

NOAA Technical Memorandum NMFS



SEPTEMBER 1997

**FISHES COLLECTED BY MIDWATER TRAWLS DURING
TWO CRUISES OF THE *DAVID STARR JORDAN*
IN THE NORTHEASTERN PACIFIC OCEAN,
APRIL-JUNE AND SEPTEMBER-OCTOBER, 1972**

John L. Butler
H. Geoffrey Moser
William Watson
David A. Ambrose
Sharon R. Charter
Elaine M. Sandknop

NOAA-TM-NMFS-SWFSC-244

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

The National Oceanic and Atmospheric Administration (NOAA), organized in 1970, has evolved into an agency which establishes national policies and manages and conserves our oceanic, coastal, and atmospheric resources. An organizational element within NOAA, the Office of Fisheries is responsible for fisheries policy and the direction of the National Marine Fisheries Service (NMFS).

In addition to its formal publications, the NMFS uses the NOAA Technical Memorandum series to issue informal scientific and technical publications when complete formal review and editorial processing are not appropriate or feasible. Documents within this series, however, reflect sound professional work and may be referenced in the formal scientific and technical literature.

Inquiries regarding this report and requests for copies should be sent to:

**H. G. Moser
Southwest Fisheries Science Center
P.O. Box 271
La Jolla, CA 92038-0271**



NOAA Technical Memorandum NMFS

This TM series is used for documentation and timely communication of preliminary results, interim reports, or special purpose information. The TMs have not received complete formal review, editorial control, or detailed editing.

SEPTEMBER 1997

FISHES COLLECTED BY MIDWATER TRAWLS DURING TWO CRUISES OF THE *DAVID STARR JORDAN* IN THE NORTHEASTERN PACIFIC OCEAN, APRIL-JUNE AND SEPTEMBER-OCTOBER, 1972

John L. Butler
H. Geoffrey Moser
William Watson
David A. Ambrose
Sharon R. Charter
Elaine M. Sandknop

National Marine Fisheries Service, NOAA
Southwest Fisheries Science Center
La Jolla Laboratory
P.O. Box 271
La Jolla, California 92038-0271

NOAA-TM-NMFS-SWFSC-244

U.S. DEPARTMENT OF COMMERCE

William M. Daley, Secretary

National Oceanic and Atmospheric Administration

D. James Baker, Under Secretary for Oceans and Atmosphere

National Marine Fisheries Service

Rolland A. Schmitten, Assistant Administrator for Fisheries

CONTENTS

INTRODUCTION	1	Macrouridae	29
METHODS AND MATERIALS	2	Moridae	29
SUMMARY OF RESULTS	3	Melanonidae	29
LIST OF FISHES	3	Bythitidae	30
Albulidae	4	Linophrynidae	30
Chlopsidae	4	Scomberesocidae	30
Muraenidae	4	Exocoetidae	30
Ophichthidae	4	Radiicephalidae	30
Congridae	4	Trachipteridae	30
Derichthyidae	5	Stylephoridae	31
Nemichthyidae	5	Anoplogastridae	31
Serrivomeridae	6	Melamphaidae	31
Cyematidae	6	Cetomimidae	33
Eurypharyngidae	6	Macrurocyttidae	33
Engraulidae	7	Centriscidae	33
Bathylagidae	7	Scorpaenidae	33
Microstomatidae	7	Carangidae	33
Opisthoproctidae	8	Coryphaenidae	34
Platyproctidae	8	Caristiidae	34
Gonostomatidae	8	Howellidae	34
Sternoptychidae	10	Labridae	34
Phosichthyidae	11	Chiasmodontidae	35
Chauliodontidae	12	Gempylidae	35
Stomiidae	12	Scombridae	35
Astronesthidae	12	Trichiuridae	35
Melanostomiidae	13	Nomeidae	35
Malacosteidae	14	Paralichthyidae	36
Idiacanthidae	15	Bothidae	36
Scopelarchidae	15	Cynoglossidae	36
Notosudidae	16	Balistidae	36
Paralepididae	16	Ostraciidae	37
Anotopteridae	17	Molidae	37
Evermannellidae	17	ACKNOWLEDGEMENTS	37
Neoscopelidae	18	LITERATURE CITED	37
Myctophidae	18	TABLES	53
Bregmacerotidae	29	FIGURES	64

Fishes collected by midwater trawls during two cruises of the
David Starr Jordan in the northeastern Pacific Ocean,
April-June and September-November, 1972.

J. L. Butler, H. G. Moser, W. Watson,
D. A. Ambrose, S. R. Charter, and E. M. Sandknop

INTRODUCTION

During the spring and fall of 1972 the Coastal Fisheries Resources Division, Southwest Fisheries Science Center, conducted two multi-vessel ichthyoplankton/midwater trawl surveys (Cruises 7205-JD and 7210-JD) in a region of the eastern Pacific Ocean between 20° and 48° N latitude, from the coast westward to ca. 145° W longitude. Midwater trawling was limited to that part of the sampling pattern occupied by the *David Starr Jordan* between 20° and 31° N latitude. The major purpose of these cruises was to increase our knowledge of the limits of spawning of jack mackerel, *Trachurus symmetricus*, and Pacific saury, *Cololabis saira*. The first results from these cruises were reported by Ahlstrom and Stevens (1976) who compared catches of fish eggs and larvae taken by neuston and oblique plankton nets on 7205-JD. They showed that larvae of some fishes (e.g., Pacific saury, flying fishes) reside almost exclusively near the surface, some (e.g., bathylagid smelts, melamphoids) occur exclusively in the water column below the surface, and others (e.g., jack mackerel) occur in both habitats.

Another goal of Cruises 7205-JD and 7210-JD was to define the physical-biological environment seaward of the standard California Cooperative Oceanic Fisheries Investigations (CalCOFI) sampling pattern and, particularly, to increase our knowledge of the distribution and abundance of fish species in this region. Analysis of the adult and juvenile fishes from the midwater trawl catches is a necessary prerequisite to work on the ichthyoplankton, since the larvae of many groups of fishes in this region are poorly known. The trawl catches provide information on the species composition, relative abundance, and distribution of juveniles and adults and, also, transformation specimens that link larvae and adults and allow the completion of ontogenetic series. This report presents preliminary results of the midwater trawling conducted on these cruises.

Much of what we know about the species composition, relative abundance, and zoogeography of midwater fishes in the northeastern Pacific is derived from midwater trawling surveys conducted in the California Current region and in adjoining water masses. Aron (1962) analyzed catches from >500 midwater trawls taken on three cruises from the Gulf of Alaska to the subarctic-transitional waters of the northern and central California Current region. Percy (1964) and collaborators (Percy and Laurs, 1965; Percy et al., 1977; Willis and Percy, 1982) contributed much information on the distribution and ecology of midwater fishes off the coasts of Oregon and Washington. Berry and Perkins (1966) employed four types of midwater trawls on their surveys that occupied ca. 200 stations in the CalCOFI survey area from San Francisco to southern Baja California. Ebeling et al. (1970) described the composition and distribution of midwater fishes in the deep-water basins off southern California and Paxton (1967) provided a distributional analysis of lanternfishes that occur in these basins. Three studies (Lavenberg and Fitch, 1966; Robison, 1972; Brewer, 1973) characterized the distributions of midwater fish species in the Gulf of California and adjoining waters of the eastern tropical Pacific. Moser et al. (1993, 1994) presented summaries of the distribution and relative abundance of larvae of midwater fishes of the California Current region. Our knowledge of the midwater fishes to the south and to the west of the CalCOFI survey area is derived from numerous surveys, beginning with Garman's (1899) expedition. Subsequent surveys

(Beebe and Vander Pyle, 1944; King and Iverson, 1962; Ahlstrom, 1971, 1972; Barnett, 1983, 1984; Clarke, 1973, 1974, 1983, 1987; Clarke and Wagner, 1976; Hartman and Clarke, 1974; Loeb, 1979, 1980) have expanded our knowledge of the distribution of midwater fishes in these regions. Several broad-scale zoogeographic analyses (Parin, 1961; Ebeling, 1962, 1967; Johnson, 1974, 1982; Willis, 1984; Willis et al., 1988) of north Pacific midwater fishes reveal distinctive faunal boundaries delimiting subarctic, transitional, central, and equatorial faunal groups.

METHODS AND MATERIALS

Two types of midwater trawls were used on 7205-JD and 7210-JD: a 6-foot (1.8m) Isaacs-Kidd Midwater Trawl (IK) and a 95-foot (30m) Universal Mark II Midwater Trawl (MT). The IK (Isaacs and Kidd, 1953) was fitted with 2 mm mesh throughout. The MT was somewhat modified from the original design (Jurkovitch, 1968). The wings and body were made of 5-inch (12.7cm) stretch mesh with No. 21 thread. The cod end was 3.5-inch (8.9cm) stretch mesh with No. 36 thread and lined with 4 mm mesh. The net was towed with 4.5 × 7.5 foot (1.4 × 2.3m) "V" doors.

A total of 32 oblique midwater trawls was taken on 19 stations on 7205-JD, from April 21 to June 3, 1972 (Fig. 1; Table 1). Most of the stations were located on latitudinal transects extending westward from the CalCOFI lines, which generally are oriented at right angles to the coastline. Four stations were within the CalCOFI grid; the numbers for these inshore stations are those of the CalCOFI pattern, with the line number given first, followed by a dot and the station number (Kramer et al., 1972). CalCOFI station numbers for the Gulf of California include a "G" after the survey line number. The numbers for the offshore stations were derived from the latitude and longitude of the station, with the latitude given first, followed by a dot and the longitude. At each trawl station, an IK was taken with a maximum of 600mwo (mwo=m of towing cable payed out). At station 31.145 the shallow IK was made with 650mwo. On 12 of the stations, a deeper tow (1000mwo) was made, either with the IK (4 tows) or the MT (8 tows). All trawls were double oblique tows at a ship speed of 3.5 knots (1.8 m/s). Trawl depth was measured with a time-depth recorder and indicated an average maximum depth of 212.1m (range=190-320m; sd=34.0m) for the 600mwo tows. The time-depth recorder malfunctioned on the deep tows on Cruise 7205.

On 7210-JD, a total of 43 oblique trawls was taken on 24 stations from September 29 to November 17, 1972 (Fig. 1; Table 2). Eight stations were within the CalCOFI grid and 16 were on the extended transect lines. At each trawl station, an IK was taken with 600mwo and on 17 of the stations a MT trawl was made with 1000mwo. Station 22.143 had only a 1000mwo MT trawl and the deep tow on station 27.143 was made with an IK. The deep MT tow at station 24.143 had 1200mwo. Average maximum trawl depth was 227.5m (range=183-283m; sd=34.0m) for the 600mwo tows and 426.9m (range=317-610m; sd=67.7m) for the 1000mwo tows. On both cruises, average fishing time per tow was 43.5 min (range=33-45 min; sd=1.8 min) for the 600 m tows and 74.1 min (range=42-88 min; sd=9.8 min) for the 1000m tows. Trawls were taken at night on both cruises, except for a few trawls taken at dusk.

A number of comprehensive taxonomic papers and guides were helpful in the identification of the specimens from the two survey cruises (Allen and Robertson, 1994; Eschmeyer et al., 1983; Fischer et al., 1995; Fitch and Lavenberg, 1968; Garman, 1899; Masuda et al., 1984; Matarese et al., 1989; Miller and Lea, 1972; Moser, 1996a; Okiyama, 1988; Ozawa, 1986a; Smith and Heemstra, 1986; Whitehead et al., 1984, 1986). In addition to these general works, other more circumscribed taxonomic publications were useful. The pertinent papers for identification of taxa within a particular family are listed under each family heading in the species list. Explanations or remarks referring to unresolved taxonomic problems are placed below each taxon in the species list.

SUMMARY OF RESULTS

Approximately 224 species of fishes were collected on the two cruises (Table 3). The number cannot be determined exactly because of the uncertain identification of some forms. The family Myctophidae accounted for a fourth of the total number of species with 55 species. Next were the Melanostomiidae with ca. 13 species and the Gonostomatidae with 11 species. Following these were Congridae and Melamphidae with 9 species, Sternoptychidae and Scopelarchidae with 8, and Paralepididae with 7. The most speciose genera were in the Myctophidae with *Diaphus* represented by at least 12 species and *Lampanyctus* by 8 species.

Approximately 23,930 specimens were collected by 48 IK and 27 MT trawls (Table 3). The family Myctophidae was the most abundant with 12,357 specimens, representing 52% of the total. Next were the Phosichthyidae with 4,848 (20%) and the Gonostomatidae with 4,805 specimens (20%). The next most abundant was the Sternoptychidae with 736 specimens (3%). These four families accounted for 95% of all specimens taken by the trawls. The five most abundant species were *Vinciguerrria lucetia* (3,335 specimens), *Cyclothone acclinidens* (2,278), *Ceratoscopelus townsendi* (1,765), *Diogenichthys atlanticus* (1,614), and *Notolychnus valdiviae* (1,377). These five species represented ca. 43% of all specimens collected. The next five most abundant species were: *Vinciguerrria nimbaria* (1,155), *Triphoturus mexicanus* (993), *Ceratoscopelus warmingii* (964), *Bolinichthys longipes* (786), and *Diogenichthys laternatus* (639). These 10 top-ranking species contributed ca. 62% of all specimens, while representing only ca. 5% of the total species complement. In contrast, about half (ca. 111) of the species were represented by five or fewer specimens and one-quarter (ca. 53) of the species were represented by a single specimen.

Comparison of the IK and the MT trawls is complicated by the much larger mouth and mesh size of the latter. On 7210-JD, 16 sample pairs were taken. The MT trawls fished to an average depth of 430m and filtered an average of 1,045,500m³ of water whereas the IK fished to an average depth of 234m and filtered an average of 9,830m³. The MT collected an average of 0.74 fish per 10m³ whereas the IK collected an average of 3.96 fish per 10m³. The smaller catch rate of the MT can be attributed to the escapement of small fish through the larger mesh. No relation was found between the number of fish collected by each trawl at the same station. In spite of the lower catch rate per volume of water filtered, the larger samples and larger sizes of fish collected by this net make it a valuable survey tool.

LIST OF FISHES

The fishes collected on this survey follow in phylogenetic order according to the classification in Eschmeyer (1990). Taxa are listed alphabetically within families. Data for each species are presented in the following order: cruise; station number; type of gear (IK=6-foot Isaacs-Kidd Midwater Trawl; MT=Universal Mark-II Midwater Trawl); the number of specimens, shown in parentheses; and the size range. Specimens captured on the CalCOFI survey pattern are listed first, followed by stations on the offshore transects. The distributions of several species are shown on a single figure to reduce the number of figures. Generally, the sequence of figures follows the sequence of species; however, in many cases, non-sequential species were grouped to reduce the total number of figures. All specimens will be deposited in the Marine Vertebrates Collection of the Scripps Institution of Oceanography.

ALBULIFORMES

Albulidae

Albula sp. (Fig. 2)

7210, 157G.25, IK, (1) 45mm; 157G.55, IK, (1) 45mm.

Reference: Charter and Moser (1996a)

ANGUILLIFORMES

Chlopsidae

Chlopsis spp. (Fig. 2)

7210, 157G.25, IK, (10) 33-55mm; 23.108, IK, (8) 31-58mm.

Reference: Smith (1989a)

Muraenidae

Gymnothorax mordax (Ayres) (Fig. 2)

7210, 23.108, IK, (2) 30-44mm.

Reference: Charter and Moser (1996b)

Ophichthidae

Myrophis vafer Jordan and Gilbert (Fig. 2)

7210, 157G.25, IK, (7) 42-77mm; 157G.55, IK, (7) 56-72mm; 23.108, IK, (21) 56-77mm.

Ophichthus zophochir (Jordan and Gilbert) (Fig. 2)

7210, 157G.25, IK, (1) 67mm.

Ophichthidae Type A

7210, 23.108, IK, (3) 72-94mm.

Ophichthidae Type B

7210, 157G.55, IK, (9) 59-79mm; 23.108, IK, (12) 55-122mm.

Ophichthidae Type D

7210, 157G.25, IK, (1) 80mm.

Ophichthidae Type E

7210, 157G.25, IK, (1) 80mm; 157G.55, IK, (1) 61mm.

Ophichthidae Type F

7210, 157G.55, IK, (1) 62mm.

Reference: Charter (1996a)

Congridae

Ariosoma gilberti (Ogilby) (Fig. 3)

7205, 130.90, MT, (1) 130mm.

7210, 130.50, MT, (1) 98mm; **157G.25**, IK, (43) 63-95mm; **157G.55**, IK, (43) 80-105mm; **23.108**, IK, (95) 63-135mm.

Ariosoma sp. (Fig. 3)

7205, 24.145, MT, (3) 190-270mm.

Note: These leptocephali are likely *A. marginatum* (D. G. Smith, pers. comm.).

Bathycongrus macrurus (Gilbert) (Fig. 3)

7210, 157G.25, IK, (29) 38-55mm; **157G.55**, IK, (21) 31-47mm; **23.108**, IK, (57) 30-52mm.

Chilconger obtusus (Garman) (Fig. 2)

7210, 130.50, MT, (1) 92mm; **157G.25**, IK, (2) 43-45mm.

Gnathophis cinctus (Garman) (Fig. 3)

7205, 130.50, IK, (3) 84-95mm.

Heteroconger canabus (Cowan and Rosenblatt) (Fig. 3)

7210, 130.90, MT, (1) ca. 77mm; **157G.25**, IK, (6) 37-46mm; **157G.55**, IK, (11) 40-57mm; **23.108**, IK, (1) 64mm.

Heteroconger digueti (Pellegrin) (Fig. 3)

7210, 157G.25, IK, (1) 55mm; **157G.55**, IK, (1) 48mm; **23.108**, IK, (2) 44-45mm.

Paraconger californiensis Kanazawa (Fig. 4)

7210, 157G.25, IK, (1) 53mm; **157G.55**, IK, (1) 50mm; **23.108**, IK, (2) 51-58mm.

Rhynchoconger nitens (Jordan and Bollman) (Fig. 4)

7210, 157G.25, IK, (5) 45-63mm; **157G.55**, IK, (2) 56-63; **23.108**, IK, (4) 37-72mm.

Reference: Castle (1980), Charter (1996b), Raju (1985)

Derichthyidae

Derichthys serpentinus Gill (Fig. 4)

7205, 31.145, MT, (1) 150mm.

Nessorhamphus danae Schmidt (Fig. 4)

7205, 20.129, MT, (1) 38mm.

Reference: Charter (1996c), Robins (1989), Smith (1989b)

Nemichthyidae

Avocettina bowersi (Garman) (Fig. 4)

7205, 150.70, IK, (1) 350mm.

Avocettina infans (Günther) (Fig. 4)

7210, 140.120, MT, (1) 529mm; **20.123**, MT, (2) 425-495mm; **22.143**, MT, (2) 480-510mm.

Nemichthys scolopaceus Richardson (Fig. 5)

7205, 20.135, IK, (1) 79mm; **20.145**, MT, (3) 98-215mm; **24.133**, IK, (2) 45-83mm; **24.145**, MT, (4) 135-214mm; **27.145**, IK, (2) 43-56mm; **31.135**, MT, (8) 91-500mm; **31.145**, IK, (5) 130-257mm; **31.145**, MT, (31) 84-215mm.

7210, 100.140, IK, (1) 525mm; **100.140**, MT, (1) 450mm; **130.90**, MT, (1) 1,090mm; **157G.25**, IK, (1) 440mm; **27.135**, MT, (1) 208mm; **31.135**, IK, (1) 574mm; **31.139**, MT, (3) 211-432mm.

Reference: Charter (1996d), Nielsen and Smith (1978)

Serrivomeridae

Serrivomer sp. (Fig. 5)

7205, 130.90, MT, (1) 410mm; **20.145**, IK, (1) 26mm; **20.145**, MT, (1) 33mm.

7210, 130.50, MT, (2) 435-506mm; **130.90**, MT, (2) 485mm + fragment; **22.143**, MT, (10) 325-488mm; **27.135**, MT, (1) 172mm.

Note: Both *Serrivomer sector* and *S. jespersenii* occur in the survey area. Bauchot (1959) separated *Serrivomer* adults based on the morphology of the branchiostegal rays and whether their anterior extensions (if any) extend beyond the margin of the adjacent ceratohyal bone. Our adult *Serrivomer* specimens were variable in branchiostegal ray morphology and could not be identified using Bauchot's (1959) characters. Our larval *Serrivomer* specimens were similar to larvae of *S. sector* from the California Current region; however, they could not be identified with certainty. Taxonomic progress on this genus awaits a critical revision that includes both larvae and adults.

Stemonidium hypomelas Gilbert (Fig. 5)

7210, 24.139, MT, (1) 184mm; **27.143**, IK, (1) 169mm; **31.139**, MT, (1) 315mm.

Reference: Bauchot (1959), Charter (1996e), Tighe (1989a, 1989b)

SACCOPHARYNGIFORMES

Cyematidae

Cyema atrum Günther (Fig. 5)

7205, 20.129, MT, (2) 32-55mm; **20.145**, IK, (1) 12mm; **24.145**, MT, (1) 11mm; **27.145**, IK, (1) 25mm; **31.135**, IK, (1) 18mm; **31.141**, IK, (1) 13mm; **31.145**, IK, (1) 18mm.

7210, 31.127, MT, (1) 40mm; **31.145**, MT, (1) 33mm.

Reference: Charter (1996f)

Eurypharyngidae

Eurypharynx pelecanoioides Vaillant (Fig. 5)

7205, 31.145, IK, (1) 25mm.

Reference: Bertelsen et al. (1989), Charter (1996g)

CLUPEIFORMES

Engraulidae

Engraulis mordax Girard

7205, 130.50, IK, (43) 12-33mm.

Reference: Watson and Sandknop (1996a), Whitehead et al. (1988)

SALMONIFORMES

Bathylagidae

Bathylagus bericoides (Borodin) (Fig. 6)

7205, 24.145, IK, (1) 19mm; 31.135, MT, (5) 19-27mm.

7210, 31.139, IK, (1) 25mm.

Bathylagus longirostris Maul (Fig. 6)

7210, 20.127, MT, (1) 34mm; 22.143, MT, (2) 31-40mm; 27.135, MT, (1) 31mm; 31.135, MT, (1) 45mm; 31.145, MT, (6) 28-74mm.

Bathylagus nigrigenys Parr (Fig. 6)

7210, 157G.25, IK, (1) 25mm; 157G.55, IK, (3) 14-50mm.

Bathylagus wesethi Bolin (Fig. 6)

7205, 130.90, MT, (2) 31-84mm; 27.125, IK, (1) 20mm; 31.127, MT, (20) 27-94mm.

7210, 100.140, MT, (1) 24mm; 130.90, MT, (1) 73mm; 31.127, MT, (3) 14-28mm; 31.135, MT, (1) 21mm.

Reference: Cohen (1964), Kobylanskiy (1985), Moser and Ahlstrom (1996a), Rass and Kashkina (1967)

Microstomatidae

Microstoma sp. (Fig. 6)

7205, 24.133, IK, (1) 31mm.

Note: Historically, this species has been referred to as *M. microstoma*; however, it is clearly a distinct, undescribed species (Moser and Butler 1996).

Nansenia ahlstromi Kawaguchi and Butler (Fig. 6)

7205, 24.145, IK, (1) 31mm.

7210, 24.139, MT, (1) 59mm.

Nansenia sp.

7205, 20.145, MT, (1) 13mm; 31.135, MT, (1) 11mm; 31.145, IK, (1) 17mm.

Reference: Kawaguchi and Butler (1984), Moser and Butler (1996)

Opisthoproctidae

Dolichopteryx sp. (Fig. 7)

7205, 20.129, MT, (1) fragment; 20.145, MT, (1) 28mm.

7210, 20.127, MT, (1) 61mm; 24.139, MT, (1) 44mm.

Opisthoproctus soleatus Vaillant (Fig. 7)

7210, 24.131, MT, (1) 21mm; 7210, 31.145, MT, (1) 40mm.

Reference: Cohen (1964), Moser (1996b)

Platyproctidae

Sagamichthys abei Parr (Fig. 7)

7210, 20.127, MT, (2) 17-20mm; 22.143, MT, (8) 12-22mm; 24.129, MT, (1) 137mm.

Reference: Ambrose (1996a)

STOMIIFORMES

Gonostomatidae

Cyclothone acclinidens Garman (Fig. 8)

7205, 20.121, IK, (2) 26-35mm; 20.129, MT, (39) 25-48mm.

7210, 130.50, MT, (949) 17-45mm; 130.90, MT, (207) 16-42mm; 140.120, MT, (323) 15-28mm; 20.123, MT, (1) 28mm; 20.127, MT, (4), 18-20mm; 22.143, MT, (133) 17-42mm (see *Cyclothone* spp.).

Cyclothone alba Brauer (Fig. 8)

7205, 20.145, MT, (4) 25mm; 24.141, IK, (1) 23mm; 24.145, MT, (118) 22-30mm; 31.135, MT, (1) 22mm.

7210, 22.143, MT, (14) 22-25mm (see *Cyclothone* spp.); 24.131, MT, (1) 20mm; 24.139, MT, (142) 17-23mm; 27.131, MT, (3) 17-20mm; 27.135, MT, (43) 17-27mm; 31.145, MT, (152) 17-33mm.

Cyclothone pallida Brauer (Fig. 8)

7205, 24.145, MT, (1) 58mm.

7210, 22.143, MT, (7) 16-28mm (see *Cyclothone* spp.).

Cyclothone pseudopallida Mukhacheva (Fig. 8)

7205, 27.145, IK, (2) 30-31mm; 31.135, IK, (1) 30mm; 31.135, MT, (1) 30mm; 31.145, MT, (13) 25-35mm.

7210, 20.127, MT, (7) 24-32mm; 22.143, MT, (100) 18-39mm (see *Cyclothone* spp.); 31.139, MT, (1) 32mm.

Cyclothone signata Garman (Fig. 8)

7205, 130.90, MT, (40) 17-30mm; 20.129, IK, (54) 15-29mm; 31.127, IK, (8) 19-28mm; 31.127, MT, (5) 18-28mm; 31.135, MT, (1) 27mm.

7210, 100.140, MT, (1) 23mm; 130.50, MT, (31) 22-35mm; 140.120, MT, (3) 22-26mm; 20.123, MT,

(123) 17-28mm; **20.127**, MT, (256) 17-33mm; **22.143**, MT, (61) 16-30mm (see *Cyclothone* spp.); **24.131**, MT, (95) 14-28mm; **27.131**, MT, (1) 29mm.

Cyclothone spp.

7205, **20.145**, IK, (1) 18mm; **24.133**, IK, (2) 17-21mm; **24.145**, MT, (1) 20mm.

7210, **140.120**, MT, (3) 17-32mm; **22.143**, MT, (1998) 14-37mm (mixed species, ca. 31% *C. acclinidens*, 5% *C. alba*, 1% *C. pallida*, 26% *C. pseudopallida*, 23% *C. signata*, and 14% disintegrated); **24.143**, MT, (3) disintegrated; **27.135**, MT, (3) 15-20mm; **31.135**, MT, (1).

Diplophos proximus Parr (Fig. 9)

7210, **140.120**, MT, (1) 101mm; **157G.55**, MT, (1) 98mm.

Diplophos taenia Günther (Fig. 9)

7205, **20.129**, MT, (1) 92mm; **20.145**, MT, (1) 133mm; **24.141**, IK, (1) 74mm; **31.145**, MT, (5) 73-123mm.

7210, **20.127**, MT, (1) 74mm; **22.143**, MT, (1) 98mm; **24.131**, MT, (3) 45-91mm; **27.131**, MT, (1) 138mm.

Gonostoma atlanticum Norman (Fig. 9)

7205, **20.129**, MT, (3) 17-28mm; **20.135**, IK, (2) 24-25mm; **20.135**, MT, (3) 22-38mm; **20.145**, IK, (1) 11mm; **20.145**, MT, (1) 59mm; **27.145**, IK, (1) 23mm; **31.135**, IK, (1) 28mm; **31.145**, MT, (12) 16-63mm.

7210, **100.140**, MT, (4) 35-57mm; **22.143**, MT, (4) 17-50mm; **24.125**, MT, (1) 50mm; **24.129**, MT, (5) 31-59mm; **24.131**, MT, (2) 21-24mm; **24.139**, MT, (5) 40-56mm; **27.135**, MT, (4) 45-68mm; **27.143**, IK, (1) 18mm; **31.145**, MT, (2) 22-47mm.

Gonostoma ebelingi Grey (Fig. 9)

7205, **20.135**, IK, (3) 22-90mm; **20.145**, IK, (3) 34-74mm; **20.145**, MT, (16) 41-144mm; **24.125**, IK, (1) 108mm; **24.141**, IK, (2) 23-32; **24.145**, IK, (4) 20-35mm; **24.145**, MT, (8) 15-32mm; **31.135**, MT, (1) 113mm; **31.145**, MT, (2) 125-130mm.

7210, **20.127**, MT, (4) 98-134mm; **20.135**, IK, (4) 47-100mm; **22.143**, MT, (7) 78-125mm; **24.125**, MT, (1) 206mm; **24.129**, MT, (7) 54-124mm; **24.139**, MT, (9) 71-148mm; **27.131**, MT, (1) 59mm; **27.135**, MT, (2) 128-135mm; **31.139**, MT, (2) 132-154mm.

Gonostoma elongatum Günther (Fig. 9)

7205, **20.145**, MT, (1) 10mm.

Margrethia obtusirostra Jespersen and Tåning (Fig. 9)

7205, **24.145**, MT, (1) 12mm.

7210, **22.143**, MT, (1) 17mm; **24.143**, IK, (1) 17mm; **27.143**, IK, (1) 25mm; **31.145**, MT, (1) 27mm.

Reference: Grey (1964), Kawaguchi (1971), Kobayashi (1973), Watson (1996a)

Sternoptychidae

Argyropelecus affinis Garman (Fig. 10)

7205, 130.90, MT, (31) 39-66mm; **24.145**, MT, (1) 71mm.

7210, 100.140, MT, (1) 55mm; **130.50**, MT, (26) 16-54mm; **130.90**, MT, (18) 16-62mm; **20.123**, MT, (1) 15mm; **20.127**, MT, (7) 12-53mm; **20.129**, MT, (1) 9mm; **22.143**, MT, (14) 20-67mm.

Argyropelecus hemigymnus Cocco (Fig. 10)

7205, 20.135, IK, (1) 27mm; **24.125**, IK, (1) 16mm; **24.145**, MT, (1) 22mm; **31.127**, IK, (3) 22-30mm; **31.127**, MT, (50) 16-32mm; **31.135**, MT, (5) 17-25mm; **31.145**, MT, (7) 14-29mm.

7210, 100.140, MT, (12) 16-27mm; **20.127**, MT, (12) 12-23mm; **20.135**, IK, (1) 18mm; **22.143**, MT, (5) 9-21mm; **24.125**, MT, (24) 15-22mm; **24.129**, MT, (3) 14-28mm; **24.131**, MT, (8) 7-23mm; **24.139**, MT, (11) 9-27mm; **27.131**, MT, (2) 16-28mm; **27.135**, MT, (1) 10mm; **31.127**, MT, (6) 21-30mm; **31.135**, MT, (1) 20mm; **31.139**, IK, (1) 26mm; **31.139**, MT, (4) 25-28mm; **31.145**, MT, (3) 8-26mm.

Argyropelecus lychnus Garman (Fig. 10)

7205, 130.50, IK, (1) 15mm; **130.90**, MT, (1) 58mm; **140.120**, IK, (1) 15mm; **150.70**, IK, (2) 23-33mm; **20.121**, IK, (2) 15-34mm; **20.129**, MT, (54) 7-17mm.

7210, 130.50, IK, (7) 18-33mm; **130.50**, MT, (11) 15-28mm; **130.90**, IK, (1) 17mm; **130.90**, MT, (16) 14-48mm; **140.120**, IK, (1) 17mm; **140.120**, MT, (5) 15-45mm; **20.123**, MT, (17) 8-49mm; **20.127**, MT, (4) 8-58mm.

Argyropelecus sladeni Regan (Fig. 10)

7205, 20.135, IK, (3) 23-35mm; **24.145**, MT, (2) 16-17mm; **31.127**, MT, (1) 32mm; **31.135**, MT, (1) 46mm.

7210, 31.127, IK, (1) 15mm; **31.127**, MT, (1) 58mm.

Argyropelecus spp.

7205, 130.90, MT, (1) disintegrated; **31.127**, IK, (1) 6mm; **31.135**, MT, (1) 15mm.

Danaphos oculatus (Garman) (Fig. 10)

7205, 31.127, IK, (5) 31-36mm; **31.127**, MT, (7) 17-37mm.

7210, 20.127, MT, (9) 21-38mm; **22.143**, MT, (2) 23-36mm; **24.129**, MT, (2) 33-34mm; **24.131**, MT, (12) 22-33mm.

Sternoptyx diaphana Hermann (Fig. 11)

7205, 20.129, MT, (1) 15mm; **24.145**, MT, (1) 7mm; **31.141**, IK, (1) 6mm; **31.145**, MT, (2) 8-17mm.

7210, 100.140, MT, (1) 19mm; **22.143**, MT, (204) 6-39mm; **24.139**, MT, (1) 14mm; **24.145**, MT, (1) 22mm; **27.135**, MT, (4) 7-14mm; **27.143**, IK, (1) 17mm; **31.145**, MT, (1) 17mm.

Sternoptyx pseudobscura Baird (Fig. 11)

7205, 31.145, MT, (1) 50mm.

Sternoptyx spp.

7205, 24.145, MT, (1) 6mm; 31.127, MT, (1) 6mm.

7210, 20.127, MT, (1) 9mm; 24.131, MT, (1) 9mm; 31.145, MT, (3) 9-10mm.

Valenciennellus tripunctulatus (Esmark) (Fig. 11)

7205, 20.135, IK, (3) 16-23mm; 20.135, IK, (2) 19-20mm; 20.145, IK, (1) 14mm; 24.141, IK, (1) 19mm; 24.145, IK, (2) 16-18mm; 24.145, MT, (7) 12-26mm; 31.135, MT, (8) 13-28mm; 31.145, IK, (1) 27mm; 31.145, MT, (6) 11-28mm.

7210, 100.140, IK, (1) 20mm; 100.140, MT, (1) 22mm; 130.50, IK, (1) 20mm; 22.143, MT, (3) 22-27mm; 24.125, MT, (2) 24-25mm; 24.131, MT, (2) 23mm; 24.139, IK, (2) 15-24mm; 24.139, MT, (12) 27-30mm; 27.131, MT, (3) 19-28mm; 27.135, MT, (3) 21-27mm; 27.143, IK, (1) 11mm; 27.143, IK, (1) 14mm; 31.127, MT, (5) 13-27mm; 31.135, IK, (2) 23-34mm; 31.135, MT, (6) 14-28mm; 31.139, MT, (4) 22-27mm; 31.145, IK, (2) 20-23mm; 31.145, MT, (4) 14-27mm.

Reference: Baird (1971, 1986), Grey (1964), Watson (1996b)

Phosichthyidae

Ichthyococcus irregularis Rehnitz and Böhlke (Fig. 11)

7205, 20.129, MT, (1) 61mm.

Ichthyococcus ovatus (Cocco) (Fig. 11)

7205, 20.145, MT, (3) 9-12mm; 24.145, MT, (1) 21mm.

7210, 22.143, MT, (1) 30mm.

Vinciguerria lucetia (Garman) (Fig. 12)

7205, 130.50, IK, (95) 13-50mm; 130.90, IK, (4) 13-38mm; 130.90, MT, (53) 13-59mm; 140.120, IK, (46) 13-34mm; 140.120, IK, (48) 11-29mm; 150.70, IK, (33) 11-56mm; 150.70, IK, (23) 17-40mm; 20.121, IK, (135) 8-31mm; 20.121, IK, (80) 13-21mm; 24.125, IK, (55) 8-26mm; 24.125, IK, (10) 16-35mm; 27.125, IK, (3) 20-32mm; 31.127, MT, (518) 17-45 mm; 31.127, IK, (2) 31-33mm.

7210, 100.140, IK, (16) 15-21mm; 100.140, MT, (45) 11-45mm; 130.50, IK, (52) 12-45mm; 130.50, MT, (506) 12-58mm; 130.90, IK, (14) 13-33mm; 130.90, MT, (789) 15-50mm; 140.120, IK, (8) 20-50mm; 140.120, MT, (226) 19-54mm; 150.70, IK, (42) 15-54mm; 157G. 25, IK, (112) 11-33mm; 157G.55, IK, (124) 12-32mm; 20.123, IK, (8) 16-37mm; 20.123, MT, (32) 15-36mm; 23.108, IK, (197) 11-44mm; 24.125, IK, (2) 24-33mm; 24.125, MT, (34) 13-32mm; 31.127, MT, (23) 13-18 mm.

Vinciguerria nimbaria (Jordan and Williams) (Fig. 12)

7205, 20.129, IK, (34) 16-38mm; 20.129, MT, (535) 11-51mm; 20.135, IK, (7) 16-24mm; 20.135, IK, (9) 15-54mm; 20.145, IK, (10) 8-26mm; 20.145, MT, (73) 15-34mm; 24.133, IK, (8) 13-34mm; 24.141, IK, (6) 15-23 mm; 24.145, IK, (7) 14-34mm; 24.145, MT, (42) 12-36mm; 27.145, IK, (3) 15-25mm; 27.145, IK, (1) 18mm; 31.127, MT, (13) 12-47mm; 31.135, IK, (1) 15mm; 31.135, MT, (46) 13-37mm; 31.141, IK, (4) 17-19mm; 31.145, IK, (5) 12-23mm; 31.145, MT, (79) 14-50mm.

7210, 20.127, IK, (3) 29-37mm; 20.127, MT, (117) 15-46mm; 20.135, IK, (2) 19-20mm; 20.135, MT, (2) 20-22mm; 22.143, MT, (41) 12-51mm; 24.129, IK, (6) 13-27mm; 24.129, MT, (8) 16-33mm; 24.131, MT, (22) 15-42mm; 24.139, IK, (3) 17-27mm; 24.139, MT, (10) 13-40mm; 24.143, IK, (5) 18-23mm;

27.131, IK, (4) 16-26mm; **27.131**, MT, (4) 15-20mm; **27.135**, IK, (1) 17mm; **27.135**, MT, (3) 13-21mm; **27.143**, IK, (23) 18-32mm; **27.143**, IK, (2) 14-25mm; **31.135**, IK, (4) 14-17mm; **31.135**, MT, (4) 16-18mm; **31.139**, IK, (1) 16mm; **31.139**, MT, (2) 20-33mm; **31.145**, IK, (2) 11-27mm; **31.145**, MT, (3) 13-27mm.

Vinciguerrria poweriae (Cocco) (Fig. 12)

7205, **20.129**, MT, (14) 16-21mm; **20.135**, IK, (2) 16-23mm; **20.135**, IK, (2) 15-25mm; **20.145**, IK, (1) 9mm; **20.145**, MT, (4) 16-17mm; **24.133**, IK, (3) 17-33mm; **24.141**, IK, (3) 16-18mm; **24.145**, IK, (2) 18-20mm; **24.145**, MT, (21) 16-33 mm; **27.135**, IK, (1) 17mm; **27.145**, IK, (1) 23mm; **27.145**, IK, (2) 20-21mm; **31.127**, IK, (2) 18-22mm; **31.127**, MT, (5) 28-34mm; **31.135**, MT, (43) 14-31mm; **31.145**, IK, (1) 12mm; **31.145**, MT, (14) 16-33mm.

7210, **100.140**, IK, (2) 21-28mm; **100.140**, MT, (6) 16-30 mm; **20.127**, MT, (3) 32-34mm; **22.143**, MT, (8) 16-31mm; **24.129**, MT, (9) 23-30mm; **24.131**, IK, (2) 18-28mm; **24.131**, MT, (18) 19-32mm; **24.139**, IK, (1) 19mm; **24.139**, MT, (21) 16-33mm; **27.131**, MT, (62) 15-30mm; **27.135**, IK, (1) 33mm; **27.135**, MT, (15) 16-32mm; **31.127**, IK, (3) 14-23mm; **31.127**, MT, (25) 15-37mm; **31.135**, IK, (2) 13-32mm; **31.135**, MT, (7) 25-34mm; **31.139**, IK, (2) 17-31mm; **31.139**, MT, (23) 23-31mm; **31.145**, IK, (1) 28mm; **31.145**, MT, (21) 20-37mm.

Vinciguerrria spp.

7205, **20.129**, MT, (15) disintegrated; **20.129**, IK, (4) disintegrated; **20.145**, MT, (3) disintegrated; **31.135**, MT, (9) disintegrated; **31.145**, MT, (5) disintegrated.

Reference: Ahlstrom and Counts (1958), Grey (1964), Rechnitzer and Böhlke (1958), Watson (1996c)

Chauliodontidae

Chauliodus sloani Bloch and Schneider (Fig. 13)

7205, **24.141**, IK, (1) 33mm; **24.145**, MT, (1) 20mm; **31.145**, MT, (1) 30mm.

