

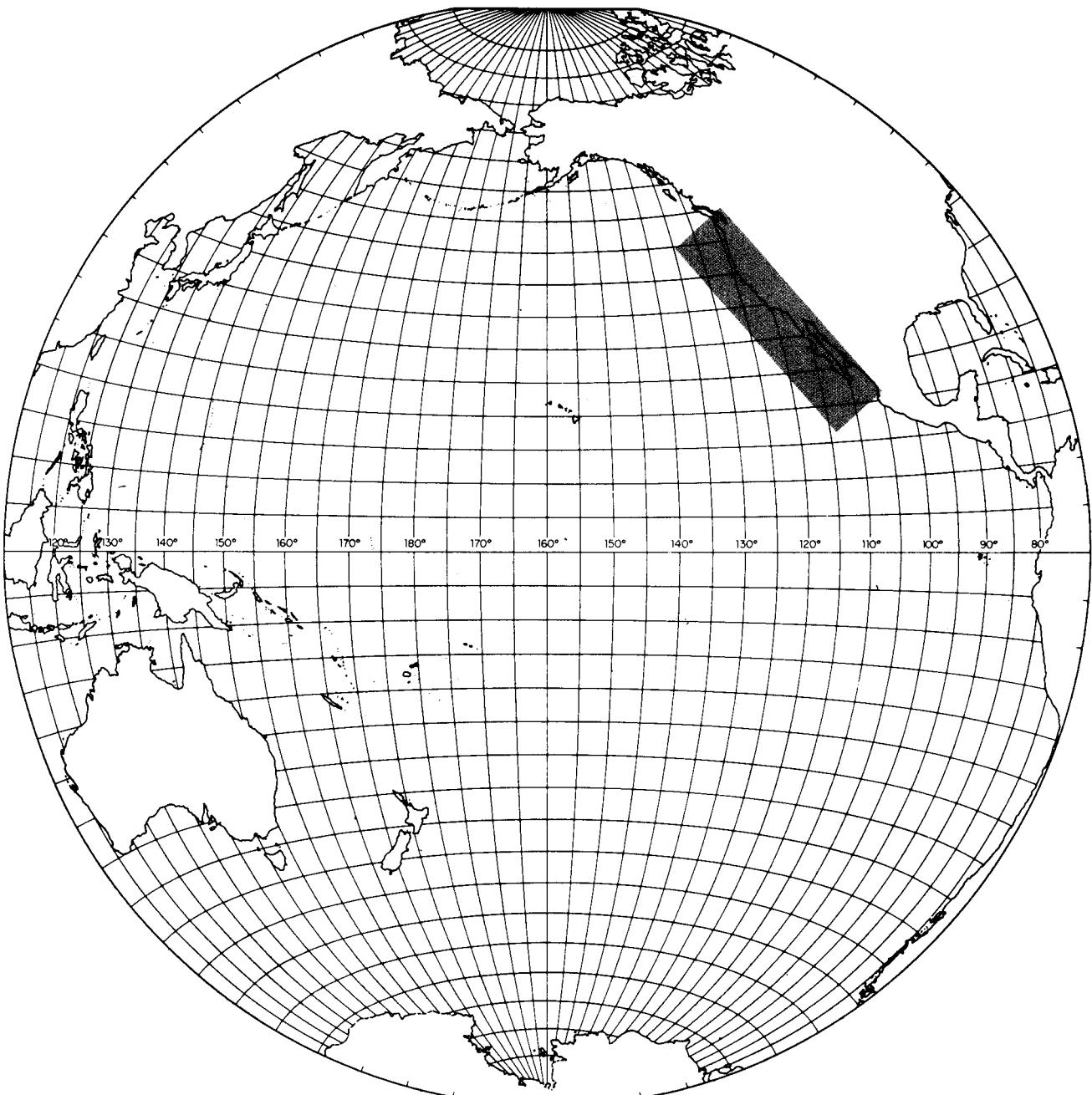


Atlas 34: Moser, H. G., R. L. Charter, P. E. Smith, D. A. Ambrose, W. Watson, S. R. Charter, and E. M. Sandknop. Distributional atlas of fish larvae and eggs in the Southern California Bight region: 1951-1998. Published March 2001.

23 May 2007

References to the data, published in annual ichthyoplankton data reports are given in the introduction to the Atlas. In addition, these data are available in PDF format on the SWFSC web site at <http://swfsc.noaa.gov/publications/swcpub/qryPublications.asp>, enter "ichthyoplankton" in the Subject line and "California Cooperative Oceanic Fisheries Investigations" in the Title line. Checking the ALL YEARS button will produce the entire list of available data.

The report for each year usually is published about 7-9 months after the fall cruise, and includes notes about nomenclature changes, etc. The ultimate goal is to update the old ichthyoplankton identifications to current standards; the database is updated as re-identifications for each cruise are completed.



# **CALIFORNIA COOPERATIVE OCEANIC FISHERIES INVESTIGATIONS**

**ATLAS No. 34**

CALIFORNIA  
COOPERATIVE  
OCEANIC  
FISHERIES  
INVESTIGATIONS

*Atlas No. 34*

*Cooperating Agencies:*

CALIFORNIA DEPARTMENT OF FISH AND GAME  
NATIONAL OCEANOGRAPHIC AND ATMOSPHERIC ADMINISTRATION, NATIONAL MARINE FISHERIES SERVICE  
UNIVERSITY OF CALIFORNIA, SCRIPPS INSTITUTION OF OCEANOGRAPHY

MARCH, 2001

## THE CALCOFI ATLAS SERIES

This is the thirty-fourth in a series of atlases containing data on the hydrography and plankton from the region of the California Current. The field work was carried out by the California Cooperative Oceanic Fisheries Investigations<sup>1</sup>, a program sponsored by the following agencies:

California Department of Fish and Game  
National Oceanic and Atmospheric Administration, National Marine Fisheries Service  
University of California, Scripps Institution of Oceanography

CalCOFI atlases<sup>2</sup> are issued as individual units as they become available. They provide processed physical, chemical and biological measurements of the California Current region. Each number may contain one or more contributions. A general description of the CalCOFI program with its objectives appears in the preface of Atlas No. 2.

CalCOFI Atlas Editorial Board:

Elizabeth L. Venrick  
Richard A. Neal  
Laura Rogers-Bennett

CalCOFI Coordinator:

Kevin T. Hill

CalCOFI atlases in this series, through May 1996 are:

- No. 1. Anonymous, 1963. CalCOFI atlas of 10-meter temperatures and salinities 1949–1959.
- No. 2. Fleminger, A. 1964. Distributional atlas of calanoid copepods in the California Current region, Part I.
- No. 3. Alvariño, A. 1965. Distributional atlas of Chaetognatha in the California Current region.
- No. 4. Wyllie, J. G. 1966. Geostrophic flow of the California Current at the surface and at 200 meters.
- No. 5. Brinton, E., 1967. Distributional atlas of Euphausiacea (Crustacea) in the California Current region , Part I.
- No. 6. McGowan, J. A. 1967. Distributional atlas of pelagic molluscs in the California Current region.
- No. 7. Fleminger, A. 1967. Distributional atlas of calanoid copepods in the California Current region, Part II.
- No. 8. Berner, L. D. 1967. Distributional atlas of Thaliacea in the California Current region.
- No. 9. Kramer, D. and E. H. Ahlstrom. 1968. Distributional atlas of fish larvae in the California Current region: northern anchovy, *Engraulis mordax* (Girard), 1951–1965.
- No. 10. Isaacs, J. D., A. Fleminger, and J. K. Miller. 1969. Distributional atlas of zooplankton biomass in the California Current region: Spring and Fall, 1955–1959.
- No. 11. Ahlstrom, E. H. 1969. Distributional atlas of fish larvae in the California Current region: jack mackerel, *Trachurus symmetricus*, and Pacific hake, *Merluccius productus*, 1951–1959.
- No. 12. Kramer, D. 1970. Distributional atlas of fish eggs and larvae in the California Current region: Pacific sardine, *Sardinops caerulea* (Girard), 1951–1966.
- No. 13. Smith, P. E. 1971. Distributional atlas of zooplankton volume in the California Current region, 1951–1966.
- No. 14. Isaacs, J. D., A. Fleminger, and J. K. Miller. 1971. Distributional atlas of zooplankton biomass in the California Current region: Winter, 1955–1959.

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<sup>1</sup> Usually abbreviated CalCOFI, sometimes CALCOFI

<sup>2</sup> For citation this issue in the series should be referred to as CalCOFI Atlas No. 34. Library of Congress Catalog Card Number 67-4236.

- No. 15. Wyllie, J. G. and R. J. Lynn. 1971. Distribution of temperature and salinity at 10 meters, 1960–1969 and mean temperature, salinity and oxygen at 150 meters, 1950–1968 in the California Current.
- No. 16. Crowe, F. J. and R. A. Schwartzlose, 1972. Release and recovery records of drift bottles in the California Current region, 1955–1971.
- No. 17. Ahlstrom, E. H. 1972. Distributional atlas of fish larvae in the California Current region: six common mesopelagic species –*Vinciguerria lucetia*, *Triphoturus mexicanus*, *Stenobrachius leucopsarus*, *Leuroglossus stilibius*, *Bathylagus wesethi*, and *Bathylagus ochotensis*, 1955–1960.
- No. 18. Brinton, E. 1973. Distributional atlas of Euphausiacea (Crustacea) in the California Current region, Part II.
- No. 19. Bowman, T. E. and M. W. Johnson. 1973. Distributional atlas of calanoid copepods in the California Current region, 1949 and 1950.
- No. 20. Thomas, W. H. and D.L. R. Seibert. 1974. Distribution of nitrate, nitrite, phosphate, and silicate in the California Current region, 1969.
- Owen, R. W., Jr. 1974. Distribution of primary production, plant pigments and Secchi depth in the California Current region, 1969.
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- No. 24. Brinton, E. and J. G. Wyllie. 1976. Distributional atlas of euphausiid growth stages off southern California, 1953–1956.
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- No. 26. Ahlstrom, E. H., H. G. Moser, and E. M. Sandknop. 1978. Distributional atlas of fish larvae in the California Current region: rockfishes, *Sebastodes* spp., 1950–1975.
- No. 27. Namias, J. 1979. Northern hemisphere seasonal 700 mb height and anomaly charts, 1947–1978, and associated North Pacific sea surface temperature anomalies.
- No. 28. Hewitt, R., 1980. Distributional atlas of fish larvae in the California Current region: northern anchovy, *Engraulis mordax* (Girard), 1966–1979.
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- No. 30. Lynn, R. J., K. A. Bliss, and L. E. Eber. 1982. Vertical and horizontal distributions of seasonal mean temperature, salinity, sigma-t, stability, dynamic height, oxygen, and oxygen saturation in the California Current, 1950–1978.
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- No. 32. 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, 1951–1984.
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- No. 34. Moser, H. G., R. L. Charter, P. E. Smith, D. A. Ambrose, W. Watson, S. R. Charter, and E. M. Sandknop. 2001. Distributional atlas of fish larvae and eggs in the Southern California Bight region: 1951–1998.

**DISTRIBUTIONAL ATLAS OF FISH LARVAE AND EGGS IN THE SOUTHERN  
CALIFORNIA BIGHT REGION: 1951–1998**

**Moser, H. G., R. L. Charter, P. E. Smith, D. A. Ambrose, W. Watson,  
S. R. Charter, and E. M. Sandknop**

**CalCOFI ATLAS NO. 34**

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# DISTRIBUTIONAL ATLAS OF FISH LARVAE AND EGGS IN THE SOUTHERN CALIFORNIA BIGHT REGION: 1951–1998

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## Introduction

This atlas summarizes the spatial and temporal distribution and abundance of 160 ichthyoplankton taxa or categories collected in plankton net tows on California Cooperative Oceanic Fisheries Investigations (CalCOFI) biological-oceanographic survey cruises in the Southern California Bight (SCB) region from 1951 to 1998. CalCOFI Atlases 31 and 32 presented distributional summaries for all taxa taken on surveys that covered the greater CalCOFI sampling area (Figure 1) extending from northern California to Cabo San Lucas, Mexico during 1951–1984. In 1985 the survey pattern was limited to 66 standard stations in the Southern California Bight region (Figure 2). Since 1985 annual surveys have been conducted on this pattern on a quarterly

basis. Ichthyoplankton and station data for all cruises from 1951 to 1998 are listed in a series of 38 data reports (Table 1).

Historically, the Southern California Bight has been the most frequently occupied region of the overall CalCOFI survey pattern. A total of 254 CalCOFI survey cruises sampled this part of the CalCOFI survey pattern from 1951 to 1998. Temporal coverage was most consistent during the early years of the surveys (1951–1960) when cruises generally were conducted at monthly intervals each year (Table 2). From 1961 to 1965 the surveys were annual with quarterly cruises that included six to eight months of the year. From 1966 to 1984 CalCOFI surveys were conducted triennially, typically with eight to eleven months represented in the samples. Since 1985, surveys have been annual with quarterly cruises that include samples from four to seven months each year.

The charts and graphs in this atlas display information on distribution, abundance, and occurrence of each taxon in the context of the major changes in ocean climate that characterize the California Current region, one of the most oceanographically and zoogeographically complex regions in the world ocean. The CalCOFI sampling grid overlays the California Current, three coastal zoogeographic provinces (Oregonian, San Diegan, and Panamic), a coastal upwelling zone, and three oceanic water masses (Subarctic, Pacific Central, and equatorial water of the eastern tropical Pacific) (Moser 1996). These water masses converge in the SCB region where complexity is heightened by a

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field of mesoscale eddies that extends from the inner margin of the California Current into the Bight, an undercurrent flowing poleward along the slope, a poleward flowing inshore countercurrent, and a persistent frontal zone (Ensenada Front) at the southwest corner of the Bight (Lynn and Simpson 1987; Haury et al. 1993). The inner third of the present CalCOFI survey pattern overlies the continental borderland off southern California, a region of complex topography that includes the mainland continental shelf and slope, ~13 deep-water basins, and numerous islands and banks and their shelves. The islands and banks extend coastal habitats >100 n.m. offshore and the basins provide deep-water habitats and zoogeographic refugia for a wealth of midwater species.

The cyclic warming and cooling of equatorial waters, known as the El Niño/Southern Oscillation (ENSO), has produced a series of El Niños (1957–58, 1963, 1982–83, 1993, and 1997) and La Niñas (1954–56, 1988–89, 1999) in the California Current region (Figure 3). A tightly grouped series of La Niñas between May 1970 and March 1976 produced prolonged cold ocean temperatures in the CalCOFI survey region. ENSO episodes are embedded in a low frequency oscillation in the North Pacific, known as the Pacific Decadal Oscillation (PDO), that is related to basin scale changes in atmospheric pressure, particularly the intensification and position of the Aleutian Low Pressure System (Mantua et al. 1997; Hollowed et al. 1998; Schwing et al., in press.). The resulting 20–30 year cooling and warming cycle produced two cool ocean regimes (1900–1924 and 1947–1976) and two warm regimes (1925–1946 and 1977–1999) during the past century. Among the apparent biological consequences of these regime shifts are basin-wide changes in primary and secondary production and in the abundance of eastern Pacific fish stocks (Figure 3). Production in the California Current region decreased dramatically after the regime shift of 1977 (Brodeur and Ware 1992; Roemmich and McGowan 1995a, b; Ware 1995; Hayward 1997; McGowan et al. 1998) as did groundfish and salmon stocks (Francis and Hare 1994; Mantua et al. 1997;

Francis et al. 1998; Hollowed et al. 1998). Major shifts occurred in the distributions of larval fishes in response to ENSO events and the PDO, as the boundaries between subarctic and equatorial water masses shifted latitudinally and intrusion of central water into the SCB region waxed and waned (Moser et. al. 1987; Smith and Moser 1988). A principal goal for this atlas is to present the distributional information in a format that permits the reader to interpret, in general terms, the affects that these high and low frequency changes in ocean conditions may have had on larval fish populations in the SCB during the past 50 years.

The time series for this atlas is composed of 11,472 net tows taken during 1951–1998 within the boundaries of the present CalCOFI survey. These include all standard CalCOFI survey tows taken since 1985 when occupancy of the present pattern was initiated. Tows used prior to 1985 are a subset from the wider ranging CalCOFI surveys (Hewitt 1988; Moser et al. 1993, 1994). On surveys prior to 1985 in the Southern California Bight nearshore stations did not always correspond to the exact positions of the 66 nominal stations used on surveys since 1985. In order to expedite the construction of the distribution maps, data for stations other than the nominal stations of the present pattern were assigned to the closest of the 66 nominal stations (Table 3).

The basic plankton tow methodology was consistent throughout the time series, double-oblique tows with a cable pay-out rate of 50 m per minute and retrieval rate of 20 m per minute at a constant wire angle; however, there was some variation in gear and maximum tow depth. Tows from 1951 through 1968 employed a 1-m ring net towed to a depth of 140 m. Beginning in 1969 the nominal tow depth was increased to 210 m and the 71-cm bongo net (McGowan and Brown 1966) replaced the ring net from the last cruise in 1977 to the present. Silk mesh (0.55 mm opening), used from 1951 to 1968, was replaced by nylon mesh (0.505 mm opening) in 1969. Detailed descriptions of gear and methods are given by Kramer et al. (1972) and Smith and Richardson (1977). Ohman and Smith (1995) summarized historical CalCOFI

zooplankton methods and calibration factors for the various gear types. Samples were preserved in 5% formalin aboard ship and returned to the laboratory where zooplankton displacement volumes (expressed as ml per 1000 m<sup>3</sup>) were determined and the fish eggs and larvae were removed (Kramer et al. 1972).

All taxa from the part of the CalCOFI time series used in this atlas are listed in rank order of abundance (number of larvae per 10 m<sup>2</sup> of sea surface) summed for all occurrences (Table 4) and in rank order of total occurrences (Table 5). These tables include 301 total larval taxa (including the unidentified and disintegrated categories). Detailed distributional summaries are presented for the larval fish taxa that had 50 or more total standardized larvae and also for five other categories: total fish larvae, total fish eggs, and the eggs of northern anchovy *Engraulis mordax*, Pacific sardine *Sardinops sagax*, and Pacific saury *Cololabis saira*. Detailed summaries were not produced for some higher taxonomic categories (genera, families, orders) that contained > 50 total larvae (Table 4) because their distributions were better represented in analyses of component taxa. In some cases taxa were combined into a higher taxonomic category in order to show the distribution and abundance of the higher category over the entire time series. For example, detailed summaries are presented for *Sebastolobus alascanus* and *S. altivelis* for 1985–1998 and also for *Sebastolobus* spp. for 1951–1998, after combining data of all three taxa (see list of caveats below).

Since 1951, fish larvae in CalCOFI samples have been identified to species or to the lowest taxon that knowledge permitted. The number of identifiable taxa increased with the improvement of taxonomic knowledge and competency. Historical identifications were evaluated thoroughly during the development of the CalCOFI ichthyoplankton computer data base in 1984–1988 and historical advances in the identification process were standardized at approximately decadal intervals. Our ability to identify larvae in the California Current region improved greatly during 1988–1995 as a result of taxonomic research that culminated in a taxonomic monograph on the ontogenetic stages of

fishes of this region (Moser 1996). This resulted in a ~ 60% increase in the number of identifiable taxa beginning in 1985. These changes, documented in previous CalCOFI ichthyoplankton data reports and atlases, are summarized briefly by the following interpretive notes and caveats:

*Anguilliformes*—this category includes all larvae of the elopomorph orders Anguilliformes, Saccopharyngiformes, and Notacanthiformes recorded from 1951 to 1998; identification of eel larvae to species began in 1985; larvae of the saccopharyngiform family Cyematidae, particularly those of *Cyema atrum*, were the most common eel taxon encountered in CalCOFI samples.

*Arctozenus risso*—the marked increase in occurrence and average abundance in the recent decade reflects intrusion of this species from central and equatorial water masses.

*Atherinidae*—identification of atherinid larvae to species began in 1985; this category is a combination of all atherinid taxa, including *Atherinops affinis*, *Atherinopsis californiensis*, and *Leuresthes tenuis*, from 1951 to 1998.

*Bathylagus pacificus*—consistently low average abundance prior to 1969 may be due to an identification problem during those years.

*Ceratoscopelus townsendi*—the steady increase during the warm regime may be due to intrusion of water from the offshore region the California Current to more coastal stations of the survey pattern.

*Chiasmodon niger*—the marked increase during the warm regime reflects intrusion of the central water mass, the principal habitat for this species.

*Citharichthys sordidus*—larvae were identified from surveys in 1954–1960 and from 1984 to the present.

*Citharichthys stigmaeus*—larvae larger than ~ 4.5 mm were identified since 1951; larvae of all sizes were identified for surveys in 1954–1960 and from

1984 to the present.

*Citharichthys xanthostigma*- larvae were identified from surveys in 1954–1960 and from 1984 to the present.

*Cololabis saira* eggs- the unusually high average abundance in 1985 is due to a single sample of 7225 eggs from station 83.51 on cruise 8502; saury deposit their eggs on floating algae or debris and occasionally these substrates and their attached eggs are taken in plankton tows.

*Cyclothona acclinidens*, *C. pseudopallida*- these are postflexion stage larvae > ~10 mm that have acquired diagnostic pigmentation; smaller larvae of the two species cannot be distinguished reliably.

*Diaphus* spp.- *Diaphus theta* is the dominant *Diaphus* species in the survey area and most of the larvae from the Southern California Bight region are this species; the generic category is used because a small proportion of the *Diaphus* larvae captured at the outer margin of the survey pattern may represent other species whose larvae are indistinguishable from those of *D. theta*.

*Diogenichthys atlanticus*- the steady increase in occurrence and average abundance in the survey pattern during the warm regime reflects the intrusion of central water inhabited by this warm water cosmopolite.

*Diogenichthys laternatus*- the enormous increase in occurrence and average abundance in 1998 (~500 and 2000%, respectively) probably represents advection of this Eastern Topical Pacific species by the unusually strong countercurrent flow developed during the 1997–98 El Niño.

*Electrona risso*- the steady increase in occurrence and average abundance in the warm regime reflects intrusion of central water, the principal habitat of this species.

*Etrumeus teres*- absence of larvae of this species in samples prior to 1963 probably reflects low nearshore sampling effort during those years.

*Glyptocephalus zachirus*- Sakamoto (1984) changed pleuronectid generic designations for species in the CalCOFI area as follows: 1) *Glyptocephalus zachirus* was changed to *Errex zachirus*; 2) *Isopsetta isolepis*, *Lepidopsetta bilineata*, and *Parophrys vetulus* were transferred into *Pleuronectes* and 3) *Lyopsetta exilis* was changed to *Eopsetta exilis*; although these changes were incorporated in the lists of Robins et al. (1991) and Eschmeyer (1998) we follow Nelson (1994) in retaining the older nomenclature because Sakamoto's (1984) changes were based on a phenetic study; also, the older names are used in the major identification guides to fishes of our region (Miller and Lea 1972, Eschmeyer et al. 1983, Matarese et al. 1989, and Moser 1996).

*Haemulidae*- identification of haemulid larvae to species began in 1985; this category is a combination of all haemulid taxa, primarily *Anisotremus davidsoni* and *Xenistius californiensis*, from 1951 to 1998.

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

*Hygophum atratum*- absence of larvae prior to 1969 may represent an identification problem during the early years of CalCOFI; the marked increase in occurrence and average abundance in 1998 probably represents advection of this Eastern Topical Pacific species by unusually strong countercurrent flow developed during the 1998 El Niño (see comment for *Diogenichthys laternatus*).

*Hygophum reinhardtii*- the steady increase in occurrence and average abundance in the survey pattern during the warm regime reflects the intrusion of central water inhabited by this warm water cosmopolite.

*Hypsypops rubicundus*- garibaldi larvae are rare in CalCOFI samples because the species is subtidal, deposits its eggs in nests, and is not abundant; the unusually high average abundance in 1965 was caused by a single sample of 600 larvae from station

93.27, cruise 6509; the next largest single sample was 25 larvae from station 90.28, cruise 6608.

*Icelinus quadriseriatus*- includes only specimens in good condition in which the diagnostic pigment pattern of this species could be discerned.

*Icelinus* spp.- may include larvae of any of the half dozen *Icelinus* species that occur in the SCB, including small, poorly preserved *I. quadriseriatus* larvae that lacked diagnostic pigment.

*Icichthys lockingtoni*- decreases in occurrence and average abundance of larvae of this subarctic-transitional species during the 1957–1959 El Niño and after the regime shift in 1976 are likely related to warm, oligotrophic ocean conditions and weaker California Current flow that prevailed during those years.

*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* (= *L. ritteri*) and *N. regale* (= *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 CalCOFI atlases these were referred to by the descriptive names *Lampanyctus* “niger” and *Lampanyctus* “no pectorals”, respectively (see Moser 1996).

*Nannobrachium bristori*- see comment for *Lampanyctus* spp.

*Nannobrachium hawaiiensis*- See comment for *Lampanyctus* spp.

*Nannobrachium regale*- see comment for *Lampanyctus* spp.

*Nannobrachium ritteri*- see comment for *Lampanyctus* spp.

*Lepidopsetta bilineata*- see comment for *Glyptocephalus zachirus*.

*Lyopsetta exilis*- see comment for *Glyptocephalus zachirus*.

Macrouridae- identification of macrourid larvae to species began in 1985; this category is a combination of all macrourid taxa, including *Albatrossia pectoralis*, *Coryphaenoides* spp., *C. acrolepis*, and *C. leptolepis*, from 1951 to 1985.

*Merluccius productus*- Pacific hake larvae are patchily distributed; the unusually high average abundance for 1986 is caused by a single sample of 116,004 larvae from station 80.55, cruise 8602.

*Microstoma* spp.- larvae of a distinct, but undescribed microstomatid species (Moser 1996).

*Myctophum nitidulum*- larvae of this warm water cosmopolite show a trend of increasing occurrence and average abundance following the regime shift in 1977, reflecting intrusion of tropical/subtropical water into the SCB.

*Notolychnus valdiviae*- larval occurrence and average abundance of this circumglobal warm water species were generally higher following the regime shift in 1977; the intrusion of larvae into the SCB during the warm regime is apparent in the distribution charts.

*Paralabrax* spp.- includes larvae of all *Paralabrax* species that occur in the region; relatively low average abundance during 1951–1962 may be a result of low nearshore sampling effort prior to 1963.

*Paralichthys californicus*- relatively low average abundance prior to 1963 may be due to low nearshore sampling effort during those years.

*Parophrys vetulus*- see comment for *Glyptocephalus zachirus*.

*Parvilux ingens*- identification of this species began in 1969 but was inconsistent until 1985.

*Pleuronichthys ritteri*— absence of larvae from 1951 to 1957 may be due to an identification problem during the early years of CalCOFI.

*Poromitra* spp.— identification of *Poromitra* larvae to species began in 1985; this category is a combination of *Poromitra* spp., *P. crassiceps*, and *P. megalops*; nearly all records of this genus in the SCB are *P. crassiceps*.

*Rathbunella* spp.— a combination of all *Rathbunella* larvae, including those identified as *R. allenii*.

*Sciaenidae*— species identification of sciaenids began in 1981; this is a combination of all sciaenid taxa, including *Atractoscion regalis*, *Cheilotrema saturnum*, *Genyonemus lineatus*, *Menticirrhus undulatus*, *Roncador stearnsii*, and *Seriphus politus*, from 1951 to 1998; relatively low average abundance prior to 1963 may be related to low nearshore sampling effort during those years.

*Scopelarchus* spp.— identification of larvae of this genus began in 1972 and species identification was initiated in 1985; this is a combination of all *Scopelarchus* larvae, including *S. analis* and *S. guentheri*, from 1972 to 1998.

*Scopeloberyx robustus*— the generally higher larval occurrence and average abundance of this central water mass species after the regime shift are related to intrusion of central water into the SCB.

*Scopelogadus bispinosus*— higher occurrence and average abundance after the regime shift reflect expansion of this tropical species to the SCB.

*Scopelosaurus* spp.— according to Balanov and Savinykh (1999) there are two valid species of this genus in the north Pacific, *S. adleri* and *S. harryi*, but only the former spawns in the California Current region; the generic designation is used here since we have not yet reexamined the historical CalCOFI samples to confirm the findings of Balanov and Savinykh (1999).

*Sebastodes diploproa*— larvae of this species were not

identified for the years 1972–1986.

*Sebastes goodei*— larvae of this species were identified and verified only for the years 1951–1969.

*Sebastes* spp.— unidentified larvae of *Sebastes*, excluding larvae of *S. aurora*, *S. jordani*, *S. levis*, and *S. paucispinis* and including larvae of *S. goodei* for the years 1972–1998 and *S. diploproa* for the years 1972–1986.

*Sebastolobus alascanus*— includes larvae >~10 mm for the years 1985–1998.

*Sebastolobus altivelis*— includes larvae >~10 mm for the years 1985–1998.

*Sebastolobus* spp.— this is a combination of all *Sebastolobus* larvae for the years 1951–1998, including specimens of *S. alascanus* and *S. altivelis* >10 mm identified for the years 1985–1998.

*Syngnathus* spp.— although this category was included in CalCOFI Atlases 31 and 32, it was included only in Tables 4 and 5 in this atlas; since 1985, all syngnathids captured in CalCOFI survey tows have been categorized as juvenile fish; pipefish larvae are brooded in a pouch in the male and most are released as small juveniles; newly released young of some species may have residual yolk and incompletely formed fins and are larvae, however, a thorough review of historical specimens would be necessary to determine which specimens included in the previous atlases were larvae and which were juveniles; this category includes all pipefishes: *Bryx*, *Doryrhamphus*, and *Syngnathus* species.

*Tarletonbeania crenularis*— decreases in occurrence and average abundance of larvae of this subarctic-transitional species during the 1957–1959 El Niño and after the regime shift in 1967 are likely related to warm, oligotrophic ocean conditions and weaker California Current flow during those years.

*Trachipteridae*— a combination of all trachipterid taxa; nearly all records of Trachipteridae larvae in the SCB are *Trachipterus altivelis*.

*Triphoturus mexicanus*—the general increase in occurrence and average abundance following the regime shift represents the influence of warm water in the SCB region, conducive to the presence of this subtropical species.

*Vinciguerria lucetia*—*V. lucetia*, an eastern tropical Pacific species, is common in the present CalCOFI survey 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.

*Vinciguerria poweriae*—includes larvae that have developed pigment diagnostic for this species.

### Explanation of Charts and Graphs

The distributions are summarized in a series of charts and graphs, one page per taxon. Abundance of larvae or eggs is expressed as the number per 10 m<sup>2</sup> of sea surface and occurrence is expressed as the proportion of positive tows for larvae or eggs of a particular taxon. For taxa represented by a full time series (1951–1998) the upper left panel is a map of mean abundance at individual CalCOFI stations within the boundaries of the present survey pattern prior to the regime shift in 1977. The upper right panel is a map of mean abundance at these stations for the years following the regime shift (1977–1998). For taxa with time series limited to the warm regime the distribution is represented by a single map in the upper right panel. The range of years used to calculate the average values for each station are given on the maps and in Table 6. The total standardized number of larvae represented in each map is listed on the map below the range of years. The middle left panel is a graph of seasonal occurrence for the stations where the taxon occurred consistently within the survey area (see Table 6 for the range of stations used in these calculations). The middle right panel is a graph of mean seasonal abundance for the stations where the taxon occurred consistently within the survey area (see Table 6). The lower left panel is a graph of annual occurrence during the principal spawning period at the stations

where the taxon occurred consistently within the survey area (see Table 6 for the range of months used in these calculations). The lower right panel is a graph of mean annual abundance during the principal spawning period of the taxon for the stations where its larvae were consistently found within the survey area (see Table 6). The cool and warm regimes of the Pacific Decadal Oscillation (PDO) are indicated on each of these graphs and El Niño/Southern Oscillation (ENSO) events are indicated by vertical bars (El Niño, shading; La Niña, hatching; the wide hatched bar represents a series of three consecutive La Niñas between May 1970 and March 1976). The dashed line indicates the period of triennial CalCOFI surveys when CalCOFI surveys were conducted on a triennial basis (1966–1984). Six cruises were conducted in the SCB in non-survey years 1967, 1968, 1974, 1977, and 1980. Data from these cruises were used in calculating seasonal occurrence and average seasonal abundance but were not used in constructing the graphs that show inter-annual occurrence and abundance.

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This atlas is dedicated to the memory of Michael Mullin who served on the CalCOFI Committee for many years and whose contributions to marine science and graduate education will remain forever bright. The atlas is a result of the dedicated efforts of many people. We are indebted to the founders of the CalCOFI program and the many scientists, technicians, and ships' crews who have carried out the surveys. We are especially indebted to David Griffith, Ronald Dotson, and Amy Hays, who conducted the plankton collections during CalCOFI survey cruises for the past decade or more and who are responsible for the high quality of the net tows and associated data and for the excellent condition of the fish eggs and larvae captured in the nets. Elbert H. Ahlstrom's vision and dedicated effort at the beginnings of CalCOFI provided the foundation for a faunal approach to ichthyoplankton studies. Amy Hays and Susan Manion were responsible for entry of data into the ichthyoplankton data base. We are especially grateful for Susan Jacobson's assistance in constructing computer files for the

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Table 1. List of ichthyoplankton data reports for CalCOFI surveys from 1951 to 1998. Citations for each report are included in the Literature Cited section of this atlas.

Survey Year	Senior Author	Publication Year
1951	Ambrose et al.	1987a
1952	Sandknop et al.	1987a
1953	Stevens et al.	1987a
1954	Sumida et al.	1987a
1955	Ambrose et al.	1987b
1956	Stevens et al.	1987b
1957	Sumida et al.	1987b
1958	Sandknop et al.	1987b
1959	Stevens et al.	1987c
1960	Ambrose et al.	1987c
1961	Sandknop et al.	1988a
1962	Sumida et al.	1988a
1963	Ambrose et al.	1988a
1964	Sandknop et al.	1988b
1965	Stevens et al.	1988a
1966	Sumida et al.	1988b
1967	Ambrose et al.	1988b
1968	Sandknop et al.	1988c
1969	Stevens et al.	1988b
1972	Sumida et al.	1988c
1975	Ambrose et al.	1988c
1978	Sandknop et al.	1988d
1981	Ambrose et al.	1988d
1984	Stevens et al.	1990
1985	Ambrose et al.	1999a
1986	Charter et al.	1999a
1987	Sandknop et al.	1999a
1988	Watson et al.	1999a
1989	Ambrose et al.	1999b
1990	Charter et al.	1999b
1991	Sandknop et al.	1999b
1992	Watson et al.	1999b
1993	Ambrose et al.	1999c
1994	Charter et al.	1999c
1995	Sandknop et al.	1999c
1996	Watson et al.	1999c
1997	Ambrose et al.	1999d
1998	Charter et al.	1999d

Table 2. Total CalCOFI stations used in this atlas, listed by month and year.

Year	Month												Total
	1	2	3	4	5	6	7	8	9	10	11	12	
1951	34	28	24	37	35	30	21	25	29	15	19	14	311
1952	22	22	20	39	42	59	31	20	20	18	19		312
1953	28	29	29	51	60	48	39	33	12	17	12	23	381
1954	38	33	32	47	47	43	34		35	34		30	373
1955	24	22	27	35	42	46	45			31	4	22	298
1956	26	28	37	41	68	32	52		15	30	23	35	387
1957		33	34	40	50	51	48			36	35	18	345
1958	23	38	42	49	51	51	50		49	50	31	33	467
1959	41	59	27	51	54	50	50	48	27	50	39	43	539
1960	57	52	58	41	36	47	45	28	7	39			410
1961	21	33		51		7	43			51			206
1962	21	30	9	41			30	16		43	7		197
1963	23	35		52	11		51			53			225
1964	23	47		60		22	45			55			252
1965	61		2	59		35	27	5	45				234
1966	14	76	22	30	57	54	52	48	47	57		55	512
1967						40	11						51
1968	56					51							107
1969	58	60	2	51	54		58	21	32	58	25	29	448
1972	48	56	59	18			53		11	2	5		252
1974											43	33	76
1975	69	5	88		75	27	47			48	27	40	426
1977												47	47
1978	74	39	48	56	64	28	51	65					425
1980										29	24		53
1981	53	32	19	97	58		53						312
1984	59	43	17	56	29	31	59			55			349
1985		43	8		52			56			55		214
1986	2	52			55				50	6	57		222
1987			62	3	63				64		62		254
1988	60	4		10	42			66		66			248
1989	53	10		64			59	5			66		257
1990			58	49			31	34			66		238
1991	61	12	42				36	30	13	50			244
1992	16	45		66			66		22	42			257
1993	66		9	57				65		66			263
1994	43	22	38	28				66	4	60			261
1995	64			55			66			66			251
1996	10	55		58	2			66		61	4		256
1997	13	53		62			66		45	13			252
1998	38	25		65			66		66				260
Total	1299	1121	813	1519	1047	752	1385	697	593	1172	628	446	11472

Table 3. Total CalCOFI stations used in this atlas, listed by line and station numbers.

Station	Line						Total
	77	80	82	83	87	90	
27						214	214
28					247	162	409
30					278	233	511
33				181			181
35				229	63	189	481
37					231		231
40				214		230	444
40.6				221			221
42				239			239
45					195	229	608
46.9			174				174
49	159						159
50					205		435
51	115	272		255			642
53						287	287
55	198	240		196	192		1001
60	140	226		215	210	238	216
70	126	216		171	168	221	193
80	114	215		158	160	205	183
90	104	206		149	150	200	170
100	51	100		56	56	128	106
110				44	43	76	63
120						91	67
Total	1007	1475	174	1704	2003	2494	2615
							11472

Table 4. Ranked abundance of larval fish taxa in the present CalCOFI survey pattern. The total for each taxon is the summed count (larvae per 10 m<sup>2</sup> of sea surface, adjusted for percentage of sample sorted) for all recorded occurrences from 1951 through 1998.

Rank	Taxon	Total	Rank	Taxon	Total
1	<i>Engraulis mordax</i>	2973739.4	41	Gobiidae	4952.5
2	<i>Merluccius productus</i>	845487.9	42	Sternopychidae	4794.5
3	<i>Leuroglossus stilbius</i>	364342.2	43	<i>Lestidiops ringens</i>	4225.1
4	<i>Sebastes</i> spp.	309874.7	44	<i>Parophrys vetulus</i>	3887.1
5	<i>Vinciguerria lucetia</i>	238387.6	45	<i>Lyopsetta exilis</i>	3704.5
6	<i>Stenobrachius leucopsarus</i>	223842.4	46	<i>Tetragonurus cuvieri</i>	3637.5
7	<i>Sardinops sagax</i>	105958.2	47	<i>Sebastes aurora</i>	3460.9
8	<i>Trachurus symmetricus</i>	81852.0	48	<i>Chromis punctipinnis</i>	3364.9
9	<i>Sebastes jordani</i>	69856.9	49	<i>Paralabrax</i> spp.	3339.1
10	<i>Bathylagus ochotensis</i>	49994.2	50	<i>Paralichthys californicus</i>	3248.4
11	Sciaenidae	37904.4	51	Cottidae	3165.4
12	<i>Triphoturus mexicanus</i>	36949.2	52	<i>Bathylagus</i> spp.	3099.7
13	<i>Bathylagus wesethi</i>	34212.9	53	<i>Hypsoblennius</i> spp.	3043.4
14	<i>Protomyctophum crockeri</i>	30484.4	54	<i>Argyropelecus sladeni</i>	2578.0
15	<i>Ceratoscopelus townsendi</i>	23127.8	55	<i>Sphyraena argentea</i>	2564.2
16	<i>Citharichthys stigmaeus</i>	21693.1	56	<i>Pleuronichthys verticalis</i>	2434.2
17	<i>Nannobrachium ritteri</i>	21102.5	57	<i>Danaphos oculatus</i>	2420.2
18	<i>Tarletonbeania crenularis</i>	20002.4	58	<i>Microstoma</i> spp.	2368.3
19	<i>Diogenichthys atlanticus</i>	18810.2	59	<i>Peprilus simillimus</i>	2309.1
20	<i>Citharichthys</i> spp.	18746.2	60	<i>Nannobrachium regale</i>	2289.8
21	<i>Scomber japonicus</i>	17996.0	61	Labridae	2282.4
22	<i>Sebastes paucispinis</i>	17561.1	62	<i>Stomias atriventer</i>	2176.1
23	<i>Symbolophorus californiensis</i>	15958.0	63	<i>Sebastolobus</i> spp.	2172.2
24	<i>Cyclothona signata</i>	15274.7	64	<i>Melamphaes lugubris</i>	2017.8
25	<i>Lampanyctus</i> spp.	15263.7	65	<i>Bathylagus pacificus</i>	2011.9
26	<i>Genyonemus lineatus</i>	14222.1	66	<i>Sebastes goodei</i>	1987.9
27	Disintegrated fish larvae	12712.1	67	<i>Seriphis politus</i>	1900.8
28	<i>Citharichthys sordidus</i>	12610.5	68	<i>Coryphopterus nicholsii</i>	1799.6
29	<i>Diaphus</i> spp.	12504.7	69	Paralepididae	1624.7
30	<i>Cyclothona</i> spp.	11663.2	70	<i>Nansenia candida</i>	1530.3
31	<i>Vinciguerria poweriae</i>	9406.7	71	<i>Microstomus pacificus</i>	1514.5
32	Unidentified fish larvae	8758.5	72	<i>Sternopyx</i> spp.	1471.7
33	<i>Icichthys lockingtoni</i>	7380.0	73	<i>Diogenichthys laternatus</i>	1459.6
34	<i>Melamphaes</i> spp.	7170.4	74	Ophidiiformes	1214.4
35	Myctophidae	6160.6	75	<i>Hygophum reinhardtii</i>	1174.2
36	<i>Sebastes diploproa</i>	6127.7	76	<i>Sympodus atricaudus</i>	1156.0
37	<i>Argentina sialis</i>	5894.5	77	<i>Notoscopelus resplendens</i>	1105.1
38	<i>Oxyjulis californica</i>	5541.2	78	Trachipteridae	1067.4
39	<i>Idiacanthus antrostomus</i>	5469.1	79	<i>Myctophum nitidulum</i>	1054.1
40	<i>Chauliodus macouni</i>	5212.3	80	<i>Scopelogadus bispinosus</i>	1042.2

Rank	Taxon	Total	Rank	Taxon	Total
81	<i>Cololabis saira</i>	979.4	125	<i>Zaniolepis latipinnis</i>	290.0
82	Clinidae	939.5	126	<i>Howella</i> spp.	288.2
83	<i>Argyropelecus affinis</i>	932.3	127	<i>Bathylagus milleri</i>	284.3
84	<i>Hypsoblennius jenkinsi</i>	806.6	128	<i>Trachipterus altivelis</i>	275.3
85	<i>Electrona risso</i>	791.8	129	<i>Cataetyx rubrirostris</i>	259.1
86	<i>Scorpaenichthys marmoratus</i>	751.9	130	<i>Scopelarchus analis</i>	255.8
87	<i>Scopelosaurus</i> spp.	719.2	131	Pleuronectiformes	245.8
88	<i>Ophidion scrippsae</i>	709.4	132	<i>Pleuronichthys decurrens</i>	243.2
89	<i>Cyclothona acclinidens</i>	692.7	133	<i>Cyclothona pseudopallida</i>	239.4
90	<i>Hypsopops rubicundus</i>	691.5	134	<i>Citharichthys xanthostigma</i>	235.8
91	<i>Notolychnus valdiviae</i>	677.3	135	<i>Ichthyococcus irregularis</i>	224.7
92	<i>Aristostomias scintillans</i>	674.6	136	<i>Lythrypnus dalli</i>	223.9
93	<i>Hippoglossina stomata</i>	618.4	137	<i>Xystreurus liolepis</i>	212.8
94	<i>Chiasmodon niger</i>	602.3	138	<i>Loweina rara</i>	212.5
95	<i>Brosmophycis marginata</i>	587.4	139	Stichaeidae	209.0
96	<i>Arctozenus risso</i>	580.9	140	Cyclopteridae	208.4
97	<i>Sebastes levis</i>	549.6	141	<i>Nannobrachium hawaiiensis</i>	206.4
98	Agonidae	523.9	142	<i>Medialuna californiensis</i>	203.5
99	<i>Argyropelecus hemigymnus</i>	521.3	143	Blennioidei	200.9
100	<i>Lepidogobius lepidus</i>	516.5	144	<i>Brama japonica</i>	193.9
101	<i>Icelinus quadriseriatus</i>	512.1	145	<i>Pleuronichthys</i> spp.	175.5
102	<i>Poromitra</i> spp.	482.7	146	<i>Girella nigricans</i>	172.0
103	<i>Zaniolepis</i> spp.	470.4	147	<i>Gigantactis</i> spp.	168.0
104	<i>Glyptocephalus zachirus</i>	469.3	148	<i>Syngnathus</i> spp.	165.5
105	<i>Ruscarius creaseri</i>	469.0	149	<i>Scopelarchus</i> spp.	164.5
106	<i>Chilara taylori</i>	467.1	150	Atherinidae	164.2
107	<i>Oxylebius pictus</i>	452.0	151	<i>Cryptotrema corallinum</i>	163.9
108	<i>Tactostoma macropus</i>	444.1	152	<i>Argyropelecus</i> spp.	161.7
108	<i>Pleuronichthys coenosus</i>	444.1	153	<i>Psettichthys melanostictus</i>	152.1
110	Gonostomatidae	436.3	154	<i>Oneirodes</i> spp.	145.8
111	<i>Benthalbella dentata</i>	424.5	155	<i>Sebastolobus altivelis</i>	143.5
112	<i>Diogenichthys</i> spp.	399.2	156	Ceratioidei	137.7
112	<i>Semicossyphus pulcher</i>	399.2	157	<i>Hypsopsetta guttulata</i>	136.3
114	<i>Lampadena urophaos</i>	398.6	158	<i>Lythrypnus zebra</i>	123.1
115	Scopelarchidae	381.3	159	<i>Typhlogobius californiensis</i>	120.8
116	<i>Argyropelecus lychnus</i>	381.0	160	<i>Artedius lateralis</i>	114.0
117	<i>Melamphaes parvus</i>	377.7	161	Macrouridae	111.8
118	<i>Poromitra crassiceps</i>	374.6	162	<i>Icosteus aenigmaticus</i>	109.9
119	<i>Rosenblattichthys volucris</i>	338.3	163	<i>Zaniolepis frenata</i>	107.1
120	Stomiiformes	321.4	164	Bathylagidae	106.2
121	<i>Rathbunella</i> spp.	304.2	165	<i>Scopeloberyx robustus</i>	106.0
122	<i>Pleuronichthys ritteri</i>	301.8	166	<i>Hygophum atratum</i>	104.0
123	<i>Bathophilus flemingi</i>	295.5	167	<i>Parvilux ingens</i>	102.3
124	<i>Synodus lucioceps</i>	294.2	168	<i>Halichoeres semicinctus</i>	99.7

Rank	Taxon	Total	Rank	Taxon	Total
169	<i>Lampanyctus steinbecki</i>	99.5	213	<i>Oligocottus</i> spp.	28.3
170	<i>Etrumeus teres</i>	99.3	214	<i>Hexagrammos decagrammus</i>	28.0
171	Haemulidae	94.4	215	<i>Paricelinus hopliticus</i>	27.2
172	<i>Icelinus</i> spp.	93.8	216	<i>Dolichopteryx longipes</i>	25.5
173	<i>Hypsoblennius gentilis</i>	93.6	217	Oneirodidae	24.5
174	<i>Scopelarchus guentheri</i>	91.1	218	<i>Nansenia crassa</i>	23.9
175	<i>Neoclinus stephensae</i>	89.2	219	<i>Platichthys stellatus</i>	23.5
176	<i>Chitonotus pugetensis</i>	88.3	220	<i>Macroramphosus gracilis</i>	23.4
177	<i>Rathbunella allenii</i>	86.3	221	<i>Isopsetta isolepis</i>	21.6
178	<i>Hygophum</i> spp.	86.1	222	<i>Anoplarchus purpurescens</i>	21.4
179	<i>Lepidopsetta bilineata</i>	83.2	223	<i>Bathyagonus pentacanthus</i>	20.6
180	<i>Nannobrachium bristori</i>	78.0	224	<i>Caristius maderensis</i>	20.1
181	<i>Xenistius californiensis</i>	70.3	225	<i>Magnisudis atlantica</i>	19.5
182	<i>Atherinopsis californiensis</i>	70.0	226	<i>Psenes pellucidus</i>	19.3
183	<i>Xeneretmus latifrons</i>	67.4	227	<i>Leuresthes tenuis</i>	19.2
184	<i>Ophiodon elongatus</i>	65.2	228	<i>Atherinops affinis</i>	19.1
185	<i>Seriola lalandi</i>	62.3	229	<i>Cyema atrum</i>	18.6
186	Melanostomiinae	60.4	230	<i>Diplophos taenia</i>	18.5
186	Anguilliformes	60.4	231	<i>Xeneretmus leiops</i>	18.0
188	<i>Odontopyxis trispinosa</i>	59.9	232	<i>Dolopichthys</i> spp.	17.8
189	<i>Artedius harringtoni</i>	56.8	233	<i>Orthonopias triacus</i>	15.6
190	<i>Liparis mucosus</i>	56.6	234	<i>Caulolatilus princeps</i>	14.9
191	<i>Plectobranchus evides</i>	55.1	235	<i>Eopsetta jordani</i>	14.8
192	<i>Artedius fenestralis</i>	53.3	236	<i>Nezumia</i> spp.	14.6
193	<i>Sarda chiliensis</i>	51.3	237	<i>Artedius</i> spp.	13.8
194	<i>Sebastolobus alascanus</i>	51.1	238	<i>Neoclinus</i> spp.	13.7
195	<i>Melamphaes simus</i>	44.3	239	Exocoetidae	13.3
196	Pleuronectidae	43.1	240	<i>Clinocottus analis</i>	13.2
197	<i>Valenciennellus tripunctulatus</i>	42.7	241	<i>Eutaeniophorus festivus</i>	12.8
198	<i>Citharichthys fragilis</i>	42.6	242	Perciformes	12.6
199	Hexagrammidae	41.7	243	<i>Lepidopus fitchi</i>	11.8
200	<i>Gonichthys tenuiculus</i>	38.0	244	<i>Macropinna microstoma</i>	11.6
201	Gempylidae	36.0	245	<i>Cheilopogon pinnatibarbatus</i>	10.7
202	<i>Diplospinus multistriatus</i>	34.2	246	Zoarcoidae	10.0
203	<i>Atractoscion nobilis</i>	33.4	247	<i>Embassichthys bathybius</i>	9.9
204	<i>Desmodema lorum</i>	33.3	247	<i>Cubiceps baxteri</i>	9.9
205	<i>Scorpaena guttata</i>	33.2	249	<i>Gonostoma atlanticum</i>	9.8
206	<i>Anisotremus davidsoni</i>	33.1	250	Carangidae	9.7
207	<i>Cheilotrema saturnum</i>	32.7	250	<i>Gonostoma</i> spp.	9.7
208	<i>Photonectes</i> spp.	32.6	252	<i>Coryphaena hippurus</i>	9.3
209	Melamphaidae	31.4	252	<i>Leptocephalus holsti</i>	9.3
210	<i>Hypsoblennius gilberti</i>	30.2	254	Pomacentridae	9.2
211	<i>Centrobranchus nigrocellatus</i>	29.4	255	<i>Roncador stearnsii</i>	9.1
212	<i>Stemonosudis macrura</i>	29.1	255	<i>Liparis</i> spp.	9.1

Rank	Taxon	Total	Rank	Taxon	Total
257	<i>Ophichthus zophochir</i>	7.9	279	<i>Aulorhynchus flavidus</i>	4.9
258	<i>Hermosilla azurea</i>	7.8	279	<i>Caulophryne</i> spp.	4.9
269	Gobiesocidae	7.7	282	<i>Eutaeniophorus</i> spp.	4.8
260	<i>Triphoturus nigrescens</i>	7.5	282	Cyematidae	4.8
260	<i>Anoplopoma fimbria</i>	7.5	282	<i>Umbrina roncador</i>	4.8
262	Trichiuridae	6.5	285	<i>Ronquilus jordani</i>	4.7
263	<i>Neoclinus blanchardi</i>	5.6	285	<i>Gobiesox maeandricus</i>	4.7
264	<i>Bolinichthys longipes</i>	5.4	285	<i>Liparis fucensis</i>	4.7
264	<i>Eustomias</i> spp.	5.4	285	<i>Leptocephalus giganteus</i>	4.7
264	Clupeiformes	5.4	286	<i>Taaningichthys minimus</i>	4.6
267	Pholidae	5.3	286	<i>Gibbonsia</i> spp.	4.6
267	<i>Albatrossia pectoralis</i>	5.3	291	<i>Coryphaenoides</i> spp.	4.5
269	<i>Prionotus</i> spp.	5.2	291	<i>Gonostoma ebelingi</i>	4.5
269	<i>Bathophilus filifer</i>	5.2	293	<i>Menticirrhus undulatus</i>	4.4
269	<i>Lampanyctus tenuiformes</i>	5.2	293	<i>Radiiceps elongatus</i>	4.4
272	<i>Coryphaena equiselis</i>	5.1	295	<i>Cryptopsaras couesii</i>	4.3
273	<i>Lepidocybium flavobrunneum</i>	5.0	295	<i>Ilypnus gilberti</i>	4.3
273	<i>Lythrypnus</i> spp.	5.0	295	<i>Hemilepidotus spinosus</i>	4.3
273	<i>Poromitra megalops</i>	5.0	298	<i>Enophrys bison</i>	4.1
273	<i>Myctophum lychnobium</i>	5.0	299	<i>Clevelandia ios</i>	4.0
273	<i>Coryphaenoides acrolepis</i>	5.0	300	<i>Physiculus</i> spp.	3.3
273	<i>Coryphaenoides leptolepis</i>	5.0	301	<i>Pronotogrammus multifasciatus</i>	2.2
279	<i>Nealotus tripes</i>	4.9			

Table 5. Ranked occurrence of larval fish taxa in the present CalCOFI survey area. The total for each taxon is the sum of all recorded occurrences from 1951 through 1998.

Rank	Taxon	Total	Rank	Taxon	Total
1	<i>Engraulis mordax</i>	5954	42	<i>Tetragonurus cuvieri</i>	449
2	<i>Sebastes</i> spp.	5425	43	<i>Scomber japonicus</i>	436
3	<i>Stenobrachius leucopsarus</i>	4707	44	<i>Microstoma</i> spp.	428
4	<i>Leuroglossus stilbius</i>	4427	45	<i>Oxyjulis californica</i>	407
5	<i>Protomyctophum crockeri</i>	3537	46	<i>Parophrys vetulus</i>	402
6	<i>Merluccius productus</i>	3352	47	<i>Paralichthys californicus</i>	383
7	<i>Bathylagus ochotensis</i>	2705	48	<i>Argyropelecus sladeni</i>	378
8	<i>Triphoturus mexicanus</i>	2323	49	<i>Stomias atriventer</i>	361
9	<i>Nannobrachium ritteri</i>	2054	50	<i>Danaphos oculatus</i>	352
10	<i>Vinciguerria lucetia</i>	1885	51	Paralepididae	348
11	<i>Tarletonbeania crenularis</i>	1884	52	<i>Nannobrachium regale</i>	331
12	<i>Citharichthys stigmaeus</i>	1855	53	<i>Pleuronichthys verticalis</i>	329
13	<i>Bathylagus wesethi</i>	1784	54	Cottidae	312
14	<i>Trachurus symmetricus</i>	1775	55	<i>Melamphaes lugubris</i>	302
15	<i>Diogenichthys atlanticus</i>	1699	56	<i>Sebastolobus</i> spp.	297
16	<i>Symbolophorus californiensis</i>	1678	57	Trachipteridae	267
17	<i>Lampanyctus</i> spp.	1660	58	<i>Bathylagus pacificus</i>	260
18	<i>Citharichthys</i> spp.	1589	59	<i>Chromis punctipinnis</i>	259
19	Disintegrated fish larvae	1546	60	<i>Hypsoblennius</i> spp.	249
20	<i>Sebastes jordani</i>	1471	61	<i>Bathylagus</i> spp.	239
21	<i>Melamphaes</i> spp.	1208	61	<i>Paralabrax</i> spp.	239
22	<i>Sebastes paucispinis</i>	1147	63	<i>Sebastes goodei</i>	236
23	<i>Ceratoscopelus townsendi</i>	1134	64	<i>Microstomus pacificus</i>	235
24	<i>Cyclothone</i> spp.	1035	65	<i>Sternopyx</i> spp.	231
25	<i>Diaphus</i> spp.	984	66	<i>Nansenia candida</i>	217
26	<i>Sardinops sagax</i>	940	67	Ophidiiformes	212
27	<i>Chauliodus macouni</i>	918	68	Labridae	210
28	<i>Icichthys lockingtoni</i>	915	69	<i>Genyonemus lineatus</i>	206
29	Unidentified fish larvae	905	70	<i>Cololabis saira</i>	199
30	Myctophidae	868	71	<i>Scopelogadus bispinosus</i>	198
31	<i>Cyclothone signata</i>	864	72	<i>Myctophum nitidulum</i>	197
32	<i>Sebastes diploproa</i>	814	73	<i>Coryphopterus nicholsii</i>	196
33	<i>Citharichthys sordidus</i>	804	74	<i>Peprilus simillimus</i>	192
34	Gobiidae	776	75	<i>Hygophum reinhardtii</i>	188
35	Sternopychidae	670	76	<i>Notoscopelus resplendens</i>	160
36	Sciaenidae	668	77	<i>Sympodus atricaudus</i>	152
37	<i>Lestidiops ringens</i>	651	78	<i>Argyropelecus affinis</i>	151
38	<i>Idiacanthus antrostomus</i>	633	79	<i>Vinciguerria poweriae</i>	150
39	<i>Sebastes aurora</i>	543	80	<i>Sphyraena argentea</i>	148
40	<i>Lyopsetta exilis</i>	497	81	Clinidae	146
41	<i>Argentina sialis</i>	488	82	<i>Scopelosaurus</i> spp.	138

Rank	Taxon	Total	Rank	Taxon	Total
83	<i>Electrona risso</i>	132	127	<i>Bathylagus milleri</i>	43
84	<i>Scorpaenichthys marmoratus</i>	129	127	<i>Brama japonica</i>	43
85	<i>Hippoglossina stomata</i>	122	127	<i>Zaniolepis latipinnis</i>	43
86	<i>Sebastes levis</i>	117	130	<i>Synodus lucioceps</i>	42
87	<i>Arctozenus risso</i>	116	130	<i>Citharichthys xanthostigma</i>	42
88	<i>Aristostomias scintillans</i>	114	130	Pleuronectiformes	42
88	<i>Chiasmodon niger</i>	114	133	<i>Pleuronichthys ritteri</i>	41
90	<i>Poromitra</i> spp.	112	134	Atherinidae	40
91	Agonidae	107	135	<i>Lowina rara</i>	39
92	<i>Notolychnus valdiviae</i>	105	135	<i>Lepidogobius lepidus</i>	39
92	<i>Brosmophycis marginata</i>	105	137	<i>Cyclothona pseudopallida</i>	38
94	<i>Zaniolepis</i> spp.	104	138	<i>Girella nigricans</i>	35
95	Scopelarchidae	102	139	<i>Nannobrachium hawaiiensis</i>	34
96	<i>Pleuronichthys coenosus</i>	101	140	<i>Ruscarius creaseri</i>	33
97	<i>Oxylebius pictus</i>	99	141	<i>Xystreurus liolepis</i>	32
98	<i>Chilara taylori</i>	97	141	Ceratioidei	32
99	<i>Cyclothona acclinidens</i>	96	141	<i>Gigantactis</i> spp.	32
100	<i>Ophidion scrippsae</i>	93	144	<i>Hypsopsetta guttulata</i>	31
101	<i>Diogenichthys</i> spp.	89	145	<i>Scopelarchus</i> spp.	29
102	<i>Argyropelecus hemigymnus</i>	87	146	<i>Argyropelecus</i> spp.	28
103	Gonostomatidae	79	146	Macrouridae	28
103	<i>Tactostoma macropus</i>	79	146	Blennioidei	28
105	<i>Diogenichthys laternatus</i>	76	146	<i>Psettichthys melanostictus</i>	28
106	<i>Rosenblattichthys volucris</i>	66	150	<i>Rathbunella</i> spp.	27
107	<i>Benthalbella dentata</i>	65	151	<i>Oneirodes</i> spp.	26
107	<i>Glyptocephalus zachirus</i>	65	152	<i>Cataetyx rubrirostris</i>	25
109	<i>Argyropelecus lychnus</i>	64	153	<i>Icelinus quadriseriatus</i>	24
109	<i>Poromitra crassiceps</i>	64	154	<i>Scopeloberyx robustus</i>	22
111	<i>Lampadena urophaos</i>	62	155	<i>Lampanyctus steinbecki</i>	21
111	<i>Semicossyphus pulcher</i>	62	155	Stichaeidae	21
113	<i>Hypsoblennius jenkinsi</i>	61	157	<i>Halichoeres semicinctus</i>	19
114	Stomiiformes	55	158	<i>Hygophum</i> spp.	18
114	<i>Melamphaes parvus</i>	55	158	<i>Lythrypnus dalli</i>	18
114	<i>Howella</i> spp.	55	160	<i>Parvilux ingens</i>	17
117	<i>Pleuronichthys</i> spp.	54	160	Anguilliformes	17
118	<i>Syngnathus</i> spp.	53	162	<i>Hygophum atratum</i>	16
119	<i>Seriphus politus</i>	52	162	<i>Iceosteus aenigmaticus</i>	16
120	<i>Bathophilus flemingi</i>	50	162	<i>Scopelarchus guentheri</i>	16
121	<i>Pleuronichthys decurrens</i>	49	165	<i>Etrumeus teres</i>	15
122	Cyclopteridae	48	165	<i>Sebastolobus altivelis</i>	15
123	<i>Scopelarchus analis</i>	47	165	<i>Typhlogobius californiensis</i>	15
124	<i>Medialuna californiensis</i>	45	169	<i>Nannobrachium bristori</i>	14
125	<i>Ichthyococcus irregularis</i>	44	169	<i>Lepidopsetta bilineata</i>	14
125	<i>Trachipterus altivelis</i>	44	169	<i>Zaniolepis frenata</i>	14

Rank	Taxon	Total	Rank	Taxon	Total
169	<i>Hypsypops rubicundus</i>	14	210	<i>Scorpaena guttata</i>	4
173	<i>Atherinopsis californiensis</i>	13	210	<i>Cheilotrema saturnum</i>	4
174	Bathylagidae	12	210	<i>Caristius maderensis</i>	4
174	<i>Xeneretmus latifrons</i>	12	210	<i>Psenes pellucidus</i>	4
174	Hexagrammidae	12	210	<i>Cyema atrum</i>	4
177	<i>Artedius lateralis</i>	11	221	<i>Diplophos taenia</i>	3
177	<i>Lythrypnus zebra</i>	11	221	Carangidae	3
177	<i>Neoclinus stephensae</i>	11	221	<i>Dolopichthys</i> spp.	3
177	<i>Cryptotrema corallinum</i>	11	221	<i>Eopsetta jordani</i>	3
181	<i>Odontopyxis trispinosa</i>	10	221	Pleuronectidae	3
181	<i>Hypsoblennius gentilis</i>	10	221	<i>Xeneretmus leiops</i>	3
183	Melanostomiinae	9	221	<i>Bathyagonus pentacanthus</i>	3
183	<i>Icelinus</i> spp.	9	221	<i>Oligocottus</i> spp.	3
183	<i>Ophiodon elongatus</i>	9	221	<i>Clinocottus analis</i>	3
183	<i>Sarda chiliensis</i>	9	221	Pomacentridae	3
187	<i>Melamphaes simus</i>	8	221	Trichiuridae	3
187	<i>Citharichthys fragilis</i>	8	221	<i>Eutaeniophorus festivus</i>	3
187	<i>Xenistius californiensis</i>	8	233	<i>Gonostoma atlanticum</i>	2
187	<i>Sebastolobus alascanus</i>	8	233	<i>Atherinops affinis</i>	2
187	<i>Seriola lalandi</i>	8	233	<i>Leuresthes tenuis</i>	2
192	<i>Nansenia crassa</i>	7	233	Exocoetidae	2
192	Haemulidae	7	233	<i>Cheilopogon pinnatibarbatus</i>	2
192	<i>Diplospinus multistriatus</i>	7	233	<i>Platichthys stellatus</i>	2
192	Gempylidae	7	233	<i>Anoplarchus purpureescens</i>	2
192	Melamphaidae	7	233	Zoarcoidei	2
192	<i>Desmodema lorum</i>	7	233	<i>Neoclinus</i> spp.	2
192	<i>Gonichthys tenuiculus</i>	7	233	<i>Paricelimus hopliticus</i>	2
192	<i>Centrobranchus nigrocellatus</i>	7	233	<i>Artedius</i> spp.	2
192	<i>Valencienellus tripunctulatus</i>	7	233	<i>Orthonopias triacus</i>	2
192	<i>Plectobranchus evides</i>	7	233	<i>Anoplopoma fimbria</i>	2
192	<i>Liparis mucosus</i>	7	233	<i>Lepidopus fitchi</i>	2
203	<i>Photonectes</i> spp.	6	233	<i>Cubiceps baxteri</i>	2
203	<i>Artedius fenestralis</i>	6	233	Perciformes	2
203	<i>Anisotremus davidsoni</i>	6	233	<i>Leptocephalus holti</i>	2
206	<i>Atractoscion nobilis</i>	5	233	<i>Nezumia</i> spp.	2
206	<i>Chitonotus pugetensis</i>	5	233	Gobiesocidae	2
206	<i>Hypsoblennius gibberti</i>	5	233	<i>Caulolatilus princeps</i>	2
206	Oneirodidae	5	233	<i>Prionotus</i> spp.	2
210	<i>Dolichopteryx longipes</i>	4	233	<i>Triphoturus nigrescens</i>	2
210	<i>Stemonosudis macrura</i>	4	255	Clupeiformes	1
210	<i>Magnisudis atlantica</i>	4	255	<i>Eustomias</i> spp.	1
210	<i>Rathbunella allenii</i>	4	255	<i>Gonostoma ebelingi</i>	1
210	<i>Macroramphosus gracilis</i>	4	255	<i>Bolinichthys longipes</i>	1
210	<i>Artedius harringtoni</i>	4	255	<i>Lampanyctus tenuiformes</i>	1

Rank	Taxon	Total	Rank	Taxon	Total
255	<i>Ophichthus zophochir</i>	1	255	<i>Nealotus triples</i>	1
255	<i>Cyematidae</i>	1	255	<i>Coryphaena equiselis</i>	1
255	<i>Caulophryne</i> spp.	1	255	<i>Coryphaena hippurus</i>	1
255	<i>Cryptopsaras couesii</i>	1	255	<i>Pronotogrammus multifasciatus</i>	1
255	<i>Isopsetta isolepis</i>	1	255	<i>Poromitra megalops</i>	1
255	<i>Embassichthys bathybius</i>	1	255	<i>Radiiceps elongatus</i>	1
255	<i>Pholidae</i>	1	255	<i>Gobiesox maeandricus</i>	1
255	<i>Gibbonsia</i> spp.	1	255	<i>Clevelandia ios</i>	1
255	<i>Neoclinus blanchardi</i>	1	255	<i>Ilypnus gilberti</i>	1
255	<i>Hemilepidotus spinosus</i>	1	255	<i>Lythrypnus</i> spp.	1
255	<i>Hexagrammos decagrammus</i>	1	255	<i>Aulorhynchus flavidus</i>	1
255	<i>Hermosilla azurea</i>	1	255	<i>Liparis fucensis</i>	1
255	<i>Menticirrhus undulatus</i>	1	255	<i>Liparis</i> spp.	1
255	<i>Umbrina roncador</i>	1	255	<i>Enophrys bison</i>	1
255	<i>Physiculus</i> spp.	1	255	<i>Leptocephalus giganteus</i>	1
255	<i>Albatrossia pectoralis</i>	1	255	<i>Eutaeniophorus</i> spp.	1
255	<i>Coryphaenoides leptolepis</i>	1	255	<i>Myctophum lychnobium</i>	1
255	<i>Coryphaenoides acrolepis</i>	1	255	<i>Taaningichthys minimus</i>	1
255	<i>Coryphaenoides</i> spp.	1	255	<i>Macropinna microstoma</i>	1
255	<i>Ronquilus jordani</i>	1	255	<i>Bathophilus filifer</i>	1
255	<i>Roncador stearnsii</i>	1	255	<i>Gonostoma</i> spp.	1
255	<i>Lepidocybium flavobrunneum</i>	1			

Table 6. Year, station, and month ranges used in calculating averages for atlas graphs.

Taxon	Years	Stations	Months	Page
Total fish larvae	1951 – 1998	27 – 120	1 – 12	2
Total fish eggs	1951 – 1998	27 – 120	1 – 12	3
<i>Engraulis mordax</i> larvae	1951 – 1998	27 – 120	1 – 12	4
<i>Engraulis mordax</i> eggs	1951 – 1998	27 – 90	1 – 12	5
<i>Merluccius productus</i>	1951 – 1998	27 – 120	11 – 6	6
<i>Leuroglossus stibius</i>	1951 – 1998	27 – 100	12 – 6	7
<i>Sebastes</i> spp.	1951 – 1998	27 – 90	1 – 12	8
<i>Vinciguerria lucetia</i>	1951 – 1998	27 – 120	1 – 12	9
<i>Stenobrachius leucopsarus</i>	1951 – 1998	27 – 120	12 – 6	10
<i>Trachurus symmetricus</i>	1951 – 1998	27 – 120	2 – 9	11
<i>Sardinops sagax</i> larvae	1951 – 1998	27 – 120	1 – 12	12
<i>Sardinops sagax</i> eggs	1951 – 1998	27 – 90	1 – 12	13
<i>Sebastes jordani</i>	1951 – 1998	27 – 70	1 – 5	14
Sciaenidae	1951 – 1998	27 – 70	1 – 12	15
<i>Bathylagus ochotensis</i>	1951 – 1998	27 – 120	12 – 7	16
<i>Triphoturus mexicanus</i>	1951 – 1998	27 – 120	3 – 11	17
<i>Bathylagus wesethi</i>	1951 – 1998	27 – 120	1 – 12	18
<i>Protomyctophum crockeri</i>	1951 – 1998	27 – 120	1 – 12	19
<i>Ceratoscopelus townsendi</i>	1951 – 1998	60 – 120	1 – 12	20
<i>Citharichthys stigmaeus</i>	1954 – 1998	27 – 70	1 – 12	21
<i>Nannobrachium ritteri</i>	1954 – 1998	40 – 120	1 – 12	22
<i>Tarletonbeania crenularis</i>	1951 – 1998	27 – 120	1 – 12	23
<i>Diogenichthys atlanticus</i>	1951 – 1998	35 – 120	1 – 12	24
<i>Scomber japonicus</i>	1951 – 1998	27 – 100	3 – 9	25
<i>Sebastes paucispinis</i>	1951 – 1998	27 – 80	12 – 4	26
<i>Symbolophorus californiensis</i>	1951 – 1998	50 – 120	1 – 12	27

Taxon	Years	Stations	Months	Page
<i>Cyclothona signata</i>	1985 – 1998	28 – 120	1 – 11	28
<i>Lampanyctus</i> spp.	1951 – 1998	27 – 120	1 – 12	29
<i>Genyonemus lineatus</i>	1981 – 1998	27 – 70	10 – 3	30
<i>Citharichthys sordidus</i>	1954 – 1960; 1984 – 1998	27 – 100	1 – 12	31
<i>Diaphus</i> spp.	1951 – 1998	30 – 120	4 – 10	32
<i>Vinciguerria poweriae</i>	1985 – 1998	70 – 120	7 – 10	33
<i>Icichthys lockingtoni</i>	1951 – 1998	40 – 120	11 – 7	34
<i>Sebastes diploproa</i>	1951 – 1969; 1987 – 1998	27 – 70	1 – 12	35
<i>Argentina sialis</i>	1951 – 1998	27 – 100	1 – 12	36
<i>Oxyjulis californica</i>	1961 – 1998	27 – 90	3 – 10	37
<i>Idiacanthus antrostomus</i>	1951 – 1998	30 – 120	1 – 12	38
<i>Chauliodus macouni</i>	1951 – 1998	27 – 120	1 – 12	39
<i>Lestidiops ringens</i>	1961 – 1998	27 – 120	1 – 12	40
<i>Parophrys vetulus</i>	1952 – 1998	27 – 90	12 – 7	41
<i>Lyopsetta exilis</i>	1951 – 1998	27 – 90	1 – 7	42
<i>Tetragonurus cuvieri</i>	1951 – 1998	40 – 120	1 – 12	43
<i>Sebastes aurora</i>	1951 – 1998	27 – 80	11 – 8	44
<i>Chromis punctipinnis</i>	1951 – 1998	27 – 70	6 – 10	45
<i>Paralabrax</i> spp.	1951 – 1998	27 – 60	6 – 10	46
<i>Paralichthys californicus</i>	1951 – 1998	27 – 70	1 – 12	47
<i>Argyropelecus sladeni</i>	1985 – 1998	28 – 120	1 – 11	48
<i>Sphyraena argentea</i>	1951 – 1998	27 – 100	4 – 10	49
<i>Pleuronichthys verticalis</i>	1951 – 1998	27 – 70	1 – 12	50
<i>Danaphos oculatus</i>	1972 – 1998	27 – 120	1 – 12	51
<i>Microstoma</i> spp.	1951 – 1998	27 – 120	1 – 12	52
<i>Sebastolobus</i> spp.	1951 – 1998	30 – 100	1 – 11	53

Taxon	Years	Stations	Months	Page
<i>Peprilus simillimus</i>	1951 – 1998	27 – 55	1 – 12	54
<i>Nannobrachium regale</i>	1954 – 1998	40 – 120	2 – 11	55
<i>Stomias atriventer</i>	1951 – 1998	27 – 120	1 – 12	56
<i>Melamphaes lugubris</i>	1985 – 1998	35 – 120	1 – 11	57
<i>Bathylagus pacificus</i>	1951 – 1998	27 – 110	12 – 6	58
<i>Sebastes goodei</i>	1951 – 1969	28 – 70	11 – 4	59
<i>Seriphis politus</i>	1981 – 1998	27 – 55	4 – 8	60
<i>Coryphopterus nicholsii</i>	1985 – 1998	27 – 90	1 – 11	61
<i>Nansenia candida</i>	1951 – 1998	45 – 120	1 – 8	62
<i>Microstomus pacificus</i>	1951 – 1998	27 – 110	1 – 10	63
<i>Sternopyx</i> spp.	1985 – 1998	27 – 120	1 – 11	64
<i>Diogenichthys laternatus</i>	1951 – 1998	27 – 120	1 – 12	65
Trachipteridae	1951 – 1998	40 – 120	1 – 12	66
<i>Hygophum reinhardtii</i>	1951 – 1998	70 – 120	1 – 11	67
<i>Sympodus atricaudus</i>	1951 – 1998	27 – 90	7 – 12	68
<i>Notoscopelus resplendens</i>	1951 – 1998	40 – 120	1 – 10	69
<i>Myctophum nitidulum</i>	1951 – 1998	55 – 120	1 – 12	70
<i>Scopelogadus bispinosus</i>	1951 – 1998	35 – 120	1 – 12	71
<i>Cololabis saira</i> larvae	1951 – 1998	27 – 120	1 – 12	72
<i>Cololabis saira</i> eggs	1951 – 1998	27 – 120	1 – 12	73
<i>Argyropelecus affinis</i>	1985 – 1998	30 – 120	1 – 11	74
<i>Poromitra</i> spp.	1951 – 1998	30 – 120	1 – 11	75
<i>Hypsoblennius jenkinsi</i>	1985 – 1998	27 – 55	4 – 11	76
<i>Electrona risso</i>	1951 – 1998	40 – 120	1 – 11	77
<i>Scorpaenichthys marmoratus</i>	1951 – 1998	27 – 70	10 – 4	78
<i>Scopelosaurus</i> spp.	1959 – 1998	55 – 120	3 – 10	79
<i>Ophidion scrippsae</i>	1951 – 1998	27 – 80	7 – 10	80

Taxon	Years	Stations	Months	Page
<i>Cyclothona acclinidens</i>	1985 – 1998	55 – 120	1 – 11	81
<i>Hypsypops rubicundus</i>	1957 – 1998	27 – 51	7 – 9	82
<i>Notolichnus valdiviae</i>	1951 – 1998	55 – 120	1 – 12	83
<i>Aristostomias scintillans</i>	1951 – 1998	55 – 120	1 – 12	84
<i>Hippoglossina stomata</i>	1951 – 1998	27 – 70	1 – 12	85
<i>Chiasmodon niger</i>	1951 – 1998	55 – 120	1 – 12	86
<i>Brosmophycis marginata</i>	1951 – 1998	30 – 80	3 – 7	87
<i>Arctozenus risso</i>	1961 – 1998	60 – 120	1 – 12	88
<i>Sebastes levis</i>	1951 – 1998	27 – 60	1 – 6	89
<i>Argyropelecus hemigymnus</i>	1985 – 1998	30 – 120	1 – 11	90
<i>Lepidogobius lepidus</i>	1985 – 1998	27 – 60	1 – 11	91
<i>Icelinus quadriseriatus</i>	1985 – 1998	27 – 51	1 – 10	92
<i>Scopelarchus</i> spp.	1972 – 1998	55 – 120	1 – 12	93
<i>Glyptocephalus zachirus</i>	1951 – 1998	33 – 90	2 – 8	94
<i>Ruscarius creaseri</i>	1985 – 1998	27 – 55	1 – 8	95
<i>Chilara taylori</i>	1951 – 1998	27 – 90	6 – 1	96
<i>Oxylebius pictus</i>	1951 – 1998	27 – 60	9 – 6	97
<i>Tactostoma macropus</i>	1951 – 1998	40 – 120	1 – 10	98
<i>Pleuronichthys coenosus</i>	1951 – 1998	27 – 80	1 – 11	99
<i>Benthalbella dentata</i>	1972 – 1998	27 – 120	1 – 11	100
<i>Semicossyphus pulcher</i>	1961 – 1998	27 – 60	4 – 10	101
<i>Lampadena urophaos</i>	1951 – 1998	80 – 120	6 – 11	102
<i>Rathbunella</i> spp.	1985 – 1998	27 – 51	1 – 11	103
<i>Argyropelecus lychnus</i>	1985 – 1998	37 – 120	1 – 11	104
<i>Melamphaes parvus</i>	1985 – 1998	45 – 120	11 – 8	105
<i>Rosenblattichthys volucris</i>	1972 – 1998	55 – 120	1 – 12	106
<i>Pleuronichthys ritteri</i>	1951 – 1998	27 – 51	1 – 12	107

Taxon	Years	Stations	Months	Page
<i>Bathophilus flemingi</i>	1951 – 1998	35 – 120	1 – 10	108
<i>Synodus lucioceps</i>	1951 – 1998	27 – 60	7 – 1	109
<i>Zaniolepis latipinnis</i>	1985 – 1998	27 – 60	9 – 4	110
<i>Howella</i> spp.	1961 – 1998	60 – 120	3 – 11	111
<i>Bathylagus milleri</i>	1951 – 1998	40 – 120	1 – 12	112
Atherinidae	1951 – 1998	27 – 60	1 – 9	113
<i>Cataetyx rubrirostris</i>	1985 – 1998	27 – 70	4 – 8	114
<i>Pleuronichthys decurrens</i>	1951 – 1998	30 – 100	10 – 7	115
<i>Cyclothona pseudopallida</i>	1985 – 1998	70 – 120	1 – 11	116
<i>Citharichthys xanthostigma</i>	1954 – 1960; 1985 – 1998	27 – 90	1 – 12	117
<i>Ichthyococcus irregularis</i>	1951 – 1998	27 – 120	1 – 12	118
<i>Lythrypnus dalli</i>	1985 – 1998	27 – 55	8 – 10	119
<i>Xystreurus liolepis</i>	1951 – 1998	27 – 55	1 – 12	120
<i>Loweina rara</i>	1951 – 1998	37 – 120	1 – 12	121
<i>Nannobrachium hawaiiensis</i>	1985 – 1998	70 – 120	1 – 11	122
<i>Medialuna californiensis</i>	1951 – 1998	27 – 90	4 – 10	123
Haemulidae	1951 – 1998	27 – 51	7 – 10	124
<i>Brama japonica</i>	1951 – 1998	70 – 120	1 – 12	125
<i>Girella nigricans</i>	1951 – 1998	27 – 70	4 – 10	126
<i>Gigantactis</i> spp.	1985 – 1998	55 – 120	7 – 11	127
<i>Cryptotrema corallinum</i>	1985 – 1998	27 – 51	1 – 11	128
<i>Psettichthys melanostictus</i>	1951 – 1998	40 – 60	1 – 7	129
<i>Oneirodes</i> spp.	1985 – 1998	70 – 120	7 – 1	130
<i>Sebastolobus altivelis</i>	1985 – 1998	35 – 90	1 – 11	131
<i>Hypsopsetta guttulata</i>	1951 – 1998	27 – 53	7 – 4	132
Macrouridae	1951 – 1998	27 – 120	1 – 12	133
<i>Lythrypnus zebra</i>	1985 – 1998	27 – 53	7 – 10	134

Taxon	Years	Stations	Months	Page
<i>Typhlogobius californiensis</i>	1985 – 1998	27 – 55	2 – 10	135
<i>Artedius lateralis</i>	1985 – 1998	27 – 51	10 – 4	136
<i>Icosteus aenigmaticus</i>	1951 – 1998	51 – 90	1 – 5	137
<i>Zaniolepis frenata</i>	1985 – 1998	27 – 51	10 – 5	138
<i>Scopeloberyx robustus</i>	1961 – 1998	50 – 120	1 – 12	139
<i>Hygophum atratum</i>	1951 – 1998	27 – 120	1 – 12	140
<i>Parvilux ingens</i>	1969 – 1998	70 – 120	1 – 12	141
<i>Halichoeres semicinctus</i>	1961 – 1998	27 – 80	7 – 10	142
<i>Lampanyctus steinbecki</i>	1985 – 1998	80 – 120	4 – 11	143
<i>Etrumeus teres</i>	1951 – 1998	27 – 51	1 – 12	144
<i>Icelinus</i> spp.	1985 – 1998	27 – 51	1 – 11	145
<i>Hypsoblennius gentilis</i>	1985 – 1998	27 – 51	3 – 10	146
<i>Neoclinus stephensae</i>	1985 – 1998	27 – 51	1 – 11	147
<i>Chitonotus pugetensis</i>	1985 – 1998	27 – 51	11 – 5	148
Anguilliformes	1951 – 1998	27 – 100	1 – 12	149
<i>Lepidopsetta bilineata</i>	1961 – 1998	27 – 51	2 – 7	150
<i>Nannobrachium bristori</i>	1985 – 1998	60 – 120	1 – 11	151
<i>Xeneretmus latifrons</i>	1985 – 1998	27 – 55	1 – 8	152
<i>Ophiodon elongatus</i>	1951 – 1998	27 – 51	2 – 4	153
<i>Seriola lalandi</i>	1954 – 1998	27 – 90	7 – 9	154
<i>Odontopyxis trispinosa</i>	1985 – 1998	27 – 51	2 – 10	155
<i>Artedius harringtoni</i>	1985 – 1998	27 – 51	4 – 8	156
<i>Liparis mucosus</i>	1985 – 1998	27 – 55	1 – 9	157
<i>Plectobranchus evides</i>	1985 – 1998	27 – 51	3 – 4	158
<i>Artedius fenestralis</i>	1985 – 1998	27 – 51	3 – 10	159
<i>Sarda chiliensis</i>	1956 – 1998	27 – 40	4 – 7	160
<i>Sebastolobus alascanus</i>	1985 – 1998	30 – 100	2 – 11	161

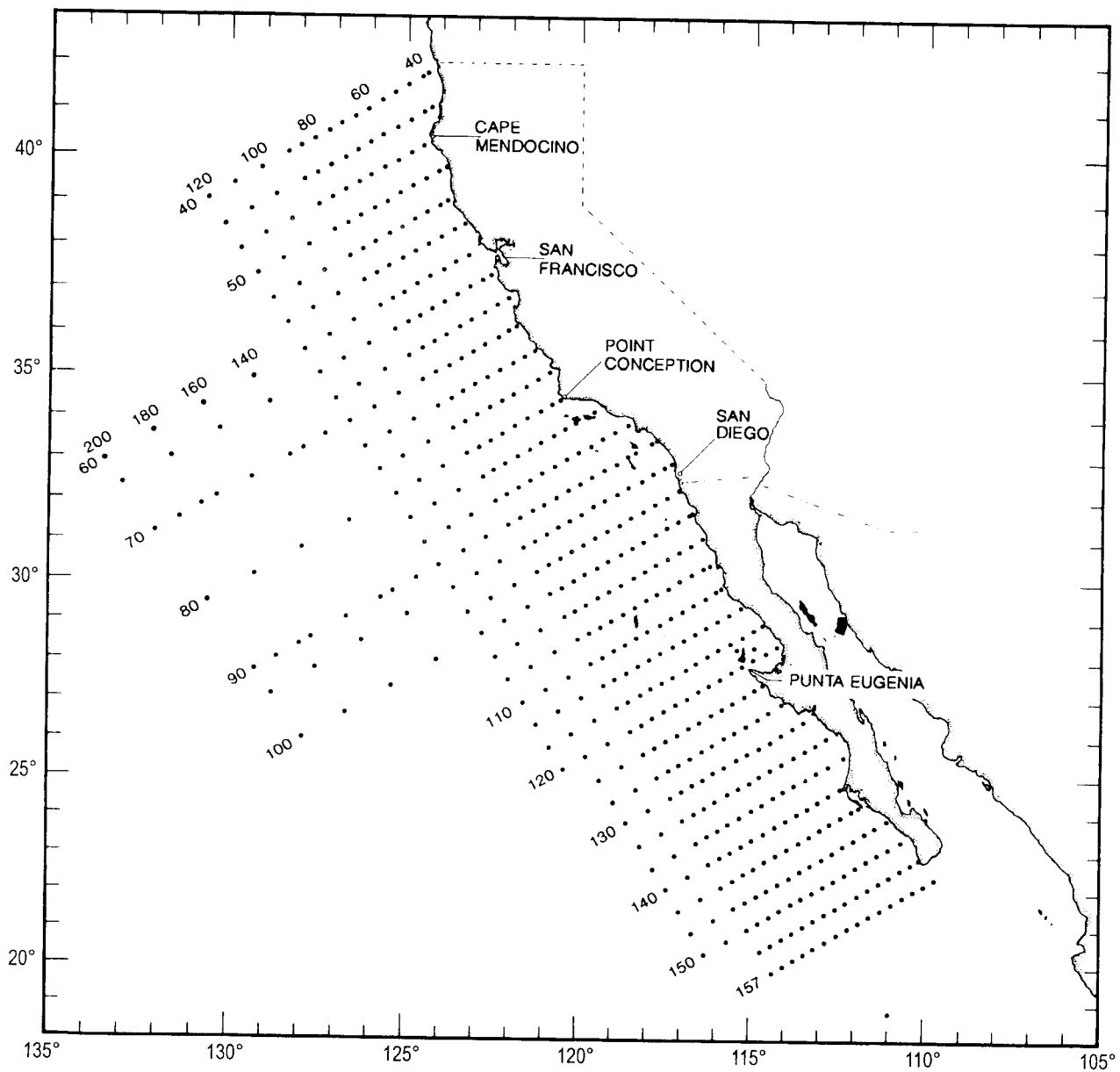
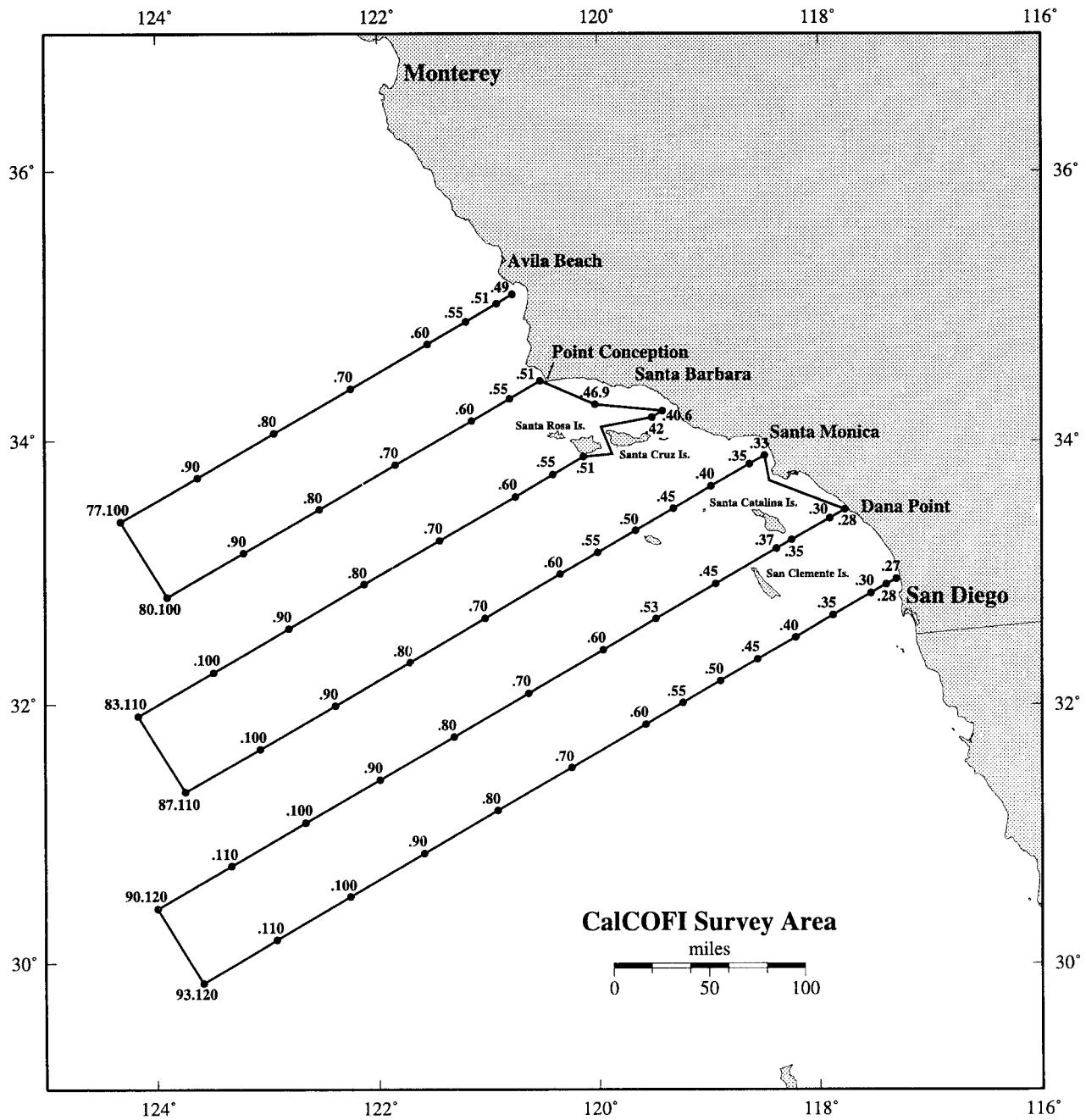


Figure 1. The basic CalCOFI station pattern occupied, in part, by cruises during 1951–1984.



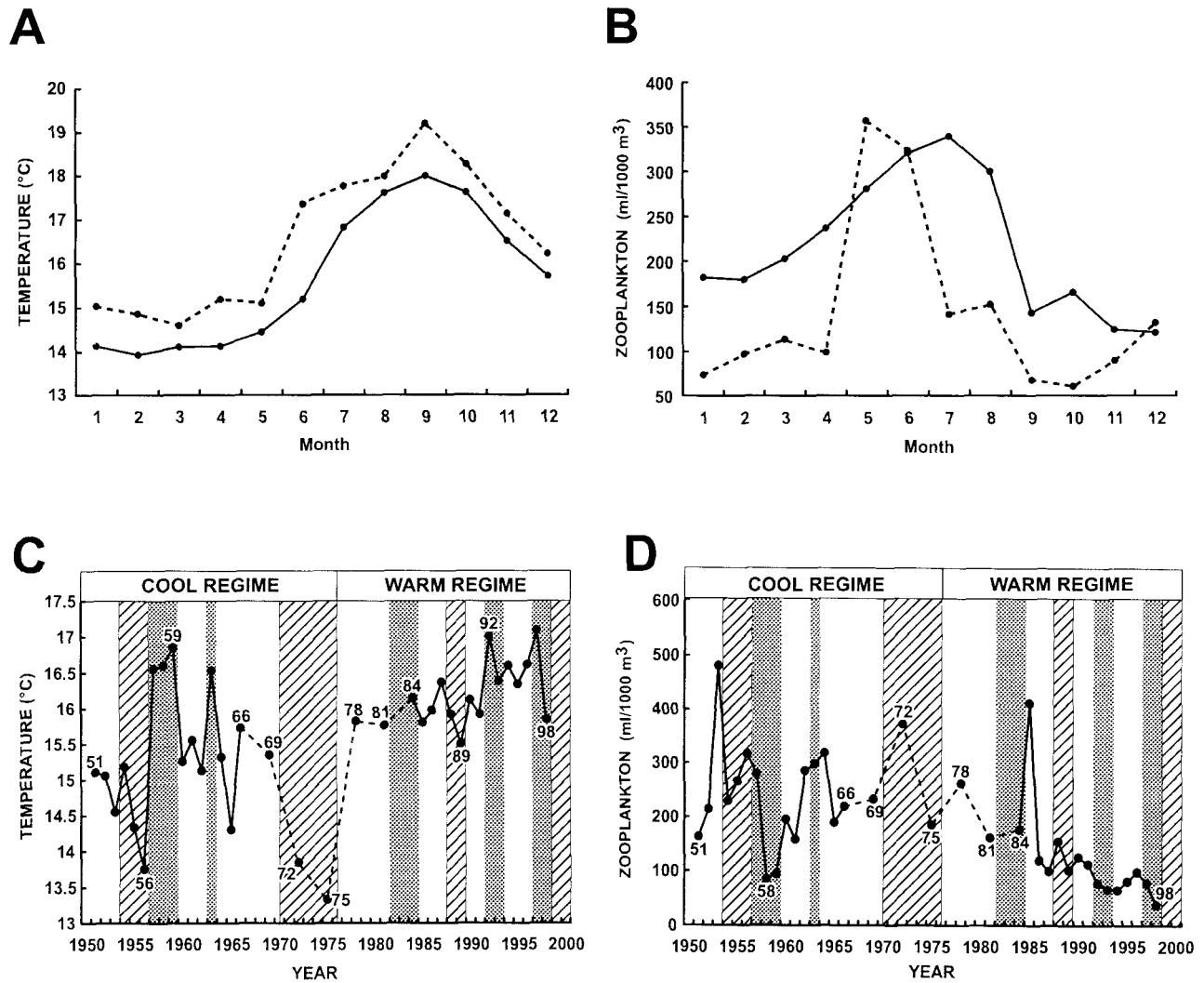


Figure 3. Average monthly and annual temperatures and zooplankton volumes for CalCOFI stations used in this study. A) Average monthly temperatures for cool (solid line) and warm (dashed line) regimes of the Pacific Decadal Oscillation (PDO); cool regime years in the CalCOFI time series were 1951–1976 and warm regime years were 1977–1998. B) Average monthly zooplankton volumes for cool and warm PDO regimes as in A. C) Average annual temperatures for the CalCOFI time series from 1951 to 1998; cool and warm PDO regimes are indicated above the graph and El Niño Southern Oscillation (ENSO) events are indicated by vertical bars (El Niño, shading; La Niña, hatching; the wide hatched bar represents a series of three consecutive La Niñas between May 1970 and March 1976); dashed line indicates period of triennial CalCOFI surveys. D) Average annual zooplankton volumes for the CalCOFI time series from 1951 to 1998.

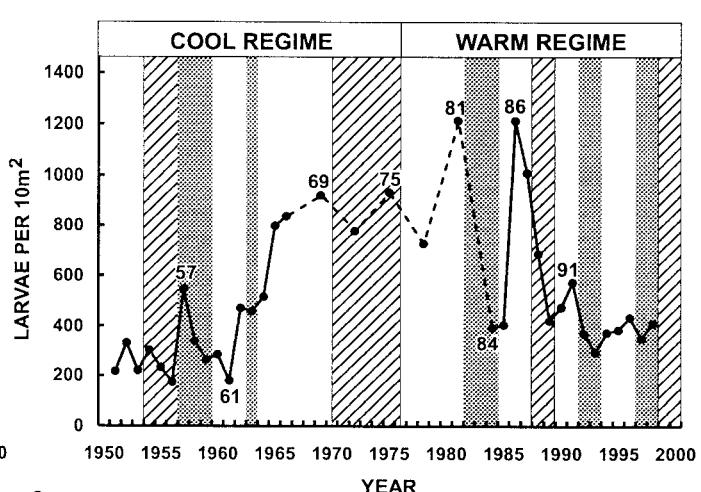
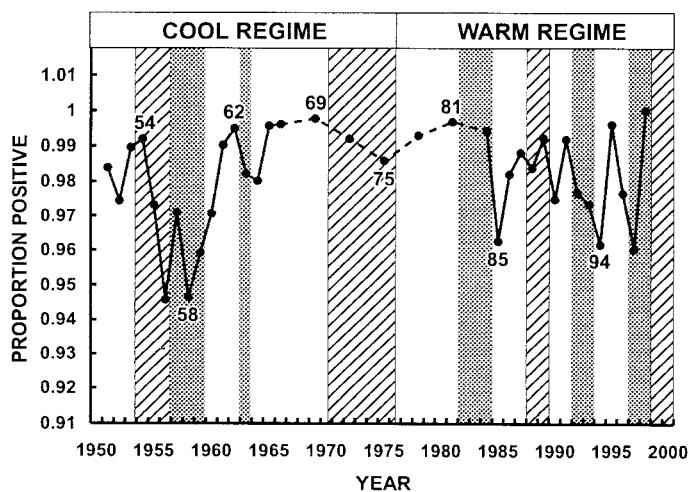
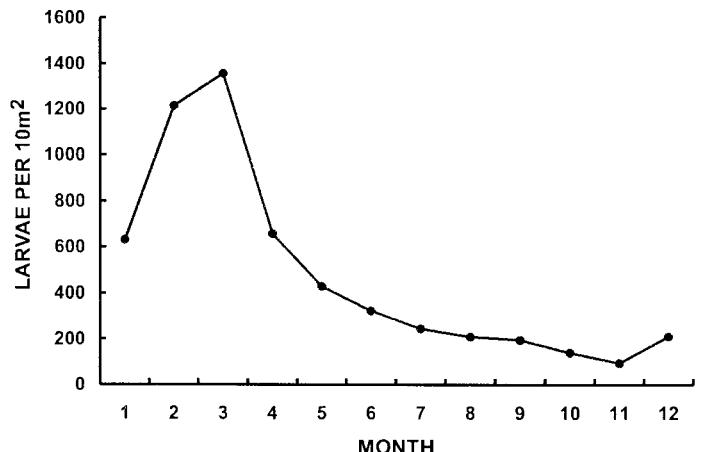
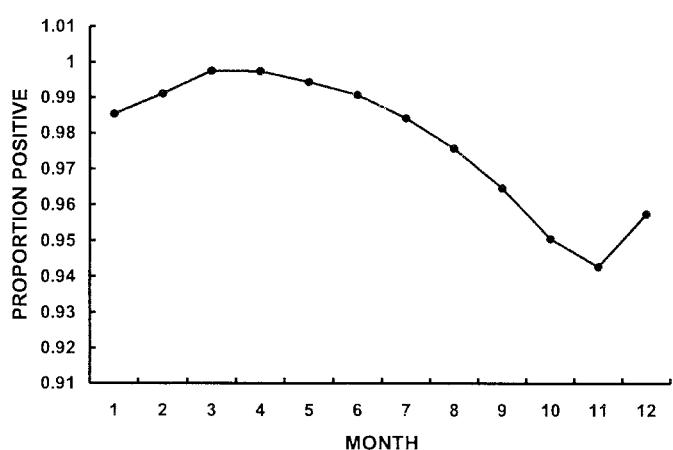
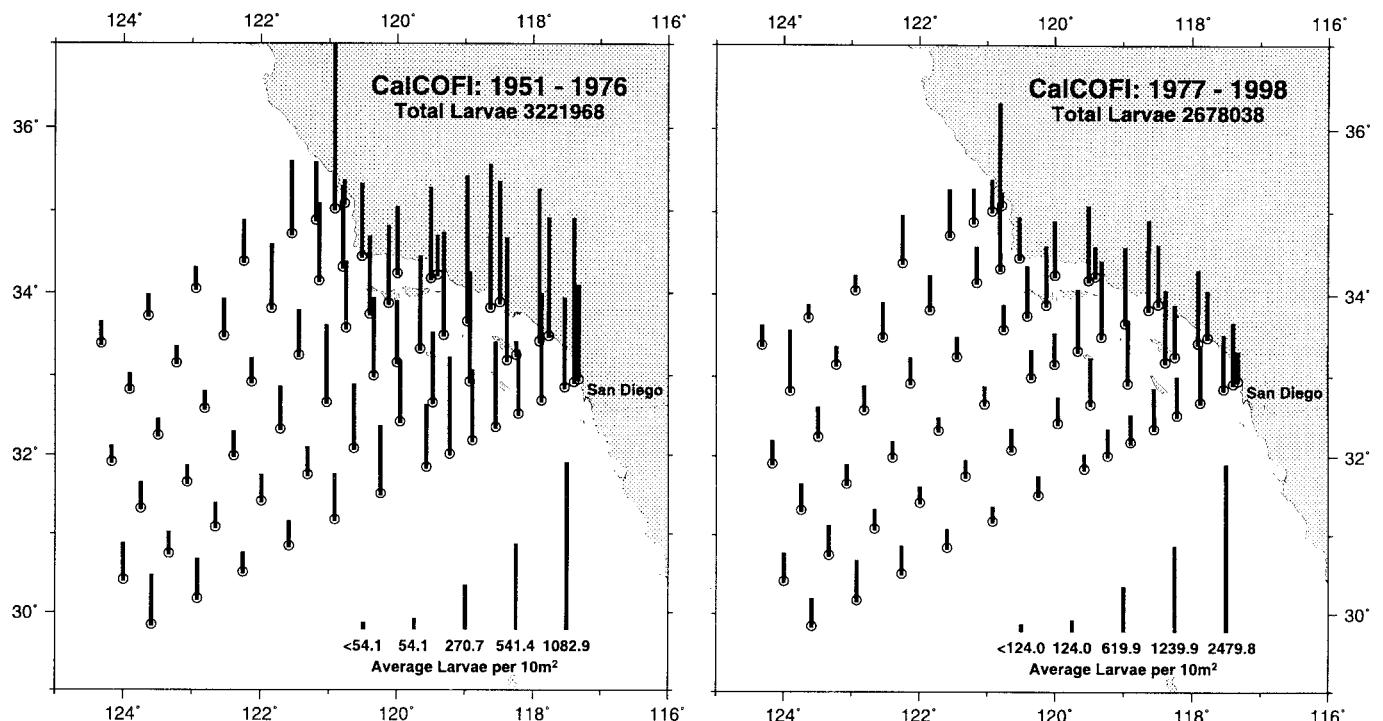
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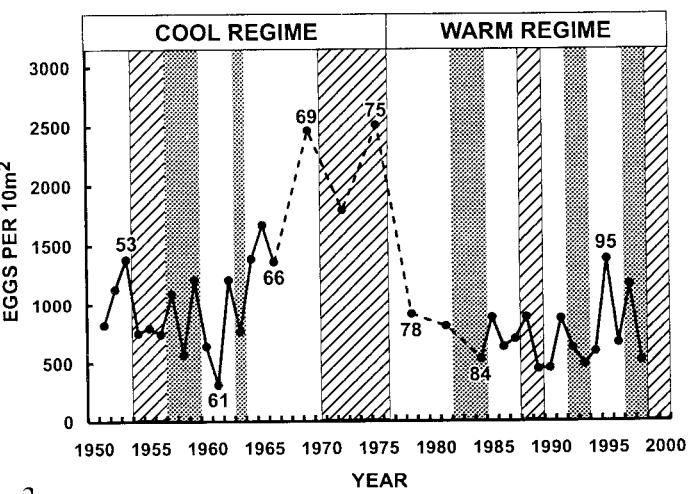
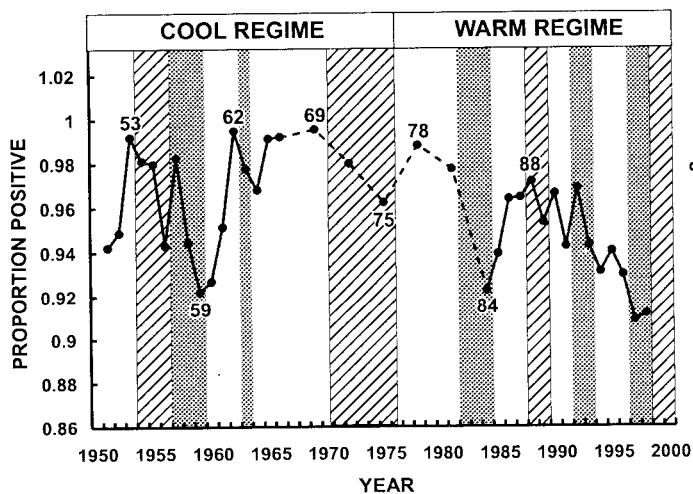
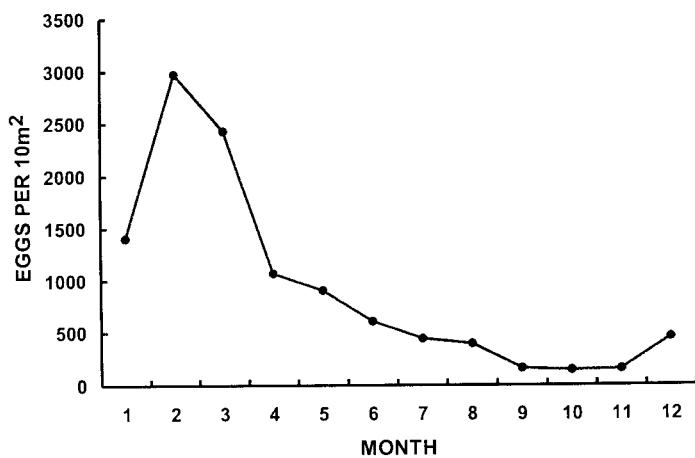
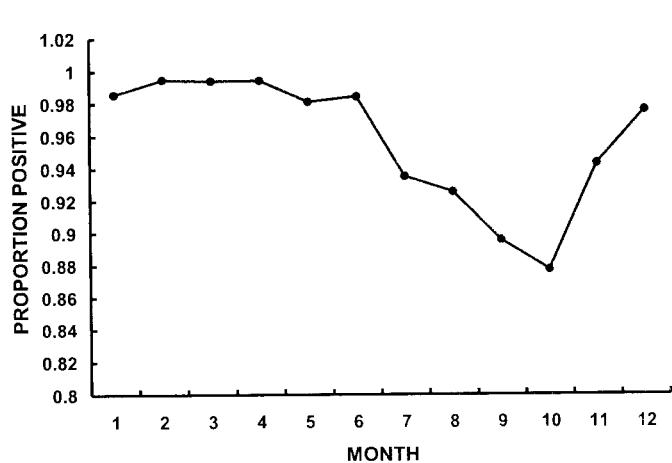
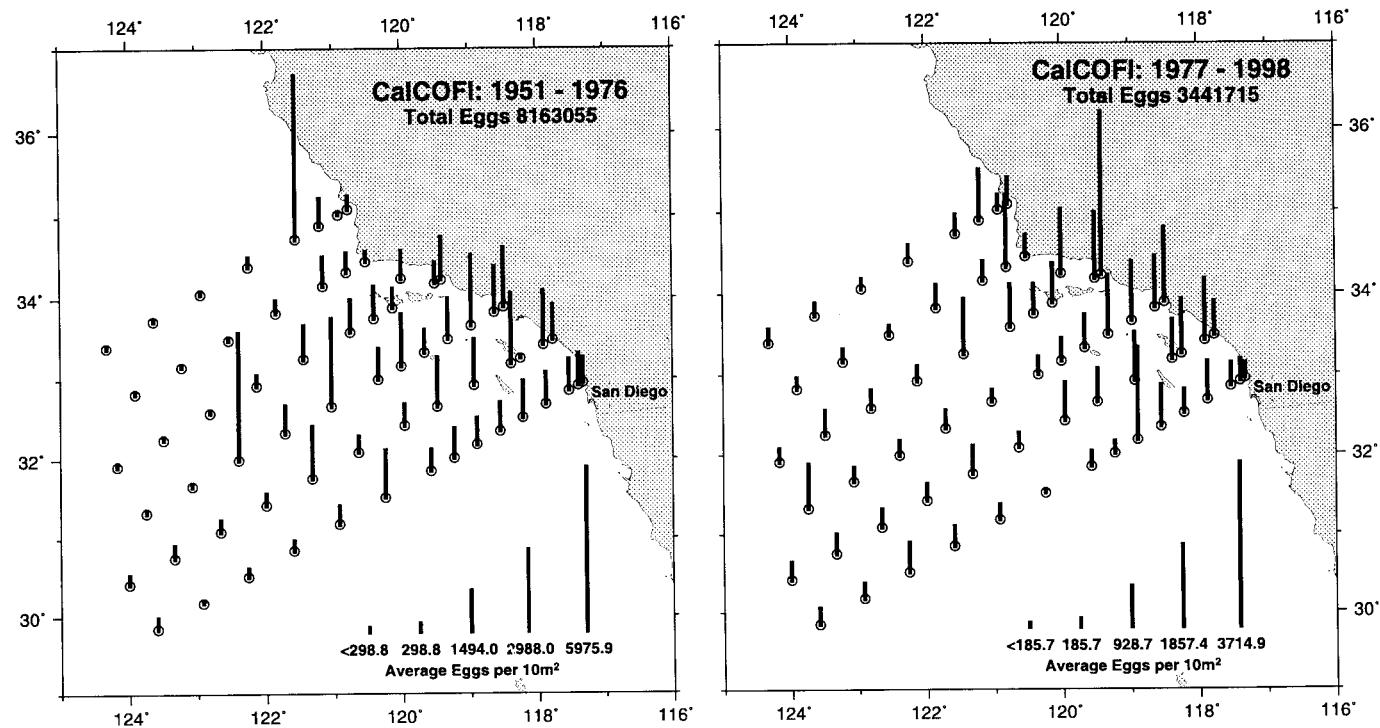
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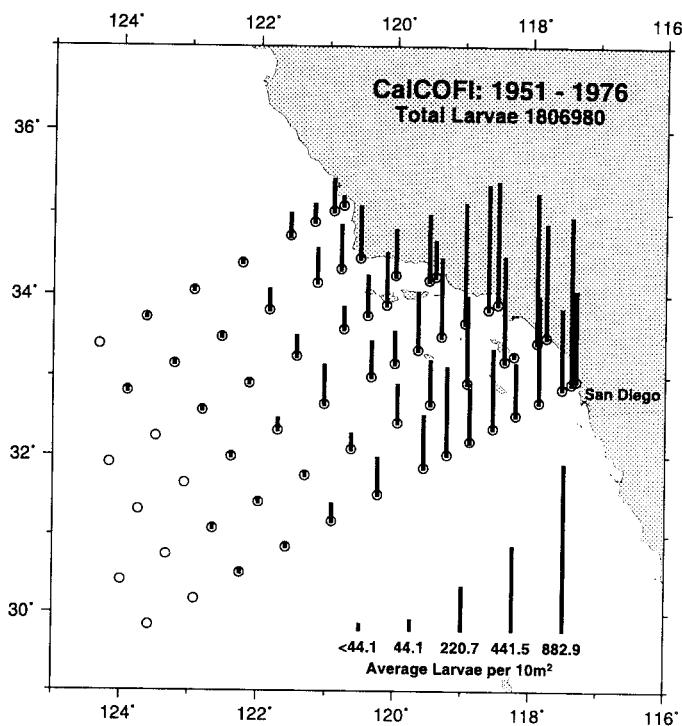
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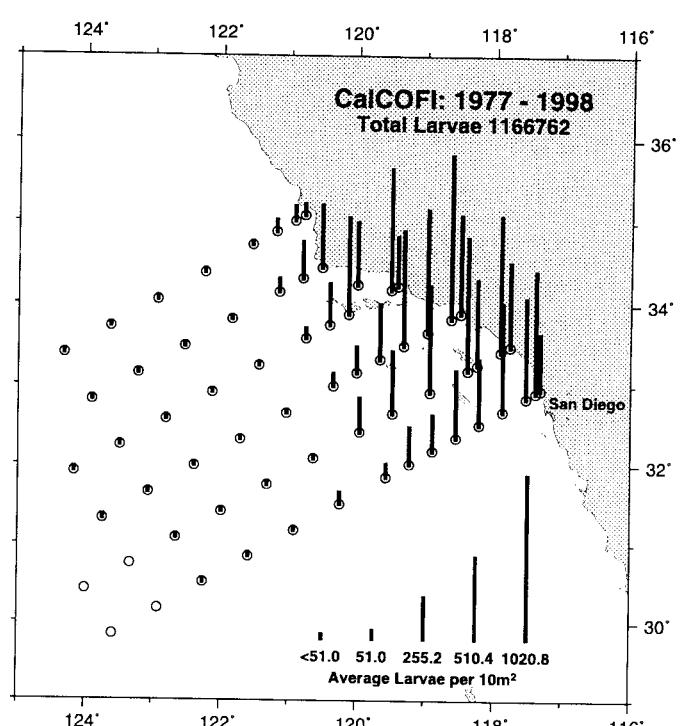
## TOTAL FISH EGGS



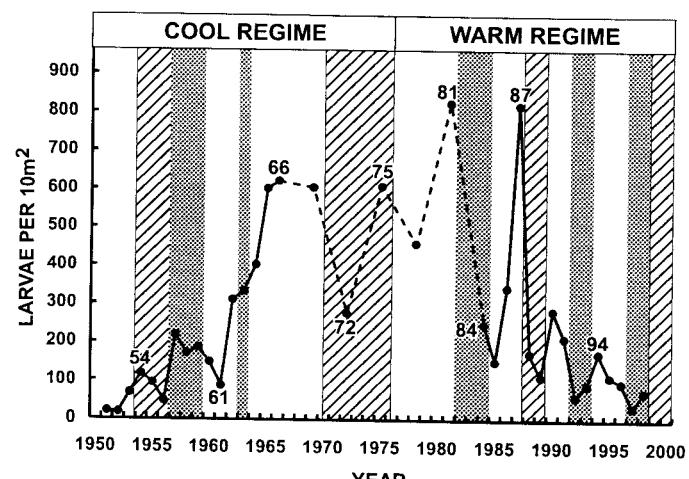
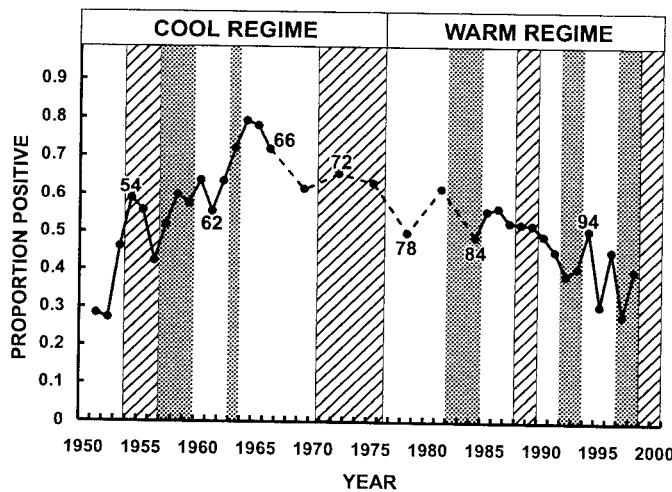
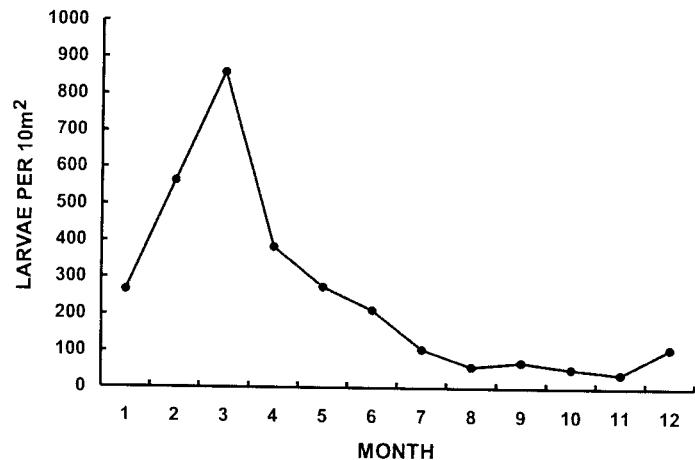
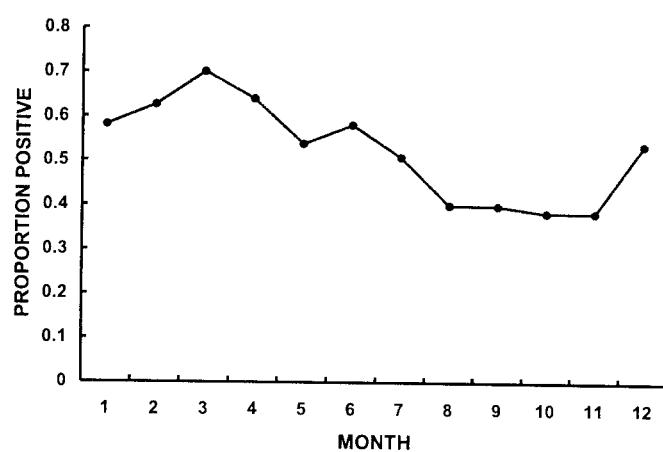
*Engraulis mordax* larvae



Northern anchovy larvae



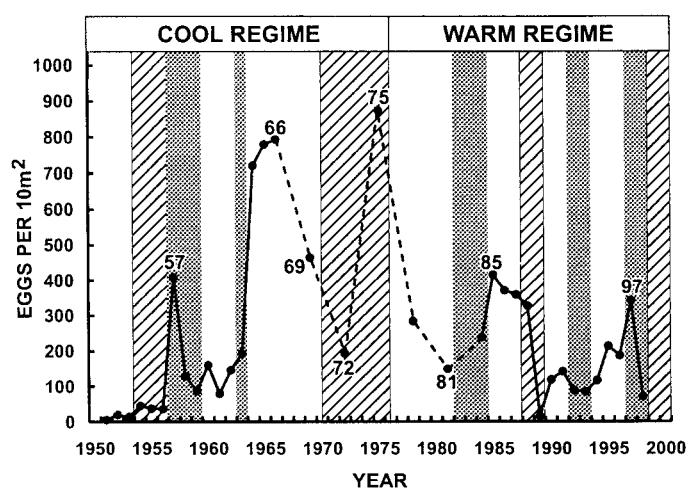
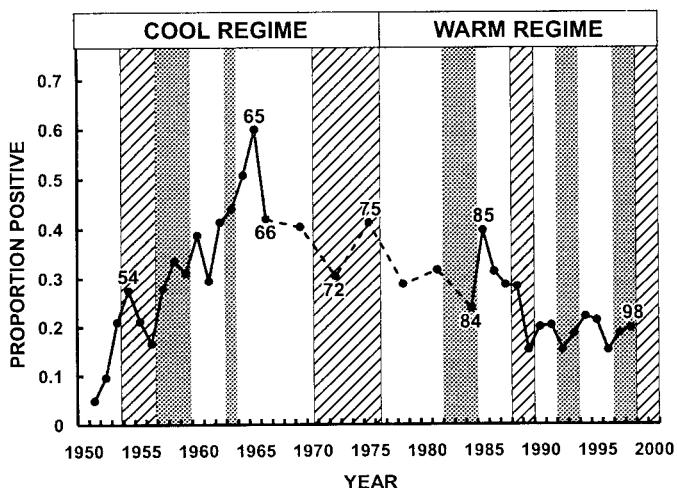
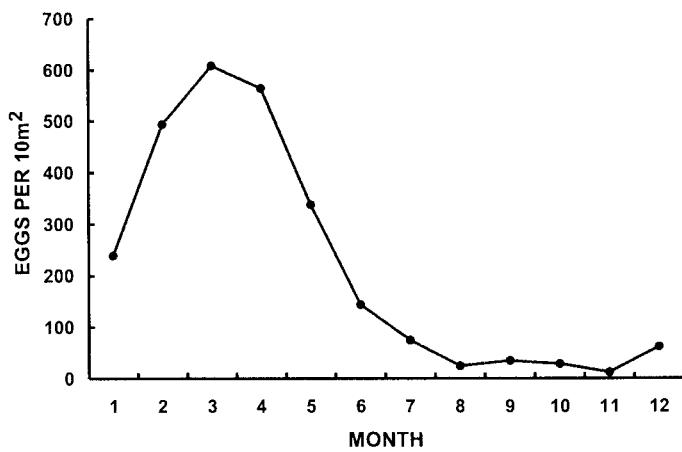
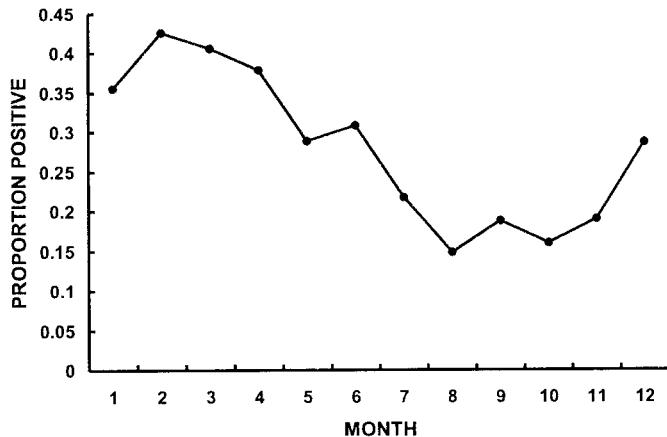
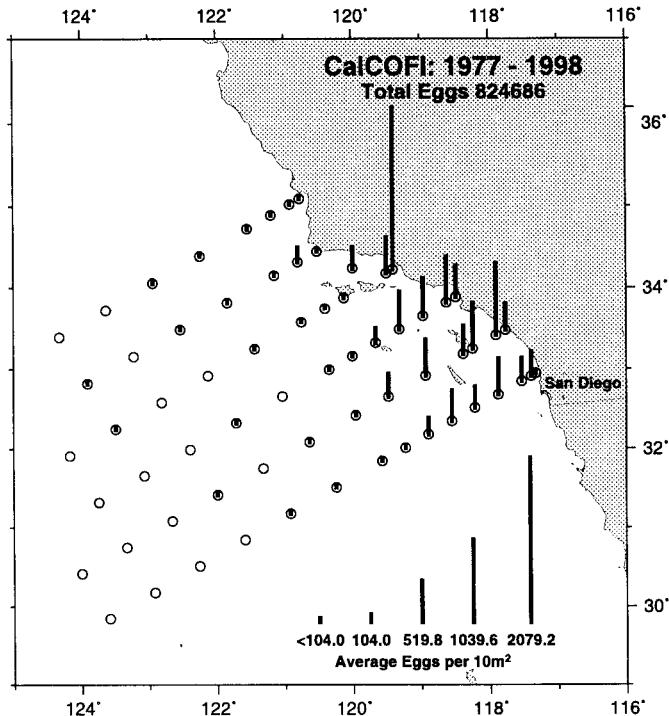
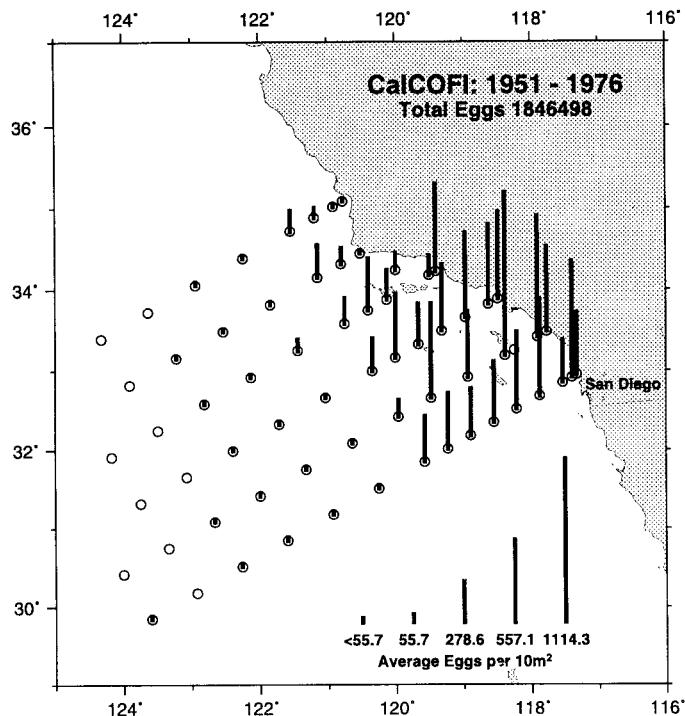
ENGRAULIDAE



## ENGRAULIDAE

## Northern anchovy eggs

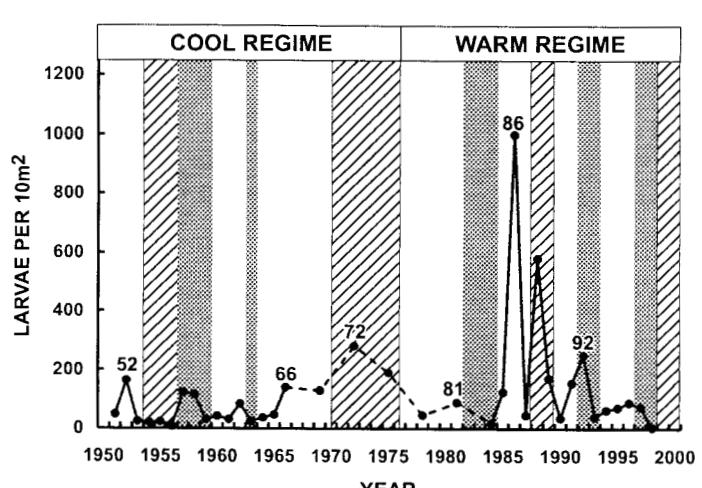
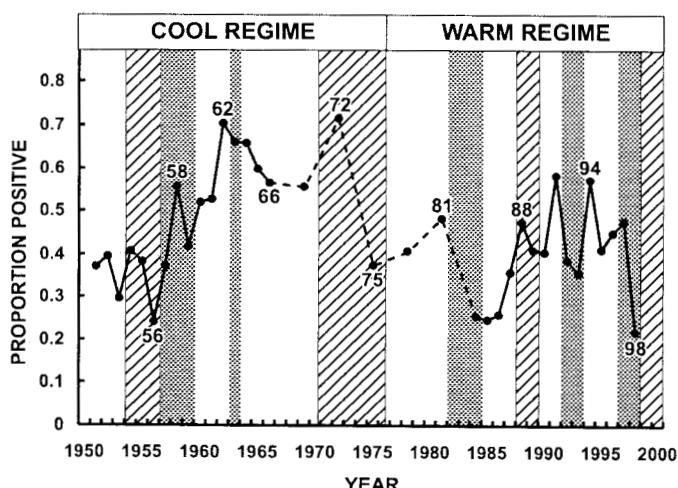
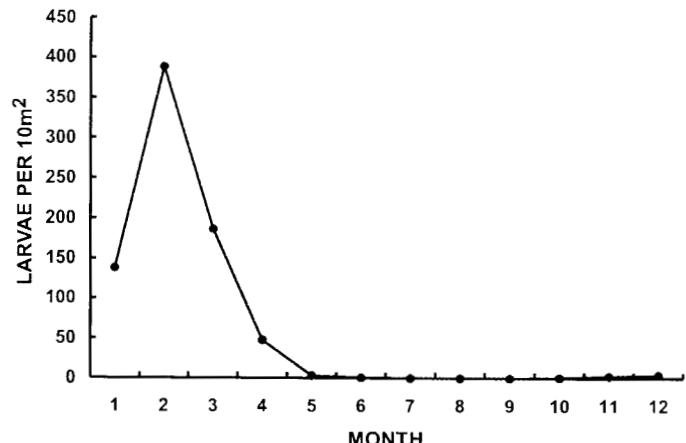
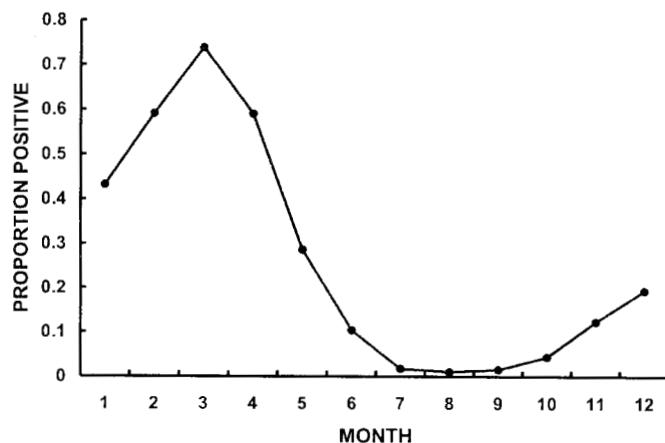
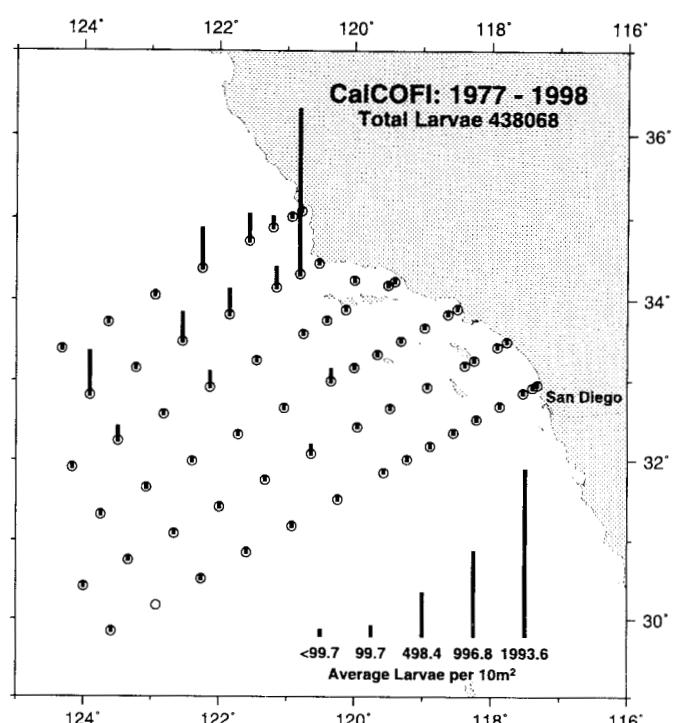
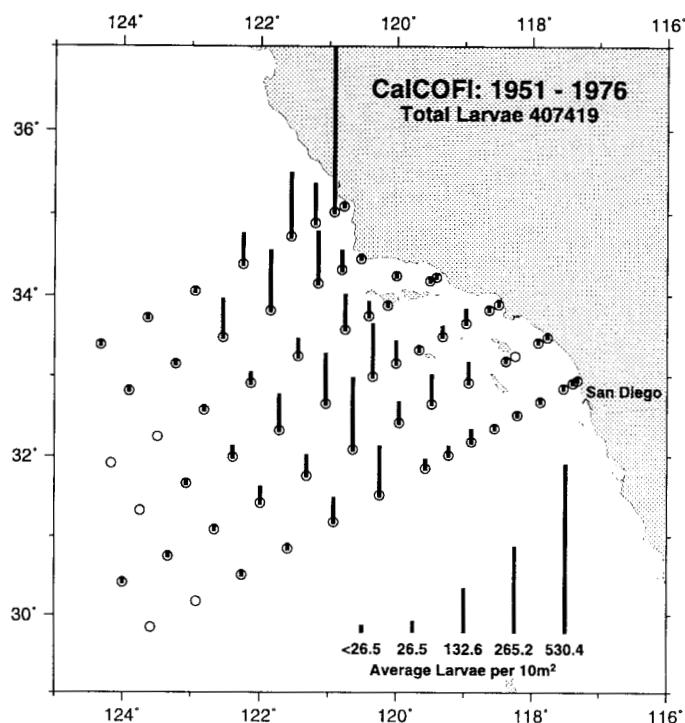
## *Engraulis mordax* eggs



*Merluccius productus*

Pacific hake or whiting

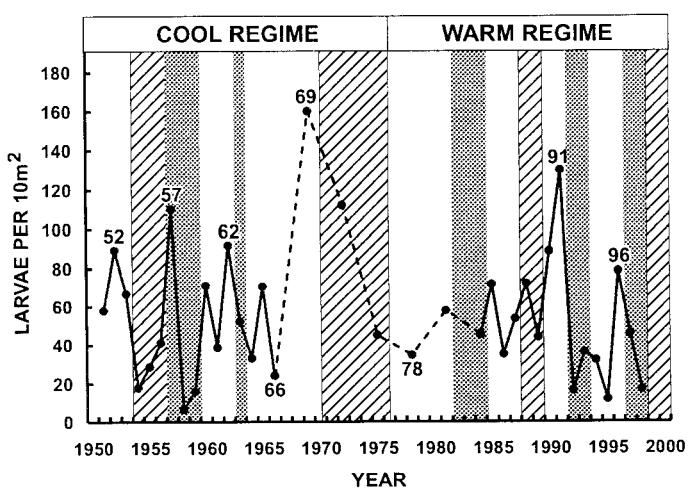
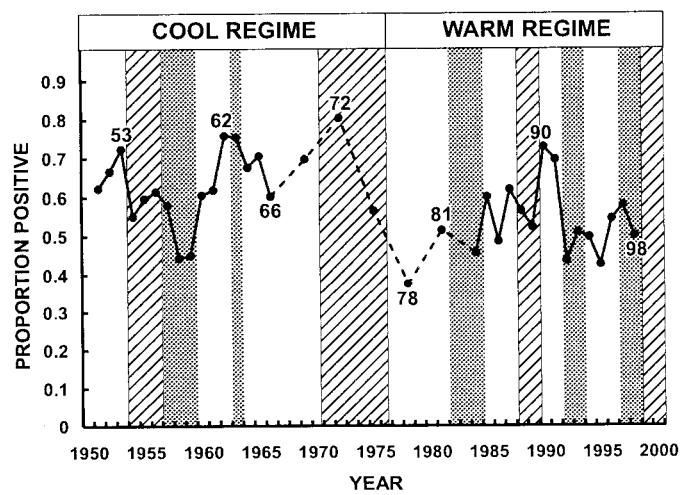
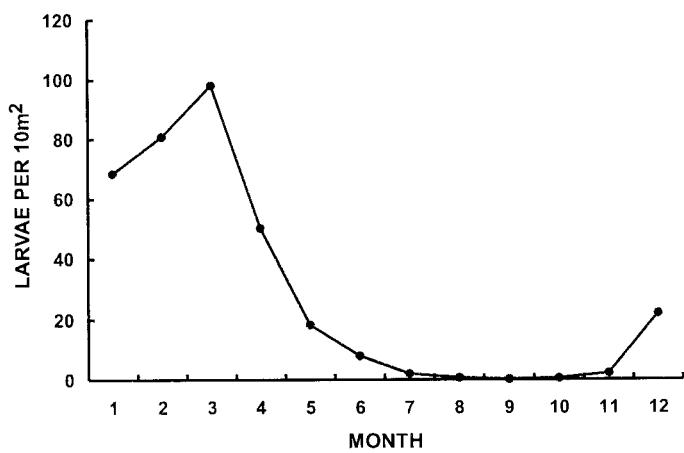
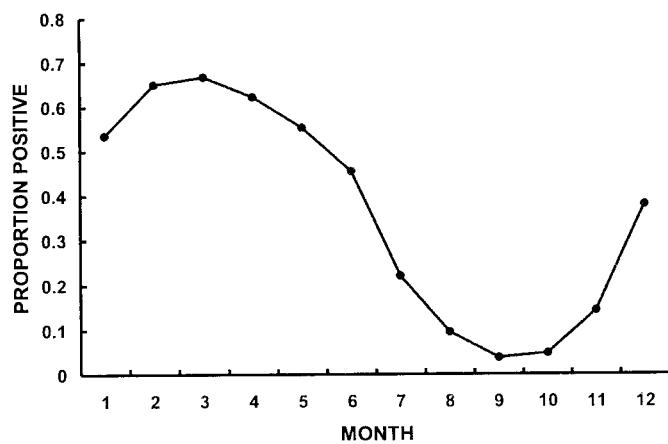
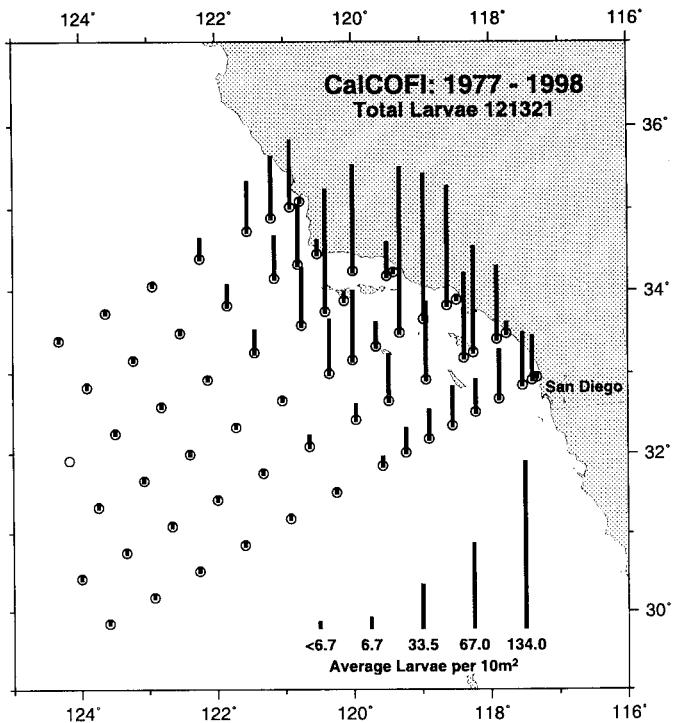
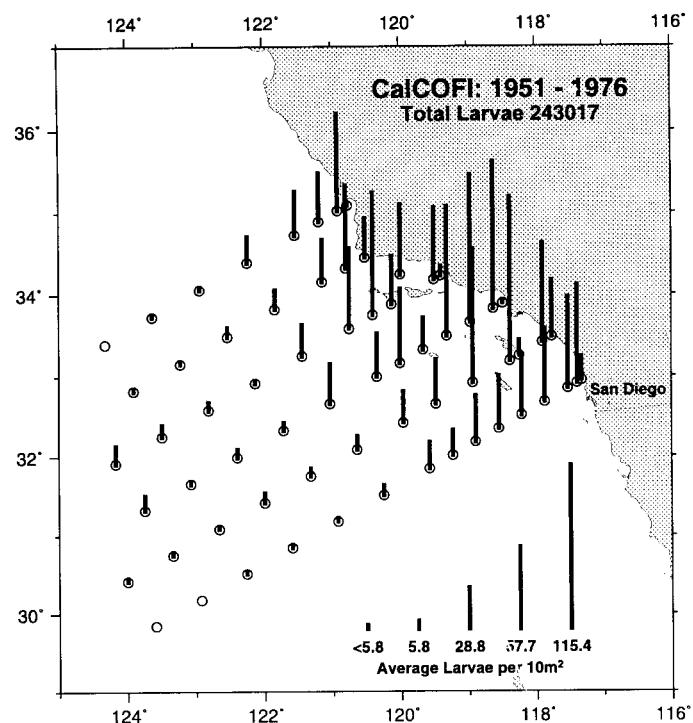
MERLUCCIIDAE



## BATHYLAGIDAE

## California smoothtongue

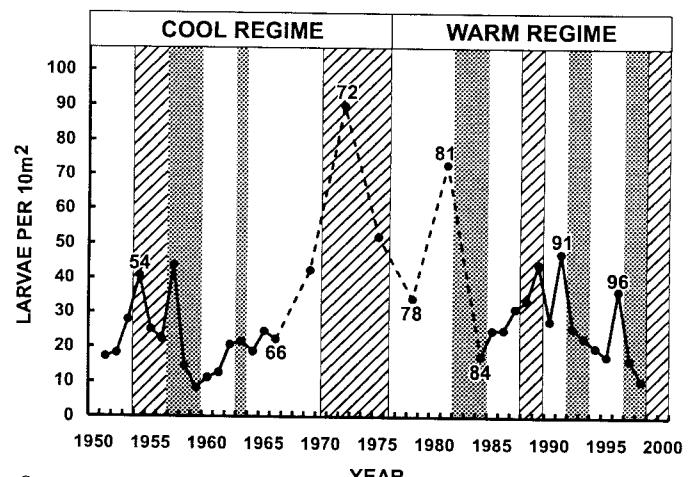
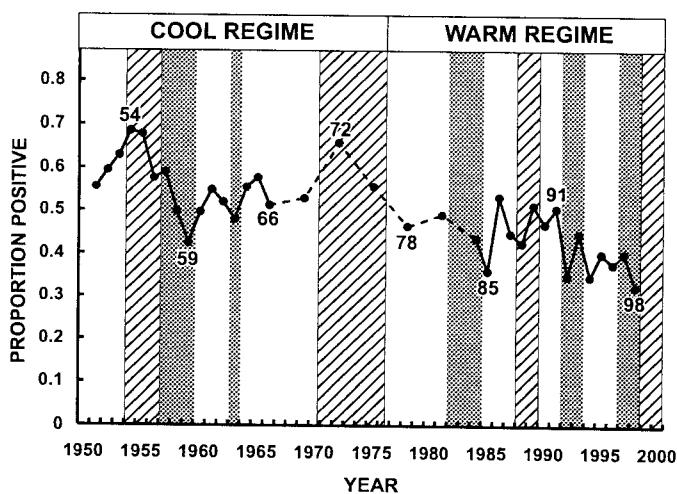
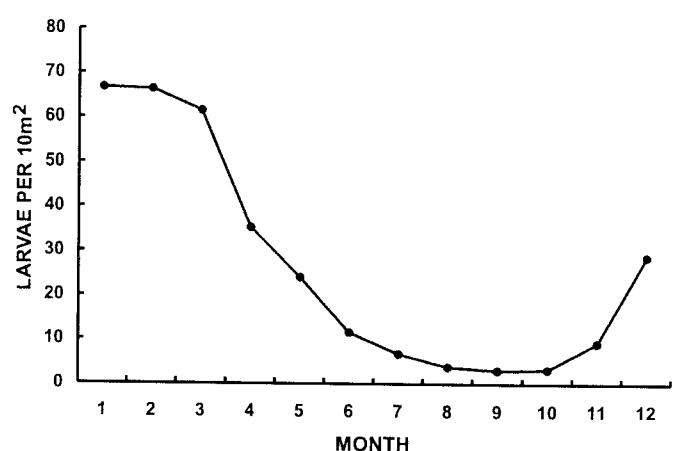
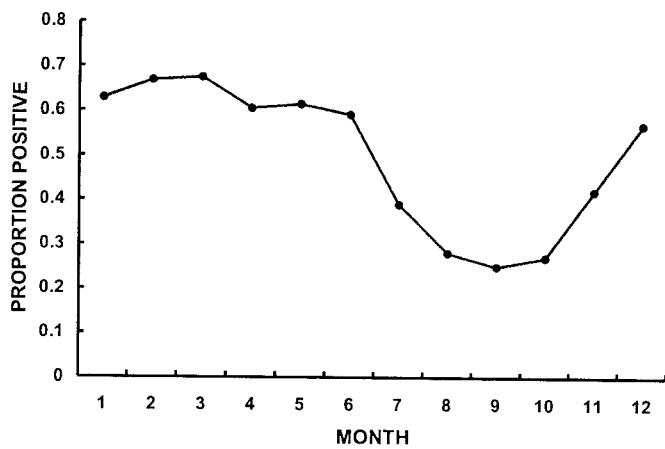
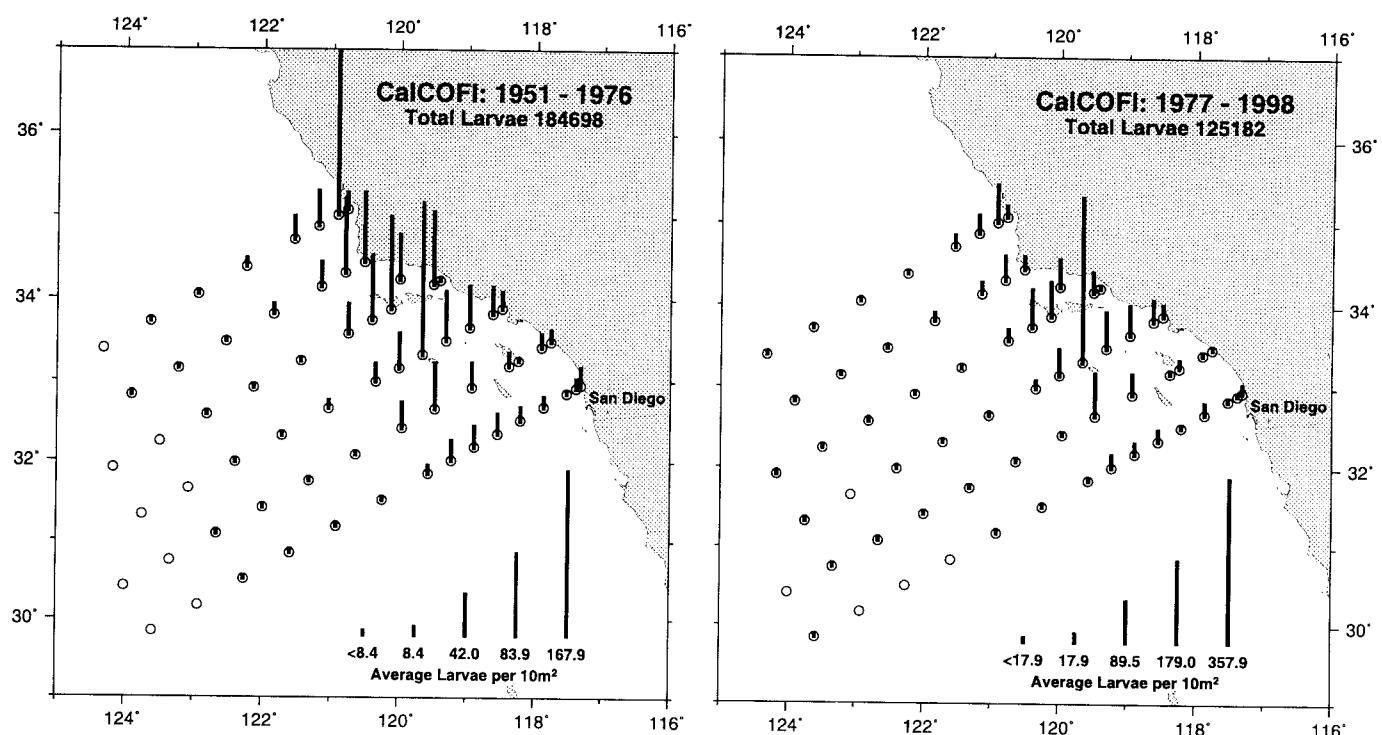
## *Leuroglossus stilius*



## Sebastes spp.

## Rockfishes

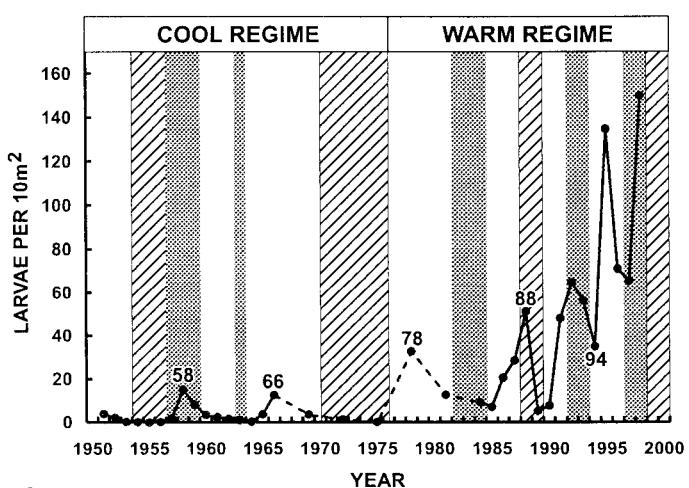
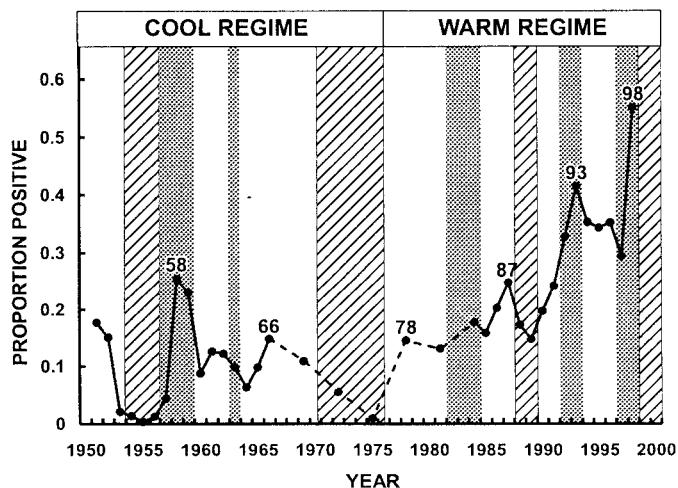
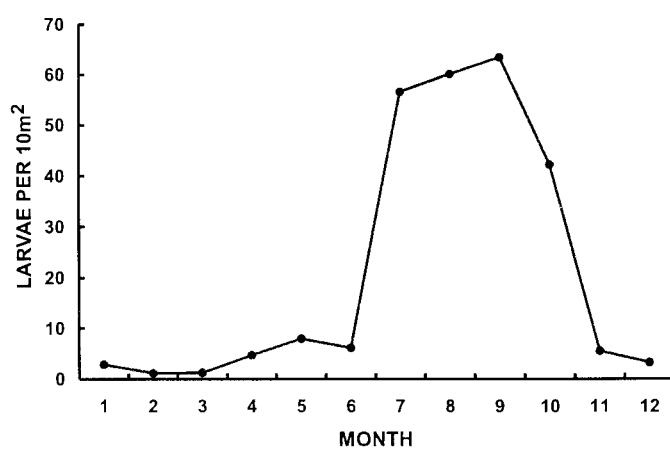
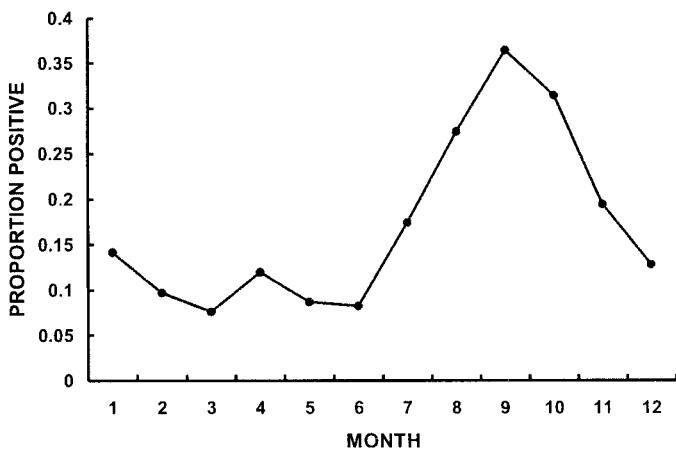
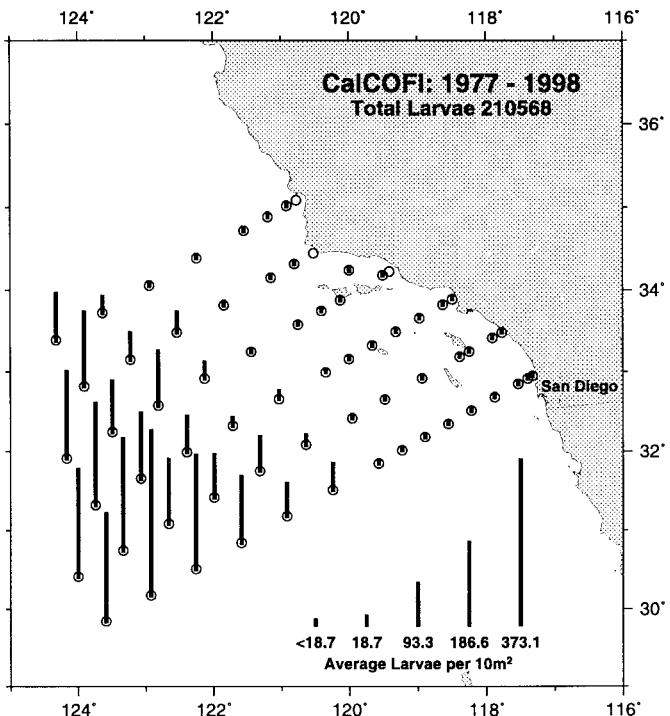
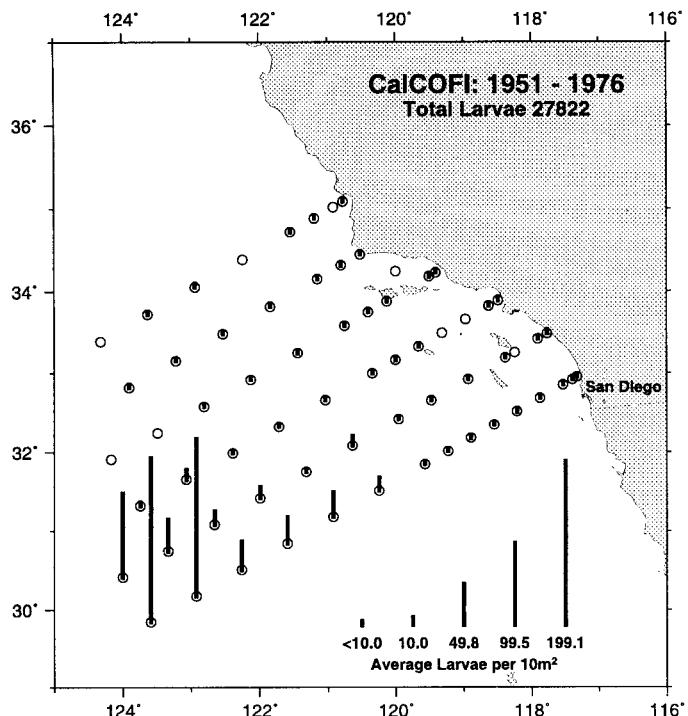
## SEBASTIDAE



