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U.S. DEPARTMENT OF COMMERCE
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National Oceanic and Atmospheric Administration
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Southwest Fisheries Science Center
8604 La Jolla Shores Drive
La Jolla, California, USA 92037

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U.S. DEPARTMENT OF COMMERCE
Donald L. Evans, Secretary
National Oceanic and Atmospheric Administration
Scott B. Gudes, Acting Under Secretary for Oceans and Atmosphere
National Marine Fisheries Service
William T. Hogarth, Assistant Administrator for Fisheries

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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 1990. It is the 9th report in a series that presents surface tow data for all biological-oceanographic CalCOFI surveys from 1977 to the present. A total of 239 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 1990. 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 76 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 9th 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 1990. 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 1990 CalCOFI survey are published in Charter 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 1990 CalCOFI cruises were published by the Scripps Institution of Oceanography (Univ. of Calif., SIO 1991a, b). All available records for Manta tows on the 1990 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	1986	Charter et al. 2002b
1980-81	Ambrose et al. 2002a	1987	Sandknop et al. 2002
1984	Charter et al. 2002a	1988	Watson et al. 2002
1985	Ambrose et al. 2002b	1989	Ambrose et al. 2002c

SAMPLING AREA AND PATTERN

The 1990 CalCOFI survey consisted of four quarterly cruises on which a total of 233 Manta net tows was taken at the 259 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 1990 (Figures 2 and 3) are summarized below:

9003, RV *David Starr Jordan*, 56 stations, 4–19 March;

9004, RV *David Starr Jordan*, 47 stations, 17–29 April;

9008, RV *New Horizon*, 65 stations, 25 July–8 August;

9011, RV *New Horizon*, 65 stations, 5–19 November.

The survey area extended from Avila Beach to San Diego, California and seaward on six survey lines (Cruise 9004 occupied 5 lines) to approximately 120–330 n. mi. (Figures 1and 2). The most seaward station, 90.0 120.0 was approximately 400 n. mi. west of Punta Baja, Baja California, Mexico. CalCOFI lines 76.7 and 80.0 extended seaward to station 90.0 on cruise 9003 and to station 100.0 on cruise 9011. Stations on line 76.7 were not sampled on Cruise 9004 but extended to station 90.0 on cruise 9008. Line 80.0 extended to station 60.0 on cruise 9004 and to station 100.0 on cruise 9008. Lines 83.3 and 86.7 extended to station 90.0 on cruise 9004, to station 100.0 on cruise 9003, and to station 110.0 on cruises 9008 and 9011. Lines 90.0 and 93.3 extended to station 100.0 on cruise 9003 and to station 120.0 on all other cruises. Offshore coverage of Manta net tows on these survey lines varied between cruises because Manta net tows were not taken on all stations (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. 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 76 larval fish categories (including the disintegrated category) was identified: 67 to species, 7 to genus, and 1 to family.

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

Cyclothone spp.–small or damaged larvae, mostly *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 poorly preserved, 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 *Lampanyctus ritteri*) and *N. regale* (formerly *Lampanyctus regalis*), occur commonly in the present CalCOFI survey pattern; larvae of these species > ~ 5 mm have been identified 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; in previous data reports these were referred to as *Lampanyctus* "niger" and *Lampanyctus* "no pectorals", respectively (see Moser 1996).

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 84.3% of the total fish larvae and first in occurrence with larvae collected in 17.7% of the total samples (Tables 2 and 3). They were over 17 times more abundant than the second most abundant species, Pacific sardine (*Sardinops sagax*), which accounted for 4.8% of the total larvae and ranked fourth in occurrence (8.2% of the total samples). The rockfish genus *Sebastes* ranked third in abundance with 2.4% of the total larvae and third in frequency of occurrence (9.5% of the samples). Pacific saury (*Cololabis saira*) ranked fourth in abundance (2.1% of total larvae) and second in total occurrences (17.0% of the samples). Cabezon *(Scorpaenichthys marmoratus*) ranked fifth in abundance (0.9% of total larvae) and tied for sixth in total occurrences (2.1% of the samples). A single large collection (2533 larvae) of northern anchovy on station 83.3.51 on Cruise 9003 contributed to the high overall ranking of this species. The next five most abundant taxa were mussel blenny *Hypsoblennius jenkinsi* (.06% of total larvae), blacksmith *Chromis punctipinnis* (0.5%), Pacific mackerel *Scomber japonicus* (0.4%), Pacific hake *Merluccius productus* (0.4%), and shortbelly rockfish *Sebastes jordani* (0.3%). In frequency of occurrence, mussel blenny and blacksmith tied for 8th with one other taxon, Pacific mackerel tied for 6th, Pacific hake ranked 5th, and shortbelly rockfish tied for 15th with three other taxa. The 10 most abundant taxa comprised 96.7% of all the larvae collected in Manta net tows on CalCOFI cruises in 1990. The remaining 3.3% was distributed among 66 other taxa. 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 149 taxa collected in the oblique tows during the 1990 survey, northern anchovy also was the most abundant (55.6% of the larvae) and was over six times more abundant than the second-ranked species, California smoothtongue, which accounted for 8.2% of the total (Charter et al. 1999). The third ranked species in the Manta collections, *Sebastes* spp., ranked fourth in the oblique tows. The fourth- and fifth-ranked species, Pacific saury and cabezon, ranked 73rd and 89th in the oblique tows, respectively. Among the ten most abundant taxa in the oblique tows in 1990, half also were among the ten most abundant in the Manta tows (northern anchovy, Pacific sardine, *Sebastes* spp., Pacific hake, and shortbelly rockfish).

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 1990 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 1990 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 1990 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 1990 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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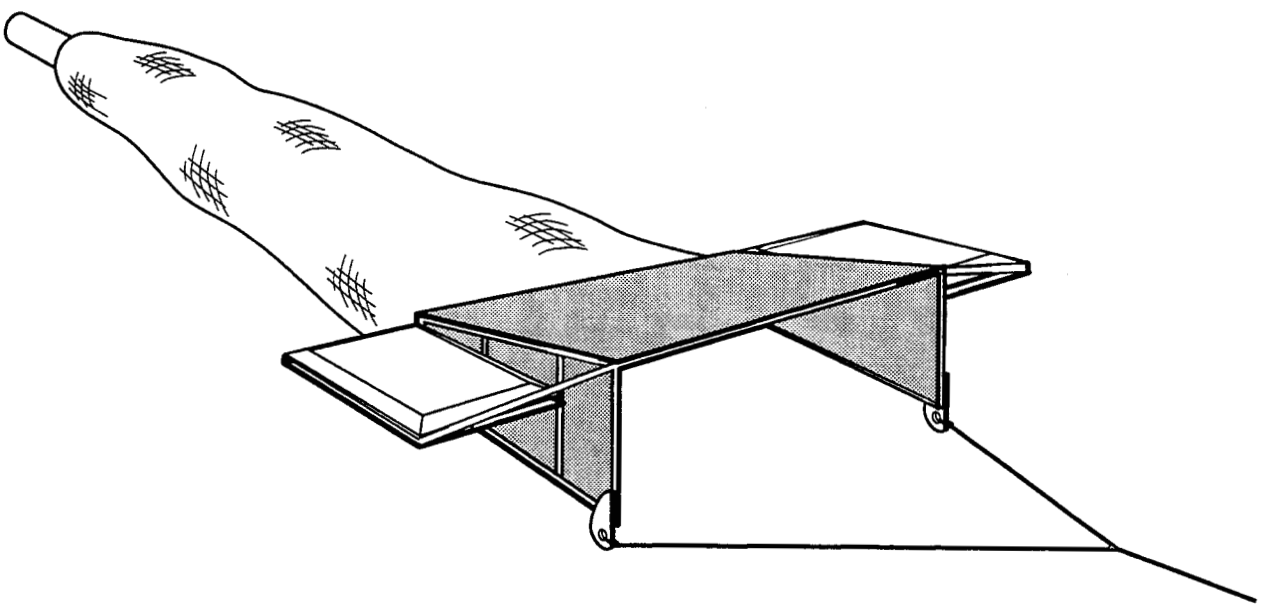

Figure 1. Diagram of the Manta net used on CalCOFI surveys.

