

Juvenile Pacific Salmon (*Oncorhynchus* spp.) Trawl Survey on the South Coast of British Columbia, July 9 - 18, 2014

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JUVENILE PACIFIC SALMON (*ONCORHYNCHUS* SPP.) TRAWL SURVEY ON THE SOUTH
COAST OF BRITISH COLUMBIA, JULY 9 - 18, 2014

by

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ABSTRACT

Jung, Y., Tabata, A.M. and King, J.R. 2026. Juvenile Pacific Salmon (*Oncorhynchus* spp.) Trawl Survey on the South Coast of British Columbia, July 9 - 18, 2014. Can. Data Rep. Fish. Aquat. Sci. 1464: vi + 42 p.

Fisheries and Oceans Canada (DFO) conducted a surface trawl survey from July 9 to 18, 2014 on the CCGS *W.E. Ricker*. This study targeted juvenile Pacific Salmon (*Oncorhynchus* spp.) in southern British Columbia (BC). There were 15,008 individuals caught from 36 species in 69 tows. Juvenile Pink Salmon was the most abundant species with 48% of the total catch. Juvenile salmon species caught in decreasing abundance by count were: Pink Salmon, Chum Salmon, Sockeye Salmon, Coho Salmon and Chinook Salmon, with catch distribution varied 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 (60 locations), water samples for chemistry and chlorophyll *a* along with zooplankton samples (60 locations) were returned to the Institute of Ocean Sciences (DFO, Sidney, BC).

RÉSUMÉ

Jung, Y., Tabata, A.M. and King, J.R. 2026. Juvenile Pacific Salmon (*Oncorhynchus* spp.) Trawl Survey on the South Coast of British Columbia, July 9 - 18, 2014. Can. Data Rep. Fish. Aquat. Sci. 1464: vi + 42 p.

Pêches et Océans Canada a effectué un relevé au chalut de surface entre le 9 et le 18 juillet 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.). 15,008 individus de 36 espèces ont été capturés au cours de 69 traits. Le saumon rose juvéniles était l'espèce la plus abondante avec 48% 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 rouge juvéniles, saumon coho juvéniles et saumon quinnat 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 (60 sites) les échantillons d'eau pour la chimie et la chlorophylle *a* ainsi que les échantillons de zooplancton (60 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 July 09 to July 18, 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 present in the central and the north coast of 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 the central and the north coast of British Columbia, including Johnstone Strait, Queen Charlotte Strait, Queen Charlotte Sound, Hecate Strait and northern inlets of British Columbia (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 32 m wide by 14 m high, or an area of 448 m².

Tow speed averaged 9 km/hr, and varied between 5.2 to 12.4 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 was 150 m (Appendix C). Tow duration was 15-30 min, with the time starting when the Jet 5 m² 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 timeframe, 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 (km³) to calculate catch per unit effort (CPUE).

2.4 BIOLOGICAL SAMPLING

All salmon species 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. 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 60 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 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 °C. Nutrient and chl *a* samples were sent for analyses at the Institute of Ocean Sciences (DFO, Sidney, BC).

2.6 ZOOPLANKTON

At 60 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 69 trawl net tows on the central and the north coast of British Columbia (Figure 1, Appendix C) with 69 trawls completed successfully.

3.2 CATCH COMPOSITION

Total catch for the survey from usable tows was 15,008 fish, with 11,890 (or 79%) 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 juvenile Pink Salmon (n=7,160), juvenile Chum Salmon (n=3,880), then Pacific Herring (n=815; Table 1). Juvenile Pacific Salmon species caught, in order of abundance by count, were: Pink Salmon, Chum Salmon, Sockeye Salmon, Coho Salmon and Chinook 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/km³) of juvenile salmon is shown in Figure 2. Juvenile Chinook Salmon and juvenile Coho Salmon were caught in the Johnstone Strait, Queen Charlotte Sound and Douglas Channel in northern BC. Juvenile Chum Salmon were found in the Johnstone Strait, Queen Charlotte Sound and the Hecate Strait. Juvenile Pink Salmon were caught primarily in Queen Charlotte Strait and Queen Charlotte Sound, and also found in the Hecate Strait. A large juvenile Pink Salmon catch was expected given that Pink Salmon have alternating large and small return years. Juvenile Sockeye Salmon were the third abundant salmon species caught within the migratory corridor through Johnstone Strait, Queen Charlotte Sound and Hecate Strait, and Douglas Channel.

3.3 BIOLOGICAL SAMPLES

Samples were collected for GSI (n=1,026), otoliths (n=848), pathogen analyses (n=281), energy density and stable isotope analyses (n=1,503). CWTs (n=18) when present and detected were retained. 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 3 to 7. Double log transformed length-weight regressions coefficients were large in Chinook Salmon, Chum Salmon, Coho Salmon and Pink Salmon. Sockeye Salmon had a slightly smaller coefficient. A larger coefficient typically represents better condition,

whereas a smaller coefficient typically represents worse condition. Lengths and weights of 28 species were recorded (Table 2). The length frequencies for species with greater than 50 length measurements (Pacific Herring, Opalescent Inshore Squid, Pacific Sand Lance, Walleye Pollock and Rockfishes) are presented in Figure 8.

Within juvenile Pacific salmon, Chinook Salmon had the largest maximum length (294 mm) and weight (312 g), whereas Sockeye Salmon had the smallest maximum length (190 mm) and weight (66 g).

3.5 OCEANOGRAPHY

CTD casts and water samples were completed at 60 sites with cast depths ranging from 50 m to 250 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 201436.

3.6 ZOOPLANKTON

Vertical bongo tows were conducted at 60 stations to depths ranging from 50 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 201436.

4 DISCUSSION

This juvenile Pacific Salmon trawl survey collected valuable information on distribution, abundance, condition, and genetic stock composition for juvenile Pacific Salmon in the central and the north coast of British Columbia. Overall, juvenile Pink Salmon and juvenile Chum Salmon were most abundant, whereas juvenile Chinook 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 Marc Trudel was Chief Scientist on this survey. We appreciate the expertise of the following science staff who participated in the survey: Brian Hunt, Evgeny Pakhomov, Jayme Hills, Meredith Journey, Rosemary Nguyen and Tyler Zubkowski and, in particular, Hugh Maclean 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*, July 09 to July 18, 2014.

Common Name	Scientific Name	Tows	Count	Max	Mean
Pink Salmon (Juveniles)	<i>Oncorhynchus gorbuscha</i>	39	7,160	1,465	184
Chum Salmon (Juveniles)	<i>Oncorhynchus keta</i>	36	3,880	928	108
Pacific Herring	<i>Clupea pallasii</i>	22	815	470	37
Pink Salmon (Adults)	<i>Oncorhynchus gorbuscha</i>	39	595	93	15
Lions Mane	<i>Cyanea capillata</i>	49	475	30	10
Sockeye Salmon (Juveniles)	<i>Oncorhynchus nerka</i>	26	360	185	14
Pacific Sand Lance	<i>Ammodytes personatus</i>	8	333	137	42
Coho Salmon (Juveniles)	<i>Oncorhynchus kisutch</i>	40	322	43	8
Chinook Salmon (Juveniles)	<i>Oncorhynchus tshawytscha</i>	28	168	23	6
Opalescent Inshore Squid	<i>Doryteuthis opalescens</i>	7	162	52	23
Moon Jellyfish	<i>Aurelia</i>	23	147	50	6
Walleye Pollock	<i>Gadus chalcogrammus</i>	17	119	67	7
Rockfishes	<i>Sebastes</i>	11	95	24	9
Chum Salmon (Adults)	<i>Oncorhynchus keta</i>	15	92	56	6
Chinook Salmon (Adults)	<i>Oncorhynchus tshawytscha</i>	18	57	9	3
Comb Jellyfish	<i>Ctenophora</i>	9	44	11	5
Threespine Stickleback	<i>Gasterosteus aculeatus</i>	5	36	17	7
Coho Salmon (Adults)	<i>Oncorhynchus kisutch</i>	18	33	4	2
Soft Sculpin	<i>Psychrolutes sigalutes</i>	9	24	7	3
Salps	<i>Salpida</i>	2	24	24	24
Sockeye Salmon (Adults)	<i>Oncorhynchus nerka</i>	8	22	6	3
Prowfish	<i>Zaprora silenus</i>	9	14	4	2
North Pacific Spiny Dogfish	<i>Squalus suckleyi</i>	3	7	5	2
Pacific Sandfish	<i>Trichodon trichodon</i>	4	6	2	2
Flatfishes	<i>Pleuronectiformes</i>	3	3	1	1
Pacific Spiny Lumpsucker	<i>Eumicrotremus orbis</i>	3	3	1	1
Fried Egg Jellyfish	<i>Phacellophora camtschatica</i>	2	3	2	2
Starry Flounder	<i>Platichthys stellatus</i>	2	2	1	1
Wolf Eel	<i>Anarrhichthys ocellatus</i>	2	2	1	1
Black Rockfish	<i>Sebastes melanops</i>	1	1	1	1
Crested Sculpin	<i>Blepsias bilobus</i>	1	1	1	1
Curlfin Sole	<i>Pleuronichthys decurrens</i>	1	1	1	1
Lampreys	<i>Petromyzontidae</i>	1	1	1	1
Mosshead Sculpin	<i>Clinocottus globiceps</i>	1	1	1	1
Water Jellyfish	<i>Aequorea</i>	50			
Pacific Sea Nettle	<i>Chrysaora fuscescens</i>	1			

