

# Juvenile Pacific Salmon (*Oncorhynchus* spp.) Trawl Survey on the South Coast of British Columbia, October 9 - 29, 2014

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## Canadian Data Report of Fisheries and Aquatic Sciences 1448

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JUVENILE PACIFIC SALMON (*ONCORHYNCHUS* SPP.) TRAWL SURVEY ON THE SOUTH  
COAST OF BRITISH COLUMBIA, OCTOBER 9 - 29, 2014

by

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## ABSTRACT

Jung, Y., Tabata, A.T. and King, J.R. 2026. Juvenile Pacific Salmon (*Oncorhynchus* spp.) Trawl Survey on the South Coast of British Columbia, October 9 - 29, 2014. Can. Data Rep. Fish. Aquat. Sci. 1448: vi + 46 p.

Fisheries and Oceans Canada (DFO) conducted a surface trawl survey from October 9 - October 29, 2014 on the CCGS *W.E. Ricker*. This study targeted juvenile Pacific Salmon (*Oncorhynchus* spp.) in southern British Columbia (BC). There were 10,630 individuals caught from 31 species in 84 tows. Squid was the most abundant species with 53% of the total catch. Juvenile salmon species caught in decreasing abundance by count were: Pink Salmon, Chum Salmon, Coho Salmon, Chinook Salmon and Sockeye Salmon, with catch distribution varying based on species. Biological samples for genetic stock composition, otoliths, and coded wire tags were returned to the Pacific Biological Station (DFO, Nanaimo, BC). Associated information on the physical oceanography (55 locations), water samples for chemistry and chlorophyll *a* along with zooplankton samples (53 locations) were returned to the Institute of Ocean Sciences (DFO, Sidney, BC).

## RÉSUMÉ

Jung, Y., Tabata, A.T. and King, J.R. 2026. Juvenile Pacific Salmon (*Oncorhynchus* spp.) Trawl Survey on the South Coast of British Columbia, October 9 - 29, 2014. Can. Data Rep. Fish. Aquat. Sci. 1448: vi + 46 p.

Pêches et Océans Canada a effectué un relevé au chalut de surface entre octobre 9 to octobre 29, 2014 sur le CCGS *W.E. Ricker*. Cette étude ciblait le saumon du Pacifique juvénile (*Oncorhynchus* spp.) dans le sud de la Colombie-Britannique (C.-B.). 10,630 individus de 31 espèces ont été capturés au cours de 84 traits. Les calmars étaient l'espèce la plus abondante avec 53% de la prise totale. Les espèces de saumon juvénile capturées par ordre décroissant d'abondance par comptage étaient les suivantes: saumon rose juvéniles, saumon kéta juvéniles, saumon coho juvéniles, saumon quinnat juvéniles et saumon rouge juvéniles, avec la répartition des prises variait selon les espèces. Les échantillons biologiques pour la composition génétique des stocks, les otolithes, et les micromarques magnétisées codées ont été retournés à la Station biologique du Pacifique (MPO, Nanaimo, C.-B.). Les informations associées sur l'océanographie physique (55 sites) les échantillons d'eau pour la chimie et la chlorophylle *a* ainsi que les échantillons de zooplancton (53 sites) ont été retournés à l'Institut des sciences de la mer (MPO, Sidney, C.-B.).

## 1 INTRODUCTION

Fisheries and Oceans Canada (DFO) conducted a trawl survey, targeting juvenile Pacific Salmon (*Oncorhynchus* spp.) from October 09 to October 29, 2014 on the CCGS *W.E. Ricker*. The main objectives of this survey were:

1. to determine the abundance, condition, distribution, and genetic stock composition of juvenile Pacific Salmon (*Oncorhynchus* spp.) present in southern British Columbia;
2. the associated physical oceanography; and
3. the distribution and biomass of zooplankton.

This survey was part of an ongoing suite of surveys (1997-2016) which was led by the High Seas Salmon Program at the Pacific Biological Station, Nanaimo, British Columbia (BC) in support of research on Pacific Salmon ocean ecology. These surveys were conducted annually since 1997 (Welch et al. 2002), initially from the Gulf of Alaska to the southern continental shelf of BC, albeit with differences in location, survey area and timing each year. The survey is focused on juvenile Pacific Salmon, specifically Chum Salmon (*O. keta*), Chinook Salmon (*O. tshawytscha*), Coho Salmon (*O. kitsutch*), Pink Salmon (*O. gorbuscha*) and Sockeye Salmon (*O. nerka*). This data report documents the biological, oceanographic, and zooplankton data and samples collected.

## 2 METHODS

### 2.1 SURVEY LOCATIONS

Fishing, oceanographic, and zooplankton sampling occurred in southern British Columbia, including Johnstone Strait, Queen Charlotte Strait, Queen Charlotte Sound, north coast of British Columbia, west coast of Vancouver Island, and Juan de Fuca Strait (Figure 1).

### 2.2 FISHING OPERATIONS

The CCGS *W.E. Ricker* deployed a Cantrawl model 250 midwater trawl net (approximately 90 m long x 30 m wide x 15 m high; (Cantrawl Nets Ltd., Richmond, Canada; Appendix Table A and Appendix Figure B). This three-bridle midwater net had a codend liner with 12.7 mm mesh (stretched) to retain smaller species. On this survey, the mean trawl net opening was 35 m wide by 15 m high, or an area of 525 m<sup>2</sup>.

Tow speed averaged 8.4 km/hr, and varied between 4.6 to 11.7 km/hr speed over ground, depending on the wind, tide, and current. The target headrope depths were 0 m, 15 m, and 30 m. Warp length ranged from 150 m to 200 m (Appendix C). Tow duration was 5 - 30 minutes, with the time starting when the Jet 5 m<sup>2</sup> trawls doors were locked and the net started fishing.

## **2.3 CATCH PROCESSING**

All fish were sorted to species and counted. If the catch of a species was too large to effectively count within a reasonable time frame, the species' catch was weighed (kg) and a subsample was counted and weighed to extrapolate an estimated catch count. The catch (count) of juvenile Pacific Salmon by species was divided by swept volume ( $\text{km}^3$ ) to calculate catch per unit effort (CPUE).

## **2.4 BIOLOGICAL SAMPLING**

All Pacific Salmon specimens were measured for fork length (mm) and weight (g), and sex determined. Pacific Salmon were divided into juveniles and adults based on their fork lengths. All Pacific Salmon species that were < 300 mm in length were considered juveniles, with the exception of Chinook Salmon and Coho Salmon, for which length threshold as juveniles were < 350 mm and < 400 mm respectively. Additional collections included: fin clips for genetic stock identification (GSI), additional salmon tissues for molecular identification of pathogens, muscle tissue for energy density estimation, stable isotope analyses or proximate analyses, otoliths, adipose fin status (i.e. clipped vs. non-clipped), and coded wire tags (CWTs). Other fish species were measured for length (mm) and weight (g) as time permitted.

## **2.5 OCEANOGRAPHY**

A Sea-Bird 911plus CTD (conductivity-temperature-depth; Sea-Bird Scientific, Bellevue, WA) was used for oceanographic profiles at 55 locations (Figure 1, Appendix D). A Niskin bottle at 10 m from the surface was used for nutrient and chlorophyll (chl *a*) collections. Seawater samples for nitrate, phosphate, and silicate were placed in acid-washed glass test tubes and frozen. Seawater samples for chl *a* estimation were filtered with 25 mm GF/F (glass fibre filter) disks under vacuum, not exceeding 5 inHg (inch of mercury). Filter disks were then placed in polypropylene scintillation vials and frozen. Both the nutrient and chl *a* samples were frozen and maintained at  $-18^\circ\text{C}$ . Nutrient and chl *a* samples were sent for analyses at the Institute of Ocean Sciences (DFO, Sidney, BC).

## **2.6 ZOOPLANKTON**

At 53 locations (Figure 1, Appendix D), vertical tows to sample zooplankton were conducted to approximately 150 m or within 10 m of the bottom with two 60 cm diameter, 253 micrometer mesh nets mounted in a bongo-drum style frame, one of which was equipped with a flow meter. Zooplankton collected from one bongo net were preserved in 10% formalin and sent to the zooplankton laboratory at the Institute of Ocean Sciences (DFO, Sidney, BC) for species enumeration. The zooplankton sample from the other bongo net 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, or proximate analyses and sent to the Pacific Biological Station (DFO, Nanaimo, BC) for processing or archiving.

## 3 RESULTS

### 3.1 FISHING OPERATIONS

This survey conducted 86 trawl net tows in southern British Columbia (Figure 1, Appendix C) with 84 trawls completed successfully. There were 2 unusable tows due to the appearance of whales nearby. There were no sampling between October 13th to 15th due to CCGS maintenance day and crew change, and between October 17th to 21st due to science crew change in Gold River.

### 3.2 CATCH COMPOSITION

Total catch for the survey from usable tows was 10,968 fish, with 3,004 (or 27%) juvenile Pacific Salmon. Detailed catch composition for each tow is included in Appendix E. For each species captured during the survey, the number of tows in which the species was present, total catch count, maximum tow catch count, and mean tow catch count in usable tows is presented in Table 1. The top three abundant species caught by count were Opalescent Inshore Squid (n=5,585), Smelts (n=1,421), then juvenile Pink Salmon (n=1,281; Table 1). Juvenile Pacific Salmon species caught, in order of abundance by count, were: Pink Salmon, Chum Salmon, Coho Salmon, Chinook Salmon and Sockeye Salmon. The survey targeted juvenile Pacific Salmon so the catches of adult Pacific Salmon should be interpreted with care.

The location and catch per unit effort (CPUE, count/km<sup>3</sup>) of juvenile Pacific Salmon is shown in Figure 2. Juvenile Chinook Salmon were caught throughout the survey area but were most abundant near Barkley Sound of the west coast of Vancouver Island. Juvenile Chum Salmon were abundant throughout the survey area especially in Queen Charlotte Strait and the west coast of Vancouver Island. Juvenile Coho Salmon were found throughout the survey area and abundant near Nootka Sound. Juvenile Pink Salmon were caught primarily in Queen Charlotte Strait and were found throughout the west coast of Vancouver Island. Juvenile Sockeye Salmon (*O. nerka*) were localized within the migratory corridor through Queen Charlotte Strait and BC inlets.

### 3.3 BIOLOGICAL SAMPLES

Samples were collected for GSI (n=790), otoliths (n=629), pathogen analyses (n=337), energy density and stable isotope analyses (n=1,354). CWTs (n=48) when present and detected were retained. These biological samples were analysed or archived at the Pacific Biological Station, DFO (Nanaimo, BC).

### **3.4 LENGTH AND WEIGHT**

Length frequencies and length-weight relationships are presented for juvenile Pacific Salmon species in Figures 3 to 7. Double log transformed length-weight regressions coefficients were similar in Chinook Salmon, Chum Salmon, and Coho Salmon. Juvenile Pink Salmon and Sockeye Salmon had slightly smaller coefficients, with juvenile Sockeye Salmon being slightly larger than Pink Salmon. A larger coefficient typically represents better condition, whereas a smaller coefficient typically represents worse condition. Lengths and weights of 30 species were recorded from all tows (Table 2). The length frequencies for species with greater than 50 length measurements (Opalescent Inshore Squid, Sablefish, Pacific Herring and Smelts) are presented in Figure 8.

Within juvenile Pacific Salmon, Coho Salmon had the largest maximum length (390 mm) and weight (693 g), whereas Sockeye Salmon had the smallest maximum length (215 mm) and weight (94 g).

