Central Coast Juvenile Herring Survey, August 2009

M. Thompson, C. Fort, and T.W. Therriault

Fisheries and Oceans Canada
Science Branch, Pacific Region
Pacific Biological Station
Nanaimo, British Columbia
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M. Thompson, C. Fort, and T.W. Therriault

Fisheries and Oceans Canada
Science Branch, Pacific Region
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V9T 6N7

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ABSTRACT

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In 2009, a Central Coast juvenile herring survey was conducted from August 9-21. Sixty sets were made at 13 locations within Statistical Management Areas 6, 7, 8 and 9. The study area extended from Meyers Passage in the north to Rivers Inlet in the south. The survey serves to address information gaps on the distribution, abundance, size and feeding habits of juvenile herring in these nearshore, northern waters.

Fourteen species of fish were identified in all purse seine catches with Pacific herring (*Clupea pallasi*) being the most frequently encountered species. A total of 4669 herring were measured resulting in a length frequency distribution that was distinctly bimodal representing age-0+ and age-1+ fish. Age-0+, age-1+, and age-2+ or older herring occurred in 65.0, 80.0, and 40.0% of the sets, respectively. Two oblique plankton tows were performed at each of the 13 locations resulting in a total of 26 tows during the survey. *Acartia longimeres*, larval euphausiids and *Pseudocalanus sp.* occurred in all samples, and *Acartia longimeres* and *Pseudocalanus sp.* showed up in the largest biomass. Twenty-six CTD casts also were performed during the survey to document oceanographic conditions.

RÉSUMÉ

Thompson, M., Fort, C., and Therriault, T.W. 2010. Central Coast juvenile herring survey, August 2009. Can. Manuscr. Rep. Fish. Aquat. Sci. 2939: vi + 54 p.

En 2009, une campagne de recensement portant sur les stocks de harengs juvéniles de la partie centrale de la côte a été effectuée entre le 9 et le 21 août. Au total, 60 traits de senne ont été réalisés à 13 endroits différents des zones de gestion statistiques 6, 7, 8 et 9. Le secteur couvert s'étendait du passage Meyers, au nord, à l'inlet Rivers, au sud. Le relevé vise à combler les lacunes dans les données sur la répartition, l'abondance, la taille et les habitudes alimentaires des harengs juvéniles dans ces eaux littorales du nord.

En tout, 14 espèces de poissons ont été dénombrées dans les ponctions effectuées, le hareng du Pacifique (*Clupea pallasi*) étant l'espèce la plus souvent représentée, et 4669 harengs ont été mesurés. Les résultats indiquent une distribution nettement bimodale e la fréquence des longueurs, représentant la prédominance des individus d'âge 0+ et d'âge 1+. Les harengs des classes d'âge 0+, 1+ et 2+ correspondaient respectivement à 65,0 , 80,0 et 40,0 % des poissons récoltés dans les traits. Deux traits obliques de filets à plancton ont été effectués à chacun des 13 endroits, pour un total de 26 traits. *Acartia longimeres*, larvaire euphausiids et des *Pseudocalanus* sp. étaient présents dans tous les échantillons, alors que *Acartia longimeres* et des *Pseudocalanus* sp. constituaient la biomasse la plus élevée. Enfin, 26 profils verticaux de STD ont été réalisés en concomitance avec les opérations de recensement, pour documenter les conditions océanographiques.

INTRODUCTION

Pacific herring (*Clupea pallasi*) are an important commercial species and a vital forage fish for many marine mammals, birds and other fish in British Columbia's coastal waters. Herring spawn principally on marine vegetation in the subtidal and upper intertidal zone between February and June, with peak spawning between March and April (Humphreys and Hourston 1978). Larvae hatch in two to three weeks, and disperse with surface currents, metamorphosing into juvenile herring at a length of ~25mm (Hourston and Haegele 1980). Juvenile herring consist of two distinct age classes, age-0+ and age-1+, with recruitment for this species occurring at age 3 when they join the sexually mature spawning population (Hay and McCarter 1999). During daylight hours, juvenile herring congregate in schools, occasionally forming mixed aggregates with other pelagic species, close to shore near the bottom (Haegele 1997). At dusk, these fish migrate into surface waters to feed on plankton. During this time they are vulnerable to purse seine gear.

Relatively little is known about the distribution, abundance, size and feeding habits of juvenile herring in the Central Coast of British Columbia (Figure 1). In 2002-2004, and 2007-2009 juvenile herring surveys were designed to address information gaps and learn about the general biology of herring in this northern geographical area. The survey used an ecosystem based approach to biological sampling. Therefore, in addition to juvenile herring, all other fish species were retained for analyses. Also, plankton samples and oceanographic data samples were collected. This approach will potentially provide a better understanding of the role and relationships juvenile herring have in Central Coast waters, and may provide an empirical forecast of recruitment to the herring roe fishery based on relative juvenile abundance (Schweigert et. al. 2009).

METHODS

In 2009, the Central Coast juvenile herring survey was conducted from August 9-21. Sixty sets were made at 13 locations within Statistical Management Areas 6, 7, 8, and 9 (Table 1). The study area extended from Meyers Passage in the north to Rivers Inlet in the south (Figures 2 and 3). The 2009 set locations followed the 2007 survey (Thompson and Therriault 2009). The sampling sites originally were chosen based on known historical herring spawning sites, and represent both nearshore and open water habitats (Haegele and Armstrong 2003).

Fish Sampling

The 12 m, aluminum-hulled Fisheries Research Vessel *Walker Rock* was used for all fishing events. A 183 m long and 27 m deep purse seine net of knotless web, resulting in an area fished of ~2665 m^2, was used for all fishing events. The body of the net had 46 m of 22.2 mm mesh at the tow end followed by 91 m of 19.0 mm mesh, and the bunt end was 46 m of 9.5 mm mesh. The net fished to a depth of 10 m, and was able to retain fish greater than 20 mm in length. All sets were made after dusk when herring are feeding

near the surface. All sets were made “blind” at predetermined set locations. Five sets were completed per night for all locations. Four sets were cancelled in Kwakshua channel (set code 2) due to the onset of high winds and one set was cancelled in Kitasu Bay (set code 7) due to high winds. For most sets, it was possible to land the entire catch for biological sampling. On occasion, it was not practical to land a large set in its entirety, so sub-sampling was necessary. When sub-sampling was required, a herring bucket was filled with randomly selected fish and retained for biological sampling. Several dipnet samples from various parts of the net (catch) would be used to make up the random sub-sample. The remainder of the set was released over the corkline, its size estimated as the number of buckets released. The number of herring caught in each set was determined by multiplying the sub-sample herring weight and number by the number of estimated buckets released (total catch). The number of other species caught in the sub-sample was determined in the same manner (Table 2). All fish retained for sampling were weighed, bagged and preserved in a 3.7 % seawater formalin solution, with the exception of large predator species (e.g., adult salmon, dogfish and mackerel). These fish were individually weighed and measured in the field. Retained samples were taken back to the Pacific Biological Station for laboratory analysis.

From each set, 100 or more herring from each represented age-class and all other fish species caught were identified, weighed and measured. If the set contained less than 200 herring, then all herring were weighed and measured. Consistent with standard practices, herring were measured to standard length; salmon to fork length; dogfish, hake and pollock to total length. All other fish species were measured to standard length.

Plankton Sampling

Twenty-six stepped oblique plankton tows were performed during the survey (Figures 4 and 5). Two plankton samples were taken from each location, one sample "nearshore" and the other "offshore or channel". The tows were completed after dusk and immediately before fishing events. Dual 19 cm diameter bongo nets with 350 µm mesh were used for sampling, resulting in ‘left’ and ‘right’ bongo plankton samples (only left samples were processed). The bongos were lowered to 20m and raised by an electric winch at a rate of 1m every 15 seconds. A General Oceanics® 2030R model flowmeter was attached to the left bongo to determine the volume of seawater filtered. Volume filtered was calculated using the following equation (McCarter and Hay 2002):

$$\mathbf{V = (A \cdot F \cdot K) / 999{,}999}$$

Where:

V = volume of water filtered through the plankton net (m^3)
A = area of net opening (0.02835 m^2)
F = number of revolutions recorded by the flow meter (m)
K = standard speed rotor constant for 7cm rotor (26,873)

Upon retrieval, the bongo nets were washed with a high pressure deck hose, and the samples preserved in 3.7 % seawater formalin.

In the laboratory, a volumetric splitter was used to reduce the sample size to a point where organisms could be conveniently counted and identified in a counting tray using a stereo microscope under 30X magnification. Sample splitting continued until a target size of roughly 300 organisms was reached (Thompson et al. 2003).

When possible, plankters were identified to the lowest taxonomic level. Copepods were identified to species. Densities for all plankters were determined and expressed as plankters $\cdot$ m^{-3}.

CTD Sampling

To characterize oceanographic conditions in the surveyed area, a total of 26 CTD (conductivity – temperature – density) casts were made using a RBR XR-620 (Figures 4 and 5). One CTD cast was performed at each location before plankton sampling. The CTD unit was weighted and lowered over the side of the vessel to within a few meters of the bottom to give the largest water profile possible. Descent rate of the CTD is close to 1 m/sec. Data was subsequently downloaded to a laptop computer from the CTD unit each evening.

RESULTS

Sixty sets were made during the 2009 survey; five in section 101 (Rivers Inlet), five in section 091 (Fish Egg Inlet), one in section 085 (Kwakshua Channel), five in section 076 (Kilditdt Sound), nine in section 067 (Kitasu Bay and Meyers Passage), five in section 077 (East Higgins Pass), ten in section 072 (Powell Anchorage and Spiller Channel), five in section 073 (Hunter Channel), five in section 084 (Burke Channel), and five in section 081 (Dean Channel). All set locations correspond to set locations used in the 2007 Central Coast survey (Figures 2 and 3, Table 1). One set was cancelled in Kitasu Bay due to high winds and all four sets were lost in Kwakshua channel due to high winds.

Fourteen species of fish and one invertebrate species were identified in the purse seine catches. The most frequently encountered species (>25% occurrence) included: Pacific herring, Pacific sardine and capelin (Tables 2 and 3).

Herring

A total of 4669 herring were measured resulting in a bimodal length-frequency distribution. Based on this length-frequency distribution (Figure 6), the length designations for the two juvenile herring age-classes are:
0+ = herring less than or equal to 82 mm standard length

1+ = herring between 83 mm and 138 mm standard length
2+ and older = herring greater than or equal to 139 mm standard length

Age-0+ herring occurred in 39 of the 60 sets (65.0 % occurrence; Table 3). Table 4 shows the average length and weight for age-0+ herring, and the total herring catch weight at each set location. The mean length and weight of all sampled age-0+ herring (n=1907) was 58 mm and 2.49 g respectively.

Age-1+ herring occurred in 48 of the 60 sets (80.0% occurrence; Table 3). Table 4 shows the average length and weight for age-1+ herring, and the total herring catch weight at each set location. The mean length and weight of all sampled age-1+ herring (n=2634) was 107 mm and 16.26 g respectively.

Age-2+ herring occurred in 24 of the 60 sets (40.0 % occurrence; Table 3). Table 4 shows the average length and weight for age-2+ herring, and the total herring catch weight at each set location. The mean length and weight of all sampled age-2+ herring (n=128) was 153 mm and 50.25 g respectively.

The relationship between length and weight for all sampled herring was determined by fitting a logistic function to the length-weight data (Figure 8). Kwakshua, Thompson Bay and Kitasu Bay sets resulted in the least amount of herring caught in relation to total catch. Meyers Pass, Hunter Channel, Spiller Channel and Powell Anchorage sets resulted in the highest amount of herring caught (Table 2 and 4).

Plankton

There were 29 categories of organisms identified in 26 plankton samples (Tables 5 and 6). An average of 14.4476 m^3 of water was filtered per plankton tow. Copepods occurred in all samples along with *Acartia longimeres* and larval euphausiids. *Acartia longimeres*, larvaceans (*Oikopleura sp.* and *Fritillaria sp.*), crab zoea, larval euphausiids, and *Pseudocalanus sp.* occurred in >95 % of samples (Table 7). *Acartia longimeres* and *Pseudocalanus sp.* made up >55 % of all zooplankton biomass captured.

CTD

Two CTD casts were performed at each location before plankton sampling. The CTD provided a range of data for temperature (^oC), salinity (ppt), dissolved oxygen (%) and depth (m) (Figure 9). This is only the second year that CTD casts have been made; therefore, we have limited data for making broad observations relative to offshore ocean conditions in our sampling areas.

CONCLUSION

Sixty stations were sampled resulting in 14 different fish species being recorded from the purse seine sets. A total of 4669 herring were measured and weighed creating a distinct bimodal histogram representing two juvenile herring age groups. Twenty-six plankton tows were performed with all plankton samples being processed. This resulted in *Acartia longimeres*, larval euphausiids and *Pseudocalanus sp.* occurring in all samples and *Acartia longimeres* and *Pseudocalanus sp.* showing up in the largest biomass.

ACKNOWLEDGMENTS

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REFERENCES

Haegele, C.W. 1997. The occurrence, abundance and food of juvenile herring and salmon in the Strait of Georgia, British Columbia in 1990 to 1994. Can. Manuscr. Rep. Fish. Aquat. Sci. 2390: 124 p.

Haegele, C.W., and Armstrong, R.W. 2003. Juvenile herring survey of the Central Coast of British Columbia, August 11-24, 2002. Contractors report for the Herring Conservation and Research Society: 34 p.

Hay, D.E., and McCarter, P.B. 1999. Age of sexual maturation and recruitment in Pacific herring. Can. Sci. Advis. Sec. Res. Doc. 99/175: 42 p.

Hourston, A.S., and Haegele, C.W. 1980. Herring on Canada's Pacific coast. Can. Spec. Publ. Fish. Aquat. Sci. 48: 23 p.

Humphreys, R.D., and Hourston, A.S. 1978. British Columbia herring spawn deposition survey manual. Fish. Mar. Serv. Misc. Spec. Publ. 38: 40 p.

McCarter, P.B., and Hay, D.E. 2002. Eulachon embryonic egg and larval outdrift sampling manual for ocean and river surveys. Can. Tech. Rep. Fish. Aquat. Sci. 2451: 33 p.

Schweigert, J.F. Hay, D.E., Therriault, T.W., Thompson, M., and Haegele, C.W. 2009. Recruitment forecasting using indices of young-of-the-year (age-0^{+}) Pacific herring (*Clupea pallasi*) abundance in the Strait of Georgia, British Columbia, Canada. ICES Journal of Marine Science. 66:1681-1687.

Thompson, M., Hrabok, C., Hay, D.E., Schweigert, J., Haegele, C., and Armstrong, B. 2003. Juvenile herring surveys: methods and data base. Can. Manuscr. Rep. Fish. Aquat. Sci. 2651: 31 p.

Thompson, M., and Therriault, T.W. 2009. Central Coast juvenile herring survey, August 2007. Can. Manuscr. Rep. Fish. Aquat. Sci. 2867: vi + 53 p.

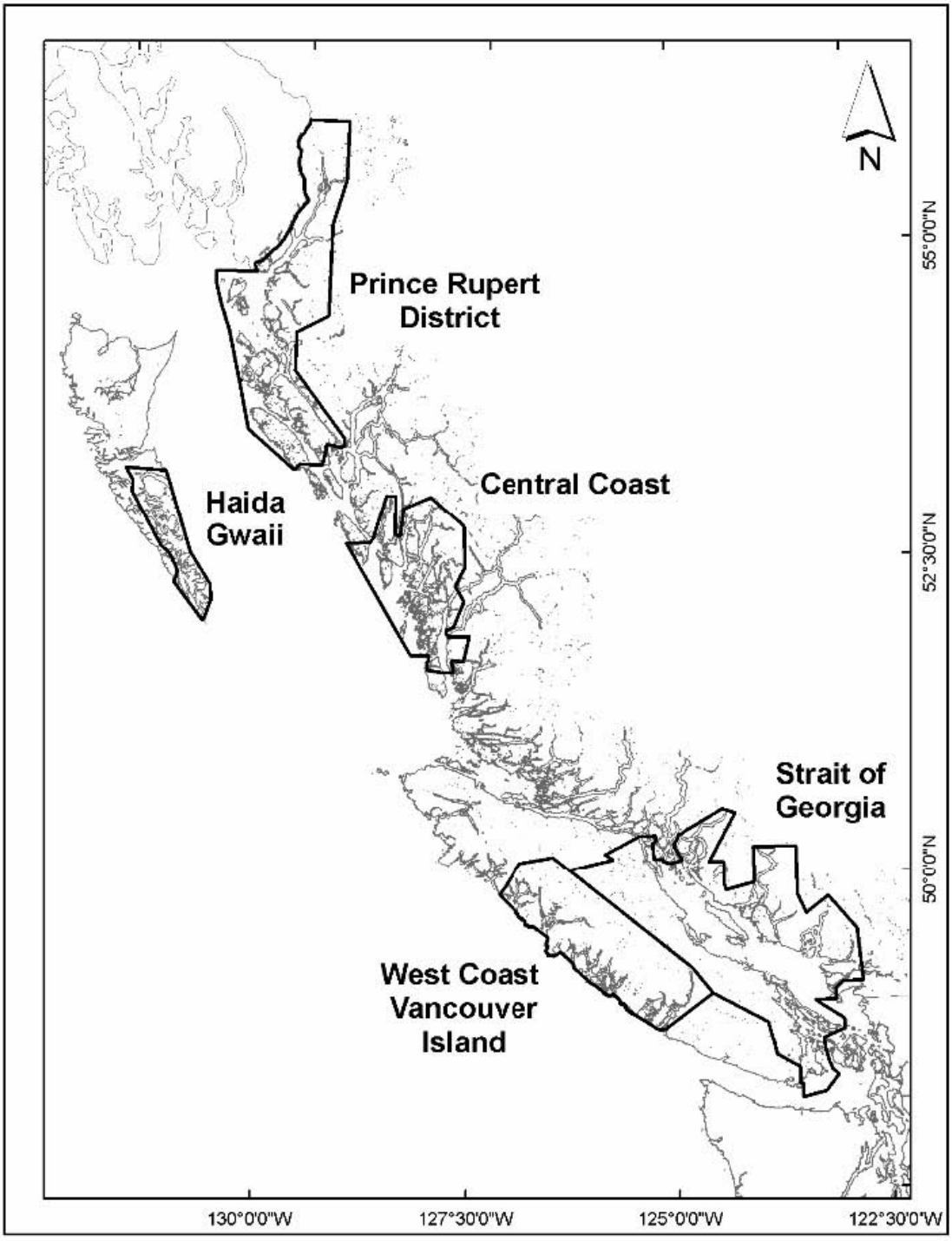


Figure 1. The five major British Columbia herring stock assessment areas.

