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CRUISE DETAILS AND BIOLOGICAL INFORMATION FROM THE
PACIFIC OCEAN PERCH LARVAL SURVEY,

R/V *W. E. RICKER*, JULY 14-18, 1996

by

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ABSTRACT

Cornthwaite, A. M., B. M. Leaman, and R. D. Stanley. 1999. Cruise details and biological information from the Pacific ocean perch larval survey, R/V *W.E. RICKER*, July 14-18, 1996. Can. Data Rep. Fish. Aquat. Sci. 1048: 22 pp.

Preliminary results of the 1996 research cruise to investigate the geographic and bathymetric distribution of larvae of Pacific ocean perch (*Sebastes alutus*) are presented. The survey was the fourth in a series of surveys to investigate the areas of origin and dispersal of *S. alutus* larvae in Queen Charlotte Sound. The study area consisted of stations at specific and variable depths along five transect lines on and around Goose Island Bank, and replicated the stations established for the initial survey in 1991. Thirty-four Tucker trawl tows to collect plankton samples and 19 CTD probe casts were completed in the study area.

Larvae provisionally identified as *S. alutus* were extracted from the plankton samples and preserved in alcohol for subsequent verification, genetic analysis and age determination, while the remainder of the plankton samples were preserved in formaldehyde for subsequent identification and enumeration. Observations of the plankton samples while at sea suggested that Pacific ocean perch larvae were scarce but still detectable within the survey grid.

RÉSUMÉ

Cornthwaite, A. M., B. M. Leaman, and R. D. Stanley. 1999. Cruise details and biological information from the Pacific ocean perch larval survey, R/V *W.E. RICKER*, July 14-18, 1996. Can. Data Rep. Fish. Aquat. Sci. 1048: 22 pp.

Les auteurs présentent les résultats préliminaires de la campagne de recherche de 1996 portant sur l'étude de la répartition géographique et bathymétrique des larves de sébaste à longue mâchoire (*Sebastodes alutus*). Il s'agissait du quatrième relevé d'une série destiné à étudier les aires d'origine et de dispersion des larves de *S. alutus* dans le détroit de la Reine-Charlotte. La zone d'étude comportait des stations situées à des profondeurs déterminées et variables le long de cinq lignes de transect sur le banc de l'île Goose et au voisinage, et correspondait aux stations établies pour le premier relevé effectué en 1991. On a effectué trente-quatre traits de chalut Tucker pour recueillir des échantillons de plancton et mouillé dix-neuf sondes CTD dans la zone d'étude.

Les larves identifiées provisoirement comme celles de *S. alutus* ont été extraites des échantillons de plancton et conservées dans l'alcool aux fins de vérification subséquente, d'analyse génétique et de détermination de l'âge, tandis que le reste des échantillons de plancton ont été placés dans le formaldéhyde en vue de leur identification et dénombrement ultérieurs. D'après les observations des échantillons de plancton en mer, il semble que les larves de sébaste à longue mâchoire étaient rares mais qu'on pouvait encore en déceler dans le quadrillage utilisé pour le relevé.

INTRODUCTION

In 1991, the Stock Assessment and Recruitment Biology program at the Pacific Biological Station initiated a 5-year study of the larval and juvenile stages of Pacific ocean perch (*Sebastodes alutus*) stocks in Queen Charlotte Sound, British Columbia. The purpose of the study was to determine the areas of origin and patterns of dispersal of the larvae of Pacific ocean perch, and to describe the oceanography of these areas, in order to develop a quantitative model of the factors influencing recruitment and cohort success of the adult stocks in Queen Charlotte Sound.

The first survey of the study took place in March 1991 and coincided with the expected beginning of parturition (larval release) in Queen Charlotte Sound (Gillespie et al. 1992). Plankton samples were taken from a systematic grid of stations in the survey area in order to closely determine the location of parturition, and to track changes in the density and geographic and bathymetric distribution of the larvae throughout the month of March. Subsequent surveys took place in April 1992 and June 1993, and continued to track the gradual dispersal of the larvae throughout the survey grid, as they moved from the deepwater spawning grounds into shallower waters (Cornthwaite et al. 1996).

This report describes the fourth survey of Pacific ocean perch larvae in Queen Charlotte Sound which took place in July 1996. The purpose of this survey was to locate any Pacific ocean perch larvae which remained within the study area in order to track their continued dispersal towards their juvenile habitat.

METHODS

VESSEL AND NETS

The survey took place aboard the R/V *W.E. RICKER*, a 57.3 m stern trawler. Plankton samples were collected using a three-opening 1 m² Tucker trawl as in the previous surveys (Gillespie et al. 1992, Cornthwaite et al. 1996).

STATION LOCATIONS AND SAMPLING PROCEDURES

The sampling grid consisted of twenty stations along five transect lines, A-E, on and around the Goose Island Bank in Queen Charlotte Sound (Table 1, Fig. 1). These stations replicated the station locations determined for the initial survey in 1991 (Gillespie et al. 1992). Sampling procedures for Tucker trawls were similar to those in the previous surveys. At each station, the Tucker trawl was deployed obliquely to depth, towed horizontally at depth for 15 minutes, and then retrieved obliquely to the surface. As it was unnecessary to collect two oblique samples for each tow, we removed the codend from the bottom net of the Tucker trawl assembly, and collected samples from the top and middle nets only. The top net was open during deployment. When the target depth was reached, a messenger was sent to close the top net and open the middle net. After 15 minutes a second messenger was sent to close the middle net and the net was retrieved. Most stations were sampled twice with target depths 50 m below the

surface and 50 m above the bottom. For those stations where bottom depth was about 100 m, only one Tucker trawl was performed with a target depth 50 m below the surface. Deployment and retrieval of the Tucker trawl were at target cable speeds of 1m/sec, and target towing speed was 1.5 kt during the entire tow. CTD data were collected at each station prior to the start of sampling.