## PHOSICHTHYIDAE

## Panama lightfish

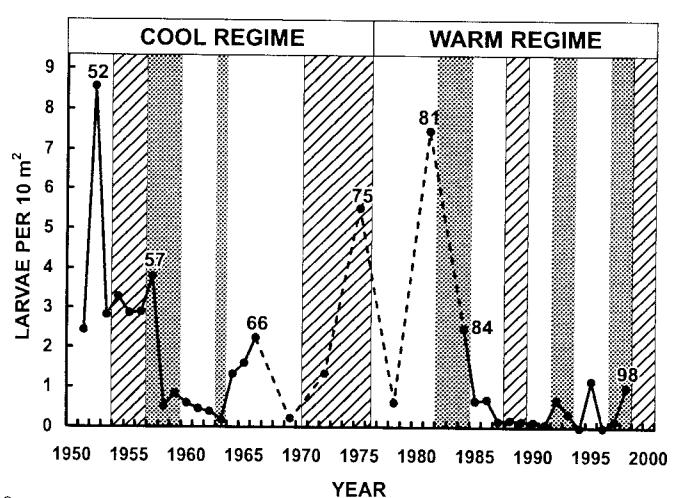
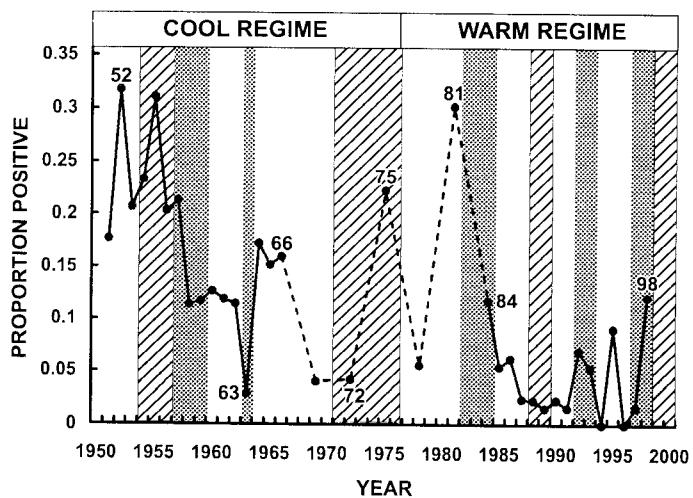
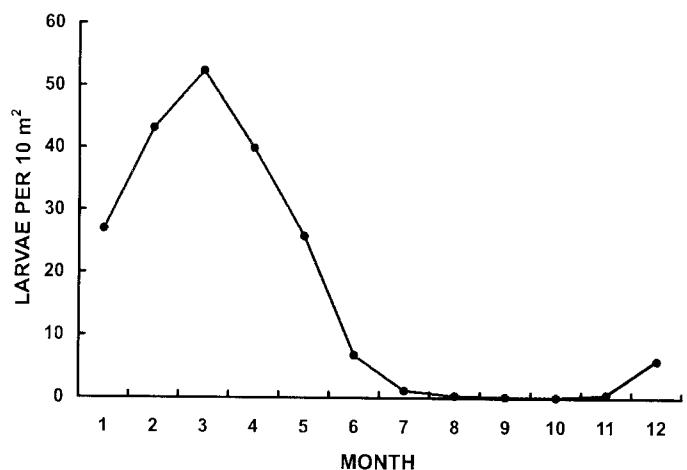
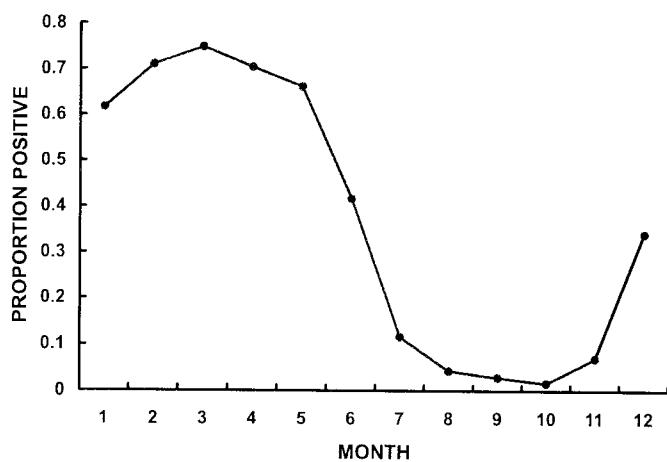
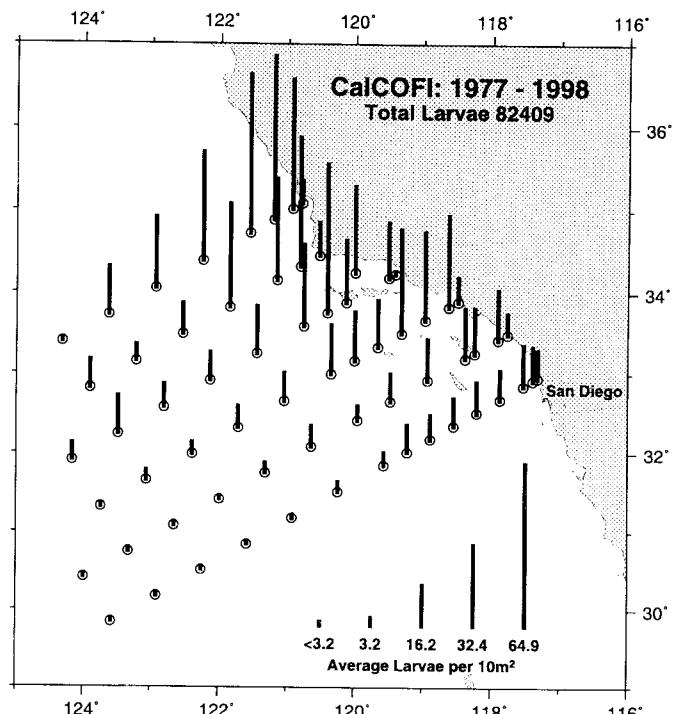
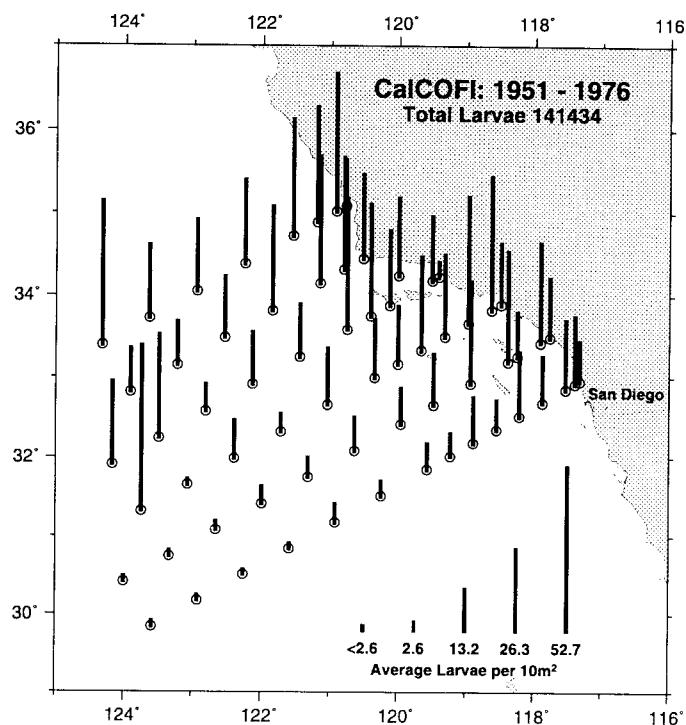
## *Vinciguerria lucetia*



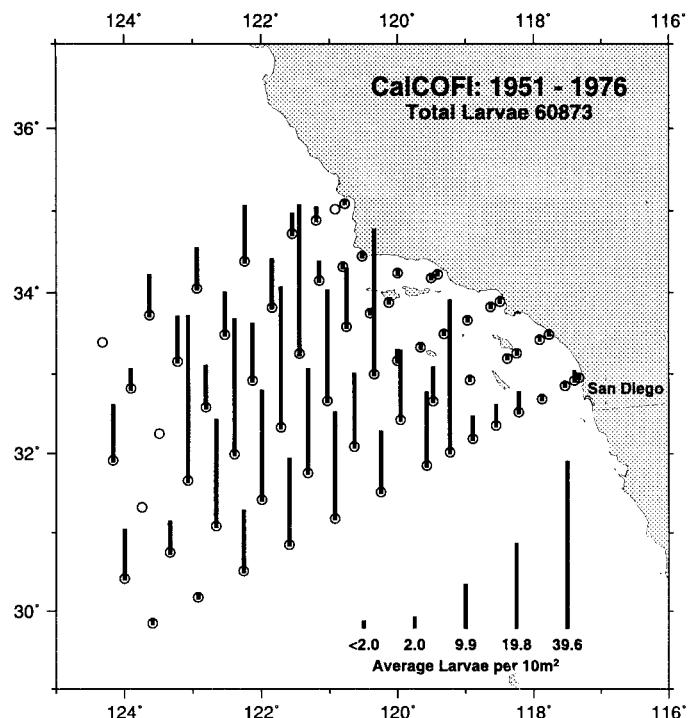
*Stenobrachius leucopsarus*

Northern lampfish

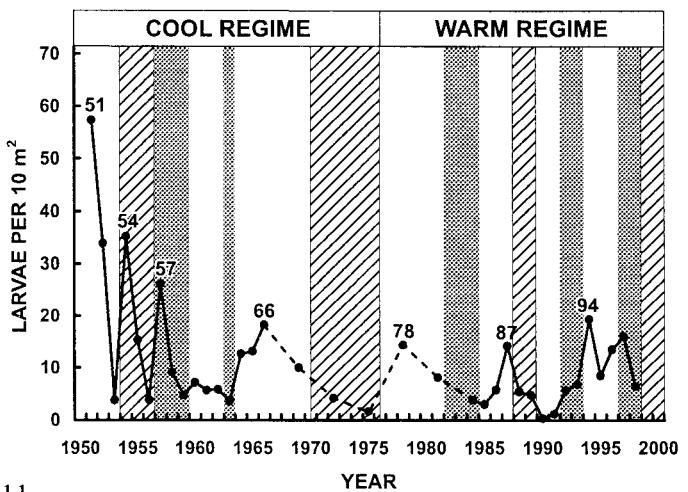
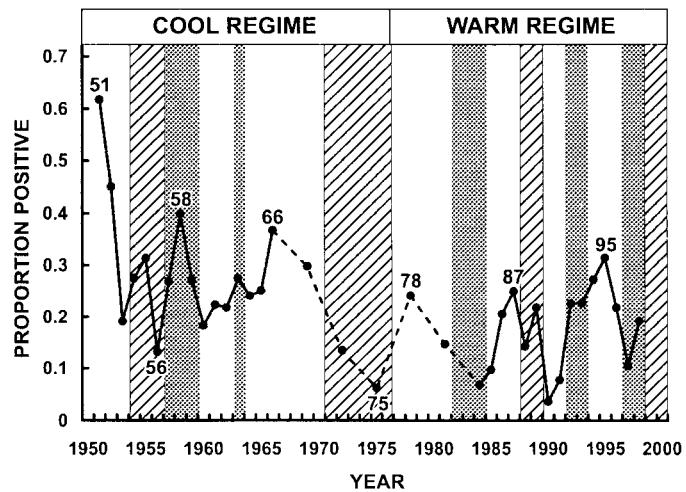
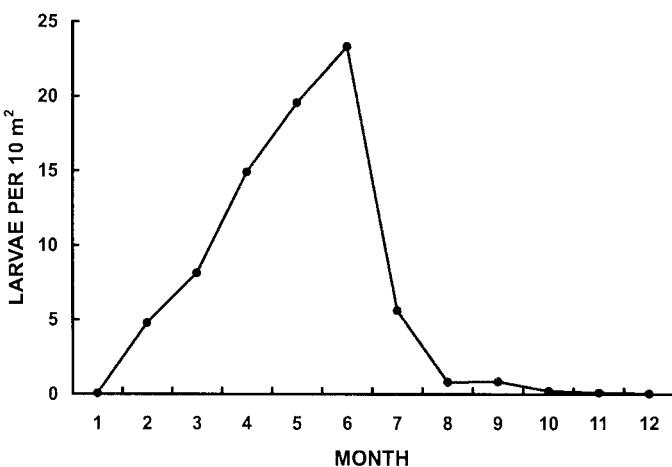
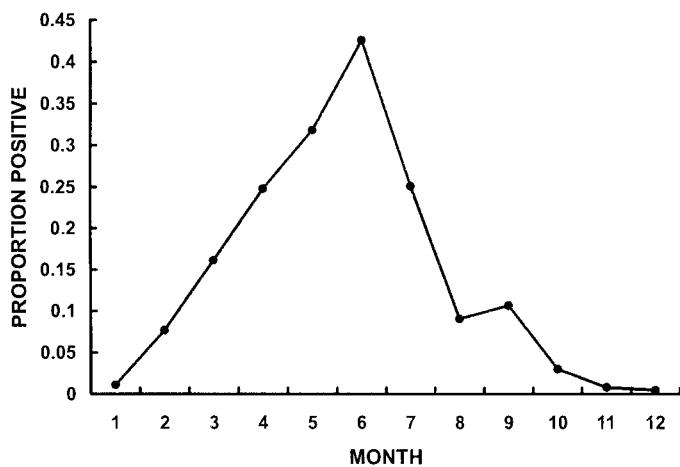
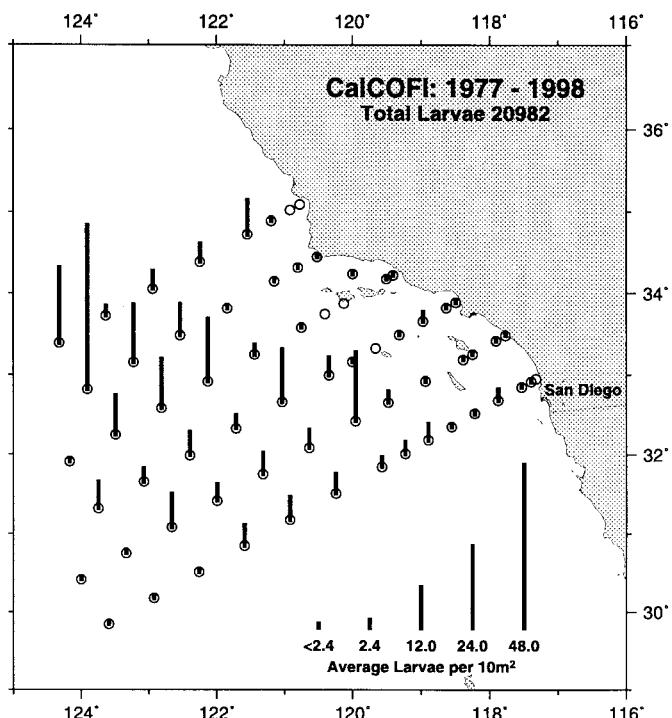
MYCTOPHIDAE



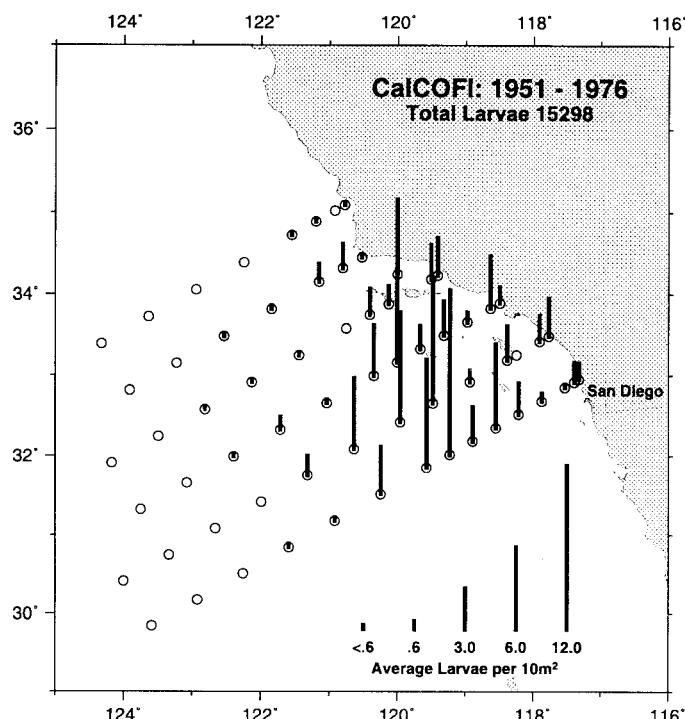
## CARANGIDAE



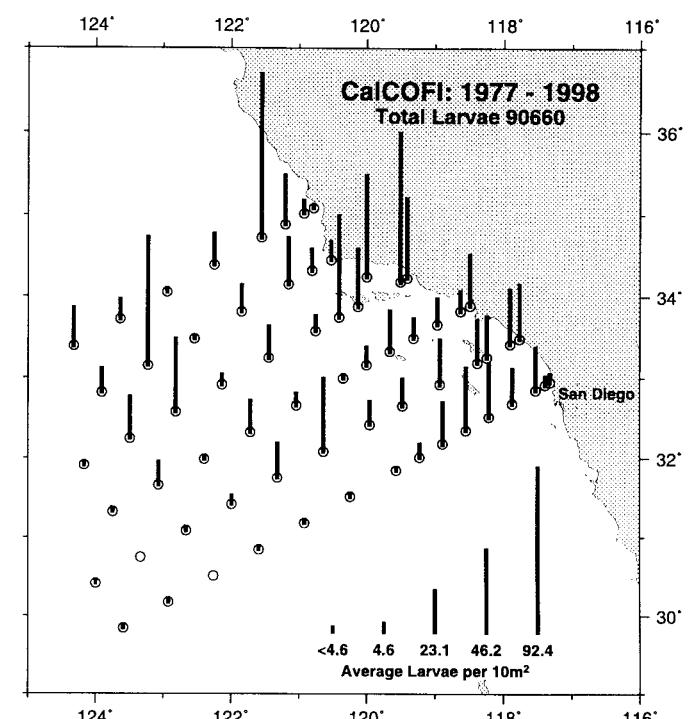
## Jack mackerel



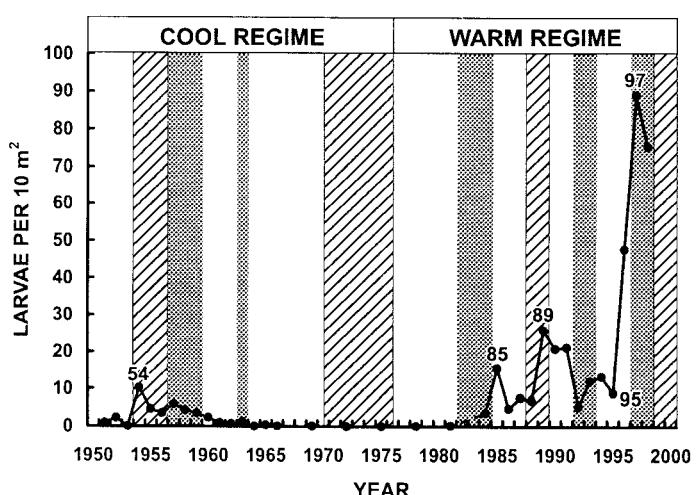
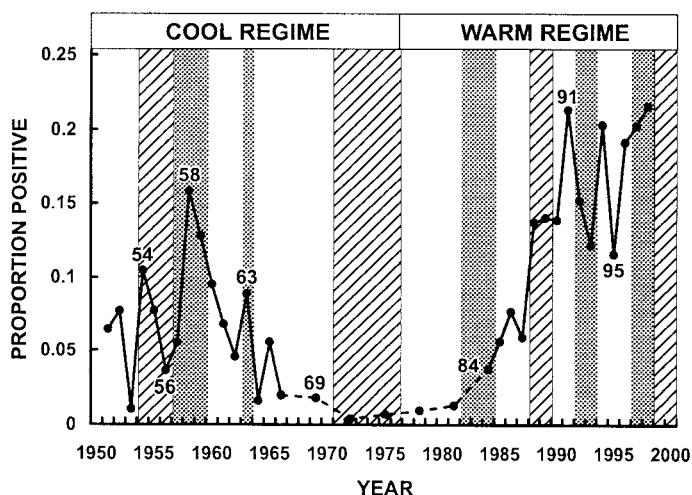
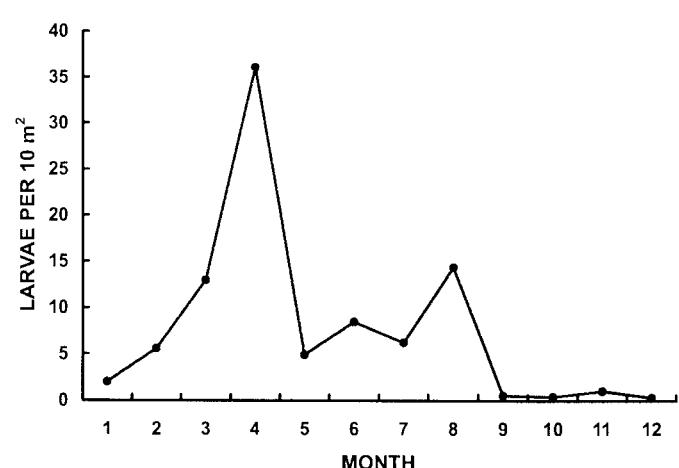
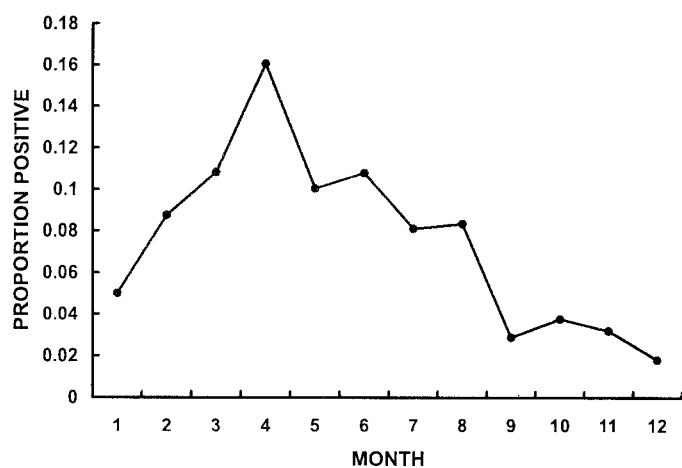
### Sardinops sagax larvae



### Pacific sardine larvae



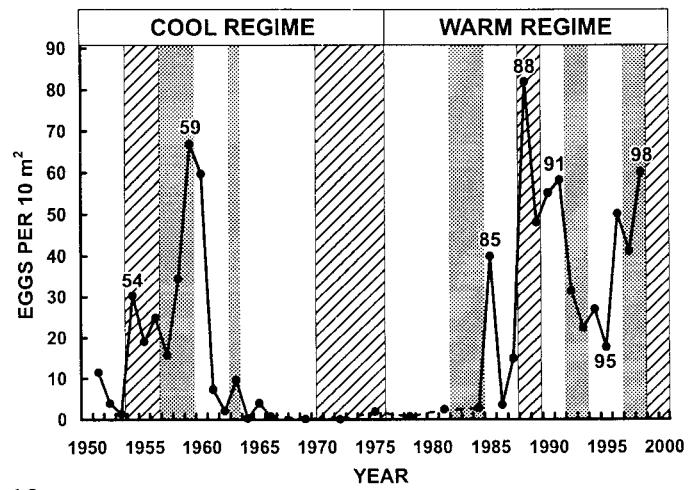
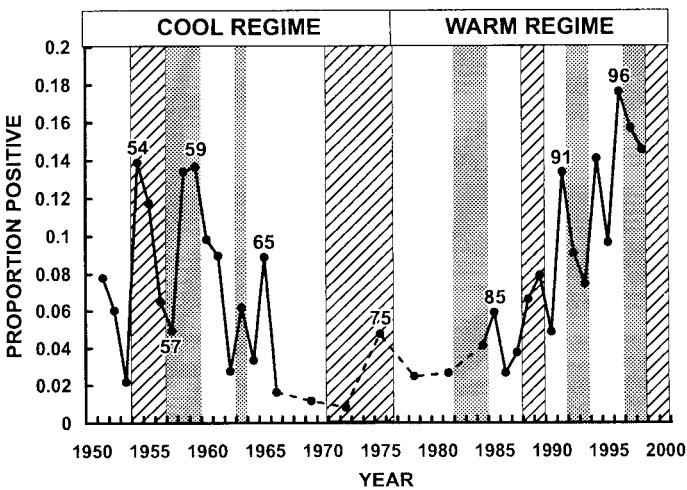
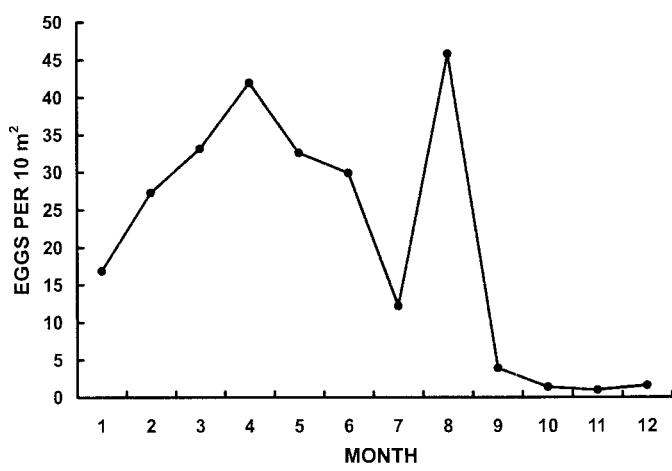
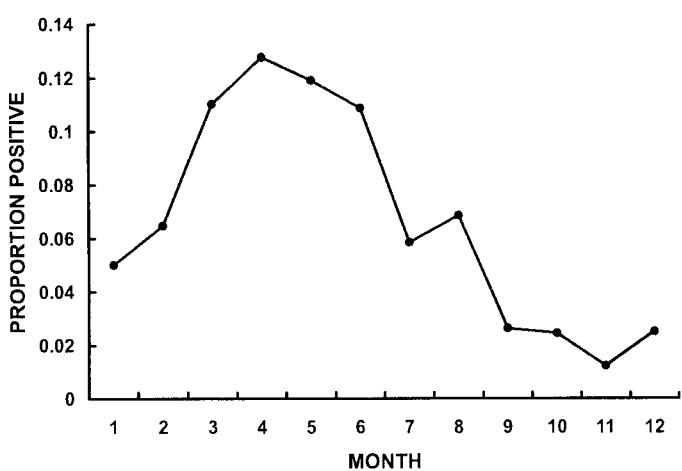
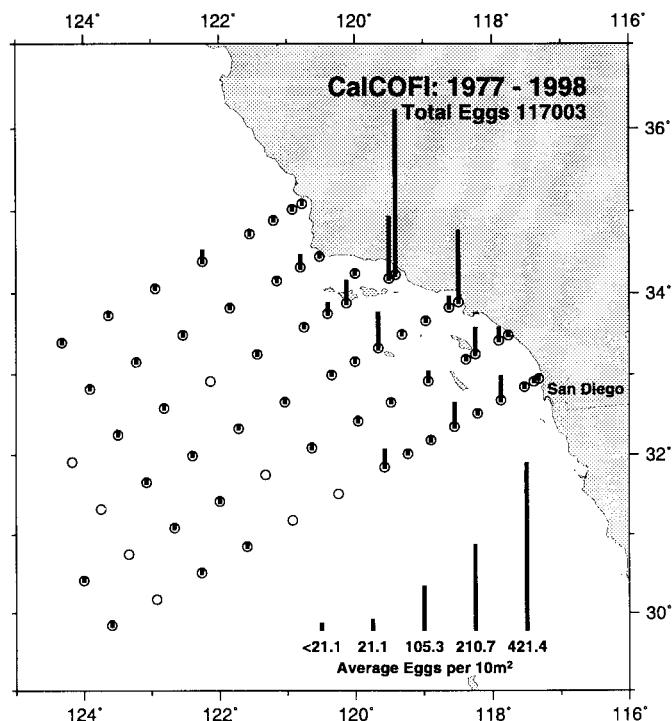
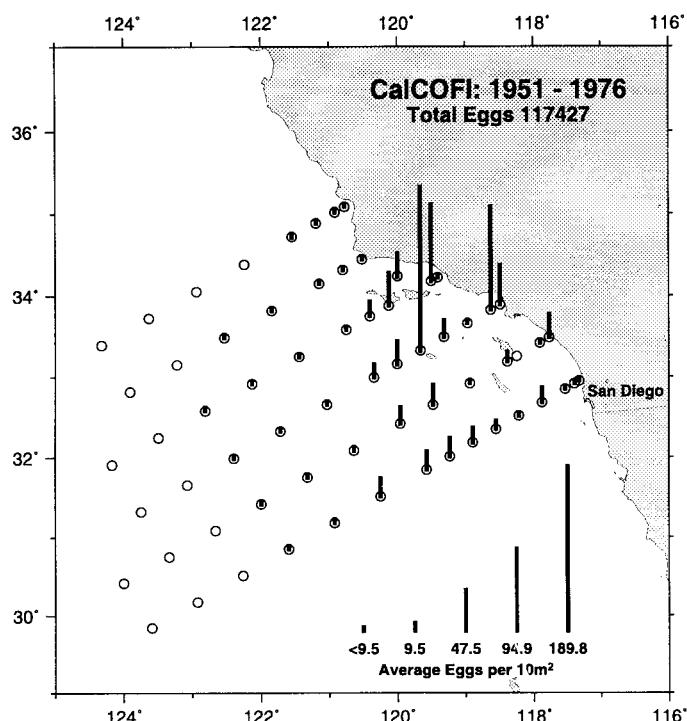
### CLUPEIDAE



## CLUPEIDAE

## Pacific sardine eggs

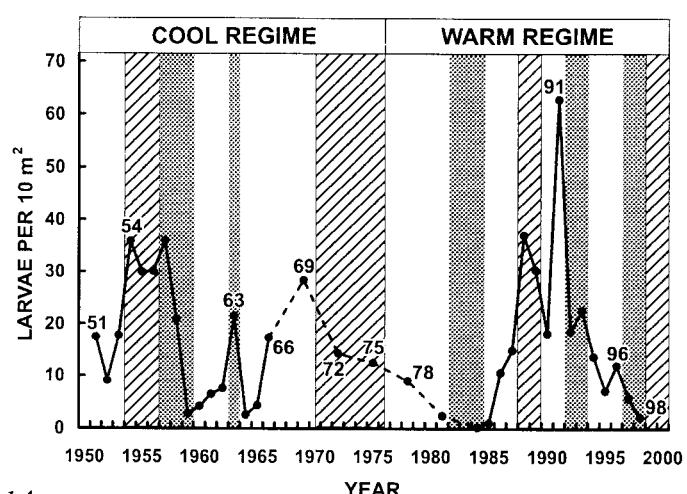
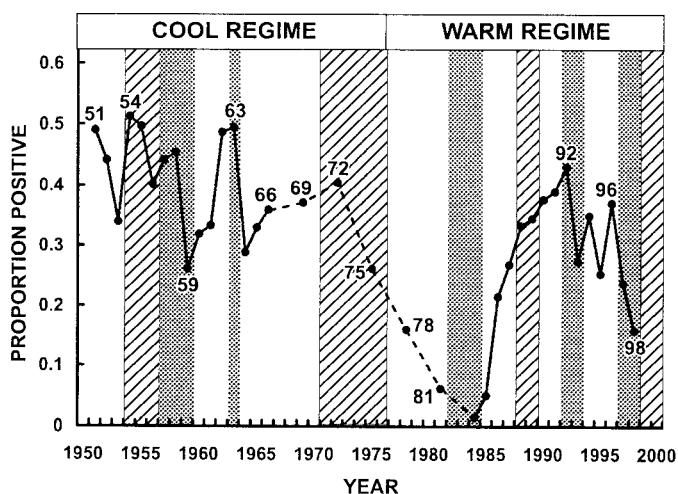
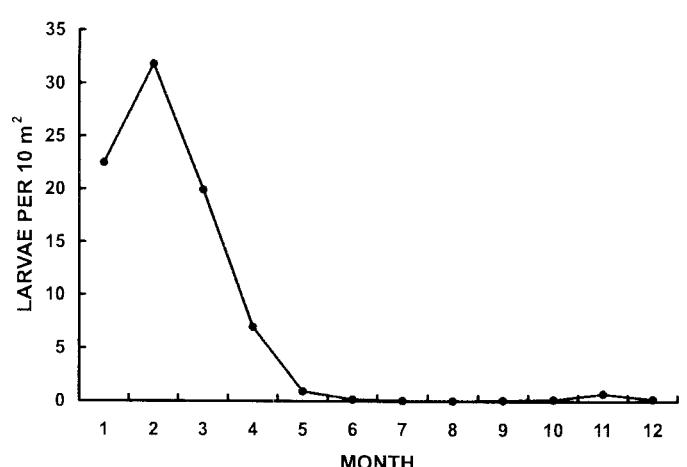
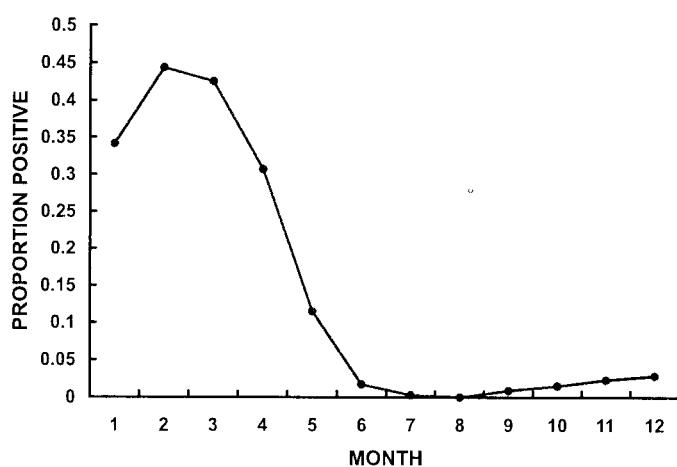
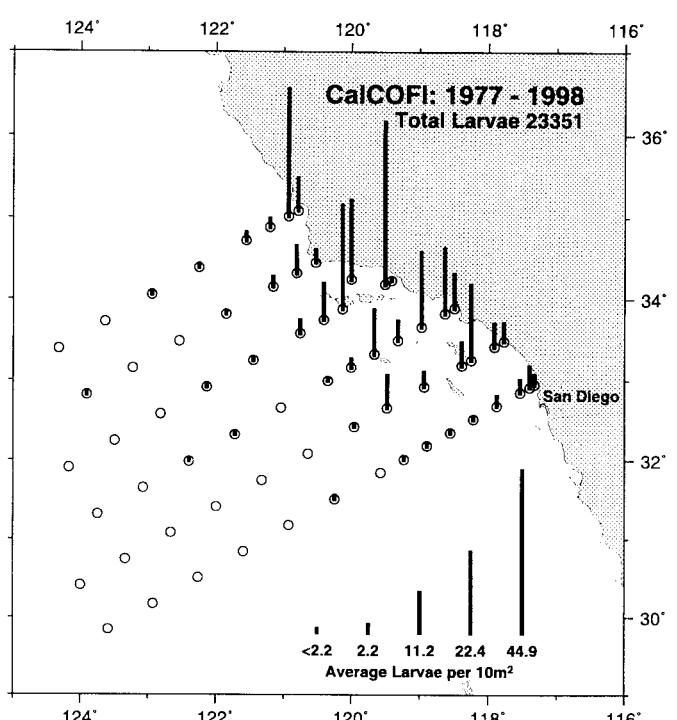
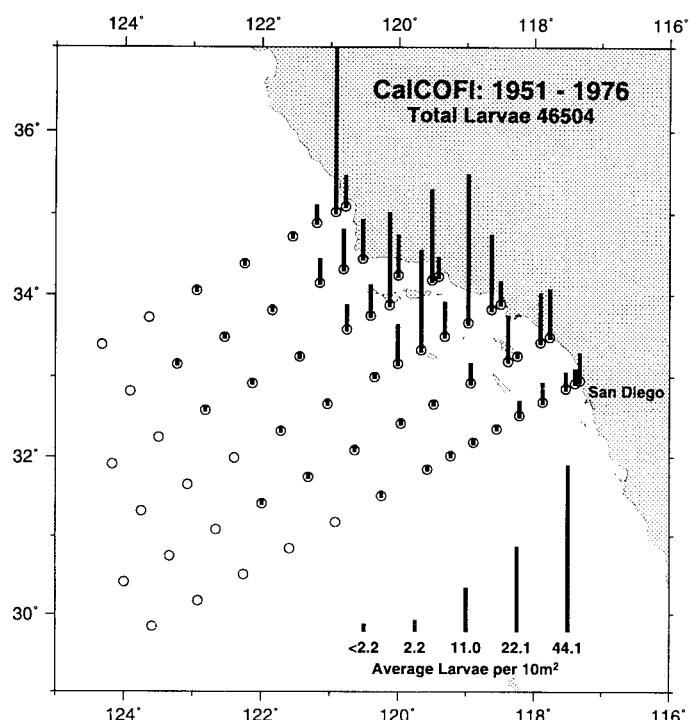
## *Sardinops sagax* eggs



*Sebastes jordani*

Shortbelly rockfish

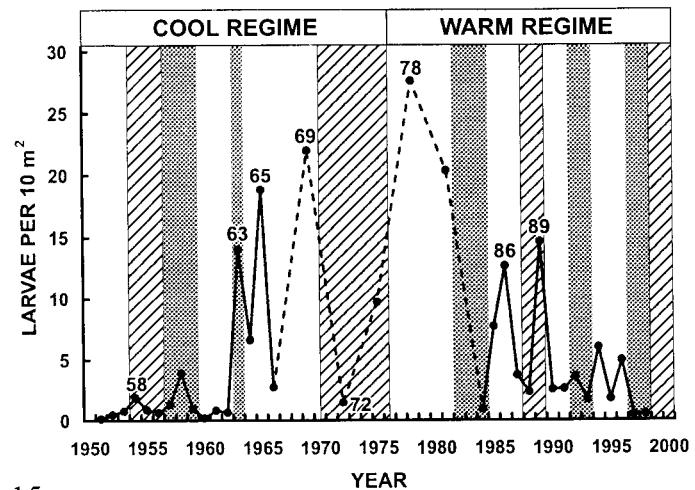
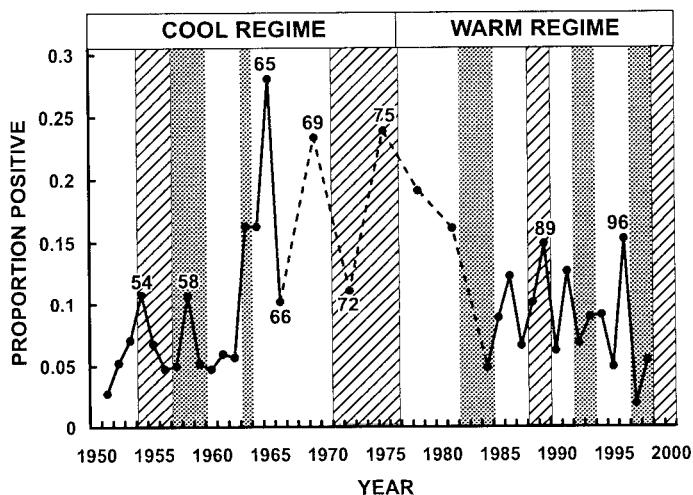
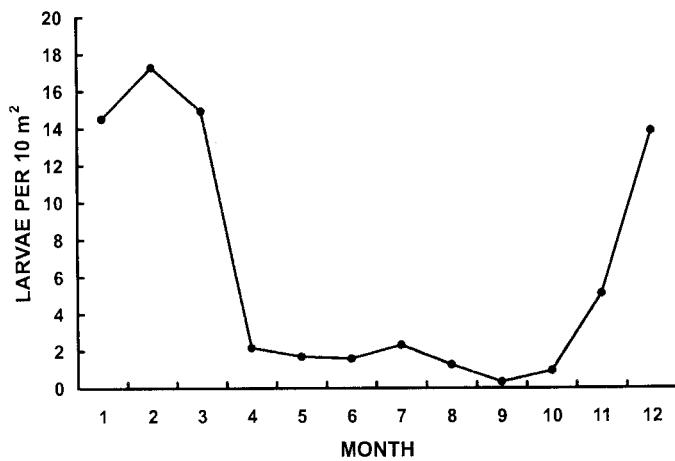
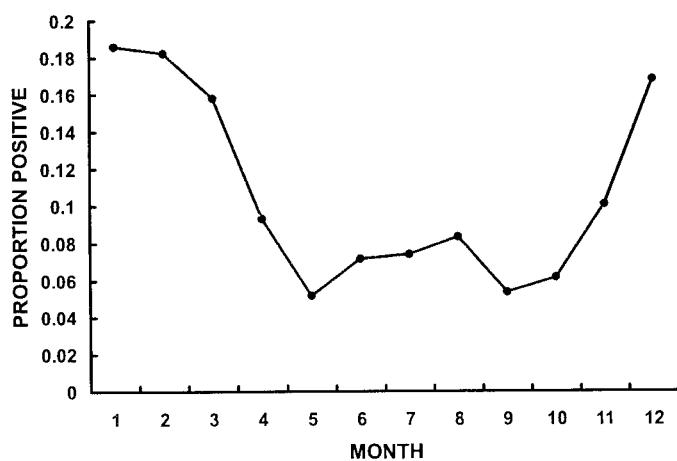
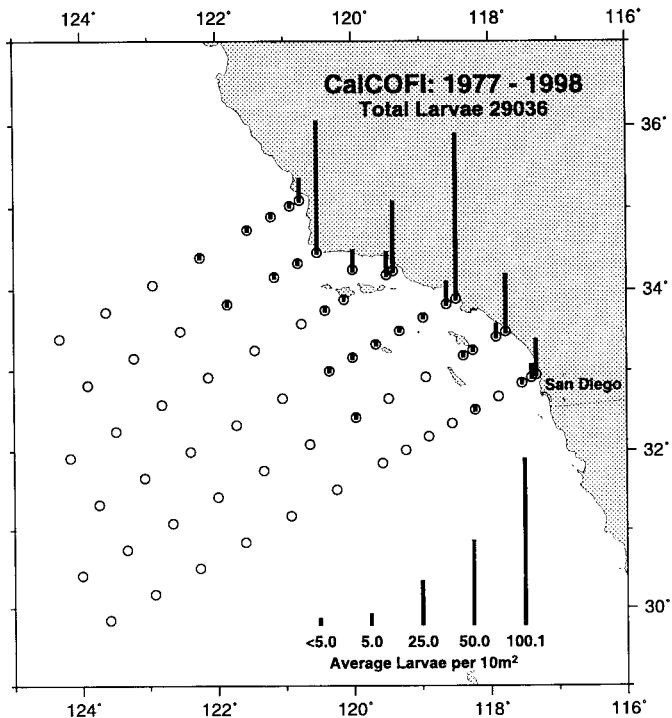
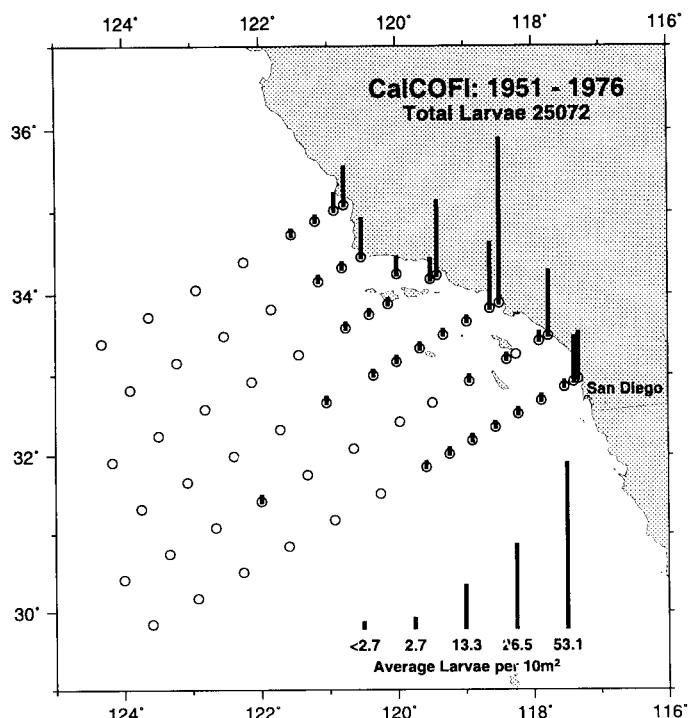
SEBASTIDAE



## SCIAENIDAE

## Croakers

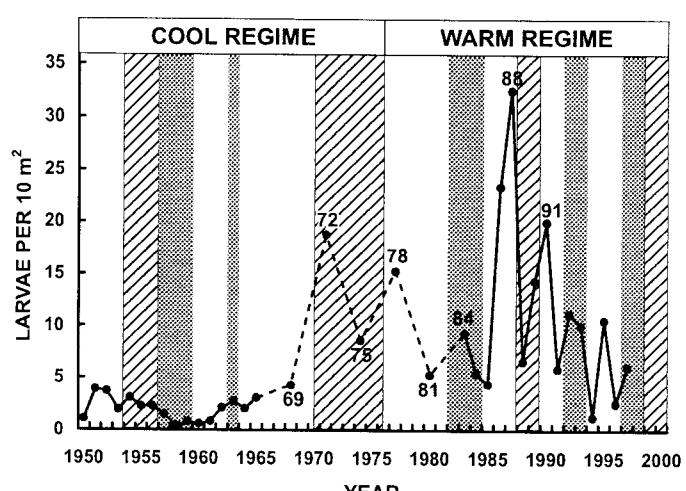
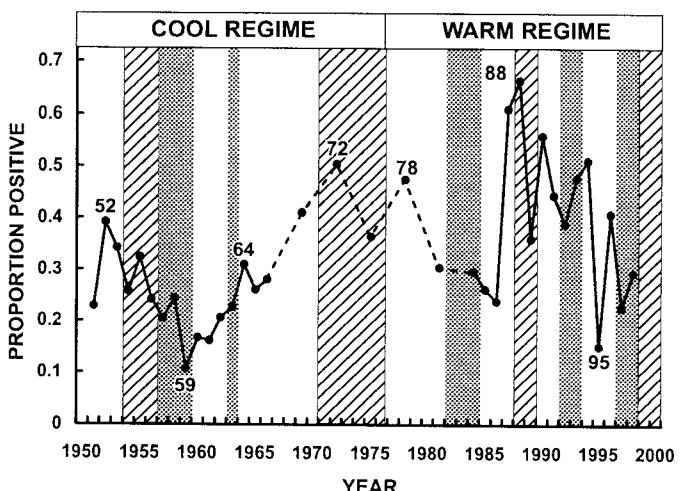
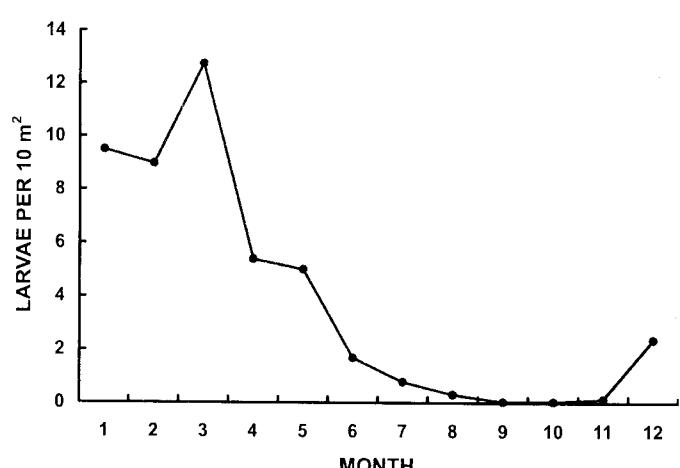
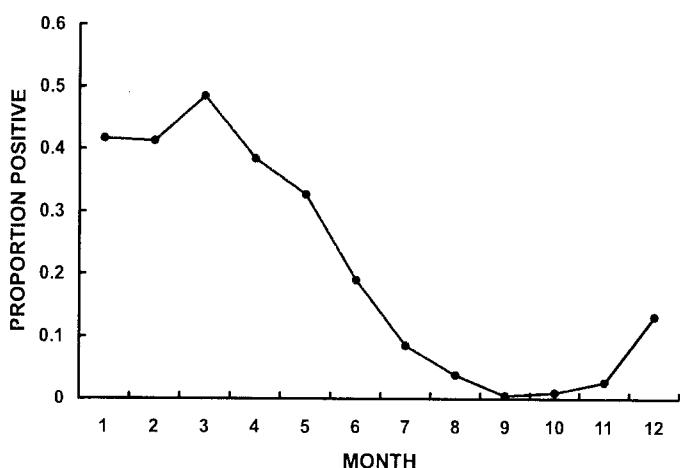
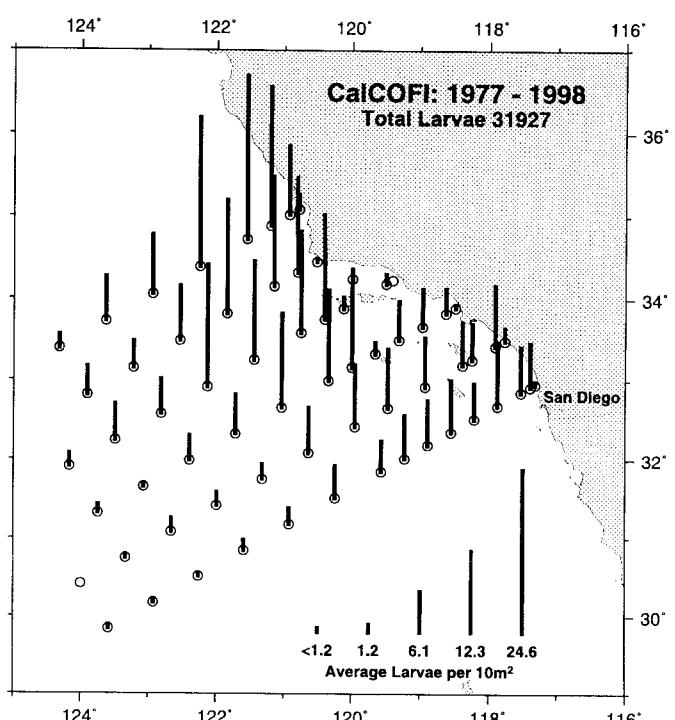
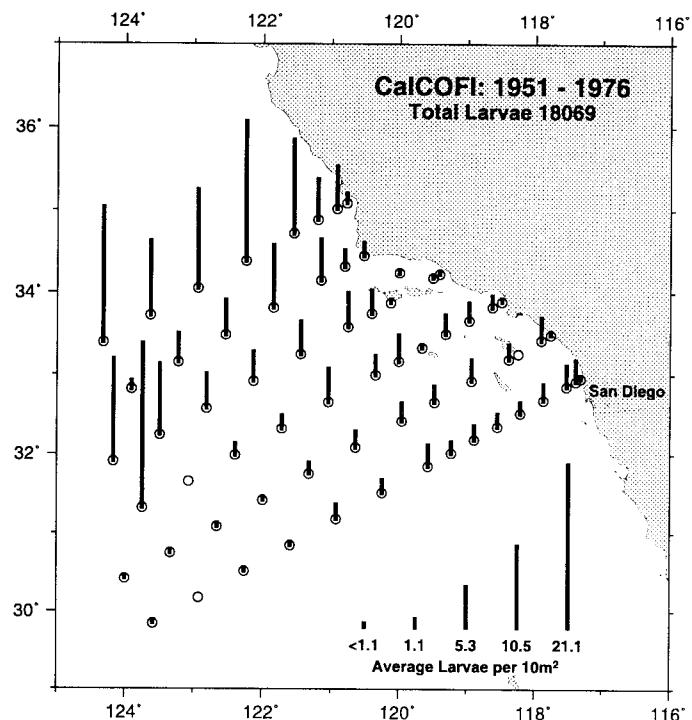
## SCIAENIDAE



*Bathylags ochotensis*

Popeye blacksmelt

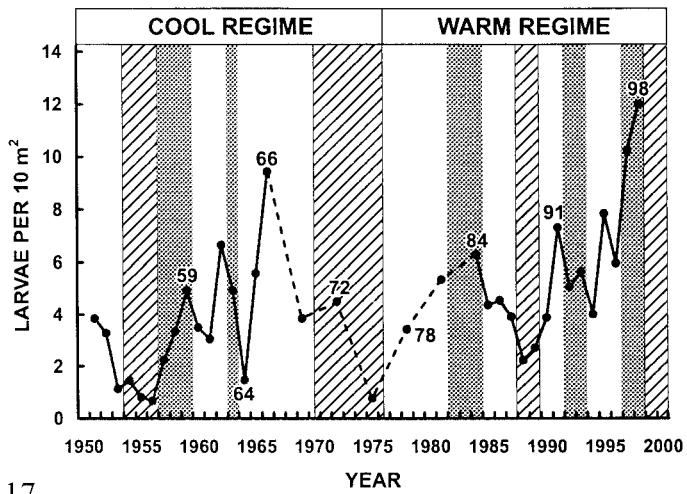
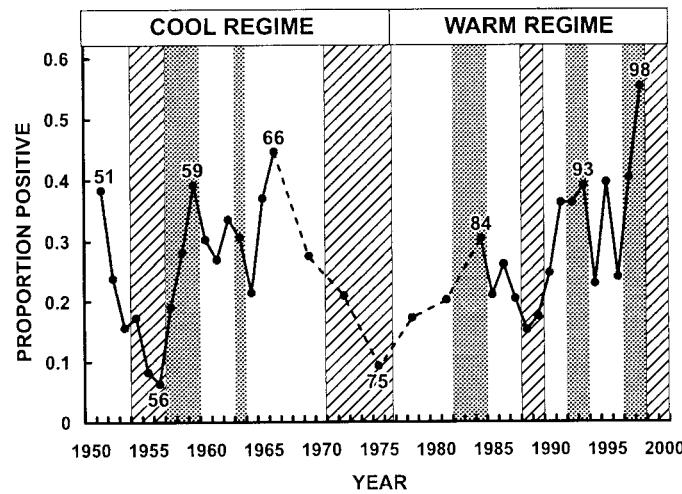
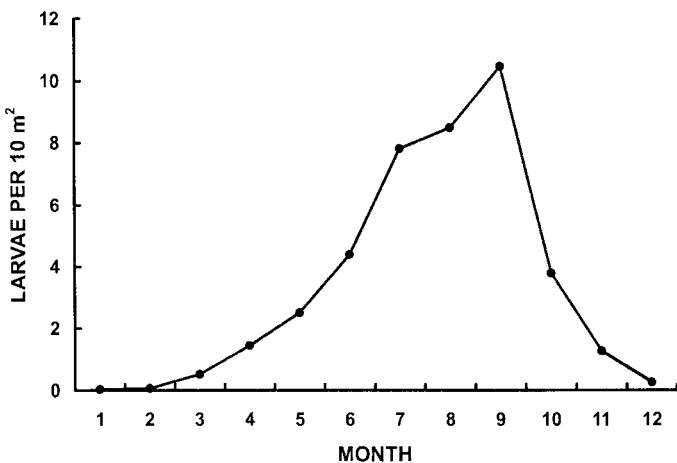
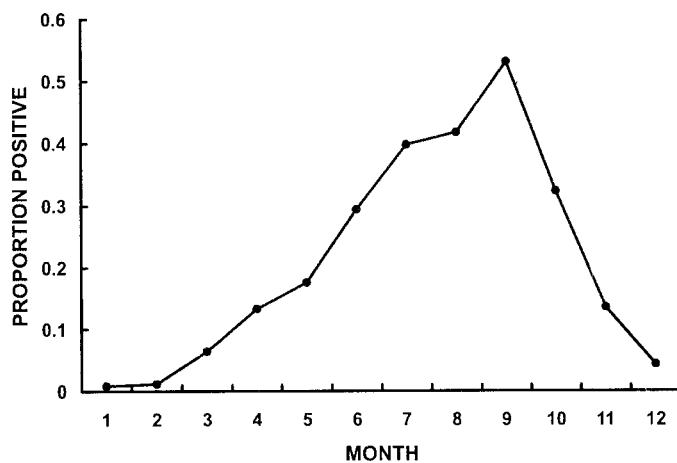
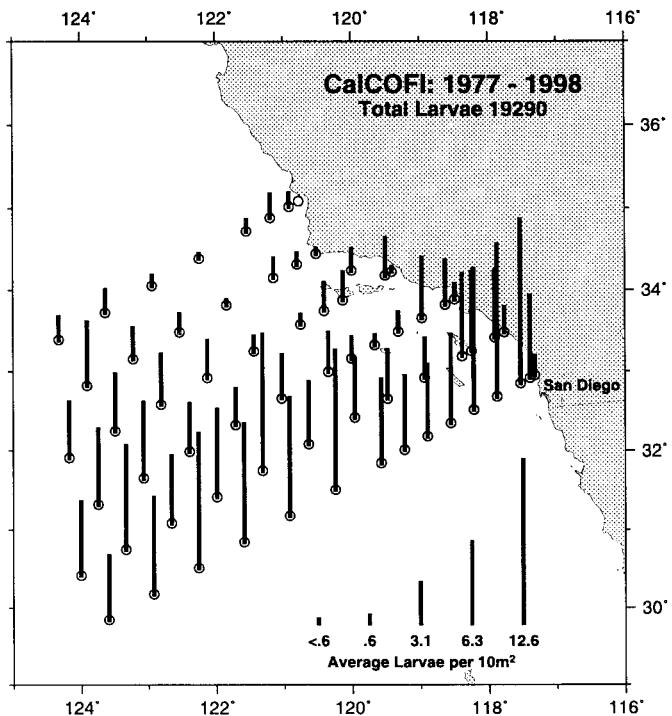
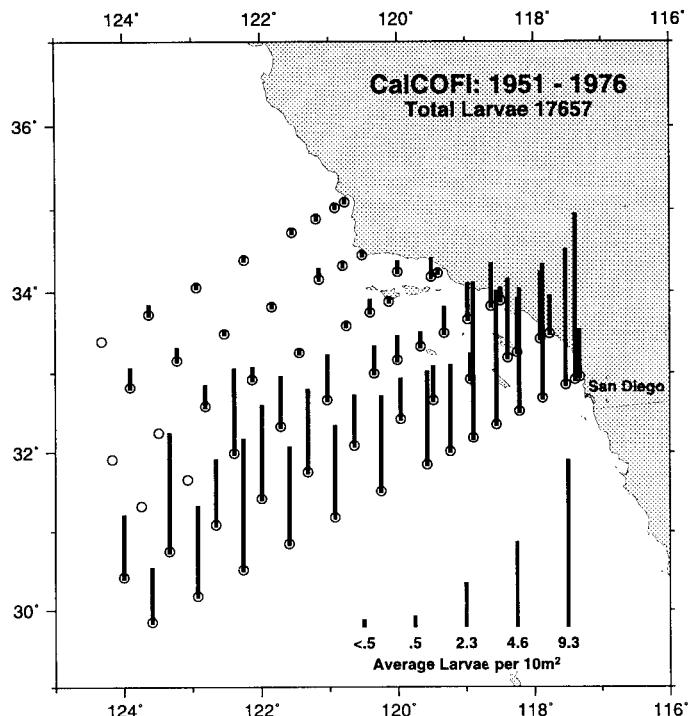
BATHYLAGIDAE



## MYCTOPHIDAE

## Mexican lampfish

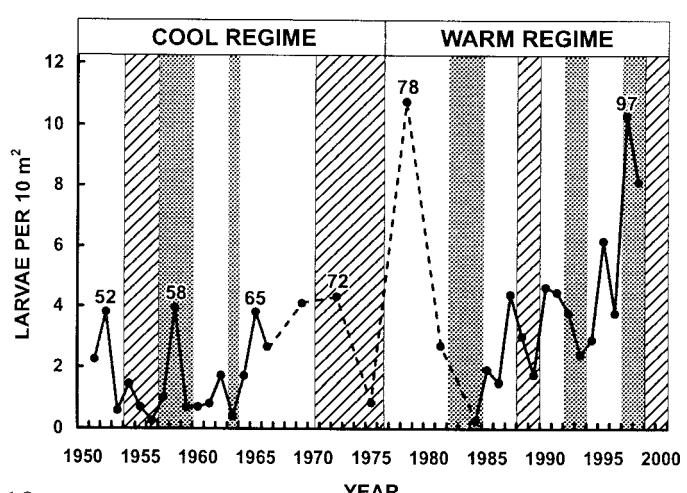
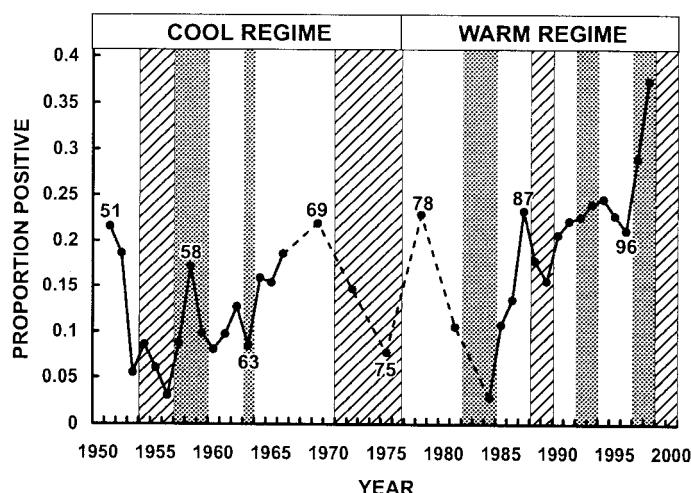
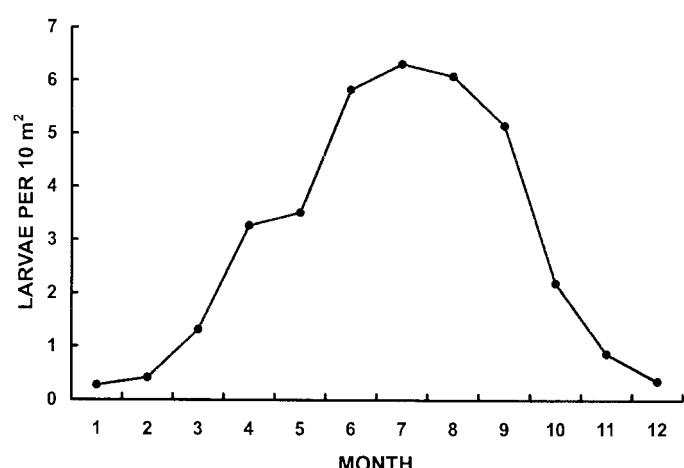
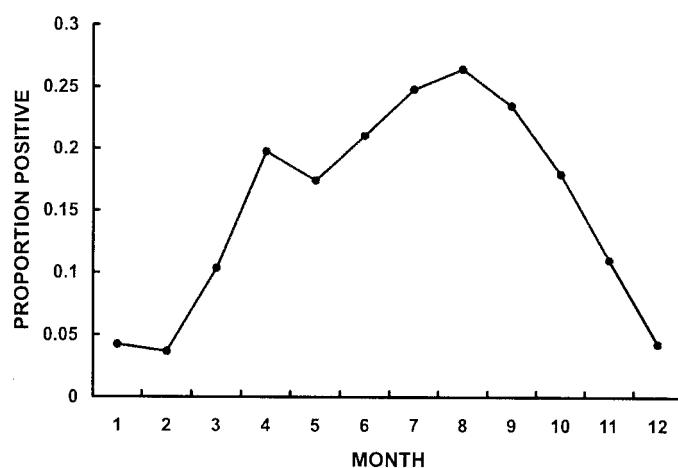
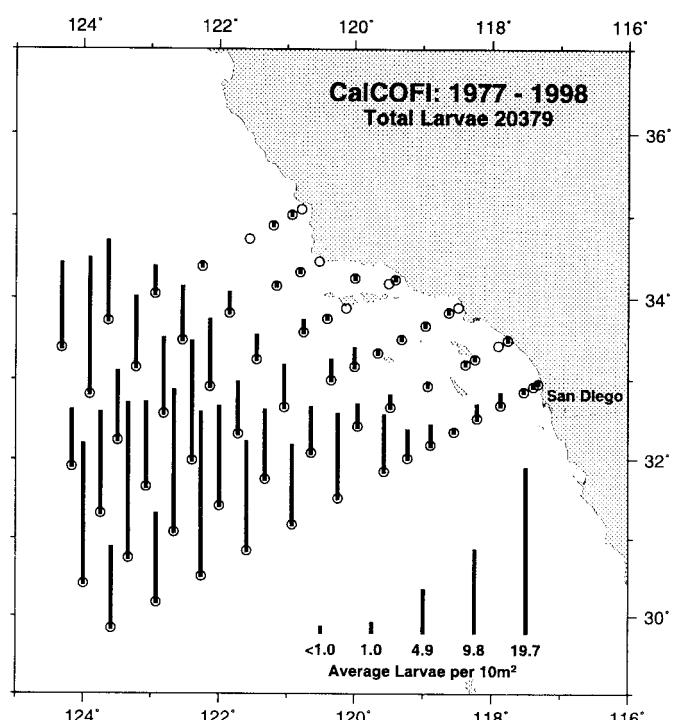
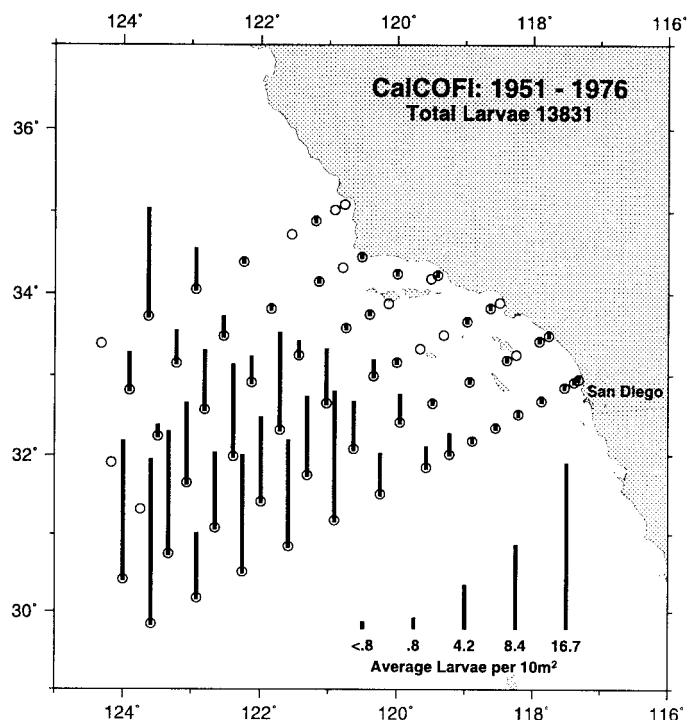
## *Triphoturus mexicanus*



### *BathyLAGUS wesethi*

### Snubnose blacksmelt

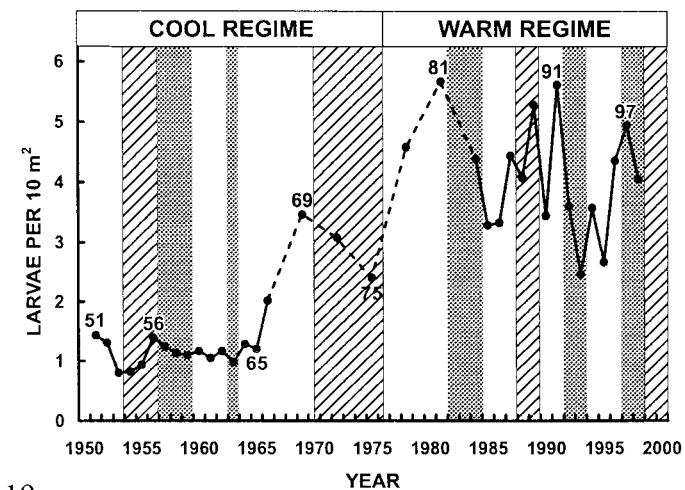
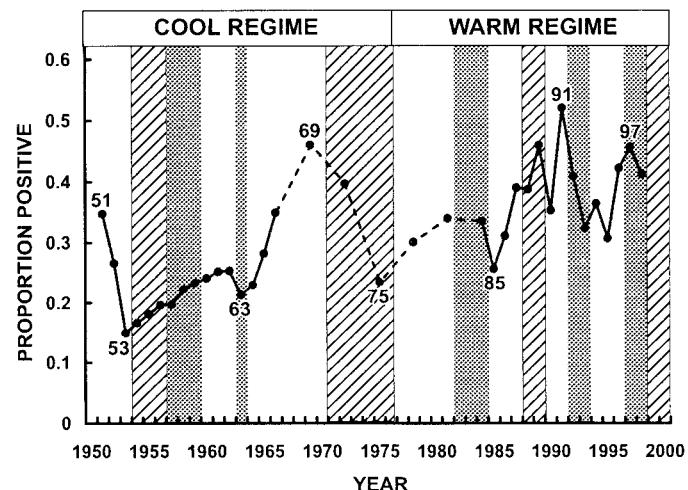
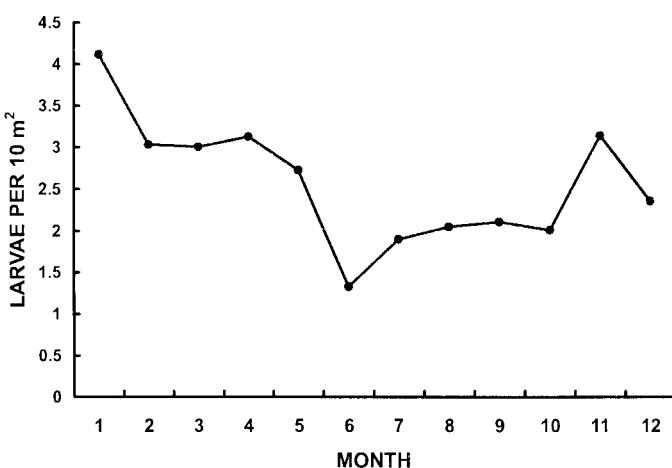
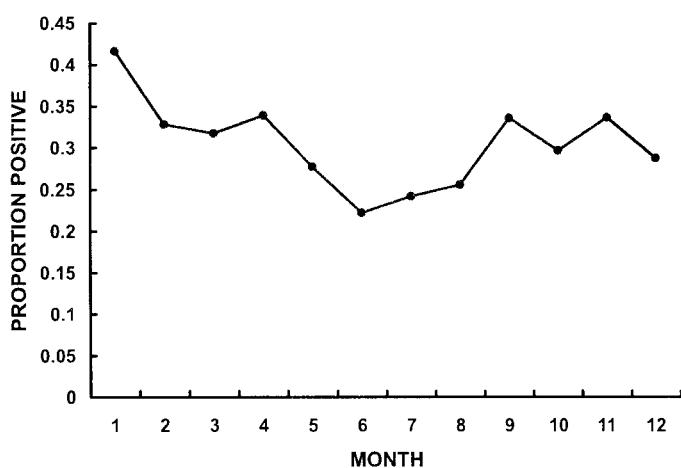
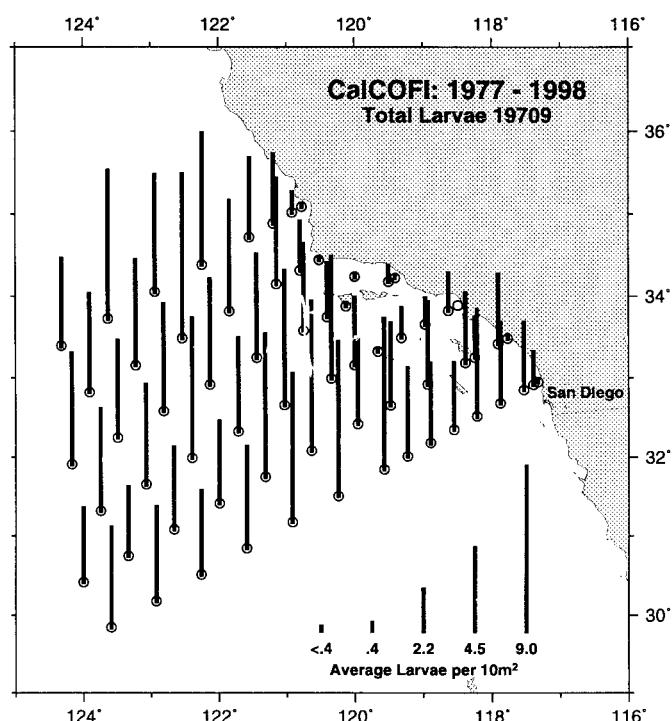
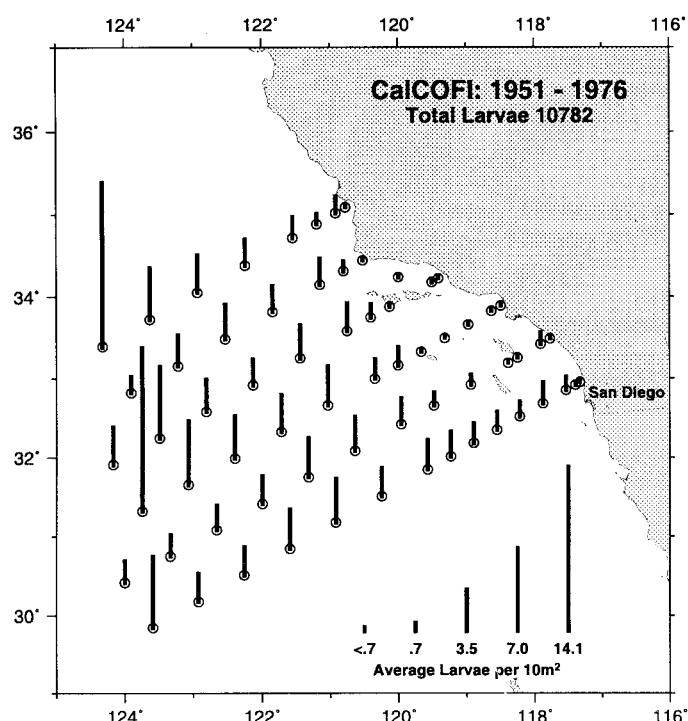
### BATHYLAGIDAE



## MYCTOPHIDAE

## California flashlightfish

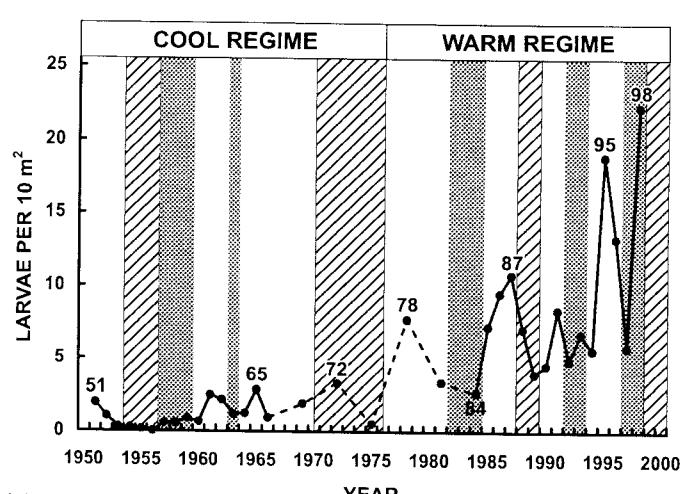
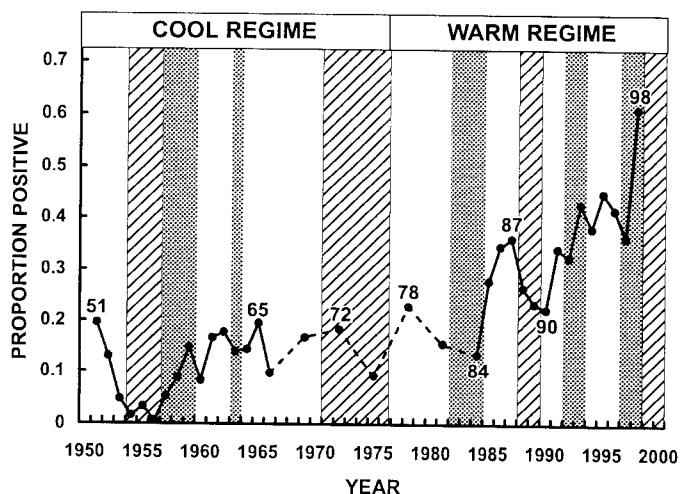
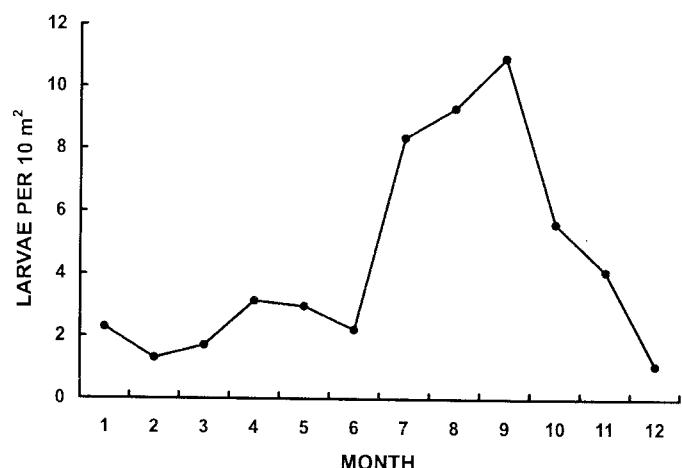
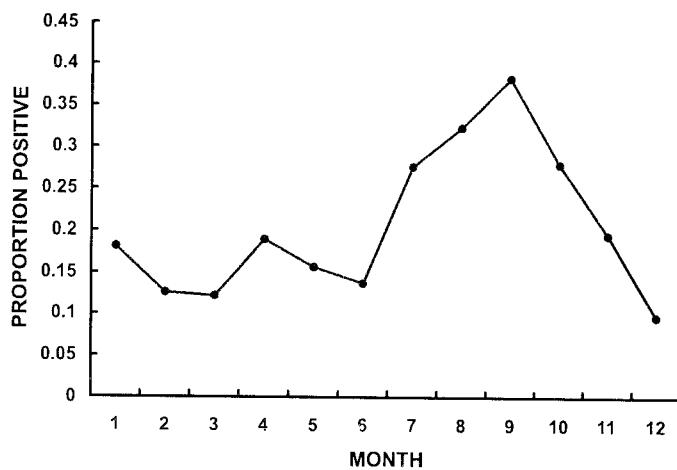
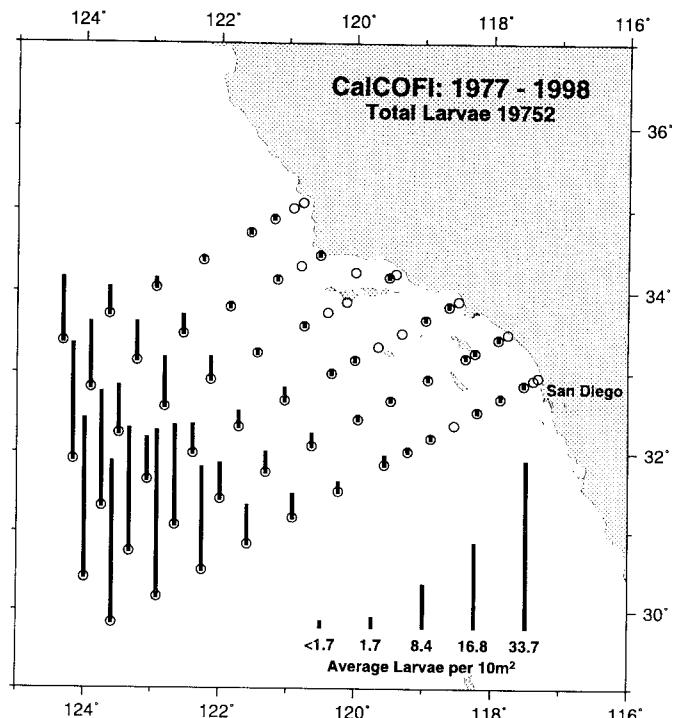
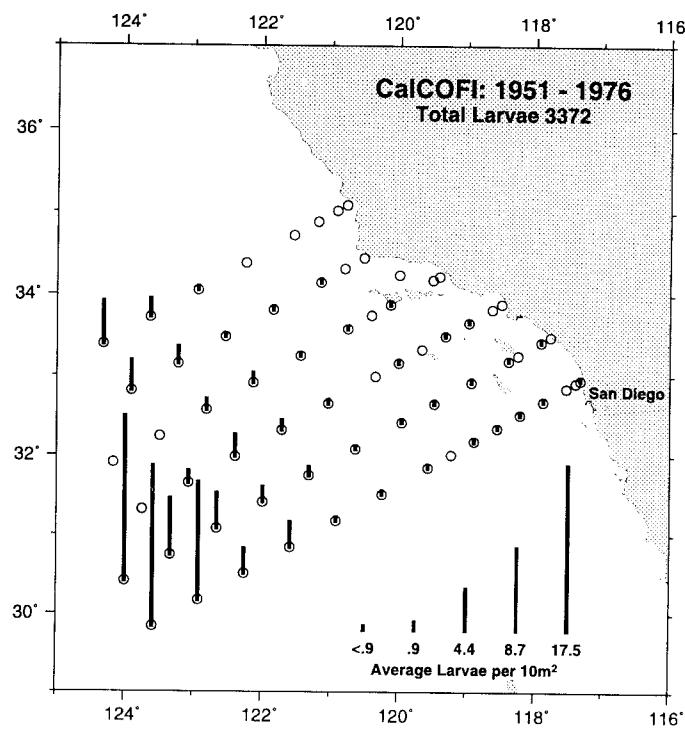
## *Protomyctophum crockeri*



*Ceratoscopelus townsendi*

Dogtooth lampfish

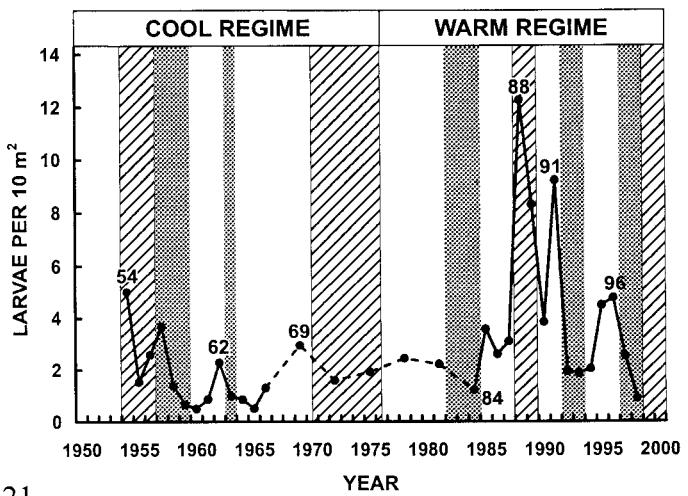
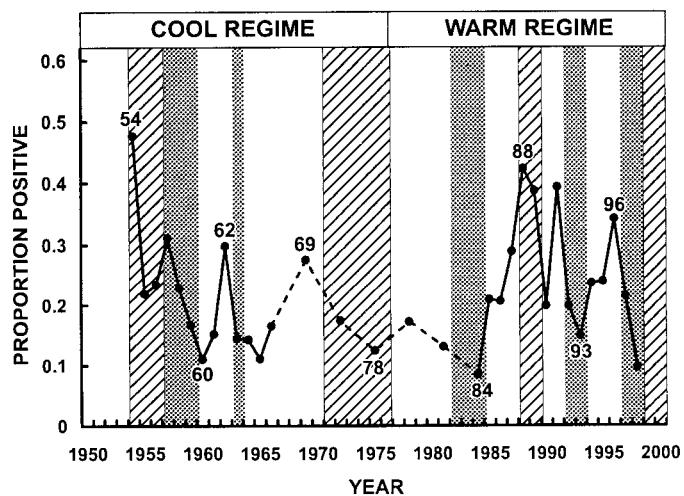
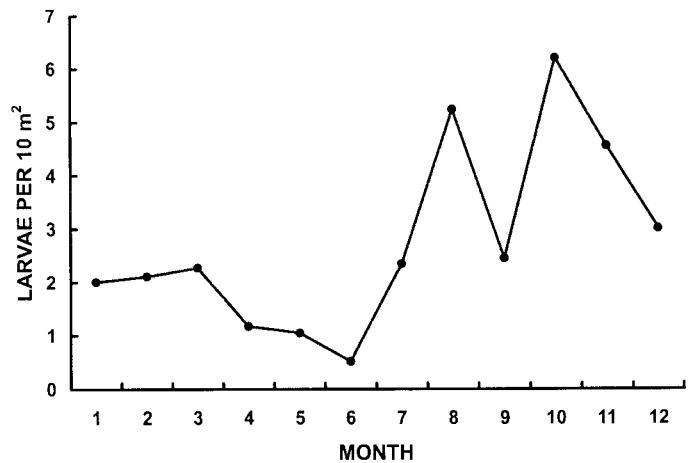
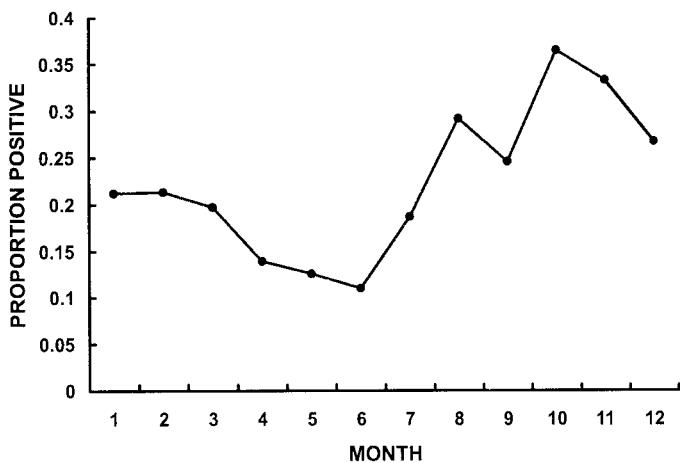
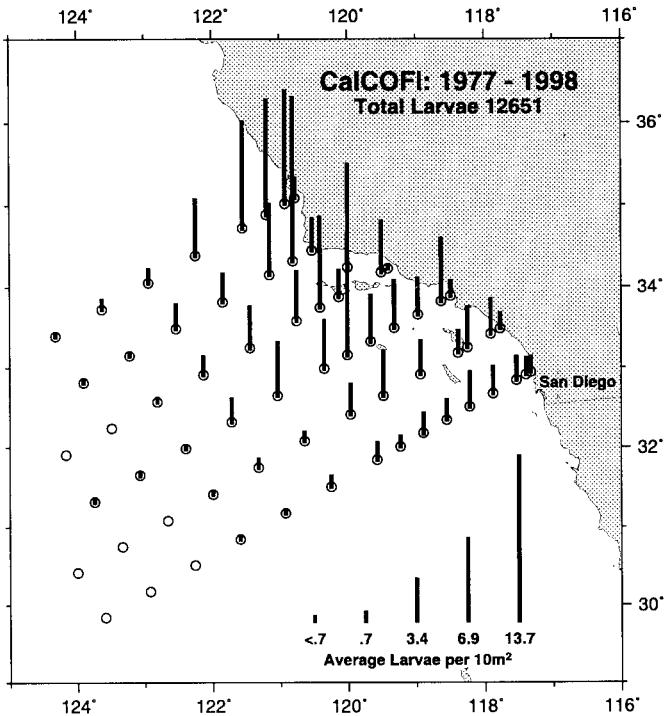
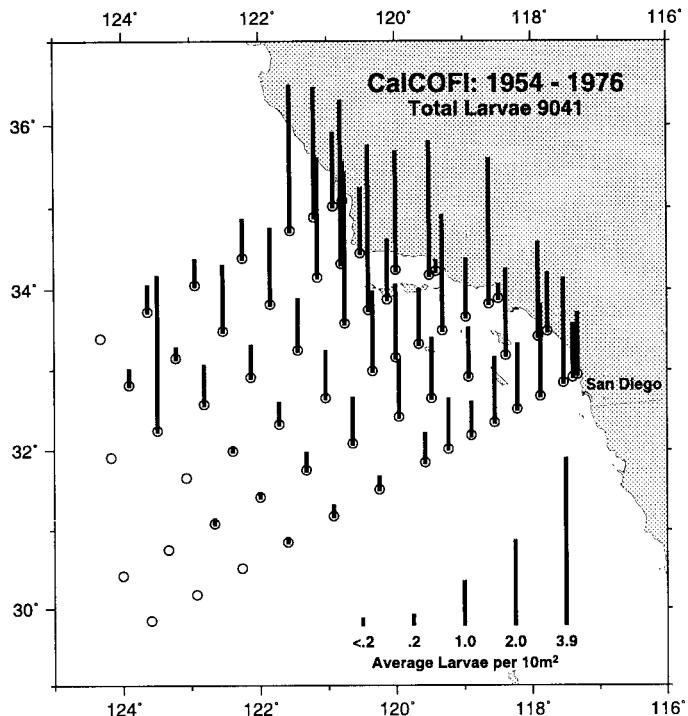
MYCTOPHIDAE



## PARALICHTHYIDAE

## Speckled sanddab

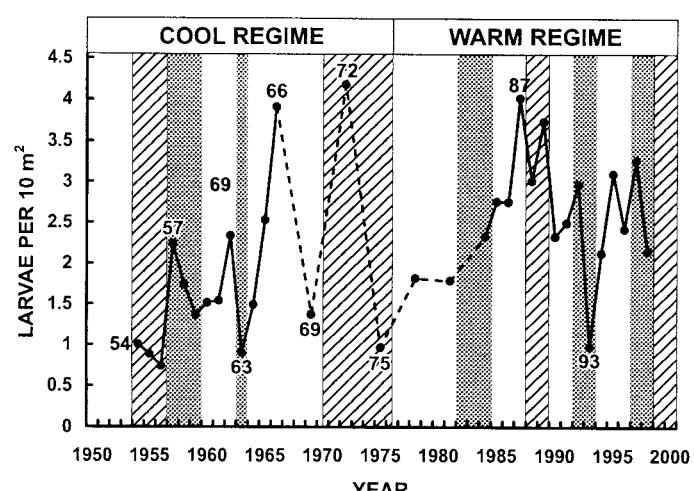
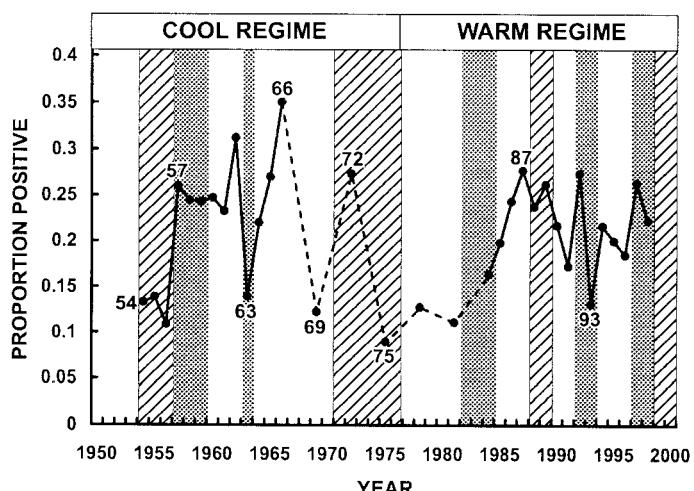
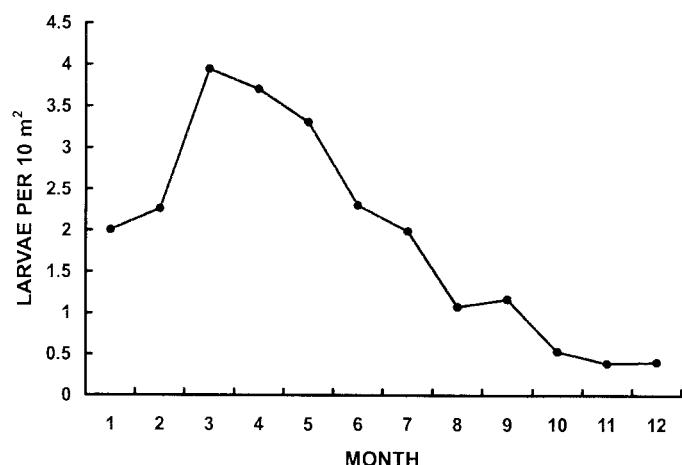
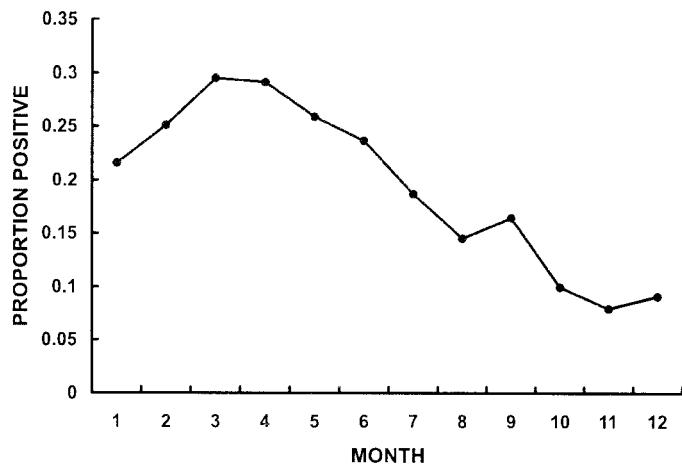
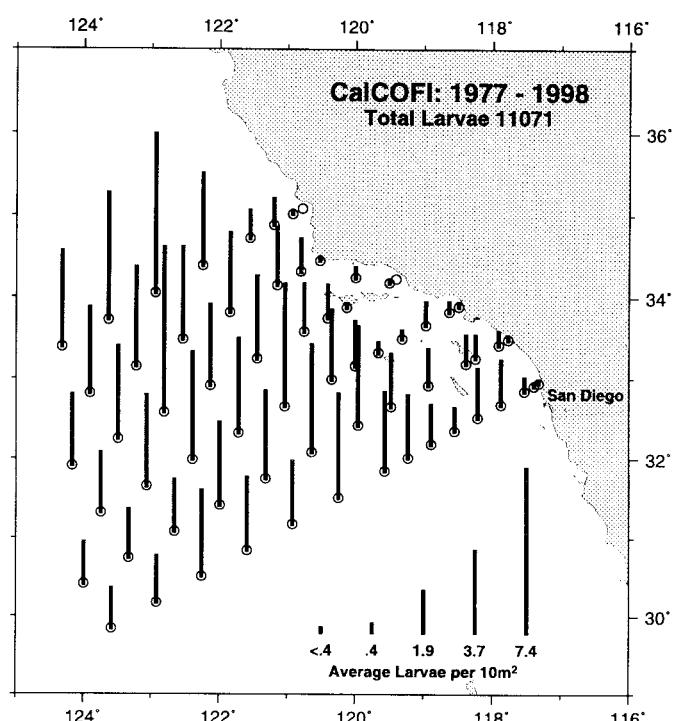
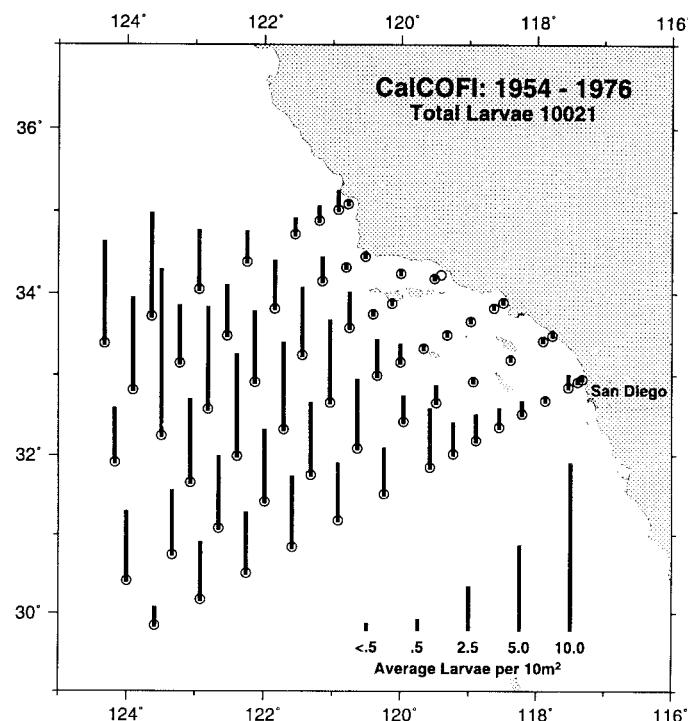
## *Citharichthys stigmaeus*



*Nannobrachium ritteri*

Broadfin lampfish

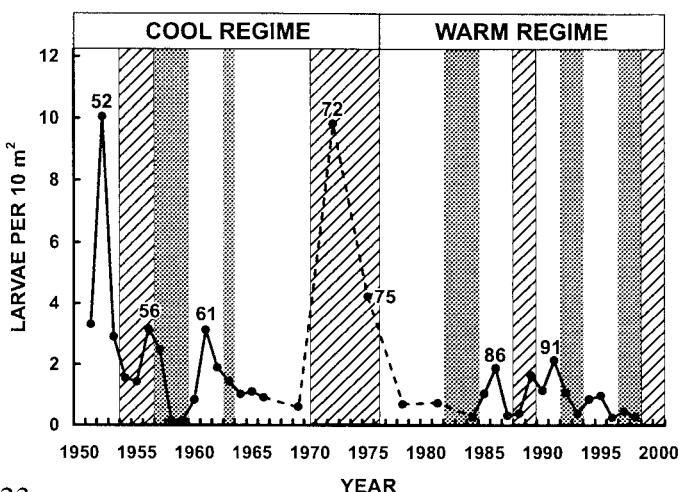
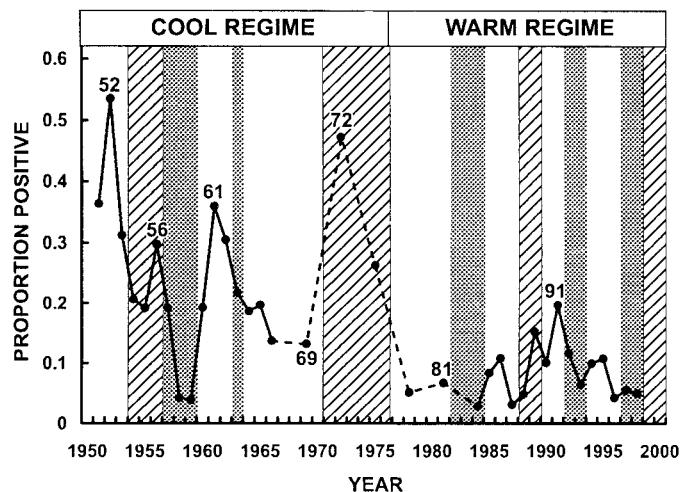
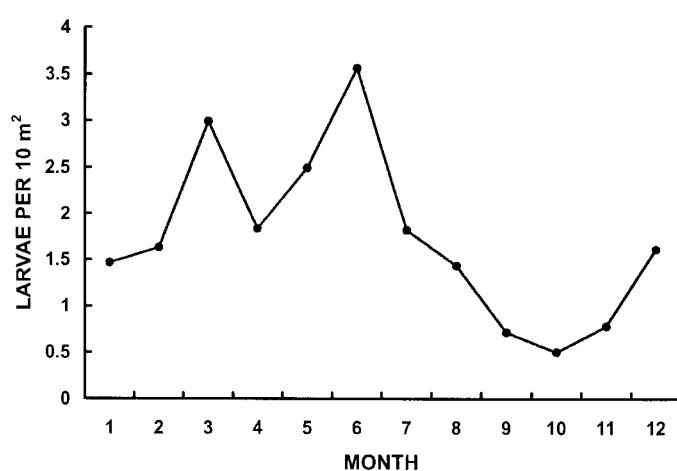
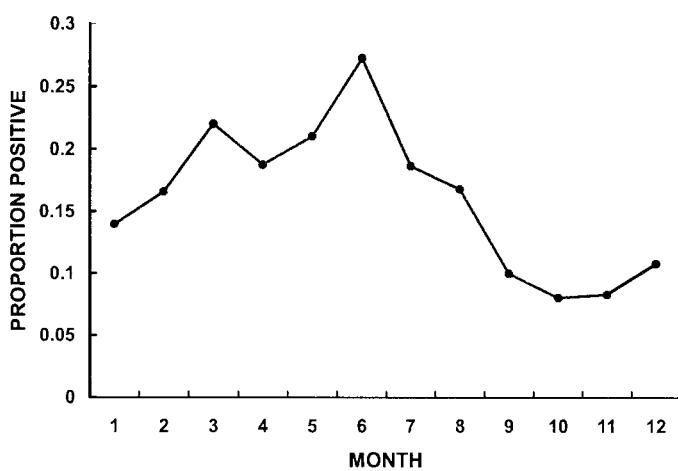
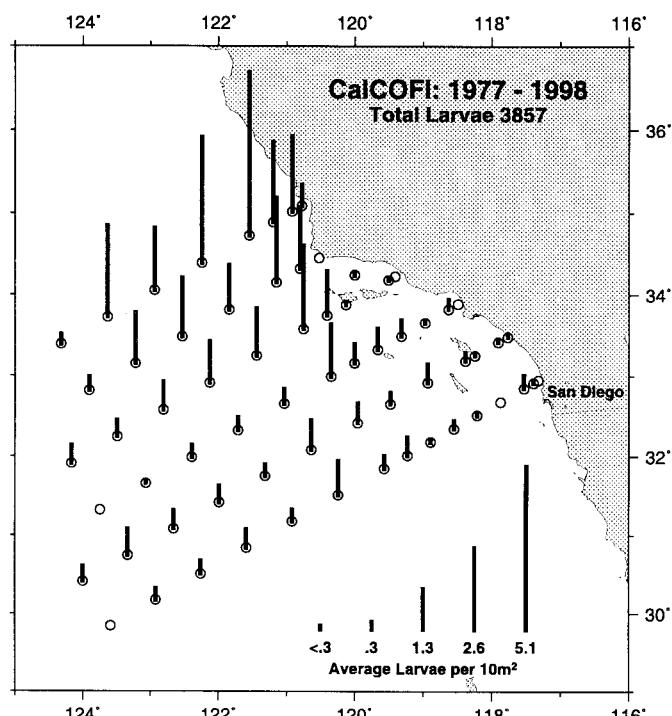
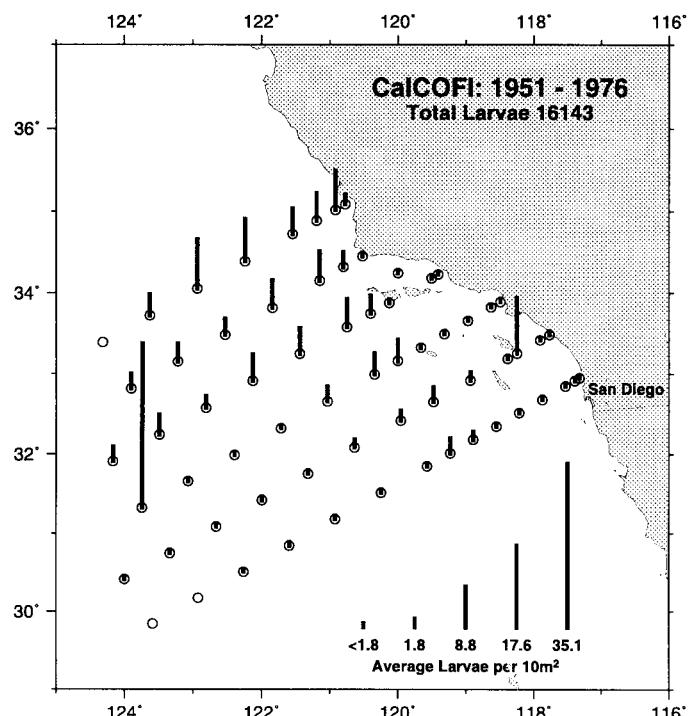
MYCTOPHIDAE



## MYCTOPHIDAE

## Blue lanternfish

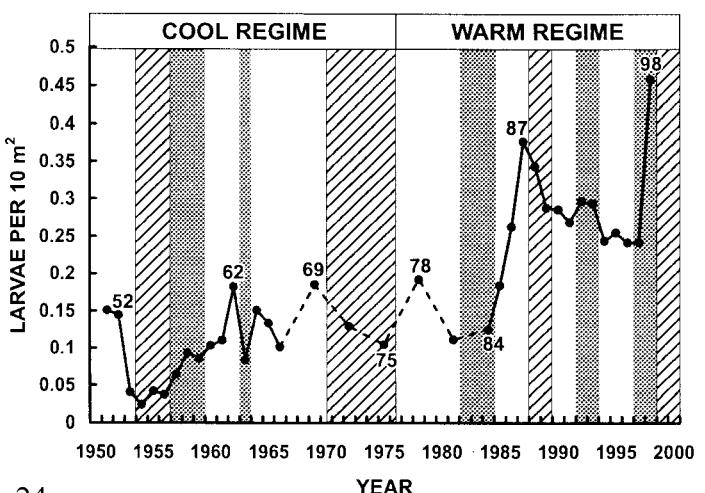
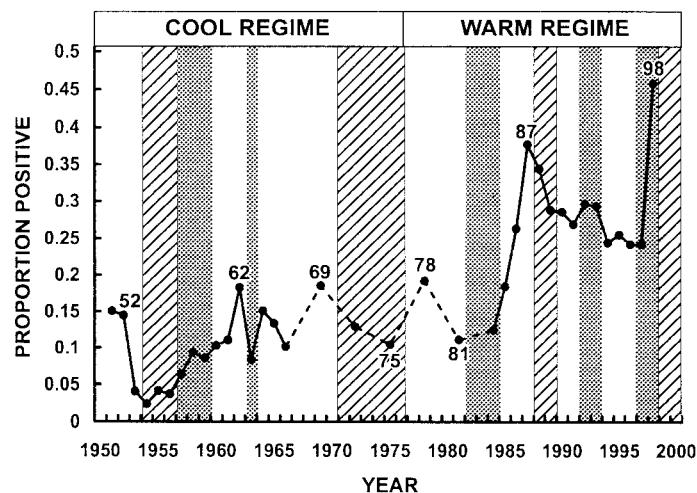
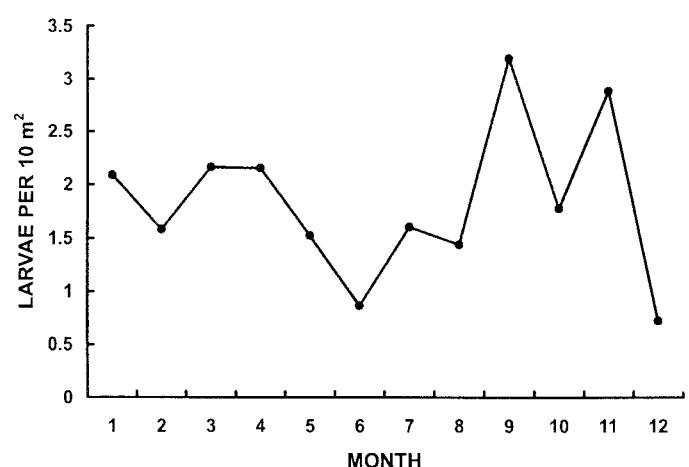
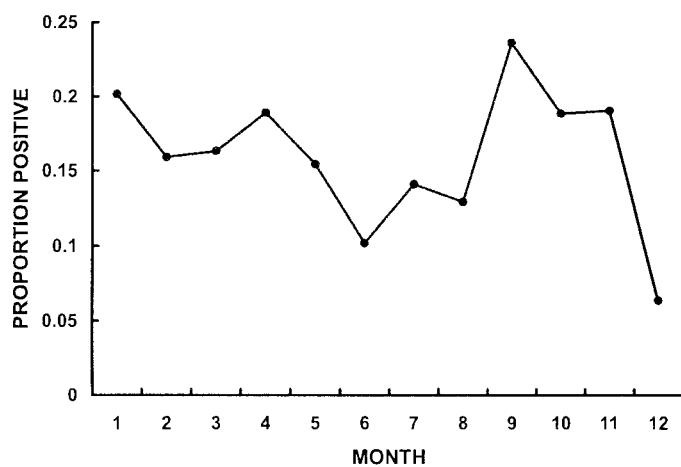
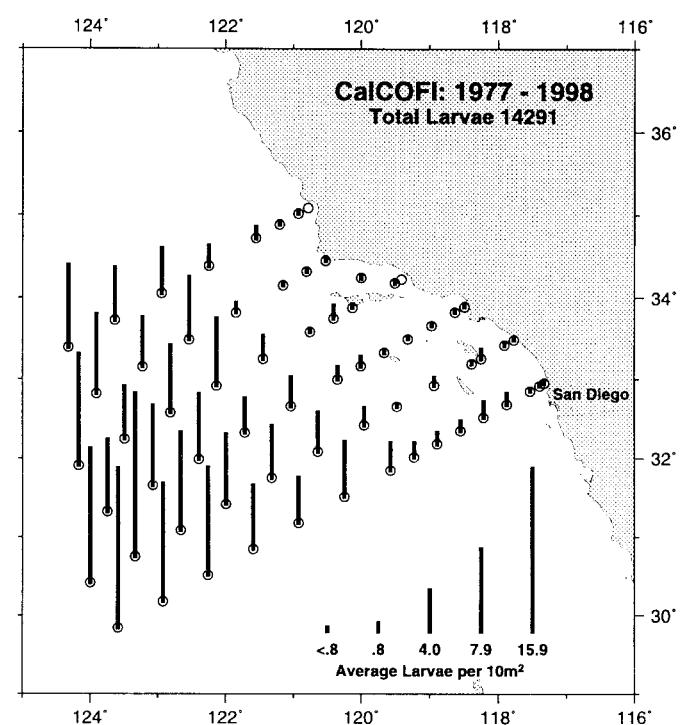
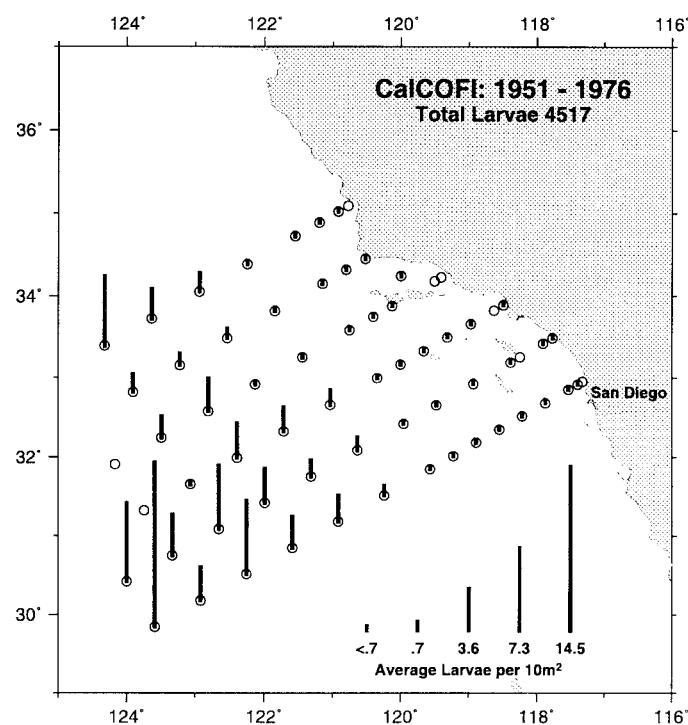
## *Tarletonbeania crenularis*



*Diogenichthys atlanticus*

Longfin lanternfish

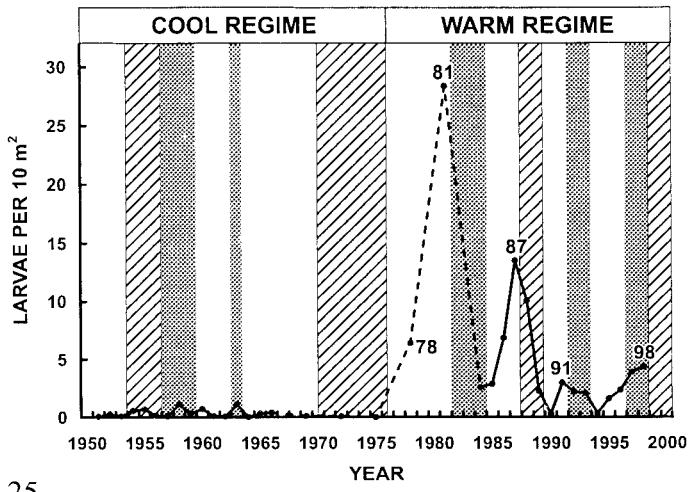
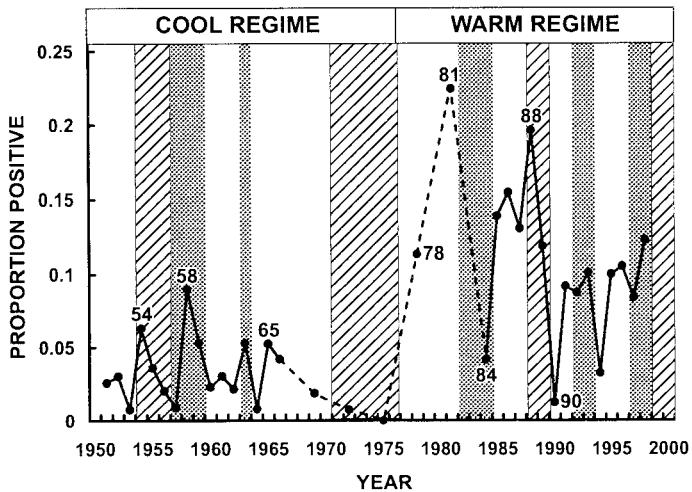
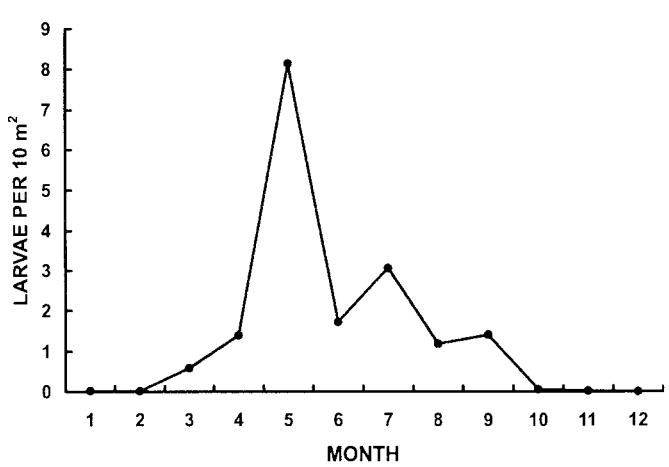
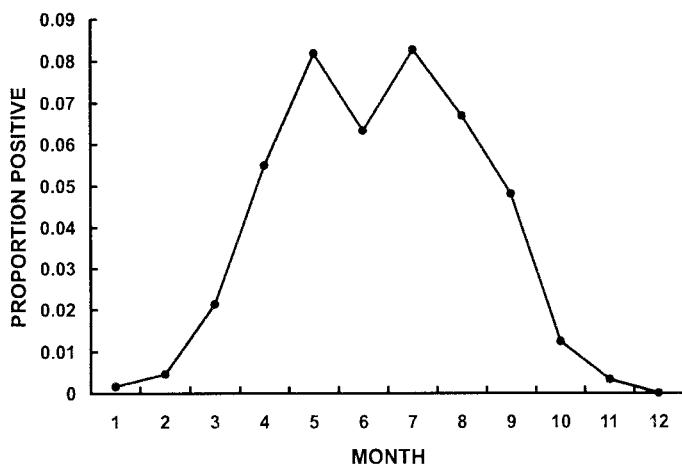
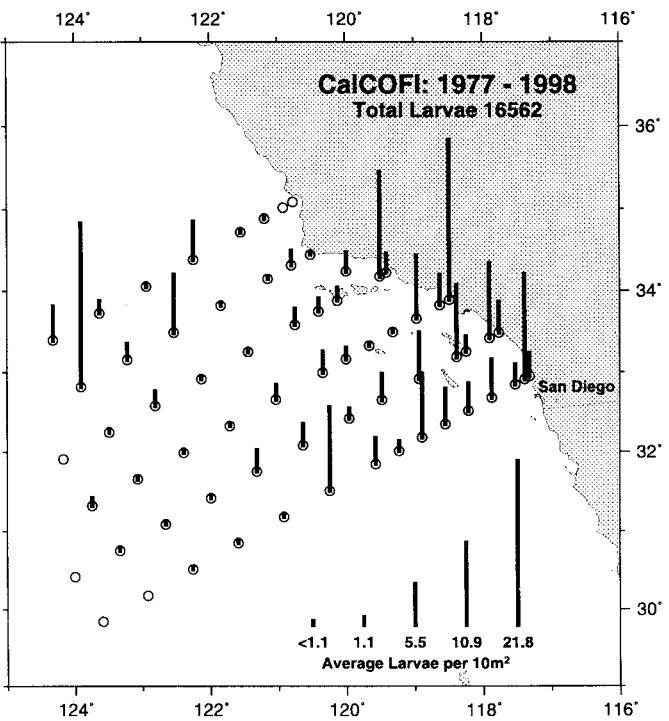
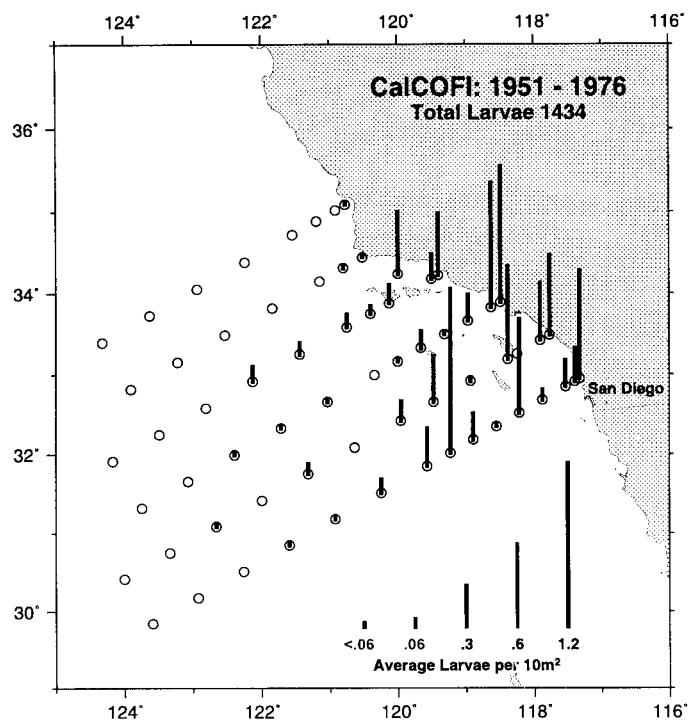
MYCTOPHIDAE



## SCOMBRIDAE

## Chub mackerel

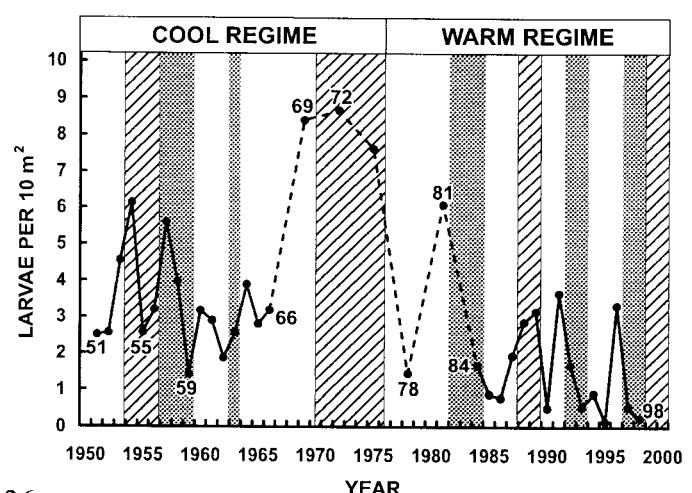
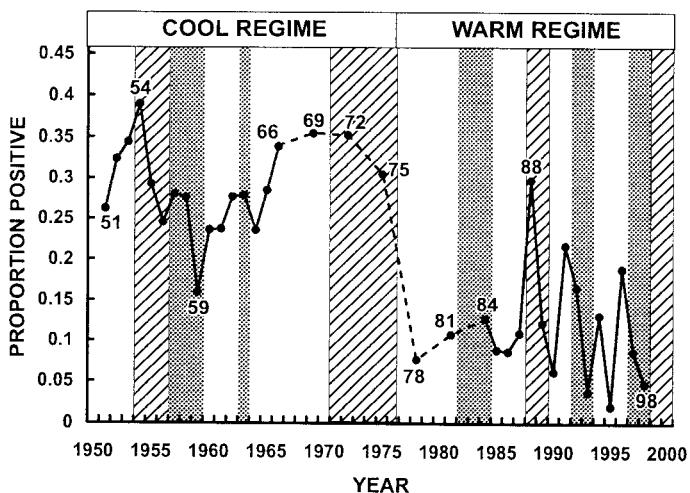
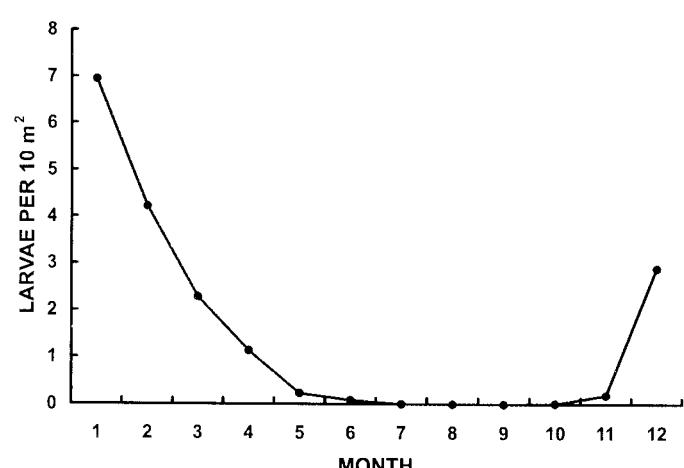
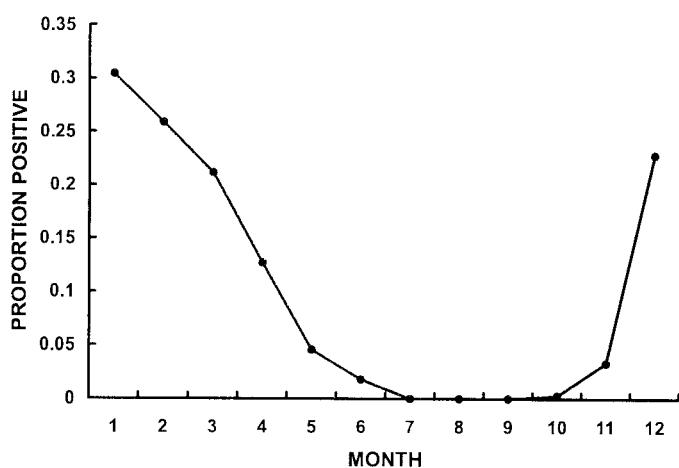
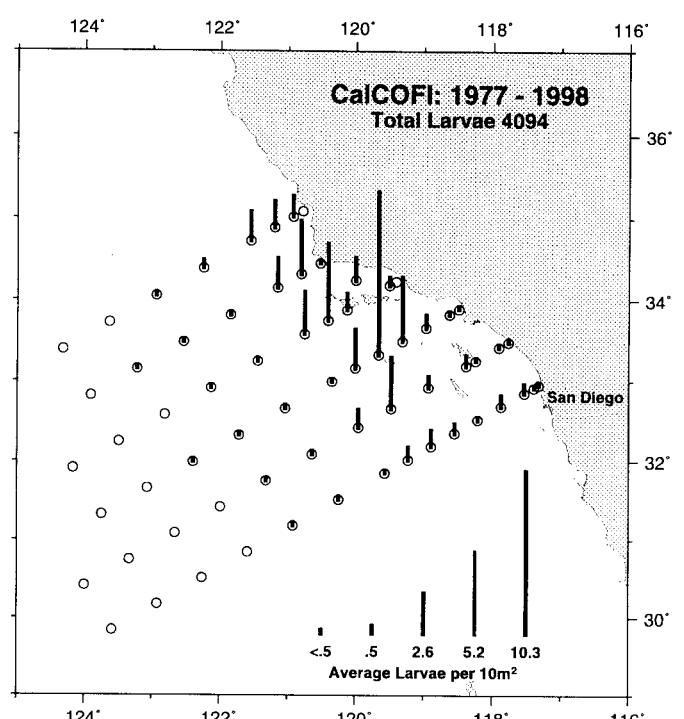
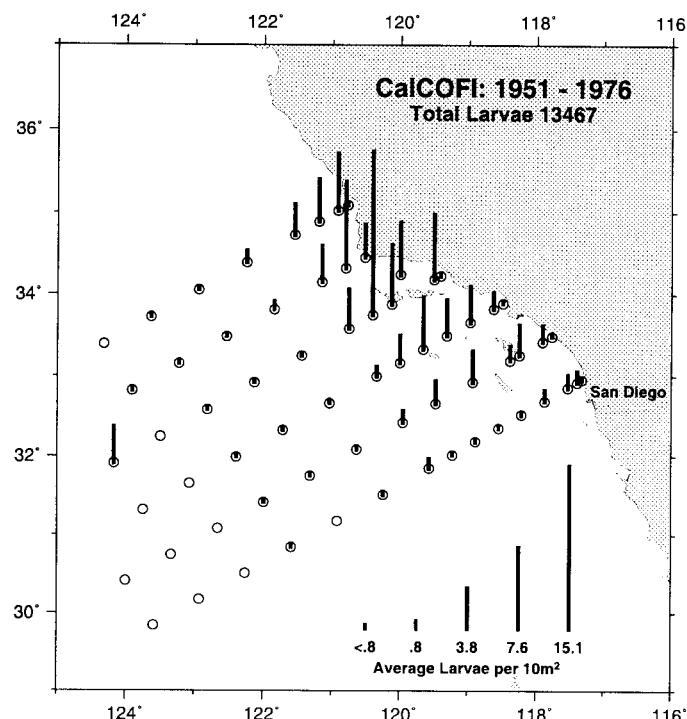
## *Scomber japonicus*



*Sebastes paucispinis*

Bocaccio

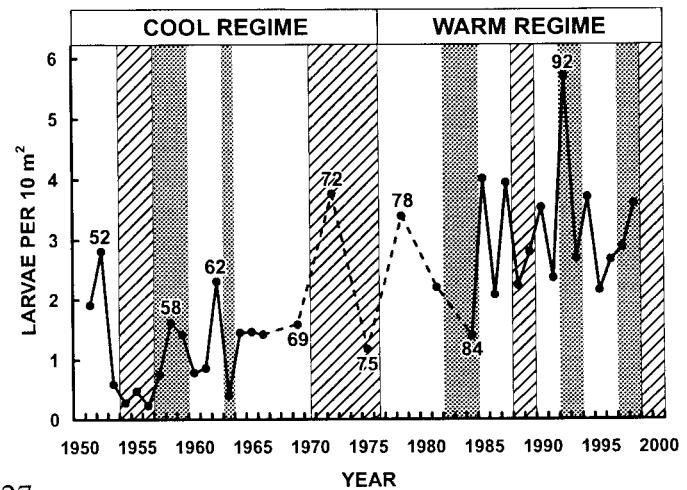
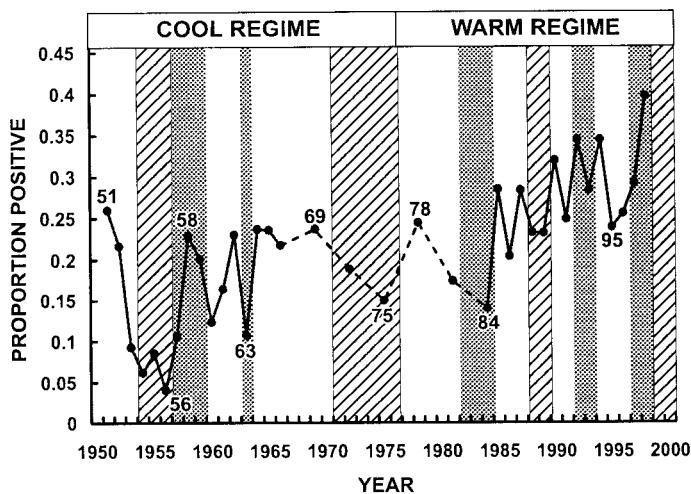
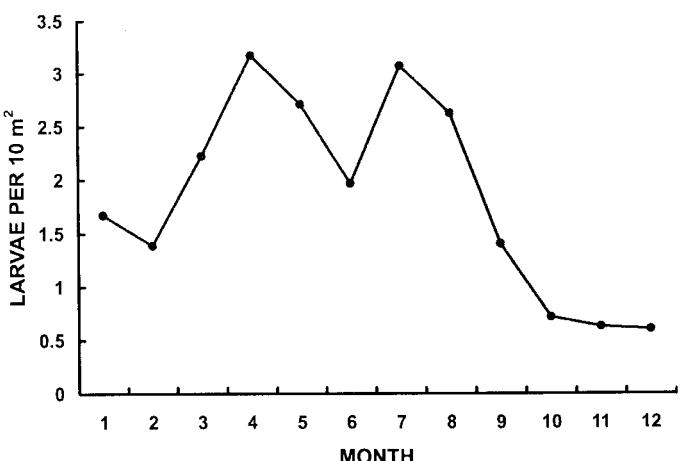
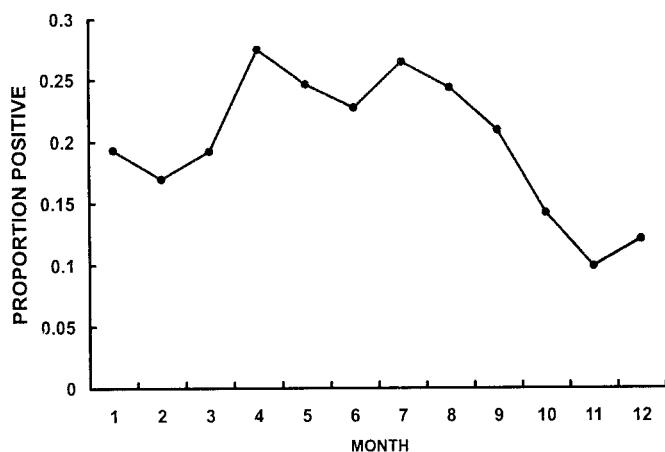
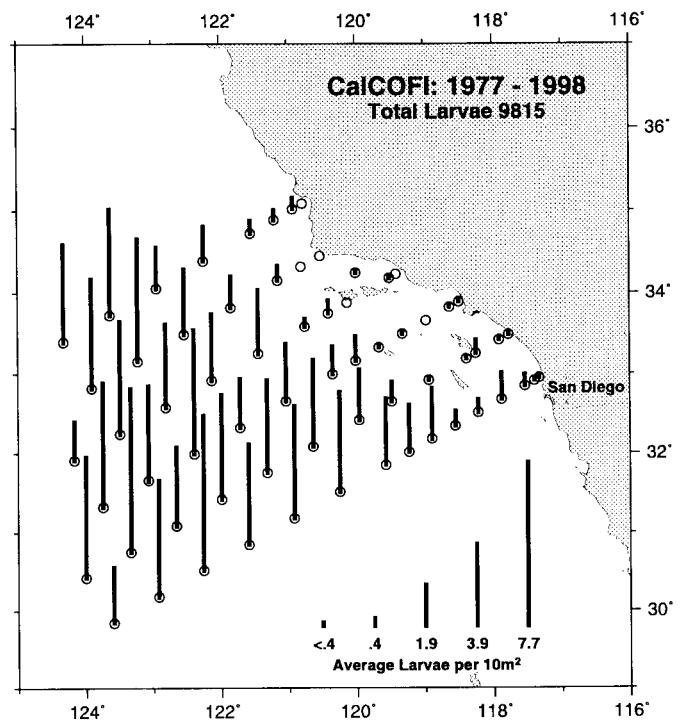
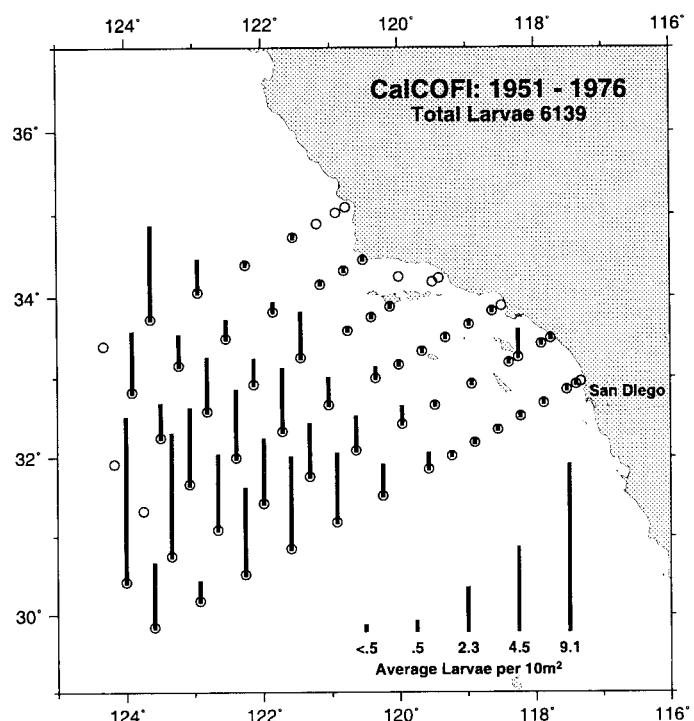
SEBASTIDAE



## MYCTOPHIDAE

## California lanternfish

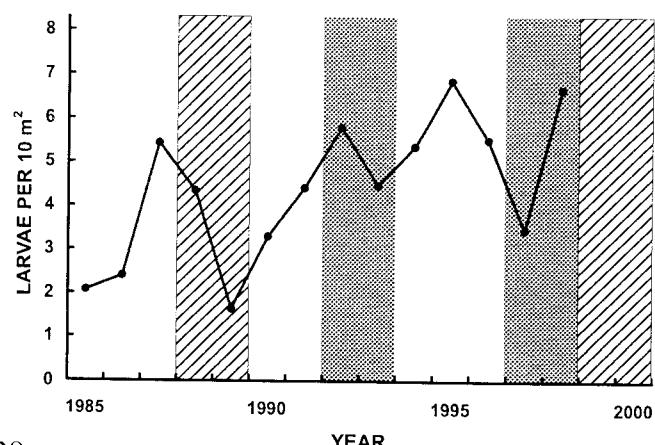
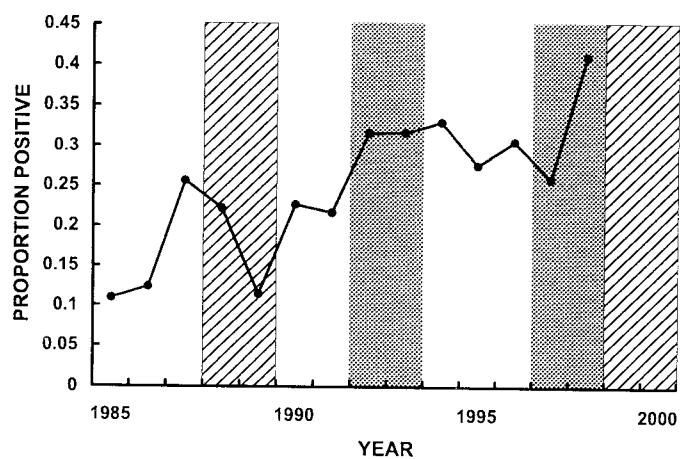
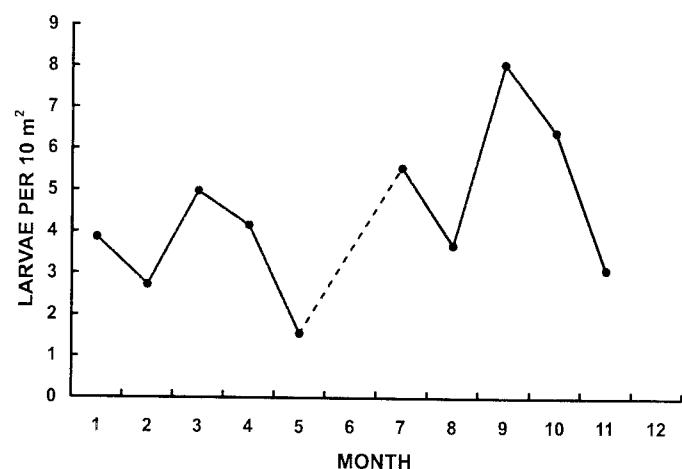
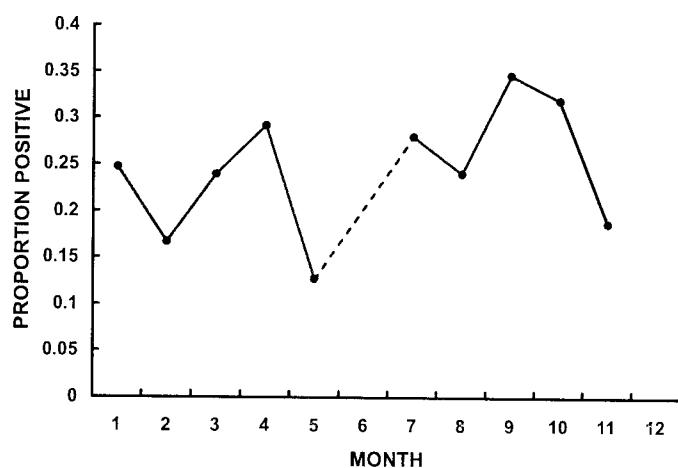
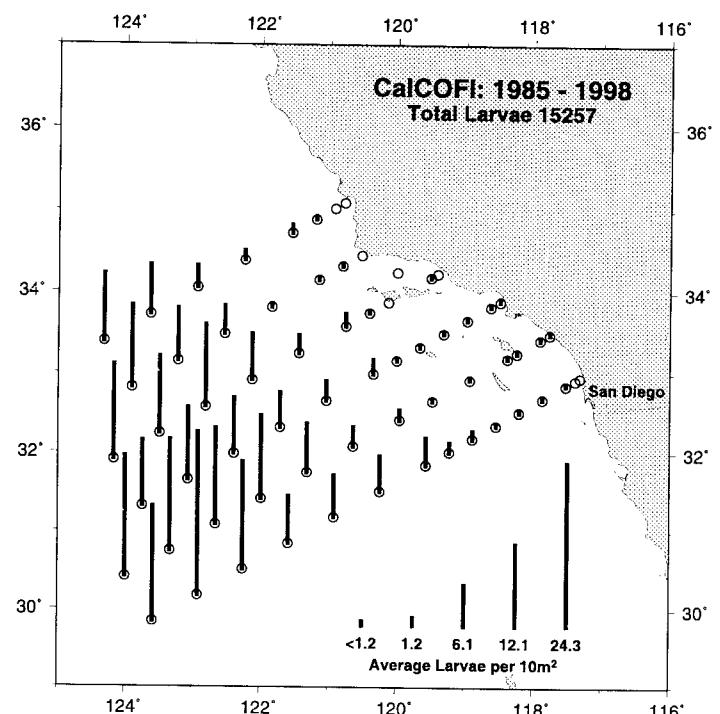
## *Symbolophorus californiensis*



*Cyclothona signata*

Showy bristlemouth

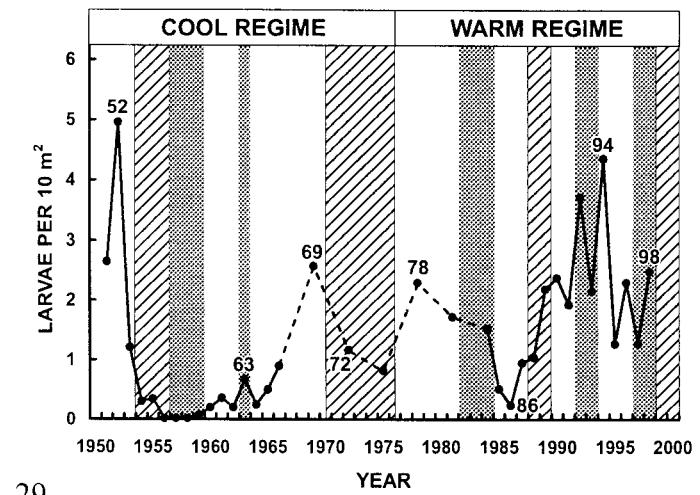
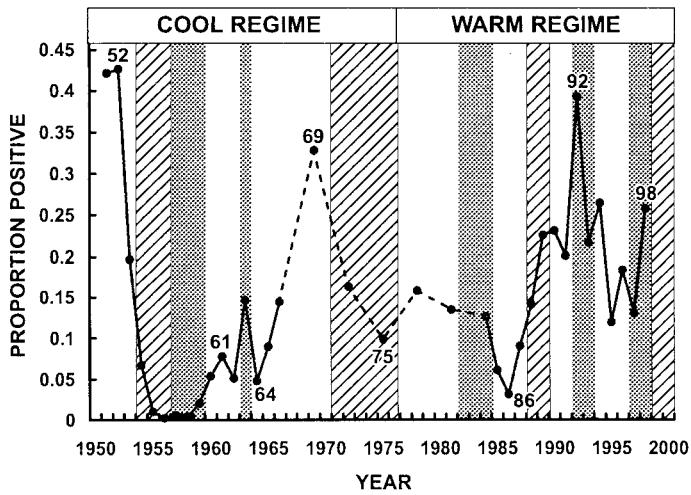
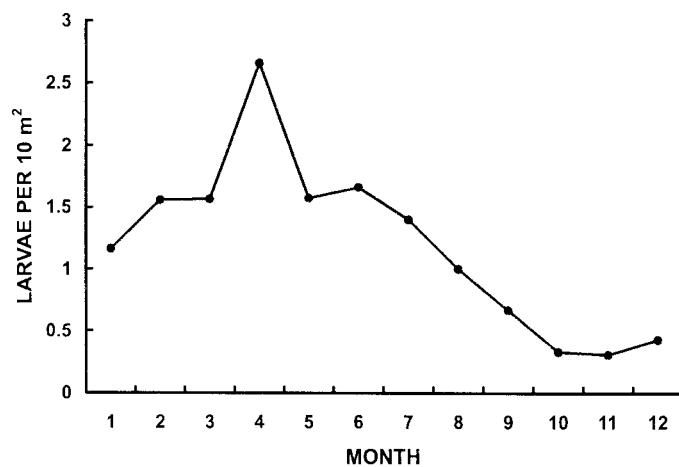
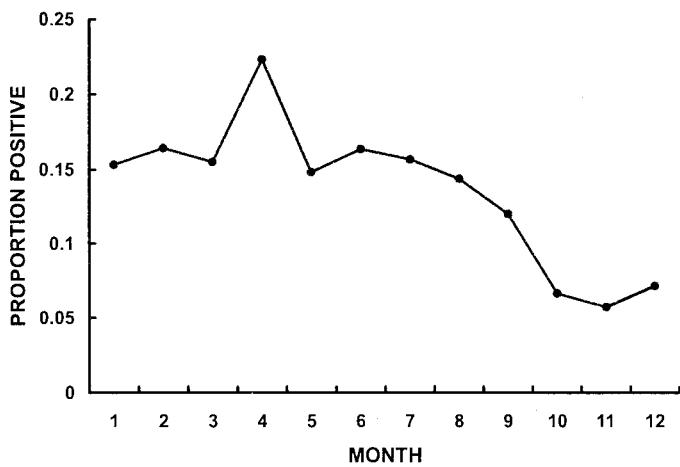
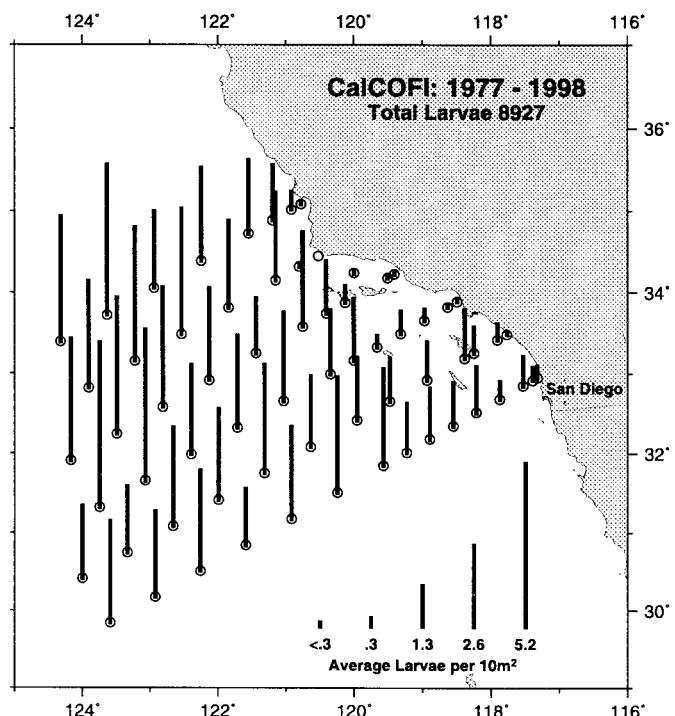
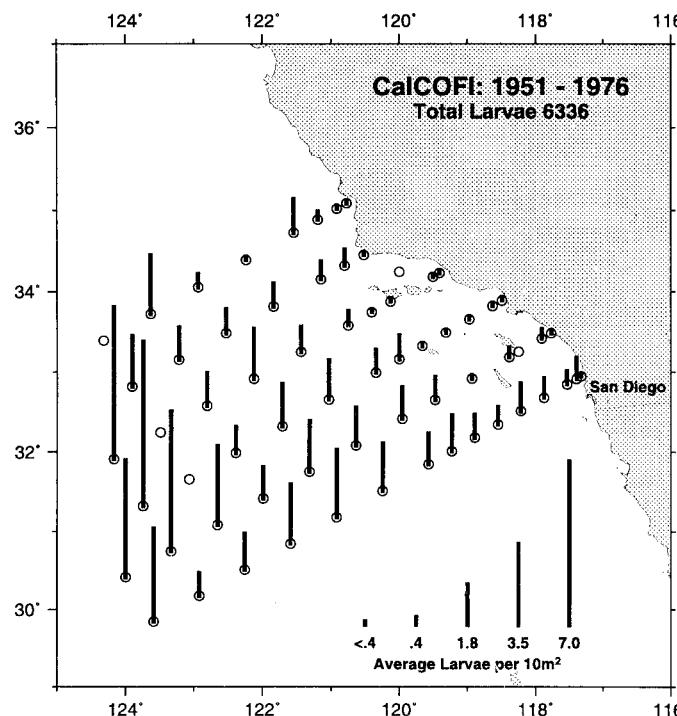
GONOSTOMATIDAE



## MYCTOPHIDAE

## Lampfishes

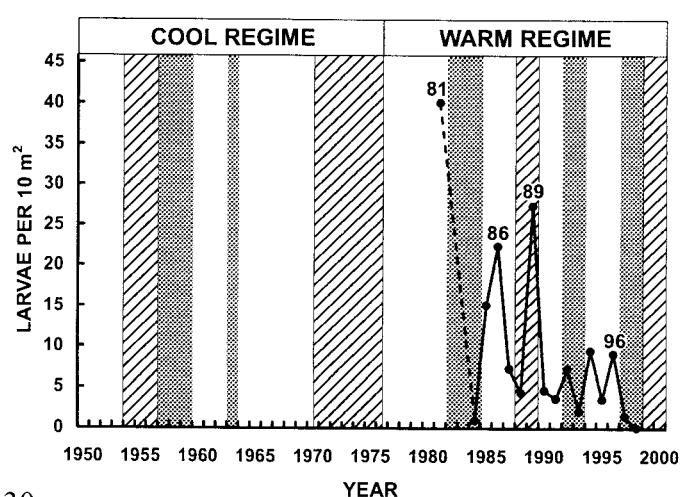
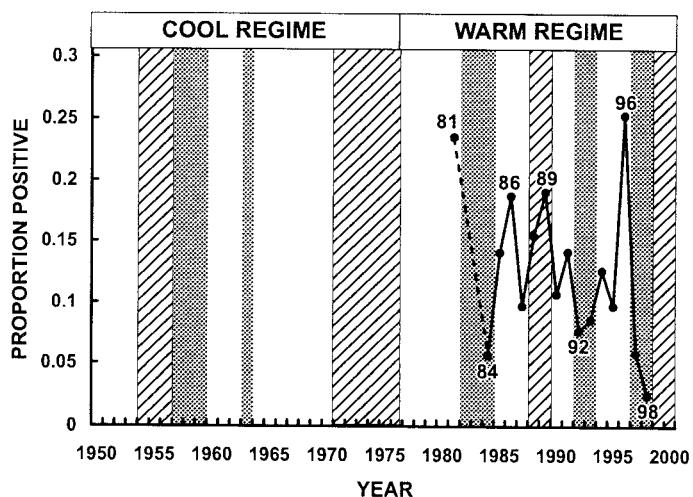
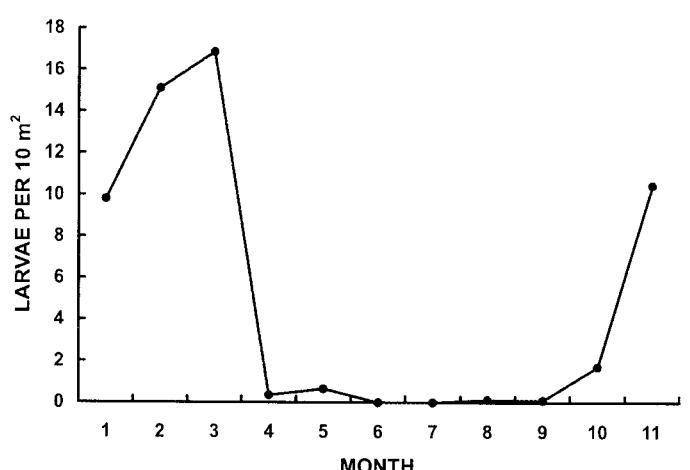
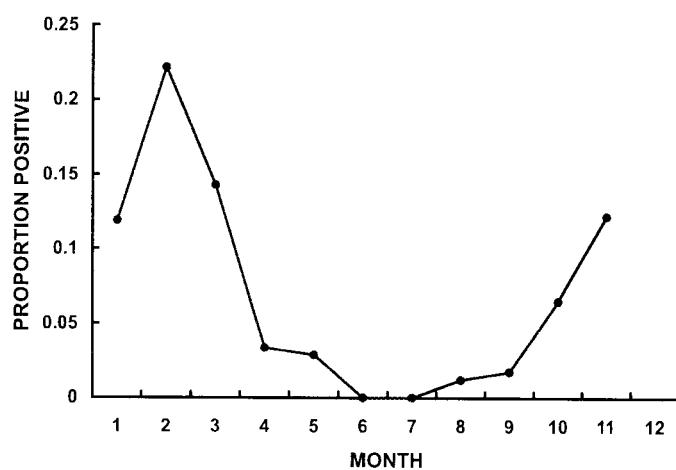
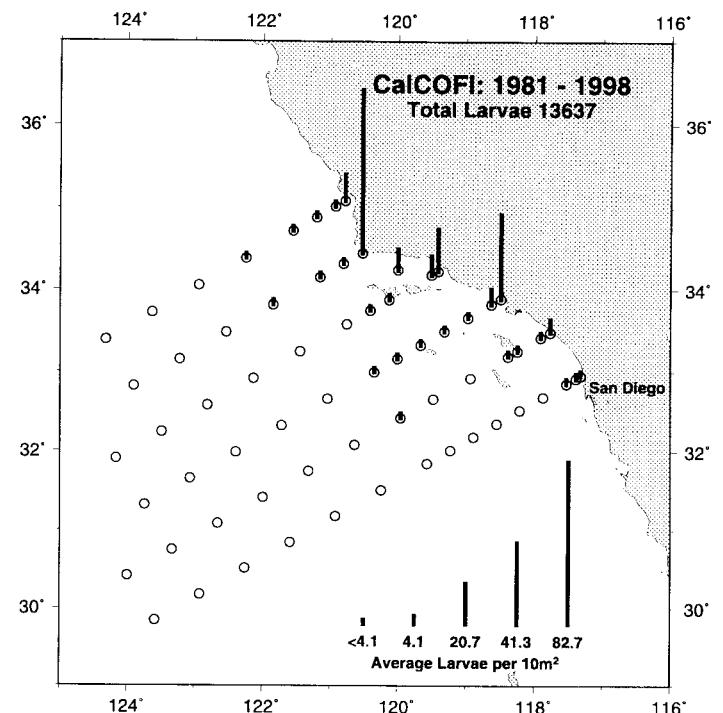
## *Lampanyctus* spp.