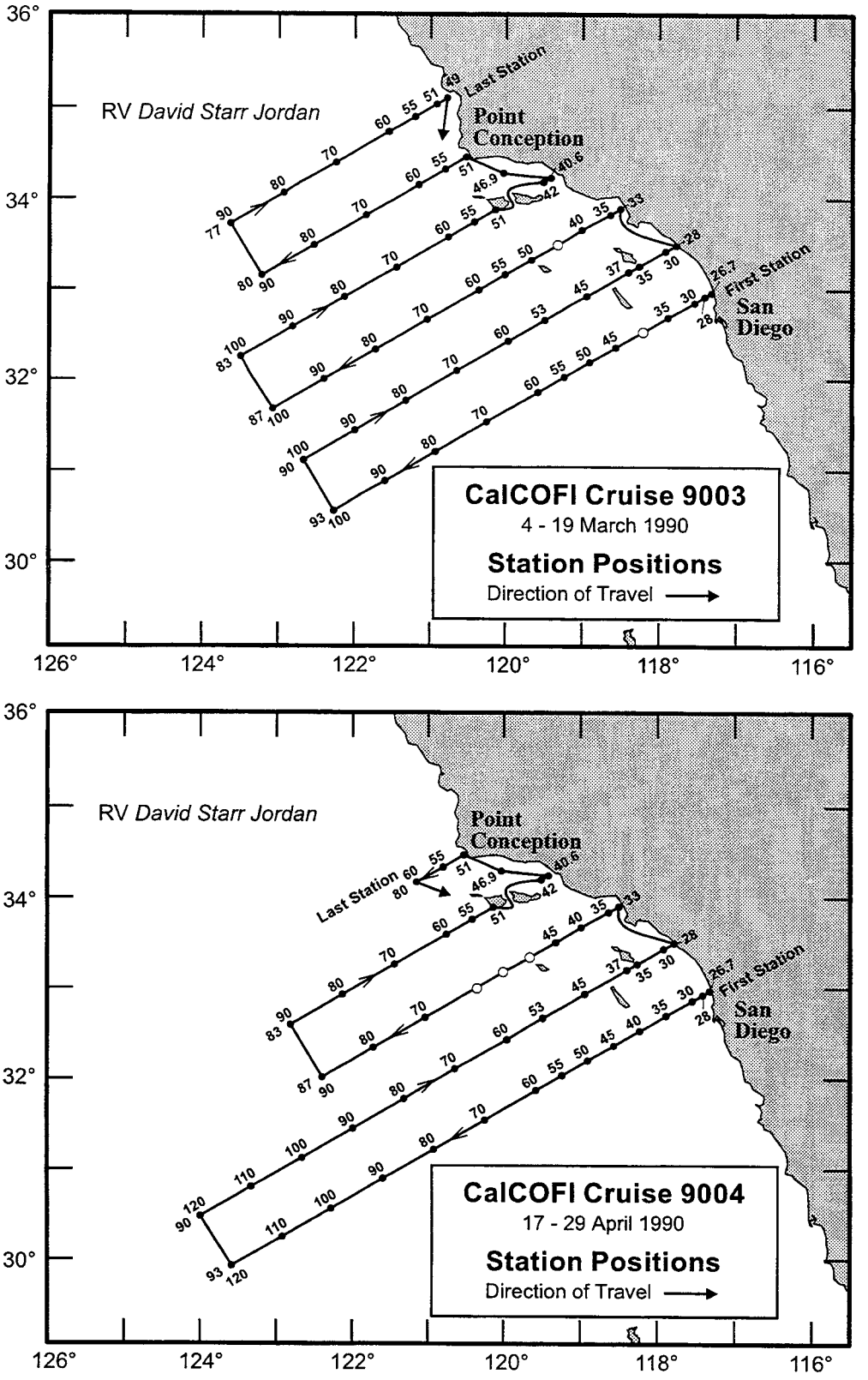

Figure 2. Stations and cruise tracks for CalCOFI cruises 9003 (above) and 9004 (below). Dots indicate stations where Manta and oblique tows were taken; open circles indicate stations where only oblique tows were taken. On Cruise 9004, a Manta tow without an accompanying oblique tow was taken at station 80.0 60.0.

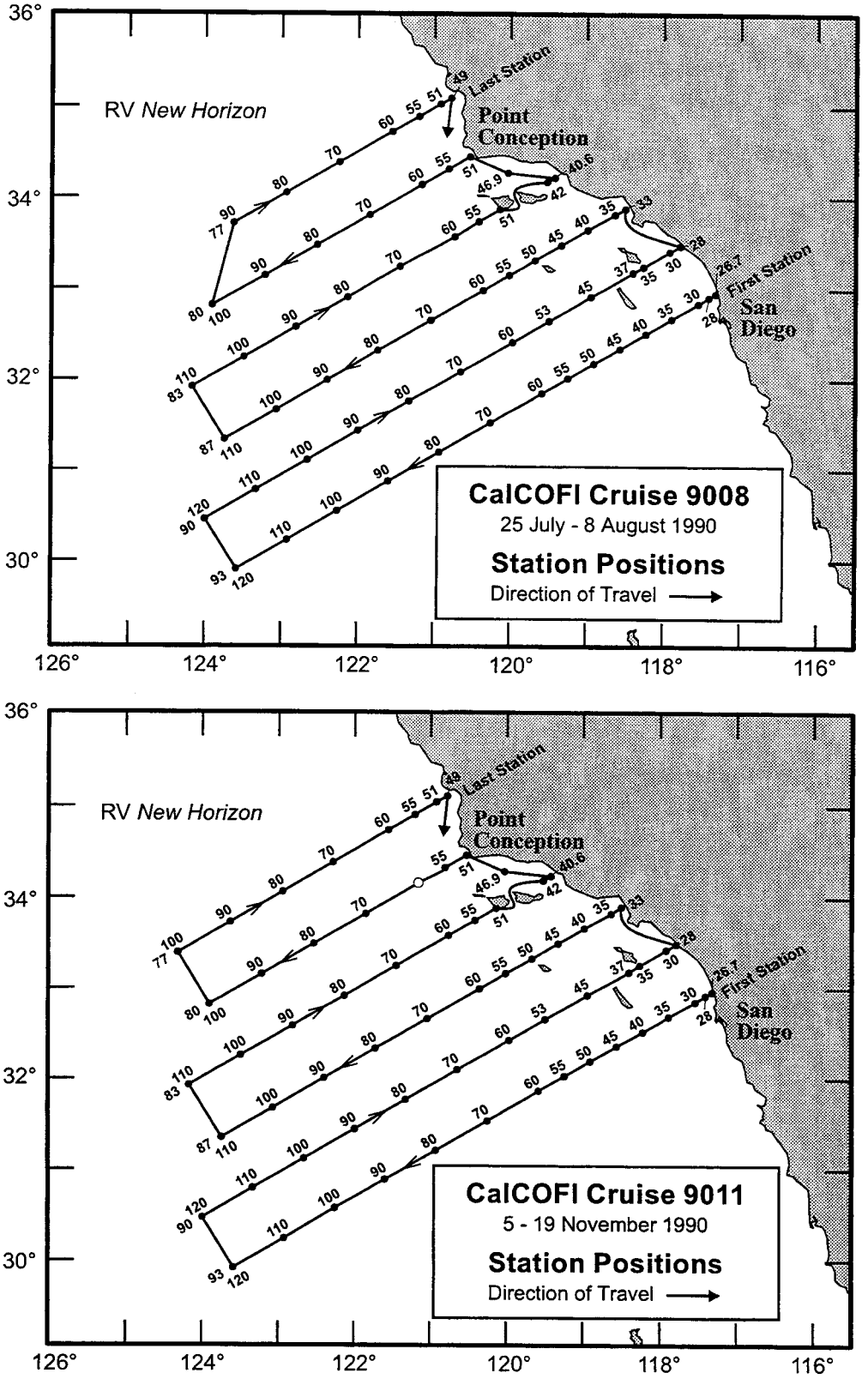

Figure 3. Stations and cruise tracks for CalCOFI cruises 9008 (above) and 9011 (below). Symbols as in Figure 2.

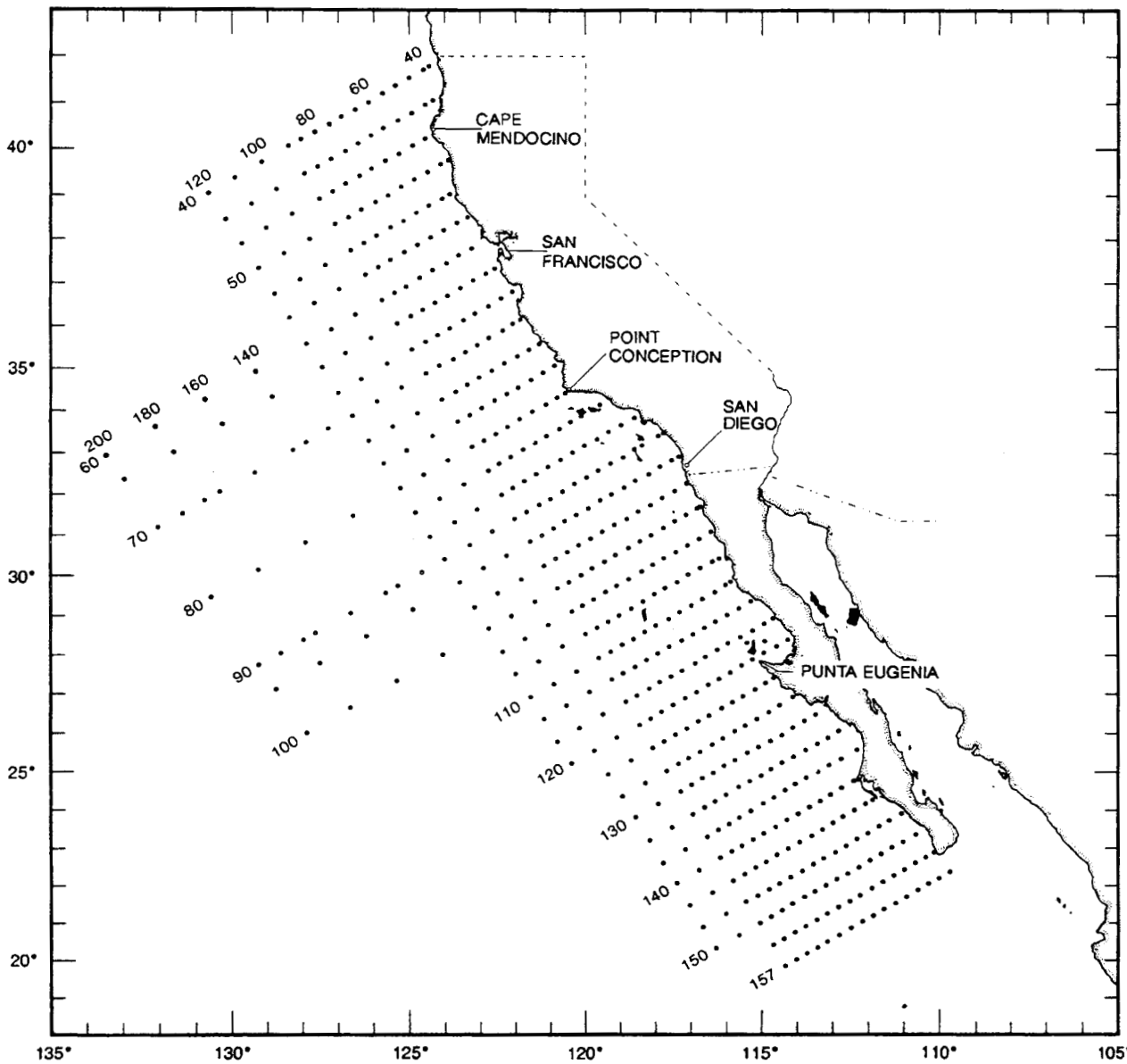

Figure 4. The basic station plan for CalCOFI cruises from 1950 - 1984.

TABLE 1. Station and plankton tow data for Manta tows taken on the 1990 CalCOFI survey. Numbers of fish eggs and larvae are raw counts, unadjusted for volume (cubic meters) of water filtered.