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*, July 09 to July 18, 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	57	FL	2,767	83	600	192	789	5	2,600	572
Chum Salmon	45	FL	1,549	82	878	156	392	7	9,500	273
Coho Salmon	45	FL	353	114	735	230	320	15	5,490	272
Pacific Herring	22	FL	348	49	256	147				
Sockeye Salmon	32	FL	247	73	672	158	194	4	3,940	179
Chinook Salmon	32	FL	224	80	765	226	217	5	6,690	266
Opalescent Inshore Squid	6	ML	156	31	115	65				
Pacific Sand Lance	5	TL	104	54	89	72				
Walleye Pollock	16	TL	103	40	410	63				
Rockfishes	11	TL	93	22	64	53				
Threespine Stickleback	5	TL	36	50	89	81				
Soft Sculpin	9	TL	24	30	50	41				
Prowfish	9	TL	13	52	128	83				
North Pacific Spiny Dogfish	3	TL	7	320	703	515				
Pacific Sandfish	4	TL	6	72	92	81				
Moon Jellyfish	5	BD	5	80	260	138				
Flatfishes	3	TL	3	62	70	67				
Fried Egg Jellyfish	2	BD	3	210	450	363				
Lions Mane	3	BD	3	85	170	122				
Pacific Spiny Lumpsucker	3	TL	3	37	86	56				
Starry Flounder	2	TL	2	334	400	367				
Wolf Eel	2	TL	2	380	561	470				
Black Rockfish	1	TL	1	350	350	350				
Crested Sculpin	1	TL	1	80	80	80				
Curlfin Sole	1	TL	1	230	230	230				
Lampreys	1	TL	1	208	208	208				
Mosshead Sculpin	1	TL	1	37	37	37				
Tube-nose Poacher	1	TL	1	50	50	50				

8 FIGURES

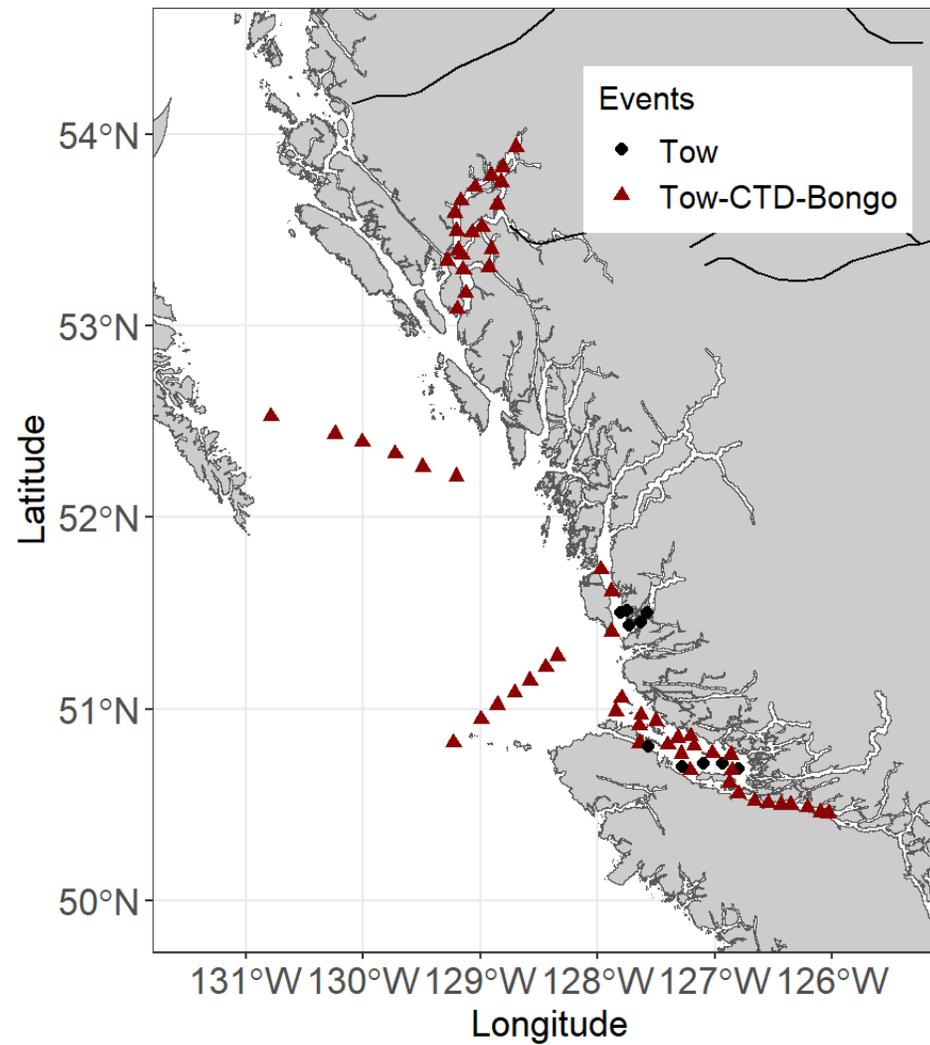


Figure 1. Location of survey events (fishing tows, CTD casts and zooplankton bongo casts) during the juvenile Pacific Salmon trawl survey from July 09 to July 18, 2014 on the CCGS *W.E. Ricker*.

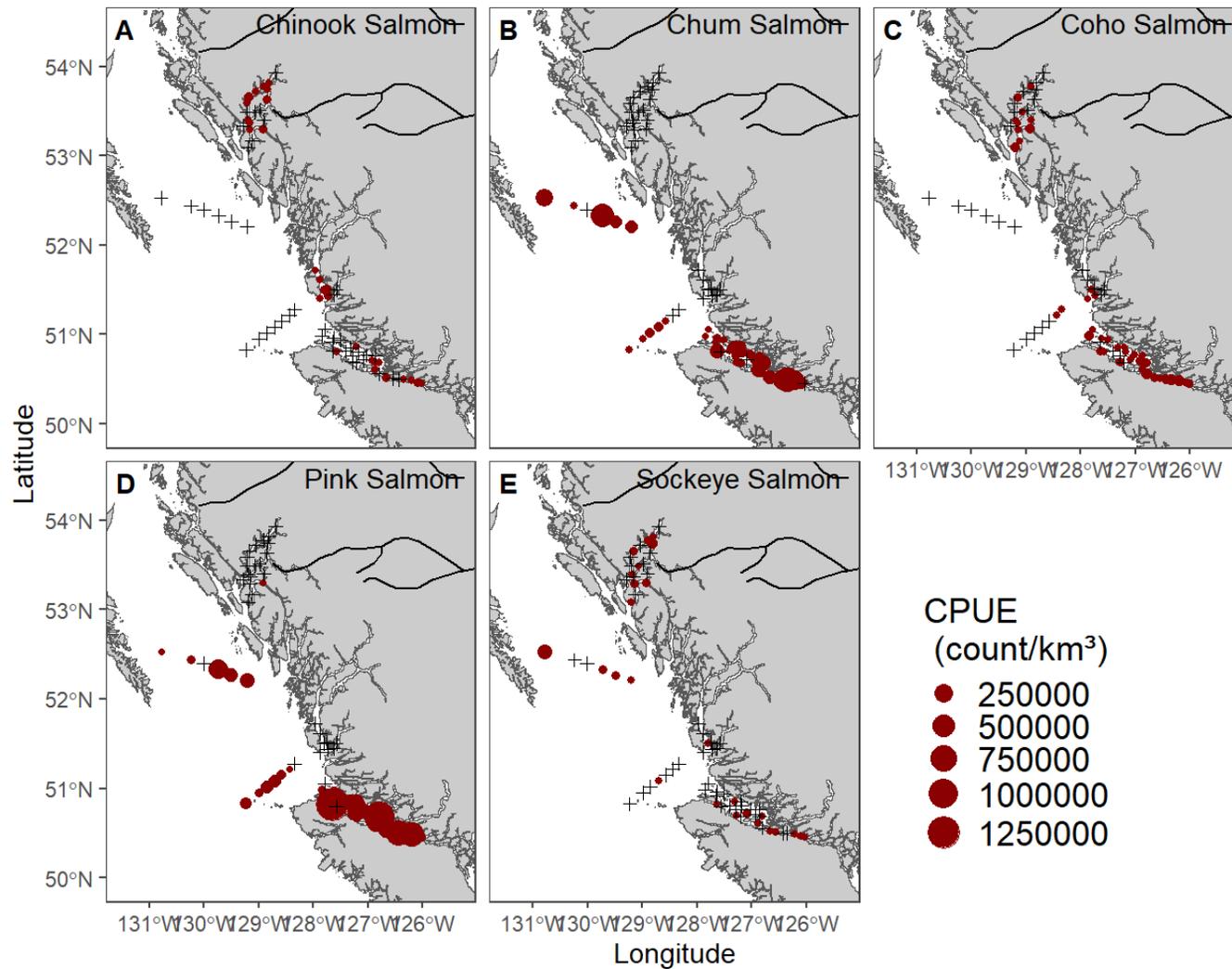


Figure 2. Juvenile Pacific Salmon (*Oncorhynchus* spp.) catch (count) per unit effort (CPUE; count/km³) for each tow. Circles are proportional to maximum abundance, and zero catches are shown with a cross (+). **A.** juvenile Chinook Salmon. **B.** juvenile Chum Salmon. **C.** juvenile Coho Salmon. **D.** juvenile Pink Salmon. **E.** juvenile Sockeye Salmon.