Plankton samples from the middle net of the Tucker trawl were examined briefly while at sea to determine the presence of any *Sebastes* larvae. Possible candidates were removed and preserved in 95% ethanol for future verification, growth ring counts, and DNA analyses. The remainder of the plankton samples from the middle and top nets were preserved in 3.75% buffered formaldehyde for future analyses in the laboratory, including detailed identification and enumeration of any fish larvae.

RESULTS

CATCH

Thirty-four successful Tucker trawl tows were completed during the survey (Appendix Table 1). We sampled 19 of the 20 specified stations. Station A200 was omitted from the survey, as we were forced to suspend sampling for 24 hours on the second day of the survey, and we did not have sufficient remaining time to visit all of the stations. Towing speed ranged from 1.5 to 2.0 kt, with an average towing speed of 1.6 kt. This is a smaller range than in the previous surveys, and is within the range of towing speeds which we consider unlikely to influence larval catch rates (Cornthwaite et al. 1996).

Preliminary examination of the plankton samples while at sea indicated that large *Sebastes* larvae which could potentially be Pacific ocean perch were scarce (Table 2). We observed small post-extrusion larvae, possibly from summer spawners such as *S. brevispinis* and *S. variegatus*, throughout the survey grid, while large larvae tentatively identified as *S. alutus* were present at very few stations.

OCEANOGRAPHIC DATA

We made one CTD (conductivity/temperature/depth) probe cast at each station that we visited. The data logger recorded all parameters three times per second, but we have summarized the raw data by 10 m intervals (Appendix Table 2). Temperatures in the shallower depths (0-50 m) ranged from approximately 9-14 °C (Fig. 2) and were warmer than in the previous surveys, where increases between spring and early summer temperatures had already been noted (Cornthwaite et al. 1996).

ACKNOWLEDGEMENTS

We thank Captain Suraj Gulati and the officers and crew of the R/V *W.E. RICKER* for their assistance and cooperation. We especially appreciate the efforts made to allow us to complete our sampling within the short period of time allotted for this survey. In addition, we thank Mike Smith for lending us his knowledge and experience, and assisting us in the completion of our cruise objectives.

LITERATURE CITED

- Cornthwaite, A.M., W. Carolsfeld, G.E. Gillespie, B.M. Leaman, and R.D. Stanley. 1996. Cruise details and biological information from the Pacific ocean perch larval surveys aboard the R/V *W.E. RICKER*, April 16-30, 1992, and June 9-18, 1993. Can. Data Rep. Fish. Aquat. Sci. 984: 97 p.
- Gillespie, G.E., R.D. Stanley, and B.M. Leaman. 1992. Cruise details and biological information from the Pacific ocean perch larval survey aboard the R/V *W.E. RICKER*, March 11-29, 1991. Can. Data Rep. Fish. Aquat. Sci. 873: 53 p.

Table 1. Approximate location of stations occupied by the *R/V W.E. RICKER* during the Pacific ocean perch larval survey, July 14-19, 1996.

Station No.	Tow No.	Approximate location
A300	15,16	51°50' N x 129°42' W
A400	17,18	51°39' N x 130°09' W
A2000	1, 2	51°27' N x 130°40' W
B100	14	51°43' N x 129°29' W
B200	23,24	51°34' N x 129°51' W
B300	21,22	51°31' N x 129°59' W
B400	19,20	51°28' N x 130°04' W
C100	13	51°30' N x 129°28' W
C200	25,26	51°25' N x 129°42' W
C300	28,29	51°17' N x 130°00' W
C2000	3,4	51°07' N x 130°26' W
D100	8	51°30' N x 128°44' W
D200	9,10	51°25' N x 128°54' W
D300	11,12	51°18' N x 129°12' W
D400	30,31	51°08' N x 129°45' W
E100	36	51°09' N x 128°49' W
E200	34,35	51°01' N x 129°20' W
E300	32,33	50°56' N x 129°42' W
E2000	5,6,7	50°50' N x 129°54' W

Table 2. Preliminary observations of plankton samples collected during the Pacific ocean perch larval survey aboard the R/V *W.E. RICKER*, July 14-18, 1996.