CalCOFI Cruise 9003

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	90	03	19	0854	96	1	36
76.7	51.0	35	01.3	120	55.1	JD	90	03	19	0617	92	25	4
76.7	55.0	34	53.1	121	11.9	JD	90	03	19	0228	88	3	9
76.7	60.0	34	43.3	121	33.0	JD	90	03	18	2152	89	14	31
76.7	70.0	34	23.3	122	14.8	JD	90	03	18	1547	89	0	0
76.7	80.0	34	03.6	122	55.9	JD	90	03	18	0825	84	0	9
76.7	90.0	33	43.2	123	38.0	JD	90	03	18	0208	96	3	1
80.0	51.0	34	27.0	120	31.4	JD	90	03	16	1912	92	45	8
80.0	55.0	34	19.0	120	48.1	JD	90	03	16	2222	96	639	32
80.0	60.0	34	09.0	121	08.9	JD	90	03	17	0155	87	413	18
80.0	70.0	33	49.0	121	50.6	JD	90	03	17	0746	89	2	35
80.0	80.0	33	29.1	122	32.0	JD	90	03	17	1416	98	1	6
80.0	90.0	33	09.0	123	13.2	JD	90	03	17	2012	97	10	17
81.8	46.9	34	16.5	120	01.5	JD	90	03	16	1440	78	5	17
83.3	40.6	34	13.5	119	24.7	JD	90	03	16	0845	106	1	1861
83.3	42.0	34	10.7	119	30.5	JD	90	03	16	0644	92	53	994
83.3	51.0	33	52.7	120	08.0	JD	90	03	15	2343	98	2573	92
83.3	55.0	33	44.7	120	24.6	JD	90	03	15	2054	85	187	4
83.3	60.0	33	34.7	120	45.3	JD	90	03	15	1651	86	0	9
83.3	70.0	33	14.4	121	26.6	JD	90	03	15	0947	86	0	0
83.3	80.0	32	54.7	122	07.8	JD	90	03	15	0325	88	2	4
83.3	90.0	32	34.6	122	48.7	JD	90	03	14	2052	82	1	0
83.3	100.0	32	14.6	123	29.5	JD	90	03	14	1445	97	9	3
86.7	33.0	33	53.4	118	29.5	JD	90	03	12	0435	93	222	693
86.7	35.0	33	49.4	118	37.6	JD	90	03	12	0725	93	2	14
86.7	40.0	33	39.4	119	00.0	JD	90	03	12	1231	96	22	6
86.7	50.0	33	19.4	119	39.8	JD	90	03	12	2048	84	429	2
86.7	55.0	33	09.5	120	00.3	JD	90	03	13	0121	87	8	1
86.7	60.0	32	59.4	120	21.0	JD	90	03	13	0558	83	5	0
86.7	70.0	32	39.4	121	01.9	JD	90	03	13	1315	85	5	4
86.7	80.0	32	19.4	121	42.9	JD	90	03	13	1926	100	63	3
86.7	90.0	31	59.5	122	23.6	JD	90	03	14	0055	98	10	1
86.7	100.0	31	39.5	123	04.2	JD	90	03	14	0705	101	1	5
90.0	28.0	33	29.1	117	46.0	JD	90	03	11	0943	82	32	47
90.0	30.0	33	25.1	117	54.4	JD	90	03	11	0639	83	490	613
90.0	35.0	33	15.1	118	14.9	JD	90	03	10	2351	83	115	1939
90.0	37.0	33	11.1	118	23.3	JD	90	03	10	2052	90	172	174
90.0	45.0	32	55.1	118	56.1	JD	90	03	10	1429	94	7	10
90.0	53.0	32	39.1	119	28.9	JD	90	03	10	0640	103	3	1
90.0	60.0	32	25.1	119	57.6	JD	90	03	10	0040	90	8	1
90.0	70.0	32	05.1	120	38.4	JD	90	03	09	1622	87	1	1
90.0	80.0	31	45.1	121	18.9	JD	90	03	09	0558	70	8	0
90.0	90.0	31	25.1	121	59.4	JD	90	03	08	1946	93	19	2
90.0	100.0	31	05.1	122	39.7	JD	90	03	08	0823	82	4	4
93.3	26.7	32	57.4	117	18.4	JD	90	03	04	1334	97	21	1
93.3	28.0	32	54.9	117	23.6	JD	90	03	04	1649	93	492	59
93.3	30.0	32	50.8	117	31.8	JD	90	03	04	2135	93	652	211

TABLE 1. (cont.) CalCOFI Cruise 9003 (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	35.0	32	40.8	117	52.4	JD	90	03	05	0426	87	218	1423
93.3	45.0	32	20.8	118	33.3	JD	90	03	05	1858	91	362	1710
93.3	50.0	32	10.9	118	53.5	JD	90	03	05	2353	88	22	38
93.3	55.0	32	00.9	119	14.1	JD	90	03	06	0446	101	68	103
93.3	60.0	31	50.8	119	34.4	JD	90	03	06	0859	87	2	14
93.3	70.0	31	30.8	120	14.7	JD	90	03	06	1747	95	6	2
93.3	80.0	31	10.8	120	55.3	JD	90	03	07	0012	83	17	0
93.3	90.0	30	50.9	121	35.4	JD	90	03	07	0720	97	2	2
93.3	100.0	30	30.8	122	15.6	JD	90	03	07	2340	92	0	5

CalCOFI Cruise 9004

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	51.0	34	27.0	120	31.4	JD	90	04	29	0228	85	7	2
80.0	55.0	34	19.0	120	48.1	JD	90	04	29	0531	92	2	2
80.0	60.0	34	09.1	121	09.1	JD	90	04	29	0947	73	0	5
81.8	46.9	34	16.5	120	01.5	JD	90	04	28	2007	94	181	319
83.3	40.6	34	13.5	119	24.7	JD	90	04	28	1450	91	3	1822
83.3	42.0	34	10.7	119	30.5	JD	90	04	28	1248	97	6	6469
83.3	51.0	33	52.7	120	08.0	JD	90	04	28	0648	99	17	17
83.3	55.0	33	44.7	120	24.6	JD	90	04	28	0342	86	79	13
83.3	60.0	33	34.7	120	45.3	JD	90	04	27	2327	85	2	8
83.3	70.0	33	14.7	121	26.6	JD	90	04	27	1723	75	0	10
83.3	80.0	32	54.6	122	07.8	JD	90	04	27	0957	82	0	26
83.3	90.0	32	34.7	122	48.6	JD	90	04	27	0324	73	4	2
86.7	33.0	33	53.4	118	29.4	JD	90	04	23	1951	87	494	4981
86.7	35.0	33	49.4	118	37.7	JD	90	04	23	2232	83	64	5237
86.7	40.0	33	39.4	118	58.9	JD	90	04	24	0306	80	100	2411
86.7	45.0	33	29.4	119	19.1	JD	90	04	24	0729	92	0	2
86.7	70.0	32	39.4	121	02.0	JD	90	04	25	2036	89	2	8
86.7	80.0	32	19.4	121	42.9	JD	90	04	26	0230	68	6	19
86.7	90.0	31	59.4	122	23.6	JD	90	04	26	1425	64	0	2
90.0	28.0	33	29.1	117	46.1	JD	90	04	23	0929	99	6	6347
90.0	30.0	33	25.1	117	54.3	JD	90	04	23	0727	100	1	4487
90.0	35.0	33	15.1	118	15.0	JD	90	04	23	0331	88	191	3166
90.0	37.0	33	11.1	118	22.9	JD	90	04	23	0052	77	79	489
90.0	45.0	32	55.1	118	55.9	JD	90	04	22	1941	78	13	0
90.0	53.0	32	39.2	119	28.9	JD	90	04	22	1352	81	0	1
90.0	60.0	32	24.7	119	57.0	JD	90	04	22	0742	87	0	0
90.0	70.0	32	05.1	120	38.3	JD	90	04	22	0053	86	0	5
90.0	80.0	31	45.1	121	18.9	JD	90	04	21	1750	85	1	8
90.0	90.0	31	25.1	121	59.4	JD	90	04	21	1113	85	0	640
90.0	100.0	31	04.9	122	39.8	JD	90	04	21	0435	78	11	180
90.0	110.0	30	45.1	123	19.9	JD	90	04	20	2232	89	11	24
90.0	120.0	30	25.1	124	00.0	JD	90	04	20	1640	86	0	27
93.3	26.7	32	57.4	117	18.3	JD	90	04	17	1213	83	18	18
93.3	28.0	32	54.7	117	23.7	JD	90	04	17	1528	95	15	0
93.3	30.0	32	50.8	117	31.9	JD	90	04	17	1847	90	766	4

TABLE 1. (cont.) CalCOFI Cruise 9004 (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	35.0	32	40.8	117	52.4	JD	90	04	17	2345	94	33	44
93.3	40.0	32	30.8	118	12.9	JD	90	04	18	0402	96	3	4
93.3	45.0	32	20.8	118	33.3	JD	90	04	18	0843	77	0	5
93.3	50.0	32	10.8	118	53.6	JD	90	04	18	1430	88	0	5
93.3	55.0	32	00.8	119	14.0	JD	90	04	18	1849	81	11	11
93.3	60.0	31	50.7	119	34.3	JD	90	04	18	2255	86	4	126
93.3	70.0	31	30.8	120	14.8	JD	90	04	19	0510	91	2	2
93.3	80.0	31	10.8	120	55.2	JD	90	04	19	1138	96	0	91
93.3	90.0	30	50.8	121	35.5	JD	90	04	19	1700	84	0	304
93.3	100.0	30	30.1	122	16.5	JD	90	04	19	2301	89	6	317
93.3	110.0	30	10.9	122	55.4	JD	90	04	20	0428	93	7	28
93.3	120.0	29	50.8	123	35.2	JD	90	04	20	0951	96	1	87

CalCOFI Cruise 9008

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	NH	90	08	08	1755	98	3	3095
76.7	51.0	35	01.4	120	55.1	NH	90	08	08	1548	90	23	897
76.7	55.0	34	53.2	121	11.8	NH	90	08	08	1240	90	1	8
76.7	60.0	34	43.3	121	33.0	NH	90	08	08	0817	88	10	19
76.7	70.0	34	23.3	122	14.7	NH	90	08	07	2142	83	80	5
76.7	80.0	34	03.3	122	56.6	NH	90	08	07	1625	91	1	11
76.7	90.0	33	43.3	123	38.0	NH	90	08	07	1015	87	0	1
80.0	51.0	34	27.1	120	31.5	NH	90	08	05	1700	87	21	567
80.0	55.0	34	19.0	120	48.2	NH	90	08	05	2048	73	32	15
80.0	60.0	34	08.8	121	09.3	NH	90	08	06	0055	81	8	5
80.0	70.0	33	49.0	121	50.3	NH	90	08	06	0634	87	4	73
80.0	80.0	33	29.0	122	32.0	NH	90	08	06	1327	91	0	8
80.0	90.0	33	09.0	123	13.3	NH	90	08	06	1944	70	10	8
80.0	100.0	32	49.3	123	54.7	NH	90	08	07	0137	87	1	7
81.8	46.9	34	16.5	120	01.6	NH	90	08	05	1220	97	5	4556
83.3	40.6	34	13.5	119	24.7	NH	90	08	05	0611	97	122	3029
83.3	42.0	34	10.8	119	30.8	NH	90	08	05	0250	88	146	2527
83.3	51.0	33	52.7	120	08.0	NH	90	08	04	1910	89	1	600
83.3	55.0	33	44.7	120	24.8	NH	90	08	04	1545	87	2	4
83.3	60.0	33	34.7	120	43.3	NH	90	08	04	1042	87	0	14
83.3	70.0	33	15.2	121	26.4	NH	90	08	04	0450	93	2	7
83.3	80.0	32	54.7	122	07.7	NH	90	08	03	2305	94	3	3
83.3	90.0	32	34.8	122	48.6	NH	90	08	03	1708	83	3	6
83.3	100.0	32	14.7	123	29.5	NH	90	08	03	1015	89	1	6
83.3	110.0	31	54.9	124	10.2	NH	90	08	03	0431	93	4	9
86.7	33.0	33	53.4	118	29.4	NH	90	07	31	1635	97	0	104
86.7	35.0	33	49.4	118	37.7	NH	90	07	31	1905	90	4	71
86.7	40.0	33	39.4	118	58.6	NH	90	07	31	2252	79	29	80
86.7	45.0	33	29.4	119	19.3	NH	90	08	01	0248	81	17	0
86.7	50.0	33	19.3	119	40.0	NH	90	08	01	0613	89	4	1272
86.7	55.0	33	09.4	120	00.4	NH	90	08	01	1310	80	1	11
86.7	60.0	32	59.4	120	21.1	NH	90	08	01	1705	85	0	11

