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

LIST OF FIGURES

Page

LIST OF TABLES

Page

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 1994. It is the 13th report in a series that presents surface tow data for all biological-oceanographic CalCOFI surveys from 1977 to the present. A total of 262 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 261 Manta net tows was taken during 1994. 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 61 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 13th 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 1994. 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 1994 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 1994 CalCOFI cruises were published by the Scripps Institution of Oceanography (Univ. of Calif., SIO 1994, 1995). All available records for Manta tows on the 1994 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	1988	Watson et al. 2002a
1980-81	Ambrose et al. 2002a	1989	Ambrose et al. 2002c
1984	Charter et al. 2002a	1990	Charter et al. 2002c
1985	Ambrose et al. 2002b	1991	Sandknop et al. 2002b
1986	Charter et al. 2002b	1992	Watson et al. 2002b
1987	Sandknop et al. 2002a	1993	Ambrose et al. 2002d

SAMPLING AREA AND PATTERN

The 1994 CalCOFI survey consisted of four quarterly cruises on which a total of 262 Manta net tows was taken at most of the 66 standard CalCOFI survey stations occupied on each cruise (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 1994 (Figures 2 and 3) are summarized below:

9401, RV *David Starr Jordan*, 66 stations, 20 January–5 February;

9403 RV *David Starr Jordan*, 65 stations, 22 March–7 April;

9408, RV *New Horizon*, 66 stations, 5–19 August;

9410, RV *New Horizon*, 64 stations, 30 September–14 October.

The core 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 plankton tow station, 90.0 120.0, was approximately 400 n. mi. west of Punta Baja, Baja California, Mexico. On all cruises, lines 76.7 and 80.0 extended seaward to station 100.0, lines 83.3 and 86.7 extended to station 110.0, and lines 90.0 and 93.3 extended to station 120.0 (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 material 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 61 larval fish categories (including the disintegrated category) was identified: 54 to species and 6 to genus.

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.

Howella spp.–larvae represent a single species, either *H. brodiei* or *H. sherborni*; taxonomy of the adult is unresolved.

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 *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 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 49.7% of the total fish larvae and second in occurrence with larvae collected in 13.5% of the total samples (Tables 2 and 3). They were almost twice as abundant as the second most abundant species, Pacific sardine (*Sardinops sagax*), which accounted for 25.6% of the total larvae and ranked third in occurrence (9.9% of the total samples). Pacific saury (*Cololabis saira*) was the third most abundant taxon with 6.1% of the total larvae; it ranked first in frequency of occurrence (15.9% of the samples). Jack mackerel (*Trachurus symmetricus*) ranked fourth in abundance (4.7% of total larvae) and sixth in total occurrences (4.6% of the samples). Mussel blenny (*Hypsoblennius jenkinsi*) ranked fifth in abundance (2.4% of total larvae) and eighth in total occurrences (3.5% of the samples). The next five most abundant taxa were the rockfish genus *Sebastes* (1.7% of total larvae),blacksmith Chromis punctipinnis (1.7%), white croaker *Genyonemus lineatus* (1.0%), Pacific hake *Merluccius productus* (1.0%), and cabezon *Scorpaenichthys marmoratus* (0.7%). These five species were ranked 4th, tied for 11th, tied for 30th with 5 other taxa, tied for 24th with two other taxa, and tied for 13th. The high abundances of Pacific hake and white croaker were attributable to single large collections on Cruise 9401: 59 larvae at station 83.3 70.0 and 65 larvae at station 83.3 40.6, respectively. The ten most abundant taxa comprised 94.6% of all the larvae collected in Manta net tows on CalCOFI cruises in 1994. The remaining 5.4% was distributed among 51 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 140 taxa collected in the oblique tows during the 1994 survey, northern anchovy also was the most abundant (42.3% of the larvae) and was four and one-half times more abundant than the second-ranked Panama lightfish, which accounted for 9.4% of the total (Charter et al. 1999). The third-, fourth-, and fifth-ranked species in the Manta collections, Pacific saury, jack mackerel, and mussel blenny, were 95th, 8th, and 44th, respectively, in oblique tows. Among the ten most abundant taxa in the oblique tows in 1994, half (northern anchovy, Pacific sardine, jack mackerel, *Sebastes* spp., and Pacific hake) also were among the ten most abundant in the Manta tows, although another five occurred in the Manta samples. Only two mesopelagic bathylagid species among the ten most abundant in oblique tows were absent from the Manta samples.

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 1994 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 1994 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 1994 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 1994 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.

ACKNOWLEDGMENTS

The following NMFS personnel were responsible for making the collections at sea: Dimitry Abramenkoff (all cruises), Ronald Dotson (9401, 9403), David Griffith (9408, 9410), Amy Hays (all cruises), Susan Manion (9401, 9403). The samples were sorted by Lucy Dunn, Jeanne Haddox, and Frances Pocinich. Amy Hays and Susan Manion entered the data and Susan Jacobson provided programming assistance. The cooperation and assistance provided by the crews of the CalCOFI research vessels were instrumental in making the collections and observations at sea.

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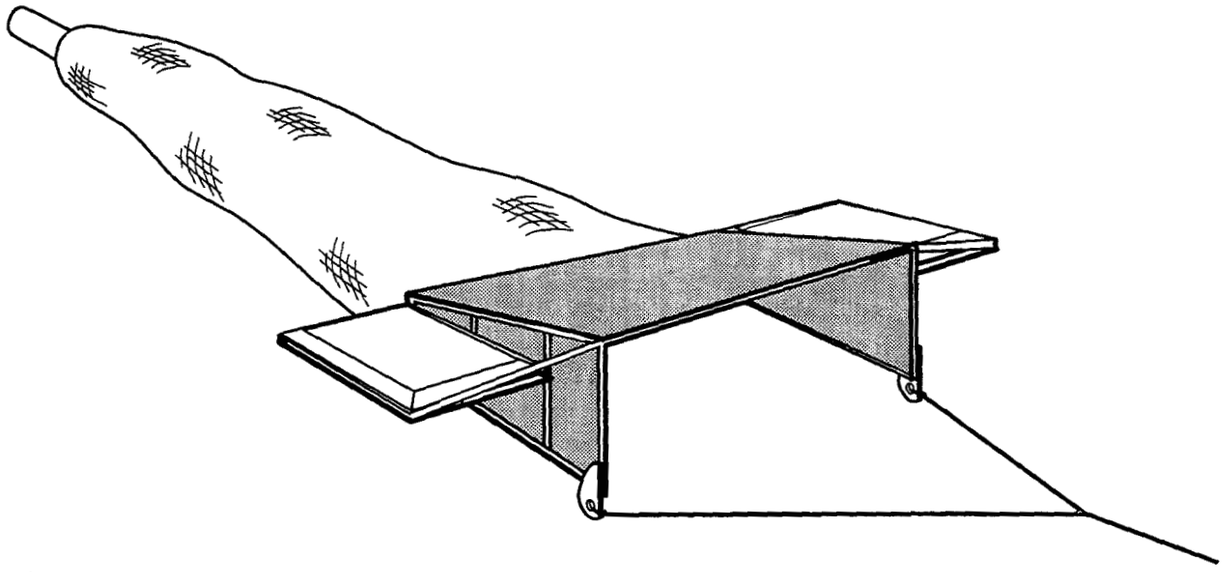

Figure 1. Diagram of the Manta net used on CalCOFI surveys.

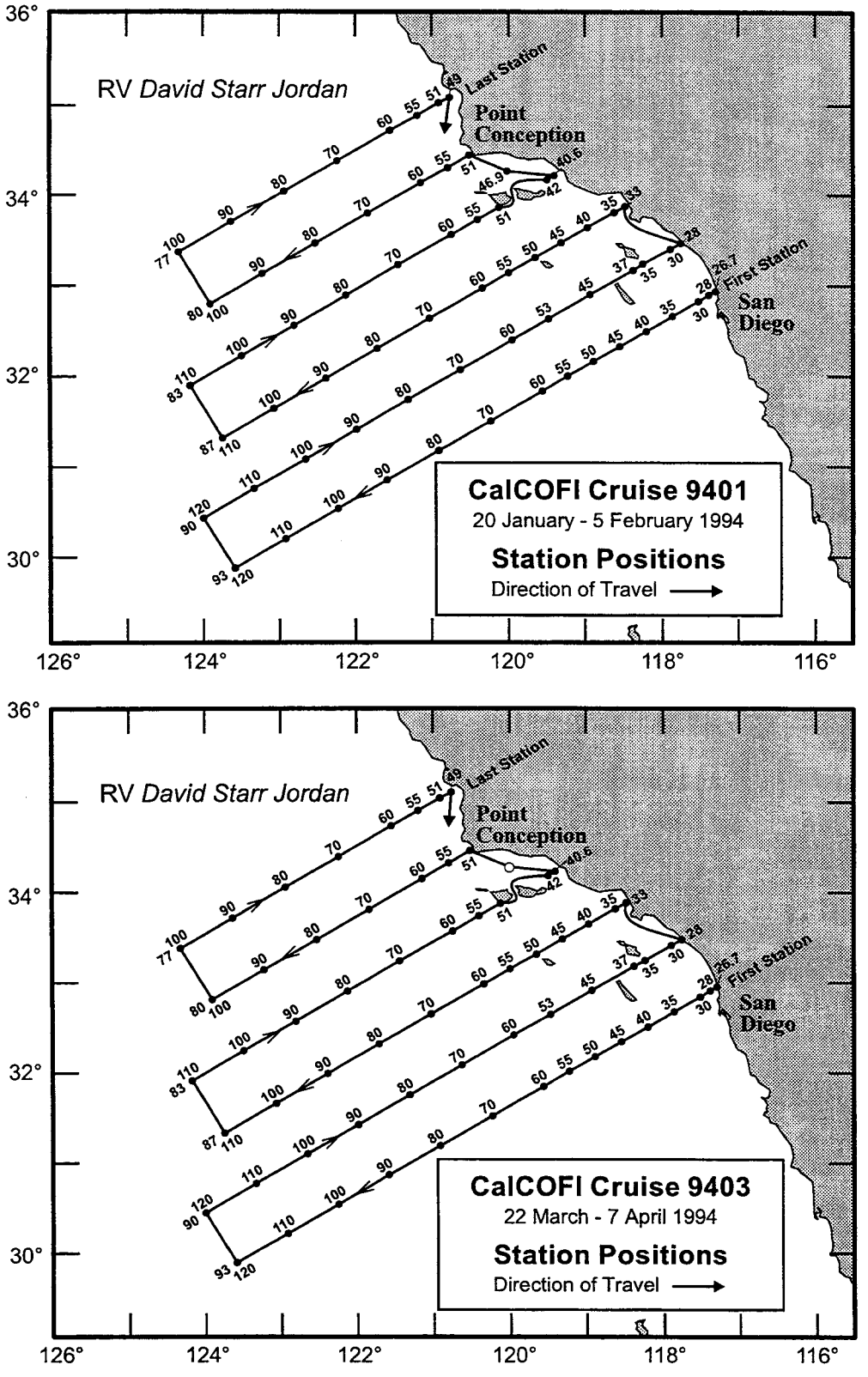

Figure 2. Stations and cruise tracks for CalCOFI cruises 9401 (above) and 9403 (below). Dots indicate stations where Manta and oblique tows were taken; open circles indicate stations where only oblique tows were taken. A single Manta tow without an accompanying oblique tow was taken at station 93.3 26.7 on Cruise 9401.

