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ICHTHYOPLANKTON AND STATION DATA FOR MANTA (SURFACE) TOWS TAKEN ON CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS SURVEY CRUISES IN 1999

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U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southwest Fisheries Science Center

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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 1999. It is the 18th report in a series that presents surface tow data for all biological-oceanographic CalCOFI surveys from 1977 to the present. A total of 255 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 255 Manta net tows was taken during 1999. 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 56 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 18th 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 1999. 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 1999 CalCOFI survey are published in Ambrose et al. (2001a). 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 1999 CalCOFI survey were published by the Scripps Institution of Oceanography (Univ. of Calif., SIO 2000a, b). All available records for Manta tows on the 1999 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	1991	Sandknop et al. 2002b
1980–81	Ambrose et al. 2002a	1992	Watson et al. 2002b
1984	Charter et al. 2002a	1993	Ambrose et al. 2002d
1985	Ambrose et al. 2002b	1994	Charter et al. 2002d
1986	Charter et al. 2002b	1995	Sandknop et al. 2002c
1987	Sandknop et al. 2002a	1996	Watson et al. 2002c
1988	Watson et al. 2002a	1997	Ambrose et al. 2002e
1989	Ambrose et al. 2002c	1998	Ambrose et al. 2002f
1990	Charter et al. 2002c		

SAMPLING AREA AND PATTERN

The 1999 CalCOFI survey consisted of four quarterly cruises on which a total of 255 Manta net tows was taken at the 255 standard CalCOFI net tow stations occupied during the survey (Table 1; Figures 2–3). Three vessels were employed on the survey, the NOAA vessel RV *David Starr Jordan* and the SIO vessels RV *New Horizon* and RV *Roger Revelle*. Dates and numbers of stations sampled with the Manta net in 1999 (Figures 2–3) are summarized below:

9901, RV *Roger Revelle*, 65 stations, January 9–23;

9904, RV *David Starr Jordan*, 61 stations, April 1–15;

9908, RV *New Horizon*, 65 stations, August 7–23;

9910, RV *New Horizon*, 64 stations, October 3–19.

The survey area extended from Avila Beach to San Diego, California and seaward on six survey lines to approximately 120–330 n. mi. (Figures 2 and 3). The most seaward station, 90.0 120.0, was approximately 400 n. mi. west of Punta Baja, Baja California, Mexico. Stations on CalCOFI lines 76.7 and 80.0 extended seaward to station 100.0, stations on lines 83.3 and 86.7 extended seaward to station 110.0, and stations on lines 90.0 and 93.3 extended seaward to station 120.0 on all cruises except 9904, when stations 100.0, 110.0, and 120.0 were not sampled on line 93.3 (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 56 larval fish categories was identified: 47 to species, 8 to genus, and 1 to family.

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

Nannobrachium–Zahuranec (2000) moved the subgroup of *Lampanyctus* characterized by small or absent pectoral fins in adults to the genus *Nannobrachium*; two *Nannobrachium* species, *N. ritteri*

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

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, Pacific sardine (*Sardinops sagax*) ranked first in abundance with 59.4% of the total fish larvae and fourth in occurrence with larvae collected in 12.2% of the total samples. (Tables 2 and 3). They were more than five times as abundant as the second most abundant species, Pacific saury (*Cololabis saira*) which had 11.3% of the total larvae and ranked first in occurrence (45.1% of the total samples). Northern anchovy (*Engraulis mordax*) was the third most abundant taxon with 9.4% of the total larvae and ranked second in frequency of occurrence (18.4% of the samples). The rockfish genus *Sebastes* ranked fourth in abundance (2.4% of total larvae) and third in total occurrences (12.9% of the samples). Splitnose rockfish (*Sebastes diploproa*) ranked fifth in abundance (2.3% of total larvae) and ninth in total occurrences (4.3% of the samples). The next five most abundant taxa were jacksmelt *Atherinopsis californiensis* (2.2% of total larvae), cabezon *Scorpaenichthys marmoratus* (1.8%), mussel blenny *Hypsoblennius jenkinsi* (1.5%), speckled sanddab *Citharichthys stigmaeus* (1.4%), and jack mackerel *Trachurus symmetricus* (1.2%). These species ranked tied for 14th, 5th, 8th, 16th, and 6th in frequency of occurrence, respectively. The ten most abundant taxa comprised 92.9% of all the larvae collected in Manta net tows on CalCOFI cruises in 1999. The remaining 7.1% was distributed among 46 other taxa. Of the ten most abundant taxa, half were coastal demersal taxa, four were coastal pelagic species, and one was epipelagic.

In contrast to the surface collections, among the 119 taxa collected in the oblique tows during the 1999 survey, Pacific sardine also ranked first in abundance (37.0% of the total), followed by northern anchovy (19.9%), and Panama lightfish (8.0%). Pacific saury and jacksmelt were not collected in the oblique samples and none of the five mesopelagic blacksmelt species taken in oblique tows occurred in the Manta collections (Ambrose et al. 2000a).

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 1999 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*), NH (*New Horizon*), or RR (*Roger Revelle*). 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*, RV *New Horizon*, and RV *Roger Revelle* during the 1999 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*, RV *New Horizon* , and RV *Roger Revelle* during the 1999 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*, RV *New Horizon* , and RV *Roger Revelle* during the 1999 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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LITERATURE CITED

Ahlstrom, E. H. and E. G. Stevens. 1976. Report of neuston (surface) collections made on an extended CalCOFI cruise during May 1972. Calif. Coop. Oceanic Fish. Invest. Rep. 18:167–180.

Ambrose, D. A., R. L. Charter, and H. G. Moser. 2001. Ichthyoplankton and station data for California Cooperative Oceanic Fisheries Investigations survey cruises in 1999. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-SWFSC-311. 69 pp.

Ambrose, D. A., R. L. Charter, and H. G. Moser. 2002a. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1980-81. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-319. 100 pp.

Ambrose, D. A., R. L. Charter, and H. G. Moser. 2002b. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1985. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-321. 36 pp.

Ambrose, D. A., R. L. Charter, and H. G. Moser. 2002c. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1989. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-325. 45 pp.

Ambrose, D. A., R. L. Charter, and H. G. Moser. 2002d. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1993. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-329. 41 pp.

Ambrose, D. A., R. L. Charter, and H. G. Moser. 2002e. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1997. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-333. 41 pp.

Ambrose, D. A., R. L. Charter, and H. G. Moser. 2002f. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1998. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-334. 43 pp.

Banse, K. 1975. Pleuston and neuston: on the categories of organisms in the uppermost pelagial. Int. Rev. ges. Hydrobiol. 60(4):439–447.

Brown, D. M. and L. Cheng. 1981. New net for sampling the ocean surface. Mar. Ecol. Prog. Ser. 5:224–227.

Charter, S. R, R. L. Charter, and H. G. Moser. 2002a. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1984. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-320. 84 pp.

Charter, S. R, R. L. Charter, and H. G. Moser. 2002b. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1986. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-322. 40 pp.

Charter, S. R, R. L. Charter, and H. G. Moser. 2002c. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1990. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-326. 41 pp.

Charter, S. R, R. L. Charter, and H. G. Moser. 2002d. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1994. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-330. 40 pp.

Doyle, M. J. 1992a. Patterns in distribution and abundance of ichthyoplankton off Washington, Oregon, and northern California (1980–1987). U.S. Dep. Commer., Nat. Mar. Fish. Serv., Alaska Fish. Sci. Ctr. Proc. Rep. 92-14. 344 pp.

Doyle, M. J. 1992b. Neustonic ichthyoplankton in the northern region of the California Current ecosystem. Calif. Coop. Oceanic Fish. Invest. Rep. 33:141–161.

Eschmeyer, W. N. (ed.). 1998. Catalog of fishes. Center for Biodiversity Research and Information. Calif. Acad. Sci. Spec. Publ. 1. Vols. I-III. 2905 pp.

Eschmeyer, W. N., E. S. Herald, and H. Hammann. 1983. A field guide to Pacific coast fishes of North America. Houghton Mifflin Co. Boston. 336 pp.

Gruber, D., E. H. Ahlstrom, and M. M. Mullin. 1982. Distribution of ichthyoplankton in the Southern California Bight. Calif. Coop. Oceanic Fish. Invest. Rep. 23:172–179.

Hempel, G. and H. Weikert. 1972. The neuston of the subtropical and boreal northeastern Atlantic Ocean. A review. Mar. Biol. 13:70–88.

Hewitt, R. P. 1988. Historical review of the oceanographic approach to fishery research. Calif. Coop. Oceanic Fish. Invest. Rep. 29:27-41.

Kramer, D., M. Kalin, E. G. Stevens, J. R. Thrailkill, and J. R. Zweifel. 1972. Collecting and processing data on fish eggs and larvae in the California Current Region. NOAA Tech. Rep. NMFS Circ. 370. 38 pp.

Matarese, A. C., A. W. Kendall, Jr., D. M. Blood, and B. M. Vinter. 1989. Laboratory guide to early life history stages of northeast Pacific fishes. U.S. Dep. Commer., NOAA Tech. Rep. NMFS 80. 652 pp.

Miller, D. J. and R. N. Lea. 1972. Guide to the coastal marine fishes of California. Calif. Dep. Fish Game. Fish Bull. 157. 235 pp.

Moser, H. G. (ed.). 1996. The early stages of fishes in the California Current region. CalCOFI Atlas 33. 1505 pp.

Moser, H. G., R. L. Charter, P. E. Smith, D. A. Ambrose, S. R. Charter, C. A. Meyer, E. M. Sandknop, and W. Watson. 1993. Distributional atlas of fish larvae and eggs in the California Current region: taxa with 1000 or more total larvae, 1951 through 1984. CalCOFI Atlas 31. 233 pp.

Moser, H. G., R. L. Charter, P. E. Smith, D. A. Ambrose, S. R. Charter, C. A. Meyer, E. M. Sandknop, and W. Watson. 1994. Distributional atlas of fish larvae in the California Current region: taxa with less than 1000 total larvae, 1951 through 1984. CalCOFI Atlas 32. 181 pp.

Moser, H. G., R. L. Charter, P. E. Smith, D. A. Ambrose, W. Watson, S. R. Charter, and E. M. Sandknop. 2001a. Distributional atlas of fish larvae and eggs in the Southern California Bight region: 1951–1998. CalCOFI Atlas 34. 166 pp.

Moser, H. G., R. L. Charter, D. A. Ambrose, and E. M. Sandknop. 2001b. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1977-78. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-313. 58 pp.

Naumann, E. 1917. Beiträge zur Kenntnis des Teichnannoplanktons. II. Über das Neuston das Süsswassers. Biol. Zentralbl. 37:98–106.

