

Eastern Bering Sea (BASIS) Coastal Research (August - October 2003) on Juvenile Salmon

by

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Abstract

An eastern Bering Sea research cruise was conducted by National Marine Fisheries Service scientists from the Auke Bay Laboratory, Ocean Carrying Capacity program during August - October 2003 to study early marine distribution, migration, and growth of juvenile salmon (*Oncorhynchus* spp.) salmon on the eastern Bering Sea shelf. A total of 15,963 salmon were captured including juvenile pink (*O. gorbuscha*; 26.0%), chum (*O. keta*; 22.3%), sockeye (*O. nerka*; 39.1%), coho (*O. kisutch*; 6.1%), and chinook (*O. tshawytscha*; 3.8%) salmon; less than 7% of the catch consisted of immature and mature chum, sockeye, and chinook salmon. Juvenile pink and chum salmon were widely distributed with large catches occurring nearshore from Kotzebue Sound to Norton Sound, across the shelf from the Yukon River to Nunivak Island, and within the nearshore and offshore regions of Bristol Bay. Juvenile sockeye salmon were widely distributed within the southern region of Bristol Bay with the largest catches occurring east of longitude 166°W. Juvenile coho salmon were also distributed within the Bristol Bay region with the largest catches occurring in nearshore locations. Juvenile chinook salmon were distributed across the shelf from Norton Sound to Nunivak Island and in the northern regions of Bristol Bay with the largest catches occurring nearshore within Norton Sound and Bristol Bay. Greater than 80% (percent body weight) of the prey items found in juvenile salmon stomachs consisted of larval and juvenile fish with the exception of juvenile chum (approximately 70% larval and juvenile fish and roughly 30% Mysidacea, Coelenterata, or megalopa brachyura) and juvenile sockeye salmon less than 200 mm in length (approximately 52% larval and juvenile fish and 40% *Thysanoessa raschii* and megalopa brachyura). Juvenile pink, chum, sockeye, and chinook salmon were smallest within the area sampled during Leg 1 (southeastern Bering Sea; Bristol Bay) and largest within the area sampled during Leg 2 (northeastern Bering Sea). Analyses of plankton, and of salmon age, size, growth data, and genetic stock identification, will be done to gain additional information on the early marine ecology of salmon along the eastern Bering Sea shelf.

Introduction

Pacific salmon (*Oncorhynchus* spp.) runs in rivers that flow into the eastern Bering Sea have been inconsistent and at times very weak. Low returns of chinook (*O. tshawytscha*) and chum (*O. keta*) salmon to the Yukon River, Kuskokwim River, and Norton Sound areas of Alaska prompted the state of Alaska to restrict commercial and subsistence fisheries during 2000 and declare the region a fisheries disaster area. Weak salmon returns to these river systems follow several years of low sockeye (*O. nerka*) salmon

returns to Bristol Bay, which was declared a fisheries disaster region during 1998 by both the State of Alaska and the U.S. Department of Commerce. Causes of the poor salmon returns to these river systems are not known however, the regional-scale decline of these stocks indicates that the marine environment may play a critical role. Ocean conditions, particularly in the first few months after the salmon leave fresh water, are known to significantly affect salmon survival (Holtby et al. 1990; Friedland et al. 1996; Beamish and Mahnken 2001). Mechanisms affecting marine survival of the eastern Bering Sea salmon stocks are unknown, principally due to the lack of marine life history information on western Alaska salmon. To improve understanding of the marine life-history stage of salmon in the Bering Sea, the North Pacific Anadromous Fish Commission (NPAFC) began an internationally coordinated research program on salmon in the Bering Sea called the Bering-Aleutian Salmon International Survey (BASIS) (NPAFC 2001).

As part of BASIS, scientists from the National Marine Fisheries Service (NMFS), Ocean Carrying Capacity (OCC) program conducted a fall survey on the eastern Bering Sea shelf to provide key ecological data for eastern Bering Sea salmon stocks during their juvenile life-history stage. The goal of the OCC/BASIS salmon research cruise was to understand mechanisms underlying the effects of environment on distribution, migration, and growth of juvenile salmon on the eastern Bering Sea shelf. Primary objectives of BASIS include: 1) to determine the extent of offshore migrations of juvenile salmon from rivers draining into the eastern Bering Sea, 2) to describe the physical environment of the eastern and northeastern Bering Sea shelf occupied by juvenile salmon, and 3) to collect biological information on other ecologically important species. Summaries of previous Bering Sea juvenile salmon research cruises can be found in Farley et al. (1999, 2000, 2001, 2002).

Methods

The OCC survey of the eastern Bering Sea was conducted during fall 2003 (August 15 - October 13). The cruise itinerary and participating scientists are listed in tables 1 and 2. Transects sampled during the survey were along longitudinal (161°W to 168°W) and latitudinal lines (60°N to 65°N; Figure 1). Sampling stations and locations along each transect are listed in Table 3.

The survey was conducted aboard the contracted fishing vessel (F/V) *Sea Storm* (38 m long). Fish samples were collected using two midwater rope trawls, models 400 and 300, made by Cantrawl Pacific Limited¹ of Richmond, B.C. Stations in relatively deeper waters along the longitude 162°W to 166°W transects were sampled using a midwater trawl model 400; stations in relatively shallow waters along longitudes 167°W and 168°W, and latitudinal transects north of 60°N were sampled using a midwater trawl, model 300. Both nets are 198 m long, have hexagonal mesh in wings and body, and a 1.2-cm mesh liner in the codend. The 400 and 300 rope trawls were towed at 3.5 to 5 kts, at or near the surface, and had typical spreads of 41 m horizontally and 14 m vertically,

¹ Reference to trade names does not imply endorsement by the National Marine Fisheries Service, NOAA.

and 56 m horizontally and 12 m vertically, respectively. All tows lasted 30 minutes and covered 2.8 to 4.6 km. All sampling was done during daylight hours.

Salmon and other fishes were sorted by species and counted. Standard biological measurements including fork length, body weight, and sex were recorded. Scale samples were collected from the preferred area (Clutter and Whitesel 1956) to document age and growth for all salmon species. Juvenile sockeye and chum salmon were frozen whole at -70°C for genetic analyses. Prevalence and intensity of sea lice (*Lepeophtheirus salmonis*) infection on juvenile pink (*O. gorbuscha*) salmon was also examined during the survey (see Trudel et al. 2002 for details). Otoliths from immature and maturing chum salmon were collected to document distribution and migration of hatchery salmon whose otoliths were thermally marked during incubation. Tissues from immature and maturing chum salmon were also collected (frozen at 0°C) to document distribution of Pacific Rim salmon stocks within the survey area. Stomachs were removed and analyzed on board to document feeding behavior. All other fish species collected were counted and measured (fork length and body weight).

Oceanographic data were collected at each trawl station immediately prior to deploying the trawl. Vertical profiles of temperature, salinity, chlorophyll a fluorescence, light transmission, and photosynthetic available radiation (PAR) were measured with a Sea-Bird Electronics Inc.¹ SBE 25 Sealoger Conductivity-Temperature-Depth profiler (CTD). Water samples for nutrients, size-fractionated chlorophyll a determinations (>0.7 , >2 , and $>10\ \mu\text{m}$), and phytoplankton and microzooplankton species were collected with Niskin bottles from the surface and below the pycnocline. Along-transect surface temperature and salinity data were measured continuously with a thermosalinograph mounted aboard ship.

Results and Discussion

During the survey, 151 trawl stations were sampled along the eastern Bering Sea shelf (Figure 1; Table 3). A total of 15,963 salmon were captured including juvenile pink (*O. gorbuscha*; 26.0%), chum (*O. keta*; 22.3%), sockeye (*O. nerka*; 39.1%), coho (*O. kisutch*; 6.1%), and chinook (*O. tshawytscha*; 3.8%) salmon; less than 7% of the catch consisted of immature and mature chum, sockeye, and chinook salmon (Table 4). Other marine fish species captured during the survey included (see Table 5) walleye pollock (*Theragra chalcogramma*), crested sculpin (*Blepsias bilobus*), sturgeon poacher (*Podothecus acipenserinus*), Pacific herring (*Clupea pallasii*), Bering wolffish (*Anarhichas orientalis*), Pacific sandfish (*Trichodon trichodon*), capelin (*Mallotus villosus*), Pacific cod (*Gadus macrocephalus*), prowlfish (*Zaprora silenus*), Pacific sandlance (*Ammodytes hexapterus*), northern rock sole (*Lepidopsetta peracuada*), lamprey (Petromyzontidae), sablefish (*Anoplopoma fimbria*), Atka mackerel (*Pleurogrammus monopterygius*), starry flounder (*Platichthys stellatus*), rainbow smelt (*Osmerus mordax*), rock greenling (*Hexagrammos lagocephalus*), salmon shark (*Lamna ditropis*), saffron cod (*Eleginus gracilis*), 9-spine

stickleback (*Pungitius pungitius*), 3-spine stickleback (*Gasterosteus aculeatus*), Arctic cod (*Boreogadus saida*), arrowtooth flounder (*Atheresthes stomias*), slender eelblenny (*Lumpenus fabricii*), unidentified flatfish (Pleuronectiformes), Arctic char (*Salvelinus alpinus*), yellowfin sole (*Limanda aspera*), smooth lump sucker (*Aptocyclus ventricosus*), Pacific spiny lump sucker (*Eumicrotremus orbis*), unidentified sculpin (Cottidae), flathead sole (*Hippoglossoides elassodon*), and unidentified rockfish (Scorpaenidae).