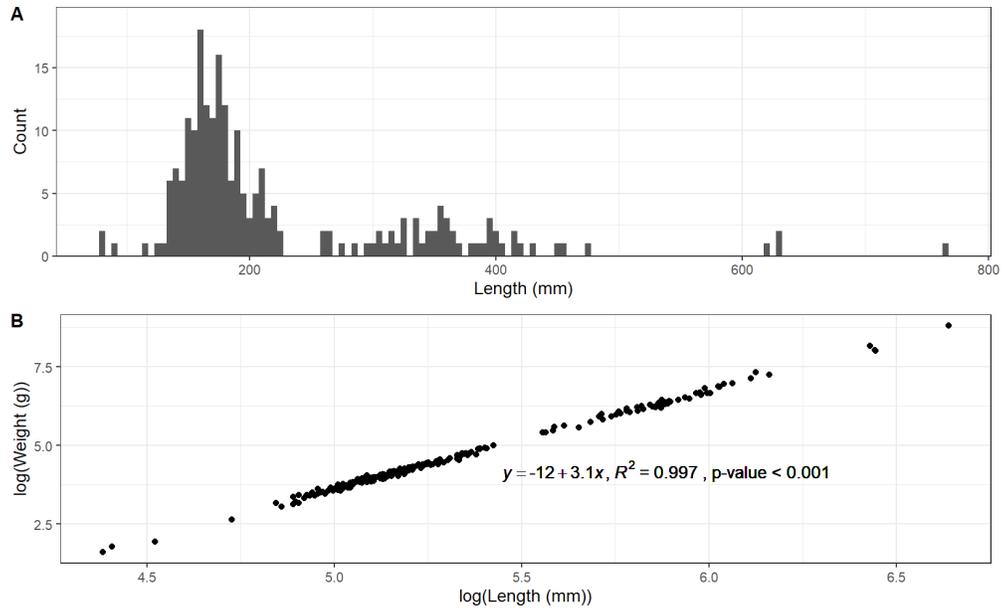


Figure 3. **A.** Chinook Salmon (*Oncorhynchus tshawytscha*) length frequency plot as sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, July 09 to July 18, 2014. **B.** Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test.

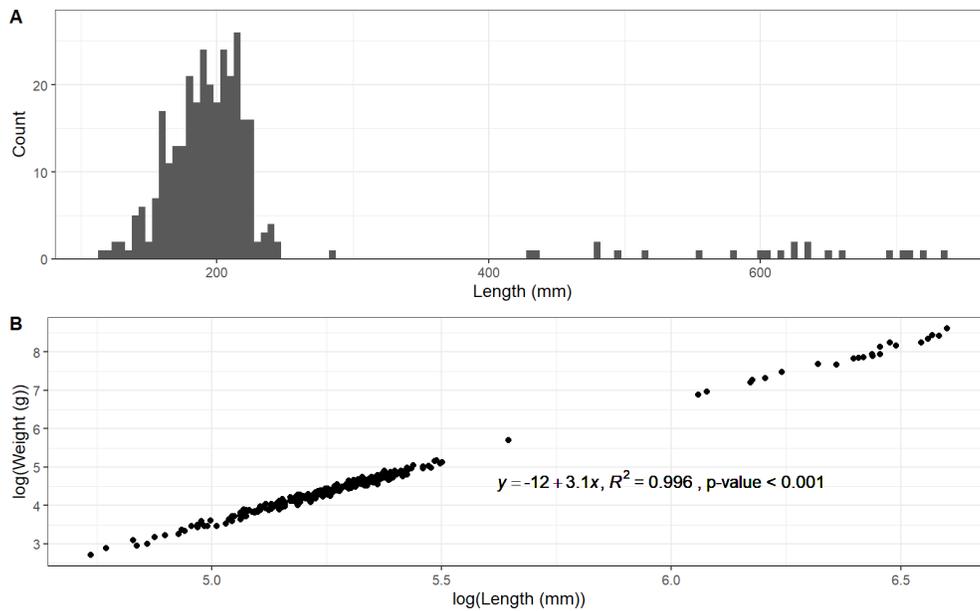


Figure 4. **A.** Coho Salmon (*Oncorhynchus kisutch*) length frequency plot as sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, July 09 to July 18, 2014. **B.** Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test.

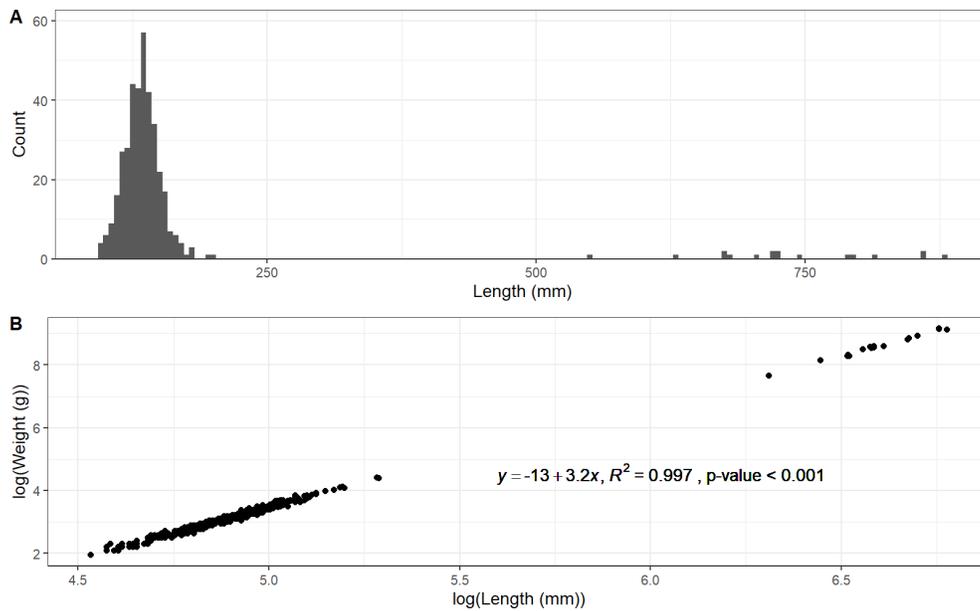


Figure 5. **A.** Chum Salmon (*Oncorhynchus keta*) length frequency plot as sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, July 09 to July 18, 2014. **B.** Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test.

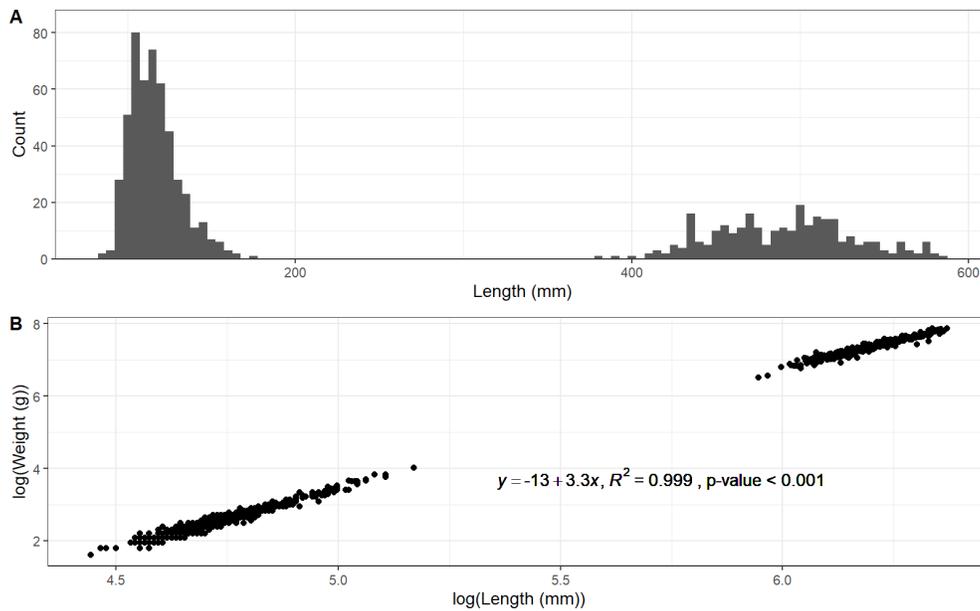


Figure 6. **A.** Pink Salmon (*Oncorhynchus gorbusha*) length frequency plot as sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, July 09 to July 18, 2014. **B.** Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test.

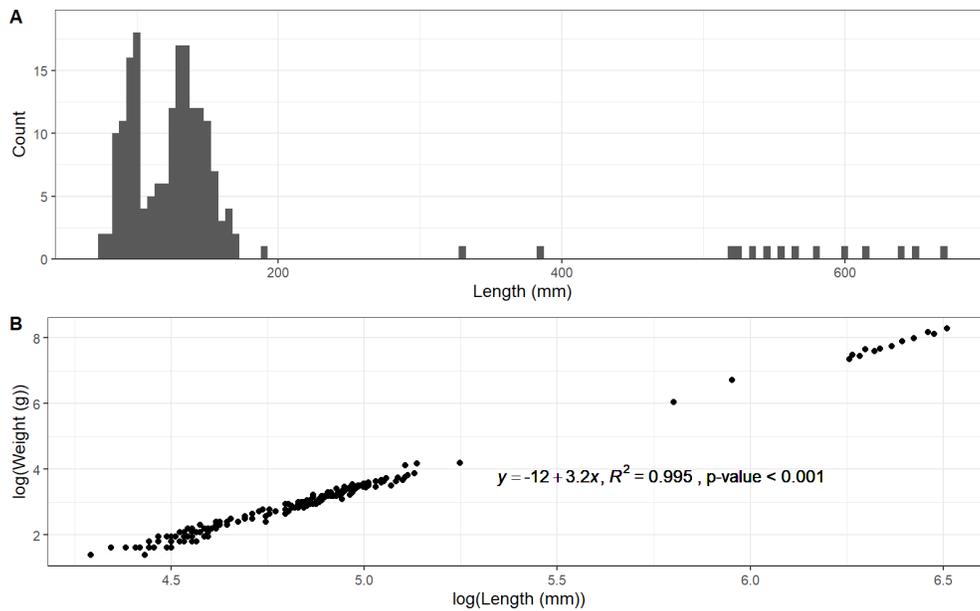


Figure 7. **A.** Sockeye Salmon (*Oncorhynchus nerka*) length frequency plot as sampled during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, July 09 to July 18, 2014. **B.** Double log-transformed length-weight regression with outliers removed, using a Bonferroni outlier test.

