1969), Hartt (1949), and Karp and Miller (1977) found shrimp, then fish, to be the most important foods.

In contrast, Feder (1977) discovered that in both Cook Inlet and the northeast Gulf of Alaska, snow crab was eaten more frequently than any other food. This was followed by crangonid shrimp (in Cook Inlet) and, in decreasing order of importance, by fish, amphipods, and shrimp (in the Gulf of Alaska).

Hunter (1979) and Feder (1977) both noticed that the cod's utilization of fish as food increased with the size of the cod. In our work, however, when the mean percent number and percent weight of fish eaten were plotted against the mean length of cod (from Tables 12-14), the maximum percent by weight of fish eaten occurred when the cod were about 250 mm long. When the cod approached their maximum length (in our samples) of nearly 500 mm, they relied very little on fish. Fish never made up the majority of the diet. As cod in our samples grew larger, they relied more and more heavily on shrimp in both weight and numbers.

Feder (1977) also noted that as cod grew, they relied less on small crustaceans. In our study, this was partially true. The utilization of gammarid amphipods increased in percent by number in the 50-150 mm length range and in percent by weight between 50 and 100 mm. Reliance on gammarids then declined rapidly until, by the time the cod was 250 mm long, gammarids hardly occurred at all in the diet.

Walleye Pollock (Theragra chalcogramma). Pollock were most frequently sampled from the otter trawl, although significant numbers of small (size class I) pollock were also taken from the try net. As with the cod, pollock tended to rely more on shrimp and fish as their size increased (Fig. 11, Tables 15-17). Mysids and euphausids were the most important foods to the small pollock but their importance, especially in terms of weight, decreased in each successively larger size group. Calanoids contributed a high percent by number to the diet of small and mid-sized pollock during the spring, but their contribution by weight was fairly unimportant.

In contrast, Barraclough (1967a, c) examined pollock larvae 4-22 mm long and found that their diet consisted entirely of copepods and their eggs. Cross et al. (1978) and Takahashi and Yamaguchi (1972) reported that juvenile pollock were feeding most heavily on calanoid copepods and secondly on amphipods, shrimp, mysids, euphausids, and cumaceans.

Both Bailey and Dunn (1979) and Smith et al. (1978) stated that as pollock grew, their reliance on copepods decreased. In both studies, euphausids were the most important food to most pollock, but consumption of fish increased with the size of the pollock. Smith et al. (1978) found that fish was the most important food for pollock longer than 500 mm.

In other studies, mysids or euphausids were usually the primary foods (Simenstad et al. 1977; Nikol'skii 1954; Andriashev 1957, in his work on the Bering Sea). Takahashi and Yamaguchi (1972) found that juveniles ate copepods, euphausids, and mysids, whereas adults ate euphausids, amphipods, and fish. In contrast to other studies, Suyehiro (1942) listed shrimp as the most important food for pollock, followed by gammarids, euphausids, and copepods.

Pacific Tomcod (Microgadus proximus). Studies that report on tomcod feeding habits are rare. Hart (1949) noted that of 22 fish which he examined, 19 had eaten euphausids and 5 had eaten shrimp. Other foods were fish, crabs, and isopods.

In this study, we examined stomachs from 43 tomcod. Of the 15 in the smallest size class, mysids and gammarids were the predominant foods in weight and number (Table 18). The tomcod in size class II ate mostly fish in August and November and the two with food in March had been eating shrimp and pagurid crabs. The largest fish, of which only three had been feeding, fed mostly upon fish and mysids.

Scorpaenidae

Black Rockfish (Sebastes melanops). Only four black rockfish were sampled and only two of these had been feeding. The sole contents were shrimp.

Hexagrammidae

Kelp Greenling (Hexagrammos decagrammus). Kelp greenling appear to be quite opportunistic in their feeding. In several cases, they fed heavily on epibenthic crustacea such as crab, shrimp, and gammarid amphipods (Tables 19 and 20). Other epibenthic invertebrates such as lacunid snails and clam siphons were occasionally important, but fish and fish eggs were also frequently important. Hart (1973) listed worms, crustaceans, and small fish as important foods to the kelp greenling while Moulton (1977) listed a diverse diet of holothurians and crabs (most important by weight) and amphipods (by number). He also found shrimp, chitons, and snails in their stomachs.

Masked Greenling (Hexagrammos octogrammus). Masked greenling 0-150 mm long relied mostly on gammarid amphipods (by both number and weight) and polychaetes (by weight). They also fed, to a lesser extent, on other epibenthic crustacea such as isopods, harpacticoids, shrimp, and crab (Fig. 12). By contrast, the larger greenling ate a more diverse diet--gammarids still dominated by number, but by weight, the diet was divided fairly evenly among epibenthic crustaceans, polychaetes, gastropods, clam siphons, fish, and fish eggs. Other foods for these two size groups are given in Tables 21 and 22. Only seven masked greenling larger than 300 mm were sampled and their foods are presented in Table 23.

Harris and Hartt (1977) believed that for food habit studies, greenling should be separated by whether they were captured inshore (by beach seine) or were pelagic (by townet). They reported that masked greenling juveniles captured by townet ate calanoid copepods while those taken inshore ate more epibenthic foods such as amphipods, polychaetes, and harpacticoids.

All of our small masked greenling were taken by beach seine, so we cannot make a similar comparison. However, the diet of the smallest size class of masked greenling in our samples did compare well with that reported (for the juveniles captured with a beach seine) by Harris and Hartt.

Most of the masked greenling 151-300 mm long were taken from the trammel net although sizable numbers were also taken from the beach seine. The diets of the fish taken by these two gears were similar and are compared in Fig. 13.

Harris and Hartt (1977) list amphipods as the most important food for adult masked greenling followed by polychaetes, shrimp, small crabs and isopods. Rutenberg (1962) said that masked greenling feed primarily on amphipods, which does not hint at the wide diversity in the diet that was evident in this study and in the study by Harris and Hartt.

Rock Greenling (Hexagrammos octogrammus). The smallest rock greenling were captured mostly by beach seine, those 151-300 mm long were taken mostly by trammel net, and the largest ones were taken in nearly equal numbers from the beach seine and trammel nets. However, difference in foods between the two gears will not be discussed here.

Like the masked greenling, the diet of the rock greenling appeared to become more diverse as the fish grew. This was not an artifact caused by unequal sample sizes since both size groups I and III were represented by nearly equal numbers of fish. Gammarid amphipods were the most important food to the rock greenling in size class I (Fig. 14). Also important during the summer were gastropods, by weight, and harpacticoids and unidentified eggs by number (Table 24). Other foods of secondary importance in both summer and autumn were polychaetes, gastropods, shrimp, and isopods.

As the fish grew, gammarids become less and less important (Tables 24-26). When the rock greenling were longer than 300 mm, gammarids contributed very little by weight to their diet. No single food was of major importance in terms of weight to rock greenling larger than 150 mm, although fish did increase in importance as the rock greenling grew. By number, fish eggs dominated in size classes II and III, but by weight, they were unimportant. Foods listed in Tables 24-26 range through a huge array of algae, zooplankton, benthic and epibenthic invertebrates, fish, and fish eggs, indicating that the rock greenling is a classic "garbage-gut".

Simenstad (1971) studied the rock greenling at both Amchitka Island and Attu Island (Simenstad et al. 1978) and found that amphipods were the major food in their diet. He also found other foods like mysids, copepods, crab, algae, polychaetes, gastropods, chitons, fish and fish eggs. He concluded that rock greenling are opportunistic feeders that concentrate on bethic macroinvertebrates, fish, and algae.

Rutenberg (1962), in his study of rock greenling diets, stated fish, crustaceans (including shrimp and mysids), polychaetes, and plants were important while Klyashtorin (1962) reported that isopods, amphipods, molluscs, fish, crab, and shrimp were important. Neither authors found any pelagic foods in the rock greenling diet.

Simenstad (1971) believed that rock greenling forage throughout the day with perhaps a slight diurnal emphasis and Klyashtorin (1962) found rock greenling feeding most in the morning and evening. Both authors reported that rock greenling foraged at high tide close to the shoreline.

Whitespotted Greenling (*Hexagrammos stelleri*). The smallest whitespotted greenling, which were taken mostly inshore by beach seine, fed primarily on harpacticoids, mysids, and gammarid amphipods (Fig. 15). The ones in size class II, which were captured mainly by trammel net, ate mostly shrimp, crab and fish by weight. Eggs dominated by number in the spring and were replaced by both eggs and mysids in the summer. The largest fish, which were also taken mostly from the trammel net, ate primarily crab and fish by weight and eggs by number. Like the rock and masked greenling, the diet of the whitespotted greenling was quite diverse and this is evident in Tables 27-29.

Harris and Hartt (1977), Barraclough and Fulton (1968), and Barraclough et al. (1968) reported that pelagic juveniles tended to feed on copepods and other zooplankton. However, in juveniles captured inshore, Harris and Hartt found that harpacticoids, caprellids, and calanoids predominated.

Rutenberg (1962) said that adult whitespotted greenling fed on worms, crustaceans, and small fish by foraging in the rocks and sand of the littoral strip. Simenstad et al. (1979) sampled several habitats in Puget Sound and the Strait of Juan de Fuca and found, instead, that gammarid amphipods were always the predominant food of the adults (no lengths were given). These were followed by shrimp, crab, polychaetes, fish, tanaids, and clams. In our sampling, gammarids contributed the most to the diet of the small whitespotted greenling (the smallest ones in our sampling averaged 73 mm long - see Table 27), but when they reached the length of 250 mm, amphipods contributed negligible amounts to the percent composition of the diet.

Unidentified Greenling (*Hexagrammos* spp.). These were, in all cases, rock, masked, whitespotted or kelp greenling that were not porperly identified in the field. For this reason, we have chosen not to report their food habits.

Lingcod (*Ophiodon elongatus*). We sampled few lingcod: 15 in size class I and 2 in size class II. The small lingcod fed mainly on fish (82% by weight) and also on shrimp and mysids. The larger lingcod had eaten only shrimp.

Wilky (1937), Forrester (1969), Hart (1973), and Moulton (1977) all listed fish as the main food of lingcod, and herring and sand lance were consistently named as the most important species of fish in their diet. Other forms eaten were flatfish, codfish, rockfish, and lingcod. The invertebrates - crab, shrimp, squid, octopus, and snails - were also consumed. Hart (1973) said that food of juvenile lingcod is comprised of copepods and other small crustacea.

Anoplopomatidae

Sablefish (*Anoplopoma fimbria*). Shubnikov (1963), in studying sablefish from the Bering Sea, found that they were chiefly piscivorous but, in addition, they ate some ophiuroids, shrimp, and other invertebrates. Grinols and Gill (1968) observed sablefish feeding at night on blue lanternfish, saury, and euphausids that had been attracted to searchlights on their ship. Finally, Hart (1973) listed crustacea, worms, and small fish as food of the sablefish.

In our study, stomachs from the smaller fish (151-300 mm) contained mostly fish by weight, but euphausids and brachyuran larvae by number (June) or shrimp and fish by number (August). The larger sablefish (>300 mm) primarily ate fish, but shrimp ranked a high second (Table 30).

Cottidae

Silverspotted Sculpin (*Blepsias cirrhosus*). Gammarid amphipods were, by far, the primary food consumed by the silverspotted sculpins

(Table 31). Other epibenthic crustacea (except for a small amount of clam siphons) formed the remainder of the diet. Similarly, Simenstad et al. (1979) reported that this sculpin relies on epibenthic crustacea such as gammarid amphipods, mysids, and to a lesser degree, flabelliferan isopods and shrimp.

Staghorn Sculpin (Leptocottus armatus). We collected only one stomach from a staghorn sculpin and it contained one polychaete, one gammarid amphipod, and one harpacticoid (Table 31). Jones, in his study of staghorn sculpins in Tomales Bay, California, demonstrated that adults relied on benthic shrimp (Crangon sp. and Upogebia pugettensis) and secondarily on northern anchovy (Engraulis mordax). Juveniles ate mostly gammarid amphipods (especially Corophium sp.) and nereid polychaetes.

Conley (1977) studied the food habits of staghorn sculpin taken from Everett Bay, Washington. They had eaten mostly the gammarid Corophium sp. (by number) and fish (especially Leptocottus armatus) and mud shrimp (Callianassa sp.) by weight.

Simenstad et al. (1979) examined staghorn sculpins taken from several habitats in the Strait of Juan de Fuca and northern Puget Sound and stated that their foods varied by area. Gammarid amphipods, fish, clams siphons and isopods were frequently the most important foods, but the sculpins also ate tanaids, crab larvae, mysids, crab, and shrimp.

Gymnocanthus spp. . In our sampling, the genus Gymnocanthus was represented by two species, G. galeatus (armorhead sculpin) and G. pistilliger (threaded sculpin). Since we took only 20 Gymnocanthus stomachs in all, we decided to combine the food habits of the two species. Their foods ranged from epibenthic (gammarids, polychaetes, shrimp, cumaceans, and mysids) to benthic (clams) to pelagic (crab megalops and euphausids) and fish (Table 31).

Red Irish Lord (Hemilepidotus hemilepidotus). Red Irish lords that we sampled ate a combination of benthic and epibenthic organisms such as fish (including Pacific sandfish), chitons, crabs (including atelecyclid and cancrid crabs), and also algae, barnacle cirri, snails, chitons, clams, cephalopods, and echinoderms (Table 32).

Clemens and Wilby (1961) reported that red Irish lords ate crabs, barnacles and mussels while Simenstad et al. (1979) called them bottom-oriented omnivores that consumed flabelliferan isopods, brachyuran crabs, fish, and shrimp.

Yellow Irish Lord (Hemilepidotus jordani). Yellow Irish lord stomachs were taken mainly from try net (size class I) and otter trawl (size classes II and III) catches. We did not compare differences in diets between gears and within a size class. As with most of the other species of fish that we have examined, more types of food contributed significant amounts to the diet of the smallest size group of yellow Irish lord than for the larger fish (Fig. 16). However, in all three cases, shrimp, crab, and fish were the most significant foods, although reliance on these forms varied by season. The large yellow Irish lord, for instance, ate a small proportion of shrimp in the summer and winter, but a large proportion of fish. They depended largely on shrimp in the spring and autumn but very little on fish. There was little relationship between the size of the yellow Irish lord and the percentage of shrimp eaten, but the percentage by weight of fish in the diet seemed to increase somewhat as they grew longer (Tables 33-35).

The smallest yellow Irish lord ate some zooplankton such as crustacean larvae and copepods. Other foods (in general) were algae, barnacles, mysids, euphausids, bryozoans, and ophiuroids.

Hunter (1979) examined the contents from 11 yellow Irish lord stomachs and reported that they had mostly fed upon cumaceans (which he speculated had been swarming). It is also possible, however, that the cumaceans came from the stomachs of digested fish. The stomach contents also included fish, gammarid amphipods, and Chionocoetes bairdi.

Myoxocephalus spp. . Four species of Myoxocephalus occur in the Kodiak area, the most common of which is M. polyacanthocephalus, the great sculpin. Shipboard identification was somewhat difficult and was probably not always correct. For this reason, we have combined the stomach data from all Myoxocephalus spp.

Myoxocephalus in size classes I and II were sampled mostly from beach seine catches while those in size class III were sampled mostly from otter trawl catches. Significant numbers were also taken from the beach seine; however, we have not yet compared the differences in food habits by habitat for the large Myoxocephalus.

The Myoxocephalus in our sampling were fish specialists. Through all size groups and nearly all seasons, fish were the predominant food by weight (Fig. 17). Gammarid amphipods were more important to the smaller Myoxocephalus than to either of the larger size groups in terms of both percent number and weight, but by the time the sculpins reached 200 mm in length, the percentage by weight of gammarids in the diet dropped nearly to zero and when the Myoxocephalus were 250 mm long, the percentage by number also dropped nearly to zero (Tables 36-38). Crabs were also fairly important to the Myoxocephalus and the contribution of crabs to the diet increased as the Myoxocephalus grew.

The large great sculpin in deep waters off Kodiak Island had eaten primarily snow crab plus large fish, shrimp and a few large snails (Hunter 1979). Four great sculpins taken near Attu Island had fed upon crabs and amphipods (Simenstad et al. 1978), while Feder (1977) reported that Myoxocephalus had been feeding mostly on crab and the shrimp, Crangon dalli, in lower Cook Inlet. Only Harris and Hartt (1977), who sampled 16 juvenile and 11 adult great sculpin near Kodiak Island, reported that fish (especially sand lance) was the most important component of their diet, although crabs also ranked fairly high. Gammarid amphipods were important by number, but contributed very little to the biomass of the stomach contents.

Agonidae

Tubenose Poacher (Pallasina barbata). The one stomach from a tubenose poacher that we examined was empty. However, Simenstad et al. (1979) examined 35 tubenose poacher stomachs that were taken at two sites in the Strait of Juan de Fuca, Washington. Their diet was highly specialized and oriented almost entirely toward mysids.

Trichodontidae

Pacific Sandfish (Trichodon trichodon). In every month, and for both size groups, fish, including ammodytids (sand lance) and osmerids (smelt) dominated the sandfish diet (Table 39).

Harris and Hartt (1977), who studied stomach contents from 16 juvenile sandfish, found primarily crab zoea and larval fish by weight, while Mineva (1955, whose paper was reviewed by Macy et al. 1978) found small crustaceans such as mysids, amphipods and cumaceans.

Zaproridae

Prowfish (Zaprora silenus). The stomach that we sampled was empty and there is a lack of information on the life history of this species in the literature.

Stichaeidae

Snake Prickleback (Lumpenus sagitta). The smallest snake prickleback fed mostly on harpacticoid copepods and mysids but other foods included calanoid copepods, barnacle cyprids, and gammarid amphipods (Table 40). The mid-sized prickleback switched to polychaetes in June and August, and to gammarids in July, while the largest ones ate mostly polychaetes and fish eggs in June, and gammarids in July. Other foods were calanoid copepods, several types of small epibenthic crustacea (including harpacticoid copepods), clams, siphons, euphausids, shrimp, ophiuroids, echiuroids, bryozoans, fish, and fish eggs.

Snake pricklebacks that we sampled had eaten both benthic and pelagic prey. Simenstad et al. (1979), however, classified them as benthivores because in samples taken in northern Puget Sound, the only important foods were benthic in origin (i.e., clams, tanaids, polychaetes, and gammarids). Similarly, stomachs taken near Anacortes, Washington contained mostly oligochaete worms, then gammarids and polychaetes.

Harris and Hartt (1977) examined stomachs from 41 juveniles and adults and reported that gammarid amphipods were most important by weight (they also contributed large numbers to the diet) and harpacticoid copepods by number. Polychaetes also contributed significantly to the biomass of the diet. Finally, Barraclough et al. (1968) reported that larval snake prickleback fed mostly on copepods.

Daubed Shanny (*Lumpenus maculatus*). The stomach that we sampled was empty and there is a lack of information on the life history of this species in the literature.

Pholidae

Crescent Gunnel (*Pholis laeta*). Crescent gunnel fed almost entirely on small epibenthic organisms, although they did eat some pelagic copepods (Table 41). Most important to the smallest gunnel were gammarid amphipods (May, June, and July) or gammarids and copepods (August). The larger fish depended on a slightly more diverse array of food i.e., gammarid amphipods, polychaetes, *Cancer* crabs, and ostracods.

Simenstad et al. (1978), Cross et at. (1978), and Simenstad et al. (1979) all reported that epibenthic organisms formed the bulk of the crescent gunnel diet, and either gammarid amphipods or harpacticoid copepods were the most important components of the their diet.

Penpoint Gunnel (*Apodichthys flavidus*). The two penpoint gunnel stomachs that we examined contained a variety of epibenthic organisms (especially nemertean worms, by weight), pelagic zooplankton (calanoid copepods), and fish larvae (Table 42). Hart (1973) reported that their diet consisted solely of small crustacea and molluscs while Simenstad et al. (1979) reported that their most important foods were isopods, gammarid amphipods and other epibenthic organisms.

Pleuronectidae

Arrowtooth Flounder (*Atheresthes stomias*). Even though we examined over 40 arrowtooth flounder stomachs, we found only two types of food: primarily fish and secondarily shrimp (Table 42). This type of specialized feeding is echoed in the literature. Hart (1973) listed shrimp and herring, while Hunter (1979), in his studies off Kodiak, stated that fish (mostly pollock) comprised 98.6% of the weight of the diet. Frequently, in stomachs that contained food, there was only one item per stomach. Gotshall (1969) sampled arrowtooth flounder stomachs off northern California and reported that fish and crustaceans were equally important by volume, but shrimp and amphipods were important by number. He categorized the arrowtooth flounder a large-fish specialist.

Smith et al. (1978) examined arrowtooth flounder stomachs that were taken from the northeast Gulf of Alaska and learned that fish and crustaceans (especially decapods) were the most frequently occurring foods. Among fish in the diet, osmerids, gadids, and zoarcids were the most important (listed in descending order of importance). By size grouping, euphausids and small decapods were the most important foods of arrowtooth flounder 0-150 mm long. Crustaceans plus fish were most important to arrowtooth flounder 151-250 mm and 250-450 mm long, respectively, while those larger than 450 mm ate fish almost exclusively. Euphausids were not eaten by fish larger than 350 mm and, although polychaetes, molluscs, and echinoderms did occur in the diet, they were rare.

Starry Flounder (*Platichthys stellatus*). The stomachs from starry flounder that we examined contained only anthozoans (sea anemones) and gammarid amphipods (Table 42). According to the literature, the starry flounder is generally a benthivore. For example, stomachs that Hunter (1979) examined contained clams. Cross et al. (1978) found that polychaetes and gammarids predominated in the diet, while Skalkin (1963) listed clams, polychaetes, and sand lance as important foods to starry flounder in the Bering Sea. Finally, Miller (1967) discovered that priapulids and nemertean worms predominated by volume in the diet of starry flounder taken near Orcas Island, Washington. Polychaetes and clams were also important, but crabs and ophiuroids contributed relatively minor amounts to their diet. He also reported that the starry flounder were not feeding during the winter, but during other seasons, they fed between sunrise and sunset.

Butter Sole (*Isopsetta isolepis*). The butter sole stomachs that we collected were all empty and there was a lack of life history information on this species in the literature.

Flathead Sole (*Hippoglossoides elassodon*). Small flathead sole ate mostly mysids-euphausids, shrimp, crab, and fish (in the winter), but as they grew, mysids and euphausids became less and less important (Fig. 18). The largest flathead sole did not eat mysids or euphausids at all. Crab was also unimportant to the fish longer than 150 mm. In addition, the small fish consumed other small epibenthic prey such as gammarid amphipods, polychaetes and clam siphons. Only shrimp and fish were important to the larger flathead sole. Similarly, Miller (1970), in studying flathead sole from Puget Sound, learned that those shorter than 320 mm fed heavily on mysids, but mysids were replaced by shrimp and fish (especially herring) as the sole grew.

Shrimp was the main food of flatheads 151-300 mm long. However, the largest flathead sole ate mostly shrimp in the spring, shrimp and fish in the summer, and fish in the winter. All foods for each of the size groupings are listed to family in Tables 43-45.

Flathead sole 0-150 and 151-300 mm long were sampled mostly from try net and otter trawl catches. The percent composition by weight of the foods eaten by specimens taken from each gear are compared in Fig. 19. The diets of the smaller fish were quite similar except that those fish taken from the try net ate more mysids than did those taken from the otter trawl catches. Diets of the larger flathead sole differed mainly in that those taken in deeper water by the otter trawl relied far more heavily on shrimp than did those sampled from the try net.

Hunter (1979) determined that flathead sole were the most significant shrimp predator after Pacific cod in deep water off Kodiak Island. In additon, ophiuroids and euphausids were relatively important. Smith et al. (1978) studied the flathead sole in both the Bering Sea and the Gulf of Alaska. In the Bering Sea the flatheads ate mainly the northern pink shrimp, Pandalus borealis during the spring, while in other seasons, mysids, amphipods, ophiuroids, and/or juvenile pollock predominated. The sole from the Gulf of Alaska consumed mostly euphausids and ophiuroids: Suyehiro (1934) examined flathead sole stomachs from the northeast Pacific and found mostly shrimp in their stomachs.

In other studies, Skalkin (1963) and Mineva (1964) reported that ophiuroids and secondarily, shrimp, were eaten by flathead sole collected in the Bering Sea, although Skalkin added that euphausids and chaetognaths dominated in the stomach contents of the fish caught in shallow water. Finally, Hayase and Hami (1974) sampled flathead sole near Japan and reported that ophiuroids followed by fish and shrimp were their primary foods (by number).

Rock Sole (*Lepidopsetta bilineata*). The diet of the rock sole is quite diverse, as can be ascertained from the lengths of Tables 46-48. Irrespective of habitat, polychaetes and fish or gammarid amphipods (in the small fish) were the most important foods by weight, while gammarids (especially in the smaller fish) and polychaetes tended to predominate by number (Fig. 20). Gammarid amphipods became less important as the rock sole grew. This phenomenon was also noted by Smith et al. (1978) in rock sole taken from the Bering Sea. Also, fish increased in importance (by weight) as the rock sole grew. The one exception was the high percent by weight of fish in the diet of small rock sole during the winter. An increased reliance on fish as the rock sole grew was also observed by Forrester and Thomson (1969) and Smith et al. (1978). Consumption of polychaetes appeared to be relatively unrelated to the size of the rock sole and were, for each size class, always important by number and only somewhat less important by weight for the largest fish than for the smaller ones.

Hunter (1979), Skalkin (1963), Cross et al. (1978), Smith et al. (1978), and Zebold (1970) all reported that polychaetes were usually the predominant food of rock sole, although fish or molluscs were sometimes listed as of close secondary importance to their diet. Forrester and Thomson (1969) and Harris and Hartt (1977) stated that large rock sole ate mainly fish (especially sand lance) by weight. Other foods listed in the preceding papers were amphipods, clam siphons, and tanaids.

Rock sole were sampled primarily from try net catches and secondarily, for size classes II and III, from otter trawl and trammel net catches. Diets by percent weight are compared in Fig. 21 by gear for rock sole in size classes II and III. In both instances, far lower proportions of fish were consumed by rock sole taken in the trammel net than either the try net or otter trawl. Of less significance, shrimp were more important in rock sole taken from the otter trawl than from the other two gears and crab were more important in those taken from the trammel net than from the other two gears.

Yellowfin Sole (*Limanda aspera*). The yellowfin sole appears to be another epibenthic-benthic generalist. Although they do consume some zooplankton such as larvaceans, copepods, Leptomedusae, and euphausids (Tables 49-51), these items do not contribute significantly to their diet. Polychaetes are most important by weight to the smallest yellowfin sole, while fish contributed more to the diet of the sole longer than 150 mm than to the diet of the smaller sole (Fig. 22).

The small sole were sampled mostly from try net catches, but those larger than 150 mm were taken in significant numbers from both the try net and otter trawl. In both size groups, shrimp and fish were more significant in the diet of the sole caught by otter trawl, and clam siphons were more important to yellowfin sole caught by try net (Fig. 23). Mid-sized yellowfin sole ate far more polychaetes in shallow water (try net) while large yellowfin sole ate far more siphons and ophiuroids in shallow than in deeper water.

Harris and Hartt (1977) sampled 59 juveniles and adults from Ugak Bay, Kodiak Island, and reported that their stomach contents consisted mostly of clams by frequency of occurrence and number, and fish (especially sand lance) and echiuroids by weight, although the latter items were eaten mostly by a few large adults. Fadeev (1963) reported that ctenophores, pelagic crustacea, and smelt were the main foods of yellowfin sole in the Bering Sea. However, he also stated that as the food benthos became scarcer, the yellowfin sole relied more heavily on pelagic foods. Finally, Skalkin (1963), who sampled this species in the southeast Bering Sea, listed a potpourri of foods, including gammarid and hyperrid amphipods, mysids, euphausids, small clams, Molgula sp. (a tunicate), echiuroids, shrimp, and ophiuroids. He reported wide differences in the diet of yellowfin sole by area and depth. Polychaetes predominated between 50 and 60 m, molluscs between 65 and 80 m, and the ophiuroid, Ophiura sarsi in yellowfin sole caught deeper than 80 m.

Pacific Halibut (Hippoglossus stenolepis) . The 44 halibut that we sampled had eaten mostly shrimp, fish, and other miscellaneous crustaceans (Table 52). Hunter (1979) and Novikov (1963) divided their halibut into three size groupings and in each study, halibut less than 300 mm long had eaten mostly shrimp (Hunter listed fish and crab also). Those longer than 300 mm switched to fish, although according to Hunter, crab was of secondary importance. Gray (1964) published one observation in which two large halibut (14 and 36 kg) had eaten three large, whole crabs apiece.

Feeding on Crab, Shrimp, and Fish

Crab, shrimp, and fish comprise a significant portion of the diet of many species of fish, and thus are ecologically, as well as (in many cases) economically important. For these reasons, we have included this section on how the crab, shrimp, and fish resources were divided among the various species of fish. Predation on these organisms depends largely upon the species and size of the predator, as well as its habitat.

Crab

The families of crab that were most important by weight to the fish (that we sampled) were, in decreasing order of importance: the majids, atelecyclids, cancrids, and pagurids (Fig. 24a and b). A list of all species of crab that were eaten is presented by family in Table 53. Of the species that we studied, the stomach contents of yellow Irish lord, Myoxocephalus (>150 mm long), rock greenling, whitespotted greenling, and yellowfin sole (>150 mm) were more than 10% crab by weight. In all, the stomachs of the more than 14,000 fish that we examined contained about 5200 g of crab, 43.1% of which was consumed by Myoxocephalus (Fig. 24c). Myoxocephalus, rock greenling, and whitespotted greenling combined accounted for over 80% of all the crab eaten.

Myoxocephalus, averaged over size and habitat, ate mostly majid crabs, although the individuals 151-300 mm long ate nearly equal amounts of majids and atelcyclids. The Myoxocephalus were sampled from four gears (Table 6). As an average over all the sizes of Myoxocephalus were sampled, those taken by beach seine ate mostly Telmessus cheiragonus (65.1%), Pugettia gracilis (14.2%), and Cancer spp. (14.2%). Those sampled from the trammel net ate mostly Cancer spp. (46.7%), and T. cheiragonus (35.1%). Majid crabs were important to Myoxocephalus taken by the try net (Chionocetes spp., 77.6%) and the otter trawl (Chionocetes spp., 88.6%).

Rock greenling were sampled primarily from the beach seine and trammel net, although most of the small specimens were taken with the beach seine (Table 6). The average length of rock greenling taken by the beach seine was 186 mm while those caught by the trammel net averaged 307 mm. Similar species of crab were eaten by rock greenling taken in the two gears. Overall, they ate atelecyclids (48.8%), majids (24.6%), pagurids (14.9%), and cancrids (8.4%).

The whitespotted greenling ate, in decreasing order of importance, atelecyclid, cancrid, majid, and pagurid crabs. Those caught by beach seine, possibly because most of them were small fish (Table 6), ate relatively little crab. Atelecyclids comprised 56.2% by weight of the crab eated by individuals sampled from the trammel net and Cancer spp. contributed another 14%. Pagurids and majids (Chionocetes spp.) were most important to the fish taken from the try net.

Shrimp

A list of all the species of shrimp that were eaten is presented in Table 53. The pandalid shrimp, especially Pandalus borealis and P. hypsinotus, were overwhelmingly the most important (Fig. 25a and b). Shrimp contributed more than 10% by weight to the stomach contents of yellow Irish lord, whitespotted greenling (151-300 mm long), Pacific cod (>150 mm), walleye pollock (>150 mm), flathead sole, and yellowfin sole (>150 mm). The fish that we examined consumed almost 9,700 g of shrimp, and the most significant shrimp predator was by far the Pacific cod (Fig. 25c). More than 80% of the shrimp were eaten by Pacific cod, walleye pollock, yellow Irish lord, and flathead sole.

An average of 99.7% of the shrimp eaten by Pacific cod were pandalids. Those caught by otter trawl accounted for most of this, but cod taken by other gears (beach seine, trammel net, try net, townet - Table 6) ate approximately equal portions of pandalids, hippolytids, and crangonids. Walleye pollock captured by otter trawl also ate mostly pandalids (99.8%), although those captured in other gears did not eat shrimp at all. Of the shrimp eaten by yellow Irish lord and flathead sole, more than 98% by weight were pandalids, although among flathead sole taken by try net, "only" 80.7% were pandalids while 12.6% were crangonids and 6.7% were hippolytid shrimp.

Fish

Many species of fish were identified from the stomach contents (Table 54), but the cottids, osmerids, gadids and ammodytids were the most important families (Fig. 26a and b). Of the species of predators that we studied, the stomach contents of yellow Irish lord, Myoxocephalus ,rock greenling (>150 mm long) masked greenling (151-300 mm), whitespotted greenling (>150 mm), Pacific cod (>150 mm), walleye pollock (>150 mm), rock sole, and yellowfin sole (>150 mm) were all more than 10% fish by weight.

Myoxocephalus was the most significant fish predator, accounting for nearly one half of the total biomass (the total equalled nearly 15,600 g) of fish eaten (Fig. 26c). Of the fish that they consumed, 43.8% were cottids, 18.2% were pleuronectids, and 15.6% were gadids. Myoxocephalus from the beach seine (these tended to be small fish - see Table 6) preyed mostly upon Ammodytes hexapterus and secondarily upon cottids. The few caught by trammel net consumed A. hexapterus and stichaeids. Finally, Myoxocephalus taken from the otter trawl and trammel nets ate mostly cottids plus significant amounts of pleuronectids, gadids, and stichaeids. In addition to Myoxocephalus, yellow Irish lord, rock sole, and Pacific cod were important predators on fish, each consuming over 100 g of fish.

Of the identifiable larval fish that were consumed, 67% by number were osmerids. Cottids, hexagrammids, and ammodytids each ammounted to 30% of the total weight of fish larvae eaten. Osmerid larvae were consumed by yellowfin sole, rock sole, flathead sole and pink salmon. Cottid larvae were eaten by ten species of fish (yellowfin, flathead, and rock sole, Myoxocephalus, masked, rock, kelp, and whitespotted greenling, coho salmon, and sand lance). The hexagrammid larvae were consumed by rock sole, whitespotted greenling, pink salmon, and Dolly Varden. Finally, ammodytids were eaten by both pink salmon and walleye pollock, but pollock were the most significant predators on sand lance larvae.

VII. DISCUSSION

Food habits of the 13 major species are compared by size class in Figs. 27-29. For the purposes of this discussion, the data have been averaged over bay and gear. Months have been averaged to season.

Diets of the smallest fish (Fig. 27) ranged from zooplankton and small epibenthic crustacea (pink and chum salmon, Pacific sand lance, walleye pollock, and rock greenling) to a diet of primarily larger prey. The masked greenling and rock sole concentrated on gammarids and polychaetes, although the rock sole did consume a high proportion of fish during the winter. The small flathead sole ate a generalized diet of mostly epibenthic organisms, while the yellow Irish lord consumed mainly crab, shrimp, and fish. Finally, the Myoxocephalus, even when small, favored fish, and secondarily, gammarid amphipods.

Of the fish 151-300 mm long, only walleye pollock ate significant amounts of zooplankton, although shrimp and fish were their primary foods (Fig. 28). Similarly, only the rock sole ate large amounts of gammarid amphipods. The diets of rock greenling, masked greenling, and yellowfin sole were quite generalized, although fish were somewhat more important than the other foods to the yellowfin sole. Yellow Irish lord and whitespotted greenling ate mostly shrimp, crab, and fish while walleye pollock and Pacific cod ate mostly fish and shrimp. Flathead sole relied almost exclusively on shrimp. Finally, Myoxocephalus depended almost entirely on fish during the summer and autumn and on crab and fish during the spring. The gammarid amphipods that were relatively important to the small Myoxocephalus were totally unimportant to the larger ones.

None of the large fish ate zooplankton or significant amounts of gammarid amphipods (Fig. 29). The diets of large rock greenling, yellowfin sole, and rock sole were diverse, although rock sole concentrated somewhat on fish. Large flathead sole, walleye pollock, and yellow Irish lord ate mostly crab, shrimp, and fish, while whitespotted greenling concentrated on crab and fish. The cod specialized on shrimp and the Myoxocephalus on fish, and secondarily, on crab.

VIII. SUMMARY AND CONCLUSIONS

During April - August and November of 1978 and March 1979, we sampled fish from four bays along the southeast coasts of Kodiak and Afognak Islands. We took most of the fish from five types of gear, which sampled different habitats. These were:

- Beach seine - shallow littoral
- Townet - pelagic
- Try net - shallow benthic
- Otter trawl - deep benthic
- Trammel net - shallow rocky/kelp beds

The resulting collection totalled over 14,000 stomachs from about 40 species of fish, 13 of which were each represented by over 300 stomachs (juvenile pink and chum salmon, Pacific sand lance, Pacific cod, walleye pollock, yellow Irish lord, Myoxocephalus spp., rock, masked, and whitespotted greenling, rock, yellowfin, and flathead sole).

In general, the stomach contents of the 13 major species weighed less in March than in the other months and the stomach contents of fish shorter than 150 mm weighed less than in larger fish. The stomach contents of the smaller fish weighed more during May and June than during the other months, although they were not significantly heavier during those months in the larger fish. In addition, the stomach contents of flatfish and sand lance weighed significantly less in November than in the other months. Overall, the differences in the weight of the stomach contents were much greater among species and size classes than among months. There were some differences among bays, but they were not consistent.

Similarly, for a single type of prey, differences among bays were seldom consistent, although the food habits of fish taken from Izhut

Bay tended to differ from those of fish taken from the other bays. For example, fish was consumed more in Izhut Bay than in the other bays and rock greenling from Izhut relied less on gammarid amphipods than did those taken from the other bays. The food habits of fish taken from Kaiugnak, Kalsin, and Kiliuda bays tended to be similar. Finally, the variation in the composition of the foods was much greater among species and size groups than among bays, and differences were as much related to habitat (gear) as to bays.

The amount and composition of the foods were generally different in March and November, but similar during April through August. Overall, the differences between bays for single prey items tended to be greater than differences between months. However, because of poor sample sizes, March and April were excluded from the two-way analyses.

Within the 13 most frequently sampled species of fish, those longer than 150 (with the exception of walleye pollock 151-300 mm long) did not generally eat significant amounts of zooplankton. When the fish were less than 150 mm long, all 13 species ate large amounts of small epibenthic crustaceans (especially harpacticoids, gammarid amphipods, and mysids) but as the fish grew, they relied less and less on such organisms for food. Among fish 151-300 mm long, only rock greenling and flathead sole ate significant amounts of small epibenthic crustacea. These organisms were totally unimportant to fish longer than 300 mm.

Some of the 13 major species specialized on zooplankton and/or small epibenthic crustacea. These species were the juvenile pink and chum salmon, Pacific sand lance, small walleye pollock, and small Pacific cod. Among the minor species, the capelin, silverspotted sculpin, tubenose poacher (based on the literature), and possible the crescent gunnel, may be specialists on zooplankton and/or small epibenthic crustacea. Dolly Varden, coho salmon, and Gymnocanthus also ate significant amounts of zooplankton and/or small epibenthic crustacea, although their diets were varied.

Crab, shrimp, and/or fish were important to some degree to all size groups of Pacific cod, yellow Irish lord, Myoxocephalus, flathead sole, rock sole, to masked greenling 151-300 mm long, and to walleye pollock, rock greenling, whitespotted greenling, and yellowfin sole longer than 150 mm. Pacific cod, Myoxocephalus, and flathead sole longer than 151 mm were crab, fish and/or shrimp specialists as were all sizes of yellow Irish lord and walleye pollock longer than 300 mm.

Among the minor species, lingcod, sablefish, arrowtooth flounder, halibut and sandfish were also crab, fish, and/or shrimp specialists. According to the literature, Dolly Varden often feeds selectively on fish. In our samples, however, it was an opportunist. Tomcod may shift from epibenthic crustacea to crab, fish, and shrimp as they grow, but our samples were too small, and the literature too scarce for us to state this definitely. Finally, coho salmon, kelp greenling, Gymnocanthus, red Irish lord, penpoint gunnel, and crescent gunnel all fed on crab, fish, and/or shrimp.

Nearly one-half of all the fish (by weight) were consumed by Myoxocephalus. Pacific cod, rock sole, yellow Irish lord, rock greenling, and flathead sole each accounted for another 5 to 10% and walleye pollock, whitespotted greenling, yellowfin sole, and sablefish each consumed between 3 and 5%. These figures are weighted by the sample sizes of each species. Finally, stomach contents of masked greenling were more than 10% fish by weight.

Cottids were the most important forage fish, followed by osmerids, then gadids, and finally ammodytids. Of the larval fish that were consumed, 67% by number were osmerids and 30% each by weight were cottids, hexagrammids, and ammodytids. The ammodytid larvae were consumed mostly by walleye pollock.

The stomachs of Myoxocephalus also contained nearly one-half of all the crab (by weight) eaten by fish in this study. Whitespotted and rock greenling each ate more than 10% of the total crab. Yellow Irish lord ate 8% while masked greenling and yellowfin sole each ate 3% of the total crab. Majids (including tanner crabs) were the most important family of crabs by weight. These were followed by atelecyclids, then cancrids, and finally, by pagurid crabs.

