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ICHTHYOPLANKTON AND STATION DATA FOR MANTA (SURFACE) TOWS TAKEN ON CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS SURVEY CRUISES IN 1987

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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ABSTRACT

This report provides ichthyoplankton data and associated station and tow data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations (CalCOFI) cruises in 1987. It is the sixth report in a series that presents surface tow data for all biological-oceanographic CalCOFI surveys from 1977 to the present. A total of 254 net tow stations was occupied during four quarterly cruises over the survey area which extended from Avila Beach to San Diego, California and seaward in a southwesterly direction to a maximum of approximately 330 n. mi. The most seaward station, 90.120, was approximately 400 n. mi. west of Punta Baja, Baja California, Mexico. A total of 233 Manta net tows was taken during 1987. The data for stations on which Manta tows were taken are listed in a series of four tables; the background, methodology, and information necessary for interpretation of the data are presented in an accompanying text. All pertinent station and tow data, including volumes of water filtered are listed in the first table. Another table lists, by station and month, standardized counts of each of the 69 larval fish categories identified from Manta tows taken on the survey. This series of reports makes the CalCOFI ichthyoplankton and station data available to all investigators and serves as a guide to the computer data base.

INTRODUCTION

This report, the sixth in a series of surface tow data reports, provides ichthyoplankton and associated station and Manta net tow data from California Cooperative Oceanic Fisheries Investigations (CalCOFI) joint biological-oceanographic survey cruises conducted in 1987. This program was initiated in 1949, under the sponsorship of the Marine Research Committee of the State of California, to study the population fluctuations of the Pacific sardine (*Sardinops sagax*) and the environmental factors that may play a role in these fluctuations. CalCOFI is a partnership among the Southwest Fisheries Science Center (SWFSC) of the National Marine Fisheries Service (NMFS), the Scripps Institution of Oceanography (SIO), and the California Department of Fish and Game (CDFG). NMFS and SIO supply ships and personnel to conduct the sea surveys, NMFS processes the plankton samples and analyzes the ichthyoplankton from them. SIO processes and analyzes hydrographic and biological samples and analyzes invertebrate groups from the plankton samples.

The boundaries, station placement, and sampling frequency for the CalCOFI surveys were based on the results of joint biological-oceanographic cruises conducted by NMFS and SIO during 1939–41. Originally, CalCOFI cruises were designed to collect sardine eggs and larvae in oblique net tows and hydrographic data associated with the tows over the entire areal and seasonal spawning range of the species. From 1951 to 1960 the surveys were annual with cruises conducted monthly. The survey area was occupied quarterly during 1961–1965 and in 1966 the surveys became triennial with monthly cruises. Beginning in 1985 annual surveys were resumed, with quarterly cruises occupying only the Southern California Bight region (see Hewitt 1988; Moser et al. 1993, 1994, 2001a for summaries of historical CalCOFI sampling effort). Neuston[1] sampling with the Manta net (Figure 1) was initiated in 1977-78. Station and ichthyoplankton data for oblique tows taken on the 1987 CalCOFI survey are published in Sandknop et al. (1999). Ahlstrom and Stevens (1976), Gruber et al. (1982) and Doyle (1992a, b) provided initial information

[1]Usage of the term "neuston" for surface-living marine organisms is controversial because it was applied originally to organisms associated with the surface film in freshwater habitats (Naumann 1917). Banse (1975) reviewed in detail the evolution of the usage of this term, a related term, "pleuston", and the various subdivisions of each. Neuston is now used by most workers in referring to the uppermost (upper ~10–20 cm) layer of the sea and to the assemblage of organisms that lives in that zone, either permanently or facultatively (Zaitsev 1970; Hempel and Weikert 1972; Peres 1982; Doyle 1992b). We accept this definition and use it interchangeably with the more general term "surface" (e.g., surface waters, surface zone, surface tow, surface assemblage).

on the distribution and abundance of surface ichthyoplankton in the northeastern Pacific.

Hydrographic and biological data from the 1987 CalCOFI cruises were published by the Scripps Institution of Oceanography (Univ. of Calif., SIO 1987, 1988) and a data report is being prepared for the others. All available records for Manta tows on the 1987 CalCOFI surveys were verified and edited to produce this data report. The CalCOFI ichthyoplankton data reports make CalCOFI ichthyoplankton and station data available to all investigators and serve as guides to the ichthyoplankton computer data base. They are the basic documents against which changes in the data base can be compared as it is modified to correct errors and update earlier identifications. Citations for previous reports in this series are:

Survey	Report	Survey	Report
1977-78	Moser et al. 2001b	1985	Ambrose et al. 2002b
1980-81	Ambrose et al. 2002a	1986	Charter et al. 2002b
1984	Charter et al. 2002a		

SAMPLING AREA AND PATTERN

The1987 CalCOFI survey consisted of four quarterly cruises on which a total of 233 Manta net tows was taken at the 254 standard CalCOFI net tow stations occupied during the survey (Table 1; Figures 2 and 3). Two vessels were employed on the survey, the NOAA vessel RV *David Starr Jordan* and the SIO vessel RV *New Horizon*. Dates and numbers of stations sampled with the Manta net in 1987 (Figures 2 and 3) are summarized below:

8703, RV *David Starr Jordan*, 60 stations, March 2–17;

8705, RV *David Starr Jordan*, 66 stations, April 30–May 14;

8709, RV *New Horizon*, 62 stations, September 4–19;

8711, RV *New Horizon*, 45 stations, November 13–28.

The survey area extended from Avila Beach to San Diego, California and seaward on six survey lines to approximately 120–330 n. mi (Figures 2 and 3). The most seaward oblique plankton tow station, 90.0 120.0, was approximately 400 n. mi. west of Punta Baja, Baja California, Mexico. Stations on CalCOFI lines 76.7 and 80.0 extended seaward to station 100.0 on cruises 8703 and 8705, stations on lines 83.3 and 86.7 extended seaward to station 110.0 on cruises 8705, 8709, and 8711, and stations on lines 90.0 and 93.3 extended to station 120.0 on all cruises (Figures 2 and 3).

SAMPLING GEAR AND METHODS

Plankton tows were made with a modified version of the Manta net originally designed by Brown and Cheng (1981). It consists of a rectangular mouth 15.5 cm deep and 86 cm wide attached to a frame that supports square lateral extensions covered with plywood and urethane foam (Figure 1). These extensions stabilize the net when it is towed and keep the top of the net at the sea surface. The net is constructed of 0.505 mm nylon mesh. The towing bridle is asymmetrical with one side longer than the other; when the net is towed this bridle arrangement forces the mouth away from the ship at a slight angle. A General Oceanics flowmeter was suspended across the center of the net mouth to measure the amount of water filtered during

each tow. At each Manta tow station the tow line from the bridle was attached to the hydrographic wire and then lowered to slightly below the surface of the water before the net was deployed. The net was towed at a ship speed of 1.0–2.0 knots for 15 minutes. Samples were preserved in 5% buffered formalin and returned to the plankton sorting laboratory at the SWFSC at the end of the cruise.

LABORATORY PROCEDURES

The ichthyoplankton was removed from the invertebrate portion of each sample and bottled separately in 3% buffered formalin. In addition to fish eggs and larvae, some samples contained surface-living juvenile, and occasionally adult, stages of fishes; these were removed and bottled separately in 3% formalin. The volume of water filtered by each net was computed from the flowmeter readings. A "standard haul factor" is used for oblique CalCOFI net tows to calculate the total number of ichthyoplankters of a taxon per unit surface area (Kramer et al 1972; Smith and Richardson 1977; Moser et al. 1993). A requirement for this is the entire depth distribution of the taxon must be encompassed during the tow. The Manta net samples only the upper ~15.5 cm of the water column and most, if not all, ichthyoplankton taxa that inhabit the surface zone have a vertical range > 15.5 cm. Even taxa associated with the immediate surface layer may range deeper than 15.5 cm as a result of diel migratory patterns or vertical mixing (Hempel and Weikert 1972; Doyle 1992b). Calculation of total numbers of eggs or larvae per unit surface area from Manta net samples awaits accurate information on the fine-scale vertical distribution of these organisms in the upper region of the water column. Even if there are few species whose larvae are restricted to the upper 15.5 cm of the water column, the time series of Manta samples provides a useful index of relative abundance for species whose larvae appear in these samples. In this report we express quantities of eggs or larvae in each sample as unadjusted counts or as numbers of eggs or larvae per unit volume of water filtered by the net.

IDENTIFICATION

Constituent taxa in the samples were identified by the senior author and D. A. Ambrose. Early ontogenetic stages of fishes are difficult to identify; most identifications were based on descriptions of ontogenetic series of fishes in published identification guides to early stages of fishes in the northeastern Pacific (Matarese et al. 1989; Moser 1996). Larval specimens that could not be identified with these guides were identified by establishing ontogenetic series on the basis of morphology, meristics, and pigmentation, and then linking these series through overlapping features to known metamorphic, juvenile, or adult stages (Miller and Lea 1972; Eschmeyer et al. 1983; Powles and Markle 1984). Except for damaged specimens, most of the larvae and juvenile/adults taken in the surface tows could be identified to species. A total of 69 larval fish categories (including unidentified and disintegrated categories) was identified: 57 to species, 8 to genus, and 2 to family.

The following taxonomic categories in Tables 2–4 require special explanation:

Cyclothone spp. – small or damaged larvae, almost entirely *C. acclinidens* and/or *C. pseudopallida* lacking diagnostic characters.

Disintegrated fish larvae – larvae that could not be identified because of their poor condition; separated from the "unidentified" category to monitor the general condition of the ichthyoplankton samples through the time series.

Lampanyctus spp. – most of the larvae in this category are small (< 5 mm), often damaged, specimens belonging to the subgroup of *Lampanyctus*, characterized by small or absent pectoral fins in adults, placed by Zahuranec (2000) in the genus *Nannobrachium*; two *Nannobrachium* species,

N. ritteri (formerly *L. ritteri*) and *N. regale* (formerly *L. regalis*), occur commonly in the present CalCOFI survey pattern; larvae of these species > ~ 5 mm have been identified in oblique tow samples since 1954; beginning in 1985, larvae of two other species, *N. bristori* and *N. hawaiiensis*, have been identified and included in the CalCOFI data base for oblique tows; in previous oblique tow data reports these were referred to as *Lampanyctus* "niger" and *Lampanyctus* "no pectorals", respectively (see Moser 1996).

Unidentified fish larvae – larvae that were generally in good condition but could not be identified because of their small size or early stage of development.

Vinciguerria lucetia – V. lucetia, an eastern tropical Pacific species, is common in the present CalCOFI region whereas the central water mass species *V. poweriae* is rarely encountered; a small percentage of *V. poweriae* larvae may have been included in the *V. lucetia* category because of the difficulty in separating early larvae of the two species.