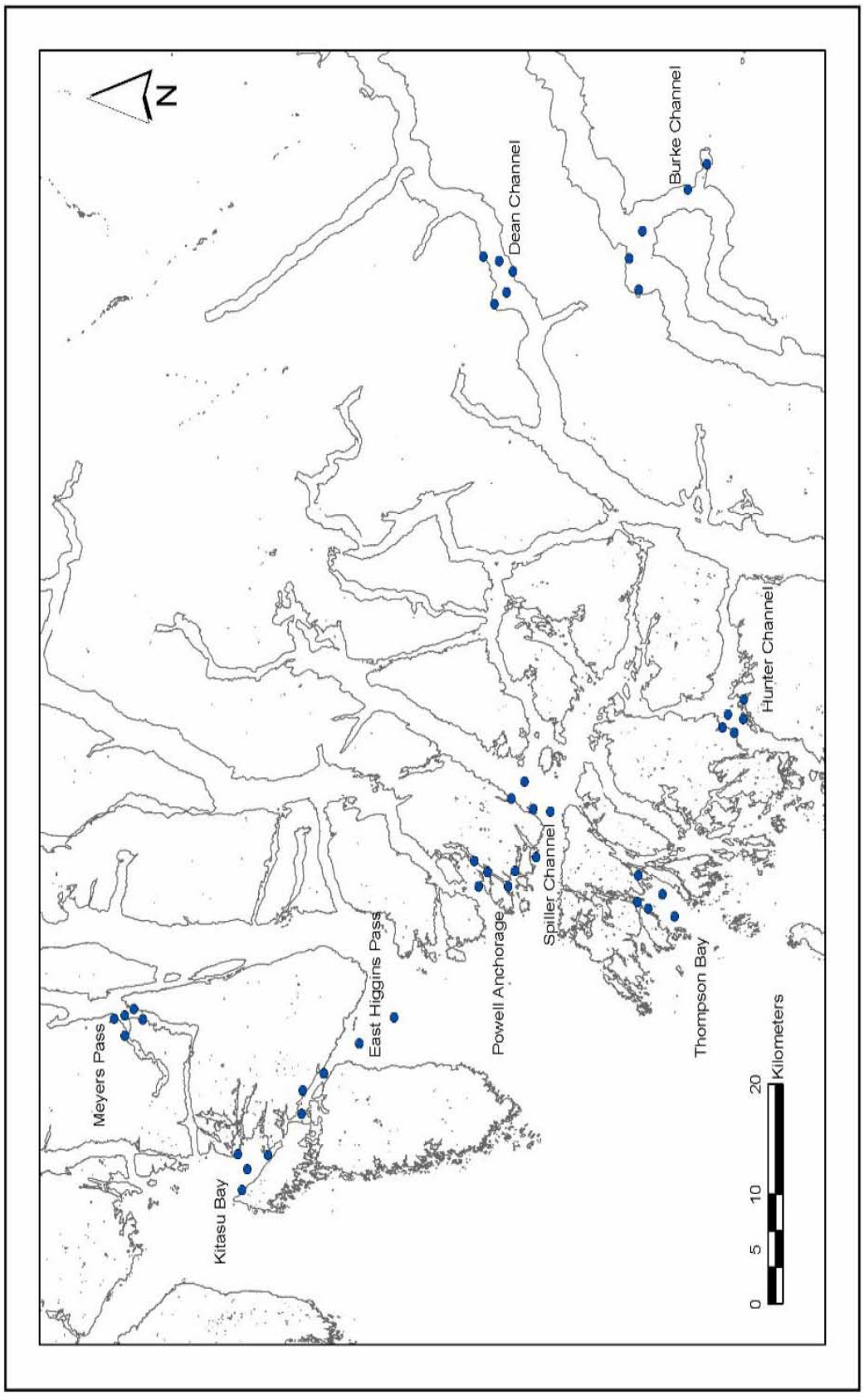


Figure 2. Upper Central Coast purse seine set locations for the 2009 juvenile herring survey.

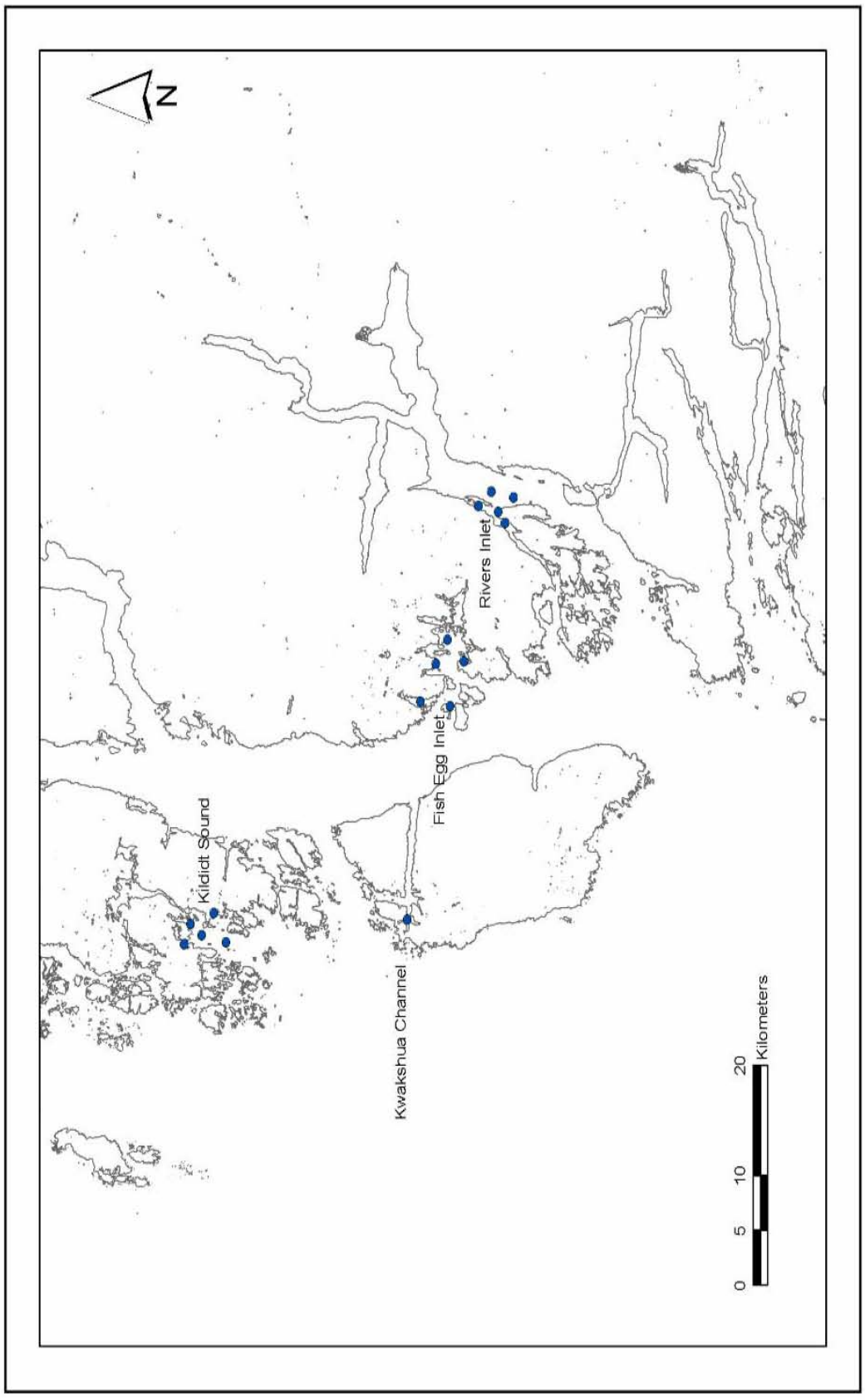


Figure 3. Lower Central Coast purse seine set locations for the 2009 juvenile herring survey.

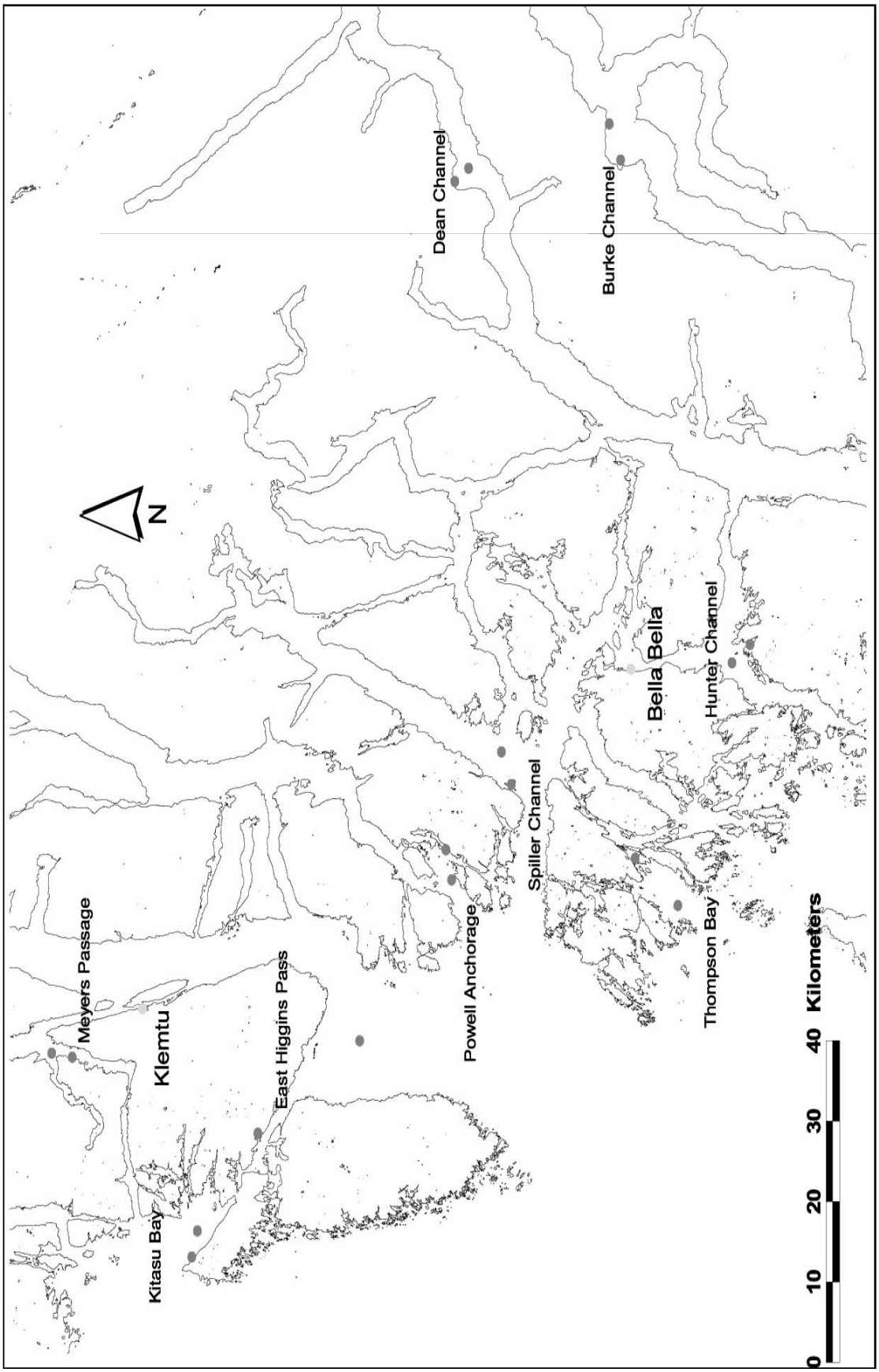


Figure 4. Upper Central Coast plankton and CTD set locations for the 2009 survey.

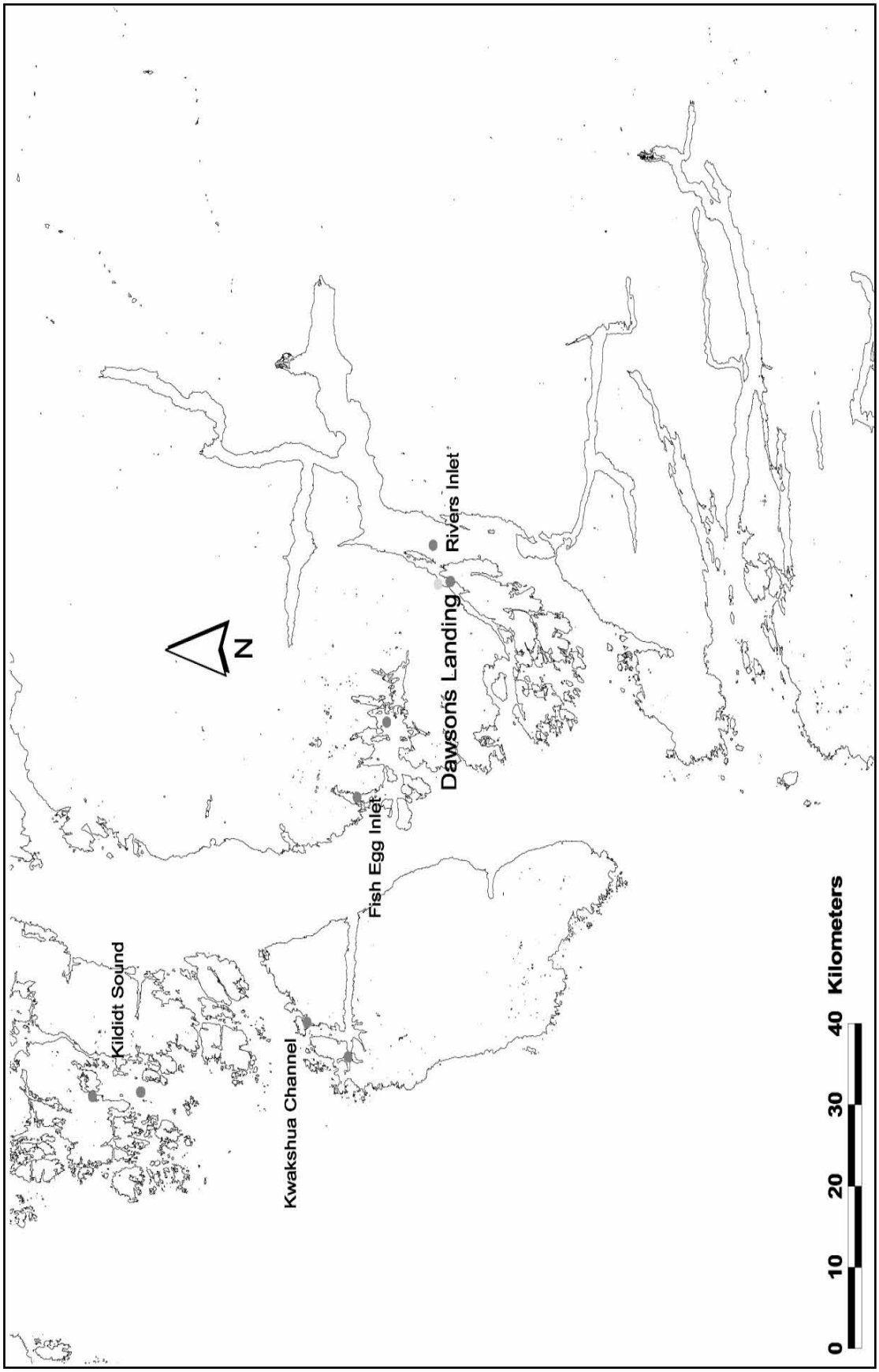


Figure 5. Lower Central Coast plankton and CTD set locations for the 2009 survey.

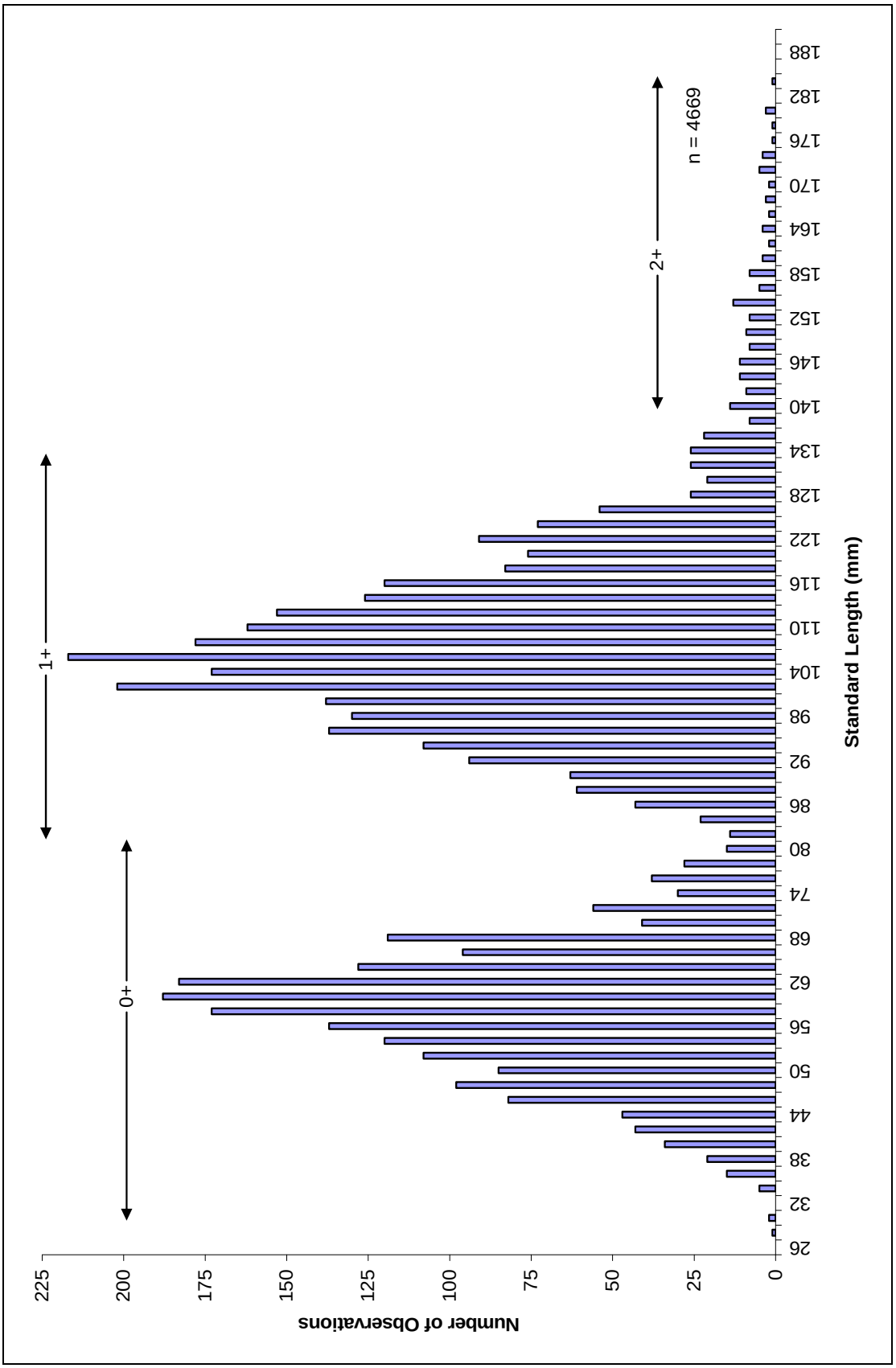
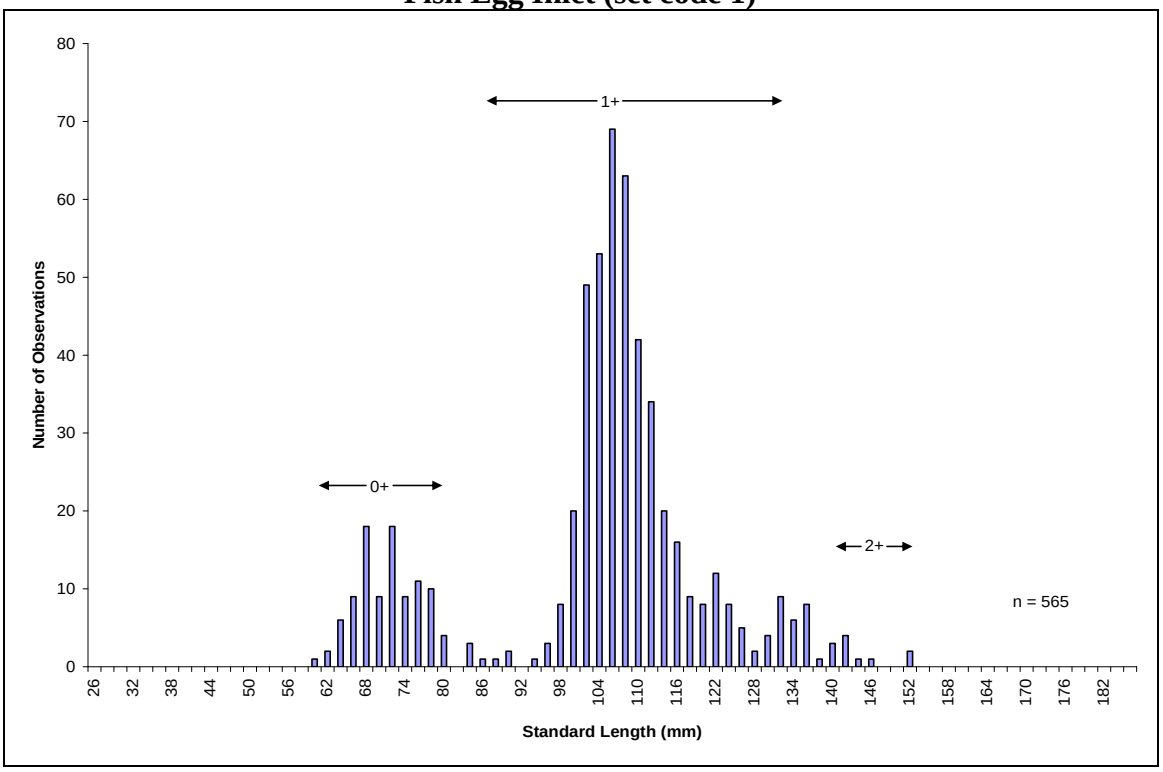


Figure 6. Length-frequency distribution for all sampled herring from the 2009 Central Coast juvenile herring survey.

