

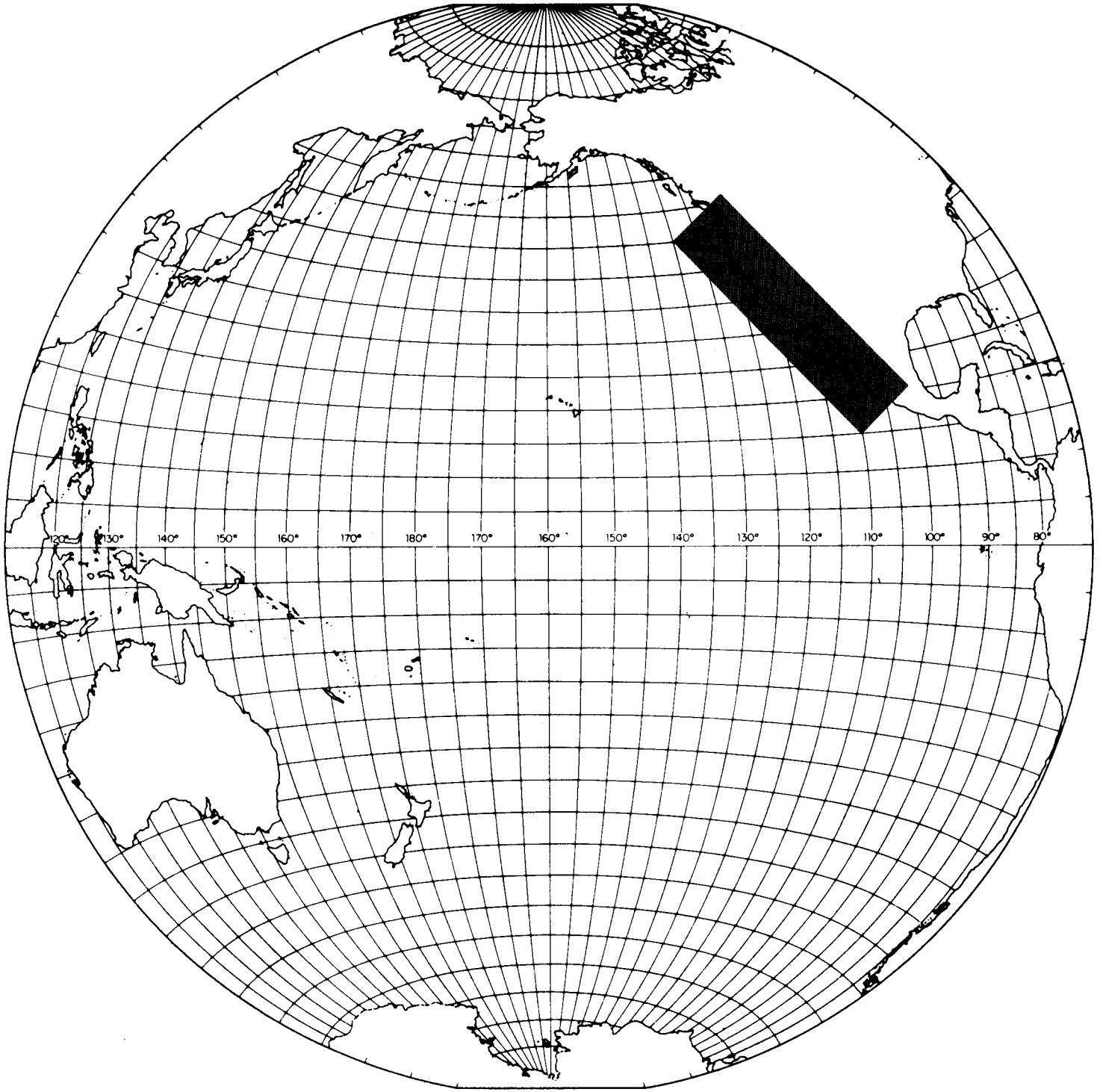


Atlas 32: Moser, H. G., R. L. Charter, P. E. Smith, D. A. Ambrose, S. R. Charter, C. A. Meyer, E. M. Sandknop, and W. Watson. Distributional atlas of fish larvae in the California Current region: taxa with less than 1000 total larvae, 1951-1984. Published October 1994.

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. 32

CALIFORNIA
COOPERATIVE
OCEANIC
FISHERIES
INVESTIGATIONS

Atlas No. 32

Cooperating Agencies:

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

OCTOBER, 1994

THE CALCOFI ATLAS SERIES

This is the thirty-second 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,¹ a program sponsored by the following agencies:

California Department of Fish and Game
National Oceanic and Atmospheric Administration, National Marine Fisheries Service²
University of California, Scripps Institution of Oceanography

CalCOFI atlases³ 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.

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CalCOFI atlases in this series, through October 1994 are:

- No. 1. Anonymous, 1963. CalCOFI atlas of 10-meter temperatures and salinities 1949 through 1959.
- No. 2. Fleminger, A., 1964. Distributional atlas of calanoid copepods in the California Current region, Part I.
- No. 3. Alvarino, 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 through 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 through 1966.
- No. 12. Kramer, D., 1970. Distributional atlas of fish eggs and larvae in the California Current region: Pacific sardine, *Sardinops caerulea* (Girard), 1951 through 1966.
- No. 13. Smith, P.E., 1971. Distributional atlas of zooplankton volume in the California Current region, 1951 through 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.

¹ Usually abbreviated CalCOFI, sometimes CALCOFI or CCOFI.

² Formerly called U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries.

³ For citation this issue in the series should be referred to as CalCOFI Atlas No. 32
Library of Congress Catalog Card Number 67-4238.

- 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 through 1971.
- No. 17. Ahlstrom, E.H., 1972. Distributional atlas of fish larvae in the California Current region: six common mesopelagic fishes - *Vinciguerria lucetia*, *Triphoturus mexicanus*, *Stenobranchius leucopsarus*, *Leuroglossus stilbius*, *Bathylagus wesethi*, and *Bathylagus ochotensis*, 1955 through 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. 21. Fleminger, A., J.D. Isaacs and J.G. Wyllie, 1974. Zooplankton biomass measurements from CalCOFI cruises of July 1955 to 1959 and remarks on comparison with results from October, January and April cruises of 1955 to 1959.
- No. 22. Namias, J., 1975. Northern hemisphere seasonal sea level pressure and anomaly charts, 1947-1974.
- No. 23. Ahlstrom, E.H. and H.G. Moser, 1975. Distributional atlas of fish larvae in the California Current region: flatfishes, 1955 through 1960.
- No. 24. Brinton, E. and J.G. Wyllie, 1976. Distributional atlas of euphausiid growth stages off southern California, 1953 through 1956.
- No. 25. Eber, L.E., 1977. Contoured depth-time charts (0 to 200m, 1950 to 1966) of temperature, salinity, oxygen and sigma-t at 23 CalCOFI stations in the California Current.
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- 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 through 1979.
- No. 29. Namias, J., 1981. Teleconnections of 700 mb height anomalies for the northern hemisphere.
- 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.
- No. 31. Moser, H.G., R.L. Charter, P.E. Smith, D.A. Ambrose, S.R. Charter, C.A. Meyer, E.M. Sandknop and W. Watson, 1993. Distributional atlas of fish larvae and eggs in the California Current region: Taxa with 1000 or more total larvae, 1951 through 1984.
- 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 through 1984.

**DISTRIBUTIONAL ATLAS OF FISH LARVAE IN THE CALIFORNIA CURRENT
REGION: TAXA WITH LESS THAN 1000 TOTAL LARVAE,
1951 THROUGH 1984**

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

CALCOFI ATLAS NO. 32

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October, 1994

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Introduction

This atlas summarizes the spatial and temporal distributions of 122 larval fish taxa with < 1000 total larvae (summed counts per 10 m²) collected on California Cooperative Oceanic Fisheries Investigations (CalCOFI) plankton survey cruises from 1951 through 1984. Atlas 31 summarized the distributions of 110 taxa with ≥1000 total larvae and presented background and interpretive information on the CalCOFI survey station pattern, cruise coverage, sampling and processing methods, and the CalCOFI ichthyoplankton data base (Moser et al., 1993). The two atlases provide basic information on the distribution and abundance of all taxa

represented in the current CalCOFI ichthyoplankton data base and serve as guides to users of the data base.

The CalCOFI surveys from 1951 through 1984 in the California Current region produced 31,214 plankton tows yielding ca. 12 million fish larvae distributed in 245 identified taxa. Larvae were identified to species or were assigned to the lowest taxon possible (genus, family, suborder, order). Data presented in this atlas represent either original identifications or new identifications resulting from reexamination of data and archived samples. Atlas 31 contained a table of ranked abundance (number per 10 m² of sea surface) of all taxa included in the 1951-1984 time series and a table of ranked occurrences for all taxa. Correction of tow data and reexamination of some taxa during the preparation of this atlas resulted in minor modification of the data base; revised tables of ranked abundance (Table 1) and ranked occurrence (Table 2) in this atlas reflect these changes. Five higher taxa (Stomiiformes, Myctophiformes, Scorpaenidae, Scombridae, Bothidae) with <1000 total larvae consisted primarily of small damaged specimens that could not be identified further. They were not analyzed, but their distributions are represented in analyses of component taxa.

Distributions for those taxa adequately represented in the data base are summarized in a series of charts and graphs arranged on two

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facing pages per taxon. The upper panel on the left page is a map of total abundance expressed as the logarithm of summed abundance (larvae per 10 m²) for all occurrences in the time series (station pattern shown in Figure 1). Distributions of some nearshore taxa are shown on enlarged maps because the abundance markers were obscured by the coastline on maps of the entire CalCOFI pattern; base maps of these enlarged regions of the survey pattern are shown in Figures 2 to 4. The lower panel is a series of four quarterly maps that show mean abundance (expressed as larvae per 10 m²) in each of 22 CalCOFI regions (Figure 5). Region 24 has an indeterminate area and in this data base is represented by the stations indicated in Figure 5. On the quarterly charts, Region 24 is shown as the area enclosed in the dashed line seaward of Regions 6 and 10. The number of station occupancies in each region for each quarter varied considerably, with marked diminution of effort in peripheral regions (Moser et al., 1993). Regions 3 and 23 were insufficiently sampled to be included in the maps of quarterly mean abundance. On these charts, regions within which no larvae of a subject taxon were captured during a quarter are indicated by a "0", and the region with the highest quarterly mean abundance is marked with a star.

Graphs summarizing interannual, seasonal and onshore-offshore occurrence and abundance of taxa with adequate representation are presented on the right-hand page of each taxon description. Calculations of seasonal and interannual mean occurrence and abundance were based on a pool of CalCOFI regions that fell within the principal distribution of the taxon of interest. This was determined by examination of all records in the time series for that taxon. Table 3 lists the pooled regions for all taxa analyzed in this atlas and in Atlas 31. The top-left graph gives annual mean occurrence (percent positive tows) for the selected regional pool. The top-right graph presents mean annual abundance as the number of larvae per 10 m² of surface area for all (including zeros) stations occupied in the regional pool for each year. Mean occurrence

and abundance for CalCOFI surveys in 1967 and 1968 were not included because of inadequate seasonal and areal coverage (see Table 1 in Moser et al. 1993). Missing data points on the interannual plots correspond to years when a taxon was not on the list of identifiable taxa. Also, values were not plotted for years when a taxon's selected regional pool was not sampled on CalCOFI surveys; this applies principally to 1984, when no sampling occurred south of CalCOFI line 110. The middle-left graph gives monthly mean occurrence (percent positive tows) for the regional pool and the middle-right graph gives monthly mean abundance (number per 10 m² for all stations occupied). Onshore-offshore occurrence and abundance are shown in the bottom-left and bottom-right graphs, respectively. For these calculations the data base was partitioned into seven alongshore zones (Figure 6): Northern California (N CAL), Central California (C CAL), Southern California (S CAL), Northern Baja California (N BAJA CAL), North-central Baja California (NC BAJA CAL), South-central Baja California (SC BAJA CAL), and Southern Baja California (S BAJA CAL). Stations in these zones were further segregated into 14 bins based on distance from the coast (Moser et al. 1993). For each taxon one or more zones were selected from the core of their north-south range and mean occurrence (percent positive tows) and mean abundance (number per 10 m² of surface area for all stations) were calculated for each bin. These values are plotted in the graphs. Note that the labels on the x-axis refer to the offshore limit of each bin; for example, "5 n. mi." refers to the 0-5 n. mi. bin and "10 n. mi." refers to the 5-10 n. mi. bin. Values were not plotted for onshore-offshore bins represented by less than nine tows.

Distribution summaries of taxa with very low abundance are presented in briefer formats. Beginning with Eutaeniophoridae (summed abundance of 38 larvae) only distributional maps and quarterly regional charts are presented since data were not adequate to produce graphs of mean occurrence and abundance. Taxa represented by 10 or fewer larvae do not have

quarterly regional charts: beginning with *Anotopterus pharao* (10 total larvae) only distributional maps are presented, with three taxa to a page.

Scientific names used in this atlas generally conform to those used in identification guides of the region (Miller and Lea, 1972; Eschmeyer et al., 1983; Matarese et al., 1989) and ordinal and family nomenclature follow Eschmeyer's (1990) classification. The taxa included in higher systematic categories (genera, families, and orders) changed during the course of the survey period because of refinements in our ability to identify larvae. These changes are documented in the series of CalCOFI ichthyoplankton data reports (see Moser et al., 1993) and, with other interpretive notes, are listed briefly below:

Albula spp.-- larvae probably represent a single species; however, the taxonomy of eastern Pacific albulids has not been resolved

Engraulidae-- includes nearshore taxa (mostly *Anchoa* spp.) large enough to distinguish from *Engraulis mordax*

Alepocephalidae-- these records represent probable misidentifications; however, this could not be confirmed because the specimens are missing

Bathophilus spp.-- larvae north of Punta Eugenia, Baja California are *B.flemingi*; larvae off southern Baja California are *B. filifer*

Tactostoma macropus-- see Kawaguchi and Moser (1993) for detailed discussion of distribution and abundance of this species in the north Pacific

Evermannellidae-- larvae examined to date are *Evermannella* spp.; most are too small to identify to species

Aulopus spp.-- larvae represent one or more undescribed species

Notolepis risso-- identification of paralepidid taxa began in 1961; prior identifications were to family; other paralepidids in this atlas are *Stemonosudis macrura*, *Sudis atrox*, and *Paralepis atlantica*

Scopelarchus spp.-- identification of scopelarchid taxa began in 1972; prior identifications were to family; other scopelarchids in this atlas are *Benthalbella dentata*, *Rosenblattichthys volucris*, and *Scopelarchoides nicholsi*

Myctophiformes-- includes unidentifiable damaged myctophiform and aulopiform larvae

Moridae-- almost all larvae from southern Baja California are *Microlepidium verecundum*

Physiculus spp.-- most larvae captured in the Pacific are *P. rastrelliger* and most taken in the Gulf of California are *P. nematopus*

Carapidae-- all specimens reexamined to date are *Echiodon exsilium*

Antennariidae-- all specimens reexamined to date from the regular CalCOFI pattern are *Antennarius avalonis*

Eutaeniophoridae-- all specimens reexamined to date are *Eutaeniophorus festivus*

Fistulariidae-- all specimens reexamined to date are *Fistularia commersoni*

Syngnathus spp. --contains *Cosmocampus arctus* in addition to 2 or 3 *Syngnathus* species; the majority of specimens are *Syngnathus*

Hexagrammidae-- contains mostly *Hexagrammus* spp.

Sebastes levis-- beginning in 1972, this and four other *Sebastes* (*S. aurora*, *S. jordani*, *S. macdonaldi*, *S. paucispinis*) were identified; prior to 1972, records of *S. levis* are included in *Sebastes* spp.

Blennioidei-- contains so-called "northern blennioids" and "tropical blennioids", primarily bathymasterids, stichaeids, pholids, clinids, and labrisomids that could not be identified to family (usually because of damaged condition)

Semicossyphus pulcher-- identification of labrid taxa began in 1961; prior identifications were to family

Priacanthidae-- four species occur in the CalCOFI area; the larva shown on page 176 is *Pristigenys serrula*; after the maps were completed, another specimen, possibly *Heteropriacanthus cruentatus*, was identified at station 130.50 from CalCOFI survey 7207

Cheilotrema saturnum-- identification of sciaenid taxa began in 1981; prior identifications were to family; other sciaenids in this atlas are *Attractoscion nobilis* and *Roncador stearnsii*

Sparidae-- all specimens reexamined to date are *Calamus brachysomus*

Gempylidae-- most specimens examined to date are *Gempylus serpens* and *Diplospinus multistriatus*

Euthynnus spp.-- all larvae examined in CalCOFI collections are *E. lineatus*

Scomberomorus spp.-- all larvae probably are *S. sierra*

Thunnus albacares-- larvae of *Thunnus obesus* and *T. albacares* may be indistinguishable

Nomeidae-- identification of nomeid taxa began in 1972; prior identifications were to family; in this atlas the Nomeidae category includes records of all taxa prior to 1972; other nomeid taxa in this atlas are *Cubiceps caeruleus*, *C. pauciradiatus*, *Psenes pellucidus*, and *P. sio*

Bathymasteridae-- most are *Rathbunella* spp.; these were not recognized until recently and

previously were identified as Clinidae or occasionally as Blennioidei; larval *Rathbunella* were collected primarily at inshore stations off southern California in winter and spring

Bothus spp.-- all specimens reexamined to date appear to be one species; the correct name for the common *Bothus* species in the eastern tropical Pacific is *B. leopardinus* (R. Lavenberg, pers. comm.)

Citharichthys platophrys-- during the preparation of the data base, all *Citharichthys* larvae from surveys in 1954-1960 and 1984 were reexamined and identified to species; records of *C. platophrys* in this atlas represent only those years

Etropus spp.-- larvae of *Etropus* are similar to those of *Citharichthys* and were not separated from them by the original identifiers; during the preparation of the data base all *Citharichthys* larvae (including *Etropus* spp.) from surveys in 1954-1960 and 1984 were reexamined and reidentified; records of *Etropus* spp. in this atlas represent only those years

Atlas 31 and 32 represent a stage in the development of the CalCOFI ichthyoplankton data base indicative of identification competence over the first three decades of the program. During the past several years the Systematics and Ecology of Fishes group at the Southwest Fisheries Science Center has been preparing an identification guide to the early life history stages of fish taxa collected on CalCOFI surveys from 1951 to the present. This has greatly improved our ability to identify CalCOFI fish eggs and larvae and these advances will be applied in the future when we identify cruises conducted since 1984 and as we examine historical samples to refine identifications within large taxonomic categories.

Acknowledgements

We are indebted to the scientists, technicians, and ships' crews associated with the CalCOFI surveys. Elbert H. Ahlstrom initiated a comprehensive approach to the identification of CalCOFI fish eggs and larvae, without which there would be no ichthyoplankton time series. Barbara Sumida MacCall and Elizabeth G. Stevens made valuable contributions during the development of the data base. Roy M. Allen was responsible for drafting most of the charts and graphs. Amy E. Hays assisted with computer programming.

Distributional atlas of fish larvae and eggs in the California Current region: Taxa with 1000 or more total larvae, 1951-1984. California Cooperative Oceanic Fisheries Investigations Atlas No. 31, 233 pp.

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Table 1. Ranked abundance of larval fish taxa identified from CalCOFI survey cruises in 1951 through 1984. The total for each taxon or category is the summed count (per 10 m² of sea surface, adjusted for percent of sample sorted) for all occurrences.

Rank	Taxon	Count	Rank	Taxon	Count
1	<i>Engraulis mordax</i>	5785424	42	Gobiidae	11909
2	<i>Merluccius productus</i>	1044623	43	<i>Parophrys vetulus</i>	11411
3	<i>Vinciguerria lucetia</i>	956790	44	<i>Lyopsetta exilis</i>	10127
4	<i>Sebastes</i> spp.	709198	45	<i>Hygophum atratum</i>	9865
5	<i>Leuroglossus stilbius</i>	455867	46	<i>Paralichthys californicus</i>	9537
6	<i>Triphoturus mexicanus</i>	404342	47	<i>Bathylagus</i> spp.	9208
7	<i>Stenobranchius leucopsarus</i>	326239	48	<i>Chauliodus macouni</i>	9047
8	<i>Sardinops sagax</i>	220009	49	<i>Sebastes paucispinis</i>	8984
9	<i>Trachurus symmetricus</i>	208217	50	<i>Pepnilus simillimus</i>	8705
10	<i>Citharichthys</i> spp.	195497	51	Ophidiiformes	8240
11	<i>Diogenichthys laternatus</i>	116308	52	<i>Genyonemus lineatus</i>	8169
12	<i>Bathylagus wesethi</i>	95075	53	<i>Chromis punctipinnis</i>	7809
13	<i>Bathylagus ochotensis</i>	83812	54	<i>Tetragonurus cuvieri</i>	7722
14	Sciaenidae	74889	55	Labridae	7447
15	<i>Cyclothone</i> spp.	68413	56	<i>Diogenichthys</i> spp.	7057
16	<i>Protomyctophum crockeri</i>	61025	57	<i>Gonichthys tenuiculus</i>	6930
17	<i>Tarletonbeania crenularis</i>	53390	58	<i>Hypsoblennius</i> spp.	6849
18	<i>Ceratoscopelus townsendi</i>	45387	59	<i>Lestidiops ringens</i>	6796
19	<i>Lampanyctus</i> spp.	44610	60	<i>Scorpaena</i> spp.	6398
20	Unidentified fish larvae	44114	61	Paralepididae	6247
21	<i>Lampanyctus ritteri</i>	42035	62	<i>Pleuronichthys verticalis</i>	6036
22	Disintegrated fish larvae	41015	63	<i>Ophidion scrippsae</i>	5932
23	<i>Diaphus</i> spp.	37571	64	Cottidae	5829
24	<i>Scomber japonicus</i>	33965	65	<i>Oxyjulis californica</i>	5651
25	<i>Citharichthys fragilis</i>	30952	66	Haemulidae	5436
26	Myctophidae	28663	67	<i>Bathylagus pacificus</i>	5304
27	<i>Citharichthys stigmaeus</i>	28584	68	<i>Idiacanthus antrostomus</i>	4906
28	<i>Synodus</i> spp.	26553	69	<i>Lampadena urophaos</i>	4784
29	<i>Symbolophorus californiensis</i>	24897	70	Clinidae	4755
30	<i>Diogenichthys atlanticus</i>	22552	71	Carangidae	4518
31	<i>Citharichthys xanthostigma</i>	22316	72	<i>Notoscopelus resplendens</i>	4228
32	<i>Melamphaes</i> spp.	21186	73	<i>Hippoglossina stomata</i>	3865
33	Sternoptychidae	20729	74	<i>Sebastolobus</i> spp.	3837
34	Serranidae	17097	75	Scopelarchidae	3817
35	<i>Prionotus</i> spp.	16542	76	Trichiuridae	3567
36	<i>Icichthys lockingtoni</i>	16136	77	<i>Nansenia crassa</i>	3543
37	<i>Symphurus</i> spp.	14843	78	<i>Myctophum nitidulum</i>	3463
38	<i>Stomias atriventer</i>	14736	78	<i>Nansenia candida</i>	3463
39	<i>Argentina sialis</i>	13308	80	<i>Citharichthys sordidus</i>	3419
40	<i>Sebastes jordani</i>	12124	81	<i>Sphyræna argentea</i>	3337
41	<i>Etrumeus teres</i>	12092	82	<i>Microstoma</i> sp.	3089

Table 1. (Cont.)

Rank	Taxon	Count	Rank	Taxon	Count
83	Chiasmodontidae	3038	126	<i>Tactostoma macropus</i>	809
84	<i>Lampanyctus regalis</i>	2985	127	<i>Loweina rara</i>	788
85	<i>Halichoeres</i> spp.	2889	128	<i>Sebastes levis</i>	745
86	<i>Microstomus pacificus</i>	2842	129	<i>Medialuna californiensis</i>	737
87	<i>Cololabis saira</i>	2665	130	<i>Bathylagus milleri</i>	722
88	Trachipteridae	2583	131	Osmeridae	706
89	<i>Sarda chiliensis</i>	2528	132	Stomiiformes	670
90	<i>Hygophum reinhardtii</i>	2356	133	Atherinidae	638
91	<i>Hygophum</i> spp.	2228	134	<i>Semicossyphus pulcher</i>	637
92	Pleuronectiformes	2161	135	<i>Pleuronichthys coenosus</i>	633
93	<i>Seriola lalandi</i>	2152	136	<i>Myctophum aurolaternatum</i>	630
94	Anguilliformes	2094	137	<i>Scopelarchus</i> spp.	623
95	<i>Glyptocephalus zachirus</i>	2084	138	<i>Brama</i> spp.	618
96	<i>Poromitra</i> spp.	1964	139	<i>Lepidopus fitchi</i>	608
97	<i>Seriphus politus</i>	1838	140	<i>Notolepis risso</i>	607
98	<i>Danaphos oculatus</i>	1782	141	<i>Electrona risso</i>	591
99	<i>Scopelogadus bispinosus</i>	1727	142	<i>Caulolatilus princeps</i>	588
100	<i>Notolychnus valdiviae</i>	1707	143	<i>Psettichthys melanostictus</i>	579
101	<i>Ichthyococcus</i> spp.	1671	144	<i>Vinciguerria poweriae</i>	571
102	<i>Auxis</i> spp.	1670	145	Blennioidei	543
103	<i>Bregmaceros</i> spp.	1612	146	<i>Oxylebius pictus</i>	523
104	Gerreidae	1567	147	<i>Syngnathus</i> spp.	506
105	<i>Sebastes macdonaldi</i>	1461	148	<i>Bathophilus</i> spp.	501
106	Pomacentridae	1412	149	Macrouridae	492
107	Gonostomatidae	1395	150	<i>Etropus</i> spp.	491
108	<i>Opisthonema</i> spp.	1332	151	<i>Rosenblattichthys volucris</i>	463
109	<i>Chilara taylori</i>	1311	152	<i>Coryphaena hippurus</i>	457
110	<i>Xystreureys liolepis</i>	1302	153	Gempylidae	426
111	Ceratioidei	1219	154	<i>Macroramphosus gracilis</i>	396
112	<i>Diplophos taenia</i>	1216	155	<i>Pleuronichthys decurrens</i>	389
113	Gobiesocidae	1187	156	Exocoetidae	337
114	<i>Pleuronichthys</i> spp.	1147	157	<i>Platichthys stellatus</i>	314
115	<i>Scorpaenichthys marmoratus</i>	1075	158	Moridae	310
116	<i>Scopelosaurus</i> spp.	1062	159	<i>Scomberomorus</i> spp.	305
117	Agonidae	1046	160	<i>Girella nigricans</i>	300
118	<i>Brosmophycis marginata</i>	1035	161	<i>Syacium ovale</i>	289
119	<i>Sebastes aurora</i>	1019	162	<i>Hypsopsetta guttulata</i>	288
120	<i>Pleuronichthys ritteri</i>	1015	163	<i>Howella brodiei</i>	286
121	<i>Zaniolepis</i> spp.	973	164	Hexagrammidae	272
122	Scombridae	965	165	<i>Icosteus aenigmaticus</i>	263
122	<i>Hypsypops rubicundus</i>	965	166	Sparidae	251
124	Cyclopteridae	861	167	Nomeidae	250
125	<i>Aristostomias scintillans</i>	835	168	<i>Protomyctophum thompsoni</i>	217

Table 1. (Cont.)

Rank	Taxon	Count	Rank	Taxon	Count
168	<i>Benthalbella dentata</i>	217	211	<i>Cheilotrema saturnum</i>	15
170	<i>Benthoosema pterota</i>	210	213	Tetraodontidae	14
171	<i>Photonectes</i> spp.	168	213	<i>Parvilux ingens</i>	14
172	Scorpaenidae	158	213	Myctophiformes	14
173	<i>Scopeloberyx robustus</i>	150	216	Hemiramphidae	12
174	<i>Mugil</i> spp.	136	217	<i>Euthynnus</i> spp.	11
175	<i>Bothus</i> spp.	133	217	Astronesthidae	11
176	<i>Lepidopsetta bilineata</i>	124	217	Scaridae	11
177	Mullidae	118	217	<i>Gonostoma</i> spp.	11
178	<i>Stemonosudis macrura</i>	99	221	<i>Anotopterus pharao</i>	10
179	<i>Centrobranchus nigroocellatus</i>	98	222	<i>Atractoscion nobilis</i>	9
180	<i>Physiculus</i> spp.	93	222	Bothidae	9
181	<i>Scopelarchoides nicholsi</i>	92	222	<i>Roncador stearnsii</i>	9
182	<i>Microgadus proximus</i>	89	222	<i>Seriola</i> spp.	9
183	Evermannellidae	81	222	Antennariidae	9
183	<i>Cubiceps pauciradiatus</i>	81	227	<i>Eopsetta jordani</i>	8
185	<i>Psenes pellucidus</i>	80	227	<i>Taaningichthys minimus</i>	8
186	<i>Bolinichthys</i> spp.	78	229	<i>Paralichthys</i> spp.	7
187	<i>Isopsetta isolepis</i>	72	229	<i>Dolichopteryx longipes</i>	7
188	<i>Sudis atrox</i>	69	231	Lophiidae	6
189	Carapidae	66	231	Balistidae	6
190	<i>Aulopus</i> spp.	55	233	<i>Hygophum proximum</i>	5
191	<i>Ophiodon elongatus</i>	51	233	<i>Cubiceps caeruleus</i>	5
192	<i>Thunnus albacares</i>	49	233	<i>Chaetodipterus zonatus</i>	5
193	<i>Albula</i> spp.	48	236	<i>Gadus macrocephalus</i>	4
194	Eutaeniophoridae	38	237	Alepocephalidae	3
194	<i>Valenciennellus tripunctulatus</i>	38	237	<i>Cyclopsetta</i> spp.	3
196	Apogonidae	37	237	<i>Bathylychnops exilis</i>	3
197	<i>Triphoturus nigrescens</i>	30	237	Fistulariidae	3
197	Polynemidae	30	237	<i>Citharichthys platophrys</i>	3
199	<i>Porichthys</i> spp.	29	237	<i>Woodsia nonsuchae</i>	3
199	<i>Bathylagus longirostris</i>	29	237	<i>Paralepis atlantica</i>	3
201	<i>Psenes sio</i>	27	237	Acanthuridae	3
202	Engraulidae	26	245	Priacanthidae	2
203	<i>Eustomias</i> spp.	25	245	<i>Achirus mazatlanus</i>	2
204	<i>Oxyporhamphus micropterus</i>	23	245	Opistognathidae	2
205	<i>Caristius macropus</i>	21			
205	Microdesmidae	21			
207	<i>Anoplopoma fimbria</i>	20			
208	<i>Leuroglossus schmidti</i>	19			
209	Bathymasteridae	16			
209	<i>Hippoglossina</i> spp.	16			
211	<i>Macropinna microstoma</i>	15			

Table 2. Ranked occurrence of larval fish taxa identified from CalCOFI survey cruises in 1951 through 1984. The total for each taxon or category is the sum of all occurrences during the survey period.

Rank	Taxon	Occurrences	Rank	Taxon	Occurrences
1	<i>Engraulis mordax</i>	14494	42	<i>Symphurus</i> spp.	1038
2	<i>Sebastes</i> spp.	12324	43	<i>Tetragonurus cuvieri</i>	1031
3	<i>Triphoturus mexicanus</i>	11968	44	<i>Synodus</i> spp.	1008
4	<i>Vinciguerria lucetia</i>	10510	45	<i>Citharichthys xanthostigma</i>	984
5	<i>Leuroglossus stilbius</i>	8510	46	<i>Parophrys vetulus</i>	953
6	<i>Protomyctophum crockeri</i>	8051	47	Scopelarchidae	945
7	<i>Merluccius productus</i>	7371	48	Labridae	928
8	<i>Stenobranchius leucopsarus</i>	7258	49	<i>Hypsoblennius</i> spp.	909
9	<i>Citharichthys</i> spp.	6321	49	<i>Diogenichthys</i> spp.	909
10	<i>Cyclothone</i> spp.	5869	51	<i>Pleuronichthys verticalis</i>	894
11	Disintegrated fish larvae	5660	52	Ophidiiformes	848
12	<i>Bathylagus wesethi</i>	5593	53	<i>Idiacanthus antrostomus</i>	843
13	<i>Trachurus symmetricus</i>	5589	54	<i>Nansenia crassa</i>	836
14	<i>Lampanyctus</i> spp.	5481	55	<i>Citharichthys fragilis</i>	821
15	<i>Diogenichthys laternatus</i>	5043	56	<i>Myctophum nitidulum</i>	795
16	Unidentified fish larvae	4813	57	Serranidae	759
17	<i>Lampanyctus ritteri</i>	4707	58	<i>Hippoglossina stomata</i>	757
18	<i>Bathylagus ochotensis</i>	4555	59	Chiasmodontidae	728
19	<i>Melamphaes</i> spp.	4065	60	Cottidae	723
20	<i>Tarletonbeania crenularis</i>	4041	61	<i>Lampadena urophaos</i>	722
21	Myctophidae	3803	62	<i>Peprilus simillimus</i>	714
22	<i>Symbolophorus californiensis</i>	3219	63	<i>Microstoma</i> sp.	681
23	<i>Ceratoscopelus townsendi</i>	3058	64	<i>Bathylagus</i> spp.	675
24	<i>Sardinops sagax</i>	3007	65	<i>Notoscopelus resplendens</i>	674
25	Sternoptychidae	2934	66	Trachipteridae	650
26	<i>Citharichthys stigmaeus</i>	2710	67	Clinidae	599
27	<i>Diogenichthys atlanticus</i>	2706	68	Trichiuridae	548
28	<i>Stomias atriventer</i>	2548	69	<i>Bathylagus pacificus</i>	535
29	<i>Diaphus</i> spp.	2119	70	<i>Chromis punctipinnis</i>	531
30	Gobiidae	1993	71	<i>Cololabis saira</i>	516
31	<i>Icichthys lockingtoni</i>	1991	72	<i>Ophidion scrippsae</i>	502
32	Sciaenidae	1978	73	<i>Microstomus pacificus</i>	479
33	<i>Chauliodus macouni</i>	1701	74	<i>Oxyjulis californica</i>	466
34	Paralepididae	1332	75	<i>Sebastolobus</i> spp.	462
35	<i>Hygophum atratum</i>	1309	76	<i>Lampanyctus regalis</i>	455
36	<i>Argentina sialis</i>	1293	77	<i>Poromitra</i> spp.	452
37	<i>Gonichthys tenuiculus</i>	1234	78	<i>Citharichthys sordidus</i>	450
38	<i>Scomber japonicus</i>	1229	79	<i>Etrumeus teres</i>	437
39	<i>Lestidiops ringens</i>	1210	80	<i>Scopelogadus bispinosus</i>	435
40	<i>Lyopsetta exilis</i>	1206	81	<i>Nansenia candida</i>	431
41	<i>Paralichthys californicus</i>	1106	82	<i>Ichthyococcus</i> spp.	427

Table 2. (Cont.)

Rank	Taxon	Occurrences	Rank	Taxon	Occurrences
83	<i>Hygophum reinhardtii</i>	414	126	<i>Electrona risso</i>	115
84	<i>Hygophum</i> spp.	408	127	Macrouridae	112
85	Anguilliformes	386	128	Gerreidae	110
86	<i>Sebastes paucispinis</i>	371	129	<i>Bathylagus milleri</i>	106
87	<i>Prionotus</i> spp.	364	130	<i>Genyonemus lineatus</i>	105
88	<i>Chilara taylori</i>	306	131	<i>Scopelarchus</i> spp.	104
89	<i>Scorpaena</i> spp.	305	131	<i>Bathophilus</i> spp.	104
90	<i>Sphyraena argentea</i>	300	133	Gempylidae	101
91	Ceratioidei	298	133	<i>Bregmaceros</i> spp.	101
92	<i>Glyptocephalus zachirus</i>	276	135	<i>Psettichthys melanostictus</i>	96
93	Gonostomatidae	270	136	Pomacentridae	92
94	<i>Halichoeres</i> spp.	267	137	<i>Sebastes aurora</i>	91
95	Agonidae	247	138	<i>Auxis</i> spp.	89
96	<i>Notolychnus valdiviae</i>	238	138	<i>Caulolatilus princeps</i>	89
97	<i>Scopelosaurus</i> spp.	236	140	<i>Rosenblattichthys volucris</i>	88
98	<i>Seriola lalandi</i>	233	141	<i>Pleuronichthys decurrens</i>	85
99	<i>Danaphos oculatus</i>	229	142	Scombridae	84
100	<i>Loweina rara</i>	223	143	<i>Girella nigricans</i>	73
101	Pleuronectiformes	217	144	<i>Macroramphosus gracilis</i>	71
102	Carangidae	213	144	<i>Etropus</i> spp.	71
103	<i>Scorpaenichthys marmoratus</i>	212	146	Exocoetidae	66
104	<i>Sebastes jordani</i>	208	146	Blennioidei	65
105	<i>Zaniolepis</i> spp.	207	148	<i>Vinciguerrria poweriae</i>	63
105	<i>Brosmophycis marginata</i>	207	148	<i>Hypsopsetta guttulata</i>	63
107	Cyclopteridae	203	148	<i>Sebastes macdonaldi</i>	63
108	<i>Xystreurus liolepis</i>	202	151	Gobiesocidae	62
109	<i>Aristostomias scintillans</i>	196	152	<i>Howella brodiei</i>	60
110	<i>Diplophos taenia</i>	192	153	<i>Myctophum aurolaternatum</i>	57
111	<i>Pleuronichthys</i> spp.	182	154	Moridae	53
112	<i>Brama</i> spp.	177	155	<i>Syacium ovale</i>	48
113	<i>Pleuronichthys ritteri</i>	165	156	<i>Sebastes levis</i>	43
114	<i>Pleuronichthys coenosus</i>	157	157	<i>Icosteus aenigmaticus</i>	40
115	<i>Syngnathus</i> spp.	154	158	<i>Lepidopus fitchi</i>	39
116	<i>Medialuna californiensis</i>	152	159	<i>Bothus</i> spp.	38
117	<i>Oxylebius pictus</i>	148	160	<i>Hypsypops rubicundus</i>	36
118	Haemulidae	145	161	Scorpaenidae	35
119	Stomiiformes	144	161	Hexagrammidae	35
120	<i>Notolepis risso</i>	135	163	<i>Photonectes</i> spp.	34
121	<i>Semicossyphus pulcher</i>	132	164	<i>Benthalbella dentata</i>	33
122	Atherinidae	125	165	<i>Seriphus politus</i>	32
123	<i>Sarda chiliensis</i>	123	166	Nomeidae	31
124	<i>Tactostoma macropus</i>	121	166	<i>Mugil</i> spp.	31
125	<i>Coryphaena hippurus</i>	120	168	<i>Physiculus</i> spp.	30

Table 2. (Cont.)

Rank	Taxon	Occurrences	Rank	Taxon	Occurrences
169	<i>Stemonosudis macrura</i>	28	209	Polynemidae	4
169	<i>Scopeloberyx robustus</i>	28	213	<i>Seriola</i> spp.	3
171	Sparidae	27	213	<i>Leuroglossus schmidti</i>	3
172	<i>Centrobranchus nigroocellatus</i>	26	213	<i>Anotopterus pharao</i>	3
173	<i>Opisthonema</i> spp.	24	213	Astronesthidae	3
174	<i>Protomyctophum thompsoni</i>	23	213	<i>Parvilux ingens</i>	3
175	<i>Lepidopsetta bilineata</i>	21	213	Bothidae	3
176	Carapidae	20	213	Antennariidae	3
177	<i>Scomberomorus</i> spp.	19	213	<i>Hippoglossina</i> spp.	3
177	Evermannellidae	19	221	Alepocephalidae	2
177	<i>Platichthys stellatus</i>	19	221	<i>Macropinna microstoma</i>	2
180	<i>Sudis atrox</i>	17	221	<i>Hygophum proximum</i>	2
181	<i>Scopelarchoides nicholsi</i>	16	221	Balistidae	2
181	Mullidae	16	221	Lophiidae	2
183	<i>Bolinichthys</i> spp.	15	221	Bathymasteridae	2
184	<i>Cubiceps pauciradiatus</i>	14	221	<i>Dolichopteryx longipes</i>	2
184	<i>Ophiodon elongatus</i>	14	221	<i>Taaningichthys minimus</i>	2
186	Osmeridae	13	221	<i>Paralichthys</i> spp.	2
186	<i>Psenes pellucidus</i>	13	221	<i>Gonostoma</i> spp.	2
188	<i>Benthoosema pterota</i>	12	221	<i>Cheilotrema saturnum</i>	2
188	<i>Porichthys</i> spp.	12	221	Priacanthidae	2
188	<i>Thunnus albacares</i>	12	233	Opistognathidae	1
191	Apogonidae	11	233	<i>Chaetodipterus zonatus</i>	1
191	<i>Aulopus</i> spp.	11	233	Acanthuridae	1
193	Eutaeniophoridae	9	233	<i>Eopsetta jordani</i>	1
193	<i>Microgadus proximus</i>	9	233	<i>Paralepis atlantica</i>	1
193	<i>Albula</i> spp.	9	233	<i>Bathylychnops exilis</i>	1
196	<i>Eustomias</i> spp.	8	233	<i>Cyclopsetta</i> spp.	1
197	<i>Triphoturus nigrescens</i>	7	233	<i>Achirus mazatlanus</i>	1
197	<i>Valenciennellus tripunctulatus</i>	7	233	Fistulariidae	1
199	<i>Oxyporhamphus micropterus</i>	6	233	<i>Citharichthys platophrys</i>	1
199	Tetraodontidae	6	233	<i>Cubiceps caeruleus</i>	1
199	<i>Bathylagus longirostris</i>	6	233	<i>Gadus macrocephalus</i>	1
199	<i>Psenes sio</i>	6	233	<i>Roncador stearnsii</i>	1
199	Microdesmidae	6	233	<i>Woodsia nonsuchae</i>	1
204	<i>Anoplopoma fimbria</i>	5	233	<i>Atractoscion nobilis</i>	1
204	<i>Isopsetta isolepis</i>	5			
204	Hemiramphidae	5			
204	<i>Caristius macropus</i>	5			
204	Engraulidae	5			
209	Scaridae	4			
209	<i>Euthynnus</i> spp.	4			
209	Myctophiformes	4			

Table 3. CalCOFI regions from which data were pooled for calculations of mean interannual and seasonal occurrence and abundance of larval fish taxa in this atlas and in CalCOFI Atlas 31. Taxa listed alphabetically.

Taxon	Region	Taxon	Region
Agonidae	4,7,11		20,21
<i>Albula</i> spp.	16,20,21	Cottidae	1,4,7,11
Anguilliformes	16,17,20,21	<i>Cubiceps pauciradiatus</i>	20,21
<i>Argentina sialis</i>	7,11,12,16	Cyclopteridae	1,2,4,5,7,11,12
<i>Aristostomias scintillans</i>	5,6,8,9,10,13 14,15,24	<i>Cyclothone</i> spp.	10,14,15,18,19 24
Atherinidae	4,7,11,12	<i>Danaphos oculatus</i>	4,5,7,8,9,11,13 14
<i>Aulopus</i> spp.	17,18,20,21	<i>Diaphus</i> spp.	1,2,4,5,8,9
<i>Auxis</i> spp.	12,16,20,21	<i>Diogenichthys atlanticus</i>	9,10,14,15,24
<i>Bathophilus</i> spp.	10,24	<i>Diogenichthys laternatus</i>	17,18,21
<i>Bathylagus milleri</i>	1,2,4,5	<i>Diplophos taenia</i>	20,21,22
<i>Bathylagus ochotensis</i>	1,2,4,5	<i>Electrona risso</i>	6,9,10,24
<i>Bathylagus pacificus</i>	1,4,5	<i>Engraulis mordax</i>	7,11,12,16
<i>Bathylagus wesethi</i>	8,9,10,13,14	<i>Etopus</i> spp.	12,16,20
<i>Benthalbella dentata</i>	7,8,9,10,24	<i>Etrumeus teres</i>	12,16
<i>Benthoosema pterota</i>	20,21,22	Evermannellidae	18,21,24
Blennioidei	1,4,7,11,12,16	Exocoetidae	11,12,13,16,17 20,21
<i>Bolinichthys</i> spp.	21,22,24	Gempylidae	10,20,21,22,24
<i>Bothus</i> spp.	16,17,20,21	<i>Genyonemus lineatus</i>	4,7,11
<i>Brama</i> spp.	9,10,13,14,15 18,24	Gerreidae	11,12,16,20
<i>Bregmaceros</i> spp.	20,21	<i>Girella nigricans</i>	7,11,12,16
<i>Brosomphycis marginata</i>	4,7,11	<i>Glyptocephalus zachirus</i>	1,4,5
Carangidae	16,20	Gobiesocidae	11,12,16
Carapidae	16,17,20,21	Gobiidae	7,11
<i>Caulolatilus princeps</i>	12,16,17	<i>Gonichthys tenuiculus</i>	17,18,21,22
<i>Centrobranchus nigroocellatus</i>	6,9,10,15,24	Haemulidae	12,16
Ceratioidei	10,14,15,24	<i>Halichoeres</i> spp.	12,16
<i>Ceratoscopelus townsendi</i>	9,10,14,15,24	Hexagrammidae	1,4
<i>Chauliodus macouni</i>	2,5,9	<i>Hippoglossina stomata</i>	7,11,12,16
Chiasmodontidae	13,14,17,18	<i>Howella brodiei</i>	6,10,14,15,24
<i>Chilara taylori</i>	7,11,12,16	<i>Hygophum atratum</i>	17,18,20,21,22
<i>Chromis punctipinnis</i>	7,11,12	<i>Hygophum reinhardtii</i>	10,14,15,24
<i>Citharichthys fragilis</i>	12,16	<i>Hypsoblennius</i> spp.	7,11,12,16
<i>Citharichthys sordidus</i>	1,4,5,7,8,11,12	<i>Hypsopsetta guttulata</i>	7,11,12
<i>Citharichthys stigmaeus</i>	4,5,7,8,9,11 12,13	<i>Hypsypops rubicundus</i>	7,11
<i>Citharichthys xanthostigma</i>	12,16	<i>Ichthyococcus</i> spp.	13,14,18
Clinidae	4,7,11,12,16	<i>Icichthys lockingtoni</i>	1,2,4,5,8,9
<i>Cololabis saira</i>	7,8,9,10	<i>Icosteus aenigmaticus</i>	1,2,4,5
<i>Coryphaena hippurus</i>	12,16,17,18,19	<i>Idiacanthus antrostomus</i>	6,9,10,24

Table 3. (Cont.)

Taxon	Region	Taxon	Region
<i>Isopsetta isolepis</i>	1,4	<i>Opisthonema</i> spp.	16
Labridae	7,8,11,12,16,20	Osmeridae	1,4
<i>Lampadena urophaos</i>	14,15,18,19	<i>Oxyjulis californica</i>	7,8,11,12,13
<i>Lampanyctus regalis</i>	4,5,8,9	<i>Oxylebius pictus</i>	4,7,8,11,12,16
<i>Lampanyctus ritteri</i>	2,5,9,14	Paralepididae	2,6,9,10,14,15
<i>Lampanyctus</i> spp.	10,14,15,18,19		20,21,22,24
	21,22,24	<i>Paralichthys californicus</i>	7,11,12,16
<i>Lepidopsetta bilineata</i>	4,7	<i>Parophrys vetulus</i>	1,4,7,11,12
<i>Lepidopus fitchi</i>	12,13,14,16,17	<i>Peprilus simillimus</i>	7,11,12,16
<i>Lestidiops ringens</i>	2,5,8,9,10,11	<i>Photonectes</i> spp.	5,9,10,14,24
	13,14	<i>Physiculus</i> spp.	11,12,13,16,17
<i>Leuroglossus stilbius</i>	7,8		21
<i>Loweina rara</i>	9,13,14,15,17	<i>Platichthys stellatus</i>	4,7
	18,19,24	<i>Pleuronichthys coenosus</i>	4,7,8,11,12
<i>Lyopsetta exilis</i>	1,4,7	<i>Pleuronichthys decurrens</i>	1,4,5,7,8,9
<i>Macroramphosus gracilis</i>	13,14,17,18	<i>Pleuronichthys ritteri</i>	7,11,12,16
Macrouridae	1,2,4,5,7,8,9	<i>Pleuronichthys verticalis</i>	7,11,12
	10,11,12,13,14	Pomacentridae	12,16,20
	16,17,20,24	<i>Poromitra</i> spp.	5,6,9,10,14,24
<i>Medialuna californiensis</i>	7,8,9,11,12,13	<i>Prionotus</i> spp.	12,16,20
	14,16	<i>Protomyctophum crockeri</i>	2,5,9,14
<i>Melamphaes</i> spp.	2,5,6,8,9,10,13	<i>Protomyctophum thompsoni</i>	1,2
	14,15,24	<i>Psenes pellucidus</i>	10,14,17,20
<i>Merluccius productus</i>	4,7,8,9,11	<i>Psettichthys melanostictus</i>	1,4
<i>Microgadus proximus</i>	4	<i>Rosenblattichthys volucris</i>	9,10,13,14,15
<i>Microstoma microstoma</i>	5,6,8,9,10		24
<i>Microstomus pacificus</i>	1,2,4,5,8,9	<i>Sarda chiliensis</i>	12,16
Moridae	20,21,22	<i>Sardinops sagax</i>	12,16
<i>Mugil</i> spp.	12,16,17,20	Sciaenidae	4,7,11 &
Mullidae	16		12,16,20
<i>Myctophum aurolaternatum</i>	20,21	<i>Scomber japonicus</i>	7,11,12,16
<i>Myctophum nitidulum</i>	10,14,15,24	<i>Scomberomorus</i> spp.	12,16,20
<i>Nansenia candida</i>	2,5,6	Scopelarchidae	10,14,15,18,19
<i>Nansenia crassa</i>	16,17		24
Nomeidae	12,13,14,16,17	<i>Scopelarchoides nicholsi</i>	20,21
	18,20,21,22	<i>Scopelarchus</i> spp.	5,8,9,10,13,14
<i>Notolepis risso</i>	9,10,24		15,18,24
<i>Notolychnus valdiviae</i>	10,15,24	<i>Scopeloberyx robustus</i>	9,10,24
<i>Notoscopelus resplendens</i>	10,14,15,18,19	<i>Scopelogadus bispinosus</i>	9,10,14,15,24
	24	<i>Scopelosaurus</i> spp.	5,6,9,10,24
Ophidiiformes	12,16,20	<i>Scorpaena</i> spp.	12,16
<i>Ophidion scrippsae</i>	7,11,12,16	<i>Scorpaenichthys marmoratus</i>	4,7
<i>Ophiodon elongatus</i>	4,7	<i>Sebastes aurora</i>	4,5,7,8,9

Table 3. (Cont.)

Taxon	Region
<i>Sebastes jordani</i>	4,7
<i>Sebastes levis</i>	4,5,7,8
<i>Sebastes macdonaldi</i>	12,16
<i>Sebastes paucispinis</i>	1,4,5,7,8
<i>Sebastes</i> spp.	1,4,7
<i>Sebastolobus</i> spp.	1,2,4,5,8,9
<i>Semicossyphus pulcher</i>	7,11,12,16
<i>Seriola lalandi</i>	12,16,17
<i>Seriphus politus</i>	7
Serranidae	16,20
Sparidae	16,20
<i>Sphyræna argentea</i>	7,11,12,16
<i>Stemonosudis macrura</i>	14,15,18,19,21 22
<i>Stenobranchius leucopsarus</i>	1,2,4,5,7,8,9
Sternoptychidae	9,10,14,15,24
<i>Stomias atriventer</i>	13,14,17,18,21
<i>Sudis atrox</i>	24
<i>Syacium ovale</i>	16,20,21
<i>Symbolophorus californiensis</i>	5,6,8,9,10,13 14,15
<i>Symphurus</i> spp.	12,16
<i>Syngnathus</i> spp.	4,7,11,12,16
<i>Synodus</i> spp.	12,16
<i>Tactostoma macropus</i>	2,5,6,9,10,24
<i>Tarletonbeania crenularis</i>	1,2,4,5
<i>Tetragonurus cuvieri</i>	5,9,10,13,14
<i>Thunnus albacares</i>	17,20,21
Trachipteridae	1,2,4,5,8,9
<i>Trachurus symmetricus</i>	5,8,9,13,14
Trichiuridae	12,13,16,17
<i>Triphoturus mexicanus</i>	13,14,17,18
<i>Vinciguerria lucetia</i>	13,14,15,17,18 19,21,22
<i>Vinciguerria poweriae</i>	24
<i>Xystreurys liolepis</i>	7,11,12,16
<i>Zaniolepis</i> spp.	4,7,11,12,16

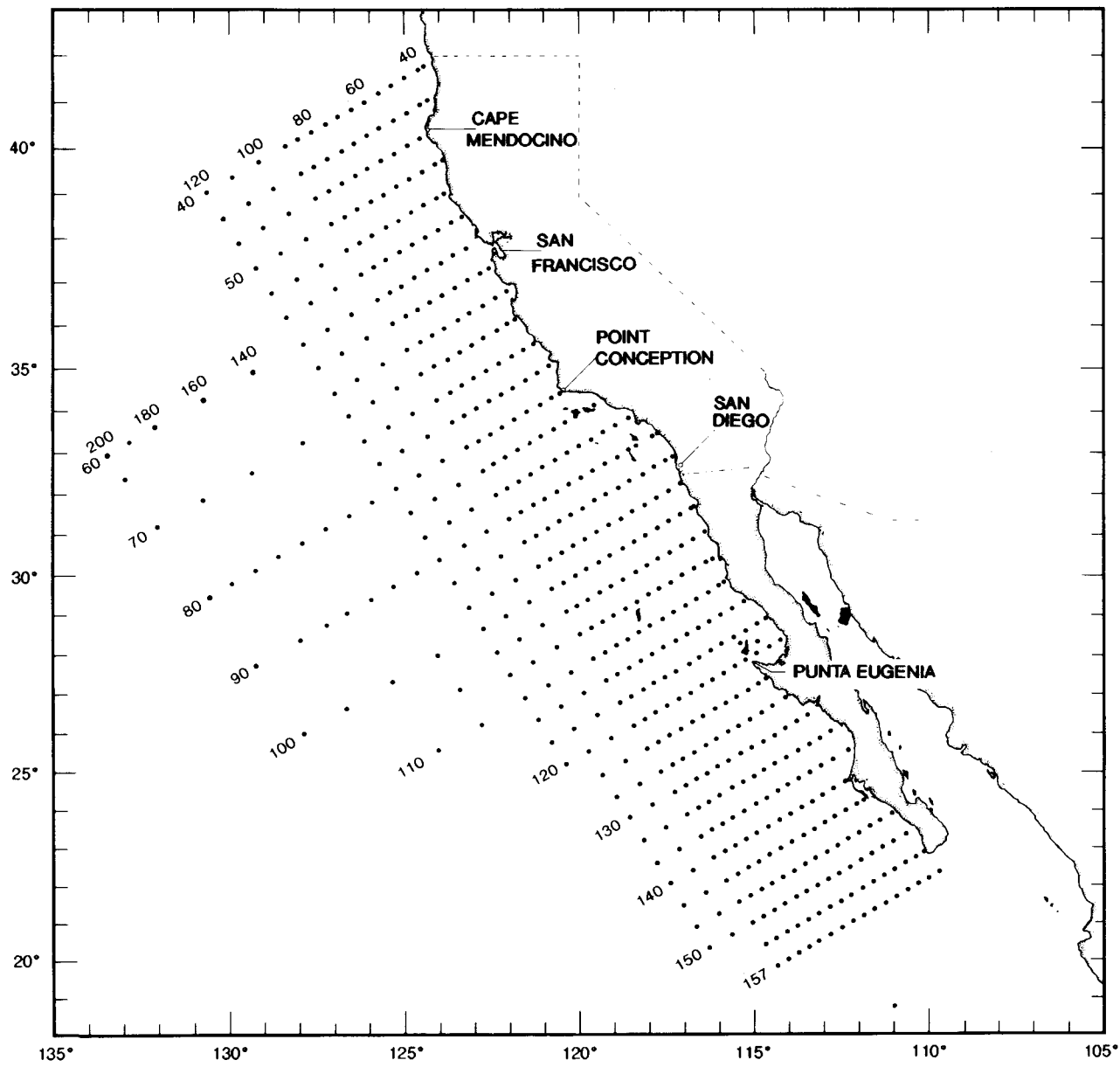


Figure 1. CalCOFI station pattern showing stations represented in the ichthyoplankton data base.

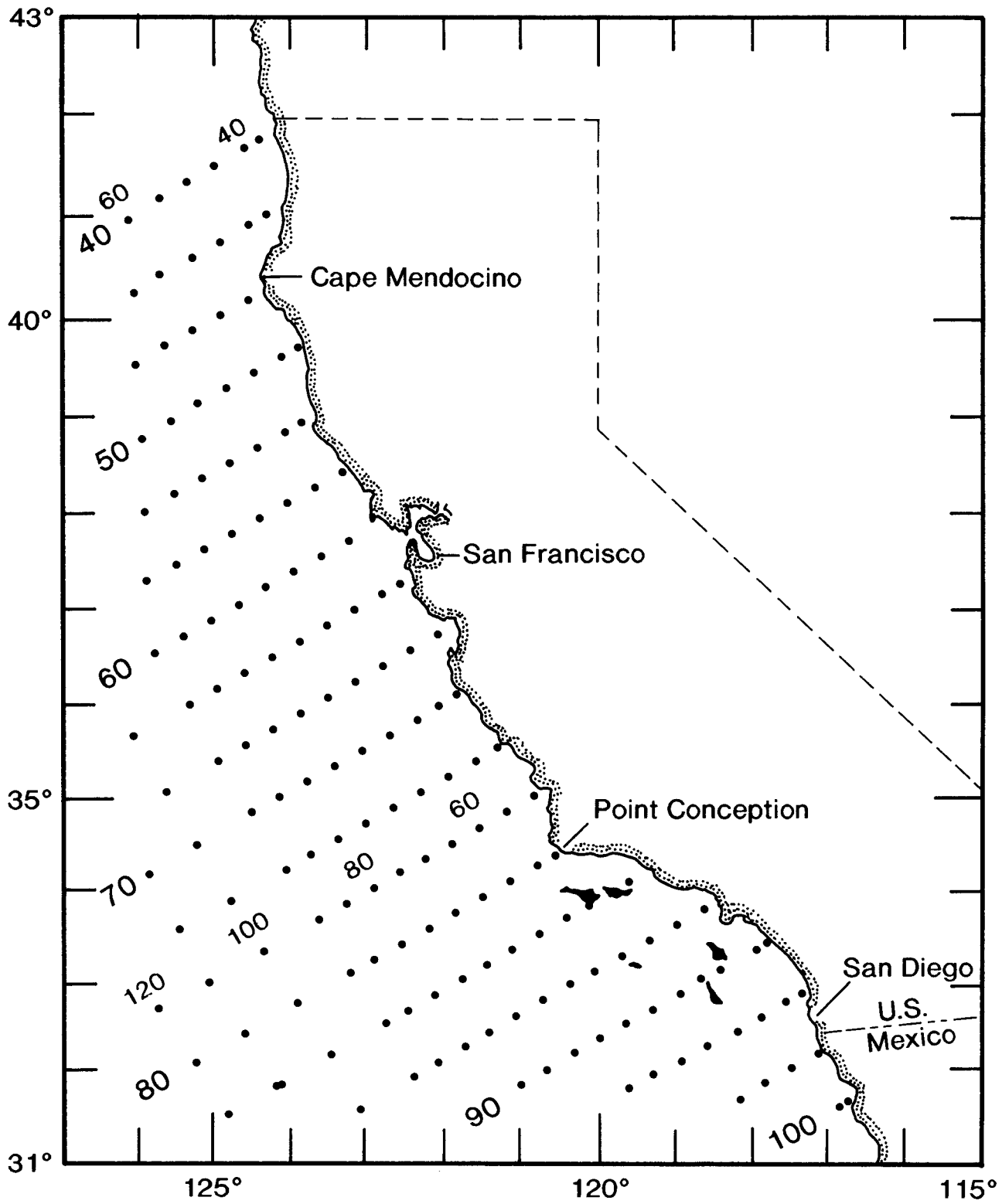


Figure 2. Enlargement of northern coastal section of CalCOFI survey pattern.

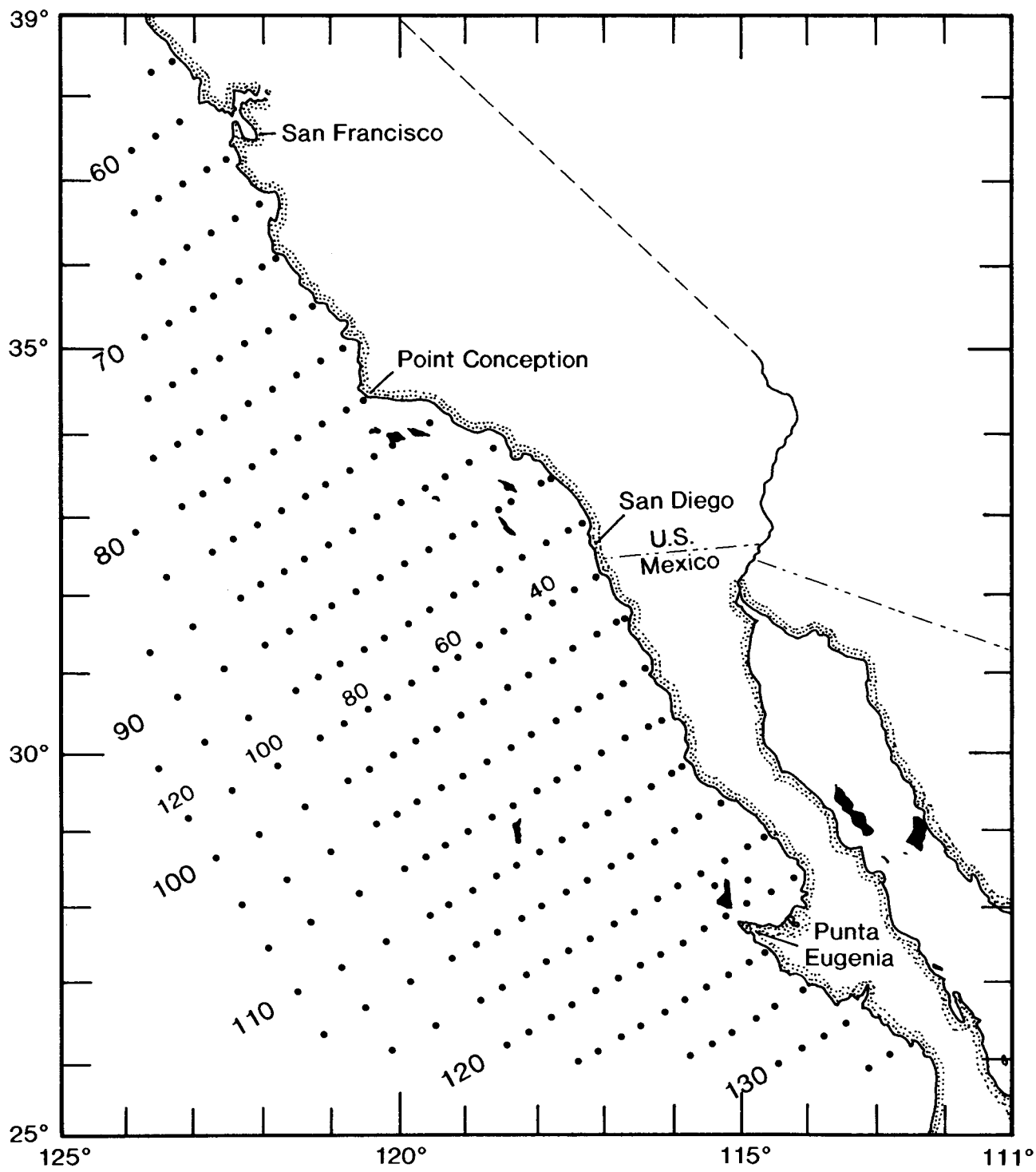


Figure 3. Enlargement of central coastal section of CalCOFI survey pattern.

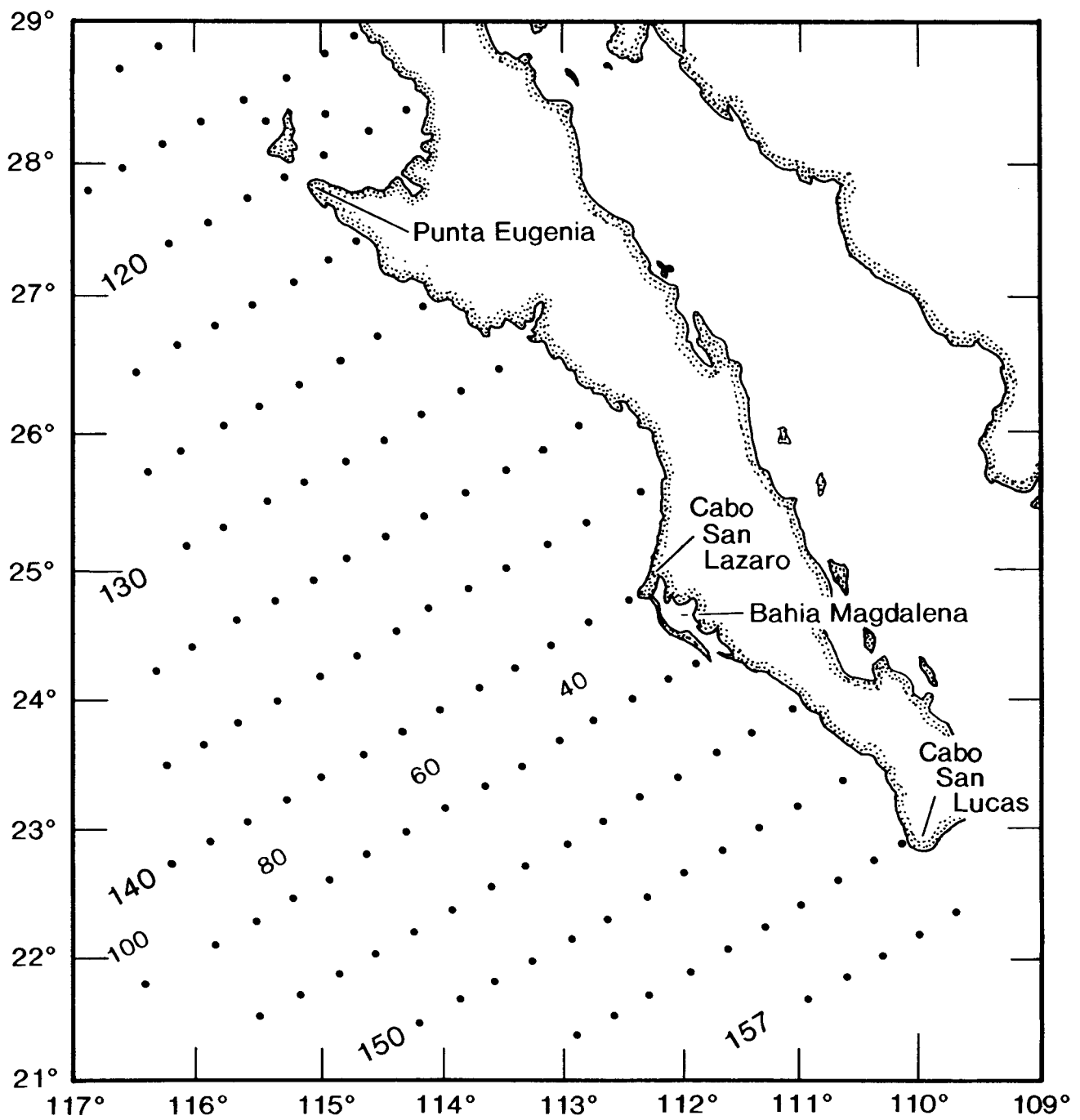


Figure 4. Enlargement of southern coastal section of CalCOFI survey pattern.

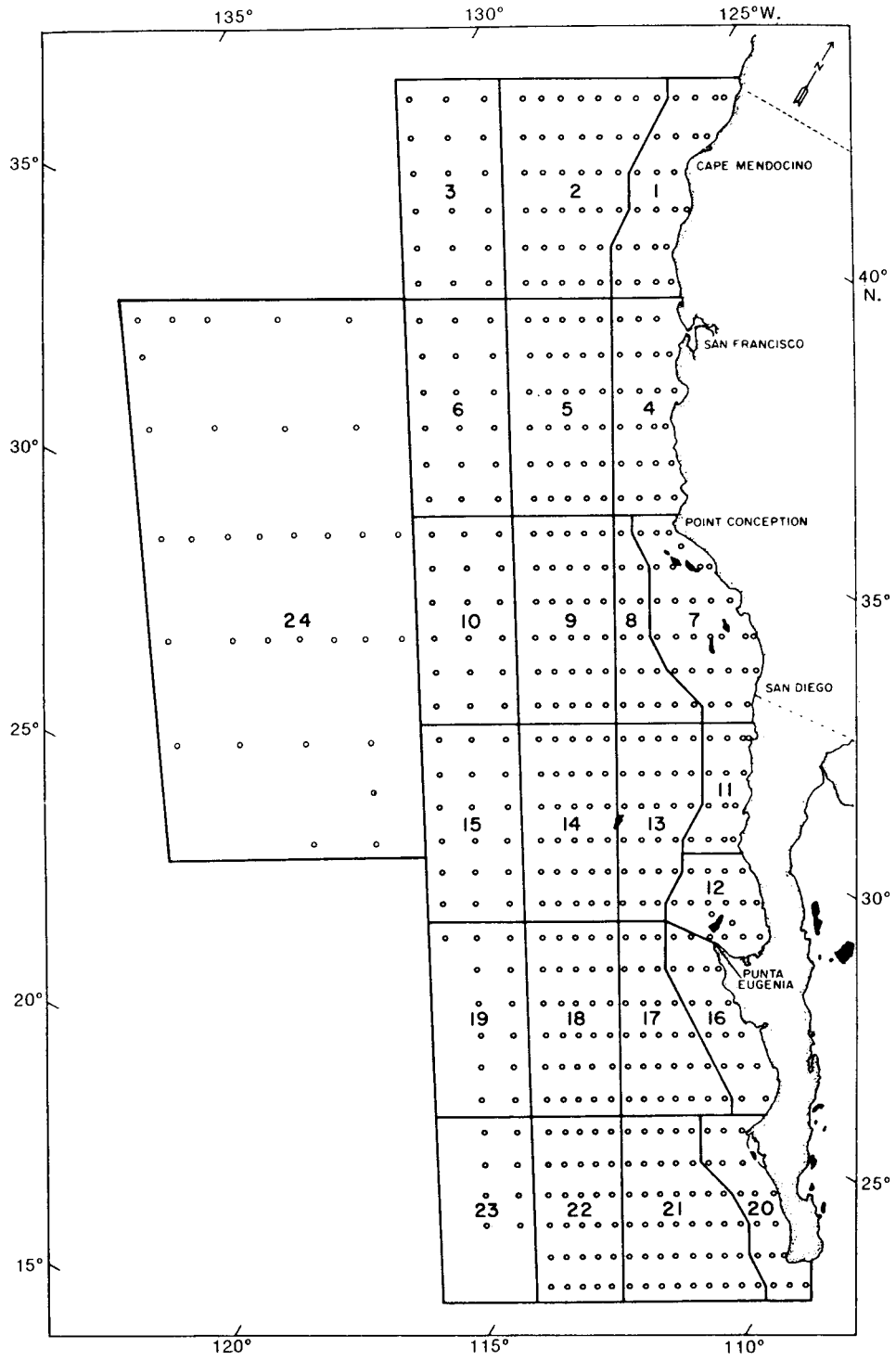


Figure 5. CalCOFI survey pattern showing the regions used in this atlas.

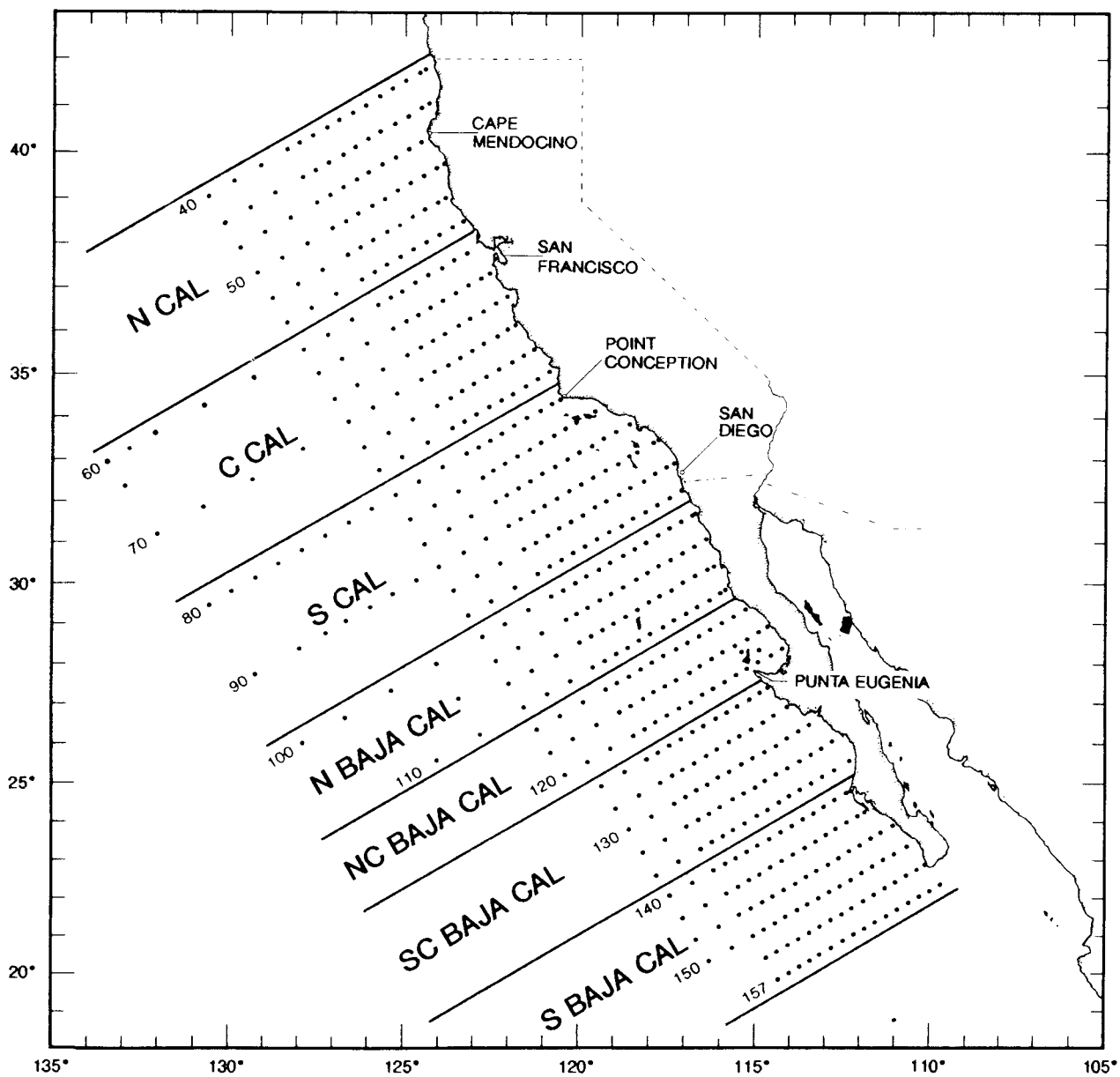


Figure 6. CalCOFI survey pattern showing the seven onshore-offshore zones used in this atlas. Abbreviations: N CAL = Northern California; C CAL = Central California; S CAL = Southern California; N BAJA CAL = Northern Baja California; NC BAJA CAL = North Central Baja California; SC BAJA CAL = South Central Baja California; S BAJA CAL = Southern Baja California.

LIST OF TAXA

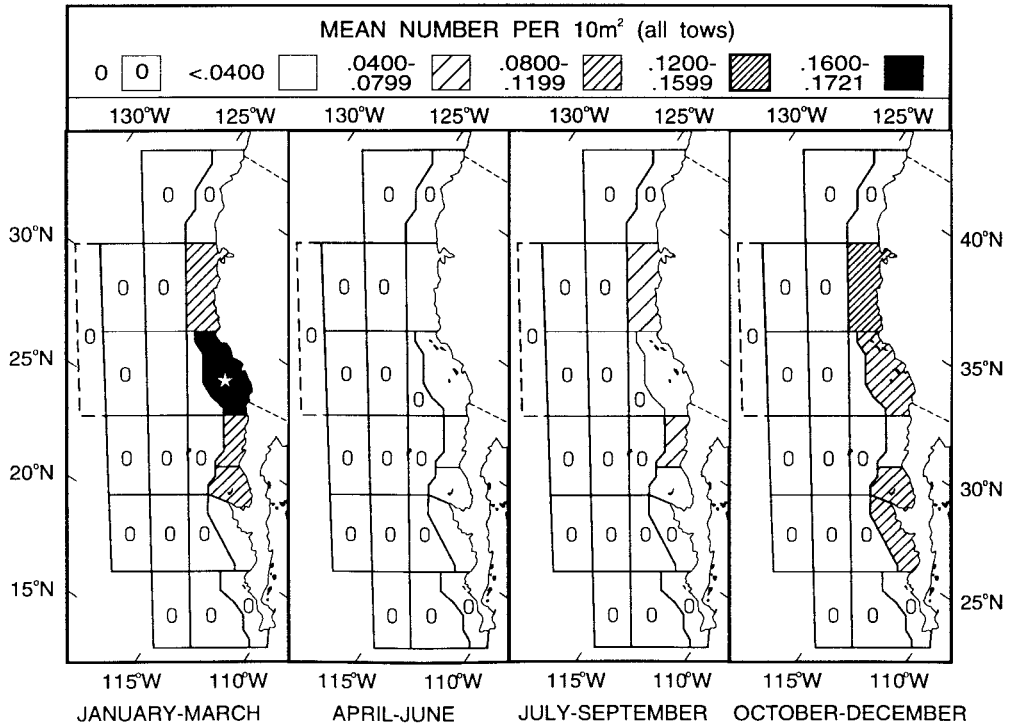
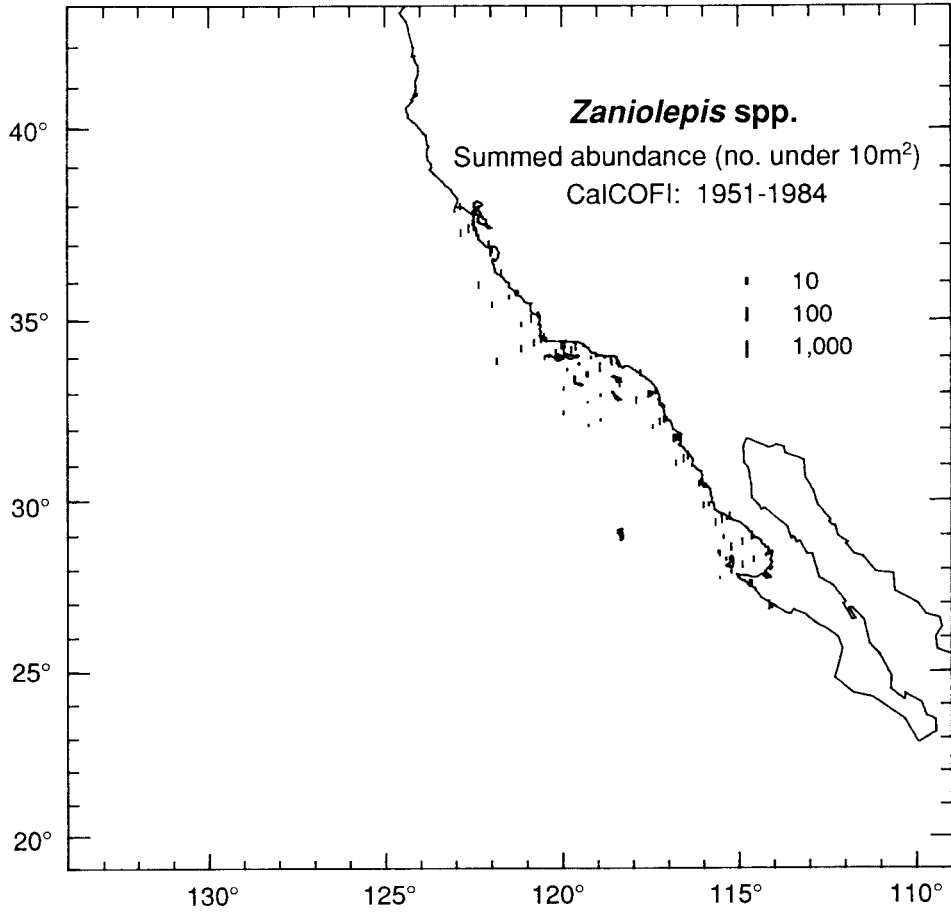
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<i>Medialuna californiensis</i>	16	<i>Bothus</i> spp.	104
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<i>Semicossyphus pulcher</i>	24	<i>Centrobranchus nigroocellatus</i>	112
<i>Pleuronichthys coenosus</i>	26	<i>Physiculus</i> spp.	114
<i>Myctophum aurolaternatum</i>	28	<i>Scopelarchoides nicholsi</i>	116
<i>Scopelarchus</i> spp.	30	<i>Microgadus proximus</i>	118
<i>Brama</i> spp.	32	Evermannellidae	120
<i>Lepidopus fitchi</i>	34	<i>Cubiceps pauciradiatus</i>	122
<i>Notolepis risso</i>	36	<i>Psenes pellucidus</i>	124
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<i>Coryphaena hippurus</i>	60	<i>Triphoturus nigrescens</i>	145
Gempylidae	62	Polynemidae	146
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<i>Pleuronichthys decurrens</i>	66	<i>Bathylagus longirostris</i>	148
Exocoetidae	68	<i>Psenes sio</i>	149
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<i>Syacium ovale</i>	78	Microdesmidae	154
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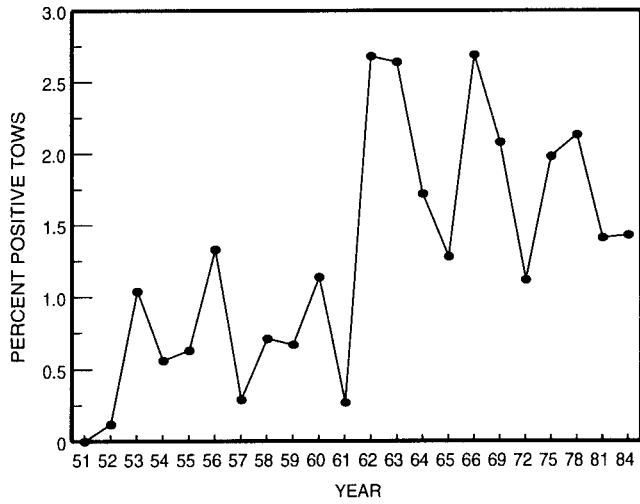
CHARTS AND GRAPHS

Zaniolepis spp.

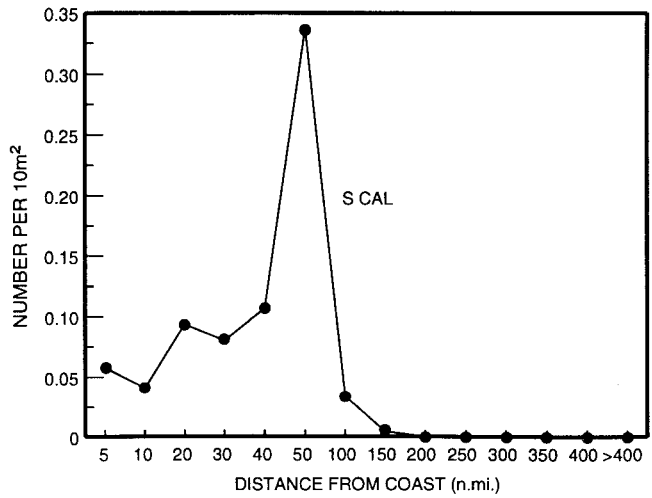
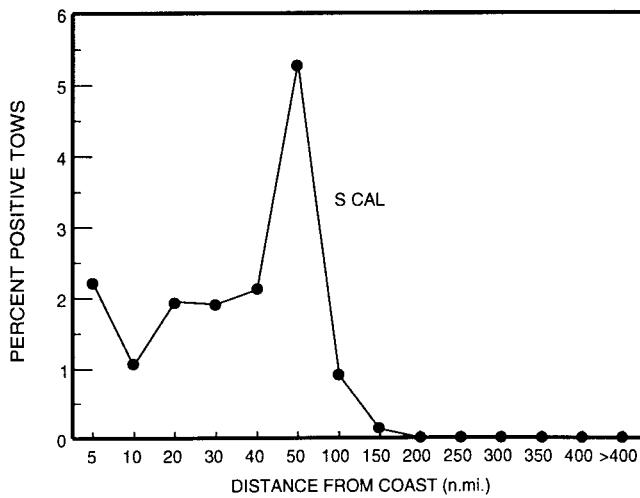
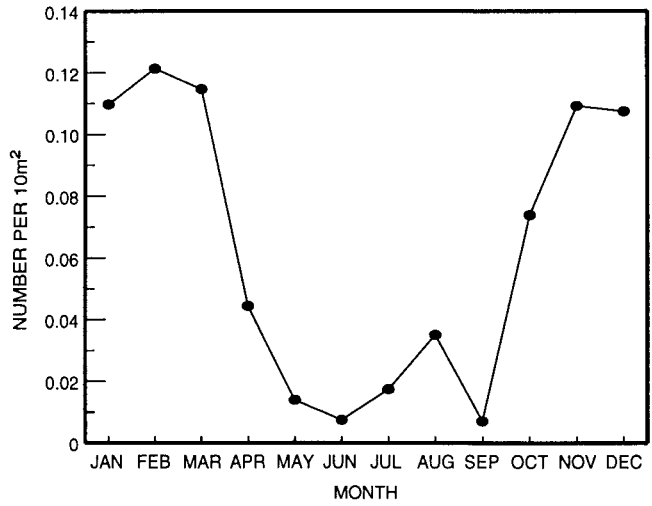
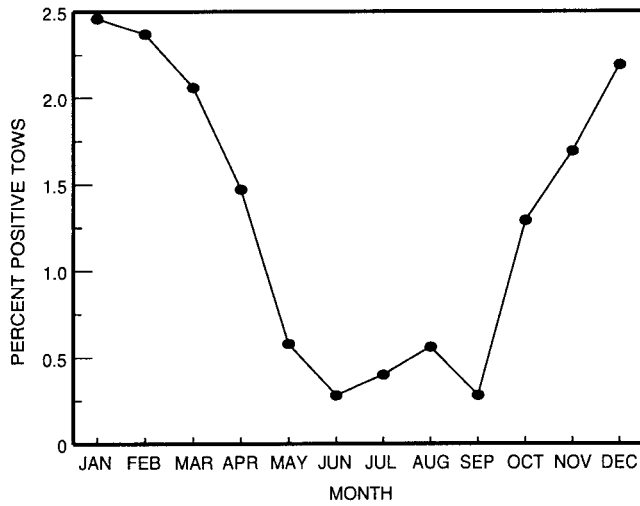
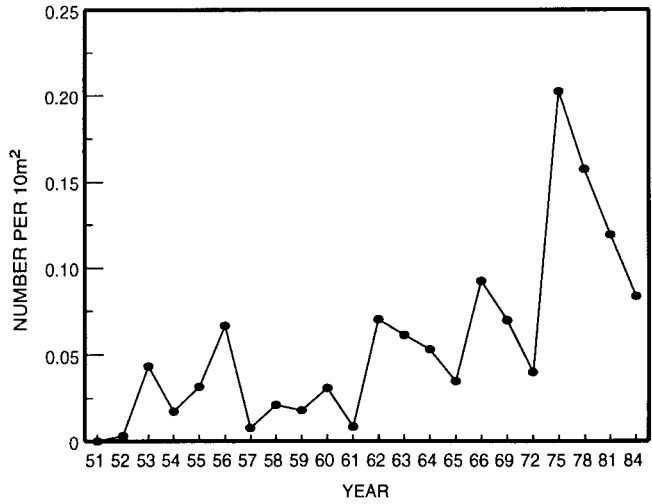
Hexagrammidae



Combfishes

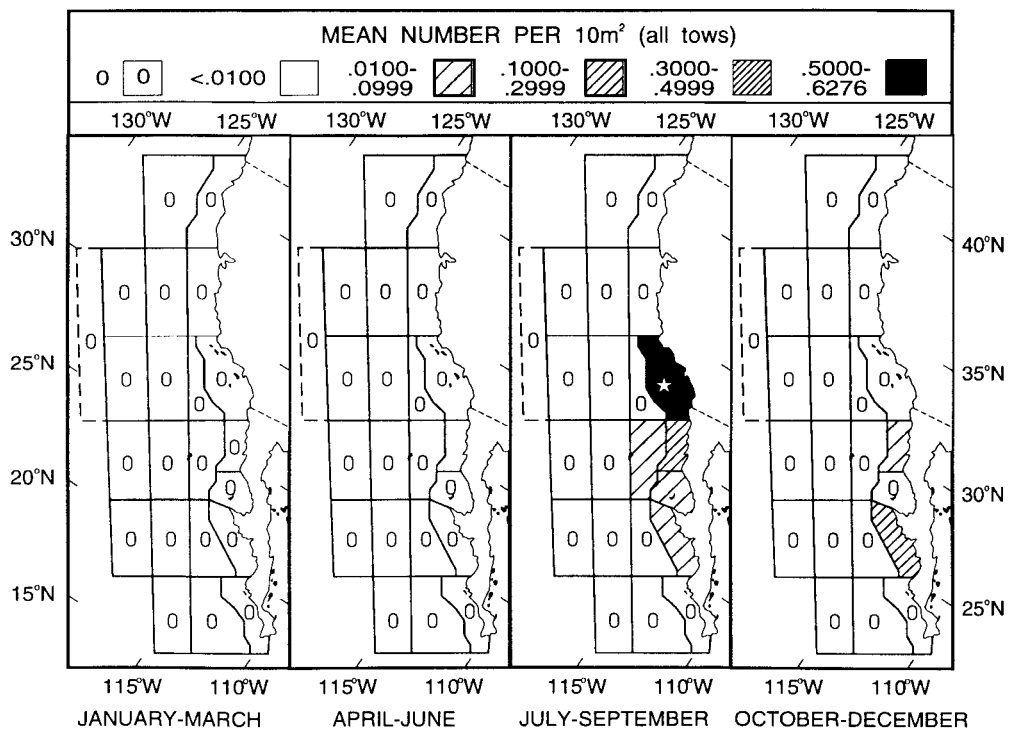
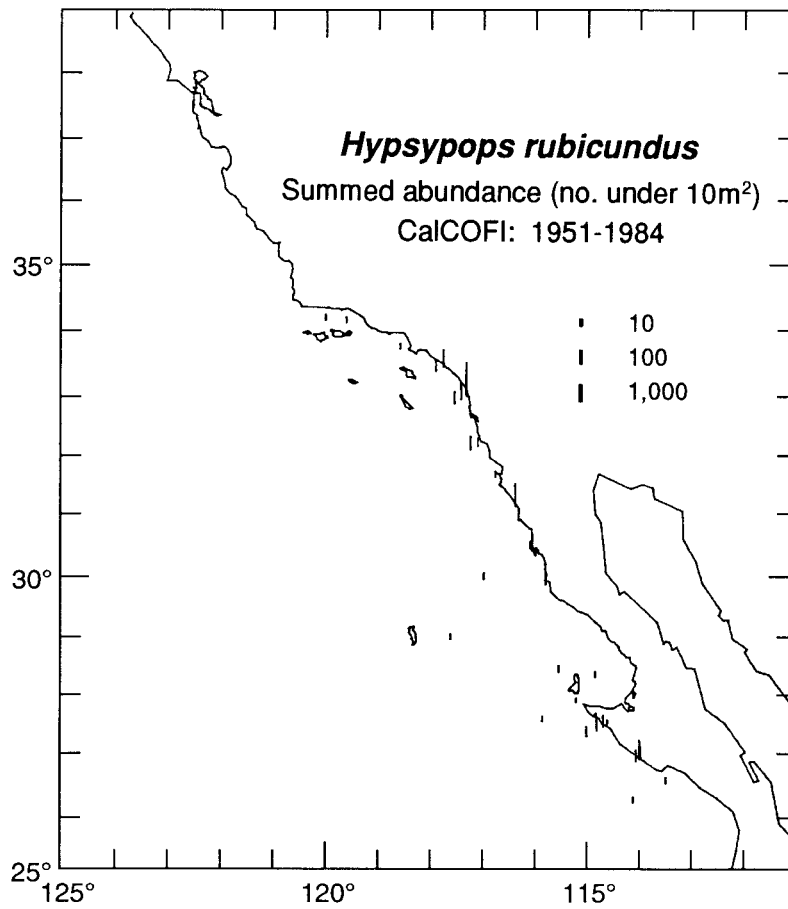


Zaniolepis spp.

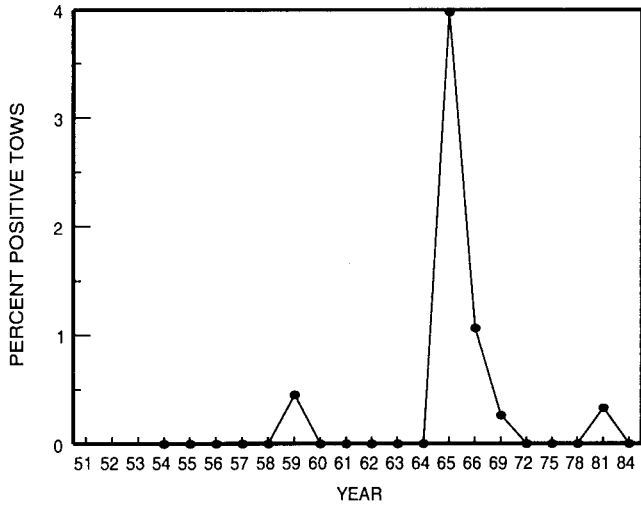


Hypsypops rubicundus

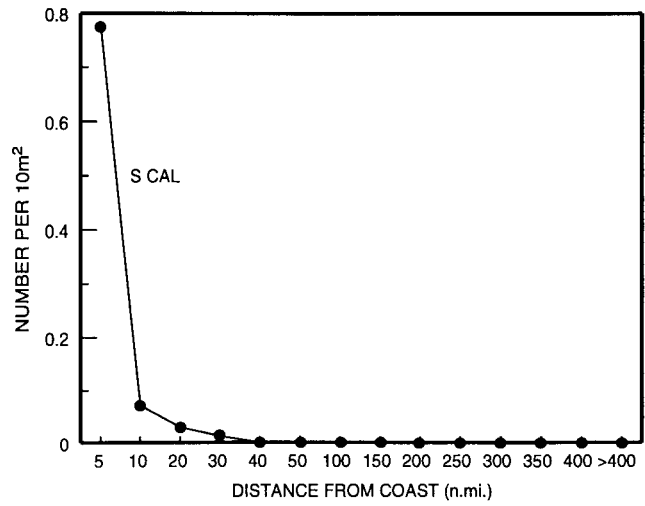
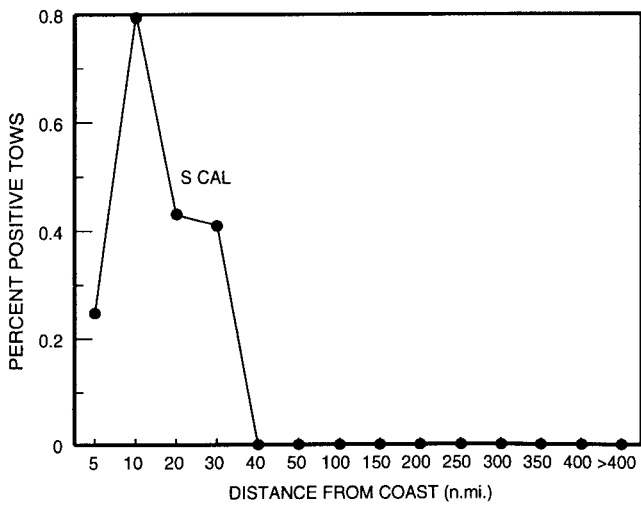
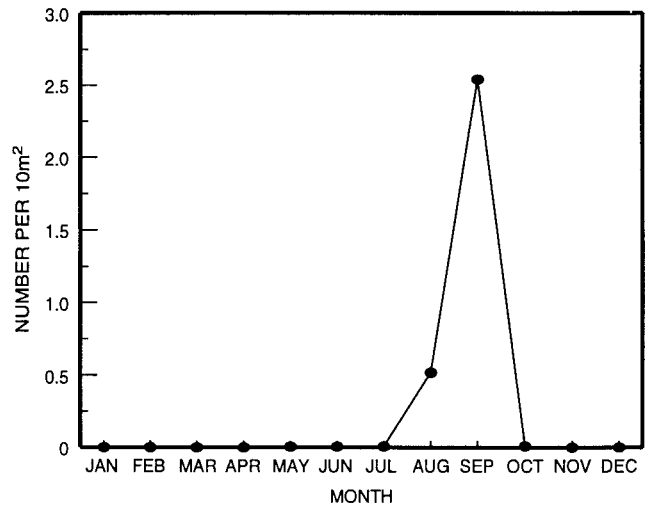
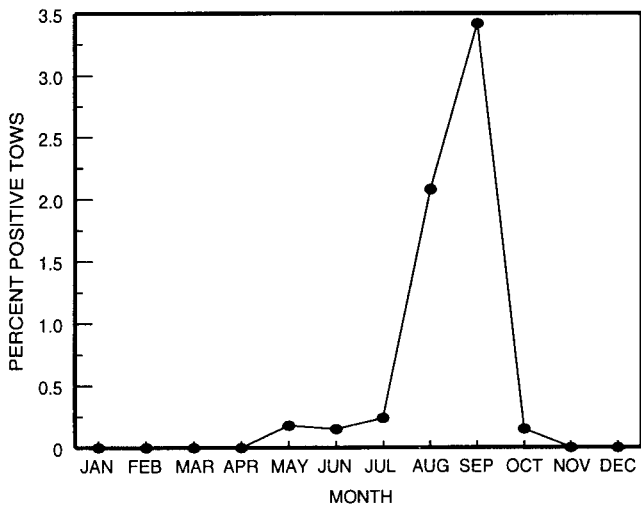
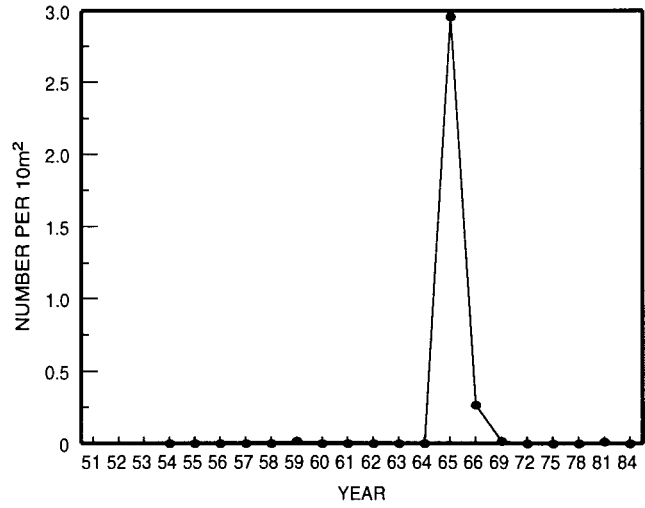
Pomacentridae



Garibaldi

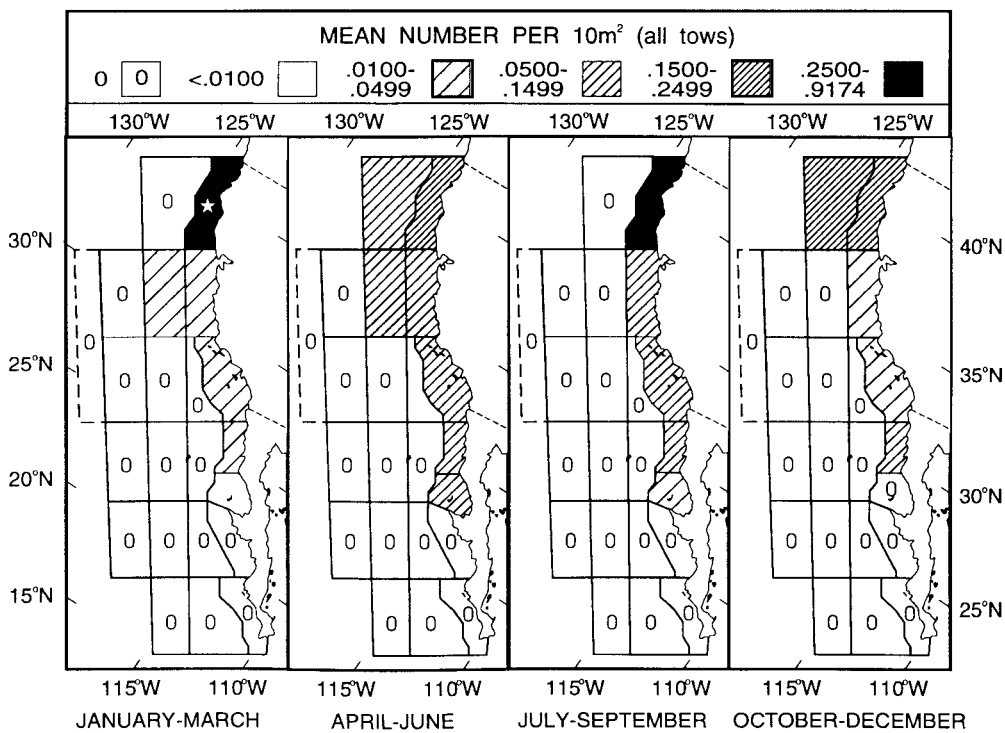
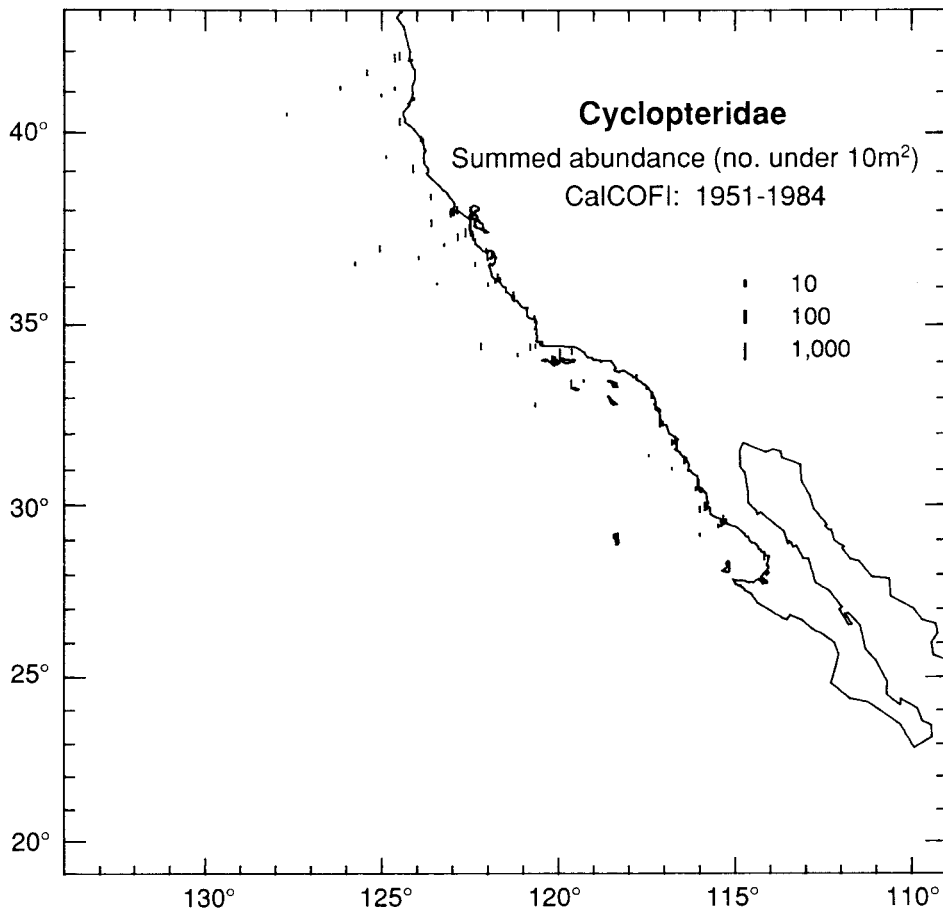


Hypsypops rubicundus



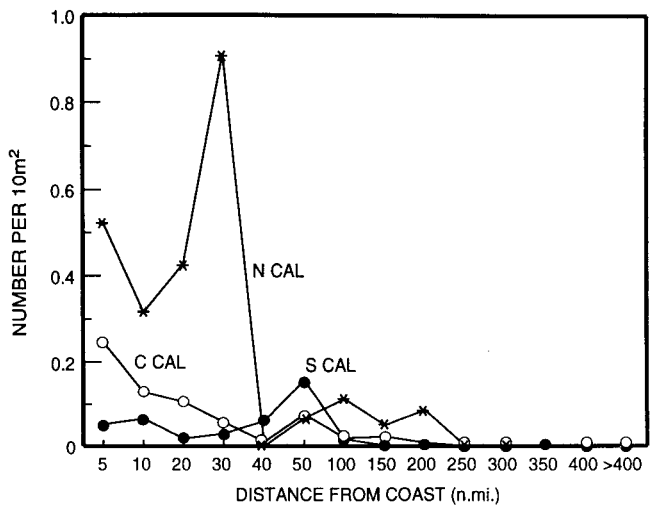
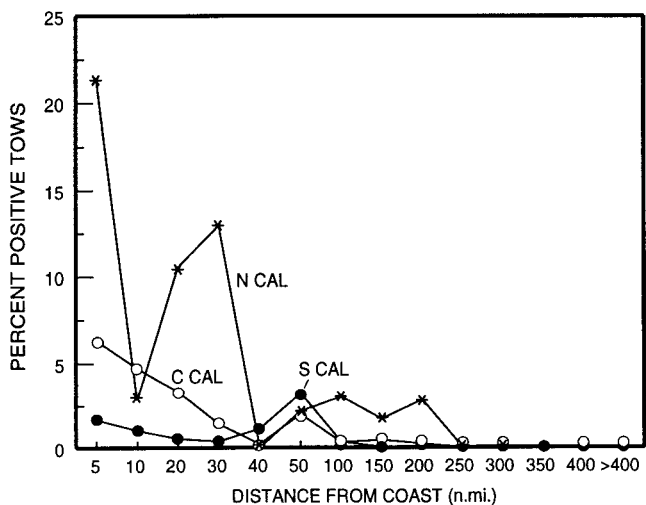
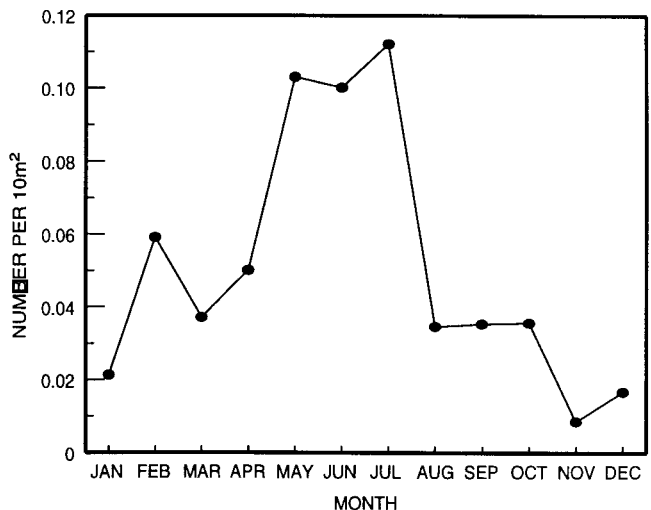
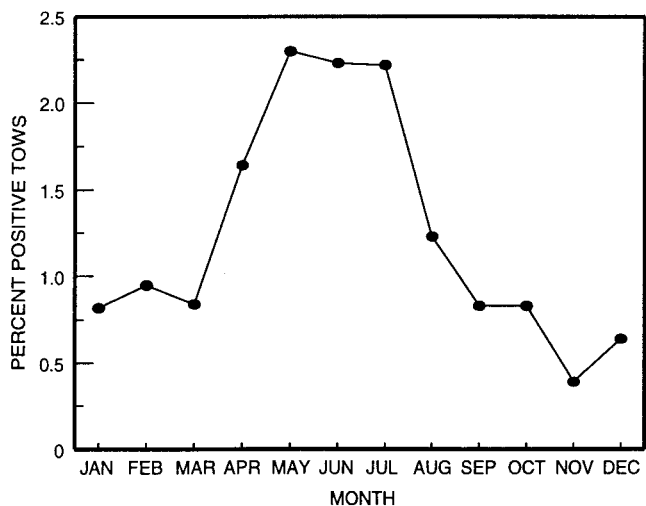
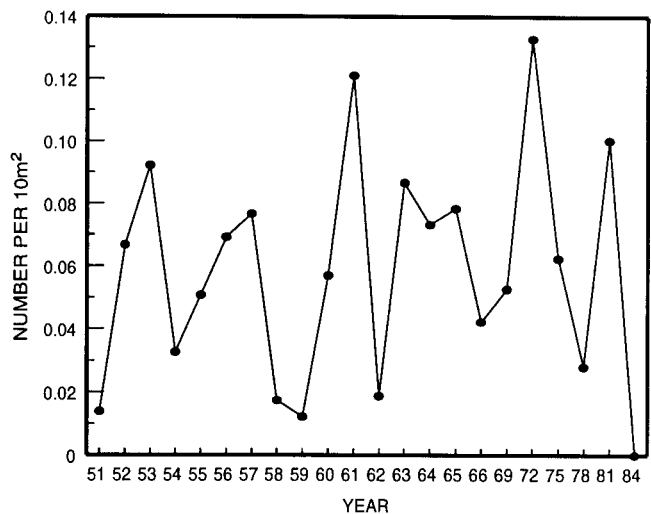
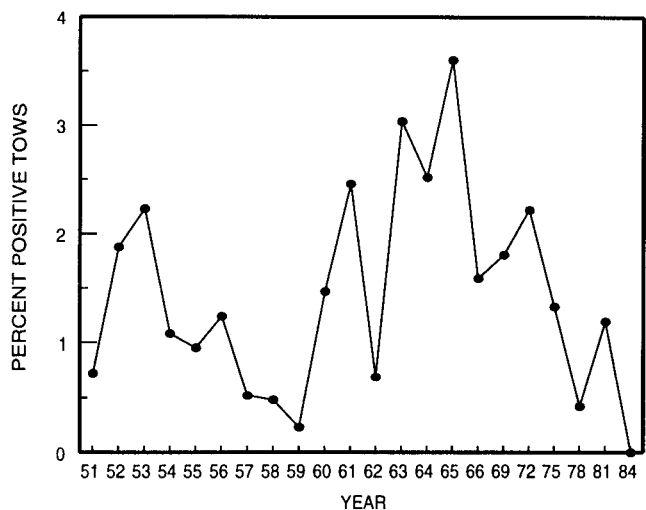
Cyclopteridae

Cyclopteridae



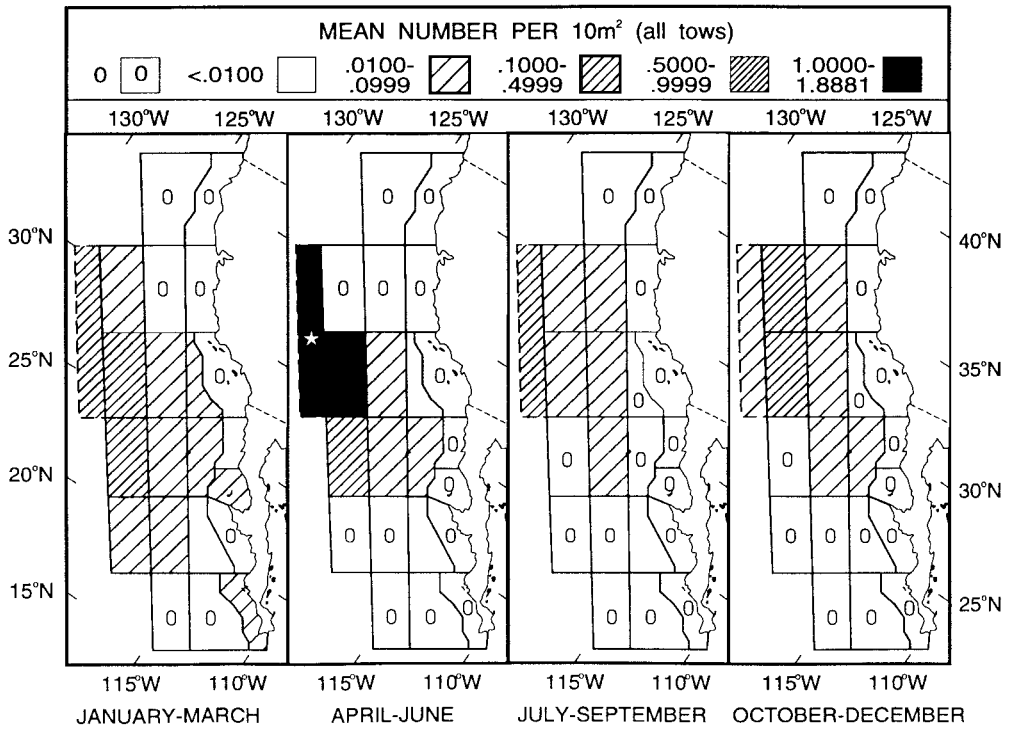
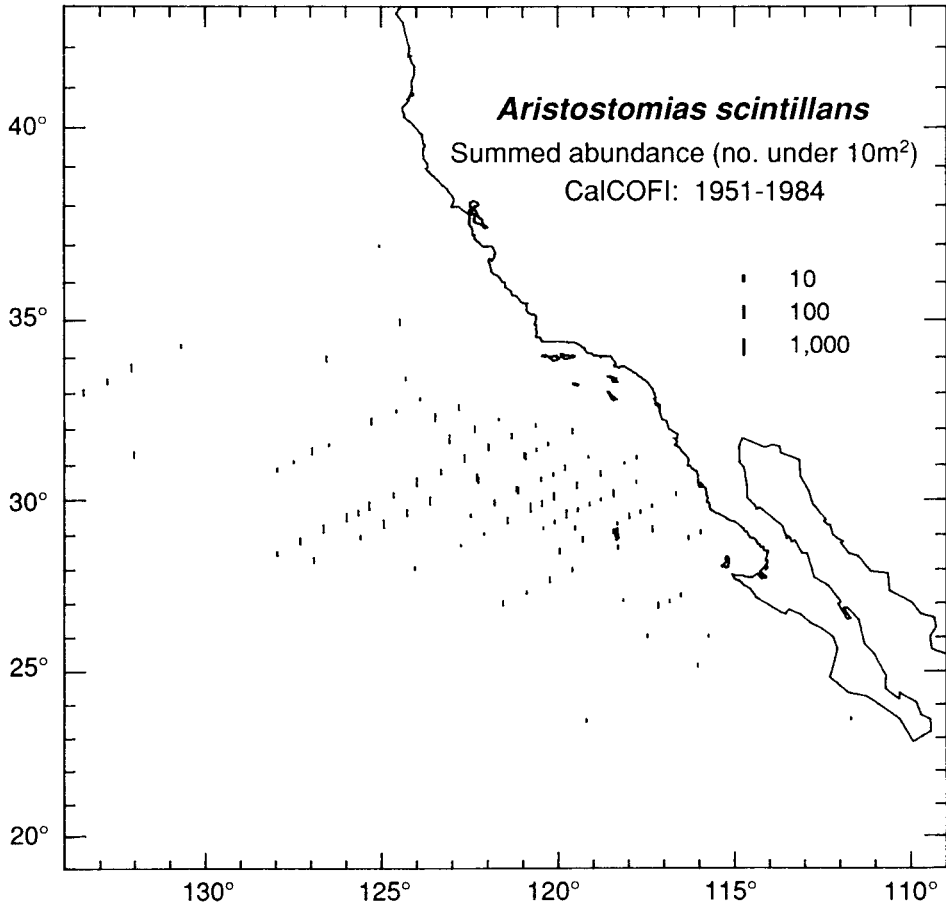
Snailfishes

Cyclopteridae

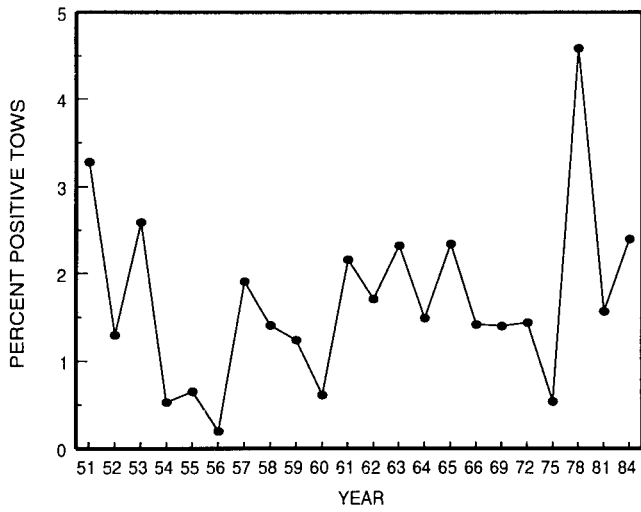


Aristostomias scintillans

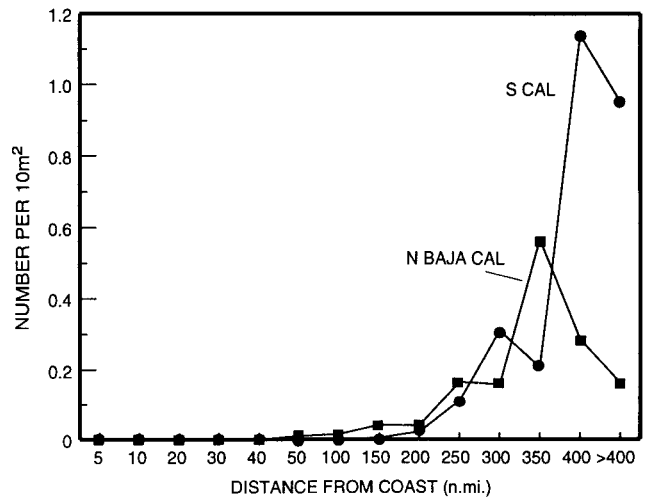
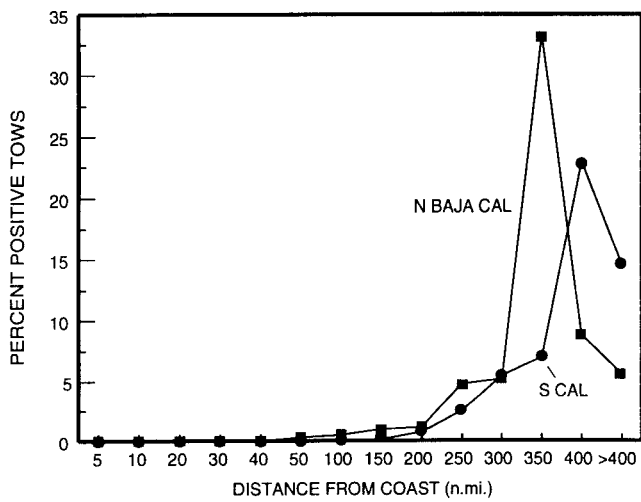
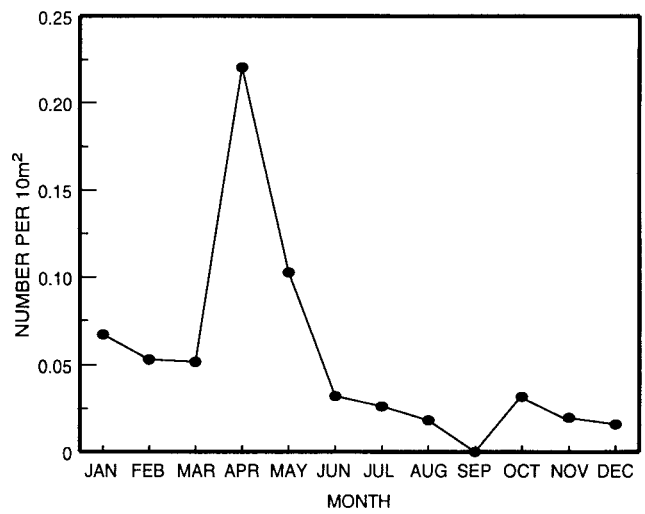
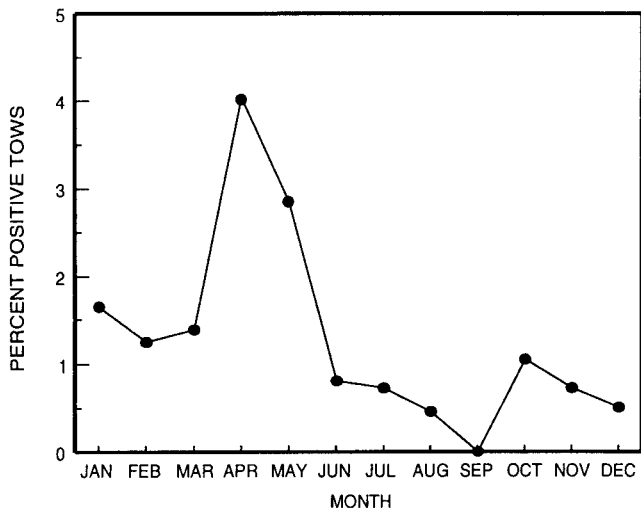
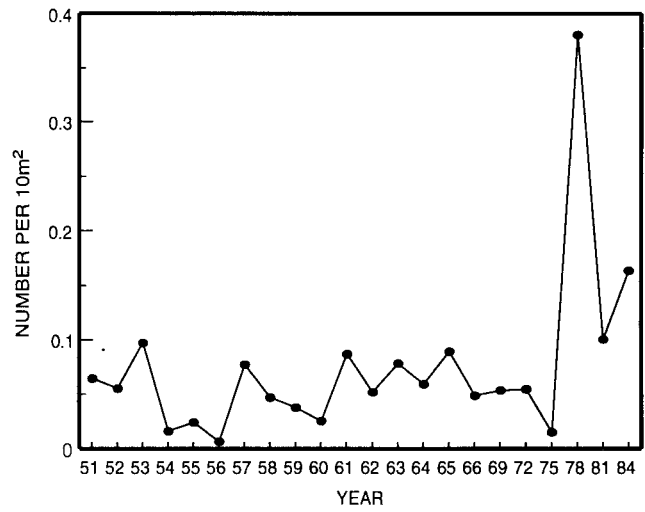
Malacosteidae



Shiny loosejaw

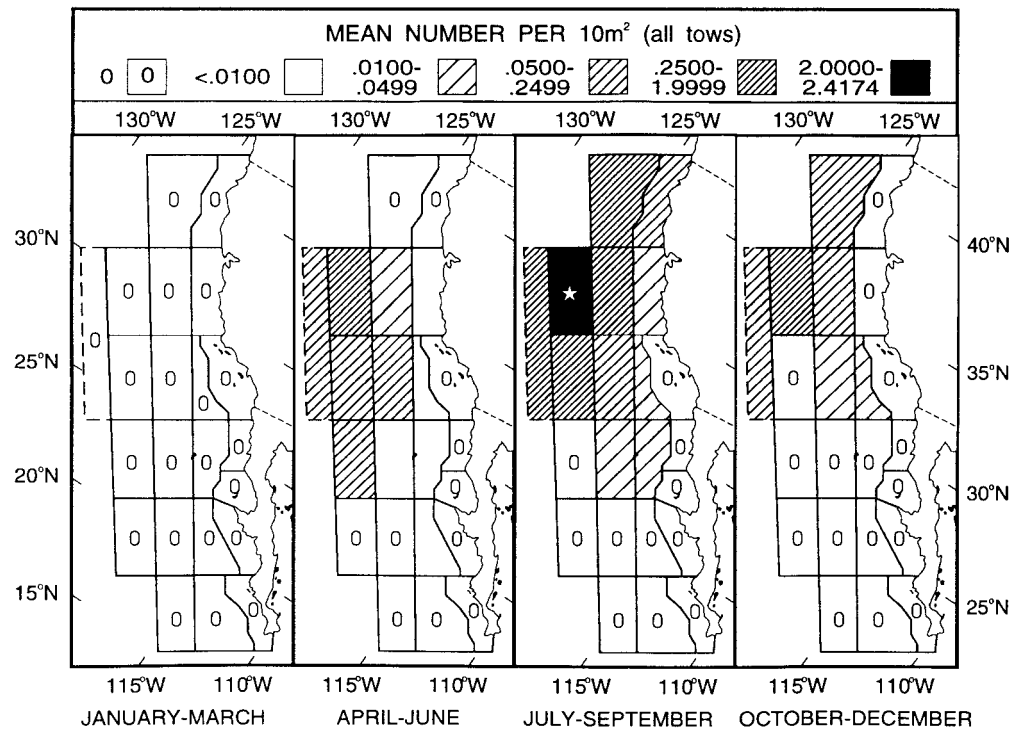
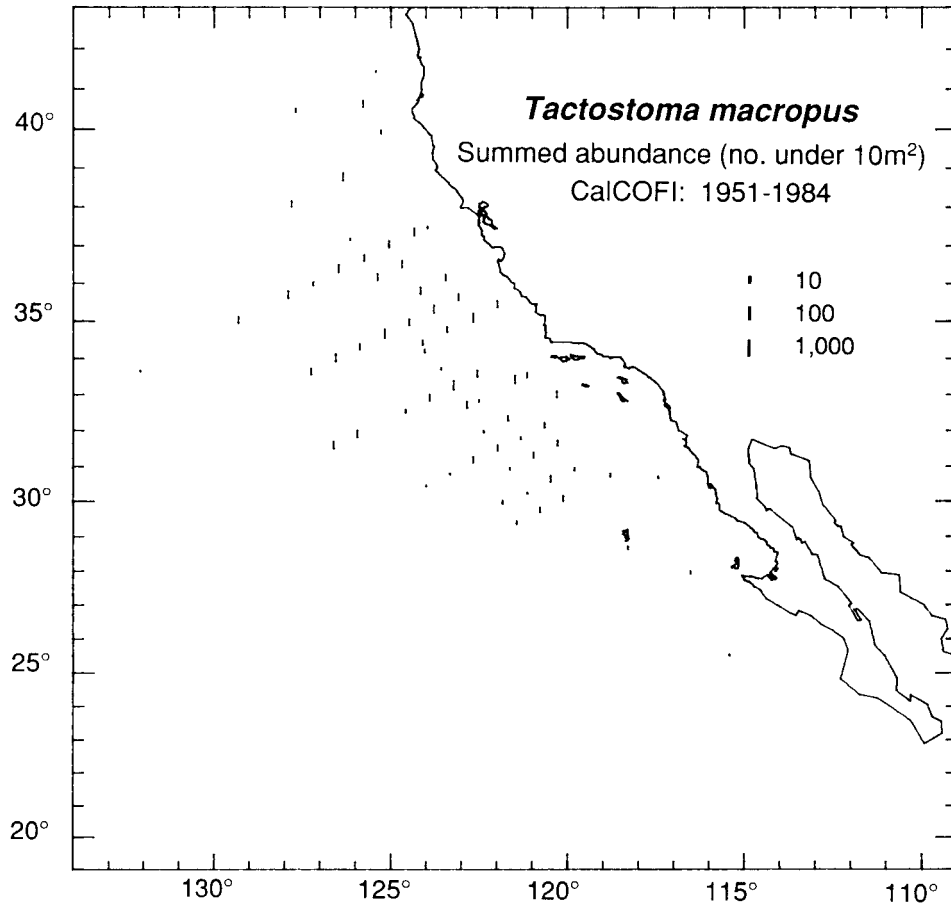


