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Cruise Details and Biological Information From the Pacific Ocean Perch Larval Survey Aboard The *R/V W. E. RICKER* March 11-29, 1991

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CRUISE DETAILS AND BIOLOGICAL INFORMATION FROM THE PACIFIC OCEAN PERCH LARVAL SURVEY ABOARD THE R/V W.E. RICKER, MARCH 11-29, 1991

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ABSTRACT

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.

Preliminary results of a research cruise to investigate the geographic and bathymetric distribution of larvae of Pacific Ocean perch, Sebastes alutus, are presented. The study area consisted of stations at various depths along 5 transect lines on and around the Goose Island Bank, in Queen Charlotte Sound. Seven bottom trawl tows, 2 midwater trawl tows, 21 neuston net tows and 76 Tucker trawl tows were completed in the study area. Two additional bottom trawl tows were conducted off Nootka Sound, on the west coast of Vancouver Island, to collect yellowtail rockfish, S. flavidus, for a separate genetic research project.

Examination of adult females confirmed Leaman's (1988) observation that the period of parturition for S. alutus in the Goose Island Gully stock was extended, relative to the stock on the west coast of the Queen Charlotte Islands. Plankton samples were preserved for later laboratory analyses. Larvae provisionally identified as S. alutus were extracted from the samples and preserved in alcohol for genetic analysis and age determination.

RÉSUMÉ

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.

On présente les résultats préliminaires d'une campagne de recherche visant à étudier la distribution géographique et bathymétrique des larves du sébaste du Pacifique (Sebastes alutus). L'étude a été effectuée dans des stations à différentes profondeurs le long de 5 transects dans le Banc de Goose Island, dans le détroit de la Reine-Charlotte. Sept traits de chalut de fond, 2 traits de chalut semi-pélagique, 21 traits de filet à neuston et 76 traits de chalut Tucker ont été effectués dans la région à l'étude. Deux autres traits de chalut de fond ont été effectués au large du détroit de Nootka, sur la côte ouest de l'île de Vancouver, afin de recueillir des sébastes à queue jaune (S. flavidus) pour un autre projet de recherche en génétique.

L'examen des femelles adultes a confirmé l'observation de Leaman (1988) que la période de ponte de S. alutus dans le stock de Goose Island Gully est plus longue que dans le stock de la côte ouest des îles de la Reine-Charlotte. Des échantillons de plancton ont été conservés pour être analysés plus tard en laboratoire. Les larves identifiées provisoirement comme étant des larves de S. alutus ont été isolées des échantillons et conservées dans l'alcool pour faire l'objet d'une analyse génétique et d'une détermination de l'âge.

INTRODUCTION

Pacific ocean perch (Sebastes alutus) are a major component of the British Columbia trawl fishery. This species, and the Sebastes in general, are characterized by a wide fluctuation in reproductive success, such that only a few cohorts dominate the age structure of the standing stock (Archibald et al. 1981). While there is evidence that successful recruitment is a coast-wide phenomenon, the causes of recruitment failure (or success) are not well known (Leaman 1990).

Despite their importance in the trawl fisheries off British Columbia, and in the Gulf of Alaska and the Bering Sea, little is known about their early life history. Many aspects of larval and juvenile ecology of the Sebastes are not known (Love et al. 1991; Moser and Boehlert 1991). The inability to positively identify larvae and juveniles to a given species is a large stumbling block to understanding the early life history of the genus (Kendall 1991).

Matarese et al. (1989) provided illustrations of S. alutus larvae at the extrusion or yolk-exhaustion stage and for the pelagic juvenile stage, but could not describe the intervening stages of development. Kendall (1989) illustrated a 58-day pre-flexion larvae of S. alutus, but was unable to rear larvae beyond that age.

Knowledge of the reproductive patterns and early life history of a commercially valuable species like S. alutus may provide key biological information which could be used in the assessment of stocks and planning of the fishery. At the very least, detection of strong cohorts years before their recruitment to the fishery would be an important planning tool for fisheries managers and industry (Kendall and Lenarz 1987).

The main purpose of this research cruise was to sample Pacific ocean perch larvae and to determine changes in their geographic and bathymetric distribution over time. Larvae were sampled throughout the month of March, during the general time of parturition . The long-term goals of the project are to develop knowledge of the early life history of rockfishes and to develop techniques for the capture, identification, and quantification of rockfish larvae.

METHODS

Vessel and Nets

The R/V W.E. RICKER, a 57.3 m stern trawler, was the research vessel for the cruise. Conventional bottom trawl tows were made with a three-bridle Nor'eastern bottom trawl, using

1200 kg oval Polyvalent steel doors, and a combined bridle/sweep length of 60 m. Conventional midwater trawl tows were made with a Diamond 5 midwater trawl using 400 kg Suberkrub doors, and 64 m bridles.

Plankton and fish larvae were collected with a 3-stage 1-m square Tucker trawl and a 1/2 m by 1/2 m neuston net. The Tucker trawl used 335 micron black Nitex nets. The neuston net used 500 micron black Nitex. The Tucker trawl was deployed over the stern ramp from the stern hydrographic winch, through a meter block suspended from the superstructure over the stern. The neuston net was deployed approximately 5-10 m off the starboard quarter by the stern HIAB, and secured to a towing point on the starboard rail for the duration of the 15 minute tow. Deck lights were extinguished for all but neuston tow 13.

Station Locations

Twenty stations were preselected along 5 transect lines, labelled A-E (Table 1, Figure 1). Four stations were placed on each transect, at approximate depths of 100, 200, 300 and 400 m. An additional station was placed at an approximate depth of 2000 m on transects A, C and E. Steep bathymetry on transects C and E made it preferable to combine the 300 and 400 m stations, which are referred to as stations C300 and E300. The W.E. RICKER followed a transect line until the appropriate depth was located, and the station was mapped for future replication. Two Tucker trawl tows, one descending to 50 m and one to within 50 m of the bottom, one neuston tow, and a CTD cast were carried out at each station. The station nearest to the spawning aggregation (Station C300) was sampled intensively at the beginning and end of the cruise.

Sampling of Tows

Methods for determining catch weights and species compositions from conventional trawl tows follow those of Gillespie and Stanley (1989), with the exception that an MSI 6260 load cell was used on this cruise. Plankton samples were preserved in 10% buffered formalin for later sorting and enumeration. Each plankton sample was given a cursory examination to determine whether *Sebastes* larvae were present, though final identification and enumeration will require detailed examination in the laboratory.

Information collected from adult Pacific ocean perch taken in conventional trawl tows included fork length (measured to the nearest cm), sex, maturity and otolith samples (L/S/M/O). The numerical codes used for rockfish maturity stages (Table 2) were adapted from Westrheim (1975) by Carter et al. (1981). Ovaries from the females of these samples were examined to determine the developmental stage of the larvae, and to provide a

comparative basis for identification of newly-extruded larvae captured in Tucker trawls. Larvae were assigned to one of six stages of development, from fertilized eggs with no visible larva to a fully developed larva which had hatched in the ovary (Table 3).

Females of other rockfish species were examined for state of reproductive maturity as they became available. Samples of late pre-extrusion larvae were taken to aid in identification of larvae contained in the plankton collections.

A sample of yellowtail rockfish, S. flavidus, was collected off the west coast of Vancouver Island. A L/S/M/O sample was taken, and tissues were collected from each fish for electrophoretic analyses. Samples of the heart, liver and muscle tissue were placed in individually numbered scintillation tubes. These tubes were sealed and the sample quick-frozen in the vessel's blast freezer.

RESULTS

Catch

Nine bottom and 2 midwater trawl tows were completed on this cruise (Appendix Table 1). S. alutus, S. diploproa and S. reedi accounted for over 87% of the fish caught by conventional trawl tows (Table 4). A total of 37 fish species were captured in these tows (Appendix Table 5).

A total of 97 plankton tows were completed, of which 76 used a three-stage Tucker trawl and 21 used a neuston net (Appendix Tables 2 and 3). Samples from these tows were examined for rockfish larvae, preserved and stored for later laboratory analyses. Some larvae, provisionally identified as S. alutus, were extracted from these samples and preserved in 90% ethyl alcohol for genetic analyses and age determination. Results of these analyses will be presented elsewhere.

Oceanographic Data

Twenty-two conductivity/temperature/depth probe (CTD) casts were performed in the study area (Appendix Table 4). The data logger recorded all of the parameters three times per second, but we have summarized the data by 10 m depth intervals.

Biological Samples

Biological samples of adult S. alutus were taken from trawl tows 1 and 2 (Table 5). The sample from tow 1 was 86% female. Of these females, 92% were in advanced states of reproductive development, carrying either fertilized eggs (stage

4) or eyed larvae (stage 5), and only 7% were spent (stage 6) or in a resting state. Most of the larvae from the ovaries of the stage 4 and 5 females (74%) were in stages C and D, and only 3 females carried fully developed, hatched larvae (Table 6).

The first random sample from tow 2 was 80% males. A second sample, consisting of 98 females, was taken to provide better representation of females from the tow. The females in this sample were mainly in stages 4 and 5 (97%), while three individuals were spent (Table 5). The majority of these females (85%) carried stage B, C and D larvae. None carried fully developed, hatched larvae (Table 6).

Leaman (1988) showed large differences in synchrony and duration of ovarian development in stocks of S. alutus from Rennell Sound and Goose Island Gully. The variation in the condition of the larvae both within and among the samples from Tows 1 and 2 confirmed an extended period of parturition in the Goose Island Gully stock.

