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**Cruise Report of the R/V TINRO Survey in the Western
Bering Sea, August – October 2006**

by

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ABSTRACT

The present document reviews results of complex epipelagic trawl survey of the western Bering Sea by RV TINRO during August-October 2006. Data on oceanological conditions, distribution and abundance of major zooplankton groups and quantitative distribution of nekton species are provided. The estimates of total quantity and biomass of fishes and cephalopods are provided for epipelagic layer of the western Bering Sea and adjacent Pacific waters. The distributions of different species of Pacific salmon are described in detail. Data on Pacific salmon feeding behavior are provided for different regions of the western Bering Sea. The brief analysis of the contemporary status of plankton and nekton communities of the epipelagic layer of the western Bering Sea is provided.

INTRODUCTION

Ecosystem complex survey of the western Bering Sea and adjacent Pacific waters was carried out during August 24-October 12, 2006. Similar to surveys during previous years, this survey was carried out within framework of TINRO-center's long-term program of fisheries research of the Bering Sea and within framework of BASIS program. The survey initiated in the Anadyr Bay and progresses southwards down to Olyutorsky Bay. The entire survey lasted 50 days, covering upper epipelagic layer of the western Bering Sea (99 stations, 611.0 thousand kilometers²) and adjacent Pacific waters (14 stations, 88.8 thousand kilometers²).

MATERIALS AND METHODS

Oceanographic conditions were sampled at the same approximate location of the trawl tows aboard R/V TINRO. The R/V TINRO used a “Neil Brown” MARK-II CTD to measure temperature and salinity to a maximum depth of 1000 m.

To sample plankton, a Juday net (area of the mouth opening – 0.1 m², capron mesh # 48, mesh size - 0.168 mm) was used aboard the R/V TINRO during both daytime and nighttime hours. Plankton was sampled at every station at the approximate location of the trawl tows. Plankton net was towed in 200-0 m stratum in deep-water areas or between bottom and 0 m in shallow areas. Each plankton sample was divided into 3 fractions - small-sized (less than 1.5 mm), medium-sized (1.5 to 3.5 mm), and large-sized (3.5 mm and more). The biomass was determined using volumeter. When calculating plankton biomass, the following correction factors were set as following: for the small-sized fraction as 1.5, for the medium-sized – 2.0, for the large-sized – euphausiids and chaetognaths shorter than 10 mm – 2.0, for 10 to 20 mm long – 5.0, over 20 mm in length – 10.0. The correction factor for hyperiids shorter than 5 mm – 1.5, 5 – 10 mm long – 5.0, for copepods under 5 mm – 2.0, over 5 mm – 3.0.

The salmon feeding was examined in groups according to body size – 10 to 20 cm, 21 to 30 cm, 31 to 40 cm, 41 to 50 cm, 51 to 60 cm, and greater than 61 cm. The samples including from 10 to 25 stomachs of the same body size group were selected from catches and processed without any prior fixation. Upon weighting the sample the species composition of food, the percentage of most numerous species and other typical parameters were analyzed. The stage of food digestion was evaluated using 5-step scale. The index of stomach fullness was calculated as relation of food mass in the stomach divided by fish body weight times 10,000. The daily food intake was calculated with due regard to feeding peaks. Thus, the daily food intake was counted as overall sum of all prey consumed for every period of time studied.

To sample salmon and other pelagic nekton standard midwater rope trawl PT/TM 80/396 m (the length of the headrope is 80 m, the perimeter of the trawl opening is 396 m) was used. The trawl hydrodynamic plate (6 m², 0.6x10 m) had floats on the headrope. The trawl was 30 m long with quadrangular mesh in the body and wings and small meshed codend. The trawl was fished with 4 bridles, each 100-120 m long and 1.9 cm thick. One 200-220 kg chain is attached to the footrope and two 400 kg weights are attached in front of

the footrope to sink the trawl. The V-shaped conic midwater trawl doors (6 m² and 1.3 tons each) were used. The trawlings were round-the-clock. To achieve the required parameters of research vessel trawling system the trawling course was adjusted according to weather and hydrological conditions. The trawl hydrodynamic plate was maintained at 0 m level (the position of the plate was verified by acoustic readings and by sight), while the length of warps was 245-280 m. The trawl was towed for one hour.

The abundance (in millions of individuals) and the biomass (in thousands of tons) of fishes and cephalopods were calculated by multiplying the average density (individuals/km²) and mass (kg/km²) for the particular species times area of the biostatistical region. The trawlings with the extremely high catches were considered only for the area of trawlings, and these results were not extrapolated for the region as a whole. Salmon tagging with disk tags was continued. During the biological analysis, we recorded various kinds of injuries on Pacific salmon bodies. The type of injury was determined based on its external appearance (Welch et al., 1991; Shuntov et al., 1993, 1994; Radchenko and Semenchenko, 1996; Melnikov, 1997; Balanov and Radchenko, 1998). Parasitological samples (including examination for sea lice presence) were also collected. The results of ongoing parasitological research will be reported in the future publications. All results of the R/V TINRO survey presented in this report were averaged by 13 statistical regions (Shuntov etc., 1988).

RESULTS AND DISCUSSION

Oceanographic observations

In 2006 autumn cooling of surface waters over deep-water areas did not exceed 1-2°C, resulting in relatively high surface temperatures (Fig. 1). Positive temperature anomalies (+1.5 - 2.5°C) were observed in upper 15-25 m throughout the survey area (except for some shallow areas) as compared to previous years averages.

Sea surface salinity exhibited stable increase seawards (Fig. 1). Navarin current showed increases SSS values. Maximum SSS (32.97) was observed in mainstream of Central Bering Sea Current (most eastern survey area). Offshore areas of Commander Basin exhibited lower SSS (32.51), as compared to such parts of Aleutian Basin (32.68).

Pacific salmon research results

During summer-autumn period of 2006 Pacific salmon constituted majority of nekton species overall biomass in upper epipelagic layer of the western Bering Sea, with chum

salmon having greatest abundance (31.1%). Immature chum salmon was the most among Pacific salmon. Immature chum exhibited peak densities in Aleutian and Commander Basins (3801 and 1660 inds./km² (Fig. 2). In the Navarin shelf area immature chum abundance was relatively low (up to 123 inds./h or 1063 inds./km²).

Similar to immature chum salmon, mature chum salmon were distributed throughout the entire survey area (Fig. 3). Mature chum salmon concentrated in coastal areas and along the boundary of Russian EEZ. Highest densities were observed in Anadyr Bay (up to 153 inds./km), Navarin Shelf (up to 104 inds./km²) and Koryak region (up to 122 inds./km²). Relatively high densities were observed in Commander Basin nearby Blizhny Strait (84 inds./km²).

Juvenile chum salmon were observed in south-western Bering Sea only (except for two trawl stations in Pacific waters off Kamchatka. Majority of juvenile chum salmon was observed nearby Olyutorsky and Karaginsky Bays (up to 2578 inds./km² and 582 inds./km², respectively) and in the central part of 12 biostatistical region (560 inds./km²).

High abundance of Asian sockeye salmon during recent years is well substantiated by results of autumn high-seas surveys and escapement statistics for Kamchatka region. In 2006 similar situation was observed in 2006. Sockeye salmon was observed throughout the entire western Bering Sea (84.4% occurrence). Majority of sockeye salmon catches was composed of immature individuals (Figure 4).

Abundance of juvenile sockeye salmon was relatively high, whereas only 3 mature sockeye salmon individuals were caught.

Immature chinook salmon was unevenly distributed throughout the entire survey area (1-14 inds./h, occurrence rate – 47.8%) (Figure 5). Higher catch rates were observed at the eastern boundary of survey region (6-14 inds./h, 42-120 inds./km²).

The abundance of mature coho salmon was very low throughout the survey area. Juvenile coho salmon was observed in the western Bering Sea primarily in the deep-water areas (Figure 6).

Spatial allocation of juvenile pink salmon during 2006 survey differed drastically as compared to 2002 and 2004 survey data. Contrary to 2002 and 2004 in August-early September 2006, no juvenile pink salmon were observed in the northern shelf and Koryak coast area. Earliest catches of pink salmon (31-64 inds./h) were recorded in the southern Aleutian Basin nearby Russian EEZ (Figure 7).