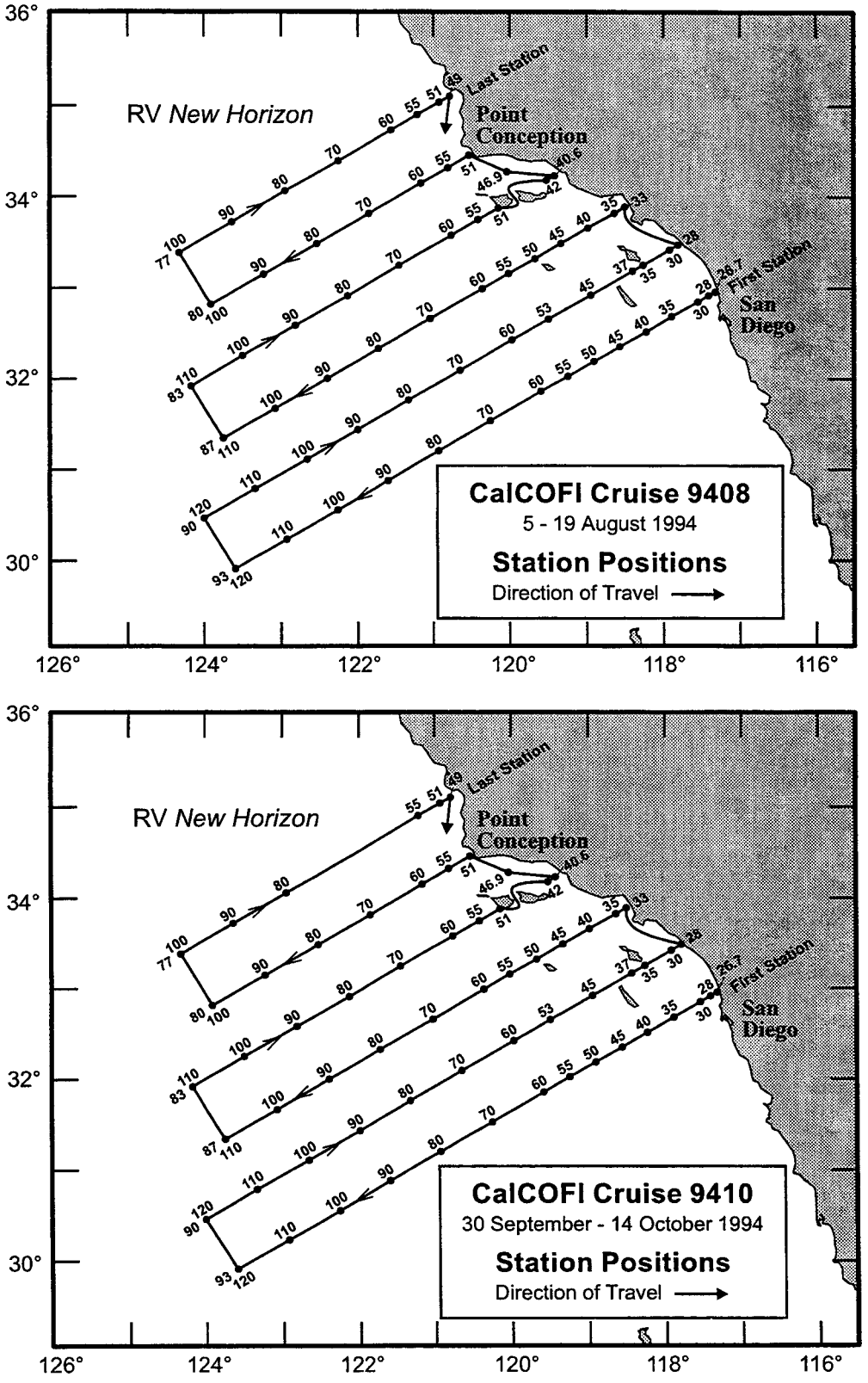

Figure 3. Stations and cruise tracks for CalCOFI cruises 9408 (above) and 9410 (below). Symbols as in Figure 2.

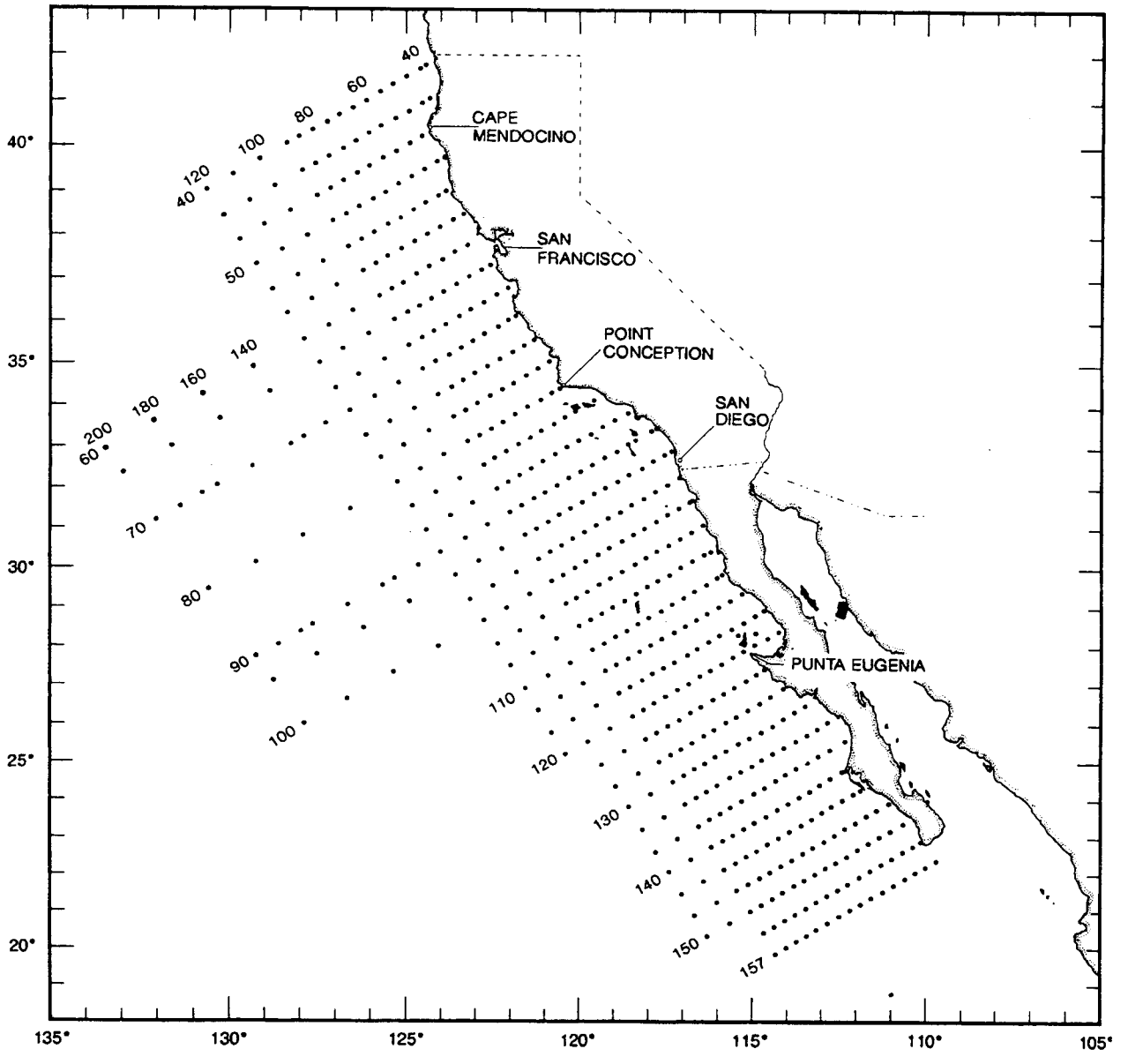

Figure 4. The basic station plan for CalCOFI cruises from 1950 - 1984.

TABLE 1. Station and plankton tow data for Manta tows taken on the 1994 CalCOFI survey. Numbers of fish eggs and larvae are raw counts, unadjusted for volume (cubic meters) of water filtered.