### **3.5 OCEANOGRAPHY**

CTD casts and water samples were completed at 55 sites with cast depths ranging from 37 m to 252 m (Appendix D). Oceanographic data from the CTD casts and nutrient analysis of the water samples are archived online within the Water Properties Data Inventory (Institute of Ocean Sciences, DFO, Sidney, BC) under cruise number 201466.

### **3.6 ZOOPLANKTON**

Vertical bongo tows were conducted at 53 stations to depths ranging from 34 m to 150 m (Appendix D). Zooplankton enumeration data are archived in the zooplankton database (Institute of Ocean Sciences, DFO, Sidney, BC) under cruise number 201466.

## **4 DISCUSSION**

This juvenile Pacific Salmon trawl survey collected valuable information on distribution, abundance, condition, and genetic stock composition for juvenile Pacific Salmon in southern British Columbia. Overall, juvenile Pink Salmon and juvenile Chum Salmon were most abundant, whereas juvenile Sockeye Salmon were least abundant. Distributions varied by species and life stage. This survey data supplements historic juvenile Pacific Salmon surveys that have been reported in Fisheries and Oceans Canada's State of the Pacific Ocean, and are being incorporated into longer term and broader scope research projects.

## 5 ACKNOWLEDGEMENTS

We would like to thank the Captain and crew of the CCGS *W.E. Ricker*. Marc Trudel was the High Seas Salmon Program Lead in 2014, and John Morris was Chief Scientist on this survey. We appreciate the expertise of the following science staff who participated in the survey: Claire Rycroft, Dylan Conover, Kelsey Flynn, Lana Fitzpatrick, Louise de Mestral Bezanson, Midoli Bresch, Strahan Tucker, Taylor McDonald, Taylor Nettles, Tyler Zubkowski and, in particular, Mary Thiess and Scott Rose who conducted oceanographic sampling.

## 6 REFERENCES

Welch, D.W., Morris, J.F.T., and Demers, E. 2002. CCGS *W.E. Ricker* Gulf of Alaska salmon survey, March - April, 1997. Can. Data Rep. Fish. Aquat. Sci. 1101: 19 p.

## 7 TABLES

Table 1. All captured species (or taxonomic group), ordered by total catch count, showing number of tows in which the species occurred, total catch count, maximum catch count, and mean catch count per tow for usable tows during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014.

Common Name	Scientific Name	Tows	Count	Max	Mean
Opalescent Inshore Squid	<i>Doryteuthis opalescens</i>	26	5,585	3,190	233
Smelts	<i>Osmeridae</i>	2	1,421	1,420	710
Pink Salmon (Juveniles)	<i>Oncorhynchus gorbuscha</i>	50	1,281	115	26
Chum Salmon (Juveniles)	<i>Oncorhynchus keta</i>	36	802	120	22
Sablefish	<i>Anoplopoma fimbria</i>	26	540	290	21
Coho Salmon (Juveniles)	<i>Oncorhynchus kisutch</i>	21	454	305	22
Chinook Salmon (Juveniles)	<i>Oncorhynchus tshawytscha</i>	47	423	86	9
Pacific Herring	<i>Clupea pallasii</i>	21	121	41	6
Soft Sculpin	<i>Psychrolutes sigalutes</i>	5	84	70	17
Sockeye Salmon (Juveniles)	<i>Oncorhynchus nerka</i>	9	44	21	5
Jack Mackerel	<i>Trachurus symmetricus</i>	16	42	8	3
Moon Jellyfish	<i>Aurelia</i>	15	38	7	3
Lions Mane	<i>Cyanea capillata</i>	23	35	5	2
Chum Salmon (Adults)	<i>Oncorhynchus keta</i>	6	28	17	5
Chinook Salmon (Adults)	<i>Oncorhynchus tshawytscha</i>	8	20	6	2
Pacific Sand Lance	<i>Ammodytes personatus</i>	1	7	7	7
Water Jellyfish	<i>Aequorea</i>	35	6	4	2
Pacific Sea Nettle	<i>Chrysaora fuscescens</i>	8	6	2	2
Pacific Saury	<i>Cololabis saira</i>	2	6	5	3
Fried Egg Jellyfish	<i>Phacellophora camtschatica</i>	6	5	1	1
Threespine Stickleback	<i>Gasterosteus aculeatus</i>	2	4	2	2
Flatfishes	<i>Pleuronectiformes</i>	2	3	2	2
Pipefishes	<i>Syngnathidae</i>	2	2	1	1
Prowfish	<i>Zaprora silenus</i>	2	2	1	1
Moon Jellyfish	<i>Aurelia labiata</i>	6	1	1	1
Black Rockfish	<i>Sebastes melanops</i>	1	1	1	1
Pacific Sandfish	<i>Trichodon trichodon</i>	1	1	1	1
Pacific Sardine	<i>Sardinops sagax</i>	1	1	1	1
Perches	<i>Percidae</i>	1	1	1	1
Rock Greenling	<i>Hexagrammos lagocephalus</i>	1	1	1	1
Rockfishes	<i>Sebastes</i>	1	1	1	1
Sturgeon Poacher	<i>Podothecus accipenserinus</i>	1	1	1	1
Wolf Eel	<i>Anarrhichthys ocellatus</i>	1	1	1	1
Jellyfish	<i>Scyphozoa</i>	16			
Salps	<i>Salpida</i>	2			

Table 2. Lengths and weights for each species (arranged descending by the number of length measurements for each by species) sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014. Tows = number of tows. Type = Type of length measurement (FL = Fork Length, TL = Total Length, SL = Standard Length, ML = Mantle Length, BD = Bell Diameter). Measured = number of length measurements. Weighed = number of weight measurements.

Common Name	Tows	Length (mm)					Weight (g)			
		Type	Measured	Min	Max	Mean	Weighed	Min	Max	Mean
Pink Salmon	51	FL	1,339	130	272	187	597	21	157	63
Chum Salmon	39	FL	840	143	808	232	350	29	6,860	441
Opalescent Inshore Squid	22	ML	613	12	134	44				
Coho Salmon	20	FL	453	183	390	312	159	68	693	319
Chinook Salmon	47	FL	443	130	625	198	359	23	2,600	111
Sablefish	26	FL	200	210	296	241				
Pacific Herring	20	FL	170	80	192	146				
Smelts	2	TL	51	42	161	63	1	34	34	34
Sockeye Salmon	9	FL	44	134	215	174	44	23	94	54
Jack Mackerel	16	FL	43	24	76	55				
Soft Sculpin	5	TL	34	20	45	34				
Lions Mane	18	BD	33	115	540	341				
Moon Jellyfish	11	BD	28	125	380	240				
Pacific Sand Lance	1	TL	7	52	62	58				
Pacific Saury	2	FL	6	181	229	207				
Pacific Sea Nettle	4	BD	6	160	255	204				
Water Jellyfish	2	BD	5	38	52	47				
Threespine Stickleback	2	TL	4	59	82	69				
Flatfishes	2	TL	3	25	46	36				
Fried Egg Jellyfish	2	BD	2	170	250	210				
Pipefishes	2	TL	2	82	100	91				
Prowfish	2	TL	2	218	220	219				
Black Rockfish	1	TL	1	210	210	210				
Pacific Sandfish	1	FL	1	77	77	77				
Pacific Sardine	1	FL	1	253	253	253				
Perches	1	TL	1	102	102	102				
Rock Greenling	1	FL	1	257	257	257				
Rockfishes	1	TL	1	23	23	23				
Sturgeon Poacher	1	TL	1	40	40	40				
Wolf Eel	1	TL	1	521	521	521				

## 8 FIGURES

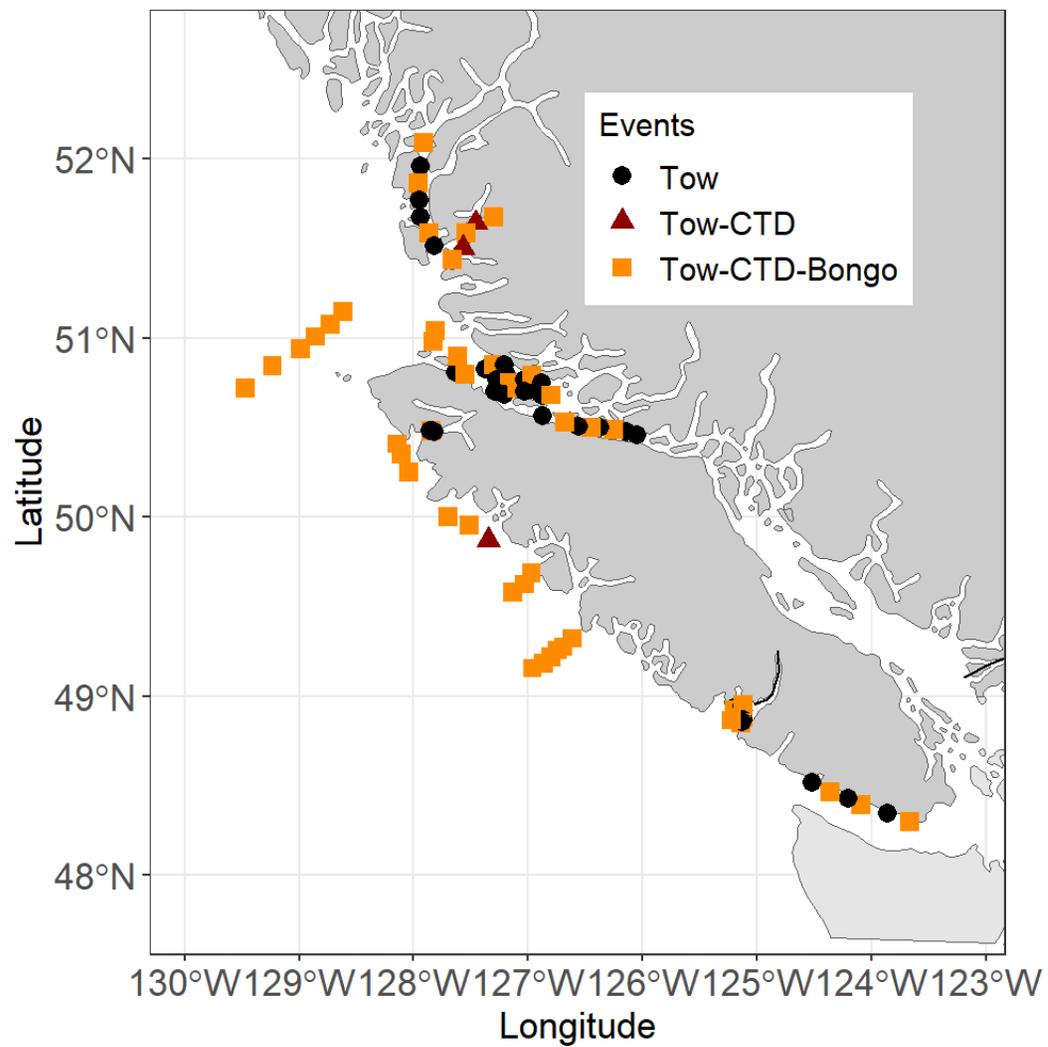


Figure 1. Location of survey events (fishing tows, CTD casts and zooplankton bongo casts) during the juvenile Pacific Salmon trawl survey from October 09 to October 29, 2014 on the CCGS *W.E. Ricker*.