7210, **24.139**, MT, (1) 160mm; **31.145**, MT, (1) 24mm.

Reference: Belyanina (1977), Morrow (1964a), Parin and Novikova (1974).

Stomiidae

Stomias atriventer Garman (Fig. 13)

7205, **130.90**, MT, (1) 205mm; **150.70**, IK, (1) 215mm.

7210, **130.50**, MT, (3) 174-199mm; **130.90**, MT, (3) 44-112mm; **140.120**, MT, (3) 76-201mm; **157G.55**, IK, (2) 30-44mm; **20.123**, MT, (2) 122-185mm.

Reference: Gibbs (1969)

Astronesthidae

Astronesthes sp. (Fig. 13)

7210, **24.139**, MT, (1) 59mm.

Note: Similar to *A. trifibulatus*; differs in lacking filaments on the barbel bulb (C. Klepadlo, pers. comm.)

Astronesthes splendidus Brauer (Fig. 13)

7205, **20.145**, MT, (1) 53mm.

Borostomias panamensis Regan and Trewavas (Fig. 13)

7210, 22.143, MT, (4) 32-37mm.

Reference: Gibbs (1964a), Gibbs et al. (1984); Regan and Trewavas (1929)

Melanostomiidae

Bathophilus brevis Regan and Trewavas (Fig. 14)

7210, 24.131, MT, (1) 32mm.

Bathophilus filifer (Garman) (Fig. 14)

7210, 140.120, MT, (1) 34mm; 157G.25, IK, (1) 67mm; 20.123, MT, (1) 82mm; 23.108, IK, (1) 85mm.

Bathophilus flemingi Aron and McCrery (Fig. 14)

7205, 31.127, MT, (2) 83-89mm; 31.135, MT, (2) 71-140mm.

7210, 100.140, MT, (1) 57mm; 24.129, MT, (1) 67mm; 27.131, MT, (4) 34-50mm; 31.127, IK, (1) 48mm; 31.127, MT, (1) 51mm; 31.135, MT, (2) 46-48 mm.

Bathophilus kingi Barnett and Gibbs (Fig. 14)

7205, 24.145, IK, (1) 54mm.

7210, 22.143, MT, (1) 104mm.

Bathophilus nigerrimus Giglioli (Fig. 14)

7210, 20.127, MT, (1) 40mm; 22.143, MT, (1) 44mm.

Bathophilus spp.

7205, 31.135, MT, (3) 15-23 mm; 31.145, MT, (1) 22mm.

Eustomias bifilis Gibbs (Fig. 15)

7205, 24.133, IK, (1) 60mm.

7210, 20.123, MT, (2) 104-109mm; 20.127, MT, (1) 78mm; 24.129, MT, (1) 122mm; 27.131, IK, (1) 114mm.

Eustomias melanostigma Regan and Trewavas (Fig. 15)

7210, 24.143, IK, (1) 113mm.

Eustomias schmidt Regan and Trewavas (Fig. 15)

7210, 27.135, MT, (1) 96mm; 31.127, MT, (1) 107mm; 31.135, MT, (2) 167-184mm.

Eustomias spp.

7205, 20.145, MT, (1) 67mm; 24.145, MT, (1) 92mm.

7210, 20.135, IK, (1) 122mm; 22.143, MT, (1) 73mm; 31.135, MT, (1) 142mm.

Leptostomias spp. (Fig. 15)

7205, 27.145, MT, (1) 65mm; 31.141, IK, (1) 63mm; 31.145, MT, (2) 60-67mm.

7210, 22.143, MT, (2) 22-400mm; 24.125, IK, (1) 24mm; 27.143, IK, (1) 70mm; 31.127, MT, (1) 237mm; 31.135, MT, (2) 83-147mm; 31.145, IK, (1) 23mm; 31.145, MT, (1) 94mm.

Note: Species were not determined because barbels were damaged on all specimens.

Melanostomias melanops Brauer (Fig. 15)

7205, 31.145, MT, (1) 98mm.

Photonectes intermedius Parr (Fig. 16)

7205, 31.145, MT, (1) 57mm.

Photonectes margarita (Goode and Bean) (Fig. 16)

7210, 31.127, MT, (1) 214mm.

Photonectes parvimanus Regan and Trewavas (Fig. 16)

7205, 24.133, IK, (1) 57mm.

Photonectes spp.

7205, 31.135, MT, (4) 20-25mm.

7210, 31.135, IK, (1) 41mm; 31.135, MT, (1) 48mm.

Melanostomiidae

7205, 130.90, MT, (1) 235mm; 20.145, MT, (1) 23mm; 24.141, IK, (1) 63mm; 31.135, MT, (1) 30mm; 31.145, MT, (2) 17-22mm.

Reference: Barnett and Gibbs (1968), Gibbs et al. (1983), Gomon and Gibbs (1985), Morrow and Gibbs (1964), Moser (1996c), Parin and Pokhilskaya (1974), Regan and Trewavas (1930)

Malacosteidae

Aristostomias polydactylus Regan and Trewavas (Fig. 16)

7210, 22.143, MT, (1) 68mm.

Aristostomias scintillans Gilbert (Fig. 16)

7205, 31.127, IK, (1) 56mm.

7210, 100.140, IK, (1) 44mm; 100.140, MT, (1) 57mm; 31.127, MT, (2) 42-45mm; 31.135, IK, (1) 46mm; 31.135, MT, (5) 42-46mm; 31.139, MT, (7) 45-47mm.

Malacosteus niger Ayres (Fig. 16)

7210, 22.143, MT, (2) 69-127mm.

Photostomias sp. (Fig. 17)

7205, 31.145, MT, (1) 122mm.

Reference: Gilbert (1915), Morrow (1964b), Regan and Trewavas (1930)

Idiacanthidae

Idiacanthus antrostomus Gilbert (Fig. 17)

7205, 150.70, IK, (1) 239mm; 31.127, MT, (2) 64-304mm; 31.135, MT, (1) 320mm.

7210, 130.50, MT, (1) 193mm; 140.120, MT, (1) 272mm; 20.123, IK, (1) 126mm; 20.123, MT, (4) 50-250mm; 20.127, MT, (7) 132-307mm; 31.127, IK, (1) 55mm; 31.127, MT, (2) 46-281mm; 31.135, IK, (1) 85mm; 31.135, MT, (2) 78-85mm; 31.139, IK, (1) 225mm; 31.139, MT, (1) 80mm.

Idiacanthus fasciola Peters (Fig. 17)

7205, 24.141, IK, (1) 148-250mm; 24.145, IK, (2) 44-45mm; 24.145, MT, (8) 37-275mm; 27.145, IK, (1) 95mm; 27.145, MT, (3) 42-80mm; 31.145, IK, (1) 41mm.

7210, 22.143, MT, (1) 95mm; 24.139, MT, (2) 217-259mm.

Idiacanthus spp.

7205, 20.129, MT, (1) 23mm; 24.125, IK, (2) 78-98mm; 24.133, IK, (2) 34-88mm.

7210, 24.129, IK, (1) 51mm; 24.143, MT, (1) fragment; 27.131, MT, (1) 115mm.

Reference: Gibbs (1964b), Novikova (1967), Regan and Trewavas (1930)

AULOPIFORMES

Scopelarchidae

Benthalbella infans Zugmayer (Fig. 17)

7205, 24.145, MT, (1) 23mm.

Rosenblattichthys hubbsi Johnson (Fig. 17)

7205, 24.145, MT, (1) 22mm.

Rosenblattichthys volucris (Rofen) (Fig. 17)

7210, 130.50, IK, (1) 38mm.

Scopelarchus analis (Brauer) (Fig. 18)

7205, 20.129, MT, (4) 16-23mm; 20.145, IK, (4) 15-16mm; 20.145, MT, (1) 20mm; 24.133, IK, (2) 21-22mm; 24.145, MT, (2) 23-24mm.

7210, 22.143, MT, (2) 17-18mm; 27.131, IK, (1) 22mm; 27.131, MT, (2) 20-34mm; 27.135, IK, (1) 18mm; 31.127, MT, (4) 22-27mm; 31.139, IK, (2) 27-28mm.

Scopelarchus guentheri Alcock (Fig. 18)

7205, 130.90, MT, (2) 81-82mm; 140.120, IK, (1) 23mm; 20.121, IK, (1) 29mm; 20.129, MT, (1) 29mm; 20.145, MT, (3) 29-83mm; 24.141, IK, (2) 18-32mm; 24.145, MT, (3) 18-25mm; 31.135, MT, (3) 29-78mm; 31.145, IK, (5) 20-78mm; 31.145, MT, (2) 18-22mm.

7210, 100.140, MT, (2) 23-38mm; 130.50, MT, (3) 28-41mm; 130.90, MT, (7) 14-43mm; 140.120, MT, (2) 50-51mm; 20.123, MT, (3) 16-25mm; 20.127, MT, (2) 21-99mm; 24.139, IK, (3) 20-30mm; 24.139, MT, (5) 19-48mm; 27.131, MT, (1) 33mm; 27.135, IK, (2) 22-24mm; 27.135, MT, (1) 25mm; 27.143, IK, (2) 19-42mm; 31.127, IK, (1) 30mm; 31.135, IK, (5) 22-40mm; 31.135, MT, (8) 18-35mm; 31.139,

IK, (3) 15-38mm; **31.139**, MT, (6) 31-44mm; **31.145**, IK, (3) 22-50mm; **31.145**, MT, (6) 16-40mm.

Scopelarchus michaelsarsi Koefoed (Fig. 18)

7205, **20.145**, IK, (1) 28mm; **20.145**, MT, (3) 15-49mm; **24.145**, MT, (3) 16-42mm.

7210, **20.127**, MT, (1) 18mm; **22.143**, MT, (3) 14-17mm; **24.139**, MT, (1) 27mm; **27.131**, MT, (2) 15-29mm; **27.135**, MT, (3) 20-24mm; **27.143**, IK, (1) 18mm.

Scopelarchus stephensi Johnson (Fig. 18)

7205, **24.133**, IK, (1) 17mm; **31.127**, MT, (3) 23-30mm; **31.135**, IK, (3) 15-18mm; **31.135**, MT, (25) 16-29mm; **31.145**, MT, (8) 26-40mm.

7210, **31.135**, MT, (2) 57-58mm.

Scopelarchus spp.

7205, **20.145**, MT, (1) 15mm; **24.145**, MT, (1) 16mm; **27.145**, MT, (2) 16-18mm; **31.135**, IK, (1) 19mm; **31.145**, MT, (1) 17mm.

Scopelarchoides nicholsi (Parr) (Fig. 18)

7210, **23.108**, IK, (4) 10-26mm.

Reference: Johnson (1974), Johnson (1984), Watson and Sandknop (1996b)

Notosudidae

Ahliesaurus brevis Bertelsen, Krefft and Marshall (Fig. 19)

7205, **24.141**, IK, (1) 42mm.

Scopelosaurus hoedti Bleeker (Fig. 19)

7205, **20.145**, IK, (3) 27-49mm; **20.145**, IK, (1) 28mm; **27.145**, IK, (1) 32mm.

7210, **24.131**, MT, (1) 108mm; **24.143**, MT, (1) 39mm.

Reference: Bertelsen et al. (1976)

Paralepididae

Arctozenus risso (Bonaparte) (Fig. 19)

7205, **20.145**, MT, (2) 42-63mm; **31.127**, MT, (6) 18-35mm; **31.135**, MT, (1) 88mm.

7210, **31.127**, IK, (1) 27mm; **31.127**, MT, (6) 19-39mm.

Lestidiops sp. (Fig. 19)

7205, **20.129**, IK, (1 + 2 damaged) 32mm; **20.129**, MT, (2) 34-47mm; **20.135**, IK, (1) 41mm; **24.141**, IK, (2) 36-41mm; **20.145**, IK, (1) 58mm; **20.145**, MT, (6) 26-53mm; **24.145**, MT, (1) 23mm; **31.127**, MT, (2) 41-42mm; **31.135**, MT, (5) 19-40mm; **31.145**, MT, (18) 28-67mm.

7210, **27.131**, MT, (1) 29mm; **27.135**, MT, (2) 82-102mm; **31.127**, MT, (1) 41mm.

Magnisudis atlantica (Krøyer) (Fig. 20)

7205, **20.145**, IK, (1) 58mm.

7210, 100.140, MT, (1) 44mm; 20.127, MT, (2) 56-60mm; 22.143, MT, (3) 35-49mm.

Stemonosudis macrura (Ege) (Fig. 20)

7205, 20.129, MT, (11) 41-81mm; 24.145, MT, (3) 70-98mm; 31.135, MT, (4) 74-91mm; 31.145, MT, (10) 69-76mm.

7210, 140.120, MT, (2) 146-152mm; 20.123, MT, (1) 25mm; 22.143, MT, (3) 48-124mm; 23.108, IK, (1) 32mm; 27.131, MT, (1) 60mm.

Sudis atrox Rofen (Fig. 20)

7205, 20.129, MT, (4) 11-20mm; 20.145, IK, (1) 33mm; 20.145, MT, (10) 14-50mm; 24.133, IK, (1) 18mm; 24.141, IK, (2) 23-26mm; 24.145, MT, (2) 15-51mm; 31.145, MT, (4) 41-85mm.

7210, 22.143, MT, (4) 19-49mm; 24.125, MT, (1) 21mm; 24.131, IK, (1) 13mm.

Uncisudis advena (Rofen) (Fig. 20)

7205, 31.145, MT, (1) 39mm.

Paralepididae

7205, 20.121, IK, (1) 72mm.

Note: This specimen has paired photophores on the ventral surface and could not be assigned to a genus or species.

Reference: Ambrose (1996b), Berry and Perkins (1966), Ege (1930, 1953, 1957), Fowler (1944), Graae (1967), Harry (1953), Ozawa (1986d, 1988b), Post (1987), Rofen (1966a)

Anotopteridae

Anotopterus pharao Zugmayer (Fig. 21)

7210, 24.129, IK, (1) 22mm.

Reference: Okiyama (1984), Rofen (1966b)

Evermannellidae

Coccorella atlantica (Parr) (Fig. 21)

7205, 24.133, IK, (1) 35mm; 24.145, MT, (2) 28-62mm; 31.145, MT, (1) 61mm.

Coccorella atrata Alcock (Fig. 21)

7205, 20.145, MT, (1) 94mm.

Evermannella ahlstromi Johnson and Glodek (Fig. 21)

7205, 20.129, MT, (4) 27-68mm.

7210, 20.123, MT, (1) 61mm.

Evermannella indica Brauer (Fig. 21)

7205, 20.135, IK, (1) 24mm; 31.145, MT, (1) 72mm.

7210, 22.143, MT, (2) 42-50mm; 27.135, MT, (1) 71mm; 31.127, MT, (1) 61mm.

Odontostomops normalops (Parr) (Fig. 21)
7205, 20.145, MT, (2) 50-66mm; 24.145, MT, (1) 50mm.

7210, 31.139, MT, (1) 95mm.

Reference: Johnson (1982), Johnson and Glodek (1975), Ozawa (1986c), Rofen (1966c)

MYCTOPHIFORMES

Neoscopelidae

Scopelengys clarkei Butler and Ahlstrom (Fig. 22)

7210, 24.139, MT, (1) 139mm.

Scopelengys tristis Alcock (Fig. 22)

7210, 130.50, MT, (2) 129-158mm.

Reference: Butler and Ahlstrom (1976)

Myctophidae

Benthoosema panamense (Tåning) (Fig. 22)

7205, 150.70, IK, (2) 14-23mm.

Benthoosema suborbitale (Gilbert) (Fig. 22)

7205, 20.145, MT, (1) 22mm; 24.141, IK, (1) 31mm; 24.145, IK, (1) 17mm; 24.145, MT, (6) 13-31mm; 27.145, IK, (1) 29mm; 31.135, MT, (1) 14mm; 31.141, IK, (1) 14mm; 31.145, IK, (4) 14-32mm; 31.145, MT, (18) 15-32mm.

7210, 22.143, MT, (4) 23-29mm; 24.129, IK, (1) 10mm; 24.139, IK, (1) 27mm; 24.139, MT, (8) 23-31mm; 24.143, IK, (1) 30mm; 27.135, MT, (8) 23-31mm; 27.143, IK, (2) 14-31mm; 27.143, MT, (1) 17mm; 31.135, IK, (2) 25-32mm; 31.135, MT, (10) 24-32mm; 31.139, MT, (2) 14-19mm; 31.145, IK, (1) 14mm; 31.145, MT, (21) 15-30mm.

Bolinichthys distofax Johnson (Fig. 22)

7210, 22.143, MT, (1) 80mm.

Note: This species was described from the western and central north Pacific (Johnson 1975). This specimen represents an eastward extension of ca. 12° longitude of its known range.

Bolinichthys longipes (Brauer) (Fig. 22)

7205, 130.90, MT, (1) 34mm; 140.120, IK, (3) 15-38mm; 140.120, IK, (6) 19-31mm; 150.70, IK, (3) 30-31mm; 150.70, IK, (1) 34mm; 20.121, IK, (3) 16-30mm; 20.121, IK, (1) 36mm; 20.129, MT, (54) 13-46mm; 20.135, IK, (2) 14-17mm; 20.135, IK, (11) 16-29mm; 20.145, IK, (2) 15-16mm; 20.145, MT, (30) 17-49mm; 24.133, MT, (2) 16-17mm; 24.141, IK, (1) 15mm; 24.145, IK, (1) 17mm; 24.145, MT, (14) 16-49mm; 27.145, IK, (1) 11mm; 31.127, MT, (17) 25-40mm; 31.135, MT, (7) 25-44mm; 31.145, MT, (12) 29-48mm.

7210, 100.140, MT, (49) 24-44mm; 130.90, IK, (1) 19mm; 130.90, MT, (5) 31-39mm; 140.120, IK, (2) 14-32mm; 140.120, MT, (26) 18-25mm; 150.70, IK, (2) 23-25mm; 20.123, IK, (7) 13-22mm; 20.123, MT, (4) 16-26mm; 20.127, IK, (8) 19-42mm; 20.127, MT, (121) 21-46mm; 20.135, IK, (2) 15-20mm;

22.143, MT, (15) 14-46mm; **24.125**, MT, (25) 21-44mm; **24.129**, IK, (1) 19mm; **24.129**, MT, (62) 8-42mm; **24.131**, IK, (1) 26mm; **24.131**, MT, (63) 17-43mm; **24.139**, MT, (42) 17-53mm; **24.143**, IK, (1) 45mm; **24.143**, MT, (3) 21-33mm; **27.131**, MT, (71) 16-46mm; **27.135**, IK, (2) 17-21mm; **27.135**, MT, (7) 15-44mm; **27.143**, IK, (3) 14-21mm; **27.143**, MT, (2) 19-21mm; **31.127**, MT, (11) 35-39mm; **31.135**, IK, (4) 19-42mm; **31.135**, MT, (20) 25-49mm; **31.139**, MT, (22) 25-47mm; **31.145**, IK, (2) 15-16mm; **31.145**, MT, (30) 16-48mm.

Centrobranchus nigroocellatus Günther (Fig. 23)

7205, **31.145**, MT, (1) 23mm.

7210, **24.125**, MT, (1) 29mm; **24.131**, MT, (1) 31mm; **24.139**, MT, (1) 6mm; **27.131**, IK, (1) 11mm; **31.127**, MT, (1) 38mm; **31.135**, MT, (1) 34mm; **31.139**, MT, (1) 39mm.

Note: Gago and Lavenberg (1992) analyzed character variation of *Centrobranchus* worldwide and determined that *C. choerocephalus* and *C. brevirostris*, two species formerly recognized in the northeast Pacific (Wisner 1976), could not be distinguished from *C. nigroocellatus*.

Ceratoscopelus townsendi (Eigenmann and Eigenmann) (Fig. 23)

7205, **130.90**, MT, (17) 14-34mm; **140.120**, IK, (1) 51mm; **20.129**, MT, (241) 10-64mm; **27.125**, IK, (9) 14-43mm; **31.127**, MT, (106) 20-74mm; **31.135**, IK, (1) 22mm; **31.135**, MT, (103) 23-52mm.

7210, **100.140**, IK, (2) 7-17mm; **100.140**, MT, (110) 10-52mm; **130.50**, MT, (2) 30-35mm; **130.90**, MT, (4) 28-38mm; **140.120**, IK, (2) 27-32mm; **140.120**, MT, (26) 24-50mm; **20.123**, MT, (1) 45mm; **20.127**, MT, (54) 28-47mm; **24.125**, IK, (6) 29-47mm; **24.125**, MT, (518) 25-51mm; **24.129**, IK, (3) 25-30mm; **24.129**, MT, (23) 27-49mm; **24.131**, MT, (15) 24-28mm; **27.131**, IK, (1) 37mm; **27.131**, MT, (76) 28-57mm; **27.135**, MT, (7) 33-39mm; **31.127**, IK, (3) 32-55mm; **31.127**, MT, (367) 23-61mm; **31.135**, IK, (2) 29-59mm; **31.135**, MT, (23) 31-55mm; **31.139**, IK, (1) 36mm; **31.139**, MT, (41) 33-46mm.

Ceratoscopelus warmingii (Lowe) (Fig. 23)

7205, **20.135**, IK, (7) 25-42mm; **20.135**, IK, (5) 22-64mm; **20.145**, IK, (3) 19-22mm; **20.145**, MT, (5) 18-62mm; **24.133**, IK, (11) 16-57mm; **24.141**, IK, (39) 20-34mm; **24.145**, IK, (11) 19-42mm; **24.145**, MT, (157) 21-51mm; **27.145**, IK, (4) 22-23mm; **27.145**, MT, (1) 24mm; **31.145**, IK, (6) 22-27mm; **31.145**, MT, (119) 21-61mm.

7210, **20.127**, IK, (8) 27-58mm; **20.127**, MT, (23) 37-64mm; **20.135**, IK, (3) 47-58mm; **20.135**, IK, (4) 48-62mm; **22.143**, MT, (46) 23-58mm; **24.131**, IK, (1) 35mm; **24.131**, MT, (70) 31-61mm; **24.139**, IK, (2) 44-48mm; **24.139**, MT, (149) 19-61mm; **24.143**, MT, (21) 25-61mm; **27.131**, MT, (8) 46-58mm; **27.135**, IK, (6) 18-50mm; **27.135**, MT, (78) 27-58mm; **27.143**, IK, (5) 19-60mm; **27.143**, MT, (2) 51-62mm; **31.135**, MT, (39) 35-52mm; **31.139**, IK, (3) 47-51mm; **31.139**, MT, (49) 35-55mm; **31.145**, IK, (2) 51-52mm; **31.145**, MT, (77) 42-60mm.

Note: Badcock and Araujo (1988) synonymized Pacific *C. warmingii* with *Ceratoscopelus townsendi* based on a worldwide study of *C. warmingii*. The two species differ in the arrangement of luminous tissue. Principally, *C. warmingii* lacks the extensive supraorbital luminous tissue that is characteristic of adult eastern Pacific *C. townsendi*. Also, the supra- and infracaudal series of luminous patches extends farther posteriad in *C. warmingii* compared with *C. townsendi*. In this survey the specific distinction of the two forms is maintained to show how they are delimited geographically, with a relatively narrow zone of overlap (Fig. 23).

Ceratoscopelus spp.

7205, 20.129, MT, (4) 10-13mm; **20.145**, IK, (2) 10-14mm; **20.145**, MT, (12) 14-16mm; **24.125**, IK, (6) 19-24mm; **24.145**, MT, (2) 10-14mm; **27.125**, IK, (1) 18mm; **27.145**, IK, (11) 15-16mm; **27.145**, IK, (11) 14-19mm; **31.127**, MT, (21) 9-16mm; **31.135**, MT, (40) 10-18mm; **31.141**, IK, (1) 18mm; **31.145**, IK, (2) 10-19mm; **31.145**, MT, (24) 11-17mm.

7210, 100.140, IK, (1) 7mm; **100.140**, MT, (2) 10mm; **20.127**, MT, (86) 21-62mm; **24.131**, MT, (154) 21-61mm; **24.139**, MT, (1) 9mm; **24.143**, MT, (1) 14mm; **27.131**, IK, (3) 17-50mm; **27.131**, MT, (18) 19-49mm; **27.135**, MT, (37) 15-61mm; **31.127**, IK, (1) 9mm; **31.127**, MT, (1) 9mm; **31.135**, MT, (3) 12-19mm; **31.139**, MT, (2) 17-18mm.

Diaphus anderseni Tåning (Fig. 23)

7205, 20.129, MT, (6) 14-19mm; **24.125**, IK, (5) 24-29mm; **24.125**, IK, (2) 30-31mm; **24.133**, IK, (2) 16-23mm; **24.141**, IK, (1) 10mm; **24.145**, MT, (2) 20-27mm; **27.125**, IK, (1) 30mm; **31.127**, IK, (2) 27-33mm; **31.127**, MT, (37) 22-30mm; **31.135**, IK, (1) 27mm; **31.135**, MT, (12) 23-29mm; **31.145**, IK, (2) 21-22mm; **31.145**, MT, (1) 21mm.

7210, 100.140, MT, (4) 25-28mm; **20.127**, IK, (3) 14-31mm; **20.127**, MT, (9) 23-31mm; **24.125**, IK, (2) 25-30mm; **24.125**, MT, (25) 23-30mm; **24.129**, MT, (6) 27-31mm; **24.131**, MT, (2) 18-27mm; **24.139**, MT, (1) 27mm; **27.131**, IK, (2) 20mm; **27.131**, MT, (6) 13-30mm; **27.135**, IK, (1) 19mm; **27.135**, MT, (3) 24-33mm; **27.143**, IK, (1) 27mm; **31.127**, IK, (2) 28-30mm; **31.127**, MT, (8) 25-28mm; **31.135**, MT, (1) 29mm; **31.139**, IK, (1) 24mm; **31.145**, IK, (1) 27mm; **31.145**, MT, (2) 17-24mm.

Diaphus bertelseni Nafpaktitis (Fig. 23)

7205, 20.145, MT, (30) 19-21mm; **24.145**, MT, (5) 17-38mm.

7210, 20.127, MT, (1) 42mm; **27.131**, MT, (1) 49mm; **27.135**, MT, (1) 39mm.

Note: Previous records of this species in the northeastern Pacific are from the Hawaiian Island region; this survey extends the range eastward ca. 27° longitude.

Diaphus brachycephalus Tåning (Fig. 23)

7205, 20.129, MT, (12) 45-55mm; **20.135**, MT, (2) 35-47mm; **20.145**, MT, (12) 12-40mm; **24.141**, IK, (1) 42mm; **31.145**, MT, (3) 28-34mm.

7210, 20.127, MT, (1) 19mm; **22.143**, MT, (4) 19-22mm; **24.139**, MT, (1) 41mm; **24.143**, MT, (1) 20mm; **31.135**, MT, (1) 14mm.

Note: Previous records of this species in the northeastern Pacific are from the Hawaiian Island region; this survey extends the range eastward ca. 27° longitude.

Diaphus elucens Brauer (Fig. 24)

7210, 31.145, MT, (1) 48mm.

Note: Previous records of this species in the eastern Pacific are from the Hawaiian Island region (Wisner 1976).

Diaphus mollis Tåning (Fig. 24)

7205, 20.135, IK, (2) 19-23mm; **20.145**, MT, (3) 25-54mm; **20.145**, IK, (1) 25mm; **24.125**, IK, (1)

39mm; **24.141**, IK, (2) 13-35mm; **24.145**, MT, (1) 27mm; **27.145**, IK, (1) 52mm; **31.127**, MT, (2) 40-46mm; **31.135**, MT, (11) 33-48mm; **31.145**, IK, (1) 29mm; **31.145**, MT, (45) 21-47mm.

7210, **100.140**, MT, (3) 37-41mm; **20.123**, MT, (1) 40mm; **20.127**, IK, (1) 37mm; **20.127**, MT, (14) 23-44mm; **20.135**, IK, (2) 18-24mm; **20.135**, IK, (1) 21mm; **22.143**, MT, (8) 19-57mm; **24.125**, MT, (14) 31-42mm; **24.129**, MT, (16) 12-45mm; **24.131**, MT, (24) 21-42mm; **24.139**, IK, (1) 57mm; **24.139**, MT, (9) 19-56mm; **27.131**, MT, (8) 36-43mm; **27.135**, MT, (16) 37-50mm; **27.143**, MT, (3) 35-48mm; **27.143**, IK, (1) 55mm; **31.127**, MT, (3) 35-38mm; **31.135**, MT, (10) 36-44mm; **31.139**, IK, (1) 44mm; **31.139**, MT, (15) 36-46mm; **31.145**, IK, (2) 21-40mm; **31.145**, MT, (7) 34-46mm.

Note: This complex includes several nominal species, including *D. fulgens* and *D. rafinesquii* (Wisner, 1976; Moser and Ahlstrom, 1996).

Diaphus pacificus Parr (Fig. 24)

7205, **20.121**, IK, (3) 19-28mm; **20.129**, MT, (3) 20-24mm.

7210, **130.50**, MT, (1) 28mm; **130.90**, MT, (1) 29mm; **150.70**, IK, (1) 29mm; **157G.25**, IK, (71) 7-31mm; **157G.55**, IK, (62) 9-33mm; **20.123**, IK, (1) 33mm; **23.108**, IK, (63) 11-33mm.

Diaphus parri Tåning (Fig. 24)

7205, **20.129**, MT, (34) 11-50mm.

7210, **20.127**, MT, (3) 38-44mm.

Diaphus phillipsi Fowler (Fig. 24)

7205, **20.135**, IK, (1) 49mm; **24.133**, IK, (1) 37mm; **24.141**, IK, (2) 48-54mm; **27.145**, IK, (1) 48mm.

7210, **20.127**, MT, (1) 35mm; **22.143**, MT, (2) 16-58mm; **24.125**, MT, (3) 36-48mm; **24.139**, MT, (1) 23mm; **24.143**, IK, (1) 33mm; **24.143**, MT, (3) 23-31mm; **27.131**, MT, (2) 47-52mm; **27.135**, IK, (1) 48mm; **27.135**, MT, (1) 46mm; **27.143**, IK, (2) 20-50mm; **31.145**, IK, (1) 57mm.

Diaphus schmidtii Tåning (Fig. 24)

7205, **20.145**, MT, (6) 34-41mm; **24.141**, IK, (1) 39mm; **24.145**, MT, (1) 34mm.

7210, **22.143**, MT, (1) 27mm.

Diaphus splendidus (Brauer) (Fig. 25)

7205, **20.145**, MT, (1) 54mm.

Diaphus trachops Wisner (Fig. 25)

7205, **20.145**, MT, (2) 68-70mm.

Diaphus sp. A (Fig. 25)

7205, **20.135**, IK, (1) 31mm; **20.145**, IK, (2) 23-33mm; **20.145**, MT, (2) 40-44mm.

7210, **20.127**, MT, (2) 34-36mm; **24.129**, MT, (4) 30-42mm; **24.131**, MT, (1) 32mm.

Note: These specimens, representing an undescribed species, were sent to Dr. Basil G. Nafpaktitis.

Diaphus spp.

7205, 20.121, IK, (1) 19mm; **20.129**, MT, (1) 20mm; **20.135**, IK, (4) 10-42mm; **20.145**, MT, (4) 9-22mm.

7210, 20.123, MT, (1) 15mm; **22.143**, MT, (1) 19mm; **31.127**, IK, (1) 12mm.

Diogenichthys atlanticus (Tåning) (Fig. 25)

7205, 20.129, MT, (59) 10-20mm; **20.135**, IK, (5) 16-20mm; **20.135**, IK, (3) 17-20mm; **20.145**, IK, (4) 13-19mm; **20.145**, MT, (46) 12-20mm; **24.125**, IK, (2) 19-20mm; **24.125**, IK, (4) 19mm; **24.133**, IK, (7) 14-19mm; **24.145**, MT, (12) 10-19mm; **27.125**, IK, (8) 21-24mm; **27.145**, IK, (1) 15mm; **31.127**, IK, (2) 21-23mm; **31.127**, MT, (81) 18-27mm; **31.135**, IK, (1) 18mm; **31.135**, MT, (53) 10-22mm; **31.141**, IK, (2) 18mm; **31.145**, IK, (2) 17mm; **31.145**, MT, (21) 15-19mm.

7210, 100.140, IK, (4) 16-24mm; **100.140**, MT, (28) 15-23mm; **20.123**, MT, (1) 15mm; **20.127**, IK, (7) 12-20mm; **20.127**, MT, (265) 14-24mm; **20.135**, IK, (2) 21-23mm; **20.135**, IK, (3) 16-18mm; **22.143**, MT, (34) 9-23mm; **24.125**, IK, (8) 17-20mm; **24.125**, MT, (143) 18-21mm; **24.129**, IK, (23) 14-22mm; **24.129**, MT, (89) 19-22mm; **24.131**, IK, (2) 20-21mm; **24.131**, MT, (141) 10-21mm; **24.139**, IK, (1) 22mm; **24.139**, MT, (29) 11-22mm; **24.143**, IK, (2) 17-21mm; **24.143**, MT, (3) 19-21mm; **27.131**, IK, (9) 12-20mm; **27.131**, MT, (213) 10-24mm; **27.135**, MT, (21) 13-23mm; **27.143**, IK, (1) 14mm; **31.127**, IK, (5) 19-22mm; **31.127**, MT, (207) 16-23mm; **31.135**, IK, (4) 11-20mm; **31.135**, MT, (32) 11-25mm; **31.139**, IK, (2) 13-14mm; **31.139**, MT, (13) 20-23mm; **31.145**, IK, (2) 15-22mm; **31.145**, MT, (7) 14-21mm.

Diogenichthys laternatus (Garman) (Fig. 25)

7205, 130.50, IK, (9) 11-27mm; **140.120**, IK, (23) 16-25mm; **140.120**, IK, (6) 17-26mm; **150.70**, IK, (6) 16-28mm; **150.70**, IK, (5) 16-26mm; **20.121**, IK, (8) 23-27mm; **20.121**, IK, (13) 17-26mm; **20.129**, MT, (25) 12-25mm; **20.135**, IK, (5) 10-12mm; **20.135**, IK, (5) 12-17mm; **20.145**, MT, (1) 11mm.

7210, 130.50, IK, (13) 17-26mm; **130.50**, MT, (119) 13-29mm; **130.90**, IK, (6) 15-27mm; **130.90**, MT, (25) 12-27mm; **140.120**, IK, (11) 14-24mm; **140.120**, MT, (153) 13-27mm; **150.70**, IK, (5) 17-23mm; **157G.25**, IK, (41) 9-23mm; **157G.55**, IK, (71) 11-28mm; **20.123**, IK, (11) 16-25mm; **20.123**, MT, (36) 10-27mm; **23.108**, IK, (42) 11-23mm.

Electrona risso (Cocco) (Fig. 25)

7205, 31.127, MT, (1) 26mm.

7210, 100.140, MT, (1) 38mm.

Gonichthys tenuiculus (Garman) (Fig. 26)

7205, 130.90, IK, (1) 54mm; **130.90**, MT, (3) 43-55mm; **150.70**, IK, (1) 53mm.

7210, 130.50, MT, (6) 34-55mm; **130.90**, MT, (1) 24mm; **140.120**, MT, (1) 45mm; **150.70**, IK, (1) 55mm.

Hygophum atratum (Garman) (Fig. 26)

7205, 130.90, MT, (16) 31-62mm; **150.70**, IK, (2) 31-59mm; **150.70**, IK, (2) 57-60mm.

7210, 130.50, MT, (4) 47-57mm; **130.90**, MT, (4) 15-25mm; **140.120**, MT, (30) 23-59mm; **150.70**, IK, (1) 48mm; **23.108**, IK, (1) 51mm.

Hygophum proximum Becker (Fig. 26)

7205, 20.129, MT, (32) 19-46mm; **20.145**, IK, (1) 11mm; **20.145**, MT, (23) 10-47mm; **24.145**, MT, (8) 14-45mm.

7210, 20.123, IK, (1) 19mm; **20.123**, MT, (4) 11-44mm; **20.127**, MT, (3) 26-38mm; **20.135**, IK, (1) 32mm; **22.143**, MT, (57) 10-46mm; **24.143**, IK, (1) 33mm; **24.143**, MT, (2) 18-22mm.

Hygophum reinhardtii (Lütken) (Fig. 26)

7205, 20.129, MT, (2) 18-50mm; **20.145**, MT, (1) 14mm; **24.133**, IK, (2) 34-40mm; **27.145**, IK, (1) 18mm; **31.127**, MT, (11) 15-41mm; **31.135**, MT, (35) 16-51mm; **31.145**, IK, (1) 35mm; **31.145**, MT, (40) 18-49mm.

7210, 100.140, MT, (34) 21-57mm; **20.127**, MT, (5) 30-45mm; **22.143**, MT, (8) 17-43mm; **24.125**, IK, (1) 35mm; **24.125**, MT, (12) 20-58mm; **24.129**, IK, (1) 14mm; **24.129**, MT, (18) 21-48mm; **24.131**, MT, (17) 15-47mm; **24.139**, MT, (18) 17-52mm; **24.143**, MT, (1) 37mm; **27.131**, IK, (3) 37-48mm; **27.131**, MT, (20) 25-50mm; **27.135**, MT, (12) 35-50mm; **27.143**, IK, (1) 17mm; **31.127**, MT, (1) 37mm; **31.135**, MT, (13) 31-51mm; **31.139**, MT, (15) 18-55mm; **31.145**, MT, (15) 18-50mm.

Lampadena anomala Parr (Fig. 26)

7210, 22.143, MT, (3) 49-83mm.

Note: This specimen represents an eastward extension (ca. 17° longitude) of the reported range of *L. anomala* in the eastern north Pacific (Bekker 1983).

Lampadena urophaos Paxton (Fig. 26)

7205, 140.120, IK, (1) 33mm; **20.135**, IK, (1) 36mm; **20.145**, MT, (6) 12-27mm; **22.143**, MT, (1) 53mm; **24.133**, IK, (4) 19-21mm; **24.141**, IK, (2) 29-30mm; **24.145**, MT, (10) 16-21mm; **27.145**, IK, (3) 19-28mm; **27.145**, IK, (3) 11-22mm; **31.135**, MT, (1) 23mm; **31.141**, IK, (1) 14mm; **31.145**, IK, (2) 17-20mm; **31.145**, MT, (2) 11-19mm.

7210, 100.140, MT, (3) 20-35mm; **140.120**, MT, (1) 28mm; **22.143**, MT, (1) 53mm; **24.131**, MT, (4) 39-79mm; **24.139**, MT, (3) 40-51mm; **27.131**, IK, (1) 39mm; **27.131**, MT, (4) 34-73mm; **31.135**, MT, (2) 32-37mm; **31.139**, MT, (3) 35-68mm; **31.145**, MT, (1) 38mm.

Lampanyctus acanthurus Wisner (Fig. 27)

7205, 27.145, IK, (2) 11-28mm; **31.135**, MT, (9) 7-31mm; **31.145**, MT, (1) 10mm.

7210, 100.140, MT, (1) 58mm; **24.139**, IK, (1) 46mm; **27.131**, MT, (7) 30-64mm; **27.135**, MT, (4) 39-50mm; **31.127**, IK, (1) 41mm; **31.127**, MT, (2) 13-43mm; **31.135**, IK, (2) 38-40mm; **31.135**, MT, (5) 31-48mm; **31.139**, IK, (2) 43-44mm; **31.139**, MT, (13) 36-47mm; **31.145**, MT, (5) 46-50mm.

Note: This survey extends the range of the species considerably southward and eastward (see Wisner 1976).

Lampanyctus idostigma Parr (Fig. 27)

7205, 130.50, IK, (9) 28-67mm; **130.90**, IK, (2) 36-65mm; **130.90**, MT, (13) 54-83mm; **140.120**, IK, (2) 38-40mm; **140.120**, IK, (3) 55-78mm; **150.70**, IK, (2) 60-68mm; **20.121**, IK, (1) 58mm; **20.129**, MT, (13) 23-78mm.

7210, 130.50, MT, (20) 30-72mm; **130.90**, IK, (3) 24-38mm; **130.90**, MT, (22) 29-79mm; **140.120**, IK, (7) 22-67mm; **140.120**, MT, (77) 28-83mm; **150.70**, IK, (2) 30-67mm; **157G.25**, IK, (1) 48mm; **157G.55**, IK, (4) 32-68mm; **20.123**, MT, (2) 69-70 mm; **23.108**, IK, (8) 30-51mm; **24.125**, MT, (6) 23-57mm; **24.139**, MT, (1) 57mm.

Note: Zahuranec (in press) revised *Lampanyctus* species with reduced or absent pectoral fins and placed 17 species in Günther's genus *Nannobranchium*. Larvae of four of Zahuranec's *Nannobranchium* (*Lampanyctus* "niger", *Lampanyctus* "no pectorals", *L. idostigma*, and *L. ritteri*) were taken on this survey.