A sample of S. flavidus was taken off the west coast of Vancouver Island, to collect tissue samples for electrophoretic analyses (Table 7). The results of these analyses will be presented elsewhere.

A small number of the female S. flavidus examined and the one S. crameri examined were near parturition (stage 5). However, the larvae of S. crameri and S. flavidus are distinguishable from those of S. alutus (see below). Females of the other rockfish species encountered were all in the early stages of reproductive development (stage 3).

Identification of Rockfish Larvae

Pre-extrusion larvae from our collection of S. alutus are consistent with the illustrations in Matarese et al. (1989). These larvae exhibited two concentrations of pigment: a shield on the posterior and dorsal aspects of the gut; and a series of postanal ventral melanophores. The presence and extent of these areas of pigmentation were used to identify S. alutus larvae in the field.

Westrheim (1975) listed the primary season of parturition for 15 Sebastes species in British Columbia waters. Based on his data it would have been possible to encounter early larvae of S. crameri, S. flavidus, S. jordani, S. paucispinis, S. pinniger and S. saxicola during the time period of this cruise, in addition to those of S. alutus. These larvae are distinguished from those of S. alutus by characteristic pigment patterns (Matarese et al. 1989). Larvae of S. crameri and S. flavidus both exhibit two melanophores on or below the hypural region, while larvae of S. jordani, S. pinniger and S. saxicola

have a dorsal pigment row. Larvae of S. paucispinis possess characteristic pigmentation of the pectoral fins.

A single larva captured in a Tucker trawl was identified as S. crameri. This larva possessed two melanophores in the ventral caudal finfold below the hypural region, in addition to pigment above the gut and the postanal ventral series. The pre-extrusion larvae collected from female S. flavidus also had two melanophores in the hypural region, but at the level of the notochord, not under it in the ventral caudal fin fold.

Detailed laboratory analyses of the plankton collections will be presented in subsequent reports.

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Table 1. Approximate location of stations occupied by the R/V W.E. RICKER during the Pacific ocean perch larval survey, March 11-29, 1991.

Station No.	Approximate location
A200	51°59′ N x 129°19′ W
A300	51°50′ N x 129°42′ W
A400	51°39′ N x 130°09′ W
A2000	51°27′ N x 130°40′ W
B100	51°43′ N x 129°29′ W
B200	51°34′ N x 129°51′ W
B300	51°31′ N x 129°59′ W
B400	51°28′ N x 130°04′ W
C100	51°30′ N x 129°28′ W
C200	51°25′ N x 129°42′ W
C300	51°17′ N x 130°00′ W
C2000	51°07′ N x 130°26′ W
D100	51°30′ N x 128°44′ W
D200	51°25′ N x 128°54′ W
D300	51°18′ N x 129°12′ W
D400	51°08′ N x 129°38′ W
E100	51°09′ N x 128°49′ W
E200	51°01′ N x 129°20′ W
E300	50°56′ N x 129°42′ W
E2000	50°50′ N x 129°54′ W

Table 2. Description of rockfish gonad maturity stages.

Code	Gonad Condition
	Females
1	Immature (translucent, small)
2	Developing (small, yellow eggs, opaque or translucent)
3	Developed (large yellow eggs, opaque)
4	Fertilized (large, orange-yellow eggs, translucent)
5	Embryos or larvae (includes eyed eggs)
6	Spent (large, flaccid, red ovaries, a few larvae may be present)
7	Resting (moderate size, firm, red-grey ovaries)
	Males
1	Immature (translucent, string-like)
2	Developing (swelling, brown-white)
4	Developed (large, white, easily broken)
5	Ripe (running sperm)
6	Spent (flaccid, red)
7	Resting (ribbon-like, small brown)

Table 3. Description of larval development stages for Pacific ocean perch.

Code	Stage of Larval Development
A	Egg fertilized, no larva recognizable.
B	Larva developing, eye lens not developed.
C	Eye lens formed, eye unpigmented.
D	Eye pigmented, body pigment absent.
E	Eye and body pigment present, unhatched.
F	Larva hatched.

Table 4. Catch weight (kg) and percent of total catch of major species captured by conventional bottom and midwater trawls, R/V W.E. RICKER, Pacific ocean perch larval survey, March 11-29, 1991.

Species	Weight (kg)	Percent of Total Catch
Sebastes alutus	6285.	61.03
S. diploproa	2161.	20.98
S. reedi	567.	5.51
Spiny dogfish	312.	3.03
Flathead sole	201.	1.95
Lingcod	187.	1.82
S. brevispinis	144.	1.40
S. flavidus	138.	1.34
Other fish	304.	2.94
	---	---
	10299.	100.00

Table 5. Length frequency and maturity summaries for Sebastes alutus captured by conventional trawl, R/V W.E. RICKER, Pacific ocean perch larval survey, March 11-29, 1991.

Area	060810		060810		060810		060810		Total	
Date	130391		130391		190391		190391			
Depth (m)	295		295		292		292			
Tow	1		1		2		2			
	M	F	M	F	M	F	M	F	M	F
Length (cm)										
32	1	-	-	-	-	-	-	-	1	-
33	1	-	-	-	-	-	-	-	1	-
34	2	-	-	1	2	-	-	-	4	1
35	2	4	-	0	1	-	-	-	3	4
36	3	3	-	1	7	1	-	1	10	6
37	2	5	-	0	10	0	-	1	12	6
38	1	9	-	1	16	1	-	1	17	12
39	1	12	-	0	22	1	-	2	23	15
40	1	16	-	4	13	1	-	3	14	24
41	-	18	-	4	3	1	-	5	3	28
42	-	8	-	2	4	1	-	11	4	22
43	-	4	-	1	0	1	-	7	0	13
44	-	4	-	-	1	3	-	21	1	28
45	-	1	-	-	1	2	-	23	1	26
46	-	1	-	-	-	7	-	14	-	22
47	-	1	-	-	-	1	-	7	-	9
48	-	-	-	-	-	-	-	2	-	2
Total	14	86	-	14	80	20	-	98	94	218
Maturity										
1	2	1	-	0	2	0	-	0	4	1
2	0	0	-	0	0	0	-	0	0	0
3	0	0	-	0	0	0	-	0	0	0
4	0	47	-	11	0	12	-	80	0	150
5	0	32	-	3	0	5	-	18	0	58
6	0	5	-	0	0	3	-	0	0	8
7	12	1	-	0	78	0	-	0	90	1
8	0	0	-	0	0	0	-	0	0	0

Table 6. Development of larvae taken from gestating female *Sebastes alutus* captured by conventional trawl, R/V W.E. RICKER, Pacific ocean perch larval survey, March 11-29, 1991.

Station	C300	C300
Date	130391	190391
Depth (m)	295	292
Tow	1	2
Development Code		
A	3	0
B	5	59
C	46	24
D	22	15
E	13	17
F	3	0
Total	92	115

Table 7. Length frequency and maturity summaries for *Sebastes flavidus* captured by conventional trawl, R/V W.E. RICKER, Pacific ocean perch larval survey, March 11-29, 1991.

Area	042502	
Date	240391	
Depth (m)	147	
Tow	9	
	M	F
Length (cm)		
35	1	-
36	0	1
37	0	1
38	3	1
39	0	0
40	3	2
41	11	3
42	7	1
43	7	4
44	8	7
45	7	9
46	5	3
47	4	2
48	-	4
49	-	4
50	-	2
Total	56	44
Maturities		
1	1	7
2	7	31
3	0	1
4	0	2
5	0	3
6	0	0
7	48	0
8	0	0