TABLE 1. (cont.) CalCOFI Cruise 9008 (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	70.0	32	39.4	121	02.0	NH	90	08	01	2300	75	4	1
86.7	80.0	32	19.4	121	43.6	NH	90	08	02	0446	92	4	4
86.7	90.0	31	59.4	122	23.6	NH	90	08	02	1013	89	2	15
86.7	100.0	31	39.4	123	04.1	NH	90	08	02	1653	84	0	24
86.7	110.0	31	19.4	123	44.7	NH	90	08	02	2228	76	4	638
90.0	28.0	33	29.1	117	46.1	NH	90	07	31	0929	91	0	1
90.0	30.0	33	25.2	117	54.3	NH	90	07	31	0720	96	0	451
90.0	35.0	33	15.0	118	15.0	NH	90	07	31	0312	99	7	73
90.0	37.0	33	11.1	118	23.2	NH	90	07	30	2355	84	9	0
90.0	45.0	32	55.1	118	56.1	NH	90	07	30	1845	80	23	53
90.0	53.0	32	39.1	119	28.8	NH	90	07	30	1012	80	0	4
90.0	60.0	32	25.1	119	57.7	NH	90	07	30	0526	79	2	7
90.0	70.0	32	05.1	120	38.3	NH	90	07	29	2335	87	6	6
90.0	80.0	31	45.2	121	19.0	NH	90	07	29	1733	89	0	4
90.0	90.0	31	25.2	121	59.4	NH	90	07	29	1138	91	2	59
90.0	100.0	31	05.3	122	39.4	NH	90	07	29	0502	93	4	59
90.0	110.0	30	45.2	123	19.9	NH	90	07	28	2310	84	5	501
90.0	120.0	30	25.1	123	59.9	NH	90	07	28	1730	93	3	68
93.3	26.7	32	57.5	117	18.4	NH	90	07	25	1215	92	6	2
93.3	28.0	32	54.8	117	23.6	NH	90	07	25	1530	98	1	6
93.3	30.0	32	50.8	117	31.9	NH	90	07	25	1843	98	31	0
93.3	35.0	32	40.5	117	52.7	NH	90	07	25	2308	92	8	0
93.3	40.0	32	30.7	118	12.9	NH	90	07	26	0330	83	8	1
93.3	45.0	32	20.8	118	33.3	NH	90	07	26	0747	80	0	5
93.3	50.0	32	10.8	118	53.5	NH	90	07	26	1237	92	2	12
93.3	55.0	32	00.8	119	13.9	NH	90	07	26	1709	101	1	0
93.3	60.0	31	50.7	119	34.4	NH	90	07	26	2113	82	16	2
93.3	70.0	31	30.7	120	14.9	NH	90	07	27	0307	92	3	1
93.3	80.0	31	10.8	120	55.4	NH	90	07	27	0843	82	6	67
93.3	90.0	30	50.9	121	35.3	NH	90	07	27	1614	92	1	28
93.3	100.0	30	30.6	122	15.7	NH	90	07	27	2215	82	6	19
93.3	110.0	30	10.7	122	55.4	NH	90	07	28	0427	92	3	69
93.3	120.0	29	50.8	123	35.2	NH	90	07	28	1007	91	0	0

CalCOFI Cruise 9011

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	NH	90	11	19	0900	101	0	650
76.7	51.0	35	01.4	120	55.2	NH	90	11	19	0655	106	6	8
76.7	55.0	34	53.3	121	11.9	NH	90	11	19	0325	101	3	4
76.7	60.0	34	43.4	121	32.9	NH	90	11	18	2256	94	6	3
76.7	70.0	34	22.4	122	16.6	NH	90	11	18	1736	83	0	2
76.7	80.0	34	03.3	122	56.5	NH	90	11	18	0712	96	1	1
76.7	90.0	33	43.3	123	38.0	NH	90	11	18	0158	88	1	7
76.7	100.0	33	23.3	124	19.4	NH	90	11	17	2036	87	0	0
80.0	51.0	34	27.0	120	31.3	NH	90	11	16	0315	100	36	86
80.0	55.0	34	19.0	120	48.2	NH	90	11	16	0620	98	3	11
80.0	70.0	33	49.0	121	50.6	NH	90	11	16	2146	96	0	6

TABLE 1. (cont.) CalCOFI Cruise 9011 (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	80.0	33	29.0	122	32.0	NH	90	11	17	0316	91	3	12
80.0	90.0	33	09.0	123	13.3	NH	90	11	17	0845	89	1	3
80.0	100.0	32	49.1	123	54.2	NH	90	11	17	1452	93	0	1
81.8	46.9	34	16.5	120	01.4	NH	90	11	15	2308	98	233	29
83.3	40.6	34	13.5	119	24.6	NH	90	11	15	1837	101	53	1791
83.3	42.0	34	10.8	119	30.6	NH	90	11	15	1641	98	1	0
83.3	51.0	33	52.7	120	08.1	NH	90	11	15	1045	100	3	5
83.3	55.0	33	44.8	120	24.6	NH	90	11	15	0725	90	2	1
83.3	60.0	33	34.7	120	45.4	NH	90	11	15	0327	82	0	2
83.3	70.0	33	14.6	121	26.6	NH	90	11	14	2113	86	0	0
83.3	80.0	32	54.7	122	07.8	NH	90	11	14	1520	90	1	0
83.3	90.0	32	34.7	122	48.7	NH	90	11	14	0810	90	2	10
83.3	100.0	32	14.7	123	29.5	NH	90	11	14	0220	93	3	2
83.3	110.0	31	54.7	124	10.2	NH	90	11	13	2038	93	2	1
86.7	33.0	33	53.5	118	29.5	NH	90	11	11	0715	90	3	354
86.7	35.0	33	49.3	118	37.7	NH	90	11	11	1309	112	2	404
86.7	40.0	33	39.4	118	58.4	NH	90	11	11	1649	104	2	51
86.7	45.0	33	29.4	119	19.1	NH	90	11	11	2114	98	3	3
86.7	50.0	33	19.4	119	39.8	NH	90	11	12	0024	103	2	8
86.7	55.0	33	09.4	120	00.4	NH	90	11	12	0625	99	0	6
86.7	60.0	32	59.4	120	21.0	NH	90	11	12	1049	100	0	40
86.7	70.0	32	39.4	121	02.0	NH	90	11	12	1649	102	1	8
86.7	80.0	32	19.3	121	43.0	NH	90	11	12	2204	93	3	5
86.7	90.0	31	59.4	122	23.5	NH	90	11	13	0326	96	1	8
86.7	100.0	31	39.4	123	04.2	NH	90	11	13	0855	102	0	1
86.7	110.0	31	19.4	123	44.5	NH	90	11	13	1512	101	0	2
90.0	28.0	33	29.1	117	46.2	NH	90	11	11	0153	102	28	141
90.0	30.0	33	25.1	117	54.2	NH	90	11	10	2350	105	17	77
90.0	35.0	33	15.2	118	15.0	NH	90	11	10	2011	103	0	231
90.0	37.0	33	10.4	118	23.5	NH	90	11	10	1738	86	10	39
90.0	45.0	32	55.2	118	56.0	NH	90	11	10	1032	95	2	81
90.0	53.0	32	39.1	119	29.0	NH	90	11	10	0348	92	0	3
90.0	60.0	32	25.1	119	57.6	NH	90	11	09	2208	84	9	3
90.0	70.0	32	05.1	120	38.4	NH	90	11	09	1643	95	1	15
90.0	80.0	31	45.1	121	18.9	NH	90	11	09	1035	92	0	4
90.0	90.0	31	25.1	121	59.4	NH	90	11	09	0500	92	2	3
90.0	100.0	31	05.0	122	39.7	NH	90	11	08	2224	91	4	21
90.0	110.0	30	45.1	123	19.9	NH	90	11	08	1655	87	3	9
90.0	120.0	30	25.1	123	59.8	NH	90	11	08	1100	89	1	2
93.3	26.7	32	57.3	117	18.3	NH	90	11	05	1207	90	0	80
93.3	28.0	32	54.8	117	23.6	NH	90	11	05	1447	103	0	1
93.3	30.0	32	50.8	117	31.8	NH	90	11	05	1714	102	0	5
93.3	35.0	32	40.8	117	52.3	NH	90	11	05	2042	94	1	181
93.3	40.0	32	30.8	118	12.7	NH	90	11	06	0015	83	1	0
93.3	45.0	32	21.0	118	33.2	NH	90	11	06	0404	73	35	1
93.3	50.0	32	10.8	118	53.5	NH	90	11	06	0753	74	0	2
93.3	55.0	32	00.8	119	13.9	NH	90	11	06	1234	75	0	0
93.3	60.0	31	50.9	119	34.2	NH	90	11	06	1634	89	0	1
93.3	70.0	31	30.8	120	14.7	NH	90	11	06	2214	79	2	7

TABLE 1. (cont.) CalCOFI Cruise 9011 (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	90	11	07	0403	90	1	2
93.3	90.0	30	50.8	121	35.3	NH	90	11	07	1009	81	0	4
93.3	100.0	30	31.7	122	14.9	NH	90	11	07	1646	83	0	2
93.3	110.0	30	10.8	122	55.4	NH	90	11	07	2227	87	5	1
93.3	120.0	29	50.9	123	35.2	NH	90	11	08	0443	86	4	0

TABLE 2. Pooled occurrences of fish larvae taken in Manta tows on the 1990 CalCOFI survey.