Fish Egg Inlet (set code 1)



Kilidit Sound (set code 4)

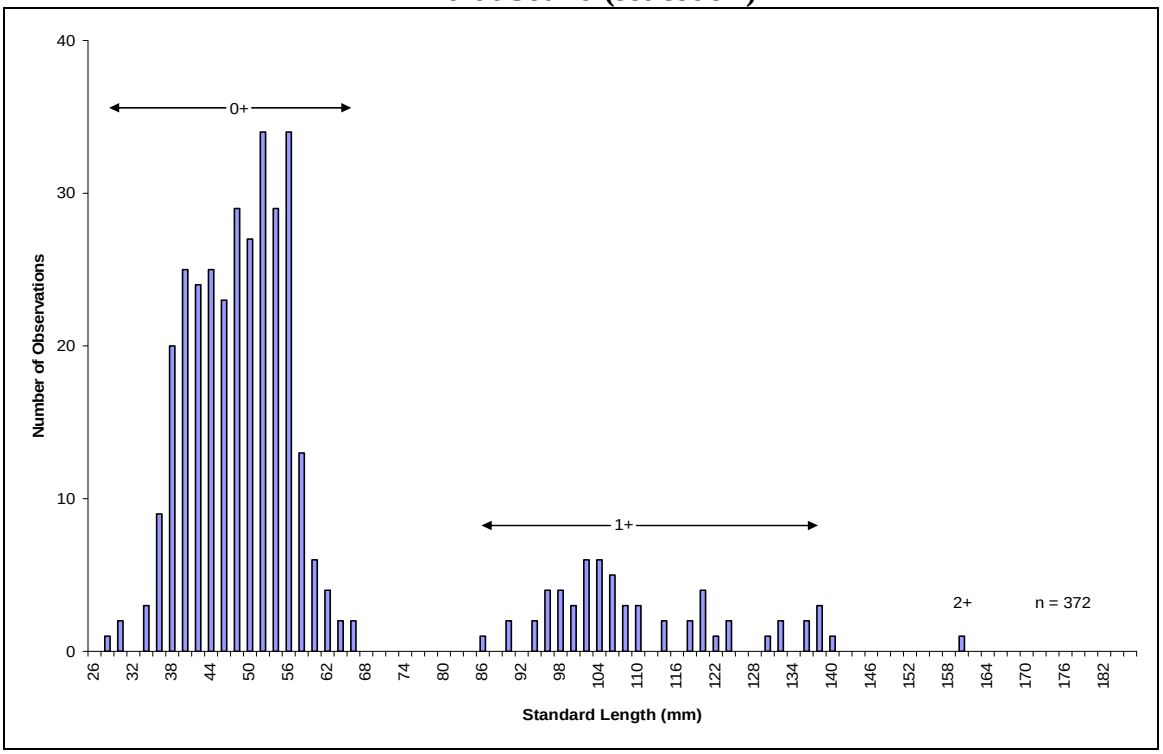
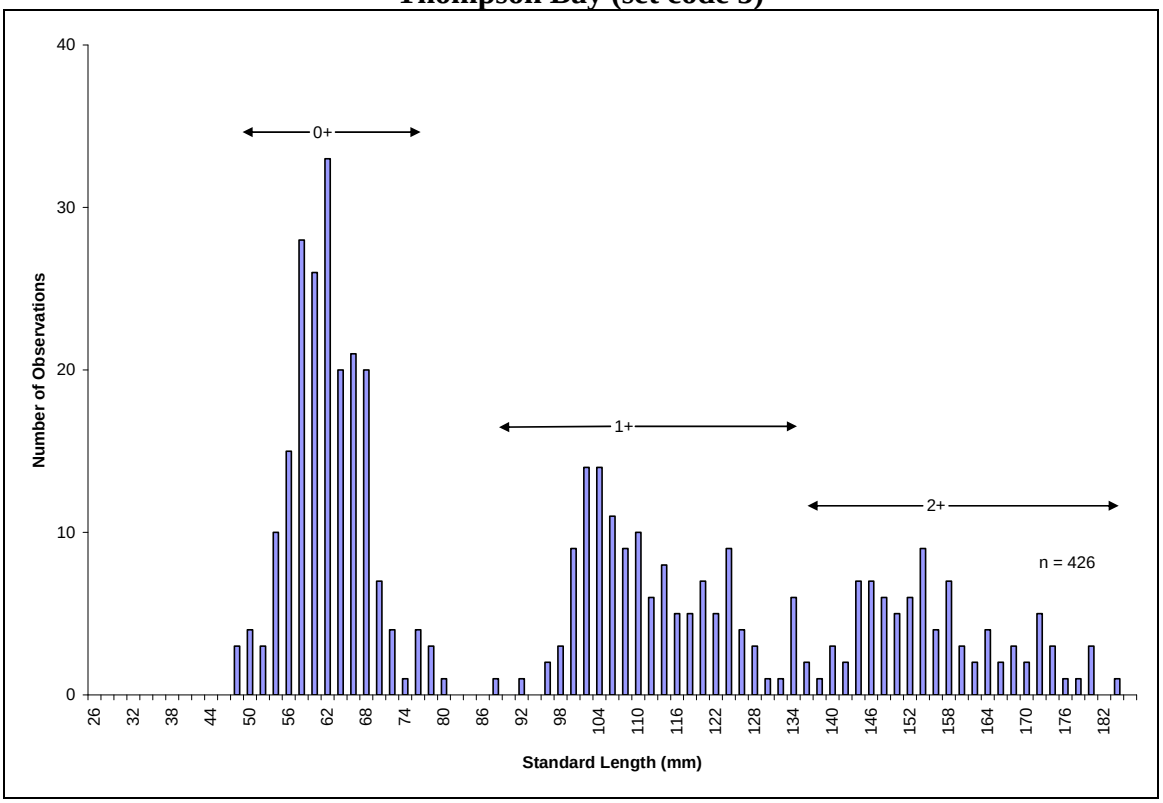


Figure 7. Length-frequency histograms by location (set code) for the 2009 Central Coast juvenile herring survey.

Thompson Bay (set code 5)



Meyers Pass (set code 6)

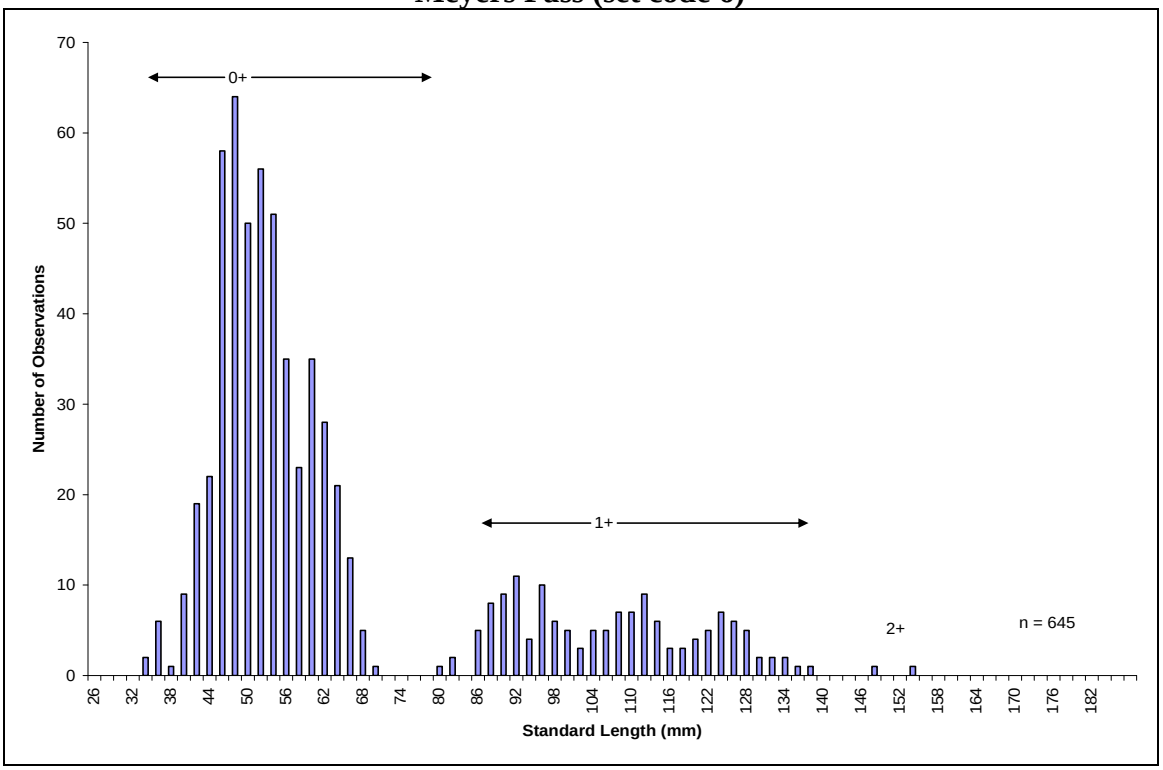
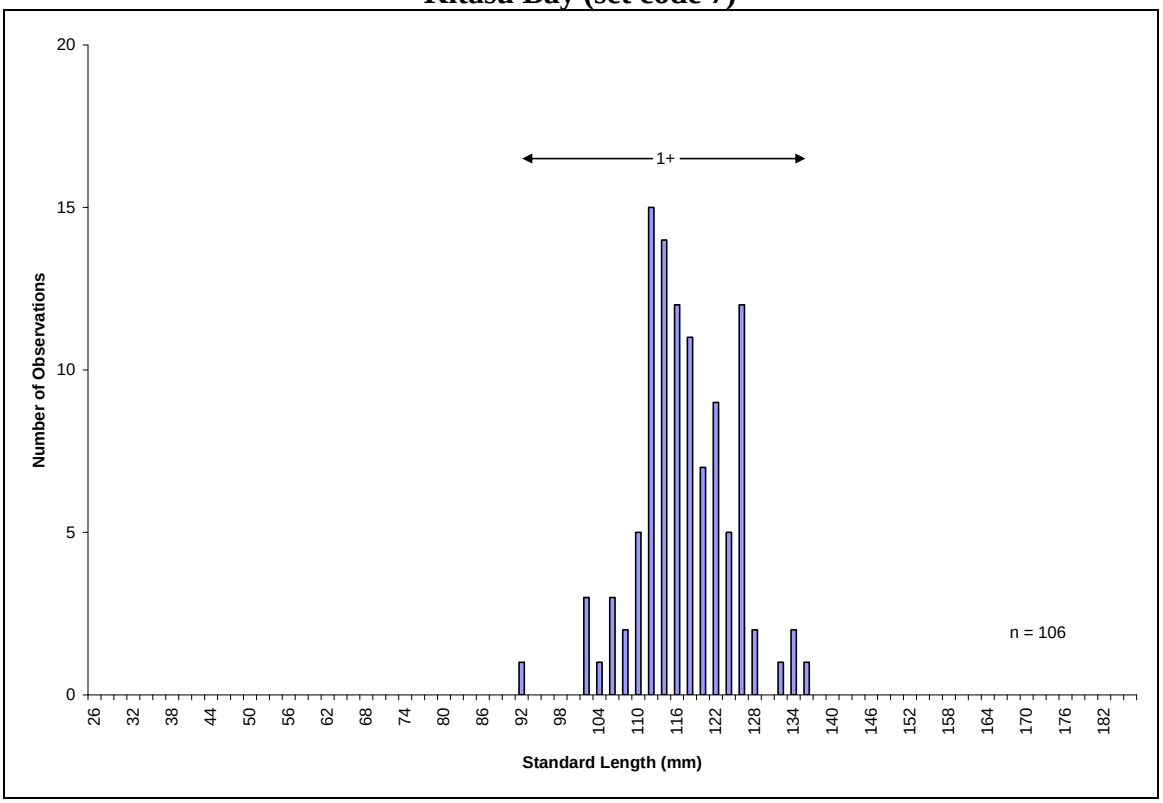


Figure 7…continued

Kitasu Bay (set code 7)



Powell Anchorage (set code 9)

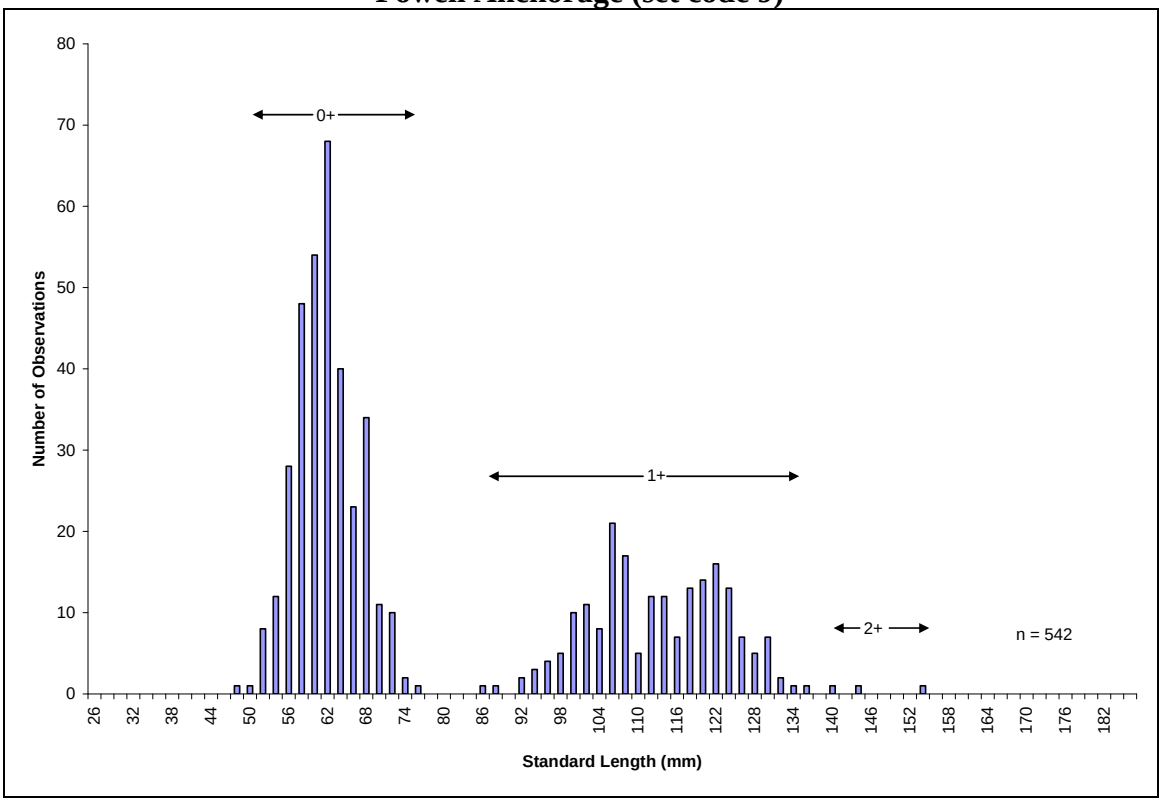
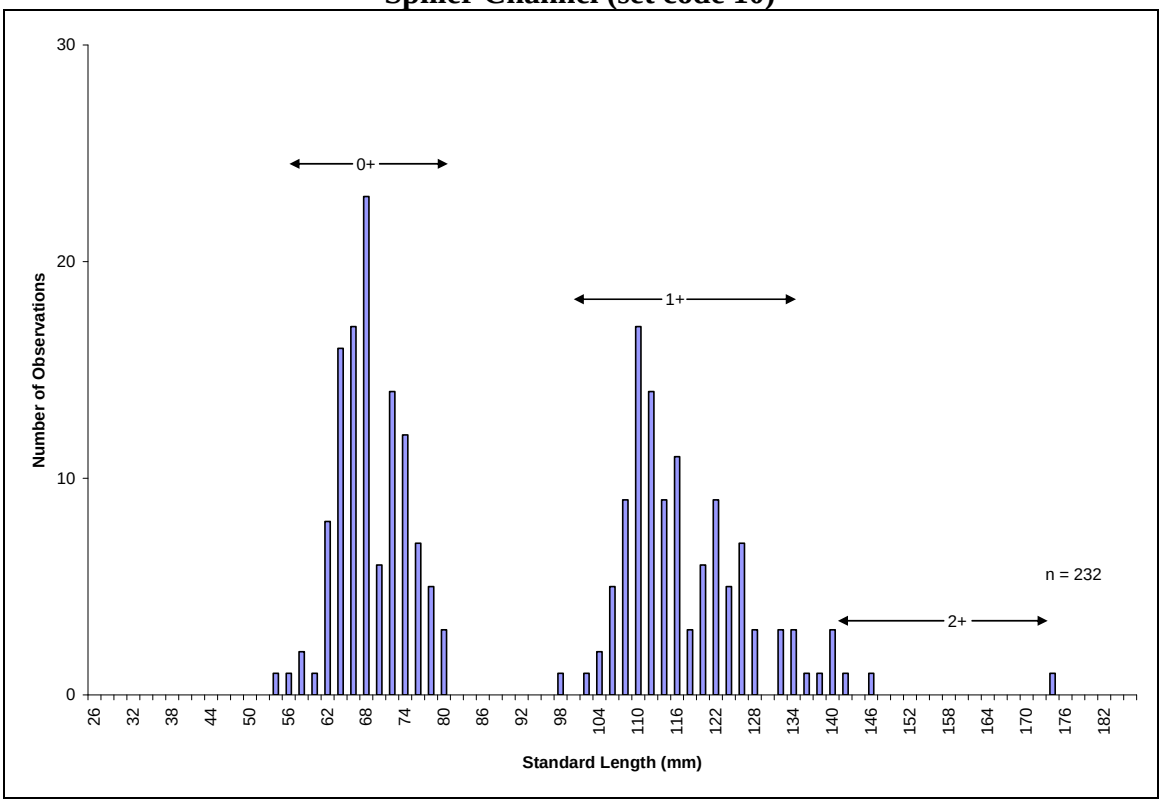


Figure 7…continued

Spiller Channel (set code 10)



Hunter Channel (set code 11)