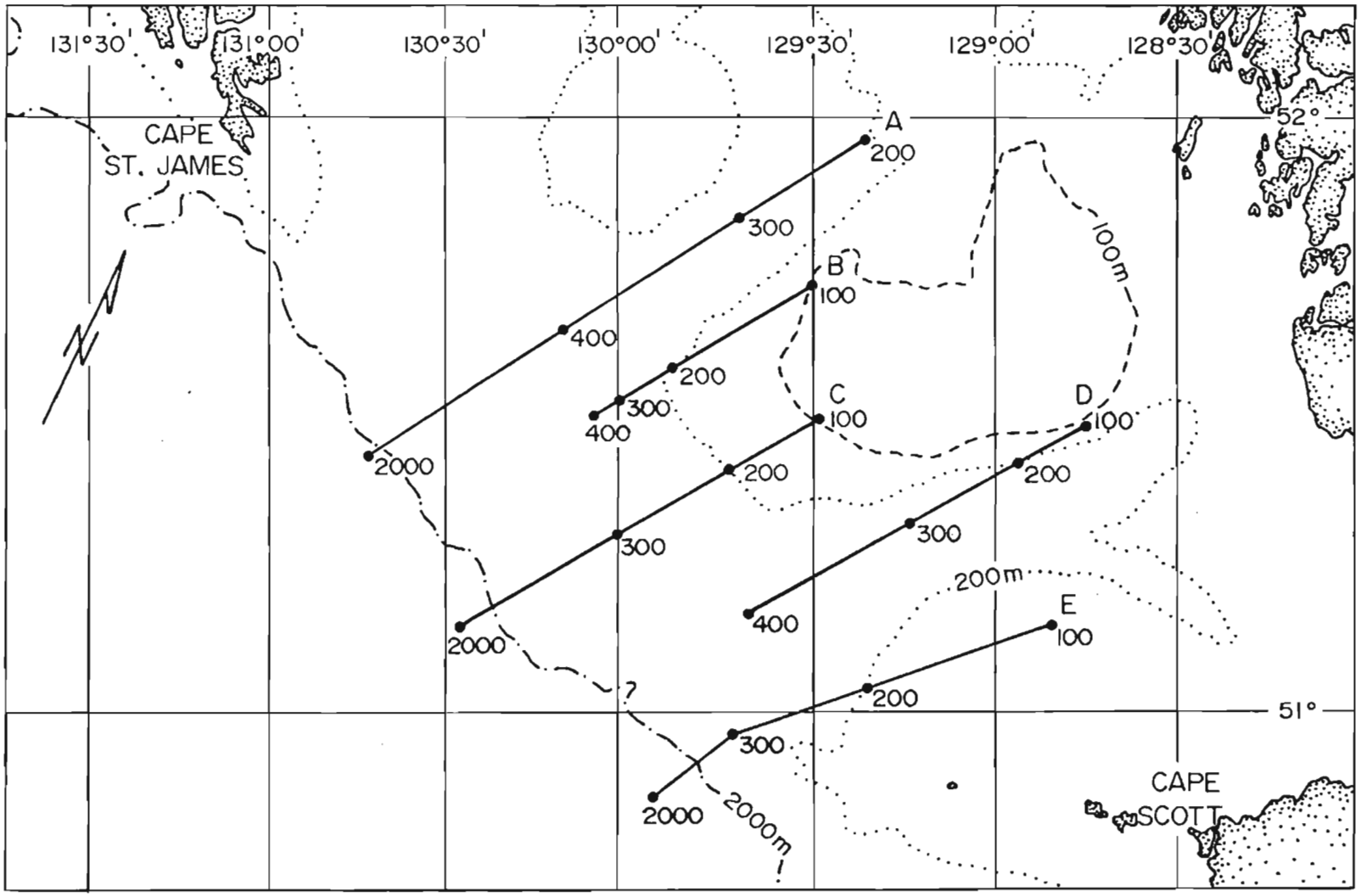

Fig. 1. Location of stations occupied by the R/V W.E. RICKER during the Pacific Ocean perch sampling cruise, March 11-29, 1991.

Appendix Table 1. Bridge logs for conventional trawl tows, R/V W.E. RICKER, Pacific ocean perch larval survey, March 11-29, 1991.

Tow Number		1	2	3	4
Date		Mar 13	Mar 19	Mar 19	Mar 20
Area (Major, Minor)		5B,08	5B,08	5A,11	5A,11
Start Time	(PDT)	9:01	8:38	15:21	10:23
Duration	(Min)	47	40	40	62
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	17.8	17.8	12.1	13.1
W. Long	(Deg)	130	130	129	128
	(Min)	1.2	1.3	6.6	59.9
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	16.2	16.3	12.6	12.2
W. Long	(Deg)	129	129	129	129
	(Min)	58.9	59.2	3.6	4.0
Tow Distance	(km)	4.4	4.0	3.3	5.5
	(N Mi)	2.4	2.2	1.8	3.0
Direction (Deg.True)		135	130	70	245
Bottom Depth	(m)	299- 291	296- 287	205- 182	164- 167
	(fm)	163- 159	162- 157	112- 100	90- 91
Modal Depth	(m)	295	292	194	166
Gear Type		BT	BT	MW	BT
Tide		..	..	Flood	..
Total Catch	(kg)	6818	2195	0	14
Remarks		Usable	Usable	No catch	Usable

Appendix Table 1. (continued)

Tow Number	1	2	3	4
Date	Mar 13	Mar 19	Mar 19	Mar 20
Area (Major, Minor)	5B,08	5B,08	5A,11	5A,11
Arrowtooth flounder	T	T	..	T
Dover sole	..	..	..	..
English sole	..	..	..	T
Flathead sole	..	..	..	3
Petrale sole	..	T	..	..
Rex sole	..	T	..	..
Other flatfish	..	..	..	..
Sebastes alutus	5773	512	..	..
S. brevispinis	..	T	..	..
S. diploproa	727	1434	..	..
S. elongatus	..	..	..	..
S. flavidus	..	..	..	..
S. paucispinis	..	..	..	..
S. pinniger	..	..	..	..
S. proriger	..	T	..	..
S. reedi	318	249	..	..
S. ruberrimus	..	..	..	..
Other rockfish	T	T	..	..
American shad	..	..	..	..
Chinook salmon	..	..	..	..
Lingcod	..	..	..	3
Pacific cod	T	T	..	2
Pacific herring	..	..	..	..
Other roundfish	..	T	..	T
Big skate	..	..	..	..
Longnose skate	..	..	..	..
Spiny dogfish	..	..	..	6
Other selachii	T	T	..	..
Total Catch (kg)	6818	2195	0	14

Appendix Table 1. (continued)

Tow Number		5	6	7	8
Date		Mar 20	Mar 21	Mar 21	Mar 24
Area (Major, Minor)		5B,08	5B,08	5B,08	3D,25
Start Time	(PDT)	14:45	9:32	11:53	8:35
Duration	(Min)	78	43	115	30
Start N. Lat.	(Deg)	51	51	51	49
	(Min)	22.0	21.9	21.3	37.2
W. Long	(Deg)	129	129	129	127
	(Min)	15.0	24.1	21.0	15.6
Finish N. Lat.	(Deg)	51	51	51	49
	(Min)	21.3	23.1	23.4	39.0
W. Long	(Deg)	129	129	129	127
	(Min)	21.2	27.5	30.7	17.4
Tow Distance	(km)	7.3	3.7	10.6	3.7
	(N Mi)	4.0	2.0	5.8	2.0
Direction (Deg.True)		250	285	290	315
Bottom Depth	(m)	163- 163	156- 154	160- 160	148- 142
	(fm)	89- 89	85- 84	87- 87	81- 78
Modal Depth	(m)	163	155	160	146
Gear Type		BT	BT	MW	BT
Tide		..	..	..	..
Total Catch	(kg)	100	214	71	268
Remarks		Usable	Usable	Usable	Usable

Appendix Table 1. (continued)

Tow Number	5	6	7	8
Date	Mar 20	Mar 21	Mar 21	Mar 24
Area (Major, Minor)	5B,08	5B,08	5B,08	3D,25
Arrowtooth flounder	..	3	..	..
Dover sole	..	..	..	T
English sole	T	29	..	8
Flathead sole	30	48	..	12
Petrale sole	..	20	..	6
Rex sole	..	2	..	T
Other flatfish	..	..	..	..
S. alutus	..	..	..	..
S. brevispinis	2	43	..	76
S. diploproa	..	..	..	..
S. elongatus	T	T	..	T
S. flavidus	..	..	..	2
S. paucispinis	..	..	..	..
S. pinniger	T	..	..	31
S. proriger	..	..	63	..
S. reedi	..	..	..	..
S. ruberrimus	..	..	..	..
Other rockfish	..	..	T	T
American shad	..	..	..	20
Chinook salmon	..	..	..	..
Lingcod	..	10	..	37
Pacific cod	T	..	..	T
Pacific herring	..	T	1	T
Other roundfish	T	T	..	..
Big skate	..	6	..	..
Longnose skate	..	..	..	..
Spiny dogfish	68	53	7	58
Other selachii	..	T	..	..
Total Catch (kg)	100	214	71	268

Appendix Table 1. (continued)

Tow Number		9	10	11
Date		Mar 24	Mar 26	Mar 26
Area (Major, Minor)		3D,25	5A,11	5A,11
Start Time	(PDT)	10:28	8:38	10:35
Duration	(Min)	40	35	59
Start N. Lat.	(Deg)	49	51	51
	(Min)	38.5	11.4	12.8
W. Long	(Deg)	127	129	128
	(Min)	16.0	0.7	49.1
Finish N. Lat.	(Deg)	49	51	51
	(Min)	38.3	10.3	13.1
W. Long	(Deg)	127	128	129
	(Min)	19.0	57.8	53.9
Tow Distance	(km)	5.5	4.0	5.9
	(N Mi)	3.0	2.2	3.2
Direction (Deg.True)		270	125	310
Bottom Depth	(m)	142- 151	137- 133	146- 145
	(fm)	78- 83	75- 73	80- 79
Modal Depth	(m)	147	135	146
Gear Type		BT	BT	BT
Tide		..	..	..
Total Catch	(kg)	453	14	152
Remarks		Usable	Usable	Usable

Appendix Table 1. (continued)

Tow Number	9	10	11
Date	Mar 24	Mar 26	Mar 26
Area (Major, Minor)	3D,25	5A,11	5A,11
Arrowtooth flounder	1	..	..
Dover sole	2	..	..
English sole	10	..	..
Flathead sole	5	..	103
Petrale sole	16	1	2
Rex sole	5	..	..
Other flatfish	..	..	..
S. alutus	..	..	..
S. brevispinis	23	..	..
S. diploproa	..	..	..
S. elongatus	1	..	..
S. flavidus	136	..	..
S. paucispinis	22	..	..
S. pinniger	7	..	..
S. proriger	..	..	..
S. reedi	..	..	..
S. ruberrimus	4	..	..
Other rockfish	T	..	..
American shad	20	..	..
Chinook salmon	..	..	1
Lingcod	94	..	43
Pacific cod	..	..	..
Pacific herring	1	1	..
Other roundfish	T	..	..
Big skate	..	..	..
Longnose skate	1	..	..
Spiny dogfish	105	12	3
Other selachii	T	..	..
Total Catch (kg)	453	14	152

Appendix Table 2. Bridge logs for Tucker trawl tows, R/V W.E. RICKER Pacific ocean perch larval survey, March 11-29, 1991.