Lampanyctus "niger" (Fig. 27)

7205, 20.129, MT, (2) 6-7mm; **20.135**, IK, (1) 9mm; **20.145**, IK, (2) 37-38mm; **20.145**, MT, (2) 6-8mm; **24.125**, IK, (2) 31-109mm; **24.133**, IK, (1) 11mm; **31.127**, MT, (7) 23-85mm; **31.135**, MT, (3) 45-107mm; **31.145**, IK, (1) 15mm; **31.145**, MT, (5) 8-13mm.

7210, 100.140, IK, (1) 76mm; **100.140**, MT, (4) 33-89mm; **20.127**, MT, (3) 40-58mm; **22.143**, MT, (1) 42mm; **24.129**, MT, (4) 55-69mm; **24.131**, MT, (3) 64-116mm; **24.139**, MT, (11) 35-117mm; **27.131**, MT, (1) 95mm; **27.135**, IK, (1) 36mm; **27.135**, MT, (4) 35-66mm; **27.143**, MT, (2) 68-89mm; **31.127**, MT, (17) 7-115mm; **31.135**, IK, (1) 36mm; **31.135**, MT, (9) 33-100mm; **31.139**, IK, (4) 27-38mm; **31.139**, MT, (9) 31-106mm; **31.145**, MT, (1) 46mm.

Note: See note for *L. idostigma*.

Lampanyctus nobilis Tåning (Fig. 27)

7205, 20.121, IK, (1) 54mm; **20.129**, MT, (23) 23-112mm; **20.135**, MT, (2) 27-29mm; **20.145**, IK, (1) 9mm; **20.145**, MT, (8) 32-112mm; **24.133**, IK, (1) 63mm; **24.141**, IK, (2) 41-46mm; **24.145**, MT, (6) 40-125mm.

7210, 20.123, MT, (2) 71-76mm; **20.127**, IK, (3) 62-75mm; **20.127**, MT, (44) 31-80mm; **20.135**, MT, (2) 21-32mm; **22.143**, MT, (3) 26-102mm; **24.131**, MT, (8) 27-63mm; **24.139**, MT, (3) 38-82mm; **24.143**, MT, (1) 40mm; **27.131**, MT, (1) 72mm; **27.135**, IK, (1) 67mm; **27.135**, MT, (1) 73mm.

Note: This survey extends the range of *L. nobilis* considerably northeastward of that shown in Bekker (1983).

Lampanyctus "no pectorals" (Fig. 28)

7205, 20.121, IK, (3) 20-37mm; **20.135**, IK, (6) 22-62mm; **20.145**, MT, (38) 44-115mm; **24.125**, IK, (1) 49mm; **24.133**, IK, (9) 39-66mm; **24.141**, IK, (1) 45mm; **24.145**, IK, (3) 23-64mm; **24.145**, MT, (18) 23-71mm; **27.145**, IK, (1) 11mm; **31.127**, MT, (3) 46-53mm; **31.135**, IK, (1) 9mm; **31.135**, MT, (11) 11-61mm; **31.145**, MT, (12) 9-57mm.

7210, 100.140, MT, (19) 28-62mm; **20.127**, IK, (1) 54mm; **20.127**, MT, (32) 27-73mm; **20.135**, IK, (2) 61-65mm; **20.135**, MT, (2) 30-59mm; **22.143**, MT, (28) 25-74mm; **24.129**, IK, (1) 57mm; **24.129**, MT, (7) 8-64mm; **24.131**, IK, (2) 21-30mm; **24.131**, MT, (29) 23-88mm; **24.139**, IK, (1) 68mm; **24.139**, MT, (49) 35-67mm; **24.143**, IK, (1) 21mm; **27.131**, IK, (2) 50-58mm; **27.131**, MT, (21) 29-65mm; **27.135**, IK, (8) 25-88mm; **27.135**, MT, (20) 18-68mm; **27.143**, IK, (1) 34mm; **27.143**, MT, (3) 44-62mm; **31.127**, MT, (7) 35-62mm; **31.135**, IK, (3) 42-68mm; **31.135**, MT, (50) 20-65mm; **31.139**, MT, (43) 9-68mm; **31.145**, IK, (2) 19-52mm; **31.145**, MT, (35) 40-66mm.

Note: See note for *L. idostigma*.

Lampanyctus parvicauda Parr (Fig. 27)

7205, 150.70, IK, (1) 80mm; 20.135, IK, (1) 7mm.

7210, 140.120, MT, (2) 43-81mm; 150.70, IK, (1) 78mm; 157G.25, IK, (3) 21-38mm; 157G.55, IK, (2) 23-67mm; 23.108, IK, (2) 9-57mm.

Lampanyctus ritteri (Gilbert) (Fig. 27)

7205, 31.127, MT, (4) 33-40mm.

7210, 130.50, IK, (1) 34mm; 130.50, MT, (3) 25-33mm; 31.127, IK, (2) 19-23mm; 31.127, MT, (3) 20-35mm.

Note: See note for *L. idostigma*.

Lampanctus steinbecki Bolin (Fig. 28)

7205, 20.129, MT, (41) 18-52mm; 20.135, IK, (3) 23-51mm; 20.135, IK, (11) 21-55mm; 20.145, IK, (4) 41-53mm; 20.145, MT, (61) 20-53mm; 24.125, IK, (2) 28-52mm; 24.133, IK, (4) 25-53mm; 24.141, IK, (7) 24-52mm; 24.145, IK, (2) 29-50mm; 24.145, MT, (26) 25-53mm; 27.145, IK, (1) 27mm; 27.145, MT, (1) 28mm; 31.127, IK, (1) 48mm; 31.127, MT, (15) 22-48mm; 31.135, MT, (25) 31-51mm; 31.141, IK, (1) 28mm; 31.145, IK, (1) 29mm; 31.145, MT, (11) 24-57mm.

7210, 100.140, IK, (1) 31mm; 100.140, MT, (8) 28-54mm; 20.123, MT, (2) 23-49mm; 20.127, IK, (5) 28-51mm; 20.127, MT, (53) 23-55mm; 20.135, IK, (1) 49mm; 22.143, MT, (46) 16-54mm; 24.125, MT, (7) 47-56mm; 24.129, IK, (2) 34-50mm; 24.129, MT, (27) 23-53mm; 24.131, IK, (3) 36-54mm; 24.131, MT, (26) 21-53mm; 24.139, IK, (1) 29mm; 24.139, MT, (25) 17-57mm; 24.143, IK, (5) 16-48mm; 24.143, MT, (4) 23-51mm; 27.131, MT, (24) 28-52mm; 27.135, IK, (2) 31-45mm; 27.135, MT, (15) 29-54mm; 27.143, IK, (2) 17-48mm; 31.127, IK, (2) 30-41mm; 31.127, MT, (9) 46-51mm; 31.135, MT, (13) 29-52mm; 31.139, IK, (8) 40-50mm; 31.139, MT, (50) 32-51mm.

Note: This species is closely related to *L. tenuiformis* and *L. festivus*, with which it may be confused. The taxonomy of this species complex is not fully resolved and identifications of *L. steinbecki* in this survey should be considered tentative.

Lampanyctus spp.

7205, 20.135, IK, (1) 55mm; 27.145, IK, (1) 10mm; 31.141, IK, (1) 25mm; 31.145, MT, (2) 7-8mm.

7210, 130.90, MT, (1) 32mm; 150.70, IK, (9) 27-45mm; 20.123, IK, (2) 22-67mm; 20.135, IK, (1) 62mm; 20.135, IK, (13) 35-43mm; 24.131, MT, (1) 22mm; 27.143, MT, (2) 34-44mm; 31.127, MT, (2) 36-37mm.

Lobianchia gemellarii (Cocco) (Fig. 28)

7205, 20.145, MT, (2) 10-41mm; 24.133, IK, (1) 57mm; 24.145, MT, (6) 17-50mm; 27.145, MT, (2) 9-43mm; 31.127, MT, (4) 47-48mm; 31.135, MT, (2) 54-64mm; 31.145, MT, (36) 18-64mm.

7210, 100.140, MT, (2) 31.35mm; 22.143, MT, (4) 16-50mm; 24.129, MT, (4) 35-66mm; 24.131, IK, (1) 61mm; 24.131, MT, (8) 28-60mm; 24.139, MT, (10) 22-64mm; 24.143, IK, (1) 51mm; 24.143, MT, (1) 31mm; 27.131, MT, (11) 31-65mm; 27.135, MT, (9) 20-66mm; 27.143, IK, (2) 21-27mm; 27.143, MT, (2) 20-26mm; 31.127, MT, (2) 54-55mm; 31.135, MT, (2) 23-58mm; 31.139, MT, (13) 25-69mm; 31.145, IK, (1) 31mm; 31.145, MT, (4) 31-39mm.

Loweina rara (Lütken) (Fig. 28)

7205, 20.129, MT, (1) 32mm; **20.145**, IK, (1) 16mm; **20.145**, MT, (1) 34mm.

7210, 130.90, IK, (1) 24mm; **140.120**, MT, (1) 27mm; **20.127**, IK, (1) 21mm; **20.135**, IK, (1) 23mm; **24.125**, MT, (1) 23mm; **24.131**, MT, (1) 23mm.

Note: *L. rara* is broadly distributed in the tropical Atlantic and Indian Oceans (Nafpaktitis et al. 1977). The species was first recorded from the tropical eastern Pacific by Beebe and Vander Pyle (1944); subsequently, Wisner (1971) determined the *Loweina* species in the eastern tropical Pacific to be distinct from *L. rara*, and named it *L. laurae*. According to Wisner (1971), "*L. laurae* is basically quite similar to *L. rara* (Lütken, 1892), differing primarily in the distinctly longer head, 29.0% of SL (27.3-30.7) vs about 25.7%. The eye is also somewhat smaller (sic), averaging about 8% of SL (7.1-8.8) vs about 6% (5.9-6.0) for *L. rara*." Measurements of 8 specimens from this survey, 14 specimens from the Atlantic, and 10 paratypes of *L. laurae*, indicate almost complete overlap for both head length and eye size. Average head length was 28.7% SL (range 26.5-30.8) for specimens from this survey, 28.0% (range 26.3-31.5) for the Atlantic material, and 29.4 (range 28.1-31.6) for the paratypes of *L. laurae*. Eye size averaged 7.1% (range 6.5-7.4) for specimens from this survey, 7.4% (range 5.9-9.0) for Atlantic material, and 6.8% (range 6.4-7.4) for *L. laurae* paratypes. Following Paxton et al. (1995), we use the name *L. rara* for the eastern tropical Pacific population of *Loweina*.

Loweina terminata Bekker (Fig. 28)

7205, 31.135, MT, (4) 10-18mm.

7210, 31.135, IK, (1) 38mm.

Myctophum aurolaternatum Garman (Fig. 29)

7210, 157G.25, IK, (1) 64mm; **157G.55**, IK, (1) 23mm.

Myctophum lychnobium Bolin (Fig. 29)

7205, 20.145, MT, (1) 21mm; **24.145**, MT, (2) 15-16mm.

7210, 20.127, MT, (2) 32-35mm; **27.131**, MT, (1) 19mm.

Myctophum nitidulum Garman (Fig. 29)

7205, 20.145, MT, (7) 12-63mm; **24.125**, IK, (2) 9-62mm; **24.141**, IK, (1) 28mm; **24.145**, MT, (1) 40mm; **31.135**, MT, (1) 37mm.

7210, 24.125, MT, (1) 69mm; **27.131**, MT, (1) 62mm.

Myctophum obtusirostre Tåning (Fig. 29)

7205, 20.145, MT, (3) 13-66mm; **24.141**, IK, (1) 9mm; **24.145**, MT, (1) 10mm.

7210, 22.143, MT, (1) 34mm.

Myctophum selenops Tåning (Fig. 29)

7205, 20.145, IK, (1) 13mm; **31.145**, MT, (2) 11-23mm.

7210, 20.127, MT, (1) 42mm; **22.143**, MT, (1) 12mm.

Notolychnus valdiviae (Brauer) (Fig. 29)

7205, 140.120, IK, (1) 22mm; **150.70**, IK, (1) 23mm; **20.129**, MT, (66) 15-24mm; **20.145**, IK, (6) 19-23mm; **20.145**, MT, (15) 16-22mm; **24.125**, IK, (30) 17-25mm; **24.125**, IK, (30) 18-23mm; **24.133**, IK, (26) 13-23mm; **24.141**, IK, (8) 15-23mm; **24.145**, IK, (2) 13-23mm; **24.145**, MT, (22) 17-24mm; **27.125**, IK, (1) 24mm; **27.145**, MT, (6) 18-23mm; **31.127**, MT, (13) 16-25mm; **31.135**, IK, (9) 19-25mm; **31.135**, MT, (63) 14-24mm; **31.141**, IK, (2) 21-23mm; **31.145**, IK, (3) 11-23mm; **31.145**, MT, (60) 17-23mm.

7210, 100.140, IK, (28) 18-24mm; **100.140**, MT, (112) 11-24mm; **140.120**, MT, (3) 18-24mm; **20.127**, MT, (108) 16-23mm; **20.127**, IK, (9) 14-20mm; **20.135**, IK, (7) 19-23mm; **20.135**, IK, (1) 19mm; **22.143**, MT, (31) 10-22mm; **24.125**, IK, (5) 18-24mm; **24.125**, MT, (36) 17-23mm; **24.129**, IK, (13) 20-23mm; **24.129**, MT, (38) 17-23mm; **24.131**, IK, (10) 19-24mm; **24.131**, MT, (115) 17-23mm; **24.139**, IK, (10) 11-23mm; **24.139**, MT, (25) 16-23mm; **24.143**, IK, (9) 16-24mm; **24.143**, MT, (1) 22mm; **27.131**, IK, (17) 17-23mm; **27.131**, MT, (101) 16-23mm; **27.135**, IK, (8) 18-23mm; **27.135**, MT, (71) 16-23mm; **27.143**, IK, (4) 22-23mm; **27.143**, MT, (2) 14-18mm; **31.127**, IK, (2) 18-24mm; **31.127**, MT, (55) 16-23mm; **31.135**, IK, (4) 21-23mm; **31.135**, MT, (43) 18-23mm; **31.139**, IK, (10) 21-23mm; **31.139**, MT, (69) 17-23mm; **31.145**, IK, (5) 21-23mm; **31.145**, MT, (61) 13-23mm.

Notoscopelus resplendens (Richardson) (Fig. 30)

7205, 130.90, MT, (2) 38-50mm; **20.129**, MT, (39) 12-70mm; **20.135**, IK, (3) 24-33mm; **24.133**, IK, (2) 22-25mm; **24.145**, MT, (1) 29mm; **27.125**, IK, (1) 28mm; **31.127**, IK, (1) 18mm; **31.127**, MT, (10) 41-66mm; **31.135**, MT, (42) 10-62mm; **31.141**, IK, (1) 17mm; **31.145**, MT, (47) 8-63mm.

7210, 100.140, MT, (12) 11-69mm; **130.50**, MT, (1) 15mm; **130.90**, MT, (3) 46-76mm; **140.120**, IK, (1) 66mm; **140.120**, MT, (8) 51-61mm; **20.127**, MT, (7) 50-74mm; **24.125**, MT, (19) 43-70mm; **24.129**, MT, (7) 49-56mm; **24.131**, MT, (7) 40-70mm; **27.131**, MT, (12) 45-65mm; **27.135**, MT, (3) 46-48mm; **31.127**, IK, (1) 43mm; **31.127**, MT, (40) 14-68mm; **31.135**, IK, (1) 14mm; **31.135**, MT, (4) 33-48mm; **31.139**, MT, (8) 46-61mm; **31.145**, MT, (1) 32mm.

Parvilux boschmai Hubbs and Wisner (Fig. 30)

7205, 20.129, MT, (1) 130mm.

Parvilux ingens Hubbs and Wisner (Fig. 30)

7205, 31.127, MT, (1) 17mm; **31.135**, MT, (2) 10-17mm.

Protomyctophum beckeri Wisner (Fig. 30)

7205, 20.135, IK, (1) 21mm; **20.145**, MT, (1) 21mm; **31.145**, MT, (1) 28mm.

Protomyctophum crockeri (Bolin) (Fig. 30)

7205, 31.127, MT, (12) 11-38mm; **31.135**, MT, (5) 22-35mm.

7210, 100.140, MT, (13) 15-38mm; **20.127**, MT, (10) 18-48mm; **24.125**, MT, (6) 13-45mm; **24.129**, MT, (1) 14mm; **24.131**, MT, (1) 37mm; **27.131**, MT, (2) 14-31mm; **31.127**, MT, (5) 14-42mm; **31.135**, MT, (1) 32mm.

Symbolophorus californiensis (Eigenmann and Eigenmann) (Fig. 31)

7205, 31.127, MT, (2) 13-16mm.

7210, 31.127, MT, (1) 36mm.

Symbolorphorus evermanni (Gilbert) (Fig. 31)

7205, 20.129, MT, (13) 14-66mm; **20.135**, IK, (2) 25-26mm; **20.135**, IK, (1) 23mm; **20.145**, MT, (2) 12-15mm; **24.133**, IK, (2) 23-38mm; **24.145**, MT, (2) 23-80mm; **27.145**, IK, (1) 28mm; **31.135**, MT, (10) 14-21mm; **31.145**, MT, (2) 14-34mm.

7210, 20.127, MT, (1) 72mm; **22.143**, MT, (4) 19-73mm; **24.131**, MT, (1) 50mm; **24.143**, MT, (1) 34mm; **31.139**, MT, (1) 68mm; **31.145**, MT, (1) 23mm.

Taaningichthys minimus (Tåning) (Fig. 31)

7205, 20.129, MT, (7) 13-48mm; **20.145**, MT, (4) 48-56mm; **24.141**, IK, (1) 24mm; **24.145**, MT, (1) 22mm; **27.145**, IK, (1) 15mm; **31.127**, MT, (1) 47mm; **31.135**, MT, (2) 32-51mm.

7210, 20.135, IK, (1) 41mm; **22.143**, MT, (3) 26-62mm; **24.125**, MT, (2) 40mm; **24.129**, MT, (3) 23-49mm; **24.131**, MT, (3) 46-52mm; **24.139**, MT, (2) 42-49mm; **27.131**, MT, (2) 49-54mm; **31.139**, MT, (1) 43mm.

Triphoturus mexicanus (Gilbert) (Fig. 31)

7205, 130.50, IK, (54) 25-61mm; **130.90**, IK, (13) 30-69mm; **130.90**, MT, (270) 29-75mm; **140.120**, IK, (1) 57mm; **150.70**, IK, (1) 55mm; **150.70**, IK, (1) 59mm; **24.125**, IK, (2) 24-56mm; **27.125**, IK, (1) 45mm; **31.127**, MT, (12) 40-63mm; **31.135**, MT, (3) 27-38mm.

7210, 100.140, MT, (1) 21mm; **130.50**, IK, (53) 20-64mm; **130.50**, MT, (401) 12-67mm; **130.90**, IK, (4) 33-52mm; **130.90**, MT, (119) 25-72mm; **140.120**, IK, (2) 58-59mm; **140.120**, MT, (44) 22-68mm; **150.70**, IK, (4) 44-58mm; **157G.25**, IK, (1) 52mm; **157G.55**, IK, (2) 18-20mm; **23.108**, IK, (2) 39-47mm; **24.125**, MT, (1) 58mm; **31.139**, MT, (1) 47mm.

Triphoturus nigrescens (Brauer) (Fig. 31)

7205, 20.129, MT, (1) 28mm; **20.135**, IK, (1) 32mm; **24.145**, MT, (11) 29-34mm; **27.145**, IK, (1) 28mm; **27.145**, MT, (1) 11mm; **31.141**, IK, (2) 24-28mm; **31.145**, IK, (1) 29mm; **31.145**, MT, (17) 23-39mm.

7210, 22.143, MT, (13) 18-31mm; **24.131**, MT, (5) 23-36mm; **24.139**, MT, (5) 21-36mm; **24.143**, IK, (5) 23-37mm; **24.143**, MT, (9) 21-36mm; **27.135**, IK, (1) 33mm; **27.135**, MT, (1) 29mm; **31.135**, IK, (2) 35-36mm; **31.135**, MT, (12) 33-36mm; **31.139**, MT, (2) 34-35mm; **31.145**, IK, (2) 18-37mm; **31.145**, MT, (7) 30-39mm.

Myctophidae (most specimens are disintegrated)

7205, 130.90, IK, (1); **130.90**, MT, (2); **140.120**, IK, (1); **150.70**, IK, (2); **20.121**, IK, (2); **20.129**, IK, (1); **20.129**, MT, (2); **20.135**, IK, (2); **20.145**, MT, (4); **24.125**, IK, (3); **24.145**, MT, (15); **31.145**, MT, (3).

7210, 20.135, IK, (13); **24.143**, MT, (9); **27.131**, IK, (3); **27.135**, IK, (1); **27.143**, IK, (2); **31.127**, IK, (1); **31.135**, IK, (2); **31.135**, MT, (4).

Reference: Bekker (1983), Moser and Ahlstrom (1970, 1996b), Nafpaktitis et al. (1977), Ozawa (1986b, 1988a), Paxton et al. (1995), Wisner (1976)

GADIFORMES

Bregmacerotidae

Bregmaceros sp. A (Fig. 32)

7205, 20.121, IK, (1) 26mm; 20.129, MT, (34) 21-57mm; 20.135, IK, (1) 27mm; 20.145, MT, (5) 27-46mm; 24.145, MT, (3) 26-40mm; 31.145, MT, (7) 23-49mm.

7210, 140.120, MT, (2) 46-48mm; 20.123, MT, (1) 51mm; 22.143, MT, (1) 53mm; 24.131, MT, (6) 25-52mm; 24.139, MT, (7) 29-50mm; 27.131, MT, (2) 38-43mm; 27.135, MT, (2) 42-50mm; 31.135, MT, (6) 33-46mm; 31.139, MT, (1) 54mm; 31.145, IK, (1) 15mm; 31.145, MT, (6) 33-46mm.

Note: These specimens represent an undescribed species (Stevens and Moser, 1996).

Bregmaceros sp. B (Fig. 32)

7205, 20.129, MT, (11) 29-43mm; 20.145, MT, (11) 27-58mm.

7210, 20.123, MT, (1) 68mm; 20.127, MT, (4) 59-66mm; 22.143, MT, (9) 17-77mm; 24.131, MT, (2) 67-68mm; 24.139, IK, (1) 25mm; 24.139, MT, (1) 80mm; 27.143, IK, (1) 33mm.

Note: These specimens represent an undescribed species similar to *B. macclellandi*.

Bregmaceros bathymaster Jordan and Bollman (Fig. 32)

7210, 157G.25, IK, (10) 16-23mm; 157G.55, IK, (10) 15-56mm; 23.108, IK, (2) 26-44mm.

Bregmaceros spp.

7205, 20.129, MT, (57) 25-59mm; 20.135, IK, (1) 23mm; 20.145, IK, (1) 18mm; 24.133, IK, (1) 20mm; 24.141, IK, (6) 18-41mm; 24.145, IK, (2) 21-22mm; 27.145, IK, (1) 21mm.

7210, 20.127, IK, (1) 12mm; 20.135, IK, (1) 31mm; 24.129, MT, (3) 32-57mm; 27.143, IK, (1) 31mm.

Reference: D'Ancona and Cavinato (1965), Houde (1984), Stevens and Moser (1996)

Macrouridae

Mesobius berryi Hubbs and Iwamoto (Fig. 32)

7205, 31.145, MT, (1) 65mm.

Reference: Ambrose (1996c)

Moridae (Fig. 32)

Unidentified Moridae

7205, 31.145, IK, (1) 6mm.

Reference: Ambrose (1996d), Fahay and Markle (1984)

Melanonidae

Melanonus zugmayeri Norman (Fig. 32)

7210, 27.135, MT, (1) 27mm; 27.143, MT, (1) 84mm; 31.135, MT, (1) 14mm.

Reference: Cohen et al. (1990), Eschmeyer et al. (1983), Fitch and Lavenberg (1968)

OPHIDIIFORMES

Bythitidae

Brotulataenia nielseni Cohen (Fig. 33)
7205, 31.127, IK, (1) 254mm.

Reference: Cohen (1974)

LOPHIIFORMES

Linophryinae

Linophryne sp. (Fig. 33)
7205, 20.145, MT, (1) 7mm; 24.145, MT, (2) 12-13mm.

Reference: Bertelsen (1951)

BELONIFORMES

Scomberesocidae

Cololabis saira (Brevoort)
7205, 31.135, IK, (1) 31mm.

Reference: Hubbs and Wisner (1980)

Exocoetidae

Exocoetus volitans Linnaeus
7210, 20.127, IK, (1) 10mm.

Oxyporhamphus micropterus (Valenciennes)
7210, 157G.25, IK, (1) 12mm; 23.108, IK, (1) 19mm.

Reference: Parin (1995a), Watson (1996d)

LAMPRIDIFORMES

Radiicephalidae

Radiicephalus elongatus Osorio (Fig. 33)
7205, 27.145, IK, (1) 20mm.

Reference: Charter and Moser (1996c)

Trachipteridae

Trachipterus altivelis Kner (Fig. 33)
7205, 27.125, IK, (1) 20mm.

Trachipterus fukuzakii Fitch (Fig. 33)
7210, 130.50, MT, (1) 1100mm.

Reference: Charter and Moser (1996d), Fitch (1964)

Stylephoridae

Stylephorus chordatus Shaw (Fig. 34)

7205, 24.145, MT, (1) 236mm; 31.145, MT, (2) 17-54mm.

7210, 24.129, MT, (1) 133mm; 31.145, MT, (1) 145mm.

Reference: Olney (1984)

BERYCIFORMES

Anoplogastridae

Anoplogaster cornuta (Valenciennes) (Fig. 34)

7210, 22.143, MT, (1) 103mm; 27.135, MT, (1) 100mm.

Reference: Kotlyar (1986)

Melamphaidae

Melamphaes eulepis Ebeling (Fig. 34)

7205, 20.145, MT, (3) 31-37mm.

7210, 20.127, MT, (1) 45mm; 22.143, MT, (1) 37mm.

Melamphaes parvus Ebeling (Fig. 34)

7205, 130.90, MT, (2) 30-31mm; 31.127, MT, (4) 39-44mm.

7210, 100.140, MT, (1) 32mm; 130.50, MT, (1) 31mm; 130.90, MT, (10) 22-43mm; 31.127, MT, (7) 16-39mm.

Melamphaes simus Ebeling (Fig. 34)

7205, 20.129, MT, (4) 16-40mm; 20.135, IK, (1) 22mm; 24.133, IK, (1) 23mm; 24.141, IK, (1) 21mm; 27.125, IK, (2) 23-25mm; 27.145, MT, (4) 14-28mm; 31.135, MT, (21) 16-26mm; 31.145, MT, (10) 14-26mm.

7210, 20.127, MT, (3) 23-26mm; 24.129, MT, (4) 23-27mm; 24.131, MT, (2) 22-26mm; 27.131, MT, (4) 13-26mm; 27.135, MT, (5) 27-32mm; 31.135, MT, (11) 16-29mm; 31.139, MT, (5) 16-27mm; 31.145, IK, (1) 25mm; 31.145, MT, (9) 23-28mm.

Melamphaes spp.

7205, 140.120, IK, (1) 20mm; 20.145, IK, (1) 11mm; 24.145, IK, (2) 10-11mm; 24.145, MT, (1) 14mm; 31.127, MT, (1) 14mm; 31.135, IK, (1) 10mm; 31.135, MT, (8) 9-19mm; 31.145, IK, (3) 9-14mm; 31.145, MT, (12) 11-30mm.

7210, 157G.55, IK, (1) 10mm; 24.139, MT, (1) 18mm; 24.143, MT, (2) 16-18mm; 31.135, MT, (2) 9-10mm; 31.139, MT, (1) 13mm.

Note: Most of these specimens are larvae that could not be identified because of their poor condition or because complete ontogenetic series linking them to adults are not available.

Poromitra crassiceps (Günther) (Fig. 35)

7205, 20.145, MT, (5), 20-22mm; 31.135, MT, (1) 91mm.

7210, 22.143, MT, (2) 87-135mm; 24.139, MT, (2) 88-89mm; 31.145, MT, (4) 87-113mm.

Poromitra megalops (Lütken) (Fig. 35)

7210, 157G.55, IK, (2) 24-27mm.

Poromitra sp. (Fig. 35)

7205, 20.129, MT, (1) 10mm; 20.145, IK, (1) 8mm; 20.145, MT, (2) 9-10mm; 24.141, IK, (6) 9-10mm; 24.145, MT, (7) 9-16mm; 27.145, IK, (1) 12mm.

Note: These are late larvae of a single species that closely resembles the *Poromitra* sp. larvae described by Belyanina (1987). Parin and Borodulina (1989) subsequently identified Belyanina's larvae as *P. gibbsi*. If the larvae reported here indeed are conspecific with *P. gibbsi*, this would represent a significant range extension from the southeastern Pacific to the north Pacific.

Poromitra spp.

7210, 24.141, IK, (3) 9-10mm.

7210, 22.143, MT, (1) 37mm; 31.145, MT, (1) 53mm.

Scopeloberyx robustus (Günther) (Fig. 35)

7205, 24.145, MT, (1) 12mm; 27.145, IK, (5) 9-11mm; 31.145, IK, (2) 9-10mm.

7210, 31.135, IK, (1) 8mm.

Scopelogadus bispinosus (Gilbert) (Fig. 36)

7205, 130.90, MT, (4) 41-75mm; 150.70, IK, (1) 35mm; 20.121, IK, (3) 35-45mm; 20.135, IK, (1) 59mm; 31.127, MT, (6) 36-77mm.

7210, 100.140, IK, (1) 38mm; 100.140, MT, (2) 32-49mm; 130.50, MT, (1) 78mm; 130.90, MT, (2) 27-49mm; 140.120, MT, (7) 33-60mm; 157G.55, IK, (1) 48mm; 20.123, IK, (2) 32-41mm; 24.125, MT, (1) 87mm; 24.129, MT, (2) 42-48mm; 31.127, MT, (2) 34-55mm.

Note: We follow Hubbs et al. (1979) in recognizing *S. bispinosus* as a species rather than as a subspecies of *S. mizolepis*. Larvae of the two species have distinctly different pigmentation.

Scopelogadus mizolepis (Günther) (Fig. 36)

7205, 20.129, MT, (10) 22-65mm; 20.145, MT, (7) 56-65mm; 24.145, MT, (3) 31-78mm.

7210, 20.127, IK, (2) 28-30mm; 20.127, MT, (12) 23-63mm; 20.135, IK, (1) 55mm; 24.131, MT, (10) 50-55mm; 24.139, IK, (1) 23mm; 24.139, MT, (11) 32-70; 27.135, IK, (1) 27mm; 27.135, MT, (1) 47mm; 31.139, MT, (1) 60mm; 31.145, MT, (2) 48-50mm.

Scopelogadus spp.

7205, 24.141, IK, (2) 12-15mm; 24.145, MT, (1) 11mm; 31.135, MT, (1) 12mm.

Reference: Belyanina (1987), Ebeling (1962, 1975), Ebeling and Weed (1963, 1973), Parin and Borodulina

(1989), Sandknop and Watson (1996a)

CETOMIMIFORMES

Cetomimidae

Cetostoma regani (Zugmayer) (Fig. 36)

7210, 24.139, MT, (1) 167mm; 27.131, MT, (1) 131mm.

Reference: Paxton (1986)

ZEIFORMES

Macrurocyttidae

Zenion sp. (Fig. 36)

7205, 24.145, MT, (3) 14-20mm.

7210, 22.143, MT, (1) 6mm.

Reference: Heemstra (1980), Machida (1984)

SYNGNATHIFORMES

Centriscidae

Macroramphosus gracilis (Lowe)

7205, 130.90, IK, (1) 11mm.

Reference: Miller and Lea (1972)

SCORPAENIFORMES

Scorpaenidae

Scorpaenodes xyris (Jordan and Gilbert) (Fig. 36)

7210, 157G.25, IK, (1) 7mm; 157G.55, IK, (1) 13mm; 23.108, IK, (4) 9-12mm.

Sebastes sp.

7205, 130.50, IK, (1) 11mm.

Reference: Moser (1996d)

PERCIFORMES

Carangidae

Decapterus sp. (Fig. 37)

7205, 130.90, IK, (1) 38mm.

Naucrates ductor (Linnaeus) (Fig. 37)

7210, 157G.55, IK, (1) 12mm.

Seriola lalandi Valenciennes (Fig. 37)
7205, 130.90, IK, (1) 11mm.

7210, 31.127, MT, (1) 51mm.

Trachurus symmetricus (Ayres) (Fig. 37)
7205, 130.90, MT, (2) 48-55mm; 27.125, IK, (2) 10-20mm.

Reference: Smith-Vaniz (1995), Watson et al. (1996)

Coryphaenidae

Coryphaena equiselis Linnaeus
7210, 23.108, IK, (1) 9mm.

Reference: Ambrose (1996e), Ditty et al. (1994)

Caristiidae

Caristius maderensis Maul (Fig. 36)
7210, 20.123, MT, (1) 165mm; 31.145, MT, (1) 7mm.

Reference: Moser (1996e)

Howellidae

Howella zina Fedoryako (Fig. 37)
7210, 24.131, MT, (1) 65mm.

Note: This occurrence of *H. zina* is a range extension from its previously westernmost known occurrence near Hawaii (Boehlert and Mundy 1992).

Howella sp. (Fig. 37)
7205, 24.133, IK, (1) 14mm; 24.145, MT, (1) 19mm; 31.127, MT, (1) 52mm.

7210, 20.127, IK, (1) 67mm; 31.127, MT, (1) 26mm; 31.139, MT, (1) 25mm.

Note: Specimens from this survey appear to represent a single species; whether this species should be referred to as *H. brodiei* or *H. sherborni* has not been resolved (see discussion in Sandknop and Watson 1996b). It is possible that the smaller specimens (≤ 26 mm) are juvenile *H. zina* that have not yet developed the diagnostic scale character (Fedoryako 1976).

Reference: Fedoryako (1976), Sandknop and Watson (1996b)

Labridae

Xyrichtys mundiceps Gill (Fig. 38)
7210, 157G.25, IK, (2) 15-16mm; 157G.55, IK, (1) 15mm; 23.108, IK, (10) 13-17mm.

Reference: Bussing (1985), Gomon (1995), Thomson et al. (1979), Watson (1996e)

Chiasmodontidae

Chiasmodon niger Johnson (Fig. 38)

7205, 20.145, MT, (1) 41mm; 24.145, MT, (1) 61mm; 27.145, IK, (1) 14mm (specimen on loan to Natural History Museum of Los Angeles County).

7210, 24.139, MT, (1) 75mm; 27.135, MT, (1) 73mm.

Kali normani (Parr) (Fig. 38)

7210, 140.120, MT, (2) 129-141mm; 24.131, MT, (1) 140mm.

Pseudoscopelus scriptus Lütken (Fig. 38)

7205, 20.129, MT, (1) 86mm.

Reference: Johnson (1969), Johnson and Cohen (1974), Norman (1929), Watson and Sandknop (1996c)

Gempylidae

Diplospinus multistriatus Maul (Fig. 38)

7205, 20.145, MT, (1) 72mm; 24.133, IK, (2) 11-12; 24.141, IK, (4) 12-112mm; 24.145, MT, (1) 11mm; 27.135, IK, (2) 11-12mm; 27.145, IK, (4) 11-60mm; 27.145, MT, (3) 8-19mm; 31.135, IK, (1) 6mm; 31.135, MT, (1) 10mm; 31.145, IK, (1) 33mm; 31.145, MT, (6) 10-71mm.

7210, 24.139, MT, (1) 188mm; 31.135, IK, (1) 13mm.

Gempylus serpens Cuvier (Fig. 38)

7210, 31.145, MT, (1) 21mm.

Nealotus tripes Johnson (Fig. 39)

7205, 20.135, IK, (1) 10mm; 20.145, IK, (1) 11mm; 20.145, MT, (3) 26-29mm.

Reference: Ambrose (1996f), Nishikawa (1987, 1988b), Ozawa (1986e), Richards (1989)

Scombridae

Thunnus albacares (Bonnaterre)

7210, 157G.25, IK, (1) 7mm.

Reference: Ambrose (1996g), Nishikawa (1988a), Richards (1989), Wild (1994)

Trichiuridae

Benthodesmus pacificus (Günther) (Fig. 39)

7205, 27.145, IK, (1) 33mm.

Reference: Nakamura and Parin (1993), Ozawa (1988c), Parin (1995b), Rosenblatt and Wilson (1987), Sandknop and Watson (1996c)

Nomeidae

Cubiceps baxteri Regan (Fig. 39)

7205, 20.129, MT, (6) 9-22mm; 20.135, IK, (1) 10mm; 24.141, IK, (1) 11mm; 24.145, IK, (2) 13-23mm; 27.125, IK, (2) 15-16mm.

7210, 20.123, MT, (11) 7-19mm; 20.123, IK, (2) 9-11mm; 24.131, MT, (2) 9-16mm; 27.143, IK, (1) 11mm; 31.135, MT, (1) 17mm.

Cubiceps pauciradiatus Günther (Fig. 39)

7210, 20.123, MT, (1) 21mm.

Cubiceps paradoxus (Fig. 39)

7210, 31.145, MT, (1) 12mm.

Psenes maculatus Lütken (Fig. 39)

7210, 24.143, IK, (1) 12mm.

Reference: Ahlstrom et al. (1976), Butler (1979), Haedrich (1967), Watson (1996f)

PLEURONECTIFORMES

Paralichthyidae

Citharichthys sp.

7210, 157G.25, IK, (1) 6mm.

Syacium ovale (Günther) (Fig. 40)

7210, 157G.25, IK, (2) 6-10mm; 157G.55, IK, (3) 9-10mm; 23.108, IK, (1) 5mm.

Reference: Moser and Sumida (1996)

Bothidae

Bothus leopardinus Günther (Fig. 40)

7205, 130.90, IK, (2) 15-17mm.

7210, 157G.25, IK, (1) 13mm; 157G.55, IK, (2) 14-21mm; 23.108, IK, (1) 13mm.

Reference: Moser and Charter (1996)

Cynoglossidae

Symphurus spp. (Fig. 40)

7210, 157G.55, IK, (1) 7mm; 23.108, IK, (1) 16mm.

Reference: Charter and Moser (1996e), Munroe (1992), Munroe et al. (1995)

TETRAODONTIFORMES

Balistidae

Canthidermis maculatus (Bloch) (Fig. 40)

7210, 157G.25, IK, (2) 7-23mm.

Reference: Berry and Baldwin (1966), Watson (1996g)

Ostraciidae

Lactoria diaphana Bloch and Schneider (Fig. 40)

7205, 20.121, IK, (1) 18mm.

Reference: Tyler (1980), Watson (1996h)

Molidae

Ranzania laevis (Pennant) (Fig. 40)

7205, 24.145, IK, (41) 104-164mm.

7210, 20.127, MT, (3) 132-140mm; 24.139, MT, (4) 118-138mm; 24.143, MT, (18) 118-132mm; 27.131, MT, (3) 135-137mm; 27.135, MT, (1) 125mm; 31.139, MT, (12) 119-125mm; 31.145, MT, (3) 140-165mm.

Reference: Scott (1995), Watson (1996i)

ACKNOWLEDGEMENTS

We are indebted to Elbert H. Ahlstrom for his support during the planning of the cruises and for his initial identifications of fish larvae from the samples. We thank Andrew Vrooman, who supervised the trawling operations on both cruises, and the ships' crews of the *David Starr Jordan*. Cindy Klepadlo (SIO) shared her knowledge of stomiid fishes and helped identify specimens in this collection. John R. Paxton and Bruce C. Mundy reviewed the manuscript and offered helpful comments. Pamela Moser provided much needed help in the word processing of the species list. Roy Allen prepared the final figures and arranged for the printing of this report.