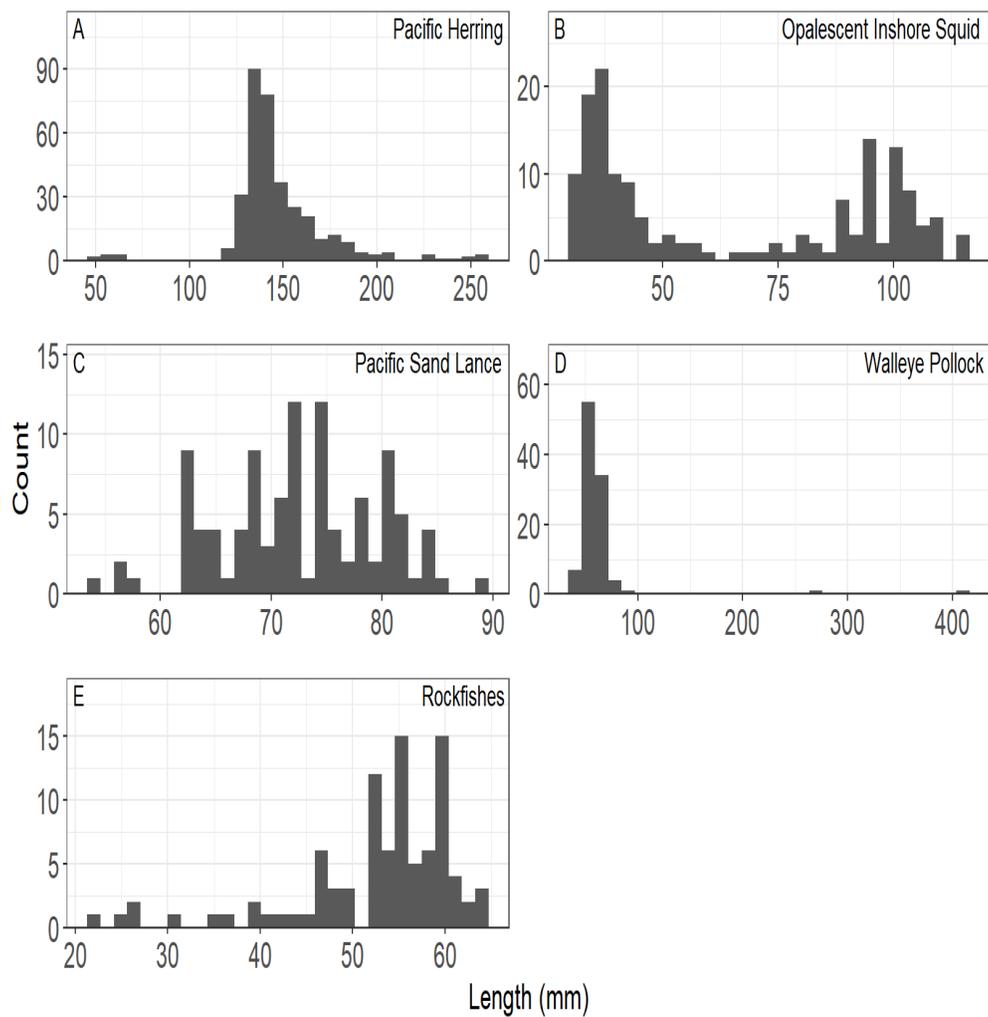


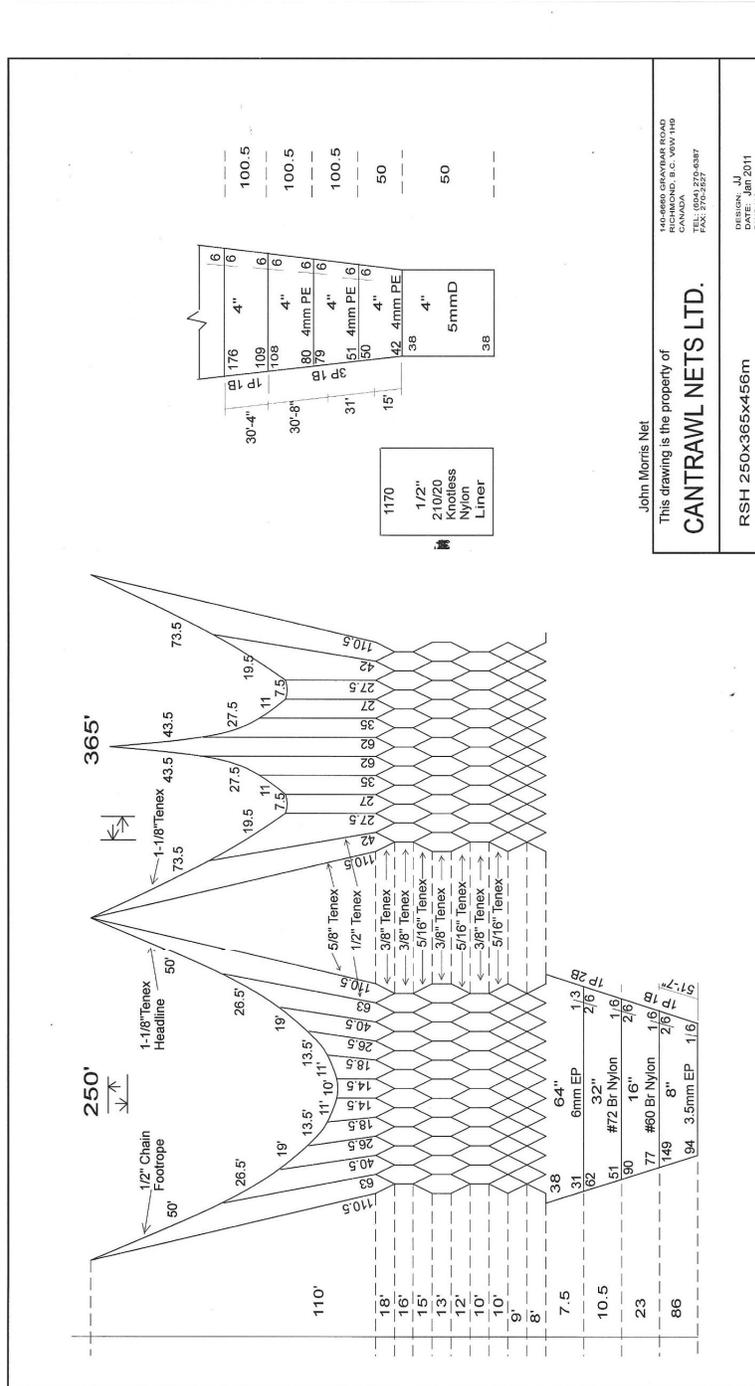
Figure 8. Length (mm) frequency plots for common species sampled ($n > 50$ samples) during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, July 09 to July 18, 2014. **A.** Pacific Herring (*Clupea pallasii*), length = Fork Length, **B.** Opalescent Inshore Squid (*Doryteuthis opalescens*), length = Mantle Length, **C.** Pacific Sand Lance (*Ammodytes personatus*), length = Total Length, **D.** Walleye Pollock (*Gadus chalcogrammus*), length = Total Length, **E.** Rockfishes (*Sebastes*), 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*, July 09 to July 18, 2014.

Part	Size	Material
Doors	2 m ²	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



John Morris Net
 This drawing is the property of
CANTRAWL NETS LTD.
 RSH 250x365x456m
 140-6660 GRAYBAR ROAD
 STANLEY, B.C. V5W 1H8
 CANADA
 TEL: (604) 270-6387
 FAX: 370-2627
 DESIGN: J.M.
 DRAWN: J.M.
 DATE: 07/2011

Figure B.1. Net diagram for CanTrawl 250 trawl net used during the juvenile Pacific Salmon trawl survey aboard the CCGS *W.E. Ricker*, July 09 to July 18, 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*, July 09 to July 18, 2014.

Station Name	JS01	JS02	JS03	JS04	JS05	JS06
Tow	1	2	3	4	5	6
Date (Pacific)	2014-07-09	2014-07-09	2014-07-09	2014-07-09	2014-07-09	2014-07-09
Start Time (Pacific)	06:58:00	08:18:00	09:40:00	11:10:00	12:36:00	13:59:00
Net	CanTrawl 250					
Duration (min)	15	15	15	15	15	15
Start Latitude	50° 27' 11" N	50° 27' 40" N	50° 29' 02" N	50° 29' 56" N	50° 29' 56" N	50° 30' 22" N
Start Longitude	126° 01' 59" W	126° 06' 04" W	126° 12' 40" W	126° 21' 18" W	126° 26' 20" W	126° 33' 00" W
End Latitude	50° 27' 50" N	50° 28' 01" N	50° 29' 24" N	50° 29' 56" N	50° 30' 04" N	50° 30' 29" N
End Longitude	126° 04' 08" W	126° 08' 02" W	126° 14' 35" W	126° 22' 44" W	126° 28' 01" W	126° 34' 41" W
Direction of Tow (deg)	296	286	286	270	276	276
Vessel Speed (km/h)	11.3	9.6	9.3	6.7	8.0	8.0
Distance Towed (km)	2.83	2.43	2.35	1.70	2.00	2.00
Net Opening Height (m)	13	13	13	16	13	14
Net Opening Width (m)	33	33	31	35	30	34
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	0	15	0	15	0	15
Start Bottom Depth (m)	98	294	338	374	380	437
End Bottom Depth (m)	274	313	351	359	392	431
Usable	Y	Y	Y	Y	Y	Y

