Ecosystem-Based Juvenile Pacific Salmon (*Oncorhynchus* spp.) Trawl Survey off North East Vancouver Island, September 30 - October 8, 2019

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Les numéros 1 à 25 de cette série ont été publiés à titre de Records statistiques, Service des pêches et de la mer. Les numéros 26-160 ont été publiés à titre de Rapports statistiques du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom de la série a été modifié à partir du numéro 161.

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2021

ECOSYSTEM-BASED JUVENILE PACIFIC SALMON (*ONCORHYNCHUS* SPP.) TRAWL SURVEY OFF NORTH EAST VANCOUVER ISLAND, BRITISH COLUMBIA, SEPTEMBER 30 - OCTOBER 8, 2019

by

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ABSTRACT

Anderson, E.D., King, J.R. and Zubkowski, T.B. 2021. Ecosystem-Based Juvenile Pacific Salmon (*Oncorhynchus* spp.) Trawl Survey off North East Vancouver Island, British Columbia, September 30 - October 8, 2019. Can. Data Rep. Fish. Aquat. Sci. 1335: vi + 39 p.

Fisheries and Oceans Canada conducted an ecosystem-based trawl survey from September 30 to October 8, 2019 on the *CFV Sea Crest*. This study targeted juvenile Pacific Salmon off North East Vancouver Island. There were 21 species sampled in 716 kg of catch, with 26% Pacific Salmon caught by weight. Overall, Opalescent Inshore Squid (29%), Chum Salmon (14%), and juvenile Sablefish (13%) were the most abundant species by weight. Lengths and weights were recorded for 14 species, including all 5 Pacific Salmon species (*Oncorhynchus* spp.). Juvenile Chum Salmon and Pink Salmon were the most abundant Pacific Salmon species with large catches throughout the study area, except within Queen Charlotte Sound. Chum Salmon had the lowest percentage of empty stomach (4%), whereas juvenile Chinook Salmon had the highest percentage of empty stomachs (20%). Juvenile Coho Salmon, Pink Salmon, and Sockeye Salmon were primarily feeding on euphausiids and amphipods. Chinook salmon were primarily feeding on Pacific Herring, as well as amphipods. Biological samples for genetic stock composition and energy density are at the Pacific Biological Station, Fisheries and Oceans Canada (Nanaimo, BC). Associated information on the physical oceanography and zooplankton composition was collected from 36 stations and analysed at the Institute of Ocean Sciences, Fisheries and Oceans Canada (Sidney, BC).

RÉSUMÉ

Anderson, E.D., King, J.R. and Zubkowski, T.B. 2021. Ecosystem-Based Juvenile Pacific Salmon (*Oncorhynchus* spp.) Trawl Survey off North East Vancouver Island, British Columbia, September 30 - October 8, 2019. Can. Data Rep. Fish. Aquat. Sci. 1335: vi + 39 p.

Pêches et Océans Canada a mené une étude écosystémique au chalutage pélagique du 30 septembre au 8 octobre, 2019 sur le *CFV Sea Crest*. Cette étude ciblait les saumons du Pacifique juvéniles de la région du nord-est de l'isle de Vancouver. Il y avait 21 espèces échantillonnées dans 716 kg de prises, avec 26% de saumon du Pacifique capturé en poids. Dans l'ensemble, les calmars opales (29%), le saumon kéta (14%) et la morue charbonnière juvénile (13%) étaient les espèces les plus abondantes en poids. Les longueurs et poids ont été enregistrés pour 14 espèces, dont les 5 espèces de saumon du Pacifique (*Oncorhynchus* spp.). Le saumon kéta juvénile et le saumon rose étaient les espèces de saumon du Pacifique les plus largement distribué, sauf dans de la région de Queen Charlotte Sound. Le saumon kéta avait seulement 4% d'estomac vide, tandis que le saumon quinnat juvénile avait 20% de vides les estomacs. Le saumon coho juvénile, le saumon rose et le saumon rouge se nourrissaient principalement d'euphausiacés et d'amphipodes. Le saumon quinnat se nourrissait principalement de hareng du Pacifique, ainsi que d'amphipodes. Les échantillons biologiques pour la composition génétique des populations et la densité énergétique se trouvent à la Station biologique du Pacifique de Pêches et Océans Canada (Nanaimo, Colombie-Britannique). Des informations sur l'océanographie physique et la composition du zooplancton ont été recueillies auprès de 36 stations et seront analysées à l'Institut des sciences de la mer, Pêches et Océans Canada (Sidney, C.-B.).

1 INTRODUCTION

Fisheries and Oceans Canada conducted an ecosystem-based midwater trawl survey, targeting juvenile Pacific Salmon (*Oncorhynchus* spp.) from September 30 to October 8, 2019 on the *CFV Sea Crest*. The main objectives of this surveys were:

1. to determine the abundance, condition, distribution, and genetic stock composition of juvenile Pacific Salmon present off North East of Vancouver Island in the fall,
2. the associated physical oceanography, and
3. the distribution and biomass of prey species, including zooplankton.

This survey supports research into linkages between oceanographic conditions, fish abundance and community composition, Pacific Salmon ocean ecology and forecasting adult returns. This data report documents the biological, oceanographic, and zooplankton data and samples collected during the ecosystem-based juvenile Pacific Salmon survey from September 30 to October 8, 2019.

2 METHODS

2.1 SURVEY LOCATIONS

Fishing (Figure 1), oceanographic and zooplankton sampling (Figure 2) occurred off North East of Vancouver Island, including Johnstone Strait, Queen Charlotte Strait, Queen Charlotte Sound, and mainland British Columbia inlets.

2.2 FISHING OPERATIONS

The vessel deployed a coastal LFS 7742 trawl net (Appendix A, manufactured by LFS Trawl (LFS Net Systems, Bellingham, USA). This two-bridle mid-water net has a codend liner (12.7 mm mesh) to retain smaller species. The coastal LFS 7742 trawl net was designed to have a net opening of 30 m wide by 15 m high, or an area of 450 m^2 (Figure A.1). Actual net openings varied and tended to be larger than expected; therefore, height and width dimensions were recorded for each tow and used in the calculation of catch per swept volume (Figures 4 to 8).

The net was fished with Thyborøn Type 15 VF, 4.5 m^2 mid water doors (approximately 730 kg each). Two chain clumps were attached to the footrope with approximately 160 kg (350 lbs) per chain clump. The vessel was equipped with a Marport Trawl System and wireless Marport Trawleye that provided realtime doorspread, headline depth and net opening values (Marport Americas Inc., Washington, USA). In addition, RBR duet temperature and depth sensors (RBR Ltd., Ottawa, ON, Canada) were attached to the headrope and footrope to record depth every 30 seconds. The vertical net opening was plotted over time to show the net opening and depth.

Tow speed varied between 6.5 to 10.9 km/hour (3.5 and 5.9 knots) speed over ground, depending on the wind, tide, and current, in order to reach the target headrope depth. The target headrope depths were 0 m (surface) and 15 m (depth). Two A-6 floats 86.4 cm x 118.1 cm (34" x 46.5") were attached to the on headrope for surface tows. Warp length ranged from 110 m to 141 m (Appendix B). Target tow duration was 15-20 min once the trawls doors were locked and the net fishing.

2.3 BIOLOGICAL SAMPLES

Species were sorted by species or taxonomic group (Figure 3), then the individuals measured for length and weight. Stomachs were analysed at sea following an established protocol (King et al. 2018). For each species in the tow, up to five whole bodies and five muscle tissues were collected for energy density and stable isotope analyses. Additional collection for Pacific Salmon species included: fin clips for genetic stock identification (GSI), otoliths, and adipose fin status, and coded wire tags (CWTs).

2.4 OCEANOGRAPHY

A standalone Sea-bird 25 CTD (conductivity-temperature-depth) was used for water profiles (Sea-bird Electronics Bellevue Washington, USA) at 36 stations (Figure 2, Appendix C). A Niskin bottle at 10 m from the surface was used for chlorophyll (chl a) and nutrient collections. Seawater samples for nitrate, phosphate, and silicate were placed in acid-washed glass test tubes and frozen. Seawater for chl a estimation were filtered with GF/F glass fibre filter disks. Filter disks were then placed in polypropylene scintillation vials and frozen. Both the chlorophyll and nutrient samples were frozen and maintained at -18℃. Seawater and chl a samples were sent for analyses at the Institute of Ocean Sciences, Fisheries and Oceans Canada (Sidney, BC).

2.5 ZOOPLANKTON

At 36 zooplankton stations (Figure 2, Appendix C), vertical tows were conducted to approximately 250 m or within 10 m of the bottom with two 60 cm diameter, 253 micrometer mesh nets mounted in a bongo-drum style frame. Zooplankton collected from the flow meter side were preserved in 10% formalin and sent to the zooplankton laboratory at the Institute of Ocean Sciences, Fisheries and Oceans Canada (Sidney, BC) for species classification and enumeration. The remaining zooplankton sample was sorted into four size fractions by successively sieving through 8.0, 1.7, 1.0, and 0.25 mm screens. Individual size fractions were frozen for future stable isotope, energy density, and proximate analyses.

2.6 ACOUSTIC DATA

Acoustic data was collected throughout the survey using the vessel SIMRAD ES60 echo sounder (Kongsberg Maritime CM Canada Lid, Vancouver, Canada).

3 RESULTS

3.1 FISHING OPERATIONS

This survey completed 37 LFS 7742 trawl net tows (Appendix B). The LFS 7742 trawl net averaged 20 m high by 35 m wide, or an area of 700 m^2, during tows on this survey. This mouth area is larger than originally designed (15 m x 30 m), but similar to a previous survey on the *FV Sea Crest* where the LFS 7742 trawl net mouth opening averaged 19 m high by 41 m wide at the surface, or area of 779 m^2, and 13 m high by 47 m wide at a headrope depth of 15 m, or area of 611 m^2 (Anderson et al. 2019). All catch per unit effort (CPUE) reported here are divided by swept volume to standardize catch values.