Tow	Station	BMLP	Net	Observations made while at sea
001	A2000	924	Middle	1 flatfish larva, 1 <i>Sebastes</i> larva
001	A2000	925	Top	not examined
002	A2000	926	Middle	no larvae observed
002	A2000	927	Top	not examined
003	C2000	928	Middle	unknown <i>Sebastes</i> larvae
003	C2000	929	Top	not examined
004	C2000	930	Middle	no larvae observed
004	C2000	931	Top	dragon fish, snipe eel
005	E2000	932	Middle	post-extrusion <i>Sebastes</i> larvae
005	E2000	933	Top	post-extrusion <i>Sebastes</i> larvae
006	E2000	934	Middle	1 post-extrusion <i>Sebastes</i> larva, 1 large larva
006	E2000	935	Top	no sample
007	E2000	936	Middle	large <i>Sebastes</i> larvae, 1 post-extrusion <i>Sebastes</i> larva
007	E2000	937	Top	not examined
008	D100	938	Middle	no larvae observed, lots of jellyfish
008	D100	939	Top	no larvae observed, lots of jellyfish
009	D200	940	Middle	1 king-of-the-salmon larva
009	D200	941	Top	no larvae observed
010	D200	942	Middle	no larvae observed, net probably contacted bottom
010	D200	943	Top	not examined
011	D300	944	Middle	1 king-of-the-salmon larva, 3 large <i>Sebastes</i> larvae: <i>S. alutus</i> ?
011	D300	945	Top	not examined
012	D300	946	Middle	no larvae observed
012	D300	947	Top	not examined
013	C100	948	Middle	no larvae observed
013	C100	949	Top	not examined
014	B100	950	Middle	no larvae observed
014	B100	951	Top	not examined
015	A300	952	Middle	1 unknown species
015	A300	953	Top	not examined
016	A300	954	Middle	1 post-extrusion <i>Sebastes</i> larva
016	A300	955	Top	not examined
017	A400	956	Middle	no larvae observed
017	A400	957	Top	not examined
018	A400	958	Middle	<i>Sebastes</i> /sculpin larvae

Table 2 - cont'd

Tow	Station	BMLP	Net	Observations made while at sea
018	A400	959	Top	not examined
019	B400	960	Middle	no larvae observed
019	B400	961	Top	not examined
020	B400	962	Middle	post-extrusion <i>Sebastes</i> larvae
020	B400	963	Top	not examined
021	B300	964	Middle	post-extrusion <i>Sebastes</i> larvae
021	B300	965	Top	not examined
022	B300	966	Middle	no larvae observed
022	B300	967	Top	not examined
023	B200	968	Middle	no larvae observed
023	B200	969	Top	not examined
024	B200	970	Middle	no larvae observed
024	B200	971	Top	not examined
025	C200	972	Middle	post-extrusion <i>Sebastes</i> larvae and 9mm <i>Sebastes</i>
025	C200	973	Top	not examined
026	C200	974	Middle	post-extrusion <i>Sebastes</i> larvae
026	C200	975	Top	not examined
027	C300	---	Middle	no sample
027	C300	---	Top	no sample
028	C300	976	Middle	12-14 mm <i>Sebastes</i> - <i>S. alutus</i> ?
028	C300	977	Top	not examined
029	C300	978	Middle	no larvae observed
029	C300	979	Top	not examined
030	D400	980	Middle	post-extrusion <i>Sebastes</i> larvae
030	D400	981	Top	not examined
031	D400	982	Middle	1 non-scorpaenid larva
031	D400	983	Top	not examined
032	E300	984	Middle	no larvae observed
032	E300	985	Top	not examined
033	E300	986	Middle	post-extrusion <i>Sebastes</i> larvae
033	E300	987	Top	not examined
034	E200	988	Middle	no larvae observed
034	E200	989	Top	not examined
035	E200	990	Middle	post-extrusion <i>Sebastes</i> larvae
035	E200	991	Top	not examined
036	E100	992	Middle	no larvae observed
036	E100	993	Top	not examined