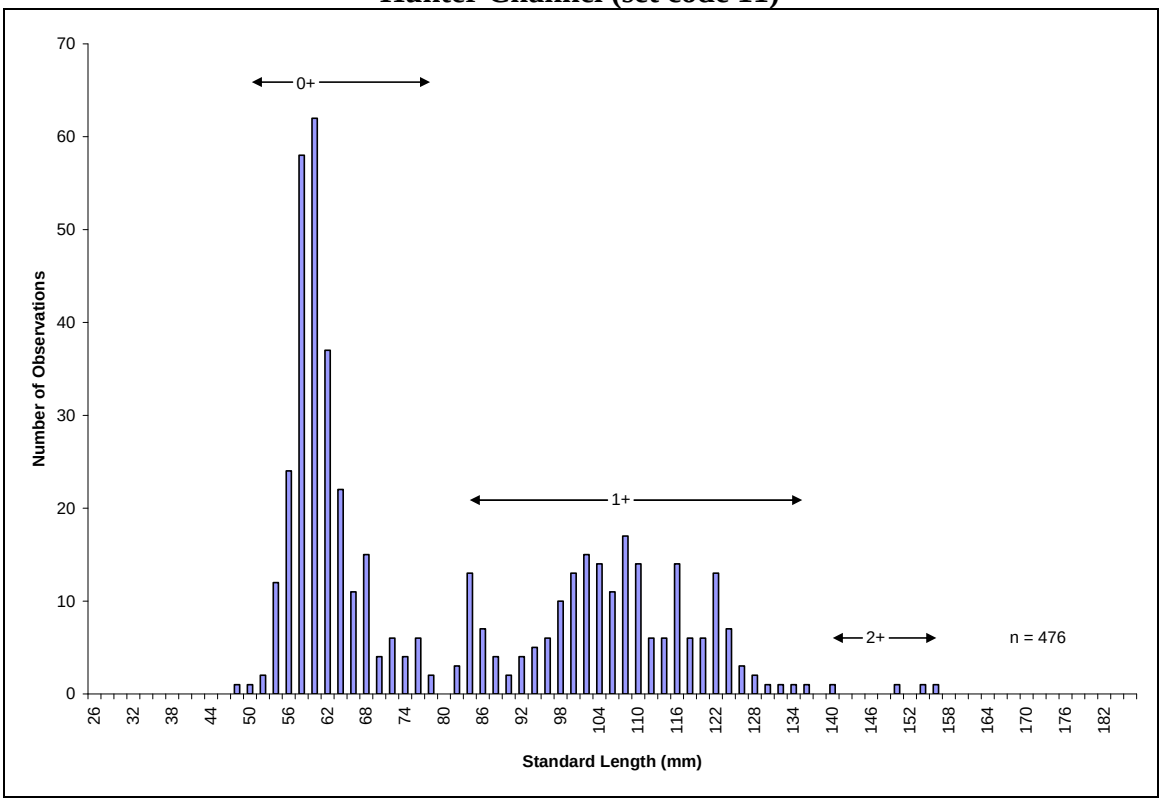
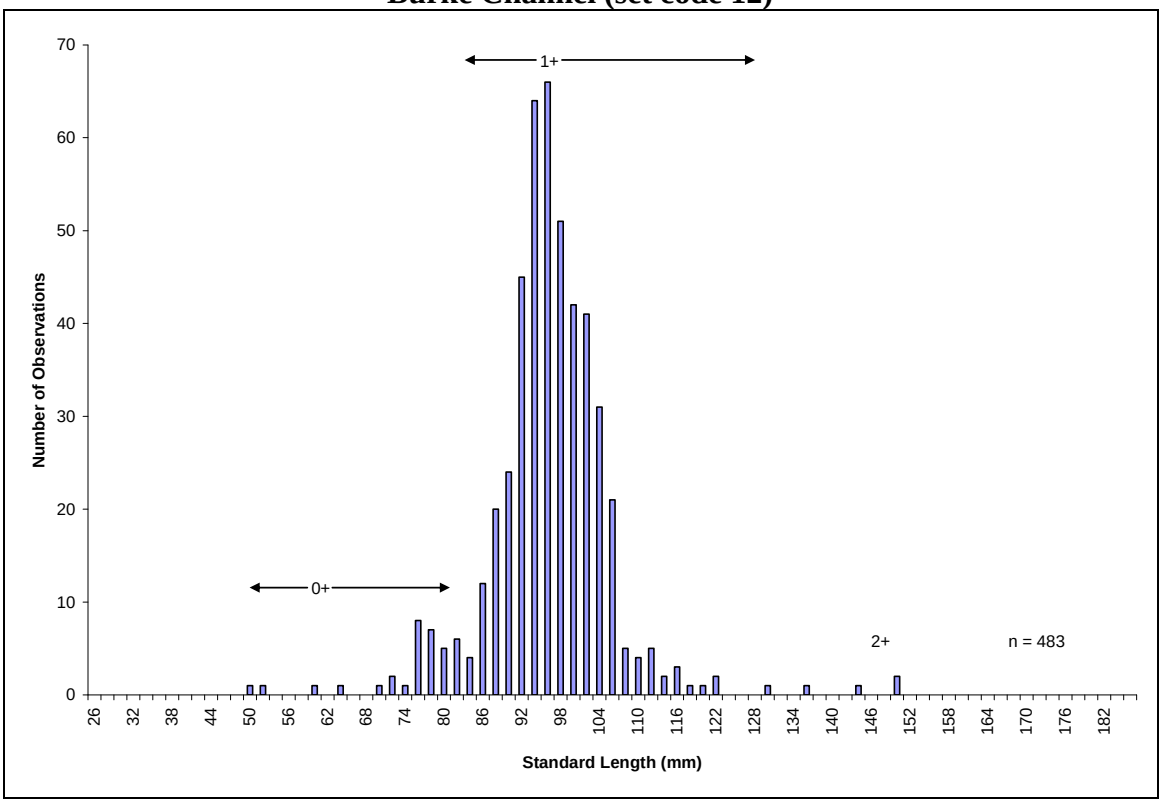


Figure 7…continued

Burke Channel (set code 12)



Dean Channel (set code 13)

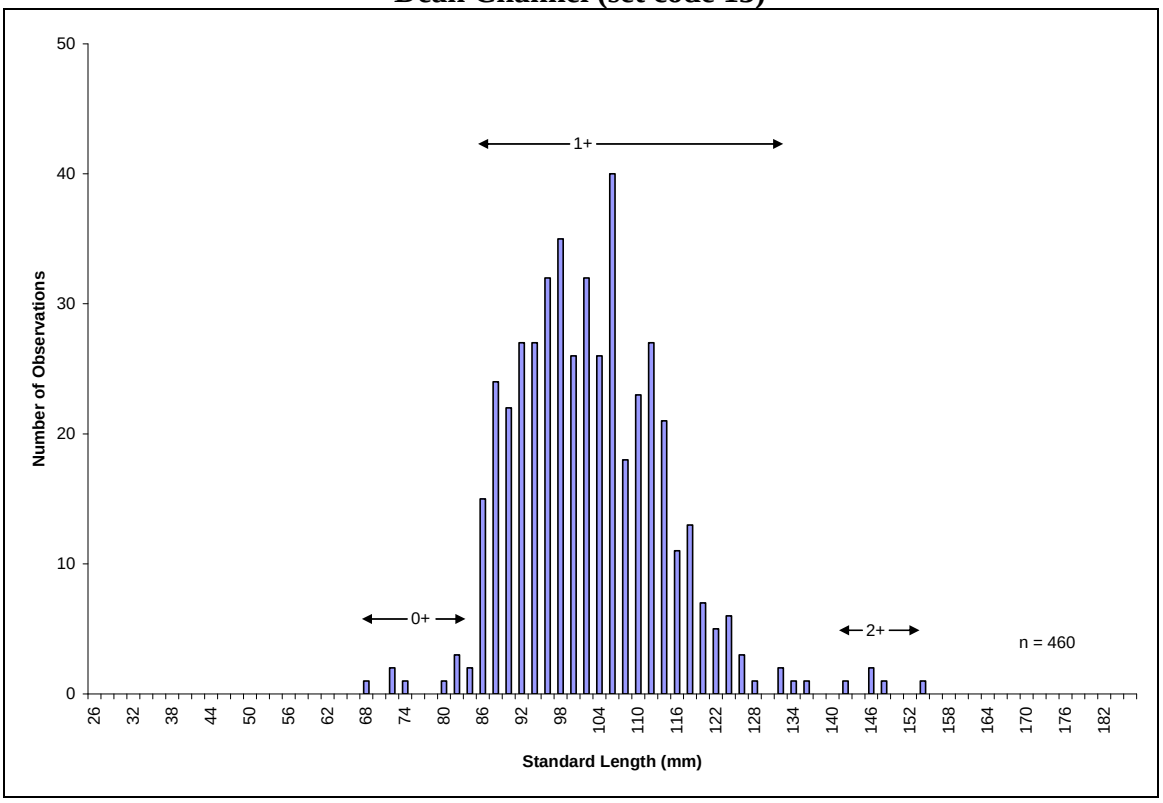


Figure 7…continued

Rivers Inlet (set code 14)

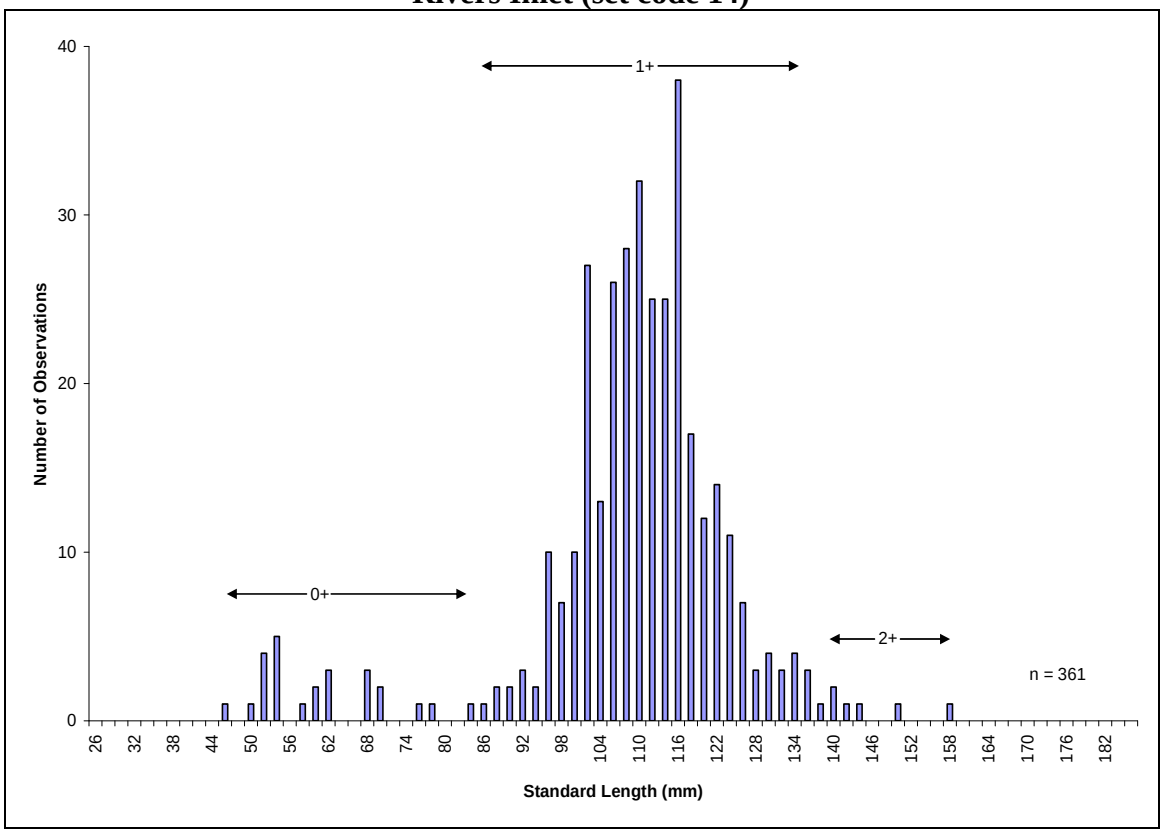


Figure 7…continued

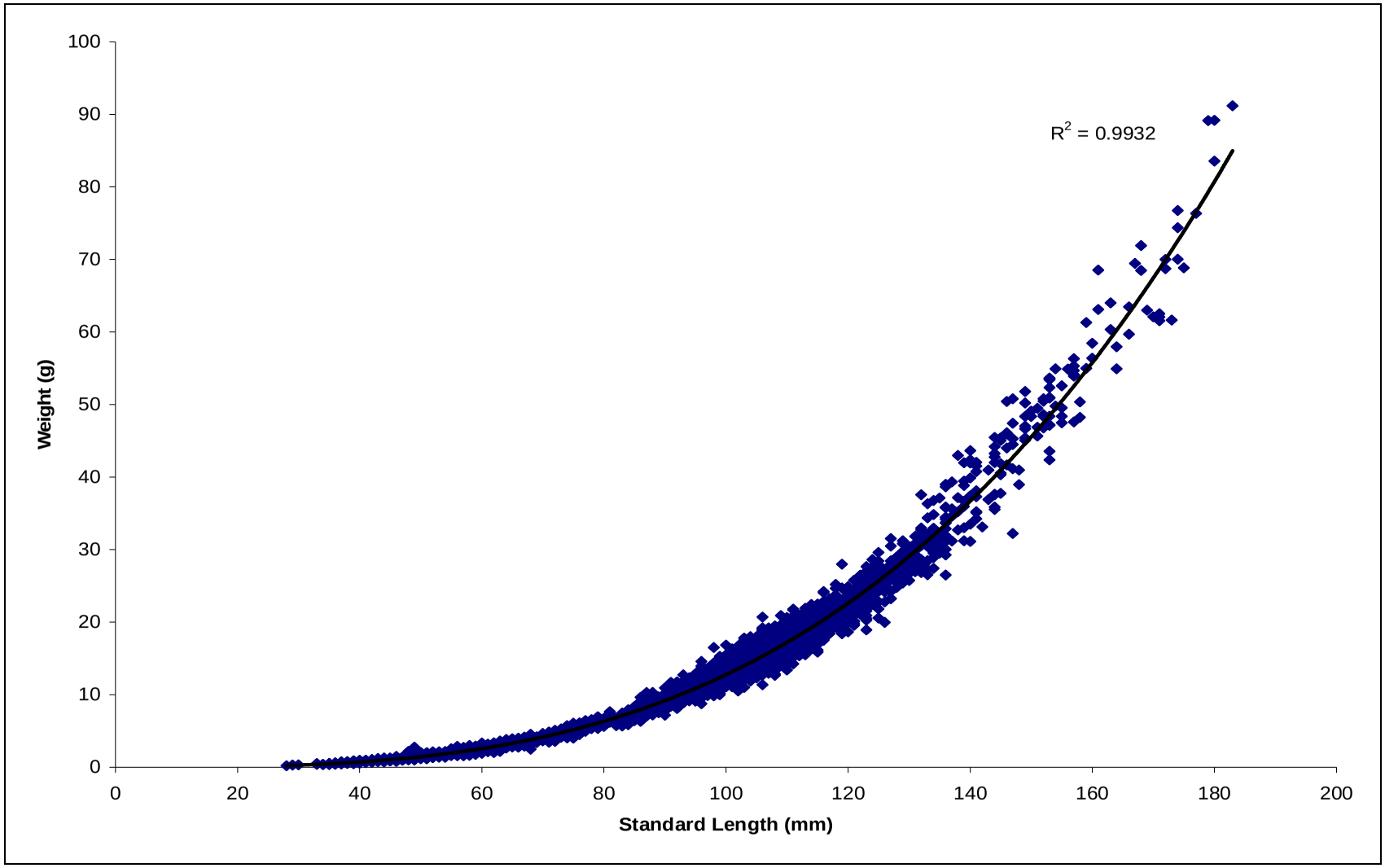


Figure 8. Length-weight relationship for all sampled herring from the 2009 Central Coast juvenile herring survey.

Fish Egg Inlet (set code 1)

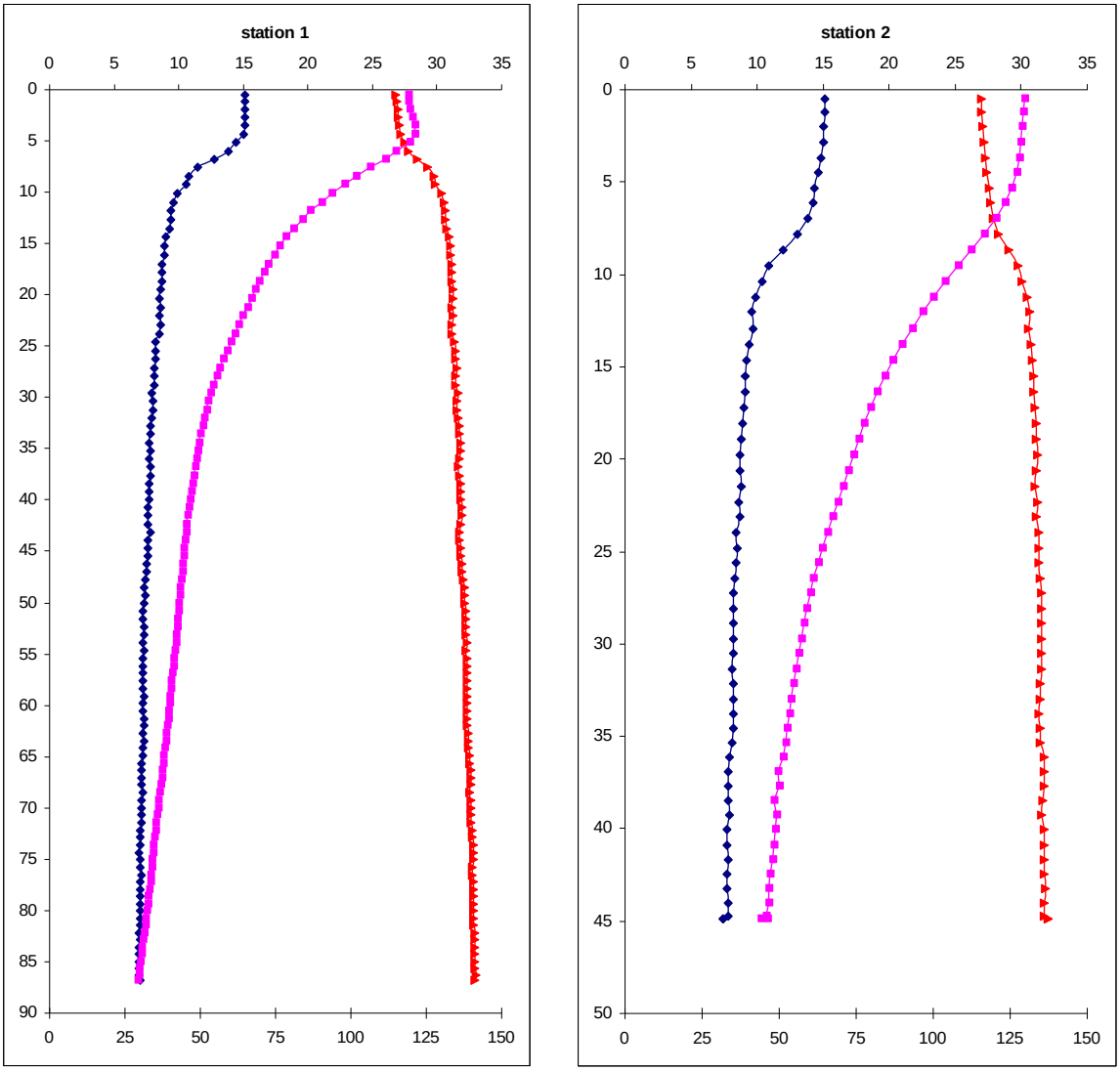


Figure 9. Temperature, salinity and dissolved oxygen profiles from CTD casts during the 2009 Central Coast juvenile herring survey.