Aristostomias scintillans

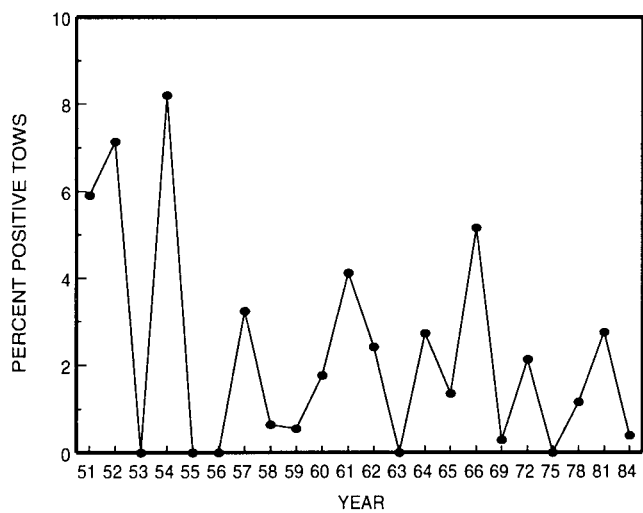


Tactostoma macropus

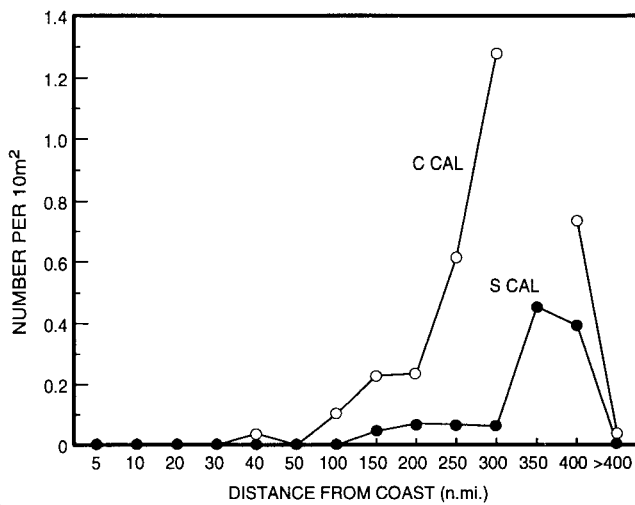
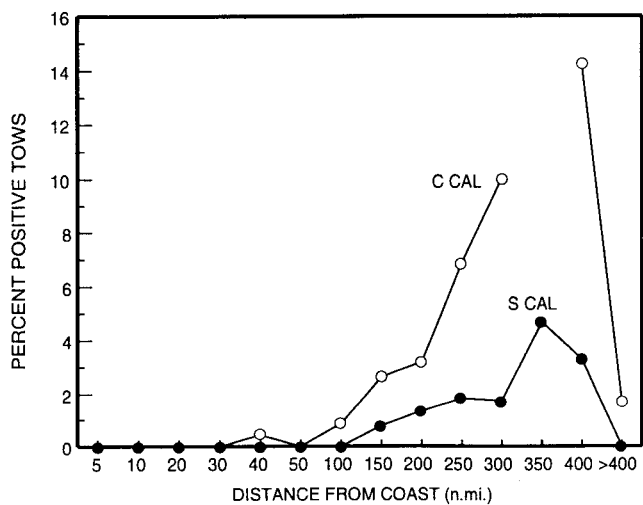
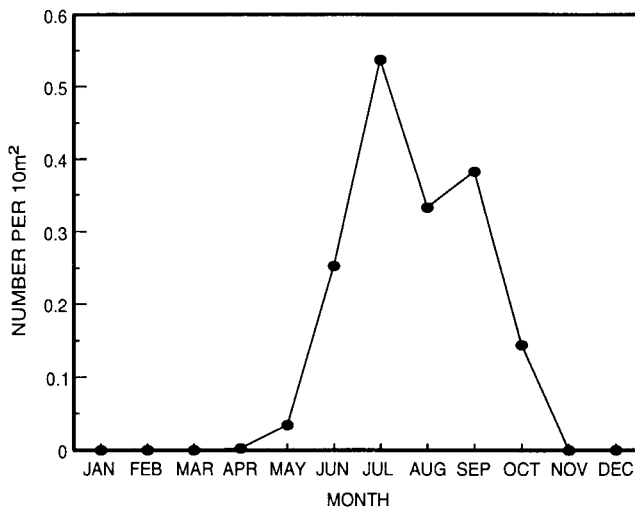
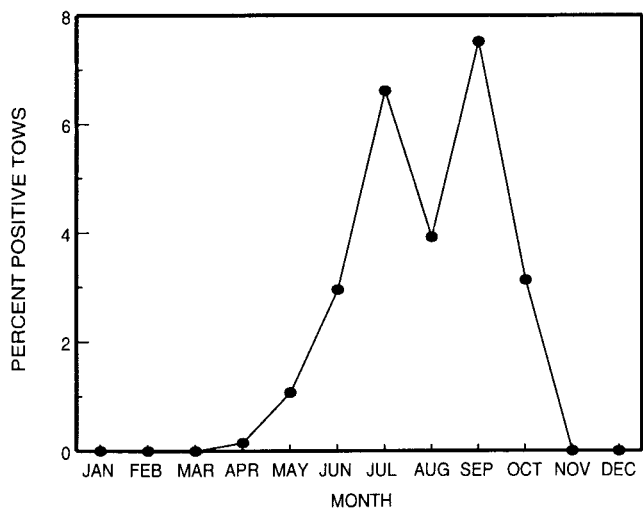
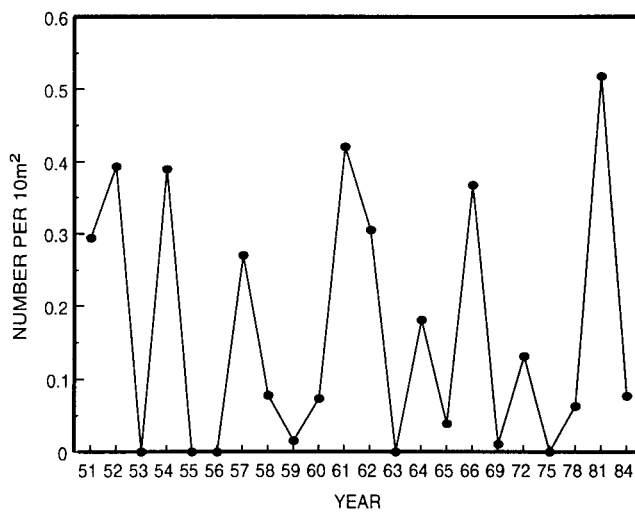
Melanostomiidae



Longfin dragonfish

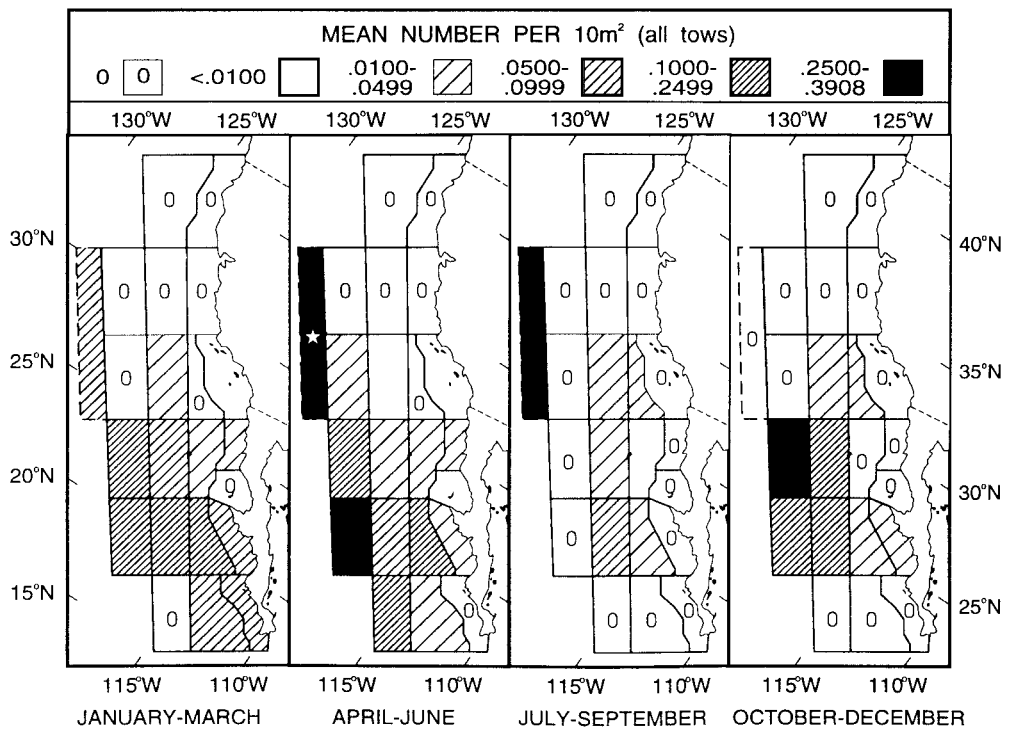
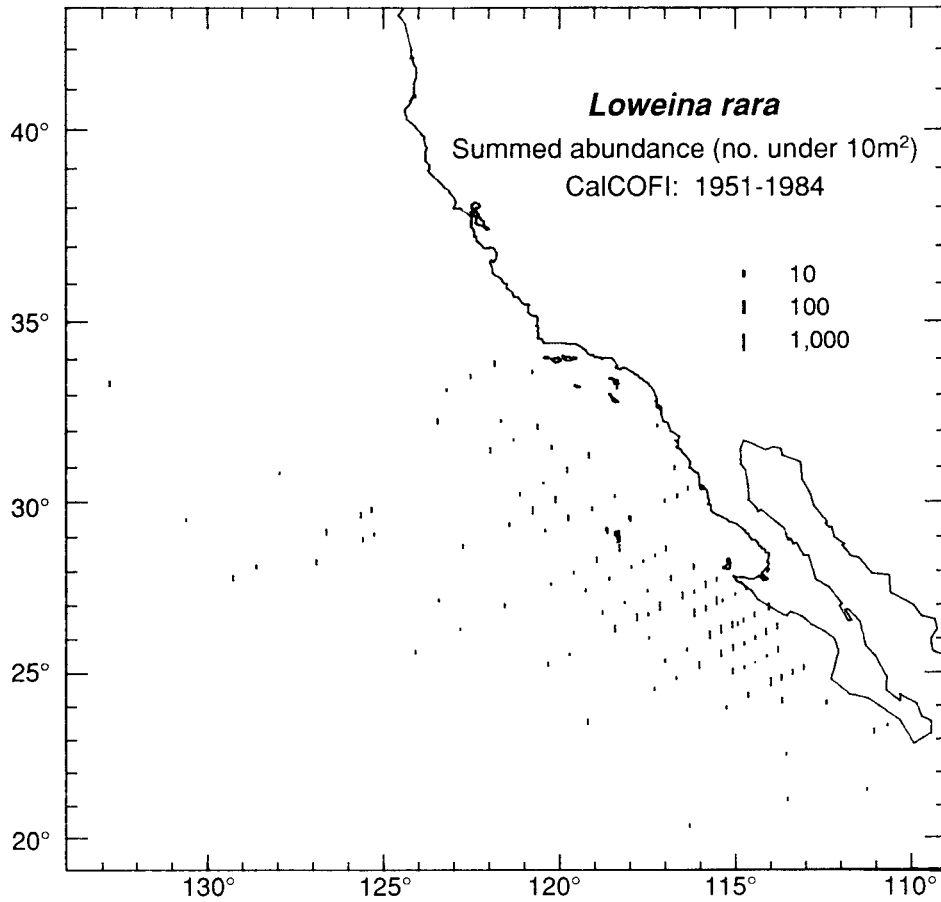


Tactostoma macropus



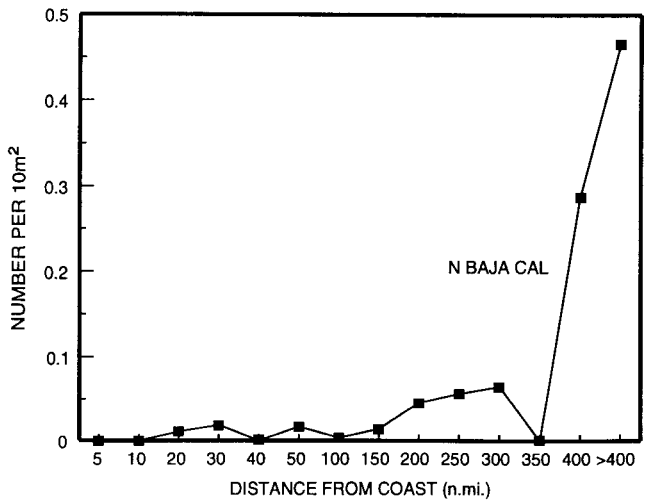
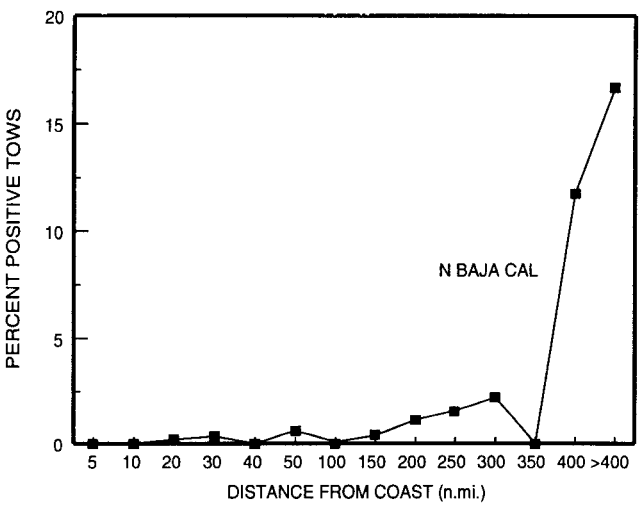
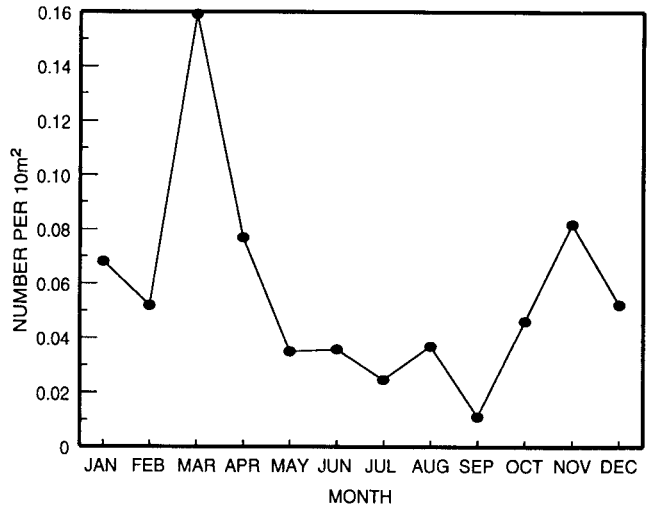
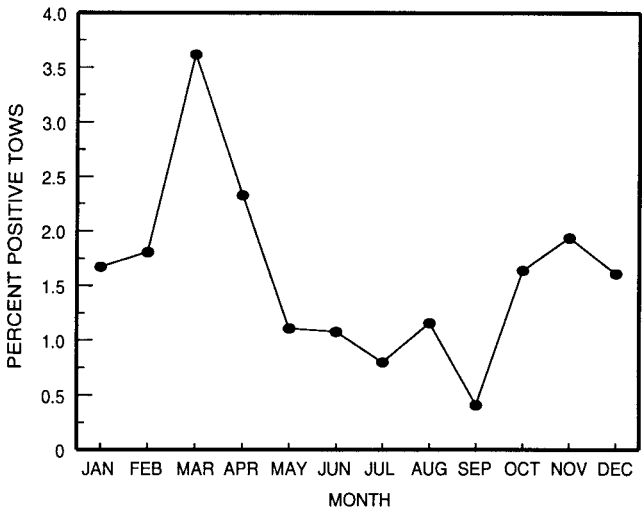
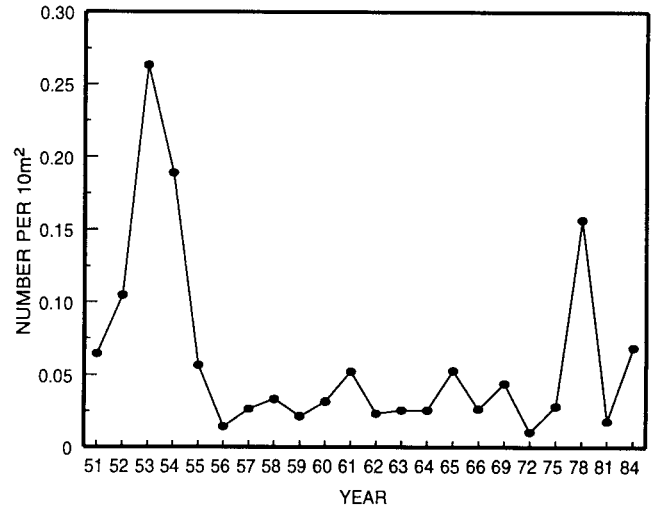
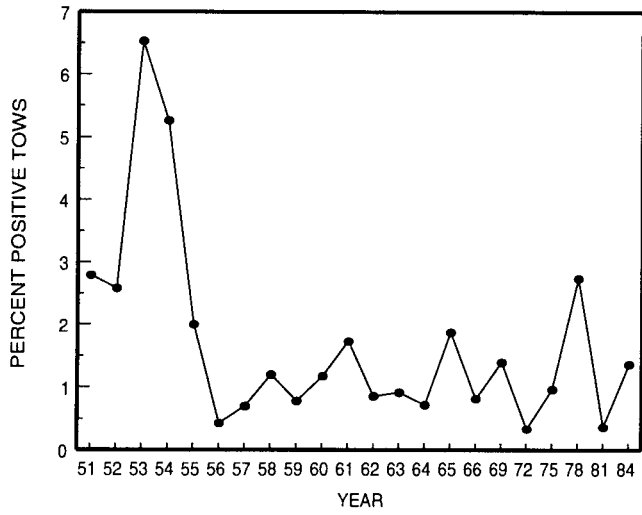
Loweina rara

Myctophidae



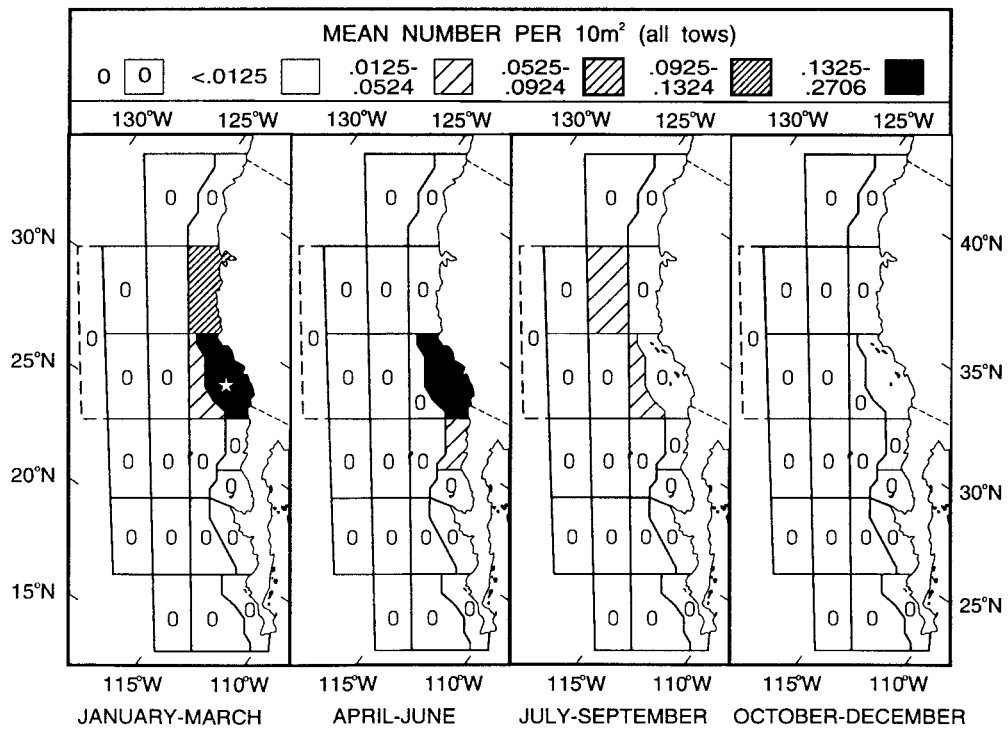
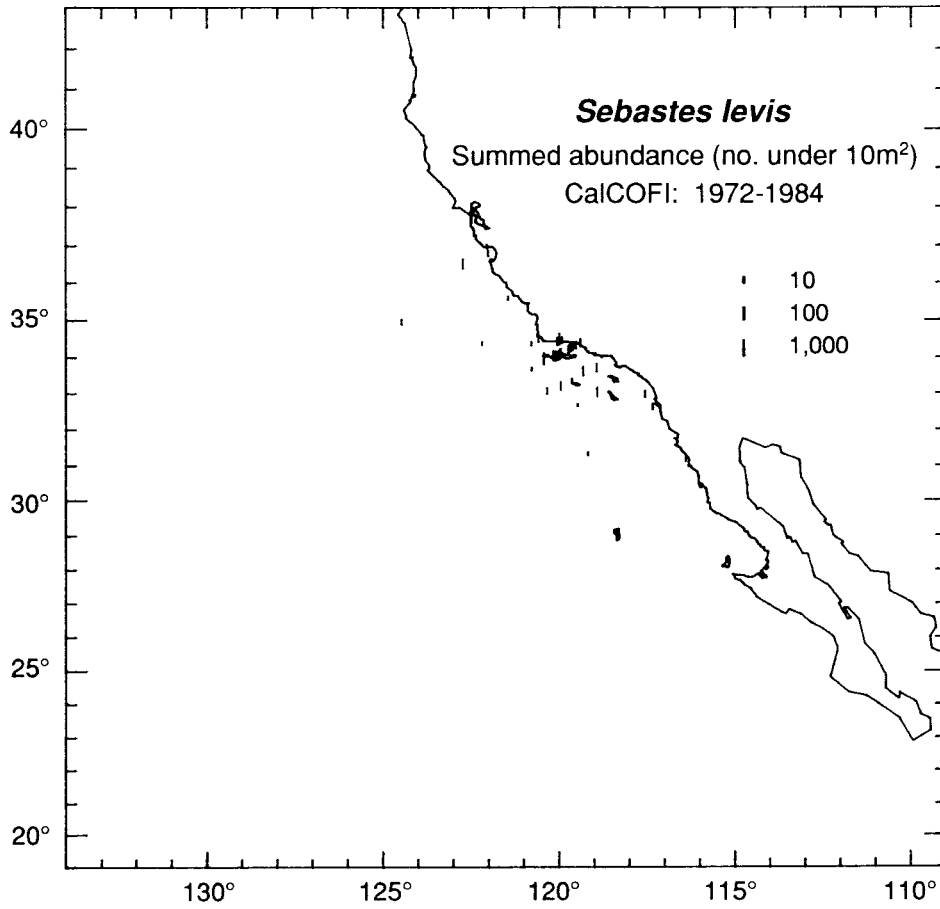
Dwarf lanternfish

Lowaina rara

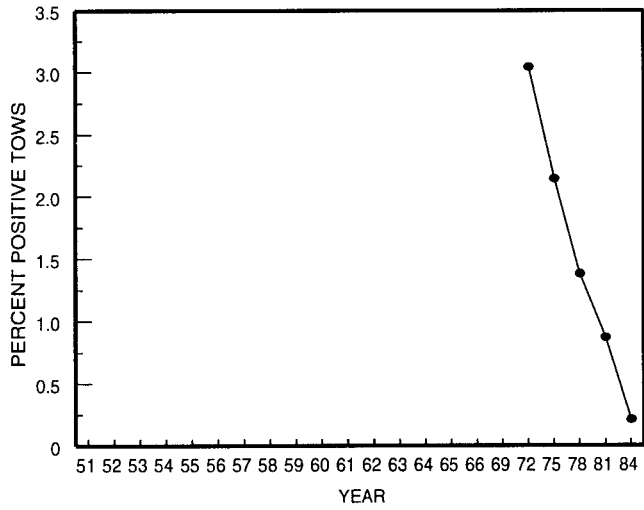


Sebastes levis

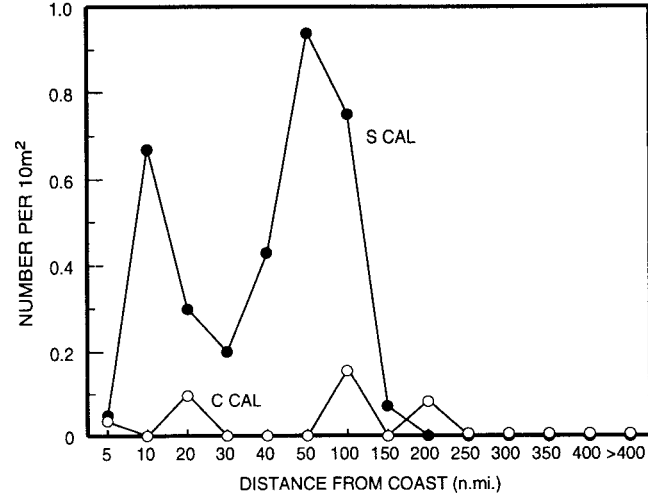
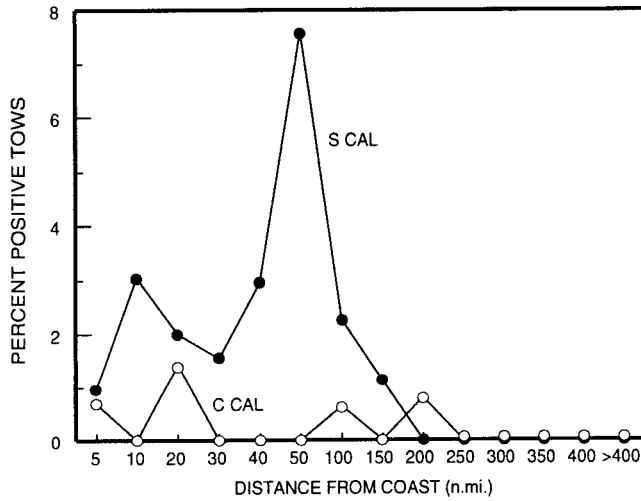
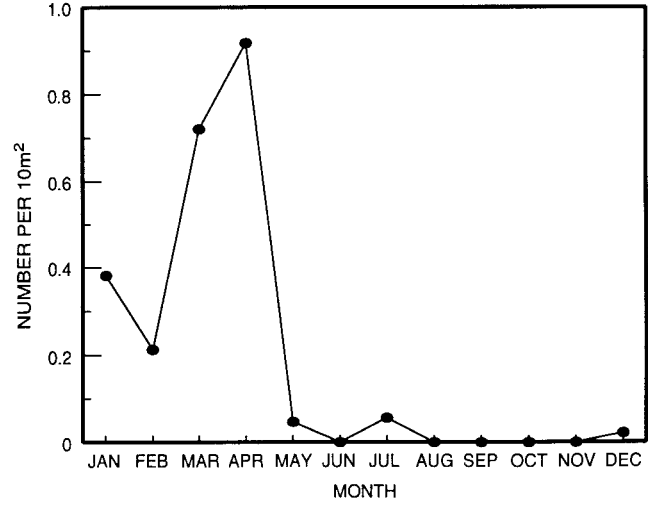
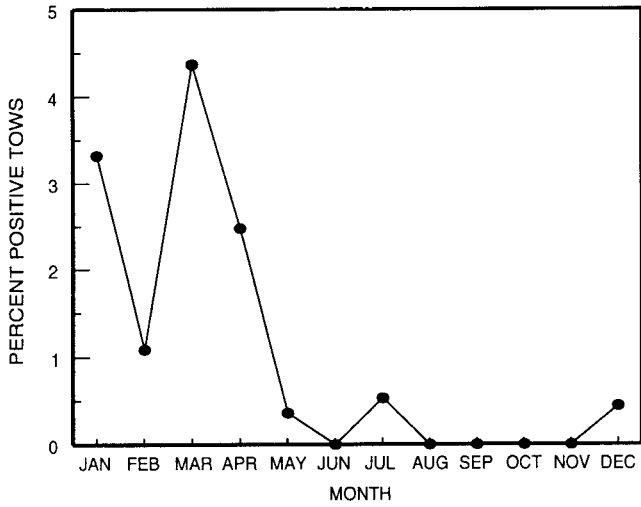
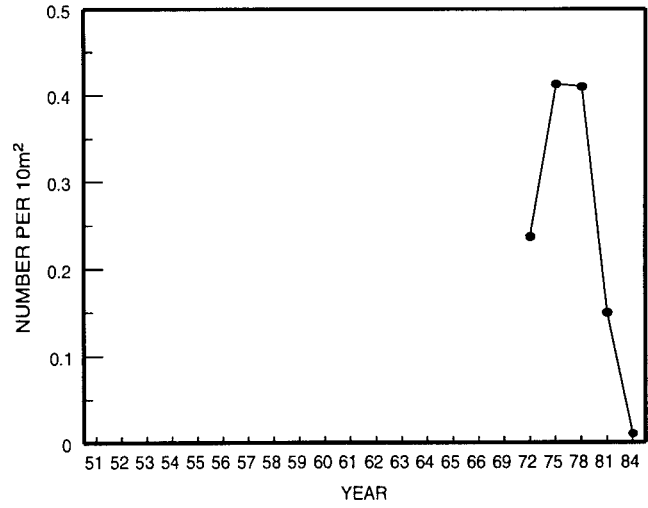
Scorpaenidae



Cowcod

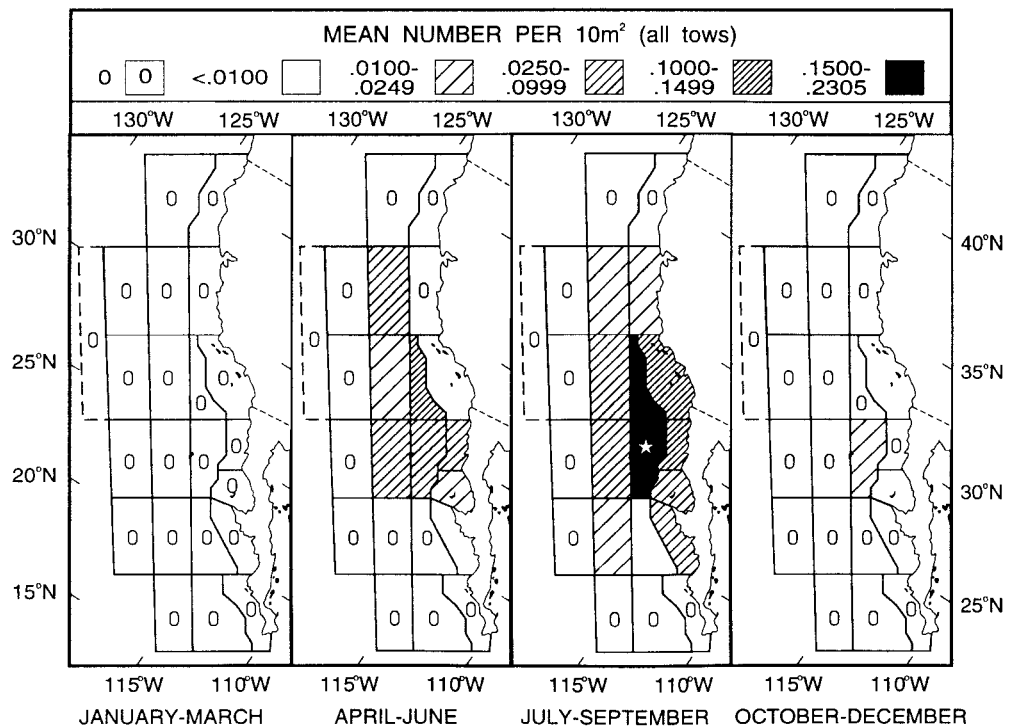
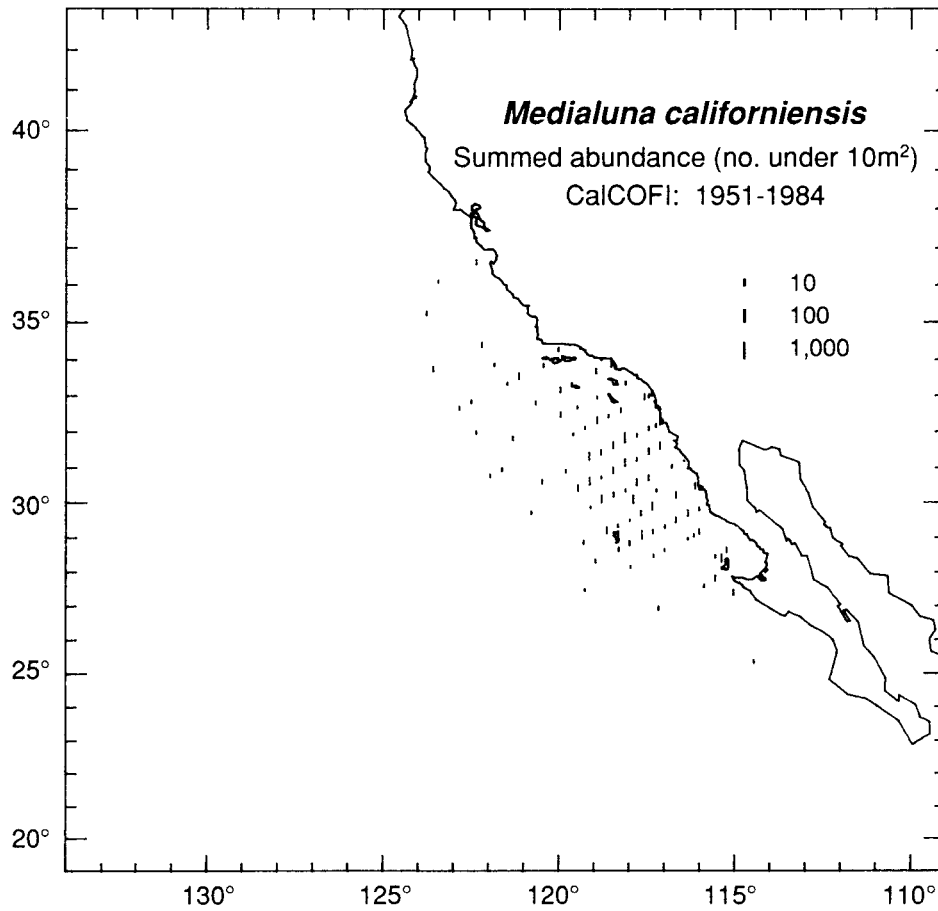


Sebastes levis

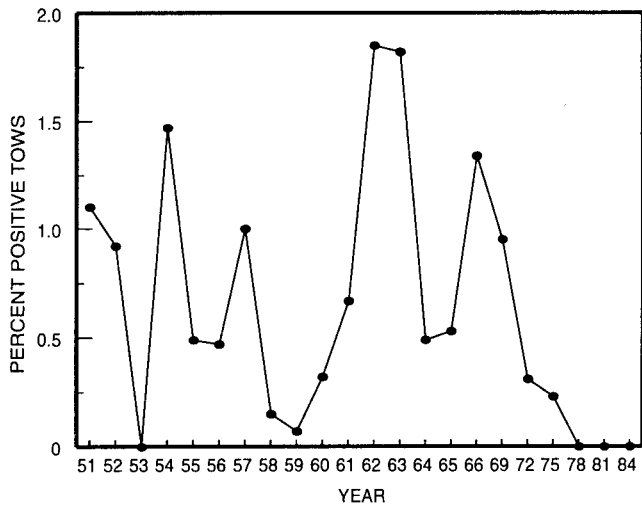


Medialuna californiensis

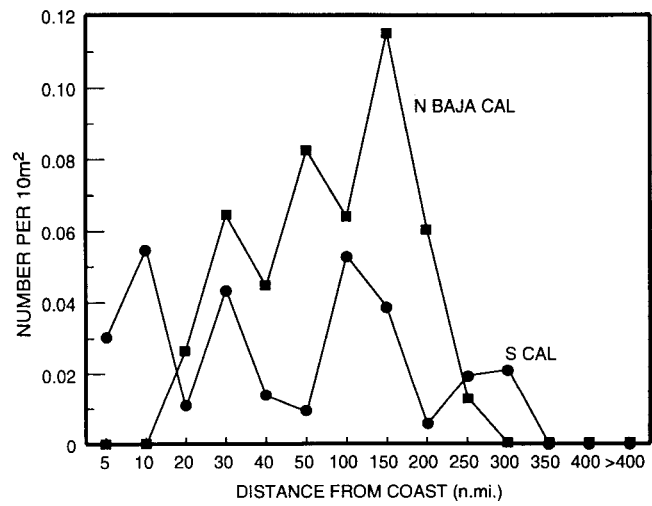
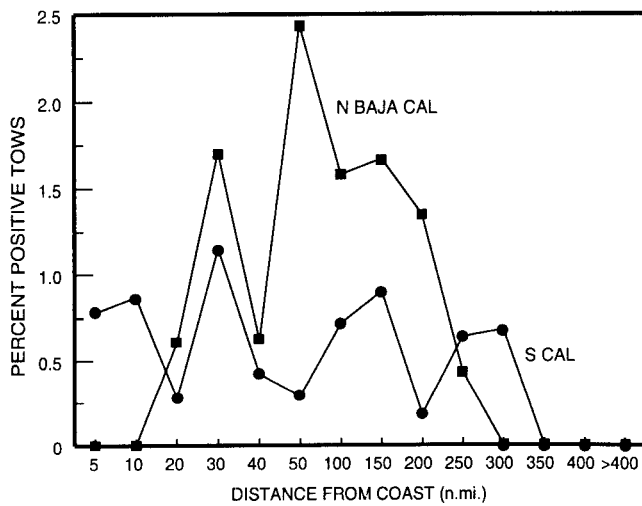
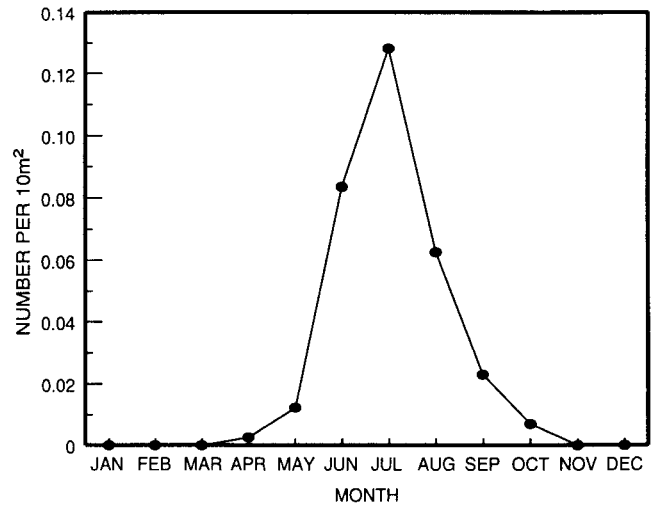
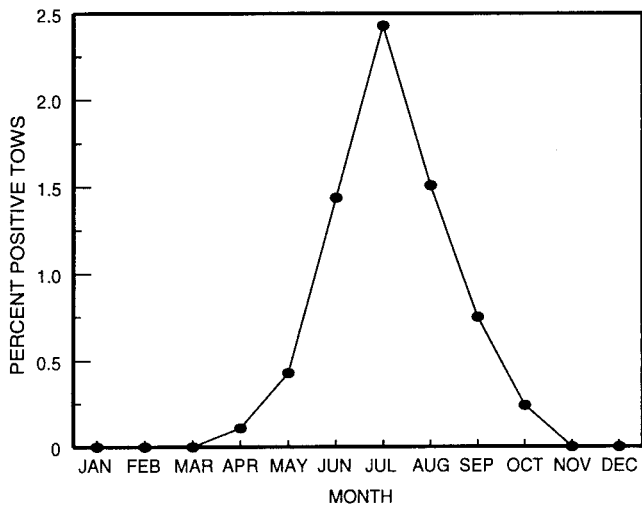
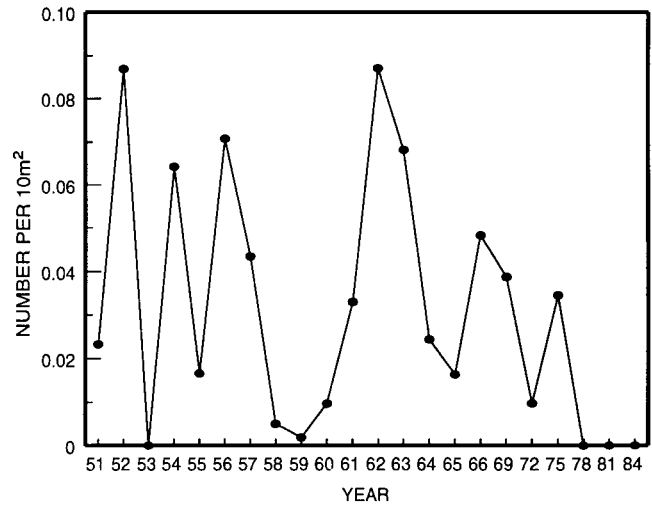
Kyphosidae



Halfmoon

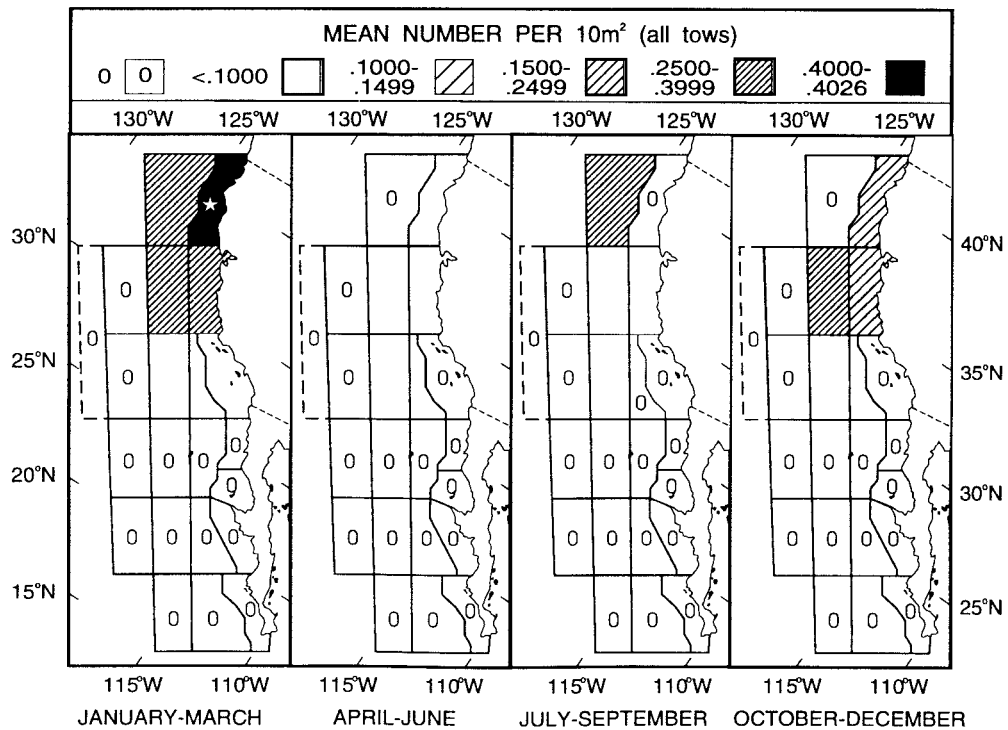
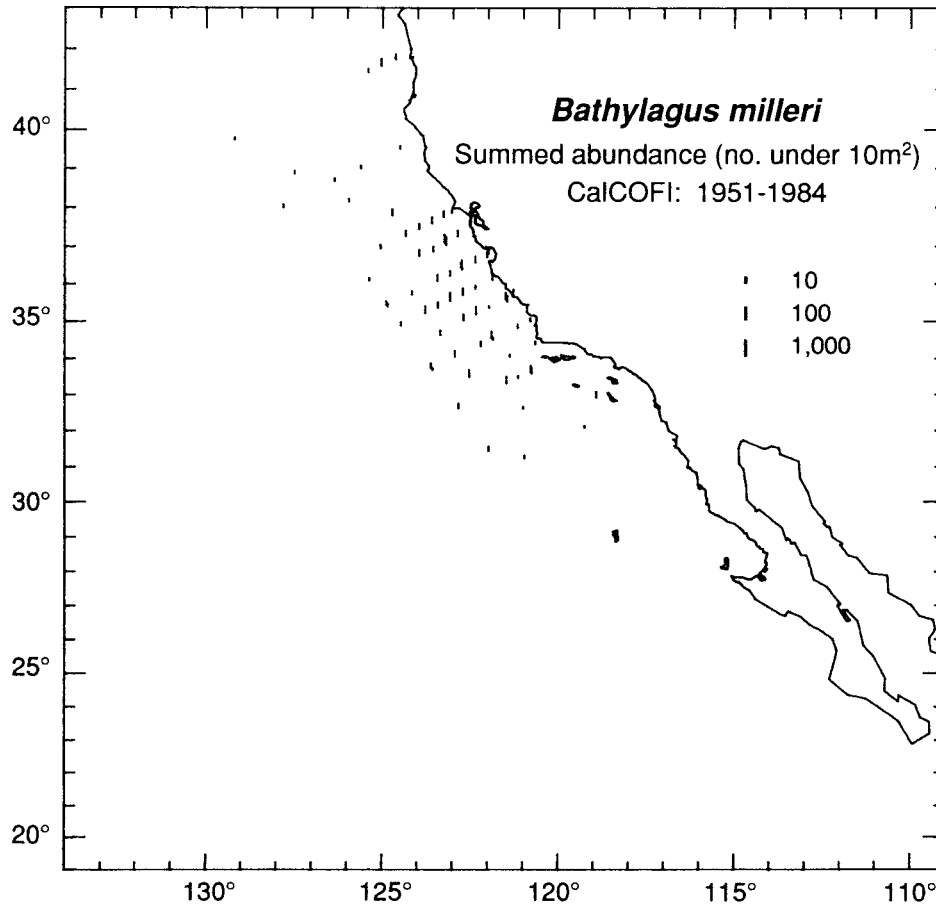


Medialuna californiensis

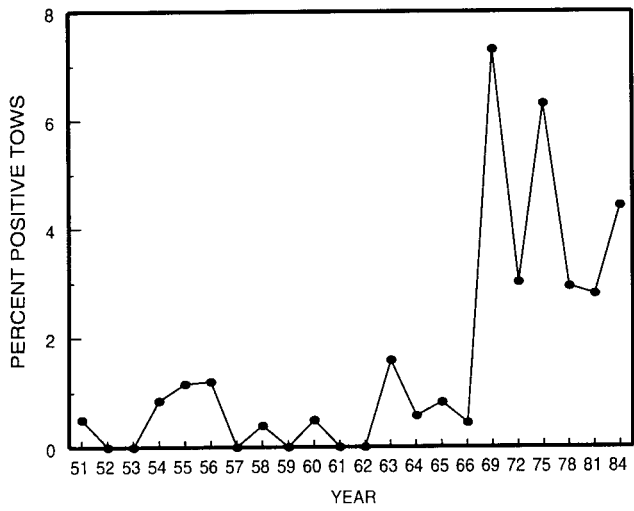


Bathylagus milleri

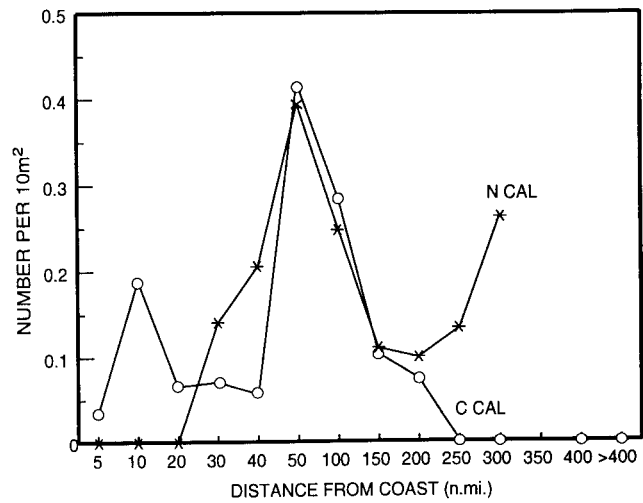
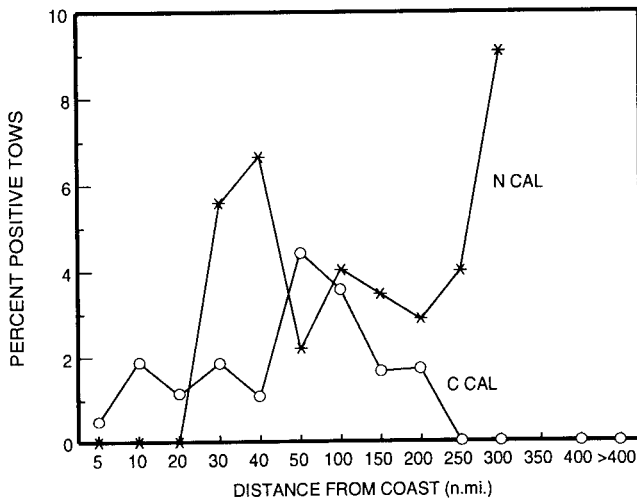
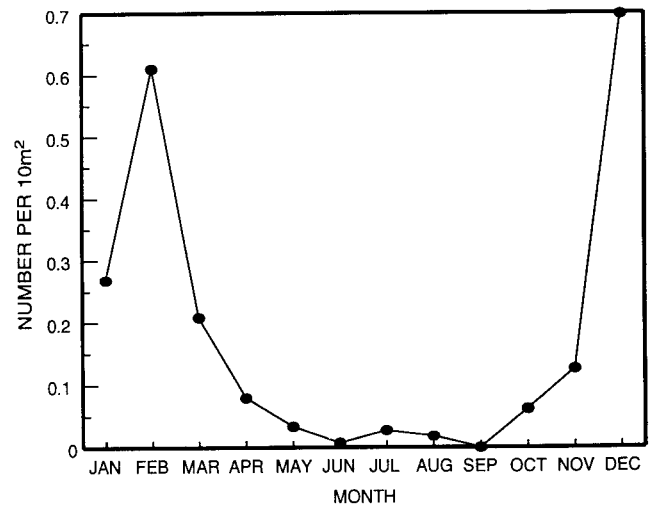
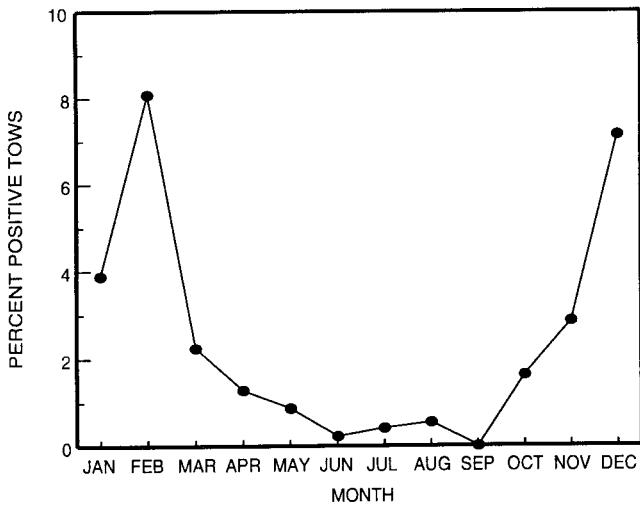
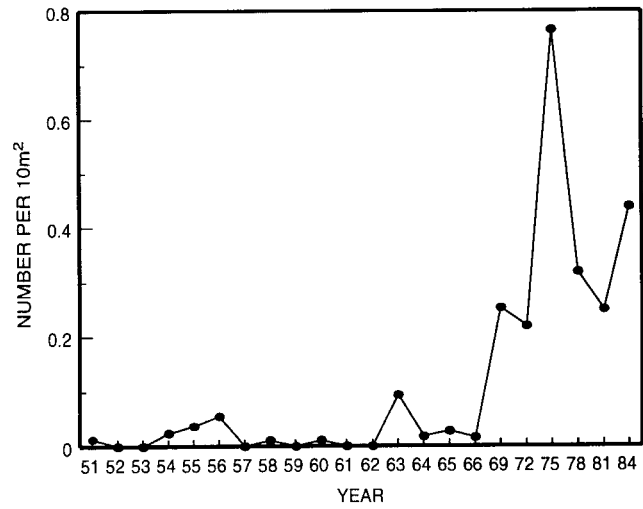
Bathylagidae



Robust blacksmelt

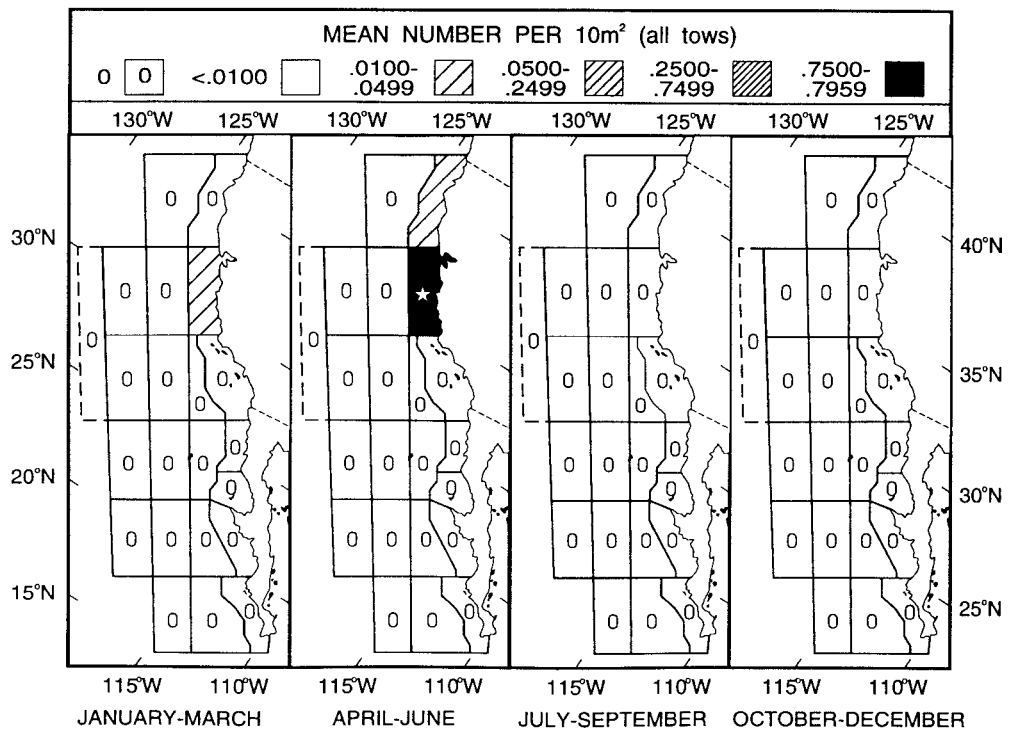
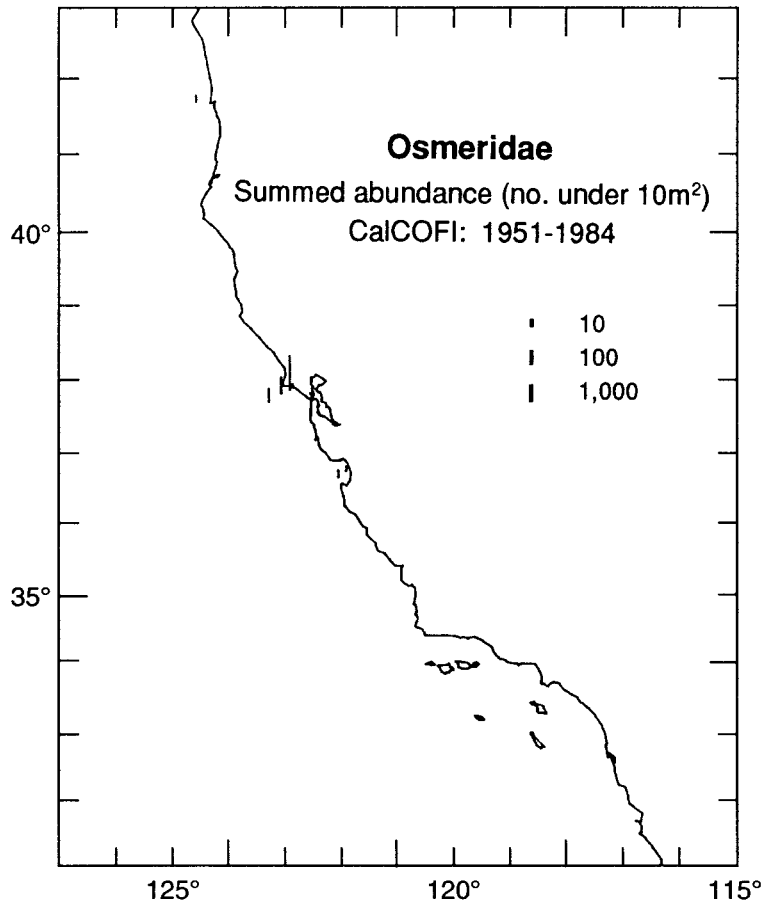


Bathylagus milleri

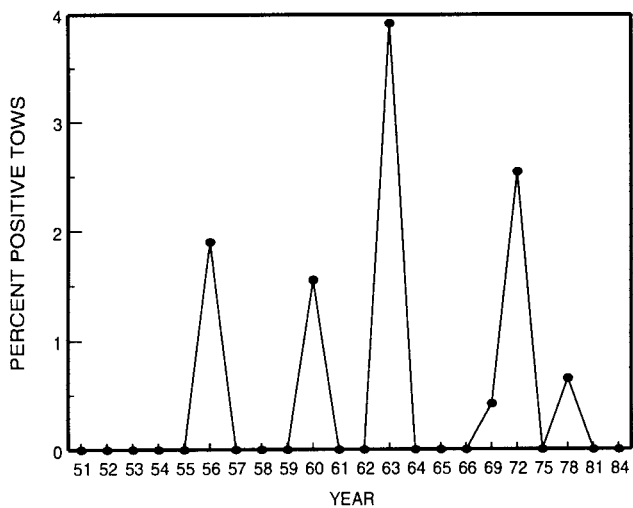


Osmeridae

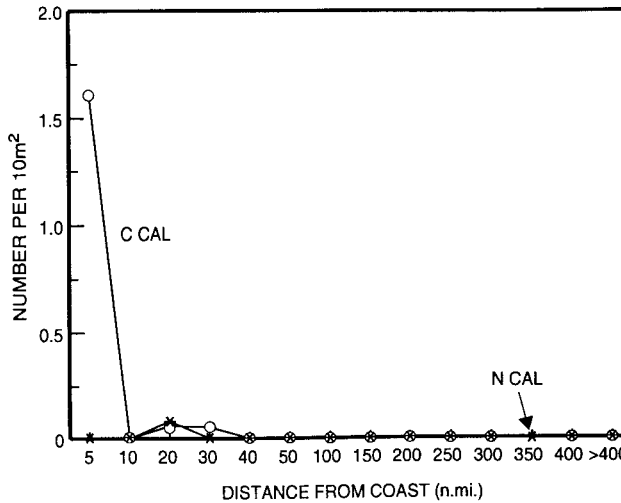
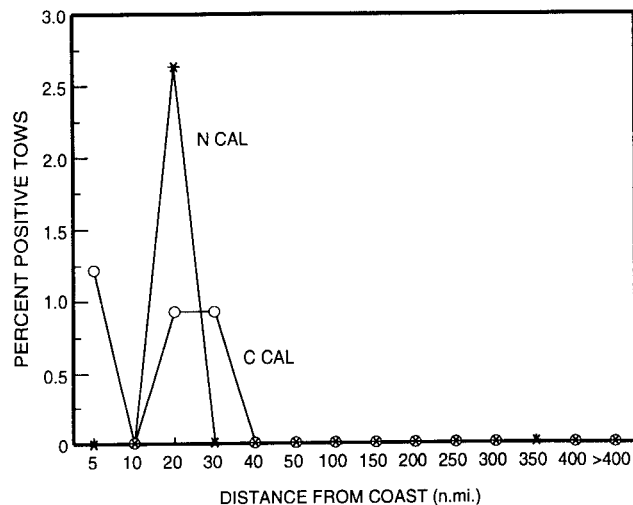
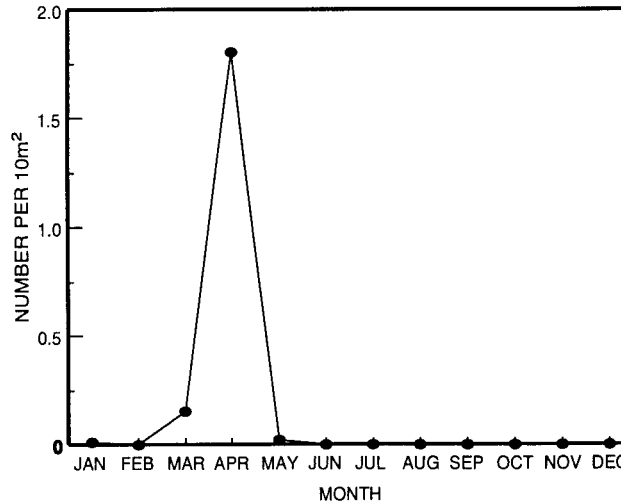
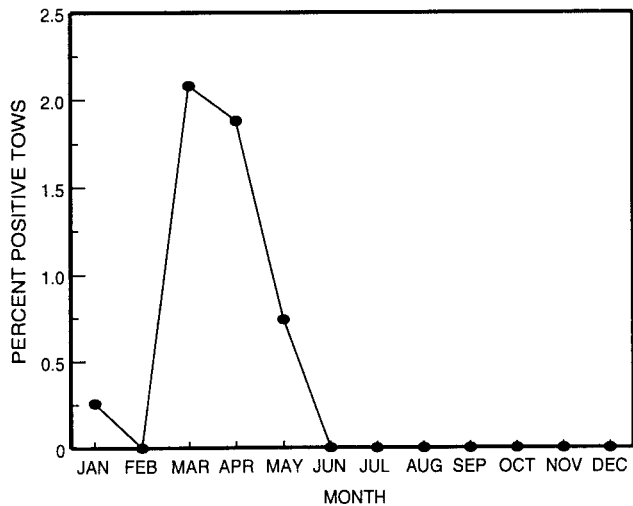
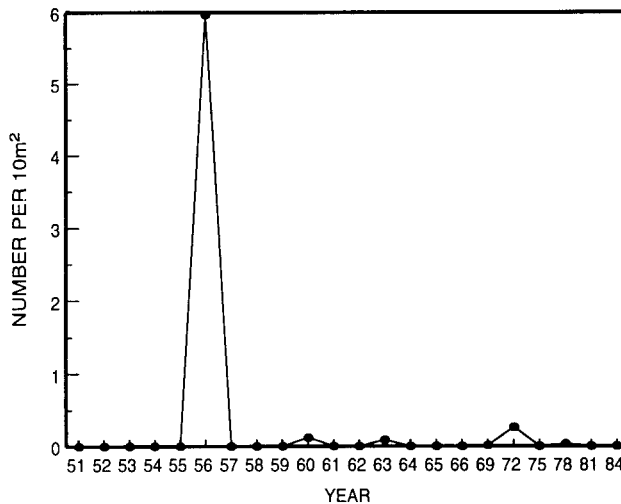
Osmeridae



Smelts

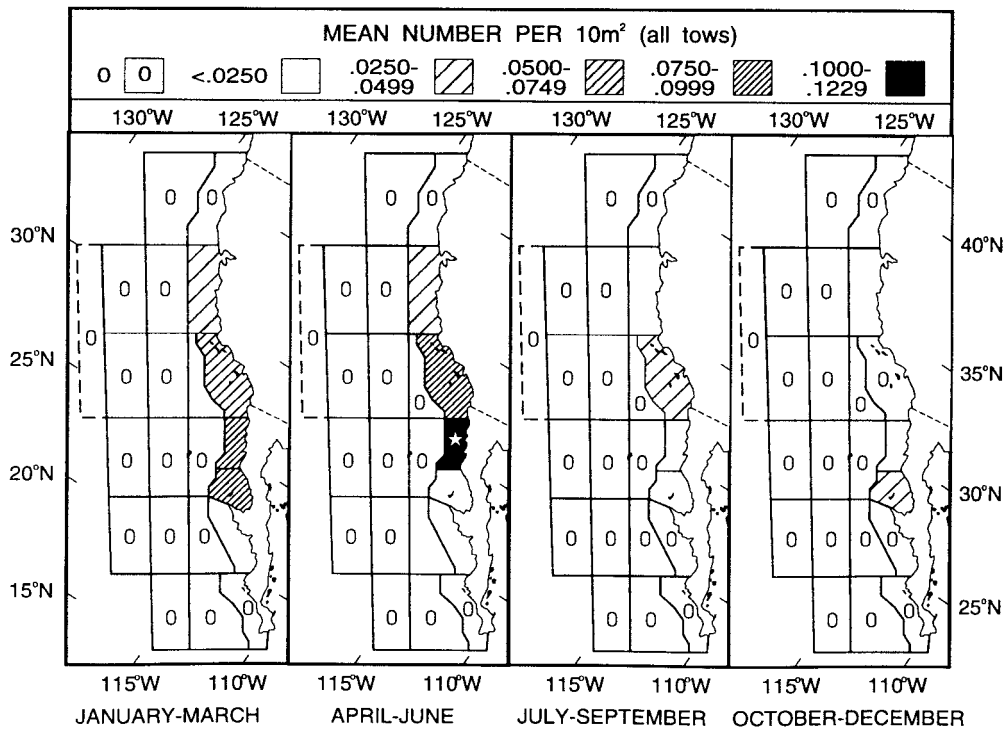
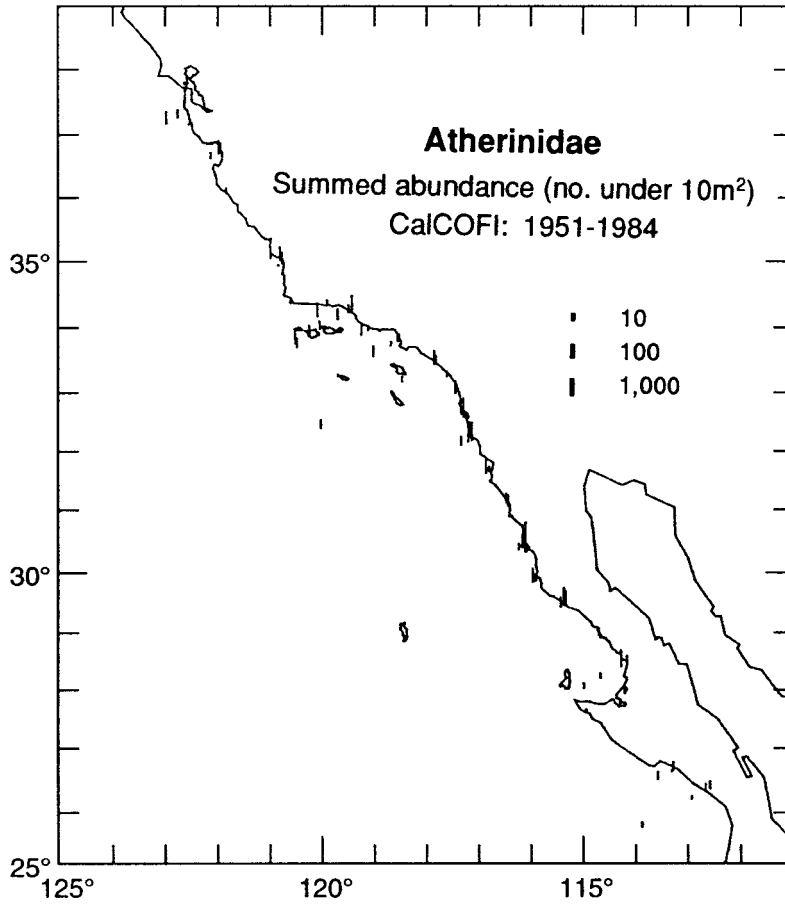


Osmeridae

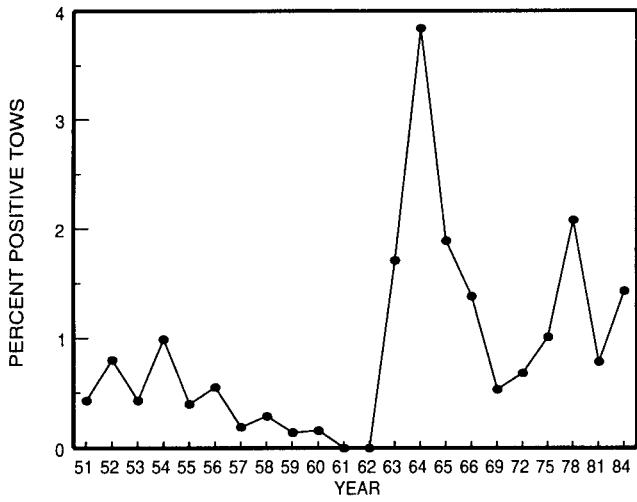


Atherinidae

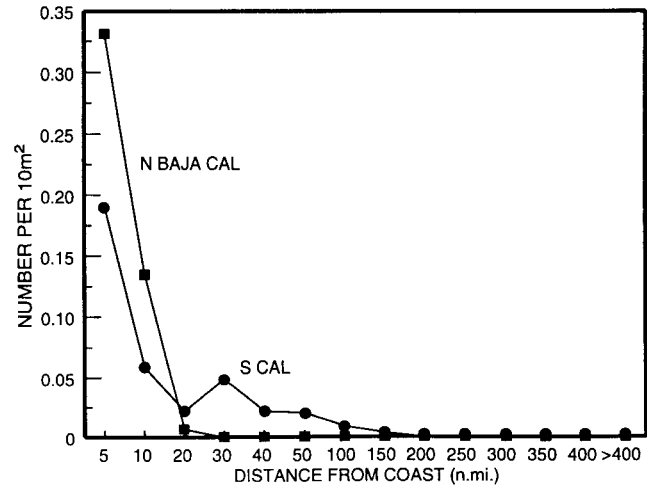
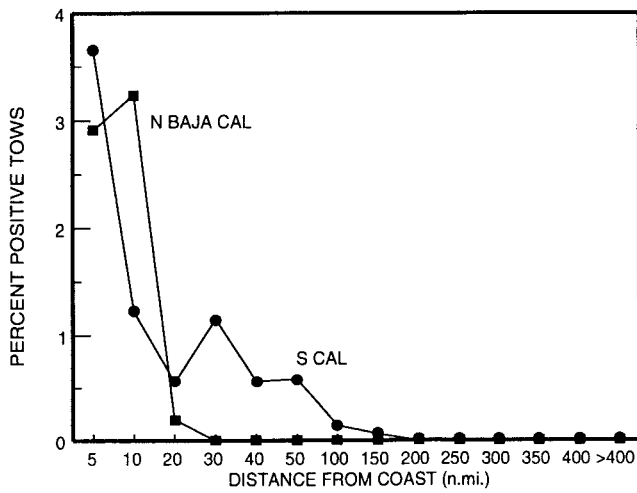
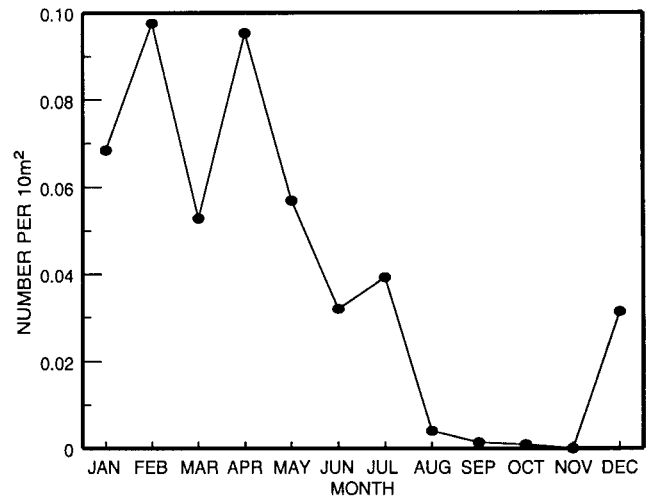
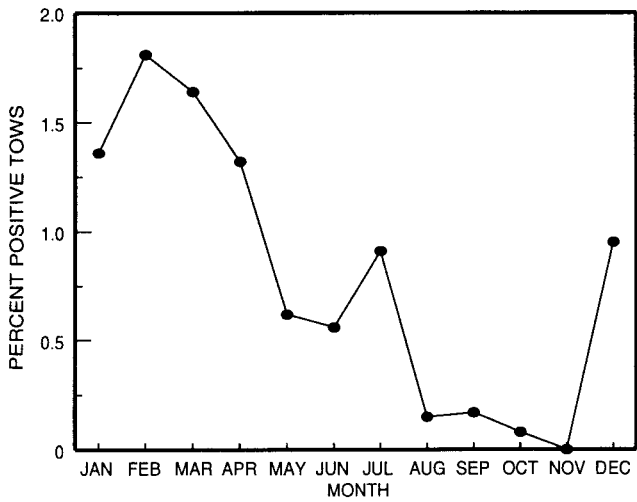
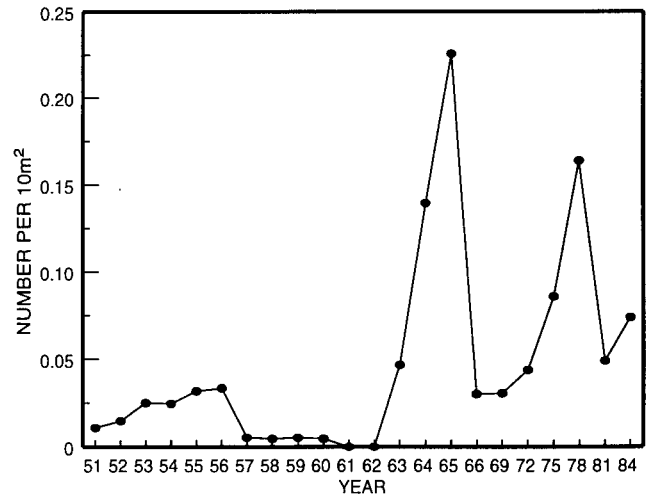
Atherinidae



Topsmelts

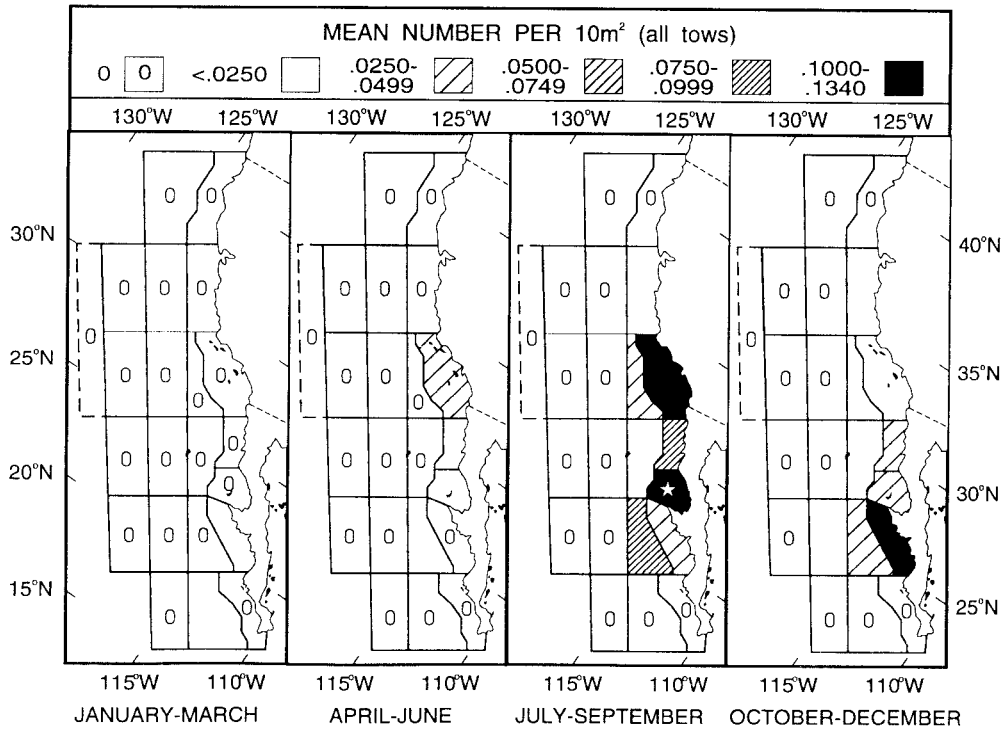
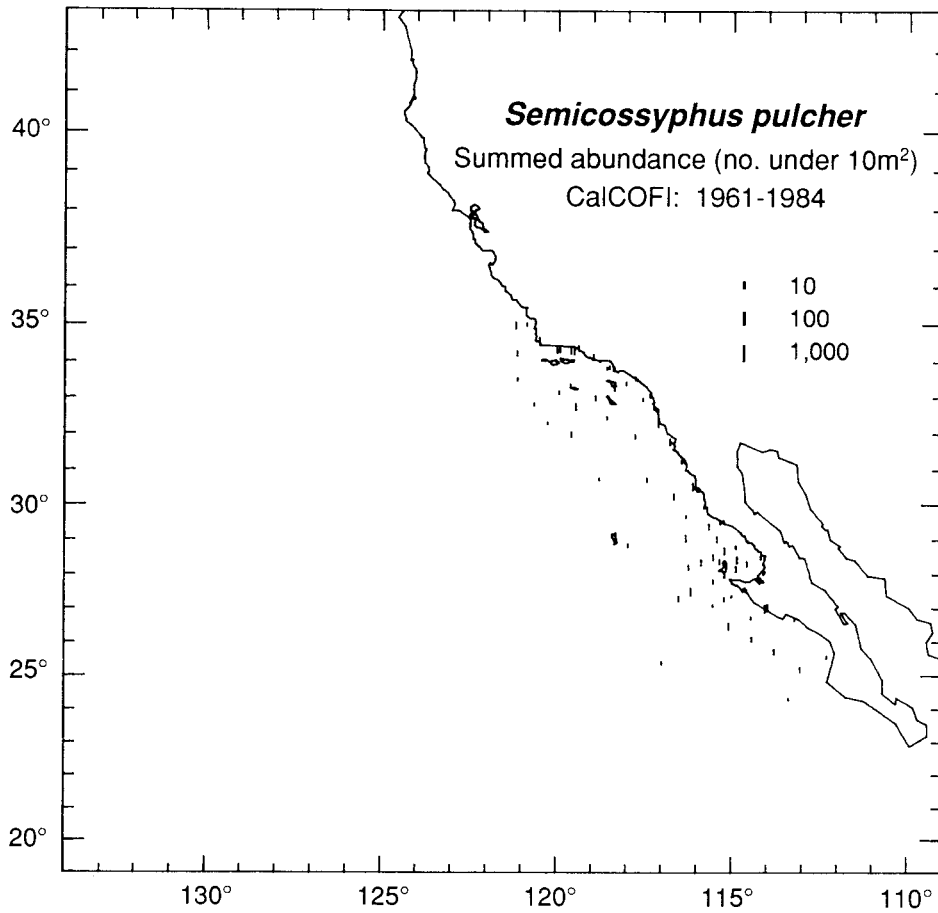


Atherinidae

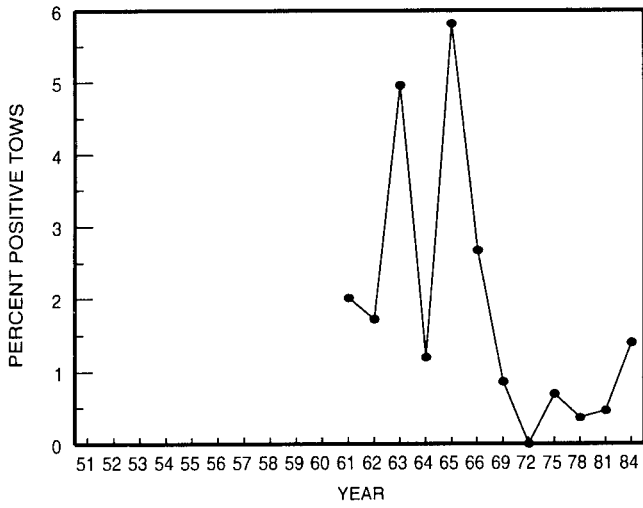


Semicossyphus pulcher

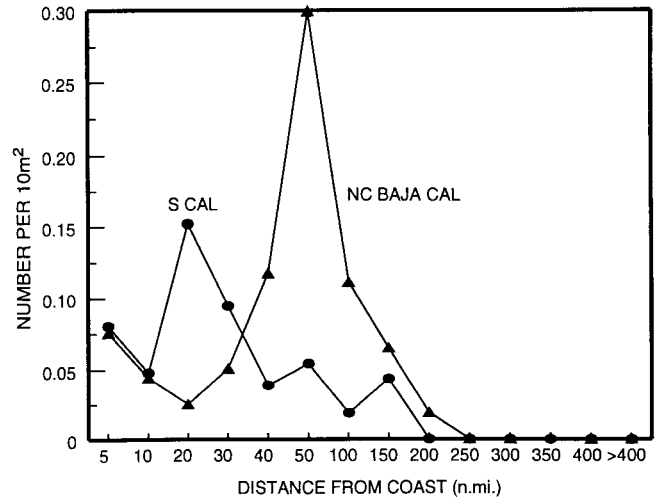
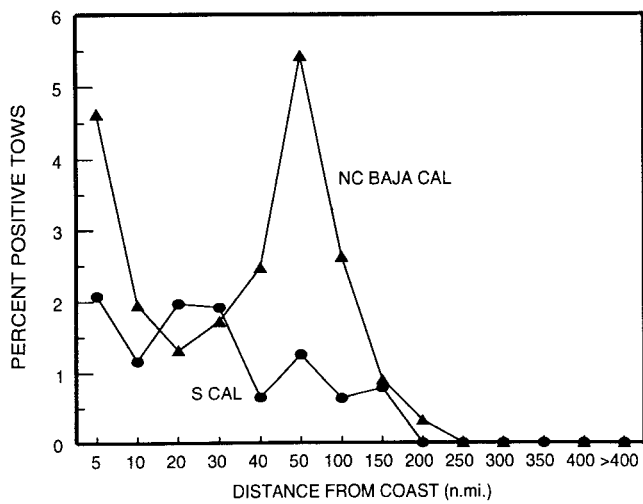
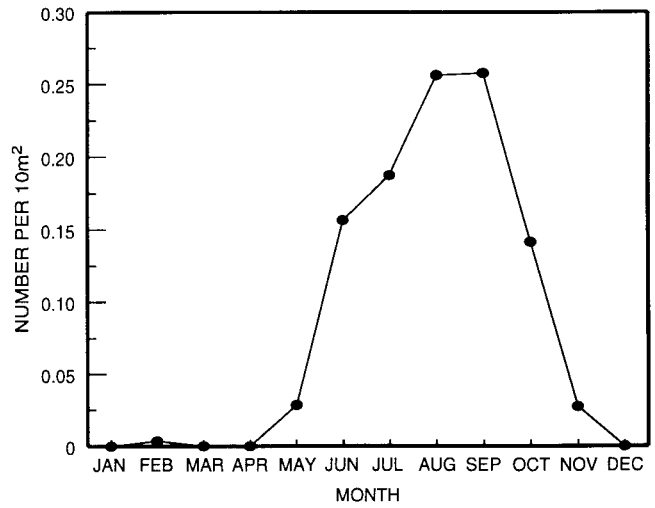
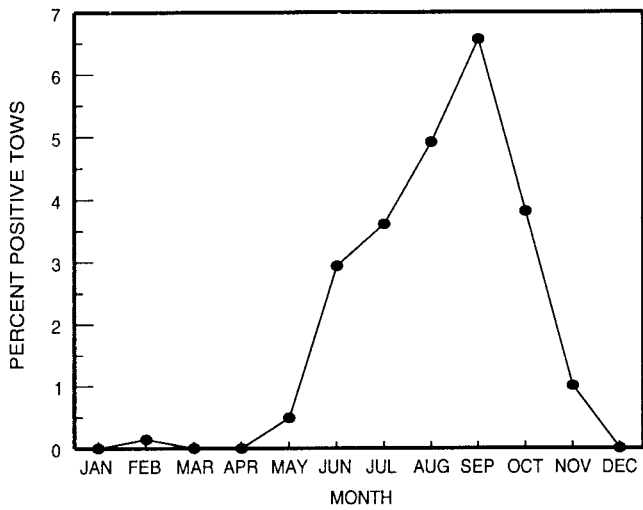
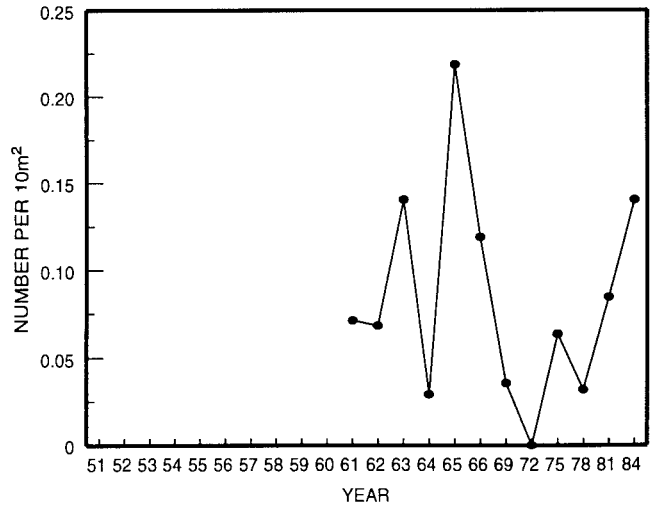
Labridae



Sheephead

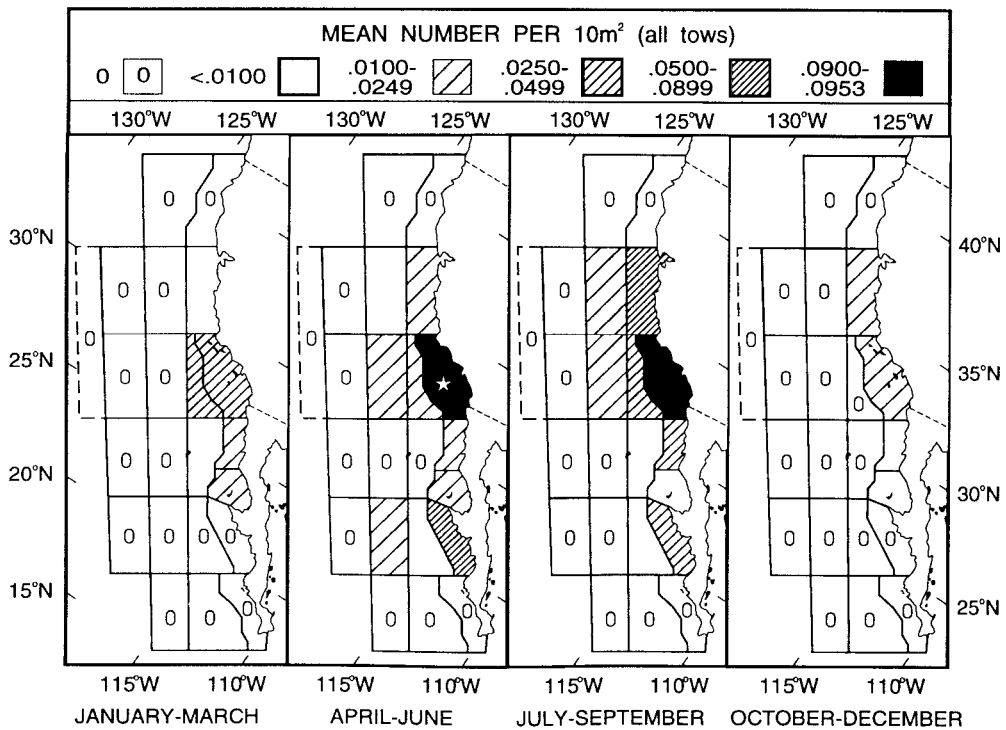
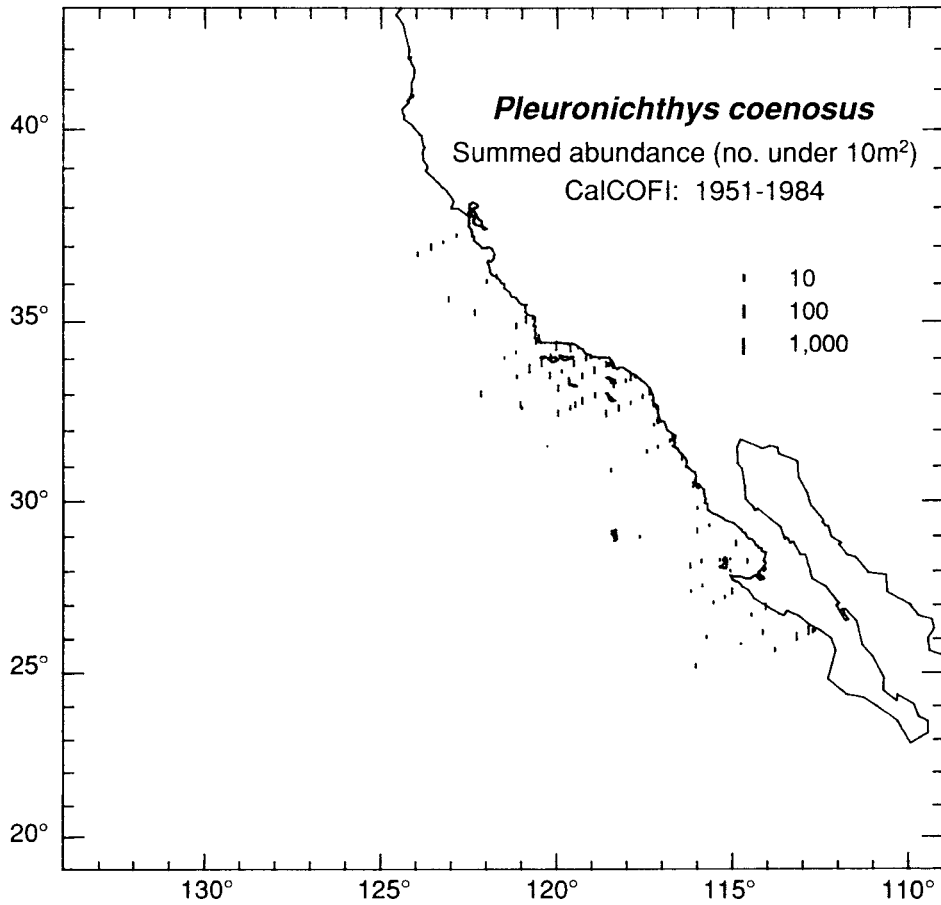


Semicossyphus pulcher

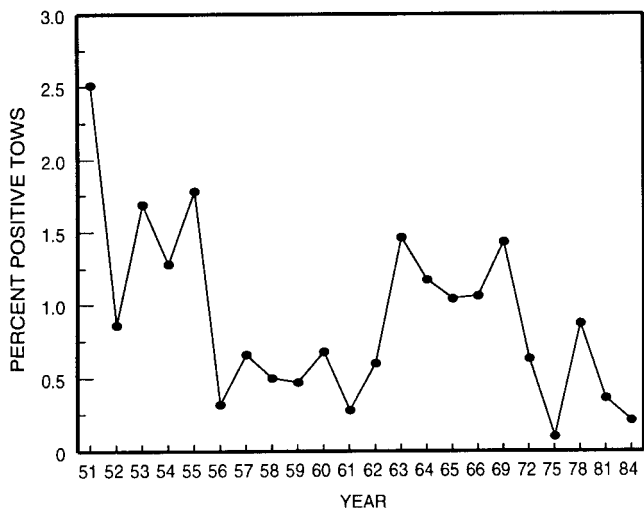


Pleuronichthys coenosus

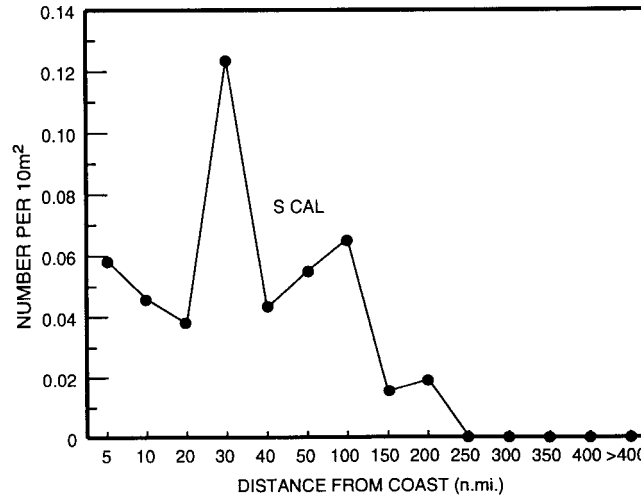
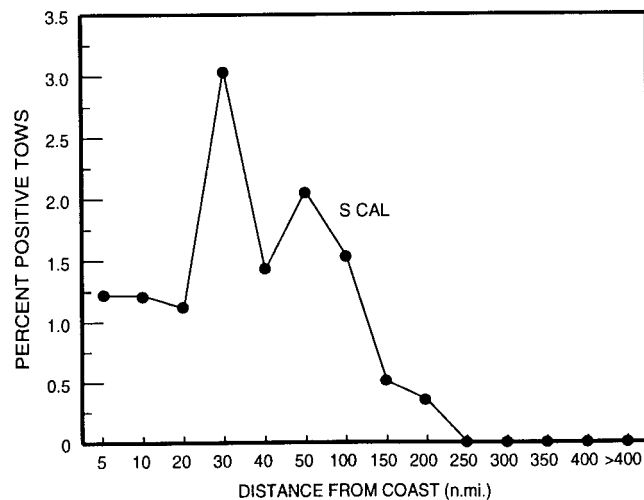
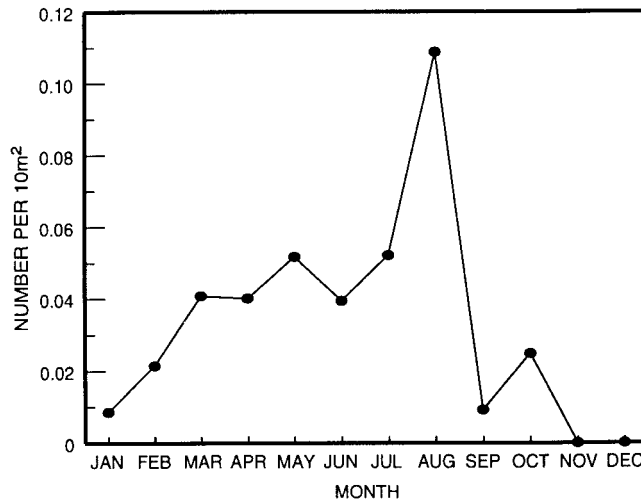
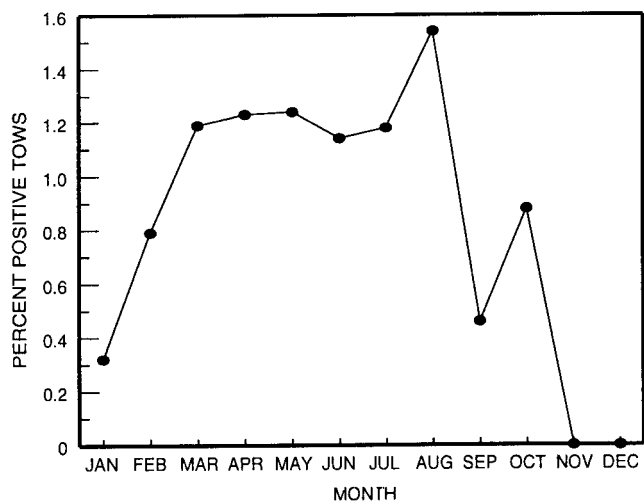
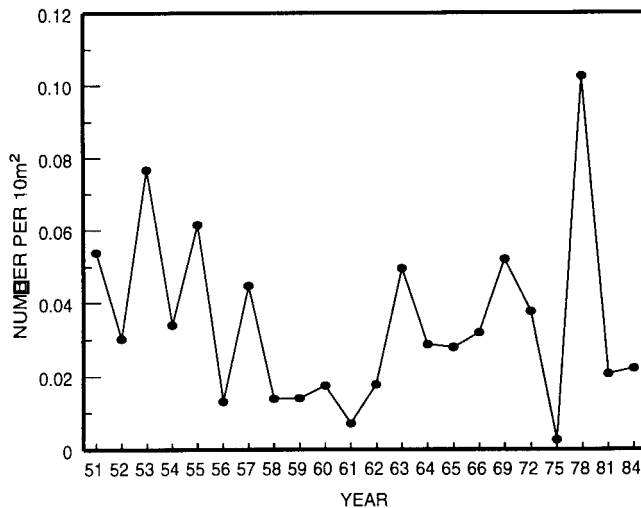
Pleuronectidae



C-O turbot

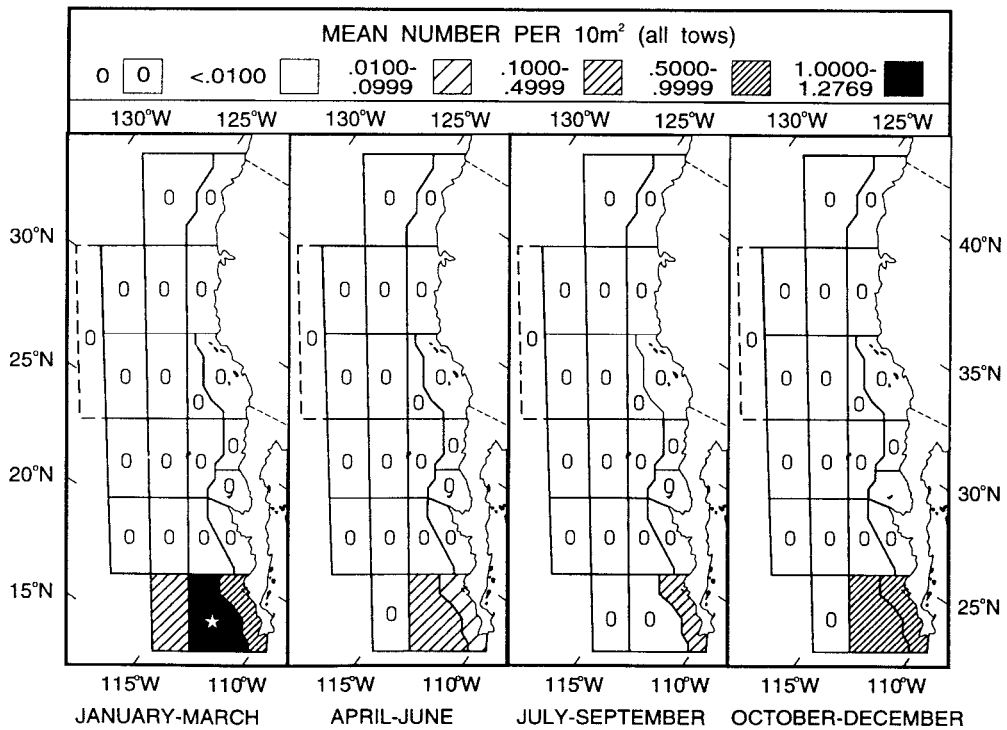
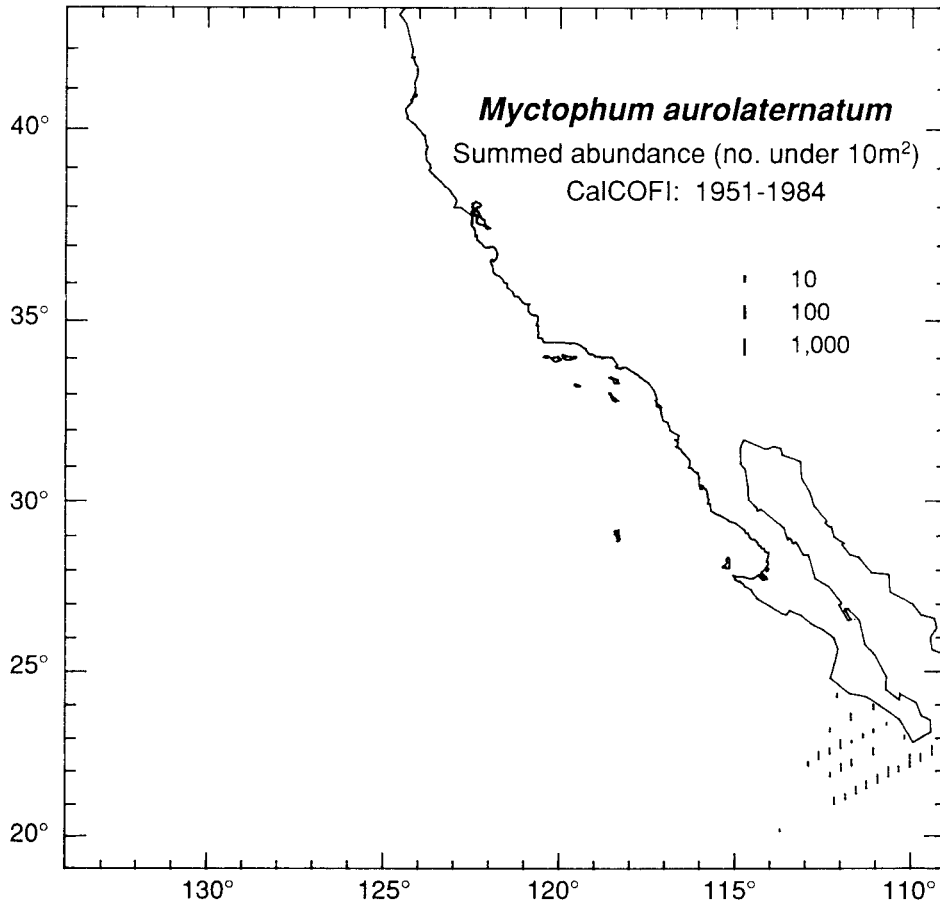


Pleuronichthys coenosus

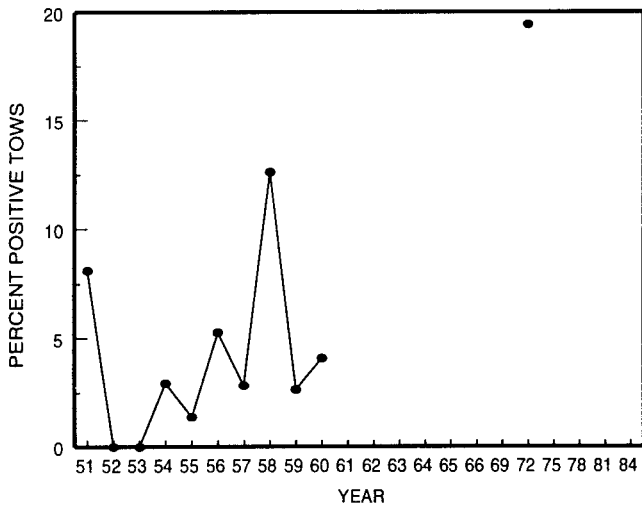


Myctophum aurolaternatum

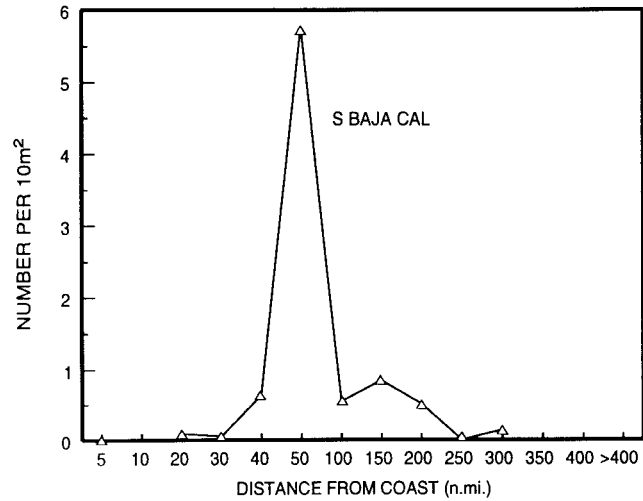
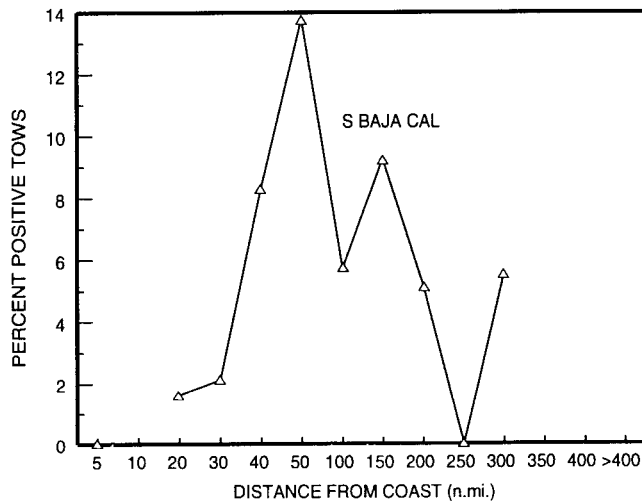
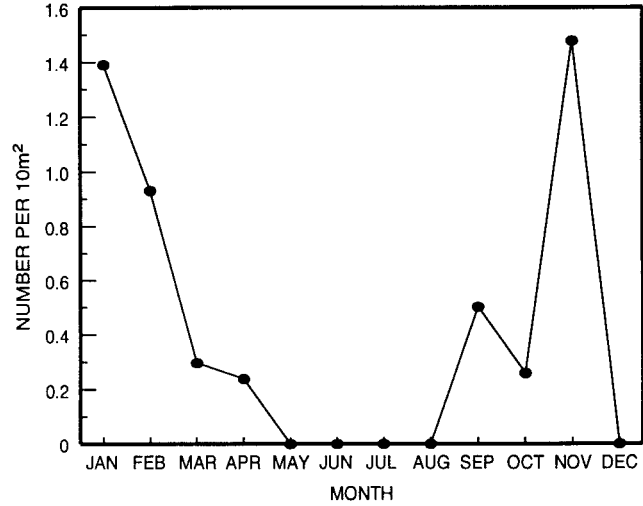
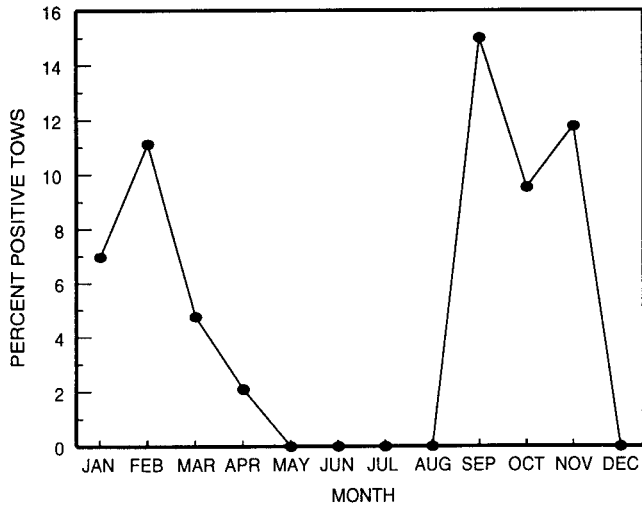
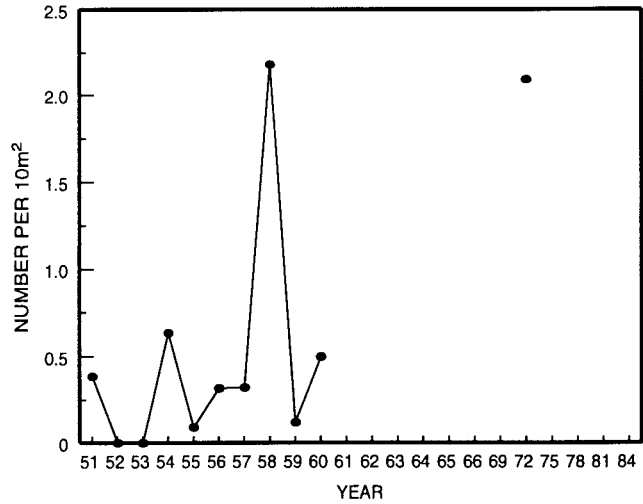
Myctophidae



Golden lanternfish

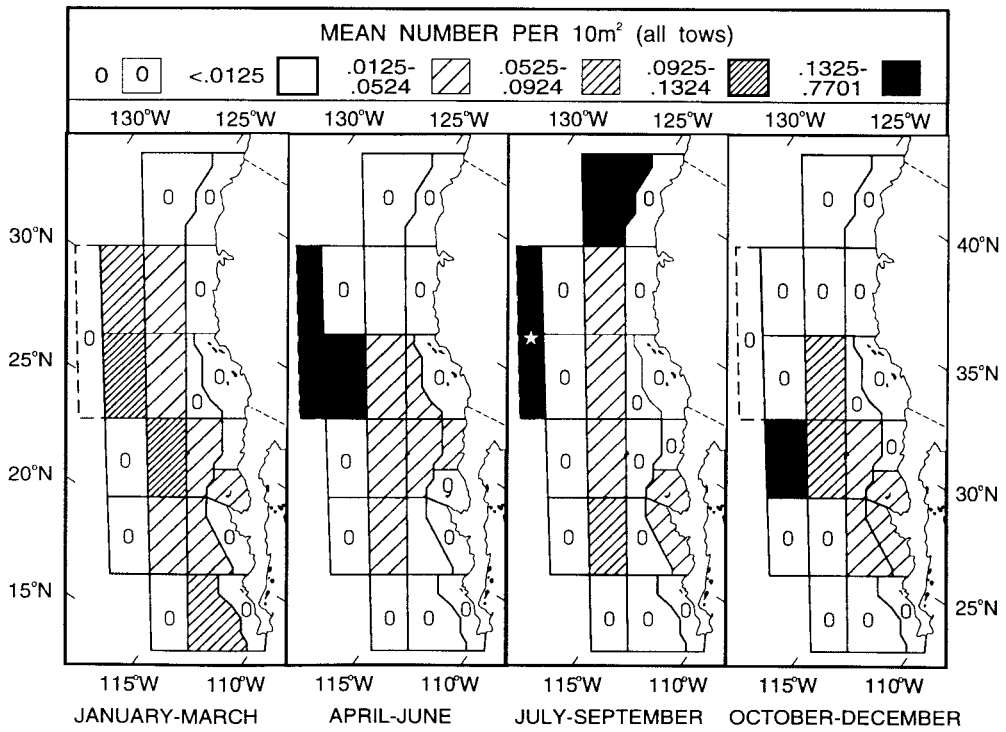
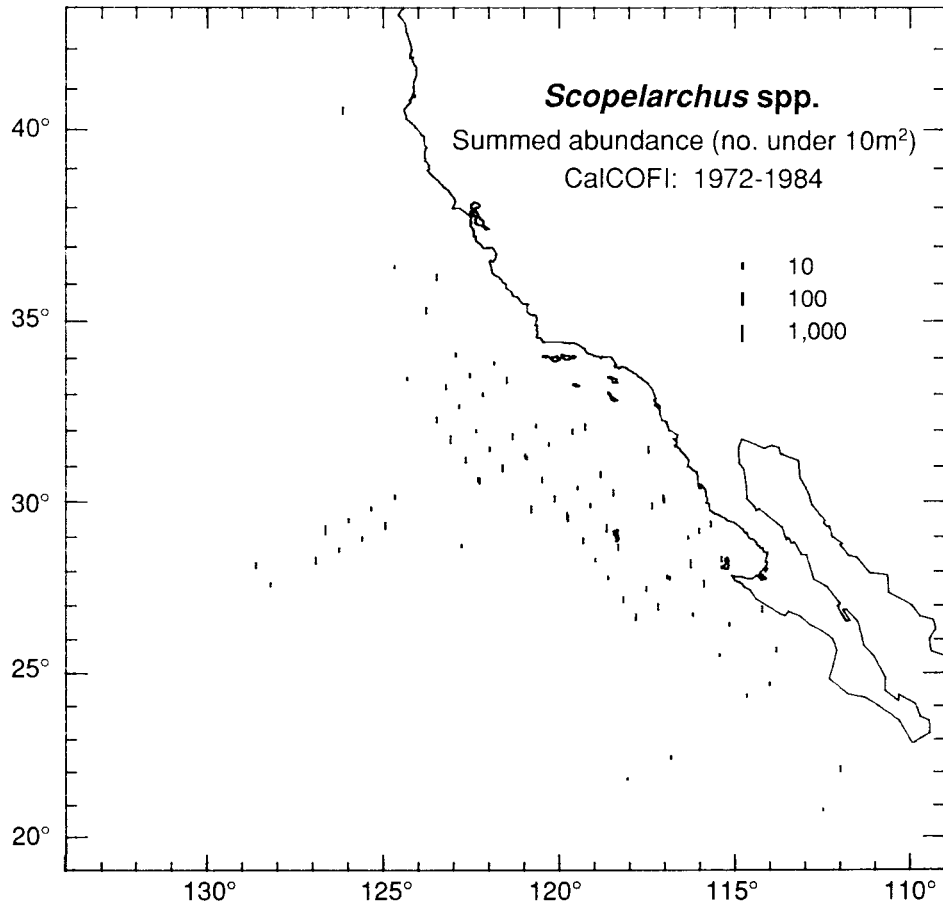


Myctophum aurolaternatum



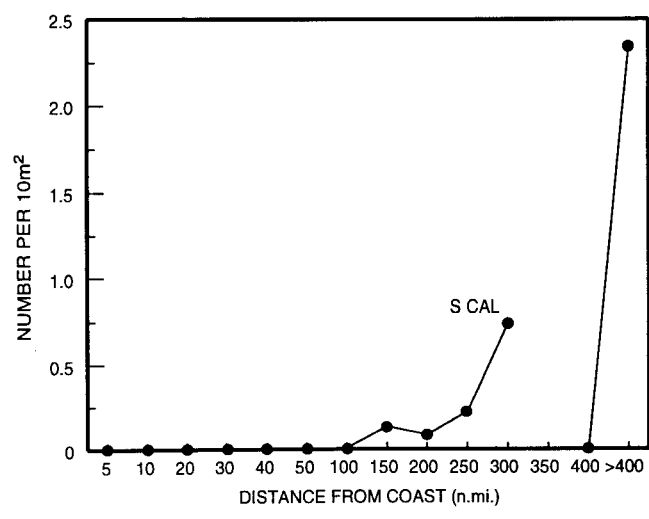
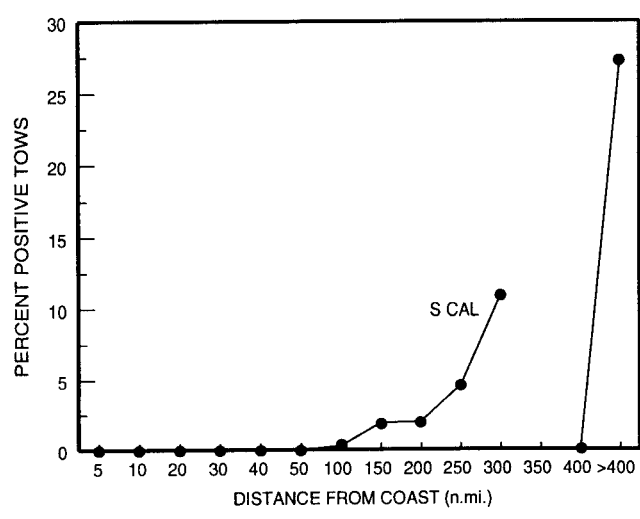
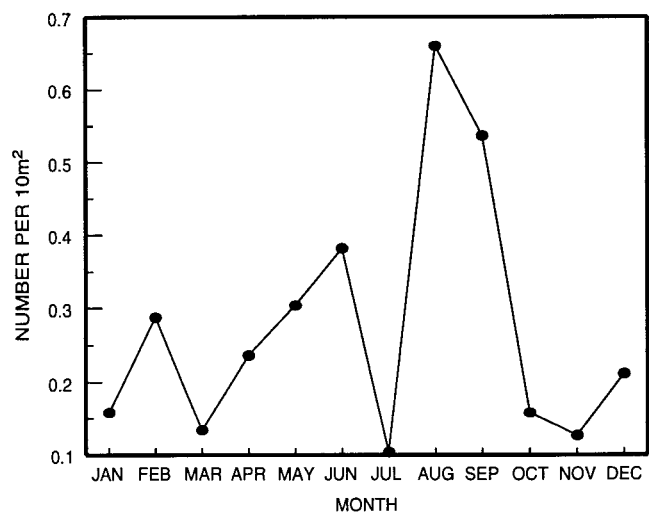
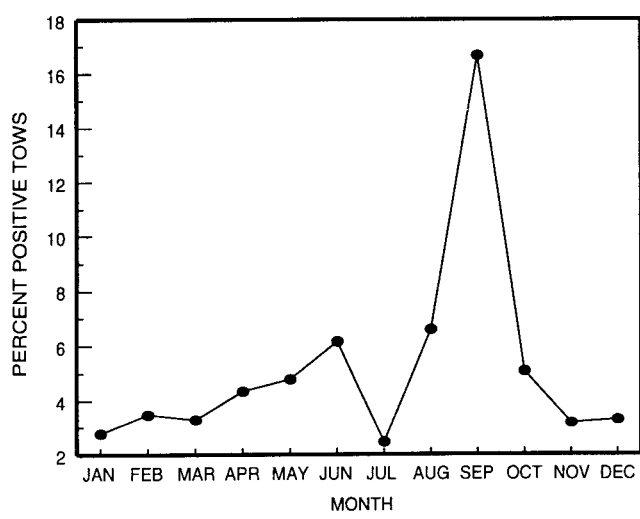
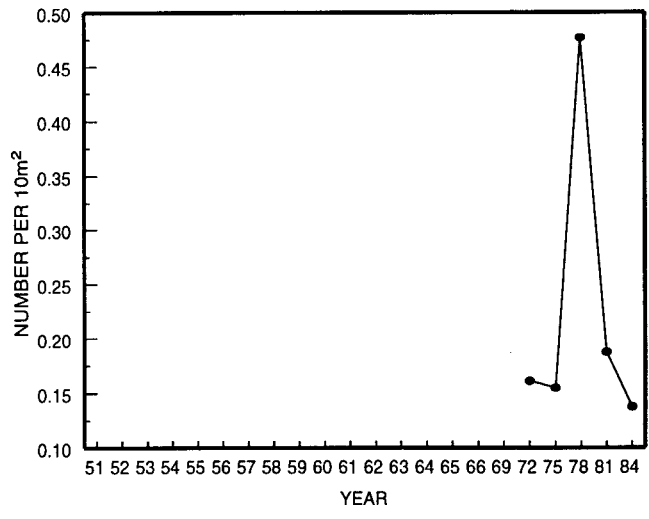
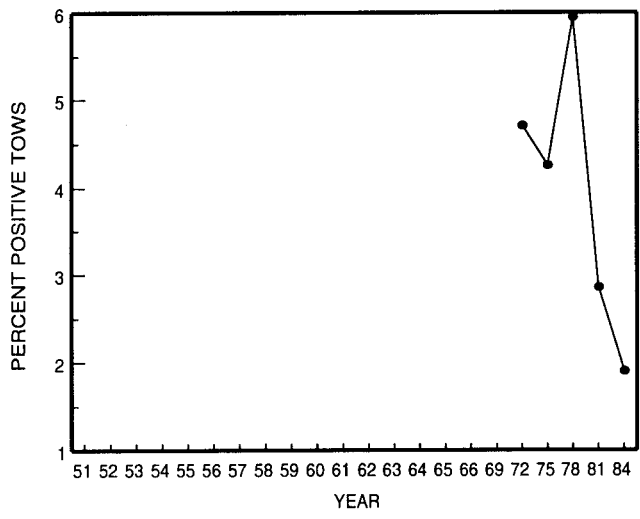
Scopelarchus spp.

Scopelarchidae



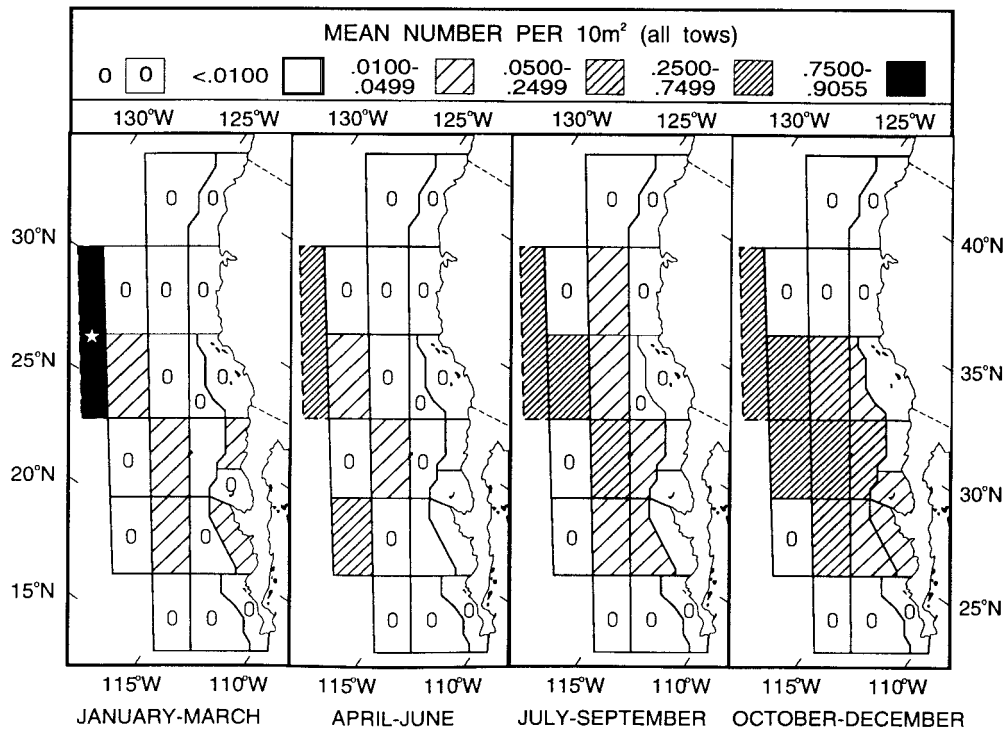
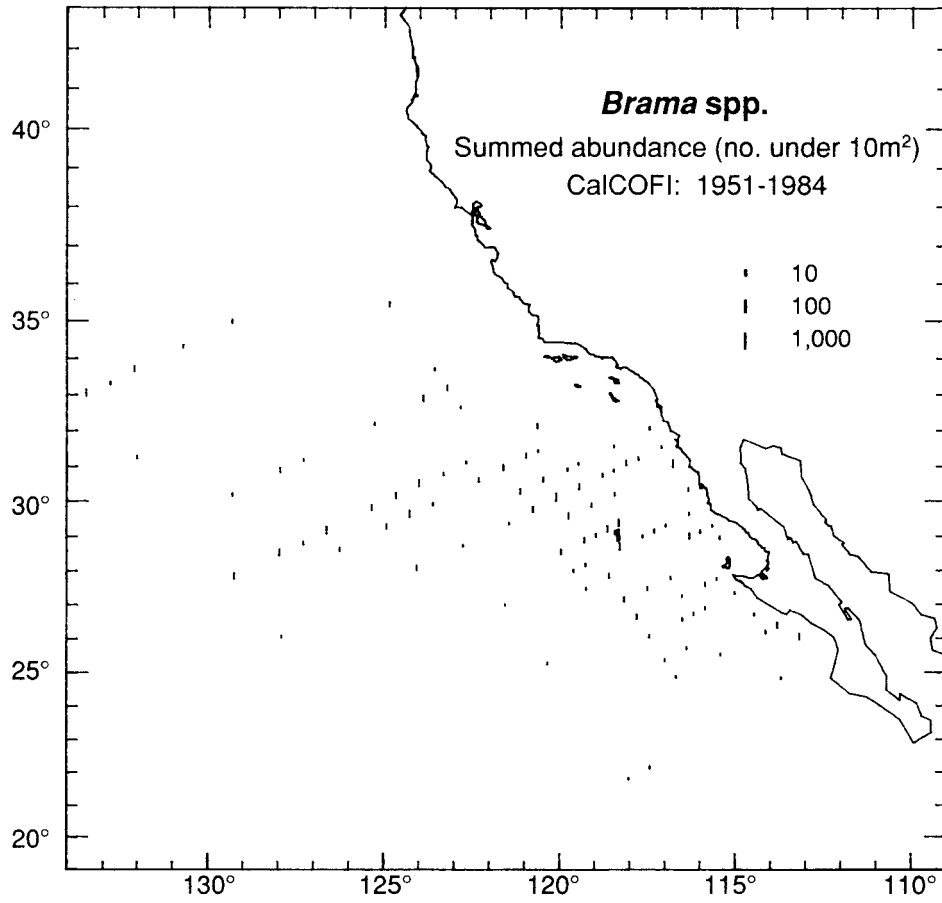
Pearleyes

Scopelarchus spp.

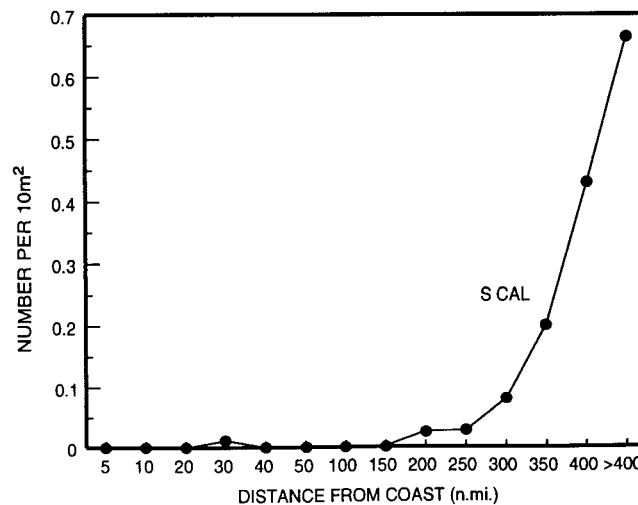
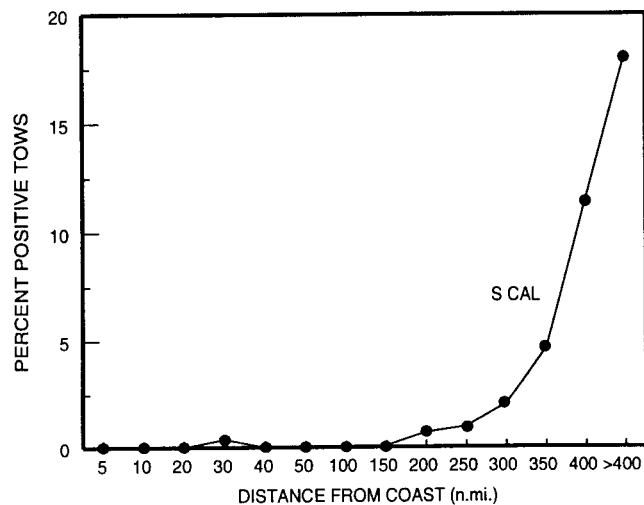
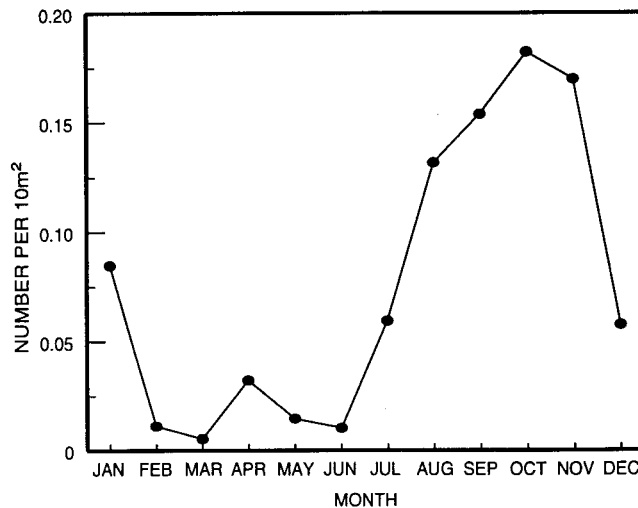
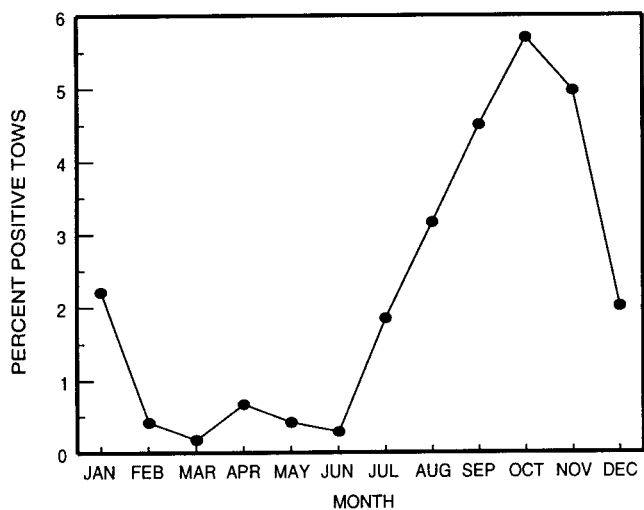
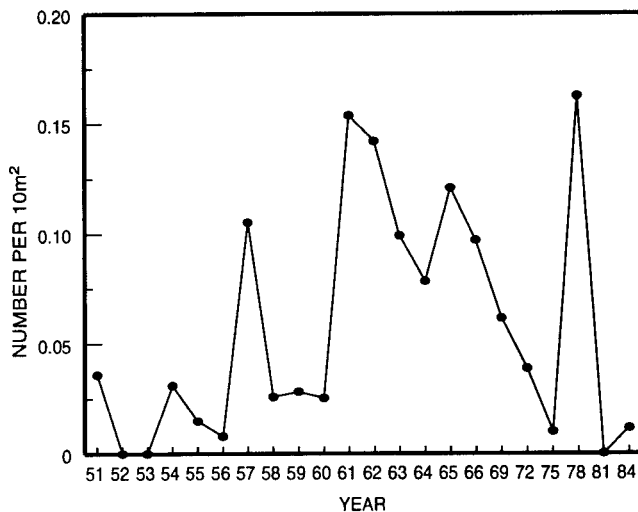
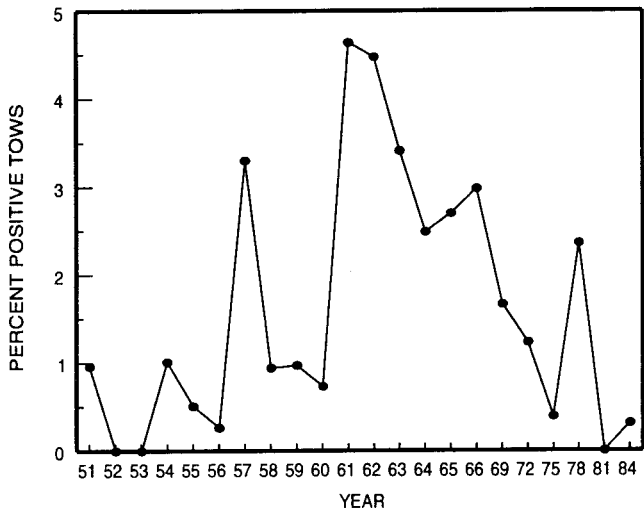


Brama spp.