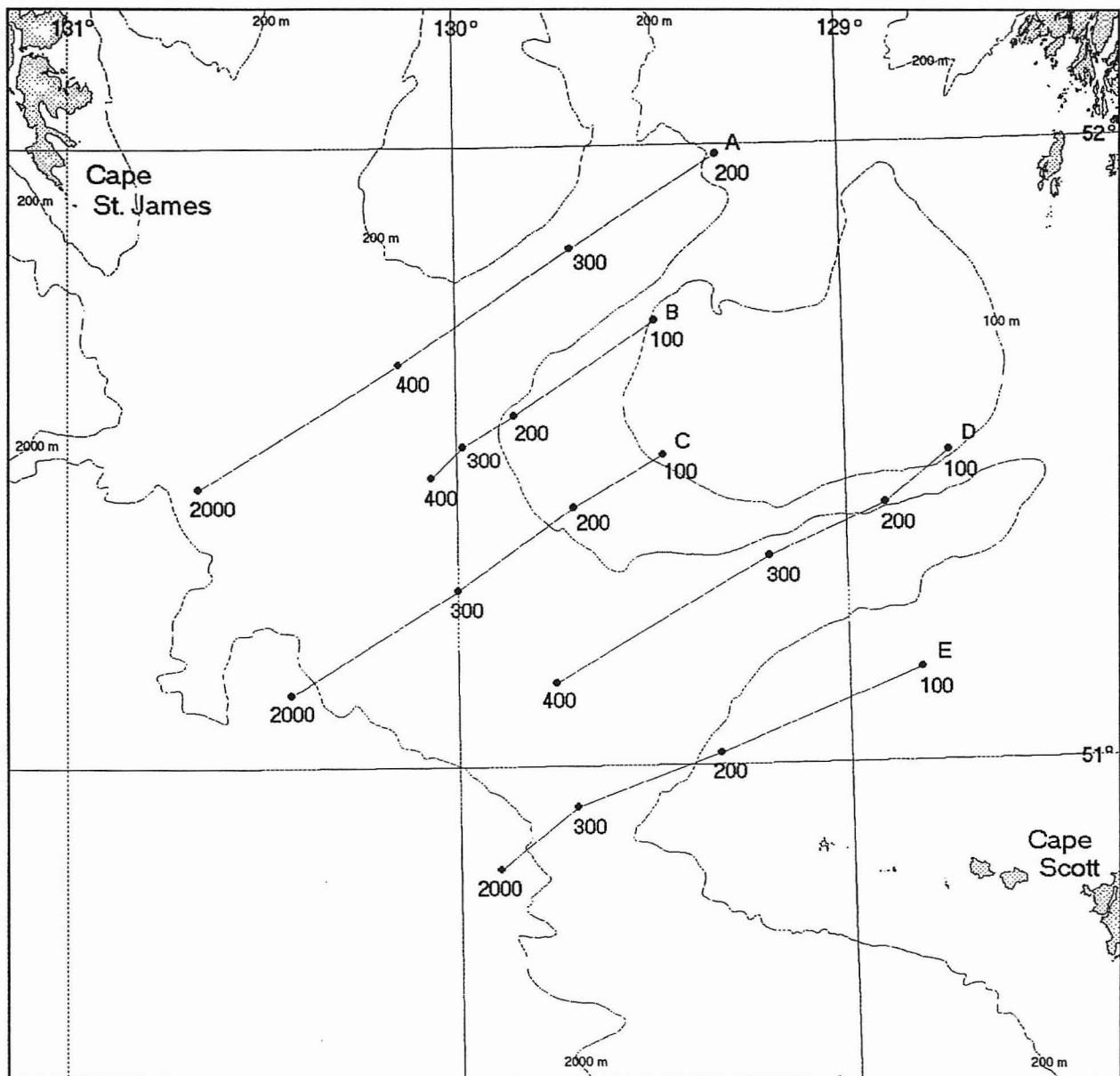


Fig. 1. Station locations for the Pacific ocean perch larval survey, R/V *W.E. RICKER*, July 14-18, 1996.

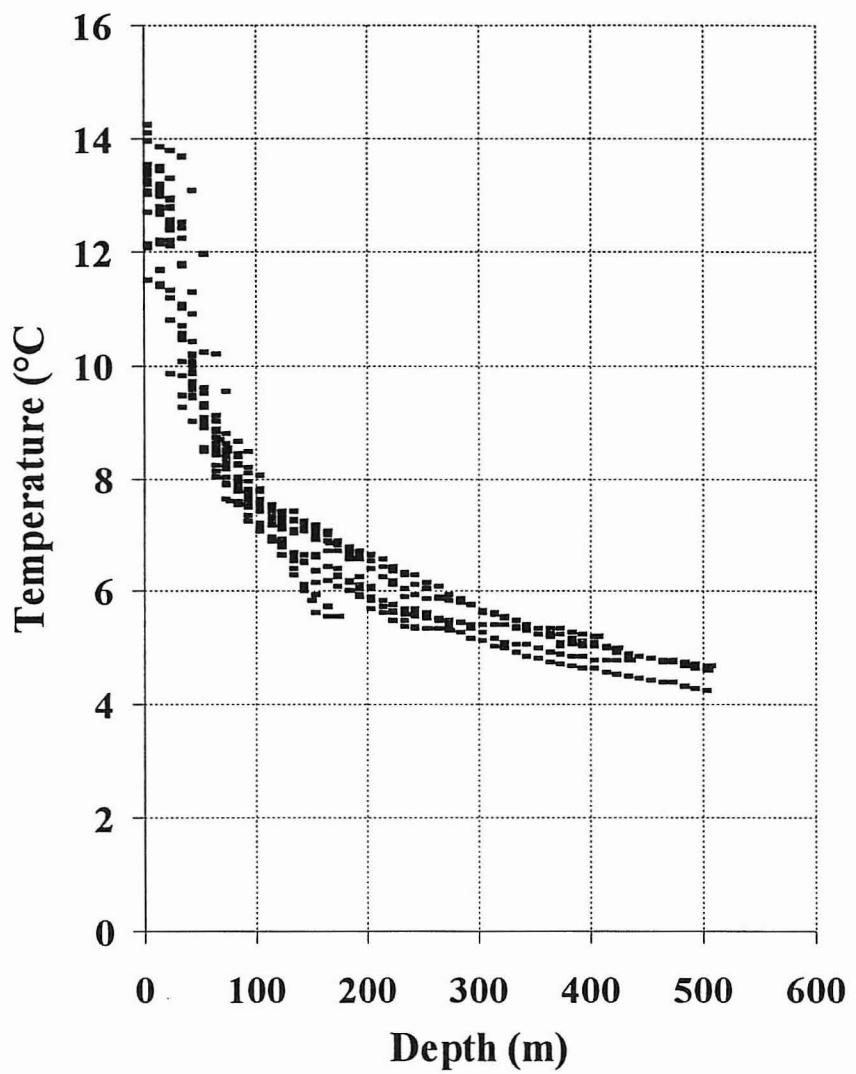


Fig. 2. Temperature summary by depth from raw CTD data, Pacific ocean perch larval survey, R/V *W.E. RICKER*, July 14-18, 1996.

Appendix Table 1. Bridge log information for Tucker trawl tows, R/V *W.E. RICKER*, Pacific ocean perch larval survey, July 14-18, 1996.