Plankton Tow No.		2	3	4	5
Date		Mar 13	Mar 13	Mar 13	Mar 14
Station No.		C300	C300	C300	C300
Start Time	(PDT)	2000	2205	2305	0041
Duration	(Min)	55	45	42	34
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	16.8	15.7	16.3	16.4
W. Long	(Deg)	129	129	130	129
	(Min)	59.6	58.9	00.6	59.6
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	15.2	16.2	16.6	16.4
W. Long	(Deg)	129	130	130	130
	(Min)	56.7	00.3	02.0	06.6
Tow Distance	(km)	4.6	2.7	1.8	1.8
Direction (Deg.True)		140	305	285	290
Vessel Speed	(kt)	2.6	2.5	2.3	2.0
Bottom Depth	(m)	299- 282	284- 297	309- 322	280- 300
Modal Depth	(m)	291	291	316	290
Net Events					
2nd Net Open					
Time	(PDT)	2019	2215	2315	0053
Depth	(m)	172	155	130	109
3rd Net Open					
Time	(PDT)	2035	2230	2330	0110
Depth	(m)	172	180	140	114
Flowmeter Readings					
Start	Net 1	932951	985839	015657	042491
	Net 2	699967	739272	756452	762043
	Net 3	016040	051085	061301	077708
Finish	Net 1	985869	015657	042491	064312
	Net 2	739273	756452	762043	773689
	Net 3	051086	061301	077708	083831
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		6	8	9	10
Date		Mar 14	Mar 14	Mar 14	Mar 14
Station No.		C300	C300	C300	C300
Start Time	(PDT)	0200	1945	2025	2100
Duration	(Min)	25	25	27	20
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	16.4	17.6	18.9	20.1
W. Long	(Deg)	129	130	130	130
	(Min)	59.0	00.4	02.6	04.6
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	16.6	18.4	19.7	20.8
W. Long	(Deg)	130	130	130	130
	(Min)	00.0	01.9	04.0	05.6
Tow Distance	(km)	1.1	3.7	2.7	2.2
Direction (Deg.True)		290	300	300	300
Vessel Speed	(kt)	2.0	2.6	2.6	2.5
Bottom Depth	(m)	274- 288	275- 284	291- 332	370- 495
Modal Depth	(m)	281	280	312	433
Net Events					
2nd Net Open					
Time	(PDT)	0207	1951	2029	2105
Depth	(m)	57	25	25	10
3rd Net Open					
Time	(PDT)	0222	2005	2046	2120
Depth	(m)	62	28	25	9
Flowmeter Readings					
Start	Net 1	064312	073979	116661	136077
	Net 2	773689	784123	791159	818436
	Net 3	083831	716200	741155	748098
Finish	Net 1	broken	116661	136077	152404
	Net 2	783389	791159	818436	845555
	Net 3	085670	741155	748098	748509
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		11	12	15	16
Date		Mar 14	Mar 15	Mar 15	Mar 15
Station No.		C300	C300	C300	C300
Start Time	(PDT)	2300	0000	0130	0316
Duration	(Min)	32	32	43	61
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	14.5	15.9	17.8	14.6
W. Long	(Deg)	129	129	130	129
	(Min)	54.9	56.7	00.8	54.1
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	15.3	16.8	18.4	15.6
W. Long	(Deg)	129	129	130	129
	(Min)	55.8	57.7	02.4	57.4
Tow Distance	(km)	2.7	2.0	2.7	4.0
Direction (Deg.True)		310	300	300	300
Vessel Speed	(kt)	2.5	2.1	2.1	2.2
Bottom Depth	(m)	277- 268	266- 266	277- 290	272- 272
Modal Depth	(m)	273	266	284	272
Net Events					
2nd Net Open					
Time	(PDT)	2311	0010	0147	0340
Depth	(m)	53	145	136	204
3rd Net Open					
Time	(PDT)	2326	0026	0203	0355
Depth	(m)	53	145	144	182
Flowmeter Readings					
Start	Net 1	152404	183570	206035	237816
	Net 2	845555	856660	876710	885727
	Net 3	748509	148182	000000	019409
Finish	Net 1	183570	206035	237816	298495
	Net 2	856660	876710	885727	914504
	Net 3	148182	000000	019409	066183
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		17	18	19	21
Date		Mar 15	Mar 15	Mar 15	Mar 15
Station No.		C300	C300	C300	C300
Start Time	(PDT)	0430	0505	0545	0703
Duration	(Min)	25	23	43	50
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	15.9	16.8	17.8	16.5
W. Long	(Deg)	129	130	130	129
	(Min)	58.0	00.0	01.9	58.0
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	16.5	17.5	16.9	15.7
W. Long	(Deg)	129	130	129	129
	(Min)	59.6	01.5	59.9	55.8
Tow Distance	(km)	1.8	1.6	3.5	3.8
Direction (Deg.True)		310	320	130	130
Vessel Speed	(kt)	2.5	2.5	2.5	2.2
Bottom Depth	(m)	273- 277	285- 290	290- 279	267- 267
Modal Depth	(m)	275	288	285	267
Net Events					
2nd Net Open					
Time	(PDT)	0435	0510	0559	0722
Depth	(m)	48	21	106	150
3rd Net Open					
Time	(PDT)	0450	0524	0613	0738
Depth	(m)	44	21	106	180
Flowmeter Readings					
Start	Net 1	298495	317741	335790	368723
	Net 2	914504	937199	975348	008112
	Net 3	066183	088595	094570	120653
Finish	Net 1	317741	335790	368723	378331
	Net 2	937199	975348	008112	029500
	Net 3	088595	094510	120653	160541
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		22	23	24	25
Date		Mar 15	Mar 15	Mar 15	Mar 15
Station No.		C300	C300	C300	C300
Start Time	(PDT)	0905	1000	1045	1125
Duration	(Min)	45	36	30	27
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	21.3	20.6	19.8	19.0
W. Long	(Deg)	130	130	130	129
	(Min)	02.7	01.6	00.8	59.9
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	20.7	20.0	19.3	18.7
W. Long	(Deg)	130	130	130	129
	(Min)	01.8	01.1	00.1	58.4
Tow Distance	(km)	2.9	1.8	1.5	2.4
Direction	(Deg.True)	170	180	170	170
Vessel Speed	(kt)	2.0	2.5	2.5	2.4
Bottom Depth	(m)	283- 270	268- 267	267- 261	263- 263
Modal Depth	(m)	277	268	264	263
Net Events					
2nd Net Open					
Time	(PDT)	0916	1011	1053	1130
Depth	(m)	205	140	105	47
3rd Net Open					
Time	(PDT)	0933	1027	1109	1146
Depth	(m)	230	160	75	60
Flowmeter Readings					
Start	Net 1	378331	384855	387118	395763
	Net 2	029500	034269	039595	045158
	Net 3	160541	164672	176767	186565
Finish	Net 1	384855	387118	395763	403878
	Net 2	034269	039595	045158	051618
	Net 3	164612	176767	186565	200825
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		26	27	28	29
Date		Mar 15	Mar 16	Mar 16	Mar 17
Station No.		C300	A400	A400	B400
Start Time	(PDT)	1200	2045	2224	0026
Duration	(Min)	20	87	27	81
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	18.5	38.2	36.2	28.3
W. Long	(Deg)	129	130	130	130
	(Min)	58.3	09.2	07.7	09.2
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	18.1	36.4	35.7	26.8
W. Long	(Deg)	129	130	130	130
	(Min)	57.8	08.2	06.2	05.2
Tow Distance	(km)	1.5	4.0	1.8	5.1
Direction	(Deg.True)	170	180	130	120
Vessel Speed	(kt)	2.2	2.4	2.1	2.3
Bottom Depth	(m)	261- 263	477- 559	590- 606	402- 863
Modal Depth	(m)	262	518	598	633
Net Events					
2nd Net Open					
Time	(PDT)	1204	2122	2228	0059
Depth	(m)	26	300	48	245
3rd Net Open					
Time	(PDT)	1219	2139	2244	0117
Depth	(m)	35	400	53	219
Flowmeter Readings					
Start	Net 1	403878	412320	495136	510690
	Net 2	051618	058297	072588	094878
	Net 3	200825	210263	269372	290431
Finish	Net 1	412785	495136	510690	591774
	Net 2	058285	072588	094878	138456
	Net 3	210429	269372	290431	333997
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		30	31	32	33
Date		Mar 17	Mar 17	Mar 17	Mar 17
Station No.		B400	B300	B300	B200
Start Time	(PDT)	0205	0424	0605	0748
Duration	(Min)	28	71	27	43
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	26.4	28.9	29.7	32.9
W. Long	(Deg)	130	130	130	129
	(Min)	04.3	04.2	00.4	54.4
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	25.8	28.8	29.9	31.1
W. Long	(Deg)	130	130	129	129
	(Min)	03.1	00.8	59.0	54.9
Tow Distance	(km)	1.8	4.4	1.6	1.8
Direction	(Deg.True)	130	040	120	190
Vessel Speed	(kt)	2.0	2.3	2.2	2.2
Bottom Depth	(m)	689- 580	330- 420	360- 375	205- 218
Modal Depth	(m)	635	375	368	212
Net Events					
2nd Net Open					
Time	(PDT)	0212	0453	0610	0759
Depth	(m)	50	208	60	121
3rd Net Open					
Time	(PDT)	0228	0511	0625	0815
Depth	(m)	50	245	60	113
Flowmeter Readings					
Start	Net 1	591774	627142	696287	722886
	Net 2	138546	140806	178818	189108
	Net 3	333997	347697	396427	405584
Finish	Net 1	627142	696287	722886	768296
	Net 2	140806	178818	189108	223019
	Net 3	347697	396427	405584	425855
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		35	37	38	39
Date		Mar 17	Mar 17	Mar 17	Mar 17
Station No.		B200	C200	C200	C100
Start Time	(PDT)	0906	1205	1303	1528
Duration	(Min)	24	50	27	28
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	29.8	22.8	23.1	28.8
W. Long	(Deg)	129	129	129	129
	(Min)	55.6	46.0	48.6	28.4
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	29.3	23.0	23.1	28.7
W. Long	(Deg)	129	129	129	129
	(Min)	56.0	48.2	49.7	27.7
Tow Distance	(km)		3.3	1.5	1.5
Direction (Deg.True)		190	280	280	280
Vessel Speed	(kt)	2.4	2.2	2.0	1.8
Bottom Depth	(m)	221- 238	212- 218	217- 222	105- 112
Modal Depth	(m)	230	215	220	109
Net Events					
2nd Net Open					
Time	(PDT)	0909	1225	1309	1538
Depth	(m)	52	140	50	73
3rd Net Open					
Time	(PDT)	0914	1240	1325	1553
Depth	(m)	56	140	54	84
Flowmeter Readings					
Start	Net 1	768296	789745	836310	854771
	Net 2	223019	233760	258586	277538
	Net 3	425855	434147	454171	463767
Finish	Net 1	789745	836310	854771	873642
	Net 2	233760	258586	277538	281318
	Net 3	434147	454171	463767	463885
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		40	42	43	44
Date		Mar 17	Mar 17	Mar 17	Mar 17
Station No.		C100	B100	B100	A300
Start Time	(PDT)	1606	1857	1931	2130
Duration	(Min)	23	27	24	60
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	28.6	41.5	40.8	48.1
W. Long	(Deg)	129	129	129	129
	(Min)	30.0	32.5	34.4	45.5
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	28.2	40.9	40.2	47.5
W. Long	(Deg)	129	129	129	129
	(Min)	30.9	34.0	35.8	48.4
Tow Distance	(km)	0.8	1.5	1.8	3.7
Direction (Deg.True)		280	240	240	235
Vessel Speed	(kt)	1.2	1.8	1.6	2.2
Bottom Depth	(m)	115- 115	108- 112	114- 121	305- 313
Modal Depth	(m)	115	110	118	309
Net Events					
2nd Net Open					
Time	(PDT)	1608	1902	1933	2150
Depth	(m)	52	71	52	248
3rd Net Open					
Time	(PDT)	1624	1917	1949	2207
Depth	(m)	54	61	48	230
Flowmeter Readings					
Start	Net 1	873642	889781	808896	924710
	Net 2	281318	286111	287932	291014
	Net 3	463885	464169	473397	484610
Finish	Net 1	889781	908896	924710	988551
	Net 2	286111	287932	291014	318825
	Net 3	464169	473397	484610	496077