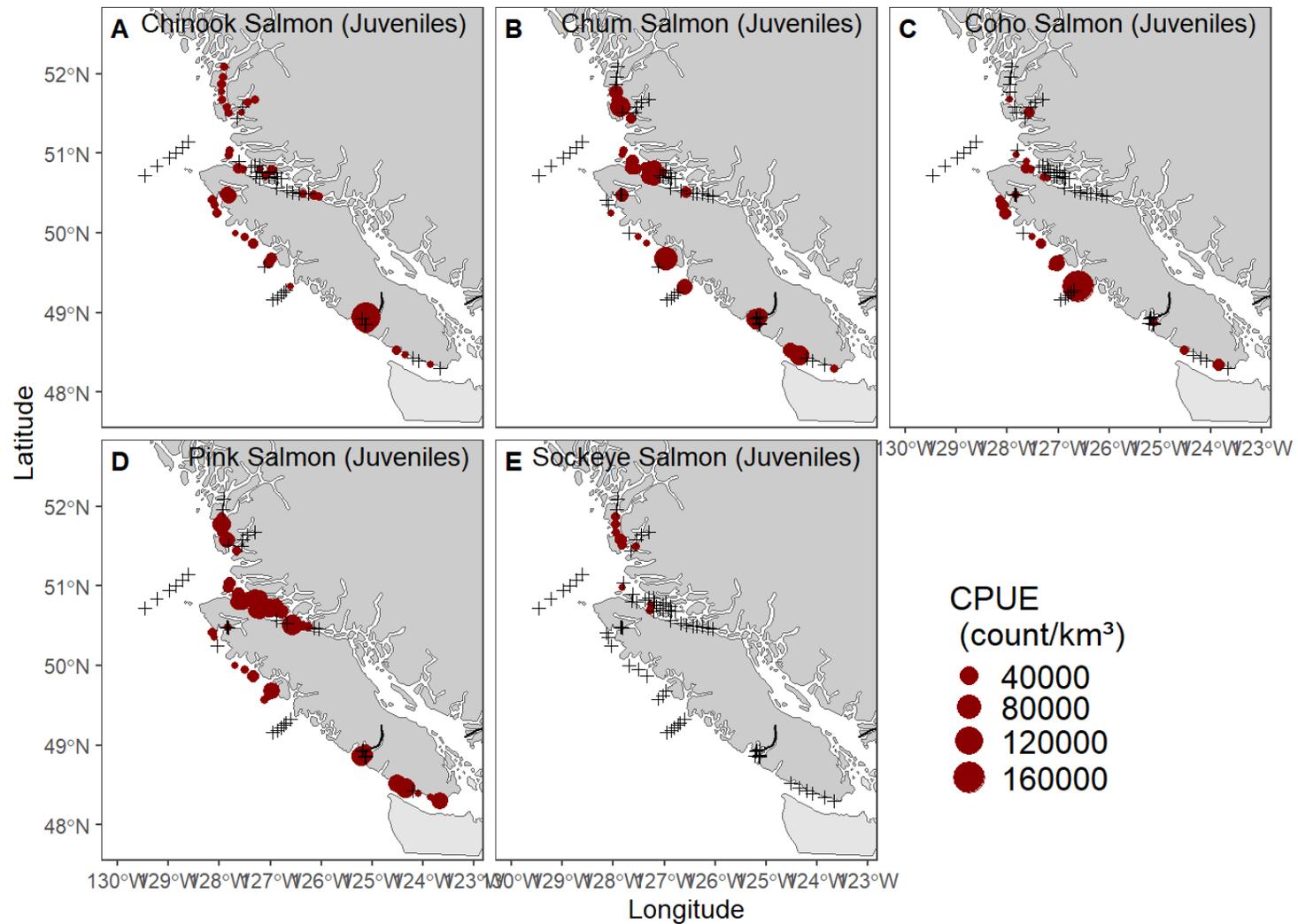


Figure 2. Juvenile Pacific Salmon (*Oncorhynchus* spp.) catch (count) per unit effort (CPUE; count/km<sup>3</sup>) for each tow. Circles are proportional to maximum abundance, and zero catches are shown with a cross (+). **A.** juvenile Chinook Salmon. **B.** juvenile chum Salmon. **C.** juvenile Coho Salmon. **D.** juvenile Pink Salmon. **E.** juvenile Sockeye Salmon.

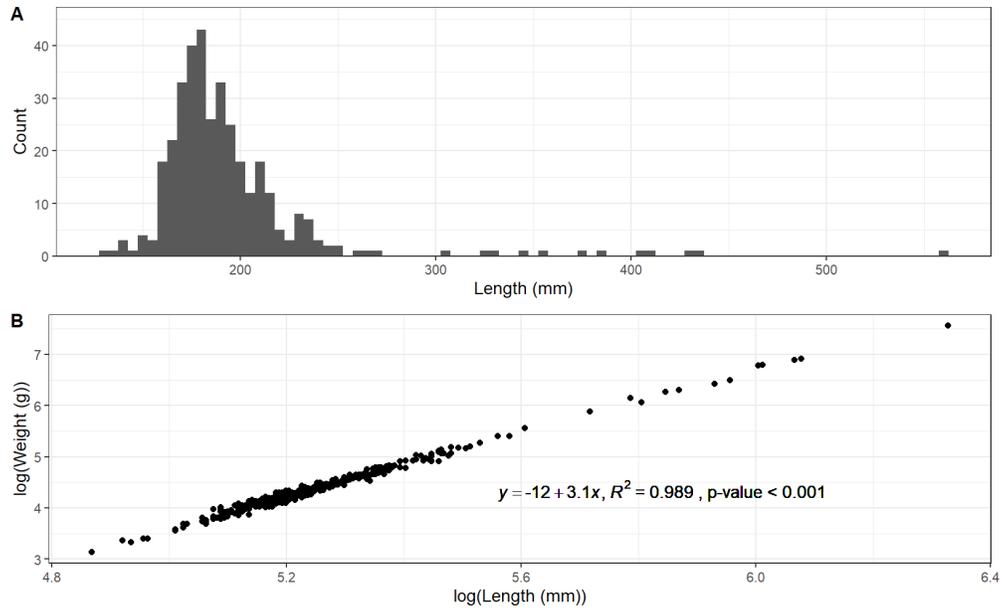


Figure 3. Chinook Salmon (*Oncorhynchus tshawytscha*), **A**. Length frequency plot as sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014. **B**. Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test.

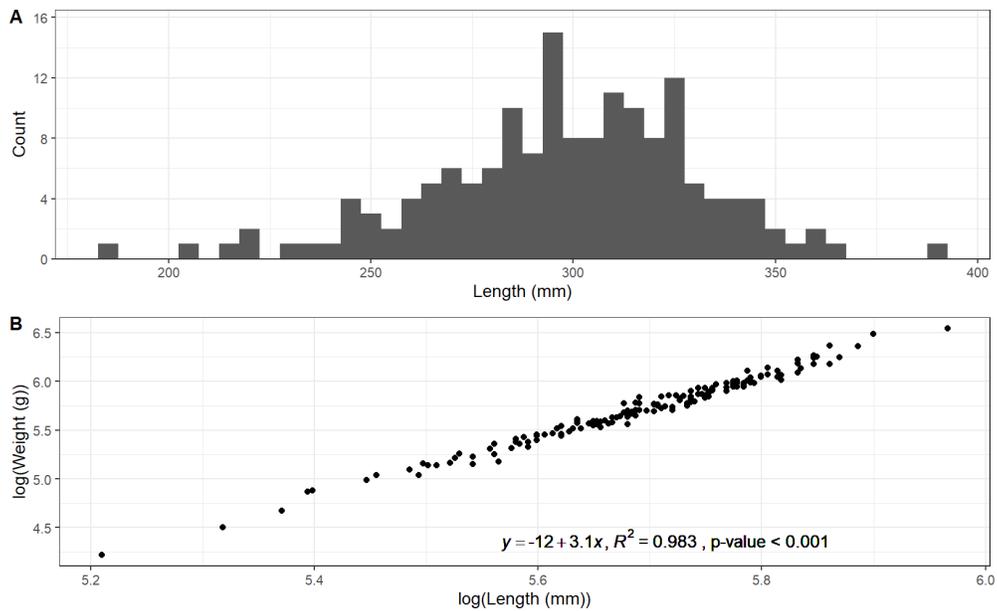


Figure 4. Coho Salmon (*Oncorhynchus kisutch*), **A.** Length frequency plot as sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014. **B.** Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test.

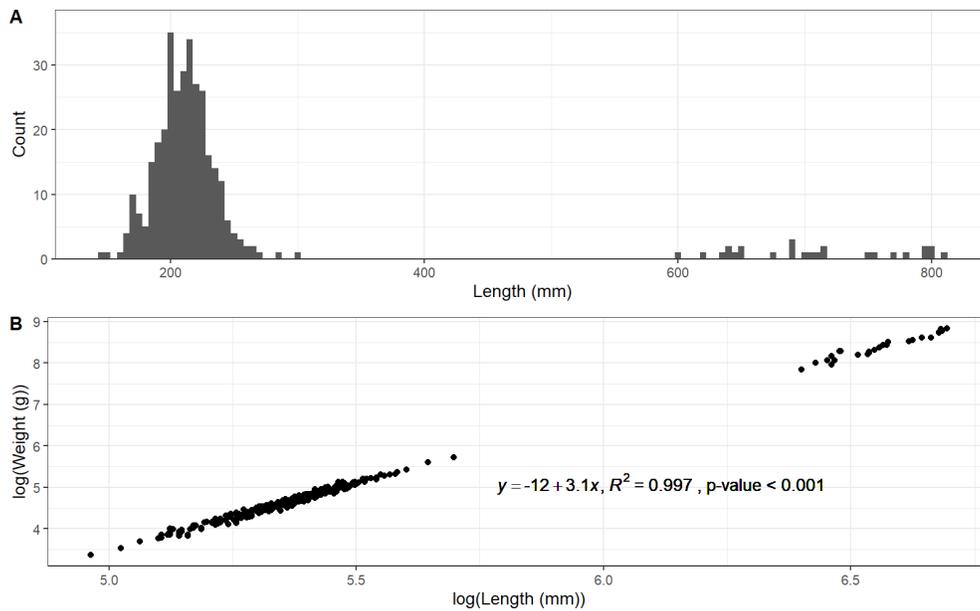


Figure 5. Chum Salmon (*Oncorhynchus keta*), **A.** Length frequency plot as sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014. **B.** Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test.

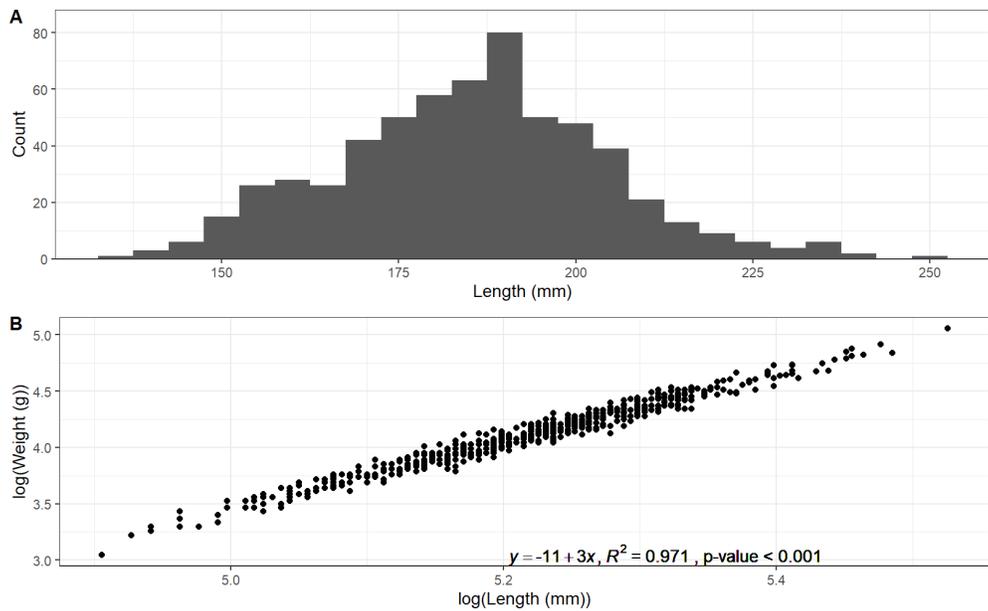


Figure 6. Pink Salmon (*Oncorhynchus gorbusha*), **A**. Length frequency plot as sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014. **B**. Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test.