Plankton Tow Number	1	2	3	4
Date	July 14	July 14	July 14	July 14
Station Number	A2000	A2000	C2000	C2000
Start Time (PST)	0950	1027	1445	1540
Duration (min)	23	76	37	72
Start Position				
N. Lat.	51°26.8'	51°27.4'	51°07.1'	51°08.2'
W. Long.	130°40.6'	130°41.5'	130°25.8'	130°25.6'
Finish Position				
N. Lat.	51°27.2'	51°28.0'	51°07.7'	51°09.9'
W. Long.	130°41.1'	130°43.0'	130°25.6'	130°25.3'
Tow Distance (naut. mi.)	0.6	---	0.6	1.7
Direction (° True)	330	330	340	330
Vessel Speed (kt)	1.5	1.5	1.5	1.5
Bottom Depth (m)	1830	1770-1710	>2000	>2000
Modal Depth (m)	1830	1740	>2000	>2000
Target Depth (m)	50	500	50	500
Net Events				
Middle Net				
Time open	0957	1102	1500	1606
Depth (m)	53	501	53	500
Top Net				
Time open	1010	1115	1517	1625
Depth (m)	48	522	53	500
Flowmeter Readings				
Start				
Middle Net	452729	475652	989728	998193
Top Net	437917	456109	515776	537697
Finish				
Middle Net	475652	492882	998193	022415
Top Net	456109	515781	537697	590959
BMLP #'s				
Middle	924	926	928	930
Top	925	927	929	931
Remarks	Usable	Usable	Usable	Usable

Appendix Table 1 – cont'd

Plankton Tow Number	5	6	7	8
Date	July 14	July 14	July 14	July 15
Station Number	E2000	E2000	E2000	D100
Start Time (PST)	2056	2157	2316	0846
Duration (min)	28	66	74	27
Start Position				
N. Lat.	50°50.0'	50°50.4'	50°51.1'	51°29.4'
W. Long.	129°55.3'	129°57.8'	130°01.0'	128°43.8'
Finish Position				
N. Lat.	50°50.2'	50°51.0'	50°52.1'	51°28.7'
W. Long.	129°56.4'	130°00.4'	130°03.7'	128°45.3'
Tow Distance (naut. mi.)	0.6	1.8	1.9	1.1
Direction (° True)	290	289	310	235
Vessel Speed (kt)	1.5	1.5	1.5	1.5
Bottom Depth (m)	>2000	>2000	>2000	106-91
Modal Depth (m)	>2000	>2000	>2000	99
Target Depth (m)	50	500	500	50
Net Events				
Middle Net				
Time open	2108	2223	2339	0851
Depth (m)	47	502	506	52
Top Net				
Time open	2123	2238	2354	0907
Depth (m)	41	502	506	52
Flowmeter Readings				
Start				
Middle Net	022415	030854	054280	071009
Top Net	590959	618310	672446	727927
Finish				
Middle Net	030854	054280	070482	096350
Top Net	618310	672446	728453	753070
BMLP #'s				
Middle	932	934	936	938
Top	933	935	937	939
Remarks	Usable	Lost top net sample	Usable (Repeat of tow #6)	Usable

Appendix Table 1 – cont'd

Plankton Tow Number	9	10	11	12
Date	July 16	July 16	July 16	July 16
Station Number	D200	D200	D300	D300
Start Time (PST)	1030	1110	1345	1424
Duration (min)	25	40	25	41
Start Position				
N. Lat.	51°24.4'	51°23.8'	51°18.6'	51°19.5'
W. Long.	128°54.8'	128°56.9'	129°12.6'	129°14.6'
Finish Position				
N. Lat.	51°24.0'	51°23.8'	51°19.3'	51°18.9'
W. Long.	128°56.1'	128°58.6'	129°14.0'	129°16.7'
Tow Distance (naut. mi.)	1.0	---	0.8	---
Direction (° True)	247	275	310	240
Vessel Speed (kt)	1.5	1.5	1.5	1.5
Bottom Depth (m)	201-200	200-193	254-250	253-264
Modal Depth (m)	201	197	252	259
Target Depth (m)	50	150	50	250
Net Events				
Middle Net				
Time open	1034	1121	1349	1433
Depth (m)	48	148	50	188
Top Net				
Time open	1049	1137	1404	1450
Depth (m)	52	127	54	188
Flowmeter Readings				
Start				
Middle Net	096350	126032	137919	168123
Top Net	753070	776585	825135	847550
Finish				
Middle Net	126032	137919	168123	189083
Top Net	776585	825135	847550	882454
BMLP #'s				
Middle	940	942	944	946
Top	941	943	945	947
Remarks	Usable	Usable	Usable	Usable

Appendix Table 1 – cont'd

Plankton Tow Number	13	14	15	16
Date	July 16	July 16	July 16	July 16
Station Number	C100	B100	A300	A300
Start Time (PST)	1713	1935	2132	2210
Duration (min)	23	21	23	39
Start Position				
N. Lat.	51°29.1'	51°42.8'	51°49.5'	51°49.4'
W. Long.	129°28.4'	129°30.3'	129°43.2'	129°44.8'
Finish Position				
N. Lat.	51°29.2'	51°43.1'	51°49.1'	51°47.9'
W. Long.	129°29.7'	129°30.2'	129°44.2'	129°46.9'
Tow Distance (naut. mi.)	1.0	0.4	0.8	2.1
Direction (° True)	272	020	240	224
Vessel Speed (kt)	1.6	1.8	1.5	1.5
Bottom Depth (m)	96	95-97	289	295-312
Modal Depth (m)	96	96	289	304
Target Depth (m)	50	50	50	225
Net Events				
Middle Net				
Time open	1717	1937	2134	2222
Depth (m)	50	53	50	211
Top Net				
Time open	1733	1952	2149	2237
Depth (m)	44	52	44	211
Flowmeter Readings				
Start				
Middle Net	189083	204679	207743	225614
Top Net	882454	897539	916335	931866
Finish				
Middle Net	204679	207743	225614	233742
Top Net	897539	916335	931866	959786
BMLP #'s				
Middle	948	950	952	954
Top	949	951	953	955
Remarks	Usable	Usable	Usable	Usable