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		45	48	49	51
Date		Mar 17	Mar 18	Mar 18	Mar 18
Station No.		A300	A200	A200	D100
Start Time	(PDT)	2240	0153	0247	0815
Duration	(Min)	45	44	25	36
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	47.4	58.1	58.4	27.5
W. Long	(Deg)	129	129	129	128
	(Min)	48.4	22.7	24.8	50.1
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	47.9	58.3	58.6	26.9
W. Long	(Deg)	129	129	129	128
	(Min)	47.0	24.4	25.6	52.2
Tow Distance	(km)	1.8	2.2	1.3	1.8
Direction (Deg.True)		065	280	290	230
Vessel Speed	(kt)	2.2	1.8	1.8	2.2
Bottom Depth	(m)	316- 311	205- 211	211- 213	119- 132
Modal Depth	(m)	314	208	212	126
Net Events					
2nd Net Open					
Time	(PDT)	2244	0205	0253	0822
Depth	(m)	49	170	50	65
3rd Net Open					
Time	(PDT)	2259	0219	0307	0839
Depth	(m)	46	141	51	56
Flowmeter Readings					
Start	Net 1	988551	008089	045321	063143
	Net 2	318825	341164	360754	366943
	Net 3	496077	498919	504474	508574
Finish	Net 1	008089	045321	063143	089860
	Net 2	341164	360754	366943	884576
	Net 3	498919	504474	508574	518217
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		52	53	54	57
Date		Mar 18	Mar 18	Mar 18	Mar 18
Station No.		D100	D200	D200	D300
Start Time	(PDT)	0855	1030	1125	1331
Duration	(Min)	25	45	28	107
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	26.9	23.8	23.0	16.5
W. Long	(Deg)	128	128	129	129
	(Min)	52.4	59.2	00.7	16.3
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	27.1	23.0	23.6	15.9
W. Long	(Deg)	128	129	128	129
	(Min)	51.2	00.9	59.3	18.6
Tow Distance	(km)	2.7	3.1	1.5	2.2
Direction (Deg.True)		090	230	080	240
Vessel Speed	(kt)	2.2	2.2	2.2	1.7
Bottom Depth	(m)	134- 128	201- 214	215- 208	285- 287
Modal Depth	(m)	131	208	212	286
Net Events					
2nd Net Open					
Time	(PDT)	0859	1040	1130	1448
Depth	(m)	47	140	45	226
3rd Net Open					
Time	(PDT)	0915	1059	1145	1503
Depth	(m)	58	150	64	210
Flowmeter Readings					
Start	Net 1	089860	109113	144954	168309
	Net 2	384576	399269	433422	451048
	Net 3	518217	521483	522579	525418
Finish	Net 1	109113	144954	168309	217606
	Net 2	399269	433422	451048	457610
	Net 3	521483	522579	525418	536995
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		58	59	60	61
Date		Mar 18	Mar 18	Mar 18	Mar 18
Station No.		D300	E100	E100	E200
Start Time	(PDT)	1529	1813	1846	2150
Duration	(Min)	23	25	23	35
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	15.7	08.6	08.2	00.1
W. Long	(Deg)	129	128	128	129
	(Min)	19.2	50.4	52.1	23.9
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	15.5	08.3	07.9	00.1
W. Long	(Deg)	129	128	128	129
	(Min)	20.4	51.7	53.2	25.3
Tow Distance	(km)	1.0	1.3	1.3	2.5
Direction (Deg.True)		240	240	240	245
Vessel Speed	(kt)	1.2	1.9	2.0	2.2
Bottom Depth	(m)	287- 288	099- 100	100- 102	200- 209
Modal Depth	(m)	288	100	101	205
Net Events					
2nd Net Open					
Time	(PDT)	1532	1818	1849	2159
Depth	(m)	57	75	55	150
3rd Net Open					
Time	(PDT)	1546	1833	1903	2216
Depth	(m)	57	66	55	130
Flowmeter Readings					
Start	Net 1	217606	237912	257451	280901
	Net 2	457610	462789	466098	471885
	Net 3	536995	541065	544699	551465
Finish	Net 1	237912	257451	280901	322893
	Net 2	462789	466098	471885	477426
	Net 3	541065	544699	551465	561071
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		62	64	65	67
Date		Mar 18	Mar 19	Mar 19	Mar 22
Station No.		E200	D400	D400	A2000
Start Time	(PDT)	2238	1950	2105	0110
Duration	(Min)	27	62	25	96
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	00.1	07.3	06.6	26.2
W. Long	(Deg)	129	129	129	130
	(Min)	25.0	42.7	46.5	41.0
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	00.7	06.5	06.9	26.0
W. Long	(Deg)	129	129	129	130
	(Min)	23.2	46.3	45.3	44.2
Tow Distance	(km)	1.8	4.0	1.8	4.0
Direction (Deg.True)		090	260	070	275
Vessel Speed	(kt)	2.3	2.2	2.0	1.4
Bottom Depth	(m)	208- 200	397- 568	546- 485	1800-1800
Modal Depth	(m)	204	483	516	1800
Net Events					
2nd Net Open					
Time	(PDT)	2242	2009	2110	0156
Depth	(m)	50	220	54	612
3rd Net Open					
Time	(PDT)	2257	2027	2124	0210
Depth	(m)	53	220	54	619
Flowmeter Readings					
Start	Net 1	322893	368507	432779	450893
	Net 2	477426	482637	510285	528025
	Net 3	551465	566609	595745	604955
Finish	Net 1	368502	432779	450893	512838
	Net 2	482637	510285	528025	533306
	Net 3	566610	595745	604955	636272
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		68	70	71	73
Date		Mar 22	Mar 22	Mar 22	Mar 22
Station No.		A2000	C2000	C2000	E2000
Start Time	(PDT)	0257	0702	0930	1355
Duration	(Min)	23	133	25	122
Start N. Lat.	(Deg)	51	51	51	50
	(Min)	26.1	06.7	07.0	48.9
W. Long	(Deg)	130	130	130	129
	(Min)	44.7	28.8	34.5	55.3
Finish N. Lat.	(Deg)	51	51	51	50
	(Min)	26.3	07.0	07.1	48.9
W. Long	(Deg)	130	130	130	130
	(Min)	45.8	34.8	33.1	00.3
Tow Distance	(km)	1.1	6.6	1.8	5.5
Direction	(Deg.True)	290	260	090	255
Vessel Speed	(kt)	1.3	2.0	2.0	1.6
Bottom Depth	(m)	1800-1800		2000-2000	1800-1800
Modal Depth	(m)	1800	2000	2000	1800
Net Events					
2nd Net Open					
Time	(PDT)	0302	0801	0935	1446
Depth	(m)	50	595	45	622
3rd Net Open					
Time	(PDT)	0317	0819	0950	1501
Depth	(m)	54	595	48	601
Flowmeter Readings					
Start	Net 1	512838	555181	676630	694586
	Net 2	533306	539906	556302	572215
	Net 3	636272	638419	684686	667547
Finish	Net 1	535181	676630	694586	808663
	Net 2	539906	556302	572215	582885
	Net 3	638419	684686	687547	716854
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		74	76	77	79
Date		Mar 22	Mar 22	Mar 22	Mar 23
Station No.		E2000	E300	E300	C300
Start Time	(PDT)	1607	1906	2016	0023
Duration	(Min)	30	64	29	23
Start N. Lat.	(Deg)	50	50	50	51
	(Min)	48.8	53.5	51.1	18.5
W. Long	(Deg)	130	129	129	130
	(Min)	00.8	39.4	39.1	01.7
Finish N. Lat.	(Deg)	50	50	50	51
	(Min)	48.6	51.4	51.0	19.2
W. Long	(Deg)	130	129	129	130
	(Min)	02.3	38.8	40.8	02.6
Tow Distance	(km)	1.6	3.7	1.8	1.3
Direction (Deg.True)		255	180	270	315
Vessel Speed	(kt)	1.8	1.8	2.2	2.0
Bottom Depth	(m)		310- 857	857- 857	294- 308
Modal Depth	(m)		584	857	301
Net Events					
2nd Net Open					
Time	(PDT)	1610	1929	2021	0028
Depth	(m)	49	225	53	24
3rd Net Open					
Time	(PDT)	1625	1945	2036	0044
Depth	(m)	49	230	53	34
Flowmeter Readings					
Start	Net 1	808663	827938	894712	915952
	Net 2	582885	598956	621284	638448
	Net 3	687547	721532	736429	744068
Finish	Net 1	827938	894712	915952	930188
	Net 2	598956	621284	638448	658985
	Net 3	721532	736429	744068	751937
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		80	81	82	83
Date		Mar 23	Mar 23	Mar 23	Mar 23
Station No.		C300	C300	C300	C300
Start Time	(PDT)	0100	0135	0220	0358
Duration	(Min)	25	35	47	55
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	18.9	18.3	17.4	16.3
W. Long	(Deg)	130	130	130	130
	(Min)	02.5	01.5	00.3	00.4
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	18.5	17.6	16.3	17.3
W. Long	(Deg)	130	130	129	130
	(Min)	01.8	00.6	59.0	02.2
Tow Distance	(km)	1.3	2.2	2.6	2.2
Direction (Deg.True)		135	135	135	320
Vessel Speed	(kt)	1.8	1.9	2.0	1.7
Bottom Depth	(m)	305- 297	294- 288	291- 286	339- 340
Modal Depth	(m)	301	291	289	340
Net Events					
2nd Net Open					
Time	(PDT)	0105	0143	0232	0411
Depth	(m)	60	94	147	167
3rd Net Open					
Time	(PDT)	0120	0159	0248	0428
Depth	(m)	53	90	152	199
Flowmeter Readings					
Start	Net 1	930188	955593	987578	029932
	Net 2	658985	662908	682039	697623
	Net 3	751937	757815	772719	791708
Finish	Net 1	955593	987578	029932	089382
	Net 2	662908	682039	697623	705306
	Net 3	757815	772719	791708	810846
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		84	85	86	87
Date		Mar 23	Mar 23	Mar 23	Mar 23
Station No.		C300	C300	C300	C300
Start Time	(PDT)	0730	0800	0841	0928
Duration	(Min)	24	27	47	49
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	14.3	15.3	16.8	18.4
W. Long	(Deg)	129	129	130	130
	(Min)	58.7	59.7	00.8	02.5
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	15.0	16.3	18.1	20.0
W. Long	(Deg)	129	130	130	130
	(Min)	59.5	00.4	00.2	04.4
Tow Distance	(km)	1.8	1.8	2.6	3.3
Direction	(Deg.True)	350	350	350	350
Vessel Speed	(kt)	3.0	2.2	2.3	2.2
Bottom Depth	(m)	355- 335	332- 333	308- 317	319- 397
Modal Depth	(m)	345	333	313	358
Net Events					
2nd Net Open					
Time	(PDT)	0732	0805	0851	0944
Depth	(m)	25	42	115	150
3rd Net Open					
Time	(PDT)	0749	0820	0907	1000
Depth	(m)	19	46	115	150
Flowmeter Readings					
Start	Net 1	089382	123591	145400	179993
	Net 2	705306	711505	739889	759037
	Net 3	810846	817360	832981	852351
Finish	Net 1	123591	145400	179993	225800
	Net 2	711505	739889	759037	791554
	Net 3	817360	832981	852351	870010
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		88	89	90	92
Date		Mar 23	Mar 26	Mar 26	Mar 26
Station No.		C300	C300	C300	C300
Start Time	(PDT)	1120	1624	1658	2010
Duration	(Min)	57	26	77	62
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	17.8	17.0	18.3	20.4
W. Long	(Deg)	130	130	130	130
	(Min)	02.7	00.0	01.4	02.3
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	19.4	18.0	21.3	18.3
W. Long	(Deg)	130	130	130	130
	(Min)	05.4	01.1	03.5	01.3
Tow Distance	(km)	3.3	1.8	4.6	4.8
Direction (Deg.True)		335	320	320	170
Vessel Speed	(kt)	2.0	2.0	2.1	2.6
Bottom Depth	(m)	?- 500	294- 288	286- 340	286- 290
Modal Depth	(m)		291	313	288
Net Events					
2nd Net Open					
Time	(PDT)	1140	1630	1718	2030
Depth	(m)	181	45	200	200
3rd Net Open					
Time	(PDT)	1158	1645	1735	2047
Depth	(m)	169	45	218	200
Flowmeter Readings					
Start	Net 1	225800	280613	299442	389959
	Net 2	791554	825856	843920	873016
	Net 3	870010	897700	908634	941672
Finish	Net 1	280551	299442	389959	454985
	Net 2	825815	843920	873016	896647
	Net 3	897859	908634	941672	976556
Remarks					