Majority of juvenile pink salmon was concentrated in Commander Basin (3-3983 inds./h) No active migrations of juvenile pink salmon towards Commander Islands straits were observed. The other distinctive feature of 2006 was high juvenile pink salmon abundance in western Bering Sea and uneven distribution in this area (6-26559 inds./km², average – 2170 inds./km²). Total survey estimates of juvenile pink salmon in 2006 reach 645.1 mln. inds. and 51.79 th. t. Juvenile pink salmon abundance in southwestern Bering Sea (Olyutorsky and Karaginsky Bays stocks of pink salmon) was estimated to be 644.6 mln. inds.

Pacific salmon feeding behavior

In Olyutorsky Bay juvenile chum salmon consumed primarily Pteropoda (*Limacina helicina*) (31-81% of daily food ratio) and appendicularians (19-100%). In the Aleutian Basin 74% of daily ration was composed of Copepoda (*Eucalanus bungii*), and Amphipoda (*Themisto pacifica*). In the Commander Basin (12 biostatistical region) Pteropoda (*L. helicina*) were major food items of juvenile chum salmon (36-57% of stomach content). Also Decapoda zoea (23%), early maturity stages of Amphipoda (15-17%) and Euphausiacea (8-10%) were important food items (Table 1).

In the shelf and basin areas chum salmon (FL=30-40 cm) fed primarily (12-70% of food ration) of fish species (walleye pollock and northern lampfish). Euphausiacea were other important food item in Koryak shelf and Aleutian Basin (31-50%). In the northern shelf areas and Koryak shelf appendicularians and pteropods were of high importance (65 and 51%, respectively).

Food ration of 40-50 cm chum salmon was relatively similar to that of 30-40 cm chum salmon (Table 1). Food ration of 50-60 cm chum salmon was comprised primarily by fishes and appendicularians. Chum salmon greater 60 cm had increased quantity of digested food in their stomachs (Table 1, 2).

Juvenile pink salmon consumed primarily Euphausiacea, Copepoda, Amphipoda (basin areas) and Pteropoda (shelf areas) (Table 3). In Pacific waters of Commander Islands juvenile pink salmon fed primarily on Euphausiacea, Amphipoda and Cephalopoda larvae (Table 4).

Different size groups of sockeye salmon exhibited similar feeding behavior in the Bering Sea (Table 5) with Euphausiacea (primarily early stages of *Th. longipes*) and Pteropoda (exclusively *L. helicina*) being major food components. In Pacific waters off

Commander Islands larger sockeye salmon had a lower proportion of Euphausiacea and higher proportion of nekton species in their stomachs, as compared to smaller sockeye salmon (Table 4).

In the Bering Sea chinook salmon of 10-30 cm fed primarily on juvenile walleye pollock. Euphausiacea were of lower importance. Large size chinook salmon consumed almost exclusively nekton species (fishes and squids) (Table 6). In the Pacific waters off Commander Islands 20-30 cm chinook salmon fed exclusively on Amphipoda (Table 7).

Coho salmon. In the Bering Sea basin areas coho salmon of 20-40 cm fed exclusively on juvenile walleye pollock (Table 8). In Pacific waters off Commander Islands coho salmon fed primarily on fish species (70-100% of food ration) (Table 7).

Plankton research

During the survey phytoplankton abundance was relatively low (Table 9). Similar to previous years of research, small-size fraction of zooplankton concentrated in surface waters. Biomass of small-size fraction was low (2.5 – 10.5% of overall zooplankton biomass in upper epipelagic layer) (Table 10-12). In the western Bering Sea biomass of medium-size fraction of zooplankton was 1.5 – 3 times higher than that of small-size fraction. The proportion of biomass of medium-size fraction of zooplankton in upper epipelagic layer ranged between 4.5 (4 biostatistical area) and 29.2% (9 biostatistical area) (Table 11-12). Medium-sized fraction of zooplankton was unevenly distributed throughout the survey area with peak values (up to 400 mg/m³) in Anadyr shelf, Koryak shelf break area and Olyutorsky Bay.

Large-size fraction of zooplankton dominated among size fractions of the upper epipelagic layer of western Bering Sea. It accounted for 61.7-90.9% and 74.7-92.0% of total zooplankton biomass in upper epipelagic layer and epipelagic layer, respectively (Table 11-12). Large-size fraction of zooplankton was unevenly distributed throughout the survey area. Increased concentrations of large-size fraction of zooplankton were (higher than 500 mg/m³) were observed in Anadyr shelf, Aleutian Basin, Koryak shelf break and southern Commander Basin. Throughout the entire western Bering Sea Copepoda and Sagitta dominated large-size fraction of zooplankton.

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Table 1

Chum salmon diet composition (%) in the western Bering Sea during August 24 – October 12, 2006

Food item	Biostatistical areas																	
	8	9	12	9	10	12	3	5	7	8	9	12	3	5	7	8	9	12
	Size group, cm																	
	10.1-20			20.1-30			30.1-40						40.1-50					
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Euphausiacea	0.0	0.0	8.4	0.0	0.0	10.4	15.0	10.7	49.5	31.2	0.0	0.3	23.9	0.0	6.9	22.1	0.0	5.5
Thysanoessa longipes	0.0	0.0	0.6	0.0	0.0	7.0	0.0	0.0	0.0	17.4	0.0	0.0	0.0	0.0	4.7	19.4	0.0	5.5
Th. longipes (furcilia)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0
Th. inermis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	10.6	0.0	1.3	0.0	0.0	0.0
Th. inermis (furcilia)	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0
Furcilia sp.	0.0	0.0	7.9	0.0	0.0	0.0	15.0	10.7	49.5	9.3	0.0	0.0	13.3	0.0	0.8	1.5	0.0	0.0
Euphausia sp	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0
Amphipoda	25.8	7.7	14.6	0.0	0.0	16.8	0.0	2.3	28.3	10.4	0.0	2.8	0.0	1.4	45.5	4.9	0.0	0.6
Themisto pacifica	25.8	7.7	14.6	0.0	0.0	16.8	0.0	2.3	28.3	10.4	0.0	2.8	0.0	1.4	45.5	4.9	0.0	0.5
Th. libellula	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Primno macropa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2
Amphipoda gen sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Copepoda	74.2	0.0	6.2	0.0	0.0	2.7	10.0	5.2	0.0	8.8	0.0	0.0	0.0	0.0	0.0	6.8	0.0	0.0
Neocalanus cristatus	0.0	0.0	6.2	0.0	0.0	2.7	10.0	5.2	0.0	5.6	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0
Eucalanus bungii	74.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0
Decapoda	0.0	0.0	2.3	0.0	0.0	23.1	10.0	12.1	0.0	8.5	0.0	0.5	0.0	0.0	0.0	6.0	0.0	0.1
Decapoda sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Decapoda zoea	0.0	0.0	2.3	0.0	0.0	23.1	10.0	12.1	0.0	8.5	0.0	0.4	0.0	0.0	0.0	6.0	0.0	0.0
Pteropoda	0.0	30.9	56.7	81.3	0.0	36.1	0.0	0.0	5.7	0.5	51.0	12.0	0.0	0.0	4.7	1.4	53.8	2.0
Limacina helicina	0.0	30.9	56.7	81.3	0.0	36.1	0.0	0.0	5.7	0.5	51.0	12.0	0.0	0.0	4.7	1.4	53.8	2.0
Tunicata	0.0	61.4	0.0	18.7	100.0	0.0	65.0	0.0	16.5	0.8	9.8	2.7	76.1	0.0	43.0	0.4	0.0	0.0
Oikopleura labrador.	0.0	61.4	0.0	18.7	100.0	0.0	65.0	0.0	16.5	0.8	9.8	2.7	76.1	0.0	43.0	0.4	0.0	0.0
Coelenterata	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	6.0
Aglantha digitale	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	6.0

Table 1 continued.