CalCOFI Cruise 9401

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	05.2	120	46.6	JD	94	02	05	2337	104	114	175
76.7	51.0	35	01.4	120	55.1	JD	94	02	05	2141	97	59	4
76.7	55.0	34	53.3	121	11.8	JD	94	02	05	1640	88	0	0
76.7	60.0	34	43.3	121	32.9	JD	94	02	05	1151	87	0	6
76.7	70.0	34	23.3	122	14.8	JD	94	02	05	0519	96	18	2
76.7	80.0	34	03.4	122	56.4	JD	94	02	04	2349	103	16	9
76.7	90.0	33	43.3	123	38.0	JD	94	02	04	1658	81	0	1
76.7	100.0	33	23.3	124	19.4	JD	94	02	04	0742	91	2	2
80.0	51.0	34	27.0	120	31.4	JD	94	02	02	1526	92	13	23
80.0	55.0	34	18.9	120	48.1	JD	94	02	02	2015	92	53	26
80.0	60.0	34	09.0	121	09.0	JD	94	02	03	0018	101	38	4
80.0	70.0	33	48.9	121	50.6	JD	94	02	03	0606	89	4	4
80.0	80.0	33	29.0	122	32.0	JD	94	02	03	1210	99	0	0
80.0	90.0	33	09.0	123	13.3	JD	94	02	03	1851	81	6	3
80.0	100.0	32	49.0	123	54.5	JD	94	02	04	0230	82	7	1
81.8	46.9	34	16.5	120	01.5	JD	94	02	02	1109	102	11	253
83.3	40.6	34	13.5	119	24.6	JD	94	02	02	0415	94	536	623
83.3	42.0	34	10.7	119	30.5	JD	94	02	02	0244	95	441	747
83.3	51.0	33	52.7	120	08.0	JD	94	02	01	1917	88	224	504
83.3	55.0	33	44.8	120	24.6	JD	94	02	01	1518	94	33	88
83.3	60.0	33	34.7	120	45.3	JD	94	02	01	0812	86	4	2
83.3	70.0	33	14.7	121	26.6	JD	94	02	01	0214	97	71	4
83.3	80.0	32	54.7	122	07.6	JD	94	01	31	1912	89	12	11
83.3	90.0	32	34.7	122	48.7	JD	94	01	31	1230	102	1	33
83.3	100.0	32	14.6	123	29.5	JD	94	01	31	0553	89	0	1
83.3	110.0	31	54.8	124	10.2	JD	94	01	30	2321	86	0	0
86.7	33.0	33	53.4	118	29.4	JD	94	01	27	2334	89	39	437
86.7	35.0	33	49.4	118	37.8	JD	94	01	28	0323	106	69	963
86.7	40.0	33	39.4	118	58.5	JD	94	01	28	0729	97	15	957
86.7	45.0	33	29.5	119	19.1	JD	94	01	28	1255	99	0	1262
86.7	50.0	33	19.5	119	39.8	JD	94	01	28	1738	87	18	4
86.7	55.0	33	09.5	120	00.2	JD	94	01	28	2214	99	17	6
86.7	60.0	32	59.4	120	21.1	JD	94	01	29	0345	99	13	18
86.7	70.0	32	39.4	121	02.0	JD	94	01	29	1105	86	0	7
86.7	80.0	32	19.4	121	42.9	JD	94	01	29	1822	91	1	0
86.7	90.0	31	59.4	122	23.5	JD	94	01	30	0202	94	1	1
86.7	100.0	31	39.4	123	04.2	JD	94	01	30	0723	88	1	3
86.7	110.0	31	19.4	123	44.7	JD	94	01	30	1630	90	0	1
90.0	28.0	33	29.2	117	46.0	JD	94	01	27	1647	87	33	701
90.0	30.0	33	25.1	117	54.3	JD	94	01	27	1111	91	6	92
90.0	35.0	33	15.3	118	15.2	JD	94	01	27	0651	88	15	436
90.0	37.0	33	11.1	118	23.1	JD	94	01	27	0411	87	4	19
90.0	45.0	32	55.2	118	56.2	JD	94	01	26	2217	92	14	754
90.0	53.0	32	39.1	119	28.9	JD	94	01	26	1625	88	2	1
90.0	60.0	32	25.1	119	57.6	JD	94	01	26	1053	82	0	0
90.0	70.0	32	05.1	120	38.3	JD	94	01	26	0352	91	0	2
90.0	80.0	31	45.2	121	19.0	JD	94	01	25	1923	77	1	0

TABLE 1. (cont.)

CalCOFI Cruise 9401 (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
90.0	90.0	31	25.0	121	59.4	JD	94	01	25	1119	84	2	0
90.0	100.0	31	05.0	122	39.7	JD	94	01	25	0315	93	2	0
90.0	110.0	30	45.1	123	19.9	JD	94	01	24	2002	79	0	24
90.0	120.0	30	25.1	123	59.9	JD	94	01	24	1227	94	0	20
93.3	26.7	32	57.4	117	18.3	JD	94	01	20	1309	99	0	10
93.3	28.0	32	54.8	117	23.7	JD	94	01	20	1703	93	0	244
93.3	30.0	32	50.8	117	31.9	JD	94	01	20	2058	91	1	5
93.3	35.0	32	40.8	117	52.5	JD	94	01	21	0150	93	4	40
93.3	40.0	32	30.7	118	12.8	JD	94	01	21	0631	85	52	115
93.3	45.0	32	20.8	118	33.3	JD	94	01	21	1119	91	0	49
93.3	50.0	32	10.8	118	53.6	JD	94	01	21	1611	86	0	0
93.3	55.0	32	00.8	119	14.0	JD	94	01	21	2025	88	3	3
93.3	60.0	31	50.9	119	34.0	JD	94	01	22	0101	93	0	1
93.3	70.0	31	30.8	120	14.8	JD	94	01	22	0631	90	0	9
93.3	80.0	31	10.8	120	55.1	JD	94	01	22	2109	100	7	40
93.3	90.0	30	50.9	121	35.2	JD	94	01	23	0618	99	7	27
93.3	100.0	30	31.5	122	14.1	JD	94	01	23	1413	89	0	13
93.3	110.0	30	10.8	122	55.4	JD	94	01	23	2118	91	1	2
93.3	120.0	29	50.8	123	35.1	JD	94	01	24	0317	98	3	3

CalCOFI Cruise 9403

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	05.2	120	46.3	JD	94	04	07	0923	100	7	8
76.7	51.0	35	01.3	120	55.1	JD	94	04	07	0739	94	0	1
76.7	55.0	34	53.3	121	11.9	JD	94	04	07	0338	88	0	19
76.7	60.0	34	43.3	121	32.9	JD	94	04	06	2334	93	2	77
76.7	70.0	34	23.3	122	14.8	JD	94	04	06	1712	92	11	475
76.7	80.0	34	03.3	122	56.6	JD	94	04	06	0601	92	7	50
76.7	90.0	33	43.3	123	38.0	JD	94	04	06	0055	91	18	53
76.7	100.0	33	23.2	124	19.4	JD	94	04	05	1846	85	0	70
80.0	51.0	34	27.1	120	31.5	JD	94	04	04	0002	85	9	0
80.0	55.0	34	19.0	120	48.2	JD	94	04	04	0326	76	31	1
80.0	60.0	34	09.0	121	09.0	JD	94	04	04	0643	86	2	5
80.0	70.0	33	49.0	121	50.6	JD	94	04	04	1645	79	9	94
80.0	80.0	33	29.0	122	31.9	JD	94	04	04	2322	80	9	48
80.0	90.0	33	09.0	123	13.3	JD	94	04	05	0535	90	9	140
80.0	100.0	32	49.0	123	54.4	JD	94	04	05	1150	90	2	4
83.3	40.6	34	13.5	119	24.7	JD	94	04	03	1425	79	13	6313
83.3	42.0	34	10.7	119	30.5	JD	94	04	03	1216	81	1	4
83.3	51.0	33	52.7	120	08.0	JD	94	04	03	0525	86	20	356
83.3	55.0	33	44.7	120	24.6	JD	94	04	03	0307	83	37	117
83.3	60.0	33	34.7	120	45.3	JD	94	04	02	2249	71	54	28
83.3	70.0	33	14.7	121	26.6	JD	94	04	02	1657	81	3	75
83.3	80.0	32	54.7	122	07.7	JD	94	04	02	0711	87	78	41
83.3	90.0	32	34.7	122	48.7	JD	94	04	02	0124	84	79	16
83.3	100.0	32	14.7	123	29.5	JD	94	04	01	1854	81	31	4
83.3	110.0	31	54.7	124	10.2	JD	94	04	01	1211	83	0	3