*Genyonemus lineatus*

White croaker

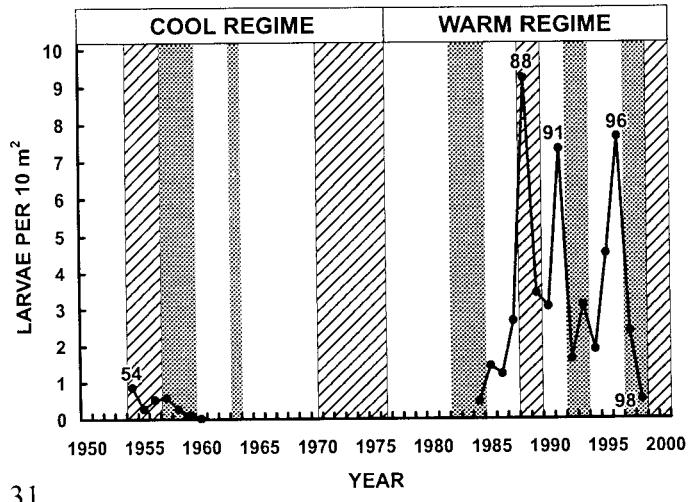
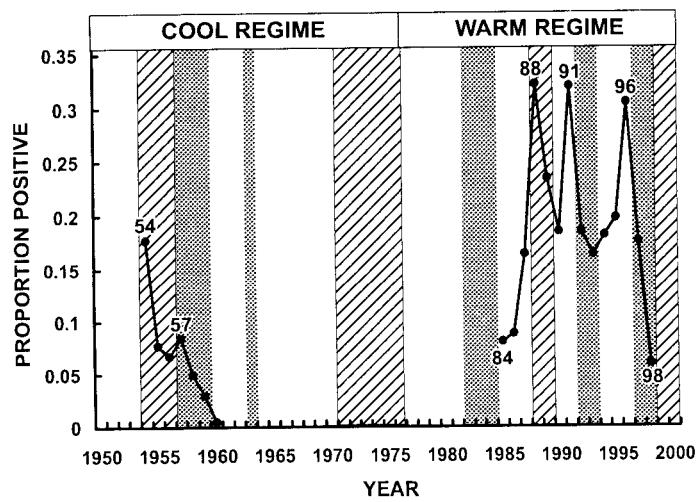
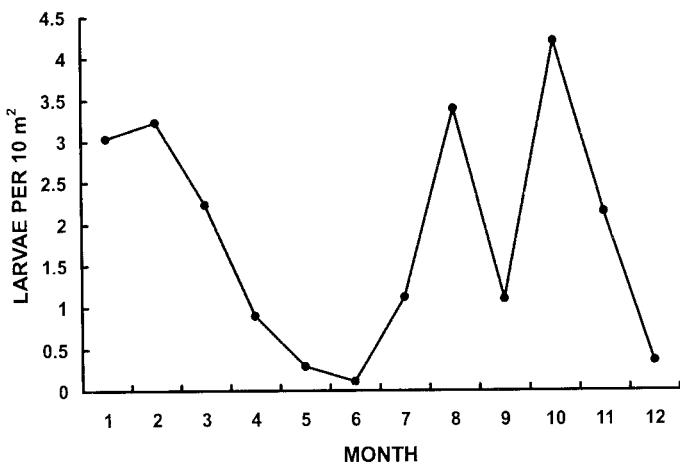
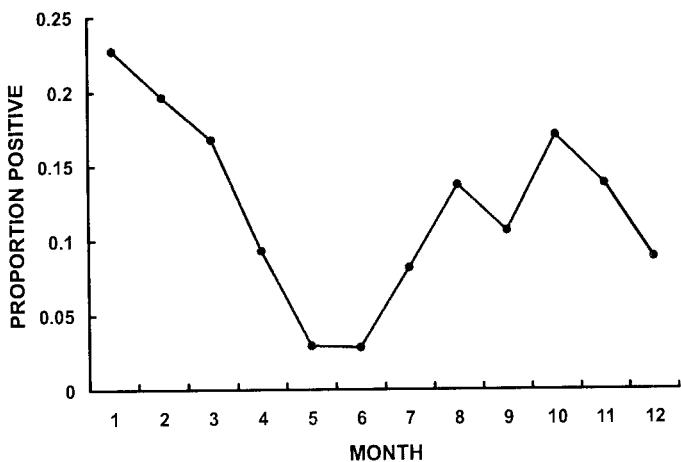
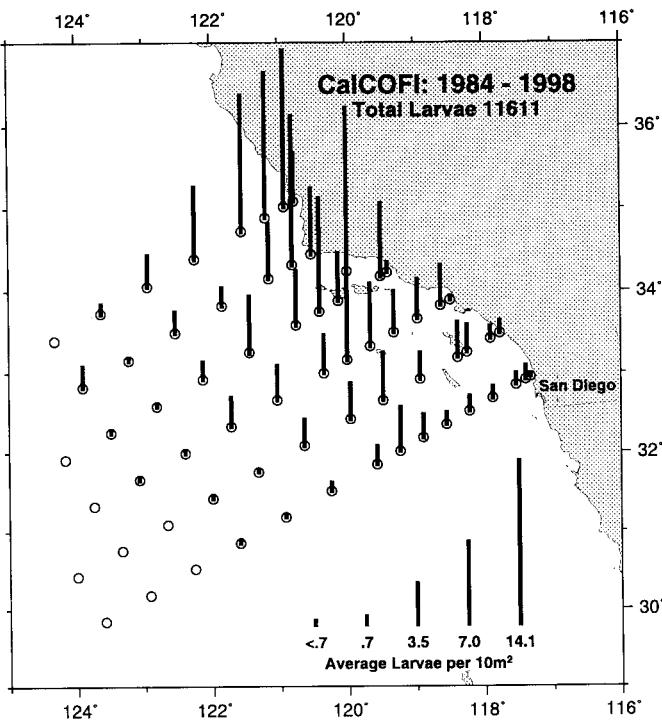
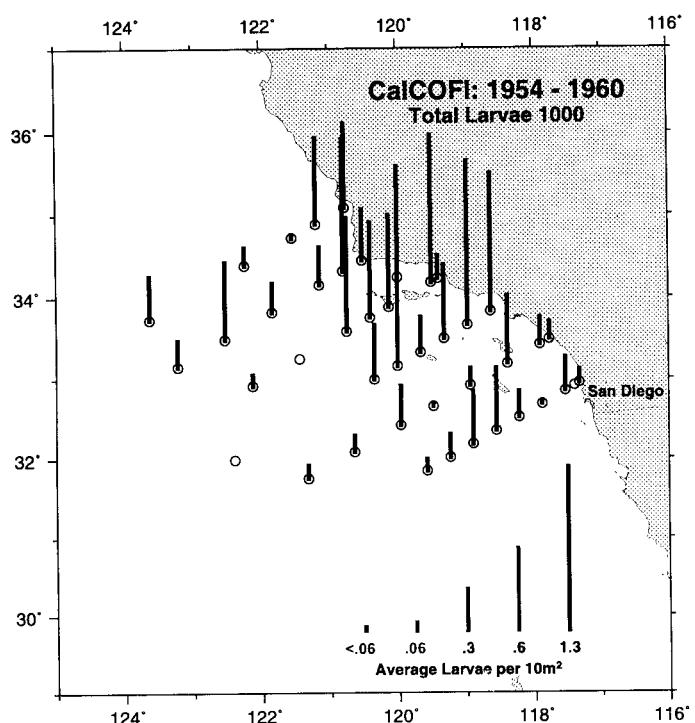
SCIAENIDAE



## PARALICHTHYIDAE

## Pacific sanddab

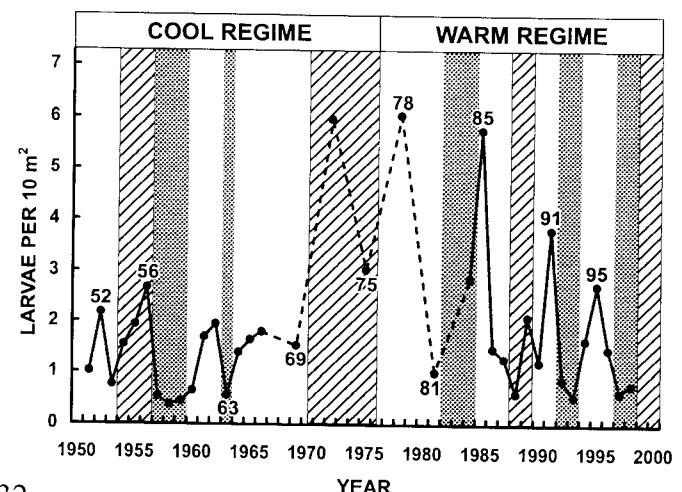
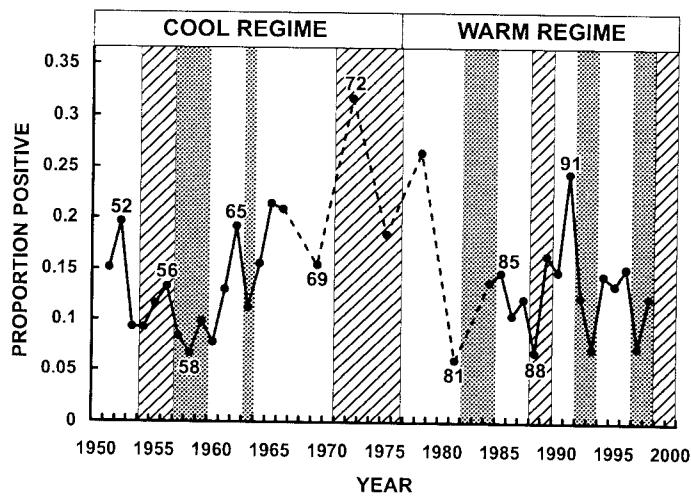
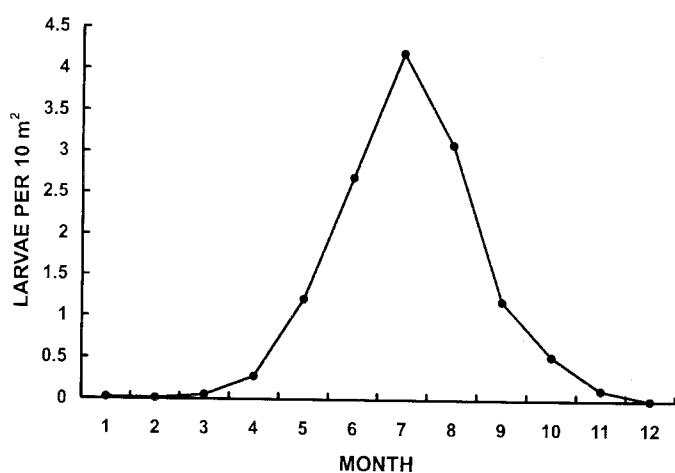
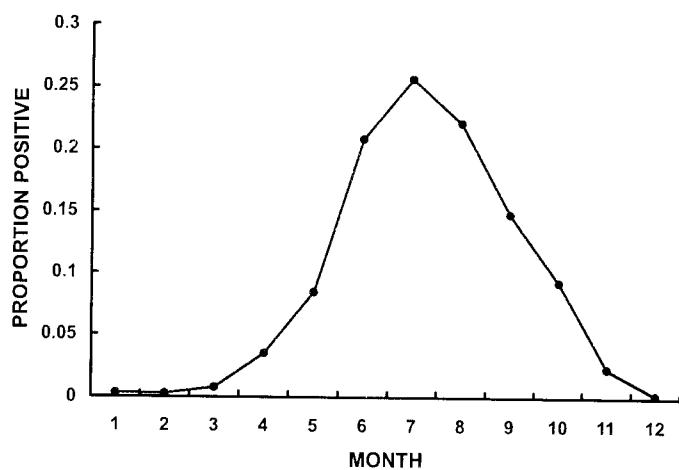
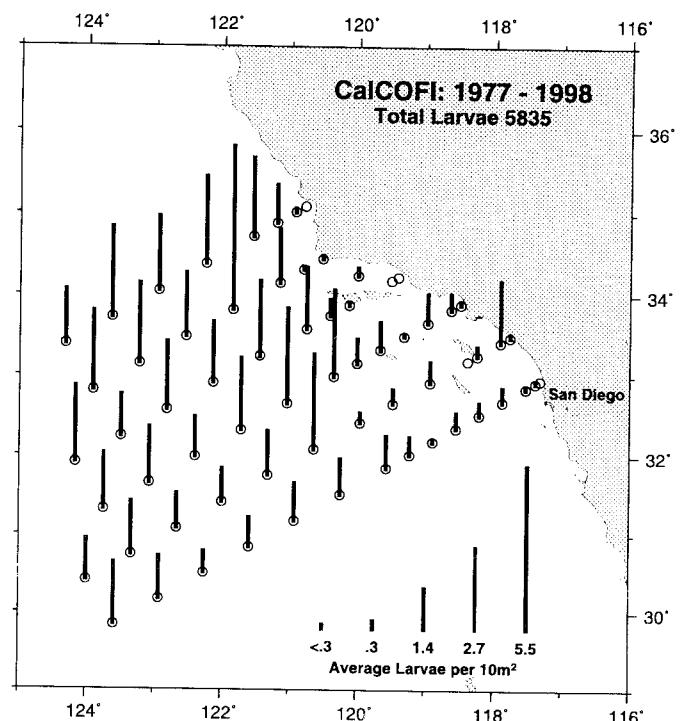
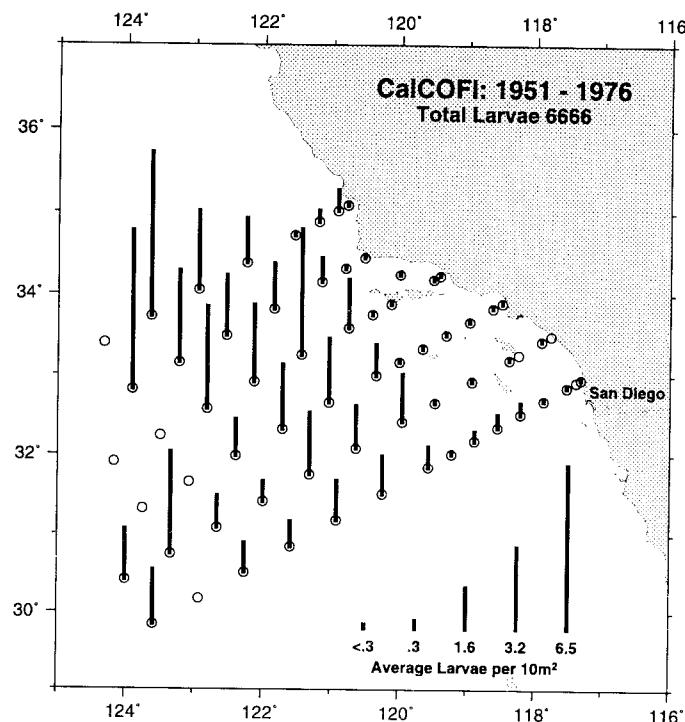
## *Citharichthys sordidus*



*Diaphus* spp.

Headlightfishes

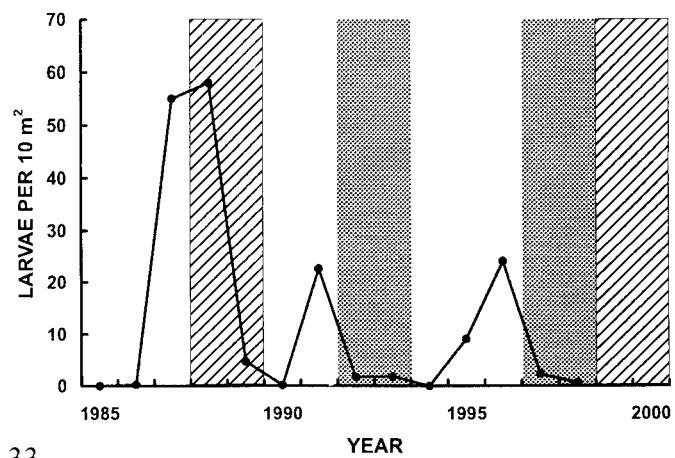
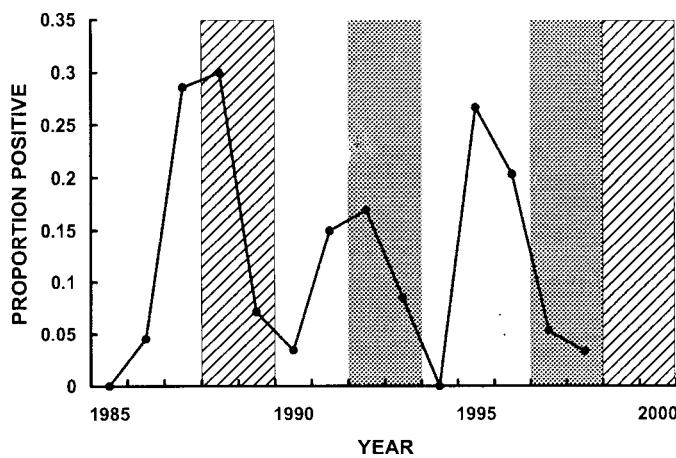
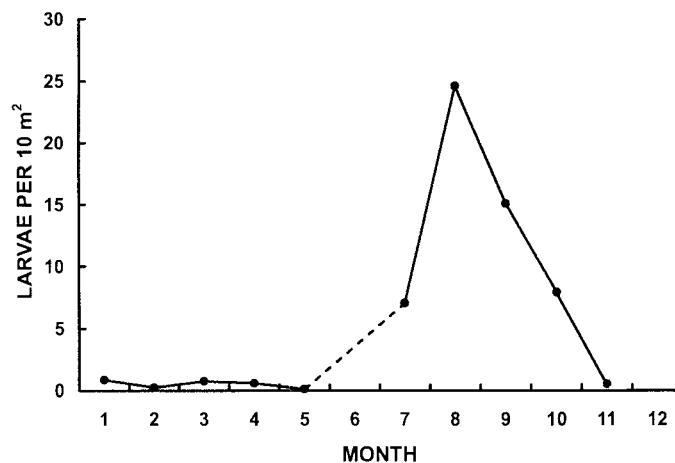
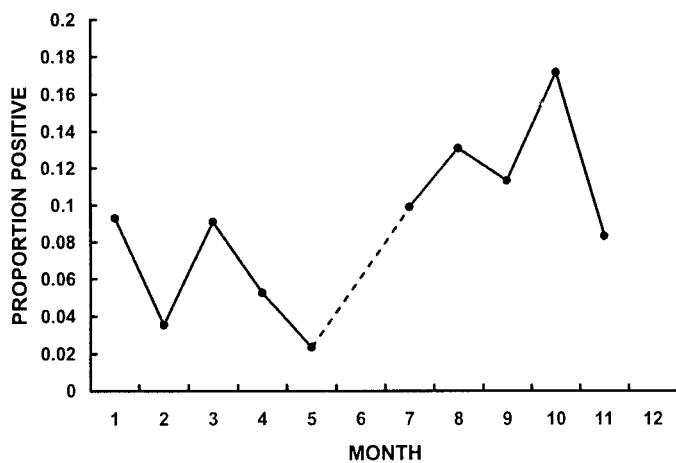
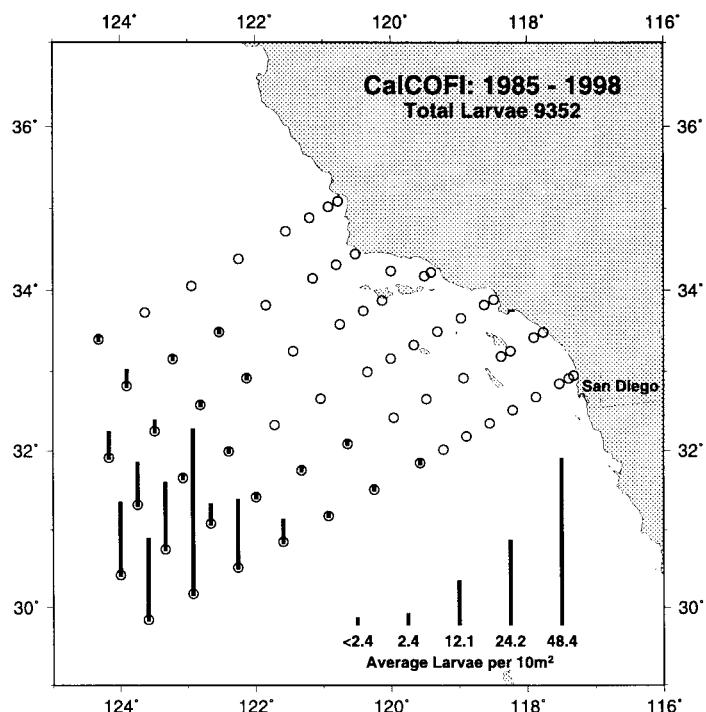
MYCTOPHIDAE



## PHOSICHTHYIDAE

## Highseas lightfish

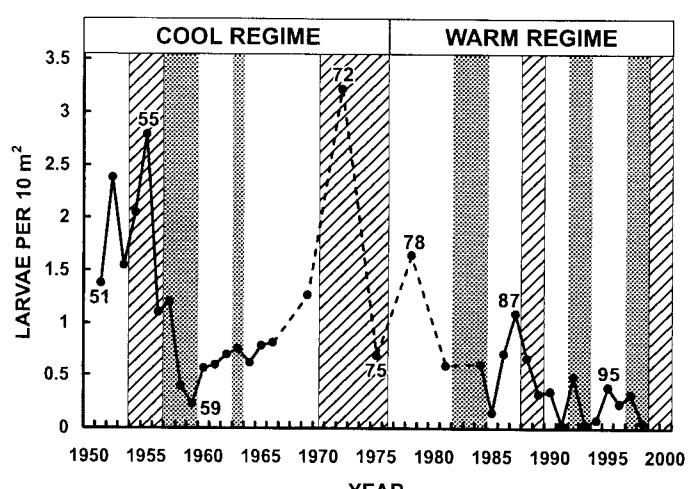
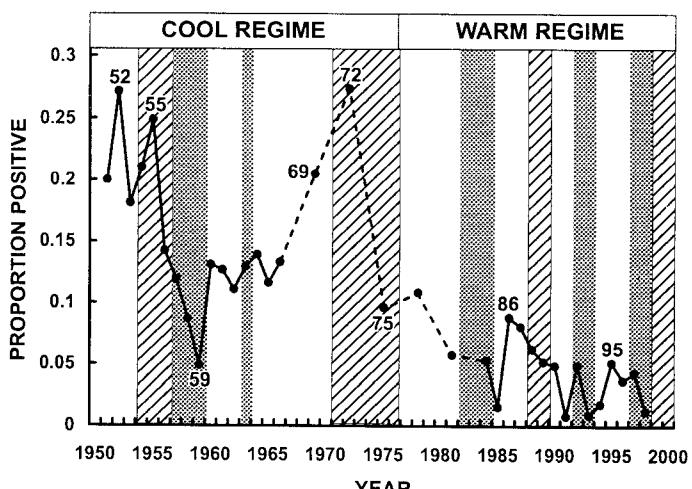
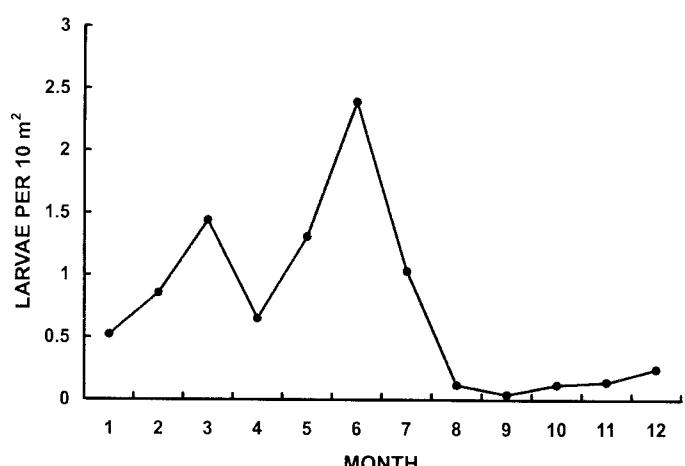
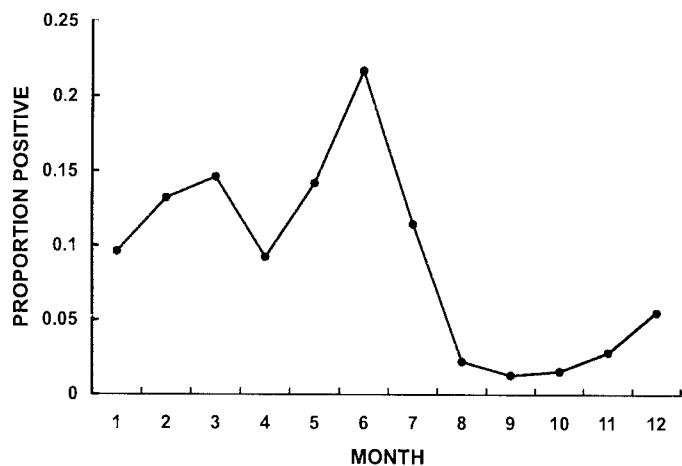
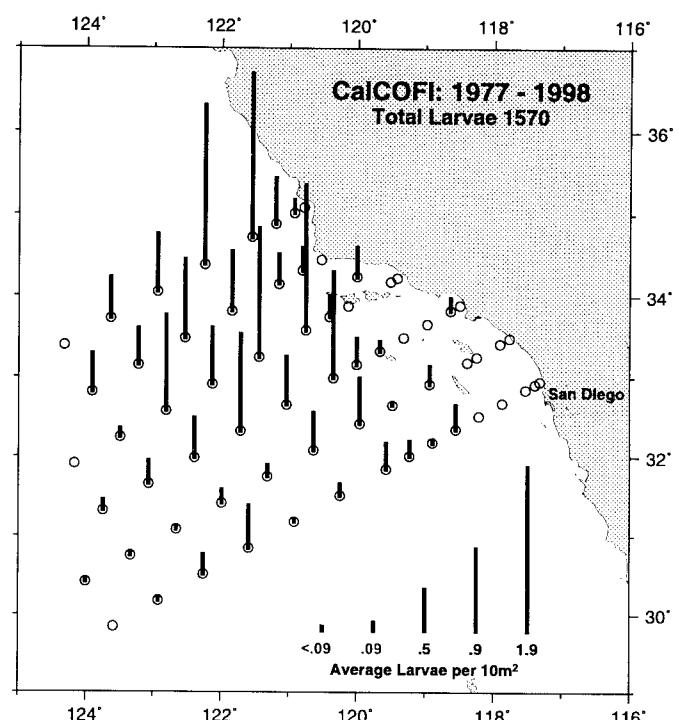
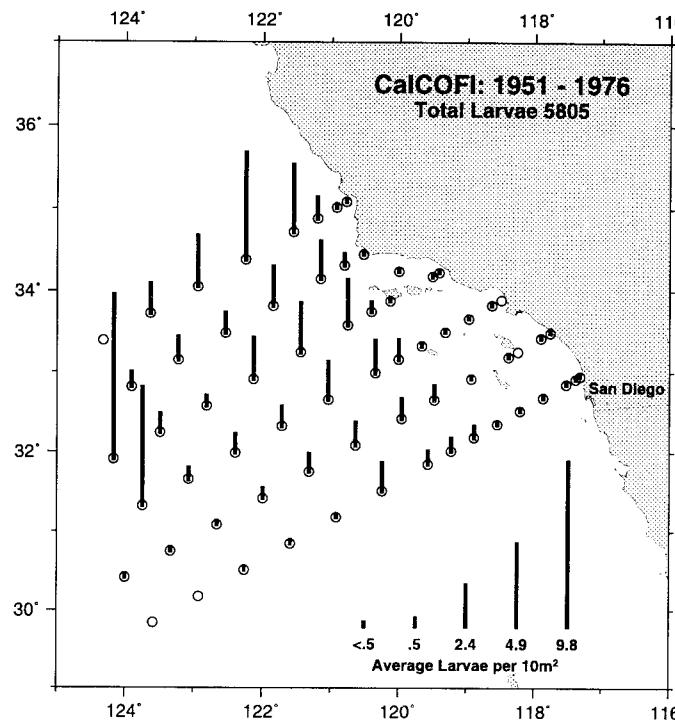
## *Vinciguerria poweriae*



*Icichthys lockingtoni*

Medusafish

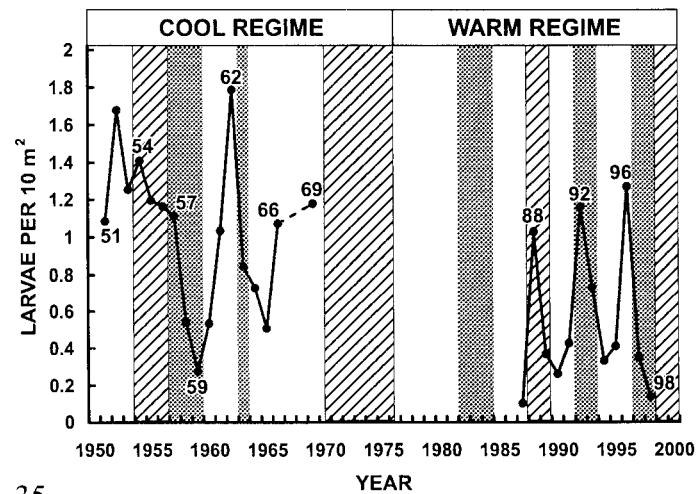
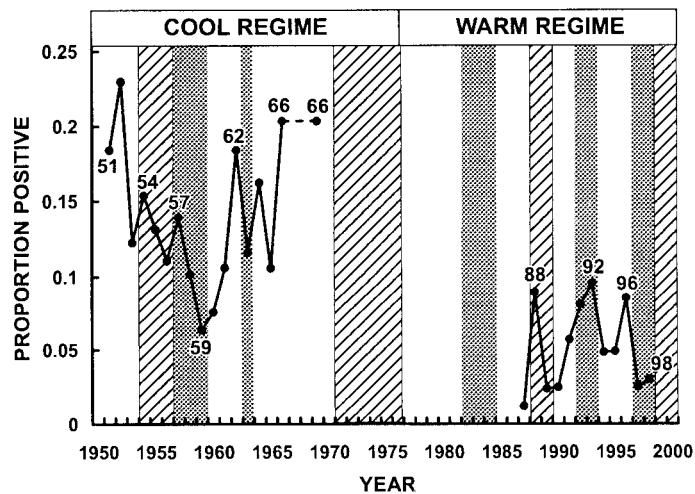
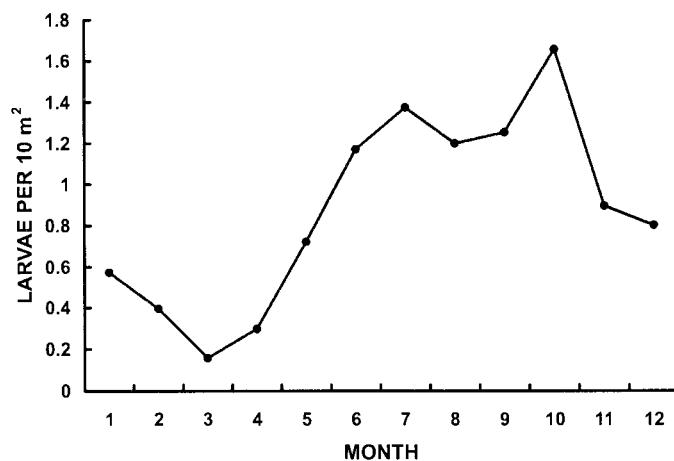
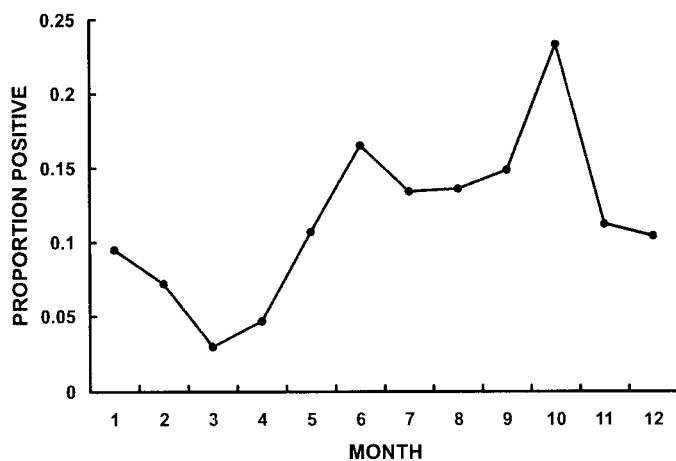
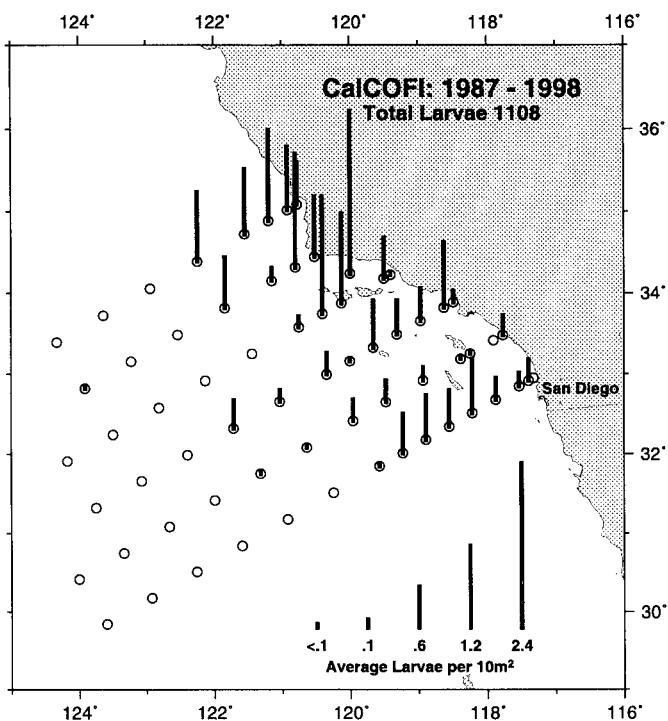
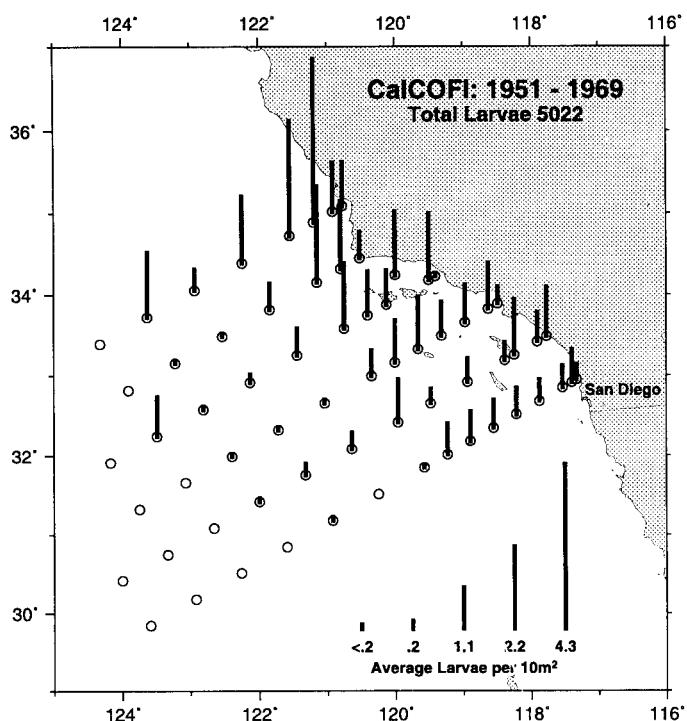
CENTROLOPHIDAE



## SEBASTIDAE

## Splitnose rockfish

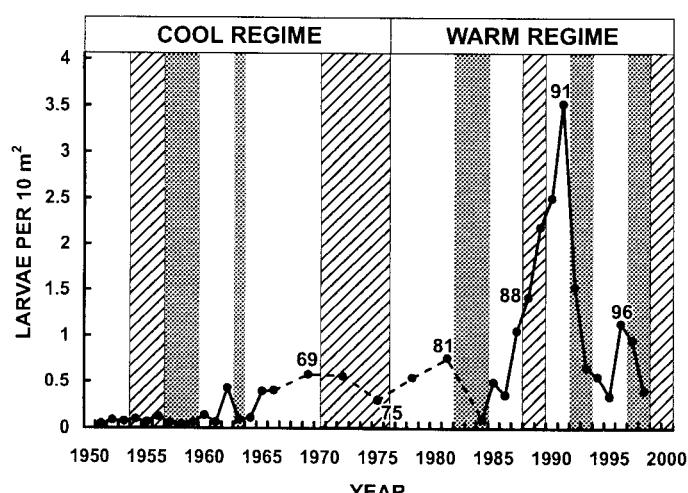
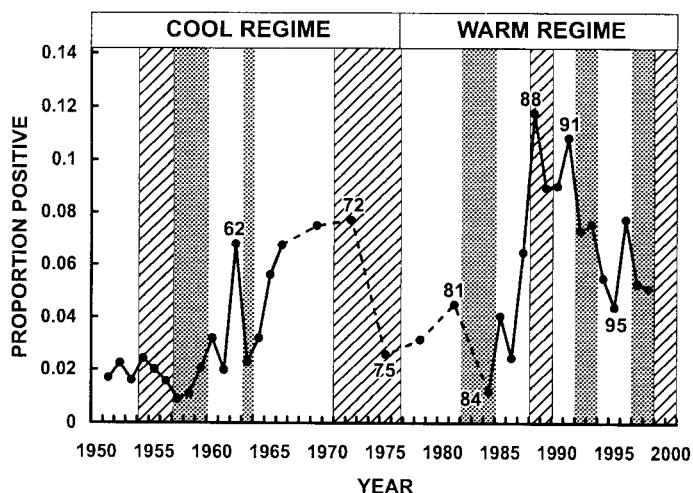
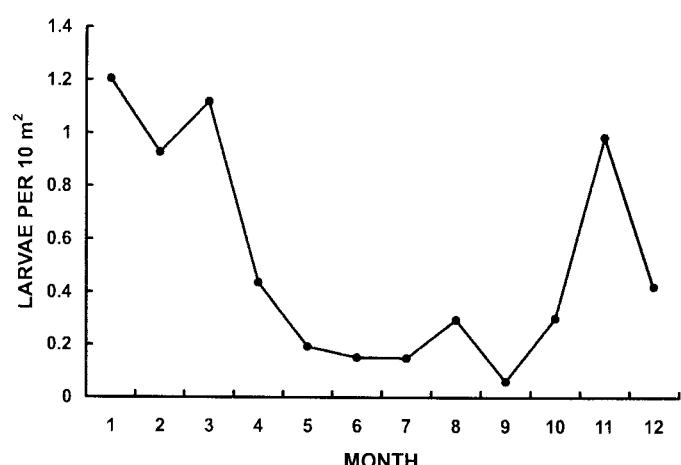
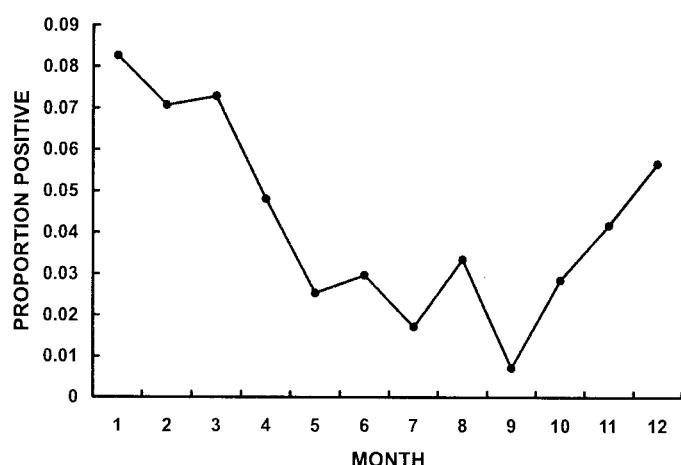
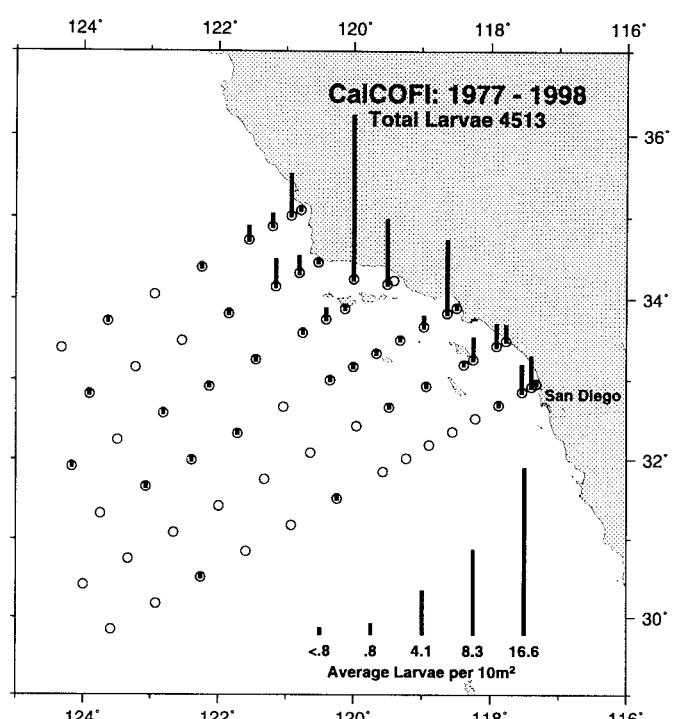
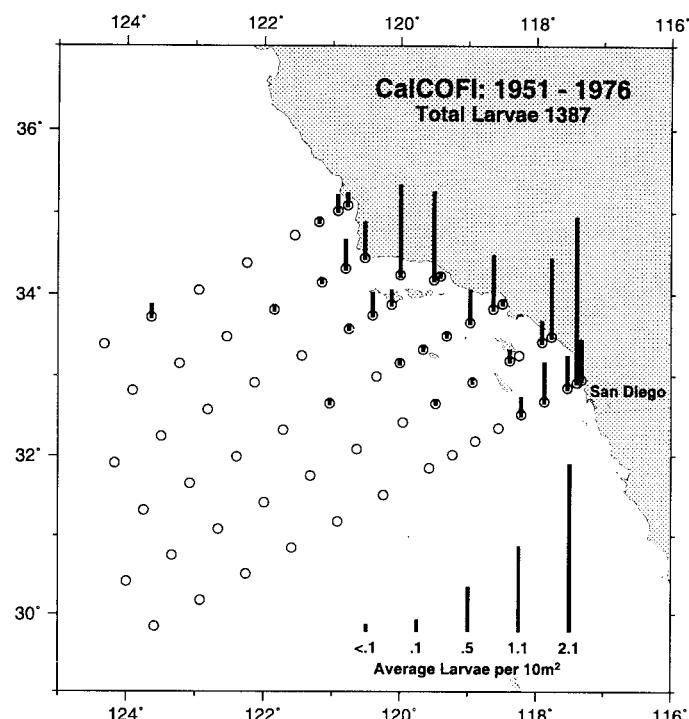
## *Sebastes diploproa*



*Argentina sialis*

Pacific argentine

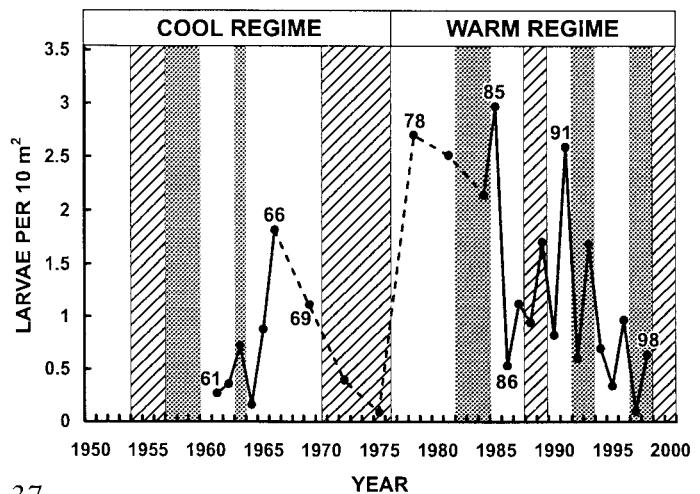
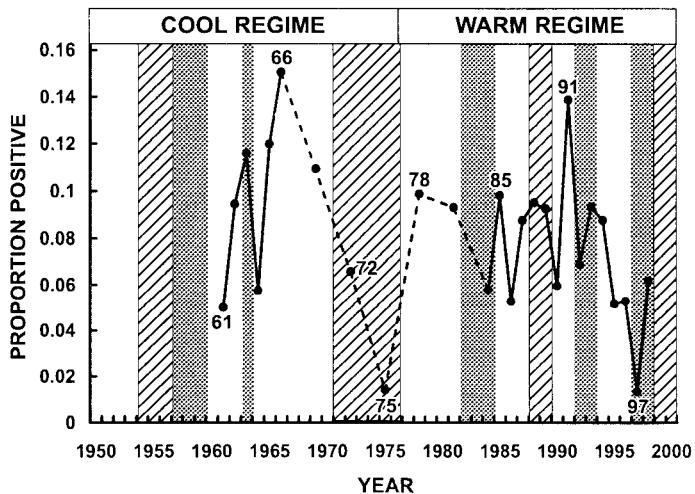
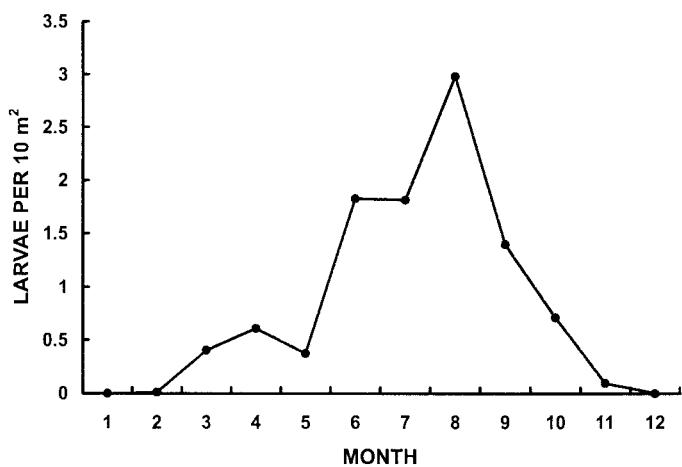
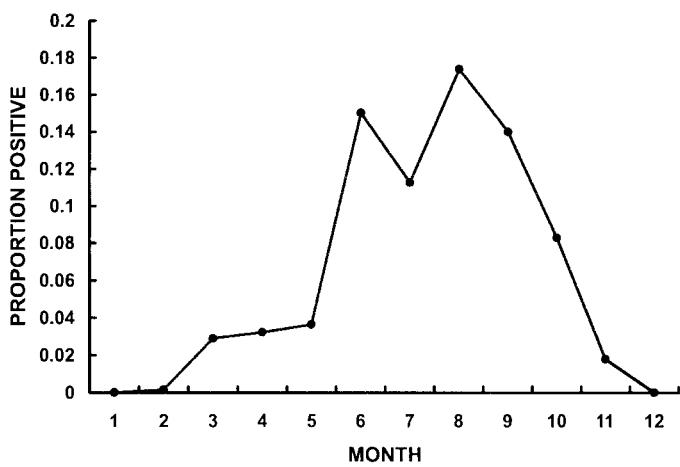
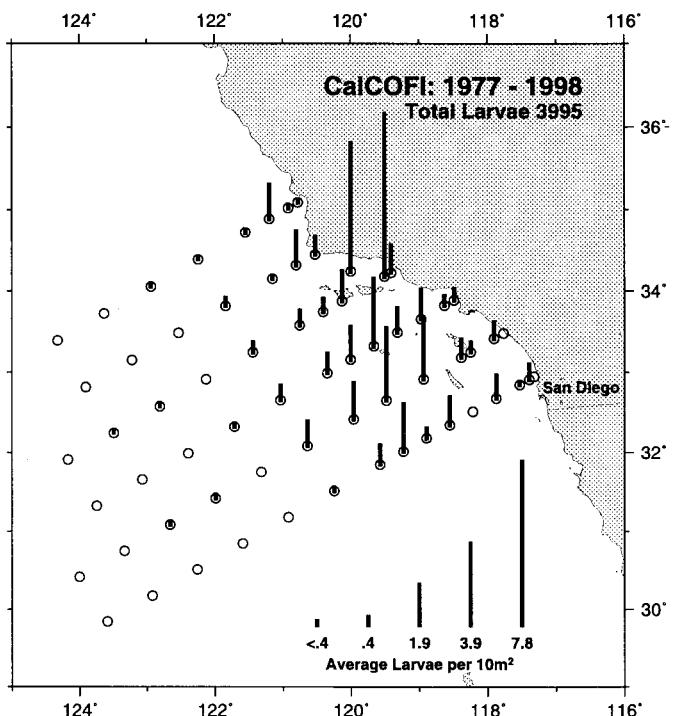
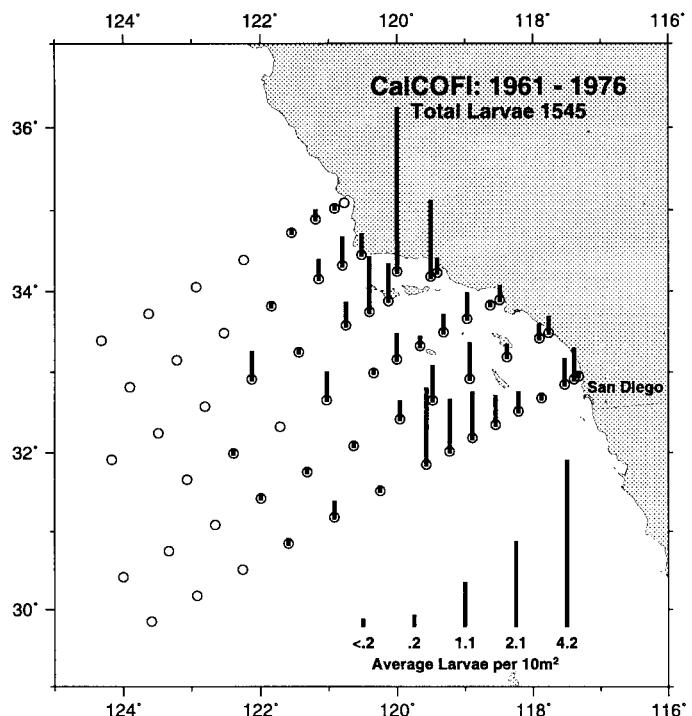
ARGENTINIDAE



## LABRIDAE

## Señorita

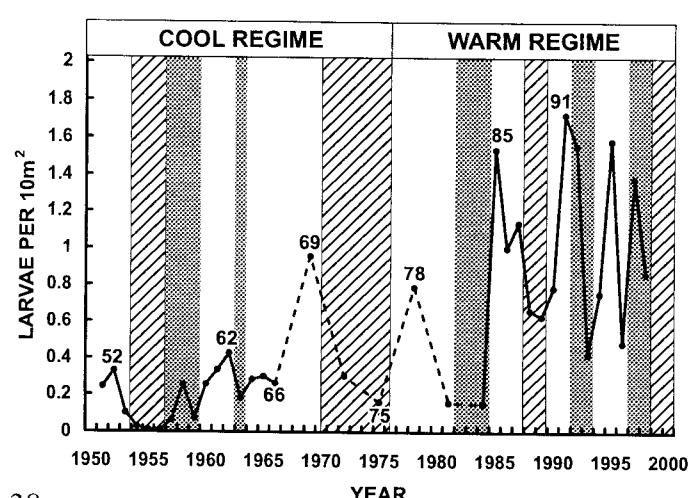
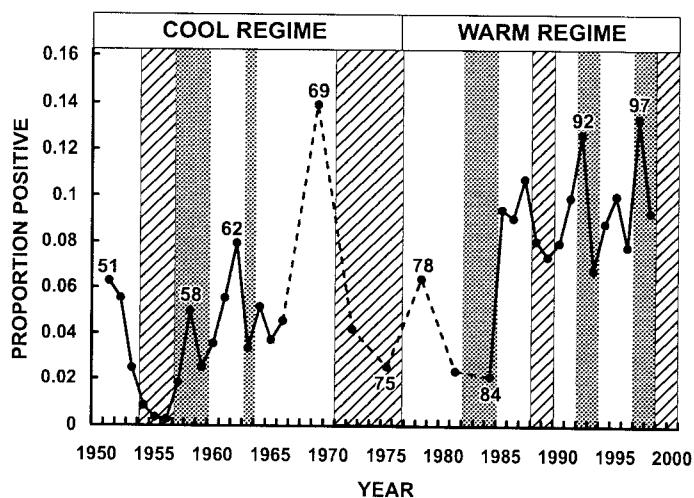
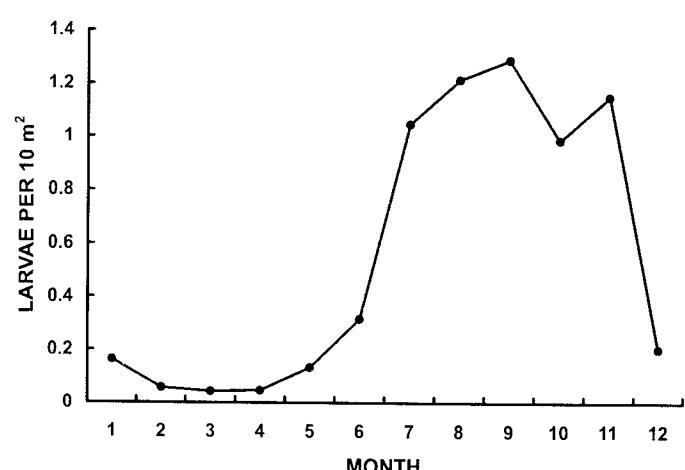
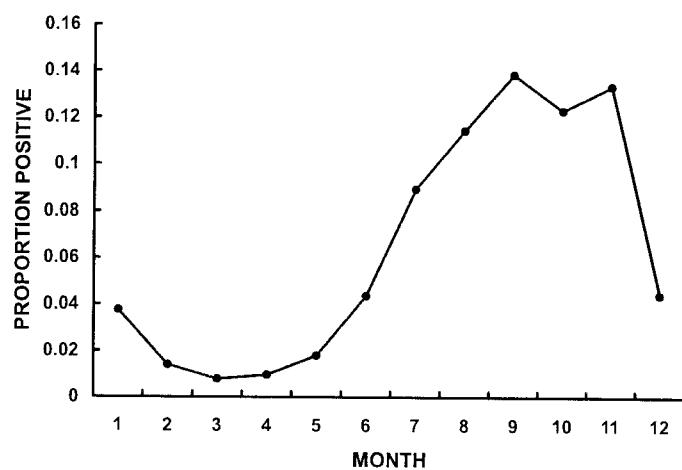
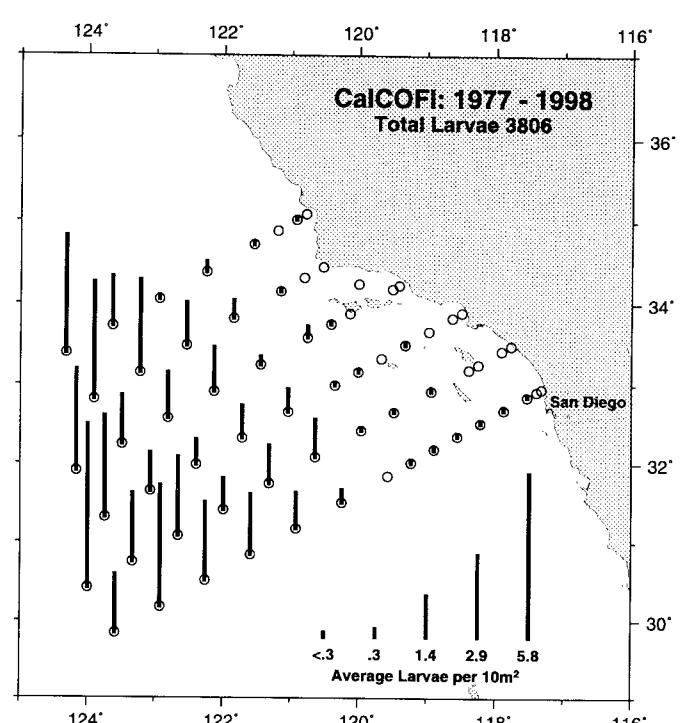
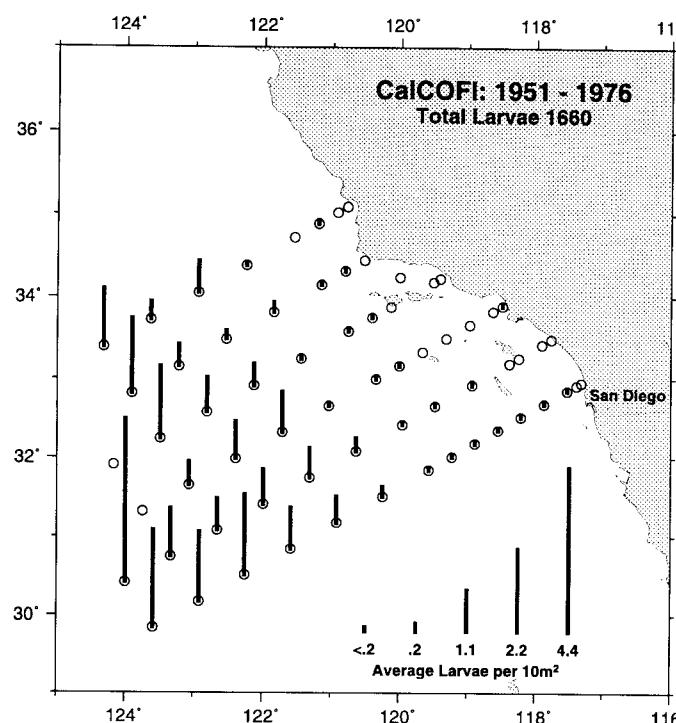
## *Oxyjulis californica*



*Idiacanthus antrostomus*

Pacific blackdragon

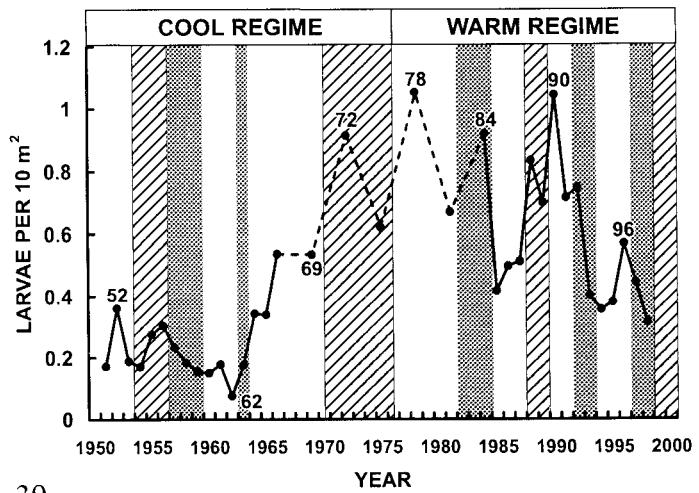
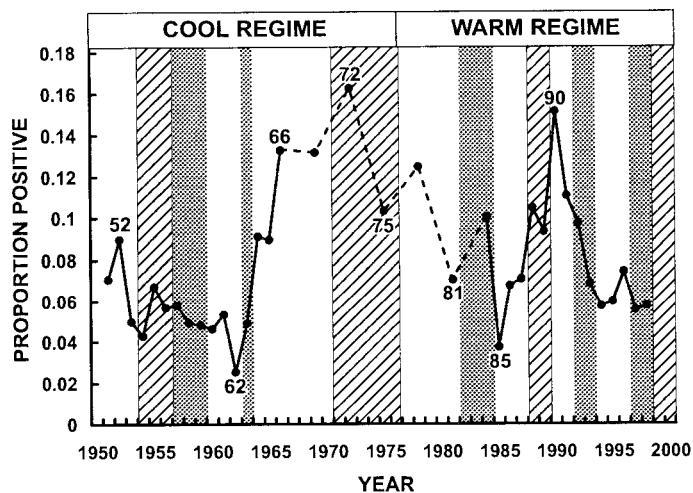
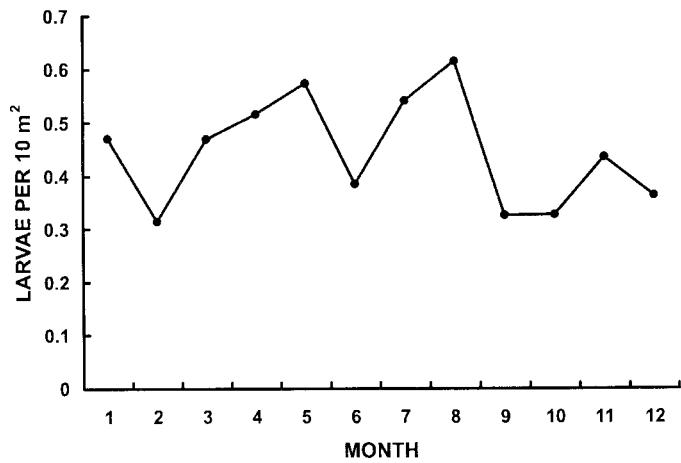
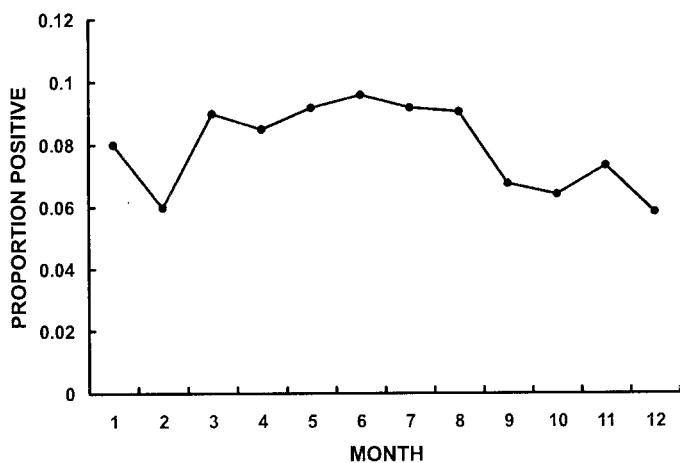
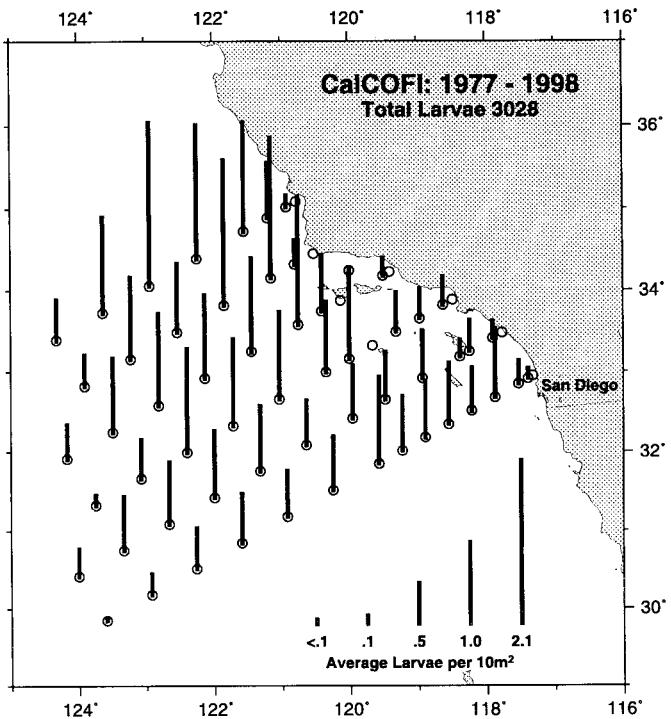
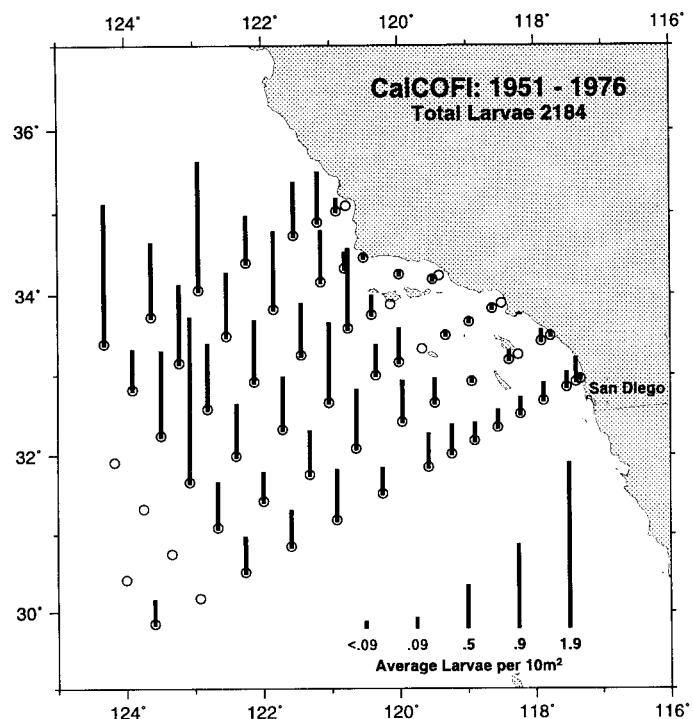
STOMIIDAE



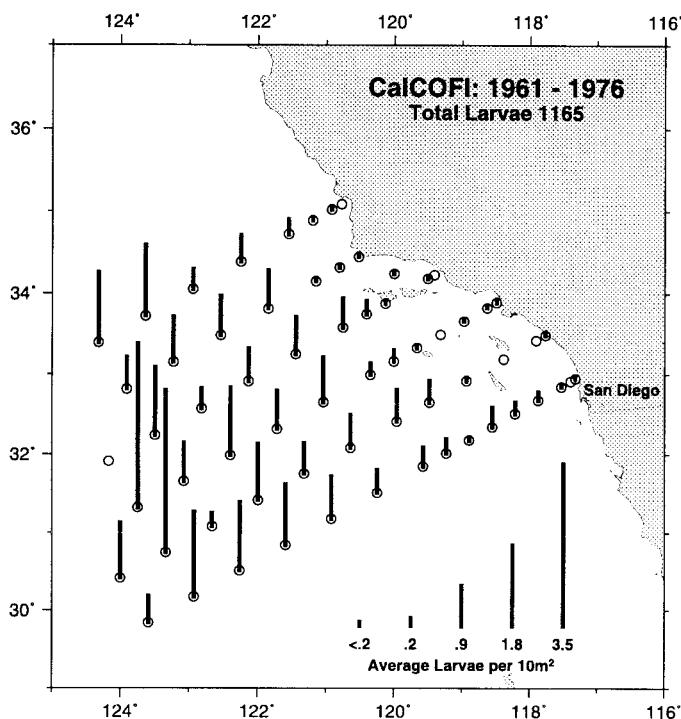
# STOMIIDAE

# Pacific viperfish

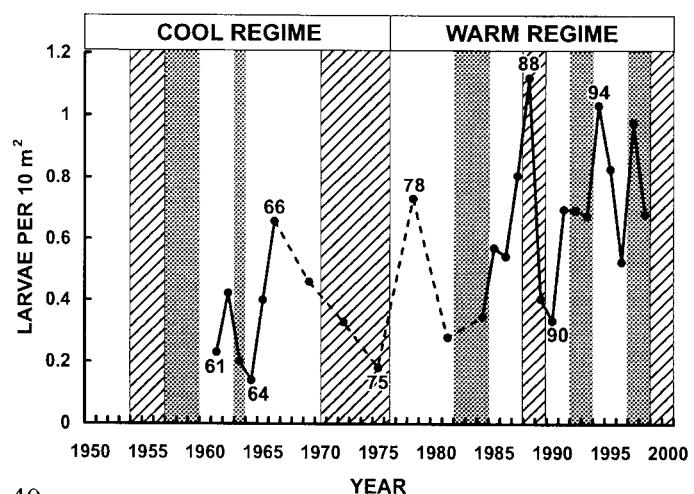
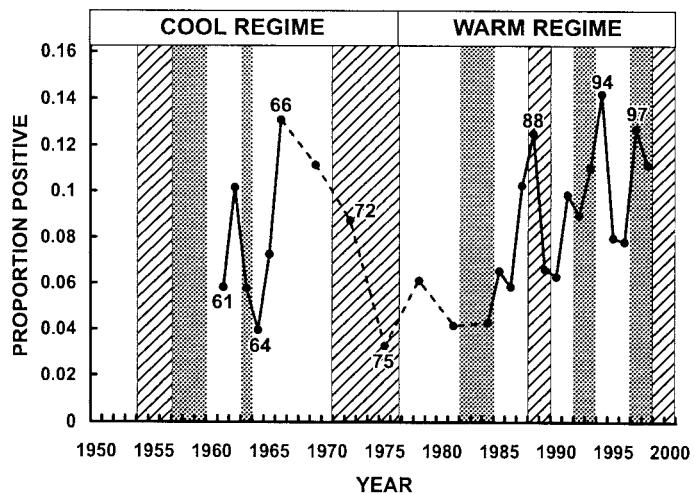
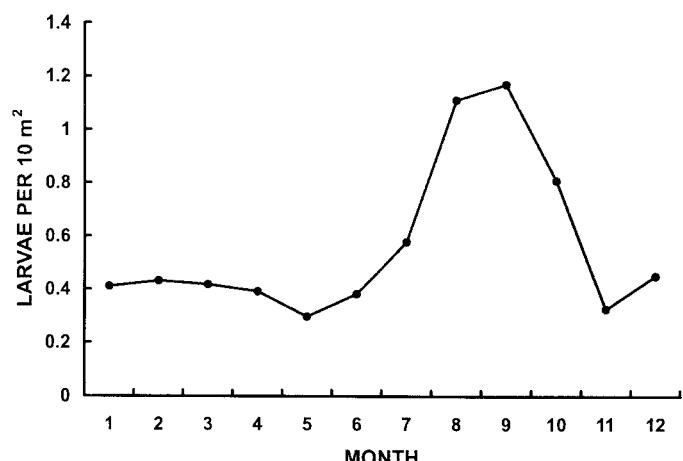
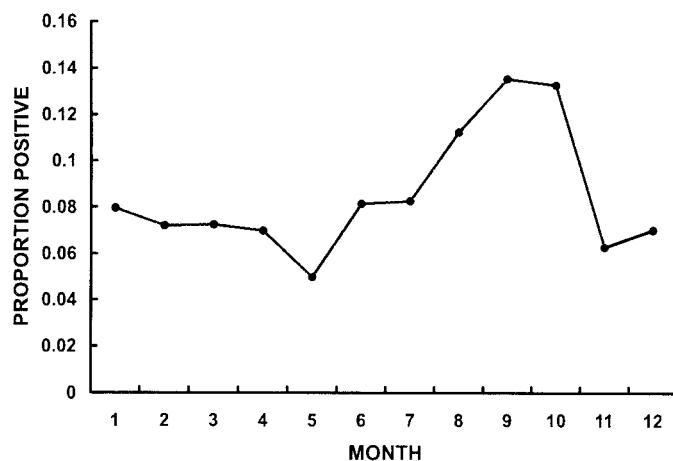
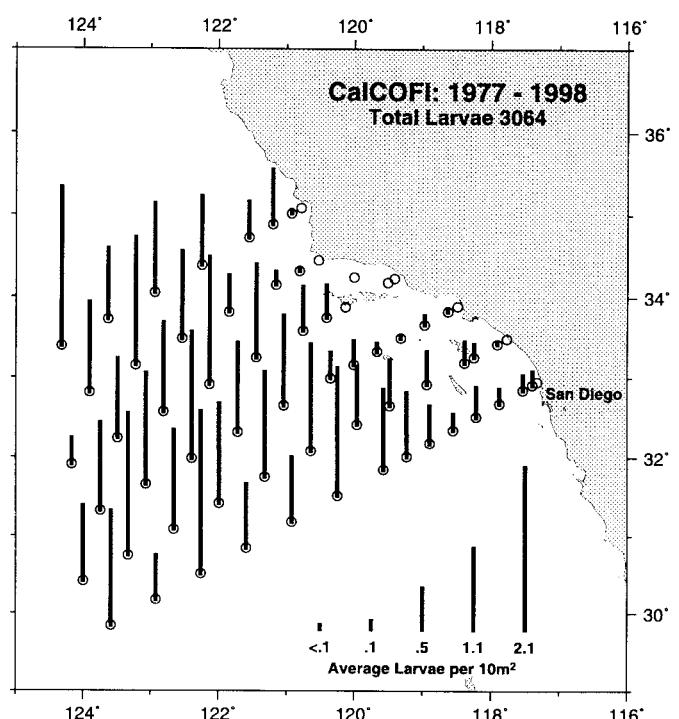
# *Chauliodus macouni*



### *Lestidiops ringens*



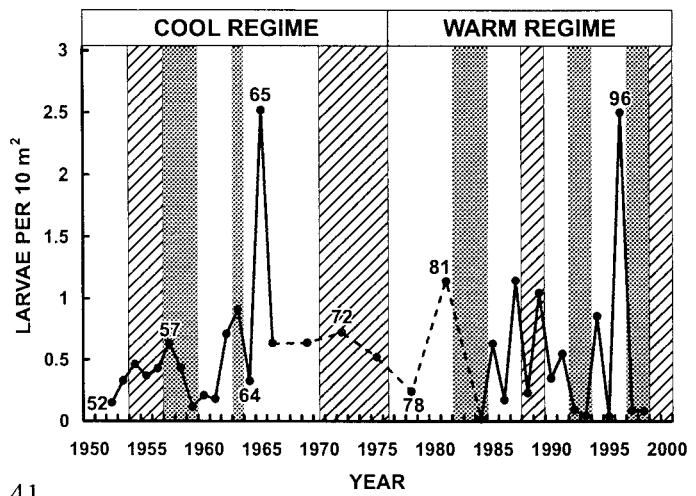
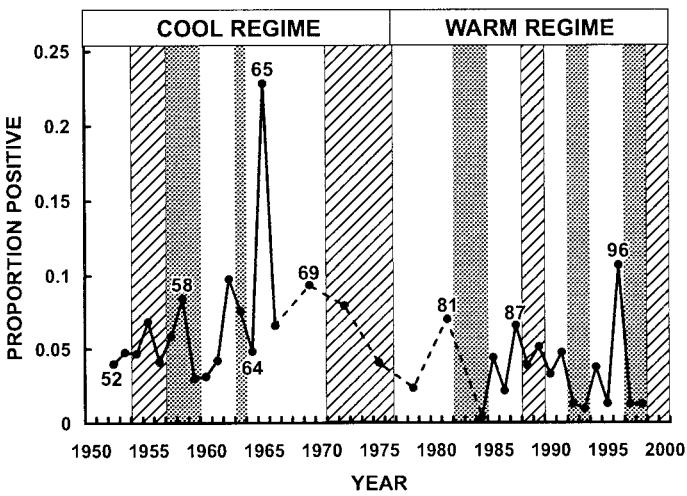
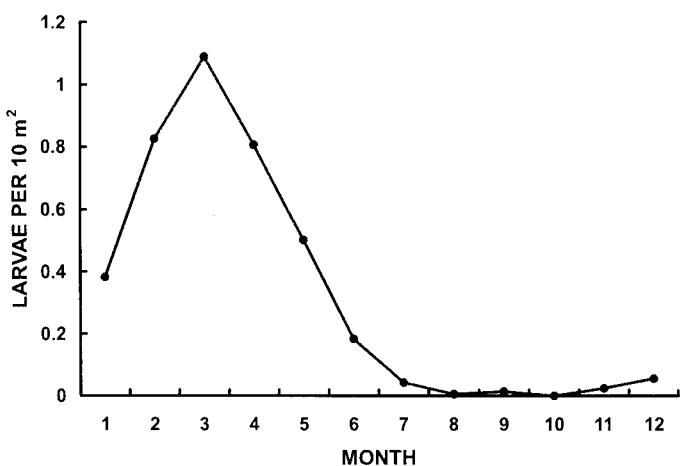
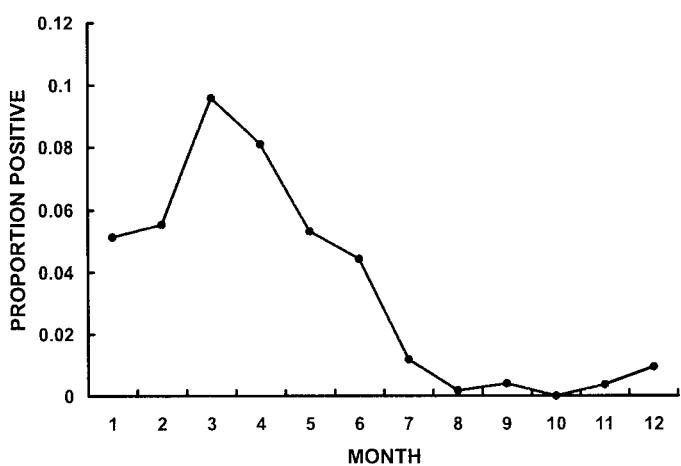
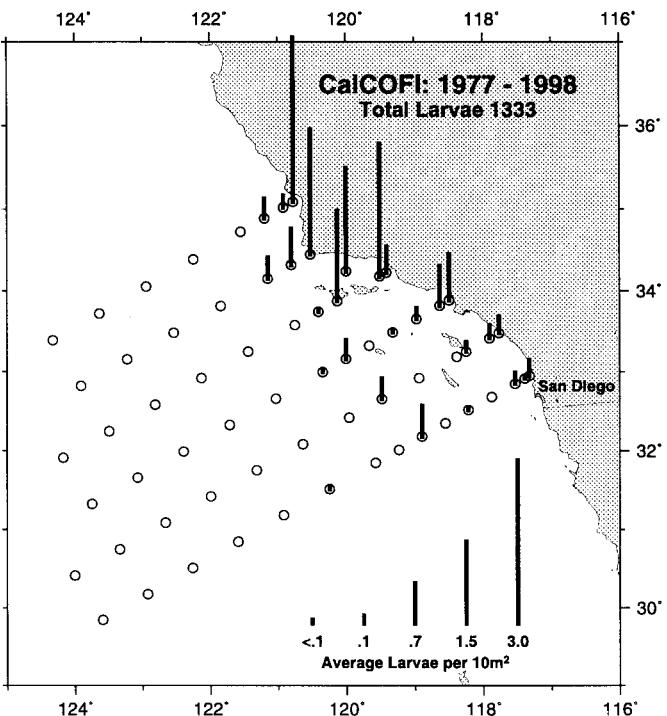
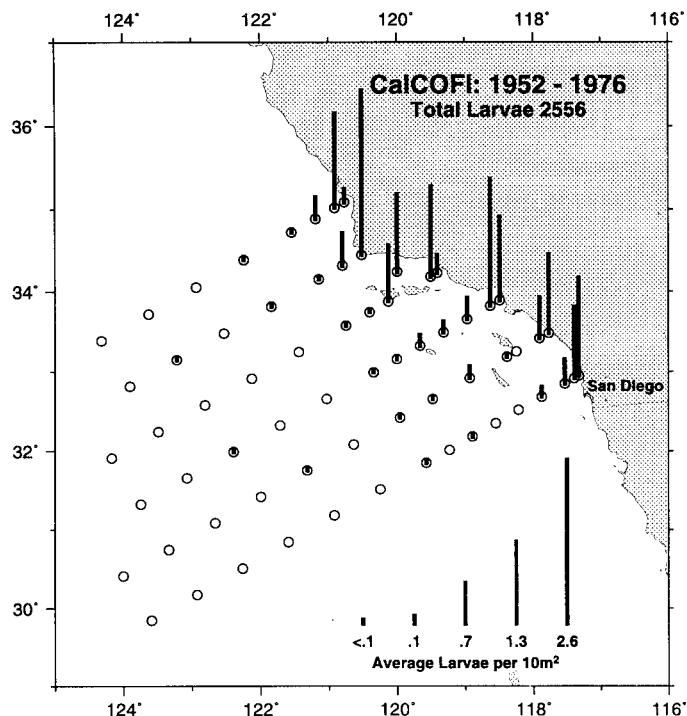
### Slender barracudina



## PLEURONECTIDAE

## English sole

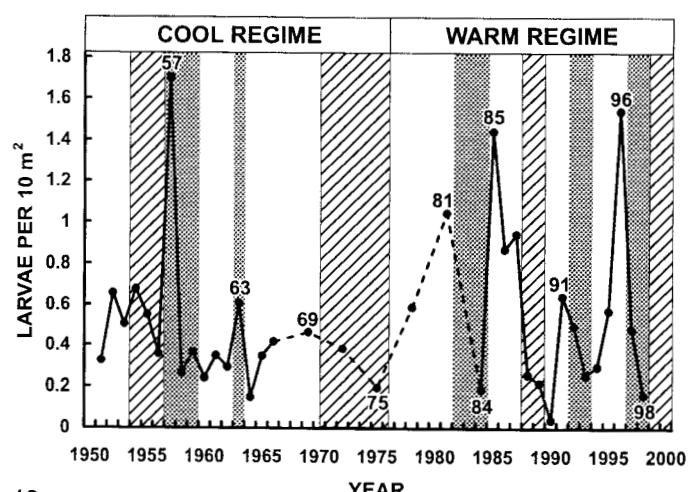
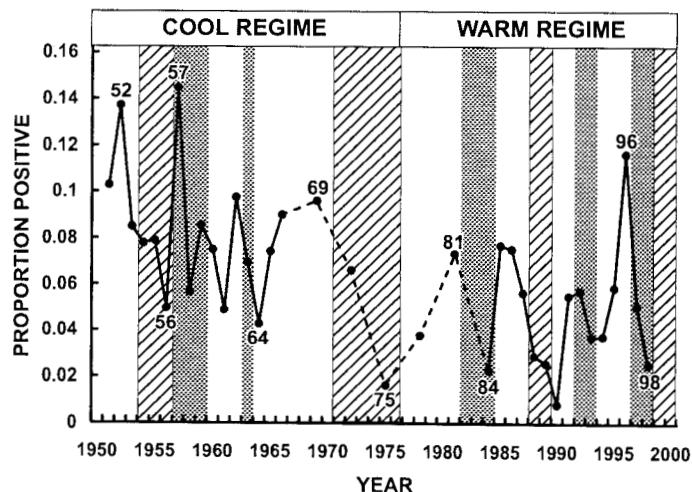
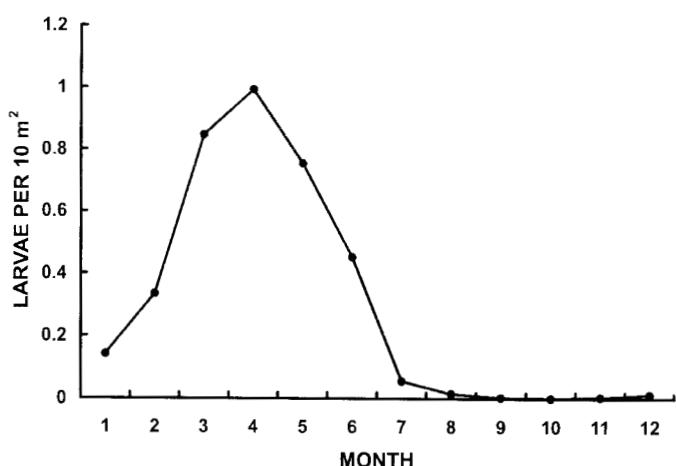
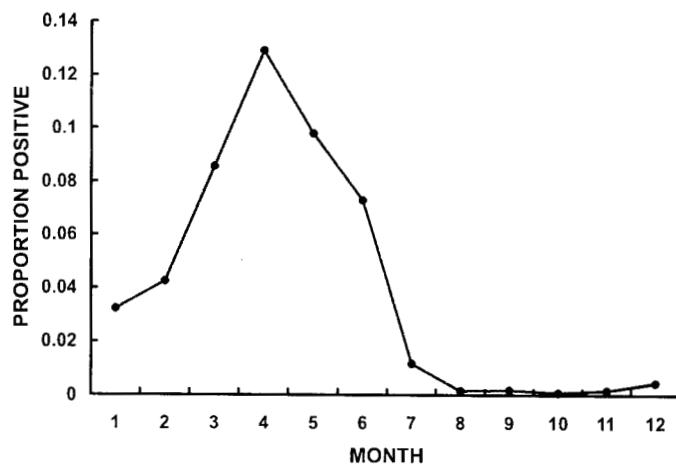
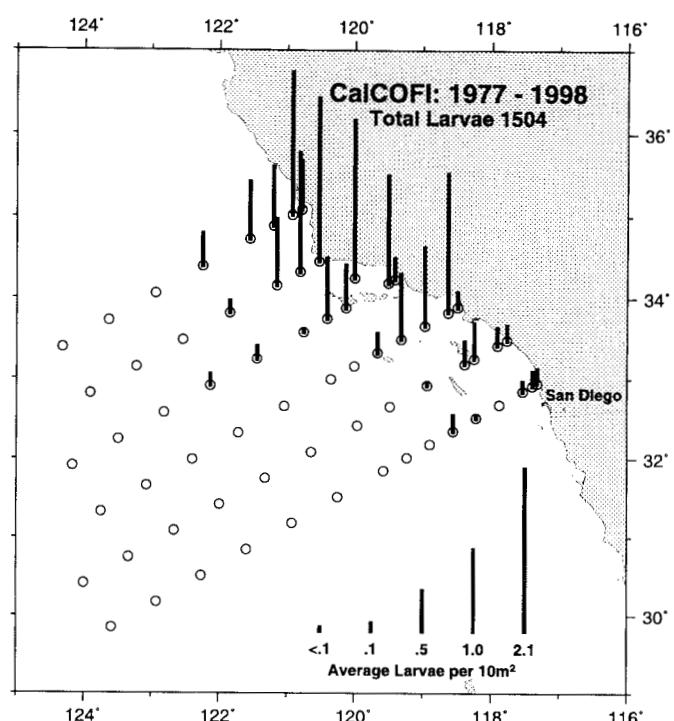
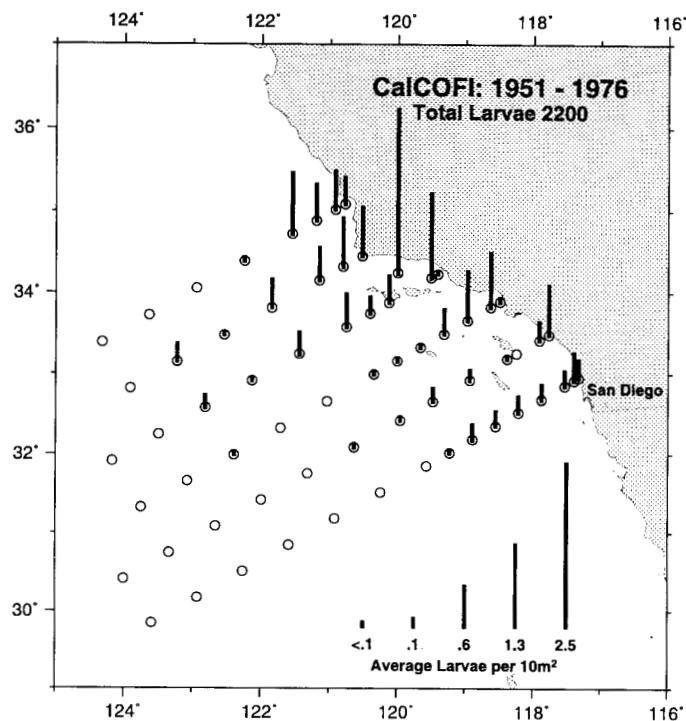
## *Parophrys vetulus*



*Lyopsetta exilis*

Slender sole

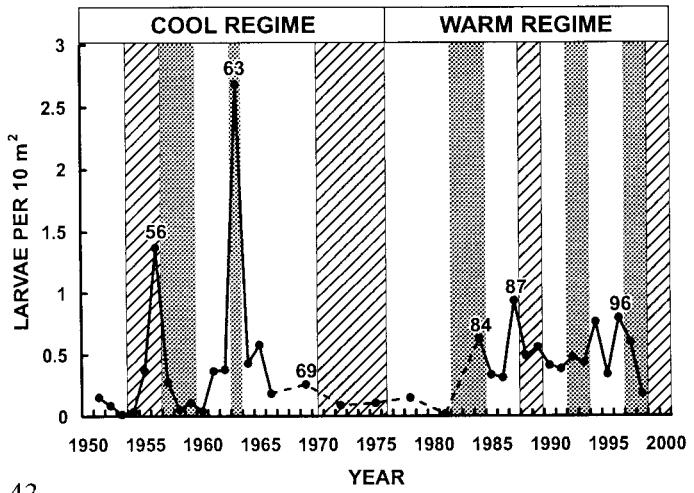
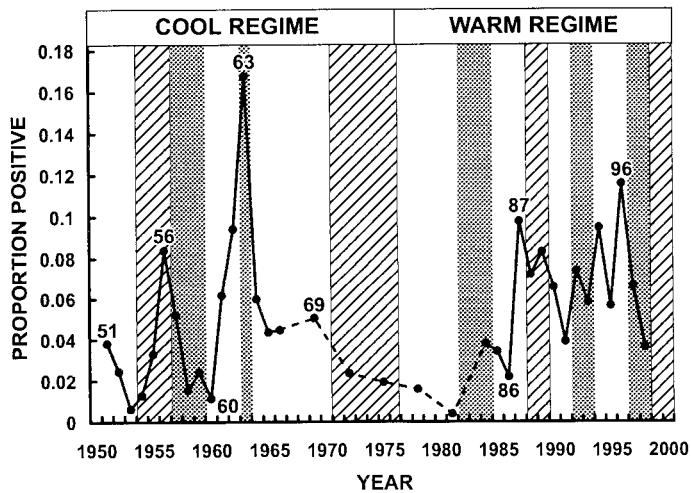
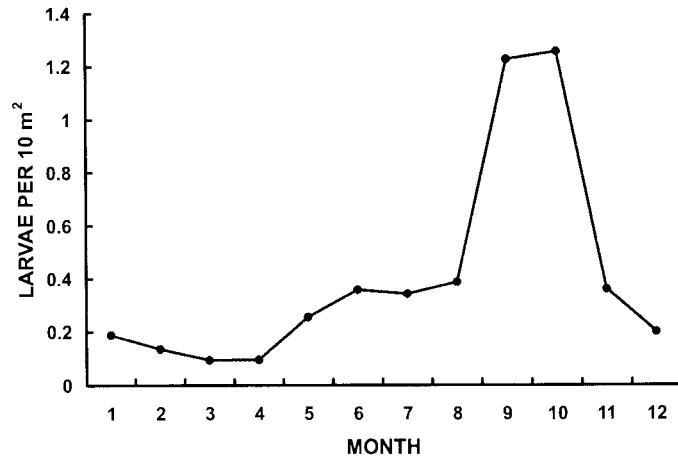
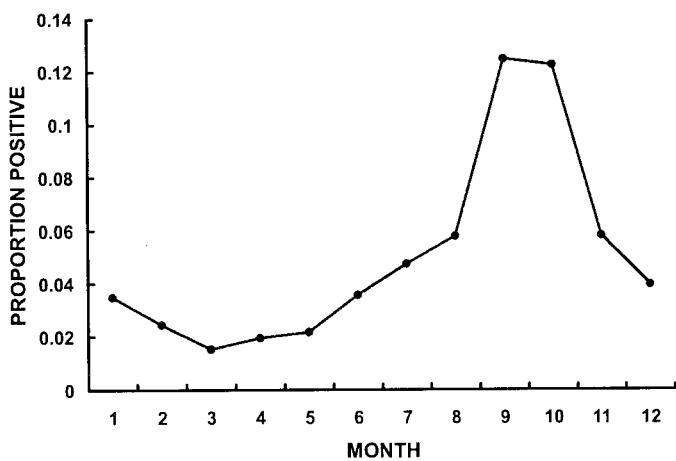
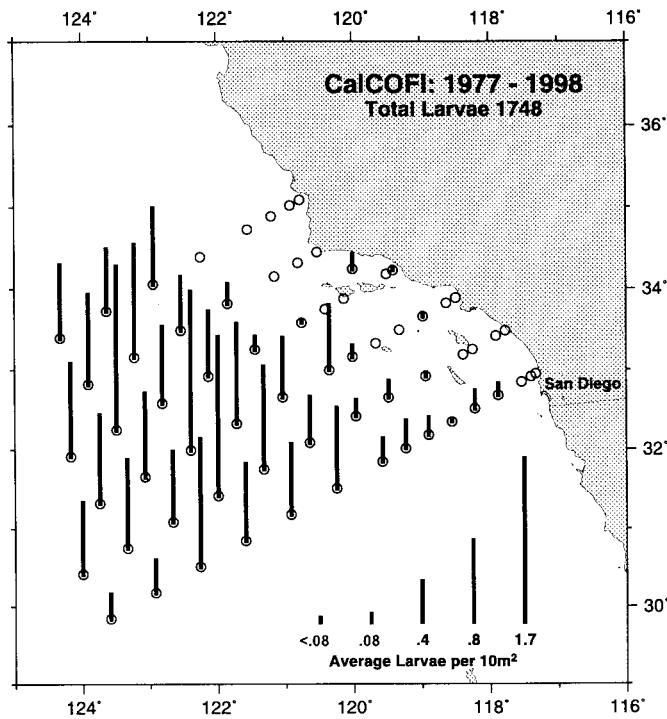
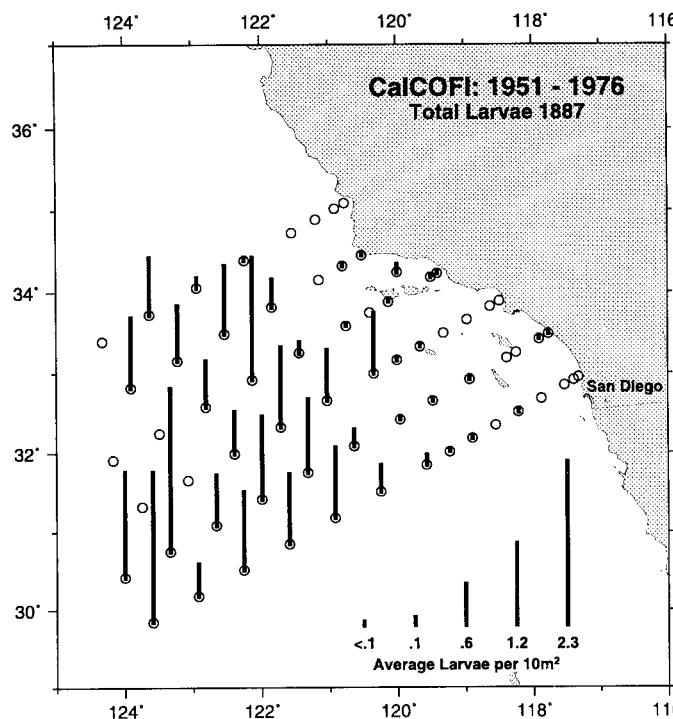
PLEURONECTIDAE



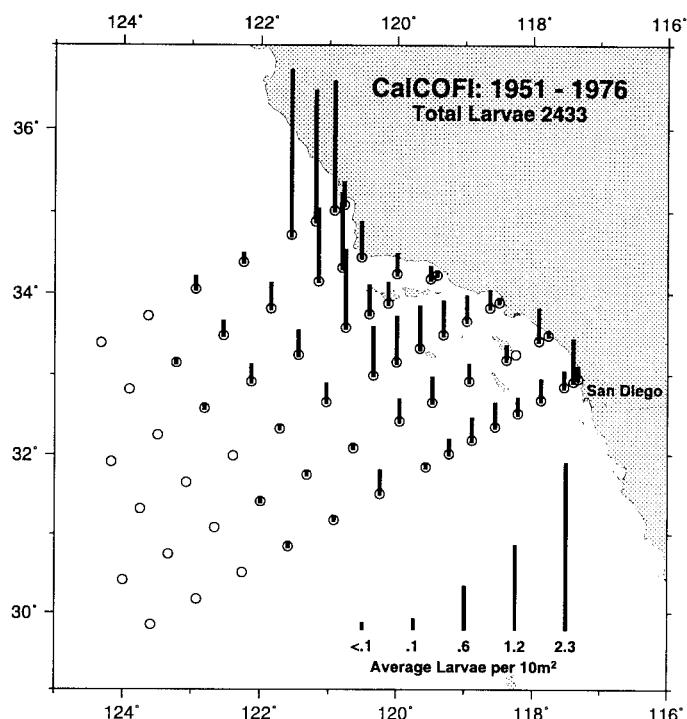
## TETRAGONURIDAE

## Smalleye squaretail

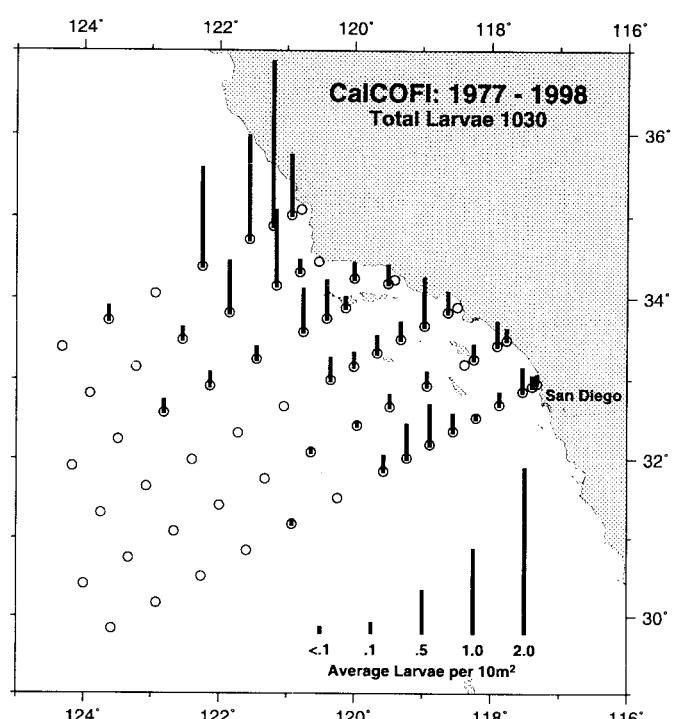
## *Tetragonurus cuvieri*



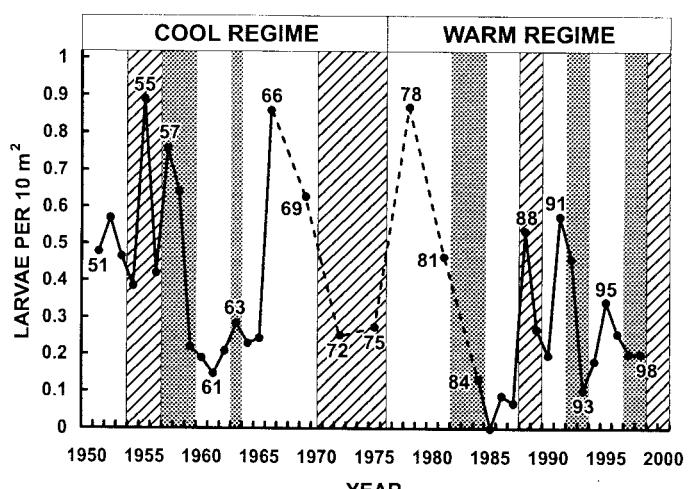
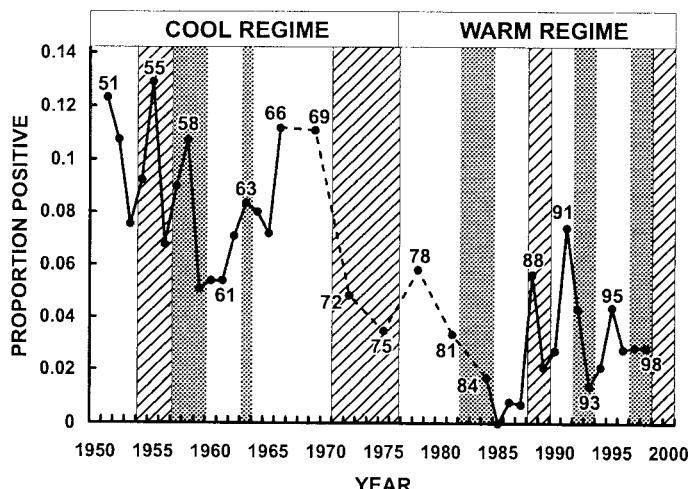
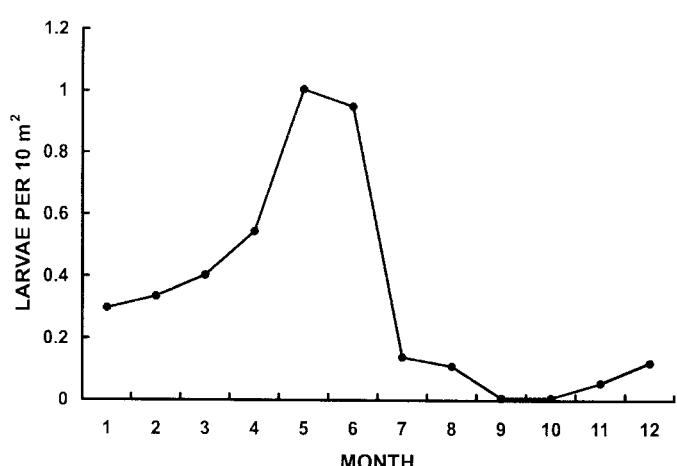
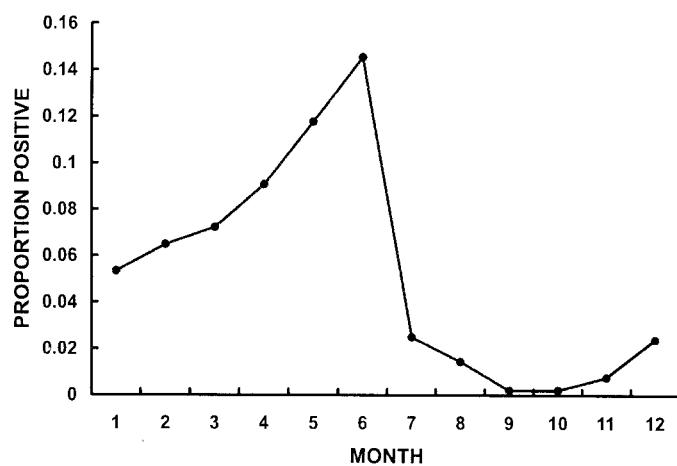
### *Sebastodes aurora*



### Aurora rockfish



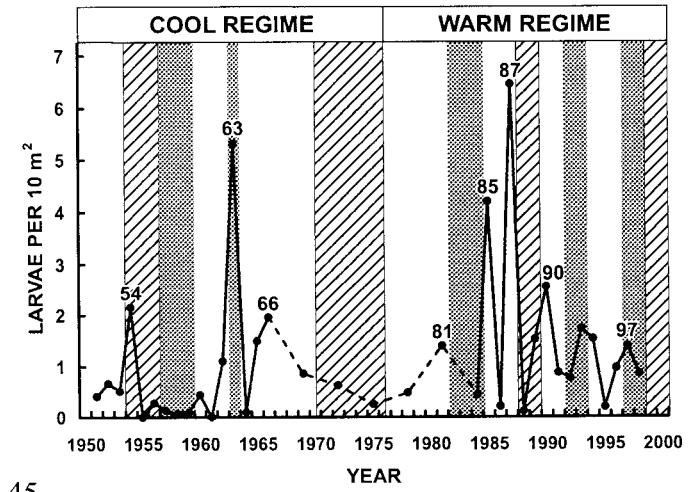
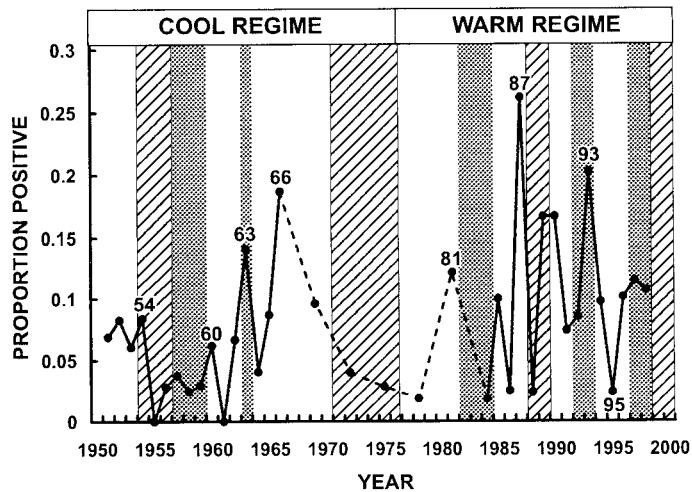
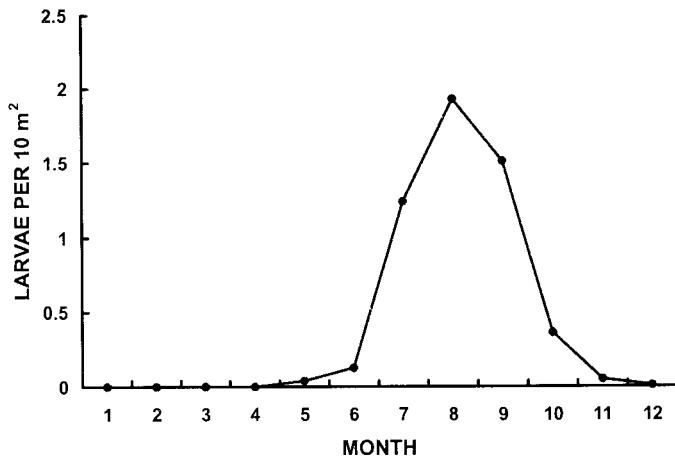
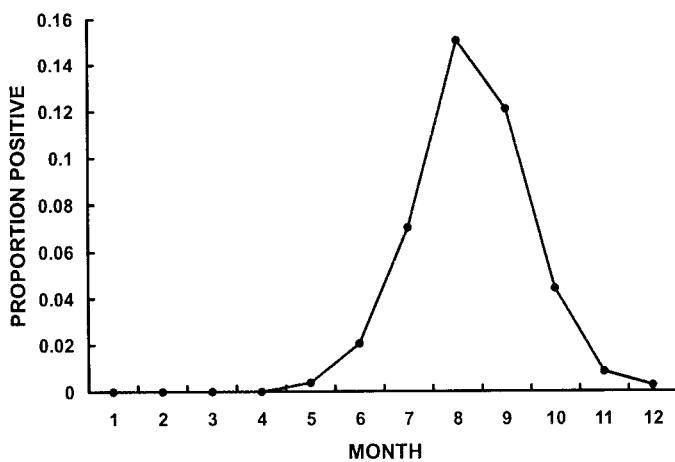
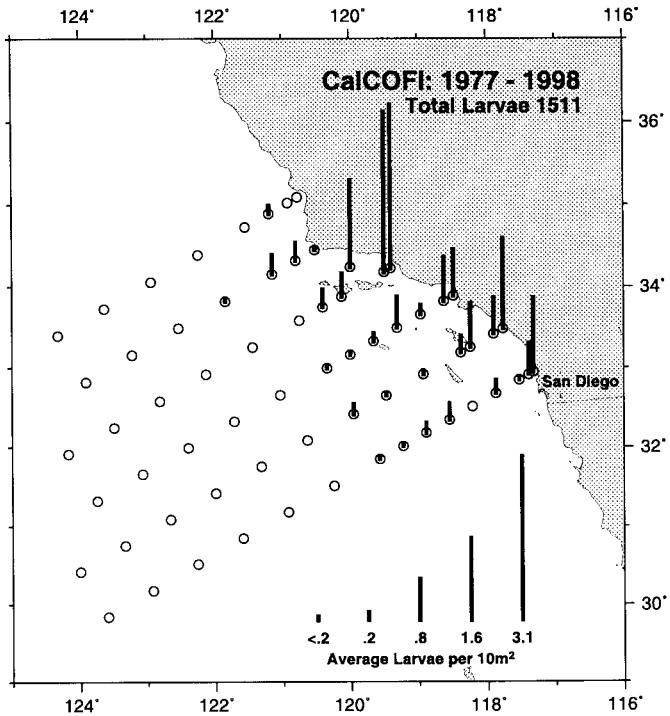
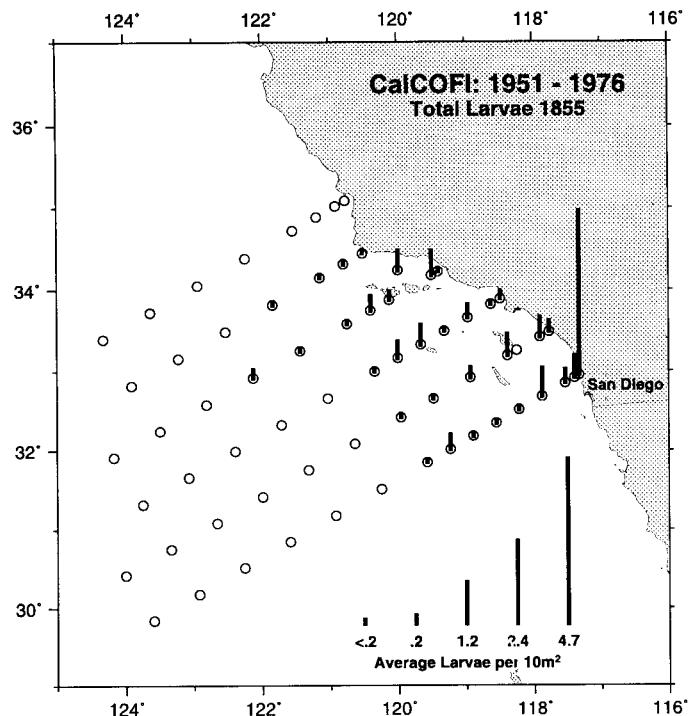
### SEBASTIDAE



## POMACENTRIDAE

### Blacksmith

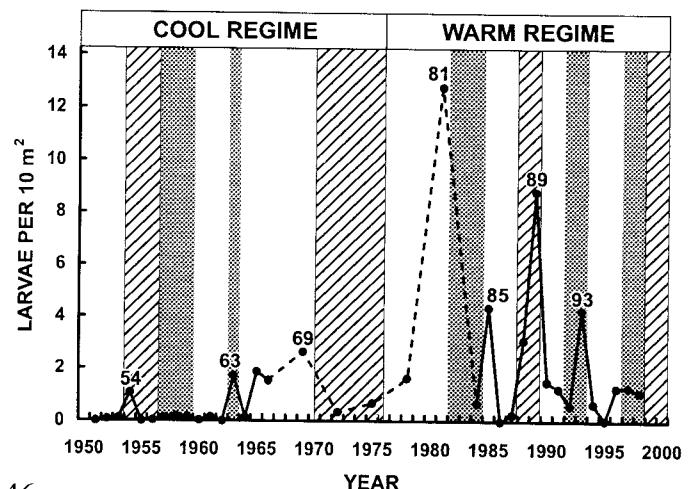
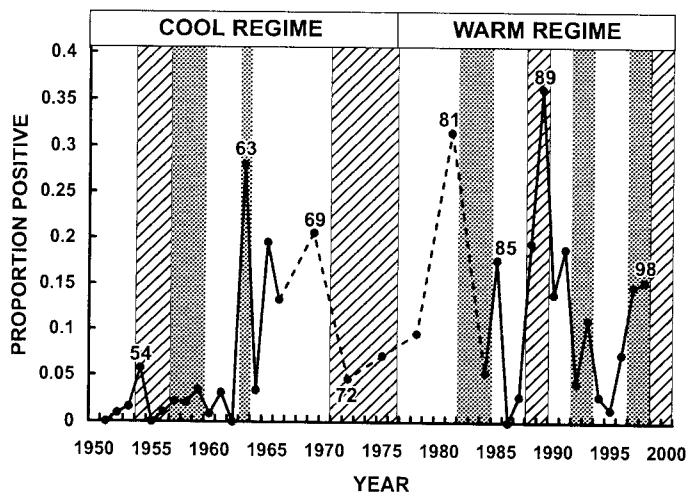
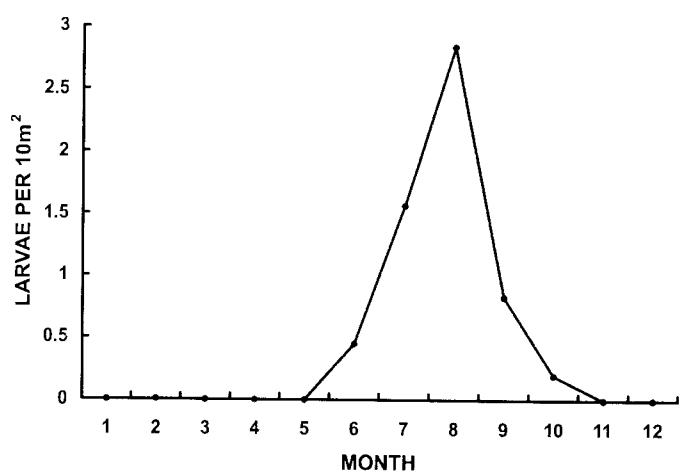
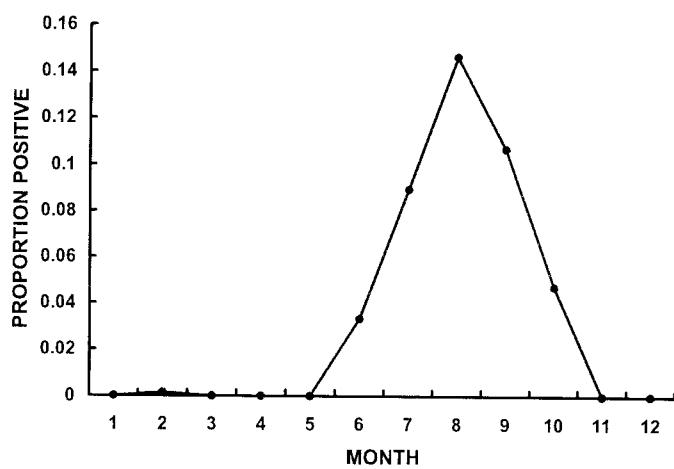
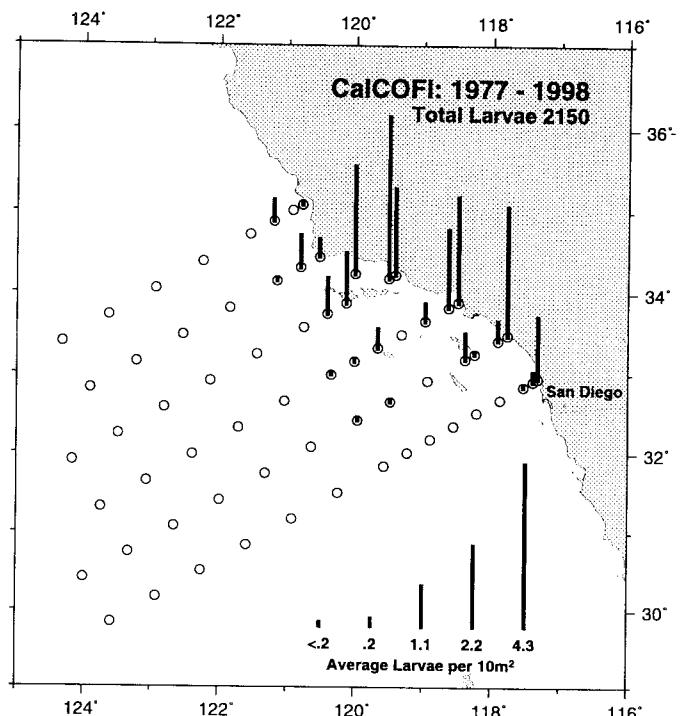
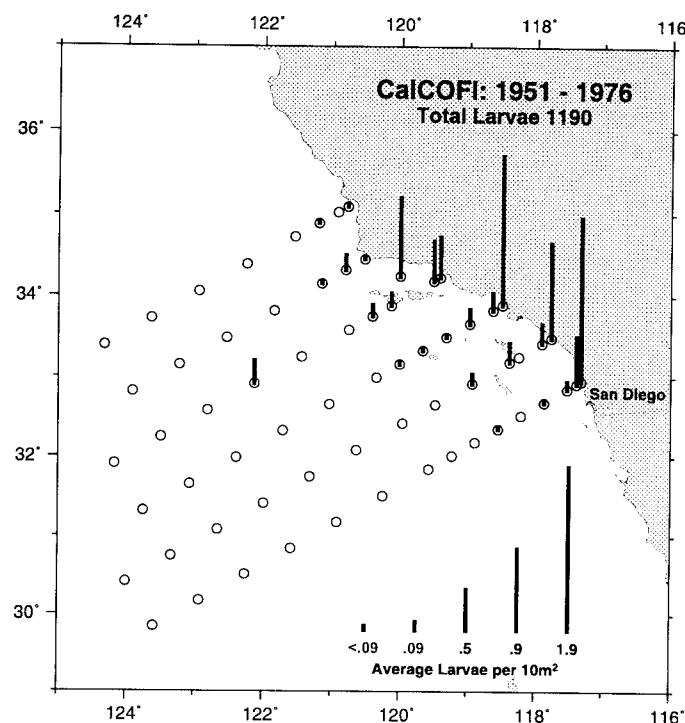
### *Chromis punctipinnis*



*Paralabrax* spp.

Kelp and sand basses

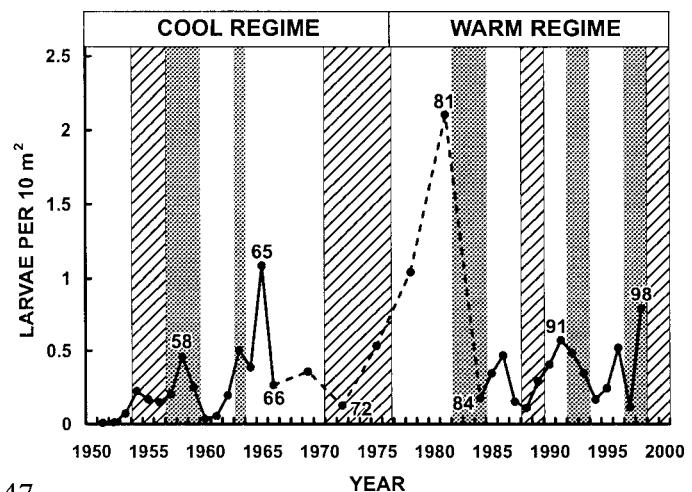
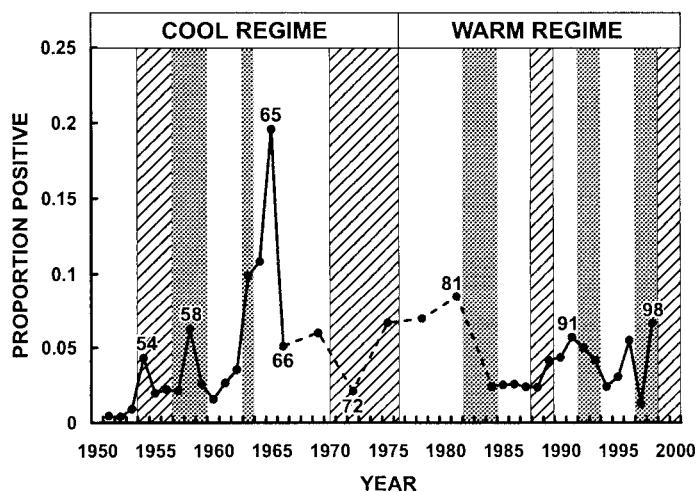
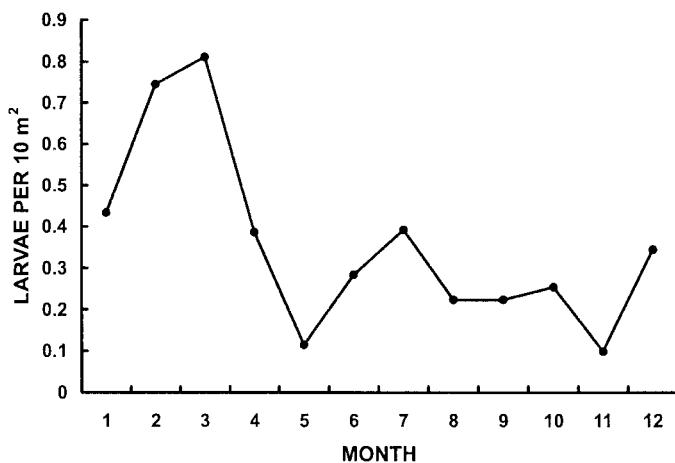
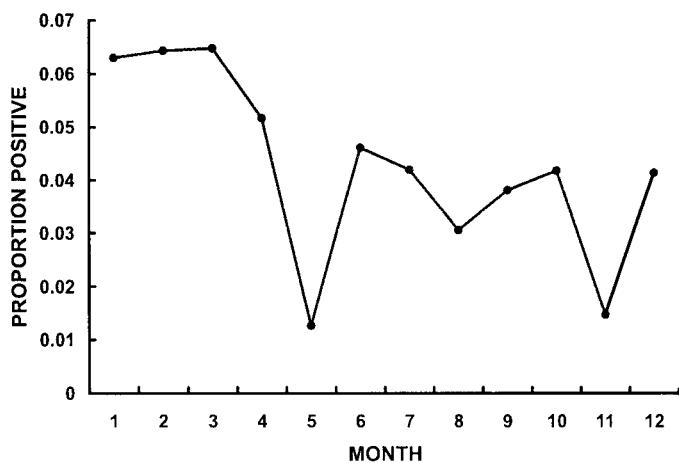
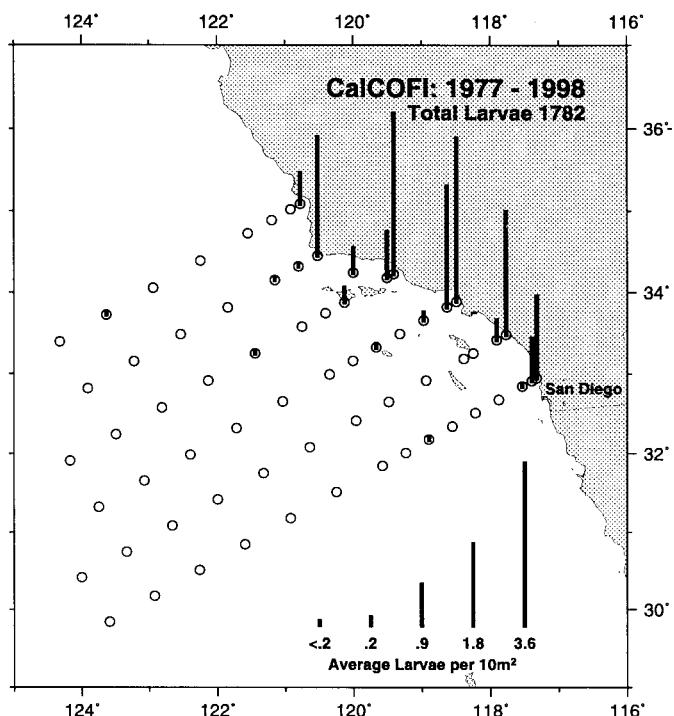
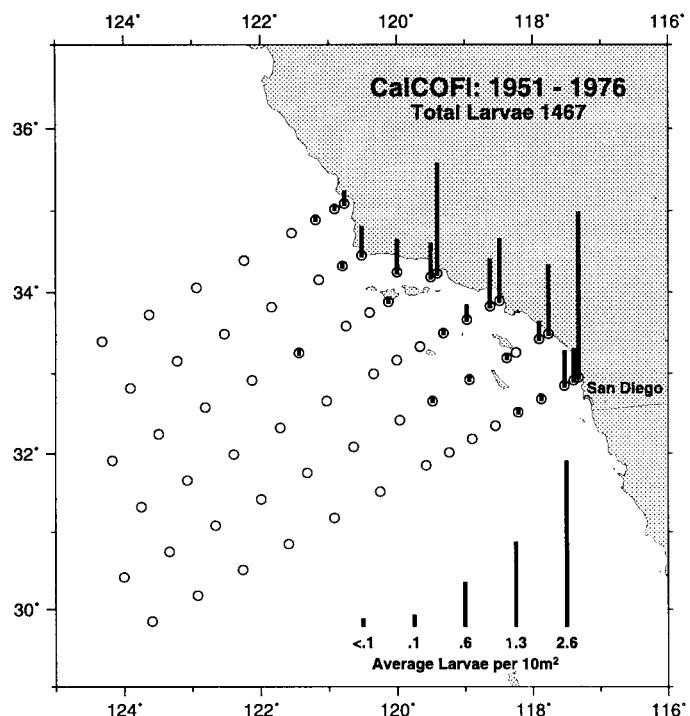
SERRANIDAE



## PARALICHTHYIDAE

## California halibut

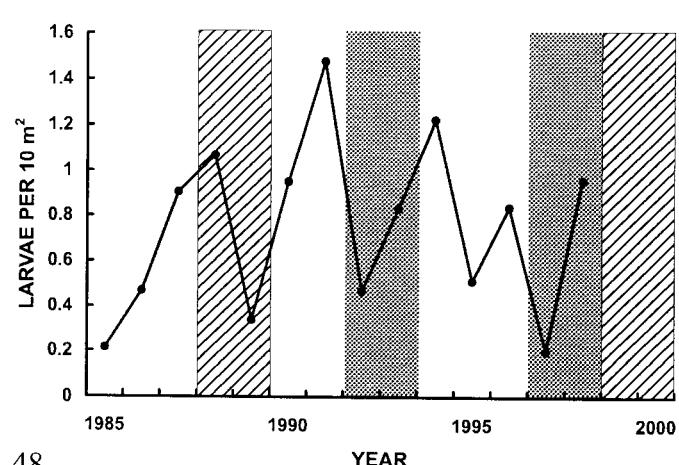
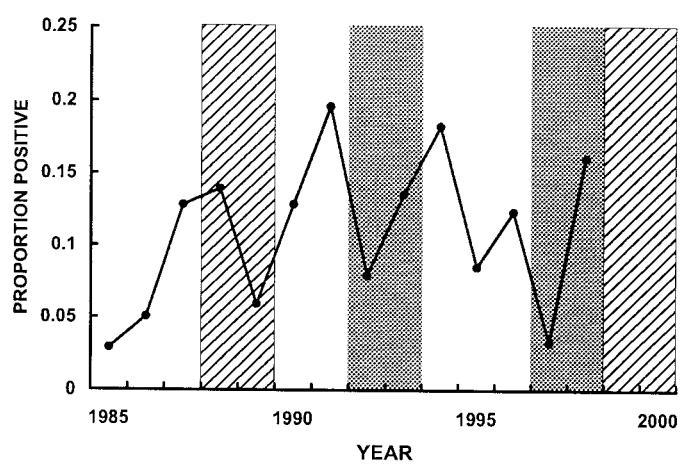
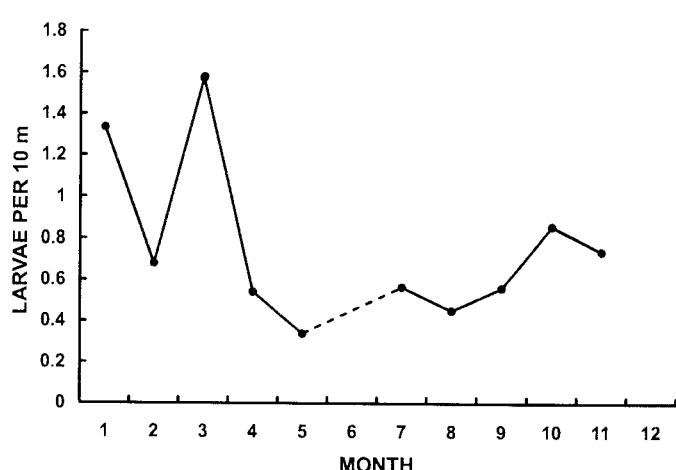
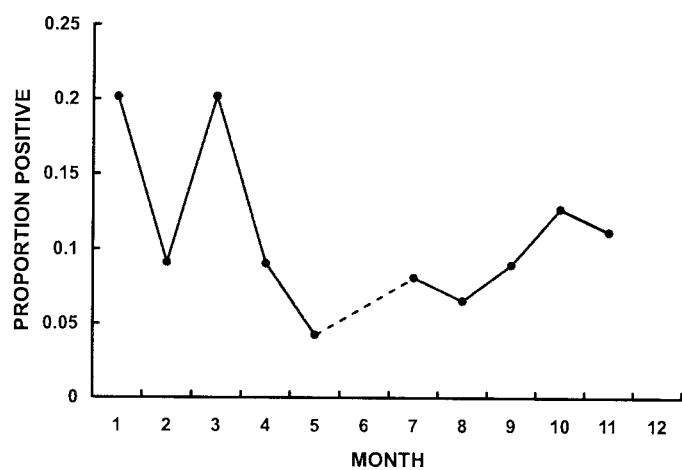
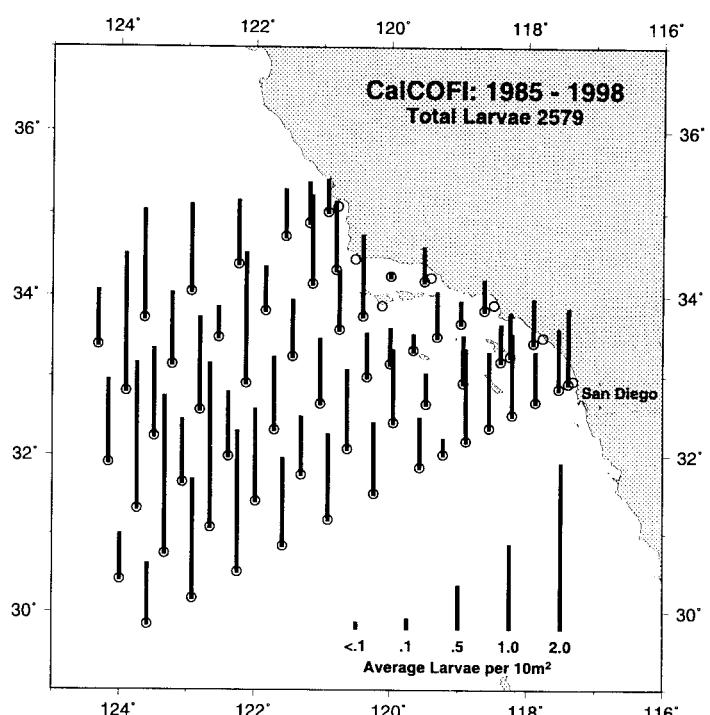
## *Paralichthys californicus*



*Argyropelecus sladeni*

## Lowcrest hatchetfish

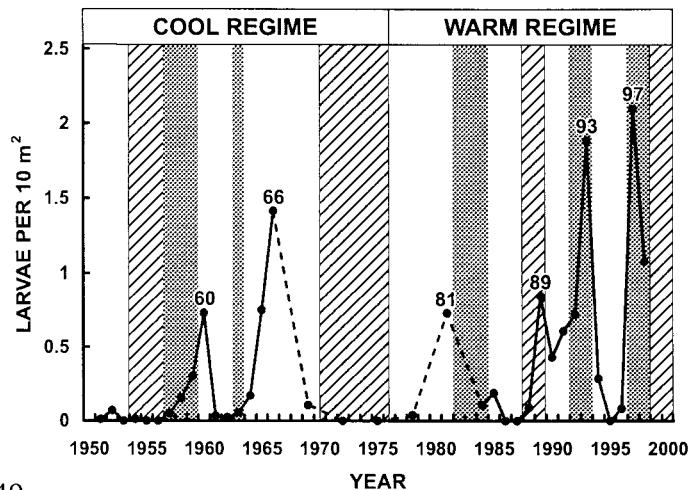
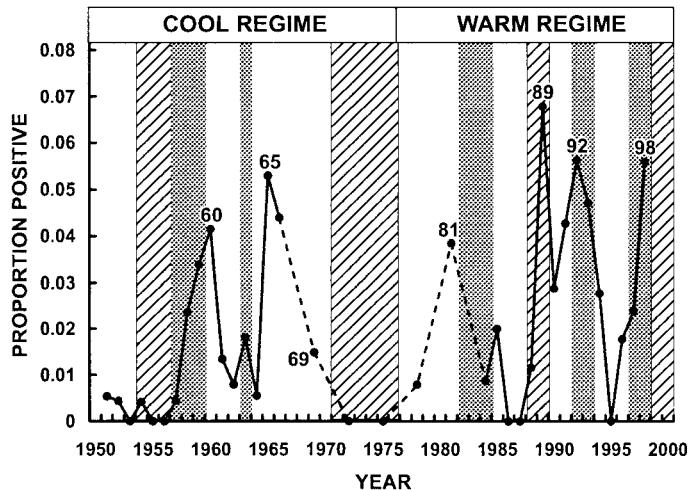
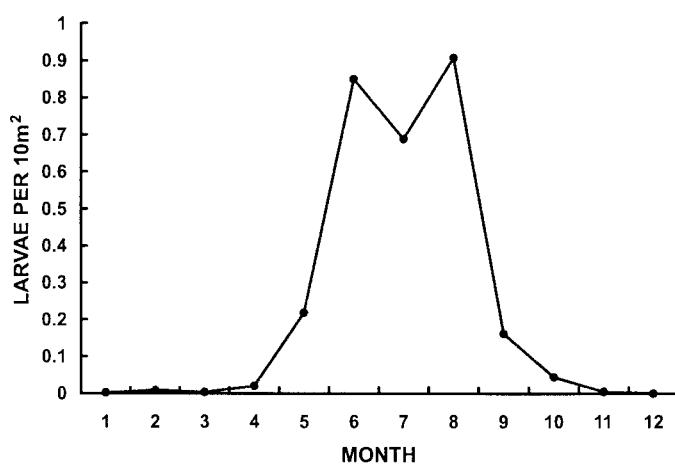
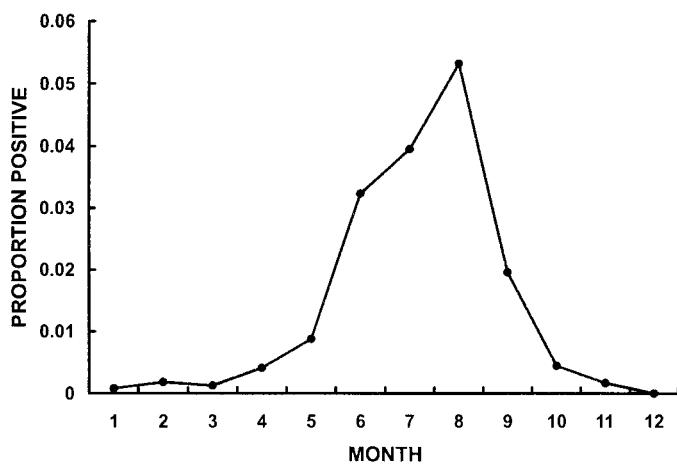
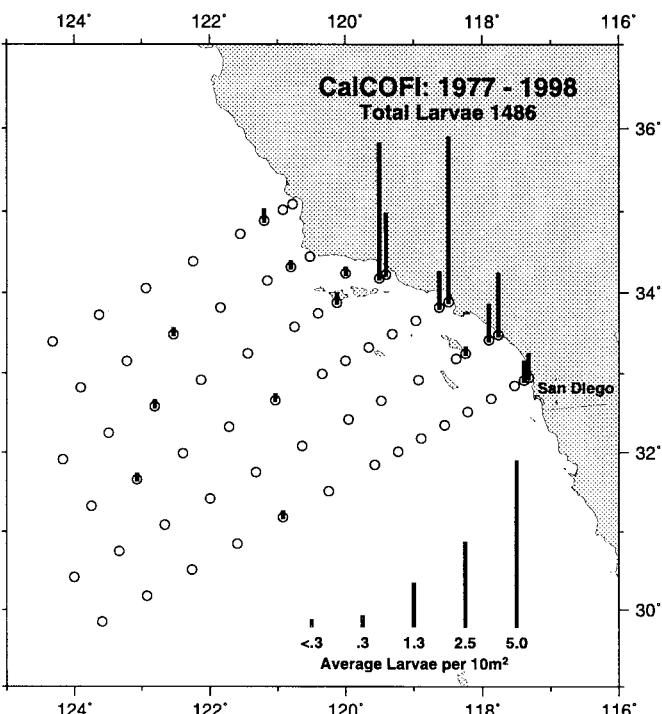
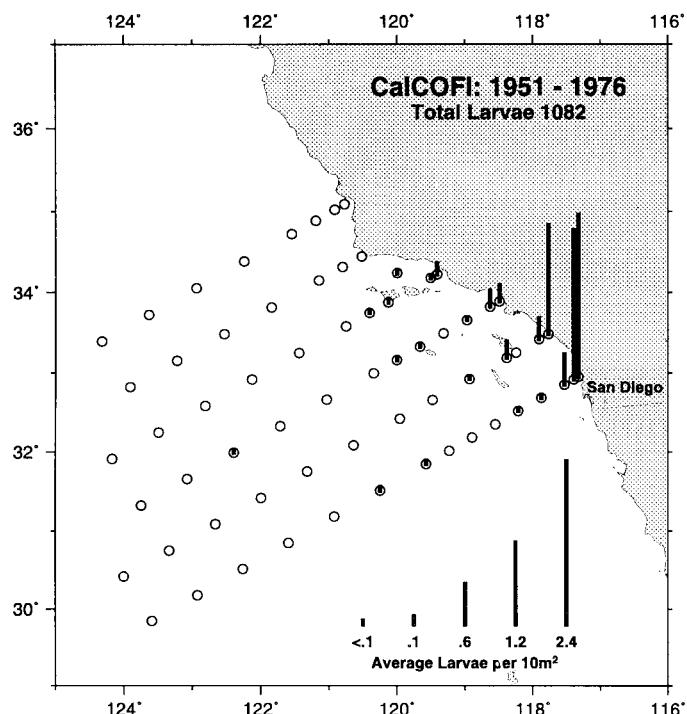
## STERNOPTYCHIDAE



## SPHYRAENIDAE

## Pacific barracuda

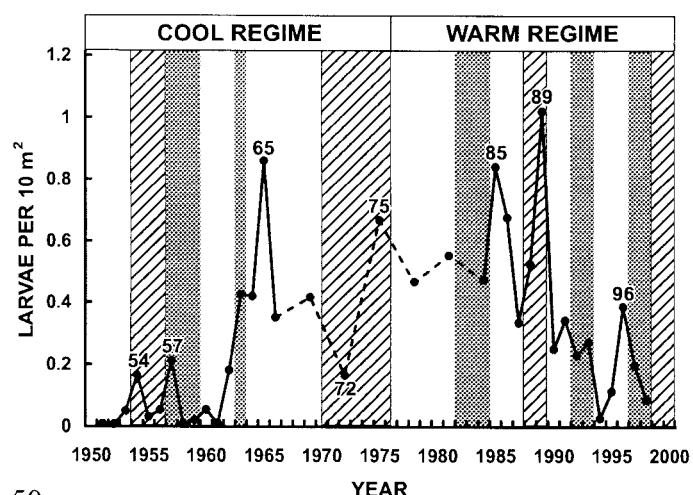
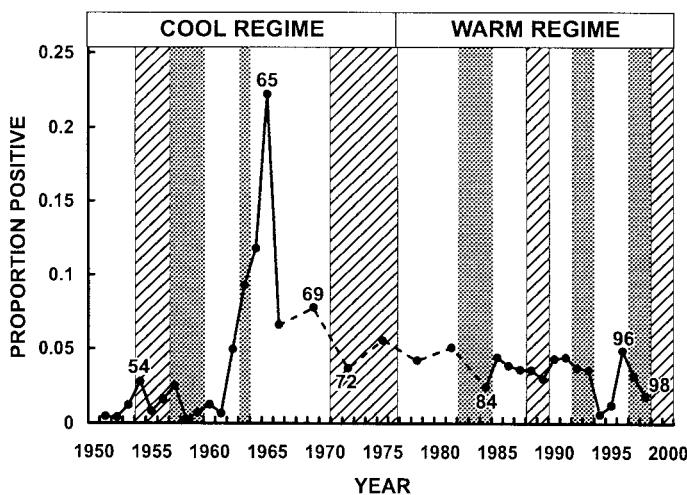
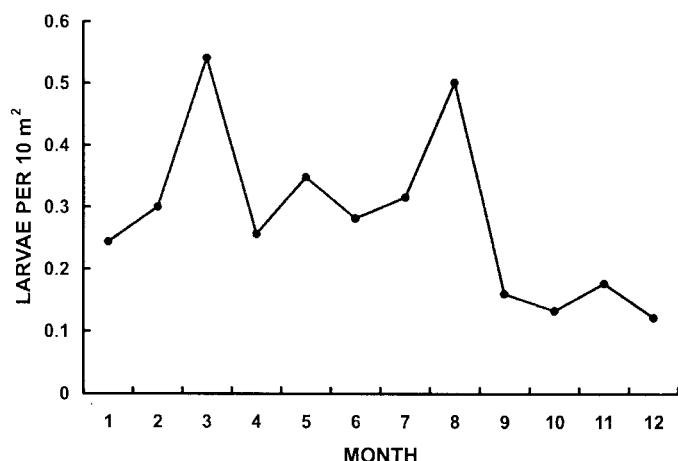
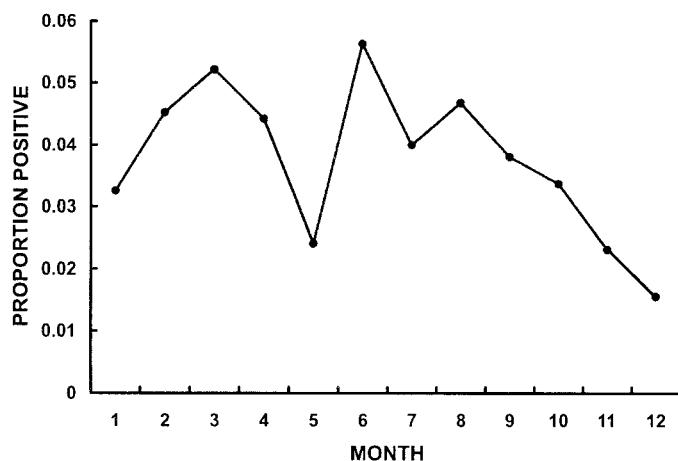
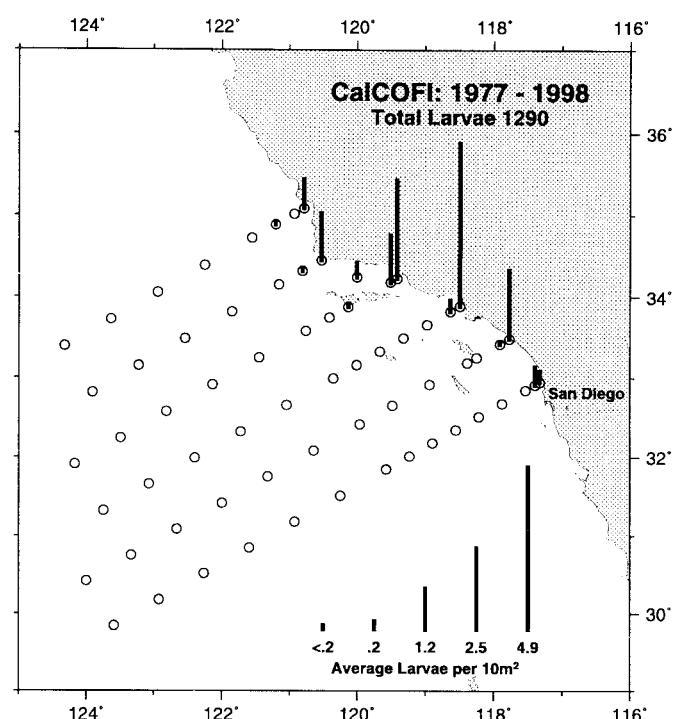
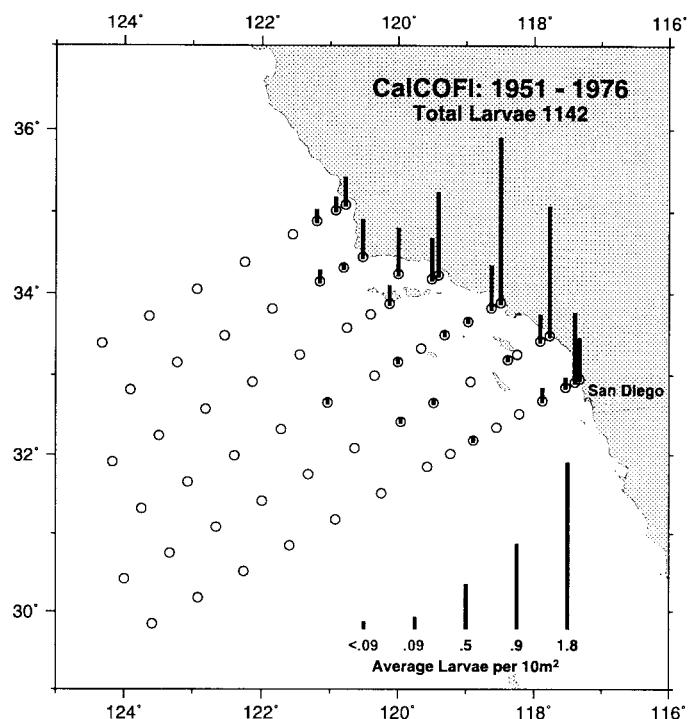
## *Sphyraena argentea*



