

# Deep-Water Fishes of the 2011 Hearst Philippine Biodiversity Expedition of the California Academy of Sciences

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The year 2017 will mark the 100<sup>th</sup> anniversary of the *Albatross* Philippine Expedition. Smith and Williams (1999) wrote:

In the history of American maritime exploration, it was the second only to the Wilkes Expedition in terms of time spent and area covered. In terms of the material collected and the pages published, the Philippine Expedition is in a class by itself and stands as one of the greatest of all oceanographic expeditions.

Whereas the offshore collecting efforts of California Academy of Sciences Hearst Philippine Expedition (HEPD) of 2011 was much smaller and more limited in duration and locations sampled, it did accomplish similar successes in that the deepwater trawling and trapping along the Verde Island Passage (between Luzon and Mindoro islands) resulted in the capture of several undescribed and many poorly known fishes. Several of the specimens remain to be conclusively identified, however we present here our findings as of this date.

During the period 28 May–4 June 2011, the M/V *DA-BFAR* of the Philippine Bureau of Fisheries and Aquatic Resources made a series of deepwater collections in waters off Batangas and Mindoro provinces off southwestern Luzon, Philippines (Fig. 1). The collecting began in the Batangas and Balayan bays, then out into the Verde Island Passage between Luzon and Mindoro islands, proceeded west through the Calavite Passage to the southern shores of the Lubang Islands and out to the shelf edge in the South China Sea before returning along the northern coast of the Lubang Islands to Batangas Bay. A total of 39 stations were occupied (Table 1; station data) of which eight were trap stations, eight otter trawls (including station HEPD-027 where the gear was entirely lost), and 23 beam trawls. In addition, a few fish were captured on hook-and-line during one evening of fishing while the vessel lay-to for the night. Fishes comprised part of the catch at all stations except two where the otter trawl was used, one where the beam trawl was used, and two where traps were used.

The number of fishes captured during this cruise included 78 families, 148 genera, and about 214 species, so far as we have been able to determine. Many of these represent new records for the area and a few represent species new to science and will be described elsewhere. A number of specimens could not be determined as to species, either because of inadequate descriptions in the published literature or because the taxonomy of the group is in need of a thorough revision. Included in this category were badly damaged specimens, and some juveniles and larvae that we made no attempt to identify. Some unidentified specimens may well represent undescribed species.

## METHODS AND MATERIALS

Traps (Fig. 2) were of a standard design used by the local fishermen. They were cylindrical cage traps approximately 1 m long and 30 cm in diameter covered with polyethylene mesh and baited with fish. They were deployed in 40-trap sets, each trap tethered to a mainline at about 50 m intervals. Depths fished with the traps ranged from as shallow as 60–77 m to as deep as 821–836 m. Although the number of fishes captured in the traps was generally low, the species rep-

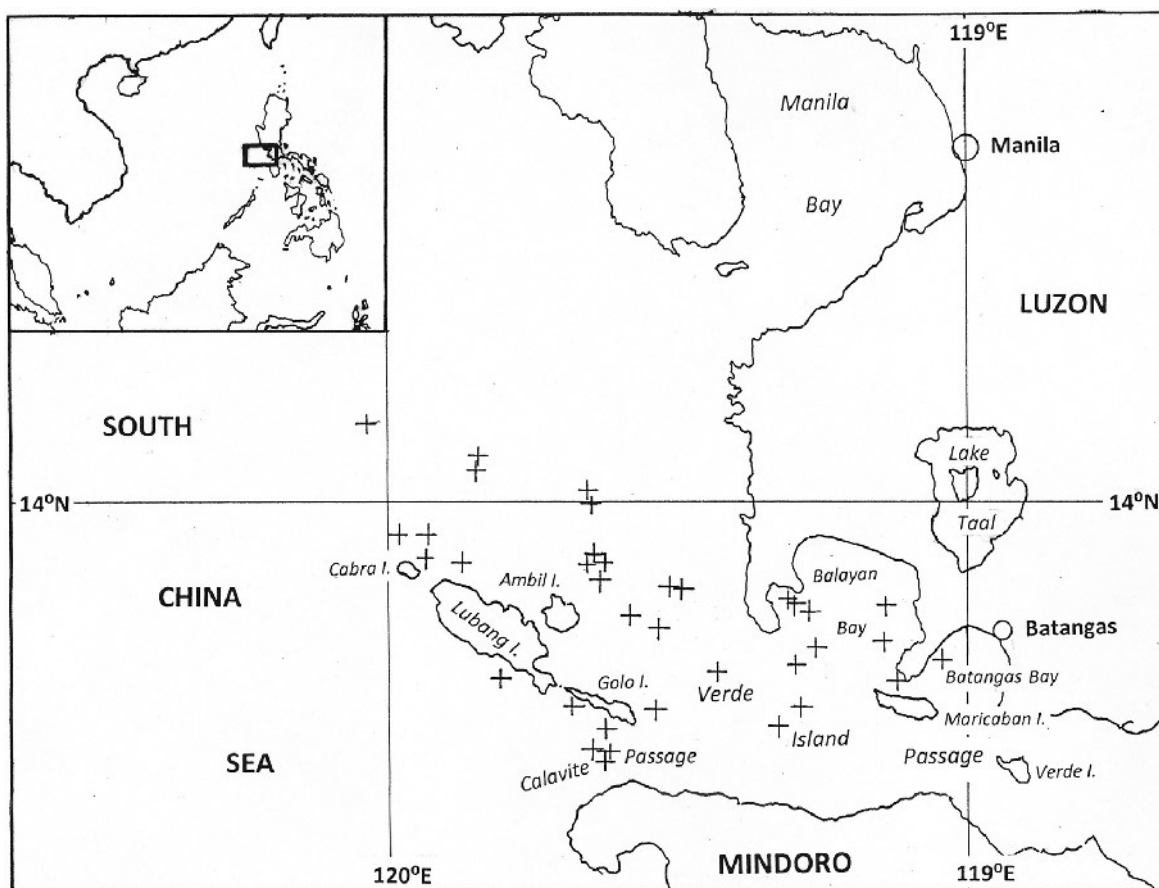


FIGURE 1. Map showing collecting stations of the M/V *DA-BEAR* during the California Academy of Sciences Hearst Philippines Expedition, 28 May through 4 June 2011.

resented were often not taken by other means: falling into this category were most notably the eels and the catsharks. Traps offer the advantage over trawls in being usable over bottom topography that would otherwise preclude dragging a trawl. The fishes obtained by this method were also in excellent shape: damaged specimens are a frequent problem in trawl catches.

**OTTER TRAWLS** (Figs. 3, 4).— When successfully fished, the otter trawls were highly productive in terms of biomass and diversity of the catch because of their wide swept area. However, they are susceptible to hang-ups and tears from rough bottoms, making them unsuitable over much of the area surveyed during the HEPD cruise. Because no opening-closing device was used on the trawl, a mixture of midwater and bottom organisms was often taken.

**BEAM TRAWLS.**— The 4-m beam trawl employed during the cruise was notable in the length of its wooden beams, which exceeded those commonly used in oceanographic work. The wide swept-area of the beam trawl resulted in good catches with high diversity. The relatively tight coverage of the substratum and the fine-mesh liner often captured small epibenthic, subsurface, and burrowing organisms, especially invertebrates, that were not sampled by the otter trawl. The durability of beam trawls in general also makes it much more feasible to deploy over rough bottoms, although on one occasion, the trawl hung up, a beam broke, and most of the gear was lost.

**PRESERVATION OF SPECIMENS.**— After capture and a rough sort of the catch on deck, the fish specimens were brought into the vessel's wet lab and further sorted and identified to the lowest level possible with the available literature on board. Representatives of each species were set aside,

TABLE 1. Station data for M/V *DA-BFAR*, 28 May to 4 June 2011. Gear abbreviations: BTR — beam trawl, OTR — otter trawl, TRA — traps, H&L — hook and line.

<i>Stn. No. HEPD</i>	<i>2011 date</i>	<i>Gear</i>	<i>Set time</i>	<i>Set latitude N</i>	<i>Set Longitude E</i>	<i>Capture depth (m)</i>	<i>Bottom type</i>
001	28-May	BTR	1412	13.714	120.953	238-252	Sandy-muddy
002	28-May	TRA	1833	13.825	120.679	146-203	Sandy-muddy
003	29-May	BTR	0805	13.822	120.763	272-291	Muddy
004	29-May	OTR	1000	13.854	120.772	154-245	Muddy
005	29-May	BTR	1157	13.718	120.756	459-496	Muddy w/pebbles
006	29-May	OTR	1504	13.703	120.638	454-457	Muddy w/coraline sand
007	29-May	OTR	1830	13.775	120.846	Aborted	
008	29-May	TRA	2005	13.876	120.876	203-252	Muddy
009	30-May	OTR	0838	13.740	120.861	322-336	Sandy-muddy
010	30-May	BTR	1022	13.820	120.843	318-333	Muddy
011	30-May	OTR	1416	13.600	120.767	636-664	Muddy
012	30-May	BTR	1642	13.601	120.667	721-761	Muddy
012.5	30-31-May	H&L		13.601	120.667	40	
013	30-May	TRA	1925	13.635	120.488		Muddy
014	31-May	BTR	0850	13.602	120.348	865-944	Muddy
015	31-May	BTR	1117	13.601	120.348	757-836	Sandy-muddy
016	31-May	OTR	1324	13.607	120.339	892-966	Muddy
017	31-May	BTR	1807	13.689	120.184	282-428	Muddy w/hard coraline rocks
018	31-May	TRA	1953	13.641	120.301	240-262	Sandy-muddy
019	1-Jun	BTR	0815	13.610	120.372	541-636	Sandy-muddy w/pebbles
020	1-Jun	BTR	1153	13.667	120.186	311-328	Trawl lost
021	1-Jun	BTR	1619	13.886	120.147	72-94	Sandy-muddy
022	1-Jun	OTR	1745	13.887	120.109	63-79	Muddy
023	1-Jun	TRA	1951	13.937	120.092	578-710	Sandy-muddy
024	2-Jun	BTR	0840	14.052	119.983	2107-2350	Sandy-muddy
025	2-Jun	BTR	1523	13.891	120.383	82-86	Sandy-rocky, hard
026	2-Jun	BTR	1609	13.904	120.357	82-86	Sandy-rocky, hard
027	2-Jun	OTR	1721	13.899	120.365		Trawl lost
028	2-Jun	BTR	1911	13.927	120.314	115-124	Sandy-rocky, hard
029	2-Jun	TRA	2020	13.932	120.298	60-77	Sandy-muddy
030	3-Jun	BTR	0740	13.993	120.322	190-201	Sandy-muddy
031	3-Jun	BTR	0928	14.017	120.334	183-188	Sandy-muddy
032	3-Jun	BTR	1355	14.080	120.175	223-369	Sandy
033	3-Jun	BTR	1620	14.080	120.172	225-347	Sandy
034	3-Jun	TRA	1855	13.950	120.044	821-836	Muddy
035	4-Jun	BTR	1117	13.835	120.451	397-439	Muddy
036	4-Jun	BTR	1330	13.795	120.410	216-262	Muddy
037	4-Jun	BTR	1532	13.844	120.483	417-481	Muddy
038	4-Jun	TRA	1029	13.852	120.451	355-368	Sandy-muddy
039	4-Jun	BTR	2035	13.686	120.581	633-642	Muddy

a plastic tag with a unique number attached (the number is prefaced with “DC” in the Materials sections), a tissue sample extracted, and a photograph taken. The tissues, usually a slice of body muscle from the right side or a portion of the right pectoral fin, were placed in tissue vials filled with 95% ethanol. A plastic tag numbered the same as the fish specimen from which it came was also inserted into the vial. The fish specimens to be preserved for the CAS collections were placed in 10% formalin for initial fixation later to be transferred in stages to 75% ethanol at CAS. Some of the specimens listed as CAS uncat. were left in the Philippines to be deposited in the Philippines National Museum. A few others will be deposited in other institutions.