Appendix Table 2. (continued)

Plankton Tow No.		93	94	95	96
Date		Mar 26	Mar 26	Mar 26	Mar 27
Station No.		C300	C300	C300	C300
Start Time	(PDT)	2120	2236	2321	2356
Duration	(Min)	66	38	25	21
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	17.9	15.6	16.8	17.6
W. Long	(Deg)	130	130	130	129
	(Min)	01.2	00.3	00.0	59.9
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	15.7	16.6	17.4	18.1
W. Long	(Deg)	130	130	129	130
	(Min)	00.5	00.0	59.9	00.1
Tow Distance	(km)	4.4	1.8	1.3	1.3
Direction	(Deg.True)	170	340	340	340
Vessel Speed	(kt)	2.5	2.0	2.0	2.0
Bottom Depth	(m)	294- 346	340- 307	296- 283	279- 277
Modal Depth	(m)	320	324	290	278
Net Events					
2nd Net Open					
Time	(PDT)	2141	2246	2326	2359
Depth	(m)	148	86	49	22
3rd Net Open					
Time	(PDT)	2157	2302	2341	0014
Depth	(m)	137	96	59	22
Flowmeter Readings					
Start	Net 1	454985	515652	548191	568930
	Net 2	896647	927098	930316	938525
	Net 3	976556	1018538	1029886	1038075
Finish	Net 1	515652	548191	568930	590971
	Net 2	927098	930316	938525	946726
	Net 3	1018538	1029886	1038075	1044947
Remarks					

Appendix Table 3. Bridge logs for neuston net tows, R/V W.E. RICKER, Pacific ocean perch larval survey, March 11-29, 1991.

Plankton Tow No.		1	7	13	14
Date		Mar 13	Mar 14	Mar 15	Mar 15
Station No.		C300	C300	C300	C300
Start Time	(PDT)	1850	1915	0048	0110
Duration	(Min)	17	17	17	18
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	16.2	16.4	16.8	17.4
W. Long	(Deg)	129	129	129	129
	(Min)	57.5	59.2	58.4	59.7
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	15.8	17.3	17.2	17.8
W. Long	(Deg)	129	129	129	130
	(Min)	56.9	59.0	59.3	00.5
Tow Distance	(km)	1.5	1.8	1.5	1.3
Direction (Deg.True)		165	320	300	300
Vessel Speed	(kt)	2.2	3.5	3.5	3.5
Bottom Depth	(m)	278- 275	276- 276	270- 270	272- 274
Modal Depth	(m)	277	276	270	273
Flowmeter Readings					
Start		883067	944362		
Finish		944359	996477		
Remarks				Lights on	

Appendix Table 3. (continued)

Plankton Tow No.		20	34	36	41
Date		Mar 15	Mar 17	Mar 17	Mar 17
Station No.		C300	B200	C200	B100
Start Time	(PDT)	0638	0836	1140	1834
Duration	(Min)	17	20	17	17
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	16.7	30.9	22.4	42.0
W. Long	(Deg)	129	129	129	129
	(Min)	59.4	55.0	44.6	31.1
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	16.6	30.1	22.7	41.6
W. Long	(Deg)	129	129	129	129
	(Min)	58.6	55.4	45.6	32.3
Tow Distance	(km)	1.3	1.8	1.3	1.1
Direction (Deg.True)		120	190	280	240
Vessel Speed	(kt)	2.7	3.0	3.0	2.0
Bottom Depth	(m)	276- 271		207- 204	102- 107
Modal Depth	(m)	274		206	105
Flowmeter Readings					
Start		126029	192366	248150	322585
Finish		185348	247978	322565	372717
Remarks					