3.2 CATCH COMPOSITION

For each of 21 species captured during the survey, the number of tows in which the species was present, total catch weight, maximum catch weight, and mean catch weight per tow for usable tows is presented in Table 1. The most abundance species caught by weight were Opalescent Inshore Squid, primarily caught in one set (206 kg), Chum Salmon (97 kg), then Sablefish (91 kg; Table 1). All species of juvenile Pacific Salmon were caught. The order of abundance by weight was: Chum Salmon, Pink Salmon, Chinook Salmon, Coho Salmon, Sockeye Salmon. Total catch for the survey from usable tows was 716 kg, with 185 kg or 26% Pacific Salmon. Detailed catch composition for each tow is included in Appendix D.

Pink Salmon had the highest abundance by count and were most abundant from Johnstone Strait to Queen Charlotte Strait (Figure 4). Chum Salmon were second most abundant by count, with the highest catches within Queen Charlotte Strait, the entrance to Rivers Inlet, and beside Thurlow Islands (Figure 5). Chinook Salmon were abundant in Wells Passage and southern Johnstone Strait (Figure 6). Juvenile Sockeye Salmon were abundant at the border of Johnstone Strait and Queen Charlotte Strait and one tow within Queen Charlotte Sound (Figure 7). Finally, Coho Salmon were the least abundant salmon species with only 30 individuals caught, mainly in Queen Charlotte Strait and the entrance to Rivers Inlet (Figure 8).

3.3 BIOLOGICAL SAMPLES

Samples were collected for DNA stock composition (401), otoliths (403), energy density (318), stable isotope analysis (194), and coded wire tags (8). These biological samples are located at the Pacific Biological Station, Fisheries and Oceans Canada (Nanaimo, BC).

3.4 LENGTH AND WEIGHT

Length frequencies and length-weight relationships are presented for juvenile Pacific Salmon species in Figures 9 to 13. Double log transformed length-weight regressions coefficients were similar for three of the five Pacific Salmon species (Pink Salmon, Chum Salmon, Chinook Salmon). Sockeye Salmon and Coho Salmon had smaller slopes compared to the other Pacific Salmon species (Figures 12 and 13). Mean, minimum, and maximum lengths and weights of 14 species were recorded, with all five Pacific Salmon species represented (Table 2), Juvenile Coho Salmon had the largest mean length (287 mm) and weight (299 g), whereas juvenile Sockeye Salmon had the smallest mean length (156 mm) and weight (41 g) of the Pacific Salmon species. These size differences are expected given the different life histories of Pacific Salmon species. For example, ocean-type or sea-type Sockeye Salmon migrate to the marine environment in their first year, whereas juvenile Coho Salmon migrate later and a portion of those individuals remain in the coastal environment (Quinn 2018).

3.5 STOMACH CONTENTS

Stomachs of 554 individual fish, from 10 species, were analysed at sea (Table 3). Chinook Salmon (20%) had the highest percentage of empty stomachs, whereas Chum Salmon (4%) had the lowest percentage of empty stomachs within Pacific Salmon species. Pink Salmon (9%), Sockeye Salmon (8%), and Coho Salmon (7%) had comparable percentages of empty stomachs (Table 3).

The most common prey within juvenile Pink Salmon, Sockeye Salmon, and Coho Salmon stomachs were amphipods and euphausiids (Table 4). Juvenile Chum Salmon also preyed upon amphipods and euphausiids; however, juvenile chum had more unidentified remains within their stomachs. Jellyfish and Squid are digested quickly; therefore, unidentified remains may represents those prey species. Juvenile Chinook salmon were primarily eating Pacific Herring and amphipods, although two individuals had a large volume of squid of their stomachs (Table 4).

3.6 OCEANOGRAPHY

CTD casts and water samples were completed at 36 sites with cast depths ranging from 50 m to 250 m (Appendix C). Samples were collected for nutrients and chlorophyll at approximately 10 m below the surface. Oceanographic data from the CTD casts and nutrient analysis of the water samples are archived online within the Water Properties Data Inventory under cruise number 2019-125, as well as Canadian Integrated Ocean Observing System or CIOOS.

3.7 ZOOPLANKTON

Vertical bongo tows were conducted at 36 stations to depths ranging from 40 m to 250 m (Appendix C). Formalin-preserved zooplankton samples will be identified and enumerated at the Institute of Ocean Sciences, Fisheries and Oceans Canada (Sidney, BC). Data will be archived in

the zooplankton database. Fractionated zooplankton samples are frozen at the Pacific Biological Station, Fisheries and Oceans Canada (Nanaimo, BC).

3.8 ACOUSTIC DATA

Acoustic data was collected throughout the survey for analysis at the Institute of Ocean Sciences, Fisheries and Oceans Canada (Sidney, BC).

4 DISCUSSION

This ecosystem-based juvenile Pacific Salmon trawl survey collected valuable information on distribution, abundance, condition, and genetic stock composition for juvenile Pacific Salmon off North East of Vancouver Island. Overall, juvenile Pink Salmon and Chum Salmon and were most abundant, whereas Coho Salmon were least abundant. Distributions and stomach contents varied by species. The most abundant prey species were amphipods, euphausiids, and Pacific Herring, depending on the predator species. We collected 36 physical oceanographic water profiles, and 36 zooplankton samples associated with the Pacific Salmon caught. Select data from laboratory analysis (i.e. GSI, energy density) has been completed and will integrated into the survey data. Other items are awaiting analysis (i.e. zooplankton, isotopic analysis). This survey data supplements historic juvenile Pacific Salmon surveys, has been reported in Fisheries and Oceans Canada State of the Pacific Ocean, and is being incorporated into longer term and broader scope research projects.

5 REFERENCES

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Quinn, T.P. 2018. The behavior and ecology of Pacific Salmon and Trout.: 547 p. UBC Press.

6 ACKNOWLEDGEMENTS

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would like to thank Captain Nathan Dobie, and crew of the *CFV Sea Crest.* We appreciate the expertise of the following science staff who participated in the survey: Cameron Freshwater, Erika Nielsen, Ben Snow.

7 FIGURES

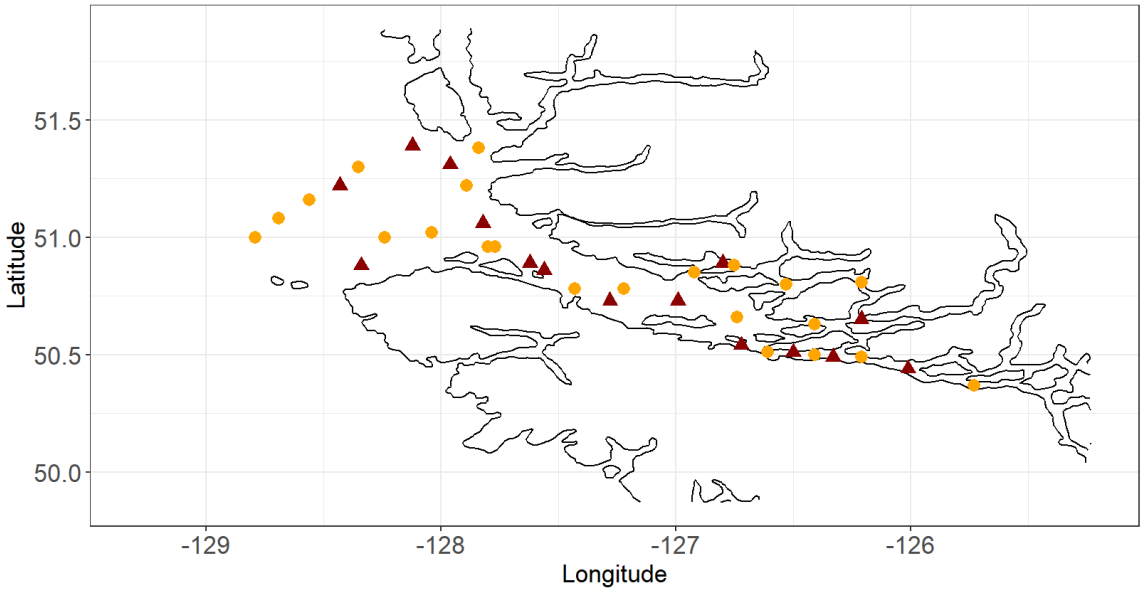

Figure 1. Fishing tow locations during the ecosystem-based juvenile Pacific Salmon survey from September 30 to October 8, 2019 on the *CFV Sea Crest*. The target head rope depth was 0 m (orange circles) or 15 m (red triangles).

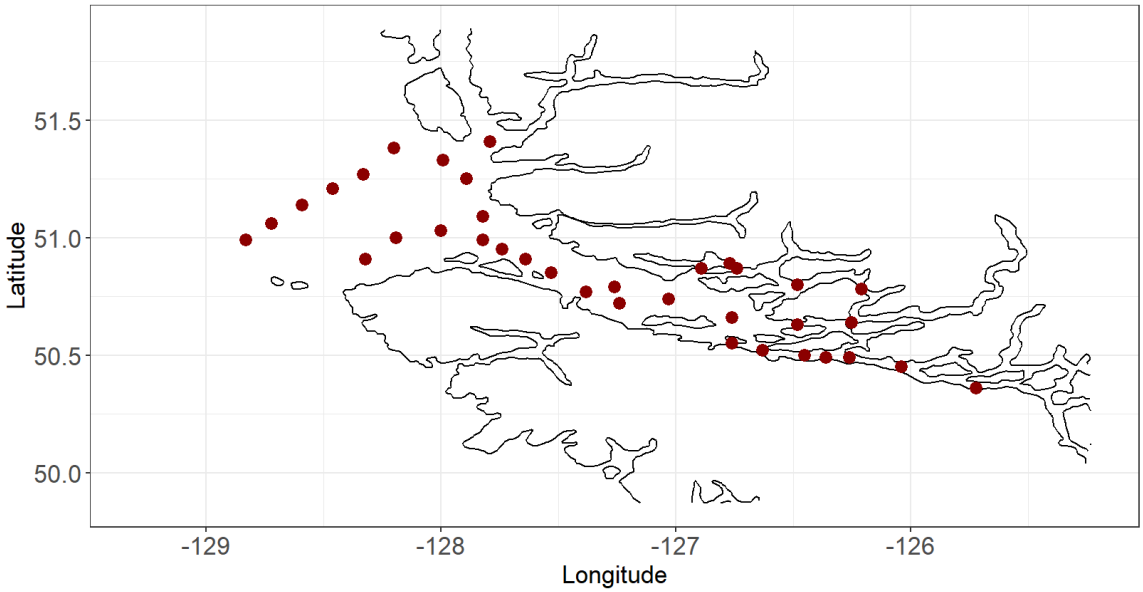

Figure 2. Oceanographic and zooplankton sampling locations during the ecosystem-based juvenile Pacific Salmon survey from September 30 to October 8, 2019 on the *CFV Sea Crest*. There were 36 Seabird 25 CTD casts and 36 zooplankton vertical tows.