TABLE 1. (cont.) CalCOFI Cruise 9403 (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	33.0	33	53.4	118	29.4	JD	94	03	29	1411	83	2	1417
86.7	35.0	33	49.4	118	37.7	JD	94	03	29	1703	87	0	5
86.7	40.0	33	39.4	118	58.4	JD	94	03	29	2104	79	47	18
86.7	45.0	33	29.4	119	19.1	JD	94	03	30	0101	86	73	3096
86.7	50.0	33	19.4	119	39.7	JD	94	03	30	0432	82	34	477
86.7	55.0	33	09.4	120	00.4	JD	94	03	30	1554	79	6	434
86.7	60.0	32	59.4	120	21.0	JD	94	03	30	2012	78	1	89
86.7	70.0	32	39.4	121	02.0	JD	94	03	31	0232	83	53	13
86.7	80.0	32	19.4	121	42.9	JD	94	03	31	0756	71	22	47
86.7	90.0	31	59.4	122	23.6	JD	94	03	31	1748	76	9	134
86.7	100.0	31	39.3	123	04.1	JD	94	04	01	0003	79	6	27
86.7	110.0	31	19.4	123	44.5	JD	94	04	01	0539	78	2	22
90.0	28.0	33	29.1	117	46.1	JD	94	03	29	0347	95	0	0
90.0	30.0	33	25.1	117	54.3	JD	94	03	29	0135	88	634	3
90.0	35.0	33	15.2	118	14.8	JD	94	03	28	2137	88	54	1185
90.0	37.0	33	11.2	118	23.2	JD	94	03	28	1901	87	133	500
90.0	45.0	32	55.1	118	56.1	JD	94	03	28	0806	90	27	1125
90.0	53.0	32	39.1	119	28.8	JD	94	03	28	0402	89	7	49
90.0	60.0	32	25.2	119	57.7	JD	94	03	27	2259	84	0	1
90.0	70.0	32	05.1	120	38.3	JD	94	03	27	1629	80	0	13
90.0	80.0	31	45.1	121	18.9	JD	94	03	27	0835	77	1	71
90.0	90.0	31	25.1	121	59.4	JD	94	03	27	0402	78	0	419
90.0	100.0	31	05.2	122	39.7	JD	94	03	26	2219	84	1	93
90.0	110.0	30	45.1	123	19.9	JD	94	03	26	1630	78	0	50
90.0	120.0	30	25.1	123	59.9	JD	94	03	26	0707	74	1	3
93.3	26.7	32	57.4	117	18.3	JD	94	03	22	1249	81	1	57
93.3	28.0	32	54.8	117	23.7	JD	94	03	22	1625	79	0	234
93.3	30.0	32	50.8	117	31.8	JD	94	03	22	1941	73	214	267
93.3	35.0	32	40.7	117	52.5	JD	94	03	23	0028	78	15	106
93.3	40.0	32	30.8	118	12.8	JD	94	03	23	0433	85	0	15
93.3	45.0	32	20.8	118	33.3	JD	94	03	23	0740	79	0	7
93.3	50.0	32	10.8	118	53.5	JD	94	03	23	1614	79	4	21
93.3	55.0	32	00.8	119	13.9	JD	94	03	23	2055	76	55	5
93.3	60.0	31	50.8	119	34.2	JD	94	03	24	0114	92	68	0
93.3	70.0	31	30.8	120	14.8	JD	94	03	24	0611	83	1	10
93.3	80.0	31	10.7	120	55.2	JD	94	03	24	1827	74	7	191
93.3	90.0	30	50.8	121	35.4	JD	94	03	25	0108	75	2	44
93.3	100.0	30	30.8	122	15.5	JD	94	03	25	0823	69	0	54
93.3	110.0	30	10.8	122	55.5	JD	94	03	25	1904	77	3	17
93.3	120.0	29	50.8	123	35.4	JD	94	03	26	0143	70	0	1

CalCOFI Cruise 9408

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	94	08	19	1537	74	0	0
76.7	51.0	35	01.4	120	55.1	NH	94	08	19	1322	76	1	1
76.7	55.0	34	53.3	121	11.9	NH	94	08	19	0852	98	0	0
76.7	60.0	34	43.4	121	33.0	NH	94	08	19	0546	80	0	4

TABLE 1. (cont.) CalCOFI Cruise 9408 (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
76.7	70.0	34	23.3	122	14.9	NH	94	08	19	0001	60	4	2
76.7	80.0	34	03.5	122	56.6	NH	94	08	18	1758	79	4	10
76.7	90.0	33	43.2	123	38.0	NH	94	08	18	1125	58	0	0
76.7	100.0	33	23.2	124	19.4	NH	94	08	18	0456	98	4	24
80.0	51.0	34	27.0	120	31.4	NH	94	08	16	1515	87	1	226
80.0	55.0	34	18.9	120	48.1	NH	94	08	16	1824	71	2	0
80.0	60.0	34	09.0	121	09.0	NH	94	08	16	2210	82	11	3
80.0	70.0	33	48.9	121	50.5	NH	94	08	17	0359	71	8	9
80.0	80.0	33	29.1	122	31.9	NH	94	08	17	0839	82	4	104
80.0	90.0	33	09.0	123	13.5	NH	94	08	17	1615	78	4	734
80.0	100.0	32	49.0	123	54.4	NH	94	08	17	2150	75	3	1065
81.8	46.9	34	16.4	120	01.5	NH	94	08	16	0841	98	1	129
83.3	40.6	34	13.6	119	24.4	NH	94	08	16	0417	80	25	1880
83.3	42.0	34	10.8	119	30.7	NH	94	08	16	0223	90	20	38
83.3	51.0	33	52.6	120	08.3	NH	94	08	15	1952	91	15	804
83.3	55.0	33	44.9	120	24.4	NH	94	08	15	1626	79	0	0
83.3	60.0	33	34.6	120	45.3	NH	94	08	15	1120	78	0	0
83.3	70.0	33	14.7	121	26.5	NH	94	08	15	0511	62	1	17
83.3	80.0	32	54.7	122	07.7	NH	94	08	14	2233	85	15	13
83.3	90.0	32	34.8	122	48.8	NH	94	08	14	1649	75	1	108
83.3	100.0	32	14.7	123	29.6	NH	94	08	14	0914	114	1	343
83.3	110.0	31	54.5	124	10.0	NH	94	08	14	0420	72	7	21
86.7	33.0	33	53.3	118	29.4	NH	94	08	11	1700	87	9	996
86.7	35.0	33	49.3	118	37.7	NH	94	08	11	1930	92	99	1
86.7	40.0	33	39.5	118	58.5	NH	94	08	11	2329	95	0	3347
86.7	45.0	33	29.5	119	19.2	NH	94	08	12	0413	91	5	30
86.7	50.0	33	19.4	119	39.7	NH	94	08	12	0747	90	0	4
86.7	55.0	33	09.4	120	00.4	NH	94	08	12	1159	93	0	1
86.7	60.0	32	59.4	120	21.0	NH	94	08	12	1646	74	0	0
86.7	70.0	32	39.3	121	02.0	NH	94	08	12	2221	74	2	27
86.7	80.0	32	19.4	121	43.1	NH	94	08	13	0355	79	9	7
86.7	90.0	31	59.4	122	23.6	NH	94	08	13	0840	92	2	3
86.7	100.0	31	39.4	123	04.2	NH	94	08	13	1615	73	2	8
86.7	110.0	31	19.4	123	44.6	NH	94	08	13	2137	87	18	361
90.0	28.0	33	28.4	117	47.7	NH	94	08	11	0930	97	1	13
90.0	30.0	33	25.1	117	54.4	NH	94	08	11	0613	92	29	74
90.0	35.0	33	15.2	118	14.9	NH	94	08	11	0219	84	10	330
90.0	37.0	33	11.2	118	23.3	NH	94	08	10	2328	93	0	1
90.0	45.0	32	55.2	118	56.1	NH	94	08	10	1832	85	3	0
90.0	53.0	32	39.1	119	28.9	NH	94	08	10	1210	117	3	0
90.0	60.0	32	25.3	119	57.6	NH	94	08	10	0713	74	1	37
90.0	70.0	32	05.0	120	38.4	NH	94	08	10	0134	82	3	25
90.0	80.0	31	45.1	121	18.9	NH	94	08	09	1920	81	3	1
90.0	90.0	31	25.1	121	59.5	NH	94	08	09	1223	93	1	27
90.0	100.0	31	05.1	122	39.7	NH	94	08	09	0554	78	0	171
90.0	110.0	30	45.1	123	20.0	NH	94	08	08	2341	76	9	239
90.0	120.0	30	25.2	123	59.8	NH	94	08	08	1754	83	8	330
93.3	26.7	32	57.4	117	18.4	NH	94	08	05	1204	101	2	3135
93.3	28.0	32	54.8	117	23.7	NH	94	08	05	1845	94	1257	34

TABLE 1. (cont.) CalCOFI Cruise 9408 (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	NH	94	08	05	2150	90	51	33
93.3	35.0	32	40.9	117	52.6	NH	94	08	06	0133	77	6	382
93.3	40.0	32	30.8	118	12.7	NH	94	08	06	0620	102	0	1080
93.3	45.0	32	20.8	118	33.3	NH	94	08	06	0904	98	1	544
93.3	50.0	32	10.8	118	53.7	NH	94	08	06	1508	100	0	68
93.3	55.0	32	00.8	119	14.0	NH	94	08	06	1855	86	5	191
93.3	60.0	31	50.9	119	35.0	NH	94	08	06	2228	82	6	19
93.3	70.0	31	30.9	120	14.8	NH	94	08	07	0444	92	5	40
93.3	80.0	31	10.8	120	55.3	NH	94	08	07	0925	85	2	82
93.3	90.0	30	50.7	121	35.3	NH	94	08	07	1715	83	2	48
93.3	100.0	30	30.8	122	15.5	NH	94	08	07	2255	83	7	214
93.3	110.0	30	10.8	122	55.5	NH	94	08	08	0543	82	2	74
93.3	120.0	29	50.7	123	35.3	NH	94	08	08	1200	85	1	404

CalCOFI Cruise 9410

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	05.2	120	46.6	NH	94	10	14	1117	75	0	43
76.7	51.0	35	01.3	120	55.1	NH	94	10	14	0822	65	1	6
76.7	55.0	34	53.3	121	11.9	NH	94	10	14	0420	62	14	0
76.7	80.0	34	03.2	122	56.5	NH	94	10	13	0805	106	3	9
76.7	90.0	33	43.3	123	38.1	NH	94	10	13	0052	84	10	11
76.7	100.0	33	23.3	124	19.3	NH	94	10	12	1856	86	8	26
80.0	51.0	34	27.0	120	31.3	NH	94	10	11	0250	76	164	274
80.0	55.0	34	19.0	120	48.2	NH	94	10	11	0614	68	10	21
80.0	60.0	34	09.0	121	09.0	NH	94	10	11	0929	60	0	0
80.0	70.0	33	49.0	121	50.6	NH	94	10	11	1807	74	9	4
80.0	80.0	33	29.0	122	31.9	NH	94	10	12	0010	77	9	7
80.0	90.0	33	09.0	123	13.3	NH	94	10	12	0540	71	26	13
80.0	100.0	32	49.0	123	54.3	NH	94	10	12	1238	82	4	12
81.8	46.9	34	16.5	120	01.3	NH	94	10	10	2318	71	25	926
83.3	40.6	34	13.5	119	24.7	NH	94	10	10	1807	69	451	61
83.3	42.0	34	10.6	119	30.3	NH	94	10	10	1618	69	0	4
83.3	51.0	33	52.7	120	08.0	NH	94	10	10	0838	87	5	251
83.3	55.0	33	44.6	120	24.5	NH	94	10	10	0353	76	0	0
83.3	60.0	33	34.7	120	45.4	NH	94	10	09	2353	76	13	0
83.3	70.0	33	14.7	121	26.6	NH	94	10	09	1810	76	25	18
83.3	80.0	32	54.6	122	07.7	NH	94	10	09	1205	83	0	13
83.3	90.0	32	34.8	122	48.8	NH	94	10	09	0528	82	6	6
83.3	100.0	32	14.7	123	29.7	NH	94	10	09	0011	84	8	32
83.3	110.0	31	54.6	124	10.2	NH	94	10	08	1806	84	14	2
86.7	33.0	33	53.4	118	29.4	NH	94	10	06	0554	83	0	18
86.7	35.0	33	49.4	118	37.6	NH	94	10	06	0805	84	0	43
86.7	40.0	33	39.4	118	58.4	NH	94	10	06	1214	88	0	8
86.7	45.0	33	29.4	119	18.9	NH	94	10	06	1656	71	0	0
86.7	50.0	33	19.3	119	39.8	NH	94	10	06	2024	97	0	28
86.7	55.0	33	09.5	120	00.6	NH	94	10	07	0049	79	0	2
86.7	60.0	32	59.4	120	21.0	NH	94	10	07	0430	73	0	4