LITERATURE CITED

- Ahlstrom, E. H. 1971. Kinds and abundance of fish larvae in the eastern tropical Pacific, based on collections made on EASTROPAC I. Fish. Bull., U.S. 69:3-77.
- . 1972. Kinds and abundance of fish larvae in the eastern tropical Pacific on the second multivessel EASTROPAC survey, and observations on the annual cycle of larval abundance. Fish. Bull., U.S. 70:1153-1242.
- , J. L. Butler, and B. Y. Sumida. 1976. Pelagic stromateoid fishes (Pisces, Perciformes) of the eastern Pacific: kinds, distributions, and early life histories and observations on five of these from the northwest Atlantic. Bull. Mar. Sci. 26:285-402.
- and R. C. Counts. 1958. Development and distribution of *Vinciguerria lucetia* and related species in the eastern Pacific. U.S. Fish Wildl. Serv. Fish. Bull. 58:363-416.
- and E. G. Stevens. 1976. Report of neuston (surface) collections made on an extended CalCOFI cruise during May 1972. Calif. Coop. Oceanic Fish. Invest. Rep. 18:167-180.
- Allen, G. R., and D. R. Robertson. 1994. Fishes of the tropical eastern Pacific. Univ. Hawaii Press, Honolulu. 332 pp.
- Ambrose, D. A. 1996a. Platyroctidae: Tubeshoulders. Pages 234-239 In H. G. Moser, ed. The early stages

- of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996b. Paralepididae: Barracudinas. Pages 352-367 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996c. Macrouridae: Grenadiers. Pages 483-499 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996d. Moridae: Codlings. Pages 500-507 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996e. Coryphaenidae: Dolphinfishes. Pages 959-963 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996f. Gempylidae: Snake mackerels. Pages 1258-1269 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996g. Scombridae: Mackerels and tunas. Pages 1270-1285 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- Aron, W. 1962. The distribution of animals in the eastern North Pacific and its relationship to physical and chemical conditions. *J. Fish. Res. Bd. Can.* 19: 271-314.
- Badcock, J. and T. M. H. Araujo. 1988. On the significance of variation in a warm water cosmopolitan species, nominally *Ceratoscopelus warmingii* (Pisces, Myctophidae). *Bull. Mar. Sci.* 42:16-43.
- Baird, R. C. 1971. The systematics, distribution, and zoogeography of the marine hatchetfishes (family Sternoptychidae). *Bull. Mus. Comp. Zool.* 142:1-128.
- . 1986. Tribe Sternoptychini. Pages 255-259 *in* M. M. Smith and P. C. Heemstra, eds. *Smiths' sea fishes*. Macmillan South Africa Ltd., Johannesburg.
- Barnett, M. A. 1983. Species structure and temporal stability of mesopelagic fish assemblages in the Central Gyres of the North and South Pacific Ocean. *Mar. Biol.* 74:245-256.
- . 1984. Mesopelagic fish zoogeography in the central tropical and subtropical Pacific Ocean: species composition at representative locations in three ecosystems. *Mar. Biol.* 82:199-208.
- and R. H. Gibbs, Jr. 1968. Four new stomioid fishes of the genus *Bathophilus* with a revised key to the species of *Bathophilus*. *Copeia*. 1968:826-837.
- Bauchot, M-L. 1959. Etude de larves leptocephales du groupe *Leptocephalus lanceolatus* Strömman et identification à la famille des Serrivomeridae. Dana-Rep. Carlsberg Found. 48. 144 pp.
- Beebe, W. and M. Vander Pyle. 1944. Eastern Pacific Expeditions of the N.Y. Zoological Society. XXXIII. Pacific Myctophidae. *Zoologica*, N.Y. 29:59-95.
- Bekker, V. E. 1983. Myctophidae of the world ocean. Nauka. Moscow. 248 pp. [in Russian].

- Belyanina, T. N. 1977. Materials on development of *Chauliodus* fishes (Chauliodontidae, Pisces). Tr. Inst. Okeanol. Akad. Nauk SSSR 109:113–132 [in Russian].
- . 1987. Early stages of development of *Poromitra* (Melamphaidae) from the region of the Nasca submarine ridge. J. Ichthyol. 27 (5):163-166.
- Berry, F. H. and W. J. Baldwin. 1966. Triggerfishes (Balistidae) of the eastern Pacific. Proc. Calif. Acad. Sci. 34:429-474.
- . and H. C. Perkins. 1966. Survey of pelagic fishes of the California Current area. Fish. Bull., U.S. 65:625–682.
- Bertelsen, E. 1951. The ceratioid fishes. Ontogeny, taxonomy, distribution and biology. Dana-Rep. Carlsberg Found. 39. 276 pp.
- , G. Krefft, and N. B. Marshall. 1976. The fishes of the family Notosudidae. Dana-Rep. Carlsberg Found. 86. 114 pp.
- , J. Nielsen, and D. G. Smith. 1989. Suborder Saccopharyngoidei: families Saccopharyngidae, Eurypharyngidae, and Monognathidae. Pages 636–655 in E. B. Böhlke, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1. Pt. 9.
- Boehlert, G. W. and B. C. Mundy. 1992. Distribution of ichthyoplankton around Southeast Hancock Seamount, central north Pacific, in summer 1984 and winter 1985. NOAA Tech. Memo. NOAA-TM-NMFS-SWFSC-176.
- Brewer, G. D. 1973. Midwater fishes from the Gulf of California and the adjacent eastern tropical Pacific. Nat. Hist. Mus. Los Ang. Cty. Contr. Sci. 242. 47pp.
- Bussing, W. A. 1985. Los peces de la familia Labridae de la costa Pacifica de Costa Rica. Rev. Biol. Trop. 33:81-98.
- Butler, J. L. 1979. The nomeid genus *Cubiceps* (Pisces) with a description of a new species. Bull. Mar. Sci. 29:226–241.
- and E. H. Ahlstrom. 1976. Review of the deep-sea fish genus *Scopelengys* (Neoscopelidae) with a description of a new species, *Scopelengys clarkei*, from the central Pacific. Fish. Bull., U.S. 74:142–150.
- Castle, P. H. J. 1980. Identification of *Congrogadus marginatus* from Hawaii with the eel genus *Ariosoma* (Pisces: Congridae). Copeia. 1980:159-160.
- Charter, S. R. 1996a. Ophichthidae: Snake and worm eels. Pages 93-99 In H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996b. Congridae: Conger eels. Pages 100-117 In H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996c. Derichthyidae: Longneck eels. Pages 119-121 In H. G. Moser, ed. The early stages of fishes

- in the California Current region. CalCOFI Atlas 33.
- . 1996d. Nemichthyidae: Snipe eels. Pages 122-129 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996e. Serrivomeridae: Sawtooth eels. Pages 131-133 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996f. Cyematidae: Bobtail eels. Pages 145-149 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996g. Eurypharyngidae: Umbrellamouth gulpers. Pages 155-157 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- and H. G. Moser. 1996a. Albulidae: Bonefishes. Pages 79-81 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996b. Muraenidae: Morays. Pages 88-91 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996c. Radiicephalidae: Tapertails. Pages 665-667 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996d. Trachipteridae: Ribbonfishes. Pages 669-677 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996e. Cynoglossidae: Tonguefishes. Pages 1408-1413 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- Clarke, T. A. 1973. Some aspects of the ecology of lanternfishes (Myctophidae) in the Pacific Ocean near Hawaii. *Fish. Bull.*, U.S. 71:401-434.
- . 1974. Some aspects of the ecology of stomiatoid fishes in the Pacific Ocean near Hawaii. *Fish. Bull.*, U.S. 72:337-351.
- . 1983. Sex ratios and sexual differences in size among mesopelagic fishes from the Central Pacific Ocean. *Mar. Biol.* 73:203-209.
- . 1987. The distribution of vertically migrating fishes across the Central Equatorial Pacific. *Biol. Oceanogr.* 4:47-81.
- and P. J. Wagner. 1976. Vertical distribution and other aspects of the ecology of certain mesopelagic fishes taken near Hawaii. *Fish. Bull.*, U.S. 74:635-645.
- Cohen, D. M. 1964. Suborder Argentinoidea. Pages 1-70 *In* H. B. Bigelow, ed. *Fishes of the western North Atlantic*. Mem. Sears Found. Mar. Res. 1. Pt.4.
- . 1974. A review of the pelagic ophidioid fish genus *Brotulataenia* with descriptions of two new species. *J. Linn. Soc. Lond. Zool.* 55:119-149.

- . 1984. Argentinidae, Bathylagidae, and Opisthoproctidae. Pages 386–398 *In* P. J. P. Whitehead, M.-L. Bauchot, J.-C. Hureau, J. Nielsen, and E. Tortonese, eds. *Fishes of the north-eastern Atlantic and the Mediterranean*. I. UNESCO, Paris.
- , T. Inada, T. Iwamoto, and N. Scialabba. 1990. *FAO species catalogue. Gadiform fishes of the world (order Gadiformes). An annotated and illustrated catalogue of cods, hakes, grenadiers and other gadiform fishes known to date.* *FAO Fish. Synop.* 125. Vol. 10. 442 pp.
- D'Ancona, U. and G. Cavinato. 1965. The fishes of the family Bregmacerotidae. *Dana-Rep. Carlsberg Found.* 64. 95 pp.
- Ditty, J. G., R. F. Shaw, C. B. Grimes, and J. S. Cope. 1994. Larval development, distribution, and abundance of common dolphin, *Coryphaena hippurus*, and pompano dolphin, *C. equiselis* (family: Coryphaenidae), in the northern Gulf of Mexico. *Fish. Bull., U.S.* 92:275–291.
- Ebeling, A. W. 1962. Melamphaidae I. Systematics and zoogeography of the species in the bathypelagic fish genus *Melamphaes* Günther. *Dana-Rep. Carlsberg Found.* 58. 164 pp.
- . 1967. Zoogeography of tropical deep-sea animals. *Stud. Trop. Oceanogr. Miami.* 5: 593-613.
- . 1975. A new Indo-Pacific bathypelagic fish species of *Poromitra* and a key to the genus. *Copeia* 1975:306–315.
- , R. M. Ibara, R. J. Lavenberg, and F. J. Rohlf. 1970. Ecological groups of deep-sea animals off southern California. *Nat. Hist. Mus. Los Ang. Cty. Sci. Bull.* 6. 43 pp.
- and W. H. Weed III. 1963. Melamphaidae III. Systematics and distribution of the species in the bathypelagic fish genus *Scopelogadus* Vaillant. *Dana-Rep. Carlsberg Found.* 60. 58 pp.
- . 1973. Order Xenoberyces (Stephanoberyciformes). Pages 397–478 *In* D. M. Cohen, ed. *Fishes of the western North Atlantic*. *Mem. Sears Found. Mar. Res.* 1. Pt. 6.
- Ege, V. 1930. Sudidae (*Paralepis*). *Rep. Dan. Oceanogr. Exped. Mediterr.* 2(A13). 201 pp.
- . 1953. Paralepididae I (*Paralepis* and *Lestidium*). Taxonomy, ontogeny, phylogeny and distribution. *Dana-Rep. Carlsberg Found.* 40. 184 pp.
- . 1957. Paralepididae II (*Macroparalepis*). Taxonomy, ontogeny, phylogeny and distribution. *Dana-Rep. Carlsberg Found.* 43. 101 pp.
- Eschmeyer, W. N. 1990. *Catalog of the genera of recent fishes.* Calif. Acad. Sci., San Francisco. 697 pp.
- , E. S. Herald, and H. Hammann. 1983. *A field guide to Pacific coast fishes of North America.* Houghton Mifflin Co. 336 pp.
- Fahay, M. P. and D. F. Markle 1984. Gadiformes: development and relationships. Pages 265–283 *In* H. G. Moser, W. J. Richards, D. M. Cohen, M. P. Fahay, A. W. Kendall, Jr., and S. L. Richardson, eds. *Ontogeny and systematics of fishes.* *Am. Soc. Ichthyol. Herpetol. Spec. Publ.* 1.

- Fedoryako, B. I. 1976. Materials on the systematics and distribution of the oceanic Cheilodipteridae. Trans. P. P. Shirshov Inst. Oceanol. 104:156–190 [in Russian].
- Fischer, W., F. Krupp, W. Schneider, C. Sommer, K. E. Carpenter, and V. H. Niem, eds. 1995. Guía FAO para la identificación de especies para los fines de la pesca. Pacífico Centro-Oriental. FAO Rome. 1813 pp. [in Spanish].
- Fitch, J. E. 1964. The ribbonfishes of the eastern Pacific (Family Trachipteridae) of the eastern Pacific Ocean, with a description of a new species. Calif. Fish and Game. 50:228-240.
- Fitch, J. E. and R. J. Lavenberg. 1968. Deep-water teleostean fishes of California. Univ. Calif. Press, Berkeley. 155 pp.
- Fowler, W. H. 1944. Results of the Fifth George Vanderbilt Expedition (1941). Bahamas, Caribbean Sea, Panama, Galapagos Archipelago and Mexican Pacific Islands. The Fishes. Acad. Nat. Sci. Phila. Monogr. 6:57-529.
- Gago, F. J. and R. J. Lavenberg. 1992. Systematics of the lanternfish genus *Centrobranchus* (Pisces: Myctophidae). Copeia. 1992:154-161.
- Garman, S. 1899. Reports on an exploration off the west coasts of Mexico, Central and South America, and off the Galápagos Islands, in charge of Alexander Agassiz, by the U.S. Fish Commission Steamer "Albatross," during 1891, Lieut. Commander Z. L. Tanner, U.S.N., Commanding. The fishes. Mem. Mus. Comp. Zool. Harvard 24. 431 pp.
- Gibbs, R. H., Jr. 1964a. Astronesthidae. Pages 311-350 In H. B. Bigelow, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1. Pt. 4.
- . 1964b. Idiacanthidae. Pages 512–522 In H. B. Bigelow, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1. Pt. 4.
- . 1969. Taxonomy, sexual dimorphism, vertical distribution and evolutionary zoogeography of the bathypelagic fish genus, *Stomias* (Family Stomiidae). Smiths. Contrib. Zool. 31:1–25.
- , T. A. Clarke, and J. R. Gomon. 1983. Taxonomy and distribution of the stomioid genus *Eustomias* (Melanostomiidae), I: subgenus *Nominostomias*. Smithson. Contr. Zool. 389. 139 pp.
- , K. Amaoka, and C. Haruta. 1984. *Astronesthes trifibulatus*, a new Indo-Pacific stomioid fish (family Astronesthidae) related to the Atlantic *A. similis*. Jpn. J. Ichthyol. 31:5-14.
- Gilbert, C. H. 1915. Fishes collected by the U.S. fisheries steamer "Albatross" in southern California in 1904. Proc. U.S. Nat. Mus. 48:305–380.
- Gomon, M. F. 1995. Labridae. Pages 1201–1225 In W. Fischer, F. Krupp, W. Schneider, C. Sommer, K. E. Carpenter, and V. H. Niem, eds. Guía FAO para la identificación de especies para los fines de la pesca. Pacífico Centro-Oriental. FAO, Rome [in Spanish].

- Gomon, J. R. and R. H. Gibbs, Jr. 1985. Taxonomy and distribution of the stomioid genus *Eustomias* (Melanostomiidae), II: subgenus *Biradiostomias*, new subgenus. *Smiths. Contr. Zool.* 409. 58 pp.
- Graae, M. J. F. 1967. *Lestidium bigelowi*, a new species of paralepidid fish with photophores. *Breviora.* 277:1-10.
- Grey, M. 1964. Family Gonostomatidae. Pages 78–240 *In* H. B. Bigelow, ed. *Fishes of the western North Atlantic.* Mem. Sears Found. Mar. Res. 1. Pt. 4.
- Haedrich, R. L. 1967. The stromateoid fishes: systematics and a classification. *Bull. Mus. Comp. Zool. Harvard.* 135:31–139.
- Harry, R. R. 1953. Studies on the bathypelagic fishes of the family Paralepididae (order Iniomi). 2. A revision of the North Pacific species. *Proc. Acad. Nat. Sci. Phila.* 105:169–230.
- Hartman, A. R. and T. A. Clarke. 1974. The distribution of myctophid fishes across the central equatorial Pacific. *Fish. Bull., U.S.* 73:633-641.
- Heemstra, P. C. 1980. A revision of the zeid fishes (Zeiformes; Zeidae) of South Africa. *Ichthyol. Bull. Rhodes Univ.* 41. 18 pp.
- Houde, E. D. 1984. Bregmacerotidae: development and relationships. Pages 181–184 *In* H. G. Moser, W. J. Richards, D. M. Cohen, M. P. Fahay, A. W. Kendall, Jr., and S. L. Richardson, eds. *Ontogeny and systematics of fishes.* Am. Soc. Ichthyol. Herpetol. Spec. Publ. 1.
- Hubbs, C. L., W. I. Follett, and L. J. Dempster. 1979. List of fishes of California. *Occas. Pap. Calif. Acad. Sci.* 133. 51 pp.
- Hubbs, C. L. and R. L. Wisner. 1980. Revision of the sauries (Pisces, Scomberesocidae) with descriptions of two new genera and one new species. *Fish. Bull., U.S.* 77:521–566.
- Hulley, P. A. 1986. Family No. 123: Stylephoridae. Page 404 *In* Smith, M. M. and P. C. Heemstra. eds. *Smiths' sea fishes.* Macmillan South Africa Ltd., Johannesburg.
- Isaacs, J. D. and L. W. Kidd. 1953. Isaacs-Kidd midwater trawl. *Scripps Inst. Oceanogr. Ref.* 53-3. 21 pp.
- Johnson, R. K. 1969. A review of the fish genus *Kali* (Perciformes: Chiasmodontidae). *Copeia* 1969:386–391.
- . 1974. A revision of the alepisauroid family Scopelarchidae (Pisces: Myctophiformes). *Field. Zool.* 66. 249 pp.
- . 1975. A new myctophid fish, *Bolinichthys distofax*, from the western and central north Pacific Ocean, with notes on other species of *Bolinichthys*. *Copeia* 1975:53-60.

- . 1982. Fishes of the families Evermannellidae and Scopelarchidae: systematics, morphology, interrelationships, and zoogeography. *Field. Zool. New Ser.* 12. 252 pp.
- . 1984. Scopelarchidae: development and relationships. Pages 245–250 *In* H. G. Moser, W. J. Richards, D. M. Cohen, M. P. Fahay, A. W. Kendall, Jr., and S. L. Richardson, eds. *Ontogeny and systematics of fishes*. *Am. Soc. Ichthyol. Herpetol. Spec. Publ.* 1.
- and D. M. Cohen. 1974. Results of the research cruises of FRV "Walther Herwig" to South America. XXX. Revision of the chiasmodontid fish genera *Dysalotus* and *Kali*, with descriptions of two new species. *Arch. Fischereiwiss.* 25:13–46.
- and G. S. Glodek. 1975. Two new species of *Evermannella* from the Pacific Ocean, with notes on other species endemic to the Pacific Central or the Pacific Equatorial water masses. *Copeia* 1975:715–730.
- Jurkovitch, J. E. 1968. Are universal trawls effective? *World Fishing*. June: 48-51.
- Kawaguchi, K. 1971. Gonostomatid fishes of the western North Pacific. *Jpn. J. Ichthyol.* 18: 1-16.
- and J. L. Butler. 1984. Fishes of the genus *Nansenia* (Microstomatidae) with descriptions of seven new species. *Nat. Hist. Mus. Los Ang. Cty. Contrib. Sci.* 352. 22 pp.
- King, J. E. and R. T. B. Iverson. 1962. Midwater trawling for forage organisms in the central Pacific 1951-1956. *Fish. Bull., U.S.* 62: 271-319.
- Kobayashi, B. N. 1973. Systematics, zoogeography, and aspects of the biology of the bathypelagic fish genus *Cyclothone* in the Pacific Ocean. PhD Diss., Univ. Calif., San Diego. 487 pp.
- Kobylyanskiy, S. G. 1985. Material for the revision of the genus *Bathylagus* Günther (Bathylagidae): the group of "light" deep-sea smelts. *J. Ichthyol.* 25(2):1-17.
- Kotlyar, A. N. 1986. Classification and distribution of fishes of the family Anoplogastridae (Beryciformes). *J. Ichthyol.* 26(4):133–152.
- Kramer, D., M. J. Kalin, E. G. Stevens, J. R. Thrailkill, and J. R. Zweifel. 1972. Collecting and processing data on the fish eggs and larvae in the California Current region. U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 370. 38 pp.
- Lavenberg, R. J. and J. E. Fitch. 1966. Annotated list of fishes collected by midwater trawl in the Gulf of California, March-April 1964. *Calif. Fish and Game.* 52 (2):92-110.
- Loeb, V. J. 1979. Larval fishes in the zooplankton community of the North Pacific Central Gyre. *Mar. Biol.* 53:173-191.
- . 1980. Patterns of spatial and species abundance within the larval fish assemblage of the North

- Pacific Central Gyre during late summer. *Mar. Biol.* 60:189-200.
- Lütken, C. F. 1892. *Spolia Atlantica*. Scopelini. *Mus. Zool. Univ. Huanien. Vidensk. Selsk. Skrift.* Copenhagen. Ser. 6. 7:220-297.
- Machida, Y. 1984. Family Zeidae, Page 118 *In* H. Masuda, K. Amaoka, C. Araga, T. Uyeno, and T. Yoshino, eds. *The fishes of the Japanese Archipelago*. Tokai Univ. Press, Tokyo.
- Masuda, H., K. Amaoka, C. Araga, T. Uyeno, and T. Yoshino, eds. 1984. *The fishes of the Japanese Archipelago*. Tokai Univ. Press, Tokyo. 437 pp.
- Matarese, A. C., A. W. Kendall, Jr., D. M. Blood, and B. M. Vinter. 1989. Laboratory guide to early life history stages of northeast Pacific fishes. U.S. Dep. Commer., NOAA Tech. Rep. NMFS 80. 652 pp.
- McCosker, J. E. 1973. The osteology, classification, and relationships of the family Ophichthidae (Pisces, Anguilliformes). PhD Diss., Univ. Calif., San Diego. 289 pp.
- Miller, D. J. and R. N. Lea. 1972. Guide to the coastal marine fishes of California. Calif. Dep. Fish Game Fish Bull. 157. 235 pp.
- Morrow, J. E. 1964a. Family Chauliodontidae. Pages 274–289 *In* H. B. Bigelow, ed. *Fishes of the western North Atlantic*. Mem. Sears Found. Mar. Res. 1. Pt. 4.
- . 1964b. Family Malacosteidae. Pages 523–549 *In* H. B. Bigelow, ed. *Fishes of the western North Atlantic*. Mem. Sears Found. Mar. Res. 1. Pt. 4.
- and R. H. Gibbs, Jr. 1964. Family Melanostomiidae, Pages 351–511 *In* H. B. Bigelow, ed. *Fishes of the western North Atlantic*. Mem. Sears Found. Mar. Res. 1. Pt. 4.
- Moser, H. G., ed. 1996a. The early stages of fishes in the California Current region. *CalCOFI Atlas* 33. 1517 pp.
- . 1996b. Opisthoproctidae: Spookfishes. Pages 216-223 *In* H. G. Moser, ed. *The early stages of fishes in the California Current region*. *CalCOFI Atlas* 33.
- . 1996c. Melanostomiidae: Scaleless dragonfishes. Pages 308-319 *In* H. G. Moser, ed. *The early stages of fishes in the California Current region*. *CalCOFI Atlas* 33.
- . 1996d. Scorpaenidae: Scorpionfishes and rockfishes. Pages 733-795 *In* H. G. Moser, ed. *The early stages of fishes in the California Current region*. *CalCOFI Atlas* 33.
- . 1996e. Caristiidae: Manefishes or veelfins. Pages 973-975 *In* H. G. Moser, ed. *The early stages of fishes in the California Current region*. *CalCOFI Atlas* 33.
- . and E. H. Ahlstrom. 1970. Development of lanternfishes (family Myctophidae) in the California

- Current. Part I. Species with narrow-eyed larvae. Nat. Hist. Mus. Los Ang. Cty. Sci. Bull. 7. 145 pp.
- . 1996a. Bathylagidae: Blacksmelts and smoothtongues. Pages 188-207 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996b. Myctophidae: Lanternfishes. Pages 387-475 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- and J. L. Butler. 1996. Microstomatidae: Argentines and pencilfishes. Pages 208-215 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- and S. R. Charter. 1996. Bothidae: Lefteye flounders. Pages 1357-1367 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- , R. L. Charter, P. E. Smith, D. A. Ambrose, S. R. Charter, C. A. Meyer, E. M. Sandknop, and W. Watson. 1993. Distributional atlas of fish larvae and eggs in the California Current region: taxa with 1000 or more total larvae, 1951 through 1984. CalCOFI Atlas 31. 233 pp.
- , 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 and eggs in the California Current region: taxa with less than 1000 total larvae, 1951 through 1984. CalCOFI Atlas 32. 181 pp.
- and B. Y. Sumida. 1996. Paralichthyidae: Lefteye flounders and sanddabs. Pages 1325-1355 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- Munroe, T. A. 1992. Interdigitation pattern of dorsal-fin pterygiophores and neural spines, an important diagnostic character for symphurine tonguefishes (*Symphurus*: Cynoglossidae: Pleuronectiformes). Bull. Mar. Sci. 50:357-403.
- , F. Krupp, and M. Schneider. 1995. Cynoglossidae. Pages 1039-1059 *In* W. Fischer, F. Krupp, W. Schneider, C. Sommer, K. E. Carpenter, and V. H. Niem, eds. Guía FAO para la identificación de especies para los fines de la pesca. Pacífico Centro-Oriental. FAO, Rome [in Spanish].
- Nafpaktitis, B. G., R. H. Backus, J. E. Craddock, R. L. Haedrich, B. H. Robison, and C. Karnella. 1977. Family Myctophidae. Pages 13-299 *In* R. H. Gibbs, Jr., ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1. Pt. 7.
- Nakamura, I. and N. V. Parin. 1993. FAO Species catalogue. Snake mackerels and cutlassfishes of the world. FAO Fish. Synop. 125. Vol. 15. 136 pp.
- Nielsen, J. and D. G. Smith. 1978. The eel family Nemichthyidae. Dana-Rep. Carlsberg Found. 88. 71 pp.
- Nishikawa, Y. 1987. Studies on the early life history of gempylid fishes. Bull. Far Seas Fish. Res. Lab. 24:1-154.

- . 1988a. *Thunnus albacares* (Bonnaterre). Pages 621–622 *In* M. Okiyama, ed. An atlas of the early stage fishes in Japan. Tokai Univ. Press, Tokyo [in Japanese].
- . 1988b. Gempylidae. Pages 624–634 *In* M. Okiyama, ed. An atlas of the early stage fishes in Japan. Tokai Univ. Press, Tokyo [in Japanese].
- Norman, J. R. 1929. The teleostean fishes of the family Chiasmodontidae. *Ann. Mag. Nat. Hist.* 3:529–544.
- Novikova, N. S. 1967. Idiacanthids of the Indian and Pacific Oceans. Pages 159–208 *In* T. S. Rass, ed. The pelagic and bathypelagic fishes of the world ocean. *Trudy Inst. Okeanol.* 84 [English transl. Inst. of Modern Languages, Wash. D.C.]
- Okiyama, M. 1984. Myctophiformes: development. Pages 206–218 *In* H. G. Moser, W. J. Richards, D. M. Cohen, M. P. Fahay, A. W. Kendall, Jr., and S. L. Richardson, eds. *Ontogeny and systematics of fishes.* *Am. Soc. Ichthyol. Herpetol. Spec. Publ.* 1.
- , ed. 1988. An atlas of the early stage fishes in Japan. Tokai Univ. Press, Tokyo. 1154 pp. [in Japanese].
- Olney, J. E. 1984. Lampriformes: development and relationships. Pages 368–379 *In* Moser, H. G., W. J. Richards, D. M. Cohen, M. P. Fahay, A. W. Kendall, Jr., and S. L. Richardson, eds. *Ontogeny and systematics of fishes.* *Am. Soc. Ichthyol. Herpetol., Spec. Publ.* 1.
- Ozawa, T., ed. 1986a. Studies on the oceanic ichthyoplankton in the western North Pacific. Kyushu Univ. Press, Fukuoka. 430 pp.
- . 1986b. Early life history of the family Myctophidae in the ocean off southern Japan. Pages 114–188 *In* T. Ozawa, ed. Studies on the oceanic ichthyoplankton in the western North Pacific. Kyushu Univ. Press, Fukuoka.
- . 1986c. The larvae of the family Evermannellidae in the Pacific off southern Japan. Pages 202–210 *In* T. Ozawa, ed. Studies on the oceanic ichthyoplankton in the western North Pacific. Kyushu Univ. Press, Fukuoka.
- . 1986d. Paralepidid larvae off southern Japan. Pages 224–264 *In* T. Ozawa, ed. Studies on the oceanic ichthyoplankton in the western North Pacific. Kyushu Univ. Press, Fukuoka.
- . 1986e. Gempylid fish larvae in the ocean off southern Japan. Pages 275–288 *In* T. Ozawa, ed. Studies on the oceanic ichthyoplankton in the western North Pacific. Kyushu Univ. Press, Fukuoka.
- . 1988a. Myctophidae. Pages 194–233 *In* M. Okiyama, ed. An atlas of the early stage fishes in Japan. Tokai Univ. Press, Tokyo [in Japanese].
- . 1988b. Paralepididae. Pages 235–250 *In* M. Okiyama, ed. An atlas of the early stage fishes in

- Japan. Tokai Univ. Press, Tokyo [in Japanese].
- . 1988c. Trichiuridae. Pages 634–639 *In* M. Okiyama, ed. An atlas of the early stage fishes in Japan. Tokai Univ. Press, Tokyo [in Japanese].
- Parin, N. V. 1961. Contribution to the knowledge of the flyingfish fauna (Exocoetidae) of the Pacific and Indian Oceans. *Tr. Inst. Okeanol. Akad. Nauk SSSR* 42:40–91 [in Russian; English transl., Nat. Mar. Fish. Serv., Syst. Lab., Washington, D.C.].
- . 1995a. Exocoetidae. Pages 1091–1103 *In* W. Fischer, F. Krupp, W. Schneider, C. Sommer, K. E. Carpenter, and V. H. Niem, eds. Guia FAO para la identificación de especies para los fines de la pesca. Pacifico Centro-Oriental. FAO, Rome [in Spanish].
- . 1995b. Three new species and new records of cutlass fishes of the genus *Aphanopus* (Trichiuridae). *J. Ichthyol.* 35(2):128–138.
- and O. D. Borodulina. 1989. A new species of the genus *Poromitra* (Melamphaidae) from the southeastern part of the Pacific Ocean. *J. Ichthyol.* 29:1028–1030.
- and N. S. Novikova. 1974. Taxonomy of the viperfishes (Chauliodontidae, Osteichthys) and their distribution in the world ocean. *Trudy. Inst. Okeanol.* 96:255-315 [in Russian].
- and G. N. Pokhilskaya. 1974. A review of the Indo-Pacific species of the genus *Eustomias* (Melanostomiidae, Osteichthys). *Trudy Inst. Okeanol.* 96:316-368 [in Russian].
- Paxton, J. R. 1967. A distributional analysis for the lanternfishes (family Myctophidae) of the San Pedro Basin, California. *Copeia* 1967:442-440.
- . 1986. Cetomimidae. Pages 524-525 *In* P. J. P. Whitehead, M.-L. Bauchot, J.-C. Hureau, J. Nielsen, and E. Tortonese, eds. Fishes of the north-eastern Atlantic and the Mediterranean. I. UNESCO, Paris.
- , R. J. Lavenberg, and C. Sommer. 1995. Myctophidae. Pages 1315–1321 *In* W. Fischer, F. Krupp, W. Schneider, C. Sommer, K. E. Carpenter, and V. H. Niem, eds. Guia FAO para la identificación de especies para los fines de la pesca. Pacifico Centro-Oriental. FAO, Rome [in Spanish].
- Pearcy, W. G. 1964. Some distributional features of mesopelagic fishes off Oregon. *J. Mar. Res.* 22: 83-102.
- , E. E. Krygier, R. Mesecar, and F. Ramsey. 1977. Vertical distribution and migration of oceanic micronekton off Oregon. *Deep-sea Res.* 24:223-245.
- and R. M. Laurs. 1965. Vertical migration and distribution of mesopelagic fishes off Oregon. *Deep-sea Res.* 13:153-165.
- Post, A. 1987. Results of the research cruises of FRV "Walther Herwig" to South America. LXVII.

- Revision of the subfamily Paralepididinae (Pisces, Aulopiformes, Alepisauroidei, Paralepididae). I. Taxonomy, morphology and geographical distribution. Arch. Fischereiwiss. 38:75–131.
- Raju, S. N. 1985. Congrid eels of the eastern Pacific and key to their leptocephali. U.S. Dep. Commer., NOAA Tech. Rep. NMFS 22. 19 pp.
- Rass, T. S. and A. A. Kashkina. 1967. Bathylagid fishes of the northern Pacific (Pisces, Bathylagidae). Pages 209-221 *In* T. S. Rass, ed. The pelagic and bathypelagic fishes of the world ocean. Trudy Inst. Okeanol. 84 [English transl. Inst. of Modern Languages, Wash. D.C.].
- Rechnitzer, A. B. and J. Böhlke. 1958. *Ichthyococcus irregularis*, a new gonostomatine fish from the eastern Pacific. Copeia 1958:10–15.
- Regan, C. T. and E. Trewavas. 1929. The fishes of the families Astronesthidae and Chauliodontidae. Dana Rep. 5. 39 pp.
- and E. Trewavas. 1930. The fishes of the families Stomiidae and Malacosteidae. Dana Rep. 6. 143 pp.
- Richards, W. J. 1989. Preliminary guide to the identification of the early life history stages of scombroid fishes of the western central Atlantic. U.S. Dep. Commer., NOAA Tech. Memo., NMFS-SEFC-240. 101 pp.
- Robins, C. H. 1989. Family Derichthyidae. Pages 420-431 *In* E. B. Böhlke, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1. Pt. 9.
- Robison, B. H. 1972. Distribution of midwater fishes of the Gulf of California. Copeia. 1972: 448-461.
- Rofen, R. R. 1966a. Family Paralepididae. Pages 205–461 *In* G. W. Mead, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1. Pt. 5.
- . 1966b. Family Anotopteridae. Pages 498–510 *In* G. W. Mead, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1. Pt. 5.
- . 1966c. Family Evermannellidae. Pages 511–565 *In* G. W. Mead, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1. Pt. 5.
- Rosenblatt, R. H. and R. R. Wilson, Jr. 1987. Cutlassfishes of the genus *Lepidopus* (Trichiuridae), with two new eastern Pacific species. Jpn. J. Ichthyol. 33:342–351.
- Sandknop, E. M. and W. Watson. 1996a. Melamphaidae: Bigscales. Pages 692-711 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996b. Howellidae: Pelagic basslets. Pages 1072-1077 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.

- . 1996c. Trichiuridae: Cutlassfishes. Pages 1287-1293 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- Scott, W. B. 1995. Molidae. Pages 1275-1277 *In* W. Fischer, F. Krupp, W. Schneider, C. Sommer, K. E. Carpenter, and V. H. Niem, eds. Guia FAO para la identificación de especies para los fines de la pesca. Pacifico Centro-Oriental. FAO, Rome [in Spanish].
- Smith, D. G. 1989a. Family Chlopsidae: leptocephali. Pages 933–942 *In* E. B. Böhlke, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 2. Pt. 9.
- . 1989b. Family Derichthyidae: leptocephali. Pages 917–920 *In* E. B. Böhlke, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 2. Pt. 9.
- Smith, M. M. and P. C. Heemstra. eds. 1986. Smiths' sea fishes. Macmillan South Africa Ltd., Johannesburg. 1047 pp.
- Smith-Vaniz, W. F. 1995. Carangidae. Pages 940–986 *In* W. Fischer, F. Krupp, W. Schneider, C. Sommer, K. E. Carpenter, and V. H. Niem, eds. Guia FAO para la identificación de especies para los fines de la pesca. Pacifico Centro-Oriental. FAO, Rome [in Spanish].
- Stevens, E. G. and H. G. Moser. 1996. Bregmacerotidae: Codlets. Pages 477-481 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- Tighe, K. A. 1989a. Family Serrivomeridae. Pages 613-637 *In* E. B. Böhlke, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 1. Pt. 9.
- . 1989b. Family Serrivomeridae: leptocephali. Pages 921–924 *In* E. B. Böhlke, ed. Fishes of the western North Atlantic. Mem. Sears Found. Mar. Res. 2. Pt. 9.
- Thomson, D. A., L. T. Findley, and A. N. Kerstitch. 1979. Reef fishes of the Sea of Cortez. The rocky-shore fishes of the Gulf of California. Univ. Arizona Press, Tucson. 302 pp.
- Tyler, J. C. 1980. Osteology, phylogeny, and higher classification of the fishes of the order Plectognathi (Tetraodontiformes). U.S. Dep. Commer., NOAA Tech. Rep. NMFS Circ. 434. 422 pp.
- Watson, W. 1996a. Gonostomatidae: Bristlemouths. Pages 246-267 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996b. Sternoptychidae: Hatchetfishes. Pages 268-283 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996c. Phosichthyidae: Lightfishes. Pages 284-293 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996d. Exocoetidae: Flyingfishes. Pages 643-657 *In* H. G. Moser, ed. The early stages of fishes in

- the California Current region. CalCOFI Atlas 33.
- . 1996e. Labridae: Wrasses. Pages 1088-1109 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996f. Nomeidae: Driftfishes. Pages 1300-1311 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996g. Balistidae: Triggerfishes. Pages 1417-1421 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996h. Ostraciidae: Trunkfishes. Pages 1425-1427 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996i. Molidae: Molas. Pages 1439-1441 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- and E. M. Sandknop. 1996a. Engraulidae: Anchovies. Pages 173-183 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996b. Scopelarchidae: Pearleyes. Pages 332-347 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- . 1996c. Chiasmodontidae: Swallowers. Pages 1131-1137 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- Watson, W., S. R. Charter, H. G. Moser, D. A. Ambrose, and E. M. Sandknop. 1996. Carangidae: Jacks. Pages 914-953 *In* H. G. Moser, ed. The early stages of fishes in the California Current region. CalCOFI Atlas 33.
- Whitehead, P. J. P., M.-L. Bauchot, J.-C. Hureau, J. Nielsen, and E. Tortonese, eds. 1984. Fishes of the north-eastern Atlantic and the Mediterranean. I:1-510. UNESCO, Paris.
- . 1986. Fishes of the north-eastern Atlantic and the Mediterranean. II and III:517-1473. UNESCO, Paris.
- , G. J. Nelson, and T. Wongratana. 1988. FAO species catalogue. Clupeoid fishes of the world (suborder Clupeioidi). An annotated and illustrated catalogue of the herrings, sardines, pilchards, sprats, shads, anchovies and wolf-herrings. Part 2. Engraulidae. FAO Fish. Synop. 125 Vol. 7:305-579.
- Wild, A. 1994. A review of the biology and fisheries for yellowfin tuna, *Thunnus albacares*, in the eastern Pacific Ocean. Pages 52-107 *In* R. S. Shomura, J. Majkowski, and S. Langi, eds. Interactions of Pacific tuna fisheries. 2. Papers on biology and fisheries. FAO Fish. Tech. Paper 336/2.
- Willis, J. M. 1984. Mesopelagic fish faunal regions of the northeast Pacific. *Biol. Oceanogr.* 3:167-185.

- and W. G. Pearcy. 1982. Vertical distribution and migration of fishes of the lower mesopelagic zone off Oregon. *Mar. Biol.* 70:87-98.
- , J. M., W. G. Pearcy, and N. V. Parin. 1988. Zoogeography of midwater fishes in the subarctic Pacific. Pages 79-142. *In* T. Nemoto and W. G. Pearcy, eds. *The biology of the subarctic Pacific — Proceedings of the Japan-United States of American seminar on the biology of the micronekton of the subarctic Pacific. Part II.* Bull. Ocean Res. Inst. Univ. Tokyo.
- Wisner, R. L. 1971. Descriptions of eight new species of myctophid fishes from the eastern Pacific Ocean. *Copeia*. 1971:39-54.
- . 1976. *The taxonomy and distribution of lanternfishes (family Myctophidae) of the eastern Pacific Ocean.* U.S. Government Printing Office, Washington, D.C. 229 pp.
- Zahuranec, B. J. In press. Zoogeography and systematics of the lanternfishes of the genus *Nannobranchium* (Lampanyctini: Myctophidae). *Smiths. Contr. Zool.*

Table 1. Station data for *David Starr Jordan* Cruise 7205-JD.

Station	Lat. North	Long. West	Date	Start time	End time	Bottom depth (m)	Wire out (m)	Haul depth (m)	Net
31.127	31° 00'	127° 00'	4/21	0010	0055	4600	600		IK
31.127	31 00	127 00	4/21	0130	0247	4600	1000		MT
31.135	31 00	135 00	4/23	0147	0231	4600	600		IK
31.135	31 00	135 00	4/23	0253	0410	4600	1000		MT
31.141	31 00	141 00	4/24	0247	0331	4700	600	320	IK
31.145	31 00	145 00	4/25	2037	2205	5700	1000		MT
31.145	31 00	145 00	4/26	0125	0216	5700	650	260	IK
27.145	27 00	144 58	4/27	0118	0203	4900	600	240	IK
27.145	27 00	144 58	4/27	0220	0322	4900	1000		IK
27.135	27 00	135 00	4/29	1837	1920	4500	600		IK
27.135	27 00	135 00	5/2	0428	0512	4500	600	210	IK
130.50	25 50	114 47	5/13	2157	2240	3600	600	200	IK
130.90	24 26	117 17	5/14	2210	2253	3800	600	190	IK
130.90	24 26	117 17	5/15	0228	0346	3800	1000		MT
24.125	24 00	125 00	5/16	2352	0035	4200	600	190	IK
24.125	24 00	125 00	5/17	0138	0240	4200	1000		IK
24.133	24 00	133 00	5/18	2227	2310	4400	600	200	IK
24.141	24 00	141 00	5/20	2334	0017	4400	600	210	IK
24.145	24 00	145 00	5/21	2348	0031	5300	600	220	IK
24.145	24 00	145 00	5/22	0344	0440	5300	1000		MT
20.145	20 00	145 00	5/23	0421	0504	4800	600	190	IK
20.145	20 00	145 00	5/23	0533	0652	4800	1000		MT
20.135	20 00	135 00	5/26	0312	0345	4700	600	200	IK
20.135	20 00	135 00	5/26	0359	0501	4700	1000		IK
20.129	20 00	129 00	5/27	1653	1736	4800	600	210	IK
20.129	20 00	129 00	5/27	2103	2222	4800	1000		MT
20.121	20 00	121 00	5/29	2348	0031	4200	600	190	IK
20.121	20 00	121 00	5/30	0042	0143	4200	1000		MT
140.120	21 45	118 01	5/31	0142	0225	4000	600	200	IK
140.120	21 45	118 01	5/31	0236	0337	4000	1000		IK
150.70	21 41	113 48	6/3	2250	2333	3800	600		IK
150.70	21 41	113 48	6/3	2336	0018	3800	1000		IK

Table 2. Station data for *David Starr Jordan* Cruise 7210-JD.