SPECIES SUMMARY

Of the five most abundant larvae, northern anchovy (*Engraulis mordax*) ranked first in abundance with 80.0% of the total fish larvae and first in occurrence with larvae collected in 36.1% of the total samples. (Tables 2 and 3). They were more than twice as abundant as the second most abundant species, blacksmith (*Chromis punctipinnis*), which accounted for 6.0% of the total larvae but ranked only 11th in occurrence (3.9% of the total samples). The high abundance of blacksmith is attributable to a single large collection (1009 larvae) at station 90.0 28.0 on cruise 8709NH. Pacific saury (*Cololabis saira*) was the third most abundant taxon with 2.7% of the total larvae and ranked second in frequency of occurrence (33.9% of the samples). The rockfish genus *Sebastes* ranked fourth in abundance (2.6% of total larvae) and third in total occurrences (18.5% of the samples). Pacific sardine (*Sardinops sagax*) ranked fifth in abundance (1.9% of total larvae) and fifth in total occurrences (9.9% of the samples). The next five most abundant taxa were Pacific mackerel *Scomber japonicus* (1.2% of total larvae), jack mackerel *Trachurus symmetricus* (0.8%), shortbelly rockfish *Sebastes jordani* (0.8%), mussel blenny *Hypsoblennius jenkinsi* (0.6%), and cabezon *Scorpaenichthys marmoratus* (0.5%). These taxa ranked tied for 6th, 4th, 41st, tied for 6th, and 8th, in frequency of occurrence, respectively. The 10 most abundant taxa comprised 97.0% of all the larvae collected in Manta net tows on CalCOFI cruises in 1987. The remaining 3.0% was distributed among 59 other taxa (including the disintegrated and unidentified categories). Of the ten most abundant taxa, half were coastal demersal taxa, four were coastal pelagic species, and one was epipelagic.

In comparison with the surface collections, among the 148 taxa collected in the oblique tows during the 1987 survey, northern anchovy also ranked first in abundance and occurrence with 74.0% of the total larvae and 48.0% positive tows. Among the ten most abundant taxa in the oblique tows in 1987, half (northern anchovy, *Sebastes* spp., Pacific sardine, Pacific mackerel, and jack mackerel) were among the ten most abundant in Manta tows (Sandknop et al. 1999).

EXPLANATION OF TABLES

Table 1. This table lists for each tow the pertinent station and tow data, the volume of water filtered, and the total number of fish eggs and larvae for ichthyoplankton stations occupied during the 1987 CalCOFI survey. Cruises are designated by a six character alphanumeric code; the first two digits indicate the year and the second two the month, followed by the ship code, JD (*David Starr Jordan*) or NH (*New Horizon*). Within each cruise the data are listed in order of increasing line and station number (southerly and seaward directions); the order of station occupancy is shown on the station

charts (Figures 2 and 3). Stations are designated by two groups of numbers; the first set indicates the line and decimal fraction and the second set indicates the station and decimal fraction. Time is listed as Pacific Standard Time at the start of each tow in 24-hour designation. The values for total fish eggs and larvae are raw counts (unadjusted for volume of water filtered). The listings for station latitude and longitude in this table may differ from values given for the same station in the SIO data reports, reflecting the slight difference in position of the net tow and hydrocast.

Table 2. Pooled occurrences of all larval fish taxa taken in Manta nets on the RV *David Starr Jordan* and the RV *New Horizon* during the 1987 CalCOFI survey. Taxa are listed in rank order.

Table 3. Pooled counts (unadjusted for volume of water filtered) of all larval fish taxa taken in Manta net tows on the the RV *David Starr Jordan* and the RV *New Horizon* during the 1987 CalCOFI survey. Taxa are listed in rank order.

Table 4. Numbers of fish larvae for each taxon taken in Manta net tows on the RV *David Starr Jordan* and the RV *New Horizon* during the 1987 CalCOFI survey. Numbers of larvae are listed as number per 100 m^3 of water filtered. Orders and families are listed in phylogenetic sequence (Eschmeyer 1998); other taxa are listed alphabetically.

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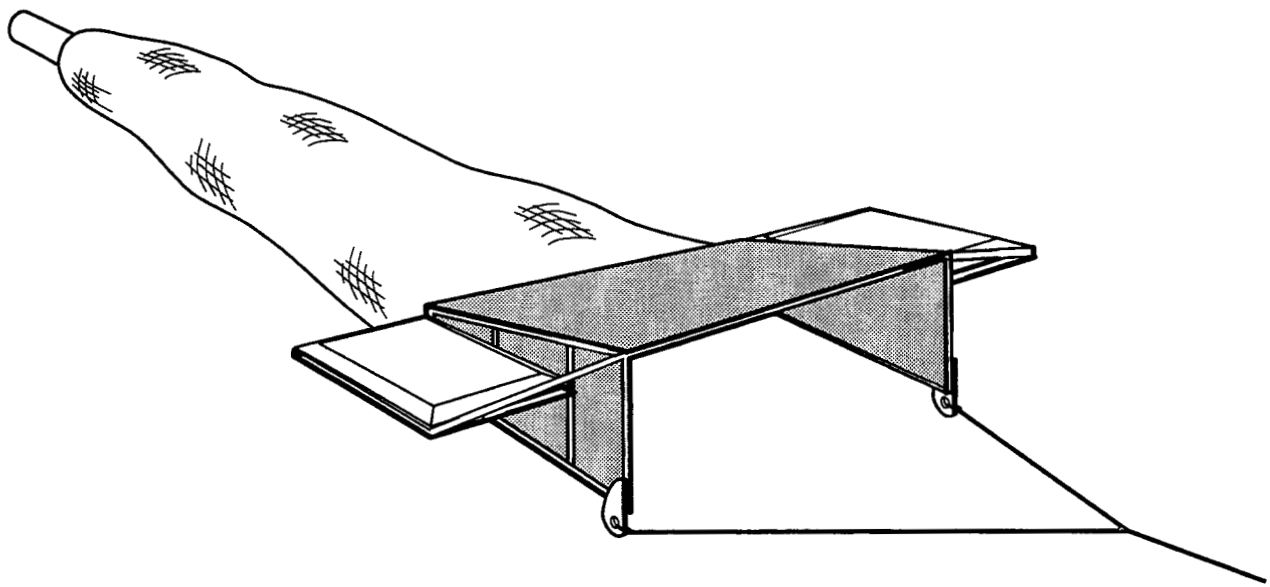

Figure 1. Diagram of the Manta net used on CalCOFI surveys.

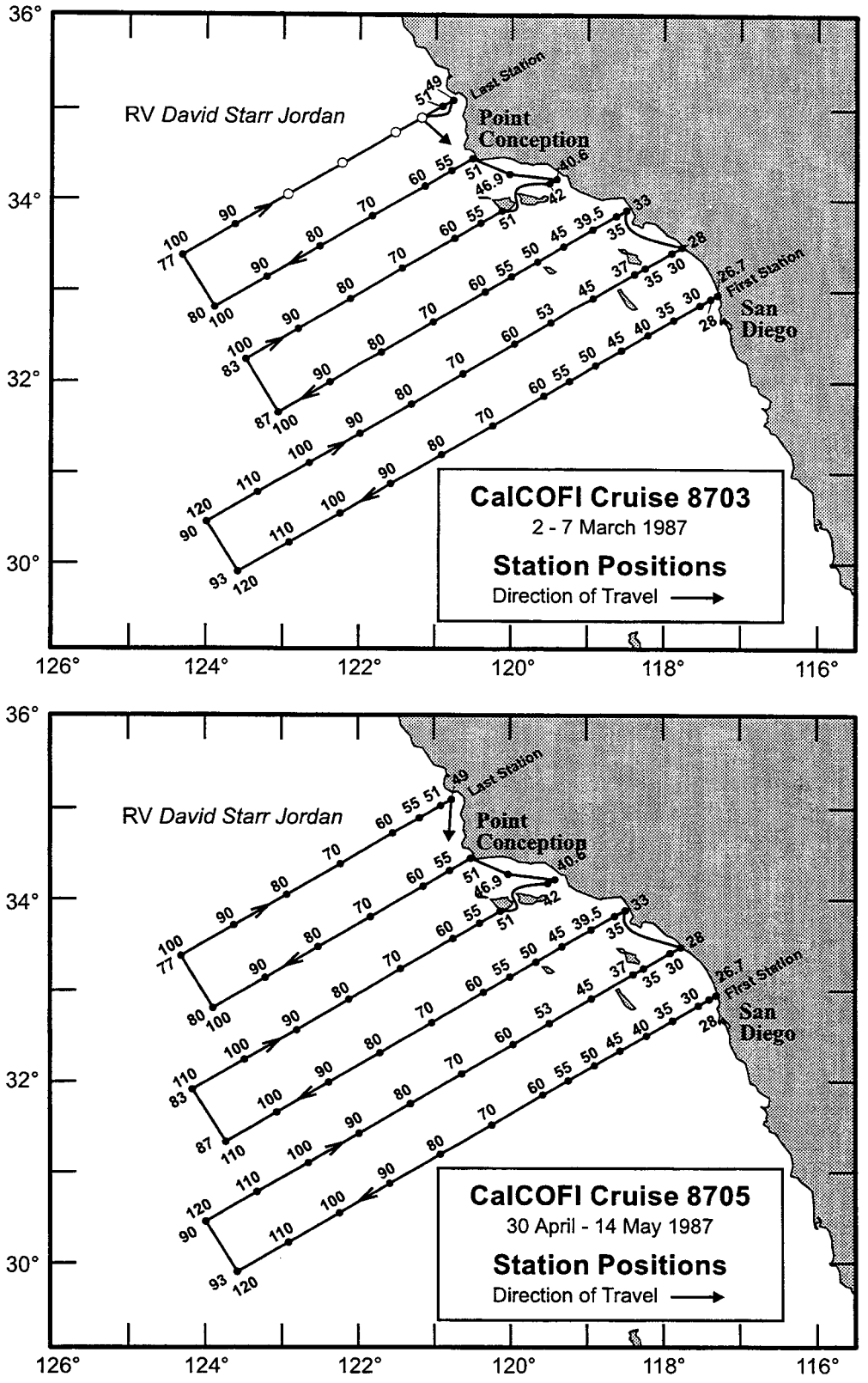

Figure 2. Stations and cruise tracks for CalCOFI cruises 8703 (above) and 8705 (below). Dots indicate stations where Manta and oblique tows were taken; open circles indicate stations where only oblique tows were taken .