*Pleuronichthys verticalis*

Hornyhead turbot

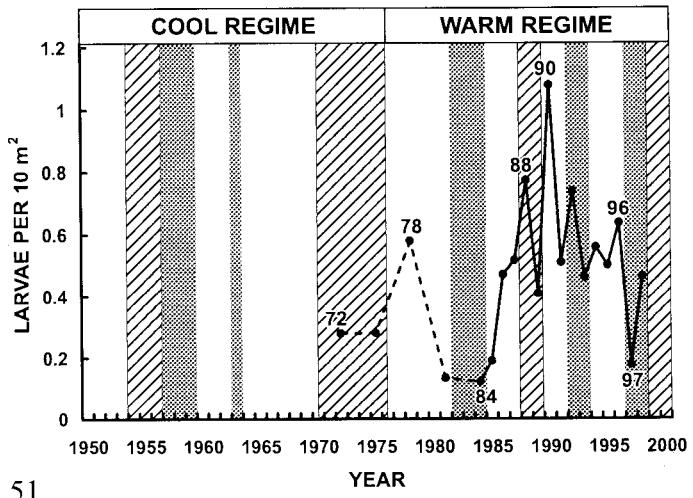
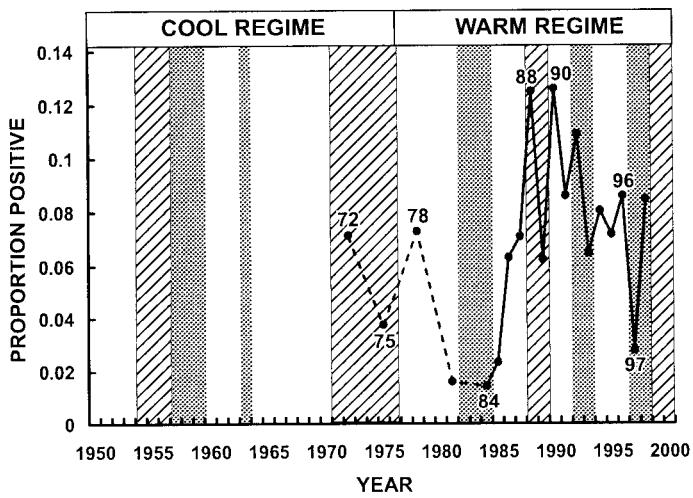
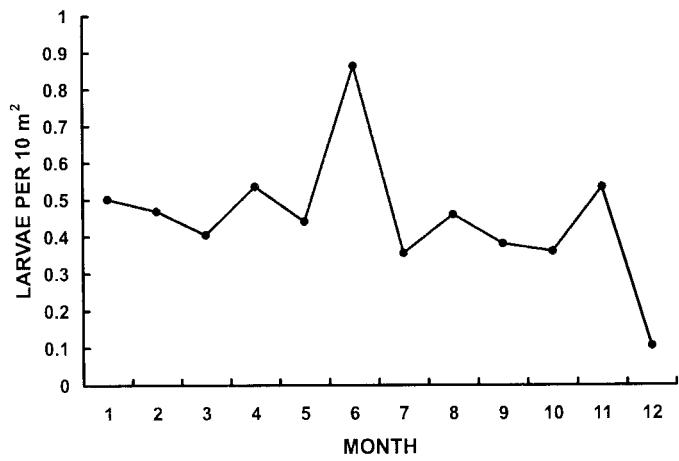
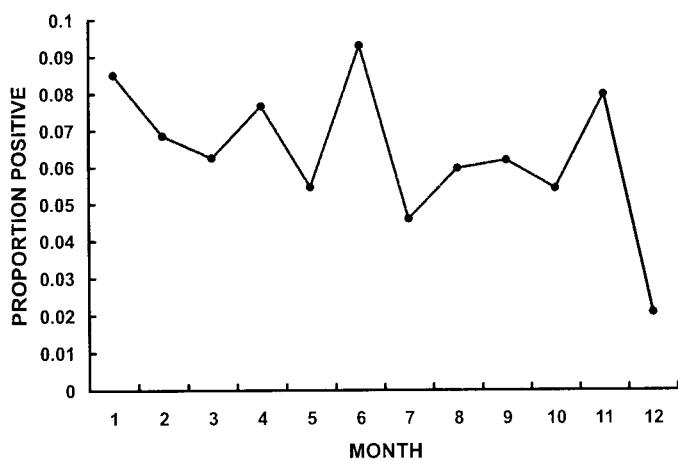
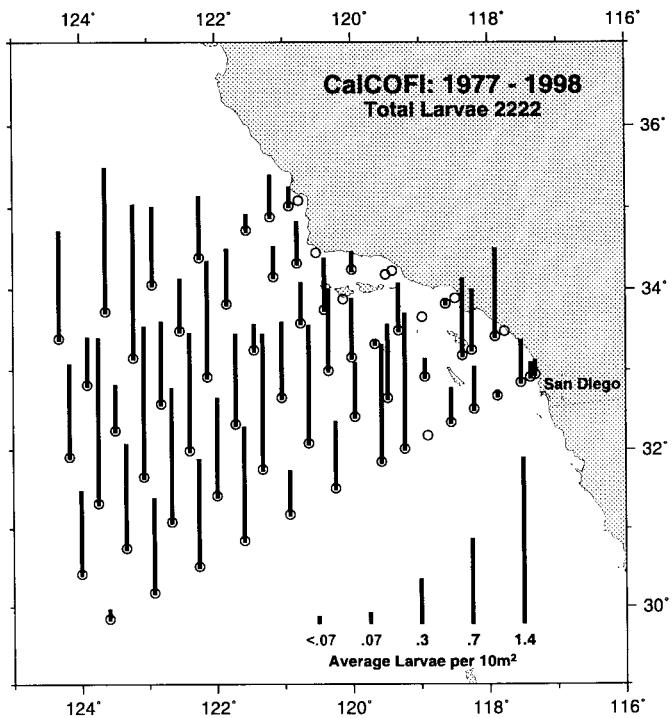
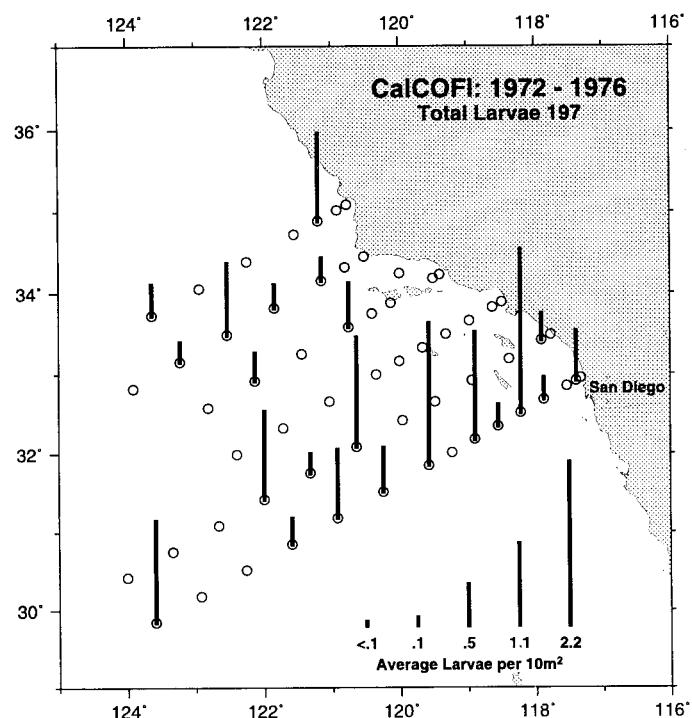
PLEURONECTIDAE



## STERNOPTYCHIDAE

## Bottlelight

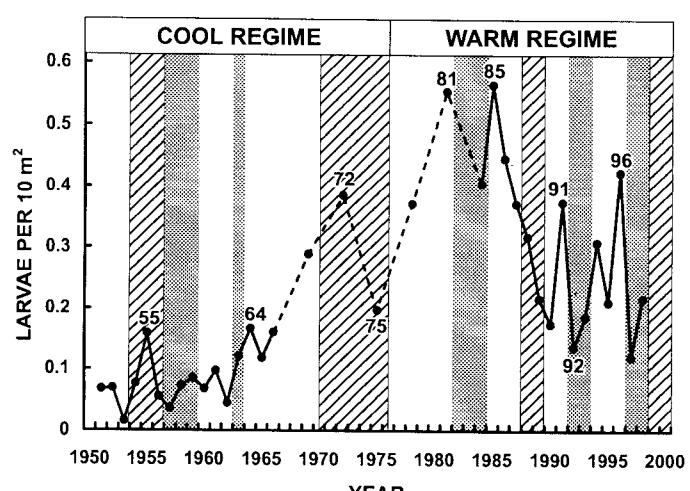
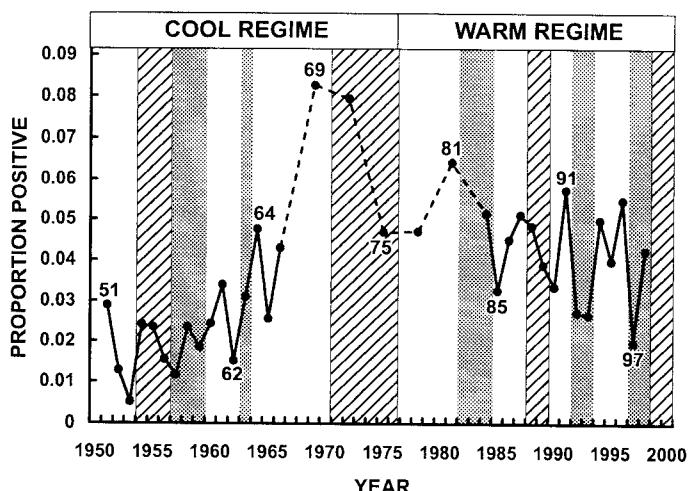
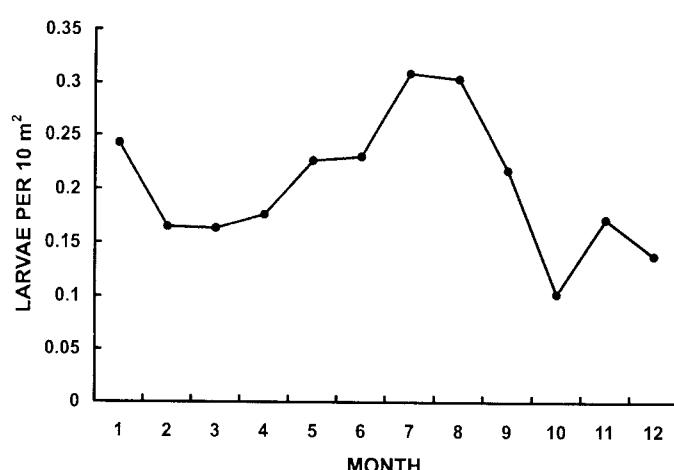
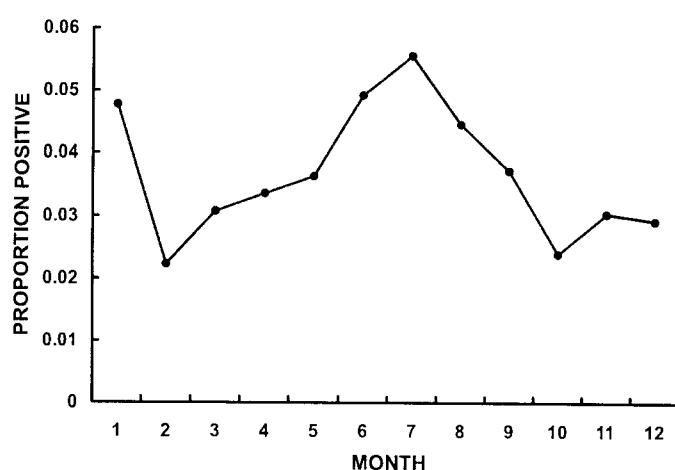
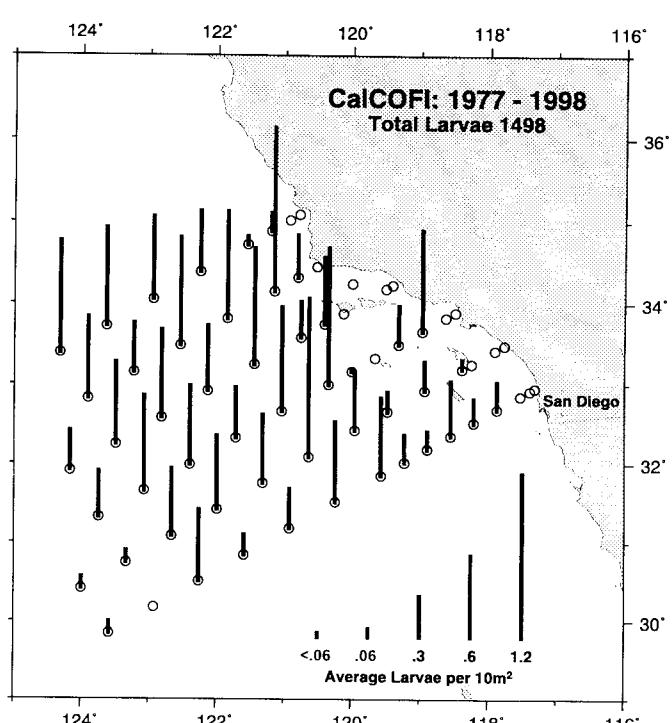
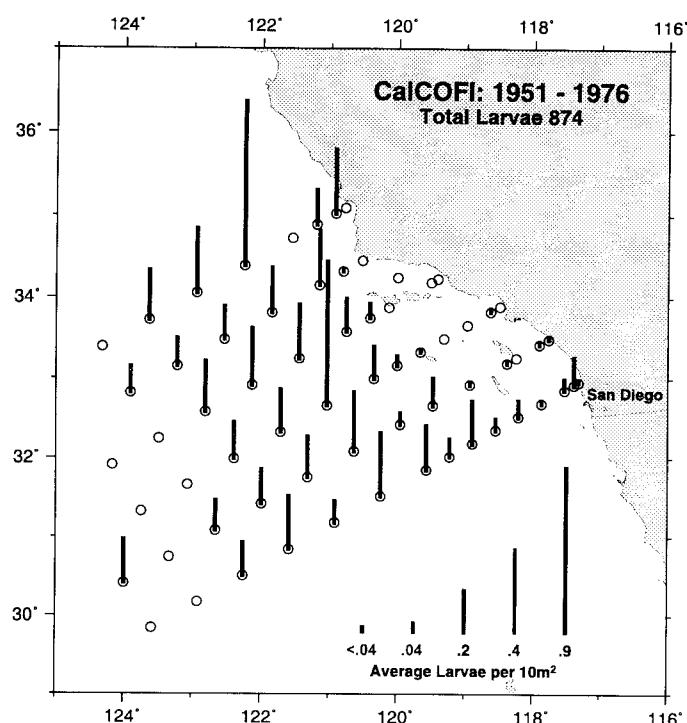
## *Danophos oculatus*



### *Microstoma* spp.

### Dusky pencilsmelt

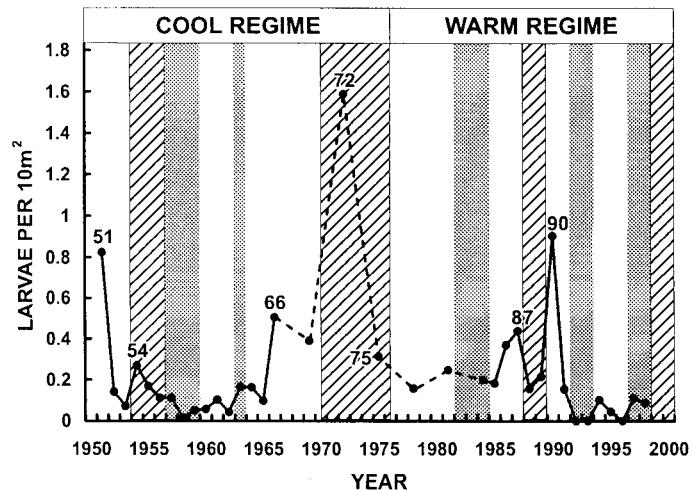
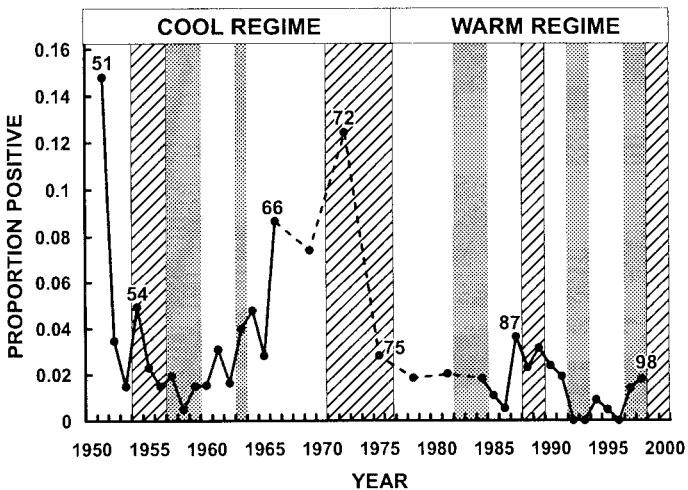
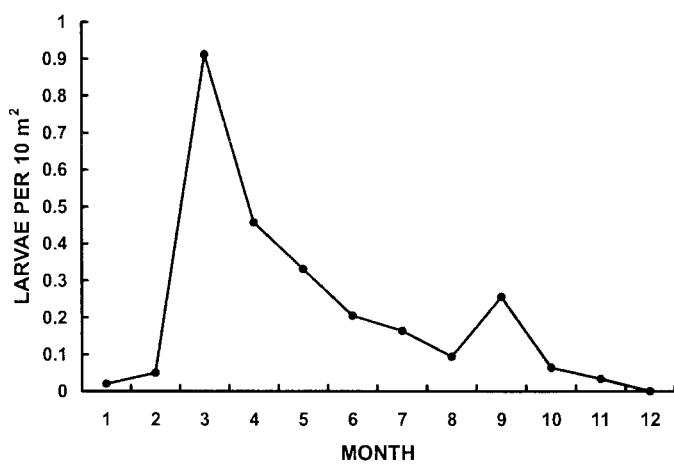
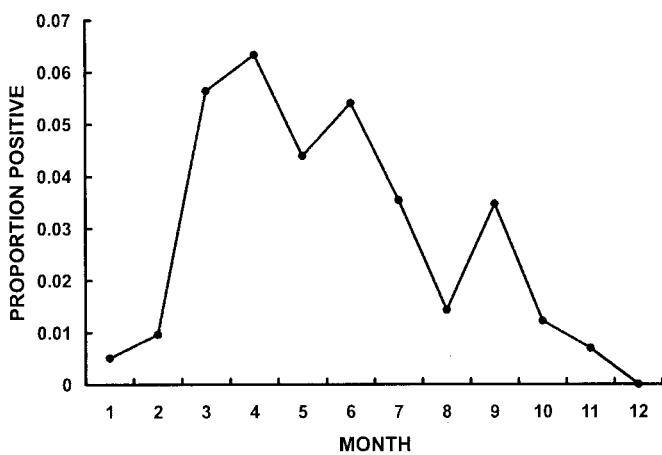
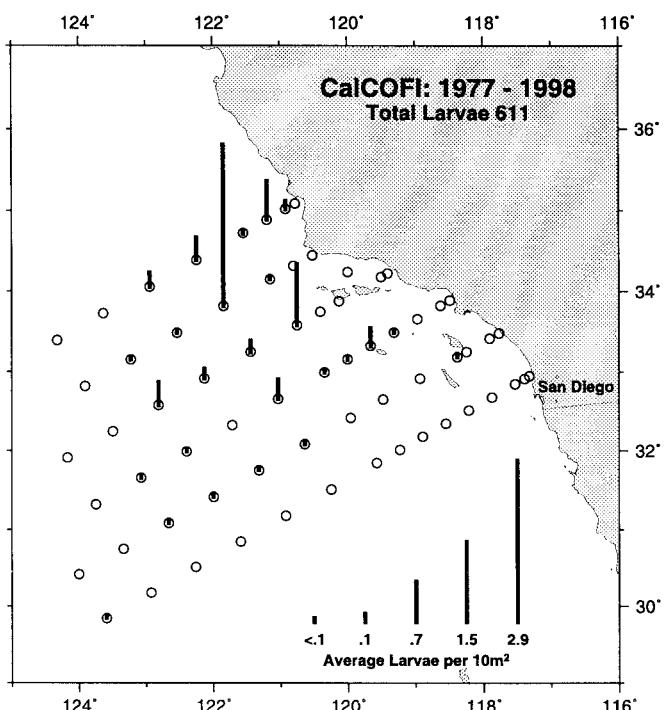
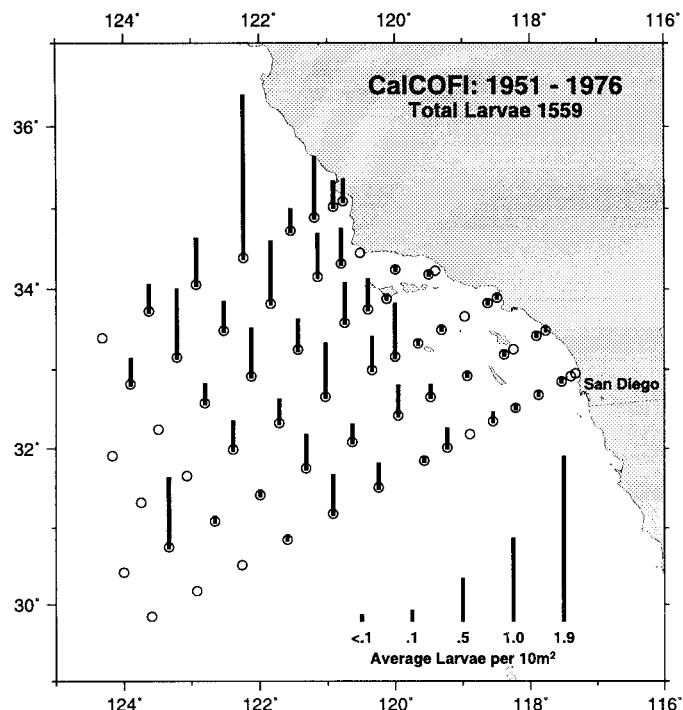
### MICROSTOMATIDAE



## SEASTIDAE

## Thornyheads

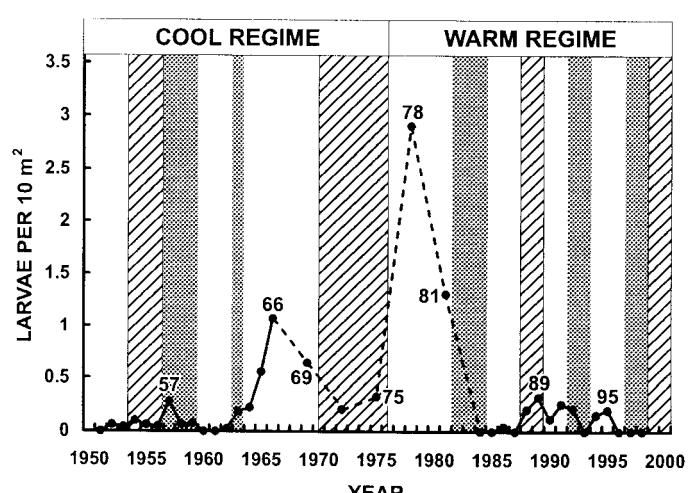
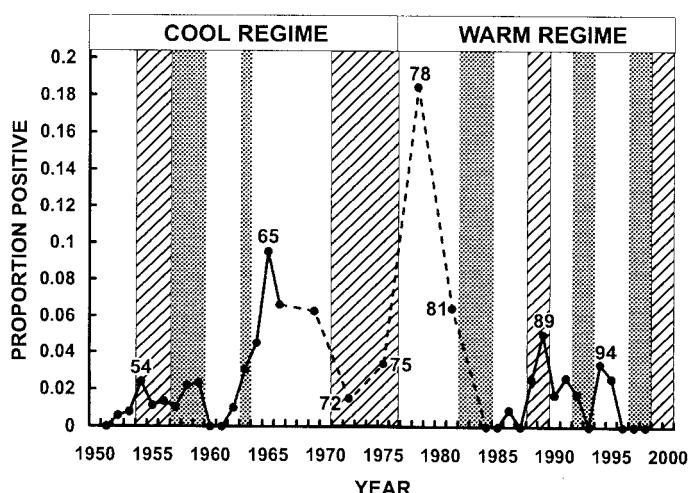
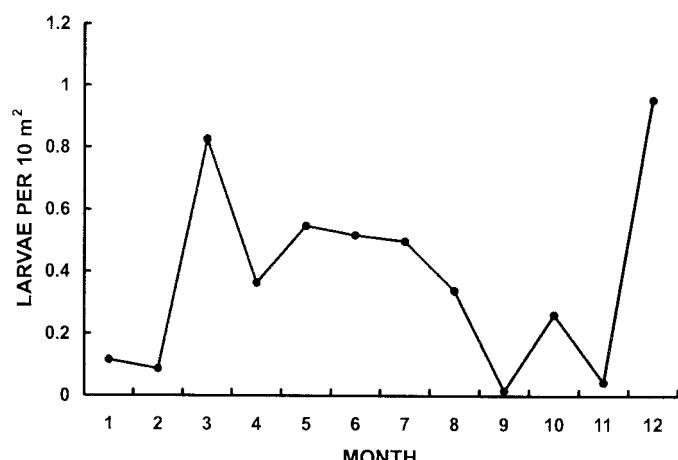
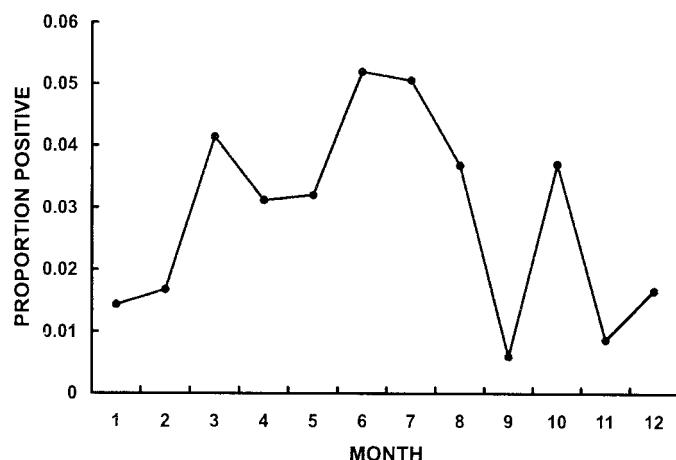
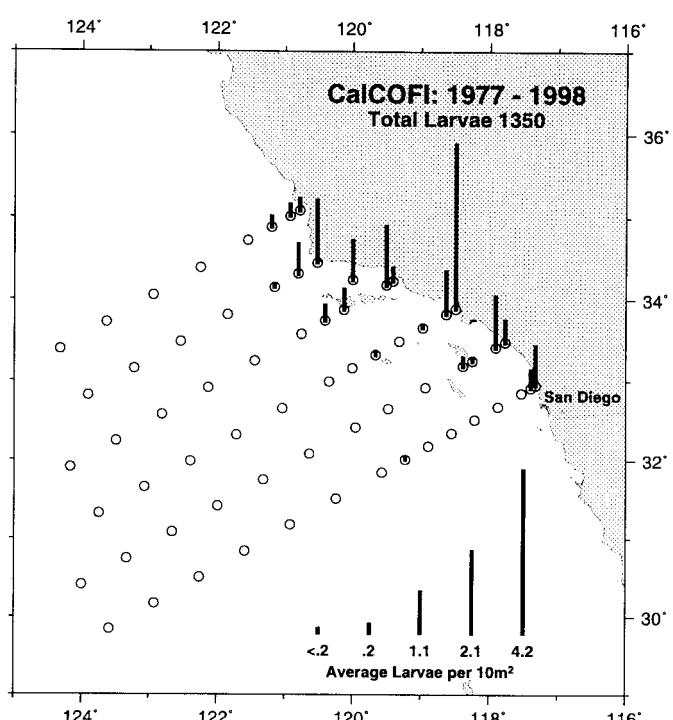
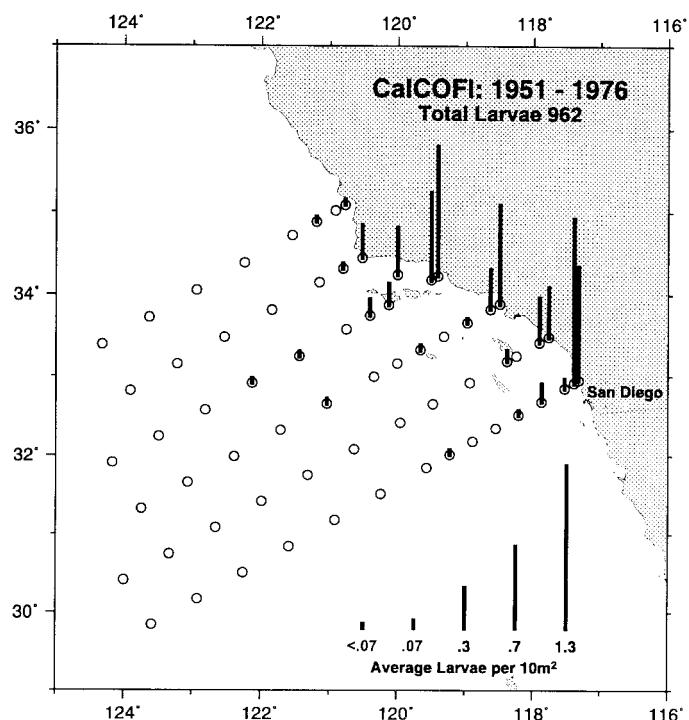
## *Sebastolobus* spp.



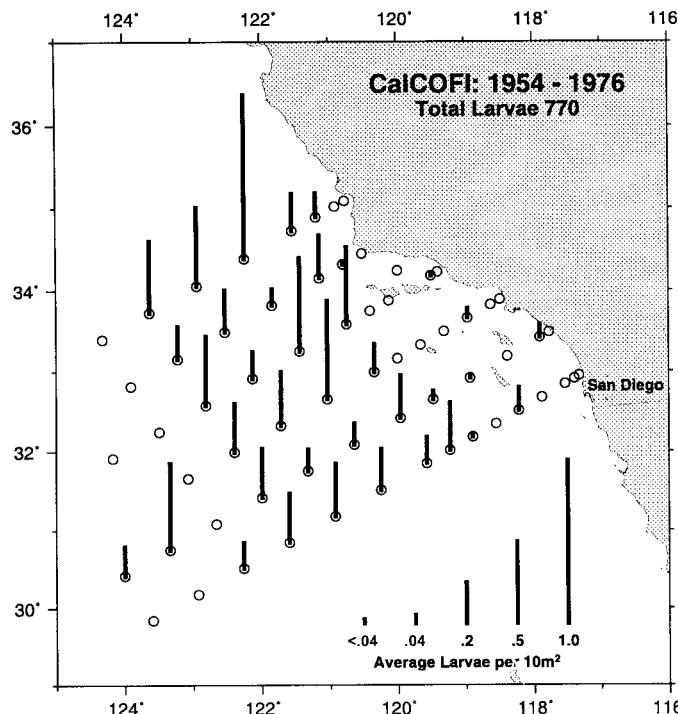
*Peprilus simillimus*

Pacific butterfish

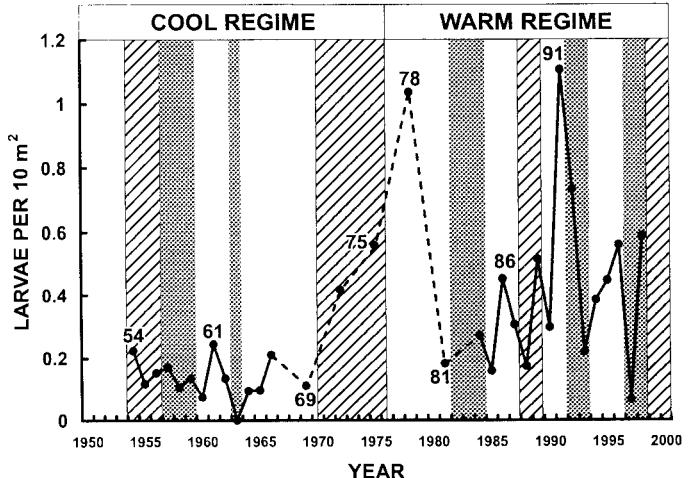
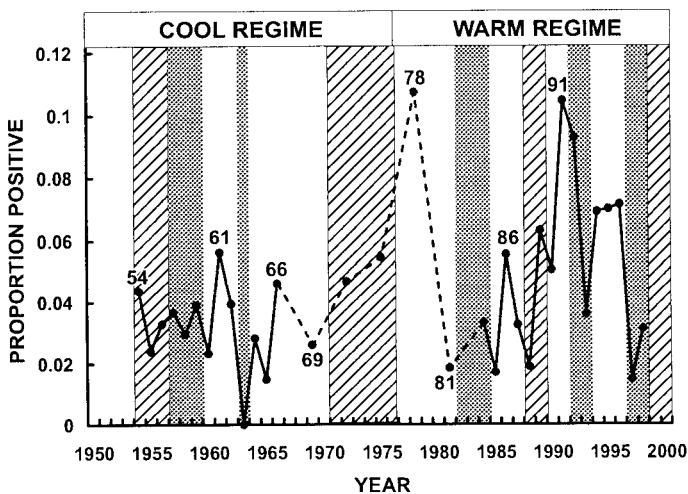
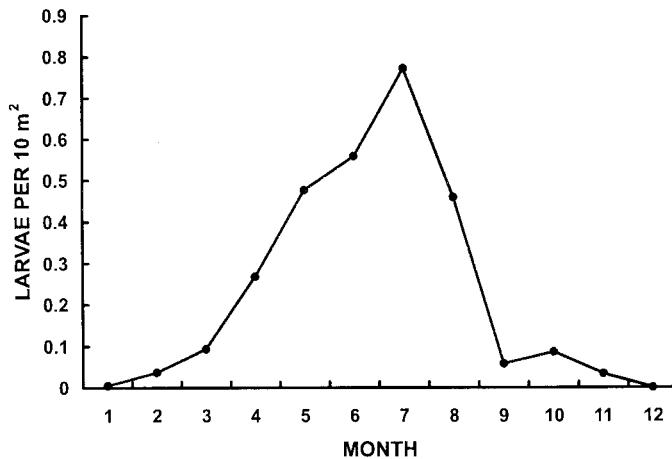
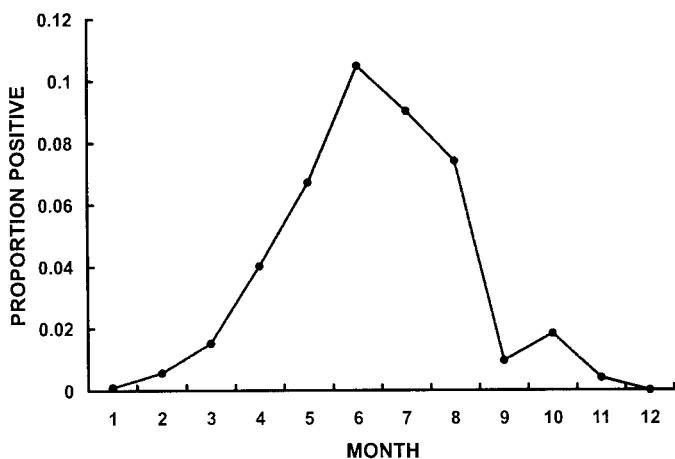
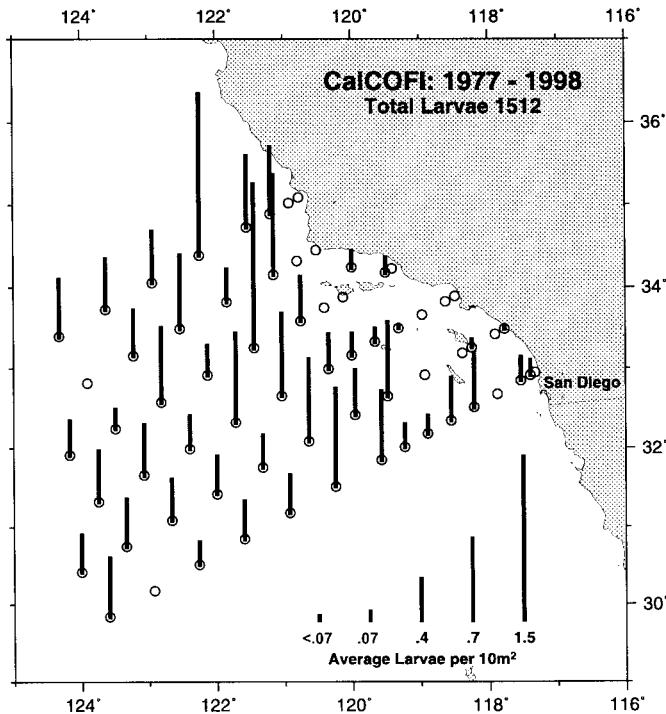
STROMATEIDAE



## MYCTOPHIDAE



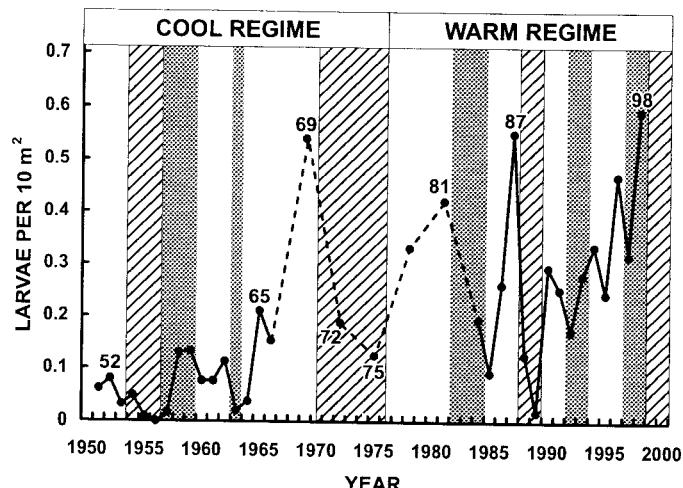
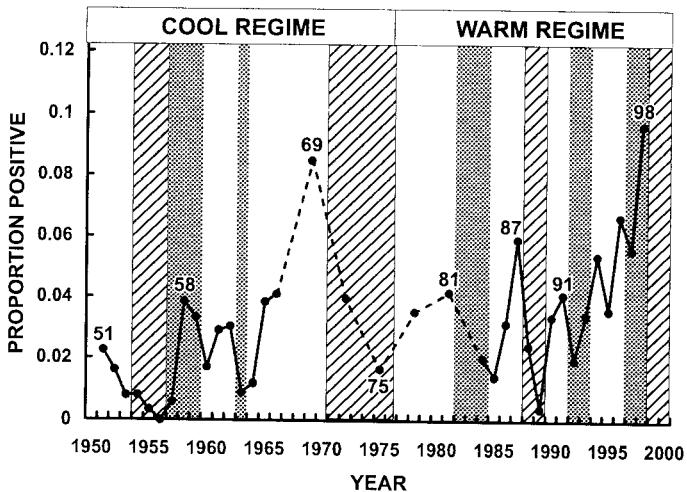
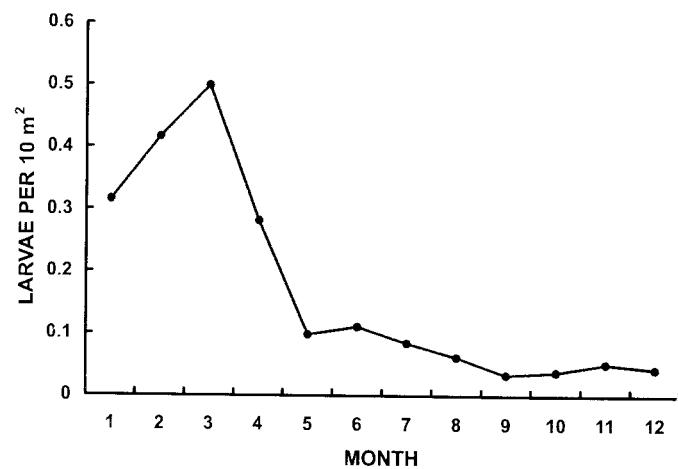
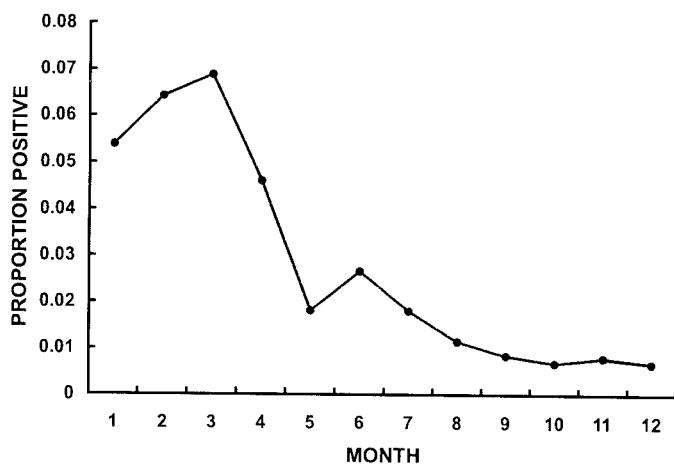
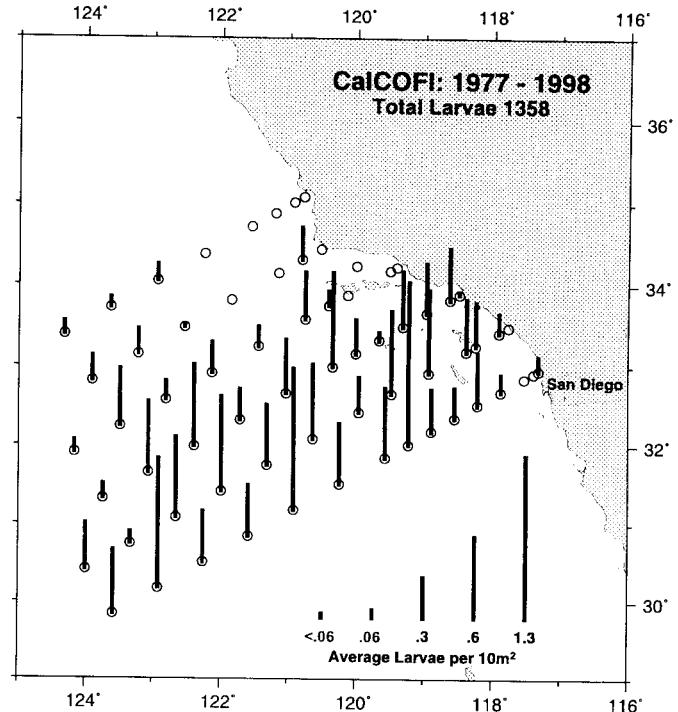
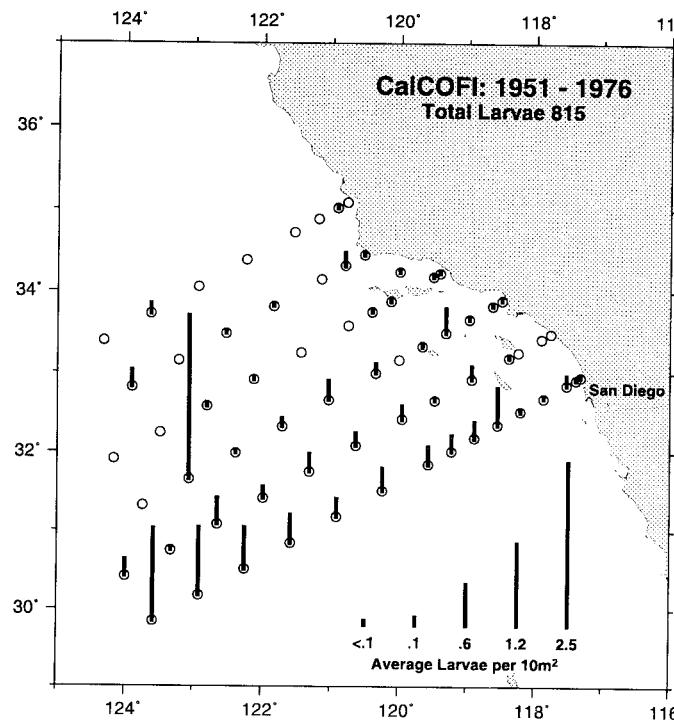
## Pinpoint lampfish



*Stomias atriventer*

Blackbelly dragonfish

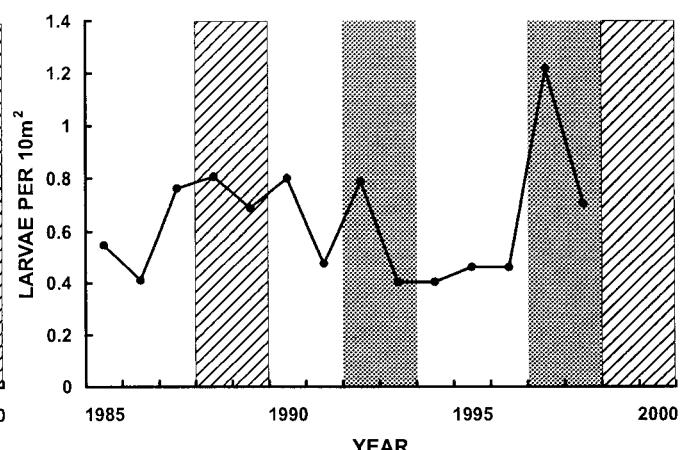
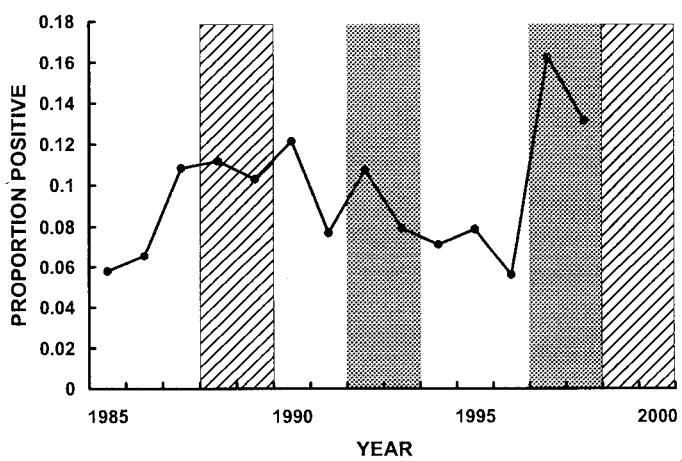
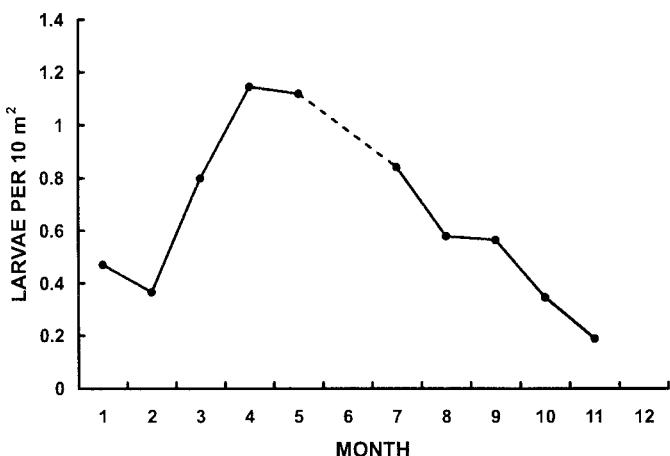
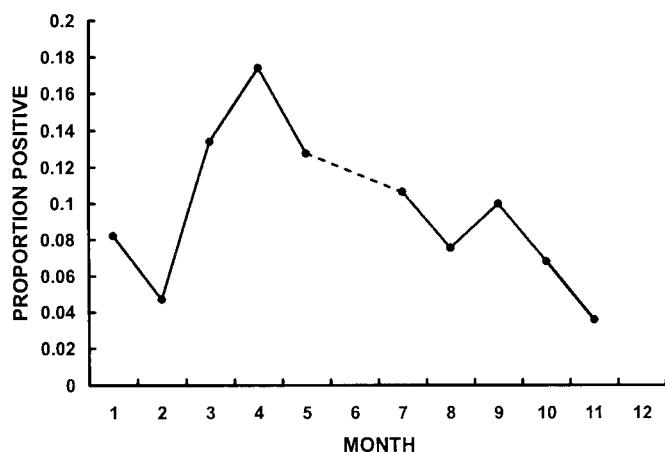
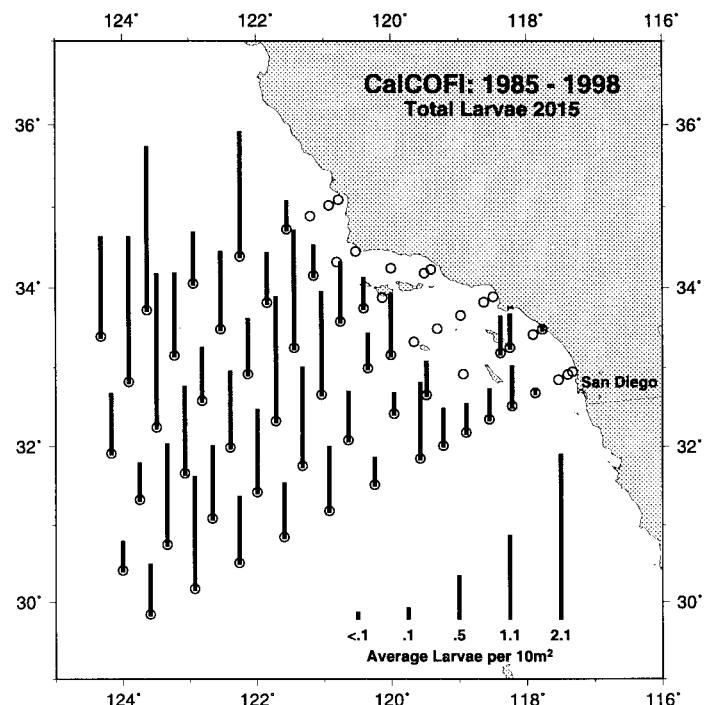
STOMIIDAE



# MELAMPHAIDAE

## Hignsnout bigscale

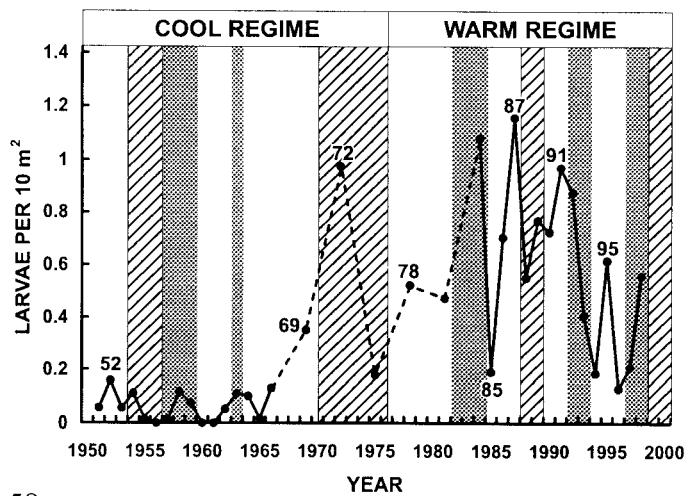
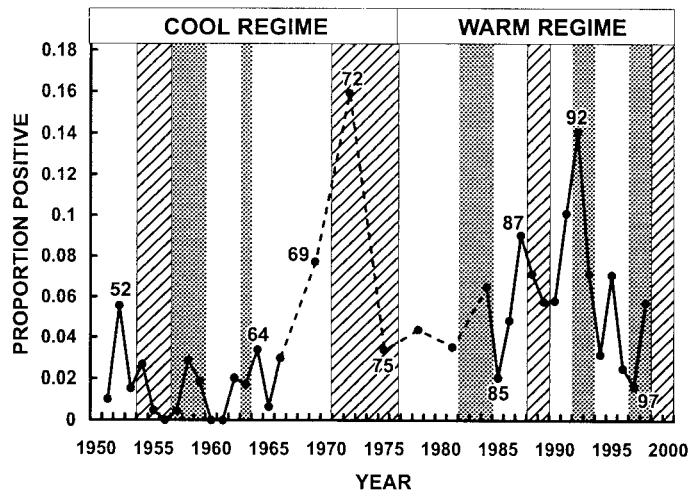
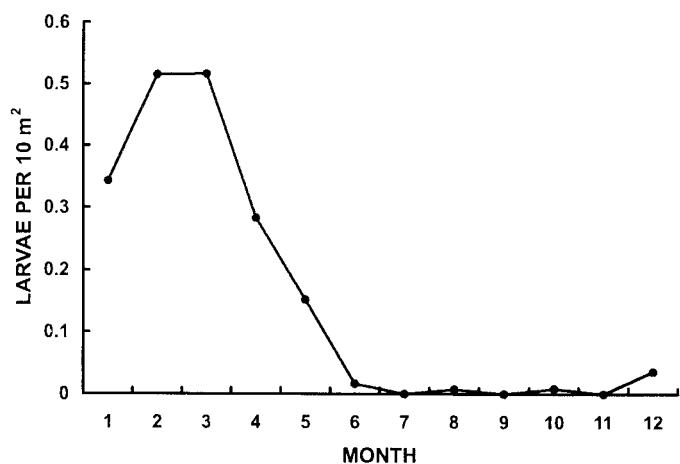
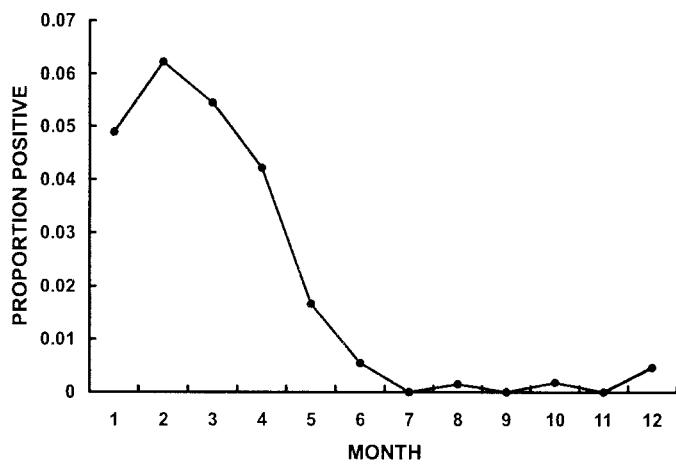
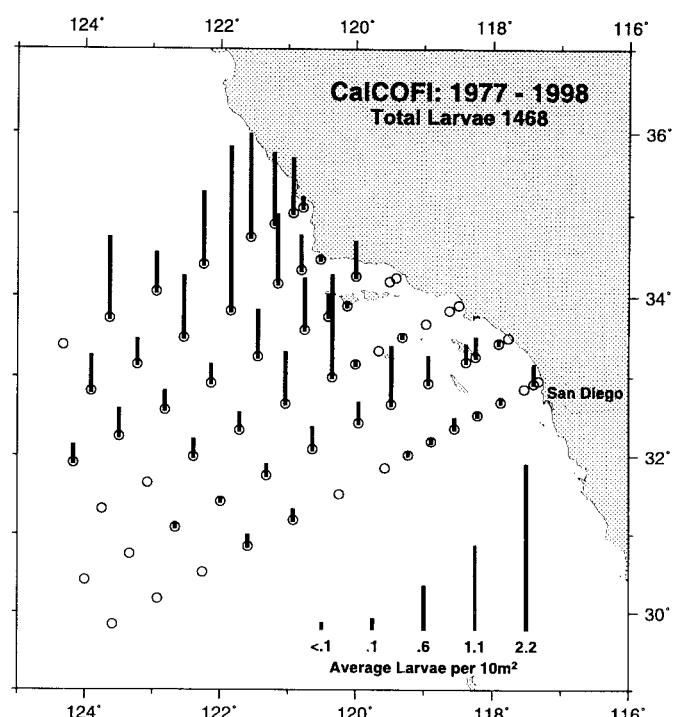
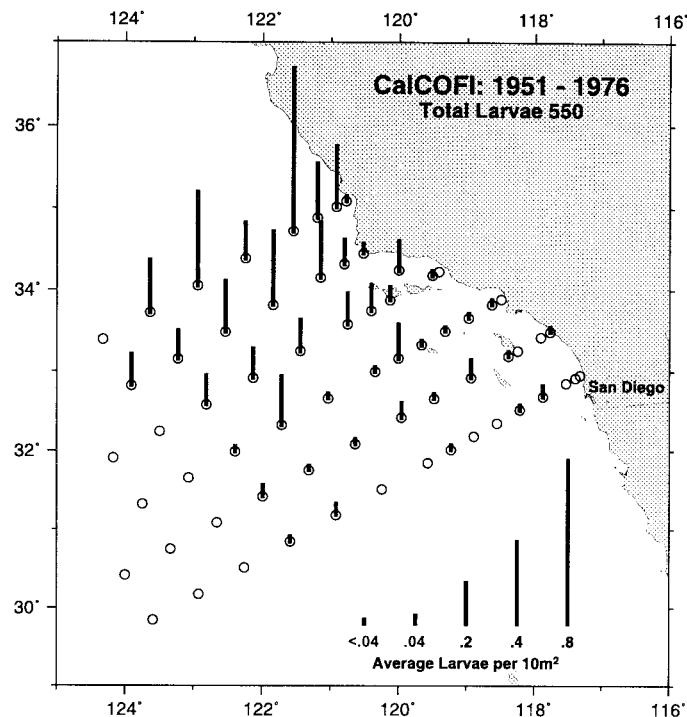
## *Melamphaes lugubris*



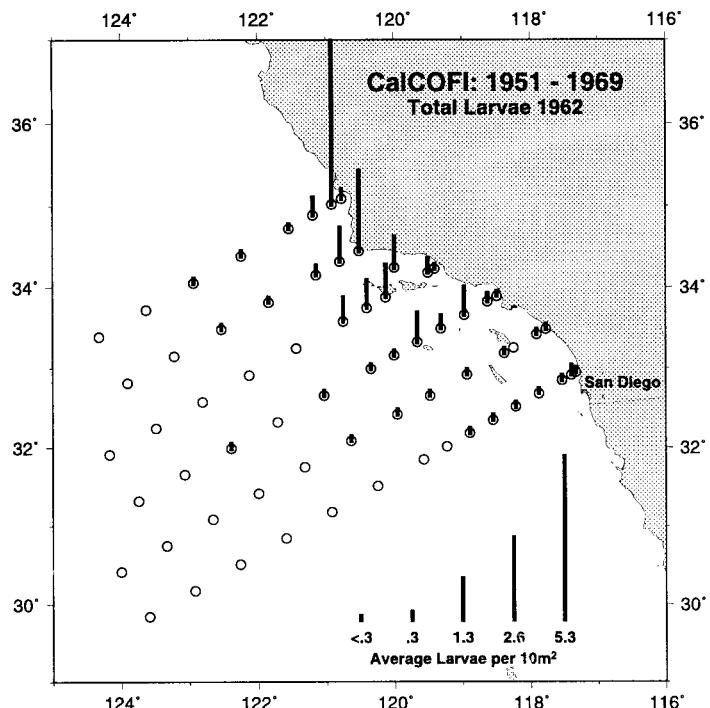
*Bathylags pacificus*

Pacific blacksmelt

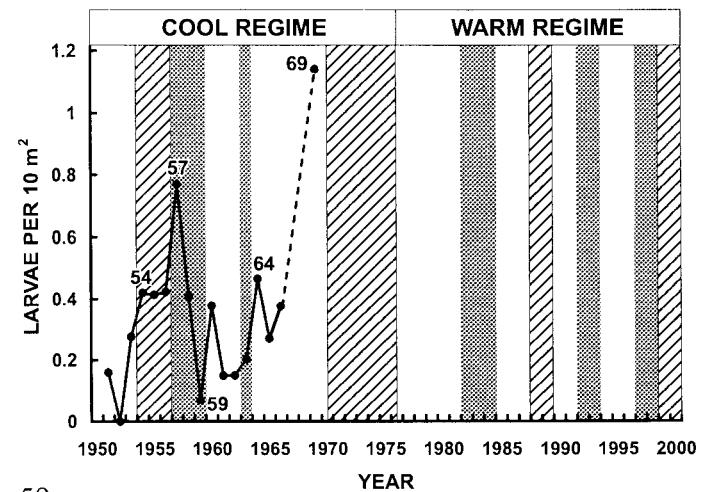
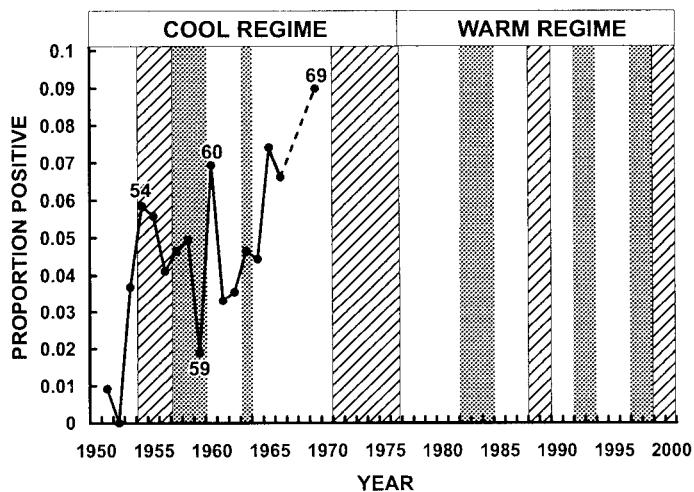
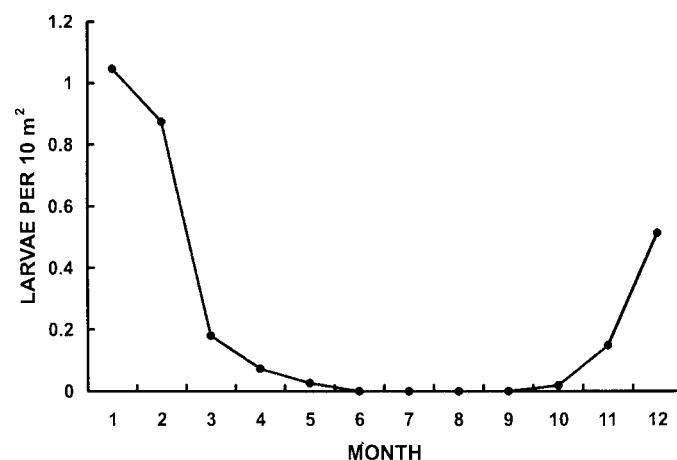
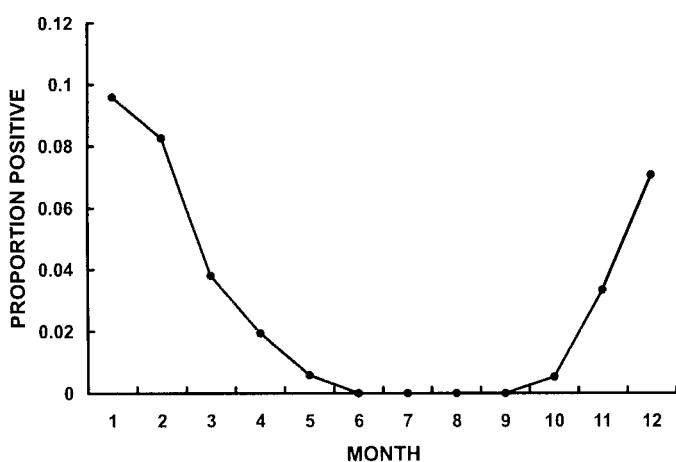
BATHYLAGIDAE



## SEBASTIDAE



## Chilipepper

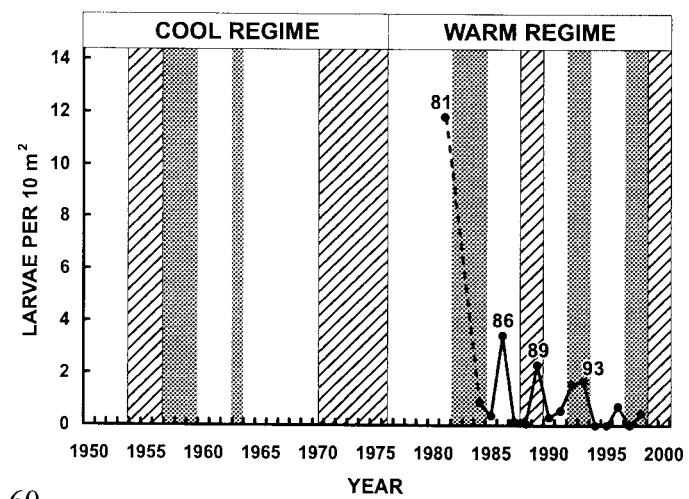
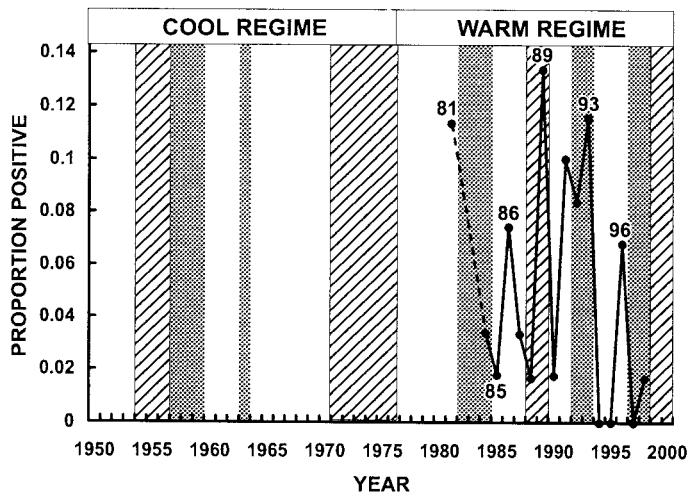
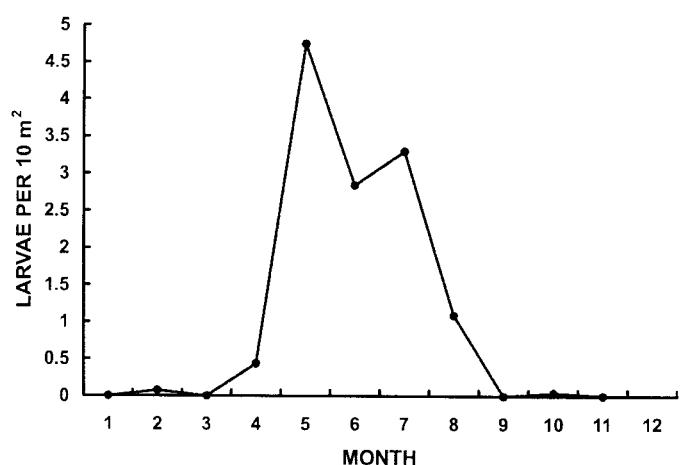
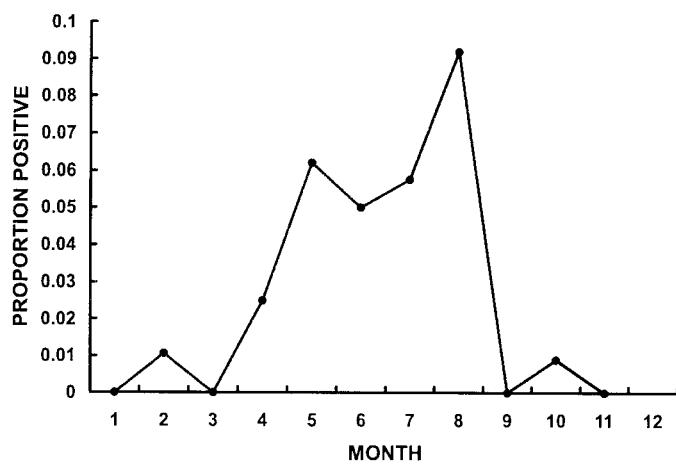
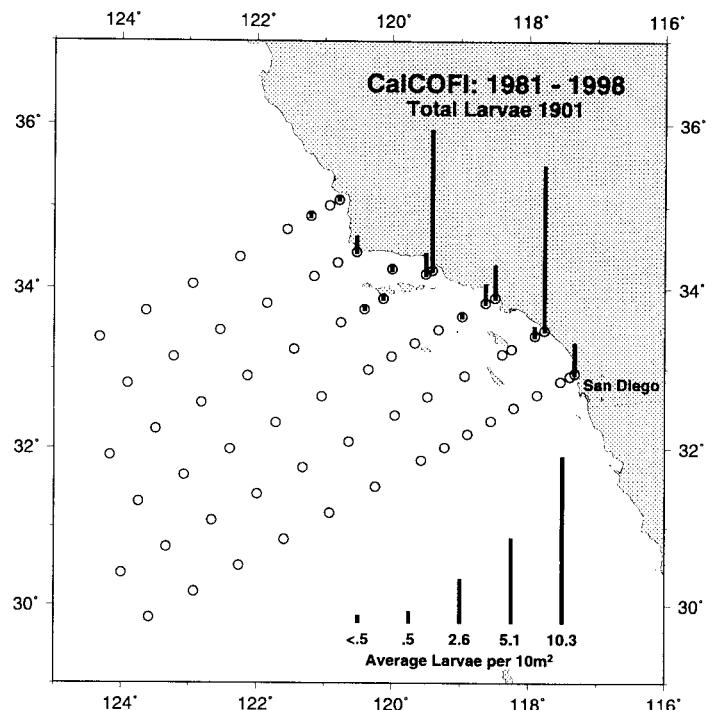


## *Sebastes goodei*

*Seriphis politus*

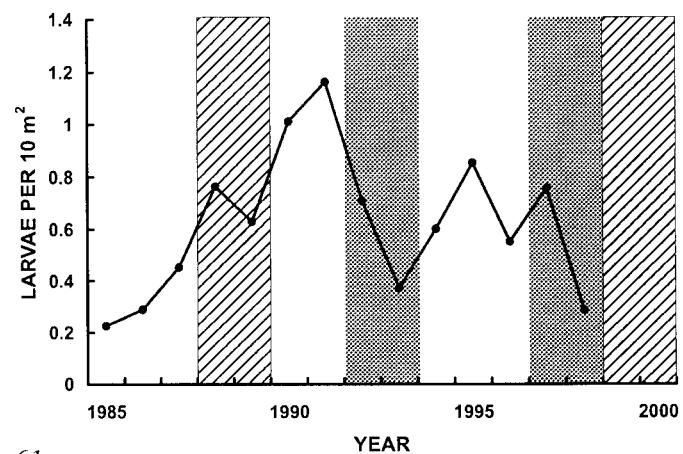
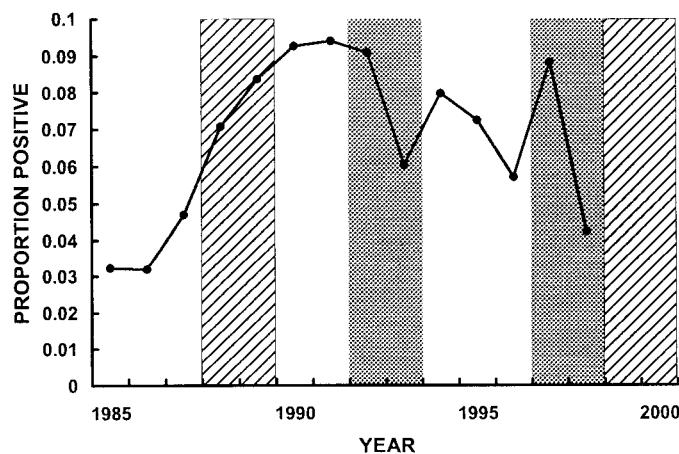
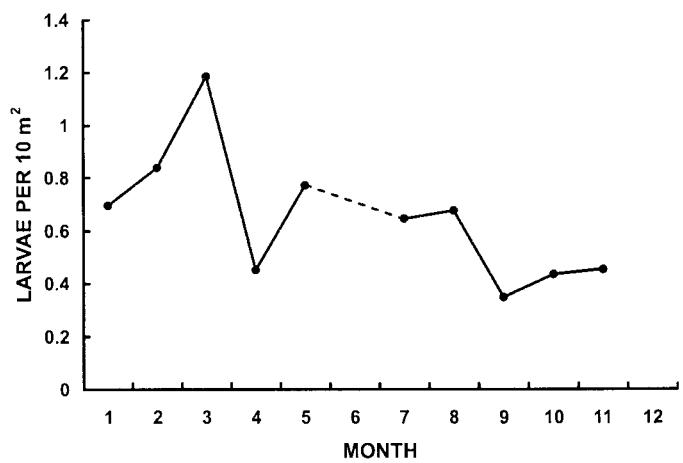
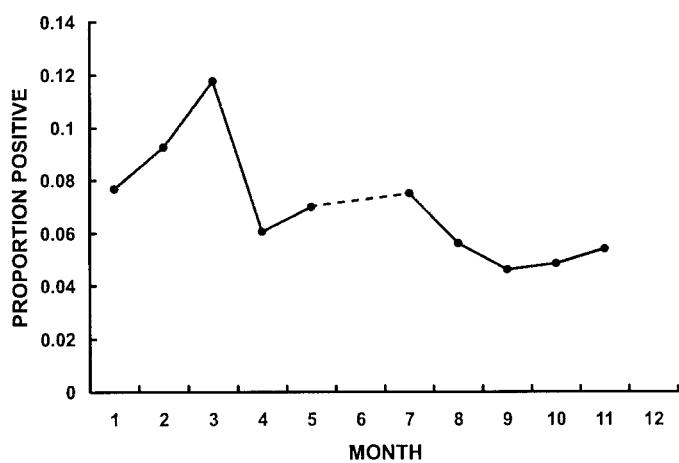
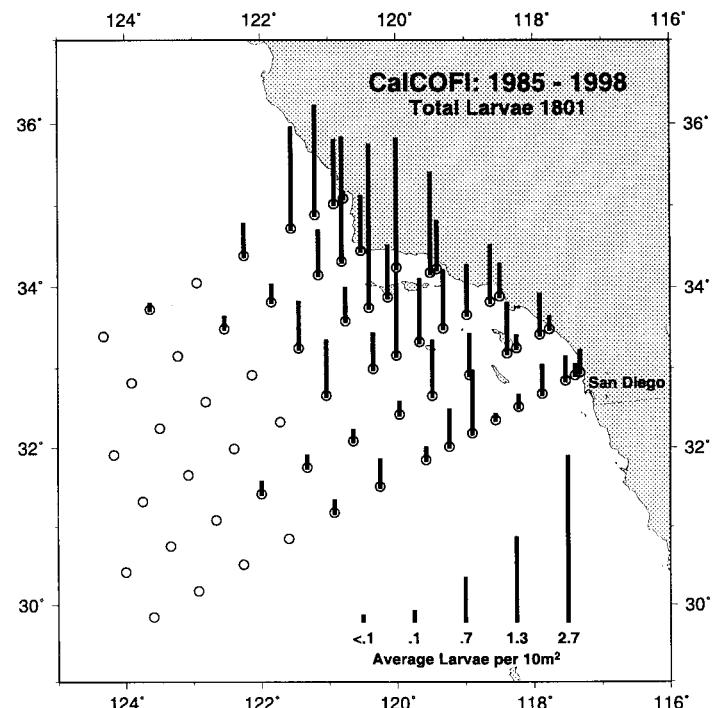
Queenfish

SCIAENIDAE



## GOBIIDAE

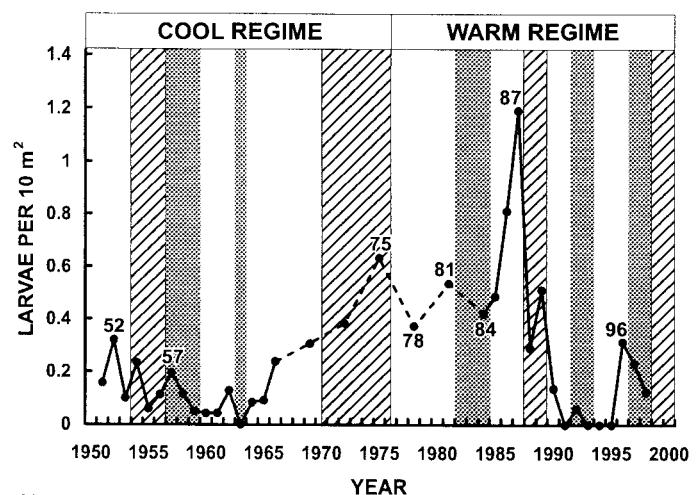
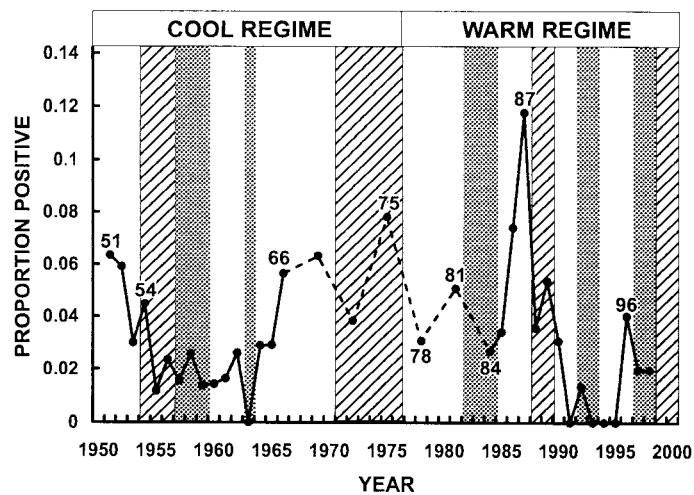
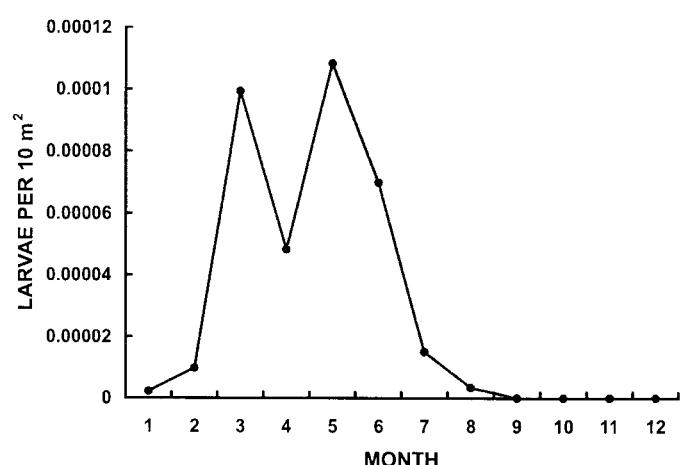
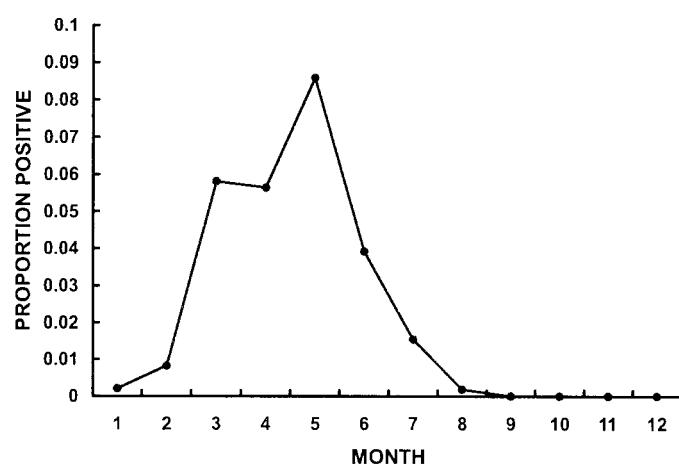
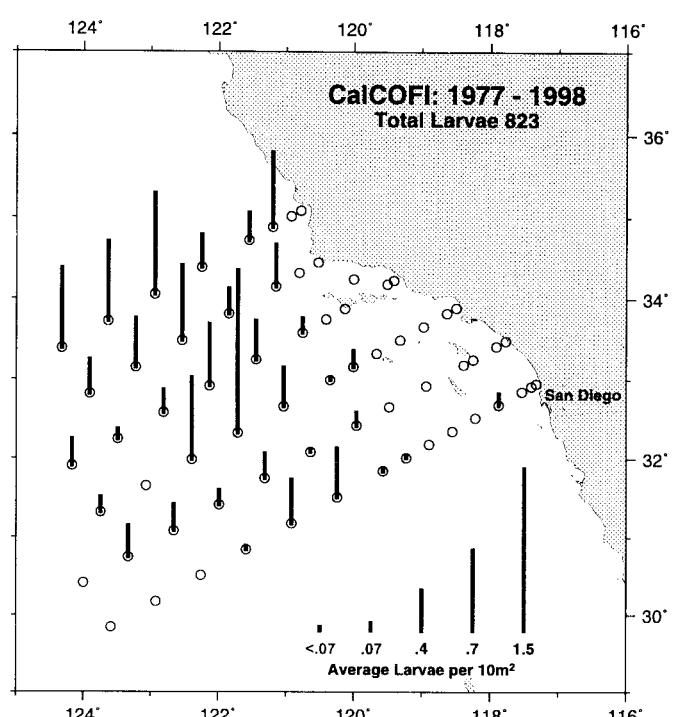
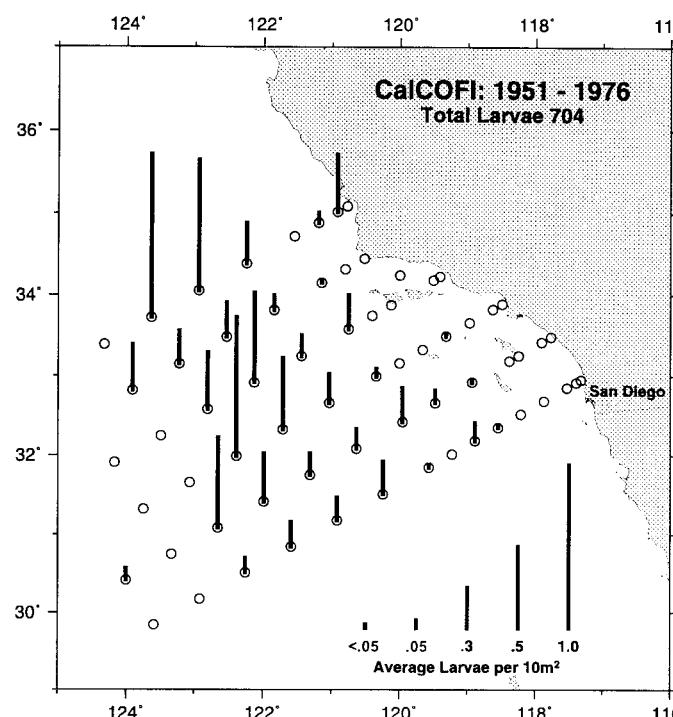
## Blackeye goby

*Coryphopterus nicholsii*

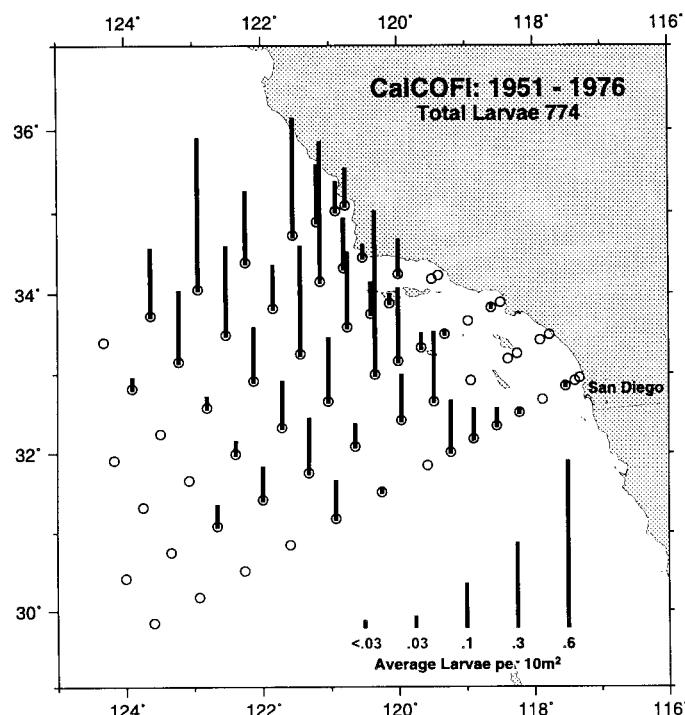
### *Nansenia candida*

### Bluethroat argentine

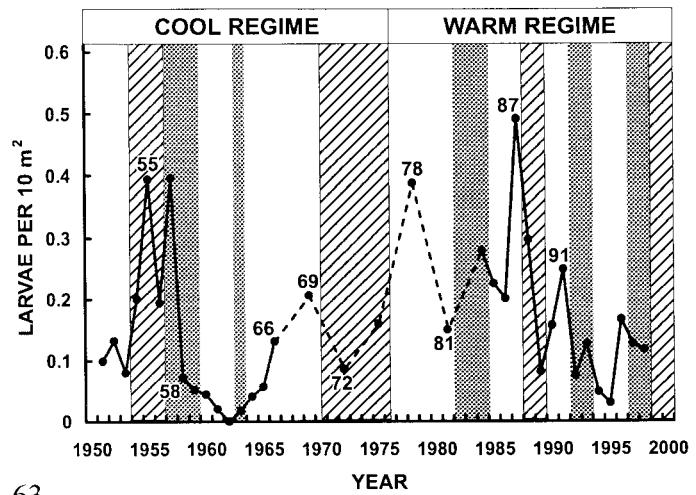
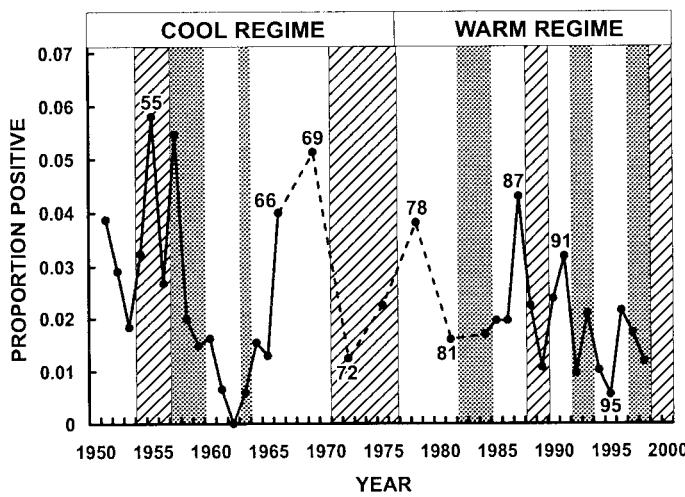
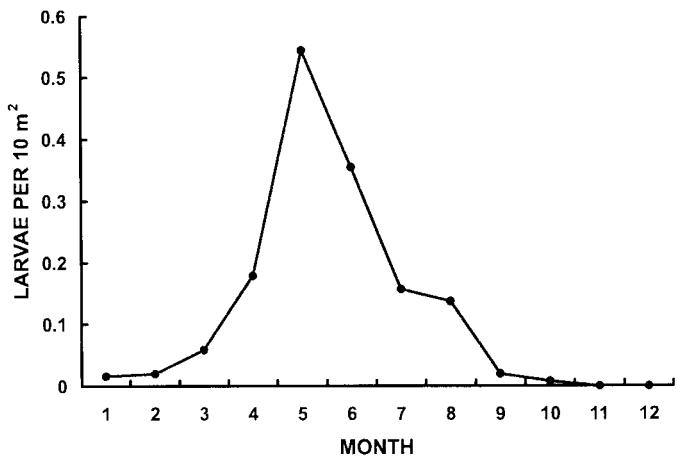
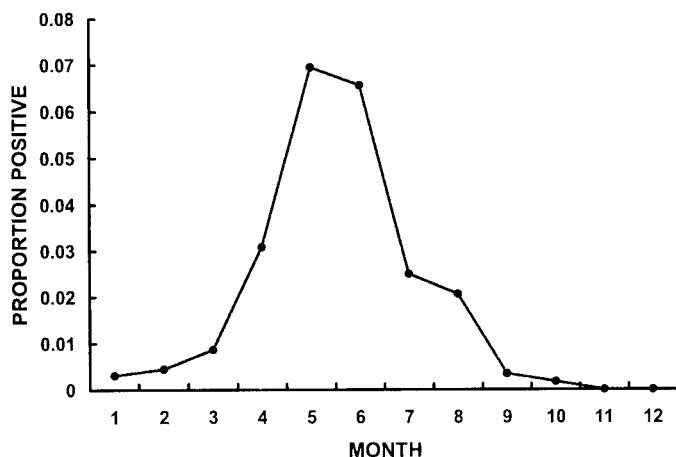
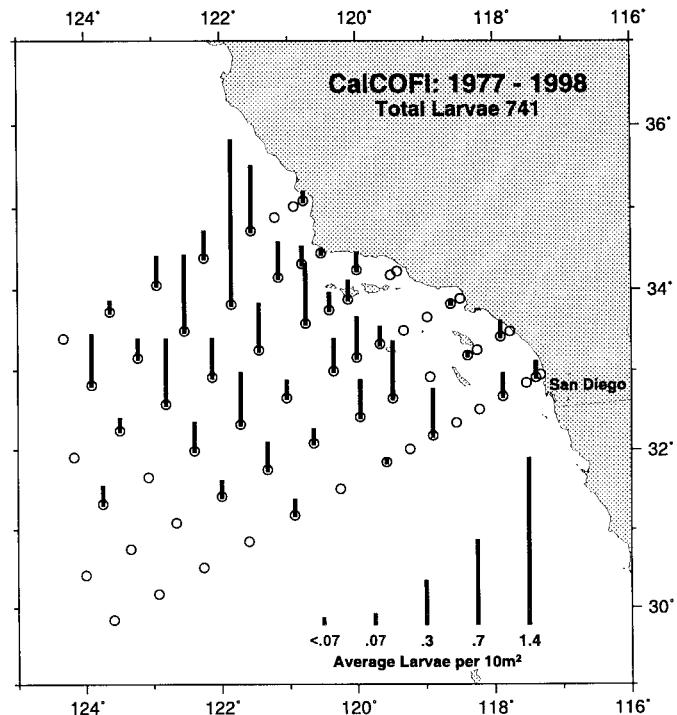
### MICROSTOMATIDAE



## PLEURONECTIDAE



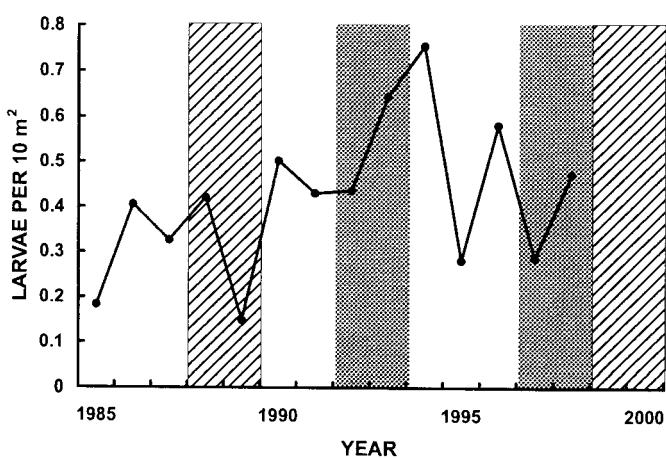
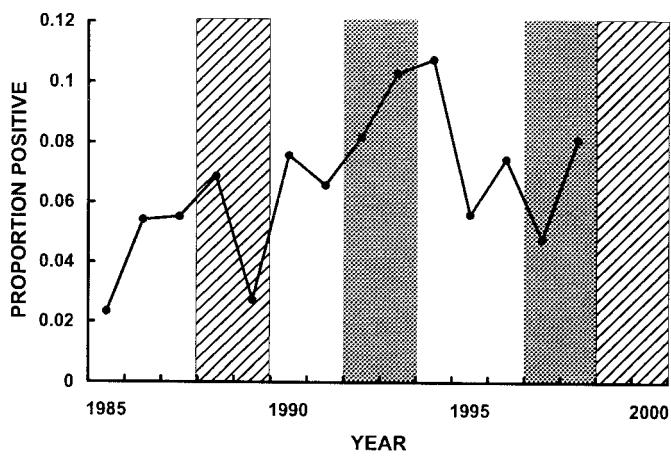
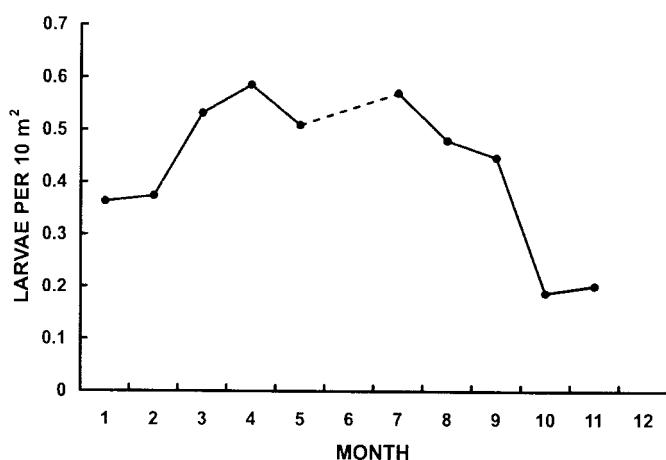
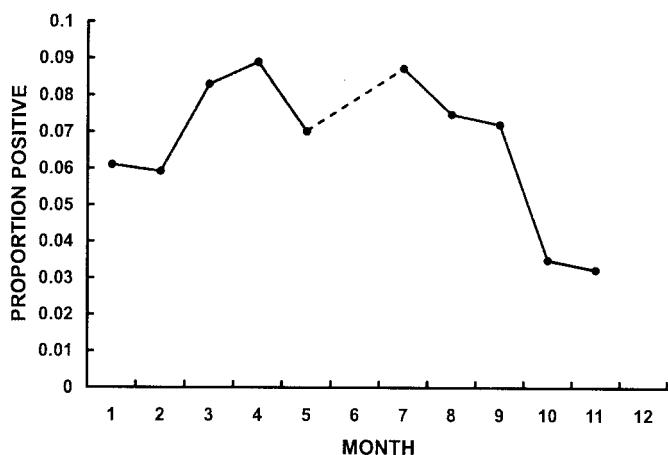
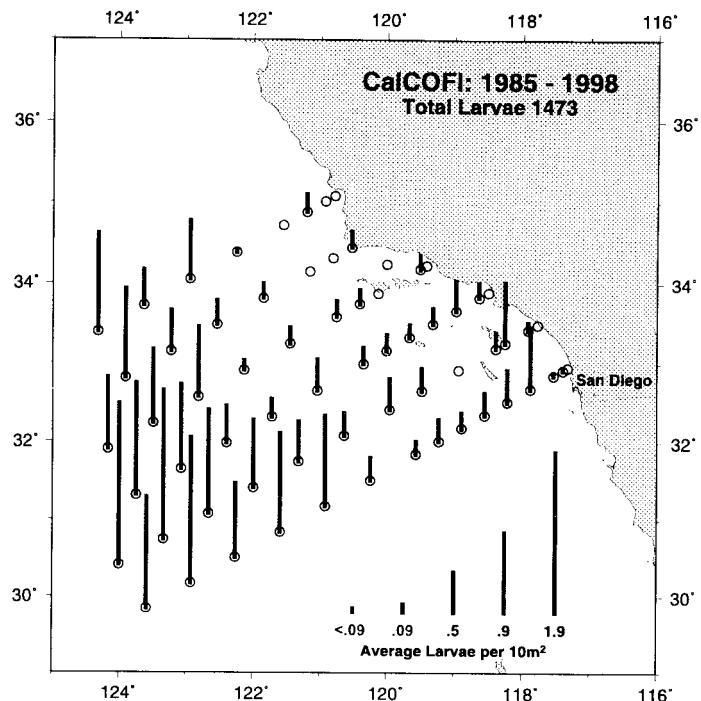
## Dover sole



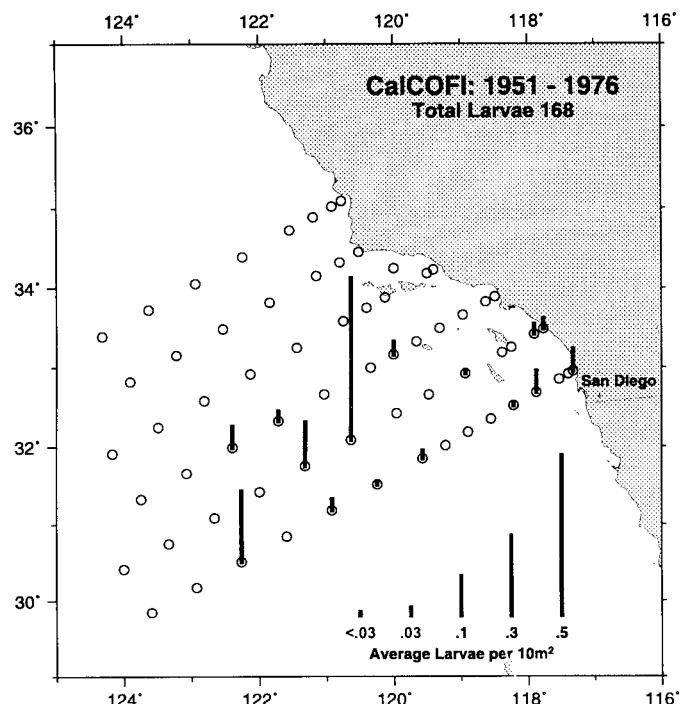
*Sternoptyx* spp.

Dollar hatchetfishes

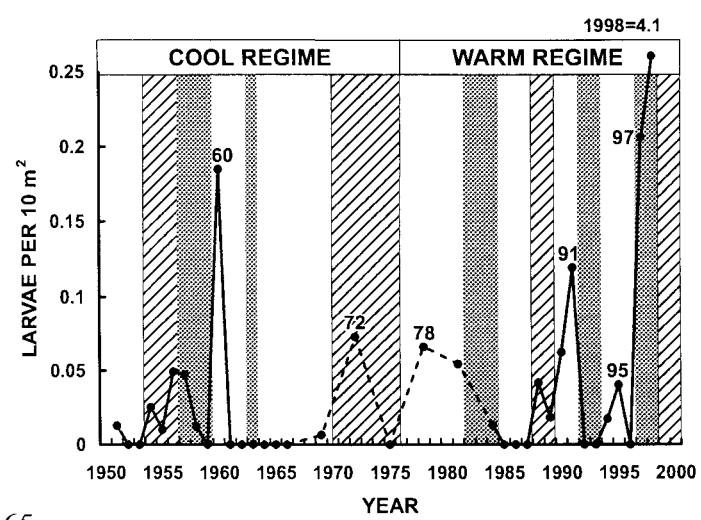
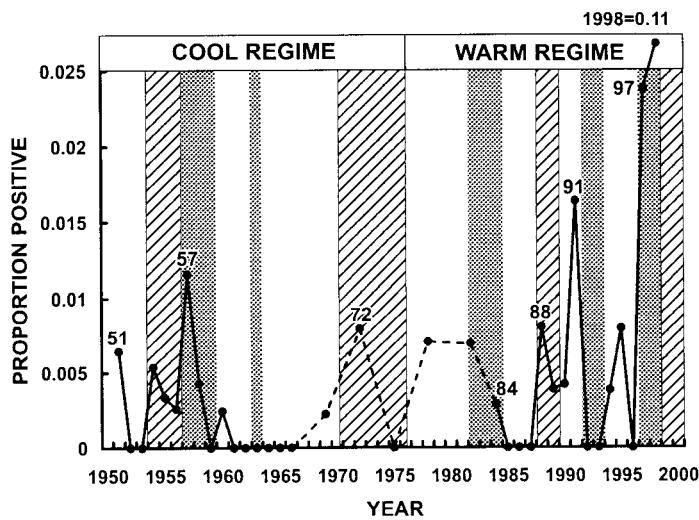
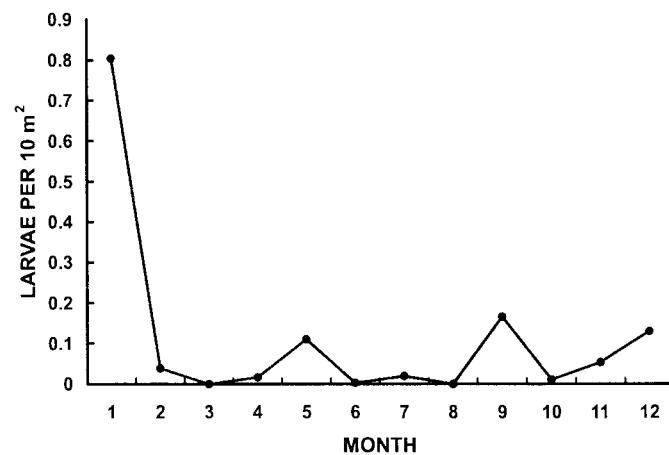
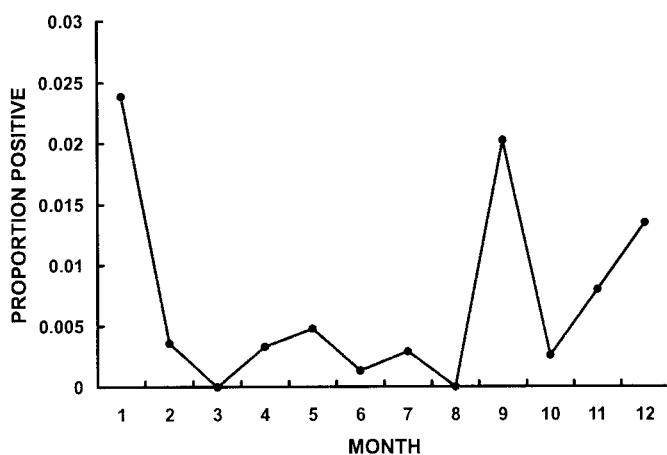
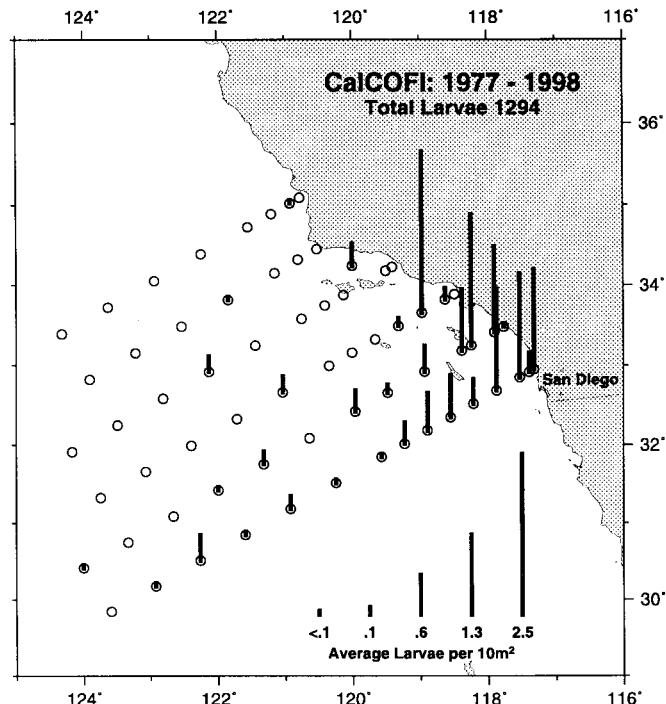
STERNOPTYCHIDAE



## MYCTOPHIDAE



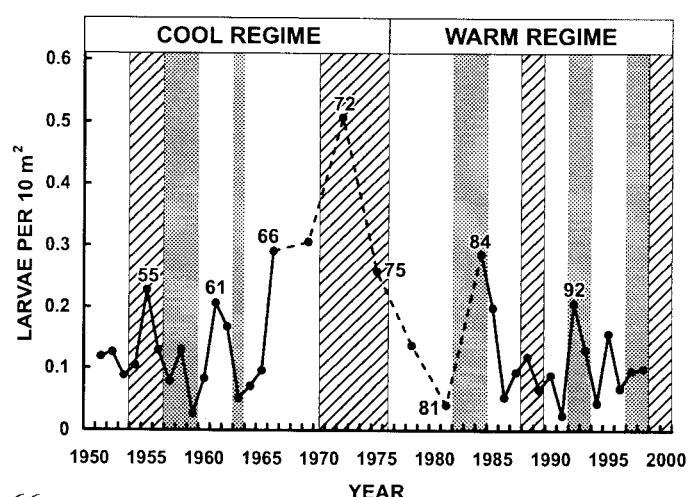
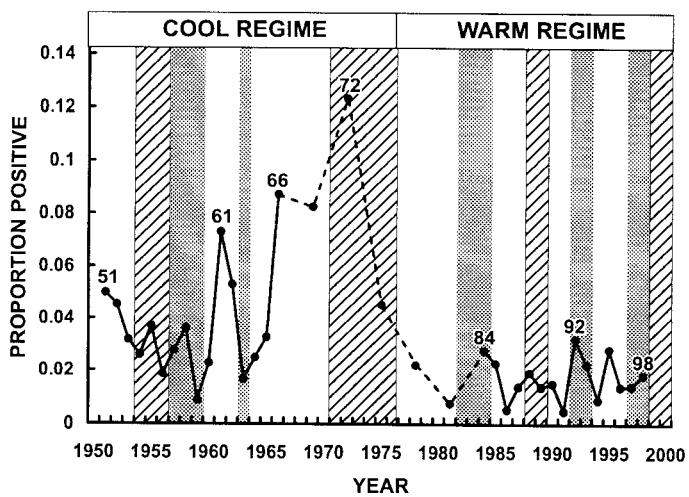
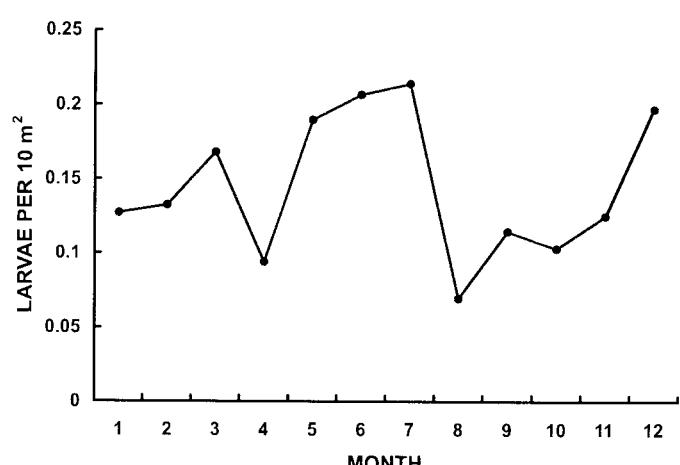
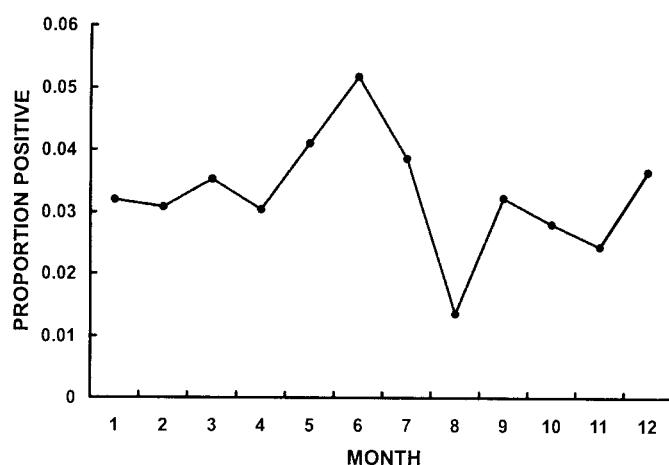
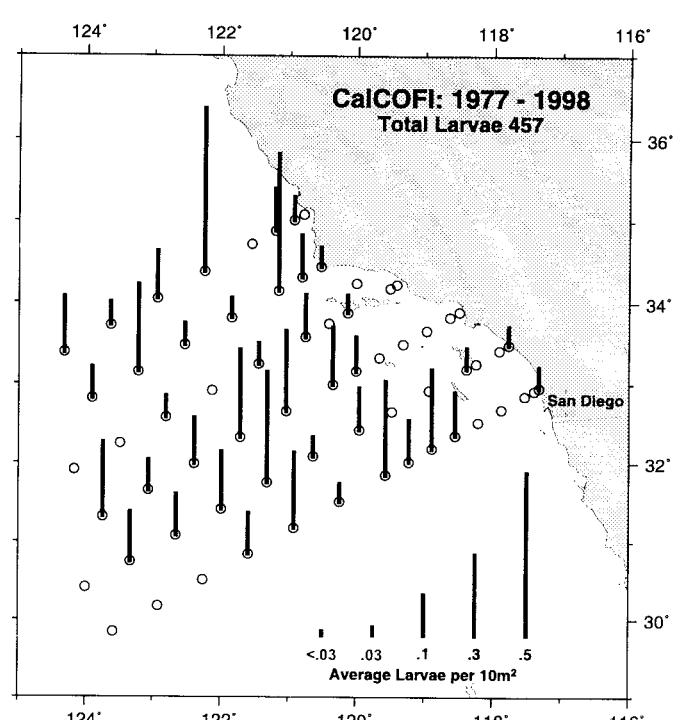
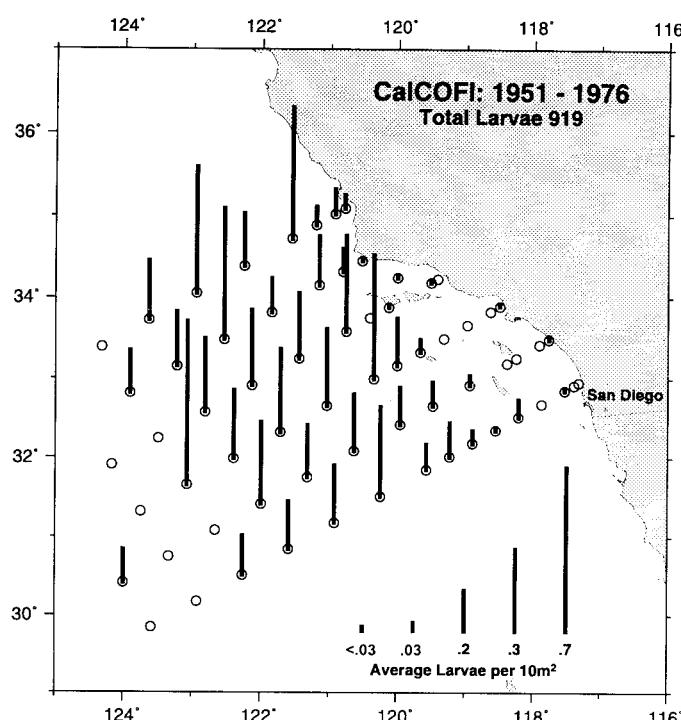
## Diogenes lanternfish



# TRACHIPTERIDAE

# Ribbonfishes

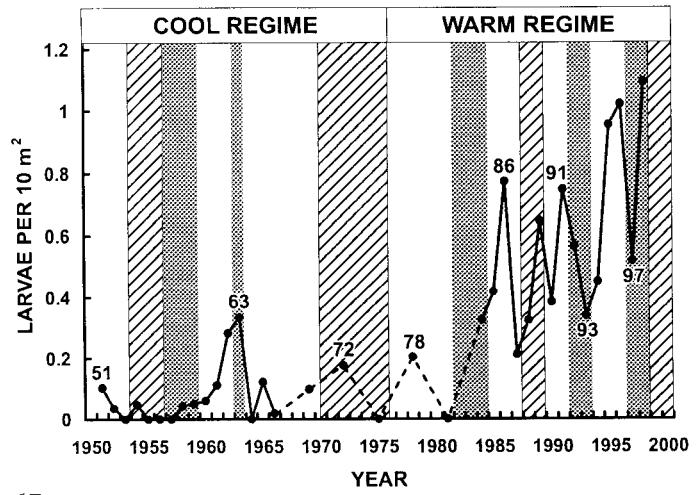
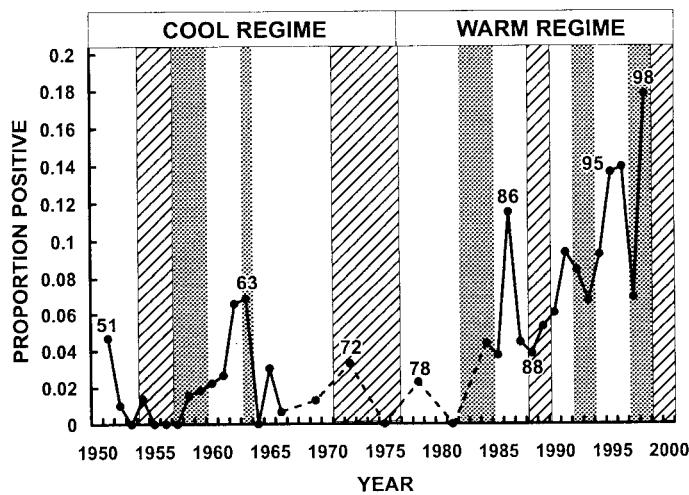
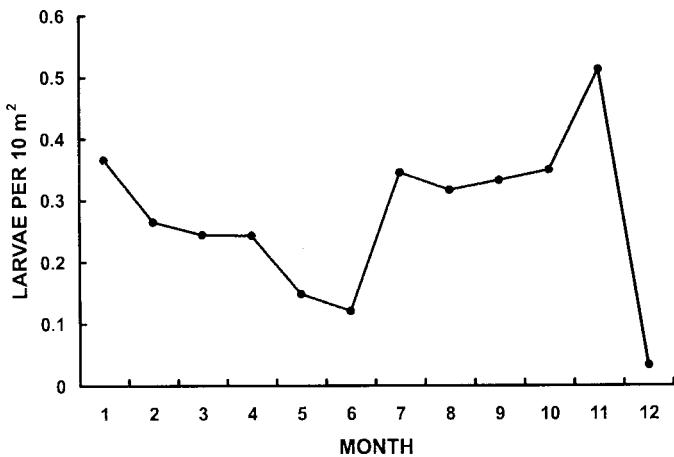
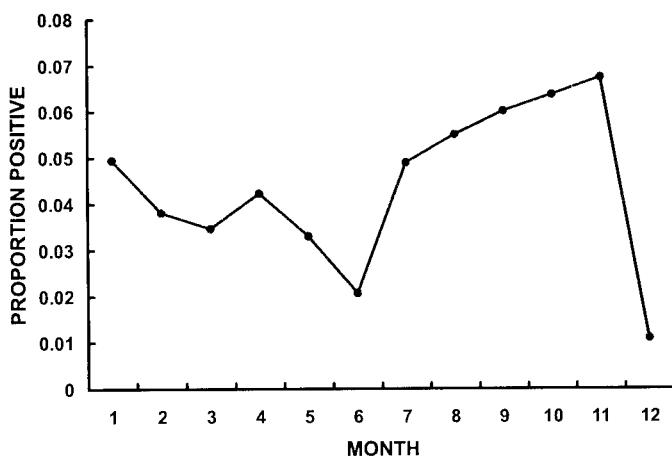
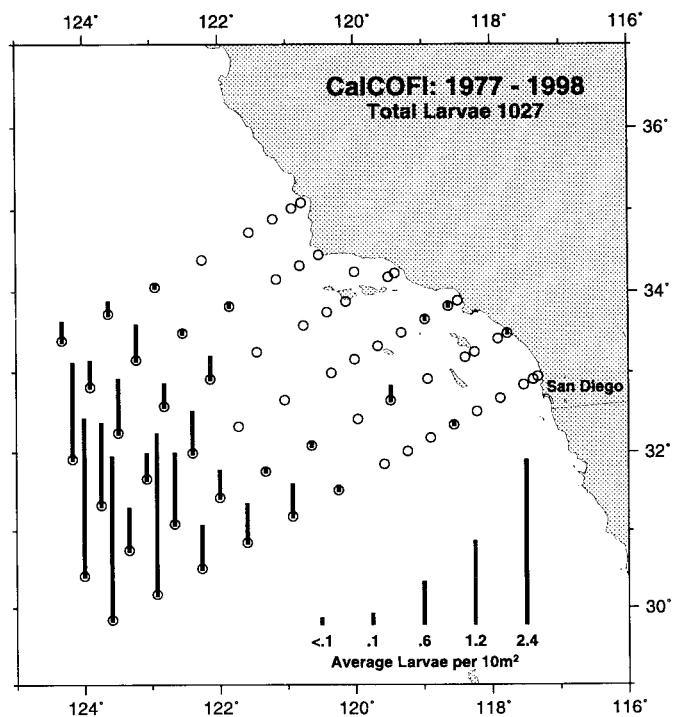
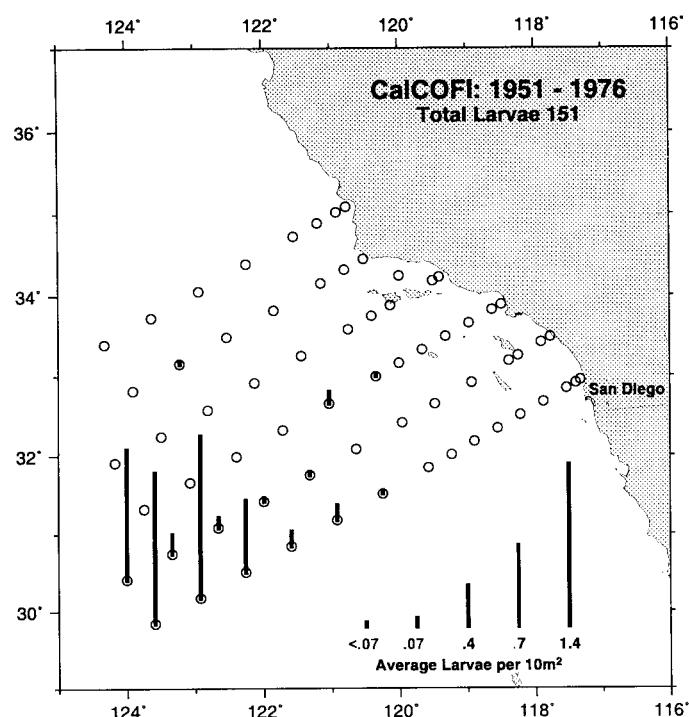
# TRACHIPTERIDAE



## MYCTOPHIDAE

## Slender lanternfish

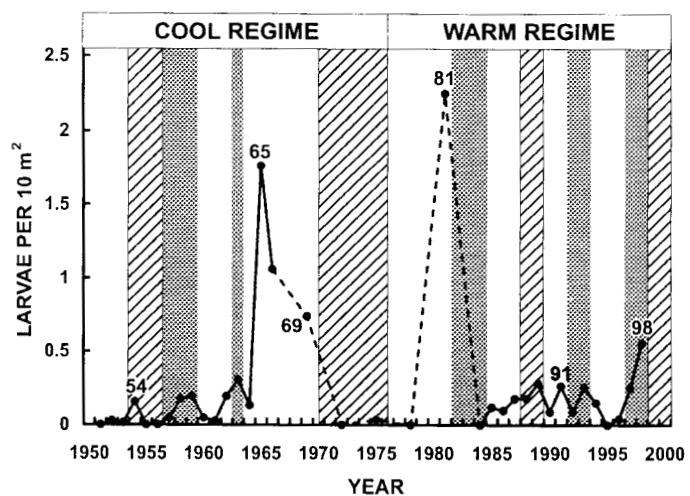
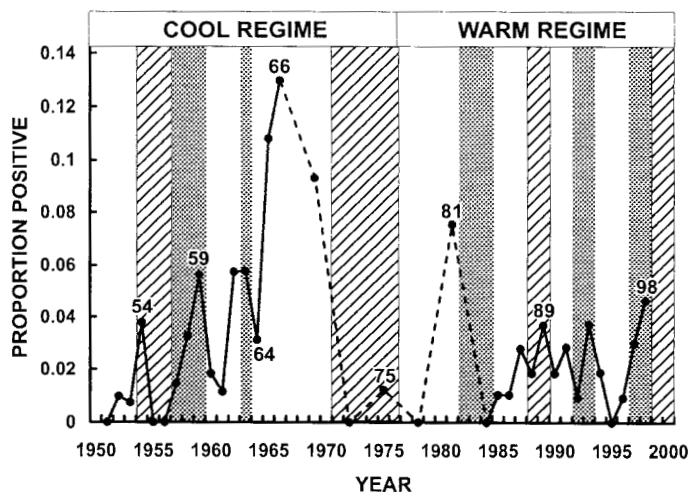
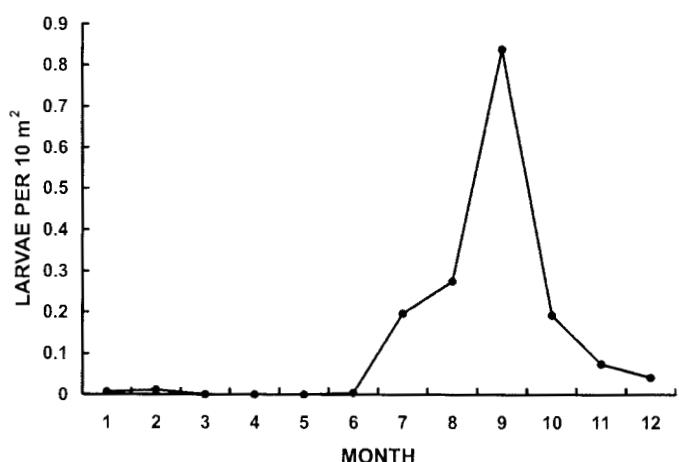
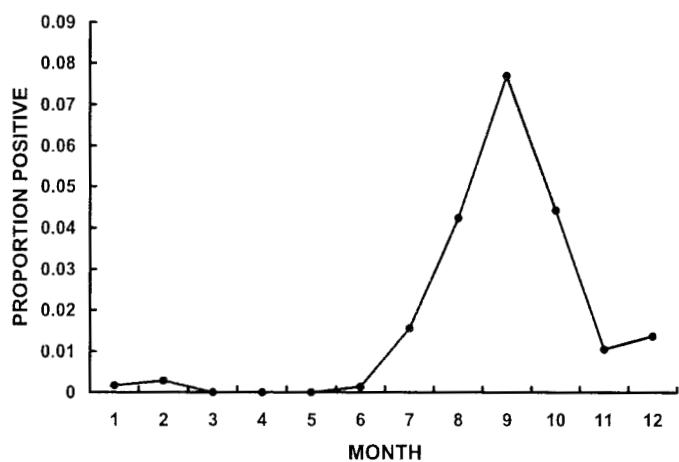
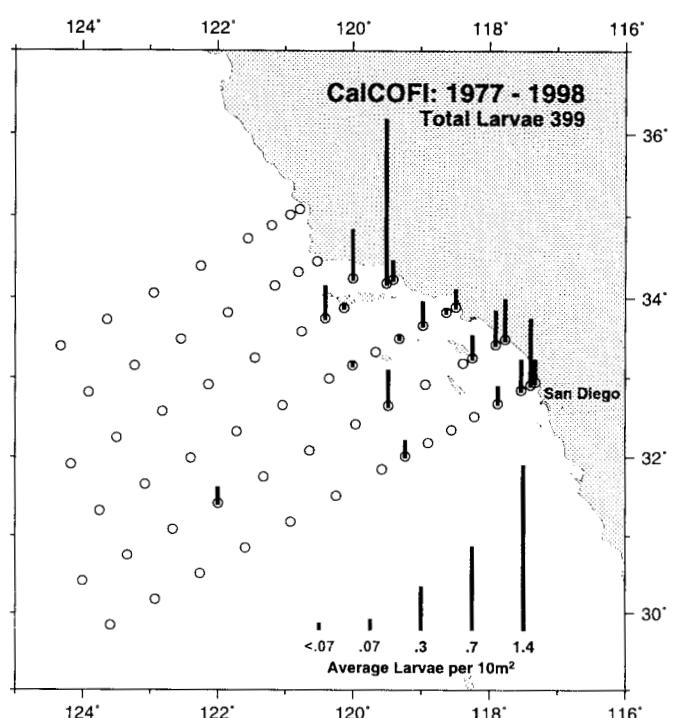
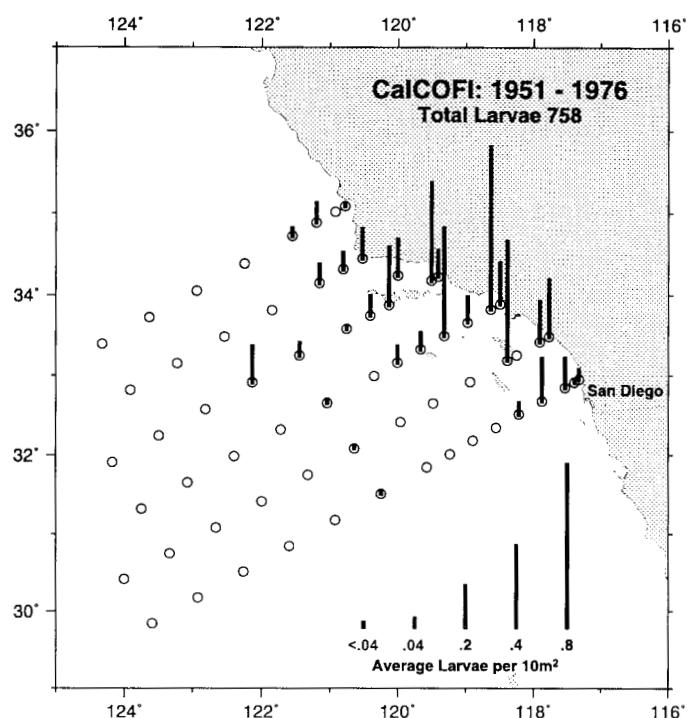
## *Hygophum reinhardtii*



*Sympodus atricaudus*

California tonguefish

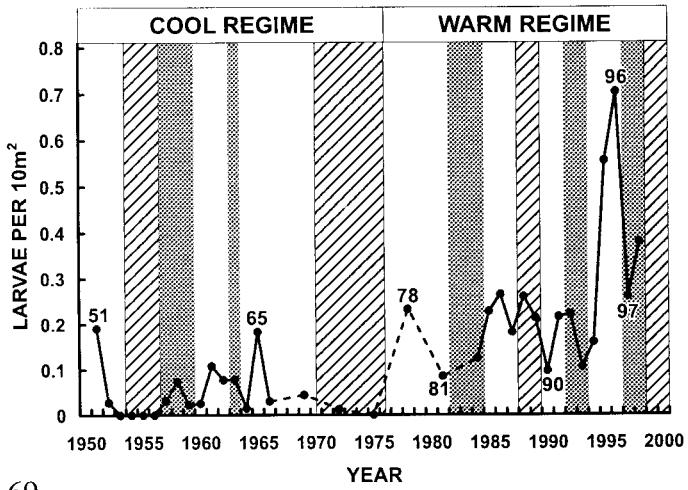
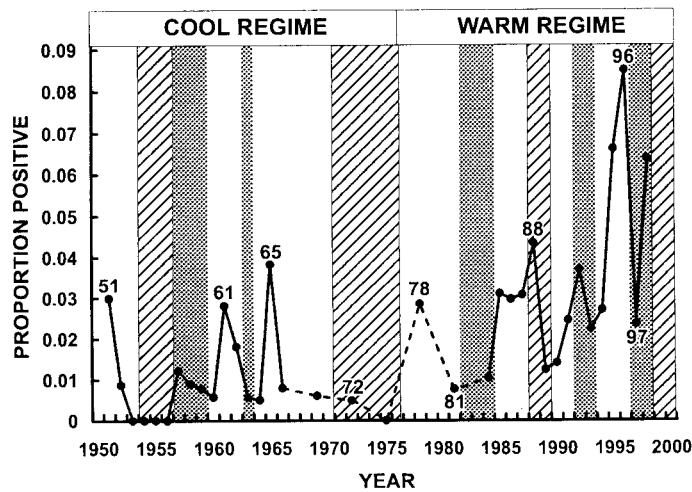
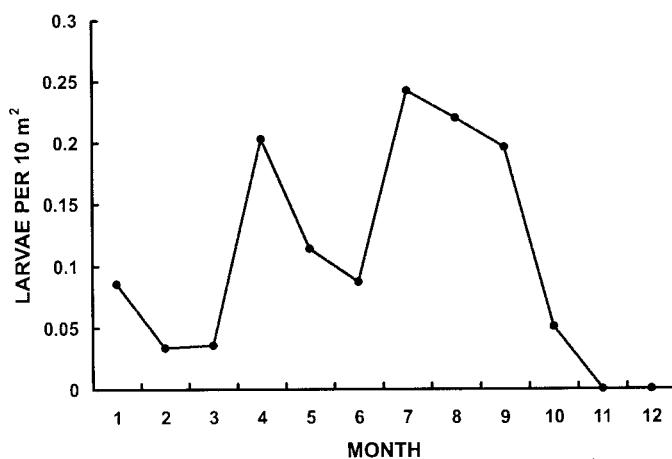
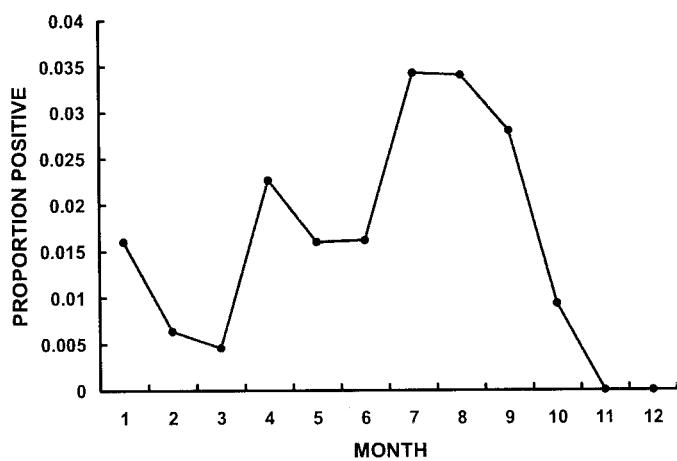
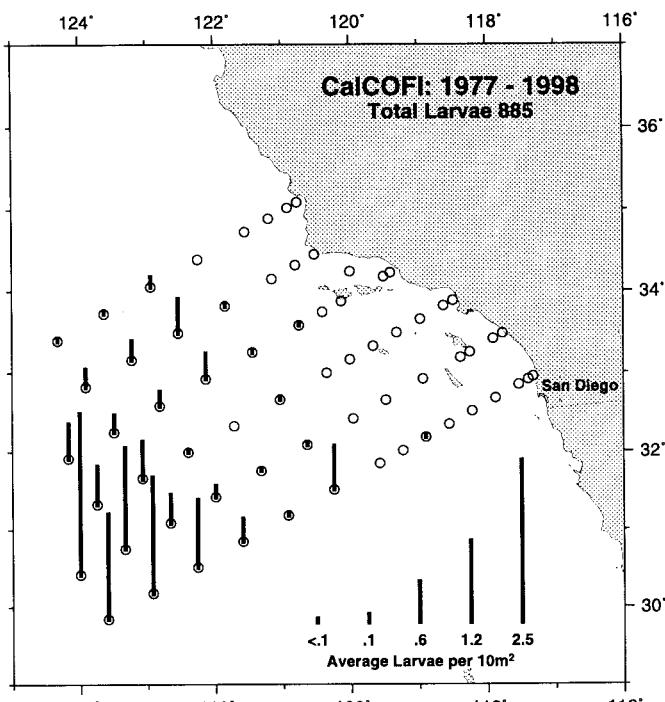
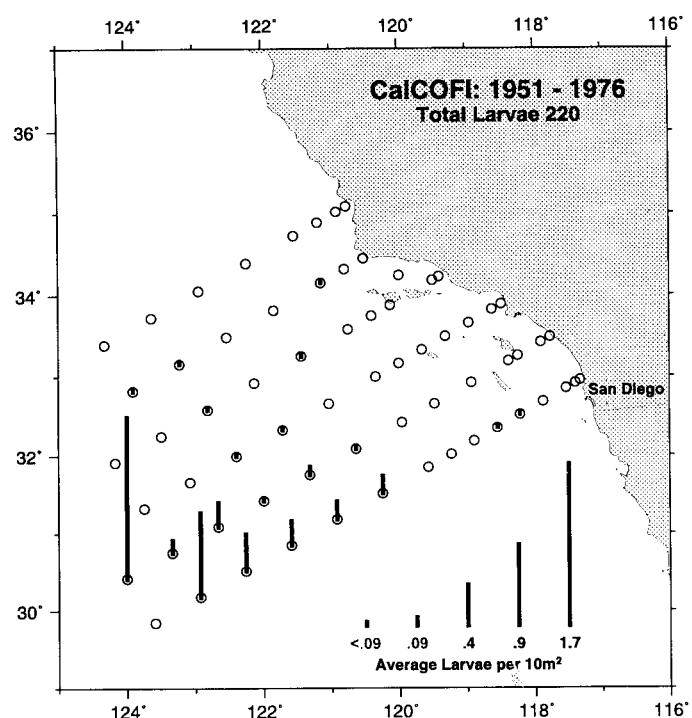
CYNOGLOSSIDAE



## MYCTOPHIDAE

## Patchwork lampfish

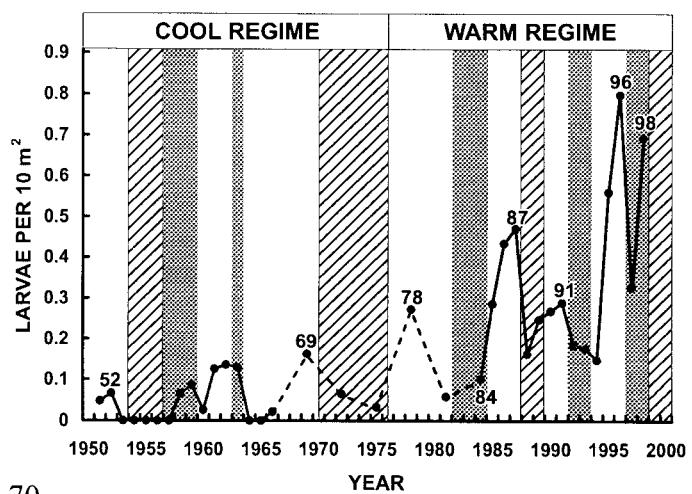
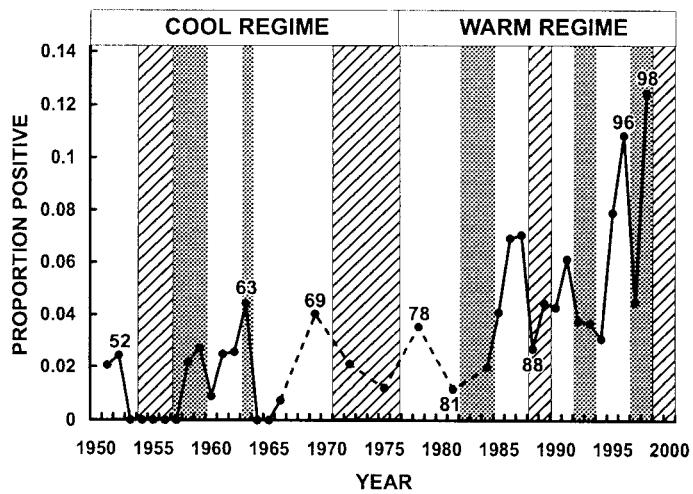
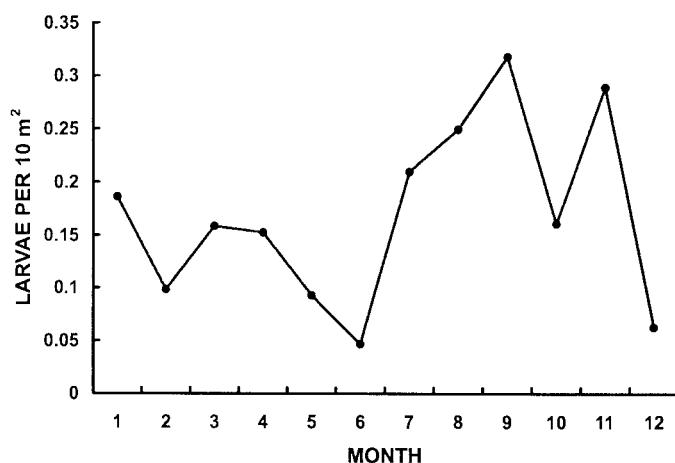
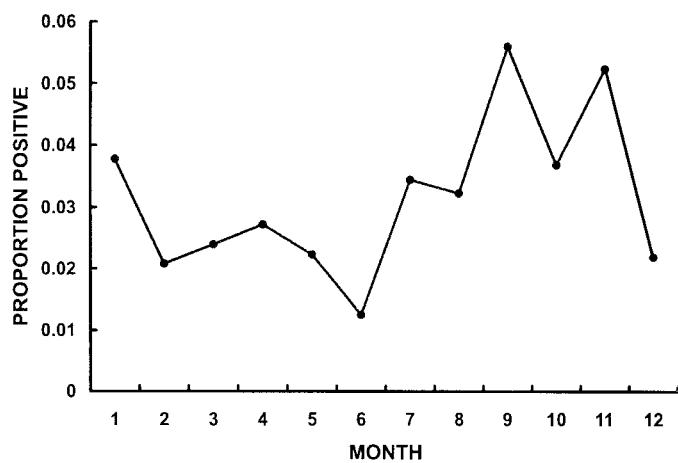
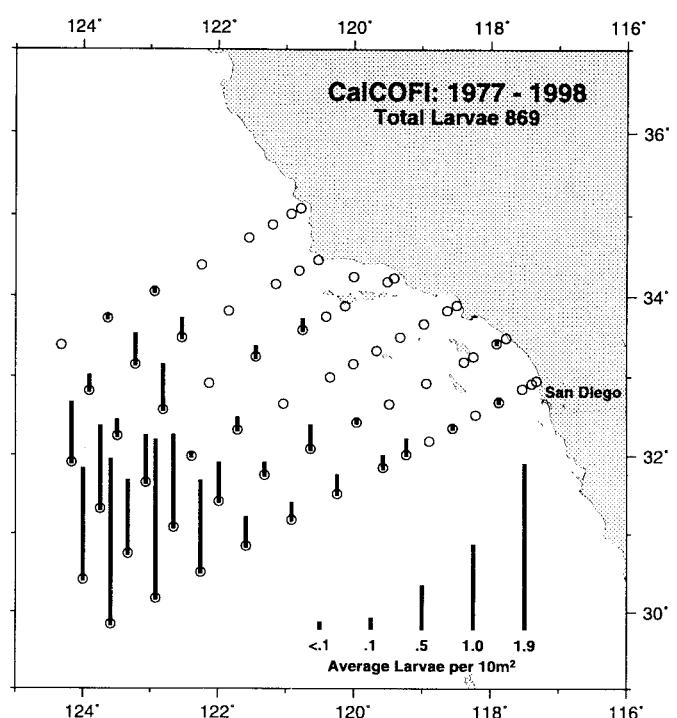
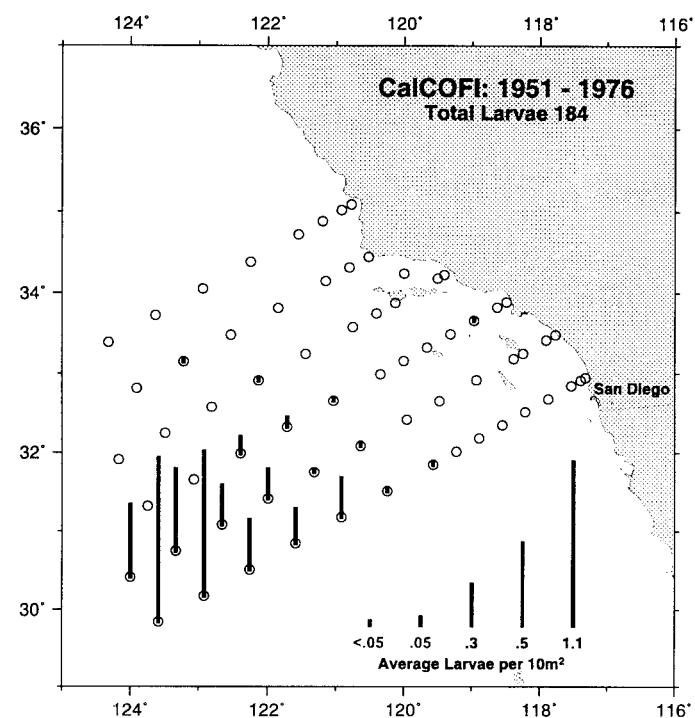
## *Notoscopelus resplendens*



*Myctophum nitidulum*

Pearly lanternfish

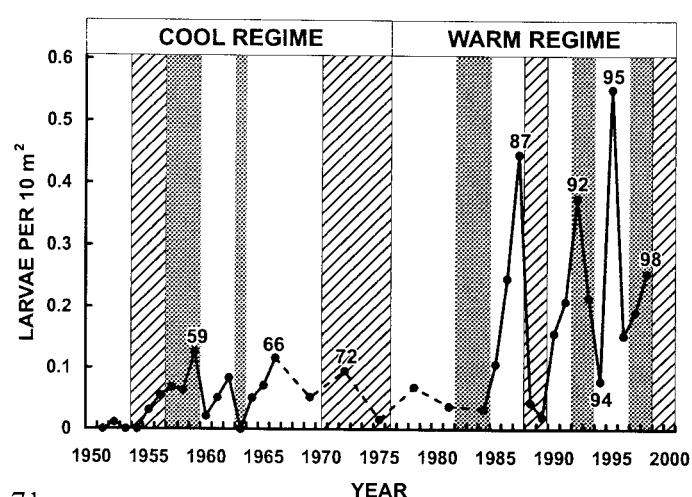
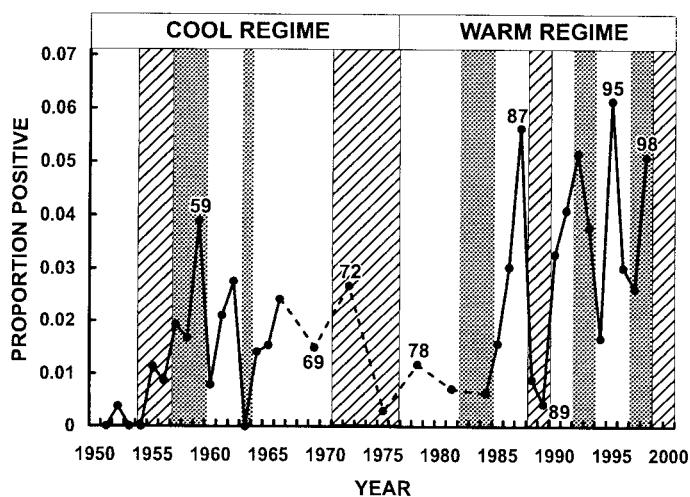
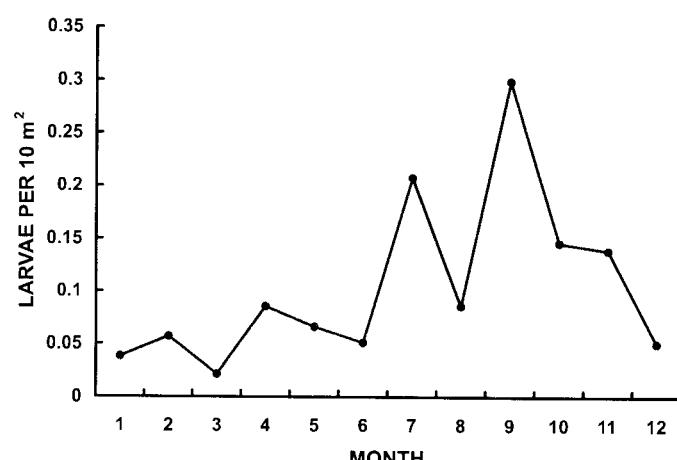
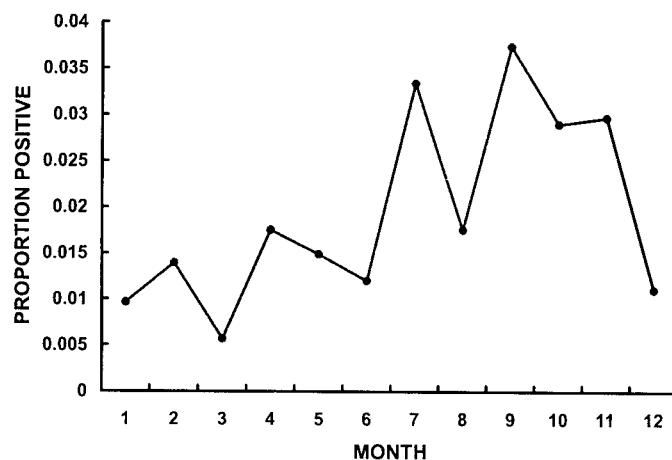
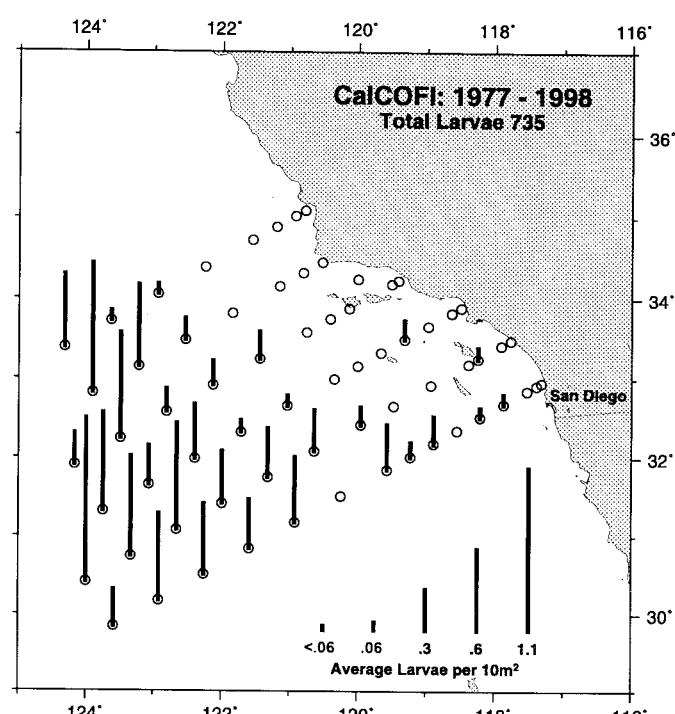
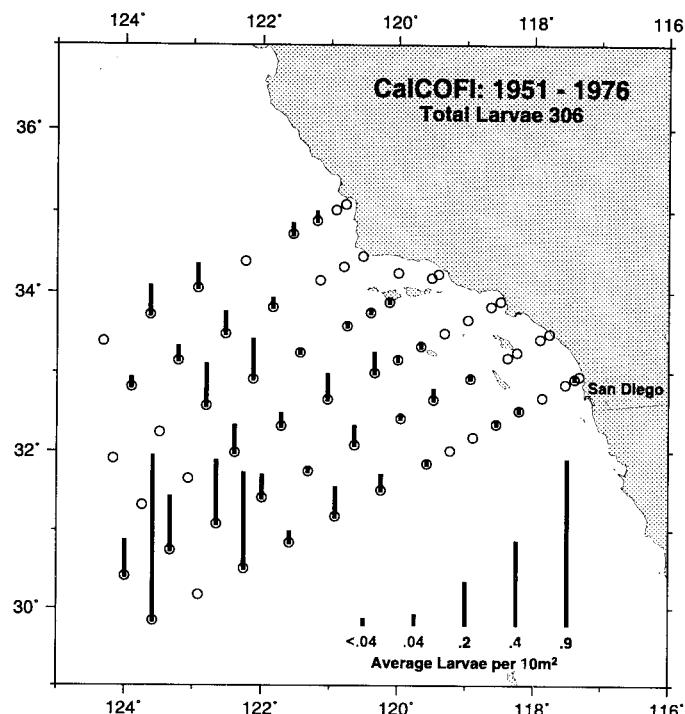
MYCTOPHIDAE



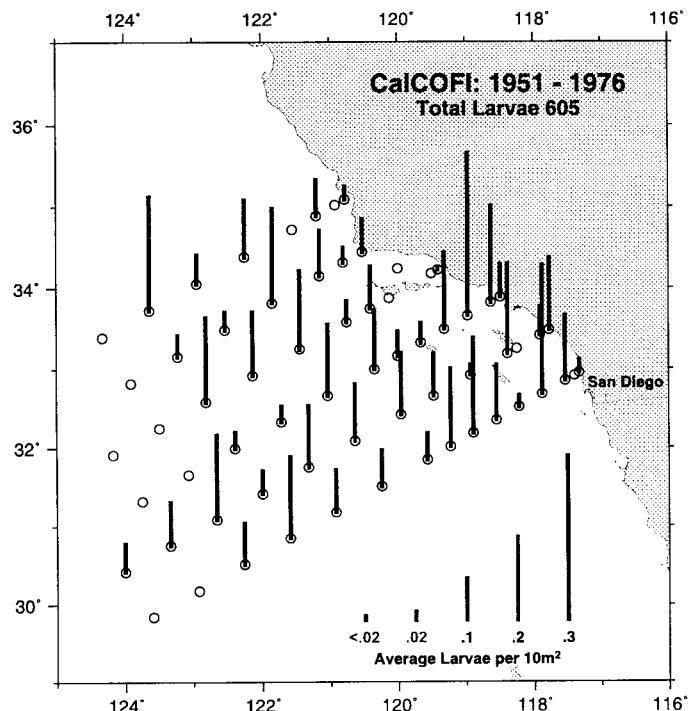
# MELAMPHAIIDAE

## Twospine bigscale

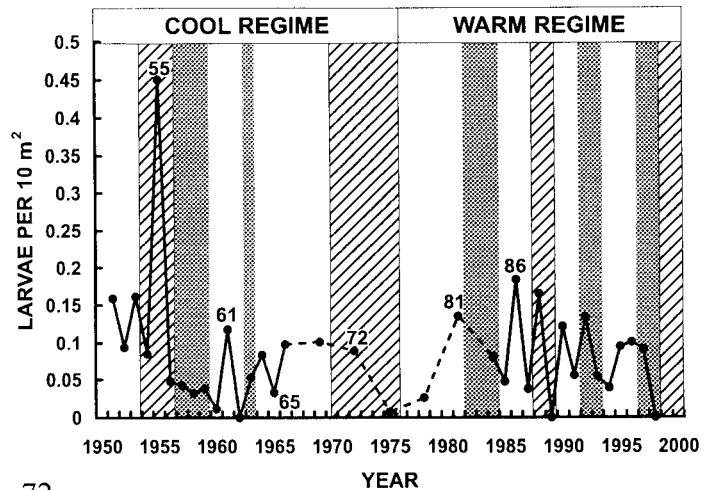
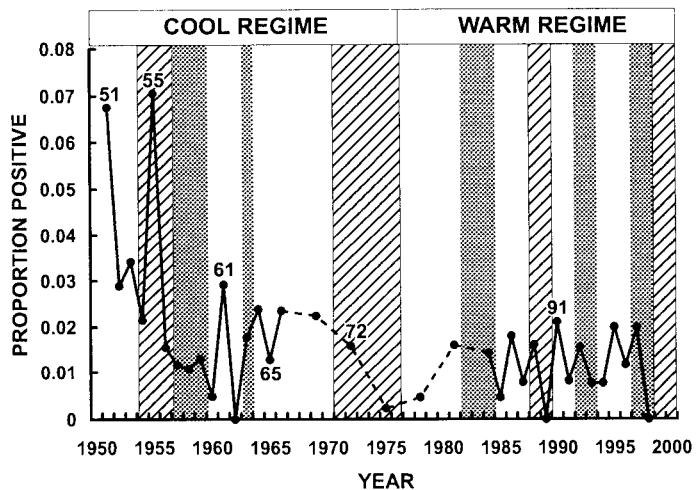
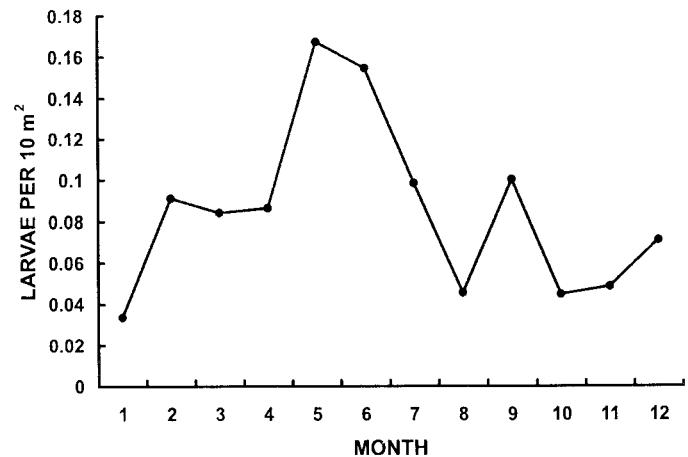
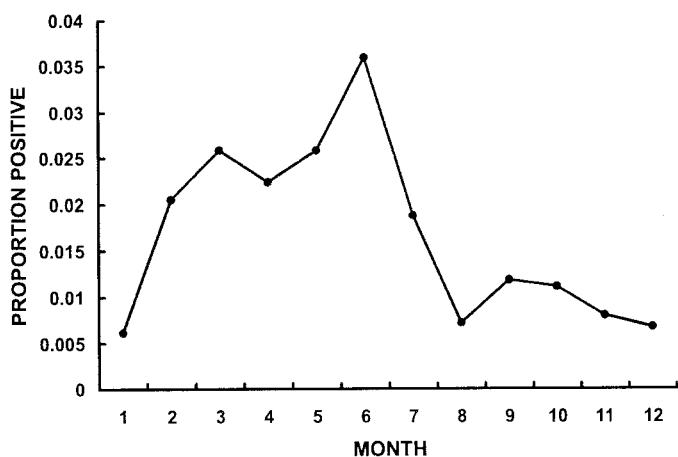
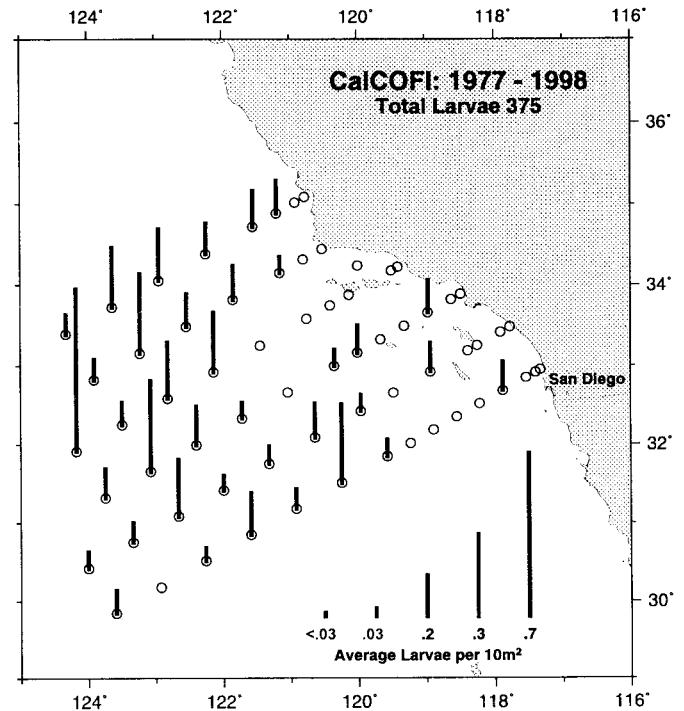
## *Scopelogadus bispinosus*