Bramidae

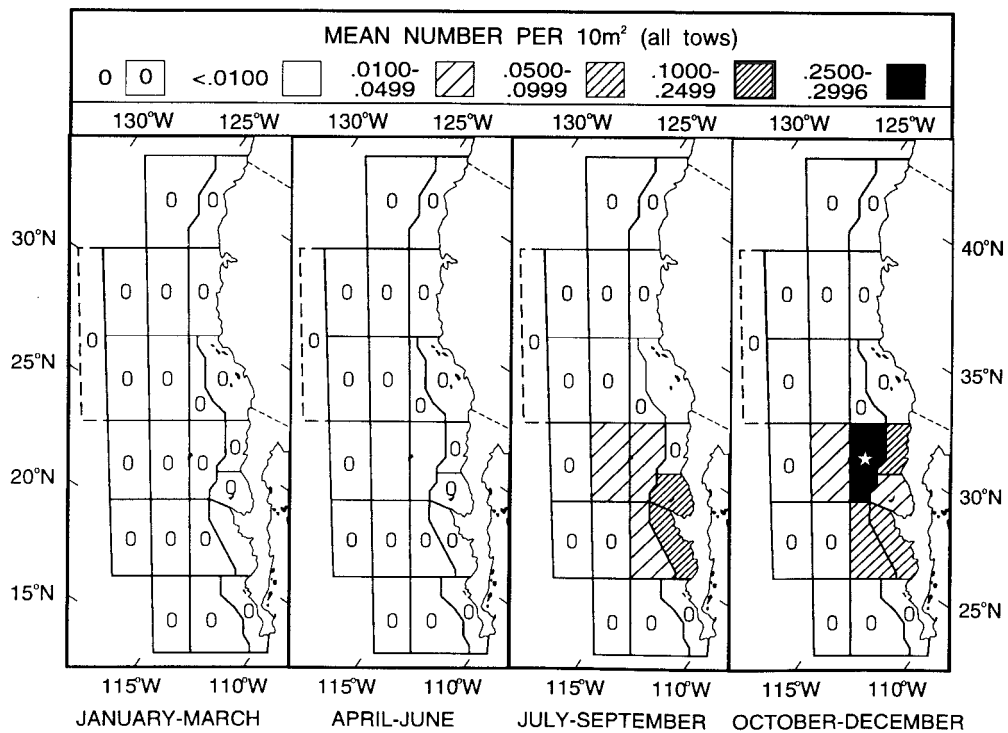
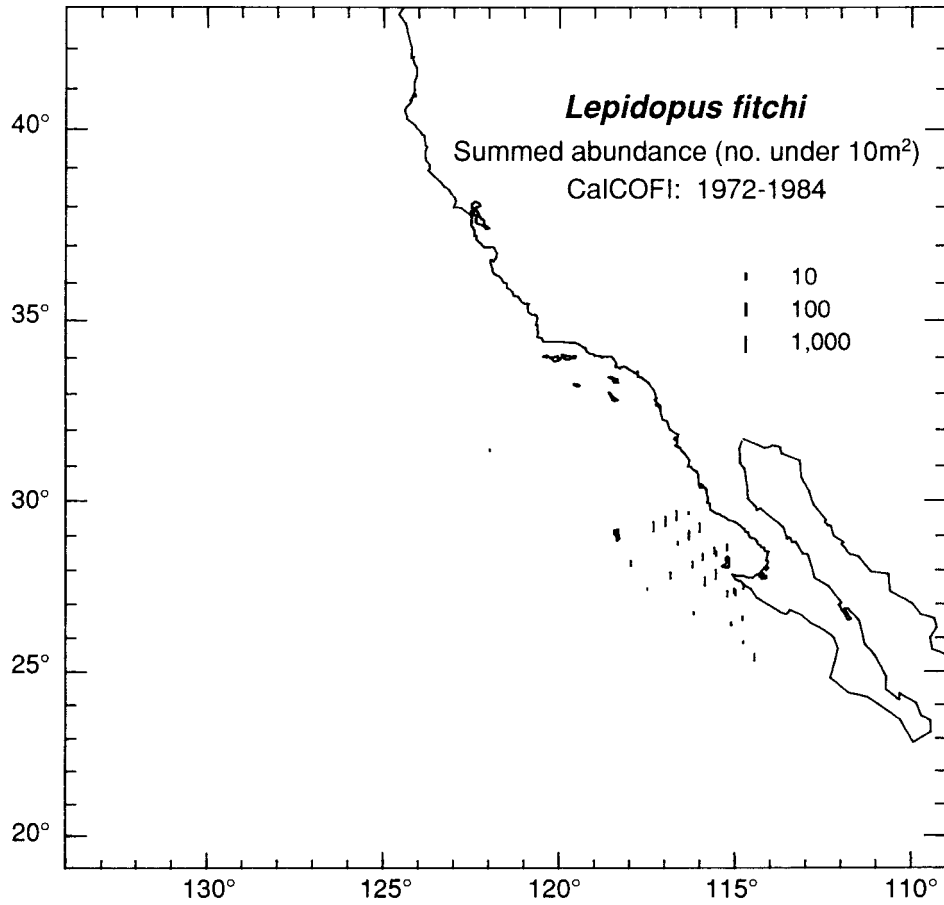


Pomfrets

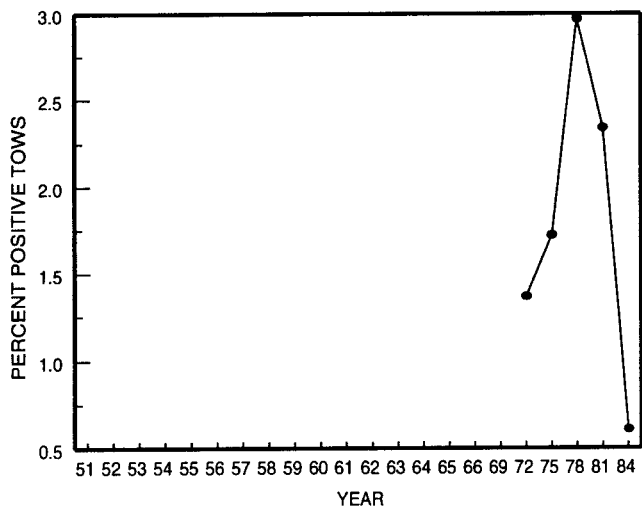


Lepidopus fitchi

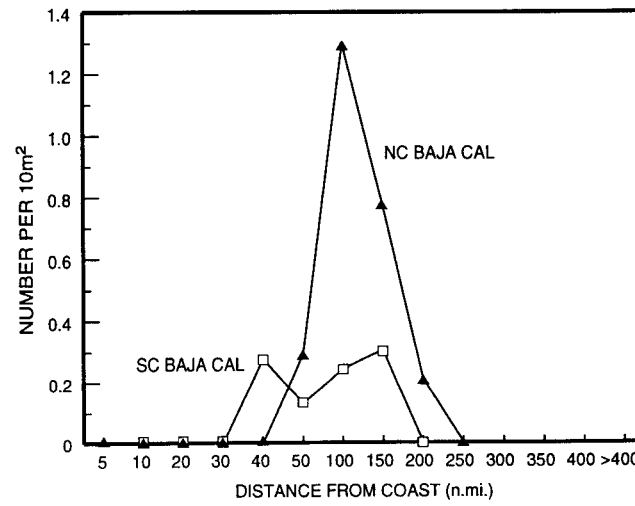
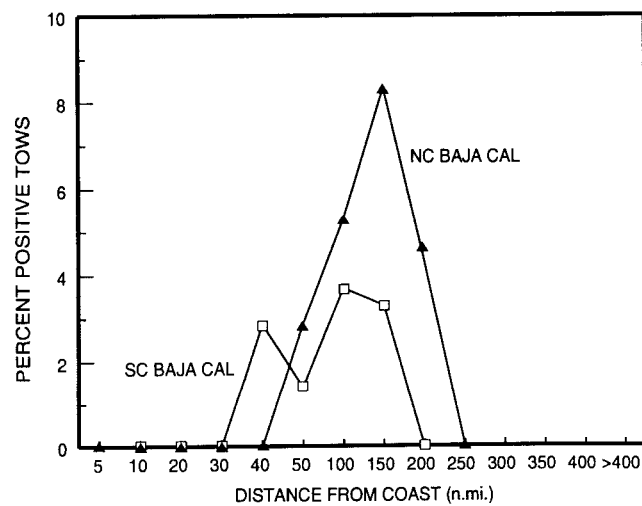
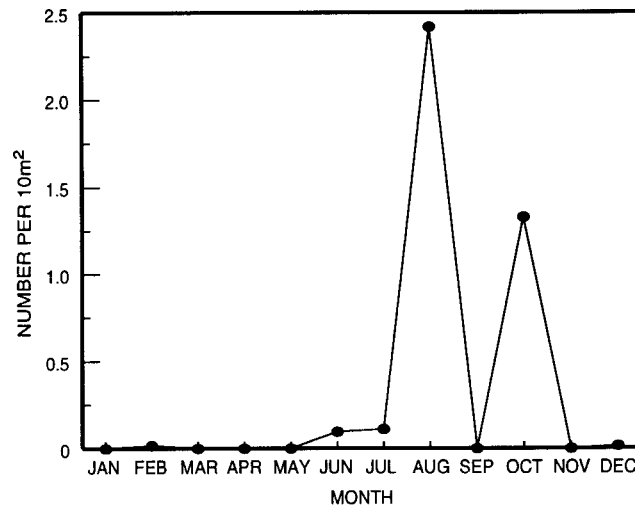
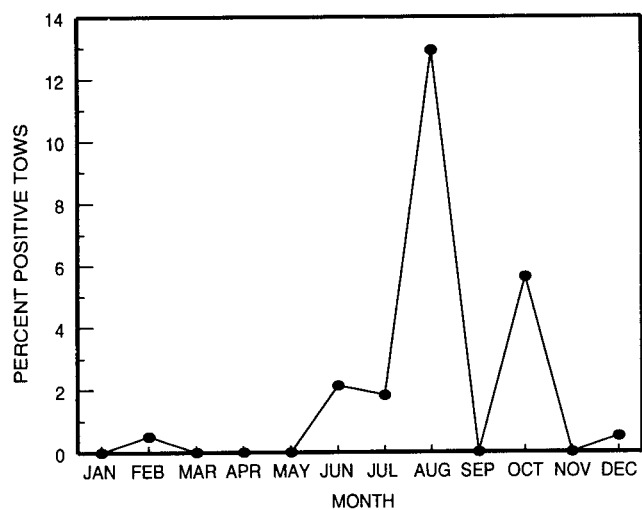
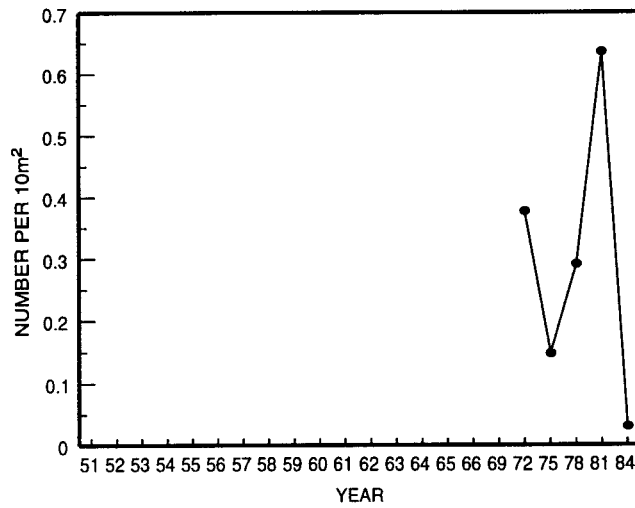
Trichiuridae



Pacific scabbardfish

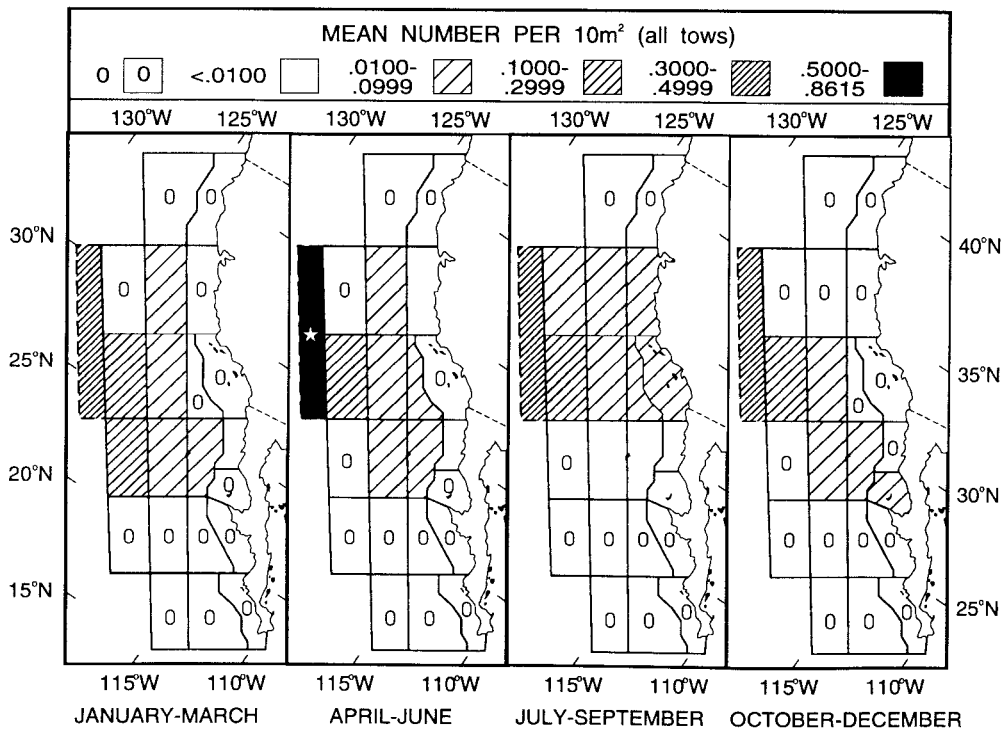
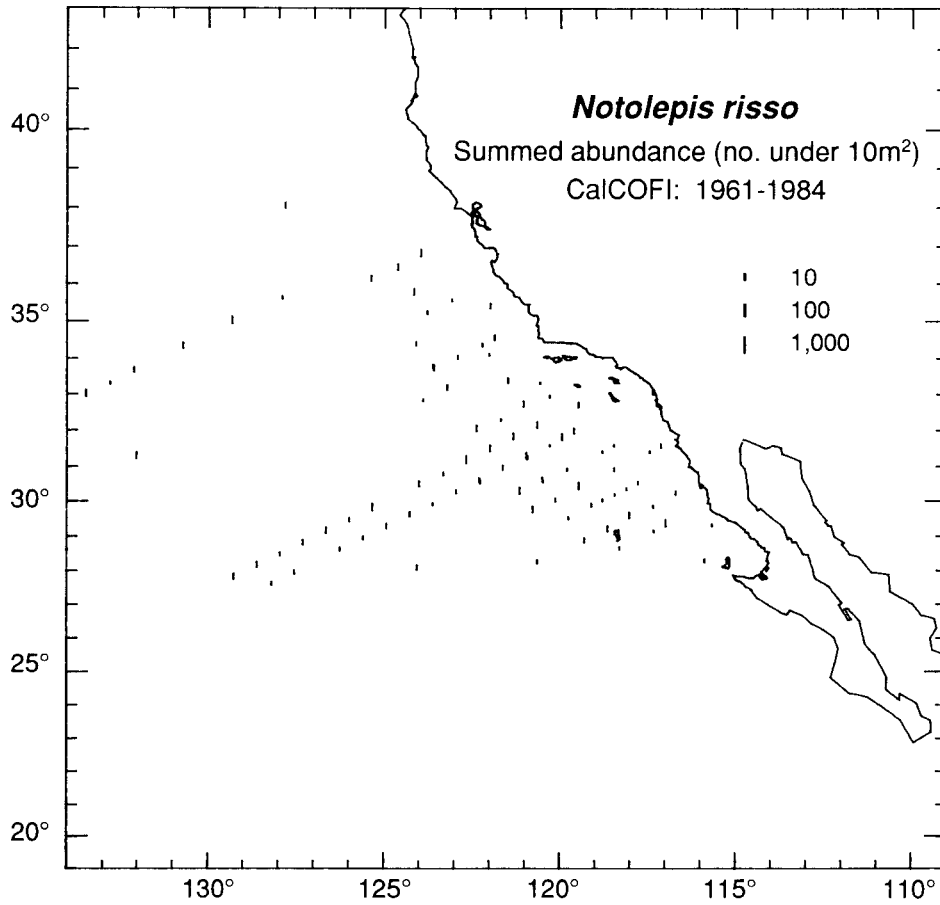


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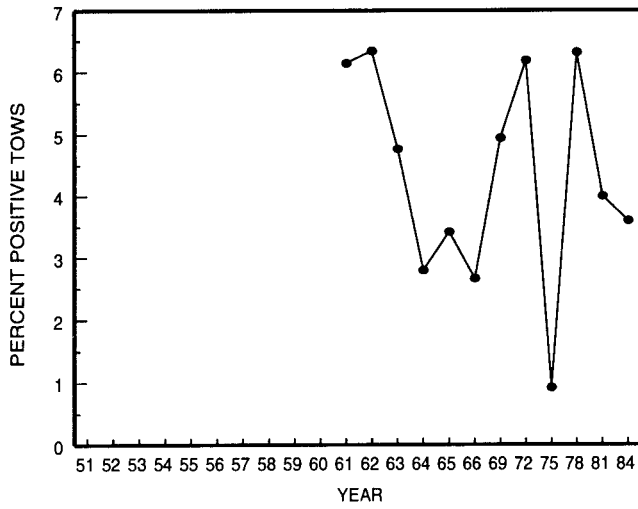
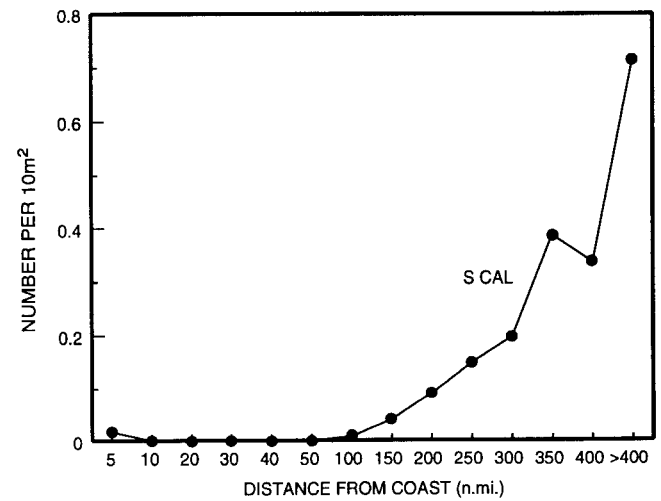
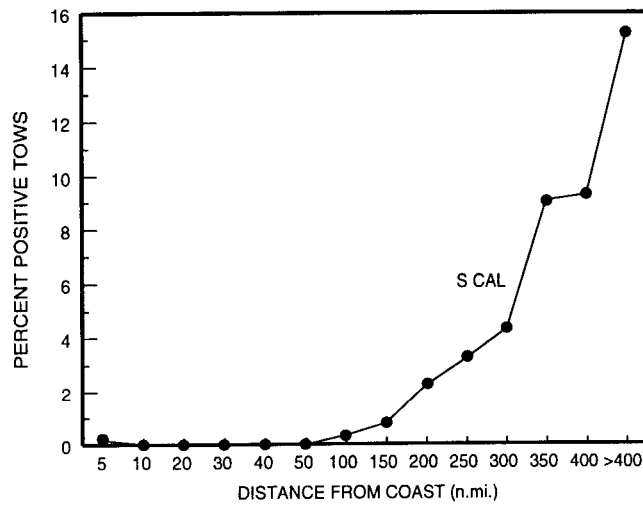
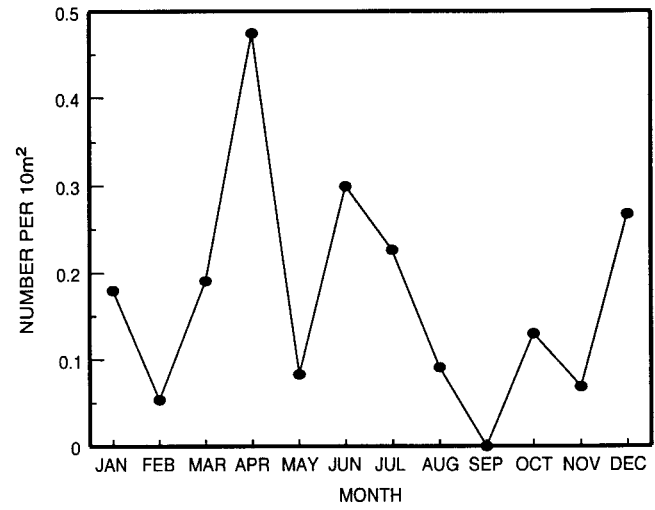
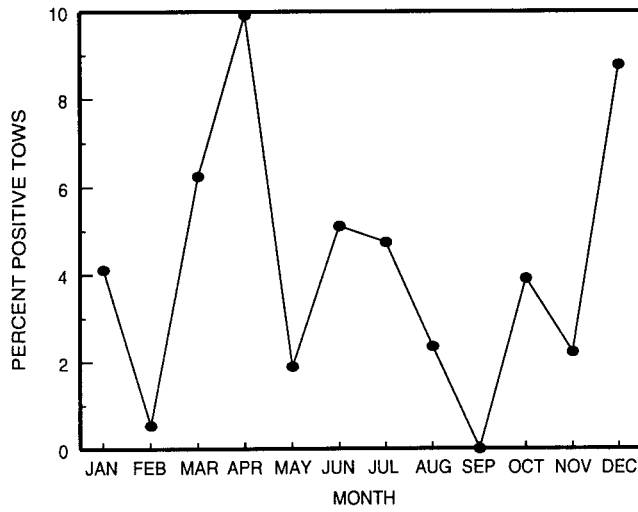
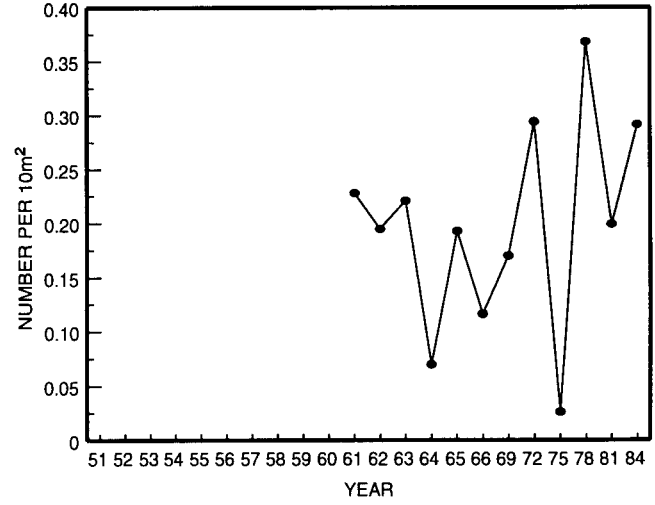


Notolepis risso

Paralepididae

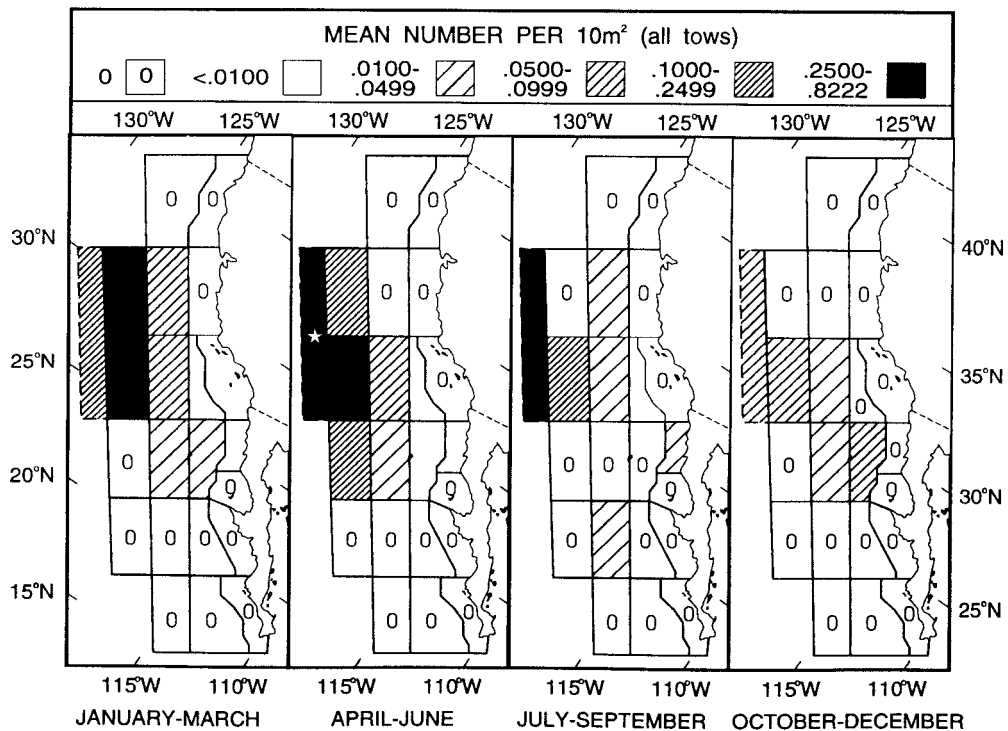
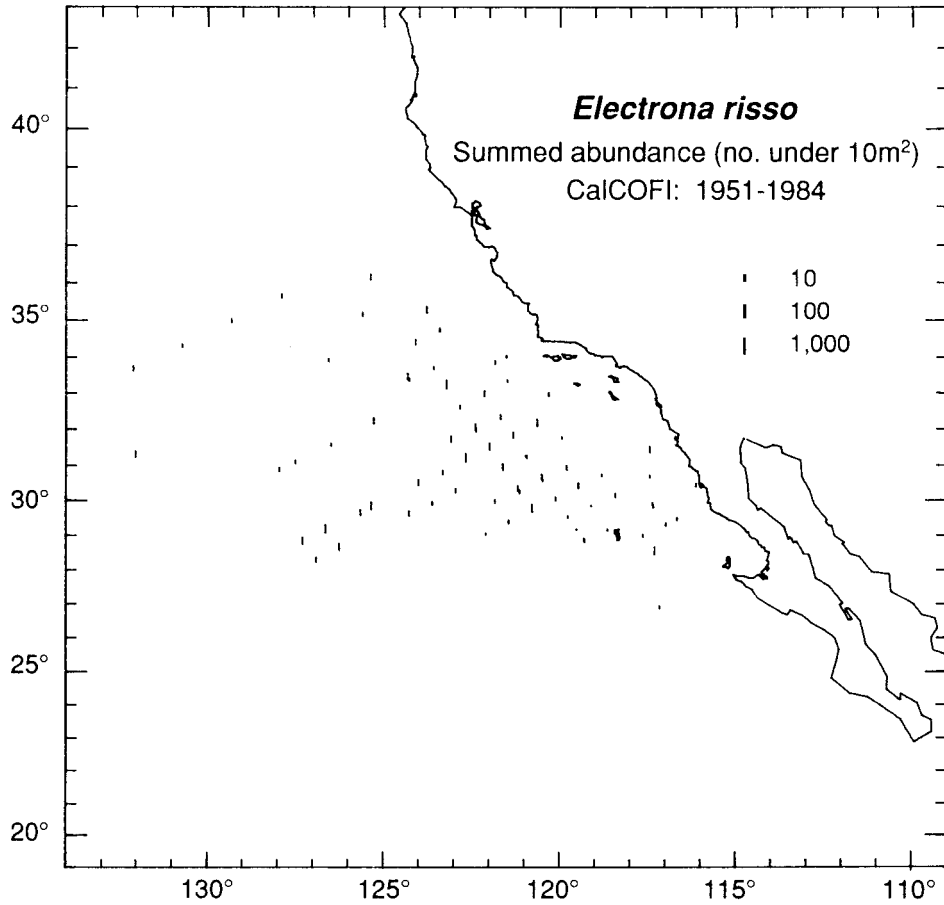


Ribbon barracudina

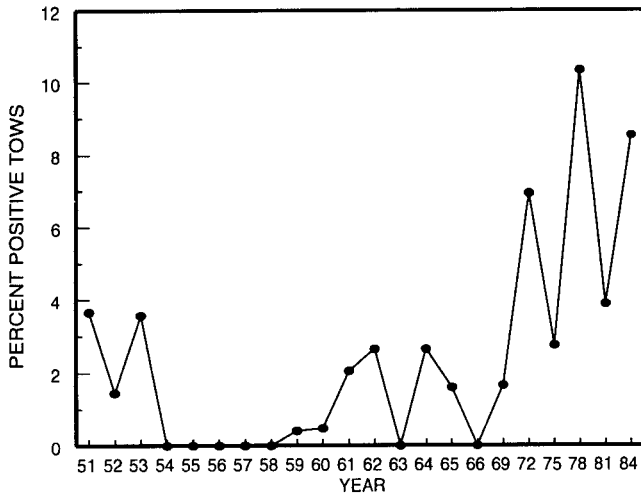
*Notolepis risso*

Electrona risso

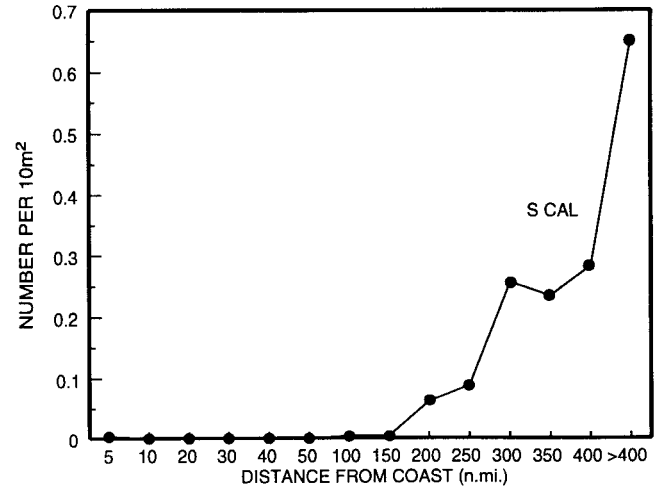
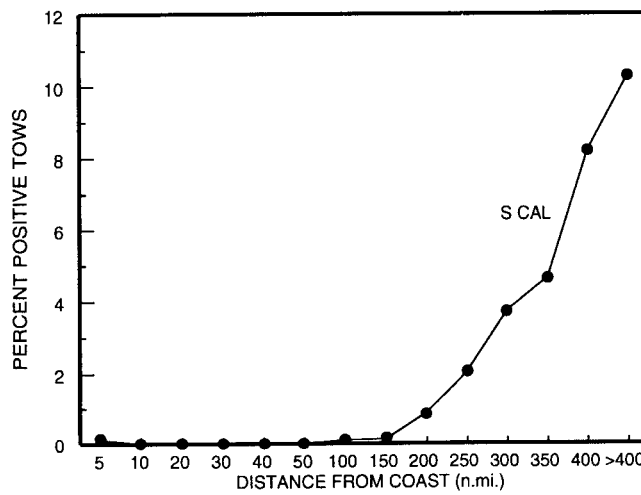
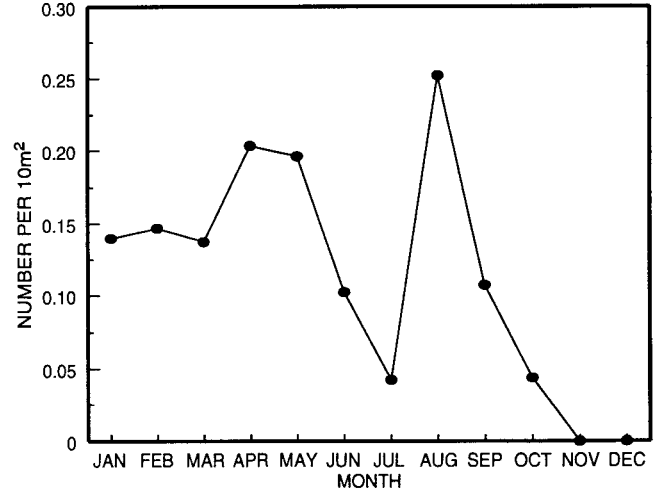
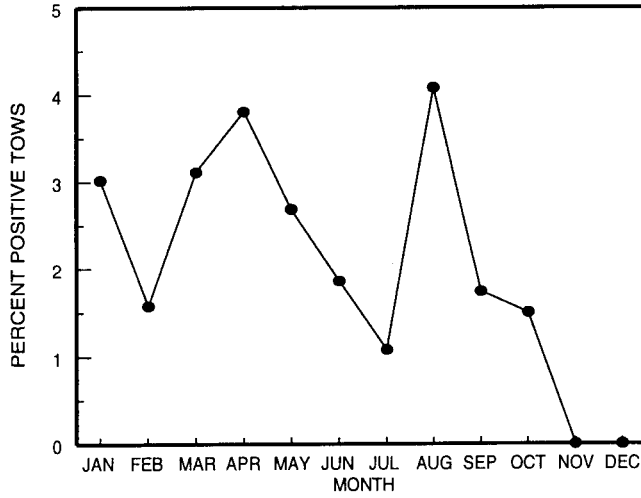
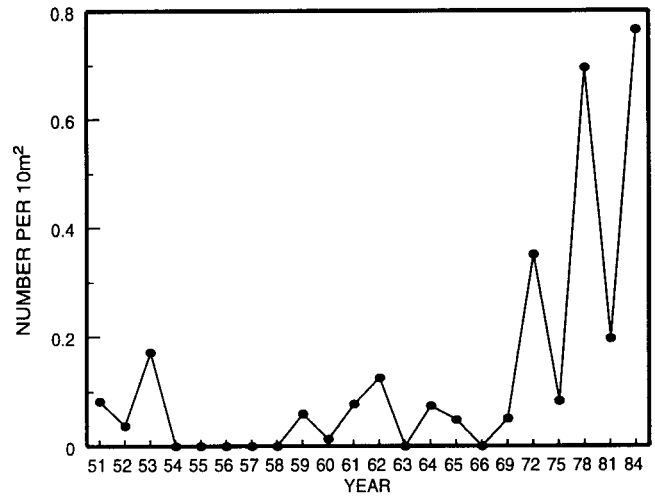
Myctophidae



Chubby flashlightfish

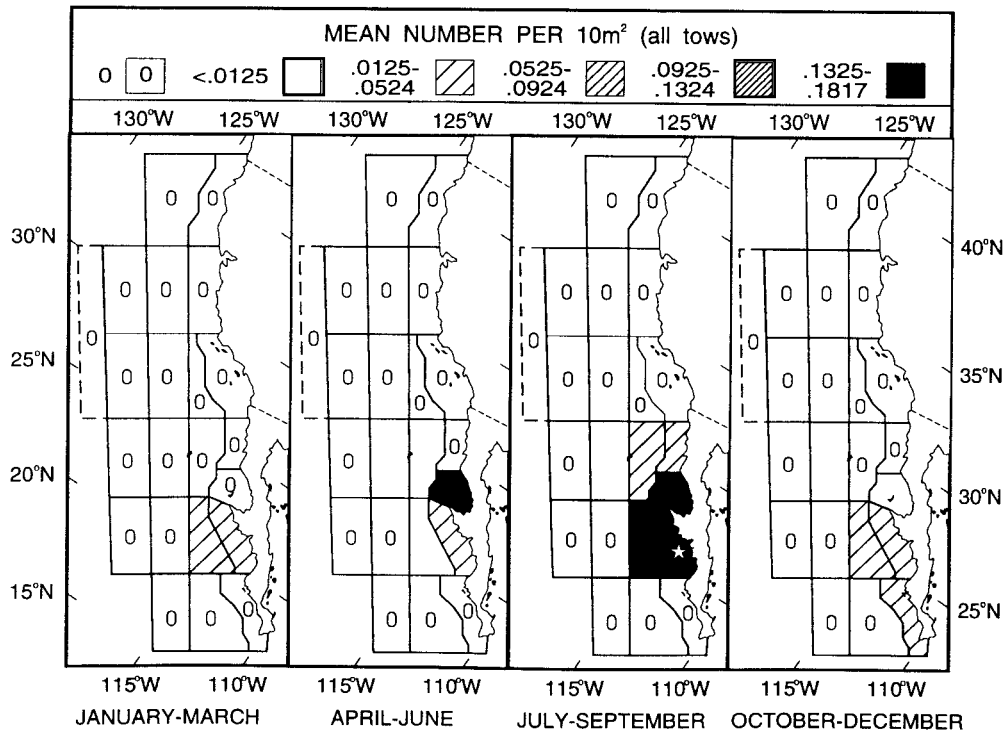
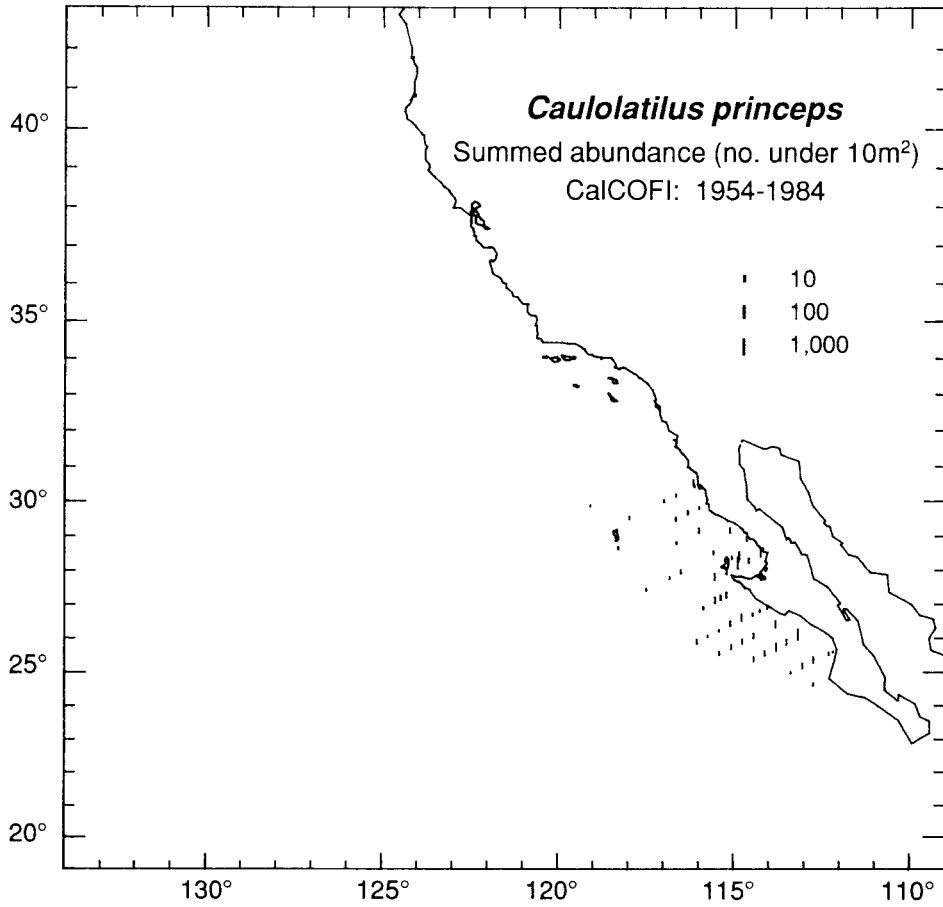


Electrona risso

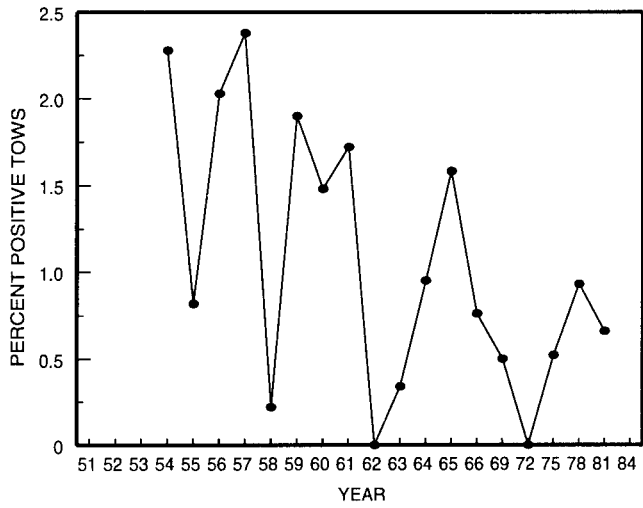


Caulolatilus princeps

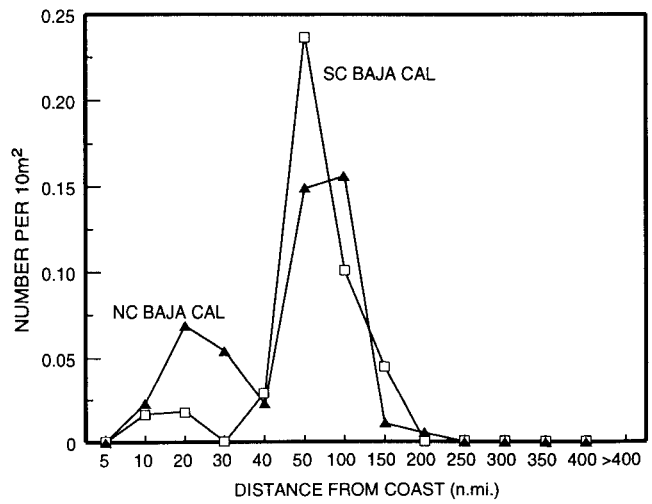
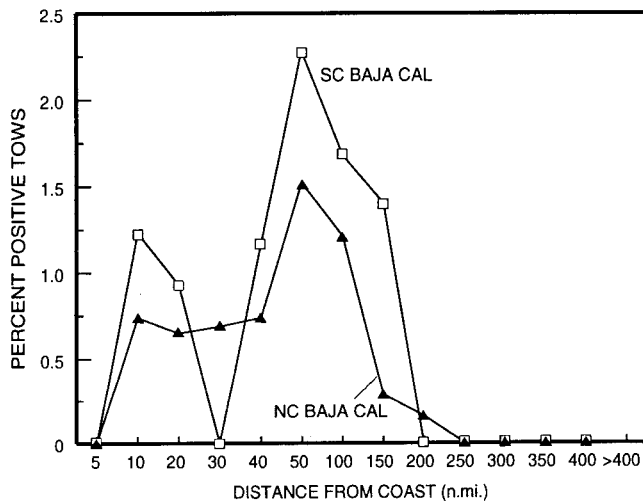
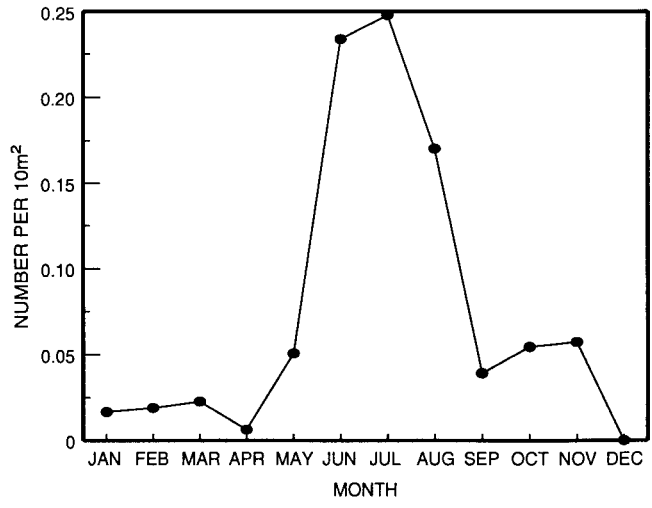
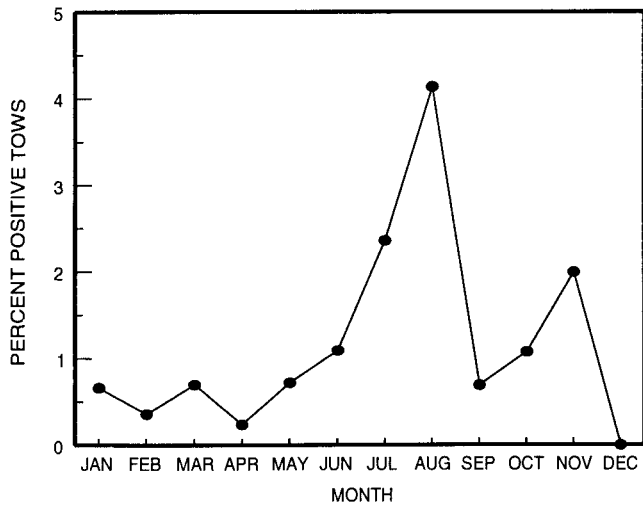
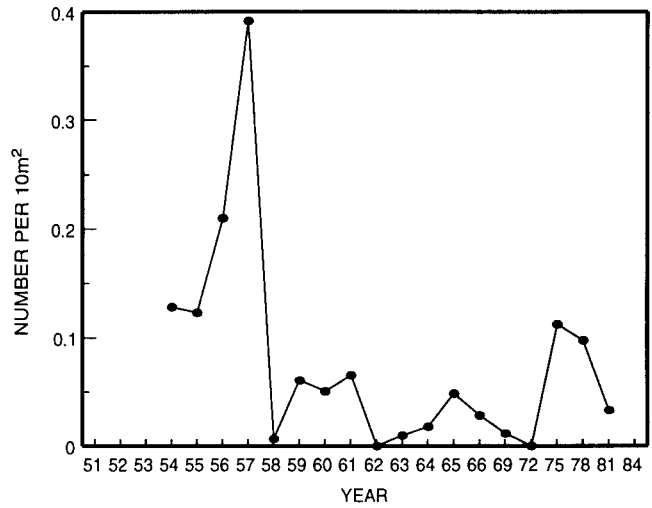
Malacanthidae



Ocean whitefish

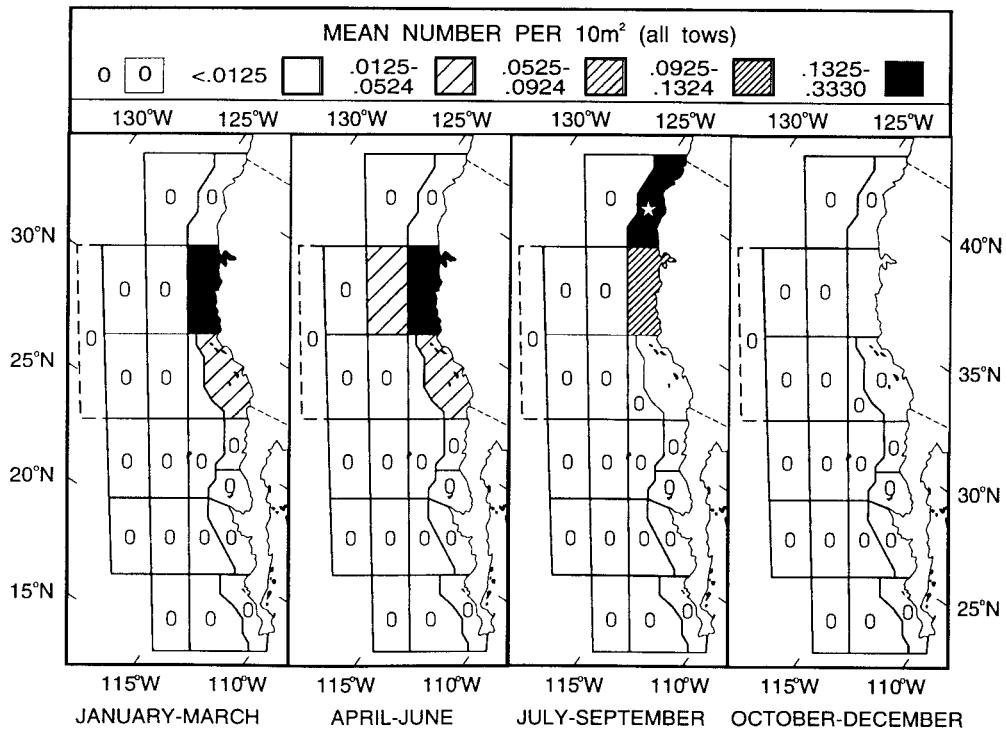
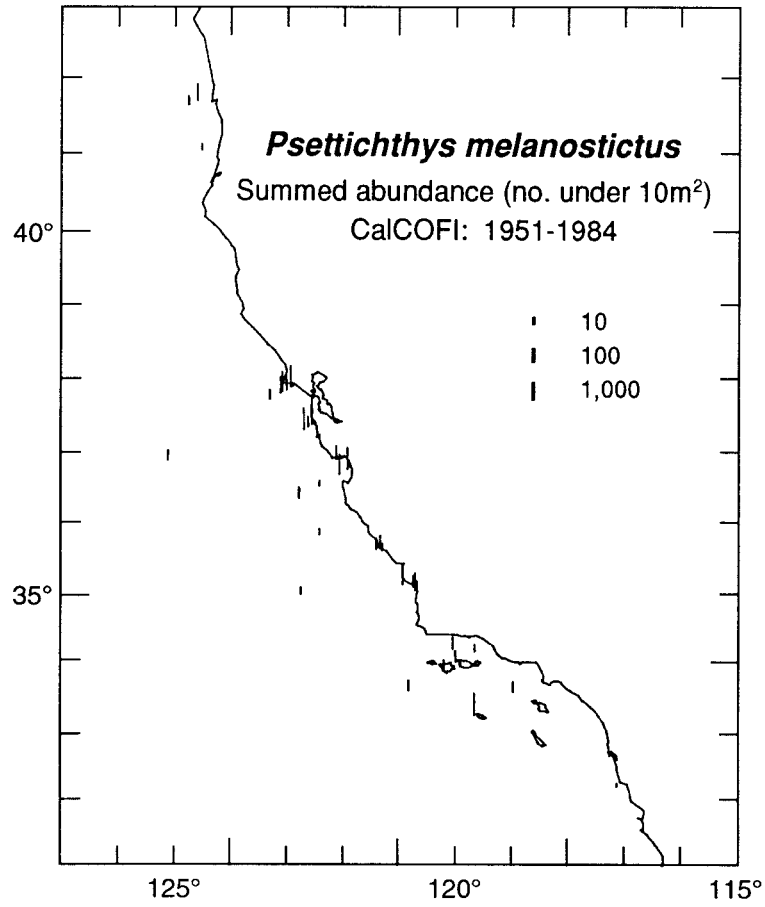


Caulolatilus princeps

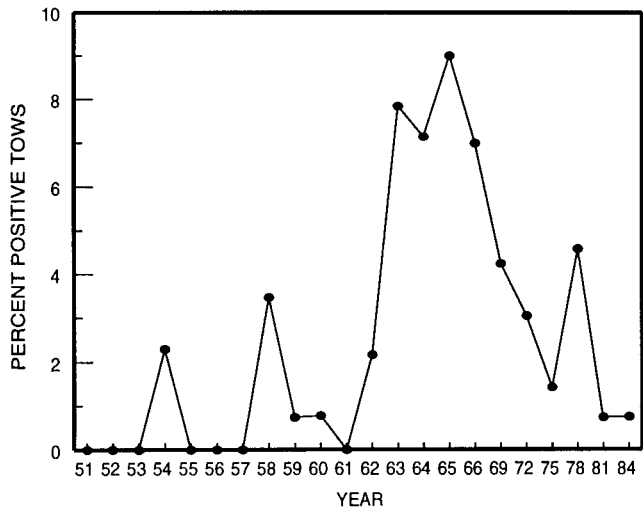


Psettichthys melanostictus

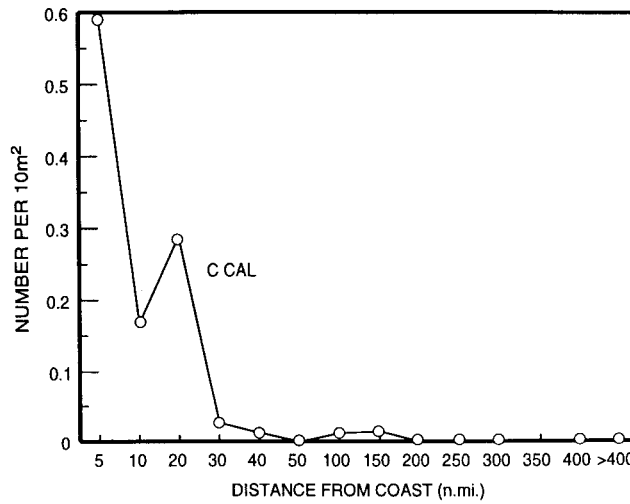
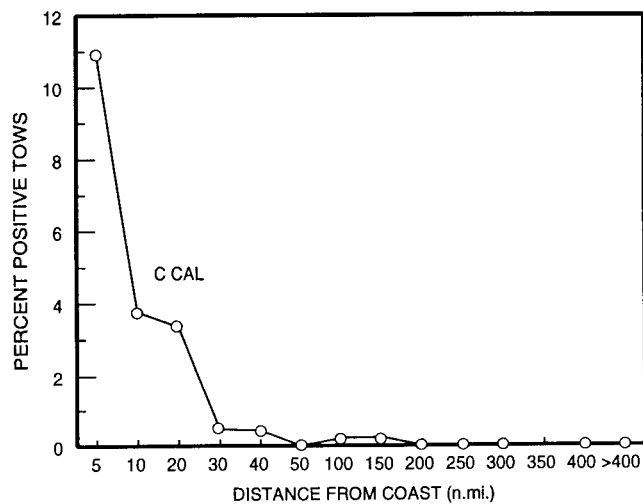
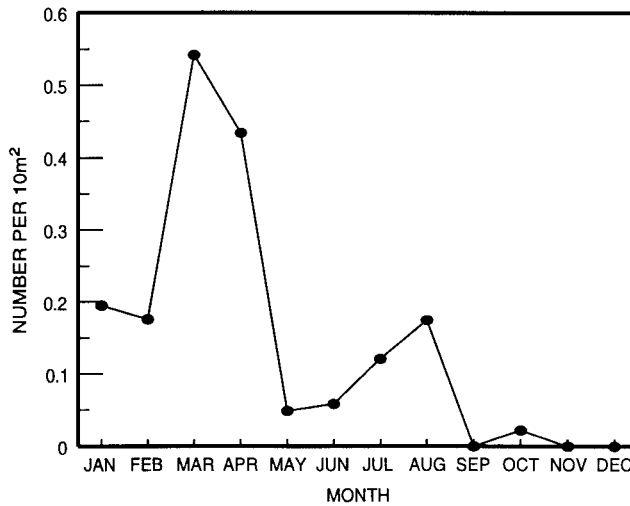
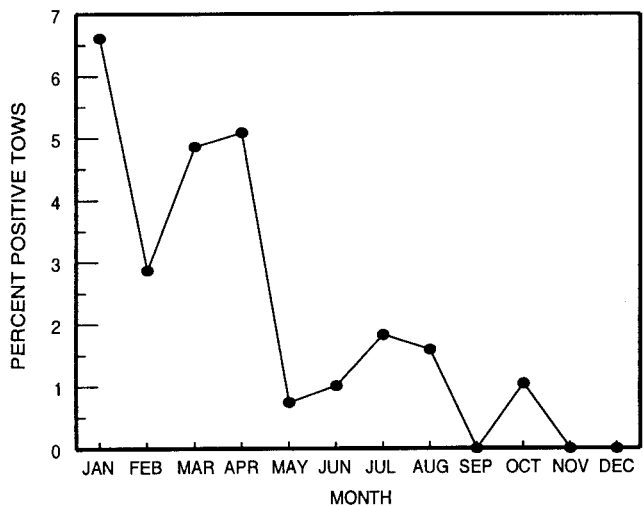
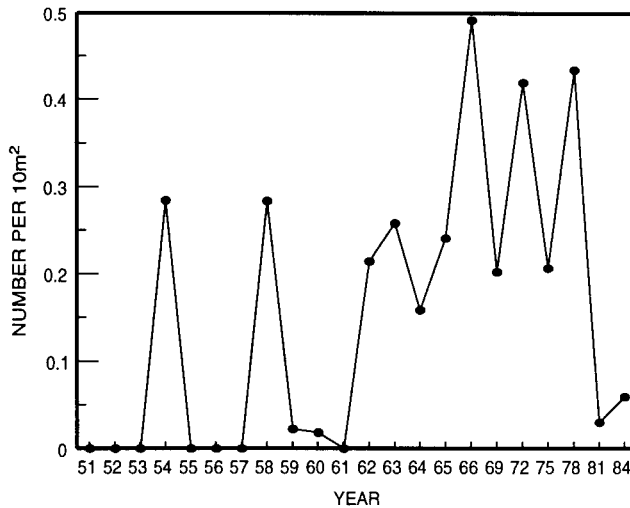
Pleuronectidae



Sand sole

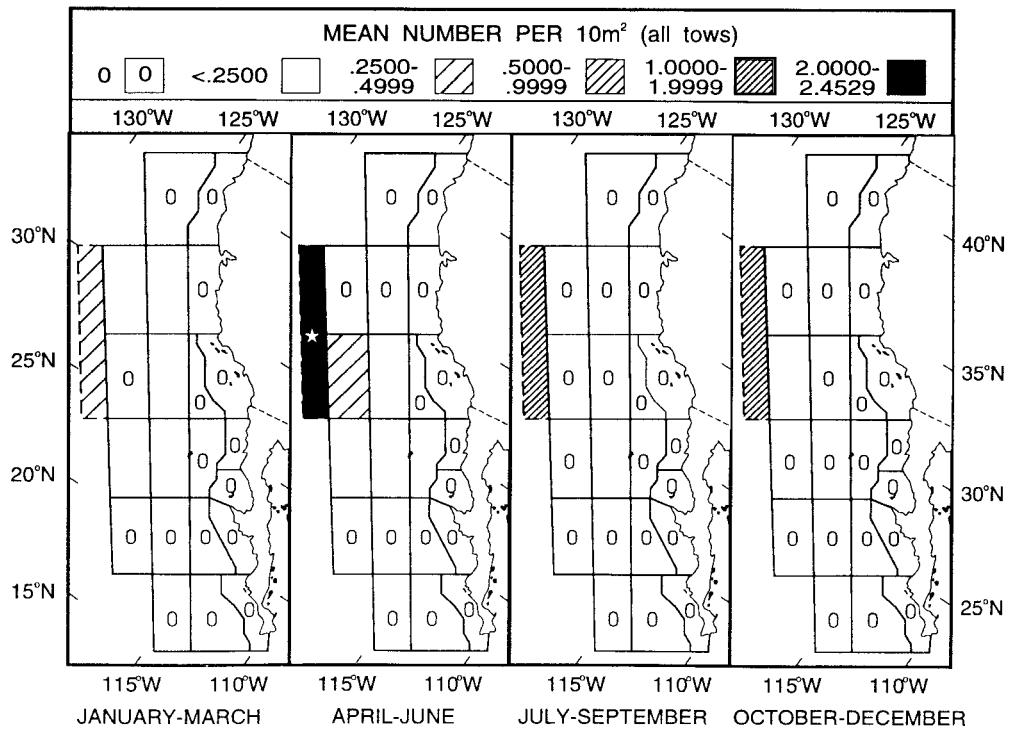
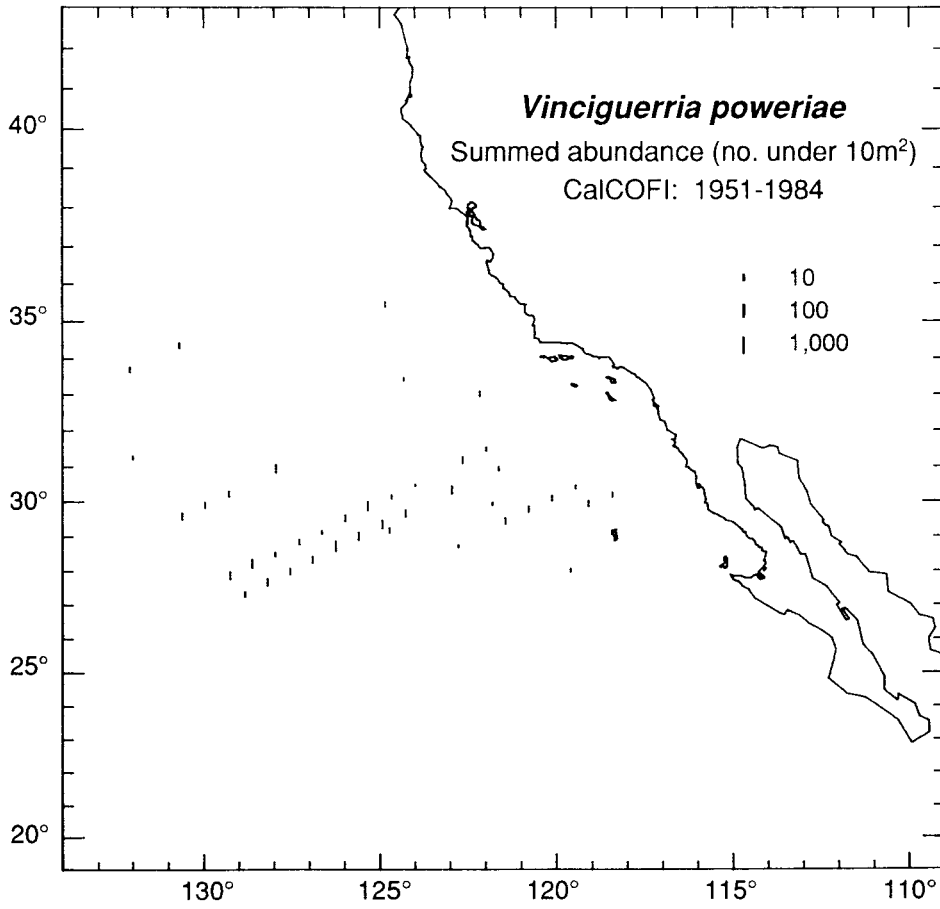


Psettichthys melanostictus

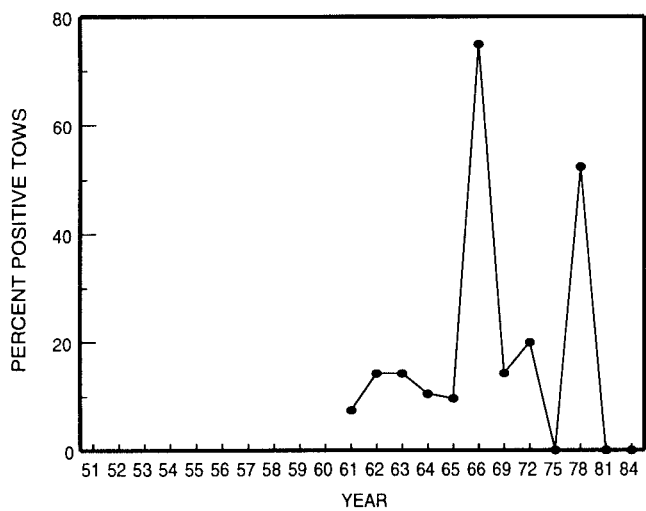


Vinciguerria poweriae

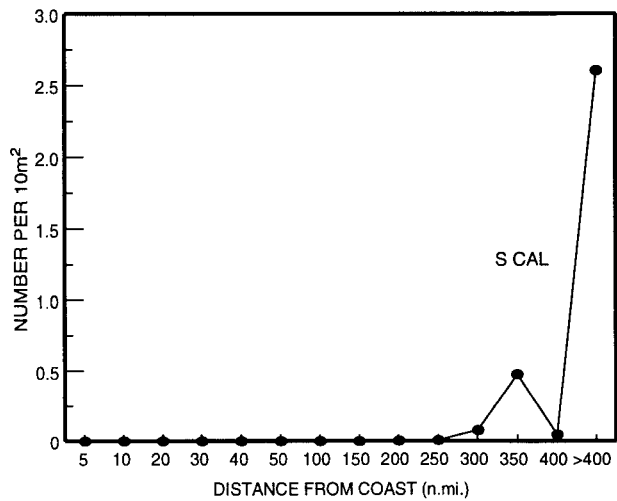
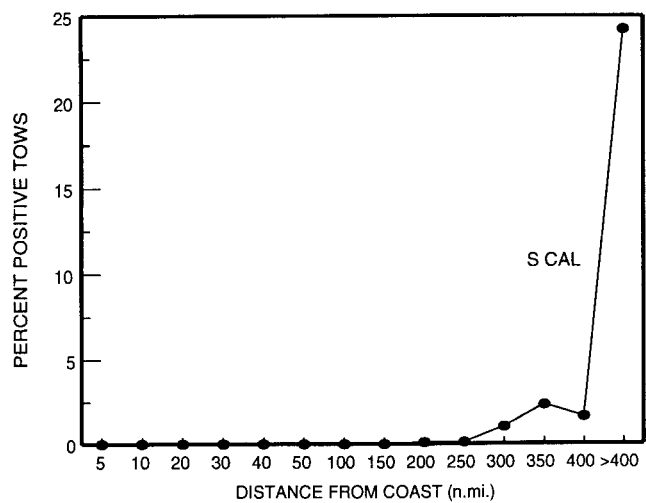
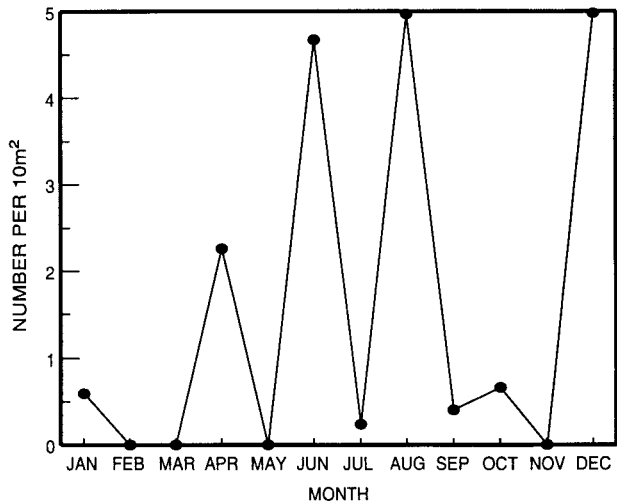
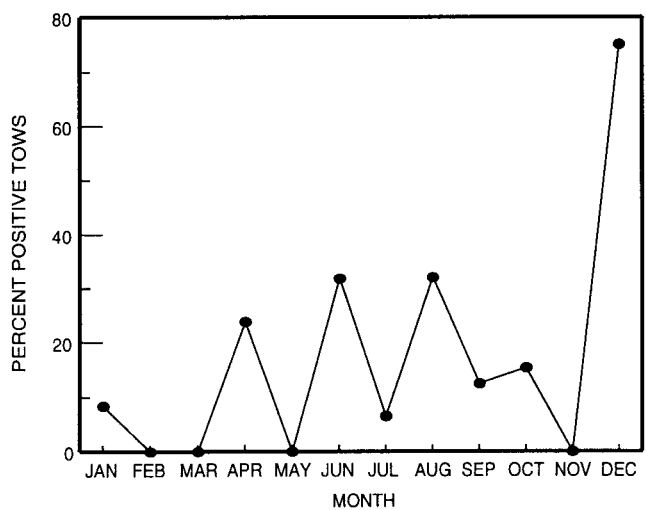
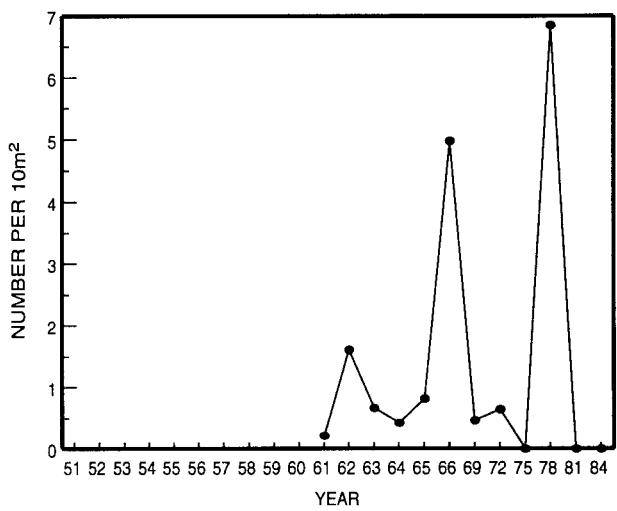
Phosichthyidae



Highseas lightfish

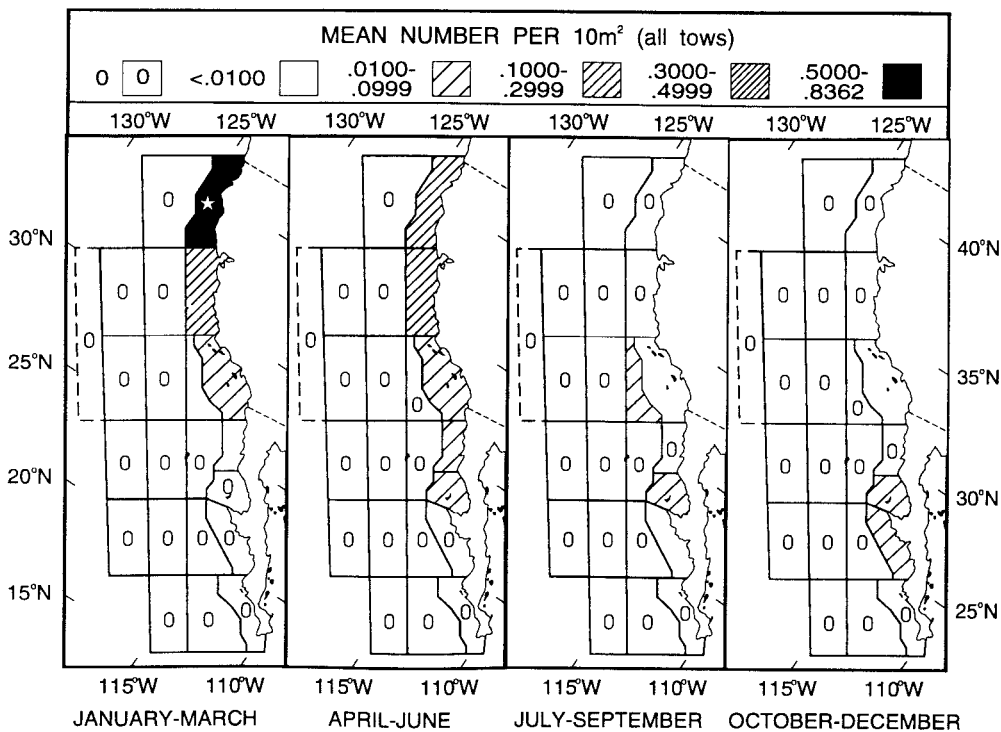
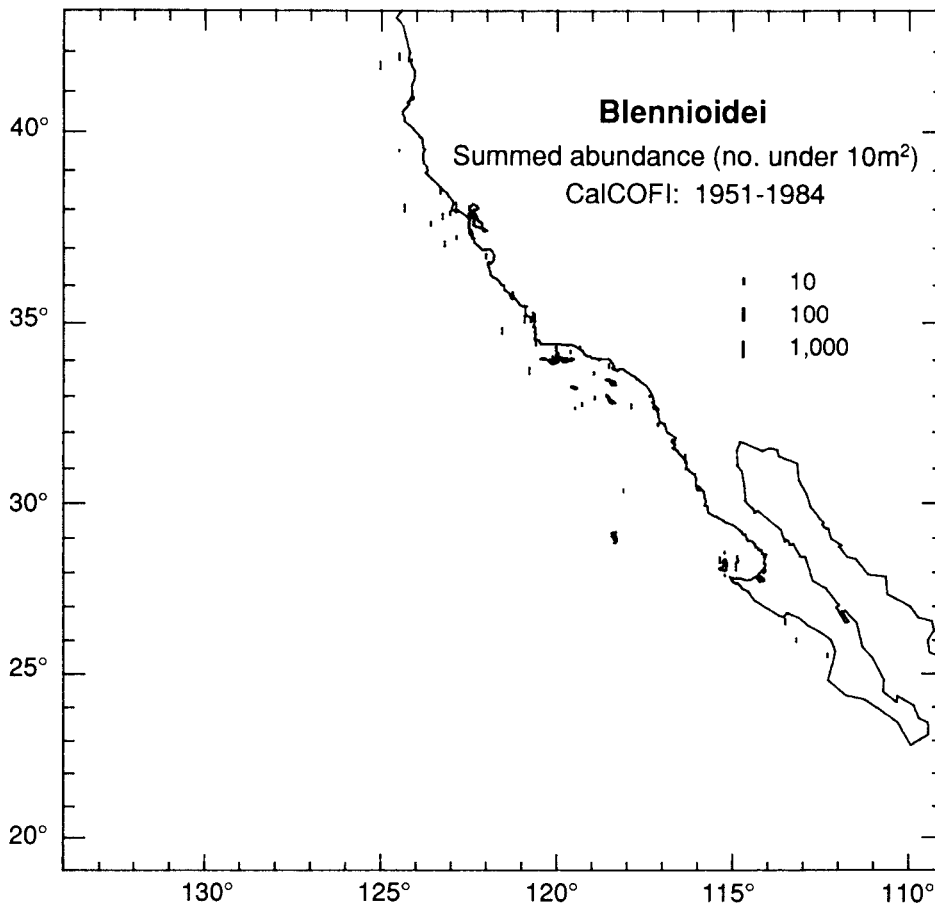


Vinciguerria poweriae

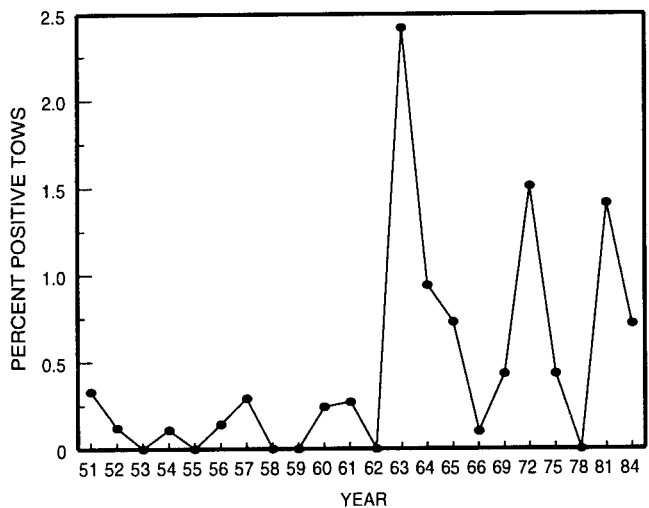


Blennioidei

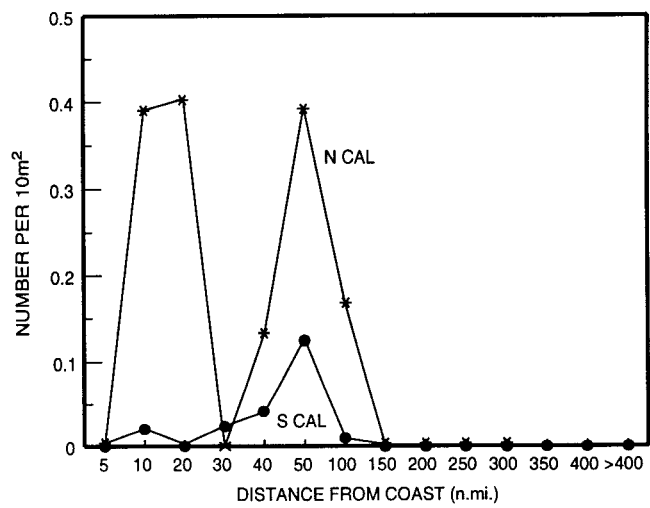
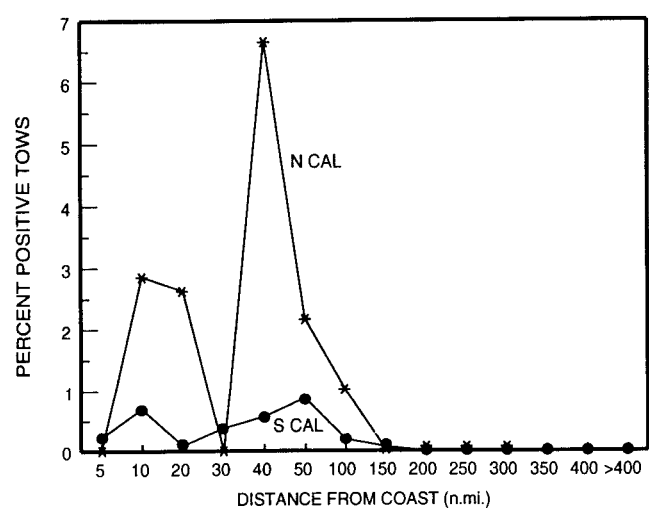
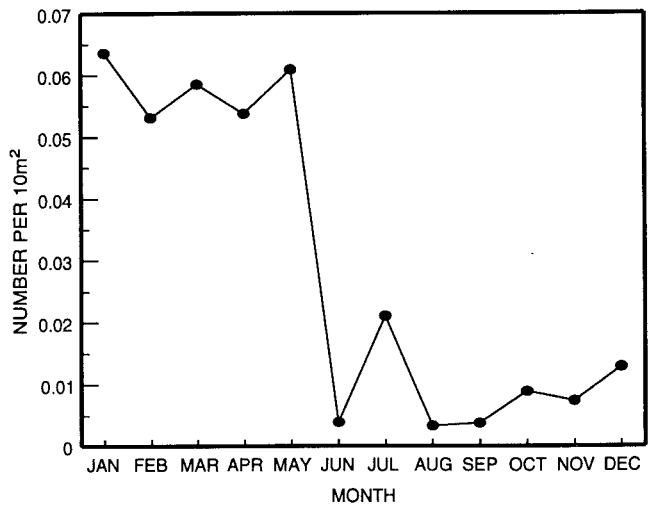
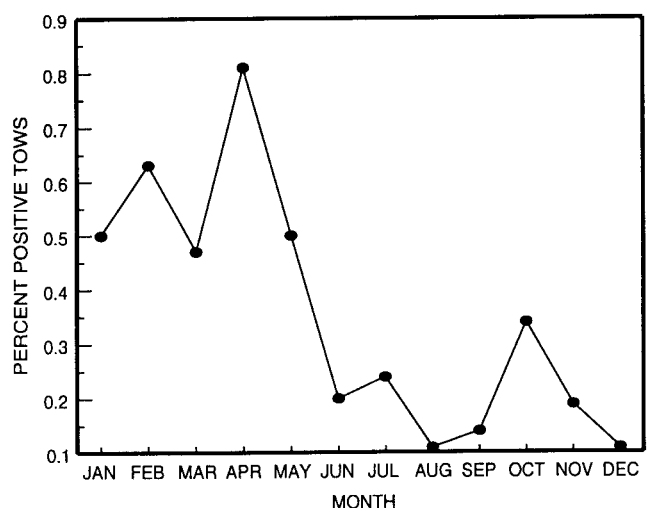
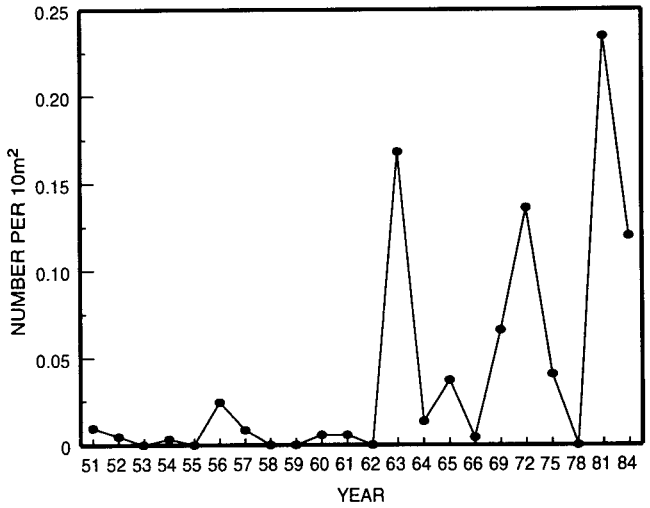
Blennioidei



Blennies

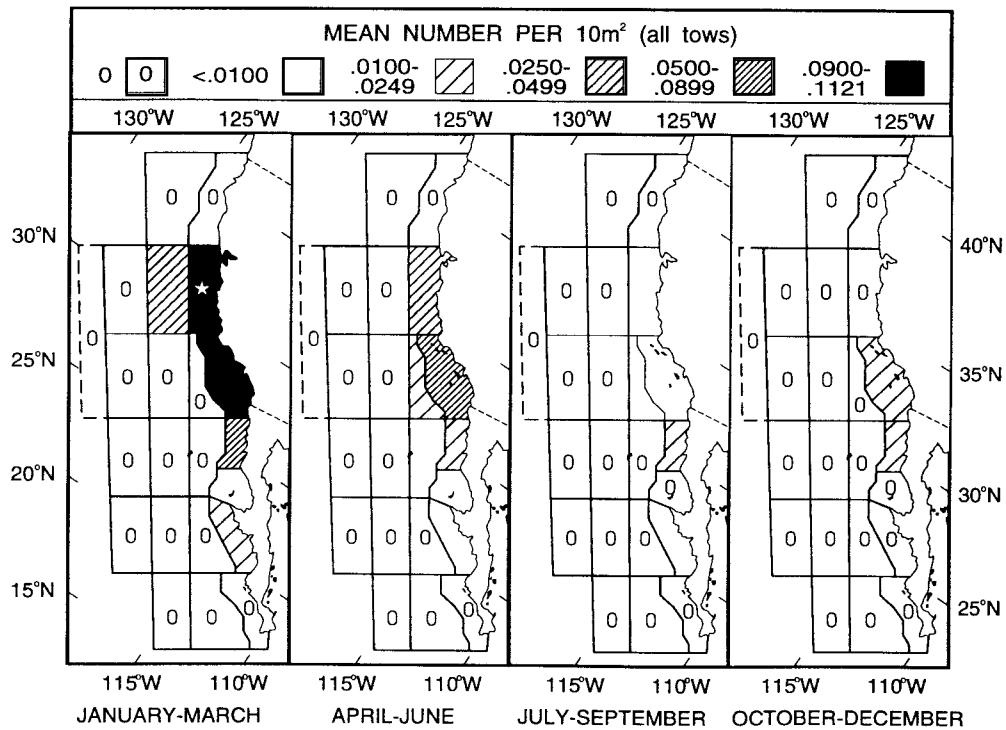
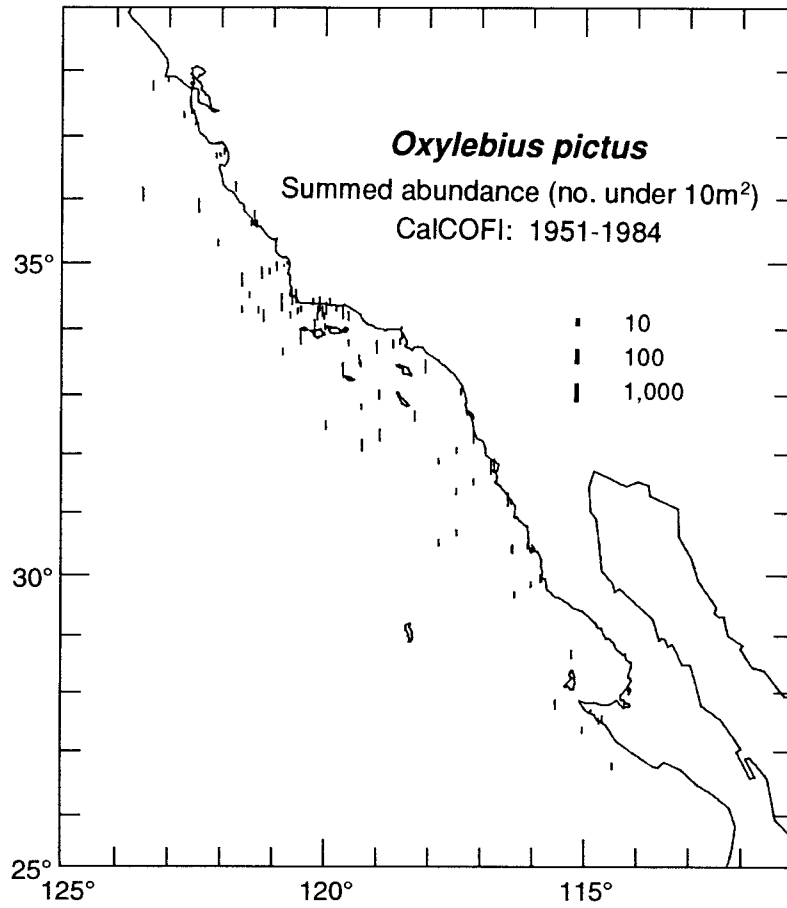


Blennioidei

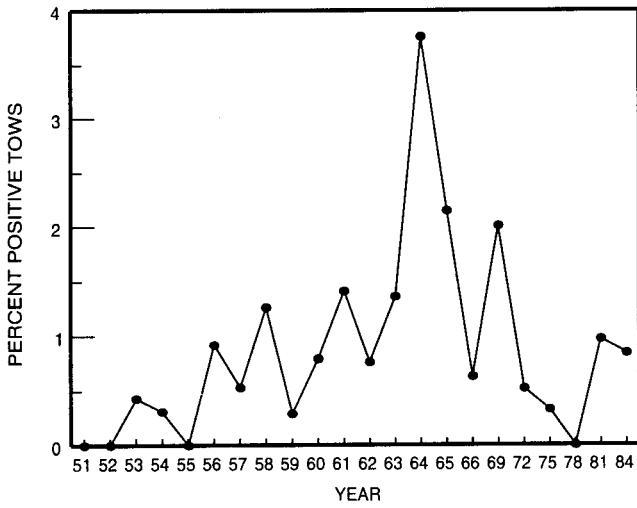


Oxylebius pictus

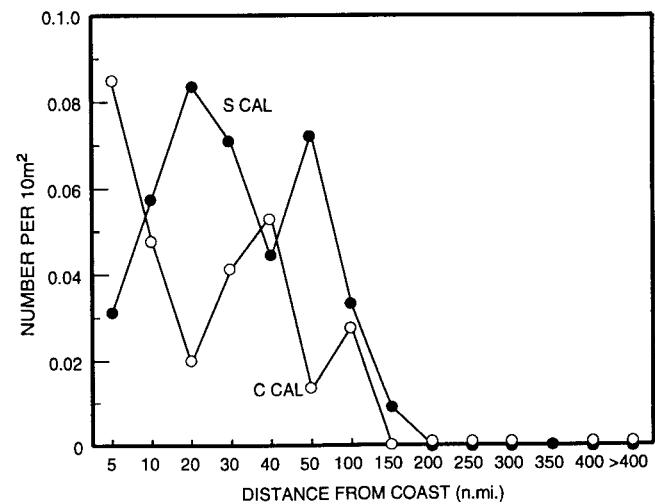
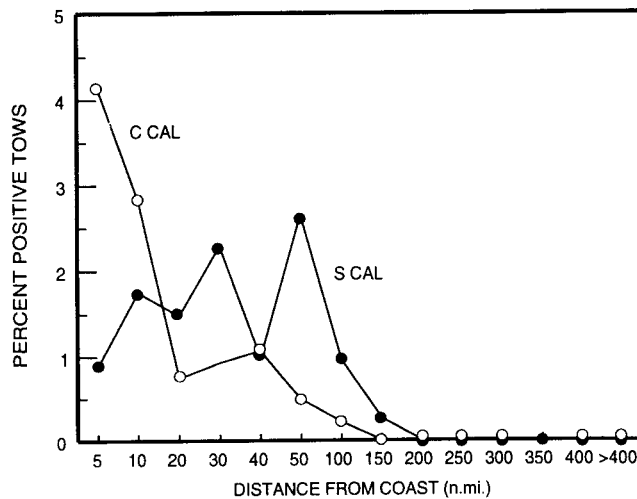
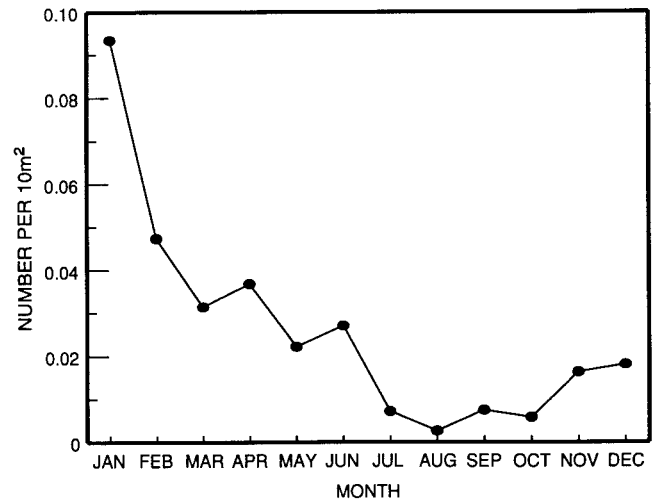
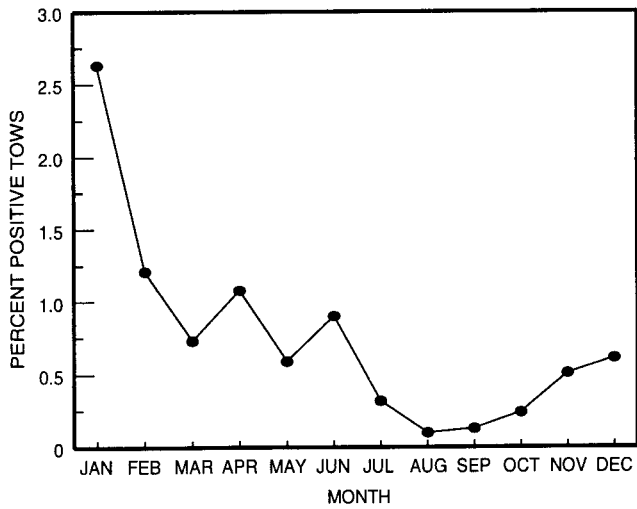
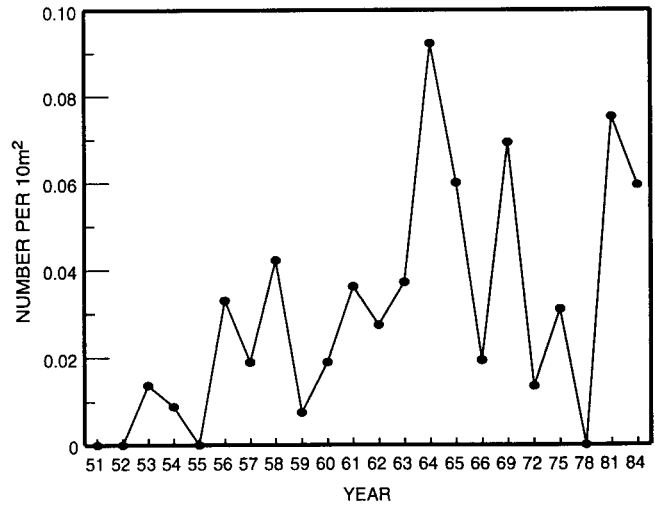
Hexagrammidae



Painted greenling

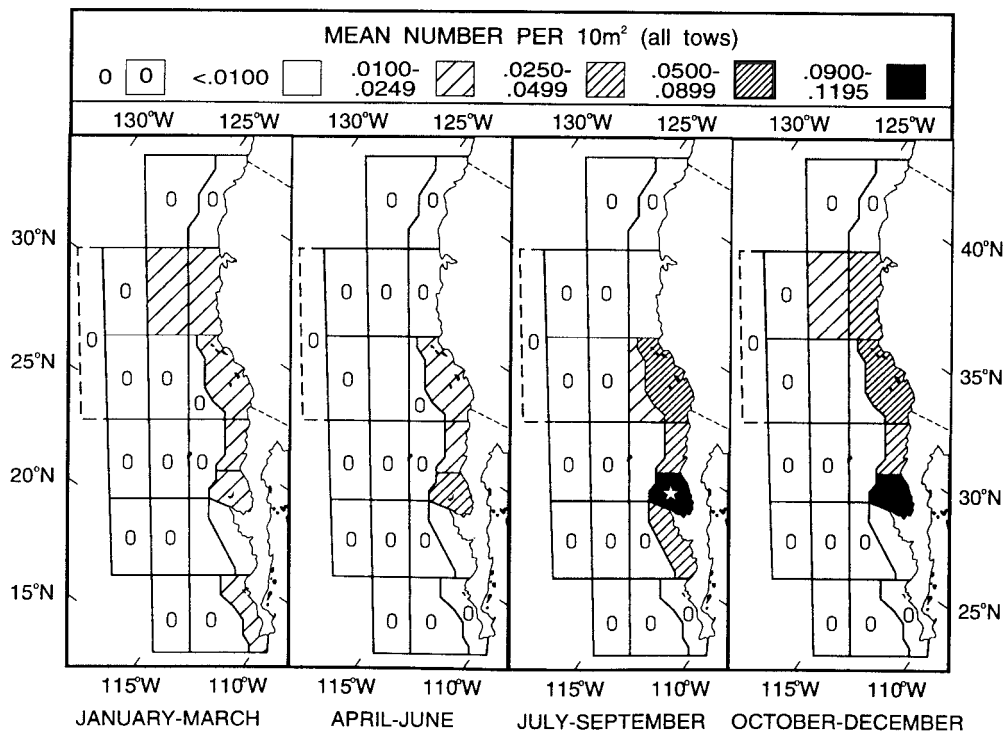
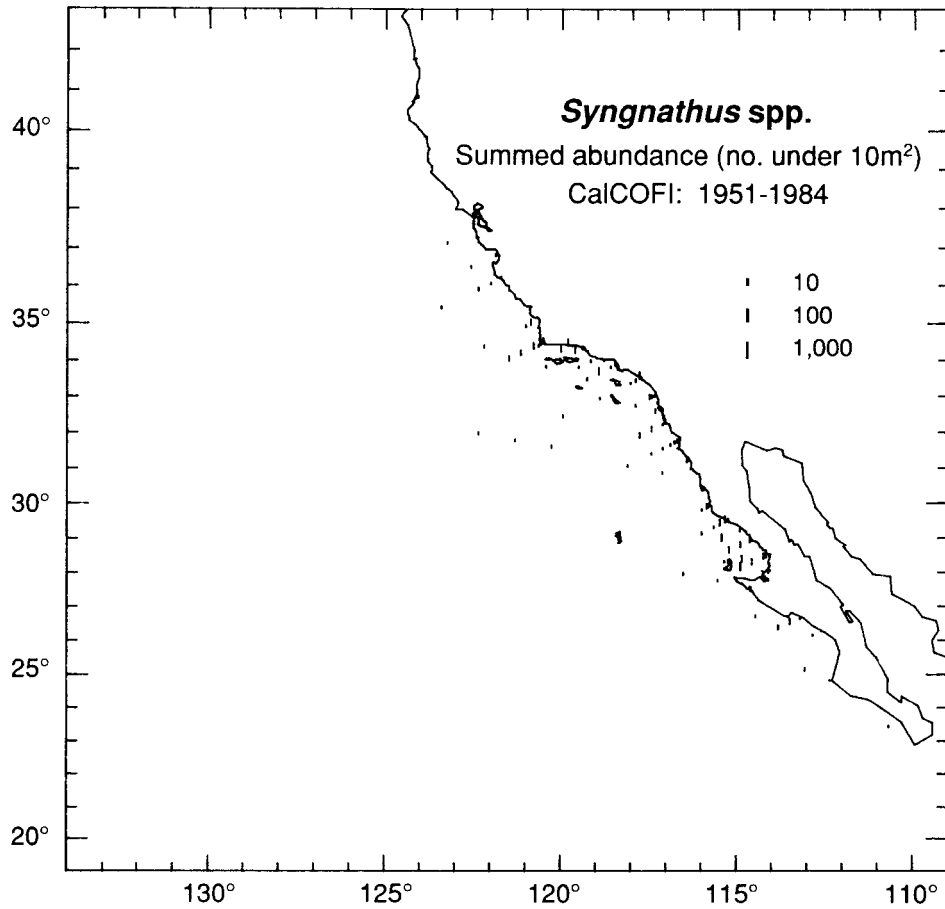


Oxylebius pictus

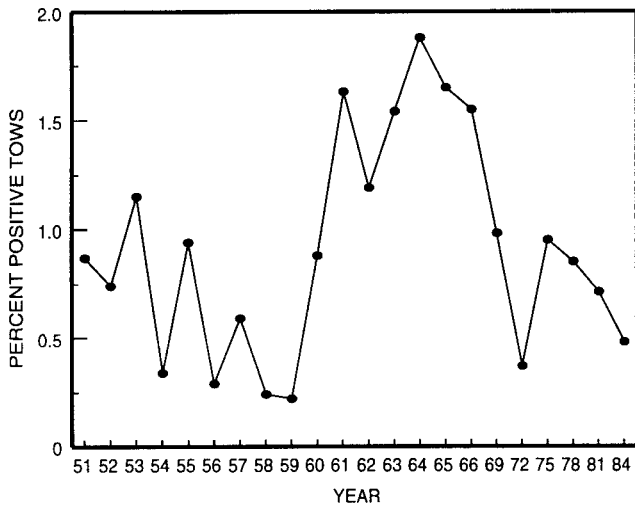


Syngnathus spp.

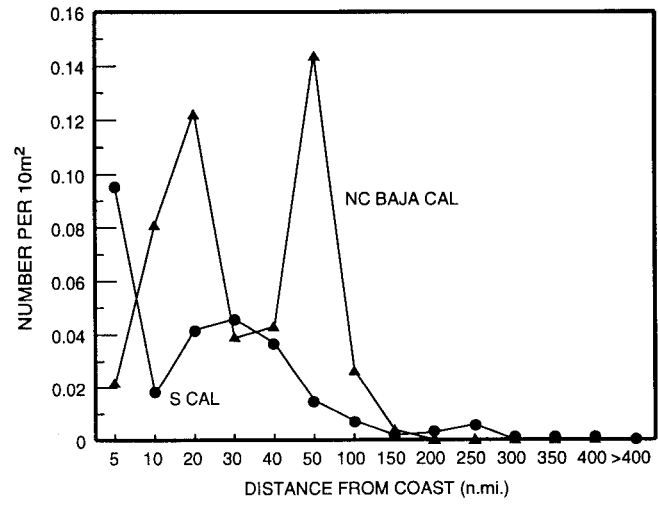
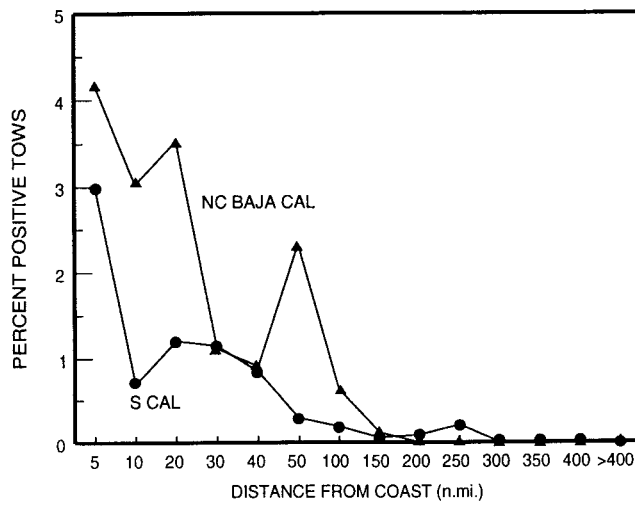
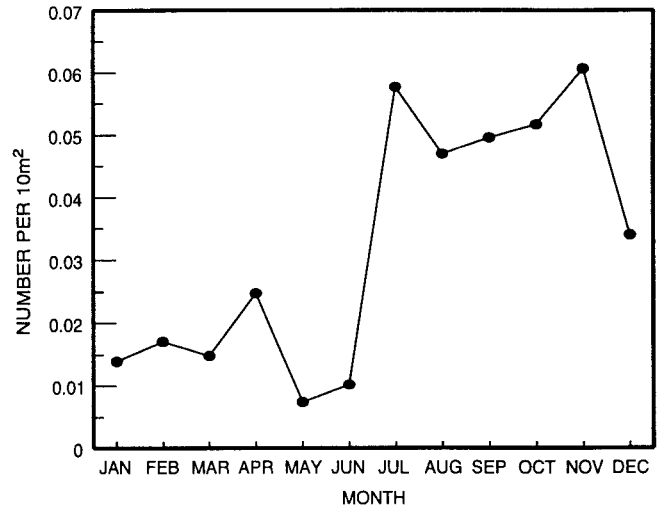
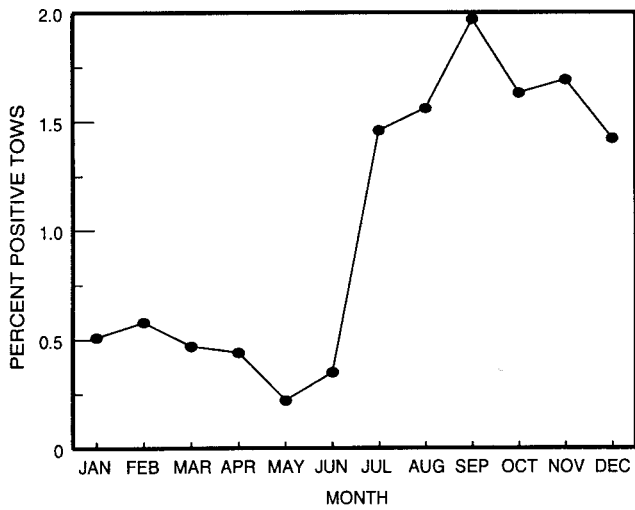
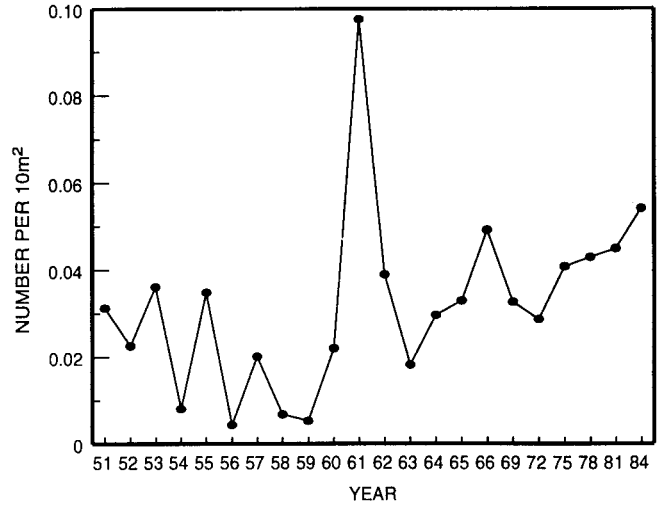
Syngnathidae



Pipefishes

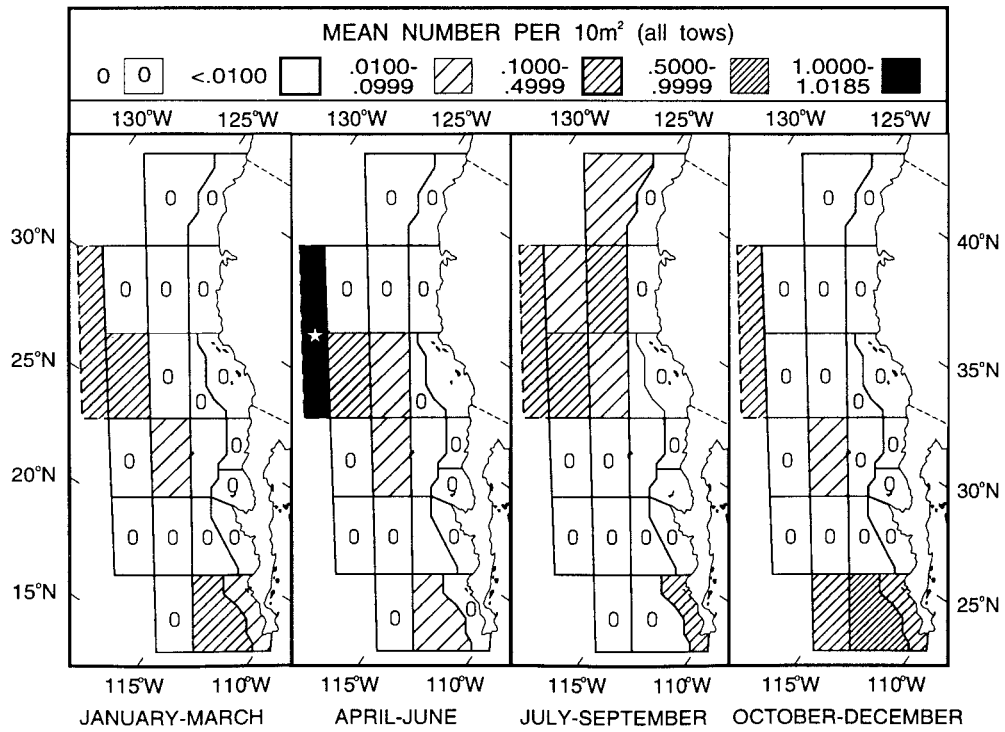
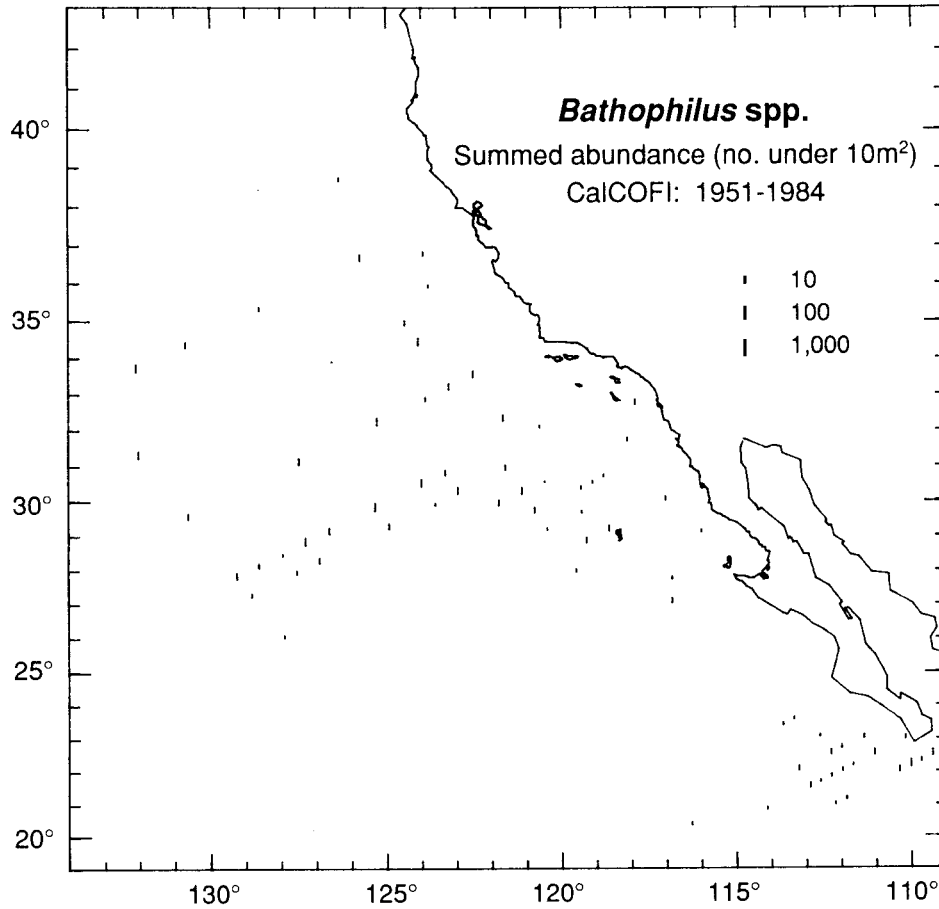


Syngnathus spp.

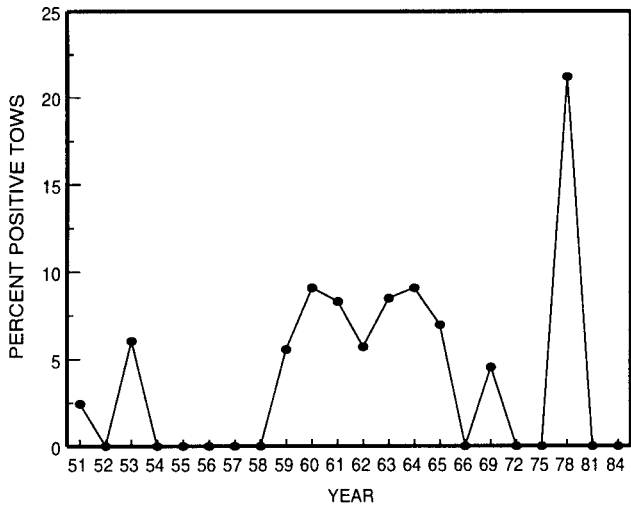


Bathophilus spp.

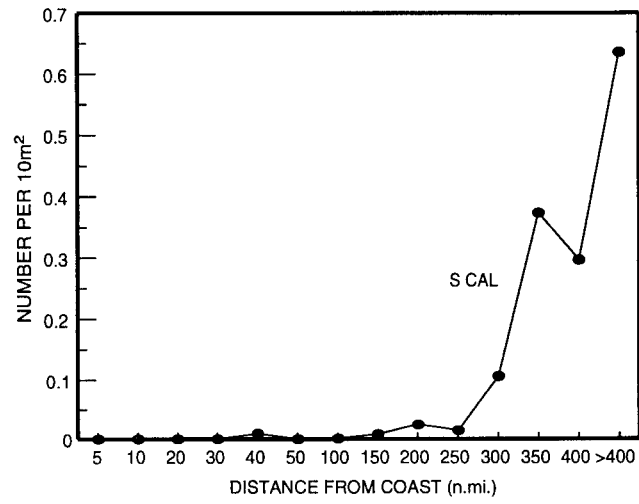
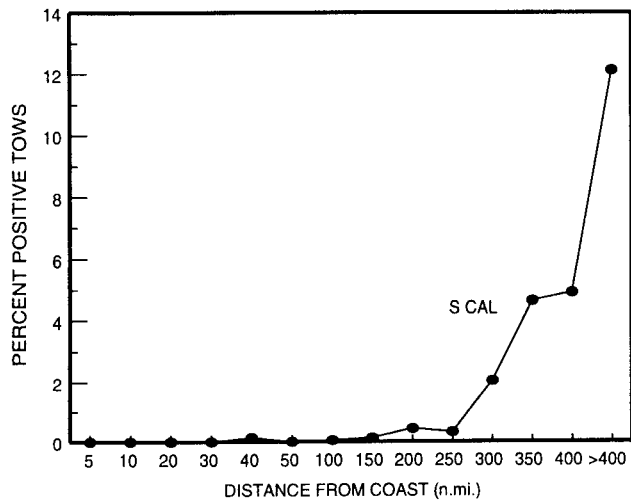
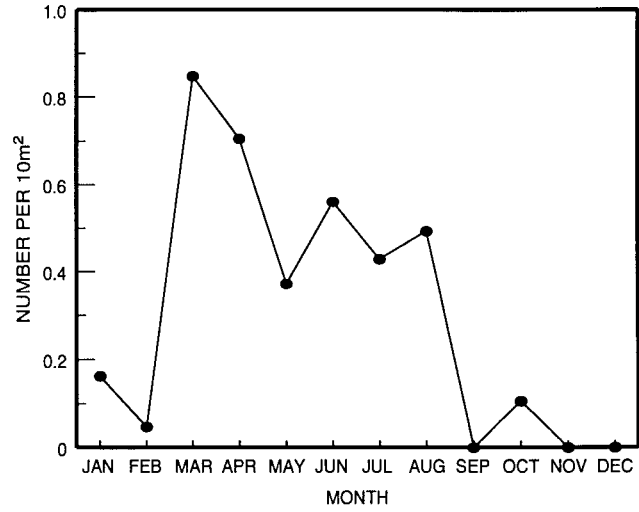
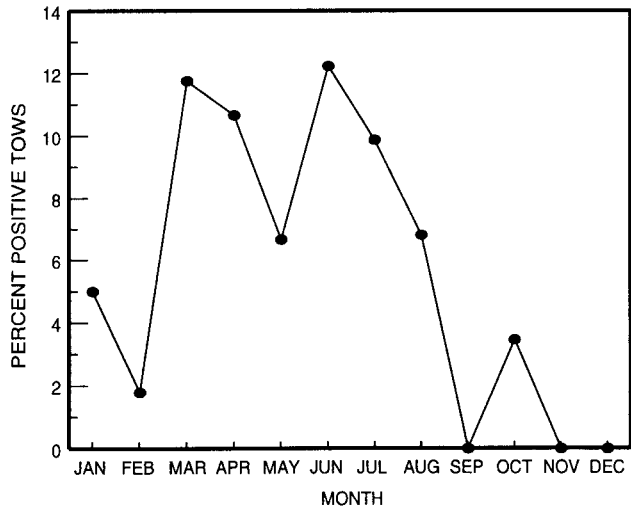
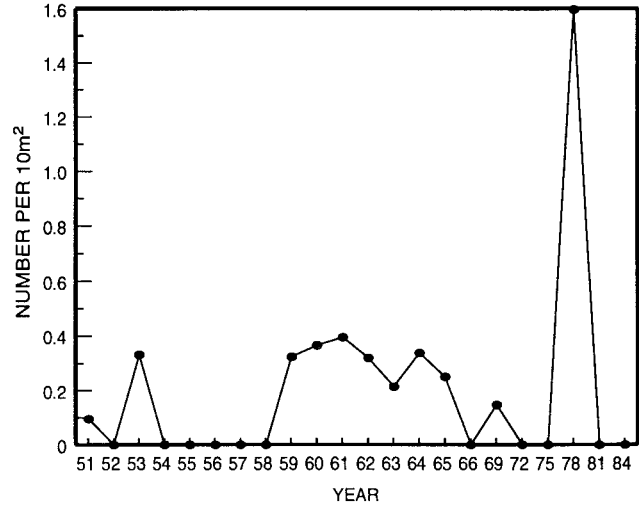
Melanostomiidae



Highfin dragonfishes

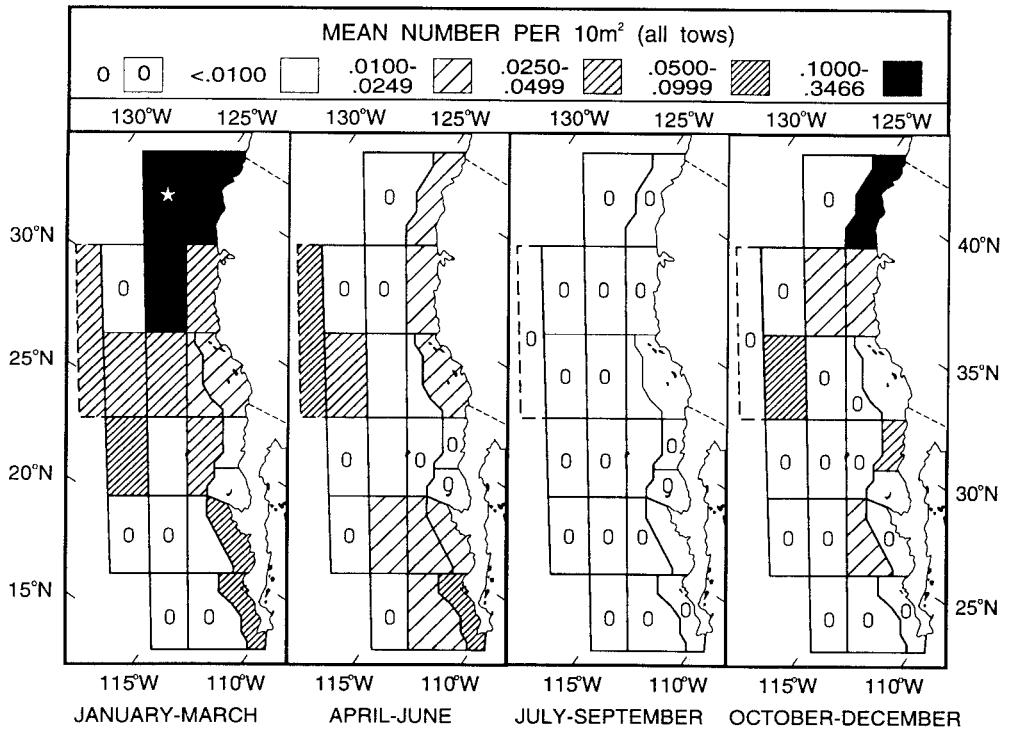
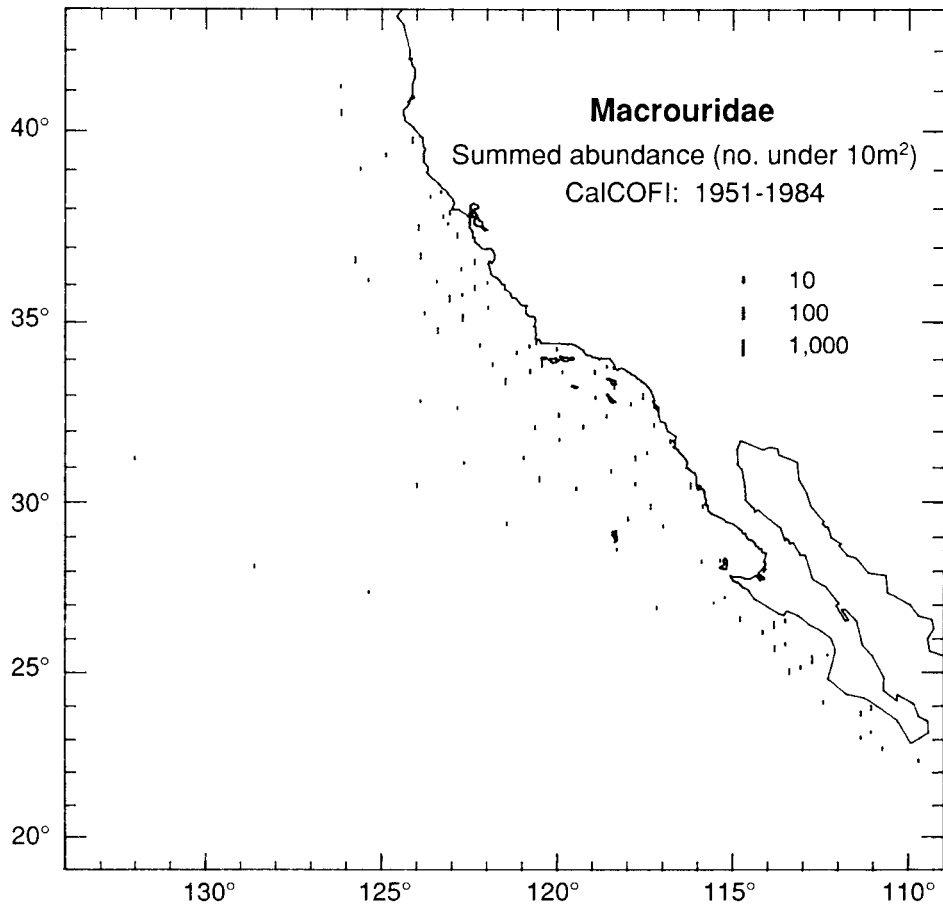


Bathophilus spp.



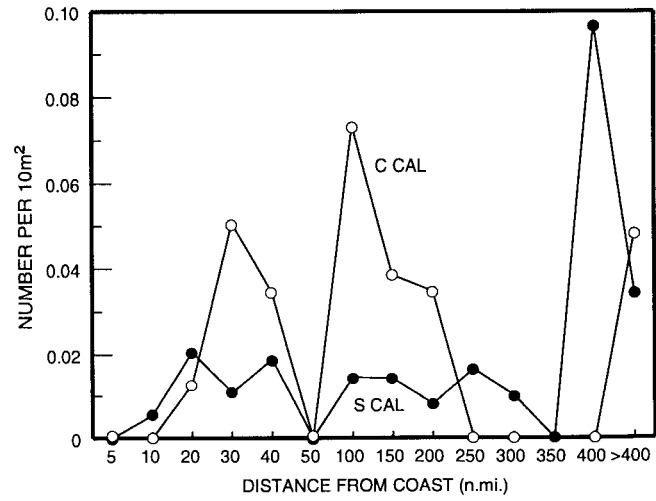
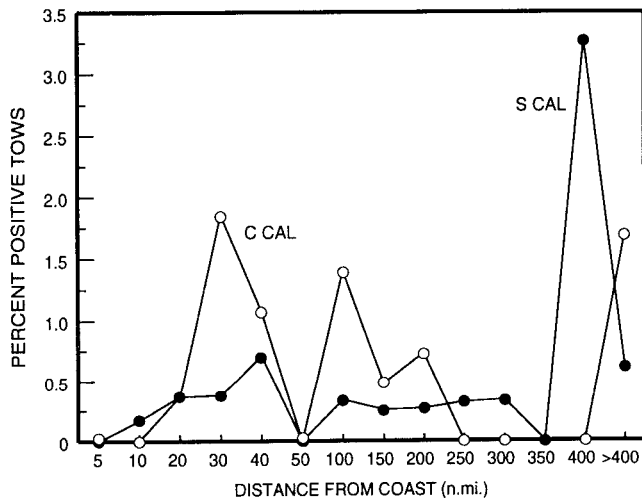
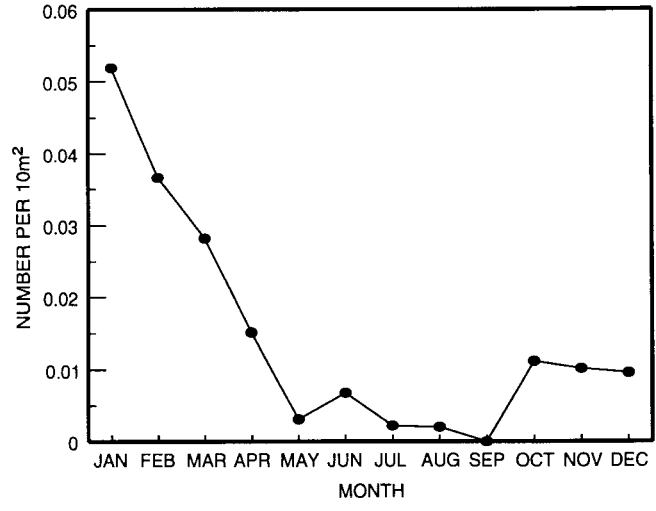
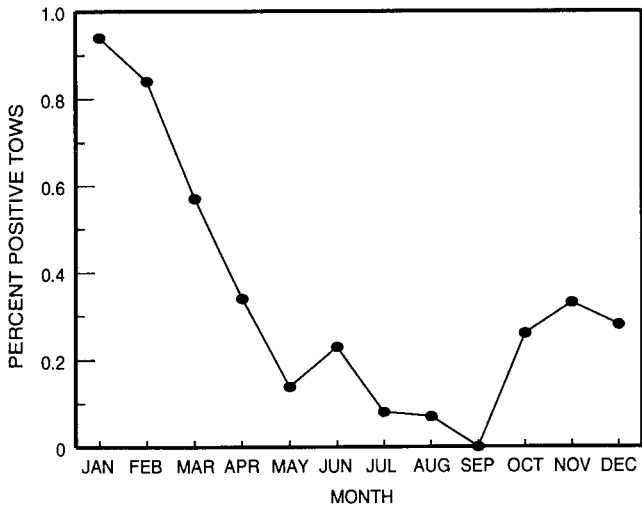
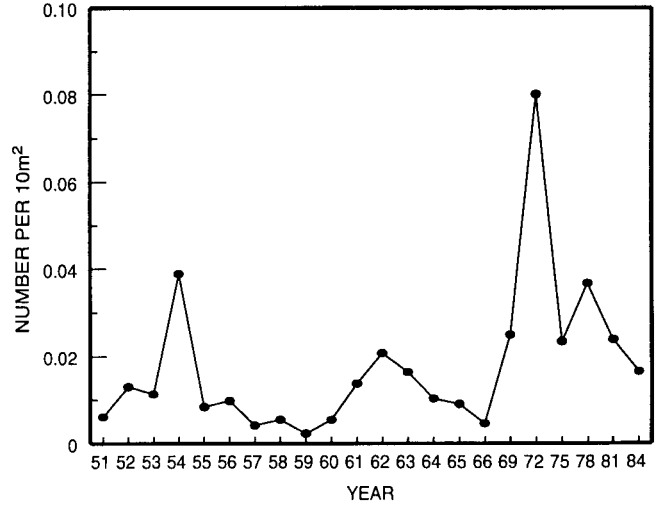
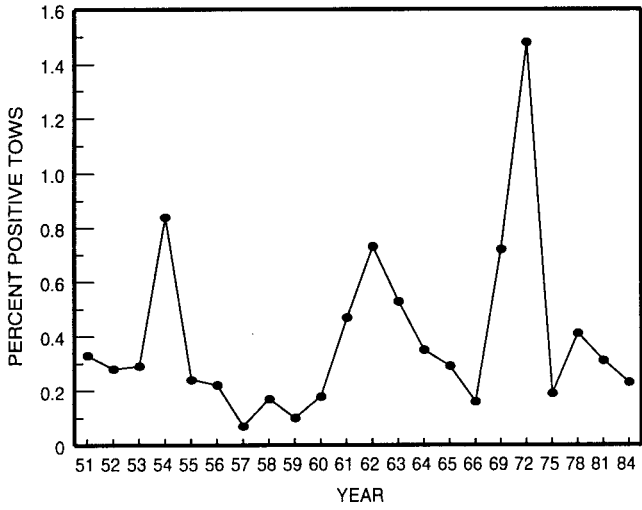
Macrouridae

Macrouridae



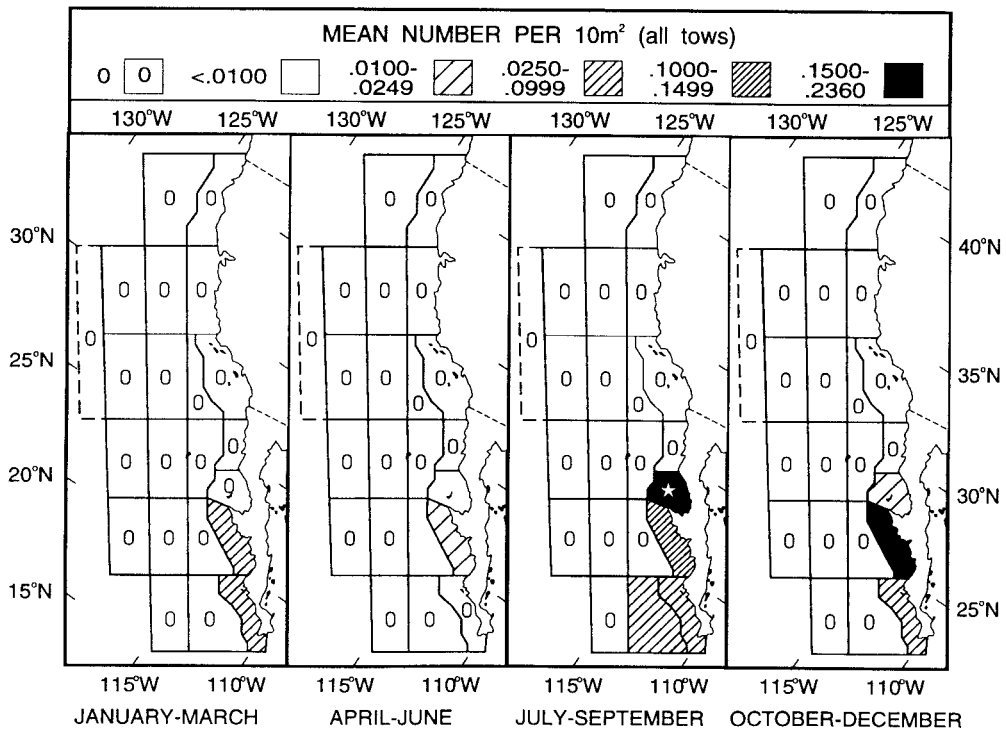
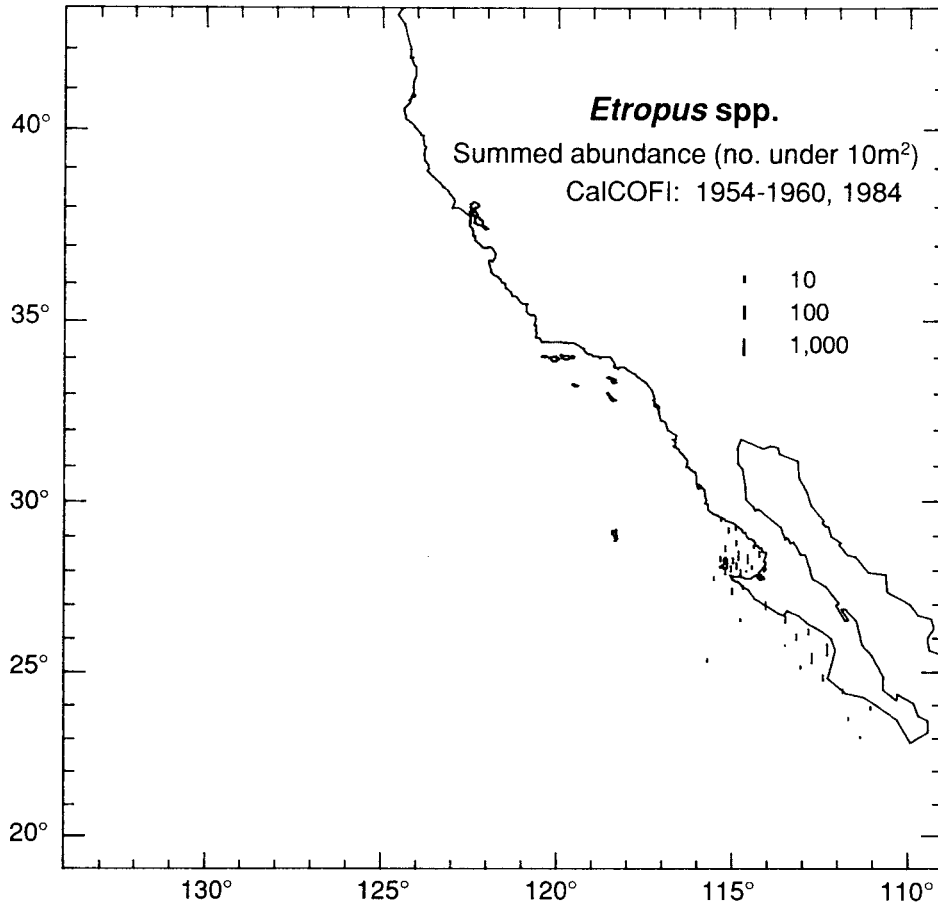
Grenadiers

Macrouridae



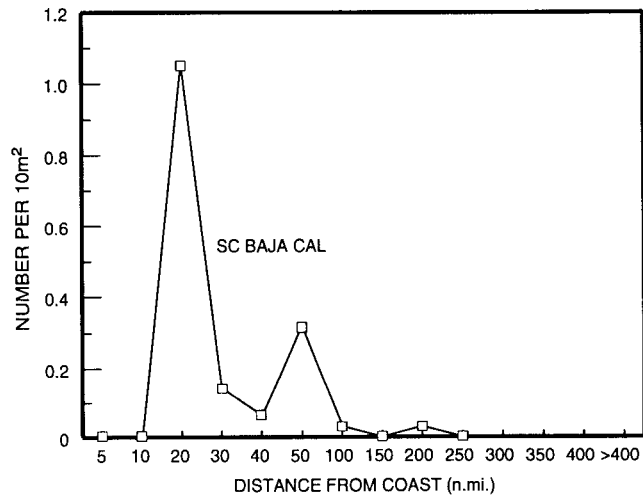
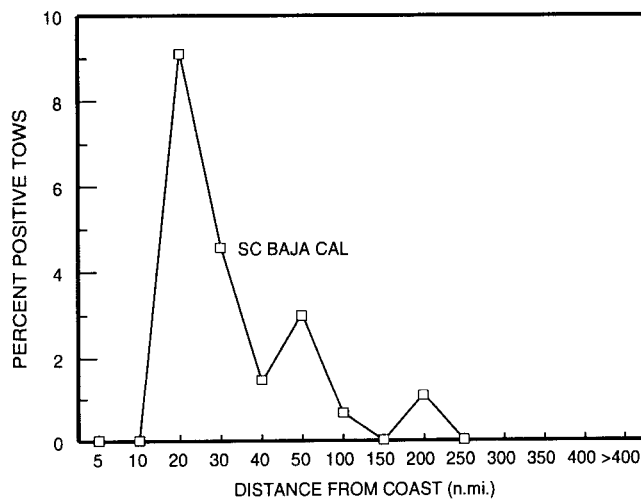
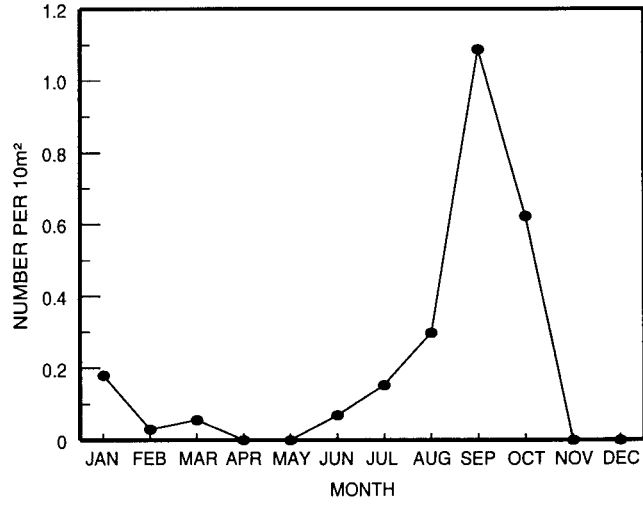
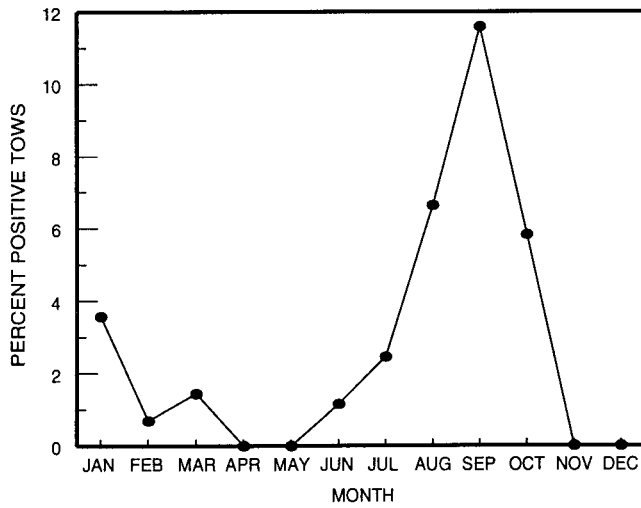
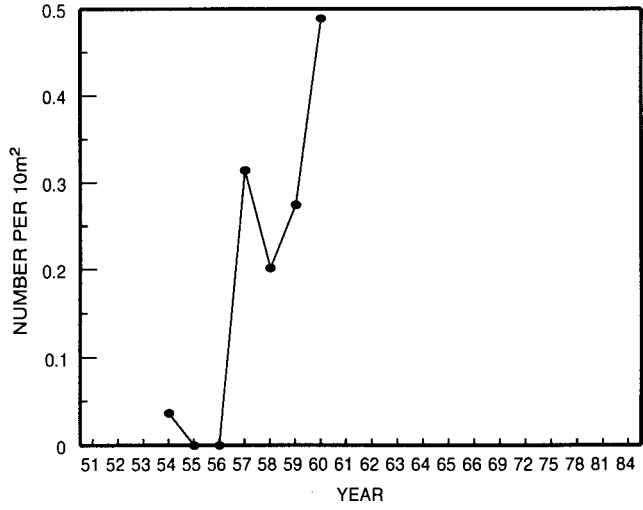
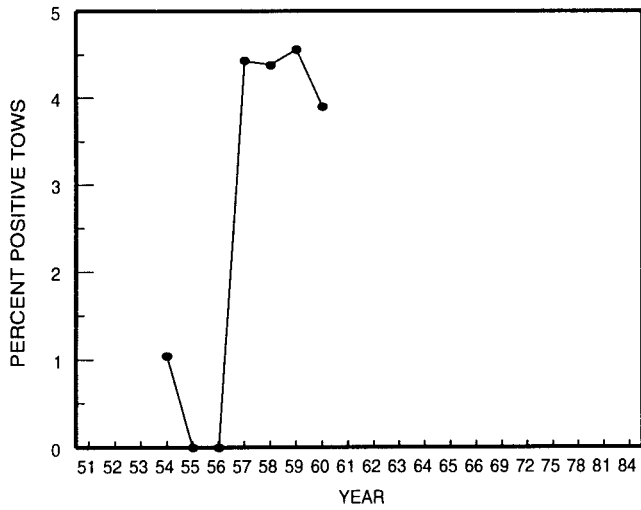
Etropus spp.