Peres, J. M. 1982. Specific pelagic assemblages: 1. Assemblages at the air-ocean interface *In* Marine Ecology. O. Kinne (ed.). 5 (1):313–372.

Powles, H. and D. F. Markle. 1984. Identification of larvae. Pages 31-33 *in* H. G. Moser, W. J. Richards, D. M. Cohen, M. P. Fahay, A. W. Kendall, Jr., and S. L. Richardson (eds.). Ontogeny and Systematics of Fishes. Am. Soc. Ichthyol. Herpetol. Spec. Publ. 1. 760 pp.

Sandknop, E. M., R. L. Charter, and H. G. Moser. 2002a. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1987. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-323. 40 pp.

Sandknop, E. M., R. L. Charter, and H. G. Moser. 2002b. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1991. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-327. 41 pp.

Sandknop, E. M., R. L. Charter, and H. G. Moser. 2002c. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1995. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-331. 42 pp.

Smith, P. E. and S. L. Richardson. 1977. Standard techniques for pelagic fish egg and larva surveys. FAO Fish. Tech. Pap. 175. 100 pp.

University of California, Scripps Institution of Oceanography. 2000a. Data Report. Physical, chemical and biological data. CalCOFI Cruise 9901, 9–29 January 1999 and CalCOFI Cruise 9904, 1– 20 April 1999. SIO Ref 00-6. 99 pp.

University of California, Scripps Institution of Oceanography. 2000b. Data Report. Physical, chemical and biological data. CalCOFI Cruise 9908, 7–29 August 1999 and CalCOFI Cruise 9910, 3–21 October 1999. SIO Ref 00-10. 104 pp.

Watson, W, R. L. Charter, and H. G. Moser. 2002a. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1988. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-324. 44 pp.

Watson, W, R. L. Charter, and H. G. Moser. 2002b. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1992. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-328. 40 pp.

Watson, W, R. L. Charter, and H. G. Moser. 2002c. Ichthyoplankton and station data for Manta (surface) tows taken on California Cooperative Oceanic Fisheries Investigations survey cruises in 1996. U.S. Dep. Commer., NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-332. 45 pp.

Zahuranec, B. J. 2000. Zoogeography and systematics of the lanternfishes of the genus *Nannobrachium* (Lampanyctini: Myctophidae). Smiths. Contrib. Zool. 607. 69 pp.

Zaitsev, Y. P. 1970. Marine neustonology. Naukova Dumka. Kiev. 264 pp.[In Russian]. [English transl.: 1971. Israel Progr. Sci. Transl. No. 5976. 207 pp.]

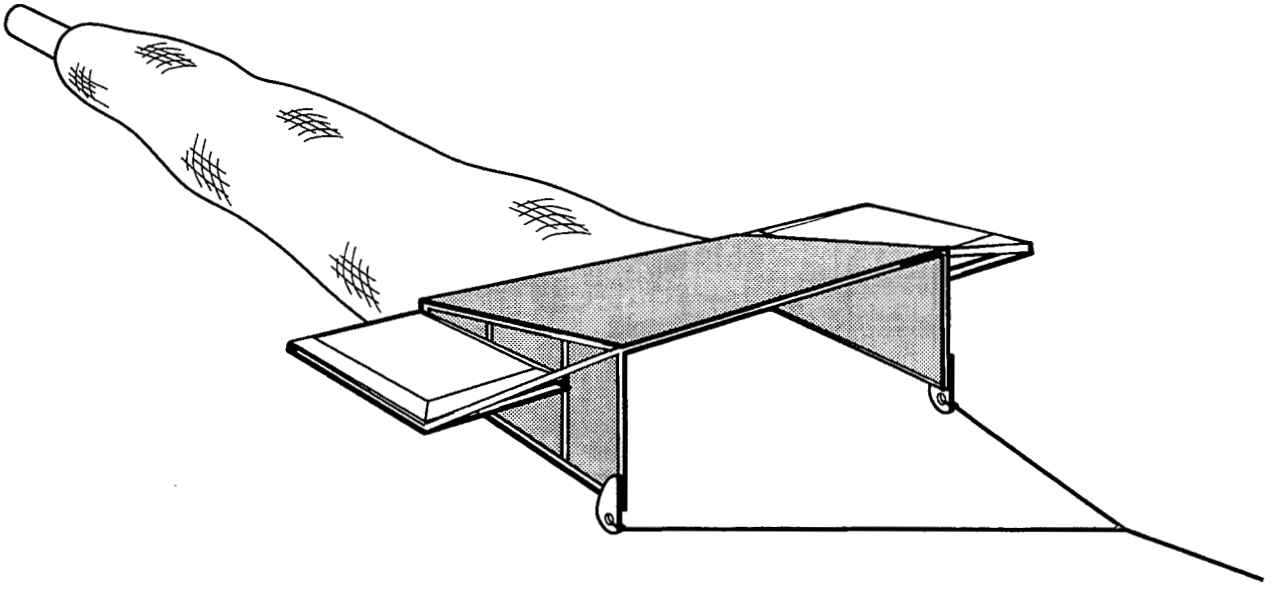

Figure 1. Diagram of the Manta net used on CalCOFI surveys.

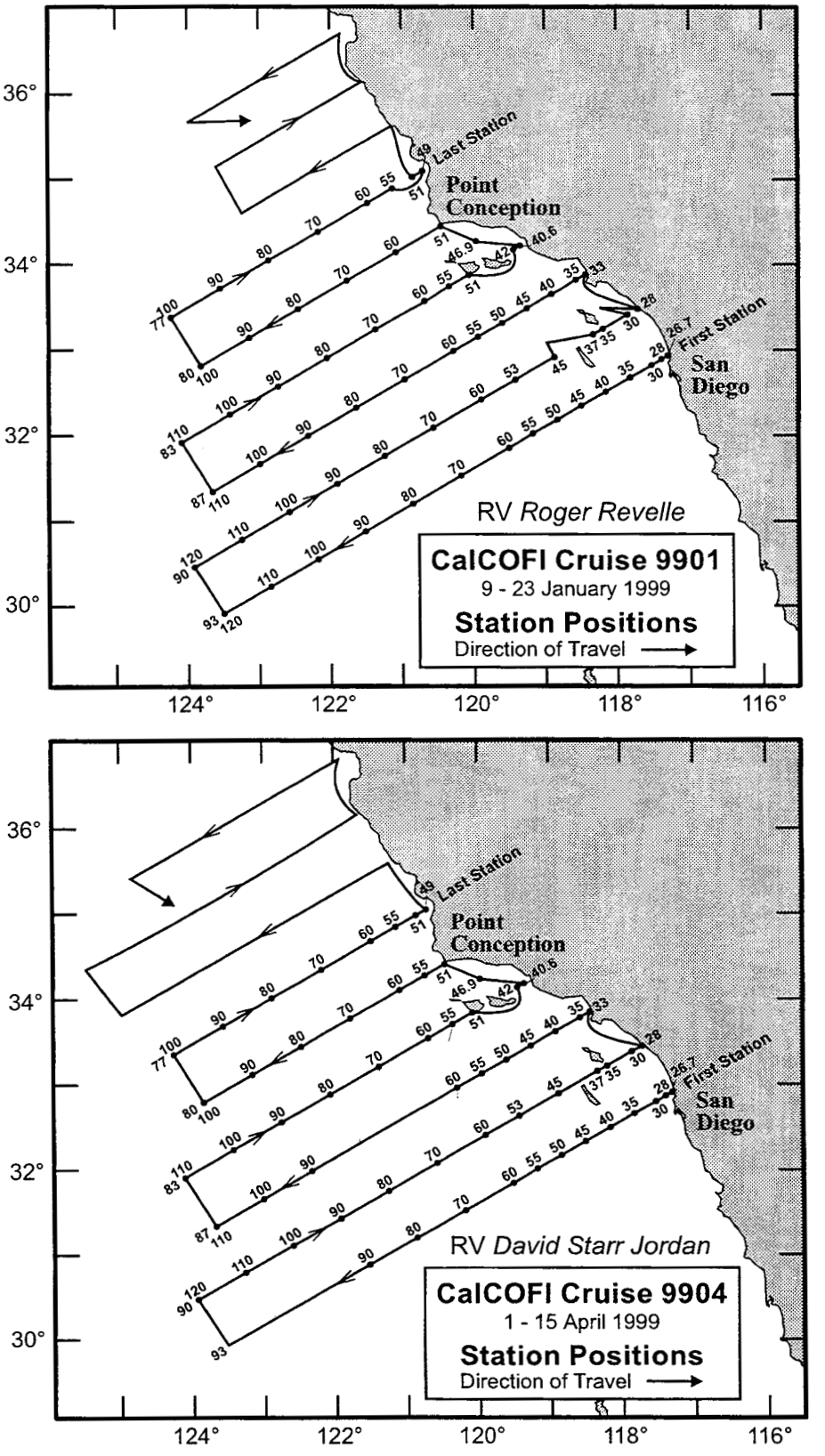

Figure 2. Stations and cruise tracks for CalCOFI cruises 9901 (above) and 9904 (below). Dots indicate stations where Manta tows were taken; open circles indicate stations where only oblique tows were taken.