Kwakshua Channel (set code 2)

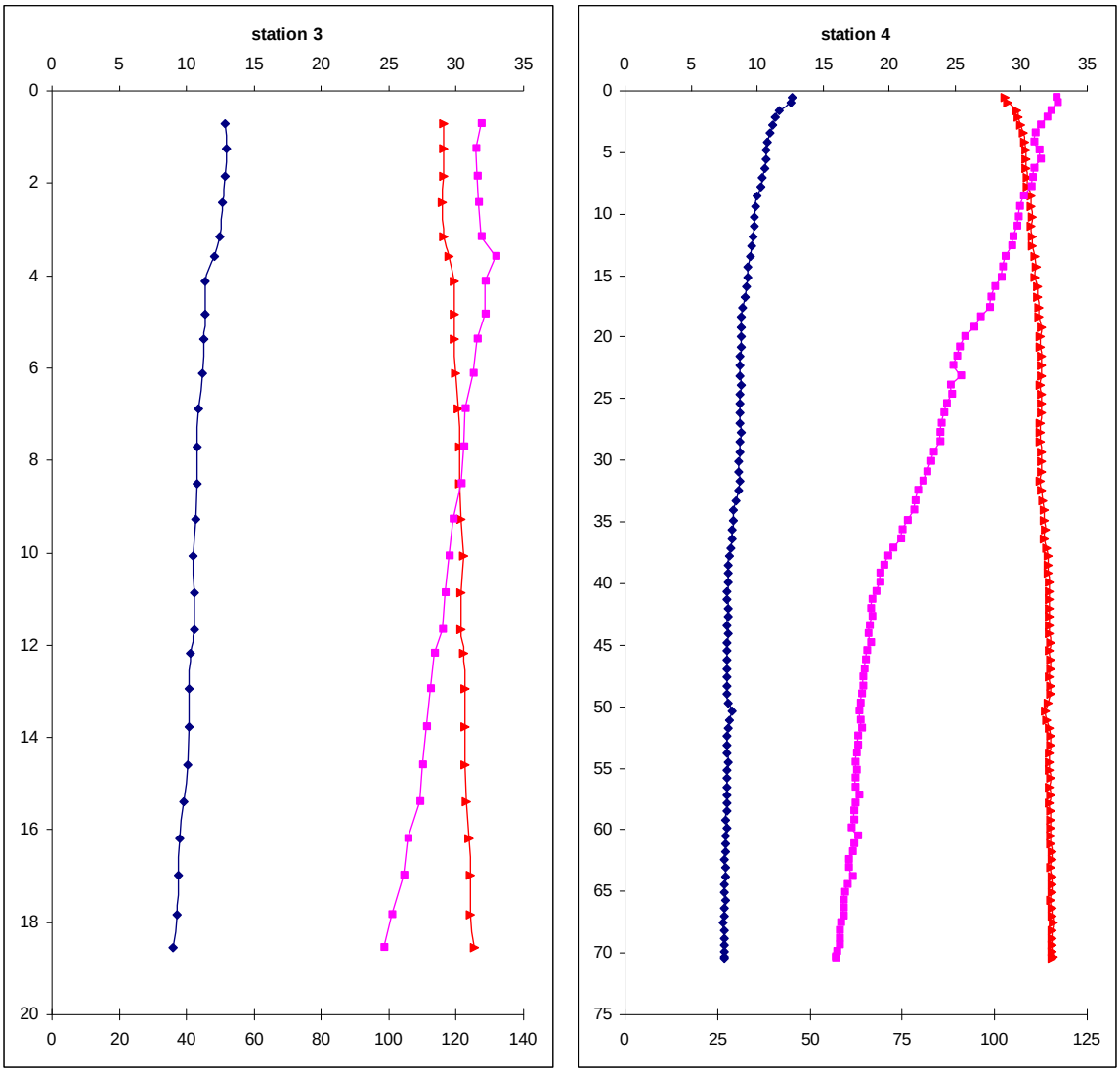


Figure 9 continued…

Kilddit Sound (set code 4)

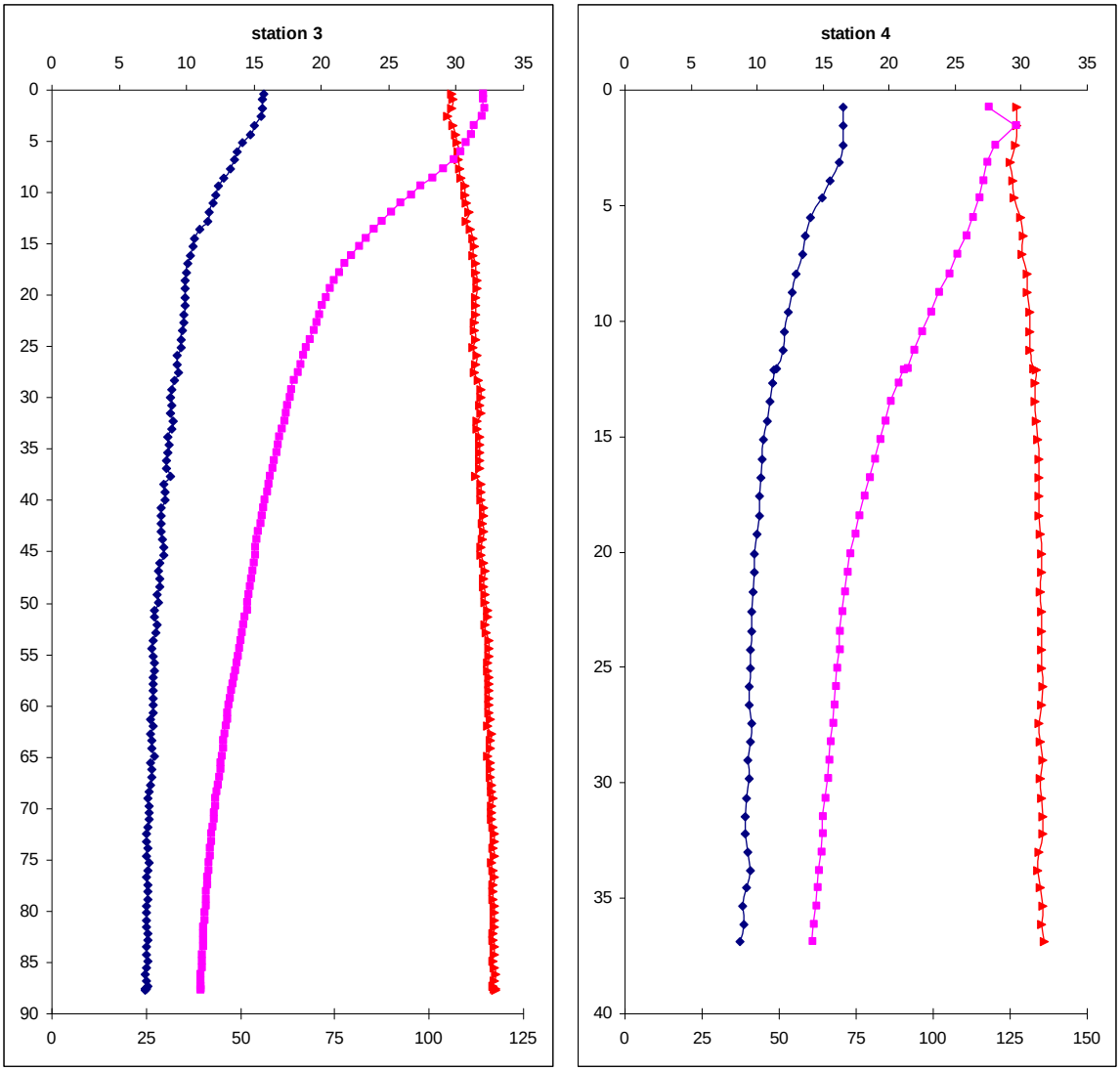


Figure 9 continued…

Thompson Bay (set code 5)

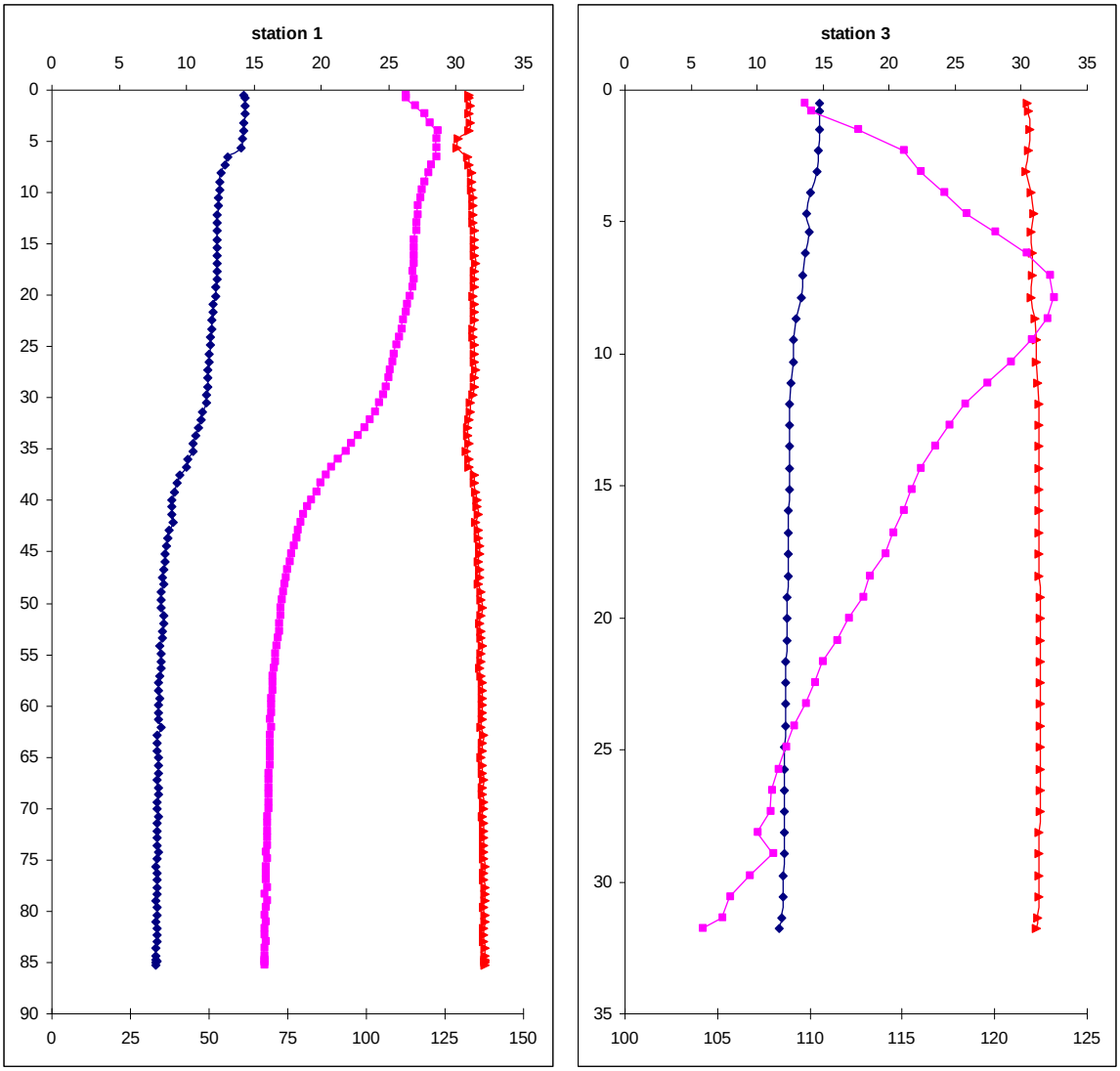


Figure 9 continued…

Meyers Passage (set code 6)

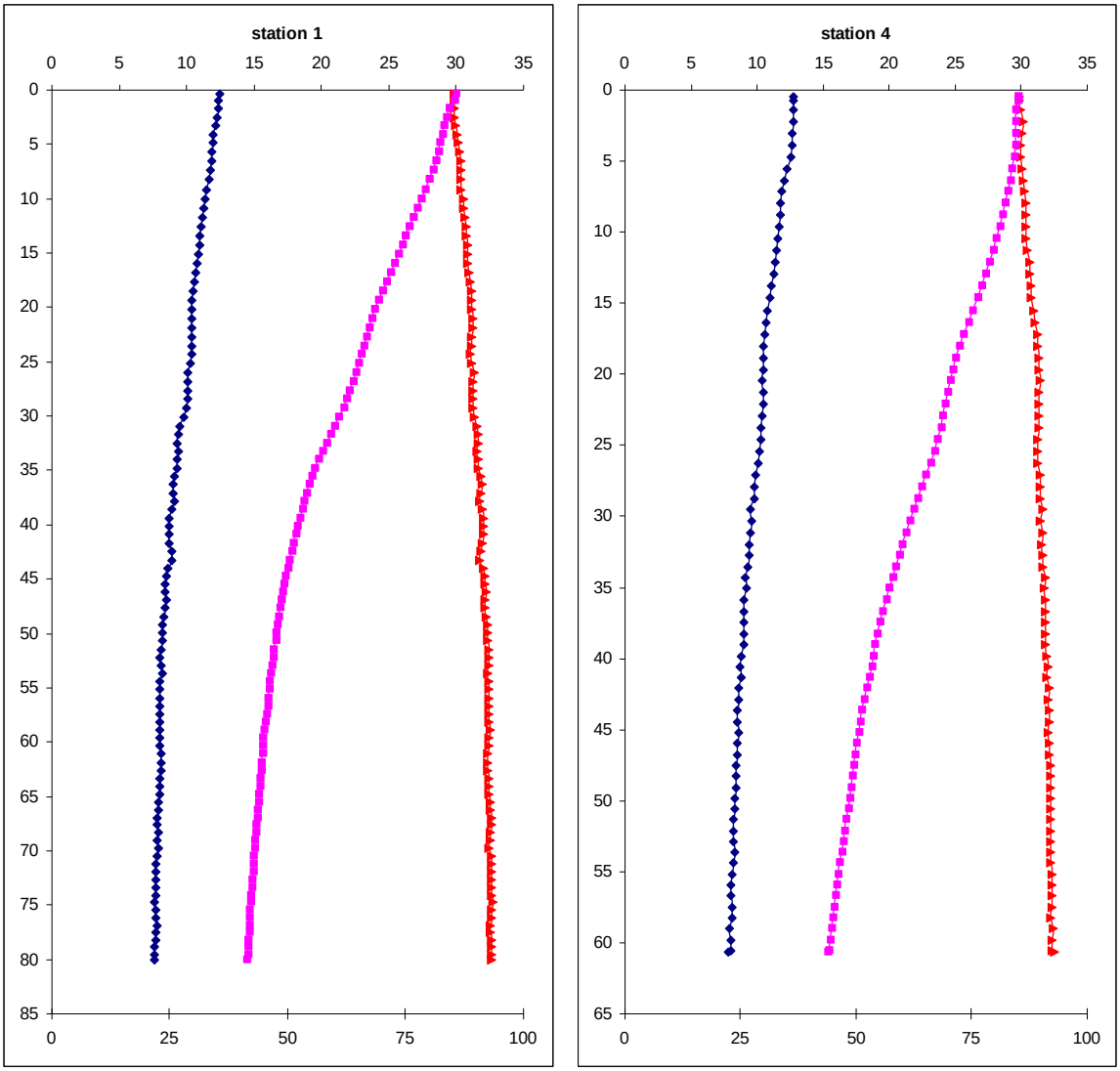


Figure 9 continued…

Kitasu Bay (set code 7)

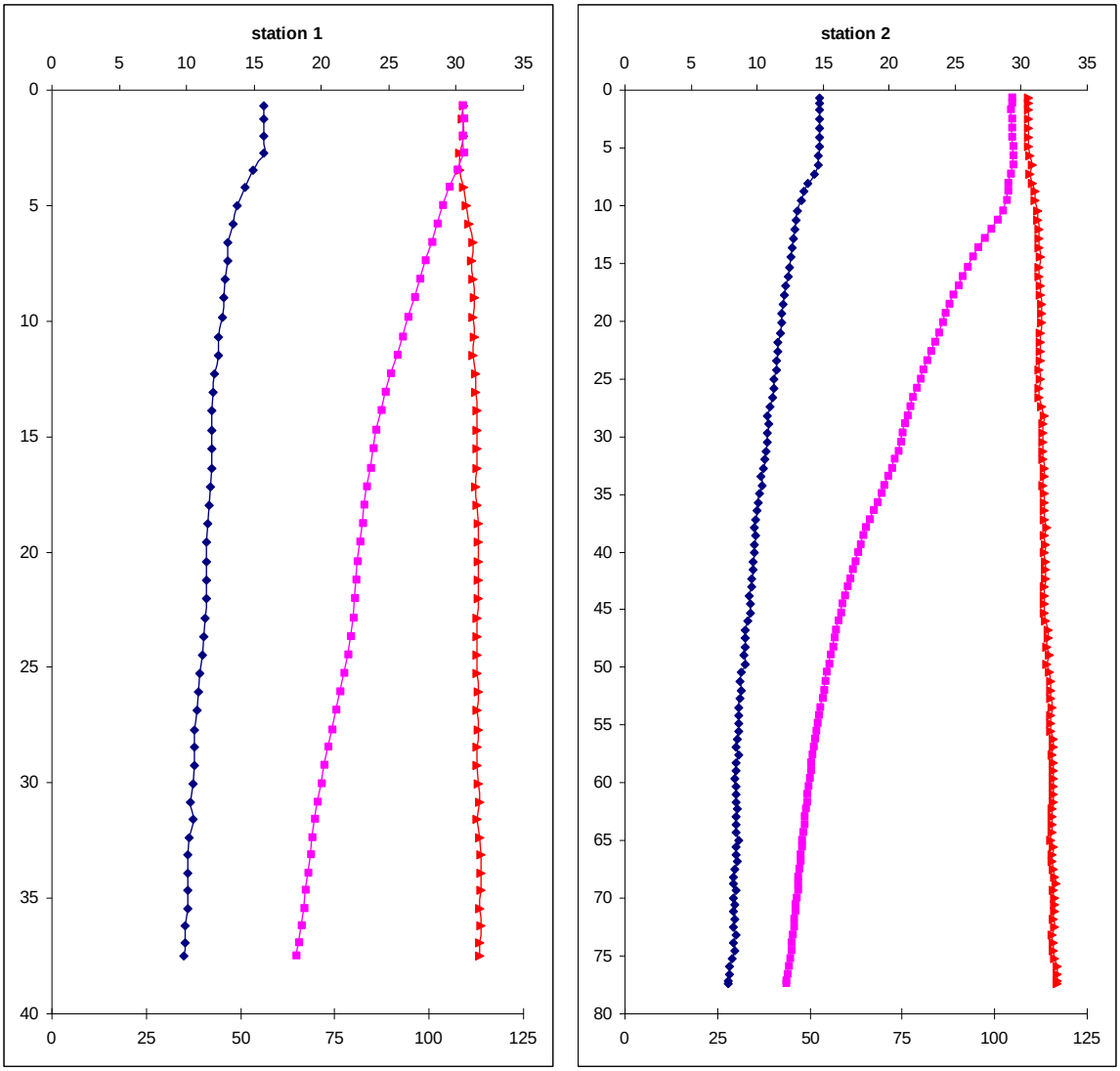


Figure 9 continued…

East Higgins Pass (set code 8)

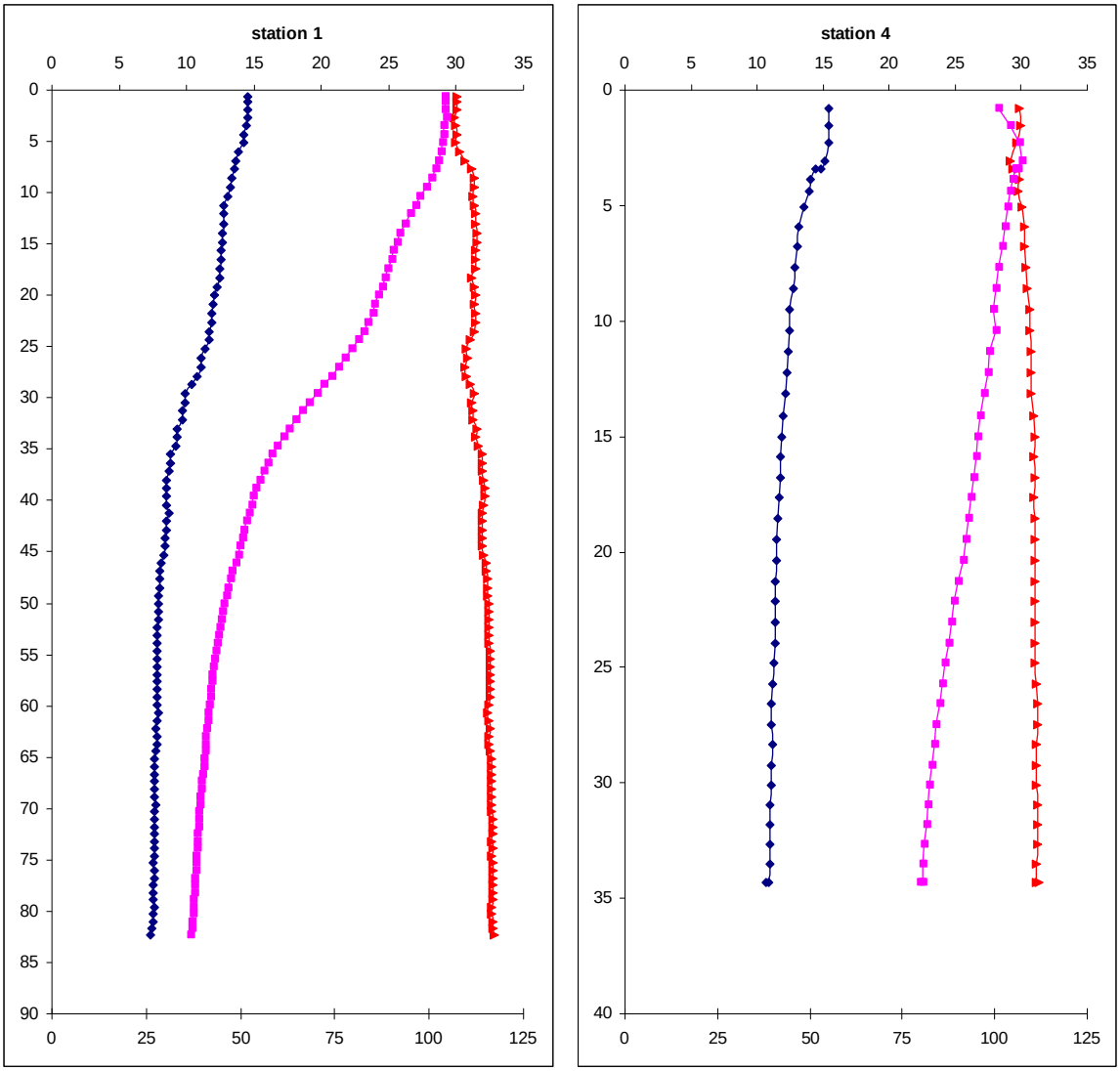


Figure 9 continued…

Powell Anchorage (set code 9)