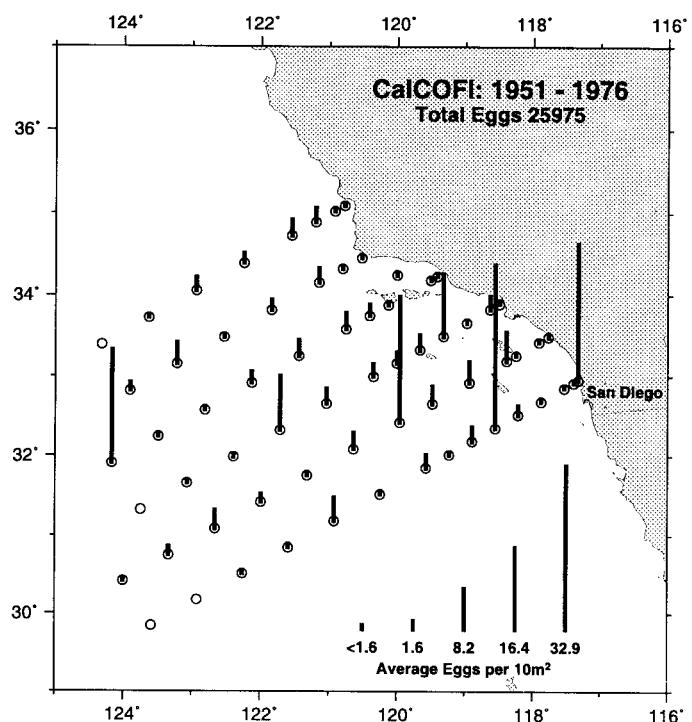
### *Cololabis saira* larvae



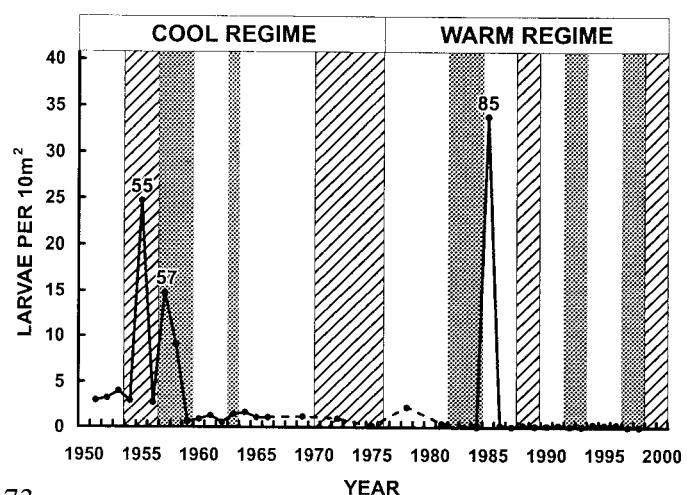
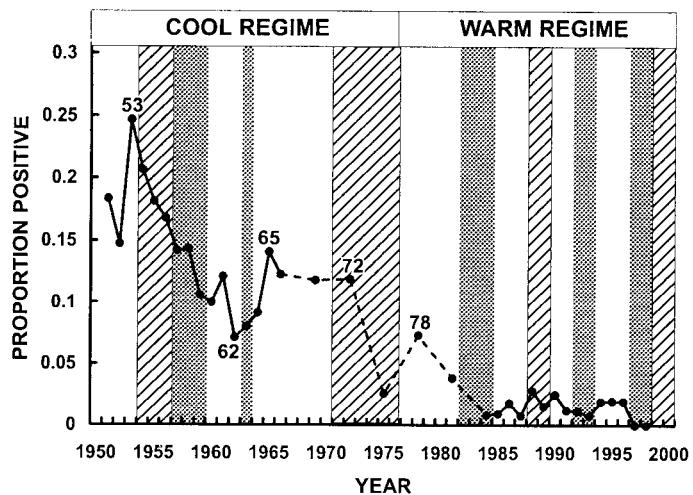
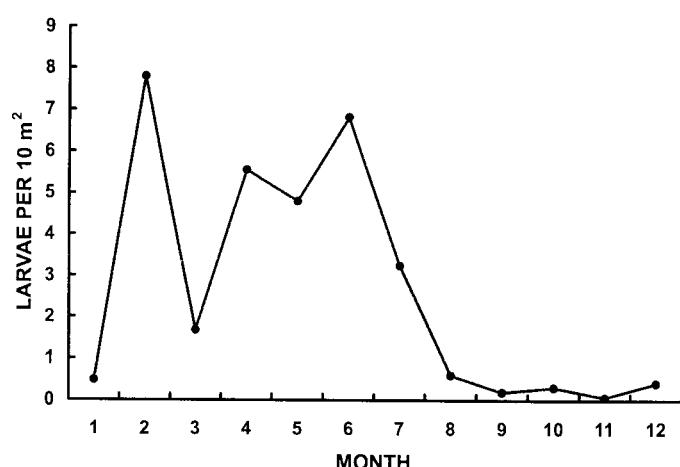
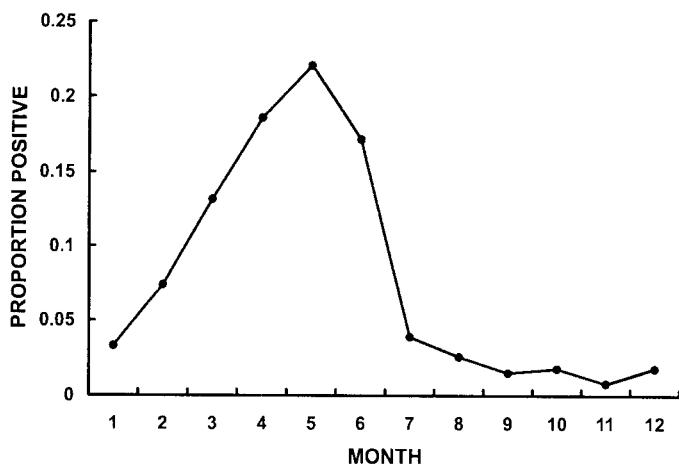
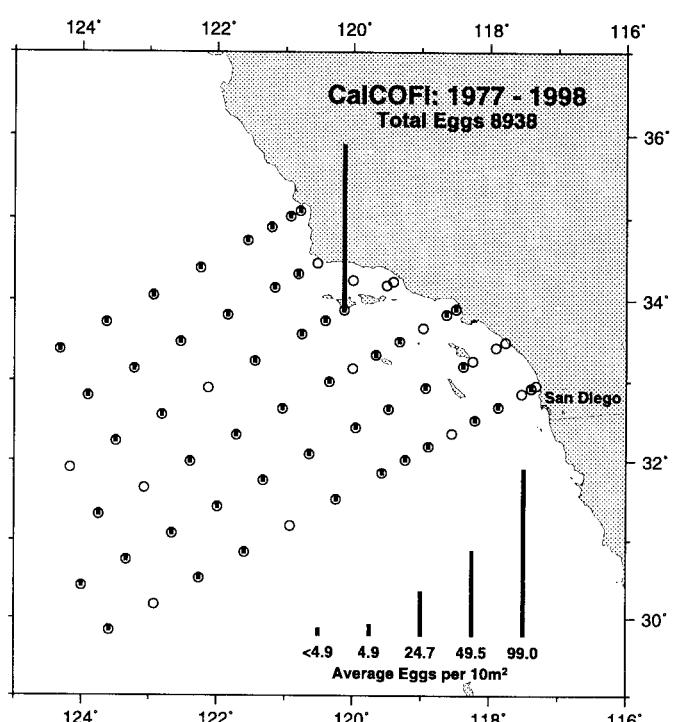
### Pacific saury larvae



## SCOMBERESOCIDAE



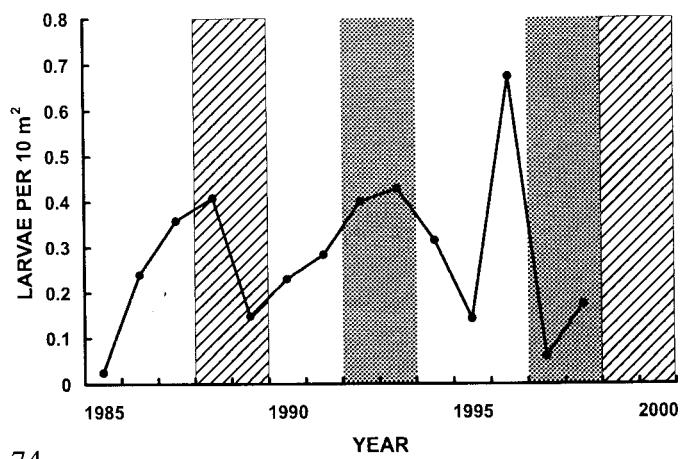
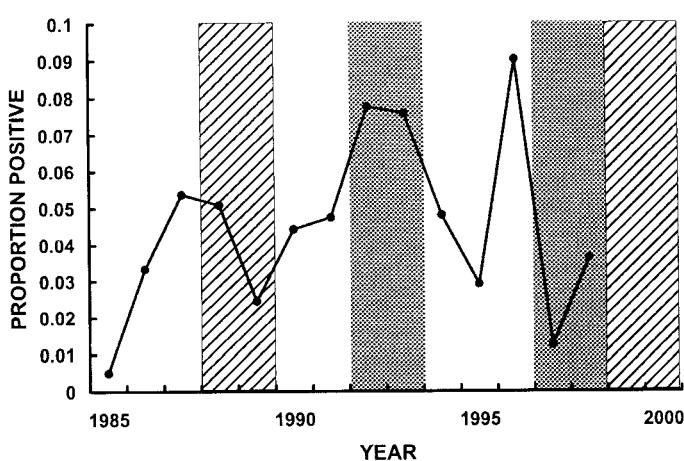
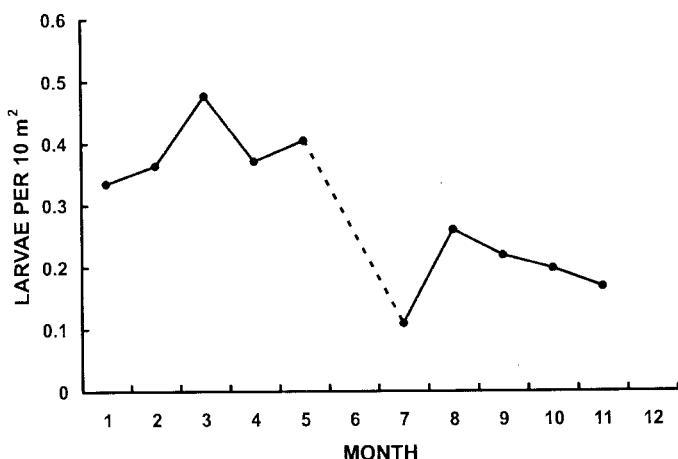
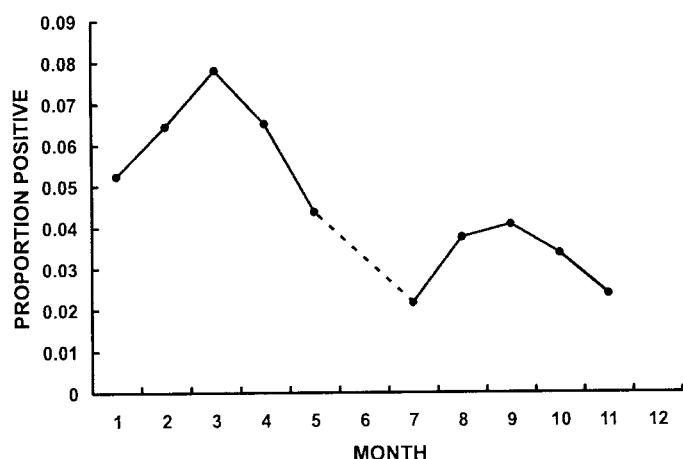
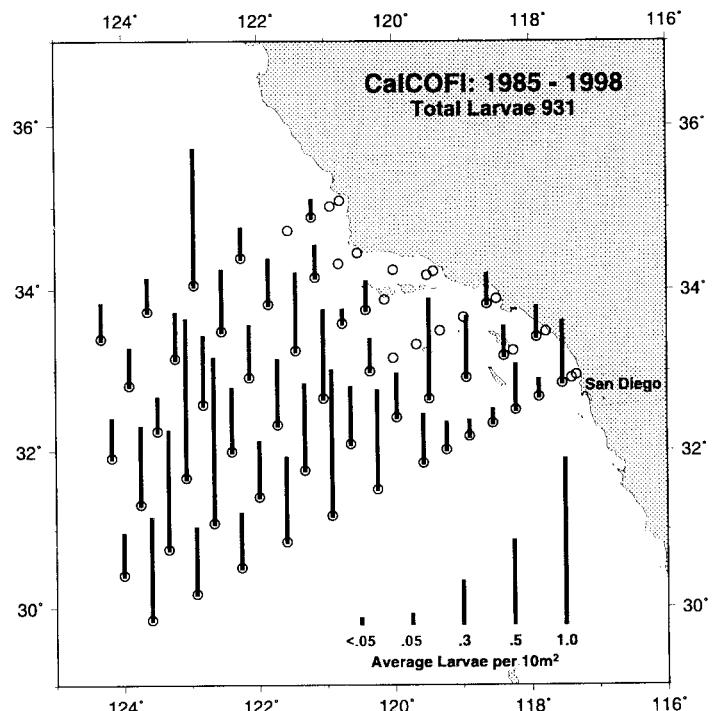
## Pacific saury eggs



*Argyropelecus affinis*

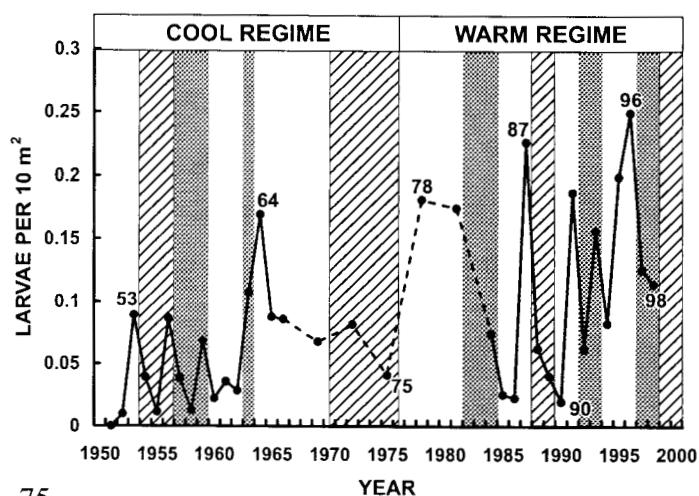
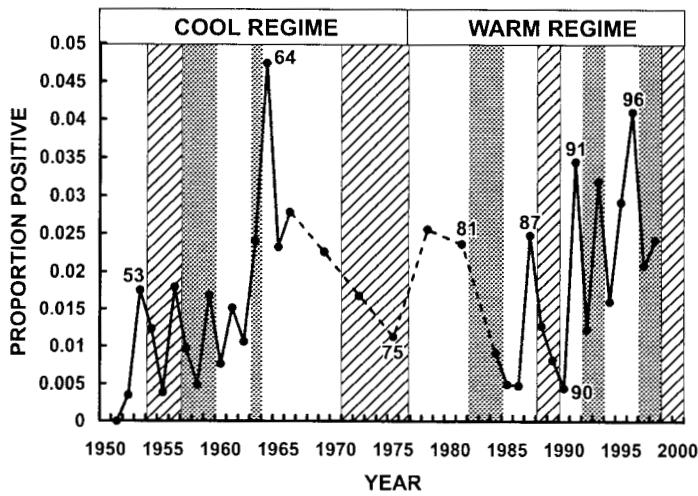
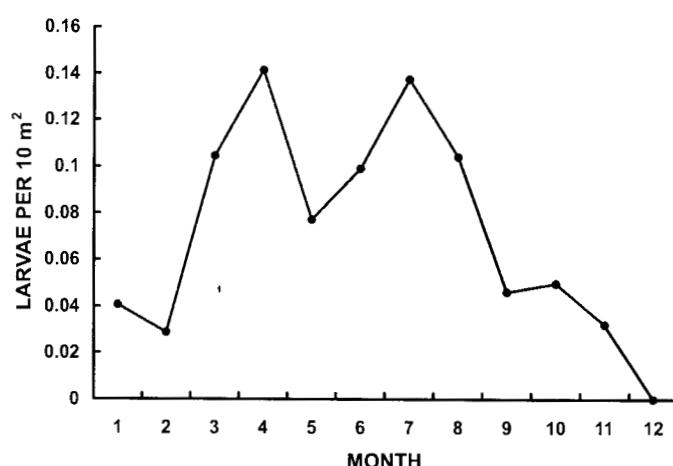
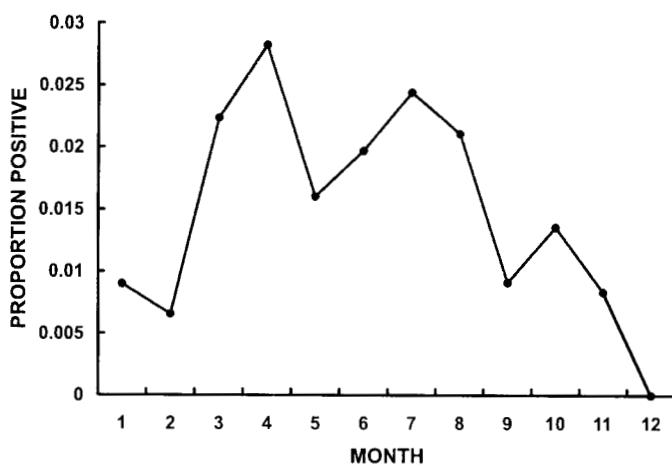
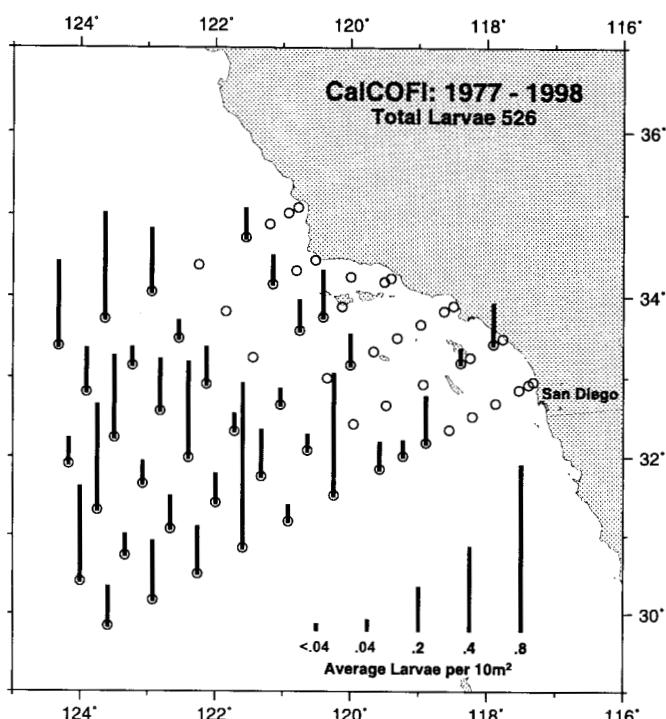
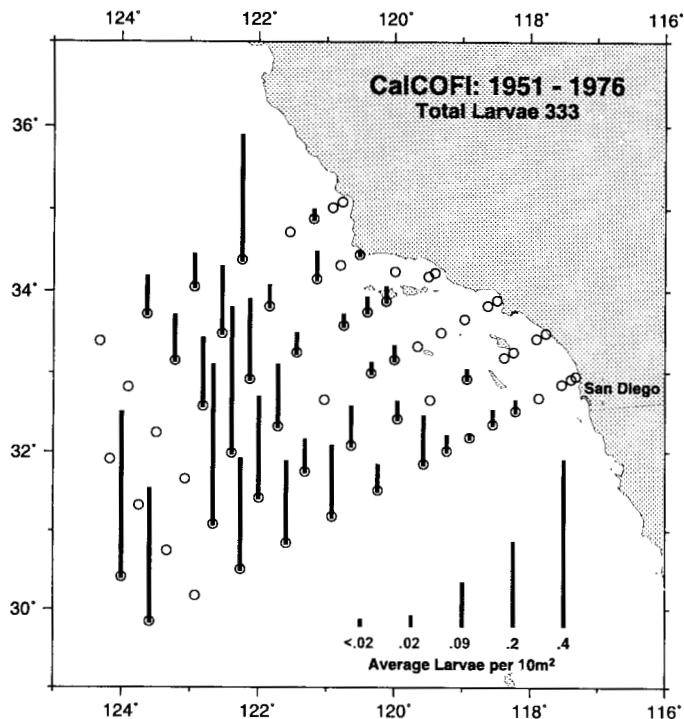
## Slender hatchetfish

## STERNOPTYCHIDAE



## MELAMPHAIDAE

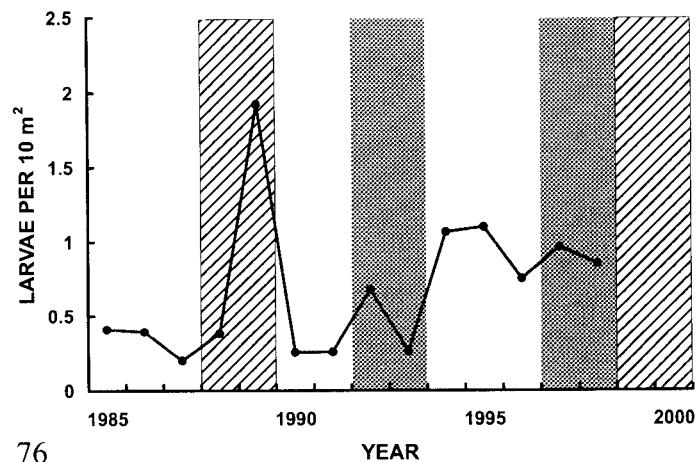
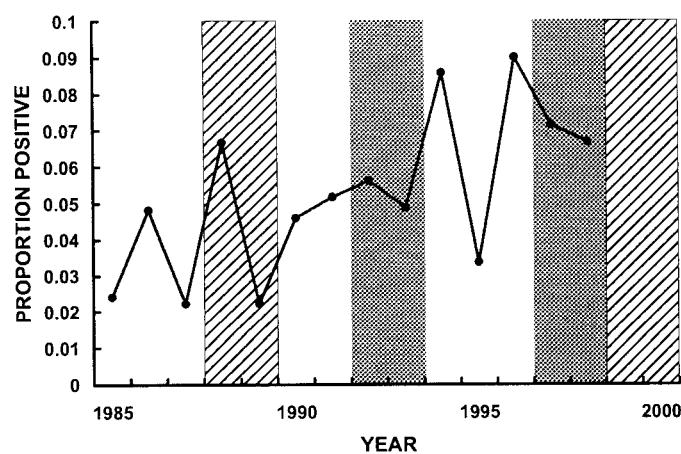
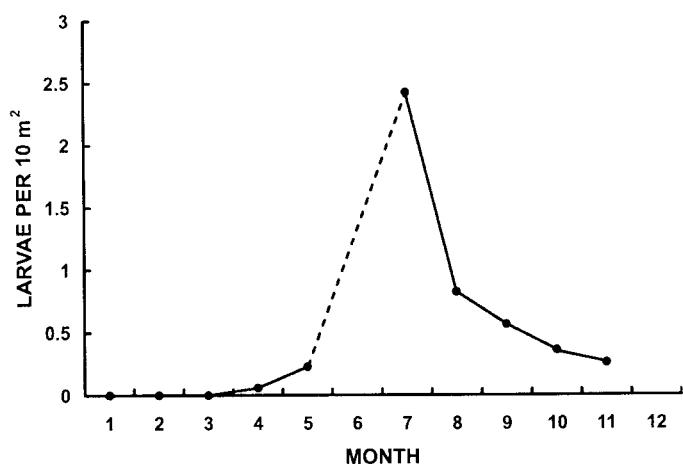
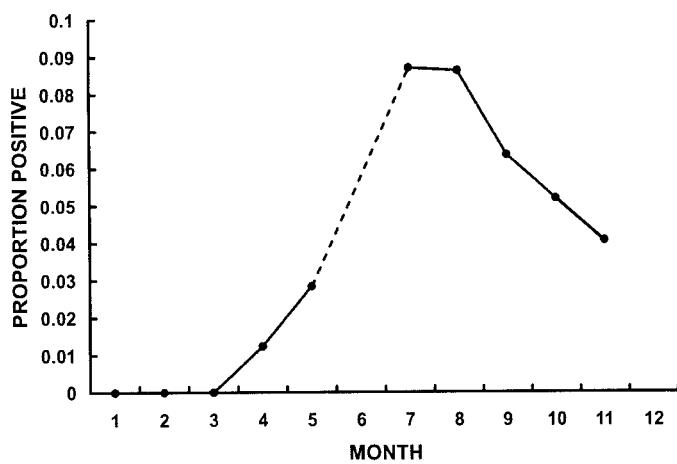
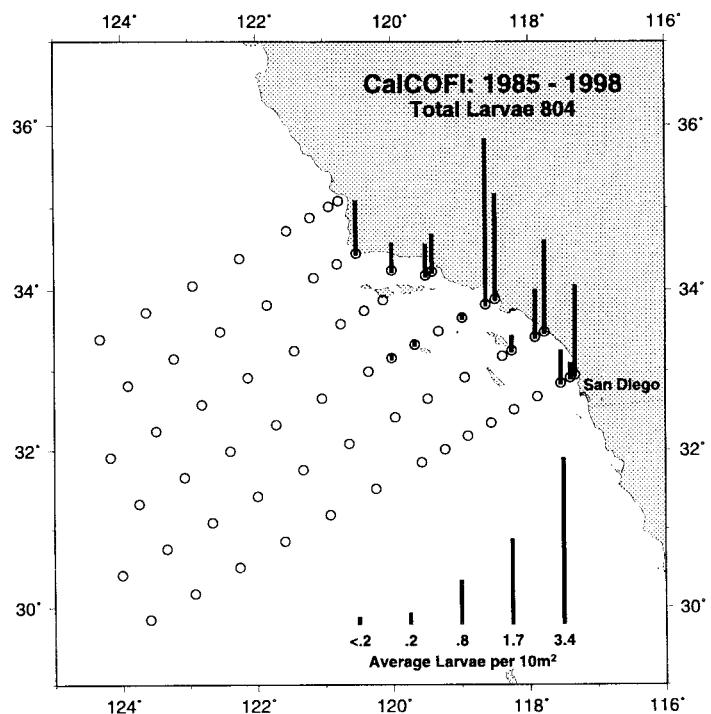
*Poromitra* spp.



*Hypsoblennius jenkinsi*

Mussel blenny

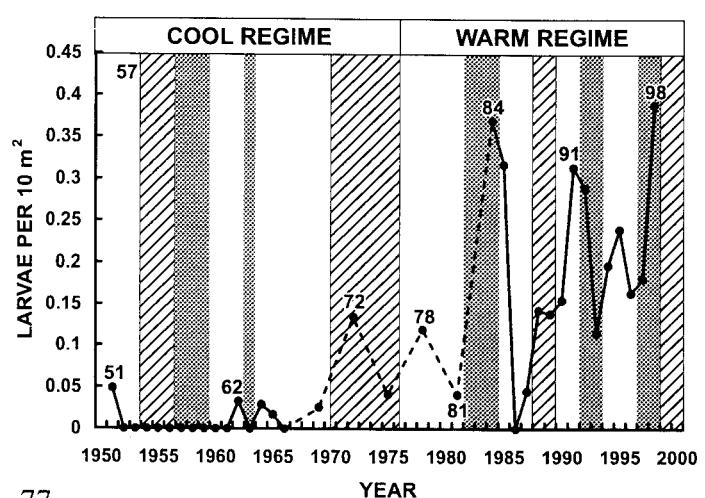
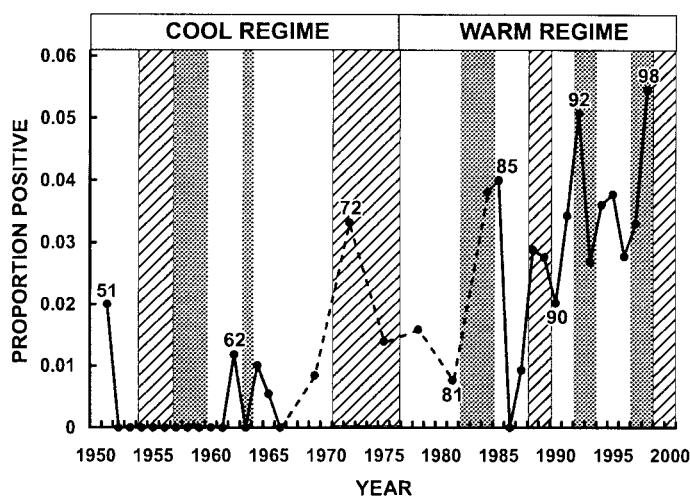
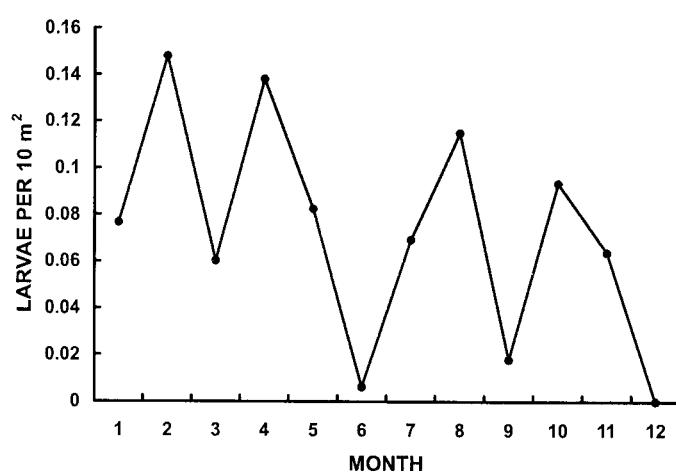
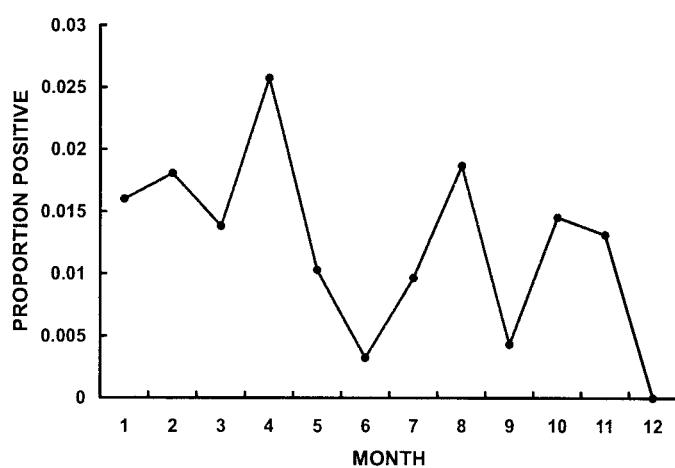
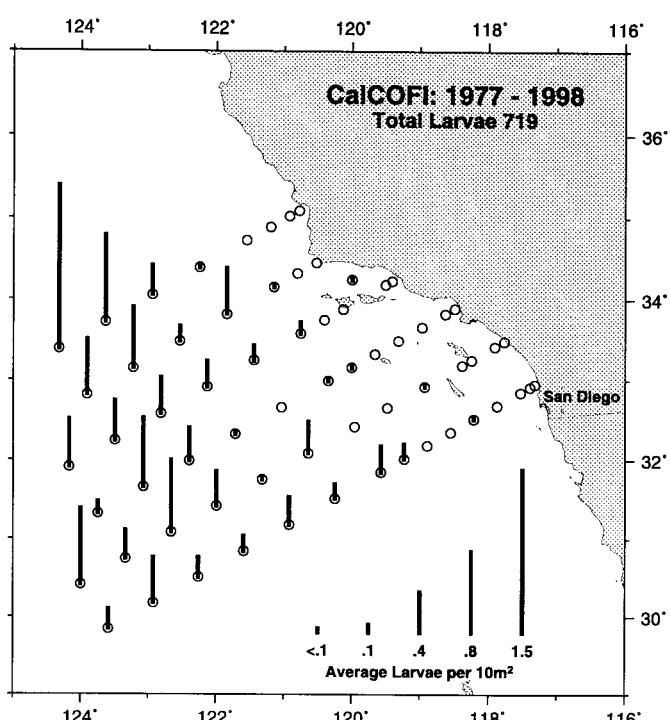
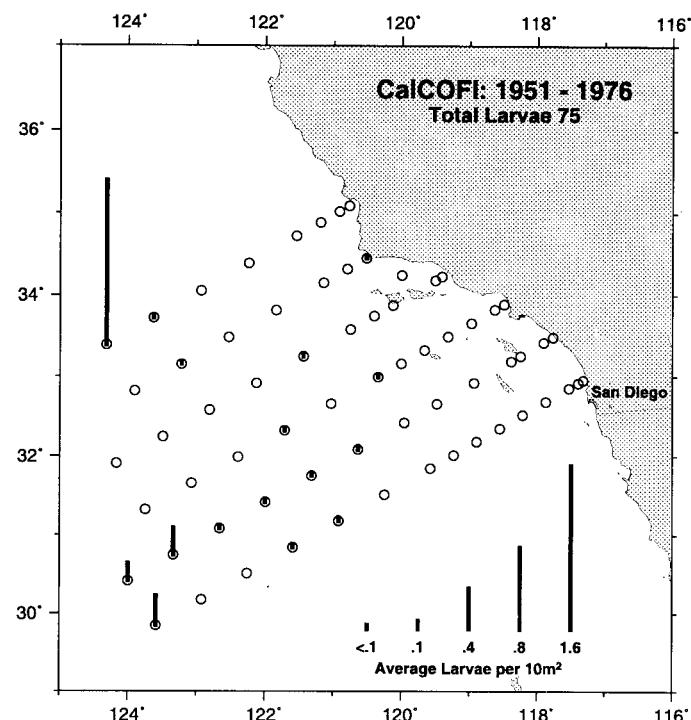
BLENNIIDAE



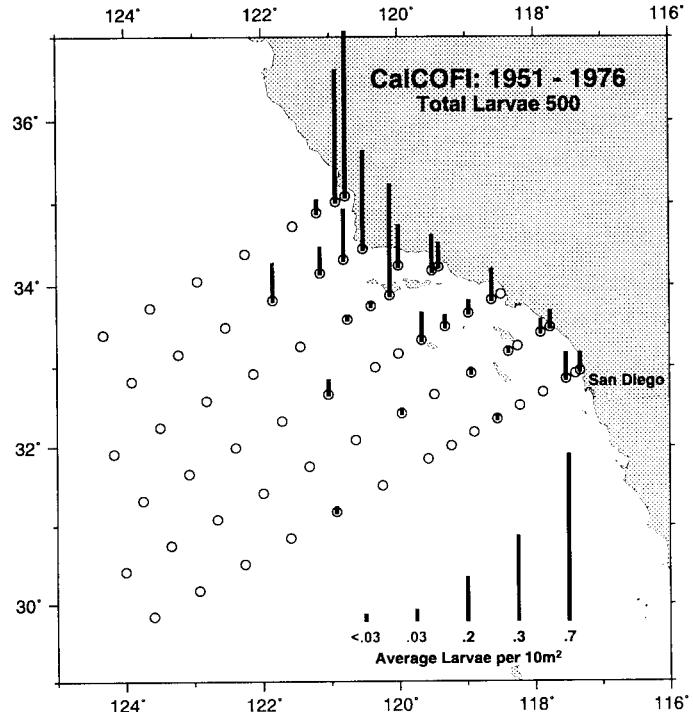
## MYCTOPHIDAE

## Chubby flashlightfish

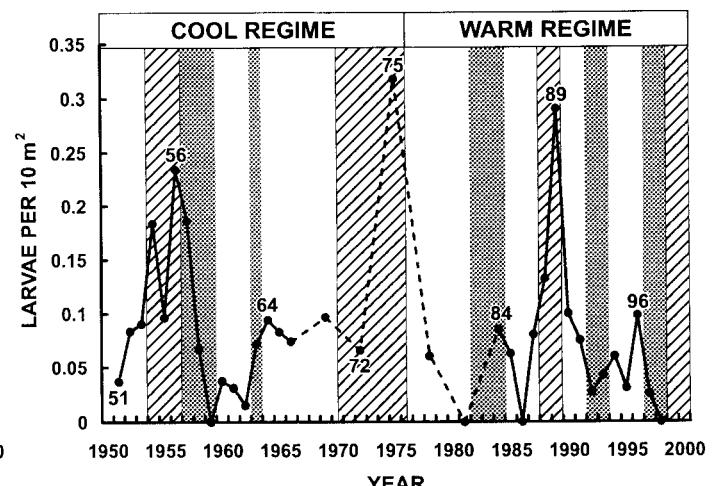
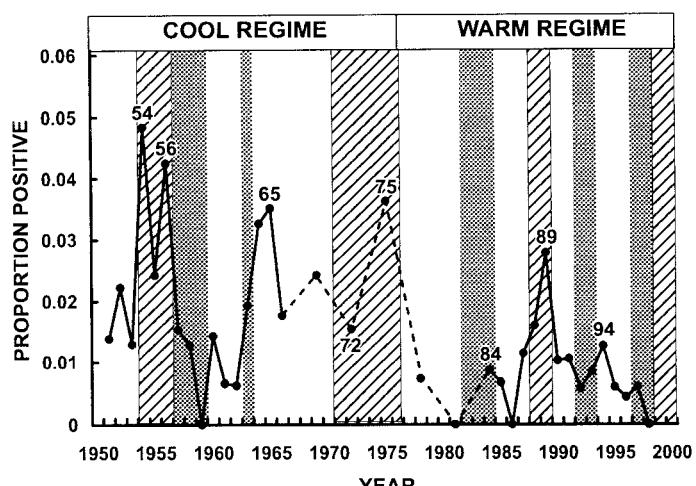
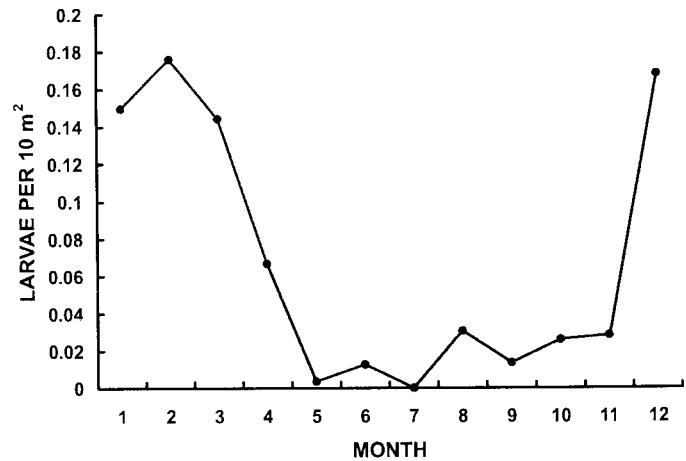
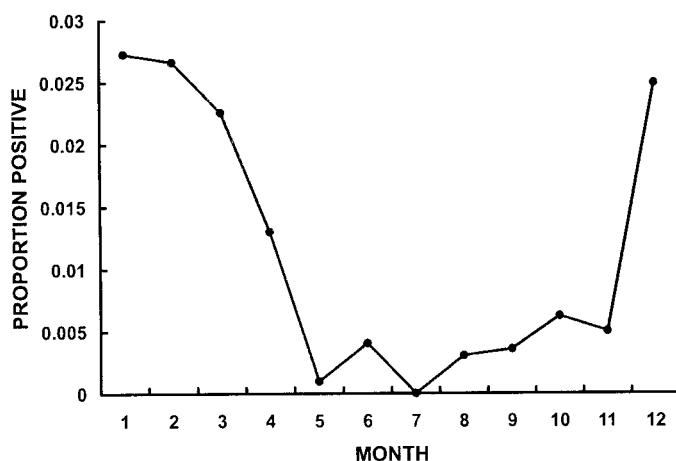
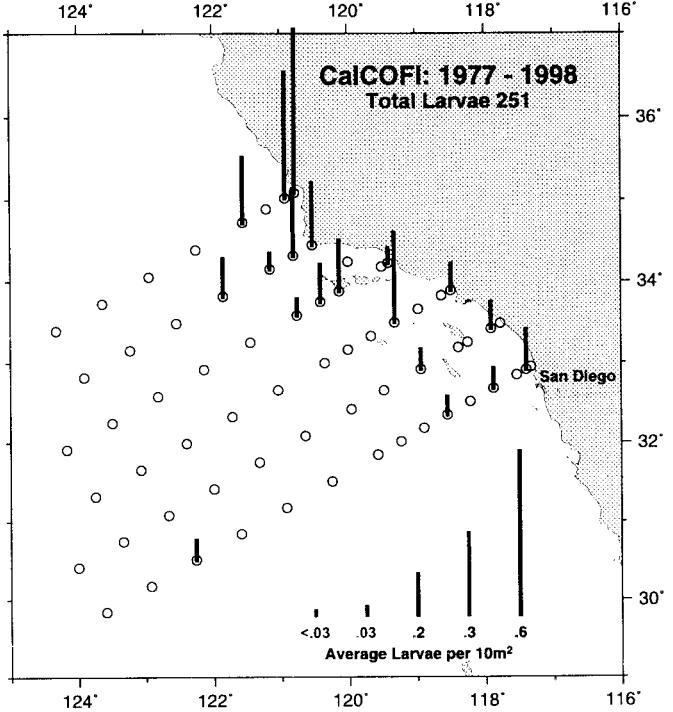
## *Electrona risso*



### *Scorpaenichthys marmoratus*



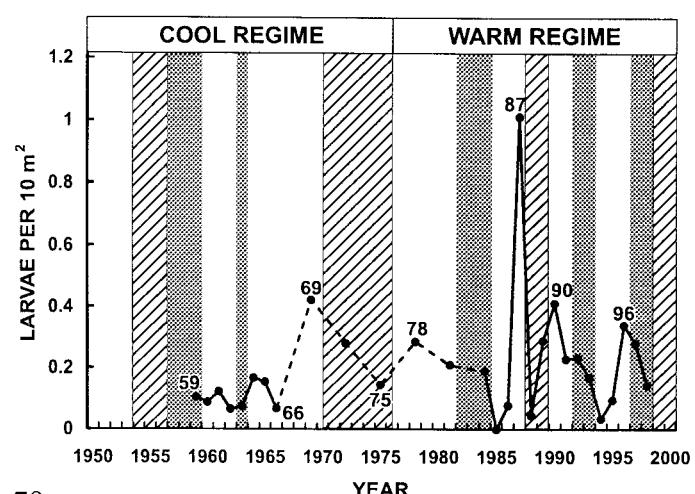
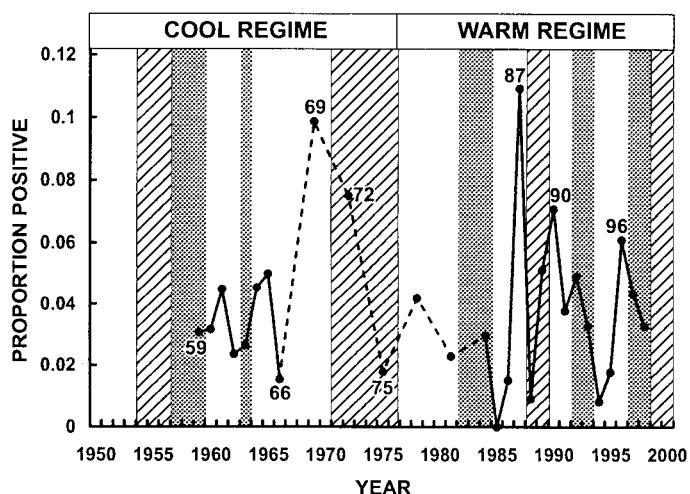
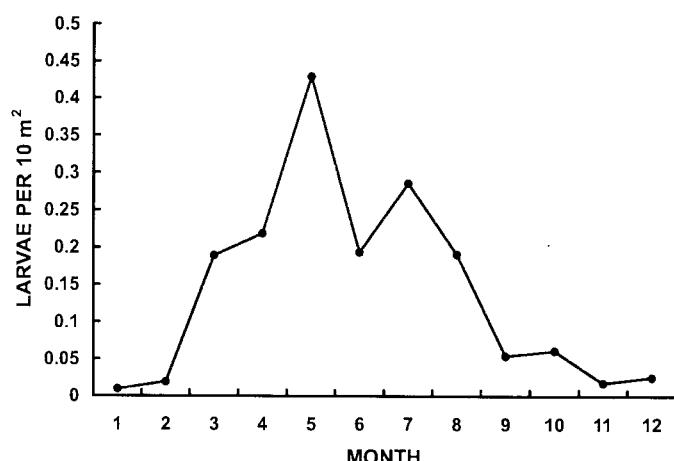
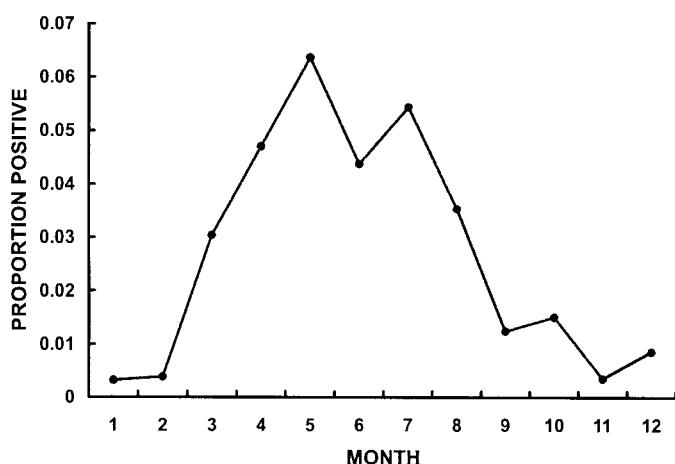
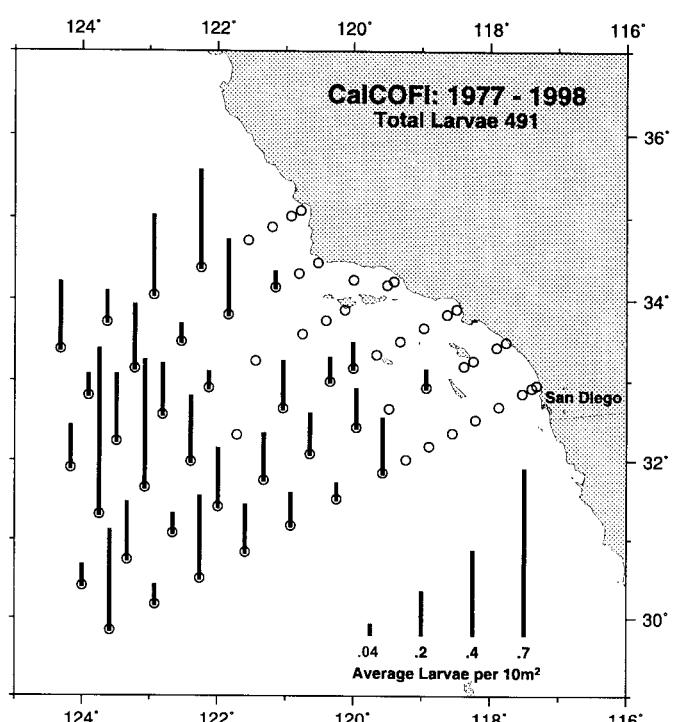
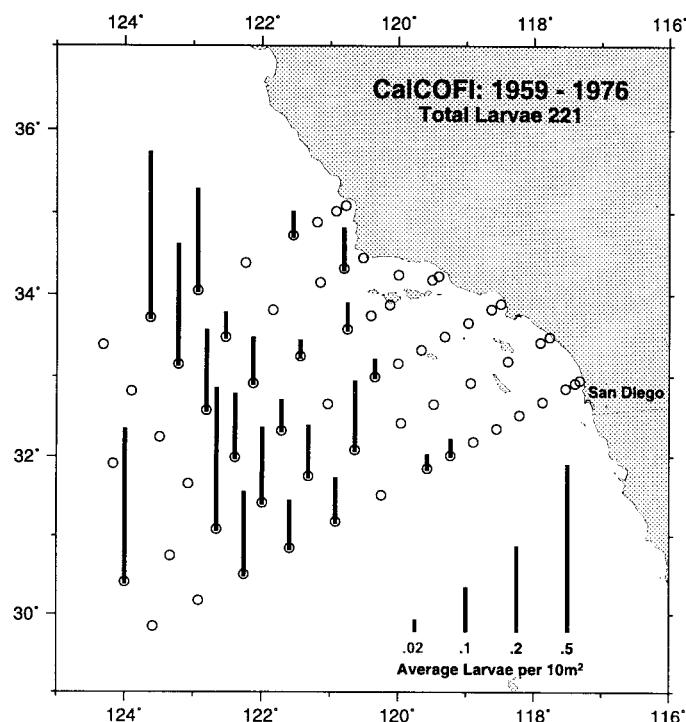
### Cabezon



## NOTOSUDIDAE

## Paperbones

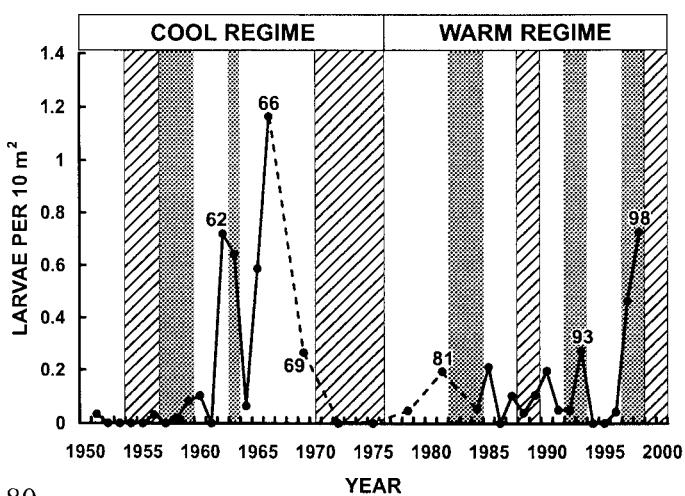
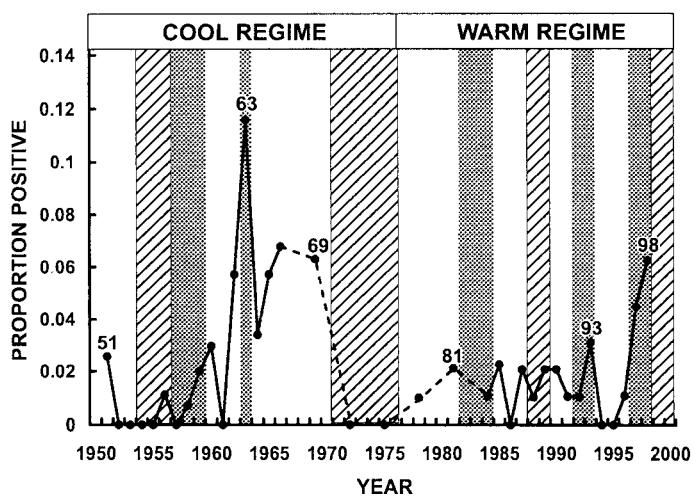
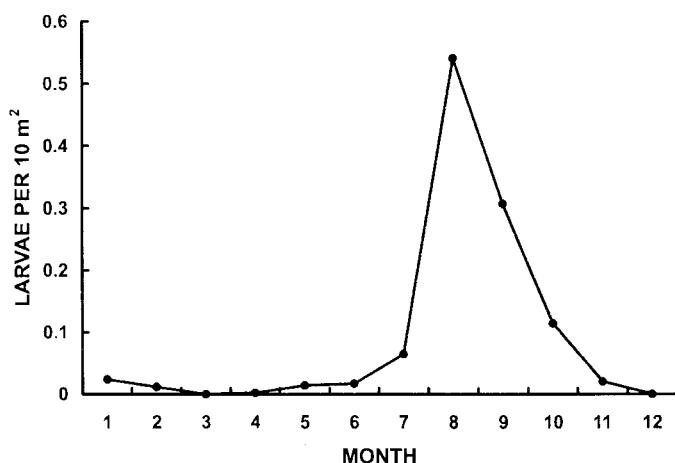
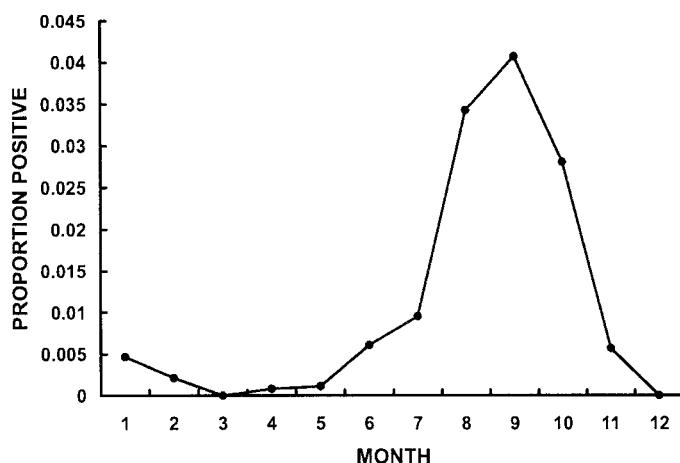
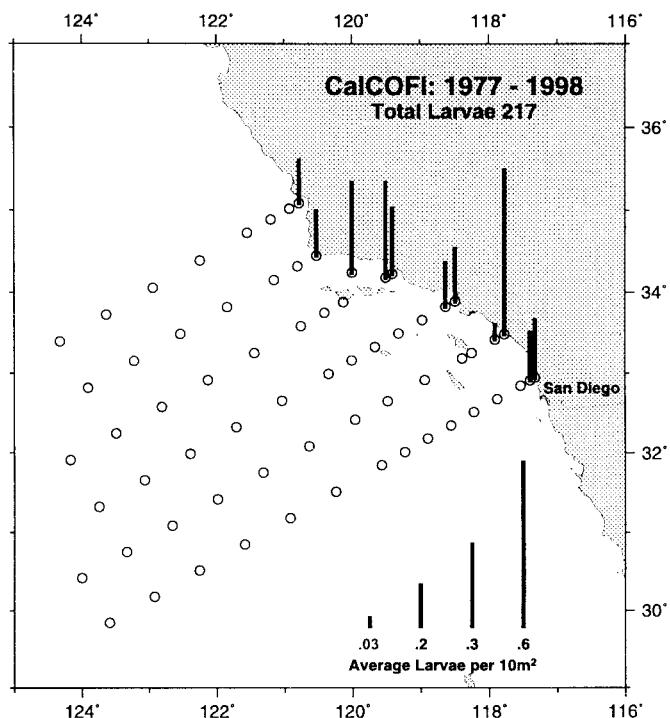
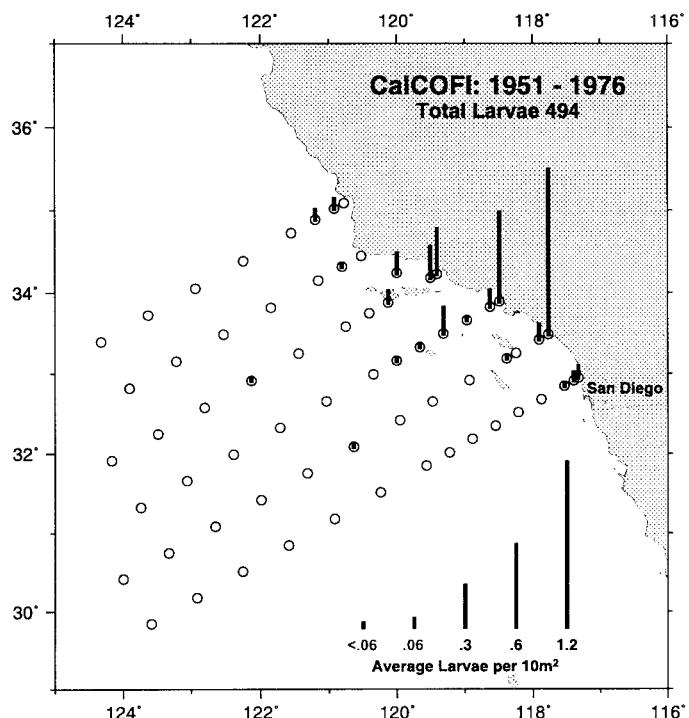
## *Scopelosaurus* spp.



*Ophidion scrippsae*

Basketweave cusk-eel

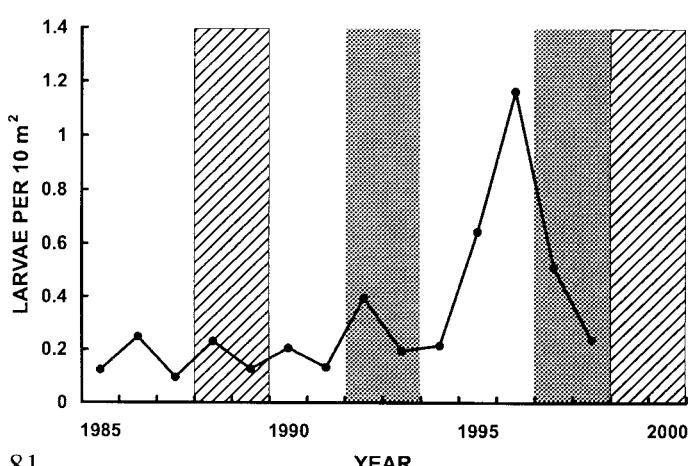
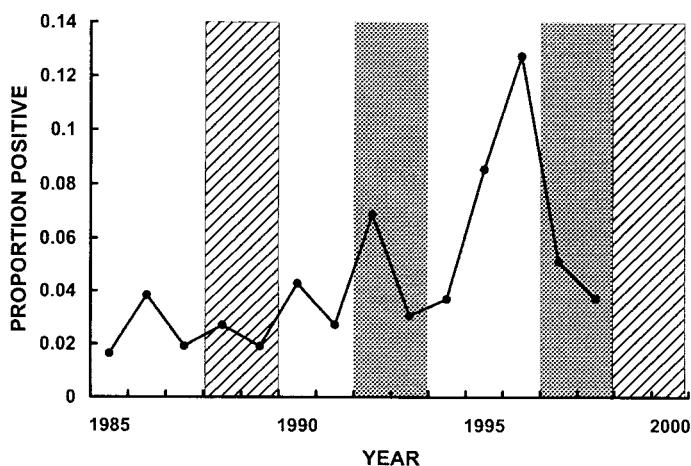
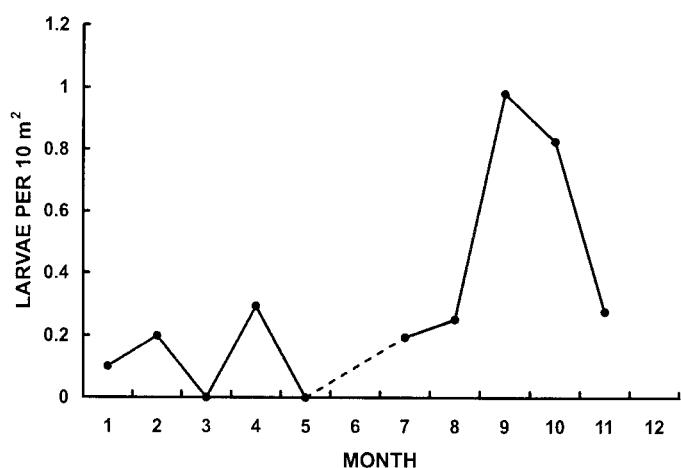
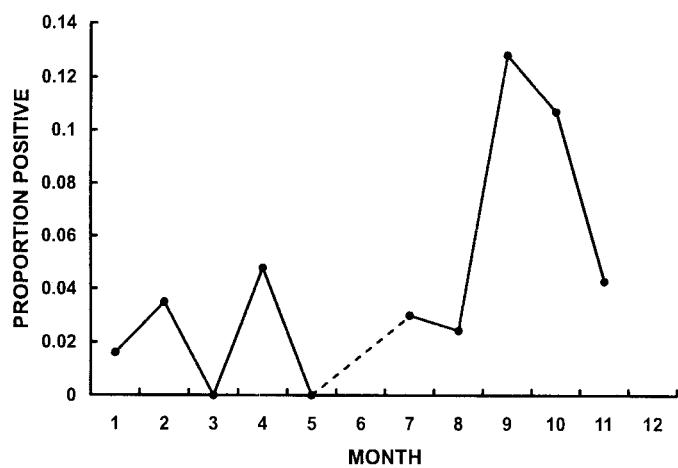
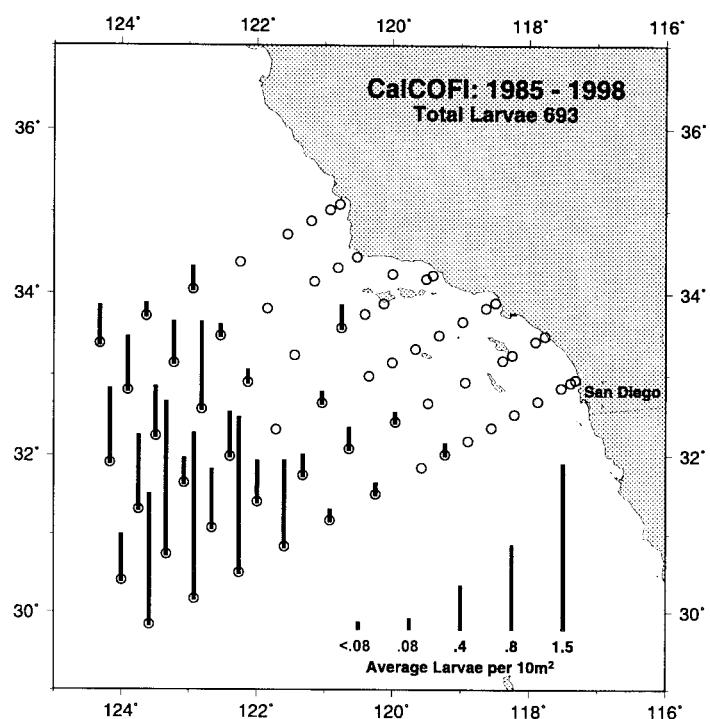
OPHIDIIDAE



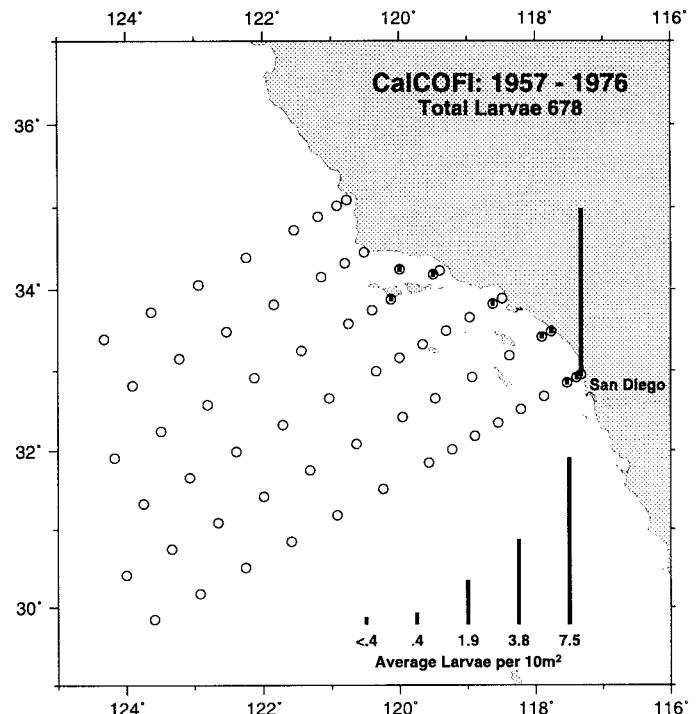
## GONOSTOMATIDAE

## Benttooth bristlemouth

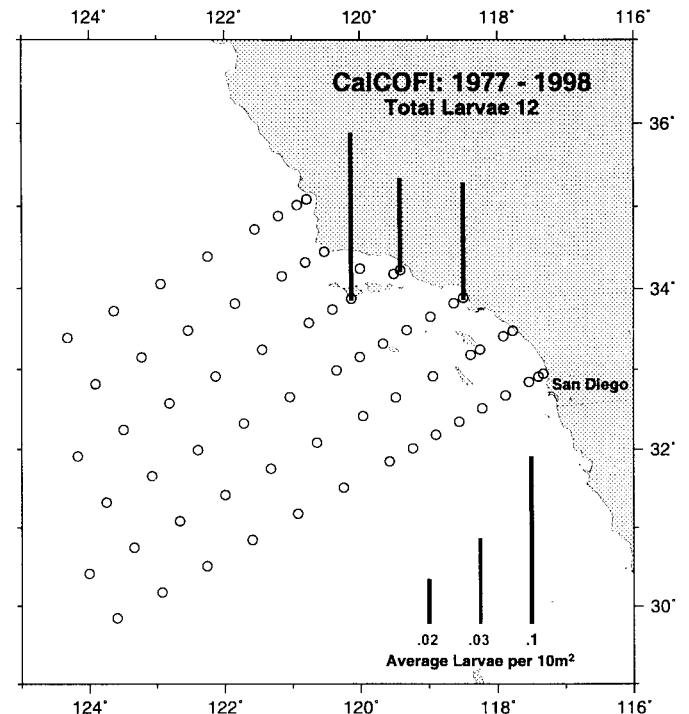
## *Cyclothetae acclinidens*



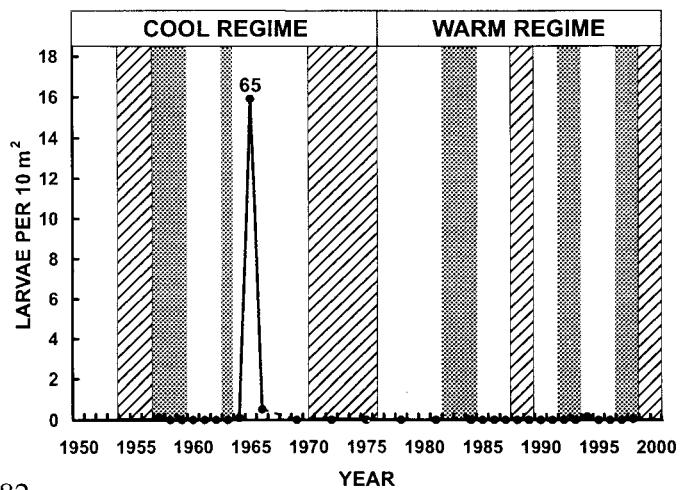
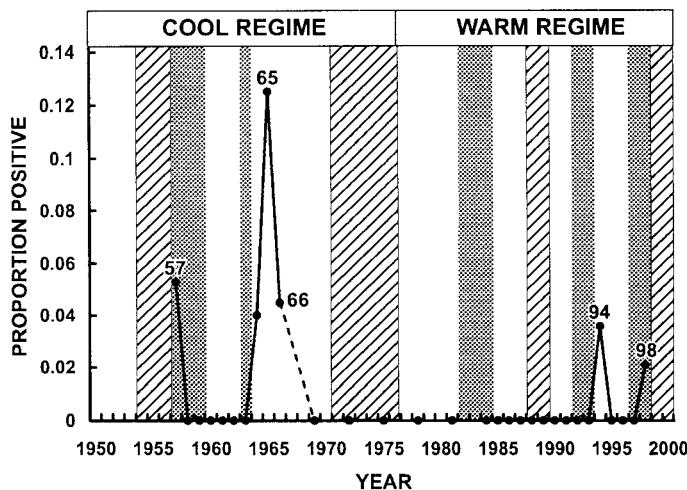
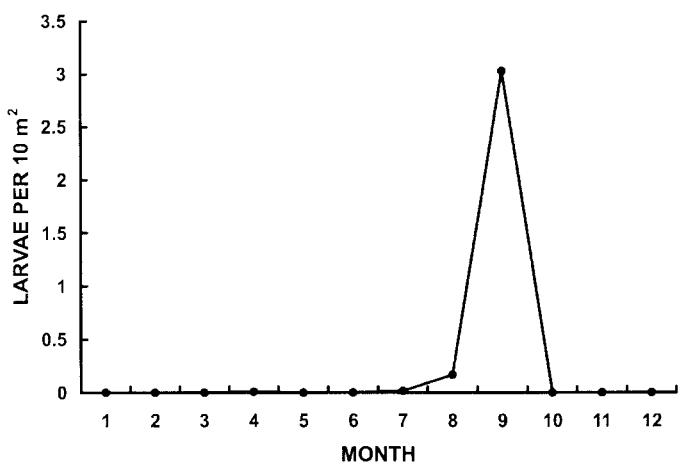
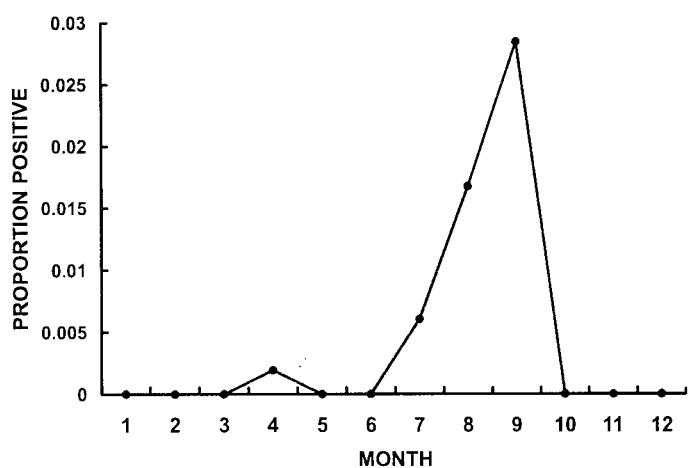
*Hypsypops rubicundus*



Garibaldi



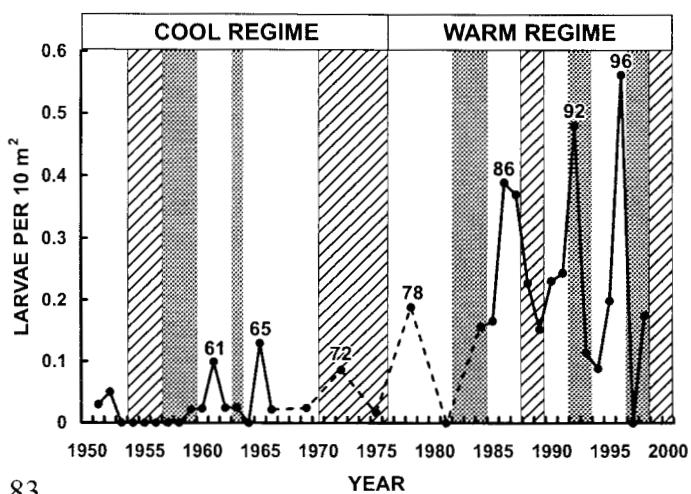
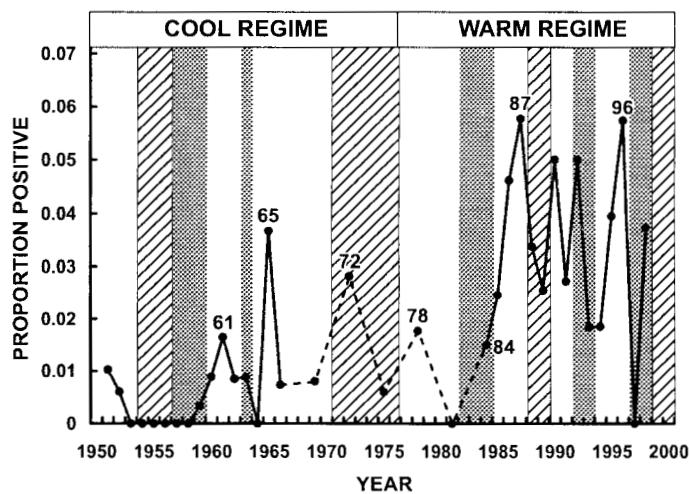
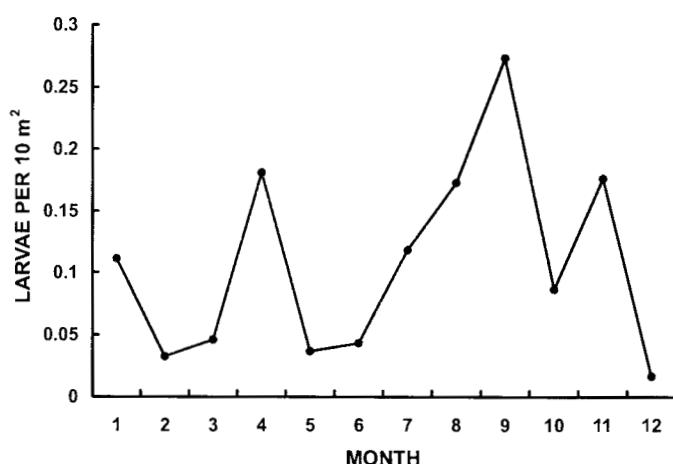
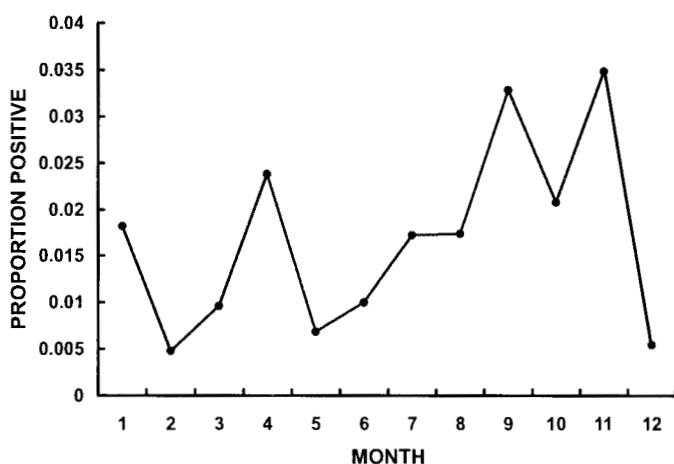
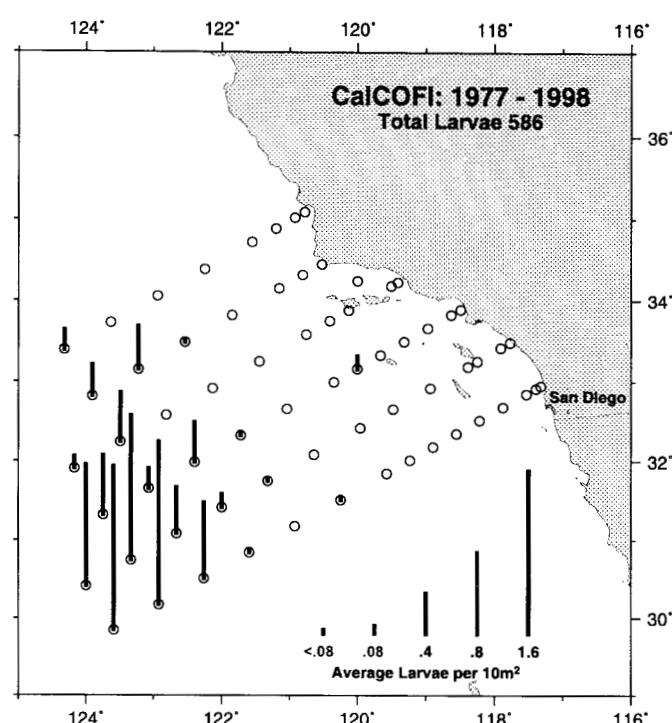
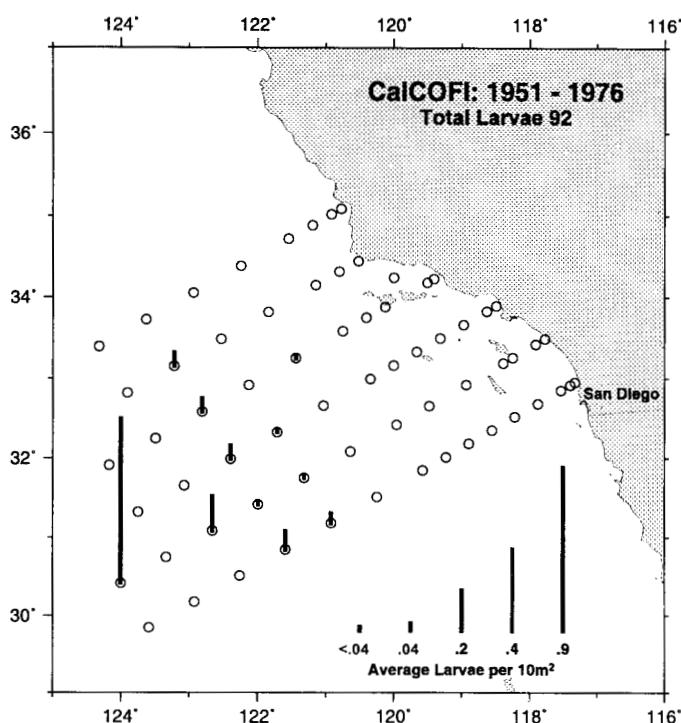
POMACENTRIDAE



## MYCTOPHIDAE

## Topside lampfish

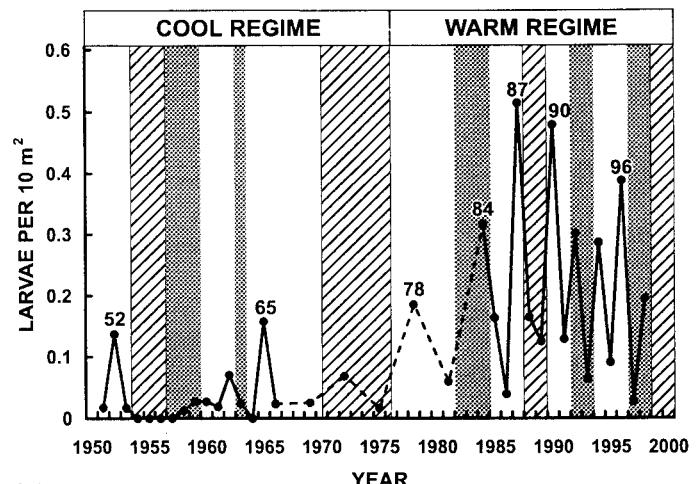
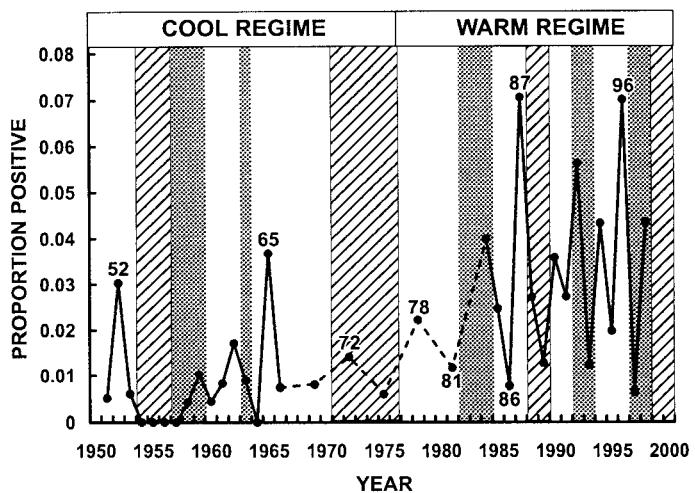
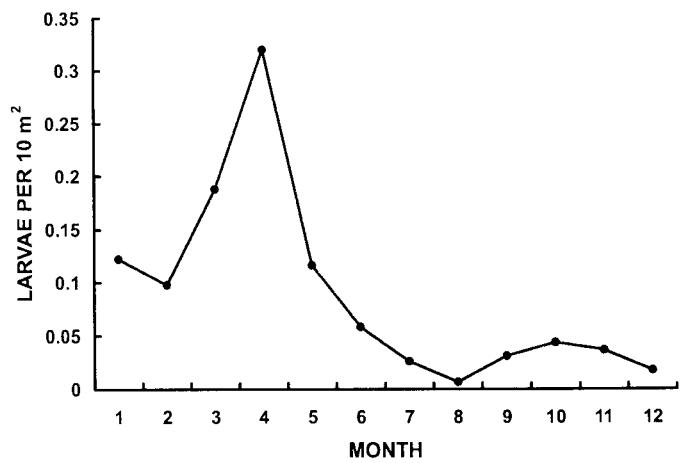
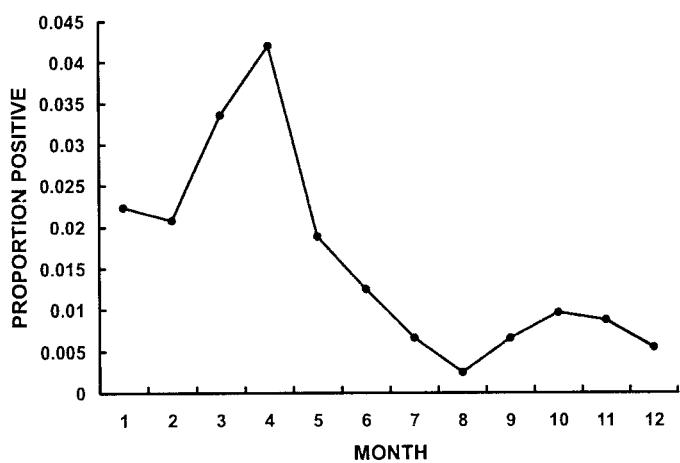
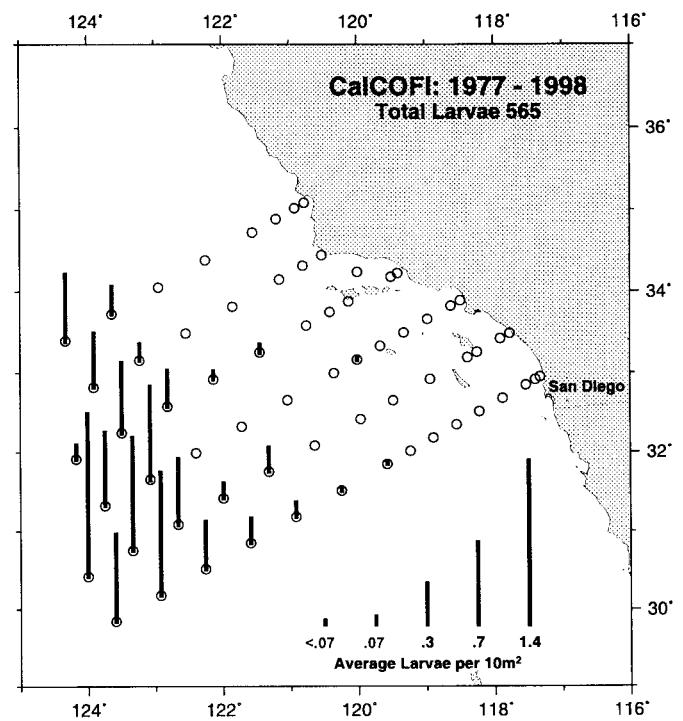
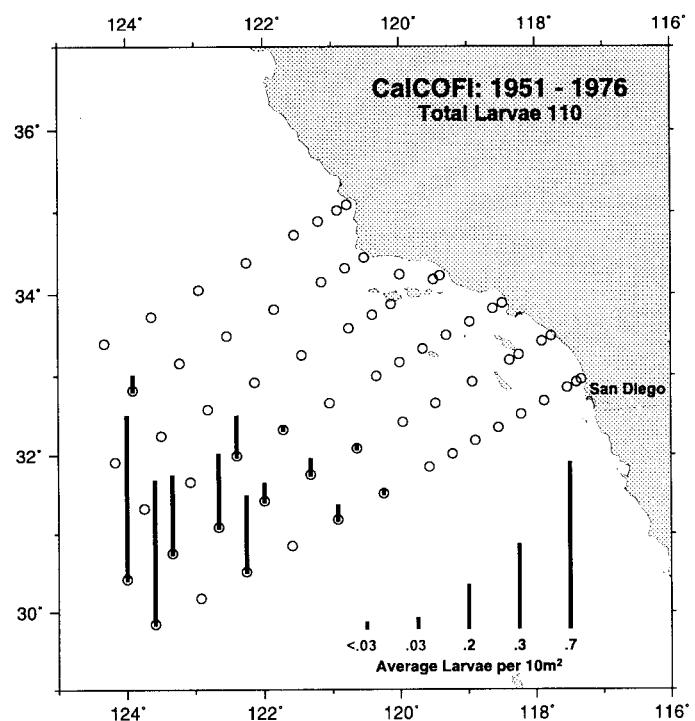
## *Notolychnus valdiviae*



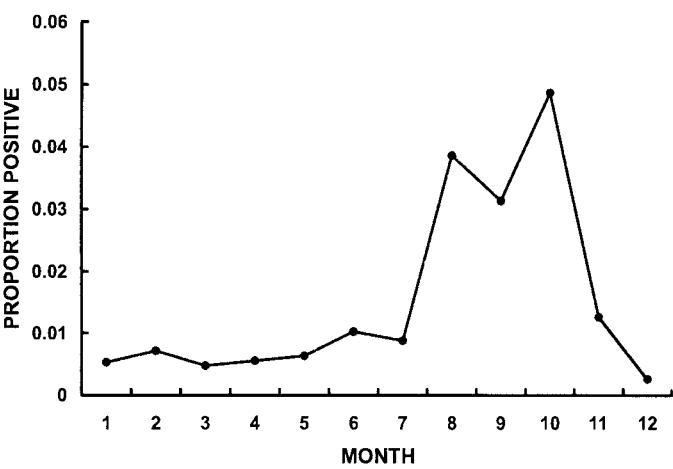
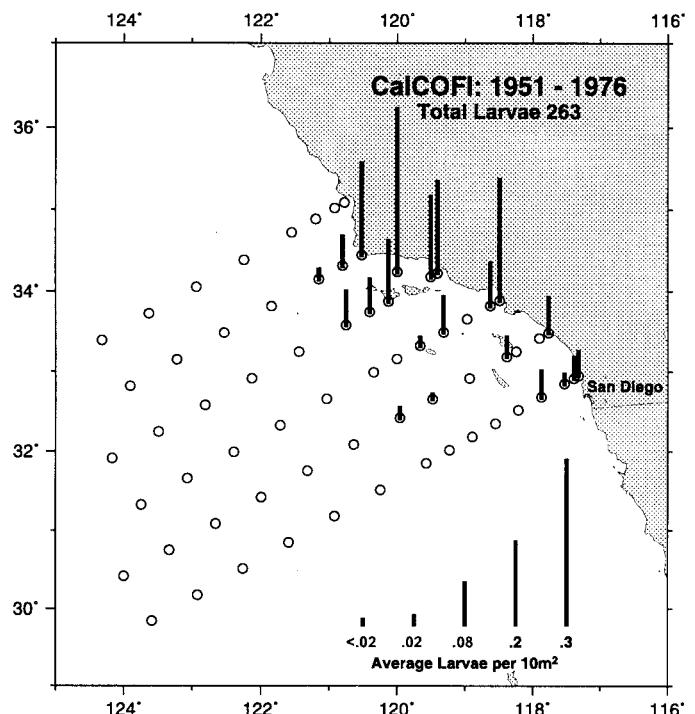
*Aristostomias scintillans*

Shining loosejaw

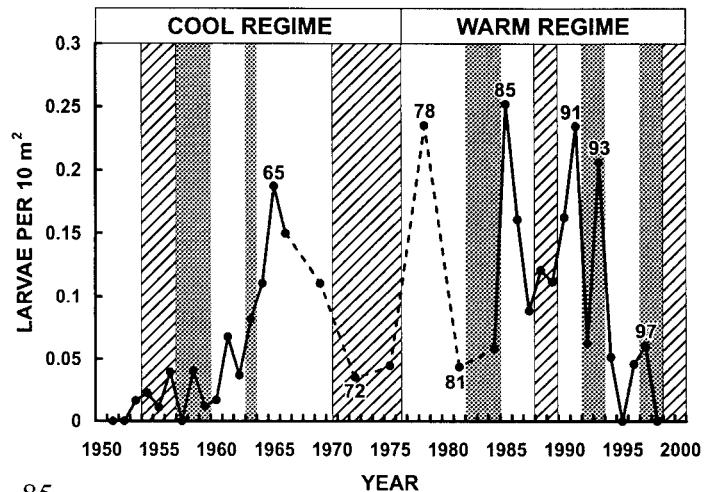
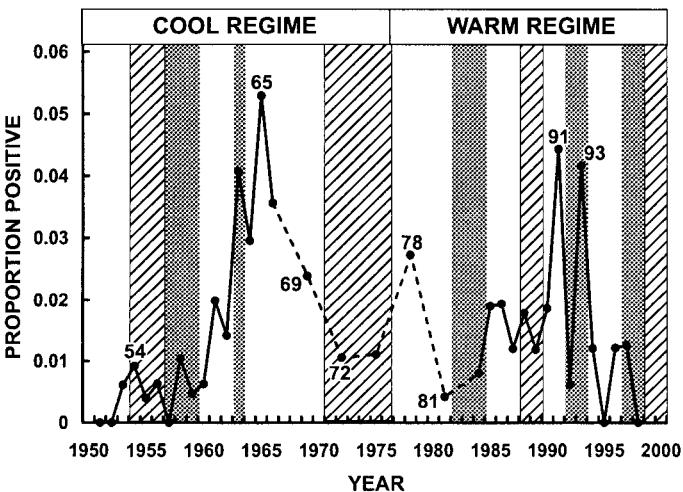
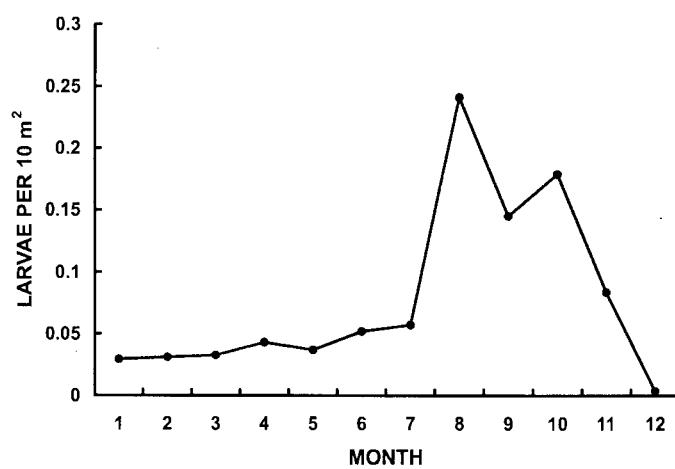
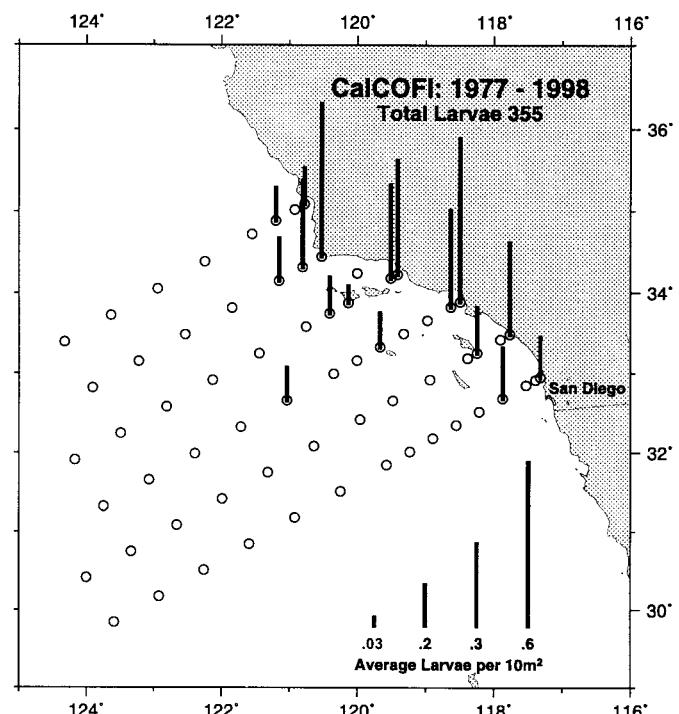
STOMIIDAE



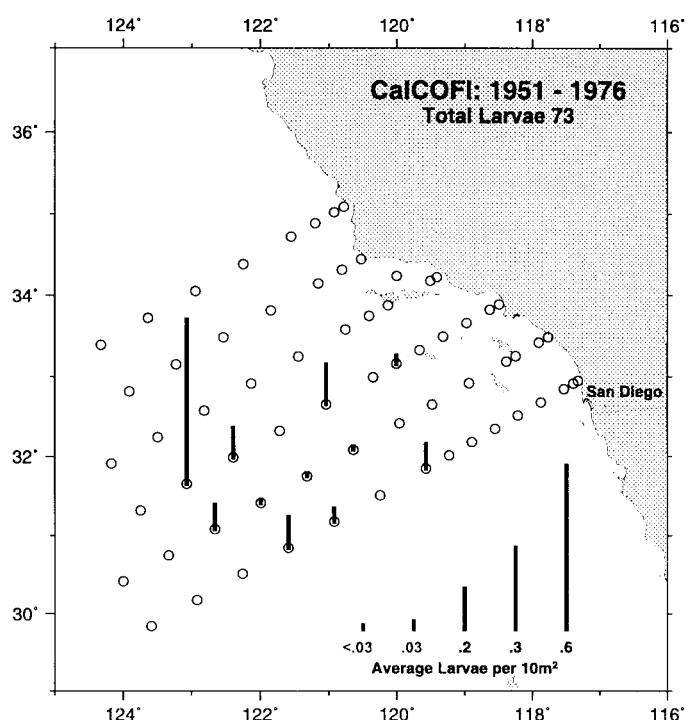
## PARALICHTHYIDAE



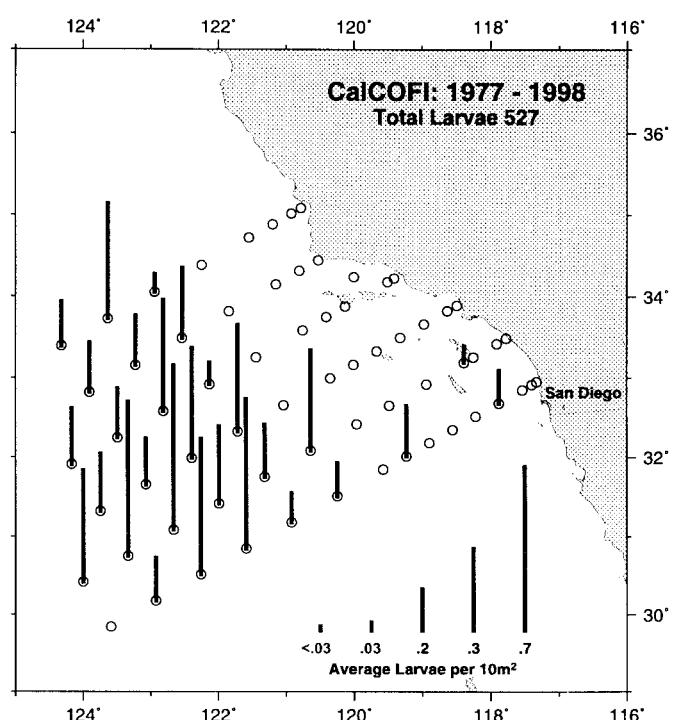
## Bigmouth sole



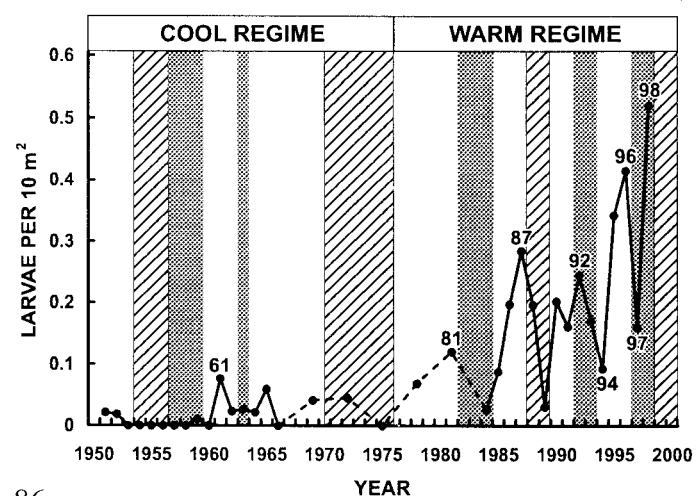
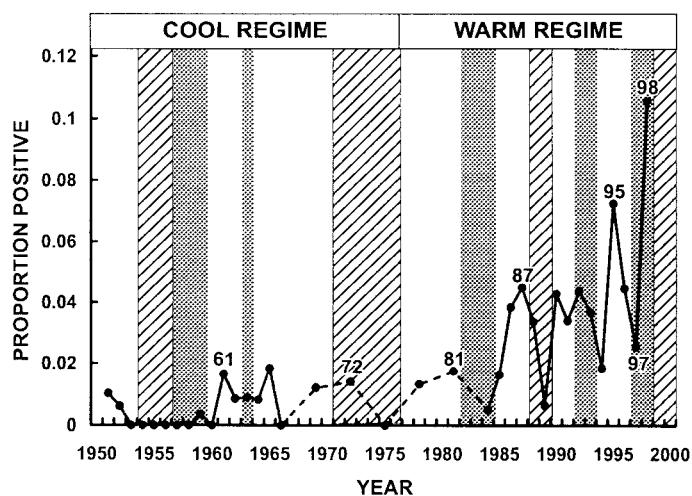
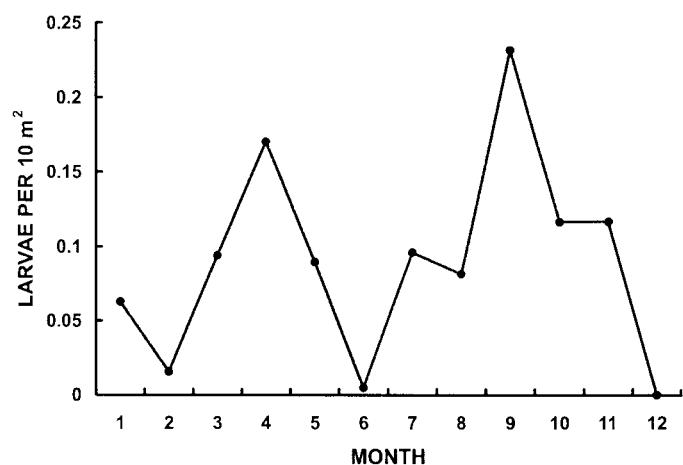
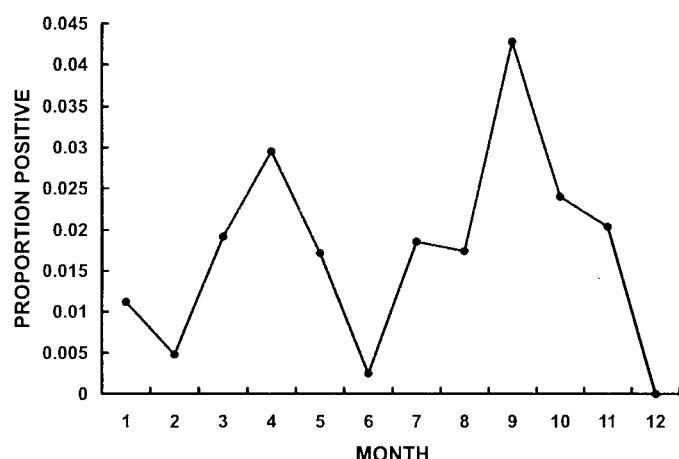
*Chiasmodon niger*



Black swallower



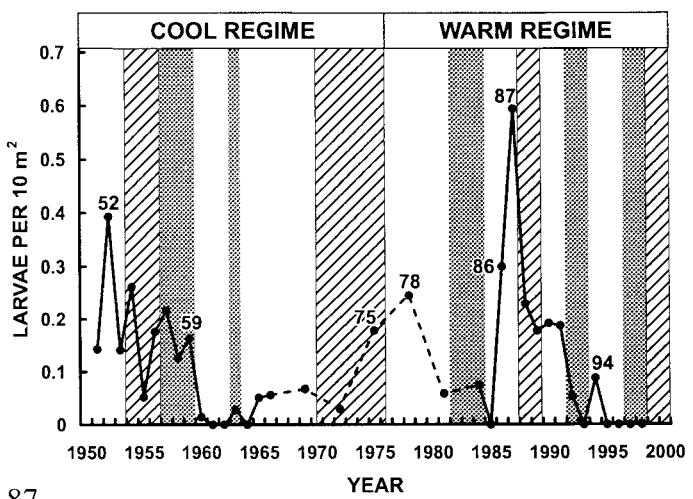
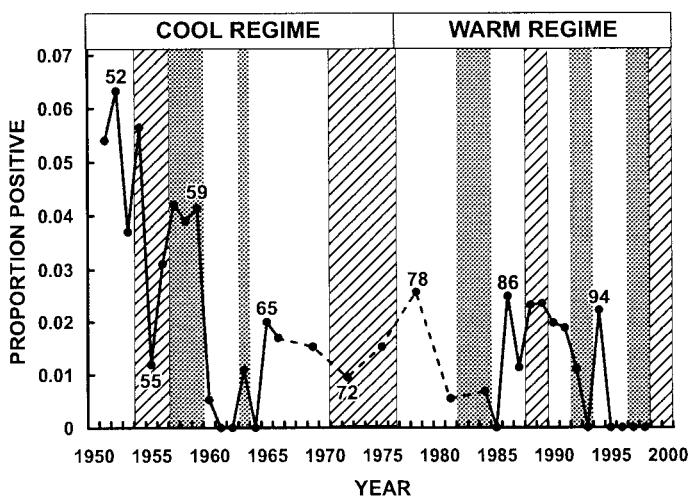
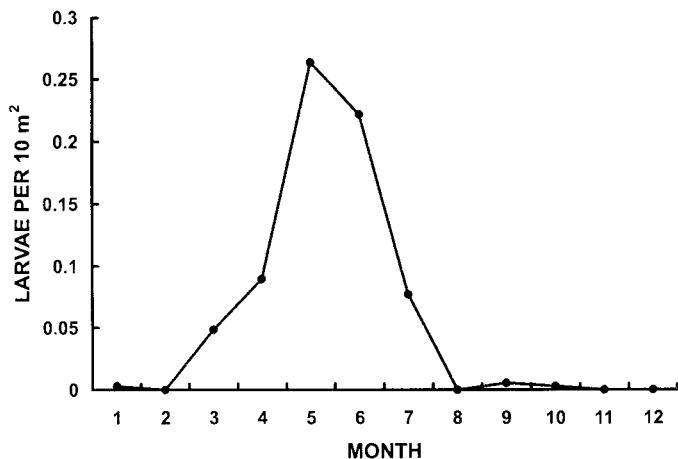
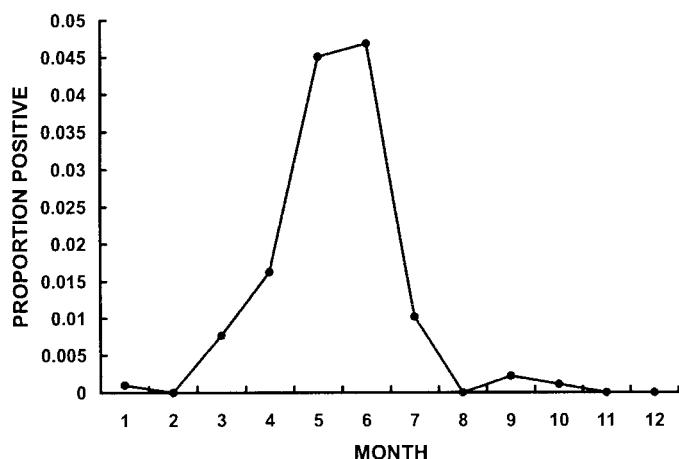
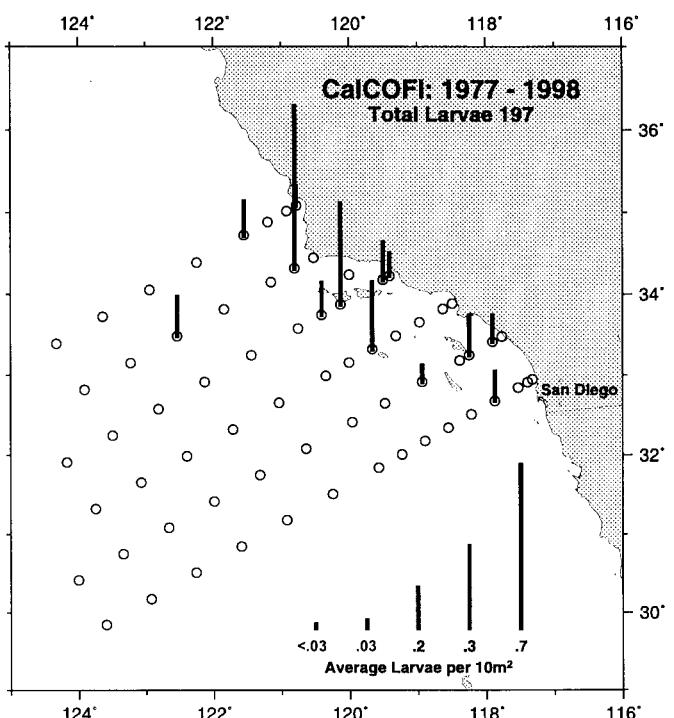
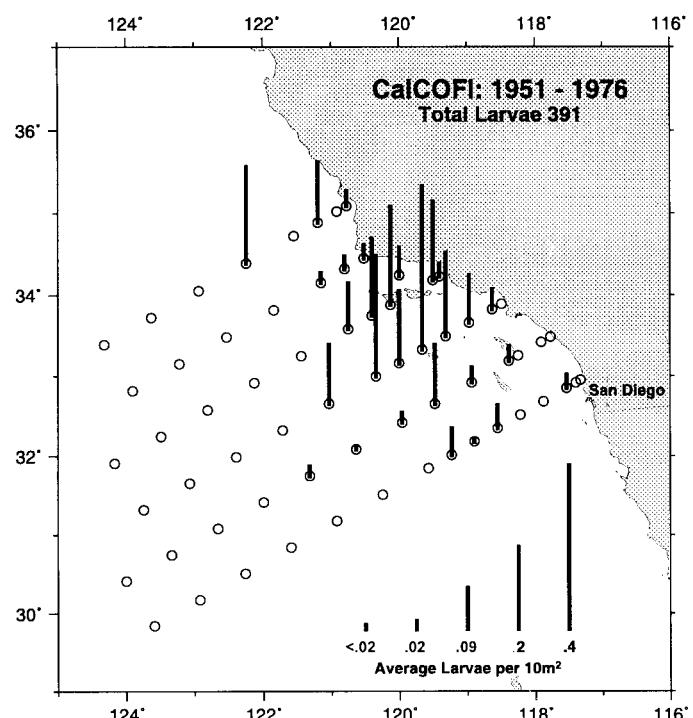
CHIASMODONTIDAE



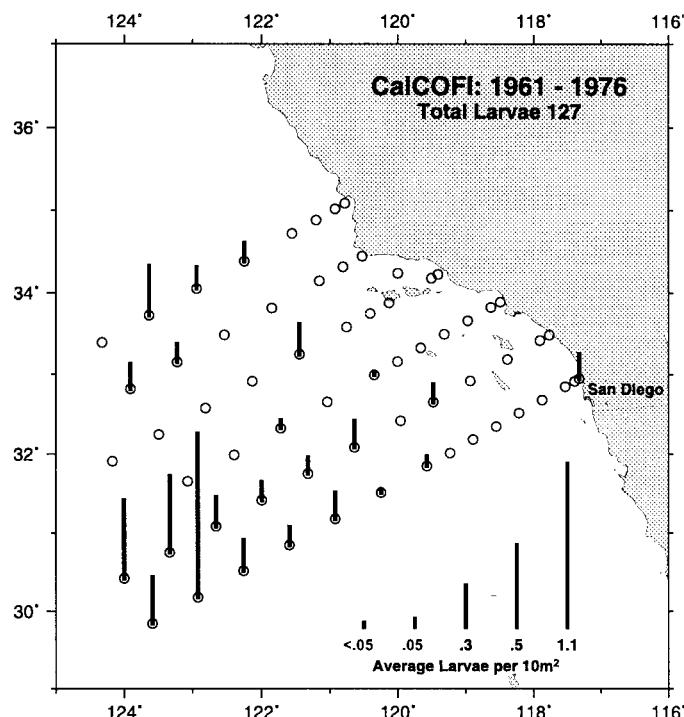
## BYTHITIDAE

## Red brotula

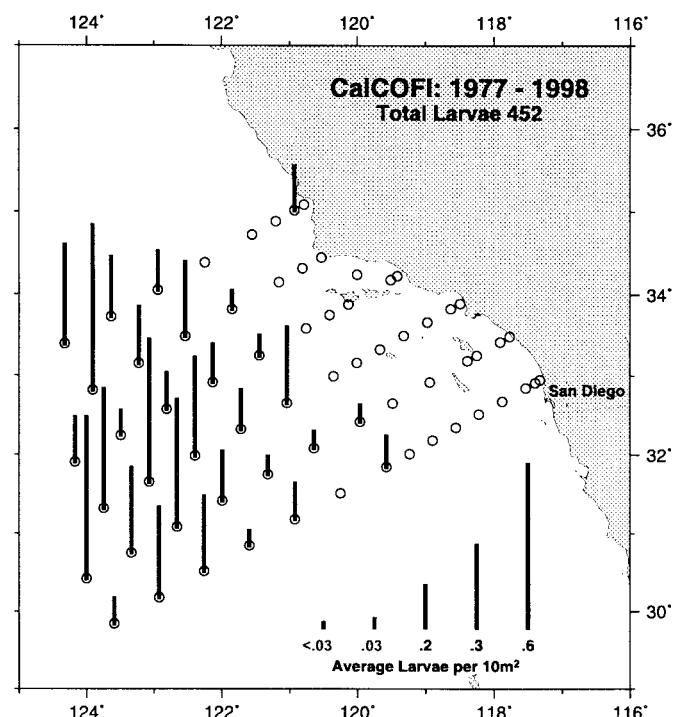
## *Brosmophycis marginata*



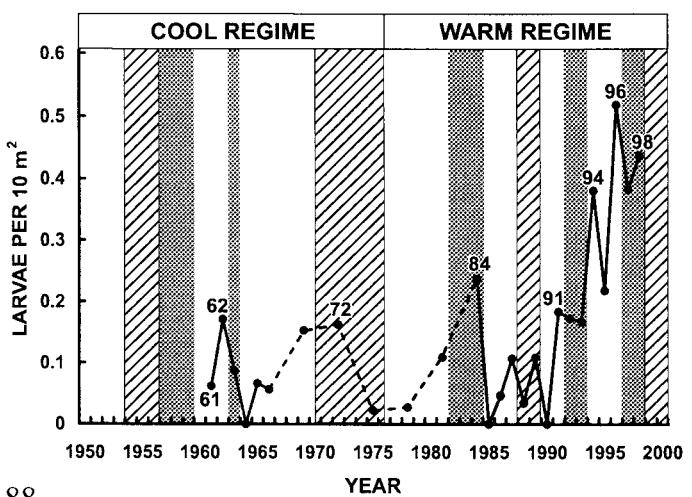
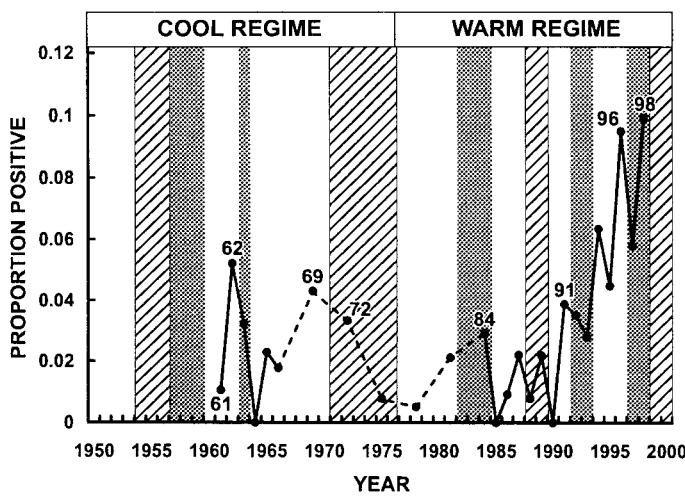
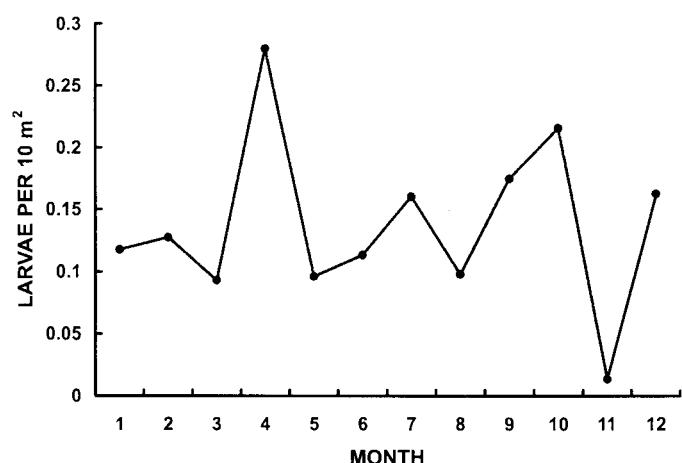
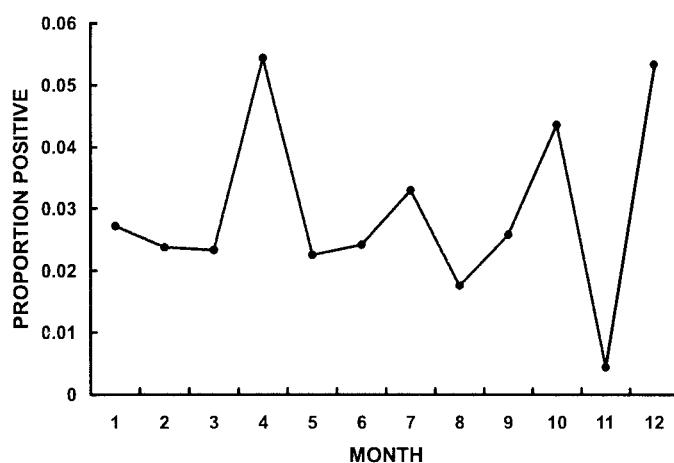
*Arctozenus risso*



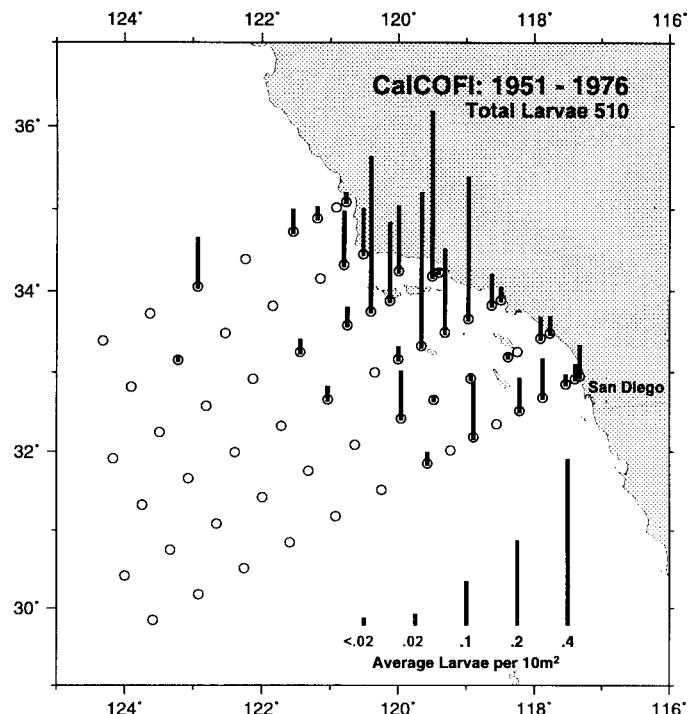
Ribbon barracudina



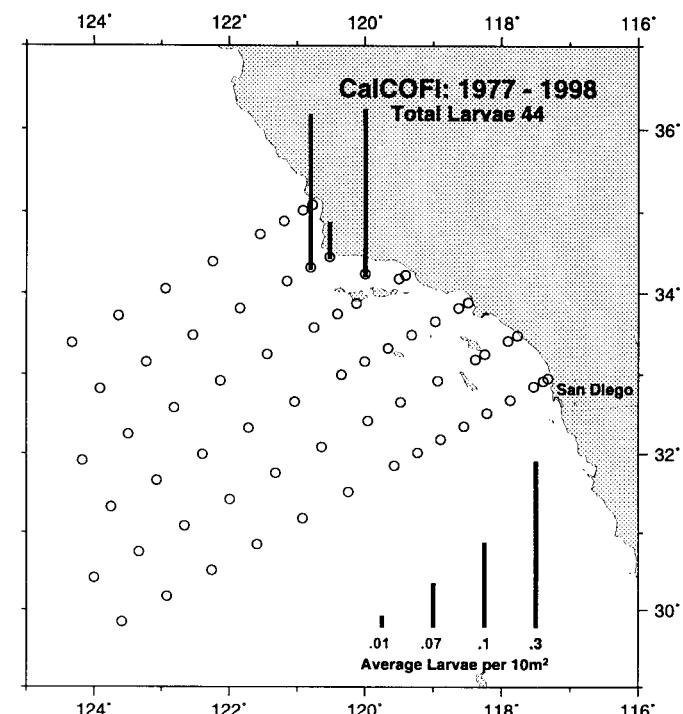
PARALEPIDIDAE



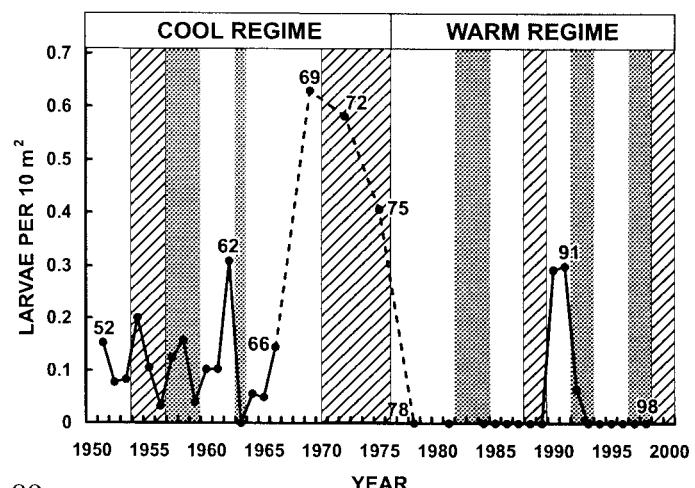
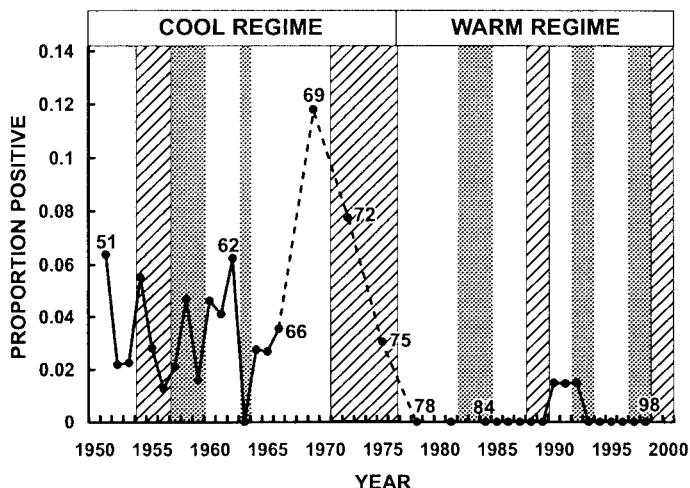
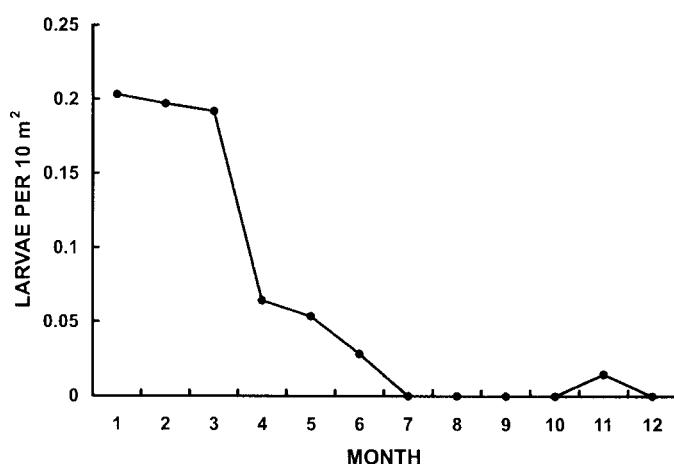
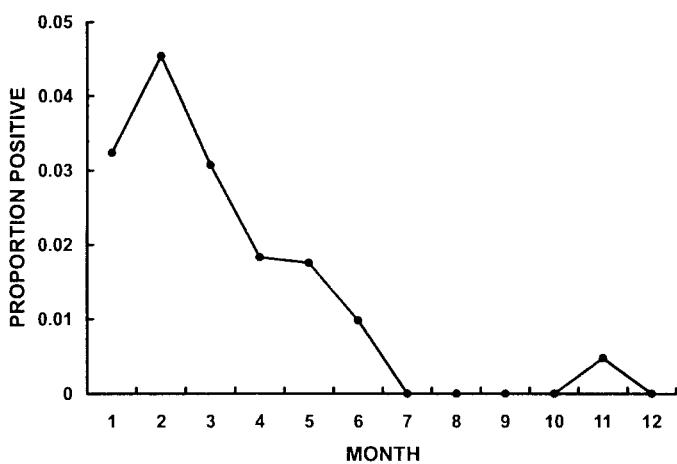
## SEBASTIDAE



## Cowcod



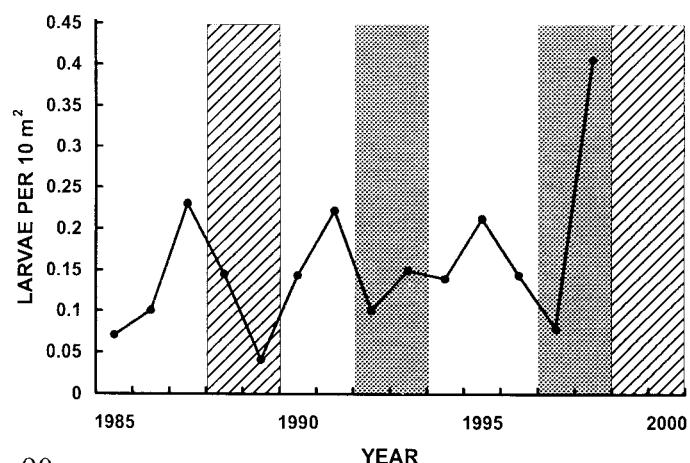
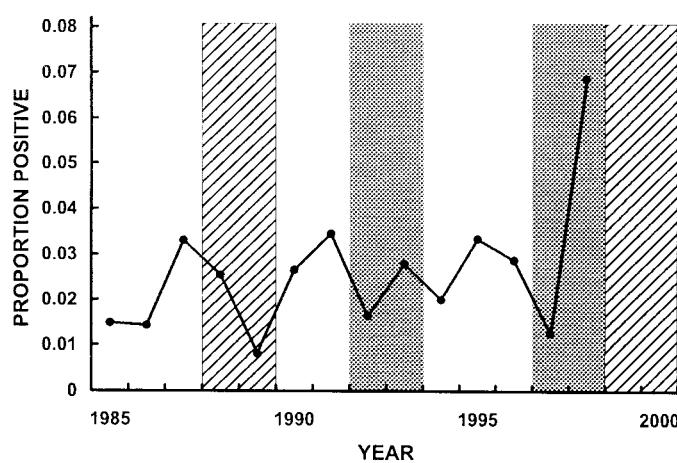
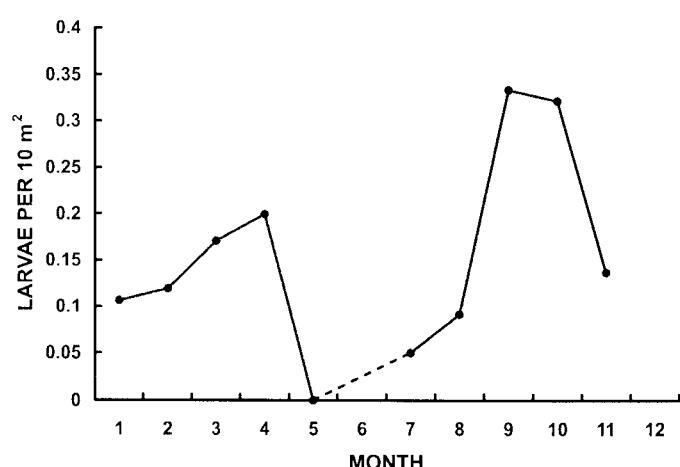
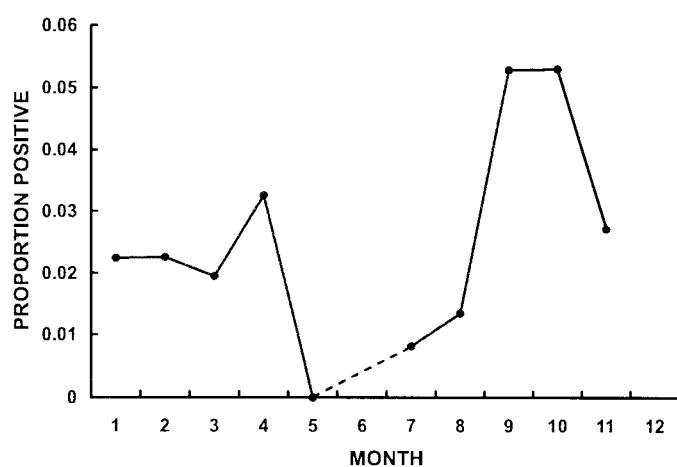
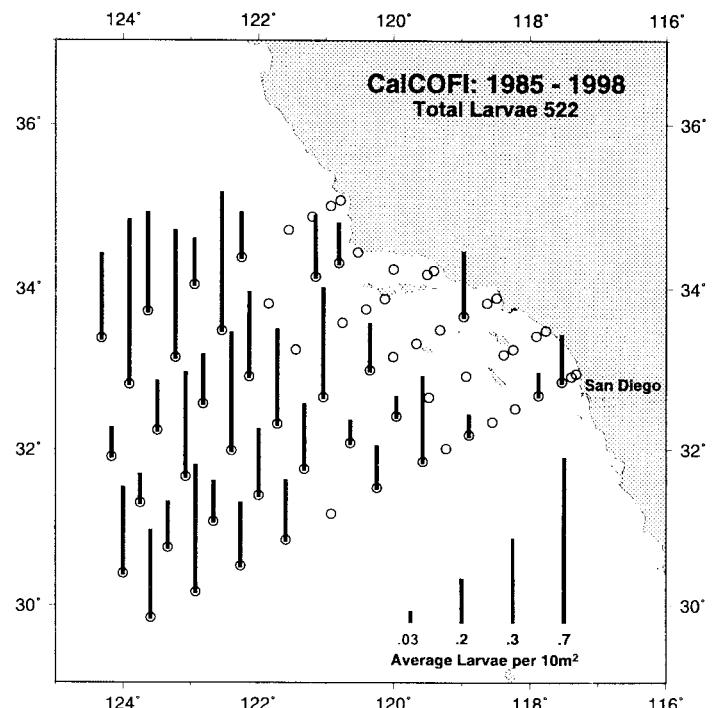
## *Sebastes levis*



*Argyropelecus hemigymnus*

Spurred hatchetfish

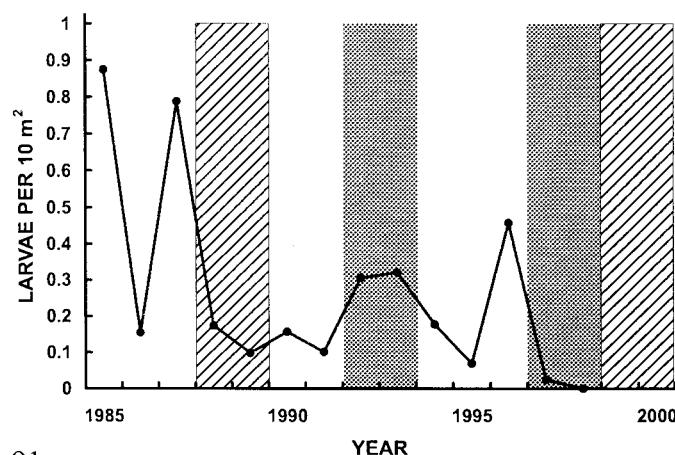
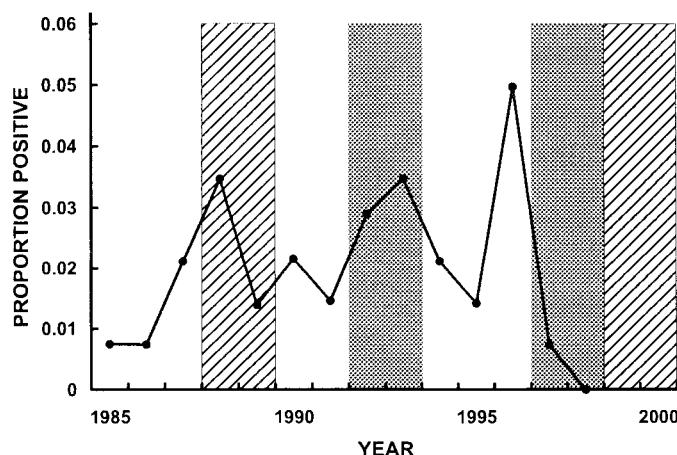
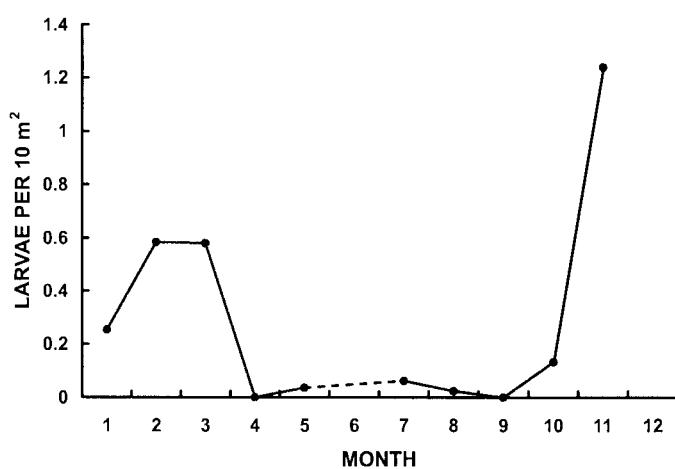
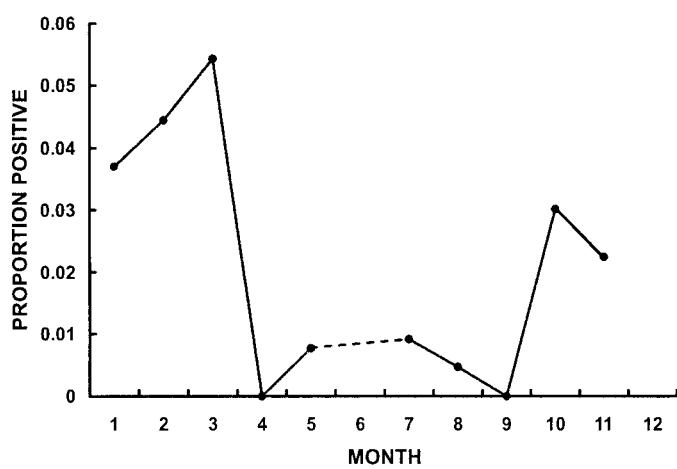
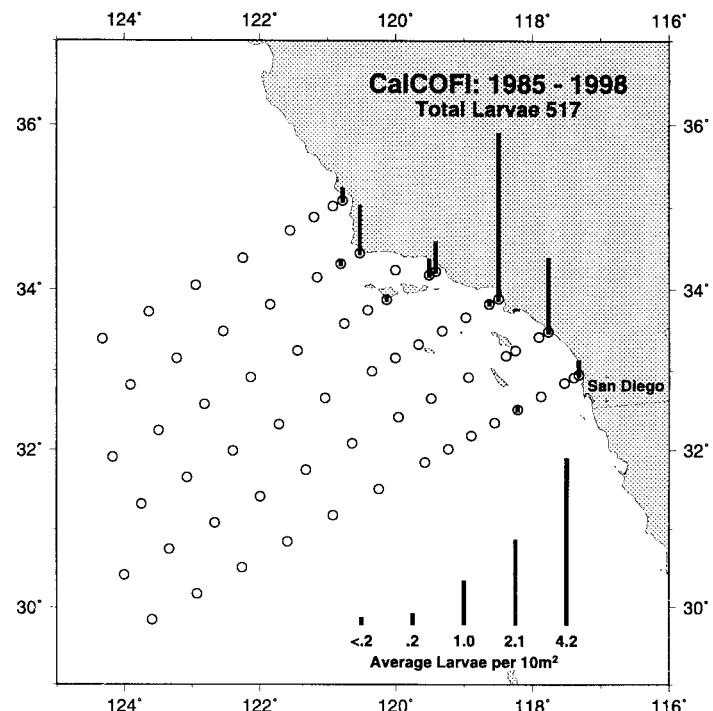
STERNOPTYCHIDAE



## GOBIIDAE

## Bay goby

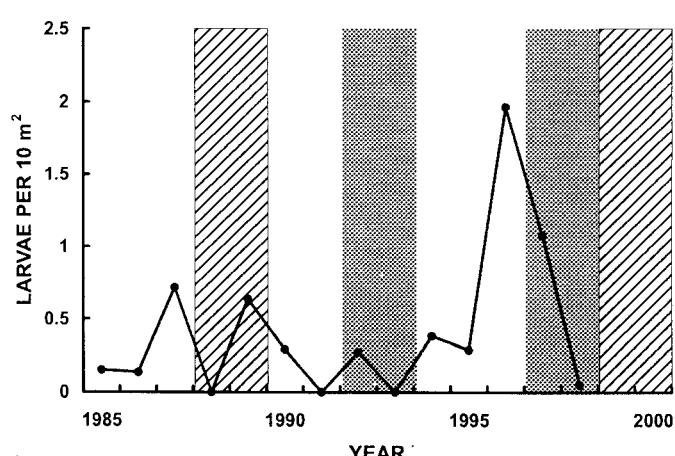
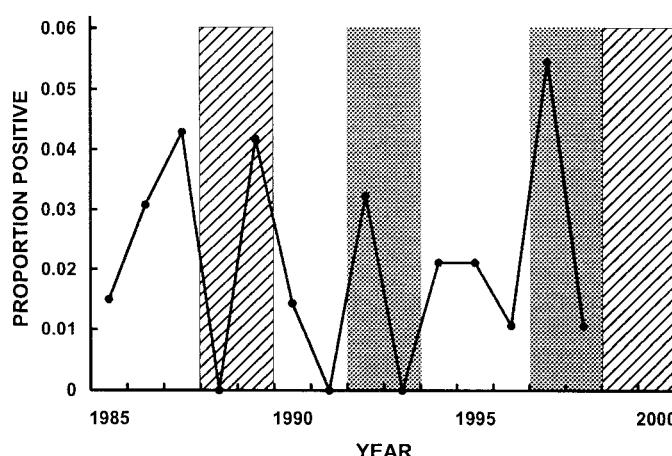
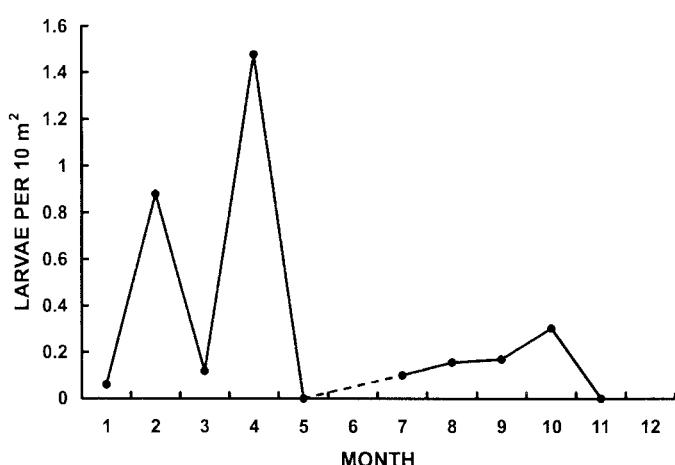
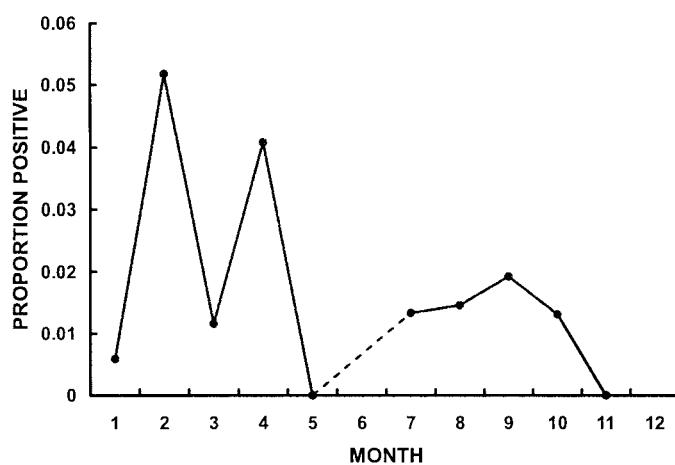
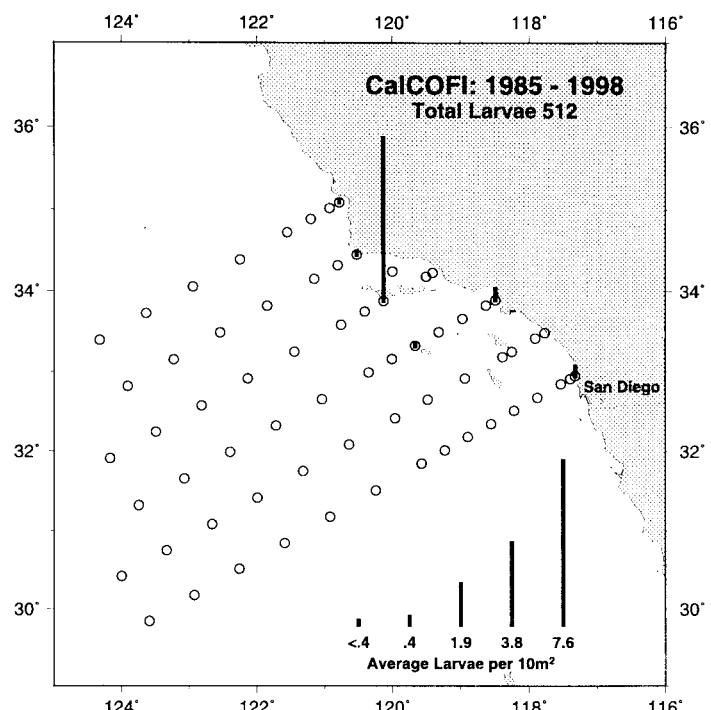
## *Lepidogobius lepidus*



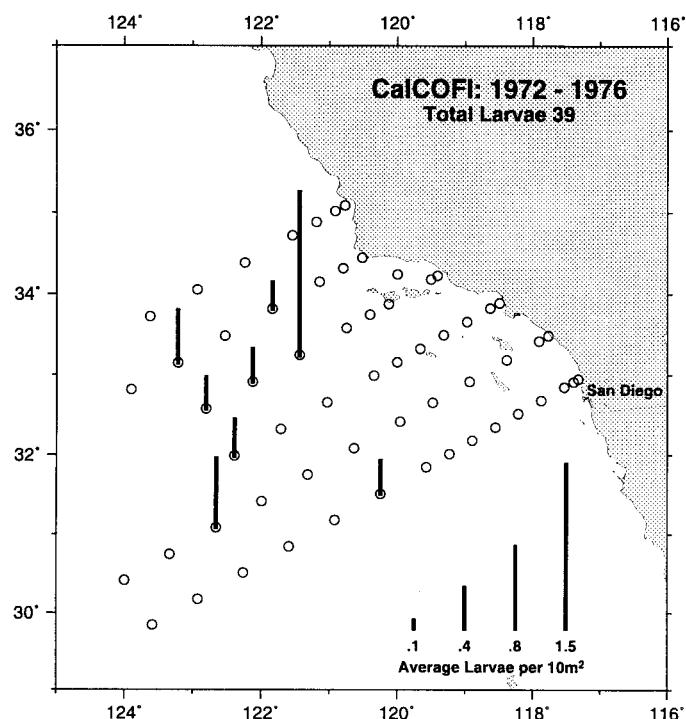
*Icelinus quadriseriatus*

Yellowchin sculpin

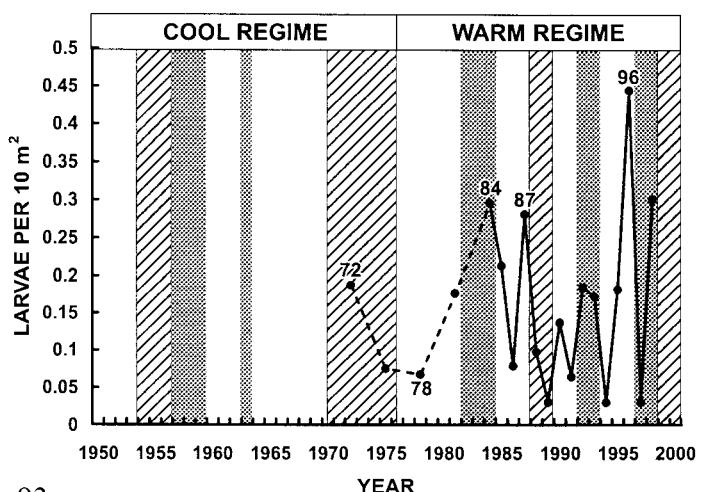
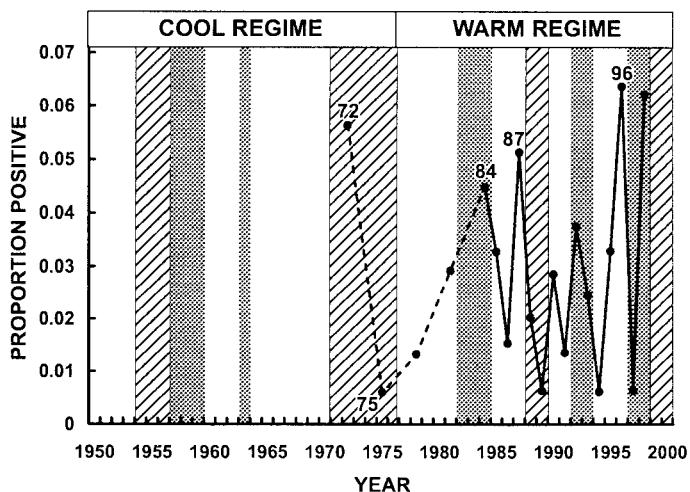
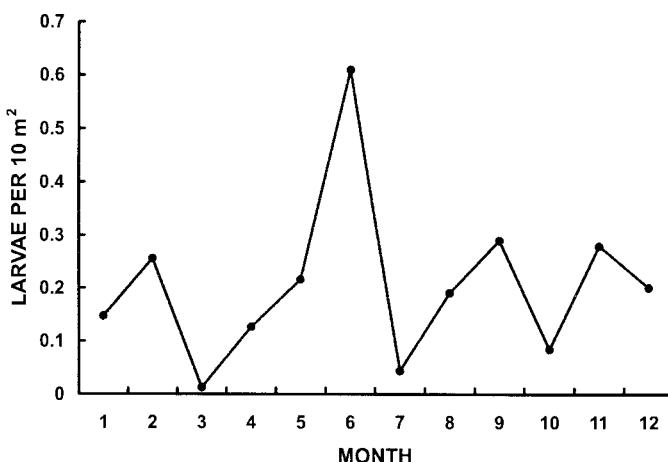
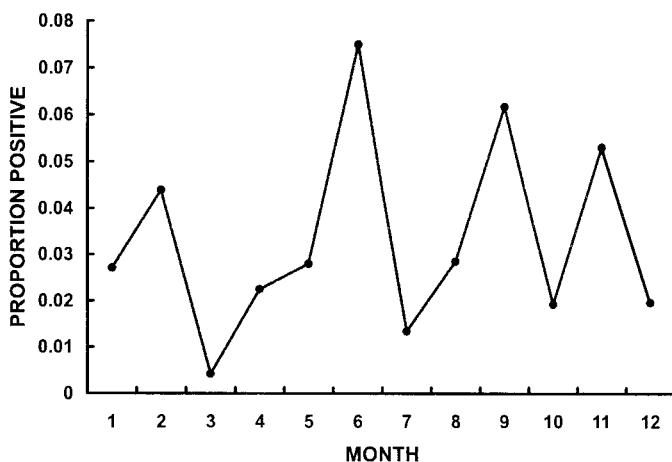
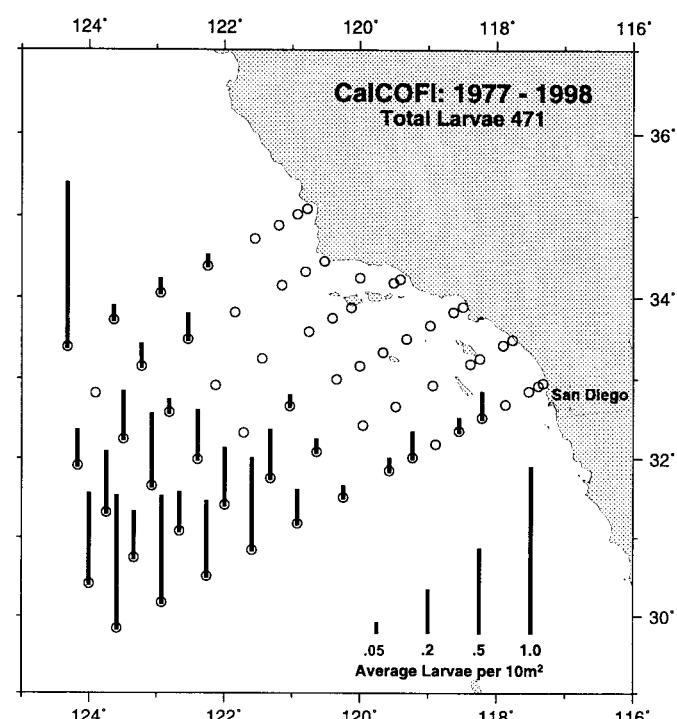
COTTIDAE



## SCOPELARCHIDAE



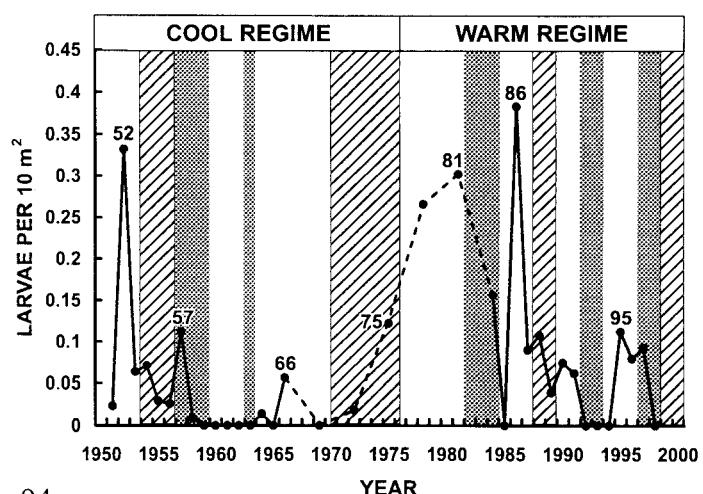
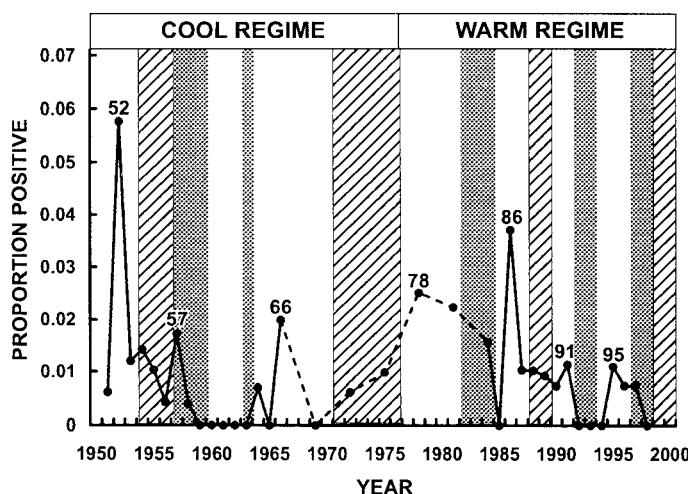
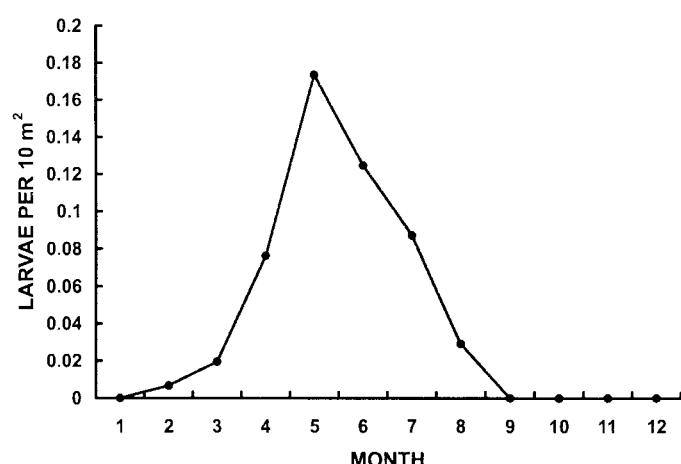
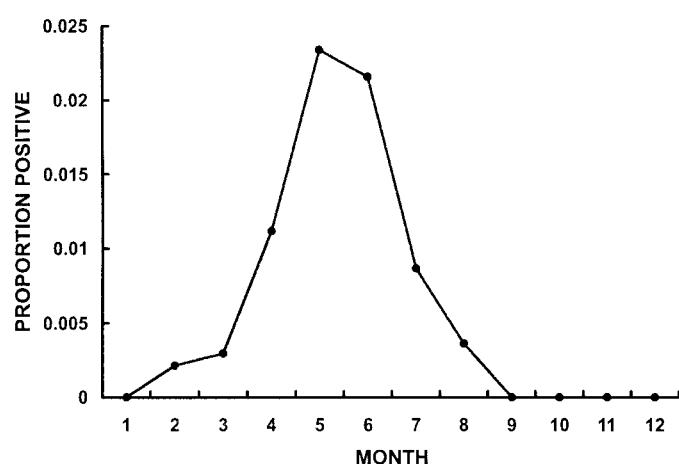
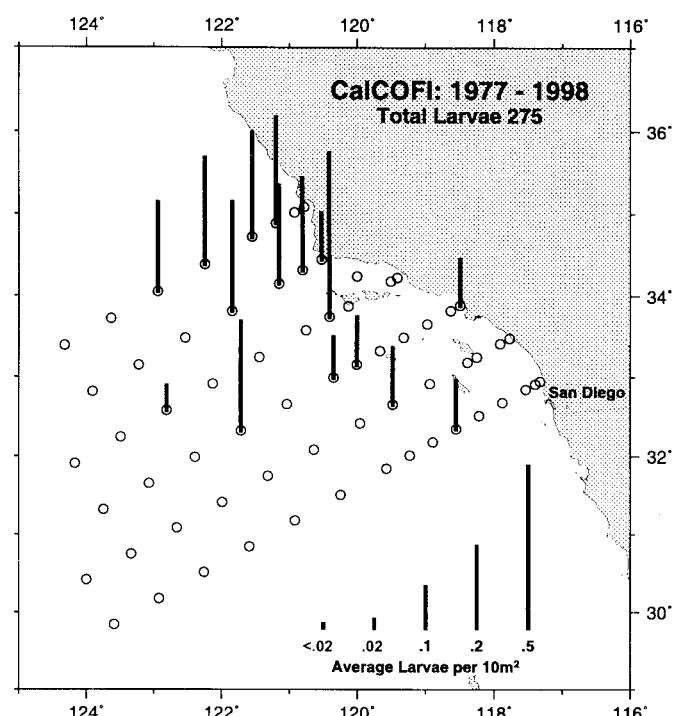
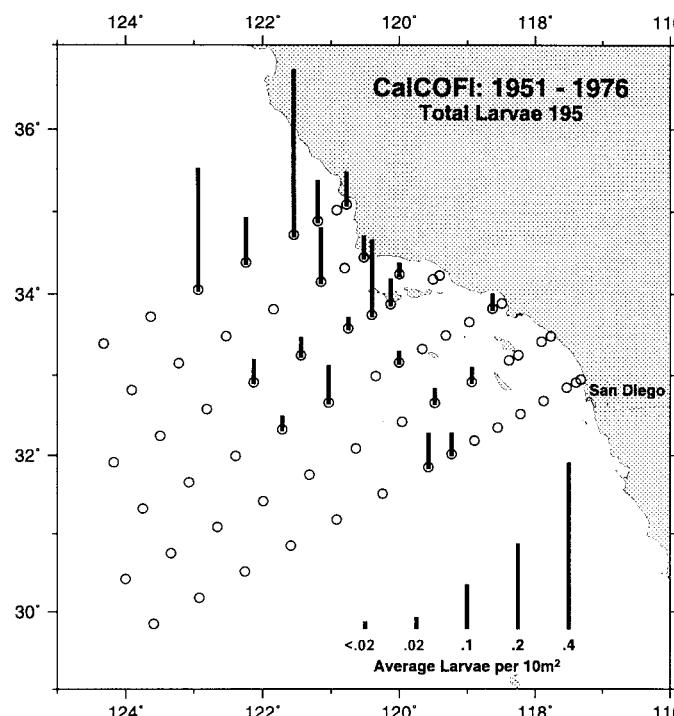
## Pearleyes