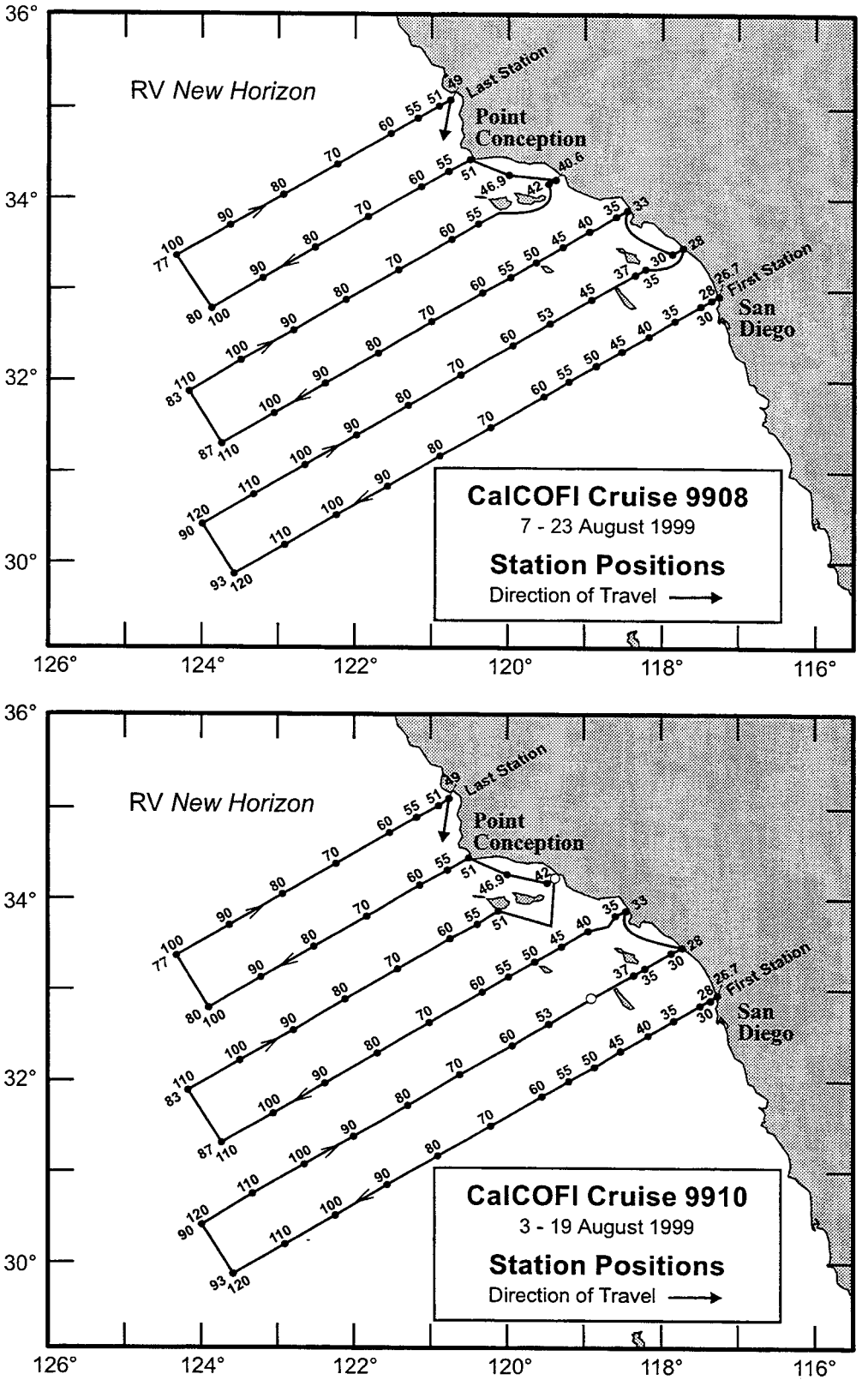

Figure 3. Stations and cruise tracks for CalCOFI cruises 9908 (above) and 9810 (below). Symbols as in Figure 2. Manta tows without accompanying oblique tows were taken at station 86.7 on Cruise 9908 and at 76.7 on Cruise 9910.

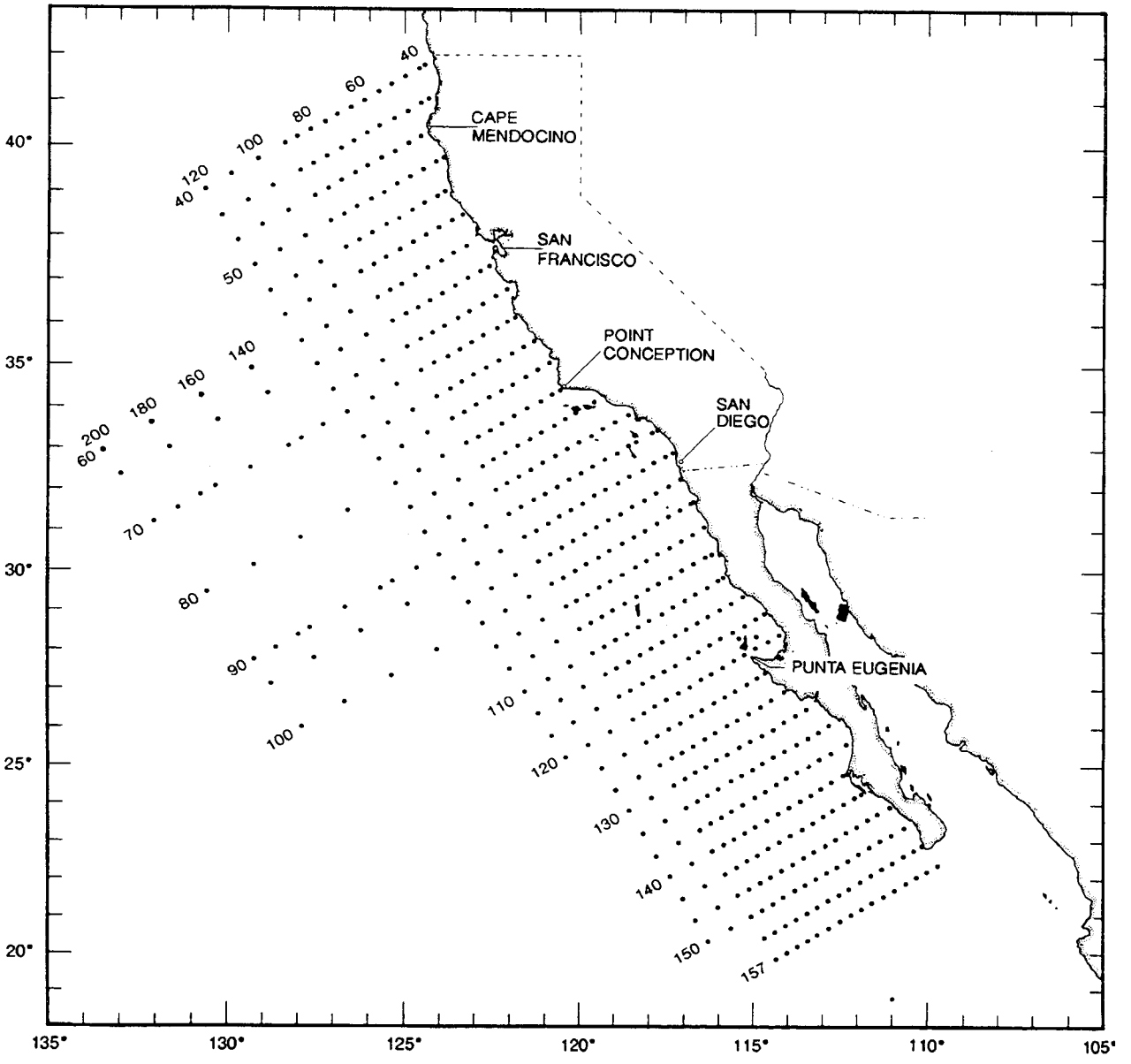

Figure 4. The basic station plan for CalCOFI cruises from 1950 - 1984.

TABLE 1. Station and plankton tow data for Manta tows taken on the 1999 CalCOFI survey. Numbers of fish eggs and larvae are raw counts, unadjusted for volume (cubic meters) of water filtered.

CalCOFI Cruise 9901

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	RR	99	01	24	2335	50	11	0
76.7	51.0	35	01.3	120	55.1	RR	99	01	25	0159	78	6	0
76.7	55.0	34	53.3	121	11.9	RR	99	01	24	1459	92	2	2
76.7	60.0	34	43.3	121	32.9	RR	99	01	24	1110	100	3	1
76.7	70.0	34	23.3	122	14.8	RR	99	01	24	0514	65	16	6
76.7	80.0	34	03.3	122	56.5	RR	99	01	23	2347	80	4	0
76.7	90.0	33	43.3	123	38.0	RR	99	01	23	1646	86	0	1
76.7	100.0	33	23.3	124	19.4	RR	99	01	23	0810	110	3	2
80.0	51.0	34	27.0	120	31.4	RR	99	01	21	2325	98	17	79
80.0	60.0	34	09.0	121	09.0	RR	99	01	22	0409	75	16	13
80.0	70.0	33	49.0	121	50.6	RR	99	01	22	0830	106	1	4
80.0	80.0	33	29.0	122	32.0	RR	99	01	22	1537	87	3	27
80.0	90.0	33	09.0	123	13.3	RR	99	01	22	2056	111	3	2
80.0	100.0	32	49.0	123	54.4	RR	99	01	23	0201	103	3	0
81.8	46.9	34	16.5	120	01.5	RR	99	01	21	1629	104	27	66
83.3	40.6	34	13.5	119	24.7	RR	99	01	21	0909	82	4	28
83.3	42.0	34	10.7	119	30.5	RR	99	01	21	0715	103	6	138
83.3	51.0	33	52.7	120	08.0	RR	99	01	21	0053	52	19	48
83.3	55.0	33	44.7	120	24.6	RR	99	01	20	2132	84	3	0
83.3	60.0	33	34.7	120	45.3	RR	99	01	20	1737	90	13	1
83.3	70.0	33	14.7	121	26.6	RR	99	01	20	0849	87	0	5
83.3	80.0	32	54.7	122	07.7	RR	99	01	20	0424	64	0	2
83.3	90.0	32	34.7	122	48.7	RR	99	01	19	2308	97	0	0
83.3	100.0	32	14.7	123	29.5	RR	99	01	19	1733	92	8	1
83.3	110.0	31	54.7	124	10.2	RR	99	01	19	1134	103	5	0
86.7	33.0	33	53.4	118	29.4	RR	99	01	16	1615	107	7	1066
86.7	35.0	33	49.4	118	37.7	RR	99	01	16	1900	116	52	9
86.7	40.0	33	39.4	118	58.5	RR	99	01	17	0221	89	7	2
86.7	45.0	33	29.4	119	19.1	RR	99	01	17	0725	72	0	0
86.7	50.0	33	19.4	119	39.8	RR	99	01	17	1114	74	0	3
86.7	55.0	33	09.4	120	00.4	RR	99	01	17	1444	86	0	0
86.7	60.0	32	59.4	120	21.0	RR	99	01	17	1926	115	8	8
86.7	70.0	32	39.4	121	02.0	RR	99	01	18	0047	66	0	8
86.7	80.0	32	19.4	121	42.9	RR	99	01	18	0858	102	0	13
86.7	90.0	31	59.4	122	23.6	RR	99	01	18	1835	98	0	1
86.7	100.0	31	39.4	123	04.2	RR	99	01	18	2354	81	1	0
86.7	110.0	31	19.4	123	44.6	RR	99	01	19	0506	89	0	1
90.0	28.0	33	29.1	117	46.1	RR	99	01	16	0458	72	4	0
90.0	30.0	33	25.1	117	54.3	RR	99	01	15	1953	115	5	7
90.0	35.0	33	15.1	118	15.0	RR	99	01	15	1538	100	0	79
90.0	37.0	33	11.1	118	23.2	RR	99	01	15	1242	71	4	1874
90.0	45.0	32	55.1	118	56.1	RR	99	01	14	2013	105	1	1
90.0	53.0	32	39.1	119	28.9	RR	99	01	14	1520	93	7	1
90.0	60.0	32	25.1	119	57.6	RR	99	01	14	0404	65	13	6
90.0	70.0	32	05.1	120	38.3	RR	99	01	13	2338	91	0	1
90.0	80.0	31	45.1	121	18.9	RR	99	01	13	1542	94	4	4
90.0	90.0	31	25.1	121	59.4	RR	99	01	13	0805	101	2	1