Station	Lat. North	Long. West	Date	Start time	End time	Bottom depth (m)	Wire out (m)	Haul depth (m)	Net
31.127	31° 00'	127° 00'	9/29	0039	0123	4600	600	220	IK
31.127	31 00	127 00	9/29	0208	0326	4600	1000		MT
31.135	31 00	135 00	10/1	0008	0052	4600	600	230	IK
31.135	31 00	135 00	10/1	0115	0234	4600	1000		MT
31.139	31 00	139 00	10/2	0120	0204	4600	600	230	IK
31.139	31 00	139 00	10/2	0224	0343	4600	1000	317	MT
31.145	31 00	145 00	10/4	2025	2110	5700	600	210	IK
31.145	31 00	145 00	10/5	0300	0419	5700	1000	470	MT
27.143	26 56	143 00	10/6	0020	0132	4800	1000	384	IK
27.143	26 56	143 00	10/6	0140	0221	4800	600	220	IK
27.135	27 00	135 00	10/8	0131	0250	4500	1000	443	MT
27.135	27 00	135 00	10/8	0024	0108	4500	600	226	IK
27.131	27 00	131 00	10/9	0321	0405	4400	600	228	IK
27.131	27 00	131 00	10/9	0429	0550	4400	1000	400	MT
100.140	28 00	124 04	10/11	0059	0143	4200	600	206	IK
100.140	28 00	124 04	10/11	0200	0319	4200	1000		MT
130.50	25 49	114 45	10/21	2224	2341	3700	1000	610	MT
130.50	25 49	114 45	10/21	2125	2209	3700	600	236	IK
130.90	24 00	117 18	10/23	0023	0144	4000	1000	420	MT
130.90	24 29	117 18	10/23	0212	0256	4000	600	248	IK
24.125	24 00	125 00	10/25	0318	0402	3800	600	241	IK
24.125	24 00	125 00	10/25	0421	0540	3800	1000	361	MT
24.129	24 00	128 58	10/26	0156	0240	4000	600	283	IK
24.129	24 00	128 58	10/26	0256	0415	4000	1000		MT
24.131	24 00	131 00	10/26	1917	2036	4800	1000	442	MT
24.131	24 00	131 00	10/26	2054	2138	4800	600	243	IK
24.139	24 00	139 00	10/28	2338	0022	3800	600	256	IK
24.139	24 00	139 00	10/29	0040	0159	3800	1000	494	MT
24.143	24 00	142 50	10/29	2238	2357	4900	1000	411	MT
24.143	24 00	142 50	10/30	0339	0423	4900	600	221	IK
22.143	21 47	142 48	10/30	2055	2340	5200	1200	570	MT

Table 2. Continued.

Station	Lat. North	Long. West	Date	Start time	End time	Bottom depth (m)	Wire out (m)	Haul depth (m)	Net
20.135	20° 00'	135° 00'	11/2	2134	2218	3700	600	226	IK
20.135	20 00	135 00	11/2	2225	2336	3700	1000	376	MT
20.127	20 00	127 00	11/5	0344	0503	4900	1000	443	MT
20.127	20 00	127 00	11/5	0244	0328	4900	600	220	IK
20.123	20 00	123 06	11/6	0209	0332	4200	1000	389	MT
20.123	20 00	123 06	11/6	0354	0438	4200	600	250	IK
140.120	21 45	118 00	11/8	0202	0321	4000	1000	443	MT
140.120	21 45	118 00	11/8	0101	0145	4000	600	227	IK
150.70	21 41	113 48	11/11	2011	2055	3800	600	222	IK
157G.25	22 40	109 09	11/14	2022	2106	2900	600	200	IK
157G.55	22 54	108 40	11/15	0138	0222	3100	600	207	IK
23.108	23 06	108 35	11/17	1806	1850	2600	600	183	IK

Table 3. Occurrences (Occ.) and numbers of specimens (No.) of identified fish taxa captured by 6-foot Isaacs-Kidd (IK) and Universal Mark II (MT) midwater trawls on Cruises 7205-JD and 7210-JD. Unidentifiable species categories ("spp.") not included in table, except in cases where a genus or family is represented solely by an unidentifiable species category.

Taxon	Cruise 7205-JD				Cruise 7210-JD				Total	
	IK		MT		IK		MT		Occ.	No.
	Occ.	No.	Occ.	No.	Occ.	No.	Occ.	No.		
Albulidae										
<i>Albula</i> sp.	0	0	0	0	2	2	0	0	2	2
Chlopsidae										
<i>Chlopsis</i> spp.	0	0	0	0	2	18	0	0	2	18
Muraenidae										
<i>Gymnothorax mordax</i>	0	0	0	0	1	2	0	0	1	2
Ophichthidae										
<i>Myrophis vafer</i>	0	0	0	0	3	35	0	0	3	35
<i>Ophichthus zophochir</i>	0	0	0	0	1	1	0	0	1	1
Ophichthidae A	0	0	0	0	1	3	0	0	1	3
Ophichthidae B	0	0	0	0	2	21	0	0	2	21
Ophichthidae D	0	0	0	0	1	1	0	0	1	1
Ophichthidae E	0	0	0	0	2	2	0	0	2	2
Ophichthidae F	0	0	0	0	1	1	0	0	1	1
Congridae										
<i>Ariosoma gilberti</i>	0	0	1	1	3	181	1	1	5	183
<i>Ariosoma</i> sp.	0	0	1	3	0	0	0	0	1	3
<i>Bathycongrus macrurus</i>	0	0	0	0	3	107	0	0	3	107
<i>Chiloconger obtusus</i>	0	0	0	0	1	2	1	1	2	3
<i>Gnathophis cinctus</i>	1	3	0	0	0	0	0	0	1	3
<i>Heteroconger canabus</i>	0	0	0	0	3	18	1	1	4	19
<i>Heteroconger digueti</i>	0	0	0	0	3	4	0	0	3	4
<i>Paraconger californiensis</i>	0	0	0	0	3	4	0	0	3	4
<i>Rhynchoconger nitens</i>	0	0	0	0	3	11	0	0	3	11
Derichthyidae										
<i>Derichthys serpentinus</i>	0	0	1	1	0	0	0	0	1	1
<i>Nessorhamphus danae</i>	0	0	1	1	0	0	0	0	1	1
Nemichthyidae										
<i>Avocettina bowersi</i>	1	1	0	0	0	0	0	0	1	1
<i>Avocettina infans</i>	0	0	0	0	0	0	3	5	3	5
<i>Nemichthys scolopaceus</i>	4	10	4	46	3	3	4	6	15	65
Serrivomeridae										
<i>Serrivomer</i> sp.	1	1	2	2	0	0	4	15	7	18
<i>Stemonidium hypomelas</i>	0	0	0	0	1	1	2	2	3	3
Cyematidae										
<i>Cyema atrum</i>	5	5	2	3	0	0	2	2	9	10

Table 3. Cont.

Taxa	Cruise 7205-JD				Cruise 7210-JD				Total	
	IK		MT		IK		MT		Occ.	No.
	Occ.	No.	Occ.	No.	Occ.	No.	Occ.	No.		
Eurypharyngidae										
<i>Eurypharynx pelecyanoides</i>	1	1	0	0	0	0	0	0	1	1
Engraulidae										
<i>Engraulis mordax</i>	1	43	0	0	0	0	0	0	1	43
Bathylagidae										
<i>Bathylagus bericoides</i>	1	1	1	5	1	1	0	0	3	7
<i>Bathylagus longirostris</i>	0	0	0	0	0	0	5	11	5	11
<i>Bathylagus nigrigenys</i>	0	0	0	0	2	4	0	0	2	4
<i>Bathylagus wesethi</i>	1	1	2	22	0	0	4	6	7	29
Microstomatidae										
<i>Microstoma</i> sp.	1	1	0	0	0	0	0	0	1	1
<i>Nansenia ahlstromi</i>	1	1	0	0	0	0	1	1	2	2
<i>Nansenia</i> sp.	1	1	2	2	0	0	0	0	3	3
Opisthoproctidae										
<i>Dolichopteryx</i> sp.	0	0	2	2	0	0	2	2	4	4
<i>Opisthoproctus soleatus</i>	0	0	0	0	0	0	2	2	2	2
Platyroctidae										
<i>Sagamichthys abei</i>	0	0	0	0	0	0	3	10	3	10
Gonostomatidae										
<i>Cyclothone acclinidens</i>	1	2	1	39	0	0	6	2237	8	2278
<i>Cyclothone alba</i>	1	1	3	123	0	0	6	454	10	578
<i>Cyclothone pallida</i>	0	0	1	1	0	0	1	23	2	24
<i>Cyclothone pseudopallida</i>	2	3	2	14	0	0	3	619	7	636
<i>Cyclothone signata</i>	2	62	3	46	0	0	8	1030	13	1138
<i>Diplophos proximus</i>	0	0	0	0	0	0	2	2	2	2
<i>Diplophos taenia</i>	1	1	3	7	0	0	4	6	8	14
<i>Gonostoma atlanticum</i>	4	5	4	19	1	1	8	27	17	52
<i>Gonostoma ebelingi</i>	5	13	4	27	1	4	8	33	18	77
<i>Gonostoma elongatum</i>	0	0	1	1	0	0	0	0	1	1
<i>Margrethia obtusirostra</i>	0	0	1	1	2	2	2	2	5	5
Sternoptychidae										
<i>Argyropelecus affinis</i>	0	0	2	32	0	0	7	68	9	100
<i>Argyropelecus hemigymnus</i>	3	5	4	63	2	2	13	92	22	162
<i>Argyropelecus lychnus</i>	4	6	2	55	3	9	5	53	14	123
<i>Argyropelecus sladeni</i>	1	3	3	4	1	1	1	1	6	9
<i>Danaphos oculus</i>	1	5	1	7	0	0	4	25	6	37
<i>Sternoptyx diaphana</i>	1	1	3	4	1	1	6	212	11	218
<i>Sternoptyx pseudobscura</i>	0	0	1	1	0	0	0	0	1	1
<i>Valenciennellus tripunctulatus</i>	5	9	3	21	7	10	11	45	26	85

Table 3. Cont.

Taxa	Cruise 7205-JD				Cruise 7210-JD				Total	
	IK		MT		IK		MT			
	Occ.	No.	Occ.	No.	Occ.	No.	Occ.	No.	Occ.	No.
Phosichthyidae										
<i>Ichthyococcus irregularis</i>	0	0	1	1	0	0	0	0	1	1
<i>Ichthyococcus ovatus</i>	0	0	2	4	0	0	1	1	3	5
<i>Vinciguerria lucetia</i>	12	534	2	571	10	575	7	1655	31	3335
<i>Vinciguerria nimbaria</i>	12	95	6	788	12	56	11	216	41	1155
<i>Vinciguerria poweriae</i>	11	20	6	101	8	14	12	218	37	353
Chauliodontidae										
<i>Chauliodus sloani</i>	1	1	2	2	0	0	2	2	5	5
Stomiidae										
<i>Stomias atriventer</i>	1	1	1	1	1	2	4	11	7	15
Astronesthidae										
<i>Astronesthes</i> sp.	0	0	0	0	0	0	1	1	1	1
<i>Astronesthes splendidus</i>	0	0	1	1	0	0	0	0	1	1
<i>Borostomias panamensis</i>	0	0	0	0	0	0	1	4	1	4
Melanostomiidae										
<i>Bathophilus brevis</i>	0	0	0	0	0	0	1	1	1	1
<i>Bathophilus filifer</i>	0	0	0	0	2	2	2	2	4	4
<i>Bathophilus flemingi</i>	0	0	2	4	1	1	5	9	8	14
<i>Bathophilus kingi</i>	1	1	0	0	0	0	1	1	2	2
<i>Bathophilus nigerrimus</i>	0	0	0	0	0	0	2	2	2	2
<i>Eustomias bifilis</i>	1	1	0	0	1	1	3	4	5	6
<i>Eustomias melanostigma</i>	0	0	0	0	1	1	0	0	1	1
<i>Eustomias schmidti</i>	0	0	0	0	0	0	3	4	3	4
<i>Leptostomias</i> spp.	1	1	2	3	3	3	4	6	10	13
<i>Melanostomias melanops</i>	0	0	1	1	0	0	0	0	1	1
<i>Photonectes intermedius</i>	0	0	1	1	0	0	0	0	1	1
<i>Photonectes margarita</i>	0	0	0	0	0	0	1	1	1	1
<i>Photonectes parvimanus</i>	1	1	0	0	0	0	0	0	1	1
Malacosteidae										
<i>Aristostomias polydactylus</i>	0	0	0	0	0	0	1	1	1	1
<i>Aristostomias scintillans</i>	1	1	0	0	2	2	4	14	7	17
<i>Malacosteus niger</i>	0	0	0	0	0	0	1	2	1	2
<i>Photostomias</i> sp.	0	0	1	1	0	0	0	0	1	1
Idiacanthidae										
<i>Idiacanthus antrostomus</i>	1	1	2	3	4	4	9	20	16	28
<i>Idiacanthus fasciola</i>	3	4	2	10	0	0	1	1	6	15

Table 3. Cont.

Taxa	Cruise 7205-JD				Cruise 7210-JD				Total	
	IK		MT		IK		MT		Occ.	No.
	Occ.	No.	Occ.	No.	Occ.	No.	Occ.	No.		
Scopelarchidae										
<i>Benthalbella infans</i>	0	0	1	1	0	0	0	0	1	1
<i>Rosenblattichthys hubbsi</i>	0	0	1	2	0	0	0	0	1	2
<i>Rosenblattichthys volucris</i>	0	0	0	0	1	1	0	0	1	1
<i>Scopelarchus analis</i>	2	6	3	7	3	4	3	8	11	25
<i>Scopelarchus guentheri</i>	4	9	6	14	7	19	12	46	29	88
<i>Scopelarchus michaelisarsari</i>	1	1	2	6	1	1	5	10	9	18
<i>Scopelarchus stephensi</i>	2	4	3	36	0	0	1	2	6	42
<i>Scopelarchoides nicholsi</i>	0	0	0	0	1	4	0	0	1	4
Notosudidae										
<i>Ahliesaurus brevis</i>	1	1	0	0	0	0	0	0	1	1
<i>Scopelosaurus hoedti</i>	3	5	0	0	0	0	2	2	5	7
Paralepididae										
<i>Arctozenus risso</i>	0	0	3	9	1	1	1	6	5	16
<i>Lestidiops</i> sp.	4	7	6	34	0	0	3	4	13	38
<i>Magnisudis atlantica</i>	1	1	0	0	0	0	3	6	4	7
<i>Stemonosudis macrura</i>	0	0	4	28	1	1	4	6	9	35
<i>Sudis atrox</i>	3	4	4	20	1	1	2	5	10	30
<i>Uncisudis advena</i>	0	0	1	1	0	0	0	0	1	1
Anotopteridae										
<i>Anotopterus pharao</i>	1	1	0	0	0	0	0	0	1	1
Evermannellidae										
<i>Coccorella atlantica</i>	1	1	2	3	0	0	0	0	3	4
<i>Coccorella atrata</i>	0	0	1	1	0	0	0	0	1	1
<i>Evermannella ahlstromi</i>	0	0	1	4	0	0	1	1	2	5
<i>Evermannella indica</i>	1	1	1	1	0	0	3	4	5	6
<i>Odontostomops normalops</i>	0	0	2	3	0	0	1	1	3	4
Neoscopelidae										
<i>Scopelengys clarkei</i>	0	0	0	0	0	0	1	1	1	1
<i>Scopelengys tristis</i>	0	0	0	0	0	0	1	2	1	2
Myctophidae										
<i>Benthosema panamense</i>	1	2	0	0	0	0	0	0	1	2
<i>Benthosema suborbitale</i>	5	8	4	26	6	8	7	54	22	96
<i>Bolinichthys distofax</i>	0	0	0	0	0	0	1	1	1	1
<i>Bolinichthys longipes</i>	12	35	8	137	13	36	18	578	51	786
<i>Centrobranchus nigroocellatus</i>	0	0	1	1	1	1	6	6	8	8
<i>Ceratoscopelus townsendi</i>	3	11	4	467	8	20	14	1267	29	1765
<i>Ceratoscopelus warmingii</i>	8	86	4	282	9	34	11	562	32	964

Table 3. Cont.

Taxa	Cruise 7205-JD				Cruise 7210-JD				Total	
	IK		MT		IK		MT			
	Occ.	No.	Occ.	No.	Occ.	No.	Occ.	No.	Occ.	No.
Myctophidae (cont.)										
<i>Diaphus anderseni</i>	8	16	5	58	8	13	11	67	32	154
<i>Diaphus bertelseni</i>	0	0	2	35	0	0	3	3	5	38
<i>Diaphus brachycephalus</i>	1	1	4	29	0	0	5	8	10	38
<i>Diaphus elucens</i>	0	0	0	0	0	0	1	1	1	1
<i>Diaphus mollis</i>	6	8	5	62	7	9	15	151	33	230
<i>Diaphus pacificus</i>	1	3	1	3	5	198	2	2	9	206
<i>Diaphus parri</i>	0	0	1	34	0	0	1	3	2	37
<i>Diaphus phillipsi</i>	4	5	0	0	4	5	7	13	15	23
<i>Diaphus schmidti</i>	1	1	2	7	0	0	1	1	4	9
<i>Diaphus splendidus</i>	0	0	1	1	0	0	0	0	1	1
<i>Diaphus trachops</i>	0	0	1	2	0	0	0	0	1	2
<i>Diaphus</i> sp. A	2	3	1	2	0	0	3	7	6	12
<i>Diogenichthys atlanticus</i>	12	41	6	272	15	75	15	1226	48	1614
<i>Diogenichthys laternatus</i>	9	80	2	26	8	200	4	333	23	639
<i>Electrona risso</i>	0	0	1	1	0	0	1	1	2	2
<i>Gonichthys tenuiculus</i>	2	2	1	3	1	1	3	8	7	14
<i>Hygophum atratum</i>	2	4	1	16	2	2	3	38	8	60
<i>Hygophum proximum</i>	1	1	3	63	3	3	4	66	11	133
<i>Hygophum reinhardtii</i>	3	4	5	89	4	6	14	189	26	288
<i>Lampadena anomala</i>	0	0	0	0	0	0	1	3	1	3
<i>Lampadena urophaos</i>	8	17	5	20	1	1	9	22	22	60
<i>Lampanyctus acanthurus</i>	1	2	2	10	4	6	7	37	14	55
<i>Lampanyctus idostigma</i>	6	19	2	26	6	25	6	128	20	198
<i>Lampanyctus "niger"</i>	5	7	5	19	4	7	13	69	27	102
<i>Lampanyctus nobilis</i>	4	5	4	39	2	4	9	65	19	113
<i>Lampanyctus "no pectorals"</i>	8	25	5	82	11	24	14	345	38	476
<i>Lampanyctus parvicauda</i>	2	2	0	0	4	8	1	2	7	12
<i>Lampanyctus ritteri</i>	0	0	1	4	2	3	2	6	5	13
<i>Lampanyctus steinbecki</i>	11	37	7	180	11	32	14	309	43	558
<i>Lobianchia gemellarii</i>	1	1	6	52	4	5	13	72	24	130
<i>Loweina rara</i>	1	1	2	2	3	3	3	3	9	9
<i>Loweina terminata</i>	0	0	1	4	1	1	0	0	2	5
<i>Myctophum aurolaternatum</i>	0	0	0	0	2	2	0	0	2	2
<i>Myctophum lychnobium</i>	0	0	2	3	0	0	2	3	4	6
<i>Myctophum nitidulum</i>	2	3	2	9	0	0	2	2	6	14
<i>Myctophum obtusirostre</i>	1	1	2	4	0	0	1	1	4	6
<i>Myctophum selenops</i>	1	1	1	2	0	0	2	2	4	5
<i>Notolychnus valdiviae</i>	12	119	7	245	16	142	16	871	51	1377
<i>Notoscopelus resplendens</i>	5	24	6	141	3	3	14	132	28	300
<i>Parvilux boschmai</i>	0	0	1	1	0	0	0	0	1	1
<i>Parvilux ingens</i>	0	0	2	3	0	0	0	0	2	3

Table 3. Cont.

Taxa	Cruise 7205-JD				Cruise 7210-JD				Total	
	IK		MT		IK		MT		Occ.	No.
	Occ.	No.	Occ.	No.	Occ.	No.	Occ.	No.		
Myctophidae (cont.)										
<i>Protomyctophum beckeri</i>	1	1	2	2	0	0	0	0	3	3
<i>Protomyctophum crockeri</i>	0	0	2	17	0	0	8	39	10	56
<i>Symbolophorus californiensis</i>	0	0	1	2	0	0	1	1	2	3
<i>Symbolophorus evermanni</i>	4	6	5	29	0	0	6	9	16	44
<i>Taaningichthys minimus</i>	2	2	5	15	1	1	7	16	15	34
<i>Triphoturus mexicanus</i>	7	73	3	285	7	68	6	567	23	993
<i>Triphoturus nigrescens</i>	4	5	4	30	4	10	8	54	20	99
Bregmacerotidae										
<i>Bregmaceros</i> sp. A	2	2	4	49	1	1	10	34	17	86
<i>Bregmaceros</i> sp. B	0	0	2	22	2	2	5	17	9	41
<i>Bregmaceros bathymaster</i>	0	0	0	0	3	22	0	0	3	22
Macrouridae										
<i>Mesobius berryi</i>	0	0	1	1	0	0	0	0	1	1
Moridae										
Moridae larvae	1	1	0	0	0	0	0	0	1	1
Melanonidae										
<i>Melanonus zugmayeri</i>	0	0	0	0	0	0	3	3	3	3
Bythitidae										
<i>Brotulataenia nielseni</i>	1	1	0	0	0	0	0	0	1	1
Linophrynidae										
<i>Linophryne</i> sp.	0	0	2	3	0	0	0	0	2	3
Scomberesocidae										
<i>Cololabis saira</i>	1	1	0	0	0	0	0	0	1	1
Exocoetidae										
<i>Exocoetus volitans</i>	0	0	0	0	2	2	0	0	2	2
<i>Oxyporhamphus micropterus</i>	0	0	0	0	1	1	0	0	1	1
Radiicephalidae										
<i>Radiicephalus elongatus</i>	1	1	0	0	0	0	0	0	1	1
Trachipteridae										
<i>Trachipterus altivelis</i>	1	1	0	0	0	0	0	0	1	1
<i>Trachipterus fukuzakii</i>	0	0	0	0	0	0	1	1	1	1
Stylephoridae										
<i>Stylephorus chordatus</i>	0	0	2	3	0	0	2	2	4	5

Table 3. Cont.

Taxa	Cruise 7205-JD				Cruise 7210-JD				Total	
	IK		MT		IK		MT		Occ.	No.
	Occ.	No.	Occ.	No.	Occ.	No.	Occ.	No.		
Anoplogastridae										
<i>Anoplogaster cornuta</i>	0	0	0	0	0	0	2	2	2	2
Melamphidae										
<i>Melamphaes eulepis</i>	0	0	1	3	0	0	2	2	3	5
<i>Melamphaes parvus</i>	0	0	2	6	0	0	4	19	6	25
<i>Melamphaes simus</i>	4	5	4	39	1	1	8	43	17	88
<i>Poromitra crassiceps</i>	0	0	2	6	0	0	3	8	5	14
<i>Poromitra megalops</i>	0	0	0	0	1	2	0	0	1	2
<i>Poromitra</i> sp.	3	8	3	10	0	0	0	0	6	18
<i>Scopeloberyx robustus</i>	2	7	1	1	1	1	0	0	4	9
<i>Scopelogadus bispinosus</i>	3	5	2	10	3	4	7	17	15	36
<i>Scopelogadus mizolepis</i>	0	0	3	20	4	5	6	37	13	62
Cetomimidae										
<i>Cetostoma regani</i>	0	0	0	0	0	0	2	2	2	2
Macrurocyttidae										
<i>Zenion</i> sp.	0	0	1	3	0	0	1	1	2	4
Centriscidae										
<i>Macroramphosus gracilis</i>	1	1	0	0	0	0	0	0	1	1
Scorpaenidae										
<i>Scorpaenodes xyris</i>	0	0	0	0	3	6	0	0	3	6
<i>Sebastes</i> sp.	1	1	0	0	0	0	0	0	1	1
Carangidae										
<i>Decapterus</i> sp.	1	1	0	0	0	0	0	0	1	1
<i>Naucrates ductor</i>	0	0	0	0	1	1	0	0	1	1
<i>Seriola lalandi</i>	1	1	0	0	0	0	1	1	2	2
<i>Trachurus symmetricus</i>	1	1	1	1	0	0	0	0	2	2
Coryphaenidae										
<i>Coryphaena equiselis</i>	0	0	0	0	1	1	0	0	1	1
Caristiidae										
<i>Caristius maderensis</i>	0	0	0	0	0	0	2	2	2	2
Howellidae										
<i>Howella zina</i>	0	0	0	0	0	0	1	1	1	1
<i>Howella</i> sp.	1	1	2	2	1	1	2	2	6	6
Labridae										
<i>Xyrichtys mundiceps</i>	0	0	0	0	3	13	0	0	3	13

Table 3. Cont.

Taxa	Cruise 7205-JD				Cruise 7210-JD				Total	
	IK		MT		IK		MT		Occ.	No.
	Occ.	No.	Occ.	No.	Occ.	No.	Occ.	No.		
Chiasmodontidae										
<i>Chiasmodon niger</i>	1	1	2	2	0	0	2	2	5	5
<i>Kali normani</i>	0	0	0	0	0	0	2	3	2	3
<i>Pseudoscopelus scriptus</i>	0	0	1	1	0	0	0	0	1	1
Gempylidae										
<i>Diplospinus multistriatus</i>	6	14	5	12	1	1	1	1	13	28
<i>Gempylus serpens</i>	0	0	0	0	0	0	1	1	1	1
<i>Nealotus tripes</i>	2	2	1	3	0	0	0	0	3	5
Scombridae										
<i>Thunnus albacares</i>	0	0	0	0	1	1	0	0	1	1
Trichiuridae										
<i>Benthodesmus pacificus</i>	1	1	0	0	0	0	0	0	1	1
Nomeidae										
<i>Cubiceps baxteri</i>	4	6	1	6	2	3	3	14	10	29
<i>Cubiceps pauciradiatus</i>	0	0	0	0	0	0	1	1	1	1
<i>Cubiceps paradoxus</i>	0	0	0	0	0	0	1	1	1	1
<i>Psenes maculatus</i>	0	0	0	0	1	1	0	0	1	1
Paralichthyidae										
<i>Citharichthys</i> sp.	0	0	0	0	1	1	0	0	1	1
<i>Syacium ovale</i>	0	0	0	0	3	6	0	0	3	6
Bothidae										
<i>Bothus leopardinus</i>	1	2	0	0	3	4	0	0	4	6
Cynoglossidae										
<i>Symphurus</i> spp.	0	0	0	0	2	2	0	0	2	2
Balistidae										
<i>Canthidermis maculatus</i>	0	0	0	0	1	2	0	0	1	2
Ostraciidae										
<i>Lactoria diaphana</i>	1	1	0	0	0	0	0	0	1	1
Molidae										
<i>Ranzania laevis</i>	1	41	0	0	0	0	7	44	8	85

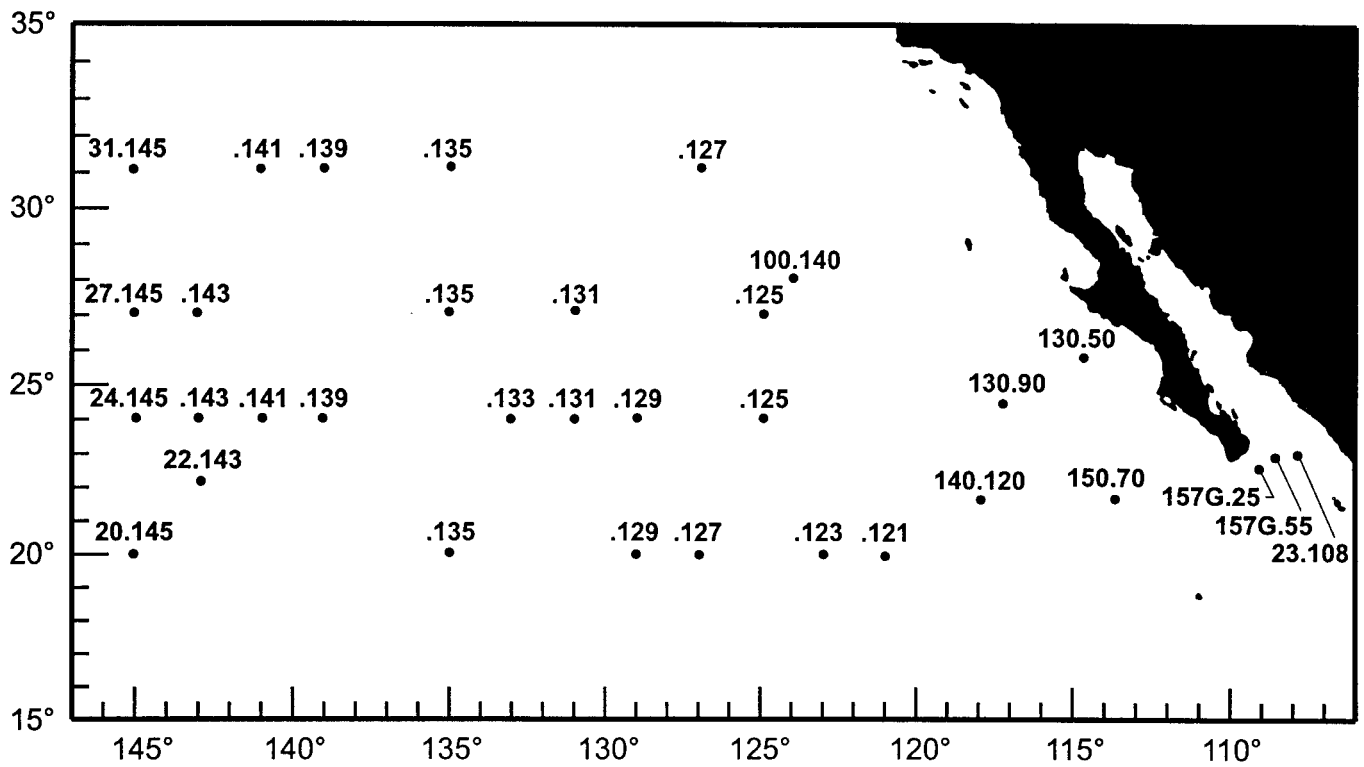


Figure 1. Station pattern for midwater trawls taken on 7205-JD and 7210-JD.

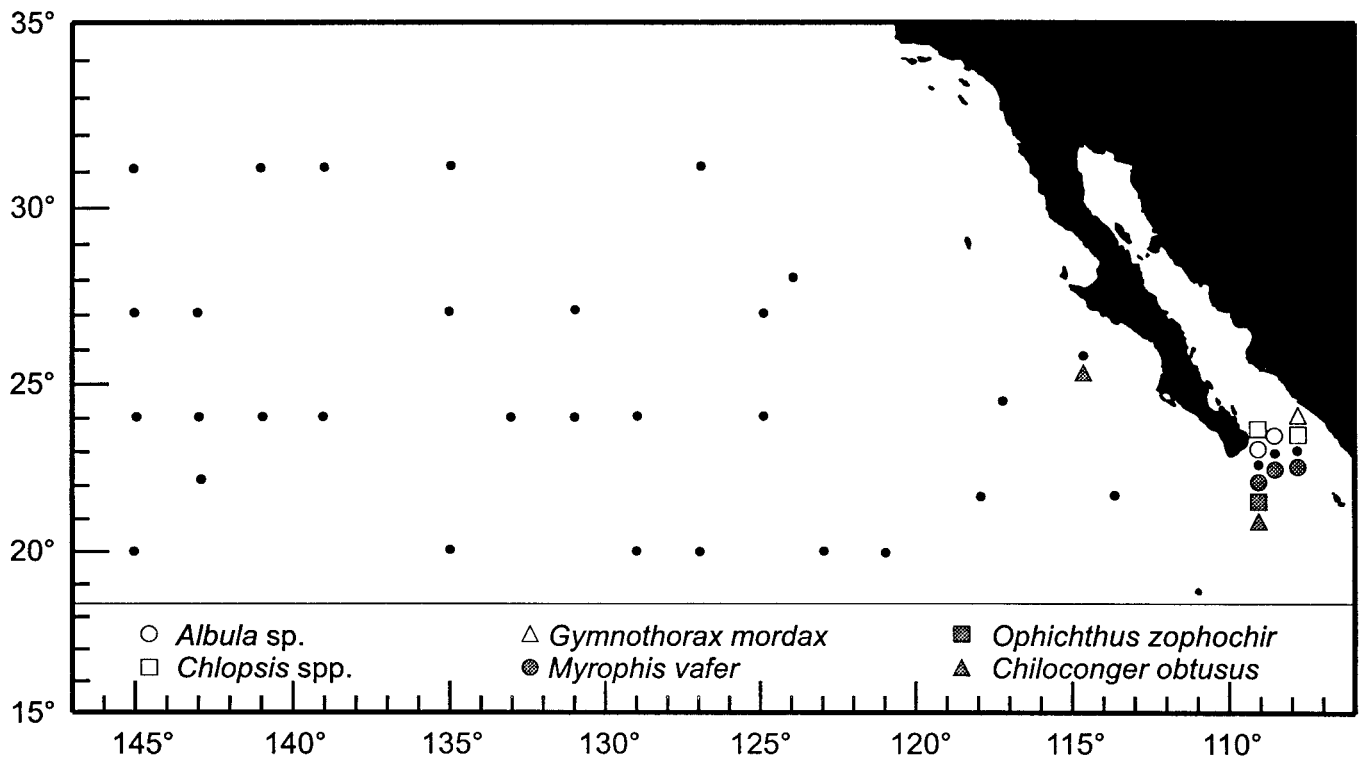


Figure 2. Localities of capture for species taken on cruises 7205-JD and 7210-JD. Species and their symbols given in the legend. Open symbols are above the station dot and solid symbols are below the dot in this and subsequent figures.

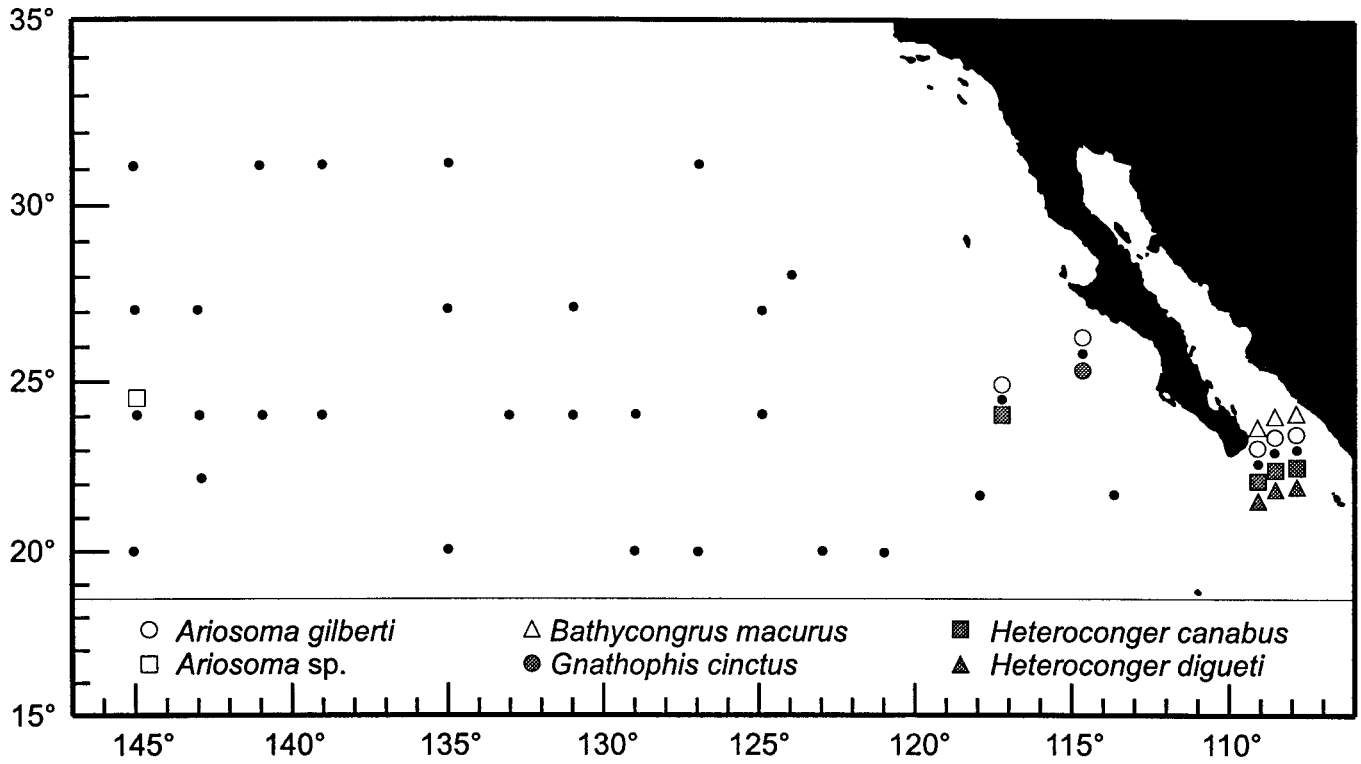


Figure 3. See caption for figure 2.

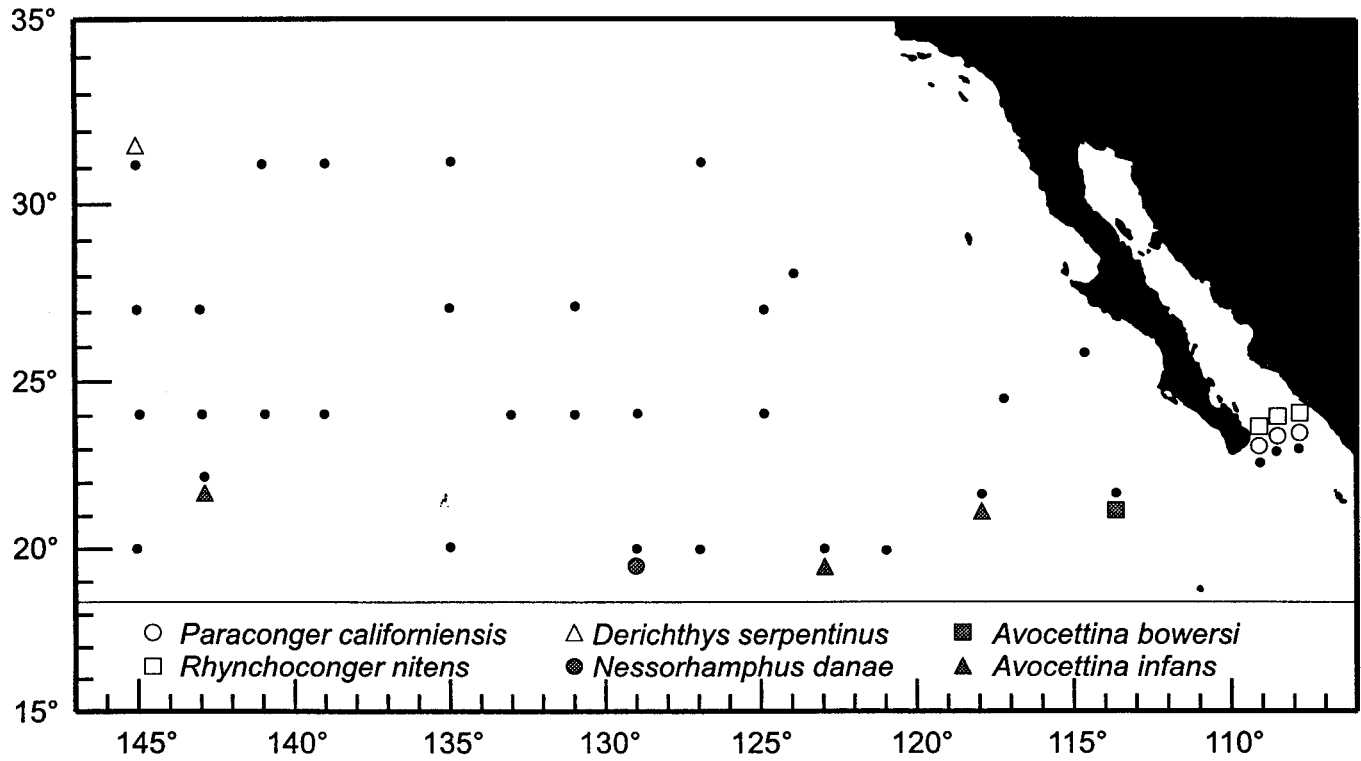


Figure 4. See caption for figure 2.