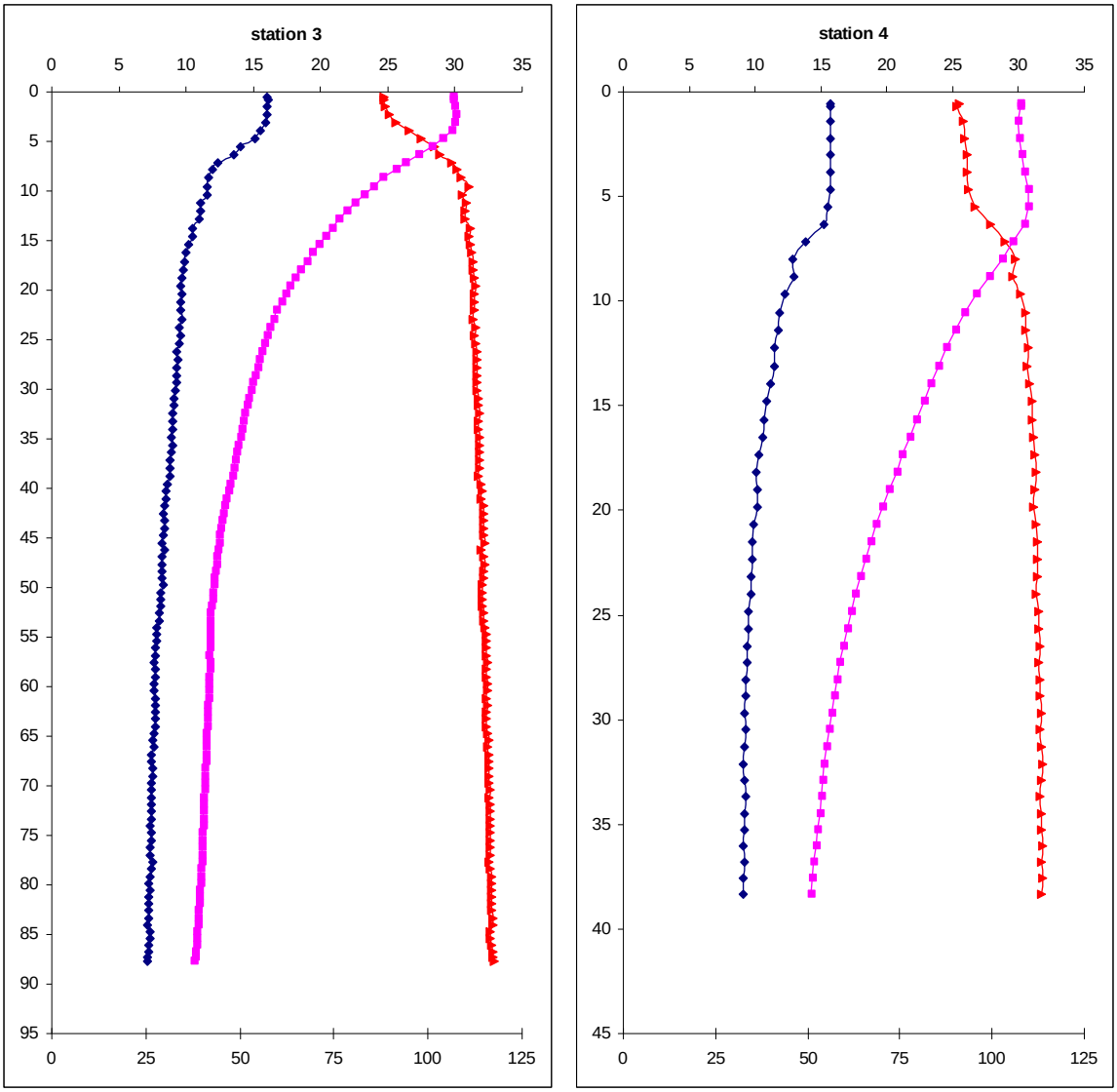


Figure 9 continued…

Spiller Channel (set code 10)

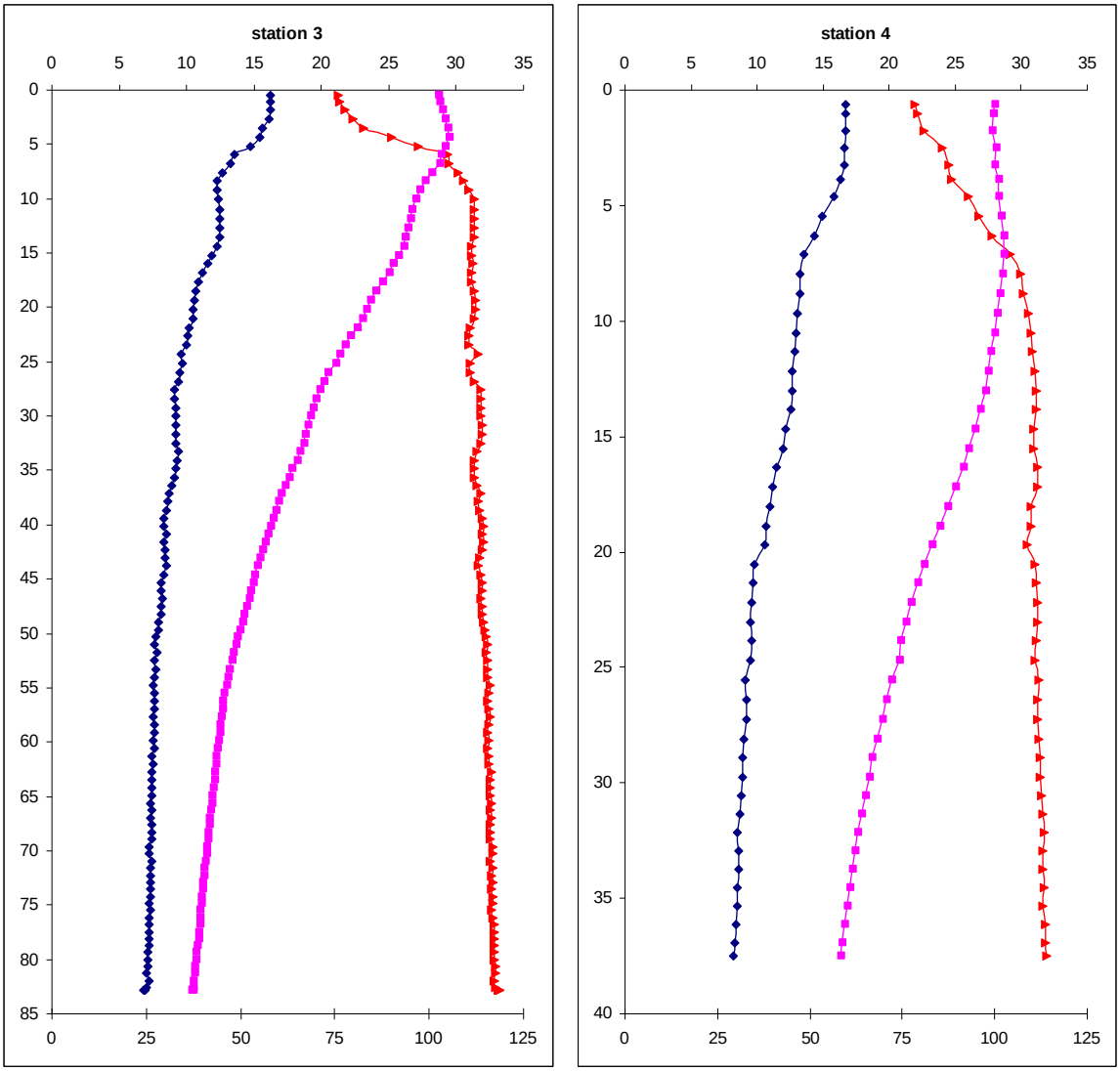


Figure 9 continued…

Hunter Channel (set code 11)

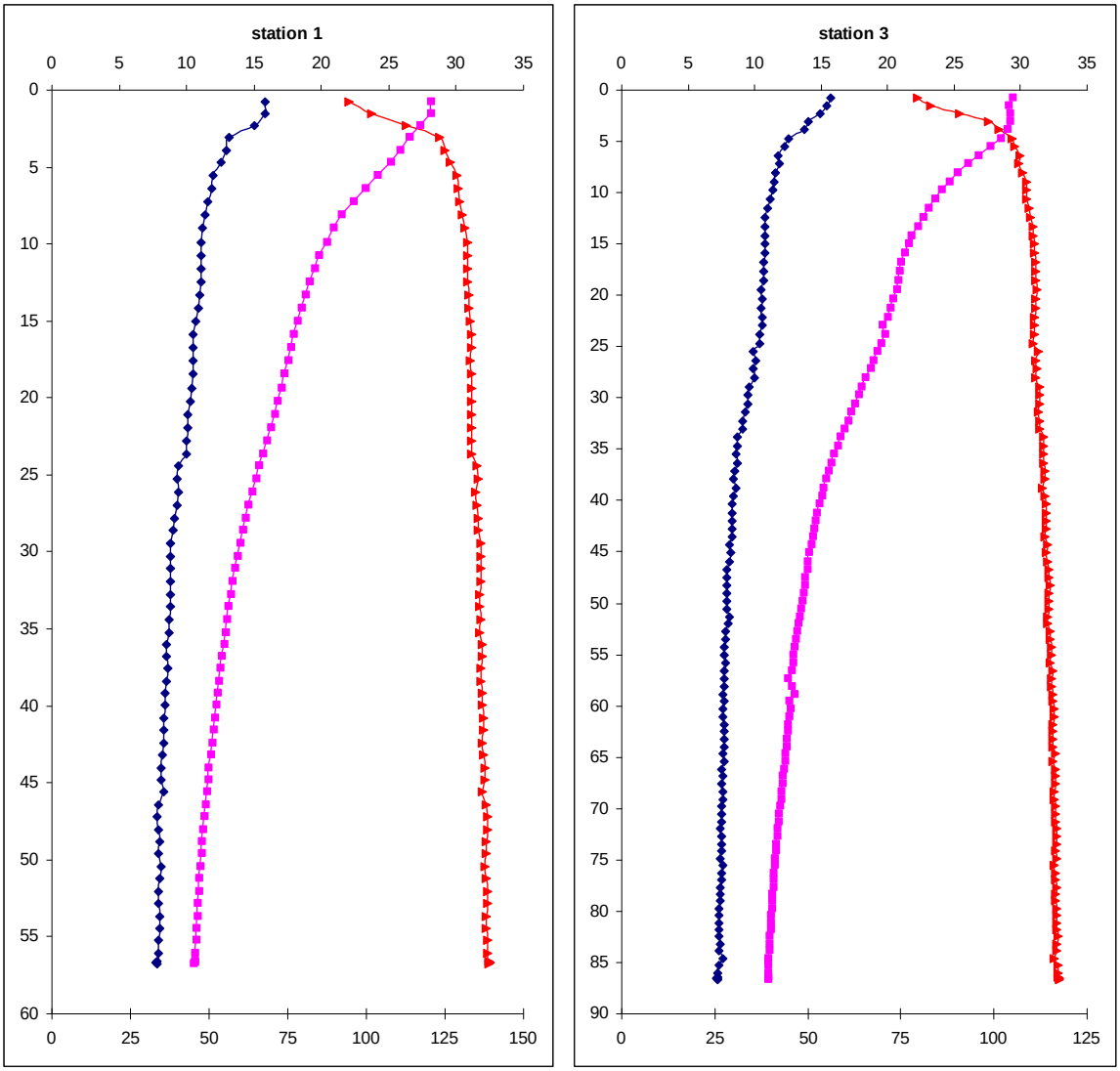


Figure 9 continued…

Burke Channel (set code 12)

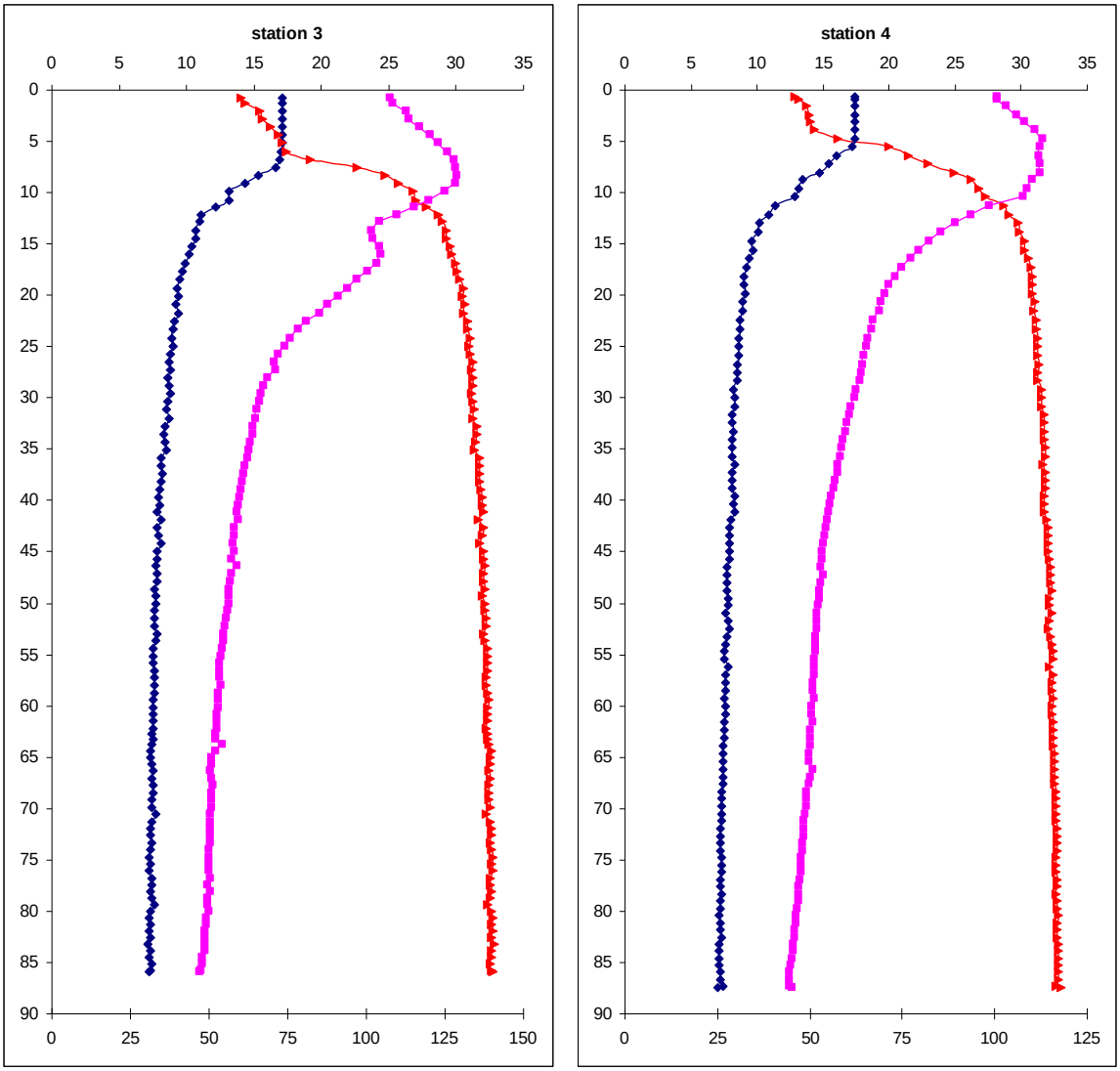


Figure 9 continued…

Dean Channel (set code 13)

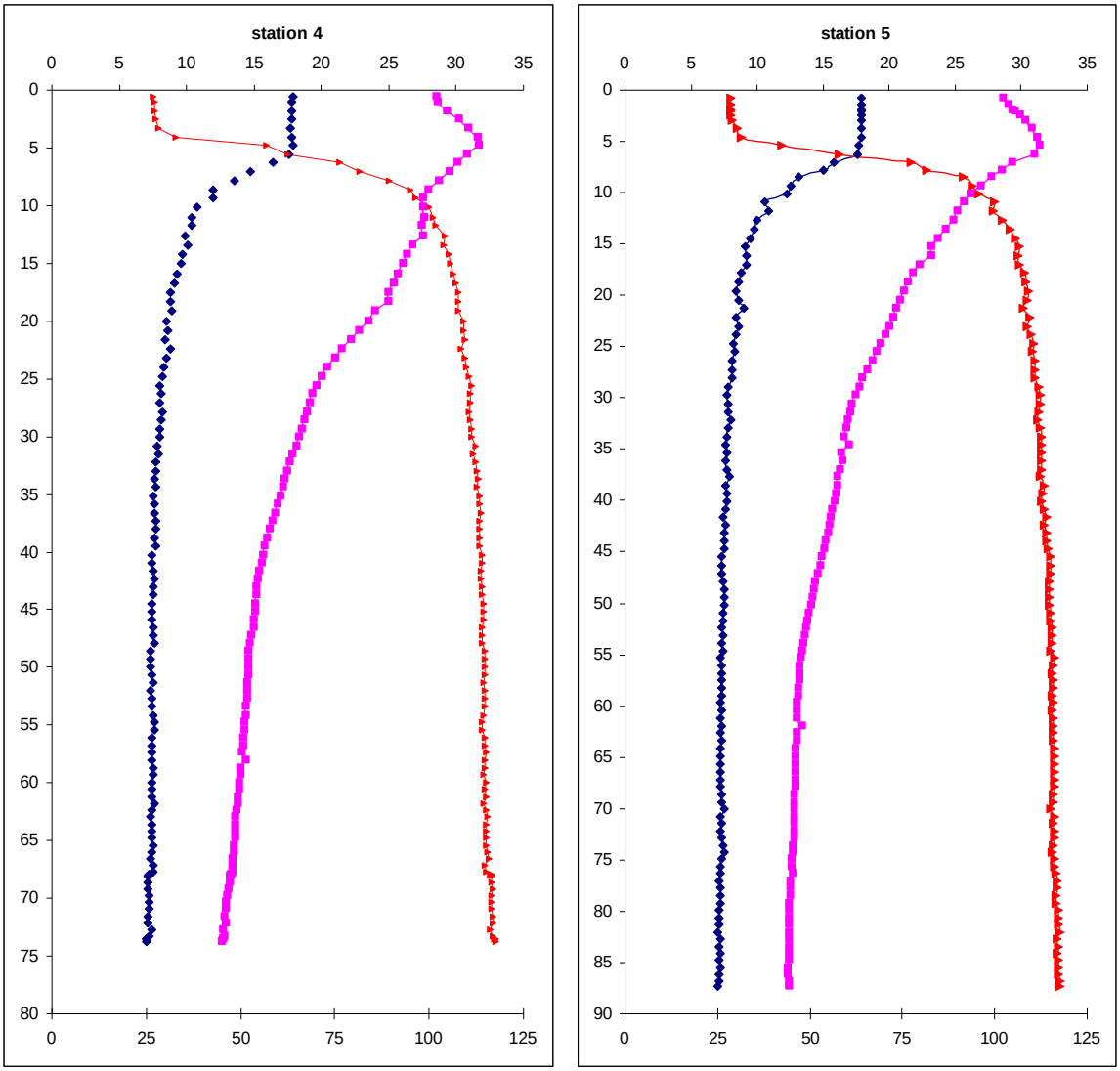


Figure 9 continued…

Rivers Inlet (set code 14)