The primary references used for the initial identifications include the *FAO Species Identification Guide for Fishery Purposes, The Living Marine Resources of the Western Central Pacific* (Carpenter and Niem 1999 and 2001); *Fishes of Japan with Pictorial Keys to the Species* (Nakabo 2000); and *The Fishes of the Japanese Archipelago* (Masuda et al. 1984). More specialized literature as listed in the References, and specimens from the Academy collections, were used to verify our identifications. On occasion, we took advantage of the internet and advice from experts on different fish groups to garner identifications from images taken aboard ship. For the most part, we did not conduct thorough investigations into the literature coupled with comparisons of museum specimens for the HEPD specimens identified, as would be the case were this paper meant to be a full taxonomic treatise. The purpose of this paper is to provide a basic list of specimens procured during the deepwater phase of the Expedition; our tentative identifications and photographs will guide others who wish to follow up with more extensive studies of specimens of interest.

Abbreviations are generally the standard ones used in the taxonomic literature, including SL—standard length, TL—total length, FL—fork length, HL—head length, 1D and 2D—first and second dorsal fin, A—anal fin, P—pectoral fin, V—pelvic fin, C—caudal fin, GR—gill raker, m—meters, fm—fathom. Photophore abbreviations for Myctophiformes, Stomiiformes, and others can be found in most texts dealing with those fishes. The fishing (gear) depths recorded aboard the M/V *DA-BFAR* were in fathoms; these were converted in the text to meters using the multiplier 1.8288. A question mark after a species name in the subheads indicates an uncertainty in the correctness of



FIGURE 2. Traps used during the Expedition.



FIGURE 3. The otter trawl during haul-back, otter doors on deck; note beam trawl on right behind black plastic tub.

the specific name; a cf. before the specific name indicates that the fish is similar to, but not the same as, the species indicated.

The list of species and the classification of families largely follow Nelson's (2006) *Fishes of the World*, Fourth Edition.

### DISCUSSION

The Coral Triangle has long been considered the center of diversity of marine organisms (Allen and Erdman, 2012) and the Philippines are thought by some (Carpenter and Springer 2005) to be the center of the center of diversity. The deepwater fish fauna of this region have yet to be adequately compared with those from other regions, but collections by the former U.S. Fish Commission steamer *Albatross* in the Philippines and Dutch East Indies during the early part of the 20th century (1907–1910) (see Smith and Williams 1999) provide a broad measure of the diversity of the deepwater fauna. No other expedition to this region has equaled the extent of coverage and resultant new species described from these *Albatross* collections. The French ORSTOM cruises over the past three decades collected huge numbers of fishes and invertebrates from offshore waters, but the fishes from those cruises have yet to be adequately examined and published on. A short ORSTOM cruise off Lubang Island in 1976 resulted in the collection of 43 deepwater fish species (de la Paz and Interior 1979) that was deposited in the Zoological Museum of the University of the Philippines (UPZM). The list of species in that collection, included only a few species that corresponded with the HEPD list. We were unable to access the UPZM collection and therefore could not check the identifications. Most ORSTOM collections are housed in the Muséum



FIGURE 4. The otter trawl on deck.

national d'Histoire naturelle in Paris: they offer a treasure-trove of research material for those willing to dig through the many drums of formalin-preserved fishes.

In September 1995 the Taiwan fishery vessel *Fishery Researcher I* conducted a short survey off the east coast of Luzon using a large otter trawl and a 2-m ORI ring net. Seven deep bottom hauls were made using the otter trawl at depths from 174 m to 1053 m, and one shallow haul made in 40 m. Midwater hauls were made between the surface and about 1550 m, four using the otter trawl and two using the ORI ring net. About 300 species were identified from this 1995 survey, a number far exceeding what the HEPD expedition obtained, mostly owing to the larger catches of midwater fishes and perhaps the larger trawl used by the *Fishery Researcher I*. The fish collections were split among various institutions, including the Philippine Bureau of Fisheries and Aquatic Resources, the Australian Museum, the Peabody Museum of Yale University, the Taiwan Fisheries Research Institute in Kaohsiung, and the California Academy of Sciences. Two subsequent cruises sponsored by the Taiwanese government were made in the early part of 2000, with the collections deposited in the National Museum of the Philippines in Manila and the Academia Sinica in Taiwan.

The extent to which the Chinese have surveyed the South China Sea is unknown to us, but is likely to be substantial. Randall and Lim (2000) recorded 3365 species of marine fishes from the South China Sea. That number continues to grow as more collecting continues, often in areas hitherto untouched, and as new, more-refined techniques tease out previously imperceptible taxa. Randall and Lim acknowledge that the pelagic and deep-sea fauna has not been well studied in the South China Sea and that “these deep-sea habitats are. . . important areas for future exploration” (op. cit. p. 570).

## ACKNOWLEDGMENTS

We had identification help from numerous ichthyologists who were generous with their time and expertise. These include Abner Bucol (Muraenidae), Kent E. Carpenter and Thomas H. Fraser (Apogonidae), Barry Goldman (Nemipteridae), Martin F. Gomon (Trachichthyidae), Hsuan-Chieh Ho (Ogcocephalidae and deepsea anglerfishes); Doug Hoese (Gobiidae), Helen Larson (Gobiidae), Keiichi Mastuura (Tetraodontidae), Michael Mincarone (Myxinidae); Stuart G. Poss (Scorpiiforms), John E. Randall (Nemipteridae), William J. Richards (Triglidae, Peristediidae), and David G. Smith (Congridae). Ichthyology staff of the California Academy of Sciences (CAS) were extremely helpful: David Catania photographed almost all of the species during the expedition and answered continual questions concerning specimens and data; Jon Fong provided radiographs, photographs, and data; Mysi Hoang ensured accurate and timely cataloging of specimens and provided necessary administrative and other assistance; and Anna Sellas and Claudia Rocha provided genomic assistance and advice. Don Dumale (National Museum of the Philippines) provided ichthyological advice and assistance while in the field and identified specimens while at the CAS. We thank expedition leaders Terrence Gosliner and Richard Mooi for their invitation to participate in the expedition and for support of our efforts during and after the cruise. And most importantly, we thank the persons who made it all possible, William and Margaret Hearst, sponsors of the expedition.

**Annotated list of species collected on the Philippine Bureau of Fisheries and Aquatic Resources research vessel M/V *DA-BFAR*, 28 May to 5 June 2011**

MYXINIDAE (LAMPREYS)

***Myxine cf. formosana* Mok and Kuo, 2001 (Fig. 5)**

**MATERIAL.**— CAS 233680 (440 mm TL, female with eggs, DC-1388); HEPD-013, traps in 587–604 m.

**REMARKS.**— This specimen is tentatively identified by Michael Mincarone and McCosker (this volume) as *Myxine formosana*. It represents the first Philippine specimen of the species.

***Eptatretus luzonicus* Fernholm, Norén, Kullander, Quattrini, Zintzen, Roberts, Mok, and Kuo, 2013 (Fig. 6)**

**MATERIAL.**— CAS 233675 (563 mm TL); HEPD-023, traps set in 578–710 m. CAS 233676 (3, 334–430 mm TL); HEPD-013, traps set in 587–604 m. NPM 1999 (443 mm TL); collected with CAS 233676.

**REMARKS.**— Mincarone and McCosker (this volume) have discovered the lost holotype of *Eptatretus luzonicus* (= *Eptatretus fernholmi* McMillan and Wisner, 2004), lost prior to its description; they redescribed it along with the five specimens collected during the Hearst Expedition.

CHIMAERIDAE (SHORTNOSE CHIMAERAS OR RATFISHES)

***Hydrolagus deani* (Smith and Radcliffe, 1912) (Fig. 7)**

**MATERIAL.**— CAS 235485 (female, 730 mm TL, DC-1413); HEPD 016, otter trawl in 892–966 m.

**REMARKS.**— The Philippine Chimaera is known only from the Philippines.

SCYLIORHINIDAE (CAT SHARKS)

***Apristurus platyrhynchus* Tanaka, 1909 (Fig. 8)**

**MATERIAL.**— CAS 234027 (225 mm TL, DC-1405); HEPD-015, beam trawl in 757–836 m.

**REMARKS.**— Distributed from southern Japan, Taiwan, to northern Borneo, the East China Sea, the Philippines and the South China Sea at depths between approximately 600 and 1000 m.

***Cephaloscyllium* sp. (Fig. 9a-c)**

**MATERIAL.**— (7 specimens trapped and trawled at 355–480 m.)

**REMARKS.**— McCosker sent pictures and the sequencing map provided by Anna Sellas (CAS) to Peter Last, the CSIRO shark biologist who has done so much work on this group. Last has advised McCosker that he has a market specimen from the Philippines that is most probably the same as ours and was in the process of describing it, and would like our involvement. He now has concerns about separating the Philippine material from another species that John E. Randall (BPBM) described as *Cephaloscyllium stevensi* Clark and Randall, 2011 from New Ireland, and is trying to get tissue from that species. A juvenile specimen (135 mm TL) was captured and cataloged as CAS 235500. Measurements of the six larger specimens are here provided: DC-1313 (female, 580 mm TL); DC-1314 (mature male, 610 mm TL); DC-1315 (female, 625 mm TL); CAS 235501, DC-1438 (immature male, 395 mm); DC-1576 (mature male, 520 mm TL); DC-1577 (immature male, 410 mm TL).

SQUALIDAE (DOGFISH SHARKS)

***Etmopterus brachyurus* Smith and Radcliffe in Smith, 1912 (Fig. 10)**

**MATERIAL.**— CAS 233994 (2, 132–203 mm TL); HEPD-005, beam trawl in 459–496 m.

**REMARKS.**— Originally described from Jolo Is., Philippines; the species is also known from Japan and Western Australia.



## HEXATRYGONIDAE (SIXGILL STINGRAYS)

*Hexatrygon bickelli* Heemstra and Smith, 1980 (Fig. 11)

**MATERIAL.**— CAS 233779 (female, 620 mm TL, DC-1295); HEPD-006, otter trawl in 454–457 m.

**REMARKS.**— This species was originally described from South Africa, but subsequently recorded from Japan, Australia, Hawaii and waters adjoining these areas. It is occasionally sold in fish markets in Taiwan.