Figure 3. Sorting catch of juvenile Pacific Salmon (*Oncorhynchus* spp.), juvenile Sablefish (*Anoplopoma fimbria*), Moon Jellyfish (*Aurelia labiata*), and Lions Mane Jellyfish (*Cyanea capillata*) (photo credit E. Anderson).

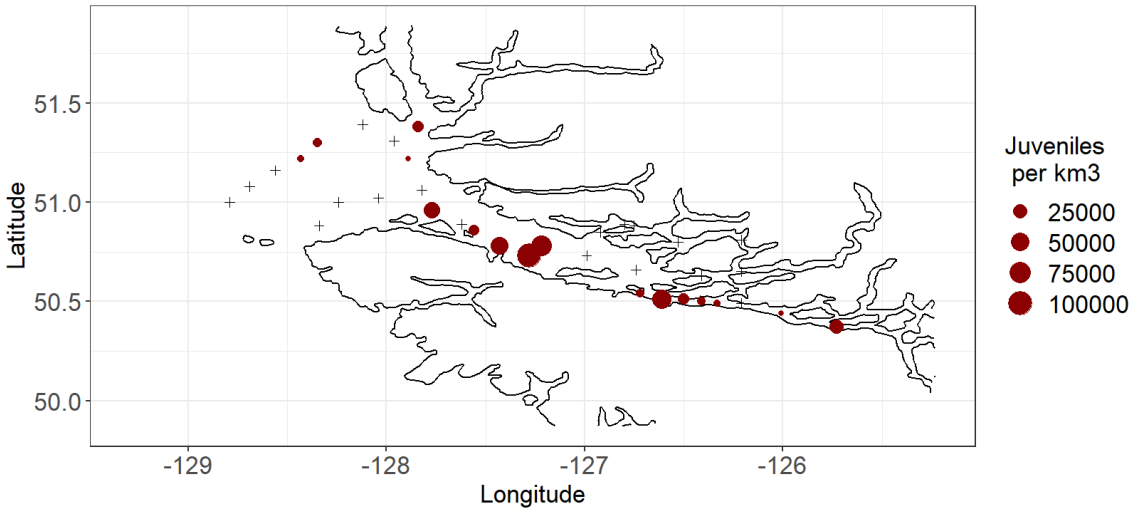

Figure 4. Juvenile Pink Salmon (*Oncorhynchus gorbusha*) catch per km^3 for each tow. Red circles are proportional to catch abundance, and zero catches are shown with a cross (+).

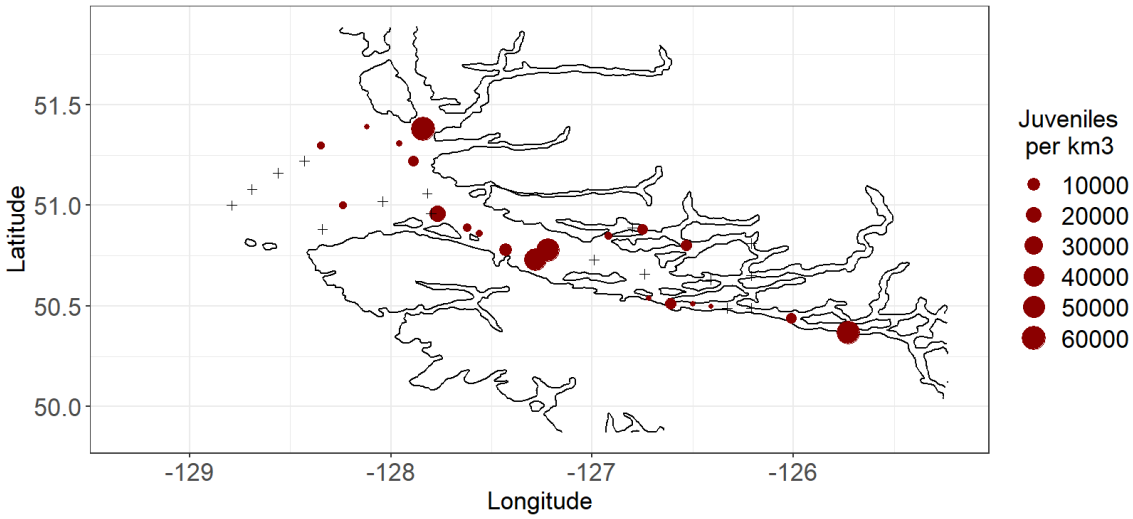

Figure 5. Juvenile Chum Salmon (*Oncorhynchus keta*) catch per km^3 for each tow. Red circles are proportional to catch abundance, and zero catches are shown with a cross (+).

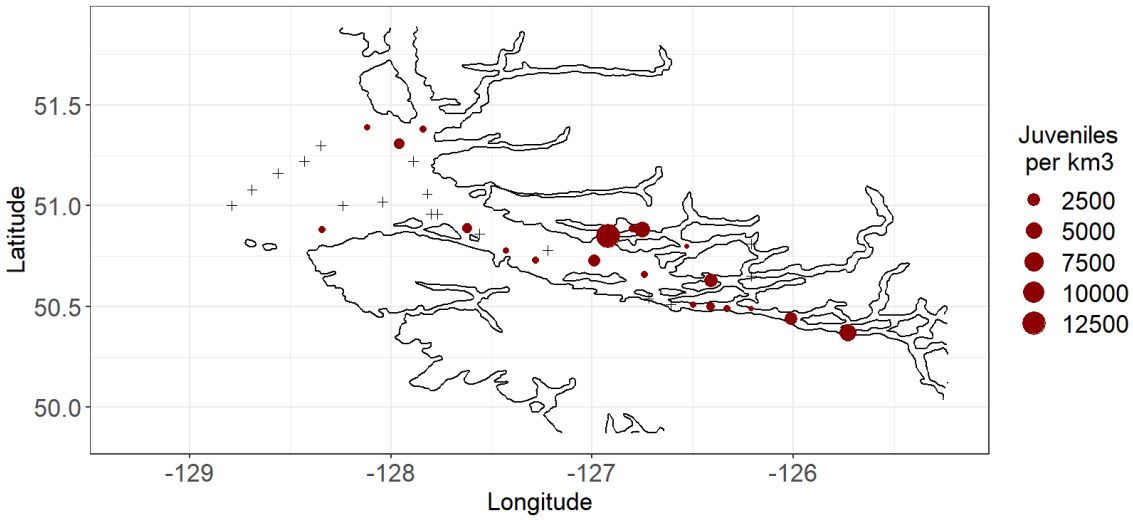

Figure 6. Juvenile Chinook Salmon (*Oncorhynchus tschawytscha*) catch per km^3 for each tow. Red circles are proportional to catch abundance, and zero catches are shown with a cross (+).

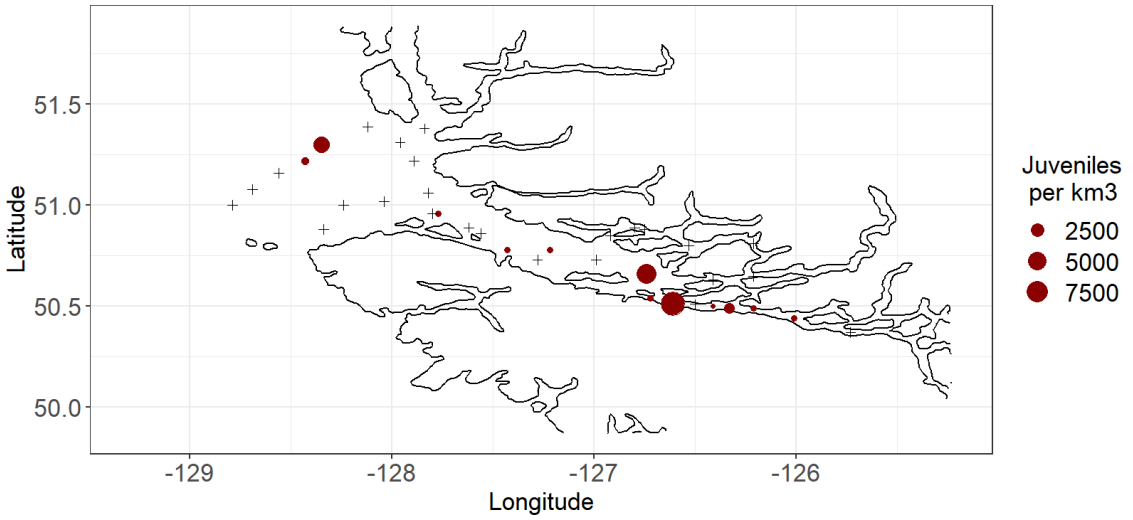

Figure 7. Juvenile Sockeye Salmon (*Oncorhynchus nerka*) catch per km^3 for each tow. Red circles are proportional to catch abundance, and zero catches are shown with a cross (+).