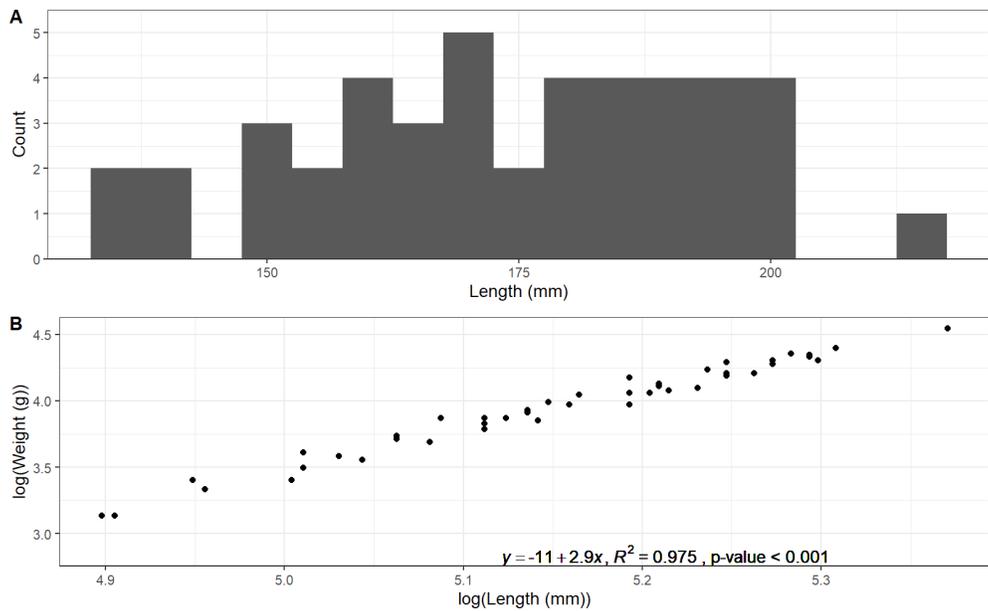


Figure 7. Sockeye Salmon (*Oncorhynchus nerka*), **A**. Length frequency plot as sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014. **B**. Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test.

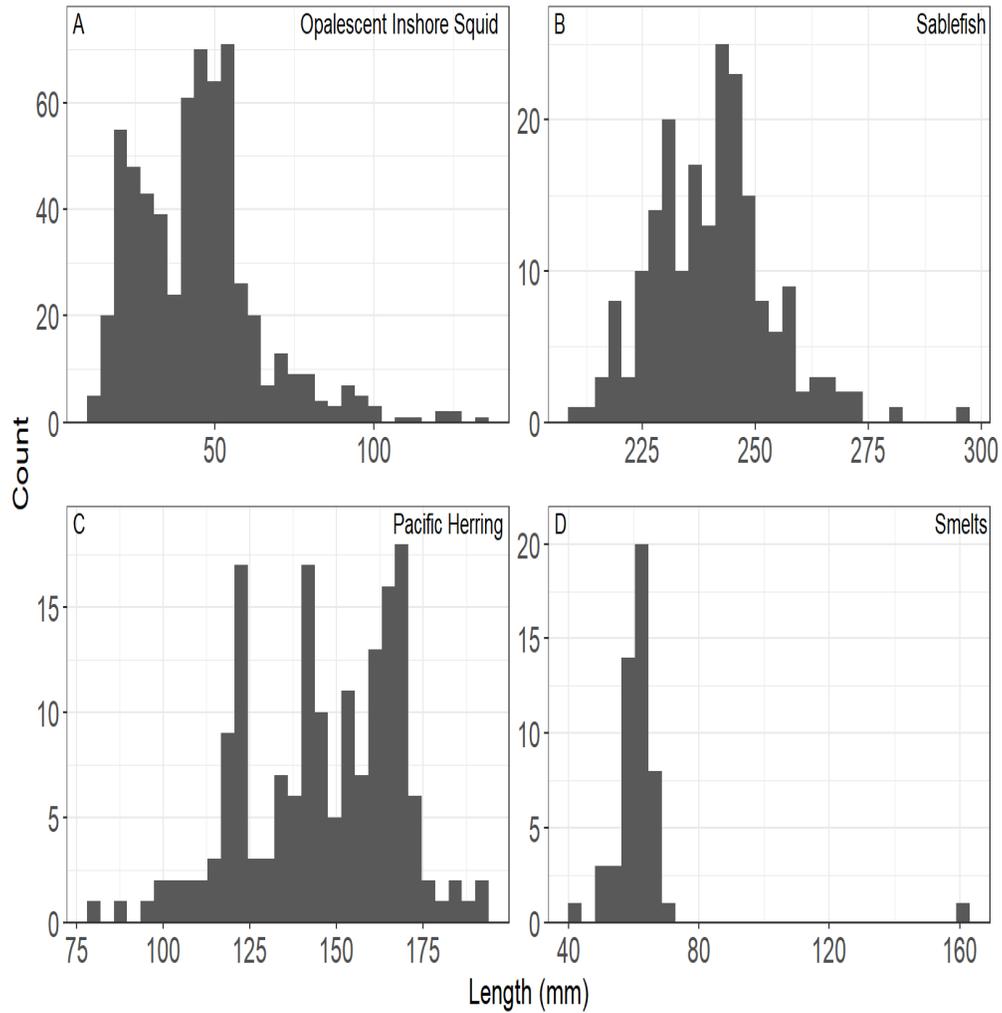


Figure 8. Length (mm) frequency plots for common species sampled ( $n > 50$  samples) during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014. **A.** Opalescent Inshore Squid (*Doryteuthis opalescens*), length = Mantle Length, **B.** Sablefish (*Anoplopoma fimbria*), length = Fork Length, **C.** Pacific Herring (*Clupea pallasii*), length = Fork Length, **D.** Smelts (*Osmeridae*), length = Total Length.

## APPENDIX A CANTRAWL 250 NET SPECIFICATIONS

Table A.1. Net specifications for the CanTrawl 250 net used during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014.

Part	Size	Material
Doors	2 m <sup>2</sup>	Jet
Door Legs	12.2 m (6.67 fm)	1 inch Spectra rope
Bridles	45.72 m (25 fm)	5/8 Wire Rope
Head Line	76.2 m (41.7 fm)	1 1/8 inch Tenex
Foot Rope	76.2 (41.7 fm)	1/2 chain
Mesh incl. Codend	3.8 cm (1.5 inch)	Knotted nylon
Codend Liner	12.7 mm (0.5 inch)	210/20 knotless liner

## APPENDIX B CANTRAWL 250 NET DIAGRAM

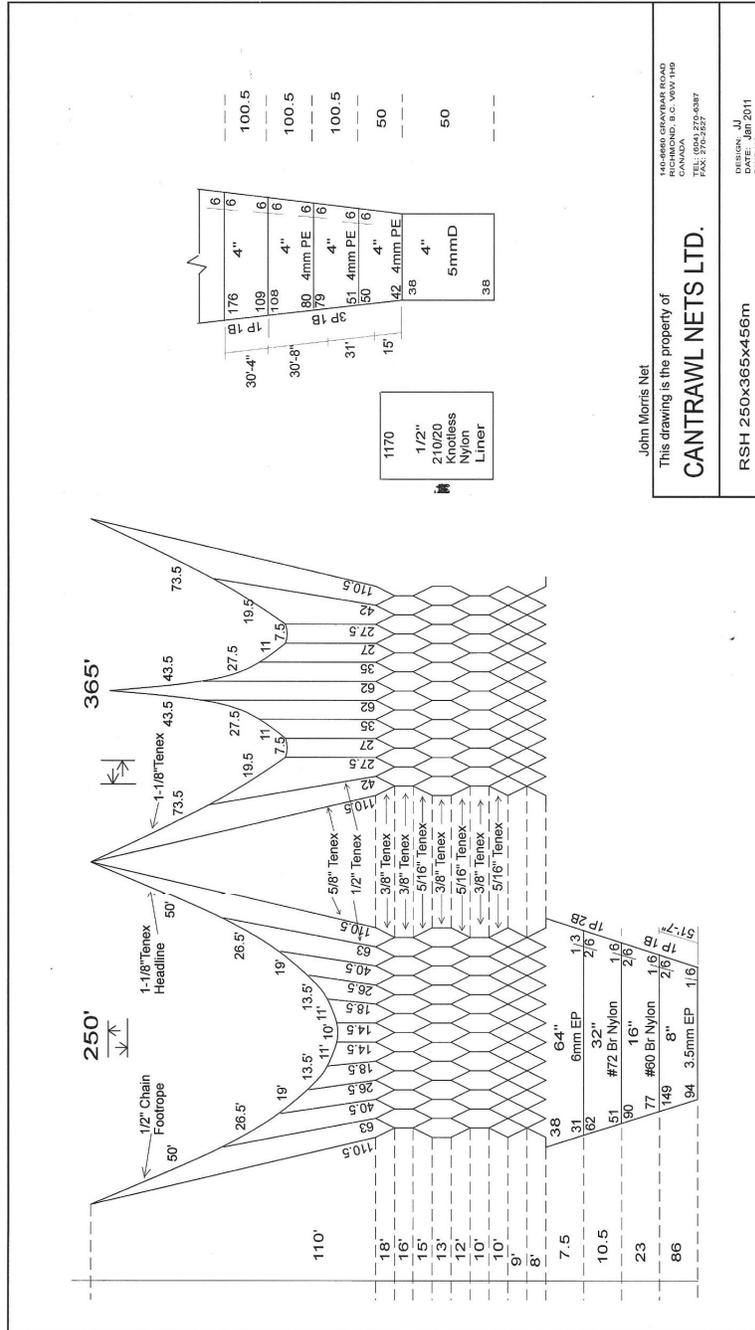


Figure B.1. Net diagram for CanTrawl 250 trawl net used during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014.

**APPENDIX C TRAWL BRIDGE LOG DATA**

Table C.1. Bridge log information for trawl tows during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, October 09 to October 29, 2014.