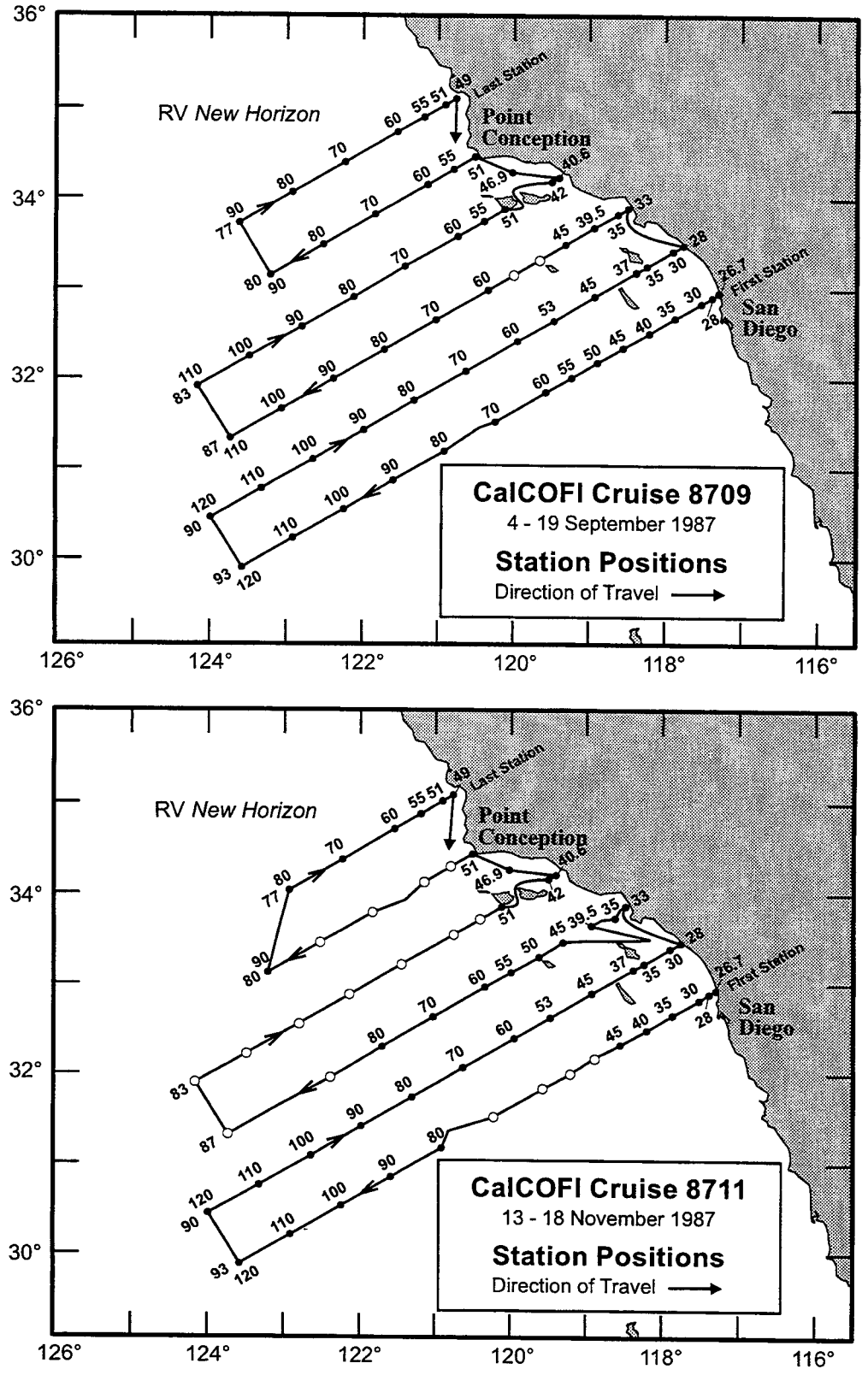

Figure 3. Stations and cruise tracks for CalCOFI cruises 8709 (above) and 8711 (below). Symbols as in Figure 2.

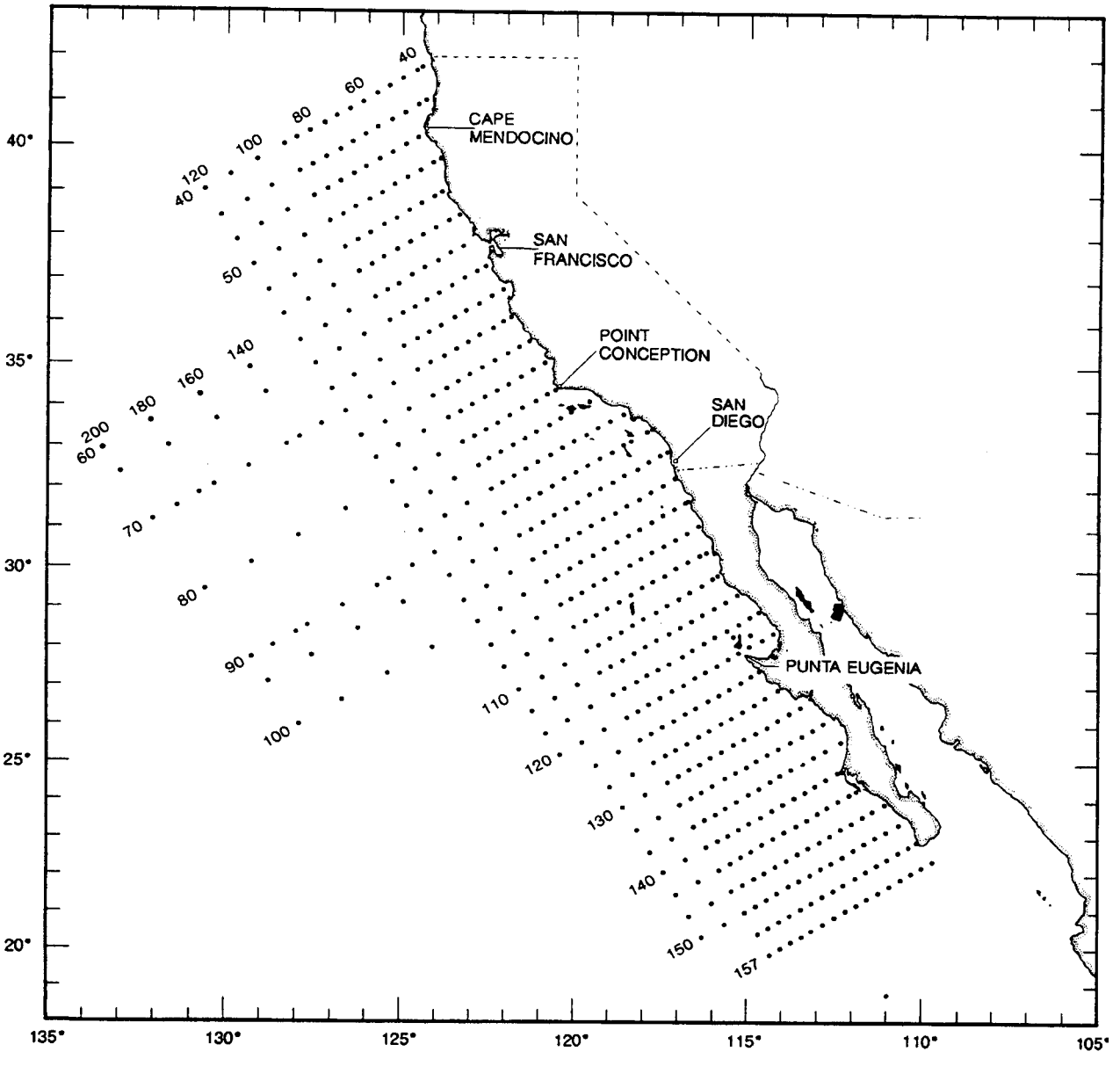

Figure 4. The basic station plan for CalCOFI cruises from 1950 - 1984.

TABLE 1. Station and plankton tow data for Manta tows taken on the 1987 CalCOFI survey. Numbers of fish eggs and larvae are raw counts, unadjusted for volume (cubic meters) of water filtered.

CalCOFI Cruise 8703

Line	Station	Latitude (N) deg.	min.	Longitude (W) deg.	min.	Ship Code	Tow Date yr.	mo.	day	Time (PST)	Volume Water Strained	Total Larvae	Total Eggs
76.7	49.0	35	05.3	120	46.6	JD	87	03	16	0920	76	25	859
76.7	51.0	35	01.3	120	55.1	JD	87	03	16	1145	71	2	7
76.7	90.0	33	43.3	123	38.2	JD	87	03	14	1650	98	0	27
76.7	100.0	33	23.3	124	19.4	JD	87	03	14	1148	92	3	3
80.0	51.0	34	27.0	120	31.4	JD	87	03	12	2330	90	9	202
80.0	55.0	34	19.0	120	48.1	JD	87	03	13	0319	92	960	1693
80.0	60.0	34	09.0	121	09.1	JD	87	03	13	0719	95	47	29
80.0	70.0	33	49.1	121	50.6	JD	87	03	13	1315	96	1	168
80.0	80.0	33	29.0	122	32.0	JD	87	03	13	1845	91	2	3
80.0	90.0	33	09.0	123	13.3	JD	87	03	14	0048	95	5	3
80.0	100.0	32	49.0	123	54.2	JD	87	03	14	0608	103	0	0
81.8	46.9	34	16.9	120	02.0	JD	87	03	12	1917	73	1618	1
83.3	40.6	34	13.5	119	24.7	JD	87	03	12	1440	100	1085	411
83.3	42.0	34	10.7	119	30.5	JD	87	03	12	1227	38	78	717
83.3	51.0	33	52.7	120	08.0	JD	87	03	12	0644	92	366	453
83.3	55.0	33	44.8	120	24.6	JD	87	03	12	0323	96	136	2993
83.3	60.0	33	34.7	120	45.3	JD	87	03	11	2255	74	45	13
83.3	70.0	33	14.7	121	26.6	JD	87	03	11	1751	91	1	161
83.3	80.0	32	54.7	122	07.7	JD	87	03	11	1230	82	0	1359
83.3	90.0	32	34.7	122	48.7	JD	87	03	11	0700	95	0	3
83.3	100.0	32	14.6	123	29.5	JD	87	03	11	0150	94	5	3
86.7	33.0	33	53.3	118	29.5	JD	87	03	08	1658	96	508	1362
86.7	35.0	33	49.4	118	37.7	JD	87	03	08	2010	86	215	317
86.7	39.5	33	40.4	118	56.4	JD	87	03	09	0348	111	794	8883
86.7	45.0	33	29.4	119	19.1	JD	87	03	09	0856	83	390	4466
86.7	50.0	33	19.4	119	39.8	JD	87	03	09	1413	91	26	958
86.7	55.0	33	09.5	120	00.5	JD	87	03	09	1815	83	317	292
86.7	60.0	32	59.4	120	21.0	JD	87	03	09	2226	87	179	8
86.7	70.0	32	39.4	121	02.0	JD	87	03	10	0350	93	136	1036
86.7	80.0	32	19.4	121	43.0	JD	87	03	10	0904	76	0	61
86.7	90.0	31	59.4	122	23.7	JD	87	03	10	1505	103	2	38
86.7	100.0	31	39.4	123	04.1	JD	87	03	10	2000	88	4	10
90.0	28.0	33	29.1	117	46.1	JD	87	03	08	0720	97	66	15
90.0	30.0	33	25.1	117	54.4	JD	87	03	08	0507	112	175	1416
90.0	35.0	33	15.1	118	15.0	JD	87	03	07	2324	85	104	805
90.0	37.0	33	11.2	118	23.3	JD	87	03	07	2005	84	178	178
90.0	45.0	32	55.1	118	56.1	JD	87	03	07	1458	90	569	1465
90.0	53.0	32	39.2	119	28.9	JD	87	03	07	0844	84	157	257
90.0	60.0	32	25.1	119	57.7	JD	87	03	07	0405	88	111	843
90.0	70.0	32	05.2	120	38.3	JD	87	03	06	2144	82	49	26
90.0	80.0	31	45.1	121	18.9	JD	87	03	06	1628	87	2	34
90.0	90.0	31	25.1	121	59.5	JD	87	03	06	1043	89	0	36
90.0	100.0	31	05.1	122	39.8	JD	87	03	06	0435	98	0	2
90.0	110.0	30	45.1	123	19.9	JD	87	03	05	2218	88	5	0
90.0	120.0	30	25.1	123	59.9	JD	87	03	05	1614	97	1	4
93.3	26.7	32	57.3	117	18.3	JD	87	03	02	1715	106	9	401
93.3	28.0	32	54.8	117	23.7	JD	87	03	02	1925	97	303	270

TABLE 1. (cont.) CalCOFI Cruise 8703 (cont.)