Appendix Table 3. (continued)

Plankton Tow No.		46	47	50	55
Date		Mar 17	Mar 18	Mar 18	Mar 18
Station No.		A300	A200	D100	D200
Start Time	(PDT)	2311	0128	0755	1201
Duration	(Min)	17	17	15	15
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	48.0	57.9	28.0	23.7
W. Long	(Deg)	129	129	128	128
	(Min)	46.6	21.0	48.4	58.7
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	48.4	58.1	27.6	24.0
W. Long	(Deg)	129	129	128	128
	(Min)	45.4	22.2	49.7	57.3
Tow Distance	(km)	1.8	1.5	1.8	1.3
Direction (Deg.True)		080	280	235	080
Vessel Speed	(kt)	2.8	3.1	3.0	3.3
Bottom Depth	(m)		199- 205		202- 195
Modal Depth	(m)		202		199
Flowmeter Readings					
Start		372714	442192	510067	576967
Finish		442192	510154	576967	642504
Remarks					

Appendix Table 3. (continued)

Plankton Tow No.		56	63	66	69
Date		Mar 18	Mar 19	Mar 22	Mar 22
Station No.		D300	D400	A2000	C2000
Start Time	(PDT)	1410	1919	0045	0636
Duration	(Min)	16	16	17	21
Start N. Lat.	(Deg)	51	51	51	51
	(Min)	16.0	06.7	26.3	06.5
W. Long	(Deg)	129	129	130	130
	(Min)	17.5	40.4	39.5	26.6
Finish N. Lat.	(Deg)	51	51	51	51
	(Min)	16.4	07.1	26.2	06.7
W. Long	(Deg)	129	129	130	130
	(Min)	16.2	41.6	40.8	28.4
Tow Distance	(km)	1.6	1.3	1.6	1.8
Direction (Deg.True)		070	070	275	280
Vessel Speed	(kt)	3.3	2.5	3.3	3.4
Bottom Depth	(m)	287- 285	450- 441	1800+	1800+
Modal Depth	(m)	286	446	1800+	1800+
Flowmeter Readings					
Start		642504	712718	323980	832138
Finish		712723	767310	498793	920210
Remarks					

Appendix Table 3. (continued)

Plankton Tow No.		72	75	78	91
Date		Mar 22	Mar 22	Mar 23	Mar 26
Station No.		E2000	E300	C300	C300
Start Time	(PDT)	1335	1845	0008	1935
Duration	(Min)	15	16	10	23
Start N. Lat.	(Deg)	50	50	51	51
	(Min)	49.7	54.6	17.8	21.7
W. Long	(Deg)	129	129	130	130
	(Min)	53.7	39.5	00.7	03.1
Finish N. Lat.	(Deg)	50	50	51	51
	(Min)	49.3	53.7	18.3	20.9
W. Long	(Deg)	129	129	130	130
	(Min)	54.8	39.5	01.4	02.7
Tow Distance	(km)	1.5	1.3	0.9	1.8
Direction (Deg.True)		230	180	315	180
Vessel Speed	(kt)	3.3	2.5	3.2	3.0
Bottom Depth	(m)	1800+	300- 490	288- 291	213- 298
Modal Depth	(m)	1800+	395	290	256
Flowmeter Readings					
Start		920204	540013	053150	098088
Finish		540012	053150	053388	158863
Remarks					

Appendix Table 3. (continued)

Plankton Tow No.		97
Date		Mar 27
Station No.		C300
Start Time	(PDT)	0030
Duration	(Min)	17
Start N. Lat.	(Deg)	51
	(Min)	18.5
W. Long	(Deg)	130
	(Min)	00.2
Finish N. Lat.	(Deg)	51
	(Min)	19.2
W. Long	(Deg)	130
	(Min)	00.6
Tow Distance	(km)	1.6
Direction	(Deg.True)	340
Vessel Speed	(kt)	3.3
Bottom Depth	(m)	275- 271
Modal Depth	(m)	273

Flowmeter Readings

Start	158860
Finish	217880

Remarks

Appendix Table 4. Temperature depth summary, R/V W.E. RICKER, Pacific ocean perch larval survey, March 11-29, 1991.

Station	C300	A400	B400	B300	B200
N Lat. (Deg.)	51	51	51	51	51
(Min.)	16.7	38.4	28.4	29.5	32.9
W Long. (Deg.)	129	130	130	130	129
(Min.)	59.2	08.7	09.6	04.0	54.4
Date	Mar 13	Mar 16	Mar 17	Mar 17	Mar 17
Time (PST)	1809	2019	0001	0336	0730
Depth (m)			Temp (°C)		
Surface	7.21	6.76	7.22	7.08	7.06
10	7.20	6.76	7.22	7.10	7.07
20	7.05	6.70	7.07	7.08	7.07
30	7.35	6.76	7.04	7.06	7.08
40	7.85	6.95	7.04	7.06	7.07
50	7.82	6.99	7.03	7.10	7.08
60	7.82	7.07	7.17	7.24	7.08
70	7.49	7.23	7.43	7.51	7.18
80	7.41	7.39	7.51	7.48	7.30
90	7.30	7.37	7.53	7.45	7.43
100	7.57	7.31	7.64	7.41	7.59
110	7.76	7.31	7.48	7.36	7.58
120	7.80	7.30	7.45	7.24	7.29
130	7.74	7.21	7.27	7.17	7.28
140	7.68	7.00	7.10	7.08	7.14
150	7.62	6.89	7.10	7.06	7.12
160	7.51	6.86	6.95	7.03	7.02
170	7.40	6.86	7.17	6.95	7.00
180	7.23	6.81	6.83	6.95	
190	7.17	6.76	6.71	6.93	
200	7.00	6.73	6.69	6.94	
210	7.00	6.73	6.65	6.94	
220	6.89	6.74	6.57	6.81	
230	6.88	6.72	6.50	6.80	
240	6.83	6.62	6.42	6.73	
250	6.73	6.53	6.41	6.73	
260		6.48	6.37		
270		6.40	6.27		
280		6.31	6.24		
290		6.27	6.20		
300		6.21	6.14		
310		6.11	6.11		
320		5.99	6.08		
330		5.99	6.06		
340		5.99	6.04		
350		6.00	5.99		
360		6.01	5.91		
370		5.98	5.69		
Last Reading					
Temp (°C)	6.70	5.92	5.69	6.73	6.99
Depth (m)	253	375	379	256	275

Appendix Table 4. (continued)

Station	C200	C100	B100	A300	A200
N Lat. (Deg.)	51	51	51	51	51
(Min.)	22.4	28.9	42.2	48.3	58.0
W Long. (Deg.)	129	129	129	129	129
(Min.)	44.5	28.1	30.5	45.1	20.5
Date	Mar 17	Mar 17	Mar 17	Mar 17	Mar 18
Time (PST)	1124	1514	1818	2113	0114
Depth (m)			Temp (°C)		
Surface	7.70	7.62	7.45	6.92	6.84
10	7.49	7.43	7.31	6.93	6.83
20	7.47	7.38	7.33	6.75	6.75
30	7.44	7.31	7.31	6.73	6.79
40	7.40	7.38	7.33	6.69	7.04
50	7.55	7.40	7.27	6.80	6.87
60	7.36	7.38	7.23	6.82	7.27
70	7.70	7.78	7.26	6.83	7.20
80	7.81			7.26	7.26
90	7.81			7.22	7.30
100	7.72			7.29	7.28
110	7.78			7.00	7.20
120	7.77			7.07	7.07
130	7.70			7.21	7.04
140	7.64			7.09	6.86
150	7.56			7.07	6.77
160	7.30			6.95	6.72
170	7.16			7.03	6.70
180				6.94	
190				6.94	
200				6.96	
210				6.95	
220				6.86	
230				6.83	
240				6.69	
250				6.64	
260				6.54	
270				6.48	
280					
290					
300					
310					
320					
330					
340					
350					
360					
370					
Last Reading					
Temp (°C)	7.09	7.78	7.25	6.43	6.70
Depth (m)	179	76	74	278	170

Appendix Table 4. (continued)

Station	D100	D200	D300	E100	E200
N Lat. (Deg.)	51	51	51	51	51
(Min.)	28.2	23.8	15.9	08.7	00.1
W Long. (Deg.)	128	128	129	128	129
(Min.)	48.0	58.9	18.0	50.1	24.2
Date	Mar 18	Mar 18	Mar 18	Mar 18	Mar 18
Time (PST)	0742	1014	1354	1759	2132
Depth (m)			Temp (°C)		
Surface	7.17	7.41	7.61	7.90	7.71
10	7.17	7.40	7.61	7.84	7.71
20	7.02	7.36	7.66	7.77	7.73
30	6.99	7.37	7.66	7.73	7.75
40	6.97	7.39	7.57	7.77	7.77
50	6.99	7.73	7.49	7.76	7.74
60	7.26	7.79	7.50	7.75	7.89
70	7.49	7.87	7.46	7.71	7.78
80		7.79	7.38		7.45
90		7.78	7.63		7.65
100		7.77	7.71		7.80
110		7.61	7.71		7.82
120		7.65	7.73		7.76
130		7.65	7.63		7.79
140		7.61	7.52		7.73
150		7.50	7.39		7.78
160		7.40	7.35		7.77
170		7.36	7.31		7.74
180			7.23		
190			7.20		
200			7.12		
210			7.00		
220			7.00		
230			7.00		
240			7.00		
250			7.00		
260					
270					
280					
290					
300					
310					
320					
330					
340					
350					
360					
370					
Last Reading					
Temp (°C)	7.50	7.27	7.00	7.71	7.74
Depth (m)	72	173	252	73	174