Station Name	JS01	JS02	JS03	JS04	JS05	JS06
Tow	1	2	3	4	5	6
Date (Pacific)	2014-10-09	2014-10-09	2014-10-09	2014-10-09	2014-10-09	2014-10-09
Start Time (Pacific)	07:13:00	08:18:00	09:52:00	10:48:00	12:20:00	13:15:00
Net	CanTrawl 250					
Duration (min)	30	30	30	25	30	30
Start Latitude	50° 27' 22" N	50° 28' 30" N	50° 29' 20" N	50° 29' 56" N	50° 29' 53" N	50° 30' 14" N
Start Longitude	126° 03' 00" W	126° 08' 17" W	126° 15' 14" W	126° 22' 23" W	126° 26' 49" W	126° 33' 36" W
End Latitude	50° 28' 23" N	50° 29' 06" N	50° 30' 00" N	50° 29' 53" N	50° 30' 14" N	50° 30' 36" N
End Longitude	126° 07' 26" W	126° 12' 50" W	126° 20' 06" W	126° 25' 30" W	126° 31' 19" W	126° 37' 08" W
Direction of Tow (deg)	290	282	282	268	277	279
Vessel Speed (km/h)	11.1	10.9	11.7	8.7	10.6	8.3
Distance Towed (km)	5.57	5.48	5.85	3.67	5.35	4.22
Net Opening Height (m)	12	15	12	15	12	14
Net Opening Width (m)	34	34	34	38	34	34
Warp Length (m)	150	175	175	200	175	175
Target Headrope Depth (m)	0	15	0	30	0	15
Start Bottom Depth (m)	227	302	368	370	387	458
End Bottom Depth (m)	307	337	313	373	389	444
Usable	Y	Y	Y	Y	Y	Y

Station Name	JS07	JS08	QCST01	QCST02	QCST03	QCST04
Tow	7	8	9	10	11	12
Date (Pacific)	2014-10-09	2014-10-09	2014-10-09	2014-10-10	2014-10-10	2014-10-10
Start Time (Pacific)	14:46:00	16:05:00	17:43:00	07:15:00	08:51:00	10:17:00
Net	CanTrawl 250					
Duration (min)	30	5	30	30	30	30
Start Latitude	50°31' 41" N	50°33' 58" N	50°40' 52" N	50°48' 29" N	50°47' 49" N	50°49' 26" N
Start Longitude	126°40' 34" W	126°52' 26" W	126°52' 16" W	127°38' 02" W	127°32' 56" W	127°22' 30" W
End Latitude	50°32' 46" N	50°33' 54" N	50°41' 38" N	50°48' 00" N	50°47' 13" N	50°50' 49" N
End Longitude	126°44' 38" W	126°51' 43" W	126°51' 43" W	127°56' 13" W	127°34' 08" W	127°29' 42" W
Direction of Tow (deg)	293		287	111	106	54
Vessel Speed (km/h)	10.4	10.6	9.6	9.8	7.8	8.7
Distance Towed (km)	5.20	0.85	4.87	4.91	3.96	4.41
Net Opening Height (m)	12	12	12	12	14	12
Net Opening Width (m)	34	34	34	34	36	34
Warp Length (m)	175	200	175	150	175	175
Target Headrope Depth (m)	0	30	0	0	15	0
Start Bottom Depth (m)	491	125	189	365	359	159
End Bottom Depth (m)	474	175	196	353	359	131
Usable	Y	N	Y	Y	Y	Y

Station Name	QCST05	QCST06	QCST07	QCST08	QCST09	QCST10
Tow	13	14	15	16	17	18
Date (Pacific)	2014-10-10	2014-10-10	2014-10-10	2014-10-10	2014-10-10	2014-10-10
Start Time (Pacific)	11:50:00	12:52:00	13:47:00	14:50:00	16:15:00	17:41:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	50°51' 00" N	50°50' 53" N	50°47' 49" N	50°46' 01" N	50°45' 00" N	50°42' 07" N
Start Longitude	127°18' 04" W	127°12' 25" W	127°11' 24" W	127°16' 08" W	127°09' 58" W	127°17' 35" W
End Latitude	50°51' 04" N	50°48' 32" N	50°46' 41" N	50°45' 07" N	50°43' 44" N	50°41' 06" N
End Longitude	127°19' 26" W	127°15' 04" W	127°10' 55" W	127°14' 24" W	127°11' 46" W	127°12' 58" W
Direction of Tow (deg)	88	158	239	108	236	114
Vessel Speed (km/h)	7.0	9.3	8.1	10.7	8.3	9.1
Distance Towed (km)	3.52	4.69	4.09	5.41	4.22	4.57
Net Opening Height (m)	12	12	14	14	14	12
Net Opening Width (m)	34	34	36	34	34	34
Warp Length (m)	200	175	175	175	200	150
Target Headrope Depth (m)	30	0	15	0	30	0
Start Bottom Depth (m)	130	128	155	203	181	98
End Bottom Depth (m)	124	188	159	195	205	100
Usable	Y	Y	Y	Y	Y	Y

Station Name	QCST11	QCST12	QCST13	QCST14	QCST15	QCST16
Tow	19	20	21	22	23	24
Date (Pacific)	2014-10-11	2014-10-11	2014-10-11	2014-10-11	2014-10-11	2014-10-11
Start Time (Pacific)	07:12:00	08:50:00	09:41:00	11:06:00	12:19:00	13:35:00
Net	CanTrawl 250					
Duration (min)	30	17	30	30	30	30
Start Latitude	50° 41' 06" N	50° 43' 08" N	50° 46' 12" N	50° 47' 24" N	50° 44' 56" N	50° 42' 04" N
Start Longitude	127° 12' 36" W	127° 05' 35" W	127° 01' 52" W	126° 58' 08" W	126° 52' 44" W	127° 01' 37" W
End Latitude	50° 41' 42" N	50° 44' 13" N	50° 48' 07" N	50° 45' 54" N	50° 43' 19" N	50° 42' 07" N
End Longitude	127° 14' 02" W	127° 08' 46" W	127° 04' 41" W	126° 56' 20" W	126° 55' 37" W	126° 57' 22" W
Direction of Tow (deg)	76	28	36	143	228	89
Vessel Speed (km/h)	9.3	8.9	8.7	6.9	8.9	10.0
Distance Towed (km)	4.65	2.26	4.41	3.48	4.52	5.00
Net Opening Height (m)	12	14	14	14	12	14
Net Opening Width (m)	34	32	32	36	34	36
Warp Length (m)	150	175	150	200	175	175
Target Headrope Depth (m)	0	15	0	30	0	15
Start Bottom Depth (m)	91	190	185	114	162	152
End Bottom Depth (m)	122	153	110	155	135	199
Usable	Y	Y	Y	Y	Y	Y

Station Name	QCST17	QCST18	JF01	JF02	JF03	JF04
Tow	25	26	27	28	29	30
Date (Pacific)	2014-10-11	2014-10-11	2014-10-16	2014-10-16	2014-10-16	2014-10-16
Start Time (Pacific)	14:30:00	16:00:00	07:44:00	09:08:00	11:10:00	12:34:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	
Start Latitude	50° 42' 07" N	50° 40' 52" N	48° 17' 53" N	48° 20' 38" N	48° 23' 31" N	48° 25' 44" N
Start Longitude	126° 55' 05" W	126° 47' 49" W	123° 40' 01" W	123° 51' 43" W	124° 05' 24" W	124° 11' 56" W
End Latitude	50° 41' 06" N	50° 37' 59" N	48° 18' 32" N	48° 20' 53" N	48° 24' 25" N	48° 25' 44" N
End Longitude	126° 51' 07" W	126° 47' 56" W	123° 43' 55" W	123° 54' 40" W	124° 08' 28" W	124° 11' 56" W
Direction of Tow (deg)	112	182	284	284	295	
Vessel Speed (km/h)	10.0	10.6	9.8	7.4	8.1	
Distance Towed (km)	5.02	5.33	4.96	3.72	4.15	
Net Opening Height (m)	14	14	13	16	13	12
Net Opening Width (m)	32	36	33	34	29	32
Warp Length (m)	150	200	150	175	150	
Target Headrope Depth (m)	0	30	0	15	0	0
Start Bottom Depth (m)	198	167	161	129	102	88
End Bottom Depth (m)	188	158	166	131	97	88
Usable	Y	Y	Y	Y	Y	N

Station Name	JF05	JF06	IVI01	IVI02	IVI03	IVI04
Tow	31	32	33	34	35	36
Date (Pacific)	2014-10-16	2014-10-16	2014-10-17	2014-10-17	2014-10-17	2014-10-17
Start Time (Pacific)	13:25:00	14:50:00	07:50:00	09:02:00	10:00:00	10:39:00
Net	CanTrawl 250					
Duration (min)	30	30	15	15	15	15
Start Latitude	48° 27' 43" N	48° 31' 05" N	48° 55' 16" N	48° 56' 28" N	48° 55' 23" N	48° 56' 13" N
Start Longitude	124° 21' 32" W	124° 31' 05" W	125° 11' 56" W	125° 10' 55" W	125° 11' 49" W	125° 11' 13" W
End Latitude	48° 29' 28" N	48° 31' 05" N	48° 56' 28" N	48° 55' 23" N	48° 56' 10" N	48° 55' 26" N
End Longitude	124° 24' 32" W	124° 34' 19" W	125° 10' 59" W	125° 11' 53" W	125° 11' 17" W	125° 11' 49" W
Direction of Tow (deg)	310	271	28	210	24	209
Vessel Speed (km/h)	9.8	8.0	10.0	9.3	6.3	6.5
Distance Towed (km)	4.94	3.98	2.52	2.32	1.59	1.65
Net Opening Height (m)	16	13	13	16	17	20
Net Opening Width (m)	35	32	32	34	37	42
Warp Length (m)	175	150	150	175	200	200
Target Headrope Depth (m)	15	0	0	15	30	45
Start Bottom Depth (m)	83	128	100	100	99	97
End Bottom Depth (m)	106	161	95	102	97	98
Usable	Y	Y	Y	Y	Y	Y

Station Name	IVI05	IVI06	IVI07	IVI08	IVI09	IVI10
Tow	37	38	39	40	41	42
Date (Pacific)	2014-10-17	2014-10-17	2014-10-17	2014-10-17	2014-10-22	2014-10-22
Start Time (Pacific)	11:56:00	14:17:00	16:01:00	17:45:00	10:36:00	11:56:00
Net	CanTrawl 250					
Duration (min)	15	15	15	15	15	15
Start Latitude	48° 55' 26" N	48° 57' 04" N	48° 56' 35" N	48° 56' 56" N	48° 52' 37" N	48° 51' 25" N
Start Longitude	125° 11' 46" W	125° 07' 16" W	125° 07' 59" W	125° 07' 30" W	125° 07' 19" W	125° 08' 02" W
End Latitude	48° 56' 10" N	48° 56' 13" N	48° 57' 18" N	48° 56' 17" N	48° 51' 11" N	48° 52' 05" N
End Longitude	125° 11' 20" W	125° 08' 28" W	125° 06' 58" W	125° 08' 17" W	125° 08' 35" W	125° 06' 58" W
Direction of Tow (deg)	21	118	114	218	226	47
Vessel Speed (km/h)	5.6	5.6	5.4	6.1	8.3	7.0
Distance Towed (km)	1.43	1.41	1.35	1.56	2.11	1.80
Net Opening Height (m)	20	13	15	20	14	15
Net Opening Width (m)	42	33	33	40	30	30
Warp Length (m)	200	150	175	200	150	175
Target Headrope Depth (m)	60	0	15	30	0	15
Start Bottom Depth (m)	97	93	91	90	134	126
End Bottom Depth (m)	96	92	92	96	112	144
Usable	Y	Y	Y	Y	Y	Y