Pacific cod stomachs contained 49% of all the shrimp eaten by fish in this study. These were followed by walleye pollock (12%), yellow Irish lord (11%), flathead sole (10%), whitespotted greenling (4%), Myoxocephalus (4%), halibut (3%), and sablefish (2%). Pandalids were, by far, the most important family of shrimp in the diet of the fish.

There were no specialists on either clams or polychaetes, but of the 13 major species, yellow Irish lord, yellowfin sole, masked greenling (size class I), and rock sole relied the most on polychaetes.

The three major species of greenling (rock, masked, and to a lesser extent, whitespotted) tended towards a generalized diet as did the rock sole, yellowfin sole and small flathead sole. Among the minor species, Dolly Varden, kelp greenling, Gymnocanthus, Leptocottus, red Irish lord, snake prickleback, penpoint gunnel, and starry flounder appeared to be generalists.

IX. ACKNOWLEDGMENTS

A project of this magnitude takes a cooperative effort by many talented people to be successful.

We wish to thank the crews of the R/V COMMANDO and the M/V YANKEE CLIPPER, Jim Blackburn's group at Kodiak (ADF&G), and FRI biologists Chris Wilson, Michael Gross, and Steven Quinnell for braving the cold, often stormy, waters of the Gulf of Alaska. The foul weather frequently made their jobs difficult, but their hard work yeilded over 14,000 fish stomachs.

The laboratory personnel opened up and examined all of these stomachs. For a job well done, we thank Julianne Fegley, Kelly McAllister, Thomas Kline, Mark Hunter, and Carolyn Wesch.

Lastly, we would like to acknowledge the help of Katie Swanson and Mark Hunter with the computer analysis, our secretary Ingrid Pearson, the remaining clerical staff, and Dorothy Beall's excellent production personnel for getting this project out of the laboratory and into this report.

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Table 1. The number of fish stomachs sampled by species and month (April-August and November 1978, and March 1979).

	April	May	June	July	August	November	March	Total
Salmonidae:								
Pink salmon	22	220	371	127	46	1	1	788
Chum salmon	4	215	349	76	2		1	647
Coho salmon			24	3				27
Dolly Varden	11							11
Osmeridae:								
Capelin		1	33	3		5	33	75
Gadidae:								
Pacific cod	21	85	94	145	122	70	32	569
Pacific tomcod					10	23	10	43
Walleye pollock		81	85	46	69	63	44	388
Scorpaenidae:								
Black rockfish					4			4
Hexagrammidae:								
Unidentified greenling		4		1				5
Kelp greenling		5	5	2	7	5	2	26
Rock greenling	6	78	231	167	171	101	26	780
Masked greenling	71	107	223	250	265	177	16	1109
Whitespotted greenling		49	110	177	289	70	20	715
Lingcod					11	7	1	19
Anoplopomatidae:								
Sablefish			25		35	13		73
Cottidae:								
Silverspotted sculpin	7						1	8
Gymnocanthus spp.	1	7				1	13	22
Red Irish lord			2	6	5	3		16
Yellow Irish lord	1	102	153	107	114	62	32	571
Staghorn sculpin	1							1
Myoxocephalus spp.	13	84	72	94	154	160	67	644
Agonidae:								
Tubenose poacher						1		1
Trichodontidae:								
Pacific sandfish		13	1	27	39	2	6	88
Zaproridae:								
Prowfish				1				1
Stichaeidae:								
Snake prickleback		2	18	37	11		4	72
Daubed shanny		1						1
Pholidae:								
Penpoint gunnel					2			2
Crescent gunnel		20	16	15	54	1	4	110
Ammodytidae:								
Pacific sand lance	26	210	187	154	300	83	27	987
Pleuronectidae:								
Arrowtooth flounder		43						43
Flathead sole	18	209	394	177	180	180	112	1270
Butter sole		3						3
Rock sole	232	533	693	389	301	428	274	2850
Yellowfin sole	29	382	656	303	277	250	221	2118
Starry flounder	3					4		7
Pacific halibut			25	19				44
Total	466	2454	3767	2326	2468	1710	947	14,138

Table 2. Data sets used for statistical analysis on geometric mean weights of stomach contents.

Predator species (gear)	Size group (mm)	Number of Bays	Number of Months	Fish	Shrimp	Crab	Gammarids	Mysids	Polychaetes	Isopods	Snails	Siphons	Clams	Eggs
Rock greenling (trammel)	151-300	4	4 (June, July, August, November)	+	+	+	+		+	+	+	+	+	+
	>300	"	"	+	+	+	+		+	+	+	+	+	+
Rock sole (try)	0-150	3 (Izh., Kal., Kil.)	7 (All)	+	+	+	+		+			+	+	
	151-300	"	"	+	+	+	+		+			+		
	>300	2 (Izh. Kal.)	6 (except Mar.)	+			+		+			+	+	
Flathead sole (try)	0-150	2 (Izh., Kil.)	5 (except Mar., Apr.)		+		+	+	+					
Flathead sole (otter trawl)	151-300	"	6 (except Apr.)	+	+									
Yellow Irish lord (otter trawl)	151-300	"	5 (except Mar., Apr.)	+	+	+								
	>300	"	4 (May, Jun. July, Aug.)	+	+	+								

Table 3. Statistically significant differences in mean weights of food items (α = .05) from two-way ANOVA and Friedman randomized block.

Food item	Predator species (size and gear)	Significant differences in mean weights (mg)
Fish	1) Yellow Irish lord (>300 mm, otter trawl)	Izhut (1036) higher than Kiliuda (132) Friedman only
	2) Rock sole (151-300, try)	Izhut (167) higher than Kalsin (14) and Kiliuda (10)
Shrimp	1) Rock greenling (>300, trammel)	Izhut (236) higher than Kalsin (144), Kiliuda (124), and Kaiugnak (62). Higher in November (356) than in June (62), July (71), and August (76)
	2) Rock greenling (151-300, trammel)	Izhut (95) higher than Kalsin (41), Kiliuda (56), and Kaiugnak (38)
	3) Flathead sole (151-300, otter trawl)	Izhut (277) lower than Kiliuda (693). May (1280) higher than June (134), July (268), August (275), November (418), and March (113)
	4) Yellow Irish lord (151-300, otter trawl)	Izhut (196) lower than Kiliuda (629). May (1034) higher than June (254), July (230), August (355), and November (192)
	5) Yellow Irish lord (>300, otter trawl)	Izhut (496) lower than Kiliuda (1418)
Crab	1) Yellow Irish lord (151-300, otter trawl)	Izhut (486) higher than Kiliuda (54)
Polychaetes	1) Rock sole (0-150, try)	Izhut (28) lower than Kalsin (70) and Kiliuda (71)
Clams and siphons	1) Rock sole (0-150, try)	Izhut (3) lower than Kalsin (17) and Kiliuda (39)
	2) Rock sole (151-300, try)	Kiliuda (206) higher than Kalsin (45) and Izhut (31)
Gammarid amphipods	1) Rock greenling (151-300, trammel)	Izhut (37) lower than Kalsin (353), Kiliuda (252), and Kaiugnak (123). June (213) and July (395) higher than August (66) and November (91).

Table 4. Composition (% weight) of identifiable stomach contents by bay for fish collected by trammel net (greenling) and try net (sole) during May-August. Blanks where < 5% in each bay and + where one of the two bays was < 1%.

Predator species	Bay	Fish	Crab	Shrimp	Euphausids	Mysids	Gammarids	Polychaetes	Clams and siphons	Snails	Eggs	Isopods
		Prey category										
Rock greenling (151-300 mm)	Izhut	10	29	5			4	10	16	6	5	3
	Kalsin	6	27	5			22	5	9	7	+	15
	Kiliuda	12	18	5			21	5	9	10	3	17
	Kaiugnak	6	18	8			17	9	19	10	3	4
Rock greenling (>300 mm)	Izhut	23	32	6			1	3	18	1	5	
	Kalsin	16	34	2			7	5	13	13	2	
	Kiliuda	22	26	1			3	3	2	8	7	
	Kaiugnak	12	28	3			11	9	7	7	8	
Rock sole (0-151 mm)	Izhut	6		7			24	48	6	0		
	Kalsin	3		+			7	59	24	0		
	Kiliuda	+		1			1	63	27	5		
	Kaiugnak	6		0			2	61	18	+		
Rock sole (151-300 mm)	Izhut	31					2	42	9			
	Kalsin	1					5	70	17			
	Kiliuda	+					6	61	25			
	Kaiugnak	0					2	66	14			
Rock sole (>300 mm)	Izhut	60					1	24	6			
	Kalsin	11					9	50	14			
	Kiliuda	14					+	13	69			
Flathead sole (0-150 mm)	Izhut	5		30	31	18		6				
	Kalsin	12		32	17	28		1				
	Kiliuda	15		23	1	39		12				
Flathead sole (151-300 mm)	Izhut	23		77		2		4				
	Kalsin	24		70		4		0				
	Kiliuda	61		23		5		5				

Table 5. Composition (% weight) of identifiable stomach contents by bay for fish collected by otter trawl during May-August. Blanks where <5% in each bay and + where one of the two bays was <1%.

Predator species	Bay	Prey category: Fish	Crab	Shrimp	Euphausids	Polychaetes
Flathead sole	Izhut	36		24	21	5
(0-150 mm)	Kiliuda	16		19	38	+
(151-300 mm)	Izhut	33		32	24	
	Kiliuda	4		96	+	
(>300 mm)	Izhut	44		54		
	Kiliuda	9		91		
Yellow Irish lord	Izhut	38	38	17		
(151-300 mm)	Kiliuda	16	8	68		
(>300 mm)	Izhut	46	14	38		
	Kiliuda	9	4	85		
Myoxocephalus spp.	Izhut	52	30	18		
(>300 mm)	Kiliuda	42	25	29		

Table 6. The number of fish stomachs analyzed by species, size class, and gear type (summed over months and bays). Size Class I: 0-150 mm long, II: 151-300 mm, and III: >300 mm.

		Gear Type				
	Size class	Beach seine	Trammel net	Try net	Otter trawl	Tow net
Pink salmon	I	651				120
	II	17				
Chum salmon	I	549				98
Coho salmon	I	22				
	II	5				
Dolly Varden	II	7				
	III	4				
Capelin	I	2		7	37	23
	II				6	
Pacific cod	I	143		19	27	12
	II	3	70	18	95	
	III			1	181	
Pacific tomcod	I			1	15	
	II		1		21	
	III	1			2	
Walleye pollock	I	1		48	149	
	II		4	6	111	
	III				69	
Black rockfish	III		4			
Unid. greenling	I	3				
	II	2				
Kelp greenling	I	2			1	
	II		7	1	1	
	III		14			
Rock greenling	I	63	2	4		
	II	30	315	5		
	III	21	335	5		
Masked greenling	I	326	1	3		
	II	172	480	19	1	
	III	4	2		1	
Whitespotted greenling	I	197		44	2	
	II	38	211	73	79	
	III	3	47	6	15	
Lingcod	I			4		
	II			3		
Sablefish	II			3	21	
	III			2	47	
Silverspotted sculpin	I	8				
Gymnocanthus spp.	I			19		
	II			2		
Red Irish lord	I			1		
	II	1	1			
	III	12			1	

Table 6. The number of fish stomachs analyzed by species, size class, and gear type (summed over months and bays). Size Class I: 0-150 mm long, II: 151-300 mm, and III: >300 mm – continued.

		Gear type				
	Size class	Beach seine	Trammel net	Try net	Otter trawl	Tow net
Yellow Irish lord	I	16		64	33	
	II	5	2	85	218	
	III	2	2	16	128	
Staghorn sculpin	II	1				
<u>Myoxocephalus</u> spp.	I	306		25	1	
	II	59	11	15	8	
	III	24	30	20	146	
Tubenose poacher	I	1				
Pacific sandfish	I			2	38	
	II			1	47	
Prowfish	I					1
Snake prickleback	I	6		7		
	II	11		8	16	
	III	4		2	18	
Daubed shanny	I			1		
Penpoint gunnel	I	2				
Crescent gunnel	I	73		2		
	II	31		4		
Pacific sand lance	I	871				89
	II	16				3
Arrowtooth flounder	I			1	1	
	II			1	39	
	III			1		
Flathead sole	I		1	557	143	
	II			135	275	
	III			11	148	
Butter sole	II			3		
Rock sole	I	76	3	1152	81	
	II	64	126	674	193	
	III	14	77	264	125	
Yellowfin sole	I		1	673	9	
	II		18	908	315	
	III	1	6	207	79	
Starry flounder	I	1		1		
	II			3		
	III			2		
Pacific halibut	II				8	
	III		1		35	

Table 7. The average number and weight (mg) of prey items per pink salmon stomach (T = trace, P = pooled).

	Pink salmon (*Oncorhynchus gorbuscha*)													
	0 - 150 mm long										> 300 mm			
	April		May		June		July		August		July		August	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Mollusca														
Gastropoda														
Prosobranchia							.6	.8						
Veliger							.1	.2						
Mesogastropoda									T	.1				
Arthropoda														
Crustacea														
Cladocera														
Polyphemidae							28.6	1.9	192.	9.6				
Ostracoda									.5	.1				
Copepoda					1.3	.2								
Calanoida	.2	T	1.4	1.2	14.0	11.2	126.	24.6						
Harpacticoida	6.0	.2	23.6	3.8	18.0	10.9	32.8	4.3	24.6	3.1				
Cirripedia														
Nauplii							1.2	.2						
Cypris					.2	T	16.9	2.1						
Cirri							.1	.2						
Mysidacea					.1	.5	.3	.1						
Cumacea			.1	T	2.9	.9	.6	9.1	8.4	3.7				
Amphipoda														
Gammaridea	.4	T	7.6	1.6	1.0	1.4	4.6	4.0	12.6	22.5				
Hyperiidea							.1	T						
Caprellidea							17.2	19.0						
Eucarida														
Larvae							17.2	5.1	.3	.6				
Euphausiacea					.1	3.5	.3	.5	.1	2.2				
Reptantia														
Zoea					.2	.1	.3	T						
Pagurid megalops									.2	.3				
Brachyura														
Oxyrhyncha							.1	.3						
Insecta			.1	.1	.2	.2	.1	T	.3	.6				
Pupae									9.3	19.0				
Diptera					.2	.5	1.7	2.8	10.7	36.9				
Larvae					.1	.1	.1	.1						
Urochordata larvae							1.0	2.1						
Vertebrata														
Teleostei									.1	2.1	2.2	2653.	.1	93.4
Larvae			.1	1.0										
Osmerid larvae									8.8	8.3				
Hexagrammid larvae									1.4	9.9				
Ammodytid larvae	T	.1												
Unidentified *			.3	.4									.2	11.9
Unidentified eggs			.8	3.8	10.9	1.1								
Total	6.6	.2	32.9	7.8	39.4	33.7	261.	78.5	269.	119.	2.2	2653.	.3	105.
Total number stomachs	22		220		371		119		35		6		11	
Number empty stomachs	P		P		P		P		2		4		8	
Mean fullness	4.0		4.0		4.2		3.8		5.1		2.2		1.3	
Mean length (mm)	35.0		39.2		49.0		68.4		82.5		506.3		519.3	

* In tables that follow this format, the "Unidentified" category includes not only unidentified materials but also, because the data was truncated to family, unidentified algae and miscellany such as rocks, feces, and bark.

Table 8. The average number and weight (mg) of prey items per juvenile chum salmon stomach (T = trace, P = pooled).

	Chum Salmon (*Oncorhynchus keta*)									
	April		May		June		July		August	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Mollusca										
Gastropoda										
Acmaeidae	.3	T								
Arthropoda										
Crustacea										
Copepoda										
Calanoida	2.5	T	5.9	6.4	10.4	11.6	11.4	.3		
Harpacticoida	6.5	.8	28.7	12.3	39.1	13.8	248.	20.7	23.5	11.5
Cyclopoida					.4	.1				
Cirripede cypris			.4	.1	.2	T	1.9	.3	1.0	T
Cirri					.2	.2				
Mysidacea			T	.2						
Cumacea					6.4	5.8	1.3	1.0		
Isopoda							.1	T		
Amphipoda										
Gammaridea			2.7	1.6	6.0	6.8	81.9	115.		
Amphithoidae					.2	.2				
Hyperiidea							.1	T		
Eucarida larvae					T	.1				
Euphausidacea					T	.4				
Reptant zoea					.2	T				
Insecta			T	.2	.5	.4	.1	.1		
Insect larvae			.2	.1						
Pupae			.6	T						
Collembola	5.8	1.5								
Diptera	3.0	2.5	4.0	3.8	.6	2.3	2.1	4.2	20.5	57.0
Larvae							1.0	.4		
Chironomid larvae							.2	T		
Chordata										
Vertebrata										
Teleost eggs					.8	.1				
Larvae			T	.2						
Unidentified	75.0	T								
TOTAL	93.1	4.8	42.5	24.9	65.0	41.8	348.	142.	45.0	68.5
Total number stomachs	4		204		349		76		2	
Number empty stomachs	P		P		P		P		0	
Mean fullness	6.0		4.7		4.2		3.8		5.5	
Mean length (mm)	40.0		43.2		50.3		57.8		66.5	

Table 9. The average number and weight (mg) of prey items per juvenile coho salmon stomach (P = pooled).

	Coho salmon (Oncorhynchus kisutch)					
	0 - 150 mm long				151 - 300 mm	
	June		July		June	
	No.	Wt.	No.	Wt.	No.	Wt.
Annelida						
Polychaeta	.1	.5				
Phyllodocidae			.3	2.0		
Arthropoda						
Crustacea						
Copepoda						
Harpacticoida	5.8	5.4	13.7	2.3		
Cumacea			2.3	1.0		
Amphipoda						
Gammaridea	.7	7.5				
Euphausiacea	1.7	124.			10.2	892.
Reptantia						
Megalops					3.2	40.2
Anomura						
Paguridae	.3	1.4				
Brachyura						
Oxyrhyncha megalops					3.6	38.0
Insecta	.1	12.3				
Diptera	.3	.1	.7	1.7	.2	.2
Chordata						
Vertebrata						
Teleostei	5.7	202.			.2	52.0
Larvae	.3	60.0			.6	122.
Clupeidae					.2	159.
Cottid larvae					.2	20.2
Pholidae	.1	11.4				
Unidentified	.1	7.1				
Unidentified egg	29.9	26.3				
TOTAL	45.1	458.	17.0	7.0	18.4	1324.
Total number stomachs	19		3		5	
Number empty stomachs	P		1		0	
Mean fullness	4.6		2.0		4.8	
Mean length (mm)	117.6		96.3		160.2	

Table 10. The average number and weight (mg) of prey items per Dolly Varden and capelin stomach (P = pooled).

	Dolly Varden (Salvelinus malma)				Capelin (Mallotus villosus)					
Length (mm):	151 - 300		> 300		0 - 150				151 - 300	
	April		April		June		March		November	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Polychaeta	3.3	137.	2.5	680.						
Nereidae	2.4	969.	4.0	1384.						
Arthropoda										
Crustacea					.1	.6	T	.7	.3	14.5
Copepoda										
Calanoida	141.	550.	280.	1026.	39.6	216.				
Eucarida							.5	44.8		
Mysidacea	.1	7.9	.3	7.8						
Amphipoda										
Gammaridea	21.7	221.								
Calliopiidae			333.	3591.						
Natantia							.1	9.7		
Reptant zoea					.3	.2				
Chordata										
Vertebrata										
Teleostei										
Hexagrammid larvae	.3	12.4	.5	61.0						
TOTAL	169.	1897.	620.	6750.	40.0	217.	.6	55.2	.3	14.5
Total number stomachs	7		4		31		33		4	
Number empty stomachs	P		P		P		21		3	
Mean fullness	5.4		6.0		2.3		2.3		1.3	
Mean length (mm)	267.6		322.0		119.5		111.4		212.5	

Table 11. The average number and weight (mg) of prey items per Pacific sand lance stomach (T = trace, P = pooled).

	Sand lance (*Ammodytes hexapterus*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Annelida														
Polychaeta														
Larvae							.4	.1						
Mollusca														
Gastropoda														
Prosobranchia			.5	2.2	.1	.1			1.9	.8				
Veliger			.7	.4			.2	T						
Bivalve veliger							3.4	.1	1.5	.1				
Arthropoda														
Crustacea											T	.1		
Zoea							.1	T						
Cladocera														
Polyphemidae							40.3	4.0	95.9	10.3				
Copepoda									68.7	4.3				
Calanoida	76.0	42.5	72.2	89.1	108.	55.4	65.8	7.0	56.9	8.5	6.7	.8	.2	T
Harpacticoida			1.3	1.4	32.4	6.2	.9	.1	3.4	.6	.3	T	.3	T
Cyclopoida					5.5	.5							.1	T
Cirripede nauplius			6.1	1.2			31.3	3.4	97.9	11.4			27.8	7.7
Cypris			12.9	2.8	.1	T	12.7	1.3	15.6	2.5				
Mysidacea	.8	8.0	.7	13.1	T	.2			.1	.2	.1	2.4	.1	.3
Cumacea					.1	.2								
Tanaidacea	.3	.2												
Isopoda														
Sphaeromatidae					.1	.1								
Amphipoda	.2	.1												
Gammaridea	1.5	18.9	.2	1.0	.6	.2			.2	.8	.3	.6	5.9	33.0
Amphithoidae					7.0	25.4								
Hyperiidea	.2	.2											.3	.8
Euphausiaceae	.2	3.2	T	1.2										
Natantia			.1	2.4					.1	.2				
Pandalidae			9.7	38.8										
Reptantia									.1	2.0				
Zoea	175.	.1					.8	.4	.5	.3				
Megalops	.2	.2	.6	4.3	T	.1			.1	.1				
Anomura														
Paguridae									T	.1				
Megalops									.5	1.2				
Urochordata														
Larvacea														
Oikopleuridae									.1	T				
Chordata														
Vertebrata														
Teleost egg	.6	10.7	.1	4.8			6.9	1.0						
Larvae							.1	.3	.1	.1				
Cottidae larvae									.1	1.7				
Unidentified					T	.1	.1	13.7						
Egg					42.8	10.9								
Larvae									.2	T				
TOTAL	255.	84.1	105.	163.	196.	99.4	163.	31.4	343.	45.5	7.4	40.5	285.	43.6
Total number stomachs	23		197		187		154		300		81		27	
Number empty stomachs	P		P		P		P		P		69		17	
Mean fullness	3.4		3.7		3.8		3.0		3.5		1.4		2.5	
Mean length (mm)	107.9		107.9		112.4		89.3		99.2		120.7		99.0	

Table 12. The average number and weight (mg) of prey items per stomach from Pacific cod 0-150 mm in length (T = trace, P = pooled).

	Pacific Cod (*Gadus macrocephalus*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Annelida														
Polychaeta	.4	15.4							T	.3				
Nereidae	.1	68.1												
Glyceridae											T	3.6		
Mollusca														
Gastropoda							T	.1						
Arthropoda														
Crustacea	.7	13.2							.2	2.3	.4	16.4		
Cladocera														
Polyphemidae							3.7	.3						
Ostracoda					1.0	.1			.2	T				
Copepoda									7.7	2.0				
Calanoida	.7	.5			500.	91.0	15.9	1.9	12.0	1.9				
Harpactacoida			1.2	.2	21.0	8.0	27.5	6.7	11.2	2.0	.1	T		
Cyclopoida							.1	T	.1	T				
Cirripede nauplii							.1	T	2.7	.3				
Cypris			.1	T			1.2	.2	2.4	.3				
Malcostraca														
Leptostraca	.2	.6											.3	20.8
Mysidacea			1.5	28.5					.1	1.2	1.1	51.2		
Cumacea	3.0	7.5												
Isopoda														
Sphaeromatidae									.2	2.0				
Idoteidae									.1	.9				
Amphipoda														
Gammaridea	66.0	154.	2.1	4.0			9.1	10.6	8.3	37.3	11.2	214.	4.8	29.2
Caprellidae											.2	.6		
Eucarida							T	.3					.1	8.0
Larvae					5.0	4.0								
Natantia	1.9	67.0	1.0	245.										
Hippolytidae	.7	38.3							T	2.5				
Pandalidae							T	1.0	T	.7				
Crangonidae											T	4.0		
Reptantia									T	2.6				
Zoea							1.9	.8	.8	.2				
Megalops			1.8	17.0										
Anomura														
Paguridae									.1	1.0				
Insecta pupae									3.8	14.0				
Chordata														
Vertebrata														
Teleostei			.3	352.										
Egg									T	.3				
Ammodytidae											T	76.8		
Unidentified	.1	7.9			1.0	11.0	.1	.2	.1	.4	.1	7.2		
Unidentified eggs							T	1.0						
TOTAL	73.8	372.	8.0	647.	528.	114.	59.6	23.1	50.0	72.2	13.1	374.	5.2	58.0
Total number stomachs	10		6		1		74		65		25		19	
Number empty stomachs	0		1		0		P		P		1		11	
Mean fullness	4.9		4.2		4.0		4.4		4.7		4.1		2.2	
Mean length (mm)	138.0		136.7		131.0		55.0		77.1		118.8		133.0	

Table 13. The average number and weight (mg) of prey items per stomach from Pacific cod 151-300 mm in length (T = trace).

	Pacific Cod (*Gadus macrocephalus*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta	.1	1.0												
Phaeophyta							T	4.0						
Rhodophyta									T	6.4				
Angiosperma														
Potamogetonaceae							T	3.0						
Annelida														
Polychaeta	.8	204.	.5	.4	T	.2	.1	10.5			.1	13.8	.3	5.8
Nereidae							T	11.8						
Mollusca														
Gastropoda														
Trochidae									T	1.3				
Mesogastropoda							.1	.1						
Lacunidae							.3	.9						
Trichotrophidae									.3	6.4				
Buccinidae									T	1.7				
Bivalvia	.1	.3	.1	T			.1	.7						
Nuculanidae									T	4.5				
Arthropoda														
Crustacea	.2	15.3	T	30.2	1.4	102.	.3	62.2	.1	15.5				
Copepoda														
Calanoida			.4	.2										
Harpacticoida			1.1	.2										
Cirripedia	.3	.5												
Balanomorpha											.1	2.8		
Malcostraca											.1	1.4		
Leptostraca	.3	4.4												
Mysidacea	.1	5.3	.1	6.1	.1	3.7	.1	.3	T	.5	1.9	49.5		
Cumacea	1.3	22.2	.1	.1			T	.2						
Isopoda							T	.1						
Sphaeromatidae			.1	4.5			.6	31.7						
Idoteidae							.2	59.1	T	4.9				
Amphipoda														
Gammaridea	9.8	146.	61.7	492.	2.1	33.9	13.8	174.	.2	2.6			5.0	129.
Corophiidae							T	.1	.1	236.				
Caprellidea							.5	21.5						
Caprellidae							6.2	62.0						
Eucarida							T	.4	.1	14.3	.5	11.1		
Euphausiacea			.3	11.0			.4	4.0	.1	5.6				
Natantia	.7	203.	.4	234.	.1	56.8	T	1.1	.2	489.	1.8	672.		
Hippolytidae	1.8	183.			.1	43.8	T	11.9	.1	12.1				
Pandalidae			.3	794.	.4	852.	.3	504.	.5	628.	1.2	455.		
Crangonidae			T	95.0	T	20.2	.1	31.6			.1	1.4		
Reptantia					T	174.	T	3.1	.2	8.5				
Paguridae							.1	38.8						
Brachyura			T	9.0	.2	18.4								
Oxyrhyncha	.3	3.7					T	1.9	.1	.3				
Majidae							.2	16.2	.2	23.0				
Atelecyclidae									.1	113.				
Cancridae									.1	18.8				
Brachyrhyncha														
Pinnotheridae											.1	32.6		
Insecta									T	1.5				
Chordata														
Vertebrata														

Table 13. The average number and weight (mg) of prey items per stomach from Pacific cod 151-300 mm in length (T = trace) - continued.

	Pacific Cod (*Gadus macrocephalus*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Teleostei			.2	580.	.1	291.	.8	257.	.1	435.	.3	1057.	.5	240.
Larvae			T	46.0										
Clupeiformes									T	214.				
Clupeidae			.1	724.	.1	952.	.1	631.						
Osmeridae									.1	724.				
Perciformes									.1	51.7				
Ammodytidae			.1	196.			.1	130.	.2	358.				
Unidentified					.1	7.1	1.2	10.7	T	1.0	.5	26.9	.5	.2
Unidentified egg											.1	1.1		
TOTAL	15.8	789.	65.5	3222.	4.7	2556.	25.6	2090.	2.9	3377.	6.8	2325.	6.3	375.
Total number stomachs	10		20		45		56		38		17		4	
Number empty stomachs	0		1		7		6		6		1		1	
Mean fullness	5.8		5.3		4.0		3.6		3.7		4.1		3.0	
Mean length (mm)	159.2		207.7		229.3		233.1		254.1		245.0		164.2	

Table 14. The average number and weight (mg) of prey items per stomach from Pacific cod >300 mm in length (T = trace).

	Pacific Cod (*Gadus macrocephalus*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Phaeophyta					T	389.							.1	205.
Fucaceae					T	76.7								
Rhodophyta			T	2.8										
Porifera							.1	1322.						
Cnidaria														
Hydrozoa													.1	1.7
Annelida														
Polychaeta													.2	808.
Mollusca														
Gastropoda							.1	203.						
Cymatidae					T	312.								
Bivalvia					T	5.5	.1	54.2						
Mytilidae					T	35.5								
Nuculanidae					T	11.2								
Arthropoda														
Crustacea					T	108.	.1	48.9			.3	64.2		
Amphipoda														
Gammaridea			.1	6.4										
Euphausiacea					.1	2.7					.2	5.8		
Natantia			.1	434.	.2	423.	.5	1588.	.3	376.	.3	1309.	.1	20.1
Hippolytidae			.1	144.							T	23.0		
Pandalidae			12.9	50,908.	2.5	545.	3.7	15,475.	10.0	39,046.	3.0	14,213.	.8	1389.
Crangonidae					T	12.1	.1	79.3						
Reptantia					T	26.2			.1	293.				
Anomura														
Paguridae					.1	139.	.1	45.6					.1	443.
Brachyura			T	40.8	T	94.6								
Oxyrhyncha					.1	89.4								
Majidae			.3	1496.	.1	223.								
Chordata														
Vertebrata														
Teleostei			.4	4241.	.2	1036.			.1	392.	.3	1391.	.8	4264.
Clupeidae					T	213.			.1	423.				
Salmonidae					T	160.								
Osmeridae					T	182.								
Gadidae	1.0	13,990.	.1	1498.							.6	3715.	.4	3607.
Cottidae					T	137.					T	1445.	.1	64.9
Agonidae			T	109.										
Perciformes									.1	55.7				
Bathymasteridae							.1	467.						
Ammodytidae							.1	144.	.1	208.			1.1	2482.
Pleuronectidae							.1	900.						
Unidentified					.8	2001.	.2	476.					2.0	125.
TOTAL	1.0	13,990.	14.0	58,880.	4.1	6222.	5.3	20,803.	10.8	40,794.	4.7	22,166.	5.8	13,410.
Total number stomachs	1		59		48		18		19		28		9	
Number empty stomachs	0		0		10		0		0		1		2	
Mean fullness	7.0		6.4		4.1		4.8		4.5		4.7		4.1	
Mean length (mm)	411.0		486.6		418.7		472.1		478.1		399.4		437.4	

Table 15. The average number and weight (mg) of prey items per stomach from walleye pollock 0-150 mm long (T = trace, P = pooled).

	Walleye pollock (Theragra chalcogramma)											
	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Annelida												
Polychaeta	T	.1	.1	20.5								
Arthropoda												
Crustacea	T	.2	7.9	72.0					.5	19.7		
Cladocera												
Polyphemidae							2.5	.2				
Copepoda												
Calanoida	33.0	41.3	151.	147.	4.8	24.5	135.	2.8				
Cirripedia							2.5	T				
Cypris	.6	.3										
Mysidacea	2.6	9.7	17.2	31.3			6.3	198.	1.6	136.		
Cumacea	.4	1.6	.8	6.0	.3	15.5			T	.1		
Amphipoda												
Gammaridea	.7	3.3	2.2	19.3	1.5	2.9						
Hyperiidea			T	.1	.5	3.1			.1	.1		
Eucarida									.1	6.0	.4	21.6
Larvae			.1	.1	16.5	64.1						
Euphausiacea	.1	3.0	.1	1.8	2.8	196.	1.3	70.2	2.8	82.1	4.0	124.
Natantia			T	.4	1.4	12.4			.4	14.7	.1	23.1
Reptant zoea			18.0	19.6	3.4	5.8						
Megalops			5.1	24.4								
Anomura												
Paguridae					.9	4.6						
Megalops			.2	.6	.1	.4						
Brachyura megalops			T	.2	.3	2.0						
Chaetognatha	7.9	138.										
Chordata												
Vertebrata												
Teleostei			T	3.5	.1	43.2			T	1.0		
Perciformes					.1	14.5						
Ammodytid larvae	T	1.9	.4	36.2								
TOTAL	45.3	199.	203.	383.	32.7	389.	148.	271.	5.5	260.	4.5	169.
Total number stomachs	53		54		8		4		36		43	
Number empty stomachs	P		P		1		0		5		22	
Mean fullness	3.8		3.8		4.6		3.8		4.4		3.3	
Mean length (mm)	114.0		131.8		146.4		113.7		118.3		120.0	

Table 16. The average number and weight (mg) of prey items per stomach from walleye pollock 151-300 mm long (T = trace, P = pooled).

	Walleye pollock (*Theragra chalcogramma*)									
	May		June		July		August		November	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Rhodophyta							T	.1		
Arthropoda			23.2	466.	4.0	36.4	.4	55.3	.1	6.1
Crustacea										
Copepoda										
Calanoida	2.5	12.2	168.	239.	51.3	252.				
Caligoida			T	.1						
Malacostraca							.5	58.1		
Mysidacea	1.1	252.	39.4	21.1	24.5	122.	1.2	17.7	5.1	414.
Cumacea			T	.1	38.5	15.8				
Amphipoda										
Gammaridea			.1	.3	.3	1.4	.2	1.5	3.3	130.
Eucarida					3.6	13.6			.2	4.8
Larvae					7.3	27.7				
Euphausiacea			.6	77.4	4.8	463.	.4	36.6	.1	4.6
Natantia			T	26.4	3.3	187.	1.1	204.	1.5	1092.
Pandalidae	.6	827.	.1	184.			.1	346.		
Reptant zoea			2.0	2.0	7.3	4.1				
Megalops			.3	.8			1.0	8.9		
Anomura										
Paguridae					.1	.4				
Brachyura zoea			.1	.5						
Megalops			T	.3	T	.1				
Oxyrhyncha										
Majidae					.1	.3				
Chordata										
Vertebrata										
Teleostei					.2	178.	.3	521.	.1	287.
Larvae			T	.8						
Perciformes							T	12.6		
Ammodytidae					T	33.6			.2	377.
Larvae			.3	31.0	T	14.9				
Unidentified							.1	1.0		
TOTAL	4.2	1091.	234.	1050.	145.	1350.	5.3	1263.	10.6	2316.
Total number stomachs	8		31		26		42		13	
Number empty stomachs	P		P		0		2		0	
Mean fullness	3.0		4.5		5.8		4.3		4.8	
Mean length (mm)	230.3		199.8		186.0		200.8		214.3	

Table 17. The average number and weight (mg) of prey items per stomach from walleye pollock >300 mm long (T = trace).

	Walleye pollock (*Theragra chalcogramma*)							
	May		July		August		November	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Arthropoda								
Crustacea	.9	90.6	.3	4.8	.3	27.8	.1	85.5
Copepoda								
Calanoida			3.5	18.9				
Mysidacea					.2	16.9	.1	70.1
Eucarida					.1	10.5		
Euphausiacea	5.3	492.	15.2	1590.	.3	46.0		
Euphausidae	3.1	260.						
Natantia			.4	1012.	1.3	4713.	.1	11.5
Pandalidae	1.8	4627.	2.4	11,719.	9.0	32,226.	1.3	4315.
Crangonidae			.1	86.8			.1	88.1
Reptantia					T	.3		
Megalops					.2	.9		
Anomura								
Paguridae					T	.4		
Chordata								
Vertebrata								
Teleostei	.3	1495.	.1	113.	.1	61.6	.1	340.
Osmeridae					.1	1255.		
Gadidae	.7	8555.					1.4	13,813.
Pholidae					T	1.7		
Unidentified	T	1.0					.1	424.
TOTAL	12.1	15,521.	22.0	14,544.	11.6	38,360.	3.3	19,147.
Total number stomachs	20		12		23		14	
Number empty stomachs	1		0		2		2	
Mean fullness	4.3		4.8		4.5		4.4	
Mean length (mm)	475.3		505.6		491.0		463.0	

Table 18. The average number and weight of prey items per Pacific tomcod stomach.

	Pacific tomcod (*Microgadus proximus*)									
	0-150 mm long		151-300 mm						> 300 mm	
	November		August		November		March		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Mollusca										
Bivalvia			.1	21.0						
Gastropoda										
Mesogastropoda	.1	4.3								
Arthropoda										
Crustacea	.6	14.2	.1	13.5					.2	30.8
Malacostraca									.2	30.0
Mysidacea	1.9	69.3			.8	22.9			13.8	453.
Amphipoda										
Gammaridea	3.1	65.4	.1	14.4	.6	114.			1.2	12.0
Euphausiacea					.4	5.1				
Natantia	.1	1.1	.1	24.3	2.0	226.				
Crangonidae	.1	28.5					.3	293.		
Reptantia										
Anomura										
Paguridae							.3	333.		
Brachyura			.2	11.8						
Chordata										
Vertebrata										
Teleostei			.6	2429.	1.1	968.			.4	378.
Clupeiformes			.1	661.						
Gadidae					.1	854.				
Perciformes			.1	338.						
Pleuronectidae									.2	105.
TOTAL	5.9	183.	1.4	3513.	5.0	2190.	.6	626.	16.0	1009.
Total number stomachs	15		10		8		4		5	
Number empty stomachs	1		0		0		2		2	
Mean fullness	4.3		5.2		4.1		3.5		3.6	
Mean length (mm)	123.0		238.3		271.1		266.2		324.4	

Table 19. The average number and weight (mg) of prey items per stomach from kelp greenling 0-300 mm long.

	Kelp greenling (*Hexagrammos decagrammus*)							
	0-150 mm long		151-300 mm					
	June		May		August		November	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Phaeophyta			.3	113.				
Rhodophyta			.3	5.0				
Annelida								
Polychaeta					3.3	63.7		
Opheliidae							1.0	12.0
Mollusca								
Gastropoda								
Lacunidae					74.3	2064.		
Bivalvia	1.5	22.5						
Arthropoda								
Crustacea								
Amphipoda								
Gammaridea			71.3	644.	8.3	133.	.5	8.0
Isopoda								
Sphaeromatidae	.5	11.0						
Natantia			1.3	1981.	.7	91.3		
Hippolytidae			3.3	624.			2.5	188.
Reptantia								
Anomura								
Paguridae	.5	152.						
Brachyura					1.3	496.		
Brachyrhyncha								
Atelecyclidae			.3	150.				
Cancridae			.3	20.3				
Chordata								
Teleostei	.5	150.			.3	3.3		
Egg			250.	2005.				
Cottid larvae			1.0	59.7				
Unidentified			1.0	1.1	11.7	33.7	.5	208.
TOTAL	3.0	336.	329.	5603.	99.9	2885.	4.5	416.
Total number stomachs	2		3		3		2	
Number empty stomachs	0		0		0		0	
Mean fullness	6.0		6.3		5.3		3.5	
Mean length (mm)	137.0		220.0		246.0		225.0	

Table 20. The average number and weight (mg) of prey items per stomach from kelp greenling >300 mm long.

	Kelp greenling (*Hexagrammos decagrammus*)									
	May		June		July		August		November	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Rhodophyta			1.0	53.3						
Cnidarea										
Hydrozoa							.3	15,504.		
Annelida										
Polychaeta					1.0	359.			.3	295.
Mollusca					1.0	232.				
Gastropoda										
Prosobranchia			.7	26.0			5.3	202.	.3	53.3
Mesogastropoda							.3	16.5		
Lacunidae	13.0	720.								
Bivalvia			1.0	337.						
Siphons			1.0	325.	1.0	15,038.	.3	78.8		
Arthropoda										
Crustacea									3.3	147.
Amphipoda										
Gammaridea	27.5	100.	159.	1255.			7.5	43.0	.7	15.3
Natantia	2.1	193.					2.5	31.0		
Hippolytidae	9.0	894.	.3	52.3					4.7	1223.
Pandalidae									.3	1809.
Reptantia	.7	342.			5.0	1050.				
Anomura										
Paguridae			1.3	218.						
Brachyura										
Oxyrhyncha										
Majidae					1.5	790.	.5	1042.		
Brachyrhyncha										
Atelecyclidae	2.0	1484.	1.0	7238.	.5	2250.	2.3	5360.		
Cancridae			.3	871.	.5	1184.				
Chordata										
Vertebrata										
Teleostei			2.0	986.	1.0	7111.	2.8	9038.	1.7	568.
Larvae	9.5	1232.								
Trichodontidae									10.7	316.
Unidentified	13.5	1892.	1.0	421.	128.	3984.	51.7	8933.	42.5	2898.
Total	77.3	6857.	169.	11,783.	140.	31,998.	73.5	40,248.	64.5	7325.
Total number stomachs	2		3		2		4		3	
Number empty stomachs	0		0		0		0		0	
Mean fullness	5.5		5.3		6.0		6.0		5.3	
Mean length (mm)	362.5		383.3		391.0		435.5		437.0	

Table 21. The average number and weight (mg) of prey items per stomach from masked greenling 0-150 mm long (T = trace, P = pooled).