TABLE 1. (cont.) CalCOFI Cruise 9901 (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	100.0	31	05.1	122	39.7	RR	99	01	13	0214	104	0	0
90.0	110.0	30	45.1	123	19.9	RR	99	01	12	1953	94	6	1
90.0	120.0	30	25.1	123	59.9	RR	99	01	12	1100	117	0	21
93.3	26.7	32	57.4	117	18.3	RR	99	01	09	1242	93	88	0
93.3	28.0	32	54.8	117	23.7	RR	99	01	09	1523	95	0	0
93.3	30.0	32	50.8	117	31.9	RR	99	01	09	1835	90	4	25
93.3	35.0	32	40.8	117	52.4	RR	99	01	09	2235	77	1	0
93.3	40.0	32	30.8	118	12.8	RR	99	01	10	0259	109	3	2
93.3	45.0	32	20.8	118	33.3	RR	99	01	10	0707	107	0	5
93.3	50.0	32	10.8	118	53.6	RR	99	01	10	1112	94	0	12
93.3	55.0	32	00.8	119	14.0	RR	99	01	10	1535	88	0	1
93.3	60.0	31	50.8	119	34.3	RR	99	01	10	1941	105	0	101
93.3	70.0	31	30.8	120	14.8	RR	99	01	11	0109	99	1	4
93.3	80.0	31	10.8	120	55.2	RR	99	01	11	0624	59	1	8
93.3	90.0	30	50.8	121	35.4	RR	99	01	11	1252	99	0	0
93.3	100.0	30	30.8	122	15.5	RR	99	01	11	1802	88	2	0
93.3	110.0	30	10.8	122	55.4	RR	99	01	11	2342	91	4	0
93.3	120.0	29	50.8	123	35.2	RR	99	01	12	0510	84	6	12

CalCOFI Cruise 9904

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	99	04	15	1357	82	3	6
76.7	51.0	35	01.3	120	55.1	JD	99	04	15	1144	74	0	16
76.7	55.0	34	53.3	121	11.9	JD	99	04	15	0825	91	5	1411
76.7	60.0	34	43.3	121	32.9	JD	99	04	15	0503	94	173	706
76.7	70.0	34	23.3	122	14.8	JD	99	04	14	2332	83	95	408
76.7	80.0	34	03.3	122	56.5	JD	99	04	14	1744	78	109	4484
76.7	90.0	33	43.3	123	38.0	JD	99	04	14	1150	82	1	477
76.7	100.0	33	23.3	124	19.4	JD	99	04	14	0558	83	3	40
80.0	51.0	34	27.0	120	31.4	JD	99	04	12	1548	83	9	10
80.0	55.0	34	19.0	120	48.1	JD	99	04	12	1938	75	2	10
80.0	60.0	34	08.9	121	09.0	JD	99	04	12	2349	78	3	4
80.0	70.0	33	49.0	121	50.6	JD	99	04	13	0548	74	12	1244
80.0	80.0	33	28.9	122	32.0	JD	99	04	13	1142	77	61	50
80.0	90.0	33	09.0	123	13.3	JD	99	04	13	1741	83	50	723
80.0	100.0	32	49.0	123	54.4	JD	99	04	13	2342	84	31	103
81.8	46.9	34	16.5	120	01.5	JD	99	04	12	1127	82	0	0
83.3	40.6	34	13.5	119	24.7	JD	99	04	12	0632	86	5	0
83.3	42.0	34	10.7	119	30.5	JD	99	04	12	0451	93	26	6
83.3	51.0	33	52.7	120	08.0	JD	99	04	11	2253	77	24	759
83.3	55.0	33	44.7	120	24.6	JD	99	04	11	1933	85	22	529
83.3	60.0	33	34.7	120	45.3	JD	99	04	11	1522	75	4	1349
83.3	70.0	33	14.6	121	26.6	JD	99	04	11	0817	83	20	31
83.3	80.0	32	54.7	122	07.7	JD	99	04	11	0318	83	313	233
83.3	90.0	32	34.6	122	48.7	JD	99	04	10	2133	82	159	1200
83.3	100.0	32	14.7	123	29.5	JD	99	04	10	1555	85	0	9
83.3	110.0	31	54.7	124	10.2	JD	99	04	10	0838	83	0	2

TABLE 1. (cont.) CalCOFI Cruise 9904 (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	99	04	07	1805	96	9	101
86.7	35.0	33	49.4	118	37.7	JD	99	04	07	2106	88	13	27
86.7	40.0	33	39.4	118	58.5	JD	99	04	08	0104	84	18	4
86.7	45.0	33	29.4	119	19.1	JD	99	04	08	0446	86	66	1
86.7	50.0	33	19.4	119	39.8	JD	99	04	08	0750	98	9	52
86.7	55.0	33	09.4	120	00.4	JD	99	04	08	1344	77	5	6
86.7	60.0	32	59.4	120	21.0	JD	99	04	08	1745	79	76	2611
86.7	90.0	31	59.4	122	23.6	JD	99	04	09	1146	82	5	37
86.7	100.0	31	39.4	123	04.2	JD	99	04	09	1815	85	1	4
86.7	110.0	31	19.4	123	44.6	JD	99	04	10	0014	74	13	1
90.0	28.0	33	29.1	117	46.1	JD	99	04	07	0943	94	1	11
90.0	30.0	33	25.1	117	54.3	JD	99	04	07	0759	82	49	16
90.0	35.0	33	15.1	118	15.0	JD	99	04	07	0403	83	17	107
90.0	37.0	33	11.1	118	23.2	JD	99	04	07	0124	89	56	67
90.0	45.0	32	55.1	118	56.1	JD	99	04	06	2034	79	43	0
90.0	53.0	32	39.1	119	28.9	JD	99	04	06	1541	89	1	16
90.0	60.0	32	25.1	119	57.6	JD	99	04	06	1056	87	1	17
90.0	70.0	32	05.1	120	38.3	JD	99	04	06	0457	88	515	10
90.0	80.0	31	45.1	121	18.9	JD	99	04	05	2252	87	1000	125
90.0	90.0	31	25.1	121	59.4	JD	99	04	05	1645	81	1	24
90.0	100.0	31	05.1	122	39.7	JD	99	04	05	0807	88	9	1
90.0	110.0	30	45.1	123	19.9	JD	99	04	05	0242	73	1	8
90.0	120.0	30	25.1	123	59.9	JD	99	04	04	2019	80	4	109
93.3	26.7	32	57.4	117	18.3	JD	99	04	01	1308	82	7	0
93.3	28.0	32	54.8	117	23.7	JD	99	04	01	1609	88	2	0
93.3	30.0	32	50.8	117	31.9	JD	99	04	01	1910	91	19	0
93.3	35.0	32	40.8	117	52.4	JD	99	04	01	2321	95	11	50
93.3	40.0	32	30.8	118	12.8	JD	99	04	02	0332	74	32	284
93.3	45.0	32	20.8	118	33.3	JD	99	04	02	0759	87	3	179
93.3	50.0	32	10.8	118	53.6	JD	99	04	02	1211	79	0	77
93.3	55.0	32	00.8	119	14.0	JD	99	04	02	1641	68	3	1
93.3	60.0	31	50.8	119	34.3	JD	99	04	02	2100	77	2	3
93.3	70.0	31	30.8	120	14.8	JD	99	04	03	0334	75	2	141
93.3	80.0	31	10.8	120	55.4	JD	99	04	03	0907	74	10	49
93.3	90.0	30	50.8	121	35.4	JD	99	04	03	1627	71	0	19

CalCOFI Cruise 9908

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	05.1	120	46.5	NH	99	08	23	1150	95	0	2343
76.7	51.0	35	01.0	120	55.4	NH	99	08	23	0806	91	0	31
76.7	55.0	34	53.3	121	12.1	NH	99	08	23	0434	96	2	16
76.7	60.0	34	43.2	121	33.1	NH	99	08	23	0037	111	2	17
76.7	70.0	34	23.4	122	14.8	NH	99	08	22	1850	88	0	2
76.7	80.0	34	03.3	122	56.5	NH	99	08	22	1235	100	0	15
76.7	90.0	33	43.2	123	38.0	NH	99	08	22	0444	85	1	2
76.7	100.0	33	23.3	124	19.9	NH	99	08	21	2101	80	20	10
80.0	51.0	34	26.7	120	31.3	NH	99	08	19	2111	90	1	429