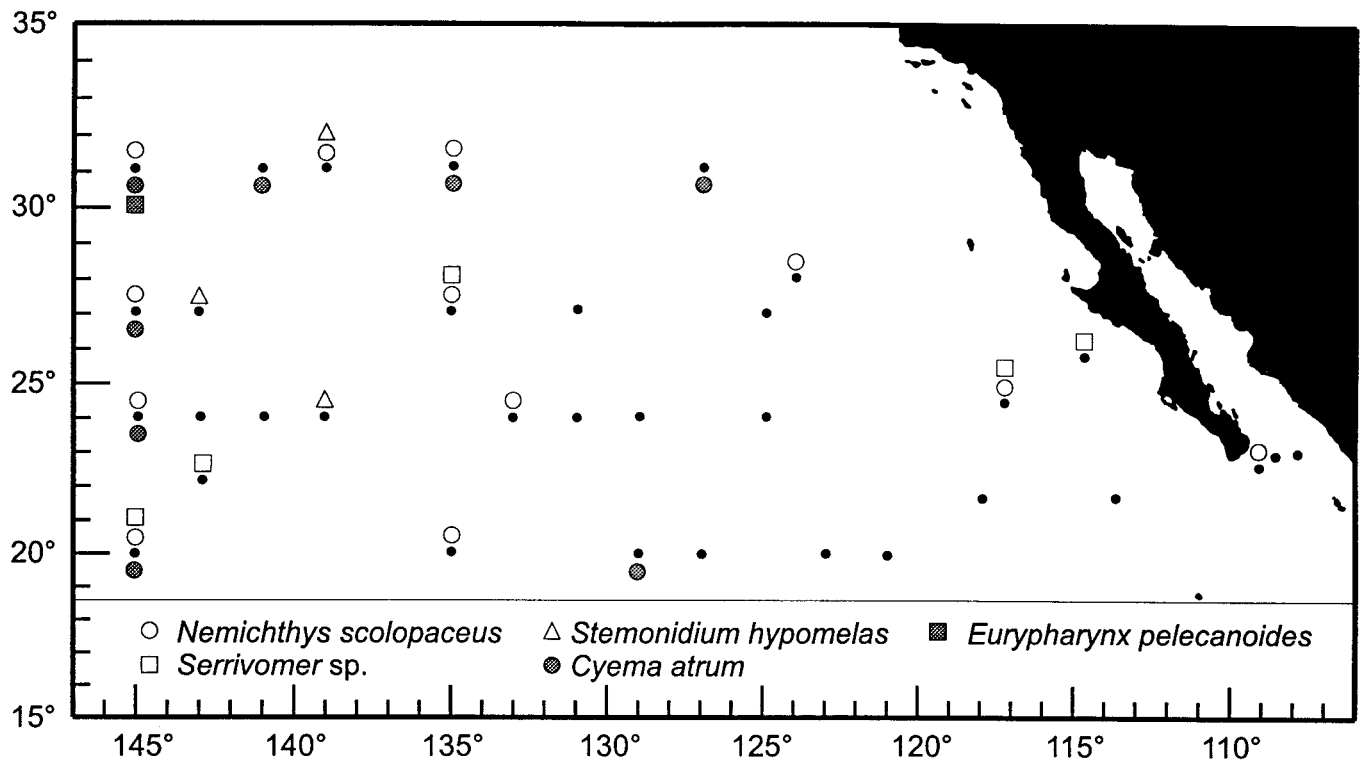


Figure 5. See caption for figure 2.

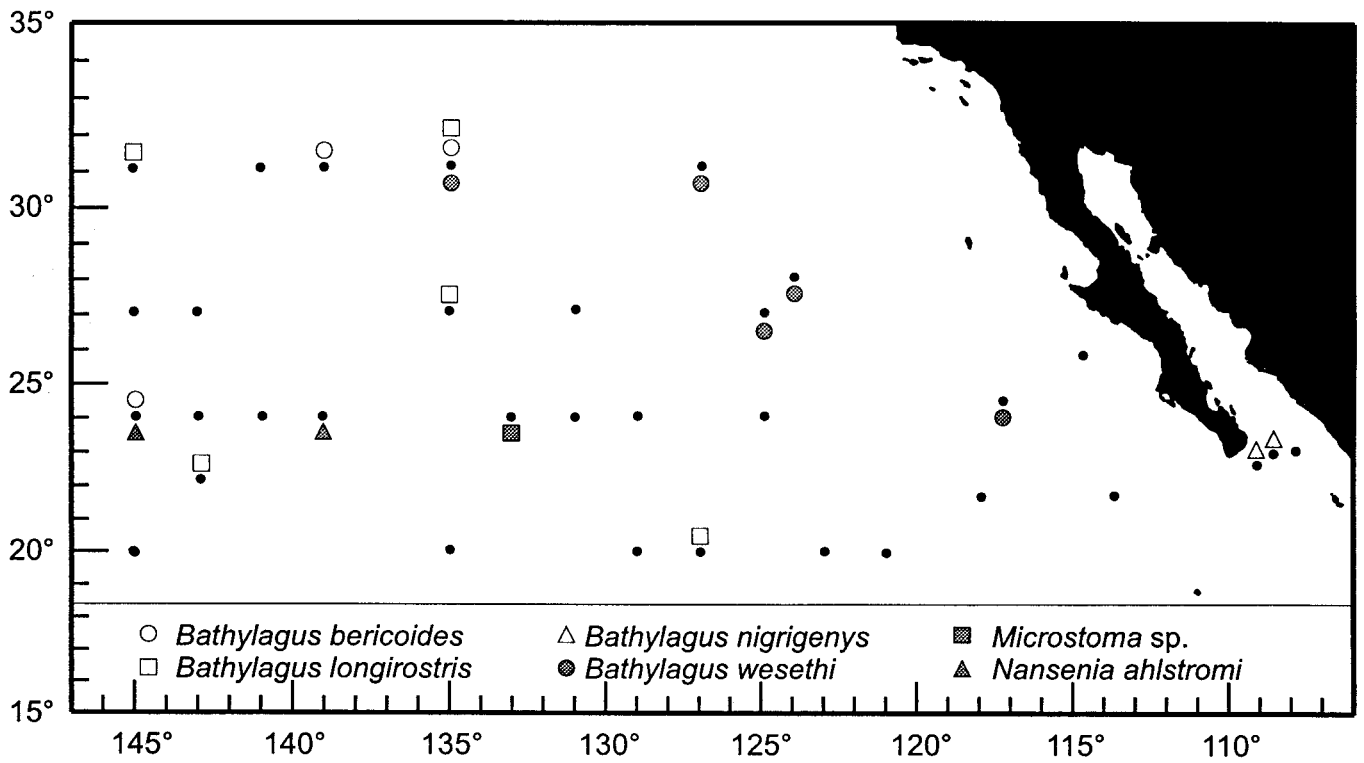


Figure 6. See caption for figure 2.

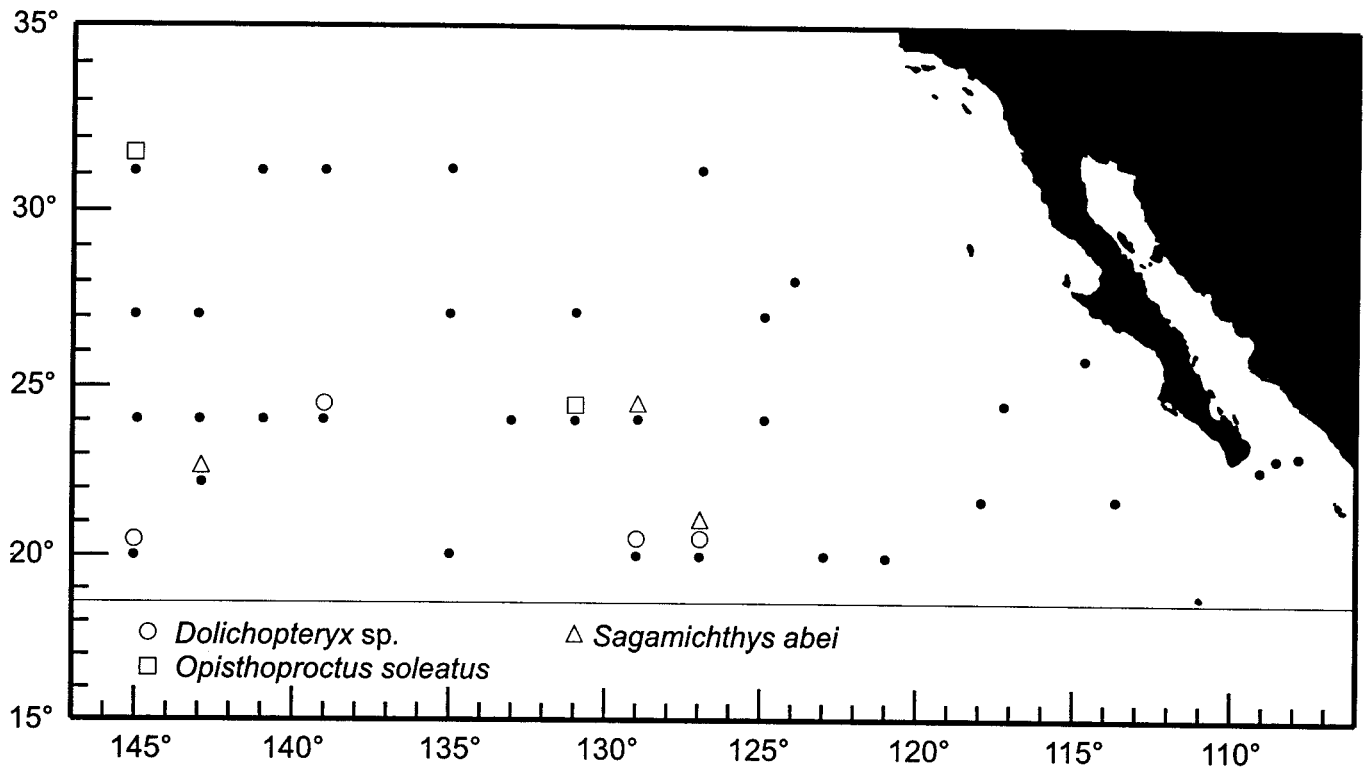


Figure 7. See caption for figure 2.

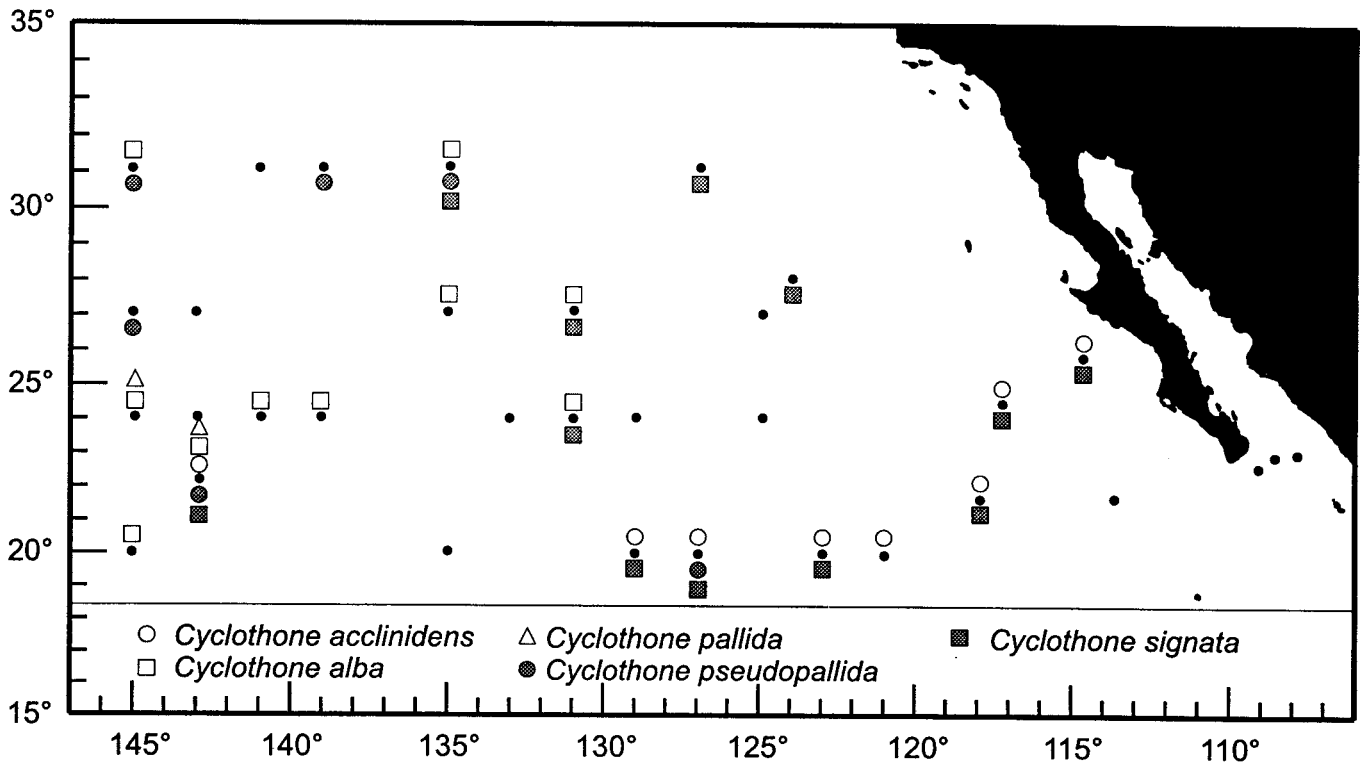


Figure 8. See caption for figure 2.

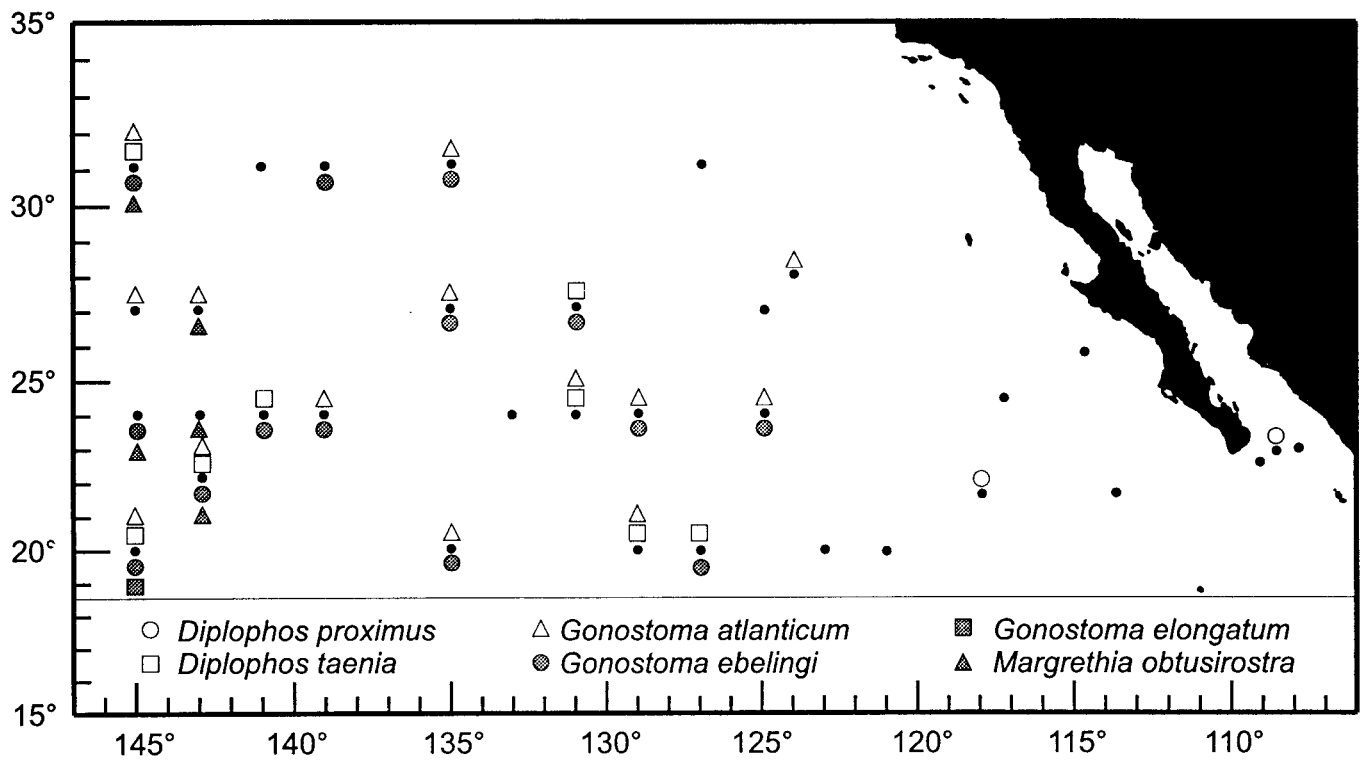


Figure 9. See caption for figure 2.

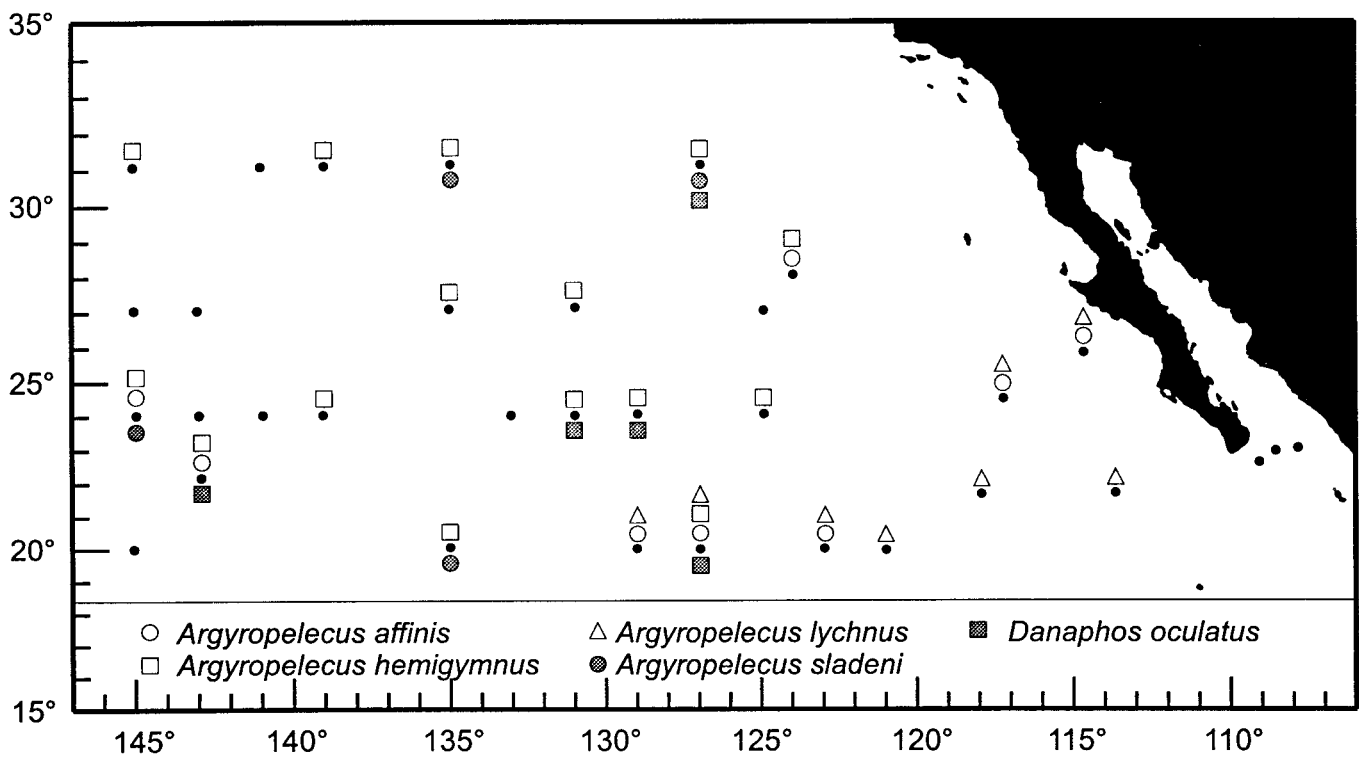


Figure 10. See caption for figure 2.

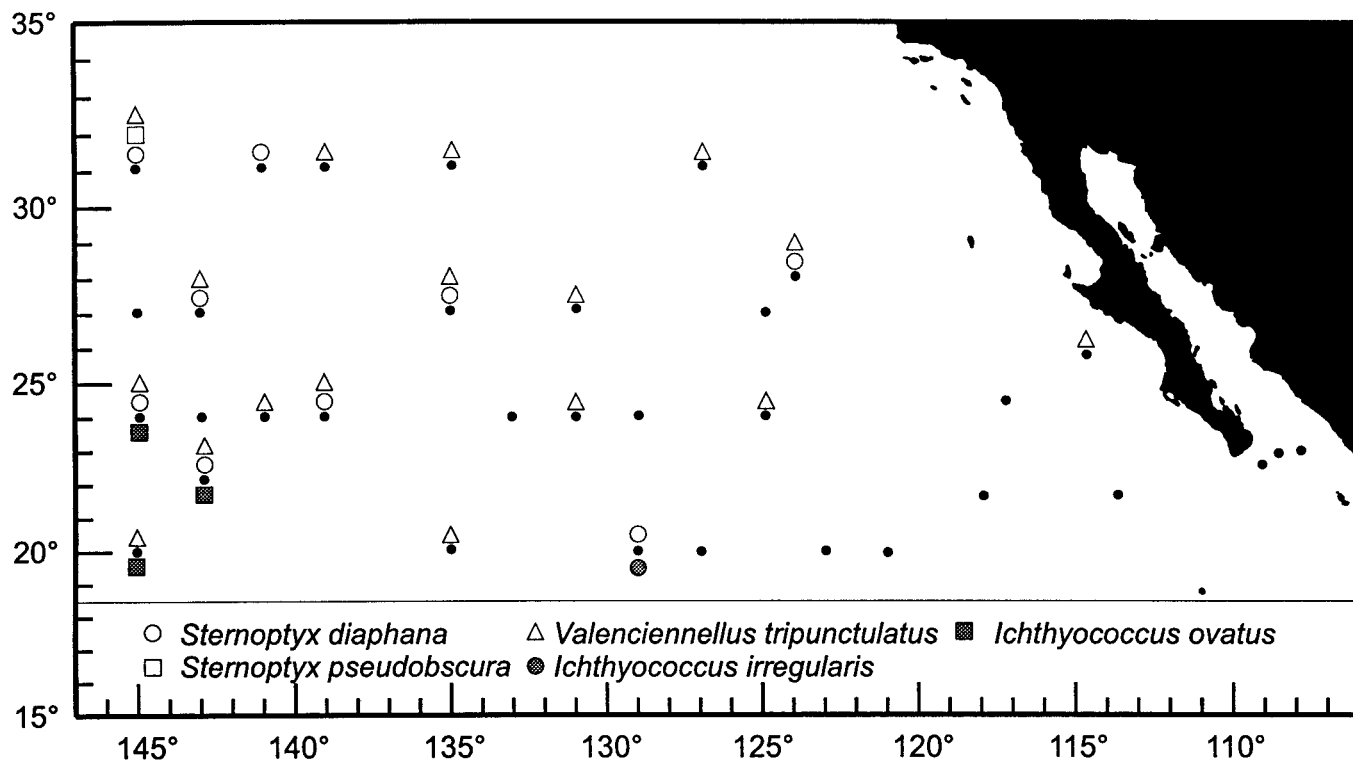


Figure 11. See caption for figure 2.

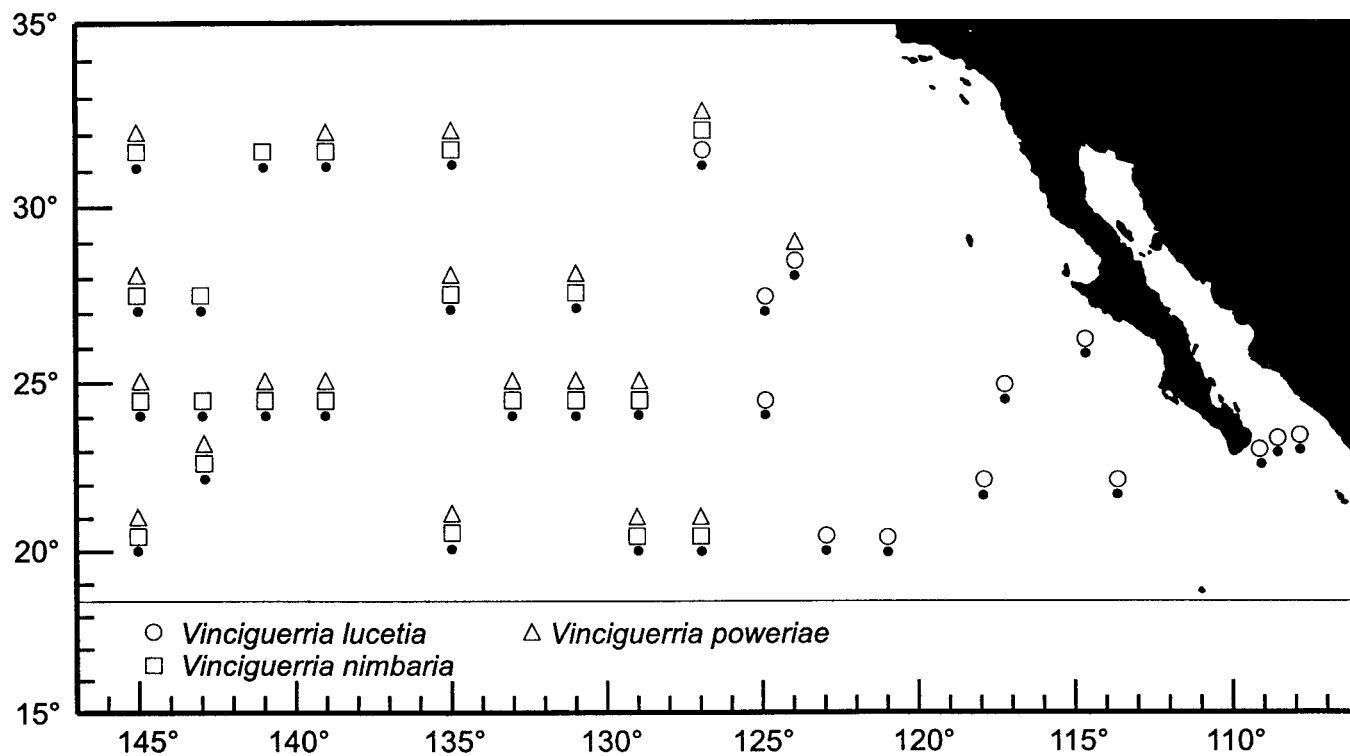


Figure 12. See caption for figure 2.

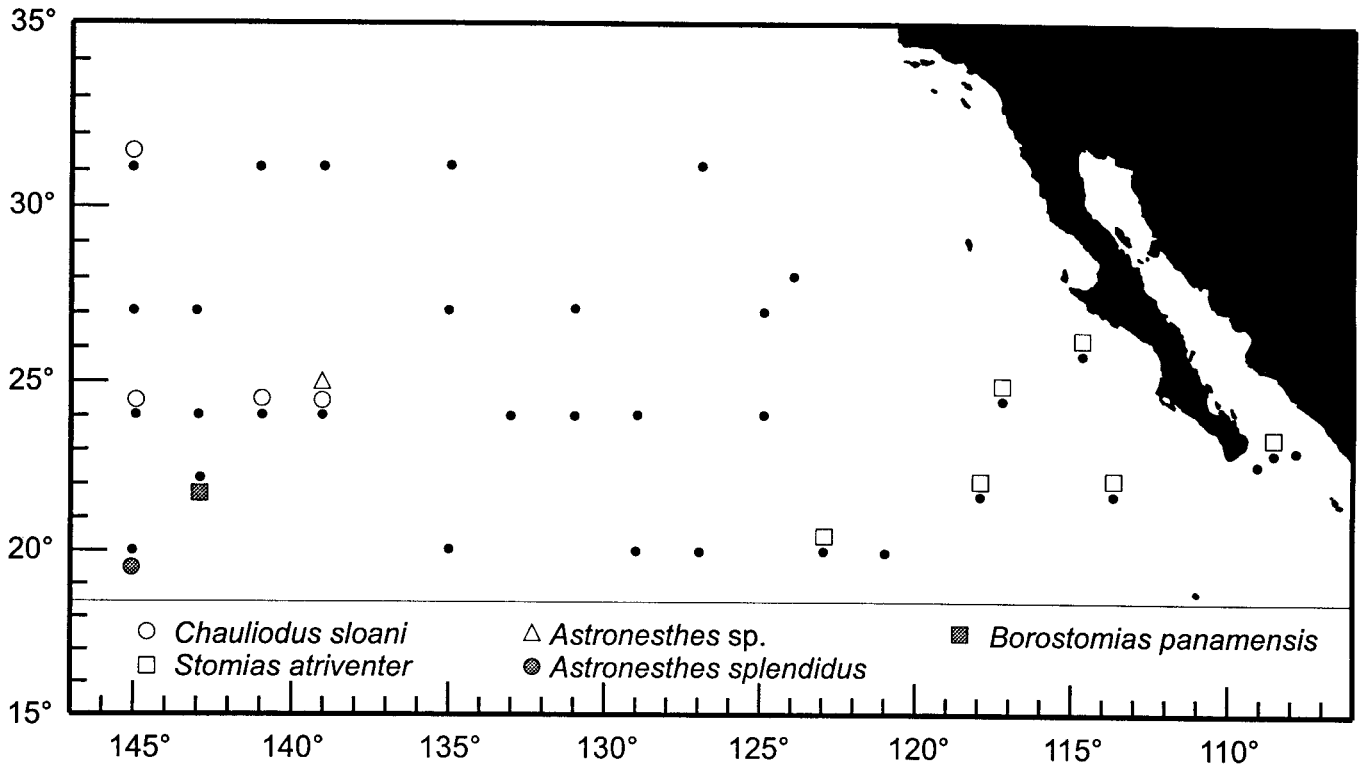


Figure 13. See caption for figure 2.

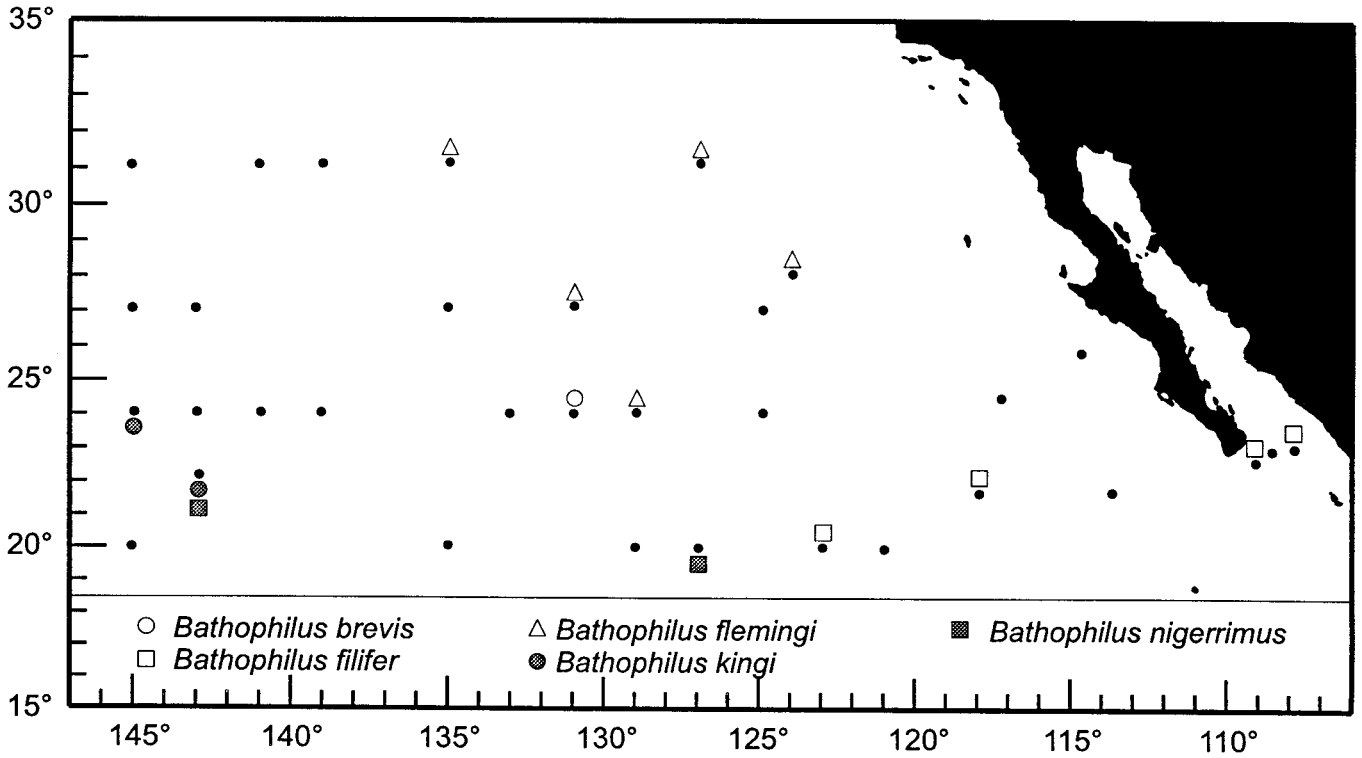


Figure 14. See caption for figure 2.

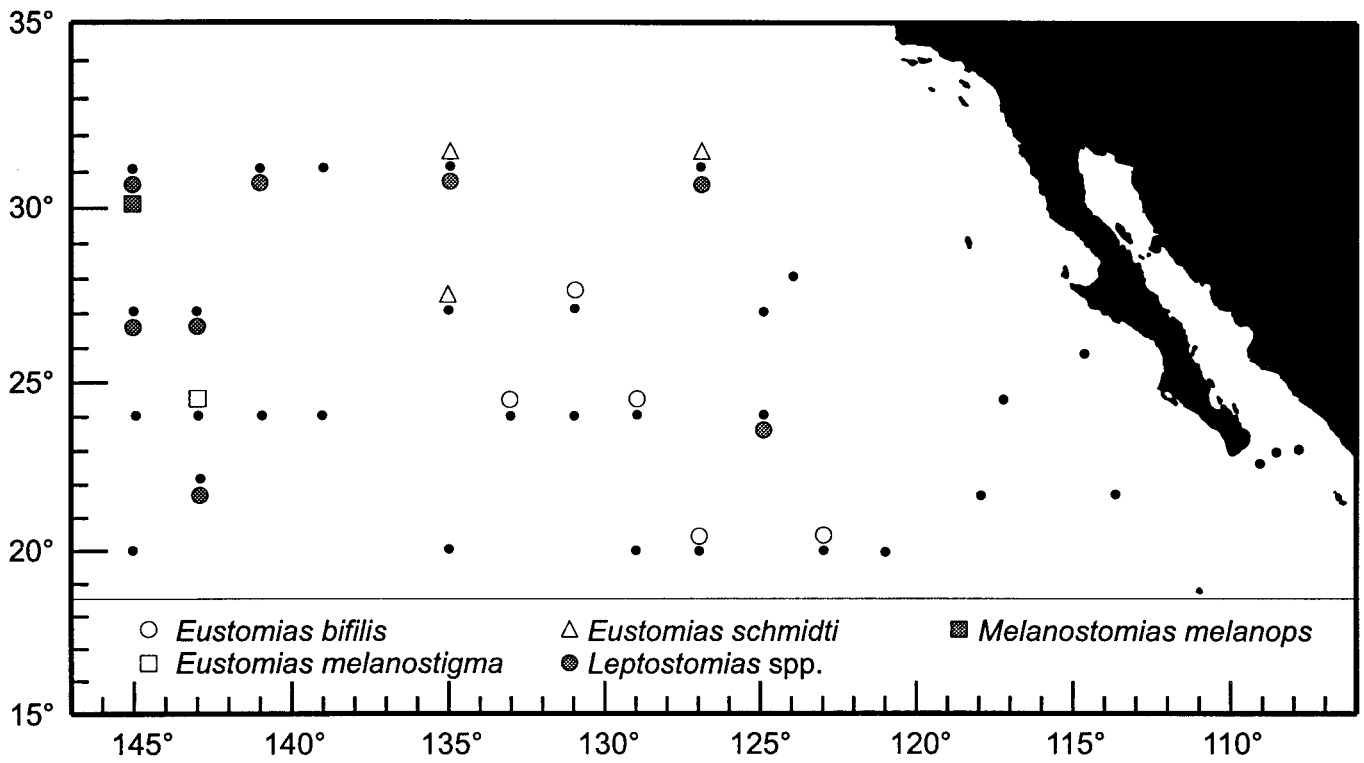


Figure 15. See caption for figure 2.

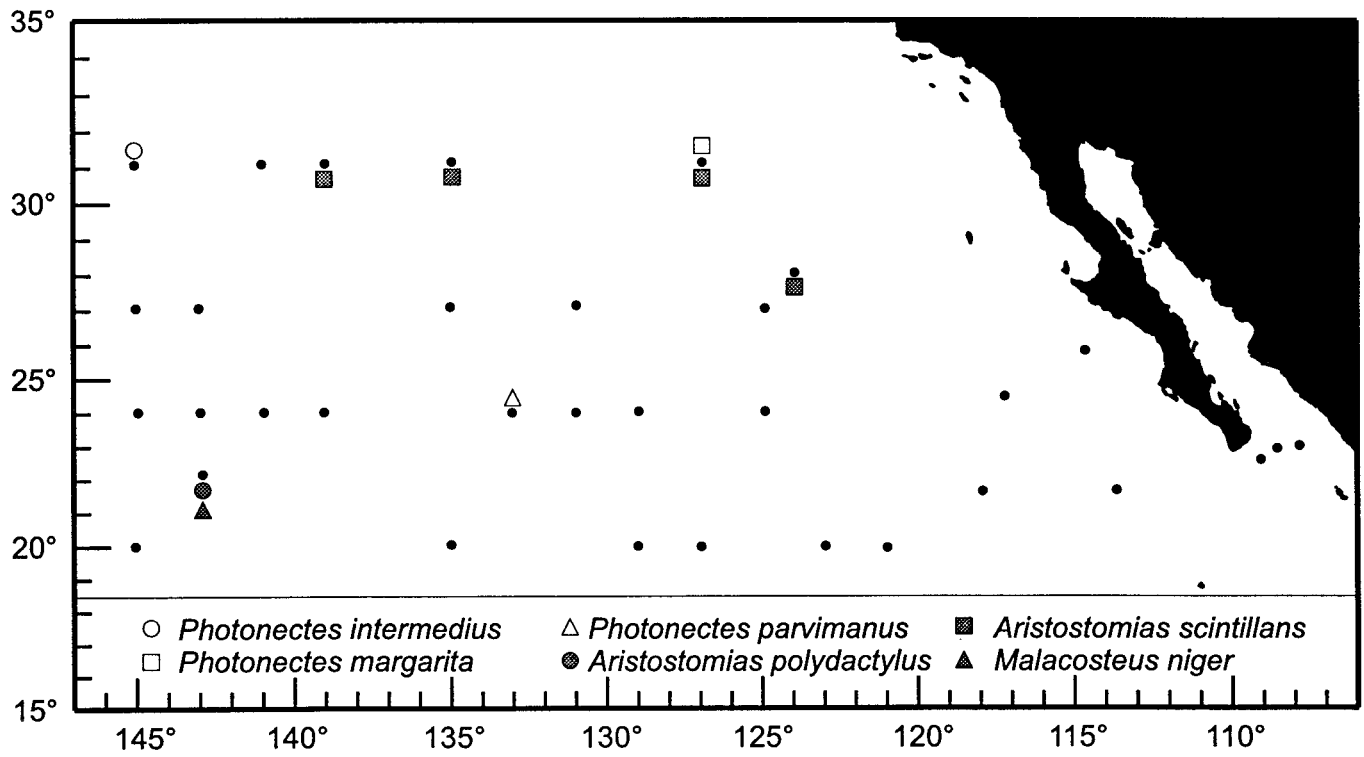


Figure 16. See caption for figure 2.