	Masked greenling (*Hexagrammos octogrammus*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	
Rhodophyta	T	1.2			.1	T								
Angiosperma														
Potamogetonaceae	T	.1												
Annelida														
Polychaeta	1.9	43.5	2.9	73.5	.9	38.1	T	.2	T	3.7	.5	10.7		
Phyllodocidae					T	.1			T	.1				
Nereidae	T	15.5					T	73.1			.1	7.1		
Opheliidae	.1	9.0	1.3	14.5					.4	1.8	1.8	43.4		
Glyceridae											T	.4		
Pectinariidae	T	.2			.1	2.8								
Owenidae					.1	.9								
Serpulidae	.3	1.5												
Opercula	.6	3.8	.1	.2	T	.3								
Mollusca														
Gastropoda														
Prosobranchia	.3	.3	.3	1.2			.1	T	.7	1.8	.2	.2		
Lacunidae	.2	.6					.2	1.7	.1	T	.2	.6		
Littorinidae									T	.1				
Bivalvia					T	.3			.1	.1	.1	.1		
Siphons	.4	.7	.3	1.0	.3	.6	T	.1			.2	.3		
Mytilidae					.1	.5								
Arthropoda														
Crustacea			.1	1.6					T	.5	T	.4		
Cladocera														
Polyphemidae							.5	.2						
Ostracoda							4.9	.8	.7	.1				
Copepoda									9.3	2.7				
Calanoida	.7	.3					.4	.2	13.8	4.2				
Harpacticoida	20.2	5.6	7.8	1.3	6.4	1.3	49.4	9.3	44.0	7.4	.1	T		
Cyclopoida							.1	T						
Cirripedia														
Cypris							.2	T	2.6	.8				
Cirri					.8	1.6			.5	4.1				
Mysidacea					T	1.9								
Cumacea	.1	.1	.2	.4	T	.1			1.3	.7	T	.2		
Tanaidacea			.1	.1										
Isopoda	.2	.1									.1	T		
Sphaeromatidae	T	.1	.1	8.0	.3	9.1	.4	19.8	.4	7.8	.1	1.7		
Munnidae			.1	T										
Idoteidae	T	.1							.2	1.1	T	.8		
Flabellifera			.3	3.3										
Limnoridae									.1	4.8				
Asellota			T	.1										
Amphipoda														
Gammaridea	15.0	41.3	17.2	109.	87.1	175.	37.0	43.9	20.9	33.5	34.0	150.	5.0	6
Corophiidae					.2	.3			.3	1.1	.7	3.5		
Caprellidea	.2	2.2	.5	5.5	.5	4.2	T	.1	.1	.2				

Table 21. The average number and weight (mg) of prey items per stomach from masked greenling 0-150 mm long (T = trace, P = pooled) - continued.

	Masked greenling (*Hexagrammos octogrammus*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Caprellidae							.2	.6	2.0	4.9	.1	.2	1.8	19.8
Euphausiacea			.9	67.7			.1	.1						
Natantia			.3	17.8	T	.3	T	.1	.5	10.1	T	1.4		
Hippolytidae	.1	15.1	T	3.7	.1	8.3								
Crangonidae	T	5.1												
Reptantia			.1	3.7			T	.4	.1	.8				
Megalops	.1	.1	T	.6	.1	.7								
Anomura														
Paguridae					.1	35.8	T	4.4	.1	1.0				
Megalops									T	.1				
Brachyura														
Oxyrhyncha					.1	1.9								
Brachyrhyncha					T	.5								
Atelecyclidae							.4	7.5	T	1.8				
Cancridae					.2	8.1								
Insecta					T	.7								
Diptera							2.0	4.1						
Chironomid larvae							.6	.7						
Chordata														
Vertebrata														
Teleostei	.1	.4	.1	7.9	.1	12.2			T	.6				
Eggs	.6	.6												
Larvae			.3	11.8										
Hexagrammidae									T	.4				
Unidentified	.1	T	.1	T	.2	4.3			.2	3.4	.9	.7		
Eggs			13.2	.1										
TOTAL	41.2	146.	46.1	333.	97.8	310.	96.5	167.	98.6	99.7	39.1	222.	6.8	85.5
Total number stomachs	29		38		34		44		87		85		9	
Number empty stomachs	1		P		P		P		P		4		4	
Mean fullness	4.8		4.6		4.5		5.2		4.8		4.4		2.4	
Mean length (mm)	107.1		118.3		133.8		77.8		80.7		110.5		117.4	

Table 22. The average number and weight (mg) of prey items per stomach from masked greenling 151-300 mm long (T = trace).

Masked greenling (*Hexagrammos octogrammus*)	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta	T	.1			.1	1.9	T	.4	T	.3				
Ulotrichales	T	.2	.1	.1	.1	3.9								
Ulvaceae							T	.5						
Phaeophyta	T	.6	T	.1	T	.6	T	.9	T	1.8				
Laminariaceae	.2	24.5			T	.3								
Rhodophyta					.1	2.0	T	.3	.1	12.2				
Bangiaceae	T	.5												
Gigartinaceae	.1	5.9												
Cystoseiraceae							.1	.4						
Rhodomelaceae					T	1.2								
Angiosperma														
Potamogetonaceae	T	.2			T	.2	T	.3	T	1.1	T	10.4		
Cnidaria														
Hydrozoa	.1	T					T	.6						
Anthozoa			T	.4	T	3.4								
Nemertinea	T	3.3					T	.7						
Annelida														
Polychaeta	4.8	133.	3.5	270.	1.9	102.	.9	124.	.6	32.0	4.3	112.		
Polynoidae							T	.1	T	.1	T	.8		
Aphroditidae									T	23.8	T	34.9		
Phyllodocidae			T	.6			.1	1.8	T	.3				
Nereidae			T	7.6	T	16.4	T	5.5	T	1.1	T	38.3		
Glyceridae			T	1.1	T	6.0			T	2.0	T	.4		
Goniadidae					T	2.2	T	.4			T	.5		
Lambrineridae					T	3.0	T	.2						
Spionidae							T	.2						
Flabelligeridae					T	4.3	T	3.6	T	3.8	T	1.0		
Opheliidae	1.5	17.2	3.0	38.3	T	.6			.2	1.4	2.2	35.9		
Pectinariidae			T	.1	T	.2	T	2.1						
Oweniidae					.4	3.6								
Ampharetidae			T	.5	.1	2.5								
Terebellidae					.1	1.5	T	1.0						
Serpulidae	.1	.2			.3	5.6	T	.4	.1	.2	T	.5		
Opercula	.3	2.1	.1	2.4	.6	6.4	.2	1.8	.2	1.9				
Sabellidae					T	.2			T	.1				
Maldanidae			.2	4.6	T	1.4								
Capitellidae					T	.2								
Mollusca					T	31.5	T	6.7						
Gastropoda														
Prosobranchia	.1	6.8			1.1	5.8	.6	10.9	.1	2.2	.4	6.1		
Acmaeidae			T	.1										
Trochidae	T	.1			T	.2			T	.4				
Lacunidae	8.9	138.	.8	12.7	4.6	33.5	1.2	13.8	.3	2.7	1.7	59.0		
Littorinidae	.3	6.8			T	1.3	T	.6	T	.6				
Lamellariidae							T	.2						
Olividae									T	.3				
Pyramidellidae							T	.1						

Table 22. The average number and weight (mg) of prey items per stomach from masked greenling 151-300 mm long (T - trace) - continued.

	Masked greenling (*Hexagrammos octogrammus*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Bullidae	.1	.6	T	.2										
Nudibranchia														
Doridae					T	3.8	.1	2.3	.2	3.2	.1	6.0		
Amphineura														
Polyplacophora			T	.2	T	.2	.1	2.6	.1	2.6	.1	3.9		
Ischnochitonidae					T	1.0								
Mopalidae					T	1.5					T	.4		
Bivalvia	.1	.5	T	.2	.1	2.8	.1	.1	T	.7	.1	.1		
Siphons	5.9	274.	.1	2.6	1.2	80.6	.5	47.7	.4	46.0	.2	11.9		
Mytilidae							T	.1	T	1.6				
Cephalopod jaws			T	4.9			T	3.1						
Octopoda					T	45.3	T	4.1						
Arthropoda														
Crustacea	.1	T	.1	3.5	T	6.0	T	2.5	.2	14.0	T	5.3		
Copepoda														
Calanoida	1.3	.2												
Harpacticoida	2.7	.9												
Caligoida					T	.1								
Cirripedia					T	.4			T	.2				
Cirri					.1	1.1	.1	.2	T	.1				
Balanomorpha									.3	4.4	T	.1		
Malacostraca							T	.1						
Leptostraca			T	.1					T	.1				
Nebaliidae					T	.3			T	.1				
Mysidacea			T	.1	T	1.4	T	.4	T	.5				
Cumacea			.1	1.3	.2	1.4								
Isopoda	.2	.4			T	.9	T	.5	T	.1	T	2.1		
Sphaeromatidae			.4	12.5	1.3	49.6	1.3	32.3	1.1	48.0	.5	20.2		
Valvifera	T	2.8					T	1.1						
Munnidae			T	.1										
Idoteidae			T	19.0	.1	23.1	.1	14.2	.3	31.1	.3	54.9		
Flabellifera			.7	25.7										
Limnoridae							T	.1						
Amphipoda														
Gammaridea	25.5	150.	75.6	427.	68.9	386.	81.1	413.	23.1	233.	24.3	179.	13.8	109.
Pleustidae									.5	1.6				
Amphithoidae	.1	2.4			.1	4.6			.2	22.1				
Gammaridae			1.1	7.4	T	1.0			T	.6				
Eusiridae	.1	4.6							T	.3				
Calliopiidae	.5	.6												
Ischyroceridae	13.7	32.2												
Corophiidae	.1	.1	.2	21.2	.7	2.0	.3	.4	.1	1.0	.3	.3		
Caprellidea	.1	.7	.8	10.2	2.1	18.5	7.0	60.3	.1	.5				
Caprellidae	1.7	42.3			2.4	31.6	6.8	63.6	.9	3.7				
Euphausiacea			.1	3.8			T	.1						
Natantia	T	1.0	.2	13.4	.2	38.7	.2	12.4	.2	17.1	.2	44.6	.2	9.5
Hippolytidae	.2	45.2	1.3	174.	.1	29.5	.2	25.0	.2	22.0	.3	48.0		
Pandalidae					.1	6.7	.2	21.4	.1	13.8				
Crangonidae					.1	3.7								

Table 22. The average number and weight (mg) of prey items per stomach from masked greenling 151-300 mm long (T = trace) - continued.

Masked greenling (*Hexagrammos octogrammus*)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Reptantia	.1	34.3	.2	99.8	.1	23.6	.5	41.3	.4	49.8	T	2.9		
Megalops			.1	16.8	T	.4	.1	2.9						
Legs					T	2.8								
Anomura					T	.4								
Paguridae	T	1.5	.1	30.5	.3	78.7	.1	34.5	.3	70.2	.1	46.9		
Lithodidae							T	.1	T	.1				
Callianassidae					T	28.8								
Brachyura					T	.1	.3	7.5	.1	16.0	T	3.1		
Megalops					T	.2								
Oxyrhyncha	T	5.9	.1	10.2	.5	13.3	.2	11.4	.1	9.2				
Majidae			.1	24.9	.1	20.5	.2	16.3	.2	35.1	T	.9	.3	140.
Brachyrhyncha			T	7.5	T	.4	.1	1.5						
Atelecyclidae	.2	100.	.1	20.0	.1	62.4	1.4	91.1	.6	101.	T	2.7		
Legs											T	.5		
Cancridae	T	11.6	T	3.2	T	6.4	.1	13.4	.1	20.1				
Insecta														
Chironomid larvae							2.7	1.3						
Echiura					T	10.7			T	.7	T	7.6		
Echiuridae											.1	92.8		
Bryozoa	.1	T					T	.1	T	.5				
Echinodermata														
Ophiuroidea					T	.2	T	.2						
Echinoidea					T	.2								
Chordata														
Teleostei	.1	.6	.1	2.6	.2	48.5	.1	19.6	.7	82.4	.2	129.		
Eggs	14.2	42.5	.7	1.1	1.3	10.2	3.0	14.3	41.7	175.	.2	8.4		
Larvae			.1	8.8	T	3.4								
Gadidae									T	20.3				
Cottidae					.1	20.3	.1	30.1	.1	52.3	T	86.6		
Larvae					T	.7			T	.1				
Cyclopteridae							T	.1						
Hexagrammidae							T	1.6	T	13.9				
Eggs									3.6	13.1				
Ammodytidae									.2	344.	T	59.8		
Stichaeidae									T	11.5	T	2.2		
Pholidae									T	3.9			.2	53.5
Pleuronectidae			T	1.2	T	10.6								
Unidentified	1.3	29.1	2.0	40.9	T	2.3	2.0	49.1	3.3	109.	4.8	127.		
Eggs	12.2	T			1.1	.6	1.5	.5	.3	.8				
TOTAL	97.0	112.	92.1	1,333.	90.9	1,329.	114.	1,223.	81.3	1,686.	40.4	1,247.	14.5	312.
Total number of stomachs	36		68		187		202		177		92		6	
Number empty stomachs	0		1		1		5		4		3		2	
Mean fullness	5.2		5.1		4.8		4.6		4.6		4.9		4.2	
Mean length (mm)	191.2		198.5		204.0		204.5		209.7		212.5		198.2	

Table 23. The average number and weight (mg) of prey items per stomach from masked greenling >300 mm long.

Masked greenling (Hexagrammos octogrammus)	May		June		July		August		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Annelida										
Polychaeta	17.0	208.	.5	870.			4.0	1,073.		
Mollusca										
Gastropoda										
Lacunidae	3.0	15.0								
Bivalvia	1.0	261.								
Arthropoda										
Crustacea										
Isopoda										
Sphaeromatidae			11.5	595.	1.5	37.5	17.0	1,030.		
Idoteidae							1.0	176.		
Amphipoda										
Gammaridea	2.0	3.0	4.5	61.0	1.5	12.5	19.0	165.		
Caprellidea										
Caprellidae					1.0	120.				
Natantia			.5	178.						
Hippolytidae			3.0	683.						
Reptantia										
Anomura										
Paguridae			.5	19.						
Brachyura										
Oxyrhyncha										
Majidae			.5	104.						
Chordata										
Teleostei									1.0	10,820.
Cottidae					.5	237.	1.0	372.		
Unidentified			.5	93.0						
TOTAL	23.0	487.	21.5	2,510.	4.5	299.	42.0	2,816.	1.0	10,820.
Total number of stomachs	1		2		2		1		1	
Number of empty stomachs	0		0		1		0		0	
Mean fullness	4.0		5.0		2.0		6.0		6.0	
Mean length (mm)	396.0		372.5		334.0		389.0		351.0	

Table 24. The average number and weight (mg) of prey items per stomach from rock greenling 0-150 mm long (T = trace, P = pooled).

Rock greenling (*Hexagrammos lagocephalus*)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Rhodophyta									T	.1				
Annelida														
Polychaeta	6.0	86.5			.1	7.6			.6	4.1	.4	6.1		
Nereidae									.1	.3	.1	11.6		
Opheliidae											1.6	27.7		
Serpulidae					.1	4.1			T	.1				
Opercula											.3	1.8		
Mollusca														
Gastropoda														
Prosobranchia					.4	5.6	.1	1.6	.2	.4	.1	.4		
Mesogastropoda									.1	.2				
Lacunidae							.9	2.4	1.4	18.6	.9	9.4		
Littorinidae									.1	2.4				
Nudibranchia														
Dorididae											.1	2.9		
Bivalvia									.5	T				
Siphons	2.5	10.5			.4	3.0			.1	.2	.1	2.2		
Arthropoda														
Crustacea							.2	9.2			.1	15.6	.1	110.
Ostracoda									.3	T				
Copepoda									.3	T				
Calanoida	2.5	3.5												
Harpacticoida	14.5	4.5			8.3	.9	21.7	8.6	15.7	2.9				
Cirripede cypris									1.1	.1				
Cirri									.1	.3	1.9	18.2		
Mysidacea									.1	.1				
Cumacea									.8	.7				
Tanaidacea									.1	.2				
Isopoda														
Sphaeromatidae									.1	.3	1.1	31.7		
Idoteidae									.3	4.1				
Amphipoda														
Gammaridea	28.5	86.0	10.0	45.0	20.0	406.	15.8	49.4	35.2	31.6	24.2	166.		
Amphithoidae											7.3	37.4		
Corophiidae									.4	.4	.2	.1		
Hyperiidea											.1	T		
Caprellidea														
Caprellidae									.1	T				
Natantia									T	.2				
Hippolytidae											.1	28.2		
Reptantia									.1	1.9				
Zoea									.2	1.0				
Megalops					1.1	12.3								
Anomura														
Paguridae									.2	3.7	.3	4.8		
Zoea									T	.3				
Brachyura									T	.2				
Insecta														
Diptera larvae							.1	T						
Unidentified					.4	13.7	.4	3.3	.3	8.6	.9	2.1		
Egg									20.3	.3				
TOTAL	54.0	191.	10.0	45.0	30.8	453.	39.2	74.5	78.8	83.3	39.8	366.	.5	110.
Total number of stomachs	2		1		7		9		32		16		2	
Number of empty stomachs	0		0		0		0		0		0		1	
Mean fullness	4.5		5.0		4.1		4.4		4.6		5.1		3.0	
Mean length (mm)	106.5		138.0		114.4		78.4		87.8		116.9		116.0	

Table 25. The average number and weight (mg) of prey items per stomach from rock greenling 151-300 mm long (T = trace).

Rock greenling (Hexagrammos lagocephalus)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta									T	1.1				
Ulotrichales			T	2.5	T	.4	.1	.8						
Phaeophyta			T	.4	.1	6.0	.1	.2	.1	17.9			.2	2.9
Laminariales									T	.7				
Desmarestiaceae									T	.1				
Cystoseraceae							T	2.8						
Rhodophyta					T	2.0			.1	8.8				
Bangiaceae					T	1.2								
Gigartinaceae									T	3.8				
Corallinaceae					T	.6			T	6.0				
Rhodymeniaceae									.1	22.5				
Porifera									T	1.8				
Cnidarea					T	.8								
Hydrozoa							T	84.8	.1	2.0				
Anthozoa			T	35.6										
Nemertinea					T	1.8								
Annelida														
Polychaeta	4.5	90.5	.8	160.	1.3	147.	.5	103.	.8	96.6	1.3	76.8	.3	41.1
Phyllodocidae											T	43.2		
Polynoidae									T	.1				
Nereidae			.1	62.7	.1	20.2	T	5.3	T	12.9	.1	.1		
Glyceridae					T	1.3	T	.1						
Lumbrineridae					T	.1			T	11.4				
Flabelligeridae					T	6.1	T	2.7			.1	30.6		
Opheliidae	4.0	85.0	1.9	19.0	.3	4.2					.3	3.1		
Oweniidae					.1	.9								
Ampharetidae									T	1.1				
Sabellidae													.2	2.9
Serpulidae			T	.4	.1	1.2	.1	.8	T	.1			.4	2.2
Opercula			.2	.7	.2	2.4	.1	.8	.7	7.4	.1	.5		
Mollusca					T	127.	.4	174.						
Gastropoda														
Prosobranchia					.7	34.5	.4	15.2	.4	7.9	1.4	86.6	1.8	395.
Acmaeidae					.3	5.5			.1	2.2	T	.5		
Trochidae					T	2.7								
Mesogastropoda							.1	.4	.2	5.2				
Lacunidae	1.5	22.5	4.2	109.	5.5	138.	6.5	114.	2.4	56.7	5.9	500.	4.6	163
Littorinidae					T	1.4	.8	13.6	T	.1				
Lamellaridae					T	.6	.1	7.4	.1	12.5				
Naticidae									.3	4.9				
Buccinidae											.1	116.		
Bullidae			T	.2	T	.1								
Doridae					T	1.2	.9	37.4	.2	6.6	.1	10.8		
Polyplacophora					.5	98.4	.3	63.3	.2	34.6	.4	56.0		
Ischnochitonidae					.1	32.5	.2	27.1	T	21.8	T	6.6		
Mopaliidae							T	.6	T	.7				
Bivalvia					.6	74.7	.9	88.7	.9	145.				
Veliger			T	.6										

Table 25. The average number and weight (mg) of prey items per stomach from rock greenling 151-300 mm long (T = trace) - continued.

	April		May		June		July		August		November		March	
Rock greenling (*Hexagrammos lagocephalus*)	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Siphons			1.7	340.	4.1	469.	.5	140.	2.1	258.				
Cephalopod jaws					T	.8			T	1.1				
Arthropoda														
Crustacea			.1	53.6	T	3.6	.1	30.3	.3	85.4	.1	4.7	.4	17.1
Cirripedia					T	1.9	.8	8.6	.1	1.0				
Cirri					T	.5	.1	.6						
Balanomorpha					T	.5					T	11.8		
Mysidacea			.1	.5	T	.6					.1	1.3		
Cumacea											.1	.4		
Isopoda					.1	.7								
Sphaeromatidae			.9	32.0	1.3	55.5	1.9	69.5	1.5	25.6	.4	5.9	.1	2.4
Idoteidae			T	4.8	.7	79.3	.9	80.7	1.3	168.	1.2	143.	1.1	110.
Amphipoda														
Gammaridea	.5	6.5	39.6	736.	29.3	313.	104.	410.	10.5	78.2	18.4	368.	17.4	188.
Amphithoidae					T	1.8	.1	8.0	.1	8.7				
Corophiidae					.5	1.6	.1	.3						
Caprellidea					.4	3.9	2.1	16.9						
Caprellidae					.4	3.8	3.6	31.1	.1	.2				
Eucarida									T	1.9				
Euphausiacea			T	3.2	T	.3								
Natantia			T	3.0	.1	27.3	.2	3.2	.5	32.3	.1	17.4		
Hippolytidae			1.2	246.	.2	84.4	.1	17.4	.1	19.0	.4	99.0	.8	148.
Pandalidae					T	5.6	T	1.1	T	.2			.1	31.5
Crangonidae					T	4.2								
Reptantia			T	4.9	.3	19.5	1.2	117.	.2	164.	T	10.6		
Megalops			.3	12.6			T	.3						
Legs					T	1.6								
Anomura			T	74.2	T	.3								
Paguridae			.1	81.4	.5	235.	.2	52.4	.4	119.	.4	102.	.8	326.
Legs													.4	10.0
Lithodidae					T	.5			T	3.9				
Brachyura					T	18.3	.1	28.3	.1	12.6				
Megalops					.4	7.9								
Oxyrhyncha			.1	62.7	.2	15.0	.1	1.6	.2	25.4				
Majidae			.1	13.3	1.6	246.	T	11.6	.4	66.8	.1	31.7		
Brachyrhyncha							T	.4						
Atelecyclidae	1.5	1,258.	.1	94.3	.1	152.	T	40.2	.4	56.0				
Cancridae			.1	28.5	.1	59.0	.2	15.4	.1	47.2	T	16.4	.1	2.5
Insecta														
Chironomid larvae							.9	.2						
Echiura											T	85.6		
Bryozoa			T	.6	T	.2			T	.6				
Urochordata														
Ascidacea			.1	11.1										
Chordata														
Vertebrata														
Teleostei	27.5	53.0	.1	122.	.2	114.	.2	292.	.1	23.1	.1	372.	.1	21.2
Eggs			19.1	35.5	2.8	5.1	1.2	2.9	100.	413.	21.6	94.5	45.0	301.
Larvae			.3	97.5	.1	6.8	T	.9						

Table 25. The average number and weight (mg) of prey items per stomach from rock greenling 151-300 mm long (T = trace) - continued.

	Rock greenling (*Hexagrammos lagocephalus*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Gadoidei			T	18.6										
Cottoidei					T	7.1								
Cottidae					T	8.7			T	7.6	.2	262.		
Larvae			T	8.0										
Hexagrammid egg									21.1	74.2				
Perciformes									T	38.9				
Stichaeidae											T	23.5		
Ammodytidae									.2	238.				
Unidentified	3.5	980.	5.5	140.	4.8	73.8	8.8	249.	9.3	230.	2.6	130.	.9	22.0
Egg					8.2	10.0	1.5	6.1	3.5	10.8				
TOTAL	43.0	2,496.	76.7	2,615.	66.3	2,852.	140.	2,379.	159.	2,703.	55.6	2,711.	74.7	1,787.
Total number of stomachs	2		40		113		71		77		37		10	
Number empty stomachs	2		1		1		1		1		0		0	
Mean fullness	5.0		5.3		5.1		5.0		4.9		5.1		4.9	
Mean length (mm)	230.0		248.7		252.5		248.9		245.1		245.4		261.6	

Table 26. The average number and weight (mg) of prey items per stomach from rock greenling >300 mm long (T = trace).

Rock greenling (*Hexagrammos lagocephalus*)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta					T	11.0	.1	.4						
Ulotrichales			T	2.5	T	6.0								
Cladophoraceae	.5	39.5												
Phaeophyta			.4	317.	.3	500.	.2	266.	.2	282.	T	20.3	.2	9.9
Chordariaceae			T	.9										
Laminariales			.2	73.5			T	4.8	.1	54.9				
Laminariaceae					T	48.8								
Alariaceae			T	10.1										
Desmarestiaceae					T	43.8								
Fucales			T	17.5										
Cytoceraceae							T	5.7						
Rhodophyta	1.5	426.			.1	42.4	.1	7.1	4.2	276.	T	.6		
Phyllophoraceae			.1	3.0			.2	2.6						
Corallinaceae			.1	.1			.3	16.1	3.2	69.3				
Kallymeniaceae	18.0	258.												
Rhodymeniaceae					T	35.0								
Ceramiales			T	1.4										
Delesseriaceae			T	4.4										
Angiosperma														
Potamogetonaceae					.8	456.	T	36.1	.1	16.6	.6	35.5		
Cnidaria														
Hydrozoa					T	.6	.1	150.	.1	5.6	.1	8.0		
Seratularridae											T	17.9		
Anthozoa							.1	22.0						
Metridiidae					T	17.2								
Nemertinea					.1	9.6								
Annelida														
Polychaeta	2.5	1,054.	3.8	592.	.9	126.	.4	190.	1.0	87.4	2.2	151.	.2	10.4
Larvae			4.1	214.										
Polynoidae					T	12.1							.1	.1
Phyllodocidae									T	2.6				
Nereidae			T	9.3	.2	23.1	.1	1.9	.4	253.	.1	.4	.1	4.7
Glyceridae			.1	68.0	T	4.6	T	5.7						
Goniadidae							T	.8						
Lumbrineridae			T	.6					.1	2.3				
Flabelligeridae							T	13.0			.1	21.0	.1	112.
Opheliidae			T	.6	T	.2								
Pectinariidae									T	5.6	T	.1	.1	8.5
Sabellariidae					.1	1.4								
Ampharetidae					T	.6								
Serpulidae													.6	5.6
Opercula			.1	16.2	.1	.6	T	.2	T	.2	.3	1.4		
Sabellidae									T	.1	T	.5	.1	4.4
Maldanidae	T	.3												
Eunicidae									T	.2				
Nephtyidae									T	1.0	T	3.0		

Table 26. The average number and weight (mg) of prey items per stomach from rock greenling >300 mm long (T = trace) - continued.

Rock greenling (*Hexagrammos lagocephalus*)	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Mollusca					.7	111.	.1	79.0	T	102.				
Gastropoda														
Prosobranchia			.3	22.9	1.0	46.0	.5	19.1	1.1	34.4	.9	65.6		
Acmaeidae			T	.1	.1	6.8	T	.5						
Trochidae			T	2.7	T	4.2			T	14.0	1.6	22.3	1.8	60.5
Mesogastropda					T	1.0	.2	6.1						
Lacunidae	1.0	44.0	5.1	286.	15.7	940.	2.7	59.7	.5	22.8	4.7	340.	12.5	705.
Littorinidae					T	3.2	1.5	43.5			T	4.8		
Cerithiidae			T	1.3										
Trichotropidae							T	1.4						
Lamellaridae							.1	28.2					.4	592.
Naticidae							T	.9						
Muricidae			T	6.6										
Buccinidae											T	17.2	.1	148.
Olividae											.1	4.6		
Aglajidae					T	2.2								
Bullidae					T	26.8								
Nudibranchia														
Chromodoridae					T	4.1								
Dorididae					.2	54.4	1.1	81.0			T	5.2	.1	5.7
Tritonidae							T	5.7						
Aeolidiidae									T	10.0				
Polyplacophora					.3	45.4	.3	168.	.2	48.9	.3	331.	.2	33.8
Ischnochitonidae					T	31.7	T	1.6			T	4.2		
Mopaliidae					.1	164.			T	82.5	T	3.2		
Bivalvia			.2	26.6	.4	98.1	.2	58.1	.6	95.9	1.6	24.7		
Siphons	3.5	92.	.3	42.0	4.7	1,115.	.8	232.	.7	205.	2.4	667.	.1	6.7
Mytilioida			.1	2.3	T	.7	T	.9	T	.2				
Cephalopod jaws					T	.8								
Octopoda			T	138.	T	48.3								
Arthropoda														
Pyncnogonida			.1	T										
Crustacea					.3	12.5	.2	97.7	T	15.5	T	13.4	.4	27.9
Cirripedia					.1	2.8	T	.8			.1	20.9	.1	1.2
Cirri					T	.2								
Balanidae							.1	12.6						
Mysidacea							T	.4					37.3	285.
Cumacea							T	.1						
Isopoda							.1	.1						
Sphaeromatidae			.2	7.0	6.5	411.	3.0	147.	.4	18.8	.2	.2		
Idoteidae			.4	57.8	.3	74.6	.7	158.	.5	84.1	.1	40.7		
Asellota					T	.1								
Flabellifera			2.0	36.6			T	.1						
Amphipoda														
Gammaridea	12.5	240.	50.3	482.	23.9	241.	24.9	197.	2.4	41.7	6.5	77.1	22.9	448.
Amphithoidae					.2	11.0	T	11.2						
Eusiridae					.3	3.7								

Table 26. The average number and weight (mg) of prey items per stomach from rock greenling >300 mm long (T = trace) - continued.

Rock greenling (*Hexagrammos lagocephalus*)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Caprellidea			.6	7.6	.4	2.1	.4	9.4						
Caprellidae					28.8	275.	1.0	17.0	.1	.6	.5	4.7		
Euphausiacea							.1	4.9						
Natantia			.1	26.9	.1	13.2	.3	8.3	.3	69.7	1.0	116.	3.1	228.
Hippolytidae	1.0	180.	2.1	318.	.3	56.1	1.7	67.9	.1	35.8	2.4	472.	2.5	721.
Pandalidae							.6	21.0	.2	28.4	.2	37.9	.1	88.8
Crangonidae							T	.8						
Reptantia			.2	80.2	.2	513.	1.2	249.	.2	163.	T	53.4		
Megalops			.3	48.6	T	3.3								
Legs					T	32.2					T	16.0		
Anomura														
Paguridae			.1	112.	.3	414.	.1	143.	.2	103.	.5	840.	.1	10.4
Chelae					T	18.0					T	21.1		
Lithodidae							T	15.6	T	1.7			.2	72.9
Brachura					.1	19.7	.5	87.2			T	2.2		
Legs											T	19.2		
Oxyhrhyncha					.4	51.0	.2	16.2	.1	.6				
Majidae			2.5	1,461.	.4	352.	.8	694.	.8	464.	1.0	1,031.	.1	62.0
Brachyrhyncha			T	4.6										
Atelecyclidae	3.5	3,350.	.7	2,610.	.4	2,293.	.6	1,170.	.4	667.			.1	24.0
Cancridae			.6	466.	.1	215.	.2	165.	.3	197.	.5	189.	.1	138.
Pinnotheridae											T	2.1		
Insecta											T	1.6		
Diptera larvae					.3	1.0								
Echiura			.1	893.	T	.1							.1	10.6
Priapula									T	17.0				
Bryozoa					.1	1.1	T	.1	.1	.9				
Echinodermata														
Asteroidea							T	.2						
Ophiuroidea											T	2.5		
Holothuroida					T	.2								
Urochordata	1.0	944.												
Ascidacea					.1	154.	.1	12.4					.2	304.
Chordata														
Teleostei			.9	1,593.	1.1	630.	.5	1,441.	7.1	1,857.	1.7	3,814.	.4	1,620.
Eggs	1,913.	1,913.	54.8	192.	69.6	185.	129.	569.	172.	1,058.	25.0	80.8		
Larvae			.2	51.6	T	7.6								
Scorpaenid larvae			.1	5.1										
Cottidae			T	232.	T	1.1	.1	40.8			T	161.	.1	536.
Cyclopteridae							T	239.	T	.6				
Hexagrammidae			T	540.			T	152.	.1	365.				
Eggs									223.	1,149.				
Perciformes					T	20.5	T	40.9	T	61.7				
Stichaeidae			T	23.6										
Pholidae			T	274.			T	158.	.1	495.	T	219.		
Ammodytidae			T	54.1			T	67.8	.8	1,160.				
Unidentified			10.6	835.	9.2	1,313.	19.6	1,203.	14.5	1,887.	16.2	1,717.	3.7	176.
Egg					27.2	54.9			60.1	240.				
TOTAL	1,958.	8,740.	142.	12,272.	196.	11,426.	195.	8.728.	496.	11,864.	70.9	10,702.	88.2	6,461.
Total number of stomachs	2		37		111		87		62		48		14	
Number of empty stomachs	0		1		2		2		0		0		1	
Mean fullness	6.0		5.7		5.2		5.0		5.5		5.4		5.0	
Mean length (mm)	360.5		353.4		368.5		356.0		360.5		358.5		359.1	

Table 27. The average number and weight (mg) of prey items per stomach from whitespotted greenling 0-150 mm long (T = trace, P = pooled).

Whitespotted greenling (Hexagrammos stelleri)												
	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Rhodophyta	.2	T										
Annelida												
Polychaeta	1.0	62.8			T	.3	.4	5.9				
Flabelligeridae									T	4.0		
Opheliidae									T	.3		
Maldanidae									T	14.3		
Pectinariidae									T	7.0		
Polynoidae	1.2	6.2										
Nereidae									T	.9		
Serpulidae									T	3.1		
Opercula												
Mollusca												
Gastropoda												
Prosobranchia					.3	.4	.1	1.9				
Mesogastropoda					.1	T						
Bivalvia							.1	.2				
Siphons			.3	.1			.2	.3	.2	.4		
Arthropoda												
Crustacea	.2	8.8	1.4	32.1			.1	1.1	.5	25.6		
Ostracoda							.1	T				
Copepoda					1.5	.4	.9	.2				
Calanoida					14.5	2.8	1.2	1.0				
Harpacticoida	.8	.2			74.2	7.3	6.8	.9	.1	T		
Cirripedia					.2	.1	.4	3.4				
Cypris							13.3	2.1				
Cirri					.5	2.3	1.2	4.6				
Mysidacea	.3	45.0	1.9	103.	.3	12.0	T	.3	1.7	88.9	.1	2.5
Cumacea							.6	1.1				
Tanaidacea							T	.2				
Isopoda												
Sphaeromatidae			.1	.1			.8	9.3	T	.7		
Idoteidae							T	.3				
Amphipoda												
Gammaridea	2.7	54.3	8.9	28.4	11.8	16.7	26.4	76.9	8.0	17.4		
Corophiidae					1.0	1.8	.2	.4				
Caprellidea	.2	.7			.3	1.0						
Caprellidae					.3	.9	.2	.4	T	.1		
Euphausiacea	.2	.7					.1	1.0	.4	7.2		
Natantia							T	.3	.1	1.5		
Hippolytidae							T	1.7	.1	3.6		
Crangonidae			.1	2.7					T	.2		
Reptantia	.3	24.2	1.7	13.9			T	1.7				
Zoea	.8	4.3										
Legs									T	1.2		
Anomura	.2	4.2										
Paguridae							T	4.6	T	.1		
Zoea							.1	.2				
Brachyura			.3	3.1								

Table 27. The average number and weight (mg) of prey items per stomach from whitespotted greenling 0-150 mm long (T = trace, P = pooled) - continued.

Whitespotted greenling (<u>Hexagrammos</u> <u>stelleri</u>)

	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Oxyrhyncha												
Majidae			.7	46.1								
Brachyrhyncha												
Insecta									T	.2		
Diptera							.4	.7				
Chironomid larvae					.1	T						
Chordata												
Vertebrata												
Teleostei	.2	1.7	.4	21.9	T	2.6	T	1.8				
Egg									1.0	8.8	12.5	26.2
Larvae			.1	6.1			T	.3				
Cottidae							T	.2				
Larvae							T	.4				
Unidentified	.5	.3			.2	2.4	.5	3.2	1.9	1.4		
Egg			10.0	19.4			.1	T				
TOTAL	8.8	213.	25.9	277.	105.	51.0	54.2	12.9	14.1	188.	12.6	28.7
Total number of stomachs	6		7		59		143		29		8	
Number of empty stomachs	1		1		p		p		1		5	
Mean fullness	4.2		3.9		3.6		4.7		4.0		1.6	
Mean length (mm)	139.0		140.9		73.1		90.2		121.8		126.2	

Table 28. The average number and weight (mg) of prey items per stomach from whitespotted greenling 151-300 mm long (T = trace).

Whitespotted greenling (*Hexagrammos stelleri*)	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta			T	1.7	.1	39.7						
Ulotrichales			.1	3.5			T	.2				
Phaeophyta			T	2.1	T	3.3	T	4.3				
Rhodophyta			.1	20.7	T	5.2	.9	106.	T	7.0		
Corallinaceae							T	21.1				
Angiosperma							.1	5.3				
Potamogetonaceae			T	2.9	.2	11.0						
Cnidaria			T	.3								
Hydrozoa					T	45.2	3.9	25.9	T	3.9		
Nemertinea			T	.1								
Annelida												
Polycheata	1.1	33.0	.5	63.7	.7	43.5	1.5	95.6	.1	3.0		
Polynoidae							T	8.5				
Nereidae			T	18.7	T	3.6						
Gyceridae			T	25.9	T	.1	T	.2				
Goniadidae							T	.2				
Flabelliferidae					T	3.1						
Opheliidae			.2	2.5								
Pectinariidae					T	1.0	T	.6				
Sabellidae			T	1.8								
Nephtyidae					T	14.1						
Mollusca												
Gastropoda												
Prosobranchia			T	46.8	T	1.9	T	11.0	T	.1		
Lacunidae					.3	2.7	T	.1				
Littorinidae					.1	.2						
Trichotropidae			.3	1.6								
Nudibranchia												
Polyplacophora					T	10.8						
Ischnochitonidae					.1	13.0						
Bivalvia			T	.6	.1	7.5			.1	.6		
Siphons			.3	4.8	T	.1	.1	10.0	.1	.7		
Mytiloida					1.2	19.5						
Cephalopod jaws							T	3.6				
Octopoda							T	40.8				
Arthropoda												
Pycnogonida			T	.3			T	1.0				
Crustacea	.3	187.	.1	122.	.1	190.			.2	281.		
Copepoda							.2	21.6				
Harpacticoida					1.4	.1	.2	.3				
Cirripedia			.1	3.	.1	8.7						
Mysidacea			.3	25.6	1.0	7.9	.6	53.6	2.3	135.		
Cumacea			.2	1.2	1.0	2.0	.2	1.3				
Isopoda					T	.2						
Sphaeromatidae			.1	1.7	.7	12.8	.5	23.3				
Idoteidae							.1	12.4				

Table 28. The average number and weight (mg) of prey items per stomach from whitespotted greenling 151-300 mm long (T = trace) - continued.

Whitespotted greenling (*Hexagrammos stelleri*)

	May No.	May Wt.	June No.	June Wt.	July No.	July Wt.	August No.	August Wt.	November No.	November Wt.	March No.	March Wt.
Flabellifera	T	.4										
Amphipoda												
Gammaridea	1.7	14.5	4.7	84.9	14.4	134.	10.0	133.	.8	5.8		
Corophiidae							.1	.2				
Caprellidea			2.9	23.0	.6	5.8						
Caprellidae			2.0	22.9	13.5	182.	T	.1				
Euphausiacea	.6	27.6			T	5.0	T	1.0				
Natantia	1.1	1,487.	.4	245.	.2	45.8	.3	136.	.1	200.	.1	48.0
Hippolytidae			T	10.0	.2	6.6	.1	13.0	.2	19.1	.2	116.
Pandalidae	.3	608.	.4	1,006.	.6	296.	.1	24.7	.1	148.		
Crangonidae	.1	241.	.2	112.	.2	70.7	T	24.9	.1	.4		
Reptantia	.1	251.	.6	213.	.2	124.	.2	111.				
Megalops			T	.6	T	.2	T	.2				
Legs			T	.4								
Anomura			T	.1								
Paguridae	.1	27.5	.5	56.2	.1	54.4	.3	170.				
Megalops							T	.2				
Lithodidae					.6	12.8	.1	10.0				
Porcellanidae							T	6.4				
Callianassidae							T	1.4				
Brachyura	.1	8.2	.1	9.4	.5	110.	.2	36.9				
Legs					T	7.3						
Oxyrhyncha			.2	141.	.1	186.	.2	166.			.1	3.0
Megalops			T	.1								
Majidae			.4	104.	.9	247.	.2	69.4				
Brachyrhyncha							T	.9				
Atelecyclidae			T	408.	.1	153.	.2	91.5	T	131.		
Cancridae			.1	119.	.1	34.8	.5	158.				
Insecta					.1	7.6		–				
Echiura					.1	44.8	T	44.7	T	2.4		
Echinodermata												
Holothuroidea			T	21.6					T	81.6		
Urochordata												
Ascidacea							T	2.2				
Chordata												
Vertebrata												
Teleostei	T	65.6	.3	324.	60.1	124.	.5	284.	.3	474.		
Eggs							126.	392.				
Larvae	.4	39.3	T	6.3								
Clupeidae							T	16.6				
Gadidae	T	257.					T	11.3				
Scorpaeniformes			.1	35.3	T	15.7						
Cottidae			.1	26.6	.1	39.5	.1	51.0				
Larvae			.1	5.3	T	.8						
Cyclopteridae											.1	431.
Hexagrammidae					T	44.8						
Eggs							.1	8.0				

Table 28. The average number and weight (mg) of prey items per stomach from whitespotted greenling 151-300 mm long (T = trace) - continued.