TABLE 1. (cont.) CalCOFI Cruise 9908 (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	55.0	34	18.9	120	48.0	NH	99	08	20	0036	66	0	108
80.0	60.0	34	09.0	121	09.2	NH	99	08	20	0838	77	0	4
80.0	70.0	33	49.2	121	50.7	NH	99	08	20	1647	78	3	1
80.0	80.0	33	28.8	122	31.7	NH	99	08	20	2340	82	7	4
80.0	90.0	33	08.6	123	12.8	NH	99	08	21	0554	83	0	3
80.0	100.0	32	48.8	123	52.7	NH	99	08	21	1258	91	6	485
81.8	46.9	34	16.5	120	00.9	NH	99	08	19	1311	102	0	86
83.3	40.6	34	13.6	119	24.8	NH	99	08	19	0602	83	1	253
83.3	42.0	34	10.8	119	30.4	NH	99	08	19	0425	73	13	277
83.3	55.0	33	44.6	120	24.6	NH	99	08	18	1725	72	1	1
83.3	60.0	33	34.5	120	45.3	NH	99	08	18	1247	98	1	0
83.3	70.0	33	14.4	121	26.8	NH	99	08	18	0000	91	4	0
83.3	80.0	32	54.7	122	07.6	NH	99	08	17	1749	78	1	3
83.3	90.0	32	34.2	122	48.8	NH	99	08	17	1212	96	1	45
83.3	100.0	32	14.6	123	29.6	NH	99	08	17	0505	86	19	17
83.3	110.0	31	54.2	124	09.9	NH	99	08	16	2313	92	12	63
86.7	33.0	33	53.5	118	29.4	NH	99	08	14	0038	88	49	122
86.7	35.0	33	49.4	118	37.7	NH	99	08	14	0318	96	71	2
86.7	40.0	33	39.8	118	58.5	NH	99	08	14	1212	103	2	115
86.7	45.0	33	29.5	119	19.1	NH	99	08	14	1621	85	0	51
86.7	50.0	33	19.4	119	39.8	NH	99	08	14	1957	82	0	23
86.7	55.0	33	09.6	119	59.8	NH	99	08	15	0010	80	3	0
86.7	60.0	32	59.4	120	21.4	NH	99	08	15	0437	81	3	0
86.7	70.0	32	40.3	121	01.1	NH	99	08	15	1148	70	2	1
86.7	80.0	32	19.4	121	42.6	NH	99	08	15	2250	96	5	2
86.7	90.0	31	59.5	122	23.5	NH	99	08	16	0451	79	4	3
86.7	100.0	31	39.6	123	03.7	NH	99	08	16	1130	82	1	21
86.7	110.0	31	19.3	123	44.5	NH	99	08	16	1710	85	1	95
90.0	28.0	33	29.1	117	46.1	NH	99	08	13	1540	92	1	243
90.0	30.0	33	25.1	117	54.4	NH	99	08	13	1844	102	4	7
90.0	35.0	33	15.2	118	15.2	NH	99	08	13	0821	89	10	778
90.0	37.0	33	11.2	118	23.2	NH	99	08	13	0613	80	13	655
90.0	45.0	32	54.8	118	56.5	NH	99	08	13	0033	77	10	0
90.0	53.0	32	39.0	119	28.9	NH	99	08	12	1854	83	5	0
90.0	60.0	32	24.6	119	57.8	NH	99	08	12	1333	75	1	7
90.0	70.0	32	05.1	120	38.2	NH	99	08	12	0624	76	0	8
90.0	80.0	31	45.0	121	19.1	NH	99	08	12	0000	85	4	8
90.0	90.0	31	25.1	121	59.2	NH	99	08	11	1729	82	0	9
90.0	100.0	31	05.1	122	39.8	NH	99	08	11	0818	78	2	161
90.0	110.0	30	45.2	123	19.7	NH	99	08	11	0131	91	8	339
90.0	120.0	30	24.9	123	59.8	NH	99	08	10	1909	100	12	1905
93.3	26.7	32	57.4	117	18.0	NH	99	08	07	1154	74	5	2742
93.3	28.0	32	54.7	117	23.7	NH	99	08	07	1327	87	0	471
93.3	30.0	32	50.7	117	31.9	NH	99	08	07	1950	87	13	355
93.3	35.0	32	41.0	117	52.2	NH	99	08	08	0000	183	34	5332
93.3	40.0	32	30.8	118	12.8	NH	99	08	08	0353	72	72	0
93.3	45.0	32	20.8	118	33.4	NH	99	08	08	0738	72	2	2
93.3	50.0	32	11.2	118	52.9	NH	99	08	08	1309	76	1	1
93.3	55.0	32	00.9	119	13.9	NH	99	08	08	1717	83	1	4

TABLE 1. (cont.) CalCOFI Cruise 9908 (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	60.0	31	51.1	119	33.7	NH	99	08	08	2125	88	0	6
93.3	70.0	31	30.6	120	14.8	NH	99	08	09	0347	78	0	2
93.3	80.0	31	11.2	120	54.5	NH	99	08	09	0813	84	0	38
93.3	90.0	30	50.8	121	35.3	NH	99	08	09	1745	81	3	336
93.3	100.0	30	31.3	122	14.9	NH	99	08	09	2356	98	5	6682
93.3	110.0	30	10.8	122	55.4	NH	99	08	10	0544	87	0	604
93.3	120.0	29	51.2	123	34.7	NH	99	08	10	1241	85	3	2099

CalCOFI Cruise 9910

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	99	10	19	0442	83	1	197
76.7	51.0	35	00.8	120	54.7	NH	99	10	19	0209	64	2	247
76.7	55.0	34	53.3	121	11.9	NH	99	10	18	2227	73	6	0
76.7	60.0	34	43.3	121	32.9	NH	99	10	18	1834	66	101	3
76.7	70.0	34	23.3	122	14.8	NH	99	10	18	1209	69	4	4
76.7	80.0	34	03.3	122	56.3	NH	99	10	18	0555	80	17	5
76.7	90.0	33	43.0	123	38.0	NH	99	10	17	2355	77	2	89
76.7	100.0	33	23.3	124	19.4	NH	99	10	17	1802	89	4	76
80.0	51.0	34	27.0	120	31.3	NH	99	10	15	2241	85	12	319
80.0	55.0	34	19.2	120	47.5	NH	99	10	16	0203	68	6	119
80.0	60.0	34	09.3	121	09.2	NH	99	10	16	0840	77	1	435
80.0	70.0	33	49.0	121	50.5	NH	99	10	16	1749	66	4	52
80.0	80.0	33	29.0	122	32.0	NH	99	10	16	2328	67	11	23
80.0	90.0	33	09.0	123	13.2	NH	99	10	17	0510	91	11	33
80.0	100.0	32	48.9	123	54.4	NH	99	10	17	1149	79	6	21
81.8	46.9	34	16.4	120	01.3	NH	99	10	15	1734	78	2	525
83.3	42.0	34	10.7	119	30.5	NH	99	10	15	0902	83	0	77
83.3	51.0	33	52.7	120	08.0	NH	99	10	14	1848	86	4	3685
83.3	55.0	33	43.9	120	24.8	NH	99	10	14	1404	68	0	3
83.3	60.0	33	34.4	120	45.8	NH	99	10	14	0858	68	0	6
83.3	70.0	33	14.6	121	26.7	NH	99	10	13	2341	62	2	6
83.3	80.0	32	54.6	122	07.6	NH	99	10	13	1735	96	5	95
83.3	90.0	32	34.4	122	48.0	NH	99	10	13	0830	78	0	2
83.3	100.0	32	14.6	123	29.5	NH	99	10	13	0342	71	4	5
83.3	110.0	31	54.6	124	10.2	NH	99	10	12	2153	91	11	16
86.7	33.0	33	52.9	118	29.3	NH	99	10	09	1942	92	3	417
86.7	35.0	33	49.4	118	37.4	NH	99	10	09	2212	89	11	182
86.7	40.0	33	39.5	118	58.5	NH	99	10	10	0644	81	0	112
86.7	45.0	33	29.3	119	19.0	NH	99	10	10	1137	74	0	186
86.7	50.0	33	19.4	119	39.8	NH	99	10	10	1704	76	2	21
86.7	55.0	33	09.4	120	00.4	NH	99	10	10	2050	78	0	4
86.7	60.0	32	59.3	120	20.8	NH	99	10	11	0044	80	1	1
86.7	70.0	32	39.4	121	02.0	NH	99	10	11	1207	78	2	25
86.7	80.0	32	19.4	121	42.8	NH	99	10	11	1943	77	25	42
86.7	90.0	31	59.5	122	23.4	NH	99	10	12	0136	77	2	19
86.7	100.0	31	39.4	123	03.7	NH	99	10	12	0822	85	5	6
86.7	110.0	31	19.5	123	44.4	NH	99	10	12	1606	97	5	11

TABLE 1. (cont.) CalCOFI Cruise 9910 (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	28.0	33	28.8	117	45.8	NH	99	10	09	1341	84	11	890
90.0	30.0	33	25.1	117	54.3	NH	99	10	09	0816	104	2	332
90.0	35.0	33	15.0	118	14.9	NH	99	10	09	0513	69	2	82
90.0	37.0	33	10.7	118	23.6	NH	99	10	09	0218	88	2	111
90.0	53.0	32	38.6	119	28.9	NH	99	10	08	1554	97	7	65
90.0	60.0	32	24.4	119	57.3	NH	99	10	08	0857	77	1	1
90.0	70.0	32	05.1	120	38.3	NH	99	10	08	0109	69	3	6
90.0	80.0	31	44.7	121	18.6	NH	99	10	07	1855	81	12	16
90.0	90.0	31	23.9	122	01.1	NH	99	10	07	1238	73	1	2
90.0	100.0	31	05.1	122	39.7	NH	99	10	07	0631	57	21	7
90.0	110.0	30	45.2	123	19.9	NH	99	10	06	2344	72	34	5
90.0	120.0	30	24.3	123	59.5	NH	99	10	06	1725	61	1	3
93.3	26.7	32	57.3	117	18.4	NH	99	10	03	1450	73	3	68
93.3	28.0	32	54.2	117	23.5	NH	99	10	03	1003	78	1	0
93.3	30.0	32	50.8	117	31.8	NH	99	10	03	1757	78	5	0
93.3	35.0	32	40.7	117	52.3	NH	99	10	03	2152	82		
93.3	40.0	32	31.0	118	12.3	NH	99	10	04	0148	68	2	1
93.3	45.0	32	20.8	118	33.2	NH	99	10	04	0545	69	1	9
93.3	50.0	32	10.3	118	53.2	NH	99	10	04	0847	80	2	0
93.3	55.0	32	01.0	119	13.3	NH	99	10	04	1522	70	2	0
93.3	60.0	31	50.8	119	34.3	NH	99	10	04	1917	69	2	33
93.3	70.0	31	30.9	120	14.1	NH	99	10	05	0107	75	21	51
93.3	80.0	31	10.8	120	55.2	NH	99	10	05	0831	75	2	1
93.3	90.0	30	51.2	121	34.9	NH	99	10	05	1618	82	3	5
93.3	100.0	30	30.7	122	15.4	NH	99	10	05	2156	73	12	25
93.3	110.0	30	11.0	122	54.6	NH	99	10	06	0340	66	5	4
93.3	120.0	29	50.7	123	35.0	NH	99	10	06	0821	74	2	3

TABLE 2. Pooled occurrences of fish larvae taken in Manta tows on the 1999 CalCOFI survey.

Rank	Taxon	Occurrences
1	*Cololabis saira*	115
2	*Engraulis mordax*	47
3	*Sebastes* spp.	33
4	*Sardinops sagax*	31
5	*Scorpaenichthys marmoratus*	27
6	*Trachurus symmetricus*	16
7	*Tetragonurus cuvieri*	13
8	*Hypsoblennius jenkinsi*	12
9	*Sebastes diploproa*	11
10	*Ceratoscopelus townsendi*	10
11	*Vinciguerria lucetia*	9
11	*Chromis punctipinnis*	9
13	*Hypsoblennius gilberti*	8
14	*Atherinopsis californiensis*	7
14	*Stenobrachius leucopsarus*	7
16	*Citharichthys stigmaeus*	6
17	*Anoplopoma fimbria*	5
18	*Oxylebius pictus*	4
18	*Pleuronichthys coenosus*	4
18	*Gigantactis* spp.	4
21	*Ophiodon elongatus*	3
21	*Lampadena urophaos*	3
21	*Hypsoblennius* spp.	3
21	*Hypsoblennius gentilis*	3
21	*Cyclothone signata*	3
21	*Cyclothone acclinidens*	3
27	*Triphoturus mexicanus*	2
27	*Aristostomias scintillans*	2
27	*Desmodema lorum*	2
27	*Leuresthes tenuis*	2
27	*Nannobrachium regale*	2
27	*Howella* spp.	2
27	*Oxyjulis californica*	2
27	*Medialuna californiensis*	2
27	*Hexagrammos decagrammus*	2
27	*Pleuronichthys decurrens*	2
27	*Sebastes aurora*	2
38	*Hirundichthys marginatus*	1
38	*Paralichthys californicus*	1
38	*Citharichthys sordidus*	1
38	*Typhlogobius californiensis*	1
38	*Coryphopterus nicholsii*	1
38	*Stomias atriventer*	1
38	*Neoclinus blanchardi*	1
38	*Rathbunella* spp.	1
38	*Nannobrachium ritteri*	1
38	*Nannobrachium bristori*	1
38	*Cheilopogon pinnatibarbatus*	1
38	*Cheilopogon* spp.	1

TABLE 2. (cont.)