Paralichthyidae



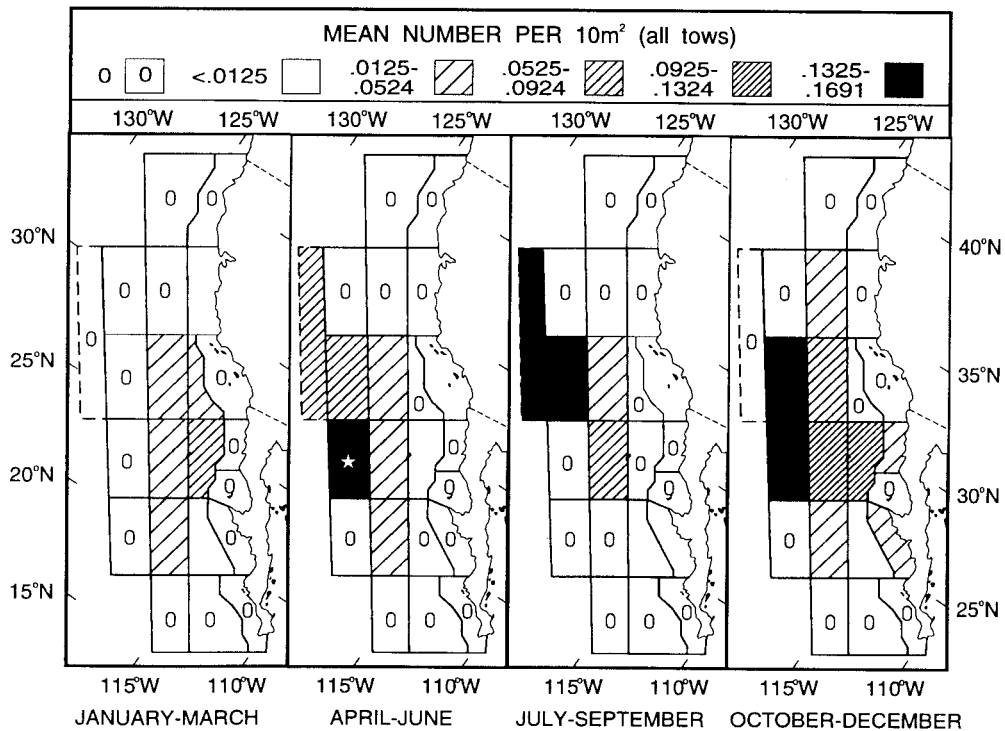
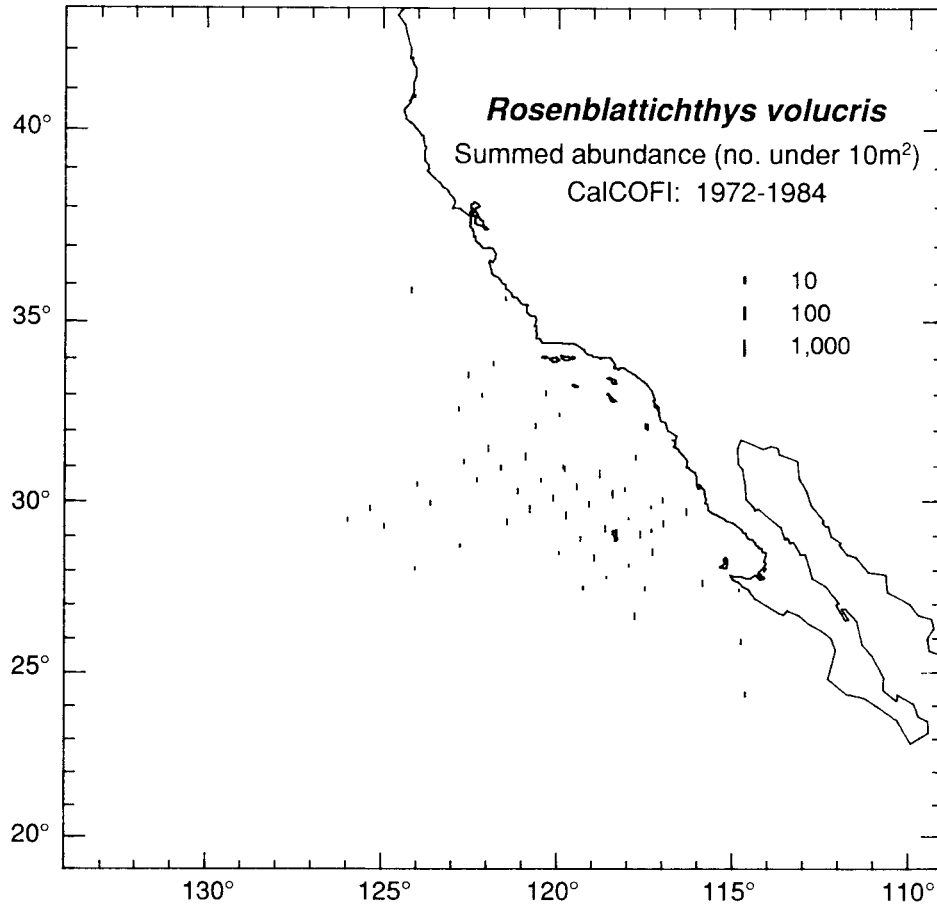
Fringed flounders

Etropus spp.

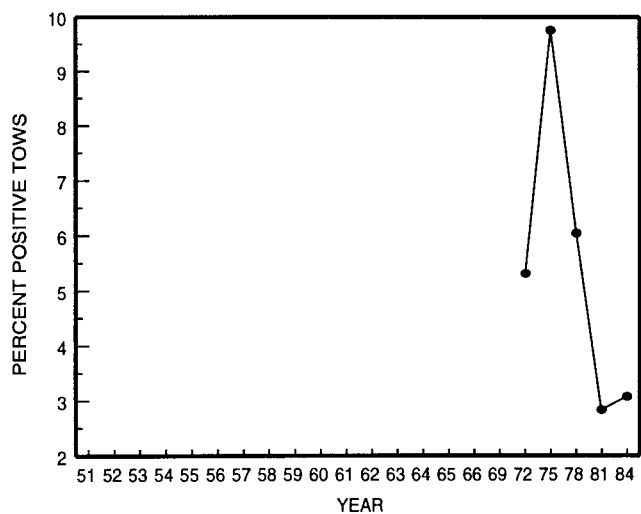


Rosenblattichthys volucris

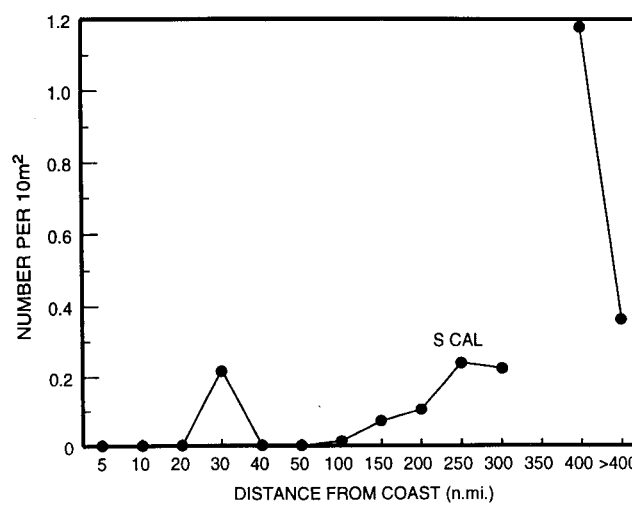
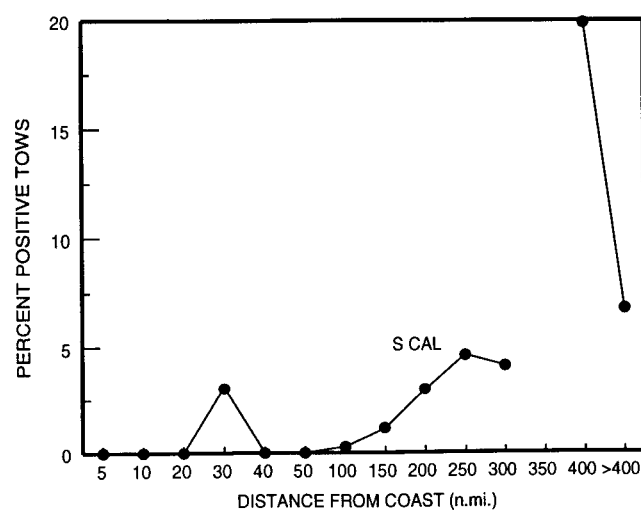
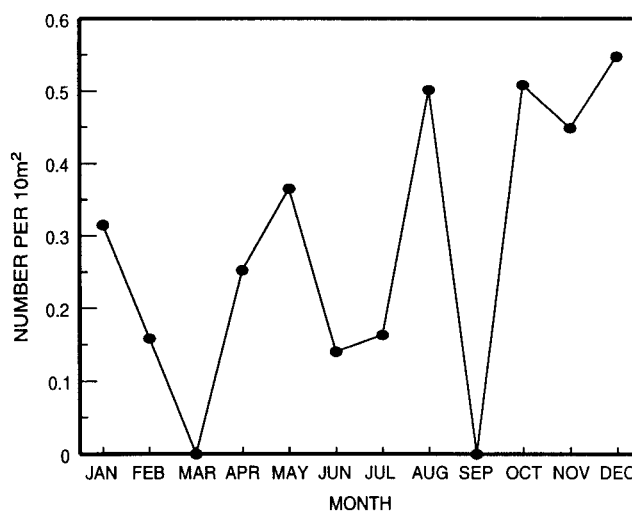
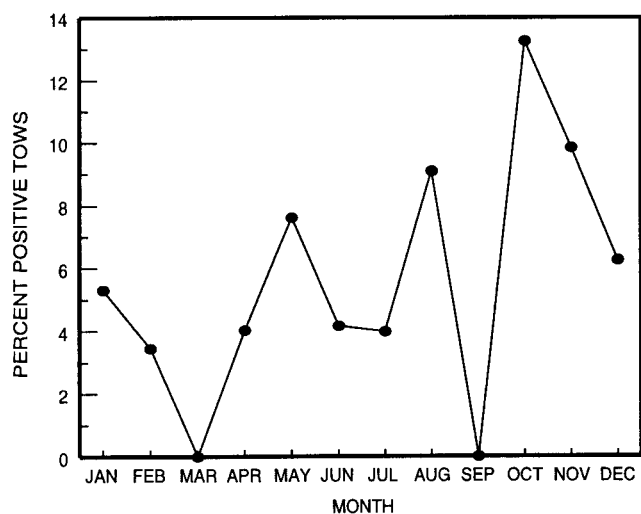
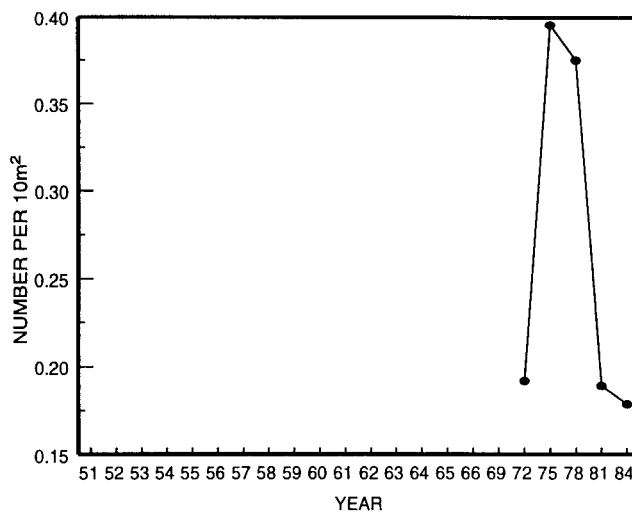
Scopelarchidae



Chubby pearleye

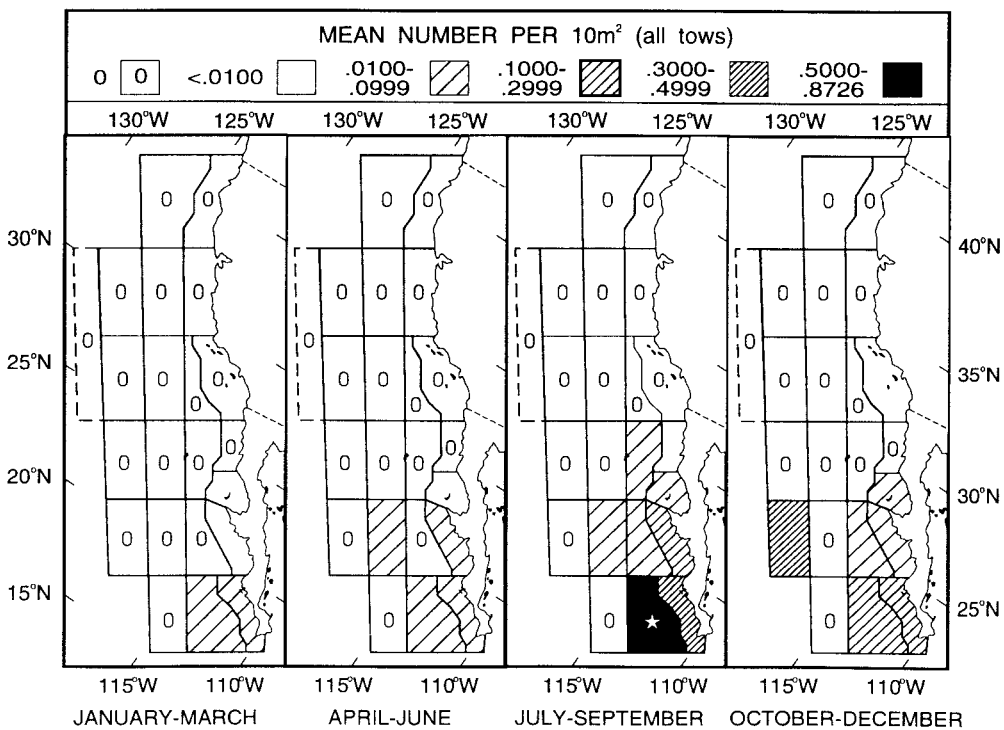
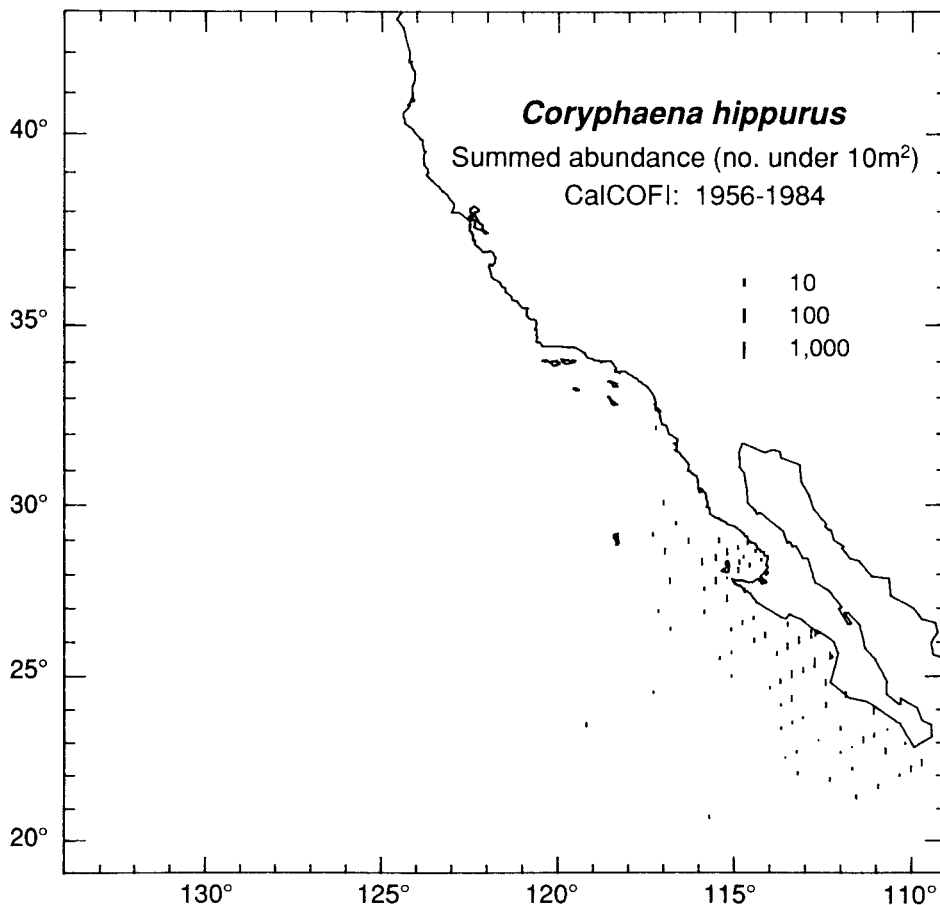


Rosenblattichthys volucris

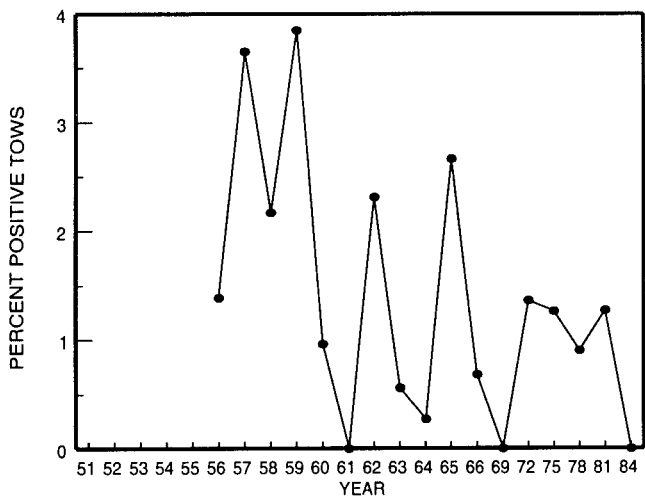


Coryphaena hippurus

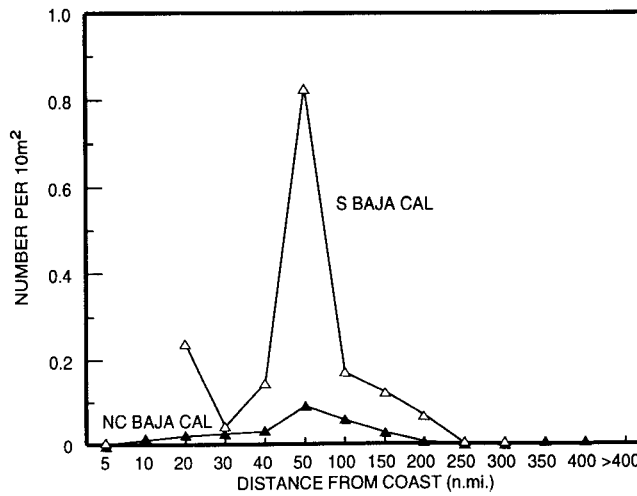
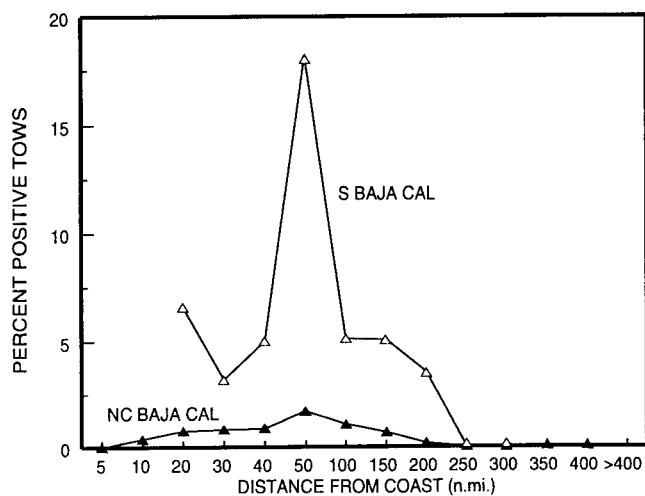
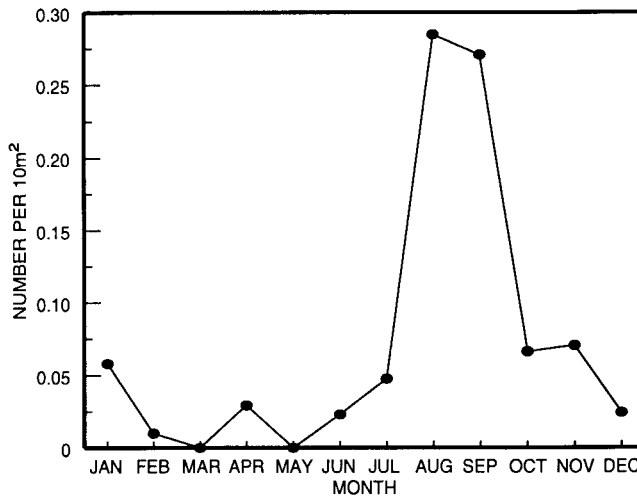
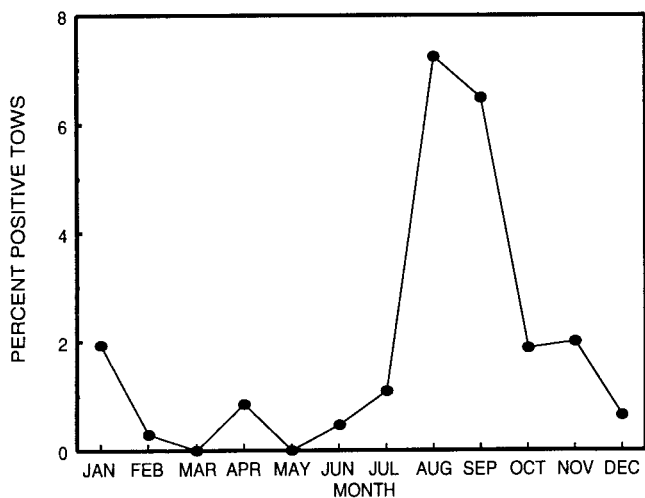
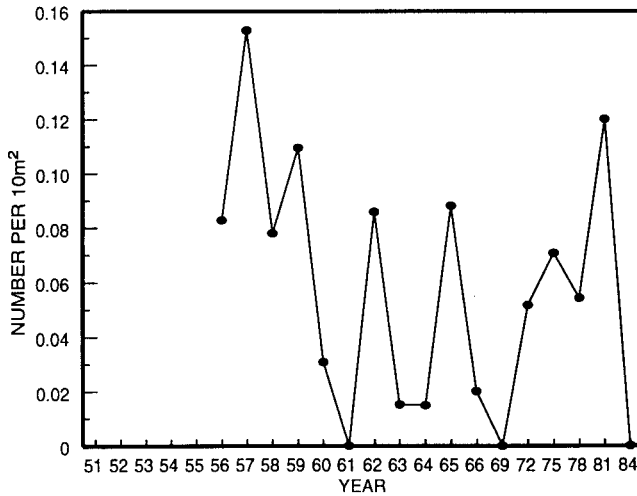
Coryphaenidae



Dolphin

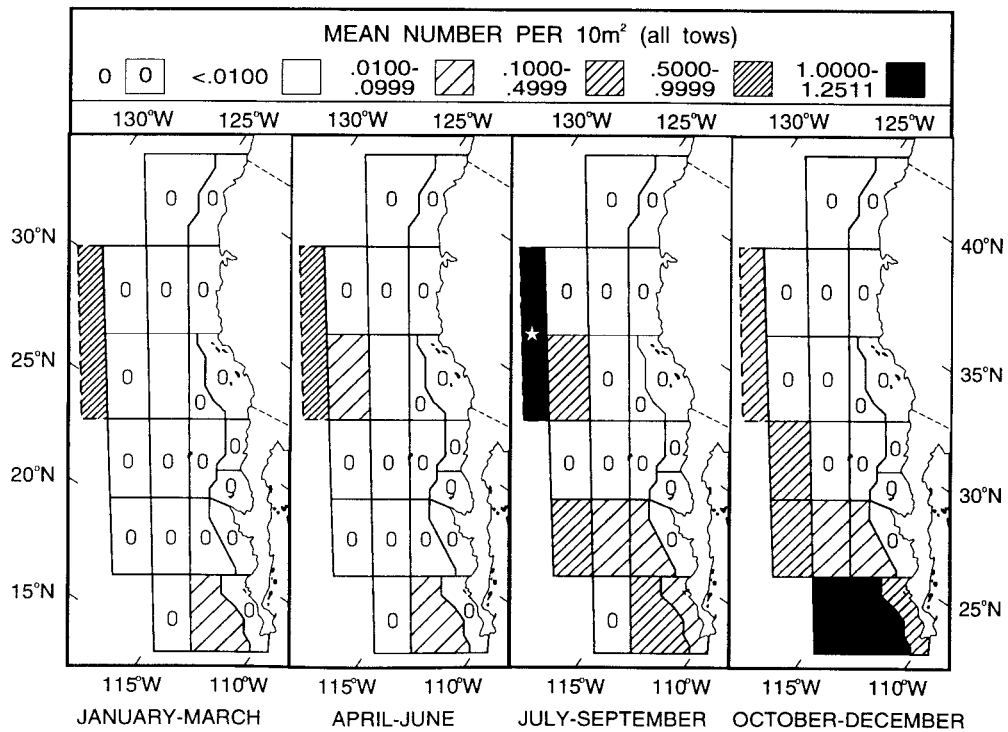
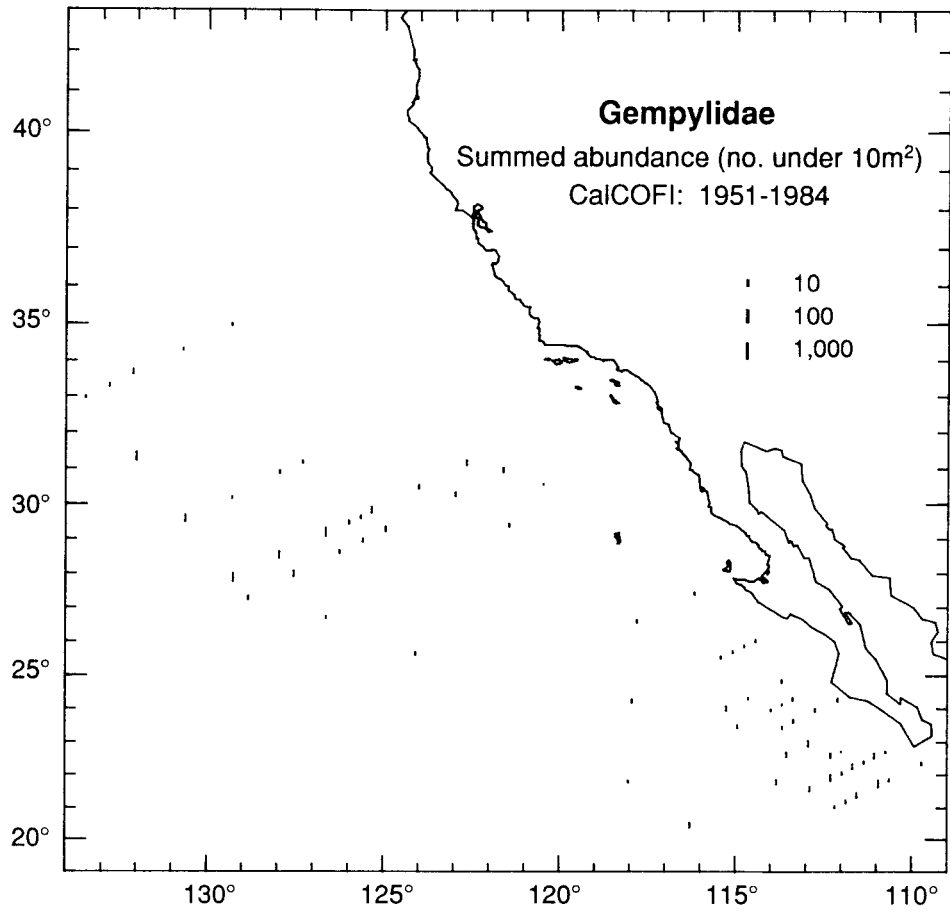


Coryphaena hippurus

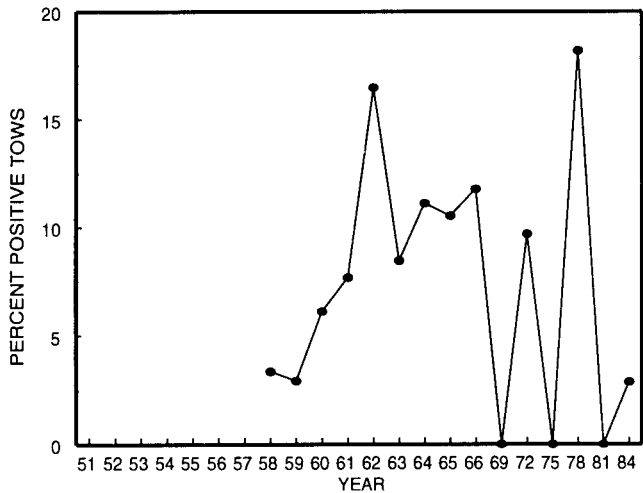


Gempylidae

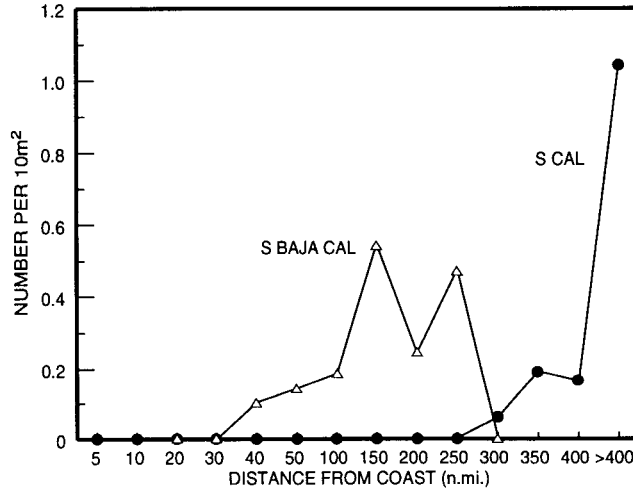
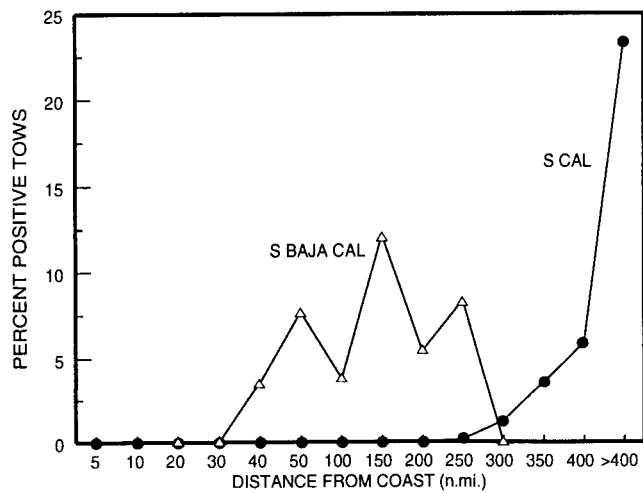
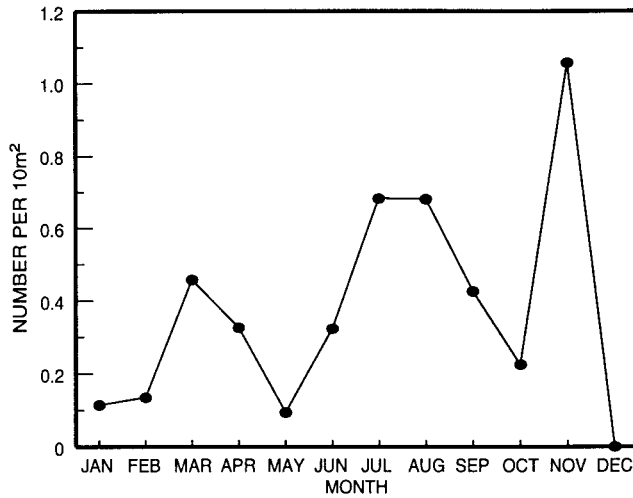
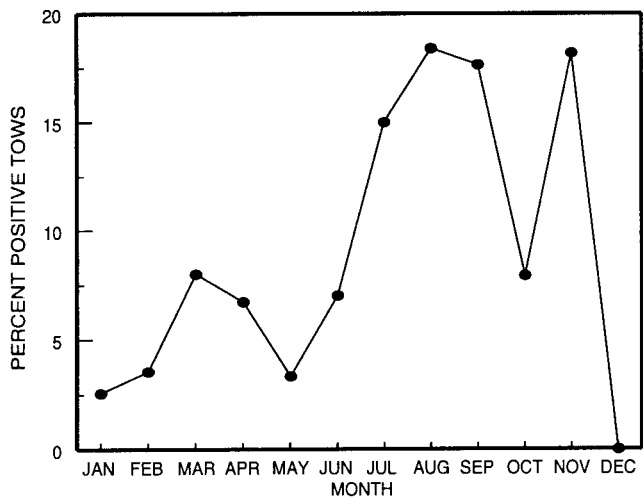
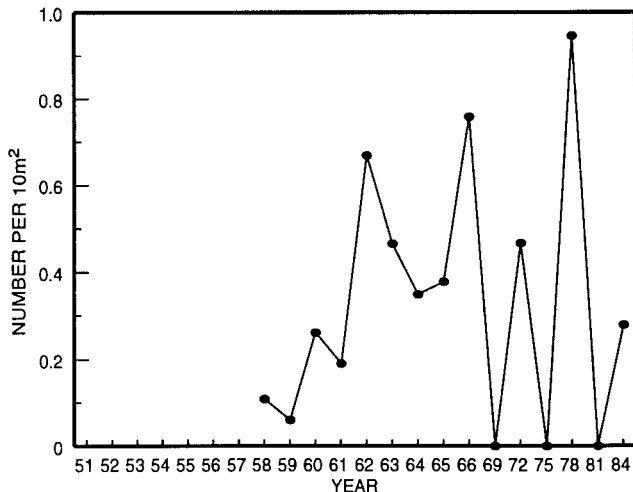
Gempylidae



Snake mackerels

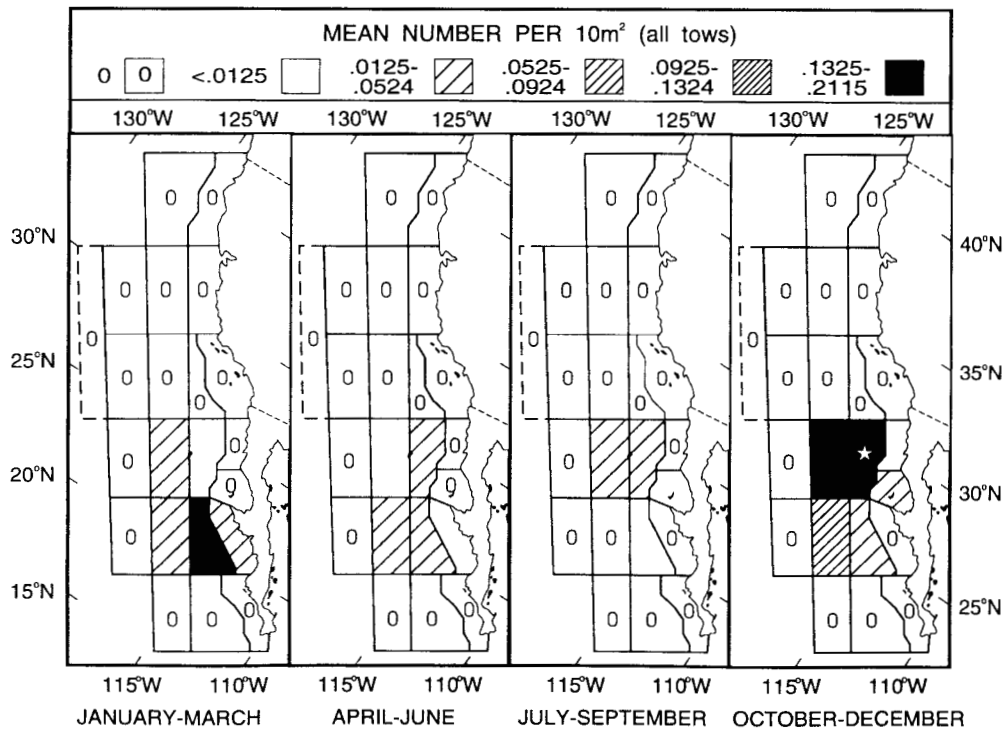
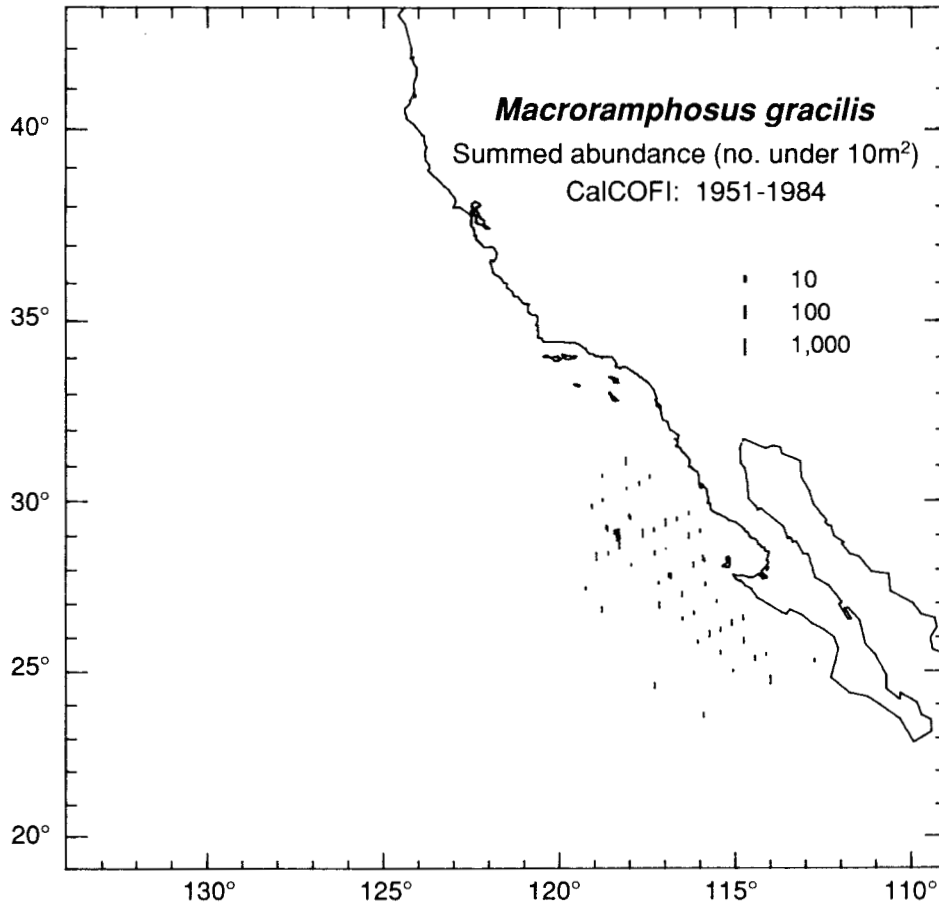


Gempylidae

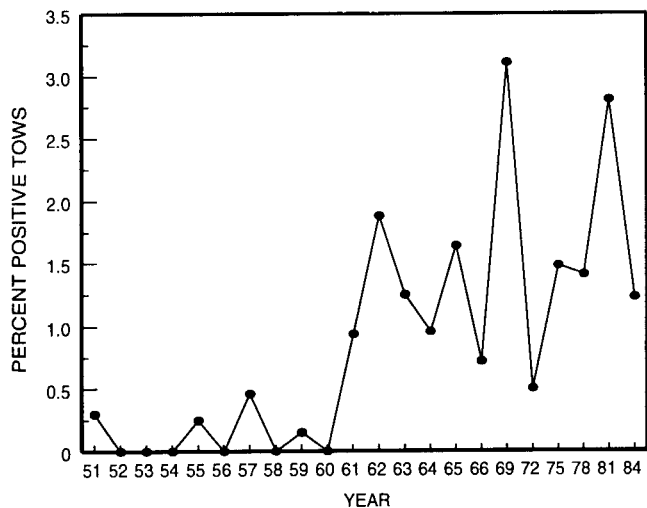


Macroramphosus gracilis

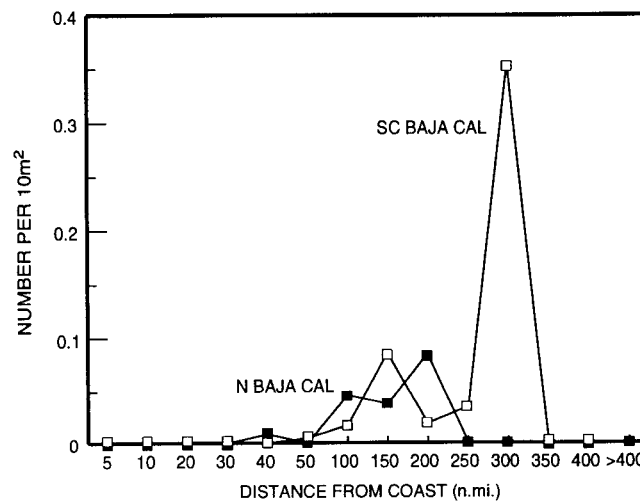
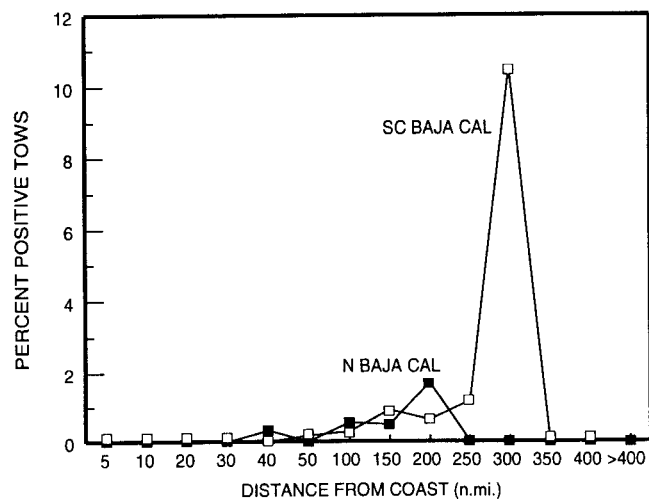
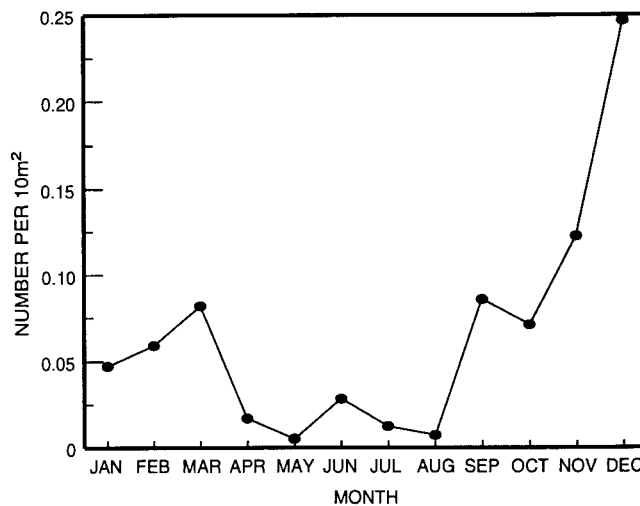
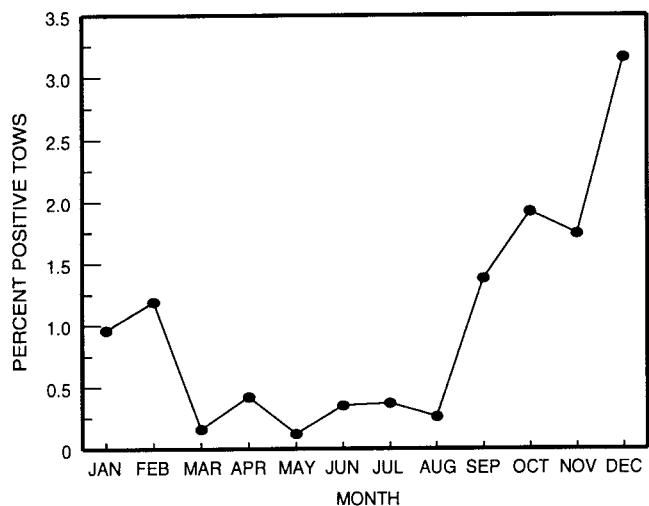
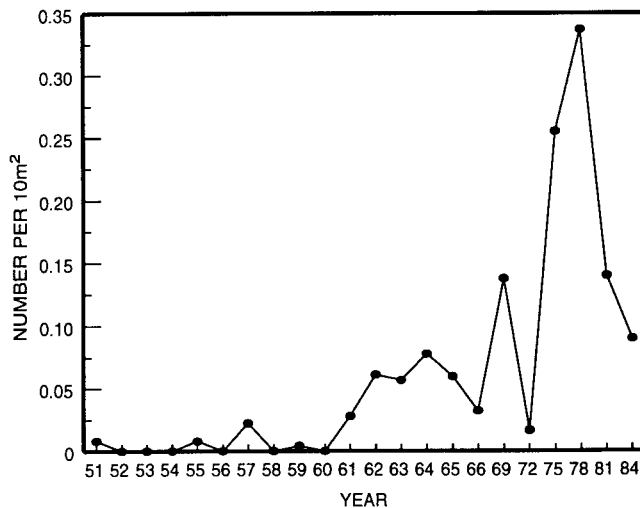
Centriscidae



Slender snipefish

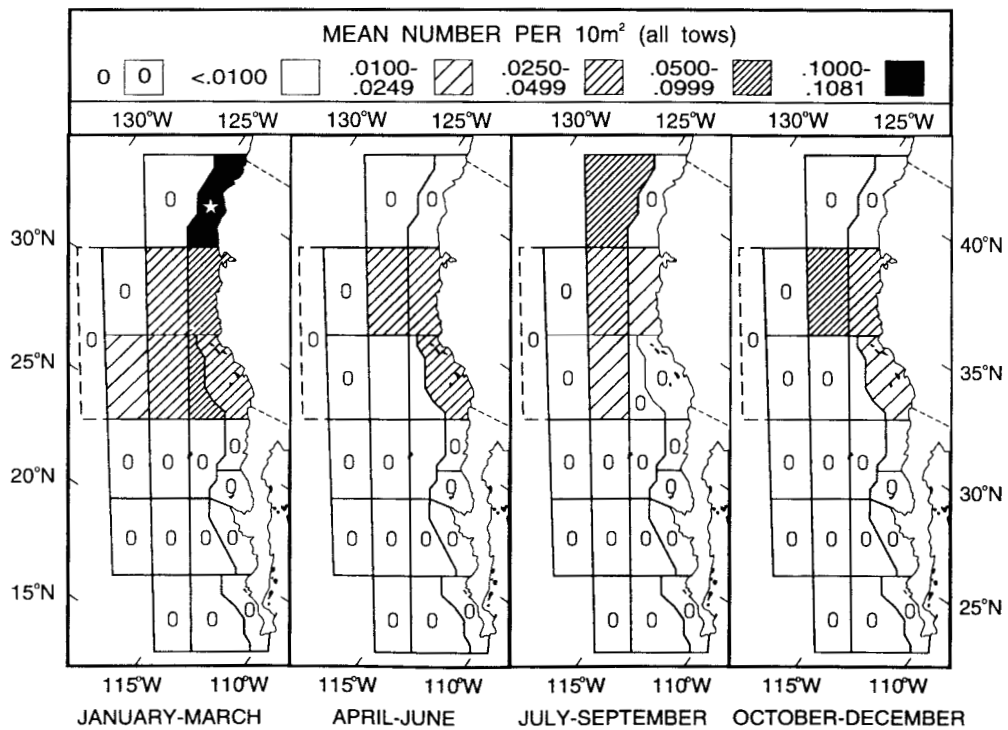
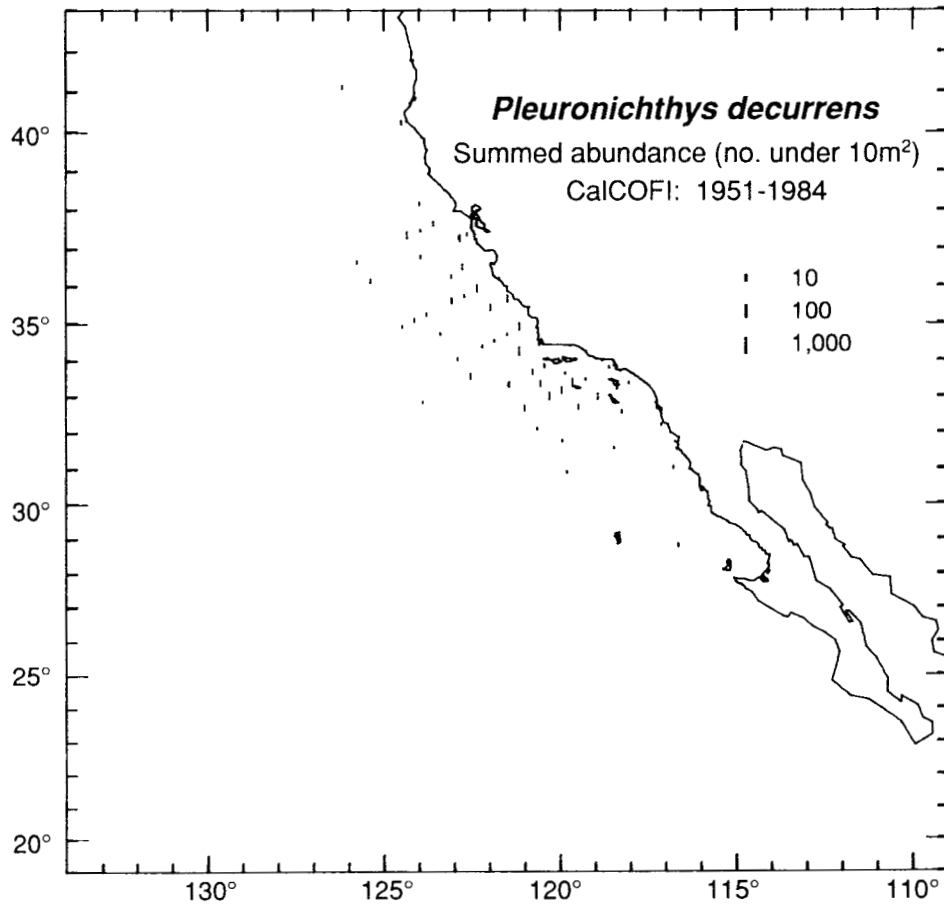


Macroramphosus gracilis

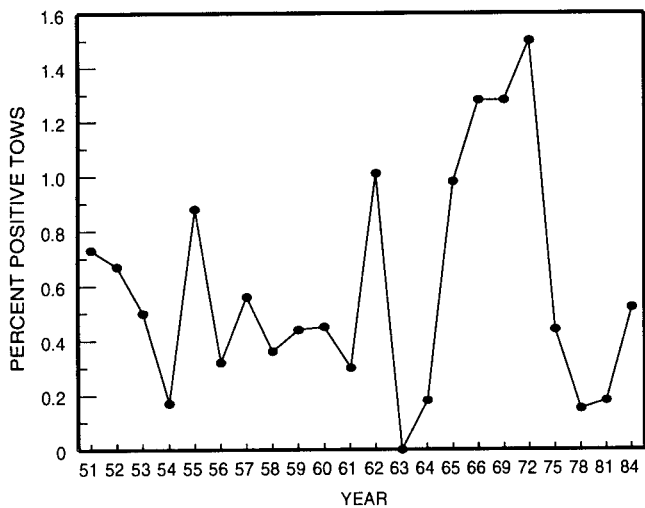
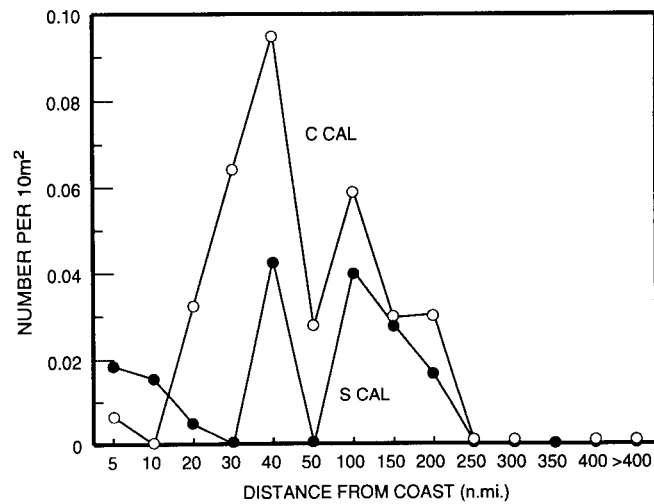
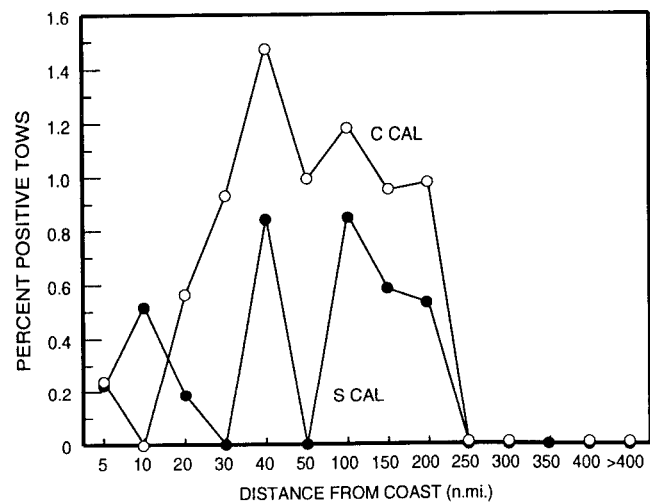
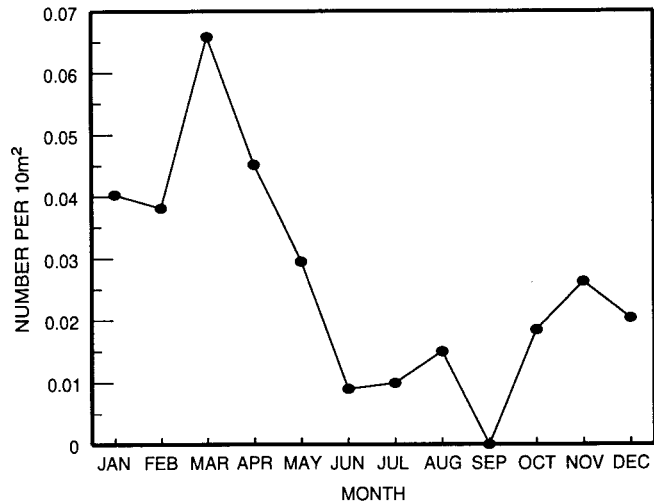
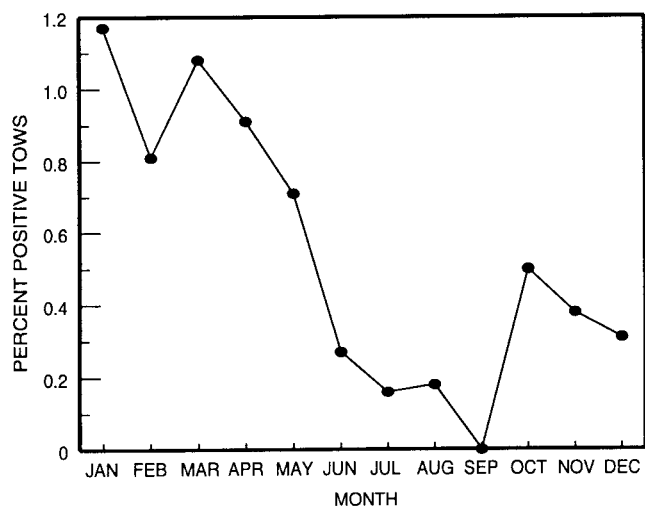
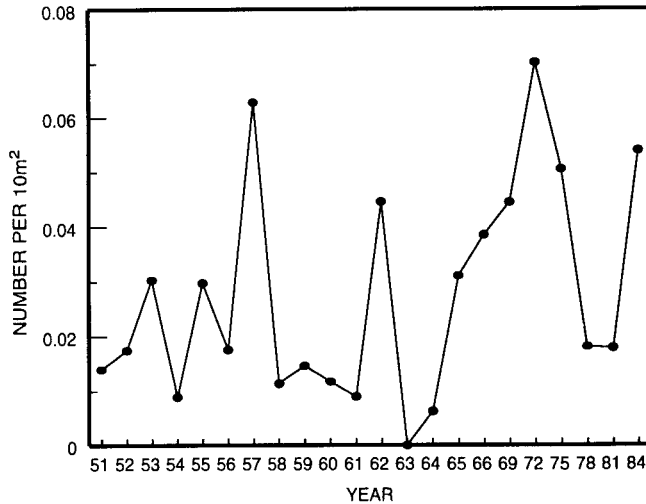


Pleuronichthys decurrens

Pleuronectidae

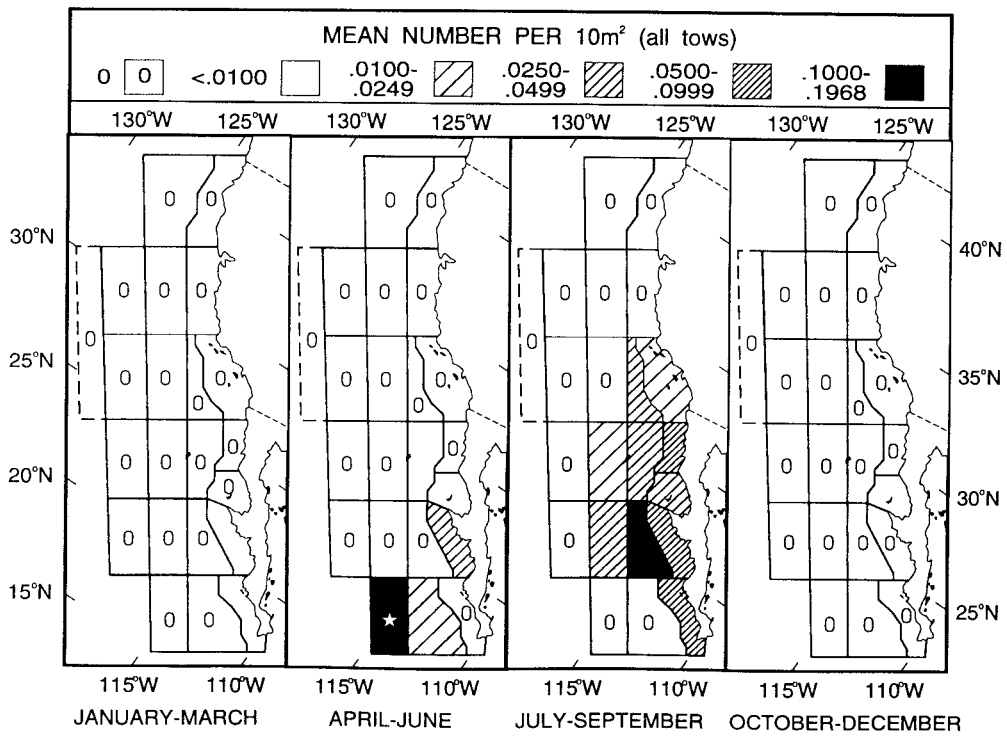
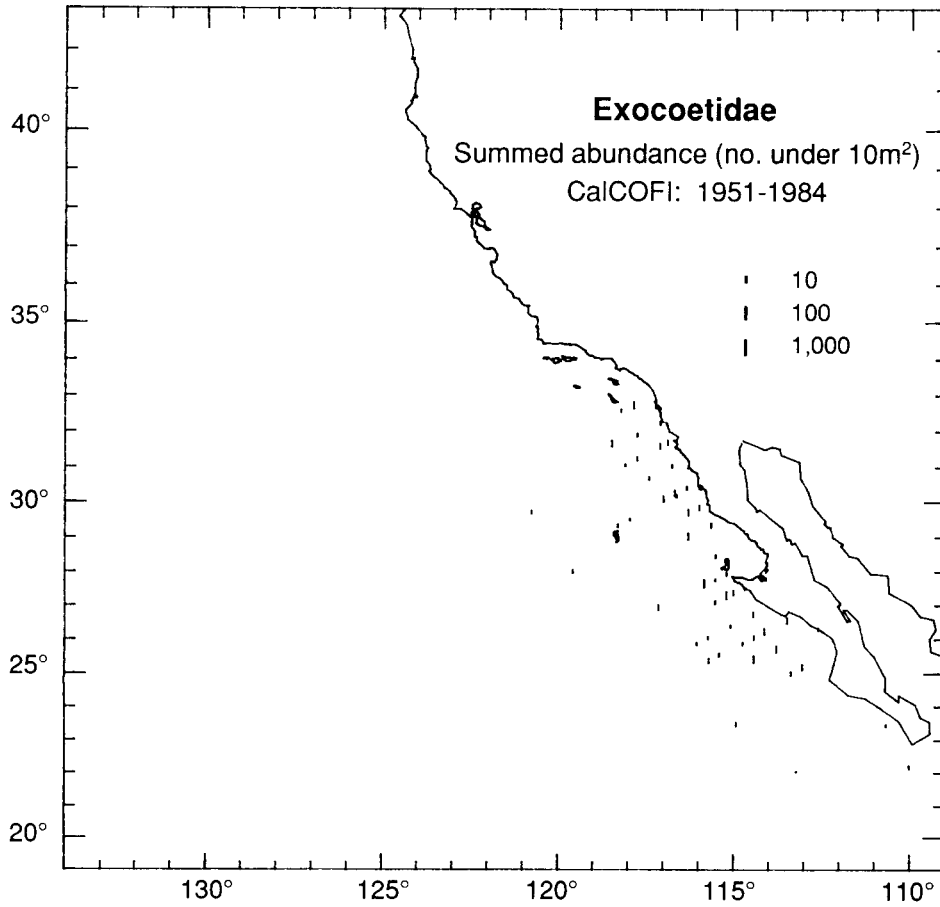


Curlfin turbot

*Pleuronichthys decurrens*

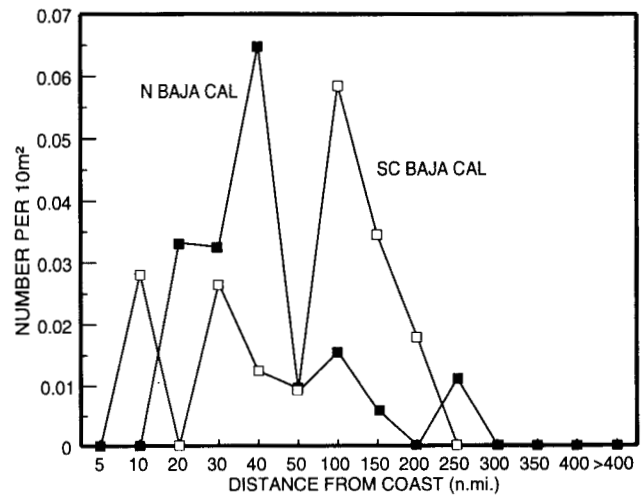
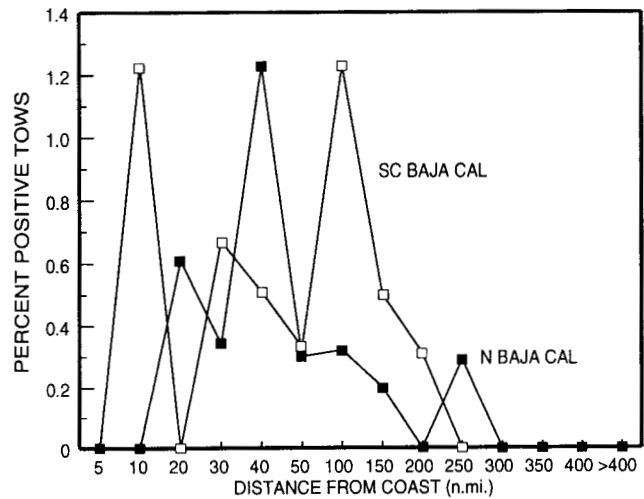
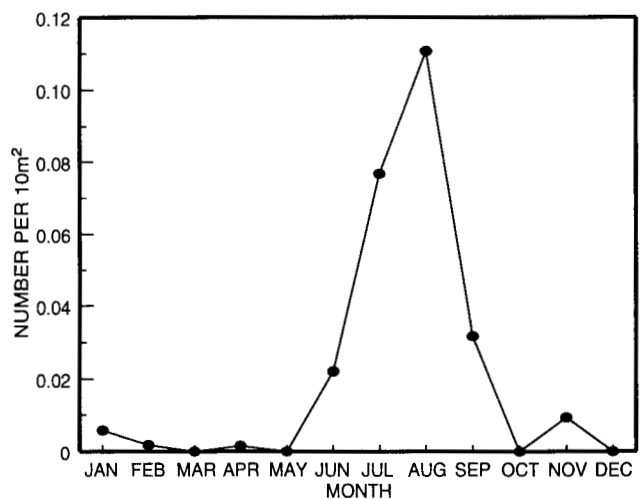
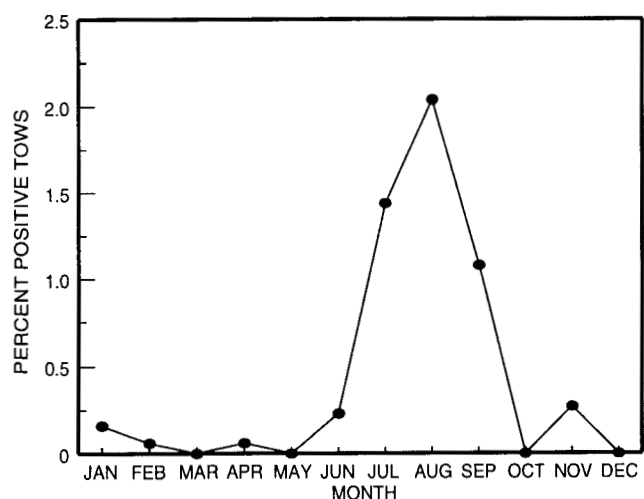
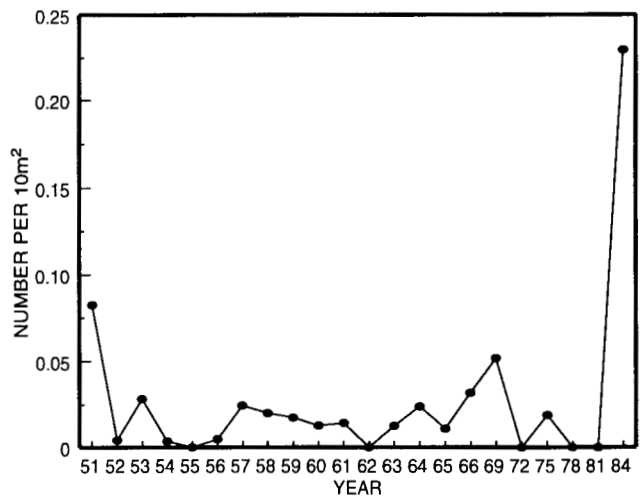
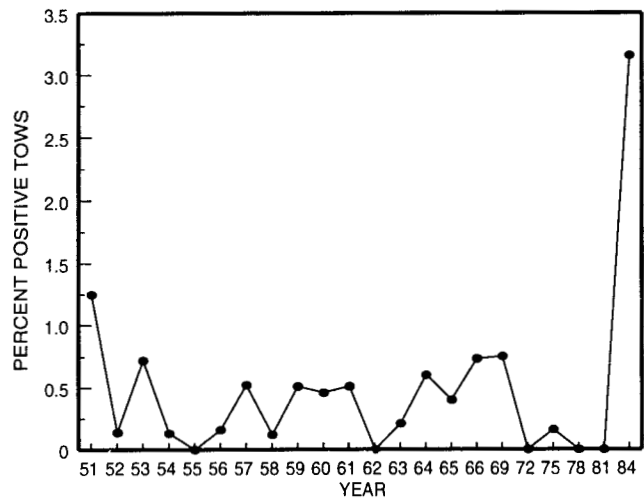
Exocoetidae

Exocoetidae



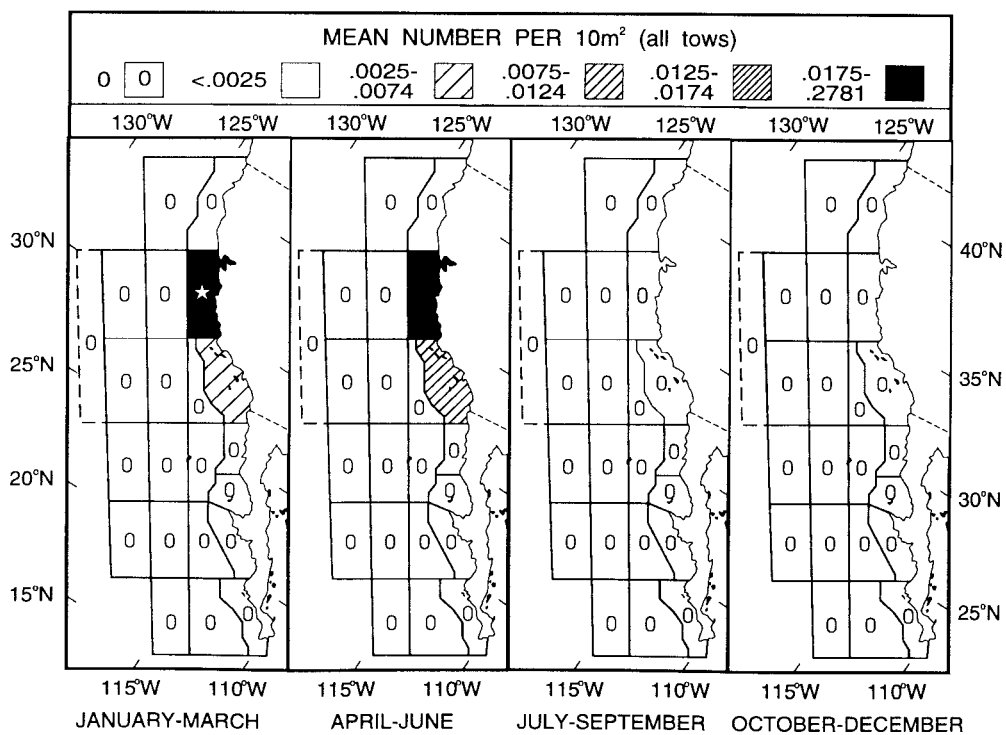
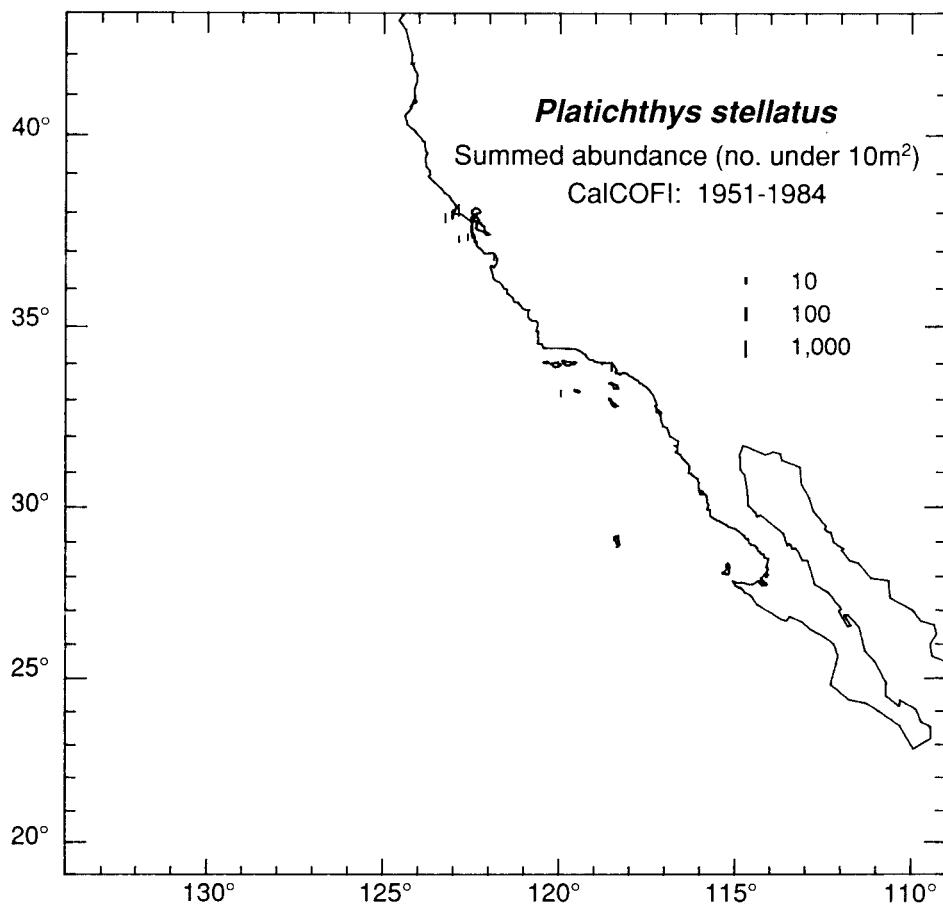
Flyingfishes

Exocoetidae



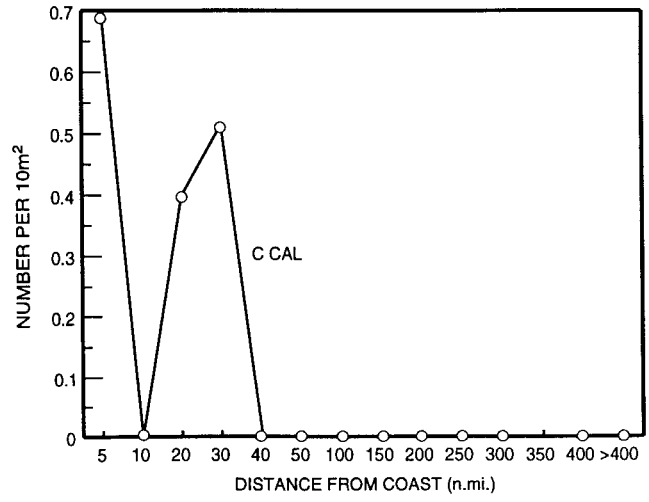
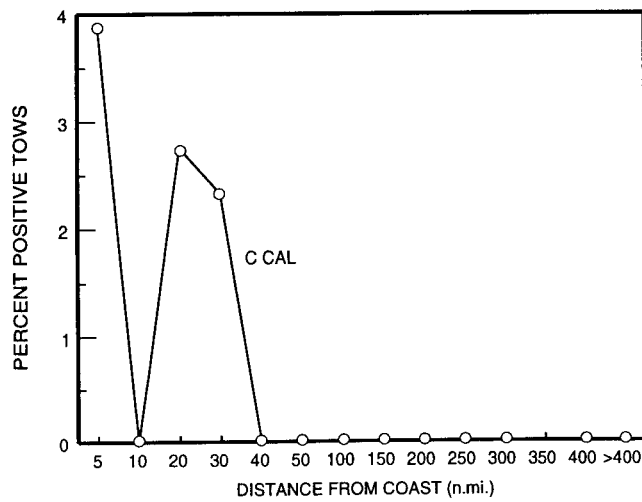
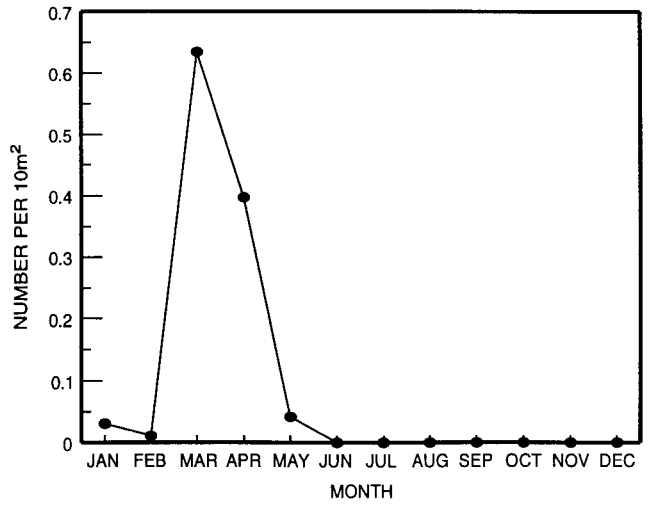
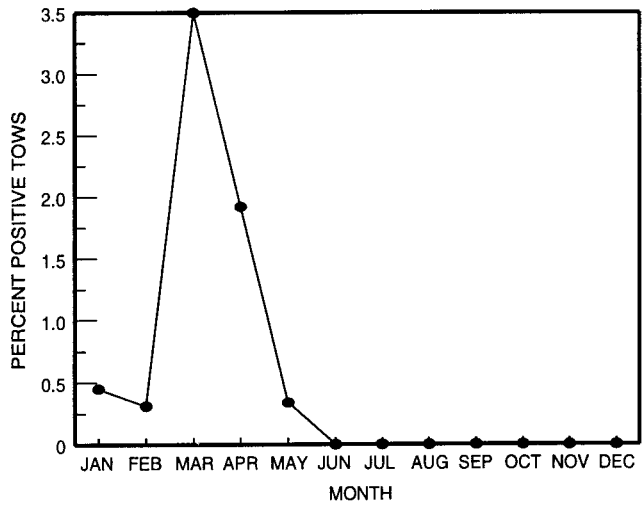
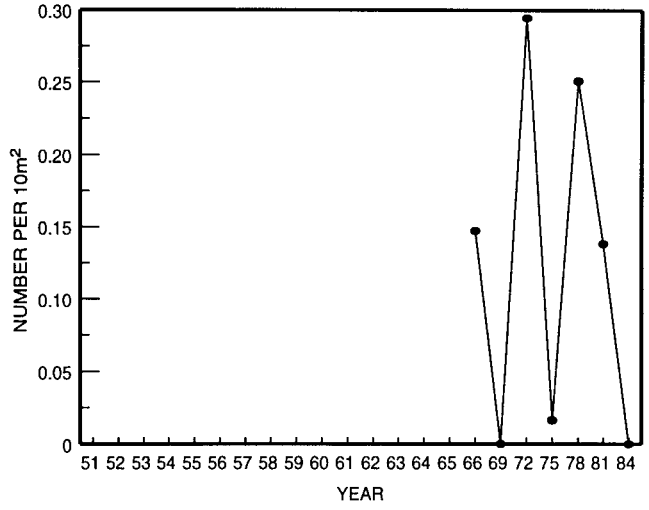
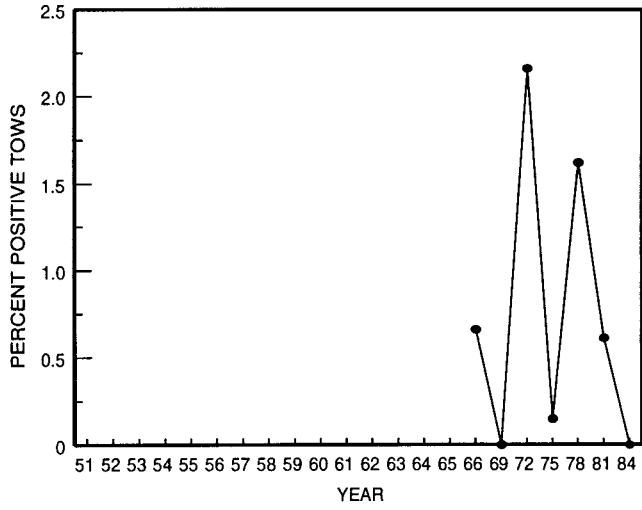
Platichthys stellatus

Pleuronectidae



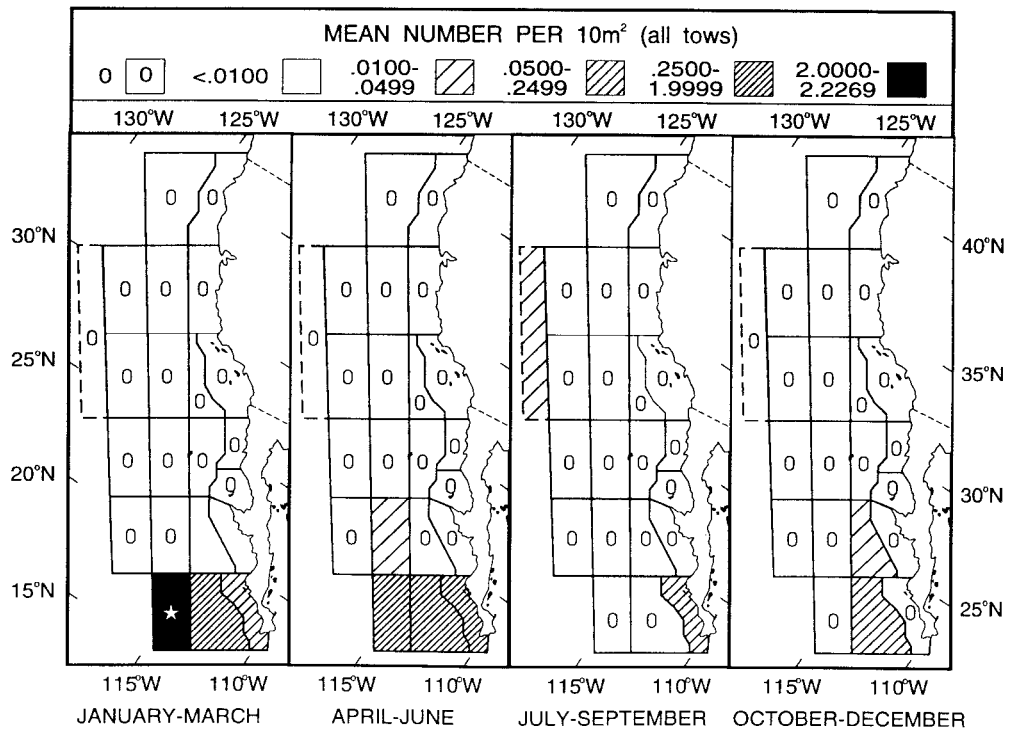
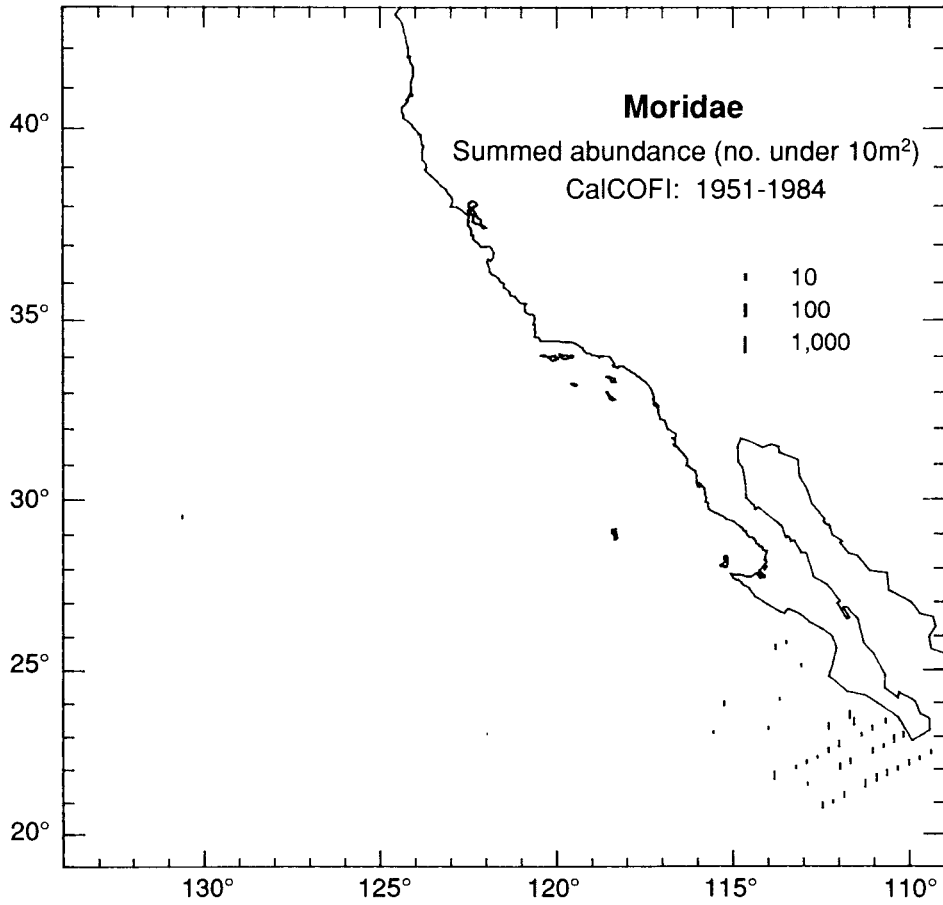
Starry flounder

Platichthys stellatus

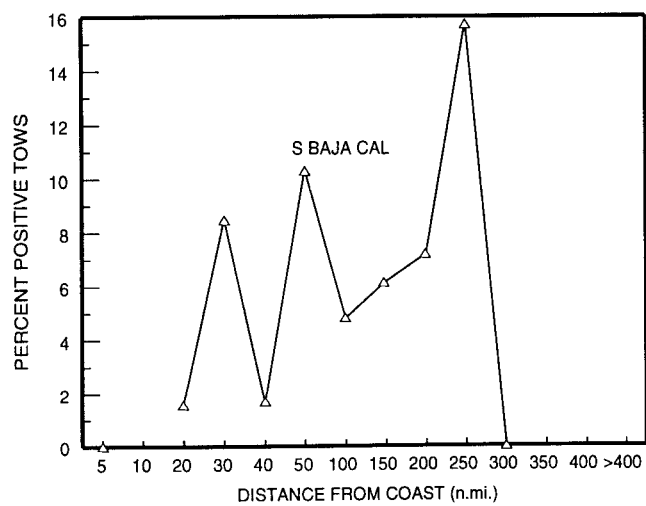
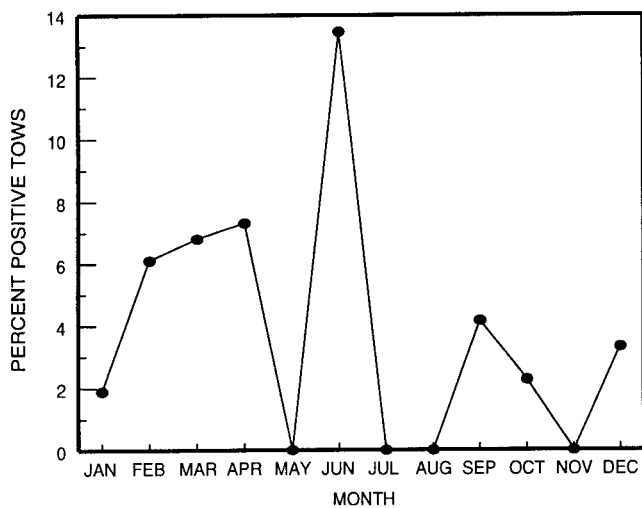
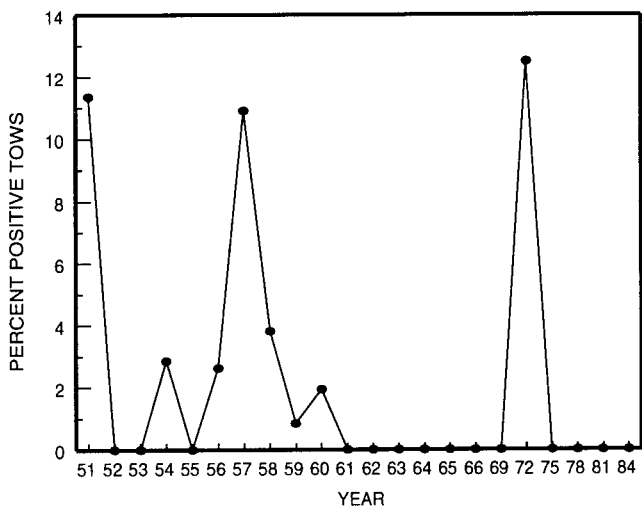


Moridae

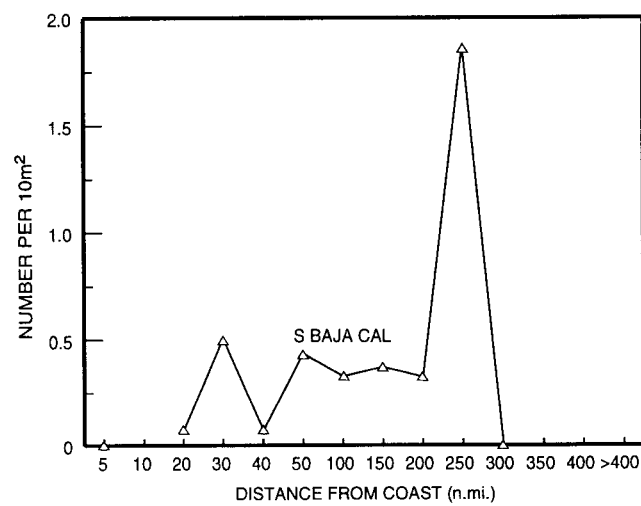
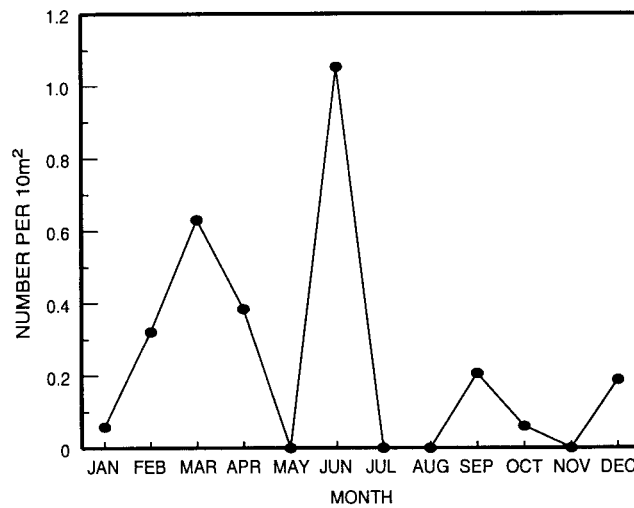
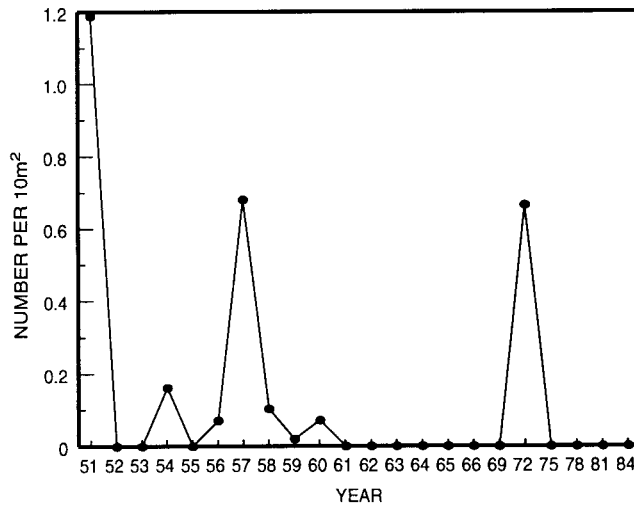
Moridae



Codlings

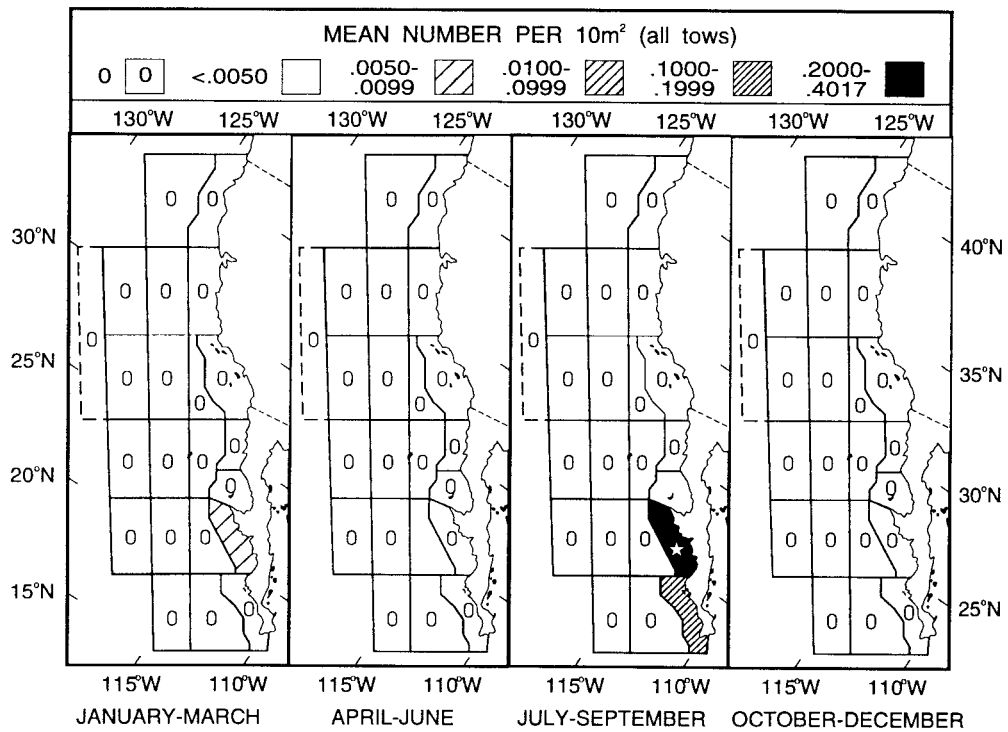
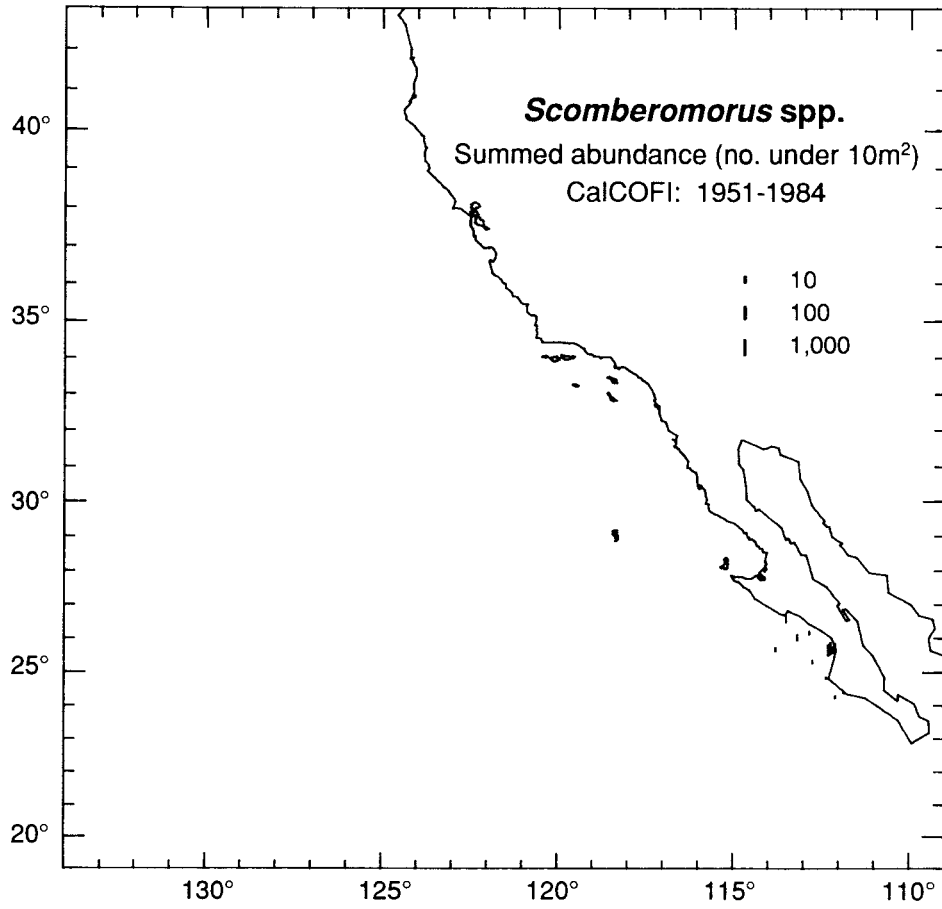


Moridae

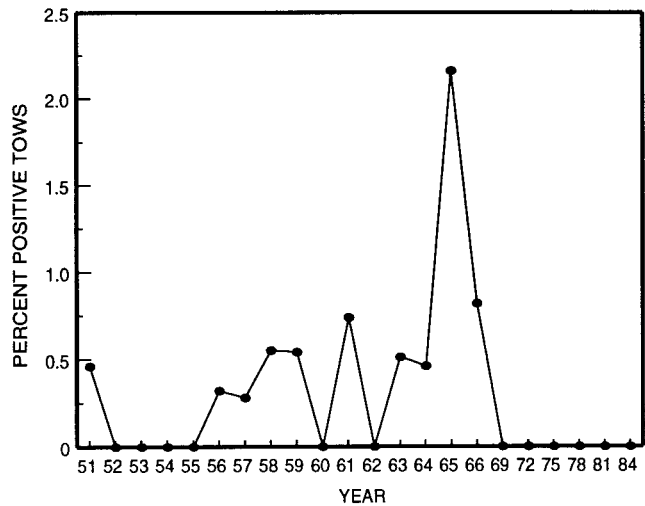
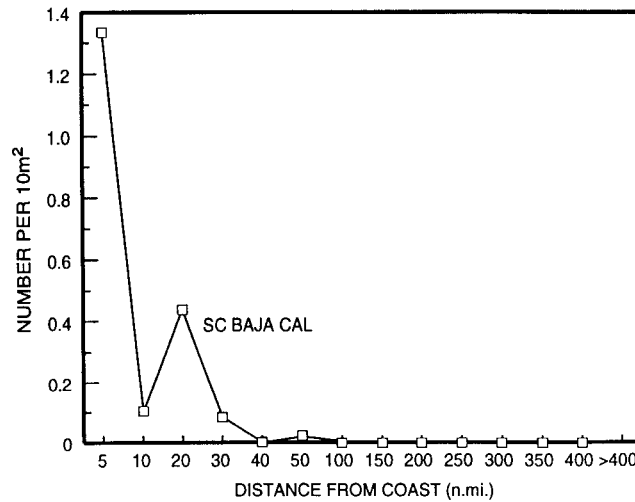
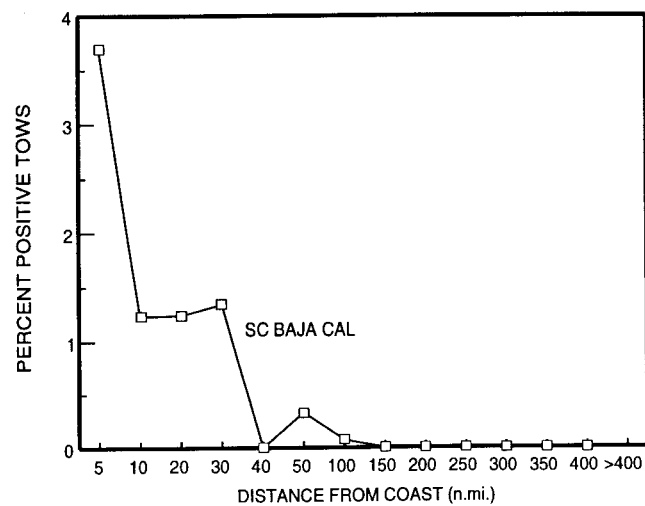
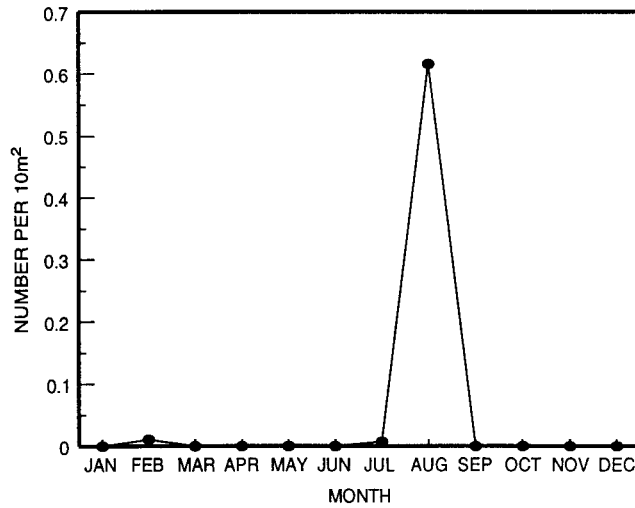
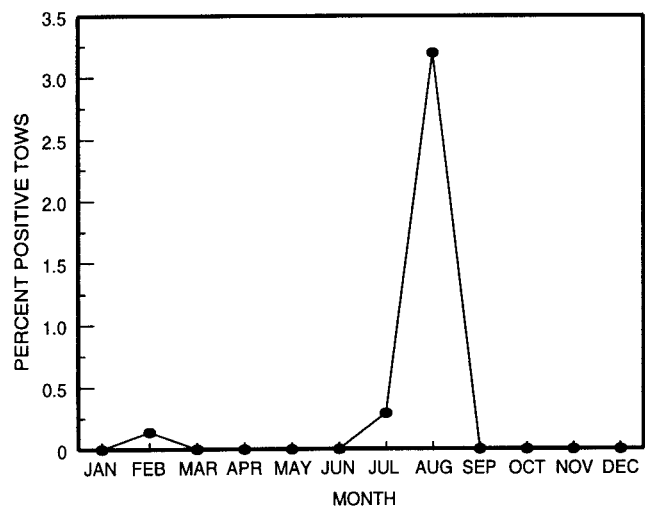
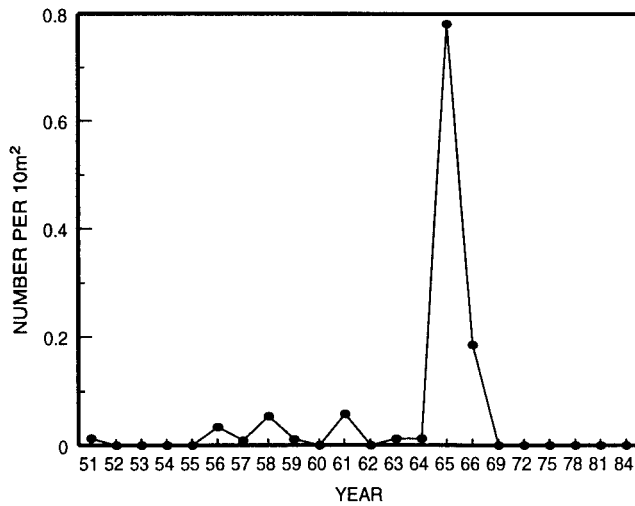


Scomberomorus spp.

Scombridae

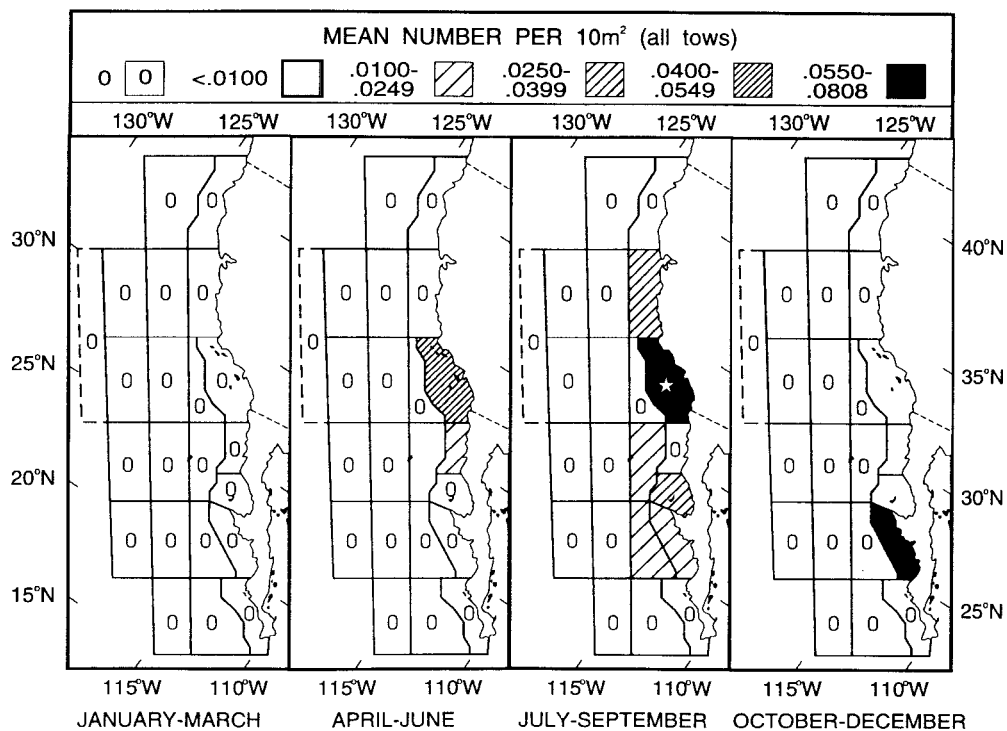
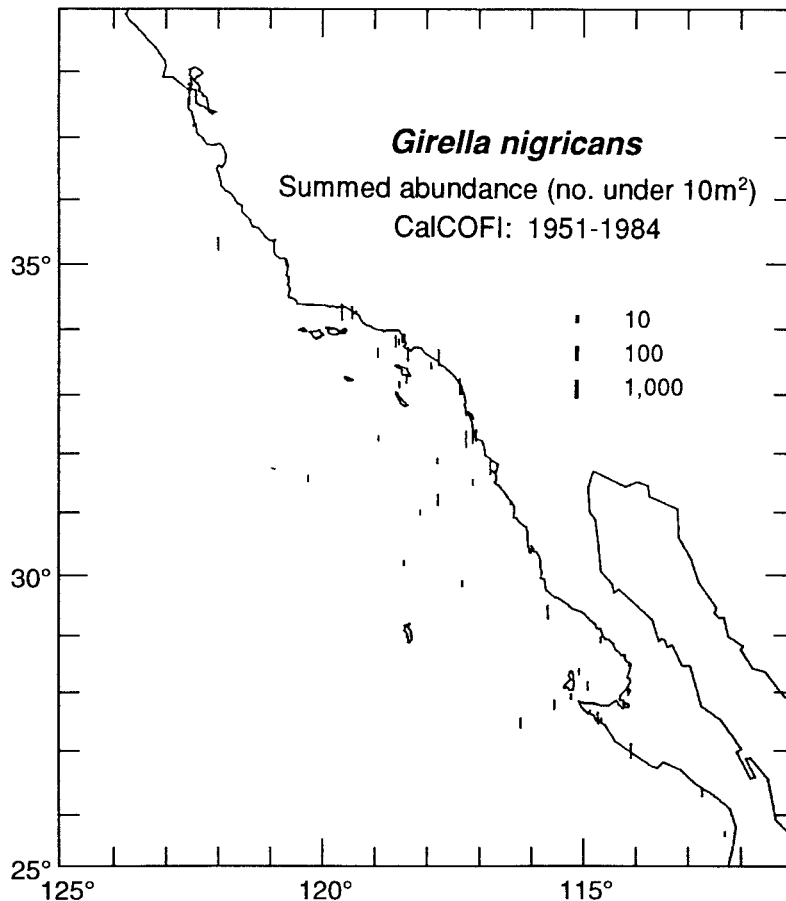


Sierras

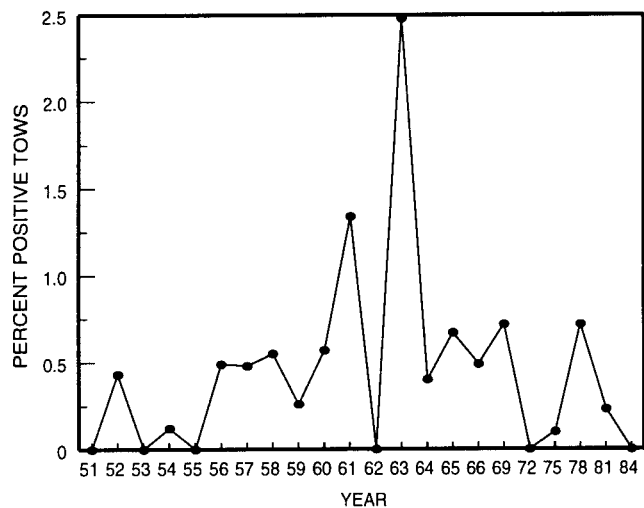
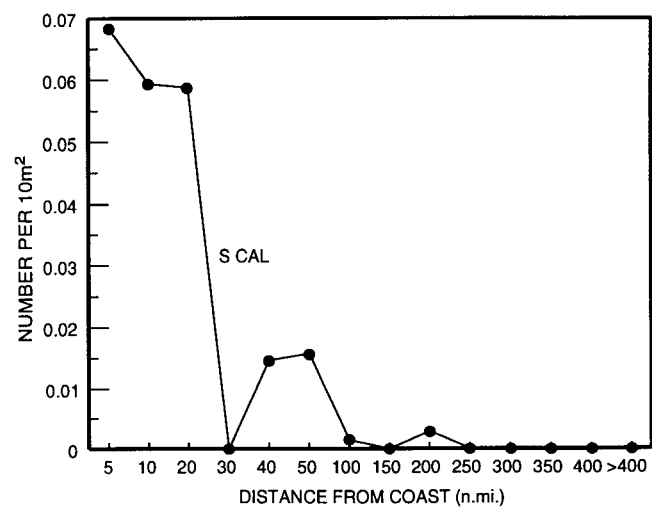
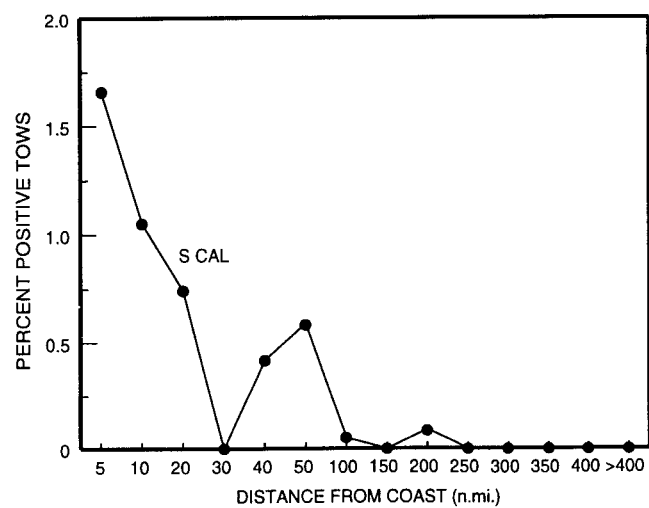
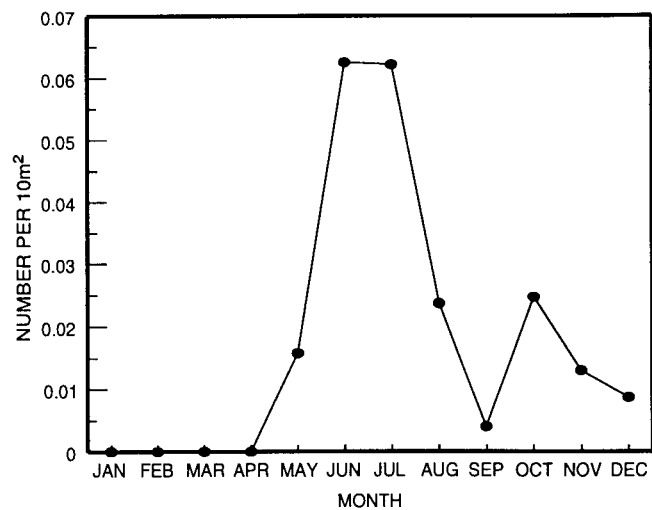
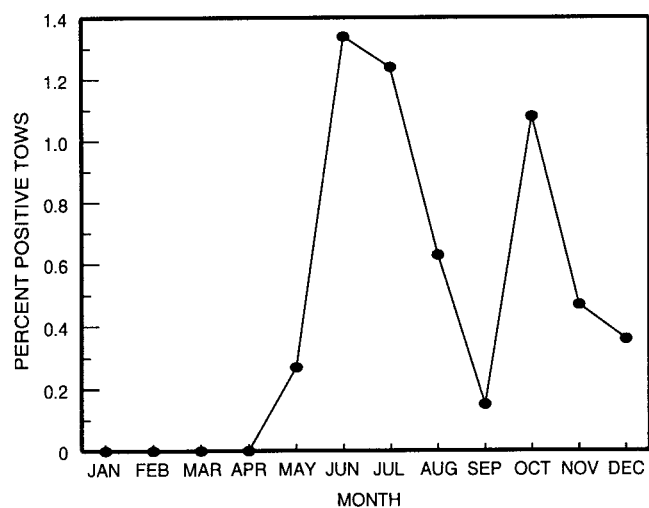
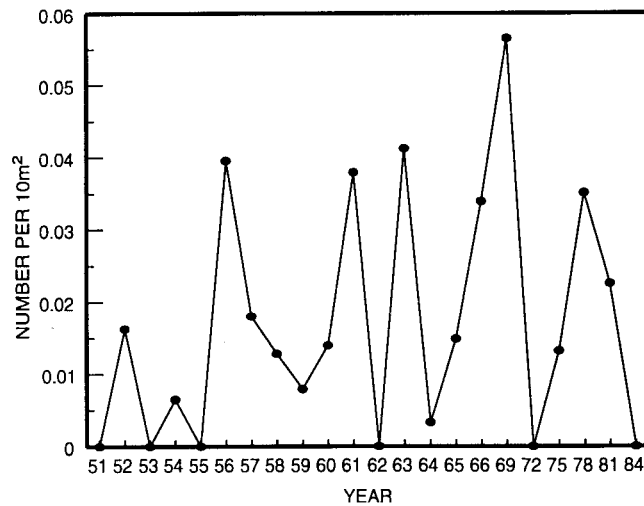
*Scomberomorus* spp.