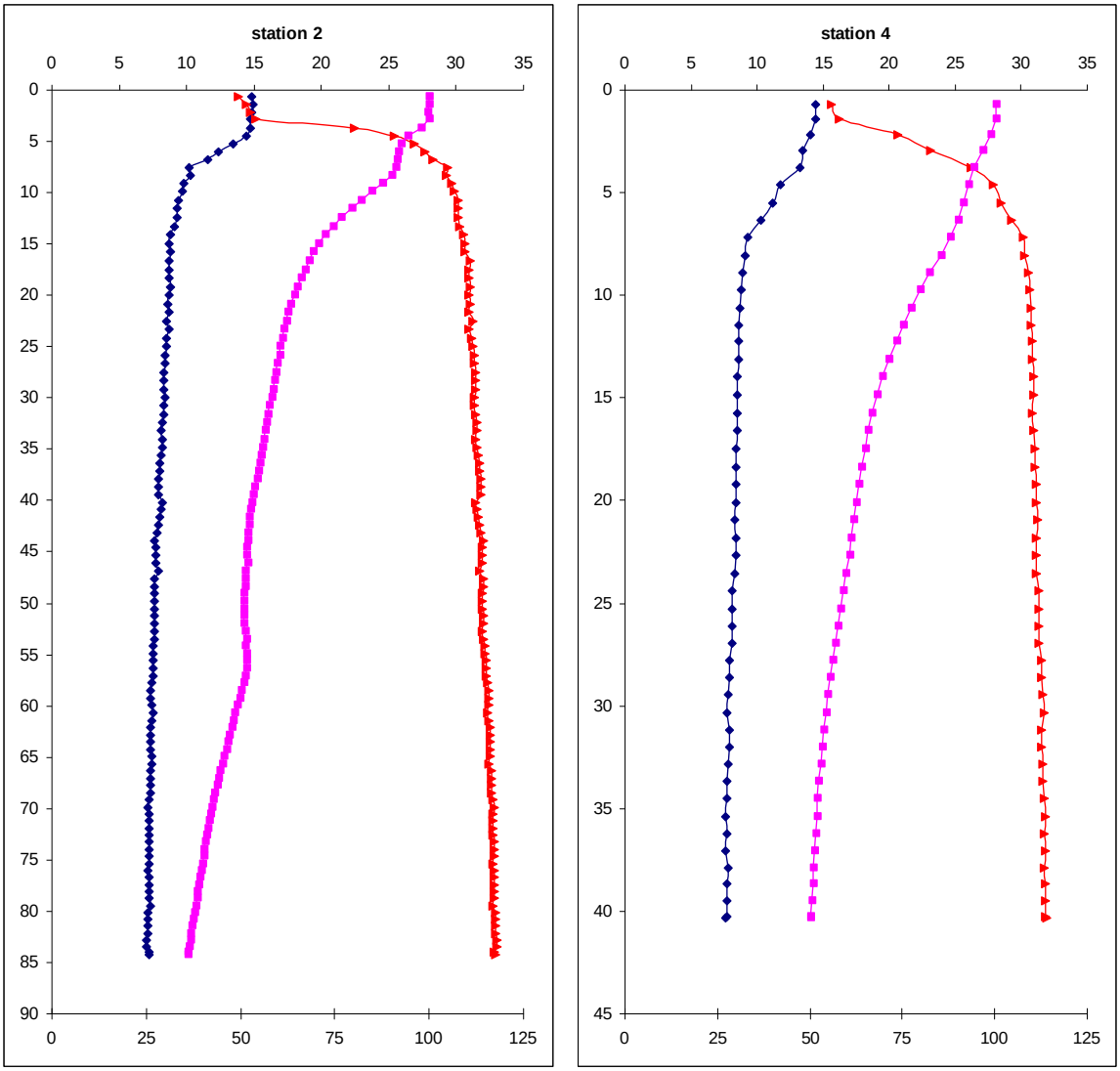


Figure 9 continued…

Table 1. Summary of the purse seine set locations from the 2009 Central Coast juvenile herring survey.

Set	Year	Month	Set Day	Location	Set Code	Station	Set Start Time	DD Lat (N)	DD Long (W)
1	2009	8	9	Kwakshua Channel	2	4	2205	51.6550	128.1150
2	2009	8	10	Burke Channel	12	4	2220	52.1719	127.5732
3	2009	8	10	Burke Channel	12	6	2250	52.1820	127.5321
4	2009	8	10	Burke Channel	12	3	2325	52.1693	127.4946
5	2009	8	10	Burke Channel	12	2	0005	52.1239	127.4380
6	2009	8	10	Burke Channel	12	5	0040	52.1051	127.4035
7	2009	8	11	Dean Channel	13	5	2205	52.3297	127.5348
8	2009	8	11	Dean Channel	13	4	2230	52.3139	127.5398
9	2009	8	11	Dean Channel	13	3	2300	52.2997	127.5533
10	2009	8	11	Dean Channel	13	2	2325	52.3058	127.5816
11	2009	8	11	Dean Channel	13	1	2355	52.3181	127.5974
12	2009	8	12	Thompson Bay	5	1	2205	52.1210	128.4070
13	2009	8	12	Thompson Bay	5	2	2230	52.1340	128.3780
14	2009	8	12	Thompson Bay	5	3	2300	52.1480	128.3980
15	2009	8	12	Thompson Bay	5	5	2325	52.1587	128.3902
16	2009	8	12	Thompson Bay	5	4	0005	52.1590	128.3540
17	2009	8	13	East Higgins Pass	8	1	2220	52.4020	128.5580
18	2009	8	13	East Higgins Pass	8	2	2300	52.4360	128.5950
19	2009	8	13	East Higgins Pass	8	3	2340	52.4710	128.6380
20	2009	8	13	East Higgins Pass	8	5	0005	52.4917	128.6615
21	2009	8	13	East Higgins Pass	8	4	0030	52.4920	128.6930
22	2009	8	14	Kitasu Bay	7	1	2220	52.5500	128.8000
23	2009	8	14	Kitasu Bay	7	2	2250	52.5450	128.7710
24	2009	8	14	Kitasu Bay	7	5	2315	52.5551	128.7515
25	2009	8	14	Kitasu Bay	7	4	2350	52.5250	128.7510
26	2009	8	15	Meyers Pass	6	4	2220	52.6549	128.5758
27	2009	8	15	Meyers Pass	6	3	2240	52.6645	128.5621
28	2009	8	15	Meyers Pass	6	1	2305	52.6730	128.5720
29	2009	8	15	Meyers Pass	6	5	2330	52.6725	128.5994
30	2009	8	15	Meyers Pass	6	2	0000	52.6840	128.5770
31	2009	8	16	Powell Anchorage	9	3	2215	52.3207	128.3780
32	2009	8	16	Powell Anchorage	9	4	2245	52.3255	128.3442
33	2009	8	16	Powell Anchorage	9	5	2310	52.3117	128.3587
34	2009	8	16	Powell Anchorage	9	1	2335	52.2910	128.3760
35	2009	8	16	Powell Anchorage	9	2	0000	52.2840	128.3550

Table 1 continued…

Set	Year	Month	Set Day	Location	Set Code	Station	Set Start	DD Lat (N)	DD Long (W)

							Time		
36	2009	8	17	Spiller Channel	10	3	2155	52.2770	128.2350
37	2009	8	17	Spiller Channel	10	4	2220	52.2900	128.2590
38	2009	8	17	Spiller Channel	10	2	2250	52.2680	128.2710
39	2009	8	17	Spiller Channel	10	1	2320	52.2500	128.2740
40	2009	8	17	Spiller Channel	10	5	2355	52.2632	128.3357
41	2009	8	18	Hunter Channel	11	1	2205	52.0570	128.1150
42	2009	8	18	Hunter Channel	11	2	2240	52.0570	128.1410
43	2009	8	18	Hunter Channel	11	5	2305	52.0660	128.1594
44	2009	8	18	Hunter Channel	11	3	2325	52.0730	128.1350
45	2009	8	18	Hunter Channel	11	4	2350	52.0780	128.1530
46	2009	8	19	Kildidt Sound	4	3	2200	51.8370	128.1540
47	2009	8	19	Kildidt Sound	4	4	2230	51.8500	128.1160
48	2009	8	19	Kildidt Sound	4	1	2300	51.8620	128.1460
49	2009	8	19	Kildidt Sound	4	5	2325	51.8734	128.1317
50	2009	8	19	Kildidt Sound	4	2	2355	51.8790	128.1590
51	2009	8	20	Fish Egg Inlet	1	1	2145	51.6210	127.7450
52	2009	8	20	Fish Egg Inlet	1	2	2215	51.6040	127.7730
53	2009	8	20	Fish Egg Inlet	1	5	2245	51.6320	127.7770
54	2009	8	20	Fish Egg Inlet	1	3	2320	51.6170	127.8320
55	2009	8	20	Fish Egg Inlet	1	4	2350	51.6470	127.8280
56	2009	8	21	Rivers Inlet	14	3	2140	51.5922	127.5678
57	2009	8	21	Rivers Inlet	14	5	2210	51.5652	127.5892
58	2009	8	21	Rivers Inlet	14	4	2235	51.5724	127.5752
59	2009	8	21	Rivers Inlet	14	2	2300	51.5795	127.5490
60	2009	8	21	Rivers Inlet	14	1	2330	51.5570	127.5555

Table 2. Summary of the number and weight by species, transect, and station from the 2009 Central Coast juvenile herring survey.

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
1	2	4	Kwakshua Channel	**Pacific herring age-1+**	1	0.02
				Chinook salmon	2	0.04
				Pink salmon	1	0.02
				Sockeye salmon	1	0.60
2	12	4	Burke Channel	**Pacific herring age-1+**	1025	12.81
				Pacific herring age-2+	5	0.25
				Chinook salmon	5	0.03
3	12	6	Burke Channel	**Pacific herring age-1+**	1015	13.40
				Chinook salmon	15	0.23
4	12	3	Burke Channel	**Pacific herring age-1+**	82	1.04
				Pacific herring age-2+	1	0.05
				Northern anchovy	1	0.01
				Three-spine stickleback	1	trace
5	12	2	Burke Channel	**Pacific herring age-0+**	77	0.51
				Pacific herring age-1+	4675	55.68
				Pacific herring age-2+	22	0.89
				Three-spine stickleback	121	0.14
				Northern anchovy	22	0.42
				Spiny dogfish	1	0.50
6	12	5	Burke Channel	**Pacific herring age-0+**	104	0.59
				Pacific herring age-1+	150	1.47
				Three-spine stickleback	19	0.02
				Spiny dogfish	14	7.00
				Capelin	1	trace
				Chinook salmon	1	0.01
				Coho salmon	1	0.01
				Pacific sardine	1	0.19
				Chum salmon	1	1.50

* Weights ≤ 9g referred to as trace

Table 2 continued…

Set	Set	Station	Location Name	Species	Number	Weight (kg)*

	Code						
7	13	5	Dean	Channel	**Pacific herring age-0+**	2	0.01
					Pacific herring age-1+	52	0.65
					Pink salmon	17	17.00
					Northern anchovy	1	0.02
					Three-spine stickleback	5	0.01
					Capelin	1	trace
8	13	4	Dean	Channel	**Pacific herring age-0+**	5	0.04
					Pacific herring age-1+	287	4.43
					Northern anchovy	3	0.05
					Pink salmon	3	3.00
					Three-spine stickleback	3	trace
					Pacific sardine	2	0.34
					Capelin	1	trace
					Chinook salmon	1	0.01
9	13	3	Dean	Channel	**Pacific herring age-1+**	171	2.38
					Pacific herring age-2+	2	0.10
					Three-spine stickleback	117	0.11
					Northern anchovy	2	0.03
					Pacific sardine	1	0.21
					Pink salmon	1	1.00
10	13	2	Dean	Channel	**Pacific herring age-0+**	24	0.12
					Pacific herring age-1+	320	4.76
					Pacific herring age-2+	2	0.08
					Pacific sardine	22	4.45
					Three-spine stickleback	12	0.02
					Pink salmon	3	3.00
11	13	1	Dean	Channel	**Pacific herring age-0+**	15	0.09
					Pacific herring age-1+	768	11.02
					Pacific herring age-2+	9	0.43
					Pink salmon	6	6.00

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
12	5	1	Thompson Bay	**Pacific herring age-0+**	14	0.05
				Pacific herring age-1+	24	0.66
				Pacific herring age-2+	168	9.07
				Capelin	2	trace
13	5	2	Thompson Bay	Pacific sardine	5282	1001.90
14	5	3	Thompson Bay	**Pacific herring age-0+**	594	1.80
				Pacific herring age-1+	42	0.98
				Capelin	2	0.02
15	5	5	Thompson Bay	**Pacific herring age-0+**	36	0.09
				Pacific herring age-1+	4	0.10
				Chinook salmon	1	0.08
				Pacific sardine	1	0.18
				Shiner perch	1	0.04
16	5	4	Thompson Bay	**Pacific herring age-0+**	60	0.18
				Pacific herring age-1+	136	2.42
				Pacific herring age-2+	2	0.10
				Squid	13	0.19
				Shiner perch	8	0.04
				Pacific sardine	4	0.79
				Northern anchovy	1	0.02
				Chinook salmon	1	0.20
				Three-spine stickleback	1	trace
17	8	1	East Higgins Pass	Pacific sardine	46	8.19
				Pink salmon	3	3.00
18	8	2	East Higgins Pass	Pacific sardine	1345	251.87
19	8	3	East Higgins Pass	Pacific sardine	273	51.90
20	8	5	East Higgins Pass	Pacific sardine	276	51.88
21	8	4	East Higgins Pass	Pacific sardine	149	26.80

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
22	7	1	Kitasu Bay	Pacific sardine	1035	201.95
23	7	2	Kitasu Bay	**Pacific herring age-1+**	173	3.65
				Pacific sardine	242	47.98
				Capelin	66	0.52
24	7	5	Kitasu Bay	**Pacific herring age-1+**	833	17.00
				Pacific sardine	198	39.59
				Capelin	2	0.02
25	7	4	Kitasu Bay	**Pacific herring age-1+**	1	0.02
				Pacific sardine	13	2.56
				Chinook salmon	1	0.20
26	6	4	Meyers Pass	**Pacific herring age-0+**	208	0.23
				Pacific herring age-1+	20	0.27
				Pacific herring age-2+	1	0.03
				Capelin	53	0.04
27	6	3	Meyers Pass	**Pacific herring age-0+**	1292	1.92
				Pacific herring age-1+	32	0.51
				Chum salmon	4	0.02
28	6	1	Meyers Pass	**Pacific herring age-0+**	112	0.018
				Pacific herring age-1+	10	0.11
29	6	5	Meyers Pass	**Pacific herring age-0+**	5126	12.16
				Pacific herring age-1+	814	14.12
				Capelin	132	0.06
30	6	2	Meyers Pass	**Pacific herring age-0+**	99	0.18
				Pacific herring age-1+	29	0.39
				Pacific herring age-2+	1	0.04
				Capelin	14	0.01

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
31	9	3	Powell Anchorage	**Pacific herring age-0+**	45	0.15
				Pacific herring age-1+	445	10.41
				Pacific herring age-2+	15	0.65
				Capelin	1080	4.60
32	9	4	Powell Anchorage	**Pacific herring age-0+**	12675	39.16
				Pacific herring age-1+	5250	82.85
33	9	5	Powell Anchorage	**Pacific herring age-0+**	15996	49.39
				Pacific herring age-1+	217	3.12
34	9	1	Powell Anchorage	**Pacific herring age-0+**	1776	4.51
35	9	2	Powell Anchorage	**Pacific herring age-0+**	749	1.83
				Pacific herring age-1+	55	0.78
				Pacific sardine	2712	256.19
36	10	3	Spiller Channel	Pacific sardine	349	52.00
37	10	4	Spiller Channel	**Pacific herring age-0+**	1780	7.05
				Pacific sardine	5042	999.71
38	10	2	Spiller Channel	**Pacific herring age-0+**	935	5.02
				Pacific herring age-1+	36574	752.93
				Pacific herring age-2+	243	8.03
				Pacific sardine	1285	240.94
39	10	1	Spiller Channel	**Pacific herring age-1+**	95	2.09
				Pacific herring age-2+	54	2.08
				Pacific sardine	256	47.87
40	10	5	Spiller Channel	**Pacific herring age-0+**	1416	5.62
				Pacific herring age-1+	66	1.46
				Pacific herring age-2+	18	0.92
				Juvenile walleye pollock	72	5.35

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
41	11	1	Hunter Channel	**Pacific herring age-0+**	813	2.03
				Pacific herring age-1+	772	10.13
				Pacific sardine	5407	994.71
42	11	2	Hunter Channel	**Pacific herring age-0+**	35739	88.50
				Pacific herring age-1+	1441	24.94
				Pacific sardine	466	89.72
				Coho salmon	49	1.22
43	11	5	Hunter Channel	**Pacific herring age-0+**	2079	4.93
				Pacific herring age-1+	665	10.27
				Pacific herring age-2+	21	0.94
				Shiner perch	49	0.15
44	11	3	Hunter Channel	**Pacific herring age-0+**	32	0.11
				Pacific herring age-1+	205	3.39
				Pacific sardine	537	109.45
				Chinook salmon	6	0.24
45	11	4	Hunter Channel	**Pacific herring age-0+**	2360	7.67
				Pacific herring age-1+	1940	24.02
				Pacific herring age-2+	33	1.03
				Pacific sardine	2537	477.86
46	4	3	Kildidt Sound	Pacific sardine	2843	501.77
47	4	4	Kildidt Sound	**Pacific herring age-0+**	2780	4.25
				Pacific herring age-1+	16	0.23
				Coho salmon	4	0.59
48	4	1	Kildidt Sound	**Pacific herring age-0+**	83	0.12
				Pacific herring age-1+	9	0.11
				Pacific herring age-2+	11	0.66
				Pacific sardine	591	108.35
				Coho salmon	1	4.00

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
49	4	5	Kildidt Sound	**Pacific herring age-0+**	833	1.38
				Pacific herring age-1+	53	0.97
				Pacific herring age-2+	1	0.04
				Pacific sardine	2	0.38
				Coho salmon	1	0.02
				Three-spine stickleback	1	trace
50	4	2	Kildidt Sound	**Pacific herring age-0+**	427	0.36
				Capelin	39	0.03
				Pacific sardine	7	1.21
				Squid	7	0.06
				Juvenile walleye pollock	5	0.24
				Chinook salmon	1	0.10
				Shiner perch	1	trace
51	1	1	Fish Egg Inlet	**Pacific herring age-1+**	84	2.12
				Pacific herring age-2+	8	0.33
				Juvenile walleye pollock	8	0.04
				Northern anchovy	6	0.09
				Pacific sardine	4	0.84
				Capelin	2	trace
52	1	2	Fish Egg Inlet	**Pacific herring age-0+**	400	2.27
				Pacific herring age-1+	2144	35.52
				Coho salmon	1	2.80
53	1	5	Fish Egg Inlet	**Pacific herring age-0+**	1308	4.70
				Pacific herring age-1+	2320	39.37
				Pacific herring age-2+	92	3.14
				Pacific sardine	656	110.21
54	1	3	Fish Egg Inlet	**Pacific herring age-0+**	91	0.34
				Pacific herring age-1+	1417	22.74
				Pacific herring age-2+	39	1.55
				Pacific sardine	182	30.89
				Juvenile walleye pollock	26	1.90
				Capelin	13	0.01
				Chinook salmon	1	1.90

Table 2 continued…

Set	Set Code	Station	Location Name	Species	Number	Weight (kg)*
55	1	4	Fish Egg Inlet	**Pacific herring age-0+**	899	4.43
				Pacific herring age-1+	7946	118.63
				Pacific sardine	87	16.69
56	14	3	Rivers Inlet	**Pacific herring age-1+**	1617	28.64
				Pacific herring age-2+	11	0.48
				Capelin	22	0.13
				Chinook salmon	11	0.33
57	14	5	Rivers Inlet	**Pacific herring age-0+**	66	0.16
				Pacific herring age-1+	1628	32.20
				Pacific herring age-2+	44	1.79
				Capelin	11	0.01
				Three-spine stickleback	11	0.03
58	14	4	Rivers Inlet	**Pacific herring age-0+**	272	0.69
				Pacific herring age-1+	3440	57.60
				Capelin	320	0.21
				Chinook salmon	16	0.43
59	14	2	Rivers Inlet	**Pacific herring age-1+**	57	1.08
				Pacific sardine	526	106.38
				Pink salmon	1	1.00
				Capelin	3	trace
				Sockeye salmon	1	trace
				Three-spine stickleback	1	trace
60	14	1	Rivers Inlet	**Pacific herring age-0+**	2	trace
				Pacific herring age-1+	64	1.04
				Pacific herring age-2+	2	0.11
				Capelin	44	0.03
				Pacific sardine	30	5.61
				Three-spine stickleback	26	0.02
				Chinook salmon	2	0.05
				Chum salmon	2	0.03
				Juvenile hake	2	0.08

Table 3. Percent occurrence by species in purse seine sets from the 2009 Central Coast juvenile herring survey.