Rank	Taxon	Occurrences
1	*Engraulis mordax*	84
2	*Cololabis saira*	81
3	*Sebastes* spp.	45
4	*Sardinops sagax*	39
5	*Merluccius productus*	11
6	*Scorpaenichthys marmoratus*	10
6	*Scomber japonicus*	10
8	*Chromis punctipinnis*	9
8	*Sebastes diploproa*	9
8	*Hypsoblennius jenkinsi*	9
11	*Pleuronichthys coenosus*	8
12	*Atherinopsis californiensis*	7
12	*Medialuna californiensis*	7
12	*Oxyjulis californica*	7
15	*Icichthys lockingtoni*	6
15	*Tetragonurus cuvieri*	6
15	*Trachurus symmetricus*	6
15	*Sebastes jordani*	6
19	*Pleuronichthys verticalis*	5
19	*Stenobrachius leucopsarus*	5
19	*Leuresthes tenuis*	5
22	*Hypsoblennius gilberti*	4
22	*Ceratoscopelus townsendi*	4
22	*Girella nigricans*	4
22	*Triphoturus mexicanus*	4
26	*Anoplopoma fimbria*	3
26	*Microstomus pacificus*	3
26	*Cheilopogon pinnatibarbatus*	3
26	*Cheilopogon heterurus*	3
26	*Citharichthys stigmaeus*	3
26	Disintegrated fish larvae	3
26	*Genyonemus lineatus*	3
26	*Hexagrammos decagrammus*	3
26	*Lampanyctus* spp.	3
35	*Aristostomias scintillans*	2
35	*Cyclothone* spp.	2
35	*Gigantactis* spp.	2
35	*Vinciguerria lucetia*	2
35	*Bathylagus ochotensis*	2
35	*Sebastes paucispinis*	2
35	*Stomias atriventer*	2
35	*Cyclothone signata*	2
35	*Citharichthys sordidus*	2
35	*Sphyraena argentea*	2
35	*Oxylebius pictus*	2
35	*Liparis mucosus*	2
35	*Semicossyphus pulcher*	2
35	*Leptocottus armatus*	2
35	*Hexagrammos lagocephalus*	2

TABLE 2. (cont.)

Rank	Taxon	Occurrences
35	*Peprilus simillimus*	2
51	*Paralichthys californicus*	1
51	*Cyclothone acclinidens*	1
51	*Leuroglossus stilbius*	1
51	*Pleuronichthys* spp.	1
51	*Sarda chiliensis*	1
51	*Pleuronichthys ritteri*	1
51	*Synodus lucioceps*	1
51	*Coryphopterus nicholsii*	1
51	*Hypsoblennius gentilis*	1
51	*Nannobrachium ritteri*	1
51	*Neoclinus blanchardi*	1
51	*Symbolophorus californiensis*	1
51	*Sebastolobus* spp.	1
51	*Trachipterus altivelis*	1
51	*Hermosilla azurea*	1
51	*Ophidion scrippsae*	1
51	*Seriphus politus*	1
51	*Xenistius californiensis*	1
51	*Paralabrax* spp.	1
51	Exocoetidae	1
51	*Odontopyxis trispinosa*	1
51	*Scopelogadus bispinosus*	1
51	*Hemilepidotus spinosus*	1
51	*Ophiodon elongatus*	1
51	*Scorpaena guttata*	1
51	*Diogenichthys atlanticus*	1
	Total	476

TABLE 3. Pooled raw counts of fish larvae taken in Manta tows on the 1990 CalCOFI survey.

Rank	Taxon	Count
1	*Engraulis mordax*	9123
2	*Sardinops sagax*	522
3	*Sebastes* spp.	264
4	*Cololabis saira*	224
5	*Scorpaenichthys marmoratus*	98
6	*Hypsoblennius jenkinsi*	69
7	*Chromis punctipinnis*	54
8	*Scomber japonicus*	48
9	*Merluccius productus*	42
10	*Sebastes jordani*	29
11	*Ophiodon elongatus*	24
11	*Sebastes diploproa*	24
13	*Atherinopsis californiensis*	21
14	*Hexagrammos decagrammus*	20
14	*Oxyjulis californica*	20
16	*Leuresthes tenuis*	16
17	*Genyonemus lineatus*	12
17	*Medialuna californiensis*	12
19	*Stenobrachius leucopsarus*	11
19	*Hypsoblennius gilberti*	11
21	*Pleuronichthys coenosus*	10
21	*Anoplopoma fimbria*	10
23	*Sphyraena argentea*	8
23	*Cheilopogon heterurus*	8
25	*Trachurus symmetricus*	7
25	*Girella nigricans*	7
27	*Cheilopogon pinnatibarbatus*	6
27	*Xenistius californiensis*	6
27	*Icichthys lockingtoni*	6
27	*Tetragonurus cuvieri*	6
31	*Sebastolobus* spp.	5
31	*Pleuronichthys verticalis*	5
31	*Triphoturus mexicanus*	5
31	*Lampanyctus* spp.	5
35	*Seriphus politus*	4
35	*Hexagrammos lagocephalus*	4
35	Disintegrated fish larvae	4
35	*Ceratoscopelus townsendi*	4
35	*Vinciguerria lucetia*	4
40	*Synodus lucioceps*	3
40	*Microstomus pacificus*	3
40	*Leptocottus armatus*	3
40	*Coryphopterus nicholsii*	3
40	*Neoclinus blanchardi*	3
40	*Citharichthys stigmaeus*	3
40	*Cyclothone* spp.	3
40	*Citharichthys sordidus*	3
40	*Semicossyphus pulcher*	3
40	*Bathylagus ochotensis*	3

TABLE 3. (cont.)

Rank	Taxon	Count
40	*Hermosilla azurea*	3
40	*Scorpaena guttata*	3
40	*Peprilus simillimus*	3
53	*Cyclothone signata*	2
53	*Stomias atriventer*	2
53	*Aristostomias scintillans*	2
53	*Oxylebius pictus*	2
53	*Liparis mucosus*	2
53	*Sebastes paucispinis*	2
53	*Gigantactis* spp.	2
60	*Trachipterus altivelis*	1
60	*Ophidion scrippsae*	1
60	*Pleuronichthys* spp.	1
60	*Leuroglossus stilbius*	1
60	*Cyclothone acclinidens*	1
60	*Paralichthys californicus*	1
60	*Symbolophorus californiensis*	1
60	*Scopelogadus bispinosus*	1
60	*Diogenichthys atlanticus*	1
60	*Pleuronichthys ritteri*	1
60	*Hemilepidotus spinosus*	1
60	*Hypsoblennius gentilis*	1
60	*Odontopyxis trispinosa*	1
60	Exocoetidae	1
60	*Paralabrax* spp.	1
60	*Nannobrachium ritteri*	1
60	*Sarda chiliensis*	1
	Total	10828

TABLE 4. Numbers of fish larvae taken in Manta net tows on the 1990 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 49.0	-	-	0.0	-	-	-	-	1.0	-	-	0.0	-
76.7 51.0	-	-	0.0	-	-	-	-	12.6	-	-	0.0	-
76.7 60.0	-	-	0.9	-	-	-	-	0.0	-	-	0.0	-
76.7 70.0	-	-	0.0	-	-	-	-	55.9	-	-	0.0	-
76.7 90.0	-	-	1.0	-	-	-	-	0.0	-	-	0.0	-
80.0 51.0	-	-	0.0	0.0	-	-	-	12.1	-	-	17.9	-
80.0 55.0	-	-	5.8	0.0	-	-	-	3.7	-	-	0.0	-
80.0 60.0	-	-	4.3	0.0	-	-	-	4.1	-	-	-	-
80.0 70.0	-	-	0.9	-	-	-	-	0.0	-	-	0.0	-
81.8 46.9	-	-	0.0	0.0	-	-	-	0.0	-	-	35.1	-
83.3 40.6	-	-	0.0	0.0	-	-	-	94.5	-	-	4.1	-
83.3 42.0	-	-	0.0	1.9	-	-	-	62.4	-	-	0.0	-
83.3 51.0	-	-	0.0	0.0	-	-	-	0.9	-	-	1.0	-
83.3 55.0	-	-	0.0	0.9	-	-	-	0.0	-	-	0.0	-
86.7 33.0	-	-	0.0	92.1	-	-	0.0	-	-	-	0.0	-
86.7 35.0	-	-	0.0	0.8	-	-	1.8	-	-	-	0.0	-
86.7 40.0	-	-	0.0	0.8	-	-	0.8	-	-	-	0.0	-
86.7 45.0	-	-	-	0.0	-	-	-	1.6	-	-	0.0	-
86.7 70.0	-	-	0.0	1.8	-	-	-	0.0	-	-	0.0	-
86.7 80.0	-	-	1.0	2.0	-	-	-	0.0	-	-	0.0	-
90.0 28.0	-	-	0.0	0.0	-	-	0.0	-	-	-	9.2	-
90.0 35.0	-	-	0.0	0.0	-	-	2.0	-	-	-	0.0	-
90.0 45.0	-	-	0.0	0.0	-	-	8.7	-	-	-	0.0	-
90.0 90.0	-	-	0.9	0.0	-	-	0.0	-	-	-	0.0	-
90.0 100.0	-	-	0.0	6.2	-	-	0.0	-	-	-	0.0	-
93.3 35.0	-	-	0.0	0.0	-	-	0.0	-	-	-	0.9	-
93.3 40.0	-	-	-	0.0	-	-	4.2	-	-	-	0.0	-
93.3 55.0	-	-	0.0	5.7	-	-	0.0	-	-	-	0.0	-
93.3 60.0	-	-	0.0	2.6	-	-	4.1	-	-	-	0.0	-

TABLE 4. (cont.)