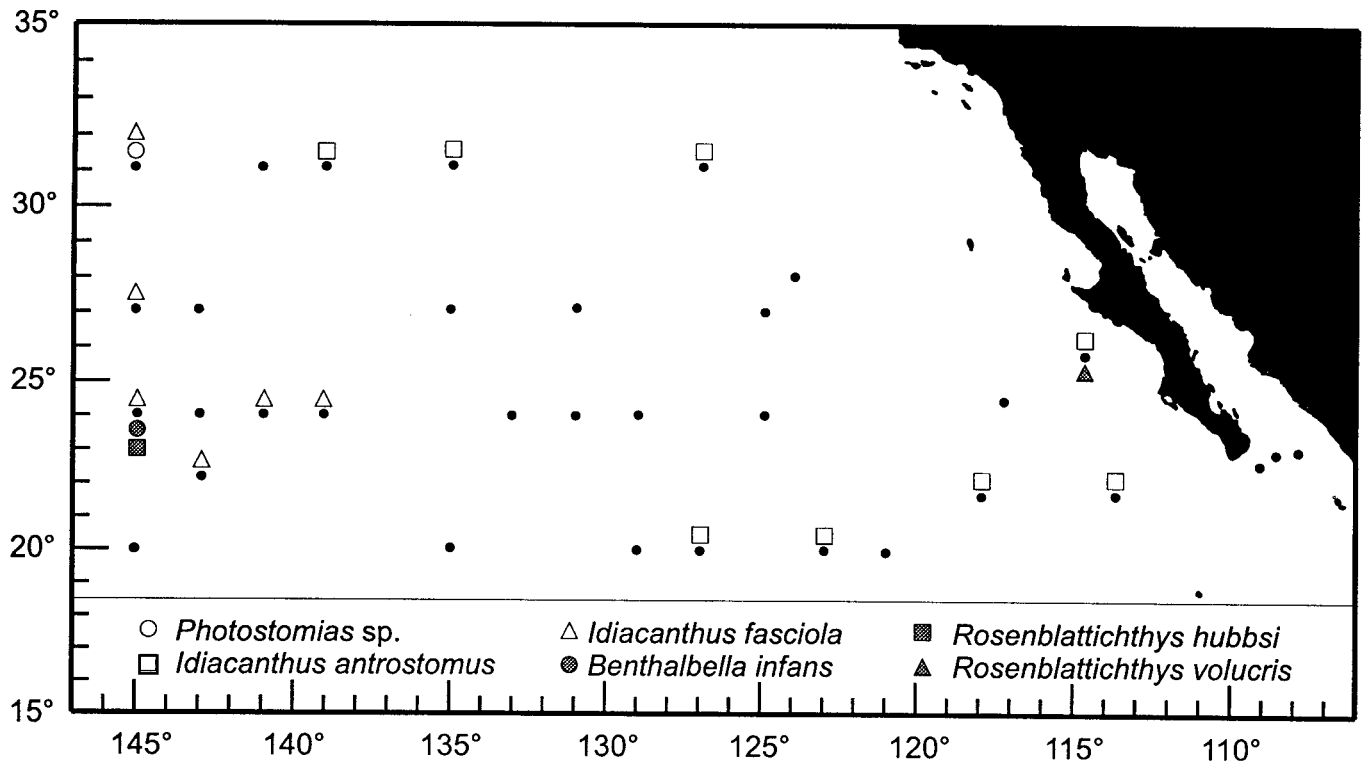


Figure 17. See caption for figure 2.

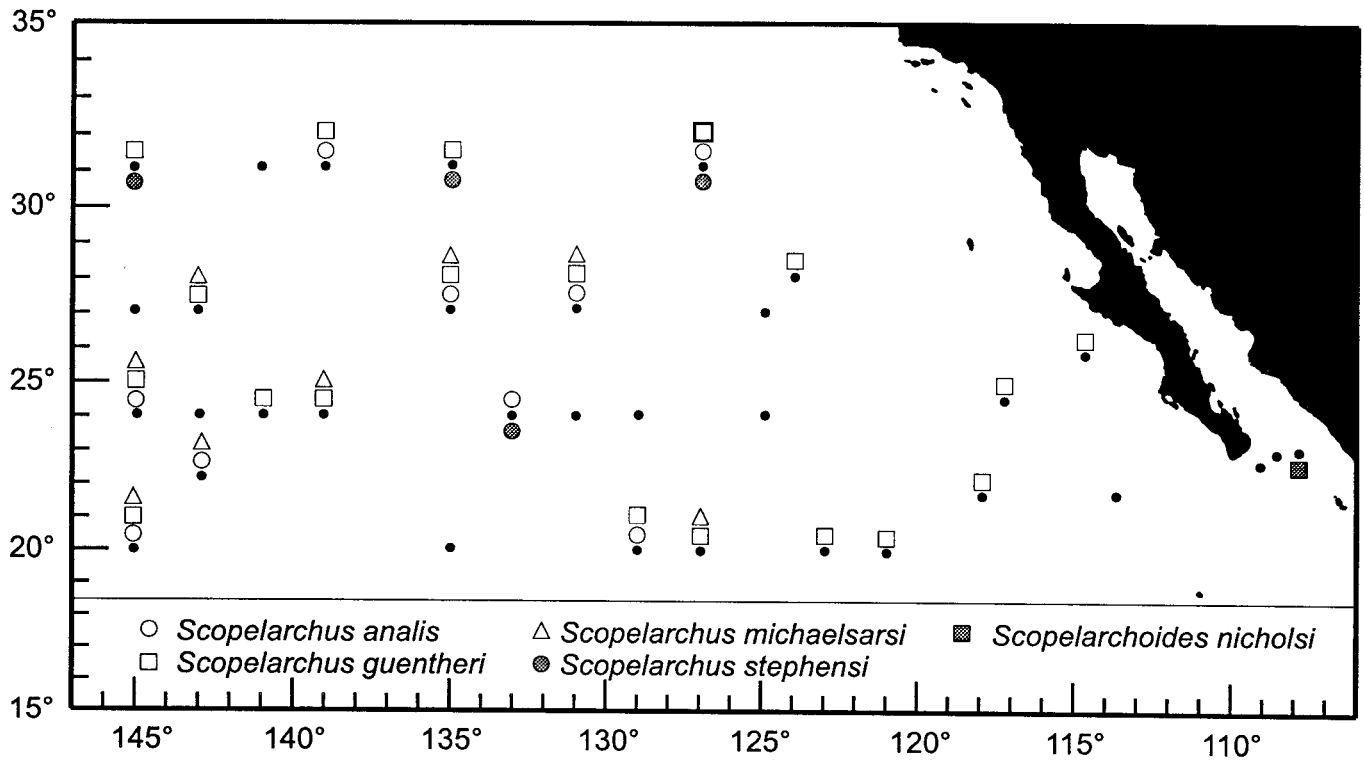


Figure 18. See caption for figure 2.

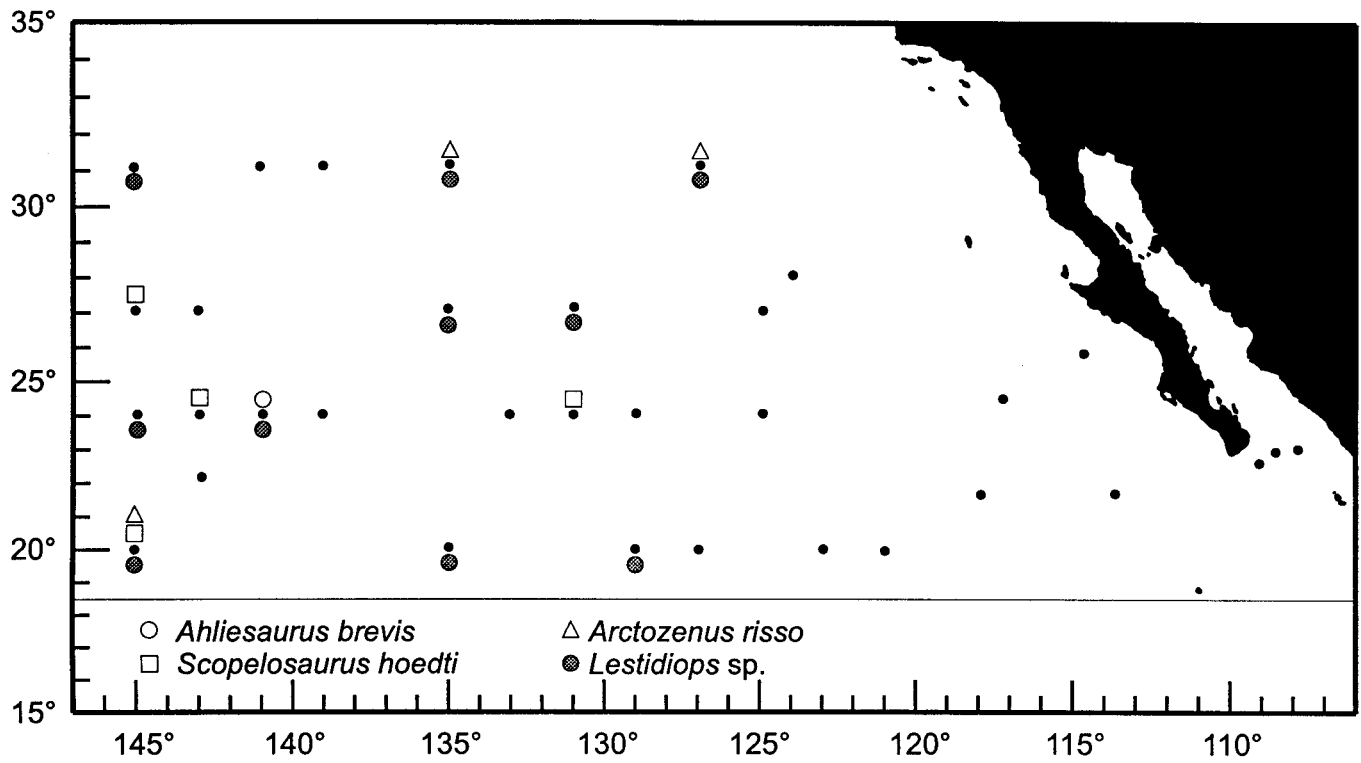


Figure 19. See caption for figure 2.

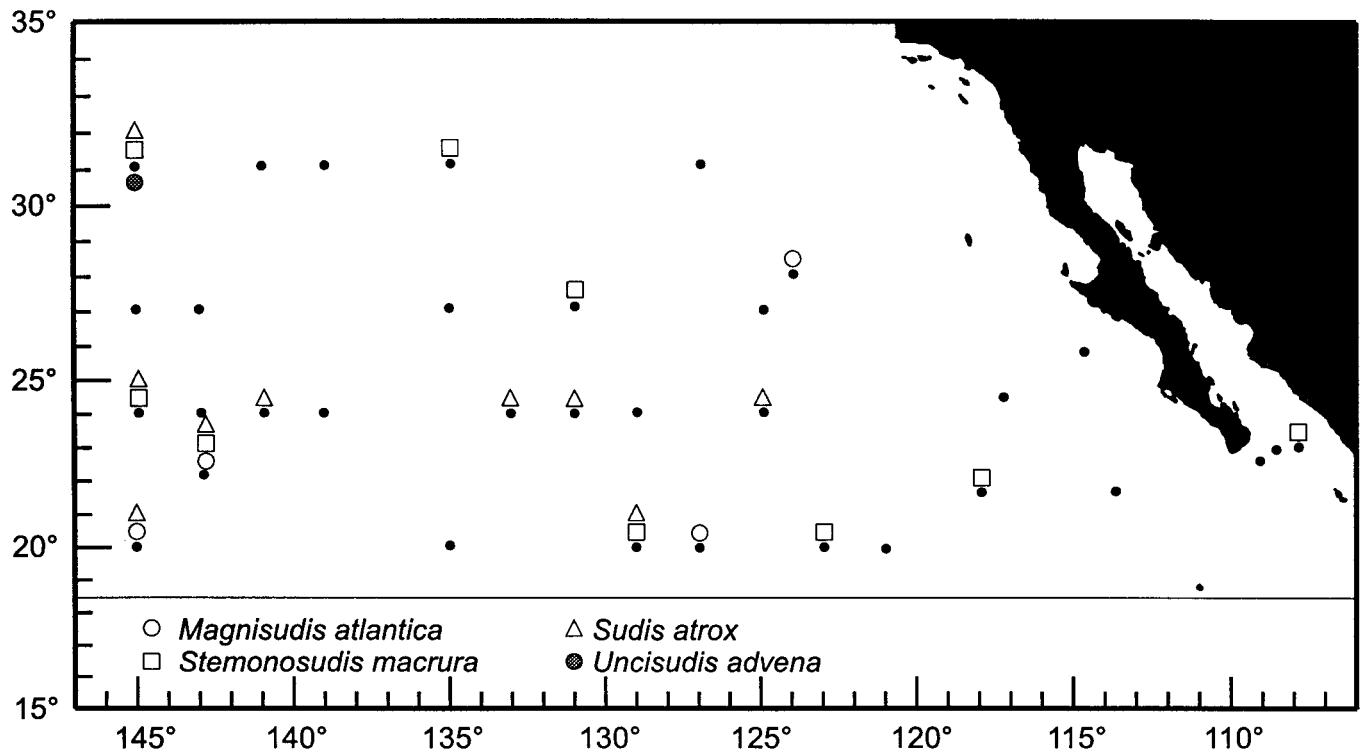


Figure 20. See caption for figure 2.

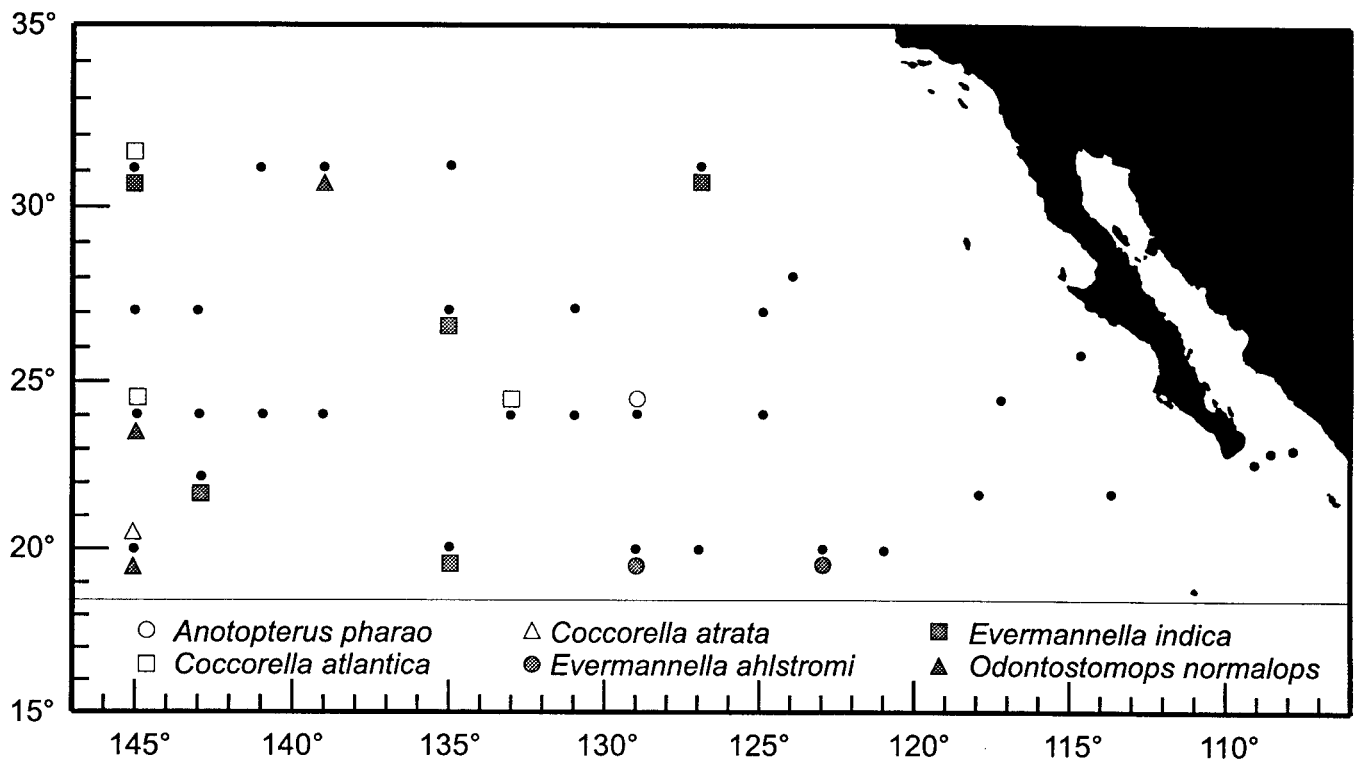


Figure 21. See caption for figure 2.

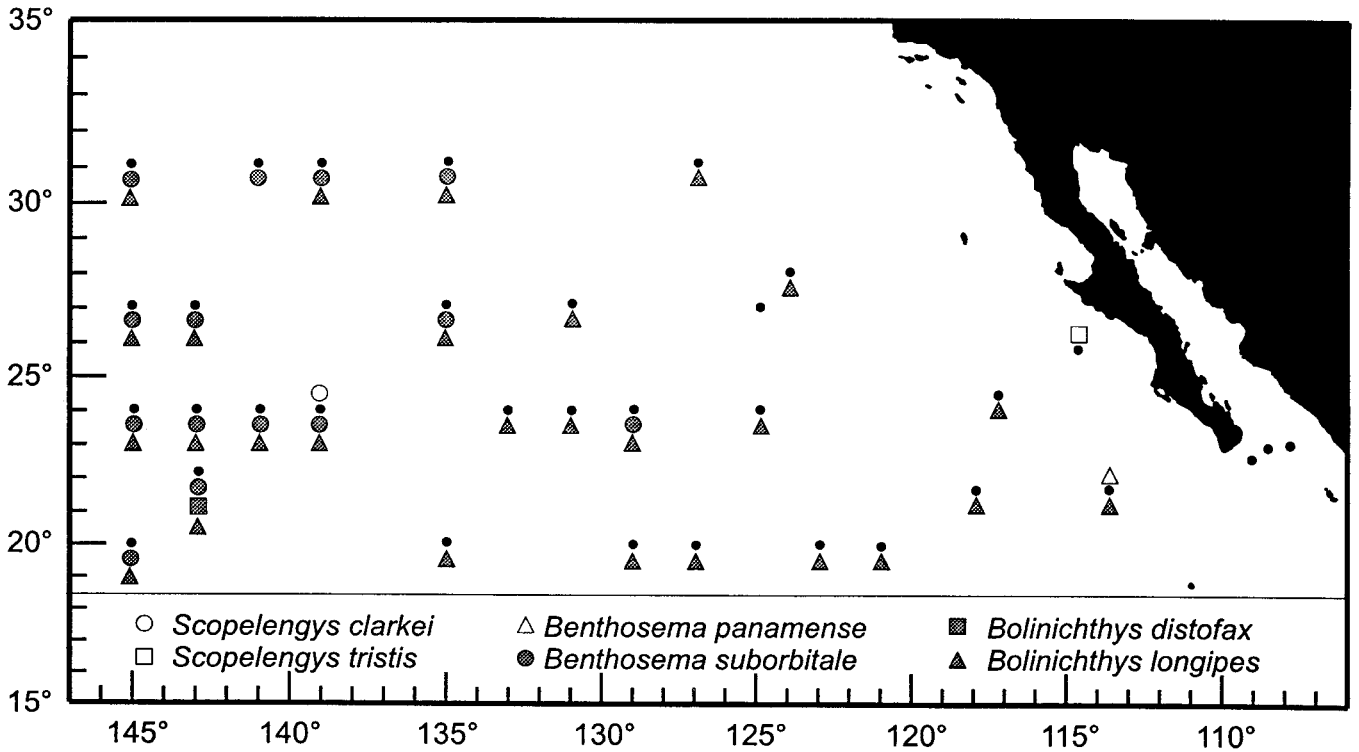


Figure 22. See caption for figure 2.

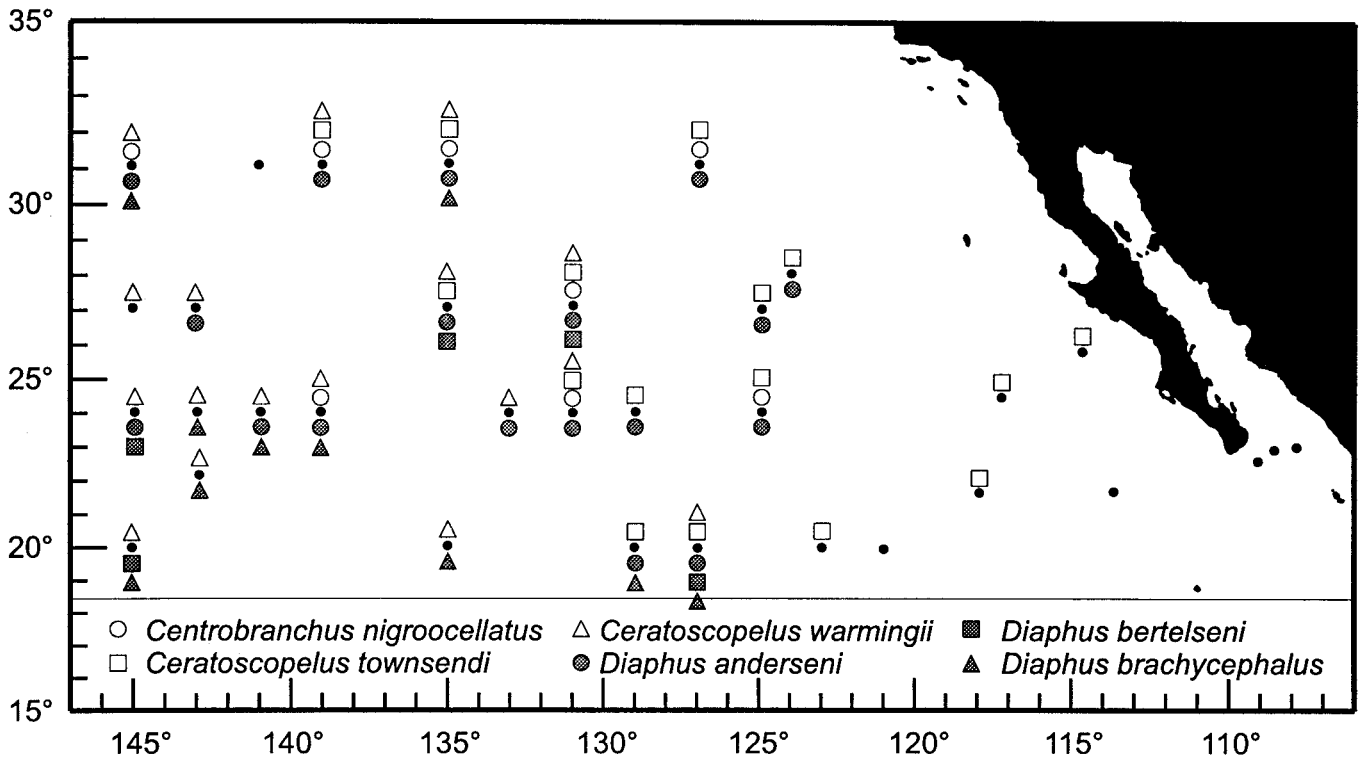


Figure 23. See caption for figure 2.

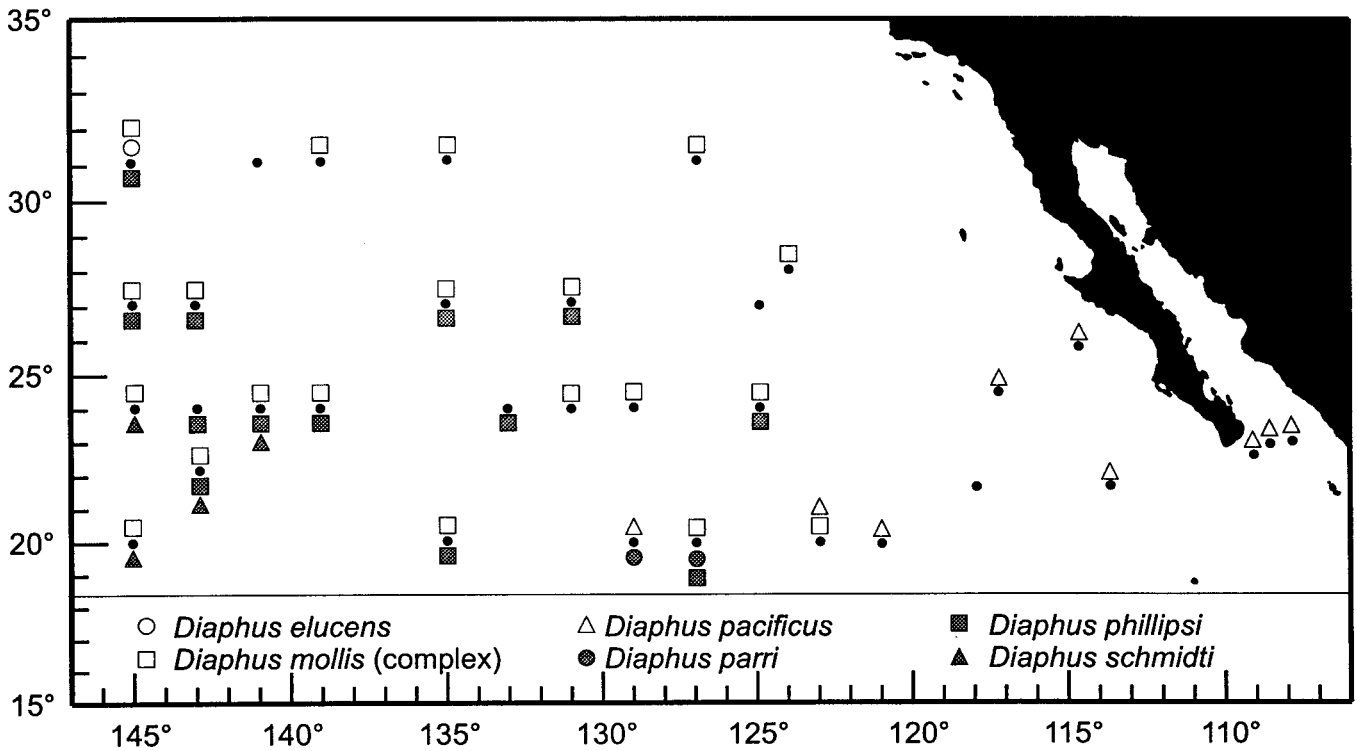


Figure 24. See caption for figure 2.

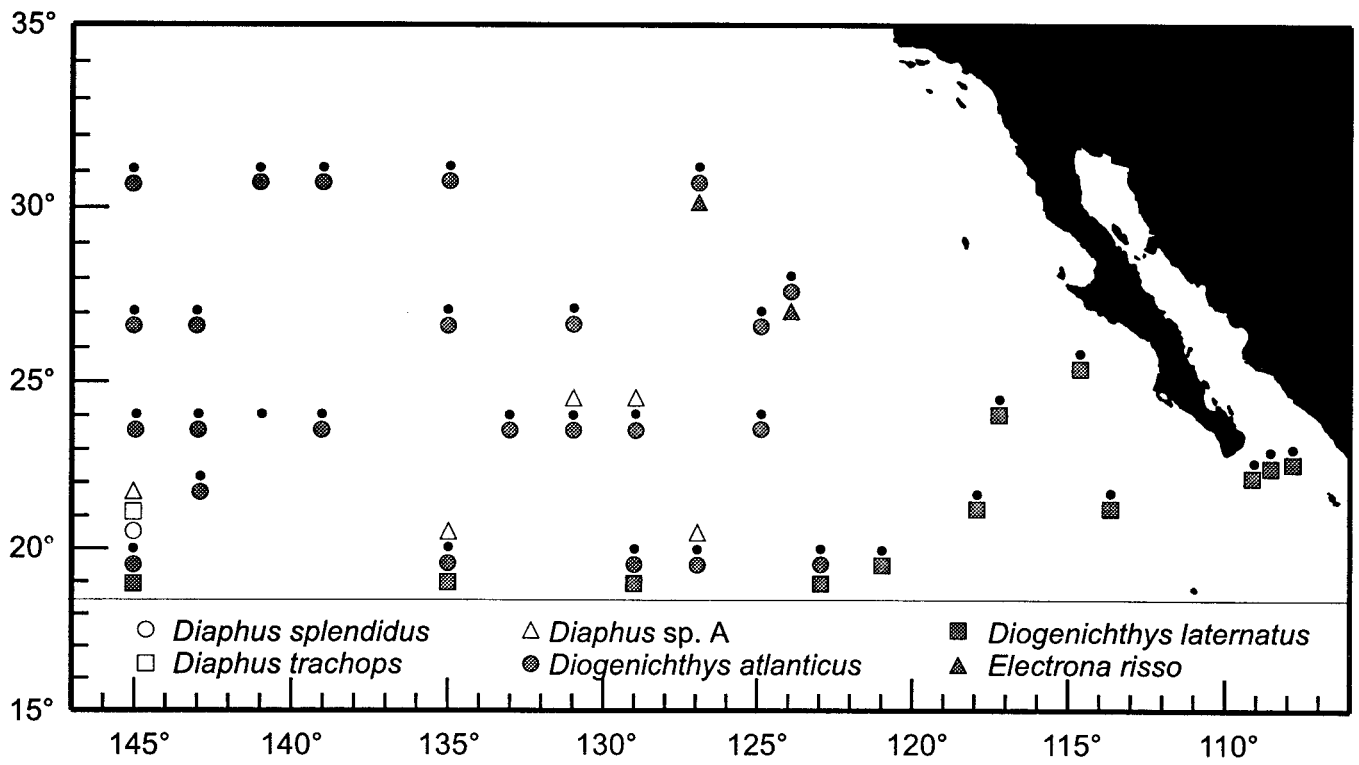


Figure 25. See caption for figure 2.

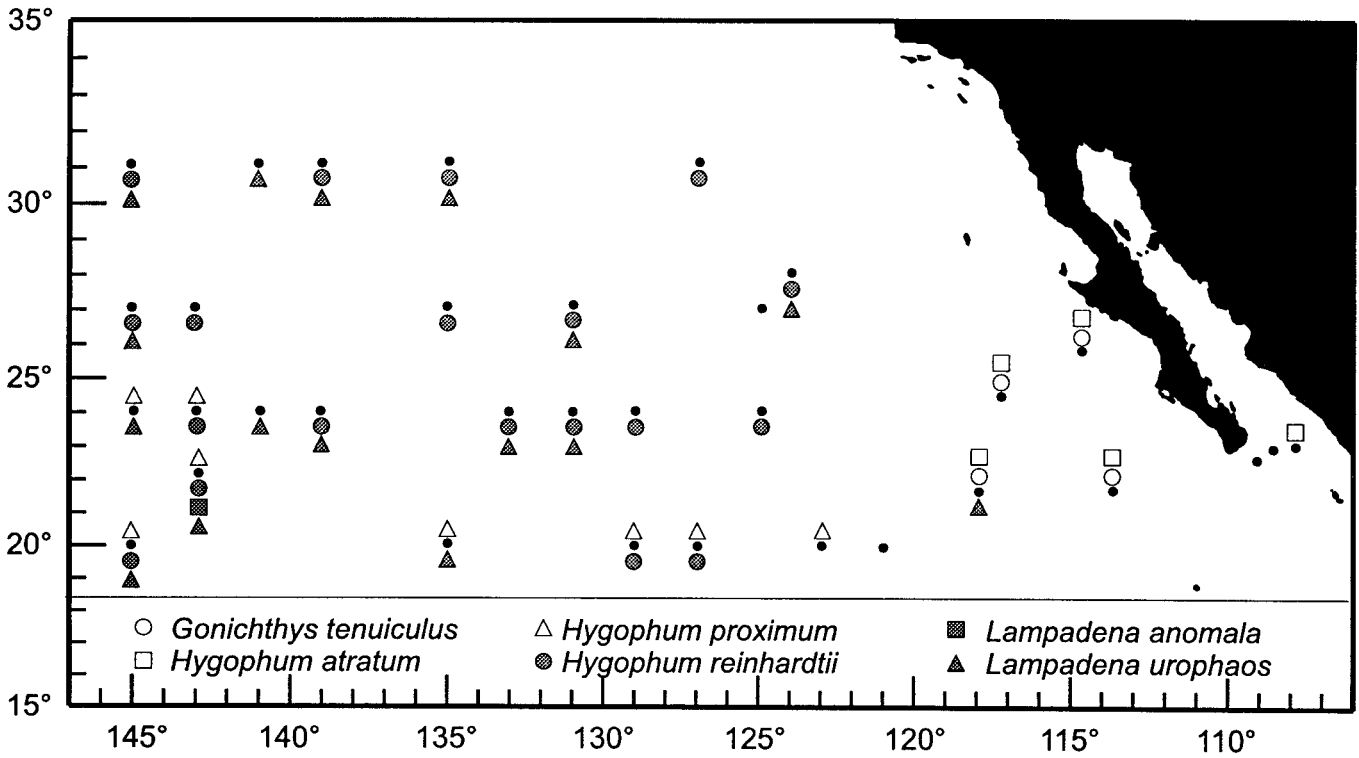


Figure 26. See caption for figure 2.

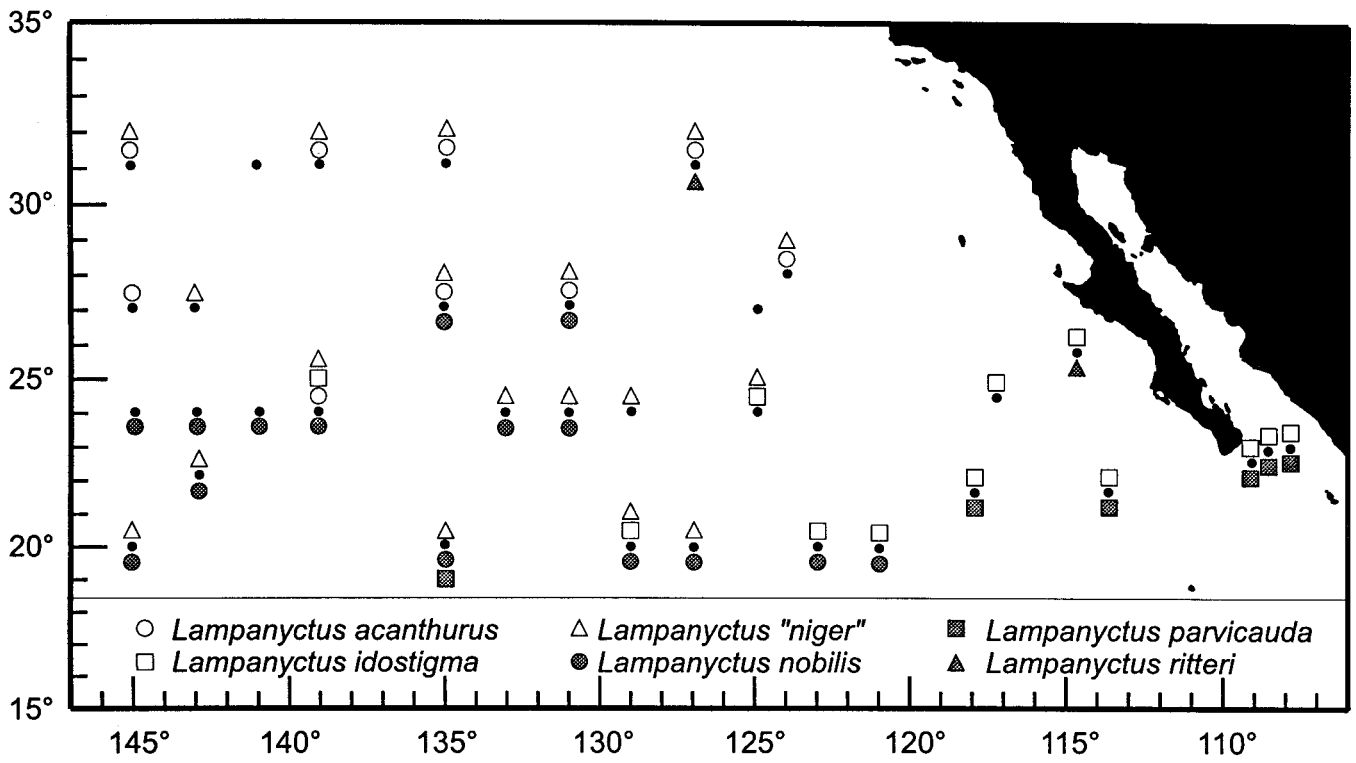


Figure 27. See caption for figure 2.

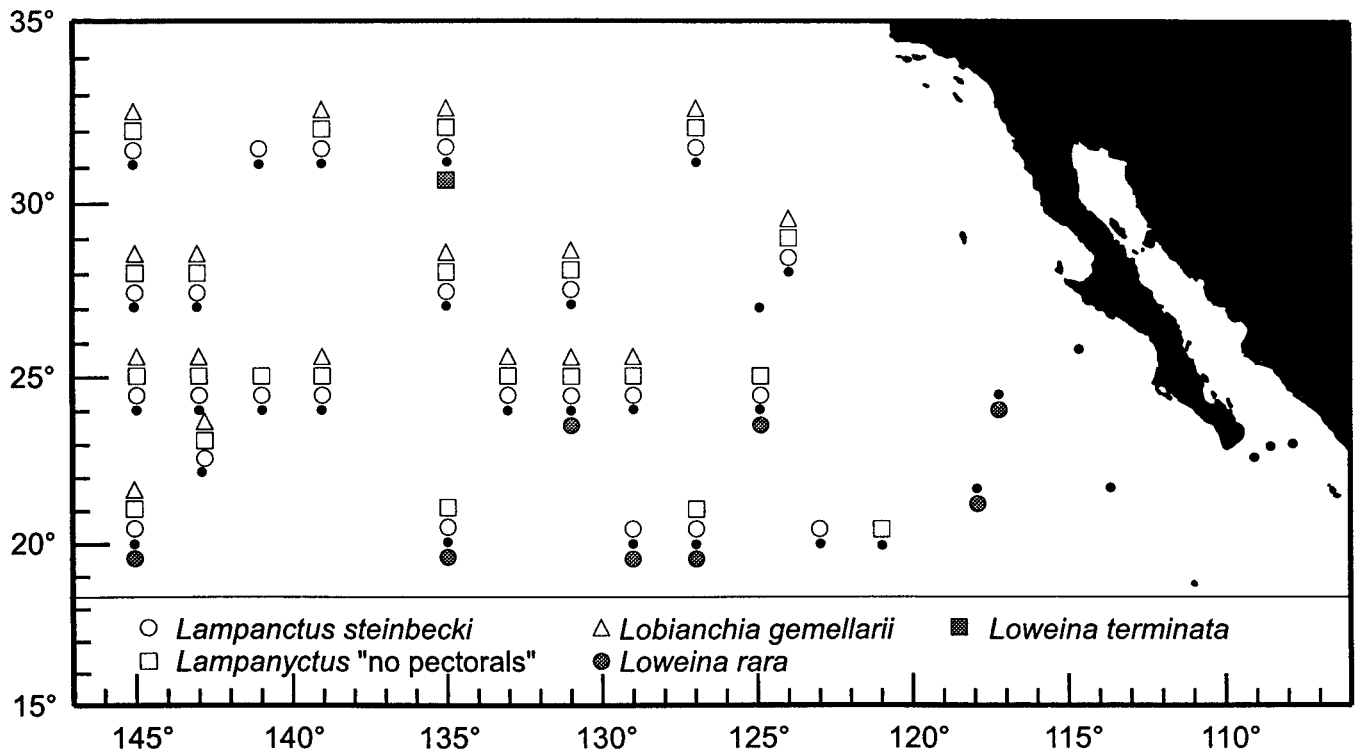


Figure 28. See caption for figure 2.