*Glyptocephalus zachirus*

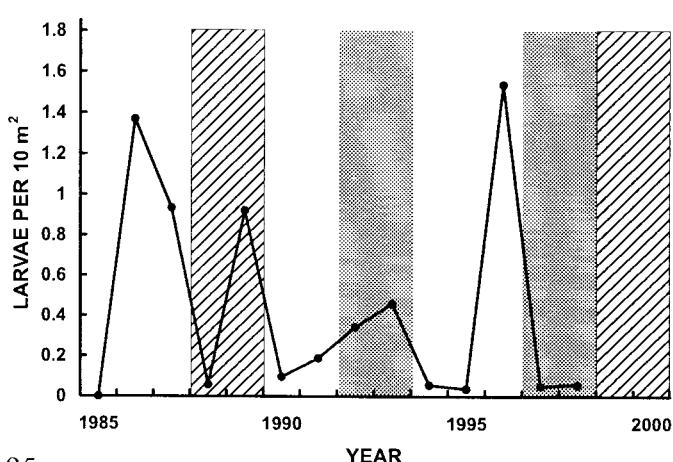
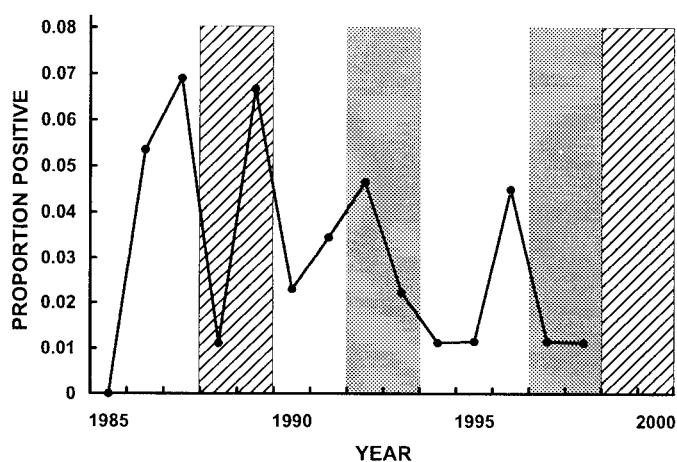
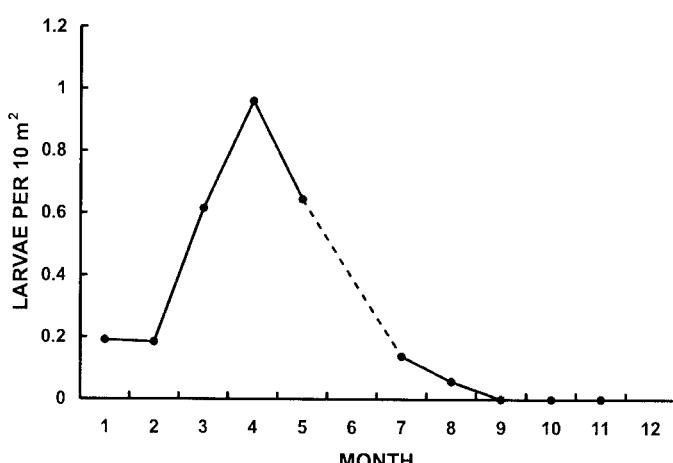
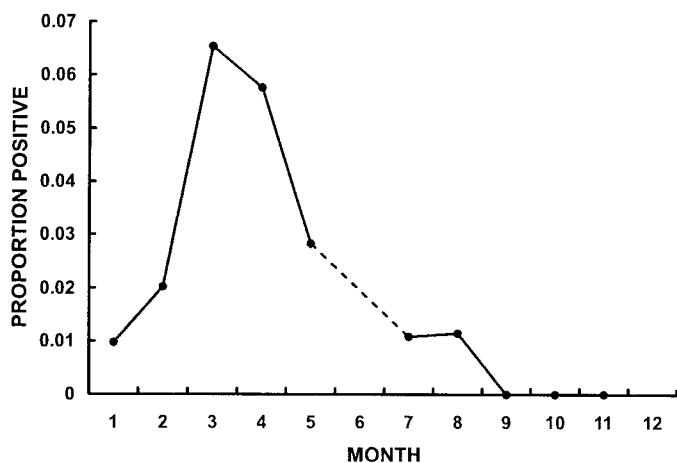
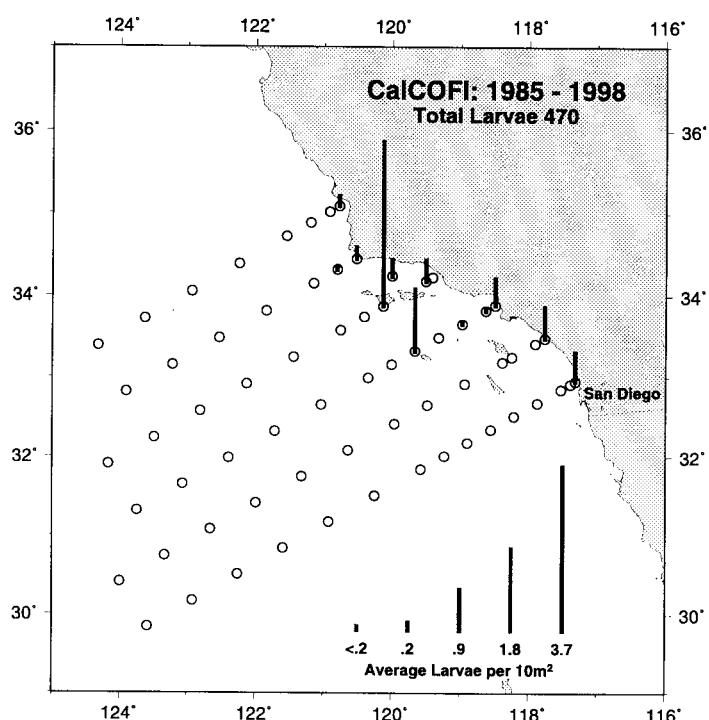
Rex sole

PLEURONECTIDAE



## COTTIDAE

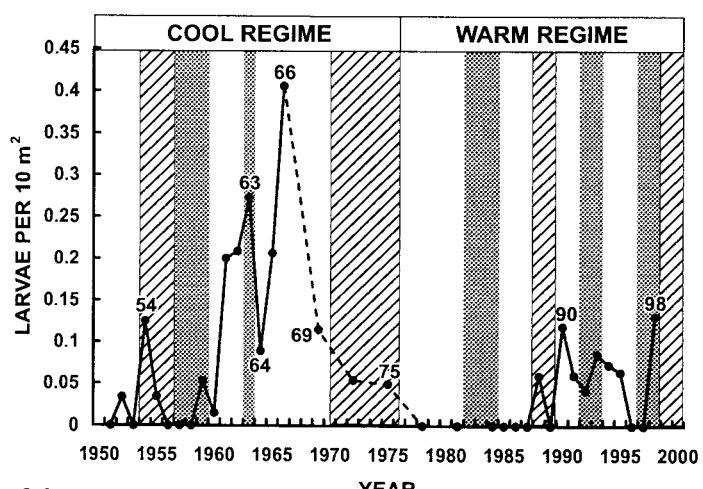
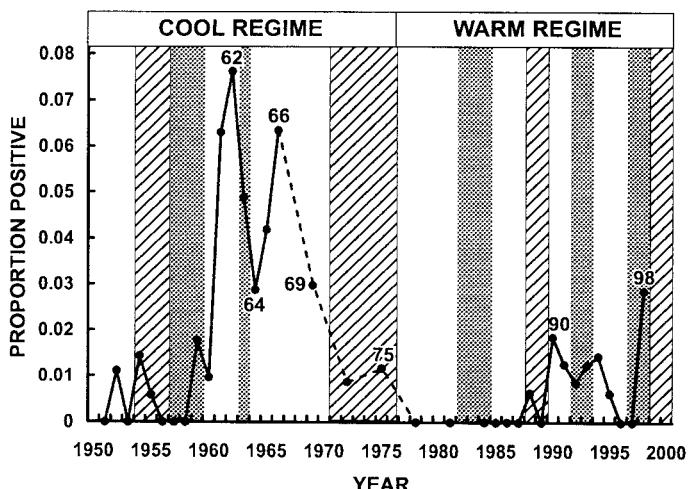
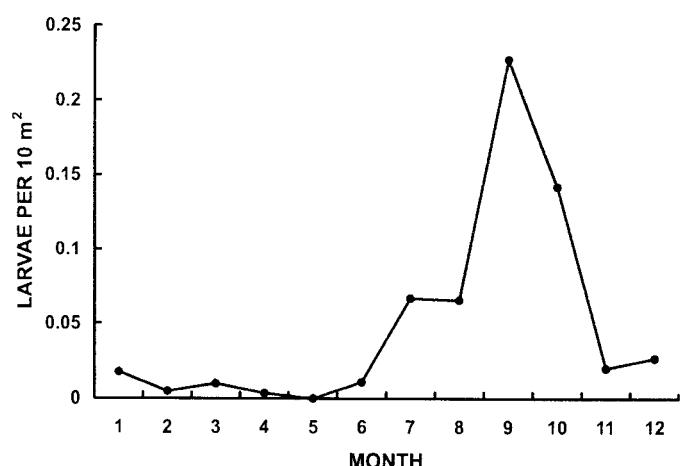
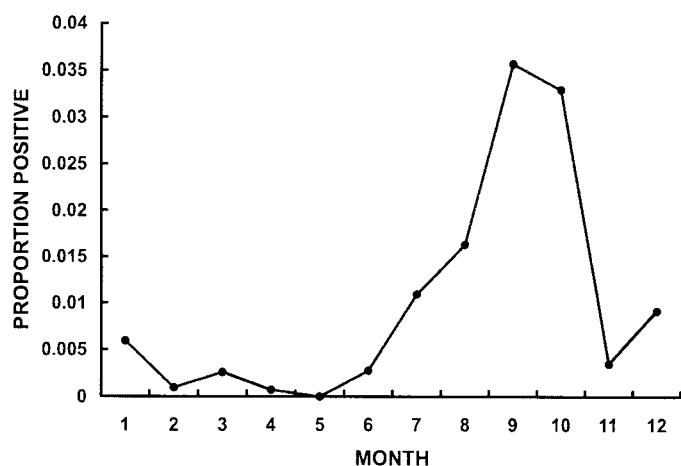
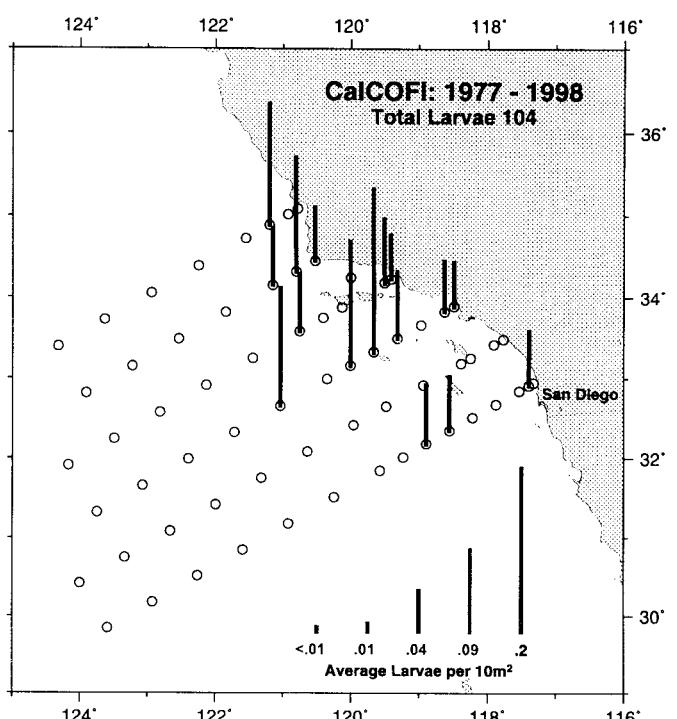
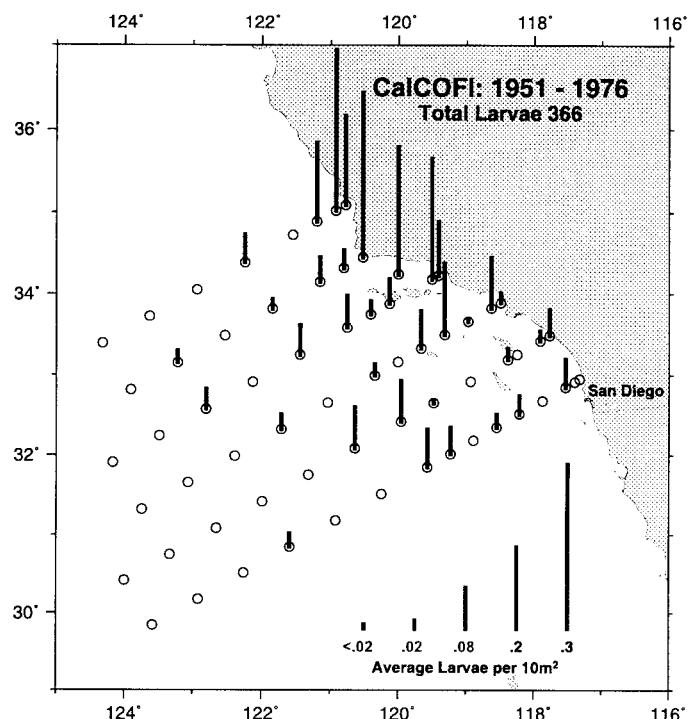
## Roughcheek sculpin

*Ruscarius creaseri*

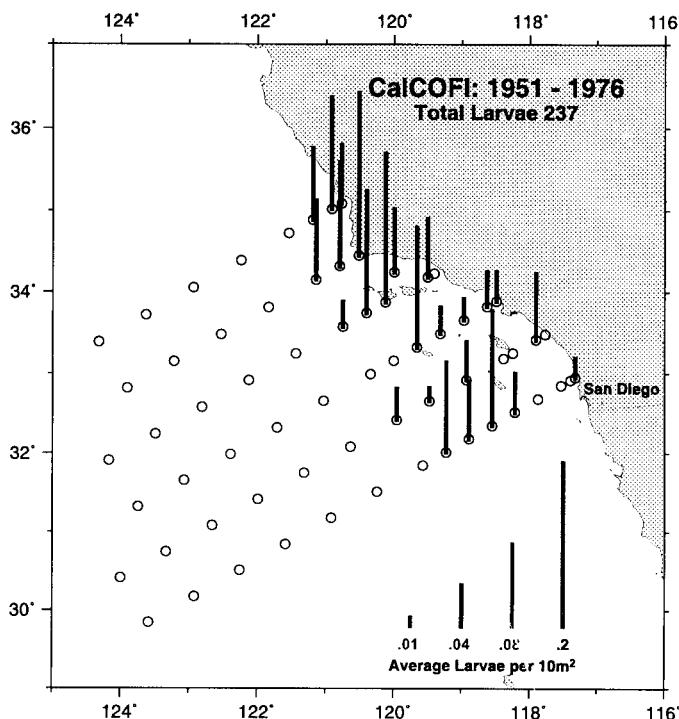
*Chilara taylori*

Spotted cusk-eel

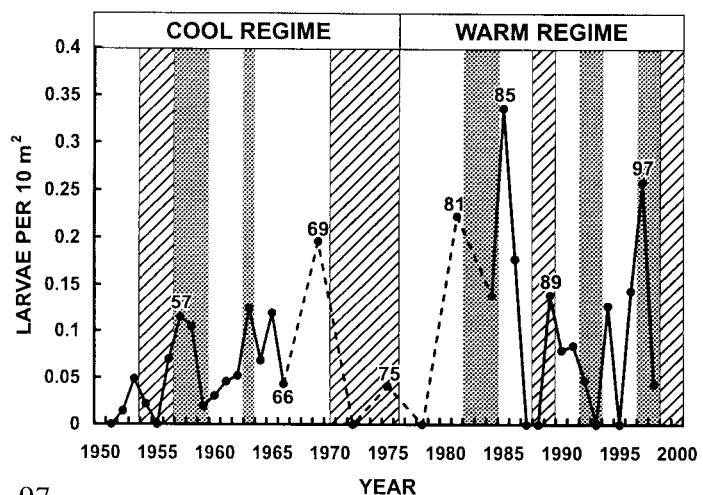
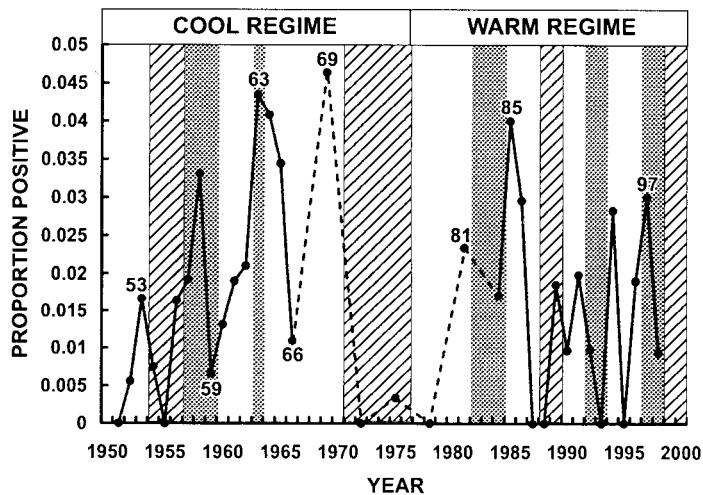
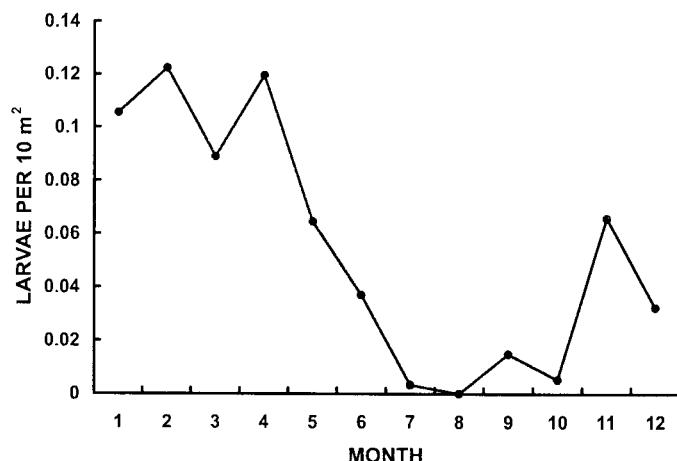
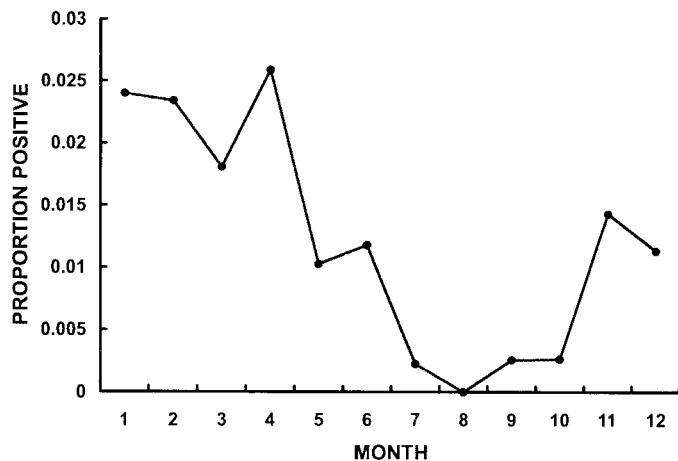
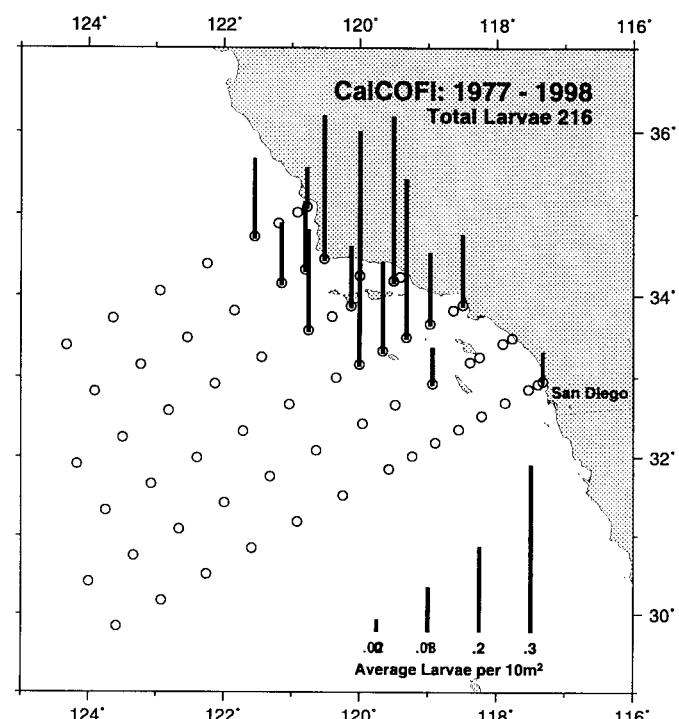
OPHIDIIDAE



## HEXAGRAMMIDAE



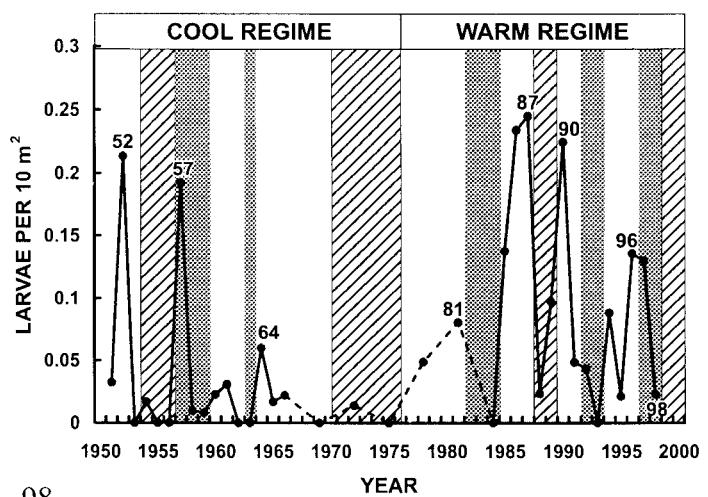
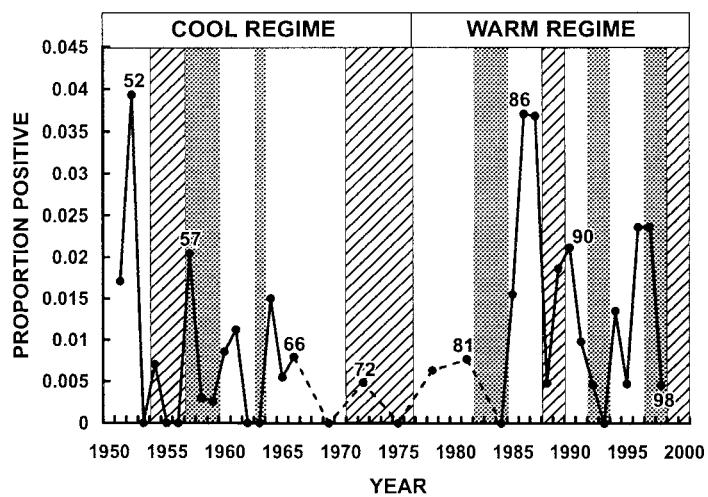
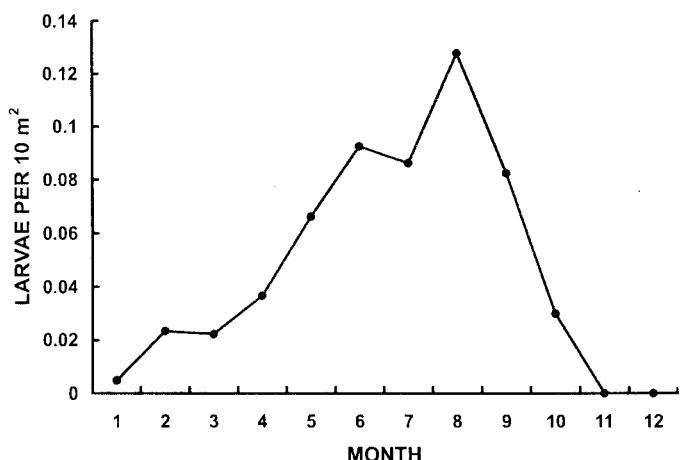
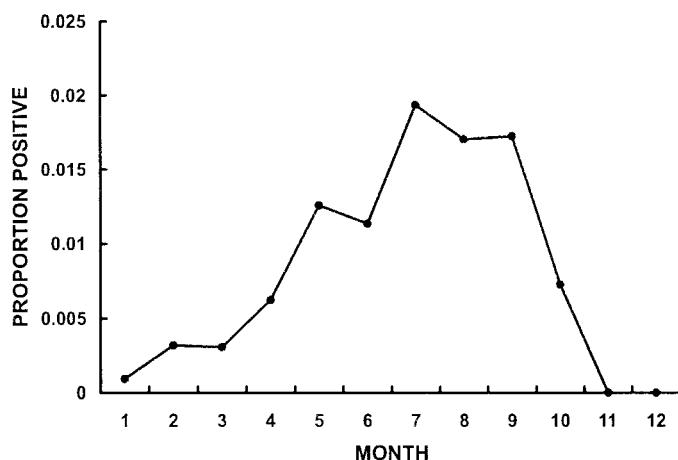
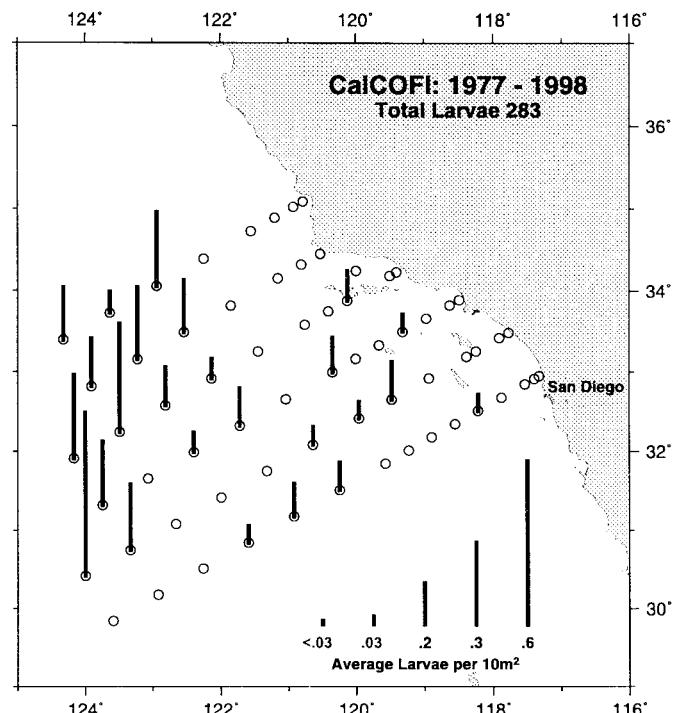
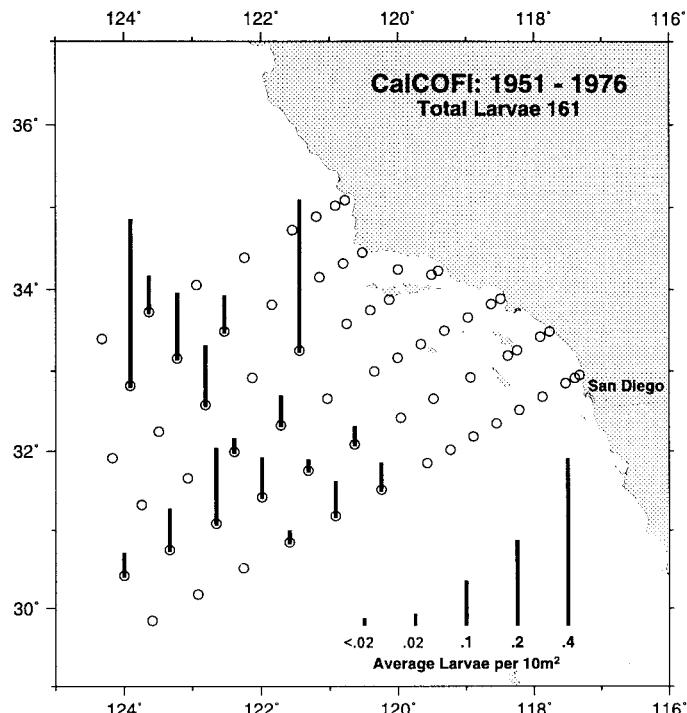
## Painted greenling



*Tactostoma macropus*

Longfin dragonfish

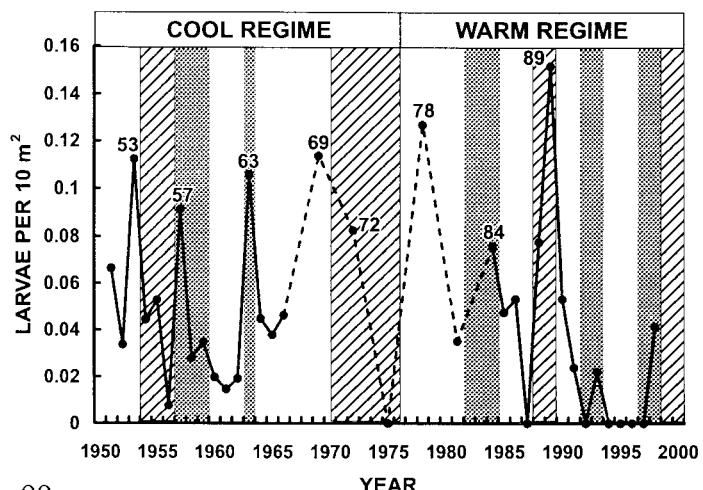
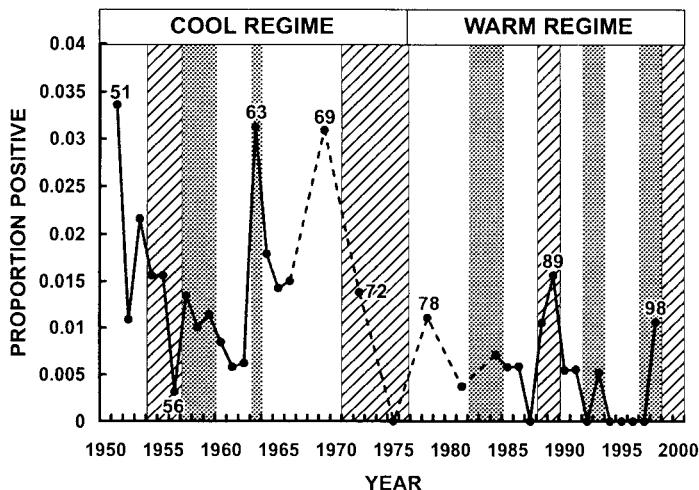
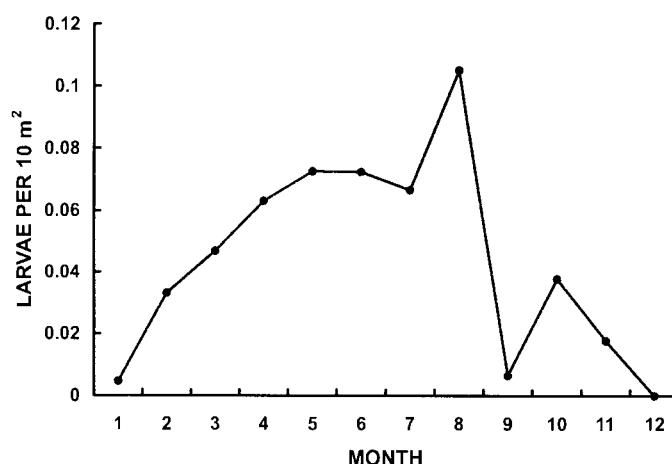
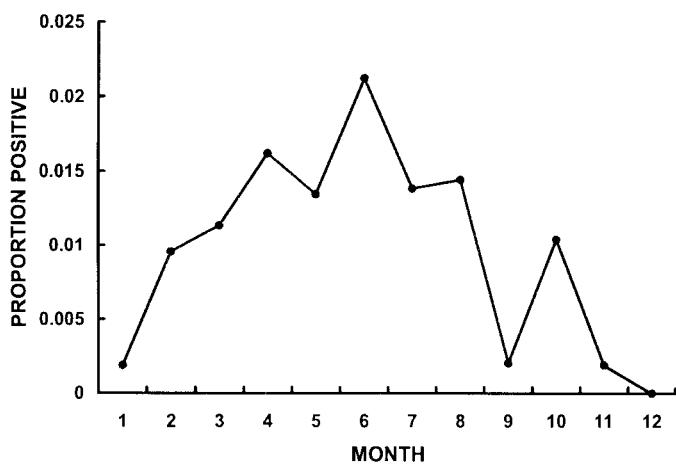
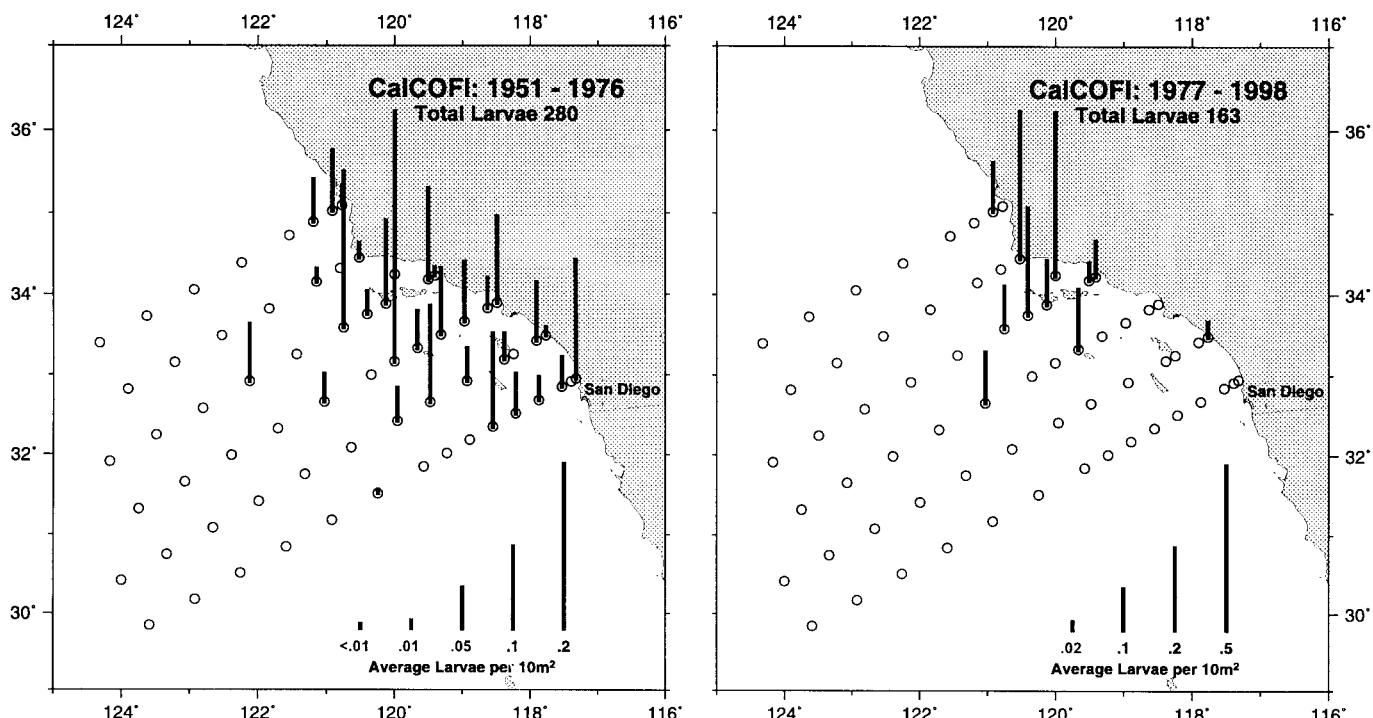
STOMIIDAE



## PLEURONECTIDAE

## C-O turbot

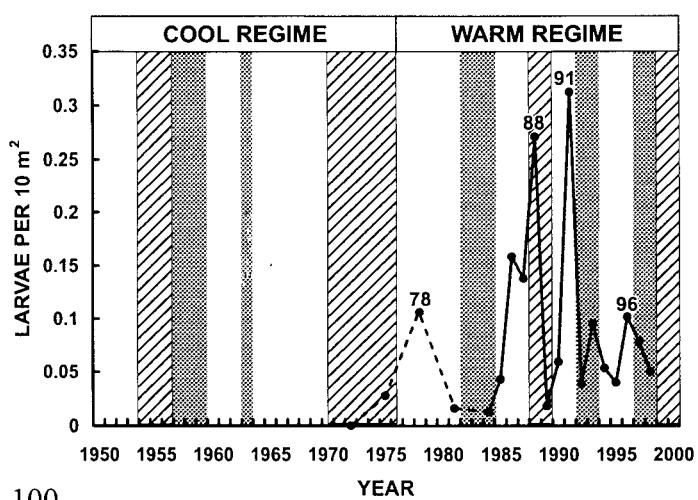
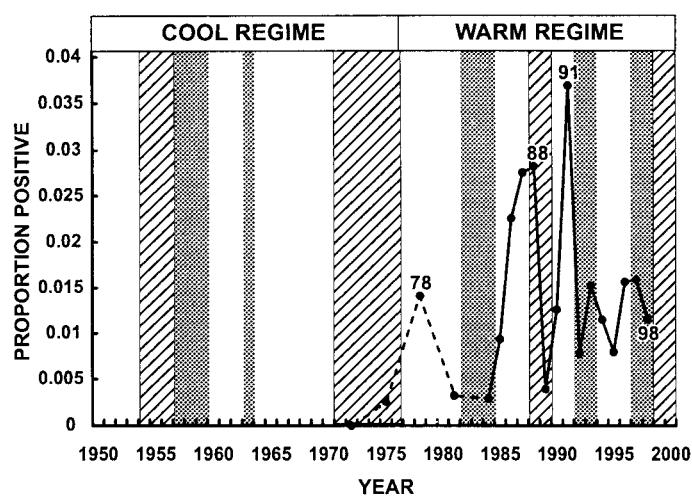
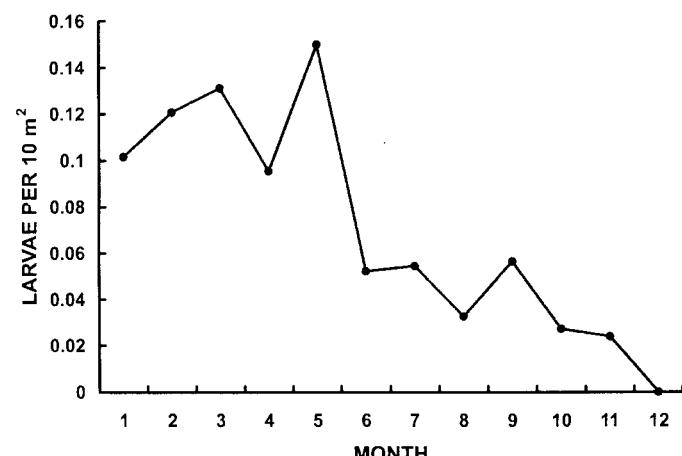
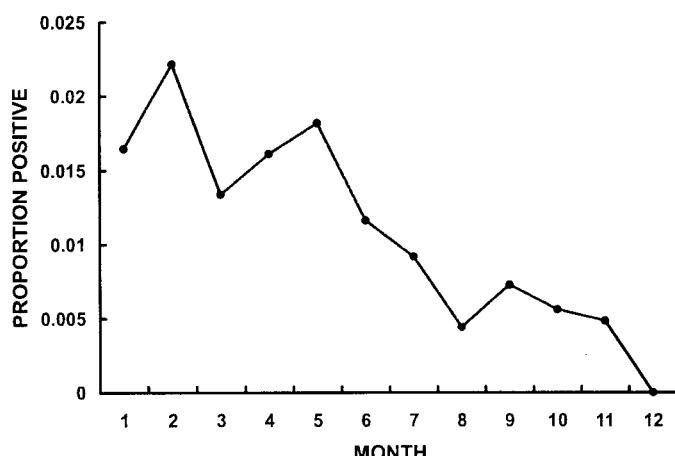
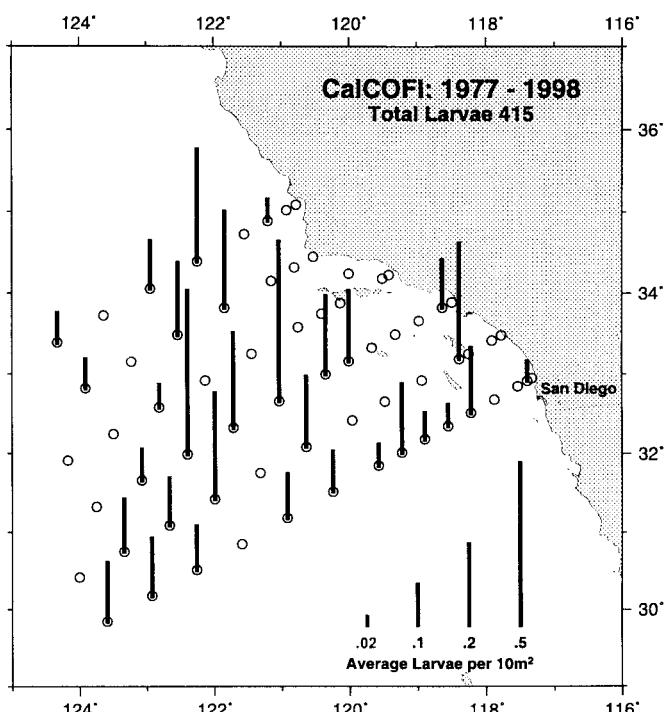
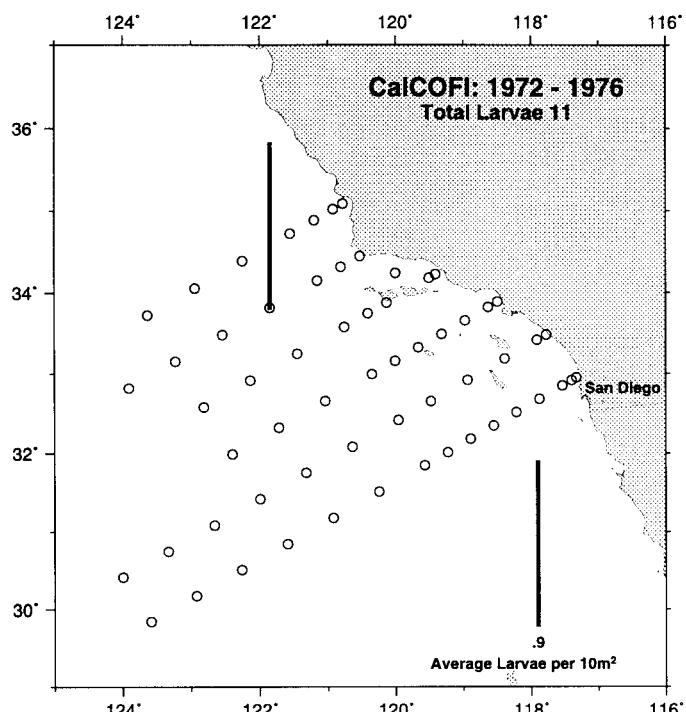
## *Pleuronichthys coenosus*



*Benthalbella dentata*

Northern pearleye

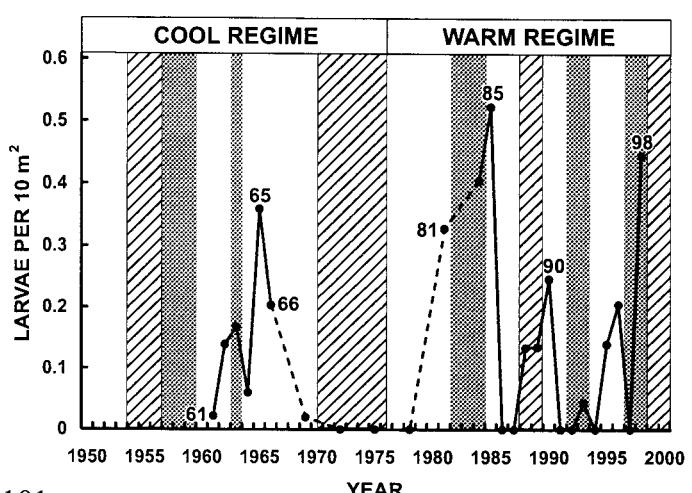
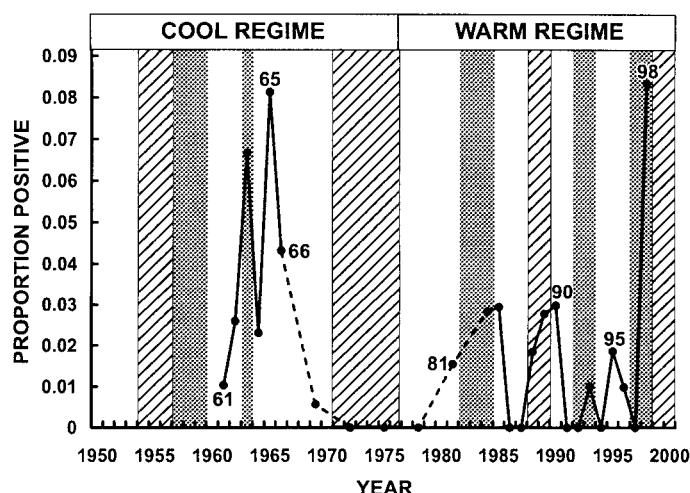
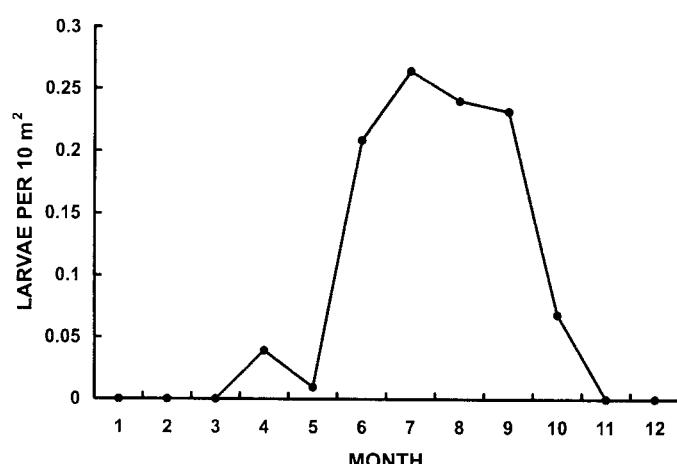
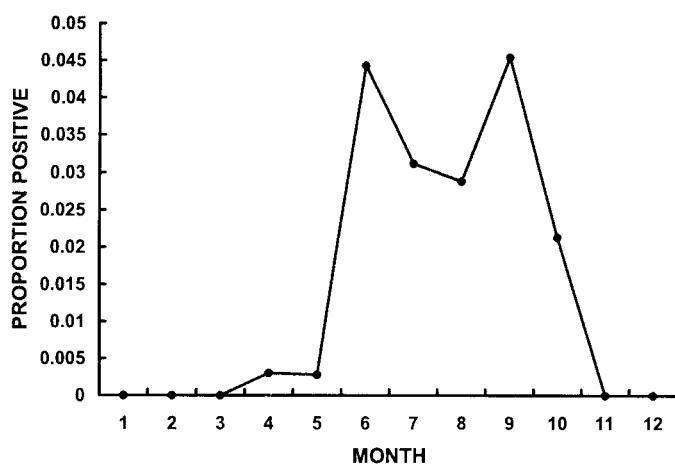
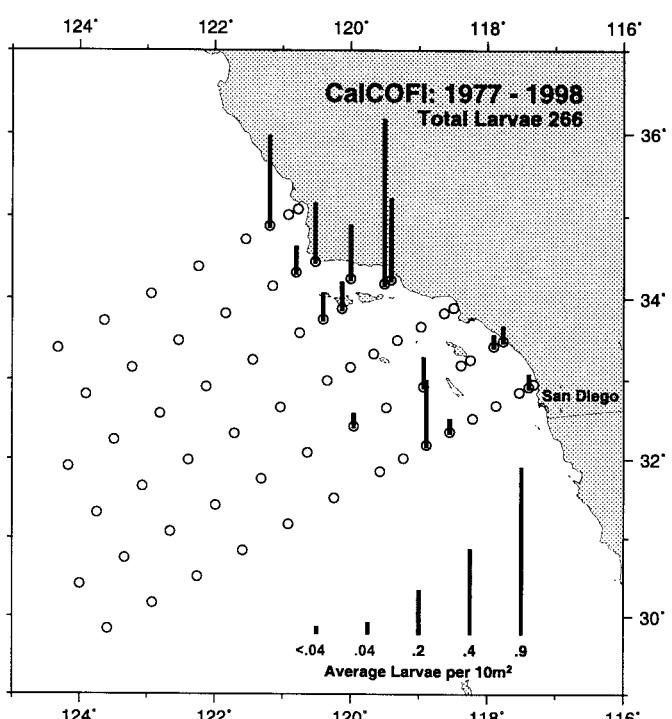
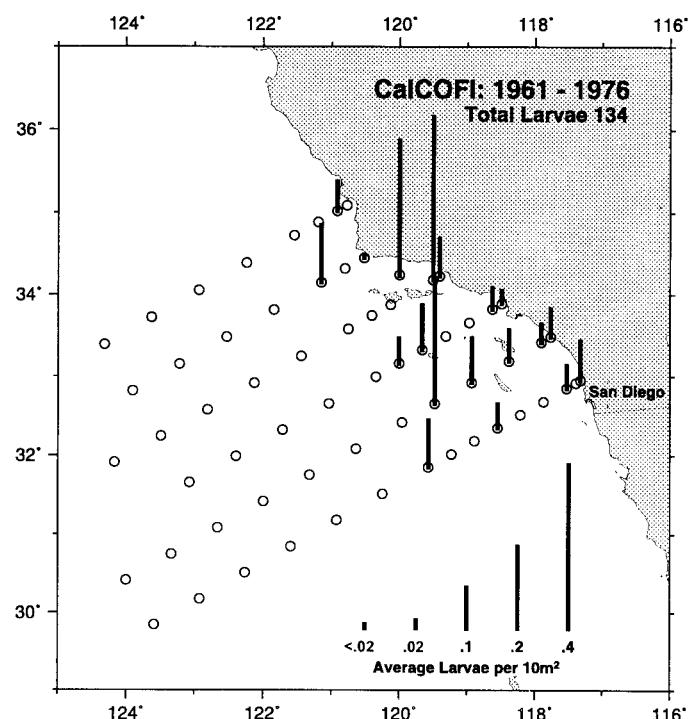
SCOPELARCHIDAE



## LABRIDAE

## Sheephead

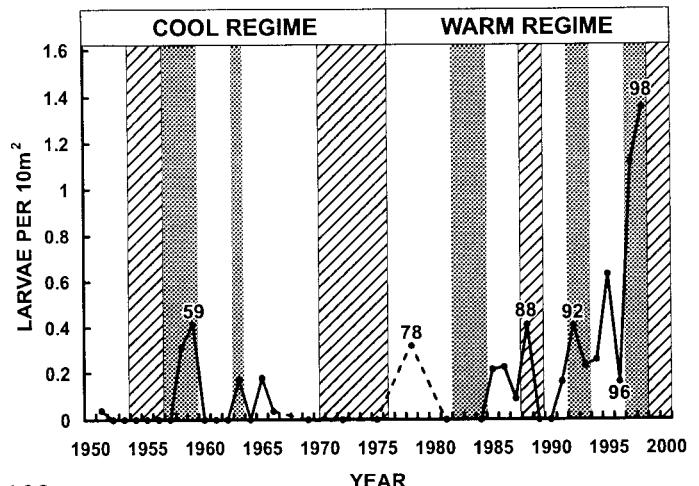
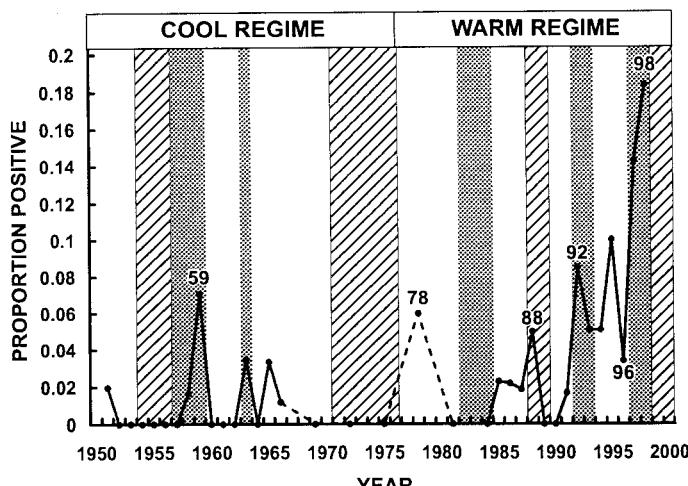
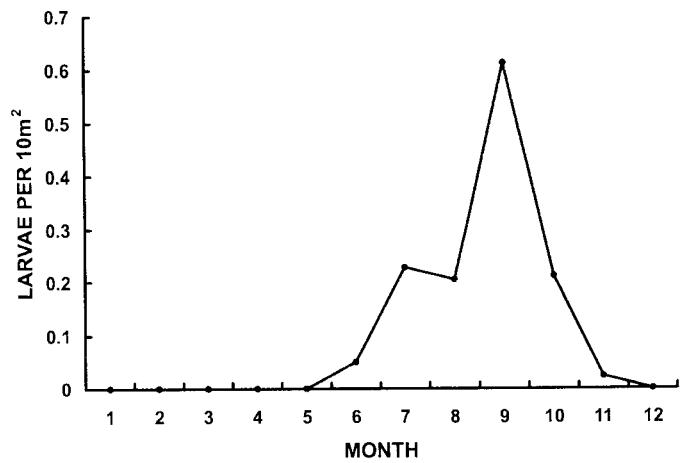
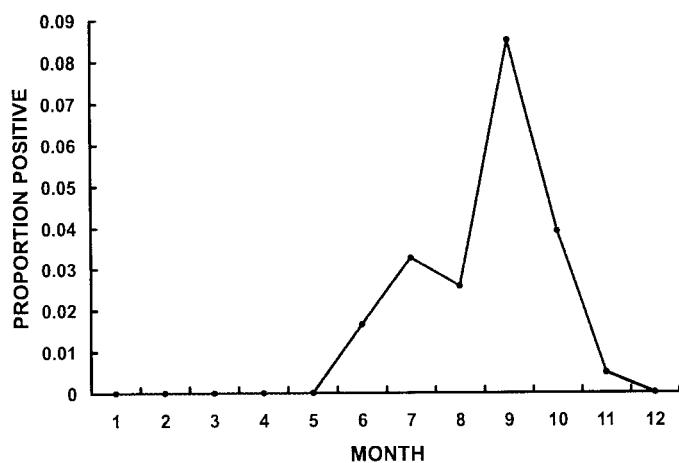
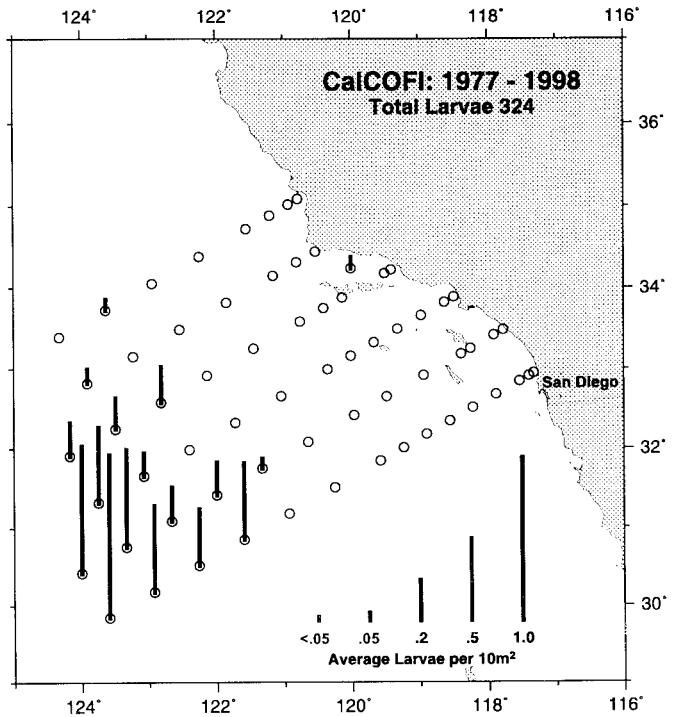
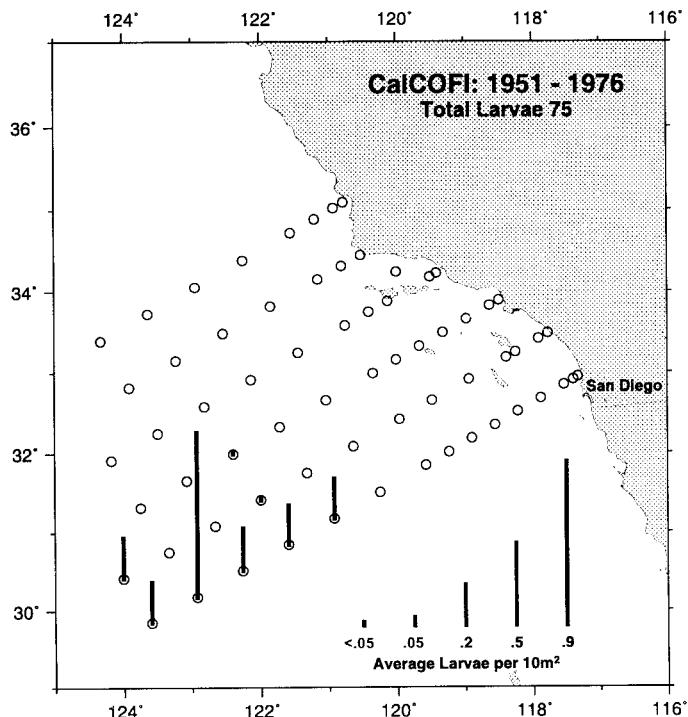
## *Semicossyphus pulcher*



### *Lampadena urophaos*

### Sunbeam lampfish

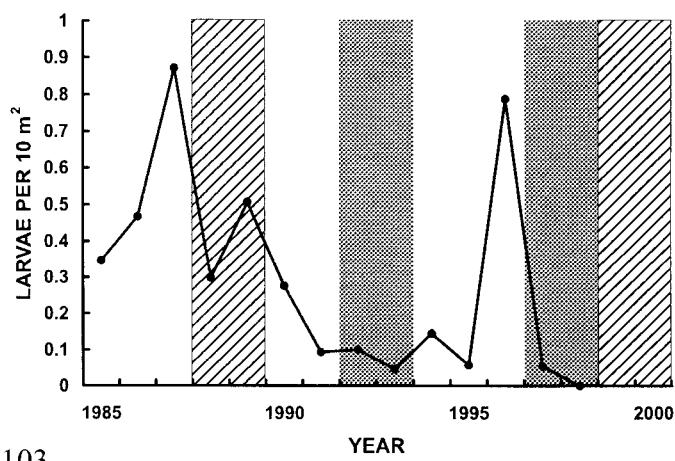
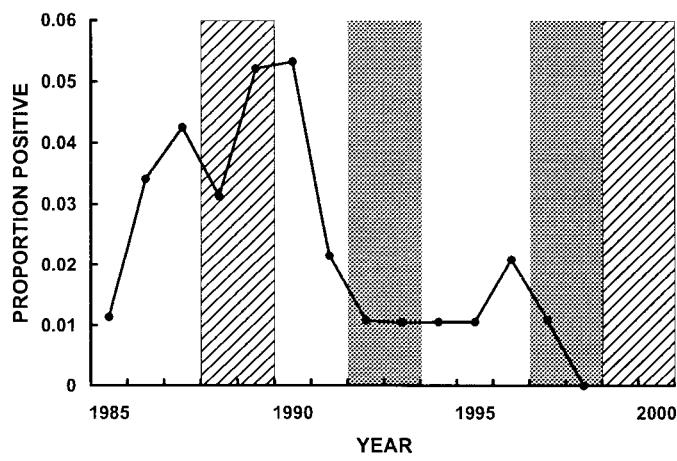
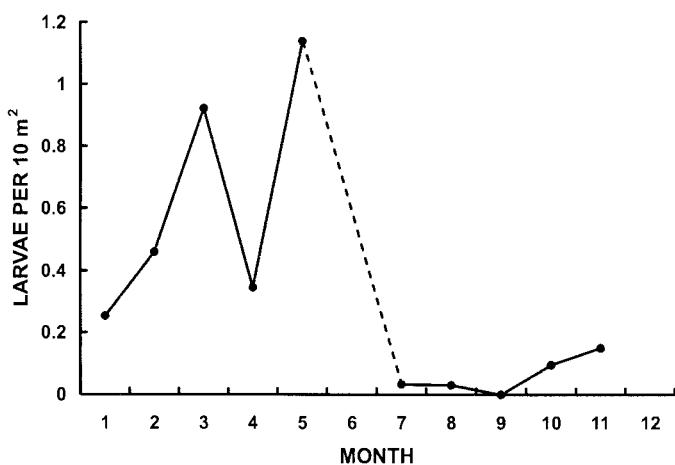
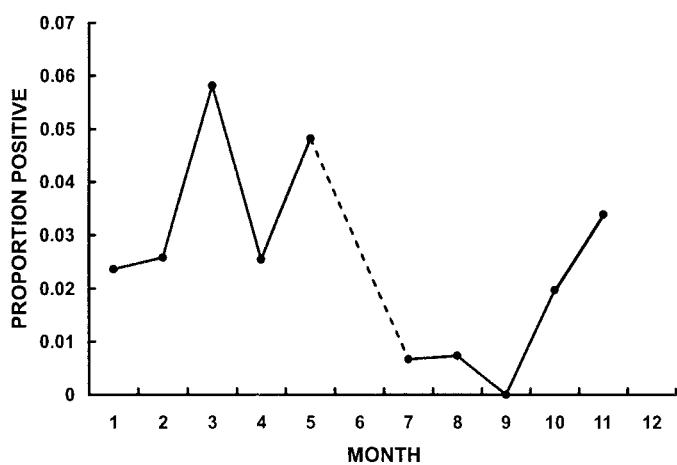
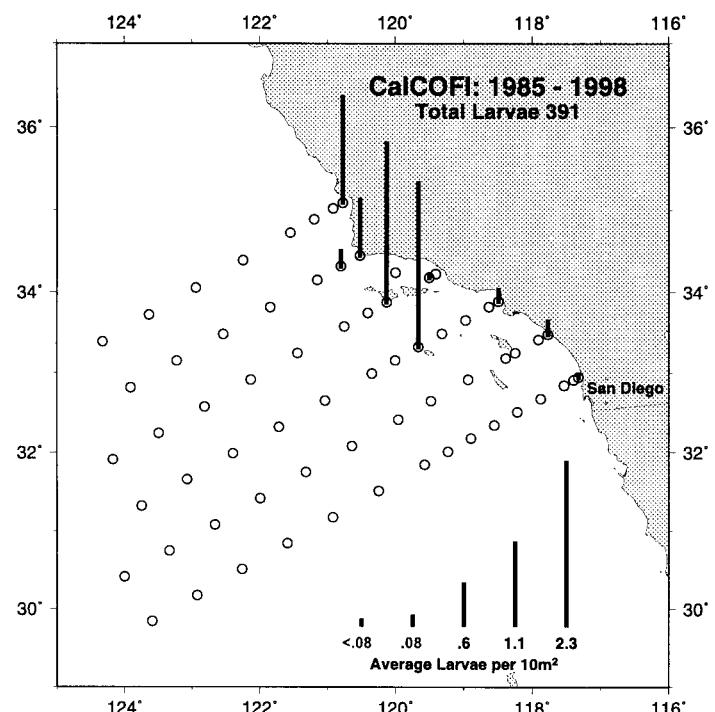
### MYCTOPHIDAE



## BATHYMASTERIDAE

## Ronquils

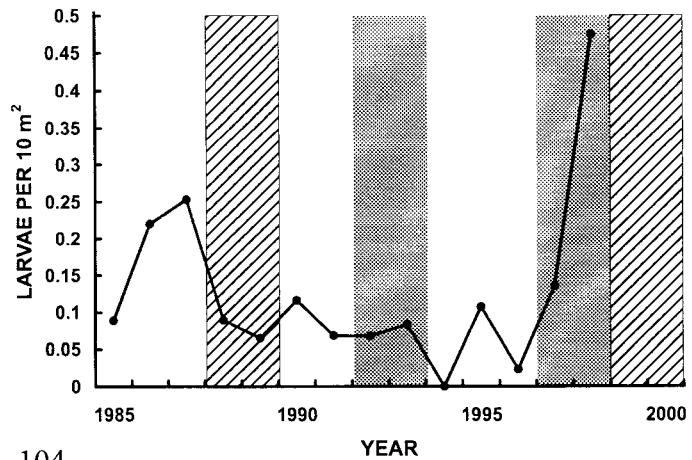
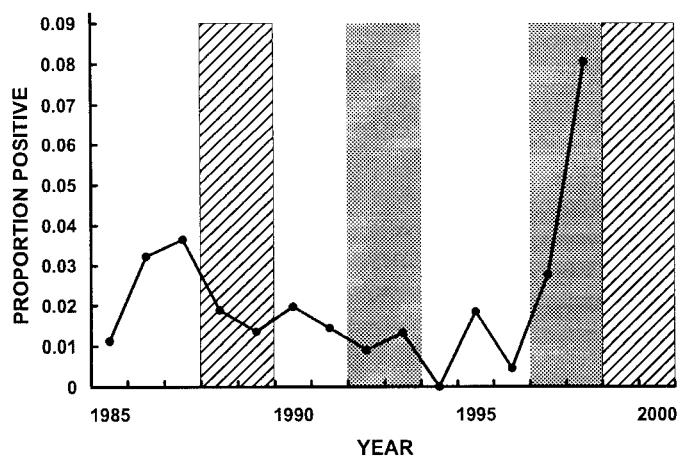
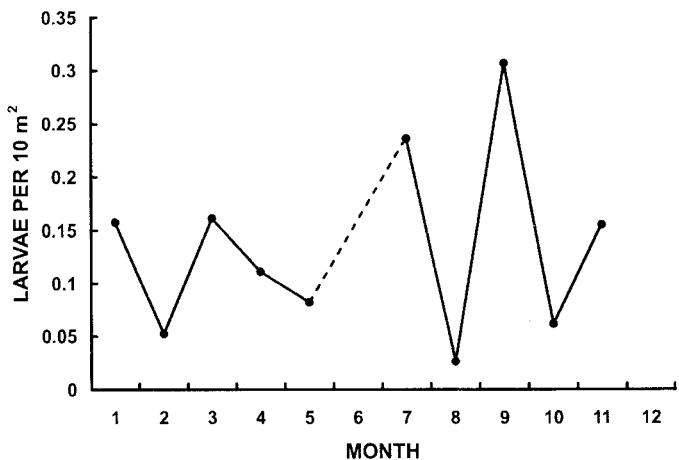
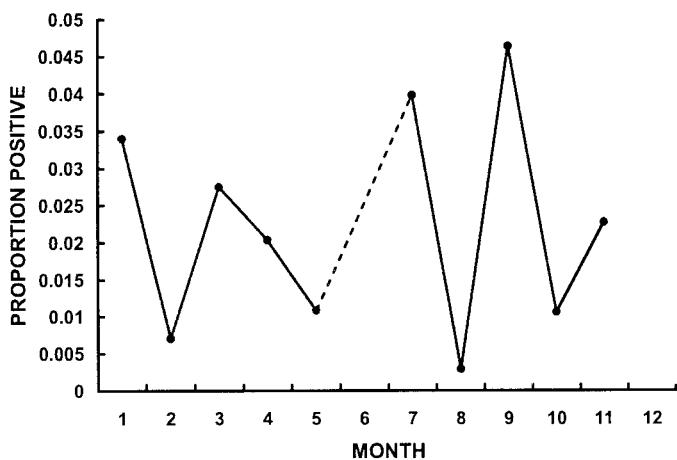
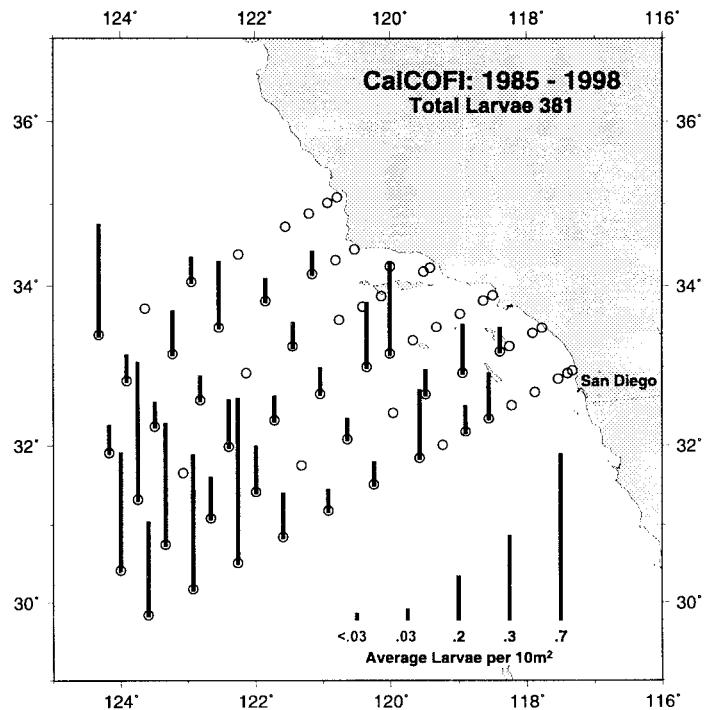
## *Rathbunella* spp.



*Argyropelecus lychnus*

## Tropical hatchetfish

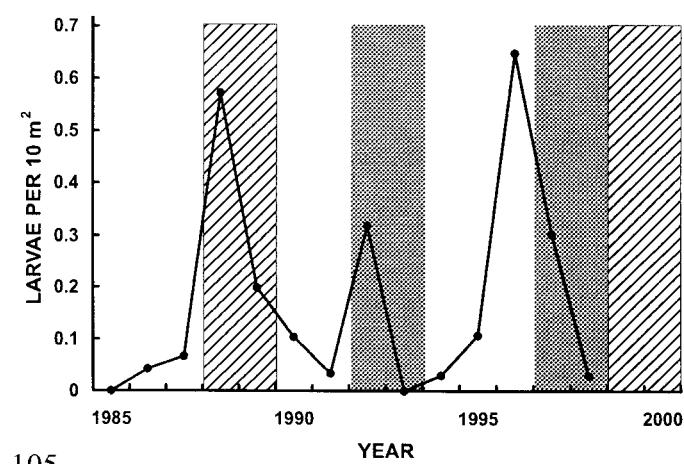
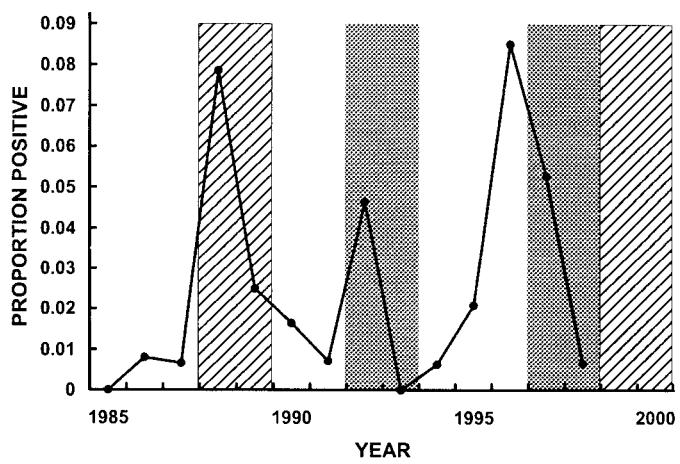
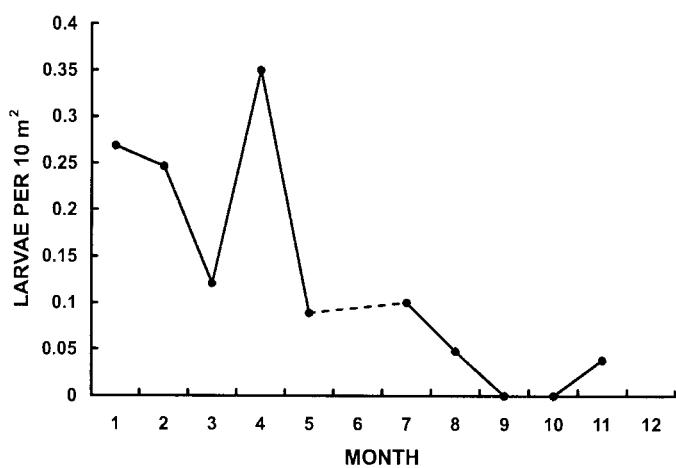
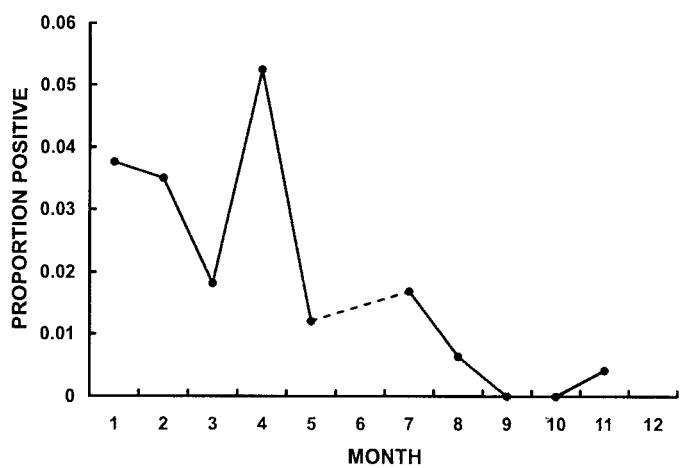
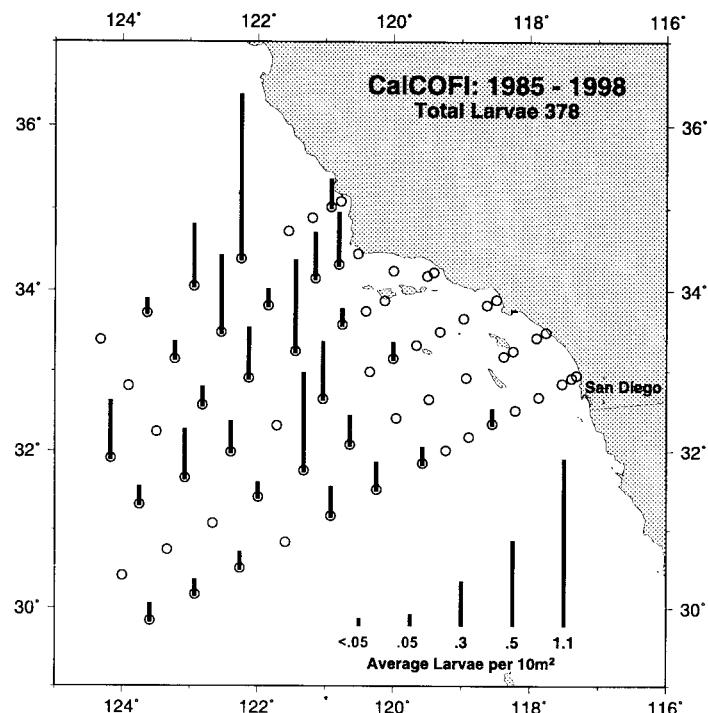
## STERNOPTYCHIDAE



# MELAMPHAIDAE

## Little bigscale

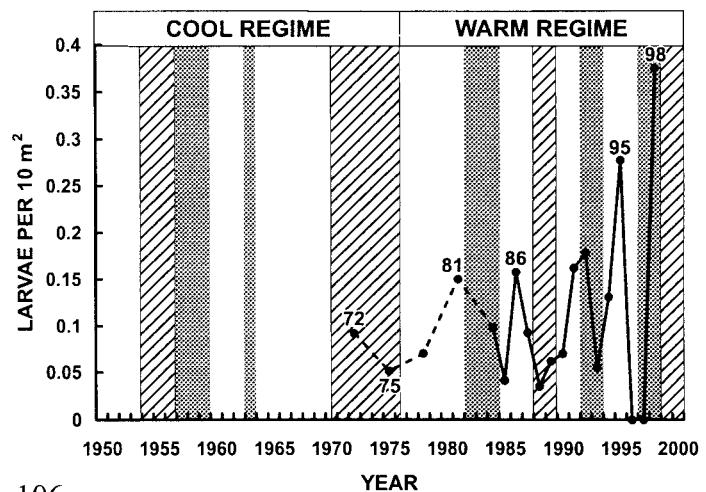
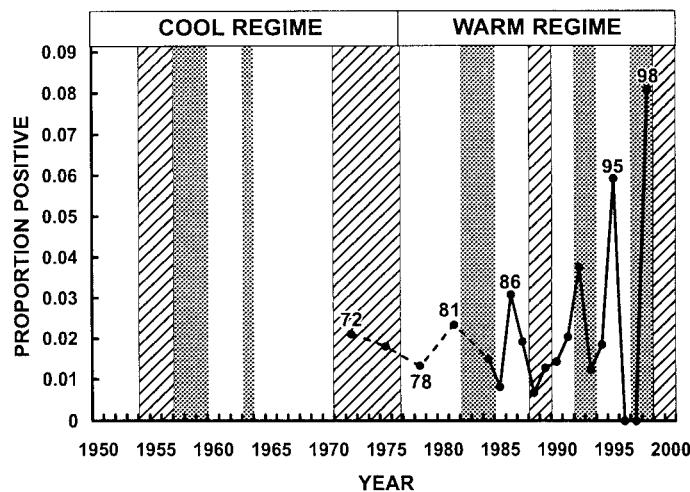
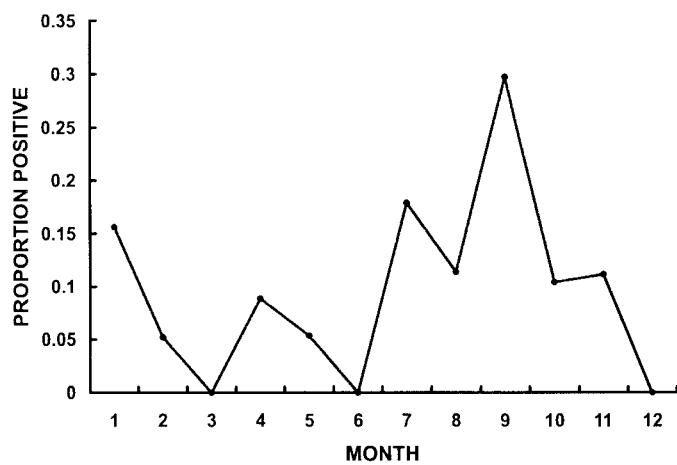
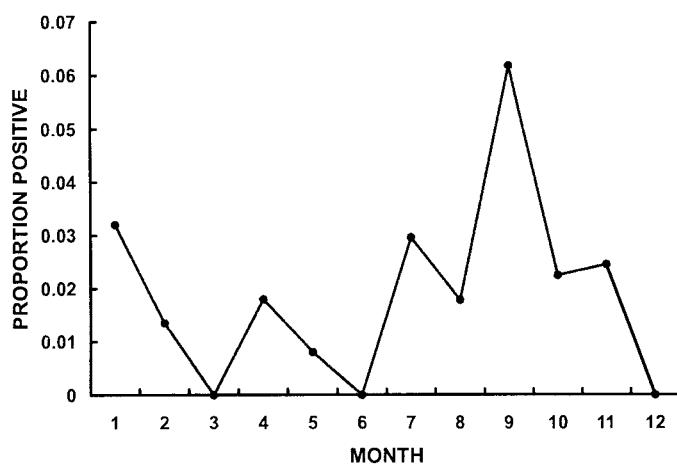
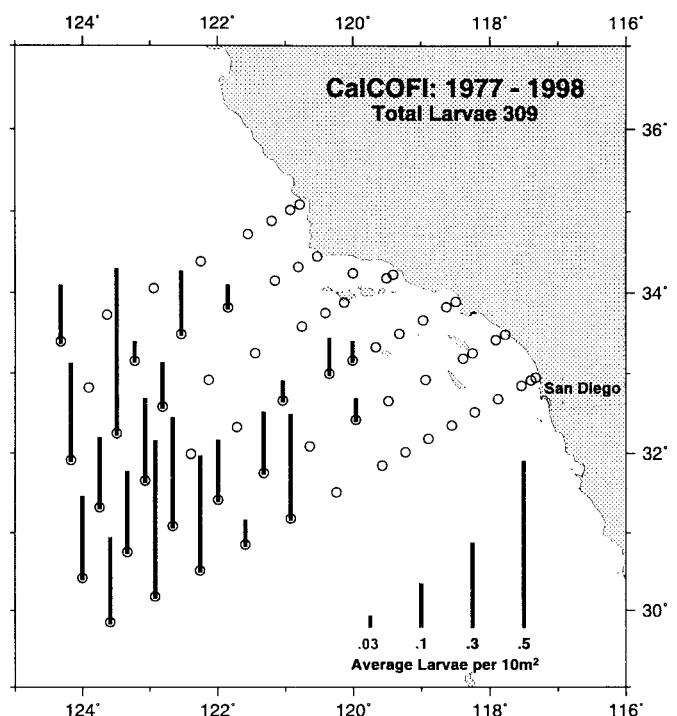
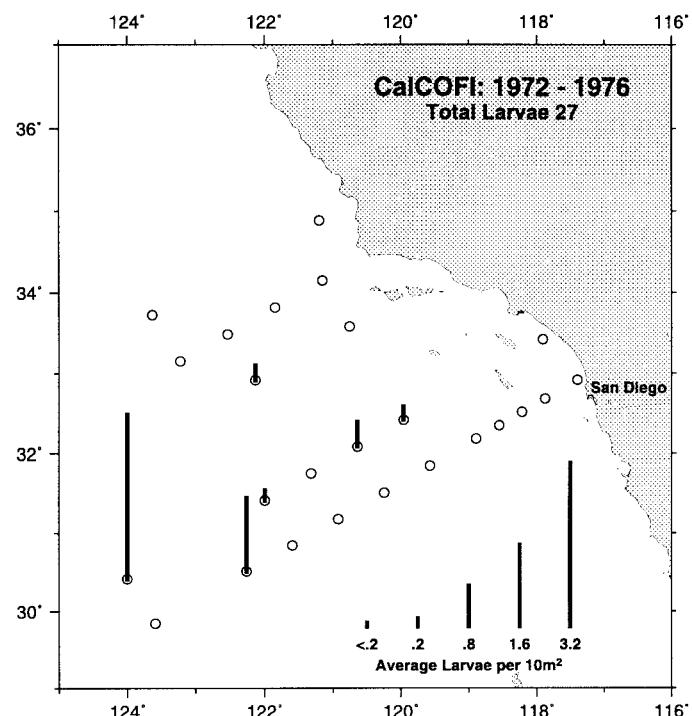
## *Melamphaes parvus*



*Rosenblattichthys volucris*

Chubby pearleye

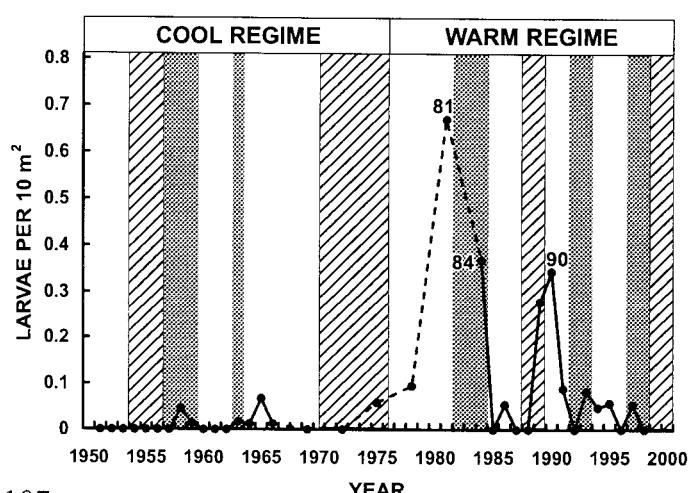
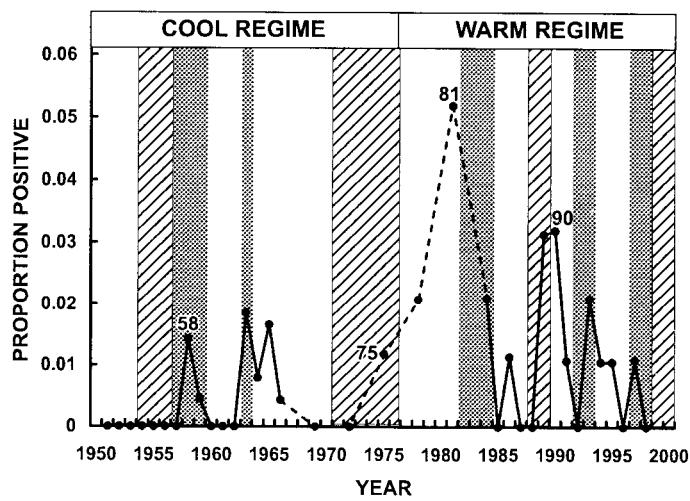
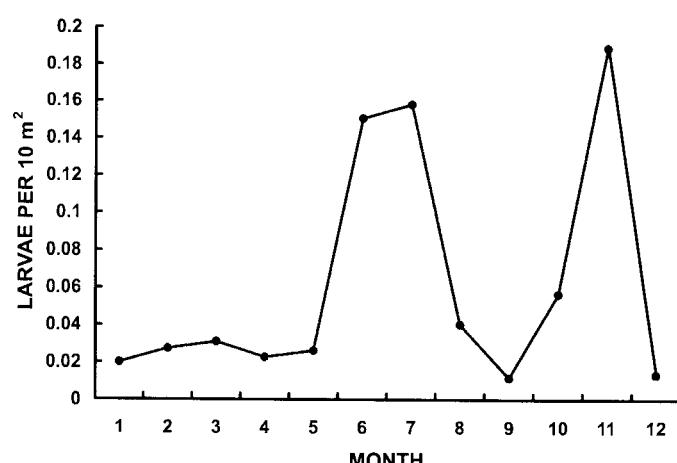
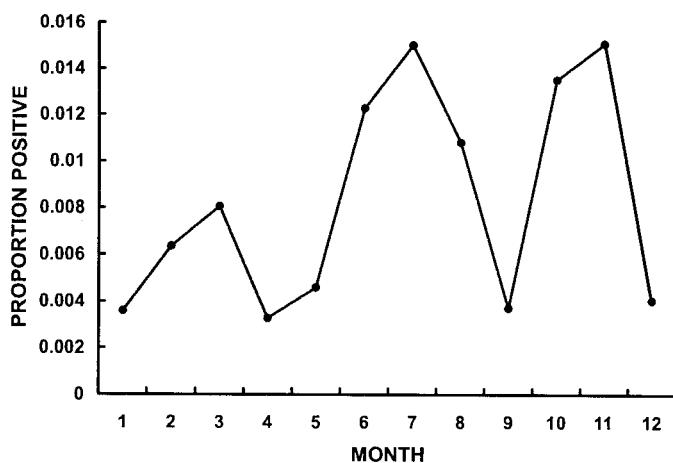
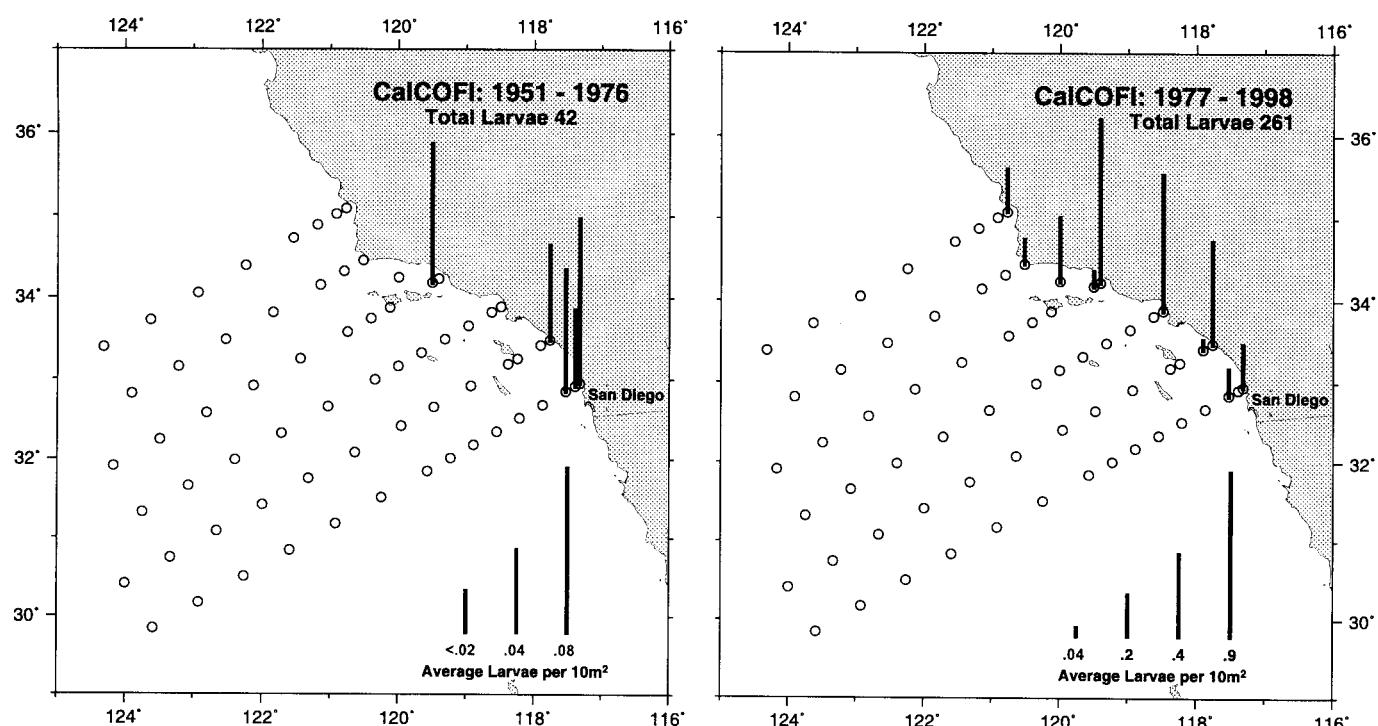
SCOPELARCHIDAE



# PLEURONECTIDAE

## Spotted turbot

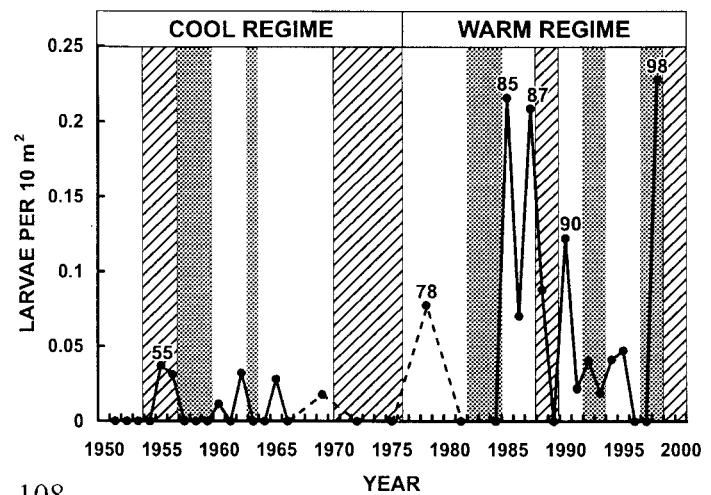
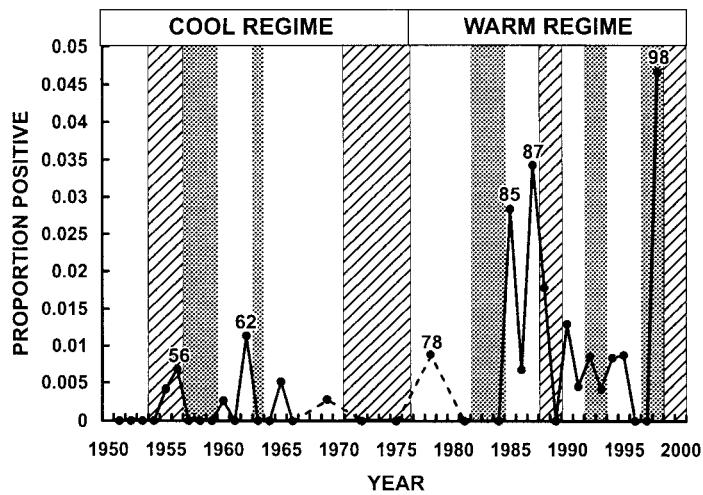
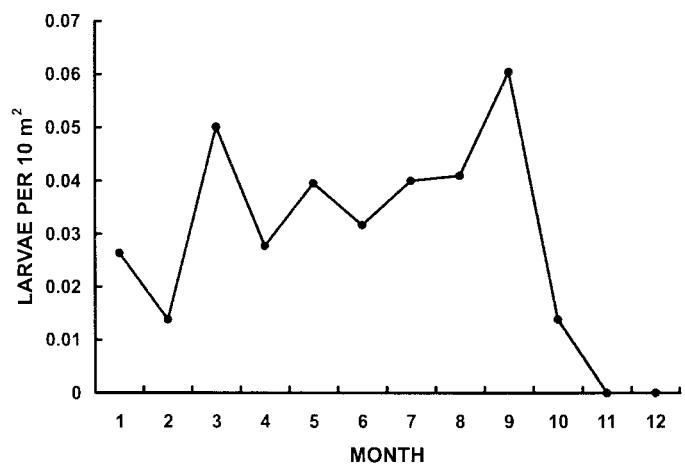
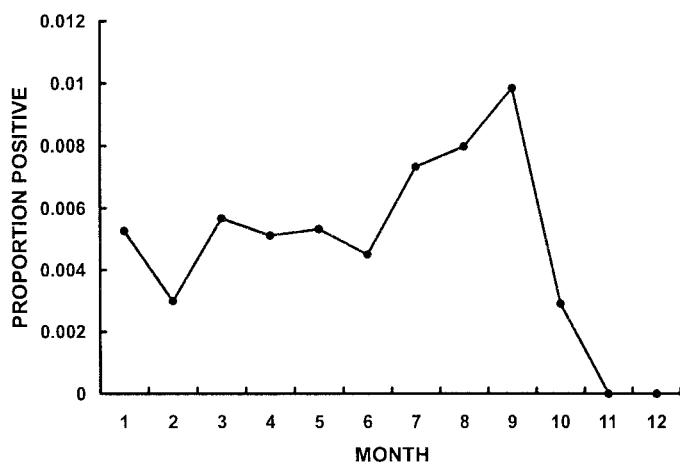
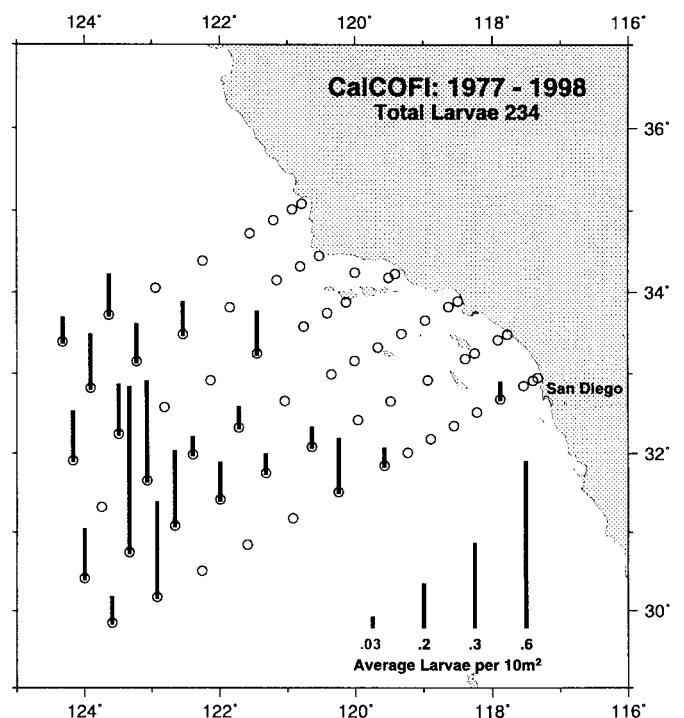
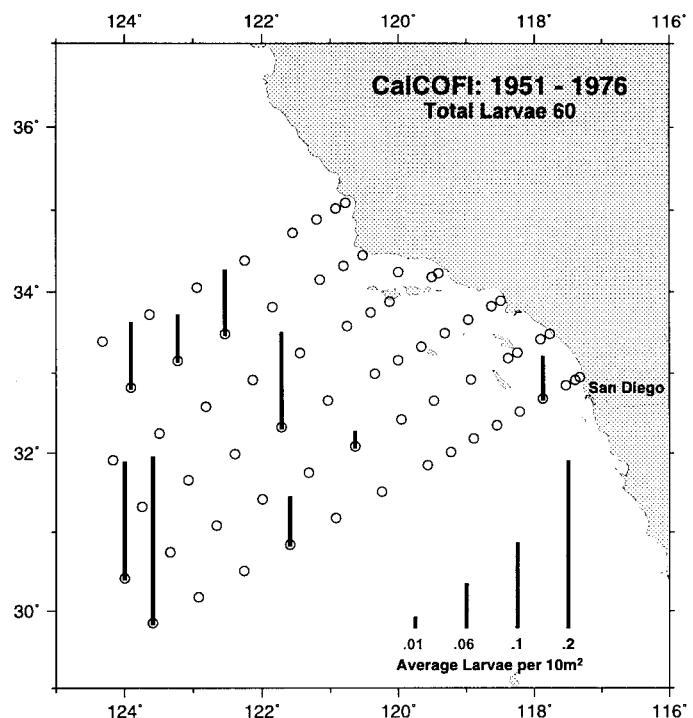
## *Pleuronichthys ritteri*



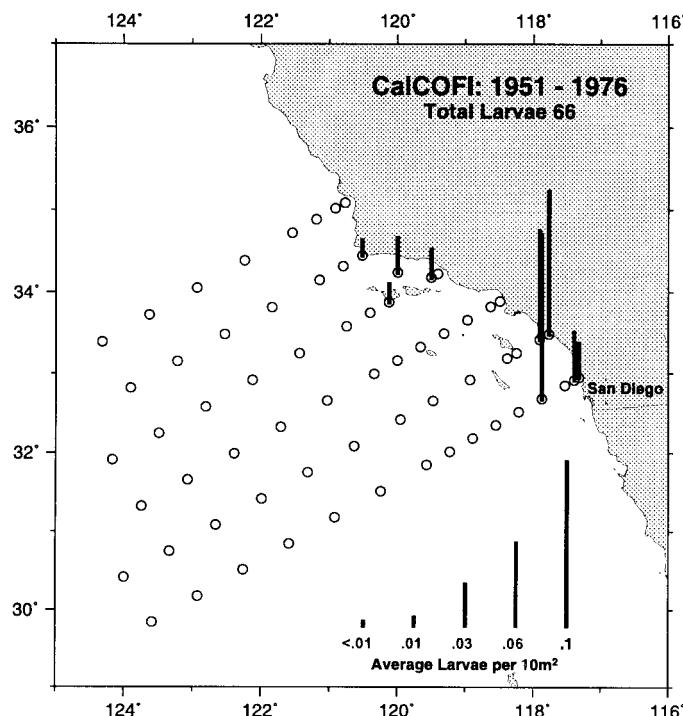
### *Bathophilus flemingi*

### Highfin dragonfish

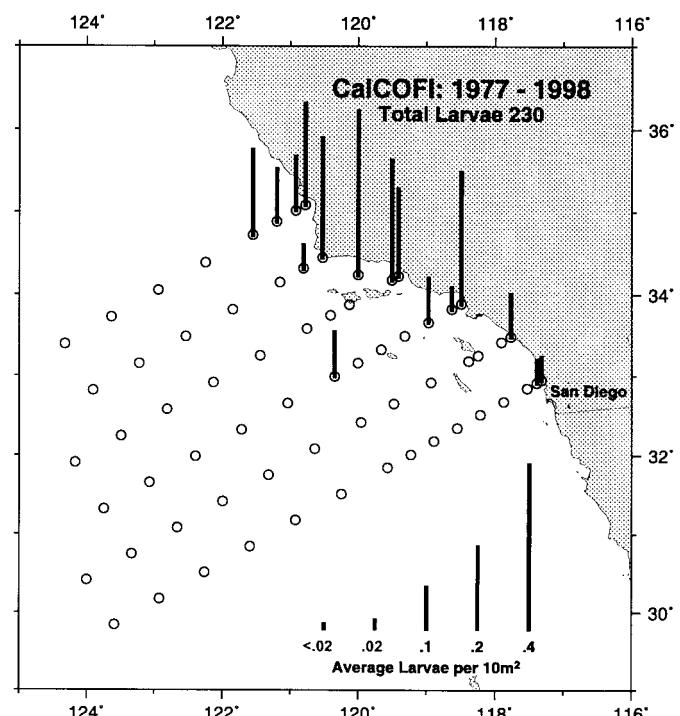
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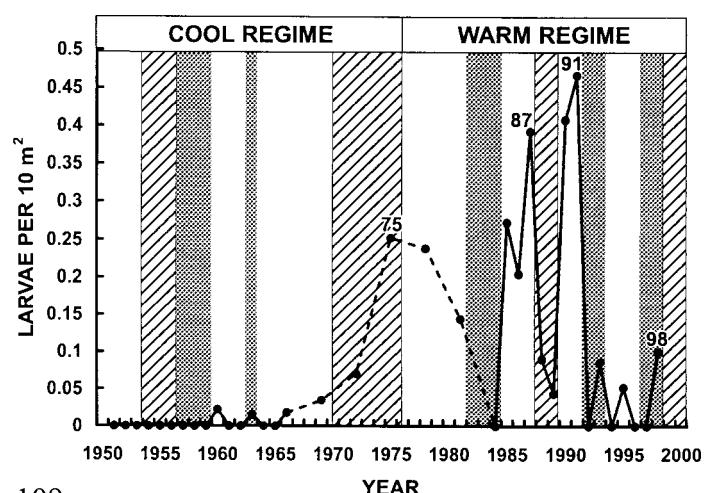
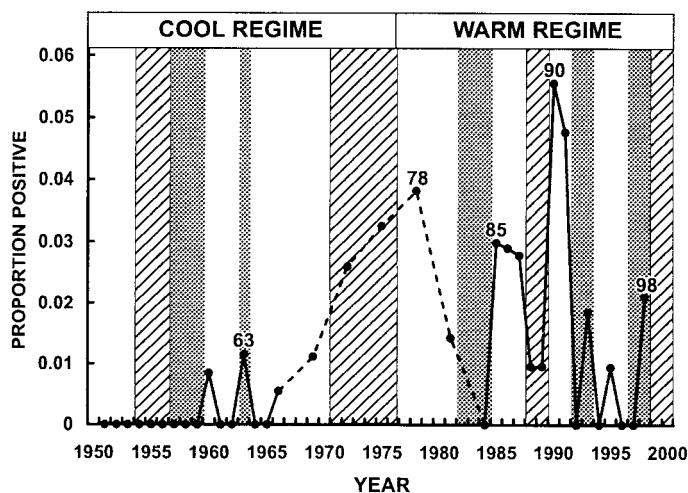
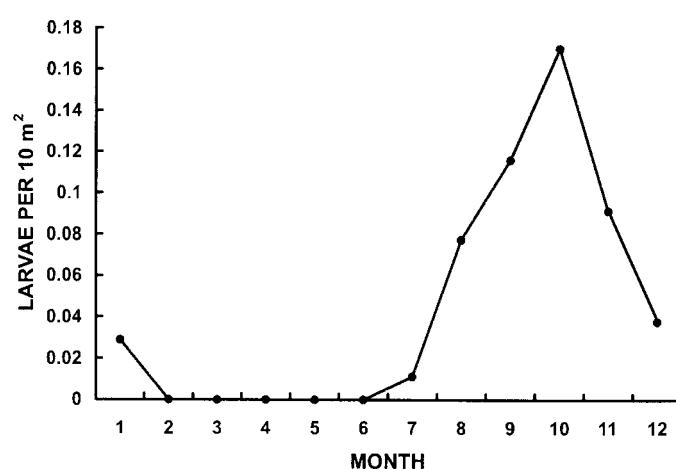
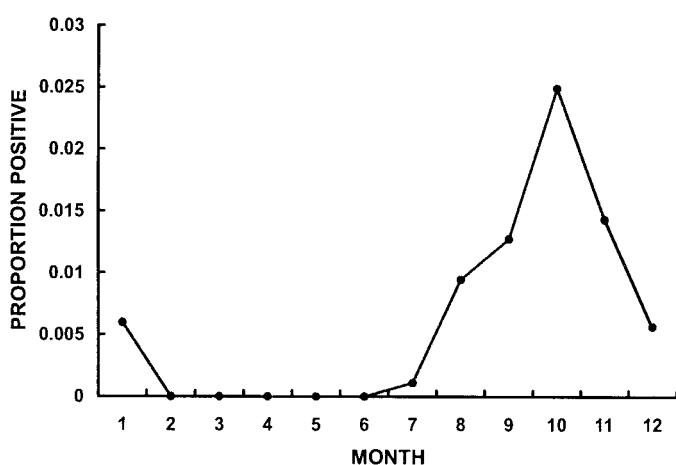
*Synodus lucioceps*



California lizardfish



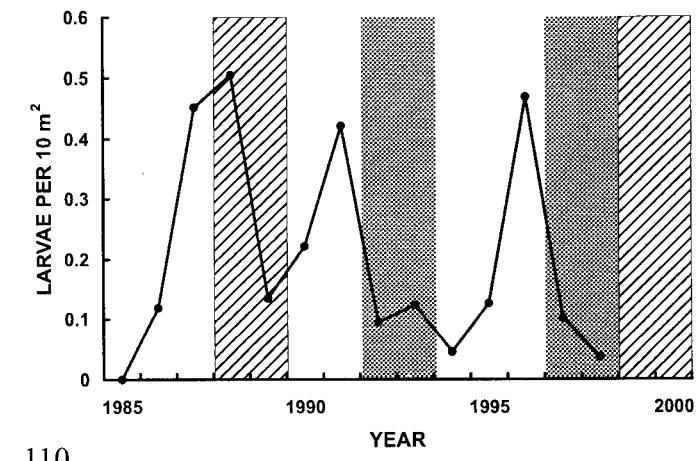
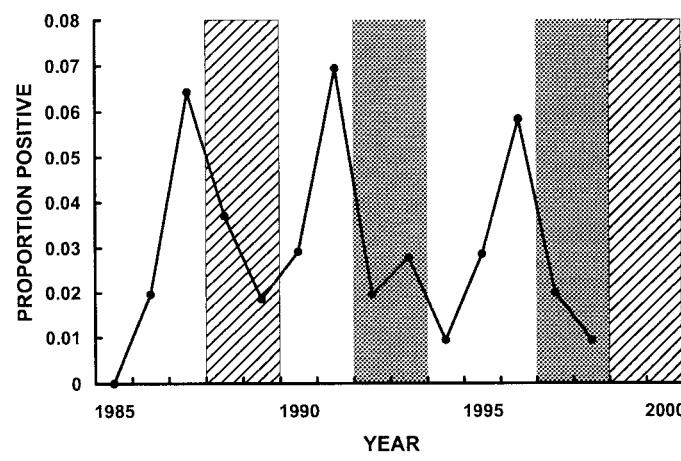
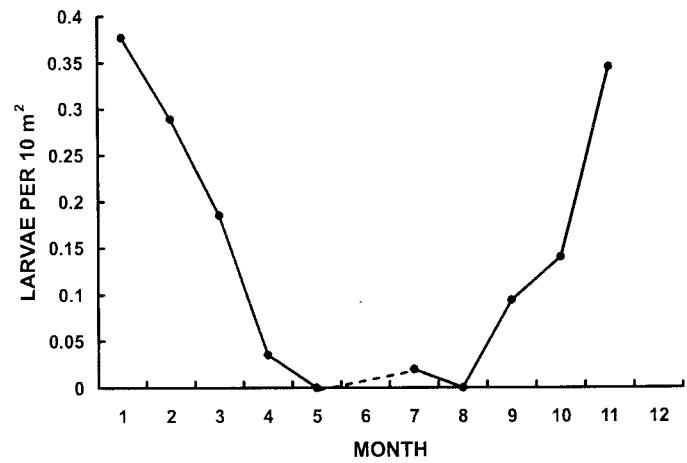
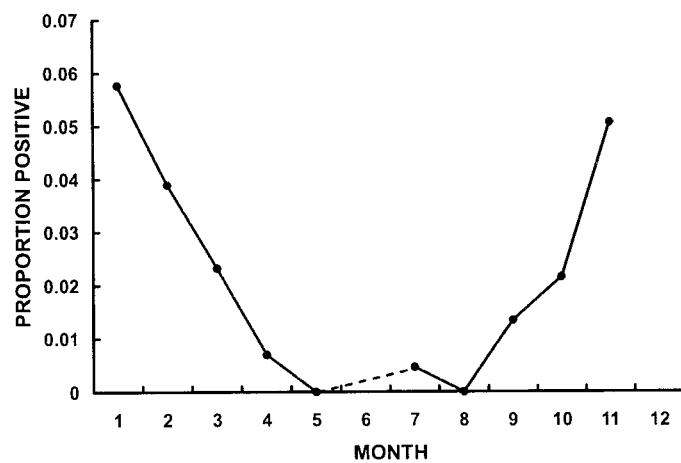
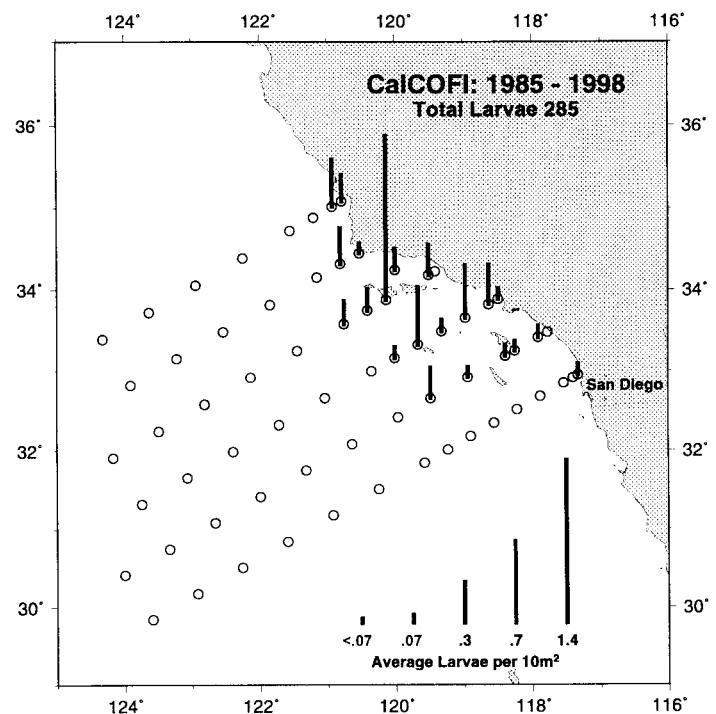
SYNODONTIDAE



### *Zaniolepis latipinnis*

### Longspine combfish

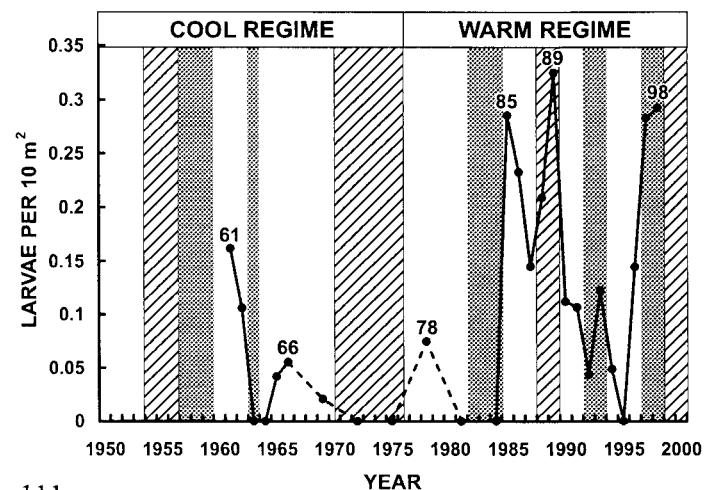
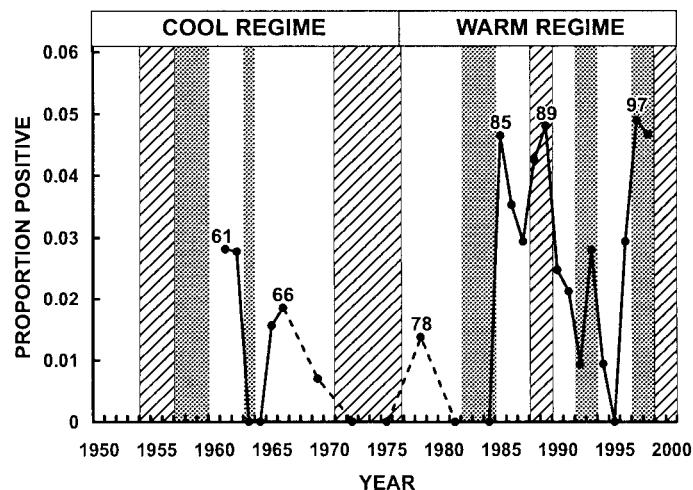
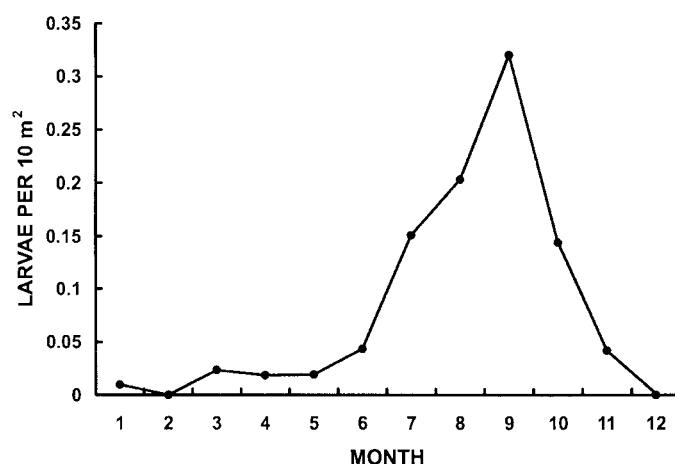
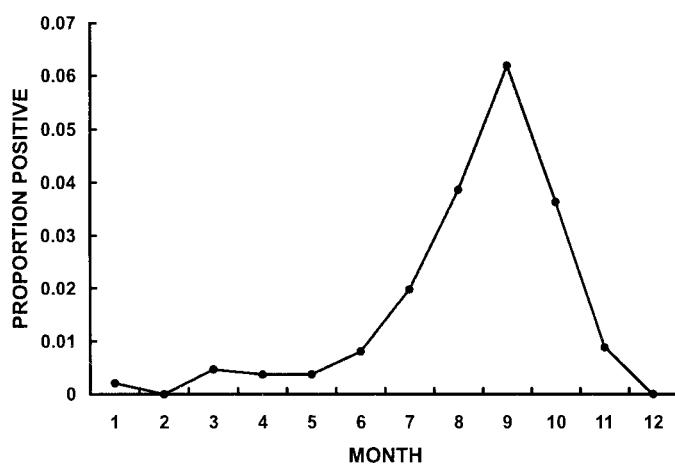
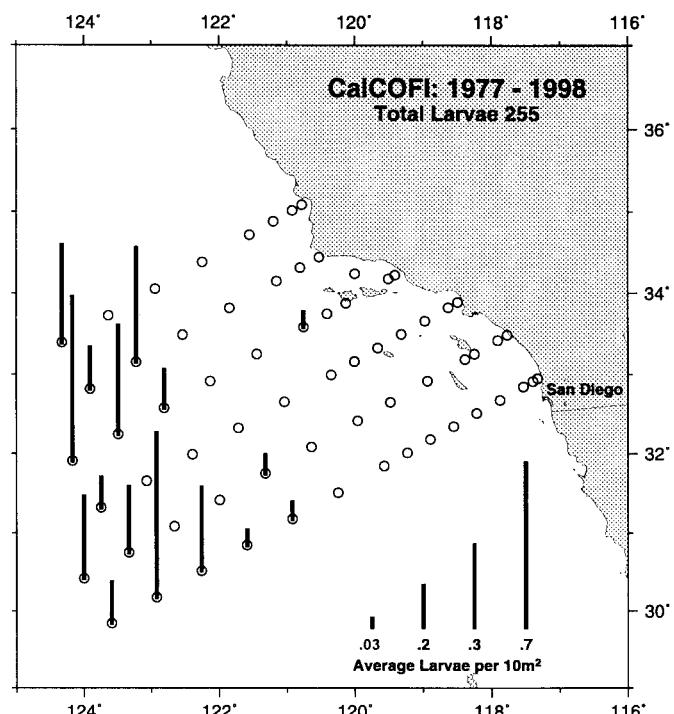
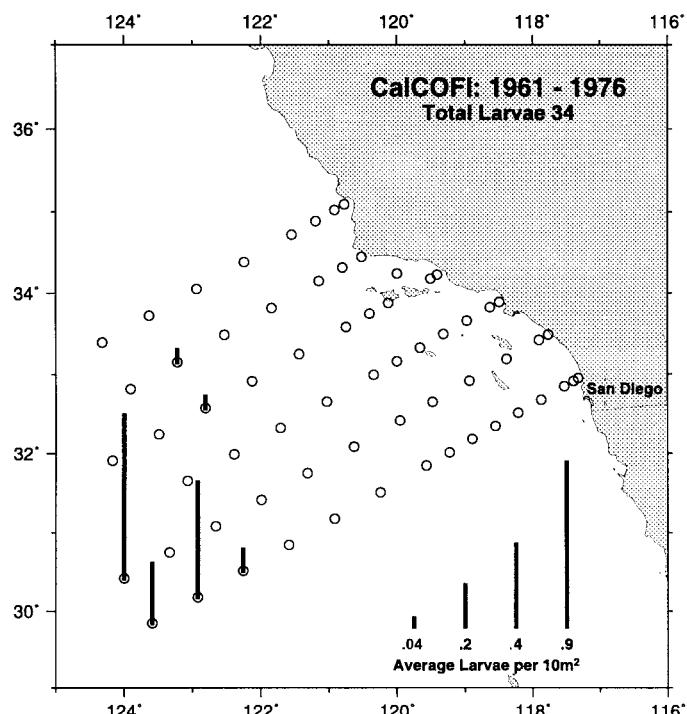
### HEXAGRAMMIDAE



## HOWELLIDAE

## Pelagic basslet

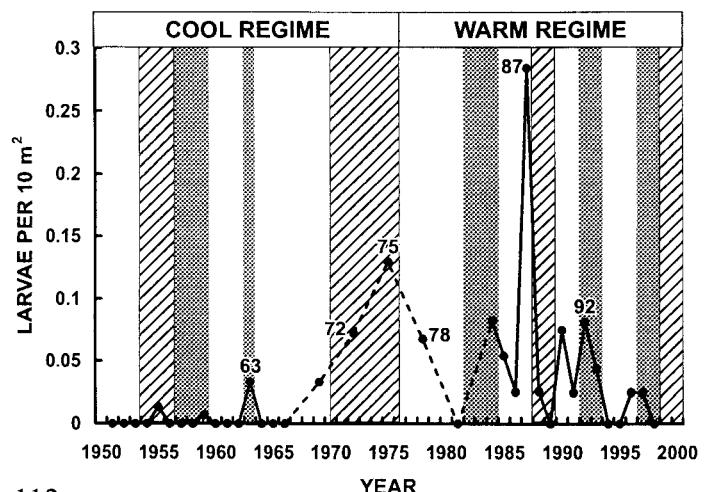
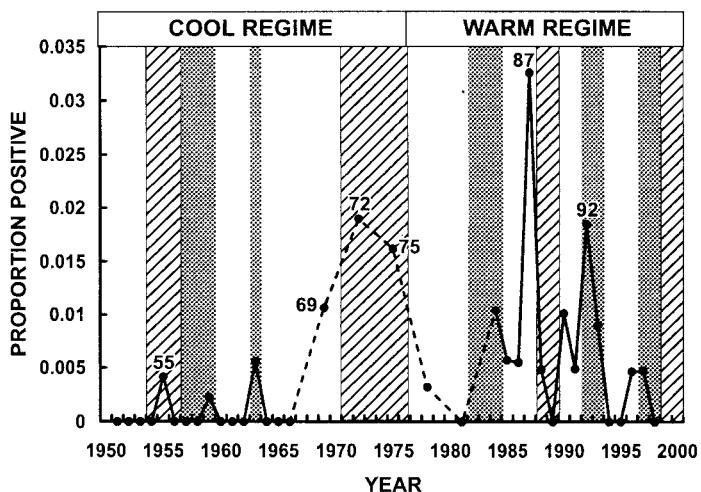
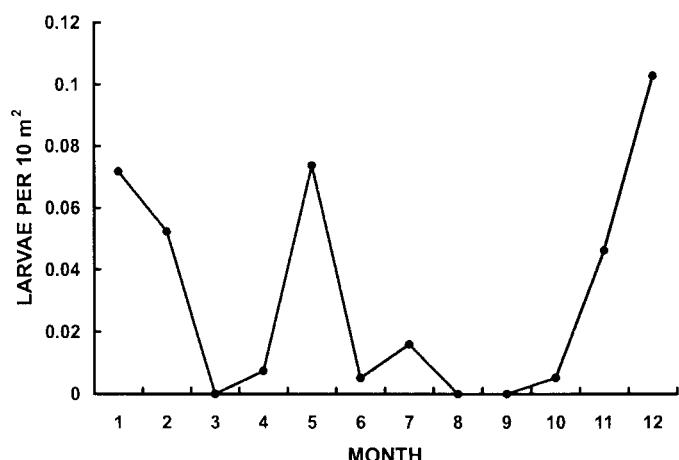
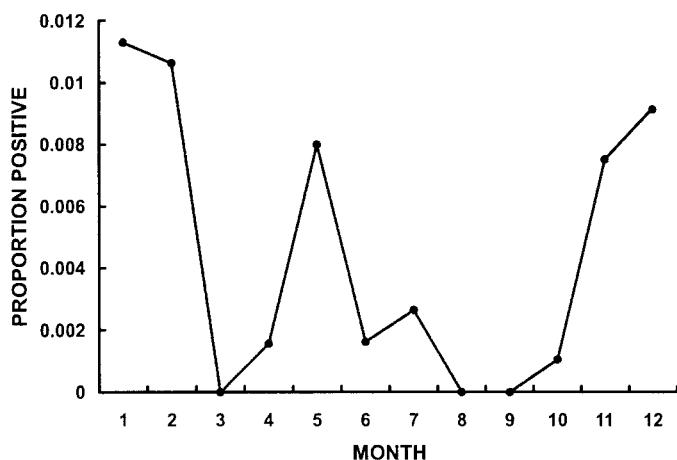
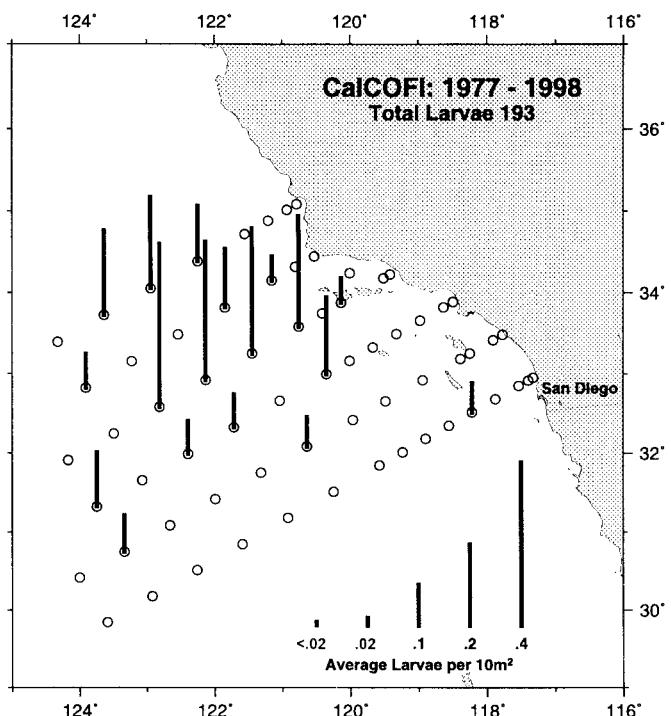
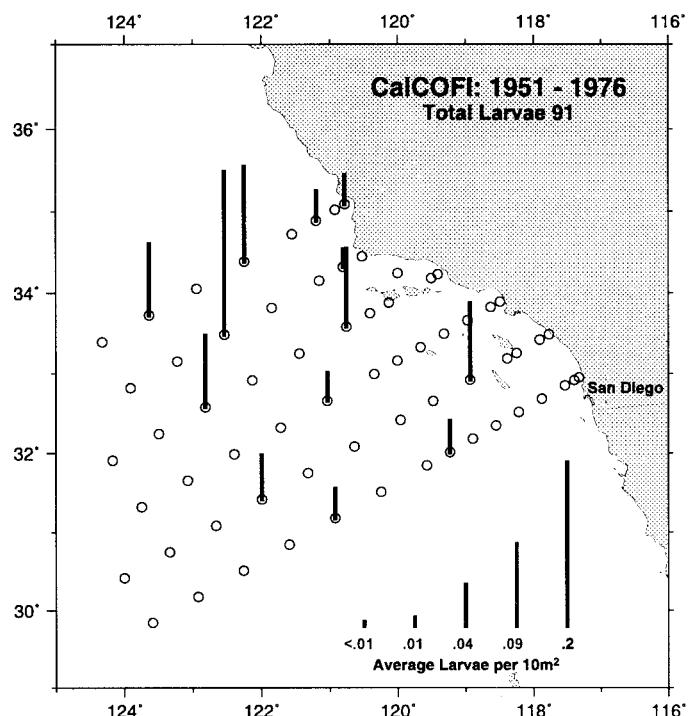
## *Howella* spp.