Girella nigricans

Kyphosidae

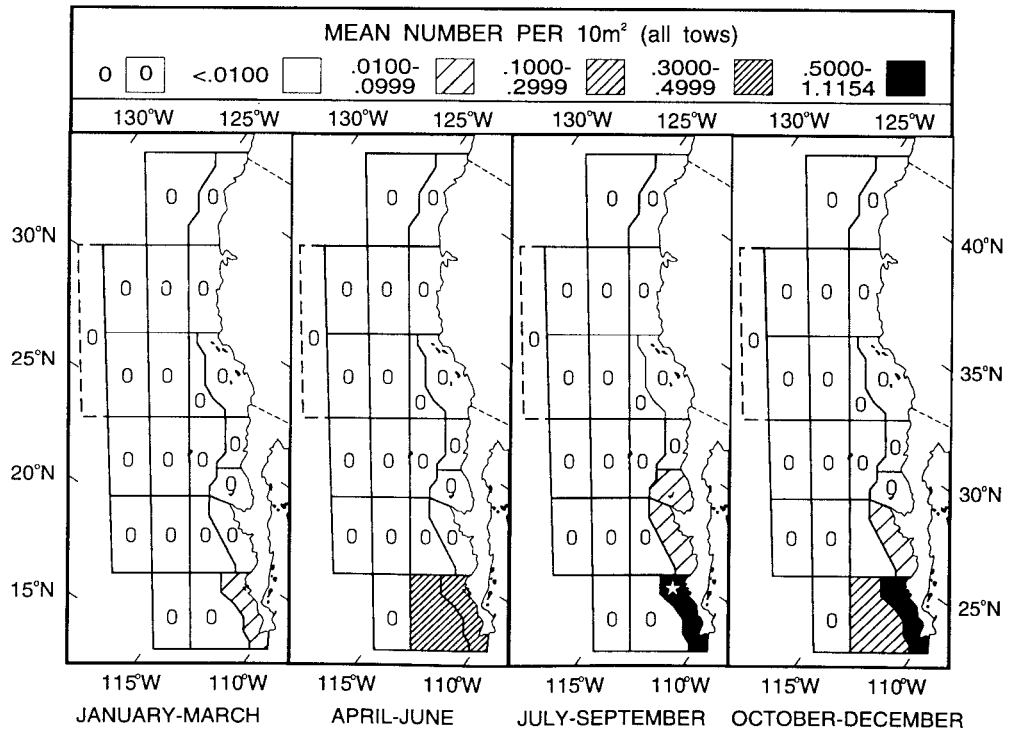
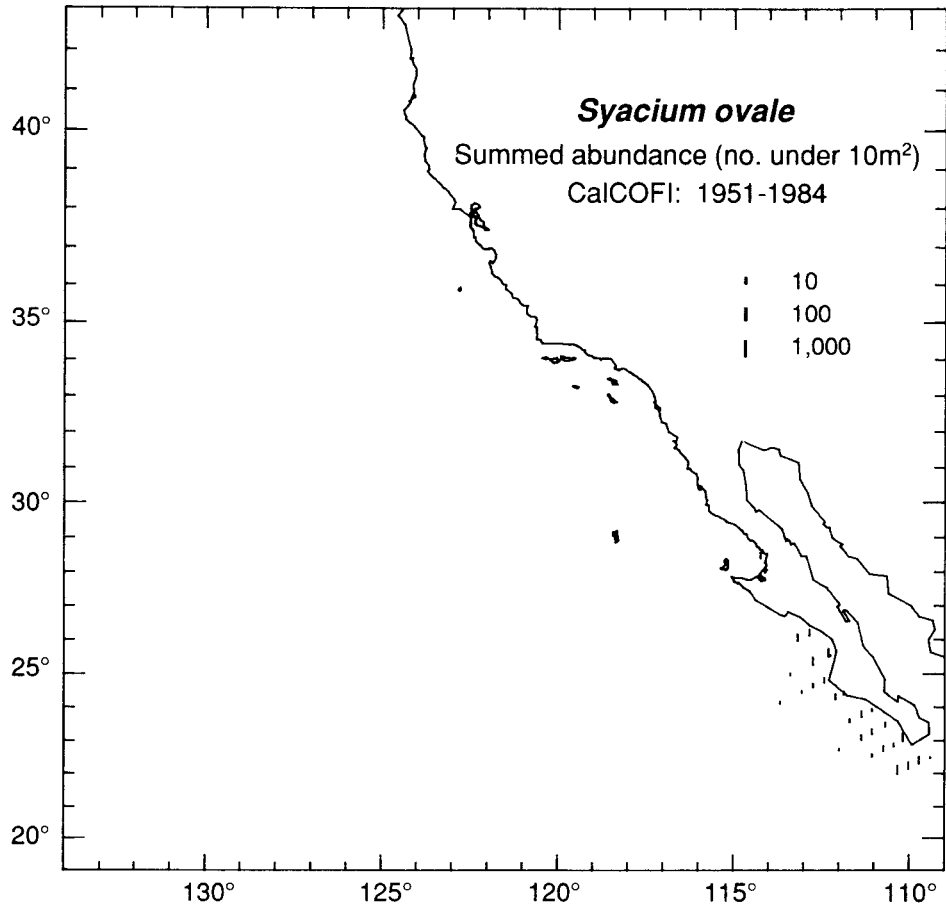


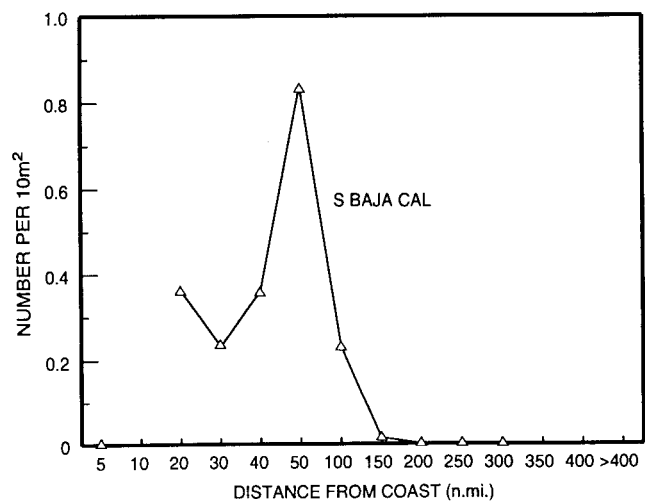
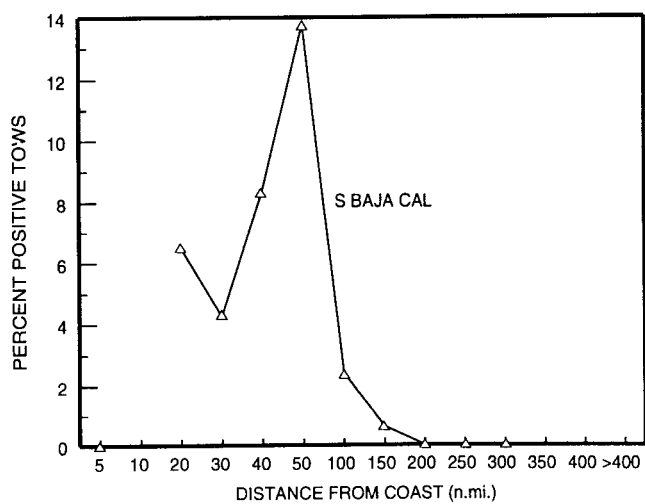
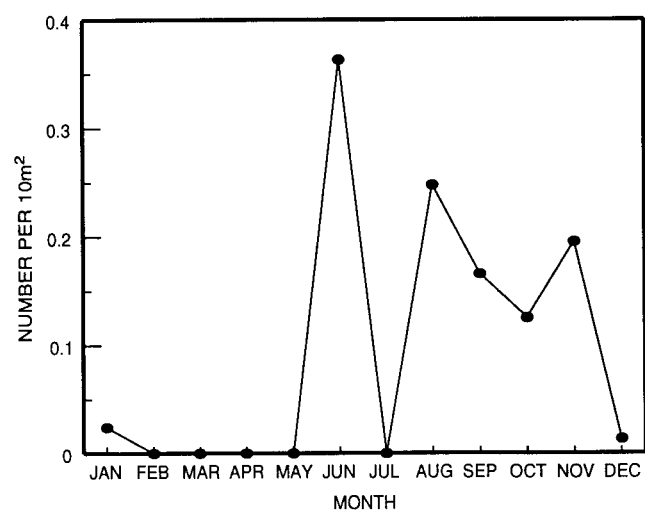
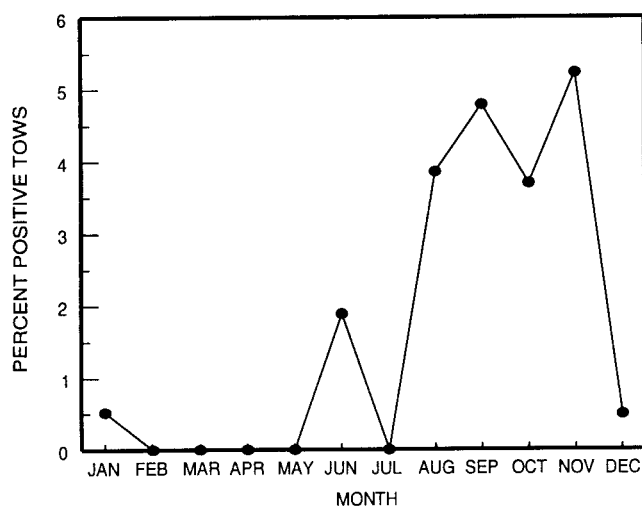
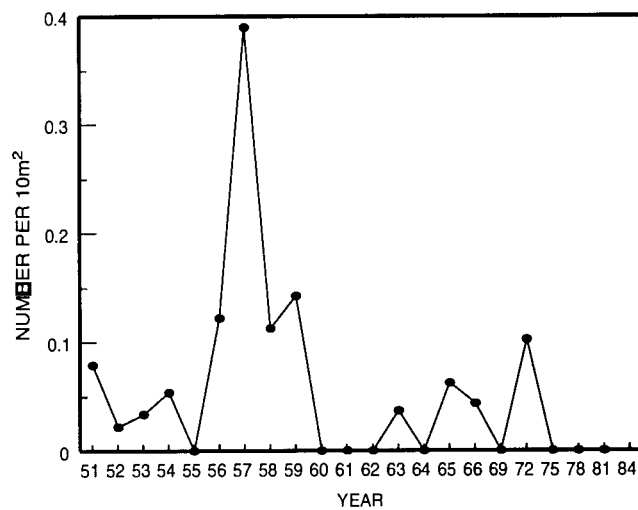
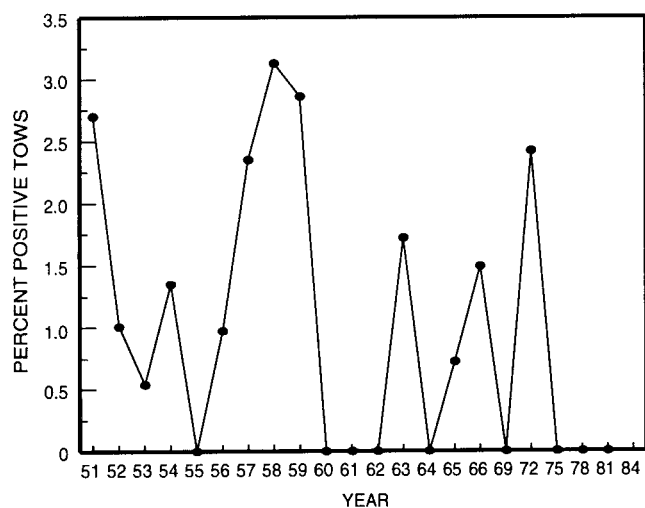
Opaleye

*Girella nigricans*

Syacium ovale

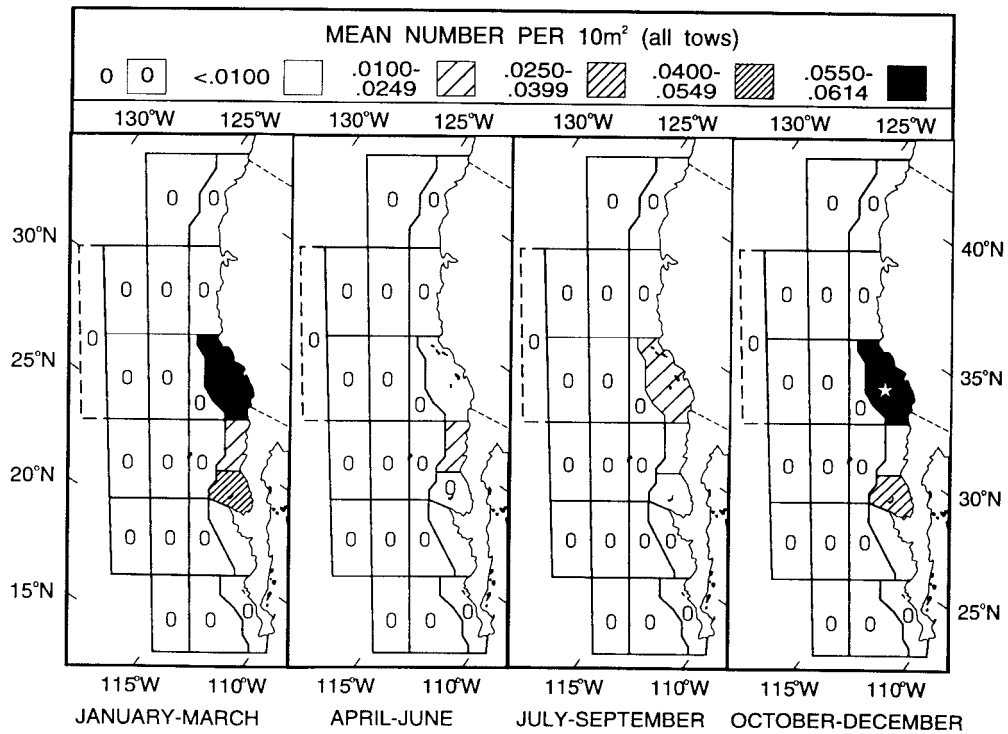
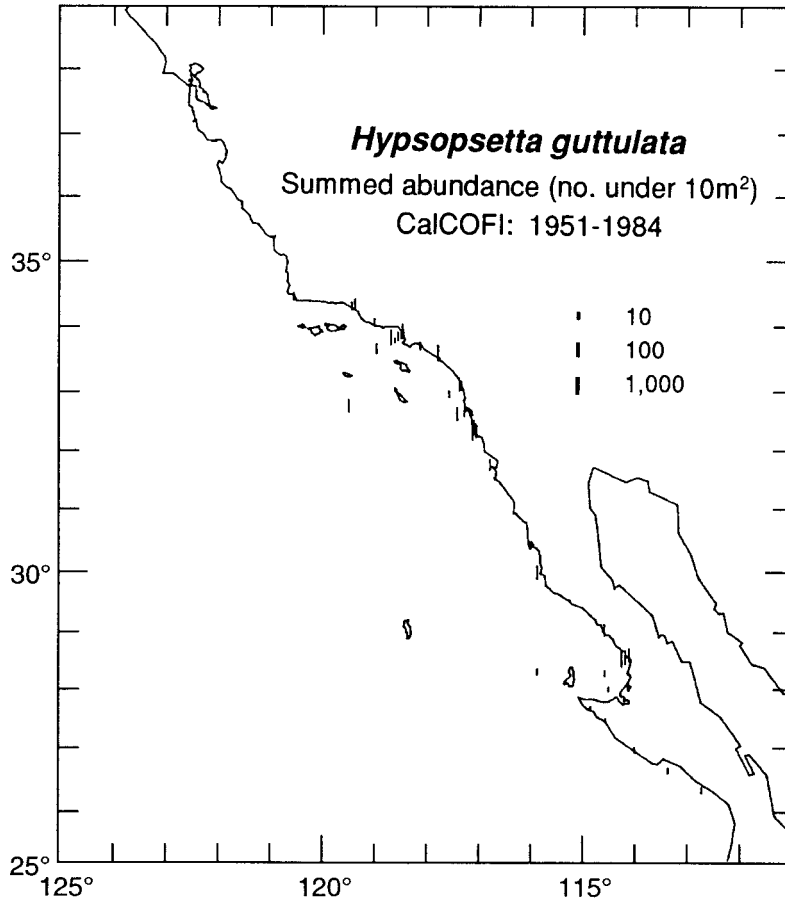
Paralichthyidae



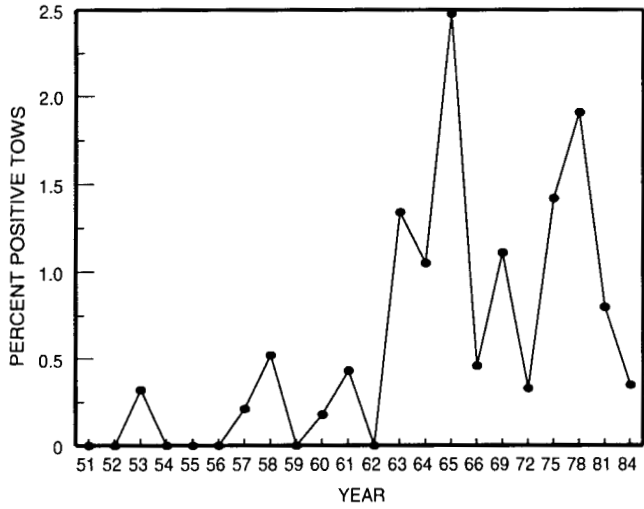
Syacium ovale

Hypsopsetta guttulata

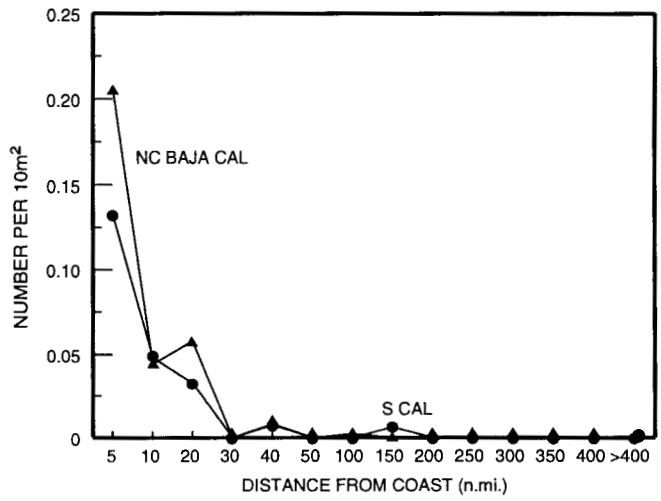
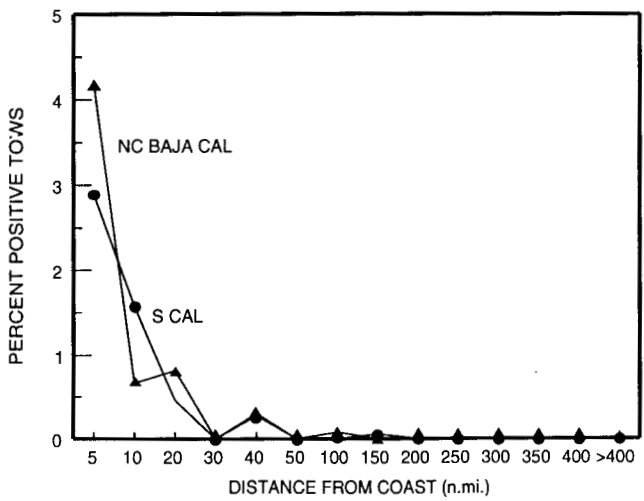
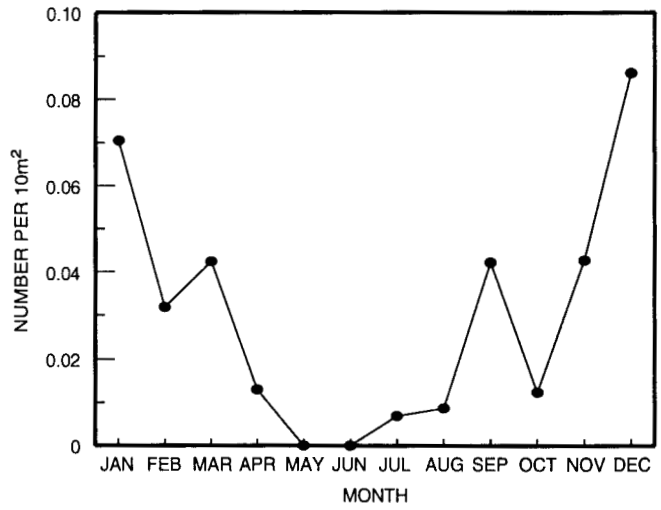
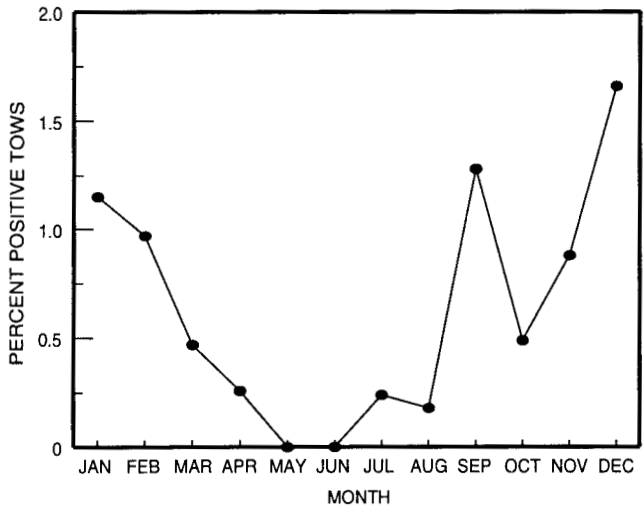
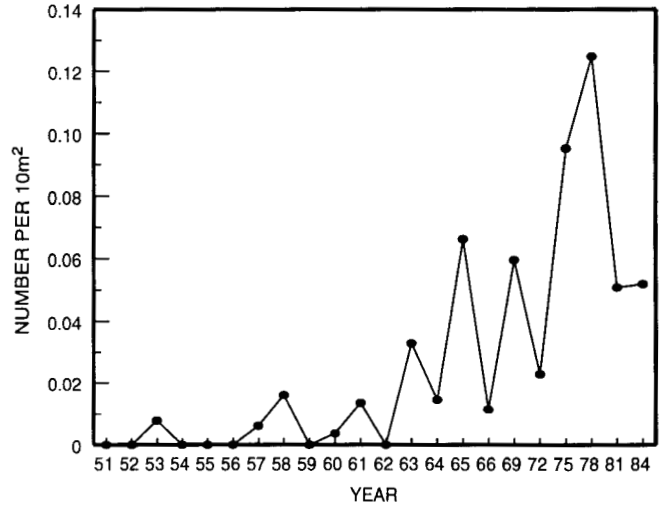
Pleuronectidae



Diamond turbot

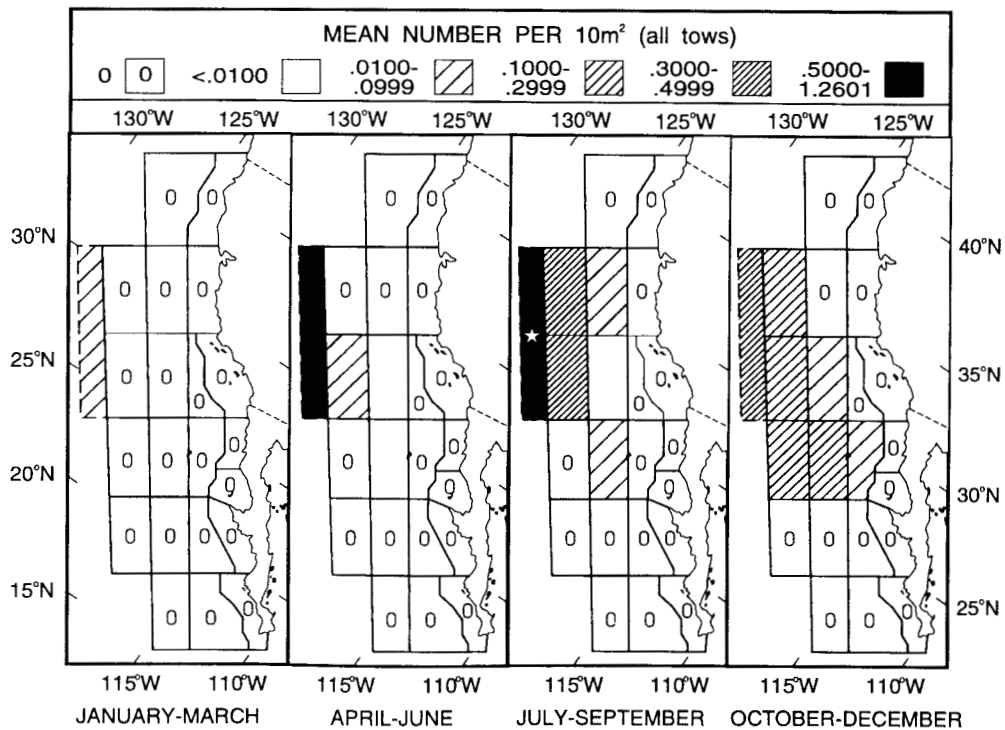
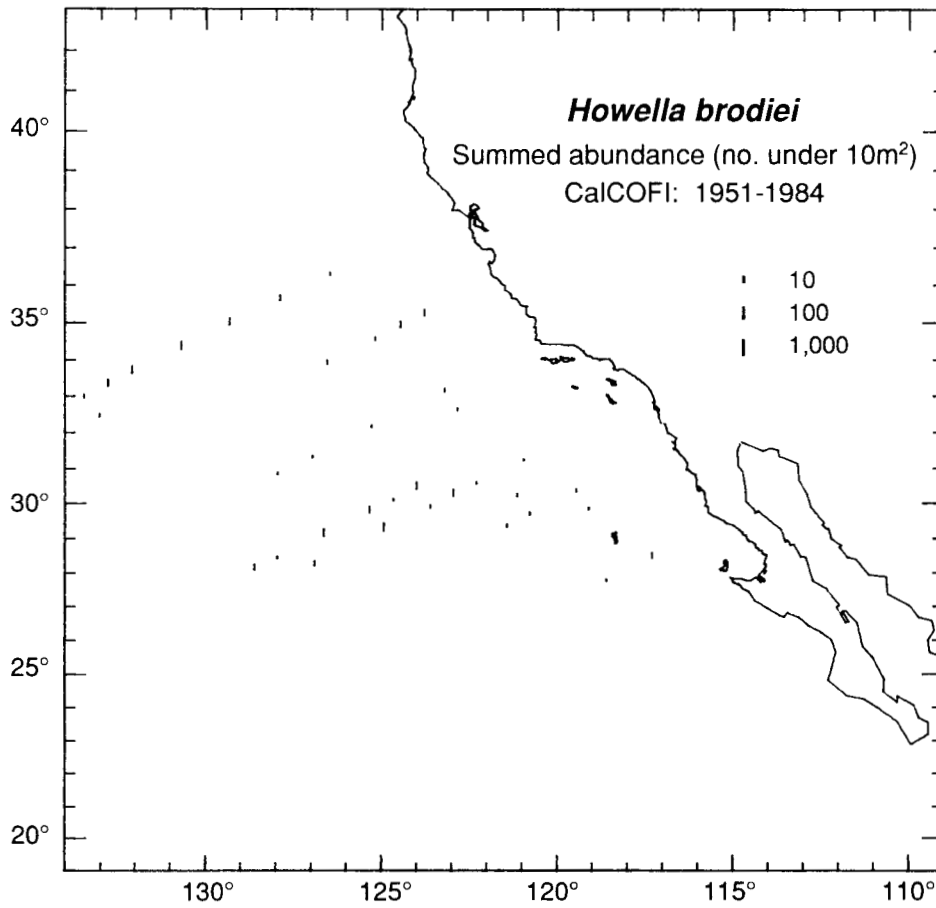


Hypsopsetta guttulata



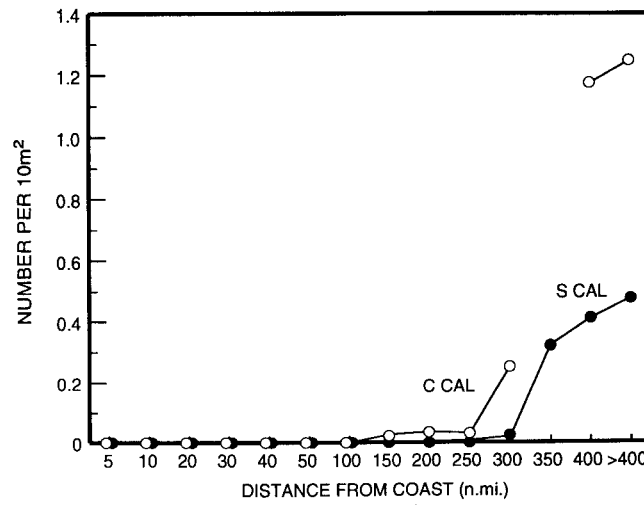
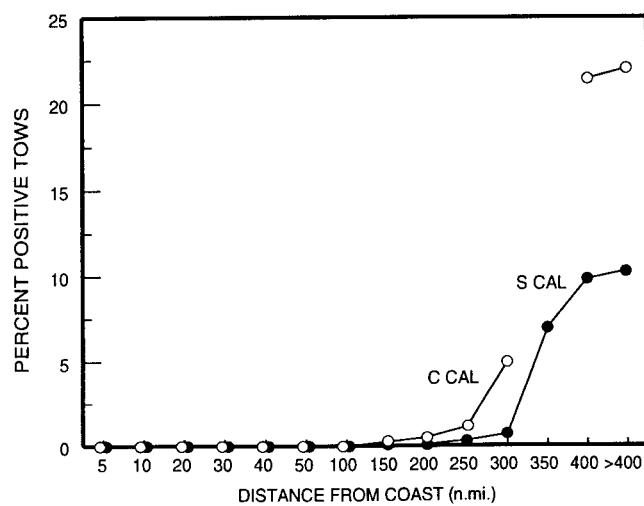
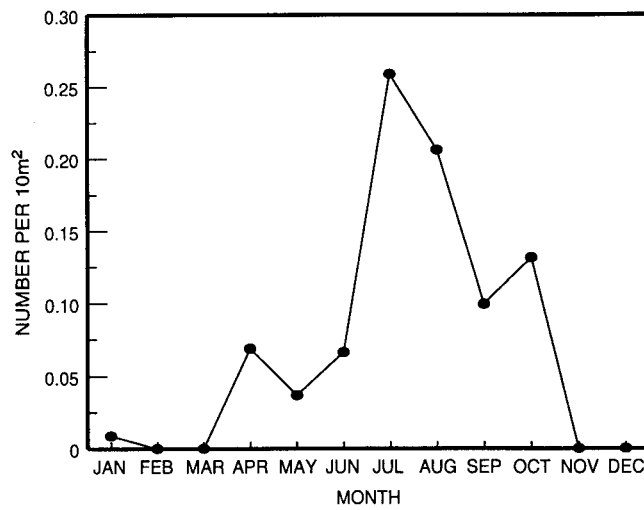
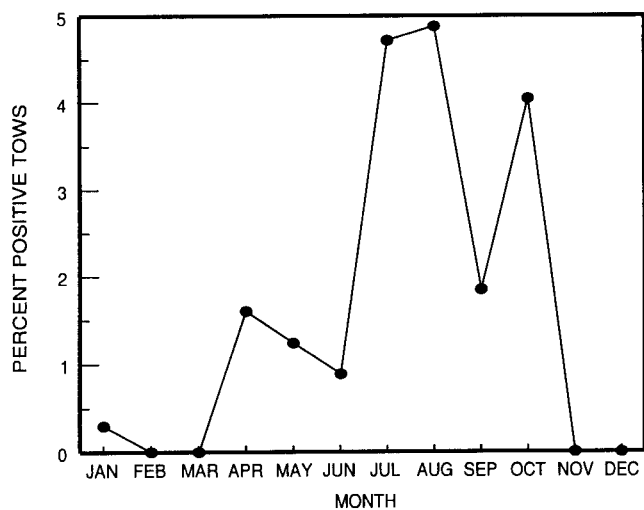
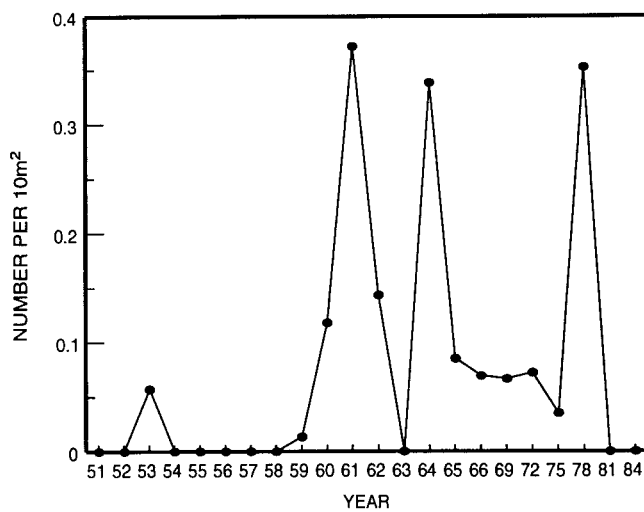
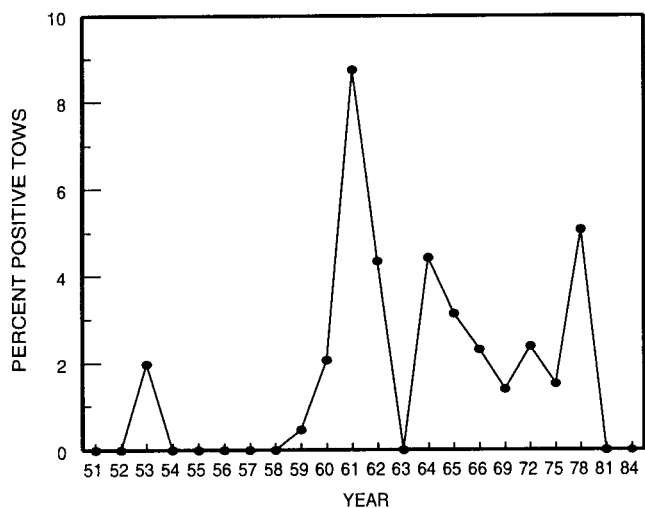
Howella brodiei

Incertae sedis



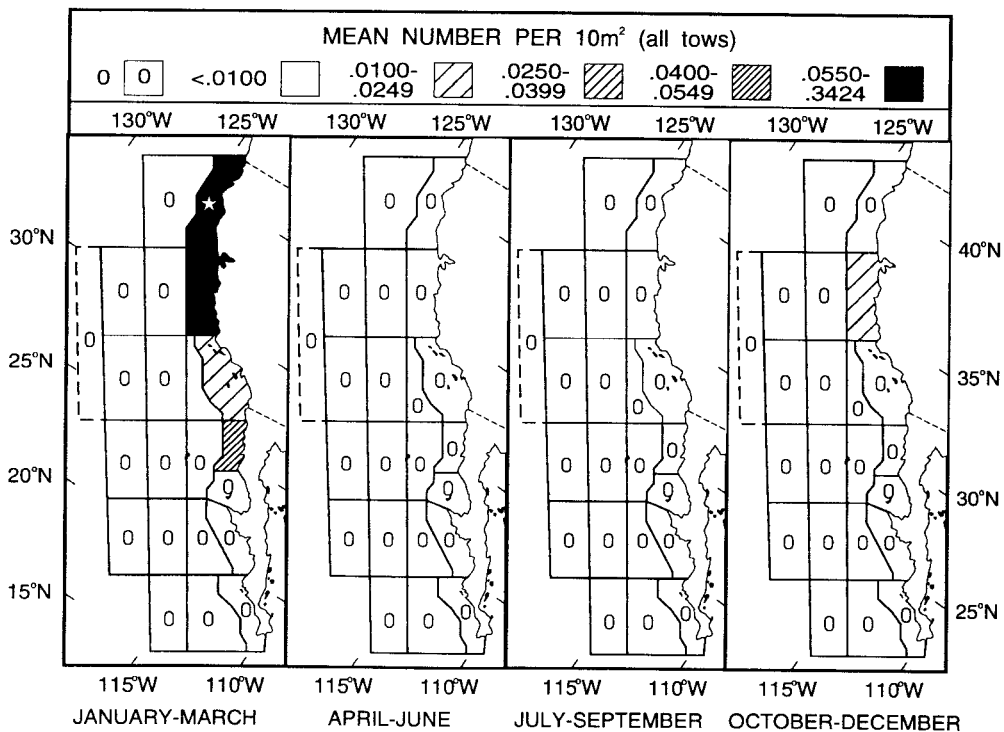
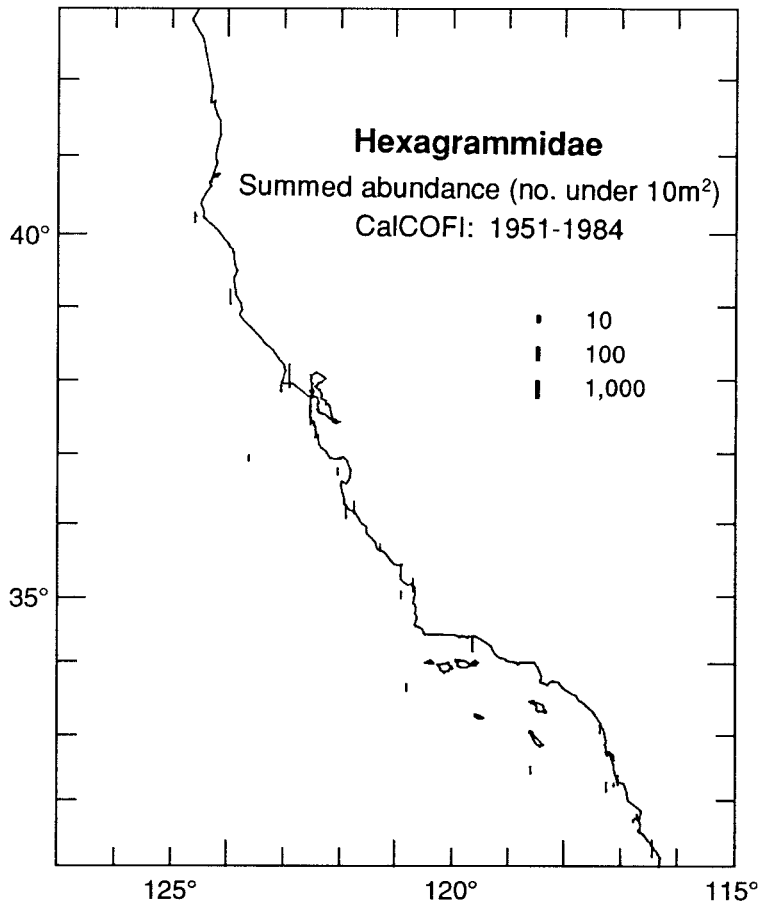
Pelagic basslet

Howella brodiei

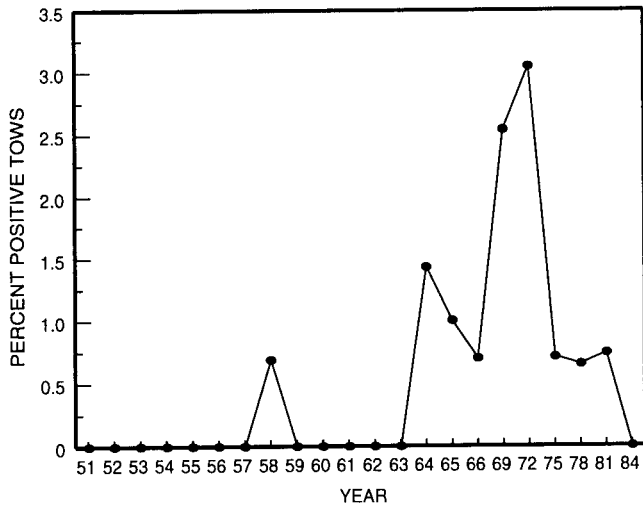


Hexagrammidae

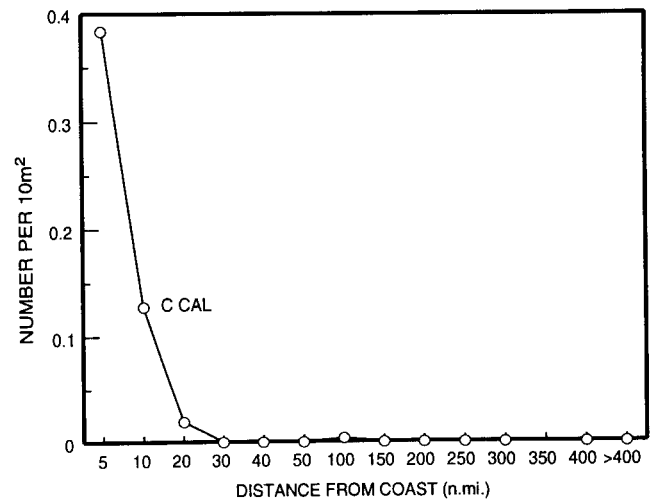
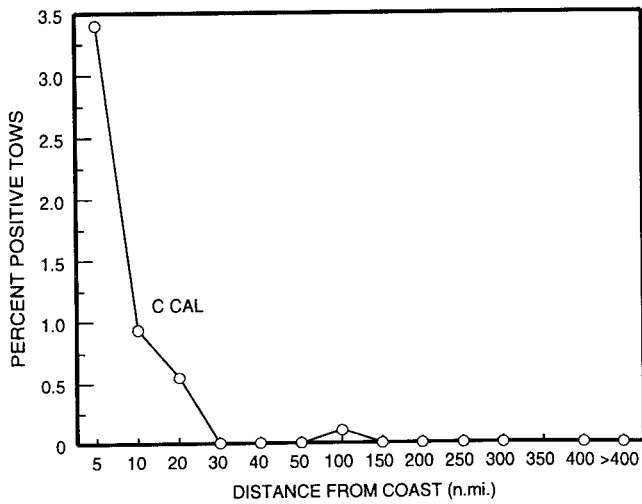
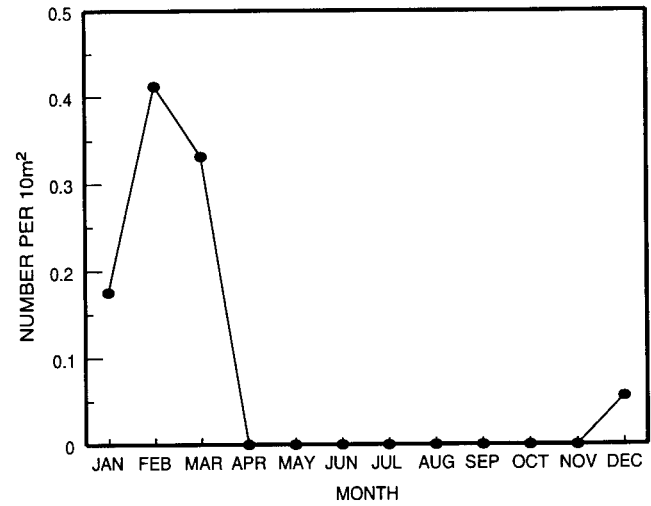
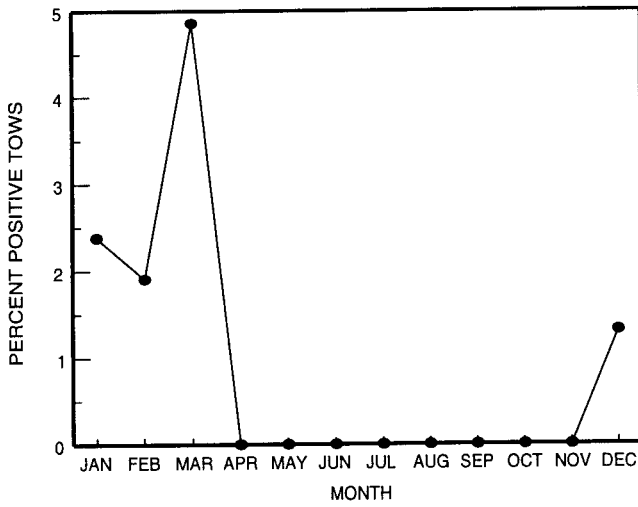
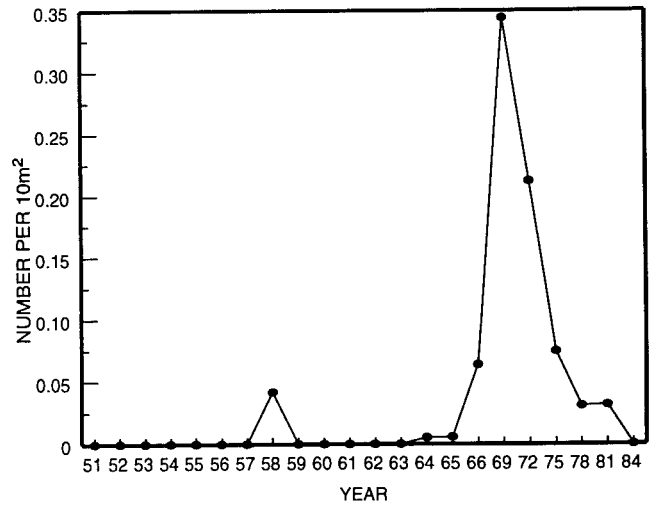
Hexagrammidae



Greenlings

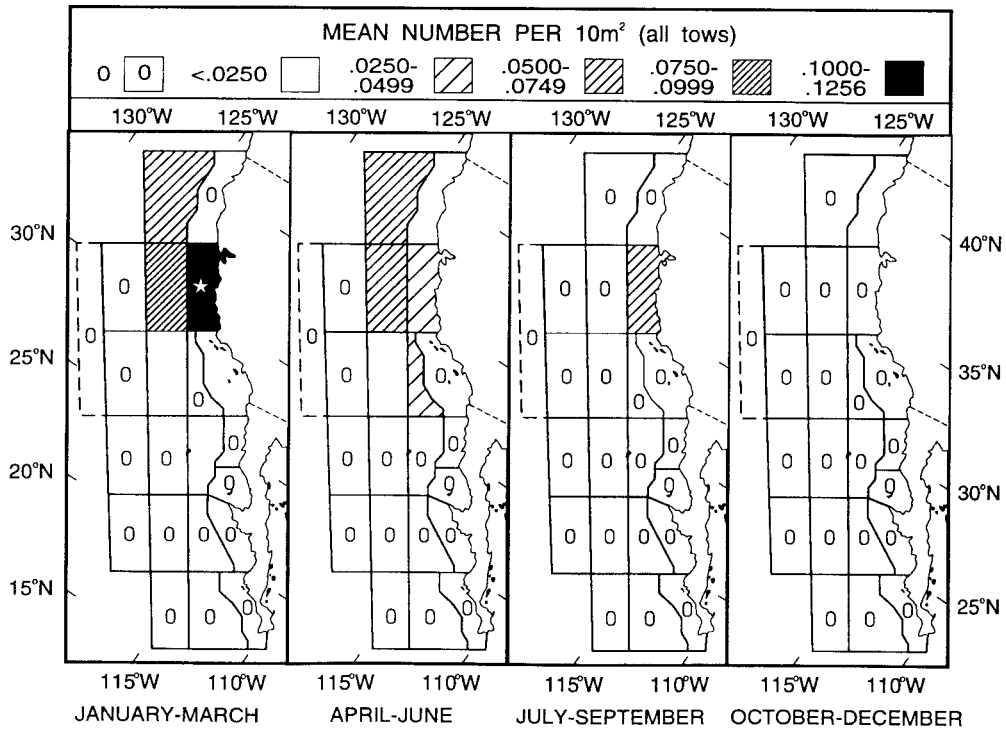
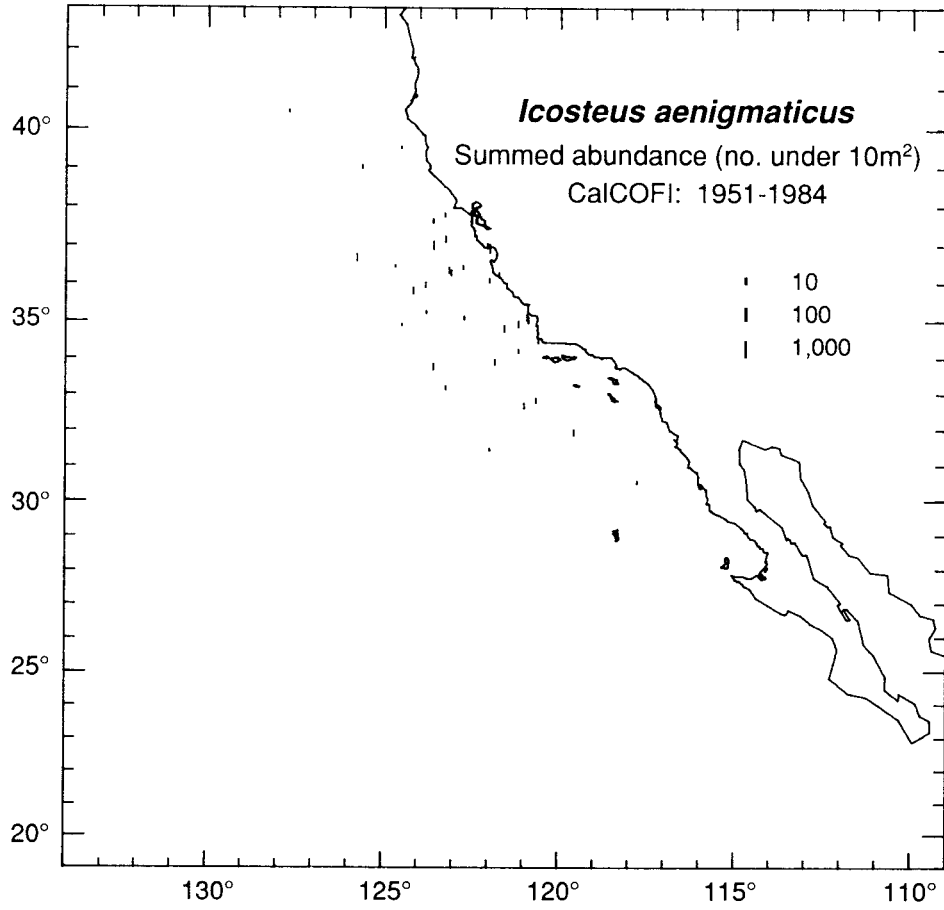


Hexagrammidae

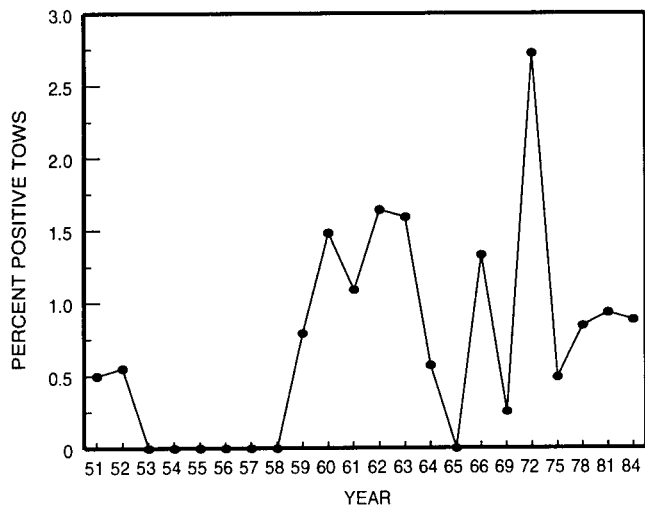
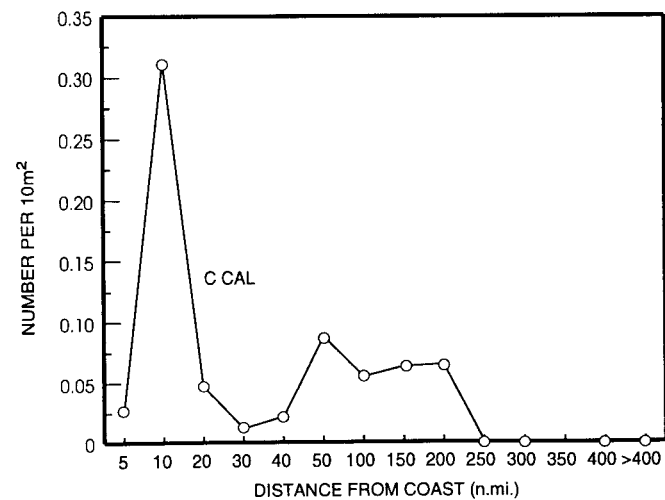
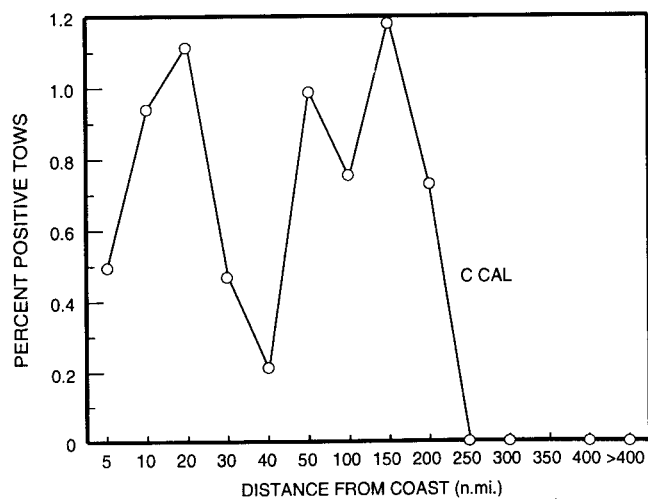
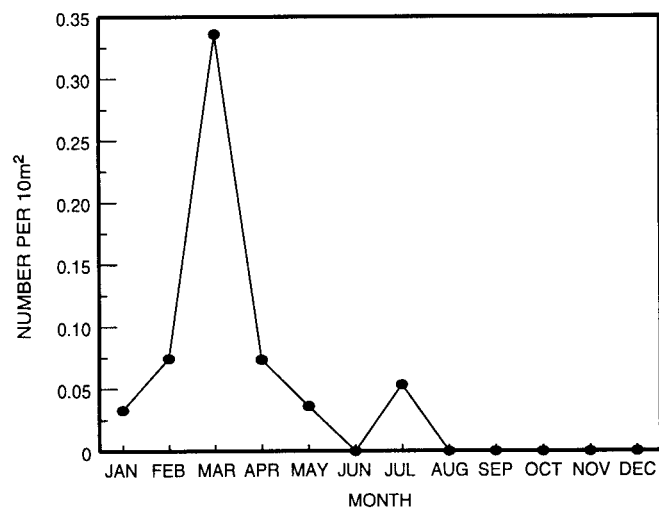
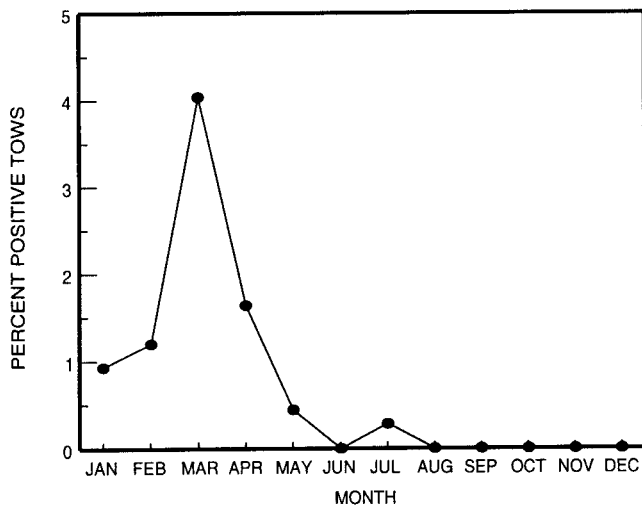
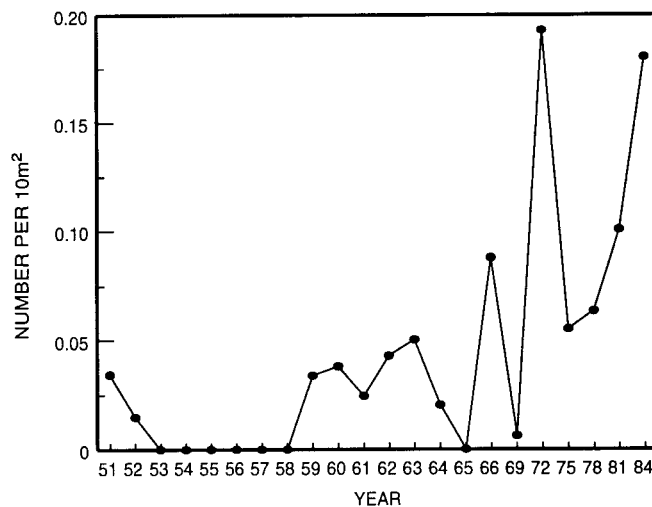


Icosteus aenigmaticus

Icosteidae

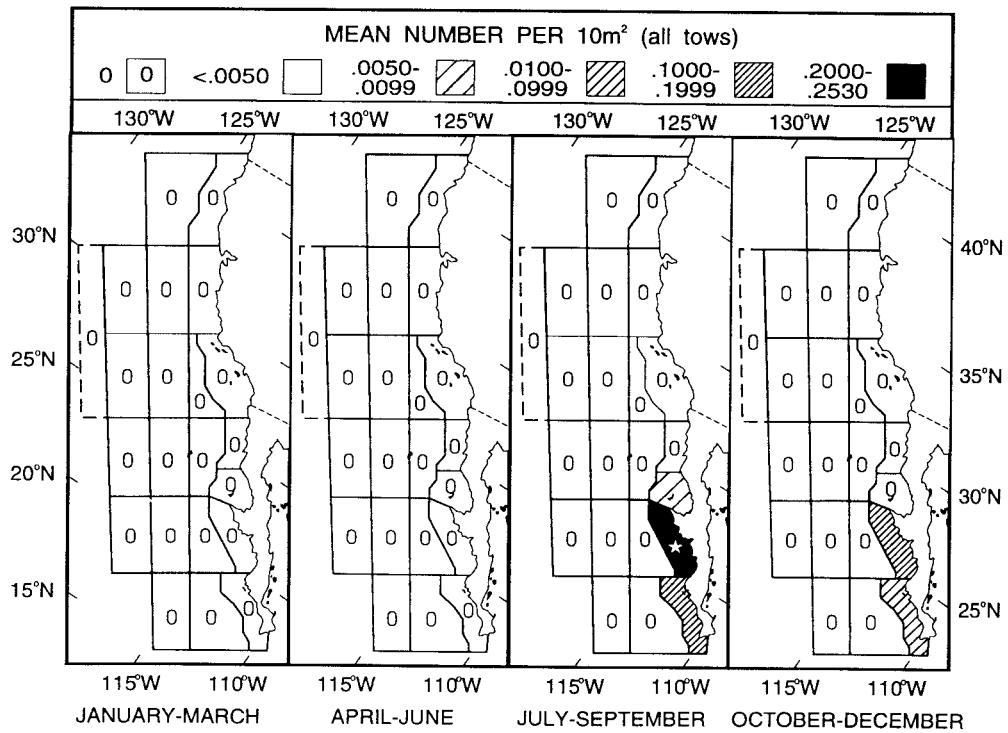
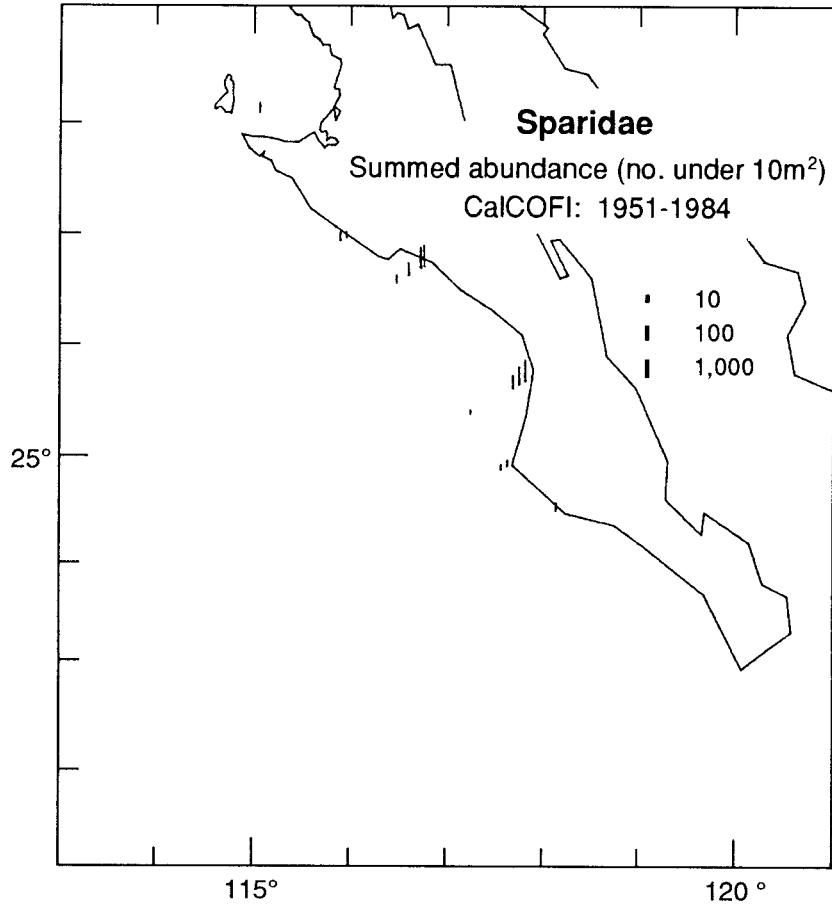


Ragfish

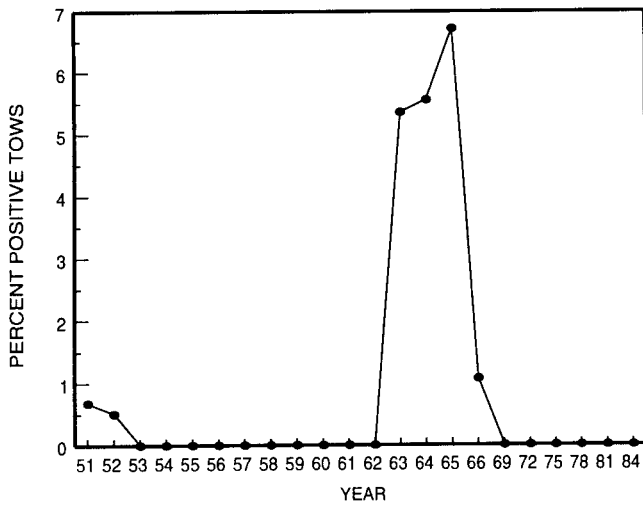
*Icosteus aenigmaticus*

Sparidae

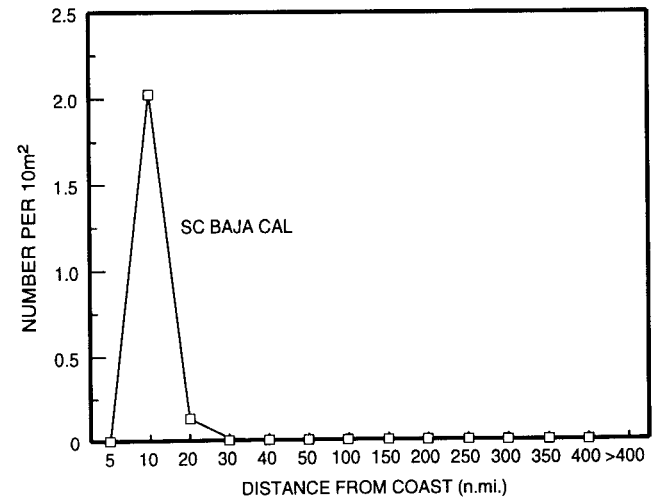
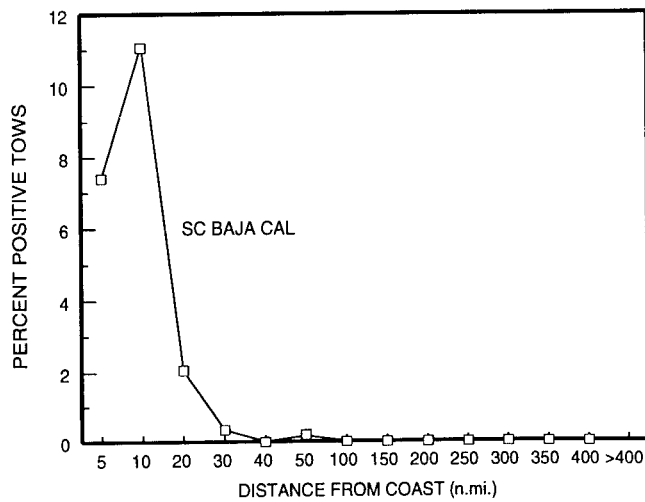
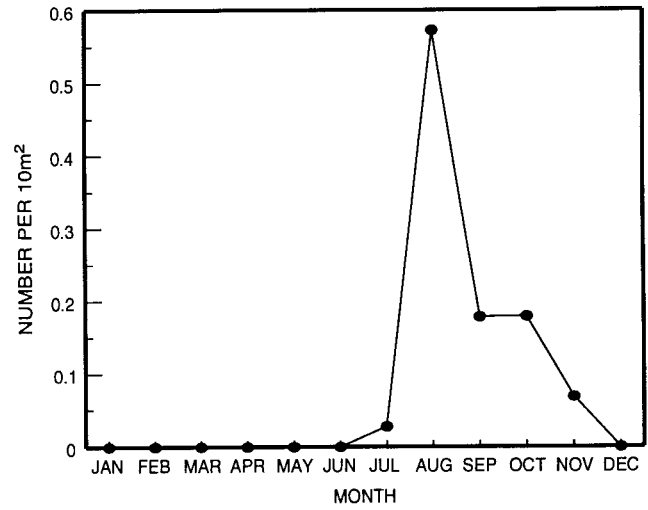
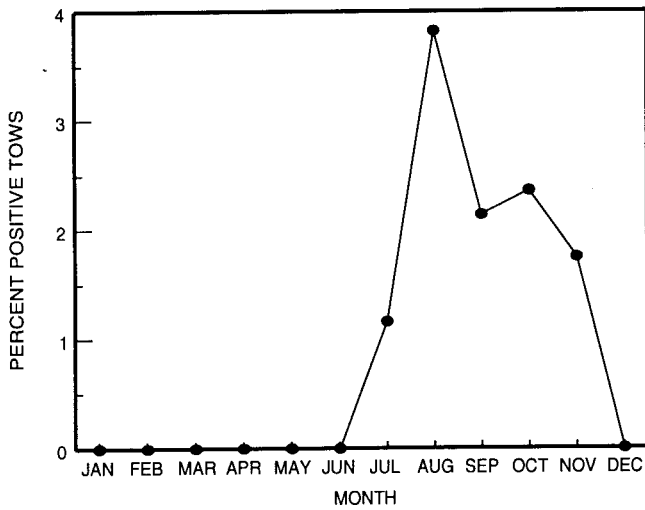
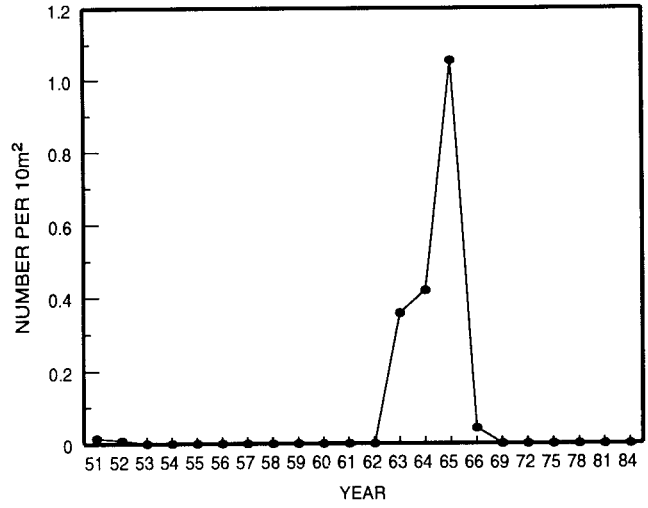
Sparidae



Porgies

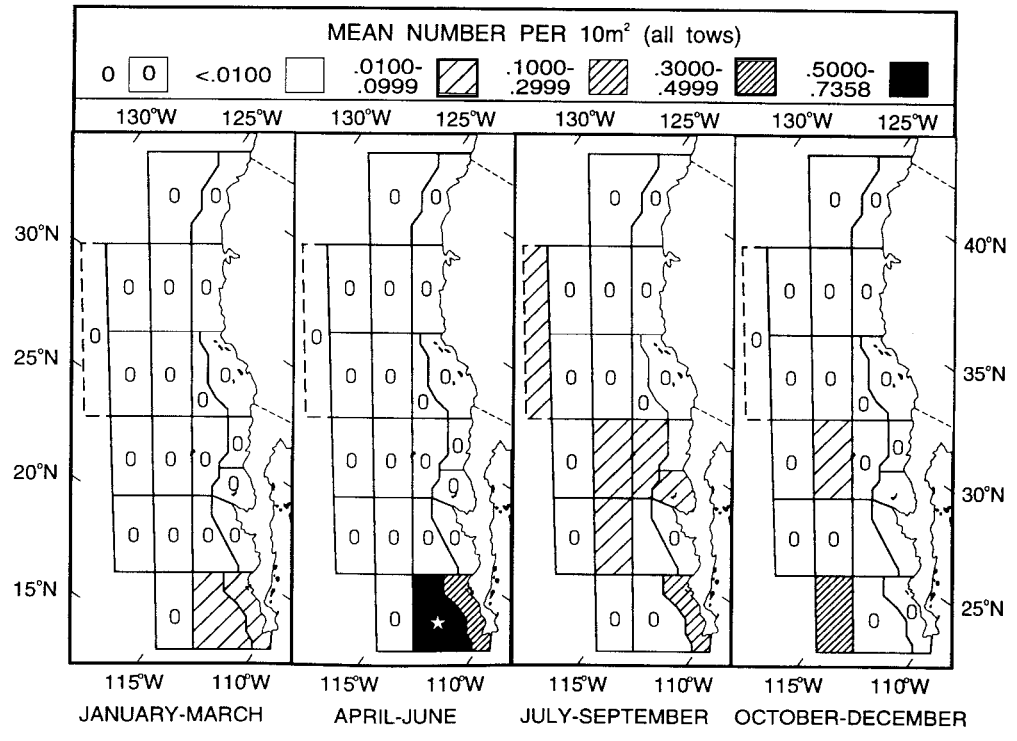
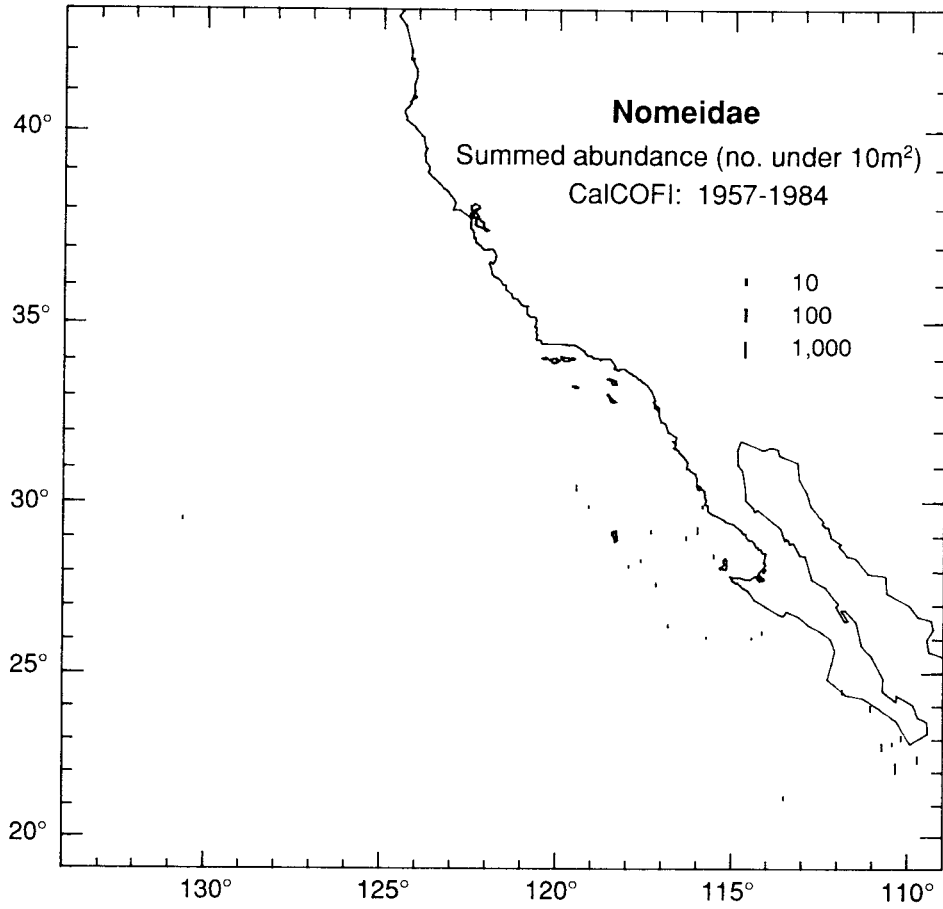


Sparidae



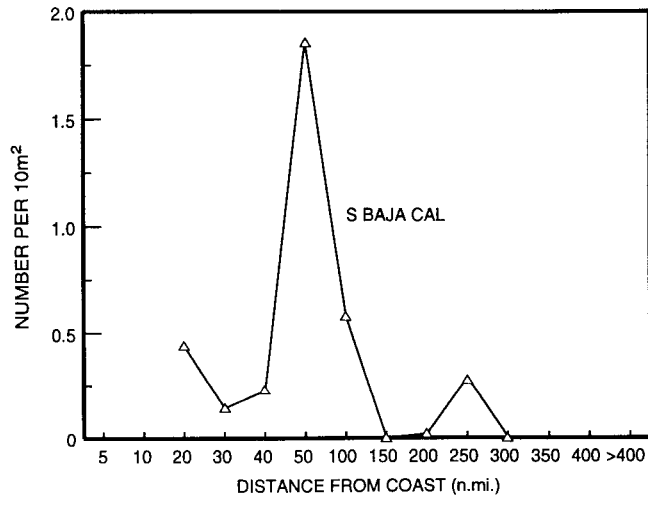
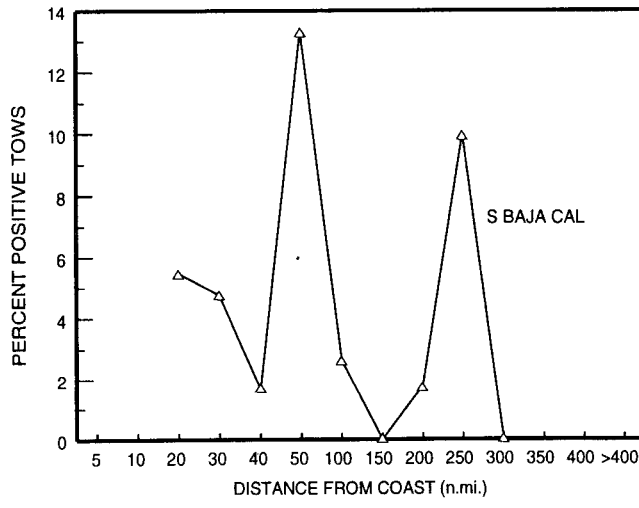
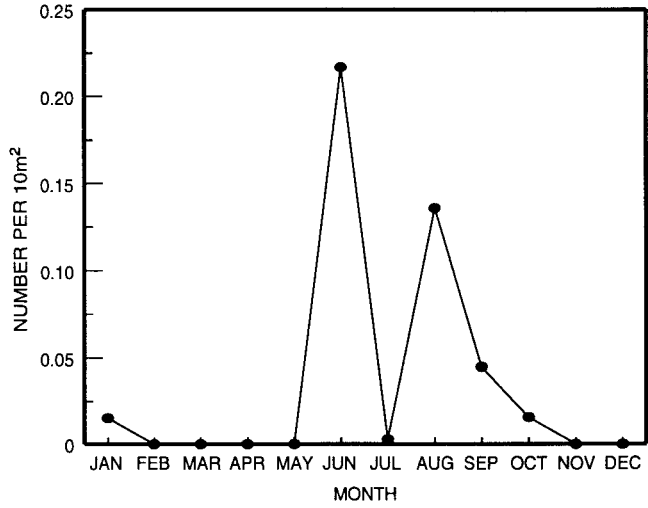
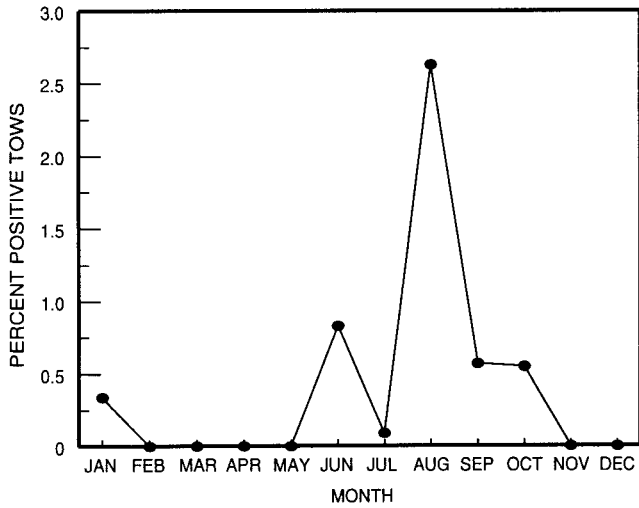
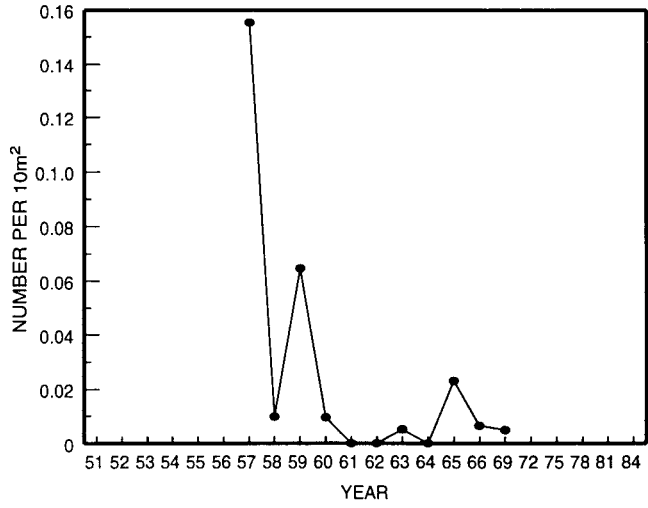
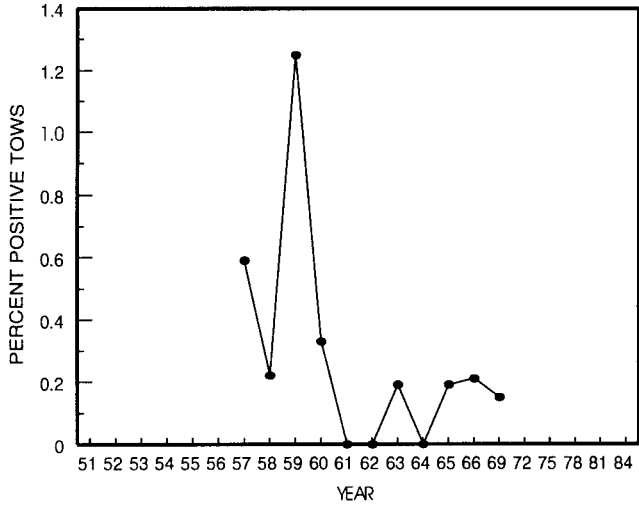
Nomeidae

Nomeidae



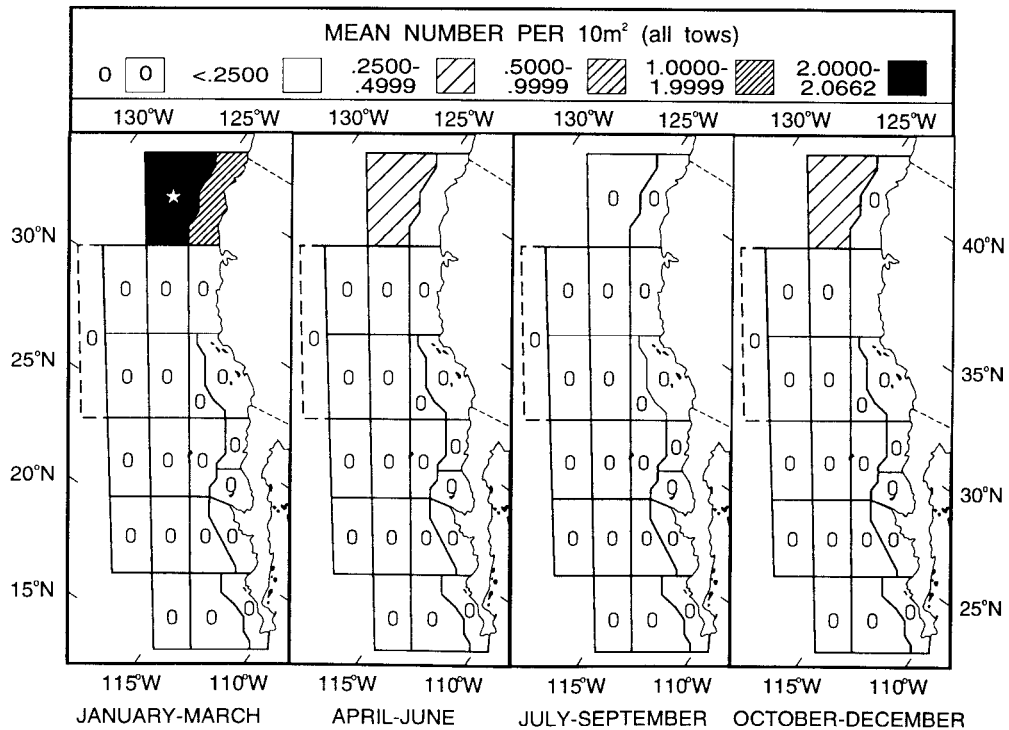
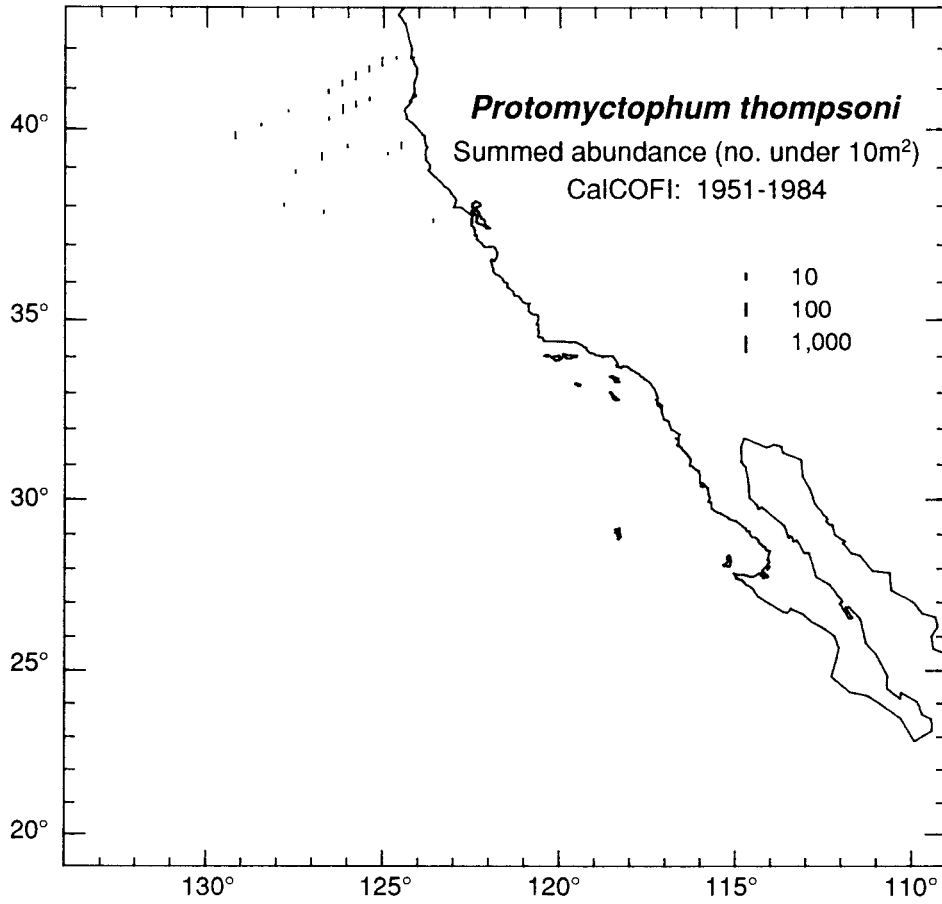
Flotsamfishes

Nomeidae

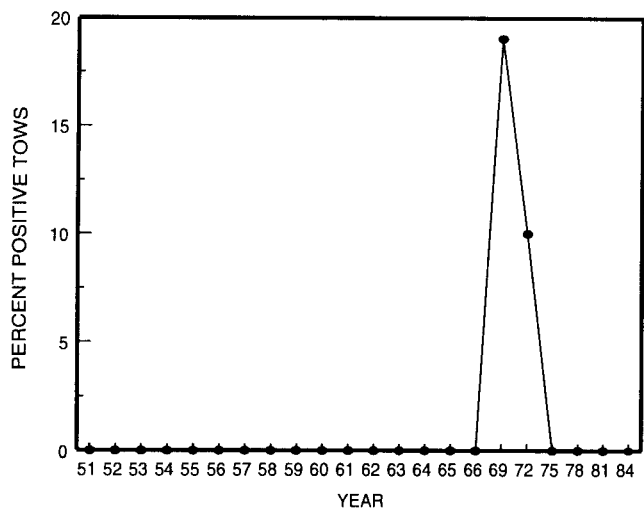


Protomyctophum thompsoni

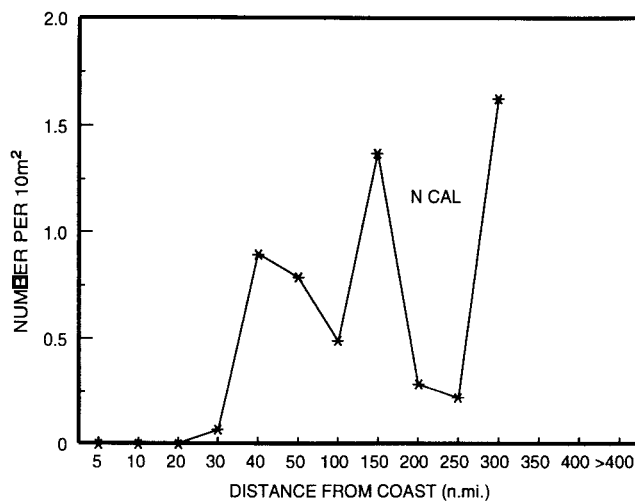
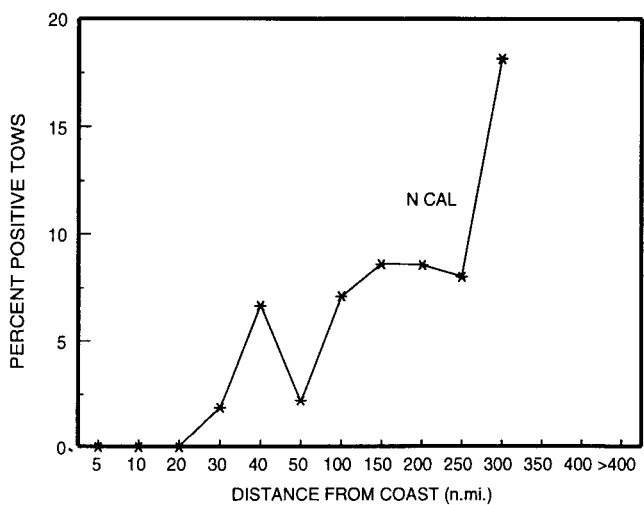
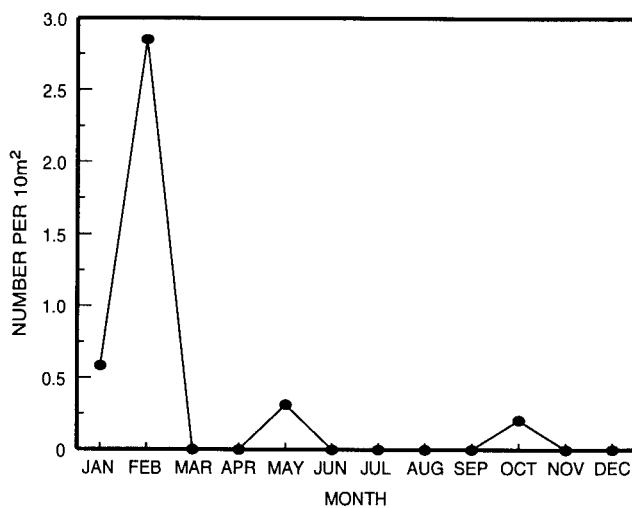
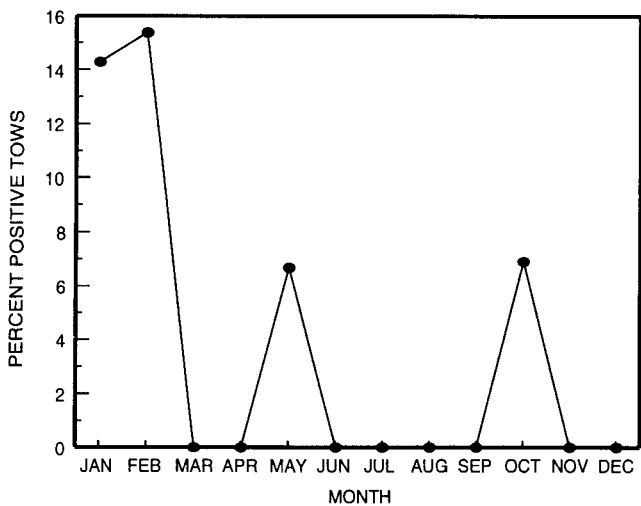
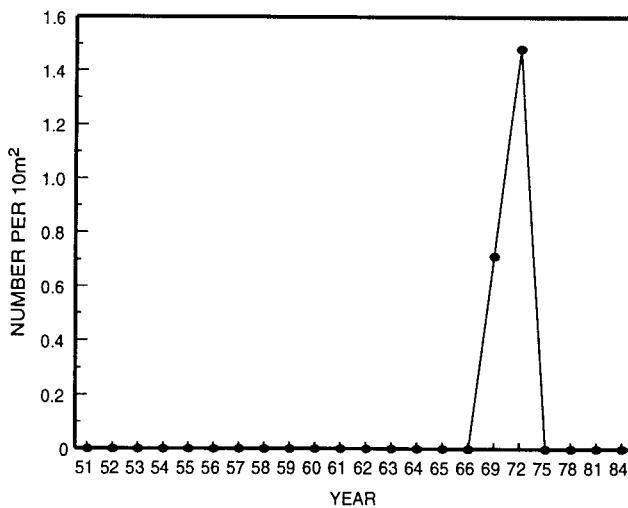
Myctophidae



Northern flashlightfish

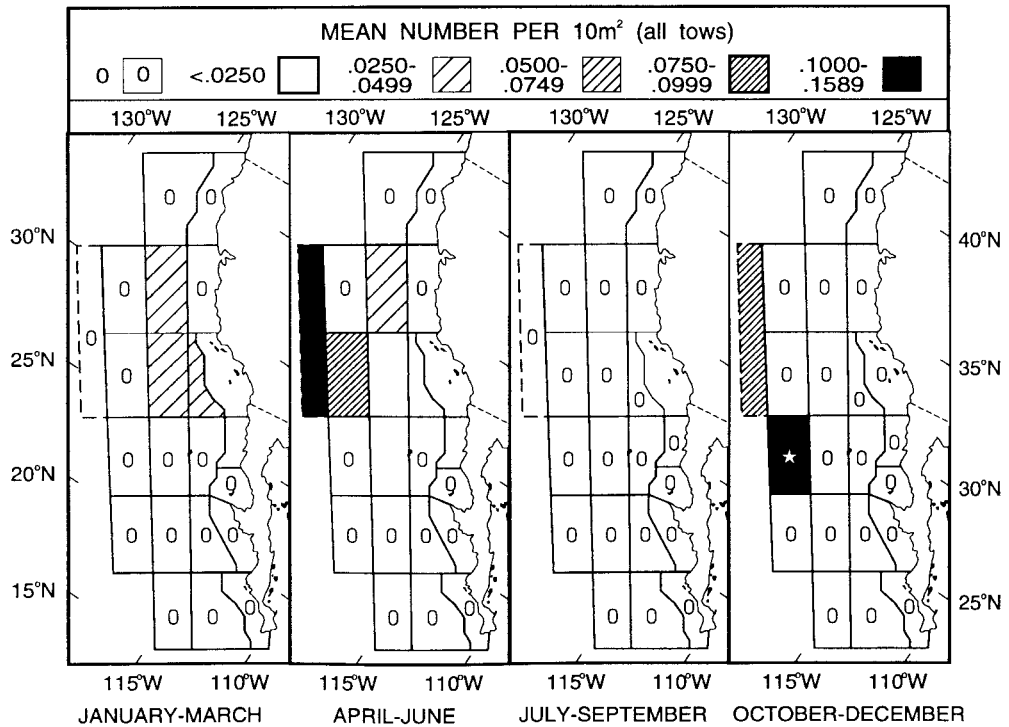
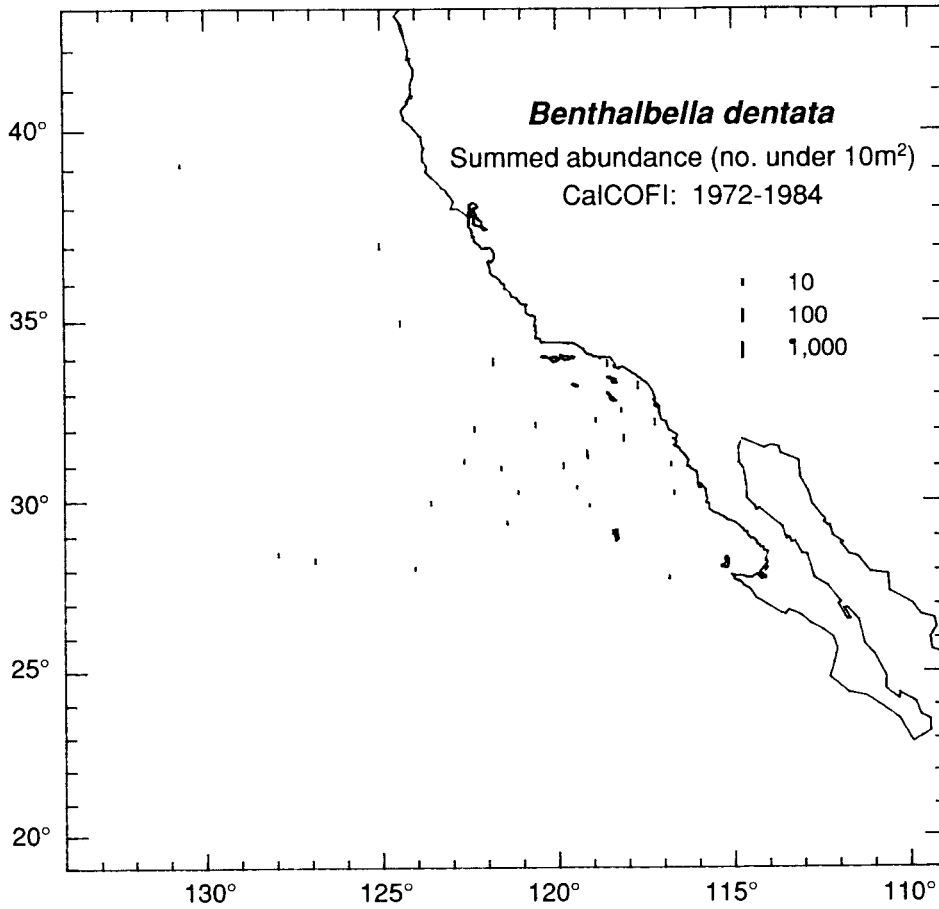


Protomyctophum thompsoni



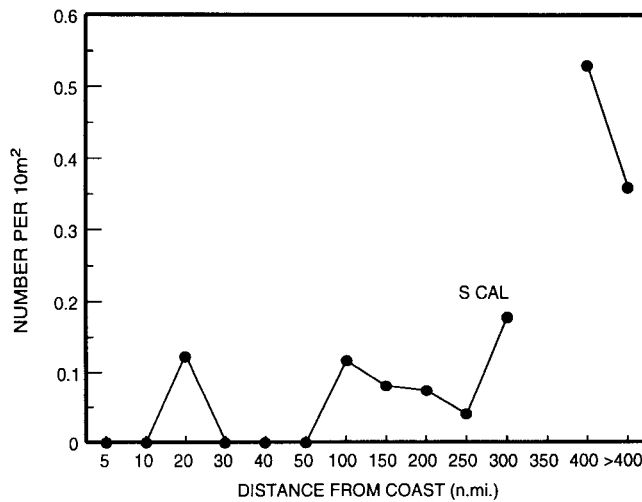
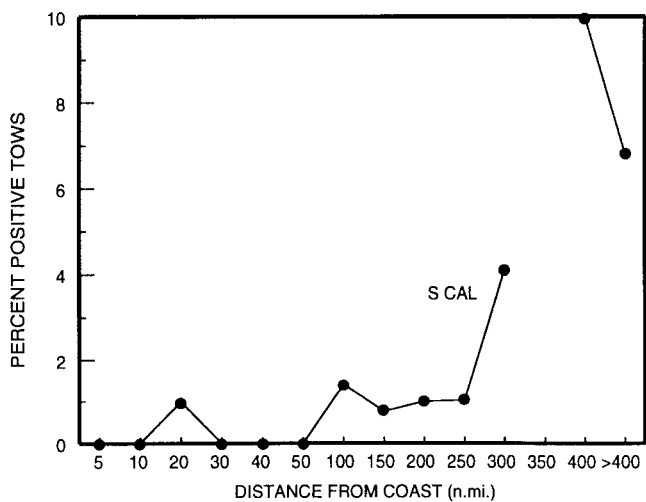
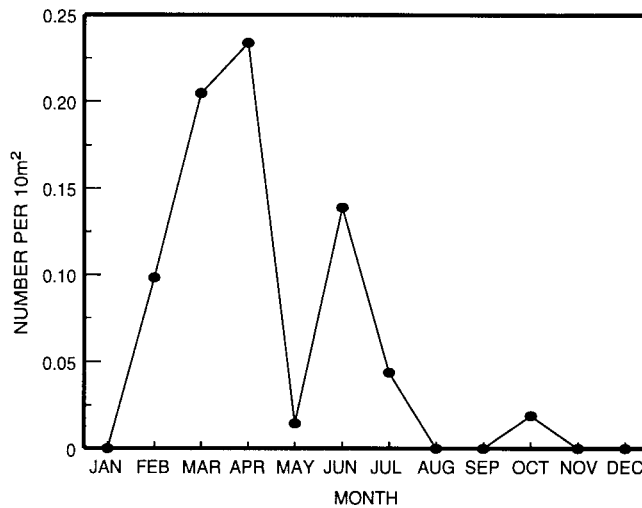
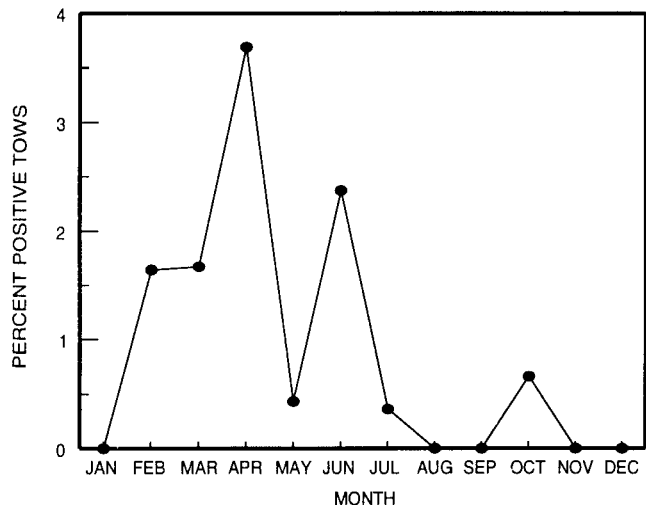
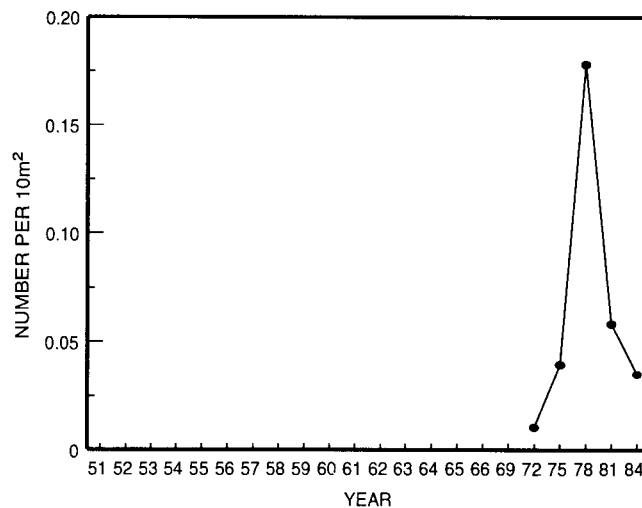
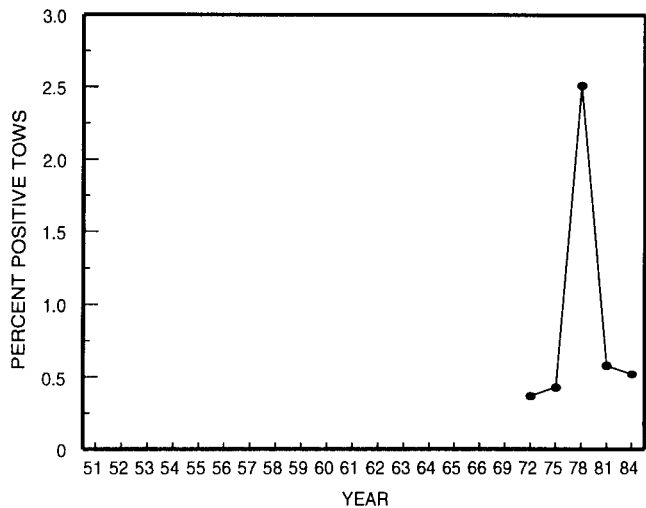
Benthalbella dentata

Scopelarchidae



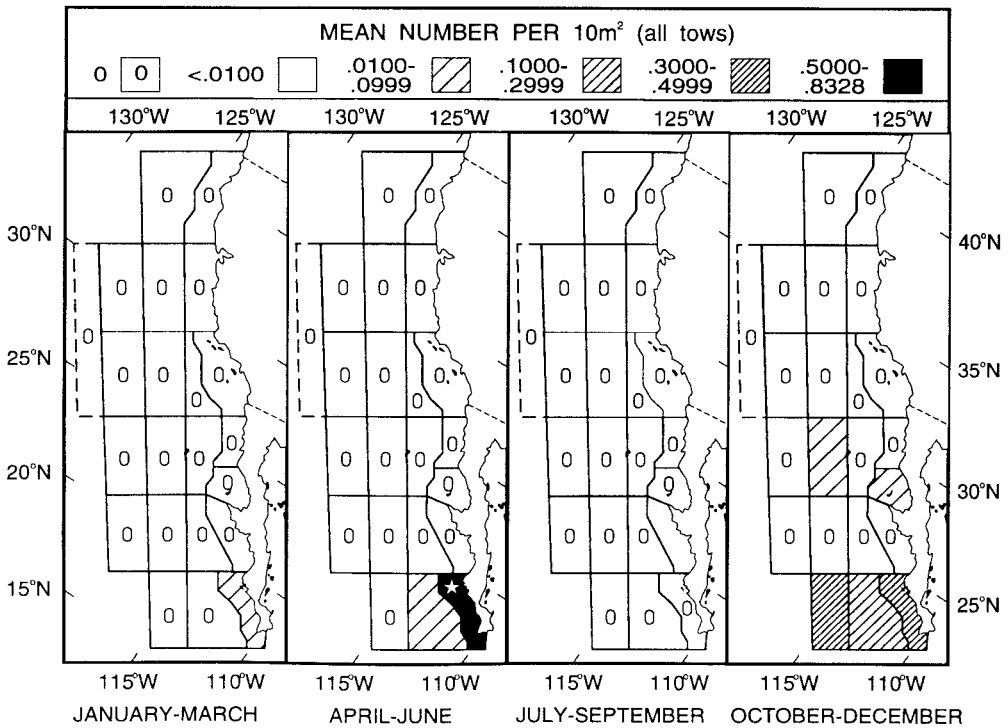
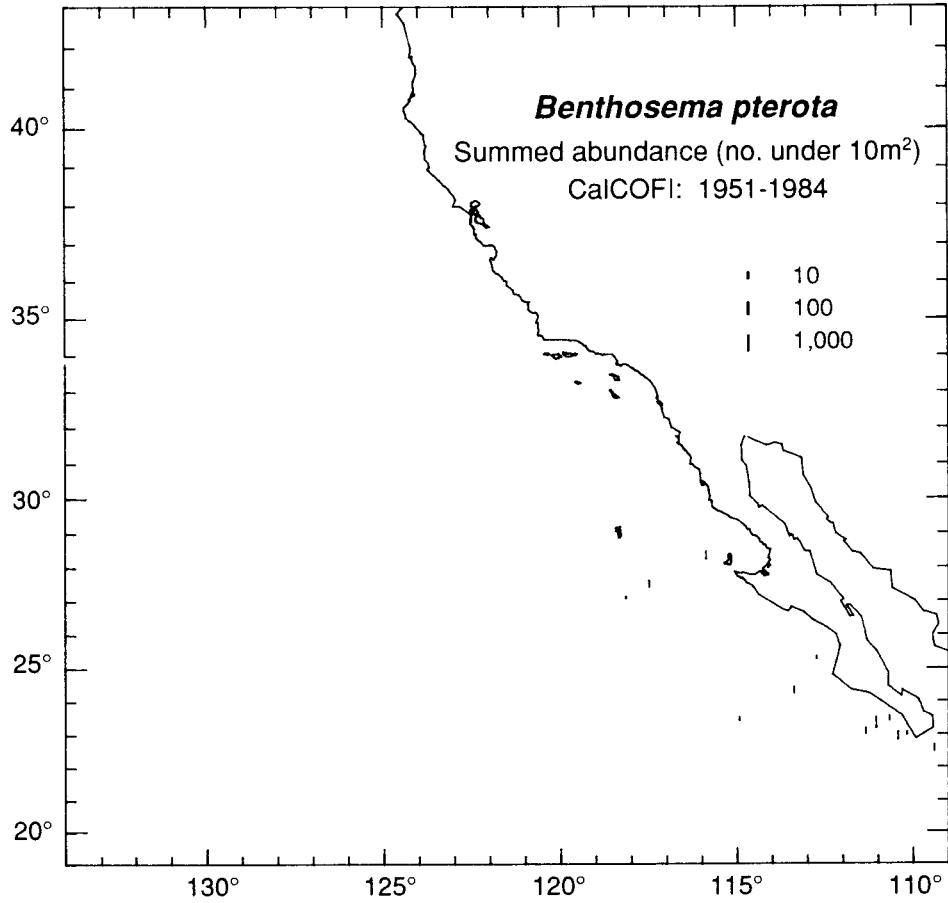
Northern pearleye

Benthalbella dentata

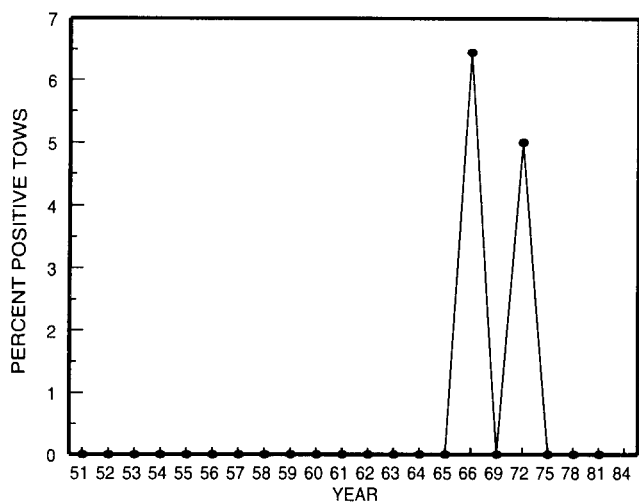


Benthoosema pterota

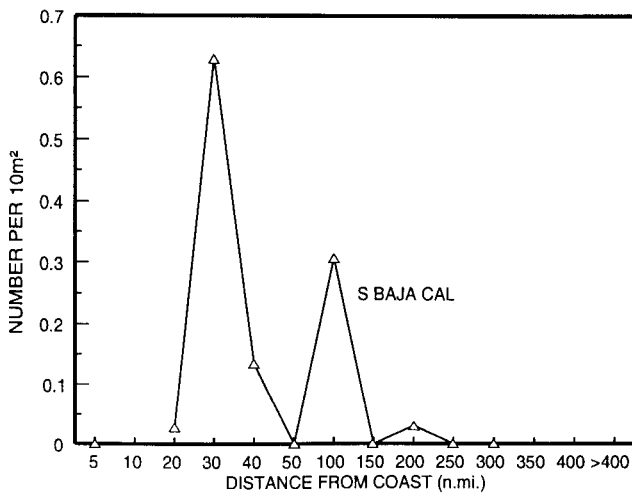
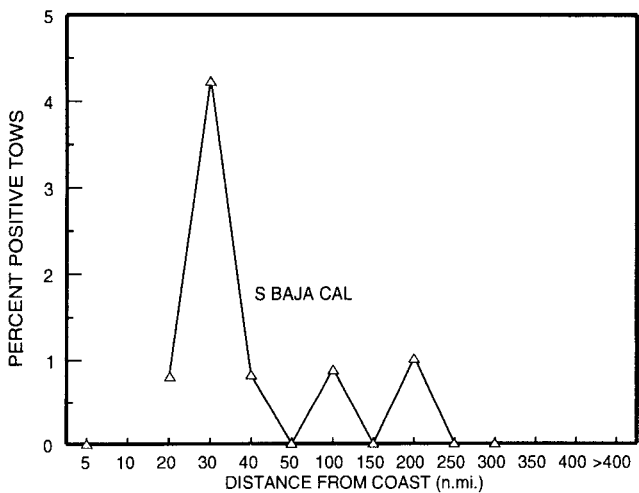
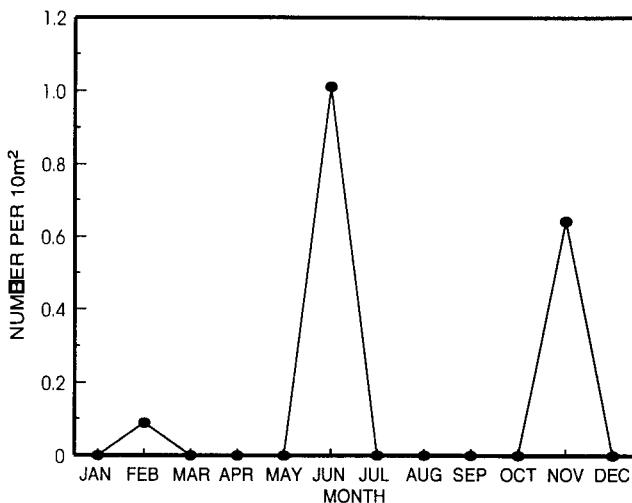
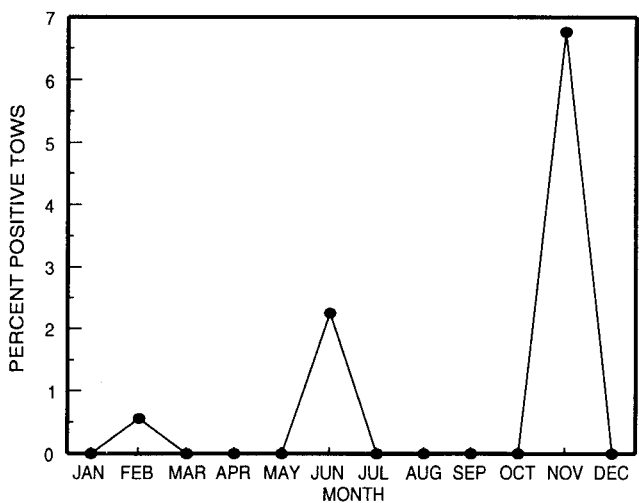
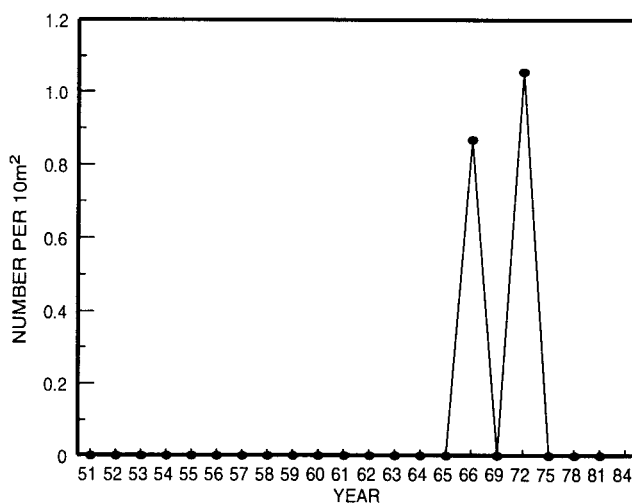
Myctophidae



Coastal lanternfish

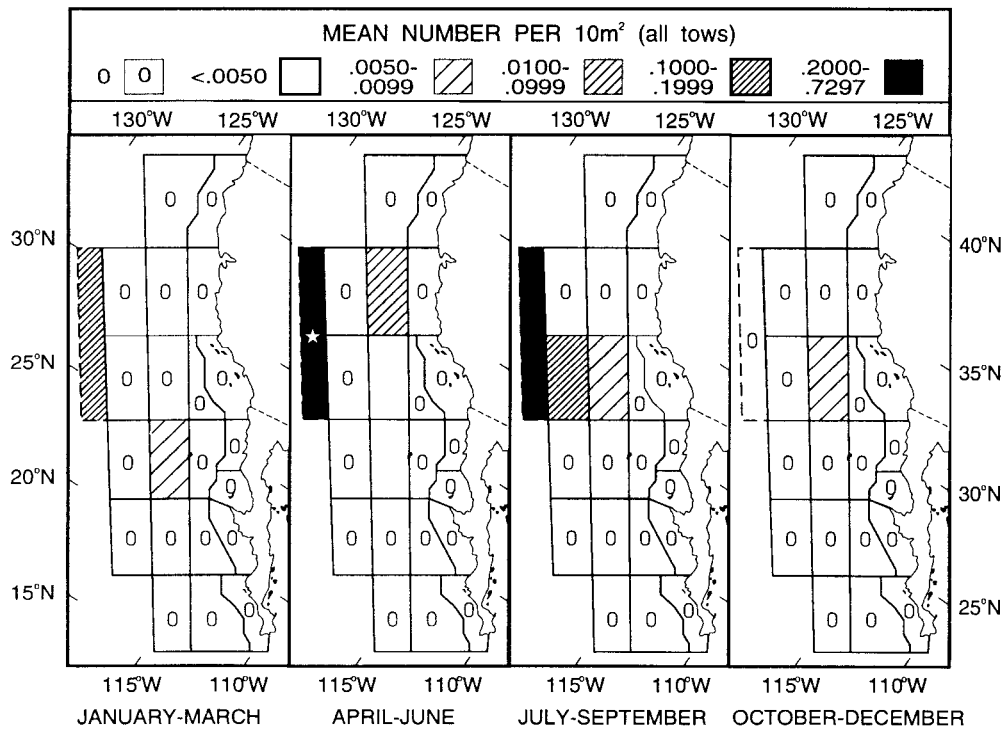
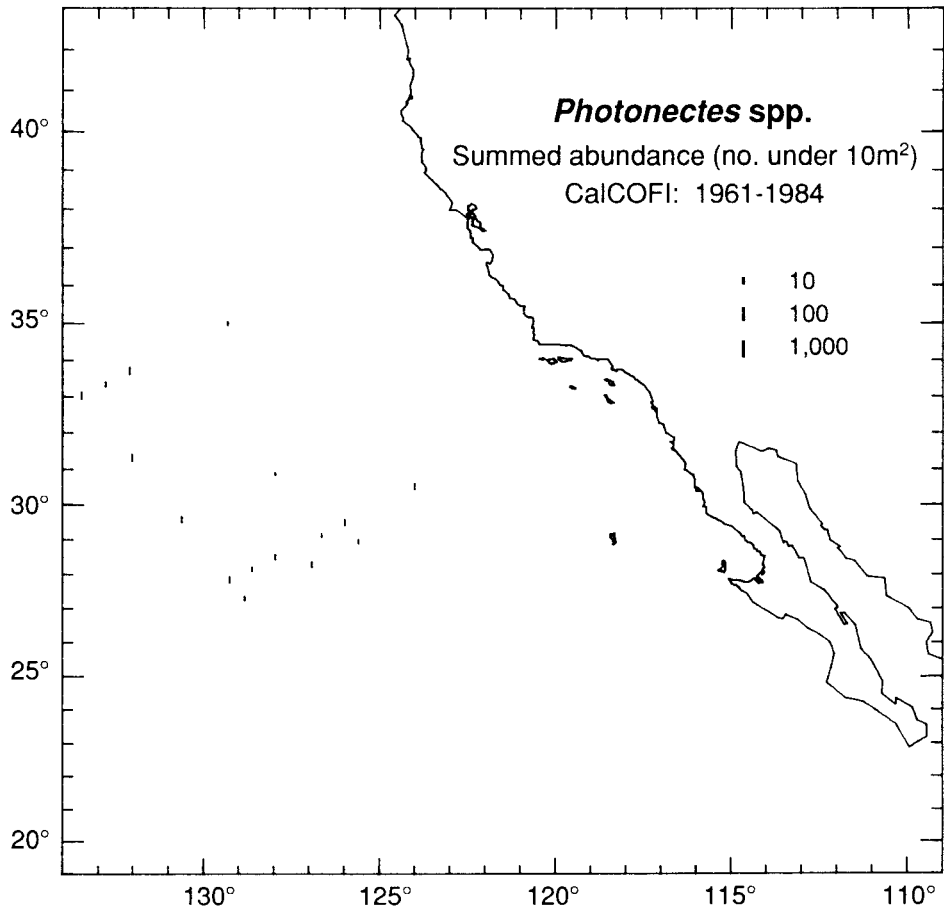


Benthoosema pterota



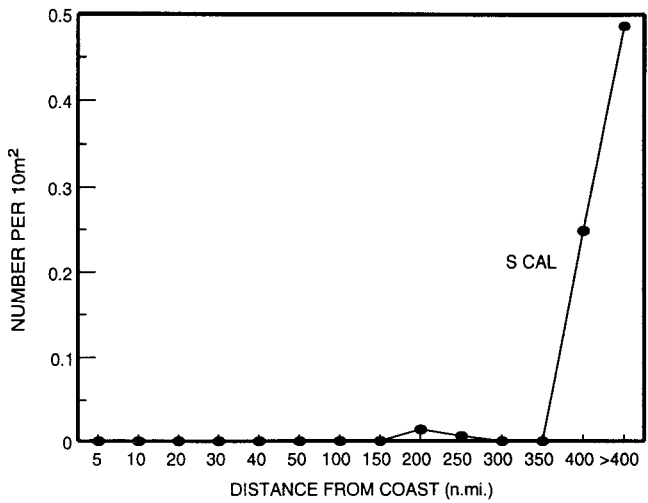
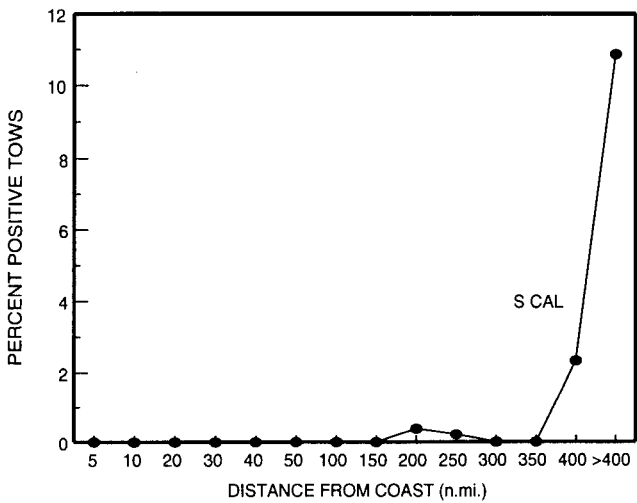
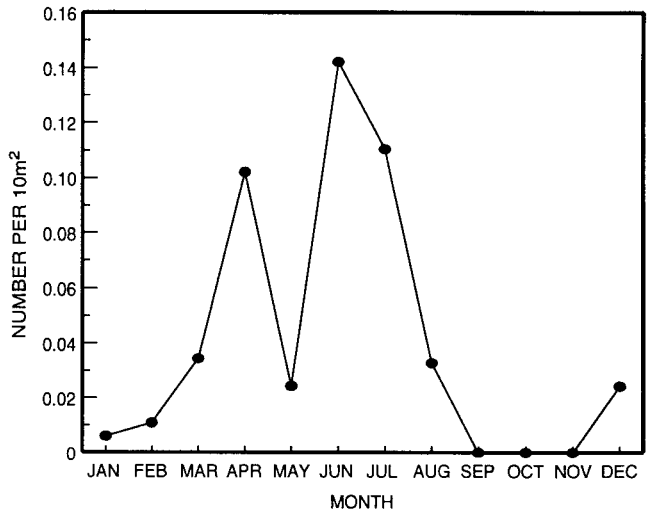
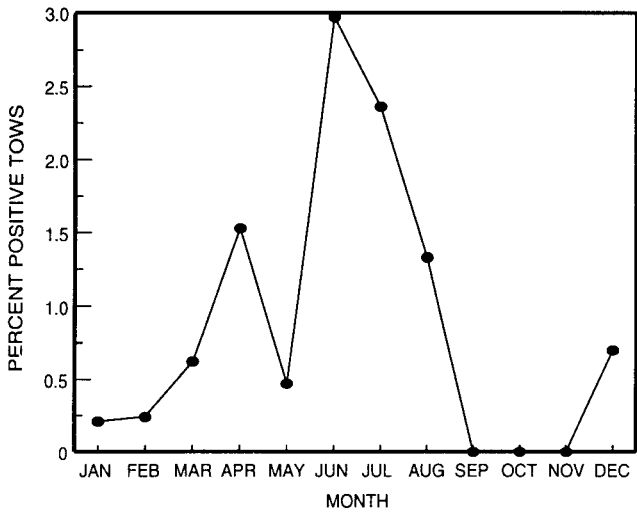
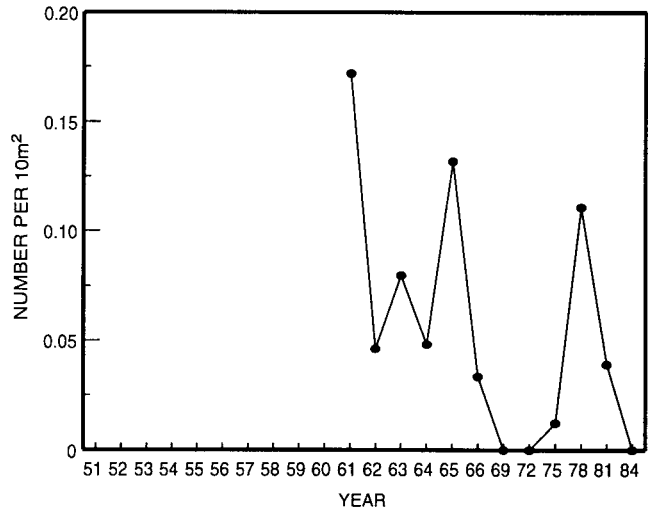
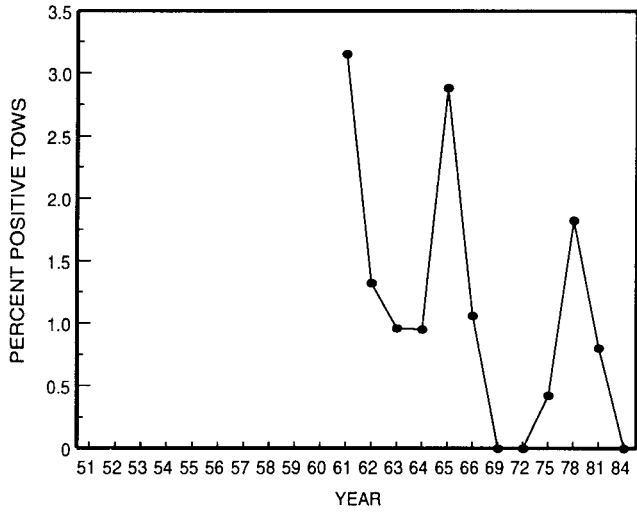
Photonectes spp.

Melanostomiidae



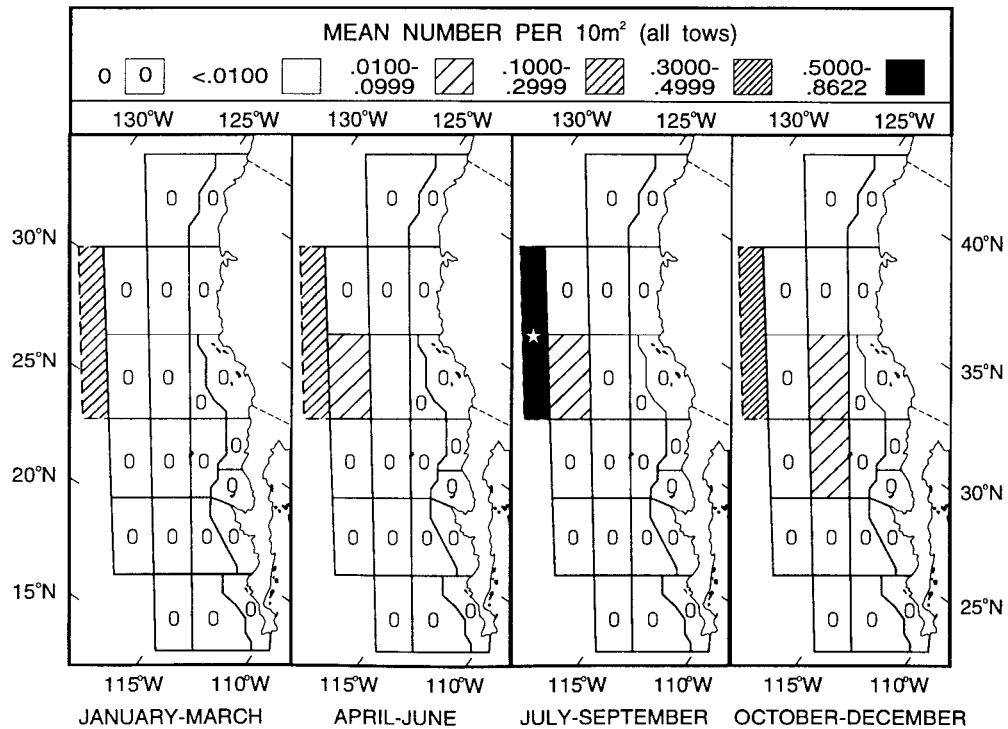
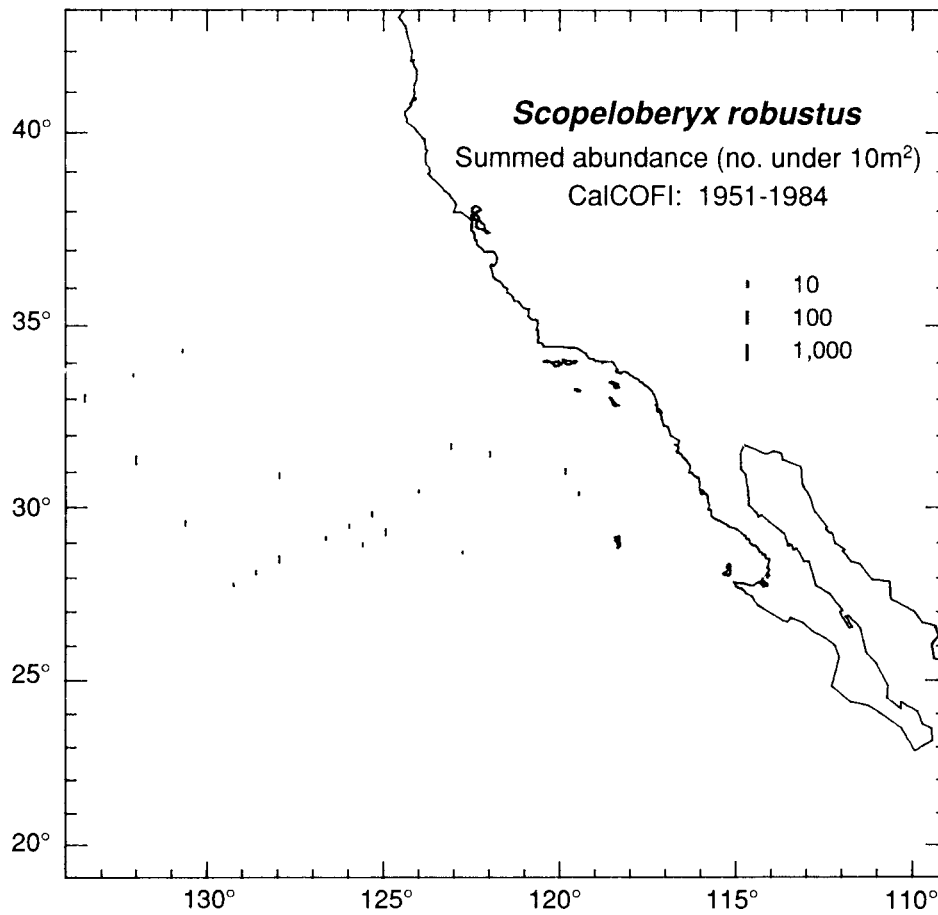
Sooty dragonfishes

Photonectes spp.

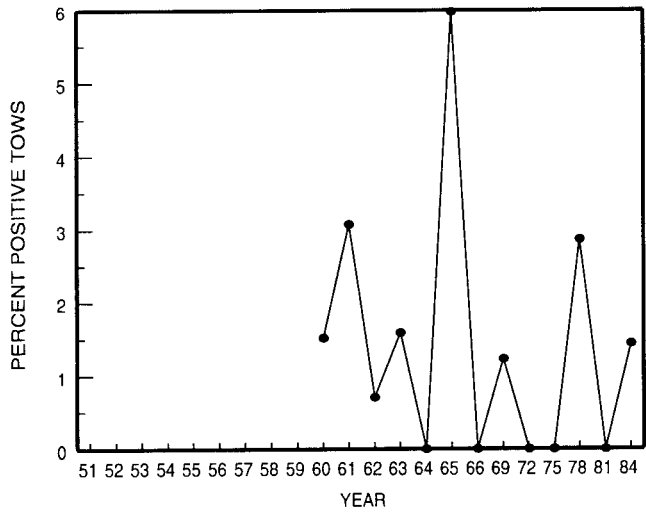


Scopeloberyx robustus

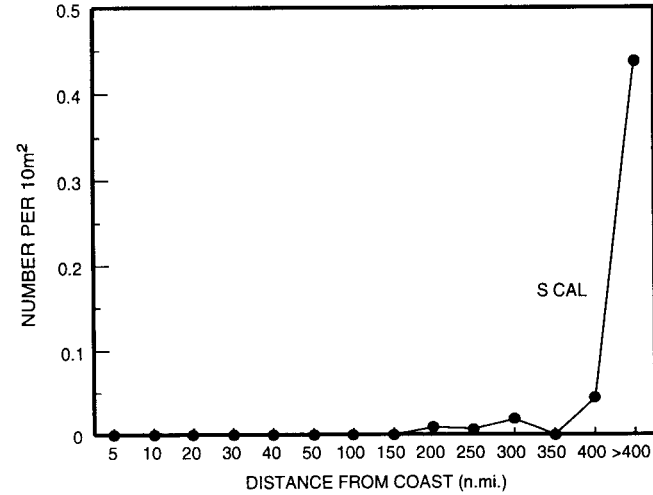
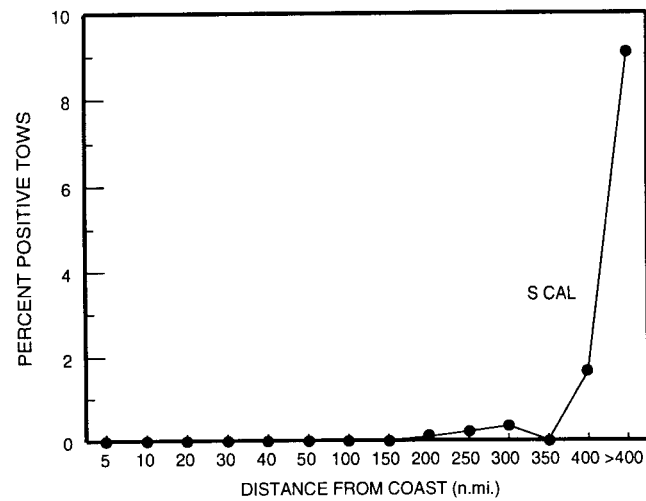
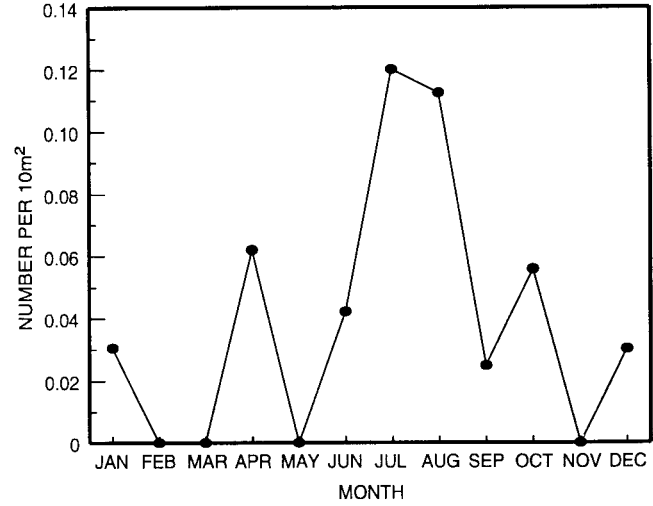
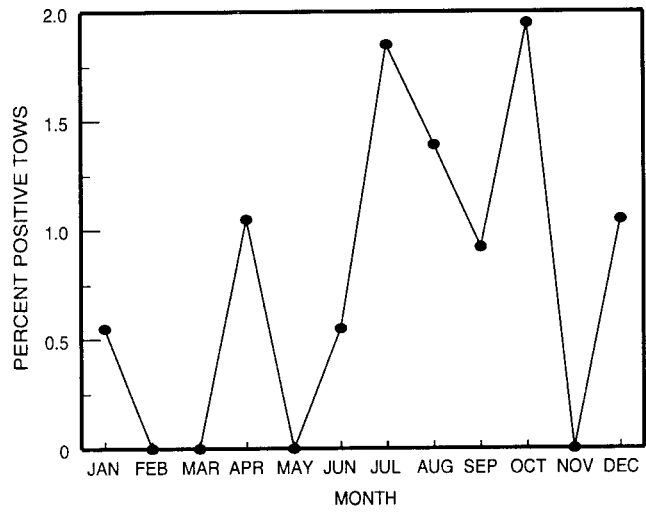
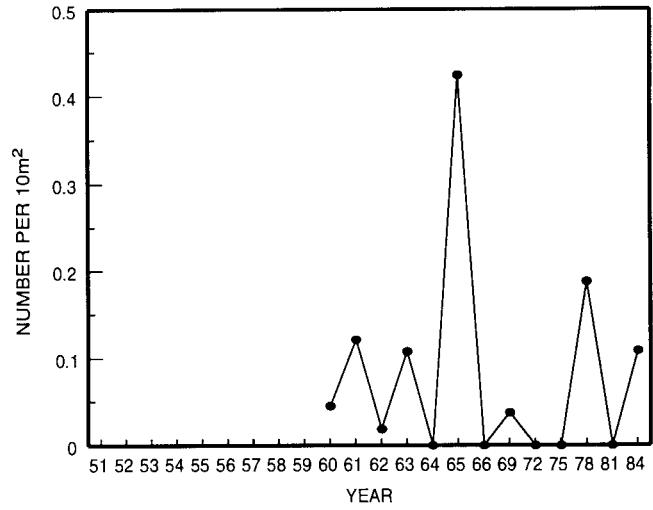
Melamphaidae



Longjaw bigscale

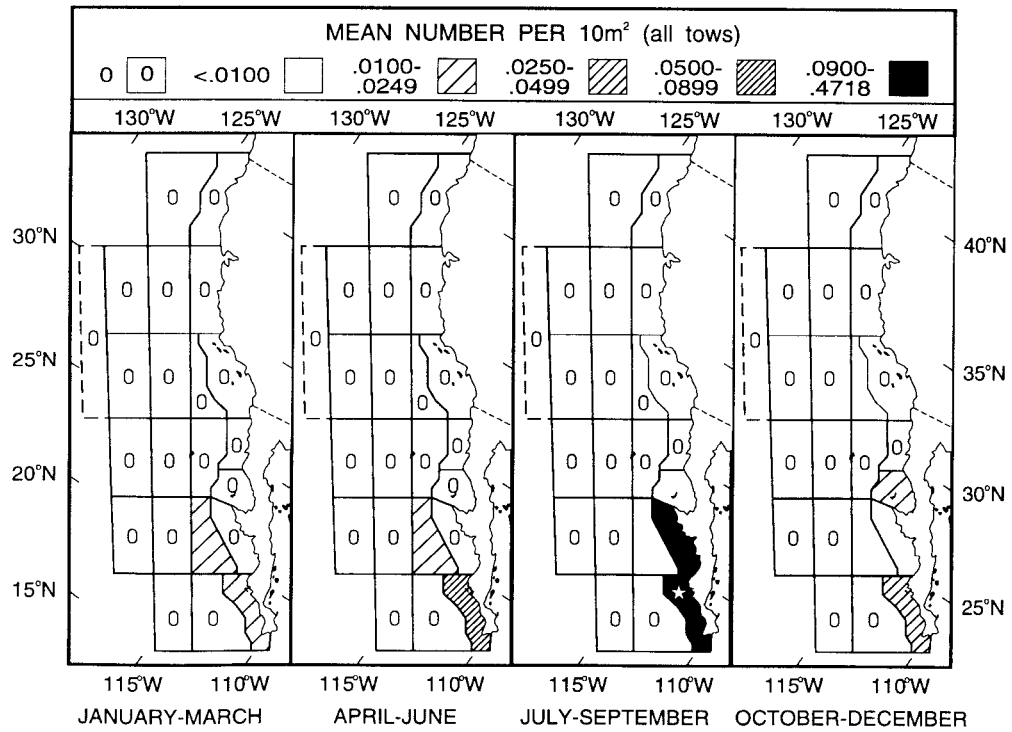
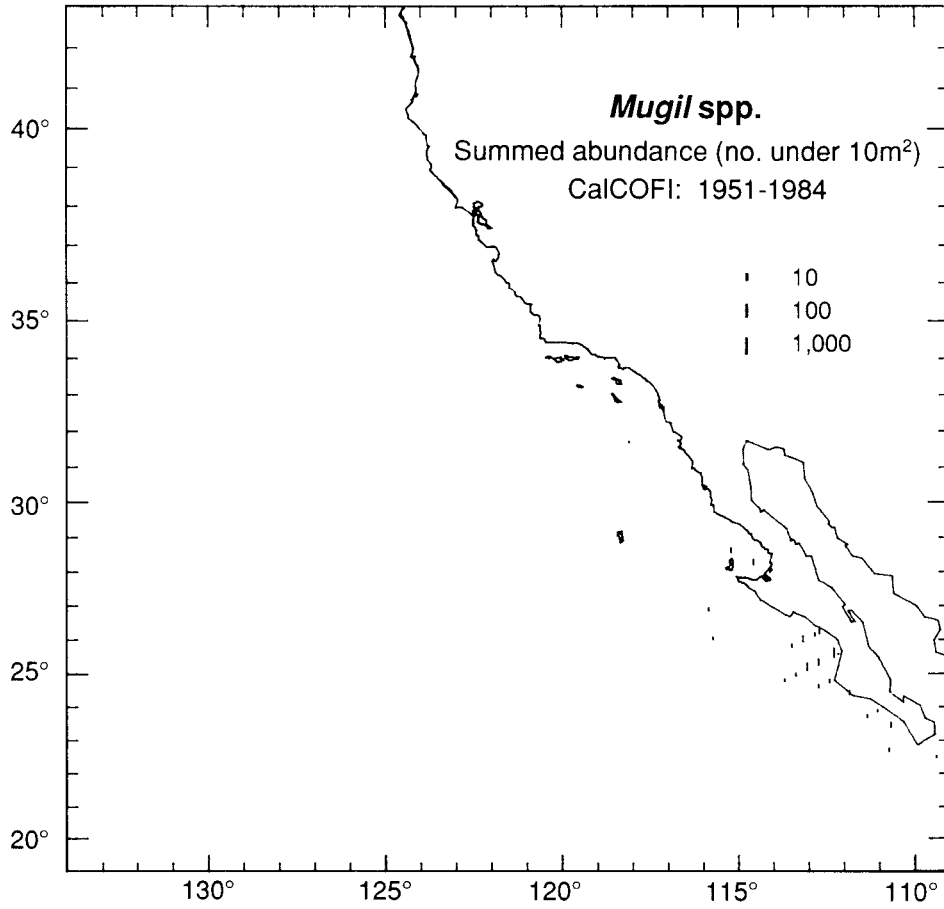


Scopeloberyx robustus



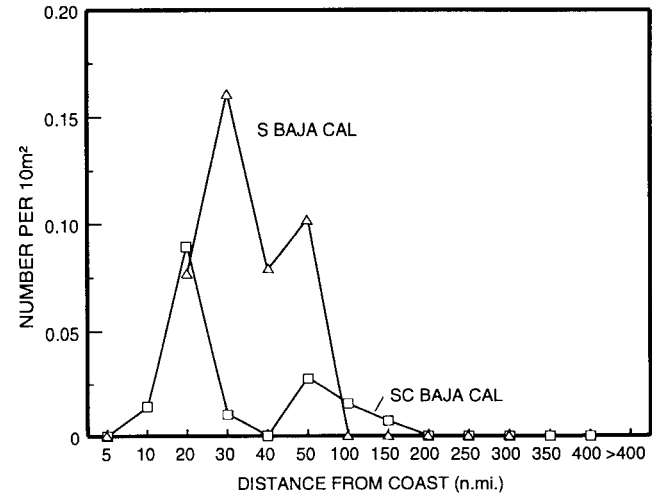
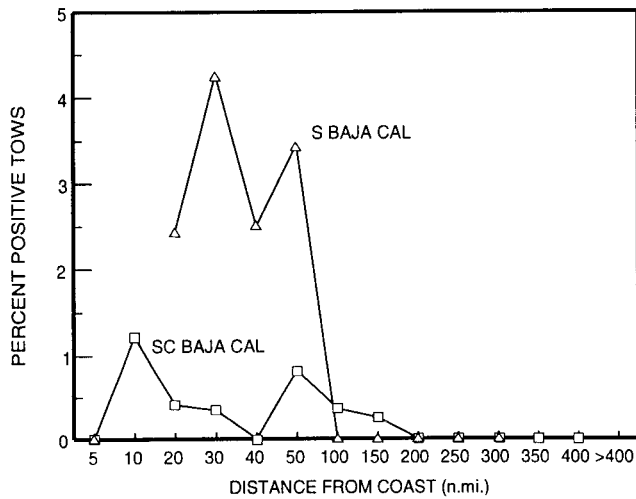
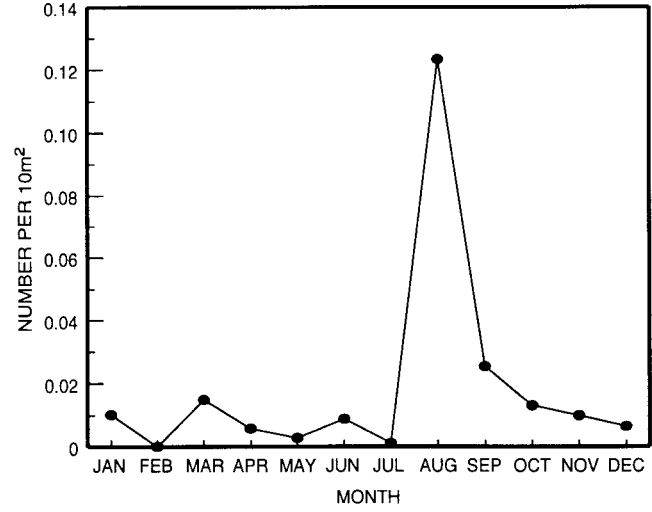
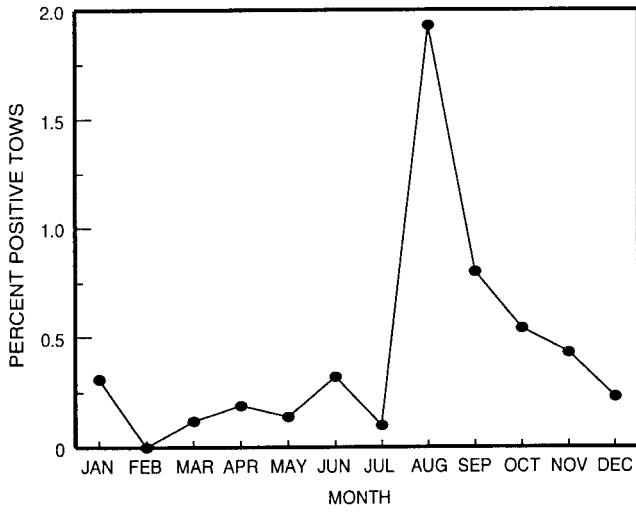
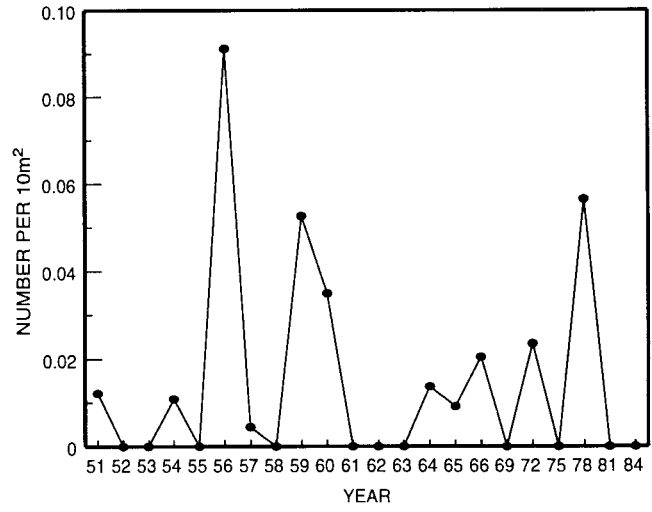
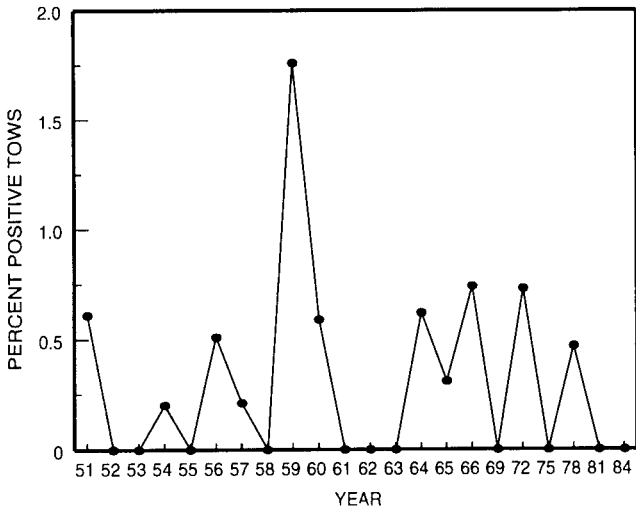
Mugil spp.