Whitespotted greenling (Hexagrammos stelleri)												
	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Larvae			T	1.4								
Perciformes							.1	44.2	T	18.9		
Ammodytidae			.1	70.6	T	33.4	.3	242.				
Stichaeidae					.5	183.	.5	155.	T	21.8		
Pholidae									T	128.		
Pleuronectiformes							T	1.6				
Pleuronectidae			T	9.3	T	1.5	T	24.9				
Larvae					T	.8	T	.2				
Unidentified	1.1	40.5	1.2	93.0	.1	58.6	1.8	92.3	.1	.4		
Eggs			11.2	19.1	10.8	4.2						
TOTAL	7.1	3,288.	27.8	3,516.	117.	2,681.	150.	2,971.	4.5	1,663.	.5	598.
Total number of stomachs	37		89		97		129		37		12	
Number of empty stomachs	1		3		5		5		7		8	
Mean fullness	5.4		4.7		4.7		4.7		3.5		2.1	
Mean length (mm)	217.5		242.6		244.8		245.8		235.8		252.9	

Table 29. The average number and weight (mg) of prey items per stomach from whitespotted greenling >300 mm long (T = trace).

Whitespotted greenling (*Hexagrammos stelleri*)	May		June		July		August		November	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta					T	6.0				
Ulotrichales					.1	73.7				
Phaeophyta			.1	12.8	T	19.2				
Desmarestiaceae			.1	24.9						
Bangiaceae							.1	.8		
Gigartinaceae							.1	294.		
Corallinaceae							.1	142.		
Angiosperma										
Potamogetonaceae					.2	236.	.1	29.9		
Annelida										
Polychaeta	.2	32.4	.1	950.	.2	41.5				
Nereidae					.1	2.3	.1	3.2		
Syllidae			.1	931.						
Mollusca										
Gastropoda										
Prosobranchia	6.0	198.			.1	100.	.1	2.4		
Mesogastropoda					.2	1.0				
Lacundidae					.1	.7				
Bivalvia					.2	6.1				
Siphons					.1	373.			.3	219.
Cephalopoda					.1	1.9				
Arthropoda										
Crustacea			.1	40.8	T	804.	.1	564.		
Mysidacea							.4	1.6		
Isopoda										
Sphaeromatidae			.5	25.9	3.8	237.				
Idoteidae			.2	71.1						
Amphipoda										
Gammaridea	12.0	2,622.	3.8	106.	4.7	100.	.2	1.9		
Caprellidea	.4	.2			19.7	226.				
Natantia	.6	989.	.1	258.	.8	805.	.5	1,400.		
Hippolytidae					.1	50.3			1.0	1,644.
Pandalidae			.1	678.	.4	33.7				
Crangonidae					T	56.1				
Reptantia			.1	650.	.3	1,837.	.4	152.		
Anomura										
Paguridae			.4	115.						
Chelae									.3	312.
Brachyura					.3	218.				
Oxyrhynca			.1	732.	.5	104.				
Majidae					1.0	129.	.8	638.		
Brachyrhyncha										
Atelecyclidae	.2	867.	.9	2,263.	.4	7,550.	.2	1,270.		
Legs			.1	73.6						
Cancridae					.1	295.	.2	1,262.		
Chordata										
Vertebrata										
Teleostei			.2	1,314.	1.4	349.	.1	154.		

Table 29. The average number and weight (mg) of prey items per stomach from whitespotted greenling > 300 mm long (T = trace) - Continued.

Whitespotted greenling (Hexagrammos stelleri)

	May		June		July		August		November	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Eggs					5.1	496.	102.	420.		
Gadidae							.1	408.	.5	6,193.
Scorpaeniformes			.1	9,386.						
Scorpaenidae	.2	1,051.								
Cottidae			.1	28.8	.2	144.			.3	1,004.
Hexagrammidae					T	386.				
Pholidae									.3	1,104.
Ammodytidae									.3	164.
Unidentified			1.2	107.	5.0	558.	1.4	362.	1.0	177.
Egg			256.	485.			.1	T		
TOTAL	19.6	5,760.	264.	18,253.	45.2	15,240.	107.	7,106.	4.0	10,817.
Total number of stomachs	5		14		21		17		7	
Number of emptry stomachs	1		2		1		1		1	
Mean fullness	5.0		4.0		5.1		4.3		4.3	
Mean length (mm)	325.0		357.6		317.8		322.5		312.7	

Table 30. The average number and weight (mg) of prey items per stomach from sablefish > 151 mm long (T = trace).

	Sablefish (*Anoplopoma fimbria*)									
	151-300 mm long				>300 mm					
	June		August		June		August		November	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Arthropoda										
Crustacea										
Euphausiacea	6.5	522.			2.4	290.				
Mysidacea	.1	.4								
Natantia	.1	174.					.5	1,540.	.5	1,364.
Hippolytidae							T	55.1		
Pandalidae			1.8	2,586.			.7	2,474.	.4	1,769.
Reptantia										
Brachyura										
Zoea	.1	2.3								
Megalops	2.8	27.8								
Urochordata										
Ascidacea							3.9	36.6		
Chordata										
Vertebrata										
Teleostei	.6	792.	.3	836.	.5	2,322.	.2	290.		
Clupeiformes			.6	4,434.			.4	2,532.		
Clupeidae	.2	415.	.6	1,721.			T	114.		
Osmeridae	.6	6,420.			.9	10,732.	T	364.		
Gadidae									.1	6,970.
Perciformes							T	18.5		
Bathymasteridae							T	86.8		
Stichaeidae							T	72.1		
Ammodytidae									.1	128.
Unidentified			.4	10.9						
TOTAL	11.0	8,354.	3.7	9,588.	3.8	13,344.	5.7	7,583.	1.1	10,231.
Total number of stomachs	14		8		11		27		11	
Number of empty stomachs	2		0		1		3		4	
Mean fullness	4.8		5.5		6.1		3.9		2.9	
Mean length (mm)	287.4		285.9		317.8		333.2		369.8	

Table 31. The average number and weight (mg) of prey items per stomach from silverspotted sculpin 0-150 mm long, *Gymnocanthus* spp. 0-150 mm long, and a staghorn sculpin 151 mm long (T = trace).

	Silverspotted sculpin (*Blepsias cirrhosus*)		Staghorn sculpin (*Leptocottus armatus*)		*Gymnocanthus* spp.							
	April		April		April		May		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Annelida												
Polychaeta			1.0	403.	4.0	22.0	1.0	21.7	1.0	8.0		
Mollusca												
Gastropoda												
Bullidae							.2	T				
Bivalvia							.3	4.3				
Siphons	.1	.1										
Arthropoda												
Crustacea												
Copepoda												
Harpacticoida	2.7	.2	1.0	.1								
Mysidacea											.9	49.2
Cumacea	.1	.3					.2	3.3				
Isopoda												
Sphaeromatidae	.3	3.4										
Idoteidae	.7	1.7										
Amphipoda												
Gammaridea	31.7	178.	1.0	3.0	2.0	101.	2.2	24.2			.1	1.2
Caprellidea												
Caprellidae	.1	.7										
Euphausiacea											.3	16.5
Natantia												
Hippolytidae	.3	26.0										
Pandalidae									1.0	201.		
Reptantia												
Megalops							.8	16.0				
Chordata												
Vertebrata												
Teleostei											.1	11.6
Unidentified									1.0	11.0		
TOTAL	36.0	210.	3.0	406.	6.0	123.	4.7	69.3	3.0	220.	1.4	77.5
Total number stomachs	7		1		1		6		1		12	
Number empty stomachs	0		0		0		1		0		5	
Mean fullness	5.6		5.0		4.0		4.0		5.0		3.2	
Mean length (mm)	103.4		151.0		147.0		89.3		145.0		80.7	

Table 32. The average number and weight (mg) of prey items per stomach from red Irish lord 151-300 mm and >300 mm long (T = trace).

Red Irish lord (Hemilepidotus hemilepidotus)

	151-300 mm				>300 mm					
	June		August		June		July		August	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Ulotricales							.2	65.8		
Phaeophyta							.2	48.7		
Laminariales									.3	7.0
Rhodophyta									.3	43.5
Mollusca										
Gastropoda										
Prosobranchia							.2	115.	.5	576.
Lacunidae										
Trochidae							.2	2.5		
Amphineura										
Polyplacophora					1.0	132.	.2	275.		
Ischnochitonidae									.3	245.
Bivalvia									.3	90.0
Mytilidae							.2	30.8		
Cephalopod jaws							.2	8.8		
Arthropoda										
Crustacea										
Cirripede cirri							.3	787.		
Reptantia							.2	182.	.3	68.3
Anomura										
Paguridae									.5	154.
Oxyrhyncha										
Majidae							.7	410.		
Brachyrhyncha										
Atelecyclidae							.3	8,761.	1.8	197.
Cancridae							3.2	2,775.	.3	133.
Echinodermata										
Ophiuroidea									1.0	218.
Chordata										
Vertebrata					4.0	22.0				
Teleostei	1.0	6,257.							.8	5,769.
Trichodontidae			1.0	4,094.						
Unidentified							1.3	1,217.	.3	T
TOTAL	1.0	6,257.	1.0	4,094.	5.0	154.	7.2	14,679.	6.6	7,441.
Total number of stomachs	1		1		1		6		4	
Number of empty stomachs	0		0		0		1		0	
Mean fullness	6.0		5.0		2.0		4.0		5.8	
Mean length (mm)	254.0		200.0		304.0		352.0		357.2	

Table 33. The average number and weight (mg) of prey items per stomach from yellow Irish lord 0-150 mm long (T = trace, P = pooled).

	Yellow Irish lord (*Hemilepidotus jordani*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Phaeophyta							T	.3						
Annelida														
Polychaeta			.1	23.1	T	11.1	T	.8	.1	6.8	.1	T	.2	13.5
Glyceridae							T	12.9						
Mollusca														
Gastropoda														
Prosobranchia									.1	1.2				
Lacunidae					T	3.6	T	1.4						
Bivalvia			T	.1										
Nuculidae							T	3.0						
Anthropoda														
Crustacea			.2	30.7	.4	4.4	T	.8	.1	17.3				
Copepoda														
Harpacticoida					.2	.1					1.1	.3		
Malacostraca							T	.3					.2	5.8
Cumacea			T	.6										
Isopoda														
Sphaeromatidae					.1	2.5					.3	12.1		
Amphipoda														
Gammaridea	3.0	5.0	1.0	7.8	.3	7.7	2.1	44.3	.6	13.7	6.9	21.0	2.5	5.0
Lysianassidae			.1	5.1										
Caprellidea							.8	5.6						
Caprellidae											.4	1.4	1.0	4.2
Eucarida							.2	.6			.1	27.3		
Natantia	1.0	38.0	.1	243.	T	3.9	1.1	8.3	.3	53.2	.3	11.3		
Hippolytidae			.5	35.2					.3	6.3	.3	1.7		
Pandalidae			T	32.7	T	66.0	.2	362.						
Crangonidae			T	4.8			T	15.6	T	19.6				
Reptantia			.2	58.0	.3	8.8	.4	9.6						
Megalops			.6	20.7	.4	7.9	1.3	53.6						
Anomura														
Paguridae			.2	151.	.1	10.4	.1	3.6	T	13.2				
Chelae											.1	7.3		
Lithodidae							T	1.0						
Brachyura			.1	6.9	.1	2.4	1.2	30.4	.2	7.5				
Oxyrhyncha							.4	13.0	.6	53.2				
Majidae			.7	16.3	.3	9.9	.7	29.8	.7	54.1				
Brachyrhyncha							T	7.4						
Atelecyclidae									.2	26.2				
Bryozoa			T	.6										
Echinodermata														
Ophiuroidea					T	5.6	T	2.5						
Chordata														
Vertebrata														
Teleostei					T	12.5			.1	409.				
Clupeiformes									.1	258.				

Table 33. The average number and weight (mg) of prey items per stomach from yellow Irish lord 0-150 mm long (T = trace, P = pooled) - continued.

Yellow Irish lord (*Hemilepidotus jordani*)														
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Cottidae									T	42.7				
Ammodytidae									.1	115.				
Stichaeidae							T	11.1						
Unidentified			.8	4.7	.1	1.5	T	1.4	.2	8.0	.7	.2	.2	1.2
TOTAL	4.0	43.0	4.6	641.	2.3	158.	9.5	619.	3.7	1,105.	10.3	82.6	4.1	29.7
Total number of stomachs	1		21		28		22		27		7		6	
Number of empty stomachs	0		P		0		1		P		1		3	
Mean fullness	4.0		5.1		3.1		4.8		4.9		3.4		2.8	
Mean length (mm)	89.0		104.9		110.8		113.7		123.9		93.0		80.3	

Table 34. The average number and weight (mg) of prey items per stomach for yellow Irish lord 151-300 mm long (T = trace).

Yellow Irish lord (Hemilepidotus jordani)	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Phaeophyta							T	1.2				
Rhodophyta							T	1.9				
Angiosperma												
Potamogetonaceae							T	23.4				
Cnidaria												
Hydrozoa							T	.4	T	.4		
Annelida							T	5.5				
Polychaeta			T	.9			.6	203.6			.1	32.6
Goniadidae			T	9.5								
Flabelligeridae							T	13.5				
Eunicidae			T	2.7								
Onuphidae					T	32.0						
Phyllodocidae									T	8.5		
Nephyidae							.1	4.8				
Mollusca												
Gastropoda												
Prosobranchia					.1	10.6	.2	7.8	T	2.8		
Acmaeidae					T	2.2						
Fissurellidae					.1	17.1	T	16.3				
Lepetidae							T	6.9				
Mesogastropoda					T	.7						
Lacunidae					.3	9.0						
Nudibranchia												
Doridae					T	.7	.5	29.1				
Bivalvia			.1	24.5	T	6.1	.1	40.3	T	1.2		
Siphons			T	.8	.1	5.3	.2	29.6				
Nuculanidae			T	8.7			T	7.0				
Pectinidae									T	.8		
Cardiidae					T	1.4						
Tellinidae									.1	9.9		
Cephalopod jaws			T	1.5					T	.6		
Arthropoda												
Crustacea	.1	90.4	.4	152.	T	91.2	.1	35.4	.1	90.7	.1	8.4
Cirripedia							T	.1				
Balanomorpha					T	1.7						
Mysidacea					T	3.5	T	.3				
Isopoda												
Sphaeromatidae			T	3.7	.1	5.1						
Amphipoda												
Gammaridea					.3	6.9	.1	.9				
Caprellidea					.1	.4						
Eucarida									.2	5.5		
Euphausiacea					.1	3.6						
Natantia	.8	2554.	.2	428.	T	98.1	.2	252.	.1	262.	.1	203.
Hippolytidae					T	1.0	T	15.5				
Pandalidae	.4	1755.	.4	1308.	.1	197.	.1	457.	.1	342.	.4	482.
Crangonidae							T	26.7	T	1.8		

Table 34. The average number and weight (mg) of prey items per stomach from yellow Irish lord >300 mm in length (T = trace) - continued.

Yellow Irish lord (<u>Hemilepidotus jordani</u>)

	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Reptantia	T	34.8	T	15.4	.3	556.	.2	64.8	T	80.6		
Megalops			T	8.1								
Anomura												
Paguridae			.1	138.	.1	115.	.2	44.0	.1	115.	.1	143.
Chelae									.1	33.4		
Brachyura	T	13.7	T	17.7	.2	11.9	.1	59.3				
Megalops					T	.5						
Legs									T	13.4		
Oxyrhyncha	T	.5	T	7.4	.3	10.7	.2	11.6	.1	8.9	.1	84.9
Majidae	.1	135.	.4	541.	1.1	671.	.4	145.	1.0	787.	.2	117.
Brachyrhycha					T	1.8	T	14.4				
Atelecyclidae					.1	31.9	.1	143.				
Cancridae			T	1.1	T	2.8	T	23.6	T	30.6		
Pinnotheridae					.1	47.8	T	7.3				
Echiura												
Echiuridae							T	173.				
Bryozoa			.2	.9								
Echinodermata												
Ophiuroidea			T	11.4	T	6.0	.4	233.	T	3.5		
Chordata												
Vertebrata												
Teleostei	.1	689.	.1	283.	.3	392.	.2	506.	.1	285.	.1	481.
Larvae			T	.7								
Clupeiformes							T	140.				
Osmeridae							.2	1595.				
Gadidae											.1	933.
Cottidae	T	59.1			T	3752.	T	8.1				
Perciformes							T	20.1				
Ammodytidae							.3	526.				
Stichaeidae			T	38.8								
Unidentified	.1	80.4	.7	121.	.3	24.6	.9	167.	1.1	8.4	.2	1.1
TOTAL	1.6	5412.	2.6	3125.	4.1	6117.	5.5	5061.	3.1	2092.	1.5	2486.
Total number of stomachs	50		93		64		59		33		10	
Number of empty stomachs	7		25		9		6		11		4	
Mean fullness	4.5		3.6		3.9		4.6		2.8		3.9	
Mean length (mm)	255.4		238.2		242.4		228.5		241.7		243.8	

Table 35. The average number and weight (mg) of prey items per stomach from yellow Irish lord >300 mm long (T = trace).

Yellow Irish lord (*Hemilepidotus jordani*)	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta					T	183.						
Phaeophyta			T	97.8	T	5.2						
Rhodophyta					T	7.8						
Angiosperma												
Potamogetonaceae			T	4.5					T	6.3		
Cnidaria							T	114.				
Hydrozoa											.1	.3
Scyphozoa					T	54.6						
Annelida												
Polychaeta			T	88.1			T	10.2				
Mollusca												
Gastropoda												
Prosobranchia											.1	2.8
Acmaeidae							.1	16.1				
Bivalvia	T	13.3	T	.2	.4	33.1					.1	.8
Siphons							.1	15.8				
Veneridae					T	4.1						
Tellinidae									T	6.7	.1	9.5
Cephalopoda												
Octopodidae											.1	9.1
Arthropoda												
Crustacea	.1	209.							.2	87.8	.1	31.3
Cirripedia			T	2.8							.1	20.4
Mysidacea	.1	5.4					.1	1.3	T	5.2	.1	1.8
Amphipoda												
Gammaridea			T	.2	.1	.3			.4	30.1	.8	123.
Gammaridae											2.4	340.
Natantia	1.1	3,516.	.3	1,022.	.3	1,322.	.5	684.	.1	1,317.	.9	92.9
Hippolytidae					T	.7						
Pandalidae	1.0	5,443.	.9	3,758.	.1	803.	.1	767.	.4	2,096	.8	1,806.
Crangonidae									T	120.	.3	47.6
Reptantia			.1	145.	.1	51.1			T	216.		
Legs											.1	344.
Anomura												
Paguridae			.1	351.	.1	61.9	.1	161.	T	321.	.1	58.5
Chelae									.1	181.	.1	20.9
Brachyura			T	221.								
Oxyrhyncha							.1	15.1	.1	30.5	.1	101.
Majidae	.1	135.	.3	1,074.	.3	1,117.			.2	205.	.5	704.
Brachyrhyncha												
Atelecyclidae					.1	130.	.1	2.3				
Cancridae									.1	206.		
Pinnotheridae			T	2.8	T	9.7			T	3.1	.1	22.5
Bryozoa											.1	.3
Echinodermata												
Ophiuroidea					.1	33.7	.1	58.0				
Chordata												

Table 35. The average number and weight (mg) of prey items per stomach from yellow Irish lord >300 mm long (T = trace) - continued.

Yellow Irish lord (*Hemilepidotus jordani*)	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Vertebrata												
Teleostei	.1	249.	.1	108.			1.0	674.	.1	404.	4.1	1,351.
Clupeiformes							.1	370.				
Clupeoidei					T	236.						
Osmeridae							1.7	15,846.				
Gadidae									T	505.	.3	4,254.
Hexagrammidae							T	186.				
Anoplopomidae			T	1,329.								
Trichodontidae											.1	1,971.
Ammodytidae							.4	2,990.			.9	1,746.
Stichaeidae					.1	649.					.1	62.9
Pleuronectidae											.1	150.
Unidentified	.1	82.8	1.2	169.	.1	103.	.1	8.3	1.6	9.9		
TOTAL	2.6	9,654.	3.0	8,373.	1.8	4,805	4.6	21,919.	3.3	5,751.	12.7	13,272.
Total number of stomachs	29		32		21		28		22		16	
Number of empty stomachs	4		3		5		3		4		1	
Mean fullness	5.1		4.3		3.7		4.9		3.5		4.8	
Mean length (mm)	330.2		335.0		314.4		322.1		323.4		333.7	

Table 36. The average number and weight (mg) of prey items per stomach from Myoxocephalus spp. 0-150 mm long (T = trace, P = pooled).

	Myoxocephalus spp.													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Annelida														
Polychaeta	1.5	43.1					T	.2	T	4.6	T	3.1		
Nereidae											T	3.9		
Mollusca														
Bivalvia					T	2.5								
Cardiidae	.1	50.6												
Anthropoda														
Crustacea					.1	13.3	.2	3.6	T	.2	T	.2		
Copepoda														
Calanoida							.5	T						
Harpacticoida							.6	.2	.3	.7				
Caligoida											T	.1		
Mysidacea							T	1.2						
Tanaidacea	.1	.2												
Isopoda							T	.2						
Sphaeromatidae					.1	16.5	.4	1.2	.4	11.5	.1	.3		
Idoteidae					.1	2.7								
Amphipoda														
Gammaridea	8.8	34.4	5.1	160.	7.8	229.	4.8	53.1	3.8	34.0	8.3	61.5	2.8	35.3
Gammaridae	.7	21.5												
Eusiridae	7.5	52.9												
Ampithoidae														
Calliopiidae	.1	.7									1.2	10.4		
Caprellidea	.6	8.3			T	.6								
Euphausiacea			.2	2.4									.1	.2
Natantia					T	3.2	T	.1	T	3.1	T	1.4	.1	31.8
Hippolytidae									T	5.4				
Crangonidae					.1	137.							.1	3.4
Reptantia	.1	7.9							T	.9				
Anomura														
Paguridae							.1	13.2						
Brachyura									T	10.2				
Oxyrhyncha														
Majidae					.4	2,013.			T	1.0				
Brachyrhyncha														
Atelecyclidae							.3	13.3						
Cancridae	.1	48.2			T	10.7	T	5.9						
Chordata														
Vertebrata														
Teleostei	.1	32.0	.2	236.	.1	89.5	.2	149.	.1	40.8	T	74.5	.1	8.7
Larvae					T	1.3								
Clupeidae					T	27.2								
Cottidae			.5	241.			.1	34.7	T	2.4				
Larvae									T	.1				
Perciformes									T	5.9				
Stichaeidae											T	16.0	.1	61.8

Table 36. The average number and weight (mg) of prey items per stomach from Myoxocephalus spp. 0-150 mm long (T = trace, P = pooled) - continued.

	Myoxocephalus spp.													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Ammodytidae					.1	125.			T	43.0	T	11.2	.1	42.4
Pholidae	.2	352.												
Pleuronectiformes					T	87.1								
Unidentified					.2	4.1	.1	3.7	.1	5.0	.2	.9		
TOTAL	19.9	652.	6.0	640.	9.0	2,763.	6.9	280.	4.7	169.	9.8	184.	3.4	184.
Total number of stomachs	13		11		31		52		93		112		17	
Number of empty stomachs	p		1		2		p		p		18		4	
Mean fullness	4.8		4.7		5.0		4.2		3.8		4.2		4.1	
Mean length (mm)	75.7		85.2		103.1		90.7		57.2		59.5		76.7	

Table 37. The average number and weight (mg) of prey items per stomach for Myoxocephalus spp. 151-300 mm long (T = trace).

	Myoxocephalus spp.											
	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Phaeophyta	.1	18.6										
Rhodophyta												
Rhodymeniaceae			.1	427.								
Angiosperma												
Potamogetonaceae			.1	54.6	.6	33.5						
Cnidaria							.3	6.3				
Hydrozoa												
Annelida												
Polychaeta							T	.3	.1	167.		
Mollusca												
Bivalvia			.1	47.0								
Arthropoda												
Crustacea											.1	28.6
Tanaidacea	.2	3.7										
Isopoda												
Sphaeromatidae	.4	23.3					.1	4.2				
Idoteidae	.4	159.					.1	15.9	.2	75.2	.1	73.6
Amphipoda												
Gammaridea	2.4	85.4			.6	22.2	.2	5.3	.1	5.7		
Natantia	.2	772.	.4	295.			T	12.2	.3	193.	.1	145.
Pandalidae	.1	170.					T	30.3				
Crangonidae									.1	16.8		
Reptantia	.1	122.	.1	99.4								
Zoea	.3	3.9										
Anomura												
Paguridae							.5	78.7				
Brachyura												
Oxyrhyncha	.1	40.6	.2	45.4								
Majidae	.1	479.	.1	212.	.3	1,195.	.2	448.	.1	179.	1.1	1,463.
Brachyrhyncha												
Atelecyclidae			.1	3,088.			.1	417.				
Cancridae			.2	152.			.1	187.				
Insecta												
Coleoptera							T	.2				
Chordata												
Vertebrata												
Teleostei	.6	1,574.	.1	61.9	.4	396.	.8	873.	.5	3,664.	.4	1,002.
Osmeridae							.1	635.				
Cottidae							.1	283.	.1	172.		
Trichodontidae							.1	324.				
Ammodytidae	.5	2,025.			.2	80.7	1.6	2,213.				
Stichaeidae							T	48.9				
Pleuronectiformes									.1	128.		
Pleuronectidae					.1	2,130.						
Unidentified	1.1	367.	.1	4.6	.2	202.	.5	206.			.4	234.
TOTAL	6.1	5,825.	1.6	4,487.	2.4	4,059.	4.8	5,788.	1.6	4,601.	2.2	2,966.
Total number of stomachs	10		11		12		34		19		7	
Number of empty stomachs	3		4		3		5		4		1	
Mean fullness	4.5		3.4		3.4		4.6		4.3		4.1	
Mean length (mm)	246.3		223.4		238.7		227.9		219.8		196.6	

Table 38. The average number and weight (mg) of prey items per stomach for Myoxocephalus spp. >300 mm long (T = trace).

	Myoxocephalus spp.											
	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta												
Ulotricales	T	3.7										
Phaeophyta			T	274.								
Laminariales	T	2.1					T	428.				
Laminariaceae	T	30.7										
Desmarestiaceae			T	153.								
Rhodophyta					T	119.						
Angiosperma												
Potamogetonaceae					T	90.2					T	2.4
Cnidaria												
Anthozoa					.1	26.7						
Nemertinea	.1	7.6										
Annelida												
Polychaeta	T	37.7	T	145.	T	113.					.6	79.3
Sabellidae											T	2.4
Mollusca												
Gastropoda												
Archeogastropoda												
Fissurellidae	.4	34.0										
Acmaeidae	T	2.3										
Prosobranchia												
Lacunidae	T	2.5										
Naticidae	T	18.0										
Cymatiidae	T	4.8										
Bivalvia	.1	29.9									T	51.3
Siphons			T	6.2								
Mytilidae											T	81.0
Arthropoda												
Crustacea	T	310.										
Cirripedia												
Balanidae					T	33.1						
Mysidacea									T	3.9		
Isopoda												
Idoteidae											T	40.3
Amphipoda												
Gammaridea	.4	6.6							.1	3.2	.3	3.4
Caprellidea	.2	7.0										
Natantia	.4	1,071.	.1	263.			.1	158.	T	256.	T	13.7
Hippolytidae	T	1.5										
Pandalidae	.4	1,602.	.5	2,135.	.2	1,172.	.1	307.	.1	553.		
Crangonidae	T	7.4	.1	178.								
Reptantia	T	250.	.2	52.5							T	173.
Anomura												
Lithodidae	T	135.										
Paguridae												
Chelae									T	6.7		

Table 38. The average number and weight (mg) of prey items per stomach for Myoxocephalus spp. >300 mm long (T = trace) - continued.

	Myoxocephalus spp.											
	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Brachyura	T	263.			T	2.6						
Oxyrhyncha	T	625.	T	144.	T	147.	T	53.3	.1	4.8		
Majidae	.4	9,017.	.2	626.	.3	3,320.	.1	2,736.	.2	5,556.	1.0	14,422.
Legs			.1	730.								
Brachyrhyncha												
Atelecyclidae	.2	1,537.			.1	457.						
Cancridae	T	1,352.	T	878.	.1	1,641.			T	40.6		
Insecta												
Trichoptera												
Larvae					T	8.7						
Chordata												
Vertebrata												
Teleostei	.6	10,331.	.3	6,978.	.1	2,525.	.2	7,979.	3.8	11,668.	.3	8,396.
Eggs											22.1	709.
Larvae	T	86.7										
Clupeidae	T	159.										
Salmonidae					T	46.5						
Osmeridae			.1	919.								
Gadiodei			T	4,574.								
Gadidae	T	10,612.	T	1,848.	T	3,221.						
Scorpaeniformes									T	2,946.		
Scorpaenidae	T	2,389.										
Anoplopomatidae			.1	20,318.								
Cottidae	T	6,984.	.1	31,398.	T	6,956.	.1	23,942.			T	513.
Cyclopteridae									T	45.5		
Perciformes			T	381.			.1	82.0				
Stichaeidae	T	272.										
Ammodytidae	.1	434.					1.0	1,595.			.1	162.
Trichodontidae											T	5,172.
Pleuronectidae	T	8,762.	T	3,397.	T	1,351.	T	3,650.			T	1,944.
Unidentified	.2	87.8	T	78.6	.1	218.	1.9	993.	T	11.6	1.4	57.1
TOTAL	3.5	56,400.	1.8	75,346.	1.0	21,448.	3.6	41,933.	4.3	21,089.	25.8	31,822.
Total number of stomachs	62		30		29		27		29		43	
Number of empty stomachs	12		6		13		9		15		19	
Mean fullness	4.2		3.6		2.6		3.3		2.7		3.3	
Mean length (mm)	430.2		436.1		439.4		456.4		469.7		465.7	

Table 39. The average number and weight (mg) of prey items per Pacific sandfish stomach (T = trace).

Pacific sandfish (Trichodon trichodon)

	0-150 mm long						151-300 mm							
	May		July		August		May		July		August		November	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Annelida														
Polychaeta					T	1.3								
Arthropoda														
Crustacea					.8	8.5			T	25.7				
Amphipoda														
Gammaridea	.1	4.1			T	1.1			.1	4.4				
Euphausiacea					.5	61.2	11.7	918.	.6	155.	.1	9.9		
Natantia					.3	30.1								
Reptantia									.2	14.7				
Megalops	1.4	3.9			9.2	59.2	2.2	19.0						
Anomura														
Paguridae									.1	.8				
Megalops					.1	.4								
Brachyura									.2	.8				
Megalops					.3	4.3								
Chordata														
Vertebrata														
Teleostei	.6	758.	.5	468.	.3	357.	1.7	5,647.	.9	3,343.	.3	575.	1.0	6,473.
Ammodytidae			1.5	912	.3	244.			1.4	772.	1.1	747.		
Clupeiformes									.1	452.	.1	863.		
Osmeridae											.3	1,906.		
TOTAL	2.1	766.	2.0	1,380.	11.8	767.	15.6	6,584.	3.6	4,768.	1.9	4,101.	1.0	6,473.
Total number of stomachs	7		6		24		6		21		15		2	
Number of empty stomachs	2		0		0		0		0		3		0	
Mean fullness	4.1		4.8		6.0		5.5		5.4		4.6		6.5	
Mean length (mm)	124.4		138.8		94.0		193.2		181.2		207.8		213.5	

Table 40. The average number and weight (mg) of prey items per snake prickleback stomach (T = trace, P = pooled).

Snake prickleback (*Lumpenus sagitta*)

	0-150 mm long				151-300 mm						>300 mm			
	July		August		June		July		August		June		July	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Annelida														
Polychaeta					11.0	102.	1.3	9.4	7.0	14.9	6.2	107.	5.7	136.
Polynoidae											.1	.2		
Phyllodocidae											.1	.1	.1	.7
Nereidae											.1	T		
Lumbrinereidae					3.0	16.5								
Opheliidae														
Oweniidae					1.0	28.0								
Mollusca							.1	.2	.2	T				
Gastropoda														
Prosobranchia														
Mesogastropoda													.1	.6
Bullidae					2.0	6.0					.1	T		
Bivalvia					5.5	16.5	.1	T	2.7	3.8	1.9	6.9		
Siphons					1.0	1.0	T	.1	.7	5.0	.2	3.6		
Nuculanidae											.1	T		
Cardiidae											.1	.3		
Arthropoda														
Crustacea														
Copepoda														
Calanoida	.4	T									.4	.3		
Harpacticoida	21.6	3.7	21.5	2.2			1.0	1.8	1.2	T	.1	.1		
Ostracoda					3.0	4.0								
Cumacea							.1	T	.2	.2	2.3	4.2		
Cirripede cypris	.4	.1												
Malacostracan larvae	.4	.1												
Mysidacea			.3	1.0										
Amphipoda														
Gammaridea	.1	.4			5.0	5.0	309.	139.	.7	7.7	4.8	36.1	644.	330.
Euphausiacea											.1	.2		
Natantia							6.3	43.8						
Reptantia													5.3	52.7
Branchyura														
Megalops											.6	6.6		
Echinodermata														
Ophiuroidea							T	.3			.1	.2		
Echinoidea											.1	.1		
Bryozoa											.1	.1	.1	.4
Chordata											.1	T		
Egg							10.0	11.7			257.	90.1	2.1	2.9
Hexagrammidae							T	1.0						
Unidentified	1.1	.3					2.7	1.4	1.2	1.2	8.1	8.7		
TOTAL	24.0	4.6	21.8	3.2	31.5	179.	301.	309.	12.9	169.	283.	265.	657.	523.
Total number of stomachs	7		4		2		23		6		16		7	
Number of empty stomachs	P		1		0		2		0		1		2	
Mean fullness	3.5		3.3		5.0		4.6		3.3		4.3		4.3	
Mean length (mm)	75.5		77.2		247.5		272.2		279.0		349.9		330.9	

Table 41. The average number and weight (mg) of prey items per crescent gunnel stomach (T = trace, P = pooled).

Crescent gunnel (Pholis laeta)

	0-150 mm long								151-300 mm							
	May		June		July		August		May		June		July		August	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Rhodophyta	.1	T	.1	T					.3	T			.1	T		
Nemertinea															.1	4.7
Annelida																
Polychaeta									1.5	86.5			.1	8.9		
Opheliidae							T	.2								
Mollusca																
Gastropoda																
Prosobranchia					.1	T			.1	T						
Bivalvia													.1	T		
Bivalve siphons					.3	.2							1.9	13.0		
Arthropoda																
Arachnida																
Halacaridae													.1	T		
Crustacea									.1	.2						
Ostracoda					4.4	.3	4.4	.5					60.9	30.0	.8	.2
Cirripede cypris			.3	T	.1	T	.3	.2								
Cirri					.9	.1							3.4	8.3		
Copepoda							6.3	.3								
Calanoida					3.5	.2	2.7	.5					3.4	T		
Harpacticoida	.2	T	2.9	.7	18.9	.9	12.2	1.5	.1	T	3.0	1.3	2.1	.2	1.3	.2
Cyclopoida							13.3	2.6							2.3	.3
Cumacea			.4	.3	.3	.2							.3	.2		
Isopoda																
Sphaeromatidae			.9	3.6							.8	8.4	.1	.6		
Munnidae					.1	T			1.5	.8						
Idoteidae			.4	1.0							.1	10.1				
Limnoridae			.4	1.6	.1	.1					1.9	4.9	1.9	4.9		
Flabellifera					.4	T										
Amphipoda																
Gammaridea	5.6	15.7	13.0	80.7	3.5	3.9	6.3	4.8	2.1	50.5	16.2	119.	9.6	60.3	4.9	50.1
Gammaridae									2.8	8.5						
Caprellidea					.1	1.5	T	.2								
Natantia	.1	.5							.3	3.6			.3	2.3		
Reptantia			.1	.4												
Anomura																
Paguridae			.1	1.0												
Brachyura	.1	.6														
Cancridae									.3	38.8						
Bryozoa															.1	T
Unidentified			.1	1.1	.8	4.0	.1	.3	4.0	15.2	1.7	11.4	.3	.9	.2	1.7
Egg											1.9	1.8				
TOTAL	6.1	16.8	18.6	90.4	33.5	11.4	45.6	11.1	13.1	204.	25.6	157.	84.6	130.	9.7	57.2
Total number of stomachs	12		7		8		44		8		9		7		10	
Number of empty stomachs	3		P		1		P		P		P		0		2	
Mean fullness	3.1		4.5		3.1		2.9		2.8		2.8		3.7		3.3	
Mean length (mm)	90.3		113.3		132.6		81.8		174.3		175.8		168.6		169.7	

Table 42. The average number and weight (mg) of prey items per penpoint gunnel, arrowtooth flounder, and starry flounder stomach (T = trace).

	Penpoint gunnel (*Apodichthys flavidus*)		Arrowtooth flounder (*Atheresthes stomias*)				Starry flounder (*Platichthys stellatus*)			
	0-150 mm long August		151-300 mm May		>300 mm May		0-150 mm April		151-300 mm April	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Cnidarea										
Anthozoa									1.0	391.
Nemertinea	.5	13.5								
Arthropoda										
Crustacea										
Copepoda										
Calanoida	3.0	.5								
Harpacticoida	7.0	1.5								
Cyclopoida	17.5	3.5								
Amphipoda										
Gammaridea	1.0	5.0					1.0	24.0		
Natantia			.2	321.						
Pandalidae			T	60.0						
Chordata										
Vertebrata										
Teleostei			.5	1,317.	1.0	392.				
Larvae	1.0	10.0	T	8.0						
Cottidae			T	30.0						
TOTAL	30.0	34.0	.7	1,736.	1.0	392.	1.0	24.0	1.0	391.
Total number of stomachs	2		40		1		2		1	
Number of empty stomachs	0		11		0		1		0	
Mean fullness	4.0		4.3		3.0		1.5		6.0	
Mean length (mm)	97.0		213.2		330.0		134.5		273.0	

Table 43. The average number and weight (mg) of prey items per stomach from flathead sole 0-150 mm long (T = trace, P = pooled).

Flathead sole (*Hippoglossoides elassodon*)														
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Nemertinea	.2	.4												
Annelida														
Polychaeta	.2	1.1	.2	3.8	.1	.6	.2	2.2	T	.4	.2	6.2	T	1.2
Glyceridae							T	.1						
Opheliidae							T	1.0	T	.6				
Pectinariidae					T	.1								
Sabellidae											T	.4		
Capitellidae					T	.2					T	.2		
Syllidae											T	.4		
Maldanidae					T	.5	T	1.9						
Ampharetidae			T	.9										
Mollusca														
Gastropoda														
Littorinidae	.1	T												
Bivalvia					T	.1	.2	.3			T	.1		
Siphons	.1	.2	.1	.5	1.3	2.7	2.1	7.4	.1	1.0				
Nuculanidae					.1	5.0								
Arthropoda														
Crustacea					T	2.3	T	.4			.1	.3	T	.3
Copepoda														
Calanoida					1.5	.6	T	.1						
Malacostraca							.1	1.9	T	.4				
Leptostraca			T	.1										
Mysidacea			.4	12.6	.6	22.5	.6	7.9	1.8	24.7	.8	17.6	.3	11.0
Cumacea	.1	T					T	2.1			T	.5		
Amphipoda														
Gammaridea	.1	T	.1	1.1	.2	.8	.1	.8	.2	.5	.2	.7	.1	.3
Eucarida							.2	.1						
Larvae					T	.2	.4	1.4						
Euphausiacea			.3	15.3	1.0	37.4	.1	3.0	.1	3.3			.4	12.8
Euphausiidae					T	1.5								
Natantia			.1	76.9	T	7.8	4.6	20.2	.2	10.3	.1	3.3		
Hippolytidae					T	.1			.1	2.0			T	5.8
Pandalidae			T	87.7	T	.4	.1	252.	.1	1.3	T	1.6		
Crangonidae					.1	10.5	T	.1			.4	4.7	T	1.0
Reptantia														
Zoea									T	.1				
Megalops					T	.7								
Anomura														
Paguridae											T	.1		
Brachyura					.1	2.0	T	.1						
Megalops									T	.1				
Oxyrhyncha					T	.6			T	.2	T	.1		
Majidae					T	1.0	T	6.8						
Brachyrhyncha											T	.1		
Bryozoa							T	2.6						
Echinodermata														

Table 43. The average number and weight (mg) of prey items per stomach from flathead sole 0-150 mm long (T = trace, P = pooled) - continued.