The distribution of juvenile salmon within the survey varied by species (Figures 2a-e). Juvenile pink and chum salmon were widely distributed with large catches occurring nearshore from Kotzebue Sound to Norton Sound, across the shelf from the Yukon River to Nunivak Island, and within the nearshore and offshore regions of Bristol Bay. Juvenile sockeye salmon were widely distributed within the southern region of Bristol Bay, with the largest catches occurring east of longitude 166°W. Juvenile coho salmon were also distributed within the Bristol Bay region with the largest catches occurring in nearshore locations. Juvenile chinook salmon were distributed across the shelf from Norton Sound to Nunivak Island and in the northern regions of Bristol Bay, with the largest catches occurring nearshore within Norton Sound and Bristol Bay. The size (length and weight) of juvenile, immature, and maturing salmon is listed in Table 6. Greater than 80% (% composition by prey weight) of the prey items found in juvenile salmon stomachs consisted of larval and juvenile fish with the exception of juvenile chum (approximately 70% larval and juvenile fish and roughly 30% Mysidacea, Coelenterata, or megalopa brachyura) and juvenile sockeye salmon less than 200 mm in length (approximately 52% larval and juvenile fish and 40% *Thysanoessa raschii* and megalopa brachyura; Table 7).

Preliminary results comparing oceanographic characteristics with juvenile salmon distribution in the southeastern Bering Sea indicate that some juvenile salmon species distributions co-varied with the location of fronts. A front separates the well-mixed coastal waters from the two-layer system farther offshore. Juvenile sockeye salmon were most abundant offshore of the well-mixed coastal waters and demonstrated partial overlap with YOY pollock distributions, the primary prey item of the salmon (Figures 3a, b). In contrast, juvenile chinook salmon were most abundant in the coastal low salinity waters in northern Bristol Bay (near Kuskokwim River; Figures 3c, d). Juvenile coho salmon had the highest abundances in coastal waters near Amak Island, along southern Bristol Bay. This was also the area where the highest surface phytoplankton biomass was located, likely due to inputs of nutrients from Unimak Pass.

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Table 1. Cruise itinerary for the NMFS OCC/BASIS August 15 - October 13, 2003 eastern Bering Sea research cruise.

Date	Location/Activity
Leg 1	
15-Aug	Scientists arrive in Dutch Harbor, AK
16-Aug	Load scientists and gear
17-Aug	Load scientists and gear
18-Aug	Test gear
19-Aug	Leave Dutch Harbor, enroute Norton Sound (620 nm)
20-Aug	Enroute Norton Sound
21-Aug	Begin sampling 64°N (west)
22-Aug	Continue sampling 64°N (west)
23-Aug	Continue sampling 64°N (west); enroute 65°N
24-Aug	Begin sampling 65°N (east); enroute 66°N
25-Aug	Begin sampling 66°N (east); enroute 67°N
26-Aug	Begin sampling 67°N (west); enroute 68°N
27-Aug	Begin sampling 68°N (west); enroute Nome, AK (240 nm)
28-Aug	Arrive Nome, AK
29-Aug	Unload Leg 1 scientists and samples; load Leg 2 scientists
Leg 2	
30-Aug	Leave Nome; enroute 60°N, 166°W (360 nm)
31-Aug	Begin sampling 166°W transect (south)
1-Sept	Continue sampling 166°W (south)
2-Sept	Continue sampling 166°W (south)
3-Sept	Continue sampling 166°W (south); enroute 165°W; begin sampling (north)
4-Sept	Continue sampling 165°W (north)
5-Sept	Continue sampling 165°W (north)
6-Sept	Continue sampling 165°W (north); enroute 164°W
7-Sept	Begin sampling 164°W (south)

8-Sept	Continue sampling 164°W (south)
9-Sept	Continue sampling 164°W (south); enroute 163°W
10-Sept	Begin sampling 163°W (north)
11-Sept	Continue sampling 163°W (north)
12-Sept	Continue sampling 163°W (north); enroute 162°W
13-Sept	Begin sampling 162°W (south)
14-Sept	Continue sampling 162°W (south); enroute 161°W
15-Sept	Begin sampling 161°W (north); enroute Dutch Harbor (320 nm)

Table 1 (Cont'd). Cruise itinerary for the NMFS OCC/BASIS August 17 - October 13, 2002 eastern Bering Sea research cruise.

Date	Location/Activity
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Leg 2 (Cont'd)

16-Sept	Enroute Dutch Harbor, AK
17-Sept	Arrive Dutch Harbor, AK
18-Sept	Unload Leg 2 scientists and samples
19-Sept	Unload Leg 2 scientists and samples
20-Sept	Load Leg 3 scientists

Leg 3

21-Sept	Test equipment prior to beginning Leg 3
22-Sept	Leave Dutch Harbor, AK; enroute 58°N, 167°W (215 nm)
23-Sept	Begin sampling 58°N (west)
24-Sept	Continue sampling 58°N (west); enroute 59°N
25-Sept	Begin sampling 59°N (east)
26-Sept	Continue sampling 59°N; enroute 60°N
27-Sept	Begin sampling 60°N (west)
28-Sept	Continue sampling 60°N (west)
29-Sept	Weather Day
30-Sept	Weather Day
1-Oct	Weather Day
2-Oct	Begin sampling 61°N (east)
3-Oct	Continue sampling 61°N (east); enroute 62°N
4-Oct	Begin sampling 62°N (west); enroute 63°N
5-Oct	Begin sampling 63°N (west)
6-Oct	Weather Day
7-Oct	Weather Day; enroute 60°N
8-Oct	Begin sampling 60°N, 172°W (east); enroute Dutch Harbor, AK (360 nm)
9-Oct	Enroute Dutch Harbor
10-Oct	Arrive Dutch Harbor

11-Oct	Unload Leg 3 scientists and gear
12-Oct	Unload Leg 3 scientists and gear; end cruise
13-Oct	Scientists depart Dutch Harbor, AK

Table 2. Participating Scientists during the August 15 - October 13, 2003 OCC/BASIS juvenile salmon survey in the coastal waters of the eastern Bering Sea.

Scientists	Affiliation	
Leg 1 (Aug 15 - Aug 29)		
FPC	Angela Middleton	NMFS/ABL
	John Pohl	NMFS/ABL
	Mary Drew	PSMFC
	George Yaska	YR DFA
	Cindi Lagoudakis	U.S. Forest Service
Leg 2 (Aug 30 - Sept 20)		
FPC	Ed Farley	NMFS/ABL
	Lisa Eisner	NMFS/ABL
	Oleg Ivanov	TINRO
	Natalia Kuznetsova	TINRO
	Marc Trudel	DFO
Leg 3 (Sept 21 - Oct 13)		
FPC	Jim Murphy	NMFS/ABL
	Jamal Moss	NMFS/ABL
	Mary Drew	PSMFC
	Oleg Ivanov	TINRO
	Natalia Kuznetsova	TINRO

FPC	-	Field Party Chief
NMFS	-	National Marine Fisheries Service
ABL	-	Auke Bay Laboratory
PSMFC	-	Pacific States Marine Fisheries Commission
DFO	-	Department of Fisheries and Oceans, Canada

Table 3. Haul information for the August 15 - October 13, 2003 OCC/BASIS juvenile salmon survey in the eastern Bering Sea. Missing values indicate data not collected.

Date	Transect	Haul ID	Lat °N	Long °W	Course (degrees)	Start Time	Speed (knots)	Net Opening		Warp (fathoms)	SST (°C)
								Vertical (fathoms)	Horizontal (fathoms)		
8/21/2003	64N	2003001	64.05	164.34	104	16:19	4.6	7.5	30.0	180	12.7
8/21/2003	64N	2003002	64.04	163.39	95	19:46	4.7	7.5	30.0	180	14.0
8/22/2003	64N	2003003	64.02	166.07	353	7:09	4.7	7.5	30.0	180	11.1
8/22/2003	64N	2003004	63.59	166.29	287	10:04	5.0	5.3	35.0	180	9.5
8/22/2003	64N	2003005	63.58	166.59	2	12:28	4.5	5.0	36.0	180	10.0
8/22/2003	64N	2003006	63.59	167.30	350	15:05	5.0	6.0	34.0	180	9.0
8/22/2003	64N	2003007	63.59	168.01	17	17:49	4.9	5.7	36.0	180	9.8
8/22/2003	64N	2003008	63.58	168.32	23	20:48	4.9	5.7	34.2	180	9.5
8/23/2003	64N	2003009	63.59	170.01	27	7:26	4.8	5.1	36.2	180	9.4
8/23/2003	64N	2003010	64.00	170.27	264	9:55	4.5	5.2	34.0	180	9.5
8/23/2003	64N	2003011	64.00	170.57	252	12:07	4.8	5.2	34.0	180	8.9
8/23/2003	64N	2003012	64.03	171.26	240	14:21	4.6	6.0	35.0	180	9.2
8/24/2003	65N	2003013	65.01	169.29	209	7:14	4.2	5.6	35.8	180	7.3
8/24/2003	65N	2003014	65.02	168.59	194	10:08	4.1	5.5	34.0	180	7.9
8/24/2003	65N	2003015	65.01	168.39	193	12:35	4.1	5.5	34.0	180	7.9
8/24/2003	65N	2003016	65.14	167.41	277	18:38	5.1	5.6	36.0	180	10.5
8/25/2003	66N	2003017	66.01	168.27	231	8:05	3.8	5.3	34.0	180	9.3
8/25/2003	66N	2003018	66.01	167.58	219	11:06	4.6	5.7	34.0	180	10.8
8/26/2003	67N	2003019	66.59	164.02	262	7:02	4.4	5.9	34.0	180	11.1
8/26/2003	67N	2003020	67.01	164.28	249	9:39	4.6	5.5	34.0	180	10.6
8/26/2003	67N	2003021	67.01	164.58	210	11:49	4.5	5.9	32.8	180	
8/26/2003	67N	2003022	67.01	165.29	201	14:14	4.4	5.4	34.0	180	9.1
8/26/2003	67N	2003023	67.01	166.00	188	16:42	4.6	5.5	34.0	180	
8/26/2003	67N	2003024	67.01	166.29	197	19:21	4.6	4.7	36.0	180	8.5
8/27/2003	68N	2003025	68.01	166.03	226	7:01	4.8	6.3	34.0	180	
8/27/2003	68N	2003026	68.01	166.29	211	9:07	4.5	6.0	33.4	180	9.3
8/27/2003	68N	2003027	68.01	166.58	213	11:26	4.6	5.8	33.0	180	
8/27/2003	68N	2003028	68.01	167.28	215	14:01	4.4	4.9	32.2	180	7.7
8/31/2003	166W	2003029	59.16	166.01	146	22:38	4.6	6.8	33.2	180	11.5
9/1/2003	166W	2003030	59.01	166.02	135	7:46	4.0	7.4	33.6	181	11.1
9/1/2003	166W	2003031	58.46	166.02	138	10:24	4.0	6.6	34.7	181	10.7
9/1/2003	166W	2003032	58.30	166.01	138	13:09	4.9	7.3	34.4	181	11
9/1/2003	166W	2003033	58.15	166.00	135	15:54	5.5	6.6	33.5	181	11.3
9/1/2003	166W	2003034	58.01	166.02	113	18:23	4.6	5.7	34.0	181	11.5
9/2/2003	166W	2003035	57.30	166.02	93	7:45	4.0	6.1	33.0	181	11.6
9/2/2003	166W	2003036	56.59	166.02	93	12:33	5.3	8.0	33.3	181	11.7
9/2/2003	166W	2003037	56.31	165.58	240	16:49	4.9	6.6	33.0	181	11.9
9/2/2003	166W	2003038	56.01	165.59	219	20:56	4.7	6.6	33.5	181	11.1
9/3/2003	166W	2003039	55.31	165.59	184	8:06	4.8	6.7	33.0	181	11.3
9/3/2003	166W	2003040	55.01	165.59	175	12:13	3.6	5.0	33.3	181	10.6
9/3/2003	166W	2003041	54.31	166.00	168	16:27	4.3	7.1	33.0	181	10.6
9/3/2003	165W	2003042	54.45	165.00	19	21:29	5.0	7.0	34.3	181	10.3