Appendix Table 1 – cont'd

Plankton Tow Number	17	18	19	20
Date	July 17	July 17	July 17	July 17
Station Number	A400	A400	B400	B400
Start Time (PST)	0055	0132	0400	0433
Duration (min)	25	45	23	53
Start Position				
N. Lat.	51°38.9'	51°38.8'	51°28.5'	51°28.0'
W. Long.	130°09.5'	130°11.6'	130°04.6'	130°04.9'
Finish Position				
N. Lat.	51°38.6'	51°37.9'	51°28.1'	51°28.6'
W. Long.	130°10.9'	130°13.8'	130°04.8'	130°06.5'
Tow Distance (naut. mi.)	0.8	---	0.8	1.5
Direction (° True)	240	280	278	318
Vessel Speed (kt)	1.5	1.5	1.5	1.5
Bottom Depth (m)	386	457-550	442-560	490-370
Modal Depth (m)	386	504	501	430
Target Depth (m)	50	350	50	350
Net Events				
Middle Net				
Time open	0101	0144	0404	0453
Depth (m)	51	194	61	245
Top Net				
Time open	0116	0202	0420	0511
Depth (m)	58	182	68	318
Flowmeter Readings				
Start				
Middle Net	233742	258841	293816	294836
Top Net	959786	989081	028167	034089
Finish				
Middle Net	258841	293816	294836	309612
Top Net	989081	028167	034089	063313
BMLP #'s				
Middle	956	958	960	962
Top	957	959	961	963
Remarks	Usable	Usable	Usable	Usable

Appendix Table 1 – cont'd

Plankton Tow Number	21	22	23	24
Date	July 17	July 17	July 17	July 17
Station Number	B300	B300	B200	B200
Start Time (PST)	0620	0652	0850	0924
Duration (min)	22	41	25	35
Start Position				
N. Lat.	51°30.4'	51°29.7'	51°34.2'	51°33.7'
W. Long.	130°00.2'	130°01.5'	129°51.6'	129°52.9'
Finish Position				
N. Lat.	51°29.9'	51°30.2'	51°33.8'	51°33.0'
W. Long.	130°01.1'	130°01.6'	129°52.6'	129°54.1'
Tow Distance (naut. mi.)	0.7	1.2	0.7	1.1
Direction (° True)	195	357	235	230
Vessel Speed (kt)	1.5	1.5	1.5	2.0
Bottom Depth (m)	256-364	353-314	190-193	197-205
Modal Depth (m)	310	334	192	201
Target Depth (m)	50	250	50	150
Net Events				
Middle Net				
Time open	0623	0708	0853	0934
Depth (m)	52	209	58	147
Top Net				
Time open	0640	0723	0908	0949
Depth (m)	52	222	43	154
Flowmeter Readings				
Start				
Middle Net	309612	319462	340816	346952
Top Net	063313	082261	105538	127468
Finish				
Middle Net	319462	340816	346592	369543
Top Net	082261	105538	127468	153452
BMLP #'s				
Middle	964	966	968	970
Top	965	967	969	971
Remarks	Usable	Usable	Usable	Usable

Appendix Table 1 – cont'd

Plankton Tow Number	25	26	27	28
Date	July 17	July 17	July 17	July 17
Station Number	C200	C200	C300	C300
Start Time (PST)	1129	1200	1400	1430
Duration (min)	21	27	23	25
Start Position				
N. Lat.	51°24.8	51°24.4	51°16.6	51°15.6
W. Long.	129°41.8	129°42.7	130°00.0	129°59.9
Finish Position				
N. Lat.	51°24.6	51°23.7	51°15.7	51°14.8
W. Long.	129°42.3	129°43.5	129°59.9	129°59.2
Tow Distance (naut. mi.)	---	---	---	---
Direction (° True)	240	240	150	150
Vessel Speed (kt)	2.0	2.0	2.0	2.0
Bottom Depth (m)	175-177	178-187	300-317	321-325
Modal Depth (m)	176	183	309	323
Target Depth (m)	50	150	50	50
Net Events				
Middle Net				
Time open	1124	1205	---	1435
Depth (m)	50	81	---	55
Top Net				
Time open	1144	1222	---	1450
Depth (m)	55	85	---	56
Flowmeter Readings				
Start				
Middle Net	369543	382597	---	430395
Top Net	153452	162697	---	200325
Finish				
Middle Net	382597	412451	---	448339
Top Net	162697	186298	---	214353
BMLP #'s				
Middle	972	974	---	976
Top	973	975	---	977
Remarks	Usable	Usable	Net didn't trigger	Usable (Repeat of tow #27)