Food item	Biostatistical areas																	
	8	9	12	9	10	12	3	5	7	8	9	12	3	5	7	8	9	12
	Size group, cm																	
	10.1-20			20.1-30			30.1-40						40.1-50					
	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
Cephalopoda	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.5	0.0	0.0	0.0	6.3	0.0	3.2
Gonatopsis borealis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1
Gonatus kamtschatikus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Cephalopoda sp. (juv.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.4	0.0	0.0
Cephalopoda sp. (larvae)	0.0	0.0	0.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.4
Cephalopoda sp	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.8	0.0	0.0
Pisces	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.7	0.0	36.2	12.2	29.6	0.0	91.2	0.0	50.9	0.0	37.6
Leuroglossus schmidtii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pleurogr. monopterygius	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Theragra chalcogramma	0.0	0.0	0.0	0.0	0.0	0.0	0.0	66.3	0.0	0.0	0.0	0.0	0.0	87.4	0.0	1.3	0.0	0.0
Th. chalcogramma (juv.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	9.4	12.2	14.1	0.0	3.8	0.0	14.5	0.0	27.4
Stenobrachius leucopsarus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	26.8	0.0	12.8	0.0	0.0	0.0	28.4	0.0	9.1
Sebastes sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0
Pisces sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	6.3	0.0	1.1
Pisces sp. (larvae)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0
Phytoplankton	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
digested food	0.0	0.0	11.1	0.0	0.0	11.1	0.0	0.0	0.0	3.5	26.9	51.6	0.0	7.4	0.0	0.0	46.2	44.9
Average stomach fullness index ‰	232.0	138.7	81.3	91.0	238.5	83.0	115.2	86.0	53.2	40.0	54.0	45.9	69.8	109.9	29.9	51.1	49.8	42.7
Number of stomachs	13	18	133	10	1	52	4	17	35	346	38	317	32	27	36	256	25	287
Number of samples	1	2	13	2	1	7	1	3	2	19	2	24	2	2	2	21	2	22
Average FL, cm	17.0	16.1	18.8	20.6	22.0	20.7	37.0	38.5	38.0	37.4	38.1	38.1	47.5	46.5	46.0	43.7	41.4	44.2
Average BW, g	58	44	71	102	130	98	607	648	674	617	707	665	1267	1209	1089	962	893	1078
% of fresh food items	80.0	0.3	20.5	10.0	97.0	6.3	10.0	18.3	0.0	13.1	0.0	5.0	15.0	16.0	9.0	15.7	21.5	4.7
% of empty stomachs	0	0	39	31	0	32	0	6	11	23	21	39	0	0	0	25	10	29

Table 1 continued.

Food item	Biostatistical areas																	
	2	3	4	5	7	8	9	12	2	3	4	5	7	8	12	3	5	7
	Size group, cm																	
	50.1-60						60.1-70						70.1-80					
Euphausiacea	0.0	2.2	0.0	0.2	31.6	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0
Thysanoessa longipes	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0
Th. longipes (furcilia)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Th. inermis	0.0	2.2	0.0	0.2	31.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Th. inermis (furcilia)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Furcilia sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Euphausia sp	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphipoda	0.0	0.0	75.1	0.2	0.0	0.0	0.0	3.1	21.9	0.0	60.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Themisto pacifica	0.0	0.0	0.0	0.2	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Th. libellula	0.0	0.0	75.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	60.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Primno macropa	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphipoda gen sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	21.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Copepoda	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Neocalanus cristatus	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decapoda	0.0	6.6	0.0	1.6	0.0	0.9	0.0	0.0	0.0	53.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decapoda sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decapoda zoea	0.0	6.6	0.0	1.6	0.0	0.9	0.0	0.0	0.0	53.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pteropoda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limacina helicina	0.0	0.0	0.0	0.0	0.0	0.0	0.0	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tunicata	0.0	71.0	0.0	0.0	43.3	1.9	31.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Oikopleura labrador.	0.0	71.0	0.0	0.0	43.3	1.9	31.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Coelenterata	0.0	0.0	0.0	0.0	0.0	12.2	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0
Aglantha digitale	0.0	0.0	0.0	0.0	0.0	12.2	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0

Table 1 continued.

Food item	Biostatistical areas																	
	2	3	4	5	7	8	9	12	2	3	4	5	7	8	12	3	5	7
	Size group, cm																	
	50.1-60						60.1-70						70.1-80					
Cephalopoda	0.0	0.0	0.0	0.0	0.0	0.5	0.0	3.7	0.0	0.0	0.0	0.0	0.0	24.2	0.0	0.0	0.0	0.0
<i>Gonatopsis borealis</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cephalopoda sp. (larvae)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cephalopoda sp	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	24.2	0.0	0.0	0.0	0.0
Pisces	0.0	0.0	4.9	91.6	0.6	83.6	69.0	41.0	0.0	0.0	32.9	0.0	0.0	75.8	29.1	0.0	0.0	0.0
<i>Theragra chalcogramma</i>	0.0	0.0	0.0	85.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
<i>Th. chalcogramma</i> (серол.)	0.0	0.0	0.0	6.4	0.0	73.1	69.0	32.1	0.0	0.0	32.9	0.0	0.0	15.5	2.9	0.0	0.0	0.0
<i>Stenobranchius leucopsarus</i>	0.0	0.0	0.0	0.0	0.0	10.5	0.0	7.7	0.0	0.0	0.0	0.0	0.0	60.3	25.6	0.0	0.0	0.0
<i>Sebastes</i> sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pisces sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0
Pisces sp. (larvae)	0.0	0.0	4.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Phyto	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0
*digested food digested food	100.0	20.2	20.0	6.2	24.4	0.0	0.0	40.3	78.1	46.3	6.6	100.0	100.0	0.0	66.5	100.0	100.0	0.0
Average stomach fullness index %	5.3	33.3	58.6	75.8	61.9	37.3	15.5	38.5	48.4	6.7	3.8	18.9	29.8	24.8	13.5	2.7	21.4	0.0
Number of stomachs	1	55	2	38	18	51	4	87	8.0	25.0	6.0	8.0	10.0	6.0	28.0	3.0	1.0	1.0
Number of samples	1	4	1	3	4	10	1	17	2.0	2.0	2.0	2.0	2.0	4.0	10.0	2.0	1.0	1.0
Average FL, cm	59.0	54.0	56.0	53.0	54.0	53.3	52.0	52.8	66.5	64.5	64.5	63.5	63.5	64.6	63.5	73.5	72.0	71.0
Average BW, g	2824	1990	2345	1863	1719	1751	1611	1799	4145	3801	3753	3438	3109	3313	3276	5229	4354	4002
% of fresh food items	0.0	7.5	5.0	6.0	44.2	6.2	0.0	9.7	47.5	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0
% of empty stomachs	0	6	0	0	3	24	25	24	0.0	28.6	50.0	0.0	0.0	30.0	34.4	66.7	0.0	100.0

Table 1 continued.

Food item	Biostatistical areas		
	8	9	12
	Size group, cm		
	70.1-80		
Cephalopoda	0.0	0.0	17.7
Gonatopsis borealis	0.0	0.0	0.0
Cephalopoda sp. (juv.)	0.0	0.0	17.7
Pisces	100.0	0.0	76.6
Leuroglossus schmidtii	0.0	0.0	0.0
Pleurogr. monopterygius	0.0	0.0	76.6
Stenobranchius leucopsarus	100.0	0.0	0.0
digested food	0.0	0.0	5.6
Average stomach fullness index ‰	7.9	0.0	8.9
Number of stomachs	2	1	7
Number of samples	2	1	5
Average FL, cm	73.0	71.0	73.3
Average BW, g	5558	5190	5065
% of fresh food items	0.0	0.0	0.0
% of empty stomachs	50	100	63

Table 2.