Table 3 (Cont'd). Haul information for the August 15 - October 13, 2003 OCC/BASIS juvenile salmon survey in the eastern Bering Sea. Missing values indicate data not collected.

Date	Transect	Haul ID	Lat °N	Long °W	Course (degrees)	Start Time	Speed (knots)	Net Opening			SST (°C)
								Vertical (fathoms)	Horizontal (fathoms)	Warp (fathoms)	
9/4/2003	165W	2003043	54.59	164.59	342	7:39	5.0	6.6	33.9	181	9.9
9/4/2003	165W	2003044	55.14	164.59	342	10:10	5.2	7.6	33.3	181	11.1
9/4/2003	165W	2003045	55.29	164.59	342	12:28	5.1	7.3	33.8	181	11.1
9/4/2003	165W	2003046	55.44	164.59	358	14:54	4.8	7.0	33.4	181	12.5
9/4/2003	165W	2003047	55.59	164.59	345	17:15	4.7	6.6	33.0	181	12.2
9/4/2003	165W	2003048	56.14	164.59	352	19:45	4.4	8.1	32.3	181	12.3
9/5/2003	165W	2003049	56.28	165.00	7	7:37	4.3	7.4	33.3	181	12.0
9/5/2003	165W	2003050	56.44	165.00	14	10:17	4.3	7.9	33.0	181	12.0
9/5/2003	165W	2003051	56.59	164.59	351	12:54	5.1	7.1	33.8	181	12.6
9/5/2003	165W	2003052	57.14	164.59	340	15:09	4.9	7.0	34.6	181	13.0
9/5/2003	165W	2003053	57.29	164.59	340	17:45	4.3	7.5	34.0	181	13.1
9/5/2003	165W	2003054	57.44	164.59	337	20:12	3.9	6.3	32.5	181	12.4
9/6/2003	165W	2003055	57.59	164.59	0	7:33	4.5	7.9	33.0	181	12.0
9/6/2003	165W	2003056	58.14	165.00	4	9:57	4.2	7.4	33.9	181	12.1
9/6/2003	165W	2003057	58.29	164.59	358	12:19	4.7	7.5	34.6	181	12.0
9/6/2003	165W	2003058	58.44	164.59	350	14:35	5.3	7.0	32.8	181	11.6
9/6/2003	165W	2003059	59.01	164.58	228	17:09	4.0	6.9	33.4	181	12.7
9/6/2003	165W	2003060	59.15	164.59	245	20:04	4.6	6.6	33.8	181	13.2
9/7/2003	164W	2003061	59.01	163.59	220	8:22	4.8	5.9	33.9	181	12.7
9/7/2003	164W	2003062	58.46	164.00	162	10:38	5.0	6.8	34.4	180	12.3
9/7/2003	164W	2003063	58.31	163.59	165	12:51	4.8	6.9	33.7	181	11.8
9/7/2003	164W	2003064	58.16	163.54	176	15:07	4.3	6.9	34.3	181	12.7
9/7/2003	164W	2003065	58.01	163.59	177	17:36	4.2	6.5	34.8	181	12.7
9/7/2003	164W	2003066	57.45	163.57	261	20:17	3.8	6.9	33.4	181	12.8
9/8/2003	164W	2003067	57.31	163.58	225	7:48	4.4	6.2	34.2	181	12.8
9/8/2003	164W	2003068	57.16	163.58	230	10:19	5.1	6.5	33.2	181	12.7
9/8/2003	164W	2003069	57.00	163.59	236	12:57	5.4	7.0	35.0	181	12.7
9/8/2003	164W	2003070	56.46	163.59	228	15:39	4.8	6.3	33.3	181	12.7
9/8/2003	164W	2003071	56.31	163.58	230	18:21	4.0	6.6	34.0	181	12.7
9/9/2003	164W	2003072	56.16	163.59	197	8:05	4.6	6.9	33.6	181	12.4
9/9/2003	164W	2003073	56.01	164.01	160	10:35	5.0	6.7	32.6	181	12.5
9/9/2003	164W	2003074	55.46	164.01	160	13:00	4.9	6.9	33.0	181	10.3
9/9/2003	164W	2003075	55.32	164.00	168	15:26	4.4	7.5	31.0	181	10.8
9/9/2003	164W	2003076	55.17	164.00	170	17:55	4.5	7.1	32.3	181	10.8
9/10/2003	163W	2003077	55.24	163.00	170	8:00	4.8	6.6	28.5	181	11.1
9/10/2003	163W	2003078	55.46	163.01	155	12:44	4.8	6.8	33.1	181	12.4
9/10/2003	163W	2003079	56.01	163.01	150	16:46	4.8	6.7	32.0	181	12.8
9/10/2003	163W	2003080	56.14	162.59	343	19:29	4.8	7.4	34.0	181	12.7
9/11/2003	163W	2003081	56.29	162.59	345	8:09	4.8	6.5	33.4	181	12.6
9/11/2003	163W	2003082	56.44	162.59	340	10:35	4.8	7.4	34.4	181	12.8
9/11/2003	163W	2003083	56.59	162.59	350	12:57	4.5	7.4	34.7	181	12.7
9/11/2003	163W	2003084	57.14	162.59	356	15:19	4.4	6.7	33.8	181	13.0

Table 3 (Cont'd). Haul information for the August 15 - October 13, 2003 OCC/BASIS juvenile salmon survey in the eastern Bering Sea. Missing values indicate data not collected.