Flathead sole (*Hippoglossoides elassodon*)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Ophiuroidea			T	.4										
Chordata														
Vertebrata														
Teleostei					T	6.7	.1	30.4	T	1.2	T	.9	T	14.5
Larvae					T	2.5	T	.4						
Osmeridae														
Larvae											.1	3.0		
Cottidae					T	1.9	.1	3.7						
Larvae					.1	4.2	T	.9						
Perciformes					T	.6					T	5.8		
Ammodytidae							T	8.3						
Stichaeidae							T	1.2						
Pleuronectidae							T	.9						
Unidentified	.1	T	.1	.3	T	.1					T	.1		
TOTAL	.9	1.7	1.3	20.0	5.1	114.	8.9	358.	2.6	46.1	1.9	46.1	.8	46.9
Total number of stomachs	18		126		227		88		87		99		62	
Number of empty stomachs	P		P		P		P		P		32		46	
Mean fullness	2.0		2.7		3.6		3.5		2.7		2.6		1.9	
Mean length (mm)	80.4		102.4		109.4		120.8		116.1		114.3		110.5	

Table 44. The average number and weight (mg) of prey items per stomach from flathead sole 150-300 mm long (T = trace, P = pooled).

Flathead sole (*Hippoglossoides elassodon*)	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Cnidaria												
Hydrozoa			T	.6								
Annelida												
Polychaeta	.1	11.0	T	.4	.1	2.4	.1	3.0			T	6.2
Lumbrineridae							T	1.2				
Polynoidae									T	.2		
Pectinariidae									T	.7		
Sabellidae									T	.2		
Opheliidae					T	.1			T.	.1		
Mollusca												
Gastropoda												
Prosobranchia			T	.4								
Bivalvia			T	.2			T	.5				
Siphons	.1	.6			.7	2.3						
Nuculidae	T	.7	T	.2								
Nuculanidae			T	.6								
Cardiidae			T	6.4								
Tellinidae									T	4.4		
Arthropoda												
Crustacea			T	1.8	.1	.1	T	.8			.1	3.3
Copepoda												
Calanoida					.3	1.3	T	.2				
Malacostraca							T	.2				
Mysidacea	T	2.1	.1	13.7	.8	3.1	.2	5.8	1.1	54.4	T	1.7
Amphipoda												
Gammaridea					.2	.5					T	.8
Euphausiacea			.8	54.7	4.1	34.5	.1	.1	.1	2.2		
Natantia	.7	1,231.	.1	85.5	2.5	24.5	.4	157.	.2	224.	.2	106.
Hippolytidae							.2	4.2	T	1.2		
Pandalidae	.7	1,920.	.1	249.	.2	380.	.3	142.	.2	541.		
Crangonidae			T	8.3	.1	36.5	.1	21.4	.1	36.8		
Reptantia			T	.3			.1	.7				
Megalops			T	.5								
Anomura												
Paguridae					T	12.9			.1	7.0		
Brachyura			.1	1.6	.1	6.0						
Oxyrhyncha			T	.3			.1	.6	T	.3		
Majidae									.1	8.6		
Brachiopoda			T	.6								
Echinodermata												
Ophiuroidea			T	2.2								
Chordata												
Vertebrata												
Teleostei	T	14.6	.2	15.4	.2	67.7	.1	27.2	T	4.4	.1	48.4
Larvae			T	.8								
Clupeidae	T	98.4										
Osmeridae					.3	41.8						

Table 44. The average number and weight (mg) of prey items per stomach from flathead sole 150-300 mm long (T = trace, P = pooled) - continued.

Flathead sole (Hippoglossoides elassodon)

	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Scorpaeniformes							T	20.3				
Cottidae									T	8.3		
Larvae			T	2.5								
Hexagrammidae					T	8.0						
Perciformes							T	38.5				
Larvae			T	1.3								
Ammodytidae							T	19.8				
Stichaeidae			T	66.2	.1	43.8	.1	42.5				
Pholidae			T	9.7	T	16.9						
Pleuronectidae					T	5.5						
Larvae			T	.5								
Unidentified	.1	.8			.1	.1						
TOTAL	1.7	3,279.	1.4	524.	9.9	688.	1.8	493.	1.9	894.	.4	167.
Total number of stomachs	70		123		59		55		60		47	
Number of empty stomachs	P		P		16		P		11		32	
Mean fullness	4.9		2.5		3.1		2.9		3.1		2.0	
Mean length (mm)	237.2		224.8		210.1		203.0		204.4		194.3	

Table 45. The average number and weight (mg) of prey items per stomach from flathead sole >300 mm long (T = trace).

Flathead sole (<u>Hippoglossoides</u> <u>elassodon</u>)

	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Cnidaria												
Hydrozoa							T	1.8				
Annelida												
Polychaeta			T	.1								
Arthropoda												
Crustacea							.1	.7				
Natantia	1.1	2,929.	T	2.3	.1	167.	.2	326.	.7	34.3		
Pandalidae	1.2	4,198.	2.0	5,628.	1.0	2,325.	.6	2,392.			1.0	2,337.
Crangonidae							.2	102.			.3	77.0
Reptantia												
Oxyrhyncha												
Majidae	.2	847.										
Bryozoa					T	.4						
Chordata												
Vertebrata												
Teleostei	.2	96.9	T	128.	T	119.	.1	685.	1.4	6,662.		
Larvae			T	4.1								
Osmeridae							1.2	11,342.				
Gadidae									.2	1,198.		
Zoarcidae			T	6.6								
Perciformes							.1	64.7				
Pholidae									.3	96.9		
Ammodytidae							.3	2,297.				
Stichaeidae	.1	136.			T	412.	.1	116.				
TOTAL	2.8	8,207.	2.0	5,769.	1.1	3,023.	2.9	17,327.	2.6	7,991.	1.3	2,414.
Total number of stomachs	13		44		30		38		22		3	
Number of empty stomachs	1		6		10		4		11		0	
Mean fullness	5.2		4.5		3.0		4.8		3.5		3.3	
Mean length (mm)	353.4		367.5		367.9		365.4		373.5		335.0	

Table 46. The average number and weight (mg) of prey items per stomach from rock sole 0-150 mm long (T = trace).

Rock sole (*Lepidopsetta bilineata*)	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Rhodophyta					T	.3								
Nemertinea	.1	.1												
Annelida														
Polychaeta			1.1	22.0	1.2	18.7	1.5	21.9	2.9	25.5	1.5	15.4	.3	3.3
Polynoidae	3.0	29.2					T	.8	T	1.4	T	.1	.1	.1
Phyllodocidae			T	.1	T	.3	.1	1.6	.2	4.9	.1	7.2	.1	.8
Nereidae	T	.1			T	1.8								
Glyceridae	T	4.6			.1	2.5	.1	.5	T	.2	T	.7		
Goniadidae									T	.2	.4	1.4	T	.5
Lumbrineridae	.3	4.1	.1	1.5	.2	1.3	.3	1.6	.5	4.3	.6	10.6		
Spionidae	.1	.7			T	.2	1.3	13.5						
Opheliidae			T	.1	.1	2.5	T	.3	.4	3.9	.9	5.2		
Scalibregmidae											T	.3		
Pectinariidae							T	.7						
Oweniidae					T	.2	T	.8	T	5.6				
Sabellaridae							T	.8	T	1.6				
Ampharetidae			.1	1.7	T	2.1					T	.5		
Euncidae											T	.1		
Serpulidae	.1	2.0			T	.2			.2	.6				
Opercula			T	.1			.1	.5						
Sabellidae							T	.2					T	.1
Maldanidae	.3	2.5	T	.7			T	2.0	T	.5			T	.1
Nephtyidae							T	.4	.1	4.7				
Mollusca							T	.2						
Gastropoda														
Prosobranchia			T	5.0										
Archeogastropoda											T	.1		
Acmaeidae							T	.1						
Lacunidae											.1	1.4		
Bullidae			.2	.6					.1	.5				
Haminoeidae									T	.1				
Nudibranchia														
Dorididae							T	.1	.1	.7				
Bivalvia	1.9	2.3	.1	2.6	T	2.3	.9	2.4	.3	1.2	.1	.1		
Siphons	11.2	23.1	1.1	8.0	6.9	10.6	3.9	8.4	1.6	4.1				
Veneroida			T	.8										
Veneridae							T	8.0						
Cardiidae	T	.3												
Anthropoda														
Crustacea			.1	1.2					T	.1	T	.2	T	.3
Copepoda														
Calanoida			.1	.1										
Harpacticoida					T	.1								
Cirripedia														
Cirri							.1	.3						
Mysidacea							T	.2	.1	.3	T	.1		
Cumacea	.1	.9	.1	.7	.3	.7	.2	1.2	.2	.4	.1	.3		
Tanaidaceae			T	.1										
Isopoda														

Table 46. The average number and weight (mg) of prey items per stomach from rock sole 0-150 mm long (T = trace, P = pooled) - continued.

Rock sole (*Lepidopsetta bilineata*)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Sphaeromatidae					T	.2								
Idoteidae											T	3.3		
Amphipoda														
Gammaridea	1.4	9.1	1.9	5.9	1.8	7.7	3.3	15.0	1.5	12.5	.9	14.5	1.2	3.5
Gammaridae									.1	.5				
Eusiridae									.2	2.5				
Caprellidea							.1	.3						
Caprellidae							T	.1						
Natantia			T	.6	.1	12.2	.1	.3	T	.2	T	.1	T	6.4
Hippolytidae									T	.3				
Crangonidae											T	.6	T	.2
Reptantia							T	.1			T	.2		
Megalops	.1	.6	.2	1.4	.2	2.0								
Legs					T	.1								
Anomura														
Paguridae			T	.2	T	.3			.1	.5	.4	7.3		
Megalops									T	.1				
Brachyura					T	.7			T	.1				
Megalops					T	.1			.3	6.0				
Oxyrhyncha					.1	.5			.2	1.3				
Majidae							T	.3	.1	.6			T	.1
Priapula							T	.2						
Bryozoa							T	.2						
Echinodermata														
Ophiroidea			T	.1	T	.1								
Echinoidea														
Strongylocentrotid spines					T	.6								
Holothuroidea														
Synaptidae													T	.1
Urochordata														
Ascidacea													.5	1.3
Chordata														
Vertebrata														
Teleostei					T	.4	T	2.1	T	.2	T	2.4	T	546.
Egg							.2	.3						
Larvae			T	.4	.1	2.2								
Cottidae	.3	2.1			T	.5								
Agonidae					T	.2								
Hexagrammid larvae			T	.1										
Perciformes											T	3.7		
Ammodytidae			T	.5							T	1.4		
Unidentified	.2	.6	T	5.2	T	2.4	.3	.5	T	.1	.2	1.9	T	.3
Egg			.9	T	.8	3.1								
TOTAL	19.1	79.3	6.0	59.7	11.9	77.1	12.4	85.9	12.2	85.8	5.3	79.1	2.2	563.
Total number of stomachs	103		270		334		155		108		212		120	
Number of empty stomachs	P		P		P		P		P		66		78	
Mean fullness	4.1		3.1		4.1		3.9		4.1		3.1		1.9	
Mean length (mm)	97.4		93.4		104.3		107.6		103.7		105.5		97.6	

Table 47. The average number and weight (mg) of prey items per stomach from rock sole 151-300 mm long (T = trace, P = pooled).

Rock sole (Lepidopsetta bilineata)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta			.1	28.4	T	15.3								
Ulotricales	.1	30.8	T	26.7			T	17.8						
Phaeophyta			T	.2	T	1.3	T	1.4			T	.5		
Rhodophyta					T	13.7	T	3.7	T	.1				
Bangiacea					T	36.5	T	4.1	.1	47.0				
Rhodymeniaceae					T	.3								
Angiosperma														
Potamogetonaceae	.1	.4			T	.8								
Foraminifera									T	.4	T	.1		
Cnidaria														
Hydrozoa	.1	T					T	.1						
Anthozoa									T	.1				
Nemertinea	T	1.4			T	.1			T	54.5	T	.2	T	48.7
Annelida														
Polychaeta	6.4	347.	5.8	421.	7.7	209.	5.7	184.	3.3	164.	5.6	94.9	.8	46.5
Polynoidae					T	.3	T	.1						
Phyllodocidae	T	.1			T	4.9	.3	7.7	T	2.7	.1	15.9	.2	13.6
Pilargidae					T	1.3								
Nereidae					T	9.5	T	42.4			T	3.0	T	92.9
Glyceridae	.2	25.8	.1	8.9	.2	38.9	.1	30.6	.1	4.4	.2	11.4		
Goniadidae	.2	7.2	.1	6.7			.3	4.2	.2	5.3	.6	14.0	.1	4.7
Lumbrineridae			.1	1.6	.6	3.5	.6	9.4	.2	2.0	2.1	27.3	T	.1
Orbiniidae	T	.1			T	.1	T	.1			.1	1.6	T	.2
Spionidae					2.1	41.1	.9	5.2	.1	1.9	.5	3.5		
Scalibregmidae									T	.7	T	.2		
Cirratularidae					T	.1								
Flabelligeridae	T	.7									T	1.1	T	.3
Arabellidae											.2	1.2		
Opheliidae	.6	24.4	.2	4.3	.3	5.2	.1	1.5	.1	3.1	4.4	41.1	.2	12.7
Pectinariidae	T	.3	T	.4	T	2.6	T	5.1	T	1.1	T	1.3	T	3.0
Oweniidae			1.1	29.5	.7	19.7	2.1	27.3	.1	18.5				
Sabellariidae							T	.2	T	.1				
Ampharetidae			.4	4.9	.1	1.5	T	.1	T	1.1	T	1.6		
Terebellidae			.1	.6	.1	.4					T	1.8		
Serpulidae			T	1.0			T	.1						
Opercula					.1	2.4	T	.1						
Sabellidae			T	.5			T	.1	T	.1	T	.1		
Nephytidae	1.0	59.8					.1	31.4	.2	4.9			T	3.5
Maldanidae	.1	2.8	T	.6			T	14.9	.1	14.7	T	1.5		
Capitellidae											T	.1	.1	51.9
Onuphidae							T	64.5			T	1.0		
Mollusca														
Gastropoda											T	.6		
Prosobranchia			T	.3							T	1.5		
Archeogastropoda											T	.9		
Fissurellidae							T	3.7						
Acmaeidae	T	1.0	T	2.0	T	.3			.1	18.5	T	2.2		
Lepetidae					.1	13.3	.4	76.9	T	8.3				
Cephalaspidea														
Aglajidae							.5	23.1						

Table 47. The average number and weight (mg) of prey items per stomach from rock sole 151-300 mm long (T = trace, P = pooled) - continued.

Rock sole (Lepidopsetta bilineata)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Bullidae	.1	3.2	.1	.2										
Haminoeidae	.2	.5												
Gastropteridae											.1	2.8		
Nudibranchia														
Dorididae							T	.1	.6	68.1	T	11.5		
Amphineura														
Ischnochitonidae			T	.3										
Bivalvia	1.0	118.	.4	29.9	.4	11.0	.7	20.3	.7	36.9	.3	6.2	T	1.8
Siphons	1.1	40.0	1.5	16.6	.4	24.7	.9	107.	.4	47.6	.1	4.9	.2	41.3
Nuculidae									T	.2				
Nuculanidae	T	6.1			T	1.6	T	13.1	T	4.2	T	10.9	T	1.4
Veneroida	.1	2.1	T	.1										
Veneridae					.4	9.4			T	1.2				
Mytilidae			T	2.7									T	.6
Thyasiridae			T	.5							.2	2.0		
Cardiidae	T	2.1			T	.3			T	3.9				
Mactricidae			T	7.3										
Tellinidae	T	1.8	.1	1.5	.6	32.1	T	2.5	.1	2.5	T	2.3	T	.5
Myidae	T	.2			T	.7			T	1.2				
Cephalopoda (jaws)					T	.1								
Arthropoda														
Crustacea	T	.6			T	1.0			T	.4	T	.1	T	.7
Copepoda														
Calanoida							T	.1						
Cirripedia	T	.3			T	.7								
Balanomorpha									T	1.1	T	.1		
Mysidacea	.1	2.8					T	.2	T	.3	T	.4	T	.4
Cumacea	.1	.3	.1	.9	.1	.7	.8	1.6	.1	.5	.2	.4	T	.1
Isopoda							T	.4						
Sphaeromatidae			.1	1.6	.2	5.8			.1	6.1	.1	.9	T	.1
Idoteidae											T	2.4		
Amphipoda														
Gammaridea	2.3	15.6	1.9	26.7	4.5	41.8	10.9	55.7	2.4	24.9	4.9	44.7	1.4	16.1
Gammaridae	.4	3.3	T	1.1	.5	10.9			.5	7.6				
Ampithoidae					T	3.1								
Ampeliscidae			T	.2										
Corophiidae													T	.1
Caprellidea			.1	.7					T	.1				
Caprellidae	.1	1.5												
Eucarida							T	2.6						
Euphausiaceae					T	.1					T	.3	T	.4
Natantia	T	1.1			.3	33.0	.6	4.5	T	.2	.1	6.2	T	.5
Pandalidae													T	9.6
Crangonidae			T	.8							T	16.2	T	1.4
Reptantia	T	.3	T	2.1	T	.3	T	.5	.1	.8				
Megalops	T	.3	.2	4.0	.2	2.8					T	.1		
Anomura														
Paguridae					T	6.6	T	.1			T	1.9	T	20.7
Brachyura							T	1.2	T	4.1	T	1.6		

Table 47. The average number and weight (mg) of prey items per stomach from rock sole 151-300 mm long (T = trace, P = pooled) - continued.

Rock sole (*Lepidopsetta bilineata*)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Megalops			T	.1	T	.3								
Oxyrhyncha			T	.7	T	3.1	T	.1	T	.3				
Megalops					T	.1								
Majidae			.1	6.4	T	.5	.1	9.3	T	.2	T	6.5		
Brachyrhyncha														
Atelecyclidae					T	13.8	T	.2	T	1.0	T	1.0		
Cancridae											T	2.8		
Pinnotheridae	T	.8												
Sipuncula														
Golfingidae									T	.1				
Echiura									T	.5				
Echiuridae													T	6.7
Priapula														
Priapulidae			T	.5	T	.4			T	5.1				
Bryozoa							T	.1						
Echinodermata														
Asteroidea											T	.1		
Ophiuroidea	T	1.5	T	.1	T	1.1	T	.4	T	.5	T	12.3	T	.1
Echinoidea			T	.1										
Spines	.1	.2									.2	.1		
Dendrasteridae					T	1.4					T	1.1		
Holothuroidea			T	.6					.3	12.9				
Synaptidae											T	.3		
Urochordata														
Ascidacea									.2	4.0			T	.6
Chordata														
Vertebrata														
Teleostei	.1	59.4	T	21.9	T	93.9	.1	97.9	.1	18.7	T	24.2	.1	256.
Eggs					42.3	17.5	2.8	3.2					.1	T
Larvae	T	38.0	T	.2	.1	3.3								
Clupeidae									T	42.4				
Osmeridae					T	108.			T	183.				
Larvae											T	.6		
Cottidae	.3	6.0	T	.1			T	5.2	T	3.2				
Larvae			T	.6	T	1.5								
Ammodytidae	.2	168.	T	10.6	T	8.2	T	17.0	.1	79.7	T	46.4	.1	249.
Pleuronectidae					T	2.7								
Unidentified	.9	1.5	.4	70.1	.9	89.3	.5	19.1	1.3	66.8	.6	26.3	.2	8.7
Egg					.9	1.1								
TOTAL	15.9	963.	13.0	747.	63.7	851.	28.5	899.	11.6	984.	20.6	466.	3.5	893.
Total number of stomachs	52		199		274		150		147		143		90	
Number of empty stomachs	6		P		p		40		35		38		49	
Mean fullness	4.4		3.5		3.3		3.5		3.5		3.1		2.3	
Mean length (mm)	219.0		232.4		243.8		238.5		245.2		242.8		227.4	

Table 48. The average number and weight (mg) of prey items per stomach from rock sole >300 mm long (T = trace).

Rock sole (*Lepidopsetta bilineata*)	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta	T	.9												
Ulotricales	T	5.4	.1	119.					T	8.8				
Phaeophyta					T	5.9							T	12.5
Rhodophyta							T	3.3						
Bangiaceae			.1	146.	T	44.6	T	26.7						
Rhodomelaceae					T	.2								
Angiosperma														
Potamogetonaceae					T	7.5			T	.7				
Cnidaria														
Hydrozoa			T	.1							T	.1		
Sertulariidae											T	.4		
Anthozoa			T	5.2										
Nemertinea							T	28.3			T	19.0		
Annelida														
Polychaeta	6.9	599.	9.4	610.	7.5	383.	4.6	188.	3.5	91.4	4.5	167.	1.0	67.0
Polynoidae							.1	12.0			T	25.8		
Phyllodocidae	T	1.2			.1	4.1	.2	2.0			.3	19.4	T	.5
Nereidae	.3	122.			.1	174.	.1	219.			.1	72.0		
Glyceridae	T	20.9			T	39.3	.1	6.3	.1	4.0	.4	17.9	T	3.3
Goniadidae							.2	4.1			.8	15.9	.3	26.7
Lumbrineridae			T	3.4	1.2	4.5	.1	.7	.7	4.1	2.3	35.2		
Orbiniidae					T	.6	.1	55.5			.3	4.4	T	.1
Spionidae	3.2	99.1			3.0	71.5	T	.1			2.6	84.8	.1	.2
Scalibregmidae									.8	25.0	T	2.6		
Cirratulidae											T	.2	T	.4
Flabelligeridae							T	2.1						
Opheliidae	.7	31.5	1.6	54.3	.1	4.5	.1	11.2			1.1	15.1	.2	2.9
Pectinariidae	.4	6.0	T	.1	.1	7.1	T	.1	.1	7.8	T	2.9		
Oweniidae					T	1.6			T	.4				
Ampharetidae					T	.2	T	4.0	T	.1	.3	4.1		
Terebellidae					.2	.7	T	36.8			T	13.2		
Sabellidae	T	.7												
Serpulidae									T	.1				
Maldanidae			T	4.4	T	86.6	.3	10.9	T	.5	.1	1.8		
Syllidae					T	.2					T	.6		
Onuphidae					T	3.4			T	.7				
Magelonidae									.1	.3				
Nephytidae							T	7.2			.1	37.6		
Mollusca														
Gastropoda														
Prosobranchia														
Fissurellidae			.1	15.9	T	5.1	T	2.6						
Acmaeidae	T	2.3	T	.6			T	4.5						
Lepetidae					.3	121.	.2	83.2	.3	111.	T	.7		
Cephalaspidea														
Bullidae	T	3.5												
Gastropteridae											T	1.3		
Nudibranchia														

Table 48. The average number and weight (mg) of prey items per stomach from rock sole >300 mm long (T = trace) - continued.

	Rock sole (Lepidopsetta bilineata)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Dorididae											.1	11.8		
Eolididae											T	.2		
Bivalvia	.3	2.3	.5	52.6	.8	87.6	.4	100.	.1	4.7	.7	25.3	.1	19.0
Siphons	1.5	245.	1.6	442.	.4	38.6	3.0	636.	1.2	379.	.4	115.	T	.4
Nuculidae											T	.3		
Nuculanidae			.1	66.3	T	1.4	T	1.2			T	18.7	T	7.2
Pectinidae			T	1.0					.2	29.9				
Veneridae	T	.3									T	1.1		
Montacutidae			T	.1										
Cardiidae	.1	30.9			T	.9								
Thyasiridae											.8	7.6		
Tellinidae	T	2.6			.5	31.0	T	2.4	.1	10.2	.1	2.5	T	10.0
Myidae					T	7.2	T	.2	.1	29.1				
Hiatellidae											T	16.7		
Arthropoda														
Crustacea	T	.4			T	.1					T	.1		
Cirripedia	T	.6												
Balanidae							T	.5						
Copepoda														
Cyclopoida													T	1.3
Mysidacea	T	1.0												
Cumacea			T	1.1	.3	1.8	.3	1.8			T	.1	T	.9
Tanaidaceae			.3	.8									T	.1
Isopoda														
Sphaeromatidae					1.0	28.2					T	.1		
Amphipoda	T	.2												
Gammaridea	.6	14.0	1.5	16.1	4.2	87.7	3.3	61.5	.3	3.2	1.2	23.3	1.2	25.5
Eusiridae	.1	3.4												
Phoxocephalidae	T	.6												
Ampeliscidae	.1	2.2	T	.4										
Lysianassidae			1.7	55.1										
Caprellidea							T	.1						
Eucarida											.1	6.0		
Euphausiacea			T	1.4									T	1.3
Natantia	T	4.5	.1	58.7	.1	13.2	T	9.0					T	30.3
Hippolytidae											T	3.2		
Pandalidae			.1	333.			T	39.7			T	11.0		
Crangonidae					T	1.6					T	24.1		
Reptantia					T	104.								
Megalops	T	.2	.2	15.7										
Anomura													.2	3.6
Paguridae									T	3.9	T	.2	T	9.1
Lithodidae	T	27.7												
Brachyura					T	85.3	T	2.6						
Oxyrhyncha					.3	4.0	.1	7.5			T	.4		
Legs											T	.5		
Majidae			T	88.9					.3	79.7	.2	69.7	T	104.
Brachyrhyncha											T	.3		

Table 48. The average number and weight (mg) of prey items per stomach from rock sole >300 mm long (T = trace) - continued.

Rock sole (*Lepidopsetta bilineata*)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Atelecyclidae									.1	110.				
Cancridae											.1	69.6		
Sipuncula														
Golfingidae											T	3.4		
Echiura									T	89.9				
Echiuridae							.1	2.0			T	41.3		
Priapula					T	64.1								
Priapulidae							T	26.5			T	41.3	T	.7
Bryozoa											T	.6		
Echinodermata														
Ophiuroidea	.1	34.5	T	1.0	T	3.6	.1	.8			T	.1		
Echinoidea	T	5.1												
Spines	.1	.2												
Strongylocentrotid spines					T	.2					.1	.1		
Dendrasteridae			T	2.0										
Holothuroidea			T	35.1	T	4.7	T	13.8						
Synaptidae											.2	17.0		
Urochordata														
Ascidacea	T	3.0												
Chordata														
Vertebrata														
Teleostei	.1	88.1	.2	562.	T	334.	.5	3,173.	.1	886.			.6	79.0
Eggs					95.3	39.8								
Larvae	T	5.2	T	.3	T	120.								
Clupeiformes					T	101.			1	804.				
Clupeoidei							T	176						
Osmeridae					T	768.	T	302.	.3	3,157.				
Larvae													T	2.6
Gadidae											T	101.		
Hexagrammid larvae					T	39.0								
Ammodytidae	1.3	1,415.	T	12.0	.3	618.	.2	188.	.1	169.	.1	446.	.6	963.
Stichaeidae			T	375.			T	10.6						
Pholidae							T	40.1						
Pleuronectidae			T	94.3			T	37.8						
Unidentified	.7	105.	.4	31.7	.3	180.	1.3	52.0	.5	81.0	1.4	1,921.	2.5	168.
Egg	7.6	.1					11.9	1.3						
TOTAL	24.1	2,887.	18.2	3,205.	116.	3,731.	27.7	5,545.	9.1	6,092.	18.4	1,793.	6.8	1,513.
Total number of stomachs	67		60		85		84		46		73		64	
Number of empty stomachs	15		10		24		13		14		26		30	
Mean fullness	3.8		4.0		3.4		4.0		2.8		3.1		2.9	
Mean length (mm)	342.0		341.6		336.1		337.2		344.4		338.9		339.8	

Table 49. The average number and weight (mg) of prey items per stomach from yellowfin sole 0-150 mm long (T = trace, P = pooled).

	Yellowfin sole (*Limanda aspera*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Ulotrichales			T	1.1										
Cnidaria									T	.1				
Anthozoa	.1	T												
Nemertinea	.9	.1					.1	3.4	T	.1				
Annelida														
Polychaeta	3.3	19.0	.7	16.8	1.1	14.8	1.0	13.6	.5	17.3	.5	8.1	T	14.3
Polynoidae									T	.2	T	2.9		
Phyllodocidae							.2	.1						
Glyceridae					T	.1	T	.9			T	.3		
Goniadidae													T	.1
Lumbrineridae					T	.2	T	.1	.1	1.1				
Orbinidae							T	4.2						
Spionidae	.1	12.1			T	.2								
Aphroditidae													T	5.5
Opheliidae					T	.8								
Nereidae											T	.2		
Oweniidae					.1	.2			T	.1				
Nephytidae											T	39.8		
Sabellariidae									T	.1				
Ampharetidae							T	.2						
Terebellidae					T	.2								
Maldanidae			T	.2	T	.2			T	3.5	T	.1		
Mollusca											T	5.1		
Gastropoda														
Prosobranchia							T	1.6			T	.2		
Lacunidae	.1	.2												
Bullidae									T	.4				
Bivalvia	.7	2.4	.2	.3	2.2	7.3	.2	.6	.1	2.2	.1	1.9		
Siphons	17.7	24.4	4.1	20.3	10.7	14.7	9.9	19.4	.6	2.6	.1	.4		
Nuculoida									T	.1				
Nuculanidae			T	.5										
Pectinidae							T	.2						
Cardiidae	T	1.0					T	.1	T	1.5	T	.6		
Tellinidae									2.5	7.9				
Arthropoda														
Crustacea					T	.2	T	.2			.1	.6		
Ostrocoda	.3	.1												
Copepoda														
Calanoida											T	.1		
Harpacticoida							.3	T						
Cyclopoida									.2	.1				
Cirripedia							.1	.6						
Nauplii							.2	T						
Cirri							T	.2						
Balanidae							T	.3						
Mysidacea	T	1.0					.1	1.8	T	4.2	.1	1.0	T	.7
Cumacea			T	.2	.3	1.7			.1	.5				
Amphipoda														
Gammaridea	5.2	6.1	.2	.9	.7	1.4	.5	1.1	.3	1.1	.4	4.6	.3	2.2
Caprellidea					T	.1	T	.4	.1	.1				

Table 49. The average number and weight (mg) of prey items per stomach from yellowfin sole 0-150 mm long (T = trace, P = pooled) -continued.

	Yellowfin sole (*Limanda aspera*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Caprellidae									T	.1				
Euphausiacea			T	1.2	T	.4			.1	.2			T	.3
Natantia	.2	45.1	T	9.9			T	.1			T	.3		
Hippolytidae					T	.2			T	.3				
Pandalidae											T	.1		
Crangonidae					T	.2	T	1.9	T	.2	T	.2		
Reptantia									T	.4				
Megalops					.1	.9								
Anomura														
Paguridae									T	.9	.5	2.3		
Megalops					T	.1			.1	.4				
Brachyura					.1	1.3			.1	1.6				
Megalops			T	.3	.1	1.5			T	.1				
Oxyrhyncha			T	.1	.2	3.5			.2	1.9				
Megalops					T	.1								
Majidae			.1	226.	.3	4.0	.1	3.2						
Brachyrhyrhyncha											T	.1		
Echinodermata														
Ophiuroidea			T	.8	T	.1	T	.4	T	.4	T	.2		
Urochordata														
Larvacea														
Oikopleuridae									3.9	13.1				
Chordata														
Vertebrata														
Teleostei			T	.4	T	.1					T	6.6	T	.1
Eggs					T	.1	1.5	1.5	.2	1.1				
Larvae			T	.3										
Osmerid larvae											T	.4		
Cottidae	T	32.6												
Pleuronectiformes									T	1.0	T	.2		
Pleuronectidae							T	1.3						
Unidentified	.1	.2	.1	111.3	.1	.1	.1	1.5	.2	1.7	.2	.2		
Egg	21.8	.2	2.9	3.3			.3	.4						
TOTAL	50.4	146.	8.3	394.	16.0	54.3	14.5	59.3	9.3	66.6	2.0	74.5	.3	23.1
Total number of stomachs	23		127		202		92		78		94		65	
Number empty stomachs	P		P		P		P		P		27		54	
Mean fullness	3.7		2.9		3.1		3.4		3.0		2.7		1.6	
Mean length (mm)	99.0		104.8		116.2		114.2		113.0		101.4		99.5	

Table 50. The average number and weight (mg) of prey items per stomach from yellowfin sole 151-300 mm long (T = trace, P = pooled).

	Yellowfin sole (*Limanda aspera*)													
	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta			.1	15.1	T	.7					T	.8		
Ulotrichales			T	12.3	T	.2								
Ulvaceae							T	.2						
Phaeophyta					T	.1								
Rhodophyta					T	4.8	T	.5						
Bangiales			T	5.5										
Bangiaceae					T	2.2	T	17.0						
Rhodymeniaceae			T	9.0										
Angiosperma														
Potamogetonaceae					T	.1			T	.2			T	.1
Foraminifera											T	.1		
Cnidaria							T	5.4						
Hydrozoa	.7	.2					T	.5						
Ctenophora									T	5.5				
Nemertinea							T	.4						
Annelida														
Polychaeta	3.5	85.0	2.2	89.1	1.3	89.5	1.6	55.9	1.1	59.7	1.1	18.7		
Polynoidae					T	1.0			T	.2	T	.1	T	.1
Phyllodocidae					T	1.2	T	7.5			T	.7		
Nereidae					T	1.6					T	.1		
Glyceridae			T	.1	T	.2	.4	8.9						
Goniadidae							T	.2	T	.1	T	.2		
Lumbrineridae			.1	.2	T	.1	.2	.4	T	.3	.2	1.0		
Orbiniidae							T	.1	.1	.5				
Spionidae			.2	11.8										
Scalibregmidae							.5	5.9			T	1.2		
Flabelligeridae									T	13.2				
Opheliidae			.1	3.6	.1	6.4	.4	17.2	T	.2	.1	1.1		
Pectinariidae					T	.1	T	.1	T	2.0	.1	.5		
Oweniidae			T	6.9	T	.5	.2	2.4	.1	1.4				
Capitellidae											.1	1.2	T	23.0
Sabellariidae									T	1.1				
Ampharetidae			.8	12.2			T	2.3			T	.2		
Terebellidae							T	6.8	T	.2				
Maldanidae			T	1.8			T	2.0	T	4.9	.1	9.1		
Syllidae							T	.1			.1	4.2		
Nephytidae					T	8.6			T	.3	T	1.3		
Euphrosinidae							T	.1						
Mollusca														
Gastropoda														
Prosobranchia			.1	14.2					T	.4	T	.3	T	.1
Acmaeidae							T	1.2						
Lepetidae					T	19.8	T	1.5						
Scaphandridae							T	.3						
Gastropteridae											.5	10.7		
Bivalvia	2.8	17.0	.4	7.4	.9	38.8	2.3	43.3	.2	5.4	.3	45.0	T	32.3
Siphons	.5	.5	1.4	118.9	1.9	26.4	5.4	43.4	.2	6.6	T	1.5		
Nuculidae			T	.2										

Table 50. The average number and weight (mg) of prey items per stomach from yellowfin sole 151-300 mm long (T = trace, P = pooled) - continued.

Yellowfin sole (Limanda aspera)

	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Nuculanidae									T	2.9	.2	23.3		
Pectinidae			T	.1			T	.1						
Limidae			T	.1										
Thyasiridae			.1	1.5										
Cardiidae	1.5	64.3	T	8.4	T	7.0	T	22.6	T	5.0				
Matricidae			T	.9	T	.8	T	.9						
Tellinidae			T	.3	T	5.9	T	6.1	T	2.1	T	3.3		
Myidae					T	1.3	T	.1						
Cephalopoda														
Octopoda											T	7.9		
Arthropoda														
Crustacea			T	6.0	T	2.6	T	.1	T	1.0	T	.8	T	.7
Cladocera											T	.6		
Cirripedia			T	.2			.1	7.8						
Cirri							T	.1						
Lepadidae									T	.4				
Balanomorpha									T	.1				
Cirri									T	.2				
Balanidae					T	2.6	.1	7.7						
Malacostraca							T	.1						
Mysidacea			T	.6	T	2.0	.1	1.1	.1	8.0	.1	4.2	T	.2
Cumacea			T	.1	.1	.9	.8	1.4	.1	.3				
Amphipoda														
Gammaridea			1.4	13.8	.4	2.7	2.3	11.0	.5	55.6	1.0	3.1	.2	2.9
Caprellidea	2.0	1.3	T	.1			.1	.4						
Caprellidae							T	.1						
Eucarida							1.1	.6						
Larvae									T	.1				
Euphausiacea					T	.8	.1	.7						
Natantia			.1	103.	T	61.2	1.1	22.5	T	1.8	T	13.9	T	19.9
Hippolytidae			T	3.5			T	.1					T	2.7
Pandalidae			.1	209.	T	86.9	.1	151.			T	42.4	T	15.5
Crangonidae			T	5.3	T	2.8	T	3.1			T	3.5		
Reptantia					T	.9	T	.7	T	2.0				
Megalops			.1	1.4	.2	6.4	T	.9						
Legs											T	.2		
Anomura					T	12.4								
Paguridae			T	.6	T	2.3	T	1.7	T	.1	T	9.4	T	16.3
Megalops									T	.1				
Legs					T	.6					T	2.6		
Brachyura			T	.8	T	.9	T	9.7	T	.7	T	.6	T	24.1
Megalops			T	.1	.1	1.8								
Oxyrhyncha			T	.1	.4	9.0	T	.9	T	3.4				
Zoea					T	.2								
Megalops					T	.2								
Majidae			.1	13.1	.5	21.9	.3	7.2	T	.9	.1	6.2	T	1.7
Brachyrhyncha														
Atelecyclidae											T	6.7		

Table 50. The average number and weight (mg) of prey items per stomach from yellowfin sole 151-300 mm long (T = trace, P = pooled) - continued.

Yellowfin sole (*Limanda aspera*)	April		May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Cancridae											T	18.2		
Sipunculida									T	5.3				
Golfingiidae			T	2.9			T	10.6						
Echiura									T	64.5				
Echiuridae							T	95.6			T	29.0		
Echinodermata														
Ophiuroidea			.1	7.7	.1	1.7	.4	10.0	.2	10.9	.1	.4		
Echinoidea														
Dendrasteridae			T	1.0										
Holothuroidea	.2	3.5							T	21.8				
Urochordata														
Thallacea									.4	1.8				
Larvacea														
Oikopleuridae									1.8	34.5				
Chordata														
Vertebrata														
Teleostei			T	43.1	T	141.	.1	114.	T	73.8	.1	44.7	T	85.8
Eggs			T	.9			1.6	1.2	.2	1.2			.6	23.1
Larvae			T	1.3	T	1.3	T	1.1			T	5.2		
Clupeidae									T	55.0				
Osmeridae					T	8.7								
Larvae											T	.1		
Gadidae									T	15.6	T	58.1		
Cottidae	.2	1.3	T	7.6										
Larvae					T	.2								
Hexagrammidae														
Egg									T	.1				
Perciformes									T	5.2				
Stichaeidae											T	31.5		
Ammodytidae							T	3.2	T	128.	T	2.5	T	13.1
Pholidae													T	10.0
Pleuronectidae									T	.4				
Unidentified			.5	12.8	.5	31.4	.3	13.0	.4	32.4	.3	97.5	4.0	5.2
Egg					9.0	4.0	T	.1						
TOTAL	11.4	173.	7.5	75.5	15.5	615.	19.6	731.	5.4	637.	4.5	515.	4.8	277.
Total number of stomachs	6		216		404		176		161		131		150	
Number of empty stomachs	1		P		P		38		38		29		124	
Mean fullness	4.3		3.4		2.8		3.1		2.9		2.6		1.5	
Mean length (mm)	175.8		231.9		234.3		228.1		222.5		222.3		225.2	

Table 51. The average number and weight (mg) of prey items per stomach from yellowfin sole >300 mm long (T = trace).

Yellowfin sole (*Limanda aspera*)												
	May		June		July		August		November		March	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Chlorophyta	T	13.2	.1	50.6								
Phaeophyta	.1	93.7					.1	69.1				
Rhodymeniaceae			T	124.								
Angiosperma												
Potamogetonaceae									T	1.0		
Cnidaria			.1	69.6	T	5.7						
Hydrozoa					.1	.9						
Leptomedusae							T	20.6				
Scyphozoa					T	153.						
Annelida												
Polychaeta	.6	45.0	.9	46.8	1.1	42.9	.1	1.2	.2	5.2		
Glyceridae					.4	4.2						
Goniadidae					.1	.2			T	.6		
Phyllodocidae									T	.3		
Lumbrineridae			.4	.8	.3	.9			T	1.0		
Spionidae									.5	8.7		
Opheliidae	T	.3			.6	12.9	T	2.4	.2	2.0		
Scalibregmidae									T	8.8		
Nephtyidae					.1	13.4						
Oweniidae	.3	7.6										
Eunicidae			T	60.0								
Pectinariidae	T	1.0										
Maldanidae			T	75.5			T	4.9				
Mollusca					.1	202.						
Gastropoda												
Prosobranchia	.2	21.4			T	63.9						
Fissurellidae			T	2.2								
Lepetidae			1.7	324.	.3	138.						
Bivalvia	.4	98.0	1.1	25.9	.1	177.	.1	16.8	1.3	4.0		
Siphons	.4	19.8			.6	5.3	.2	21.7	.3	1656.		
Nuculidae									T	.2		
Nuculanidae			T	1.0								
Pectinidae					T	65.7			T	81.7		
Veneroida	.4	16.2										
Tellinidae			.1	15.4	.1	12.7	T	6.3	T	155.		
Cardiidae	T	76.3							.4	1.1		
Mactridae	.1	7.1										
Arthropoda												
Crustacea												
Copepoda												
Calanoida					.1	T						
Mysidacea	T	.3	T	.7					T	3.2		
Cumacea					1.0	1.5						
Amphipoda												
Gammaridea	.4	21.7	.1	.3	1.4	5.4	.1	1.3	1.0	5.2		
Eucarida							T	1.0				
Larvae					.3	.1						
Natantia	.1	179.	.1	47.2	T	52.5	.1	39.7	T	.5	.2	106.