Chum salmon diet composition (%) in the Pacific waters off Commander Islands during October 5 – October 12,
2006

Food item	Biostatistical areas										
	5	5	5	6	5	6	5	6	5	6	6
	Size group, cm										
	10.1-20	20.1-30	30.1-40	40.1-50	50.1-60	60.1-70	70.1-80				
Euphausiacea	100.0	100.0	0.0	0.6	0.0	0.2	0.0	8.7	13.9	19.9	74.5
Thysanoessa longipes	100.0	0.0	0.0	0.6	0.0	0.2	0.0	0.4	6.1	6.6	0.0
Euphausia pacifica	0.0	0.0	0.0	0.0	0.0	0.0	0.0	8.4	7.8	13.3	74.5
Euphausia sp	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphipoda	0.0	0.0	0.0	58.0	0.0	18.7	0.0	42.5	0.0	0.0	0.0
Themisto pacifica	0.0	0.0	0.0	58.0	0.0	18.7	0.0	42.5	0.0	0.0	0.0
Decapoda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0	0.0	0.0
Decapoda zoea	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.7	0.0	0.0	0.0
Pteropoda	0.0	0.0	39.3	0.0	59.0	0.0	15.6	0.0	9.6	0.0	0.0
Clione limacina	0.0	0.0	39.3	0.0	45.6	0.0	15.6	0.0	3.3	0.0	0.0
Limacina helicina	0.0	0.0	0.0	0.0	13.4	0.0	0.0	0.0	6.3	0.0	0.0
Coelenterata	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2	0.0	34.9	0.0
Aglantha digitale	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2	0.0	34.9	0.0
Cephalopoda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4	20.7	0.0
Cephalopoda sp	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.4	20.7	0.0
Pisces	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	14.0	25.5
Stenobrachius leucopsarus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	14.0	25.5
digested food	0.0	0.0	60.7	41.4	41.0	81.0	84.4	25.7	69.0	10.5	0.0
Average stomach fullness index ‰	58.0	63.2	26.1	21.8	32.4	20.4	11.1	13.5	13.5	6.1	9.4
Number of stomachs	1	1	8	7	14	16	9	16	5	12	2
Number of samples	1	1	3	3	4	5	3	7	3	5	1
Average FL, cm	19.0	21.0	38.1	38.7	43.1	45.3	54.8	53.8	67.9	66.3	72.0
Average BW, g	69	95	674	645	987	1118	1947	1842	3778	3595	5037
% of fresh food items	100.0	0.0	0.0	11.3	0.0	3.2	0.0	18.0	18.5	17.8	88.0
% of empty stomachs	0	0	30	25	38	4	43	35	0	58	0

Table 3.
Pink salmon diet composition (%) in the western Bering Sea during August 24
– October 4, 2006

Food item	Biostatistical areas					
	8	9	12	8	9	12
	Size group, cm					
	10.1-20			20.1-30		
Euphausiacea	42.3	0.0	10.3	37.2	26.0	22.2
Thysanoessa longipes	41.7	0.0	8.4	37.2	0.0	21.2
Th. longipes (furcilia)	0.0	0.0	1.4	0.0	0.0	1.0
Th. inermis	0.5	0.0	0.0	0.0	0.0	0.0
Furcilia sp.	0.0	0.0	0.5	0.0	26.0	0.0
Amphipoda	6.4	26.0	32.0	19.2	0.0	45.2
Themisto pacifica	6.4	26.0	32.0	19.2	0.0	45.2
Copepoda	29.7	0.0	2.2	20.1	0.0	1.3
Neocalanus plumchrus	0.0	0.0	0.3	0.1	0.0	1.0
N. cristatus	0.0	0.0	1.9	20.0	0.0	0.2
Eucalanus bungii	29.7	0.0	0.0	0.0	0.0	0.0
Decapoda	5.0	0.0	2.7	18.5	0.0	5.6
Decapoda zoea	5.0	0.0	2.7	18.5	0.0	5.6
Pteropoda	13.3	74.0	52.8	0.3	58.0	23.2
Limacina helicina	13.3	74.0	52.8	0.3	58.0	23.2
Pisces	3.3	0.0	0.0	4.6	16.0	2.6
Stenobrachius leucopsarus	0.0	0.0	0.0	0.3	16.0	0.0
Th. chalcogramma (сеголетки)	0.0	0.0	0.0	3.4	0.0	2.6
Pisces sp.	2.0	0.0	0.0	1.0	0.0	0.0
Pisces sp. (larvae)	1.3	0.0	0.0	0.0	0.0	0.0
Average stomach fullness index %	114.5	185.2	127.0	117.8	167.3	128.0
Number of stomachs	64	3	256	96	23	332
Number of samples	5	1	16	7	1	20
Average FL, cm	19.3	14.4	18.8	21.0	22.0	21.3
Average BW, g	74	27	69	97	117	98
% of fresh food items	39.0	0.0	44.9	46.1	32.0	31.3
% of empty stomachs	25	33	15	9	13	24

Table 4.

Sockeye and pink salmon diet composition (%) in the Pacific waters off Commander Islands during
October 5 – October 12, 2006

Food item	Sockeye							Pink		
	Biostatistical areas									
	5	5	6	5	6	5	6	5	5	6
	Size group, cm									
	20.1-30	30.1-40	40.1-50	50.1-60	10.1-20	20.1-30				
Euphausiacea	100.0	92.4	0.0	82.0	63.4	24.6	2.8	76.2	96.5	91.4
Thysanoessa longipes	100.0	91.6	0.0	80.8	11.8	24.6	0.9	76.2	96.5	91.4
Th. longipes (furcilia)	0.0	0.0	0.0	0.0	7.0	0.0	0.0	0.0	0.0	0.0
Euphausia pacifica	0.0	0.0	0.0	1.2	0.7	0.0	1.9	0.0	0.0	0.0
Euphausia sp	0.0	0.8	0.0	0.0	43.9	0.0	0.0	0.0	0.0	0.0
Amphipoda	0.0	4.9	19.4	0.0	4.0	37.7	6.9	23.8	0.0	8.6
Themisto pacifica	0.0	4.9	0.0	0.0	4.0	37.7	6.9	23.8	0.0	8.6
Primno macropa	0.0	0.0	19.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Copepoda	0.0	2.8	0.0	0.0	1.0	0.0	20.0	0.0	0.0	0.0
Neocalanus cristatus	0.0	0.0	0.0	0.0	1.0	0.0	20.0	0.0	0.0	0.0
Neocalanus sp.	0.0	2.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decapoda	0.0	0.0	80.5	15.0	24.2	0.0	48.7	0.0	0.0	0.0
Decapoda zoea	0.0	0.0	80.5	15.0	24.2	0.0	48.7	0.0	0.0	0.0
Cephalopoda	0.0	0.0	0.0	2.6	7.5	37.7	2.0	0.0	3.5	0.0
Cephalopoda sp	0.0	0.0	0.0	2.6	0.0	0.0	0.0	0.0	0.0	0.0
Cephalopoda sp. (larvae)	0.0	0.0	0.0	0.0	7.5	37.7	2.0	0.0	3.5	0.0
Pisces	0.0	0.0	0.0	0.4	0.0	0.0	19.6	0.0	0.0	0.0
Stenobrachius leucopsarus	0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0
Pisces sp	0.0	0.0	0.0	0.4	0.0	0.0	18.6	0.0	0.0	0.0
Average stomach fullness index %	34.5	25.4	4.5	20.0	14.6	7.6	12.0	150.7	141.4	5.8
Number of stomachs	1	39	7	16	54	4	33	5	10	2
Number of samples	1	4	4	3	9	3	8	2	3	1
Average FL, cm	22.0	37.2	38.5	45.5	47.4	52.3	53.1	18.7	20.6	22.0
Average BW, g	116	595	640	1057	1195	1678	1771	57	86	103
% of fresh food items	100.0	34.3	0.0	46.0	13.5	50.0	17.6	69.0	55.0	100.0
% of empty stomachs	0	16	50	56	58	50	30	13	33	50

Table 5.