*Bathylagus milleri*

Robust blacksmelt

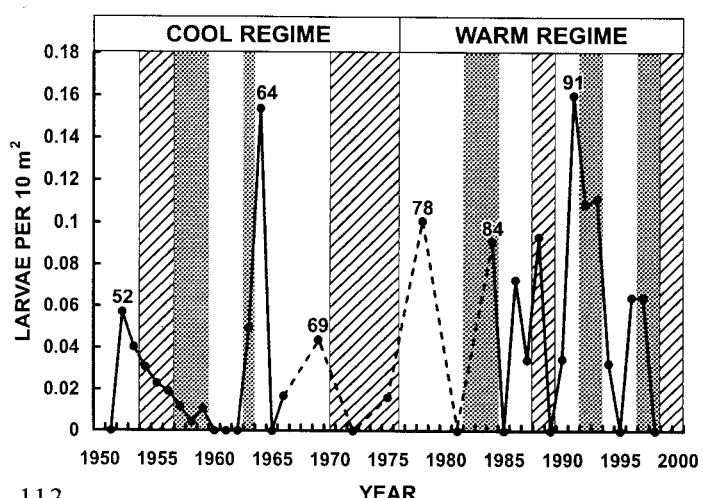
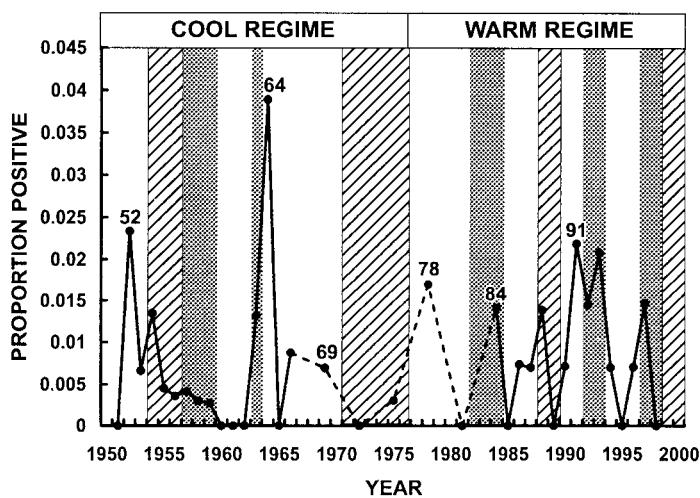
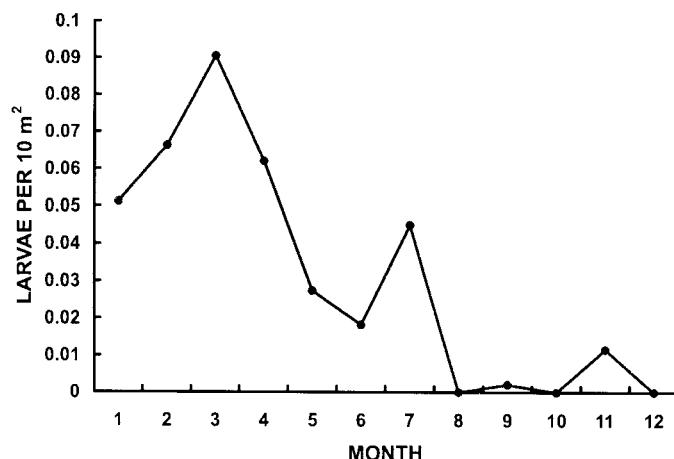
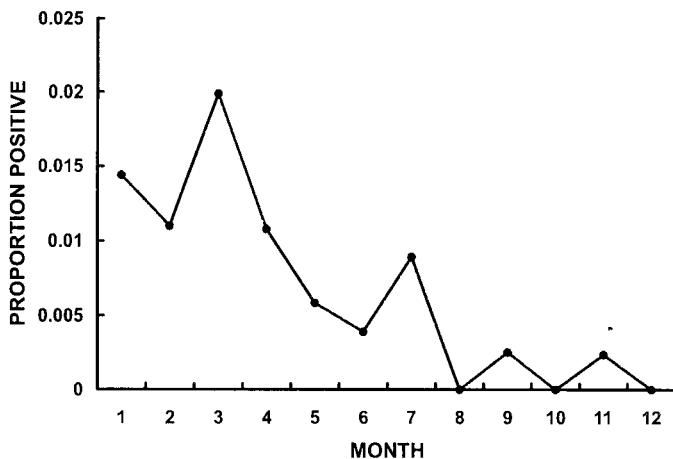
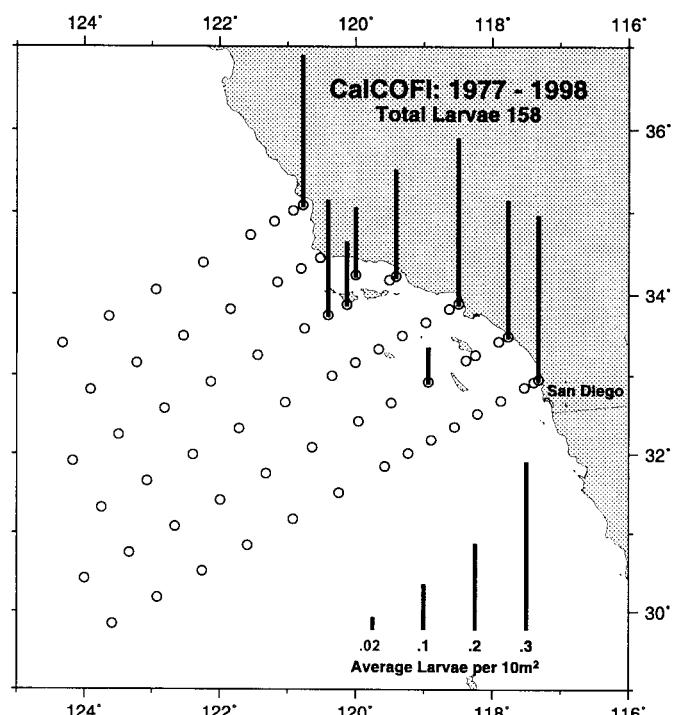
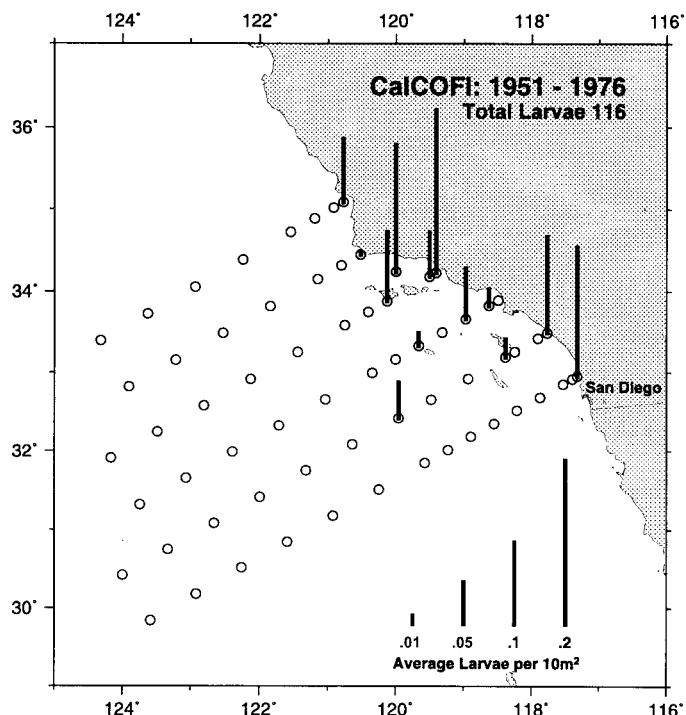
BATHYLAGIDAE



## ATHERINIDAE

## Silversides

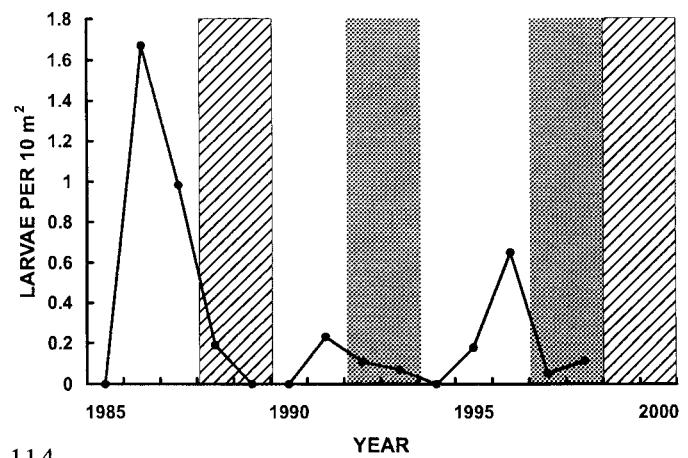
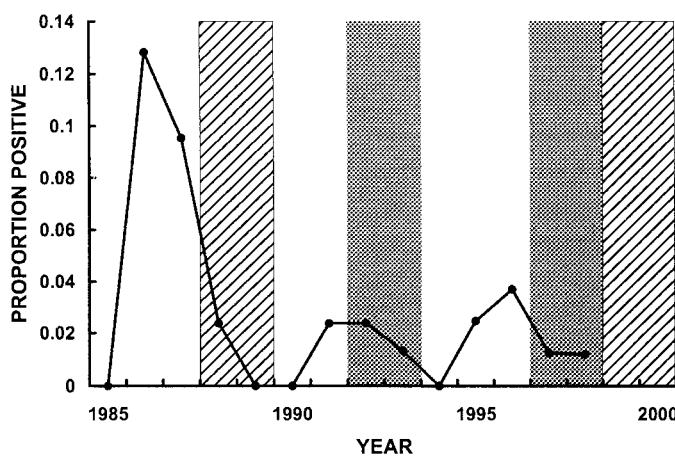
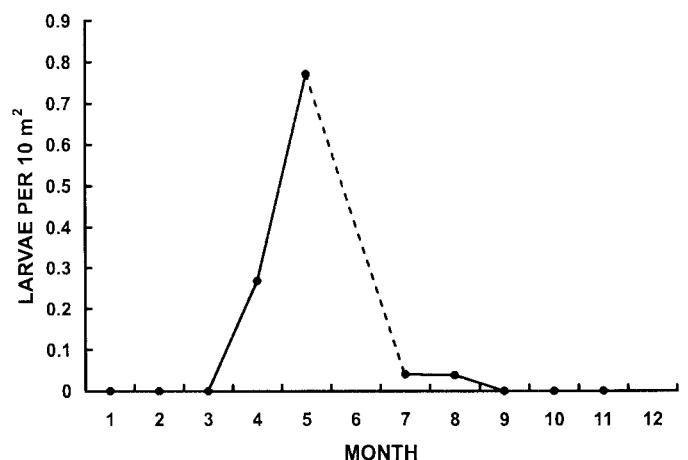
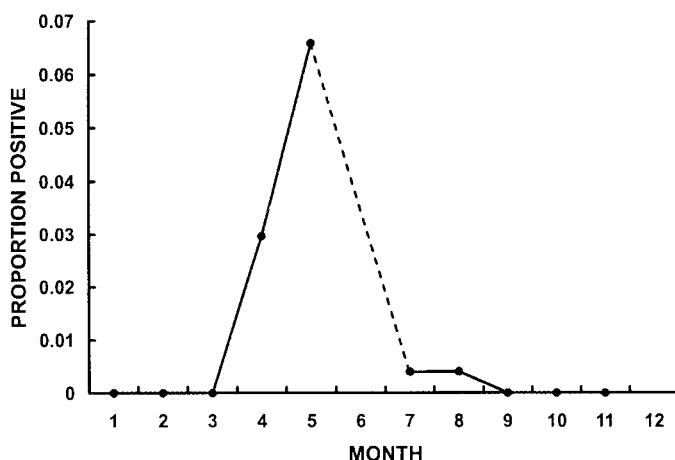
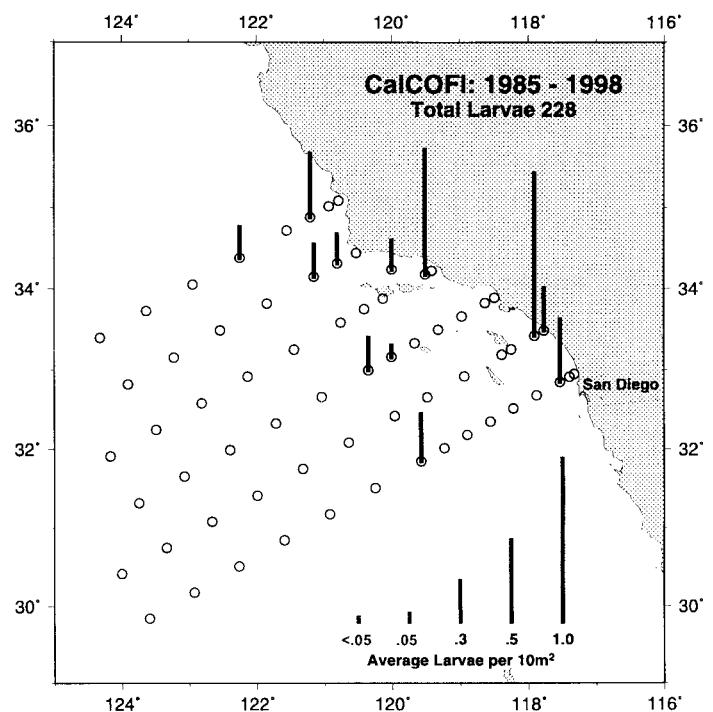
## ATHERINIDAE



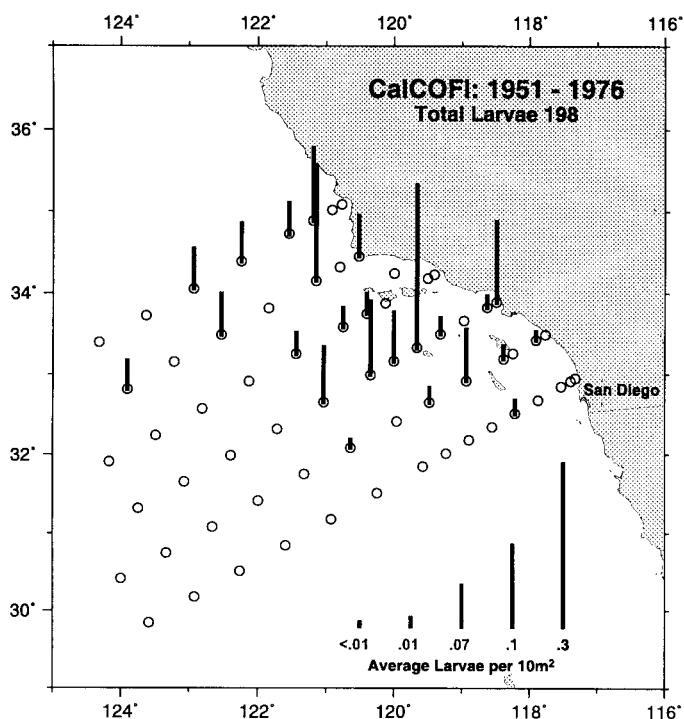
*Cataetyx rubrirostris*

Rubynose brotula

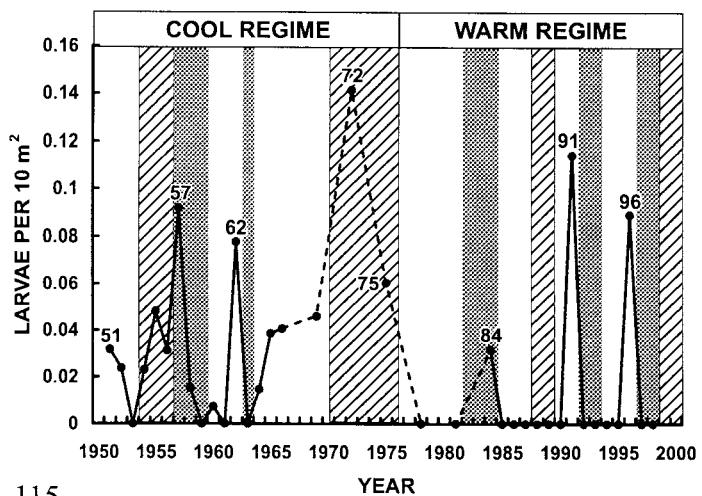
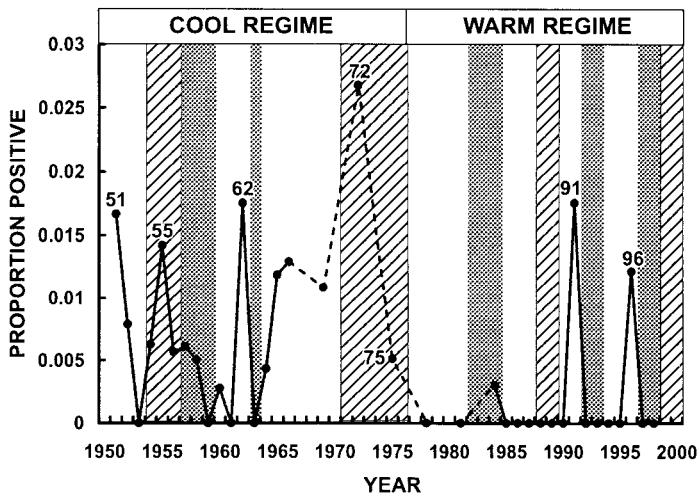
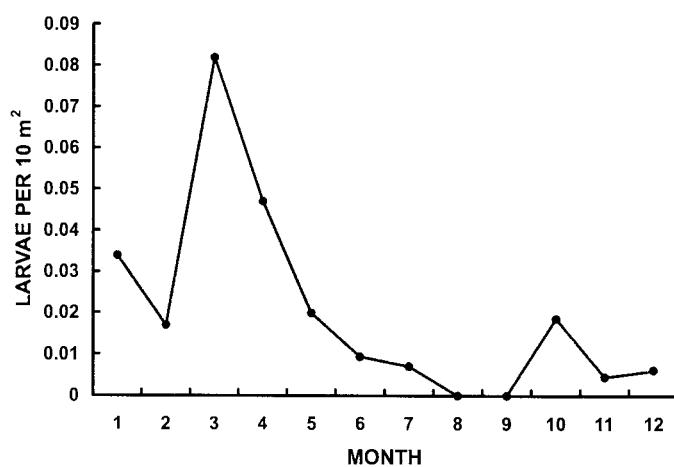
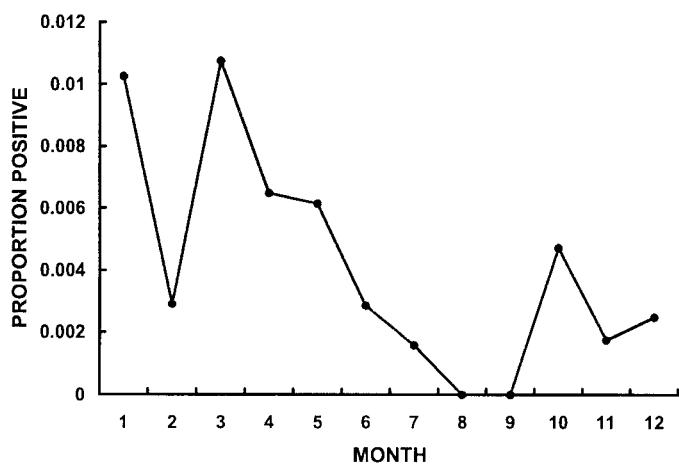
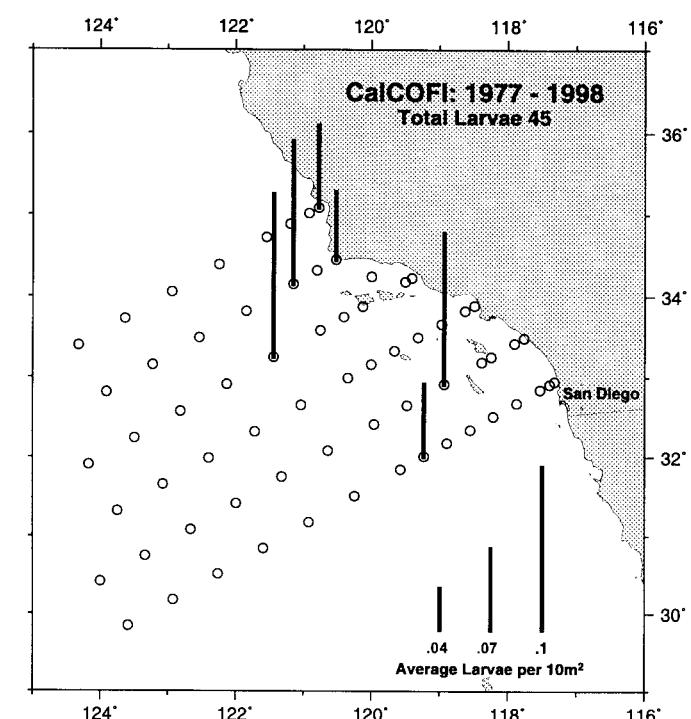
BYTHITIDAE



## PLEURONECTIDAE



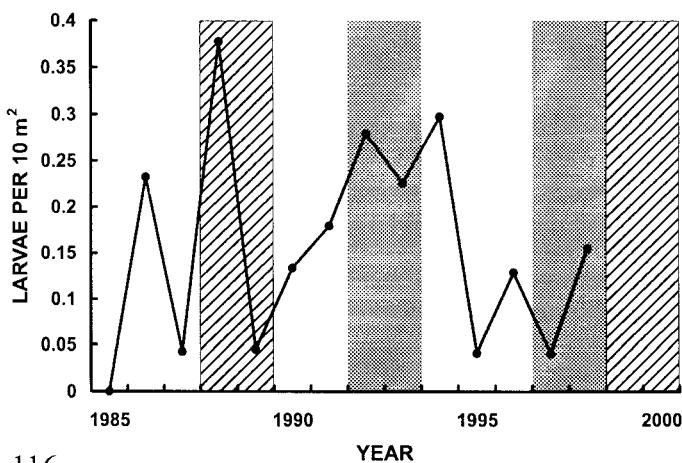
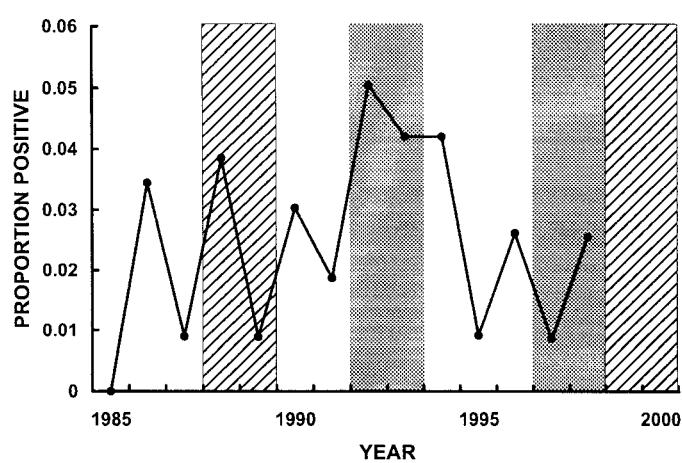
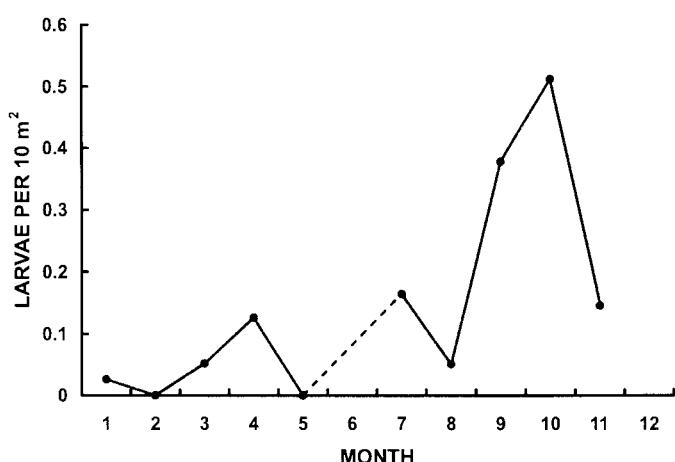
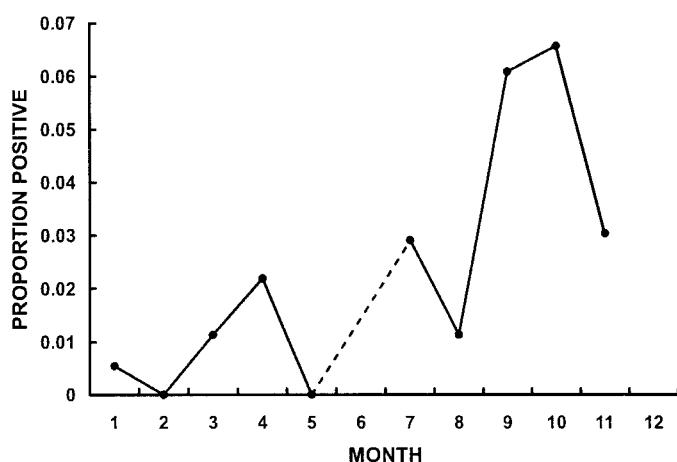
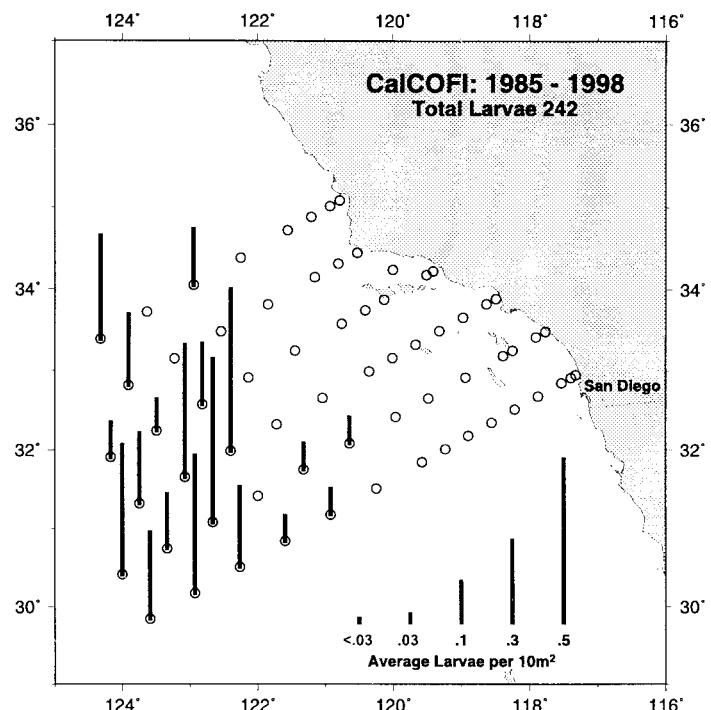
## Curlfin turbot



*Cyclothona pseudopallida*

## Slender bristlemouth

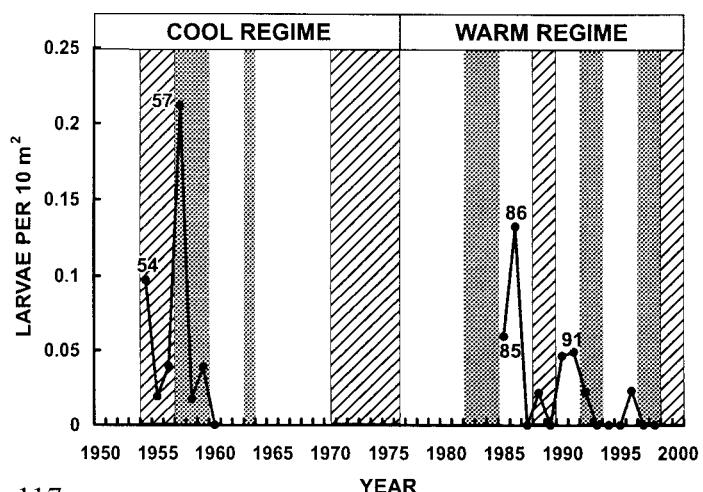
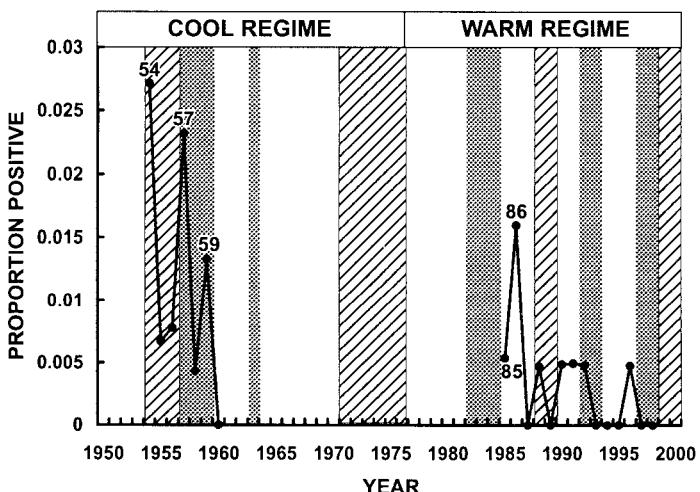
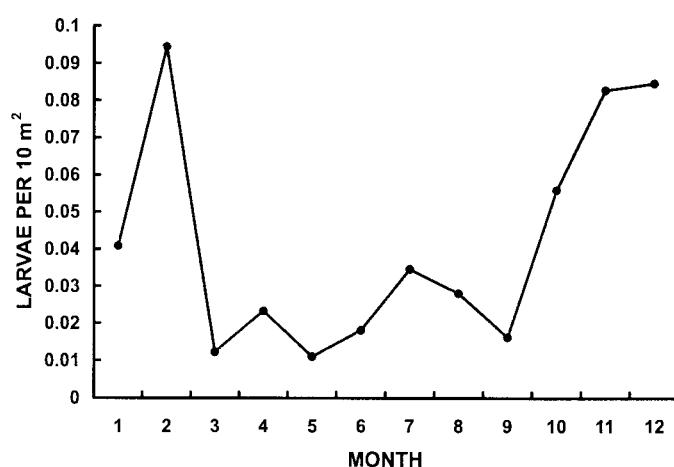
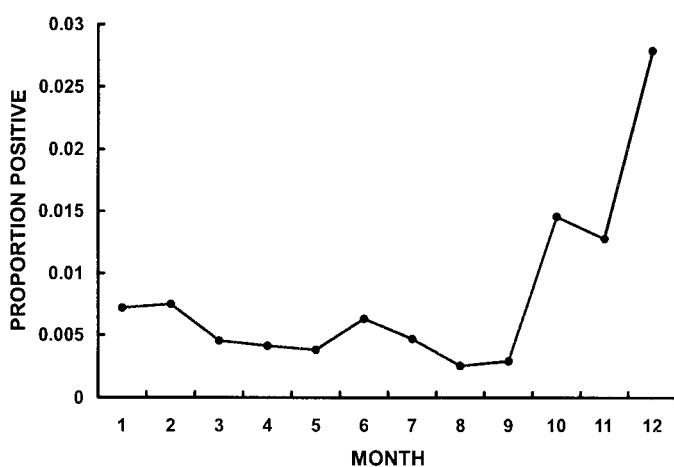
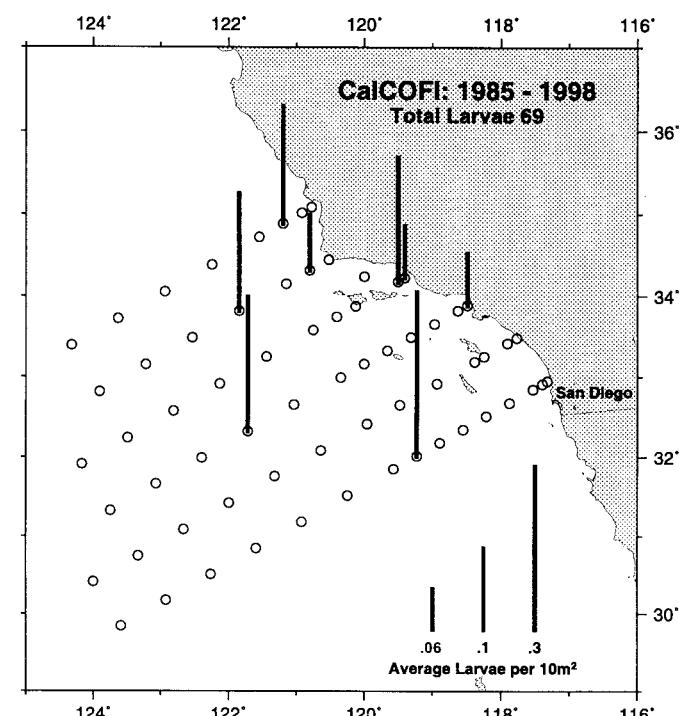
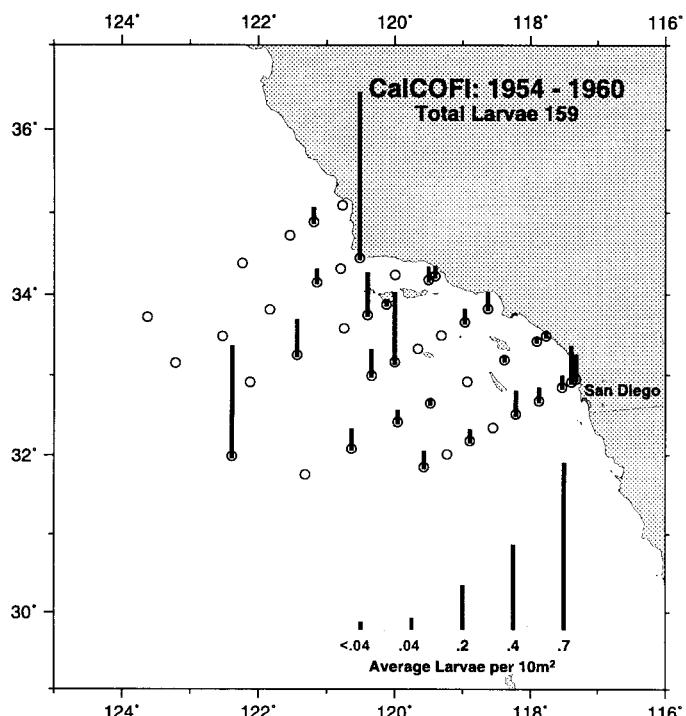
## GONOSTOMATIDAE



## PARALICHTHYIDAE

## Longfin sanddab

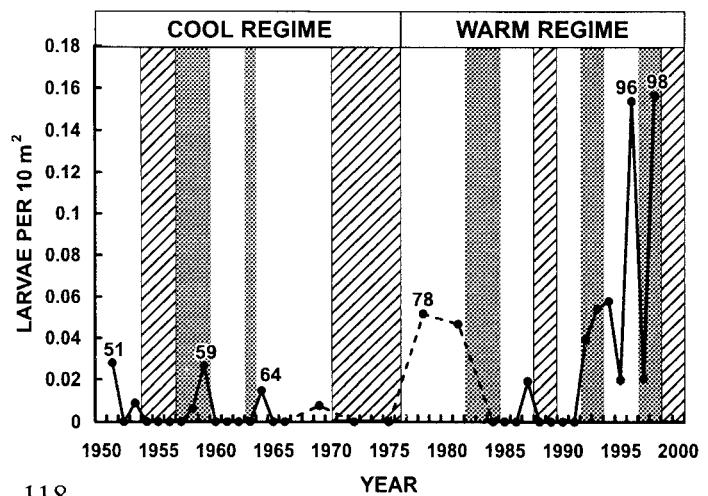
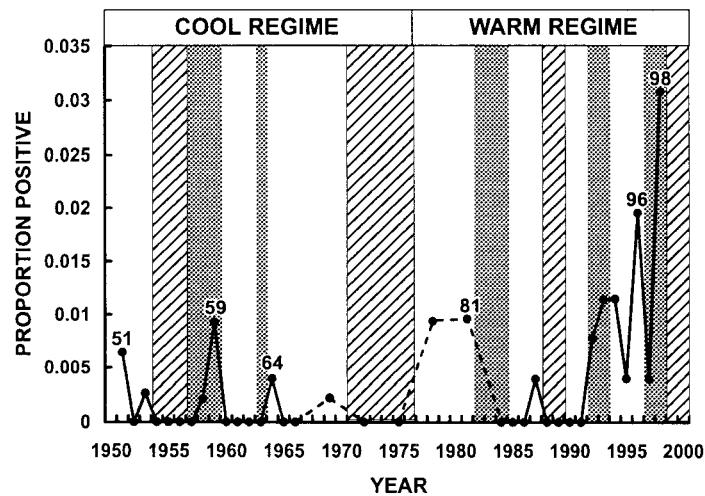
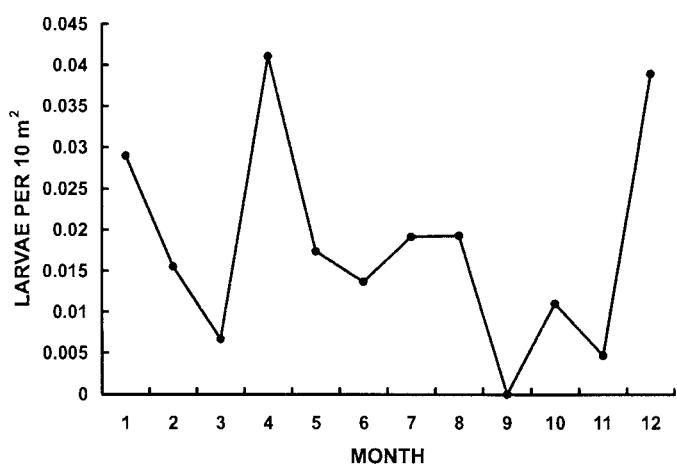
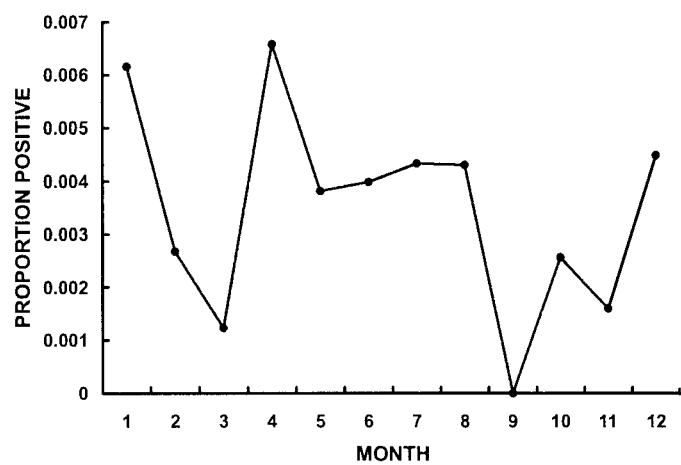
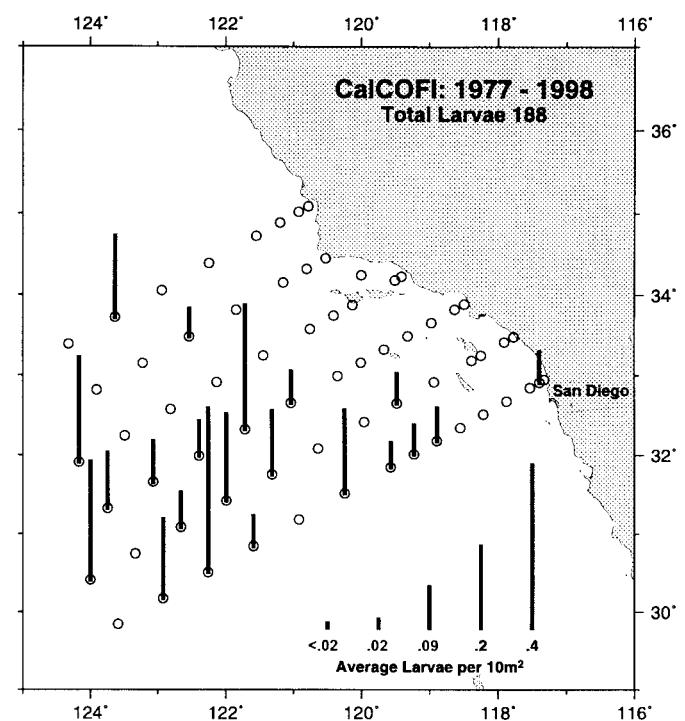
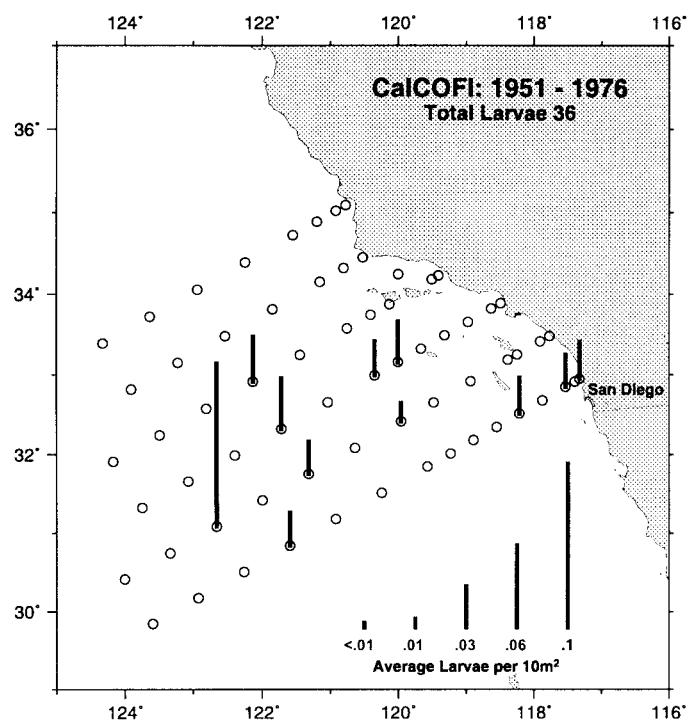
## *Citharichthys xanthostigma*



*Ichthyococcus irregularis*

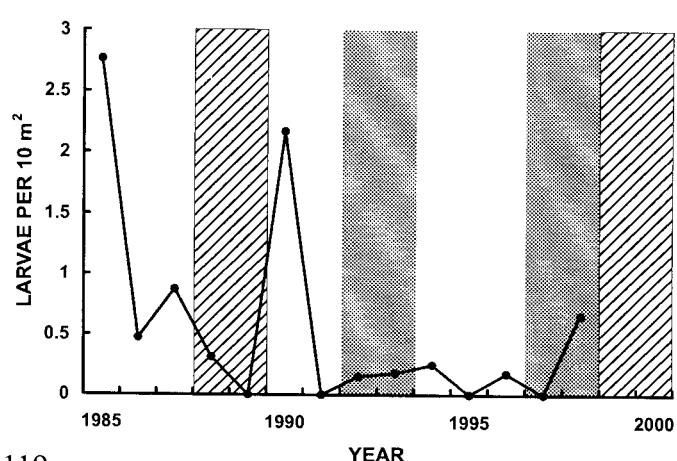
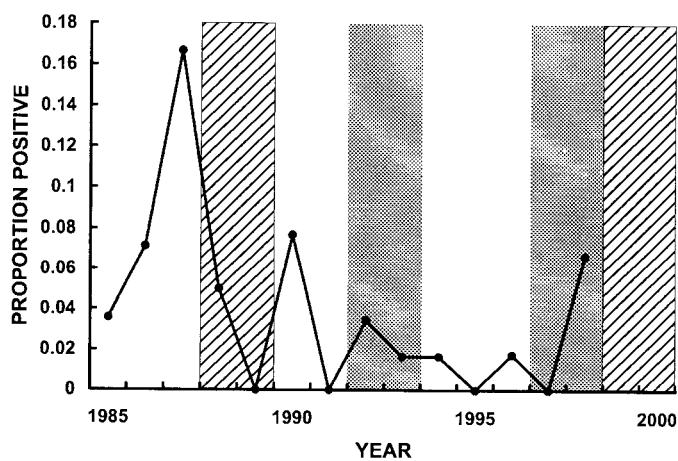
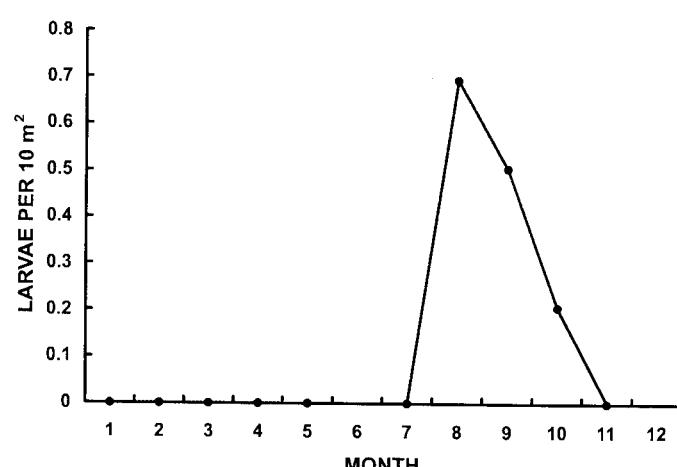
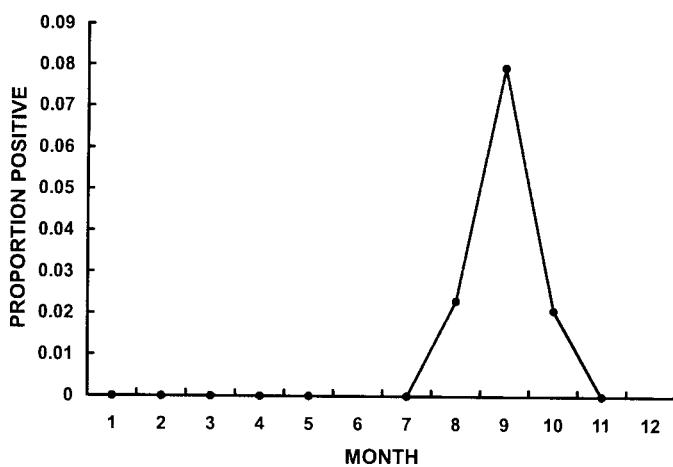
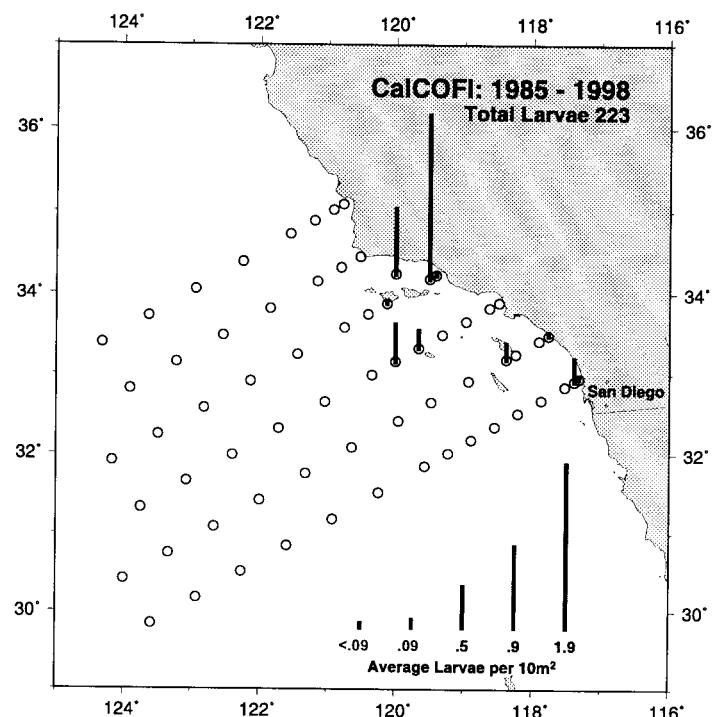
Bulldog lightfish

PHOSICHTHYIDAE



## GOBIIDAE

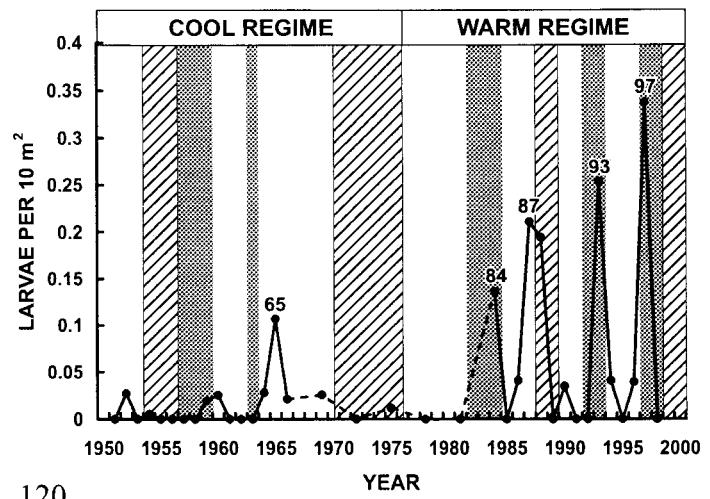
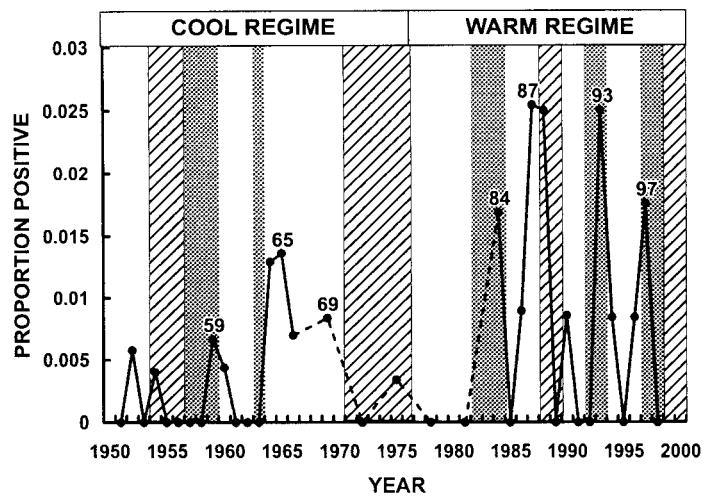
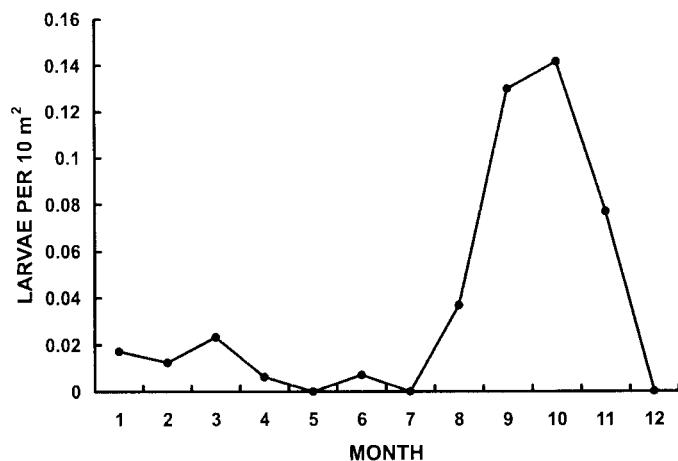
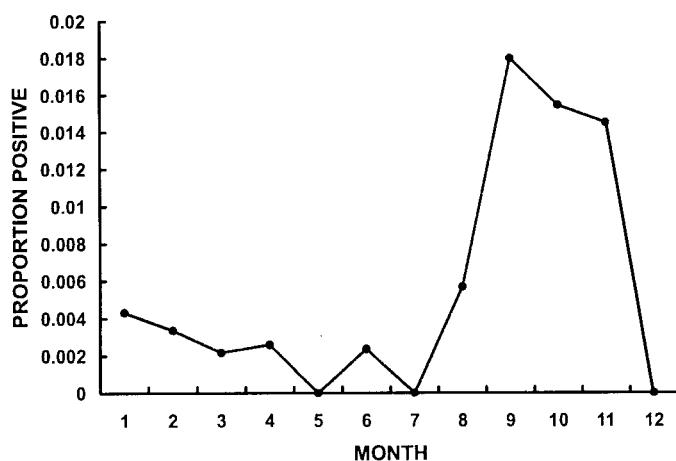
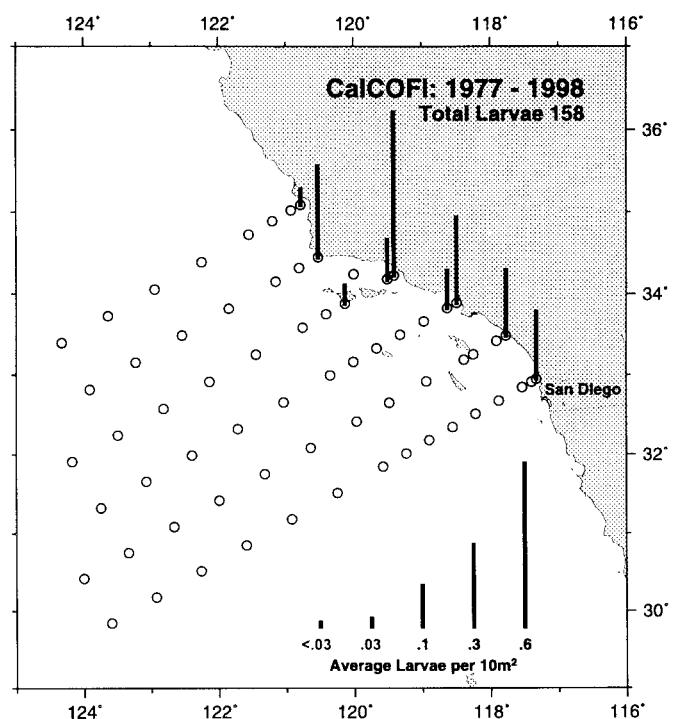
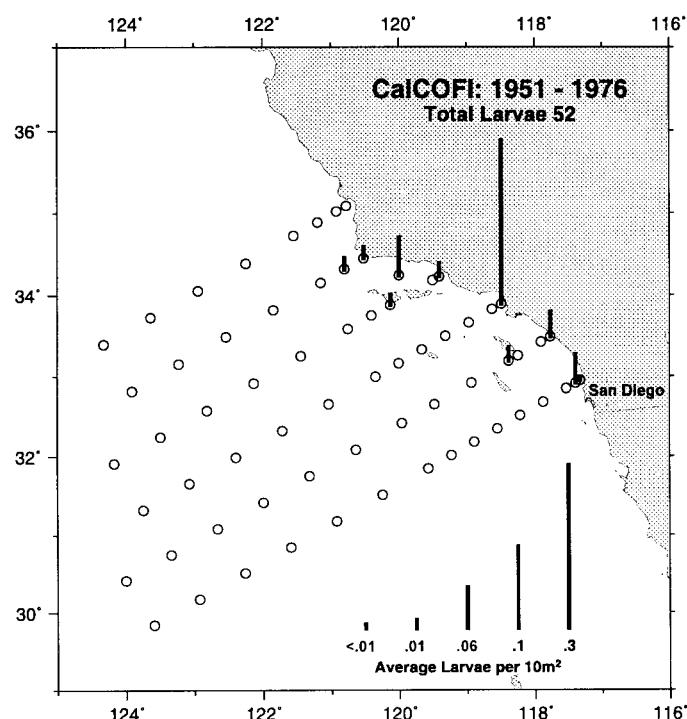
## Bluebanded goby

*Lythrypnus dalli*

*Xystreurus liolepis*

Fantail sole

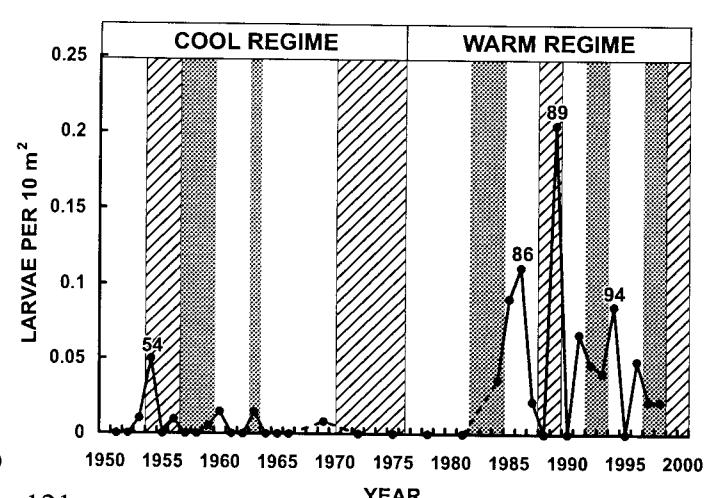
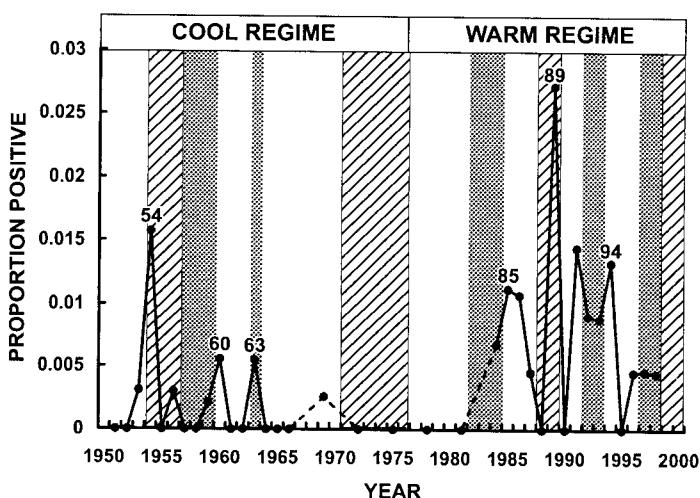
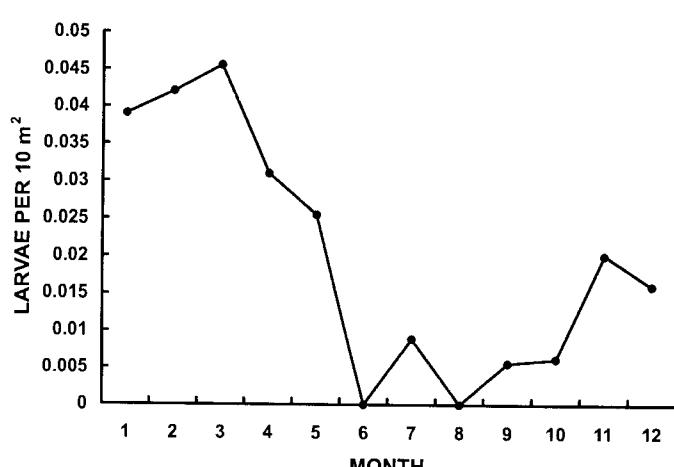
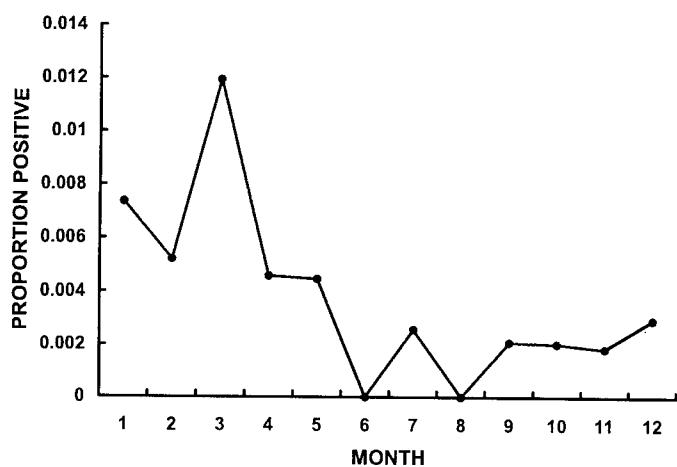
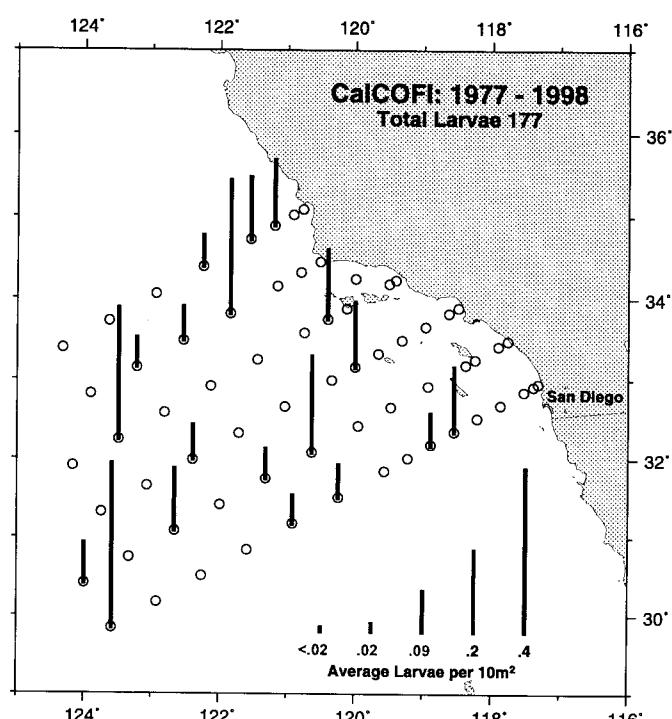
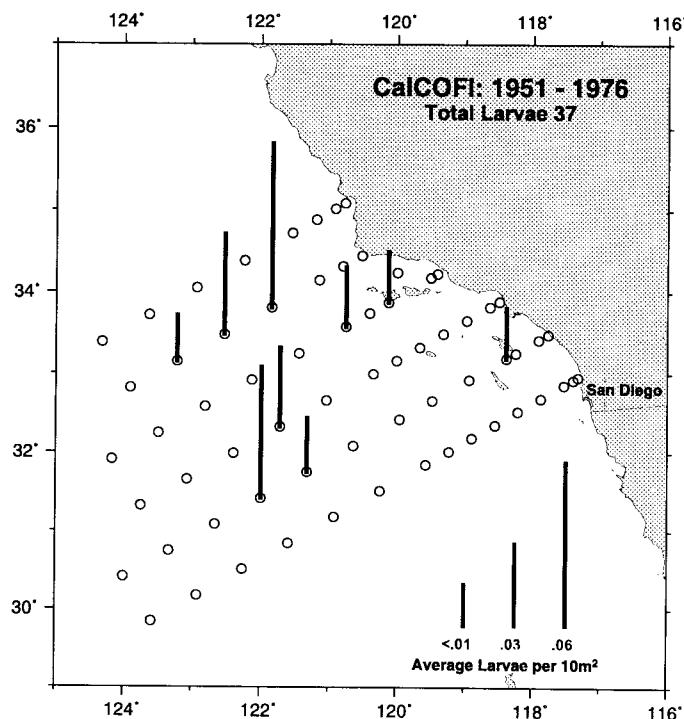
PARALICHTHYIDAE



# MYCTOPHIDAE

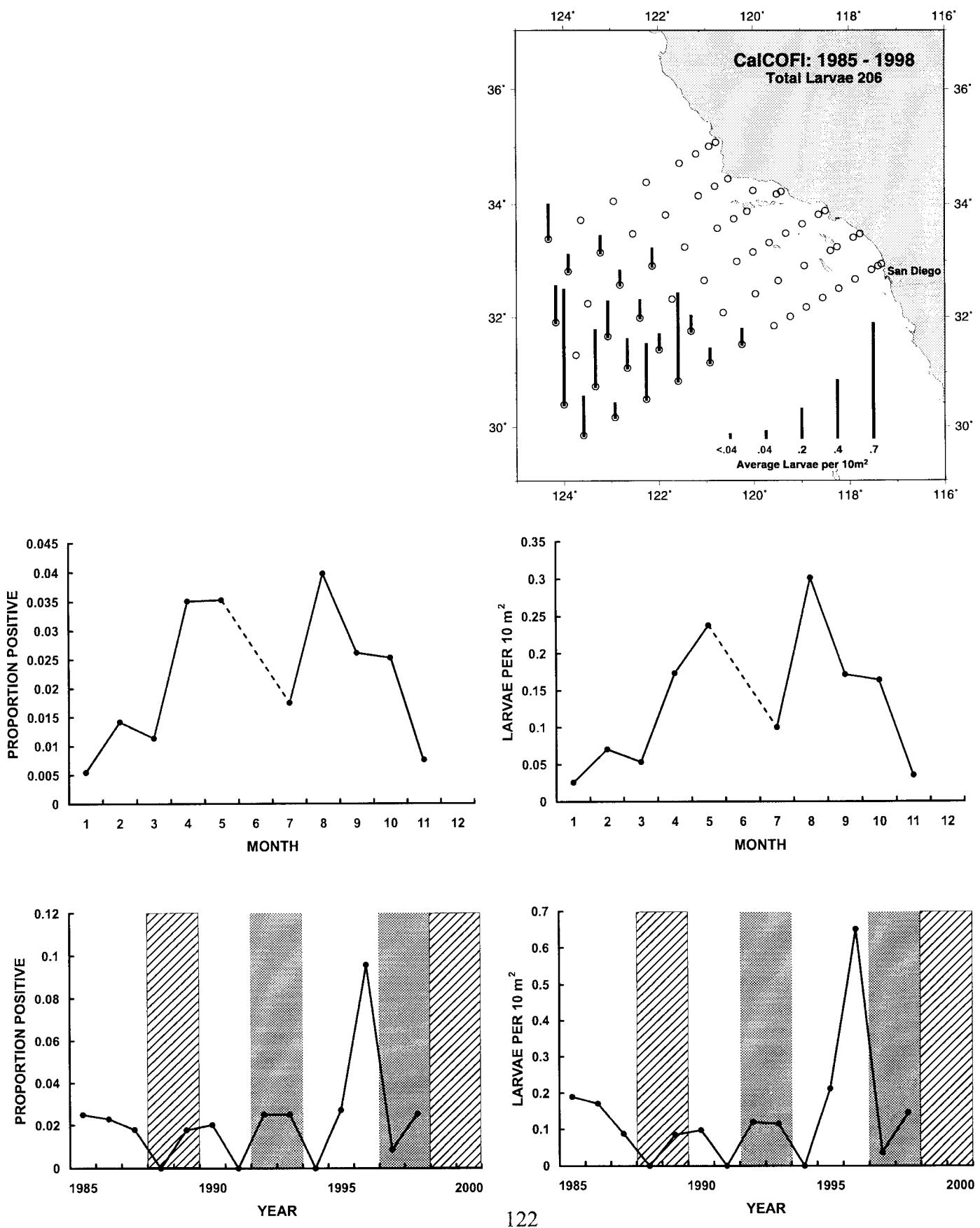
## Dwarf lanternfish

## *Loweina rara*



*Nannobrachium hawaiiensis*

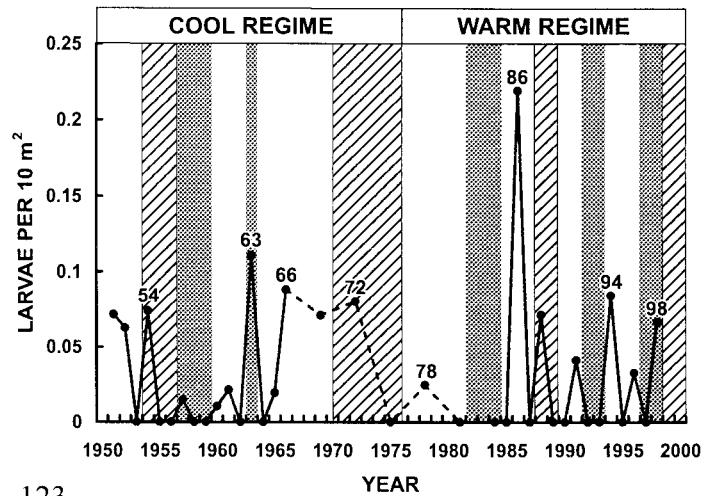
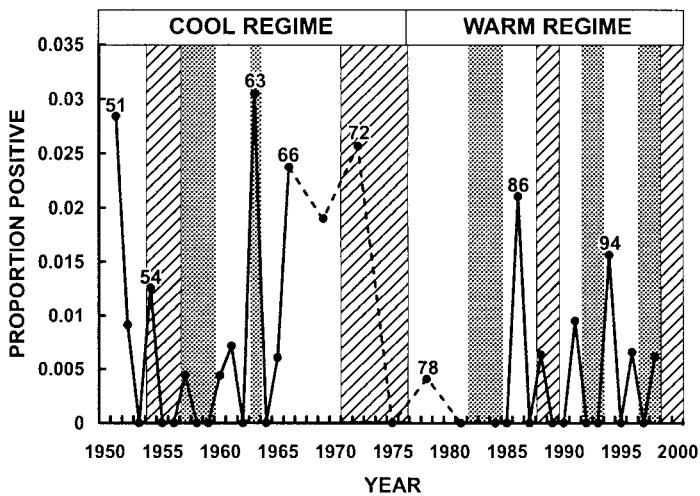
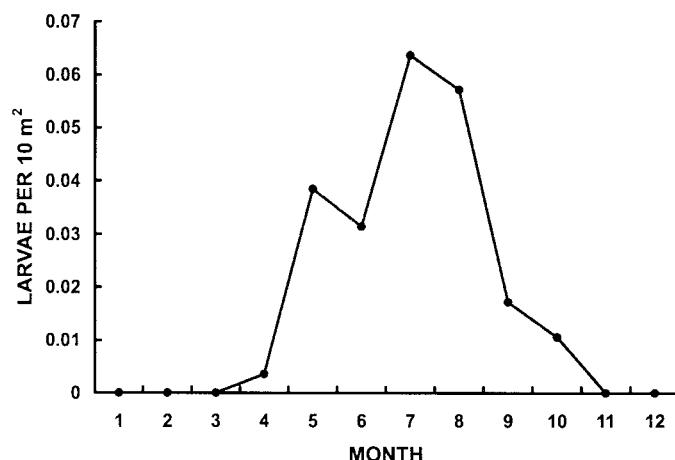
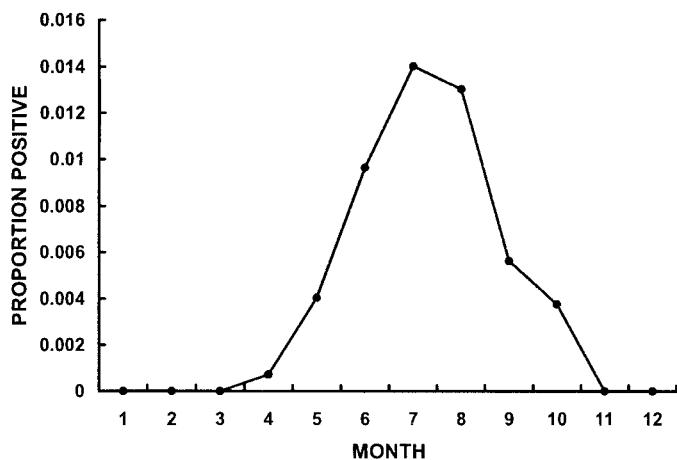
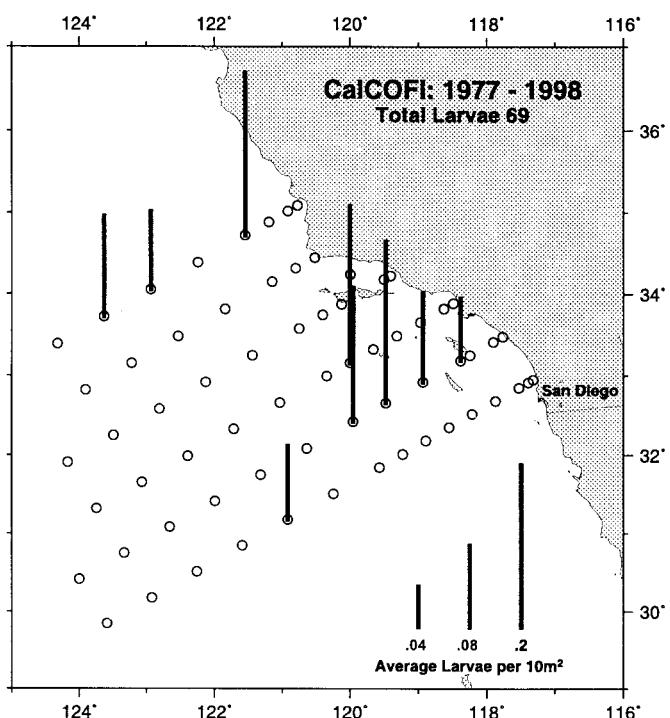
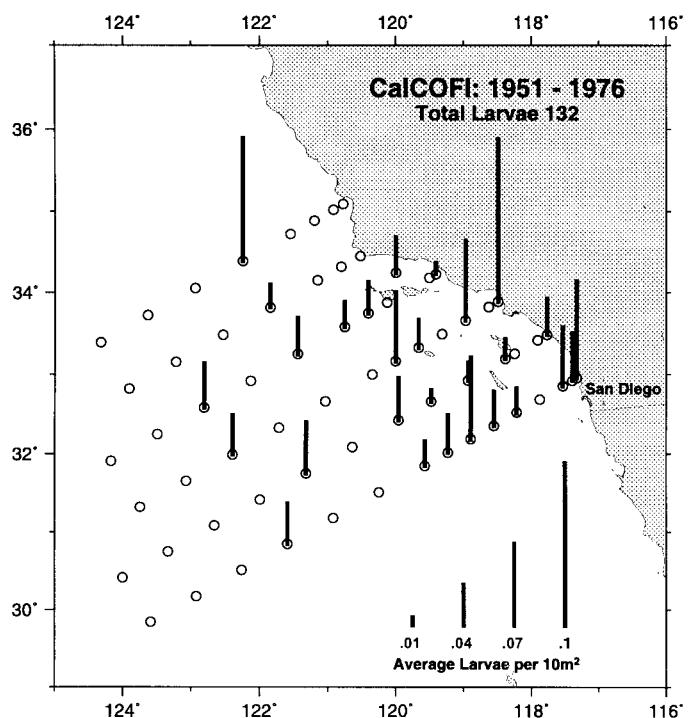
MYCTOPHIDAE



## KYPHOSIDAE

## Halfmoon

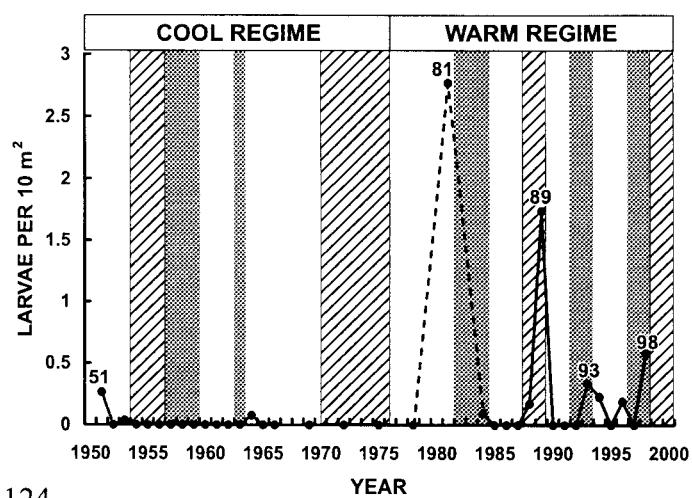
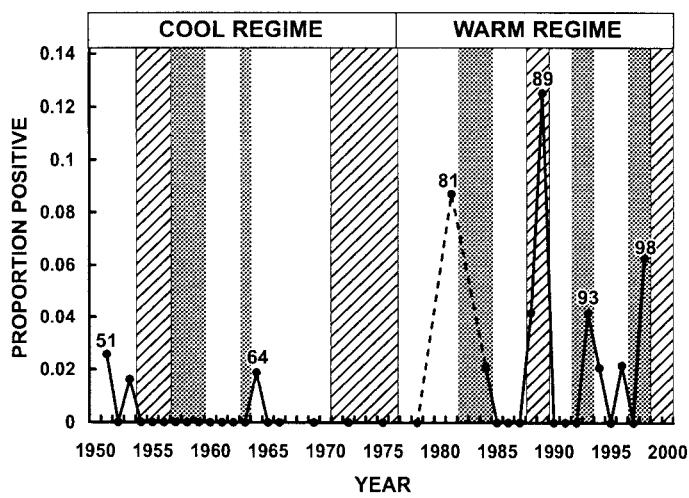
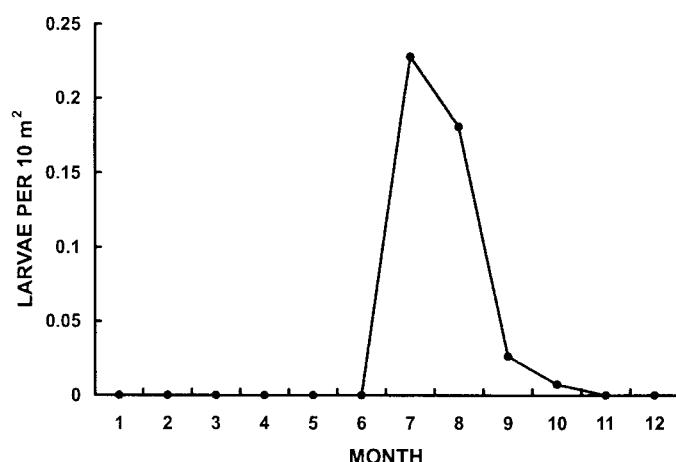
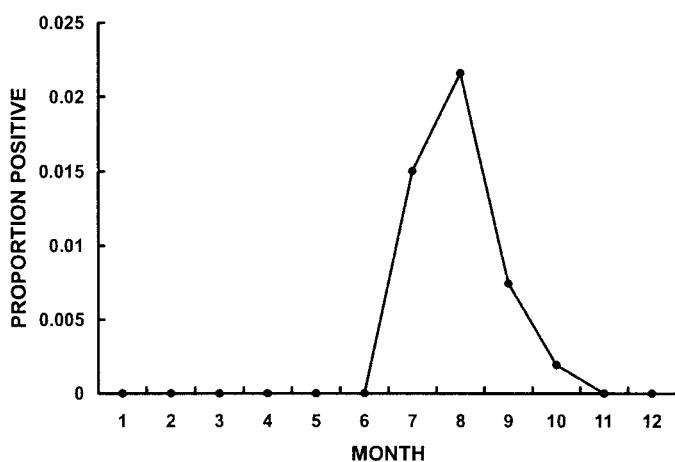
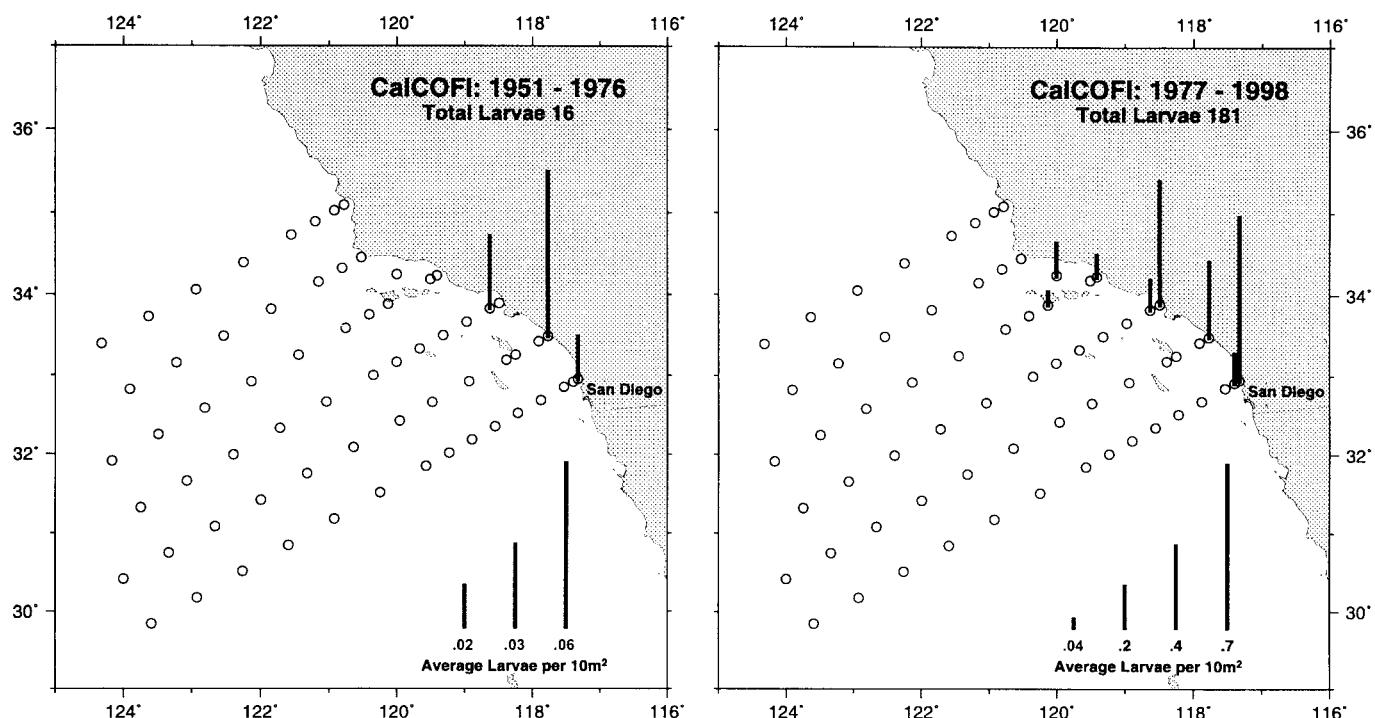
## *Medialuna californiensis*



## HAEMULIDAE

## Grunts

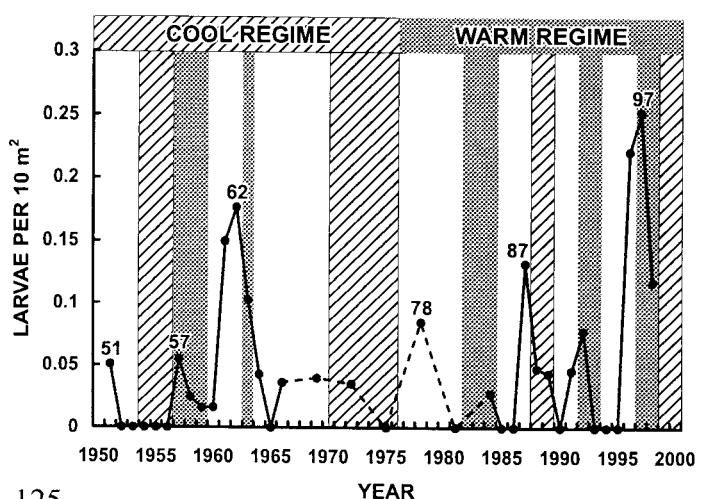
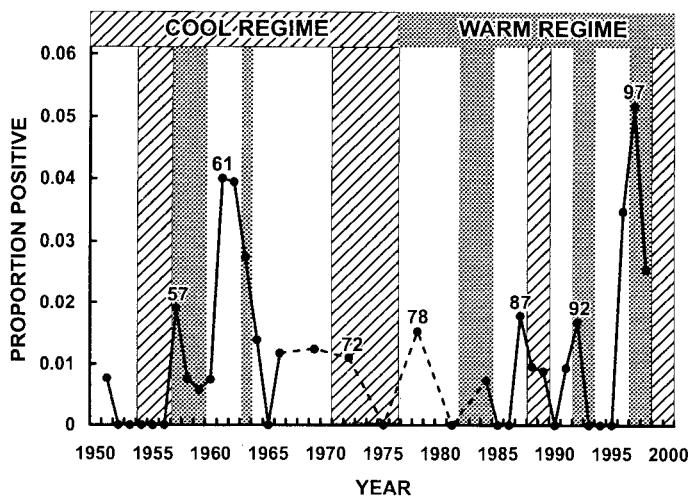
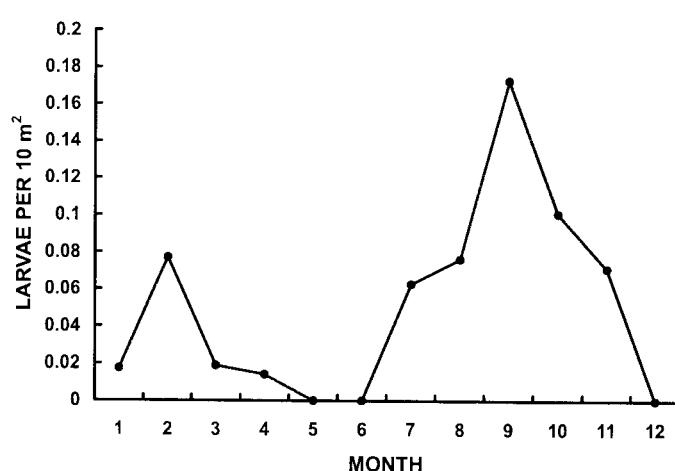
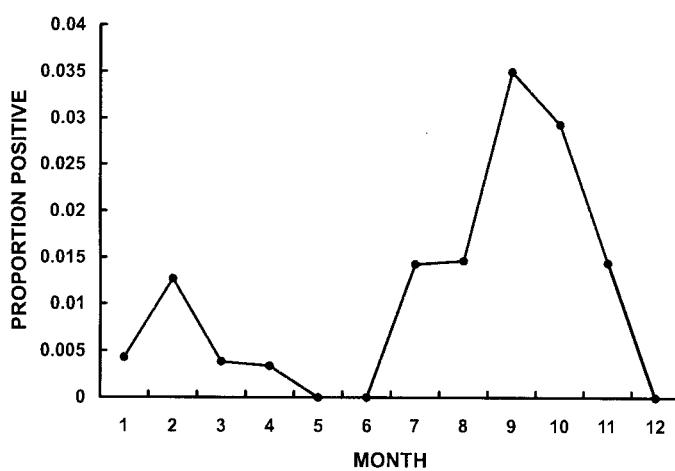
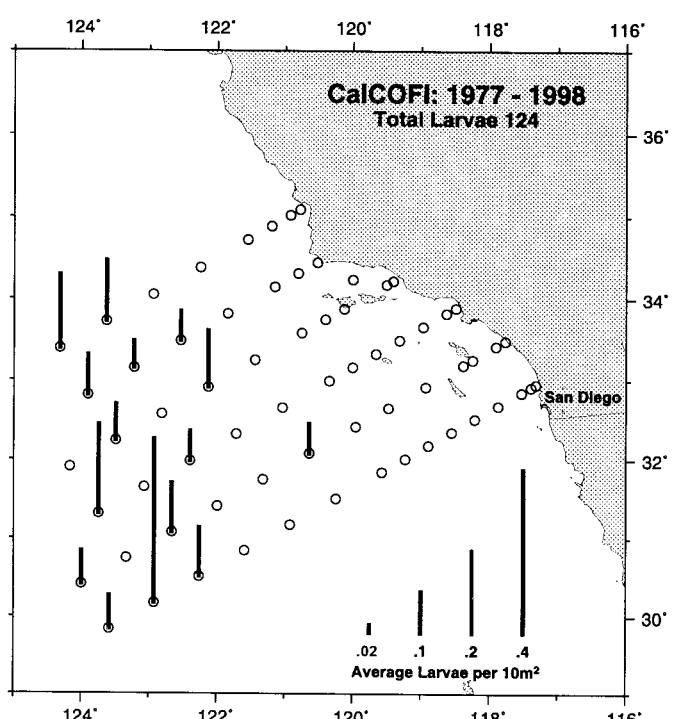
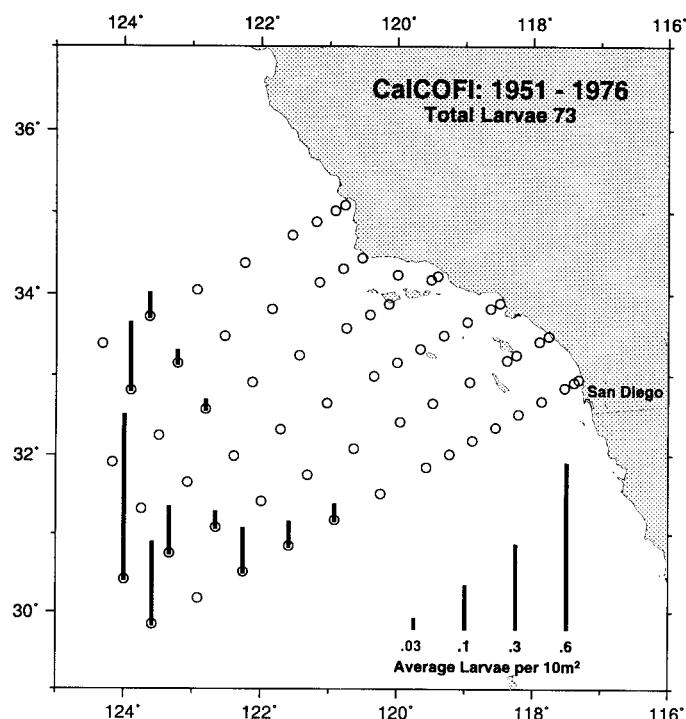
## HAEMULIDAE



## BRAMIDAE

## Pacific pomfret

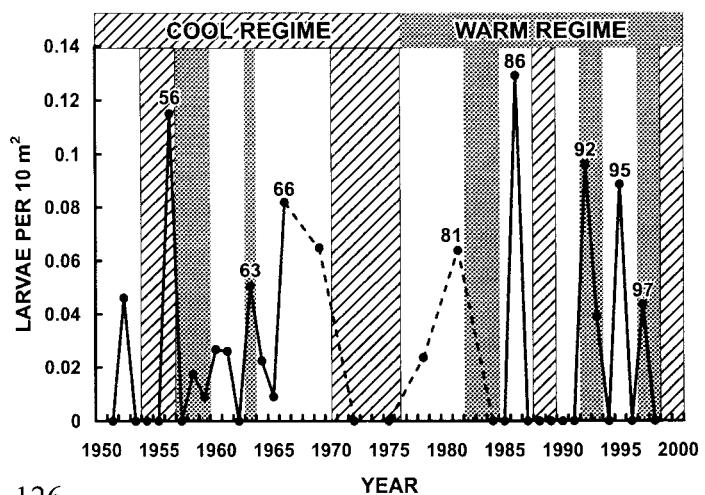
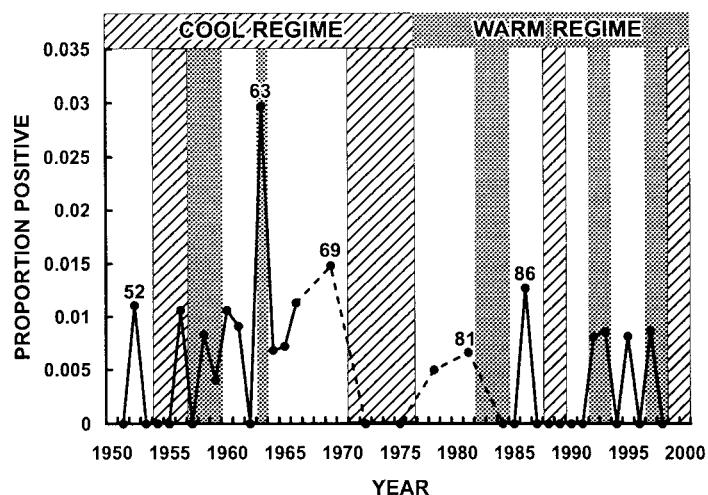
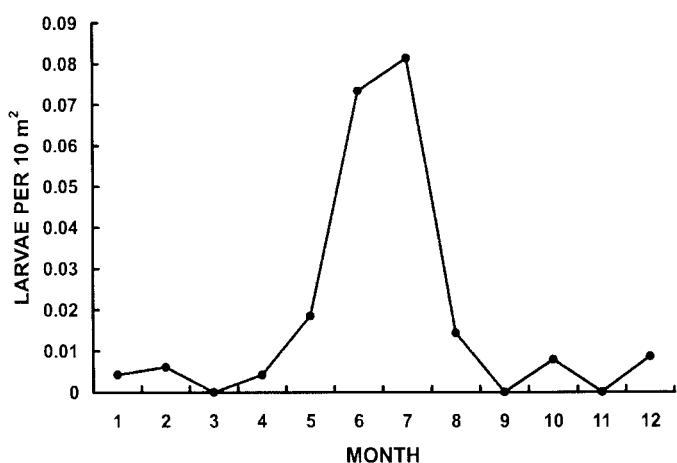
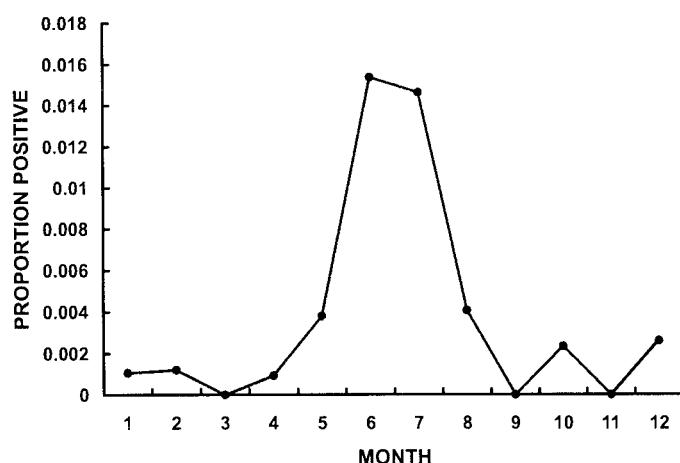
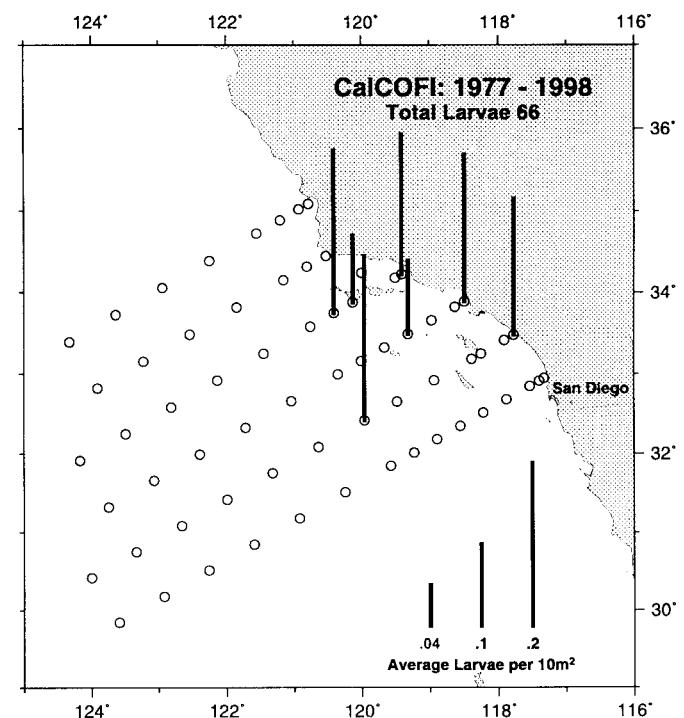
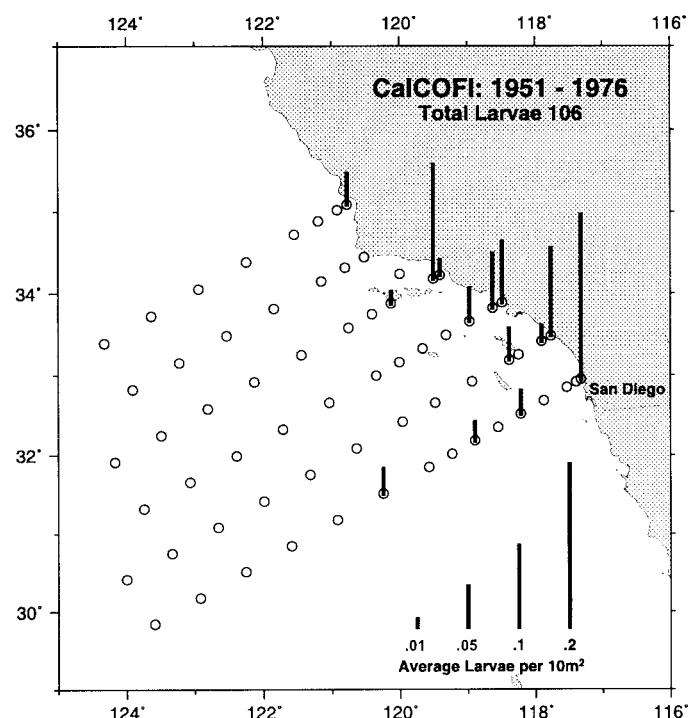
## *Brama japonica*



*Girella nigricans*

Opaleye

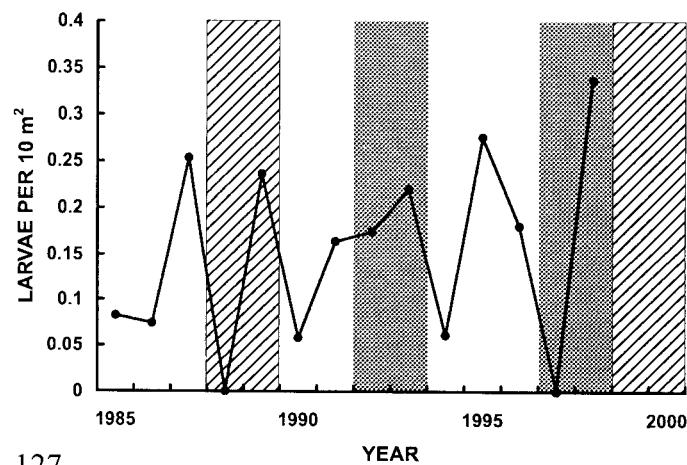
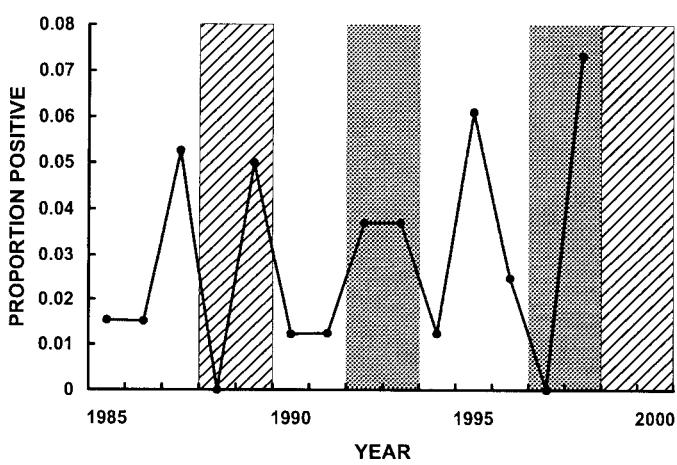
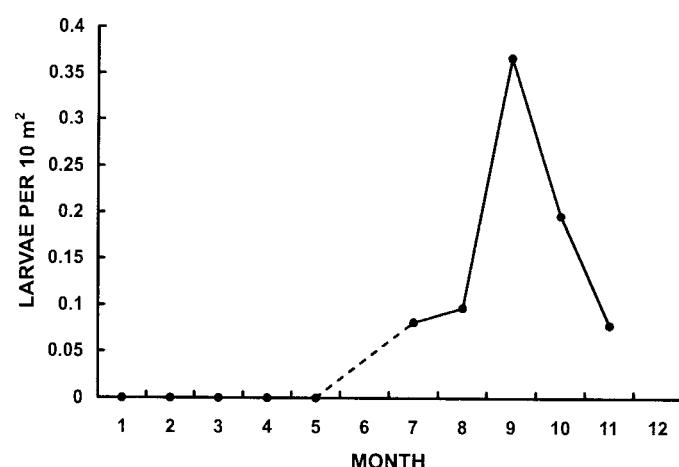
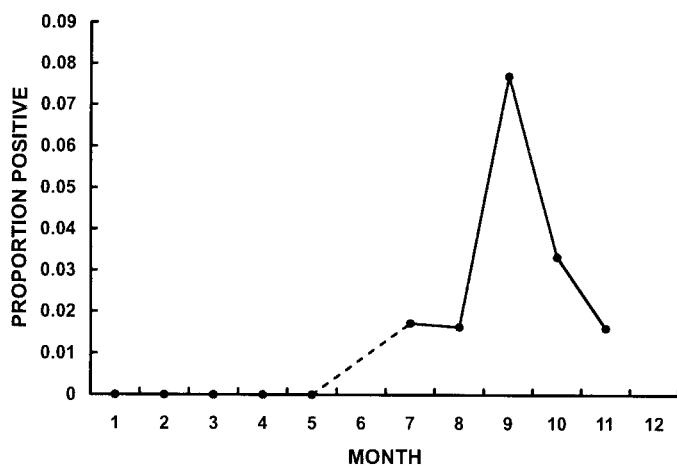
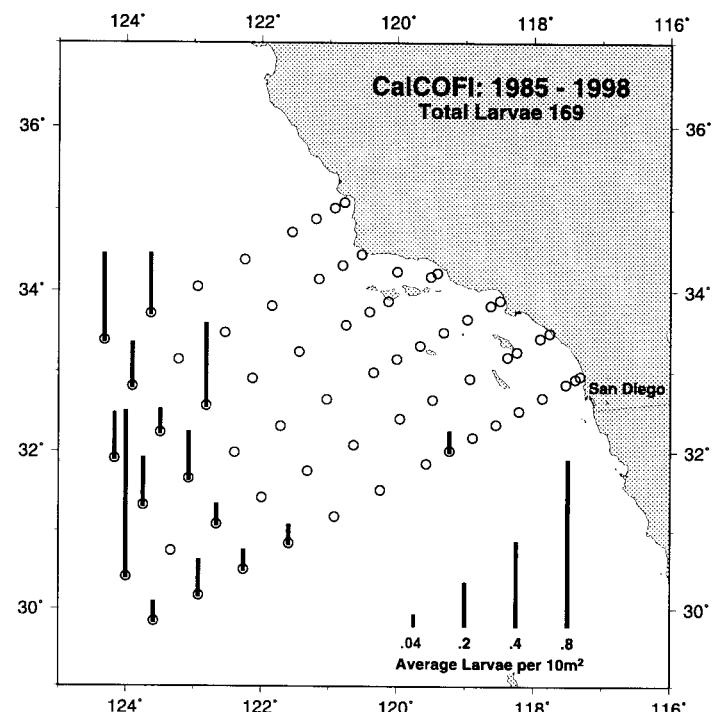
KYPHOSIDAE



# GIGANTACTINIDAE

# Whipnoses

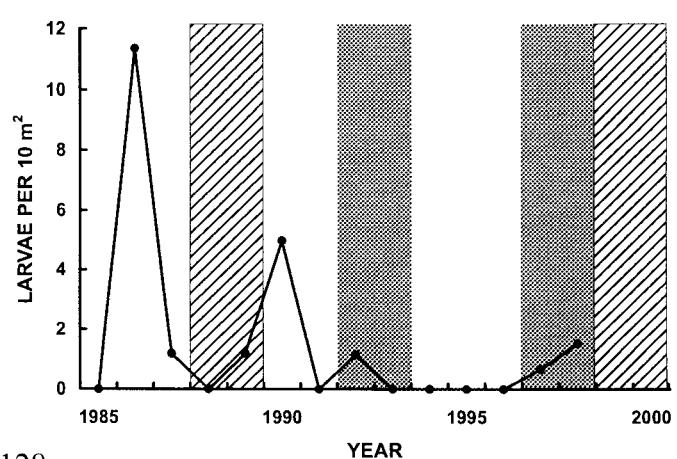
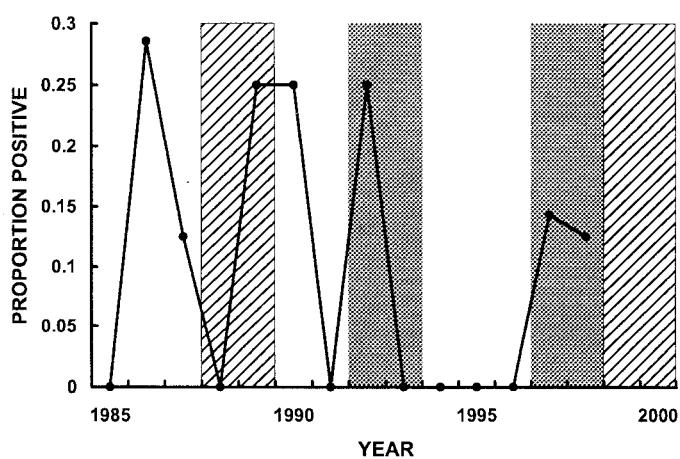
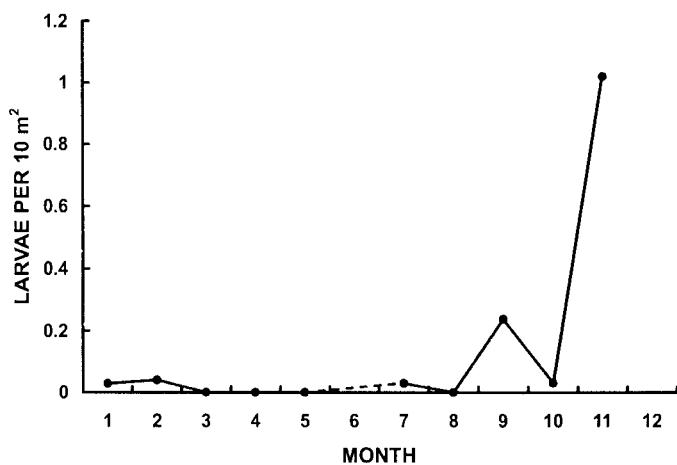
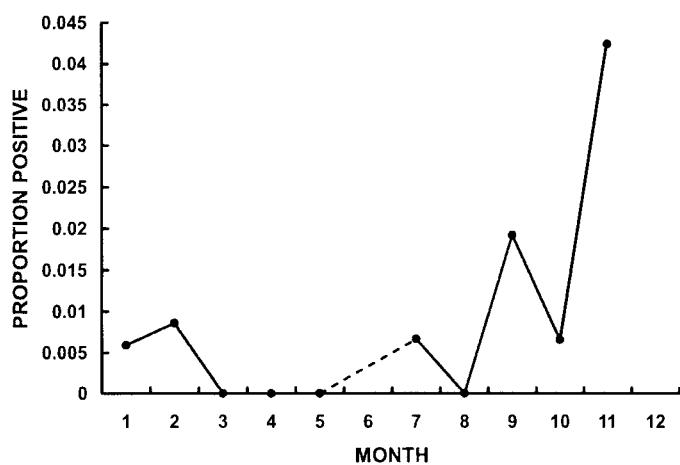
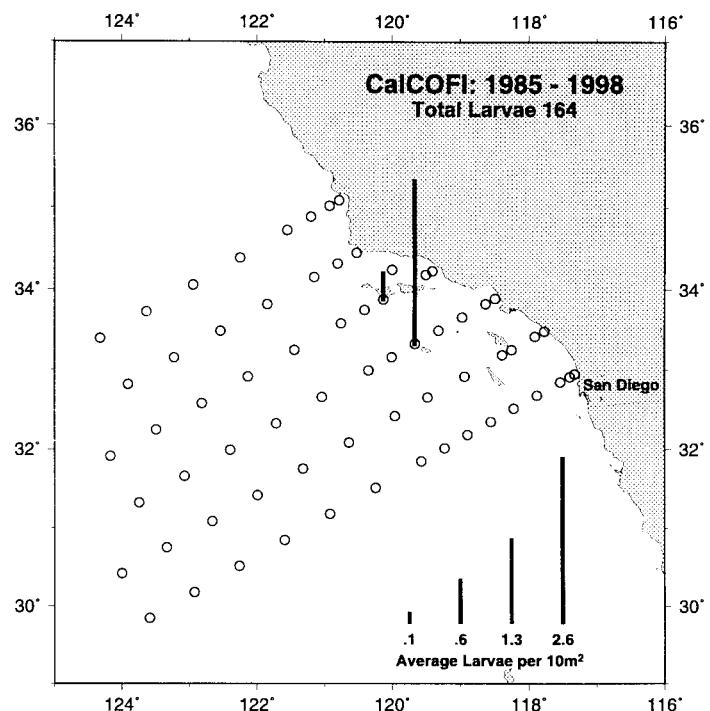
# *Gigantactis* spp.



*Cryptotrema corallinum*

Deepwater kelpfish

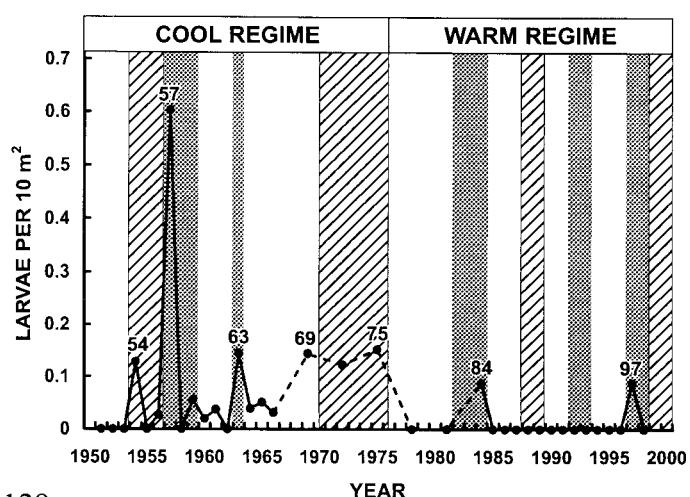
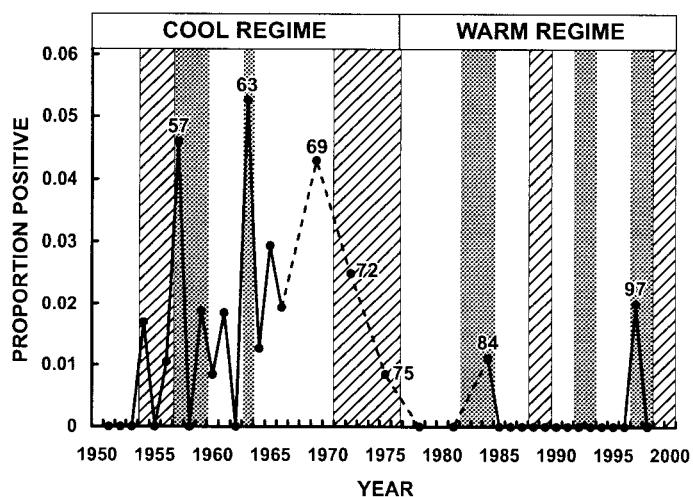
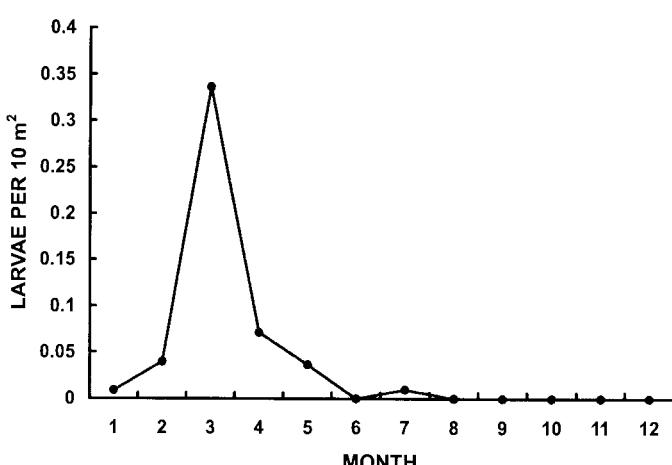
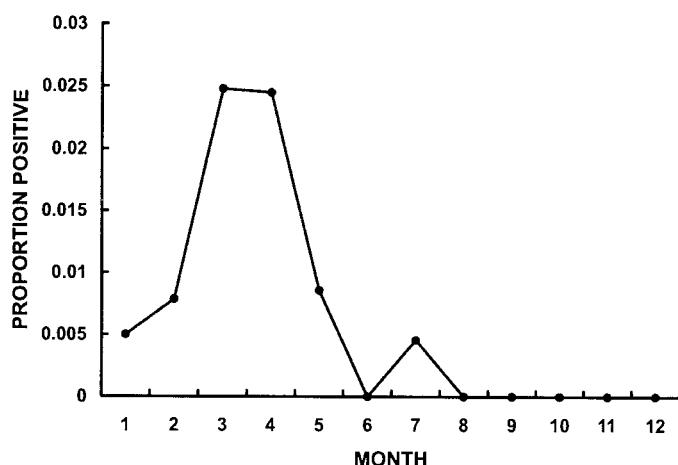
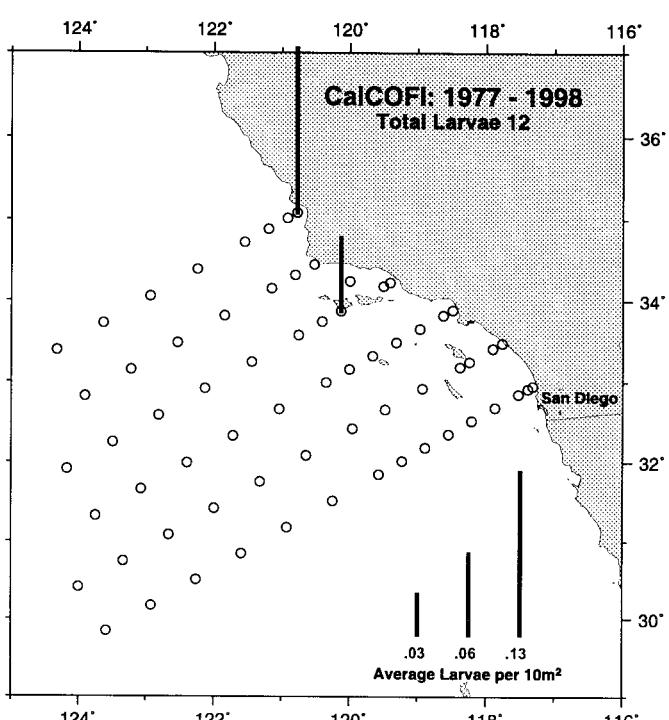
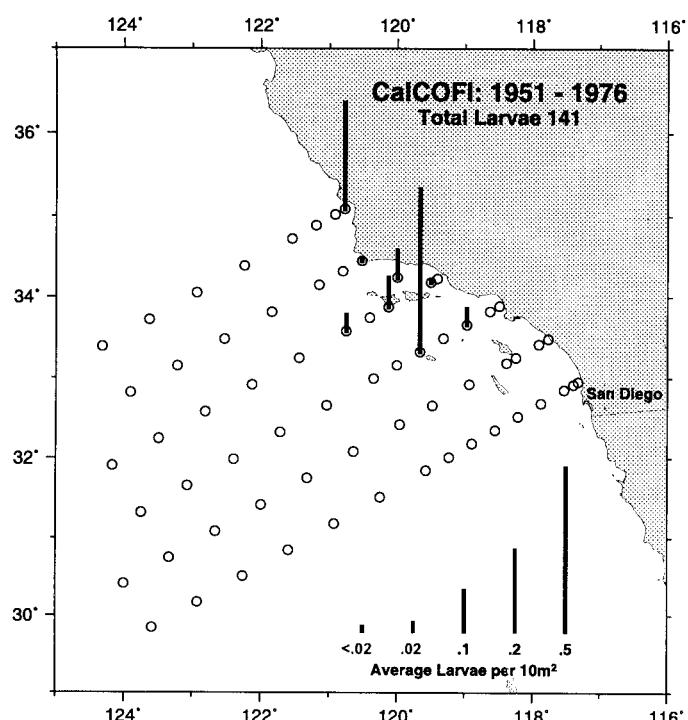
LABRISOMIDAE



# PLEURONECTIDAE

## Sand sole

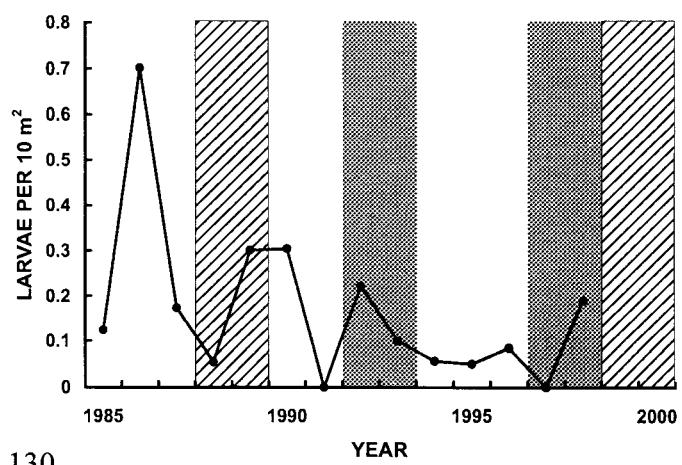
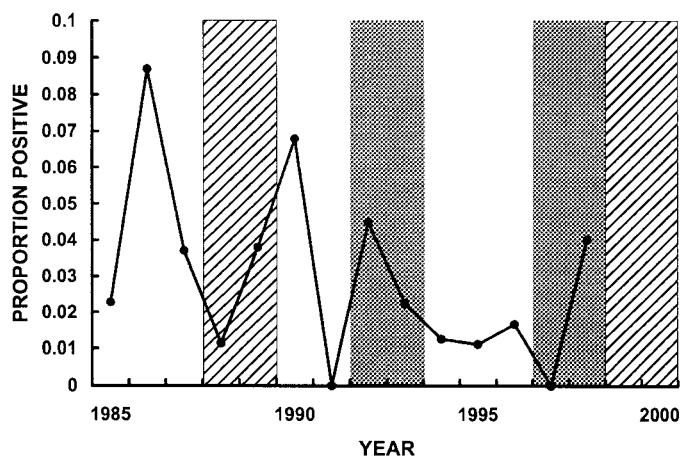
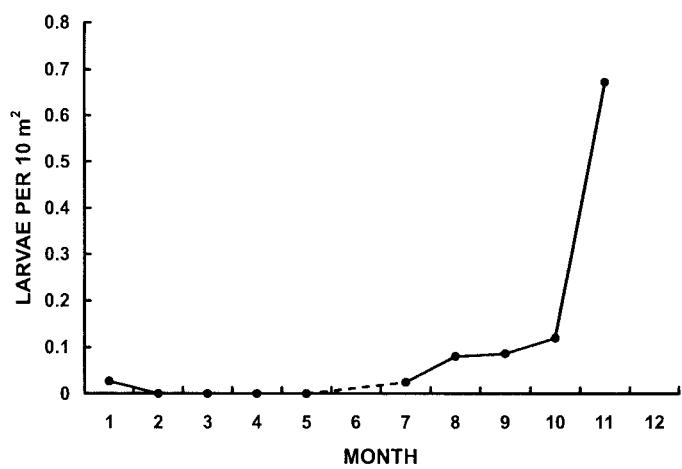
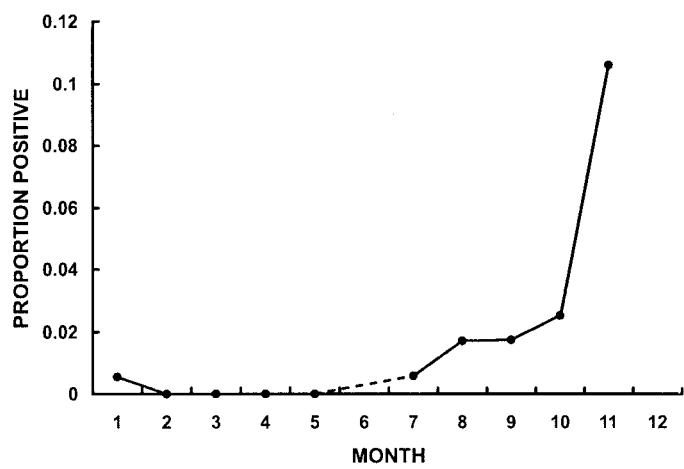
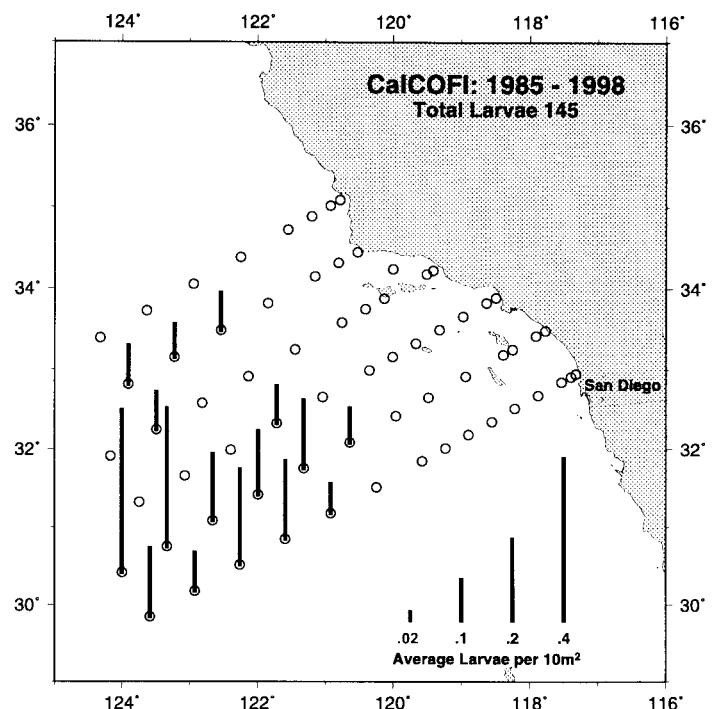
## *Psettichthys melanostictus*



*Oneirodes* spp.

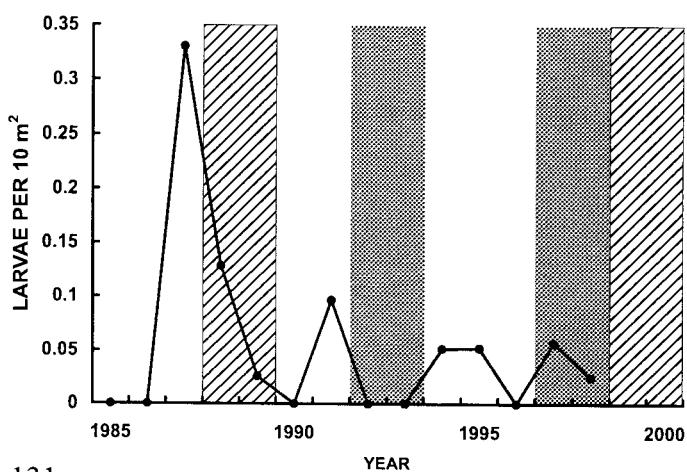
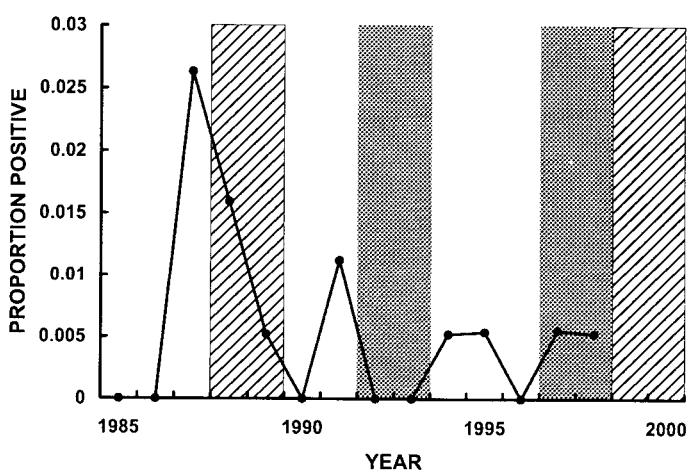
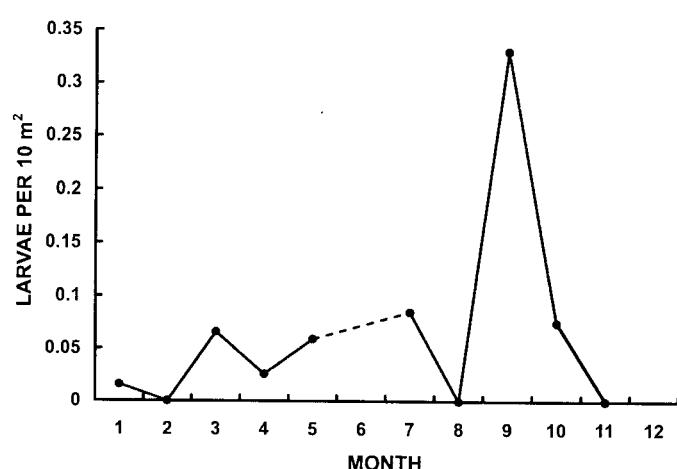
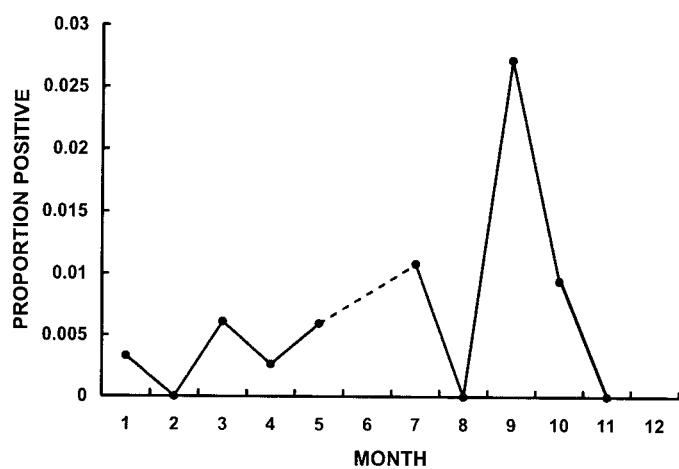
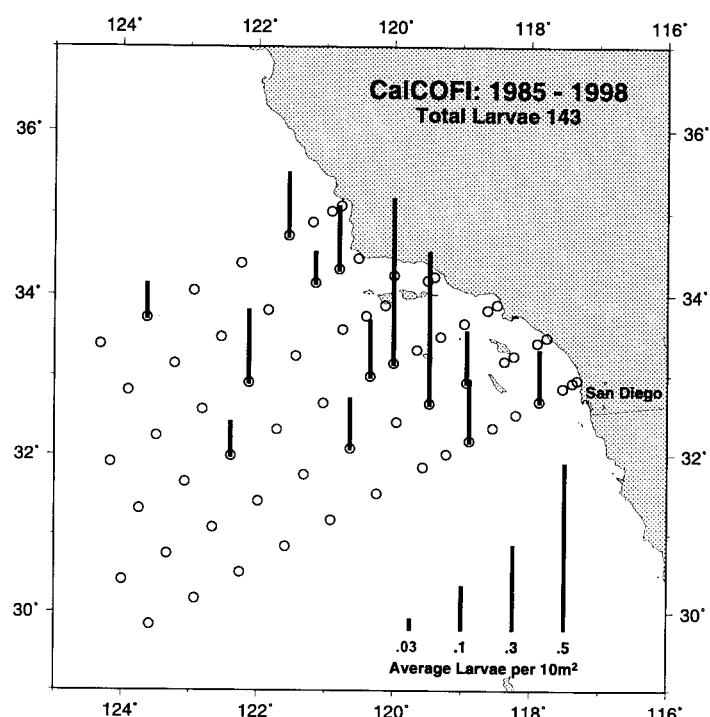
Dreamers

ONEIRODIDAE



## SEBASTIDAE

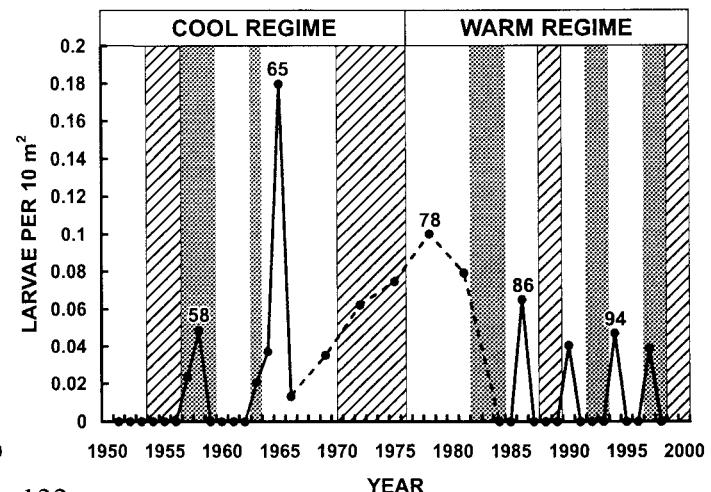
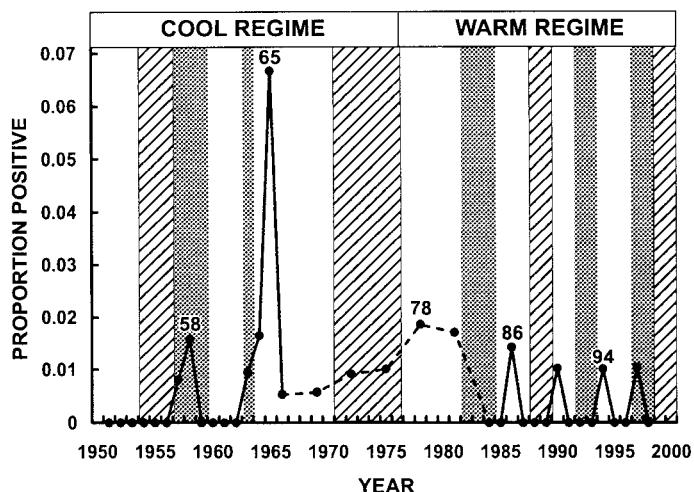
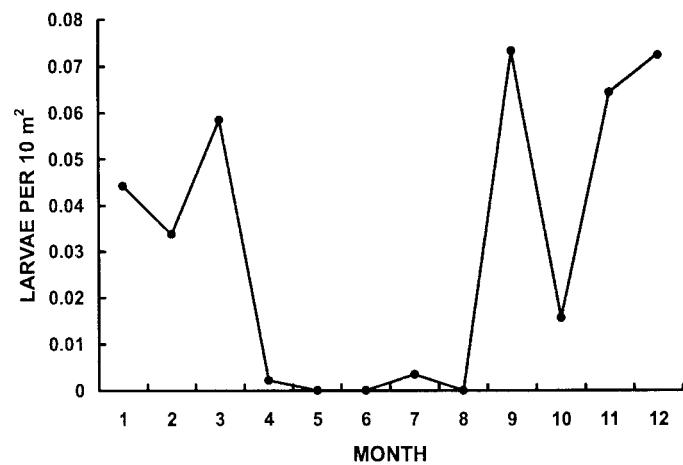
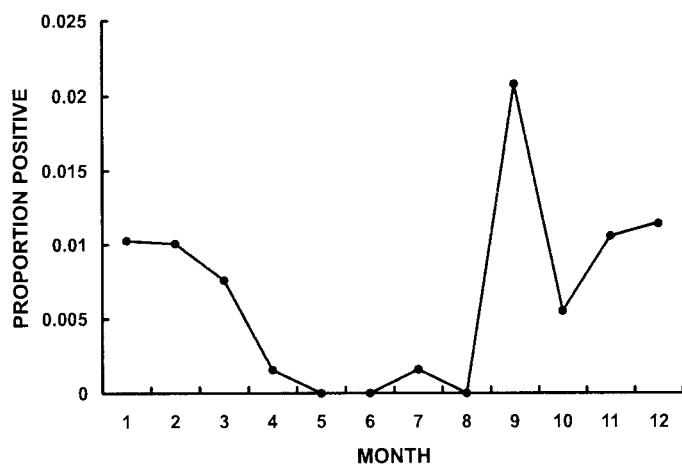
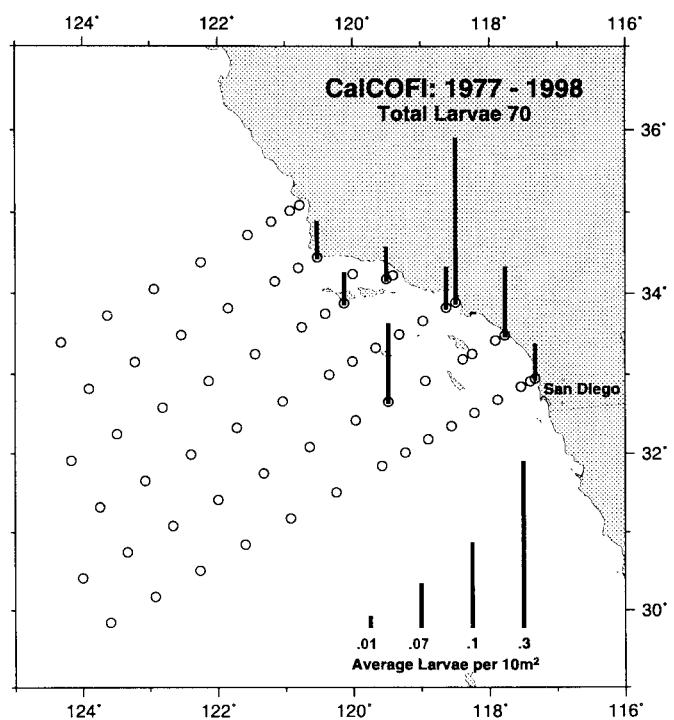
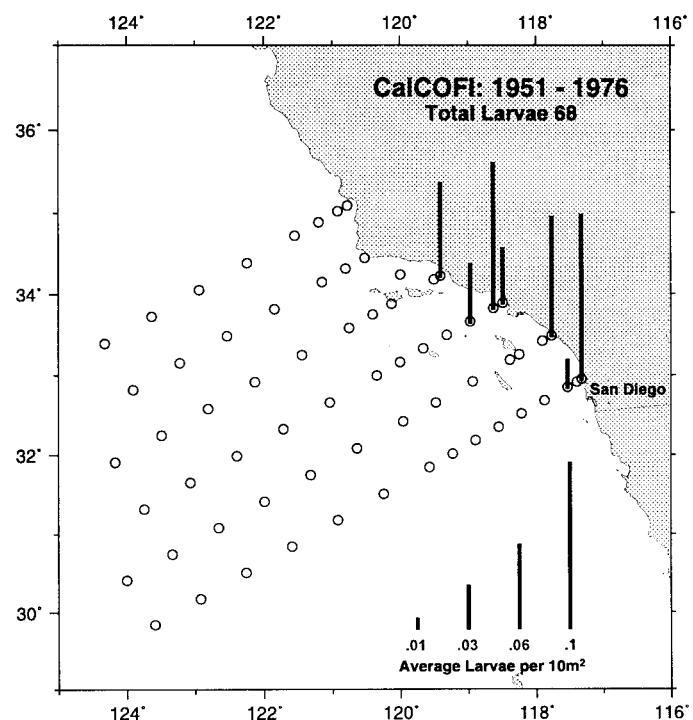
## Longspine thornyhead

*Sebastolobus altivelis*

*Hypsopsetta guttulata*

Diamond turbot

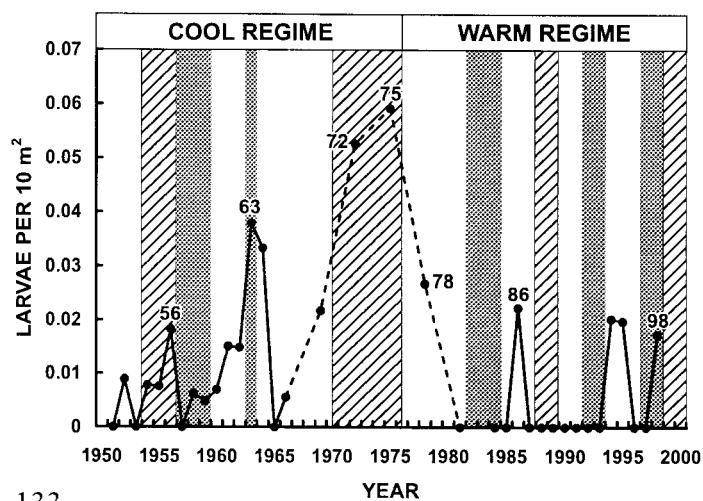
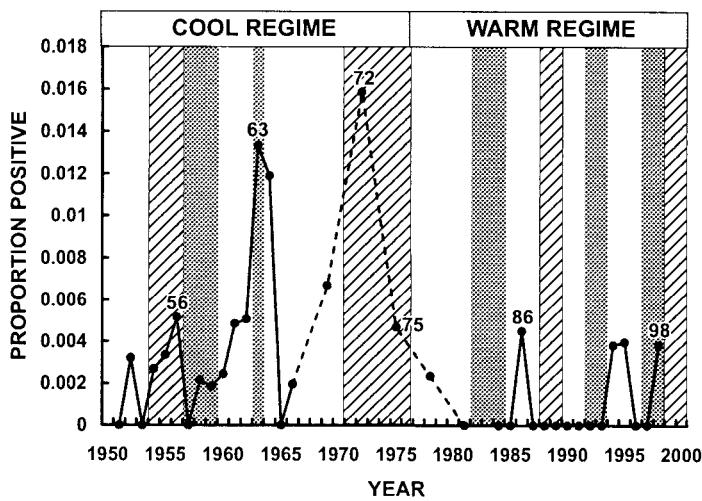
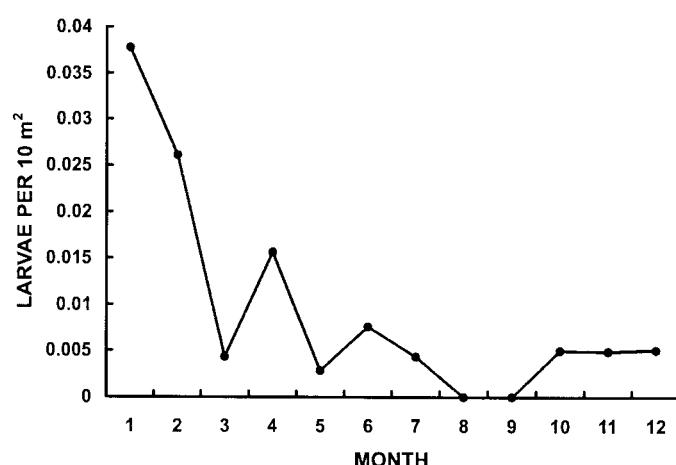
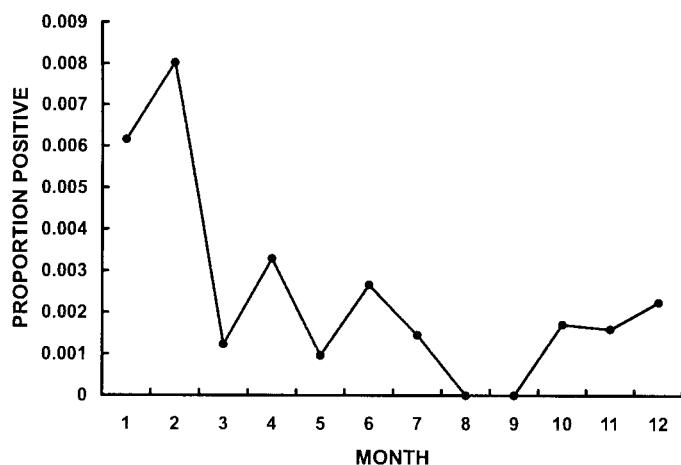
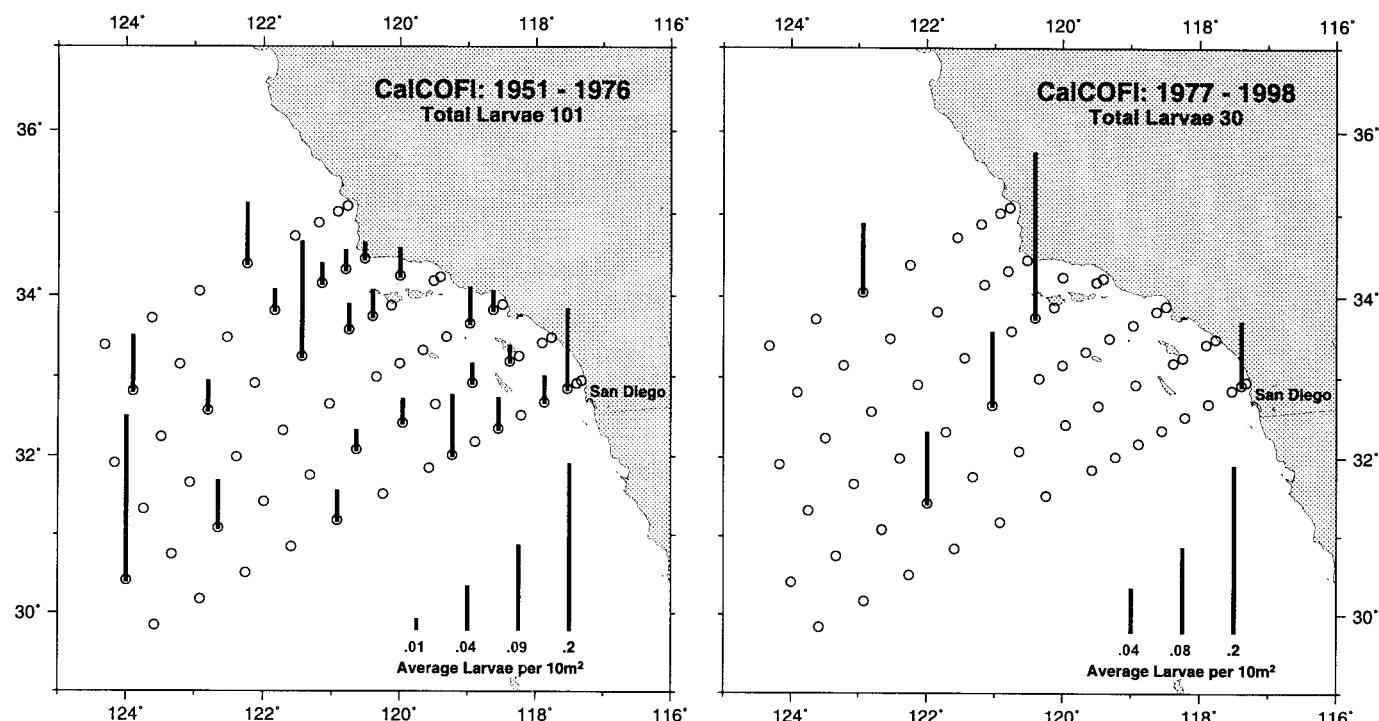
PLEURONECTIDAE



## MACROURIDAE

## Grenadiers

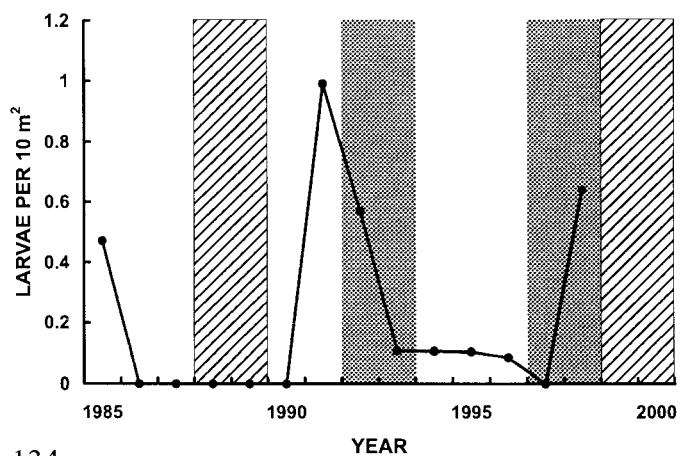
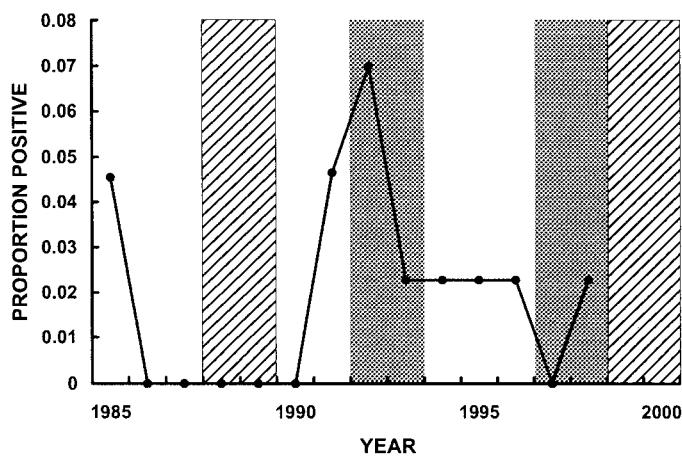
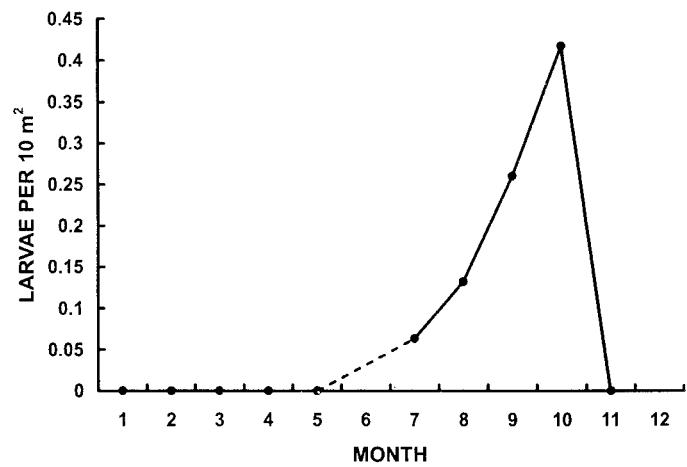
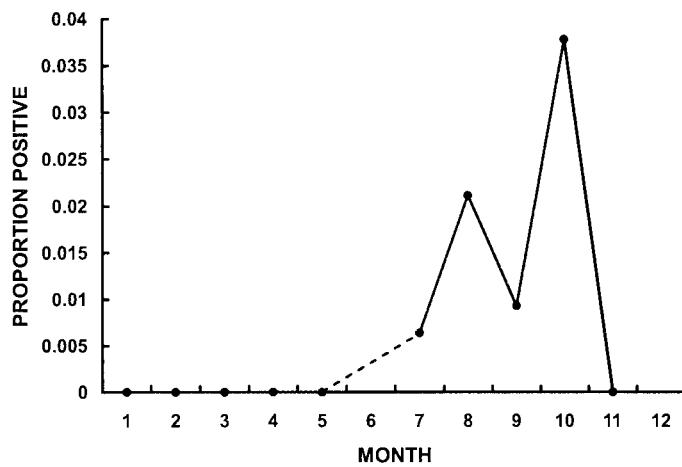
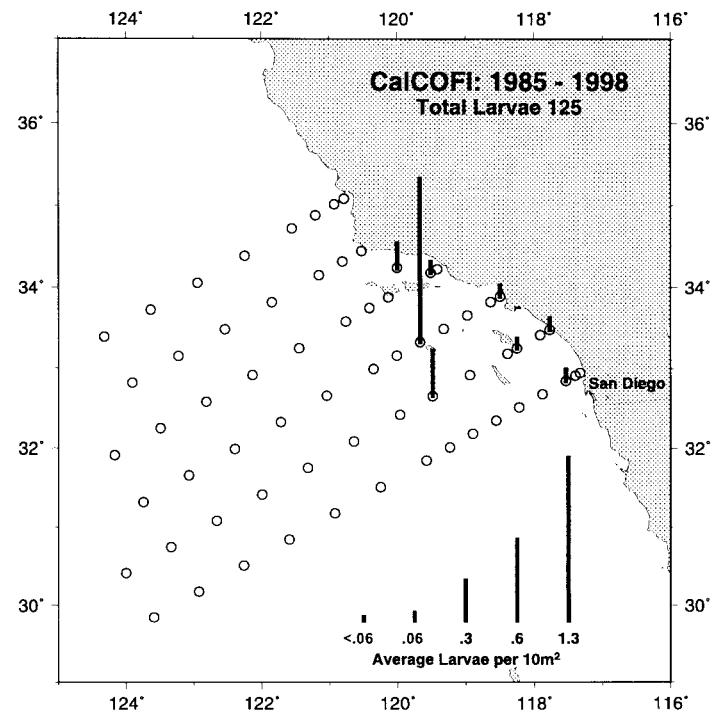
## MACROURIDAE



*Lythrypnus zebra*

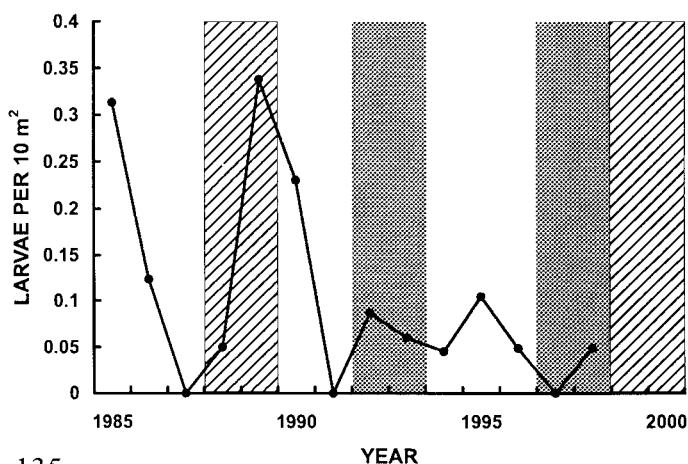
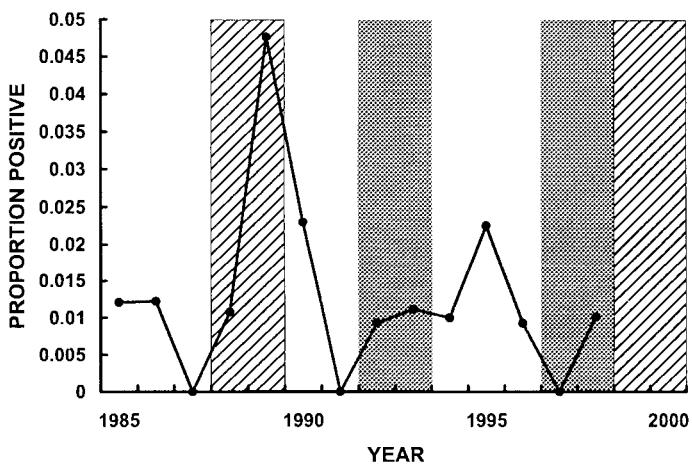
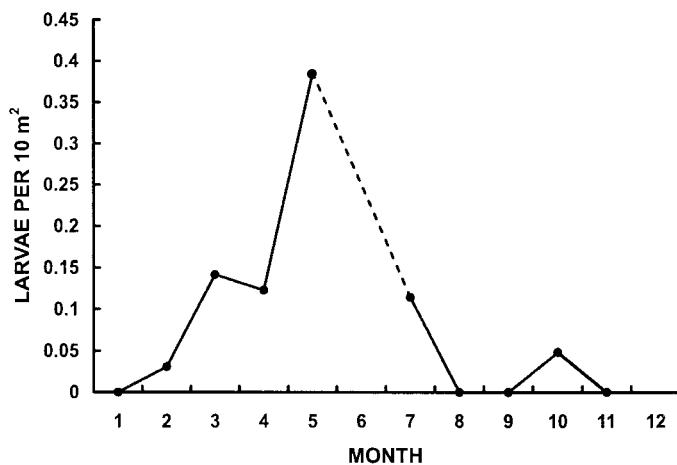
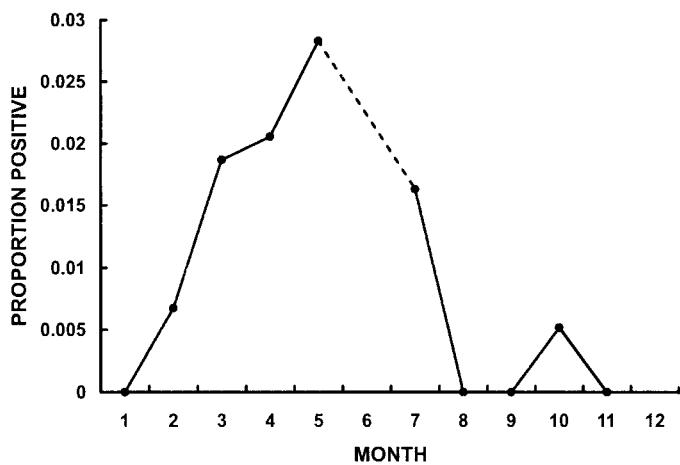
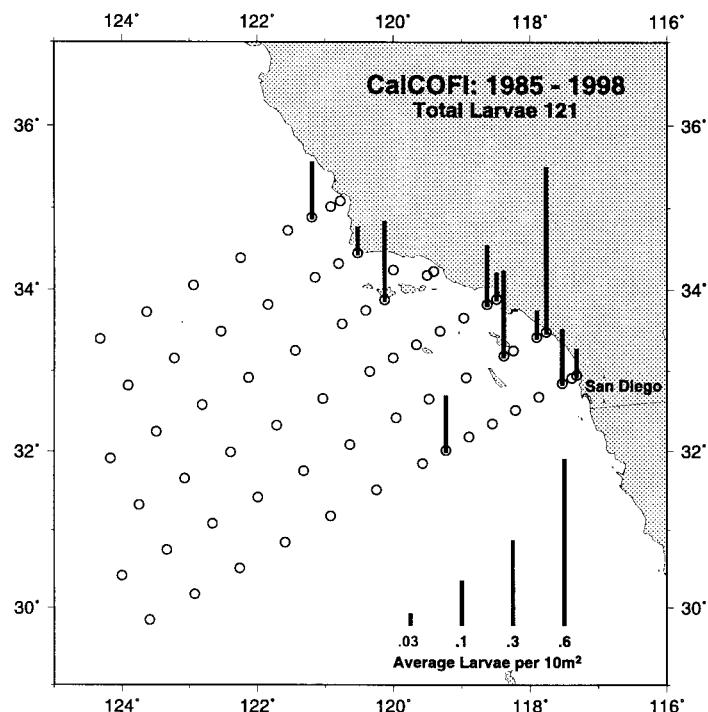
Zebra goby

GOBIIDAE



## GOBIIDAE

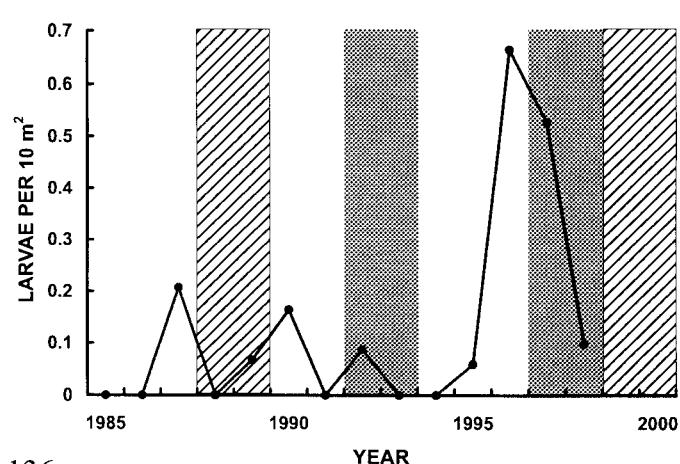
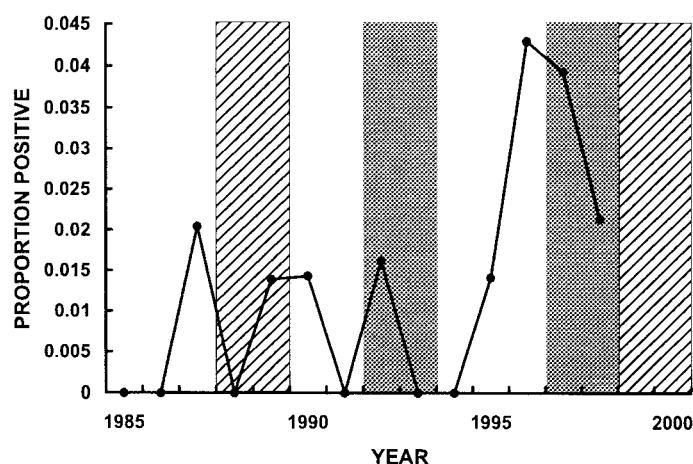
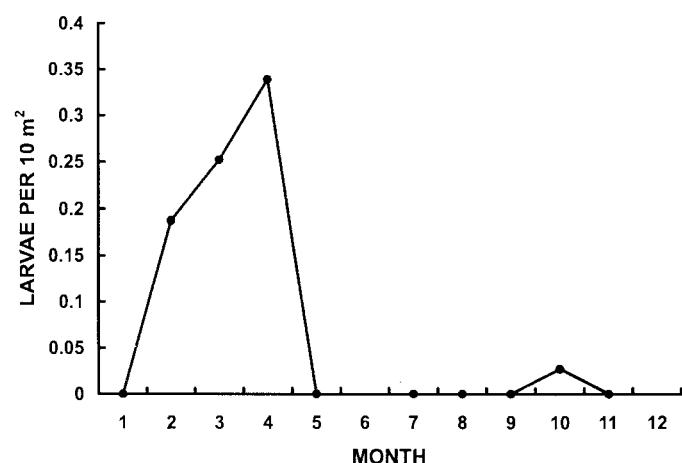
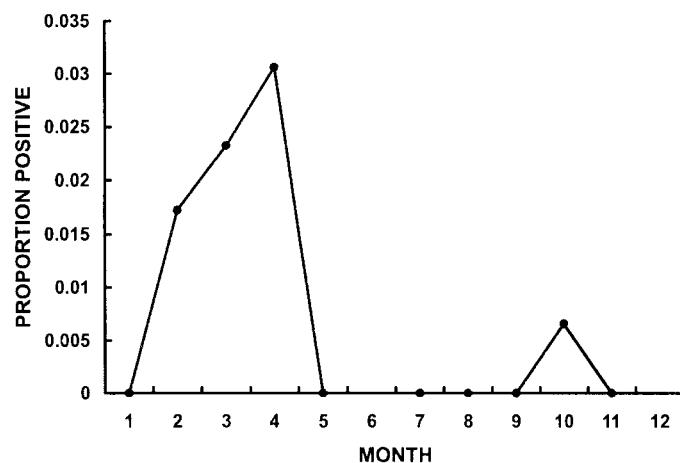
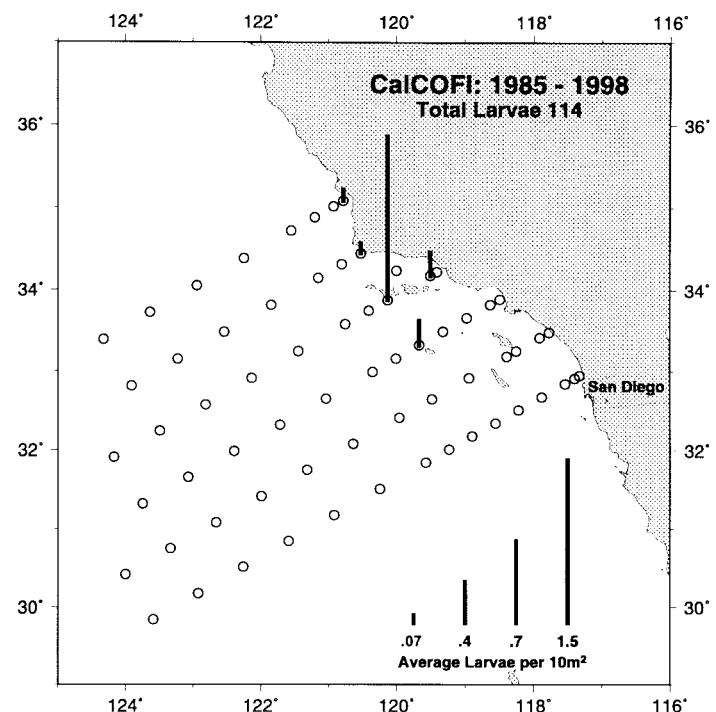
## Blind goby

*Typhlogobius californiensis*

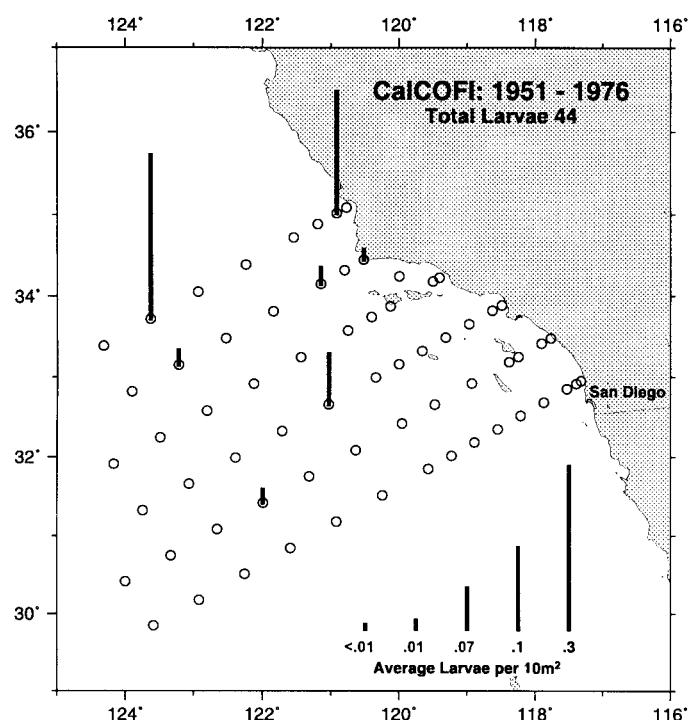
*Artedius lateralis*

## Smoothhead sculpin

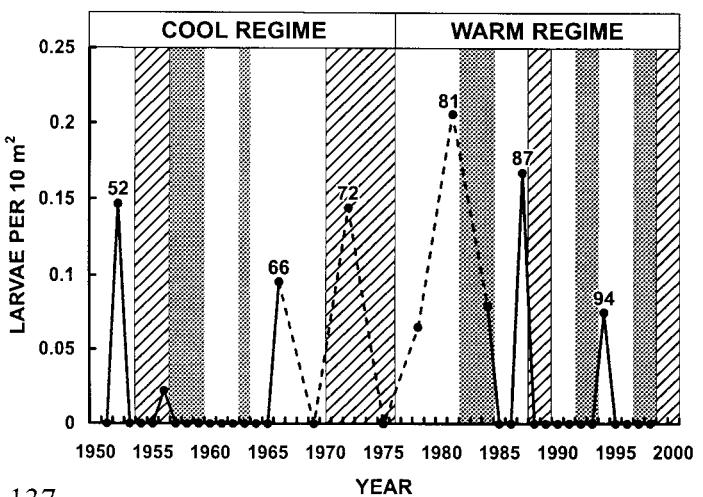
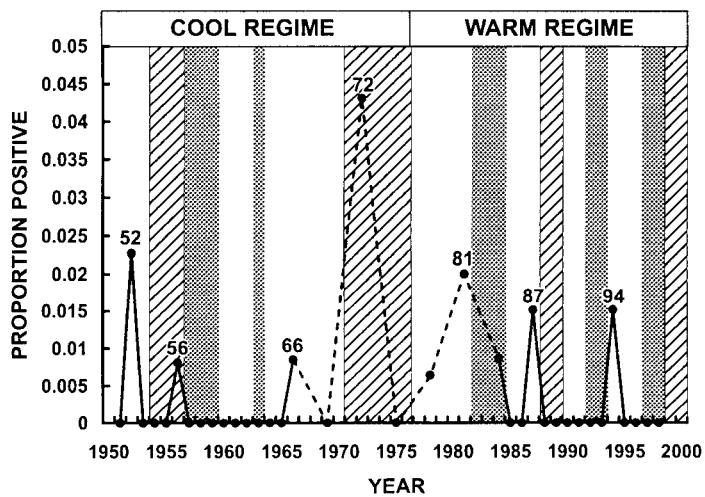
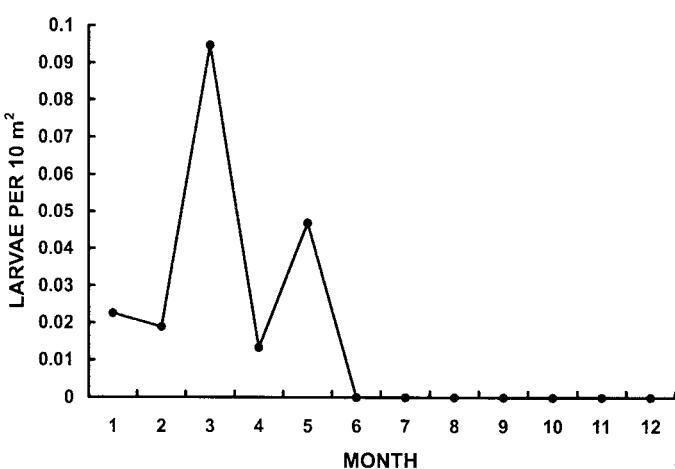
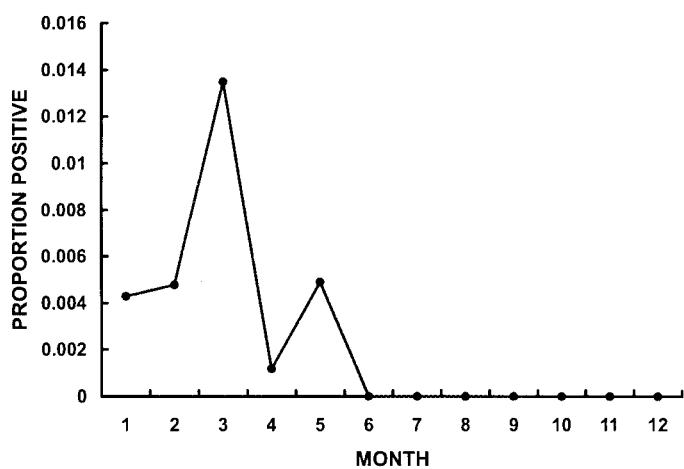
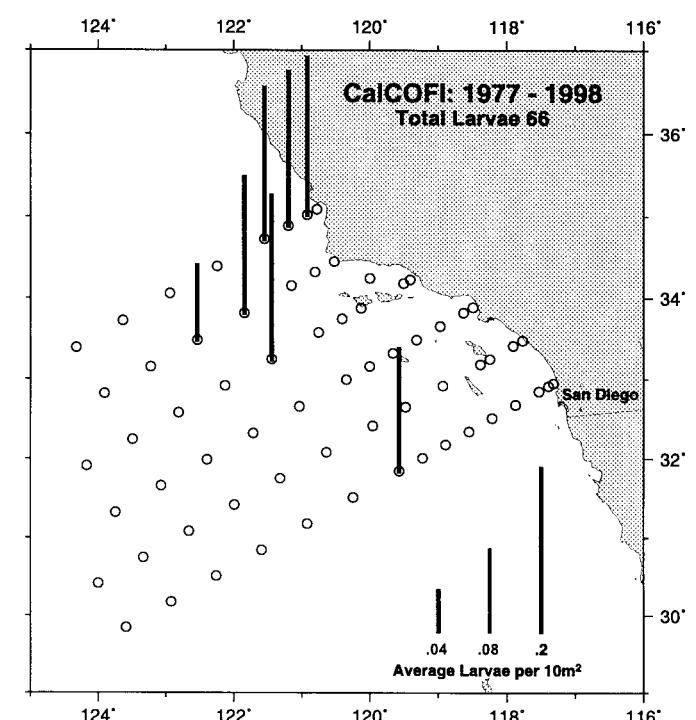
## COTTIDAE



## ICOSTEIDAE



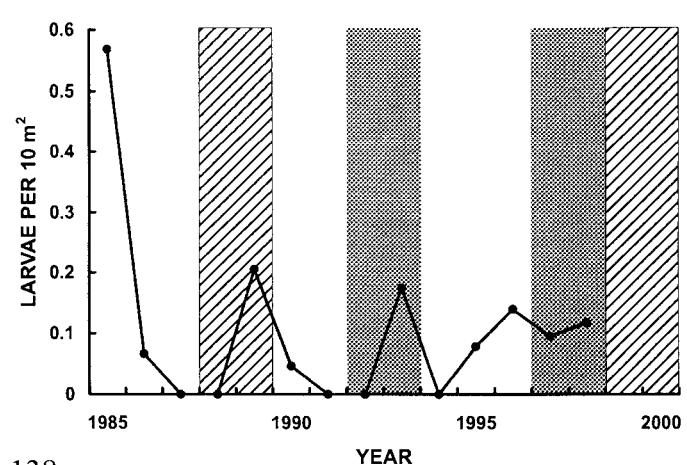
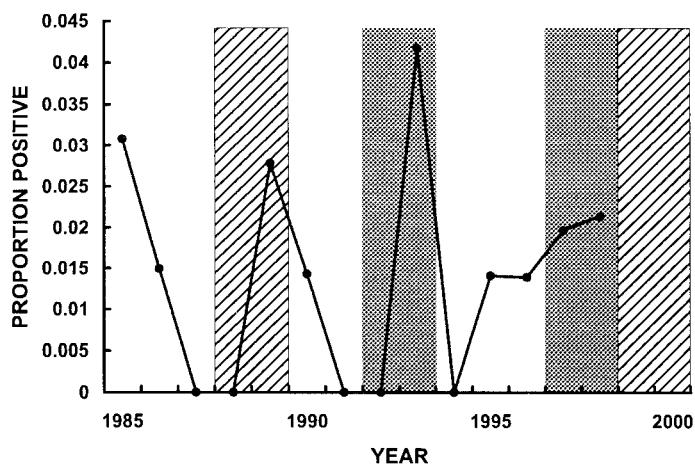
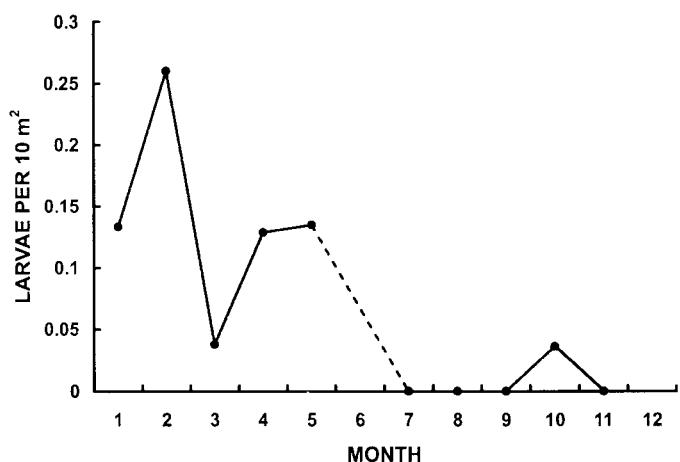
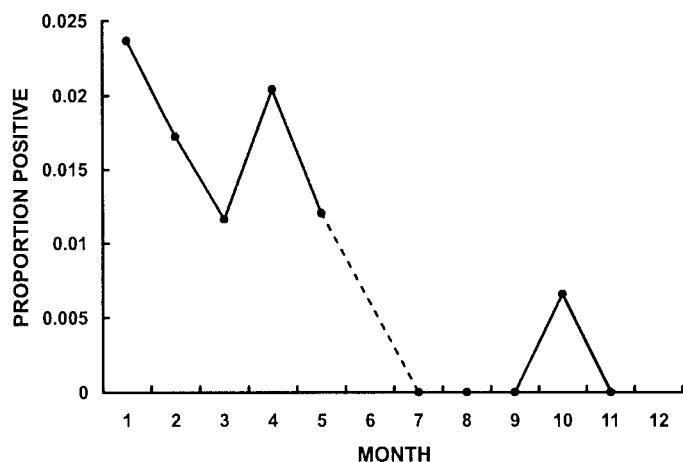
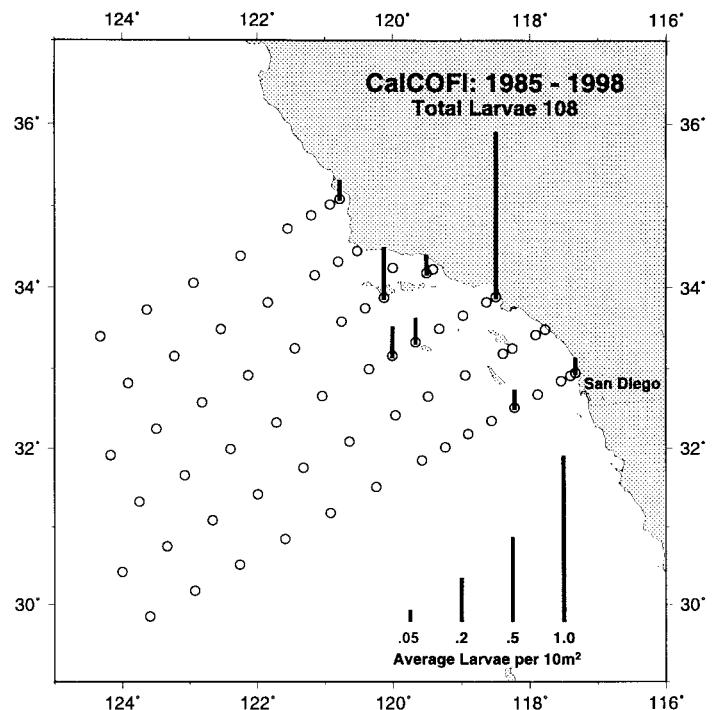
## *Icosteus aenigmaticus*