Station		*Engraulis mordax*										
		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7	55.0	-	-	0.9	-	-	-	-	0.0	-	-	2.0	-
76.7	60.0	-	-	0.9	-	-	-	-	0.0	-	-	0.9	-
80.0	51.0	-	-	13.8	6.0	-	-	-	0.9	-	-	16.9	-
80.0	55.0	-	-	557.0	0.0	-	-	-	3.7	-	-	0.0	-
80.0	60.0	-	-	307.9	0.0	-	-	-	0.0	-	-	-	-
80.0	70.0	-	-	0.0	-	-	-	-	1.7	-	-	0.0	-
81.8	46.9	-	-	0.8	159.5	-	-	-	4.8	-	-	188.2	-
83.3	40.6	-	-	1.1	2.7	-	-	-	3.9	-	-	42.5	-
83.3	42.0	-	-	36.9	0.0	-	-	-	0.0	-	-	0.0	-
83.3	51.0	-	-	2477.3	16.7	-	-	-	0.0	-	-	2.0	-
83.3	55.0	-	-	138.9	54.0	-	-	-	0.0	-	-	0.0	-
83.3	60.0	-	-	0.0	0.9	-	-	-	0.0	-	-	0.0	-
83.3	90.0	-	-	0.0	0.7	-	-	-	0.0	-	-	0.0	-
86.7	33.0	-	-	191.8	329.4	-	-	0.0	-	-	-	0.9	-
86.7	35.0	-	-	0.0	52.2	-	-	0.0	-	-	-	1.1	-
86.7	40.0	-	-	7.7	78.0	-	-	2.4	-	-	-	0.0	-
86.7	45.0	-	-	-	0.0	-	-	-	0.0	-	-	2.0	-
86.7	50.0	-	-	269.6	-	-	-	-	0.9	-	-	1.0	-
86.7	55.0	-	-	1.7	-	-	-	-	0.0	-	-	0.0	-
86.7	60.0	-	-	2.5	-	-	-	-	0.0	-	-	0.0	-
86.7	80.0	-	-	29.1	0.0	-	-	-	0.0	-	-	0.0	-
90.0	28.0	-	-	18.0	5.9	-	-	0.0	-	-	-	6.1	-
90.0	30.0	-	-	400.3	0.0	-	-	0.0	-	-	-	1.1	-
90.0	35.0	-	-	95.1	165.4	-	-	2.0	-	-	-	0.0	-
90.0	37.0	-	-	153.9	60.2	-	-	0.8	-	-	-	8.6	-
90.0	45.0	-	-	3.8	8.5	-	-	0.0	-	-	-	0.0	-
90.0	60.0	-	-	4.5	0.0	-	-	0.0	-	-	-	0.0	-
90.0	80.0	-	-	5.6	0.0	-	-	0.0	-	-	-	0.0	-
90.0	90.0	-	-	13.1	0.0	-	-	0.0	-	-	-	0.0	-
90.0	100.0	-	-	0.8	0.8	-	-	0.0	-	-	-	0.0	-
93.3	26.7	-	-	1.0	0.8	-	-	0.0	-	-	-	0.0	-
93.3	28.0	-	-	456.6	1.9	-	-	0.0	-	-	-	0.0	-
93.3	30.0	-	-	604.4	686.7	-	-	0.0	-	-	-	0.0	-
93.3	35.0	-	-	186.2	26.2	-	-	0.0	-	-	-	0.0	-
93.3	40.0	-	-	-	1.9	-	-	2.5	-	-	-	0.8	-

TABLE 4. (cont.)

Engraulis mordax (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 45.0	-	-	326.3	0.0	-	-	0.0	-	-	-	23.3	-
93.3 50.0	-	-	15.9	0.0	-	-	0.0	-	-	-	0.0	-
93.3 55.0	-	-	60.6	0.8	-	-	0.0	-	-	-	0.0	-
93.3 60.0	-	-	1.7	0.9	-	-	1.6	-	-	-	0.0	-
93.3 70.0	-	-	1.9	0.0	-	-	0.0	-	-	-	0.0	-
93.3 80.0	-	-	13.2	0.0	-	-	0.0	-	-	-	0.0	-
93.3 90.0	-	-	1.9	0.0	-	-	0.0	-	-	-	0.0	-

Bathylagus ochotensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 60.0	-	-	1.8	-	-	-	-	0.0	-	-	0.0	-
86.7 55.0	-	-	0.9	-	-	-	-	0.0	-	-	0.0	-

Leuroglossus stilbius

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

***Cyclothone* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 100.0	-	-	0.8	0.0	-	-	0.0	-	-	-	0.0	-
93.3 120.0	-	-	-	0.0	-	-	0.0	-	-	-	1.7	-

Cyclothone acclinidens

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

Cyclothone signata

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 90.0	-	-	0.0	0.7	-	-	-	0.0	-	-	0.0	-
90.0 100.0	-	-	0.8	0.0	-	-	0.0	-	-	-	0.0	-

Vinciguerria lucetia

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 100.0	-	-	0.0	0.0	-	-	1.9	-	-	-	0.0	-
93.3 110.0	-	-	-	0.0	-	-	0.0	-	-	-	1.7	-

Stomias atriventer

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 90.0	-	-	0.8	0.0	-	-	-	0.0	-	-	0.0	-

TABLE 4. (cont.)

Stomias atriventer (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 100.0	-	-	0.8	0.0	-	-	0.0	-	-	-	0.0	-

Aristostomias scintillans

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

Synodus lucioceps

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 60.0	-	-	0.0	-	-	-	-	0.0	-	-	2.8	-

Ceratoscopelus townsendi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 90.0	-	-	0.0	-	-	-	-	0.7	-	-	0.0	-
93.3 100.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-
93.3 110.0	-	-	-	0.9	-	-	0.0	-	-	-	0.9	-

***Lampanyctus* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 90.0	-	-	1.0	0.0	-	-	-	0.0	-	-	0.0	-
93.3 35.0	-	-	2.6	0.0	-	-	0.0	-	-	-	0.0	-
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.
86.7 80.0	-	-	0.0	0.7	-	-	-	0.0	-	-	0.0	-

Stenobrachius leucopsarus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 51.0	-	-	1.0	0.0	-	-	-	0.0	-	-	0.0	-
83.3 55.0	-	-	0.0	3.4	-	-	-	0.0	-	-	0.0	-
86.7 33.0	-	-	1.9	0.0	-	-	0.0	-	-	-	0.0	-
86.7 50.0	-	-	2.5	-	-	-	-	0.0	-	-	0.0	-
86.7 60.0	-	-	0.8	-	-	-	-	0.0	-	-	0.0	-

Triphoturus mexicanus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	-	-	0.0	-	-	-	-	2.0	-	-	0.0	-

TABLE 4. (cont.)

Triphoturus mexicanus (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 40.6	-	-	0.0	0.0	-	-	-	1.0	-	-	0.0	-
90.0 45.0	-	-	0.0	0.0	-	-	0.8	-	-	-	0.0	-
93.3 90.0	-	-	0.0	0.0	-	-	0.9	-	-	-	0.0	-

Diogenichthys atlanticus

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

Symbolophorus californiensis

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

Trachipterus altivelis

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

Merluccius productus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	-	-	0.9	-	-	-	-	0.0	-	-	0.0	-
76.7 90.0	-	-	1.0	-	-	-	-	0.0	-	-	0.0	-
80.0 55.0	-	-	6.7	0.0	-	-	-	0.0	-	-	0.0	-
83.3 55.0	-	-	18.7	0.0	-	-	-	0.0	-	-	1.8	-
86.7 50.0	-	-	0.8	-	-	-	-	0.0	-	-	0.0	-
86.7 80.0	-	-	1.0	0.0	-	-	-	0.0	-	-	0.0	-
90.0 53.0	-	-	1.0	0.0	-	-	0.0	-	-	-	0.0	-
90.0 70.0	-	-	0.9	0.0	-	-	0.0	-	-	-	0.0	-
93.3 55.0	-	-	1.0	0.0	-	-	0.0	-	-	-	0.0	-
93.3 70.0	-	-	3.8	0.0	-	-	0.0	-	-	-	0.0	-

Ophidion scrippsae

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

***Gigantactis* spp.**

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

TABLE 4. (cont.)

Atherinopsis californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 51.0	-	-	2.0	0.0	-	-	-	0.0	-	-	0.0	-
90.0 28.0	-	-	0.0	0.0	-	-	0.0	-	-	-	1.0	-
90.0 35.0	-	-	0.0	1.8	-	-	0.0	-	-	-	0.0	-
93.3 26.7	-	-	0.0	4.2	-	-	0.0	-	-	-	0.0	-
93.3 28.0	-	-	0.0	8.6	-	-	0.0	-	-	-	0.0	-
93.3 30.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-
93.3 35.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-

Leuresthes tenuis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	-	-	0.0	0.0	-	-	-	2.6	-	-	0.0	-
83.3 42.0	-	-	0.9	0.0	-	-	-	1.8	-	-	0.0	-
93.3 26.7	-	-	0.0	6.7	-	-	0.0	-	-	-	0.0	-
93.3 28.0	-	-	0.0	1.9	-	-	0.0	-	-	-	0.0	-

Cololabis saira

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	-	-	0.0	-	-	-	-	0.0	-	-	1.0	-
76.7 60.0	-	-	1.8	-	-	-	-	7.9	-	-	0.0	-
76.7 70.0	-	-	0.0	-	-	-	-	1.7	-	-	0.0	-
76.7 80.0	-	-	0.0	-	-	-	-	0.9	-	-	1.0	-
76.7 90.0	-	-	0.0	-	-	-	-	0.0	-	-	0.9	-
80.0 55.0	-	-	2.9	0.0	-	-	-	0.0	-	-	0.0	-
80.0 60.0	-	-	0.9	0.0	-	-	-	0.8	-	-	-	-
80.0 70.0	-	-	0.0	-	-	-	-	1.7	-	-	0.0	-
80.0 80.0	-	-	1.0	-	-	-	-	0.0	-	-	2.7	-
80.0 90.0	-	-	9.7	-	-	-	-	4.2	-	-	0.9	-
80.0 100.0	-	-	-	-	-	-	-	0.9	-	-	0.0	-
83.3 55.0	-	-	0.0	0.0	-	-	-	0.9	-	-	0.0	-
83.3 80.0	-	-	1.8	0.0	-	-	-	2.8	-	-	0.0	-
83.3 90.0	-	-	0.0	0.7	-	-	-	2.5	-	-	1.8	-
83.3 100.0	-	-	8.8	-	-	-	-	0.9	-	-	2.8	-
83.3 110.0	-	-	-	-	-	-	-	3.7	-	-	1.9	-
86.7 45.0	-	-	-	0.0	-	-	-	2.4	-	-	0.0	-
86.7 55.0	-	-	0.0	-	-	-	-	0.8	-	-	0.0	-
86.7 70.0	-	-	0.0	0.0	-	-	-	3.0	-	-	1.0	-

TABLE 4. (cont.)