Station Name	IVI11	IVI12	IVI13	IVI14	EP07	EP06
Tow	43	44	45	46	47	48
Date (Pacific)	2014-10-22	2014-10-22	2014-10-22	2014-10-22	2014-10-23	2014-10-23
Start Time (Pacific)	12:48:00	14:13:00	14:53:00	16:32:00	08:26:00	09:57:00
Net	CanTrawl 250					
Duration (min)	15	15	15	15	30	30
Start Latitude	48° 52' 05" N	48° 51' 07" N	48° 51' 29" N	48° 51' 54" N	49° 09' 22" N	49° 11' 02" N
Start Longitude	125° 07' 23" W	125° 08' 28" W	125° 08' 02" W	125° 13' 19" W	126° 57' 43" W	126° 52' 01" W
End Latitude	48° 51' 07" N	48° 51' 47" N	48° 50' 46" N	48° 53' 02" N	49° 10' 12" N	49° 12' 07" N
End Longitude	125° 08' 28" W	125° 07' 41" W	125° 08' 53" W	125° 12' 40" W	126° 54' 25" W	126° 49' 30" W
Direction of Tow (deg)	216	55	217	21	69	57
Vessel Speed (km/h)	8.7	8.5	6.7	8.9	8.5	7.2
Distance Towed (km)	2.20	2.15	1.69	2.26	4.30	3.65
Net Opening Height (m)	17	18	20	15	15	15
Net Opening Width (m)	37	43	42	30	34	35
Warp Length (m)	200	200	200	150	175	200
Target Headrope Depth (m)	30	45	60	0	15	30
Start Bottom Depth (m)	132	109	126	84	285	160
End Bottom Depth (m)	110	130	140	87	190	145
Usable	Y	Y	Y	Y	Y	Y

Station Name	EP05	EP04	EP03	EP02	VI01	VI02
Tow	49	50	51	52	53	54
Date (Pacific)	2014-10-23	2014-10-23	2014-10-23	2014-10-23	2014-10-24	2014-10-24
Start Time (Pacific)	11:59:00	13:25:00	14:52:00	16:28:00	07:43:00	09:16:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	49° 13' 01" N	49° 15' 22" N	49° 16' 30" N	49° 19' 19" N	49° 34' 44" N	49° 37' 26" N
Start Longitude	126° 47' 56" W	126° 44' 35" W	126° 41' 31" W	126° 36' 43" W	127° 07' 48" W	127° 01' 52" W
End Latitude	49° 14' 38" N	49° 16' 34" N	48° 19' 05" N	49° 19' 59" N	49° 34' 44" N	49° 37' 26" N
End Longitude	126° 46' 05" W	126° 42' 32" W	126° 39' 40" W	126° 34' 34" W	127° 05' 56" W	126° 58' 55" W
Direction of Tow (deg)	37	48	25	64	36	63
Vessel Speed (km/h)	7.4	6.5	4.6	5.7	7.6	7.8
Distance Towed (km)	3.76	3.32	2.37	2.89	3.83	3.94
Net Opening Height (m)	15	17	17	17	16	16
Net Opening Width (m)	40	38	38	38	36	36
Warp Length (m)	175	175	175	175	175	175
Target Headrope Depth (m)	15	15	15	15	15	15
Start Bottom Depth (m)	133	118	114	80	129	100
End Bottom Depth (m)	123	118	104	61	118	63
Usable	Y	Y	Y	Y	Y	Y

Station Name	VI03	VI04	VI05	VI06	VI07	VI08
Tow	55	56	57	58	59	60
Date (Pacific)	2014-10-24	2014-10-24	2014-10-24	2014-10-24	2014-10-25	2014-10-25
Start Time (Pacific)	10:36:00	13:16:00	15:03:00	16:50:00	07:40:00	09:25:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	49° 41' 06" N	49° 52' 16" N	49° 57' 07" N	50° 00' 00" N	50° 15' 04" N	50° 21' 00" N
Start Longitude	126° 58' 12" W	127° 20' 42" W	127° 30' 47" W	127° 41' 42" W	128° 02' 42" W	128° 06' 14" W
End Latitude	49° 41' 06" N	49° 52' 16" N	49° 57' 07" N	50° 00' 00" N	50° 15' 04" N	50° 21' 04" N
End Longitude	127° 01' 34" W	127° 23' 31" W	127° 34' 23" W	127° 46' 16" W	128° 04' 26" W	128° 08' 35" W
Direction of Tow (deg)	308	308	296	269	324	313
Vessel Speed (km/h)	10.2	8.5	9.4	10.7	7.0	7.4
Distance Towed (km)	5.09	4.30	4.78	5.43	3.56	3.76
Net Opening Height (m)	11	16	16	16	16	15
Net Opening Width (m)	28	34	34	34	34	37
Warp Length (m)	150	175	175	175	175	175
Target Headrope Depth (m)	0	15	15	15	15	15
Start Bottom Depth (m)	48	71	63	103	70	102
End Bottom Depth (m)	63	70	65	355	94	123
Usable	Y	Y	Y	Y	Y	Y

Station Name	VI09	IVI15	IVI16	IVI17	IVI18	T08
Tow	61	62	63	64	65	66
Date (Pacific)	2014-10-25	2014-10-25	2014-10-25	2014-10-25	2014-10-25	2014-10-26
Start Time (Pacific)	11:02:00	14:03:00	14:58:00	15:59:00	16:38:00	07:52:00
Net	CanTrawl 250					
Duration (min)	30	15	15	15	15	30
Start Latitude	50° 24' 29" N	50° 28' 52" N	50° 28' 34" N	50° 29' 02" N	50° 28' 48" N	50° 43' 12" N
Start Longitude	128° 08' 28" W	127° 50' 49" W	127° 49' 23" W	127° 51' 14" W	127° 50' 10" W	129° 27' 58" W
End Latitude	50° 24' 29" N	50° 28' 30" N	50° 28' 55" N	50° 28' 44" N	50° 29' 06" N	50° 44' 24" N
End Longitude	128° 11' 56" W	127° 49' 08" W	127° 50' 49" W	127° 49' 52" W	127° 51' 29" W	129° 25' 23" W
Direction of Tow (deg)	258	109	291	109	290	54
Vessel Speed (km/h)	8.3	8.3	7.2	6.9	6.5	7.4
Distance Towed (km)	4.20	2.09	1.83	1.72	1.65	3.76
Net Opening Height (m)	15	15	15	17	18	14
Net Opening Width (m)	37	37	37	40	41	35
Warp Length (m)	175	150	175	200	200	175
Target Headrope Depth (m)	15	0	15	30	45	15
Start Bottom Depth (m)	80	174	131	166	181	1000
End Bottom Depth (m)	113	132	186	167	160	343
Usable	Y	Y	Y	Y	Y	Y

Station Name	T07	T06	T05	T04	T03	IBC01
Tow	67	68	69	70	71	72
Date (Pacific)	2014-10-26	2014-10-26	2014-10-26	2014-10-26	2014-10-26	2014-10-27
Start Time (Pacific)	10:11:00	12:24:00	13:57:00	15:38:00	18:01:00	08:04:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	50°50' 35" N	50°56' 24" N	51°00' 29" N	51°04' 30" N	51°08' 46" N	52°05' 31" N
Start Longitude	129°14' 02" W	128°59' 20" W	128°51' 14" W	128°43' 44" W	128°36' 50" W	127°54' 36" W
End Latitude	50°51' 58" N	50°57' 50" N	51°01' 52" N	51°42' 11" N	51°09' 47" N	52°02' 42" N
End Longitude	129°11' 28" W	128°56' 24" W	128°48' 43" W	128°43' 55" W	128°34' 26" W	127°55' 08" W
Direction of Tow (deg)	50	52	50		56	187
Vessel Speed (km/h)	7.8	8.7	7.6		6.7	10.4
Distance Towed (km)	3.96	4.35	3.85		3.37	5.26
Net Opening Height (m)	14	14	16	16	16	14
Net Opening Width (m)	35	35	38	38	38	37
Warp Length (m)	175	175	175	175	175	150
Target Headrope Depth (m)	15	15	15	15	15	0
Start Bottom Depth (m)	90	61	63	65	139	397
End Bottom Depth (m)	74	72	59	65	164	371
Usable	Y	Y	Y	Y	Y	Y

Station Name	IBC02	IBC03	IBC04	IBC05	IBC06	IBC07
Tow	73	74	75	76	77	78
Date (Pacific)	2014-10-27	2014-10-27	2014-10-27	2014-10-27	2014-10-27	2014-10-27
Start Time (Pacific)	09:16:00	11:00:00	12:26:00	13:51:00	15:29:00	17:40:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	51°57' 32" N	51°52' 01" N	51°46' 19" N	51°40' 23" N	51°35' 10" N	51°30' 50" N
Start Longitude	127°56' 17" W	127°57' 18" W	127°57' 07" W	127°56' 38" W	127°51' 47" W	127°49' 19" W
End Latitude	51°55' 48" N	51°50' 10" N	51°44' 06" N	51°39' 11" N	51°33' 40" N	51°28' 52" N
End Longitude	127°56' 38" W	127°56' 24" W	127°58' 30" W	127°53' 38" W	127°48' 50" W	127°50' 56" W
Direction of Tow (deg)	187	163	201	123	129	207
Vessel Speed (km/h)	6.5	7.0	8.7	8.1	8.7	8.1
Distance Towed (km)	3.26	3.59	4.41	4.11	4.39	4.11
Net Opening Height (m)	16	18	13	16	16	16
Net Opening Width (m)	36	42	31	35	35	35
Warp Length (m)	175	200	150	200	150	175
Target Headrope Depth (m)	15	30	0	15	0	15
Start Bottom Depth (m)	469	309	388	330	116	151
End Bottom Depth (m)	350	316	375	275	167	151
Usable	Y	Y	Y	Y	Y	Y

Station Name	RI01	RI02	RI03	RI04	RI05	QCST19
Tow	79	80	81	82	83	84
Date (Pacific)	2014-10-28	2014-10-28	2014-10-28	2014-10-28	2014-10-28	2014-10-29
Start Time (Pacific)	08:04:00	09:28:00	11:01:00	12:31:00	14:39:00	07:52:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	51°40'37" N	51°38'35" N	51°35'06" N	51°30'18" N	51°26'17" N	51°02'31" N
Start Longitude	127°18'07" W	127°27'40" W	127°32'20" W	127°34'23" W	127°39'43" W	127°48'36" W
End Latitude	51°39'47" N	51°37'41" N	51°32'10" N	51°28'12" N	51°26'17" N	50°59'53" N
End Longitude	127°22'16" W	127°31'05" W	127°32'38" W	127°35'46" W	127°44'17" W	127°49'55" W
Direction of Tow (deg)	252	252	184	202	270	197
Vessel Speed (km/h)	10.0	10.7	9.8	8.3	10.4	10.2
Distance Towed (km)	5.00	5.37	4.91	4.20	5.26	5.13
Net Opening Height (m)	12	15	11	14	14	12
Net Opening Width (m)	29	32	28	32	32	31
Warp Length (m)		175	150	175	150	150
Target Headrope Depth (m)	15	15	0	15	0	0
Start Bottom Depth (m)	166	304	327	321	116	127
End Bottom Depth (m)		317	320	314	146	152
Usable	Y	Y	Y	Y	Y	Y

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Station Name	QCST20	QCST21
Tow	85	86
Date (Pacific)	2014-10-29	2014-10-29
Start Time (Pacific)	09:13:00	11:04:00
Net	CanTrawl 250	CanTrawl 250
Duration (min)	30	30
Start Latitude	50° 58' 44" N	50° 53' 53" N
Start Longitude	127° 49' 30" W	127° 36' 54" W
End Latitude	50° 57' 32" N	50° 52' 12" N
End Longitude	127° 46' 23" W	127° 33' 47" W
Direction of Tow (deg)	121	130
Vessel Speed (km/h)	8.5	9.4
Distance Towed (km)	4.26	4.80
Net Opening Height (m)	14	14
Net Opening Width (m)	32	32
Warp Length (m)	175	150
Target Headrope Depth (m)	15	0
Start Bottom Depth (m)	142	214
End Bottom Depth (m)	172	174
Usable	Y	Y

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## APPENDIX D CTD CASTS AND ZOOPLANKTON TOWS

Table D.1. CTD casts and vertical bongo tow times and depths during the juvenile Pacific Salmon trawl survey from October 09 to October 29, 2014 on the CCGS *W.E. Ricker*.