Mugilidae



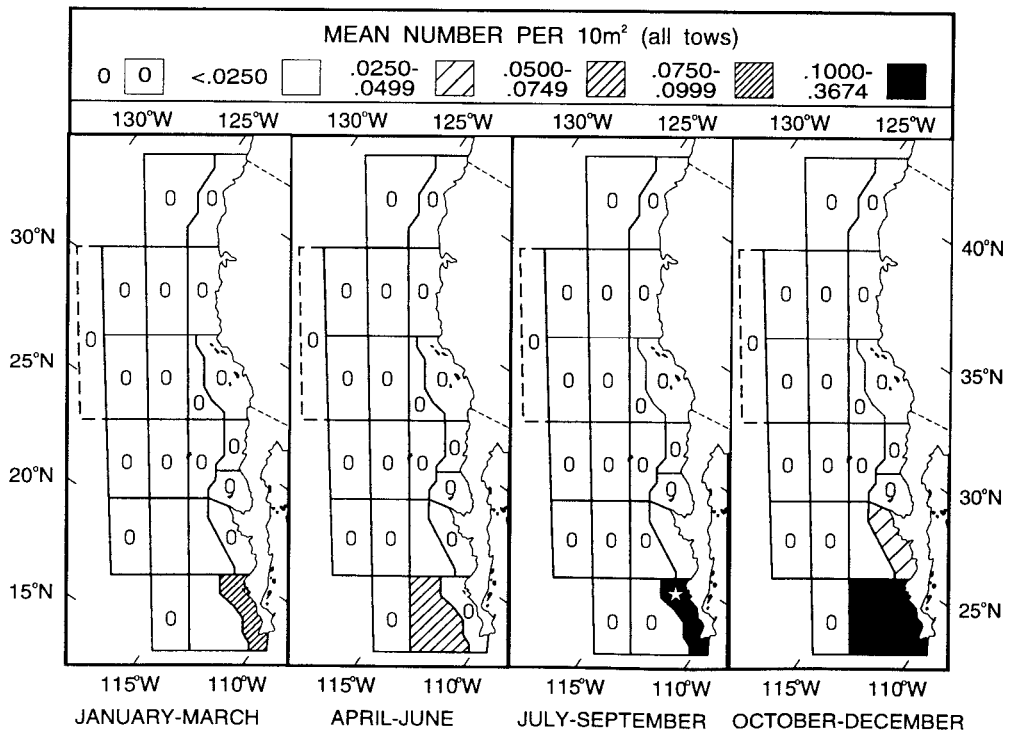
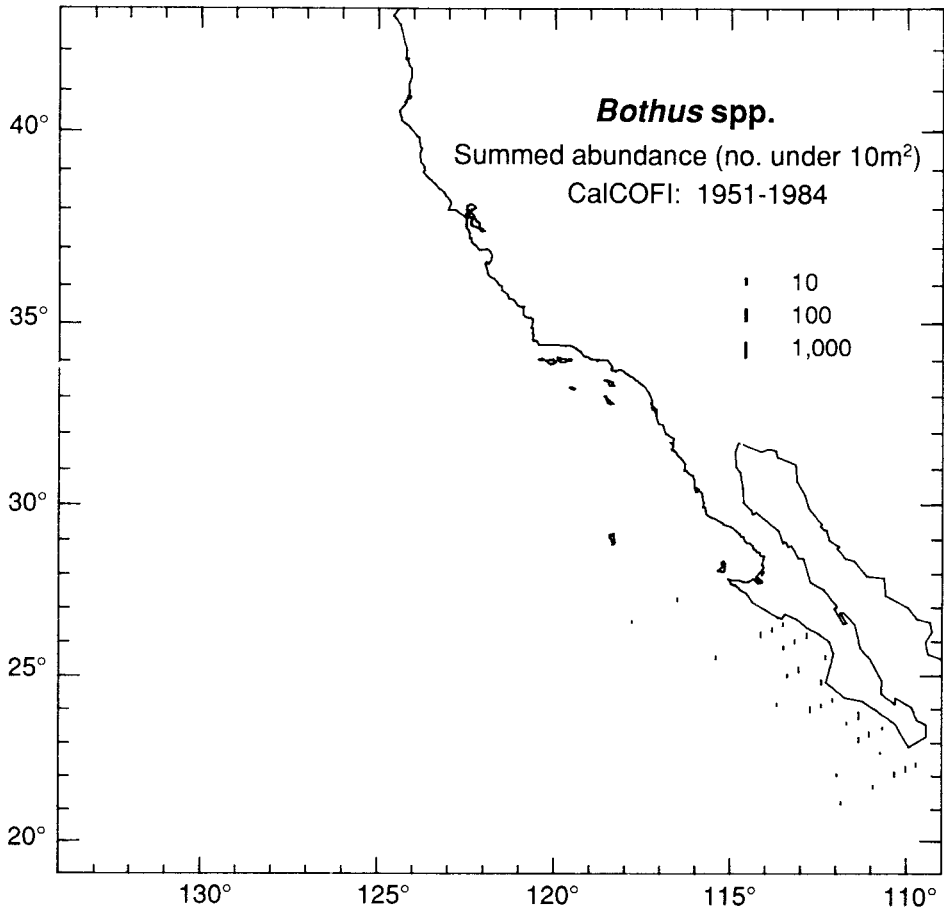
Mullet

Mugil spp.



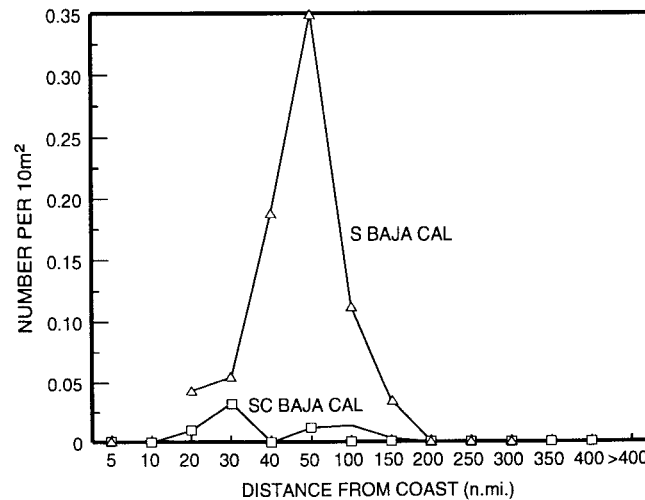
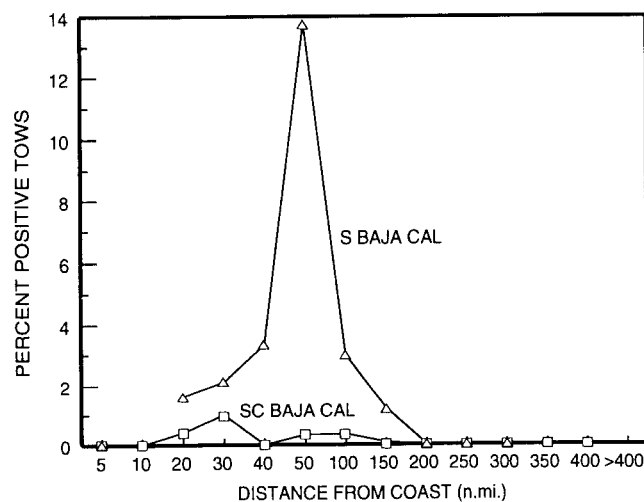
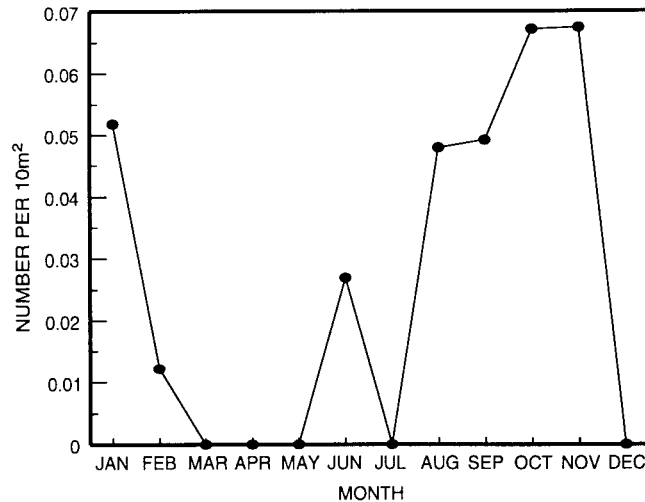
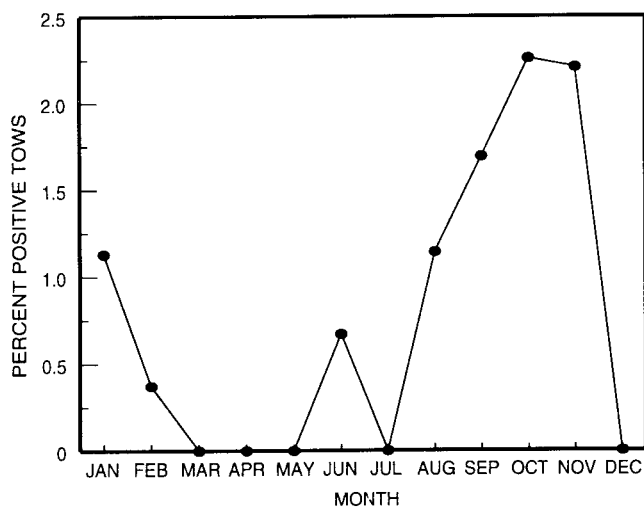
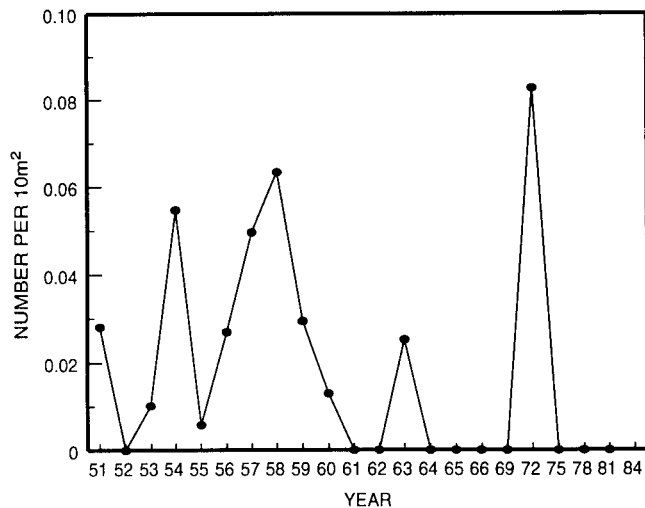
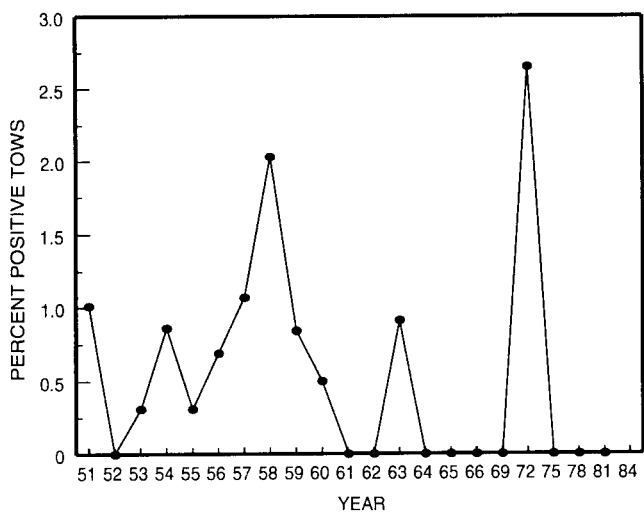
Bothus spp.

Bothidae



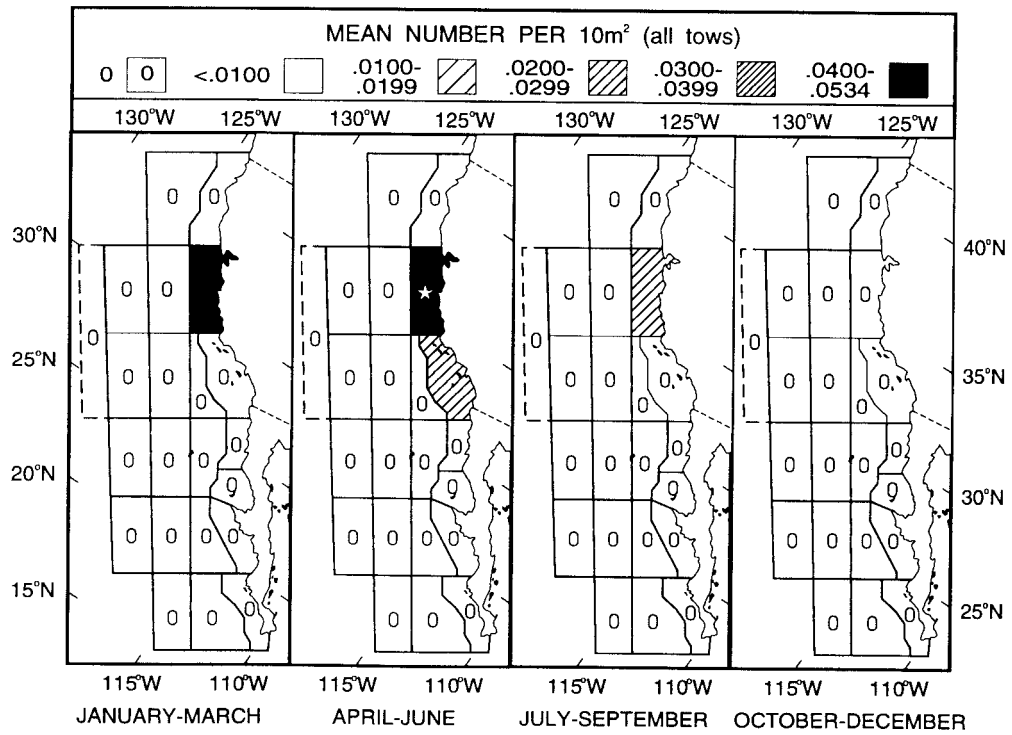
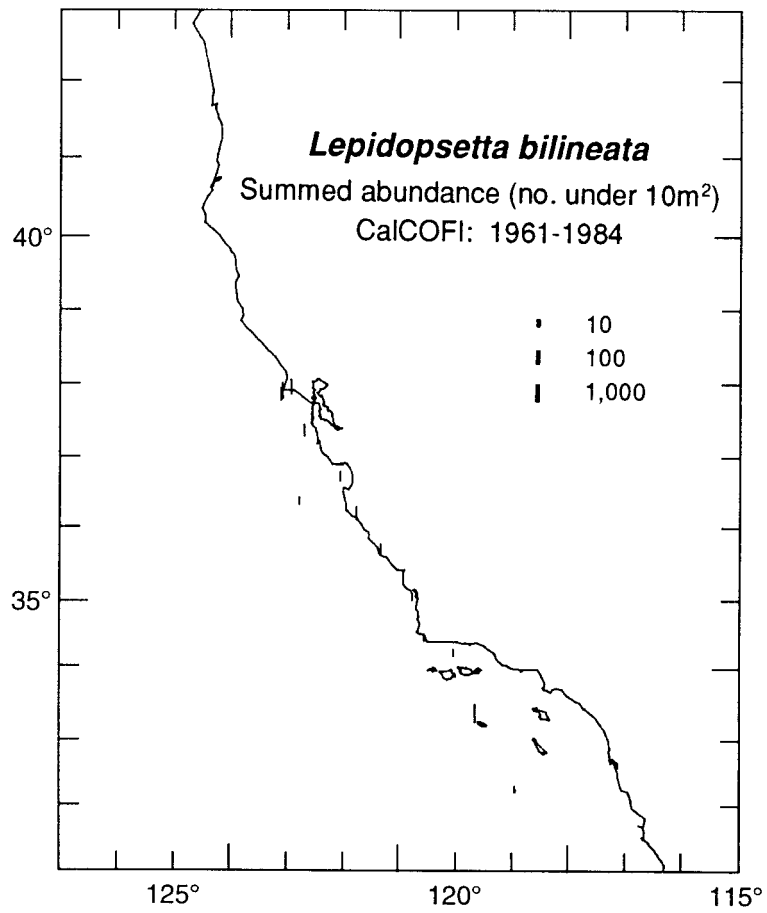
Lefteyed flounders

Bothus spp.

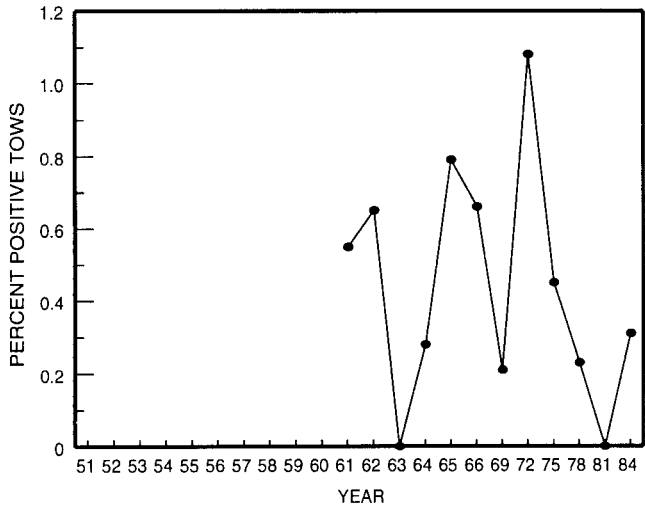


Lepidopsetta bilineata

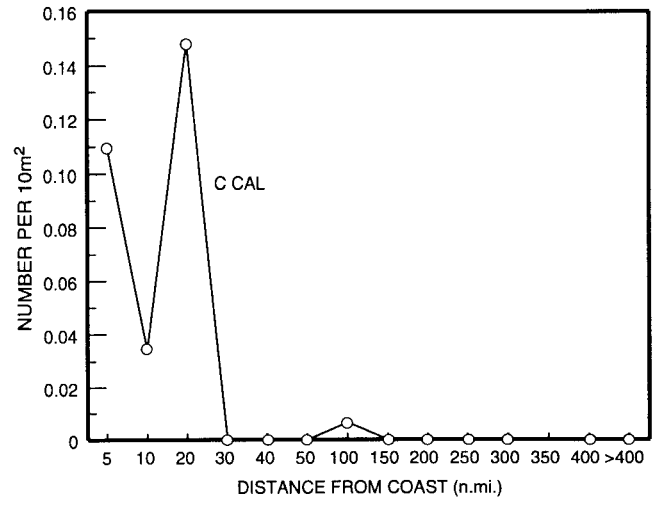
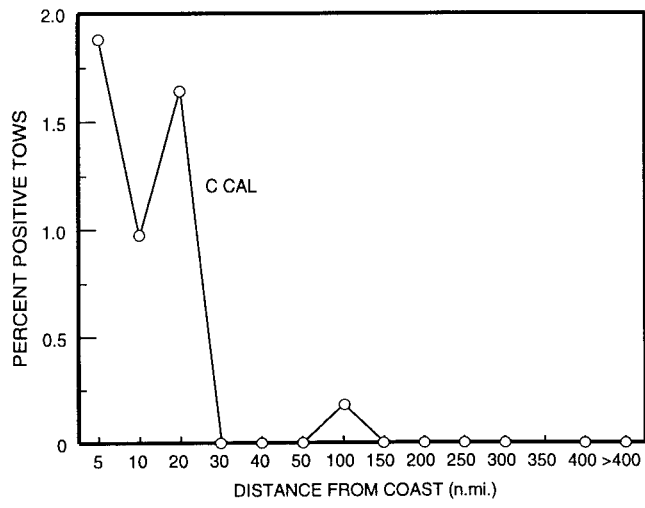
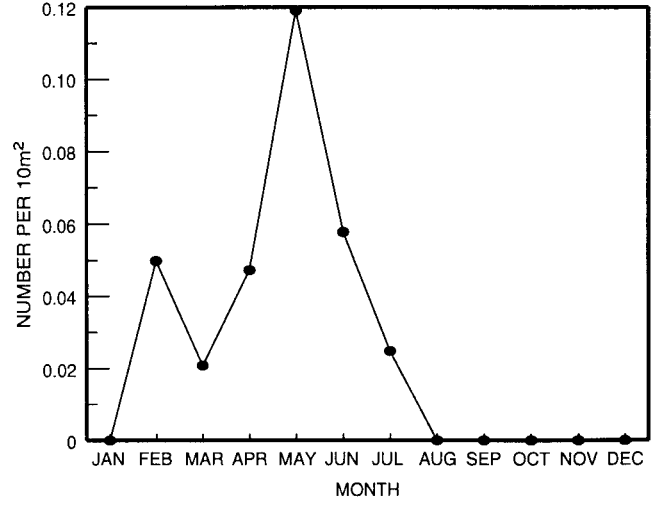
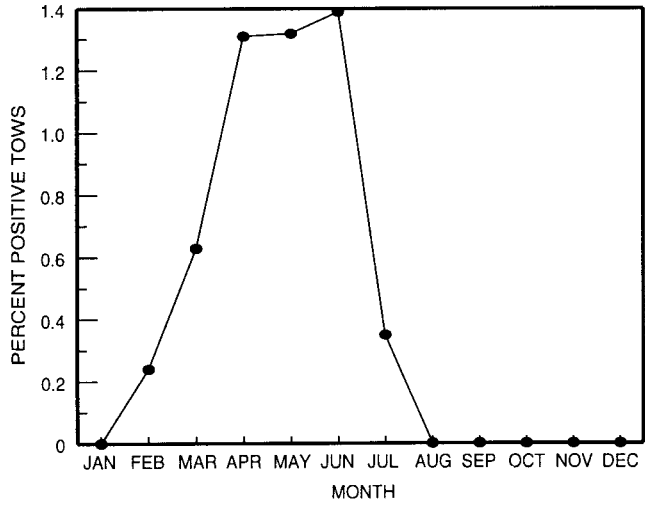
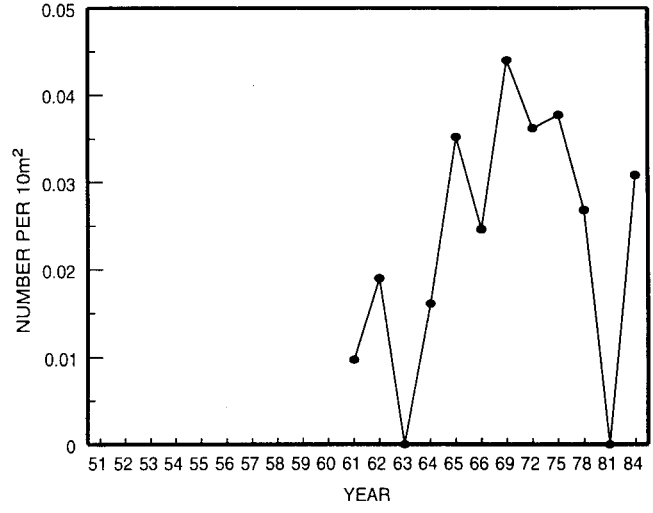
Pleuronectidae



Rock sole

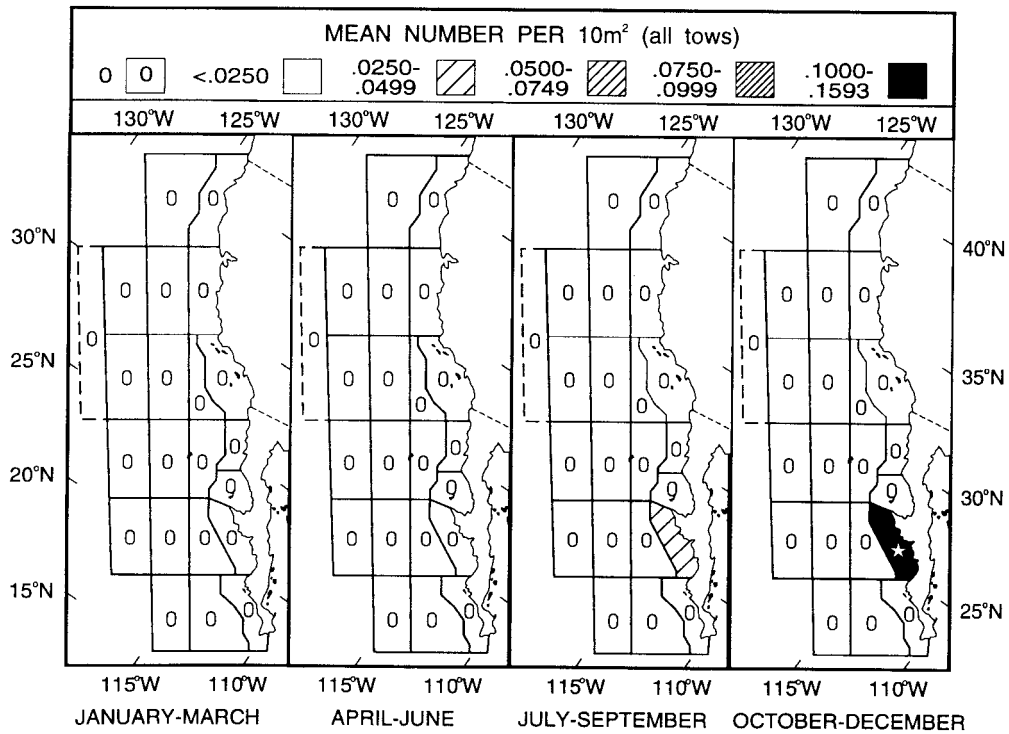
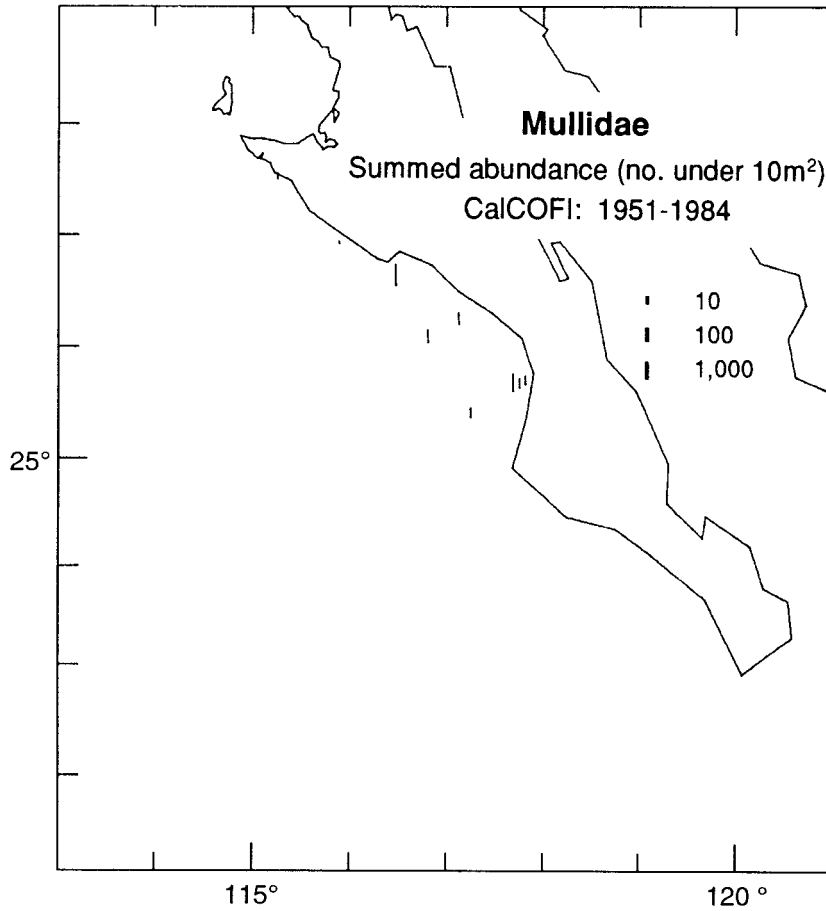


Lepidopsetta bilineata

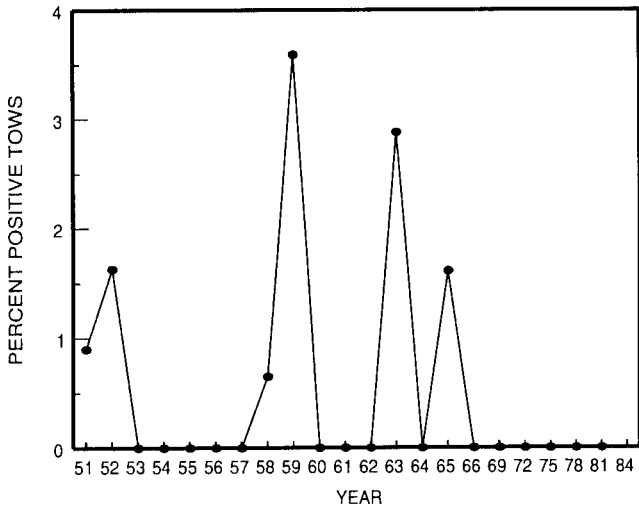


Mullidae

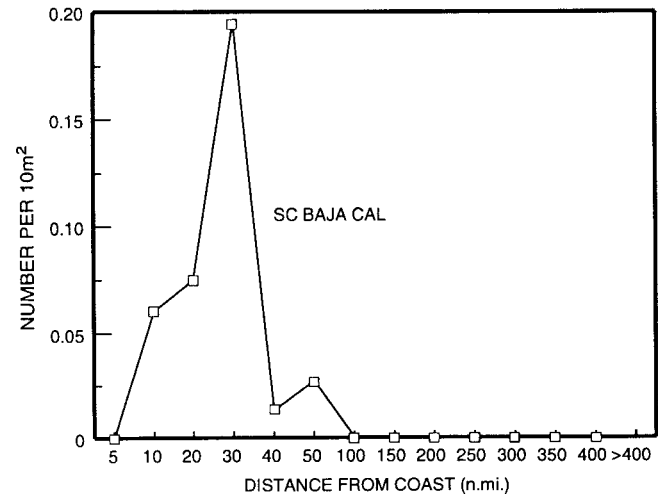
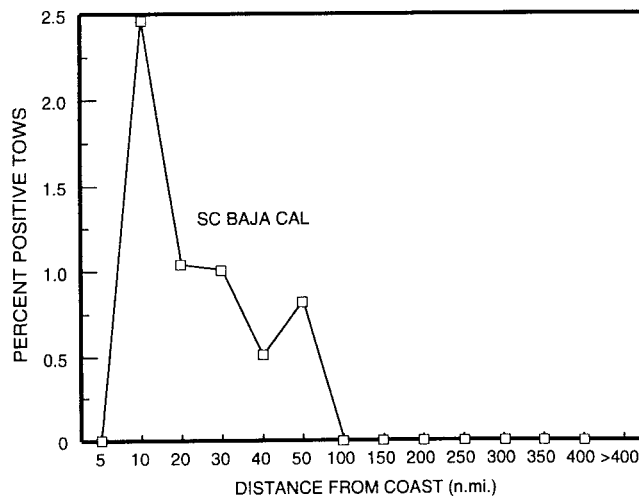
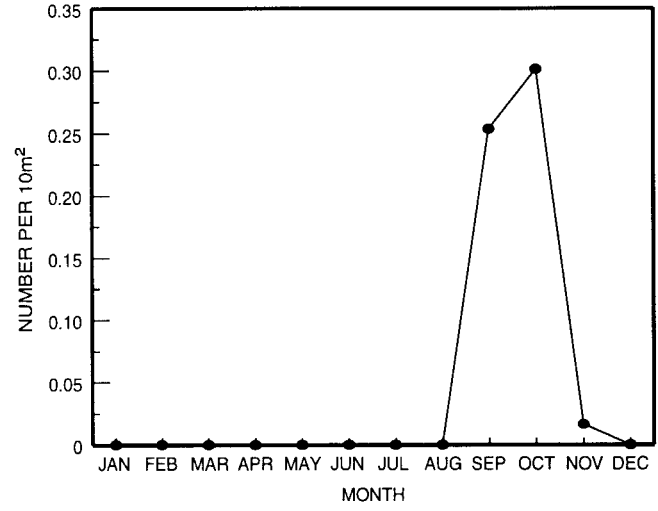
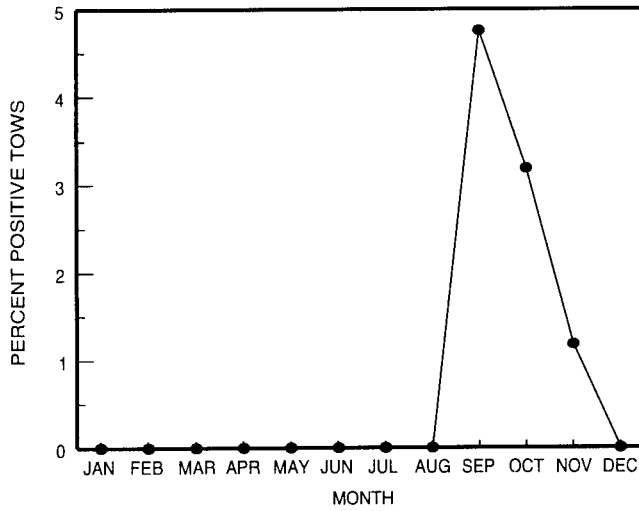
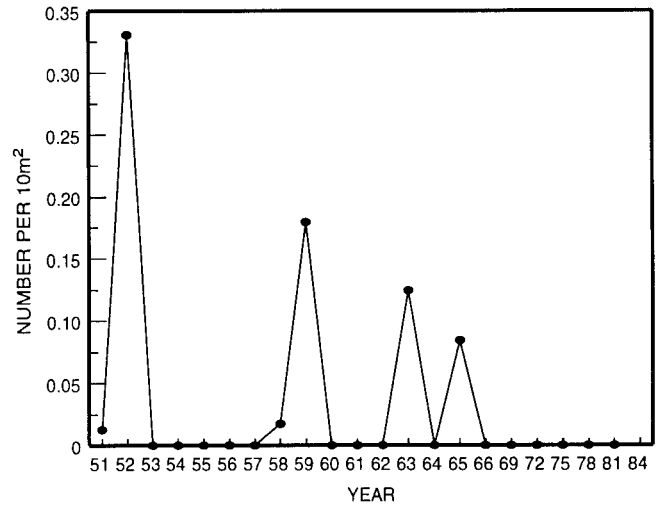
Mullidae



Goatfishes

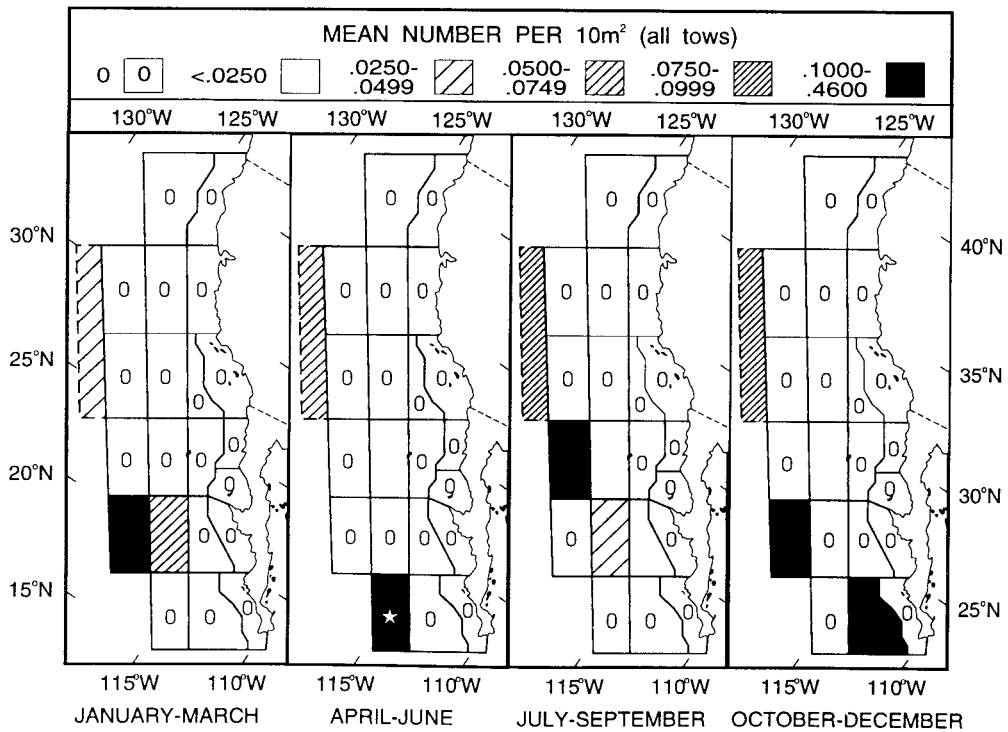
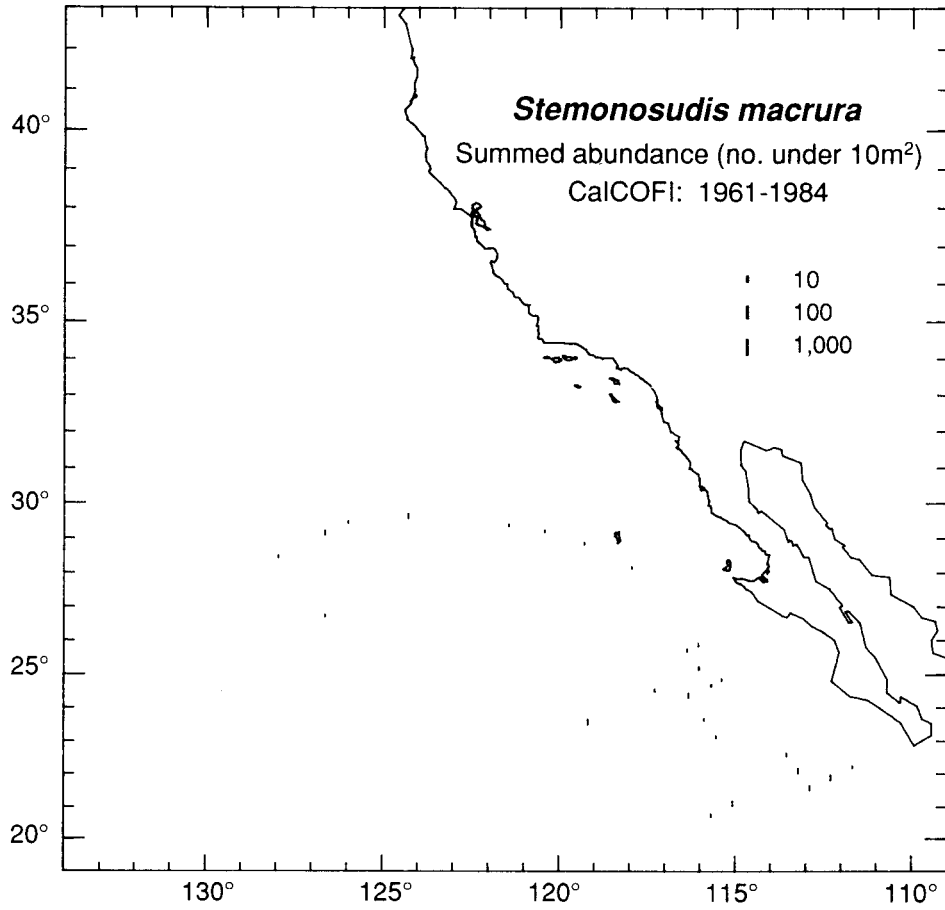


Mullidae

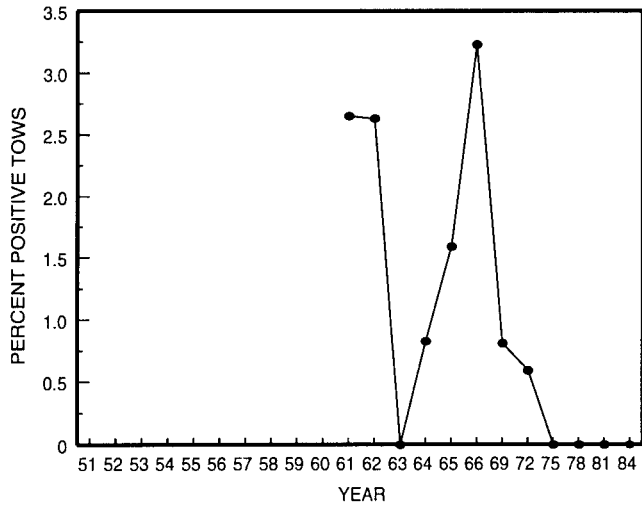


Stemonosudis macrura

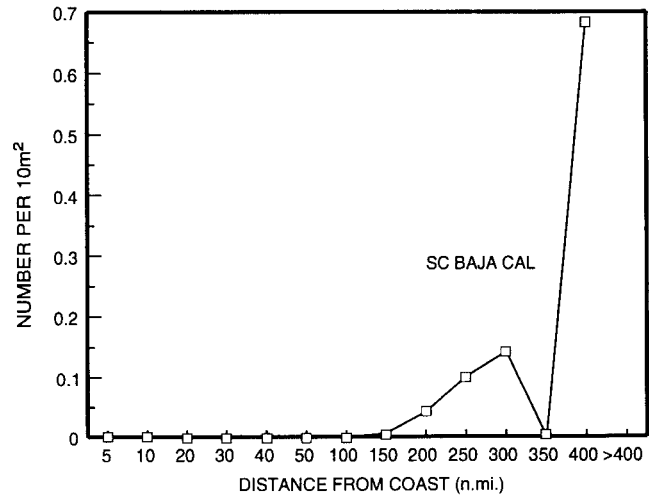
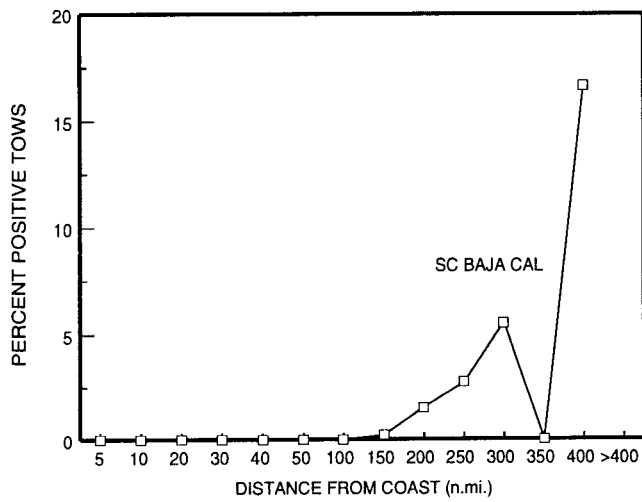
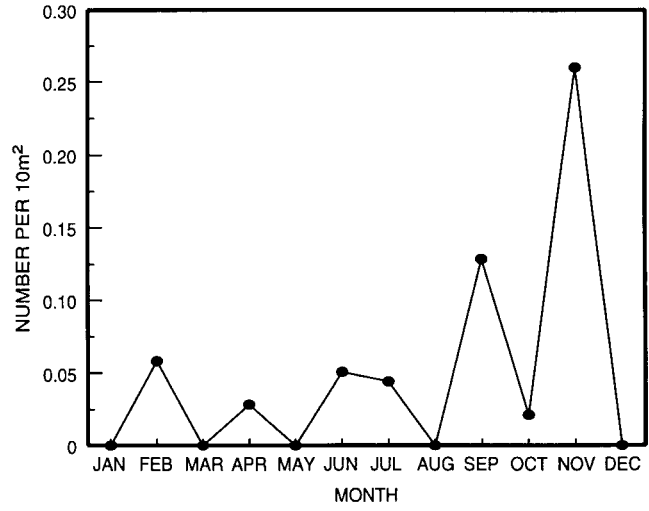
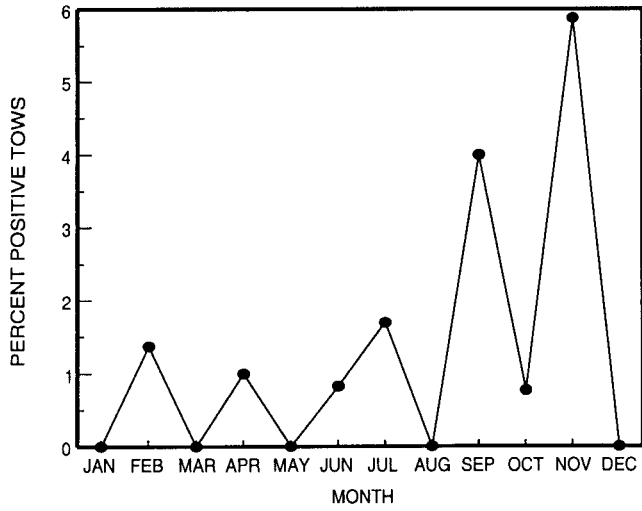
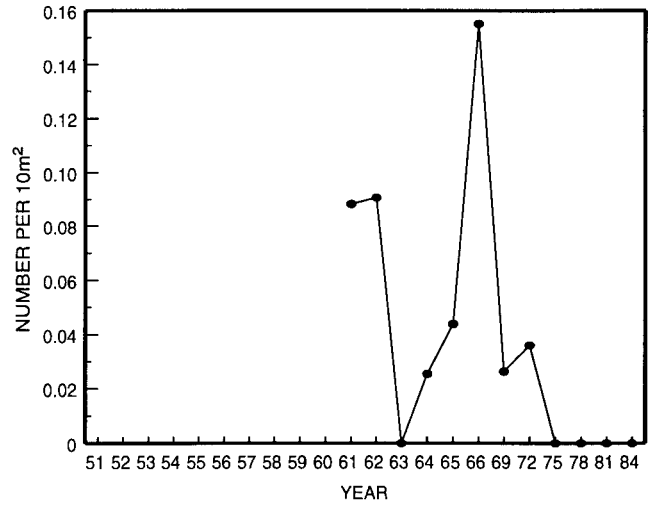
Paralepididae



Sharpchin barracudina

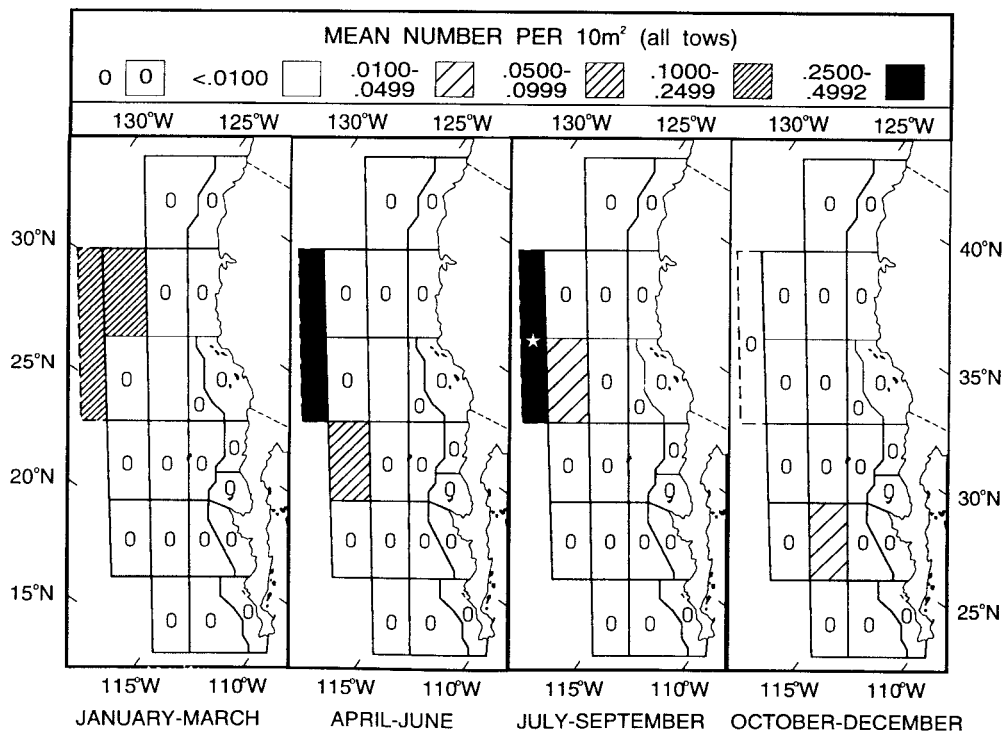
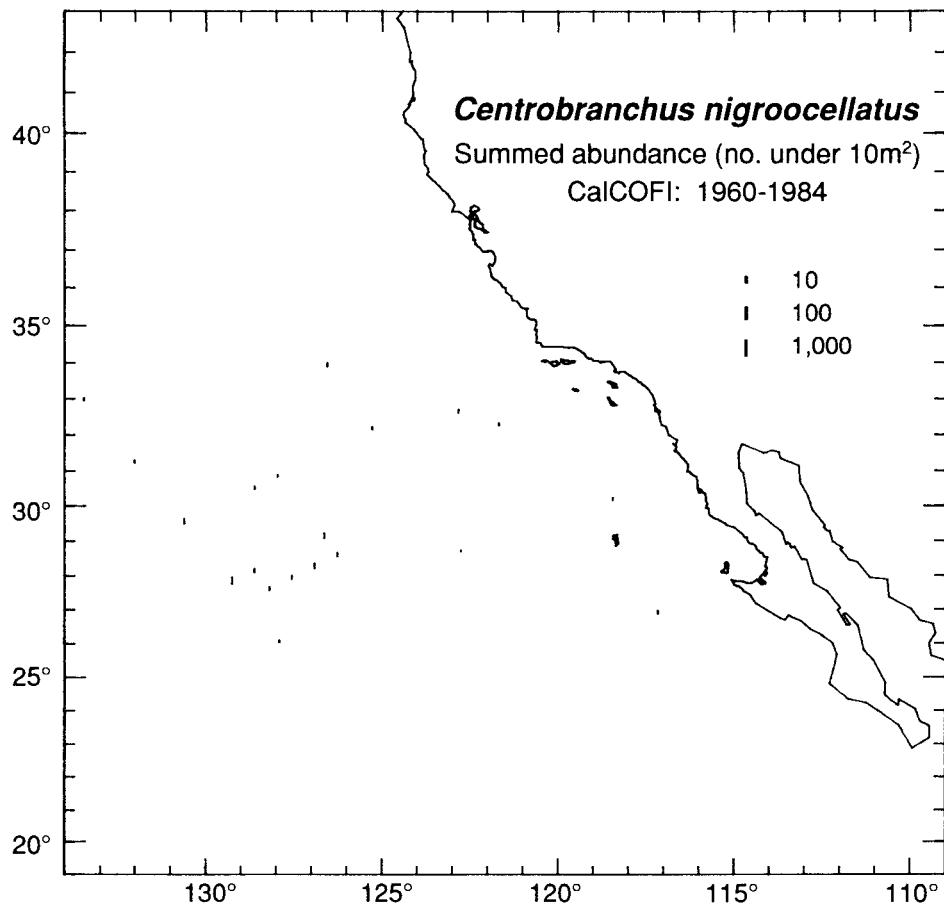


Stemonosudis macrura

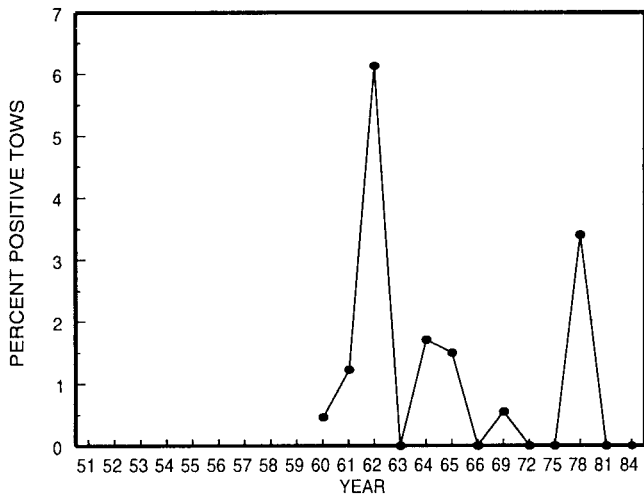


Centrobranchus nigroocellatus

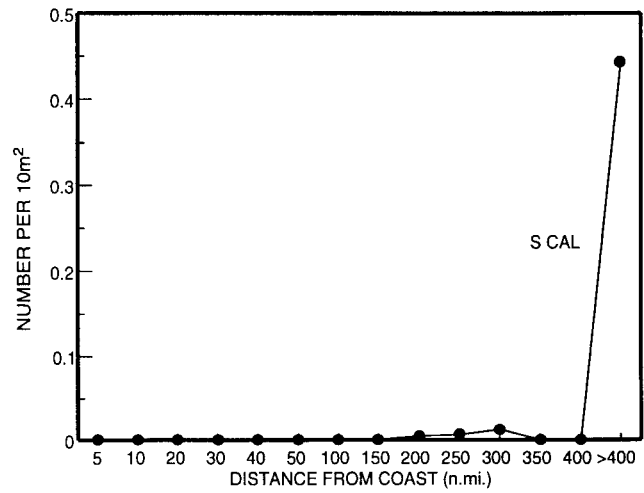
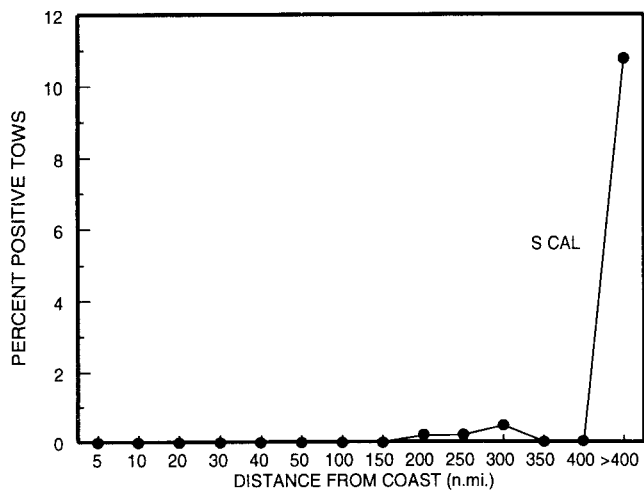
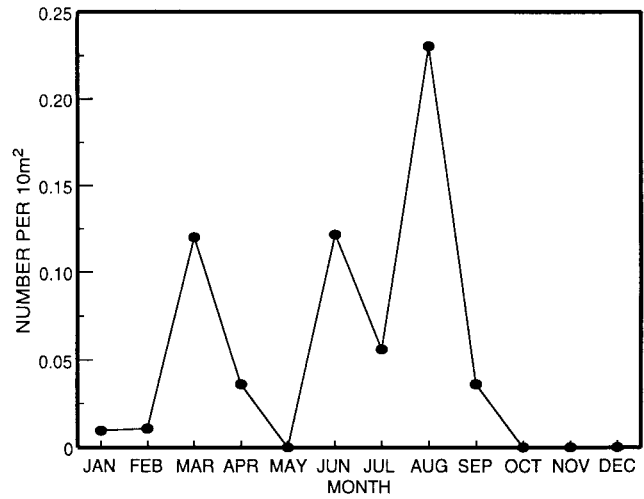
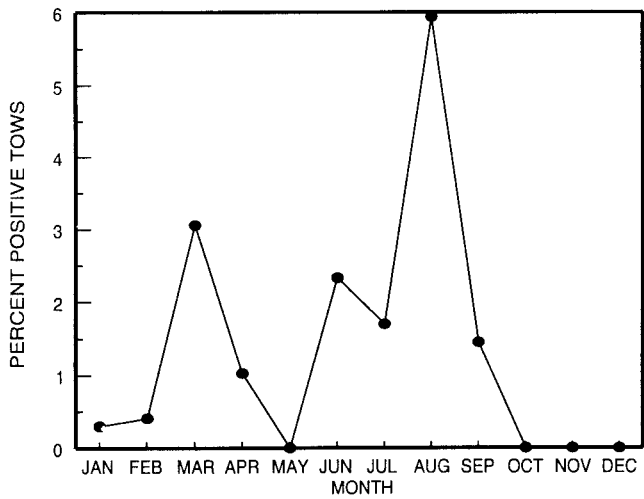
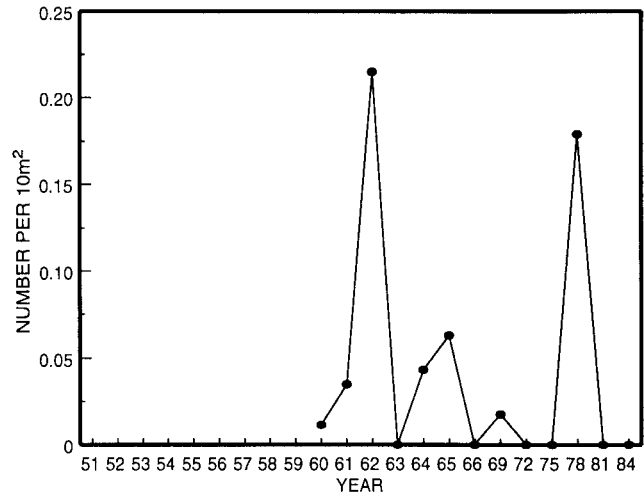
Myctophidae



Roundnose lanternfish

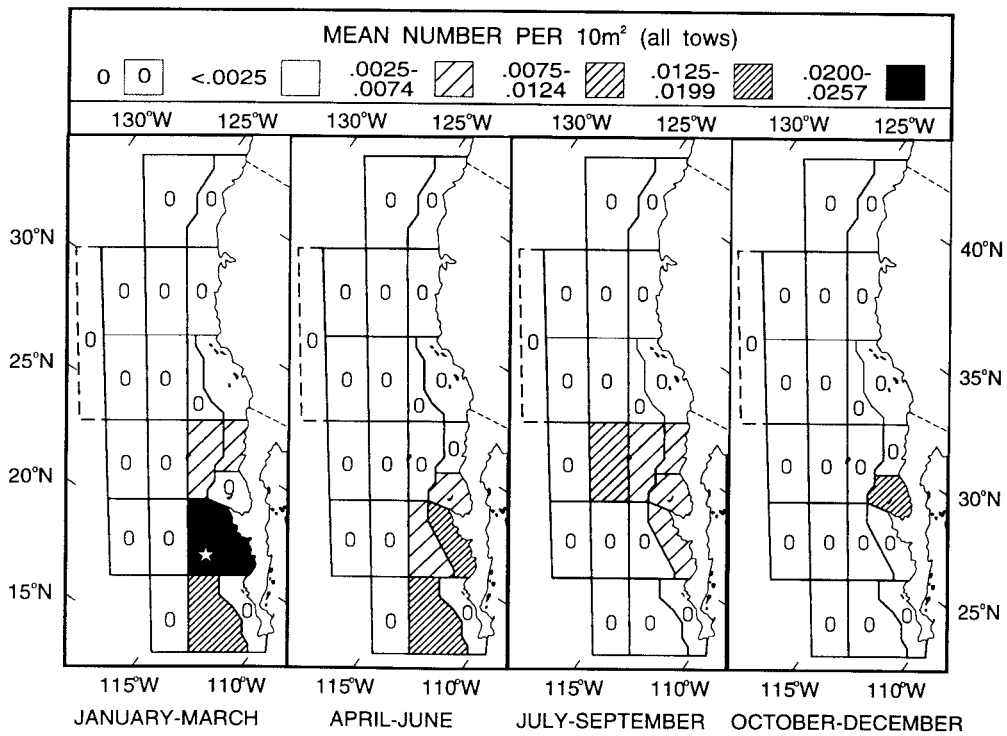
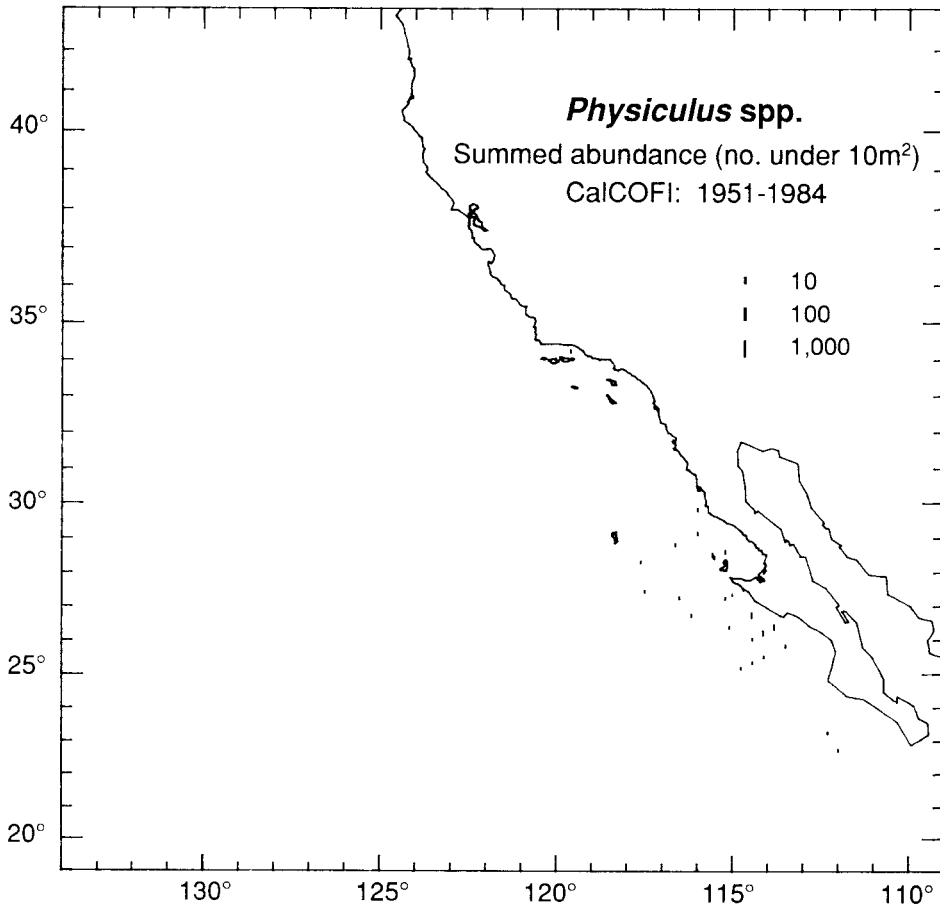


Centrobranchus nigroocellatus

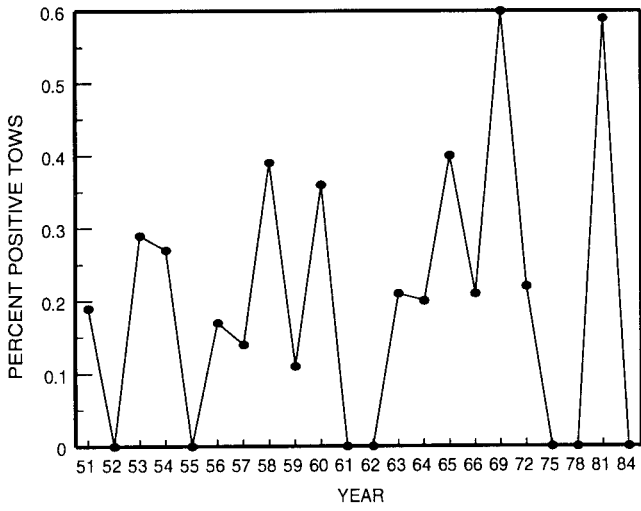


Physiculus spp.

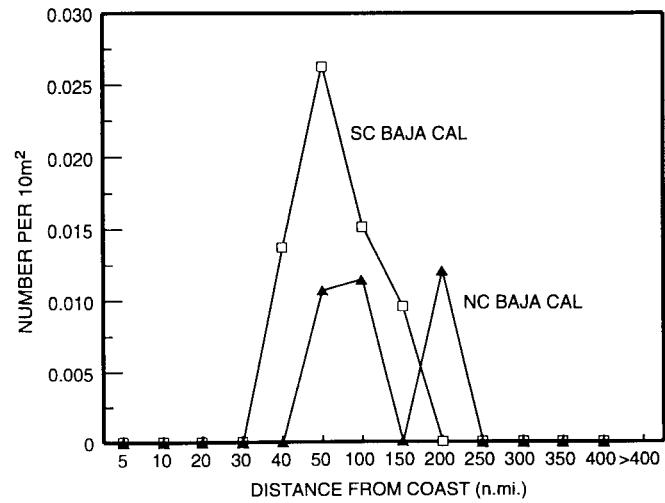
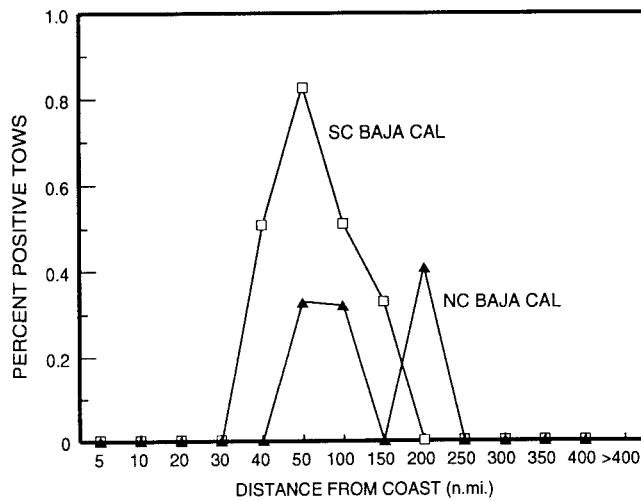
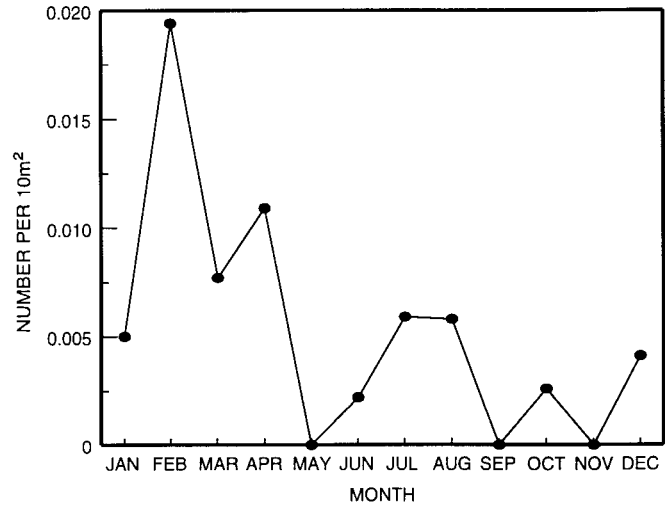
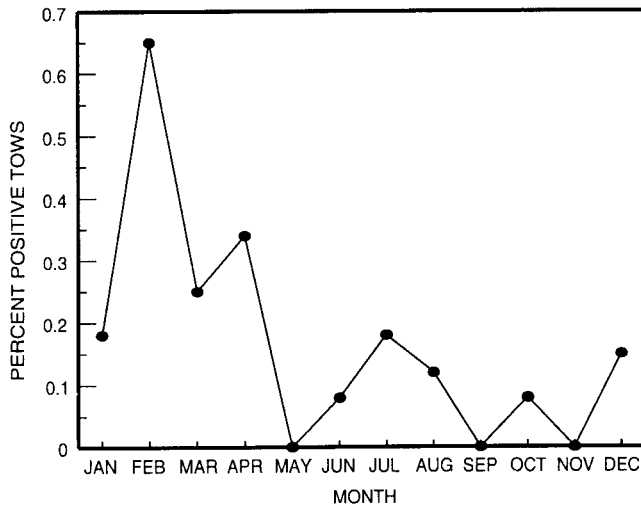
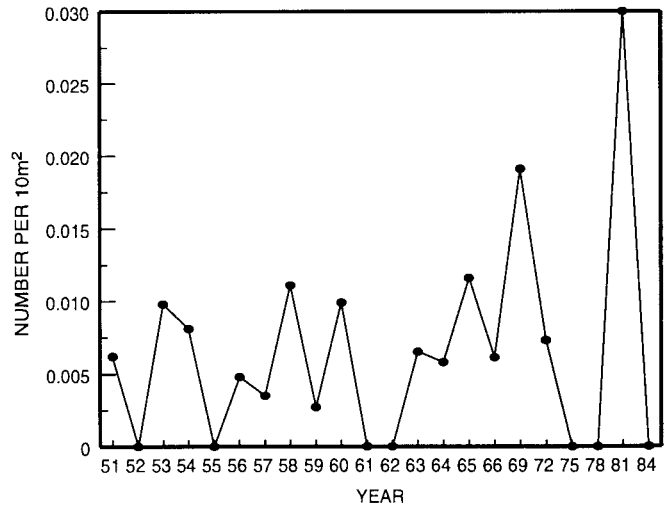
Moridae



Moras

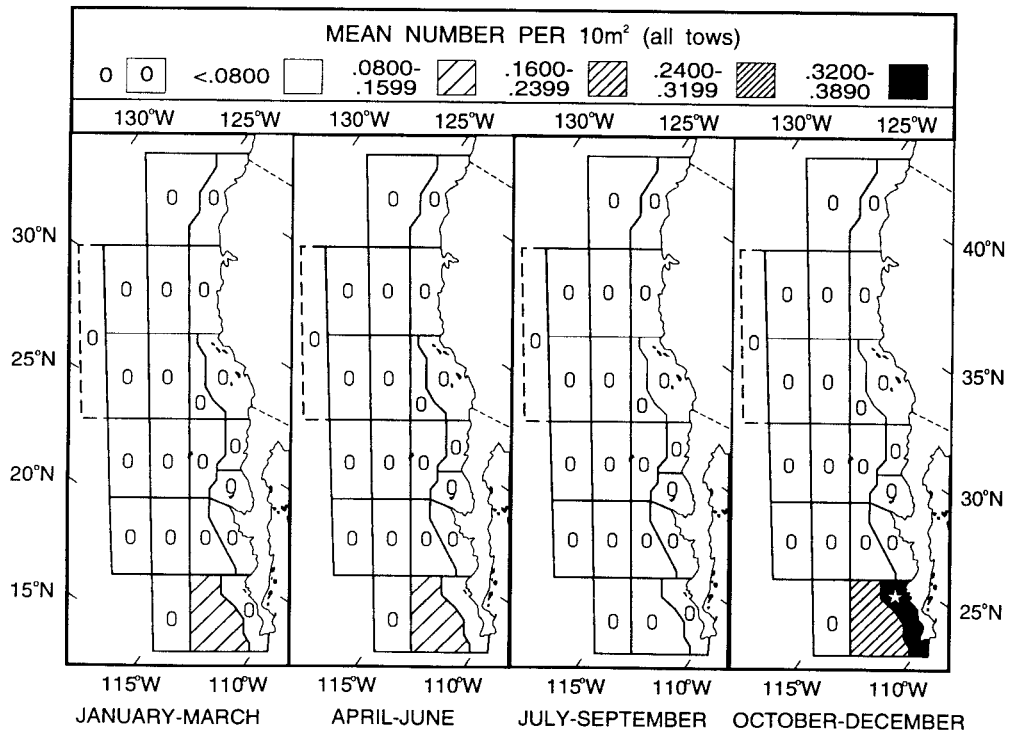
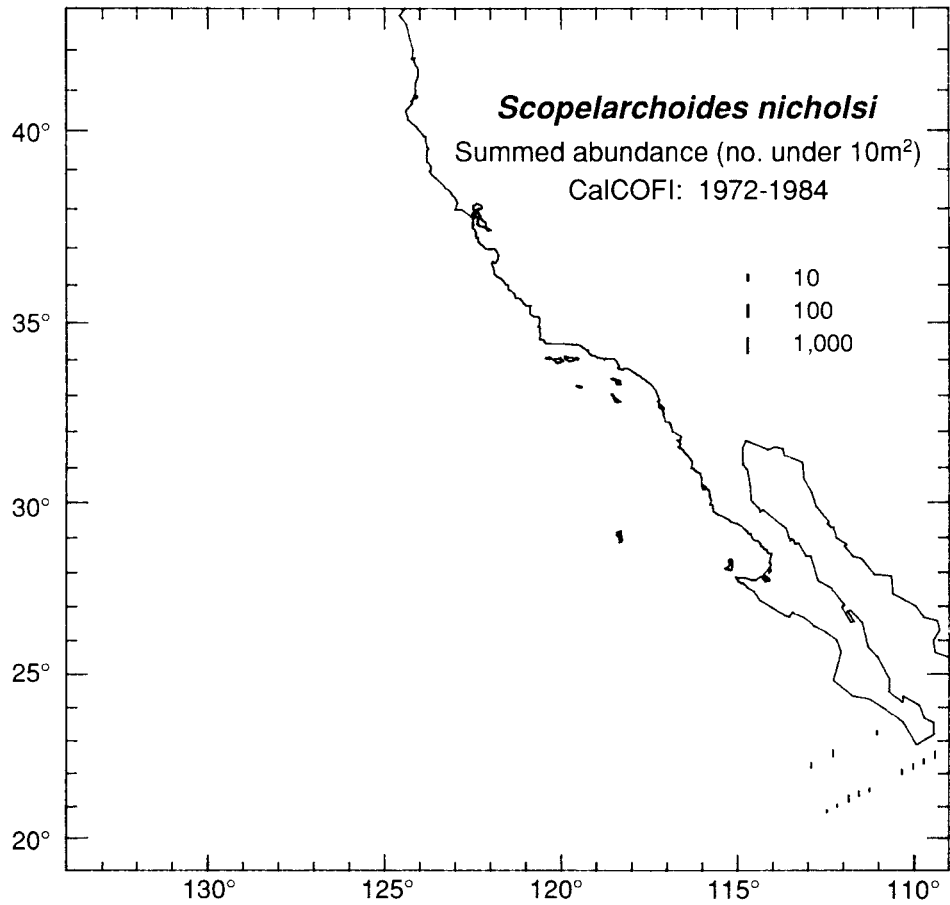


Physiculus spp.

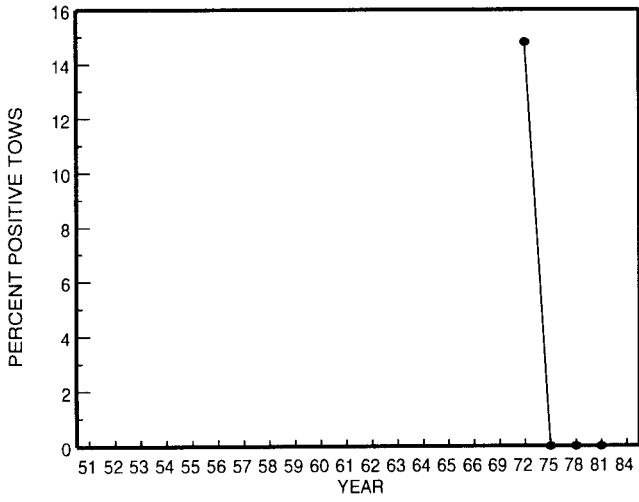


Scopelarchoides nicholsi

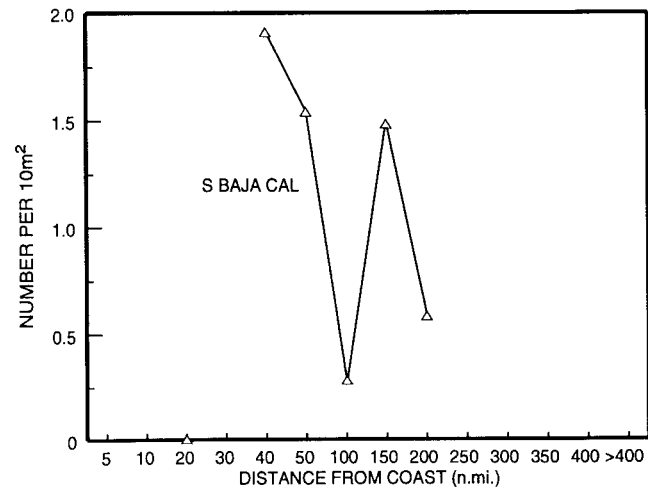
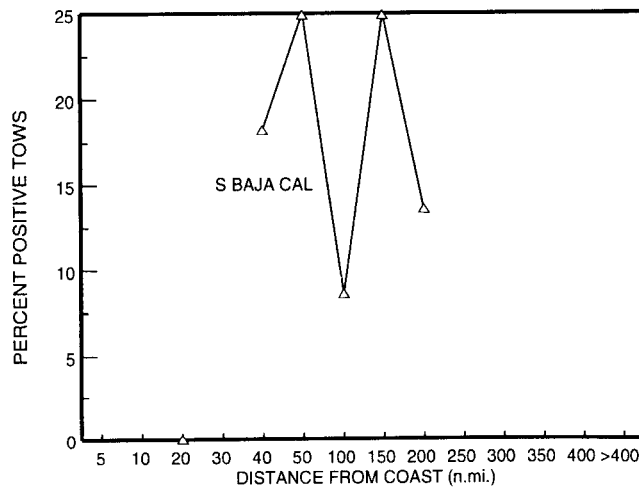
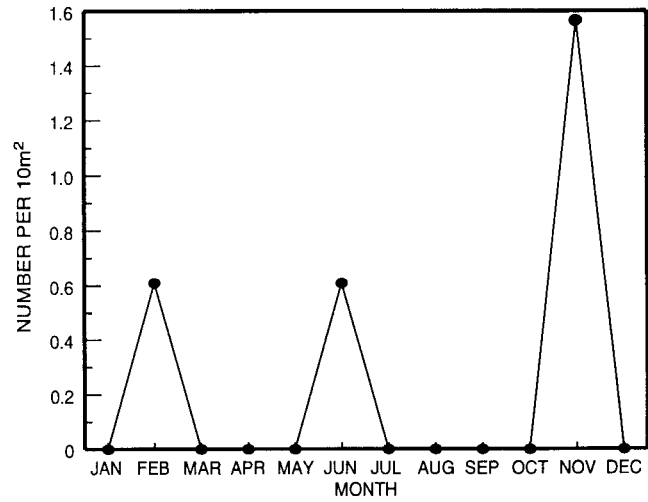
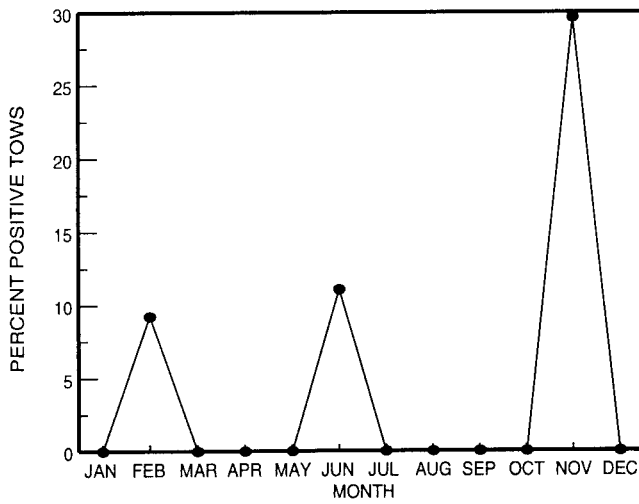
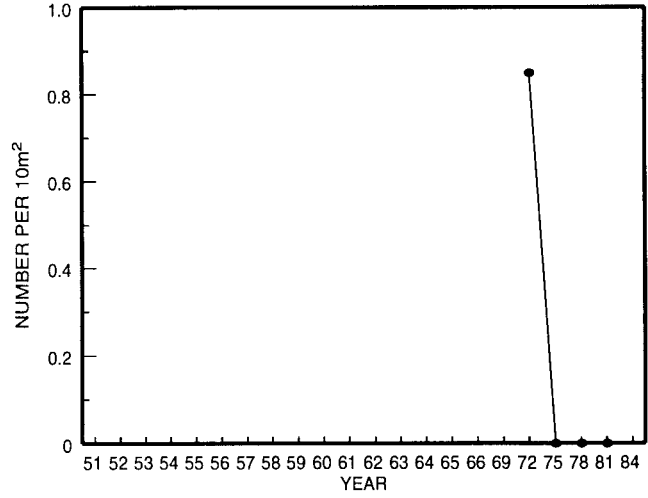
Scopelarchidae



Longgill pearleye

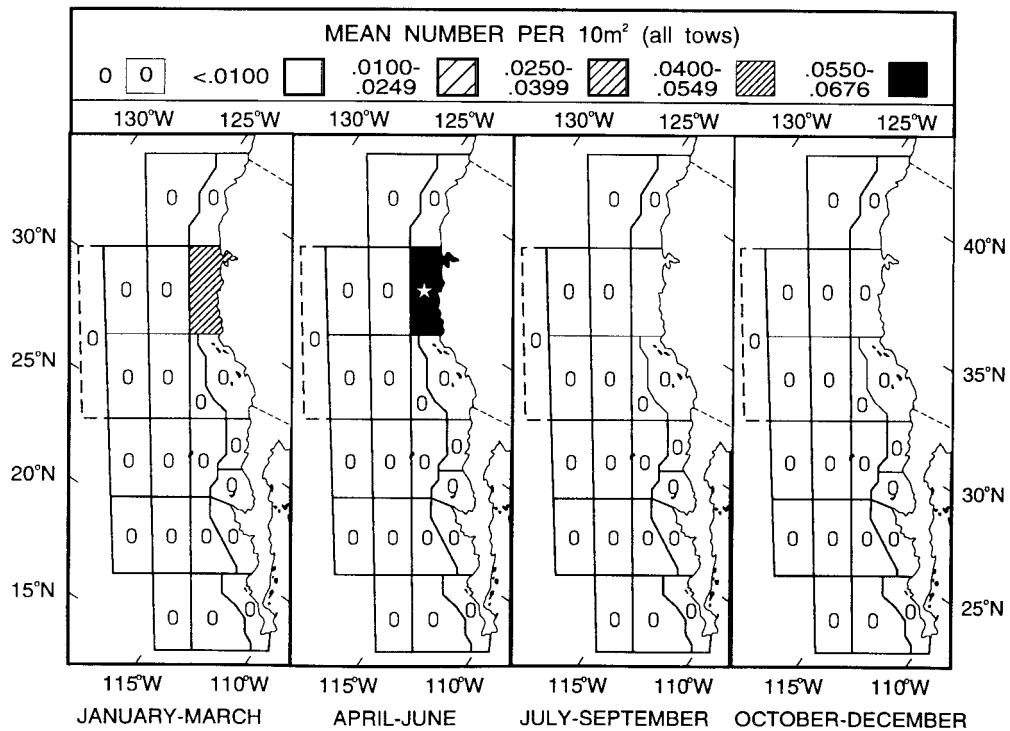
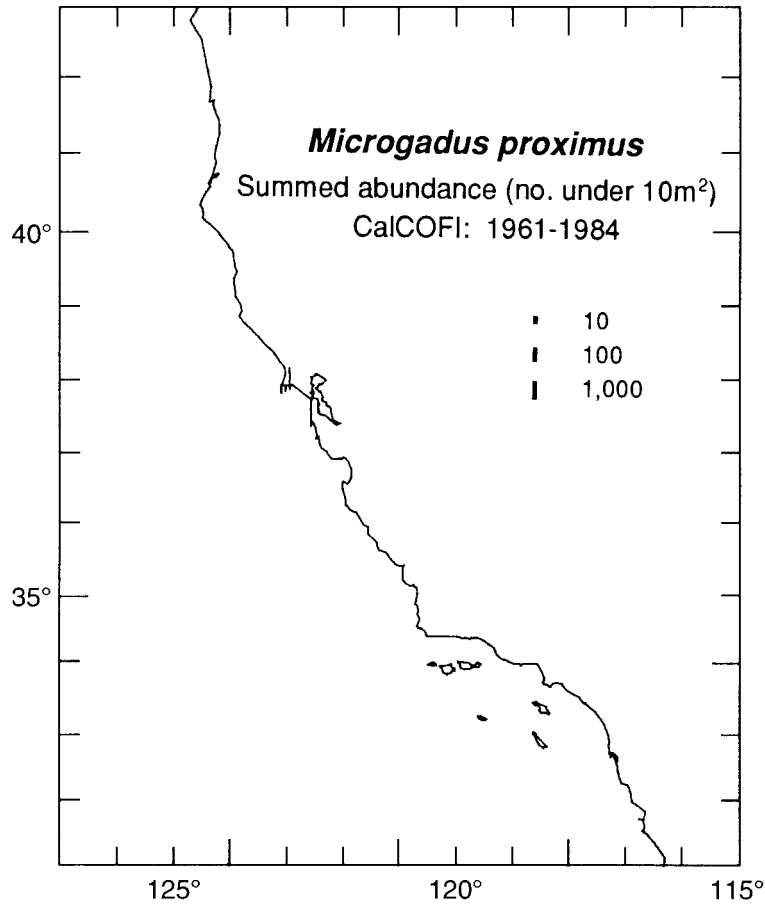


Scopelarchoides nicholsi

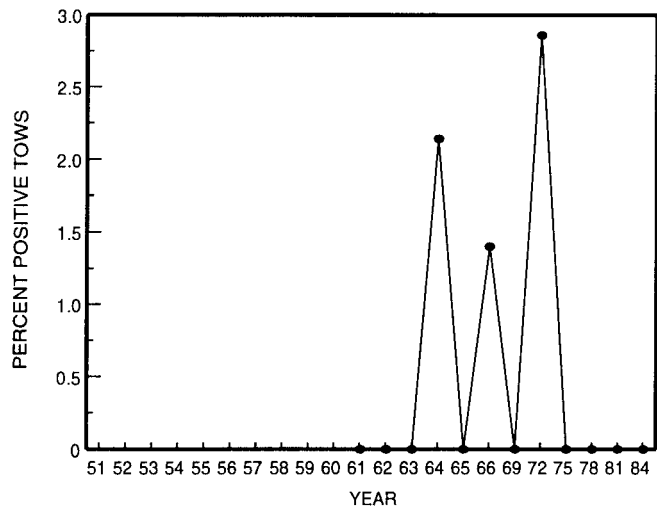


Microgadus proximus

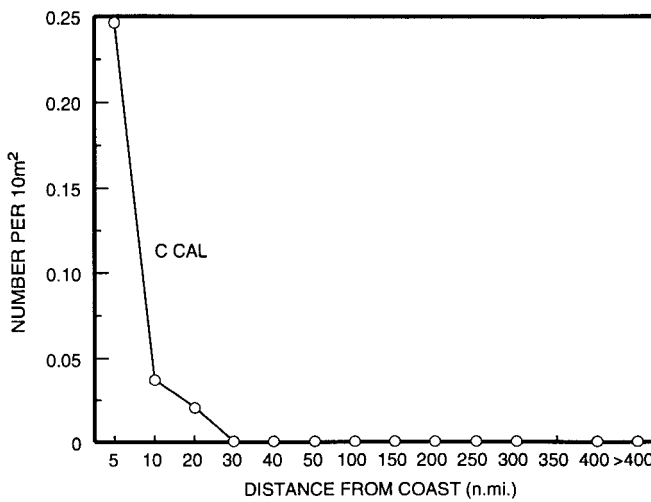
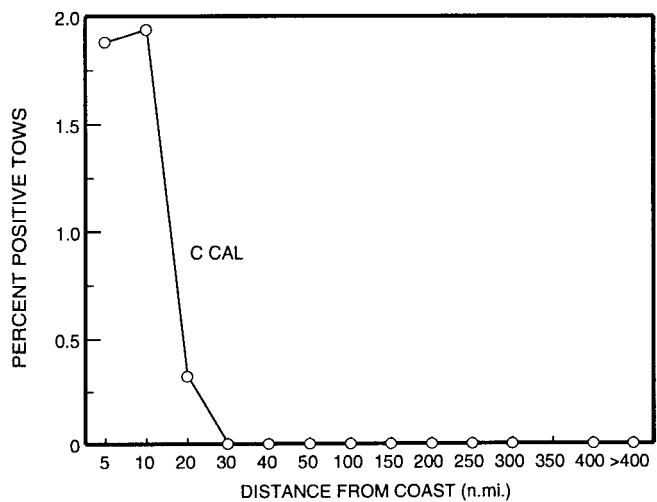
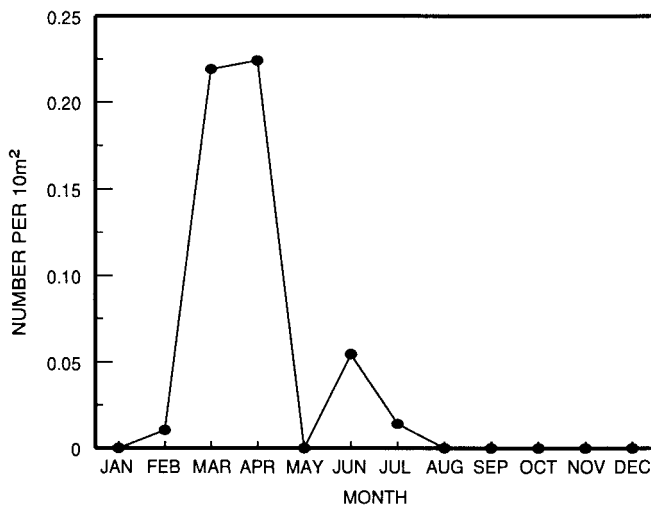
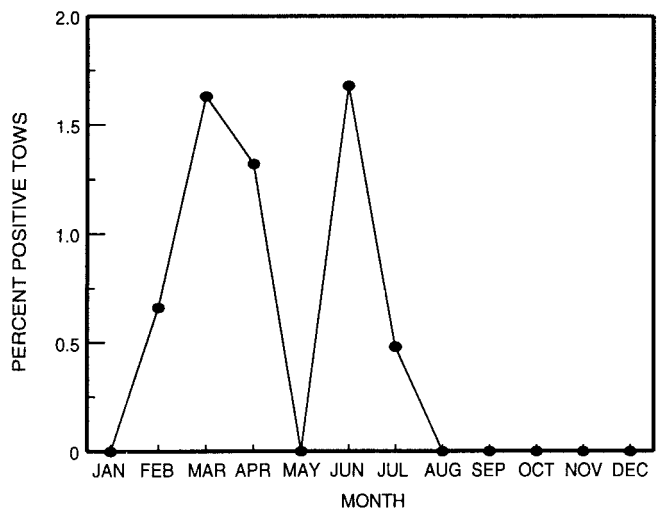
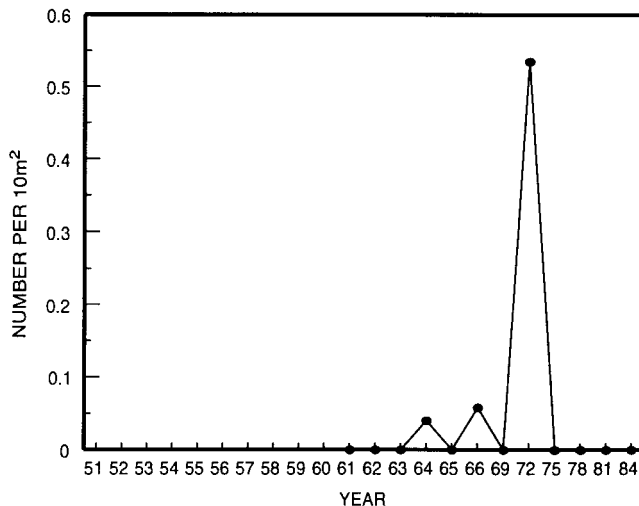
Gadidae



Pacific tomcod

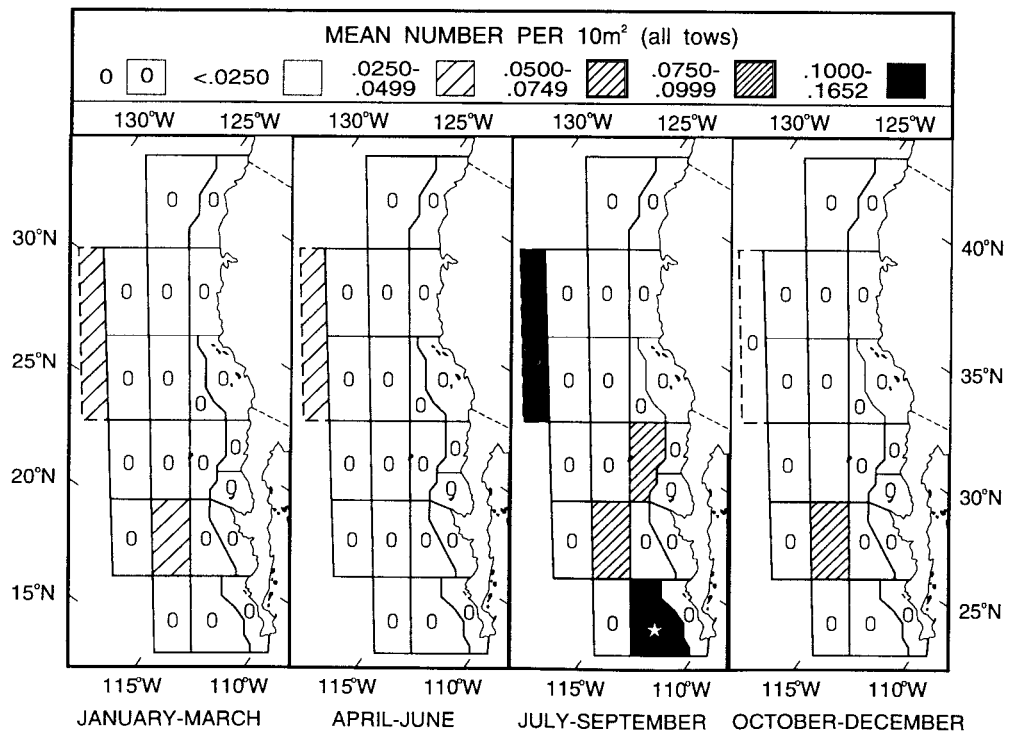
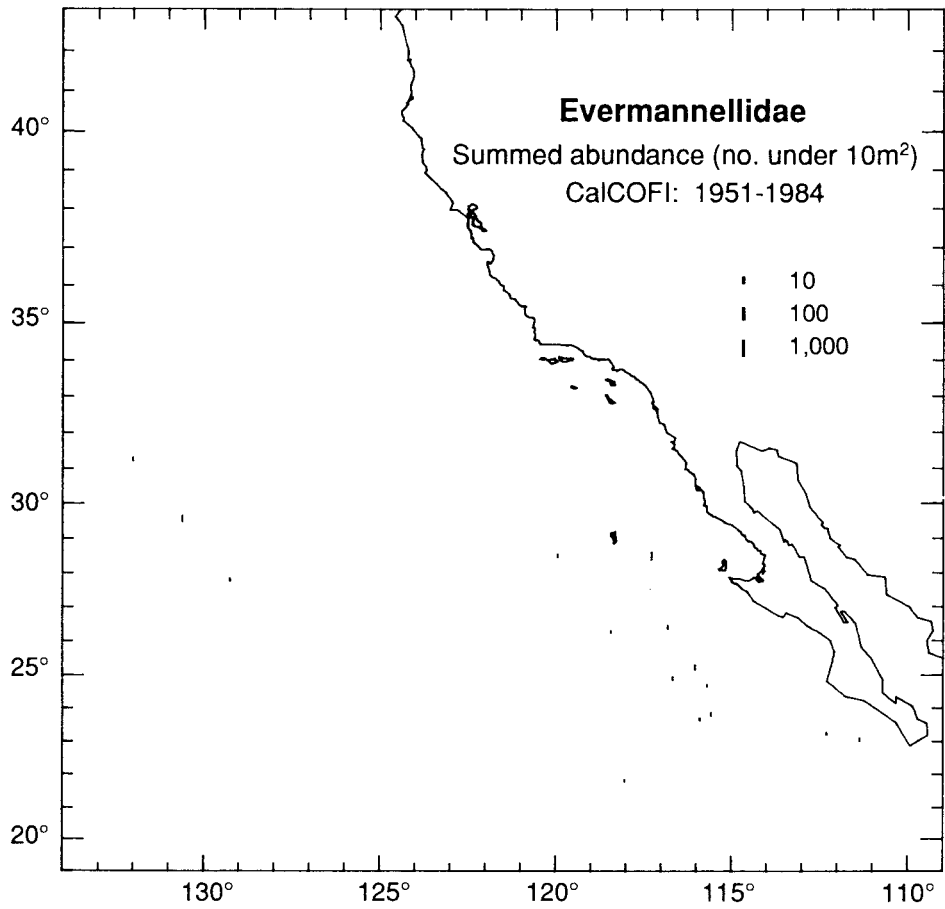


Microgadus proximus

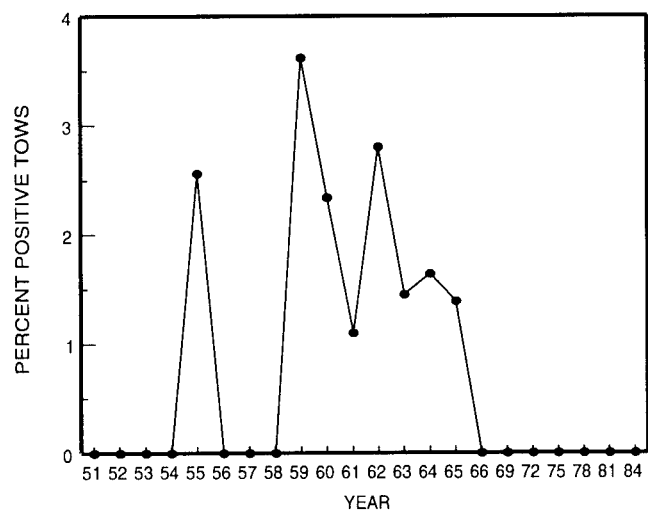


Evermannellidae

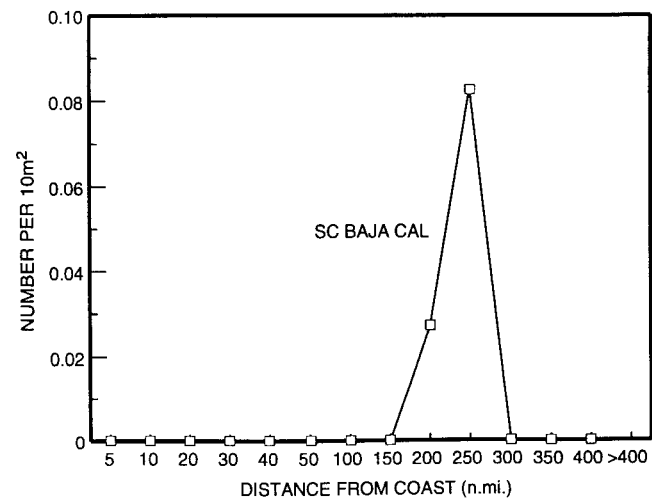
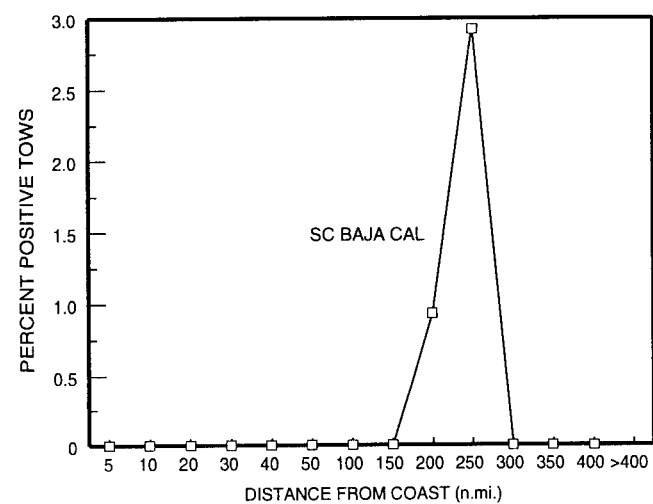
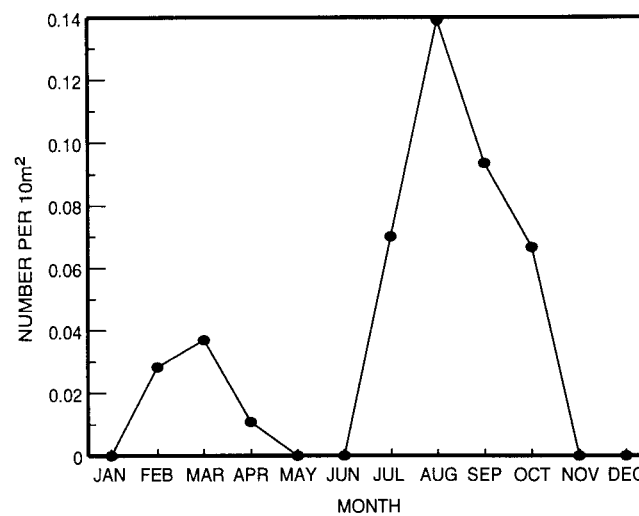
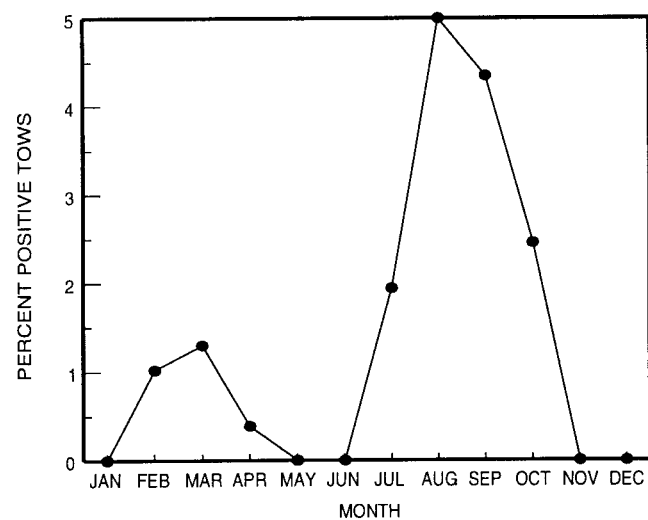
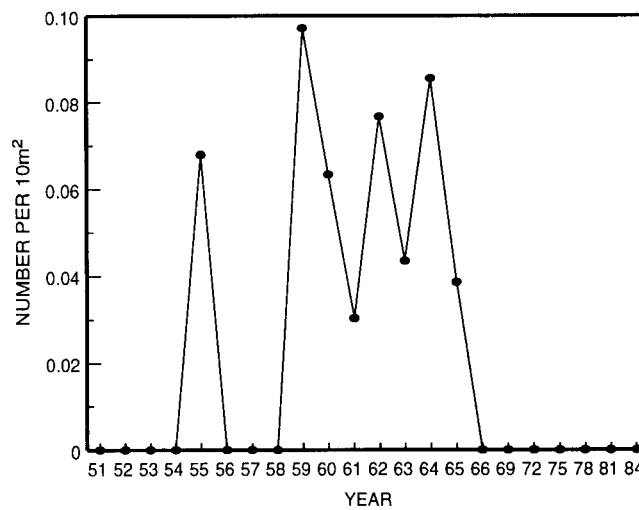
Evermannellidae



Sabertooth fishes

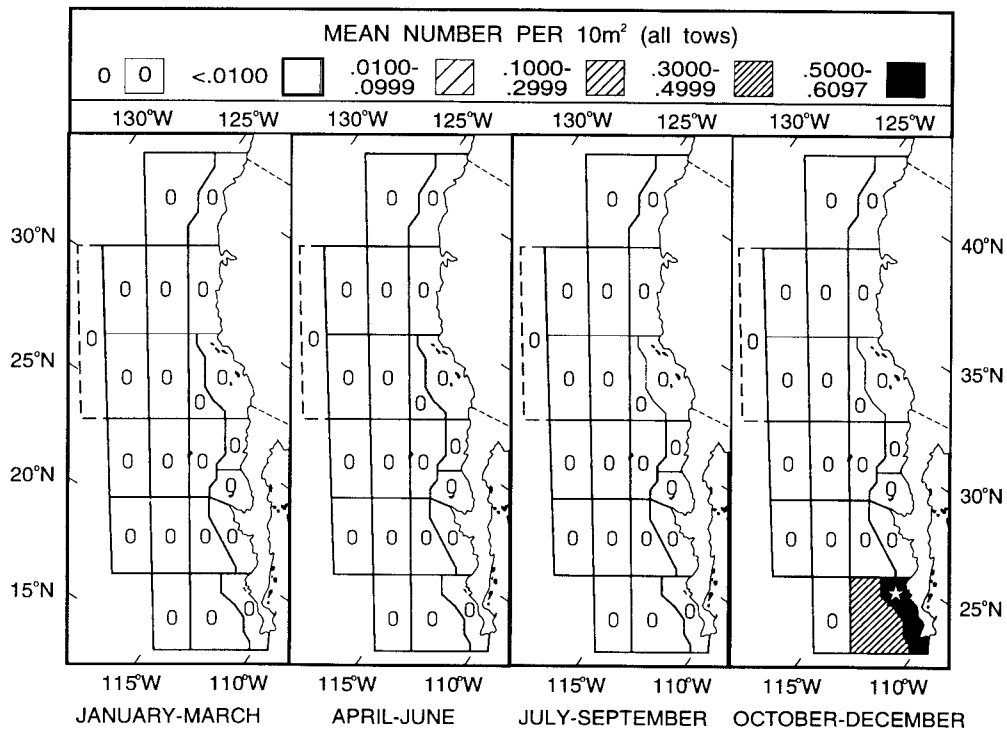
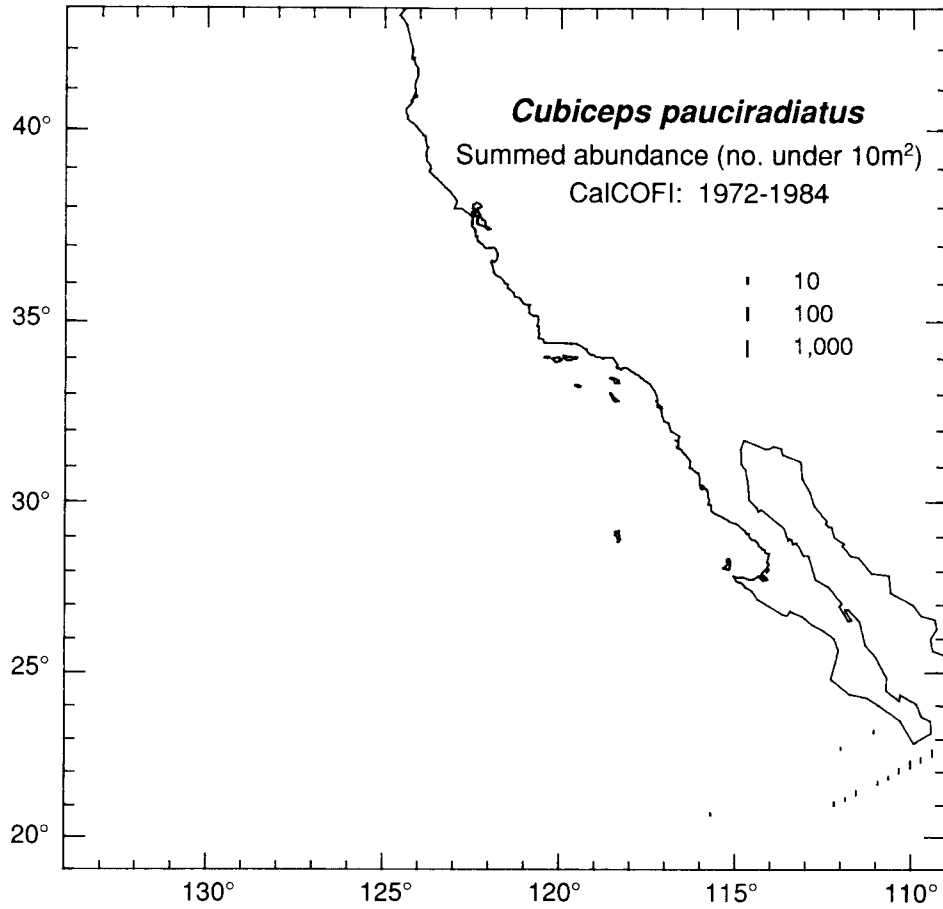


Evermannellidae

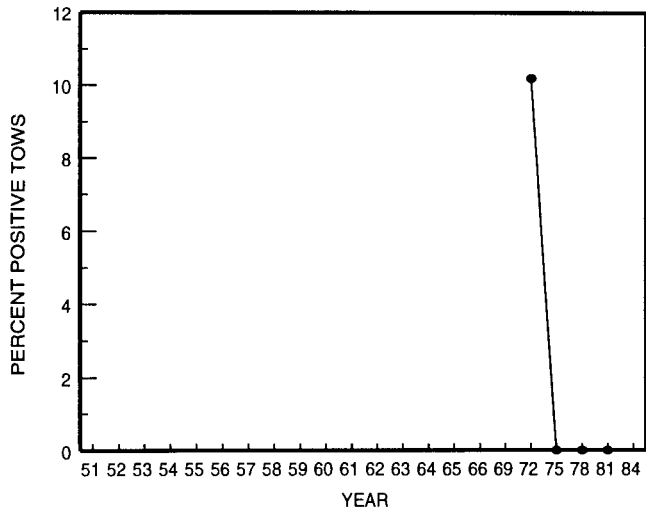


Cubiceps pauciradiatus

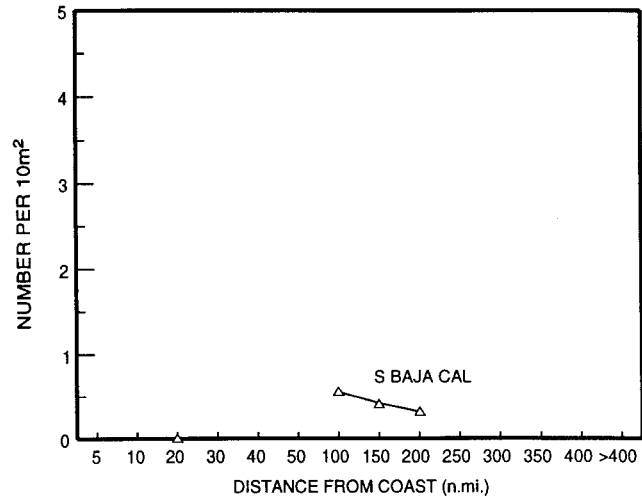
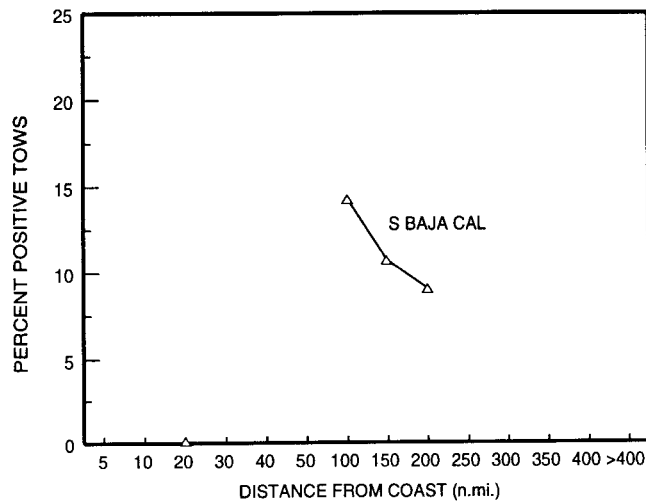
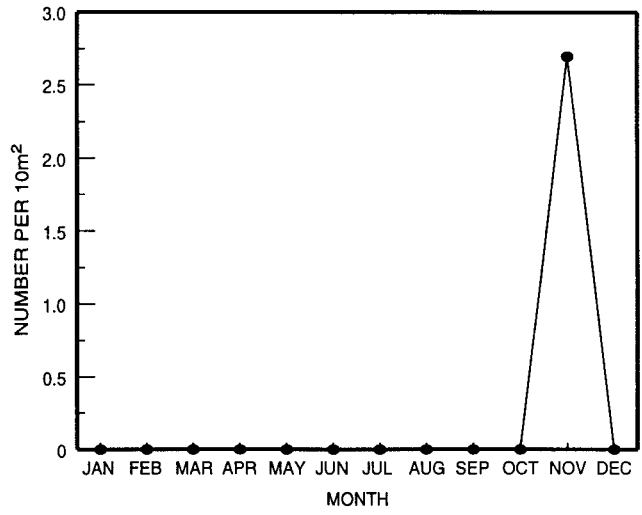
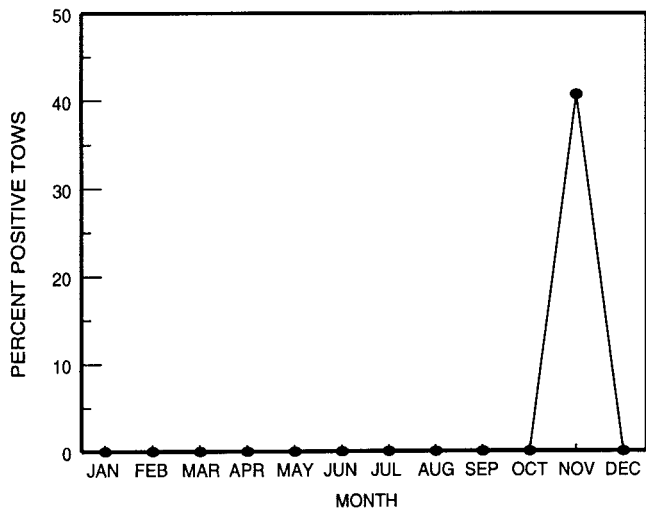
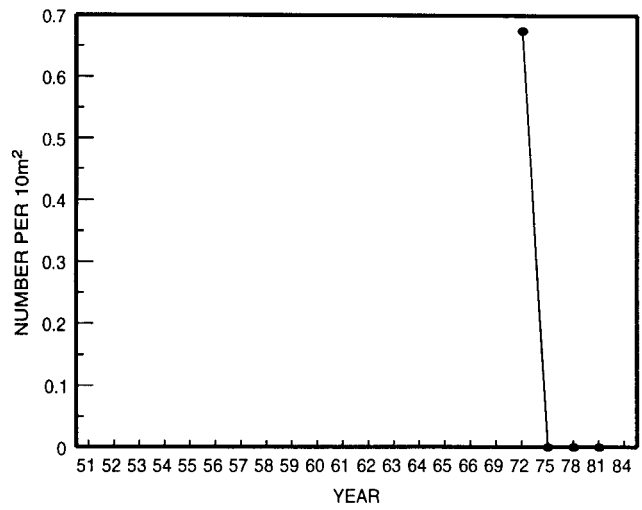
Nomeidae



Bigeye cigarfish

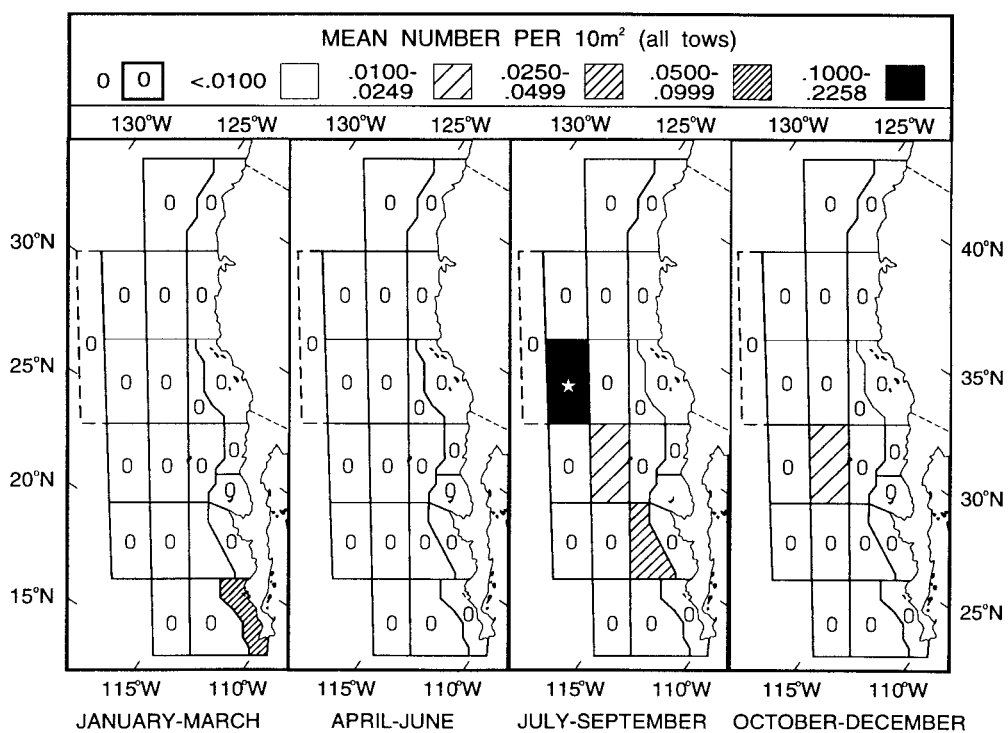
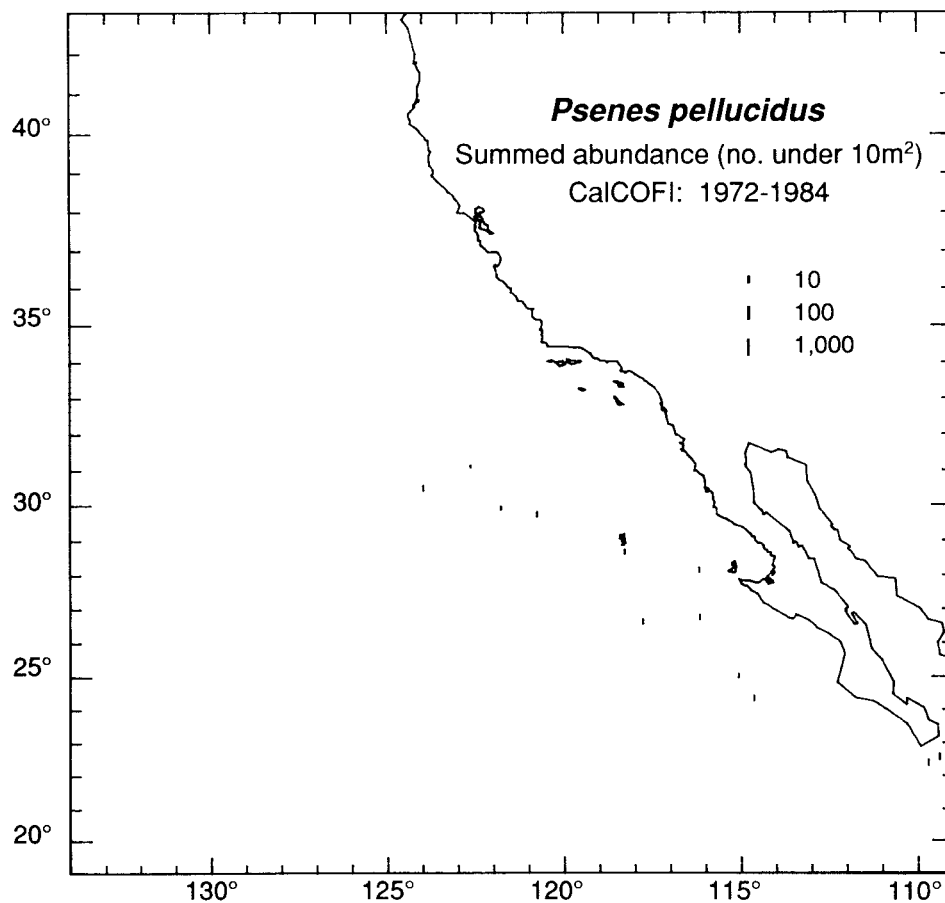


Cubiceps pauciradiatus

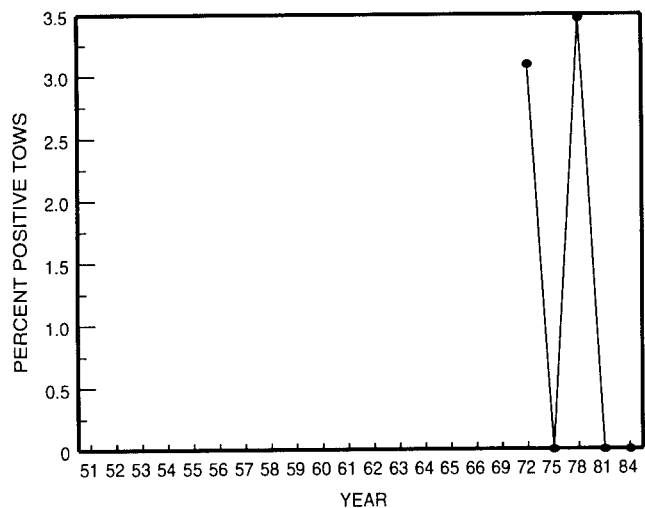


Psenes pellucidus

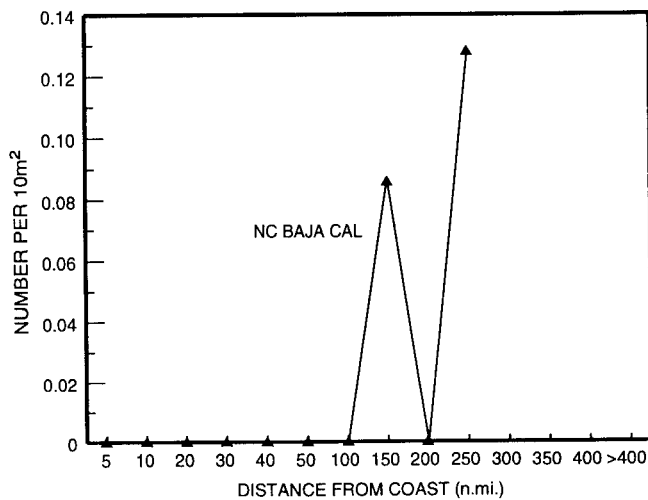
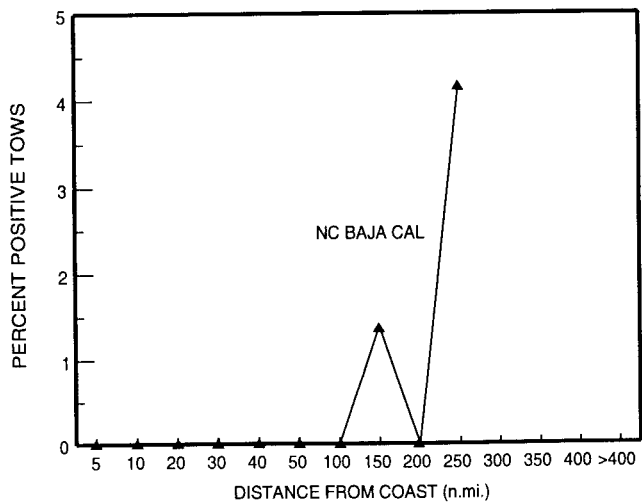
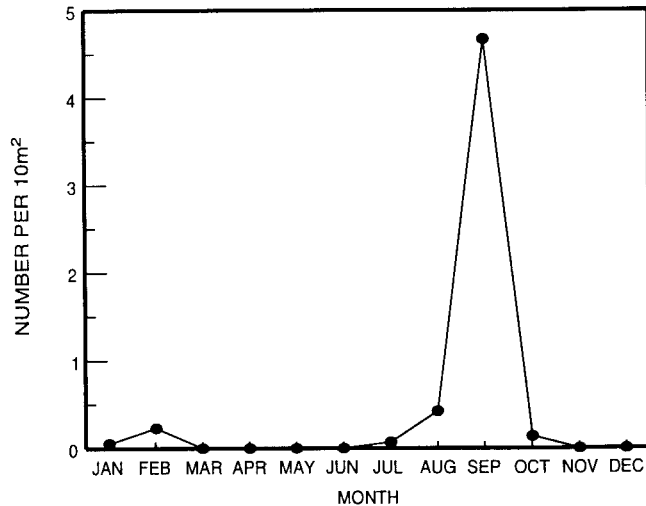
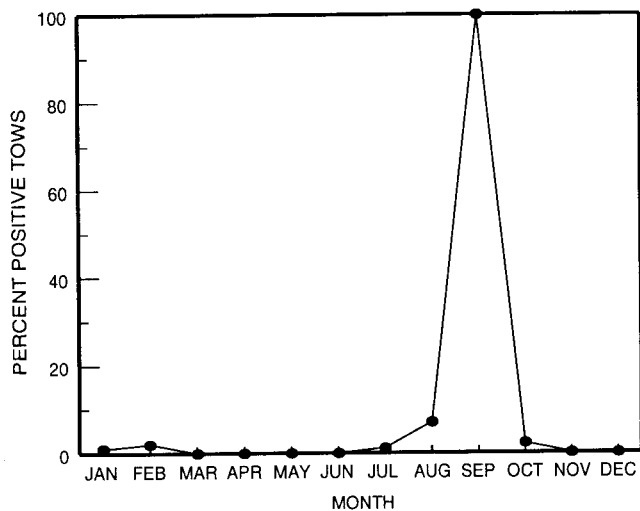
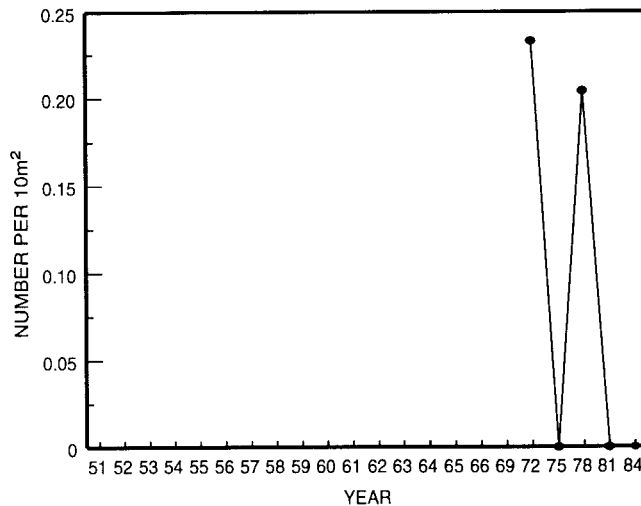
Nomeidae



Bluefin drifftish

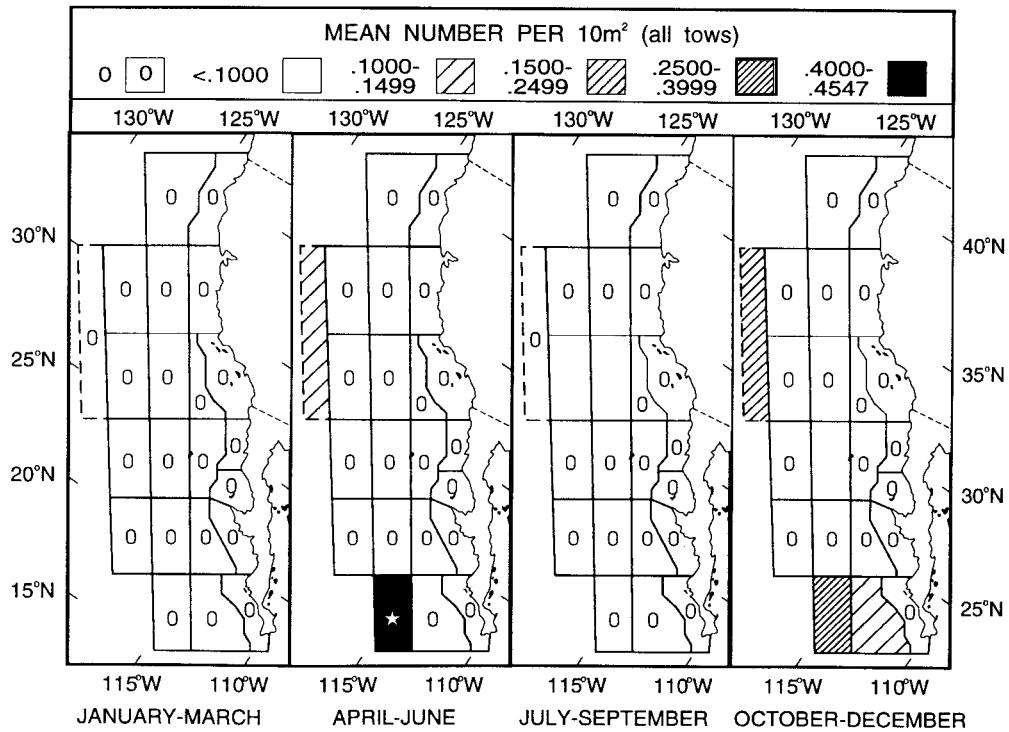
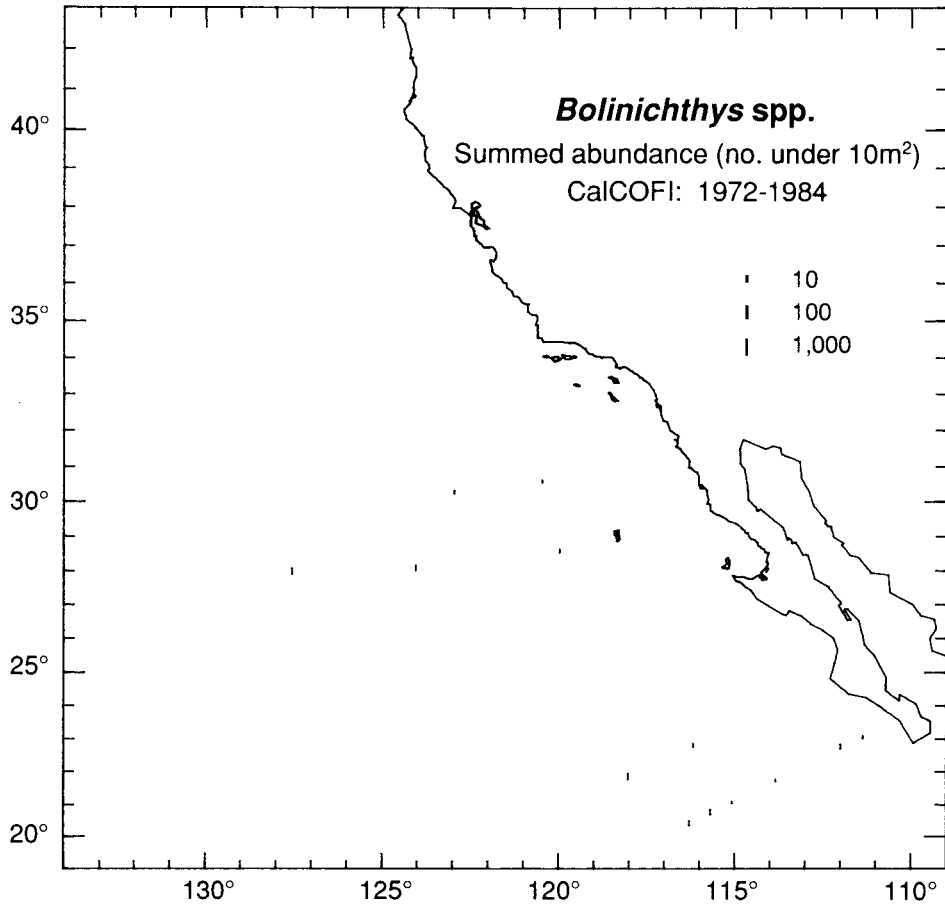


Psenes pellucidus



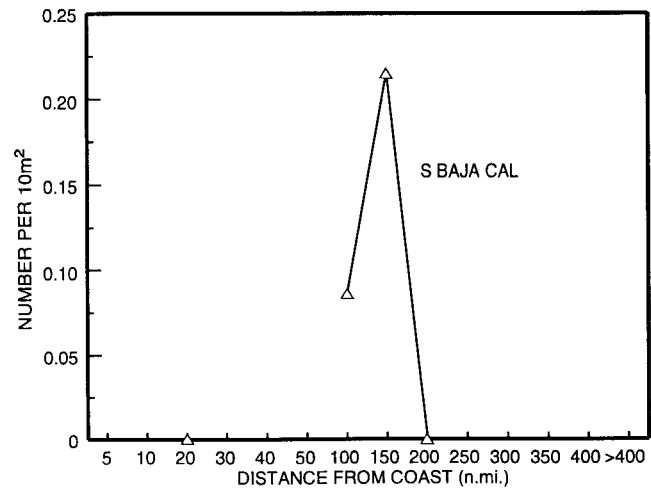
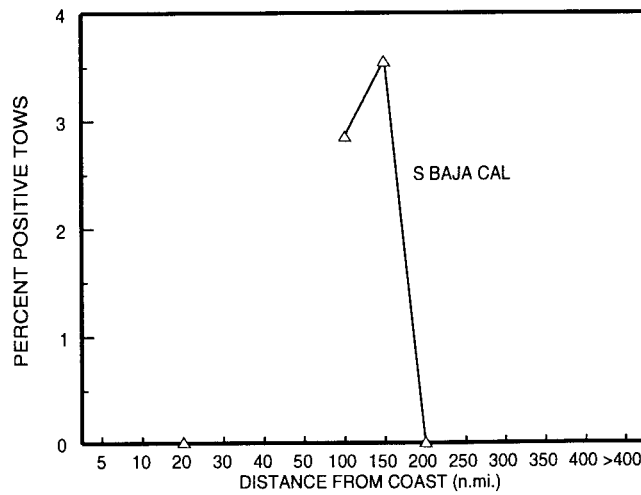
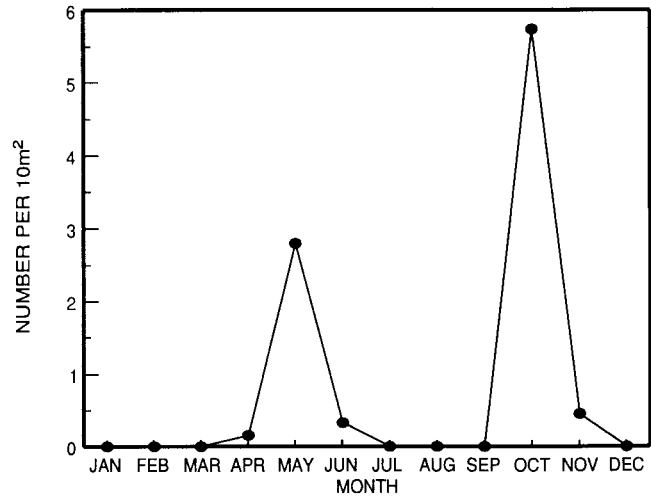
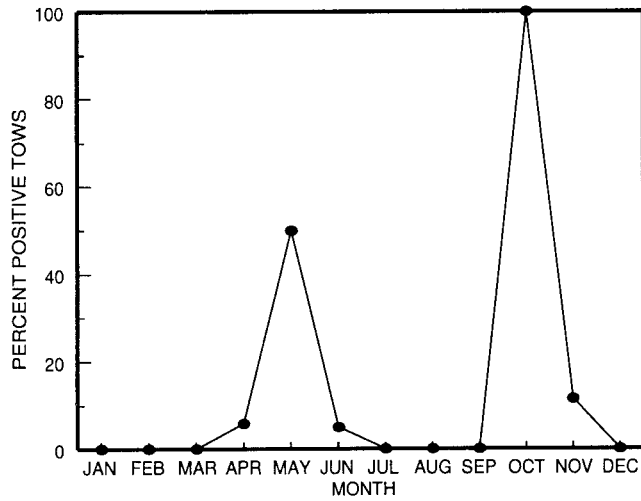
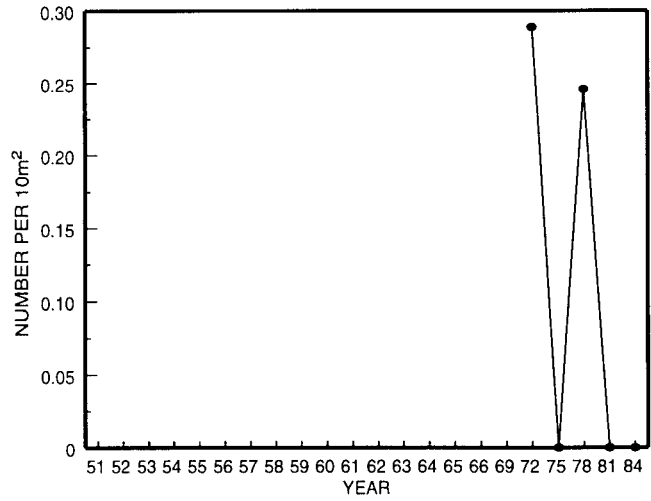
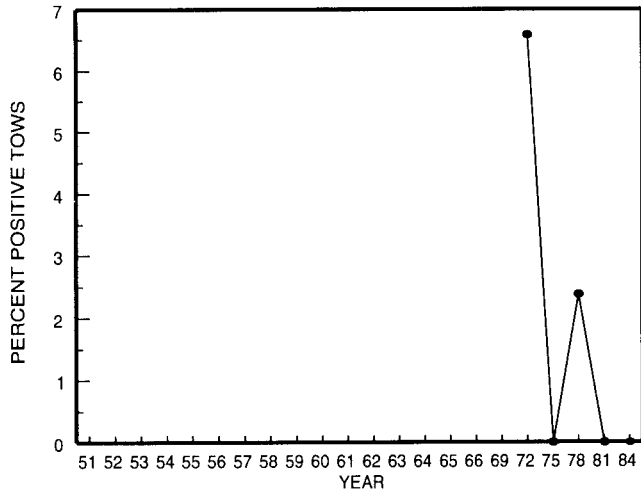
Bolinichthys spp.