Cololabis saira (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 80.0	-	-	0.0	1.4	-	-	-	2.8	-	-	2.8	-
86.7 90.0	-	-	6.9	0.0	-	-	-	1.8	-	-	1.0	-
86.7 110.0	-	-	-	-	-	-	-	3.0	-	-	0.0	-
90.0 30.0	-	-	0.0	1.0	-	-	0.0	-	-	-	0.0	-
90.0 35.0	-	-	0.8	0.0	-	-	1.0	-	-	-	0.0	-
90.0 37.0	-	-	0.0	0.0	-	-	2.5	-	-	-	0.0	-
90.0 45.0	-	-	0.0	0.0	-	-	3.2	-	-	-	0.0	-
90.0 53.0	-	-	1.0	0.0	-	-	0.0	-	-	-	0.0	-
90.0 60.0	-	-	1.8	0.0	-	-	1.6	-	-	-	7.5	-
90.0 70.0	-	-	0.0	0.0	-	-	5.2	-	-	-	1.0	-
90.0 90.0	-	-	1.9	0.0	-	-	1.8	-	-	-	1.8	-
90.0 100.0	-	-	0.0	1.6	-	-	0.9	-	-	-	3.7	-
90.0 110.0	-	-	-	9.7	-	-	3.4	-	-	-	0.9	-
90.0 120.0	-	-	-	0.0	-	-	2.8	-	-	-	0.9	-
93.3 26.7	-	-	0.0	2.5	-	-	0.0	-	-	-	0.0	-
93.3 28.0	-	-	0.0	1.0	-	-	0.0	-	-	-	0.0	-
93.3 30.0	-	-	0.0	0.0	-	-	3.9	-	-	-	0.0	-
93.3 35.0	-	-	0.0	2.8	-	-	3.7	-	-	-	0.0	-
93.3 40.0	-	-	-	1.0	-	-	0.0	-	-	-	0.0	-
93.3 50.0	-	-	0.9	0.0	-	-	0.9	-	-	-	0.0	-
93.3 55.0	-	-	0.0	0.0	-	-	1.0	-	-	-	0.0	-
93.3 60.0	-	-	0.0	0.0	-	-	2.5	-	-	-	0.0	-
93.3 70.0	-	-	0.0	0.0	-	-	2.7	-	-	-	0.8	-
93.3 80.0	-	-	0.0	0.0	-	-	4.9	-	-	-	0.9	-
93.3 100.0	-	-	0.0	3.6	-	-	4.9	-	-	-	0.0	-
93.3 110.0	-	-	-	3.7	-	-	2.8	-	-	-	0.0	-
93.3 120.0	-	-	-	1.0	-	-	0.0	-	-	-	0.9	-

Exocoetidae

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 28.0	-	-	0.0	0.0	-	-	1.0	-	-	-	0.0	-

Cheilopogon heterurus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 40.0	-	-	0.0	0.0	-	-	1.6	-	-	-	0.0	-
90.0 37.0	-	-	0.0	0.0	-	-	1.7	-	-	-	0.0	-

TABLE 4. (cont.)

Cheilopogon heterurus (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 45.0	-	-	0.0	0.0	-	-	3.2	-	-	-	0.0	-

Cheilopogon pinnatibarbatus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 45.0	-	-	-	0.0	-	-	-	0.0	-	-	1.0	-
90.0 37.0	-	-	0.0	0.0	-	-	1.7	-	-	-	0.0	-
93.3 30.0	-	-	0.0	0.0	-	-	2.9	-	-	-	0.0	-

Scopelogadus bispinosus

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

***Sebastes* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	-	-	1.0	-	-	-	-	0.0	-	-	0.0	-
76.7 51.0	-	-	7.3	-	-	-	-	0.9	-	-	4.3	-
76.7 55.0	-	-	0.0	-	-	-	-	0.9	-	-	0.0	-
76.7 60.0	-	-	0.9	-	-	-	-	0.9	-	-	0.0	-
80.0 51.0	-	-	1.8	0.0	-	-	-	1.7	-	-	0.0	-
80.0 55.0	-	-	1.0	1.8	-	-	-	0.0	-	-	0.0	-
80.0 60.0	-	-	8.7	0.0	-	-	-	0.0	-	-	-	-
81.8 46.9	-	-	3.1	3.8	-	-	-	0.0	-	-	0.0	-
83.3 42.0	-	-	11.1	2.9	-	-	-	0.0	-	-	0.0	-
83.3 51.0	-	-	9.8	0.0	-	-	-	0.0	-	-	0.0	-
83.3 55.0	-	-	1.7	6.0	-	-	-	0.9	-	-	0.0	-
86.7 33.0	-	-	4.7	0.0	-	-	0.0	-	-	-	0.9	-
86.7 35.0	-	-	1.9	0.0	-	-	0.0	-	-	-	0.0	-
86.7 40.0	-	-	10.6	0.8	-	-	0.0	-	-	-	0.0	-
86.7 50.0	-	-	63.8	-	-	-	-	0.0	-	-	0.0	-
86.7 55.0	-	-	4.4	-	-	-	-	0.0	-	-	0.0	-
86.7 60.0	-	-	0.8	-	-	-	-	0.0	-	-	0.0	-
86.7 70.0	-	-	4.2	0.0	-	-	-	0.0	-	-	0.0	-
86.7 80.0	-	-	30.1	0.0	-	-	-	0.0	-	-	0.0	-
90.0 30.0	-	-	4.1	0.0	-	-	0.0	-	-	-	0.0	-
90.0 45.0	-	-	2.8	1.6	-	-	0.0	-	-	-	0.0	-
90.0 53.0	-	-	1.0	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.
93.3 26.7	-	-	17.4	0.8	-	-	0.0	-	-	-	0.0	-
93.3 28.0	-	-	0.9	1.0	-	-	0.0	-	-	-	0.0	-
93.3 35.0	-	-	0.9	0.0	-	-	0.0	-	-	-	0.0	-
93.3 45.0	-	-	2.7	0.0	-	-	0.0	-	-	-	0.0	-
93.3 50.0	-	-	2.6	0.0	-	-	0.9	-	-	-	0.0	-
93.3 55.0	-	-	6.1	2.4	-	-	0.0	-	-	-	0.0	-
93.3 80.0	-	-	0.8	0.0	-	-	0.0	-	-	-	0.0	-

Sebastes diploproa

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 70.0	-	-	0.0	-	-	-	-	6.7	-	-	0.0	-
80.0 55.0	-	-	0.0	0.0	-	-	-	2.9	-	-	0.0	-
80.0 60.0	-	-	2.6	0.0	-	-	-	1.6	-	-	-	-
81.8 46.9	-	-	0.0	2.8	-	-	-	0.0	-	-	0.0	-
86.7 33.0	-	-	0.0	0.0	-	-	0.0	-	-	-	0.9	-
86.7 50.0	-	-	0.8	-	-	-	-	0.9	-	-	0.0	-
90.0 45.0	-	-	0.0	0.0	-	-	0.0	-	-	-	0.9	-

Sebastes jordani

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	-	-	0.9	-	-	-	-	0.0	-	-	0.0	-
80.0 60.0	-	-	2.6	0.0	-	-	-	0.0	-	-	-	-
80.0 70.0	-	-	0.9	-	-	-	-	0.0	-	-	0.0	-
83.3 51.0	-	-	1.0	0.0	-	-	-	0.0	-	-	0.0	-
86.7 33.0	-	-	1.9	0.0	-	-	0.0	-	-	-	0.0	-
86.7 50.0	-	-	17.6	-	-	-	-	0.0	-	-	0.0	-

Sebastes paucispinis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 50.0	-	-	0.8	-	-	-	-	0.0	-	-	0.0	-
86.7 80.0	-	-	1.0	0.0	-	-	-	0.0	-	-	0.0	-

***Sebastolobus* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 60.0	-	-	4.4	-	-	-	-	0.0	-	-	0.0	-

TABLE 4. (cont.)

Scorpaena guttata

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 45.0	-	-	0.0	0.0	-	-	2.4	-	-	-	0.0	-

Anoplopoma fimbria

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	-	-	0.9	-	-	-	-	0.0	-	-	0.0	-
80.0 55.0	-	-	1.0	0.0	-	-	-	0.0	-	-	0.0	-
80.0 60.0	-	-	6.9	0.0	-	-	-	0.0	-	-	-	-

Oxylebius pictus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 60.0	-	-	0.0	-	-	-	-	0.0	-	-	0.9	-
76.7 90.0	-	-	1.0	-	-	-	-	0.0	-	-	0.0	-

Hexagrammos decagrammus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	-	-	0.9	0.0	-	-	-	0.0	-	-	0.0	-
80.0 55.0	-	-	1.9	0.0	-	-	-	0.0	-	-	0.0	-
80.0 60.0	-	-	14.7	0.0	-	-	-	0.0	-	-	-	-

Hexagrammos lagocephalus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 51.0	-	-	2.9	0.0	-	-	-	0.0	-	-	0.0	-
86.7 33.0	-	-	0.9	0.0	-	-	0.0	-	-	-	0.0	-

Ophiodon elongatus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	-	-	22.1	0.0	-	-	-	0.0	-	-	0.0	-

Hemilepidotus spinosus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 60.0	-	-	0.9	0.0	-	-	-	0.0	-	-	-	-

Leptocottus armatus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	-	-	1.8	0.0	-	-	-	0.0	-	-	0.0	-
86.7 33.0	-	-	0.9	0.0	-	-	0.0	-	-	-	0.0	-

TABLE 4. (cont.)

Scorpaenichthys marmoratus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	-	-	13.7	-	-	-	-	0.0	-	-	1.1	-
80.0 55.0	-	-	37.5	0.0	-	-	-	0.0	-	-	2.9	-
80.0 60.0	-	-	6.9	0.0	-	-	-	0.0	-	-	-	-
83.3 51.0	-	-	22.5	0.0	-	-	-	0.0	-	-	0.0	-
83.3 55.0	-	-	0.0	3.4	-	-	-	0.0	-	-	0.0	-
86.7 33.0	-	-	0.9	0.0	-	-	0.0	-	-	-	0.0	-
86.7 40.0	-	-	2.9	0.0	-	-	0.0	-	-	-	0.0	-
90.0 60.0	-	-	0.9	0.0	-	-	0.0	-	-	-	0.0	-

Odontopyxis trispinosa

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 55.0	-	-	0.0	0.0	-	-	-	0.7	-	-	0.0	-

Liparis mucosus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 55.0	-	-	0.0	0.0	-	-	-	0.7	-	-	0.0	-
81.8 46.9	-	-	0.0	0.9	-	-	-	0.0	-	-	0.0	-

***Paralabrax* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	-	-	0.0	0.0	-	-	-	0.9	-	-	0.0	-

Trachurus symmetricus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 90.0	-	-	0.0	-	-	-	-	1.4	-	-	0.0	-
83.3 90.0	-	-	0.0	0.7	-	-	-	0.0	-	-	0.0	-
86.7 45.0	-	-	-	0.0	-	-	-	0.8	-	-	0.0	-
86.7 80.0	-	-	0.0	0.0	-	-	-	0.9	-	-	0.0	-
90.0 35.0	-	-	0.0	0.0	-	-	1.0	-	-	-	0.0	-
93.3 70.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-

Xenistius californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 26.7	-	-	0.0	0.0	-	-	5.5	-	-	-	0.0	-

TABLE 4. (cont.)