Station Name	JS07	JS08	QCST01	QCST02	QCST03	QCST04
Tow	7	8	9	10	11	12
Date (Pacific)	2014-07-09	2014-07-09	2014-07-10	2014-07-10	2014-07-10	2014-07-10
Start Time (Pacific)	15:29:00	17:08:00	06:40:00	07:42:00	08:56:00	09:48:00
Net	CanTrawl 250					
Duration (min)	15	15	15	15	15	15
Start Latitude	50° 31' 05" N	50° 33' 29" N	50° 36' 43" N	50° 41' 06" N	50° 40' 48" N	50° 42' 43" N
Start Longitude	126° 39' 54" W	126° 48' 14" W	126° 52' 44" W	126° 48' 04" W	126° 51' 32" W	126° 55' 59" W
End Latitude	50° 31' 41" N	50° 33' 43" N	50° 36' 36" N	50° 40' 37" N	50° 41' 17" N	50° 43' 30" N
End Longitude	126° 41' 31" W	126° 49' 34" W	126° 50' 31" W	126° 49' 59" W	126° 52' 52" W	126° 54' 25" W
Direction of Tow (deg)	300	286	95	248	300	52
Vessel Speed (km/h)	8.7	6.3	10.4	9.6	7.0	9.3
Distance Towed (km)	2.20	1.61	2.61	2.43	1.80	2.33
Net Opening Height (m)	14	15	13	15	13	15
Net Opening Width (m)	31	32	33	34	29	32
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	0	15	0	15	0	15
Start Bottom Depth (m)	390	442	103	151	182	136
End Bottom Depth (m)	441	327	106	178	190	132
Usable	Y	Y	Y	Y	Y	Y

Station Name	QCST05	QCST06	QCST07	QCST08	QCST09	QCST10
Tow	13	14	15	16	17	18
Date (Pacific)	2014-07-10	2014-07-10	2014-07-10	2014-07-10	2014-07-10	2014-07-10
Start Time (Pacific)	11:08:00	12:35:00	13:22:00	14:35:00	15:14:00	16:39:00
Net	CanTrawl 250					
Duration (min)	15	15	15	15	15	15
Start Latitude	50° 45' 29" N	50° 46' 05" N	50° 42' 54" N	50° 40' 48" N	50° 41' 49" N	50° 45' 54" N
Start Longitude	126° 51' 58" W	127° 01' 30" W	127° 05' 42" W	127° 12' 50" W	127° 16' 59" W	127° 17' 24" W
End Latitude	50° 45' 32" N	50° 45' 07" N	50° 42' 07" N	50° 40' 52" N	50° 42' 36" N	50° 46' 23" N
End Longitude	126° 54' 07" W	127° 02' 31" W	127° 07' 23" W	127° 15' 04" W	127° 18' 43" W	127° 15' 54" W
Direction of Tow (deg)	273	214	234	272	305	63
Vessel Speed (km/h)	10.0	8.5	9.6	10.4	10.0	7.8
Distance Towed (km)	2.54	2.15	2.44	2.61	2.50	1.96
Net Opening Height (m)	13	16	13	15	13	16
Net Opening Width (m)	31	34	31	32	29	34
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	0	15	0	15	0	15
Start Bottom Depth (m)	113	170	182	84	91	241
End Bottom Depth (m)	132	83	134	58	99	184
Usable	Y	Y	Y	Y	Y	Y

Station Name	QCST11	QCST12	QCSD01	QCSD02	QCST13	QCST14
Tow	19	20	21	22	23	24
Date (Pacific)	2014-07-11	2014-07-11	2014-07-11	2014-07-11	2014-07-11	2014-07-11
Start Time (Pacific)	06:45:00	08:05:00	09:56:00	11:20:00	13:14:00	15:01:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	20
Start Latitude	50° 56' 10" N	50° 57' 58" N	51° 03' 18" N	50° 59' 17" N	50° 54' 47" N	50° 49' 08" N
Start Longitude	127° 30' 25" W	127° 37' 59" W	127° 47' 49" W	127° 50' 53" W	127° 38' 53" W	127° 38' 46" W
End Latitude	50° 58' 01" N	50° 59' 42" N	51° 01' 37" N	50° 57' 58" N	50° 52' 52" N	50° 49' 41" N
End Longitude	127° 34' 55" W	127° 40' 37" W	127° 50' 53" W	127° 47' 28" W	127° 36' 58" W	127° 41' 06" W
Direction of Tow (deg)	303	316	229	121	148	290
Vessel Speed (km/h)	12.4	8.9	9.4	9.3	8.3	8.7
Distance Towed (km)	6.28	4.46	4.74	4.69	4.20	2.91
Net Opening Height (m)	13	17	15	14	18	13
Net Opening Width (m)	31	35	32	34	39	29
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	0	15	0	15	30	0
Start Bottom Depth (m)	158	160	112	137	397	359
End Bottom Depth (m)	110	124	143	171	420	342
Usable	Y	Y	Y	Y	Y	Y

Station Name	QCST15	QCST16	QCST17	QCST18	QCST19	T07
Tow	25	26	27	28	29	30
Date (Pacific)	2014-07-11	2014-07-12	2014-07-12	2014-07-12	2014-07-12	2014-07-13
Start Time (Pacific)	16:09:00	06:33:00	07:57:00	09:19:00	10:44:00	06:29:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	50° 48' 04" N	50° 48' 22" N	50° 51' 22" N	50° 50' 53" N	50° 48' 43" N	50° 49' 26" N
Start Longitude	127° 34' 19" W	127° 10' 48" W	127° 12' 40" W	127° 19' 08" W	127° 24' 14" W	129° 13' 55" W
End Latitude	50° 47' 24" N	50° 50' 31" N	50° 52' 23" N	50° 49' 23" N	50° 46' 26" N	50° 51' 00" N
End Longitude	127° 31' 34" W	127° 08' 06" W	127° 16' 08" W	127° 22' 34" W	127° 26' 56" W	129° 11' 53" W
Direction of Tow (deg)	111	38	295	235	143	40
Vessel Speed (km/h)	6.9	10.2	8.9	9.6	8.0	7.4
Distance Towed (km)	3.46	5.09	4.48	4.87	5.28	3.74
Net Opening Height (m)	16	13	16	13	14	13
Net Opening Width (m)	34	31	33	30	33	31
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	15	0	15	0	15	0
Start Bottom Depth (m)	357	188	124	128	274	107
End Bottom Depth (m)	349	117	103	160	341	73
Usable	Y	Y	Y	Y	Y	Y

Station Name	T06	T05	T04	T03	T02	T01
Tow	31	32	33	34	35	36
Date (Pacific)	2014-07-13	2014-07-13	2014-07-13	2014-07-13	2014-07-13	2014-07-13
Start Time (Pacific)	08:35:00	09:59:00	11:22:00	12:48:00	14:26:00	15:51:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	50° 56' 46" N	51° 01' 08" N	51° 04' 59" N	51° 08' 56" N	51° 13' 01" N	51° 16' 34" N
Start Longitude	128° 59' 46" W	128° 51' 29" W	128° 42' 32" W	128° 34' 44" W	128° 26' 35" W	128° 20' 38" W
End Latitude	50° 58' 41" N	51° 02' 46" N	51° 06' 43" N	51° 10' 48" N	51° 14' 49" N	51° 18' 07" N
End Longitude	128° 56' 28" W	128° 47' 35" W	128° 38' 56" W	128° 31' 16" W	128° 28' 23" W	128° 23' 24" W
Direction of Tow (deg)	47	57	52	50	328	312
Vessel Speed (km/h)	10.4	10.7	10.6	10.6	7.8	8.5
Distance Towed (km)	5.24	5.44	5.28	5.32	3.94	4.32
Net Opening Height (m)	13	13	13	13	13	13
Net Opening Width (m)	31	31	31	31	31	31
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	0	0	0	0	0	0
Start Bottom Depth (m)	63	59	63	153	186	81
End Bottom Depth (m)	69	57	103	193	108	98
Usable	Y	Y	Y	Y	Y	Y

Station Name	H01	H02	H03	H04	H05	H07
Tow	37	38	39	40	41	42
Date (Pacific)	2014-07-14	2014-07-14	2014-07-14	2014-07-14	2014-07-14	2014-07-14
Start Time (Pacific)	06:36:00	08:42:00	10:38:00	12:45:00	14:37:00	17:42:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	52° 12' 43" N	52° 15' 43" N	52° 19' 52" N	52° 23' 35" N	52° 26' 10" N	52° 31' 30" N
Start Longitude	129° 12' 29" W	129° 29' 46" W	129° 43' 44" W	130° 00' 36" W	130° 14' 28" W	130° 47' 17" W
End Latitude	52° 13' 16" N	52° 16' 19" N	52° 20' 35" N	52° 24' 50" N	52° 26' 42" N	52° 31' 12" N
End Longitude	129° 16' 23" W	129° 33' 47" W	129° 47' 35" W	130° 04' 19" W	130° 18' 43" W	130° 50' 38" W
Direction of Tow (deg)	283	284	287	299	282	262
Vessel Speed (km/h)	9.1	9.3	9.1	9.6	9.8	7.6
Distance Towed (km)	4.54	4.69	4.56	4.82	4.91	3.83
Net Opening Height (m)	13	13	13	13	13	13
Net Opening Width (m)	31	31	31	31	31	31
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	0	0	0	0	0	0
Start Bottom Depth (m)	161	193	208	257	328	120
End Bottom Depth (m)	161	204	207	289	301	135
Usable	Y	Y	Y	Y	Y	Y