Sockeye salmon diet composition (%) in the western Bering Sea during August 24 – October 4, 2006

Food item	Biostatistical areas																	
	4	9	12	8	9	10	12	5	7	8	9	12	3	7	8	9	12	
	Size group, cm																	
	10.1-20				20.1-30				30.1-40				40.1-50					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
Euphausiacea	100.0	0.0	50.4	18.9	53.3	0.0	39.8	31.3	99.3	63.0	0.0	48.3	100.0	80.3	37.2	0.0	28.6	
Thysanoessa longipes	0.0	0.0	46.8	18.4	0.0	0.0	36.5	0.0	86.2	41.3	0.0	48.1	0.0	30.4	15.6	0.0	27.8	
Th. longipes (furcilia)	0.0	0.0	3.5	0.5	0.0	0.0	2.6	0.0	0.0	2.3	0.0	0.2	0.0	0.0	2.7	0.0	0.0	
Th. inermis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	31.3	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.0	0.0	
Euphausia pacifica	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8	
Furcilia sp.	100.0	0.0	0.0	0.0	53.3	0.0	0.7	0.0	13.1	19.4	0.0	0.0	100.0	49.9	13.5	0.0	0.0	
Euphausia sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Amphipoda	0.0	0.0	24.9	33.9	0.0	0.0	16.6	0.0	0.0	6.1	0.0	1.8	0.0	7.3	17.3	0.0	19.6	
Themisto pacifica	0.0	0.0	24.9	33.9	0.0	0.0	16.6	0.0	0.0	6.1	0.0	1.8	0.0	7.3	17.3	0.0	19.6	
Copepoda	0.0	0.0	7.3	46.5	0.0	0.0	3.4	0.0	0.0	1.4	0.0	5.0	0.0	0.0	0.2	0.0	0.0	
Neocalanus plumchrus	0.0	0.0	0.8	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
N. cristatus	0.0	0.0	6.6	9.8	0.0	0.0	0.5	0.0	0.0	0.0	0.0	5.0	0.0	0.0	0.2	0.0	0.0	
Eucalanus bungii	0.0	0.0	0.0	36.6	0.0	0.0	0.0	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Decapoda	0.0	0.0	0.0	0.0	1.4	0.0	0.0	68.7	0.0	4.5	0.0	0.5	0.0	0.0	11.9	0.0	11.3	
Decapoda zoea	0.0	0.0	0.0	0.0	1.4	0.0	0.0	68.7	0.0	4.5	0.0	0.5	0.0	0.0	11.9	0.0	11.3	
Pteropoda	0.0	100.0	17.4	0.7	41.8	0.0	40.2	0.0	0.7	23.4	100.0	36.1	0.0	5.3	2.9	100.0	20.8	
Limacina helicina	0.0	100.0	17.4	0.7	41.8	0.0	40.2	0.0	0.7	23.4	100.0	36.1	0.0	5.3	2.9	100.0	20.8	
Tunicata	0.0	0.0	0.0	0.0	3.6	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Oikopleura labrador	0.0	0.0	0.0	0.0	3.6	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Chaetognatha	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Sagitta elegans	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Isopoda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	
Coelenterata	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	
Aglantha digitale	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.6	

Table 5 continued.

Food item	Biostatistical areas																	
	4	9	12	8	9	10	12	5	7	8	9	12	3	7	8	9	12	
	Size group, cm																	
	10.1-20			20.1-30					30.1-40					40.1-50				
Cephalopoda	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	1.8	
Gonatopsis borealis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	
Cephalopoda sp.	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.1	0.0	0.0	
Cephalopoda sp. (juv.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Cephalopoda sp. (larvae)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	
Pisces	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	8.3	0.0	0.0	21.3	0.0	11.6	
Leuroglossus schmidtii	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Stenobranchius leucopsarus	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.3	0.0	7.7	0.0	0.0	21.2	0.0	10.0	
Th.chalcogramma (сегол.)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0	0.1	0.0	1.6	
digested food	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.1	0.0	0.0	0.2	
Average stomach fullness index ‰	223.8	94.3	103.0	111.4	88.5	87.9	130.9	16.3	37.3	59.5	38.9	32.6	87.8	24.2	28.9	71.4	14.6	
Number of stomachs	10	4	45	53	43	1	48	6	10	198	10	118	2	23	216	6	85	
Number of samples	1	1	9	5	4	1	6	2	2	17	2	15	1	3	22	1	17	
Average FL, cm	13.0	16.9	18.6	22.7	24.9	25.5	21.8	34.0	37.9	37.5	36.9	36.7	41.0	46.2	44.0	43.0	44.9	
Average BW, g	21	53	75	142	177	182	115	461	760	663	606	606	854	1306	1138	1073	1120	
% of fresh food items	100.0	0.0	49.4	85.0	9.0	0.0	22.9	0.0	100.0	40.8	14.0	28.5	65.0	62.5	47.2	22.0	29.0	
% of empty stomachs	0	50	5	5	13	0	6	33	21	28	11	42	0	13	30	17	17	

Table 5 continued.

Food item	Biostatistical areas				
	5	7	8	9	12
	Size group, cm				
	50.1-60				
19	20	21	22	23	24
Euphausiacea	95.0	82.5	24.7	29.6	27.5
Thysanoessa longipes	0.0	12.6	5.4	0.0	12.9
Th. longipes (furcilia)	0.0	0.0	3.7	0.0	2.5
Th. inermis	95.0	1.9	0.0	29.6	0.0
Euphausia pacifica	0.0	0.0	0.0	0.0	0.0
Furcilia sp.	0.0	68.0	15.6	0.0	0.0
Euphausia sp.	0.0	0.0	0.0	0.0	12.0
Amphipoda	0.0	2.6	11.7	0.0	6.9
Themisto pacifica	0.0	2.6	11.7	0.0	6.9
Decapoda	5.0	0.0	29.6	61.1	6.8
Decapoda zoea	5.0	0.0	29.6	61.1	6.8
Pteropoda	0.0	0.0	0.1	9.3	16.8
Limacina helicina	0.0	0.0	0.1	9.3	16.8
Cephalopoda	0.0	14.9	1.2	0.0	0.0
Gonatopsis borealis	0.0	14.9	0.0	0.0	0.0
Cephalopoda sp.	0.0	0.0	0.5	0.0	0.0
Cephalopoda sp. (juv.)	0.0	0.0	0.8	0.0	0.0
Cephalopoda sp. (larvae)	0.0	0.0	0.0	0.0	0.0
Pisces	0.0	0.0	32.7	0.0	42.0
Leuroglossus schmidtii	0.0	0.0	0.8	0.0	0.0
Stenobrachius leucopsarus	0.0	0.0	30.7	0.0	15.5
Th.chalcogramma (сегол.)	0.0	0.0	1.2	0.0	26.5
Average stomach fullness index ‰	98.7	31.3	25.1	21.0	14.4
Number of stomachs	3	42	119	7	46
Number of samples	1	3	19	2	14
Average FL, cm	51.0	53.6	52.9	53.0	52.5
Average BW, g	1688	2006	1888	1891	1788
% of fresh food items	95.0	46.3	29.3	27.5	19.7
% of empty stomachs	0	10	13	17	42

Table 6.

Chinook salmon diet composition (%) in the western Bering Sea during August 24 – October 4, 2006

Food item	Biostatistical areas																	
	12	9	12	3	4	8	12	3	8	12	3	8	12	3	8	12	3	8
	Size group, cm																	
	10.1-20	20.1-30	30.1-40			40.1-50			50.1-60			60-70		70-80	80-90			
Euphausiacea	0.0	0.0	33.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thysanoessa longipes	0.0	0.0	32.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Furcilia sp.	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Amphipoda	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hyperia	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decapoda	0.0	22.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decapoda zoea	0.0	22.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pteropoda	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Limacina helicina	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cephalopoda	0.0	0.0	16.3	0.0	0.0	88.1	97.3	0.0	95.3	97.9	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0
Gonatopsis borealis	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	58.8	35.2	0.0	59.4	0.0	0.0	0.0	0.0	0.0	0.0
Gonatus kamtschaticus	0.0	0.0	10.5	0.0	0.0	0.0	97.3	0.0	0.0	59.8	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Cephalopoda sp	0.0	0.0	0.0	0.0	0.0	82.0	0.0	0.0	36.5	1.7	0.0	40.6	0.0	0.0	0.0	0.0	0.0	100.0
Cephalopoda sp. (juv.)	0.0	0.0	1.8	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cephalopoda sp. (larvae)	0.0	0.0	4.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pisces	100.0	77.2	49.6	0.0	0.0	11.9	2.7	0.0	4.7	2.1	0.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0
Pleurogr.monopterygius	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.7	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0
Theragra chalcogramma	0.0	0.0	1.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Th.chalcogramma (сегол.)	100.0	74.2	44.5	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Stenobranchius leucopsarus	0.0	0.0	2.2	0.0	0.0	11.9	0.0	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pisces sp.	0.0	0.0	1.6	0.0	0.0	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0
Pisces sp. (larvae)	0.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
digested food	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average stomach fullness index ‰	117.9	83.4	77.1	0.0	0.0	68.0	137.6	0.0	64.9	67.0	0.0	83.7	87.5	0.0	0.0	5.8	154.6	70.9
Number of stomachs	6	19	72	3	2	40	6	2	22	20	1	2	2	1	3	2	1	1
Number of samples	1	4	13	2	1	7	4	1	8	7	1	2	2	1	2	2	1	1
Average FL, cm	18.6	23.7	22.6	34.0	33.0	36.9	38.1	42.0	42.8	43.6	55.0	55.5	56.3	68.0	67.0	63.0	75.0	84.0
Average BW, g	82	166	148	441	419	645	715	850	1040	1062	1930	2375	2501	3838	3892	3438	5564	8465
% of fresh food items	0.0	9.3	23.1	0.0	0.0	3.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
% of empty stomachs	17	18	43	100	100	17	67	100	45	27	100	0	50	100	100	50	0	0

Table 7.