Date	Station	Latitude	Longitude	CTD			BONGO		
				Start Time (PDT)	Bottom Depth (m)	Gear Depth (m)	Start Time (PDT)	Bottom Depth (m)	Gear Depth (m)
2014-10-09	JS03	50° 29' 20" N	126° 15' 14" W	09:17	374	250	09:31	358	150
2014-10-09	JS05	50° 29' 53" N	126° 26' 49" W	11:34	381	250	12:01	382	150
2014-10-09	JS07	50° 31' 41" N	126° 40' 34" W	14:10	445	250	14:27	445	150
2014-10-10	QCST03	50° 47' 49" N	127° 32' 56" W	08:12	357	250	08:30	357	150
2014-10-10	QCST05	50° 51' 00" N	127° 18' 04" W	11:17	132	122	11:30	132	122
2014-10-10	QCST09	50° 45' 00" N	127° 09' 58" W	15:43	182	172	15:58	182	150
2014-10-11	QCST12	50° 43' 08" N	127° 05' 35" W	08:10	184	174	08:26	183	150
2014-10-11	QCST14	50° 47' 24" N	126° 58' 08" W	10:36	110	100	10:47	109	99
2014-10-11	QCST18	50° 40' 52" N	126° 47' 49" W	15:25	164	154	15:39	164	150
2014-10-12	SOG23			09:31	316	250	09:50	336	150
2014-10-16	JF01	48° 17' 53" N	123° 40' 01" W	07:04	165	155	07:22	163	150
2014-10-16	JF03	48° 23' 31" N	124° 05' 24" W	10:41	104	94	10:53	103	93
2014-10-16	JF05	48° 27' 43" N	124° 21' 32" W	13:01	70	60	13:10	66	56
2014-10-17	IVI01	48° 55' 16" N	125° 11' 56" W	07:12	95	85	07:25	95	85
2014-10-17	IVI05	48° 55' 26" N	125° 11' 46" W	12:59	98	88	13:11	99	89
2014-10-17	IVI06	48° 57' 04" N	125° 07' 16" W	13:46	91	81	13:58	87	77
2014-10-17	IVI08	48° 56' 56" N	125° 07' 30" W	17:45	94	84	18:33	92	82
2014-10-22	EP01			17:51	45	37	18:02	46	36
2014-10-22	IVI09	48° 52' 37" N	125° 07' 19" W	09:57	143	133	10:17	145	135
2014-10-22	IVI12	48° 51' 07" N	125° 08' 28" W	13:24	111	101	13:40	11	101
2014-10-22	IVI14	48° 51' 54" N	125° 13' 19" W	16:00	87	77	16:09	87	77
2014-10-23	EP02	49° 19' 19" N	126° 36' 43" W	15:53	93	85	16:11	92	82
2014-10-23	EP03	49° 16' 30" N	126° 41' 31" W	14:14	118	111	14:32	116	106
2014-10-23	EP04	49° 15' 22" N	126° 44' 35" W	12:50	123	113	13:07	122	112
2014-10-23	EP05	49° 13' 01" N	126° 47' 56" W	10:45	138	132	11:10	137	127
2014-10-23	EP06	49° 11' 02" N	126° 52' 01" W	09:19	177	167	09:37	175	150
2014-10-23	EP07	49° 09' 22" N	126° 57' 43" W	07:41	400	250	08:05	400	150
2014-10-24	VI01	49° 34' 44" N	127° 07' 48" W	07:05	136	126	07:22	136	126

Date	Station	Latitude	Longitude	CTD			BONGO		
				Start Time (PDT)	Bottom Depth (m)	Gear Depth (m)	Start Time (PDT)	Bottom Depth (m)	Gear Depth (m)
2014-10-24	VI03	49° 41' 06" N	126° 58' 12" W	10:10	44	37	10:19	44	34
2014-10-24	VI04	49° 52' 16" N	127° 20' 42" W	12:47	76	69			
2014-10-24	VI05	49° 57' 07" N	127° 30' 47" W	14:32	68	61	12:59	76	67
2014-10-24	VI06	50° 00' 00" N	127° 41' 42" W	16:18	87	82	14:47	67	57
2014-10-25	IVI15	50° 28' 52" N	127° 50' 49" W	13:26	180	172	13:44	182	150
2014-10-25	IVI19			17:39	124	116	17:53	121	111
2014-10-25	VI07	50° 15' 04" N	128° 02' 42" W	07:10	88	82	16:31	90	80
2014-10-25	VI08	50° 21' 00" N	128° 06' 14" W	08:49	96	90	07:22	70	60
2014-10-25	VI09	50° 24' 29" N	128° 08' 28" W	10:35	78	69	09:02	96	86
2014-10-26	T03	51° 08' 46" N	128° 36' 50" W	16:56	140	130	17:12	138	128
2014-10-26	T04	51° 04' 30" N	128° 43' 44" W	15:10	63	56	15:22	63	53
2014-10-26	T05	51° 00' 29" N	128° 51' 14" W	13:29	61	53	13:41	63	53
2014-10-26	T06	50° 56' 24" N	128° 59' 20" W	11:55	61	54	12:08	61	51
2014-10-26	T07	50° 50' 35" N	129° 14' 02" W	09:36	103	95	09:52	105	95
2014-10-26	T08	50° 43' 12" N	129° 27' 58" W	07:08	1,000	252	07:32	1,000	150
2014-10-27	IBC01	52° 05' 31" N	127° 54' 36" W	07:04	367	250	07:26	369	150
2014-10-27	IBC03	51° 52' 01" N	127° 57' 18" W	10:23	301	250	10:41	301	150
2014-10-27	IBC06	51° 35' 10" N	127° 51' 47" W	14:55	183	175	15:13	183	150
2014-10-28	RI01	51° 40' 37" N	127° 18' 07" W	07:03	160	153	07:21	161	150
2014-10-28	RI02	51° 38' 35" N	127° 27' 40" W	09:06	206	251			
2014-10-28	RI03	51° 35' 06" N	127° 32' 20" W	10:23	325	250	10:44	290	150
2014-10-28	RI04	51° 30' 18" N	127° 34' 23" W	12:02	325	250			
2014-10-28	RI05	51° 26' 17" N	127° 39' 43" W	13:30	327	250	13:49	330	150
2014-10-29	QCST19	51° 02' 31" N	127° 48' 36" W	07:02	113	106	07:17	114	104
2014-10-29	QCST20	50° 58' 44" N	127° 49' 30" W	08:38	140	132	08:56	140	130
2014-10-29	QCST21	50° 53' 53" N	127° 36' 54" W	10:27	395	250	10:46	395	150

## APPENDIX E CATCH DATA

Table E.1. Catch (counts) of species (or taxonomic groups where species identification could not be made with certainty) captured during the juvenile Pacific Salmon trawl survey from October 09 to October 29, 2014 on the CCGS *W.E. Ricker*. Rockfish catch is estimated from subsample and they are juveniles with average length of 98.48 mm.

Tow	1	2	3	4	5	6	7	9
Station ID	JS01	JS02	JS03	JS04	JS05	JS06	JS07	QCST01
Chinook Salmon (Adults)								
Chinook Salmon (Juveniles)	2	6		2				
Chum Salmon (Adults)		17						
Chum Salmon (Juveniles)						14		
Coho Salmon (Juveniles)								
Pink Salmon (Juveniles)			5	4	3	99		11
Sockeye Salmon (Juveniles)								
Black Rockfish								
Flatfishes								
Fried Egg Jellyfish								
Jack Mackerel								
Jellyfish								
Lions Mane	1	1			5		2	
Moon Jellyfish								
Moon Jellyfish								
Opalescent Inshore Squid								
Pacific Herring	6	1						
Pacific Sand Lance								
Pacific Sandfish								
Pacific Sardine								
Pacific Saury								
Pacific Sea Nettle								
Perches								
Pipefishes								
Prowfish								
Rock Greenling								
Rockfishes								
Sablefish					5		2	
Salps								
Smelts								
Soft Sculpin								
Sturgeon Poacher								
Threespine Stickleback								
Water Jellyfish								
Wolf Eel								
<b>TOTAL</b>	<b>9</b>	<b>25</b>	<b>5</b>	<b>6</b>	<b>13</b>	<b>113</b>	<b>4</b>	<b>11</b>

Tow	10	11	12	13	14	15	16	17
Station ID	QCST02	QCST03	QCST04	QCST05	QCST06	QCST07	QCST08	QCST09
Chinook Salmon (Adults)	2							
Chinook Salmon (Juveniles)	6	2				1		
Chum Salmon (Adults)					1			
Chum Salmon (Juveniles)	21	11	7	1	1	61	9	7
Coho Salmon (Juveniles)	8	2						
Pink Salmon (Juveniles)	45	45	52	45	45	39	21	43
Sockeye Salmon (Juveniles)							1	
Black Rockfish							1	
Flatfishes								
Fried Egg Jellyfish		1						
Jack Mackerel		1						
Jellyfish			0					
Lions Mane	2	2		2			1	
Moon Jellyfish						1		
Moon Jellyfish						1		
Opalescent Inshore Squid			1					
Pacific Herring	1		1			2	1	
Pacific Sand Lance								
Pacific Sandfish								
Pacific Sardine								
Pacific Saury								
Pacific Sea Nettle								
Perches								
Pipefishes								
Prowfish								
Rock Greenling								
Rockfishes								
Sablefish	50	60	290	4	44	15	15	
Salps								
Smelts								
Soft Sculpin								
Sturgeon Poacher								
Threespine Stickleback								
Water Jellyfish	0	0					0	
Wolf Eel								
<b>TOTAL</b>	<b>135</b>	<b>124</b>	<b>351</b>	<b>52</b>	<b>91</b>	<b>120</b>	<b>49</b>	<b>50</b>

Tow	18	19	20	21	22	23	24	25
Station ID	QCST10	QCST11	QCST12	QCST13	QCST14	QCST15	QCST16	QCST17
Chinook Salmon (Adults)								
Chinook Salmon (Juveniles)			2		6			
Chum Salmon (Adults)								
Chum Salmon (Juveniles)	55	30		3				
Coho Salmon (Juveniles)	3	1						
Pink Salmon (Juveniles)	45	43	5	15	1	36	47	19
Sockeye Salmon (Juveniles)	2							
Black Rockfish								
Flatfishes								
Fried Egg Jellyfish								
Jack Mackerel								
Jellyfish	0					0		
Lions Mane			2	2	2		2	0
Moon Jellyfish		1						0
Moon Jellyfish		1						0
Opalescent Inshore Squid	1							
Pacific Herring	1							
Pacific Sand Lance								
Pacific Sandfish								
Pacific Sardine								
Pacific Saury								
Pacific Sea Nettle								
Perches								
Pipefishes								
Prowfish								
Rock Greenling								1
Rockfishes								
Sablefish	2	3		1	1	1	1	11
Salps								
Smelts								
Soft Sculpin								
Sturgeon Poacher								
Threespine Stickleback								
Water Jellyfish			0		0			0
Wolf Eel		1						
<b>TOTAL</b>	<b>109</b>	<b>80</b>	<b>9</b>	<b>21</b>	<b>10</b>	<b>37</b>	<b>50</b>	<b>31</b>