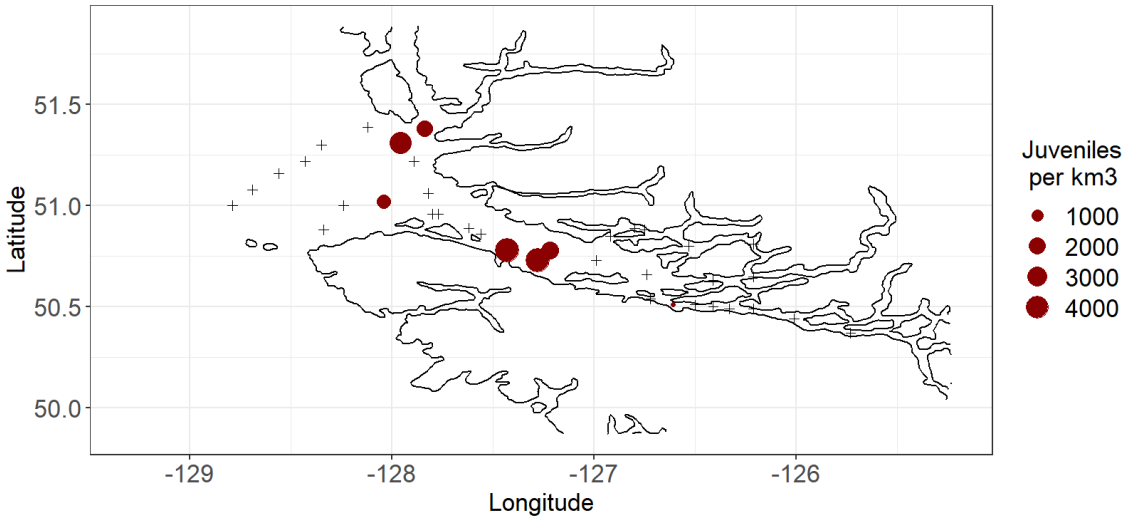

Figure 8. Juvenile Coho Salmon (*Oncorhynchus kitsutch*) catch per km^3 for each tow. Red circles are proportional to catch abundance, and zero catches are shown with a cross (+).

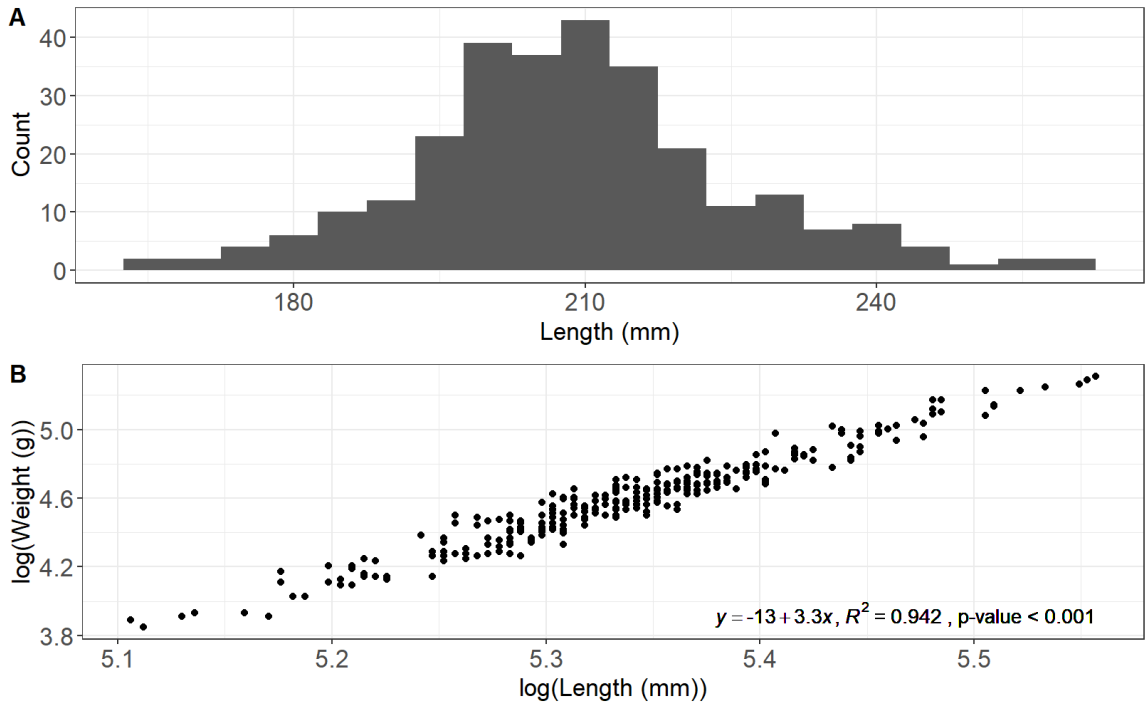

Figure 9. Juvenile Chum Salmon (*Oncorhynchus keta*) length frequency plot as sampled during the ecosystem-based juvenile Pacific Salmon survey aboard the *CFV Sea Crest*, September 30 to October 8, 2019 (A). Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test (B).

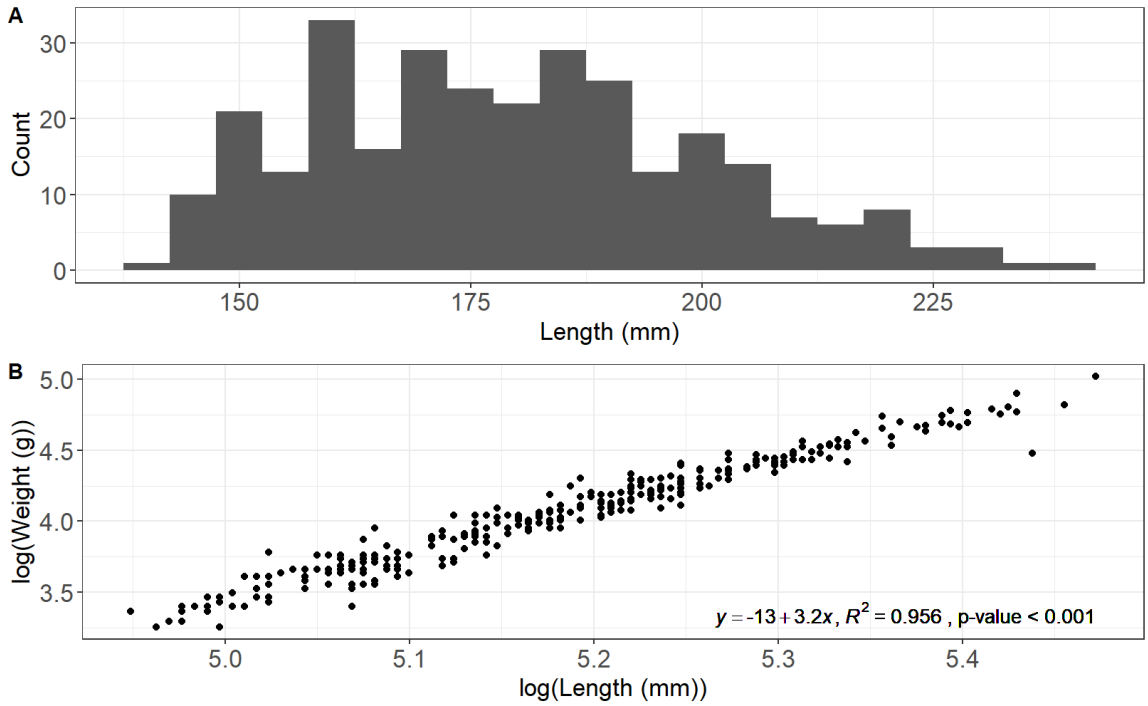

Figure 10. Juvenile Pink Salmon (*Oncorhynchus gorbusha*) length frequency plot as sampled during the ecosystem-based juvenile Pacific Salmon survey aboard the *CFV Sea Crest*, September 30 to October 8, 2019 (A). Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test (B).

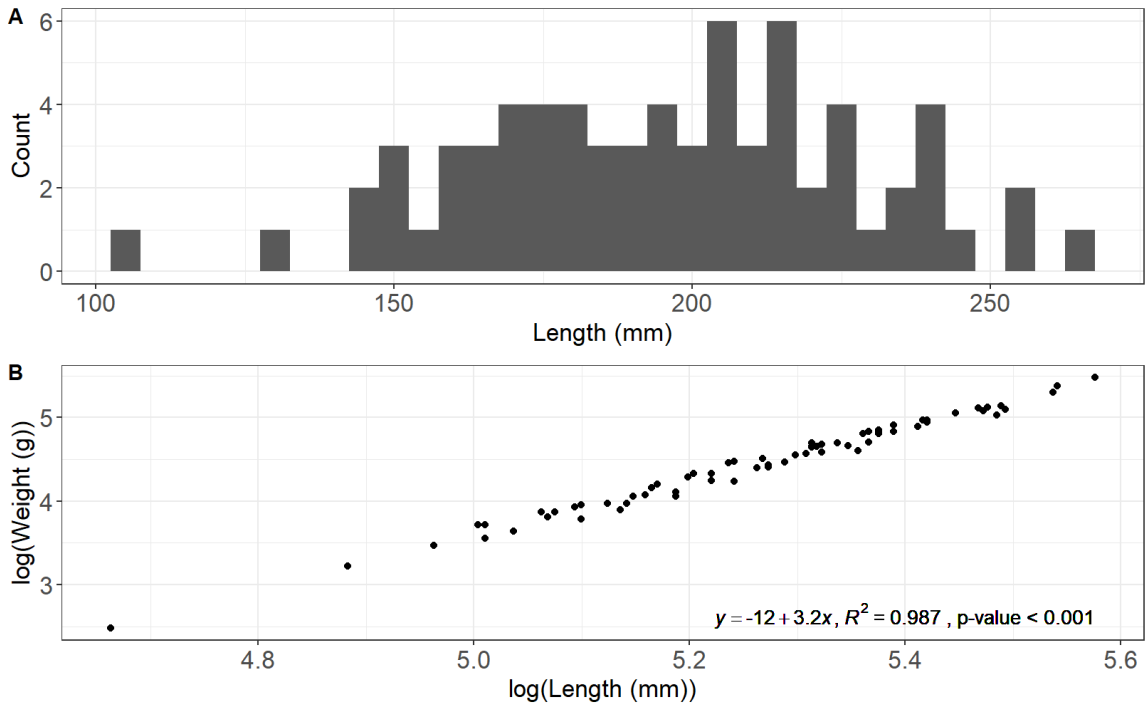

Figure 11. Juvenile Chinook Salmon (*Oncorhynchus tshawytscha)*) length frequency plot as sampled during the ecosystem-based juvenile Pacific Salmon survey aboard the *CFV Sea Crest*, September 30 to October 8, 2019 (A). Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test. No linear equation is included since there were so few caught. (B).