Coho and chinook salmon diet composition (%) in the Pacific waters off Commander Islands during October 5 – October 12, 2006

Food item	Coho				Chinook					
	Biostatistical areas									
	5	6	5	6	5	6	6	6	6	5
	Size group, cm									
	20.1-30	30.1-40	20.1-30	30.1-40	40.1-50	50.1-60	60.1-70	80.1-90		
Euphausiacea	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0
Thysanoessa longipes	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.0
Amphipoda	5.9	0.0	13.8	97.9	93.3	0.0	0.0	0.0	0.0	0.0
Themisto pacifica	1.1	0.0	13.8	97.9	0.0	0.0	0.0	0.0	0.0	0.0
Hyperia	4.7	0.0	0.0	0.0	93.3	0.0	0.0	0.0	0.0	0.0
Copepoda	8.4	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Neocalanus cristatus	8.4	0.0	5.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Decapoda	0.9	0.0	0.0	0.0	0.0	17.1	0.0	0.0	0.0	0.0
Decapoda zoea	0.9	0.0	0.0	0.0	0.0	17.1	0.0	0.0	0.0	0.0
Pteropoda	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Clione limacina	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cephalopoda	6.1	0.0	10.6	0.0	6.7	82.9	100.0	0.0	45.9	0.0
Gonatopsis borealis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.9	0.0
Gonatus kamts chatikus	5.5	0.0	7.2	0.0	0.0	82.9	70.2	0.0	0.0	0.0
Cephalopoda sp	0.0	0.0	0.0	0.0	0.0	0.0	9.7	0.0	0.0	0.0
Cephalopoda sp. (juv.)	0.0	0.0	0.0	0.0	0.0	0.0	20.1	0.0	0.0	0.0
Cephalopoda sp. (larvae)	0.7	0.0	3.4	0.0	6.7	0.0	0.0	0.0	0.0	0.0
Pisces	77.9	100.0	70.2	0.0	0.0	0.0	0.0	0.0	54.1	0.0
Stenobranchius leucops arus	39.4	0.0	60.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cololabis saira	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.1	0.0
Th. chalcogramma (ceron.)	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sebastes gen sp	34.7	100.0	7.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Gasterosteus aculeatus	0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Hexagrammidae	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pisces sp	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Average stomach fullness index %	91.3	110.8	45.4	60.8	14.9	45.6	18.3	0.0	48.6	0.0
Number of stomachs	13	1	11	3	2	2	6	1	3	1
Number of samples	3	1	3	2	1	1	5	1	3	1
Average FL, cm	28.1	30.0	31.8	32.5	23.0	36.5	42.4	59.0	65.3	83.0
Average BW, g	274.5	316.0	403.8	416.5	141.0	625.0	921.3	2508.0	3319.3	6802.0
% of fresh food items	2.5	0.0	5.5	6.5	93.0	0.0	0.0	0.0	0.0	0.0
% of empty stomachs	17	0	40	25	0	0	58	100	33	100

Table 9.

Zooplankton biomass (mg/cub. m) in the western Bering Sea and adjacent Pacific waters in upper 50 m during August 24 – October 12, 2006

Biostatistical area	Average lower depth surveyed, m	Phytoplankton	Sum of 3 fractions	Small-size fraction	Medium-size fraction	Large-size fraction	Euphausiacea	Amphipoda	Copepoda	Sagitta	Coelenterata	Other
2	42	421.5	947.9	42.6	104.5	800.8	173.8	4.4	499.6	101	1	21.1
3	50	14.4	1189.6	44.4	143.6	1001.6	152.5	21.4	596.2	218.4	3.4	9.7
4	50	7.3	1306.8	59	69.9	1178	269.7	21.5	463	415	1.2	7.5
5	50	0	775.7	56.1	167.9	551.8	110.9	11.5	239.1	112.1	1.7	76.5
7	49	45	1264.1	31.4	123.2	1109.5	370.4	31.7	568.1	103.5	1.9	33.9
8	50	2.3	1105.2	63.1	118.8	923.4	88.2	47.4	323.1	428.6	18.4	17.7
9	50	27.5	467.7	39.7	154.9	273.1	16	20.4	68.2	118.9	5.6	44
12	50	13.6	995.1	71.1	90.2	833.8	115.7	40.8	266.8	353.5	31	26
Pacific waters	50	7.1	661.6	65.8	60.9	534.9	34.9	44.2	106.7	289.6	32	27.5

Table 10 .

Zooplankton biomass (mg/cub. m) in the western Bering Sea and adjacent Pacific waters in upper 200 m during August 24 – October 12, 2006

Biostatistical area	Average lower depth surveyed, m	Phytoplankton	Sum of 3 fractions	Small-size fraction	Medium-size fraction	Large-size fraction	Euphausiacea	Amphipoda	Copepoda	Sagitta	Coelenterata	Other
2	51	421.5	967.9	41.4	92.8	833.7	212.5	4.4	499.7	100.9	1	15.3
3	92	14.4	1224.7	44.6	170.4	1009.7	160.3	21.4	596.2	218.5	3.4	9.9
4	80	7.3	1296.9	59.1	59	1178.7	269.6	21.5	463.8	415	1.2	7.6
5	164	0	957.1	61.7	145.5	749.9	110.7	6.6	407.9	209.4	6.1	9.1
7	142	23.3	1013.8	25	97.6	891.3	393.8	10.4	399.6	63.6	3.8	20.1
8	200	1.5	668.5	34.3	40.8	593.5	54.7	22.7	188.1	296.2	28.9	2.9
9	133	25.7	527.2	28.2	105.2	393.7	14.3	15.1	177.1	136.6	8.9	41.8
12	200	7.6	659.8	28.8	29.7	601.3	68.8	13.3	238.1	245.9	29	6.2
Pacific waters	200	2.7	509.8	22.3	18.5	469	70.7	19.5	72.5	254.5	34.6	17.2

Table 11.										
Zooplankton composition (%) in the western Bering Sea and adjacent Pacific waters in upper 50 m during August 24 – October 12, 2006										
Biostatistical area	Sum of 3 fractions	Small-size fraction	Medium-size fraction	Large-size fraction	Euphausiacea	Amphipoda	Copepoda	Sagitta	Coelenterata	Other
2	100	4.5	11	84.5	21.7	0.5	62.4	12.6	0.1	2.7
3	100	3.7	12.1	84.2	15.2	2.1	59.5	21.8	0.3	1.1
4	100	4.5	5.3	90.1	22.9	1.8	39.3	35.2	0.1	0.7
5	100	7.2	21.6	71.1	20.1	2.1	43.3	20.3	0.3	13.9
7	100	2.5	9.7	87.8	33.4	2.9	51.2	9.3	0.2	3
8	100	5.7	10.7	83.5	9.6	5.1	35	46.4	2	1.9
9	100	8.5	33.1	58.4	5.9	7.5	25	43.5	2.1	16
12	100	7.1	9.1	83.8	13.9	4.9	32	42.4	3.7	3.1
Pacific waters	100	9.9	9.2	80.8	6.5	8.3	19.9	54.1	6	5.2