TABLE 1. (cont.) CalCOFI Cruise 9410 (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	01.1	NH	94	10	07	0923	83	2	3
86.7	80.0	32	19.4	121	42.9	NH	94	10	07	1738	81	0	25
86.7	90.0	31	59.4	122	23.5	NH	94	10	07	2318	87	21	13
86.7	100.0	31	39.4	123	04.2	NH	94	10	08	0550	83	5	4
86.7	110.0	31	19.4	123	44.5	NH	94	10	08	1220	74	1	27
90.0	28.0	33	29.0	117	46.2	NH	94	10	05	2143	81	2	5
90.0	30.0	33	25.1	117	54.4	NH	94	10	05	1923	74	2	26
90.0	35.0	33	15.1	118	15.0	NH	94	10	05	1539	75	0	68
90.0	37.0	33	10.1	118	25.4	NH	94	10	05	1225	87	0	5
90.0	45.0	32	55.1	118	56.1	NH	94	10	05	0706	73	0	0
90.0	53.0	32	39.2	119	28.9	NH	94	10	05	0230	82	0	7
90.0	60.0	32	25.0	119	57.6	NH	94	10	04	2205	82	2	2
90.0	70.0	32	05.1	120	38.3	NH	94	10	04	1625	82	0	16
90.0	80.0	31	45.1	121	19.0	NH	94	10	04	0827	89	0	45
90.0	90.0	31	25.0	121	59.4	NH	94	10	04	0333	74	19	9
90.0	100.0	31	05.0	122	39.8	NH	94	10	03	2206	106	57	21
90.0	110.0	30	45.1	123	19.9	NH	94	10	03	1626	80	0	7
90.0	120.0	30	25.0	123	59.9	NH	94	10	03	0916	101	4	202
93.3	26.7	32	57.4	117	18.3	NH	94	09	30	1117	90	2	10
93.3	28.0	32	54.8	117	23.7	NH	94	09	30	1422	71	6	249
93.3	30.0	32	51.0	117	31.8	NH	94	09	30	1745	77	8	170
93.3	35.0	32	40.8	117	52.3	NH	94	09	30	2136	80	0	59
93.3	40.0	32	30.8	118	12.9	NH	94	10	01	0108	87	0	4
93.3	45.0	32	20.9	118	33.0	NH	94	10	01	0448	79	2	3
93.3	50.0	32	10.8	118	53.5	NH	94	10	01	0842	105	2	0
93.3	55.0	32	00.8	119	13.9	NH	94	10	01	1500	91	0	3
93.3	60.0	31	50.8	119	34.2	NH	94	10	01	1855	85	0	1
93.3	70.0	31	30.8	120	14.7	NH	94	10	02	0020	90	3	7
93.3	80.0	31	10.8	120	55.2	NH	94	10	02	0540	81	2	34
93.3	90.0	30	50.8	121	35.3	NH	94	10	02	1157	83	0	4
93.3	100.0	30	30.8	122	15.5	NH	94	10	02	1748	83	0	26
93.3	110.0	30	10.8	122	55.2	NH	94	10	02	2327	93	29	0
93.3	120.0	29	50.8	123	35.2	NH	94	10	03	0441	80	5	94

TABLE 2. Pooled occurrences of fish larvae taken in Manta tows on the 1994 CalCOFI survey.

Rank	Taxon	Occurrences
1	*Cololabis saira*	72
2	*Engraulis mordax*	61
3	*Sardinops sagax*	45
4	*Sebastes* spp.	30
5	*Vinciguerria lucetia*	22
6	*Trachurus symmetricus*	21
7	*Ceratoscopelus townsendi*	17
8	*Hypsoblennius jenkinsi*	16
9	*Medialuna californiensis*	12
10	*Stenobrachius leucopsarus*	11
11	*Tetragonurus cuvieri*	10
11	*Chromis punctipinnis*	10
13	*Oxyjulis californica*	8
13	*Scorpaenichthys marmoratus*	8
15	*Scomber japonicus*	7
16	*Citharichthys sordidus*	6
16	*Sebastes jordani*	6
16	*Nannobrachium ritteri*	6
19	*Lampanyctus* spp.	5
19	*Cyclothone signata*	5
19	*Hypsoblennius gilberti*	5
19	*Sphyraena argentea*	5
19	*Pleuronichthys coenosus*	5
24	*Triphoturus mexicanus*	4
24	*Merluccius productus*	4
24	*Icichthys lockingtoni*	4
27	*Cyclothone* spp.	3
27	*Lampadena urophaos*	3
27	*Atherinopsis californiensis*	3
30	*Hygophum reinhardtii*	2
30	*Bathophilus flemingi*	2
30	*Oneirodes* spp.	2
30	*Genyonemus lineatus*	2
30	*Hypsoblennius gentilis*	2
30	*Citharichthys stigmaeus*	2
30	*Bathylagus wesethi*	2
37	*Nannobrachium regale*	1
37	*Protomyctophum crockeri*	1
37	*Cyclothone acclinidens*	1
37	*Ophidion scrippsae*	1
37	*Stomias atriventer*	1
37	*Clinocottus analis*	1
37	*Pleuronichthys verticalis*	1
37	*Hypsopsetta guttulata*	1
37	*Paralichthys californicus*	1
37	*Coryphopterus nicholsii*	1
37	*Neoclinus stephensae*	1
37	*Hypsypops rubicundus*	1
37	*Girella nigricans*	1

TABLE 2. (cont.)

Rank	Taxon	Occurrences
37	*Sebastolobus* spp.	1
37	*Liparis mucosus*	1
37	*Leuresthes tenuis*	1
37	*Ophiodon elongatus*	1
37	*Hexagrammos decagrammus*	1
37	Disintegrated fish larvae	1
37	*Scorpaena guttata*	1
37	*Sebastes diploproa*	1
37	*Hirundichthys marginatus*	1
37	*Cheilopogon pinnatibarbatus*	1
37	*Cheilopogon heterurus*	1
37	*Howella* spp.	1
	Total	453

TABLE 3. Pooled raw counts of fish larvae taken in Manta tows on the 1994 CalCOFI survey.

Rank	Taxon	Count
1	*Engraulis mordax*	3273
2	*Sardinops sagax*	1686
3	*Cololabis saira*	400
4	*Trachurus symmetricus*	306
5	*Hypsoblennius jenkinsi*	160
6	*Sebastes* spp.	113
7	*Chromis punctipinnis*	111
8	*Genyonemus lineatus*	68
9	*Merluccius productus*	67
10	*Scorpaenichthys marmoratus*	44
11	*Ceratoscopelus townsendi*	39
12	*Vinciguerria lucetia*	36
12	*Stenobrachius leucopsarus*	36
14	*Scomber japonicus*	29
15	*Atherinopsis californiensis*	23
16	*Oxyjulis californica*	19
17	*Medialuna californiensis*	16
18	*Lampadena urophaos*	15
19	*Sebastes jordani*	14
19	*Tetragonurus cuvieri*	14
21	*Lampanyctus* spp.	12
22	*Sphyraena argentea*	10
23	*Cyclothone* spp.	9
24	*Pleuronichthys coenosus*	8
25	*Citharichthys sordidus*	7
26	*Nannobrachium ritteri*	6
26	*Hypsoblennius gilberti*	6
28	*Cyclothone signata*	5
29	*Triphoturus mexicanus*	4
29	*Icichthys lockingtoni*	4
29	*Hypsypops rubicundus*	4
32	*Leuresthes tenuis*	3
33	*Ophiodon elongatus*	2
33	*Oneirodes* spp.	2
33	*Hygophum reinhardtii*	2
33	*Bathophilus flemingi*	2
33	*Sebastes diploproa*	2
33	*Citharichthys stigmaeus*	2
33	*Bathylagus wesethi*	2
33	*Hypsoblennius gentilis*	2
41	*Cyclothone acclinidens*	1
41	*Coryphopterus nicholsii*	1
41	*Stomias atriventer*	1
41	*Clinocottus analis*	1
41	*Pleuronichthys verticalis*	1
41	*Paralichthys californicus*	1
41	*Hexagrammos decagrammus*	1
41	*Hypsopsetta guttulata*	1
41	*Cheilopogon pinnatibarbatus*	1

TABLE 3. (cont.)