Species Caught

Common Name	Scientific Name	% Occurrence
Pacific herring age-0+	*Clupea pallasi* in year of birth	65.00
Pacific herring age-1+	*Clupea pallasi* in first year	80.00
Pacific herring age-2+	*Clupea pallasi* in second or more years	40.00
Capelin	*Mallotus villosus*	31.67
Chinook salmon	*Oncorhynchus tshawytscha*	23.33
Chum salmon	*Oncorhynchus keta*	5.00
Coho salmon	*Oncorhynchus kisutch*	10.00
Juvenile hake	*Merluccius productus*	1.67
Juvenile pollock	*Theragra chalcogramma*	6.67
Northern anchovy	*Engraulis mordax mordax*	11.67
Pacific sardine	*Sardinops sagax*	58.33
Pink salmon	*Oncorhynchus gorbuscha*	13.33
Shiner perch	*Cymatogaster aggregata*	6.67
Sockeye salmon	*Onchorhynchus nerka*	3.33
Spiny dogfish	*Squalus acanthias*	3.33
Squid	*Loligo opalescens* or *Gonatus fabricii*	3.33
Three-spine stickleback	*Gasterosteus aculeatus*	20.00

Table 4. Summary of the number of herring sampled including length and weight (range, mean, and standard deviations) for each of the three herring age classes encountered. Total catch in numbers (N) and weight (Wt) of all herring by transect for the 2008 Central Coast juvenile herring survey.

Age-0+			Length (mm)			Weight (g)				
Location Name	Set Code	Sampled	Range	Mean	STDev	Range	Mean	STDev	Catch	Total Catch Weight (kg)
Fish Egg Inlet	1	97	60-80	71	4.72	2.38-6.95	4.27	1.13	2698	11.73
Kwakshua	2	-	-	-	-	-	-	-	-	-
Kildidt Sound	4	312	28-66	48	7.14	0.20-3.12	1.35	0.55	4123	6.12
Thompson Bay	5	203	47-80	62	5.96	0.99-6.20	2.95	0.90	704	2.12
Meyers Passage	6	502	33-82	52	7.24	0.37-6.63	1.70	0.75	6837	146.81
Kitasu Bay	7	-	-	-	-	-	-	-	-	-
East Higgins Pass	8	-	-	-	-	-	-	-	-	-
Powell Anchorage	9	341	47-75	61	4.79	1.21-4.97	2.87	0.66	31241	95.03
Spiller Channel	10	116	53-80	68	5.19	2.04-6.43	4.02	0.88	4131	17.69
Hunter Channel	11	270	48-82	61	5.52	1.39-6.21	2.58	0.81	41023	103.24
Burke Channel	12	34	49-82	75	7.77	1.75-7.67	5.69	1.32	181	1.09
Dean Channel	13	8	68-82	76	5.55	4.02-6.96	5.64	1.07	46	0.26
Rivers Inlet	14	24	46-78	59	8.78	0.94-5.57	2.47	1.24	340	0.85
TOTALS		1907	28-82	58	9.56	0.20-7.67	2.49	1.25	91324	384.94

Table 4 continued…

Age-1+			Length (mm)			Weight (g)				
Location Name	Set Code	Sampled	Range	Mean	STDev	Range	Mean	STDev	Catch	Total Catch Weight (kg)
Fish Egg Inlet	1	457	83-138	109	9.07	7.14-37.16	17.00	4.69	13911	218.37
Kwakshua Channel	2	1	-	114	-	-	19.29	-	1	0.02
Kildidt Sound	4	58	85-138	109	13.48	6.72-42.99	17.92	7.93	78	1.31
Thompson Bay	5	137	88-137	112	10.78	9.63-39.32	19.93	5.43	206	4.16
Meyers Passage	6	141	85-137	106	14.11	6.96-31.18	15.46	6.43	905	153.96
Kitasu Bay	7	106	91-136	117	7.36	8.67-32.14	20.48	3.99	1007	20.67
East Higgins Pass	8	-	-	-	-	-	-	-	-	-
Powell Anchorage	9	198	86-135	112	10.32	8.21-32.19	19.15	5.22	5967	97.16
Spiller Channel	10	110	98-137	116	8.12	11.95-35.62	20.77	4.25	36735	756.48
Hunter Channel	11	202	83-136	106	12.08	5.69-34.38	15.11	5.64	5023	72.74
Burke Channel	12	446	83-136	97	6.72	6.34-38.66	12.16	2.94	6947	84.40
Dean Channel	13	447	84-136	102	10.16	6.89-38.99	14.42	4.91	1598	23.25
Rivers Inlet	14	331	84-138	111	9.49	7.53-36.32	17.92	5.14	6806	120.55
TOTALS		2634	83-138	107	11.38	5.69-42.99	16.26	5.53	79184	1553.07

Table 4 continued…

Age-2+			Length (mm)			Weight (g)				
Location Name	Set Code	Sampled	Range	Mean	STDev	Range	Mean	STDev	Catch	Total Catch Weight (kg)
Fish Egg Inlet	1	11	139-151	143	4.36	31.12-46.87	38.3	4.99	139	5.01
Kwakshua Channel	2	-	-	-	-	-	-	-	-	-
Kildidt Sound	4	2	139-159	149	14.14	36.70-61.30	49	17.39	12	0.70
Thompson Bay	5	86	139-183	156	11.15	35.86-91.18	53.88	12.56	170	9.17
Meyers Passage	6	2	147-153	150	4.24	32.23-43.55	37.89	8.00	2	0.76
Kitasu Bay	7	-	-	-	-	-	-	-	-	-
East Higgins Pass	8	-	-	-	-	-	-	-	-	-
Powell Anchorage	9	3	140-153	146	6.66	37.57-50.96	43.63	6.78	15	0.65
Spiller Channel	10	6	139-174	147	13.65	33.12-70.03	43.95	13.19	315	11.03
Hunter Channel	11	4	139-155	149	7.12	31.23-47.49	41.54	7.18	54	1.98
Burke Channel	12	3	143-149	147	3.46	40.97-50.21	46.07	4.69	28	1.19
Dean Channel	13	5	141-153	147	4.28	42.03-53.66	48.57	4.58	13	0.62
Rivers Inlet	14	6	140-157	145	6.74	33.49-55.31	43.55	8.88	57	2.38
TOTALS		128	139-183	153	11.14	31.12-91.18	50.25	12.45	805	33.48

Table 5. Grouping of organisms, by phylum with abbreviations from plankton tows from the 2009 Central Coast juvenile herring survey.

Coelenterata	
COEL	Medusae - *Aequorea victoria*
SIPH	Siphonophores
Ctenophora	
CTEN	Ctenophores
Annelida	
POLY	Polychaetes
Mollusca	
GAST	Prosobranch gastropods
MUSS	Mussels
OCTO	Octopus larvae
PELE	Pelecypods
Arthropoda	
AMPH	Amphipods
BARN	Barnacle; unknown stage
CAPR	Skeleton shrimp (*Caprellida sp.*)
CLAD	Cladocerans; Podon sp. and Evadne sp.
COPE	Copepods (Table 6 for complete species list)
CNAU	Unidentified copepod nauplii
CRAM	Crab megalopea
CRAZ	Crab zoea
EUPA	Adult euphausiids; mainly *Euphausia pacifica*
EUPH	*Euphausia pacifica*
EUPL	Larval euphausiids; mainly *Euphausia pacifica*
MYSI	Mysids
OSTR	Ostracods
SEAL	*Caligus elongatus*
SHRI	Shrimp zoea
Ectoprocta	
ECTO	Ectoprocts; mostly *Membranipora sp.* larvae (cyphonautes)
Echinodermata	
ECHI	Echinoderm larvae
Chaetognatha	
CHAE	Chaetognaths; mostly *Sagitta sp.*
Chordata	
LARV	Larvaceans; mostly *Oikopluera sp.* and *Fritillaria sp.*
FISHL	Larval fish; unknown species

Table 5 continued…

Miscellaneous	
EGGS	Mainly euphausiid eggs, with some teleost eggs

Table 6. Abbreviations for calanoid and cyclopoid copepods identified in plankton samples from the 2009 Central Coast juvenile herring survey.

Calanoid copepods	
ALON	*Acartia longimeres*
CABD	*Centropages abdominalis*
CALA	*Calanus sp.*
CAND	*Candacia sp.*
CCOL	*Canadacia columbiae*
CMAR	*Calanus marshallae*
CPAC	*Calanus pacificus*
EBUN	*Eucalanus bungii*
EELO	*Eucalanus elongatus*
ELON	*Epilabidocera longipedata*
EUCH	*Euchaeta sp.*
METR	*Metridia sp.*
MPAC	*Metridia pacifica*
OBOR	*Oncaea borealis*
PPAR	*Paracalanus parvus*
PSEU	*Pseudocalanus sp.*
TDIS	*Tortanus discaudatus*
UCAL	Unidentified calanoid
Cyclopoid copepods	
OATL	*Oithona atlantica*
OSIM	*Oithona similis*

Table 7. Number of zooplankton per set per volume (m^3) of water observed in samples from the 2009 Central Coast juvenile herring survey.

Location	Set Code	Station	Volume	ALON	AMPH	BARN	CABD	CALA	CAND	CAPR	CCOL	CHAE
Fish Egg Inlet	1	1	13.8428	50.9	-	20.8	48.5	23.7	-	-	-	3.5
		2	14.4272	144.2	0.1	13.4	54.9	0.3	-	-	-	6.7
Kwakshua Channel	2	3	16.0362	227.6	1.0	44.9	10.4	-	-	-	-	0.1
		4	12.6924	162.6	-	8.8	16.2	95.8	-	-	-	-
Kildidt Sound	4	3	13.8116	41.7	2.5	67.2	111.2	31.0	-	-	-	4.6
		4	14.3853	100.1	-	15.6	108.1	6.7	-	-	-	2.2
Thompson Bay	5	1	14.7212	488.1	-	13.0	164.3	31.2	-	-	-	-
		3	14.7875	48.5	-	7.6	17.4	-	-	-	-	-
Meyers Pass	6	1	14.1140	325.1	2.3	36.3	16.3	-	-	0.1	-	-
		4	15.1860	466.9	4.5	126.4	47.2	-	-	-	-	-
Kitasu Bay	7	1	13.3705	753.5	-	-	19.1	2.8	-	-	-	-
		2	15.2804	988.5	-	-	50.3	24.7	-	-	-	-
East Higgins Pass	8	1	14.3761	235.9	3.3	-	-	15.7	2.2	-	-	1.4
		4	13.4969	170.7	-	10.3	183.0	0.3	-	-	-	-
Powell Anchorage	9	3	14.6755	316.2	2.6	43.6	40.2	0.3	-	-	-	0.1
		4	14.0203	116.4	-	5.8	29.9	-	-	-	-	-
Spiller Channel	10	3	15.8815	152.1	-	24.2	20.1	2.5	-	-	0.1	-
		4	15.9021	169.0	-	6.0	46.3	-	-	0.1	-	-
Hunter Channel	11	1	15.2111	513.3	0.4	113.7	131.7	9.2	-	-	-	-
		3	15.2050	193.6	2.1	35.8	69.5	24.3	-	-	-	-
Burke Channel	12	3	10.5052	28.9	-	1.5	-	-	-	-	-	-
		4	12.3824	35.9	-	10.3	-	-	-	-	-	-
Dean Channel	13	4	16.1253	56.6	5.0	0.5	1.9	-	-	-	-	-
		5	14.8347	3.6	0.5	0.1	-	0.1	-	-	-	-
Rivers Inlet	14	2	14.6702	41.4	1.2	15.3	3.3	0.1	-	-	-	0.4
		4	15.6972	13.8	-	7.5	-	0.2	-	-	-	0.3

Table 7 continued…

Set Code	Station	CLAD	CMAR	CNAU	COEL	CPAC	CRAM	CRAZ	CTEN	EBUN	ECHI	ECTO	EELO
1	1	196.5	0.6	-	-	0.6	0.1	1.3	-	-	-	25.4	-
	2	93.2	-	-	5.2	0.1	0.1	6.7	0.4	-	-	24.4	-
2	3	-	-	-	-	-	-	9.8	0.1	-	-	19.0	-
	4	3.8	1.3	-	-	-	-	0.3	-	-	-	-	-
4	3	39.4	0.3	-	7.0	2.5	-	3.2	0.1	-	-	4.6	-
	4	71.2	-	-	24.6	0.3	0.3	13.3	0.1	-	-	8.9	-
5	1	-	-	-	-	0.8	0.5	29.6	-	-	-	4.3	-
	3	2.7	-	-	0.8	-	-	6.3	-	-	-	2.7	-
6	1	52.1	-	-	0.6	-	0.1	1.0	0.1	-	2.3	-	-
	4	96.9	-	4.2	0.5	-	0.1	3.4	0.5	-	4.2	8.4	-
7	1	4.8	-	4.8	0.2	-	-	2.8	-	-	-	9.6	-
	2	-	0.1	-	-	-	-	0.1	-	-	-	-	-
8	1	-	2.2	-	-	-	-	0.3	-	-	-	-	2.2
	4	-	-	-	7.3	-	0.1	34.7	-	-	-	-	-
9	3	141.7	3.5	-	-	-	0.1	11.3	2.6	-	-	-	-
	4	87.9	-	-	3.4	-	0.2	17.0	0.2	-	-	1.1	-
10	3	80.6	0.1	-	-	1.0	-	0.2	-	-	-	4.0	-
	4	24.1	-	-	-	-	-	12.5	0.2	-	-	10.1	-
11	1	42.1	-	-	-	-	-	13.7	0.3	-	-	8.4	-
	3	67.3	-	-	0.2	-	-	1.3	0.2	-	-	2.1	-
12	3	71.6	-	-	6.9	-	-	3.8	74.6	-	-	1.5	-
	4	333.4	-	-	3.9	-	-	0.6	30.7	1.0	10.3	-	1.6
13	4	61.0	-	-	0.5	-	-	0.1	0.1	-	-	-	-
	5	16.0	-	-	0.4	-	-	0.1	0.8	0.1	-	-	-
14	2	34.9	-	-	1.4	-	-	-	-	2.2	-	-	-
	4	16.8	-	-	0.1	-	-	0.5	-	0.7	-	0.5	-

Table 7 continued…

Set Code	Station	EGGS	ELON	EUCH	EUPA	EUPH	EUPL	FISHL	GAST	LARV	METR	MPAC	MUSS
1	1	55.5	-	-	1.0	-	4.5	0.1	11.6	6.9	-	98.2	-
	2	-	-	-	-	-	2.4	-	17.7	-	-	-	-
2	3	3.1	-	-	-	-	7.0	0.1	-	16.0	-	-	-
	4	18.9	-	-	-	0.3	9.7	0.2	-	3.8	-	53.6	-
4	3	41.7	-	-	1.2	-	64.7	-	13.9	20.9	-	-	-
	4	2.2	-	-	-	-	18.5	-	8.9	13.3	-	-	-
5	1	82.6	0.6	-	1.6	-	154.3	0.3	-	8.7	-	0.3	-
	3	5.4	-	-	-	-	20.9	0.1	4.9	28.7	-	-	-
6	1	11.4	-	-	-	-	39.6	0.1	-	56.7	-	0.1	-
	4	8.4	-	-	-	-	69.9	-	-	84.3	-	-	-
7	1	186.7	-	-	-	-	76.6	0.1	4.8	33.5	-	-	-
	2	259.7	-	-	-	-	25.1	-	41.9	16.8	-	-	-
8	1	342.8	-	2.2	3.3	-	2.5	0.3	-	4.5	-	300.5	-
	4	2.4	-	-	-	-	2.4	-	4.7	7.1	-	-	-
9	3	143.9	0.1	-	1.2	-	15.4	-	-	6.5	-	1.6	-
	4	18.3	-	-	-	-	3.7	-	-	5.7	-	0.1	0.1
10	3	68.5	0.1	-	0.4	-	13.5	-	-	4.0	7.1	2.2	-
	4	30.2	-	-	-	-	6.1	-	-	6.0	-	0.1	-
11	1	4.3	-	-	-	-	17.0	0.1	71.5	12.6	-	0.1	-
	3	31.6	-	-	-	-	10.6	-	12.6	10.5	-	-	-
12	3	-	-	-	-	-	14.8	-	-	150.8	-	-	-
	4	25.8	-	-	-	15.5	15.5	-	-	54.3	-	-	-
13	4	-	-	-	-	-	10.5	-	1.0	5.5	-	-	-
	5	0.1	-	-	0.2	-	0.7	0.1	0.1	0.7	-	0.1	-
14	2	91.6	-	-	-	-	9.3	-	4.4	8.9	1.6	0.4	-
	4	66.8	-	-	0.5	-	3.1	-	16.3	4.2	1.5	-	-

Table 7 continued…

Set Code	Station	MYSI	OATL	OBOR	OCTO	OSIM	OSTR	PELE	POLY	PPAR	PSEU	SEAL	SHRI
1	1	-	-	-	-	-	-	-	-	-	187.2	-	3.5
	2	-	-	-	-	-	-	-	4.5	11.1	126.8	-	5.7
2	3	0.1	-	-	-	-	-	6.0	1.0	8.0	25.4	-	3.5
	4	-	-	-	-	-	-	-	-	2.5	88.4	-	0.2
4	3	-	-	-	-	2.3	-	-	2.3	11.6	187.7	-	3.5
	4	-	-	2.2	-	13.3	-	-	-	-	111.6	-	7.9
5	1	-	-	4.3	-	-	0.3	-	4.3	34.4	412.1	-	7.1
	3	-	-	0.5	-	1.6	-	-	0.5	6.1	13.5	0.1	-
6	1	-	-	-	-	6.8	-	-	0.1	22.7	68.9	-	0.4
	4	-	-	-	-	8.4	-	8.4	-	4.2	48.1	-	11.5
7	1	-	-	-	-	-	-	-	-	38.3	143.6	-	0.5
	2	-	-	-	-	16.8	-	-	-	25.1	1910.3	-	0.1
8	1	-	-	-	-	-	-	-	9.7	13.4	418.5	-	0.3
	4	-	2.4	-	-	4.7	-	-	-	67.1	111.9	0.2	21.3
9	3	-	-	-	-	6.5	-	-	0.1	41.4	171.3	-	7.1
	4	-	-	-	0.1	-	-	-	0.1	6.8	54.6	-	12.1
10	3	-	-	-	-	16.1	-	-	0.1	16.1	594.4	-	0.1
	4	-	-	-	-	8.0	-	-	-	6.0	195.2	-	0.1
11	1	-	-	-	-	-	-	-	0.1	-	95.1	-	22.5
	3	-	-	-	-	6.3	-	2.1	-	16.8	134.7	-	0.5
12	3	-	-	-	-	-	-	4.6	6.5	15.2	41.1	-	-
	4	-	-	-	-	-	11.3	7.8	12.9	22.8	68.0	-	9.0
13	4	-	-	0.5	-	1.5	-	0.5	-	0.5	47.3	-	0.6
	5	-	-	-	-	-	-	0.1	-	-	1.9	-	0.1
14	2	-	-	-	-	-	-	-	0.1	-	68.2	-	1.1
	4	-	2.0	-	-	10.2	-	-	0.1	0.5	40.6	-	-

Table 7 continued…

Set Code	Station	SIPH	TDIS	UCAL
1	1	16.2	20.8	-
	2	0.6	10.4	5.2
2	3	-	-	-
	4	-	-	-
4	3	5.2	7.0	-
	4	2.8	4.4	-
5	1	-	-	-
	3	0.1	-	-
6	1	3.0	-	-
	4	0.3	-	-
7	1	0.1	-	-
	2	-	-	-
8	1	1.4	-	-
	4	0.1	26.8	-
9	3	-	-	-
	4	0.1	6.8	-
10	3	0.1	4.0	-
	4	0.1	-	-
11	1	0.2	-	-
	3	0.1	-	-
12	3	-	-	-
	4	-	-	-
13	4	-	-	-
	5	1.0	-	-
14	2	8.0	-	-
	4	3.3	1.7	-