Line	Station	Latitude (N) deg.	min.	Longitude (W) deg.	min.	Ship Code	Tow Date yr.	mo.	day	Time (PST)	Volume Water Strained	Total Larvae	Total Eggs
93.3	30.0	32	50.8	117	31.9	JD	87	03	02	2310	88	70	744
93.3	35.0	32	40.8	117	52.6	JD	87	03	03	0330	113	5	203
93.3	40.0	32	31.0	118	12.7	JD	87	03	03	0800	86	6	3991
93.3	45.0	32	20.9	118	33.3	JD	87	03	03	1213	112	9	1028
93.3	50.0	32	10.8	118	53.6	JD	87	03	03	1615	109	4	41
93.3	55.0	32	00.5	119	14.0	JD	87	03	03	1936	167	531	534
93.3	60.0	31	50.8	119	34.2	JD	87	03	03	2320	14	3	65
93.3	70.0	31	30.6	120	14.8	JD	87	03	04	0445	95	17	13
93.3	80.0	31	10.8	120	55.1	JD	87	03	04	1010	79	0	3
93.3	90.0	30	50.8	121	35.4	JD	87	03	04	1609	80	3	34
93.3	100.0	30	30.7	122	15.4	JD	87	03	04	2145	72	0	4
93.3	110.0	30	10.8	122	55.4	JD	87	03	05	0345	86	9	2
93.3	120.0	29	50.8	123	35.2	JD	87	03	05	0930	76	0	2

CalCOFI Cruise 8705

Line	Station	Latitude (N) deg.	min.	Longitude (W) deg.	min.	Ship Code	Tow Date yr.	mo.	day	Time (PST)	Volume Water Strained	Total Larvae	Total Eggs
76.7	49.0	35	05.3	120	46.6	JD	87	05	13	1600	95	0	38
76.7	51.0	35	01.3	120	55.1	JD	87	05	13	1355	107	1	0
76.7	55.0	34	53.3	121	11.9	JD	87	05	13	1043	95	3	1
76.7	60.0	34	43.3	121	32.9	JD	87	05	13	0702	96	6	907
76.7	70.0	34	23.3	122	14.8	JD	87	05	13	0159	100	202	2097
76.7	80.0	34	03.3	122	56.5	JD	87	05	12	2058	86	2	14
76.7	90.0	33	43.3	123	38.0	JD	87	05	12	1548	100	30	67
76.7	100.0	33	23.3	124	19.4	JD	87	05	12	0942	83	4	41
80.0	51.0	34	27.0	120	31.4	JD	87	05	10	2308	78	379	646
80.0	55.0	34	19.0	120	48.1	JD	87	05	11	0204	92	76	22
80.0	60.0	34	09.0	121	09.0	JD	87	05	11	0537	96	3	22
80.0	70.0	33	49.0	121	50.6	JD	87	05	11	1054	87	2	71
80.0	80.0	33	29.0	122	32.0	JD	87	05	11	1658	105	2	147
80.0	90.0	33	09.0	123	13.2	JD	87	05	11	2328	85	4	84
80.0	100.0	32	49.0	123	54.5	JD	87	05	12	0429	86	0	0
81.8	46.9	34	17.0	120	02.0	JD	87	05	10	1927	99	392	3
83.3	40.6	34	13.4	119	24.7	JD	87	05	10	1410	112	14	1919
83.3	42.0	34	10.7	119	30.5	JD	87	05	10	1152	108	11	3032
83.3	51.0	33	52.7	120	08.0	JD	87	05	10	0427	102	18	876
83.3	55.0	33	44.7	120	24.5	JD	87	05	10	0120	88	24	1958
83.3	60.0	33	34.7	120	45.3	JD	87	05	09	2125	84	26	13
83.3	70.0	33	14.7	121	26.6	JD	87	05	09	1615	101	0	3
83.3	80.0	32	54.7	122	07.7	JD	87	05	09	1006	89	1	110
83.3	90.0	32	34.7	122	48.7	JD	87	05	09	0450	107	20	2462
83.3	100.0	32	14.7	123	29.5	JD	87	05	08	2320	98	23	172
83.3	110.0	31	54.7	124	10.2	JD	87	05	08	1810	104	2	59
86.7	33.0	33	53.4	118	29.4	JD	87	05	06	0943	101	3	627
86.7	35.0	33	49.4	118	37.7	JD	87	05	06	1243	114	3	2
86.7	39.5	33	40.4	118	56.4	JD	87	05	06	1833	101	18	736
86.7	45.0	33	29.4	119	19.1	JD	87	05	06	2335	95	91	1004
86.7	50.0	33	19.4	119	39.8	JD	87	05	07	0255	94	310	3062

TABLE 1. (cont.) CalCOFI Cruise 8705 (cont.)

Line	Station	Latitude (N) deg.	min.	Longitude (W) deg.	min.	Ship Code	Tow Date yr.	mo.	day	Time (PST)	Volume Water Strained	Total Larvae	Total Eggs
86.7	55.0	33	09.4	120	00.4	JD	87	05	07	0647	99	14	68
86.7	60.0	32	59.4	120	21.0	JD	87	05	07	1008	89	8	141
86.7	70.0	32	39.4	121	02.0	JD	87	05	07	1545	91	2	190
86.7	80.0	32	19.4	121	42.9	JD	87	05	07	2058	92	3	110
86.7	90.0	31	59.4	122	23.6	JD	87	05	08	0152	108	13	1455
86.7	100.0	31	39.4	123	04.2	JD	87	05	08	0720	99	3	535
86.7	110.0	31	19.4	123	44.3	JD	87	05	08	1245	87	2	380
90.0	28.0	33	29.1	117	46.1	JD	87	05	06	0447	117	8	20
90.0	30.0	33	25.1	117	54.4	JD	87	05	06	0306	111	532	2570
90.0	35.0	33	15.1	118	15.0	JD	87	05	05	2125	93	1970	390
90.0	37.0	33	11.2	118	23.2	JD	87	05	05	1808	100	1	424
90.0	45.0	32	55.1	118	56.1	JD	87	05	05	1235	93	4	4586
90.0	53.0	32	39.1	119	29.0	JD	87	05	05	0532	101	0	2
90.0	60.0	32	25.1	119	57.6	JD	87	05	05	0053	97	7	5
90.0	70.0	32	05.1	120	38.3	JD	87	05	04	1922	103	74	1
90.0	80.0	31	45.0	121	19.0	JD	87	05	04	1250	99	0	20
90.0	90.0	31	25.1	121	59.5	JD	87	05	04	0630	98	0	46
90.0	100.0	31	05.1	122	39.7	JD	87	05	04	0030	96	0	38
90.0	110.0	30	45.1	123	20.0	JD	87	05	03	1805	94	13	92
90.0	120.0	30	25.0	123	59.9	JD	87	05	03	1200	94	0	108
93.3	26.7	32	57.3	117	18.4	JD	87	04	30	1618	114	0	69
93.3	28.0	32	54.8	117	23.7	JD	87	04	30	1853	108	6	1
93.3	30.0	32	50.8	117	31.9	JD	87	04	30	2231	90	31	81
93.3	35.0	32	40.8	117	52.5	JD	87	05	01	0149	103	131	2557
93.3	40.0	32	30.7	118	12.8	JD	87	05	01	0457	94	16	1008
93.3	45.0	32	20.8	118	33.3	JD	87	05	01	0824	85	1	3038
93.3	50.0	32	10.8	118	53.5	JD	87	05	01	1243	91	4	345
93.3	55.0	32	00.7	119	14.0	JD	87	05	01	1615	99	1	23
93.3	60.0	31	50.9	119	34.3	JD	87	05	01	1940	96	35	1
93.3	70.0	31	30.8	120	14.8	JD	87	05	02	0109	95	0	2
93.3	80.0	31	10.7	120	55.3	JD	87	05	02	0628	104	8	12
93.3	90.0	30	50.8	121	35.4	JD	87	05	02	1223	91	0	6
93.3	100.0	30	30.8	122	15.5	JD	87	05	02	1805	92	8	806
93.3	110.0	30	10.9	122	55.3	JD	87	05	02	2345	85	1	69
93.3	120.0	29	50.7	123	35.3	JD	87	05	03	0505	87	21	36

CalCOFI Cruise 8709

Line	Station	Latitude (N) deg.	min.	Longitude (W) deg.	min.	Ship Code	Tow Date yr.	mo.	day	Time (PST)	Volume Water Strained	Total Larvae	Total Eggs
76.7	49.0	35	05.3	120	46.5	NH	87	09	18	1119	101	5	2479
76.7	51.0	35	01.3	120	55.2	NH	87	09	18	0822	96	5	2
76.7	55.0	34	53.3	121	11.8	NH	87	09	18	0510	102	36	12
76.7	60.0	34	43.4	121	33.1	NH	87	09	18	0057	95	3	2
76.7	70.0	34	23.4	122	15.0	NH	87	09	17	1850	101	36	38
76.7	80.0	34	03.5	122	56.3	NH	87	09	17	1308	99	2	2
76.7	90.0	33	43.3	123	38.0	NH	87	09	17	0643	100	0	0
80.0	51.0	34	27.1	120	31.5	NH	87	09	15	2315	100	198	15
80.0	55.0	34	18.9	120	48.2	NH	87	09	16	0217	82	116	12

TABLE 1. (cont.) CalCOFI Cruise 8709 (cont.)

Line	Station	Latitude (N) deg.	min.	Longitude (W) deg.	min.	Ship Code	Tow Date yr.	mo.	day	Time (PST)	Volume Water Strained	Total Larvae	Total Eggs
80.0	60.0	34	08.9	121	09.0	NH	87	09	16	0613	91	11	31
80.0	70.0	33	49.1	121	50.6	NH	87	09	16	1253	92	0	1
80.0	80.0	33	29.0	122	32.1	NH	87	09	16	1848	95	7	6
80.0	90.0	33	09.0	123	13.4	NH	87	09	17	0022	88	7	11
81.8	46.9	34	17.0	120	02.1	NH	87	09	15	1935	99	195	208
83.3	40.6	34	13.6	119	24.6	NH	87	09	15	1445	91	35	116
83.3	42.0	34	10.8	119	30.4	NH	87	09	15	1300	100	0	103
83.3	51.0	33	52.7	120	07.9	NH	87	09	15	0644	99	3	158
83.3	55.0	33	44.7	120	24.5	NH	87	09	15	0342	91	18	7
83.3	60.0	33	34.7	120	45.1	NH	87	09	14	2350	90	3	9
83.3	70.0	33	14.8	121	26.5	NH	87	09	14	1810	93	0	17
83.3	80.0	32	54.6	122	07.7	NH	87	09	14	1215	95	2	11
83.3	90.0	32	34.7	122	48.7	NH	87	09	14	0608	96	0	4
83.3	100.0	32	14.8	123	29.5	NH	87	09	14	0023	100	9	141
83.3	110.0	31	54.8	124	10.3	NH	87	09	13	1840	97	30	11
86.7	33.0	33	53.5	118	29.5	NH	87	09	11	0159	106	10	1836
86.7	35.0	33	49.5	118	37.7	NH	87	09	11	0559	106	3	19
86.7	39.5	33	40.4	118	56.6	NH	87	09	11	1240	103	2	5
86.7	45.0	33	29.4	119	19.2	NH	87	09	11	1840	102	961	176
86.7	60.0	32	59.4	120	21.1	NH	87	09	12	0608	90	2	11
86.7	70.0	32	39.5	121	02.1	NH	87	09	12	1225	85	0	90
86.7	80.0	32	19.4	121	43.0	NH	87	09	12	1840	100	5	5
86.7	90.0	31	59.4	122	23.8	NH	87	09	13	0021	89	7	2
86.7	100.0	31	39.3	123	04.4	NH	87	09	13	0618	101	6	51
86.7	110.0	31	19.4	123	44.7	NH	87	09	13	1230	97	1	288
90.0	28.0	33	29.2	117	46.2	NH	87	09	10	1955	102	1055	178
90.0	30.0	33	25.2	117	54.3	NH	87	09	10	1338	104	4	9
90.0	35.0	33	15.1	118	14.9	NH	87	09	10	0627	103	0	327
90.0	37.0	33	11.2	118	23.2	NH	87	09	10	0314	98	190	1662
90.0	45.0	32	55.2	118	56.1	NH	87	09	09	2150	92	36	583
90.0	53.0	32	38.9	119	28.4	NH	87	09	09	1643	102	1	20
90.0	60.0	32	25.2	119	57.5	NH	87	09	09	1135	98	1	53
90.0	70.0	32	05.0	120	38.2	NH	87	09	09	0514	98	0	7
90.0	80.0	31	45.2	121	19.0	NH	87	09	08	2315	97	4	2
90.0	90.0	31	25.1	121	59.3	NH	87	09	08	1725	100	0	2
90.0	100.0	31	05.0	122	39.8	NH	87	09	08	1014	106	4	69
90.0	110.0	30	45.0	123	19.9	NH	87	09	08	0415	92	2	424
90.0	120.0	30	25.1	123	59.9	NH	87	09	07	2140	99	2	2
93.3	26.7	32	57.6	117	18.5	NH	87	09	04	1420	103	1	222
93.3	28.0	32	54.7	117	23.7	NH	87	09	04	1753	115	9	21
93.3	30.0	32	50.8	117	31.9	NH	87	09	04	2055	102	17	201
93.3	35.0	32	40.7	117	52.6	NH	87	09	05	0125	90	6	40
93.3	40.0	32	30.8	118	12.9	NH	87	09	05	0532	101	0	59
93.3	45.0	32	20.7	118	33.3	NH	87	09	05	1122	104	1	192
93.3	50.0	32	10.8	118	53.6	NH	87	09	05	1535	102	0	4
93.3	55.0	32	00.7	119	14.0	NH	87	09	05	2118	84	3	51
93.3	60.0	31	50.9	119	34.6	NH	87	09	06	0226	93	3	3
93.3	70.0	31	30.8	120	15.0	NH	87	09	06	0835	94	1	4
93.3	80.0	31	10.8	120	55.3	NH	87	09	06	1535	95	0	18

TABLE 1. (cont.) CalCOFI Cruise 8709 (cont.)