Rank	Taxon	Count
41	*Protomyctophum crockeri*	1
41	*Hirundichthys marginatus*	1
41	*Sebastolobus* spp.	1
41	*Nannobrachium regale*	1
41	*Neoclinus stephensae*	1
41	*Scorpaena guttata*	1
41	*Girella nigricans*	1
41	*Liparis mucosus*	1
41	*Howella* spp.	1
41	*Ophidion scrippsae*	1
41	Disintegrated fish larvae	1
41	*Cheilopogon heterurus*	1
	Total	6584

TABLE 4. Numbers of fish larvae taken in Manta net tows on the 1994 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 51.0	-	1.0	-	0.0	-	-	-	0.0	-	0.0	-	-
76.7 70.0	-	0.0	-	2.8	-	-	-	0.0	-	-	-	-
76.7 80.0	-	0.0	-	6.4	-	-	-	0.0	-	0.0	-	-
76.7 90.0	-	0.0	-	5.4	-	-	-	0.0	-	0.0	-	-
80.0 55.0	-	0.0	-	0.8	-	-	-	0.0	-	0.0	-	-
80.0 70.0	-	0.0	-	0.8	-	-	-	0.0	-	0.0	-	-
80.0 80.0	-	0.0	-	4.8	-	-	-	0.0	-	0.0	-	-
80.0 90.0	-	0.0	-	4.5	-	-	-	0.8	-	0.0	-	-
83.3 40.6	-	23.6	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 42.0	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-	-
83.3 51.0	-	0.9	-	0.9	-	-	-	0.0	-	0.0	-	-
83.3 55.0	-	2.8	-	24.1	-	-	-	0.0	-	0.0	-	-
83.3 60.0	-	0.0	-	30.7	-	-	-	0.0	-	0.0	-	-
83.3 70.0	-	0.0	-	0.8	-	-	-	0.0	-	0.0	-	-
83.3 100.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
86.7 33.0	1.8	-	0.0	-	-	-	-	1.7	-	0.0	-	-
86.7 35.0	20.2	-	0.0	-	-	-	-	16.5	-	0.0	-	-
86.7 40.0	1.9	-	0.0	-	-	-	-	0.0	-	0.0	-	-
86.7 45.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
86.7 50.0	0.0	-	21.3	-	-	-	-	0.0	-	0.0	-	-
86.7 55.0	0.0	-	4.7	-	-	-	-	0.0	-	0.0	-	-
86.7 60.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-
86.7 70.0	0.0	-	3.3	-	-	-	-	0.7	-	0.0	-	-
90.0 30.0	0.0	-	0.9	-	-	-	-	2.8	-	0.0	-	-
90.0 35.0	0.0	-	0.9	-	-	-	-	4.2	-	0.0	-	-
90.0 37.0	0.0	-	55.6	-	-	-	-	0.0	-	0.0	-	-
90.0 45.0	0.0	-	10.8	-	-	-	-	0.0	-	0.0	-	-
90.0 53.0	0.0	-	5.3	-	-	-	-	0.0	-	0.0	-	-
93.3 28.0	0.0	-	0.0	-	-	-	-	1157.5	0.0	-	-	-
93.3 30.0	0.0	-	1.5	-	-	-	-	8.1	0.0	-	-	-
93.3 35.0	1.9	-	5.5	-	-	-	-	0.0	0.0	-	-	-

TABLE 4. (cont.)

Sardinops sagax (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 50.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-
93.3 55.0	0.0	-	39.0	-	-	-	-	0.0	-	0.0	-	-
93.3 60.0	0.0	-	59.7	-	-	-	-	0.0	-	0.0	-	-
93.3 80.0	0.0	-	0.7	-	-	-	-	0.0	-	0.0	-	-

Engraulis mordax

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	-	106.3	-	0.0	-	-	-	0.0	-	0.0	-	-
76.7 51.0	-	41.7	-	0.0	-	-	-	0.0	-	0.0	-	-
76.7 55.0	-	0.0	-	0.0	-	-	-	0.0	-	6.9	-	-
80.0 51.0	-	3.7	-	4.3	-	-	-	0.0	-	124.0	-	-
80.0 55.0	-	41.5	-	16.6	-	-	-	0.0	-	5.4	-	-
80.0 60.0	-	28.3	-	0.0	-	-	-	4.9	-	0.0	-	-
80.0 70.0	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-	-
81.8 46.9	-	1.0	-	-	-	-	-	0.0	-	12.1	-	-
83.3 40.6	-	410.6	-	9.5	-	-	-	13.6	-	201.3	-	-
83.3 42.0	-	410.3	-	0.8	-	-	-	0.0	-	0.0	-	-
83.3 51.0	-	193.8	-	5.2	-	-	-	3.6	-	2.6	-	-
83.3 55.0	-	16.0	-	6.7	-	-	-	0.0	-	0.0	-	-
83.3 70.0	-	10.6	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 80.0	0.9	-	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 33.0	0.9	-	1.7	-	-	-	-	0.0	-	0.0	-	-
86.7 35.0	42.5	-	0.0	-	-	-	-	32.2	-	0.0	-	-
86.7 40.0	8.7	-	37.2	-	-	-	-	0.0	-	0.0	-	-
86.7 45.0	0.0	-	62.1	-	-	-	-	2.7	-	0.0	-	-
86.7 50.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-
86.7 55.0	11.8	-	0.0	-	-	-	-	0.0	-	0.0	-	-
90.0 28.0	28.8	-	0.0	-	-	-	-	0.0	-	0.0	-	-
90.0 30.0	2.7	-	553.6	-	-	-	-	0.0	-	0.7	-	-
90.0 35.0	12.3	-	45.6	-	-	-	-	0.0	-	0.0	-	-
90.0 37.0	3.5	-	59.1	-	-	-	-	0.0	-	0.0	-	-
90.0 45.0	12.0	-	8.1	-	-	-	-	0.0	-	0.0	-	-
90.0 53.0	1.8	-	0.0	-	-	-	-	0.0	-	0.0	-	-
93.3 26.7	0.0	-	0.8	-	-	-	-	0.0	0.9	-	-	-
93.3 28.0	0.0	-	0.0	-	-	-	-	0.9	4.2	-	-	-
93.3 30.0	0.0	-	152.6	-	-	-	-	14.4	2.3	-	-	-

TABLE 4. (cont.)

Engraulis mordax (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 35.0	0.0	-	6.2	-	-	-	-	0.0	0.0	-	-	-
93.3 40.0	43.9	-	0.0	-	-	-	-	0.0	-	0.0	-	-
93.3 55.0	1.8	-	0.8	-	-	-	-	0.0	-	0.0	-	-
93.3 60.0	0.0	-	0.0	-	-	-	-	4.9	-	0.0	-	-

Bathylagus wesethi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 110.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-
93.3 80.0	1.0	-	0.0	-	-	-	-	0.0	-	0.0	-	-

Cyclothone spp.

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 100.0	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-	-
80.0 100.0	-	5.7	-	0.0	-	-	-	0.0	-	0.0	-	-
93.3 80.0	0.0	-	0.0	-	-	-	-	0.0	-	0.8	-	-

Cyclothone acclinidens

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

Cyclothone signata

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

Vinciguerria lucetia

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 100.0	-	0.0	-	0.0	-	-	-	2.0	-	1.7	-	-
80.0 70.0	-	0.0	-	0.0	-	-	-	0.7	-	0.0	-	-
80.0 80.0	-	0.0	-	0.0	-	-	-	0.0	-	3.1	-	-
80.0 90.0	-	0.0	-	0.0	-	-	-	0.0	-	2.1	-	-
80.0 100.0	-	0.0	-	0.0	-	-	-	0.8	-	0.0	-	-
83.3 90.0	0.0	-	-	0.0	-	-	-	0.0	-	1.6	-	-
83.3 110.0	0.0	-	-	0.0	-	-	-	0.7	-	0.0	-	-

TABLE 4. (cont.)

Vinciguerria lucetia (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 70.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-
86.7 80.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-
86.7 100.0	0.0	-	-	0.0	-	-	-	0.0	-	2.5	-	-
86.7 110.0	0.0	-	-	0.0	-	-	-	0.9	-	0.0	-	-
90.0 70.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-
90.0 80.0	0.0	-	0.0	-	-	-	-	1.6	-	0.0	-	-
90.0 120.0	0.0	-	0.7	-	-	-	-	2.5	-	0.0	-	-
93.3 55.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-
93.3 70.0	0.0	-	0.0	-	-	-	-	0.0	-	0.9	-	-
93.3 80.0	0.0	-	0.7	-	-	-	-	0.0	-	0.0	-	-
93.3 100.0	0.0	-	0.0	-	-	-	-	1.7	-	0.0	-	-
93.3 110.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-
93.3 120.0	1.0	-	0.0	-	-	-	-	0.0	-	0.0	-	-

Stomias atriventer

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	-	-

Bathophilus flemingi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 80.0	-	1.0	-	0.0	-	-	-	0.0	-	0.0	-	-
90.0 100.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-

Ceratoscopelus townsendi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 70.0	-	1.0	-	0.0	-	-	-	0.0	-	-	-	-
76.7 90.0	-	0.0	-	0.0	-	-	-	0.0	-	1.7	-	-
80.0 70.0	-	0.0	-	0.0	-	-	-	0.7	-	3.0	-	-
80.0 80.0	-	0.0	-	0.0	-	-	-	0.0	-	1.5	-	-
80.0 90.0	-	0.0	-	0.0	-	-	-	0.0	-	4.3	-	-
80.0 100.0	-	0.0	-	0.0	-	-	-	0.8	-	0.0	-	-
83.3 90.0	0.0	-	-	0.0	-	-	-	0.0	-	1.6	-	-
83.3 100.0	0.0	-	-	2.4	-	-	-	0.0	-	0.0	-	-
83.3 110.0	0.0	-	-	0.0	-	-	-	1.4	-	7.5	-	-
86.7 100.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
86.7 110.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
90.0 120.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-

TABLE 4. (cont.)

Ceratoscopelus townsendi (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 110.0	0.0	-	0.8	-	-	-	-	0.8	-	0.0	-	-
93.3 120.0	0.0	-	0.0	-	-	-	-	0.0	-	0.8	-	-

Lampadena urophaos

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 90.0	-	0.0	-	0.0	-	-	-	0.0	-	9.3	-	-
83.3 90.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
83.3 110.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-

Lampanyctus spp.