Appendix Table 4. (continued)

Station	D400	A2000	C2000	E2000	E300
N Lat. (Deg.)	51	51	51	50	50
(Min.)	07.0	26.4	06.3	49.5	54.6
W Long. (Deg.)	129	130	130	129	129
(Min.)	40.0	39.7	26.5	53.0	39.7
Date	Mar 19	Mar 22	Mar 22	Mar 22	Mar 22
Time (PST)	1857	0004	0559	1301	1828
Depth (m)			Temp (°C)		
Surface	7.60	7.24	7.20	7.58	7.61
10	7.61	7.23	7.20	7.56	7.58
20	7.65	7.22	7.20	7.53	7.55
30	7.66	7.18	7.27	7.45	7.56
40	7.61	7.07	6.97	7.35	7.71
50	7.66	7.29	6.97	7.42	7.69
60	7.78	7.08	7.10	7.74	7.73
70	7.82	7.25	7.16	7.60	7.77
80	7.84	7.21	6.97	7.55	7.81
90	7.85	7.21	7.01	7.40	7.82
100	7.86	7.09	7.12	7.31	7.83
110	7.82	7.17	7.47	7.27	7.84
120	7.80	7.15	7.56	7.23	7.82
130	7.80	7.20	7.57	6.94	7.78
140	7.79	7.36	7.46	7.10	7.70
150	7.77	7.44	7.31	6.99	7.66
160	7.68	7.44	7.30	7.14	7.65
170	7.65	7.38	7.30	7.07	7.61
180	7.53	7.31	7.27	6.89	7.61
190	7.50	7.21	6.95	6.69	7.59
200	7.47	7.03	6.83	6.57	7.57
210	7.40	6.82	6.59	6.42	7.47
220	7.36	6.73	6.60	6.34	7.08
230	7.34	6.69	6.46	6.26	6.91
240	7.30	6.61	6.42	6.28	6.81
250	7.24	6.43	6.36	6.30	
260	7.21	6.39	6.21	6.27	
270	7.13	6.30	6.24	6.20	
280	7.10	6.20	6.20	6.16	
290	6.90	6.12	6.15	6.14	
300	6.88	6.08	6.06	6.05	
310	6.86	5.93	5.95	5.89	
320	6.81	5.92	5.89	5.69	
330	6.77	5.89	5.82	5.61	
340	6.63	5.86	5.70	5.71	
350	6.58	5.82	5.48	5.61	
360	6.03	5.71	5.30	5.59	
370		5.69	5.13	5.56	
380		5.65	4.93	5.53	
390		5.62	5.02	5.46	
400		5.59	4.96	5.34	

Appendix Table 4. (continued)

Station	D400	A2000	C2000	E2000	E300
N Lat. (Deg.)	51	51	51	50	50
(Min.)	07.0	26.4	06.3	49.5	54.6
W Long. (Deg.)	129	130	130	129	129
(Min.)	40.0	39.7	26.5	53.0	39.7
Date	Mar 19	Mar 22	Mar 22	Mar 22	Mar 22
Time (PST)	1857	0004	0559	1301	1828
Depth (m)		Temp (°C)			
410		5.53	4.90	5.29	
420		5.43	4.87	5.21	
430		5.35	4.89	5.19	
440		5.29	4.99	5.11	
450		5.24	4.93	5.10	
460		5.19	4.97	5.06	
470		5.12	4.93	5.05	
480		5.08	4.91	5.02	
490		5.07	4.93	4.98	
500		4.98	4.91	4.94	
510		4.95	4.82	4.89	
520		4.93	4.76	4.83	
530		4.90	4.72	4.80	
540		4.87	4.65	4.78	
550		4.82	4.60	4.73	
560		4.72	4.61	4.62	
570		4.67	4.45	4.55	
580		4.59	4.35	4.51	
590		4.56	4.36	4.48	
600		4.54	4.24	4.50	
610		4.46	4.35	4.49	
620		4.47	4.33	4.43	
630		4.47	4.30	4.39	
640		4.44	4.28	4.37	
650		4.35	4.25	4.35	
660		4.34	4.22	4.31	
670		4.32	4.17	4.30	
680		4.30	4.09	4.26	
690		4.27	4.04	4.23	
700		4.25	4.00	4.19	
710		4.23	3.96	4.16	
720		4.19	3.95	4.12	
730		4.13	3.89	4.08	
740		4.06	3.85	4.06	
750		4.04	3.83	4.01	
760		4.00	3.87	4.00	
770		3.95	3.86	4.00	
780		3.94	3.84	3.97	
790		3.94	3.82	3.96	
800		3.91	3.80	3.93	

Appendix Table 4. (continued)

Station	D400	A2000	C2000	E2000	E300
N Lat. (Deg.)	51	51	51	50	50
(Min.)	07.0	26.4	06.3	49.5	54.6
W Long. (Deg.)	129	130	130	129	129
(Min.)	40.0	39.7	26.5	53.0	39.7
Date	Mar 19	Mar 22	Mar 22	Mar 22	Mar 22
Time (PST)	1857	0004	0559	1301	1828
Depth (m)		Temp (°C)			
810		3.91	3.76	3.90	
820		3.90	3.74	3.88	
830		3.87	3.73	3.86	
840		3.86	3.72	3.84	
850		3.84	3.70	3.80	
860		3.81	3.69	3.78	
870		3.78	3.68	3.75	
880		3.77	3.67		
890		3.73	3.62		
900		3.72	3.60		
910		3.70	3.56		
920		3.68	3.53		
930		3.66	3.50		
940		3.64	3.48		
950		3.63	3.46		
960		3.60	3.46		
970		3.57	3.43		
980		3.56	3.42		
990		3.56	3.40		
Last Reading					
Temp (°C)	5.68	3.55	3.38	3.75	6.81
Depth (m)	368	1000	1000	872	244

Appendix Table 4. (continued)

Station	C300	C300
N Lat. (Deg.)	51	51
(Min.)	17.5	21.7
W Long. (Deg.)	130	130
(Min.)	00.1	03.7
Date	Mar 22	Mar 26
Time (PST)	2349	1829

Depth (m)	Temp (°C)	
Surface	7.43	7.34
10	7.51	7.34
20	7.42	7.33
30	7.42	7.29
40	7.32	7.21
50	7.30	7.14
60	7.31	7.06
70	7.34	6.84
80	7.53	7.04
90	7.55	7.39
100	7.76	7.40
110	7.79	7.50
120	7.70	7.69
130	7.66	7.64
140	7.54	7.58
150	7.51	7.55
160	7.41	7.49
170	7.27	7.47
180	7.23	7.46
190	7.09	7.41
200	7.05	7.21
210	7.01	7.12
220	6.93	7.09
230	6.80	7.04
240	6.74	6.86
250	6.66	6.80
260		6.77
270		6.66
280		6.80
290		6.77
300		6.54
310		6.50
320		6.40
330		6.31
340		6.30
350		6.23
360		6.11
370		6.04

Last Reading		
Temp (°C)	6.61	5.95
Depth (m)	257	380

Appendix Table 5. Common and scientific names of fishes captured by conventional bottom and midwater trawls, R/V W.E. RICKER, Pacific ocean perch larval survey, March 11-29, 1991.

Rockfish	
Pacific ocean perch	*Sebastes alutus*
Redbanded rockfish	*S. babcocki*
Silvergray rockfish	*S. brevispinis*
Darkblotched rockfish	*S. crameri*
Splitnose rockfish	*S. diploproa*
Greenstriped rockfish	*S. elongatus*
Yellowtail rockfish	*S. flavidus*
Rosethorn rockfish	*S. helvomaculatus*
Bocaccio	*S. paucispinis*
Canary rockfish	*S. pinniger*
Redstripe rockfish	*S. proriger*
Yellowmouth rockfish	*S. reedi*
Yelloweye rockfish	*S. ruberrimus*
Sharpchin rockfish	*S. zacentrus*
Shortspine thornyhead	*Sebastolobus alascanus*
Flatfish	
Arrowtooth flounder	*Atheresthes stomias*
Petrale sole	*Eopsetta jordani*
Rex sole	*Glyptocephalus zachirus*
Flathead sole	*Hippoglossoides elassodon*
Dover sole	*Microstomus pacificus*
English sole	*Parophrys vetulus*
Selachii	
Spotted ratfish	*Hydrolagus colliei*
Big skate	*Raja binoculata*
Longnose skate	*R. rhina*
Starry skate	*R. stellulata*
Spiny dogfish	*Squalus acanthias*
Other Groundfish	
Sablefish	*Anoplopoma fimbria*
Pacific cod	*Gadus macrocephalus*
Lingcod	*Ophiodon elongatus*
Walleye pollock	*Theragra chalcogramma*
Other fish	
Whitebait smelt	*Allosmerus elongatus*
American shad	*Alosa sapidissima*
Pacific herring	*Clupea pallasi*
Bigfin eelpout	*Lycodes cortezianus*
Chinook salmon	*Oncorhynchus tshawytscha*