Table 12.										
Zooplankton composition (%) in the western Bering Sea and adjacent Pacific waters in upper 200 m during August 24 – October 12, 2006										
Biostatistical area	Sum of 3 fractions	Small-size fraction	Medium-size fraction	Large-size fraction	Euphausiacea	Amphipoda	Copepoda	Sagitta	Coelenterata	Other
2	100	4.3	9.6	86.1	25.5	0.5	59.9	12.1	0.1	1.9
3	100	3.6	13.9	82.4	15.9	2.1	59	21.6	0.3	1.1
4	100	4.6	4.6	90.9	22.9	1.8	39.3	35.2	0.1	0.7
5	100	6.4	15.2	78.3	14.8	0.9	54.4	27.9	0.8	1.2
7	100	2.5	9.6	87.9	44.2	1.2	44.8	7.1	0.4	2.3
8	100	5.1	6.1	88.8	9.2	3.8	31.7	49.9	4.9	0.5
9	100	5.3	20	74.7	3.6	3.8	45	34.7	2.3	10.6
12	100	4.4	4.5	91.1	11.4	2.2	39.6	40.9	4.8	1.1
Pacific waters	100	4.4	3.6	92	15.1	4.2	15.5	54.3	7.4	3.5

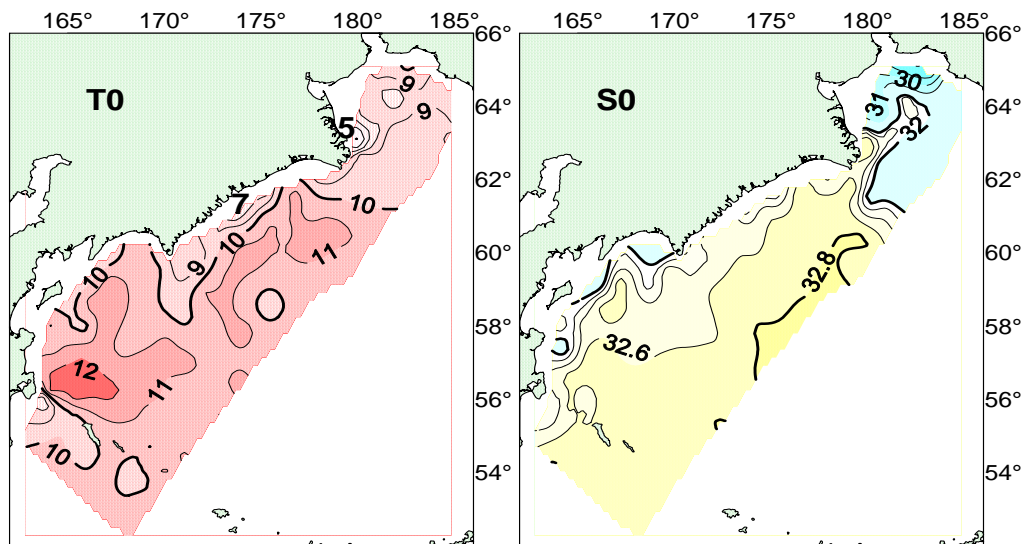


Figure 1. SST (°C) and SSS distribution during August 23 – October 13, 2006.

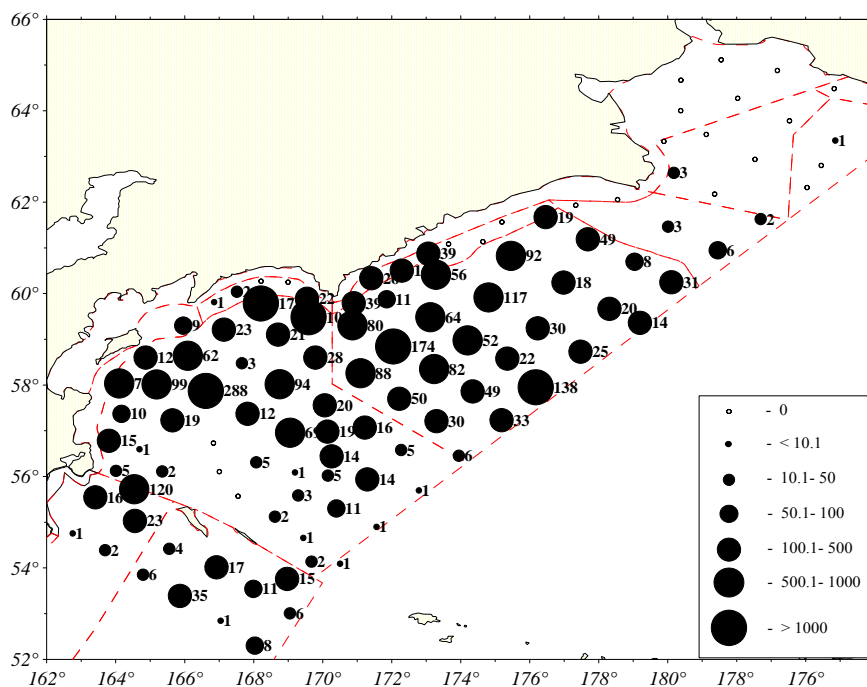


Fig. 2. Spatial distribution of immature chum salmon (inds./km²) in upper epipelagic layer of the western Bering Sea and Pacific waters off Kamchatka during August 24 – October 12, 2006. Numbers – individuals per hour of trawling.

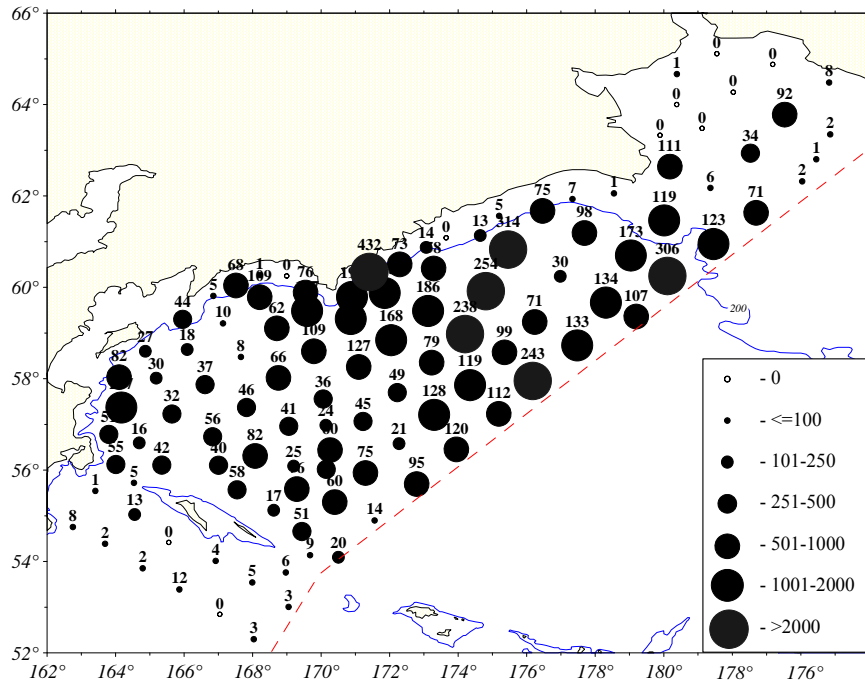


Figure 3. Spatial distribution of mature chum salmon (inds./km²) in upper epipelagic layer of the western Bering Sea and Pacific waters off Kamchatka during August 24 – October 12, 2006. Numbers – individuals per hour of trawling.