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 70.0	-	3.8	-	0.0	-	-	-	0.0	-	-	-	-
76.7 90.0	-	0.0	-	3.6	-	-	-	0.0	-	0.0	-	-
76.7 100.0	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-	-
83.3 70.0	-	0.0	-	0.8	-	-	-	0.0	-	0.0	-	-
93.3 90.0	0.0	-	1.5	-	-	-	-	0.0	-	0.0	-	-

Nannobrachium regale

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

Nannobrachium ritteri

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 90.0	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-	-
80.0 80.0	-	0.0	-	0.8	-	-	-	0.0	-	0.0	-	-
80.0 90.0	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-	-
83.3 70.0	-	0.0	-	0.0	-	-	-	0.6	-	0.0	-	-
83.3 100.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
90.0 70.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-

Stenobrachius leucopsarus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 70.0	-	10.6	-	1.8	-	-	-	0.0	-	-	-	-
76.7 90.0	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-	-
80.0 51.0	-	0.0	-	3.4	-	-	-	0.0	-	0.0	-	-
80.0 55.0	-	0.0	-	2.3	-	-	-	0.0	-	0.0	-	-
80.0 70.0	-	0.0	-	5.5	-	-	-	0.0	-	0.0	-	-
83.3 40.6	-	0.0	-	0.8	-	-	-	0.0	-	0.0	-	-

TABLE 4. (cont.)

Stenobrachius leucopsarus (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	-	2.9	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 51.0	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-	-
86.7 110.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
93.3 50.0	0.0	-	1.6	-	-	-	-	0.0	-	0.0	-	-

Triphoturus mexicanus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 28.0	0.0	-	0.0	-	-	-	-	0.9	0.0	-	-	-
93.3 50.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-
93.3 80.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
93.3 90.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-

Hygophum reinhardtii

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

Protomyctophum crockeri

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

Merluccius productus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	-	2.1	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 60.0	-	3.4	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 70.0	-	57.1	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 35.0	2.1	-	0.0	-	-	-	-	0.0	-	0.0	-	-

Ophidion scrippsae

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

***Oneirodes* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 90.0	-	0.0	-	0.0	-	-	-	0.0	-	0.8	-	-
80.0 90.0	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-	-

TABLE 4. (cont.)

Atherinopsis californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 40.6	-	9.4	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 42.0	-	1.0	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 33.0	10.6	-	0.0	-	-	-	-	0.0	-	0.0	-	-

Leuresthes tenuis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	-	0.0	-	0.0	-	-	-	2.7	-	0.0	-	-

Cololabis saira

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 60.0	-	0.0	-	0.9	-	-	-	0.0	-	-	-	-
76.7 70.0	-	1.9	-	0.0	-	-	-	2.4	-	-	-	-
76.7 80.0	-	14.4	-	0.0	-	-	-	1.6	-	2.1	-	-
76.7 90.0	-	0.0	-	0.0	-	-	-	0.0	-	5.9	-	-
76.7 100.0	-	0.0	-	0.0	-	-	-	0.0	-	5.2	-	-
80.0 60.0	-	5.1	-	0.0	-	-	-	0.0	-	0.0	-	-
80.0 70.0	-	1.8	-	0.0	-	-	-	2.8	-	3.0	-	-
80.0 80.0	-	0.0	-	0.0	-	-	-	2.5	-	2.3	-	-
80.0 90.0	-	4.9	-	0.0	-	-	-	2.3	-	1.4	-	-
80.0 100.0	-	0.0	-	0.0	-	-	-	0.8	-	3.3	-	-
83.3 51.0	-	0.0	-	0.0	-	-	-	0.0	-	1.7	-	-
83.3 60.0	-	0.0	-	0.0	-	-	-	0.0	-	9.9	-	-
83.3 70.0	-	1.0	-	0.0	-	-	-	0.0	-	19.0	-	-
83.3 80.0	9.8	-	-	0.0	-	-	-	12.7	-	0.0	-	-
83.3 90.0	1.0	-	-	0.0	-	-	-	0.7	-	0.8	-	-
83.3 100.0	0.0	-	-	0.0	-	-	-	1.1	-	6.7	-	-
83.3 110.0	0.0	-	-	0.0	-	-	-	2.9	-	1.7	-	-
86.7 55.0	4.9	-	0.0	-	-	-	-	0.0	-	0.0	-	-
86.7 60.0	12.9	-	0.0	-	-	-	-	0.0	-	0.0	-	-
86.7 70.0	0.0	-	0.8	-	-	-	-	0.7	-	1.7	-	-
86.7 80.0	0.9	-	0.0	-	-	-	-	6.3	-	0.0	-	-
86.7 90.0	0.0	-	0.0	-	-	-	-	1.8	-	16.5	-	-
86.7 100.0	0.0	-	-	0.0	-	-	-	1.5	-	0.8	-	-
86.7 110.0	0.0	-	-	0.0	-	-	-	14.7	-	0.7	-	-
90.0 60.0	0.0	-	0.0	-	-	-	-	0.0	-	1.6	-	-
90.0 70.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-

TABLE 4. (cont.)

Cololabis saira (cont.)

Station		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0	80.0	0.8	-	0.0	-	-	-	-	0.8	-	0.0	-	-
90.0	90.0	0.8	-	0.0	-	-	-	-	0.9	-	14.0	-	-
90.0	100.0	0.9	-	0.0	-	-	-	-	0.0	-	60.2	-	-
90.0	110.0	0.0	-	0.0	-	-	-	-	6.1	-	0.0	-	-
90.0	120.0	0.0	-	0.0	-	-	-	-	2.5	-	4.0	-	-
93.3	35.0	1.9	-	0.0	-	-	-	-	0.0	0.0	-	-	-
93.3	45.0	0.0	-	0.0	-	-	-	-	0.0	-	1.6	-	-
93.3	50.0	0.0	-	0.0	-	-	-	-	0.0	-	2.1	-	-
93.3	60.0	0.0	-	1.8	-	-	-	-	0.0	-	0.0	-	-
93.3	70.0	0.0	-	0.0	-	-	-	-	1.8	-	1.8	-	-
93.3	80.0	6.0	-	0.0	-	-	-	-	0.0	-	0.8	-	-
93.3	90.0	6.9	-	0.0	-	-	-	-	0.0	-	0.0	-	-
93.3	100.0	0.0	-	0.0	-	-	-	-	4.2	-	0.0	-	-
93.3	110.0	0.9	-	0.0	-	-	-	-	0.0	-	27.0	-	-
93.3	120.0	2.0	-	0.0	-	-	-	-	0.9	-	3.2	-	-

Cheilopogon heterurus

Station		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0	35.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-

Cheilopogon pinnatibarbatus

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	-	-

Hirundichthys marginatus

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

***Sebastes* spp.**

Station		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7	49.0	-	1.0	-	1.0	-	-	-	0.0	-	0.0	-	-
76.7	51.0	-	13.6	-	0.0	-	-	-	0.8	-	0.0	-	-
80.0	51.0	-	4.6	-	0.0	-	-	-	0.0	-	0.0	-	-
80.0	55.0	-	0.0	-	3.8	-	-	-	0.7	-	0.0	-	-
80.0	60.0	-	0.0	-	1.7	-	-	-	0.0	-	0.0	-	-
80.0	70.0	-	0.9	-	0.8	-	-	-	0.0	-	0.0	-	-
81.8	46.9	-	10.2	-	-	-	-	-	0.0	-	0.0	-	-

TABLE 4. (cont.)

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

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	-	1.0	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 51.0	-	0.9	-	7.8	-	-	-	0.0	-	0.0	-	-
83.3 55.0	-	8.5	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 33.0	2.7	-	0.0	-	-	-	-	0.0	-	0.0	-	-
86.7 35.0	7.4	-	0.0	-	-	-	-	0.0	-	0.0	-	-
86.7 40.0	3.9	-	0.0	-	-	-	-	0.0	-	0.0	-	-
86.7 50.0	13.0	-	1.6	-	-	-	-	0.0	-	0.0	-	-
90.0 30.0	1.8	-	0.0	-	-	-	-	0.0	-	0.0	-	-
90.0 35.0	0.9	-	0.9	-	-	-	-	0.0	-	0.0	-	-
90.0 37.0	0.0	-	0.9	-	-	-	-	0.0	-	0.0	-	-
90.0 45.0	0.9	-	5.4	-	-	-	-	0.0	-	0.0	-	-
90.0 53.0	0.0	-	0.9	-	-	-	-	3.5	-	0.0	-	-
93.3 30.0	0.0	-	2.2	-	-	-	-	0.0	0.0	-	-	-
93.3 55.0	0.9	-	0.0	-	-	-	-	0.0	-	0.0	-	-

Sebastes diploproa

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	-	0.0	-	0.0	-	-	-	0.0	-	1.2	-	-

Sebastes jordani

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	-	0.0	-	4.0	-	-	-	0.0	-	0.0	-	-
80.0 51.0	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 55.0	-	3.8	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 50.0	0.9	-	2.5	-	-	-	-	0.0	-	0.0	-	-
90.0 30.0	0.9	-	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	-	0.0	-	0.9	-	-	-	0.0	-	-	-	-

Scorpaena guttata

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 35.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-

TABLE 4. (cont.)