## HALOSAURIDAE (HALOSAURS)

*Aldrovandia phalacra* (Vaillant, 1888)? (Fig. 12)

**MATERIAL.**— CAS 236021 (213+ mm TL [tail tip missing], DC-1427); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— This specimen agrees fairly closely with *Aldrovandia oleosa* Sulak, 1977 in its dark overall coloration, but the development of, and interspace between, the palatine tooth patches, and the spacing between them and the pterygoid tooth patches is narrower, the lateral-line scale count appears to be higher (scales all lost and scale pockets not well defined), and the gill-raker count at 24 total (5+1+18) is slightly higher (cf. 19–23). The branchiostegal-ray count of 10 is lower than in *A. phalacra* (11–13) and agrees more with that in *A. oleosa* (9–11). *A. phalacra* has been recorded from the Indian Ocean and the Hawaiian Islands, but so far as we can determine, not in the western Pacific. If the HEPD specimen is correctly identified as that species, it will represent a first record for these waters.

## MURAENIDAE (MORAY EELS)

*Gymnothorax cf. johnsoni* (Smith, 1962) (Fig. 13)

**MATERIAL.**— CAS 236625 (3, 440–620+ mm TL, DC-1310–1312); HEPD-008, traps in 203–252 m.

**REMARKS.**— The deepwater white-spotted species of *Gymnothorax* requires proper analysis. Our specimen is closely related to two or more other white-spotted species, including *G. elegans* Bliss, 1883 and *G. isingteena* (Richardson, 1845), and cannot be identified with certainty. The three CAS specimens are similar to the holotype of *Lycodontis johnsoni* and have a MVF of 5–59–145, total 141–146. The type of *G. johnsoni* has 5–55–139. *Muraena stellifer* (Richardson, 1848) may be a senior synonym of *Gymnothorax johnsoni* or a junior synonym of *Gymnothorax punctatus* Bloch and Schneider, 1801; and *Gymnothorax albomaculatus* Bliss, 1883 may be a synonym of *G. elegans* (see Böhlke and Smith 2002). This species complex requires revision.

A 585 mm SL specimen of what appears in a photograph to be this species was purchased in a Dumaguete fish market by a Philippine student, Abner Bucol, who is in contact with McCosker about Philippine eels.

*Gymnothorax cf. nuttingi* Snyder, 1904 (Fig. 14)

**MATERIAL.**— CAS 236626 (female, 748 mm TL, DC-1318); HEPD-008, traps in 203–252 m.

**REMARKS.**— This deepwater moray is currently reported only from the Hawaiian Islands. Our specimen differs in coloration from that of Hawaiian specimens (see Böhlke and Randall 2000:246), but does not differ in morphometrics and dentition. It does differ in its vertebral counts (PI 5–68–148 vs. MVF of 6 specimens from Hawaii 6–71–160, total 157–165). We are hesitant to describe this as a new species until tissue from Hawaiian specimens can be made available for comparison to that of our Philippine specimen.

## SYNAPHOBRANCHIDAE (CUTTHROAT EELS)

*Dysomma anguillare* Barnard, 1923 (Fig. 15)

**MATERIAL.**— CAS 235128 (557 mm TL and CAS 235465 (5, 525–540 mm TL); HEPD-002, traps in 146–203 m. CAS 235129 (2, 517–575 mm TL); HEPD-018, traps in 240–262 m. CAS 235465 (2, 525–540 mm TL); HEPD-038, traps in 355–368 m.

**REMARKS.**— This is a circumglobal species.

*Synphobranchus kaupii* Johnson, 1862 (Fig. 16)

**MATERIAL.**— CAS 235497 (365 mm SL, DC-1381); HEPD-012, beam trawl in 721–761 m. CAS 235454 (535 mm SL, DC-1423) and CAS 235499 (535 mm SL, DC-1423); HEPD-016, otter trawl in 892–966 m. CAS 235498 (405 mm SL, DC-1500); HEPD-023, traps in 578–710 m.

**REMARKS.**—A mostly circumglobal species, including the Hawaiian Islands, but absent in the eastern Pacific.

#### SIMENCHELYIDAE (SNUBNOSE PARASITIC EELS)

##### *Simenchelys parasitica* Gill, 1879 (Fig. 17a–b)

**MATERIAL.**—CAS 235457 (463 mm TL, DC-1341); HEPD-011, otter trawl in 636–664 m.

**REMARKS.**—The only species in this family. Probably worldwide distribution in deep slope waters below 500 m to more than 1500 m.

#### OPHICHTHIDAE (SNAKE EELS AND WORM EELS)

##### *Pylorobranthus hearstorum* McCosker, 2014 (described in this volume) (Fig. 18)

**MATERIAL.**—CAS 235464 (holotype, female, 1218 mm TL, DC-1426); HEPD 016, beam trawl in 892–966 m.

**REMARKS.**—This, the largest myrophine ophichthid yet known, is described in this volume on the basis of the single specimen collected during the expedition.

##### *Ophichthus* cf. *urolophus* (Temminck and Schlegel, 1846) (Fig. 19)

**MATERIAL.**—CAS 236637 (4, 429–635 mm TL, DC-1445, JM 541–543); HEPD-018, trap in 240–262 m. CAS 236638 (547 mm TL, DC-1269); HEPD-003, beam trawl in 272–291 m. CAS 236639 (3, 508–ca. 630 mm TL); HEPD-010, beam trawl in 318–333 m.

**REMARKS.**—The eight Verde Island Passage specimens trawled and trapped between 240 m and 332 m are very similar in appearance and characteristics to *Ophichthus urolophus*, a deepwater (40–420 m) ophichthid known from Japan, western Australia, and Indonesia (Sumida and Machida 2000; McCosker 2010). It is also similar in its body proportions, general physiognomy, and vertebral counts (HEPD specimens 134–137 vs. *O. urolophus* 134–139), but differs in the location of its dorsal-fin origin (slightly in advance of end of pectoral fin in Philippine specimens, slightly behind end of pectoral fin in extralimital *O. urolophus* specimens).

#### COLOCONGRIDAE

##### *Coloconger scholesi* Chan, 1967 (Fig. 20)

**MATERIAL.**—CAS 235482 (365 mm SL, DC-1301); HEPD-006, otter trawl in 454–457 m.

**REMARKS.**—Known from western Indian Ocean and in the western Pacific off Australia and in the South China Sea.

#### CONGRIDAE (CONGER EELS)

##### *Ariosoma anago* (Temminck and Schelgel, 1846) (Fig. 21)

**MATERIAL.**—CAS 235453 (363 mm SL, DC-1480); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**—Widely distributed in the western Pacific and eastern Indian Ocean.

##### *Conger macrocephalus* Kanazawa, 1958 (Fig. 22)

**MATERIAL.**—CAS236635 (785 mm TL, DC-1316) and CAS 236636 (610 mm TL, DC-1317); HEPD-008, traps in 203–252 m. CAS 2366634 (378 mm TL, DC-1441); HEPD-018, trap in 240–262 m.

**REMARKS.**—Kanazawa (1958) described *Conger macrocephalus* (p. 254) and *C. philippinus* (p. 255) in his *Conger* revision. D. G. Smith (*in litt.* 2012) questions the difference between these species. The vertebrae of our specimens agree with Smith's (1994: 6) listing in his catalogue of eel type specimens in the USNM. Ours have 14–35–134 (DC-1316), 14–36–136 (DC-1317) and 16–38–141 (DC-1441), and the holotype of *C. macrocephalus* has 15–36–136, that of *C. philippinus* has 17–38–132.

##### *Parabathymyrus brachyrhynchus* (Fowler, 1934) (Fig. 23)

**MATERIAL.**—CAS 235589 (male, 268 mm TL, DC-1532); HEPD-031, beam trawl in 183–188 m.

**REMARKS.**—This specimen is in excellent condition and its testes are well developed. It has a vertebral formula of 13–52–171, slightly different than those of the holotype (19–55–166) and the paratype (168 total)

(Smith 1989:504; 1994:5). The specimen displays a sharp and distinct mid-sagittal crest that extends from slightly anterior to the orbit to the rear margin of the orbit. The specimen is not at all dessicated and the crest is quite apparent exteriorly.

***Bathycongrus guttulatus* (Günther, 1887) (Fig. 24)**

**MATERIAL.**— CAS 235635 (male, 319 mm TL, DC-1303); HEPD-006, otter trawl in 454–457 m. CAS 235634 (male, 417 mm TL, DC 1557); HEPD-035, beam trawl in 397–439 m.

**REMARKS.**— The vertebral formulae of the specimens are 11–42–154 (DC-1303) and 10–41–163 (DC-1557). Several species of *Bathycongrus* remain undescribed; these specimens were identified using the key in Karmovskaya and Smith (2008).

***Bathycongrus retrotinctus* (Jordan and Snyder, 1901) (Fig. 25)**

**MATERIAL.**— CAS 235455 (224 mm TL); HEPD-001; beam trawl in 238–252 m. CAS 235456 (360 mm TL, DC-1580); HEPD-038, traps in 355–368 m.

**REMARKS.**— This congrid eel is readily identified by its pointed snout, dentition, D and A fin origins, and pore and color patterns.

BATHYLAGIDAE (DEEP-SEA SMELTS)

***Nansenia ardesiaca* Jordan and Thompson, 1914 (Fig. 26)**

**MATERIAL.**— CAS 234013 (135 mm SL, DC-1332); HEPD-010, beam trawl in 318–333 m.

**REMARKS.**— Widely distributed in the western Pacific.

ALEPOCEPHALIDAE (SLICKHEADS)

***Bajacalifornia erimoensis* Amaoka and Abe, 1977 (Fig. 27)**

**MATERIAL.**— CAS 235451 (232 mm SL, DC-1416); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— Formerly known only from off Japan. The HEPD specimen extends its known range to the Philippines.

***Narctes kamoharai* Okamura, 1984 (Fig. 28)**

**MATERIAL.**— CAS 235450 (276 mm SL, DC-1417); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— This species was originally described from off the Okinawa Islands in the Ryukyu Trench; its capture during the HEPD expedition extends its known range to the Philippines. One small (78 mm SL) damaged specimen from HEPD-014 (CAS 234025) is also probably this species.

GONOSTOMATIDAE (BRISTLEMOUTHS)

***Sigmops elongatum* (Günther, 1878)**

**MATERIAL.**— CAS 235475 (95 mm SL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— A circumglobal, temperate to tropical species, mostly at bathypelagic depths but often taken in bottom trawls.

PHOTICHTHYIDAE (LIGHTFISHES)

***Pollichthys maui* Poll, 1953**

**MATERIAL.**— CAS 236663 (4, 40.2–46.9 mm SL); HEPD-004, otter trawl in 154–245 m. CAS 236511 (13, 32.0–42.2 mm SL); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— Small, vertically-migrating, mesopelagic fish found in tropical waters of Atlantic, Pacific, and Indian oceans.

***Polymetme corythaeola* (Alcock, 1900)**

**MATERIAL.**— CAS 235541 (9, 48.8–70 mm SL); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— Apparently worldwide in warm seas, commonly in 300–500 m, but sometimes to >800 m.