*Zaniolepis frenata*

## Shortspine combfish

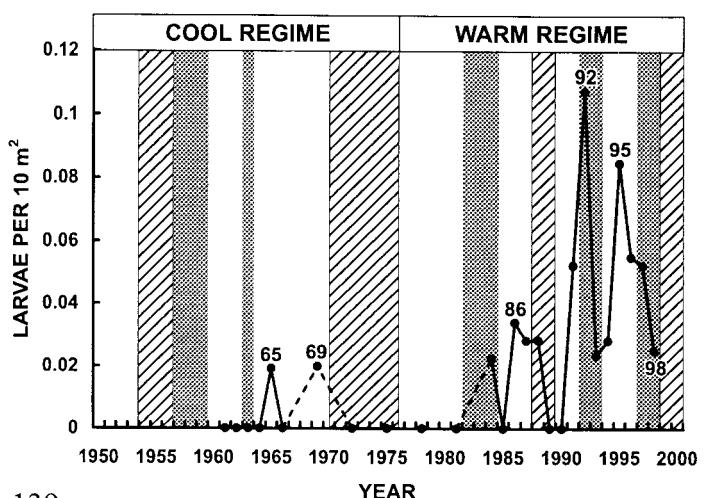
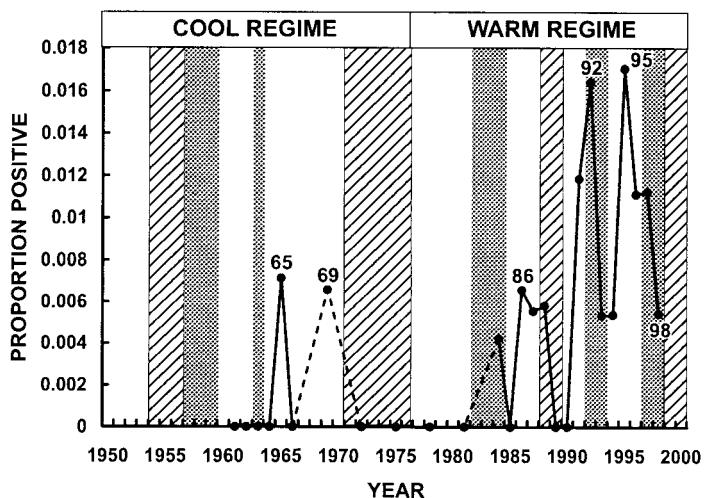
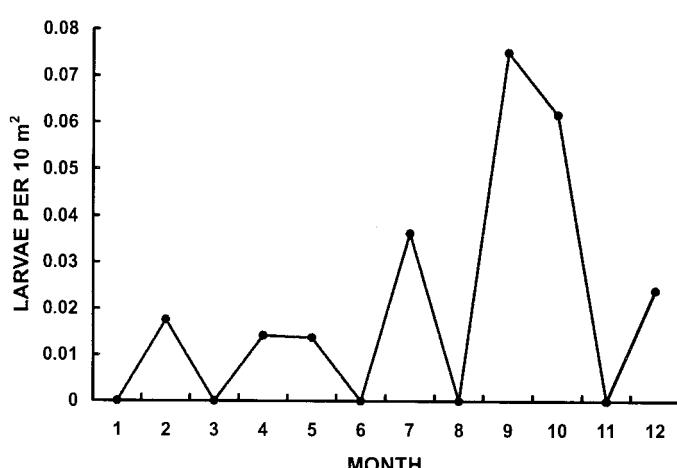
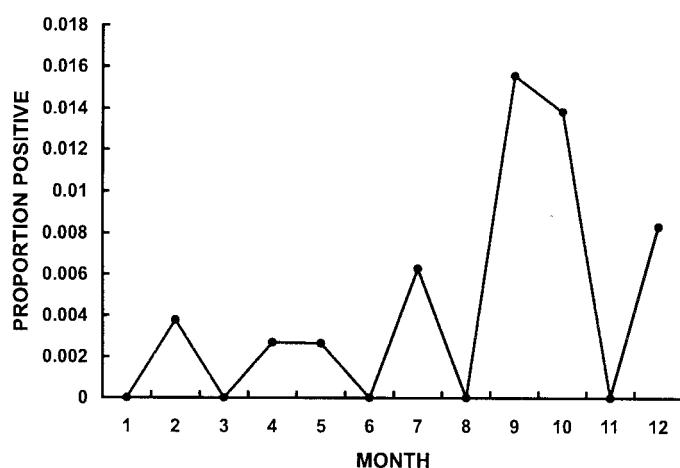
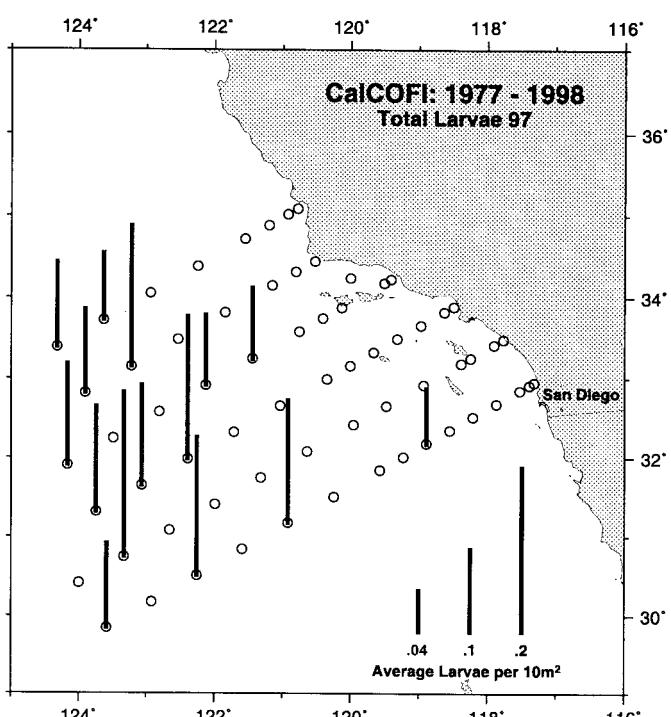
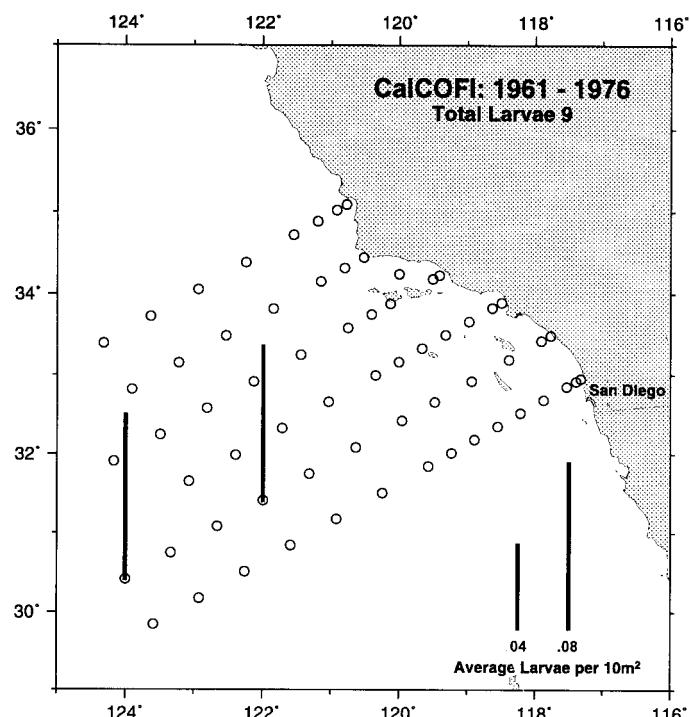
## HEXAGRAMMIDAE



## MELAMPHAIDAE

### Longjaw bigscale

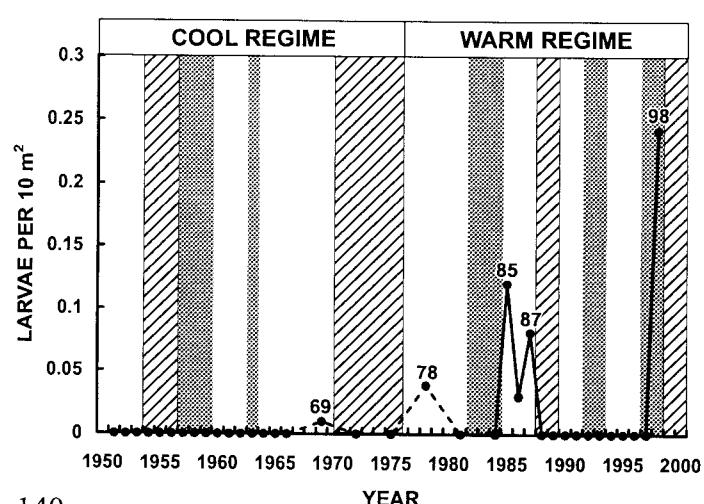
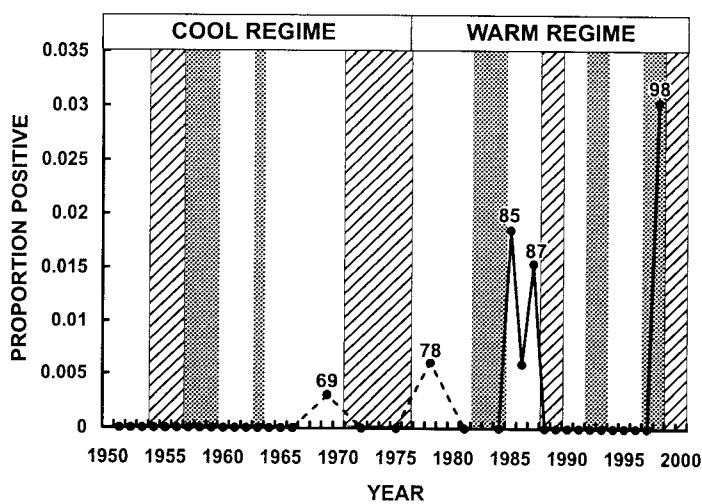
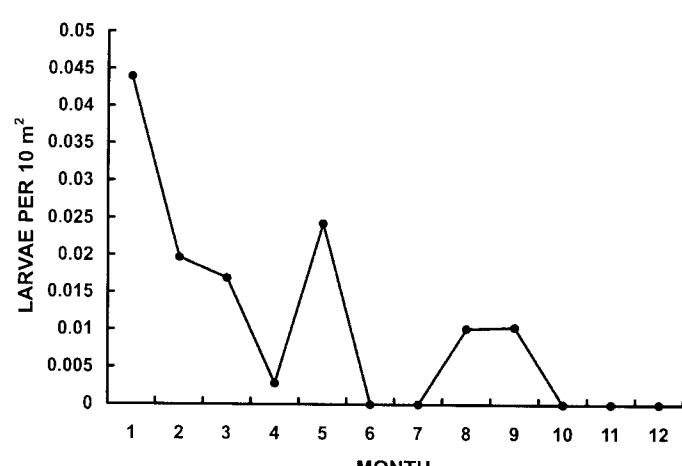
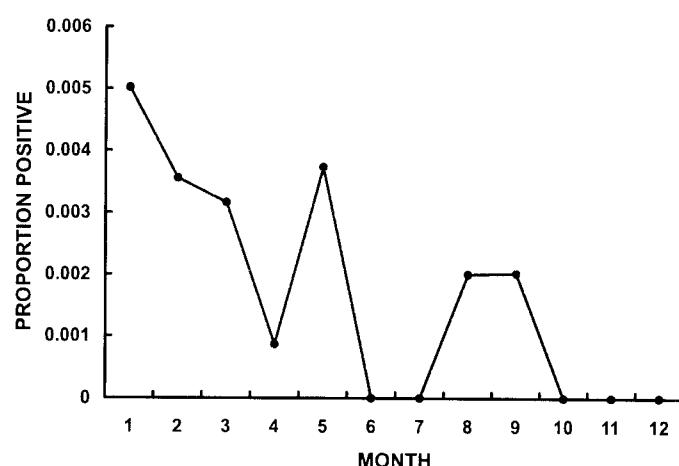
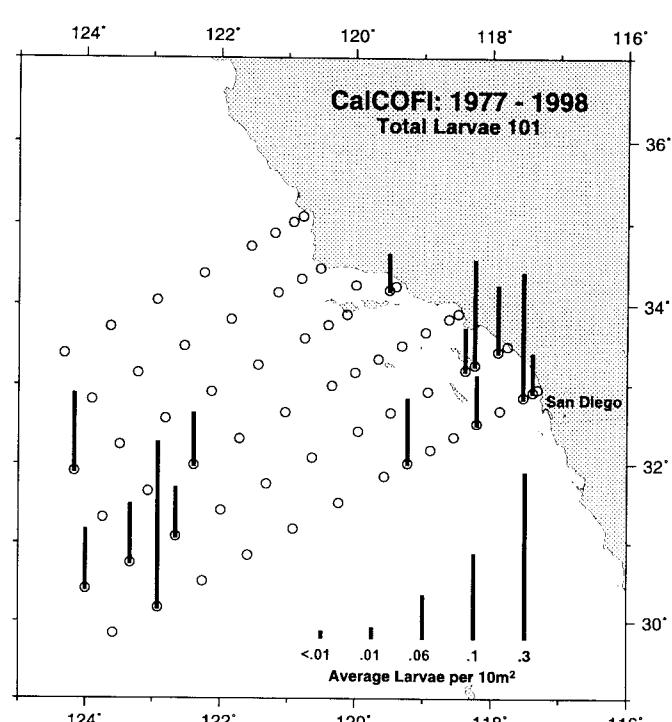
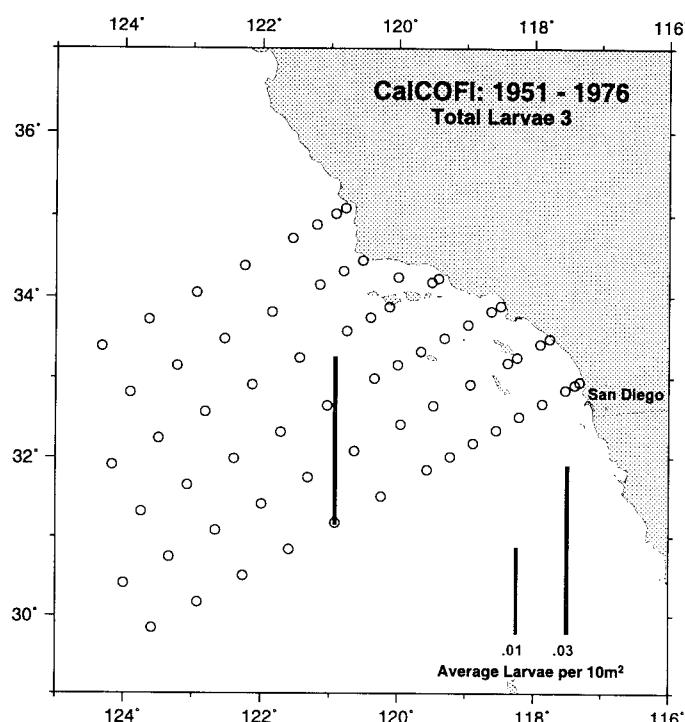
### *Scopeloberyx robustus*



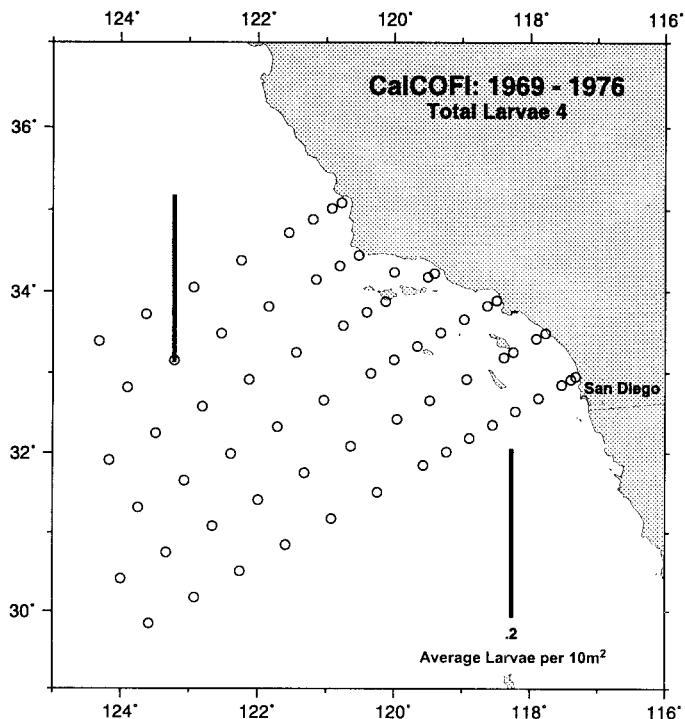
*Hygophum atratum*

Thickhead lanternfish

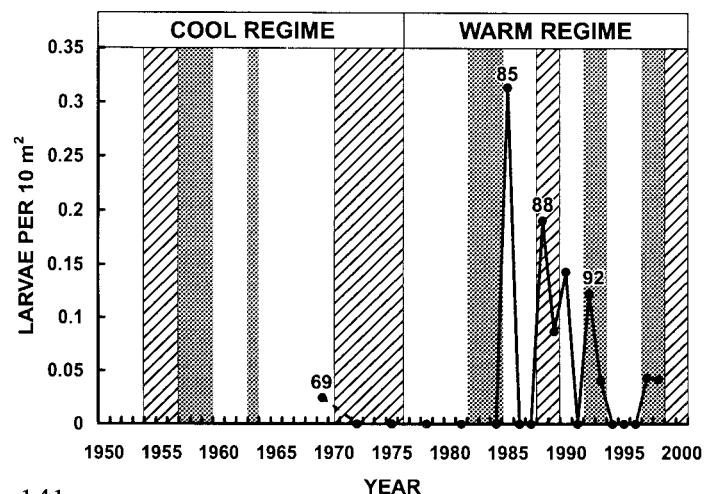
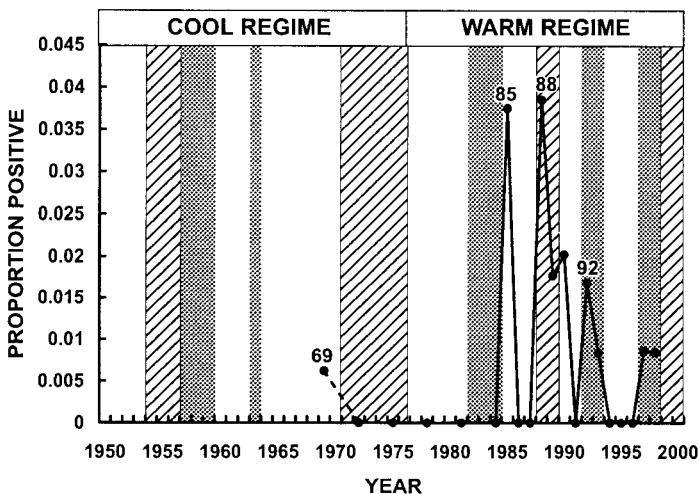
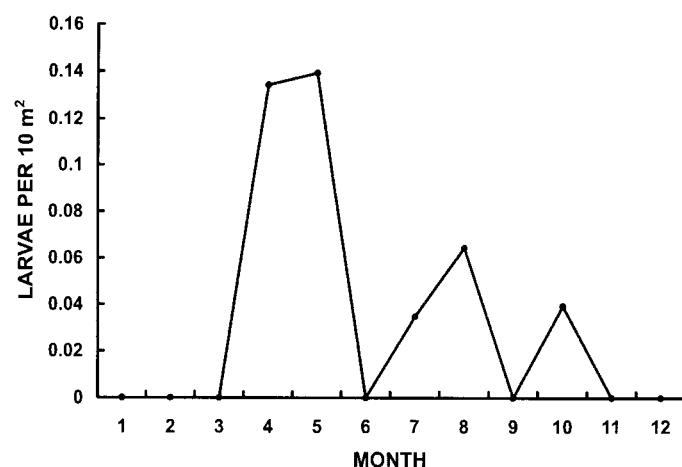
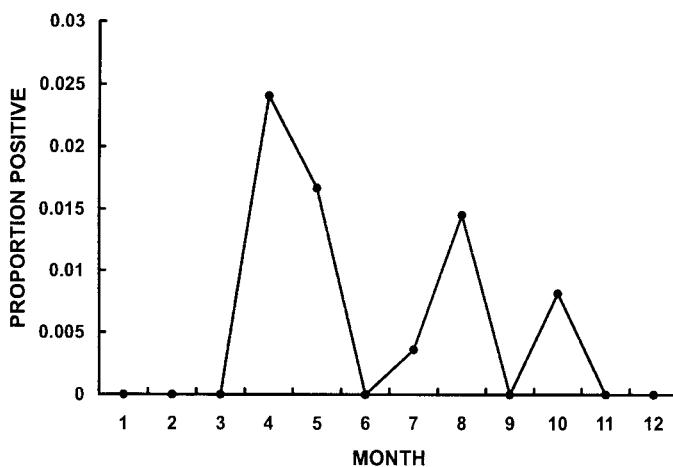
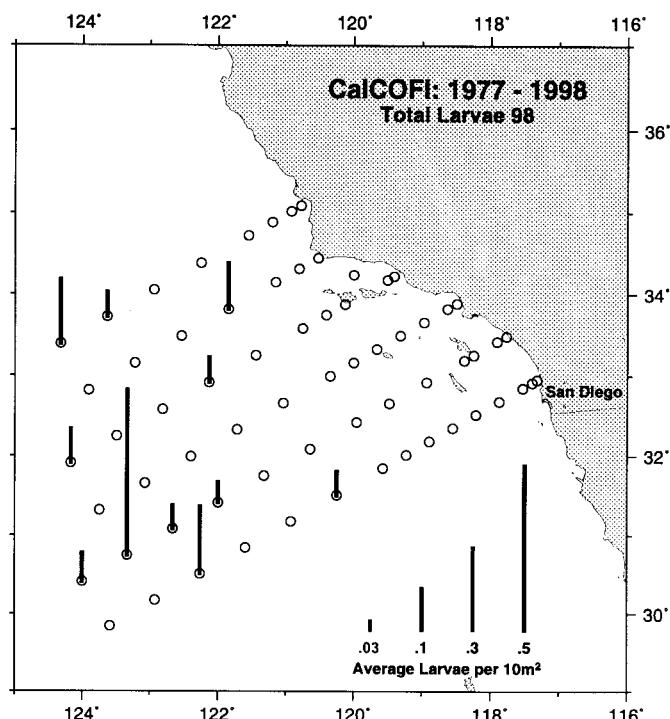
MYCTOPHIDAE



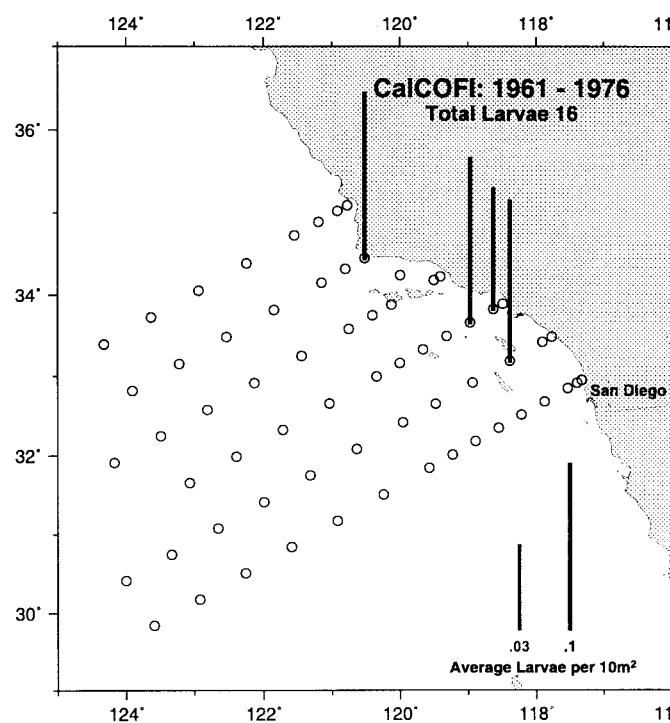
## MYCTOPHIDAE



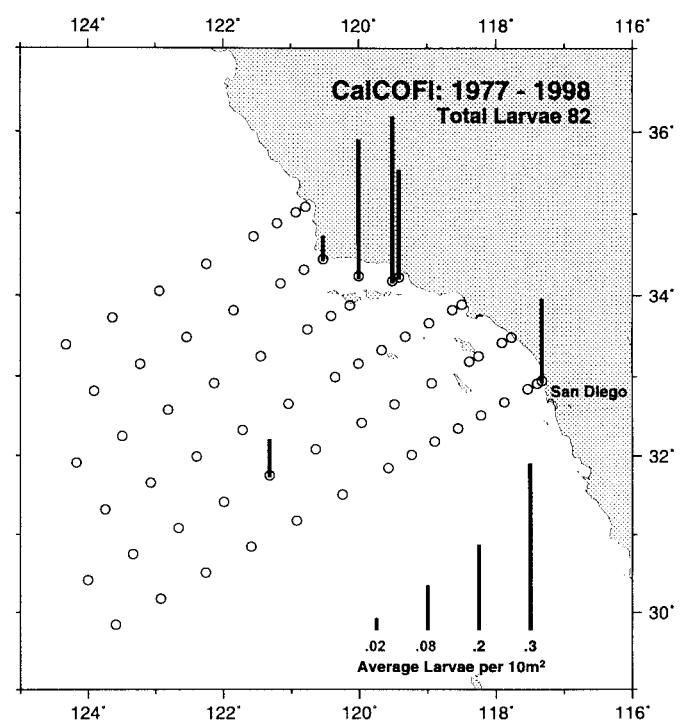
## Giant lampfish



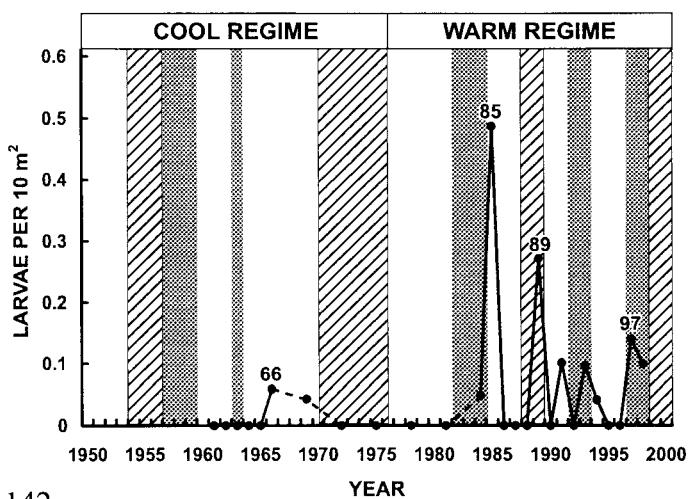
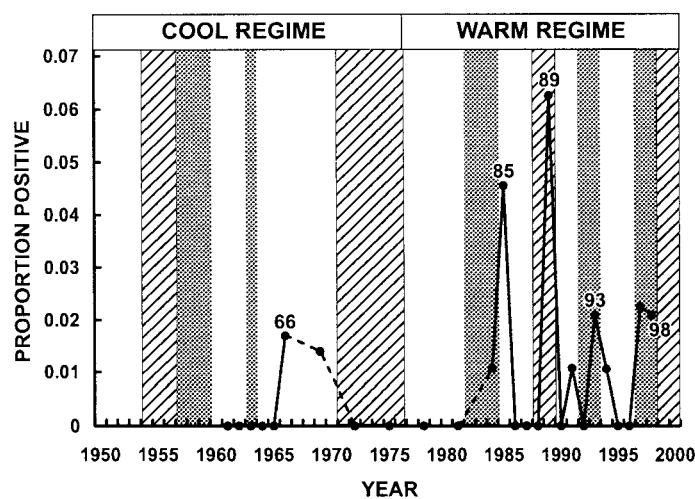
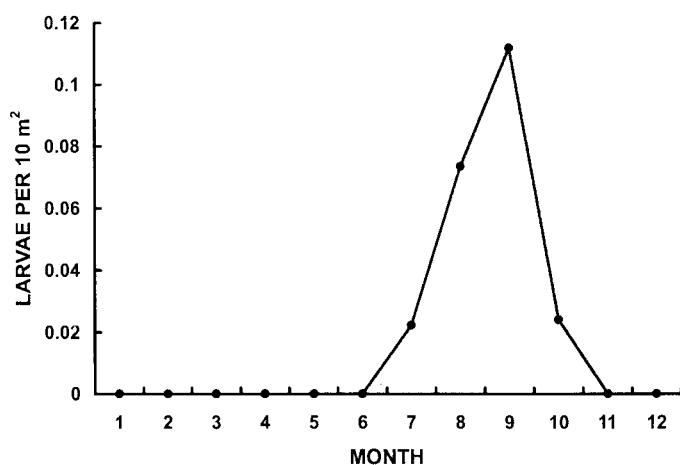
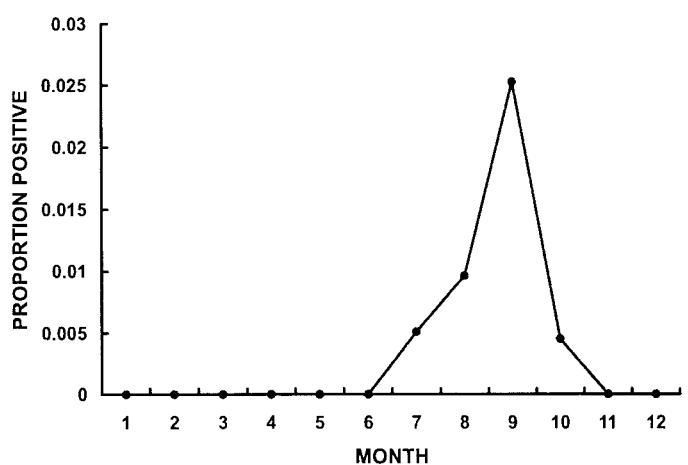
### *Halichoeres semicinctus*



### Rock wrasse



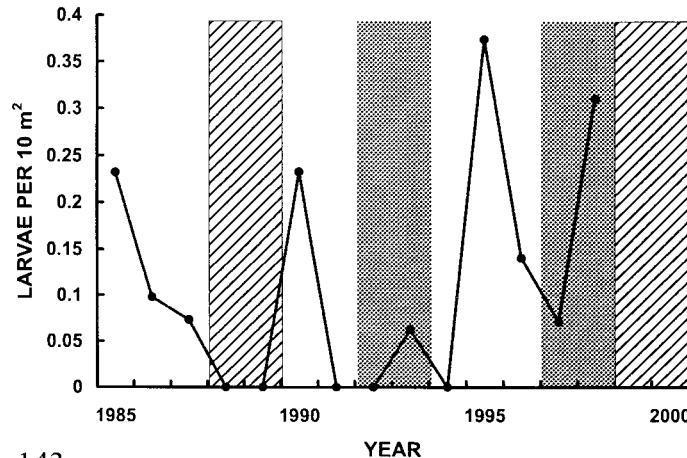
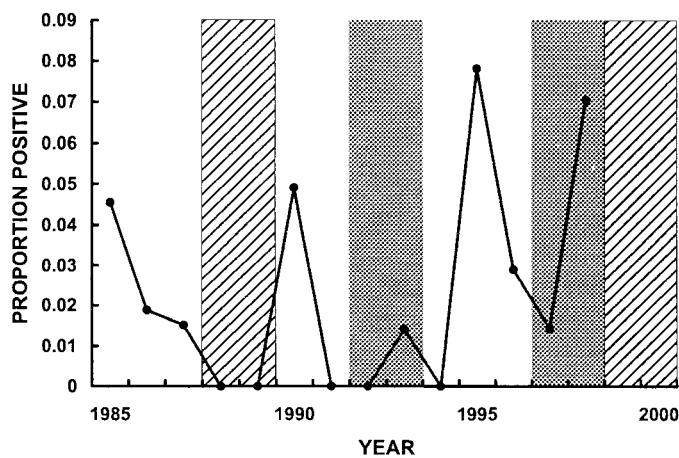
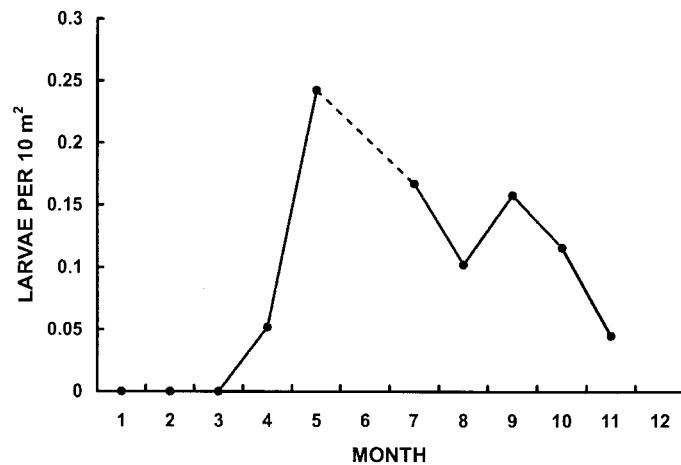
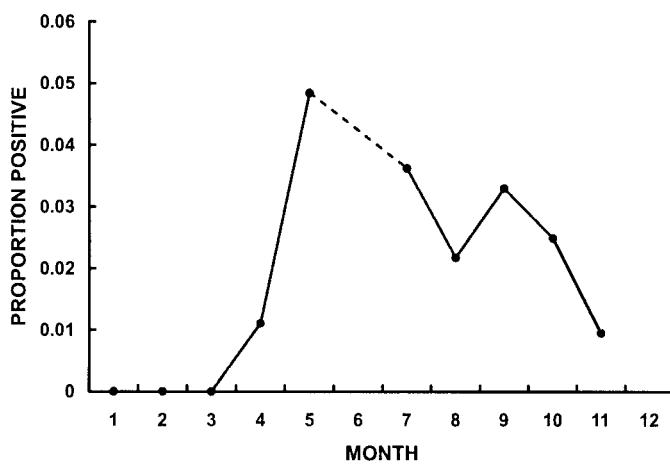
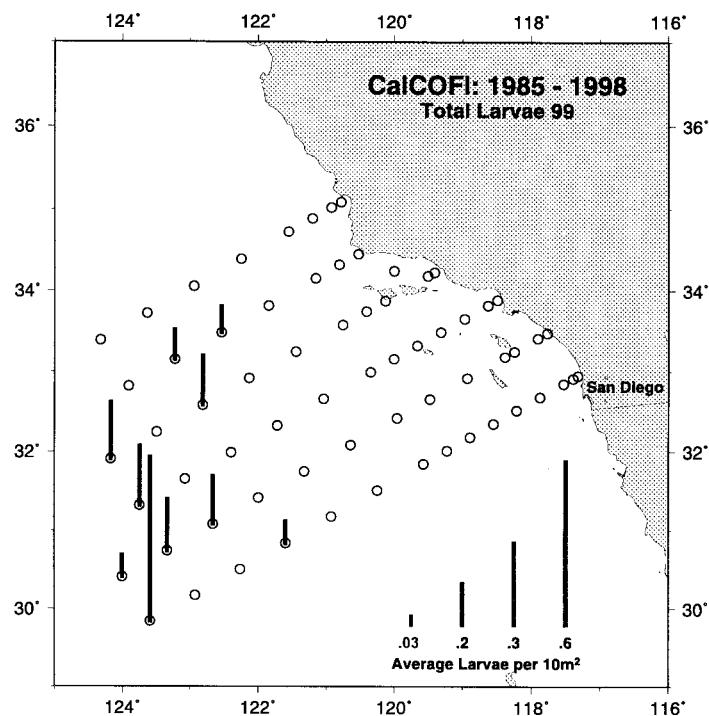
### LABRIDAE



# MYCTOPHIDAE

# Longfin lampfish

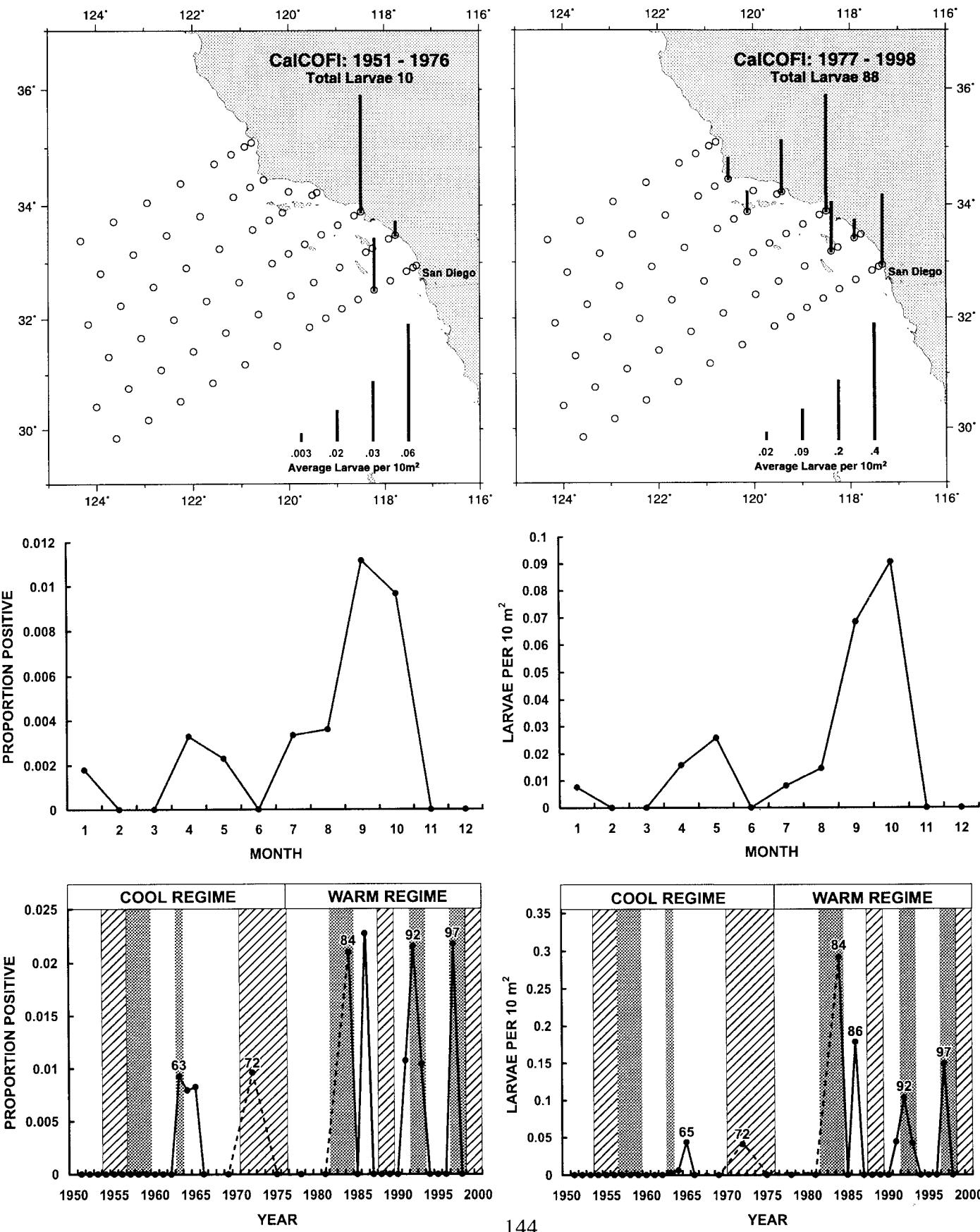
# *Lampanyctus steinbecki*



### *Etrumeus teres*

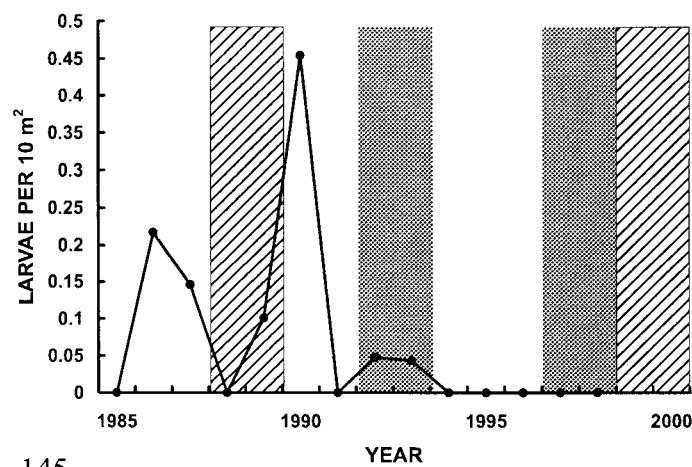
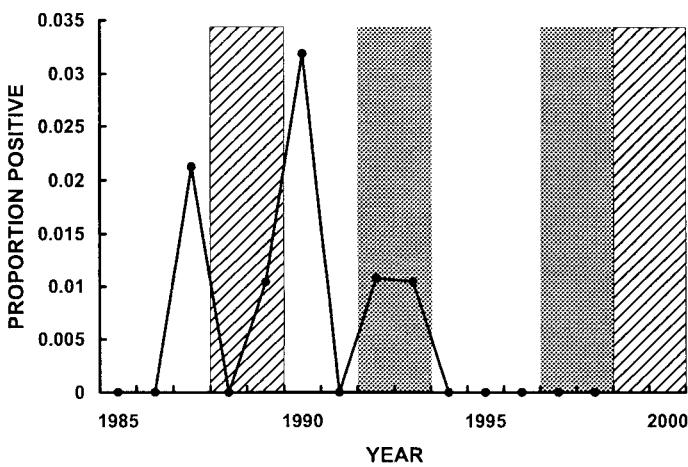
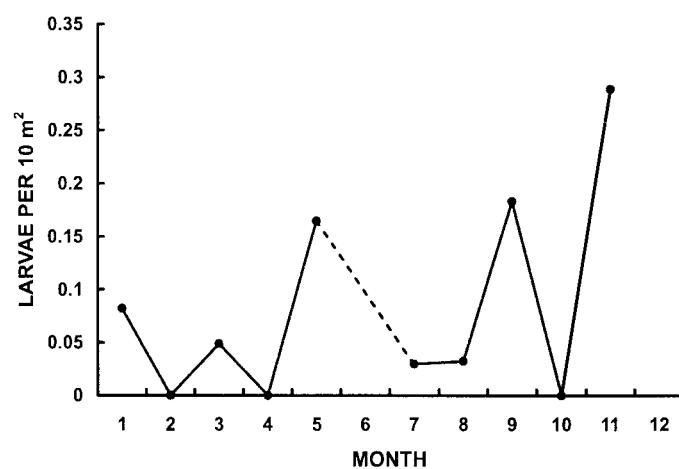
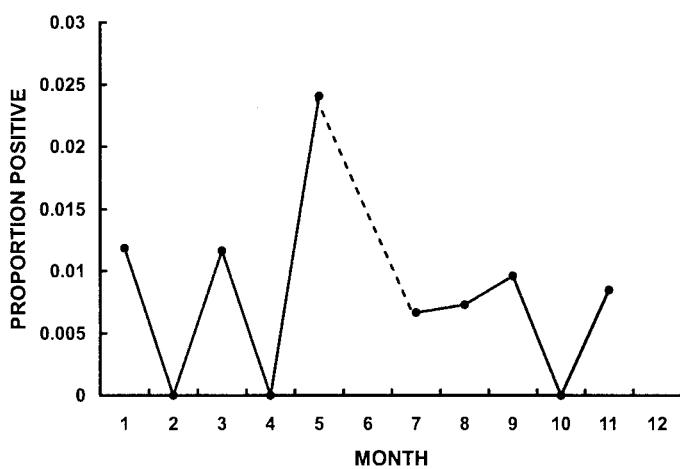
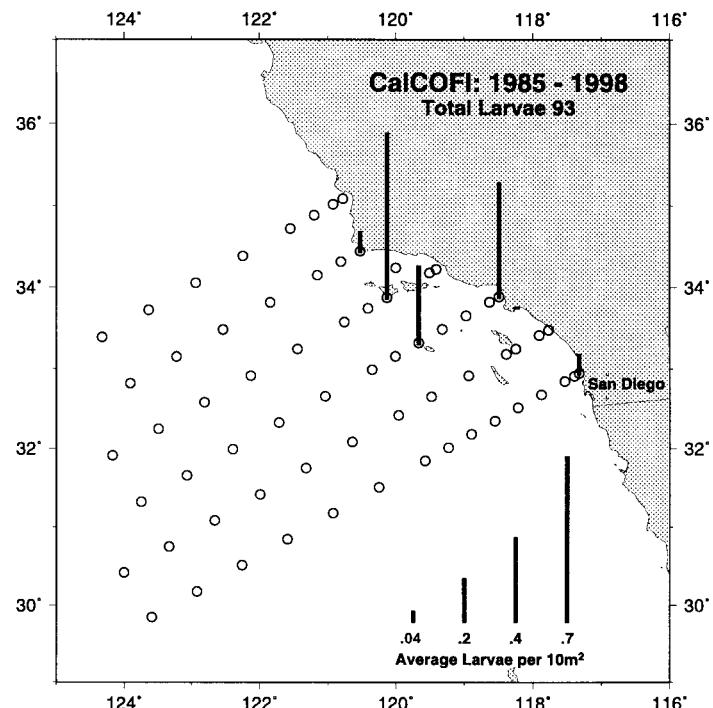
### Round herring

### CLUPEIDAE



COTTIDAE

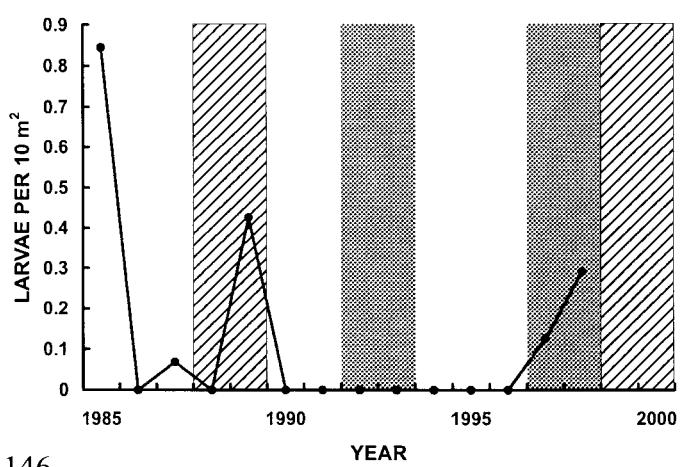
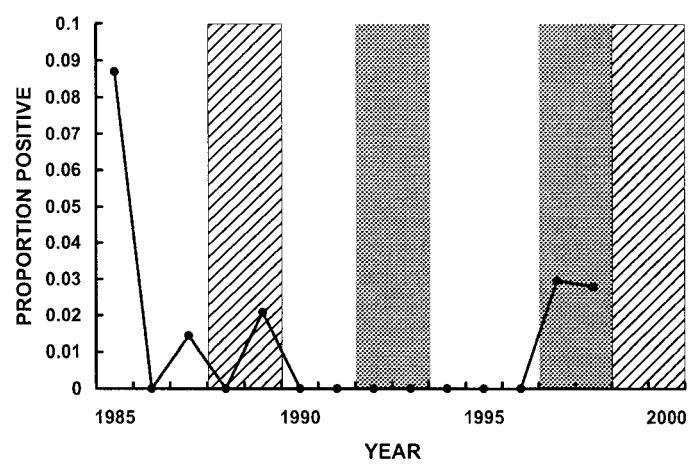
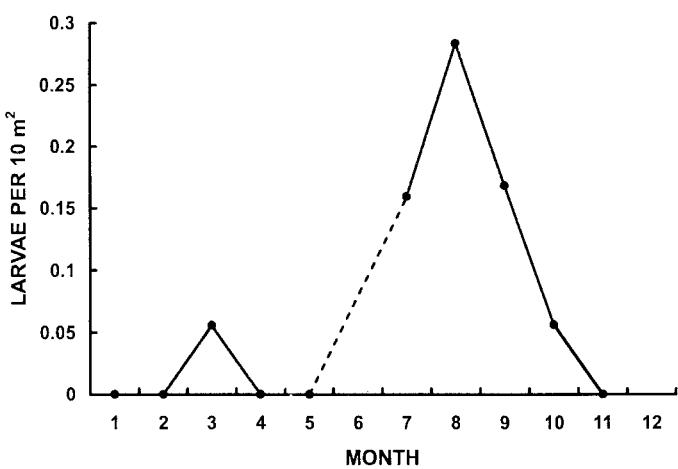
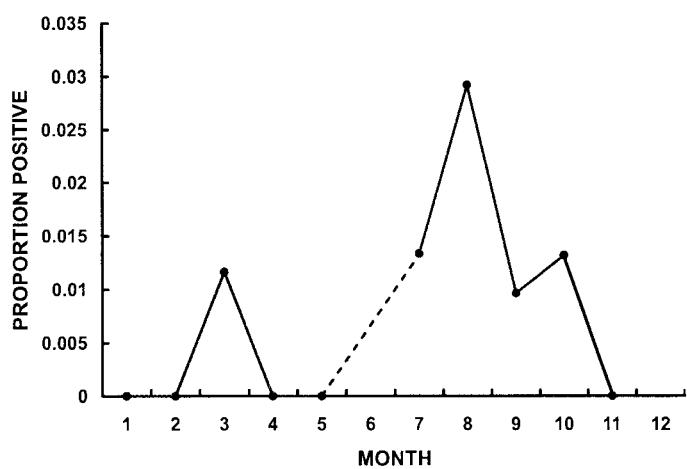
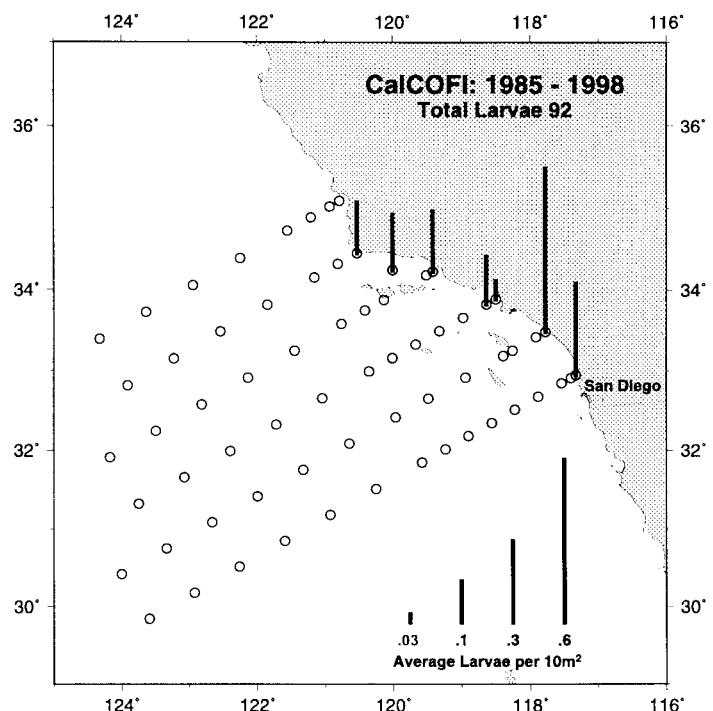
*Icelinus* spp.



*Hypsoblennius gentilis*

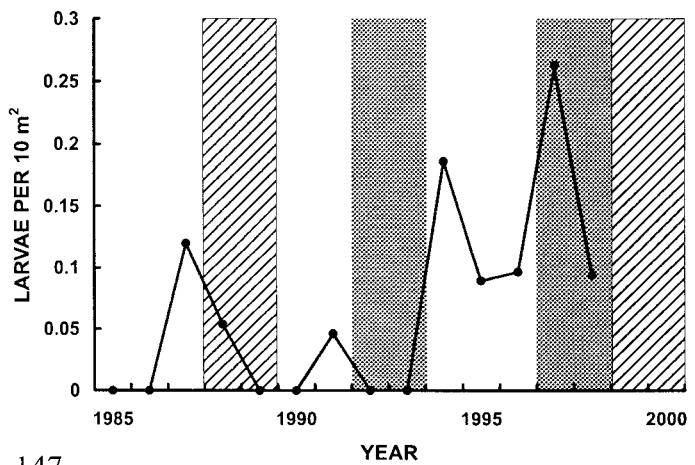
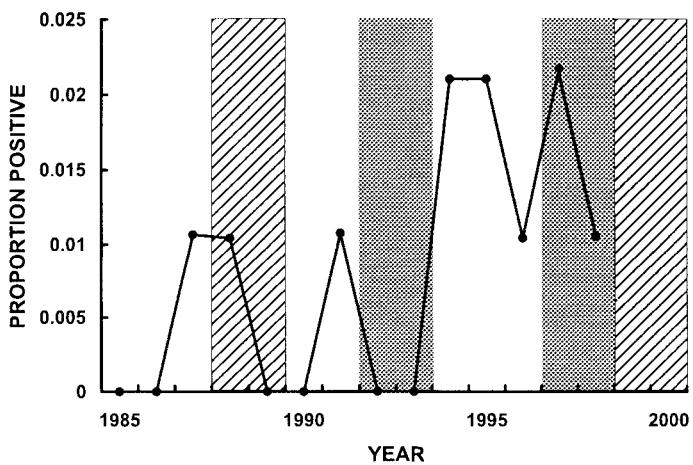
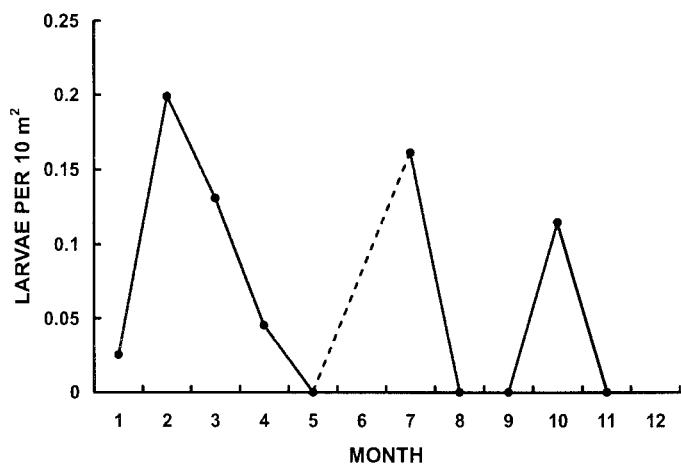
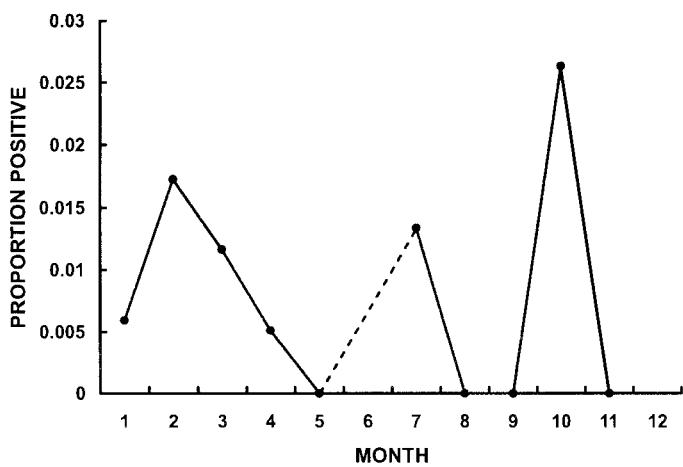
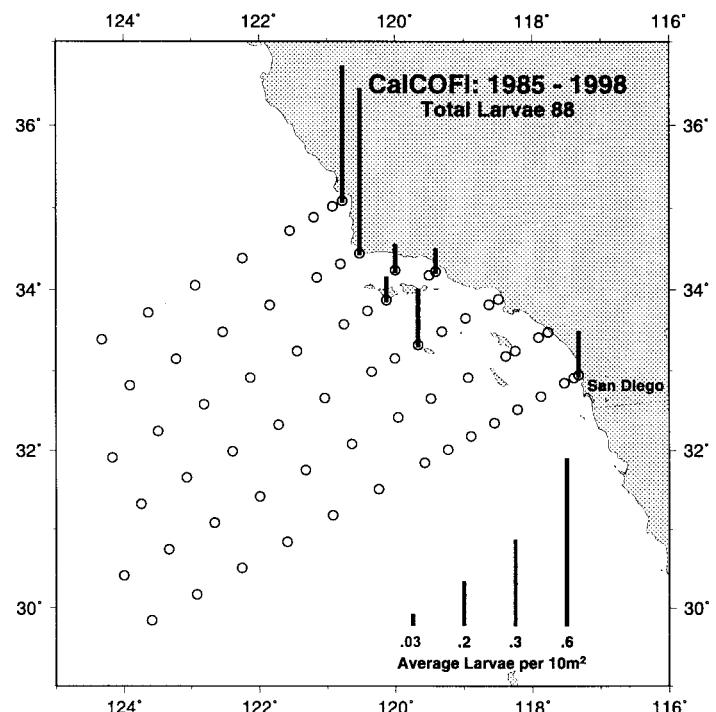
Bay blenny

BLENNIIDAE



## CHAENOPSIDAE

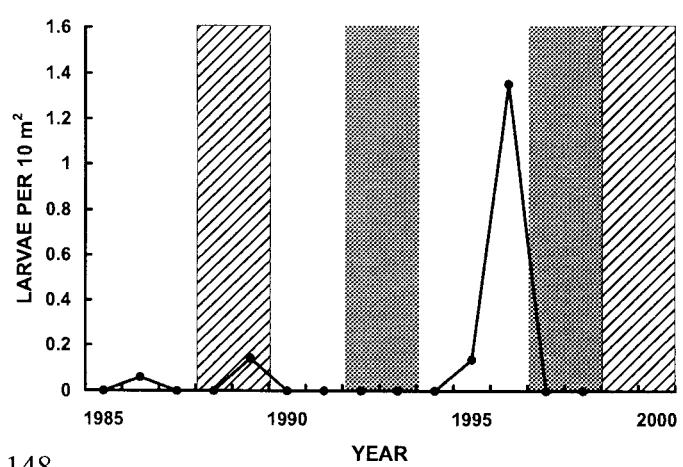
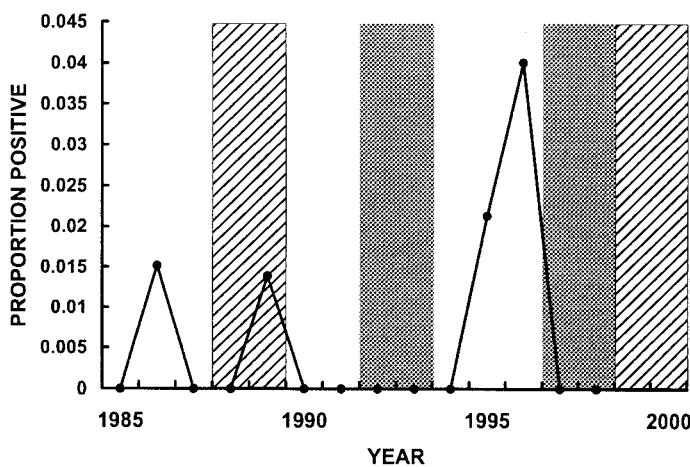
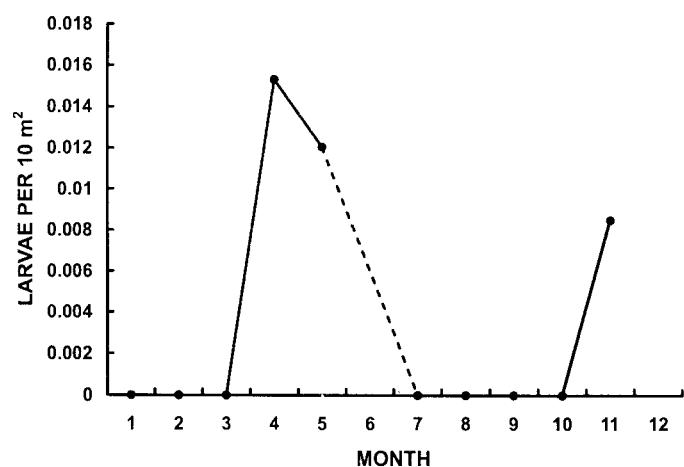
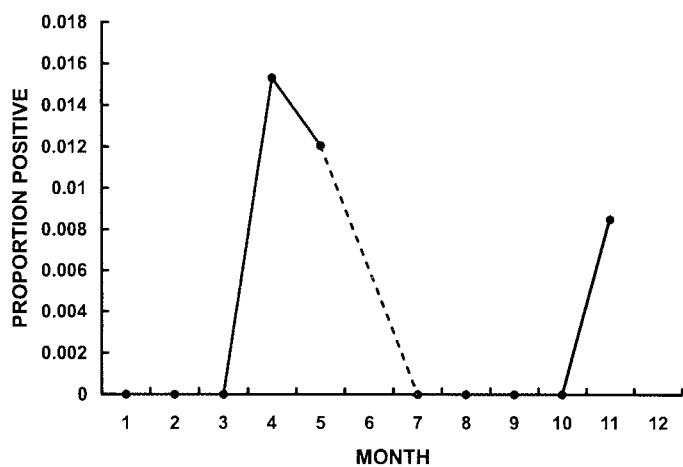
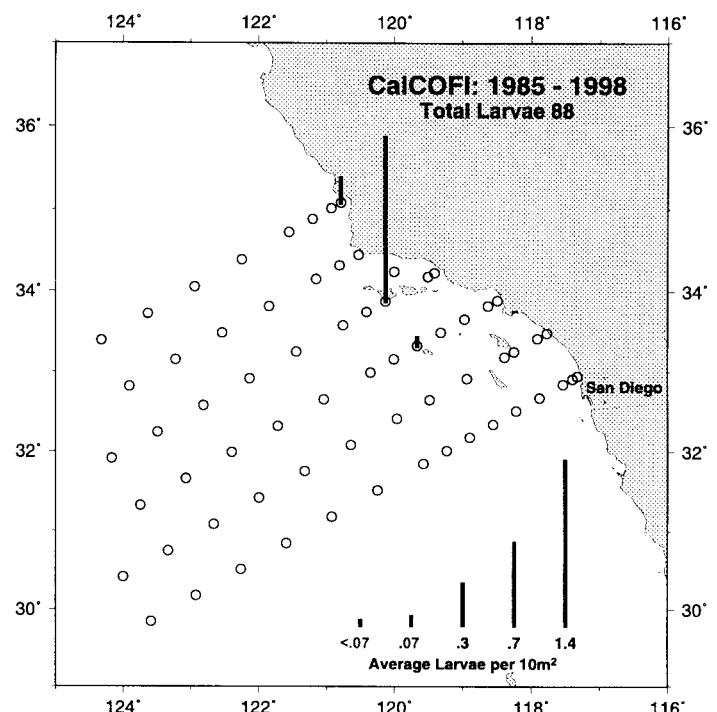
## Yellowfin fringehead

*Neoclinus stephensae*

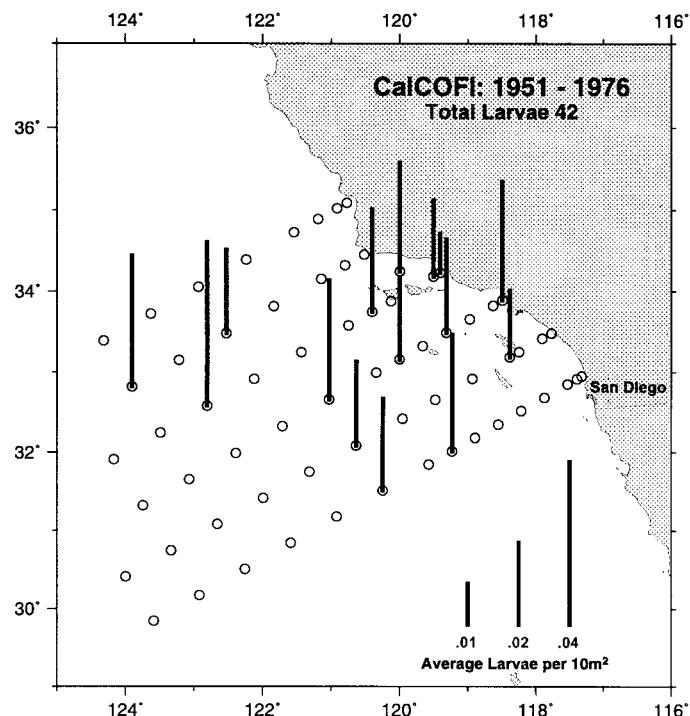
*Chitonotus pugensis*

Roughback sculpin

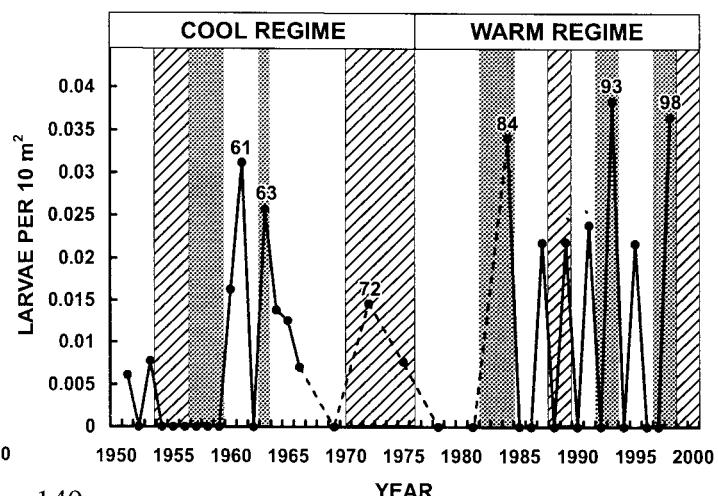
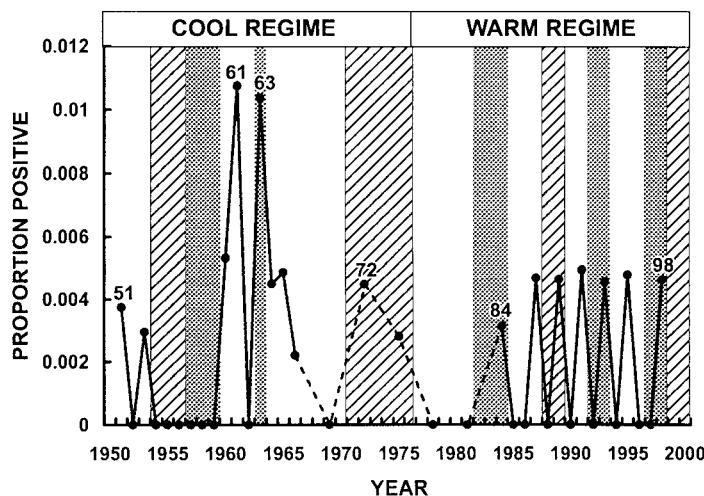
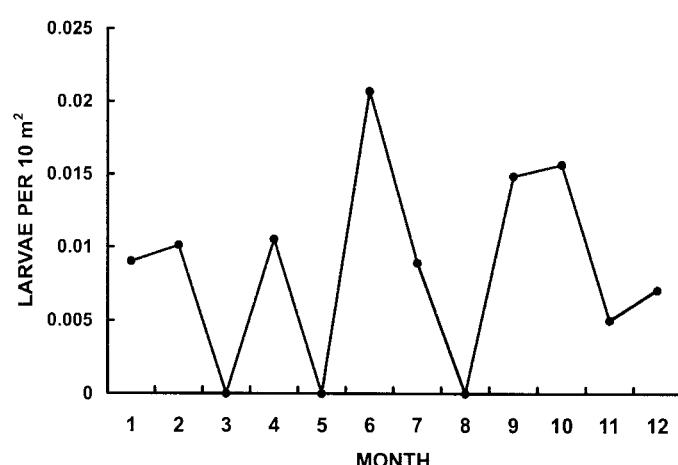
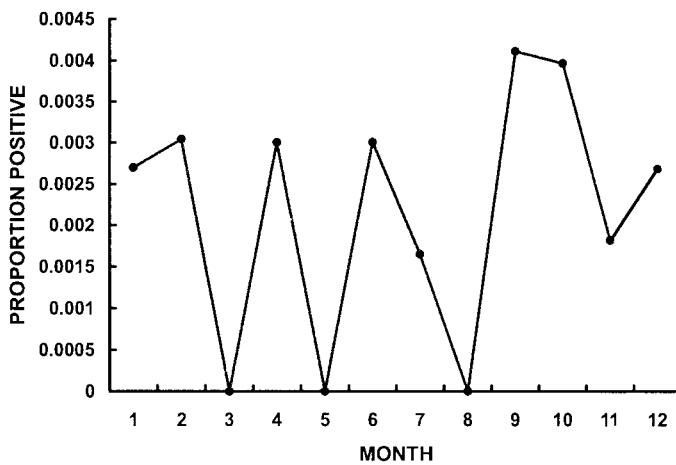
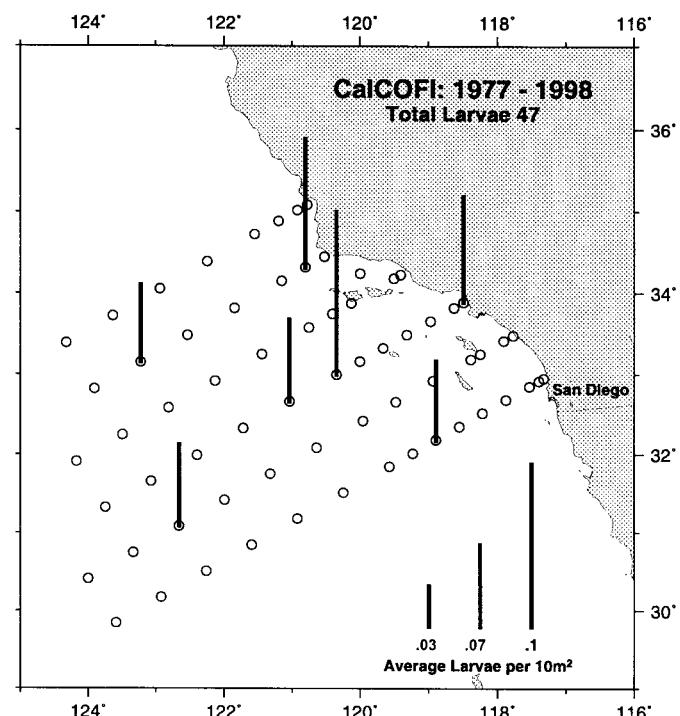
COTTIDAE



## ANGUILLIFORMES



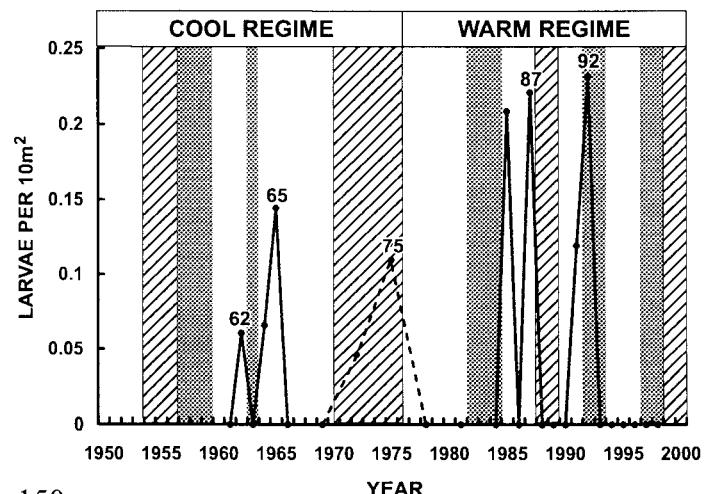
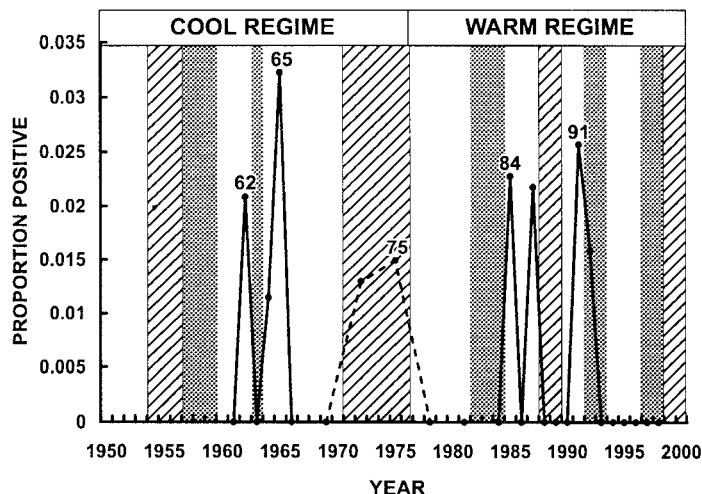
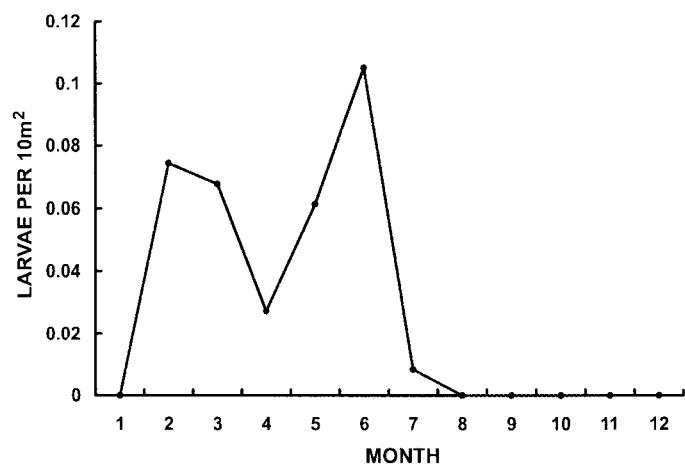
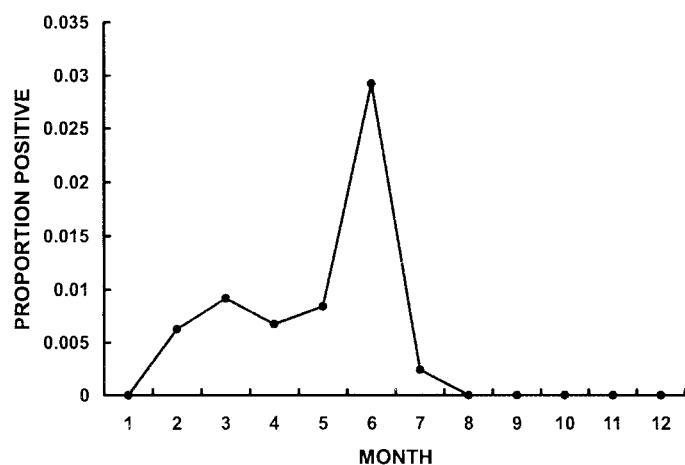
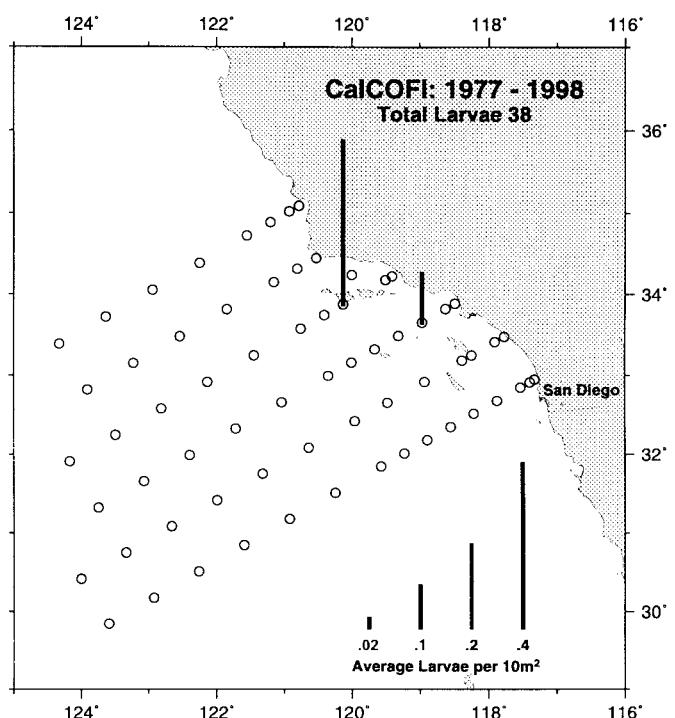
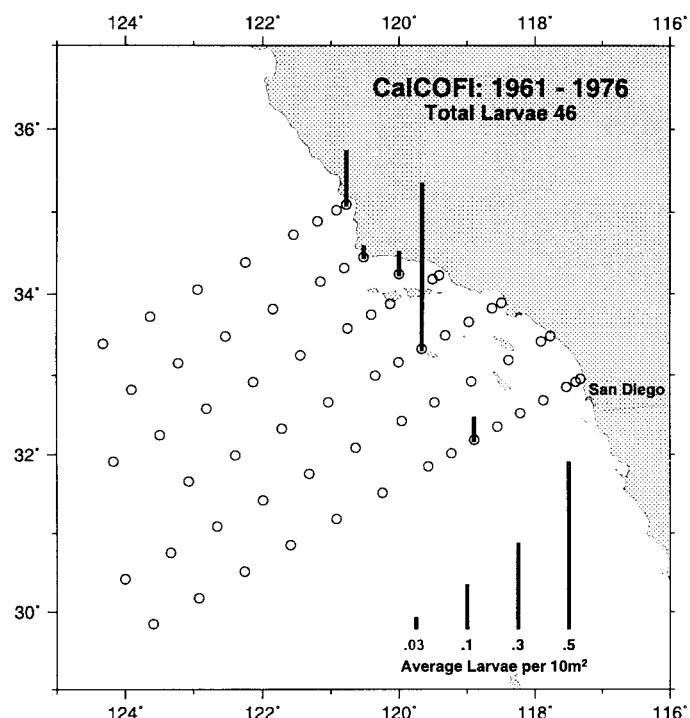
## Eels



*Lepidopsetta bilineata*

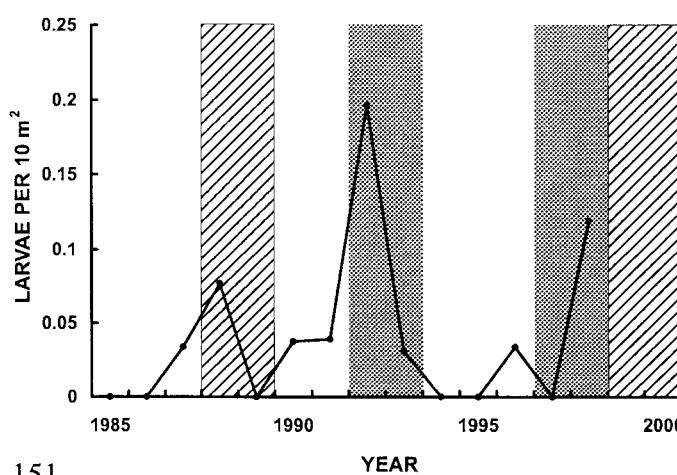
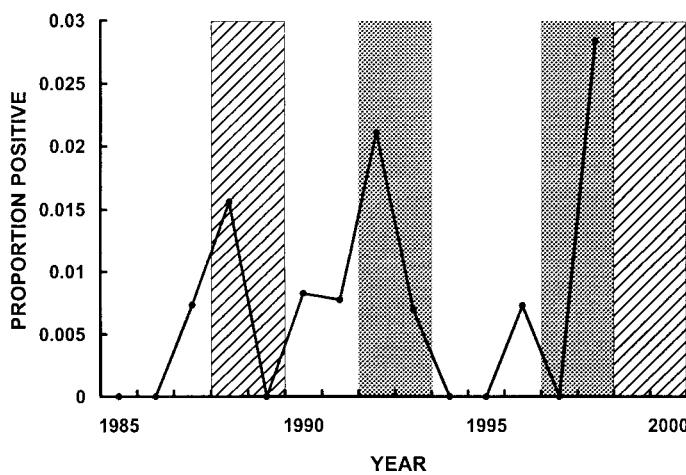
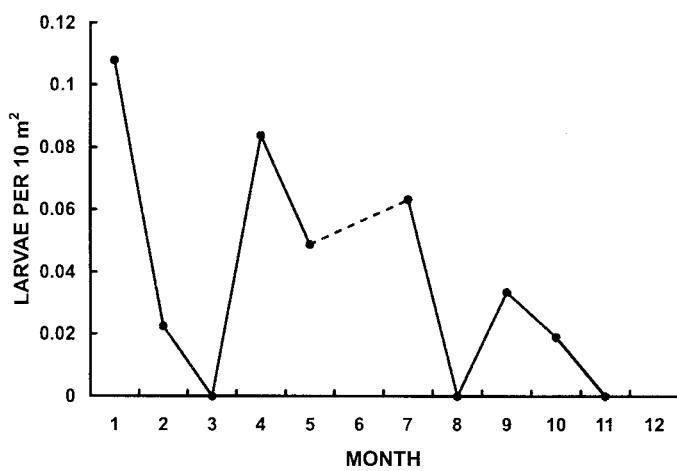
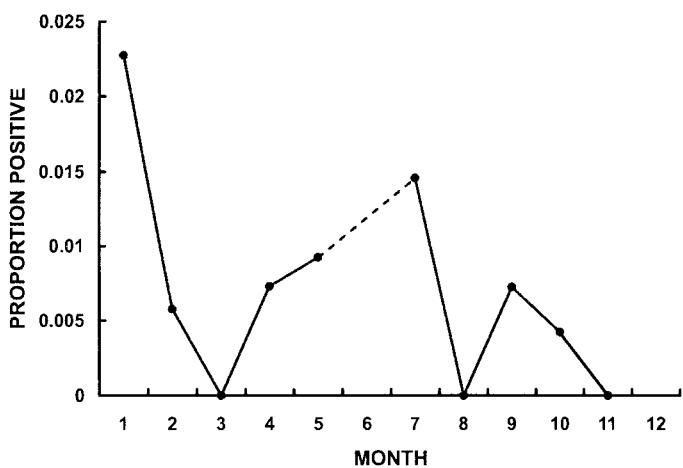
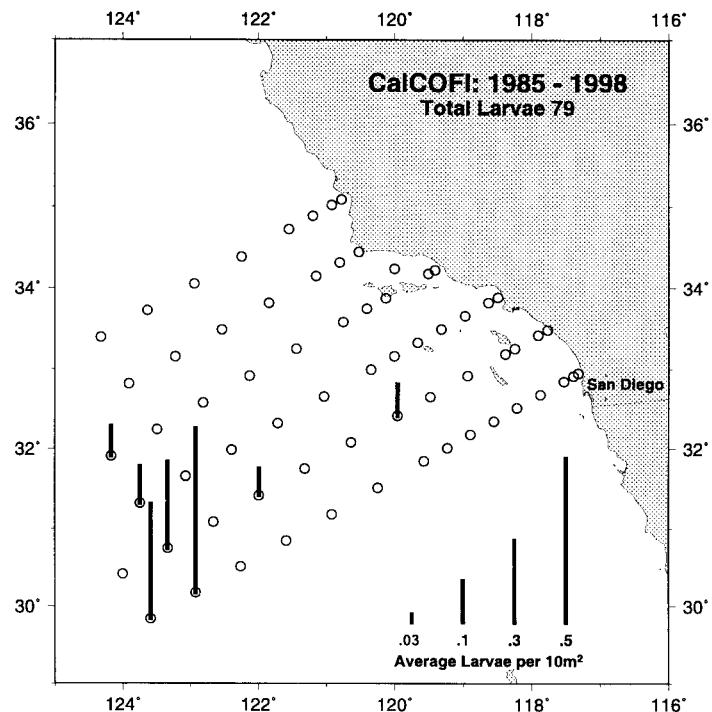
Rock sole

PLEURONECTIDAE



# MYCTOPHIDAE

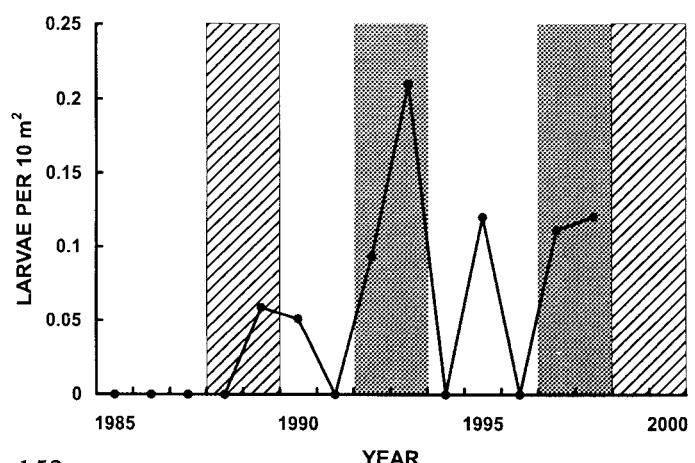
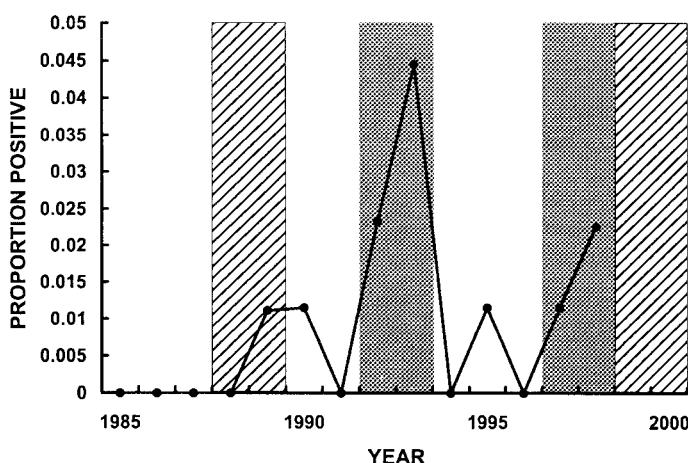
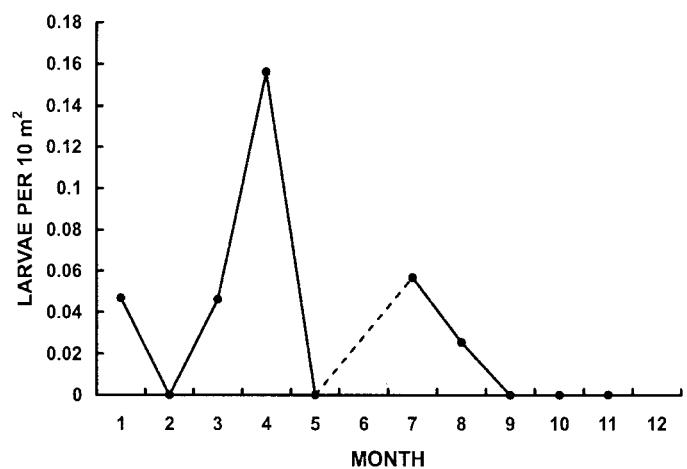
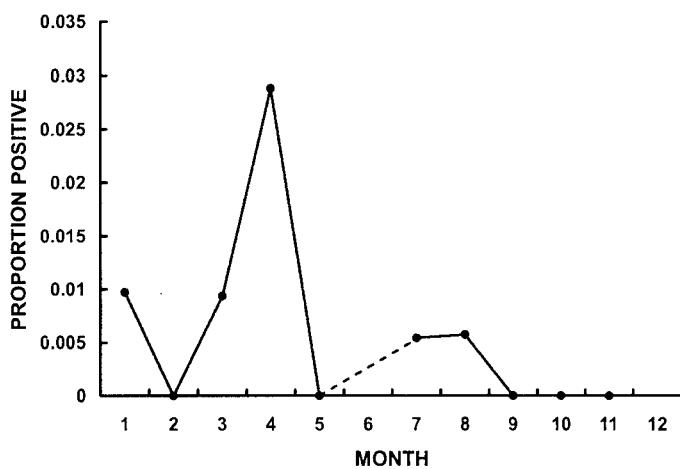
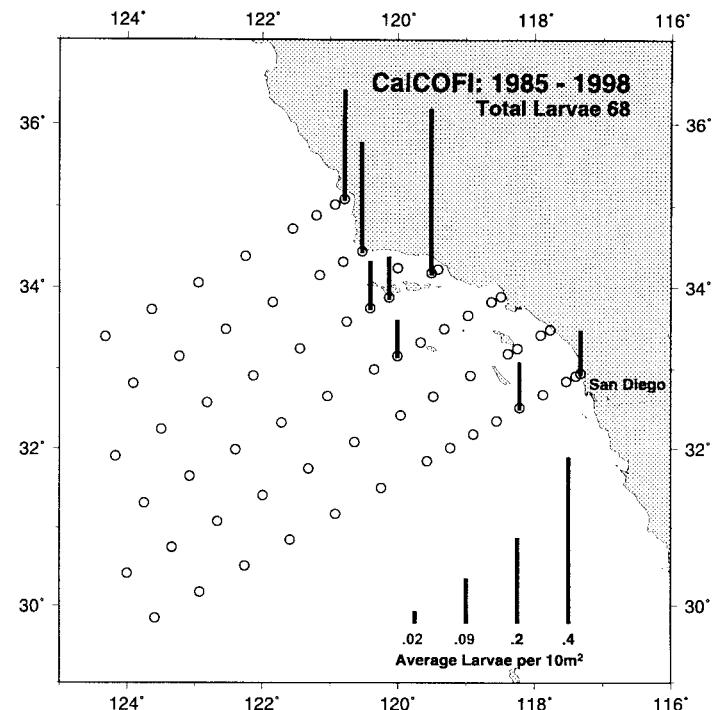
# *Nannobrachium bristori*



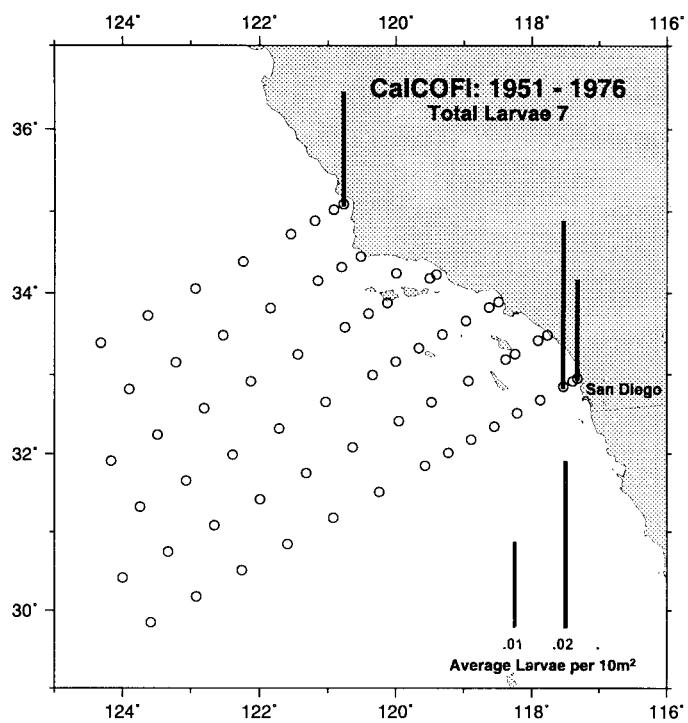
*Xeneretmus latifrons*

Blacktip poacher

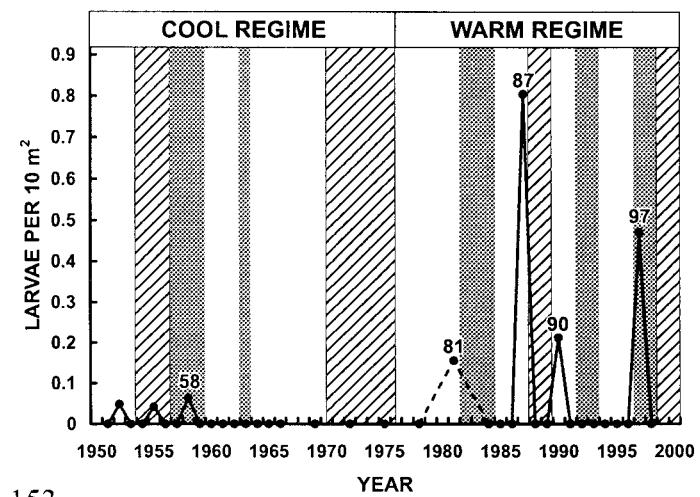
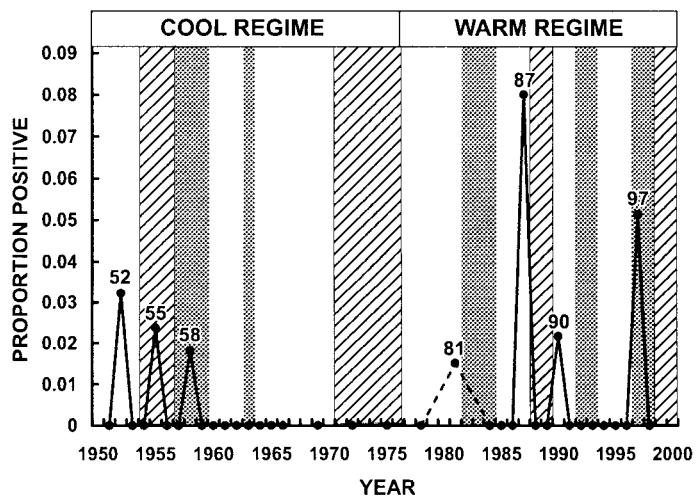
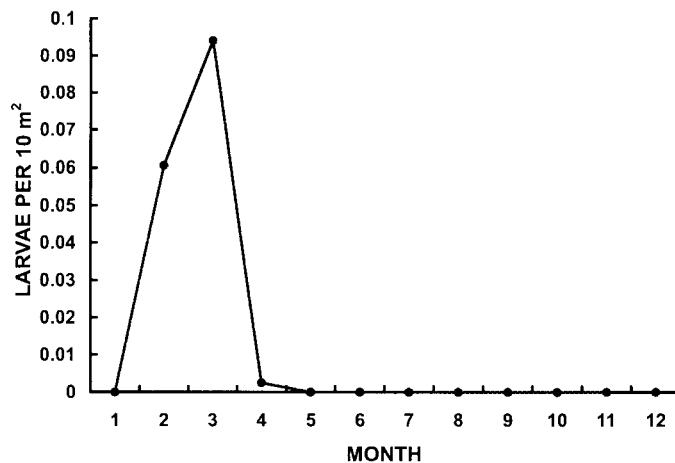
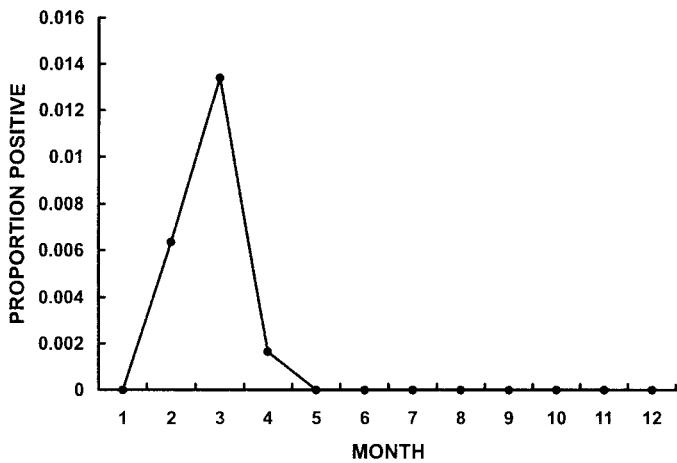
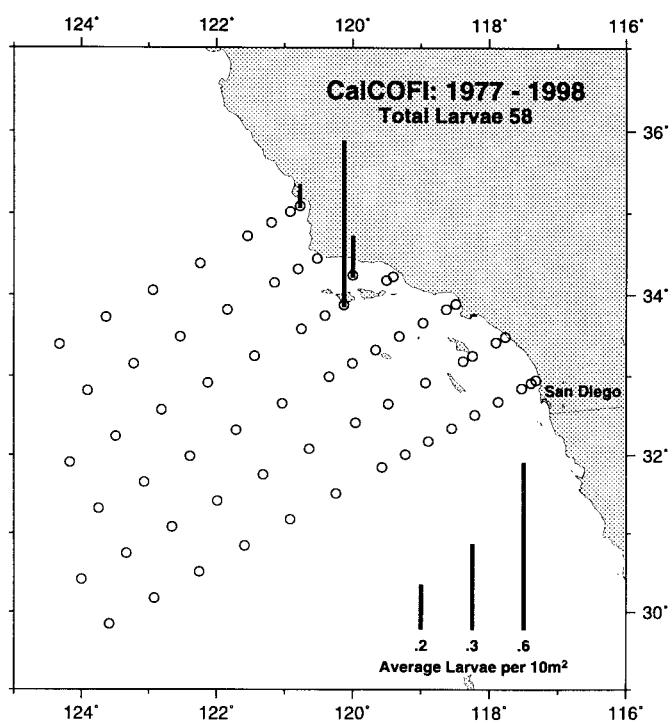
AGONIDAE



## HEXAGRAMMIDAE



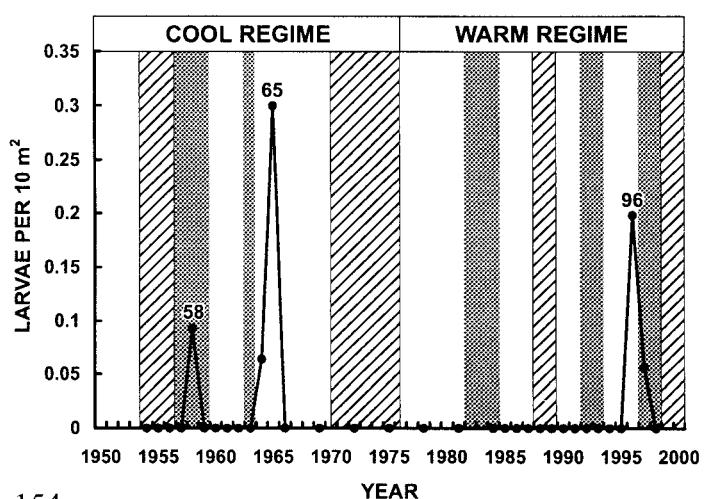
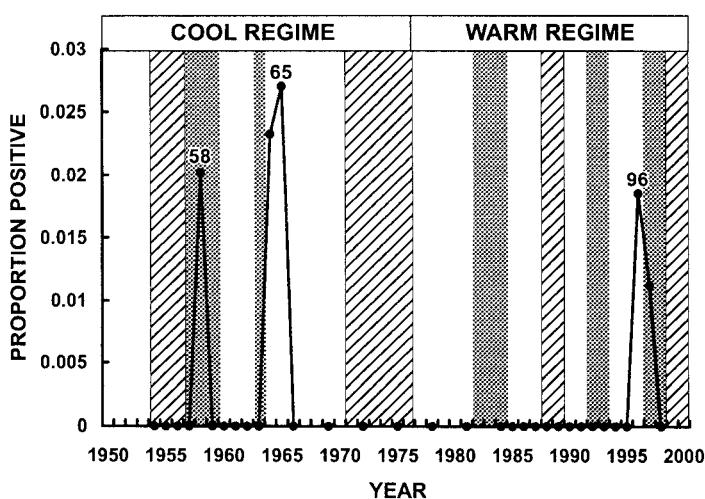
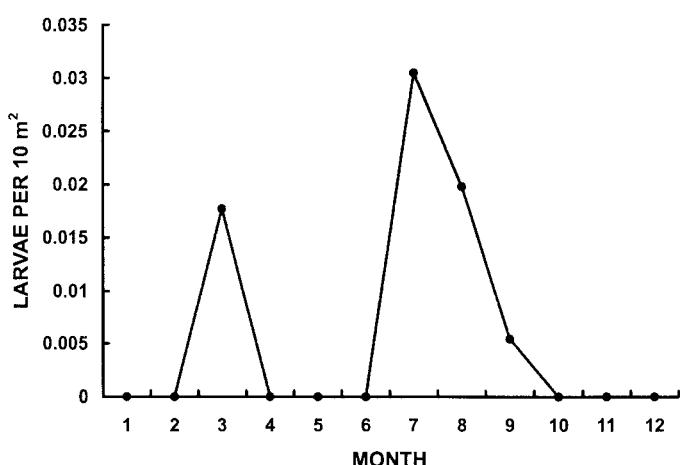
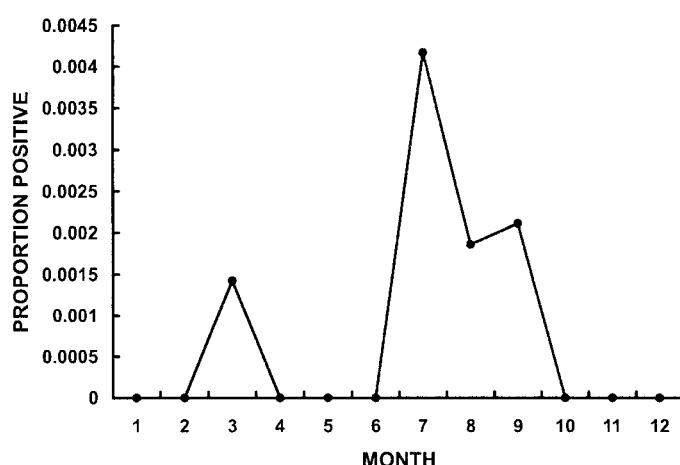
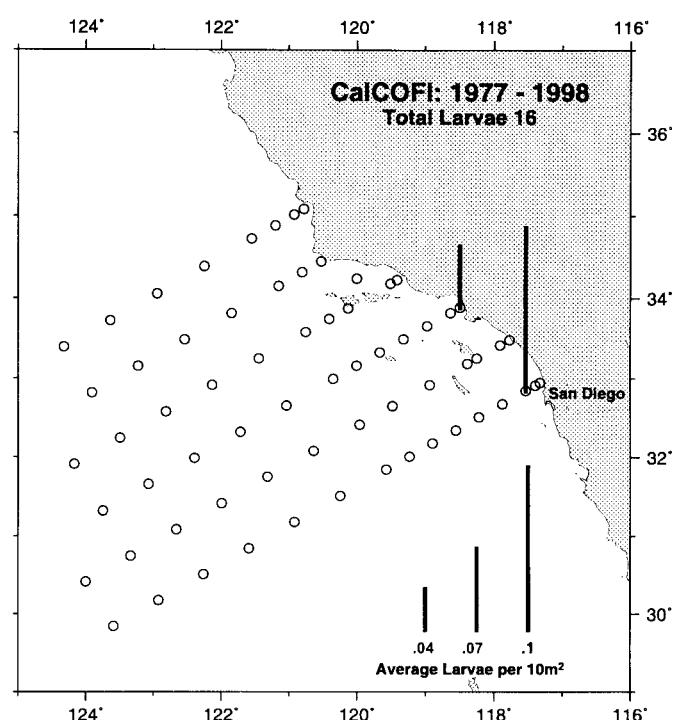
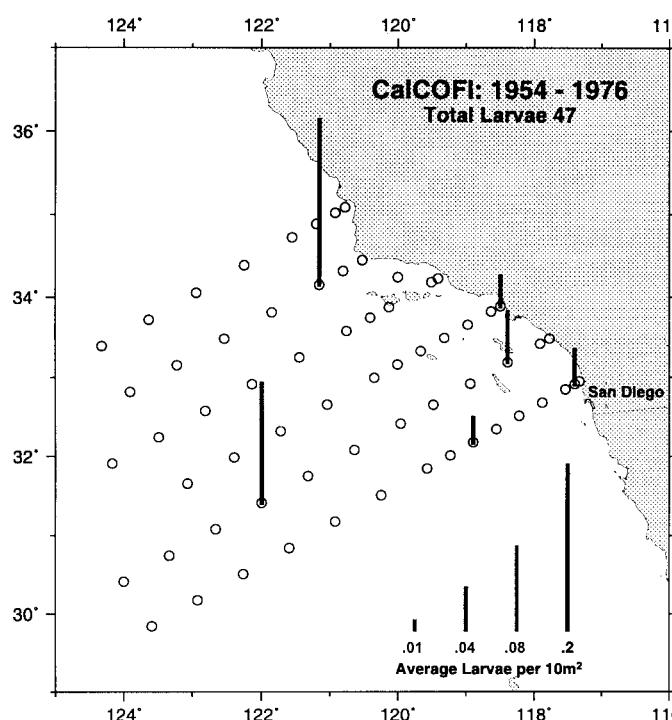
## Lingcod



*Seriola lalandi*

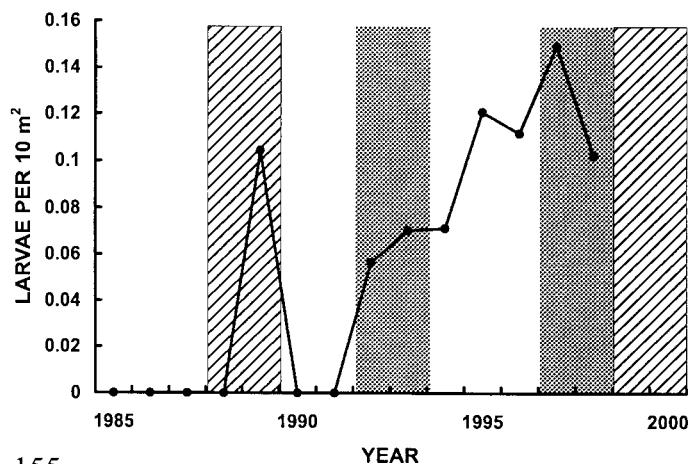
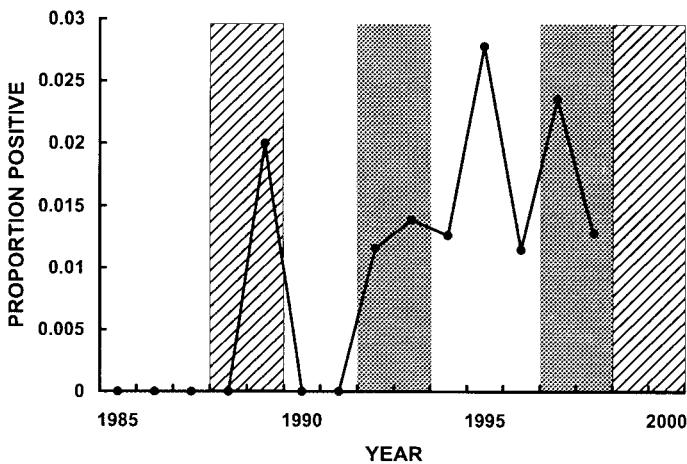
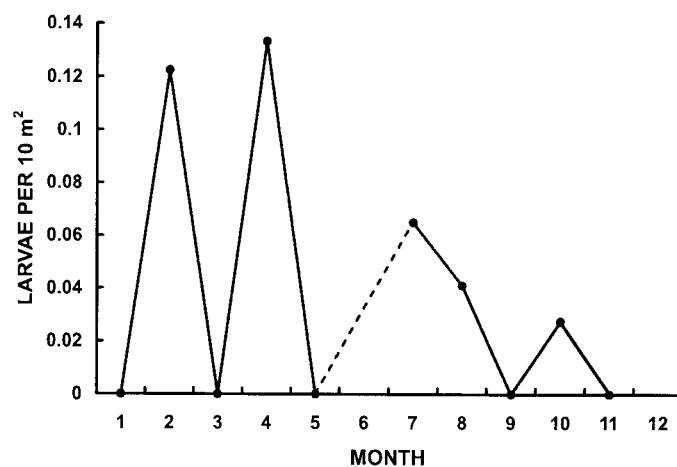
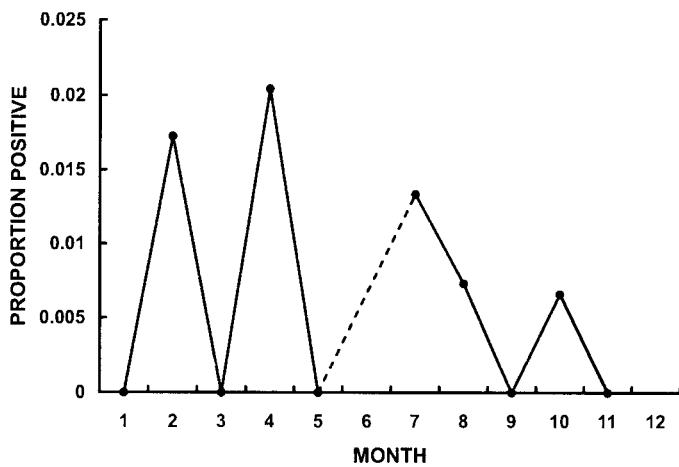
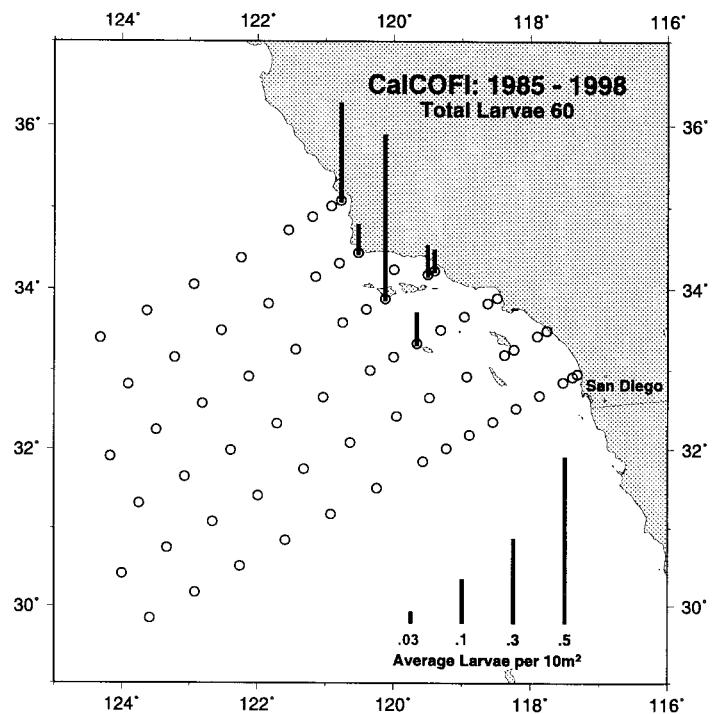
Yellowtail

CARANGIDAE



## AGONIDAE

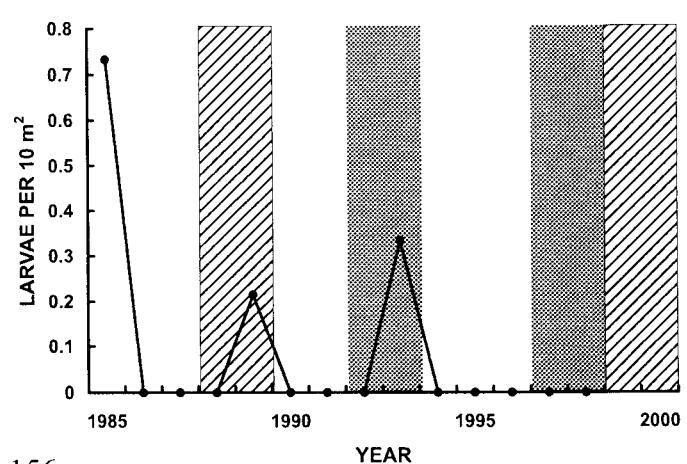
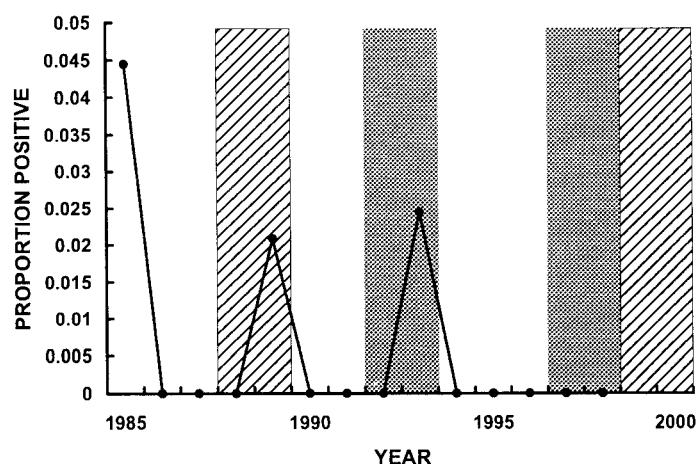
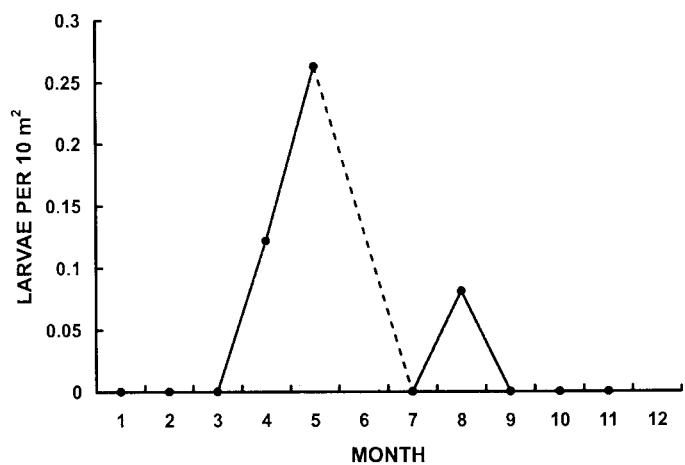
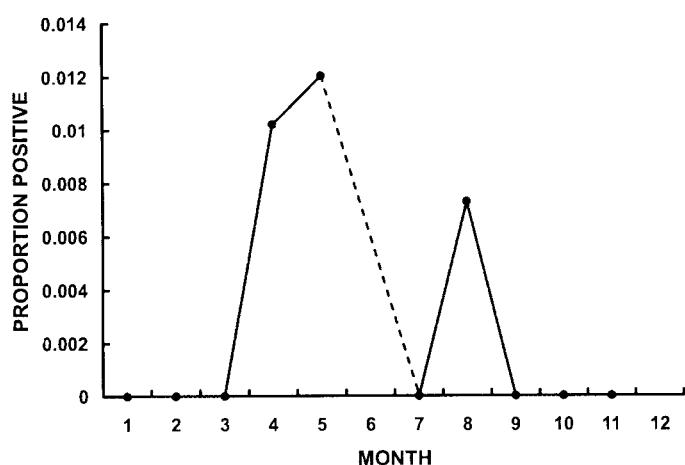
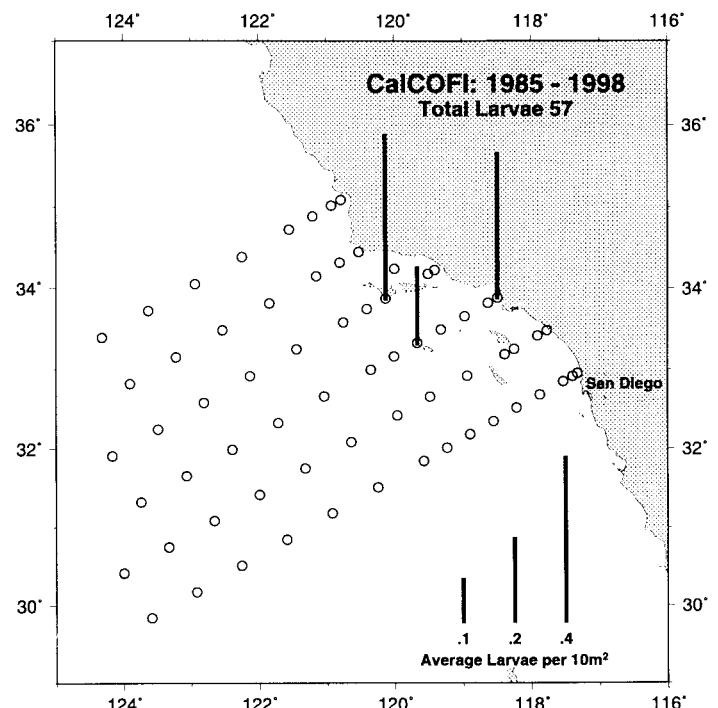
## Pygmy poacher

*Odontopyxis trispinosa*

*Artemius harringtoni*

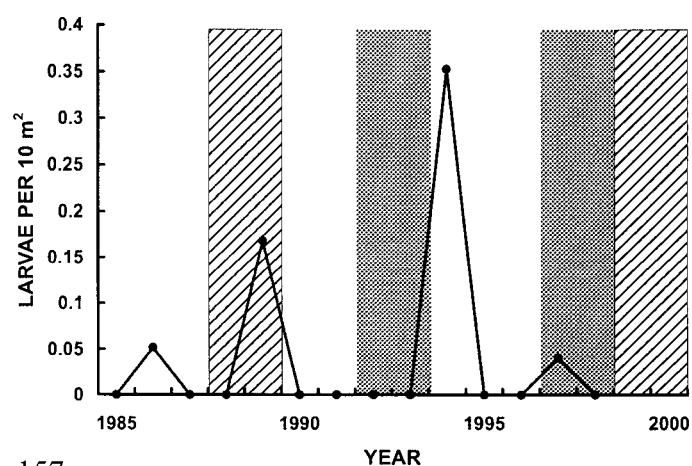
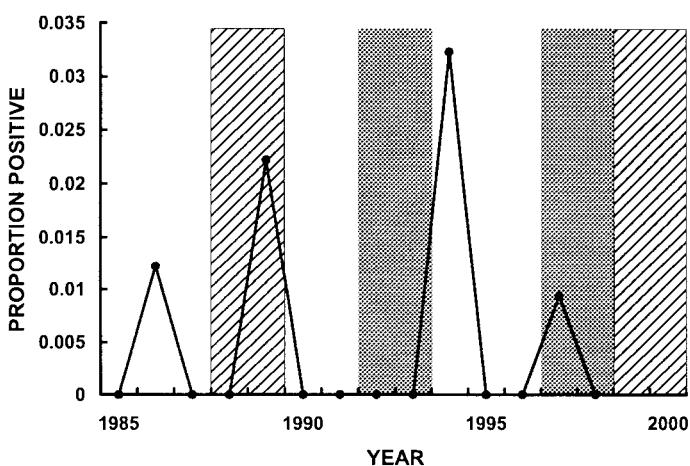
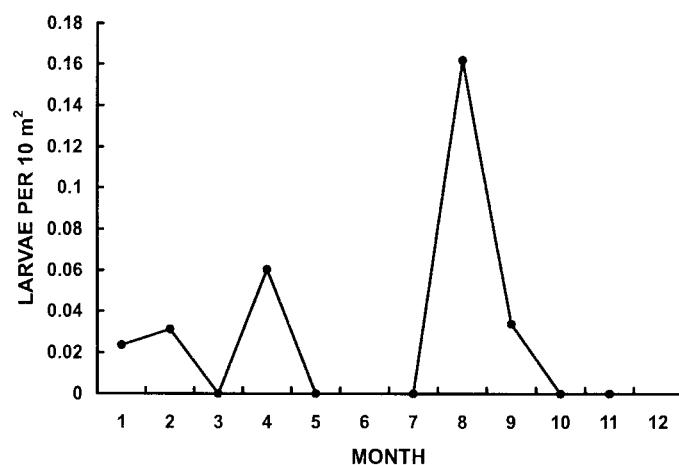
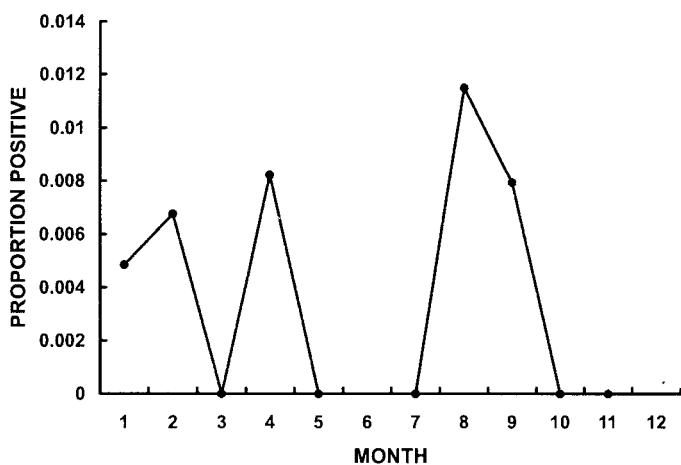
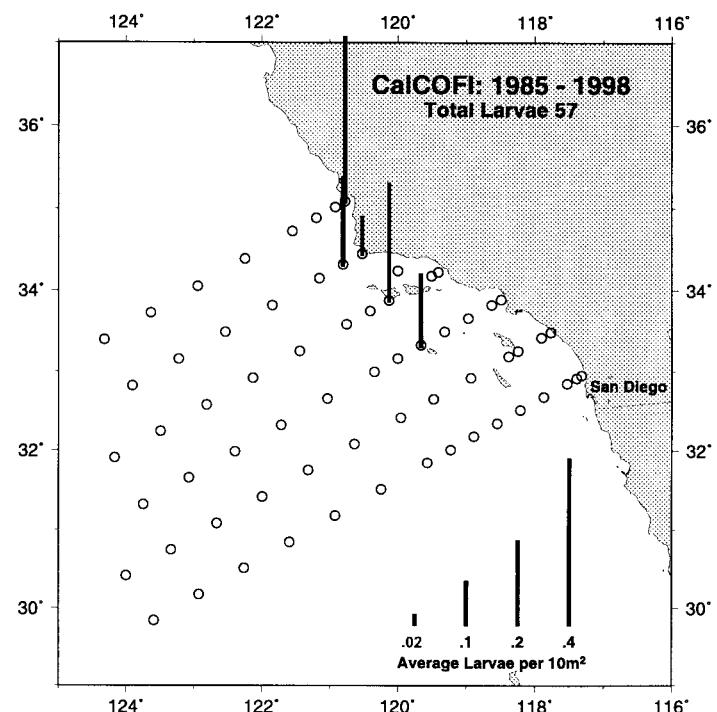
## Scalyhead sculpin

## COTTIDAE



## CYCLOPTERIDAE

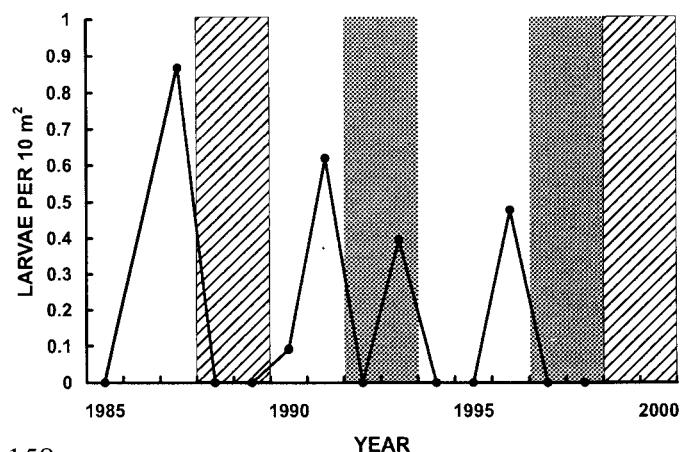
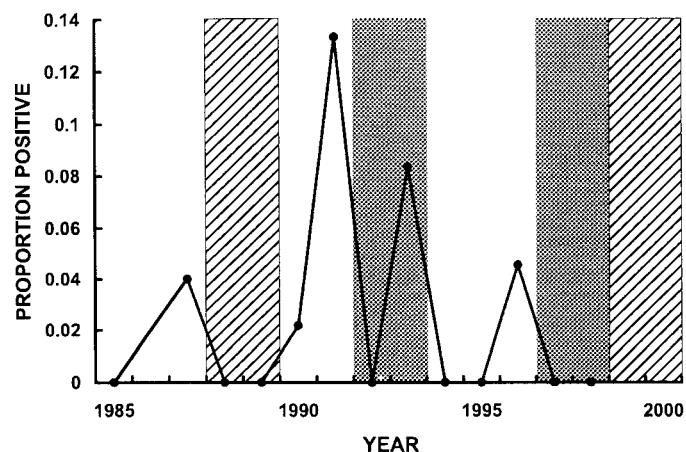
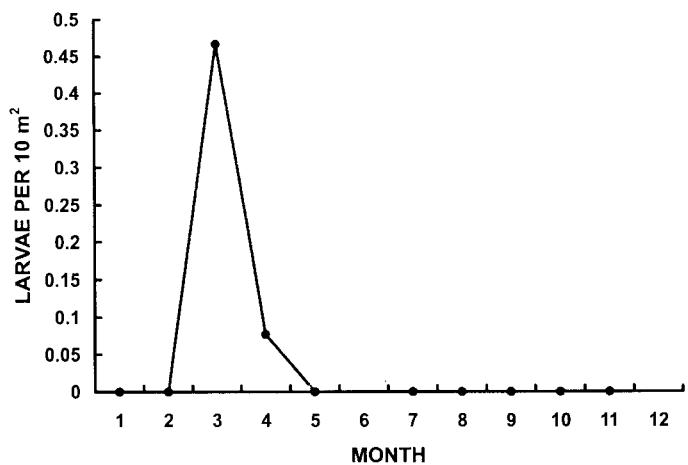
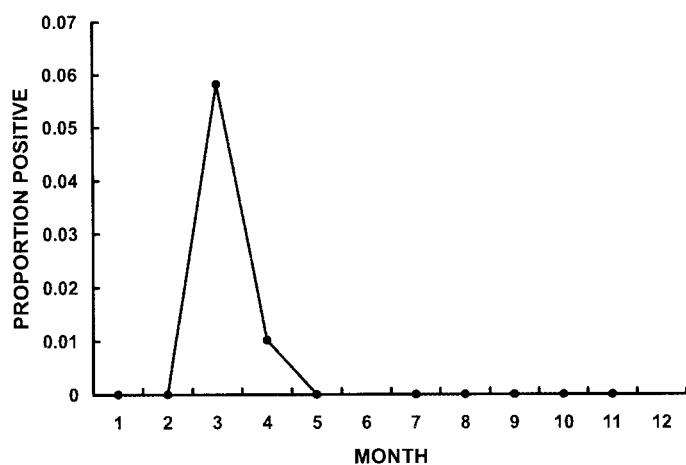
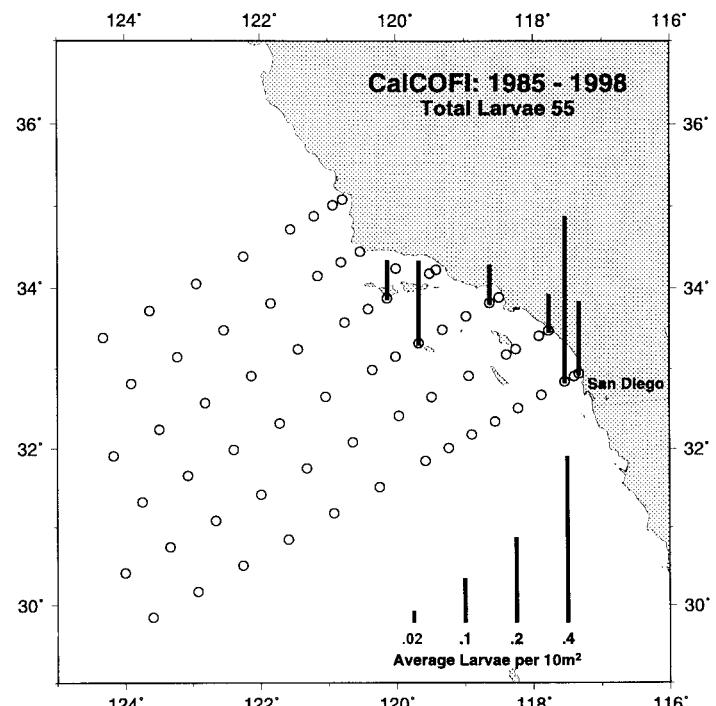
## Slimy snailfish

*Liparis mucosus*

*Plectobranchus evides*

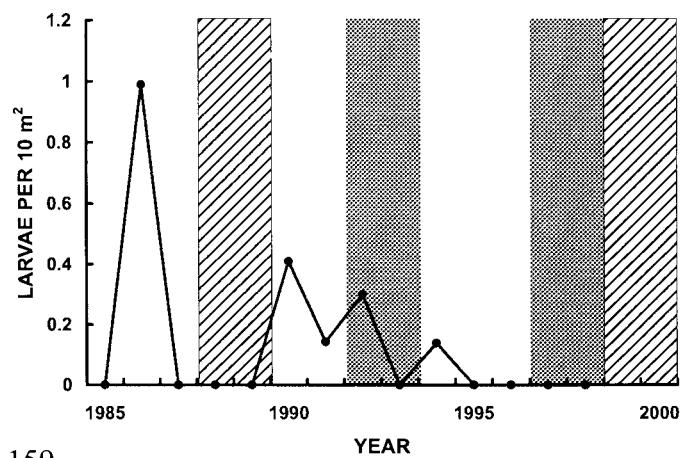
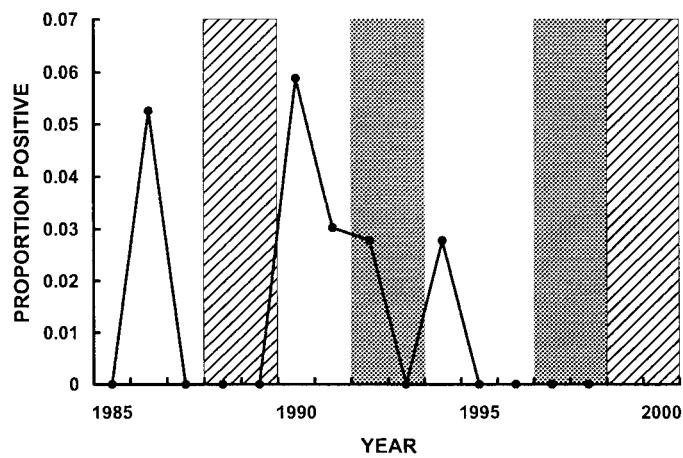
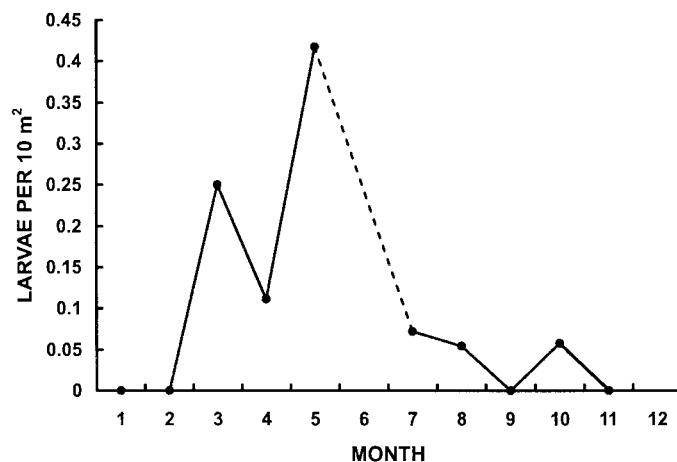
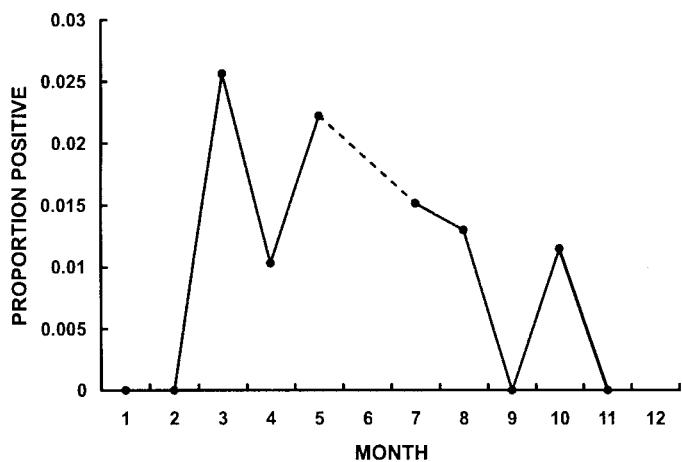
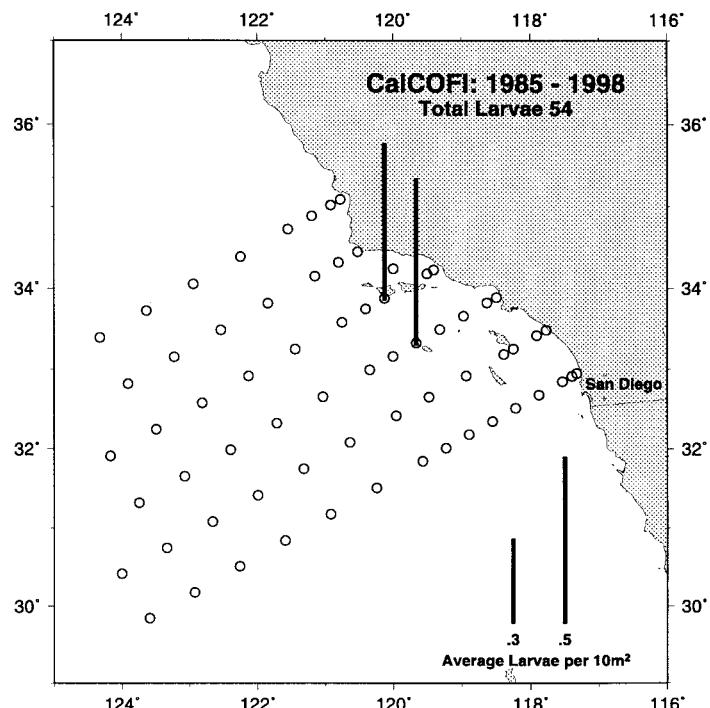
Bluebarred prickleback

STICHAEIDAE

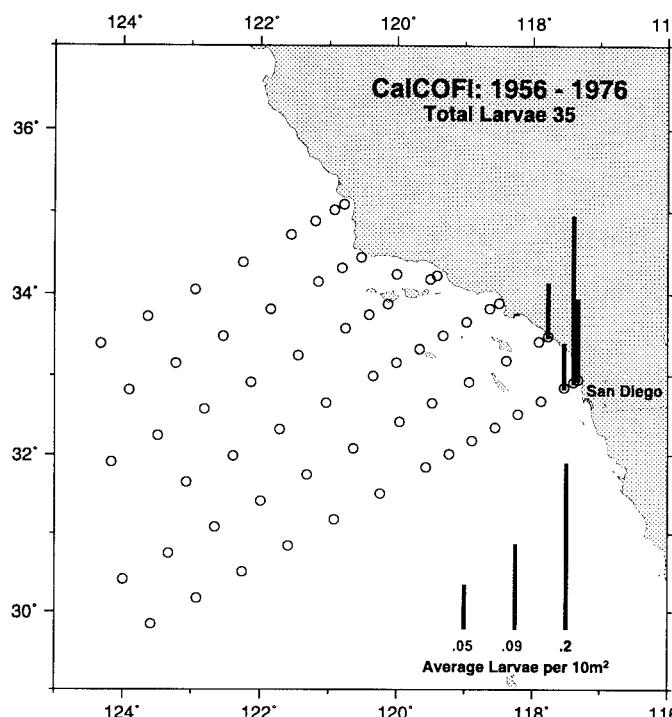


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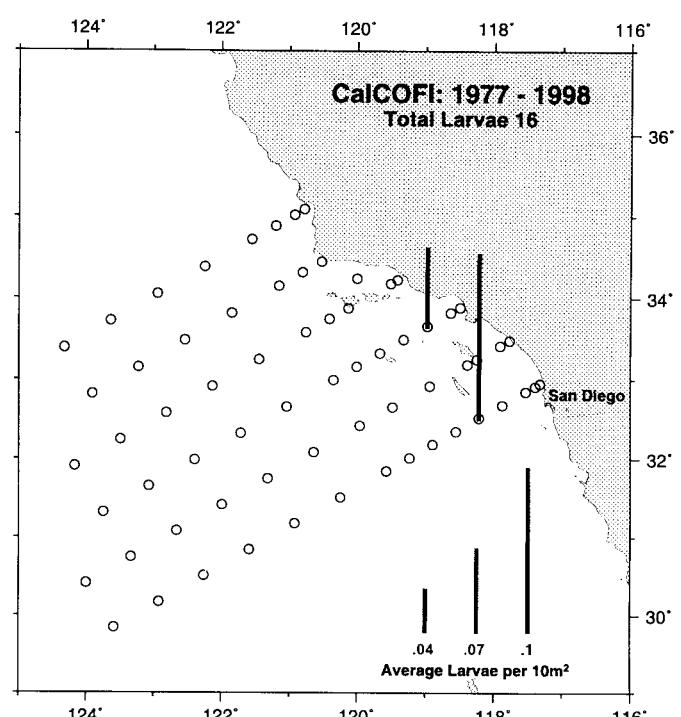
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*Arctedius fenestratus*

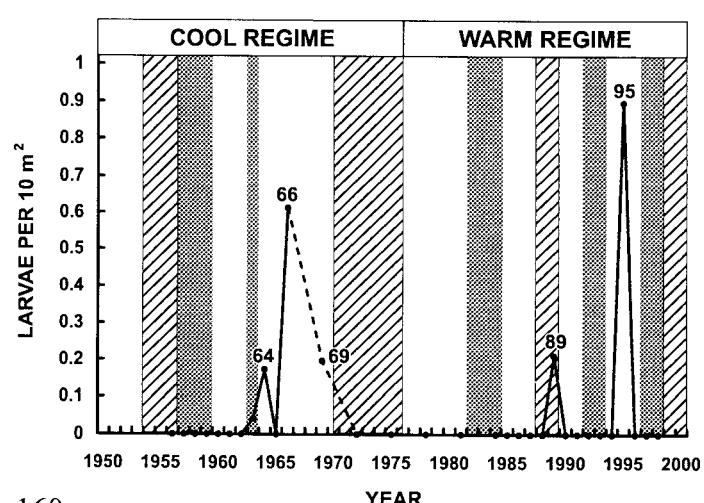
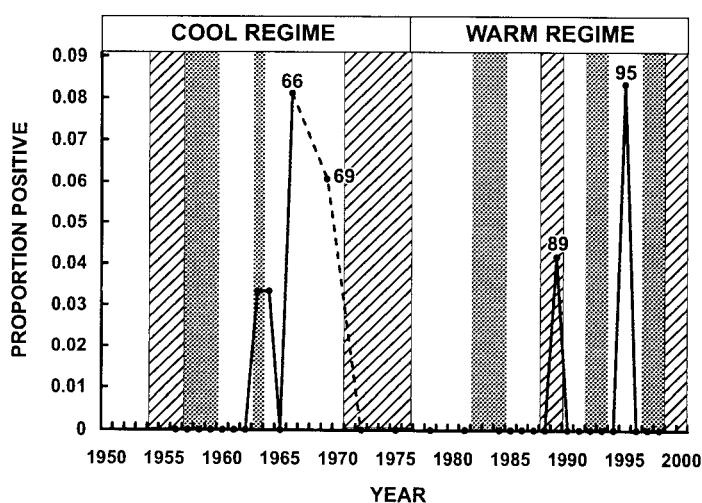
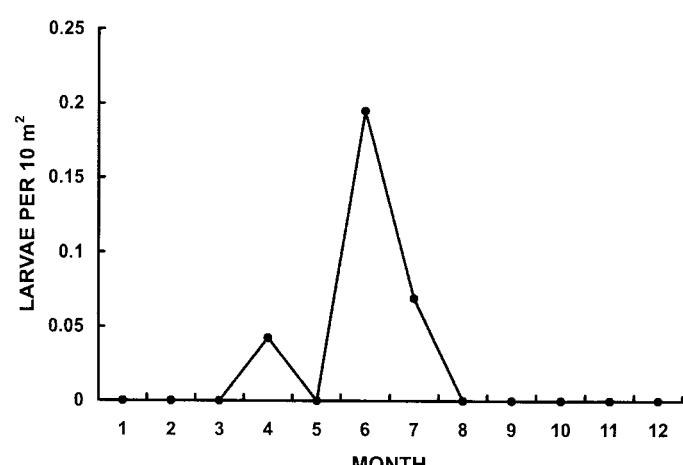
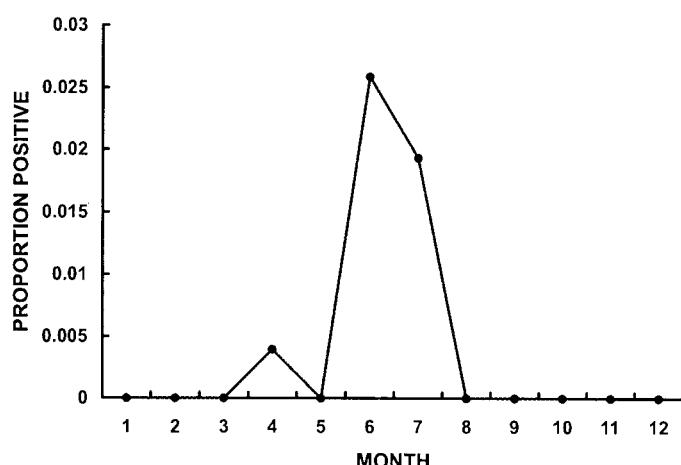
*Sarda chiliensis*



Pacific bonito

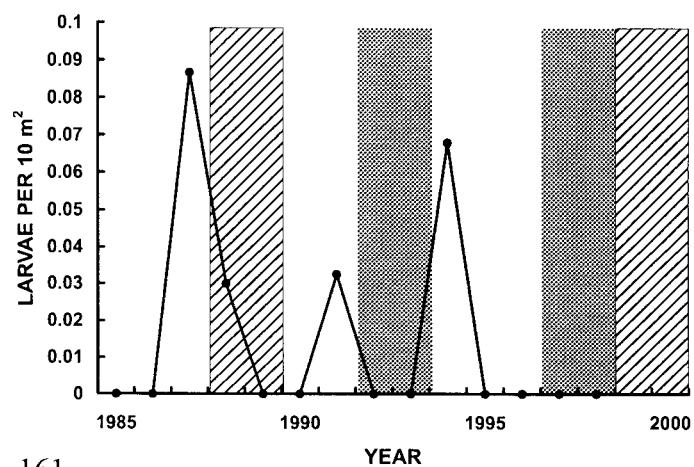
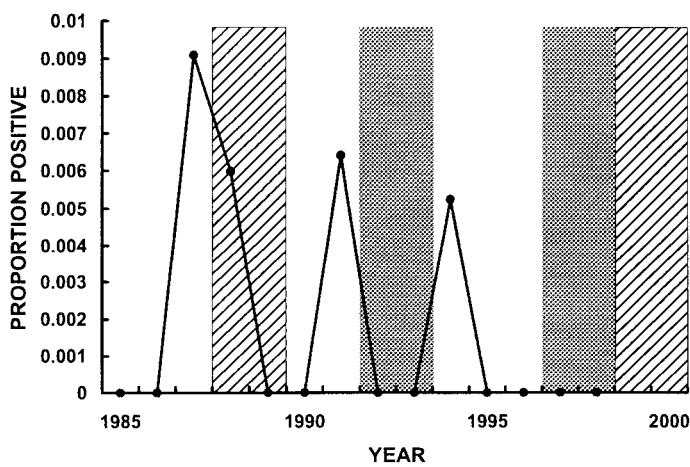
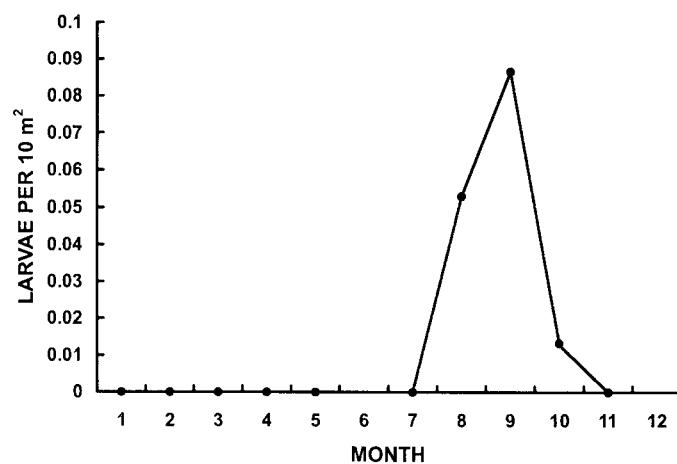
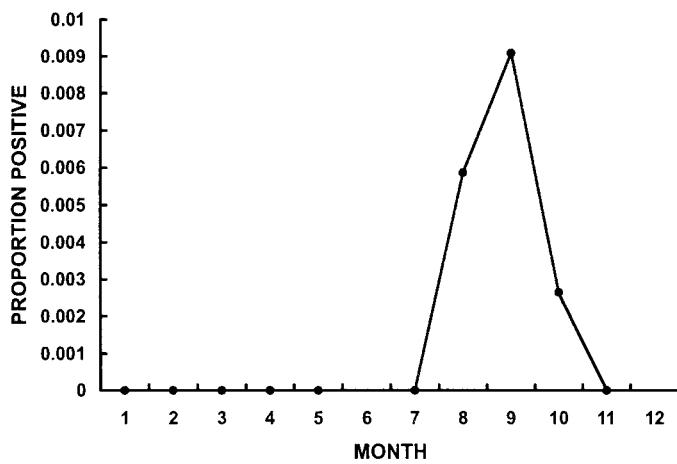
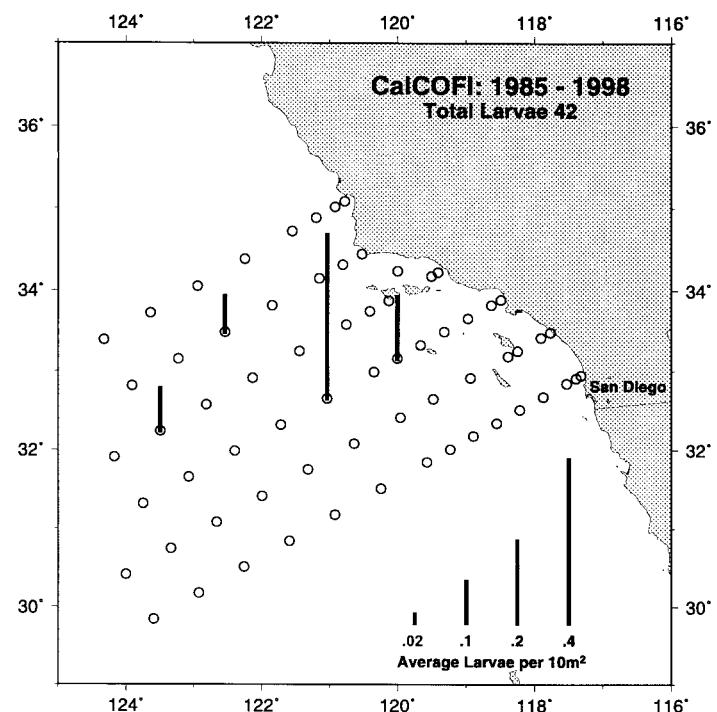


SCOMBRIDAE



## SEBASTIDAE

## Shortspine thornyhead

*Sebastolobus alascanus*

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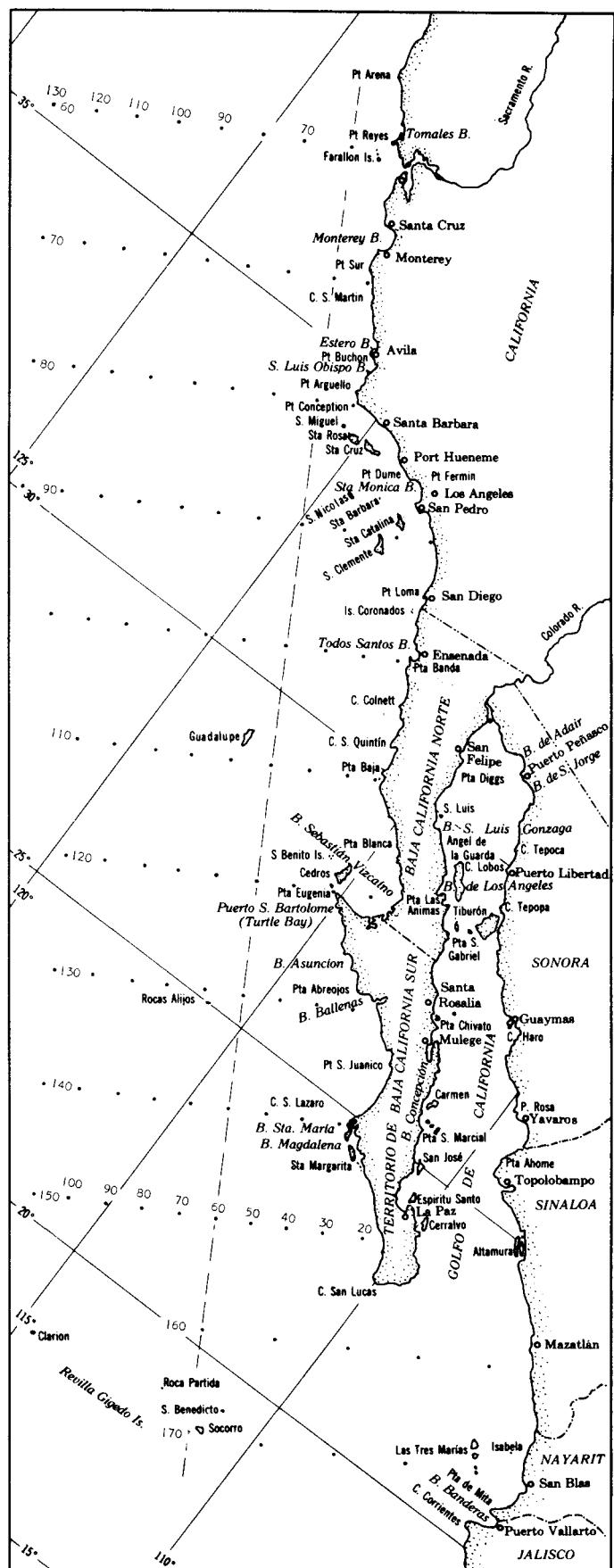
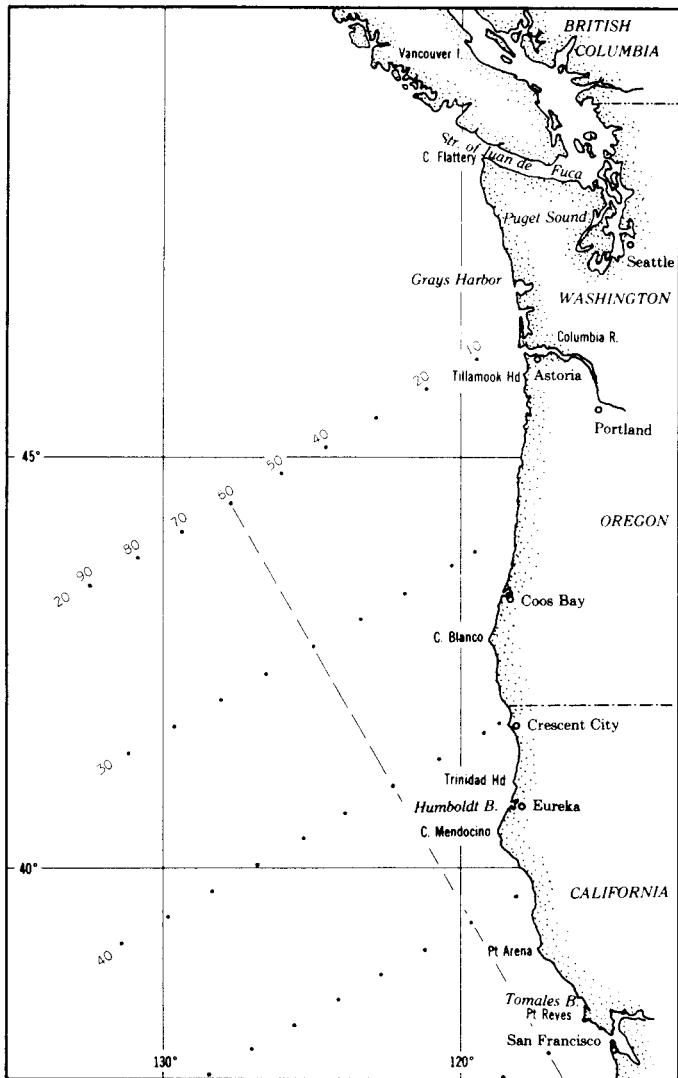
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These maps are designed to show essential details of the area most intensively studied by the California Cooperative Oceanic Fisheries Investigations. This is approximately the same area as is shown in color on the front cover. Geographical place names are those most commonly used in the various publications emerging from the research. The cardinal station lines extending southwestward from the coast are shown. They are 120 miles apart. Additional lines are utilized as needed and can be as closely spaced as 12 miles apart and still have individual numbers. The stations along the lines are numbered with respect to the station 60 line, the numbers increasing to the west and decreasing to the east. Most of them are 40 miles apart, and are numbered in groups of 10. This permits adding stations as close as 4 miles apart as needed. An example of the usual identification is 120-65. This station is on line 120, 20 nautical miles southwest of station 60.

The projection of the front cover is Lambert's Azimuthal Equal Area Projection. The detail maps are a Mercator projection.

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