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	-	-

Ophiodon elongatus

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

Clinocottus analis

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	-	-

Scorpaenichthys marmoratus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	-	9.4	-	0.0	-	-	-	0.0	-	0.0	-	-
76.7 51.0	-	1.0	-	0.0	-	-	-	0.0	-	0.0	-	-
80.0 55.0	-	7.4	-	0.0	-	-	-	0.0	-	0.0	-	-
80.0 60.0	-	3.0	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 51.0	-	0.0	-	1.7	-	-	-	0.0	-	0.0	-	-
86.7 33.0	15.9	-	0.0	-	-	-	-	0.0	-	0.0	-	-
86.7 35.0	1.1	-	0.0	-	-	-	-	0.0	-	0.0	-	-
86.7 50.0	1.7	-	0.0	-	-	-	-	0.0	-	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	-	-

***Howella* spp.**

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

Trachurus symmetricus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 70.0	-	0.0	-	5.5	-	-	-	0.0	-	-	-	-
76.7 90.0	-	0.0	-	4.5	-	-	-	0.0	-	0.0	-	-
80.0 80.0	-	0.0	-	0.0	-	-	-	0.8	-	0.0	-	-
80.0 90.0	-	0.0	-	2.7	-	-	-	0.0	-	0.0	-	-
83.3 60.0	-	0.0	-	7.1	-	-	-	0.0	-	0.0	-	-
83.3 70.0	-	0.0	-	0.8	-	-	-	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 80.0	0.0	-	-	65.4	-	-	-	0.0	-	0.0	-	-
83.3 90.0	0.0	-	-	66.4	-	-	-	0.0	-	0.0	-	-
83.3 100.0	0.0	-	-	20.4	-	-	-	0.0	-	0.0	-	-
86.7 33.0	0.0	-	0.0	-	-	-	-	6.1	-	0.0	-	-
86.7 35.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
86.7 70.0	0.0	-	38.1	-	-	-	-	0.0	-	0.0	-	-
86.7 80.0	0.0	-	14.3	-	-	-	-	0.0	-	0.0	-	-
86.7 90.0	0.0	-	6.9	-	-	-	-	0.0	-	0.0	-	-
86.7 100.0	0.0	-	-	4.7	-	-	-	0.0	-	0.0	-	-
90.0 45.0	0.0	-	0.0	-	-	-	-	1.7	-	0.0	-	-
90.0 60.0	0.0	-	0.0	-	-	-	-	0.7	-	0.0	-	-
90.0 80.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-
93.3 55.0	0.0	-	1.5	-	-	-	-	0.0	-	0.0	-	-
93.3 70.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-
93.3 80.0	0.0	-	3.7	-	-	-	-	0.0	-	0.0	-	-

Genyonemus lineatus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 40.6	-	61.4	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 42.0	-	2.9	-	0.0	-	-	-	0.0	-	0.0	-	-

Girella nigricans

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 26.7	0.0	-	0.0	-	-	-	-	1.0	0.0	-	-	-

Medialuna californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 60.0	-	0.0	-	0.0	-	-	-	0.8	-	0.0	-	-
80.0 70.0	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-	-
83.3 40.6	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-	-
83.3 51.0	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-	-
86.7 35.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
90.0 30.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
93.3 28.0	0.0	-	0.0	-	-	-	-	0.9	0.0	-	-	-
93.3 45.0	0.0	-	0.0	-	-	-	-	1.0	-	0.0	-	-
93.3 55.0	0.0	-	0.0	-	-	-	-	2.6	-	0.0	-	-

TABLE 4. (cont.)

Medialuna californiensis (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 70.0	0.0	-	0.0	-	-	-	-	2.8	-	0.0	-	-
93.3 80.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
93.3 90.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-

Chromis punctipinnis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 40.6	-	0.0	-	0.0	-	-	-	0.0	-	16.0	-	-
83.3 42.0	-	0.0	-	0.0	-	-	-	3.6	-	0.0	-	-
83.3 51.0	-	0.0	-	0.0	-	-	-	2.7	-	0.0	-	-
86.7 35.0	0.0	-	0.0	-	-	-	-	30.3	-	0.0	-	-
90.0 30.0	0.0	-	0.0	-	-	-	-	17.5	-	0.0	-	-
90.0 35.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-
93.3 28.0	0.0	-	0.0	-	-	-	-	2.8	0.0	-	-	-
93.3 30.0	0.0	-	0.0	-	-	-	-	18.9	0.0	-	-	-
93.3 35.0	0.0	-	0.0	-	-	-	-	1.5	0.0	-	-	-
93.3 55.0	0.0	-	0.0	-	-	-	-	1.7	-	0.0	-	-

Hypsypops rubicundus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 51.0	-	0.0	-	0.0	-	-	-	3.6	-	0.0	-	-

Oxyjulis californica

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	-	0.0	-	0.0	-	-	-	0.0	-	0.6	-	-
80.0 55.0	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-	-
80.0 60.0	-	0.0	-	0.0	-	-	-	0.8	-	0.0	-	-
83.3 40.6	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-	-
86.7 45.0	0.0	-	0.9	-	-	-	-	0.0	-	0.0	-	-
90.0 45.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
93.3 28.0	0.0	-	0.0	-	-	-	-	8.4	0.0	-	-	-
93.3 30.0	0.0	-	0.0	-	-	-	-	0.0	3.1	-	-	-

Neoclinus stephensae

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	-	-

TABLE 4. (cont.)

Hypsoblennius gentilis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 26.7	0.0	-	0.0	-	-	-	-	0.0	0.9	-	-	-
93.3 30.0	0.0	-	0.0	-	-	-	-	0.0	0.8	-	-	-

Hypsoblennius gilberti

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 60.0	-	0.0	-	0.0	-	-	-	0.8	-	0.0	-	-
83.3 40.6	-	0.0	-	0.0	-	-	-	1.6	-	0.7	-	-
86.7 45.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
93.3 30.0	0.9	-	0.0	-	-	-	-	0.0	0.0	-	-	-

Hypsoblennius jenkinsi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 55.0	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-	-
80.0 60.0	-	0.0	-	0.0	-	-	-	1.6	-	0.0	-	-
80.0 70.0	-	0.0	-	0.0	-	-	-	0.7	-	0.0	-	-
81.8 46.9	-	0.0	-	-	-	-	-	0.0	-	2.8	-	-
83.3 40.6	-	0.0	-	0.0	-	-	-	4.8	-	77.7	-	-
83.3 42.0	-	0.0	-	0.0	-	-	-	9.9	-	0.0	-	-
83.3 51.0	-	0.0	-	0.0	-	-	-	1.8	-	0.0	-	-
86.7 35.0	0.0	-	0.0	-	-	-	-	7.4	-	0.0	-	-
90.0 28.0	0.0	-	0.0	-	-	-	-	0.0	-	1.6	-	-
90.0 30.0	0.0	-	0.0	-	-	-	-	0.9	-	0.7	-	-
90.0 35.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-
93.3 28.0	0.0	-	0.0	-	-	-	-	0.9	0.0	-	-	-
93.3 30.0	0.0	-	0.0	-	-	-	-	2.7	0.0	-	-	-
93.3 35.0	0.0	-	0.0	-	-	-	-	3.1	0.0	-	-	-

Coryphopterus nicholsii

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	-	1.0	-	0.0	-	-	-	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	-	-	-	0.0	-	1.4	-	-
90.0 30.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
90.0 35.0	0.0	-	0.0	-	-	-	-	1.7	-	0.0	-	-
93.3 28.0	0.0	-	0.0	-	-	-	-	2.8	0.0	-	-	-

TABLE 4. (cont.)

Sphyraena argentea (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 30.0	0.0	-	0.0	-	-	-	-	1.8	0.0	-	-	-

Scomber japonicus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	0.0	-	-	-	-	-	1.0	-	0.0	-	-
83.3 40.6	-	0.0	-	0.0	-	-	-	0.0	-	13.9	-	-
83.3 60.0	-	0.0	-	0.7	-	-	-	0.0	-	0.0	-	-
86.7 35.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
90.0 28.0	0.0	-	0.0	-	-	-	-	1.0	-	0.0	-	-
90.0 30.0	0.0	-	0.0	-	-	-	-	3.7	-	0.0	-	-
93.3 26.7	0.0	-	0.0	-	-	-	-	1.0	0.0	-	-	-

Icichthys lockingtoni

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 90.0	-	0.0	-	0.9	-	-	-	0.0	-	0.0	-	-
80.0 80.0	-	0.0	-	0.8	-	-	-	0.0	-	0.0	-	-
80.0 90.0	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-	-
86.7 80.0	0.0	-	0.7	-	-	-	-	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	-	-	-	0.8	-	1.1	-	-
76.7 100.0	-	0.0	-	0.0	-	-	-	1.0	-	0.0	-	-
80.0 70.0	-	0.0	-	0.0	-	-	-	0.7	-	0.0	-	-
80.0 100.0	-	0.0	-	1.8	-	-	-	0.0	-	0.0	-	-
83.3 80.0	0.0	-	-	2.6	-	-	-	0.0	-	0.0	-	-
83.3 100.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
83.3 110.0	0.0	-	-	0.0	-	-	-	0.0	-	1.7	-	-
90.0 90.0	0.8	-	0.0	-	-	-	-	0.0	-	0.0	-	-
90.0 120.0	0.0	-	0.0	-	-	-	-	0.8	-	0.0	-	-

Citharichthys sordidus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 60.0	-	2.0	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 40.6	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 42.0	-	1.0	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 51.0	-	0.9	-	0.0	-	-	-	0.0	-	0.0	-	-

TABLE 4. (cont.)

Citharichthys sordidus (cont.)

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	-	-
86.7 50.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-

Citharichthys stigmaeus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	-	0.0	-	0.0	-	-	-	0.0	-	0.6	-	-
86.7 50.0	0.0	-	0.8	-	-	-	-	0.0	-	0.0	-	-

Paralichthys californicus

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	-	-

Hypsopsetta guttulata

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 40.6	-	0.0	-	0.0	-	-	-	0.0	-	0.7	-	-

Pleuronichthys coenosus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	-	0.0	-	-	-	-	-	0.0	-	2.8	-	-
83.3 51.0	-	0.0	-	0.0	-	-	-	0.9	-	0.0	-	-
86.7 35.0	0.0	-	0.0	-	-	-	-	0.9	-	0.0	-	-
90.0 30.0	0.0	-	0.9	-	-	-	-	0.0	-	0.0	-	-
93.3 60.0	0.0	-	0.9	-	-	-	-	0.0	-	0.0	-	-

Pleuronichthys verticalis

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	-	-

Disintegrated fish larvae

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

PHYLOGENETIC INDEX TO TABLE 4

ALPHABETICAL INDEX TO TABLE 4

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S.R. CHARTER, R.L. CHARTER, H.G. MOSER
(May 2002)

321 Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations Survey Cruises in 1985.
D.A. AMBROSE, R.L. CHARTER, H.G. MOSER
(May 2002)

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S.R. CHARTER, R.L. CHARTER, H.G. MOSER
(May 2002)

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(May 2002)

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