Appendix Table 1 – cont'd

Plankton Tow Number	29	30	31	32
Date	July 17	July 17	July 17	July 17
Station Number	C300	D400	D400	E300
Start Time (PST)	1504	1721	1757	2012
Duration (min)	39	23	51	20
Start Position				
N. Lat.	51°14.6'	51°07.6'	51°07.6'	50°57.4'
W. Long.	129°59.0'	129°45.8'	129°44.7'	129°41.9'
Finish Position				
N. Lat.	51°14.1'	51°07.9'	51°06.1'	50°57.7'
W. Long.	129°57.5'	129°45.1'	129°44.1'	129°41.1'
Tow Distance (naut. mi.)	---	0.6	1.5	0.7
Direction (° True)	150	033	173	052
Vessel Speed (kt)	2.0	2.0	2.0	1.5
Bottom Depth (m)	327-304	458-427	389-452	615-363
Modal Depth (m)	316	443	421	489
Target Depth (m)	250	50	350	50
Net Events				
Middle Net				
Time open	1512	1724	1812	2014
Depth (m)	247	50	339	48
Top Net				
Time open	1529	1740	1829	2028
Depth (m)	252	45	331	54
Flowmeter Readings				
Start				
Middle Net	448339	448339	496981	528145
Top Net	214353	214353	254033	288681
Finish				
Middle Net	472059	496981	528145	535485
Top Net	239298	254033	288681	305982
BMLP #'s				
Middle	978	980	982	984
Top	979	981	983	985
Remarks	Usable	Usable	Usable	Usable

Appendix Table 1 – cont'd

Plankton Tow Number	33	34	35	36
Date	July 17	July 17	July 18	July 18
Station Number	E300	E200	E200	E100
Start Time (PST)	2137	2344	0022	0300
Duration (min)	34	30	24	23
Start Position				
N. Lat.	50°58.3'	51°00.8'	51°02.3'	51°09.5'
W. Long.	129°38.8'	129°19.9'	129°18.1'	128°48.0'
Finish Position				
N. Lat.	50°58.7	51°01.7	51°02.8	51°09.8'
W. Long.	129°37.6	129°18.6	129°17.3	128°47.0'
Tow Distance (naut. mi.)	0.8	---	---	---
Direction (° True)	062	045	045	---
Vessel Speed (kt)	1.5	1.5	1.5	1.5
Bottom Depth (m)	268-264	182-172	173-171	101
Modal Depth (m)	266	177	172	101
Target Depth (m)	225	150	50	50
Net Events				
Middle Net				
Time open	2145	2351	0025	0303
Depth (m)	222	123	51	54
Top Net				
Time open	2201	0006	0042	0319
Depth (m)	184	112	44	50
Flowmeter Readings				
Start				
Middle Net	554760	557286	585012	608635
Top Net	332190	354886	375997	390602
Finish				
Middle Net	557286	585012	608635	636796
Top Net	354886	375997	390602	408456
BMLP #'s				
Middle	986	988	990	992
Top	987	989	991	993
Remarks	Usable	Usable	Usable	Usable

Appendix Table 2. Temperature summary by depth from raw CTD data for stations sampled during the Pacific ocean perch larval survey, R/V *W.E. RICKER*, July 14-18, 1996.

Station Number	A300	A400	A2000	B100
Date	July 16	July 17	July 14	July 16
Time (start of cast)	2111	0042	0925	1926
Depth (m)	Temperature (°C)			
Surface	12.05	12.70	13.22	13.54
10	11.41	12.66	12.19	12.74
20	11.34	12.47	10.80	12.19
30	10.55	12.25	9.82	10.70
40	9.88	9.45	9.41	10.15
50	9.04	8.55	8.92	9.51
60	8.53	8.22	8.59	8.71
70	8.32	7.92	8.52	8.69
80	8.00	7.58	8.23	
90	7.79	7.49	7.94	
100	7.63	7.43	7.58	
110	7.51	7.40	7.44	
120	7.43	7.39	7.22	
130	7.29	7.26	7.12	
140	7.06	7.13	7.09	
150	6.65	7.02	7.13	
160	6.42	6.72	6.99	
170	6.30	6.82	6.72	
180	6.16	6.70	6.56	
190	6.06	6.25	6.59	
200	5.90	6.07	6.53	
210	5.74	5.72	6.26	
220	5.49	5.61	6.20	
230	5.38	5.47	5.92	
240	5.36	5.39	5.71	
250	5.35	5.36	5.61	
260	5.34	5.33	5.48	
270		5.31	5.38	
280		5.31	5.27	
290			5.18	
300			5.12	
310			5.03	
320			4.99	
330			4.91	
340			4.84	
350			4.82	
360			4.76	
370			4.71	
380			4.68	
390			4.65	
400			4.63	
410			4.57	
420			4.53	
430			4.49	
440			4.45	
450			4.43	
460			4.40	
470			4.38	
480			4.32	
490			4.28	
500			4.26	
Final reading: Temperature (°C)	5.34	5.31	4.26	8.69
Depth (m)	251	271	500	65

Appendix Table 2 – cont'd

Station Number	B200	B300	B400	C100
Date	July 17	July 17	July 17	July 16
Time (start of cast)	0837	0610	0342	1704
Depth (m)	Temperature (°C)			
Surface	13.38	13.19	13.22	13.96
10	12.96	13.20	13.09	13.45
20	12.80	12.94	12.39	13.30
30	12.24	12.40	9.47	11.74
40	10.90	9.97	9.01	10.42
50	10.23	9.49	8.46	9.51
60	9.12	8.83	8.22	8.87
70	8.80	8.46	7.91	8.60
80	8.65	8.28	7.76	
90	8.48	8.18	7.56	
100	8.05	7.77	7.45	
110	7.31	7.26	7.24	
120	7.10	6.90	6.83	
130	6.54	6.58	6.67	
140	6.11	6.54	6.63	
150	5.61	6.35	6.61	
160	5.57	6.20	6.45	
170		6.10	6.26	
180		6.02	6.19	
190		5.90	6.13	
200		5.68	6.04	
210		5.62	5.84	
220		5.61	5.75	
230		5.61	5.68	
240			5.62	
250			5.56	
260			5.48	
270			5.44	
280			5.45	
290			5.33	
300			5.27	
310			5.16	
320			5.11	
330			5.07	
340			5.06	
350			4.98	
360			4.94	
370			4.90	
380			4.86	
390			4.85	
400			4.80	
410			4.77	
420			4.77	
430			4.77	
440				
450				
460				
470				
480				
490				
500				
Final reading: Temperature (°C)	5.56	5.60	4.77	8.56
Depth (m)	163	233	433	71