Table 51. The average number and weight (mg) of prey items per stomach from yellowfin sole >300 mm long (T = trace) - continued.

	May		June		July		August		November		March	
Yellowfin sole (*Limanda aspera*)	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Pandalidae	.1	430.	.1	472.	.1	254.	.2	873.				
Crangonidae							T	.1				
Reptantia	T	27.5	T	7.8								
Megalops									T	.1		
Legs									T	29.9		
Anomura												
Paguridae					.1	21.8						
Lithodidae	T	970.										
Brachyura					.1	21.2	T	36.5				
Legs									T	27.7		
Oxyrhyncha			.5	11.8								
Majidae			T	.2	T	239.	T	76.7	.1	190.		
Echiura												
Echiuridae			T	280.			T	267.				
Echinodermata												
Ophiuroidea	.2	21.6			.2	10.0	.3	515.				
Holothuroidea							T	45.9				
Echinoidea					T	1.3						
Ascidacea							.1	74.3				
Chordata												
Vertebrata												
Teleostei	.1	368.	.1	256.	.2	335.	.1	523.	T	354.		
Larvae			T	4.6								
Osmeridae			.1	744.			.9	6837.	T	11.2		
Gadidae	.1	730.							.2	825.		
Stichaeidae			T	30.7					T	43.3		
Ammodytidae							.2	1734.	.1	184.		
Unidentified	.4	81.7			.3	728.			.3	605.		
Egg			T	28.1								
TOTAL	3.9	3229.	5.4	2679.	7.7	2568.	2.5	11,168.	4.6	4205.	.2	106.
Total number of stomachs	38		49		35		38		26		5	
Number of empty stomachs	14		22		11		13		8		4	
Mean fullness	2.9		2.7		3.2		3.5		2.9		1.6	
Mean length (mm)	333.3		328.1		328.1		339.7		333.8		327.8	

Table 52. The average number and weight (mg) of prey items per stomach from Pacific halibut 151-300 mm and >300 mm long.

	Pacific halibut (*Hippoglossus stenolepis*) 151-300 mm				>300 mm			
	June		July		June		July	
	No.	Wt.	No.	Wt.	No.	Wt.	No.	Wt.
Mollusca								
Gastropoda								
Prosobranchia					.1	3.8		
Bivalvia							.1	11.9
Anthropoda								
Crustacea	.8	280.						
Mysidacea	1.6	85.4						
Natantia							.1	3.9
Pandalidae					3.0	12,724.		
Crangonidae	.8	176.						
Reptantia								
Anomura								
Paguridae	.2	157.	1.0	2,214.			.1	118.2
Brachyura								
Oxyrhyncha								
Majidae	.4	170.					.1	53.2
Chordata								
Vertebrata								
Teleostei	.4	1,403.	.5	2,997.	.8	2,208.	.4	2,658.
Clupeidae					.1	1,294.		
TOTAL	4.2	2,271.	1.5	5,211.	4.0	16,230.	.8	2,845.
Total number of stomachs	5		2		19		17	
Number empty stomachs	0		0		1		6	
Mean fullness	3.8		5.0		4.8		2.4	
Mean length (mm)	271.4		290.0		429.3		463.8	

Table 53. The species of crab and shrimp that were consumed by predators in this study.

Crab

Atelecyclidae (Horse crabs):

- *Telmessus cheiragonus* (Horse or bristly crab)

Callianassidae (Ghost or mud shrimp)

Cancridae (Cancer crabs):

- *Cancer magister* (Dungeness crab)
- *C. oregonensis* (Hairy cancer crab)
- *C. productus* (Red rock crab)

Lithodidae (Lithode crabs):

- *Cryptolithodes typicus*
- *Paralithodes* spp. (King crab)
- *Phyllolithodes papillosa*

Majidae (Majid crabs):

- *Chionocetes* spp. (Snow or tanner crab and others)
- *Hyas lyratus* (Lyre crab)
- *Oregonia gracilis* (Graceful decorator crab)
- *Pugettia gracilis* (Graceful kelp crab)

Paguridae (Hermit crabs):

- *Ellasochirus tenimanus*
- *Labidochirus splendescens*
- *Pagurus beringanus*
- *P. capillatus*
- *P. granosimanus*
- *P. hirsutiusculus*
- *P. ochotensis*

Pinnotheridae (Pea crabs)

Shrimp

Crangonidae:

- *Argis* sp.
- *Crangon dalli*
- *C. septemspinosa*
- *Sclerocrangon* spp.

Hippolytidae:

- *Eualus biungius*
- *Heptacarpus brevirostris* (Short-spined shrimp)
- *H. cristata*
- *Lebbeus* sp.
- *Spirontocaris ochotensis*
- *S. prionota*

Pandalidae:

- *Pandalus borealis* (Northern pink shrimp)
- *P. goniurus* (Humpy shrimp)
- *P. hypsinotus* (Humpback, king, or rose shrimp)
- *P. montigui tridens*

Table 54. The species of fish that were consumed by predators in this study.

Agonidae (Poachers)
Ammodytidae (Sand lances):
Ammodytes hexapterus (Pacific sand lance)
Anoplopomatidae (Sablefishes):
Anoplopoma fimbria (Sablefish)
Bathymasteridae (Ronquils):
Bathymaster signatus (Searcher)
Clupeidae (Herrings):
Clupea harengus pallasi (Pacific herring)
Cottidae (Sculpins):
Gymnocanthus galentus (Armorhead sculpin)
Hemilepidotus jordani (Yellow Irish lord)
Leptocottus armatus (Pacific staghorn sculpin)
Myoxocephalus spp. (Great sculpin and others)
Synchirus gilli (Manacled sculpin)
Cyclopteridae (Snailfishes and lumpfishes):
Liparis rutteri (Ringtail snailfish)
Gadidae (Codfishes):
Gadus macrocephalus (Pacific cod)
Theragra chalcogramma (Walleye pollock)
Hexagrammidae (Greenlings):
Hexagrammos lagocephalus (Rock greenling)
H. octogrammus (Masked greenling)
H. stelleri (Whitespotted greenling)
Osmeridae (Smelts):
Mallotus villosus (Capelin)
Pholidae (Gunnels):
Apodichthys flavidus (Penpoint gunnel)
Pholis laeta (Crescent gunnel)
Pleuronectidae (Righteye flounder):
Hippoglossoides elassodon (Flathead sole)
Lepidopsetta bilineata (Rock sole)
Salmonidae (Salmon and trout)
Onchorhynchus gorbuscha (Pink salmon)
Scorpaenidae (Rock fishes):
Stichaeidae (Pricklebacks):
Anoplarchus purpurescens (High cockscomb)
Lumpenus maculosus (Daubed shanny)
L. sagitta (Snake prickleback)
Trichodontidae (Sandfishes):
Trichodon trichodon (Pacific sandfish)
Zoarcidae (Eelpouts):
Lycodes sp. (Unid. eelpout)

Appendix Table 1. Geometric mean weights (mg) of major food items in stomach contents of rock greenling (151-300 mm) from trammel nets by bay and month.

		June	July	August	November
Izhut	Sample size (n)	23	32	29	8
	Fish	49	150	127	0
	Crab	584	214	291	100
	Shrimp	137	32	35	175
	Snails	66	61	81	203
	Clams and siphons	431	192	23	0
	Gammarids	32	36	62	18
	Isopods	0	42	39	0
	Polychaetes	162	112	101	97
	Total contents	1,559	1,094	1,017	764
Kalsin	Sample size (n)	30	5	9	9
	Fish	63	226	26	534
	Crab	466	89	79	298
	Shrimp	76	6	29	54
	Snails	126	6	21	91
	Clams and siphons	208	0	+	0
	Gammarids	255	1,008	45	105
	Isopods	145	63	130	283
	Polychaetes	110	5	1	68
	Total contents	1,493	1,452	335	1,727
Kiliuda	Sample size (n)	21	14	19	10
	Fish	140	27	97	210
	Crab	408	83	167	0
	Shrimp	61	1	98	62
	Snails	226	127	72	182
	Clams and siphons	116	4	5	0
	Gammarids	386	389	111	123
	Isopods	98	296	275	0
	Polychaetes	89	25	79	130
	Total contents	1,688	1,076	1,017	850
Kaiugnak	Sample size (n)	34	17	12	7
	Fish	66	83	25	382
	Crab	121	167	496	115
	Shrimp	54	16	+	82
	Snails	112	185	110	1,091
	Clams and siphons	277	158	683	0
	Gammarids	177	149	48	118
	Isopods	68	36	93	124
	Polychaetes	128	56	158	37
	Total contents	1,085	925	2,151	2,007

Appendix Table 2. Geometric mean weights (mg) of major food items in stomach contents of rock greenling (300-450 mm) from trammel nets by bay and month.

		May	June	July	August	November
Izhut	Sample size (n)		20	32	24	11
	Fish		348	522	1,050	157
	Crab		1,233	712	795	643
	Shrimp		140	125	196	481
	Snails		24	43	31	23
	Clams and siphons		1,145	308	41	0
	Eggs		108	109	221	0
	Total contents		3,361	2,400	2,776	1,674
Kalsin	Sample size (n)		23	21	8	6
	Fish		163	521	856	786
	Crab		1,053	847	732	0
	Shrimp		43	45	85	403
	Snails		773	102	141	337
	Clams and siphons		786	68	305	0
	Eggs		41	102	0	0
	Total contents		3,335	2,165	3,075	3,463
Kiliuda	Sample size (n)	12	29	12	10	21
	Fish	943	531	1,060	558	627
	Crab	814	1,015	1,161	337	678
	Shrimp	57	45	53	19	380
	Snails	104	546	43	1	39
	Clams and siphons	66	33	6	6	415
	Eggs	0	69	386	735	75
	Total contents	2,724	3,490	3,912	2,569	2,544
Kaiugnak	Sample size (n)	22	33	15	12	10
	Fish	615	67	298	677	731
	Crab	1,253	412	797	387	739
	Shrimp	308	22	61	4	159
	Snails	261	127	181	29	791
	Clams and siphons	57	104	87	158	0
	Eggs	0	64	169	922	0
	Total contents	3,845	1,618	2,133	2,918	2,879

Appendix Table 3. Geometric mean weights (mg) of major food items in the stomach contents of rock sole (30-150 mm) from try net catches by bay and month.

		March	April	May	June	July	August	November
Izhut	Sample size (n)	48	7	54	102	30	36	64
	Mean length (mm)	84	96	81	104	103	102	94
	Polychaetes	1	30	20	63	19	39	25
	Gammarids	+	0	3	16	16	35	12
	Clams and siphons	0	0	1	13	4	4	0
	Fish	0	0	2	19	1	1	0
	Total contents	2	33	29	188	42	88	47
Kalsin	Sample size (n)	26	25	100	138	47	38	66
	Mean length (mm)	86	97	94	108	106	101	111
	Polychaetes	7	66	69	136	105	47	63
	Gammarids	5	19	27	6	15	1	27
	Clams and siphons	0	2	2	65	39	9	0
	Fish	0	0	0	4	19	0	18
	Total contents	36	89	167	222	181	61	132
Kiliuda	Sample size (n)	0	47	87	68	31	14	30
	Mean length (mm)		104	100	94	105	103	113
	Polychaetes		79	118	112	43	141	4
	Gammarids		10	0	2	1	2	0
	Clams and siphons		69	50	117	20	14	0
	Fish		9	0	1	0	0	0
	Total contents		171	226	237	70	158	8
Kaiugnak	Sample size (n)	0	20	6	7	13	7	22
	Mean length (mm)		80	107	86	100	116	105
	Polychaetes		108	41	109	45	75	45
	Gammarids		87	9	+	1	3	0
	Clams and siphons		269	0	23	30	2	0
	Fish		0	41	0	0	0	0
	Total contents		473	124	132	84	94	47

+ Less than 1 mg.

Appendix Table 4. Geometric mean weights (mg) of major food items in stomach contents of rock sole (151-300 mm) from try net catches by bay and month.

		March	April	May	June	July	August	November
	Sample size (n)	30	16	42	147	38	38	35
Izhut	Mean length (mm)	229	258	239	233	233	250	261
	Polychaetes	108	322	293	208	51	167	144
	Gammarids	5	1	0	0	4	15	14
	Clams and siphons	11	7	66	34	18	40	38
	Fish	208	370	27	127	145	204	85
	Total contents	352	746	388	497	270	541	360
Kalsin	Sample size (n)	9	15	38	50	19	19	44
	Mean length (mm)	227	210	239	251	241	247	211
	Polychaetes	245	366	325	244	144	112	126
	Gammarids	20	56	41	7	28	7	39
	Clams and siphons	5	36	69	37	50	77	44
	Fish	0	62	1	0	28	0	10
	Total contents	325	591	521	301	570	197	203
Kiliuda	Sample size (n)	0	18	52	5	18	15	3
	Mean length (mm)		194	230	238	237	246	188
	Polychaetes		141	649	118	247	277	
	Gammarids		1	39	0	102	2	
	Clams and siphons		239	92	312	317	271	
	Fish		51	0	0	16	0	
	Total contents		458	816	430	711	760	+
Kaiugnak	Sample sizes all less than 10							

Appendix Table 5. Geometric mean weights (mg) of major food items in stomach contents of flathead sole (60-150 mm) from try net catches by bay and month.

		March	April	May	June	July	August	November
Izhut	Sample size (n)	24	11	78	38	34	23	36
	Mean length (mm)	110	84	103	108	121	120	114
	Fish	0	0	0	0	32	0	20
	Shrimp	13	0	10	28	119	9	+
	Polychaetes	0	5	10	0	1	4	3
	Euphausids	0	0	26	282	0	0	0
	Mysids	26	0	25	5	11	9	18
	Total contents	40	5	76	317	178	30	44
Kalsin	Sample size (n)	0	0	18	84	17	23	2
	Mean length (mm)			90	99	110	110	108
	Fish			0	12	120	0	40
	Shrimp			72	49	49	50	5
	Polychaetes			0	1	15	0	0
	Euphausids			61	58	16	0	0
	Mysids			17	102	9	61	29
	Total contents			158	242	282	111	74
Kiliuda	Sample size (n)	10	0	14	45	20	30	36
	Mean length (mm)	97		89	114	118	110	106
	Fish	12		0	16	18	3	0
	Shrimp	0		0	70	10	2	12
	Polychaetes	0		20	+	8	1	4
	Euphausids	0		2	0	+	0	0
	Mysids	0		12	28	12	26	3
	Total contents	12		33	133	47	33	21

Appendix Table 6. Geometric mean weights (mg) of major food items in stomach contents of flathead sole (151-300 mm) from try net catches by bay and month.

		May	June	July	August	November
Izhut	Sample size (n)	9	3	10	8	3
	Mean length (mm)	179	162	213	195	167
	Fish	0	50	124	130	0
	Shrimp	503	280	596	209	0
	Polychaetes	0	276	0	0	0
	Mysids	0	157	3	0	97
	Total contents	503	762	727	356	97
Kalsin	Sample size (n)	2	20	7	10	
	Mean length (mm)	182	214	190	201	
	Fish	0	0	106	273	
	Shrimp	0	494	119	172	
	Polychaetes	0	0	0	0	
	Mysids	68	0	0	4	
	Total contents	88	499	237	449	
Kiliuda	Sample size (n)	2	10	15	13	7
	Mean length (mm)	218	211	189	194	194
	Fish	0	51	254	165	57
	Shrimp	0	322	59	0	0
	Polychaetes	285	0	0	0	0
	Mysids	0	51	0	15	0
	Total contents	285	483	332	180	75

Appendix Table 7. Arithmetic mean weights (mg) of major food items in stomach contents of sand lance (40-150 mm) from beach seine catches by bay and month.

		April	May	June	July	August	November
Izhut	Sample size (n)	10	29	67	74	68	9
	Mean length (mm)	77	97	113	115	93	122
	Calanoids	7	8	96	11	7	0
	Harpacticoids	0	0	2	0	0	0
	Cirripedia	0	25	0	8	38	0
	Mysids	19	0	0	0	0	7
	Gammarids	0	0	+	0	2	0
	Total contents	34	34	98	23	57	7
Kalsin	Sample size (n)	1	3			55	5
	Mean length (mm)		90			93	133
	Calanoids		+			1	
	Harpacticoids		0			0	
	Cirripedia		17			10	
	Mysids		0			1	
	Gammarids		0			2	
	Total contents		17			15	0
Kiliuda	Sample size (n)	10	105	92	35	69	42
	Mean length (mm)	102	113	121	99	106	122
	Calanoids	8	146	43	2	1	0
	Harpacticoids	0	3	10	+	+	+
	Cirripedia	0	0	0	3	3	0
	Mysids	0	11	+	0	+	+
	Gammarids	44	1	73	+	+	1
	Total contents	52	235	130	5	6	1
Kaiugnak	Sample size (n)		60	41	8	50	24
	Mean length (mm)		116	118	74	103	125
	Calanoids		34	13	0	7	2
	Harpacticoids		+	2	2	+	+
	Cirripedia		+	0	0	3	0
	Mysids		23	0	0	0	0
	Gammarids		1	0	0	+	1
	Total contents		108	17	2	29	3

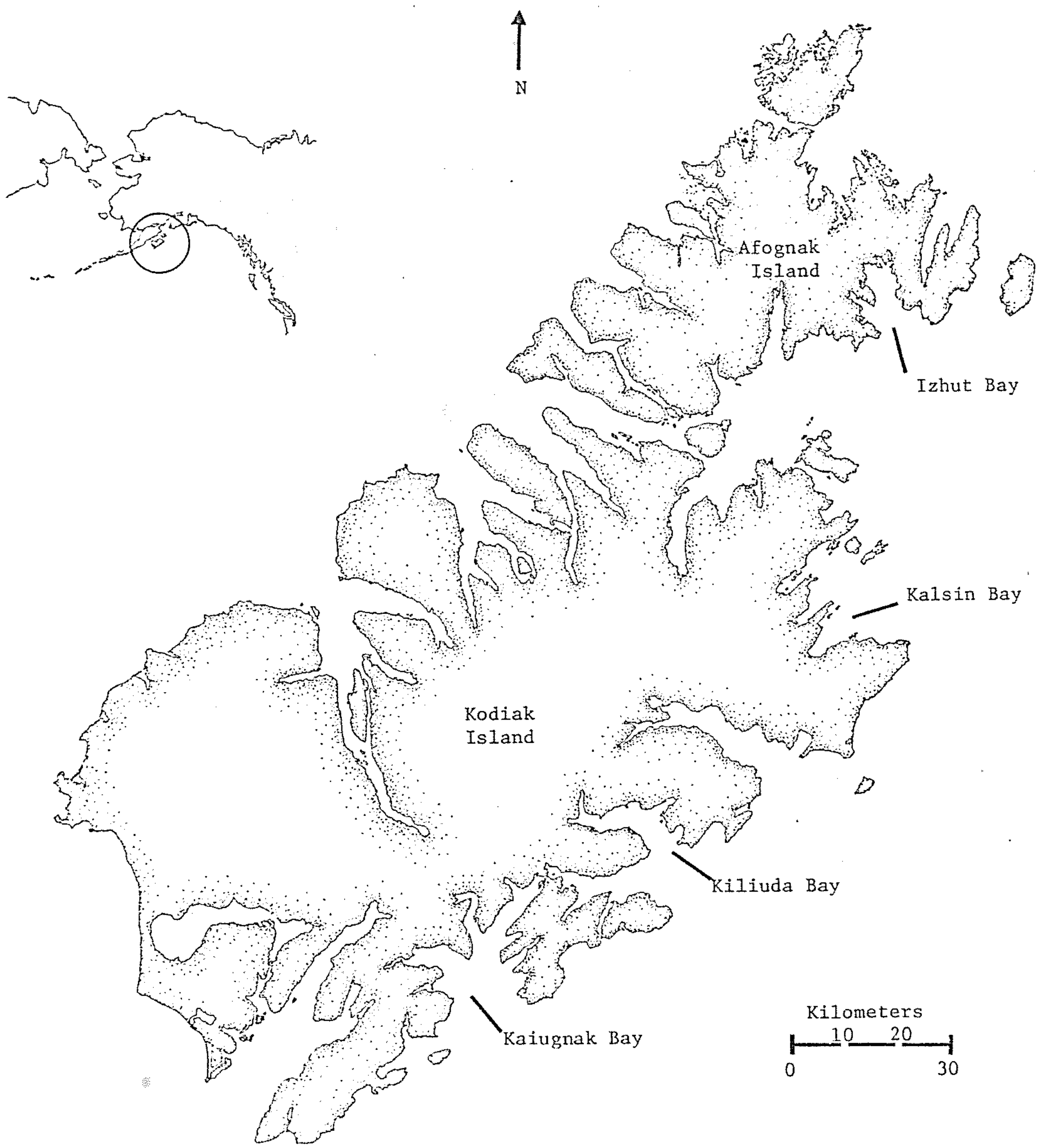

Fig. 1. Locations of bays in which fish were sampled for the Kodiak nearshore food habits studies, 1978 and 1979.

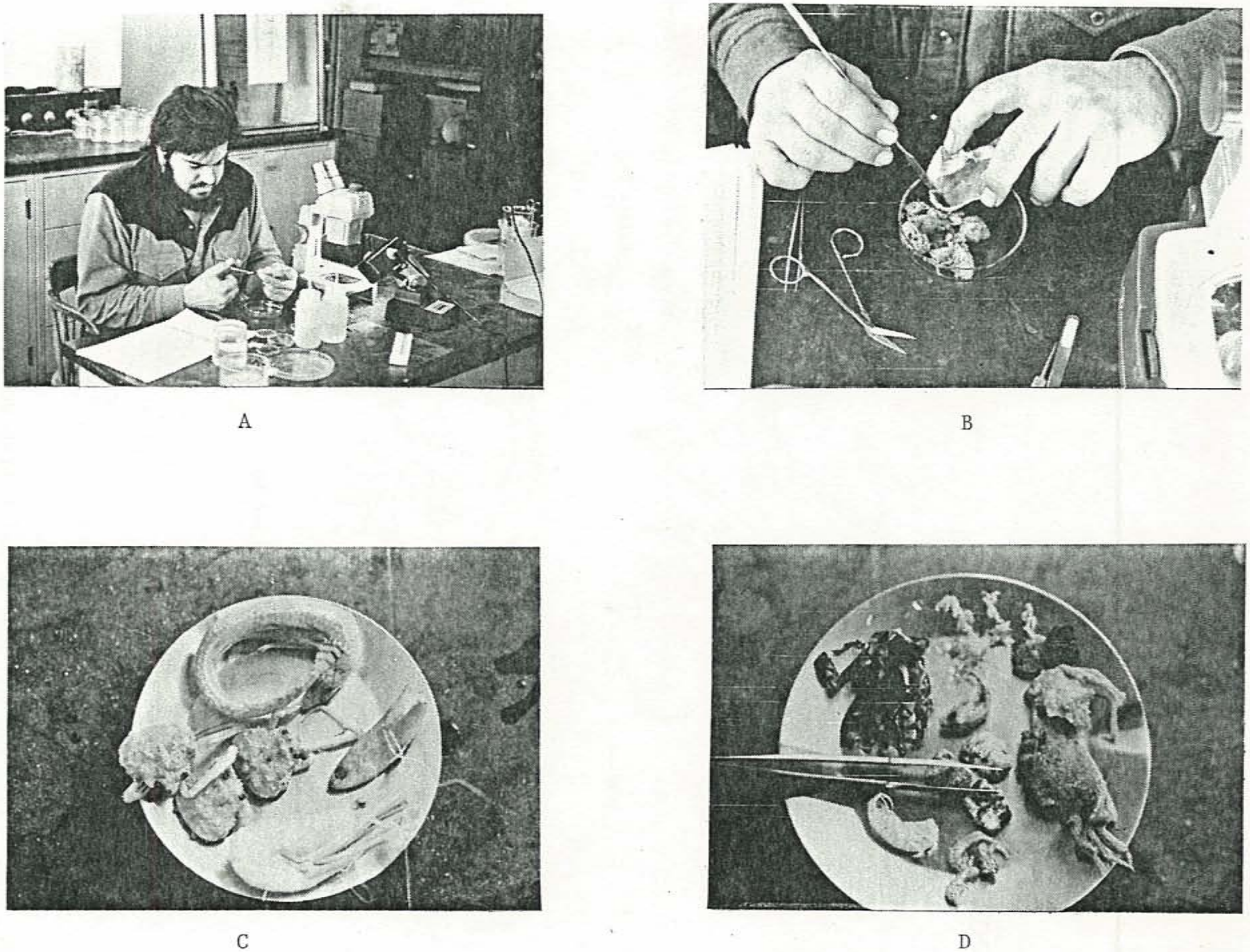

Fig. 2. Stomach content analysis. A: cutting open a stomach; B: removing stomach contents; C: contents from a stomach of <u>Myoxocephalus</u> which includes fish (<u>Hexagrammos</u> sp. and <u>Lumpenus maculatus</u>), crab (<u>Chionocetes</u> sp.) and shrimp (<u>Pandalus hypsinotus</u>); D: contents from a stomach of rock greenling which includes eel grass, clam siphons, gammarid and caprellid amphipods, fish (<u>Myoxocephalus</u> sp.) and crab (<u>Pugettia</u> sp. and <u>Telmessus chieragonus</u>).

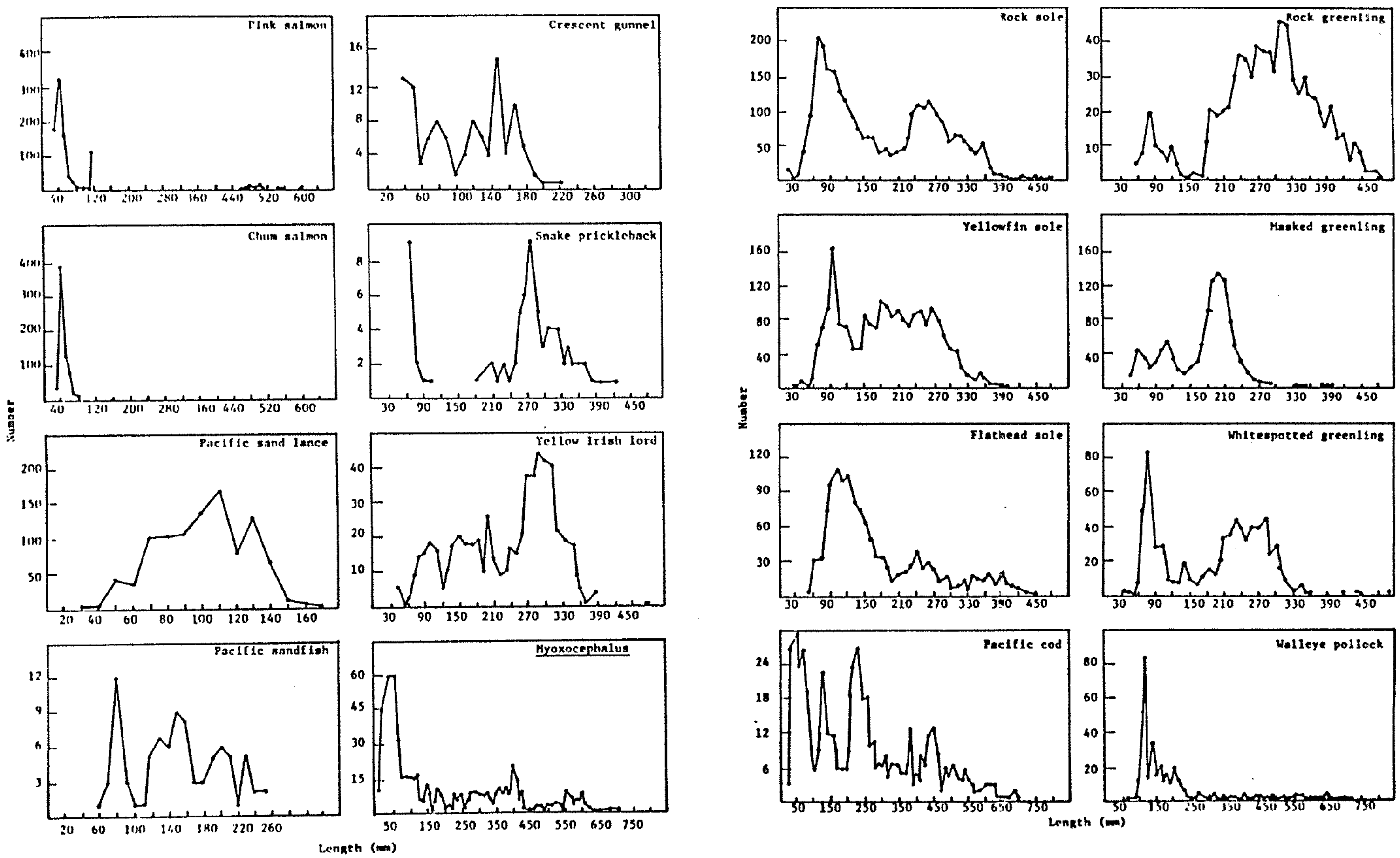

Fig. 3. Length frequency distribution of the 16 most frequently sampled species of fish, summed over bay, habitat, and month.

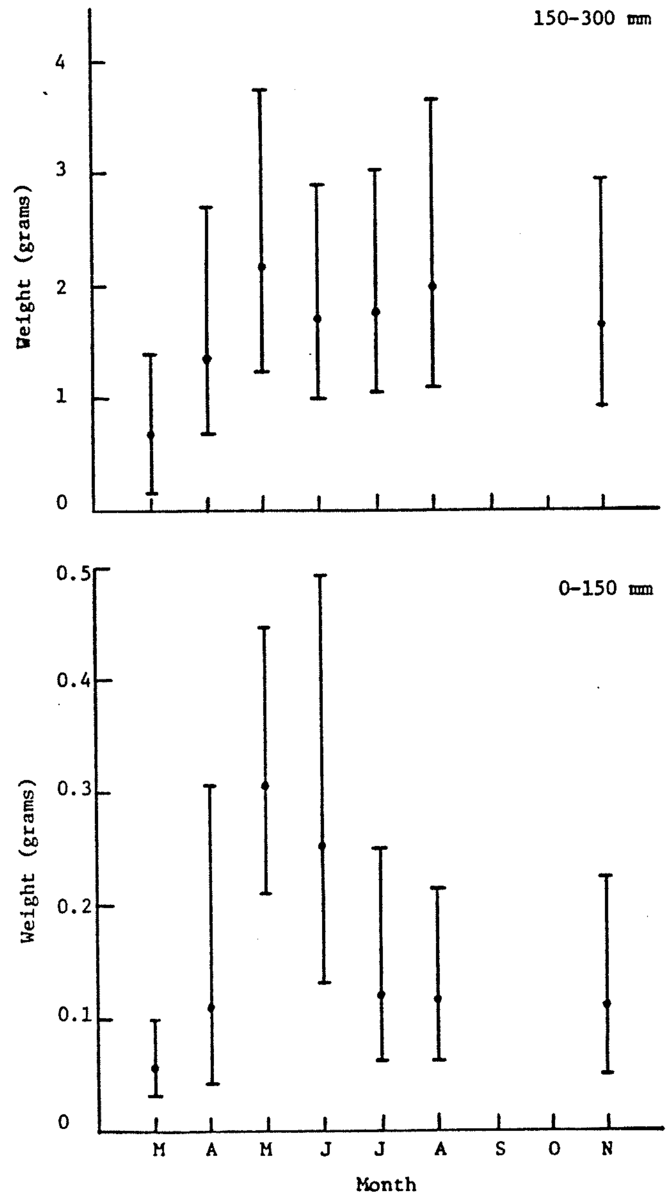

Fig. 4. Geometric means and 95% confidence limits on the weights of identifiable stomach contents in 10 species of fish for lengths between 151 and 300 mm (top) and in 11 species of fish for lengths less than 151 mm (bottom).

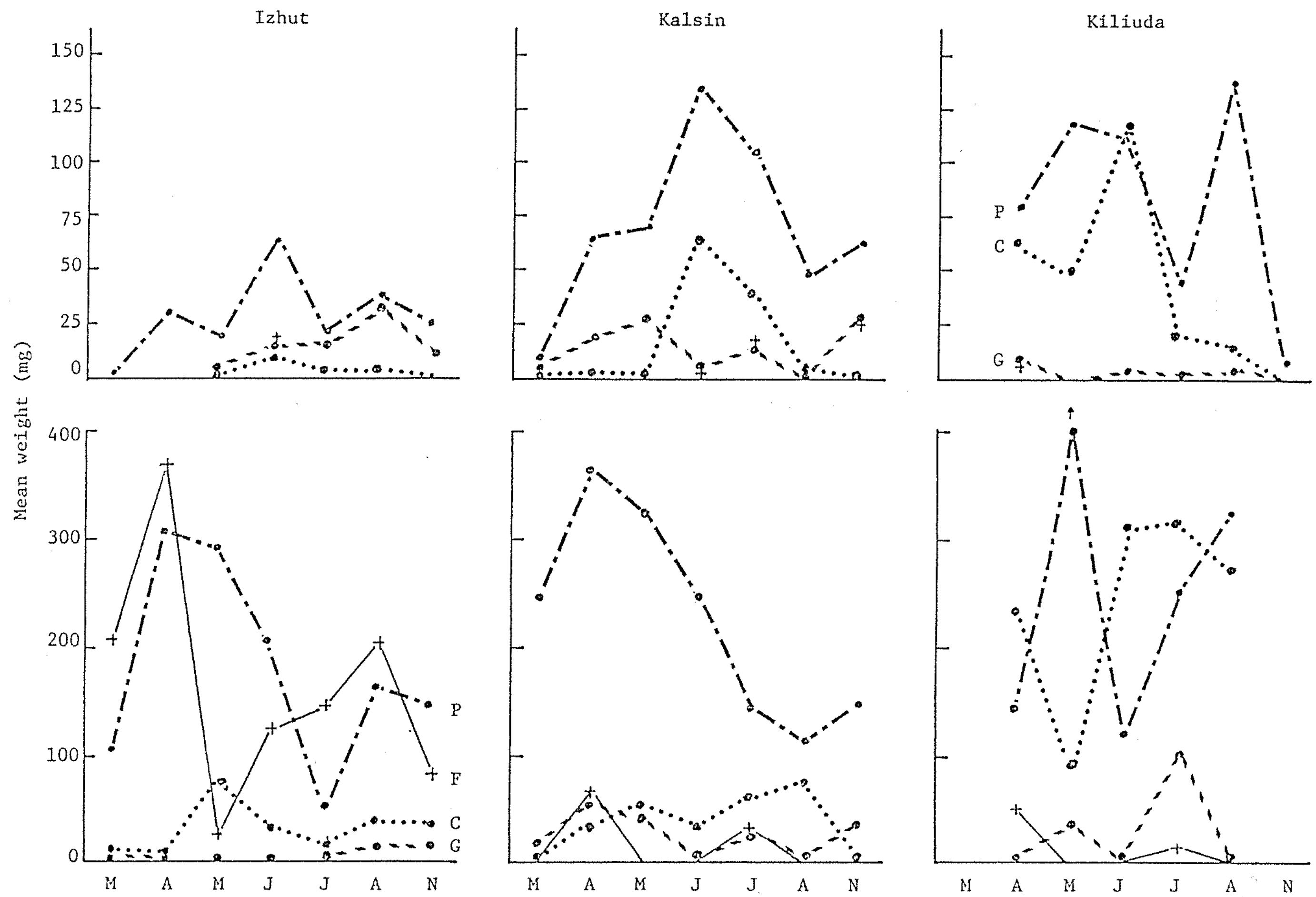

Fig. 5. Geometric mean weights of the major food items in stomachs of rock sole from try net catches, by bay and month. Upper graphs for size group I and lower graphs for size group II. P = polychaetes, F = fish, C = clams and clam siphons, G = gammarid amphipods.

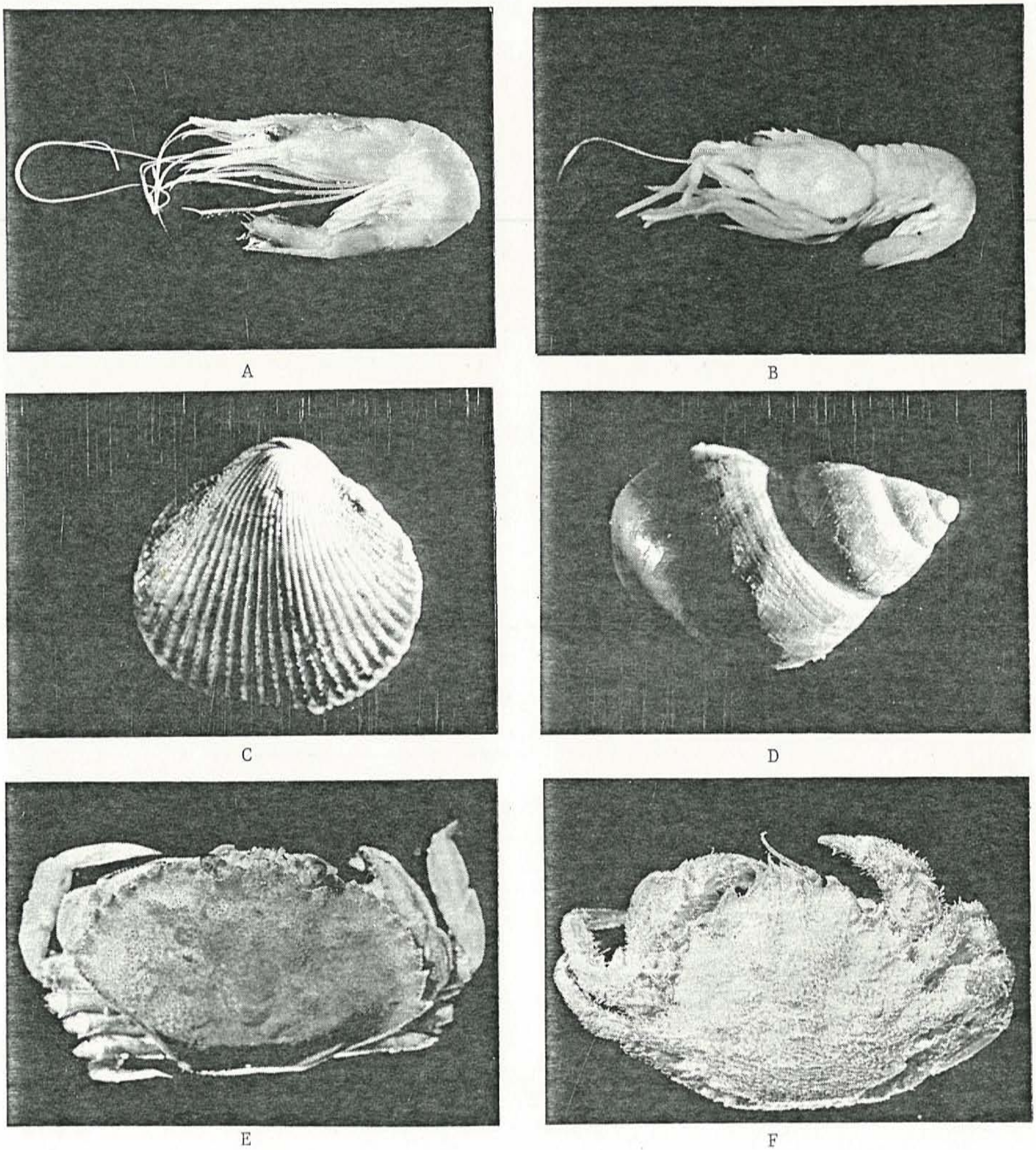

Fig. 6. Common food organisms. A: pandalid shrimp (Pandalus borealis); B: hippolytid shrimp (Heptacarpus brevirostris); C: bivalve mollusk (Clinocardium sp.); D: lacunid snail (Lacuna sp.); E: cancrid crab (Cancer magister); and F: atelecyclid crab (Telmessus chieragonus).