## STERNOPTYCHIDAE (MARINE HATCHETFISHES)

*Polyipnus spinifer* Borodulina, 1979 (Fig. 29)

**MATERIAL.**— CAS 235509 (6 spec.); HEPD-003, beam trawl in 272–291 m. CAS 233991 (46.8 mm SL, DC-1281); HEPD-004, otter trawl in 154–245 m. CAS 234000 (21, 15.7–60.0 mm SL, DC-1282); HEPD-009, otter trawl in 322–336 m. CAS 235477 (5, 48.5–58.0 mm SL); HEPD-035, beam trawl in 397–439 m.

**REMARKS.**— Known from Suruga Bay, Japan, East China Sea, and off Philippines in South China and Sulu Seas. Depth usually about 220–380 m. Previously confused with *P. tridentifer* and *P. soelae*, but distinguishable from these by multidentate ACB photophore scales.

*Polyipnus triphanos* Schultz, 1938

**MATERIAL.**— CAS 235510 (23.7 mm SL); HEPD-009, otter trawl in 322–336 m. CAS 235473 (2, 30.9–35 mm SL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— Known from the Philippines and Taiwan in the South China and Indonesian islands south to the Coral Sea. Small adult size, < 50 mm SL

*Polyipnus unispinus* Schultz, 1938 ?

**MATERIAL.**— CAS 235471 (31.4 mm SL); HEPD-014, beam trawl in 865–944 m. CAS 235472 (8, 24.5–27 mm SL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— A miniature species, not attaining adult size exceeding about 35 mm SL. The low gill-raker count (11 or 12 total) is characteristic only of *P. unispinus*. The low A-ray count (13–14, rarely 15), absence of lateral pigment bar and the ill-defined pigmentation on dorsum distinguish it from *P. danae* and all other *Polyipnus*. The HEPD specimens did not fully agree with the description provided by Harold (1994:502–504, fig. 41) in lacking denticulation on the PV photophore scales, in shape of preopercular and pterygiophore spines, and in characters of the ACB photophores. If these specimens are correctly identified, they represent the first record of the species from the South China Sea. Previous records are from the Sulu Sea south through Indonesia and east and south to the Solomon Islands, New Caledonia, and to north of New Zealand.

*Sternoptyx diaphana* Herman, 1781

**MATERIAL.**— CAS 235474 (2, 28.5–29.2 mm SL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— Worldwide in temperate to tropical seas; bathypelagic; depth range usually between 200 and 1800 m, but many records exceeding 1800 m.

## STOMIIDAE (SCALY DRAGONFISHES)

*Stomias nebulosus* Alcock, 1889 (Fig. 30)

**MATERIAL.**— CAS 233992 (106 mm SL, DC-1294); HEPD-005, beam trawl in 459–496 m.

**REMARKS.**— One of five *Stomias* species in the area. Absence of a greatly enlarged fanglike premaxillary tooth and the more numerous upper-jaw teeth distinguish the species from its congeners.

*Stomias* sp.

**MATERIAL.**— CAS 234024 (123 mm SL, DC-1397); HEPD-014, beam trawl in 865–944 m.

**REMARKS.**— Harold (1999:1908) lists five species from the western-central Pacific (*S. affinis*, *S. boa*, *S. danae*, *S. longibarbatulus*, and *S. nebulosus*).

## ASTRONESTHIDAE (SNAGGLETOOTHES)

*Astronesthes chrysophekadion* (Bleeker, 1849)

**MATERIAL.**— CAS 235748 (98 mm SL); HEPD-006, otter trawl in 454–457 m.

**REMARKS.**— The HEPD specimen had PV 19, AC 12, OV 18, VAV 19, and OA 37: the last two counts fell outside the range given by Nakabo (2000), but the specimen otherwise closely agrees with his description.

*Astronesthes ijimai* Tanaka, 1908 (Fig. 31)

**MATERIAL.**— CAS 233983 (10, 62.2–116.0 mm SL, DC-1284); HEPD-004, otter trawl in 154–245 m. CAS 235379 (107 mm SL, DC-1336); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— The black bar on the caudal peduncle and abruptly raised VAL photophores immediately separate this species from all others except *A. lucifer* Gilbert, 1905, which has a more slender caudal peduncle (depth 1.9–2.3 into length). The CAS specimens agree relatively well with descriptions of the species except for the following counts (P 7 vs. 6; VAV 17 vs. 21–24; AC 15 vs. 11–13; VAL 20 vs. 21–23; OA 39 vs. 40–42), which add a measure of uncertainty.

*Astronesthes lucifer* Gilbert, 1905 (Fig. 32)

**MATERIAL.**— CAS 235257 (2, 111–119 mm SL, DC-1335); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— The prominent black band on the ventral two-thirds of the caudal peduncle distinguishes the species from all others except *A. ijimai* (see above). Distributed in the western Pacific from the Hawaiian Islands to southern Japan and Indonesia.

*Astronesthes* sp.

**MATERIAL.**— CAS 236664 (44 mm SL); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— This small specimen was damaged, with part of the abdominal wall torn away and the tip of barbel lost. The capture of this bathypelagic fish at this relatively shallow station is unusual.

## MELANOSTOMIATIDAE (SCALELESS BLACK DRAGONFISHES)

*Photonectes albipennis* (Döderlein, 1882) (Fig. 33)

**MATERIAL.**— CAS 235547 (82.7 mm SL, DC-1428); HEPD-016, otter trawl in 892–966 m. CAS 235558 (ca. 225+ mm SL [severely bent vertebral column at thorax]); collection data lost.

**REMARKS.**— This black dragonfish is readily identified by its curved lower jaw, absence of a P fin, large postorbital photophore, and short barbel with a single filament on its bulbous tip. The CAS specimen has a long chin barbel measuring 64 mm (about 2x HL) with a filamentous tip (not included in measurement); base of barbel black, but all of remainder, including large, flattened bulb and tip without color. Widespread in the western Pacific from Japan south to Australia, including East and South China seas, off New Caledonia, Hawaii and French Polynesia, and off South Africa.

## ARGENTINIDAE (ARGENTINES, HERRING SMELTS)

*Glossanodon* sp. (Fig. 34)

**MATERIAL.**— CAS 236020 (4, 76–80 mm SL, DC-1492); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Paxton and Cohen (*in* Carpenter and Niem, 2001:1884) remarked on the need for a comprehensive revision of the family. The HEPD specimen does not agree with any of the known species and likely is undescribed.

## SYNODONTIDAE (LIZARDFISHES)

*Saurida* sp.

**MATERIAL.**— CAS 236481 (11, 29.0–39.9 mm SL); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— We were unable to identify these juvenile specimens.

*Synodus macrops* Tanaka, 1917?

**MATERIAL.**— CAS 236482 (110 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— This specimen agrees in count characters with *S. macrops*, but there are two or three short stripes on the cheek, a character that is found in *S. oculus* Cressey and not in *S. macrops*, which has instead a single short bar immediately behind the eyes.

*Synodus oculus* Cressey, 1981? (Fig. 35)

**MATERIAL.**— CAS 236488 (135 mm SL; DC-1495); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— This specimen agrees relatively well with *S. oculus* except for the dark peritoneum and the low LL-scale count (54–57 in *S. oculus*). Whether these differences are of specific importance is not known. The two or three short stripes on the cheek and the large orbit otherwise appear to distinguish *S. oculus* from other western Pacific members of the genus.

***Synodus* sp.**

**MATERIAL.**— CAS 236478 (10, 35.3–42.6 mm SL); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— We were unable to identify these juvenile specimens.

CHLOROPHTHALMIDAE (GREENEYES)

***Chlorophthalmus acutifrons* Hiyama, 1940 (Fig. 36)**

**MATERIAL.**— CAS 235821 (134 mm SL; DC-1566); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— This is a common species known from southern Japan, the East China Sea, Taiwan, and the Philippines in 260–435 m.

***Chlorophthalmus albatrossis* Jordan and Starks, 1904**

**MATERIAL.**— (91 mm SL); HEPD-003, beam trawl in 272–291 m

IPNOPIDAE (GRIDEYE SPIDERFISHES)

***Bathypterois atricolor* Alcock, 1896 (Fig. 37)**

**MATERIAL.**— CAS 2355479 and 236195 (2, 135–150 mm SL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— This species is very similar to *B. phenax* from the Atlantic, and apparently differs only in the placement of its vertical fins.

***Bathypterois guentheri* Garman, 1889 (Fig. 38)**

**MATERIAL.**— CAS235452 (2, 207–226 mm SL, DC-1399, -1400); HEPD-015, beam trawl in 757–836 m.

NEOSCOPELIDAE (BLACKCHINS)

***Neoscopelus microchir* Matsubara, 1943 (Fig. 39)**

**MATERIAL.**— CAS 235378 (2, 114.5–115.0 mm SL) and CAS 235504 (4, 75.2–93.5 mm SL); HEPD-003, beam trawl in 272–291 m. CAS 236624 (11, 74.6–114.3 mm SL); and CAS 235506 (3, 83.0–116.0 mm SL); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— We counted lateromedial photophores as 20–22 + 3 separated anteriorly over the pectoral-fin base, the series extending over the anal-fin base. Nafpaktitis (1977:9) gave counts of LO photophores that are low compared with those of our material. His study material included many Philippine specimens.

***Neoscopelus porosus* Arai, 1969**

**MATERIAL.**— CAS 233995 (11, 77–133.5 mm SL); HEPD-006, otter trawl in 454–457 m. CAS 235492 (139 mm SL, DC-1571); HEPD-039, beam trawl in 633–642 m.

MYCTOPHIDAE (LANTERNFISHES)

***Benthoosema fibulatum* (Gilbert and Cramer, 1897)**

**MATERIAL.**— CAS 236518 (2, 56.5–57.0 mm SL; DC-1285); HEPD-004, otter trawl in 154–245 m.

**REMARKS.**— This species is an exception in the genus in having the supracaudal and infracaudal luminous glands present in both sexes. Widely distributed in the western tropical Pacific and in the Indian Ocean.

***Bolinichthys distofax* Johnson, 1975**

**MATERIAL.**— CAS 236516 (58.0 mm SL); HEPD-006, otter trawl in 454–457 m.

**REMARKS.**— The crescent-shaped white tissue behind the iris is distinguishing for this genus. We are uncer-

tain if this single specimen from the expedition is *B. distophax*, although it rather well agrees with the account given by Nafpaktitis (1977:234–236, fig. 164). The species is widespread in the Atlantic and Pacific oceans although records of the species are sparse.

***Diaphus adenomus* Gilbert, 1905 (Fig. 40)**

**MATERIAL.**— CAS 236623 (6, 98–154 mm SL); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— This is a large, widely distributed species known from the western Pacific from Hawaii to Japan and in the Atlantic Ocean. The Ant (supraorbital) and Vn (infraorbital) luminous organs are well developed in the largest specimen, but much less developed in the smaller specimens.

***Diaphus fragilis* Tåning, 1928 (Fig. 41)**

**MATERIAL.**— CAS 233984 (7, 85–123 mm SL, DC-1286); HEPD-004, otter trawl in 154–245 m. CAS 233999 (123 mm SL, DC-1328); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— A mesopelagic species found in tropical waters of the Pacific, Atlantic and Indian oceans.