Appendix Table 2 – cont'd

Station Number	C200	C300	C2000	D100
Date	July 17	July 17	July 14	July 16
Time (start of cast)	1119	1350	1437	0838
Depth (m)	Temperature (°C)			
Surface	13.97	13.45	13.09	11.49
10	13.85	12.98	12.97	11.42
20	13.77	12.77	12.89	10.81
30	13.67	11.09	11.78	10.44
40	13.09	10.05	9.86	10.19
50	11.97	8.94	9.30	8.99
60	10.19	8.72	8.55	8.02
70	9.54	8.20	8.34	7.64
80	8.45	7.87	8.00	
90	7.69	7.64	7.70	
100	7.43	7.20	7.53	
110	7.17	7.16	7.37	
120	6.91	7.09	7.42	
130	6.41	7.02	7.43	
140	6.00	7.10	7.24	
150		7.06	7.16	
160		6.88	7.07	
170			6.88	
180			6.78	
190			6.70	
200			6.63	
210			6.57	
220			6.45	
230			6.33	
240			6.29	
250			6.15	
260			6.07	
270			5.96	
280			5.87	
290			5.77	
300			5.65	
310			5.59	
320			5.54	
330			5.48	
340			5.42	
350			5.36	
360			5.24	
370			5.03	
380			5.08	
390			5.02	
400			5.02	
410			5.00	
420			4.91	
430			4.87	
440			4.84	
450			4.81	
460			4.76	
470			4.74	
480			4.69	
490			4.63	
500			4.59	
Final reading: Temperature (°C)	5.84	6.86	4.59	7.61
Depth (m)	146	162	501	73

Appendix Table 2 – cont'd

	D200	D300	D400	E100
Date	July 16	July 16	July 17	July 18
Time (start of cast)	1015	1325	1706	0251
Depth (m)	Temperature (°C)			
Surface	12.14	13.25	13.55	13.27
10	12.13	13.13	13.12	11.68
20	11.18	12.90	12.41	9.84
30	10.04	10.52	11.01	9.25
40	9.64	9.69	10.00	9.01
50	8.88	9.09	9.26	8.52
60	8.13	8.63	9.01	8.48
70	7.88	8.41	8.26	8.49
80	7.54	8.37	8.02	
90	7.34	8.09	7.70	
100	7.13	7.79	7.51	
110	6.97	7.50	7.24	
120	6.66		7.16	
130	6.29		7.08	
140	6.08		7.06	
150	5.95		6.92	
160	5.74		6.88	
170	5.57		6.85	
180			6.65	
190			6.56	
200			6.39	
210			6.25	
220			6.13	
230			6.06	
240			5.96	
250			5.87	
260			5.86	
270			5.84	
280			5.80	
290			5.76	
300			5.64	
310			5.63	
320			5.56	
330			5.35	
340			5.32	
350			5.25	
360			5.21	
370			5.11	
380			5.09	
390			5.08	
400			5.09	
410			5.04	
420			5.01	
430				
440				
450				
460				
470				
480				
490				
500				
Final reading: Temperature (°C)	5.57	7.39	5.01	8.48
Depth (m)	172	111	422	72

Appendix Table 2 – cont'd

	E200	E300	E2000
Date	July 17	July 17	July 14
Time (start of cast)	1134	1954	2020
Depth (m)	Temperature (°C)		
Surface	14.11	14.24	13.02
10	12.81	13.49	13.02
20	12.57	12.81	12.11
30	12.51	10.54	11.00
40	11.29	9.56	9.97
50	9.32	8.93	9.59
60	8.85	8.40	8.58
70	8.47	8.01	8.15
80	7.90	7.84	7.88
90	7.25	7.56	7.74
100	7.06	7.49	7.47
110	6.89	7.33	7.54
120	6.80	7.29	7.32
130	6.62	7.23	7.25
140	6.51	7.22	7.07
150	6.17	7.07	7.00
160		6.71	6.89
170		6.41	6.84
180		6.00	6.75
190		5.95	6.66
200		5.84	6.55
210		5.74	6.43
220		5.65	6.35
230		5.60	6.28
240		5.54	6.12
250		5.53	6.04
260		5.51	5.91
270		5.48	5.84
280		5.46	5.82
290		5.43	5.77
300		5.41	5.67
310		5.40	5.61
320		5.40	5.52
330		5.37	5.47
340		5.36	5.40
350		5.35	5.33
360		5.33	5.30
370		5.33	5.23
380		5.26	5.16
390		5.23	5.13
400		5.20	5.09
410			5.03
420			4.95
430			4.90
440			4.85
450			4.83
460			4.80
470			4.77
480			4.73
490			4.71
500			4.67
Final reading: Temperature (°C)	6.17	5.20	4.67
Depth (m)	150	403	503