Date	Transect	Haul ID	Lat °N	Long °W	Course (degrees)	Start Time	Speed (knots)	Net Opening		Warp (fathoms)	SST (°C)
								Vertical (fathoms)	Horizontal (fathoms)		
9/11/2003	163W	2003085	57.29	162.59	0	17:42	4.7	7.5	34.4	181	12.8
9/12/2003	163W	2003086	57.44	162.59	335	7:53	5.2	6.9	35.0	181	12.6
9/12/2003	163W	2003087	57.59	162.59	335	10:16	4.9	5.5	34.0	181	12.5
9/12/2003	163W	2003088	58.14	162.59	333	12:33	4.4	7.3	33.3	181	12.2
9/12/2003	163W	2003089	58.31	163.00	165	15:31	5.5	6.6	34.9	181	12.6
9/12/2003	163W	2003090	58.45	162.59	250	19:38	5.5	5.8	30.5	181	13.0
9/13/2003	162W	2003091	58.31	162.04	117	8:09	2.9	6.3	33.4	181	12.3
9/13/2003	162W	2003092	58.16	162.02	118	10:57	4.5	7.4	33.0	181	12.5
9/13/2003	162W	2003093	58.00	162.00							
9/13/2003	162W	2003094	57.45	162.02	115	15:36	5.4	7.5	33.1	181	13.0
9/13/2003	162W	2003095	57.31	162.02	117	18:08	4.5	6.7	33.0	181	13.1
9/13/2003	162W	2003096	57.17	162.03	110	20:36	4.2	6.1	34.7	181	12.6
9/14/2003	162W	2003097	57.01	162.01	151	8:39	4.5	7.0	34.3	181	12.7
9/14/2003	162W	2003098	56.47	162.01	157	10:59	4.7	7.8	33.0	181	12.6
9/14/2003	162W	2003099	56.31	162.01	168	13:33	4.3	7.4	33.8	181	12.7
9/14/2003	162W	2003100	56.16	162.00	170	16:01	4.6	7.6	34.5	181	12.9
9/14/2003	162W	2003101	56.01	161.59	177	18:26	4.8	6.8	32.9	181	12.3
9/15/2003	161W	2003102	56.31	160.59	235	8:08	5.3	6.0	32.3	181	12.6
9/15/2003	161W	2003103	56.45	160.58	247	11:43	4.5	6.6	33.4	181	12.8
9/23/2003	58N	2003104	58.00	166.59	230	15:26	4.6	5.0	25.0	180	10.9
9/23/2003	58N	2003105	58.01	167.28	252	18:21	4.3	5.3	24.5	180	10.8
9/23/2003	58N	2003106	58.00	167.57	266	21:02	4.3	5.0	24.8	180	10.6
9/24/2003	58N	2003107	58.01	168.28	225	8:41	4.5	5.8	25.0	181	10.3
9/24/2003	58N	2003108	58.01	168.59	215	11:31	4.9	5.2	24.5	181	10.6
9/24/2003	58N	2003109	58.01	169.29	195	14:13	4.4	5.8	24.3	181	11.0
9/24/2003	58N	2003110	58.01	169.59	201	17:06	4.2	5.0	25.0	180	10.8
9/24/2003	58N	2003111	58.01	170.29	200	20:13	4.4	5.8	24.5	181	10.9
9/25/2003	59N	2003112	59.01	170.59	197	9:44	4.8	5.4	25.2	181	10.7
9/25/2003	59N	2003113	59.02	170.30	184	12:56	4.8	5.0	26.4	181	10.8
9/25/2003	59N	2003114	59.02	169.59	183	16:12	4.3	5.2	26.0	181	10.1
9/25/2003	59N	2003115	59.02	169.30	185	19:14	4.2	5.1	25.8	181	10.8
9/26/2003	59N	2003116	59.00	169.02	97	8:42	4.5	5.0	30.0	205	9.7
9/26/2003	59N	2003117	59.00	168.32	92	11:06	4.5	5.5	29.0	210	9.8
9/26/2003	59N	2003118	59.00	168.03	87	13:36	3.8	5.0	29.7	220	10.1
9/26/2003	59N	2003119	59.00	167.32	100	16:12	3.7	4.6	28.9	220	10.6
9/26/2003	59N	2003120	59.00	167.02	107	18:42	4.1	4.8	30.5	230	10.5
9/27/2003	60N	2003121	60.01	168.03	263	8:41	3.9	5.5	30.2	220	10.4
9/27/2003	60N	2003122	60.00	168.27	250	11:06	3.9	5.0	30.0	225	10.5
9/27/2003	60N	2003123	60.00	168.58	256	13:36	4.5	5.3	29.3	225	9.2
9/27/2003	60N	2003124	60.00	169.28	242	15:56	5.0	4.9	29.9	225	9.3
9/27/2003	60N	2003125	60.01	169.58	234	18:17	4.5	4.5	30.0	225	9.0
9/28/2003	60N	2003126	60.01	170.29	195	8:52	3.9	5.5	29.1	215	9.5

Table 3 (Cont'd). Haul information for the August 15 - October 13, 2003 OCC/BASIS juvenile salmon survey in the eastern Bering Sea. Missing values indicate data not collected.

Date	Transect	Haul ID	Lat °N	Long °W	Course (degrees)	Start Time	Speed (knots)	Net Opening			SST (°C)
								Vertical (fathoms)	Horizontal (fathoms)	Warp (fathoms)	
10/2/2003	61N	2003127	61.01	171.33	116	9:17	3.6	5.0	29.9	220	7.1
10/2/2003	61N	2003128	61.01	171.03	125	11:50	3.7	5.2	29.8	220	7.3
10/2/2003	61N	2003129	61.01	170.32	140	14:17	4.2	4.8	30.1	220	7.5
10/2/2003	61N	2003130	61.01	170.02	127	16:36	4.7	5.5	30.1	220	7.6
10/2/2003	61N	2003131	61.01	169.32	108	19:01	4.2	5.1	30.9	220	8.5
10/3/2003	61N	2003132	61.00	169.03	92	9:12	3.5	5.1	29.6	220	8.9
10/3/2003	61N	2003133	61.00	168.33	97	11:35	3.8	5.4	30.0	220	9.6
10/3/2003	61N	2003134	61.00	168.02	100	13:50	4.6	5.8	30.2	220	9.5
10/3/2003	61N	2003135	61.00	167.31	97	15:56	5.3	5.1	30.0	220	9.8
10/3/2003	61N	2003136	61.00	167.02	93	18:40	4.5	5.0	29.4	220	10.1
10/4/2003	62N	2003137	61.60	166.58	284	9:00	4.2	5.2	31.0	220	7.4
10/4/2003	62N	2003138	62.00	167.29	267	11:10	4.8	5.7	30.0	220	7.6
10/4/2003	62N	2003139	62.00	167.58	264	13:10	4.4	5.6	30.5	220	7.8
10/4/2003	62N	2003140	62.00	168.28	268	15:17	3.9			220	7.2
10/4/2003	62N	2003141	62.00	168.57	266	17:36	3.5	5.1	29.6	220	6.9
10/4/2003	62N	2003142	62.00	169.27	269	19:56	3.9	5.3	30.5	220	6.7
10/5/2003	63N	2003143	63.01	165.59	173	10:06	5.2	5.2	27.3	220	7.9
10/5/2003	63N	2003144	63.01	166.30	172	12:42	4.4	5.0	29.0	220	7.8
10/5/2003	63N	2003145	63.01	167.00	168	15:24	4.2	5.0	29.7	220	7.6
10/5/2003	63N	2003146	63.00	167.30	170	18:04	4.4	5.0	29.1	220	7.7
10/5/2003	63N	2003147	63.01	168.00	164	20:53	4.8	5.3	29.4	220	6.8
10/8/2003	60N	2003148	60.01	172.32	120	9:30	4.6	5.1	29.2	220	7.5
10/8/2003	60N	2003149	60.01	172.03	113	11:55	4.3	5.4	29.8	220	7.5
10/8/2003	60N	2003150	60.01	171.32	120	14:53	4.0	5.7	29.0	220	7.4
10/8/2003	60N	2003151	60.01	171.02	127	17:26	4.0	5.4	29.2	220	7.3

Table 4. Catch per unit effort (CPUE) of juvenile (J), immature (I), and mature (M) salmon by the F/V *Sea Storm* in the eastern Bering Sea, August 15 - October 13, 2003. Dash (-) indicates no salmon caught.

Date	Haul ID	Pink		Chum			Sockeye			Coho		Chinook		
		J	M	J	I	M	J	I	M	J	M	J	I	M
8/21	2003001	16	-	55	-	-	-	-	-	8	-	55	-	-
8/21	2003002	1	-	31	-	-	-	-	-	1	-	77	-	-
8/22	2003003	113	-	153	-	1	-	-	-	9	1	39	-	-
8/22	2003004	505	-	18	-	-	-	-	-	1	1	11	-	-
8/22	2003005	21	-	-	-	-	-	-	-	-	-	34	-	-
8/22	2003006	-	-	-	-	1	-	-	-	-	-	2	1	-
8/22	2003007	-	-	-	-	-	-	-	-	-	-	-	1	-
8/22	2003008	-	-	-	-	-	-	-	-	-	-	-	-	1
8/23	2003009	-	-	-	-	-	-	-	-	-	-	-	2	-
8/23	2003010	-	-	-	4	1	-	-	-	-	-	-	2	-
8/23	2003011	-	-	-	2	1	-	-	-	-	-	-	5	1
8/23	2003012	-	-	-	-	-	-	-	-	-	-	-	-	-
8/24	2003013	-	-	-	-	-	-	-	-	-	-	-	1	-
8/24	2003014	-	-	-	-	-	-	-	-	-	-	-	-	-
8/24	2003015	-	-	-	-	-	-	-	-	-	-	-	2	-
8/24	2003016	721	-	22	-	-	-	-	-	4	-	4	-	-
8/25	2003017	-	-	-	-	-	-	-	-	-	-	-	-	-
8/25	2003018	892	-	256	-	-	2	-	-	9	-	6	3	-
8/26	2003019	73	-	303	-	-	-	-	-	-	-	-	-	-
8/26	2003020	3	-	1	-	-	-	-	-	-	-	-	-	-
8/26	2003021	-	-	-	-	1	-	-	-	-	-	-	-	-
8/26	2003022	-	-	-	-	1	-	-	-	-	-	-	-	-
8/26	2003023	-	-	-	-	-	-	-	-	-	-	-	-	-
8/26	2003024	-	-	-	-	-	-	-	-	-	-	-	-	-
8/27	2003025	-	-	-	-	-	-	-	-	-	-	-	-	-
8/27	2003026	71	-	51	-	-	-	-	-	-	-	-	-	-
8/27	2003027	-	-	-	-	-	-	-	-	-	-	-	1	-
8/27	2003028	2	-	-	-	-	-	-	-	-	-	-	-	-
8/31	2003029	-	-	2	-	-	-	-	-	-	-	4	1	-
9/1	2003030	-	-	1	-	-	-	-	-	1	-	4	2	1
9/1	2003031	-	-	5	-	-	3	-	-	-	-	1	-	-
9/1	2003032	5	-	9	-	-	105	-	-	-	-	2	-	-
9/1	2003033	1	-	6	-	-	76	-	-	-	-	-	-	-
9/1	2003034	1	-	8	-	-	218	-	-	-	-	-	-	-

Table 4 (Cont'd). Catch per unit effort (CPUE) of juvenile (J), immature (I), and mature (M) salmon by the F/V *Sea Storm* in the eastern Bering Sea, August 15 - October 13, 2003. Dash (-) indicates no salmon caught.