Myctophidae



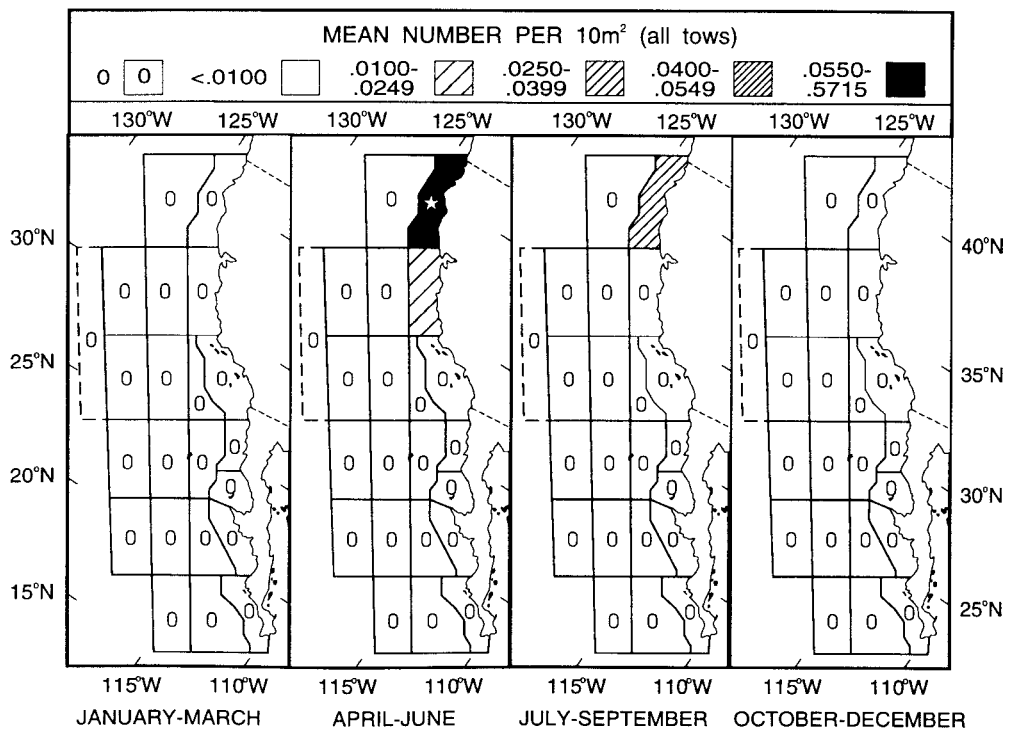
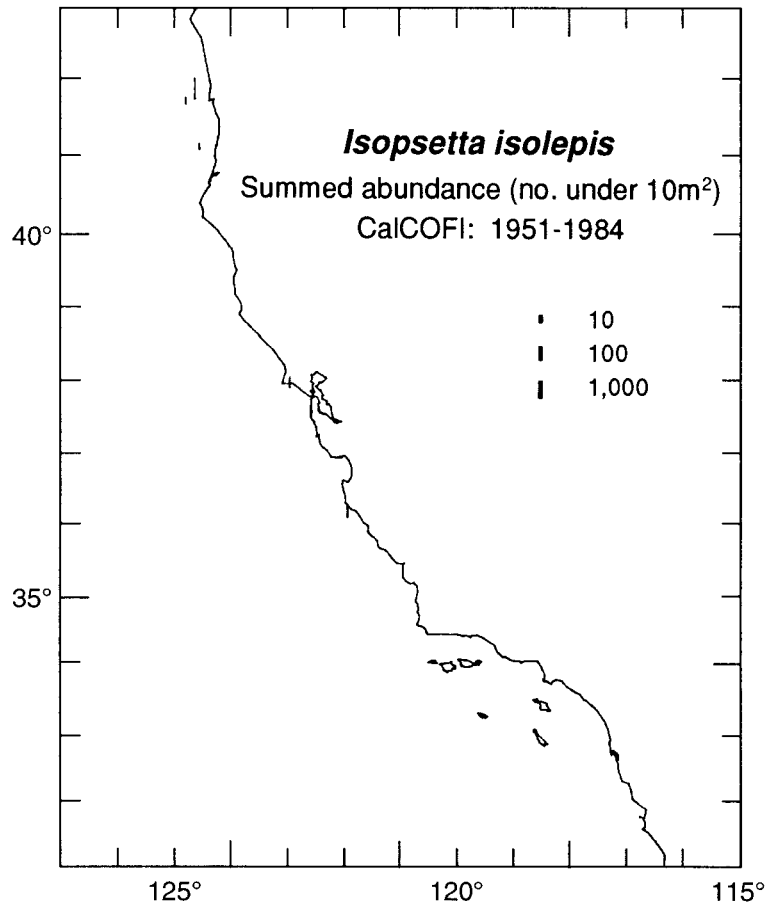
Popeye lampfishes

Bolinichthys spp.

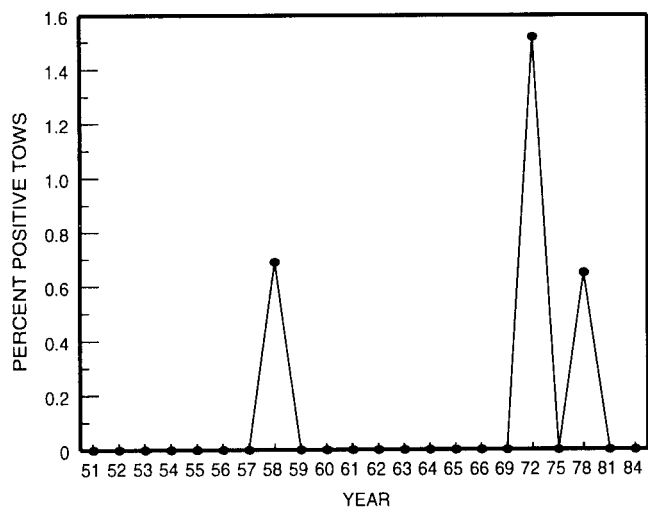


Isopsetta isolepis

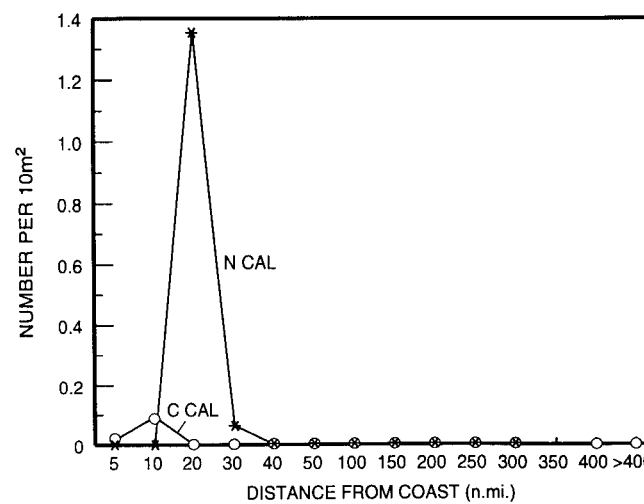
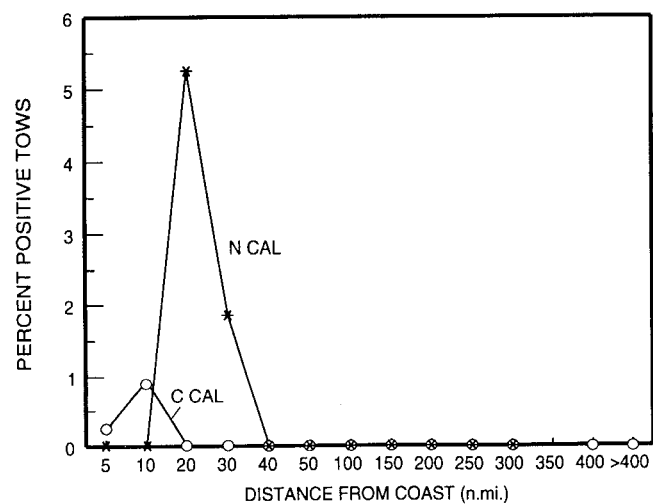
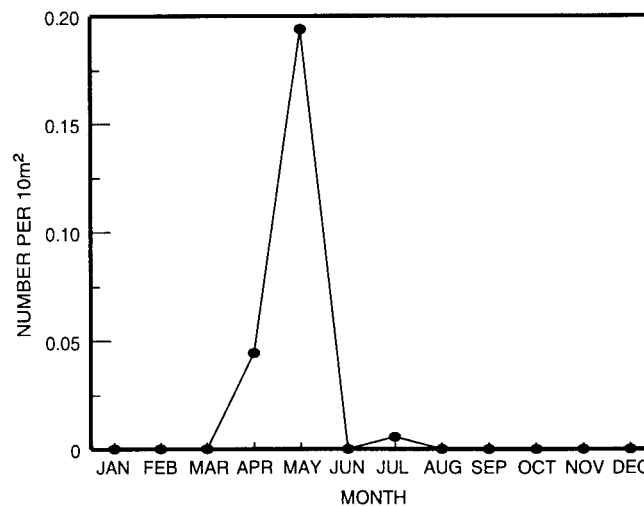
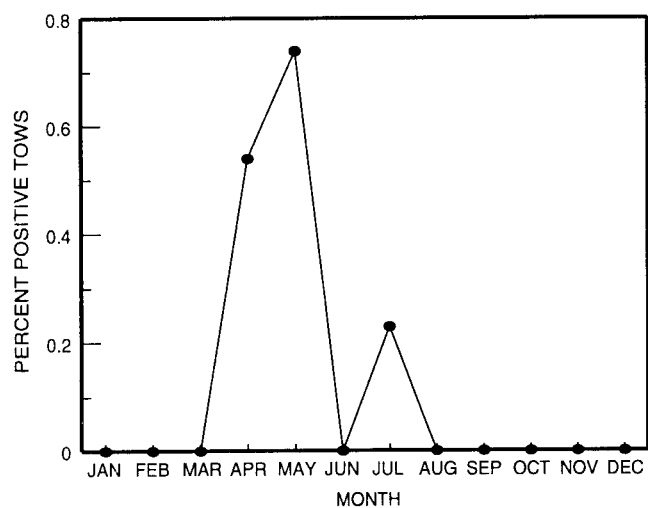
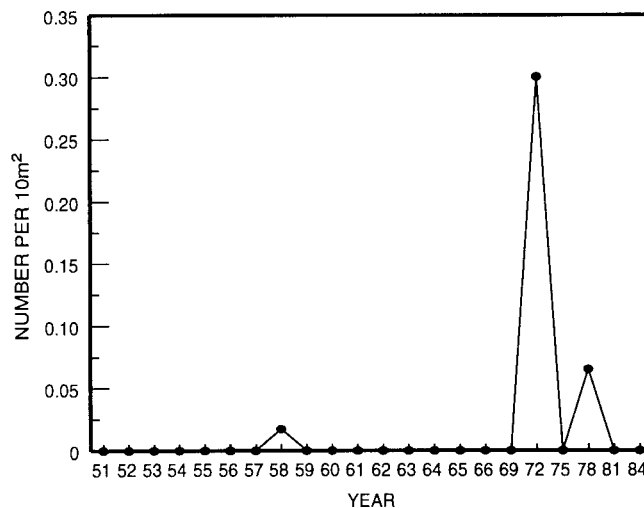
Pleuronectidae



Butter sole

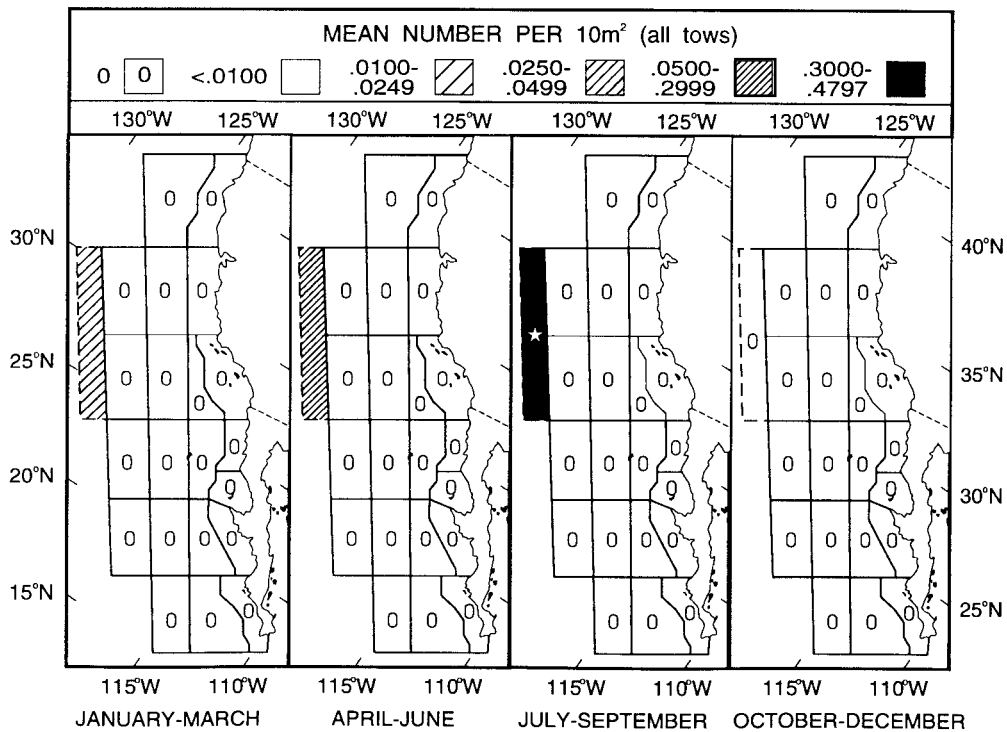
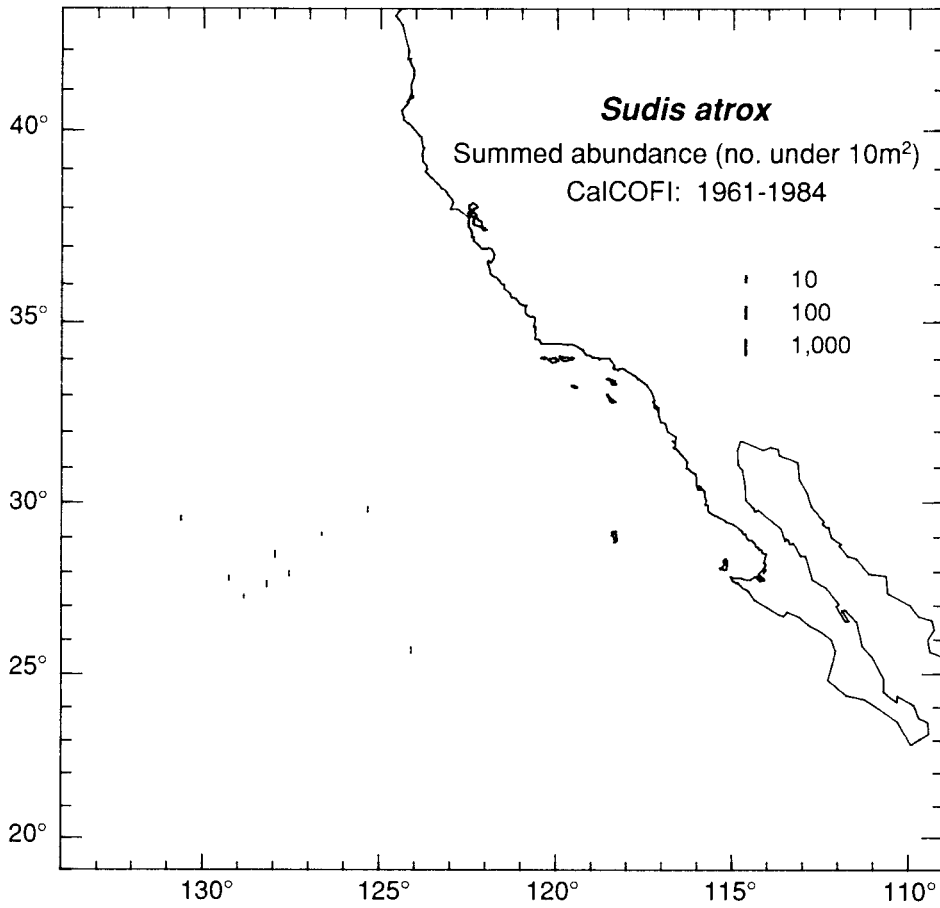


Isopsetta isolepis



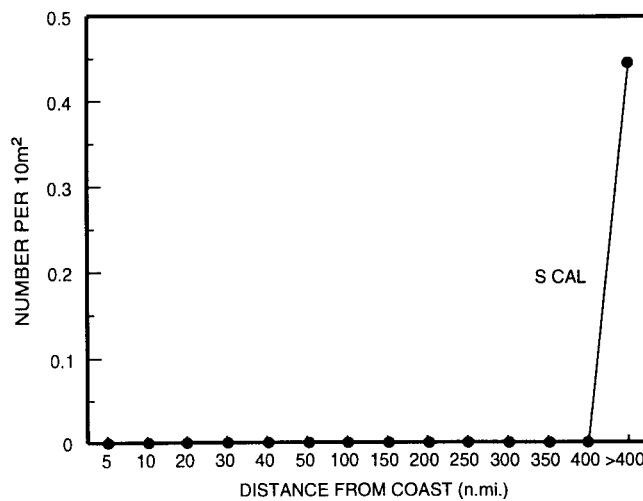
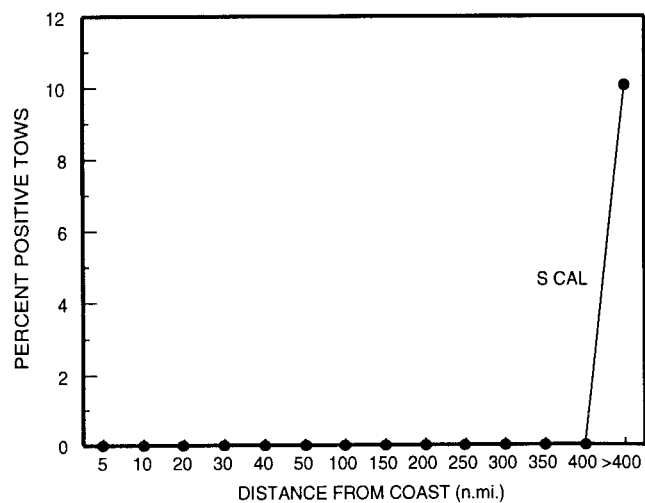
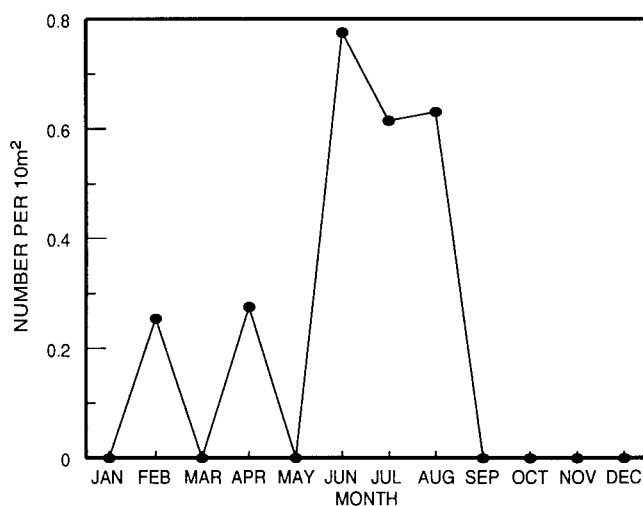
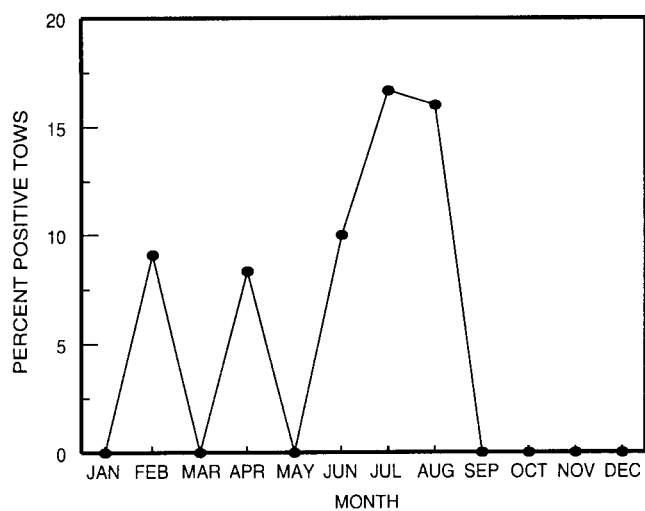
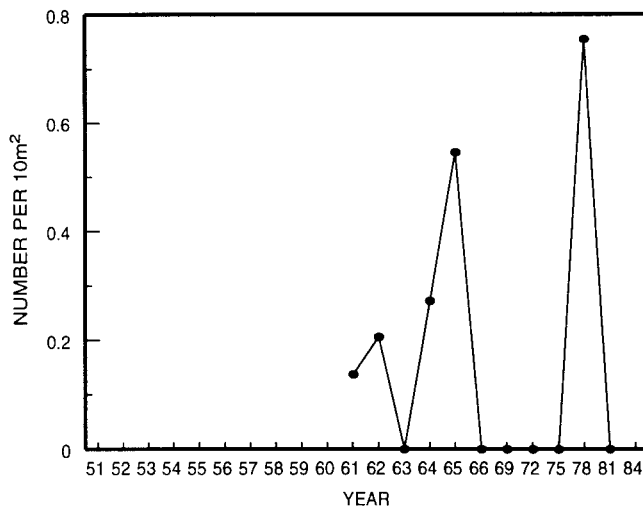
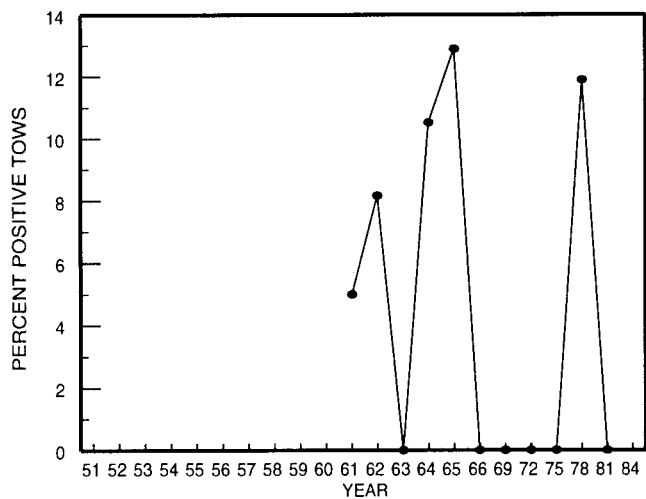
Sudis atrox

Paralepididae



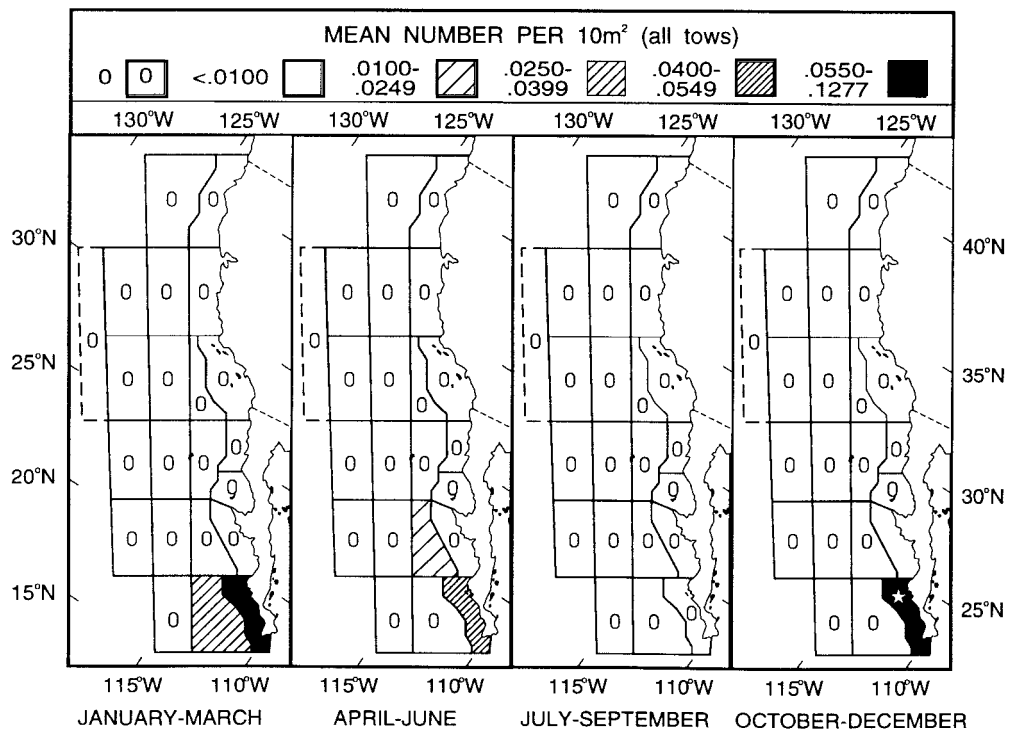
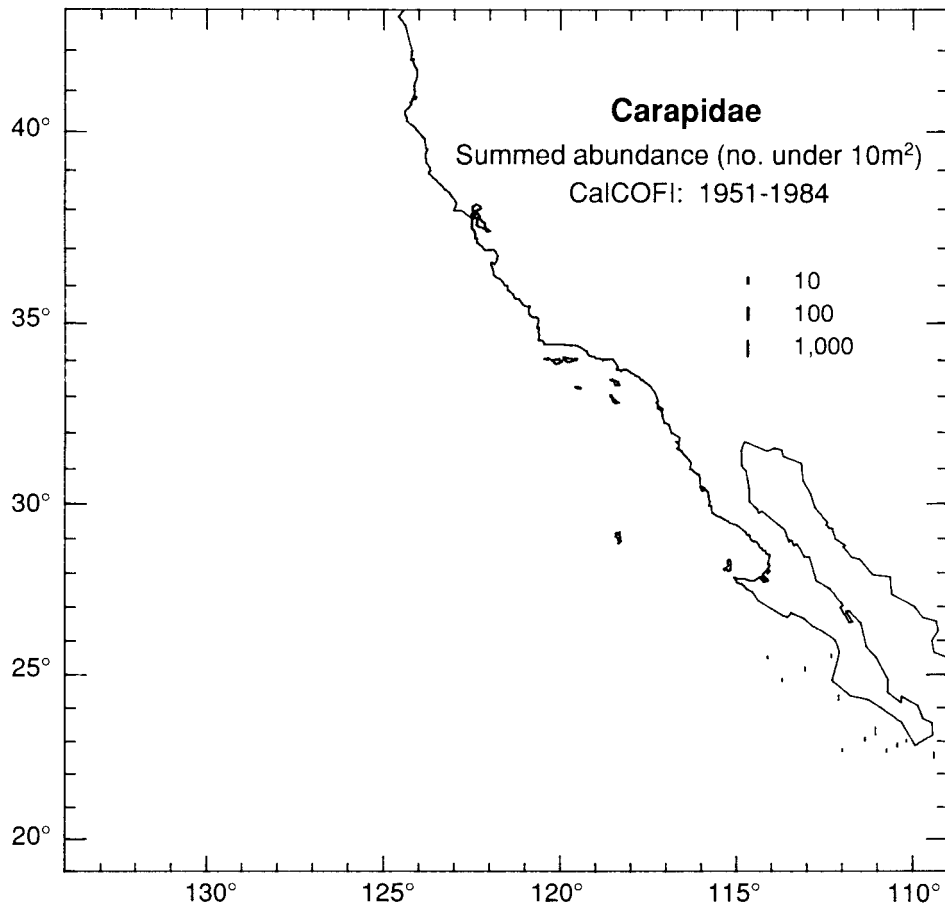
Hideous barracudina

Sudis atrox



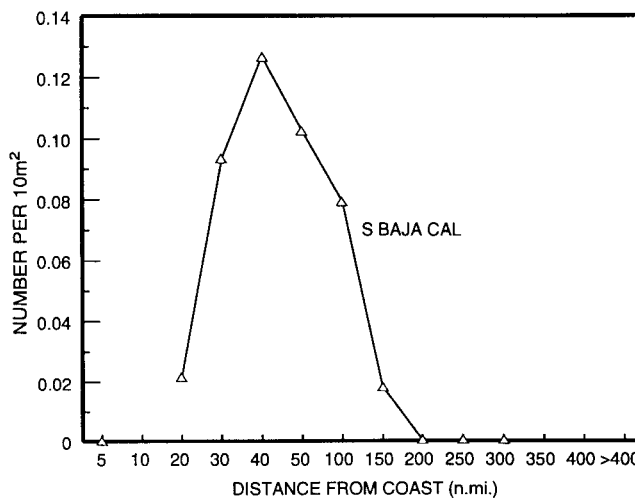
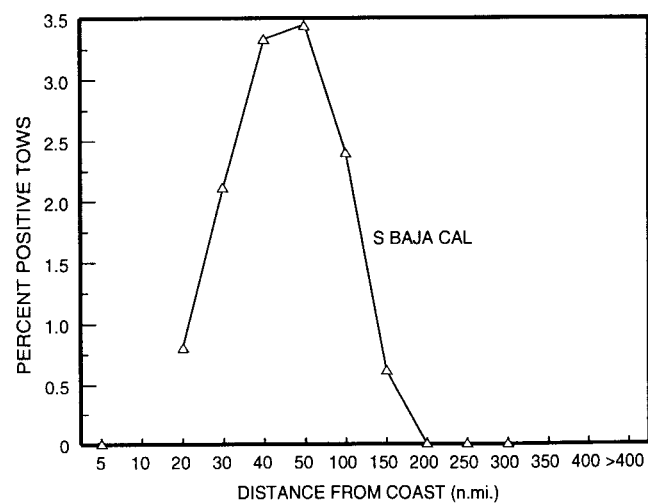
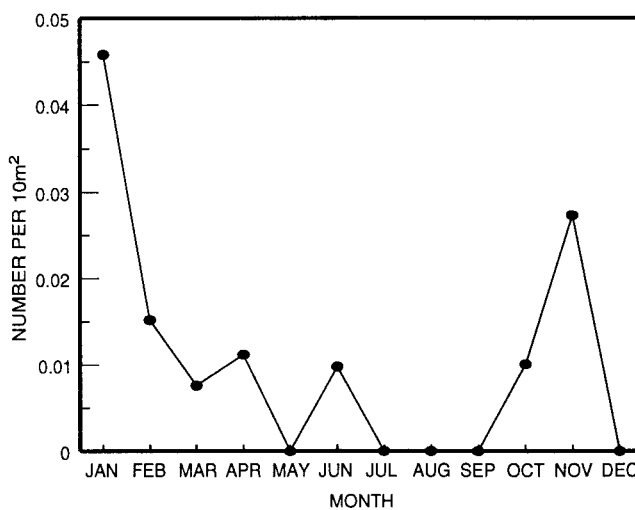
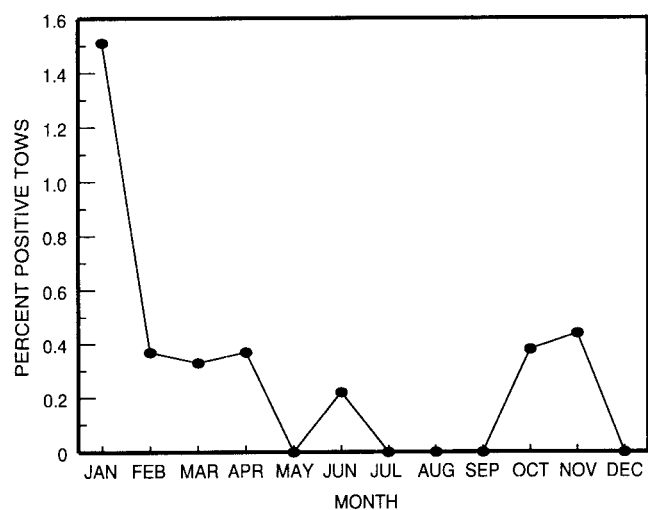
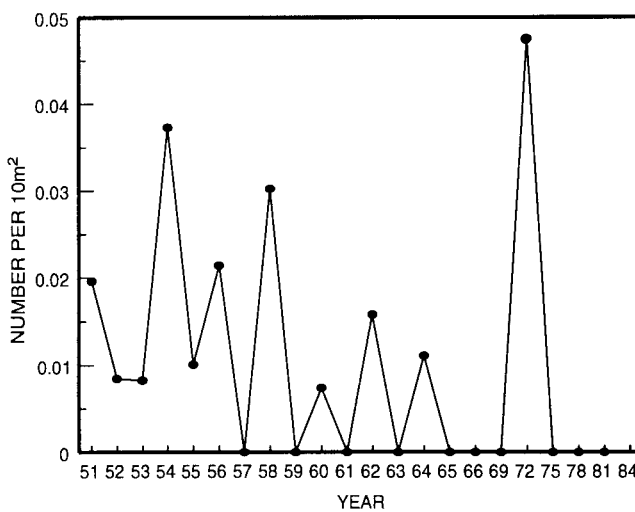
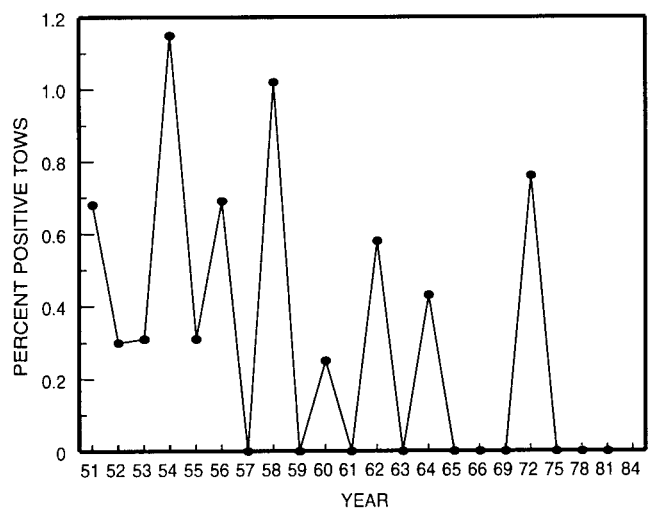
Carapidae

Carapidae



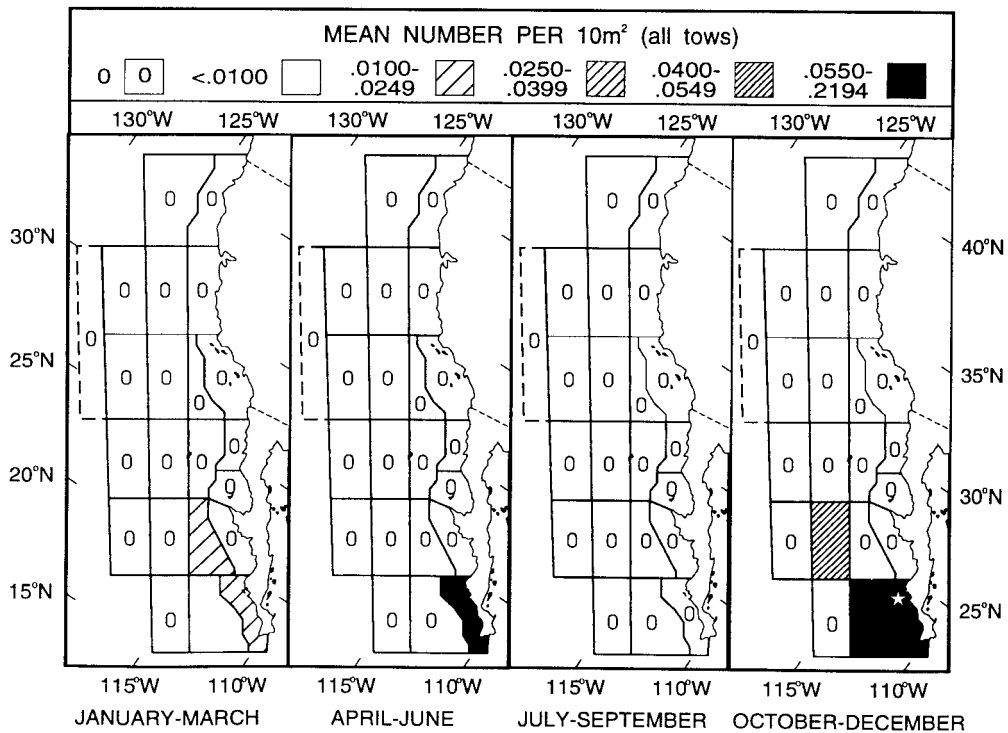
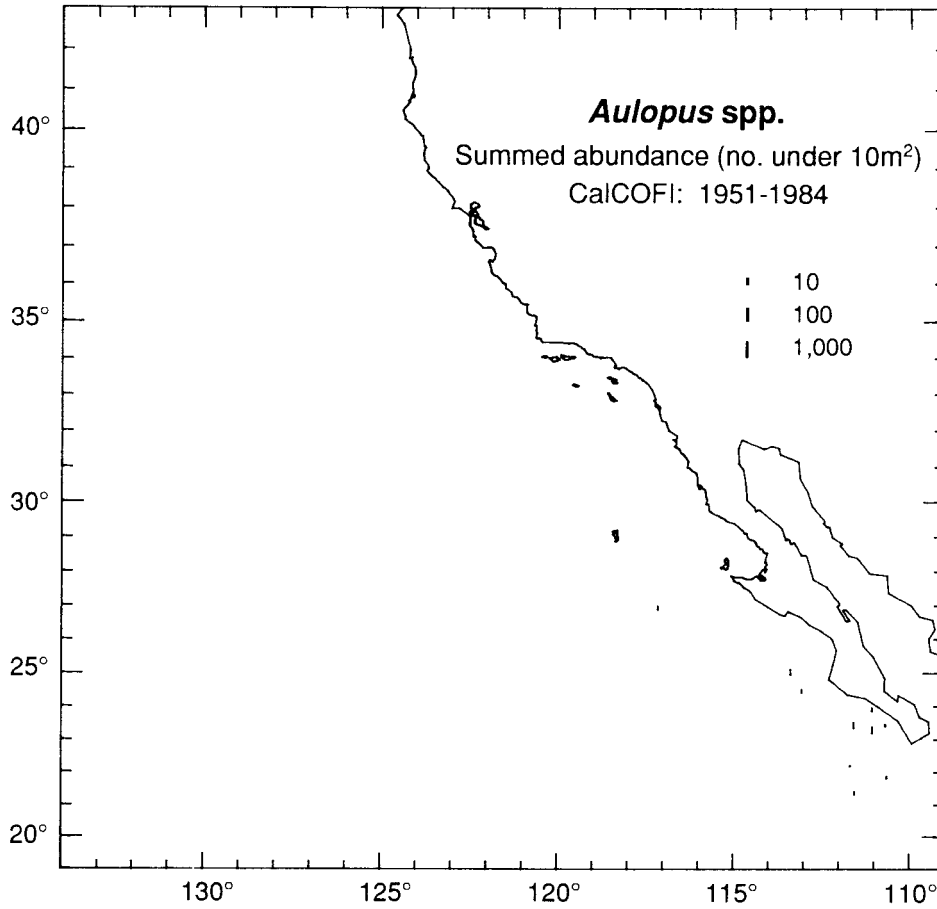
Pearlfishes

Carapidae

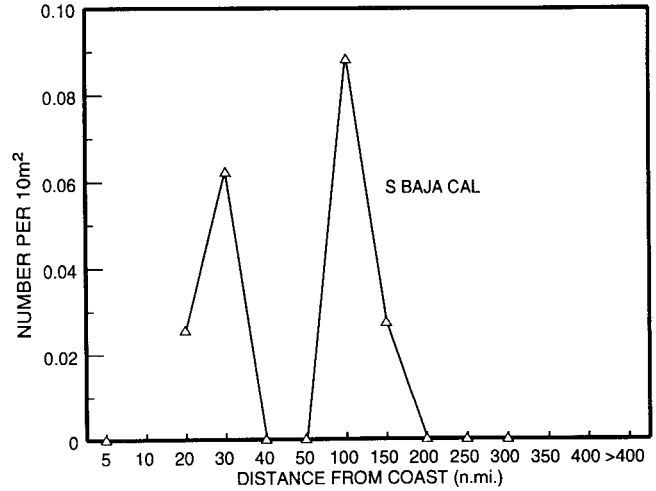
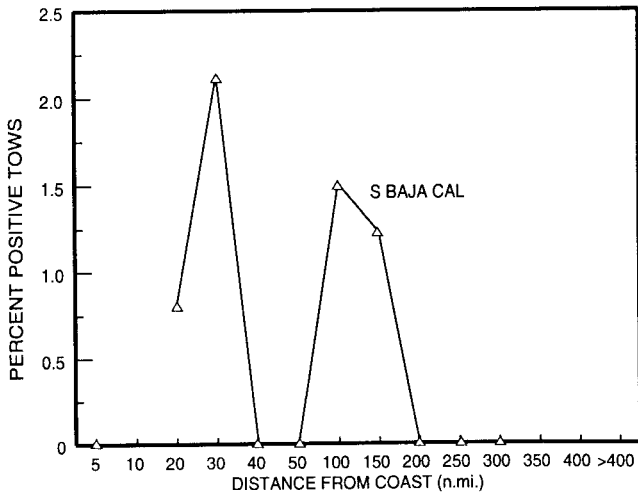
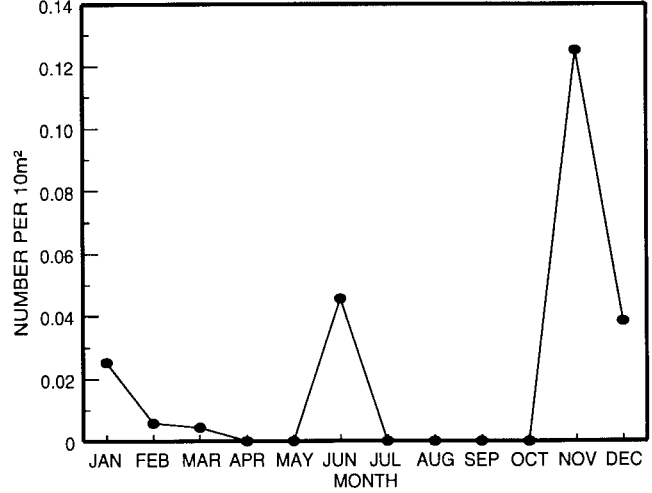
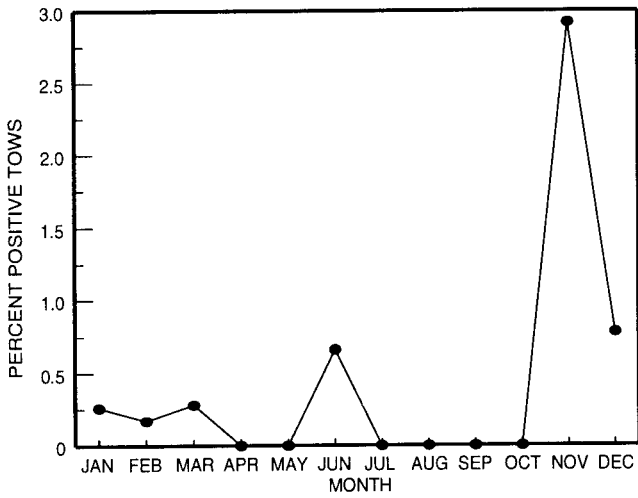
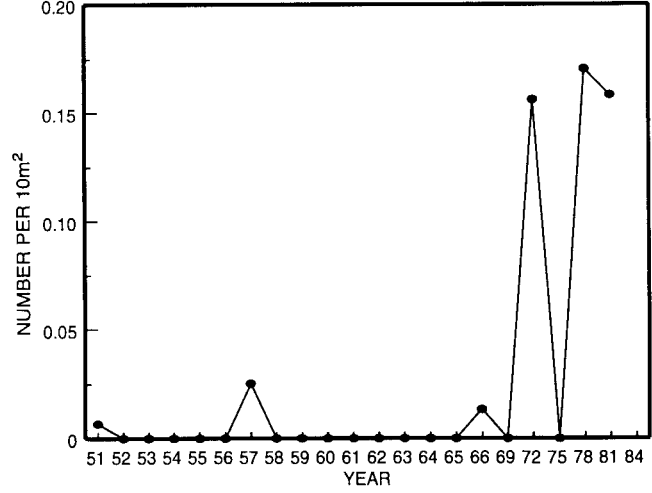
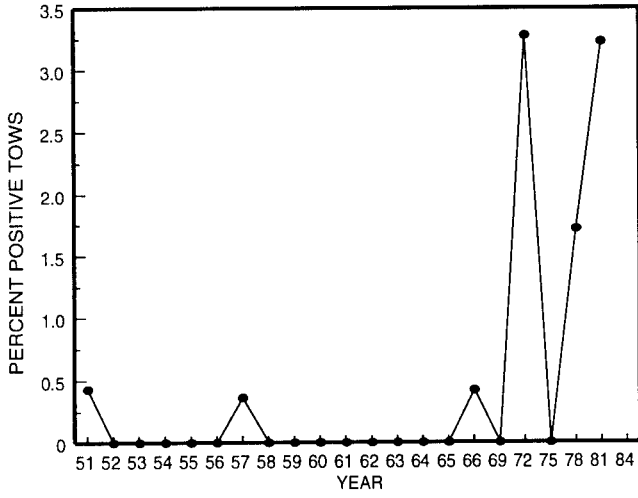


Aulopus spp.

Aulopidae

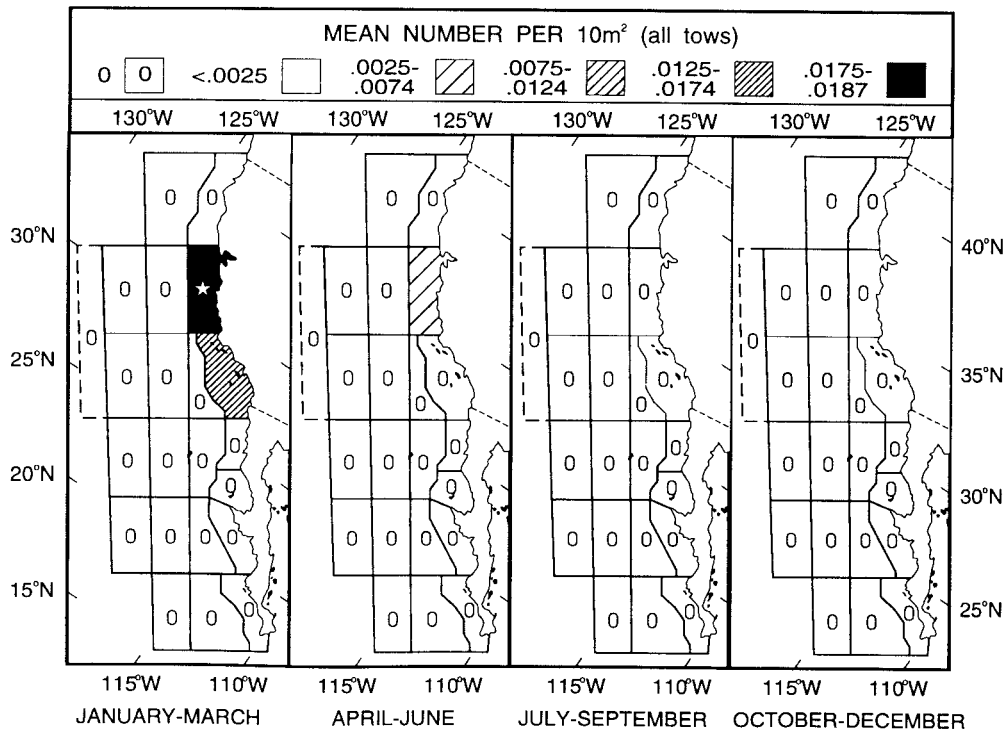
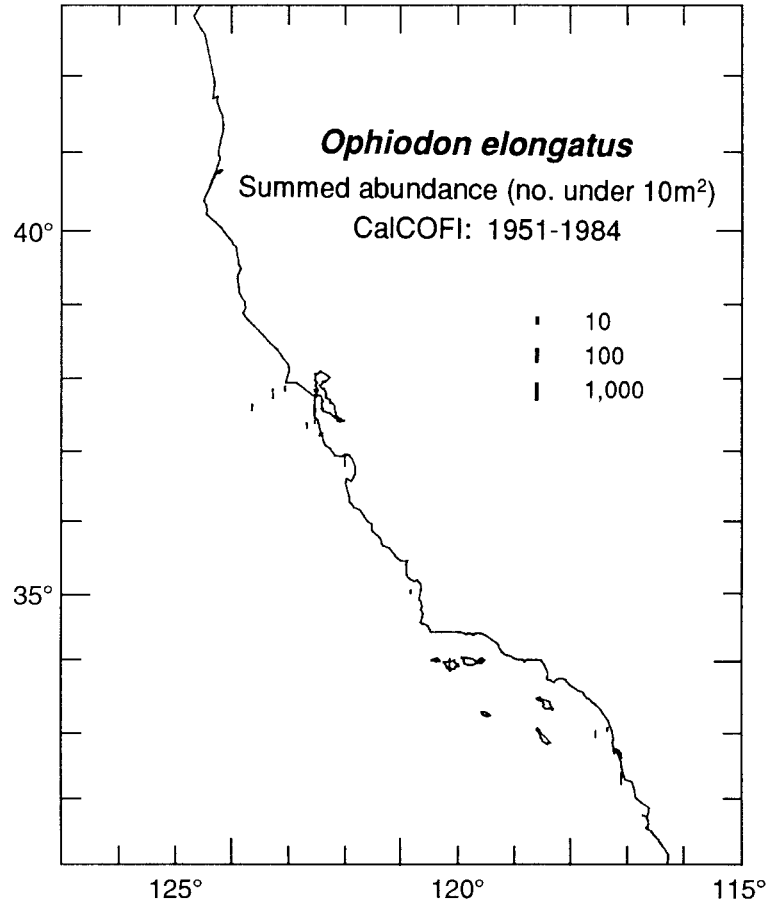


Aulopus spp.

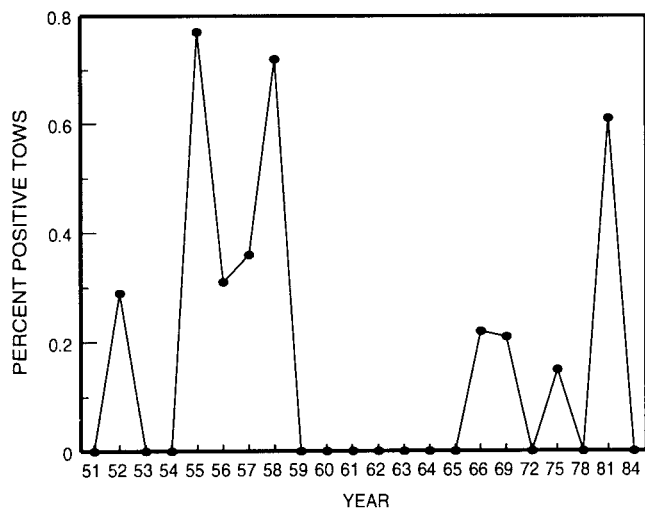
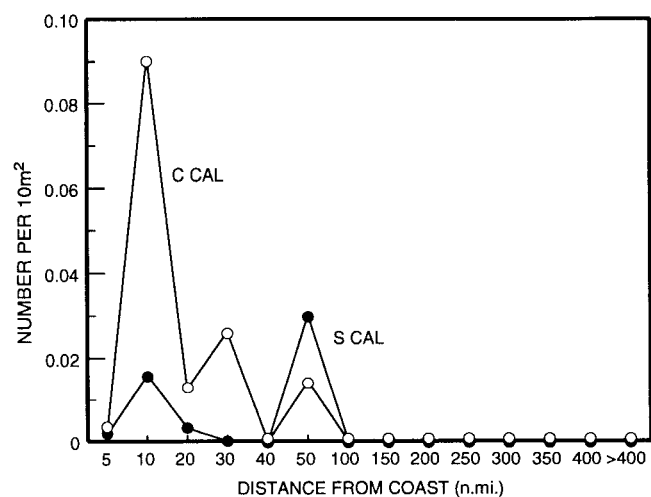
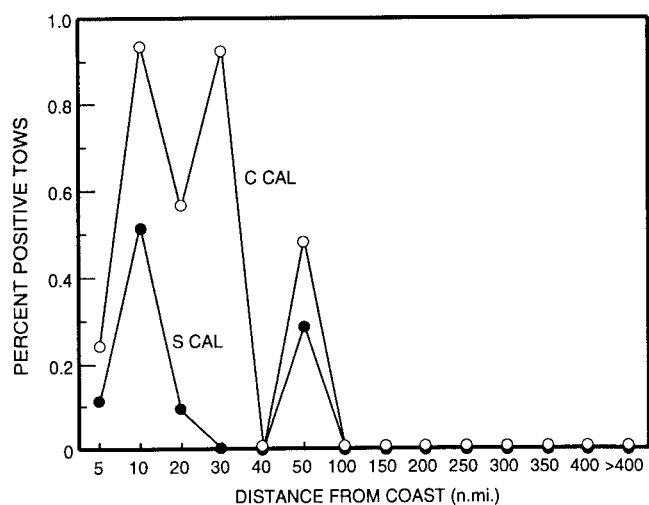
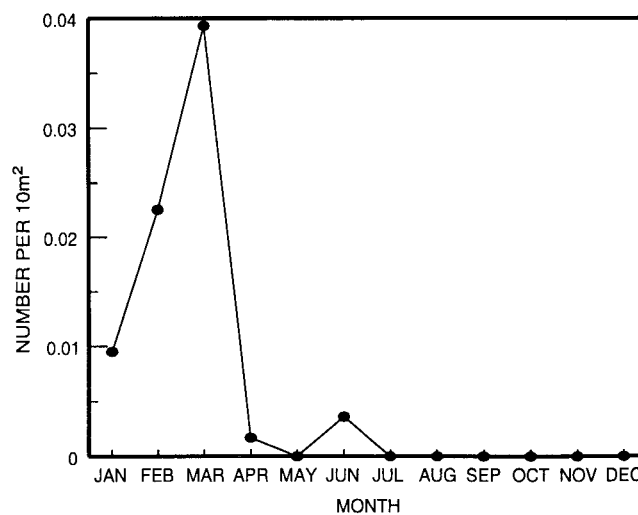
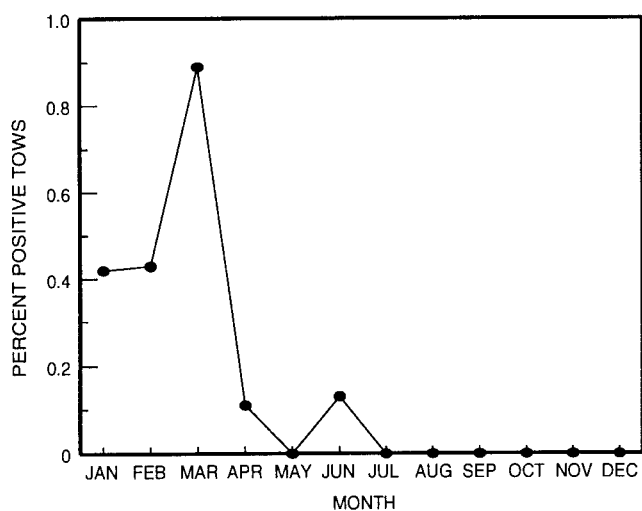
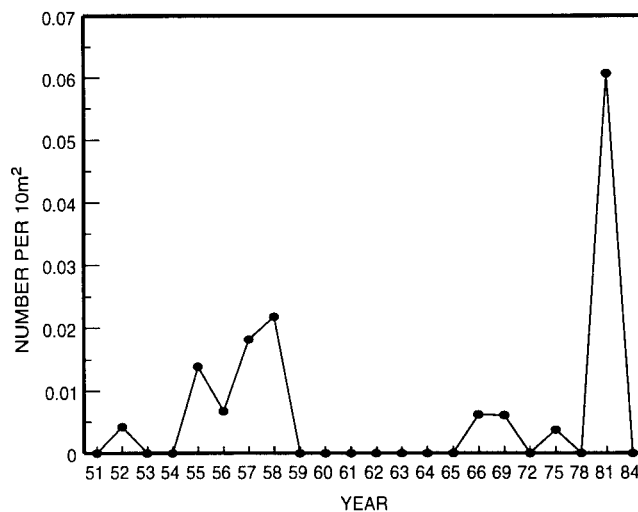


Ophiodon elongatus

Hexagrammidae

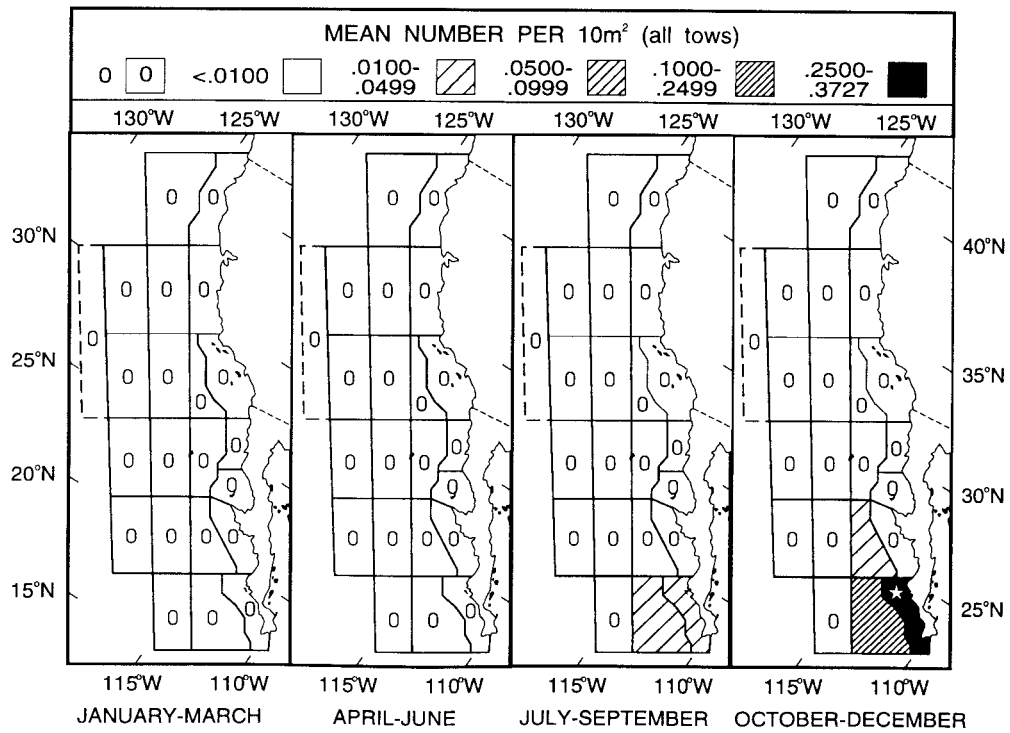
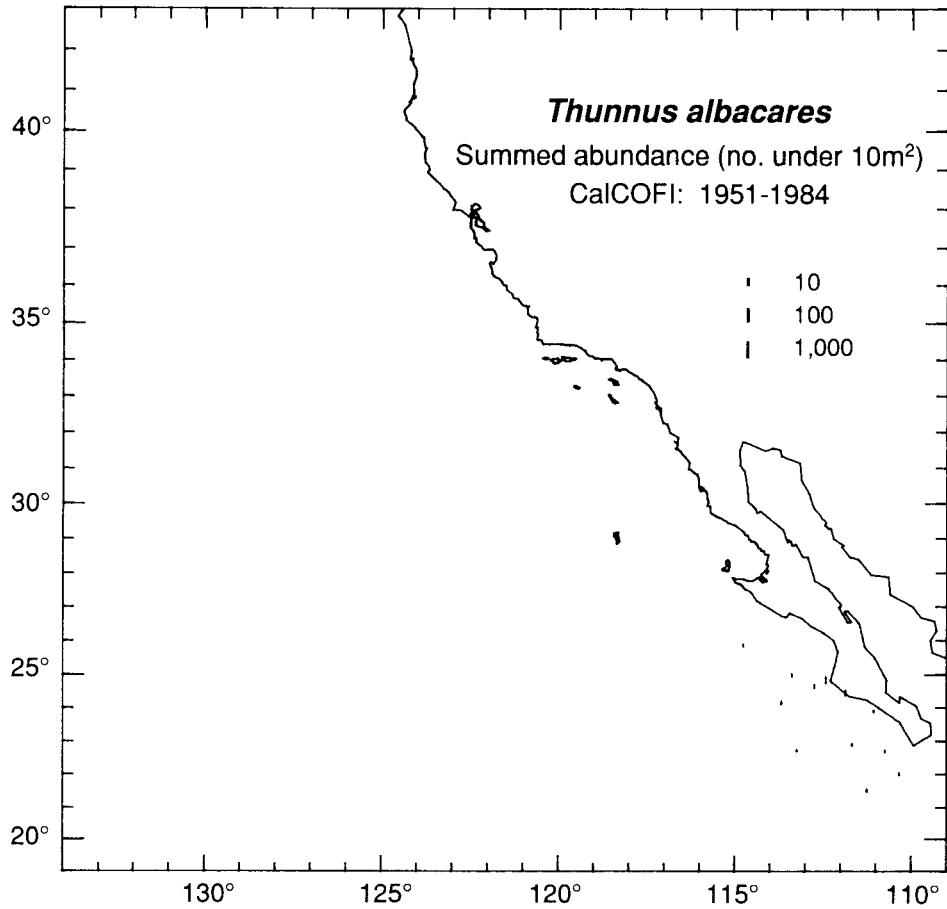


Lingcod

*Ophiodon elongatus*

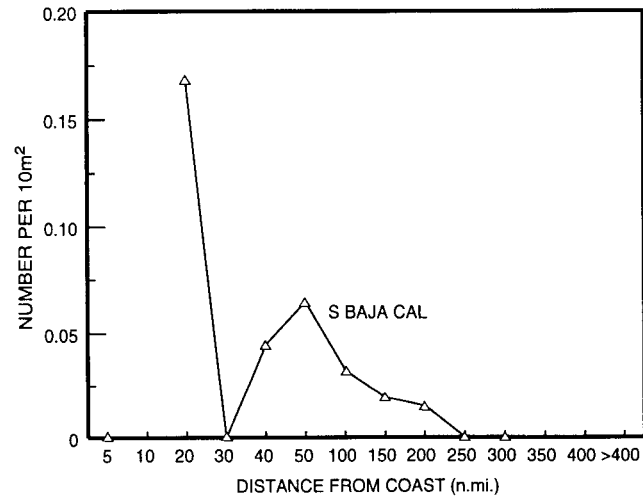
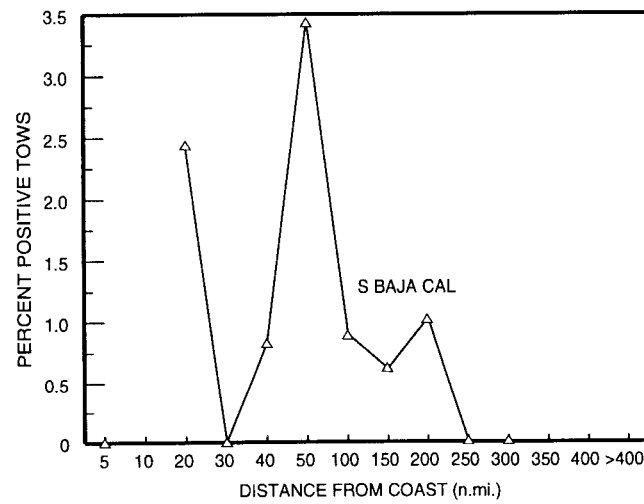
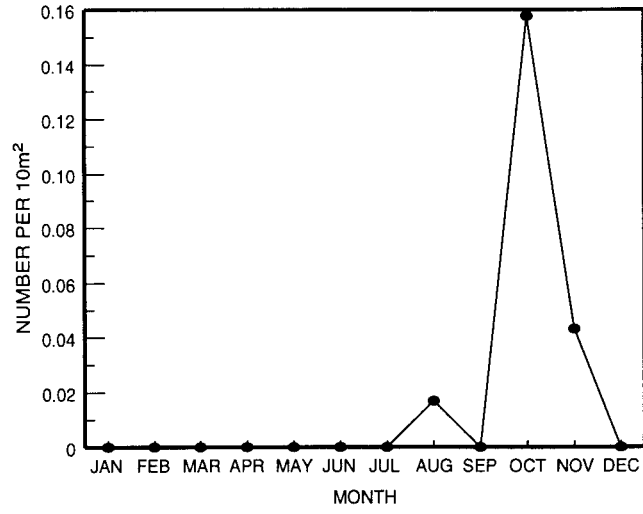
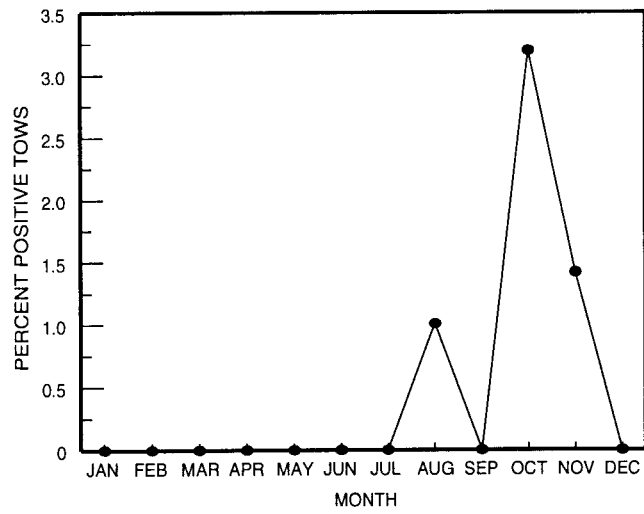
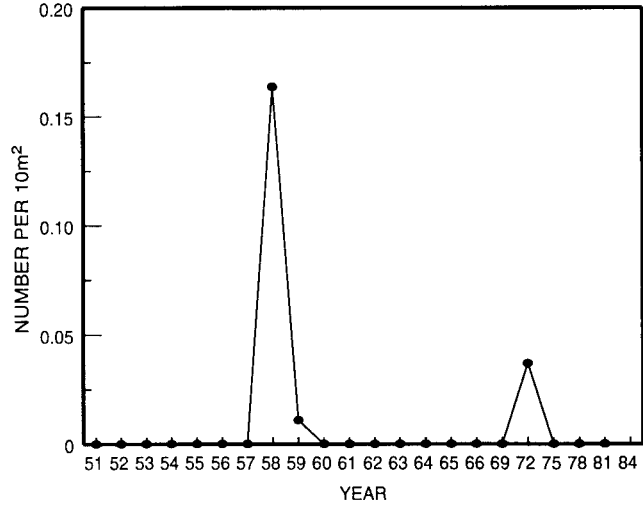
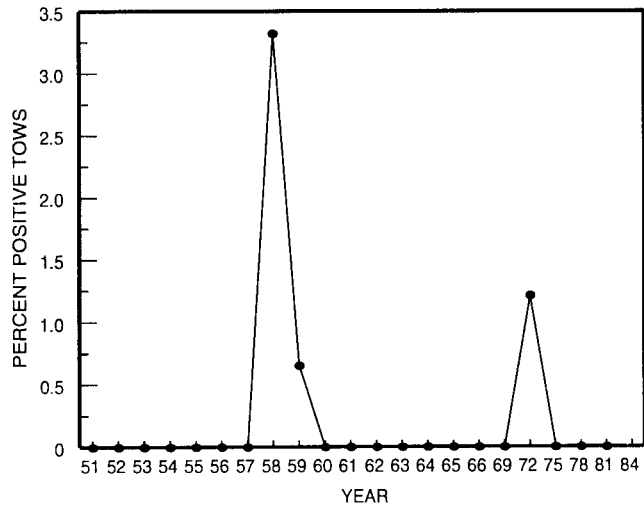
Thunnus albacares

Scombridae



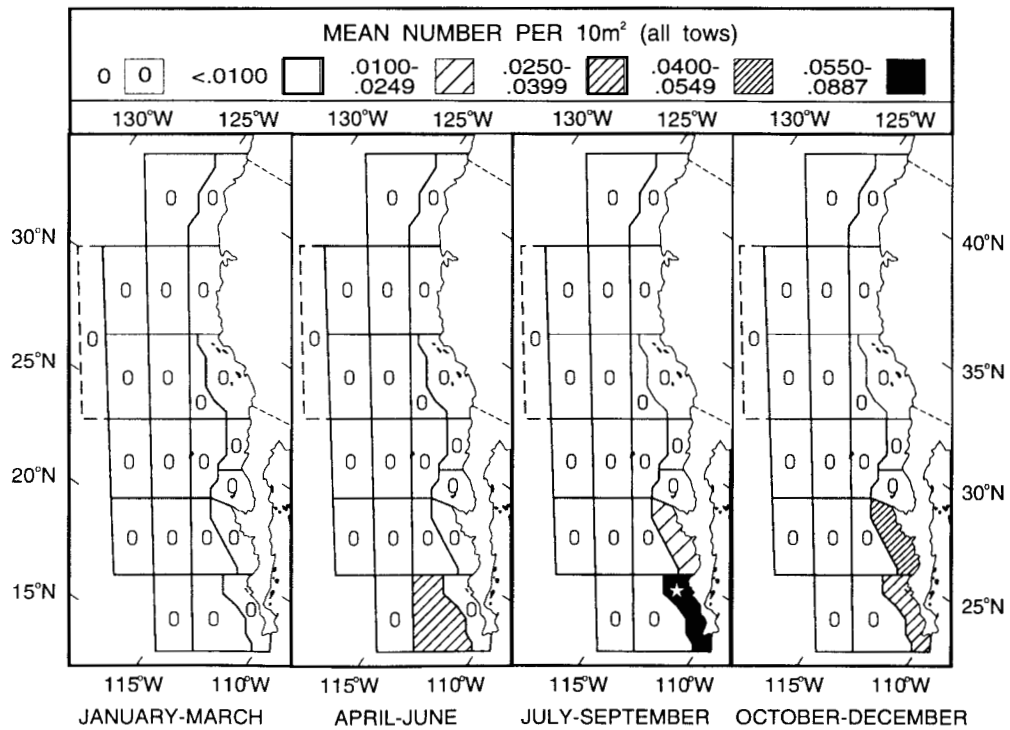
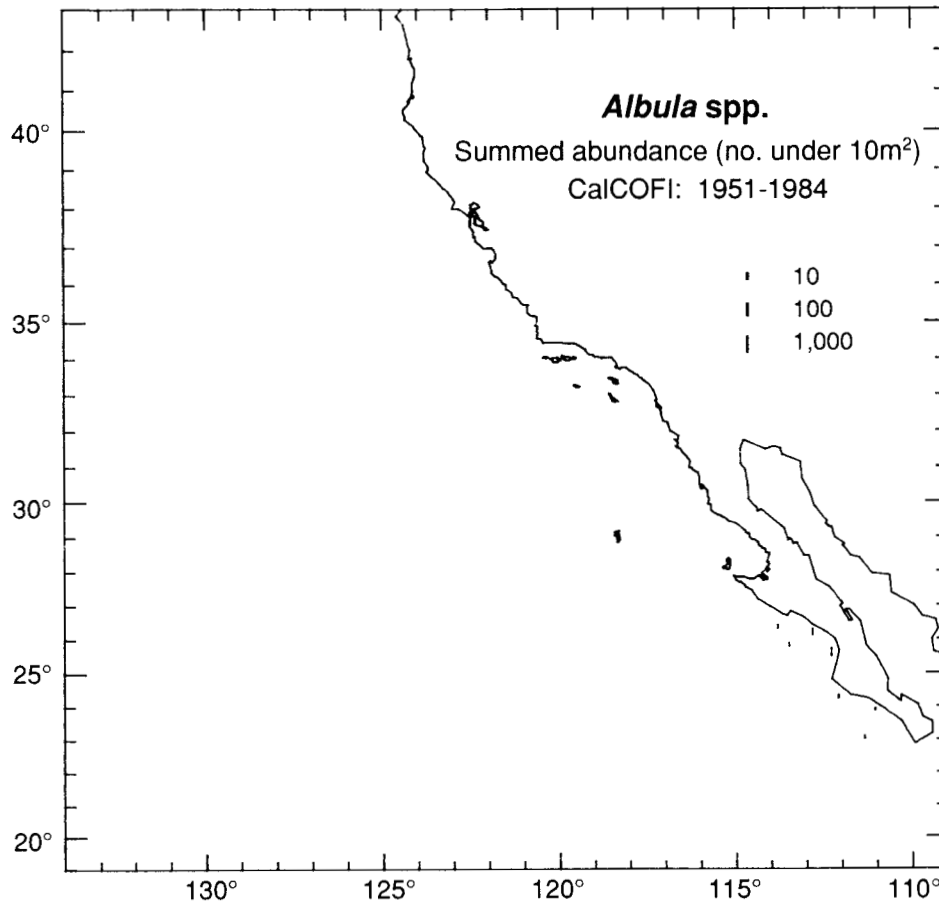
Yellowfin tuna

Thunnus albacares



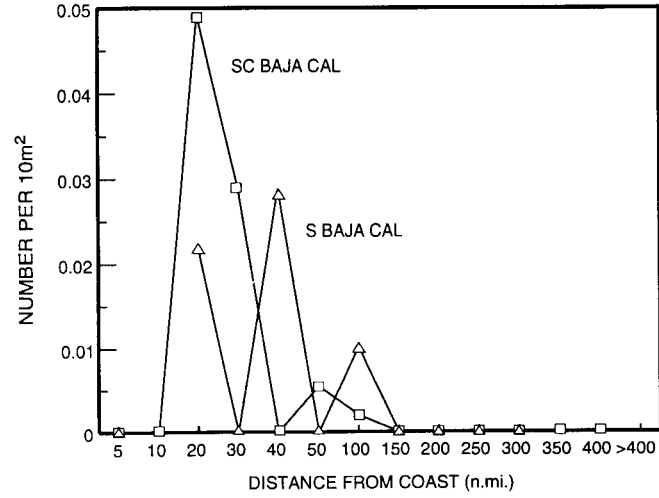
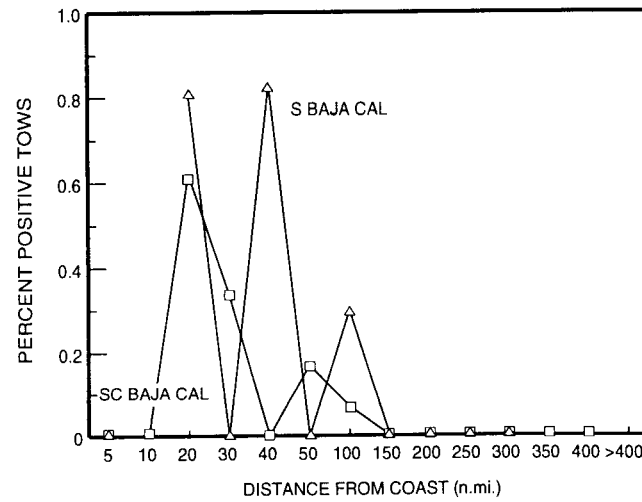
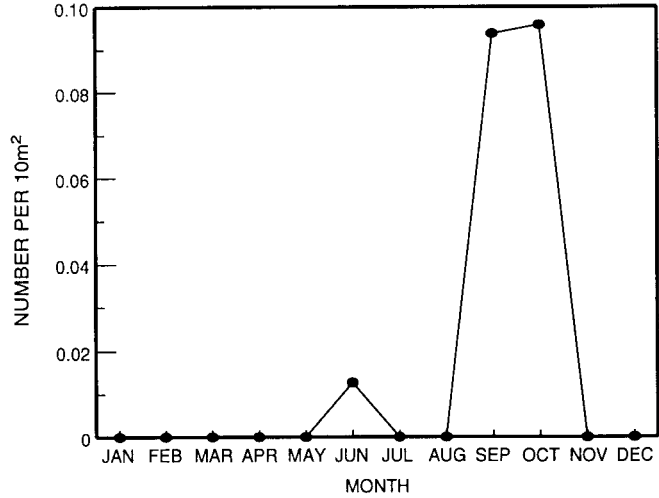
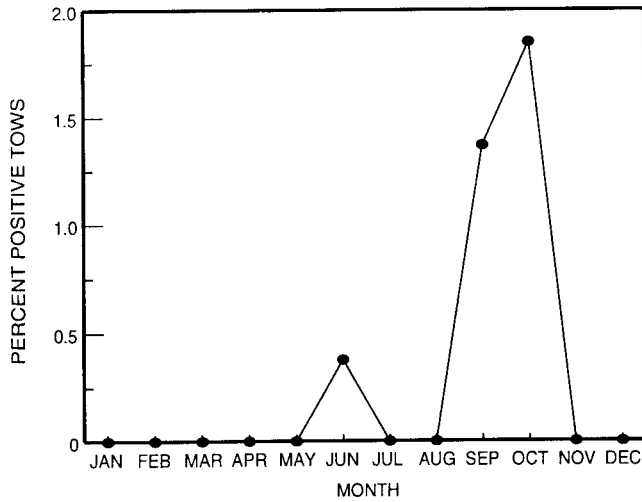
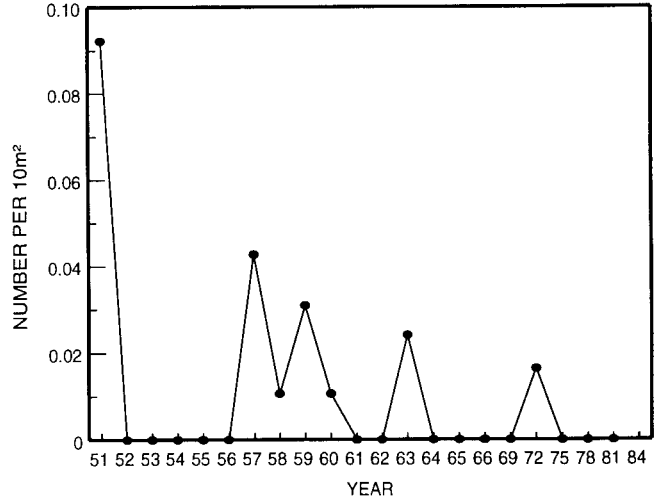
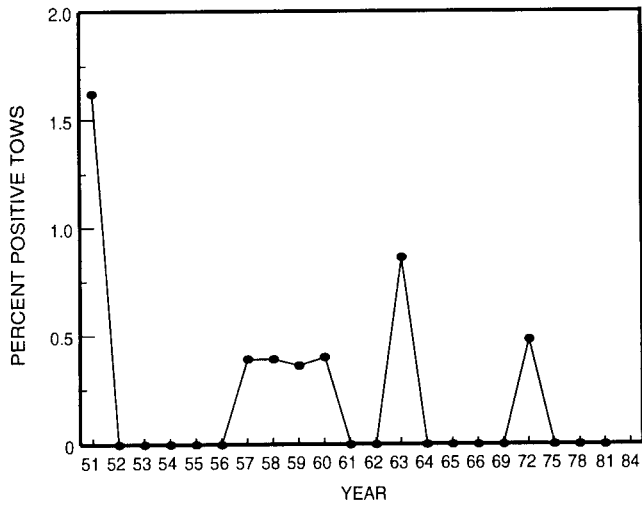
Albula spp.

Albulidae



Bonfishes

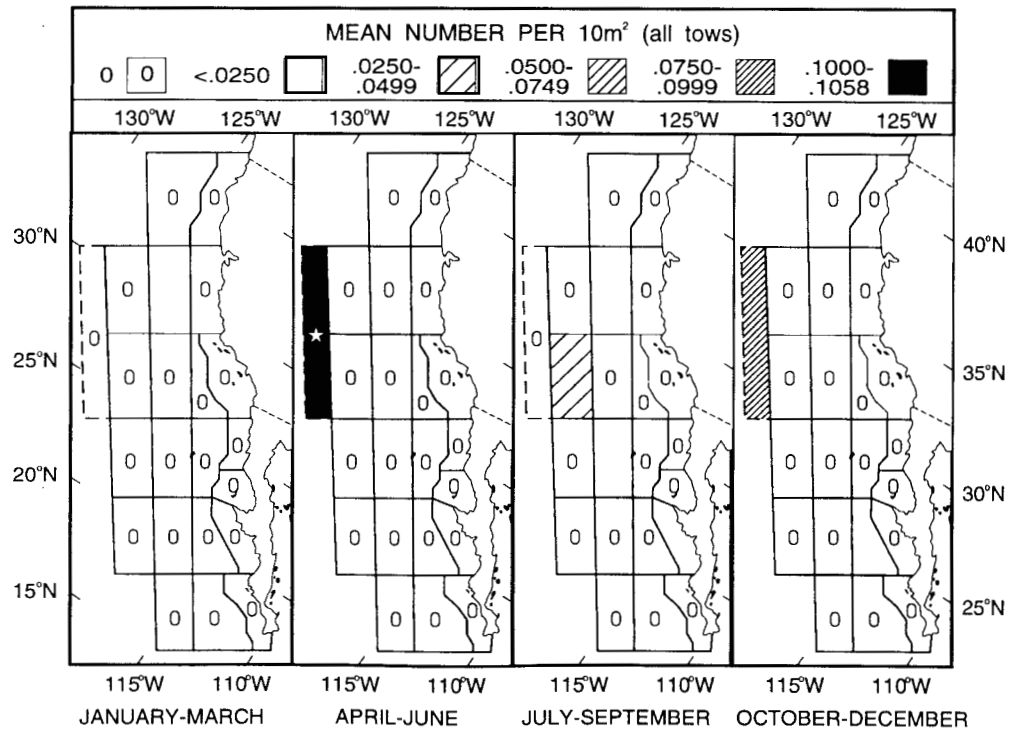
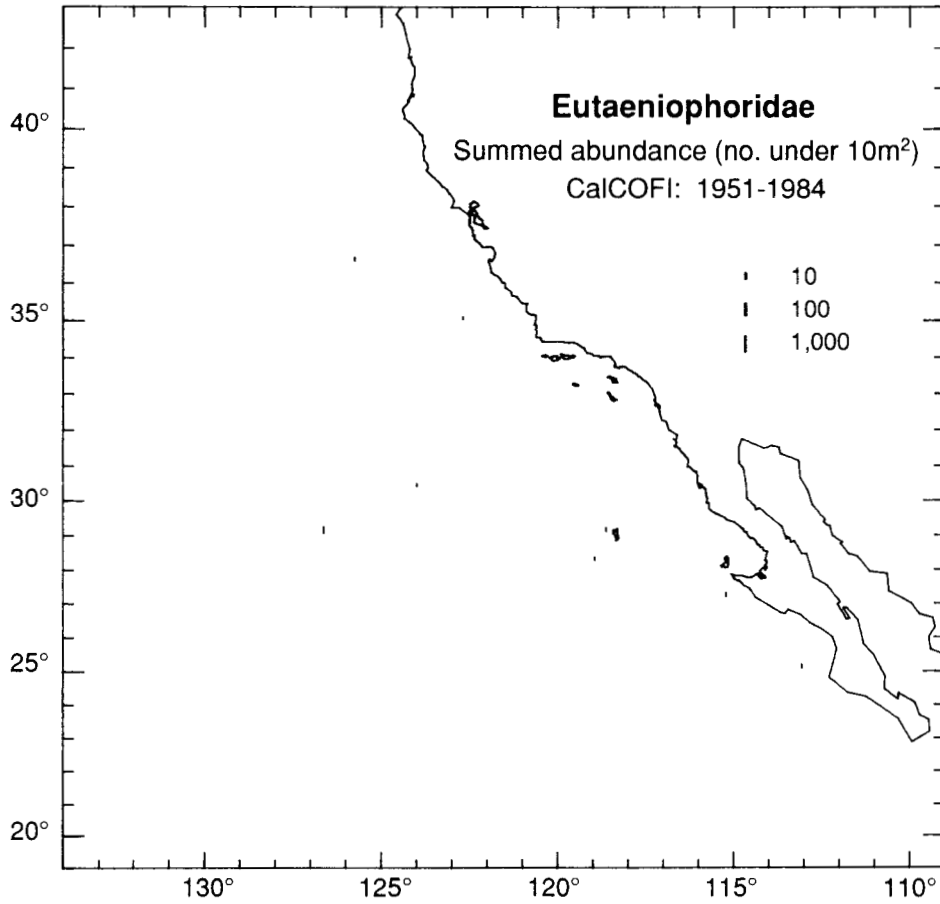
Albula spp.



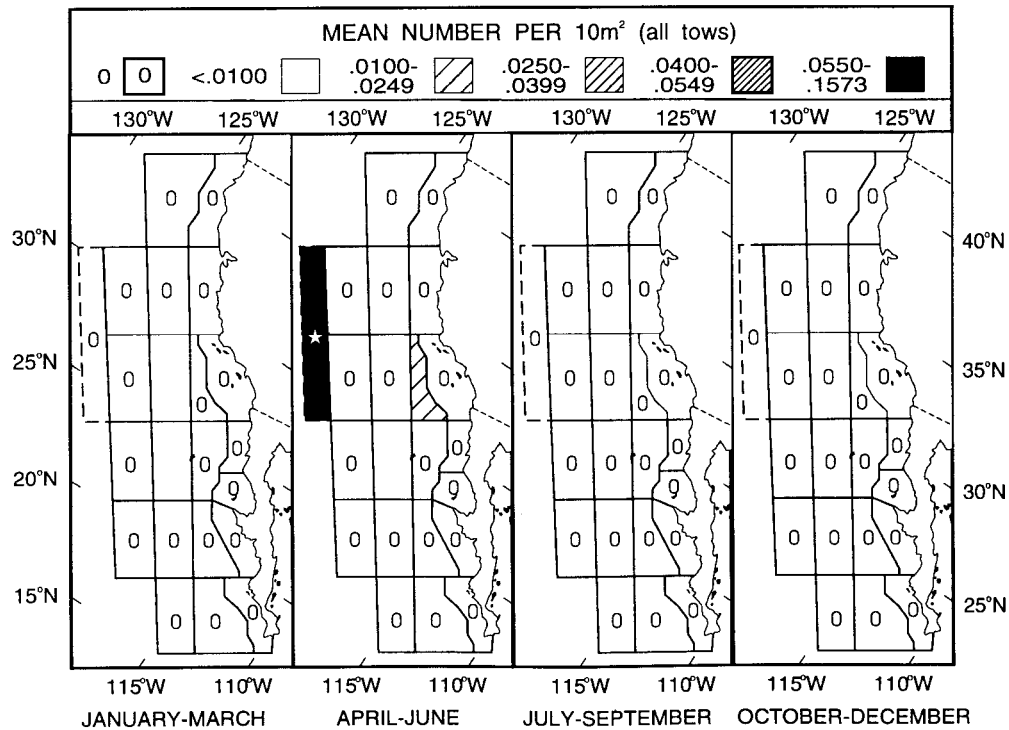
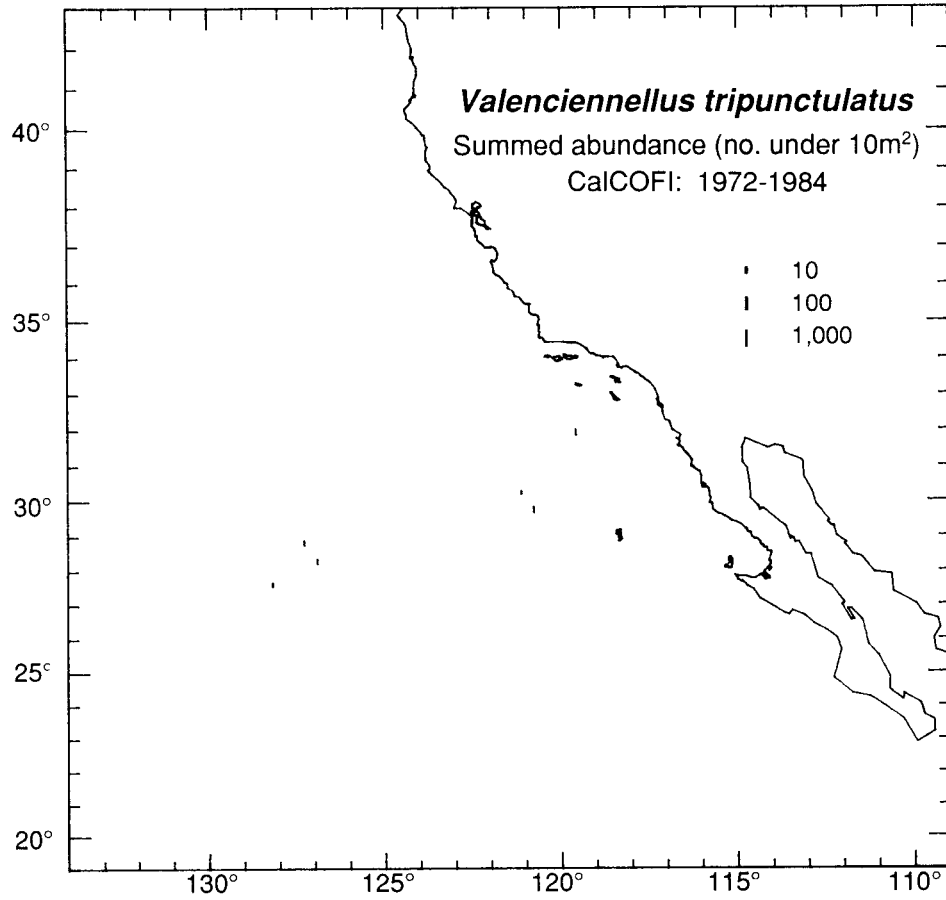
Eutaeniophoridae

Ribbontails

Eutaeniophoridae



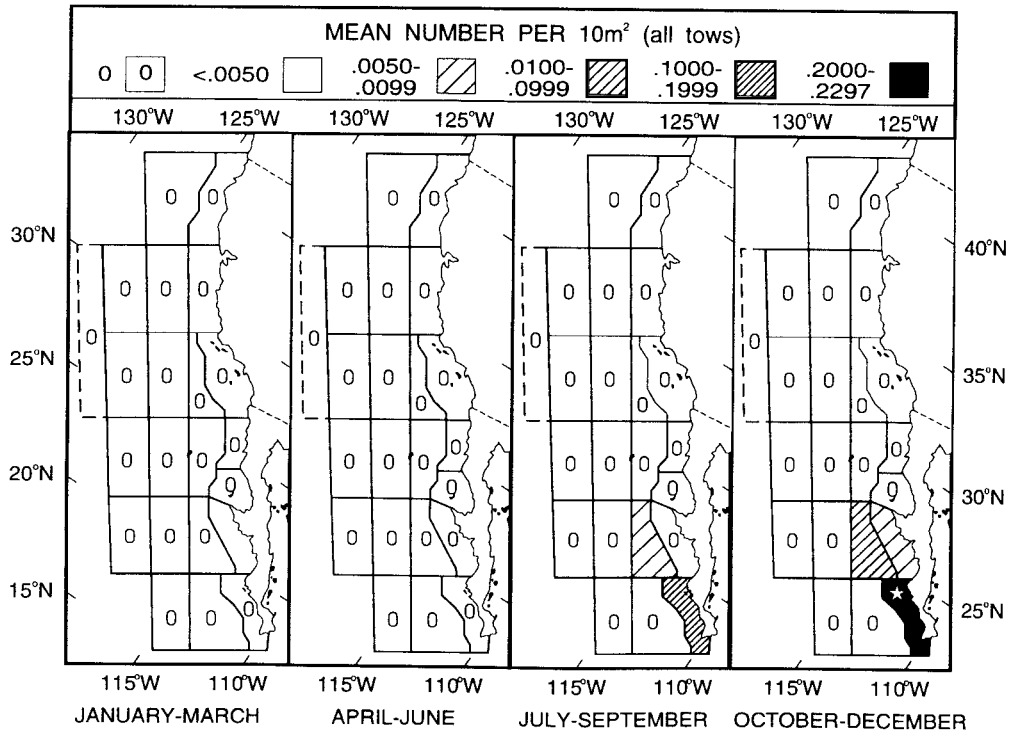
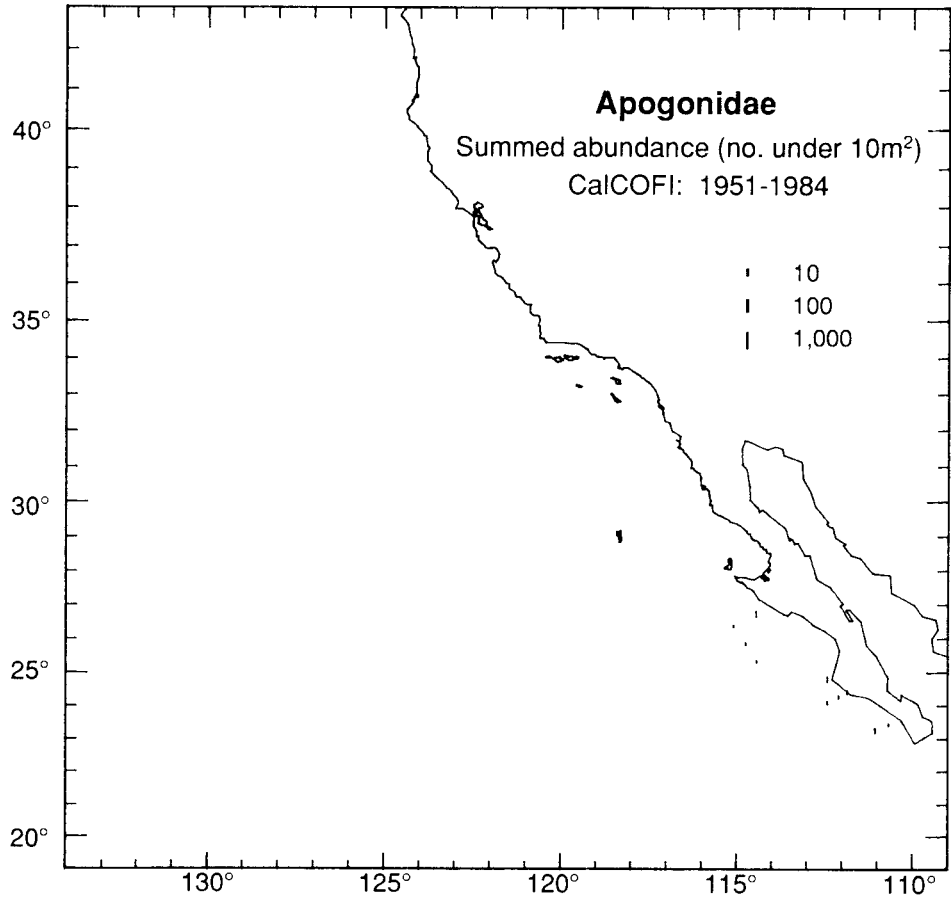
Sternoptychidae Constellationfish *Valenciennellus tripunctulatus*



Apogonidae

Cardinalfishes

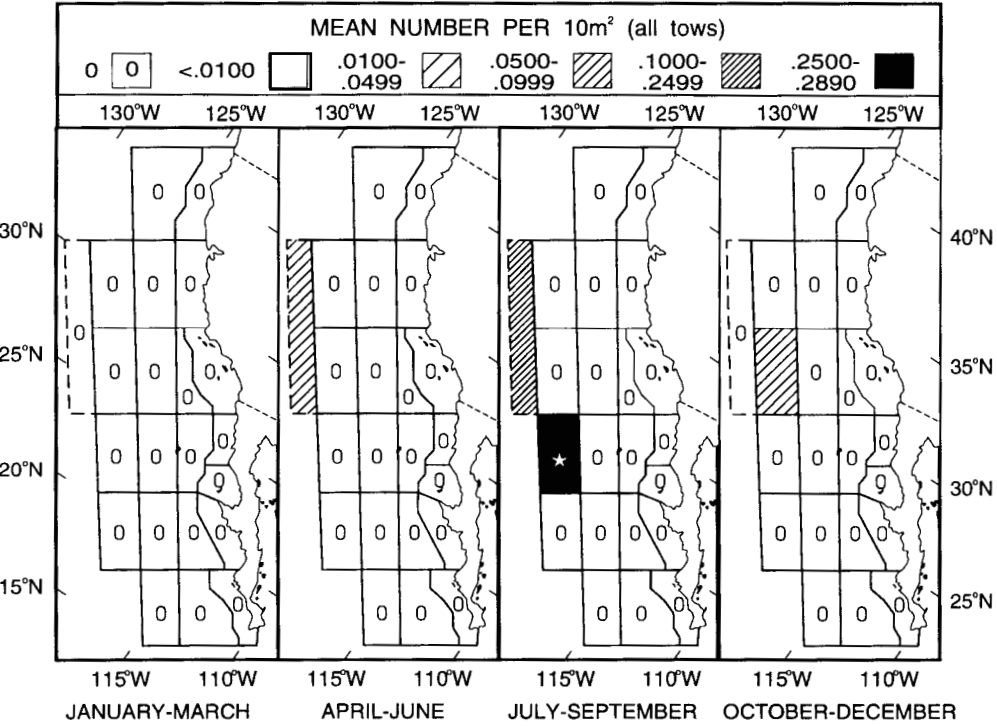
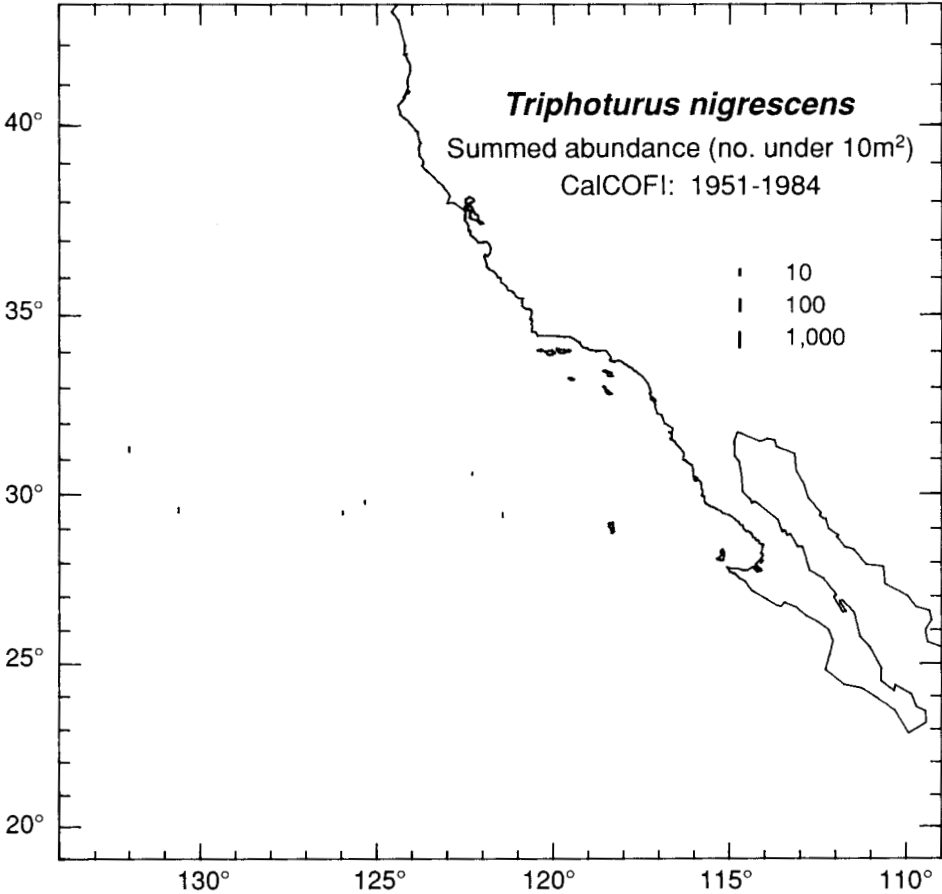
Apogonidae



Myctophidae

Highseas lampfish

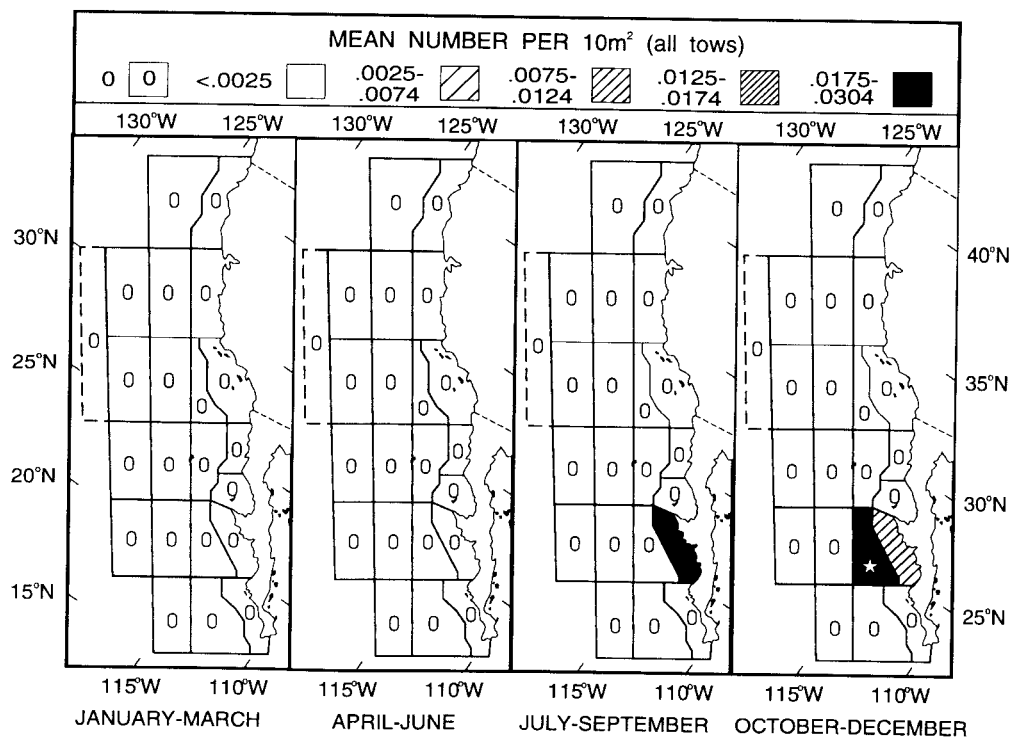
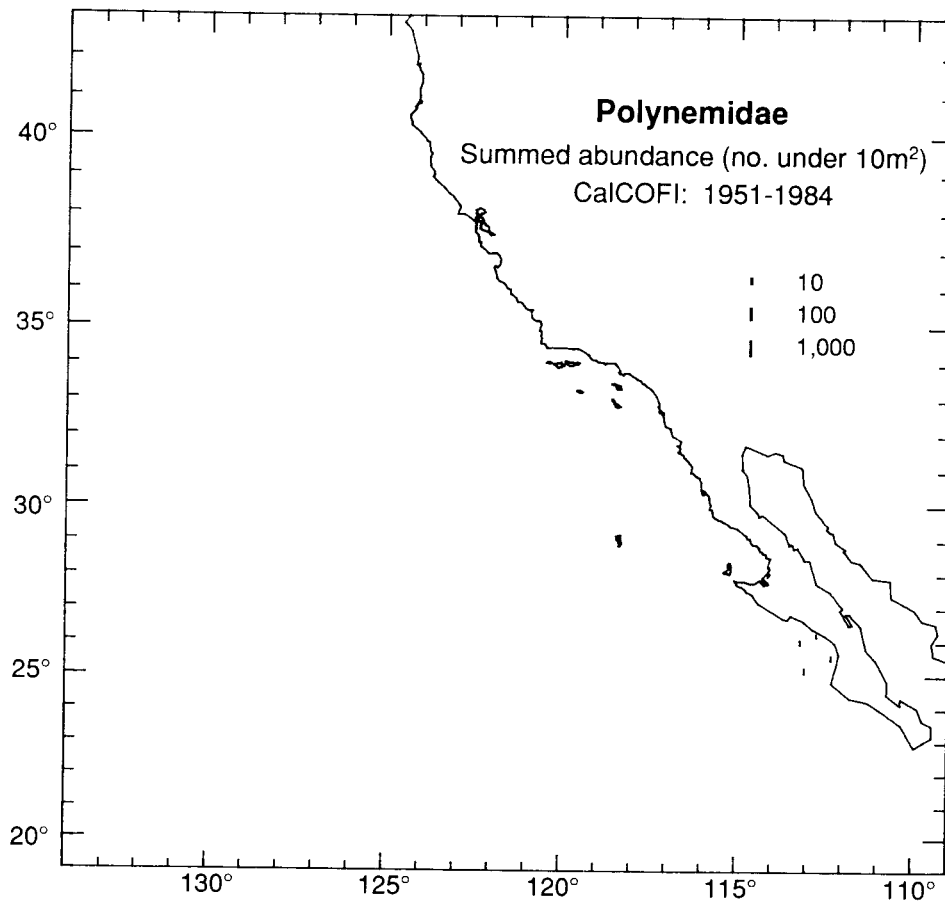
Triphoturus nigrescens



Polynemidae

Threadfins

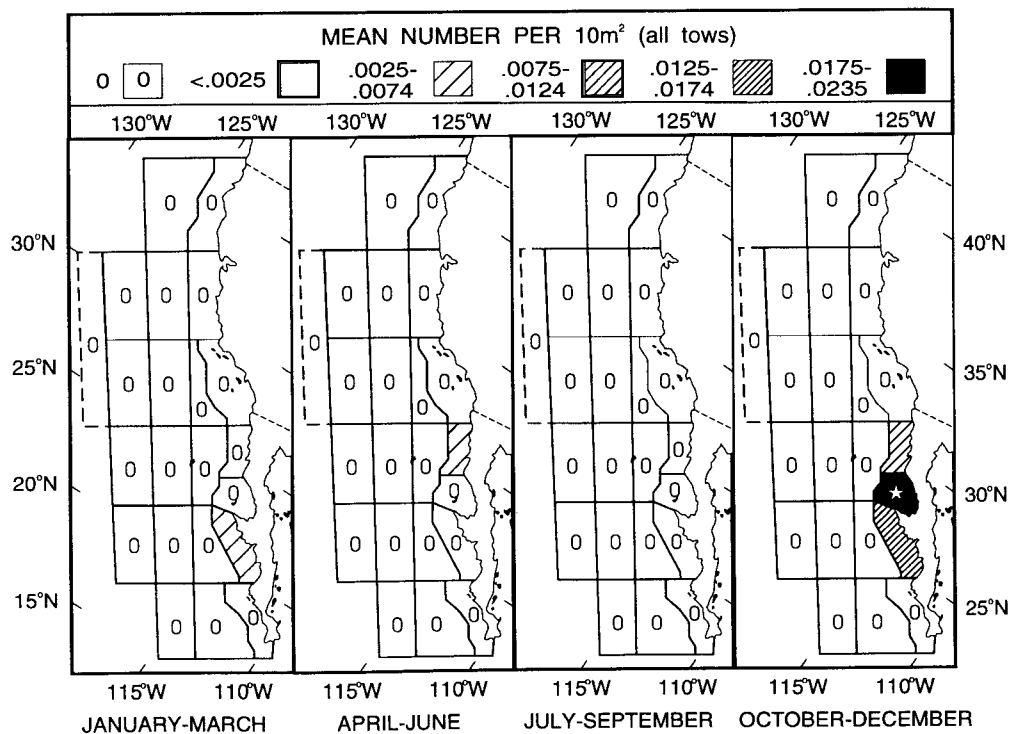
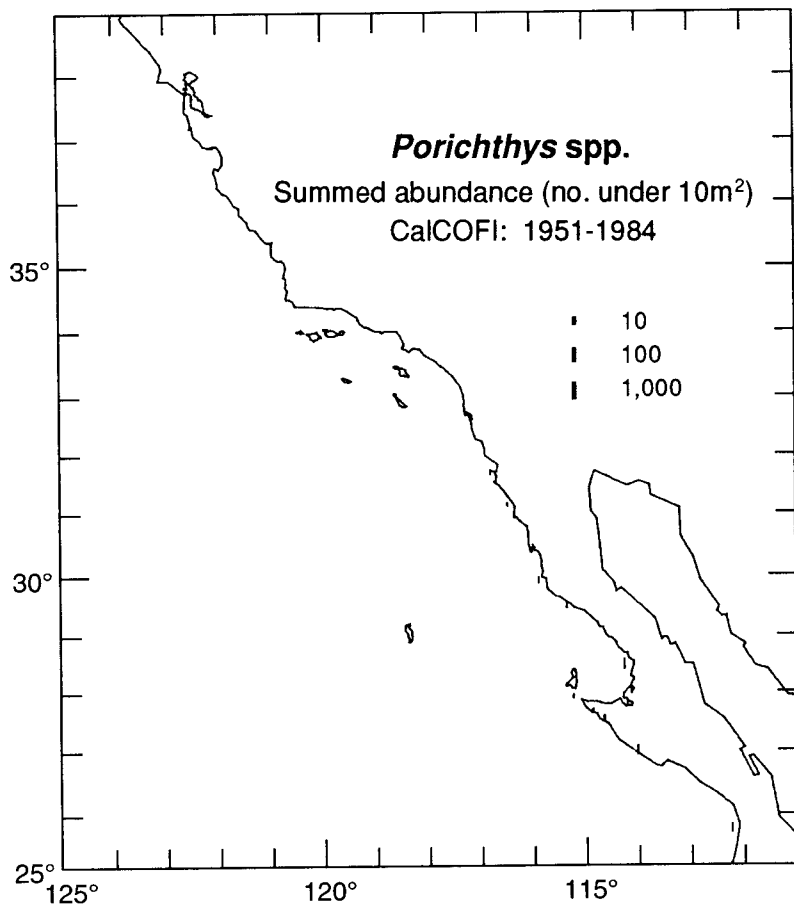
Polynemidae



Batrachoididae

Midshipmen

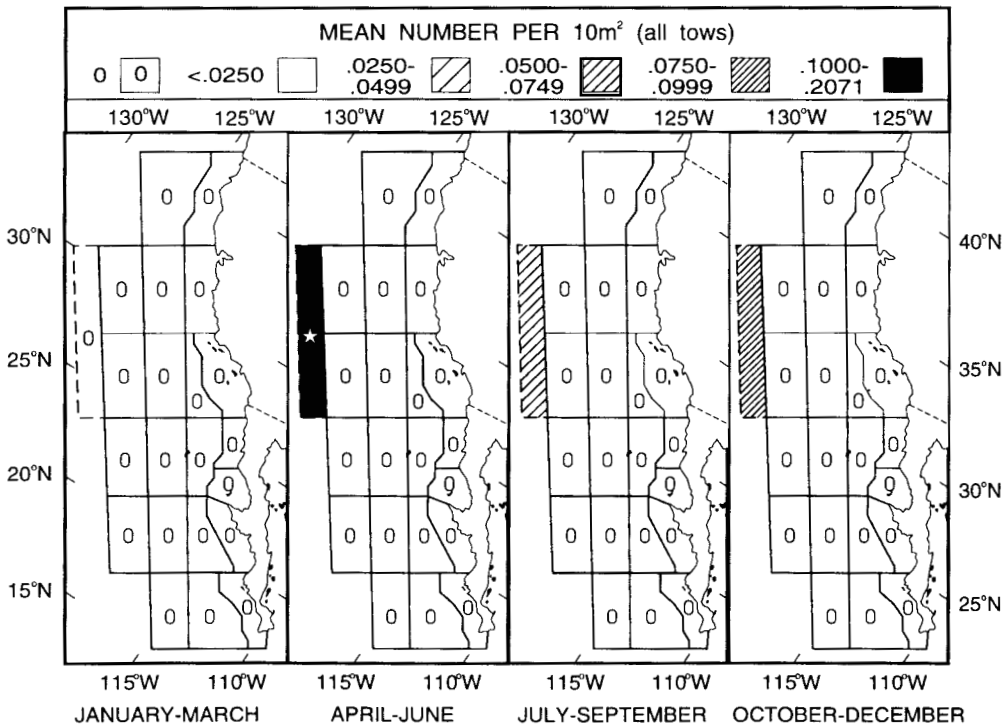
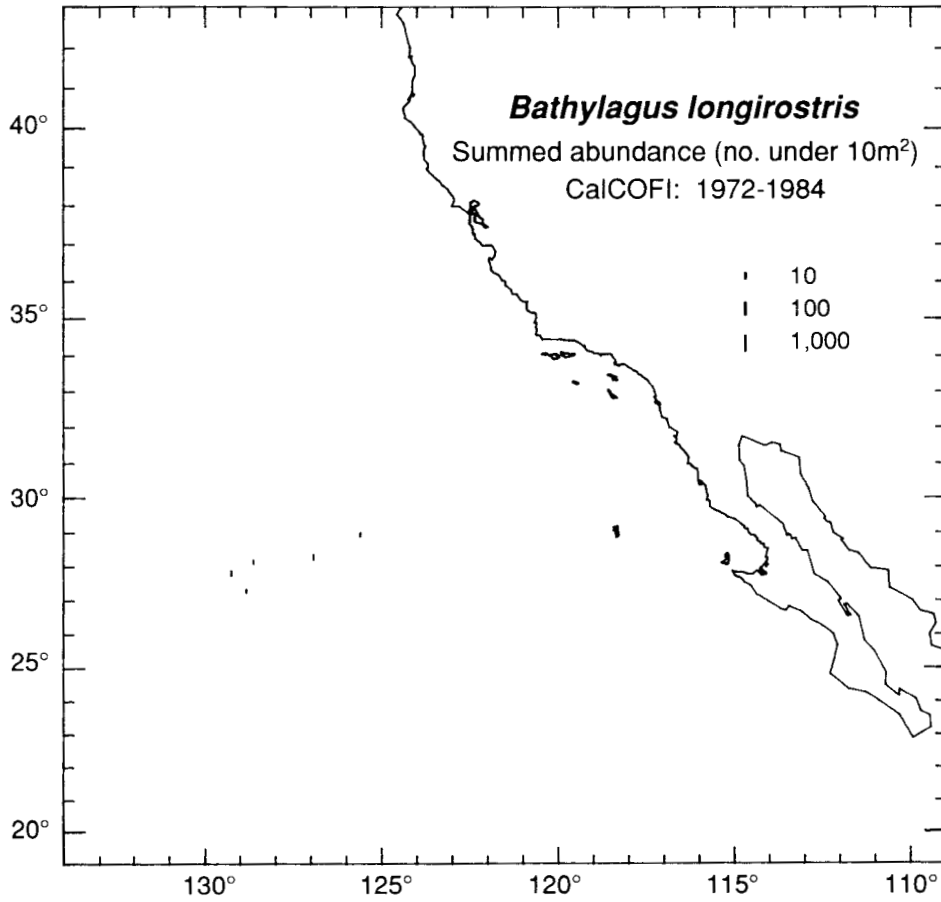
***Porichthys* spp.**



Bathylagus longirostris

Longsnout blacksmelt

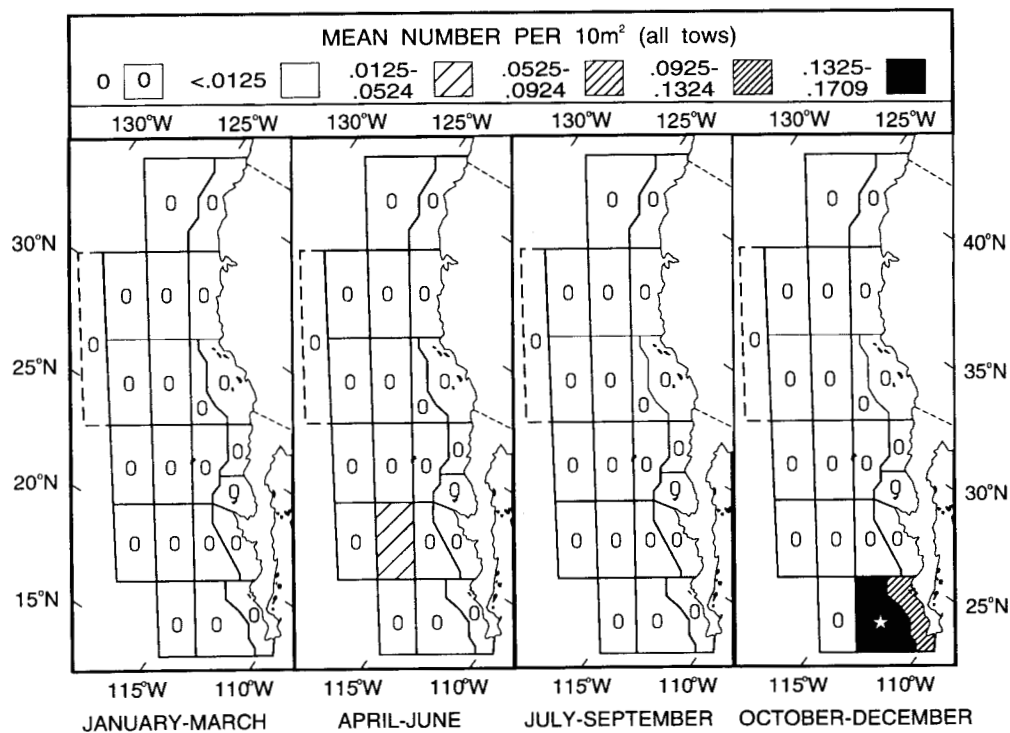
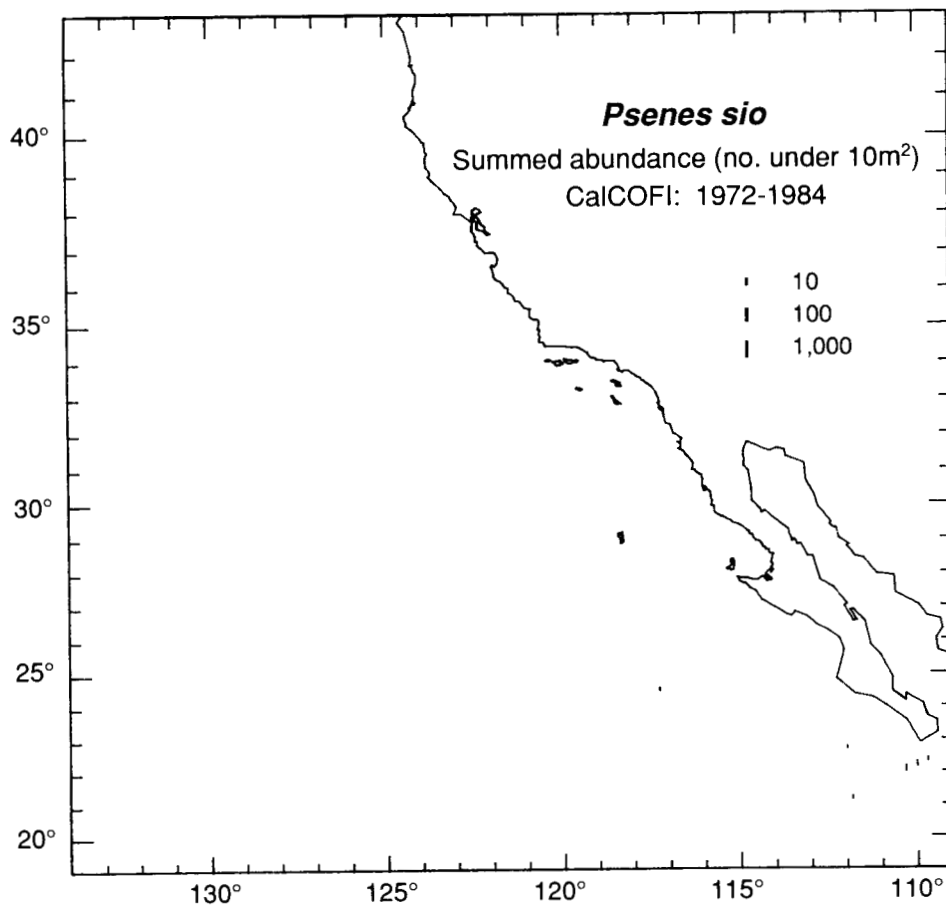
Bathylagidae



Nomeidae

Driftfish

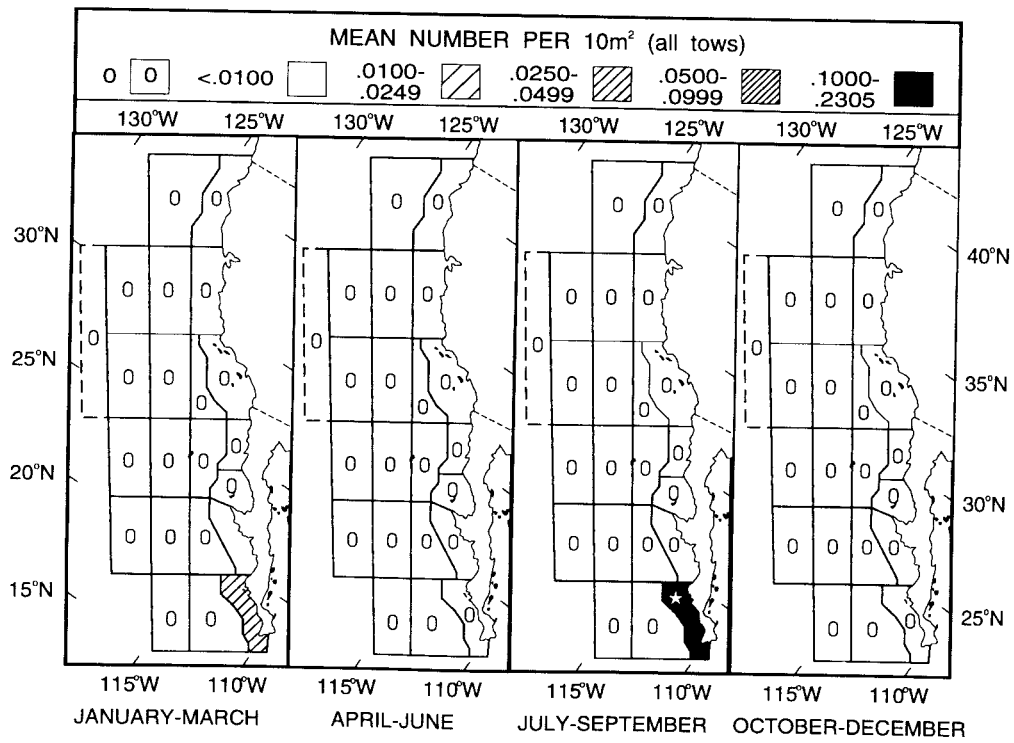
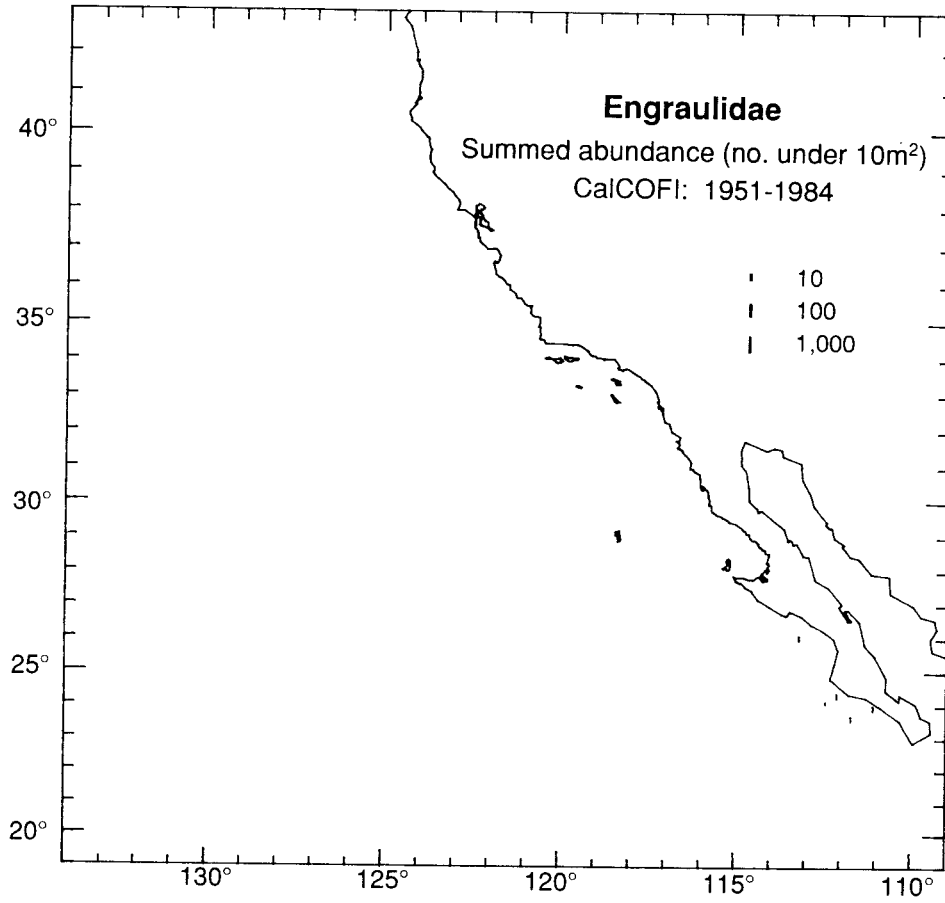
Psenes sio



Engraulidae

Anchovies

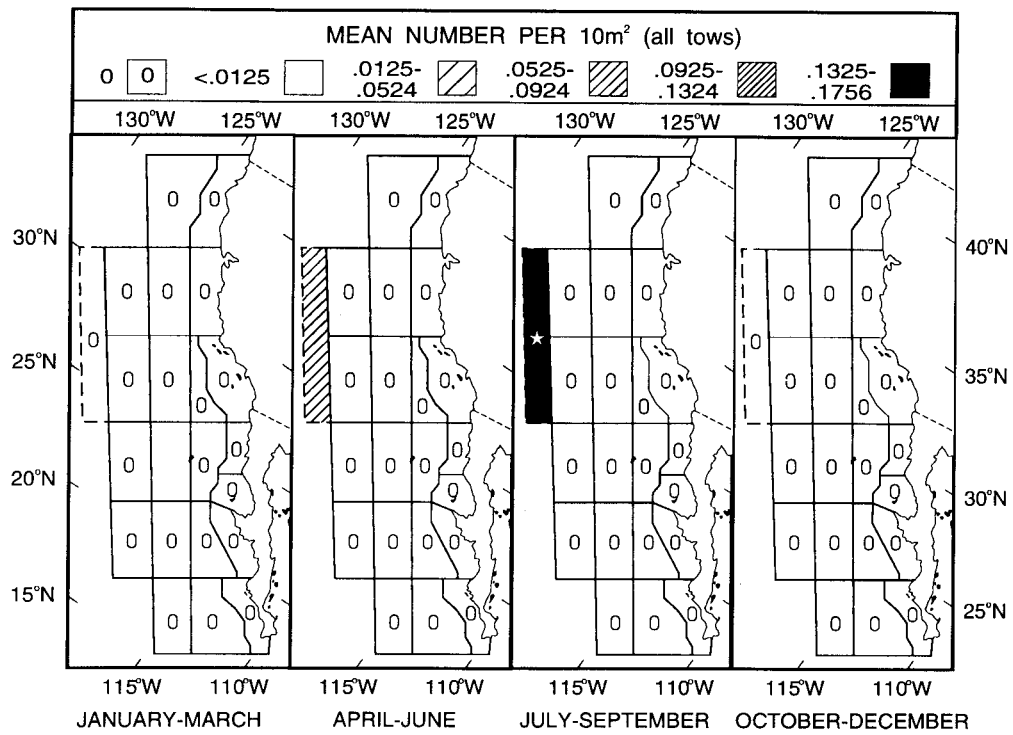
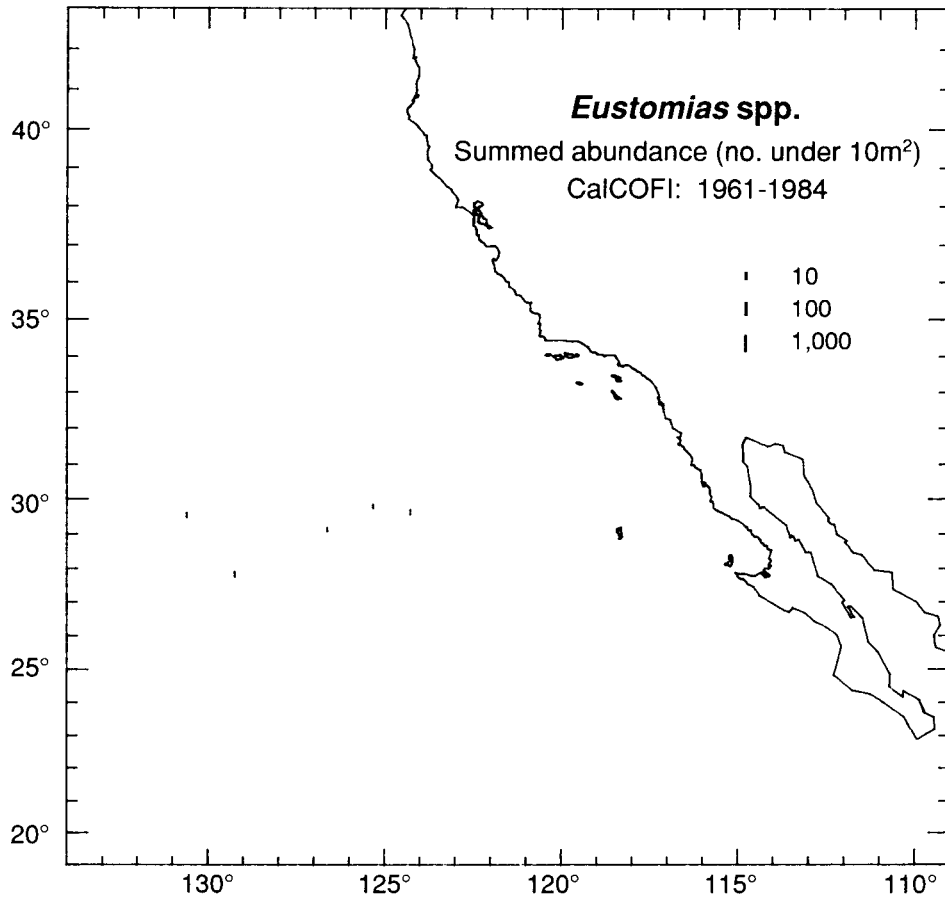
Engraulidae



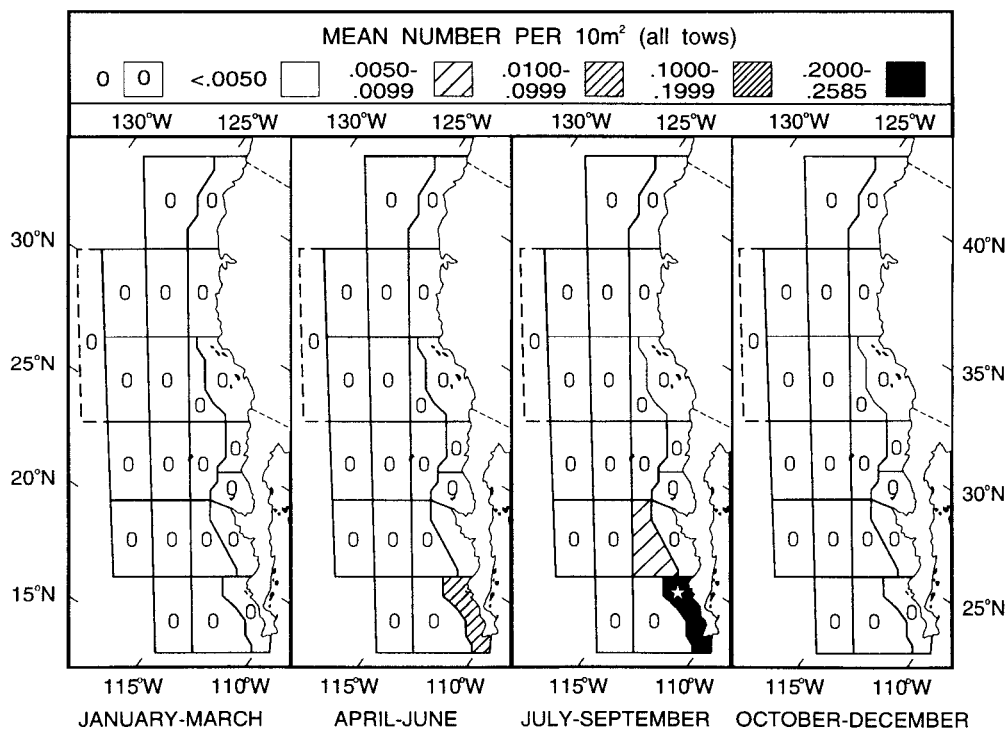
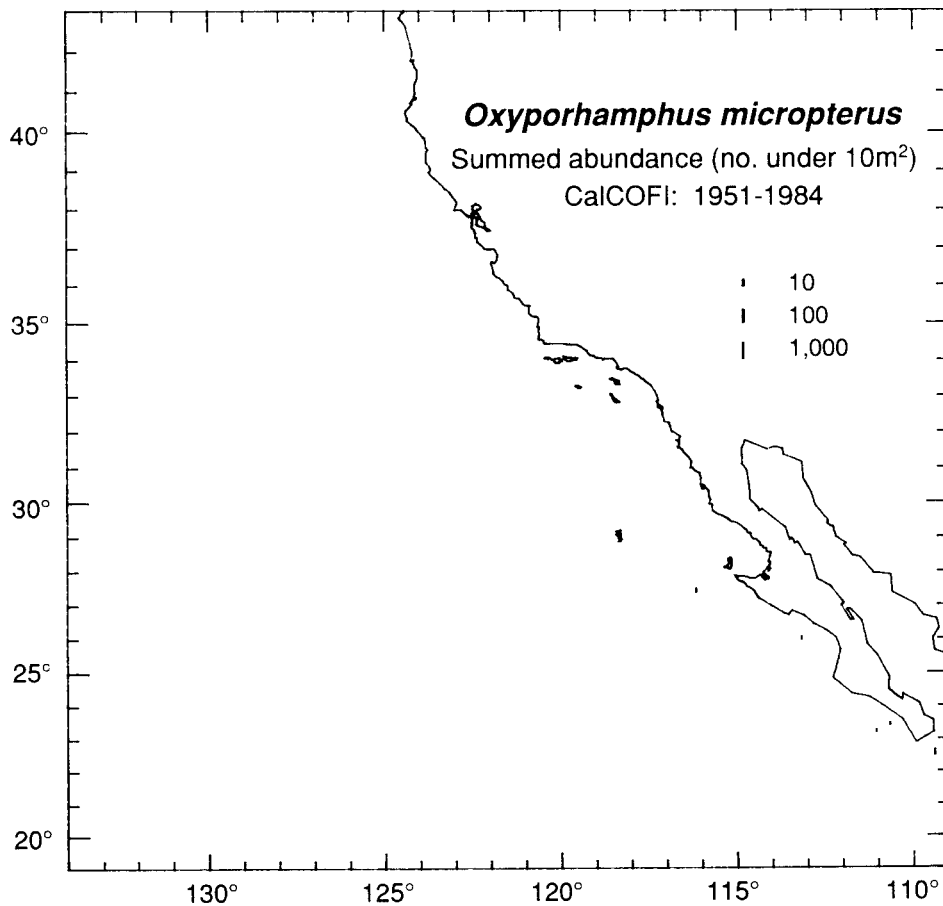
Melanostomiidae

Scaleless dragonfishes

Eustomias spp.