Station Name	IBC01	IBC02	IBC03	IBC04	IBC05	IBC06
Tow	43	44	45	46	47	48
Date (Pacific)	2014-07-15	2014-07-15	2014-07-15	2014-07-15	2014-07-15	2014-07-15
Start Time (Pacific)	06:56:00	08:50:00	10:40:00	12:35:00	14:49:00	16:24:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	53° 05' 13" N	53° 10' 08" N	53° 17' 35" N	53° 20' 20" N	53° 23' 46" N	53° 29' 42" N
Start Longitude	129° 12' 07" W	129° 07' 48" W	129° 09' 04" W	129° 17' 17" W	129° 11' 28" W	129° 12' 22" W
End Latitude	53° 05' 10" N	53° 12' 18" N	53° 19' 48" N	53° 20' 46" N	53° 26' 35" N	53° 31' 44" N
End Longitude	129° 08' 53" W	129° 07' 52" W	129° 11' 31" W	129° 13' 34" W	129° 11' 56" W	129° 11' 53" W
Direction of Tow (deg)	92	359	327	79	354	8
Vessel Speed (km/h)	7.2	8.0	9.8	8.3	10.4	7.6
Distance Towed (km)	3.61	4.00	4.93	4.19	5.26	3.82
Net Opening Height (m)	13	15	13	15	13	17
Net Opening Width (m)	31	37	31	34	31	36
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	0	15	0	15	0	30
Start Bottom Depth (m)	229	563	511	341	402	372
End Bottom Depth (m)	546	553	483	507	384	343
Usable	Y	Y	Y	Y	Y	Y

Station Name	IBC07	IBC08	IBC09	IBC10	IBC11	IBC12
Tow	49	50	51	52	53	54
Date (Pacific)	2014-07-15	2014-07-16	2014-07-16	2014-07-16	2014-07-16	2014-07-16
Start Time (Pacific)	17:43:00	06:38:00	08:15:00	10:03:00	11:36:00	13:45:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	30	30
Start Latitude	53° 35' 17" N	53° 39' 11" N	53° 43' 30" N	53° 46' 55" N	53° 49' 34" N	53° 56' 02" N
Start Longitude	129° 13' 08" W	129° 10' 08" W	129° 02' 53" W	128° 54' 22" W	128° 48' 40" W	128° 41' 49" W
End Latitude	53° 37' 12" N	53° 41' 06" N	53° 44' 28" N	53° 48' 40" N	53° 51' 40" N	53° 53' 53" N
End Longitude	129° 12' 36" W	129° 06' 54" W	129° 00' 22" W	128° 51' 04" W	128° 47' 20" W	128° 44' 28" W
Direction of Tow (deg)	9	45	57	48	20	216
Vessel Speed (km/h)	7.2	10.0	6.5	9.6	8.1	9.8
Distance Towed (km)	3.61	5.04	3.28	4.83	4.15	4.93
Net Opening Height (m)	15	13	15	13	16	13
Net Opening Width (m)	32	31	34	31	34	31
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	15	0	15	0	15	0
Start Bottom Depth (m)	255	392	346	385	345	211
End Bottom Depth (m)	313	402	358	341	297	265
Usable	Y	Y	Y	Y	Y	Y

Station Name	IBC13	IBC14	IBC15	IBC16	IBC17	IBC18
Tow	55	56	57	58	59	60
Date (Pacific)	2014-07-16	2014-07-16	2014-07-17	2014-07-17	2014-07-17	2014-07-17
Start Time (Pacific)	16:04:00	17:42:00	06:37:00	08:31:00	10:08:00	11:55:00
Net	CanTrawl 250					
Duration (min)	30	30	30	30	15	30
Start Latitude	53° 44' 56" N	53° 38' 02" N	53° 22' 08" N	53° 29' 10" N	53° 31' 01" N	53° 24' 04" N
Start Longitude	128° 49' 34" W	128° 51' 22" W	129° 09' 36" W	129° 04' 26" W	128° 59' 13" W	128° 54' 32" W
End Latitude	53° 42' 25" N	53° 35' 46" N	53° 24' 11" N	53° 30' 54" N	53° 29' 35" N	53° 21' 40" N
End Longitude	128° 48' 36" W	128° 50' 49" W	129° 07' 34" W	129° 03' 29" W	128° 59' 03" W	128° 54' 40" W
Direction of Tow (deg)	167	172	31	18	176	182
Vessel Speed (km/h)	9.4	8.5	8.7	6.7	5.2	8.9
Distance Towed (km)	4.80	4.26	4.41	3.39	2.67	4.44
Net Opening Height (m)	13	14	13	15	15	15
Net Opening Width (m)	31	33	31	33	33	31
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	0	15	0	15	0	15
Start Bottom Depth (m)	304	177	404	181	80	430
End Bottom Depth (m)	320	153	326	119	98	435
Usable	Y	Y	Y	Y	Y	Y

Station Name	IBC19	RI01	RI02	RI03	RI04	RI05
Tow	61	62	63	64	65	66
Date (Pacific)	2014-07-17	2014-07-18	2014-07-18	2014-07-18	2014-07-18	2014-07-18
Start Time (Pacific)	13:35:00	06:18:00	06:59:00	07:43:00	09:03:00	10:59:00
Net	CanTrawl 250					
Duration (min)	30	15	20	30	30	30
Start Latitude	53° 18' 18" N	51° 30' 00" N	51° 27' 00" N	51° 26' 17" N	51° 30' 50" N	51° 24' 07" N
Start Longitude	128° 55' 52" W	127° 34' 55" W	127° 38' 10" W	127° 43' 48" W	127° 45' 11" W	127° 52' 55" W
End Latitude	53° 18' 40" N	51° 28' 37" N	51° 26' 17" N	51° 27' 47" N	51° 30' 04" N	51° 26' 13" N
End Longitude	129° 00' 14" W	127° 35' 56" W	127° 40' 59" W	127° 47' 38" W	127° 49' 08" W	127° 51' 11" W
Direction of Tow (deg)	278	205	248	302	252	27
Vessel Speed (km/h)	9.6	11.1	10.6	10.4	9.4	8.7
Distance Towed (km)	4.89	2.82	3.52	5.24	4.80	4.39
Net Opening Height (m)	13	13	13	13	13	13
Net Opening Width (m)	29	31	31	31	31	31
Warp Length (m)	150	150	150	150	150	150
Target Headrope Depth (m)	0	0	0	0	0	0
Start Bottom Depth (m)	481	306	259	108	184	119
End Bottom Depth (m)	393	311	114	148	158	117
Usable	Y	Y	Y	Y	Y	Y

Station Name	RI06	IBC20	IBC21
Tow	67	68	69
Date (Pacific)	2014-07-18	2014-07-18	2014-07-18
Start Time (Pacific)	12:27:00	14:08:00	15:57:00
Net	CanTrawl 250	CanTrawl 250	CanTrawl 250
Duration (min)	30	30	30
Start Latitude	51°30' 14" N	51°36' 50" N	51°43' 41" N
Start Longitude	127°48' 18" W	127°53' 02" W	127°58' 30" W
End Latitude	51°32' 53" N	51°39' 07" N	51°46' 26" N
End Longitude	127°49' 55" W	127°53' 20" W	127°58' 41" W
Direction of Tow (deg)	339	355	358
Vessel Speed (km/h)	10.4	8.3	10.2
Distance Towed (km)	5.24	4.24	5.11
Net Opening Height (m)	13	15	13
Net Opening Width (m)	31	31	31
Warp Length (m)	150	150	150
Target Headrope Depth (m)	0	15	0
Start Bottom Depth (m)	180	256	370
End Bottom Depth (m)	174	254	369
Usable	Y	Y	Y

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 July 09 to July 18, 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)
2014-07-09	JS01	50° 26' 35" N	126° 00' 25" W	06:07	199	165	06:25	120	100
2014-07-09	JS02	50° 27' 40" N	126° 05' 20" W	07:36	277	250	07:51	280	150
2014-07-09	JS03	50° 28' 52" N	126° 11' 46" W	09:00	366	250	09:15	322	150
2014-07-09	JS04	50° 29' 53" N	126° 20' 49" W	10:34	366	250	10:47	352	150
2014-07-09	JS05	50° 29' 56" N	126° 25' 26" W	12:00	371	250	12:16	374	150
2014-07-09	JS06	50° 30' 14" N	126° 31' 55" W	13:24	404	250	13:38	407	150
2014-07-09	JS07	50° 30' 47" N	126° 39' 00" W	14:55			15:08	386	150
2014-07-09	JS08	50° 33' 11" N	126° 46' 55" W	16:31			16:47	457	150
2014-07-10	QCST01	50° 36' 36" N	126° 53' 13" W	06:12	98	90	06:20	98	90
2014-07-10	QCST03	50° 40' 48" N	126° 51' 25" W	08:23	185	175	08:32	184	150
2014-07-10	QCST05	50° 45' 29" N	126° 50' 13" W	10:35	168	155	10:45	164	150
2014-07-10	QCST06	50° 46' 30" N	127° 00' 40" W	12:04	162	150	12:15	162	150
2014-07-10	QCST08	50° 40' 34" N	127° 11' 24" W	14:10	74	65	14:17	74	64
2014-07-10	QCST10	50° 45' 18" N	127° 18' 18" W	16:04	279	250	16:16	294	150
2014-07-11	QCST11	50° 55' 44" N	127° 29' 38" W	06:02	160	150	06:12	163	150
2014-07-11	QCST12	50° 57' 40" N	127° 37' 16" W	07:36	136	125	07:44	157	116
2014-07-11	QCSD01	51° 03' 40" N	127° 47' 02" W	09:26	99	90	09:33	98	90
2014-07-11	QCSD02	50° 59' 56" N	127° 51' 50" W	10:49	134	125	10:58	133	120
2014-07-11	QCST13	50° 55' 19" N	127° 39' 29" W	12:39	400	250	12:57	400	150
2014-07-11	QCST14	50° 49' 01" N	127° 37' 37" W	14:24	384	250	14:40	385	150
2014-07-12	QCST16	50° 47' 49" N	127° 11' 20" W	06:01	150	140	06:10	150	140
2014-07-12	QCST17	50° 51' 04" N	127° 11' 28" W	07:30	121	110	07:37	123	110
2014-07-12	QCST18	50° 51' 22" N	127° 18' 07" W	08:51	122	110	08:57	124	110
2014-07-12	QCST19	50° 48' 22" N	127° 23' 38" W	10:10	246	235	10:22	252	150
2014-07-13	T07	50° 49' 08" N	129° 13' 30" W	05:59	100	90	06:08	112	100
2014-07-13	T06	50° 55' 59" N	129° 00' 18" W	08:11	56	50	08:16	58	50
2014-07-13	T05	51° 00' 14" N	128° 52' 05" W	09:37	58	50	09:42	59	50
2014-07-13	T04	51° 04' 26" N	128° 43' 16" W	10:58	60	50	11:03	62	50
2014-07-13	T03	51° 08' 20" N	128° 35' 49" W	12:20	137	130	12:28	140	125
2014-07-13	T02	51° 12' 29" N	128° 27' 43" W	13:49	187	175	13:58	192	150