Date	Haul ID	Pink		Chum			Sockeye			Coho		Chinook		
		J	M	J	I	M	J	I	M	J	M	J	I	M
9/2	2003035	-	1	-	5	-	3	7	-	1	-	-	1	-
9/2	2003036	-	-	-	11	1	-	5	-	-	-	-	-	-
9/2	2003037	-	-	-	5	-	-	12	-	-	-	-	-	-
9/2	2003038	-	-	-	15	-	-	8	-	-	-	-	-	-
9/3	2003039	1	-	1	3	-	-	2	-	-	-	-	-	-
9/3	2003040	-	-	-	88	-	1	26	-	-	1	-	-	-
9/3	2003041	-	1	-	54	1	-	19	-	-	-	-	-	-
9/3	2003042	-	-	4	3	-	-	-	-	1	-	-	-	-
9/4	2003043	-	-	-	-	-	-	-	-	-	-	-	-	-
9/4	2003044	49	-	2	17	1	21	11	-	-	-	-	-	-
9/4	2003045	-	-	2	2	-	6	-	-	-	-	-	-	-
9/4	2003046	-	-	1	2	-	17	-	-	2	-	-	1	-
9/4	2003047	6	-	3	4	-	66	3	-	-	-	-	-	-
9/4	2003048	-	-	3	-	-	48	2	-	2	-	-	-	-
9/5	2003049	-	-	-	-	-	8	2	-	1	-	-	-	-
9/5	2003050	-	-	-	1	-	206	1	-	1	-	-	-	-
9/5	2003051	-	-	-	2	-	283	2	-	2	-	-	-	-
9/5	2003052	-	-	-	2	-	142	2	-	5	-	-	-	-
9/5	2003053	-	-	-	2	-	339	2	-	1	-	-	-	-
9/5	2003054	-	-	3	8	-	233	-	-	-	-	-	-	-
9/6	2003055	-	-	4	-	-	30	-	-	-	-	-	-	-
9/6	2003056	-	-	22	-	-	129	-	-	10	-	2	-	-
9/6	2003057	4	-	11	-	-	47	-	-	49	-	2	1	-
9/6	2003058	1	-	46	-	-	5	-	-	37	-	7	-	-
9/6	2003059	1	-	13	-	-	2	-	-	60	-	6	-	-
9/6	2003060	9	-	26	-	-	-	-	-	31	-	1	-	-
9/7	2003061	3	-	23	-	-	-	-	-	14	-	2	-	-
9/7	2003062	5	-	42	-	-	13	-	-	13	-	8	-	-
9/7	2003063	4	-	22	-	-	55	-	-	7	-	3	-	-
9/7	2003064	9	-	52	-	-	233	-	-	5	-	-	-	-
9/7	2003065	3	-	19	-	-	250	-	-	6	-	5	-	-
9/7	2003066	-	-	1	-	-	61	-	-	1	-	-	-	-
9/8	2003067	1	-	8	2	-	273	-	-	1	-	1	-	-
9/8	2003068	1	-	6	-	-	64	-	-	-	-	-	-	-

Table 4 (Cont'd). Catch per unit effort (CPUE) of juvenile (J), immature (I), and mature (M) salmon by the F/V *Sea Storm* in the eastern Bering Sea, August 15 - October 13, 2003. Dash (-) indicates no salmon caught.

Date	Haul ID	Pink		Chum			Sockeye			Coho		Chinook		
		J	M	J	I	M	J	I	M	J	M	J	I	M
9/8	2003069	-	-	2	-	-	101	-	-	6	-	-	-	-
9/8	2003070	1	-	4	-	-	147	-	-	5	-	-	-	-
9/8	2003071	1	-	8	-	-	109	-	-	-	-	-	-	-
9/9	2003072	1	-	4	-	-	15	-	-	1	-	-	-	-
9/9	2003073	4	-	5	-	-	52	-	-	-	-	-	-	-
9/9	2003074	6	-	2	-	-	81	-	-	-	2	-	-	-
9/9	2003075	17	-	3	-	-	77	1	-	-	2	-	-	-
9/9	2003076	9	-	8	-	3	54	-	-	1	-	-	2	-
9/10	2003077	-	-	-	1	-	1	-	-	5	-	-	-	-
9/10	2003078	2	-	2	-	-	18	-	-	406	-	-	-	-
9/10	2003079	1	-	4	-	-	16	-	-	-	-	-	-	-
9/10	2003080	1	-	8	-	-	9	-	-	-	-	-	-	-
9/11	2003081	1	-	9	-	-	25	-	-	-	-	1	-	-
9/11	2003082	3	-	20	-	-	141	-	-	-	-	-	-	-
9/11	2003083	4	-	7	1	-	175	-	-	-	-	-	-	-
9/11	2003084	4	-	4	-	-	127	-	-	3	-	1	-	-
9/11	2003085	6	-	6	3	-	593	-	-	18	-	2	-	-
9/12	2003086	52	-	19	-	-	71	-	-	3	-	4	-	-
9/12	2003087	28	-	21	-	-	40	-	-	1	-	2	-	-
9/12	2003088	10	-	9	-	-	12	-	-	5	-	9	1	-
9/12	2003089	3	-	-	-	-	-	-	-	8	-	18	-	-
9/12	2003090	-	-	2	-	-	-	-	-	21	-	88	-	-
9/13	2003091	12	-	36	-	-	4	-	-	7	-	30	-	-
9/13	2003092	69	-	36	-	-	6	-	-	15	-	25	-	-
9/13	2003093													
9/13	2003094	65	-	11	-	-	203	-	-	3	-	5	-	-
9/13	2003095	11	-	4	-	-	254	-	-	73	-	3	-	-
9/13	2003096	32	-	2	1	-	143	-	-	3	-	3	-	-
9/14	2003097	63	-	15	-	-	247	-	-	9	-	4	-	-
9/14	2003098	15	-	13	-	-	141	-	-	1	-	-	1	-
9/14	2003099	4	-	35	-	-	18	-	-	-	-	1	-	-
9/14	2003100	2	-	26	-	-	18	-	-	-	-	-	-	-
9/14	2003101	-	-	3	-	-	4	-	-	4	-	-	-	-
9/15	2003102	1	-	19	-	-	6	-	-	1	-	-	-	-

Table 4 (Cont'd). Catch per unit effort (CPUE) of juvenile (J), immature (I), and mature (M) salmon by the F/V *Sea Storm* in the eastern Bering Sea, August 15 - October 13, 2003. Dash (-) indicates no salmon caught.

Date	Haul ID	Pink		Chum			Sockeye			Coho		Chinook		
		J	M	J	I	M	J	I	M	J	M	J	I	M
9/15	2003103	2	-	11	-	-	25	-	-	1	-	-	-	-
9/23	2003104	9	-	5	-	-	37	-	-	4	-	-	-	-
9/23	2003105	40	-	5	1	1	23	-	-	14	-	-	-	-
9/23	2003106	90	-	33	3	-	24	-	-	24	-	-	1	-
9/24	2003107	27	-	6	2	-	15	-	-	1	-	-	-	-
9/24	2003108	74	-	8	-	-	27	1	-	-	-	-	-	-
9/24	2003109	26	-	-	-	-	5	2	-	-	-	-	-	-
9/24	2003110	16	-	-	-	-	1	-	-	1	-	-	-	-
9/24	2003111	5	-	-	-	-	-	-	-	-	-	-	-	-
9/25	2003112	11	-	1	-	-	-	3	-	-	-	-	-	-
9/25	2003113	73	-	38	-	-	77	1	-	2	-	-	-	-
9/25	2003114	27	-	90	4	-	40	2	-	2	-	-	-	-
9/25	2003115	40	-	114	1	-	60	1	-	1	-	-	2	-
9/26	2003116	33	-	137	-	-	11	-	-	4	-	-	-	-
9/26	2003117	160	-	34	-	-	24	-	-	3	-	-	-	-
9/26	2003118	29	-	11	-	-	4	-	-	4	-	-	-	-
9/26	2003119	-	-	4	-	-	2	-	-	3	-	-	-	-
9/26	2003120	5	-	2	-	-	-	-	-	2	-	-	-	-
9/27	2003121	-	-	7	-	-	-	-	-	5	-	-	-	-
9/27	2003122	2	-	14	-	-	-	-	-	11	-	1	-	-
9/27	2003123	2	-	14	-	-	-	-	-	4	-	-	-	-
9/27	2003124	3	-	9	-	-	1	-	-	-	-	-	-	-
9/27	2003125	2	-	3	-	-	1	-	-	1	-	2	-	-
9/28	2003126	11	-	24	1	-	4	-	-	1	-	3	-	-
10/2	2003127	10	-	2	2	-	-	-	-	-	-	6	-	-
10/2	2003128	58	-	16	-	-	1	-	-	-	-	3	-	-
10/2	2003129	57	-	47	1	-	1	-	-	-	-	3	-	-
10/2	2003130	10	-	35	-	-	-	-	-	-	-	2	-	-
10/2	2003131	3	-	42	-	-	-	-	-	1	-	10	-	-
10/3	2003132	1	-	6	-	-	-	-	-	-	-	10	-	-
10/3	2003133	2	-	39	-	-	-	-	-	1	-	12	1	-
10/3	2003134	2	-	61	-	-	-	-	-	-	-	6	-	-
10/3	2003135	2	-	543	-	-	-	-	-	-	-	6	-	-
10/3	2003136	-	-	155	-	-	-	-	-	-	-	3	-	-

Table 4 (Cont'd). Catch per unit effort (CPUE) of juvenile (J), immature (I), and mature (M) salmon by the F/V *Sea Storm* in the eastern Bering Sea, August 15 - October 13, 2003. Dash (-) indicates no salmon caught.