Rank	Taxon	Occurrences
38	*Hirundichthys* spp.	1
38	*Symbolophorus californiensis*	1
38	*Sebastes jordani*	1
38	*Trachipterus altivelis*	1
38	*Cataetyx rubrirostris*	1
38	Exocoetidae	1
	Total	436

TABLE 3. Pooled raw counts of fish larvae taken in Manta tows on the 1999 CalCOFI survey.

Rank	Taxon	Count
1	*Sardinops sagax*	2622
2	*Cololabis saira*	499
3	*Engraulis mordax*	414
4	*Sebastes* spp.	106
5	*Sebastes diploproa*	102
6	*Atherinopsis californiensis*	98
7	*Scorpaenichthys marmoratus*	78
8	*Hypsoblennius jenkinsi*	67
9	*Citharichthys stigmaeus*	61
10	*Trachurus symmetricus*	53
11	*Hypsoblennius gentilis*	46
12	*Tetragonurus cuvieri*	41
13	*Ophiodon elongatus*	36
14	*Vinciguerria lucetia*	27
15	*Hypsoblennius gilberti*	23
16	*Ceratoscopelus townsendi*	22
17	*Chromis punctipinnis*	16
18	*Pleuronichthys coenosus*	8
18	*Stenobrachius leucopsarus*	8
20	*Hexagrammos decagrammus*	7
21	*Oxylebius pictus*	6
21	*Lampadena urophaos*	6
21	*Anoplopoma fimbria*	6
24	*Medialuna californiensis*	5
24	*Gigantactis* spp.	5
26	*Leuresthes tenuis*	4
26	*Cheilopogon pinnatibarbatus*	4
26	*Pleuronichthys decurrens*	4
29	*Cyclothone signata*	3
29	*Hypsoblennius* spp.	3
29	*Cyclothone acclinidens*	3
32	*Nannobrachium regale*	2
32	*Aristostomias scintillans*	2
32	*Citharichthys sordidus*	2
32	*Sebastes aurora*	2
32	*Desmodema lorum*	2
32	*Howella* spp.	2
32	*Oxyjulis californica*	2
32	*Triphoturus mexicanus*	2
40	*Typhlogobius californiensis*	1
40	*Coryphopterus nicholsii*	1
40	*Sebastes jordani*	1
40	*Stomias atriventer*	1
40	*Rathbunella* spp.	1
40	*Paralichthys californicus*	1
40	*Symbolophorus californiensis*	1
40	Exocoetidae	1
40	*Cheilopogon* spp.	1
40	*Hirundichthys* spp.	1

TABLE 3. (cont.)

Rank	Taxon	Count
40	*Hirundichthys marginatus*	1
40	*Trachipterus altivelis*	1
40	*Nannobrachium ritteri*	1
40	*Nannobrachium bristori*	1
40	*Neoclinus blanchardi*	1
40	*Cataetyx rubrirostris*	1
	Total	4415

TABLE 4. Numbers of fish larvae taken in Manta net tows on the 1999 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	-	-	1.6	-	-	-	0.0	-	0.0	-	-
76.7 55.0	0.0	-	-	4.6	-	-	-	0.0	-	0.7	-	-
76.7 60.0	0.0	-	-	163.3	-	-	-	0.0	-	0.0	-	-
76.7 70.0	0.0	-	-	75.8	-	-	-	0.0	-	0.0	-	-
76.7 80.0	0.0	-	-	83.0	-	-	-	0.0	-	0.0	-	-
76.7 100.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
80.0 55.0	-	-	-	1.5	-	-	-	0.0	-	0.0	-	-
80.0 70.0	0.0	-	-	6.6	-	-	-	0.0	-	0.0	-	-
80.0 80.0	0.0	-	-	43.2	-	-	-	0.0	-	0.0	-	-
80.0 90.0	0.0	-	-	36.3	-	-	-	0.0	-	0.0	-	-
80.0 100.0	0.0	-	-	25.9	-	-	-	0.0	-	0.0	-	-
83.3 55.0	0.0	-	-	17.8	-	-	-	0.0	-	0.0	-	-
83.3 60.0	0.0	-	-	2.3	-	-	-	0.0	-	0.0	-	-
83.3 70.0	0.0	-	-	7.4	-	-	-	0.0	-	0.0	-	-
83.3 80.0	0.0	-	-	242.3	-	-	-	0.0	-	0.0	-	-
83.3 90.0	0.0	-	-	128.2	-	-	-	0.0	-	0.0	-	-
86.7 45.0	0.0	-	-	1.7	-	-	-	0.0	-	0.0	-	-
86.7 55.0	0.0	-	-	1.5	-	-	-	0.0	-	0.0	-	-
86.7 60.0	0.0	-	-	57.5	-	-	-	0.0	-	0.0	-	-
86.7 90.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
86.7 110.0	0.0	-	-	3.7	-	-	-	0.0	-	0.0	-	-
90.0 28.0	0.0	-	-	0.0	-	-	-	0.9	-	0.0	-	-
90.0 35.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
90.0 45.0	0.0	-	-	15.0	-	-	-	0.0	-	-	-	-
90.0 60.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-
90.0 70.0	0.0	-	-	445.8	-	-	-	0.0	-	0.0	-	-
90.0 80.0	0.0	-	-	866.5	-	-	-	0.0	-	0.0	-	-
93.3 55.0	0.0	-	-	0.7	-	-	-	0.0	-	0.0	-	-
93.3 60.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
93.3 80.0	0.0	-	-	6.7	-	-	-	0.0	-	0.0	-	-

TABLE 4. (cont.)

Engraulis mordax

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	-	-
80.0	51.0	14.7	-	-	0.0	-	-	-	0.0	-	7.6	-	-
80.0	55.0	-	-	-	0.0	-	-	-	0.0	-	1.4	-	-
80.0	60.0	2.3	-	-	0.8	-	-	-	0.0	-	0.0	-	-
81.8	46.9	2.1	-	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3	40.6	1.6	-	-	0.0	-	-	-	0.0	-	-	-	-
83.3	42.0	1.0	-	-	0.0	-	-	-	0.7	-	0.0	-	-
83.3	51.0	3.1	-	-	0.0	-	-	-	-	-	0.9	-	-
83.3	55.0	0.8	-	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7	33.0	0.0	-	-	7.6	-	-	-	19.3	-	0.0	-	-
86.7	35.0	48.5	-	-	11.4	-	-	-	0.0	-	0.9	-	-
86.7	40.0	0.9	-	-	7.6	-	-	-	0.0	-	0.0	-	-
86.7	45.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-
86.7	55.0	0.0	-	-	0.0	-	-	-	0.8	-	0.0	-	-
86.7	60.0	0.0	-	-	0.0	-	-	-	1.6	-	0.0	-	-
90.0	28.0	0.7	-	-	0.9	-	-	-	0.0	-	0.8	-	-
90.0	30.0	4.6	-	-	38.7	-	-	-	2.0	-	0.0	-	-
90.0	35.0	0.0	-	-	11.7	-	-	-	0.0	-	1.4	-	-
90.0	37.0	0.0	-	-	48.3	-	-	-	6.4	-	0.9	-	-
90.0	45.0	0.0	-	-	18.2	-	-	-	0.0	-	-	-	-
90.0	53.0	0.0	-	-	0.0	-	-	-	3.3	-	0.0	-	-
93.3	26.7	18.6	-	-	5.7	-	-	-	0.0	-	2.2	-	-
93.3	28.0	0.0	-	-	1.8	-	-	-	0.0	-	0.0	-	-
93.3	30.0	0.9	-	-	9.1	-	-	-	6.9	-	0.0	-	-
93.3	35.0	0.0	-	-	8.5	-	-	-	42.0	-	0.0	-	-
93.3	40.0	0.0	-	-	15.6	-	-	-	0.0	-	0.0	-	-
93.3	45.0	0.0	-	-	2.6	-	-	-	0.0	-	0.0	-	-

Cyclothone acclinidens

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

TABLE 4. (cont.)

Cyclothone signata

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 110.0	0.9	-	-	0.0	-	-	-	0.0	-	0.0	-	-
93.3 100.0	0.0	-	-	-	-	-	-	0.0	-	0.7	-	-
93.3 120.0	0.8	-	-	-	-	-	-	0.0	-	0.0	-	-

Vinciguerria lucetia

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 100.0	1.1	-	-	0.0	-	-	-	1.6	-	0.0	-	-
83.3 100.0	0.0	-	-	0.0	-	-	-	6.0	-	0.0	-	-
90.0 80.0	0.0	-	-	0.0	-	-	-	0.0	-	3.2	-	-
90.0 100.0	0.0	-	-	0.0	-	-	-	0.0	-	1.1	-	-
90.0 110.0	0.0	-	-	0.0	-	-	-	0.0	-	5.0	-	-
93.3 100.0	0.0	-	-	-	-	-	-	0.0	-	1.5	-	-
93.3 120.0	0.8	-	-	-	-	-	-	0.0	-	0.7	-	-

Stomias atriventer

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 40.0	1.1	-	-	0.0	-	-	-	0.0	-	0.0	-	-

Aristostomias scintillans

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 110.0	1.0	-	-	0.0	-	-	-	0.0	-	0.0	-	-
93.3 90.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-

Ceratoscopelus townsendi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 90.0	0.0	-	-	0.0	-	-	-	0.8	-	0.0	-	-
76.7 100.0	1.1	-	-	0.0	-	-	-	3.2	-	0.0	-	-
83.3 100.0	5.5	-	-	0.0	-	-	-	1.7	-	0.0	-	-
86.7 90.0	0.0	-	-	0.0	-	-	-	2.4	-	0.0	-	-
86.7 100.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
90.0 100.0	0.0	-	-	0.0	-	-	-	0.0	-	0.6	-	-
90.0 120.0	0.0	-	-	0.0	-	-	-	2.0	-	0.0	-	-
93.3 100.0	0.9	-	-	-	-	-	-	0.0	-	0.0	-	-

Lampadena urophaos

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 100.0	0.0	-	-	0.0	-	-	-	0.0	-	2.3	-	-

TABLE 4. (cont.)