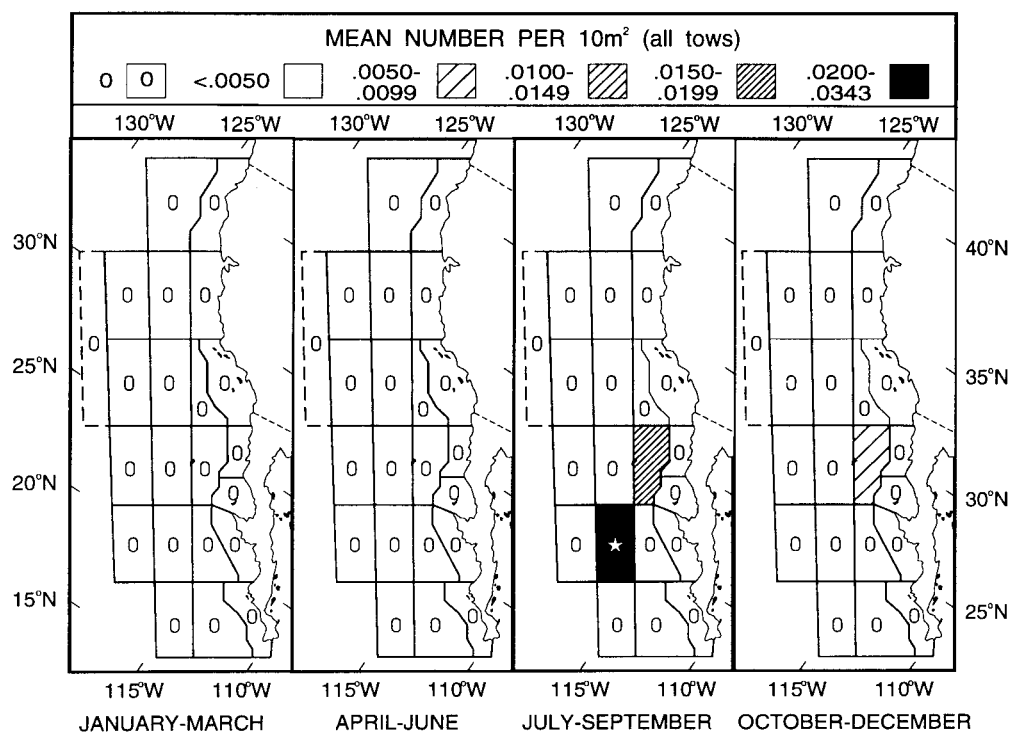
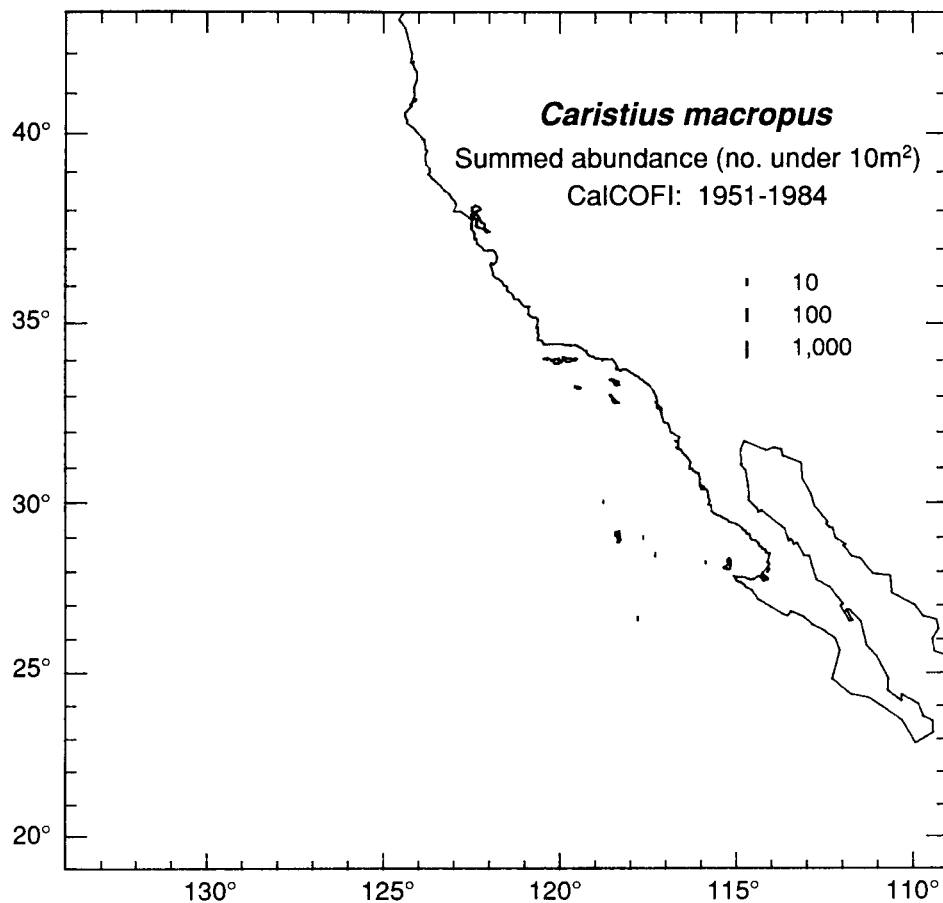
Oxyporhamphus micropterus Smallwing flyingfish Hemiramphidae



Caristiidae

Bigmouth veilfin

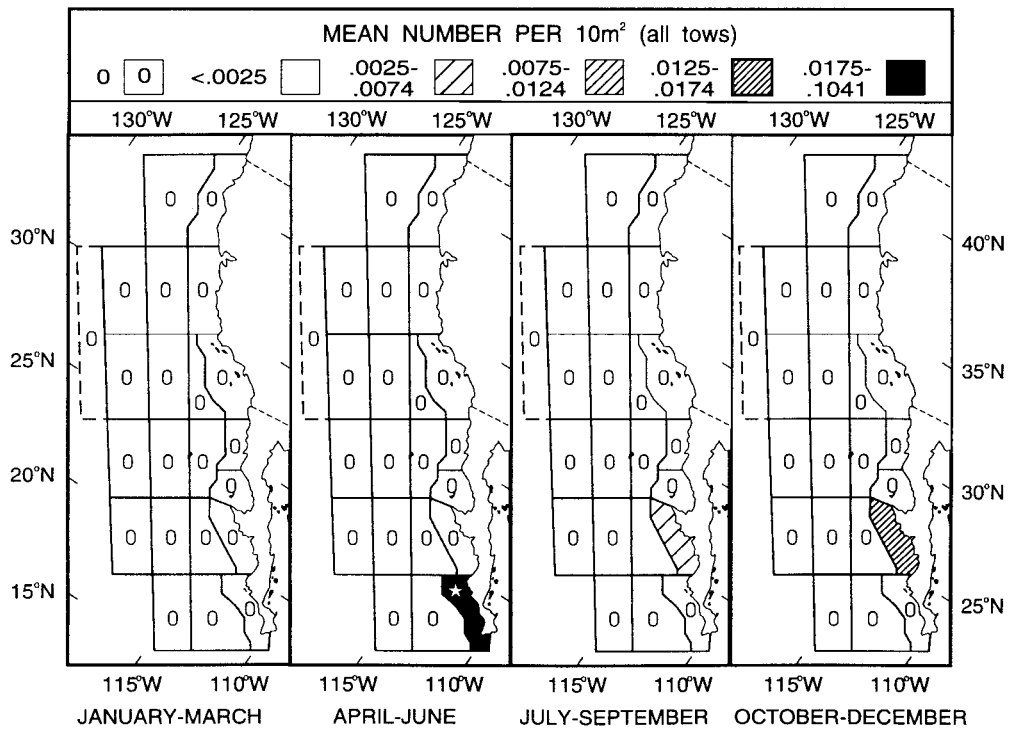
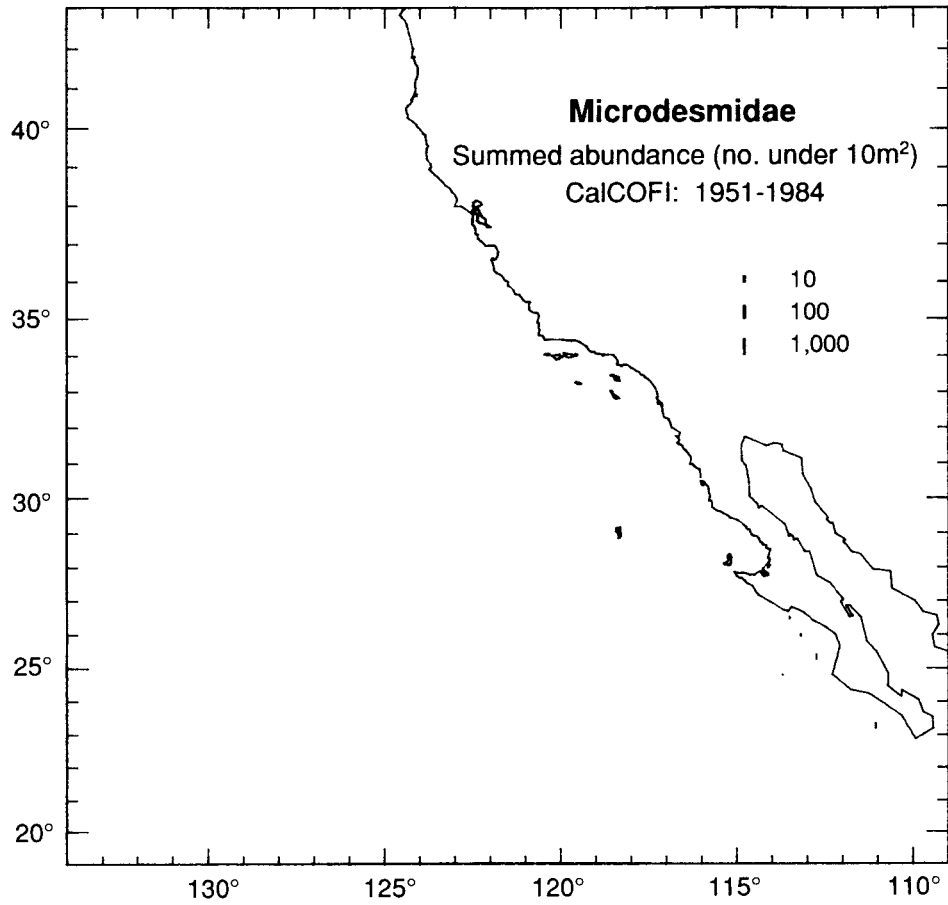
Caristius macropus



Microdesmidae

Wormfishes

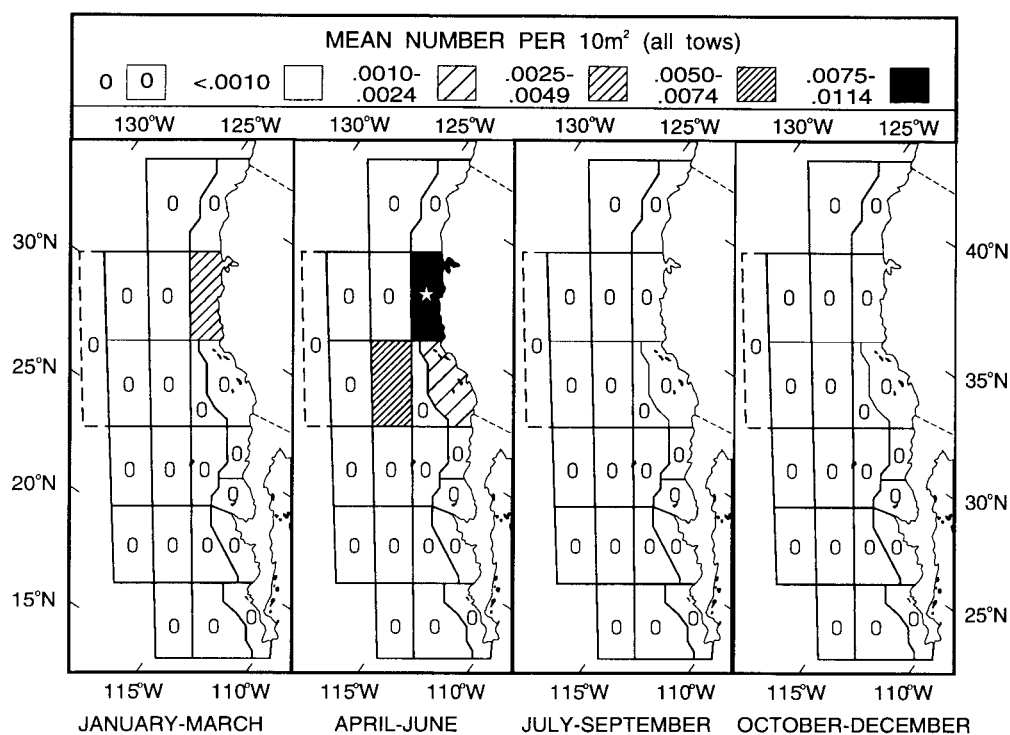
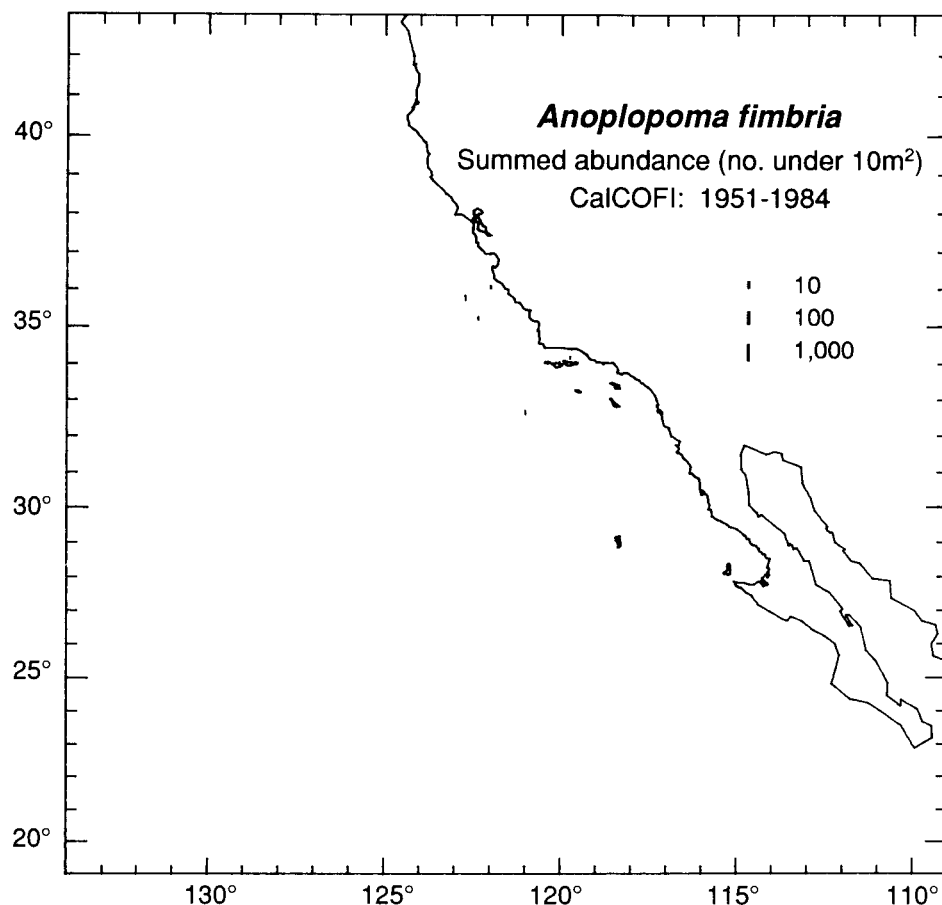
Microdesmidae



Anoplopomatidae

Sablefish

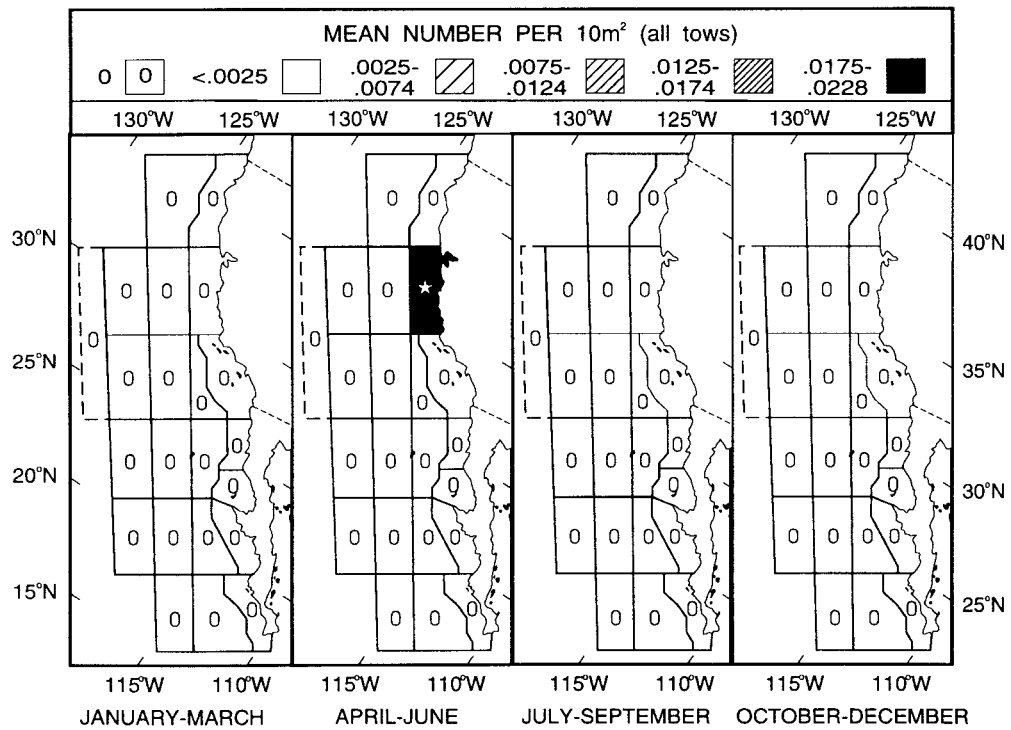
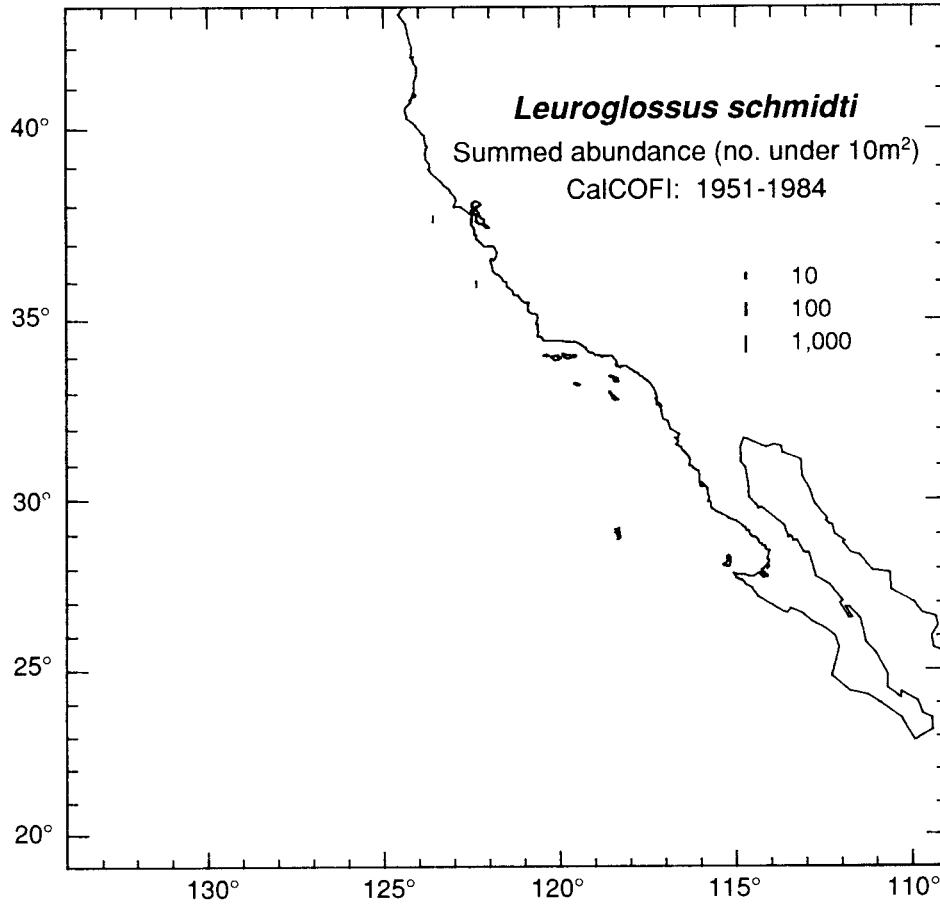
Anoplopoma fimbria



Leuroglossus schmidti

Northern smoothtongue

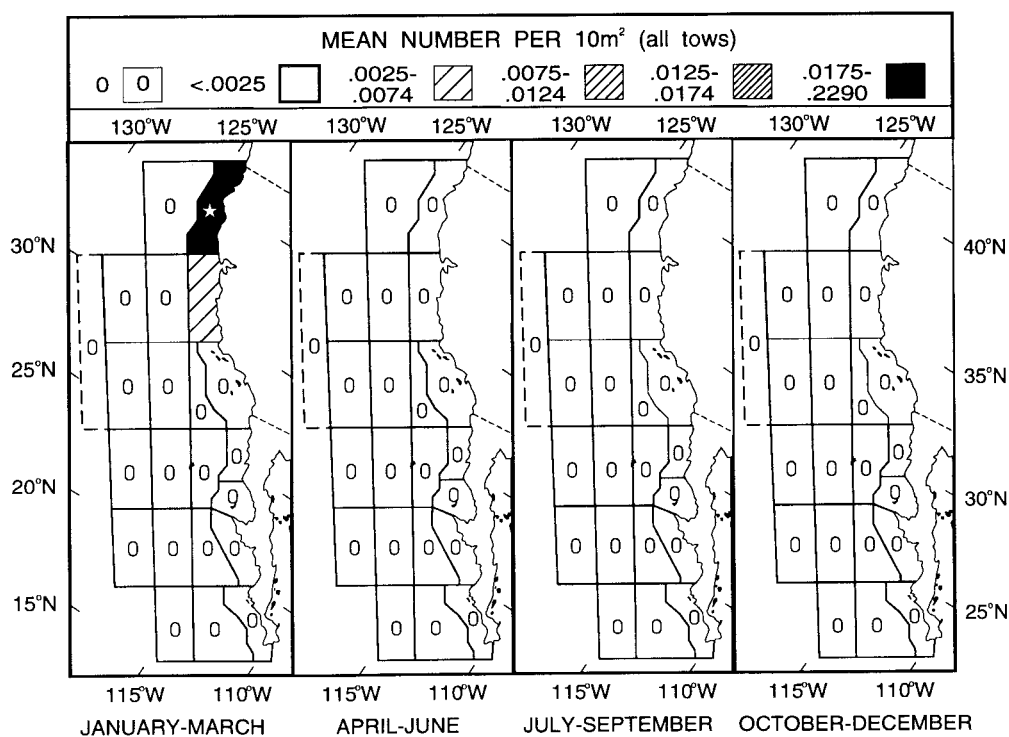
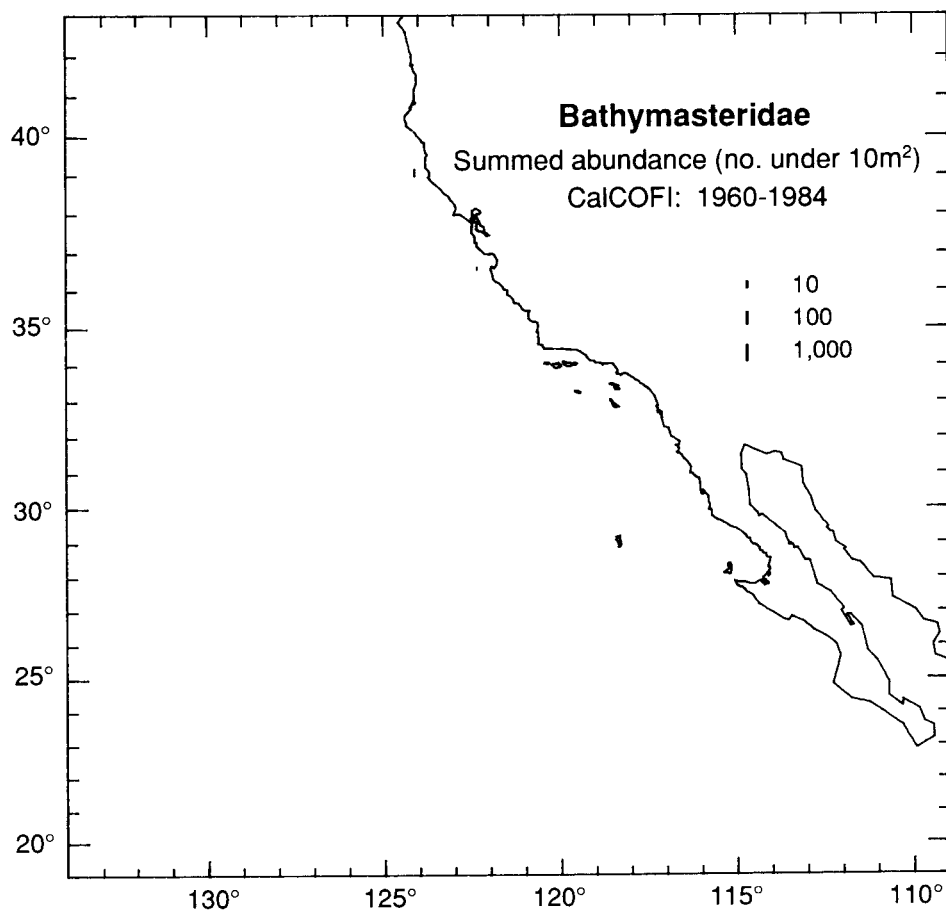
Bathylagidae



Bathymasteridae

Ronquils

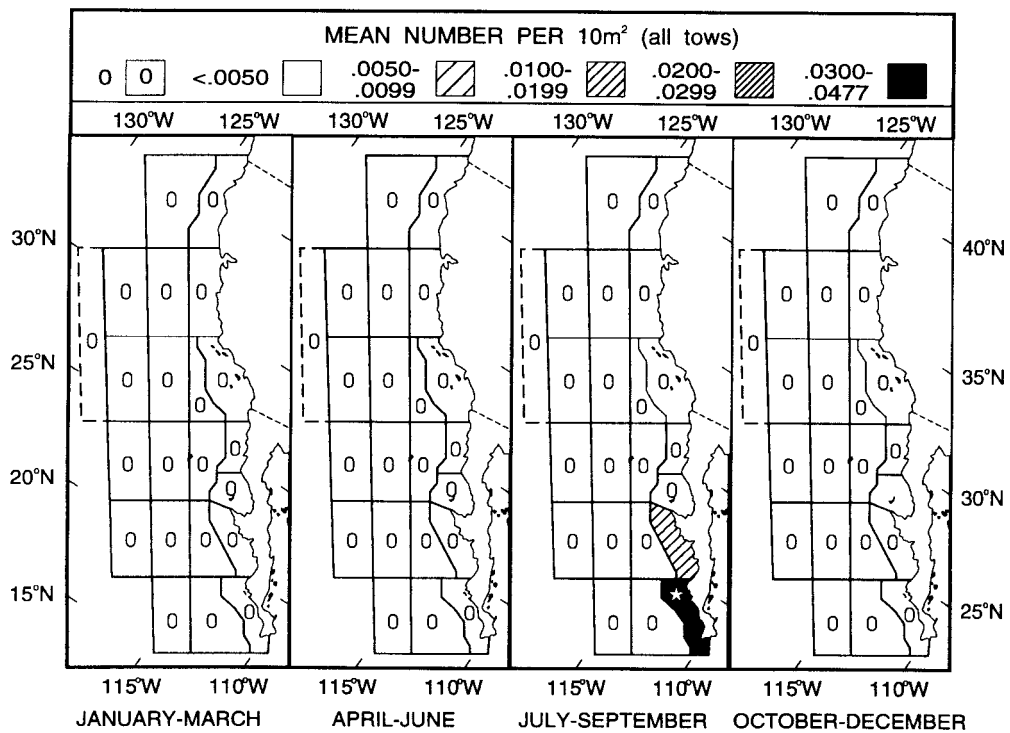
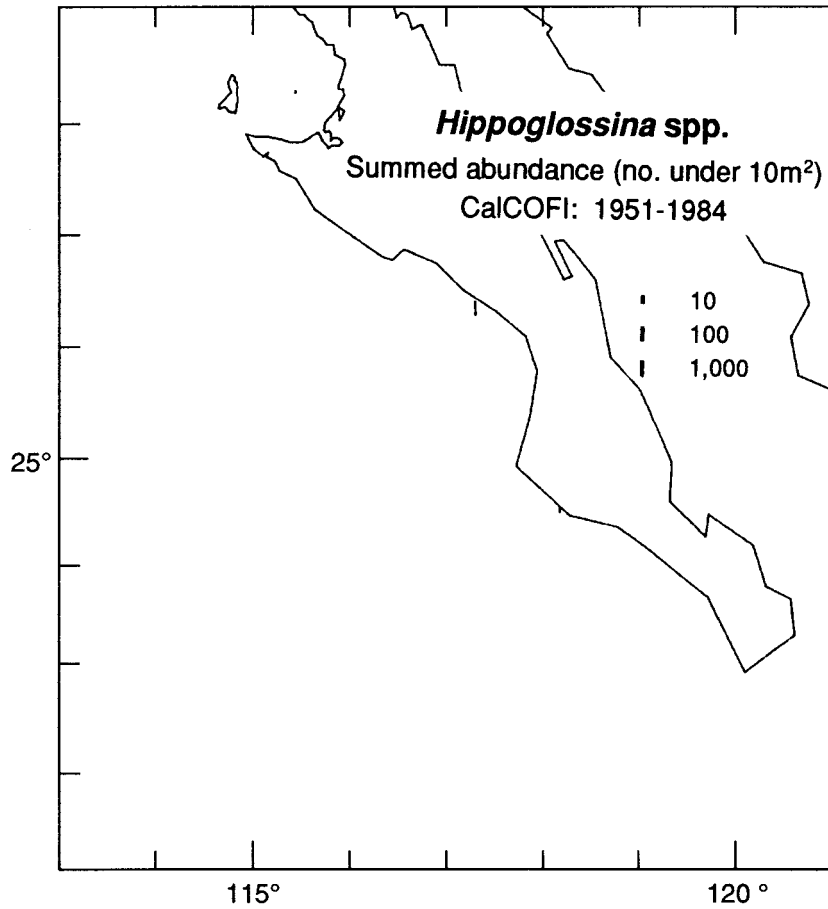
Bathymasteridae



Hippoglossina spp.

Bigmouth soles

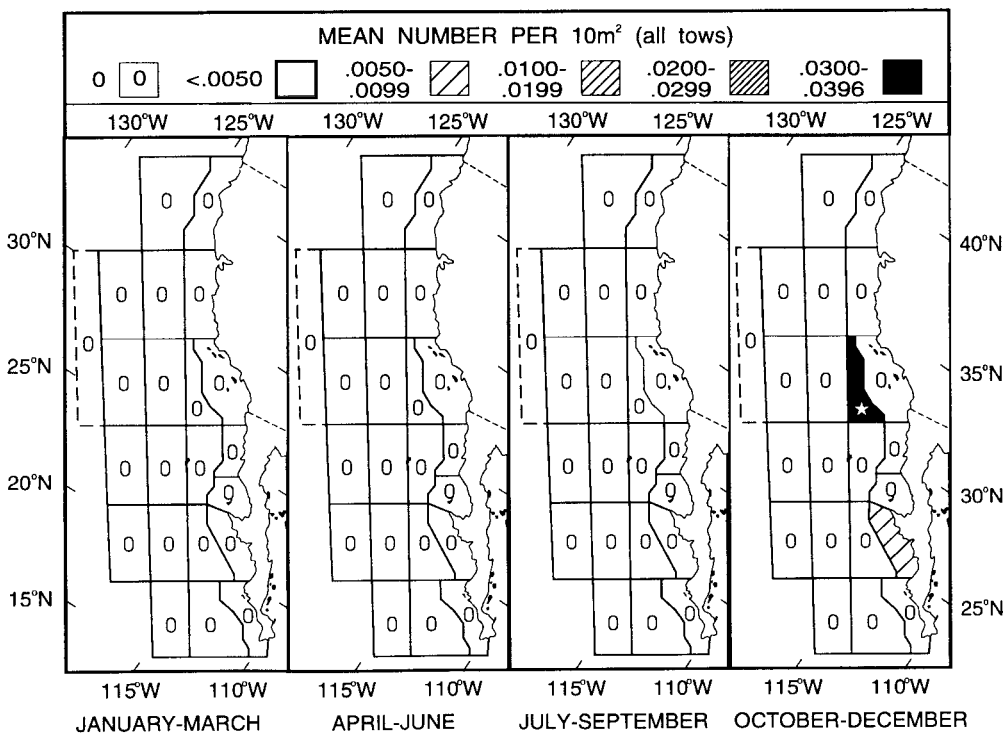
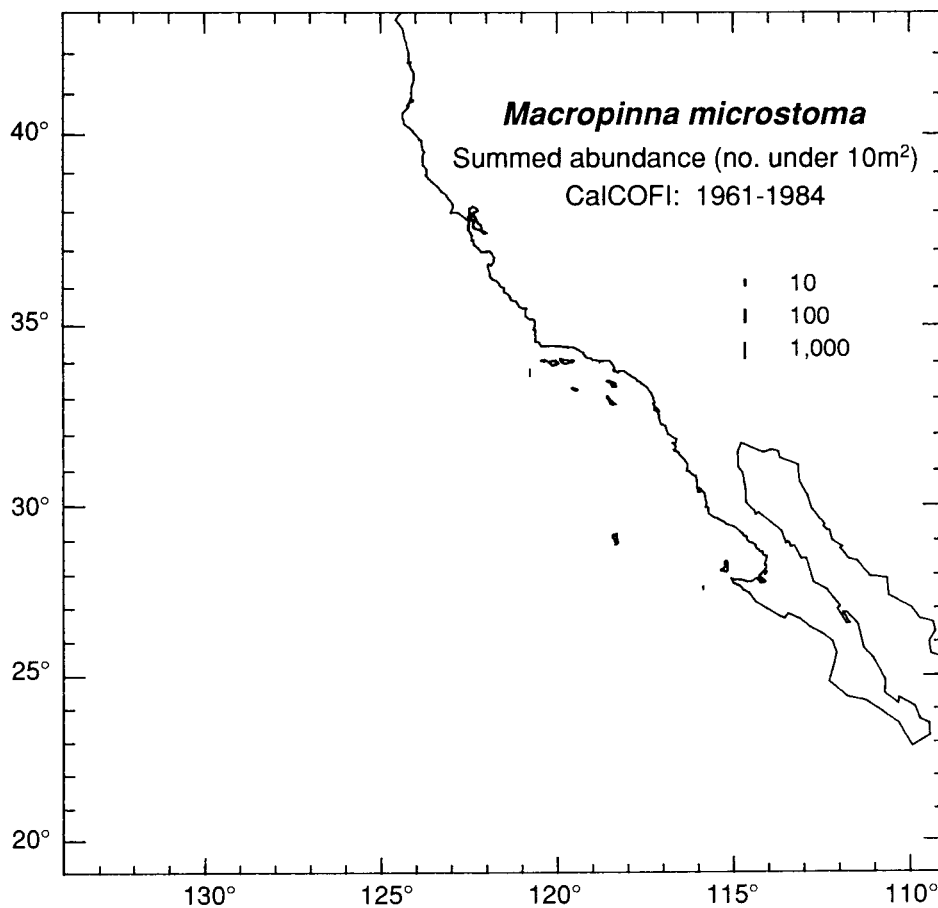
Paralichthyidae



Opisthoproctidae

Barreleye

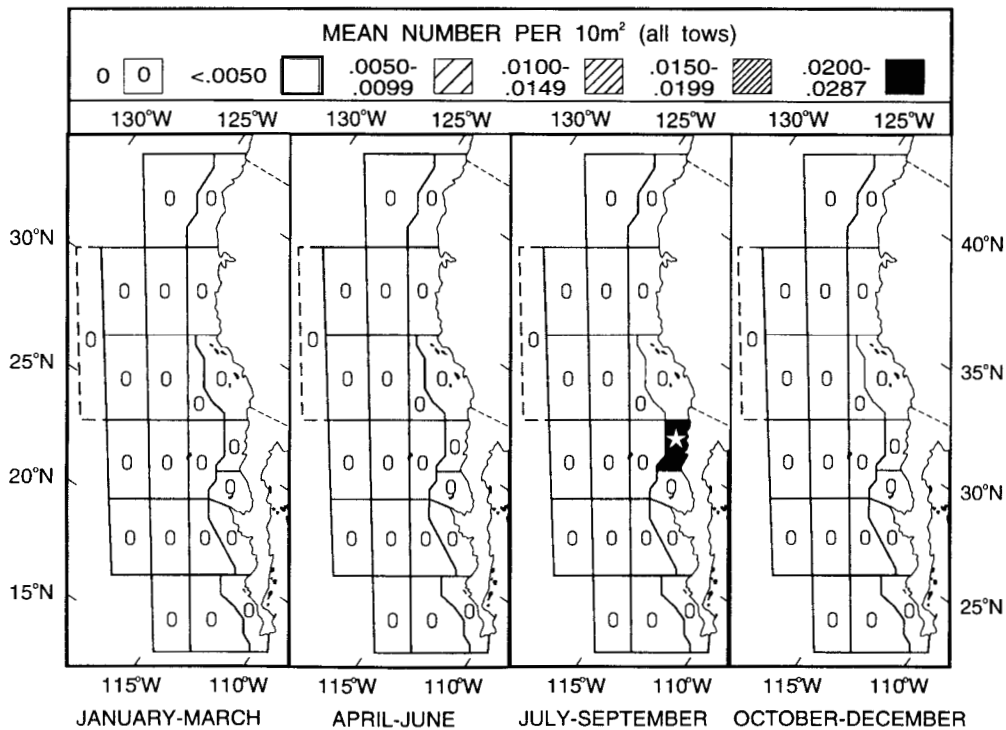
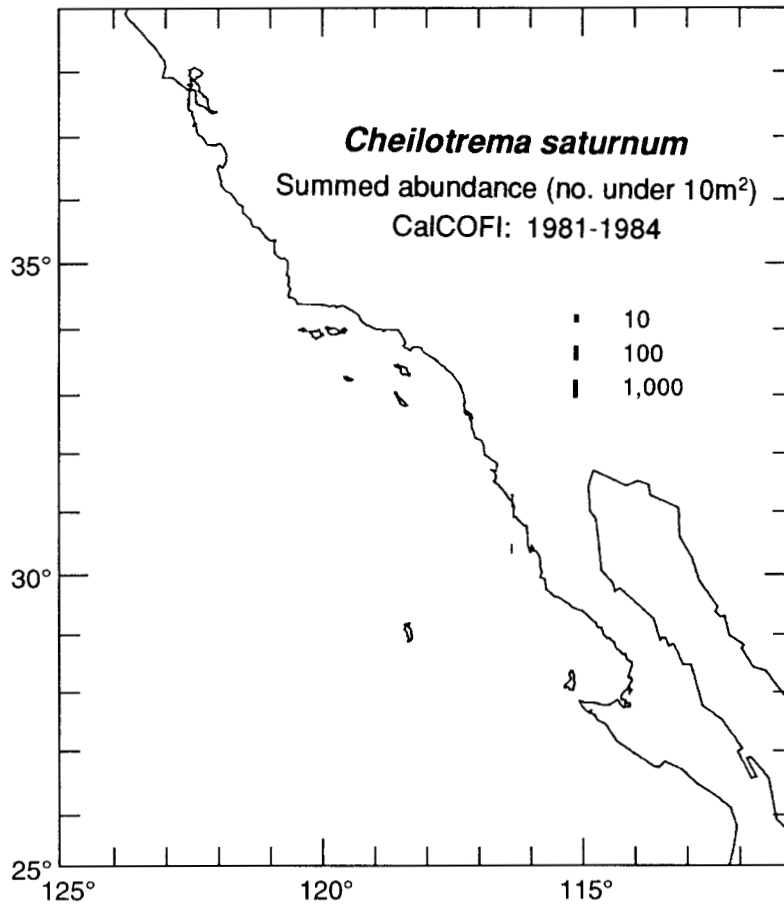
Macropinna microstoma



Cheilotrema saturnum

Black croaker

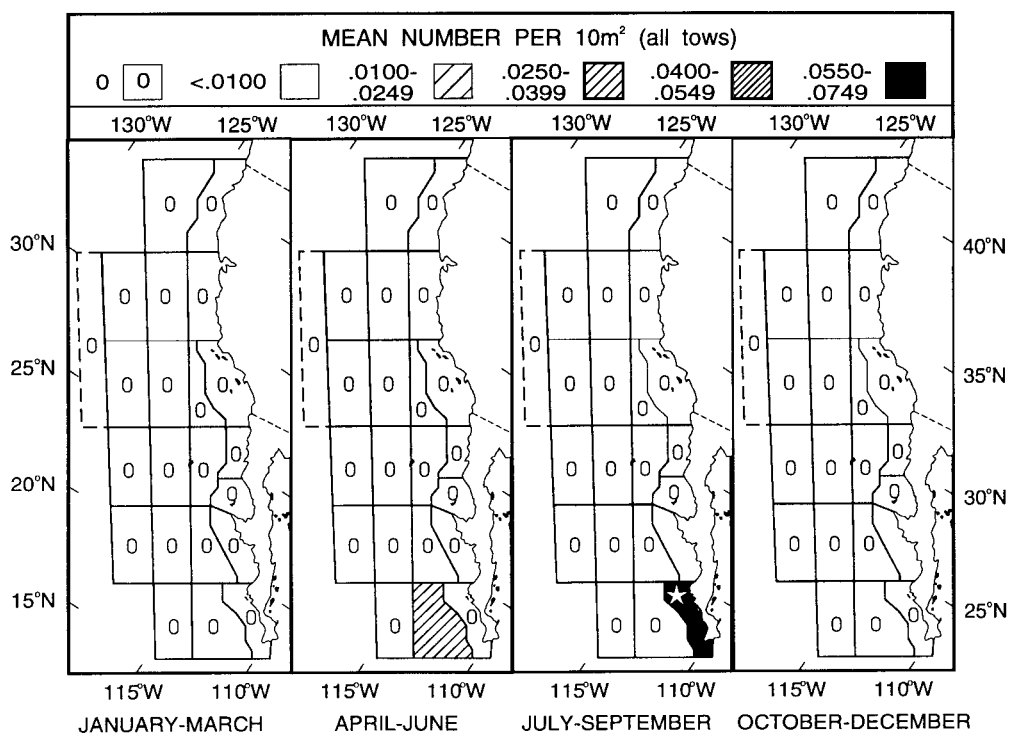
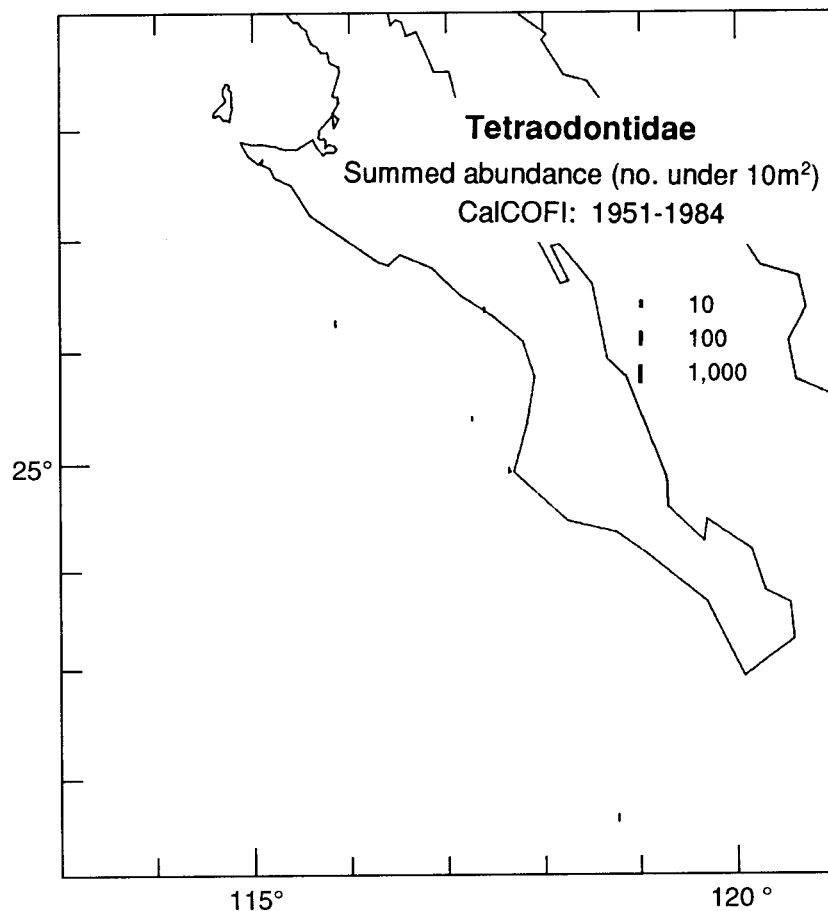
Sciaenidae



Tetraodontidae

Puffers

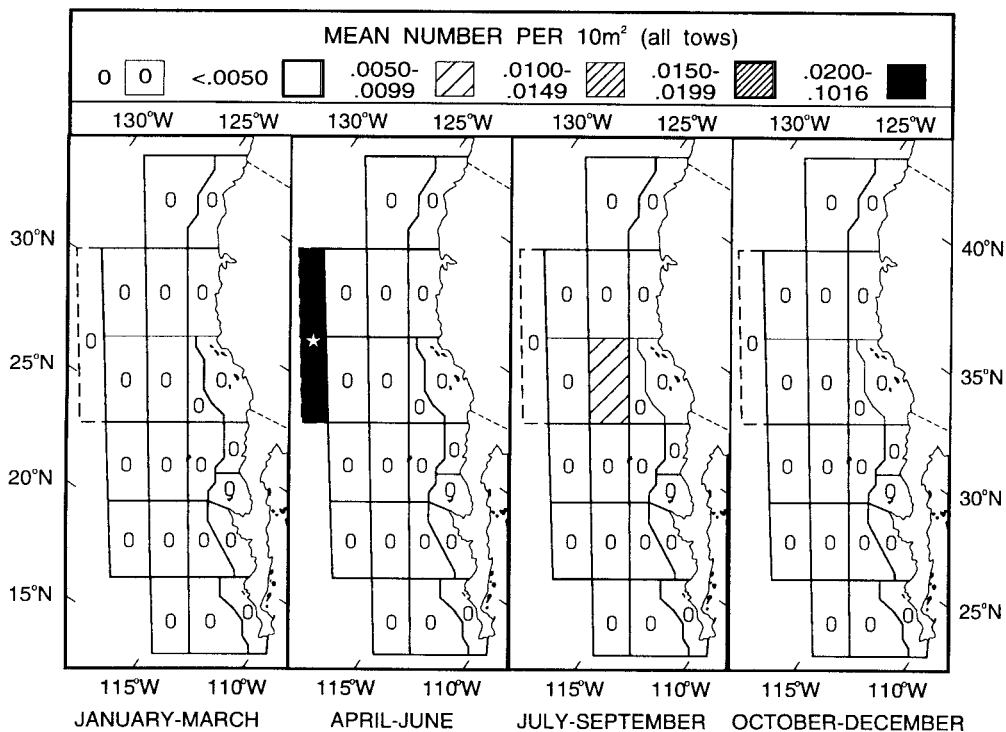
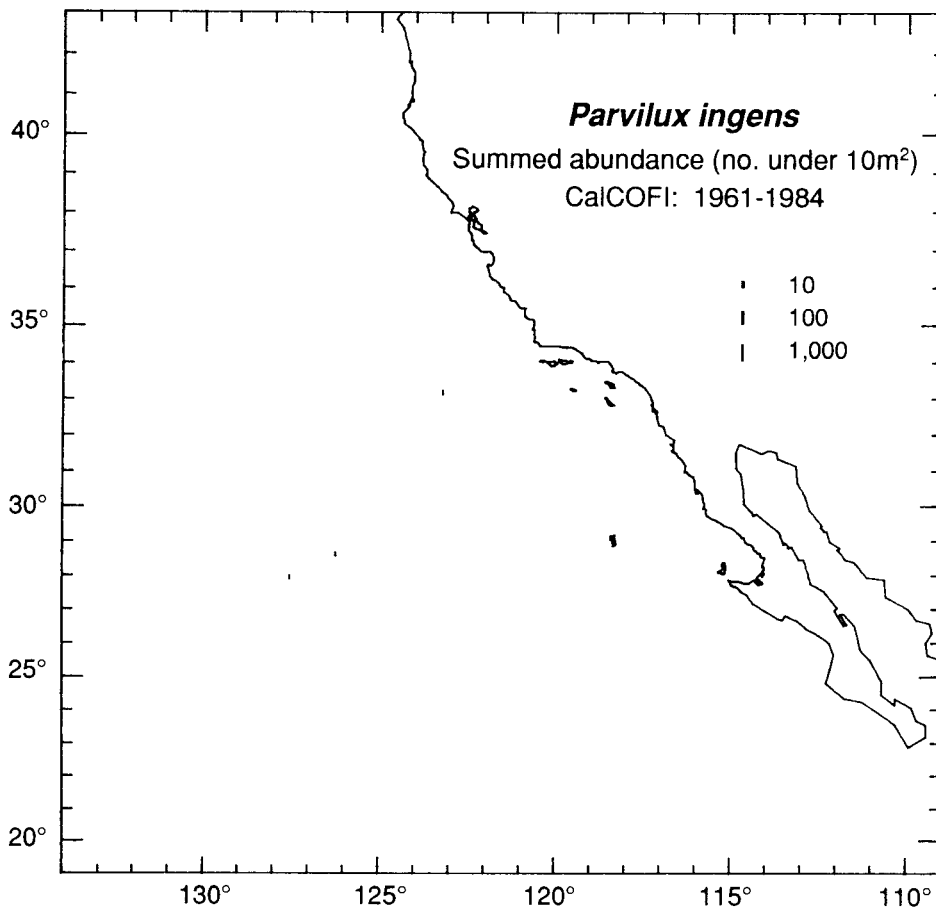
Tetraodontidae



Parvilux ingens

Giant lampfish

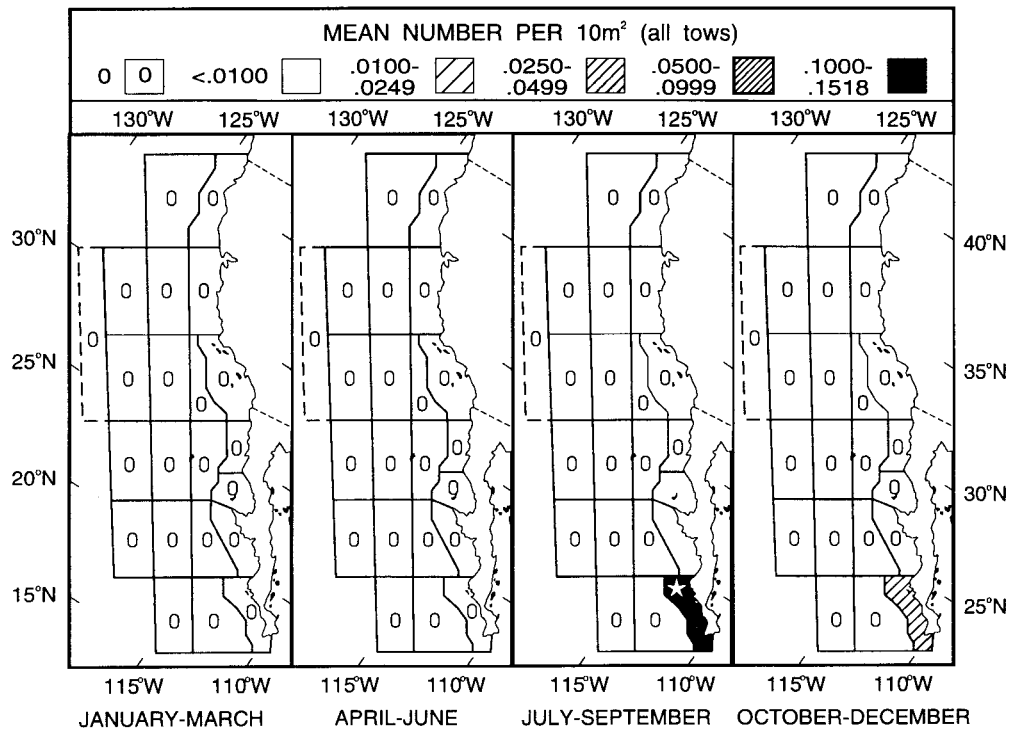
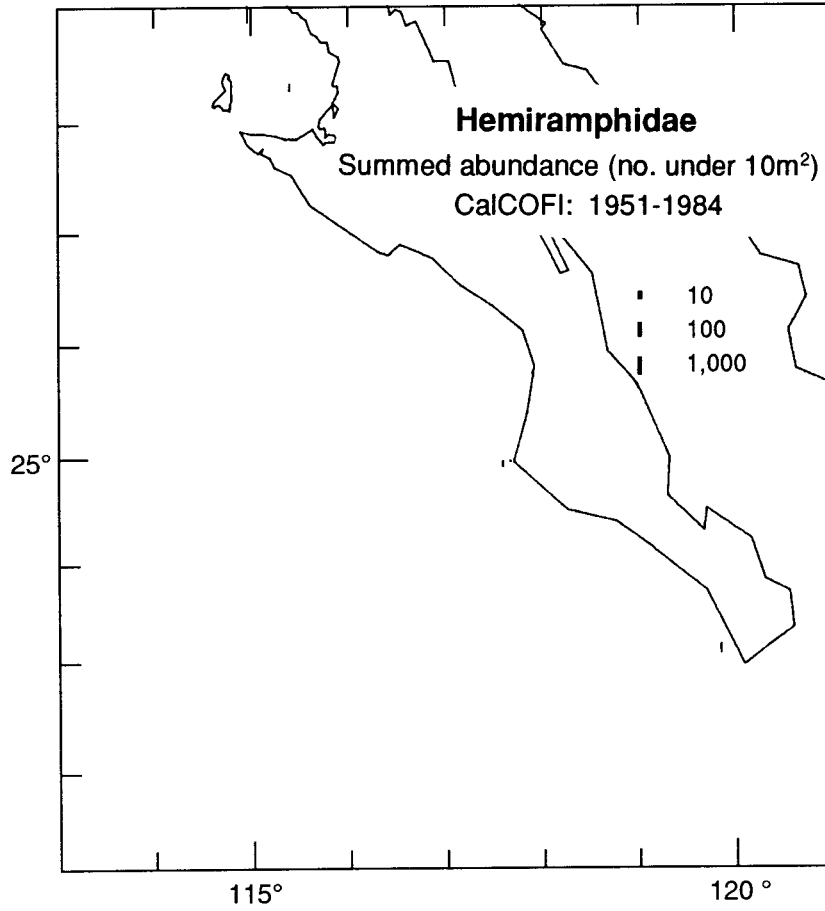
Myctophidae



Hemiramphidae

Halfbeaks

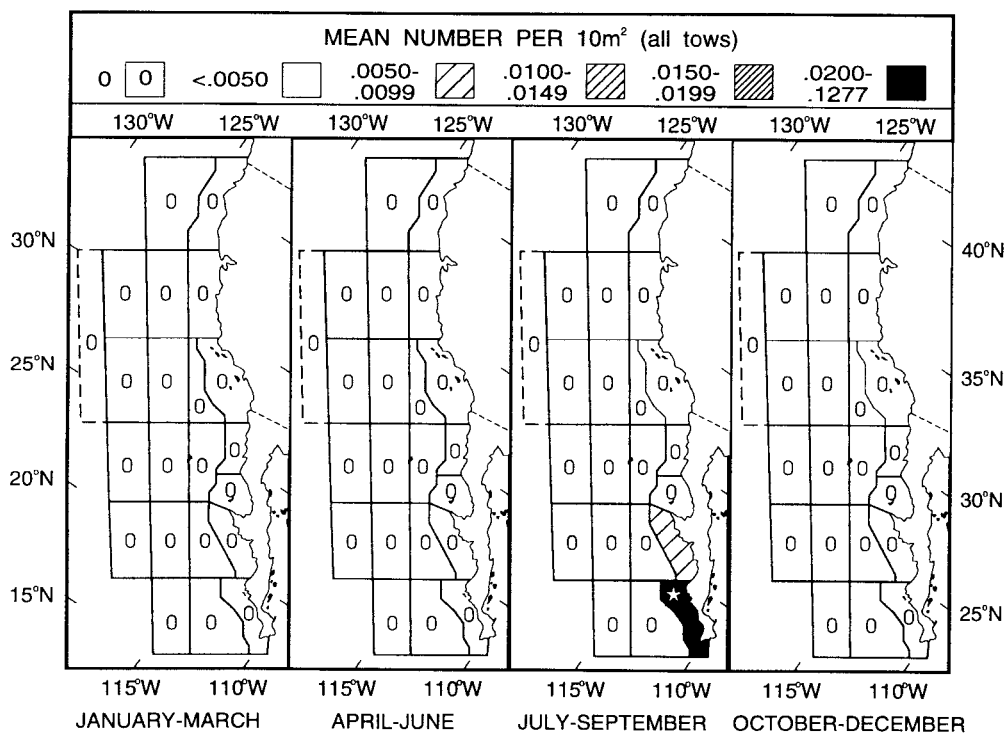
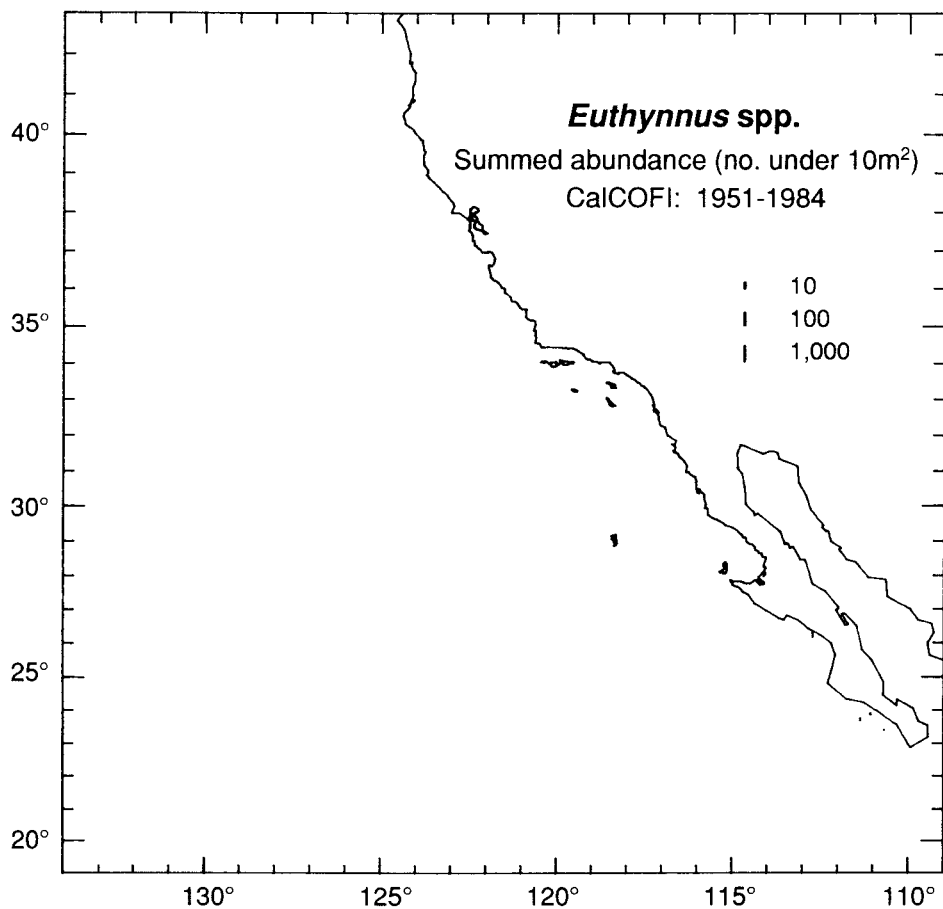
Hemiramphidae



Euthynnus spp.

Black skipjacks

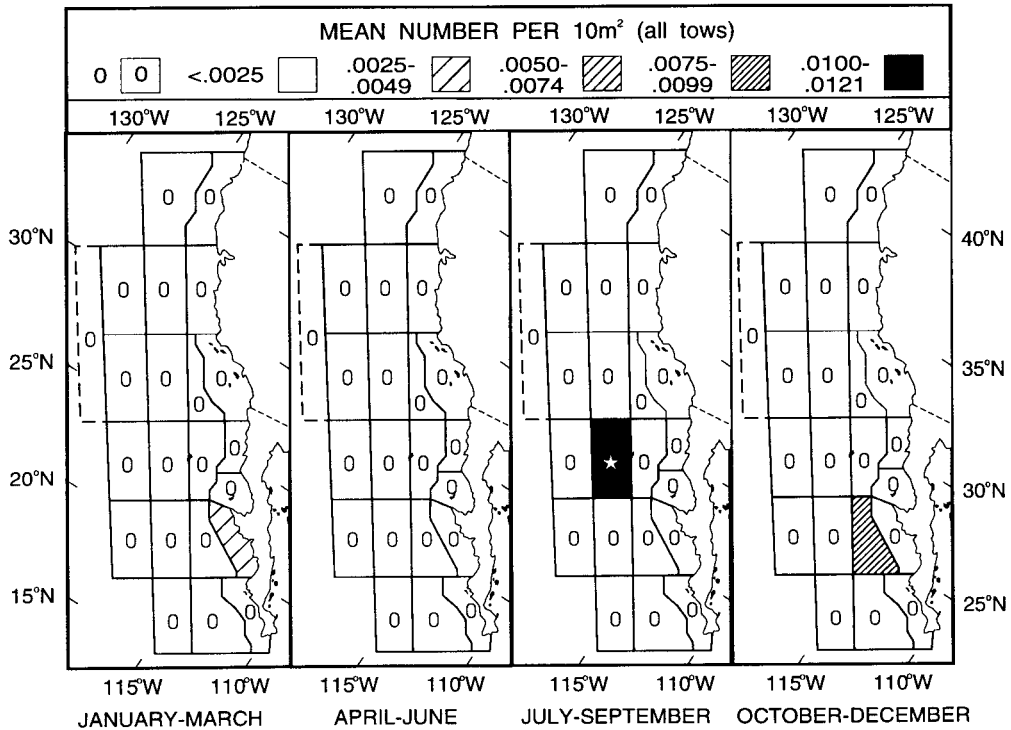
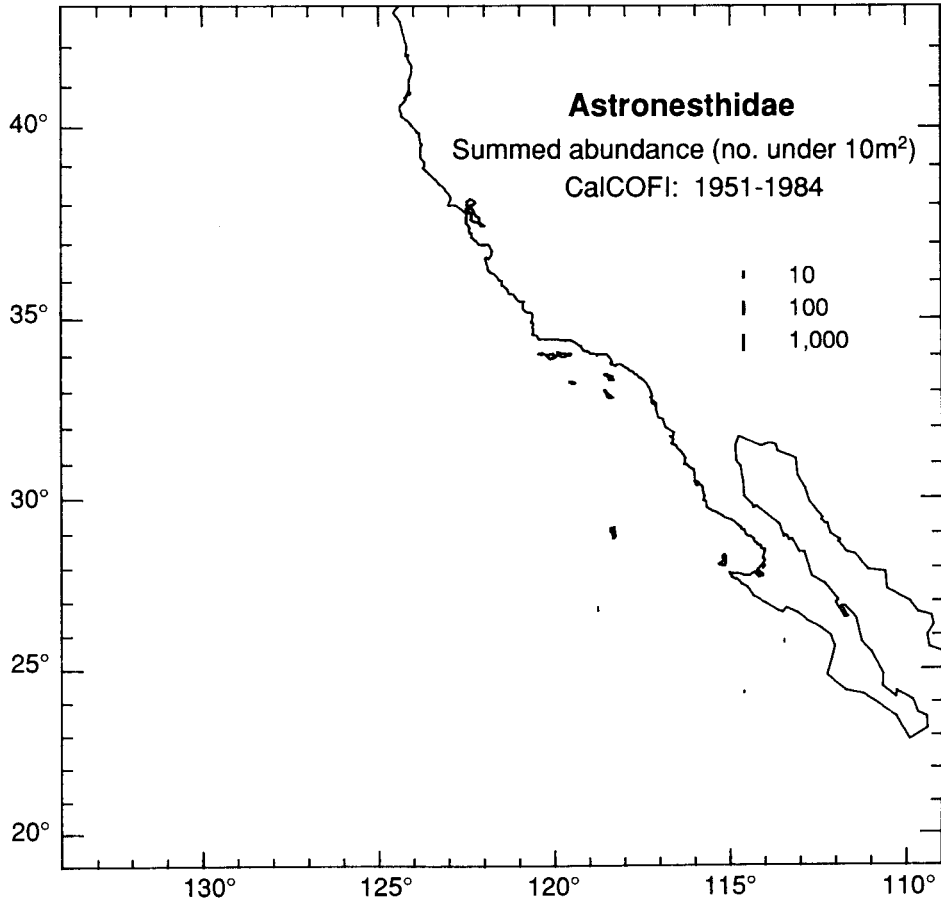
Scombridae



Astronesthidae

Snaggletooths

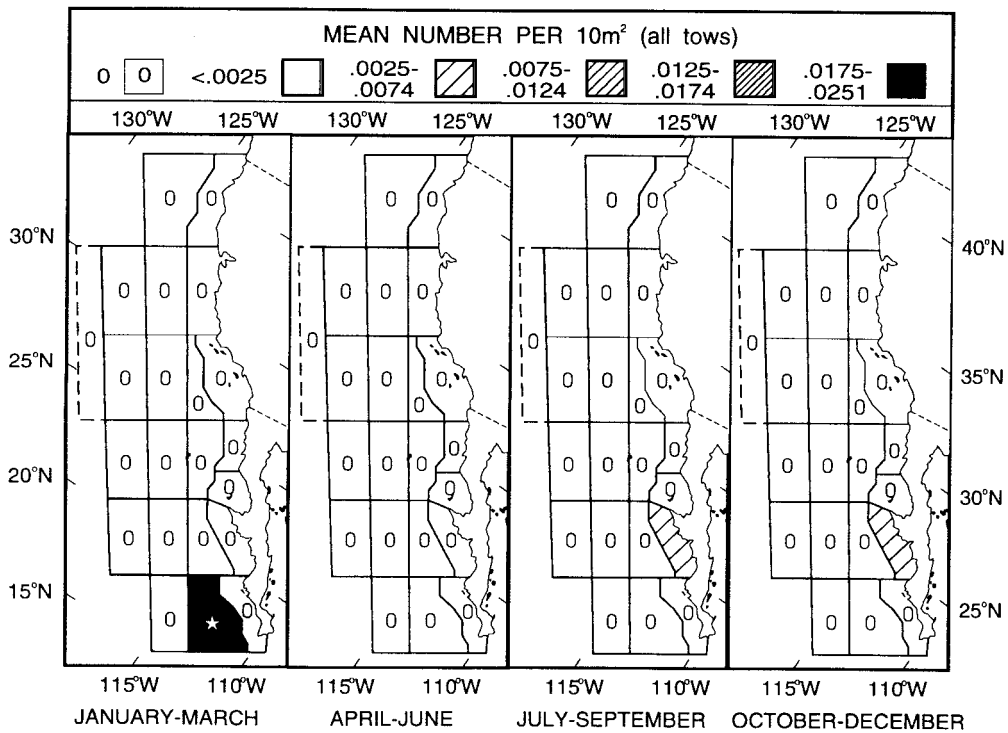
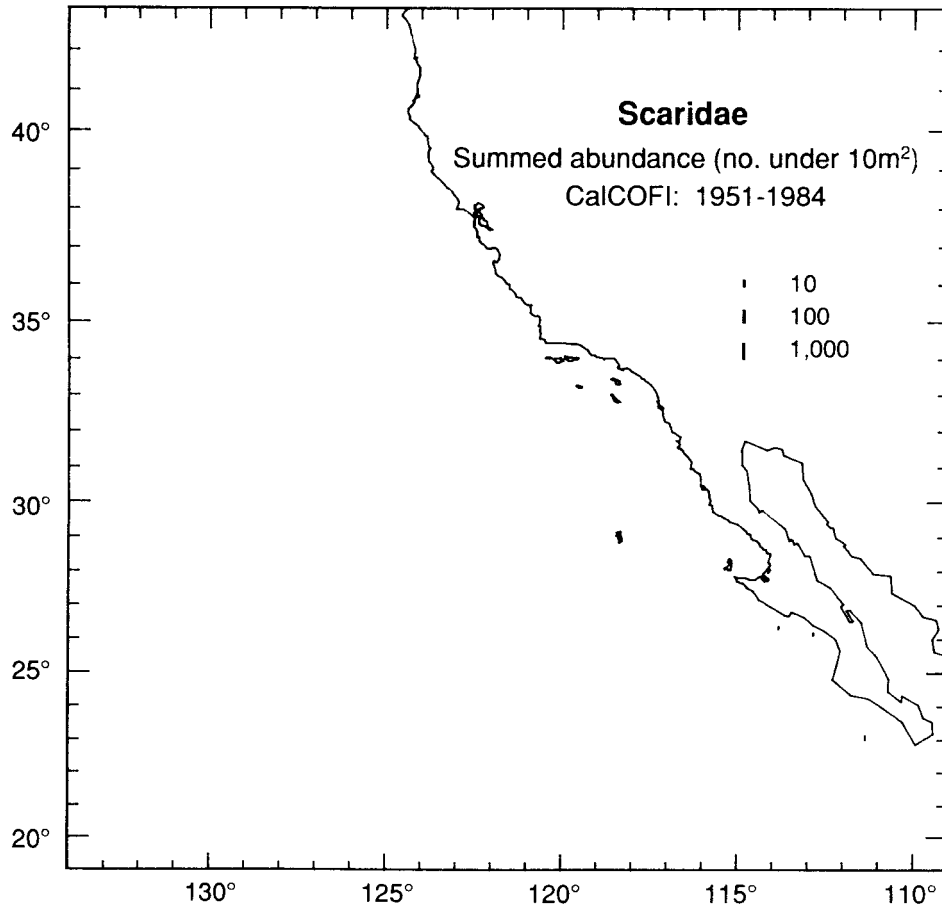
Astronesthidae



Scaridae

Parrotfishes

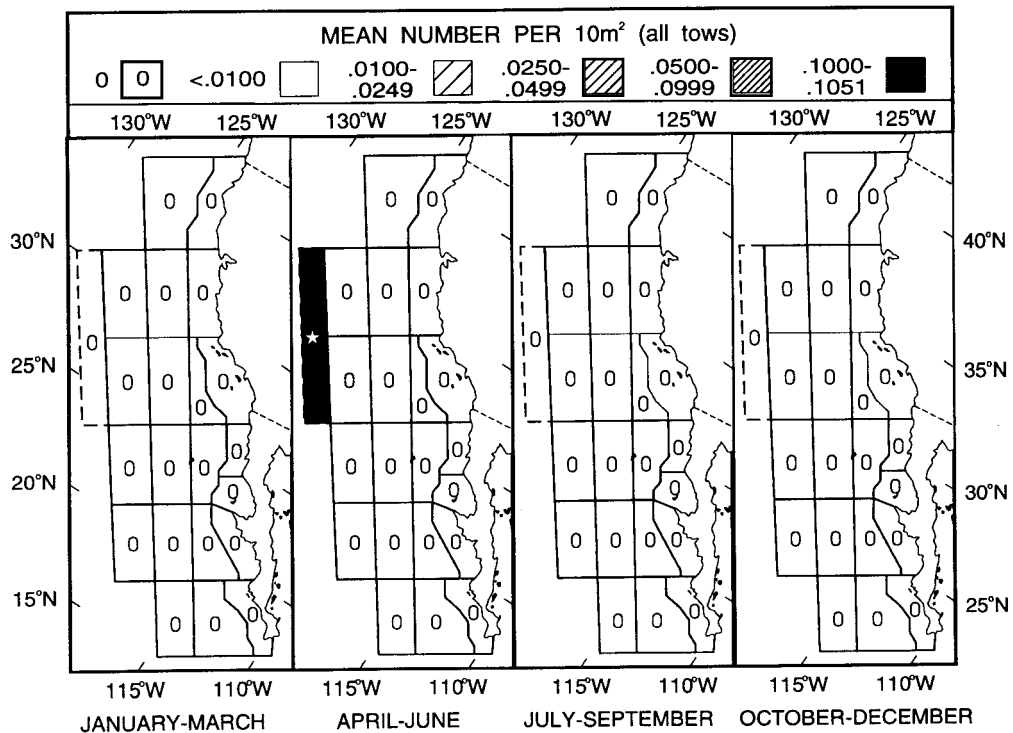
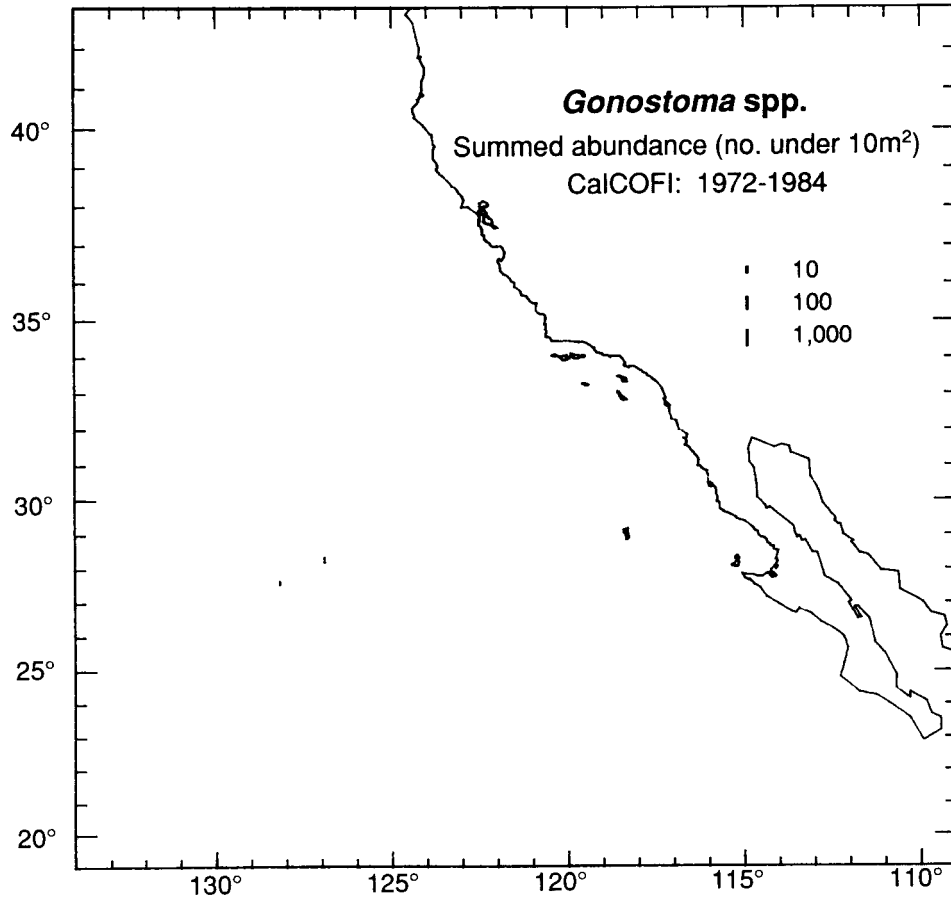
Scaridae



Gonostomatidae

Fangjaws

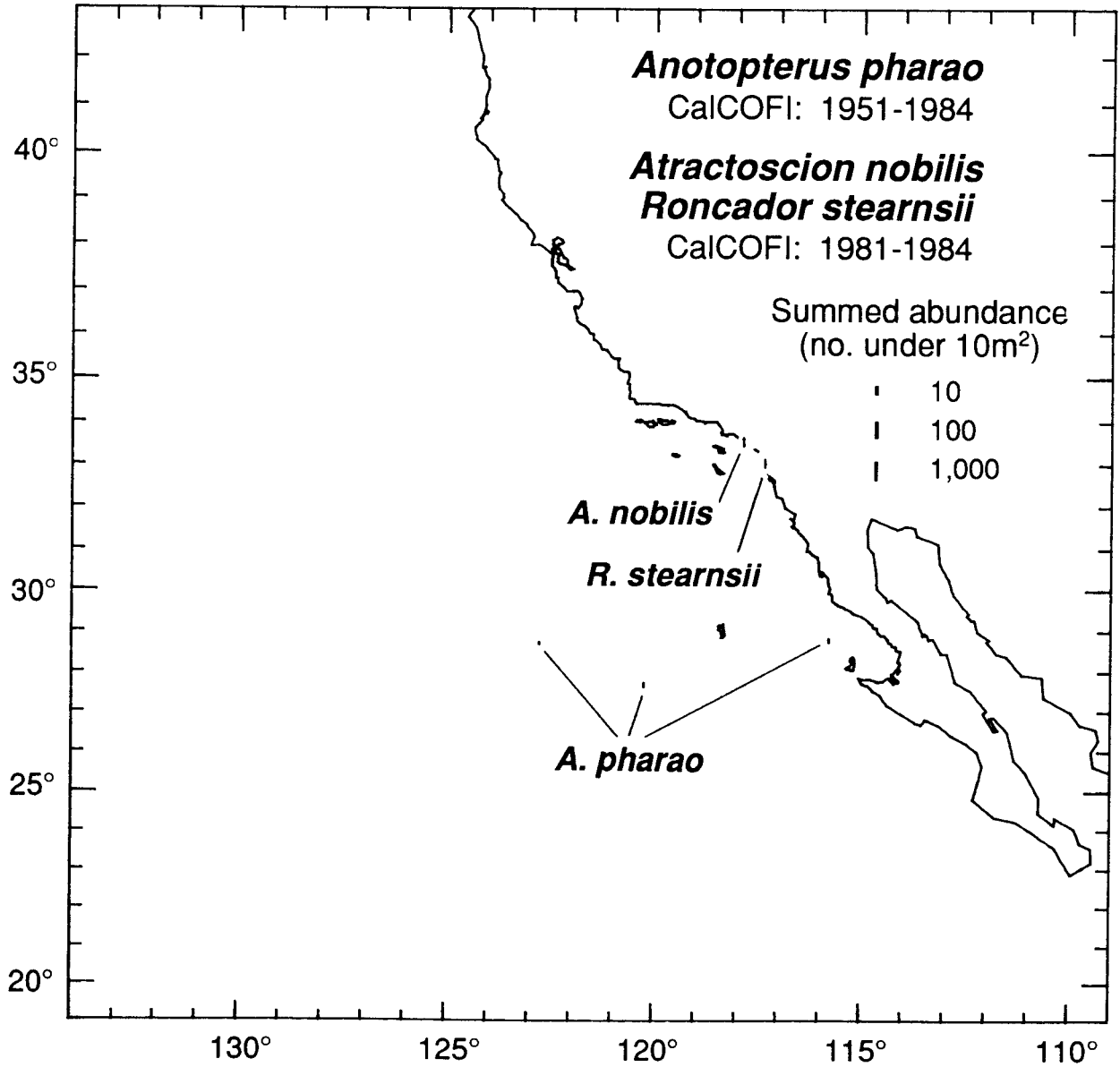
Gonostoma spp.



Anotopterus pharao
Atractoscion nobilis
Roncador stearnsii

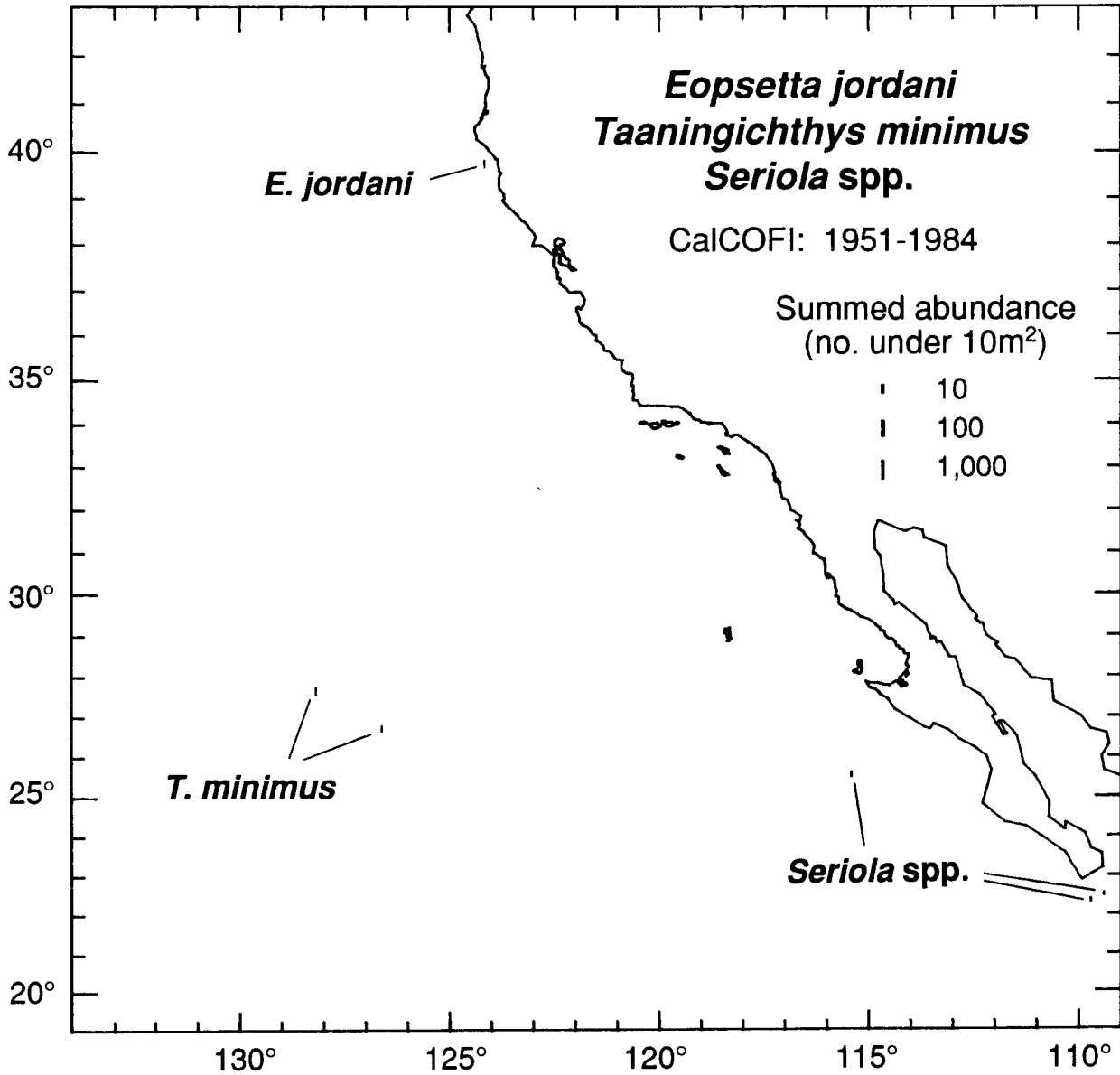
Daggertooth
 White seabass
 Spotfin croaker

Anotopteridae
Sciaenidae
Sciaenidae



Pleuronectidae Petrale sole
Myctophidae
Carangidae Amberjacks

Eopsetta jordani
Taaningichthys minimus
***Seriola* spp.**



Dolichopteryx longipes

Brownsnout spookfish

Opisthoproctidae

***Paralichthys* spp.**

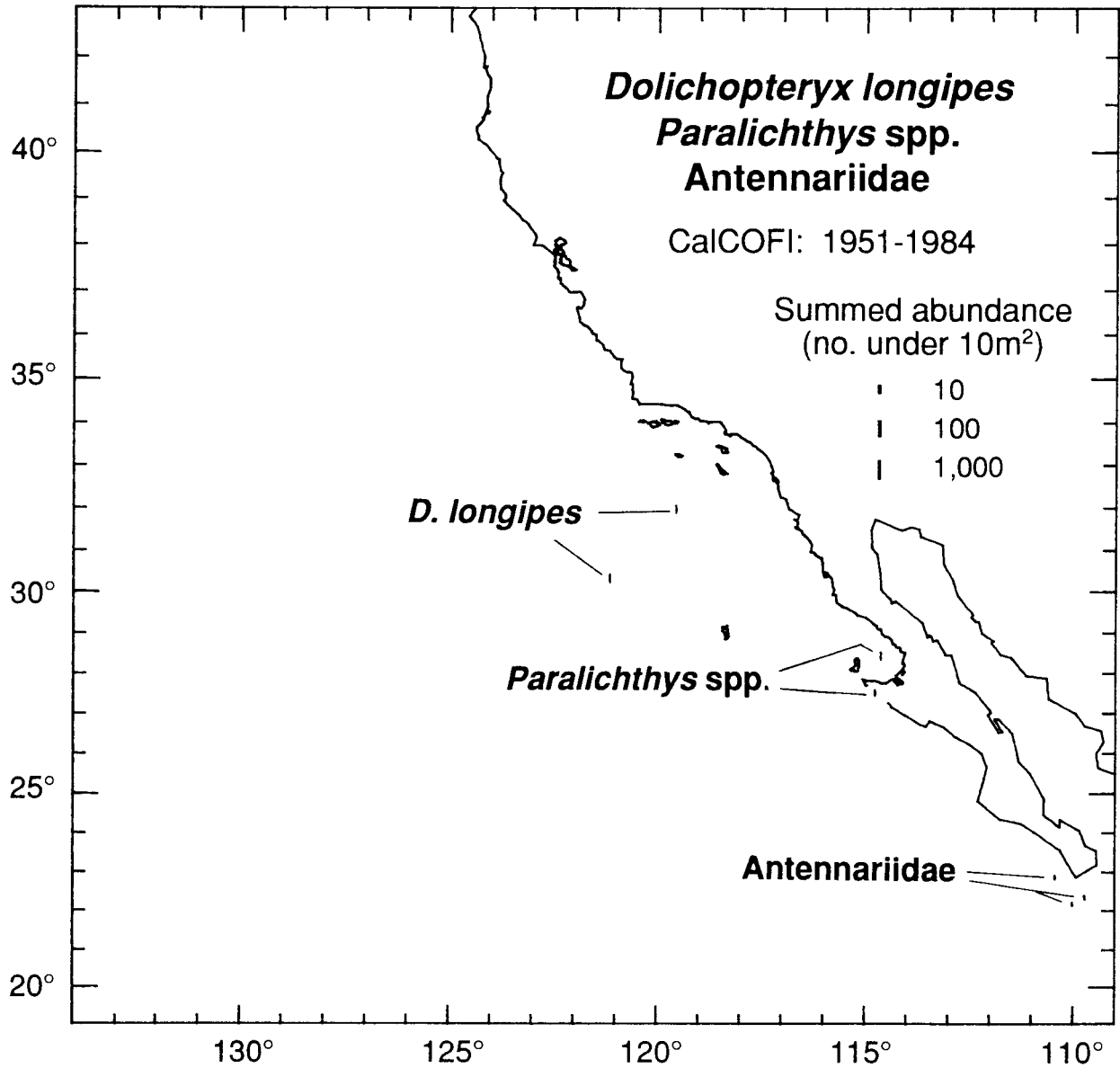
Halibuts

Paralichthyidae

Antennariidae

Frogfishes

Antennariidae



Alepocephalidae

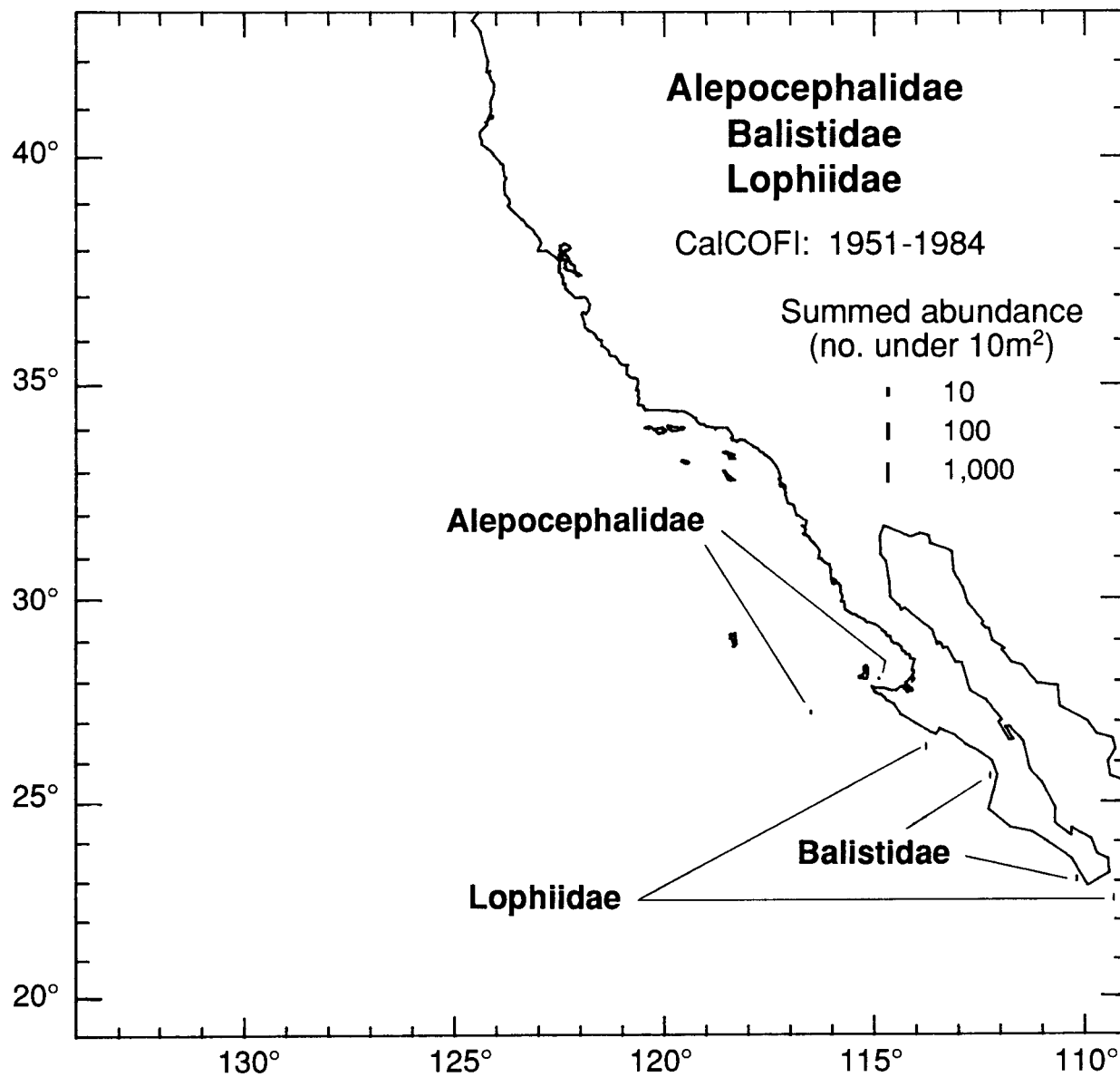
Slickheads

Alepocephalidae**Balistidae**

Triggerfishes

Balistidae**Lophiidae**

Goosefishes

Lophiidae

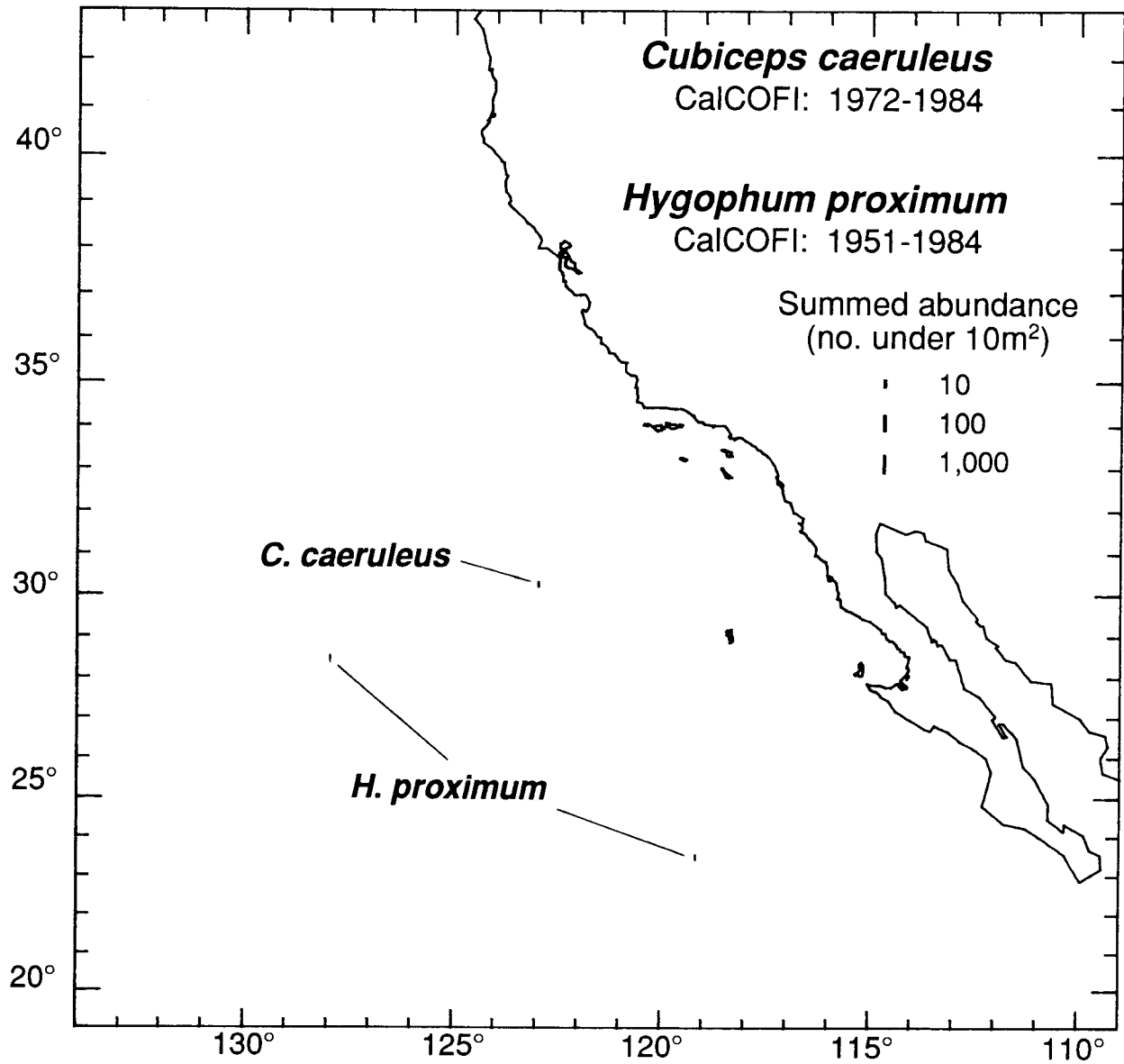
Cubiceps caeruleus

Dark blue cigarfish

Nomeidae

Hygophum proximum

Myctophidae



Gadidae

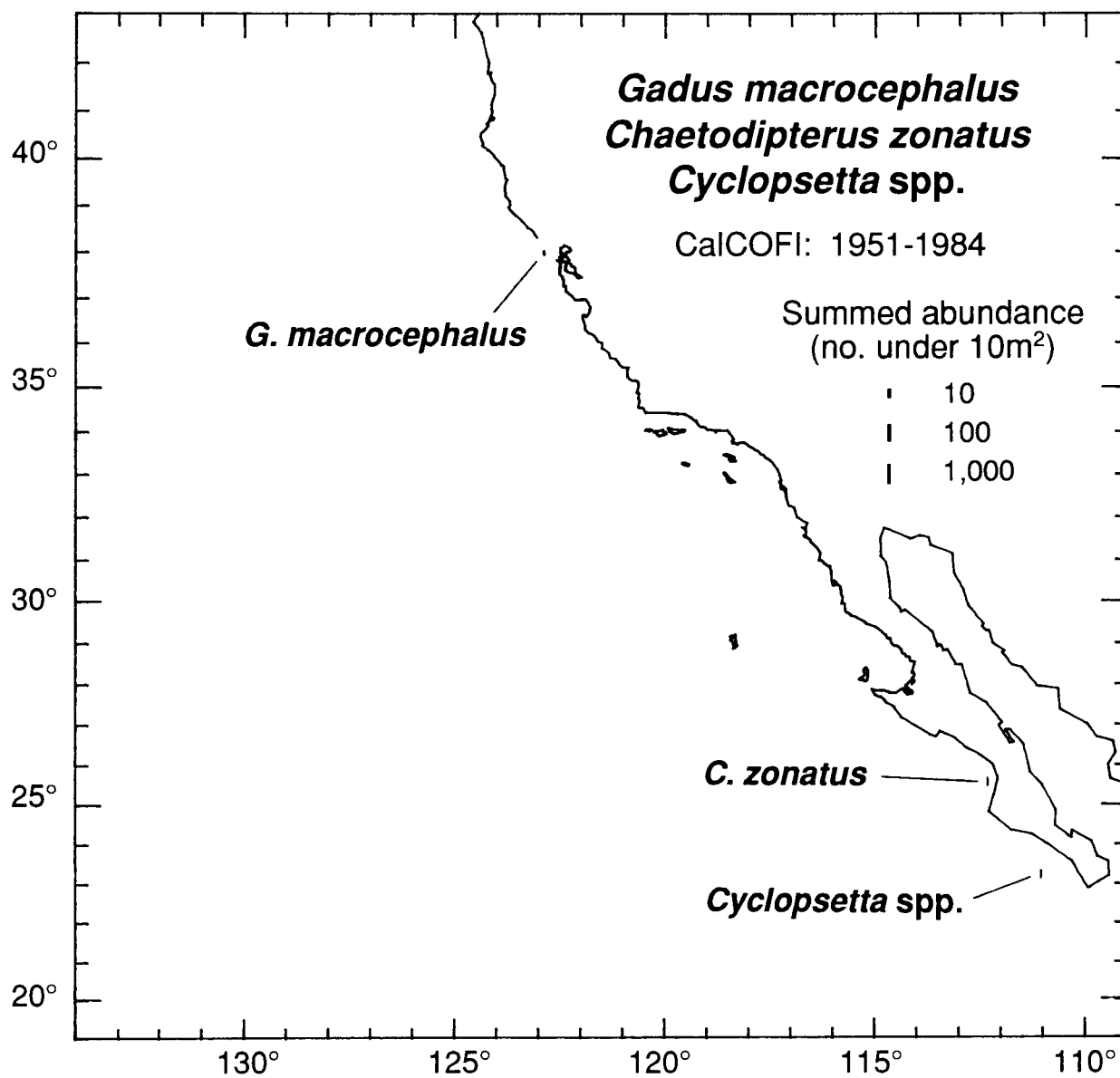
Pacific cod

Gadus macrocephalus**Ephippidae**

Pacific spadefish

Chaetodipterus zonatus**Paralichthyidae**

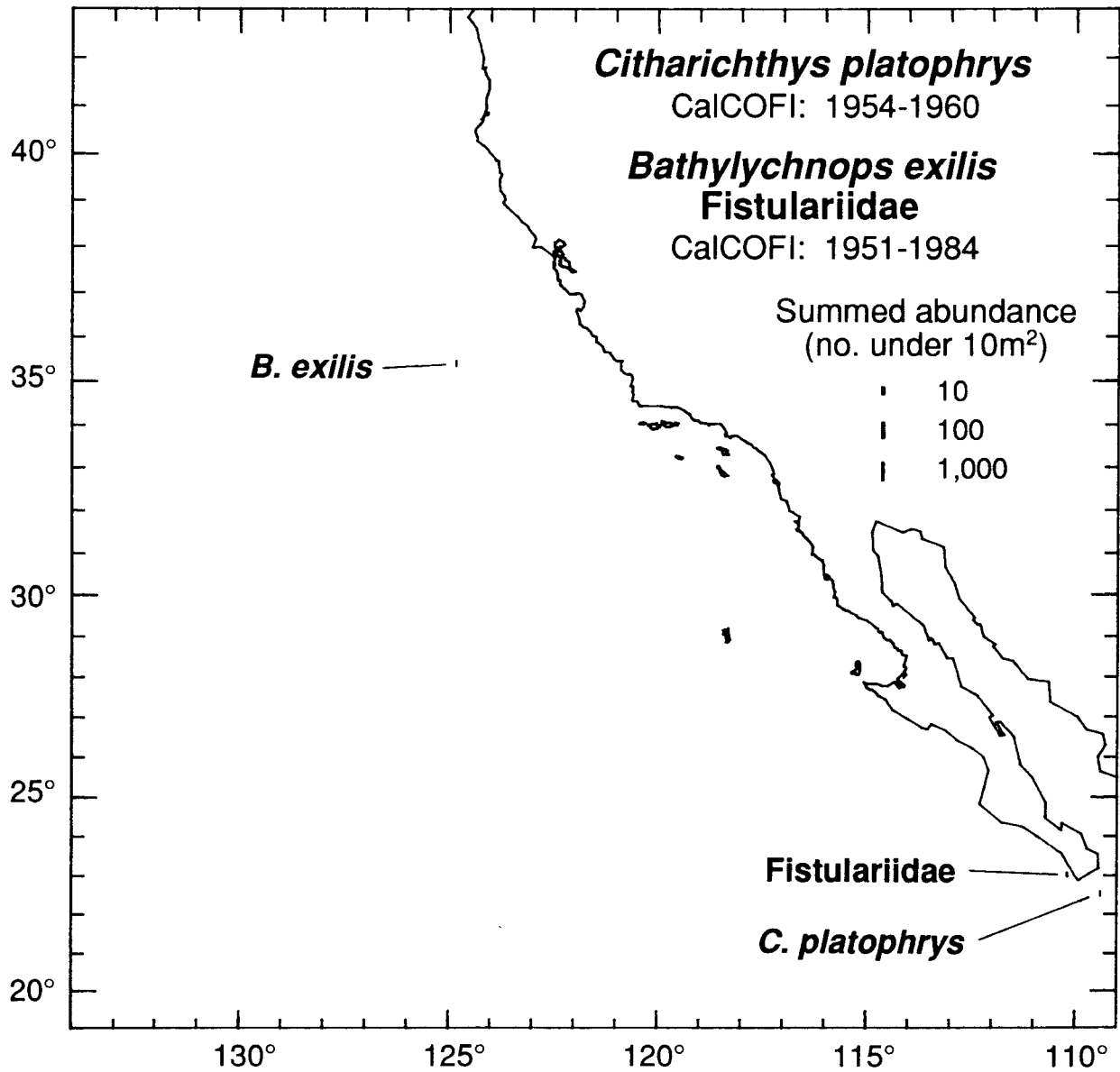
Flounders

***Cyclopsetta* spp.**

Citharichthys platophrys
Bathilychnops exilis
Fistulariidae

Broad Sanddab
 Javelin spookfish
 Cornetfishes

Paralichthyidae
Opisthoproctidae
Fistulariidae



Paralepididae

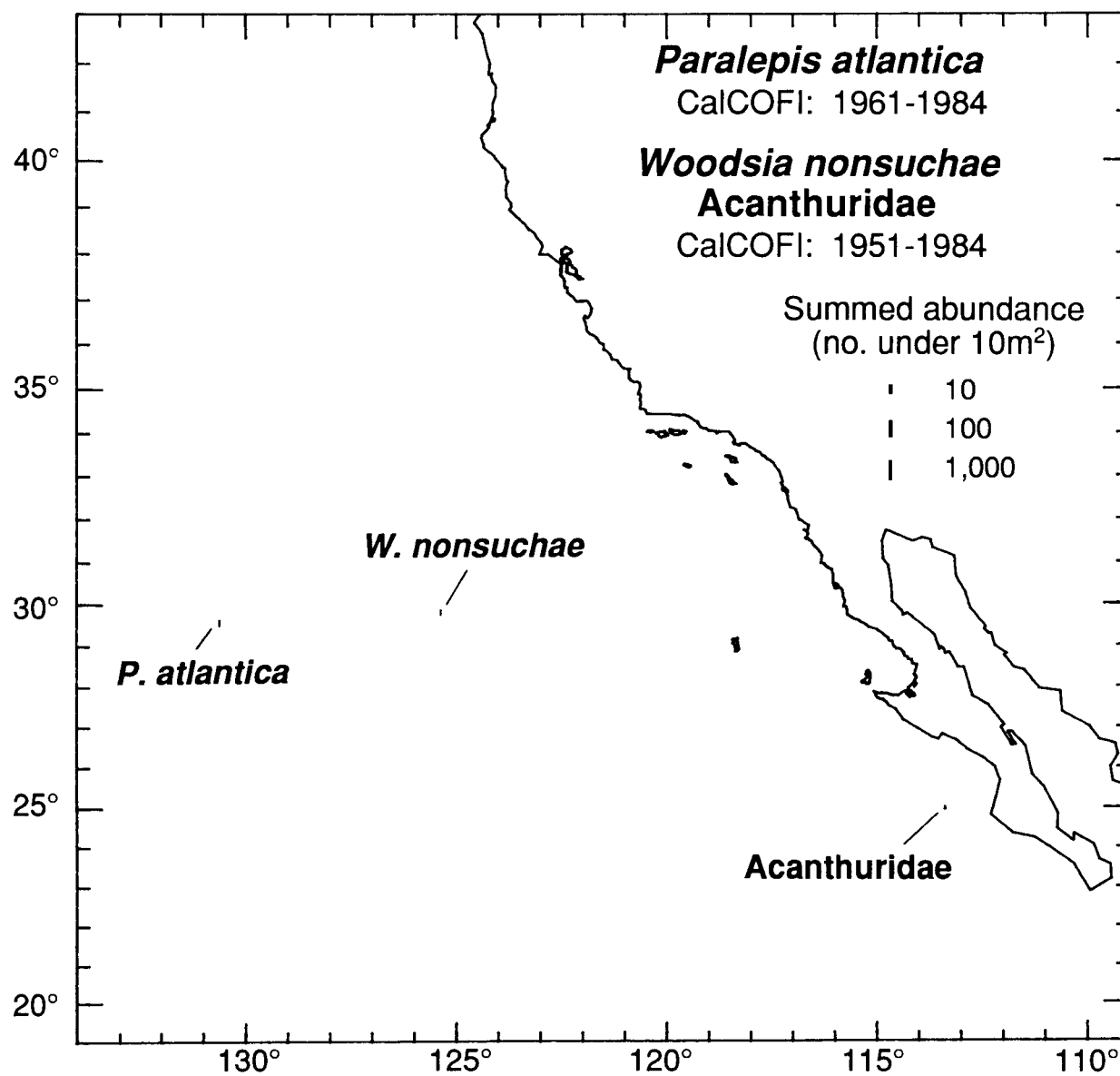
Duckbill barracudina

Paralepis atlantica**Phosichthyidae**

Bigeye lightfish

Woodsia nonsuchae**Acanthuridae**

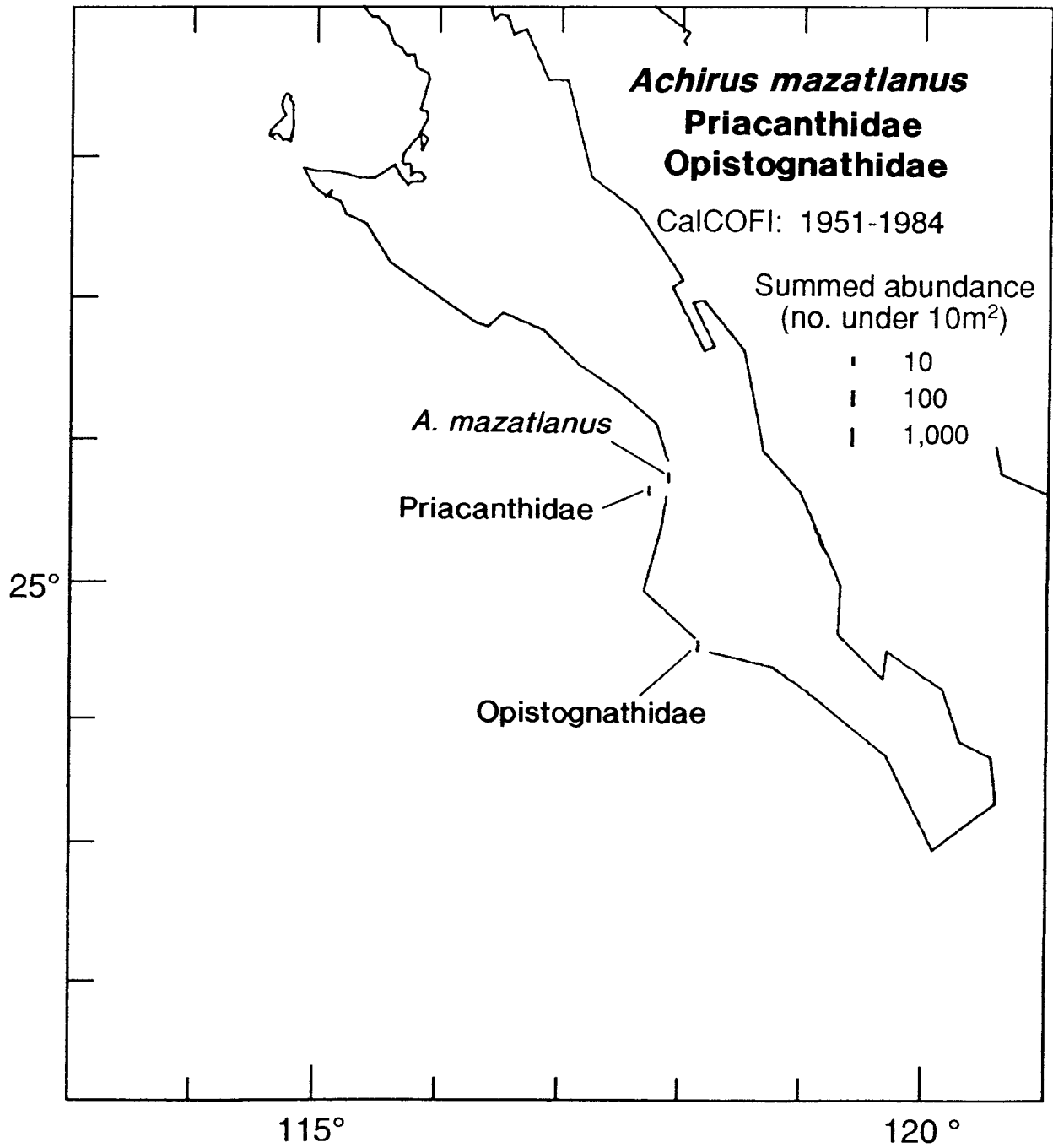
Surgeonfishes

Acanthuridae

Achirus mazatlanus
Priacanthidae
Opistognathidae

Pacific lined sole
Bigeyes
Jawfishes

Achiridae
Priacanthidae
Opistognathidae



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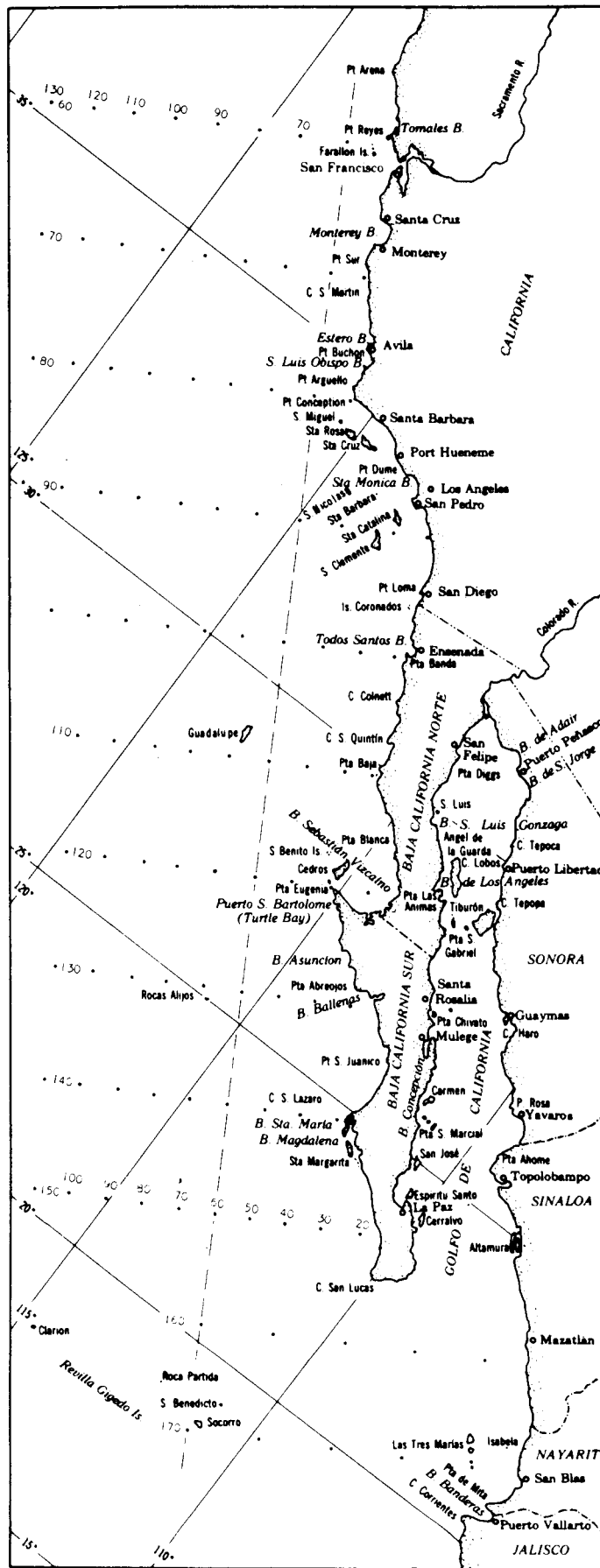
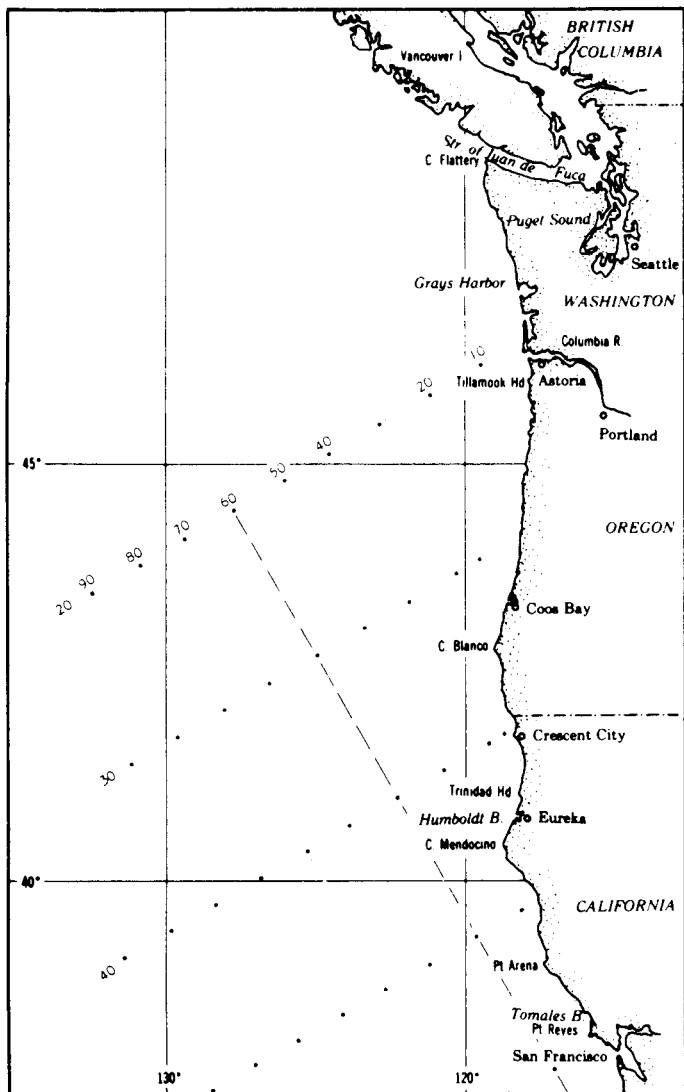
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These maps are designed to show essential details of the area most intensively studied by the California Cooperative Oceanic Fisheries Investigations. This is approximately the same area as is shown in color on the front cover. Geographical place names 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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