Tow	26	27	28	29	31	32	33	34
Station ID	QCST18	JF01	JF02	JF03	JF05	JF06	IVI01	IVI02
Chinook Salmon (Adults)			2			1		
Chinook Salmon (Juveniles)			1		2	4	44	18
Chum Salmon (Adults)						7		
Chum Salmon (Juveniles)		3			115	34	45	
Coho Salmon (Juveniles)			19			4		
Pink Salmon (Juveniles)	37	55	1	1	115	55		
Sockeye Salmon (Juveniles)								
Black Rockfish								
Flatfishes								
Fried Egg Jellyfish							1	1
Jack Mackerel						8		
Jellyfish							0	
Lions Mane	0							
Moon Jellyfish		1				4	1	
Moon Jellyfish		1				4	1	
Opalescent Inshore Squid						2	210	35
Pacific Herring	1						2	1
Pacific Sand Lance								
Pacific Sandfish								
Pacific Sardine						1		
Pacific Saury								
Pacific Sea Nettle						0		0
Perches								
Pipefishes								
Prowfish								
Rock Greenling								
Rockfishes								
Sablefish	1							
Salps								
Smelts					1			
Soft Sculpin								
Sturgeon Poacher								
Threespine Stickleback		2						
Water Jellyfish				0		1		0
Wolf Eel								
<b>TOTAL</b>	<b>39</b>	<b>62</b>	<b>23</b>	<b>1</b>	<b>233</b>	<b>125</b>	<b>304</b>	<b>55</b>

Tow	35	36	37	38	39	40	41	42
Station ID	IVI03	IVI04	IVI05	IVI06	IVI07	IVI08	IVI09	IVI10
Chinook Salmon (Adults)								
Chinook Salmon (Juveniles)	3	2		16	86	4	33	28
Chum Salmon (Adults)								
Chum Salmon (Juveniles)				1	17		1	
Coho Salmon (Juveniles)							1	
Pink Salmon (Juveniles)				2	1	1	14	1
Sockeye Salmon (Juveniles)								
Black Rockfish								
Flatfishes						1		
Fried Egg Jellyfish		1	1		0			
Jack Mackerel							2	
Jellyfish							0	0
Lions Mane		1	1					
Moon Jellyfish	1			6	3		1	
Moon Jellyfish	1			6	3		1	
Opalescent Inshore Squid	510	610		2	1	40	7	0
Pacific Herring						32	5	3
Pacific Sand Lance								
Pacific Sandfish								
Pacific Sardine								
Pacific Saury								
Pacific Sea Nettle	0		1	2	2	1		
Perches								
Pipefishes								
Prowfish								
Rock Greenling								
Rockfishes								
Sablefish								
Salps								
Smelts								
Soft Sculpin								
Sturgeon Poacher								
Threespine Stickleback								
Water Jellyfish	0			0	0			
Wolf Eel								
TOTAL	515	614	3	35	113	79	65	32

Tow	43	44	45	46	47	48	49	50
Station ID	IVI11	IVI12	IVI13	IVI14	EP07	EP06	EP05	EP04
Chinook Salmon (Adults)	3							
Chinook Salmon (Juveniles)	4			15				
Chum Salmon (Adults)								
Chum Salmon (Juveniles)				8				
Coho Salmon (Juveniles)								
Pink Salmon (Juveniles)				48				
Sockeye Salmon (Juveniles)								
Black Rockfish								
Flatfishes							2	
Fried Egg Jellyfish								
Jack Mackerel				2	2	2		1
Jellyfish			0	0				
Lions Mane								
Moon Jellyfish								2
Moon Jellyfish								2
Opalescent Inshore Squid	3190	60	16			1		
Pacific Herring		1	41	4				
Pacific Sand Lance		7						
Pacific Sandfish								
Pacific Sardine								
Pacific Saury								
Pacific Sea Nettle								
Perches								
Pipefishes								
Prowfish								
Rock Greenling								
Rockfishes								
Sablefish								
Salps								
Smelts			1420					
Soft Sculpin								
Sturgeon Poacher								
Threespine Stickleback								
Water Jellyfish						0	0	0
Wolf Eel								
TOTAL	3197	68	1477	77	2	3	2	5

Tow	51	52	53	54	55	56	57	58
Station ID	EP03	EP02	VI01	VI02	VI03	VI04	VI05	VI06
Chinook Salmon (Adults)								
Chinook Salmon (Juveniles)		1		11	8	10	4	1
Chum Salmon (Adults)		1						
Chum Salmon (Juveniles)	1	39		5	112	1	2	
Coho Salmon (Juveniles)		305	1	49	2	8	1	
Pink Salmon (Juveniles)			2	3	43	17	3	2
Sockeye Salmon (Juveniles)								
Black Rockfish								
Flatfishes								
Fried Egg Jellyfish								
Jack Mackerel	6							
Jellyfish		0			0	0	0	0
Lions Mane								
Moon Jellyfish			0					
Moon Jellyfish			0					
Opalescent Inshore Squid	2	0	650					
Pacific Herring					0			
Pacific Sand Lance								
Pacific Sandfish								
Pacific Sardine								
Pacific Saury								
Pacific Sea Nettle			0					
Perches								
Pipefishes								
Prowfish								
Rock Greenling								
Rockfishes								
Sablefish				1			10	
Salps								
Smelts								
Soft Sculpin								
Sturgeon Poacher								
Threespine Stickleback								
Water Jellyfish	0		0					
Wolf Eel								
TOTAL	9	346	653	69	165	36	20	3

Tow	59	60	61	62	63	64	65	66
Station ID	VI07	VI08	VI09	IVI15	IVI16	IVI17	IVI18	T08
Chinook Salmon (Adults)			1		2	3	6	
Chinook Salmon (Juveniles)	4	3	4	21	24	10	3	
Chum Salmon (Adults)		1			1			
Chum Salmon (Juveniles)	1			3	11			
Coho Salmon (Juveniles)	15	16	5	1				
Pink Salmon (Juveniles)		1	4	1				
Sockeye Salmon (Juveniles)								
Black Rockfish								
Flatfishes								
Fried Egg Jellyfish								
Jack Mackerel								3
Jellyfish	0		0		0			
Lions Mane								
Moon Jellyfish		0						
Moon Jellyfish		0						
Opalescent Inshore Squid						60	31	
Pacific Herring	8	2					7	
Pacific Sand Lance								
Pacific Sandfish								
Pacific Sardine								
Pacific Saury								
Pacific Sea Nettle								
Perches								
Pipefishes								
Prowfish			1				1	
Rock Greenling								
Rockfishes								1
Sablefish								
Salps								
Smelts								
Soft Sculpin								
Sturgeon Poacher								
Threespine Stickleback								
Water Jellyfish		0						0
Wolf Eel								
TOTAL	28	23	15	26	38	73	48	4

Tow	67	68	69	70	71	72	73	74
Station ID	T07	T06	T05	T04	T03	IBC01	IBC02	IBC03
Chinook Salmon (Adults)								
Chinook Salmon (Juveniles)						4	3	7
Chum Salmon (Adults)								
Chum Salmon (Juveniles)								
Coho Salmon (Juveniles)								
Pink Salmon (Juveniles)								5
Sockeye Salmon (Juveniles)								6
Black Rockfish								
Flatfishes								
Fried Egg Jellyfish								
Jack Mackerel	3				2	2	2	
Jellyfish								
Lions Mane					0	3		
Moon Jellyfish	0	0		0		1		
Moon Jellyfish	0	0		0		1		
Opalescent Inshore Squid			50			2	18	6
Pacific Herring						1		
Pacific Sand Lance								
Pacific Sandfish				1				
Pacific Sardine								
Pacific Saury				1				
Pacific Sea Nettle								
Perches								
Pipefishes								
Prowfish								
Rock Greenling								
Rockfishes								
Sablefish								
Salps	0	0						
Smelts								
Soft Sculpin						3	70	7
Sturgeon Poacher								
Threespine Stickleback								
Water Jellyfish	0	0	0		0	0		0
Wolf Eel								
<b>TOTAL</b>	<b>3</b>	<b>0</b>	<b>50</b>	<b>2</b>	<b>2</b>	<b>17</b>	<b>93</b>	<b>31</b>

Tow	75	76	77	78	79	80	81	82
Station ID	IBC04	IBC05	IBC06	IBC07	RI01	RI02	RI03	RI04
Chinook Salmon (Adults)								
Chinook Salmon (Juveniles)	1	2	2	2	2	4		1
Chum Salmon (Adults)								
Chum Salmon (Juveniles)	28	1	120					
Coho Salmon (Juveniles)		1						10
Pink Salmon (Juveniles)	73	10	58					
Sockeye Salmon (Juveniles)	3	2	21	6				2
Black Rockfish								
Flatfishes								
Fried Egg Jellyfish								
Jack Mackerel		1		3				
Jellyfish								
Lions Mane		1					2	
Moon Jellyfish								
Moon Jellyfish								
Opalescent Inshore Squid				80				
Pacific Herring								
Pacific Sand Lance								
Pacific Sandfish								
Pacific Sardine								
Pacific Saury								
Pacific Sea Nettle								
Perches								
Pipefishes					1		1	
Prowfish								
Rock Greenling								
Rockfishes								
Sablefish	1		6		1			9
Salps								
Smelts								
Soft Sculpin							1	3
Sturgeon Poacher						1		
Threespine Stickleback					2			
Water Jellyfish	0	0	0	0	1	4		
Wolf Eel								
<b>TOTAL</b>	<b>106</b>	<b>18</b>	<b>207</b>	<b>91</b>	<b>7</b>	<b>9</b>	<b>4</b>	<b>25</b>

Tow	83	84	85	86
Station ID	RI05	QCST19	QCST20	QCST21
Chinook Salmon (Adults)				
Chinook Salmon (Juveniles)		2	2	
Chum Salmon (Adults)				
Chum Salmon (Juveniles)	8	2	1	23
Coho Salmon (Juveniles)			1	1
Pink Salmon (Juveniles)	7	17	10	26
Sockeye Salmon (Juveniles)			1	
Black Rockfish				
Flatfishes				
Fried Egg Jellyfish				
Jack Mackerel			2	
Jellyfish				
Lions Mane	0	2		1
Moon Jellyfish	3	5	2	7
Moon Jellyfish	3	5	2	7
Opalescent Inshore Squid				
Pacific Herring				
Pacific Sand Lance				
Pacific Sandfish				
Pacific Sardine				
Pacific Saury			5	
Pacific Sea Nettle				
Perches	1			
Pipefishes				
Prowfish				
Rock Greenling				
Rockfishes				
Sablefish	2	3		1
Salps				
Smelts				
Soft Sculpin				
Sturgeon Poacher				
Threespine Stickleback				
Water Jellyfish	0	0	0	0
Wolf Eel				
<b>TOTAL</b>	<b>24</b>	<b>36</b>	<b>26</b>	<b>66</b>