***Diaphus garmani* Gilbert, 1906**

**MATERIAL.**— CAS 233989 (11, 44.0–61.4 mm SL); HEPD-004; otter trawl in 154–245 m. CAS 236513 (8, 37.2–53.0 mm SL); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— This is a common, worldwide species.

***Diaphus gigas* Gilbert, 1913**

**MATERIAL.**— CAS 233987 (10, 71.2–83.9 mm SL, DC-1287); HEPD-004, otter trawl in 154–245 m.

**REMARKS.**— Taxonomic uncertainty exists with this species. Wisner (1976:121) suggested that it may be conspecific with *D. elucens* (Brauer, 1904), and Kawaguchi and Shimizu (1978:68) reported that “according to Nafpaktitis (pers. comm.), *D. gigas* might be oversized senile expartriates of the warm water *D. perspicillatus*.” We know of no records of this species from the Philippines, although Okamura (*in* Okamura and Kitajima 1984:361) record it from the East China Sea off Okinawa. They give its distribution as southern Japan, East China Sea, and Indian Ocean, but Kawaguchi and Shimizu (1978:68) report it from south to 20°N, north to off Hokkaido (42°N), and as far east as 179°W. Wisner (1976:121) reported the species in the North Pacific Current eastward to 155°W.

***Diaphus suborbitalis* Weber, 1913 (Fig. 42)**

**MATERIAL.**— CAS 234003 (71.3 mm SL, DC-1330); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— This species is readily identified from other congeners by the large oval to round Vn that lies along the ventral rim of the orbit, anterior to a vertical through the posterior margin of the pupil, in combination with other photophore characters. Widely distributed in tropical to subtropical western Pacific and western Indian oceans.

***Diaphus watasei* Jordan and Starks, 1904 (Fig. 43)**

**MATERIAL.**— CAS 233899 (156 mm SL, DC-1327) and CAS 234002 (112 mm SL, DC-1329); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— The larger (CAS 233899) of the two HEPD specimens has a relatively low gill-raker count (7+1+11 = 17 total, vs. 18–23 total recorded by others), but the smaller (CAS 234002) has a count of 5+1+13 + 19 total. The snout of the smaller is damaged and the luminous organs there could not be adequately assessed. The two otherwise agree well with descriptions of the species. Distributed widely in Indo-West Pacific from southern Japan south to southern Australia and west to Africa.

***Diaphus* sp. (Fig. 44)**

**MATERIAL.**— CAS 236509 (83.5 mm SL, DC-1435); HEPD-017, beam trawl in 282–428 m.

**REMARKS.**— We are unable to identify this specimen. The area around the luminous organs in front of the orbit is damaged, and we cannot determine if it has an Ant or So photophore. In its general morphology and arrangement and numbers of photophores on the body, the specimen appears similar to *Diaphus adenomus* Gilbert, 1905.

*Diaphus* sp.

**MATERIAL.**— CAS 236510 (34.7 mm SL); HEPD-014, beam trawl in 865–944 m.

**REMARKS.**— We are unable to identify this small, damaged specimen.

*Diaphus* sp.

**MATERIAL.**— CAS 236512 (30.0 mm SL); HEPD-016, beam trawl in 892–966 m.

**REMARKS.**— We are unable to identify this specimen owing to its small size and imperfect condition, especially around the snout and orbit where the luminous organs are situated. The short, deep body and arrangement of the large photophores on the body are somewhat similar to those characters in *D. perspicillatus* (Ogilby, 1898).

*Hygophum proximum* Becker, 1965

**MATERIAL.**— CAS 236514 (41.0 mm SL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— Widespread in tropical waters of the Pacific and Indian oceans.

? *Lampanyctus* sp.

**MATERIAL.**— CAS 236507 (46.0 mm SL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— The general morphology and photophore pattern of this single, damaged specimen indicate that it is a *Lampanyctus* based on the keys provided by Nafpaktitis et al. (1977: 26–29) and Nakabo (2000: 378–399). It agrees closest with *L. nobilis* Tåning, 1928 in Nakabo's key.

*Myctophum obtusirostre* Tåning, 1928

**MATERIAL.**— CAS 236515 (2, 44.3–50.8 mm SL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— Worldwide in tropical seas. These specimens agree well with published descriptions of the species except that the luminous supracaudal (male) and infracaudal (female) organs are less developed, probably owing to the subadult size of the specimens.

*Taaningichthys* sp.

**MATERIAL.**— CAS 236517 (58.0 mm SL); HEPD-014, beam trawl in 865–944 m.

**REMARKS.**— We are uncertain of the identification of this single, denuded specimen, in which little evidence of photophores remain. The presence of supra- and infracaudal luminous glands bordered by black tissue and the crescent-shaped whitish tissue on the posterior half of the iris led us to this genus. *Bolinichthys* also has the whitish tissue on the iris, but the caudal luminous glands consist of overlapping scale-like bodies not bordered by black tissue. Body photophores are apparently absent in *T. paurolychnus* Davy, but we are uncertain of their absence in this specimen.

## PARALEPIDIDAE (BARRACUDINAS)

*Dolichosudis* ? (Fig. 45)

**MATERIAL.**— CAS 236706 (196 mm SL; DC-1424); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— We are uncertain of the genus of this barracudine. It has D 9, A 33, LL 73; a long adipose fin between the anus and A; V well anterior to D, which lies about midway between the origins of V and A; distance between D and C about 3.5 in SL; no light organs; short P; large depressible mandibular teeth in 2 rows; and relatively compressed body. Color uniformly medium brown.

## POLYMIXIIDAE (CAS GROUP 115)

*Polymixia berndti* Gilbert, 1905 (Fig. 46)

**MATERIAL.**— CAS 235791 (125 mm SL, DC-1432); HEPD-017, beam trawl in 282–428 m. CAS 235819 (3, 130–147 mm SL, DC-1567); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— The HEPD specimens agree for the most part with descriptions in Heemstra (*in* Smith and Heemstra, 1986:432, fig. 134.1) and Nakabo (2000: 407), although the snout tip does not extend beyond



the premaxillary as depicted in those works. They more closely resemble *P. japonicus* in that respect, but the scales are much smaller and the D lobe is intensely black in that species.

### MORIDAE (MORID CODS)

#### *Physiculus longifilis* Weber, 1913

**MATERIAL.**— CAS 235569 (55 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— The elongated pelvic fin is apparently distinctive among members of the genus; this and the few D rays (about 60) and the absence of scales on D and gular membranes are diagnostic. So far known only from the Flores and Sulu seas and off southwestern Luzon (HEPD specimen).

#### *Physiculus rhodopinnis* Okamura, 1982 (Fig. 47)

**MATERIAL.**— CAS 235782 (85.0 mm SL, DC-1433); HEPD-017, beam trawl in 282–428 m.

**REMARKS.**— This very small specimen agrees relatively well with the original description and Paulin's (1989) revised description using more comparative material. The developed gill rakers appeared somewhat longer and more slender than shown in Okamura's (fig. 78C) figure, and the gular membrane completely lacked scales (although Paulin states "...gular scales *usually* [italics added] present." Furthermore, scales on the mandibular rami were of two sizes, several larger ones posteriorly placed, and most of the remaining surfaces covered with tiny embedded scales that did not taper to one row anteriorly. The size of the HEPD specimen may have a bearing on these character differences. This specimen is the first record of the species from Philippine waters.

### BREGMACEROTIDAE (CODLETS)

#### *Bregmaceros japonicus* Tanaka, 1908 (Fig. 48)

**MATERIAL.**— CAS 236708 (55 mm SL, DC-1293); HEPD-005, beam trawl in 459–496 m. CAS 236480 (3, 81–106 mm SL); HEPD-006, otter trawl in 454–457 m. CAS 236483 (3, 49.8–70.5 mm SL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— This species is one of several that were captured during the Expedition, but we could not identify the others to species.

### BATHYGADIDAE (BATHYGADIDS)

#### *Bathygadus entomelas* Gibert and Hubbs, 1920 (Fig. 49)

**MATERIAL.**— CAS 233710 (38.6 mm HL, 169+ mm TL, DC-1345); HEPD-011, otter trawl in 636–6664 m. CAS 233711 (40.2 mm HL, 178+ mm TL, DC-1380); HEPD-012, beam trawl in 721–761 m.

**REMARKS.**— The following combination of characters fairly well distinguish this species from its congeners: V 10, GR-I 6+19; gill rakers long, slender, with pointed tips; fins lacking prolonged rays; no chin barbel; interorbital wider than orbit, and pyloric caeca around 36.

#### *Bathygadus spongiceps* Gibert and Hubbs, 1920? (Fig. 50)

**MATERIAL.**— CAS 236494 (ca. 27 mm HL, 131+ mm TL, DC-1415); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— This single damaged juvenile is tentatively identified as *B. spongiceps* based mainly on the counts of the pelvic fins (9), gill rakers (5+1+21), pyloric caeca (about 14), and dimensions of its orbit (20% HL), interorbital (33%), upper jaw (57%), and suborbital (16%). The genus is in need of revision. *Bathygadus spongiceps* (or a species very much like it) has been broadly recorded from the Philippines south to Indonesia, Australia, and in the southwestern Pacific (Coral Sea, off New Caledonia and adjacent regions).

#### *Gadomus denticulatus* Gilbert and Hubbs, 1920

**MATERIAL.**— CAS 233712 (33.0 mm HL, 185 mm TL); HEPD-006, otter trawl in 454–457 m.

**REMARKS.**— The species is closely similar to *G. colletti* from Japan (the range possibly extends to Western Australia; see Iwamoto and Williams 1999:117) differing in *G. colletti* having somewhat more GR (4–6+21–23, total 25–28), more pyloric caeca (95), and longer barbel (3X orbit).

***Gadomus multifilis* Günther, 1887 (Fig. 51)**

**MATERIAL.**— CAS 235518 (2, 54.0–61.9 mm HL, 294+–357 mm TL, DC-1351, -1379); HEPD-012, beam trawl in 721–761 m. CAS 235546 (20.0 mm HL, 90+ mm TL), CAS 235376 (1 spec.) and CAS 235799 (35.3 mm HL, 170+ mm TL, DC-1414); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— The high gill-raker count (6–7+27–28) and pointed rakers, the elongated ray in the paired and dorsal fins, and the pyloric-caeca count (12–16) in combination distinguish this species from others of the genus (but see Sazonov and Iwamoto 1992:37–38). This species is widespread from Japan south to Indonesia and possibly in the Indian Ocean.