Date	Haul ID	Pink		Chum			Sockeye			Coho		Chinook		
		J	M	J	I	M	J	I	M	J	M	J	I	M
10/4	2003137	-	-	-	-	-	-	-	-	-	-	10	-	-
10/4	2003138	1	-	27	-	-	-	-	-	-	-	4	-	-
10/4	2003139	4	-	62	-	-	-	-	-	-	-	5	-	-
10/4	2003140	15	-	172	-	-	-	-	-	-	-	2	-	-
10/4	2003141	14	-	2	-	-	-	-	-	1	-	1	1	-
10/4	2003142	7	-	13	-	-	-	-	-	-	-	-	-	-
10/5	2003143	-	-	-	-	-	-	-	-	-	-	26	-	-
10/5	2003144	-	-	-	-	-	-	-	-	-	-	4	-	-
10/5	2003145	-	-	-	-	-	-	-	-	-	-	-	-	-
10/5	2003146	17	-	29	-	-	-	-	-	-	-	-	-	-
10/5	2003147	7	-	59	-	-	-	-	-	-	-	2	-	-
10/8	2003148	89	-	26	-	-	5	-	-	-	-	5	-	-
10/8	2003149	168	-	47	2	-	3	-	-	-	-	-	-	-
10/8	2003150	29	-	6	2	-	6	-	-	-	-	1	-	-
10/8	2003151	20	-	14	-	-	7	-	-	-	-	2	-	-

Table 5. Total number of marine fishes caught by the F/V *Sea Storm* in the eastern Bering Sea, August 15 - October 13, 2003. (Leg 1: August 21 - August 30; Leg 2: August 31 - September 22; Leg 3: September 23 - October 8.) Dash (-) indicates no marine fishes caught. Life history stages include young of the year (YOY) and adult (A).

Scientific Name	Life-history stage	Leg 1	Leg 2	Leg 3
<i>Theragra chalcogramma</i>	YOY	5,184	1,257,262	253,277
<i>Theragra chalcogramma</i>	Juvenile	148	-	-
<i>Theragra chalcogramma</i>	A	-	82	2
<i>Blepsias bilobus</i>	A	-	49	1
<i>Podothecus acipenserinus</i>	A	-	8	-
<i>Clupea pallasii</i>	A	7,564	2,713	29,721
<i>Anarhichas orientalis</i>	Juvenile	2	1	-
<i>Trichodon trichodon</i>	A	-	3,087	3
<i>Mallotus villosus</i>	A	4,757	289	21
<i>Gadus macrocephalus</i>	YOY	144	355	6
<i>Zaprora silenus</i>	YOY	-	25	5
<i>Ammodytes hexapterus</i>	A	1,007	212	49
<i>Lepidopsetta peracuada</i>	A	-	3	-
Petromyzontidae	A	23	27	28
<i>Anoplopoma fimbria</i>	YOY	-	27	339
<i>Pleurogrammus monopterygius</i>	YOY	-	2,794	45
<i>Platichthys stellatus</i>	A	1	2	4
<i>Osmerus mordax</i>	A	-	6	22
<i>Hexagrammos lagocephalus</i>	YOY	2	452	55
<i>Lamna ditropis</i>	A	-	1	1
<i>Eleginus gracilis</i>	YOY	527	-	-
<i>Eleginus gracilis</i>	A	-	-	-
<i>Pungitius pungitius</i>	A	2	1	10,083
<i>Gasterosteus aculeatus</i>	A	-	19	50
<i>Boreogadus saida</i>	YOY	3	-	-
<i>Atheresthes stomias</i>	Juvenile	5	-	-
<i>Lumpenus fabricii</i>	A	94	-	-
<i>Pleuronectiformes</i>	A	4	-	-
<i>Salvelinus alpinus</i>	A	26	-	-
<i>Limanda aspera</i>	A	1	24	2
<i>Aptocyclus ventricosus</i>	A	-	14	-
<i>Eumicrotremus orbis</i>	A	-	1	1
Cottidae	A	264	-	1
<i>Hippoglossoides elassodon</i>	A	-	1	-
Scorpaenidae	Juvenile	-	2	-

chinook salmon caught during the August -October 2003 OCC/BASIS juvenile salmon survey during legs 2 (August 31 - September 22) and 3 (September 23 - October 8).

Prey	Pink		Chum		Sockeye			Coho		Chinook	
					Length (mm)						
					< 200	> 200					
	Leg		Leg		Leg			Leg		Leg	
	2	3	2	3	2	2	3	2	3	2	3
<i>Thysanoessa raschii</i>	1.9	6.2	0.0	0.2	26.9	0.7	0.0	0.0	0.0	0.0	0.0
Mysidacea	0.0	0.0	31.0	0.4	0.0	0.0	0.0	0.1	0.0	0.0	0.0
Coelenterata	0.0	0.0	0.0	17.2	0.0	0.5	0.0	0.0	0.0	0.0	0.0
Megalopa Brachyura	0.0	3.1	0.0	7.6	14.5	0.0	19.2	0.0	0.0	0.0	0.0
<i>Ammodytes hexapterus</i>	0.0	3.8	0.0	39.2	1.4	3.6	0.0	27.3	0.0	84.0	0.0
<i>Mallotus villosus</i>	33.0	36.7	0.0	0.0	5.6	3.6	0.0	7.7	0.0	16.0	0.0
<i>Theragra chalcogramma</i>	59.6	45.8	42.0	17.7	44.9	85.9	80.8	63.6	100.0	0.0	0.0
<i>Clupea pallasii</i>	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Larval Fish	1.1	0.7	27.0	8.9	0.2	4.7	0.0	0.0	0.0	0.0	0.0
Other	4.4	3.7	0.0	8.8	6.5	1.0	0.0	1.3	0.0	0.0	0.0



Figure 1. Stations (dots) sampled by the NMFS, OCC/BASIS cruise in the eastern Bering Sea, August 17 - October 13, 2002. Leg 1 stations include those along longitudinal transects 161°W to 165°W; Leg 2 stations include those along longitudinal transects 166°W to 167°W and along latitudinal transects 60°N to 62°N; Leg 3 stations include those along latitudinal transects 63°N to

65°N.

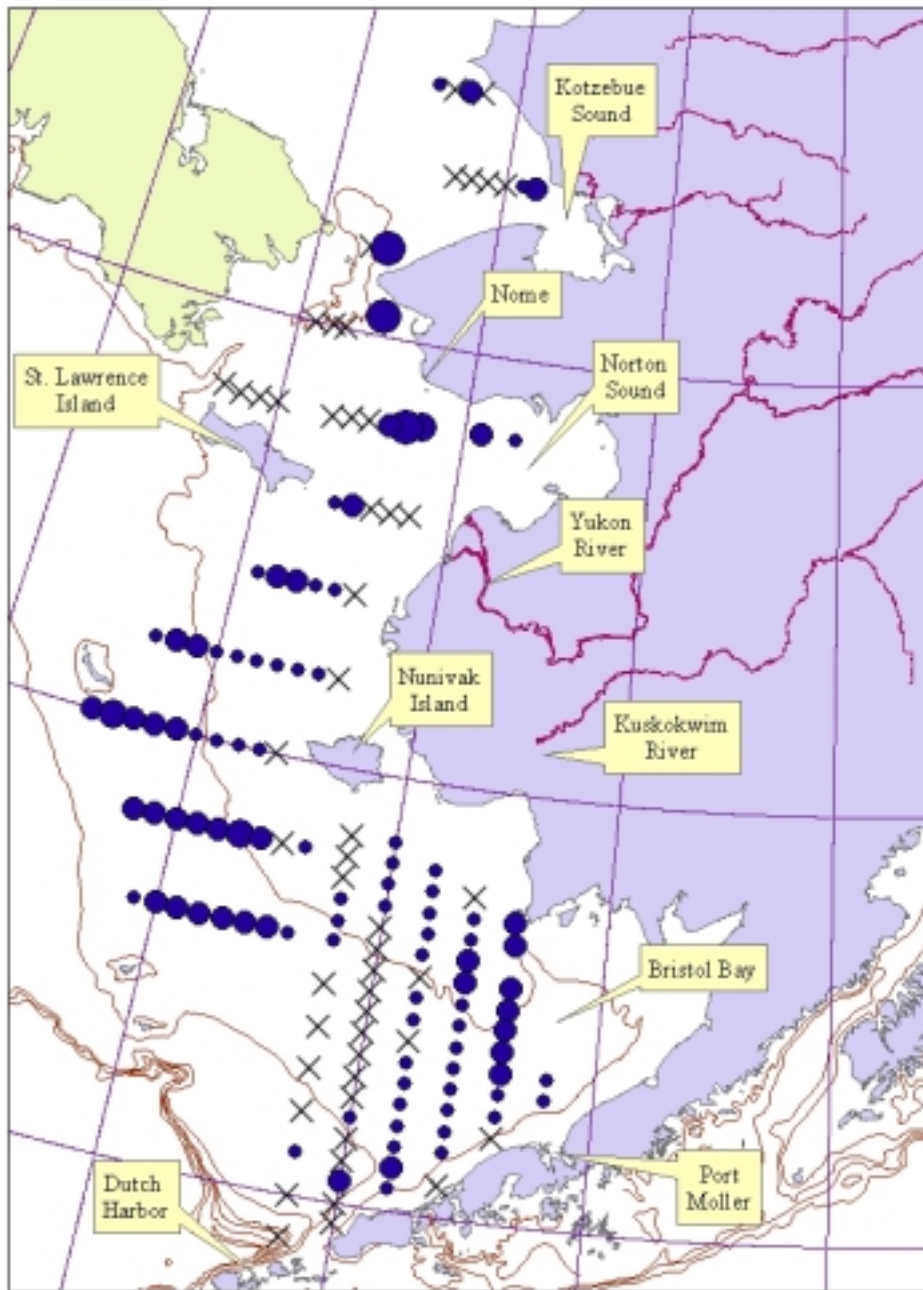


Figure 2a. Distribution (shown by graduated symbol of catch per unit effort (CPUE; smallest 1-10, next largest 11-100, next largest 101-500, largest > 501) - see Table 4) of juvenile pink salmon captured by during the August 21 - October 8, 2003 BASIS research cruise in the eastern Bering Sea. (X indicates location sampled, but no juvenile salmon of a particular species were caught).