Line	Station	Latitude (N) deg.	min.	Longitude (W) deg.	min.	Ship Code	Tow Date yr.	mo.	day	Time (PST)	Volume Water Strained	Total Larvae	Total Eggs
93.3	90.0	30	50.7	121	35.5	NH	87	09	06	2125	93	9	2
93.3	100.0	30	30.7	122	15.5	NH	87	09	07	0317	90	3	104
93.3	110.0	30	11.0	122	55.4	NH	87	09	07	0909	98	1	208
93.3	120.0	29	50.8	123	35.4	NH	87	09	07	1610	93	6	50

CalCOFI Cruise 8711

Line	Station	Latitude (N) deg.	min.	Longitude (W) deg.	min.	Ship Code	Tow Date yr.	mo.	day	Time (PST)	Volume Water Strained	Total Larvae	Total Eggs
76.7	49.0	35	05.3	120	46.7	NH	87	11	27	1213	84	0	166
76.7	51.0	35	01.4	120	55.1	NH	87	11	27	0934	92	5	5
76.7	55.0	34	53.2	121	12.1	NH	87	11	27	0630	84	1	0
76.7	60.0	34	43.3	121	32.9	NH	87	11	27	0250	100	0	23
76.7	70.0	34	23.3	122	14.8	NH	87	11	26	2047	80	3	1
76.7	80.0	34	03.2	122	56.5	NH	87	11	26	1507	88	3	8
80.0	51.0	34	27.0	120	31.4	NH	87	11	24	1910	69	4	20
80.0	90.0	33	09.0	123	13.3	NH	87	11	26	0627	73	1	2
81.8	46.9	34	17.0	120	02.0	NH	87	11	24	1530	86	1	3
83.3	40.6	34	13.6	119	24.7	NH	87	11	24	1010	105	8	954
83.3	42.0	34	10.8	119	30.6	NH	87	11	24	0830	74	1	19
83.3	51.0	33	52.7	120	08.0	NH	87	11	24	0325	99	4	31
86.7	33.0	33	53.4	118	29.4	NH	87	11	19	1904	80	14	2
86.7	35.0	33	45.6	118	37.6	NH	87	11	19	2129	93	4	2
86.7	39.5	33	40.4	118	56.4	NH	87	11	20	0250	90	0	0
86.7	45.0	33	29.5	119	19.1	NH	87	11	20	0810	81	0	0
86.7	50.0	33	19.6	119	38.1	NH	87	11	20	1154	84	1	20
86.7	55.0	33	09.3	120	00.5	NH	87	11	20	1739	75	1	0
86.7	60.0	32	59.4	120	21.3	NH	87	11	20	2133	71	0	0
86.7	70.0	32	39.3	121	02.0	NH	87	11	21	0325	79	0	1
86.7	80.0	32	19.4	121	42.7	NH	87	11	21	0910	60	0	3
90.0	28.0	33	29.2	117	46.1	NH	87	11	19	1310	95	16	115
90.0	30.0	33	25.1	117	54.2	NH	87	11	19	1050	91	0	14
90.0	35.0	33	15.1	118	15.1	NH	87	11	19	0425	78	2	4
90.0	37.0	33	11.1	118	23.2	NH	87	11	19	0135	92	0	17
90.0	45.0	32	55.1	118	56.1	NH	87	11	18	2015	96	0	0
90.0	53.0	32	39.1	119	28.9	NH	87	11	18	1408	84	0	3
90.0	60.0	32	24.9	119	57.7	NH	87	11	18	0855	98	1	8
90.0	70.0	32	05.1	120	38.3	NH	87	11	18	0315	99	2	6
90.0	80.0	31	45.1	121	18.8	NH	87	11	17	2137	98	4	13
90.0	90.0	31	25.2	121	59.3	NH	87	11	17	1602	84	3	2
90.0	100.0	31	05.2	122	39.5	NH	87	11	17	0950	92	3	1
90.0	110.0	30	45.1	123	20.0	NH	87	11	17	0405	83	29	6
90.0	120.0	30	25.7	124	00.0	NH	87	11	16	2222	98	45	0
93.3	26.7	32	57.4	117	18.3	NH	87	11	13	1228	110	1	4
93.3	28.0	32	54.8	117	23.7	NH	87	11	13	1530	109	0	1
93.3	30.0	32	50.8	117	31.8	NH	87	11	13	1828	100	3	10
93.3	35.0	32	40.7	117	52.4	NH	87	11	13	2233	88	1	2
93.3	40.0	32	30.7	118	12.7	NH	87	11	14	0300	91	1	0
93.3	45.0	32	20.7	118	33.4	NH	87	11	14	0805	83	1	2

TABLE 1. (cont.) CalCOFI Cruise 8711 (cont.)

Line	Station	Latitude (N) deg.	min.	Longitude (W) deg.	min.	Ship Code	Tow Date yr.	mo.	day	Time (PST)	Volume Water Strained	Total Larvae	Total Eggs
93.3	80.0	31	10.8	120	55.2	NH	87	11	15	1430	83	6	1
93.3	90.0	30	51.0	121	35.6	NH	87	11	15	2122	66	8	0
93.3	100.0	30	31.0	122	15.4	NH	87	11	16	0350	93	21	1
93.3	110.0	30	11.0	122	55.4	NH	87	11	16	1005	84	1	4
93.3	120.0	29	50.9	123	35.3	NH	87	11	16	1645	76	0	3

TABLE 2. Pooled occurrences of fish larvae taken in Manta tows on the 1987 CalCOFI survey.

Rank	Taxon	Occurrences
1	*Engraulis mordax*	84
2	*Cololabis saira*	79
3	*Sebastes* spp.	43
4	*Trachurus symmetricus*	28
5	*Sardinops sagax*	23
6	*Hypsoblennius jenkinsi*	20
6	*Scomber japonicus*	20
8	*Scorpaenichthys marmoratus*	12
8	*Tetragonurus cuvieri*	12
10	*Oxyjulis californica*	10
11	*Chromis punctipinnis*	9
11	*Sebastes diploproa*	9
13	*Vinciguerria lucetia*	8
14	*Leuresthes tenuis*	7
14	*Atherinops affinis*	7
16	*Pleuronichthys coenosus*	6
16	*Ceratoscopelus townsendi*	6
18	*Stenobrachius leucopsarus*	5
18	*Oxylebius pictus*	5
18	*Icichthys lockingtoni*	5
21	*Girella nigricans*	4
21	*Merluccius productus*	4
21	*Hexagrammos decagrammus*	4
21	*Pleuronichthys verticalis*	4
25	*Paralabrax* spp.	3
25	*Medialuna californiensis*	3
25	*Aristostomias scintillans*	3
25	*Citharichthys stigmaeus*	3
29	*Triphoturus mexicanus*	2
29	*Brosmophycis marginata*	2
29	*Gigantactis* spp.	2
29	*Neoclinus blanchardi*	2
29	Disintegrated fish larvae	2
29	*Pleuronichthys decurrens*	2
29	*Cyclothone* spp.	2
29	*Cyclothone signata*	2
29	*Sphyraena argentea*	2
29	*Neoclinus stephensae*	2
29	*Lampadena urophaos*	2
29	*Genyonemus lineatus*	2
41	*Tactostoma macropus*	1
41	*Synodus lucioceps*	1
41	*Bathophilus flemingi*	1
41	*Oligocottus* spp.	1
41	*Lestidiops ringens*	1
41	*Nannobrachium ritteri*	1
41	*Lampanyctus* spp.	1
41	*Desmodema lorum*	1
41	*Odontopyxis trispinosa*	1

TABLE 2. (cont.)

Rank	Taxon	Occurrences
41	*Xystreurys liolepis*	1
41	*Paralichthys californicus*	1
41	*Citharichthys sordidus*	1
41	*Coryphopterus nicholsii*	1
41	*Hypsoblennius gentilis*	1
41	*Cryptotrema corallinum*	1
41	*Rathbunella* spp.	1
41	*Xenistius californiensis*	1
41	Cottidae	1
41	*Howella* spp.	1
41	*Atherinopsis californiensis*	1
41	*Ruscarius creaseri*	1
41	Unidentified fish larvae	1
41	*Hemilepidotus spinosus*	1
41	*Sebastes levis*	1
41	*Sebastes jordani*	1
41	*Sebastes aurora*	1
41	*Macroramphosus gracilis*	1
41	Exocoetidae	1
41	*Seriola lalandi*	1
	Total	479

TABLE 3. Pooled raw counts of fish larvae taken in Manta tows on the 1987 CalCOFI survey.

Rank	Taxon	Count
1	*Engraulis mordax*	13770
2	*Chromis punctipinnis*	1032
3	*Cololabis saira*	465
4	*Sebastes* spp.	440
5	*Sardinops sagax*	327
6	*Scomber japonicus*	203
7	*Trachurus symmetricus*	199
8	*Sebastes jordani*	141
9	*Hypsoblennius jenkinsi*	100
10	*Scorpaenichthys marmoratus*	90
11	*Ceratoscopelus townsendi*	49
12	*Sebastes diploproa*	43
13	*Oxyjulis californica*	37
13	Cottidae	37
15	*Vinciguerria lucetia*	35
16	*Hexagrammos decagrammus*	24
17	*Atherinops affinis*	22
18	*Pleuronichthys coenosus*	21
19	*Leuresthes tenuis*	19
19	*Oxylebius pictus*	19
21	*Tetragonurus cuvieri*	17
22	*Icichthys lockingtoni*	8
23	*Stenobrachius leucopsarus*	7
23	*Pleuronichthys verticalis*	7
25	*Neoclinus blanchardi*	6
25	*Merluccius productus*	6
27	*Girella nigricans*	5
27	*Odontopyxis trispinosa*	5
29	*Paralabrax* spp.	4
29	*Medialuna californiensis*	4
31	*Citharichthys stigmaeus*	3
31	*Genyonemus lineatus*	3
31	*Neoclinus stephensae*	3
31	*Rathbunella* spp.	3
31	*Aristostomias scintillans*	3
36	*Atherinopsis californiensis*	2
36	*Bathophilus flemingi*	2
36	Exocoetidae	2
36	Disintegrated fish larvae	2
36	*Lampadena urophaos*	2
36	*Cyclothone signata*	2
36	*Cyclothone* spp.	2
36	*Sphyraena argentea*	2
36	*Triphoturus mexicanus*	2
36	*Pleuronichthys decurrens*	2
36	*Gigantactis* spp.	2
36	*Ruscarius creaseri*	2
36	*Hemilepidotus spinosus*	2
36	*Brosmophycis marginata*	2

TABLE 3. (cont.)