## MACROURIDAE (GRENADIERS, MACROURIDS, RATTAILS)

***Coelorinchus acantholepis* Gilbert and Hubbs, 1920 (Fig. 52)**

**MATERIAL.**— CAS 233993 (2, 33.8–38.4 mm HL, 120+–160 mm TL, DC-1289 and DC-1290); HEPD-005, beam trawl in 459–496 m.

**REMARKS.**— These small specimens agree relatively well with the original description except for the presence of scales between the orbit and infraorbital ridge, which Gilbert and Hubbs (1920:490) say are absent in *C. acantholepis*, and the count of scales below the origin of second dorsal fin (5 ½ vs. 4 ½). In these characters, the specimens agree with *C. carinifer*, but that species has a somewhat longer snout and other proportional differences. Body-scale features could not be compared because of the absence of scales on the body of the HEPD specimens. *Coelorinchus acantholepis* appears to be an East Indies species and the HEPD specimens may represent the first record from the Philippines.

***Coelorinchus carinifer* Gilbert and Hubbs, 1920 (Fig. 53a–b)**

**MATERIAL.**— CAS 235516 (73.5 mm HL, 287+ mm TL, DC-1384); HEPD-012, beam trawl in 721–761 m.

**REMARKS.**— This species was described only from the holotype; the HEPD specimen represents the second specimen and record of the species. Gilbert and Hubbs (1920) provided a good description and illustration of the species, which the HEPD specimen follows closely except for the size and orientation of the spinules on its body scales. They are arranged in much more divergent rows and are stouter and longer than figured in the original description. Also, the authors (p. 493) record "...branchial cavity lined with brownish black, except on a narrow but abrupt whitish margin along the opercular and branchiostegal membranes," whereas in the HEPD specimen, the membrane is black without a light outer margin.

***Coelorinchus kishinouyei* Jordan and Snyder, 1900**

**MATERIAL.**— CAS 235540 (26.1 mm HL, 110 mm TL); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— This is a common species in the South China Sea off Taiwan and north to southern Japan. It has been captured in depths from 200 m to more than 600 m.

***Coelorinchus smithi* Gilbert and Hubbs, 1920 (Fig. 54)**

**MATERIAL.**— CAS 235519 (2, 113–119 mm HL, 431+–432+ mm TL, DC-1402, -1403); HEPD-015, beam trawl in 757–836 m. CAS 236403 ([head only], 114.5 mm HL); HEPD-023, trap in 578–710 m.

**REMARKS.**— Widely distributed from southern Japan to Indonesia and Australia, in 300–1110 m. The specimen with only the head and parts of the vertebral column was mostly devoured by deep-sea isopods (*Bathynomus*), which were also taken in the same traps; the head remains in excellent condition allowing ready identification.

***Coryphaenoides microps* (Smith and Radcliffe, 1912) (Fig. 55)**

**MATERIAL.**— CAS 235552 (2, 48.6–75.0 mm HL, 233+–332+ mm TL, DC-1343); HEPD-011, otter trawl in 636–664 m. CAS 235554 (77 HL, 349+ TL, DC-1392); HEPD-012, beam trawl in 721–761 m. CAS 235554 (3, 44.4–71.5 HL, 201+–353 TL); HEPD-015, beam trawl in 757–836 m. CAS 236659 (53.0 mm HL, 257 mm TL, DC 1569); HEPD-039, beam trawl in 633–642 m.

**REMARKS.**— *Coryphaenoides microps* is known from the Philippines, off southwestern Taiwan (Chiou et al., 2004a: table 1; Shao et al. 2008: table 2), and the East Sea (Japan Sea) off South Korea (Kim et al, 2009: 108–110). It is very similar to, and can be confused with, *C. macrolophus*, *C. marginatus*, *C. semiscaber*,

and *C. tydemani*, but can be distinguished from them by a combination of the shape of its preopercle, length of elongated 1D ray, orbit-to-preopercle distance, and the relationship of that measurement to size of its orbit (see key in Shcherbachev and Iwamoto 1995:286–287).

***Hymenocephalus lethonemus* Jordan and Gilbert, 1904**

**MATERIAL.**— CAS 233709 (2 spec., 23.8–24.0 mm HL, 112–122 mm TL); HEPD-006, otter trawl in 454–457 m.

**REMARKS.**— Distributed from southern Japan, Kyushu-Palau Ridge, East China Sea, South China Sea off Taiwan to the Philippines.

***Hymenocephalus nascens* Gilbert and Hubbs, 1920 (Fig. 56)**

**MATERIAL.**— CAS 233942 (85+ mm TL, DC-1288); HEPD-005, beam trawl in 459–496 m.

**REMARKS.**— This species is closely similar to *H. lethonemus*. It has been recorded from the Philippines to the southwestern Pacific off New Caledonia and Australia (QLD, NSW, WA), in about 350–930 m.

***Hymenocephalus torvus* Smith and Radcliffe in Radcliffe, 1912**

**MATERIAL.**— CAS 234080 (7, 49+–113 mm TL); HEPD-009, otter trawl in 322–336 m. CAS 234076 (9, 21–27 mm HL, 75+–146 mm TL); HEPD-010, beam trawl in 318–333 m. CAS 234083 (2, 24.5–27.8 mm HL, 370+–370+ mm TL); HEPD 035, beam trawl in 397–439 m. CAS uncat (73.5 mm HL, 287+ mm TL); HEPD-012, beam trawl in 721–761 m.

**REMARKS.**— This species was recognized as a subspecies of *H. striatissimus* by Gilbert and Hubbs (1920:530), but the V-ray count, barbel length, and body pigmentation appear to distinguish the two species. According to Gilbert and Hubbs (1920: 528) the nominal subspecies ranges from Japan “southward to China, Formosa, and the east coast of Luzon,” “intergrading off the northwest coast of Luzon with the subspecies *torvus*, which inhabits the Sulu Sea and the China Sea off southern Luzon.” Those authors corrected the *Albatross* station number (sta. 5508) for the holotype of *H. torvus*, erroneously given by Radcliffe (1912:110) as station 5548.

***Mataeocephalus acipenserinus* (Gilbert and Cramer, 1897)**

**MATERIAL.**— CAS 235251 (51.2 mm HL, damaged); HEPD-011, otter trawl in 636–664 m. CAS 235822 (47 mm SL, 225+ mm TL); HEPD-39, beam trawl in 633–642 m.

**REMARKS.**— Widely distributed in the tropical Indo-Pacific, from the Sala-y-Gomez Ridge in the southeastern Pacific to Hawaii, southwestern Pacific, Philippines, Indonesia, and South China Sea, across Indian Ocean to east Africa.

***Mataeocephalus cristatus* Sazonov, Shcherbachev and Iwamoto, 2003 (Fig. 57)**

**MATERIAL.**— CAS 234020 (46.2 mm HL, 210 mm TL, DC-1383); HEPD-012, beam trawl in 721–761 m.

**REMARKS.**— This species is known from the Indian Ocean (Saya de Malha Ridge, Mascarene Ridge, Ninety-East Ridge), the South China Sea (Paracel Is.), and the Markus-Necker Ridge in the western Pacific. The HEPD specimen is the first record from the Philippines.

***Nezumia spinosa* (Gilbert and Hubbs, 1916) (Fig. 58)**

**MATERIAL.**— CAS 235798 (44.6 mm HL, 220+ mm TL, DC-1442); HEPD-019, beam trawl in 541–636 m.

**REMARKS.**— A widespread species known from Japan south and east to Australia (QLD and WA) and New Caledonia, and west to southeastern Africa.

***Sphagemacrurus pumiliceps* (Alcock, 1894) (Fig. 59)**

**MATERIAL.**— CAS 235732 (29.0 mm HL, 187+ mm TL, DC-1412) and CAS 236022 (28.2 mm HL, 190 mm TL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— Apparently widespread throughout Indo-West Pacific, but more than one species may be hiding under this name.

***Trachonurus villosus* (Günther, 1878) (Fig. 60)**

**MATERIAL.**— CAS uncat. (1, 58.7 mm HL, 340++ mm TL); HEPD-012, beam trawl in 721–761 m. CAS 235503 (61.6 mm HL, 345 mm TL, DC-1411); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— *Trachonurus* has several nominal species; all are closely similar and difficult to distinguish; more taxonomic study is necessary. Numerous specimens were collected by the *Albatross* during its 1907–1910 expedition to the Philippine and Indonesian archipelagos. *Trachonurus villosus* is apparently widespread in the northwestern Pacific.

***Ventrifossa longibarbata* Okamura, 1982 (Fig. 61)**

**MATERIAL.**— CAS 236398 (62.4 mm HL, 310+ mm TL, DC-1555); HEPD-035, beam trawl in 397–439 m.

**REMARKS.**— Previously known from southern Japan, Okinawa Trough, and Taiwan in 382–1211 m. The HEPD specimens represent the first record of the species from the Philippines.

***Ventrifossa macroptera* Okamura, 1982**

**MATERIAL.**— CAS 233997 (5, 31.3–43.5 mm HL, 175–207 mm TL); HEPD-006, otter trawl in 454–457 m.

**REMARKS.**— These HEPD specimens represent the first record of the species from the Philippines and the farthest south. It was previously known from the Kyushu-Palau Ridge and off Taiwan. *Ventrifossa sazónovi* Iwamoto and Williams, 1999 from off Vietnam and Western Australia also has a smooth spinous second ID ray, but that species has shorter P (1.5–1.9 time in HL vs. 1.3–1.5) and enlarged spinules on scales along the dorsum in adults.

***Ventrifossa saikaiensis* Okamura, 1984 (Fig. 62)**

**MATERIAL.**— CAS 235515 (2, 48.4–58.7 mm HL, 240+–287+ mm TL, DC-1382, -1390); HEPD-012, beam trawl in 721–761 m. CAS 235517 (55.9 mm HL, 295+ mm TL, DC-1406); HEPD-015, beam trawl in 757–836 m. CAS uncat. (61.6 mm HL, 345 mm TL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— Known only from the Okinawa Trough, Taiwan, and the South China Sea off Luzon, in 280–1211 m.

## OPHIDIIDAE (BROTULAS AND CUSK-EELS)

***Dicrolene tristis* Smith and Radcliffe in Radcliffe, 1913**

**MATERIAL.**— CAS 235740 (2, 116–161 mm SL, DC-1309); HEPD-006, otter trawl in 454–457 m. CAS 235468 (175 mm TL); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— Known from southern Japan, Taiwan, and the Philippines in approximately 560–990 m.

***Glyptophidium japonicum* Kamohara, 1936 (Fig. 63)**

**MATERIAL.**— CAS 233982 (123 mm SL, DC-1286); HEPD-003, beam trawl in 272–291 m.

**REMARKS.**— The genus was revised by Nielsen and Machida (1988); five of the seven species are known from off the Philippines.

***Glyptophidium lucidum* Smith and Radcliffe in Smith, 1913 (Fig. 64)**

**MATERIAL.**— CAS 235750 (5, 130+–175+ mm SL); HEPD-006, otter trawl in 454–457 m. CAS 235801 (188 mm SL, DC-1446); HEPD-019, beam trawl in 541–636 m.

**REMARKS.**— This is a common species known from the northern Philippines south to NW Australia, in 395–685 m.

***Hoplobrotula armata* (Temminck and Schlegel, 1846) (Fig. 65)**

**MATERIAL.**— CAS 235795 (207 mm SL, DC-1550); HEPD-033, beam trawl in 225–347 m.

**REMARKS.**— The HEPD specimen probably represents the first record of the species from the Philippines. The species is known from southern Japan, Okinawa, and Taiwan in upper-slope depths (in approximately 200–350 m).