Date	Station	Latitude	Longitude	CTD			BONGO		
				Start Time (PDT)	Bottom Depth (m)	Gear Depth (m)	Start Time (PDT)	Bottom Depth (m)	Gear Depth (m)
2014-07-13	T01	51° 16' 34" N	128° 19' 55" W	15:28	75	65	15:34	77	65
2014-07-14	H01	52° 12' 22" N	129° 11' 35" W	06:05	160	150	06:14	162	150
2014-07-14	H02	52° 15' 54" N	129° 28' 12" W	08:11	185	175	08:20	189	150
2014-07-14	H03	52° 19' 26" N	129° 42' 47" W	10:04	205	195	10:15	209	150
2014-07-14	H04	52° 22' 44" N	129° 59' 31" W	12:12	232	220	12:22	238	150
2014-07-14	H05	52° 25' 41" N	130° 13' 01" W	14:02	320	250	14:14	325	150
2014-07-13	H07	52° 30' 43" N	130° 50' 46" W	18:35	128	120	18:43	131	120
2014-07-15	IBC01	53° 05' 06" N	129° 12' 40" W	06:03	321	250	06:16	321	150
2014-07-15	IBC02	53° 09' 54" N	129° 07' 30" W	08:15	563	250	08:27	555	150
2014-07-15	IBC03	53° 16' 55" N	129° 08' 53" W	10:03	517	250	10:17	516	150
2014-07-15	IBC04	53° 20' 28" N	129° 18' 14" W	12:01	516	250	12:13	528	150
2014-07-15	IBC05	53° 23' 13" N	129° 11' 06" W	13:55	373	250	14:10	376	150
2014-07-15	IBC06	53° 29' 20" N	129° 12' 29" W	15:51	373	250	16:03	374	150
2014-07-15	IBC07	53° 37' 30" N	129° 12' 36" W	18:30	379	250	18:42	300	150
2014-07-16	IBC08	53° 38' 49" N	129° 10' 30" W	06:01	374	250	06:15	387	150
2014-07-16	IBC09	53° 43' 05" N	129° 03' 18" W	07:39	355	250	07:52	375	150
2014-07-16	IBC10	53° 46' 41" N	128° 55' 01" W	09:27	374	250	09:40	370	150
2014-07-16	IBC11	53° 49' 01" N	128° 48' 40" W	10:59	344	250	11:13	346	150
2014-07-16	IBC12	53° 56' 49" N	128° 41' 06" W	13:10	191	180	13:21	196	150
2014-07-16	IBC13	53° 46' 01" N	128° 49' 23" W	15:21	264	250	15:39	295	150
2014-07-16	IBC14	53° 35' 13" N	128° 50' 56" W	18:32	123	115	18:40	147	135
2014-07-17	IBC15	53° 22' 01" N	129° 09' 54" W	06:02	401	250	06:15	410	150
2014-07-17	IBC16	53° 28' 59" N	129° 04' 34" W	07:57	175	165	08:07	180	150
2014-07-17	IBC17	53° 31' 41" N	128° 59' 28" W	09:42	70	60	09:48	70	60
2014-07-17	IBC18	53° 24' 29" N	128° 54' 14" W	11:29	400	250	11:13	400	150
2014-07-17	IBC19	53° 18' 40" N	128° 54' 22" W	13:00	320	250	13:13	246	150
2014-07-18	RI05	51° 23' 42" N	127° 53' 10" W	10:31	118	110	10:40	117	105
2014-07-18	IBC20	51° 36' 14" N	127° 52' 37" W	13:36	198	190	13:46	218	150
2014-07-18	IBC21	51° 43' 01" N	127° 58' 26" W	15:23	347	250	15:35	345	150
2014-07-14	H06	52° 28' 37" N	130° 28' 48" W	16:02	171	160	16:13	175	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 July 09 to July 18, 2014 on the CCGS *W.E. Ricker*.

Tow	1	2	3	4	5	6	7
Station ID	JS01	JS02	JS03	JS04	JS05	JS06	JS07
Chinook Salmon (Adults)							2
Chinook Salmon (Juveniles)	2	6	1	1			4
Chum Salmon (Adults)							
Chum Salmon (Juveniles)		80	283	586	297	34	97
Coho Salmon (Adults)							
Coho Salmon (Juveniles)	5	3	26	27	11	1	6
Pink Salmon (Adults)		5	1	1			13
Pink Salmon (Juveniles)	5	93	555	305	527	57	97
Sockeye Salmon (Adults)							1
Sockeye Salmon (Juveniles)	1	3	1			2	1
Black Rockfish							
Comb Jellyfish							
Crested Sculpin							
Curlfin Sole							
Flatfishes							
Fried Egg Jellyfish							
Lampreys							
Lions Mane		1					
Moon Jellyfish							
Mosshead Sculpin							
North Pacific Spiny Dogfish							
Opalescent Inshore Squid							
Pacific Herring			1	2	2		
Pacific Sand Lance							
Pacific Sandfish							
Pacific Sea Nettle							
Pacific Spiny Lumpsucker							
Prowfish							
Rockfishes							
Salps							
Soft Sculpin	1						
Starry Flounder	1						
Threespine Stickleback							
Walleye Pollock							
Water Jellyfish	0	0	0	0	0	0	0
Wolf Eel							
TOTAL	15	191	868	922	837	94	221

Tow	8	9	10	11	12	13	14
Station ID	JS08	QCST01	QCST02	QCST03	QCST04	QCST05	QCST06
Chinook Salmon (Adults)				1			
Chinook Salmon (Juveniles)		2	2	1	1		
Chum Salmon (Adults)				5			
Chum Salmon (Juveniles)	2	124	227	17	23	8	15
Coho Salmon (Adults)			3	1			
Coho Salmon (Juveniles)	24	3	8	5	10	2	4
Pink Salmon (Adults)			2	24	4		
Pink Salmon (Juveniles)	1	191	1295	69	60	48	20
Sockeye Salmon (Adults)				6			
Sockeye Salmon (Juveniles)		2	2				
Black Rockfish							
Comb Jellyfish							
Crested Sculpin							
Curlfin Sole							
Flatfishes							
Fried Egg Jellyfish							
Lampreys							
Lions Mane				1		1	
Moon Jellyfish		1					
Mosshead Sculpin							
North Pacific Spiny Dogfish							
Opalescent Inshore Squid							
Pacific Herring			6	1		1	
Pacific Sand Lance					1		
Pacific Sandfish							
Pacific Sea Nettle						0	
Pacific Spiny Lumpsucker							
Prowfish							
Rockfishes							
Salps							
Soft Sculpin							
Starry Flounder							
Threespine Stickleback							
Walleye Pollock			1	1			
Water Jellyfish	0	0	0	0	0	0	0
Wolf Eel							
TOTAL	27	323	1546	132	99	60	39

Tow	15	16	17	18	19	20	21
Station ID	QCST07	QCST08	QCST09	QCST10	QCST11	QCST12	QCSD01
Chinook Salmon (Adults)							
Chinook Salmon (Juveniles)							
Chum Salmon (Adults)							
Chum Salmon (Juveniles)		9	6	7	2	22	1
Coho Salmon (Adults)			1				
Coho Salmon (Juveniles)	2		9		5	1	1
Pink Salmon (Adults)	21	20	19	4		7	
Pink Salmon (Juveniles)	17	32	16	27	5	87	
Sockeye Salmon (Adults)							
Sockeye Salmon (Juveniles)	4		3				
Black Rockfish							
Comb Jellyfish							2
Crested Sculpin							
Curlfin Sole							
Flatfishes							
Fried Egg Jellyfish							2
Lampreys							
Lions Mane		3	3		2	3	15
Moon Jellyfish						1	
Mosshead Sculpin							
North Pacific Spiny Dogfish							
Opalescent Inshore Squid							
Pacific Herring							
Pacific Sand Lance							
Pacific Sandfish							
Pacific Sea Nettle							
Pacific Spiny Lumpsucker							
Prowfish							
Rockfishes							
Salps							
Soft Sculpin							
Starry Flounder							
Threespine Stickleback							
Walleye Pollock						1	
Water Jellyfish	0	0	0		0	0	0
Wolf Eel		1					
TOTAL	44	65	57	38	14	122	21