Rank	Taxon	Count
36	*Xenistius californiensis*	2
51	*Paralichthys californicus*	1
51	*Cryptotrema corallinum*	1
51	*Coryphopterus nicholsii*	1
51	*Macroramphosus gracilis*	1
51	*Oligocottus* spp.	1
51	*Lestidiops ringens*	1
51	*Howella* spp.	1
51	*Hypsoblennius gentilis*	1
51	*Sebastes levis*	1
51	*Sebastes aurora*	1
51	*Lampanyctus* spp.	1
51	*Desmodema lorum*	1
51	*Citharichthys sordidus*	1
51	Unidentified fish larvae	1
51	*Synodus lucioceps*	1
51	*Xystreurys liolepis*	1
51	*Seriola lalandi*	1
51	*Nannobrachium ritteri*	1
51	*Tactostoma macropus*	1
	Total	17206

TABLE 4. Numbers of fish larvae taken in Manta net tows on the 1987 CalCOFI survey, listed by taxon, station, and month. Numbers of larvae are expressed as larvae per 100 cubic meters of water filtered. Unoccupied stations are indicated by a dash.

Sardinops sagax

Station		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7	55.0	-	-	-	-	0.0	-	-	-	32.7	-	0.0	-
76.7	60.0	-	-	-	-	1.0	-	-	-	0.0	-	0.0	-
76.7	70.0	-	-	-	-	4.0	-	-	-	11.1	-	0.0	-
80.0	51.0	-	-	0.9	-	0.0	-	-	-	38.2	-	0.0	-
80.0	55.0	-	-	0.0	-	0.0	-	-	-	26.1	-	-	-
81.8	46.9	-	-	0.0	-	3.0	-	-	-	100.1	-	0.0	-
83.3	40.6	-	-	8.0	-	1.1	-	-	-	1.8	-	0.0	-
83.3	51.0	-	-	59.9	-	0.0	-	-	-	0.0	-	0.0	-
86.7	33.0	-	-	3.9	-	0.0	-	-	-	2.1	-	0.8	-
86.7	39.5	-	-	0.0	-	1.0	-	-	-	0.0	-	0.0	-
86.7	60.0	-	-	2.6	-	0.0	-	-	-	0.0	-	0.0	-
90.0	28.0	-	-	0.0	-	0.0	-	-	-	11.2	-	0.0	-
90.0	35.0	-	-	1.7	-	0.9	-	-	-	0.0	-	0.0	-
90.0	37.0	-	-	1.7	-	0.0	-	-	-	0.0	-	0.0	-
90.0	70.0	-	-	0.0	-	1.0	-	-	-	0.0	-	0.0	-

Engraulis mordax

Station		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7	51.0	-	-	0.0	-	1.1	-	-	-	0.0	-	0.0	-
76.7	55.0	-	-	-	-	1.0	-	-	-	0.0	-	0.0	-
76.7	70.0	-	-	-	-	0.0	-	-	-	2.0	-	0.0	-
80.0	51.0	-	-	2.7	-	291.4	-	-	-	154.6	-	1.4	-
80.0	55.0	-	-	864.8	-	63.7	-	-	-	66.8	-	-	-
80.0	60.0	-	-	43.5	-	0.0	-	-	-	0.0	-	-	-
80.0	70.0	-	-	0.0	-	1.7	-	-	-	0.0	-	-	-
80.0	80.0	-	-	1.8	-	0.0	-	-	-	0.0	-	-	-
81.8	46.9	-	-	1122.2	-	161.5	-	-	-	61.4	-	0.0	-
83.3	40.6	-	-	846.2	-	14.6	-	-	-	10.0	-	0.0	-
83.3	42.0	-	-	17.0	-	0.0	-	-	-	0.0	-	0.0	-
83.3	51.0	-	-	262.5	-	8.1	-	-	-	3.0	-	3.0	-
83.3	55.0	-	-	103.4	-	15.9	-	-	-	8.2	-	-	-

TABLE 4. (cont.)

Engraulis mordax (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 60.0	-	-	32.5	-	18.5	-	-	-	0.0	-	-	-
83.3 70.0	-	-	0.9	-	0.0	-	-	-	0.0	-	-	-
83.3 100.0	-	-	1.9	-	2.9	-	-	-	0.0	-	-	-
86.7 33.0	-	-	483.0	-	0.0	-	-	-	0.0	-	0.8	-
86.7 35.0	-	-	182.8	-	3.4	-	-	-	0.0	-	0.0	-
86.7 39.5	-	-	869.6	-	0.0	-	-	-	0.0	-	0.0	-
86.7 45.0	-	-	321.2	-	76.7	-	-	-	959.2	-	0.0	-
86.7 50.0	-	-	9.1	-	287.3	-	-	-	-	-	0.0	-
86.7 55.0	-	-	189.8	-	6.0	-	-	-	-	-	0.0	-
86.7 60.0	-	-	144.8	-	0.9	-	-	-	0.0	-	0.0	-
86.7 70.0	-	-	119.8	-	0.0	-	-	-	0.0	-	0.0	-
90.0 28.0	-	-	54.1	-	2.3	-	-	-	10.2	-	0.0	-
90.0 30.0	-	-	181.9	-	576.2	-	-	-	0.0	-	0.0	-
90.0 35.0	-	-	85.1	-	1825.8	-	-	-	0.0	-	1.6	-
90.0 37.0	-	-	147.5	-	0.0	-	-	-	176.4	-	0.0	-
90.0 45.0	-	-	499.9	-	0.0	-	-	-	30.2	-	0.0	-
90.0 53.0	-	-	98.9	-	0.0	-	-	-	1.0	-	0.0	-
90.0 60.0	-	-	93.3	-	2.9	-	-	-	0.0	-	0.0	-
90.0 70.0	-	-	0.0	-	21.6	-	-	-	0.0	-	0.0	-
90.0 120.0	-	-	1.0	-	0.0	-	-	-	0.0	-	0.0	-
93.3 26.7	-	-	9.5	0.0	-	-	-	-	0.0	-	0.0	-
93.3 28.0	-	-	293.2	6.5	-	-	-	-	0.0	-	0.0	-
93.3 30.0	-	-	54.6	23.5	-	-	-	-	1.0	-	0.0	-
93.3 35.0	-	-	4.5	-	132.4	-	-	-	0.0	-	0.0	-
93.3 40.0	-	-	5.2	-	15.0	-	-	-	0.0	-	0.0	-
93.3 45.0	-	-	8.9	-	0.8	-	-	-	0.0	-	0.0	-
93.3 50.0	-	-	2.2	-	0.9	-	-	-	0.0	-	-	-
93.3 55.0	-	-	871.8	-	0.0	-	-	-	0.0	-	-	-
93.3 60.0	-	-	0.3	-	30.8	-	-	-	0.0	-	-	-
93.3 70.0	-	-	11.4	-	0.0	-	-	-	0.0	-	-	-
93.3 90.0	-	-	0.8	-	0.0	-	-	-	0.0	-	0.0	-

Cyclothone spp.

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	-	-	0.7	-	0.0	-	-	-	0.0	-	0.0	-
93.3 110.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-

TABLE 4. (cont.)

Cyclothone signata

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 80.0	-	-	0.0	-	0.0	-	-	-	0.9	-	-	-
86.7 90.0	-	-	0.0	-	0.0	-	-	-	0.9	-	-	-

Vinciguerria lucetia

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 60.0	-	-	0.0	-	0.0	-	-	-	2.7	-	-	-
86.7 55.0	-	-	0.0	-	0.0	-	-	-	-	-	0.8	-
86.7 80.0	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-
86.7 100.0	-	-	0.0	-	0.0	-	-	-	2.0	-	-	-
93.3 90.0	-	-	0.0	-	0.0	-	-	-	0.0	-	3.9	-
93.3 110.0	-	-	3.4	-	0.0	-	-	-	0.0	-	0.0	-
93.3 120.0	-	-	0.0	-	13.1	-	-	-	2.8	-	0.0	-

Bathophilus flemingi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 120.0	-	-	0.0	-	0.0	-	-	-	1.9	-	0.0	-

Tactostoma macropus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 110.0	-	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-

Aristostomias scintillans

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 100.0	-	-	0.0	-	1.0	-	-	-	0.0	-	-	-
90.0 110.0	-	-	0.9	-	0.9	-	-	-	0.0	-	0.0	-

Synodus lucioceps

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-

Lestidiops ringens

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 70.0	-	-	0.0	-	1.0	-	-	-	0.0	-	0.0	-

Ceratoscopelus townsendi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 80.0	-	-	0.0	-	0.0	-	-	-	0.9	-	-	-
83.3 110.0	-	-	-	-	0.0	-	-	-	26.2	-	-	-

TABLE 4. (cont.)

Ceratoscopelus townsendi (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 80.0	-	-	0.0	-	0.0	-	-	-	2.0	-	0.0	-
90.0 110.0	-	-	0.0	-	10.3	-	-	-	0.0	-	0.0	-
93.3 110.0	-	-	1.7	-	0.0	-	-	-	0.0	-	0.0	-
93.3 120.0	-	-	0.0	-	5.2	-	-	-	0.0	-	0.0	-

Lampadena urophaos

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 110.0	-	-	-	-	0.0	-	-	-	1.0	-	-	-
93.3 120.0	-	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-

Lampanyctus spp.

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 100.0	-	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-

Nannobrachium ritteri

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 100.0	-	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-

Stenobrachius leucopsarus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 90.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-
83.3 51.0	-	-	0.9	-	2.0	-	-	-	0.0	-	0.0	-
86.7 70.0	-	-	0.0	-	1.8	-	-	-	0.0	-	0.0	-
86.7 90.0	-	-	1.0	-	0.0	-	-	-	0.0	-	-	-

Triphoturus mexicanus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 50.0	-	-	1.1	-	0.0	-	-	-	0.0	-	-	-
93.3 55.0	-	-	0.0	-	1.0	-	-	-	0.0	-	-	-

Desmodema lorum

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 80.0	-	-	-	-	0.0	-	-	-	0.0	-	0.9	-

Merluccius productus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 55.0	-	-	1.9	-	0.0	-	-	-	0.0	-	-	-
83.3 100.0	-	-	0.9	-	0.0	-	-	-	0.0	-	-	-

TABLE 4. (cont.)

Merluccius productus (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 70.0	-	-	1.9	-	0.0	-	-	-	0.0	-	0.0	-
90.0 60.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-

Brosmophycis marginata

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 55.0	-	-	0.0	-	0.9	-	-	-	0.0	-	-	-
81.8 46.9	-	-	0.0	-	1.0	-	-	-	0.0	-	0.0	-

Gigantactis spp.