Lampadena urophaos (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 120.0	0.0	-	-	0.0	-	-	-	1.0	-	0.0	-	-
93.3 80.0	0.0	-	-	0.0	-	-	-	0.0	-	0.7	-	-

Nannobrachium bristori

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

Nannobrachium regale

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 70.0	0.0	-	-	0.0	-	-	-	0.0	-	0.7	-	-
93.3 55.0	0.0	-	-	0.0	-	-	-	0.8	-	0.0	-	-

Nannobrachium ritteri

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

Stenobrachius leucopsarus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
80.0 60.0	0.8	-	-	0.0	-	-	-	0.0	-	0.0	-	-
80.0 90.0	0.0	-	-	1.7	-	-	-	0.0	-	0.0	-	-
83.3 51.0	0.0	-	-	0.8	-	-	-	-	-	0.0	-	-
83.3 60.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
90.0 70.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-
90.0 80.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-

Triphoturus mexicanus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 70.0	0.0	-	-	0.0	-	-	-	0.8	-	0.0	-	-
86.7 110.0	0.0	-	-	0.0	-	-	-	0.8	-	0.0	-	-

Symbolophorus californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 110.0	0.0	-	-	0.7	-	-	-	0.0	-	0.0	-	-

Desmodema lorum

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

TABLE 4. (cont.)

Desmodema lorum (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 55.0	0.0	-	-	0.0	-	-	-	0.0	-	0.7	-	-

Trachipterus altivelis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 80.0	0.6	-	-	0.0	-	-	-	0.0	-	0.0	-	-

Cataetyx rubrirostris

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 40.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-

***Gigantactis* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 100.0	0.0	-	-	0.0	-	-	-	0.0	-	0.6	-	-
90.0 120.0	0.0	-	-	0.0	-	-	-	1.0	-	0.0	-	-
93.3 70.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
93.3 110.0	0.0	-	-	-	-	-	-	0.0	-	1.3	-	-

Atherinopsis californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 51.0	2.0	-	-	0.0	-	-	-	0.0	-	0.0	-	-
81.8 46.9	20.8	-	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 35.0	3.5	-	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 40.0	0.0	-	-	2.5	-	-	-	0.0	-	0.0	-	-
90.0 28.0	2.2	-	-	0.0	-	-	-	0.0	-	0.0	-	-
90.0 35.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
93.3 26.7	61.5	-	-	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	-	-	-	1.5	-	0.0	-	-
83.3 51.0	0.0	-	-	1.5	-	-	-	-	-	0.0	-	-

Cololabis saira

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	0.0	-	-	0.0	-	-	-	0.0	-	0.6	-	-
76.7 55.0	0.0	-	-	0.0	-	-	-	1.0	-	0.7	-	-
76.7 60.0	0.0	-	-	0.0	-	-	-	1.1	-	4.6	-	-

TABLE 4. (cont.)

Station		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
						Cololabis saira (cont.)							
76.7	70.0	0.0	-	-	2.5	-	-	-	0.0	-	2.8	-	-
76.7	80.0	3.2	-	-	0.0	-	-	-	0.0	-	13.6	-	-
76.7	90.0	0.0	-	-	0.0	-	-	-	0.0	-	1.5	-	-
76.7	100.0	1.1	-	-	1.7	-	-	-	6.4	-	2.7	-	-
80.0	60.0	1.5	-	-	0.0	-	-	-	0.0	-	0.8	-	-
80.0	70.0	0.0	-	-	1.5	-	-	-	1.6	-	1.3	-	-
80.0	80.0	2.6	-	-	0.8	-	-	-	5.7	-	7.4	-	-
80.0	90.0	0.0	-	-	0.0	-	-	-	0.0	-	10.0	-	-
80.0	100.0	3.1	-	-	0.0	-	-	-	0.0	-	4.7	-	-
83.3	42.0	0.0	-	-	0.0	-	-	-	0.7	-	0.0	-	-
83.3	60.0	0.0	-	-	0.0	-	-	-	1.0	-	0.0	-	-
83.3	70.0	0.0	-	-	0.0	-	-	-	3.6	-	1.2	-	-
83.3	80.0	0.0	-	-	0.8	-	-	-	0.8	-	4.8	-	-
83.3	90.0	0.0	-	-	1.6	-	-	-	1.0	-	0.0	-	-
83.3	100.0	0.9	-	-	0.0	-	-	-	7.8	-	2.8	-	-
83.3	110.0	4.1	-	-	0.0	-	-	-	9.2	-	10.0	-	-
86.7	35.0	1.2	-	-	0.0	-	-	-	1.9	-	0.0	-	-
86.7	40.0	5.3	-	-	0.0	-	-	-	2.1	-	0.0	-	-
86.7	45.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-
86.7	55.0	0.0	-	-	0.8	-	-	-	0.8	-	0.0	-	-
86.7	60.0	6.9	-	-	0.8	-	-	-	0.0	-	0.8	-	-
86.7	70.0	0.0	-	-	-	-	-	-	0.7	-	1.6	-	-
86.7	80.0	0.0	-	-	-	-	-	-	4.8	-	19.3	-	-
86.7	90.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
86.7	100.0	0.8	-	-	0.0	-	-	-	0.8	-	4.3	-	-
86.7	110.0	0.0	-	-	5.2	-	-	-	0.0	-	2.9	-	-
90.0	30.0	1.1	-	-	0.0	-	-	-	2.0	-	0.0	-	-
90.0	35.0	0.0	-	-	0.0	-	-	-	8.0	-	0.0	-	-
90.0	37.0	0.7	-	-	0.0	-	-	-	3.2	-	0.0	-	-
90.0	45.0	1.1	-	-	0.0	-	-	-	7.7	-	-	-	-
90.0	53.0	0.9	-	-	0.0	-	-	-	0.0	-	6.8	-	-
90.0	60.0	1.3	-	-	0.0	-	-	-	0.7	-	0.8	-	-
90.0	70.0	0.0	-	-	5.3	-	-	-	0.0	-	1.4	-	-
90.0	80.0	3.8	-	-	0.0	-	-	-	3.4	-	4.0	-	-
90.0	90.0	2.0	-	-	0.8	-	-	-	0.0	-	0.7	-	-

TABLE 4. (cont.)

Cololabis saira (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 100.0	0.0	-	-	7.9	-	-	-	1.6	-	6.9	-	-
90.0 110.0	4.7	-	-	0.7	-	-	-	6.4	-	19.3	-	-
90.0 120.0	0.0	-	-	3.2	-	-	-	4.0	-	0.6	-	-
93.3 30.0	0.9	-	-	4.6	-	-	-	1.7	-	0.0	-	-
93.3 35.0	0.0	-	-	0.0	-	-	-	1.8	-	0.0	-	-
93.3 40.0	2.2	-	-	0.0	-	-	-	50.8	-	1.4	-	-
93.3 45.0	0.0	-	-	0.0	-	-	-	1.4	-	0.0	-	-
93.3 50.0	0.0	-	-	0.0	-	-	-	0.8	-	1.6	-	-
93.3 60.0	0.0	-	-	0.0	-	-	-	0.0	-	1.4	-	-
93.3 70.0	1.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
93.3 80.0	0.0	-	-	0.0	-	-	-	0.0	-	0.7	-	-
93.3 90.0	0.0	-	-	0.0	-	-	-	2.4	-	1.6	-	-
93.3 100.0	0.9	-	-	-	-	-	-	2.9	-	5.8	-	-
93.3 110.0	3.6	-	-	-	-	-	-	0.0	-	2.0	-	-
93.3 120.0	3.4	-	-	-	-	-	-	2.5	-	0.7	-	-

Exocoetidae

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 120.0	0.0	-	-	0.0	-	-	-	1.0	-	0.0	-	-

***Cheilopogon* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 37.0	0.0	-	-	0.0	-	-	-	0.0	-	0.9	-	-

Cheilopogon pinnatibarbatus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 35.0	0.0	-	-	0.0	-	-	-	7.3	-	0.0	-	-

***Hirundichthys* spp.**

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

Hirundichthys marginatus

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

TABLE 4. (cont.)

***Sebastes* spp.**

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	2.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
76.7 55.0	1.8	-	-	0.0	-	-	-	0.0	-	0.0	-	-
76.7 70.0	2.6	-	-	0.0	-	-	-	0.0	-	0.0	-	-
76.7 80.0	0.0	-	-	1.6	-	-	-	0.0	-	0.0	-	-
80.0 51.0	0.0	-	-	6.6	-	-	-	0.0	-	0.0	-	-
80.0 70.0	0.0	-	-	0.7	-	-	-	0.0	-	0.0	-	-
81.8 46.9	3.1	-	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 40.6	0.0	-	-	4.3	-	-	-	0.0	-	-	-	-
83.3 42.0	5.1	-	-	3.7	-	-	-	0.0	-	0.0	-	-
83.3 51.0	6.7	-	-	0.8	-	-	-	-	-	0.9	-	-
83.3 55.0	0.0	-	-	0.0	-	-	-	0.7	-	0.0	-	-
83.3 60.0	7.2	-	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 33.0	7.5	-	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 40.0	0.0	-	-	1.7	-	-	-	0.0	-	0.0	-	-
86.7 45.0	0.0	-	-	1.7	-	-	-	0.0	-	0.0	-	-
86.7 50.0	0.0	-	-	7.9	-	-	-	0.0	-	0.0	-	-
86.7 55.0	0.0	-	-	1.5	-	-	-	0.0	-	0.0	-	-
86.7 60.0	2.3	-	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 70.0	0.0	-	-	-	-	-	-	0.7	-	0.0	-	-
90.0 30.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
90.0 37.0	1.4	-	-	0.0	-	-	-	0.0	-	0.0	-	-
90.0 45.0	0.0	-	-	0.8	-	-	-	0.0	-	-	-	-
90.0 53.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-
93.3 26.7	1.9	-	-	0.0	-	-	-	0.0	-	0.0	-	-
93.3 35.0	0.0	-	-	1.9	-	-	-	0.0	-	0.0	-	-
93.3 40.0	0.0	-	-	4.5	-	-	-	0.0	-	0.0	-	-
93.3 55.0	0.0	-	-	1.4	-	-	-	0.0	-	0.0	-	-
93.3 60.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
93.3 70.0	0.0	-	-	0.7	-	-	-	0.0	-	0.0	-	-

Sebastes aurora

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-
93.3 30.0	0.9	-	-	0.0	-	-	-	0.0	-	0.0	-	-

TABLE 4. (cont.)