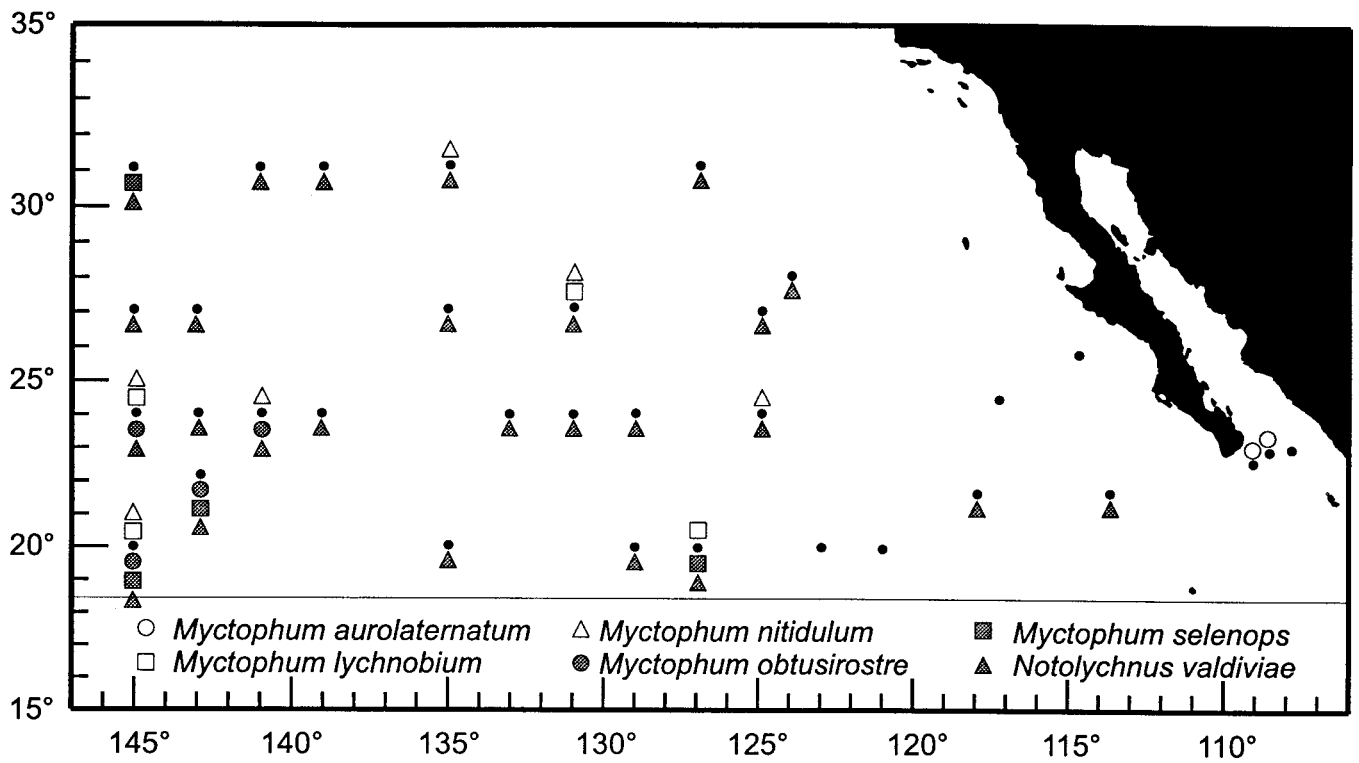


Figure 29. See caption for figure 2.

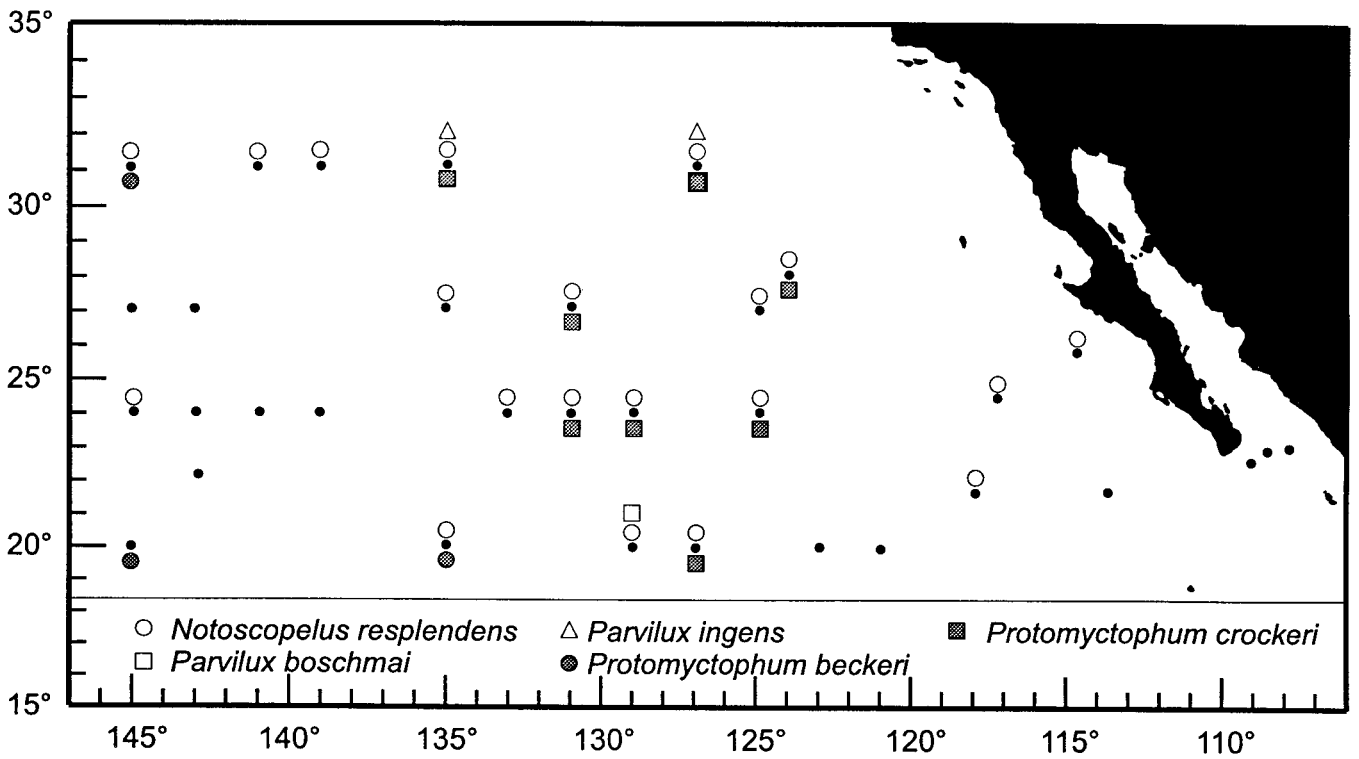


Figure 30. See caption for figure 2.

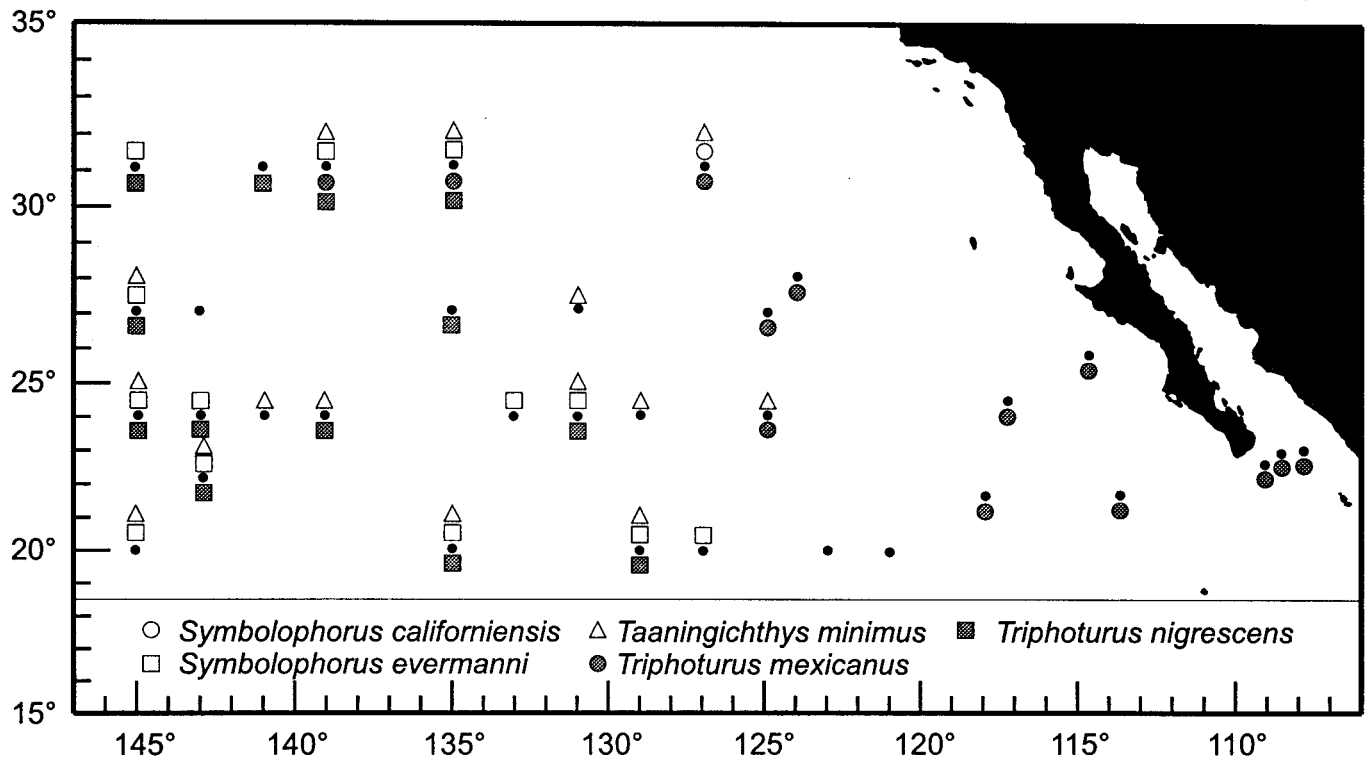


Figure 31. See caption for figure 2.

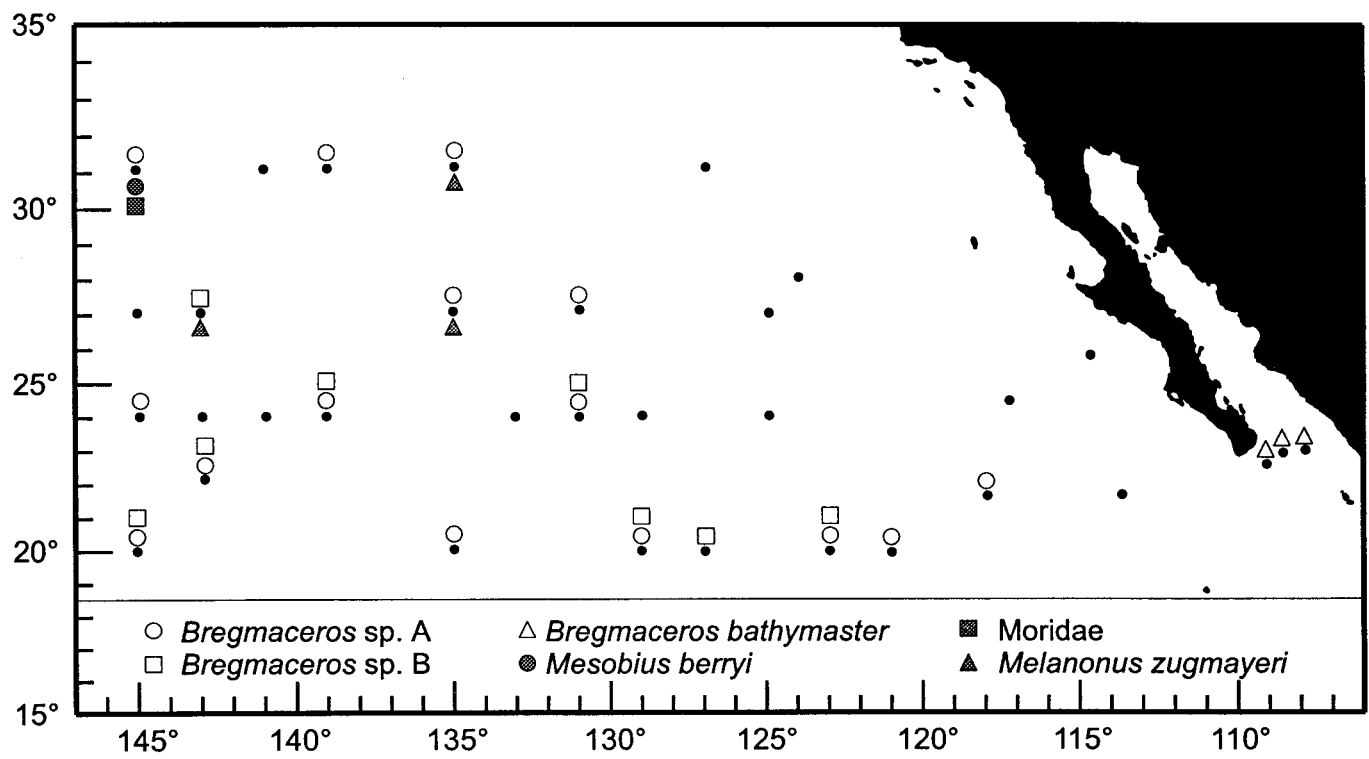


Figure 32. See caption for figure 2.

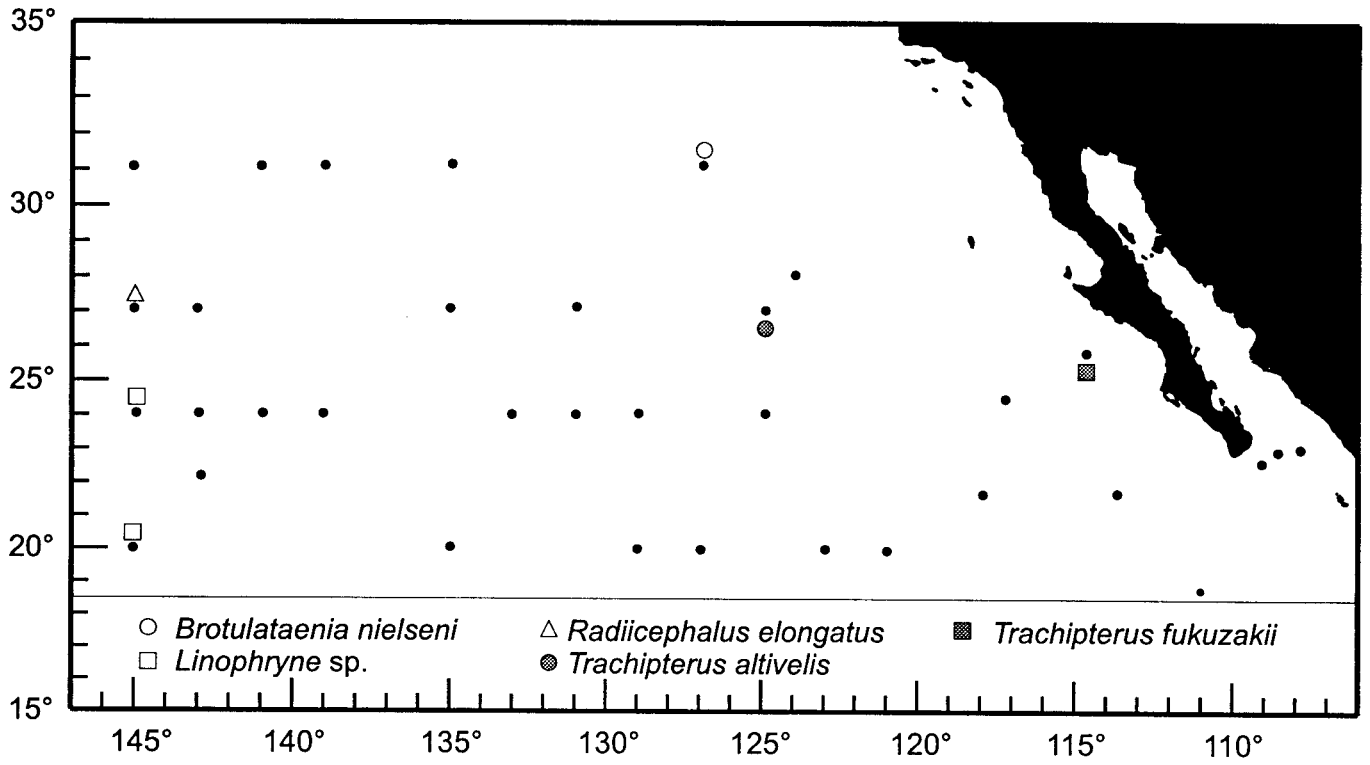


Figure 33. See caption for figure 2.

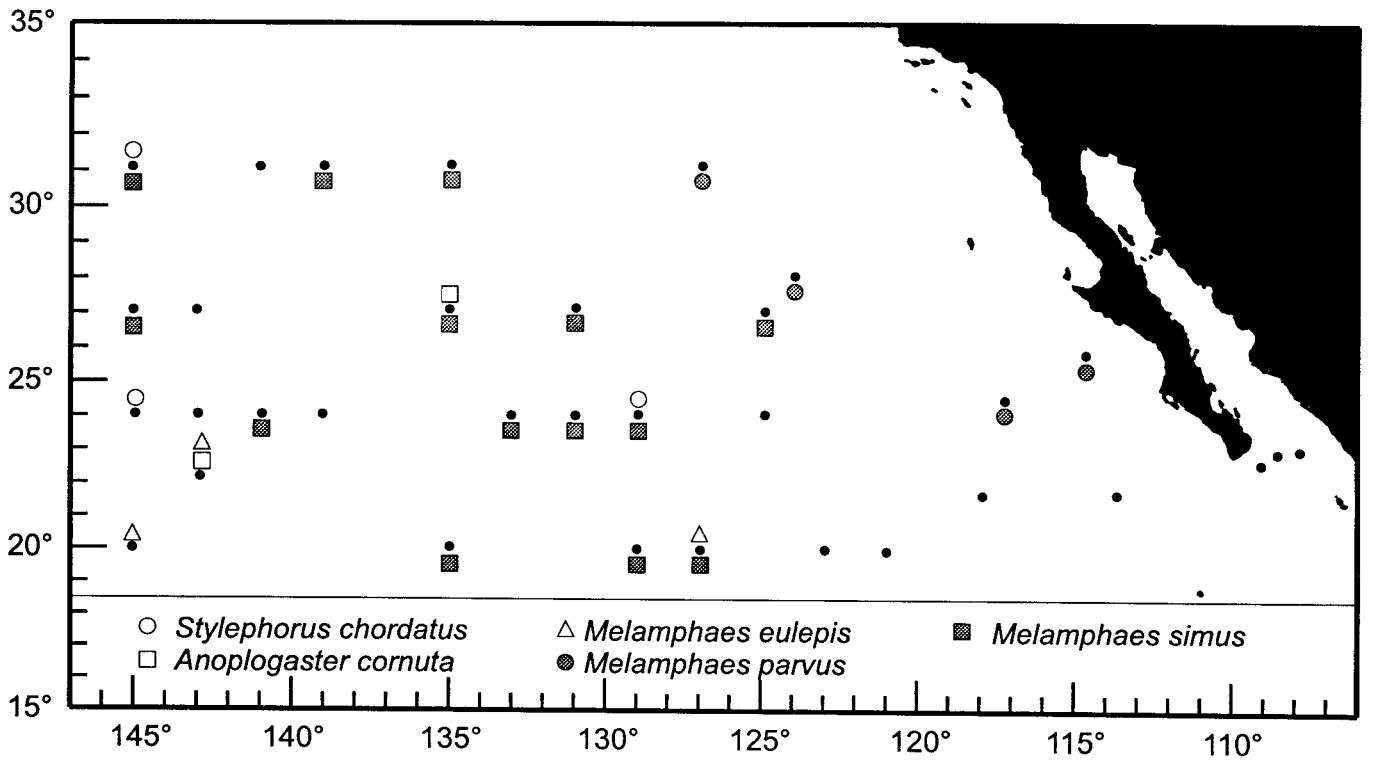


Figure 34. See caption for figure 2.

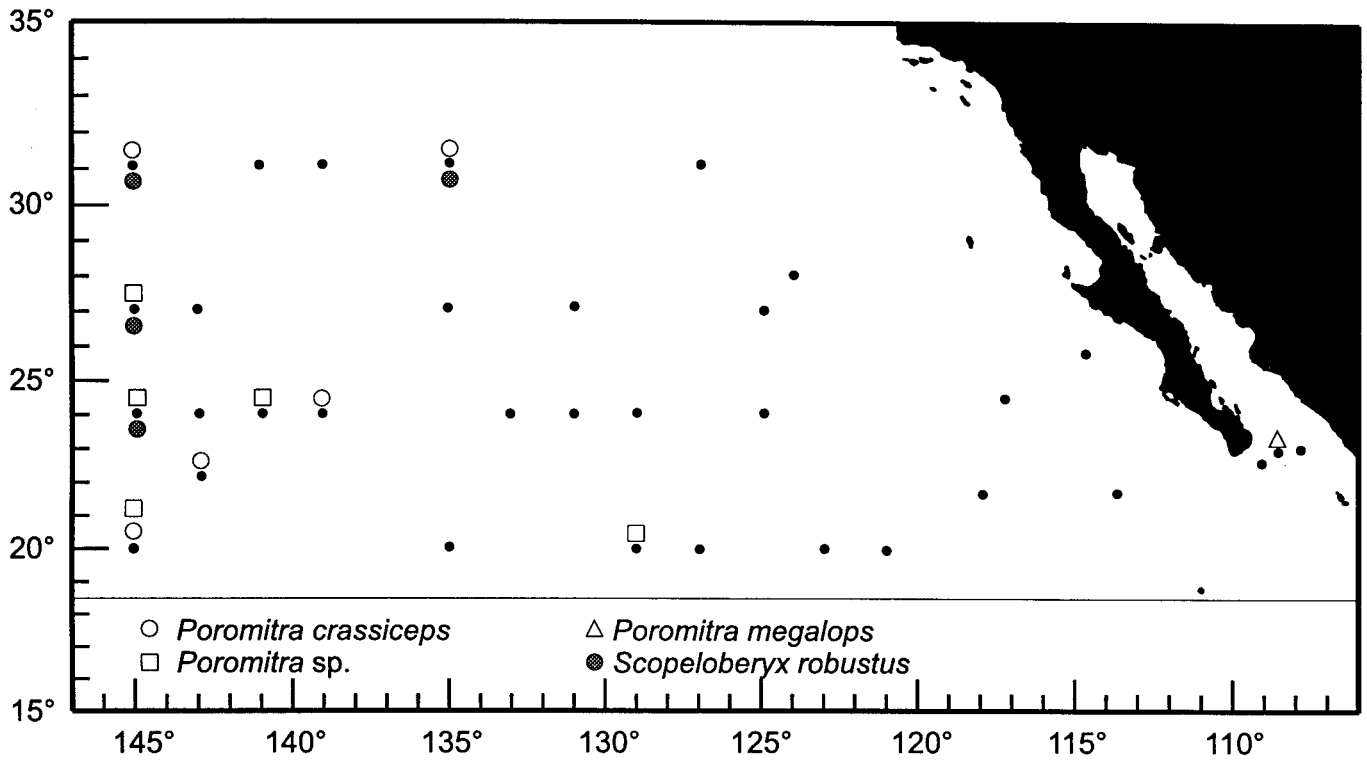


Figure 35. See caption for figure 2.

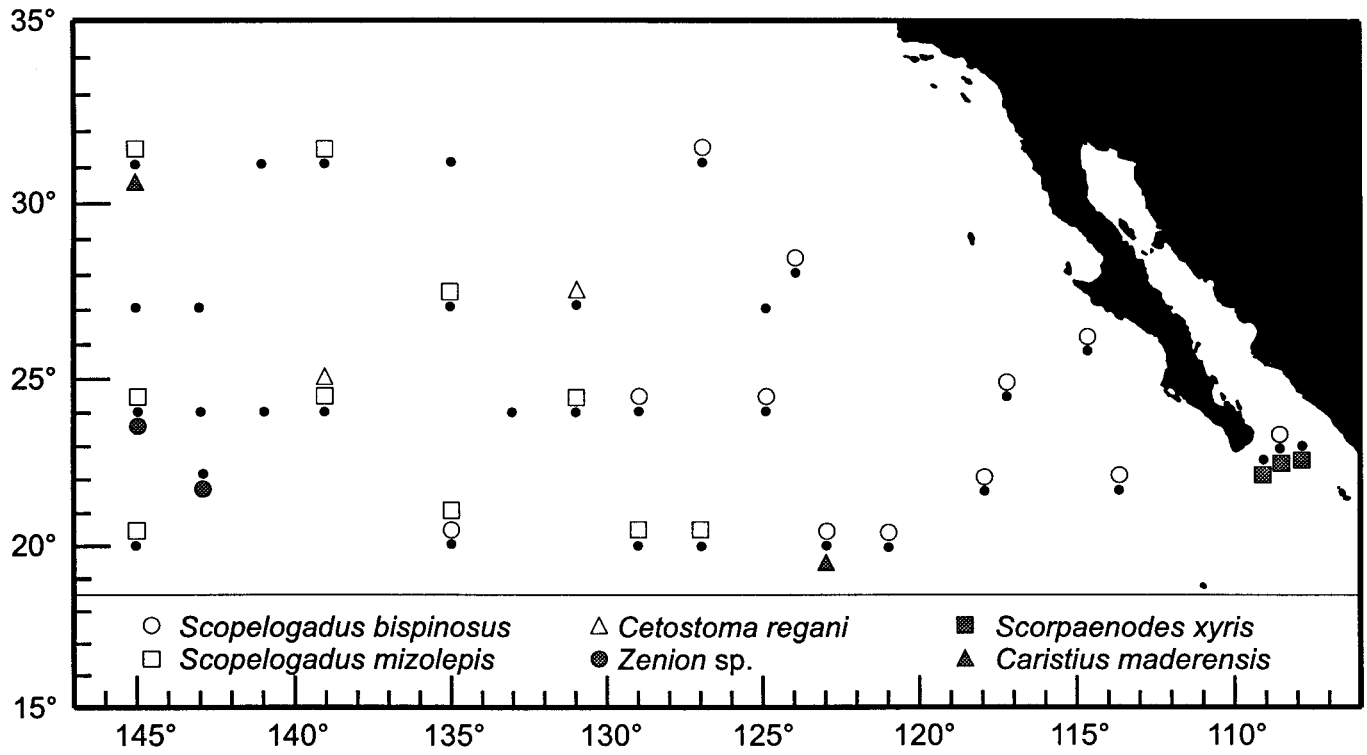


Figure 36. See caption for figure 2.

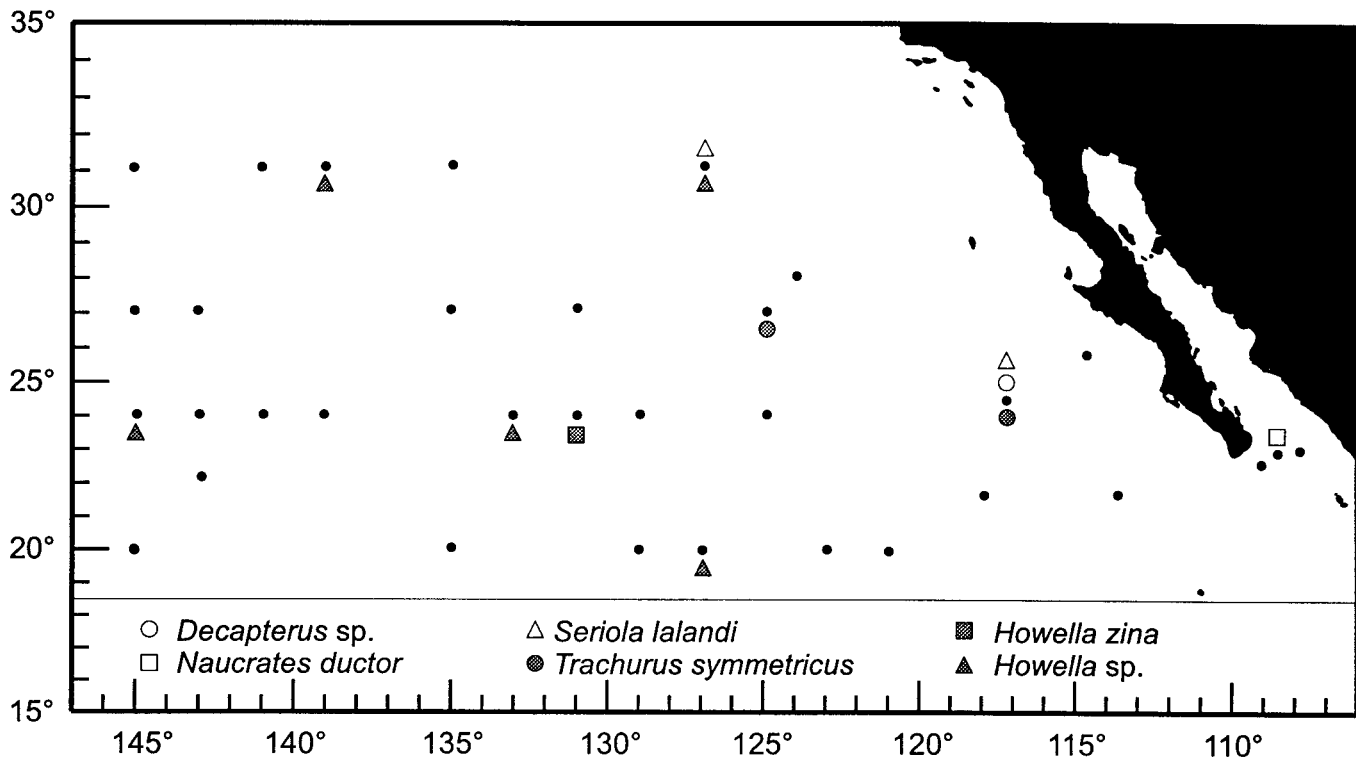


Figure 37. See caption for figure 2.

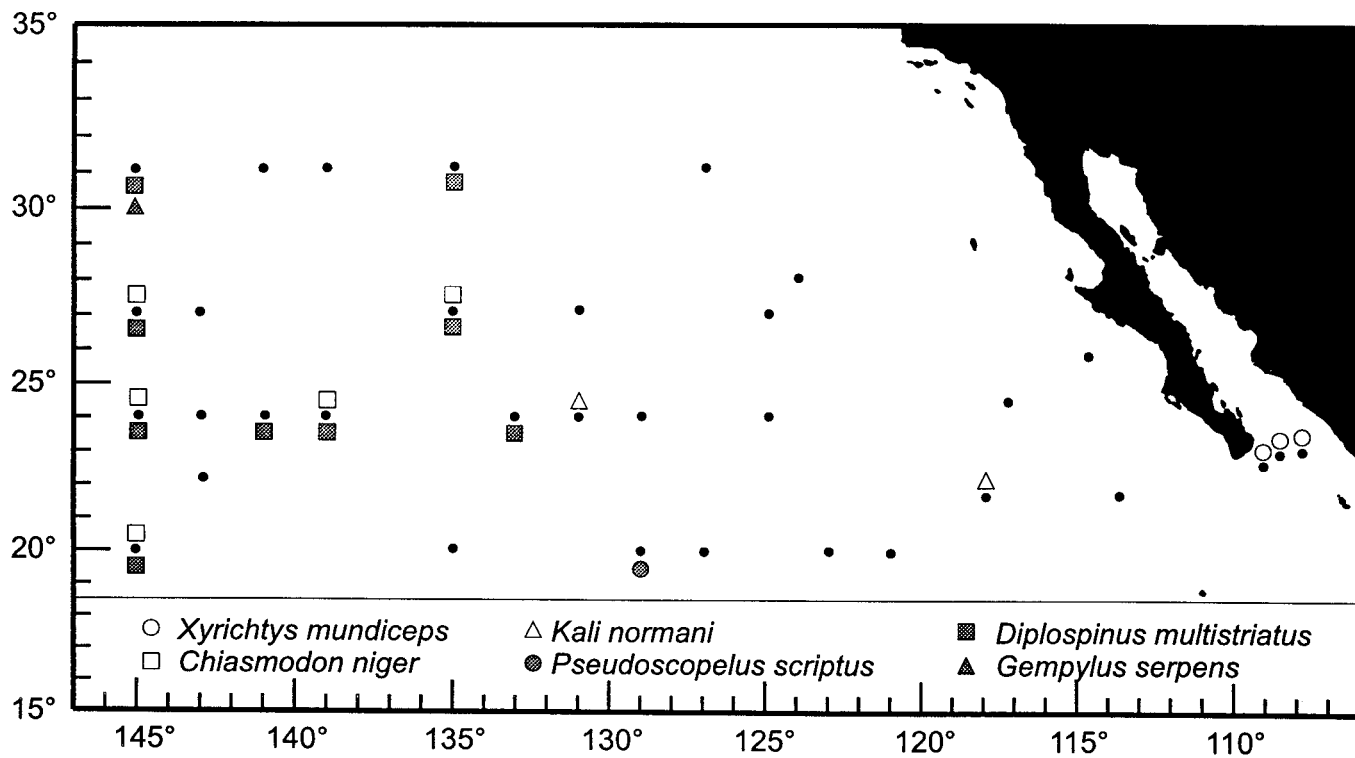


Figure 38. See caption for figure 2.

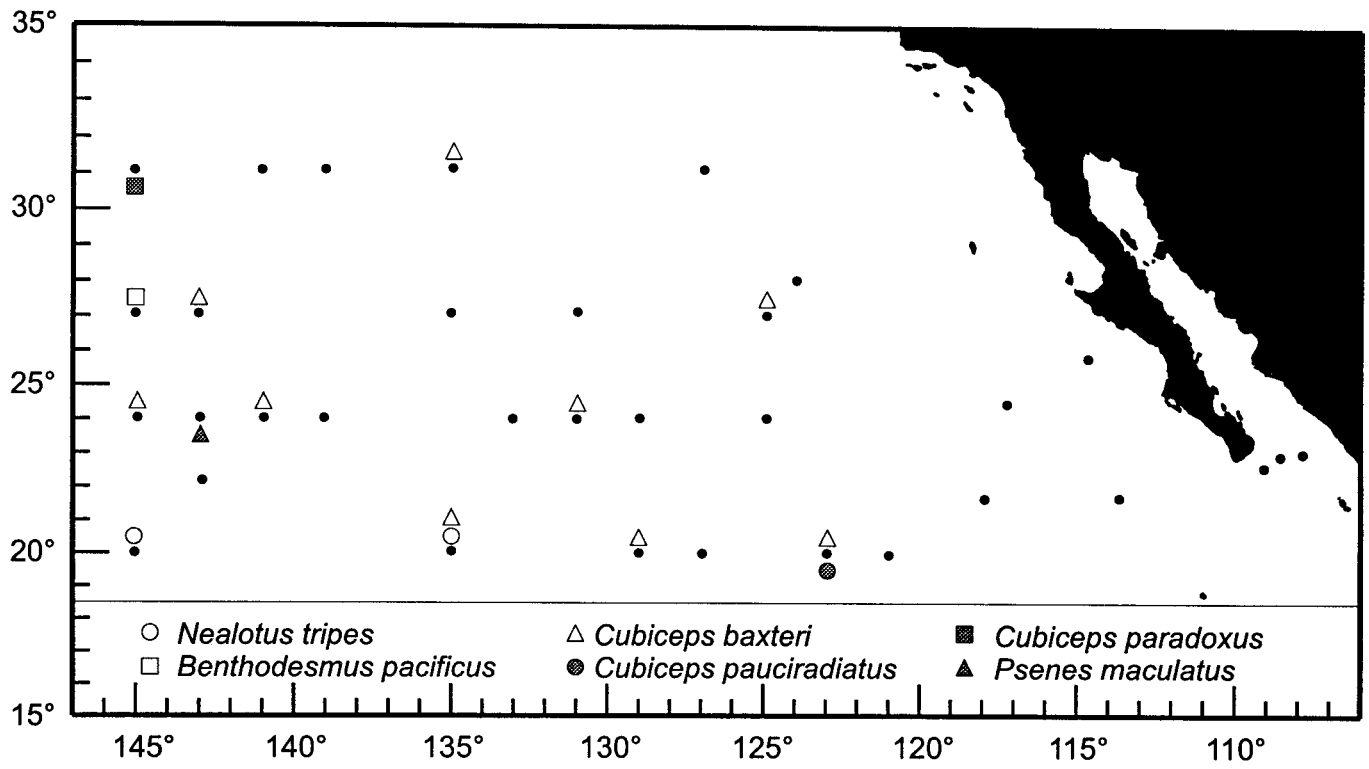


Figure 39. See caption for figure 2.

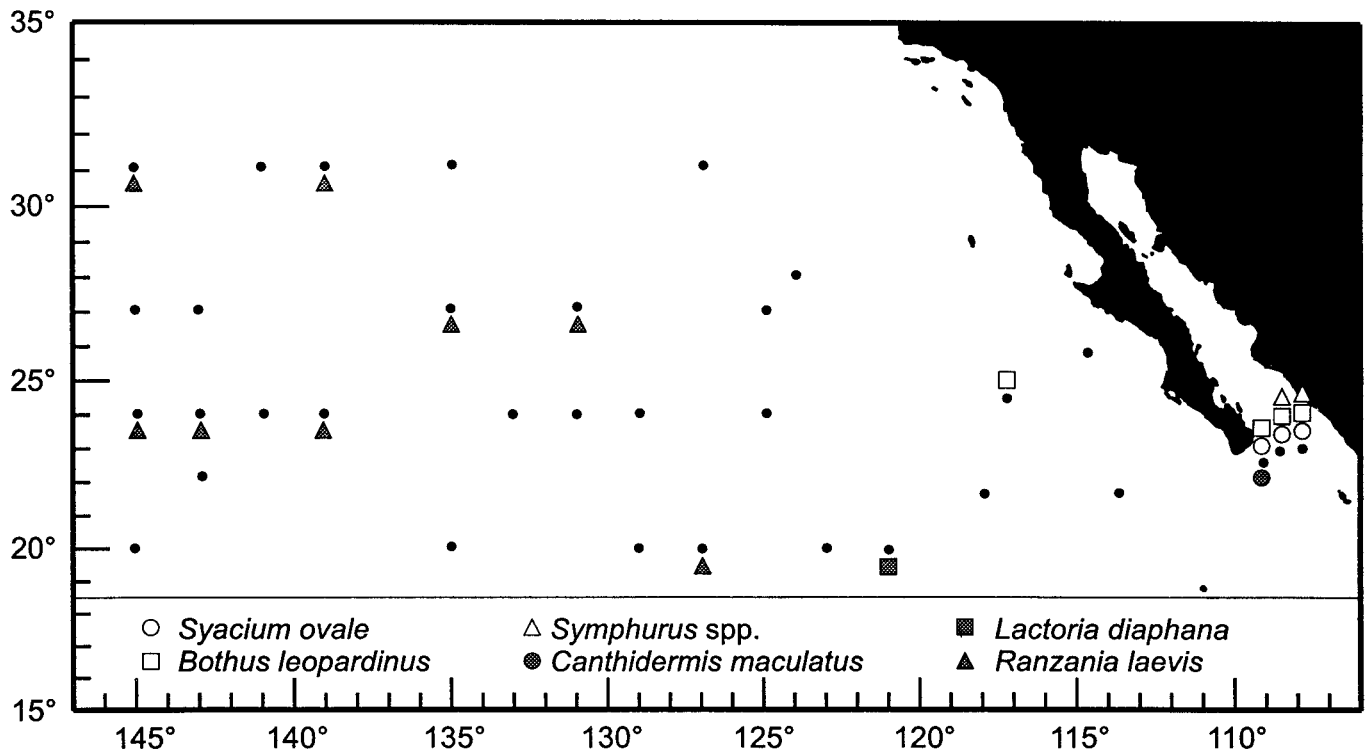


Figure 40. See caption for figure 2.

RECENT TECHNICAL MEMORANDUMS

Copies of this and other NOAA Technical Memorandums are available from the National Technical Information Service, 5285 Port Royal Road, Springfield, VA 22167. Paper copies vary in price. Microfiche copies cost \$9.00. Recent issues of NOAA Technical Memorandums from the NMFS Southwest Fisheries Science Center are listed below:

- NOAA-TM-NMFS-SWFSC- 234 Fixed costs and joint cost allocation in the management of Pacific Whiting.
J. TERRY, G. SYLVIA, D. SQUIRES, W. SILVERTHORNE,
J. SEGER, G. MONRO, R. MARASCO, D. LARSON, J. GAUVIN,
A.B. GAUTAM, S. FREESE, and R. BALDWIN
(September 1996)
- 235 Ichthyoplankton vertical distributions near Oahu, Hawai'i, 1985-1986:
Data Report.
G.W. BOEHLERT AND B.C. MUNDY
(December 1996)
- 236 Application of acoustic and archival tags to assess estuarine, nearshore,
and offshore habitat utilization and movement by salmonids.
G.W. BOEHLERT
(March 1997)
- 237 Status of the pacific sardine (*Sardinops sagax*) resource in 1996.
J.T. BARNES, M. YAREMKO, L. JACOBSON, N.C.H. LO,
and J. STEHLY
(April 1997)
- 238 Manual for OTO 3.0 and OPS programs for reading daily increments.
J. BUTLER and E. MOKSNESS
(April 1997)
- 239 Changing oceans and changing fisheries: Environmental data for
fisheries research and management. A workshop.
G. BOEHLERT and J.D. SCHUMACHER, (Editors)
(April 1997)
- 240 Documentation of California's commercial market sampling data entry
and expansion programs.
D.E. PEARSON and B. ERWIN
(April 1997)
- 241 The Hawaiian monk seal in the Northwestern Hawaiian Islands, 1995.
T.C. JOHANOS and T.J. RAGEN
(June 1997)
- 242 Plankton sampling during the whale habitat and prey study 10 July-
4 August 1996.
W.A. ARMSTRONG and S.E. SMITH
(August 1997)
- 243 Benthic Invertebrates of four Southern California marine habitats prior to
onset of ocean warming in 1976, with lists of fish predators.
J.R. CHESS and E.S. HOBSON
(August 1997)