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 100.0	-	-	0.0	-	0.0	-	-	-	1.1	-	0.0	-
93.3 110.0	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-

Atherinops affinis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	-	-	3.6	-	0.0	-	-	-	0.0	-	0.0	-
81.8 46.9	-	-	2.2	-	0.0	-	-	-	0.0	-	0.0	-
83.3 42.0	-	-	0.4	-	1.1	-	-	-	0.0	-	0.0	-
83.3 51.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-
90.0 28.0	-	-	1.9	-	0.0	-	-	-	0.0	-	9.5	-

Atherinopsis californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	2.0	-	-	-	0.0	-	0.0	-

Leuresthes tenuis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	2.0	-	-	-	0.0	-	0.0	-
83.3 40.6	-	-	0.0	-	0.0	-	-	-	0.0	-	3.1	-
83.3 42.0	-	-	0.0	-	1.1	-	-	-	0.0	-	0.0	-
86.7 33.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.8	-
86.7 50.0	-	-	0.0	-	0.9	-	-	-	-	-	0.0	-
90.0 28.0	-	-	0.0	-	5.9	-	-	-	0.0	-	0.0	-
90.0 30.0	-	-	0.0	-	6.6	-	-	-	0.0	-	0.0	-

Cololabis saira

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	-	-	0.0	-	0.0	-	-	-	4.8	-	0.0	-

TABLE 4. (cont.)

Station		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
						Cololabis saira (cont.)							
76.7	55.0	-	-	-	-	1.9	-	-	-	0.0	-	0.0	-
76.7	60.0	-	-	-	-	0.0	-	-	-	2.8	-	0.0	-
76.7	70.0	-	-	-	-	0.0	-	-	-	5.0	-	2.4	-
76.7	80.0	-	-	-	-	0.0	-	-	-	2.0	-	0.9	-
80.0	51.0	-	-	0.0	-	0.8	-	-	-	3.0	-	0.0	-
80.0	55.0	-	-	7.4	-	3.7	-	-	-	0.0	-	-	-
80.0	60.0	-	-	0.0	-	0.0	-	-	-	10.0	-	-	-
80.0	70.0	-	-	1.0	-	0.0	-	-	-	0.0	-	-	-
80.0	80.0	-	-	0.0	-	0.0	-	-	-	4.7	-	-	-
80.0	90.0	-	-	3.8	-	0.0	-	-	-	4.4	-	0.0	-
81.8	46.9	-	-	0.0	-	84.7	-	-	-	5.0	-	0.0	-
83.3	42.0	-	-	0.0	-	9.7	-	-	-	0.0	-	0.0	-
83.3	55.0	-	-	1.9	-	0.0	-	-	-	0.0	-	-	-
83.3	80.0	-	-	0.0	-	0.9	-	-	-	0.0	-	-	-
83.3	90.0	-	-	0.0	-	3.2	-	-	-	0.0	-	-	-
83.3	100.0	-	-	0.0	-	6.9	-	-	-	8.0	-	-	-
83.3	110.0	-	-	-	-	0.0	-	-	-	1.9	-	-	-
86.7	35.0	-	-	0.0	-	0.0	-	-	-	1.1	-	0.0	-
86.7	39.5	-	-	2.2	-	0.0	-	-	-	2.1	-	0.0	-
86.7	45.0	-	-	0.0	-	5.7	-	-	-	0.0	-	0.0	-
86.7	50.0	-	-	0.0	-	0.9	-	-	-	-	-	0.0	-
86.7	80.0	-	-	0.0	-	2.8	-	-	-	0.0	-	0.0	-
86.7	90.0	-	-	1.0	-	11.8	-	-	-	5.3	-	-	-
86.7	100.0	-	-	3.5	-	1.0	-	-	-	4.0	-	-	-
86.7	110.0	-	-	-	-	0.0	-	-	-	1.0	-	-	-
90.0	28.0	-	-	0.0	-	0.0	-	-	-	4.1	-	0.0	-
90.0	30.0	-	-	0.0	-	3.3	-	-	-	4.2	-	0.0	-
90.0	37.0	-	-	0.0	-	0.0	-	-	-	5.9	-	0.0	-
90.0	45.0	-	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-
90.0	60.0	-	-	0.9	-	0.0	-	-	-	0.0	-	1.0	-
90.0	70.0	-	-	4.1	-	23.7	-	-	-	0.0	-	0.0	-
90.0	80.0	-	-	0.0	-	0.0	-	-	-	1.9	-	2.9	-
90.0	90.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.8	-
90.0	100.0	-	-	0.0	-	0.0	-	-	-	3.2	-	2.8	-
90.0	110.0	-	-	3.5	-	0.0	-	-	-	1.8	-	24.0	-

TABLE 4. (cont.)

Cololabis saira (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 120.0	-	-	0.0	-	0.0	-	-	-	2.0	-	44.1	-
93.3 28.0	-	-	0.0	0.0	-	-	-	-	9.2	-	0.0	-
93.3 30.0	-	-	0.0	3.6	-	-	-	-	14.2	-	3.0	-
93.3 35.0	-	-	1.1	-	2.1	-	-	-	5.4	-	0.9	-
93.3 45.0	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-
93.3 55.0	-	-	1.7	-	0.0	-	-	-	2.5	-	-	-
93.3 60.0	-	-	0.0	-	0.0	-	-	-	2.8	-	-	-
93.3 70.0	-	-	3.8	-	0.0	-	-	-	0.9	-	-	-
93.3 80.0	-	-	0.0	-	0.0	-	-	-	0.0	-	4.1	-
93.3 90.0	-	-	0.0	-	0.0	-	-	-	8.4	-	1.3	-
93.3 100.0	-	-	0.0	-	1.8	-	-	-	0.9	-	19.6	-
93.3 110.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.8	-

Exocoetidae

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 35.0	-	-	0.0	-	1.9	-	-	-	0.0	-	0.0	-

Macroramphosus gracilis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 50.0	-	-	1.1	-	0.0	-	-	-	0.0	-	-	-

***Sebastes* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	-	-	1.5	-	0.0	-	-	-	0.0	-	0.0	-
76.7 51.0	-	-	0.7	-	0.0	-	-	-	0.0	-	1.8	-
76.7 60.0	-	-	-	-	1.9	-	-	-	0.0	-	0.0	-
80.0 51.0	-	-	0.9	-	0.8	-	-	-	0.0	-	0.0	-
80.0 55.0	-	-	0.0	-	1.8	-	-	-	0.0	-	-	-
81.8 46.9	-	-	2.2	-	71.9	-	-	-	0.0	-	0.9	-
83.3 40.6	-	-	88.9	-	0.0	-	-	-	0.0	-	1.0	-
83.3 42.0	-	-	11.7	-	0.0	-	-	-	0.0	-	0.0	-
83.3 51.0	-	-	6.4	-	4.1	-	-	-	0.0	-	0.0	-
83.3 55.0	-	-	0.0	-	4.4	-	-	-	0.0	-	-	-
83.3 60.0	-	-	0.7	-	2.5	-	-	-	0.0	-	-	-
86.7 33.0	-	-	1.0	-	1.0	-	-	-	0.0	-	0.0	-
86.7 35.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-
86.7 45.0	-	-	3.3	-	0.0	-	-	-	0.0	-	0.0	-

TABLE 4. (cont.)

***Sebastes* spp.** (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 50.0	-	-	14.5	-	0.9	-	-	-	-	-	0.8	-
86.7 55.0	-	-	73.0	-	1.0	-	-	-	-	-	0.0	-
86.7 60.0	-	-	5.2	-	6.3	-	-	-	0.0	-	0.0	-
86.7 70.0	-	-	1.9	-	0.0	-	-	-	0.0	-	0.0	-
90.0 28.0	-	-	7.7	-	0.0	-	-	-	0.0	-	0.0	-
90.0 30.0	-	-	1.1	-	0.0	-	-	-	0.0	-	0.0	-
90.0 35.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-
90.0 45.0	-	-	14.5	-	0.0	-	-	-	0.0	-	0.0	-
90.0 53.0	-	-	32.7	-	0.0	-	-	-	0.0	-	0.0	-
90.0 70.0	-	-	0.0	-	4.1	-	-	-	0.0	-	0.0	-
93.3 28.0	-	-	1.0	0.0	-	-	-	-	0.0	-	0.0	-
93.3 35.0	-	-	0.0	-	1.0	-	-	-	0.0	-	0.0	-
93.3 45.0	-	-	1.1	-	0.0	-	-	-	0.0	-	0.0	-
93.3 50.0	-	-	0.0	-	2.7	-	-	-	0.0	-	-	-
93.3 55.0	-	-	6.7	-	0.0	-	-	-	0.0	-	-	-
93.3 60.0	-	-	0.0	-	1.0	-	-	-	0.0	-	-	-
93.3 80.0	-	-	0.0	-	2.1	-	-	-	0.0	-	0.0	-

Sebastes aurora

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 55.0	-	-	1.0	-	0.0	-	-	-	0.0	-	-	-

Sebastes diploproa

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	-	-	0.0	-	0.0	-	-	-	5.0	-	0.0	-
76.7 51.0	-	-	0.0	-	0.0	-	-	-	0.0	-	2.8	-
76.7 70.0	-	-	-	-	0.0	-	-	-	3.0	-	0.0	-
80.0 51.0	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-
80.0 55.0	-	-	0.0	-	0.0	-	-	-	0.8	-	-	-
81.8 46.9	-	-	0.0	-	21.7	-	-	-	3.0	-	0.0	-
86.7 33.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.8	-
90.0 45.0	-	-	0.0	-	3.7	-	-	-	0.0	-	0.0	-

Sebastes jordani

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 40.6	-	-	140.9	-	0.0	-	-	-	0.0	-	0.0	-

TABLE 4. (cont.)

Sebastes levis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	1.0	-	-	-	0.0	-	0.0	-

Oxylebius pictus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	2.9	-	9.9	-	-	-	0.0	-	0.0	-
83.3 51.0	-	-	0.0	-	3.1	-	-	-	0.0	-	0.0	-
83.3 55.0	-	-	1.0	-	0.0	-	-	-	0.0	-	-	-
93.3 28.0	-	-	1.0	0.0	-	-	-	-	0.0	-	0.0	-

Hexagrammos decagrammus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	-	-	15.1	-	0.0	-	-	-	0.0	-	0.0	-
81.8 46.9	-	-	1.5	-	0.0	-	-	-	0.0	-	0.0	-
83.3 51.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-
83.3 55.0	-	-	1.0	-	0.0	-	-	-	0.0	-	-	-

Cottidae

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	27.1	-	0.0	-	-	-	0.0	-	0.0	-

Hemilepidotus spinosus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	1.5	-	0.0	-	-	-	0.0	-	0.0	-

***Oligocottus* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	1.0	-	-	-	0.0	-	0.0	-

Ruscarius creaseri

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	2.0	-	-	-	0.0	-	0.0	-

Scorpaenichthys marmoratus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	-	-	2.3	-	0.0	-	-	-	0.0	-	0.0	-
76.7 55.0	-	-	-	-	0.0	-	-	-	0.0	-	0.8	-
80.0 55.0	-	-	11.0	-	0.0	-	-	-	0.0	-	-	-

TABLE 4. (cont.)

Scorpaenichthys marmoratus (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 60.0	-	-	0.9	-	0.0	-	-	-	0.0	-	-	-
81.8 46.9	-	-	23.4	-	2.0	-	-	-	0.0	-	0.0	-
83.3 55.0	-	-	19.1	-	0.0	-	-	-	0.0	-	-	-
86.7 35.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.9	-
86.7 45.0	-	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-
90.0 30.0	-	-	6.7	-	0.0	-	-	-	0.0	-	0.0	-
93.3 30.0	-	-	7.0	0.0	-	-	-	-	0.0	-	0.0	-
93.3 55.0	-	-	5.0	-	0.0	-	-	-	0.0	-	-	-

Odontopyxis trispinosa

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	4.9	-	-	-	0.0	-	0.0	-

Howella spp.

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 100.0	-	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-

Paralabrax spp.

