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

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

During the spring and fall of 1972 the Coastal Fisheries Resources Division, Southwest Fisheries Science Center, conducted two multi-vessel ichthypoplankton/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, melamphaids) 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 ichthypoplankton, 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. Pearcy (1964) and collaborators (Pearcy and Laurs, 1965; Pearcy et al., 1977; Willis and Pearcy, 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

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 (Jurkovitsch, 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 212.1 m (range=190-320 m; sd=34.0 m) 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 227.5 m (range=183-283 m; sd=34.0 m) for the 600mwo tows and 426.9 m (range=317-610 m; sd=67.7 m) 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 Melamphaidae 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 Vinciguerria 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: Vinciguerria 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 721-OJD, 16 sample pairs were taken. The MT trawls fished to an average depth of 430m and filtered an average of 1,045,500m$^3$ of water whereas the IK fished to an average depth of 234m and filtered an average of 9,830m$^3$. The MT collected an average of 0.74 fish per m$^3$ whereas the IK collected an average of 3.96 fish per m$^3$. 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

Chloplidae

*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.

*Chiloconger 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. jesperseni 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.


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 pelecanoides 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.


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.


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)

Platytroctidae

*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)


**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* Jesperson 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.

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 lychmus 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, 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.


Phosichthyidae

Ichthyococcus irregularis Rechnitzer and Bohlke (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) 17-45mm; 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) 13-18mm.

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) 15-23mm; 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.

*Vinciguerra 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) 16-33mm; 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) 16-30mm; 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.

*Vinciguerra* spp.


**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.


**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. trifidus*; 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) 46-48mm.

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 schmidti 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.


*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 antrostonus* Gilbert (Fig. 17)

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*Idiacanthus fasciola* Peters (Fig. 17)

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Idiacanthus spp.

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

AULOPIFORMES

Scopelarchidae

*Benthalbella infans* Zugmayer (Fig. 17)

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*Rosenblattichthys hubbsi* Johnson (Fig. 17)

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*Rosenblattichthys volucris* (Rofen) (Fig. 17)

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*Scopelarchus analis* (Brauer) (Fig. 18)

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*Scopelarchus guentheri* Alcock (Fig. 18)

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Reference: Gibbs (1964b), Novikova (1967), Regan and Trewavas (1930)
IK, (3) 15-38mm; 31.139, MT, (6) 31-44mm; 31.145, IK, (3) 22-50mm; 31.145, MT, (6) 16-40mm.

*Scopelarchus michaelisae* 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.


**Notosudidae**

*Ahliesaurus brevis* Bertelsen, Kreft 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**

*Arciozonus risso* (Bocaparte) (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.

*Leptidiops* 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* (Kroyer) (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, (1) 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.


**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

Benthosema pananense (Tåning) (Fig. 22)
7205, 150.70, IK, (2) 14-23mm.

Benthosema 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 distosax 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; 20.135, MT, (2) 15-20mm.
Centrobranchus nigrocellatus Günther (Fig. 23)

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<th>Standard</th>
<th>Description</th>
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<td>7205, 31.145</td>
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<td>23mm.</td>
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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. nigrocellatus*.

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

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<td>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.</td>
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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 posterior 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, (31) 12-19mm; 31.139, MT, (2) 17-18mm.

Diaphus anderseni Tanning (Fig. 23)

7205, 20.129, MT, (6) 14-19mm; 24.125, IK, (2) 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, (7) 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, (2) 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 bertolisi 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 Tanning (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 Tanning (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. rufinesquii (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 Tanning (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 Tanning (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) 19-20mm; 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, IK, (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) 12-23mm; 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 lutematus (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)
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, 20.140, 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; 27.143, 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.

Lanipana 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).

Lanipana urophaos Paxton (Fig. 26)
7205, 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, 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.

Lampamyctus 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).

Lampamyctus idostignza 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.
**Lampanyctus "niger" (Fig. 27)**

<table>
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<th>Specimen</th>
<th>Date</th>
<th>Code</th>
<th>Location</th>
<th>Length (mm)</th>
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<td>7205</td>
<td>20.129</td>
<td>MT, (2)</td>
<td>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.</td>
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<tr>
<td>7210</td>
<td>100.140</td>
<td>MT, (1)</td>
<td>76mm; 100.140, MT, (4) 30-58mm; 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) 63-89mm; 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.</td>
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</table>

Note: See note for *L. idostigma*.

**Lampanyctus nobilis Tâning (Fig. 27)**

<table>
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<th>Location</th>
<th>Length (mm)</th>
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<td>7205</td>
<td>20.121</td>
<td>IK, (1)</td>
<td>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.</td>
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<td>7210</td>
<td>20.123</td>
<td>MT, (2)</td>
<td>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.</td>
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</table>

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

**Lampanyctus "no pectorals" (Fig. 28)**

<table>
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<th>Specimen</th>
<th>Date</th>
<th>Code</th>
<th>Location</th>
<th>Length (mm)</th>
</tr>
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<tr>
<td>7205</td>
<td>20.121</td>
<td>IK, (3)</td>
<td>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.</td>
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<tr>
<td>7210</td>
<td>100.140</td>
<td>MT, (19)</td>
<td>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.</td>
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</tbody>
</table>

Note: See note for *L. idostigma*.
Lanzpanyctus 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.

Lanzpanyctus 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.

Lanzpanctus 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 genzellarii (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, (2) 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 aurorotaternatum Garman (Fig. 29)
7210, 157G.25, IK, (1) 64mm; 157G.55, IK, (1) 23mm.

Myctophum lycnobiun 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 nitidulun 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; 27.135, 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, (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; 27.135, 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.

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.
*Synibolophurus 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 nzininzus* (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).

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)

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.


Macrouridae

Mesobius berryi Hubbs and Iwamoto (Fig. 32)
7205, 31.145, MT, (1) 65mm.

Reference: Ambrose (1996c)

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


Moridae (Fig. 32)

Melanidae

Melanorus 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.


LOPHIIFORMES

Linophrynidae

_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.


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.


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 sinus* 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) 55mm.

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. bispinesis 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.

(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.


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.


Coryphaenidae

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

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

Caristidae

Caristius macderensis 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. brodei* or *H. sherborni* has not been resolved (see discussion in Sandknop and Watson 1996b). It is possible that the smaller specimens (≤26mm) are juvenile *H. zina* that have not yet developed the diagnostic scale character (Fedoryako 1976).

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

Labridae

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

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.


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.


Scombridae

*Thunnus albacares* (Bonnaterre)
7210, 157G.25, IK, (1) 7mm.


Trichiuridae

*Benthodesmus pacificus* (Günther) (Fig. 39)
7205, 27.145, IK, (1) 33mm.


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.
**Cubiceps pauciradiatus** Günther (Fig. 39)
*7210, 20.123, MT, (1) 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 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.*

**Syacinum ovale** (Günther) (Fig. 40)
*7210, 157G.25, 1K, (2) 6-10mm; 157G.55, 1K, (3) 9-10mm; 23.108, 1K, (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.*


**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; 27.139, MT, (12) 119-125mm; 31.145, MT, (3) 140-165mm.


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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


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55
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.

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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.
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