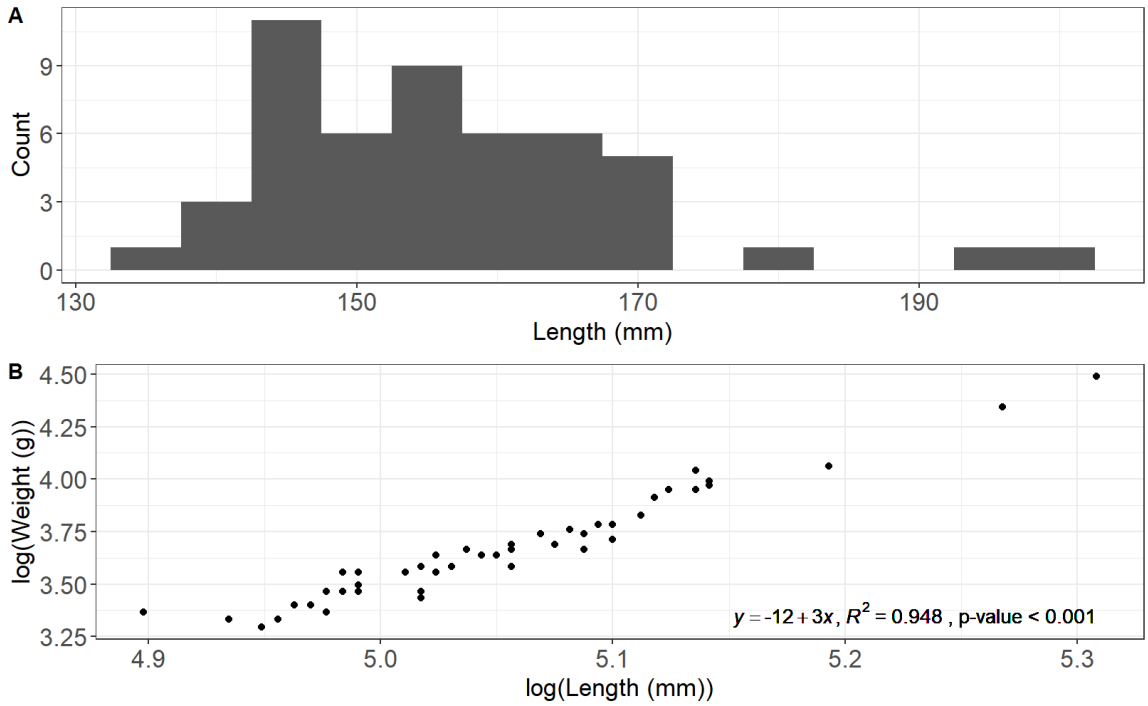

Figure 12. Juvenile Sockeye Salmon (*Oncorhynchus nerka*) length frequency plot as sampled during the ecosystem-based juvenile Pacific Salmon survey aboard the *CFV Sea Crest*, September 30 to October 8, 2019 (A). Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test (B).

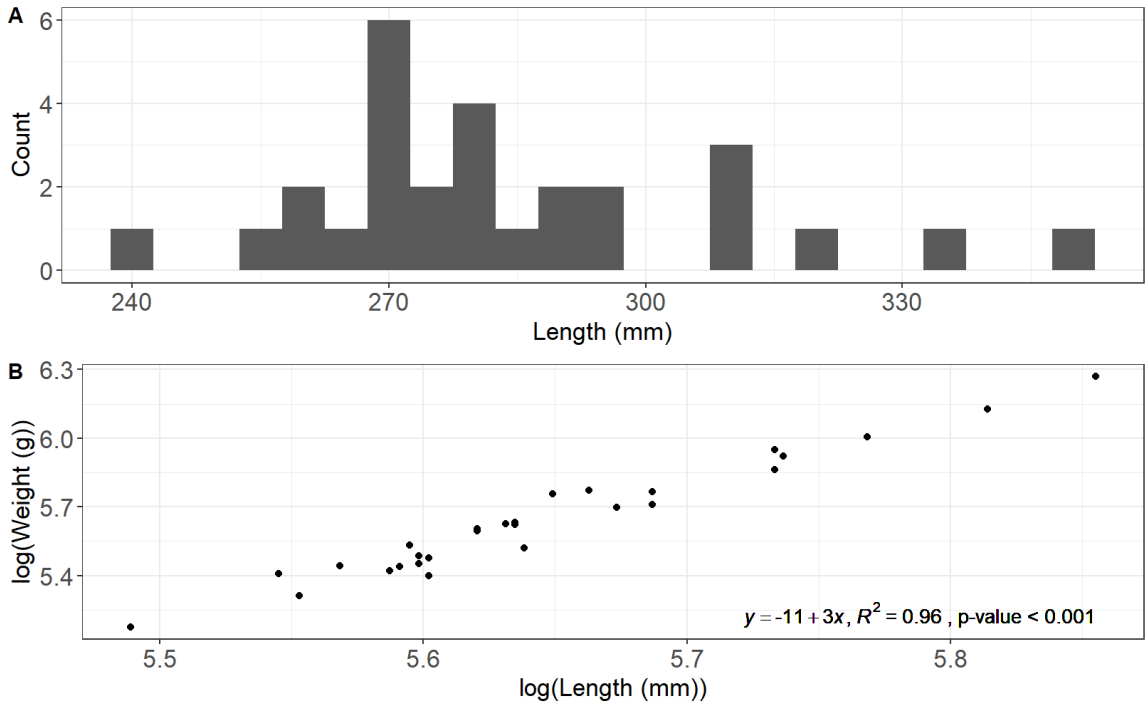

Figure 13. Juvenile Coho Salmon (*Oncorhynchus kisutch*) length frequency plot as sampled during the ecosystem-based juvenile Pacific Salmon survey aboard the *CFV Sea Crest*, September 30 to October 8, 2019 (A). Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test (B).

8 TABLES

Table 1. All captured species (or taxonomic group), ordered by total catch weight (in grams), showing number of tows in which the species occurred, total catch weight, maximum catch weight, and mean catch weight per tow for usable tows during the ecosystem-based juvenile Pacific Salmon survey aboard the *CFV Sea Crest*, September 30 to October 8, 2019. Blank weights indicate specimens which could not be weighed accurately (either released alive or too small).

Common Name	Scientific Name	Tows	Total	Max	Mean
Opalescent Inshore Squid	Doryteuthis opalescens	12	206105	140810	17175
Chum Salmon	Oncorhynchus keta	24	96936	24942	4039
Sablefish	Anoplopoma fimbria	21	90977	56460	4332
Lions Mane	Cyanea capillata	16	82174	17460	5478
Water Jellyfish	Aequorea	28	73456	19660	2623
Pink Salmon	Oncorhynchus gorbuscha	18	63429	16702	3524
Moon Jellyfish	Aurelia labiata	20	46842	12470	2342
Fried Egg Jellyfish, Egg Yolk Jelly	Phacellophora camtschatica	10	16589	5760	1659
Chinook Salmon	Oncorhynchus tshawytscha	24	11852	2960	494
Pacific Herring	Clupea pallasii	7	11761	11350	1680
Coho Salmon	Oncorhynchus kisutch	7	10515	2672	1502
Starry Flounder	Platichthys stellatus	2	2413	1550	1206
Sockeye Salmon	Oncorhynchus nerka	12	2308	870	192
Prowfish	Zaprora silenus	1	96	96	96
Polyorchis	Polyorchis	3	91	56	46
Jellyfish	Scyphozoa	1	17	17	17
Jelly (Siphonophore)	Siphonophorae	1	14	14	14
Walleye Pollock	Gadus chalcogrammus	1	9	9	9
Rockfishes	Sebastes	1			
Shortbelly Rockfish	Sebastes jordani	1			
Silvergray Rockfish	Sebastes brevispinis	1			

Table 2. Lengths and weights for each species (arranged descending by the number of length measurements for each by species) sampled during the ecosystem-based juvenile Pacific Salmon survey aboard the *CFV Sea Crest*, September 30 to October 8, 2019. (Tows = number of tows, Measured = number of length measurements, Weighed = number of weight measurements).

		Length	(mm)			Weight	(g)		
Species	**Tows**	**Measured**	**Min**	**Max**	**Mean**	**Weighed**	**Min**	**Max**	**Mean**
Opalescent Inshore Squid	11	321	13	94	39	40	3	17	6
Pink Salmon	18	298	104	238	179	298	26	151	62
Chum Salmon	22	286	165	768	214	286	47	5600	140
Sablefish	21	193	210	281	238	193	80	203	122
Pacific Herring	7	91	84	212	104	91	5	112	14
Chinook Salmon	23	79	106	539	210	79	12	1919	161
Sockeye Salmon	12	51	102	202	156	51	27	89	41
Coho Salmon	7	30	242	362	287	30	177	572	299
Moon Jellyfish	8	28	114	320	221				
Lions Mane	4	10	330	650	499				
Starry Flounder	2	2	400	510	455	2	863	1550	1206
Fried Egg Jelly	1	1	350	350	350				
Prowfish	1	1	181	181	181	1	95	95	95
Walleye Pollock	1	1	106	106	106	1	9	9	9

Table 3. Number of tows with stomach samples (Tows), number of stomachs examined (Stomachs), number of empty stomachs (empty), and percentage of empty stomachs for each species (Percent), arranged descending by number of tows, during the ecosystem-based juvenile Pacific Salmon survey aboard the *CFV Sea Crest*, September 30 to October 8, 2019.