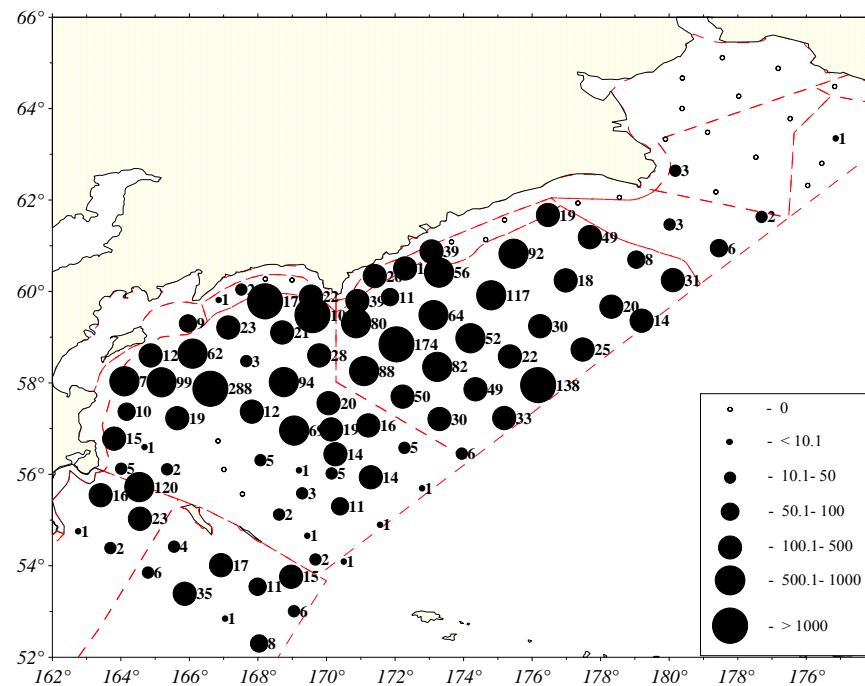


Figure 4. Spatial distribution of immature sockeye salmon (inds./km²) in upper epipelagic layer of the western Bering Sea and Pacific waters off Kamchatka during August 24 – October 12, 2006. Numbers – individuals per hour of trawling.

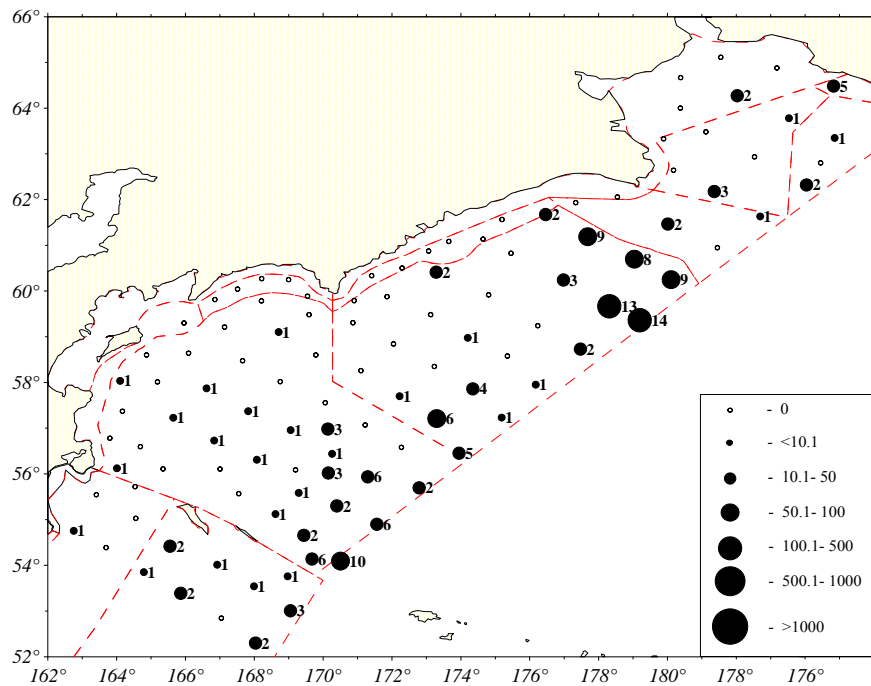


Figure 5. Spatial distribution of immature chinook salmon (inds./km²) in upper epipelagic layer of the western Bering Sea and Pacific waters off Kamchatka during August 24 – October 12, 2006. Numbers – individuals per hour of trawling.

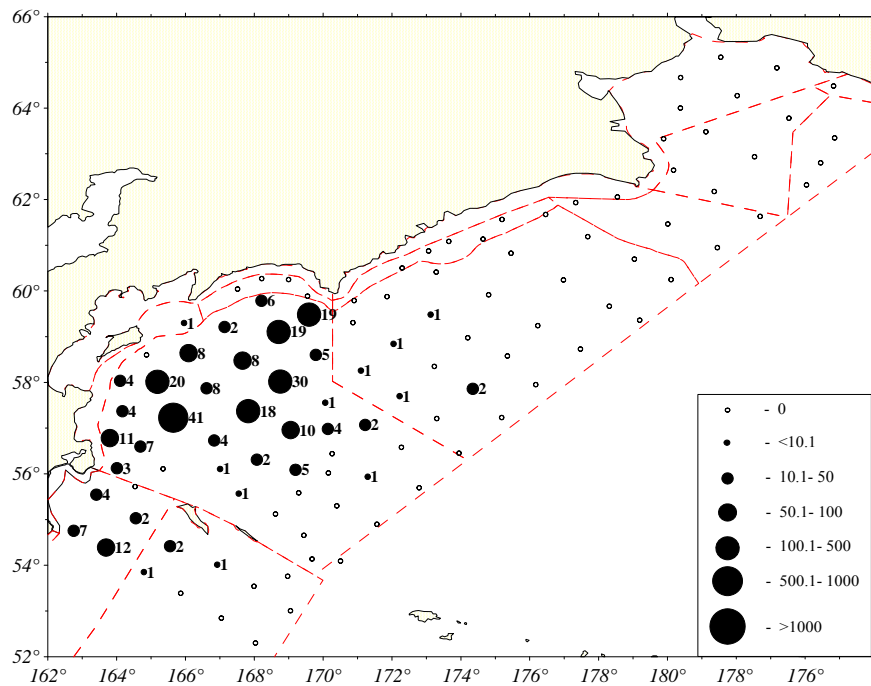


Figure 6. Spatial distribution of juvenile coho salmon (inds./km²) in upper epipelagic layer of the western Bering Sea and Pacific waters off Kamchatka during August 24 – October 12, 2006. Numbers – individuals per hour of trawling.

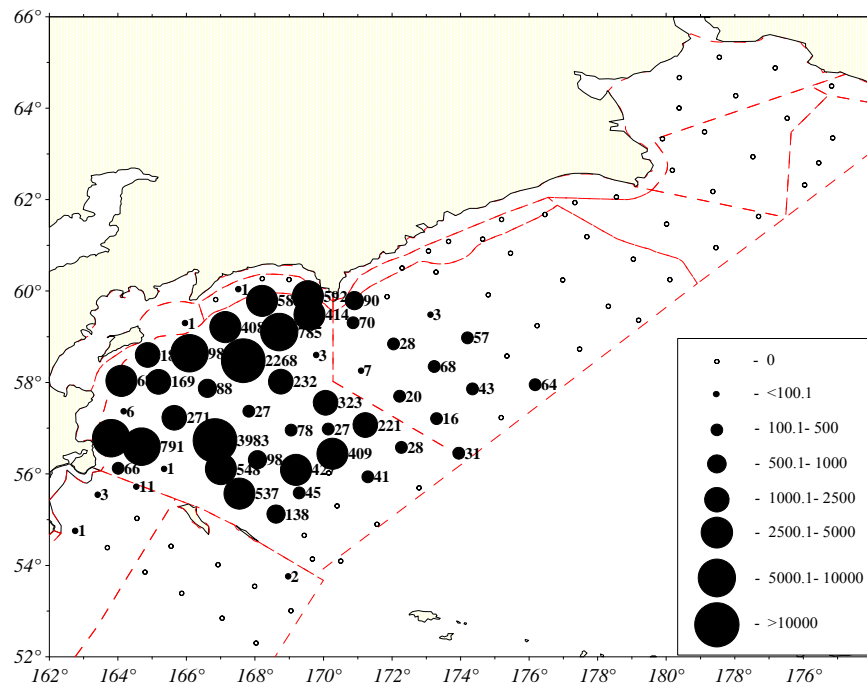


Figure 7. Spatial distribution of juvenile pink salmon (inds./km²) in upper epipelagic layer of the western Bering Sea and Pacific waters off Kamchatka during August 24 – October 12, 2006. Numbers – individuals per hour of trawling.