Tow	22	23	24	25	26	27	28
Station ID	QCSD02	QCST13	QCST14	QCST15	QCST16	QCST17	QCST18
Chinook Salmon (Adults)				9			
Chinook Salmon (Juveniles)				3		7	
Chum Salmon (Adults)			56	1			
Chum Salmon (Juveniles)	1	2	130		60	87	149
Coho Salmon (Adults)			1	1			
Coho Salmon (Juveniles)	43		11	3	2	1	4
Pink Salmon (Adults)		2		93		4	
Pink Salmon (Juveniles)	13	54	1465		269	283	222
Sockeye Salmon (Adults)							
Sockeye Salmon (Juveniles)			2				2
Black Rockfish							
Comb Jellyfish	1						
Crested Sculpin							
Curlfin Sole							
Flatfishes							
Fried Egg Jellyfish	1						
Lampreys							
Lions Mane	6	15	8	1		1	1
Moon Jellyfish							
Mosshead Sculpin							
North Pacific Spiny Dogfish		1					
Opalescent Inshore Squid			6				
Pacific Herring		1	3	102			
Pacific Sand Lance							
Pacific Sandfish							
Pacific Sea Nettle							
Pacific Spiny Lumpsucker							
Prowfish							
Rockfishes							
Salps							
Soft Sculpin							
Starry Flounder							
Threespine Stickleback							
Walleye Pollock							
Water Jellyfish	0	0	0		0	0	0
Wolf Eel							
TOTAL	65	75	1682	213	331	383	378

Tow	29	30	31	32	33	34	35
Station ID	QCST19	T07	T06	T05	T04	T03	T02
Chinook Salmon (Adults)							
Chinook Salmon (Juveniles)							
Chum Salmon (Adults)	1				1		
Chum Salmon (Juveniles)	2	6	2	41	45	2	
Coho Salmon (Adults)	2						
Coho Salmon (Juveniles)							2
Pink Salmon (Adults)	2	2	4		13		1
Pink Salmon (Juveniles)	2	68	10	130	120	24	1
Sockeye Salmon (Adults)							
Sockeye Salmon (Juveniles)					2		
Black Rockfish			1				
Comb Jellyfish							2
Crested Sculpin							
Curlfin Sole							
Flatfishes			1		1		
Fried Egg Jellyfish							
Lampreys							
Lions Mane		10	9	6	24	30	25
Moon Jellyfish		1	1	1	26	2	3
Mosshead Sculpin							
North Pacific Spiny Dogfish							
Opalescent Inshore Squid				1			
Pacific Herring				2	4		
Pacific Sand Lance						1	
Pacific Sandfish			2	2	1	1	
Pacific Sea Nettle							
Pacific Spiny Lumpsucker							
Prowfish		1				2	1
Rockfishes		9	3	24	2	1	
Salps							
Soft Sculpin							1
Starry Flounder							
Threespine Stickleback							
Walleye Pollock		1	67	3	8	4	
Water Jellyfish	0	0	0	0	0	0	0
Wolf Eel			1				
TOTAL	9	98	101	210	247	67	36

Tow	36	37	38	39	40	41	42
Station ID	T01	H01	H02	H03	H04	H05	H07
Chinook Salmon (Adults)	1						
Chinook Salmon (Juveniles)							
Chum Salmon (Adults)				1			
Chum Salmon (Juveniles)		117	118	928		2	348
Coho Salmon (Adults)	2						
Coho Salmon (Juveniles)	6						
Pink Salmon (Adults)	2						1
Pink Salmon (Juveniles)		224	150	600		16	1
Sockeye Salmon (Adults)							
Sockeye Salmon (Juveniles)		3	12	19			185
Black Rockfish							
Comb Jellyfish		4	8	11	5	7	4
Crested Sculpin							
Curlfin Sole							
Flatfishes	1						
Fried Egg Jellyfish							
Lampreys							
Lions Mane	10	6	5	20	26	18	26
Moon Jellyfish	1		3				
Mosshead Sculpin						1	
North Pacific Spiny Dogfish							
Opalescent Inshore Squid	38						
Pacific Herring		1					10
Pacific Sand Lance		137	115		2		
Pacific Sandfish							
Pacific Sea Nettle							
Pacific Spiny Lumpsucker							
Prowfish	1	1	1	4			2
Rockfishes		11		22	8	13	
Salps		24	0				
Soft Sculpin	1						
Starry Flounder							
Threespine Stickleback							
Walleye Pollock				2			8
Water Jellyfish	0	0	0	0	0	0	0
Wolf Eel							
TOTAL	63	528	412	1607	41	57	585

Tow	43	44	45	46	47	48	49
Station ID	IBC01	IBC02	IBC03	IBC04	IBC05	IBC06	IBC07
Chinook Salmon (Adults)			6	2	5	1	
Chinook Salmon (Juveniles)			7		4		5
Chum Salmon (Adults)	2		2				
Chum Salmon (Juveniles)							
Coho Salmon (Adults)					1		
Coho Salmon (Juveniles)	24	1	7		1		
Pink Salmon (Adults)	6	3	21	35	13		22
Pink Salmon (Juveniles)							
Sockeye Salmon (Adults)			2	3			1
Sockeye Salmon (Juveniles)	2		12		4		
Black Rockfish							
Comb Jellyfish							
Crested Sculpin							
Curlfin Sole							
Flatfishes							
Fried Egg Jellyfish							
Lampreys							
Lions Mane	6	1	12	3	6		
Moon Jellyfish							2
Mosshead Sculpin							
North Pacific Spiny Dogfish							
Opalescent Inshore Squid							
Pacific Herring							
Pacific Sand Lance	1						
Pacific Sandfish							
Pacific Sea Nettle							
Pacific Spiny Lumpsucker							
Prowfish							
Rockfishes							
Salps							
Soft Sculpin							
Starry Flounder							
Threespine Stickleback							
Walleye Pollock							
Water Jellyfish	0		0				
Wolf Eel							
TOTAL	41	5	69	43	34	1	30

Tow	50	51	52	53	54	55	56
Station ID	IBC08	IBC09	IBC10	IBC11	IBC12	IBC13	IBC14
Chinook Salmon (Adults)	4		3	1		2	
Chinook Salmon (Juveniles)	23	5	7	1		3	12
Chum Salmon (Adults)	6			1	8	1	
Chum Salmon (Juveniles)							
Coho Salmon (Adults)	2		4		1	4	
Coho Salmon (Juveniles)	11		2				
Pink Salmon (Adults)	34	6			78		
Pink Salmon (Juveniles)							
Sockeye Salmon (Adults)							
Sockeye Salmon (Juveniles)	9		9	1		56	
Black Rockfish							
Comb Jellyfish							
Crested Sculpin						1	
Curlfin Sole							
Flatfishes							
Fried Egg Jellyfish							
Lampreys						1	
Lions Mane	4	23	30	15	3	14	1
Moon Jellyfish		2	1	2	1		
Mosshead Sculpin							
North Pacific Spiny Dogfish							5
Opalescent Inshore Squid							
Pacific Herring			2		2	79	12
Pacific Sand Lance			1				
Pacific Sandfish							
Pacific Sea Nettle							
Pacific Spiny Lumpsucker			1			1	
Prowfish							
Rockfishes							
Salps							
Soft Sculpin							
Starry Flounder							
Threespine Stickleback		8	17	5	4	2	
Walleye Pollock			1			1	
Water Jellyfish				0			
Wolf Eel							
TOTAL	93	44	78	26	97	165	30

Tow	57	58	59	60	61	62	63
Station ID	IBC15	IBC16	IBC17	IBC18	IBC19	RI01	RI02
Chinook Salmon (Adults)	4	6		1	7		
Chinook Salmon (Juveniles)	2				13		
Chum Salmon (Adults)	1				4		
Chum Salmon (Juveniles)							
Coho Salmon (Adults)	4		1		2		
Coho Salmon (Juveniles)	1	2		2	39		
Pink Salmon (Adults)	20	3	6	3	68		
Pink Salmon (Juveniles)					1		
Sockeye Salmon (Adults)	2				1		
Sockeye Salmon (Juveniles)		1			19		
Black Rockfish							
Comb Jellyfish							
Crested Sculpin							
Curlfin Sole							
Flatfishes							
Fried Egg Jellyfish							
Lampreys							
Lions Mane				2	16	1	2
Moon Jellyfish				1	1	1	
Mosshead Sculpin							
North Pacific Spiny Dogfish							
Opalescent Inshore Squid							
Pacific Herring							
Pacific Sand Lance						75	
Pacific Sandfish							
Pacific Sea Nettle							
Pacific Spiny Lumpsucker			1				
Prowfish							
Rockfishes							
Salps							
Soft Sculpin							
Starry Flounder							
Threespine Stickleback							
Walleye Pollock						12	
Water Jellyfish							0
Wolf Eel							
TOTAL	34	12	8	9	171	89	2

Tow	64	65	66	67	68	69
Station ID	RI03	RI04	RI05	RI06	IBC20	IBC21
Chinook Salmon (Adults)		1		1		
Chinook Salmon (Juveniles)	17	17	3	15	3	1
Chum Salmon (Adults)						2
Chum Salmon (Juveniles)						
Coho Salmon (Adults)		1	1	1		
Coho Salmon (Juveniles)	2		1	4		
Pink Salmon (Adults)			1		3	28
Pink Salmon (Juveniles)						
Sockeye Salmon (Adults)						6
Sockeye Salmon (Juveniles)				3		
Black Rockfish						
Comb Jellyfish						
Crested Sculpin						
Curlfin Sole	1					
Flatfishes						
Fried Egg Jellyfish						
Lampreys						
Lions Mane	4	16	7	15	3	15
Moon Jellyfish	3	50		14	6	23
Mosshead Sculpin						
North Pacific Spiny Dogfish			1			
Opalescent Inshore Squid		27		52	5	33
Pacific Herring	20	470	7	84	3	
Pacific Sand Lance						
Pacific Sandfish						
Pacific Sea Nettle						
Pacific Spiny Lumpsucker						
Prowfish			1			
Rockfishes	1			1		
Salps						
Soft Sculpin	1	7	1	3	6	3
Starry Flounder				1		
Threespine Stickleback						
Walleye Pollock	1	5		2		1
Water Jellyfish	0	0	0	0	0	0
Wolf Eel						
TOTAL	50	594	23	196	29	112