Species	Tows	Stomachs	Empty	Percent
Chinook Salmon	23	64	13	20
Chum Salmon	22	141	6	4
Sablefish	21	127	31	24
Pink Salmon	18	132	12	9
Sockeye Salmon	12	37	3	8
Coho Salmon	7	30	2	7
Pacific Herring	6	20	12	60
Prowfish	1	1	0	0
Starry Flounder	1	1	0	0
Walleye Pollock	1	1	0	0

Table 4. Prey items (Prey) identified in the stomach contents of predator species (Species) sampled (alphabetical by Species) during during the ecosystem-based juvenile Pacific Salmon survey aboard the *CFV Sea Crest*, September 30 to October 8, 2019. Volume is average volume in cm^3; Count is the number of stomachs observed with each prey.

Species	Prey	Volume	Count
Chinook Salmon	Pacific Herring	3.54	18
Chinook Salmon	Unid. Fishes	1.03	9
Chinook Salmon	Unid. Remains	0.71	4
Chinook Salmon	Euphausiids	0.69	8
Chinook Salmon	Squids	0.40	5
Chinook Salmon	Polychaete Worms	0.20	1
Chinook Salmon	Flatfishes	0.20	1
Chinook Salmon	Pandalid Shrimp	0.15	4
Chinook Salmon	Sturgeon Poacher	0.12	5
Chinook Salmon	Unid. Plankton	0.10	1
Chinook Salmon	Polychaetes	0.10	1
Chinook Salmon	True Crabs	0.06	2
Chinook Salmon	Amphipods	0.03	11
Chinook Salmon	Mysids	0.01	2
Chinook Salmon	Misc. Non-Marine	0.01	1
Chinook Salmon (Adults)	Squids	18.30	2
Chinook Salmon (Adults)	Pacific Herring	5.10	3
Chum Salmon	Pacific Herring	5.70	1
Chum Salmon	Squids	3.50	2
Chum Salmon	Euphausiids	2.74	25
Chum Salmon	Gastropods	0.94	3
Chum Salmon	Unid. Remains	0.63	82
Chum Salmon	Ctenophores	0.47	10
Chum Salmon	Amphipods	0.45	45
Chum Salmon	Pteropods	0.04	3
Chum Salmon	Jellyfish	0.04	3
Coho Salmon	Pacific Herring	2.50	1
Coho Salmon	Squids	2.04	5
Coho Salmon	Euphausiids	1.78	12
Coho Salmon	Octopus	1.20	1
Coho Salmon	Amphipods	1.15	13
Coho Salmon	Unid. Fishes	0.20	2
Coho Salmon	True Crabs	0.20	1
Coho Salmon	Unid. Remains	0.01	2
Pacific Herring	Euphausiids	2.33	3
Pacific Herring	Squids	0.10	1
Pacific Herring	Unid. Remains	0.01	5
Pink Salmon	Euphausiids	1.78	39
Pink Salmon	True Crabs	0.88	9
Pink Salmon	Gastropods	0.84	10
Pink Salmon	Amphipods	0.73	71

Species	Prey	Volume	Count
Pink Salmon	Squids	0.67	3
Pink Salmon	Polychaetes	0.60	1
Pink Salmon	Unid. Remains	0.43	25
Pink Salmon	Misc. Non-Marine	0.10	3
Pink Salmon	Unid. Fishes	0.07	3
Pink Salmon	Isopods	0.01	1
Pink Salmon	Unid. Plankton	0.01	1
Prowfish	Unid. Remains	3.50	1
Sablefish	Pacific Herring	9.88	4
Sablefish	Squids	5.54	14
Sablefish	Euphausiids	4.71	16
Sablefish	Jellyfish	1.50	1
Sablefish	Pandalid Shrimp	1.15	2
Sablefish	Unid. Fishes	0.97	8
Sablefish	Unid. Remains	0.89	49
Sablefish	Polychaetes	0.43	4
Sablefish	Unid. Remains	0.40	1
Sablefish	Jellyfish(Scyphozoa)	0.20	1
Sablefish	Amphipods	0.14	13
Sablefish	True Crabs	0.07	3
Sablefish	Isopods	0.01	1
Sockeye Salmon	Euphausiids	1.39	14
Sockeye Salmon	Unid. Remains	0.24	6
Sockeye Salmon	Amphipods	0.14	23
Sockeye Salmon	Misc. Non-Marine	0.01	1
Sockeye Salmon	Polychaetes	0.01	1
Starry Flounder	Amphipods	0.01	1
Walleye Pollock	Euphausiids	0.20	1

APPENDIX A NET SPECIFICATIONS

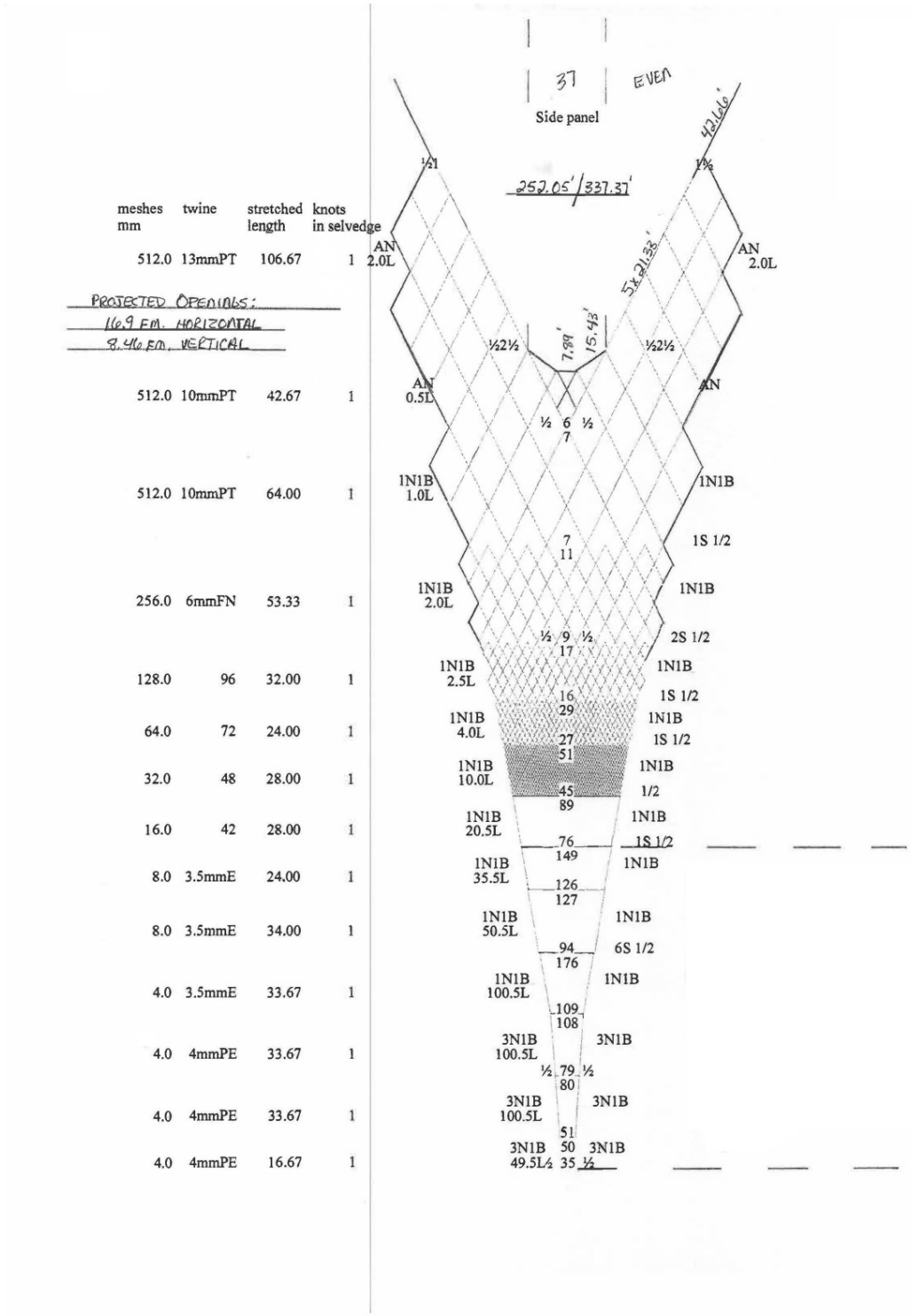

Figure A.1. Net specifications (side view) for the LFS 7742 trawl net used during the ecosystem-based juvenile Pacific Salmon survey from September 30 to October 8, 2019 on the *CFV Sea Crest*.

APPENDIX B TRAWL BRIDGE LOG DATA

Table B.1. Bridge log information for trawl tows during the ecosystem-based juvenile Pacific Salmon survey aboard the *CFV Sea Crest*, September 30 to October 8, 2019.