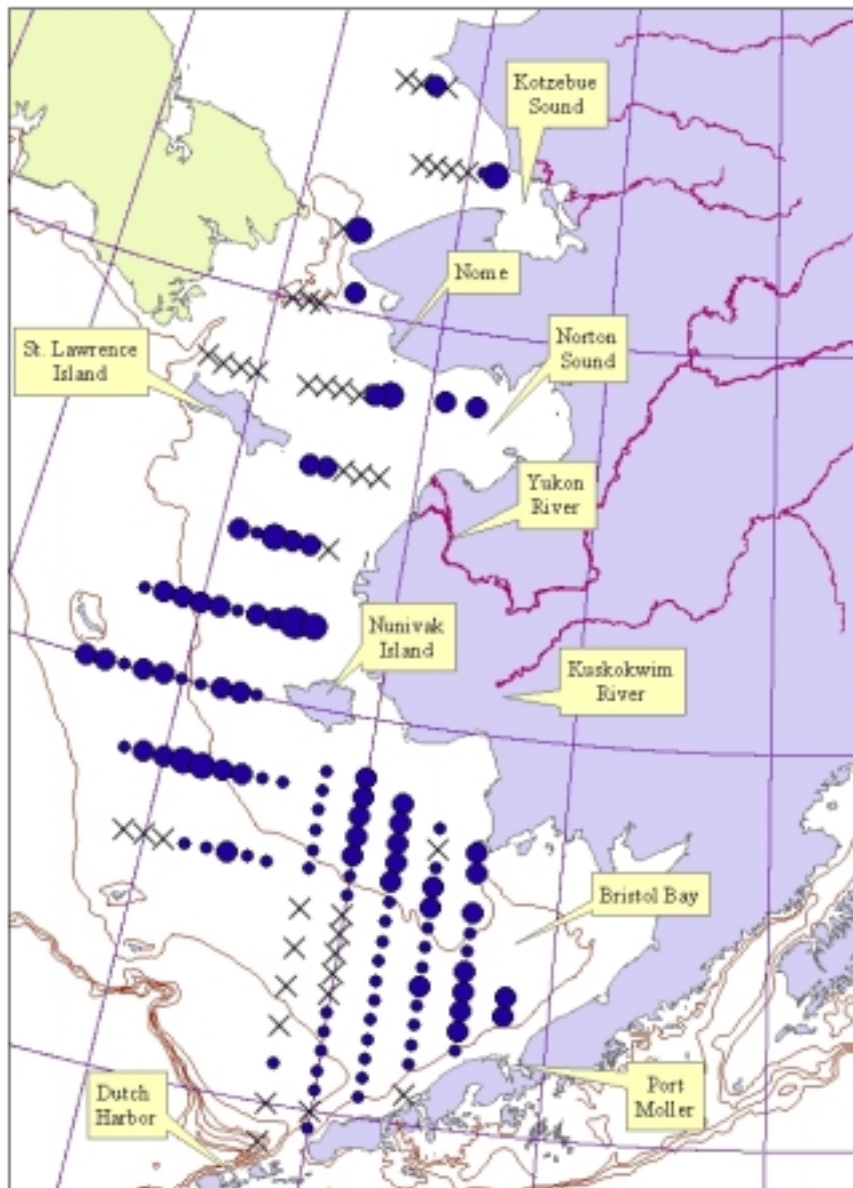


Figure 2b. Distribution (shown by graduated symbol of catch per unit effort (CPUE; smallest 1-10, next largest 11-100, next largest 101-500, largest > 501) - see Table 4) of juvenile chum salmon captured during the August 21 - October 8, 2003 BASIS research cruise in the eastern Bering Sea. (X indicates location sampled, but no juvenile salmon of a particular species were caught).

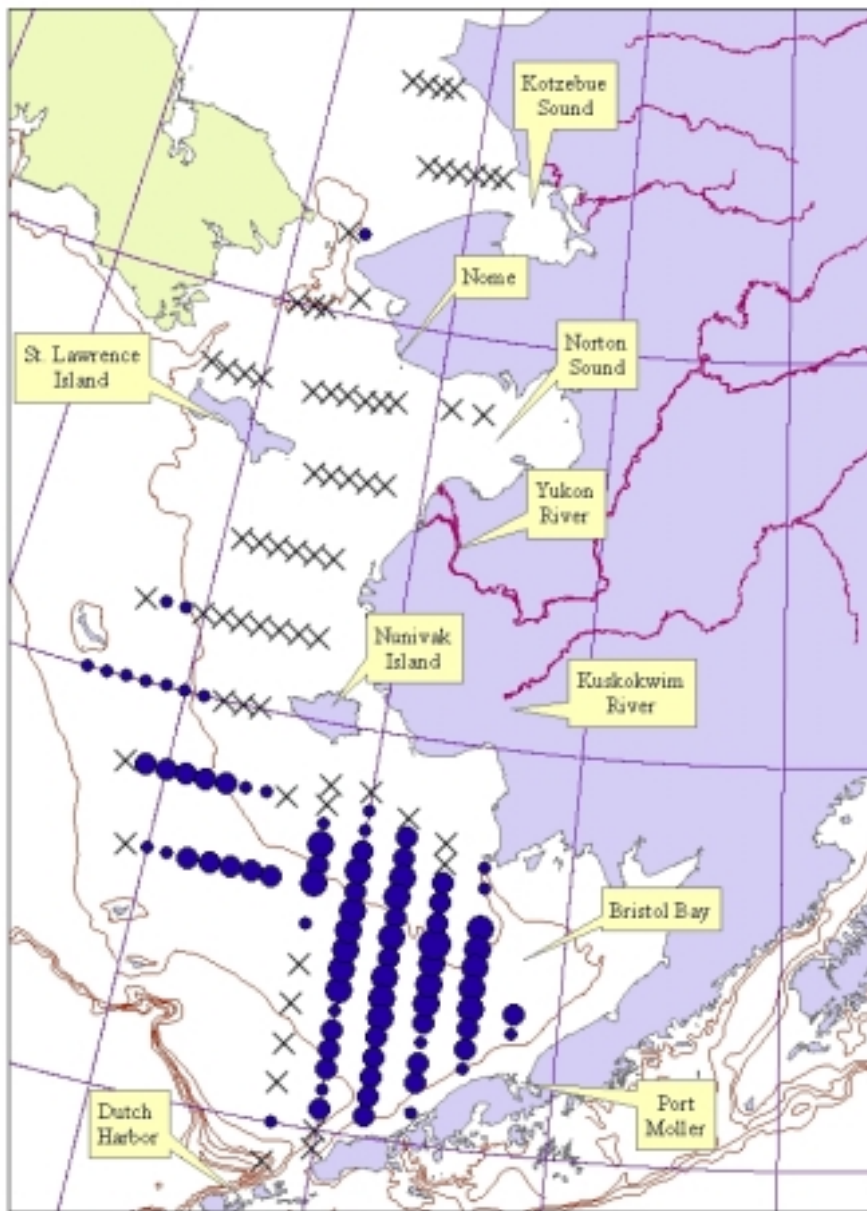


Figure 2c. Distribution (shown by graduated symbol of catch per unit effort (CPUE; smallest 1-10, next largest 11-100, next largest 101-500, largest > 501) - see Table 4) of juvenile sockeye salmon captured during the August 21 - October 8, 2003 BASIS research cruise in the eastern Bering Sea. (X indicates location sampled, but no juvenile salmon of a particular species were caught).