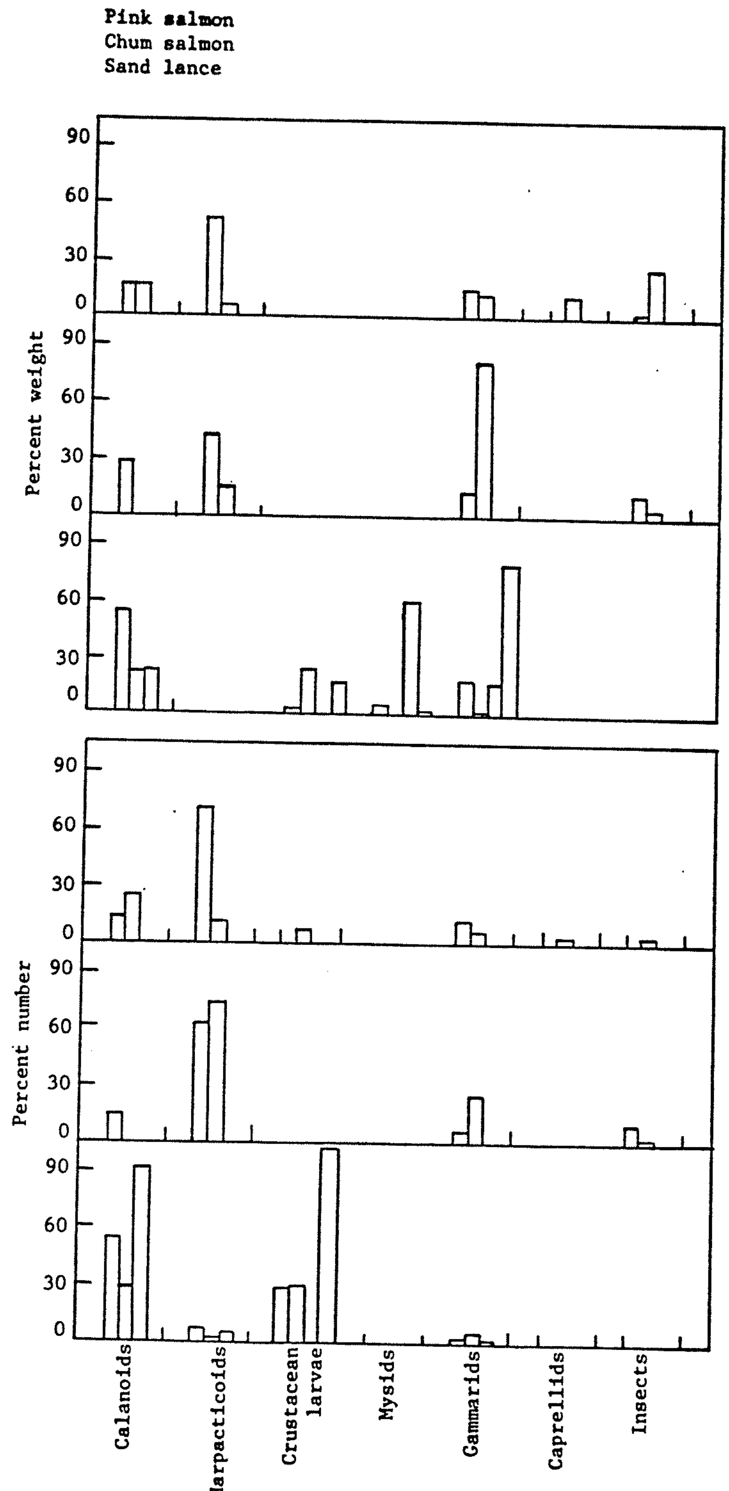

Fig. 7. Percent composition by weight and number of major prey taxa in the diet of pink salmon juveniles (top), chum salmon juveniles (middle), and Pacific sand lance (bottom). Columns indicate feeding by season, with spring on the left and winter on the right.

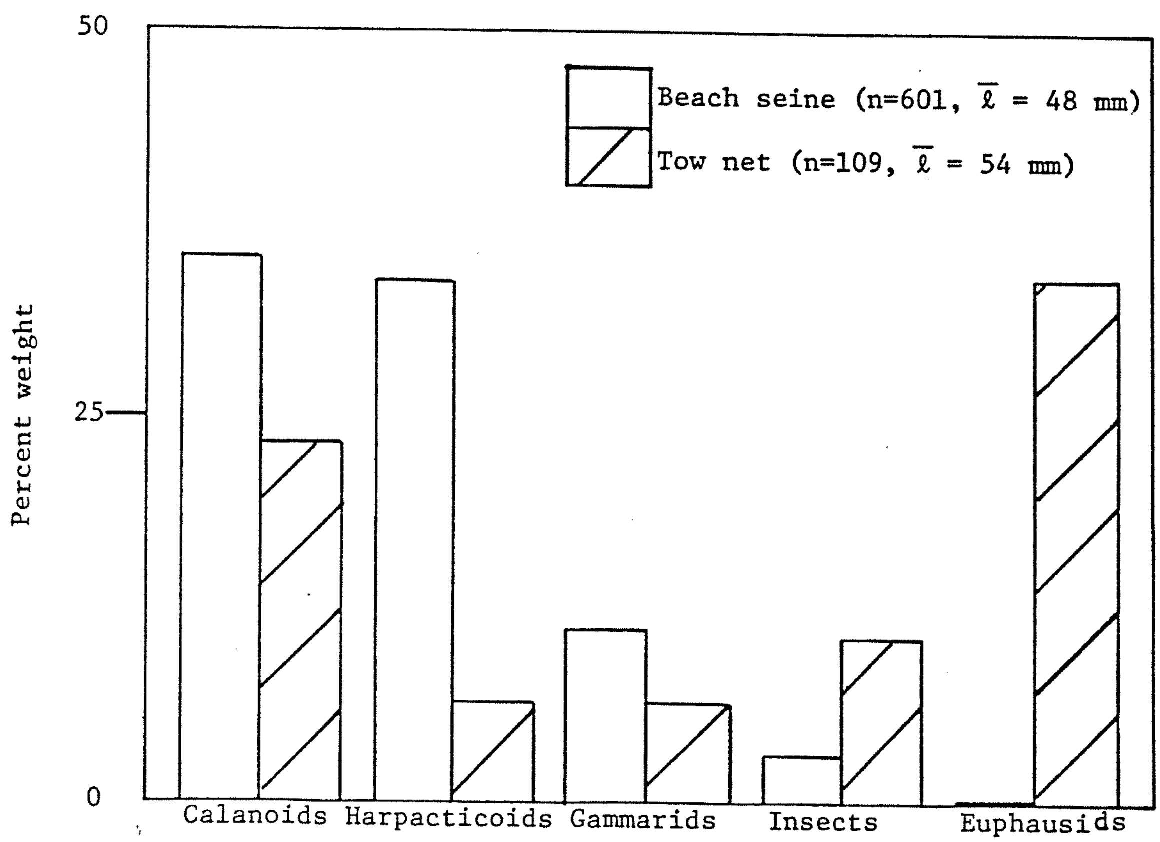

Fig. 8. The average percent composition by weight of major prey taxa in the diet of pink salmon (size class I) caught by beach seine and tow net.

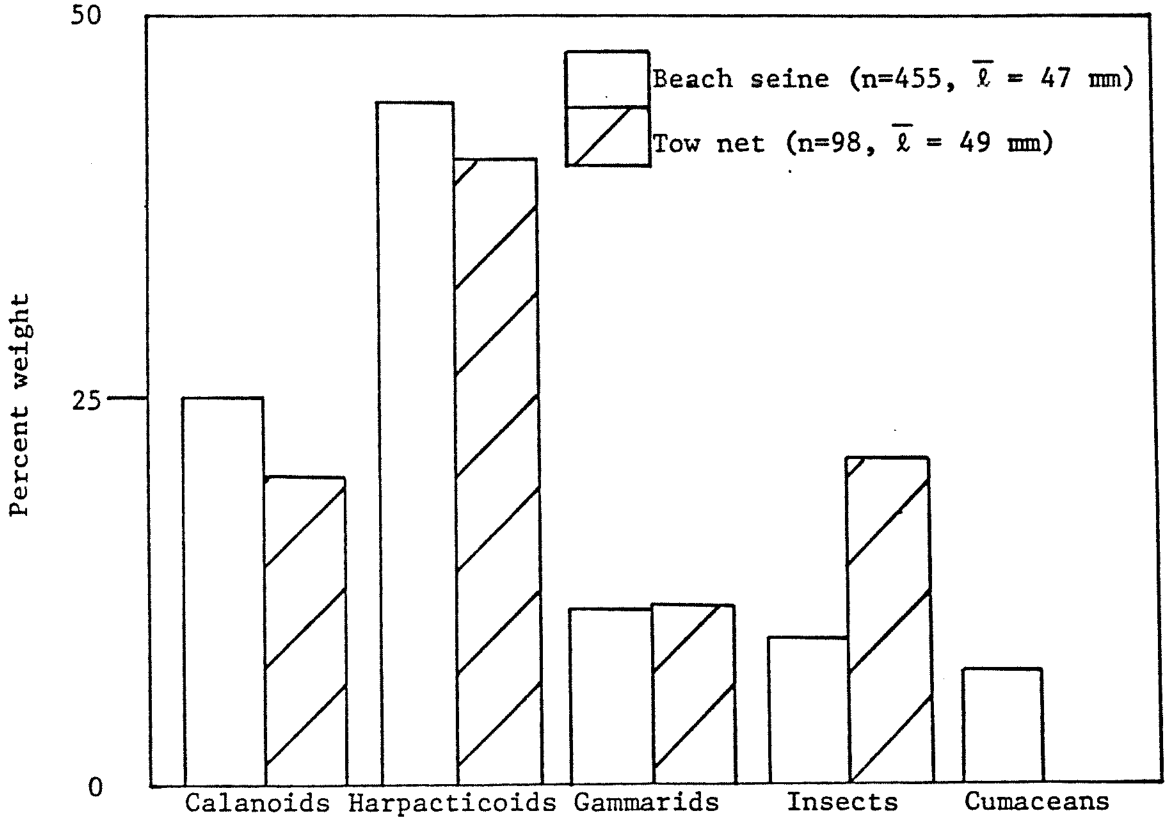

Fig. 9. The average percent composition by weight of major prey taxa in the diet of chum salmon (size class I) caught by beach seine and tow net.

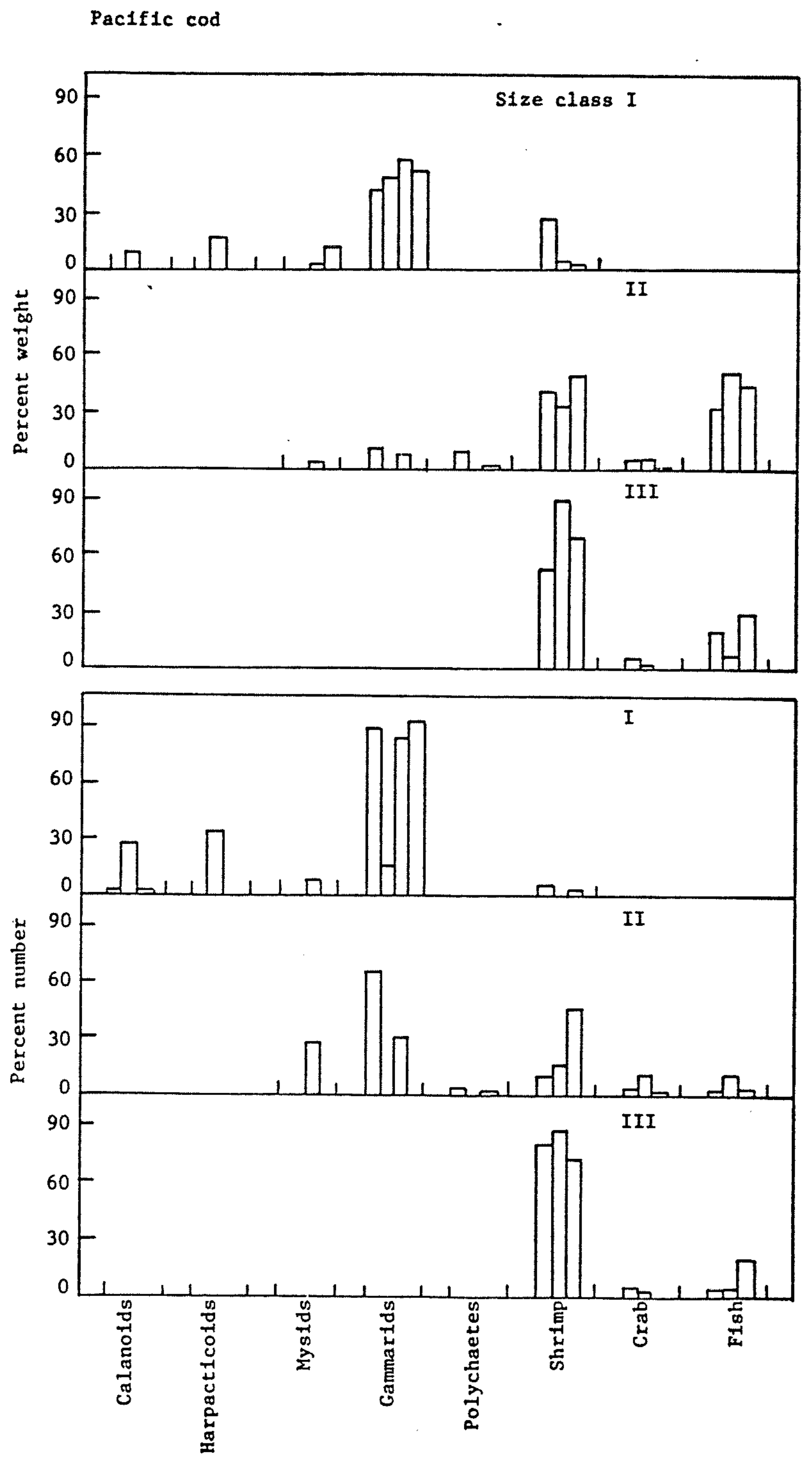

Fig. 10. Percent composition by weight and number of major prey taxa in the diet of Pacific cod. Columns indicate feeding by season, with spring on the left and winter on the right.

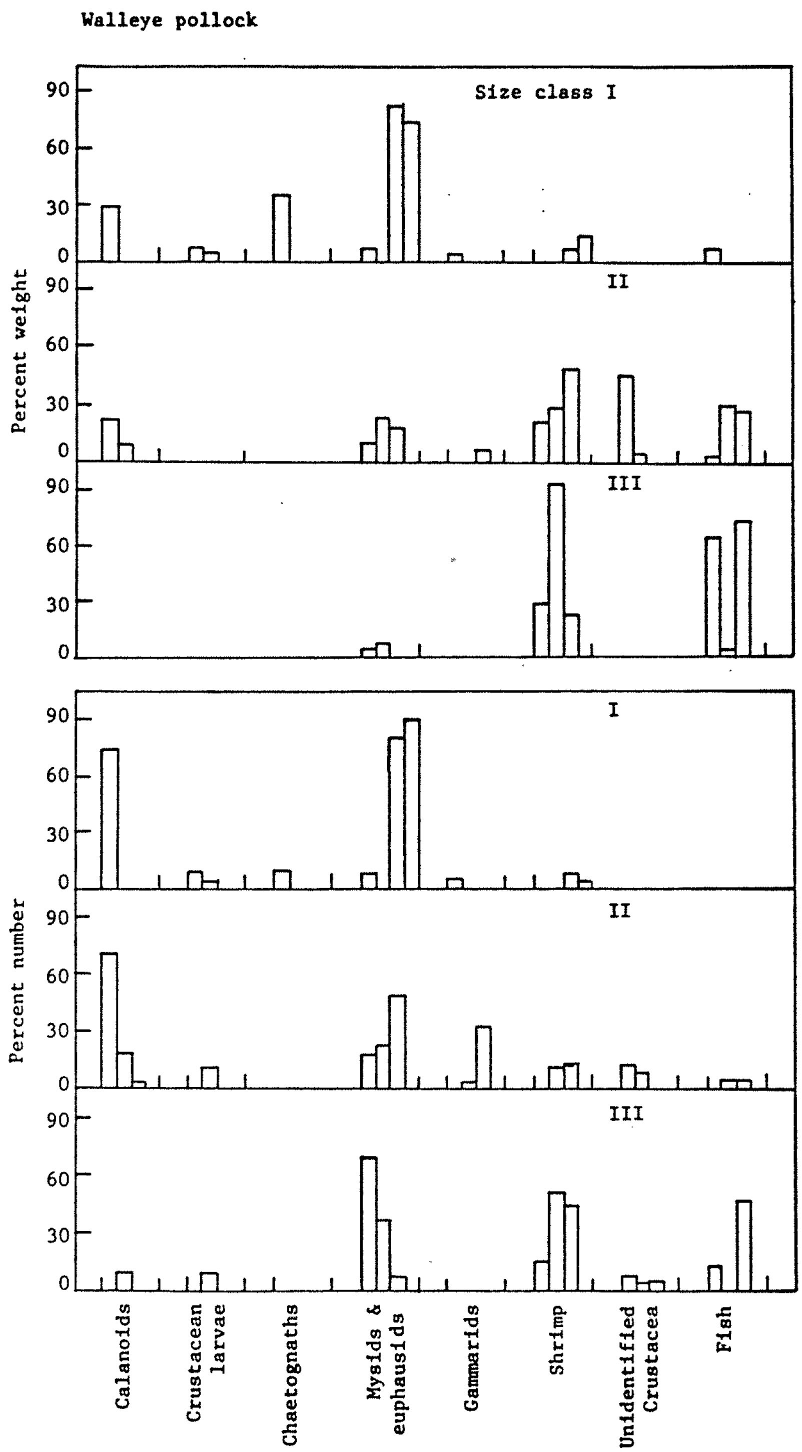

Fig. 11. Percent composition by weight and number of major prey taxa in the diet of walleye pollock. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.

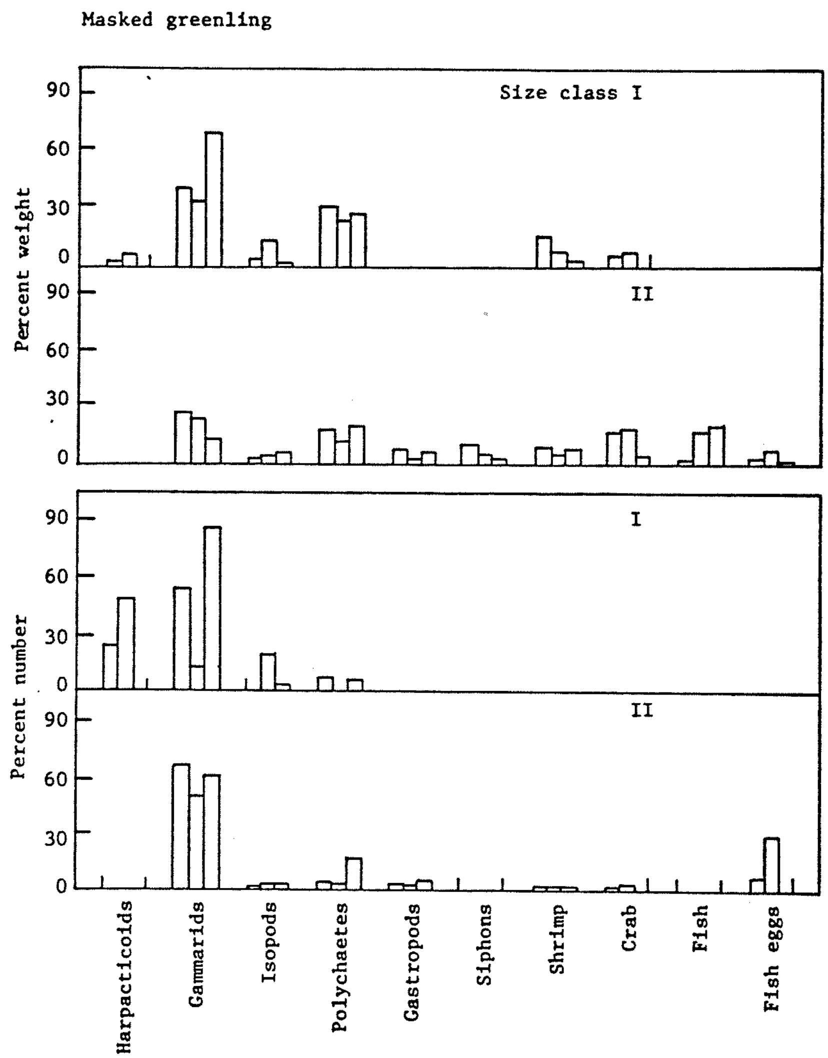

Fig. 12. Percent composition by weight and number of major prey taxa in the diet of masked greenling. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.

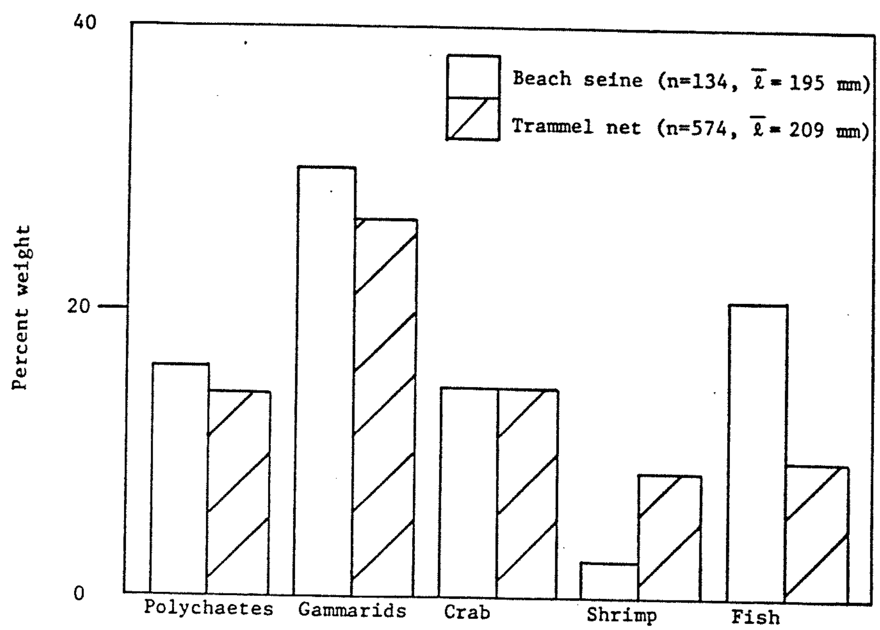

Fig. 13. The average percent composition by weight of major prey taxa in the diet of masked greenling (size class II) caught by beach seine and trammel net.

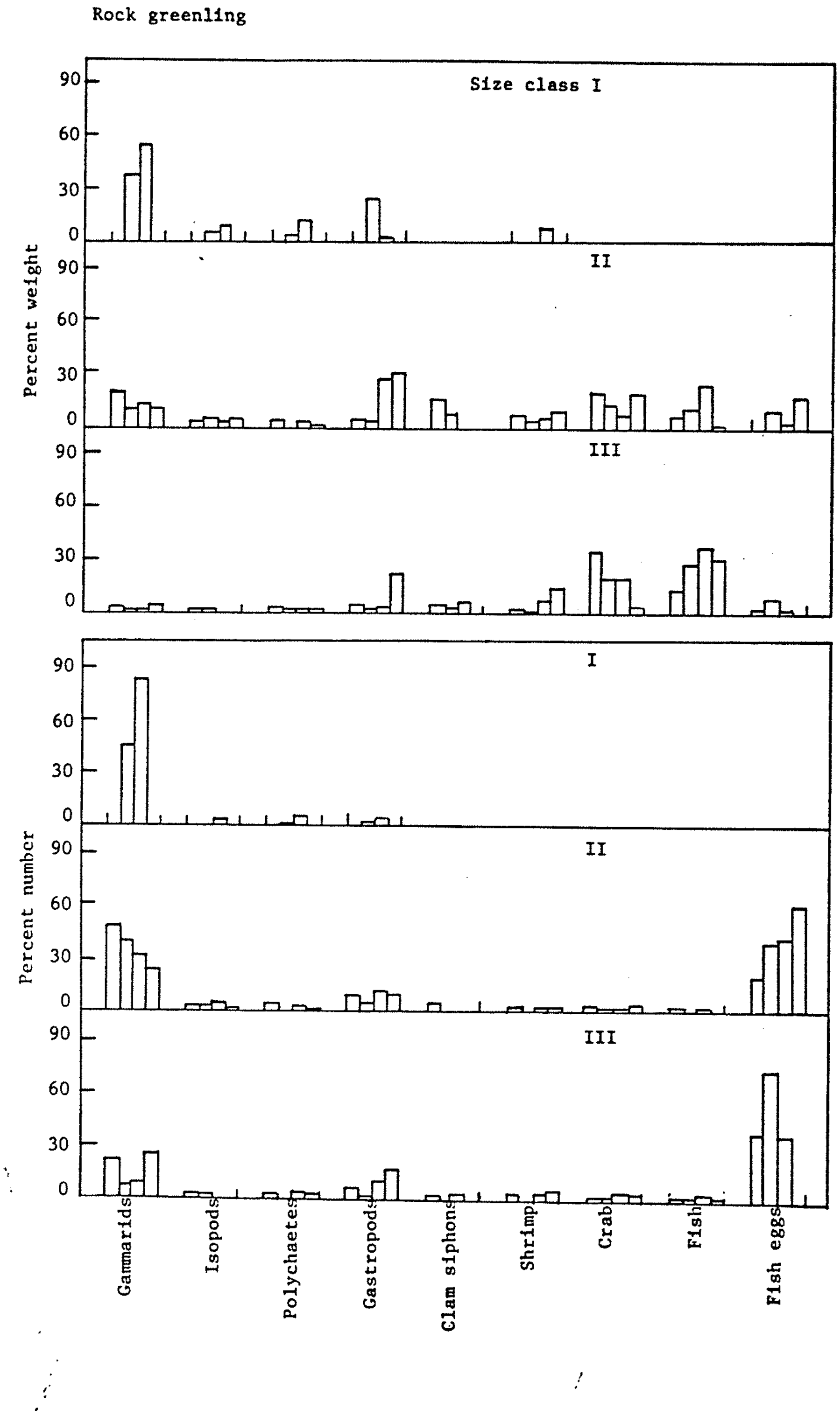

Fig. 14. Percent composition by weight and number of major prey taxa in the diet of rock greenling. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.

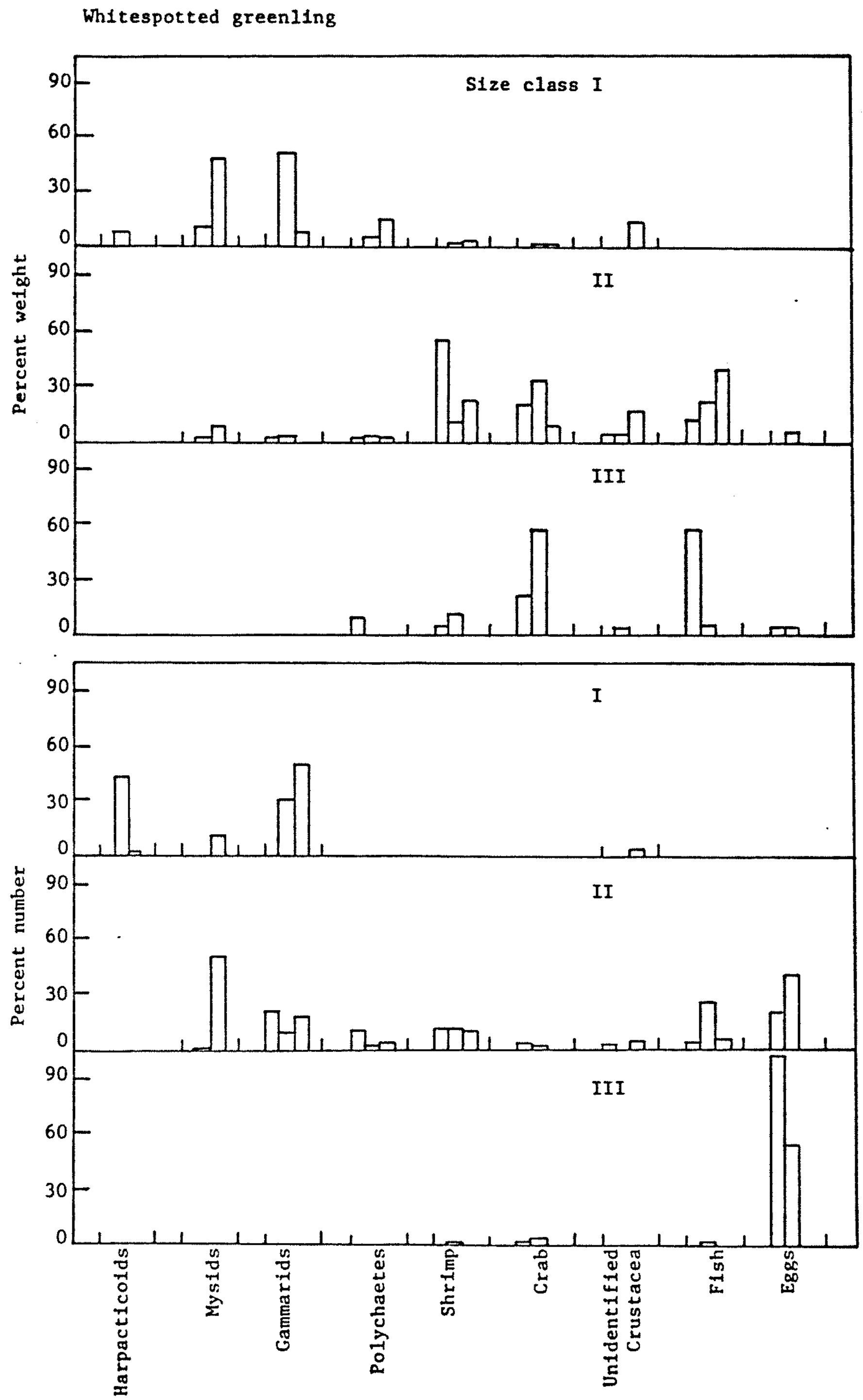

Fig. 15. Percent composition by weight and number of major prey taxa in the diet of whitespotted greenling. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.

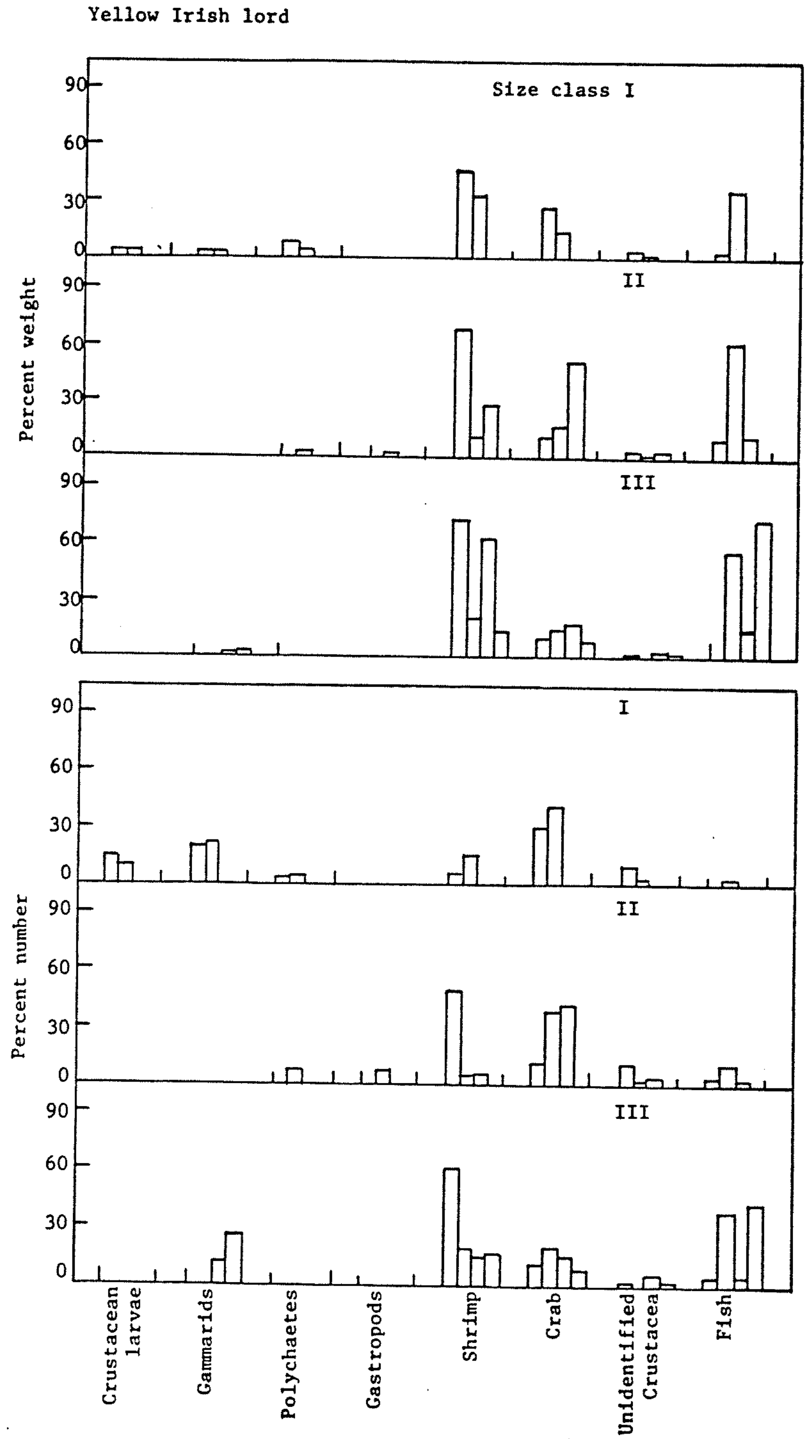

Fig. 16. Percent composition by weight and number of major prey taxa in the diet of yellow Irish lord. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.

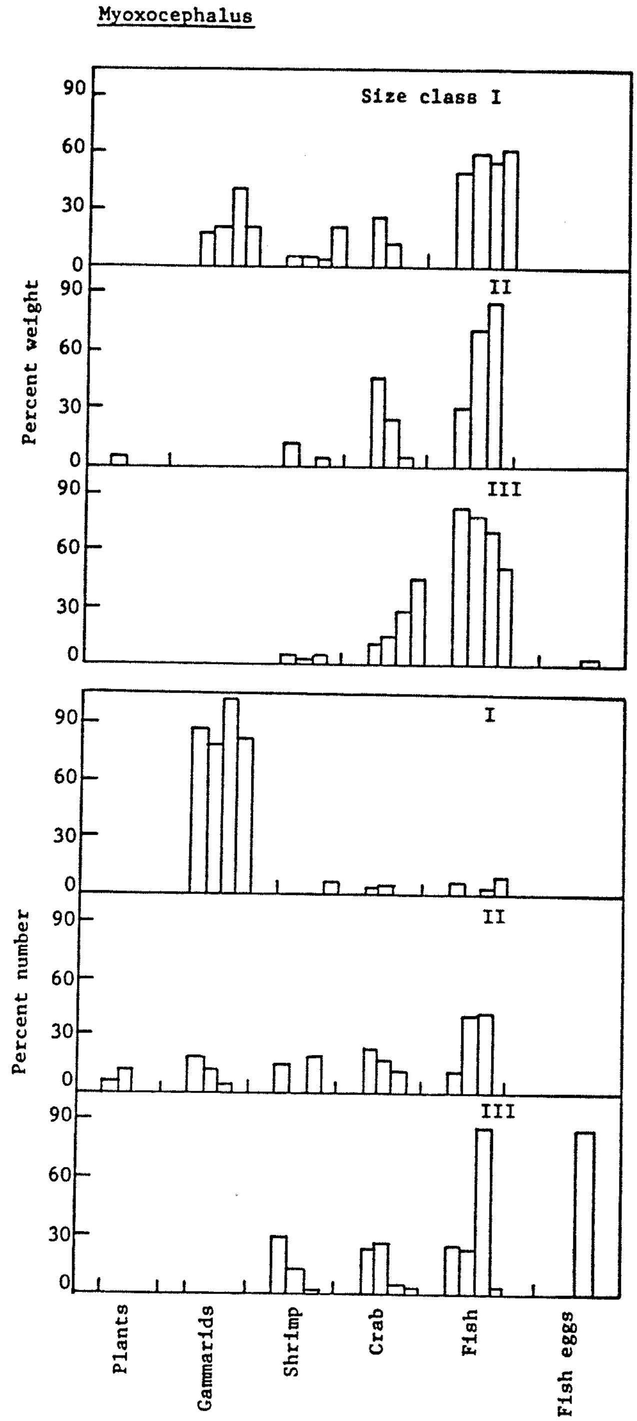

Fig. 17. Percent composition by weight and number of major prey taxa in the diet of Myoxocephalus. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.

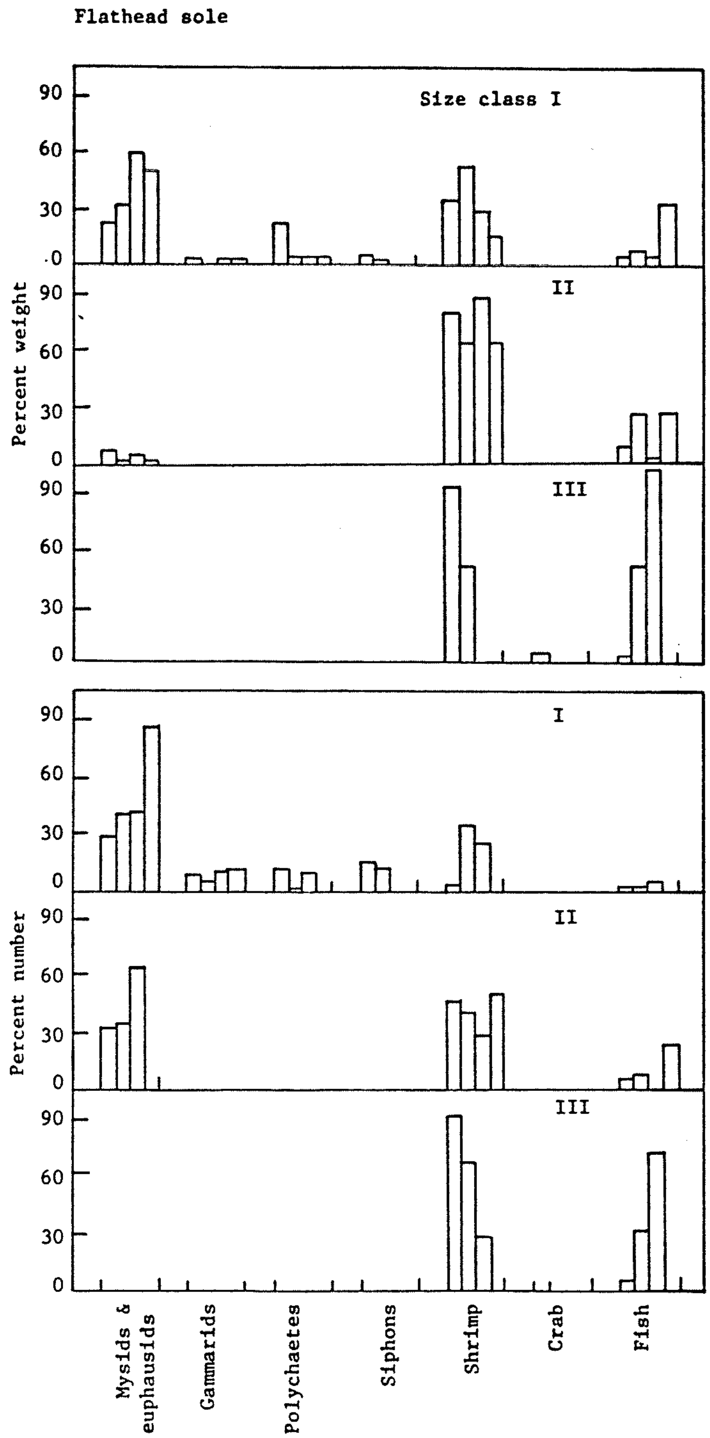

Fig. 18. Percent composition by weight and number of major prey taxa in the diet of flathead sole. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.