***Luciobrotula bartschi* Smith and Radcliffe in Radcliffe, 1913?**

**MATERIAL.**— CAS 236665 (95.0 mm SL, DC-1306); HEPD-006, otter trawl in 454–457 m.

**REMARKS.**— Widely distributed in the Indo-West Pacific at depths of about 250 to more than 1000 m.

***Monomitopus pallidus* Smith and Radcliffe in Radcliffe, 1913 (Fig. 66)**

**MATERIAL.**— CAS 235275 (2, 185–190 mm SL) and CAS 234015 (207 mm SL, DC-1350); HEPD-011, otter trawl in 636–664 m. CAS 234022 (157 mm SL, DC-1391); HEPD-012, beam trawl in 721–761 m.

**REMARKS.**— This species appears to have a limited distribution, being known only from the East China Sea and the Philippines.

***Neobythites macrops* (Günther, 1887) (Fig. 67)**

**MATERIAL.**— CAS 235747 (5, 87–124 mm SL, DC-1308); HEPD-006, otter trawl in 454–457 m. CAS 235255 (2, 151–161 mm SL); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— A common deepwater *Neobythites* of Philippine waters; also known from Indonesia, Arafura Sea, and Western Australia, in 143–686 m.

***Neobythites unimaculatus* Smith and Radcliffe in Radcliffe, 1913 (Fig. 68)**

**MATERIAL.**— CAS 235745 (137.56 mm SL, DC-1456); HEPD-021, beam trawl in 132–172 m. CAS 235787 (124 mm SL, DC-1542); HEPD-031, beam trawl in 183–188 m. CAS 235478 (162 mm SL); HEPD-032, beam trawl in 223–369 m. CAS 235753 (232 mm SL); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— *Neobythites nigromaculatus* Kamohara, 1938, recorded from Japan and Taiwan, is considered a synonym of this species. This species supposedly has short pelvic fins that fall well short of the anus, but in the HEPD specimen the outermost ray is quite long, extending to or well beyond the anus. Distributed from Japan to northern Australia and east to Fiji in 146–567 m.

***Neobythites sivicola* Jordan and Snyder, 1901**

**MATERIAL.**— CAS 235480 (166 mm SL, DC-1520); HEPD-030, beam trawl in 190–201 m.

**REMARKS.**— Known only from the Philippines in the South China Sea and a single specimen from the Arafura Sea in 176–249 m.

***Siremba imberbis* (Temminck and Schlegel, 1846) (Fig. 70)**

**MATERIAL.**— CAS 235742 (2, 124–125 mm SL, DC-1459, -1460); HEPD-021, beam trawl in 132–172 m. CAS 235534 (2, 108–120 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Distribution from Japan south through the East China Sea, Philippines, and northern Australia (QLD, WA).

## LOPHIIDAE (GOOSEFISHES)

***Lophiomus setigerus* (Vahl, 1797) (Fig. 71)**

**MATERIAL.**— CAS 236404 (142 mm SL, DC-1453); HEPD-021, beam trawl in 132–172 m.

**REMARKS.**— Widespread in the Indian Ocean and western Pacific from Japan to southeastern Australia and well into the southwestern Pacific Ocean. The dark mouth with a pattern of anastomosing lines is distinguishing.

## CHAUNACIDAE (SEA TOADS)

***Chaunax* sp. 1 (not *Chaunacops* cf. *coloratus*) (Garman, 1899) (Fig. 72a–b)**

**MATERIAL.**— CAS 235683 (33.2 mm SL, DC-1444); HEPD-019, beam trawl in 541–636 m.

**REMARKS.**— We have been advised by Hsuan-Chieh Ho (National Museum of Marine Biology & Aquarium, Pingtung, Taiwan) that this specimen should be tentatively identified as *Chaunax* sp., not *Chaunacops* cf. *coloratus*. He added that “when they are small, they tend to be dark and similar to *Chaunacops*.” The species was last treated by Caruso (1989) who found that “*coloratus* is currently known from the eastern Indian Ocean . . . and the type locality on the Cocos Ridge in the eastern Pacific Ocean . . . In the Indi-

an Ocean it has been taken between 16°S and 32°S and 87°E and 97°E at depths ranging from 1,250–1,733 m.” He cautioned, however, that the lack of adequate eastern Pacific material (only the holotype, “which has suffered from ruthless dissection”) precludes the recognition of those populations as conspecific.

***Chaunax* sp. 2 (Fig. 73)**

**MATERIAL.**— CAS 236015 (52 mm SL); HEPD-021, beam trawl in 132–172 m. CAS 236014 (69 mm SL, DC-1493); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— We were unable to identify these small specimens, which may not be the same species.

OGCOEPHALIDAE (BATFISHES)

**REMARKS.**— The Batfishes have not been thoroughly reviewed and many taxonomic problems remain to be resolved, including the description of new species; as a consequence several of the HEPD specimens are left unidentified except to genus. Hsuan-Ching (“Hans”) Ho of the National Museum of Marine Biology and Aquarium, Taiwan, is currently working on the group.

***Dibranchius* sp. (Fig. 74)**

**MATERIAL.**— CAS 234021 (75 mm SL, DC-1385); HEPD-012, beam trawl in 721–761 m. CAS 234026 (53 mm SL, DC-1407); HEPD-015, beam trawl in 757–836 m.

**REMARKS.**— We were unable to identify these specimens.

***Halicometus* sp. (Fig. 75)**

**MATERIAL.**— CAS 234019 (58 mm SL, DC-1386), HEPD-012, beam trawl in 721–761 m. CAS 236016 (55 mm SL, DC-1572); HEPD-039, beam trawl in 633–642 m.

**REMARKS.**— We could not identify this to species.

***Halieutaea* cf. *stellata* (Vahl, 1797) (Fig. 76a–b)**

**MATERIAL.**— CAS 236405 (120 mm SL, DC-1525); HEPD-030, beam trawl in 190–201 m.

**REMARKS.**— Mochizuki (*in* Masuda et al. 1984:105) gives counts of P 13 and C 9, and also states that the ventral surface of the disc is white. Aside from these discrepancies, the HEPD specimen agrees with his description and color figure (pl. 91–H). Gloerfelt-Tarp and Kailola (1984:97, color figure on p. 96) recorded an unidentified *Halieutaea* that also agrees well with the HEPD specimen, especially in its disc shape (much wider than long), but they describe the ventral surface of the disc as covered with fine spinules or simple spines, in contrast to the minute dermal denticles of the HEPD specimen. Distributed from Japan to the East Indies and west to India.

***Halieutaea* sp.**

**MATERIAL.**— CAS 235678 (25.7 mm SL) and CAS 236017 (2 spec.); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Bradbury (*in* Carpenter and Niem 1999:2025) lists five species but does not provide a key to the species. She notes, “*Halieutaea* needs revision and most species distributions are little known. There are probably 5 or 6 species to be expected in the area.”

***Halieutopsis* sp. 1 (Fig. 77)**

**MATERIAL.**— CAS 235685 (48 mm SL, DC-1422); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— This specimen is similar to *Halieutopsis vermicularis* Smith and Radcliffe, 1912, however, its coloration is much too dark.

***Halieutopsis* sp. 2 (Fig. 78)**

**MATERIAL.**— CAS 235684 (2, 51–54 mm SL, DC-1420 and DC-1421); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— The smaller specimen has black pectorals, the larger has pale pectoral fins.

***Malthopsis annulifera* Tanaka, 1908 (Fig. 79)**

**MATERIAL.**— CAS 235680 (46.5 mm SL, DC-1546); HEPD-032, beam trawl in 223–369 m.

**REMARKS.**— Widely distributed in the western Pacific, from Japan southward to the Philippines and south-eastward to New Caledonia, in 90–360 m.

***Malthopsis kobayashii* Tanaka, 1916? (Fig. 80)**

**MATERIAL.**— CAS 235679 (76 mm SL, DC-1534); HEPD-032, beam trawl in 223–369 m.

**REMARKS.**— This specimen keys out to *Malthopsis lutea* Alcock, 1891 in most references, however, Ho and Shao (2010) show that *m. lutea* is limited to the Andaman Islands and that *m. kobayashii* is the widespread Indo-West Pacific species. It has four dorsal-fin rays. The fins are pale and the specimen lacks some of the pigmentation of *m. kobayashii*. H-C Ho (*in litt.* 2013) suggests that it might be either *Malthopsis tiarella* Jordan, 1902 or *m. asperata* Ho, Roberts and Shao, 2013.

## HIMANTOLOPHIDAE (FOOTBALLFISHES)

***Himantolophus appellii* (Clark, 1878)**

**MATERIAL.**— CAS 235600 (female, 74 mm SL); collection data lost.

**REMARKS.**— This specimen probably represents a new Philippines record, although the species is circum-global in the southern hemisphere (except the eastern Pacific).

## ATELEOPIDAE (JELLYNOSE)

***Ateleopus japonicus* Bleeker, 1853 (Fig. 81)**

**MATERIAL.**— CAS 235514 (638 mm SL, DC-1331); HEPD-009, otter trawl in 322–336 m. CAS 235794 (291 mm SL; DC-1526); HEPD-030, beam trawl in 190–201 m. CAS 235639 (1 spec.); HEPD-030, beam trawl in 190–201 m.

**REMARKS.**— Several species of *Ateleopus* occur in the region of the South China Sea, East China Sea and Japan, including one that is apparently undescribed (Tatsuya Kaga, *in litt.* 19 June 2013).

## TRACHICHTHYIDAE (SLIMEHEADS)

***Hoplostethus melanopterus* Fowler, 1938 (Fig. 82)**

**MATERIAL.**— CAS 23998 (82 mm SL, DC-1299); HEPD-006, otter trawl in 454–457 m. CAS 234018 (4, 99–162 mm SL, DC-1346, -1348, -1349); HEPD-011, otter trawl in 636–664 m.

**REMARKS.**— We have compared our specimens to a paratype of *H. melanopterus* (CAS-SU 40191, 82 mm SL). They are conspecific. The 162 mm SL specimen (DC-1347) agrees in counts and proportions with the species, but differs in having pale rather than black pectoral fins. Martin Gomon (*in litt.* 11 Nov. 2013) suggests that fin coloration can change with growth in *Hoplostethus*, however, this species has not been adequately studied. Gomon advises us that *Hoplostethus melanopterus* should be in another genus. We provisionally include it in *Hoplostethus* for this listing.

***Hoplostethus* sp.**

**MATERIAL.**— CAS 233985 (97 mm SL; DC-1277); HEPD-004, otter trawl in 154–245 m.

**REMARKS.**— This specimen appears identical to *Hoplostethus ravurictus* Gomon, 2008 from Australia in its coloration (body and buccal cavity) and in its counts. We have compared it to the pale CAS paratypes (CAS 227136, 3 paratypes 79–116 mm SL), and they seem to be the same. Martin Gomon (NMV, *in litt.*, 24 Oct. 2013) has advised that such a distribution is unlikely for *Hoplostethus* and that they are probably not conspecific. We will pursue a comparative analysis of the CO1.