Tow Number	**1**	**2**	**3**	**4**	**5**	**6**
Event Number	1	5	8	11	14	17
Date	2019-10-01	2019-10-01	2019-10-01	2019-10-01	2019-10-01	2019-10-01
Station ID	JS01	JS02	JS03	JS04	JS05	JS06
Net	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl
Start Time (PDT)	07:31	10:38	13:15	14:53	16:29	18:04
Duration (min)	17	19	16	20	19	19
Start Latitude	50° 22’ 12" N	50° 26’ 24" N	50° 29’ 24" N	50° 29’ 24" N	50° 30’ 00" N	50° 30’ 36" N
Start Longitude	125° 43’ 48" W	126° 00’ 36" W	126° 12’ 36" W	126° 19’ 48" W	126° 24’ 36" W	126° 30’ 00" W
End Latitude	50° 22’ 12" N	50° 27’ 00" N	50° 29’ 24" N	50° 29’ 24" N	50° 30’ 00" N	50° 30’ 00" N
End Longitude	125° 46’ 12" W	126° 03’ 36" W	126° 15’ 00" W	126° 22’ 12" W	126° 27’ 00" W	126° 32’ 24" W
Direction of Tow (deg)	266	289	281	273	265	268
Vessel Speed (km/h)	10.4	10.9	9.1	7.2	8.0	8.7
Distance Towed (km)	3.13	3.39	2.89	2.35	2.70	2.83
Net Opening Width (m)	31	38	33	41	36	36
Net Opening Height (m)	23	15	20	16	21	17
Warp Length (m)	110	137	110	141	128	132
Target Headrope Depth (m)	0	15	0	15	0	15
Start Bottom Depth (m)	200	209	302	375	351	317
End Bottom Depth (m)	132	180	259	388	378	379
Usable	Y	Y	Y	Y	Y	Y

Tow Number	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Event Number	18	21	24	27	30	33	36
Date	2019-10-02	2019-10-02	2019-10-02	2019-10-02	2019-10-02	2019-10-03	2019-10-03
Station ID	JS07	JS08	QCST01	QCST02	QCST03	QCST04	QCST05
Net	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl
Start Time (PDT)	07:45	10:03	13:07	15:18	17:07	08:00	10:05
Duration (min)	20	19	19	19	20	19	20
Start Latitude	50° 30’ 36" N	50° 32’ 24" N	50° 39’ 36" N	50° 43’ 48" N	50° 46’ 48" N	50° 53’ 24" N	50° 57’ 36" N
Start Longitude	126° 36’ 36" W	126° 43’ 12" W	126° 44’ 24" W	126° 59’ 24" W	127° 13’ 12" W	127° 37’ 12" W	127° 48’ 00" W
End Latitude	50° 31’ 12" N	50° 33’ 00" N	50° 39’ 36" N	50° 44’ 24" N	50° 47’ 24" N	50° 54’ 36" N	51° 00’ 00" N
End Longitude	126° 39’ 00" W	126° 45’ 36" W	126° 46’ 12" W	127° 01’ 48" W	127° 15’ 00" W	127° 39’ 00" W	127° 48’ 00" W
Direction of Tow (deg)	293	272	282	283	288	314	0
Vessel Speed (km/h)	9.8	8.9	7.0	7.2	8.0	7.8	8.9
Distance Towed (km)	3.15	2.91	2.17	2.46	2.52	2.56	3.78
Net Opening Width (m)	32	38	34	36	33	34	36
Net Opening Height (m)	24	17	21	16	22	16	23
Warp Length (m)	123	132	124	124	119	128	123
Target Headrope Depth (m)	0	15	0	15	0	15	0
Start Bottom Depth (m)	436	443	114	132	148	439	155
End Bottom Depth (m)	447	463	132	163	161	430	146
Usable	Y	Y	Y	Y	Y	Y	Y

Tow Number	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Event Number	39	42	45	48	51	54	57
Date	2019-10-03	2019-10-03	2019-10-03	2019-10-03	2019-10-04	2019-10-04	2019-10-04
Station ID	QCSD01	QCSD02	QCSD03	RI01	T01	T02	T03
Net	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl
Start Time (PDT)	11:34	13:32	15:11	17:14	08:01	10:19	11:59
Duration (min)	19	20	19	18	23	19	19
Start Latitude	51° 03’ 36" N	51° 13’ 12" N	51° 18’ 36" N	51° 22’ 48" N	51° 23’ 24" N	51° 18’ 00" N	51° 13’ 12" N
Start Longitude	127° 49’ 12" W	127° 53’ 24" W	127° 57’ 36" W	127° 50’ 24" W	128° 07’ 12" W	128° 21’ 00" W	128° 25’ 48" W
End Latitude	51° 05’ 24" N	51° 15’ 00" N	51° 19’ 12" N	51° 23’ 24" N	51° 23’ 24" N	51° 16’ 48" N	51° 12’ 36" N
End Longitude	127° 49’ 12" W	127° 54’ 00" W	127° 59’ 24" W	127° 49’ 12" W	128° 09’ 00" W	128° 19’ 48" W	128° 27’ 36" W
Direction of Tow (deg)	357	355	311	60	259	138	239
Vessel Speed (km/h)	8.3	8.1	7.8	6.5	7.8	6.9	7.8
Distance Towed (km)	2.78	2.57	2.39	2.00	2.33	2.09	2.37
Net Opening Width (m)	36	31	36	35	38	36	38
Net Opening Height (m)	16	24	16	24	21	24	15
Warp Length (m)	134	113	137	123	124	132	137
Target Headrope Depth (m)	15	0	15	0	15	0	15
Start Bottom Depth (m)	116	134	158	107	119	79	178
End Bottom Depth (m)	106	136	155	103	138	78	189
Usable	Y	Y	Y	Y	Y	Y	Y

Tow Number	**21**	**22**	**23**	**24**	**25**	**26**	**27**
Event Number	60	63	66	69	72	75	78
Date	2019-10-04	2019-10-04	2019-10-04	2019-10-05	2019-10-05	2019-10-05	2019-10-05
Station ID	T04	T05	T06	QCSD04	QCSD05	QCSD06	QCST06
Net	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl
Start Time (PDT)	13:48	15:36	17:10	07:44	09:33	11:12	13:36
Duration (min)	18	20	19	20	20	9	19
Start Latitude	51° 09’ 36" N	51° 04’ 48" N	51° 00’ 00" N	50° 52’ 48" N	51° 00’ 00" N	51° 01’ 12" N	50° 57’ 36" N
Start Longitude	128° 33’ 36" W	128° 41’ 24" W	128° 47’ 24" W	128° 20’ 24" W	128° 14’ 24" W	128° 02’ 24" W	127° 46’ 12" W
End Latitude	51° 08’ 24" N	51° 04’ 12" N	50° 59’ 24" N	50° 54’ 00" N	51° 00’ 00" N	51° 01’ 48" N	50° 56’ 24" N
End Longitude	128° 34’ 48" W	128° 42’ 36" W	128° 49’ 12" W	128° 19’ 48" W	128° 12’ 36" W	128° 00’ 00" W	127° 45’ 00" W
Direction of Tow (deg)	226	225	234	18	98	77	132
Vessel Speed (km/h)	7.4	7.0	7.8	7.4	8.3	8.1	6.9
Distance Towed (km)	2.24	2.19	2.44	2.46	2.28	2.52	2.17
Net Opening Width (m)	35	38	32	37	34	33	36
Net Opening Height (m)	23	17	23	16	23	17	23
Warp Length (m)	119	128	110	132	128	119	128
Target Headrope Depth (m)	0	0	0	15	0	0	0
Start Bottom Depth (m)	166	67	65	71	101	164	177
End Bottom Depth (m)	157	66	62	88	107	150	244
Usable	Y	Y	Y	Y	Y	Y	Y

Tow Number	**28**	**29**	**30**	**31**	**32**	**33**	**34**
Event Number	81	84	87	90	93	96	99
Date	2019-10-05	2019-10-06	2019-10-06	2019-10-06	2019-10-06	2019-10-06	2019-10-07
Station ID	QCST07	QCST08	QCST09	BR01	BR02	BR03	BR04
Net	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl
Start Time (PDT)	16:00	07:52	09:37	12:37	14:19	15:36	07:50
Duration (min)	19	15	19	20	19	20	20
Start Latitude	50° 51’ 36" N	50° 46’ 48" N	50° 43’ 48" N	50° 51’ 00" N	50° 53’ 24" N	50° 52’ 48" N	50° 48’ 00" N
Start Longitude	127° 33’ 36" W	127° 25’ 48" W	127° 16’ 48" W	126° 55’ 12" W	126° 48’ 00" W	126° 45’ 00" W	126° 31’ 48" W
End Latitude	50° 51’ 00" N	50° 46’ 12" N	50° 43’ 48" N	50° 51’ 36" N	50° 52’ 48" N	50° 52’ 12" N	50° 48’ 00" N
End Longitude	127° 31’ 48" W	127° 23’ 24" W	127° 15’ 00" W	126° 54’ 00" W	126° 46’ 12" W	126° 43’ 12" W	126° 29’ 24" W
Direction of Tow (deg)	115	107	106	45	112	137	90
Vessel Speed (km/h)	7.2	8.1	7.6	7.2	7.2	7.4	7.8
Distance Towed (km)	2.33	2.65	2.35	2.20	2.35	2.44	2.39
Net Opening Width (m)	36	32	37	35	35	33	37
Net Opening Height (m)	17	21	18	23	17	23	23
Warp Length (m)	110	110	128	113	115	110	128
Target Headrope Depth (m)	15	0	15	0	15	0	0
Start Bottom Depth (m)	265	349	223	176	123	216	140
End Bottom Depth (m)	110	387	216	177	164	193	241
Usable	Y	Y	Y	Y	Y	Y	Y

Tow Number	**35**	**36**	**37**
Event Number	102	105	108
Date	2019-10-07	2019-10-07	2019-10-07
Station ID	BR05	KI01	KI02
Net	LFS 7742 trawl	LFS 7742 trawl	LFS 7742 trawl
Start Time (PDT)	10:50	13:23	15:16
Duration (min)	16	20	20
Start Latitude	50° 48’ 36" N	50° 39’ 00" N	50° 37’ 48" N
Start Longitude	126° 12’ 36" W	126° 12’ 36" W	126° 24’ 36" W
End Latitude	50° 47’ 24" N	50° 38’ 24" N	50° 37’ 48" N
End Longitude	126° 12’ 36" W	126° 14’ 24" W	126° 27’ 00" W
Direction of Tow (deg)	180	252	270
Vessel Speed (km/h)	7.8	7.8	8.1
Distance Towed (km)	2.44	2.46	2.61
Net Opening Width (m)	37	37	30
Net Opening Height (m)	24	16	23
Warp Length (m)	137	128	110
Target Headrope Depth (m)	0	15	0
Start Bottom Depth (m)	181	221	256
End Bottom Depth (m)	153	192	233
Usable	Y	Y	Y

APPENDIX C CTD CASTS AND ZOOPLANKTON TOWS

Table C.1. CTD casts and vertical bongo tow times and depths during the ecosystem-based juvenile Pacific Salmon survey from September 30 to October 8, 2019 on the *CFV Sea Crest*.