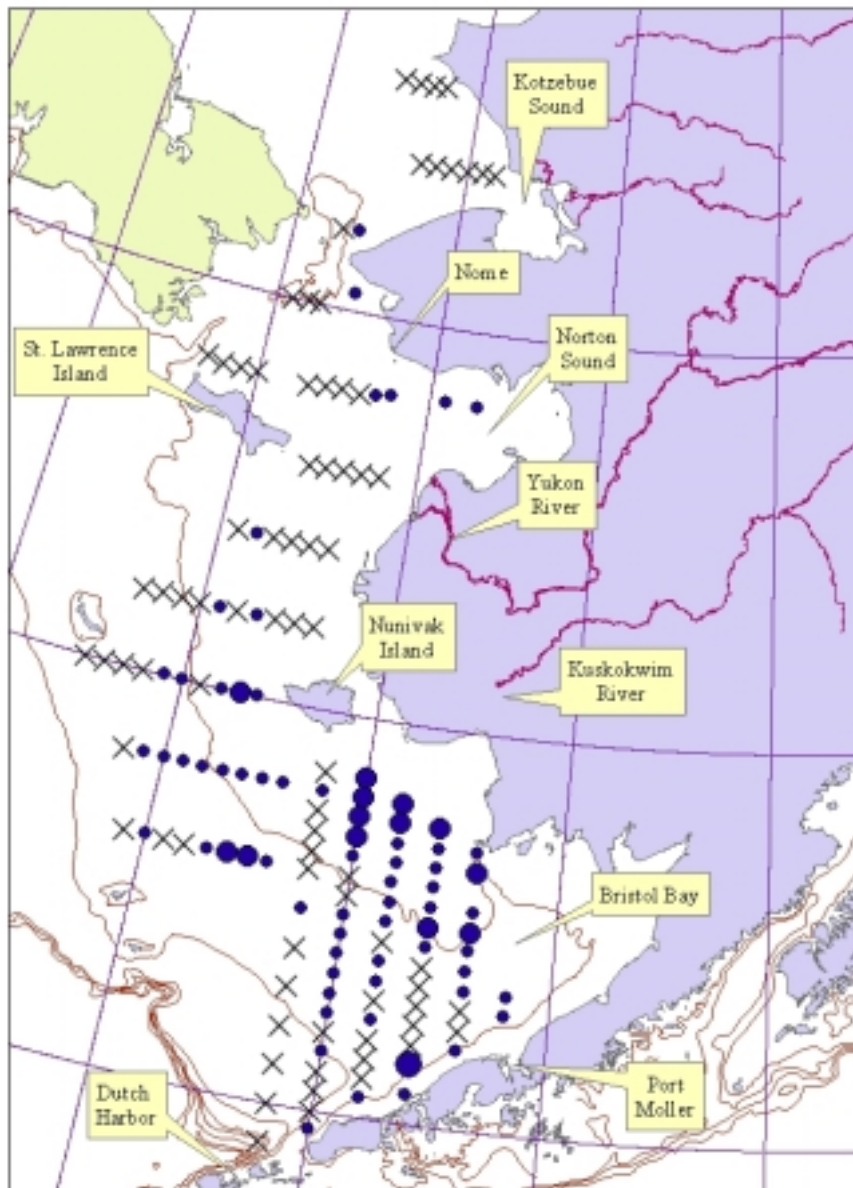


Figure 2d. Distribution (shown by graduated symbol of catch per unit effort (CPUE; smallest 1-10, next largest 11-100, next largest 101-500, largest > 501) - see Table 4) of juvenile coho salmon captured during the August 21 - October 8, 2003 BASIS research cruise in the eastern Bering Sea. (X indicates location sampled, but no juvenile salmon of a particular species were caught).

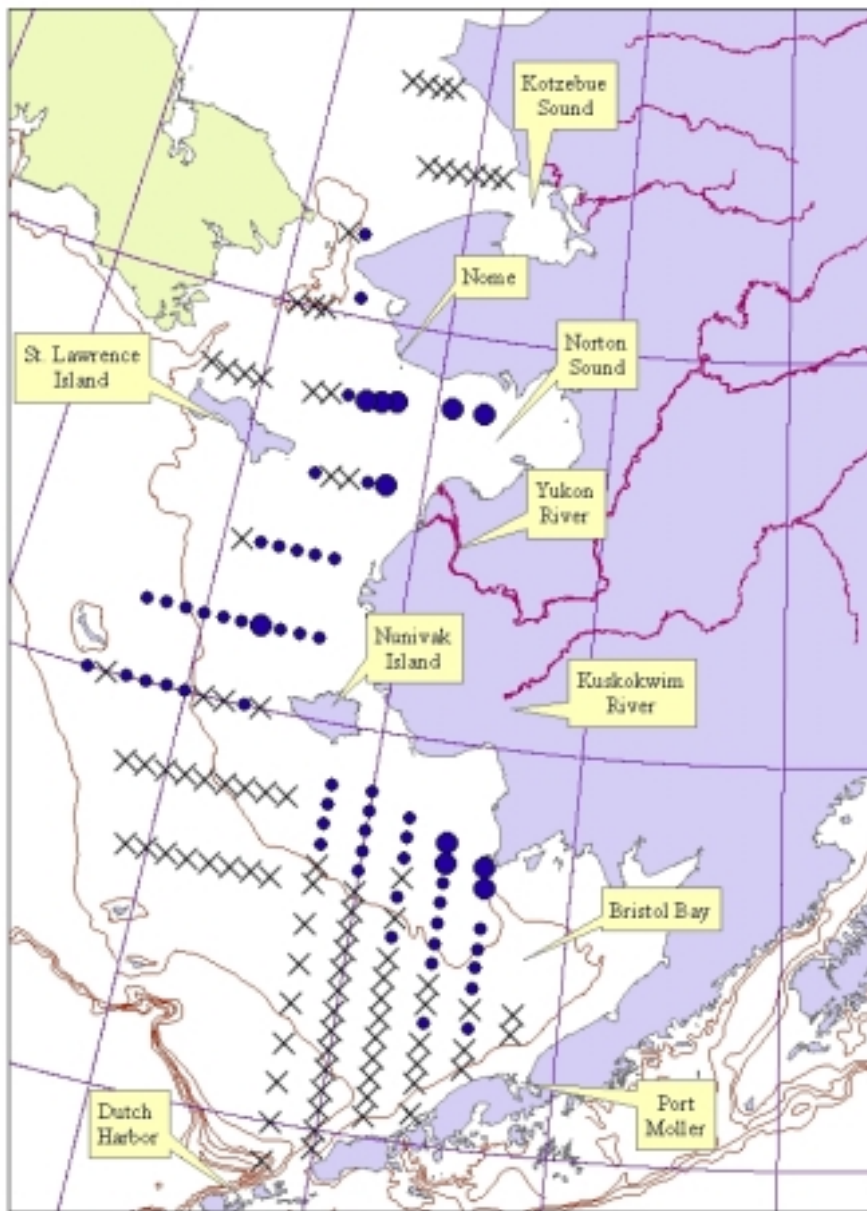


Figure 2e. Distribution (shown by graduated symbol of catch per unit effort (CPUE; smallest 1-10, next largest 11-100, next largest 101-500, largest > 501) - see Table 4) of juvenile chinook salmon captured during the August 21 - October 8, 2003 BASIS research cruise in the eastern Bering Sea. (X indicates location sampled, but no juvenile salmon of a particular species were caught.

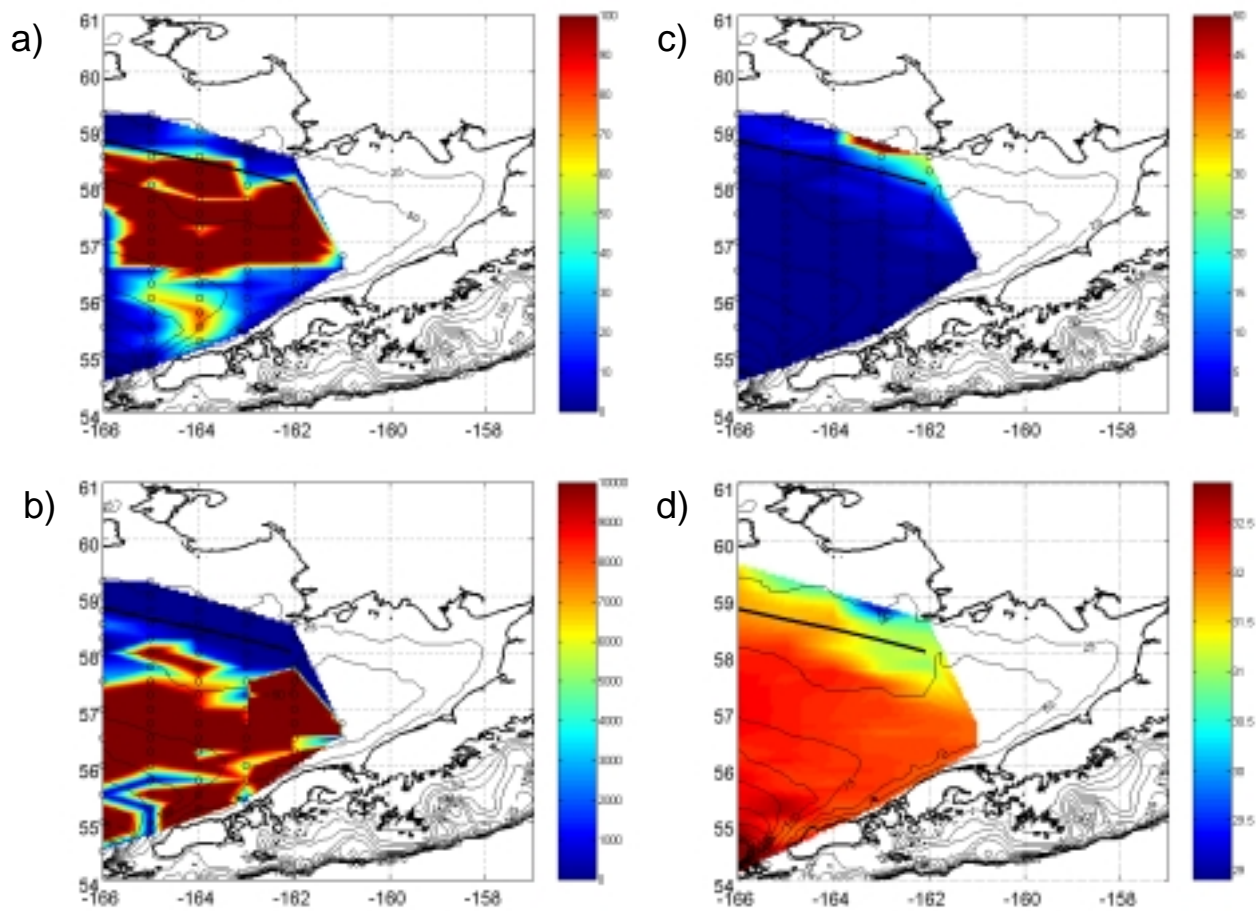


Figure 3. Contour maps (linear interpolation) of a) juvenile sockeye salmon, b) YOY pollock, c) juvenile chinook salmon, and d) surface (3 m) salinity in Bristol Bay. Solid black line shows estimated location of the inside edge of the Inner Front (~ location where the vertical structure changed from mixed to two-layered). For comparison, fish abundances were set at a maximum range of 50, 100, or 10,000 as shown on the color bars. Stations shown by open circles.