Sebastes diploproa

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	0.0	-	-	0.0	-	-	-	1.0	-	0.0	-	-
76.7 60.0	0.0	-	-	0.0	-	-	-	0.0	-	60.4	-	-
81.8 46.9	1.0	-	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 40.6	0.8	-	-	0.0	-	-	-	0.0	-	-	-	-
83.3 55.0	0.8	-	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 50.0	0.0	-	-	1.0	-	-	-	0.0	-	0.0	-	-
90.0 28.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
90.0 30.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
90.0 60.0	1.3	-	-	0.0	-	-	-	0.0	-	0.0	-	-
93.3 30.0	0.9	-	-	0.9	-	-	-	0.0	-	0.0	-	-

Sebastes jordani

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 45.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-

Anoplopoma fimbria

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 70.0	1.3	-	-	0.0	-	-	-	0.0	-	0.0	-	-
80.0 70.0	1.1	-	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 60.0	0.9	-	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 80.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
90.0 70.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-

Oxylebius pictus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	0.0	-	-	0.0	-	-	-	0.0	-	0.7	-	-
81.8 46.9	1.0	-	-	0.0	-	-	-	0.0	-	0.0	-	-
90.0 60.0	2.0	-	-	0.0	-	-	-	0.0	-	0.0	-	-
93.3 30.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-

Hexagrammos decagrammus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 51.0	4.7	-	-	0.0	-	-	-	0.0	-	0.0	-	-
93.3 40.0	0.0	-	-	0.7	-	-	-	0.0	-	0.0	-	-

TABLE 4. (cont.)

Ophiodon elongatus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 60.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
83.3 42.0	0.0	-	-	14.0	-	-	-	0.0	-	0.0	-	-
83.3 51.0	0.0	-	-	15.4	-	-	-	-	-	0.0	-	-

Scorpaenichthys marmoratus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 49.0	3.5	-	-	0.0	-	-	-	0.0	-	0.8	-	-
76.7 55.0	0.0	-	-	0.0	-	-	-	0.0	-	0.7	-	-
76.7 60.0	3.0	-	-	0.0	-	-	-	0.0	-	2.0	-	-
76.7 70.0	5.2	-	-	0.0	-	-	-	0.0	-	0.0	-	-
80.0 51.0	0.0	-	-	0.0	-	-	-	0.0	-	1.7	-	-
80.0 55.0	-	-	-	0.0	-	-	-	0.0	-	1.4	-	-
80.0 60.0	7.5	-	-	0.0	-	-	-	0.0	-	0.0	-	-
80.0 90.0	3.3	-	-	0.0	-	-	-	0.0	-	0.0	-	-
83.3 40.6	0.8	-	-	0.0	-	-	-	0.0	-	-	-	-
83.3 42.0	0.0	-	-	2.8	-	-	-	1.5	-	0.0	-	-
83.3 51.0	0.0	-	-	0.0	-	-	-	-	-	0.9	-	-
83.3 55.0	0.8	-	-	0.8	-	-	-	0.0	-	0.0	-	-
83.3 60.0	1.8	-	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 35.0	6.9	-	-	0.0	-	-	-	0.0	-	0.0	-	-
86.7 40.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
86.7 45.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-
86.7 60.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
90.0 37.0	0.7	-	-	0.0	-	-	-	0.0	-	0.0	-	-
90.0 53.0	5.6	-	-	0.0	-	-	-	0.0	-	0.0	-	-
90.0 60.0	2.6	-	-	0.0	-	-	-	0.0	-	0.0	-	-
93.3 30.0	0.0	-	-	1.8	-	-	-	0.0	-	0.0	-	-
93.3 35.0	0.8	-	-	0.0	-	-	-	0.0	-	0.0	-	-
93.3 40.0	0.0	-	-	3.0	-	-	-	0.0	-	0.0	-	-

***Howella* spp.**

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

TABLE 4. (cont.)

Trachurus symmetricus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 70.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
76.7 90.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
80.0 80.0	0.0	-	-	3.1	-	-	-	0.0	-	0.0	-	-
80.0 90.0	0.0	-	-	2.5	-	-	-	0.0	-	0.0	-	-
83.3 70.0	0.0	-	-	9.1	-	-	-	0.0	-	0.0	-	-
83.3 80.0	0.0	-	-	14.1	-	-	-	0.0	-	0.0	-	-
83.3 90.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
83.3 110.0	0.0	-	-	0.0	-	-	-	1.8	-	0.0	-	-
86.7 60.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
86.7 90.0	0.0	-	-	3.3	-	-	-	0.8	-	0.0	-	-
90.0 37.0	0.0	-	-	0.0	-	-	-	0.8	-	0.0	-	-
90.0 70.0	0.0	-	-	0.9	-	-	-	0.0	-	0.0	-	-
90.0 80.0	0.0	-	-	2.6	-	-	-	0.0	-	0.0	-	-
93.3 70.0	0.0	-	-	0.7	-	-	-	0.0	-	0.0	-	-
93.3 80.0	0.0	-	-	0.7	-	-	-	0.0	-	0.0	-	-

Medialuna californiensis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
93.3 30.0	0.0	-	-	0.0	-	-	-	0.0	-	3.1	-	-
93.3 45.0	0.0	-	-	0.0	-	-	-	0.0	-	0.7	-	-

Chromis punctipinnis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 33.0	0.0	-	-	0.0	-	-	-	0.9	-	0.9	-	-
86.7 35.0	0.0	-	-	0.0	-	-	-	0.0	-	1.8	-	-
90.0 28.0	0.0	-	-	0.0	-	-	-	0.0	-	2.5	-	-
90.0 35.0	0.0	-	-	0.0	-	-	-	0.9	-	0.0	-	-
90.0 53.0	0.0	-	-	0.0	-	-	-	0.8	-	0.0	-	-
93.3 26.7	0.0	-	-	0.0	-	-	-	3.7	-	0.0	-	-
93.3 30.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
93.3 40.0	0.0	-	-	0.0	-	-	-	0.7	-	0.0	-	-

Oxyjulis californica

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
93.3 28.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-

TABLE 4. (cont.)

***Rathbunella* spp.**

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

Neoclinus blanchardi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 33.0	0.0	-	-	1.0	-	-	-	0.0	-	0.0	-	-

***Hypsoblennius* spp.**

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	-	-
83.3 40.6	0.0	-	-	0.0	-	-	-	0.8	-	-	-	-
86.7 33.0	0.0	-	-	0.0	-	-	-	0.9	-	0.0	-	-

Hypsoblennius gentilis

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 55.0	-	-	-	0.0	-	-	-	0.0	-	0.7	-	-
86.7 33.0	0.0	-	-	0.0	-	-	-	14.0	-	0.0	-	-
86.7 35.0	0.0	-	-	0.0	-	-	-	27.9	-	0.0	-	-

Hypsoblennius gilberti

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 60.0	0.0	-	-	0.0	-	-	-	1.1	-	0.0	-	-
80.0 51.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
83.3 42.0	0.0	-	-	0.0	-	-	-	1.5	-	0.0	-	-
86.7 33.0	0.0	-	-	0.0	-	-	-	2.6	-	0.0	-	-
86.7 35.0	0.0	-	-	0.0	-	-	-	12.5	-	0.0	-	-
86.7 50.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
86.7 60.0	0.0	-	-	0.0	-	-	-	0.8	-	0.0	-	-
93.3 30.0	0.0	-	-	0.0	-	-	-	0.9	-	0.0	-	-

Hypsoblennius jenkinsi

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 55.0	0.0	-	-	0.0	-	-	-	0.0	-	1.5	-	-
80.0 55.0	-	-	-	0.0	-	-	-	0.0	-	0.7	-	-
83.3 42.0	0.0	-	-	0.0	-	-	-	3.6	-	0.0	-	-
83.3 51.0	0.0	-	-	0.0	-	-	-	-	-	0.9	-	-
86.7 33.0	0.0	-	-	0.0	-	-	-	4.4	-	1.8	-	-
86.7 35.0	0.0	-	-	0.0	-	-	-	26.0	-	7.1	-	-

TABLE 4. (cont.)

Hypsoblennius jenkinsi (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
90.0 28.0	0.0	-	-	0.0	-	-	-	0.0	-	5.0	-	-
90.0 30.0	0.0	-	-	0.0	-	-	-	0.0	-	2.1	-	-
93.3 30.0	0.0	-	-	0.0	-	-	-	1.7	-	0.0	-	-
93.3 35.0	0.0	-	-	0.0	-	-	-	11.0	-	0.0	-	-

Coryphopterus nicholsii

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 55.0	0.0	-	-	0.0	-	-	-	0.8	-	0.0	-	-

Typhlogobius californiensis

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

Tetragonurus cuvieri

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 100.0	0.0	-	-	0.0	-	-	-	3.2	-	0.9	-	-
80.0 100.0	0.0	-	-	0.0	-	-	-	4.6	-	0.0	-	-
83.3 80.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
86.7 90.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
90.0 70.0	0.0	-	-	0.0	-	-	-	0.0	-	0.7	-	-
90.0 80.0	0.0	-	-	0.0	-	-	-	0.0	-	1.6	-	-
90.0 100.0	0.0	-	-	0.0	-	-	-	0.0	-	0.6	-	-
90.0 110.0	0.0	-	-	0.0	-	-	-	0.9	-	0.0	-	-
90.0 120.0	0.0	-	-	0.0	-	-	-	3.0	-	0.0	-	-
93.3 55.0	0.0	-	-	0.0	-	-	-	0.0	-	0.7	-	-
93.3 70.0	0.0	-	-	0.0	-	-	-	0.0	-	14.3	-	-
93.3 100.0	0.0	-	-	-	-	-	-	1.0	-	0.0	-	-

Citharichthys sordidus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 45.0	0.0	-	-	1.7	-	-	-	0.0	-	0.0	-	-

Citharichthys stigmaeus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
76.7 70.0	1.3	-	-	0.0	-	-	-	0.0	-	0.0	-	-
80.0 60.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
83.3 60.0	1.8	-	-	0.0	-	-	-	0.0	-	0.0	-	-

TABLE 4. (cont.)

Citharichthys stigmaeus (cont.)

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
86.7 45.0	0.0	-	-	45.4	-	-	-	0.0	-	0.0	-	-
86.7 50.0	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-
90.0 60.0	1.3	-	-	0.0	-	-	-	0.0	-	0.0	-	-

Paralichthys californicus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
81.8 46.9	0.0	-	-	0.0	-	-	-	0.0	-	0.8	-	-

Pleuronichthys coenosus

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
83.3 42.0	0.0	-	-	2.8	-	-	-	0.0	-	0.0	-	-
86.7 40.0	0.0	-	-	1.7	-	-	-	0.0	-	0.0	-	-
90.0 35.0	0.0	-	-	0.8	-	-	-	0.0	-	0.0	-	-
90.0 37.0	0.0	-	-	1.8	-	-	-	0.0	-	0.0	-	-

Pleuronichthys decurrens

Station	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
80.0 70.0	0.0	-	-	0.0	-	-	-	0.0	-	0.7	-	-
86.7 45.0	0.0	-	-	2.6	-	-	-	0.0	-	0.0	-	-

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