				CTD			BONGO		
Date	**Station**	**Latitude**	**Longitude**	**Start Time (PDT)**	**Bottom Depth (m)**	**Gear Depth (m)**	**Start Time (PDT)**	**Bottom Depth (m)**	**Gear Depth (m)**
2019-10-01	JS01	50°21' 36" N	125°43' 12" W	07:57	219	200	09:16	206	170
2019-10-01	JS02	50°27' 00" N	126°02' 24" W	10:28	230	220	11:46	213	145
2019-10-01	JS03	50°29' 24" N	126°15' 36" W	12:59	311	250	14:14	319	210
2019-10-01	JS04	50°29' 24" N	126°21' 36" W	14:36	379	250	15:48	379	250
2019-10-01	JS05	50°30' 00" N	126°27' 00" W	16:19	383	250	17:28	384	225
2019-10-02	JS07	50°31' 12" N	126°37' 48" W	07:45	417	250	09:02	434	165
2019-10-02	JS08	50°33' 00" N	126°45' 36" W	09:53	461	250	11:04	462	220
2019-10-02	QCST01	50°39' 36" N	126°45' 36" W	13:44	147	130	13:58	146	90
2019-10-02	QCST02	50°44' 24" N	127°01' 48" W	14:58	140	120	16:05	129	85
2019-10-02	QCST03	50°47' 24" N	127°15' 36" W	17:02	170	160	18:10	176	130
2019-10-03	QCST04	50°54' 36" N	127°38' 24" W	07:40	234	220	08:58	390	150
2019-10-03	QCST05	50°59' 24" N	127°49' 12" W	09:44	154	140	10:53	154	135
2019-10-03	QCSD01	51°05' 24" N	127°49' 12" W	11:12	103	90	12:19	104	80
2019-10-03	QCSD02	51°15' 00" N	127°53' 24" W	13:13	136	120	14:23	137	105
2019-10-03	QCSD03	51°19' 48" N	127°59' 24" W	14:51	175	160	15:59	175	160
2019-10-03	RI01	51°24' 36" N	127°47' 24" W	17:03	120	110	18:10	119	110
2019-10-04	T01	51°22' 48" N	128°12' 00" W	07:52	142	130	09:00	141	125
2019-10-04	T02	51°16' 12" N	128°19' 48" W	09:06	76	65	11:11	76	50
2019-10-04	T03	51°12' 36" N	128°27' 36" W	11:40	190	180	12:52	192	130
2019-10-04	T04	51°08' 24" N	128°35' 24" W	13:30	143	130	14:39	141	95
2019-10-04	T05	51°03' 36" N	128°43' 12" W	15:18	65	50	16:23	65	45
2019-10-04	T06	50°59' 24" N	128°49' 48" W	16:50	65	55	17:56	65	40
2019-10-05	QCSD04	50°54' 36" N	128°19' 12" W	07:24	74	65	08:28	74	65
2019-10-05	QCSD05	51°00' 00" N	128°11' 24" W	09:10	118	115	10:16	118	105
2019-10-05	QCSD06	51°01' 48" N	128°00' 00" W	10:51	147	135	11:58	147	110

				CTD			BONGO		
Date	**Station**	**Latitude**	**Longitude**	**Start Time (PDT)**	**Bottom Depth (m)**	**Gear Depth (m)**	**Start Time (PDT)**	**Bottom Depth (m)**	**Gear Depth (m)**
2019-10-05	QCST06	50° 57’ 00" N	127° 44’ 24" W	13:22	332	250	14:31	322	220
2019-10-05	QCST07	50° 51’ 00" N	127° 31’ 48" W	15:43	115	90	16:50	142	130
2019-10-06	QCST08	50° 46’ 12" N	127° 22’ 48" W	07:27	450	250	08:39	420	240
2019-10-06	QCST09	50° 43’ 12" N	127° 14’ 24" W	09:17	208	195	10:27	213	170
2019-10-06	BR01	50° 52’ 12" N	126° 53’ 24" W	12:18	174	165	13:27	174	160
2019-10-06	BR02	50° 53’ 24" N	126° 46’ 12" W	13:55	137	125	15:02	146	110
2019-10-06	BR03	50° 52’ 12" N	126° 44’ 24" W	15:22	205	200	16:31	206	160
2019-10-07	BR04	50° 48’ 00" N	126° 28’ 48" W	07:28	184	175	08:36	181	145
2019-10-07	BR05	50° 46’ 48" N	126° 12’ 36" W	10:26	161	150	11:35	159	140
2019-10-07	KI01	50° 38’ 24" N	126° 15’ 00" W	13:04	172	160	14:13	172	150
2019-10-07	KI02	50° 37’ 48" N	126° 28’ 48" W	15:15	172	160	16:23	174	160

APPENDIX D CATCH DATA

Table D.1. Catch (kg) of species (or taxonomic groups where species identification could not be made with certainty) captured during the ecosystem-based juvenile Pacific Salmon survey from September 30 to October 8, 2019 on the *CFV Sea Crest*. Species with no weights (released alive or too small) are not included in this table.

Tow	1	2	3	4	5	6	7	8	9	10	11
Event Number	**1**	**5**	**8**	**11**	**14**	**17**	**21**	**24**	**27**	**33**	**42**
Chinook Salmon	0.63	0.37	0.04	0.04	0.16	0.08	0.54	0.07	0.37	0.27	1.54
Chum Salmon	10.18	1.11			0.07	0.05	0.08	11.67		0.30	1.40
Coho Salmon											
Fried Egg Jellyfish, Egg Yolk Jelly									0.67	5.76	2.04
Jelly (Siphonophore)											
Jellyfish					0.02						
Lions Mane	0.00		0.22				0.08		6.76		7.06
Moon Jellyfish	0.01							1.42		2.85	2.01
Opalescent Inshore Squid											
Pacific Herring	11.35	0.07						0.03			
Pink Salmon	1.87	0.03		0.09	0.34	1.01	0.35	13.75			0.11
Polyorchis			0.06				0.00				
Prowfish											0.10
Rockfishes										0.00	
Sablefish	0.83	0.26						3.41	1.69	1.34	0.22
Shortbelly Rockfish											
Silvergray Rockfish											
Sockeye Salmon		0.03	0.03	0.08	0.04		0.03	0.45			
Starry Flounder											
Walleye Pollock											
Water Jellyfish	0.10	0.12	0.17	0.03	0.08	0.00	0.01	0.37	0.20	1.93	3.62
TOTAL	24.97	1.99	0.52	0.24	0.71	1.14	1.09	31.17	9.69	12.45	18.10

	Tow	12	13	14	15	16	17	18	19	20	21	22
Event Number		**45**	**48**	**51**	**69**	**75**	**84**	**87**	**90**	**93**	**96**	**99**
Chinook Salmon		0.36	0.24	0.17	0.16	2.96	0.14	0.17	2.22	0.14	0.68	0.17
Chum Salmon		0.10	14.73	5.69			6.24	7.86	0.27		0.92	1.14
Coho Salmon		1.16	0.70			0.43	2.65	2.32				
Fried Egg Jellyfish, Egg Yolk Jelly							0.65	0.31				1.10
Jelly (Siphonophore)												
Jellyfish												
Lions Mane				3.46					4.01			10.74
Moon Jellyfish		1.22		1.55	0.45	2.22		0.33	0.27			0.41
Opalescent Inshore Squid		0.71		140.81	2.35	1.40						
Pacific Herring			0.19		0.02							
Pink Salmon			2.24				4.95	9.53				
Polyorchis												
Prowfish												
Rockfishes												
Sablefish		0.16	0.35		1.60		1.55	0.25	0.40			
Shortbelly Rockfish												
Silvergray Rockfish												
Sockeye Salmon							0.04					
Starry Flounder												
Walleye Pollock												
Water Jellyfish		1.55	1.24	2.03	19.66	3.45						0.17
TOTAL		5.26	19.69	153.71	24.24	10.46	16.22	20.77	7.17	0.14	1.60	13.73

Tow	23	24	25	26	27	28	29	30	31	32	33
Event Number	**108**	**18**	**30**	**54**	**72**	**78**	**81**	**60**	**66**	**39**	**57**
Chinook Salmon	0.33										
Chum Salmon		4.99	24.94	0.50	0.34	4.14	0.20				
Coho Salmon		0.58	2.67								
Fried Egg Jellyfish, Egg Yolk Jelly				0.56			0.15	1.60	3.75		
Jelly (Siphonophore)										0.01	
Jellyfish											
Lions Mane	6.11		17.46	8.19		9.00		1.63			2.42
Moon Jellyfish	0.33		3.44		12.47	9.74		0.38	1.05		2.07
Opalescent Inshore Squid				7.36	15.40			0.01	6.58	0.08	0.04
Pacific Herring						0.09					
Pink Salmon		5.85	16.70	0.60		4.77	0.98				0.18
Polyorchis		0.04									
Prowfish											
Rockfishes											
Sablefish		0.33	56.46	11.60	4.86	2.90			0.24	0.21	0.10
Shortbelly Rockfish						0.00					
Silvergray Rockfish									0.00		
Sockeye Salmon		0.87	0.22	0.35		0.09					0.08
Starry Flounder	1.55										
Walleye Pollock	0.01										
Water Jellyfish		0.02	2.62	7.36	4.83	1.62		2.77	8.06	0.03	5.81
TOTAL	8.33	12.68	124.51	36.52	37.90	32.35	1.33	6.39	19.68	0.33	10.70

	Tow	34	35	36	37
Event Number		**102**	**105**	**36**	**63**
Chinook Salmon					
Chum Salmon					
Coho Salmon					
Fried Egg Jellyfish, Egg Yolk Jelly					
Jelly (Siphonophore)					
Jellyfish					
Lions Mane		2.44	2.60		
Moon Jellyfish				3.28	1.34
Opalescent Inshore Squid				0.06	31.30
Pacific Herring		0.01			
Pink Salmon				0.08	
Polyorchis					
Prowfish					
Rockfishes					
Sablefish				2.22	
Shortbelly Rockfish					
Silvergray Rockfish					
Sockeye Salmon					
Starry Flounder			0.86		
Walleye Pollock					
Water Jellyfish				4.71	0.88
TOTAL		2.45	3.46	10.35	33.52