Genyonemus lineatus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 33.0	-	-	1.9	0.0	-	-	0.0	-	-	-	0.0	-
90.0 28.0	-	-	6.5	0.0	-	-	0.0	-	-	-	0.0	-
93.3 26.7	-	-	1.9	0.0	-	-	0.0	-	-	-	0.0	-

Seriphus politus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 33.0	-	-	0.0	3.5	-	-	0.0	-	-	-	0.0	-

Girella nigricans

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 55.0	-	-	0.0	0.0	-	-	-	1.5	-	-	0.0	-
83.3 42.0	-	-	0.0	0.0	-	-	-	2.6	-	-	0.0	-
86.7 33.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-
90.0 35.0	-	-	0.0	0.0	-	-	1.0	-	-	-	0.0	-

Hermosilla azurea

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 40.0	-	-	0.0	0.0	-	-	2.4	-	-	-	0.0	-

Medialuna californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 70.0	-	-	0.0	-	-	-	-	2.5	-	-	0.0	-
83.3 42.0	-	-	0.0	0.0	-	-	-	0.0	-	-	1.0	-
83.3 70.0	-	-	0.0	0.0	-	-	-	1.9	-	-	0.0	-
86.7 40.0	-	-	0.0	0.0	-	-	0.0	-	-	-	2.1	-
90.0 45.0	-	-	0.0	0.0	-	-	0.0	-	-	-	0.9	-
93.3 45.0	-	-	0.0	0.0	-	-	0.0	-	-	-	1.5	-
93.3 60.0	-	-	0.0	0.0	-	-	0.8	-	-	-	0.0	-

Chromis punctipinnis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 55.0	-	-	0.0	0.0	-	-	-	5.9	-	-	0.0	-
83.3 40.6	-	-	0.0	0.0	-	-	-	2.9	-	-	2.0	-
83.3 42.0	-	-	0.0	0.0	-	-	-	9.7	-	-	0.0	-
86.7 40.0	-	-	0.0	0.0	-	-	1.6	-	-	-	0.0	-
86.7 45.0	-	-	-	0.0	-	-	-	0.8	-	-	0.0	-
93.3 30.0	-	-	0.0	0.0	-	-	23.4	-	-	-	0.0	-

TABLE 4. (cont.)

Chromis punctipinnis (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 35.0	-	-	0.0	0.0	-	-	1.8	-	-	-	0.0	-
93.3 60.0	-	-	0.0	0.0	-	-	0.8	-	-	-	0.0	-

Oxyjulis californica

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	-	-	0.0	-	-	-	-	0.9	-	-	1.1	-
80.0 55.0	-	-	0.0	0.0	-	-	-	1.5	-	-	0.0	-
83.3 40.6	-	-	0.0	0.0	-	-	-	11.7	-	-	0.0	-
90.0 37.0	-	-	0.0	0.0	-	-	0.8	-	-	-	0.0	-
93.3 35.0	-	-	0.0	0.0	-	-	1.8	-	-	-	0.0	-
93.3 60.0	-	-	0.0	0.0	-	-	0.8	-	-	-	0.0	-

Semicossyphus pulcher

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	-	-	0.0	1.0	-	-	-	0.0	-	-	0.0	-
86.7 50.0	-	-	0.0	-	-	-	-	1.8	-	-	0.0	-

Neoclinus blanchardi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	2.8	-	-	-	0.0	-	-	0.0	-

Hypsoblennius gentilis

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

Hypsoblennius gilberti

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	0.0	-	-	-	0.0	-	-	1.0	-
83.3 40.6	-	-	0.0	0.0	-	-	-	1.0	-	-	0.0	-
83.3 42.0	-	-	0.0	0.0	-	-	-	7.0	-	-	0.0	-
86.7 40.0	-	-	0.0	0.0	-	-	0.8	-	-	-	0.0	-

Hypsoblennius jenkinsi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	-	0.0	0.0	-	-	-	0.0	-	-	1.0	-
83.3 40.6	-	-	0.0	0.0	-	-	-	0.0	-	-	5.1	-
83.3 42.0	-	-	0.0	0.0	-	-	-	21.1	-	-	0.0	-

TABLE 4. (cont.)

Hypsoblennius jenkinsi (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 35.0	-	-	0.0	0.0	-	-	0.0	-	-	-	1.1	-
86.7 40.0	-	-	0.0	0.0	-	-	5.5	-	-	-	0.0	-
86.7 45.0	-	-	-	0.0	-	-	-	1.6	-	-	0.0	-
90.0 28.0	-	-	0.0	0.0	-	-	0.0	-	-	-	12.2	-
90.0 30.0	-	-	0.0	0.0	-	-	0.0	-	-	-	16.8	-
93.3 45.0	-	-	0.0	0.0	-	-	0.0	-	-	-	0.7	-

Coryphopterus nicholsii

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 50.0	-	-	2.5	-	-	-	-	0.0	-	-	0.0	-

Sphyraena argentea

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 40.6	-	-	0.0	0.0	-	-	-	1.9	-	-	0.0	-
83.3 42.0	-	-	0.0	0.0	-	-	-	5.3	-	-	0.0	-

Sarda chiliensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	-	-	0.0	0.0	-	-	-	0.9	-	-	0.0	-

Scomber japonicus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	-	-	0.0	-	-	-	-	4.5	-	-	0.0	-
80.0 51.0	-	-	0.0	0.0	-	-	-	0.9	-	-	0.0	-
80.0 55.0	-	-	0.0	0.0	-	-	-	1.5	-	-	0.0	-
83.3 40.6	-	-	0.0	0.0	-	-	-	1.9	-	-	0.0	-
83.3 42.0	-	-	0.0	0.0	-	-	-	13.2	-	-	0.0	-
86.7 35.0	-	-	0.0	0.0	-	-	1.8	-	-	-	0.0	-
86.7 40.0	-	-	0.0	0.0	-	-	7.1	-	-	-	0.0	-
86.7 45.0	-	-	-	0.0	-	-	-	6.5	-	-	0.0	-
93.3 60.0	-	-	0.0	0.0	-	-	2.5	-	-	-	0.0	-
93.3 110.0	-	-	-	0.9	-	-	0.0	-	-	-	0.0	-

Icichthys lockingtoni

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	-	-	0.9	-	-	-	-	0.0	-	-	0.0	-
76.7 60.0	-	-	0.9	-	-	-	-	0.0	-	-	0.0	-

TABLE 4. (cont.)

Icichthys lockingtoni (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 60.0	-	-	0.0	0.9	-	-	-	0.0	-	-	0.0	-
90.0 28.0	-	-	0.8	0.0	-	-	0.0	-	-	-	0.0	-
93.3 55.0	-	-	1.0	0.0	-	-	0.0	-	-	-	0.0	-
93.3 70.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-

Tetragonurus cuvieri

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	-	-	0.0	-	-	-	-	0.9	-	-	0.0	-
80.0 90.0	-	-	0.0	-	-	-	-	0.7	-	-	0.0	-
86.7 90.0	-	-	1.0	0.0	-	-	-	0.0	-	-	0.0	-
90.0 100.0	-	-	0.0	0.0	-	-	0.9	-	-	-	0.0	-
90.0 110.0	-	-	-	0.0	-	-	0.8	-	-	-	0.0	-
93.3 70.0	-	-	0.0	0.0	-	-	0.0	-	-	-	0.8	-

Peprilus simillimus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 33.0	-	-	0.9	1.7	-	-	0.0	-	-	-	0.0	-

Citharichthys sordidus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 50.0	-	-	0.0	-	-	-	-	0.0	-	-	1.0	-
90.0 90.0	-	-	1.9	0.0	-	-	0.0	-	-	-	0.0	-

Citharichthys stigmaeus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 60.0	-	-	0.0	-	-	-	-	0.0	-	-	0.9	-
86.7 50.0	-	-	0.8	-	-	-	-	0.0	-	-	0.0	-
93.3 30.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-

Paralichthys californicus

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

Microstomus pacificus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 60.0	-	-	0.9	-	-	-	-	0.0	-	-	0.0	-
86.7 50.0	-	-	0.8	-	-	-	-	0.0	-	-	0.0	-

TABLE 4. (cont.)

Microstomus pacificus (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 80.0	-	-	1.0	0.0	-	-	-	0.0	-	-	0.0	-

***Pleuronichthys* spp.**

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

Pleuronichthys coenosus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 55.0	-	-	0.0	0.0	-	-	-	1.5	-	-	0.0	-
81.8 46.9	-	-	0.0	0.9	-	-	-	0.0	-	-	0.0	-
83.3 42.0	-	-	0.0	0.0	-	-	-	1.8	-	-	0.0	-
86.7 40.0	-	-	0.0	0.0	-	-	0.8	-	-	-	0.0	-
90.0 35.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-
90.0 37.0	-	-	0.0	0.8	-	-	0.0	-	-	-	0.0	-
93.3 30.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-
93.3 35.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-

Pleuronichthys ritteri

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 30.0	-	-	0.8	0.0	-	-	0.0	-	-	-	0.0	-

Pleuronichthys verticalis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	-	-	0.9	0.0	-	-	-	0.0	-	-	0.0	-
80.0 55.0	-	-	1.0	0.0	-	-	-	0.0	-	-	0.0	-
80.0 60.0	-	-	0.9	0.0	-	-	-	0.0	-	-	-	-
86.7 33.0	-	-	0.0	0.9	-	-	0.0	-	-	-	0.0	-
90.0 28.0	-	-	0.8	0.0	-	-	0.0	-	-	-	0.0	-

Disintegrated fish larvae

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	-	-	0.0	0.0	-	-	-	1.8	-	-	0.0	-
86.7 40.0	-	-	0.0	0.8	-	-	0.0	-	-	-	0.0	-
86.7 100.0	-	-	1.0	-	-	-	-	0.0	-	-	0.0	-

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ALPHABETICAL INDEX TO TABLE 4

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