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-
86.7 45.0	-	-	0.0	-	0.0	-	-	-	2.0	-	0.0	-
90.0 37.0	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-

Seriola lalandi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 45.0	-	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-

Trachurus symmetricus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 60.0	-	-	-	-	2.9	-	-	-	0.0	-	0.0	-
76.7 70.0	-	-	-	-	78.9	-	-	-	0.0	-	0.0	-
76.7 80.0	-	-	-	-	0.9	-	-	-	0.0	-	0.0	-
76.7 90.0	-	-	0.0	-	12.0	-	-	-	0.0	-	-	-
76.7 100.0	-	-	2.8	-	2.5	-	-	-	-	-	-	-
80.0 60.0	-	-	0.0	-	1.9	-	-	-	0.0	-	-	-
80.0 80.0	-	-	0.0	-	1.0	-	-	-	0.0	-	-	-
80.0 90.0	-	-	0.0	-	2.6	-	-	-	0.0	-	0.0	-

TABLE 4. (cont.)

Trachurus symmetricus (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 90.0	-	-	0.0	-	9.6	-	-	-	0.0	-	-	-
83.3 100.0	-	-	0.0	-	8.8	-	-	-	0.0	-	-	-
83.3 110.0	-	-	-	-	2.1	-	-	-	0.0	-	-	-
86.7 39.5	-	-	0.0	-	12.2	-	-	-	0.0	-	0.0	-
86.7 60.0	-	-	3.5	-	0.0	-	-	-	0.0	-	0.0	-
86.7 70.0	-	-	2.8	-	0.0	-	-	-	0.0	-	0.0	-
86.7 90.0	-	-	0.0	-	2.2	-	-	-	0.0	-	-	-
86.7 100.0	-	-	0.0	-	1.0	-	-	-	0.0	-	-	-
86.7 110.0	-	-	-	-	1.7	-	-	-	0.0	-	-	-
90.0 35.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-
90.0 60.0	-	-	2.6	-	0.0	-	-	-	1.0	-	0.0	-
90.0 70.0	-	-	23.7	-	0.0	-	-	-	0.0	-	0.0	-
90.0 80.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-
93.3 60.0	-	-	0.1	-	0.0	-	-	-	0.0	-	-	-
93.3 70.0	-	-	0.9	-	0.0	-	-	-	0.0	-	-	-
93.3 80.0	-	-	0.0	-	6.3	-	-	-	0.0	-	0.0	-
93.3 90.0	-	-	0.8	-	0.0	-	-	-	0.0	-	0.0	-
93.3 100.0	-	-	0.0	-	3.7	-	-	-	0.0	-	0.0	-

Xenistius californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 28.0	-	-	0.0	-	0.0	-	-	-	2.0	-	0.0	-

Genyonemus lineatus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 51.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-
86.7 33.0	-	-	1.9	-	0.0	-	-	-	0.0	-	0.0	-

Girella nigricans

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-
90.0 28.0	-	-	0.0	-	1.2	-	-	-	0.0	-	0.0	-
90.0 30.0	-	-	0.0	-	2.2	-	-	-	0.0	-	0.0	-
90.0 35.0	-	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-

TABLE 4. (cont.)

Medialuna californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 70.0	-	-	0.8	-	0.0	-	-	-	0.0	-	0.0	-
93.3 30.0	-	-	0.0	0.0	-	-	-	-	2.0	-	0.0	-
93.3 100.0	-	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-

Chromis punctipinnis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	-	-	-	-	0.0	-	-	-	2.0	-	0.0	-
81.8 46.9	-	-	0.0	-	0.0	-	-	-	2.0	-	0.0	-
83.3 40.6	-	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-
86.7 33.0	-	-	0.0	-	0.0	-	-	-	2.1	-	0.0	-
86.7 35.0	-	-	0.0	-	0.0	-	-	-	2.1	-	0.0	-
86.7 45.0	-	-	0.0	-	0.0	-	-	-	12.2	-	0.0	-
90.0 28.0	-	-	0.0	-	0.0	-	-	-	1031.2	-	0.0	-
93.3 26.7	-	-	0.0	0.0	-	-	-	-	1.0	-	0.0	-
93.3 28.0	-	-	0.0	0.0	-	-	-	-	1.2	-	0.0	-

Oxyjulis californica

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-
83.3 40.6	-	-	0.0	-	0.0	-	-	-	18.2	-	0.0	-
83.3 51.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-
83.3 55.0	-	-	0.0	-	0.9	-	-	-	0.0	-	-	-
83.3 60.0	-	-	0.0	-	0.8	-	-	-	0.0	-	-	-
86.7 39.5	-	-	0.0	-	5.1	-	-	-	0.0	-	0.0	-
86.7 45.0	-	-	0.0	-	0.0	-	-	-	2.0	-	0.0	-
86.7 55.0	-	-	0.0	-	4.0	-	-	-	-	-	0.0	-
90.0 37.0	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-
93.3 60.0	-	-	0.0	-	1.0	-	-	-	0.0	-	-	-

***Rathbunella* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	3.0	-	-	-	0.0	-	0.0	-

Cryptotrema corallinum

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	-	-	0.4	-	0.0	-	-	-	0.0	-	0.0	-

TABLE 4. (cont.)

Neoclinus blanchardi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	3.9	-	-	-	2.0	-	0.0	-

Neoclinus stephensae

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 40.6	-	-	0.0	-	0.0	-	-	-	0.0	-	1.0	-
83.3 51.0	-	-	1.8	-	0.0	-	-	-	0.0	-	0.0	-

Hypsoblennius gentilis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 60.0	-	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-

Hypsoblennius jenkinsi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	-	-	-	-	0.0	-	-	-	1.0	-	0.0	-
76.7 70.0	-	-	-	-	0.0	-	-	-	15.1	-	0.0	-
80.0 51.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-
81.8 46.9	-	-	0.0	-	0.0	-	-	-	12.9	-	0.0	-
83.3 40.6	-	-	0.0	-	0.0	-	-	-	0.9	-	3.1	-
83.3 42.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-
83.3 51.0	-	-	0.0	-	0.0	-	-	-	0.0	-	1.0	-
83.3 55.0	-	-	0.0	-	0.0	-	-	-	8.2	-	-	-
86.7 33.0	-	-	0.0	-	2.0	-	-	-	6.3	-	8.0	-
86.7 35.0	-	-	0.0	-	0.0	-	-	-	0.0	-	2.8	-
86.7 60.0	-	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-
90.0 28.0	-	-	0.0	-	0.0	-	-	-	19.4	-	5.7	-
90.0 30.0	-	-	3.4	-	0.0	-	-	-	0.0	-	0.0	-
90.0 35.0	-	-	0.0	-	2.8	-	-	-	0.0	-	0.0	-
93.3 26.7	-	-	0.0	0.0	-	-	-	-	0.0	-	1.1	-
93.3 40.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.9	-

Coryphopterus nicholsii

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-

Sphyraena argentea

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-

TABLE 4. (cont.)

Sphyraena argentea (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 37.0	-	-	0.0	-	1.0	-	-	-	0.0	-	0.0	-

Scomber japonicus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 70.0	-	-	-	-	118.9	-	-	-	0.0	-	0.0	-
76.7 80.0	-	-	-	-	0.9	-	-	-	0.0	-	0.0	-
76.7 90.0	-	-	0.0	-	17.9	-	-	-	0.0	-	-	-
76.7 100.0	-	-	0.0	-	0.8	-	-	-	-	-	-	-
80.0 80.0	-	-	0.0	-	1.0	-	-	-	0.0	-	-	-
80.0 90.0	-	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-
83.3 90.0	-	-	0.0	-	8.5	-	-	-	0.0	-	-	-
83.3 100.0	-	-	0.0	-	2.9	-	-	-	0.0	-	-	-
86.7 45.0	-	-	0.0	-	1.9	-	-	-	0.0	-	0.0	-
86.7 50.0	-	-	0.0	-	0.9	-	-	-	-	-	0.0	-
86.7 55.0	-	-	0.0	-	2.0	-	-	-	-	-	0.0	-
90.0 35.0	-	-	0.0	-	1.9	-	-	-	0.0	-	0.0	-
90.0 37.0	-	-	0.0	-	0.0	-	-	-	2.0	-	0.0	-
90.0 60.0	-	-	0.0	-	1.0	-	-	-	0.0	-	0.0	-
90.0 70.0	-	-	10.6	-	24.7	-	-	-	0.0	-	0.0	-
90.0 80.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-
93.3 30.0	-	-	0.0	0.9	-	-	-	-	0.0	-	0.0	-
93.3 60.0	-	-	0.0	-	1.0	-	-	-	0.0	-	-	-
93.3 110.0	-	-	0.0	-	0.8	-	-	-	0.0	-	0.0	-

Icichthys lockingtoni

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 60.0	-	-	0.0	-	1.0	-	-	-	0.0	-	-	-
83.3 100.0	-	-	1.9	-	1.0	-	-	-	0.0	-	-	-
86.7 55.0	-	-	0.0	-	1.0	-	-	-	-	-	0.0	-
90.0 60.0	-	-	0.0	-	2.9	-	-	-	0.0	-	0.0	-

Tetragonurus cuvieri

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 80.0	-	-	-	-	0.0	-	-	-	0.0	-	0.9	-
80.0 90.0	-	-	0.9	-	0.0	-	-	-	1.8	-	0.0	-
83.3 80.0	-	-	0.0	-	0.0	-	-	-	1.9	-	-	-

TABLE 4. (cont.)

Tetragonurus cuvieri (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 100.0	-	-	0.0	-	0.0	-	-	-	1.0	-	-	-
86.7 80.0	-	-	0.0	-	0.0	-	-	-	2.0	-	0.0	-
90.0 80.0	-	-	0.0	-	0.0	-	-	-	1.9	-	1.0	-
90.0 90.0	-	-	0.0	-	0.0	-	-	-	0.0	-	1.7	-
93.3 45.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.8	-
93.3 80.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.8	-
93.3 90.0	-	-	0.8	-	0.0	-	-	-	0.0	-	0.0	-

Citharichthys sordidus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 51.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-

Citharichthys stigmaeus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	-	-	-	-	0.0	-	-	-	1.0	-	0.0	-
81.8 46.9	-	-	0.7	-	0.0	-	-	-	0.0	-	0.0	-
83.3 51.0	-	-	0.0	-	1.0	-	-	-	0.0	-	0.0	-

Paralichthys californicus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 51.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-

Xystreurys liolepis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	-	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-

Pleuronichthys coenosus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 55.0	-	-	0.0	-	0.0	-	-	-	0.8	-	-	-
81.8 46.9	-	-	0.0	-	10.8	-	-	-	2.0	-	0.0	-
86.7 39.5	-	-	5.5	-	0.0	-	-	-	0.0	-	0.0	-
86.7 45.0	-	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-
90.0 45.0	-	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-

Pleuronichthys decurrens

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.7	-	0.0	-	-	-	0.0	-	0.0	-

TABLE 4. (cont.)

Pleuronichthys decurrens (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 55.0	-	-	1.0	-	0.0	-	-	-	0.0	-	-	-

Pleuronichthys verticalis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-
86.7 35.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-
90.0 30.0	-	-	3.4	-	0.0	-	-	-	0.0	-	0.0	-
90.0 35.0	-	-	0.0	-	1.9	-	-	-	0.0	-	0.0	-

Disintegrated fish larvae

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 70.0	-	-	0.8	-	0.0	-	-	-	0.0	-	0.0	-
93.3 110.0	-	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-

Unidentified fish larvae

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	-	-	0.0	-	0.8	-	-	-	0.0	-	0.0	-

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ALPHABETICAL INDEX TO TABLE 4

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