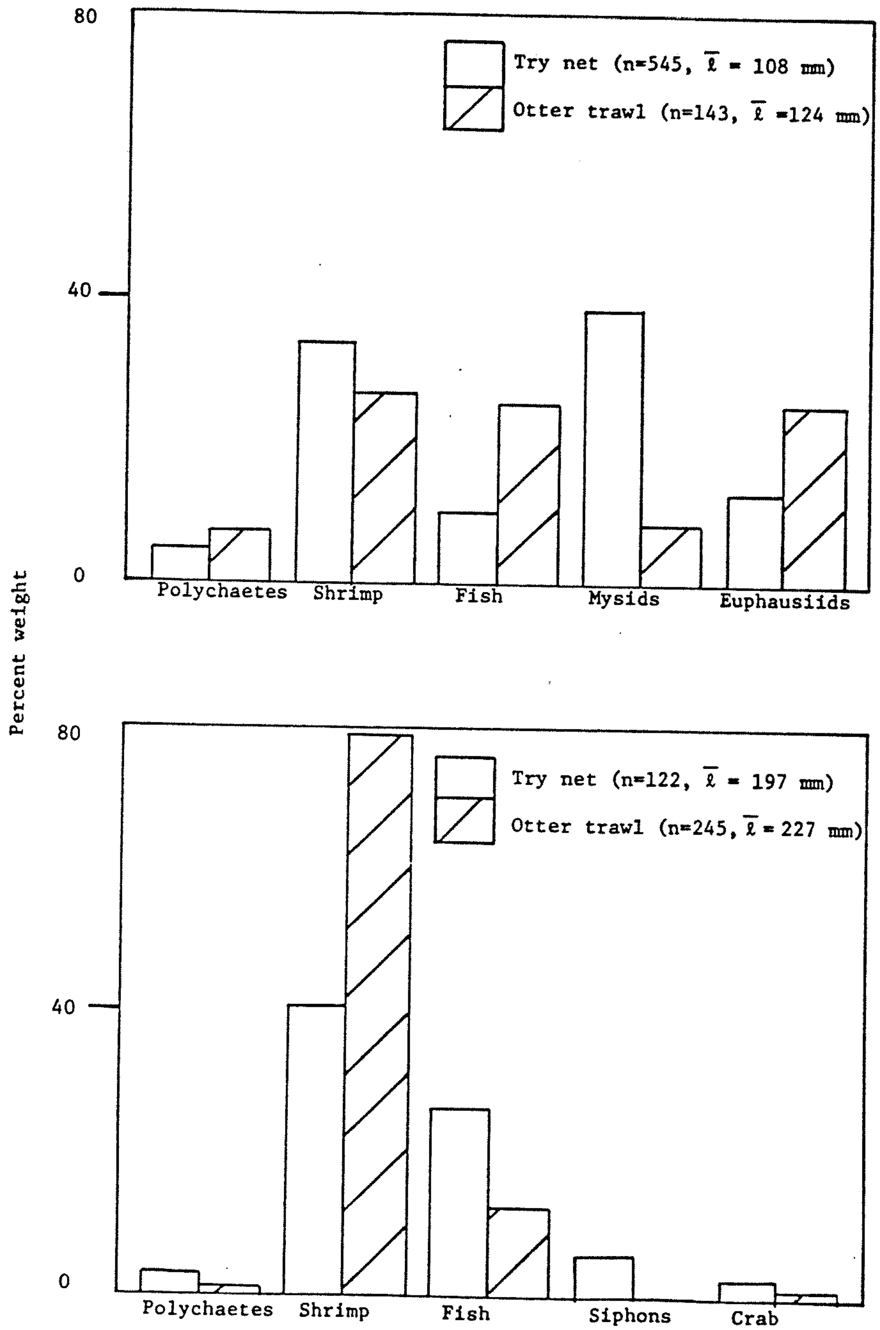

Fig. 19. The average percent composition by weight of major prey taxa in the diet of flathead sole (size classes I, top and II, bottom) caught by try net and otter trawl.

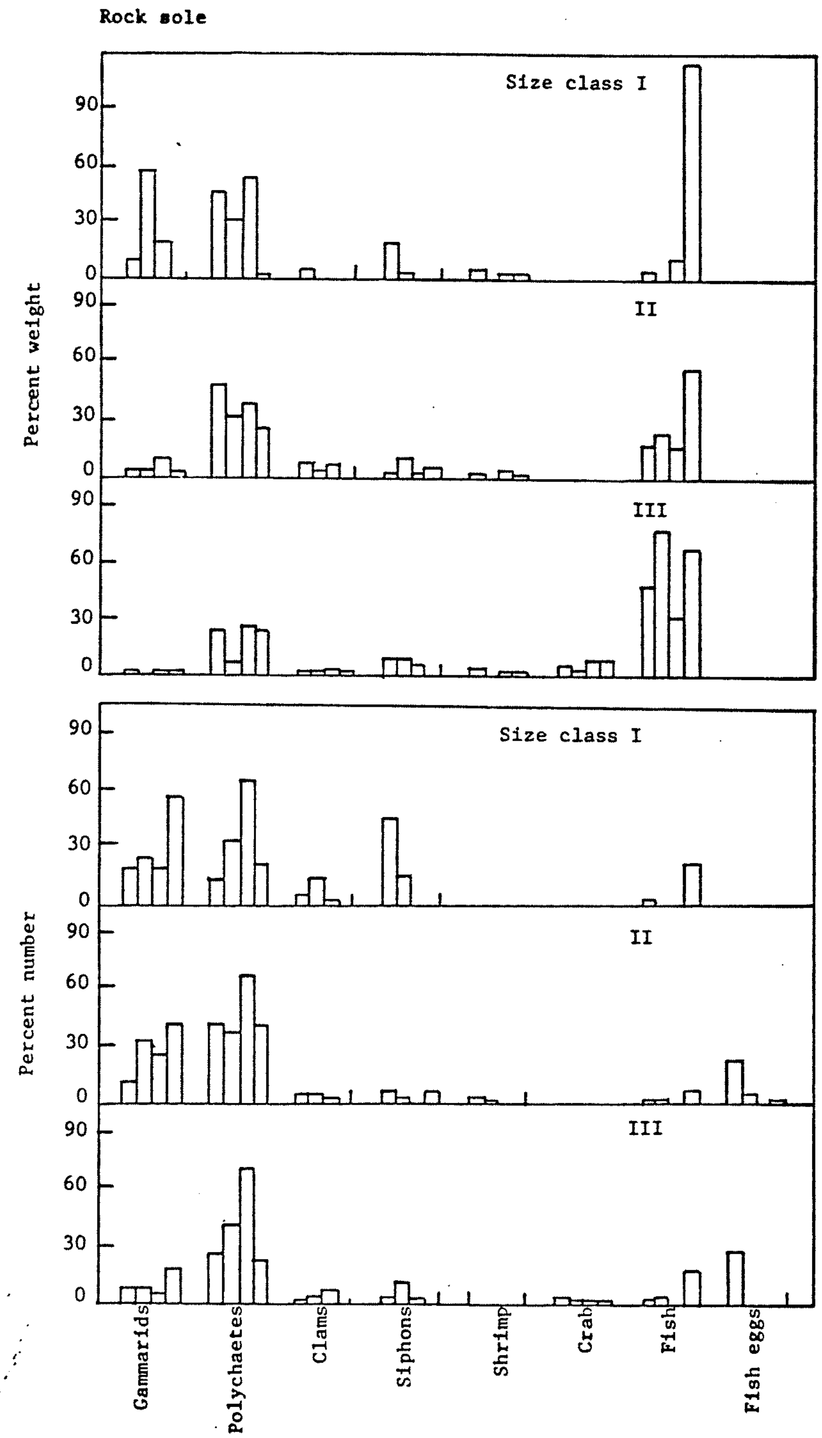

Fig. 20. Percent composition by weight and number of major prey taxa in the diet of rock sole. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.

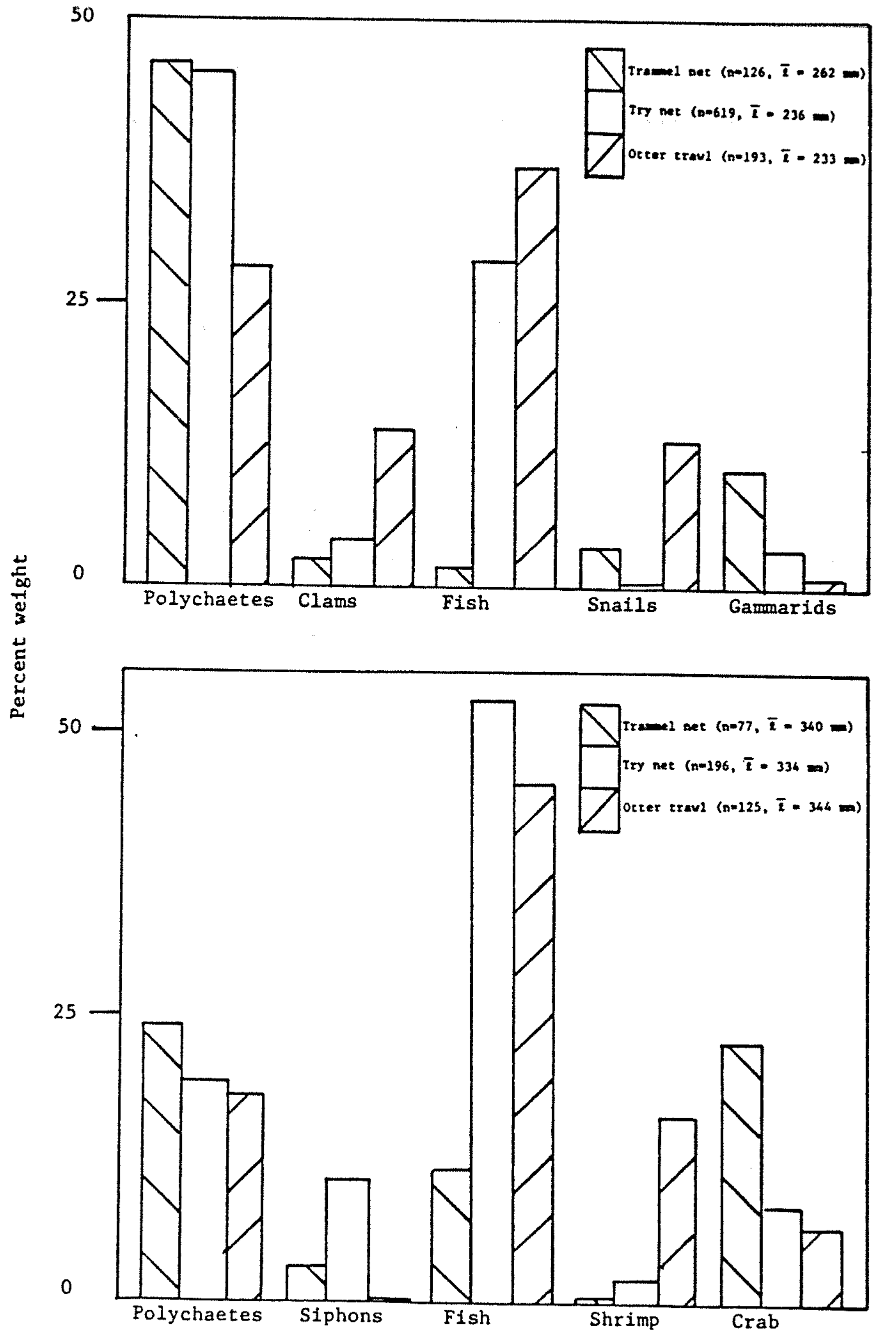

Fig. 21. The average percent composition by weight of major prey taxa in the diet of rock sole (size classes II, top and III, bottom) caught by trammel net, try net, and otter trawl.

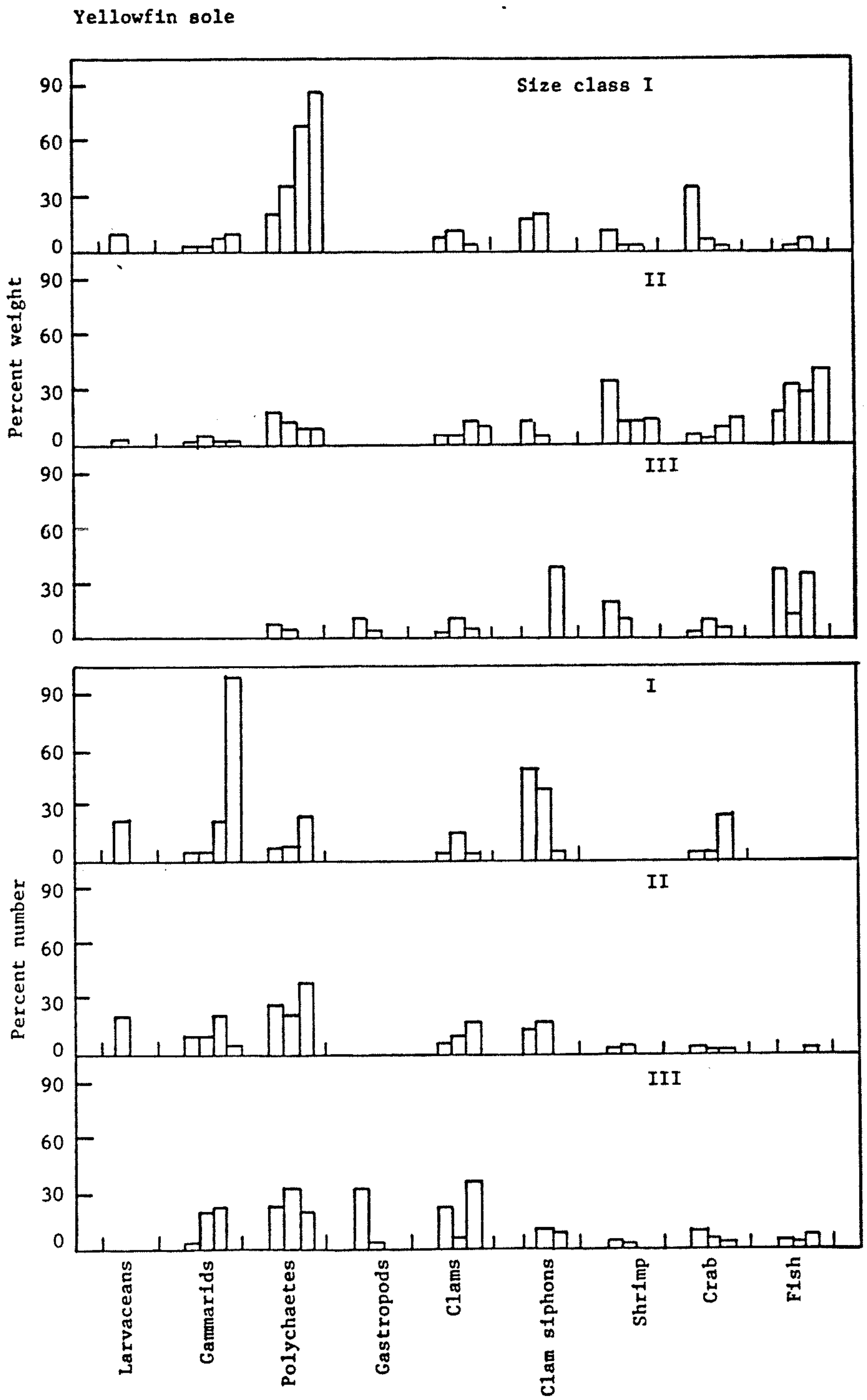

Fig. 22. Percent composition by weight and number of major prey taxa in the diet of yellowfin sole. Columns indicate feeding by season, with spring on the left and winter on the right.

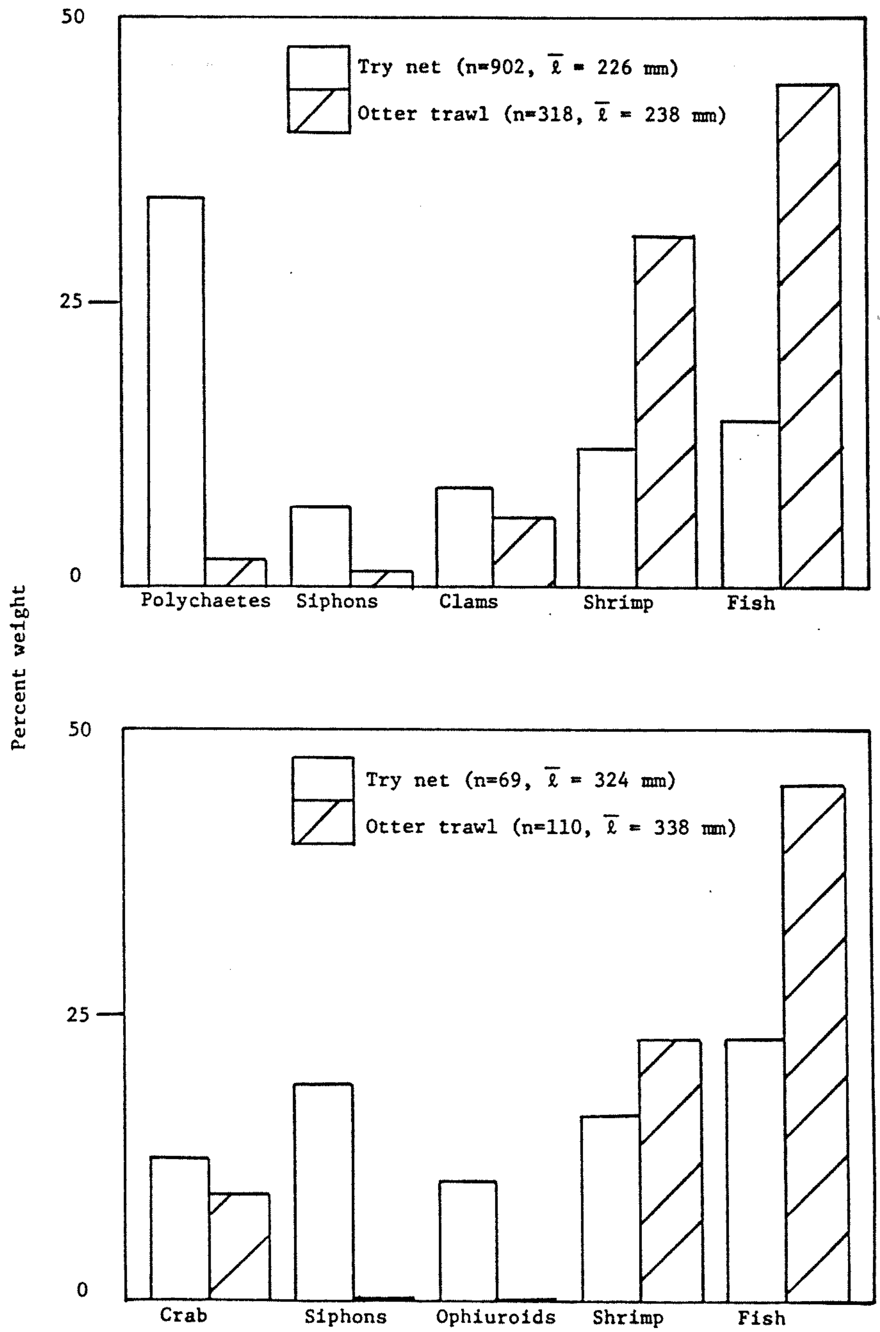

Fig. 23. The average percent composition by weight of major prey taxa in the diet of yellowfin sole (size classes II, top and III, bottom) caught by try net and otter trawl.

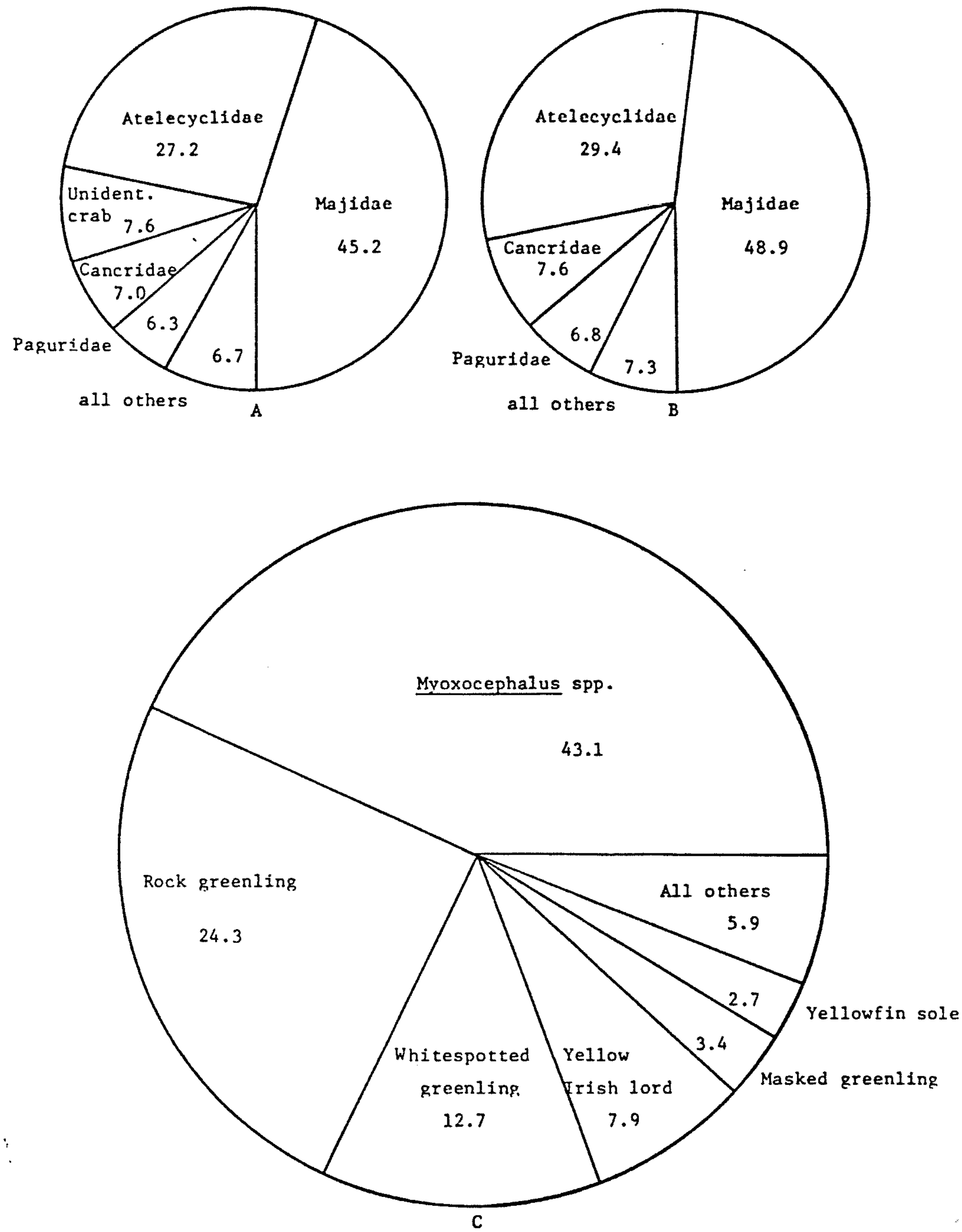

Fig. 24. The percent contribution of each family of crab to the total biomass of crab eaten (A: total crab, B: identifiable crab) and the percent contribution, by weight, of crab to the diet of each species of predator (C).

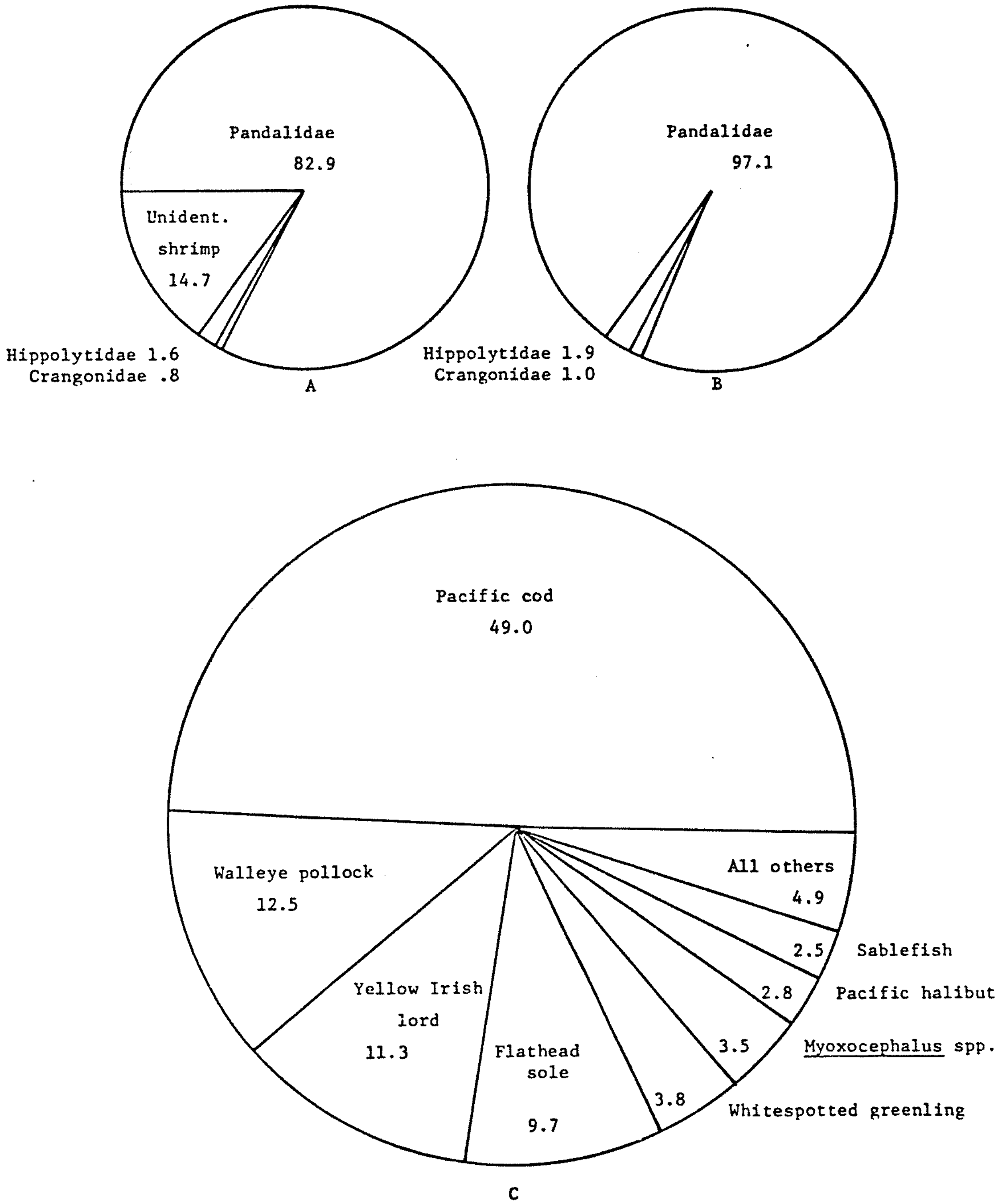

Fig. 25. The percent contribution of each family of shrimp to the total biomass of shrimp eaten (A: total shrimp, B: identifiable shrimp) and the percent contribution, by weight, of shrimp to the diet of each species of predator (C).

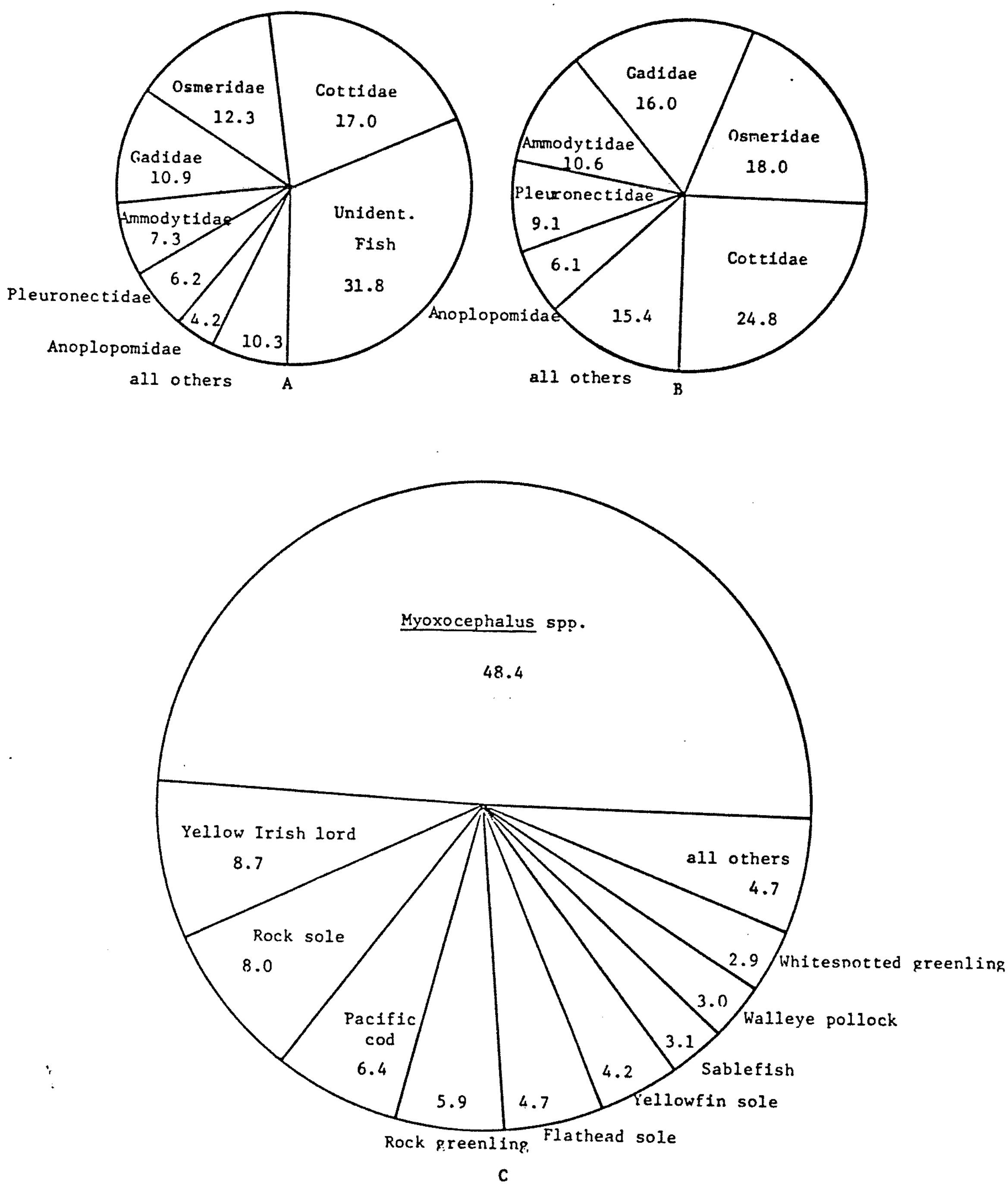

Fig. 26. The percent contribution of each family of fish to the total biomass of fish eaten (A: total fish, B: identifiable fish) and the percent contribution, by weight, of fish to the diet of each species of predator (C).

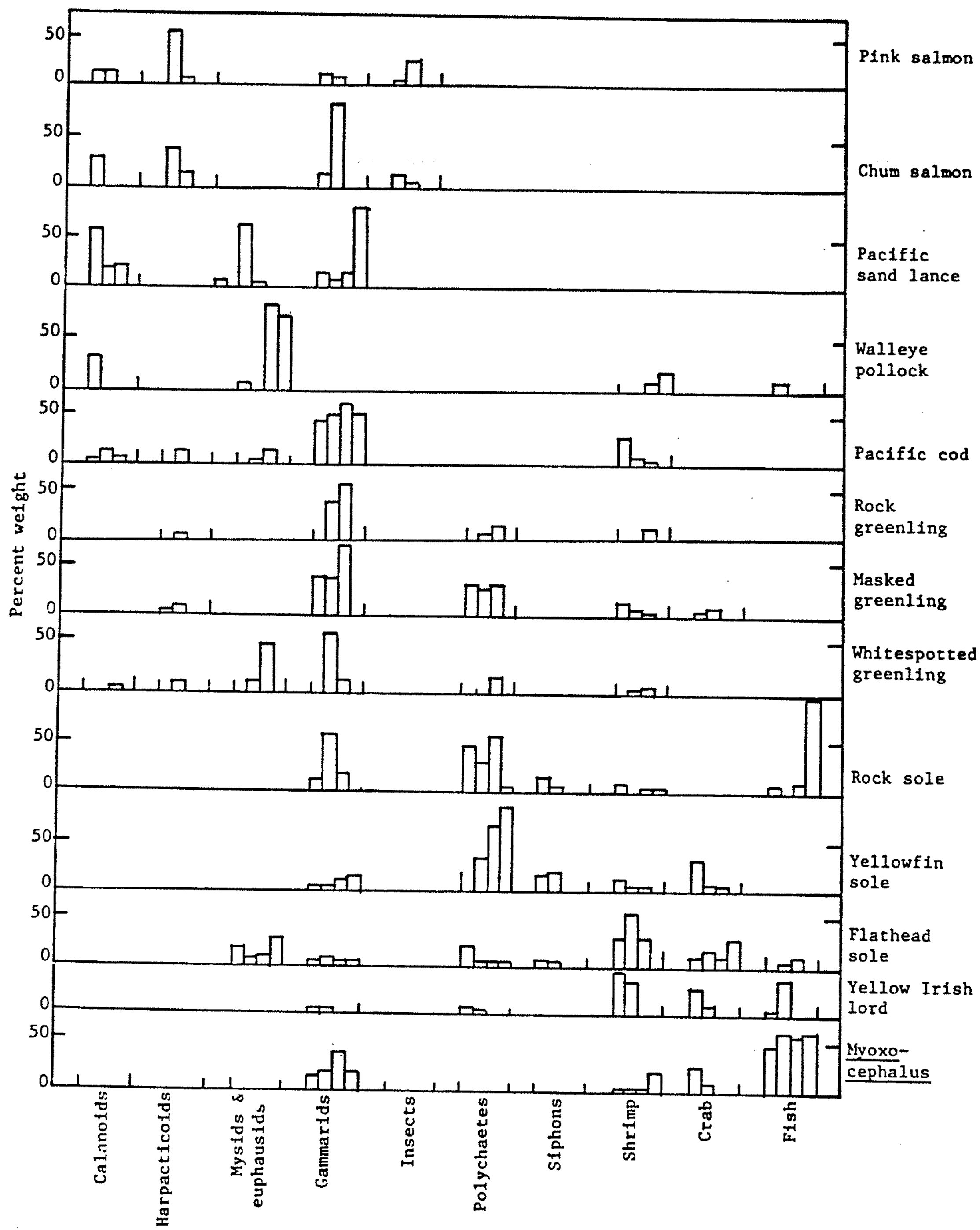

Fig. 27. Percent composition by weight of major prey taxa in stomachs of fish 0 to 150 mm long. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.

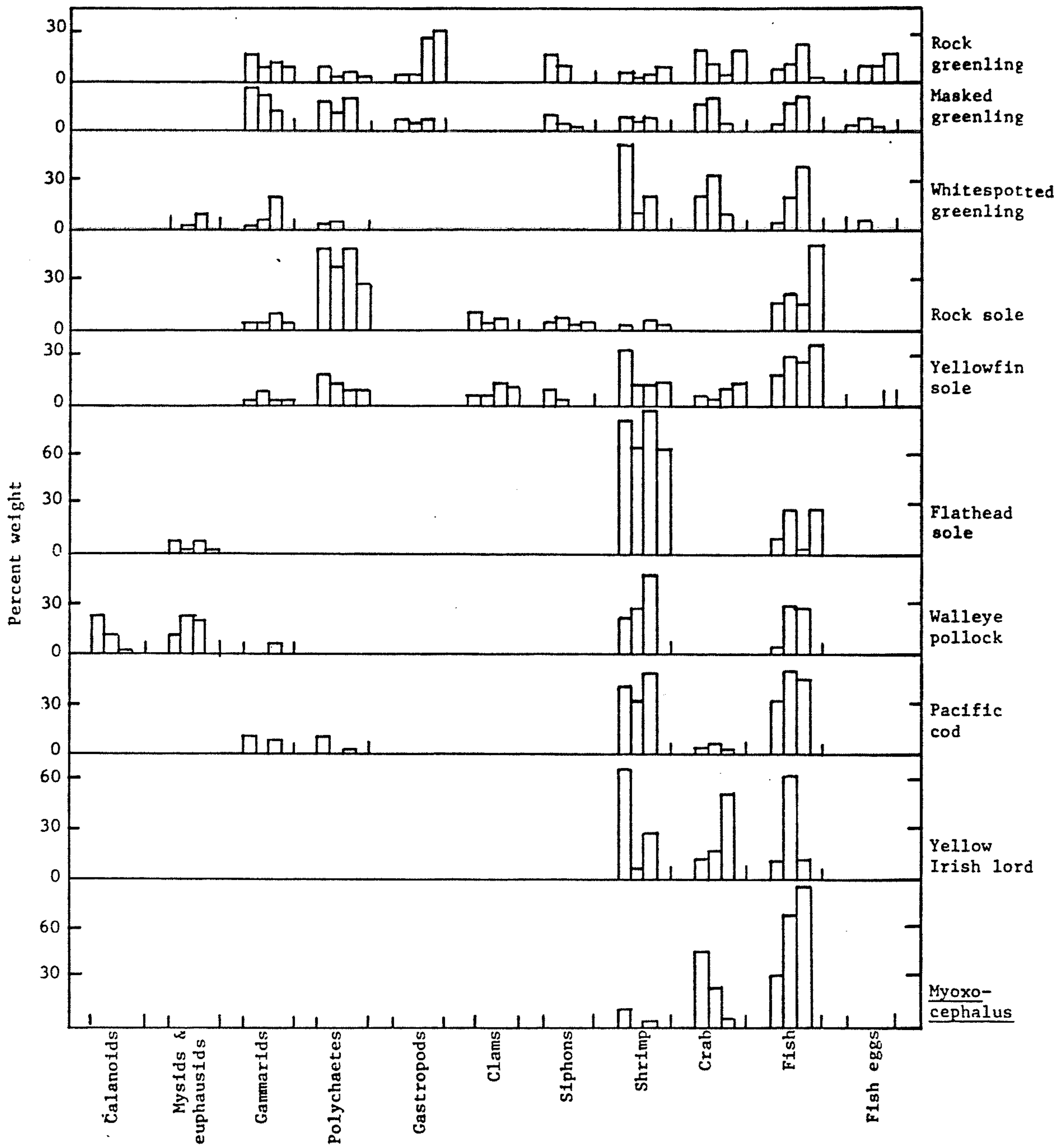

Fig. 28. Percent composition by weight of major prey taxa in stomachs of fish 151 to 300 mm long. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.

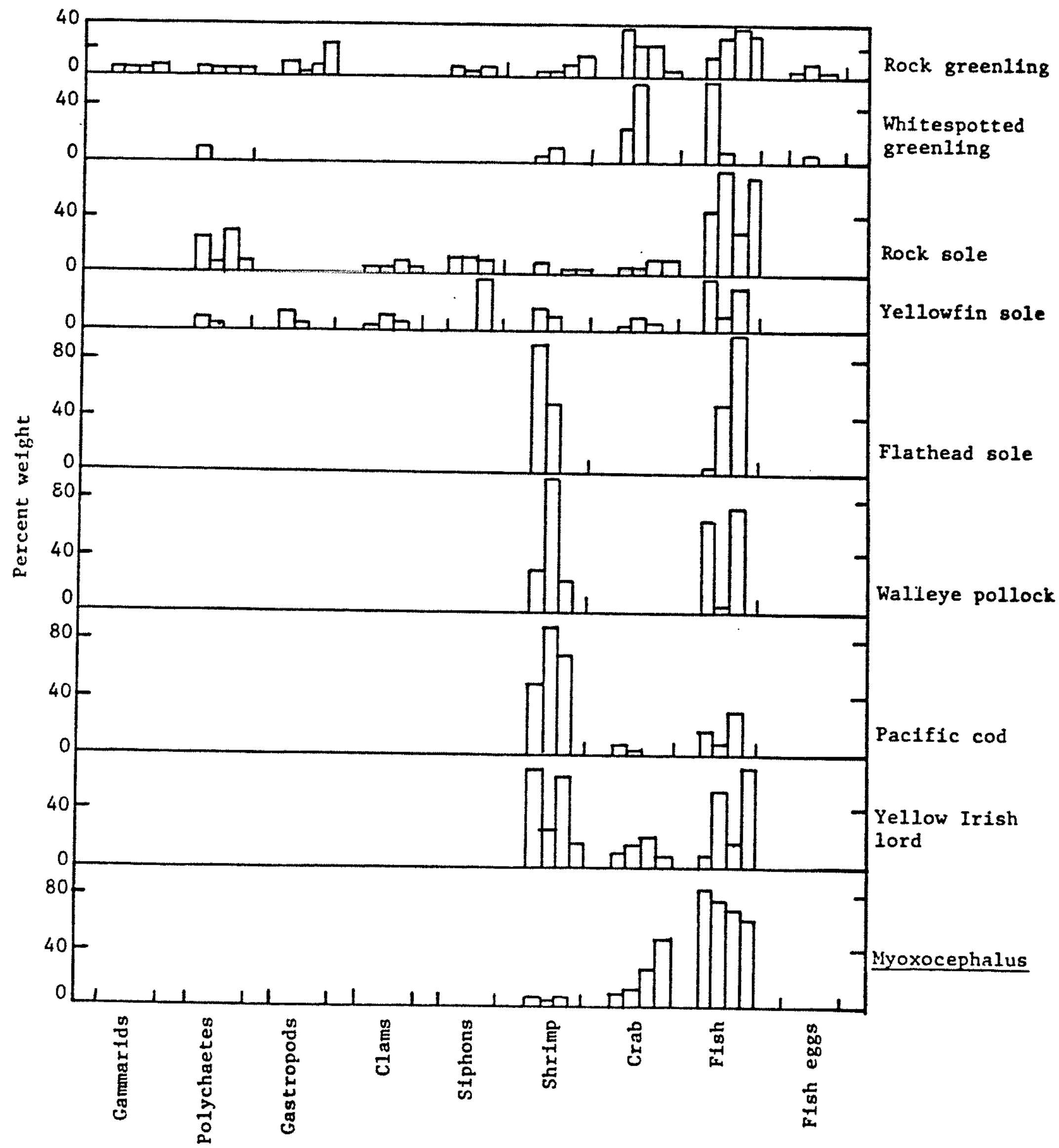

Fig. 29. Percent composition by weight of major prey taxa in stomachs of fish longer than 300 mm. Columns within each taxon indicate feeding by season, with spring on the left and winter on the right.