***Hoplostethus* sp.**

**MATERIAL.**— CAS 236495 (25.1 mm SL); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— We were unable to identify this small individual.

## HOLOCENTRIDAE (SQUIRRELFISHES)

*Myripristis hexagona* (Lacepède, 1802) (Fig. 83)

**MATERIAL.**— CAS 235467 (127 mm SL, DC-1396); HEPD-012.5, hook and line in 40 m.

**REMARKS.**— Widespread in Indo-West Pacific.

*Ostichthys cf. japonicus* (Cuvier in Cuvier and Valenciennes, 1829) (Fig. 84)

**MATERIAL.**— CAS 235783 (69 mm SL, DC-1478); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— This HEPD specimen agrees fairly closely with *O. japonicus* as described by Nakabo (2000: 494) and Randall and Greenfield (*in* Carpenter and Niem, 1999: 2247) except for the narrower suborbital (height about 1/4 of orbit diameter vs. 1/2), slightly lower gill-raker count, and the last D spine not substantially longer than the penultimate spine. The upper jaw also falls well short of a vertical through the hind margin of the orbit, as opposed to well beyond that vertical. The gill-raker counts for the HEPD specimen included only developed rakers and not the one or two rudiments in each limb of the arch. Perhaps these differences may be a result of the small size of the HEPD specimen. Nakabo (2000) gives the following counts: D XII,12–14; A IV,10–12; P 16–17; LL 28–30; GR 7–10+12–14. *O. japonicus* is widespread in the western Pacific, from Japan to Australia and west to the Andaman Sea.

## MACRUROCYTTIDAE (ARMOREYE DORIES)

*Zenion hololepis* Goode and Bean, 1896 (Fig. 85)

**MATERIAL.**— CAS 235741 (41.3 mm SL); HEPD-006, otter trawl in 454–457 m. CAS 235737 (2, 48.8–49.6 mm SL, DC-1431, -1436); HEPD-017, beam trawl in 282–428 m.

**REMARKS.**— A widespread species in slope waters of most tropical and subtropical seas.

## CAPROIDAE (BOARFISHES)

*Antigonia capros* Lowe, 1843

**MATERIAL.**— CAS 235578 (52.3 mm SL, DC-1552); HEPD-032, beam trawl in 223–369 m.

**REMARKS.**— A broadly distributed species in tropical to subtropical waters.

*Antigonia rubicunda* Ogilby, 1910 (Fig. 86)

**MATERIAL.**— CAS 235575 (25.3 mm SL); HEPD-022, otter trawl in 115–144 m. CAS 235579 (98.5 mm SL); HEPD-032, beam trawl in 223–369 m.

**REMARKS.**— The lower counts on these specimens, compared to those of *A. capros*, could place them in *A. malayana*.

## FISTULARIIDAE (CORNETFISHES)

*Fistularia petimba* Lacepède, 1803 (Fig. 87)

**MATERIAL.**— CAS 236412 (639 mm TL, DC-1479); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— This species is almost circumglobal in distribution, ranging on both sides of the Atlantic Ocean into the Indian Ocean and the Pacific Ocean to the Hawaiian Islands. It is not found in the eastern Pacific.

## SCORPAENIDAE (SCORPIONFISHES, ROCKFISHES)

*Ebosia bleekeri* (Döderlein, *in* Steindachner and Döderlein, 1884) (Fig. 88)

**MATERIAL.**— CAS 235824 (2, 57–96 mm SL, DC-1487, DC-1477); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— The high bony crest over the orbits in males of this species is unique in the family. The two HEPD specimens and one collected off Camarines Sur in southeastern Luzon (CAS 41610) are the first records of the species from the Philippines. A third unrecorded specimen (CAS 64871) comes from off Vietnam in the South China Sea. The species is otherwise known from southern Japan, Taiwan, Hong Kong, and Indonesia.



***Ectreposebastes imus* Garman, 1899 (Fig. 89)**

**MATERIAL.**— CAS 235751 (125 mm SL, DC-1418); HEPD-016, otter trawl in 892–966 m.

**REMARKS.**— A worldwide bathypelagic species.

***Erisphex ariarus* (Thomson, 1967)**

**MATERIAL.**— CAS 236697 (40.4 mm SL, DC-1324); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— This juvenile black-finned belvetfish was identified by S. G. Poss.

***Minous pictus* Günther, 1880**

**MATERIAL.**— CAS 235528 (71.2 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Widespread from Taiwan and the South China Sea to the Indo-Australian Archipelago.

***Minous quincarinatus* (Fowler, 1943) (Fig. 90)**

**MATERIAL.**— CAS 235738 (2, 72.4–77.2 mm SL, DC-1449, -1461); HEPD-021, beam trawl in 132–172 m. CAS 235595 (75 mm SL, DC-1512); HEPD-028, beam trawl in 115–124 m.

***Neocentropogon aeglefinus* (Weber, 1913) (Fig. 91)**

**MATERIAL.**— CAS 234641 (8, 60.5–91.0 mm SL) and CAS 235739 (2, 63.6–69.0 mm SL, DC-1455, -1463); HEPD-021, beam trawl in 132–172 m. CAS 235563 (62.5 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Distributed from Bali Straits to Timor Sea, Halmahera Sea; Savu Sea, Sumbawa. The HEPD specimens are the first records from the Philippines.

***Neocentropogon affinis* (Lloyd, 1909) (Fig. 92)**

**MATERIAL.**— CAS 235749 (2, 80.3–81.4 mm SL, DC-1462, -1467) and CAS 235572 (3, 67.5–78.2 mm SL); HEPD-021; beam trawl in 132–172 m. CAS 235562 (3, 52–83 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Distributed from Myanmar east through the islands of the Malay Archipelago, and with the HEPD specimens, now first recorded from the Philippines.

***Neomerinthe* sp. (Fig. 93)**

**MATERIAL.**— CAS 236002 (66.0 mm SL, DC-1447); HEPD-021, beam trawl in 132–172 m.

**REMARKS.**— This specimen was identified by Stuart G. Poss. The genus is much in need of revision.

***Ocosia zaspilota* Poss and Eschmeyer, 1975 (Fig. 94)**

**MATERIAL.**— CAS 235825 (67 mm SL, DC-1519); HEPD-030, beam trawl in 190–201 m.

**REMARKS.**— The holotype (CAS 33069) and all three paratypes were collected off Luzon Is., Batangas, as was the HEPD specimen. These are the only records of the species so far as we know.

***Parapterois heterurus* (Bleeker, 1856) (Fig. 95)**

**MATERIAL.**— CAS 236010 (53 mm SL, DC-1516); HEPD-028, beam trawl in 115–124 m.

**REMARKS.**— Distributed from southern Japan to New Guinea and in Indian Ocean to off South Africa.

***Pontinus rhodochrous* Günther, 1872) (Fig. 96)**

**MATERIAL.**— CAS 235458 (190 mm SL, DC-1437); HEPD-018, traps in 240–262 m. CAS 235594 (106.3 mm SL); HEPD-032, beam trawl in 223–369 m.

**REMARKS.**— This species has been confused in the past with *P. tentacularis* and *P. macrocephalus*, but Stuart G. Poss, in Fishbase, considers the former, and possibly the latter, to be synonyms. Masuda et al. (1984), Goerfelt-Tarp and Kailola (1984), Nakabo (2000), and others have recognized *P. macrocephalus* from Japanese waters. Okamura (*in* Okamura et al. 1982) recognized *P. tentacularis* as representative of the Indo-West Pacific fauna, and *P. macrocephalus* as confined to Hawaii and adjacent waters. Shao (2014) also used *P. tentacularis* for his Taiwan specimens. Eschmeyer (1969:24) recognized *P. tentacularis* and

*P. macrocephalus* based on differences in D and P ray counts, but he did not include *P. rhodochrous* in his discussion. If the three nominal species are determined to be a single species, its distribution would be extremely widespread, ranging from the western Indian Ocean to Hawaii and from Japan south to Indonesia and through most intervening areas of the western Pacific.

***Pterois antennata* (Bloch, 1787) (Fig. 97)**

**MATERIAL.**— CAS 235573 (105.5 mm SL, DC-1503); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— A common, widespread species from most of the Indo-West Pacific, found in lagoons to outer reefs in depths to about 76 m.

***Pterois lunulata* Temminck and Schlegel, 1842 (Fig. 98)**

**MATERIAL.**— CAS 235752 (91 mm SL, DC-1448); HEPD-021, beam trawl in 132–172 m.

**REMARKS.**— Distributed throughout the western Pacific from northern Japan and Korea to northern Australia

***Setarches longimanus* (Alcock, 1894) (Fig. 99)**

**MATERIAL.**— CAS 236699 (43 mm SL); HEPD-006, otter trawl in 454–457m. CAS 236698 (2, 340–358 mm SL); HEPD-009, otter trawl in 322–33 m. CAS 236696 (37.2 mm SL); HEPD-010, beam trawl in 318–333 m. CAS 235642 (121 mm SL); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— A wide-ranging species in tropical to subtropical waters of the Indo-West Pacific.

TRIGLIDAE (SEAROBINS)

***Lepidotrigla abyssalis* Jordan and Starks, 1904 (Fig. 100)**

**MATERIAL.**— CAS 236411 (125 mm SL, DC-1489); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Masuda et al. (1984: 334) record the distribution of this species as southern Japan and the East China Sea.

***Pterygotrigla hemisticta* (Temminck and Schlegel, 1843)**

**MATERIAL.**— CAS 235570 (89 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— A widespread species ranging from Japan south through the Philippines and China coasts to Indonesia and northern Australia, in 10–420 m.

***Pterygotrigla* sp. (Fig. 101)**

**MATERIAL.**— CAS 234010 (187 mm SL, DC-1320); HEPD-009, otter trawl in 322–336 m. CAS 236479 (96 mm SL, DC-1560); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— The genus has yet to be revised, and according to Richards (1999 in Carpenter and Niem FAO WCP, vol. 4, p. 2360) “. . . includes many species, several of which are undescribed.” We were unable to identify this specimen.

PERISTIDIIDAE (ARMORED SEAROBINS)

***Peristedion* cf. *liorhynchus* Günther, 1871 (Fig. 102)**

**MATERIAL.**— CAS 233996 (2, 116–166 mm SL, DC-1296, -1297); HEPD-006, otter trawl in 454–457 m. CAS uncat. (154 mm SL); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— In the preserved HEPD specimens, the dorsal fins are clear except for the black margins; P pale with broad black band near tip and fainter diagonal black band at mid-fin. Scales of dorsum outlined in black along posterior edges. The HEPD specimens do not agree with Richards's (1999:2370) figure of the species (adapted from Okamura, 1985) in terms of the barbel, the P pigmentation pattern and length of free rays. That figure also shows a large sharp preopercle spine, which is reportedly absent *vide* Nakabo (2000: 610) and Okamura and Amaoka (1997: 216).

## PLATYCEPHALIDAE (FLATHEADS)

*Rogadius welanderi* (Schultz, 1966)? (Fig. 103a–b)

**MATERIAL.**— CAS 235511 (87.6 mm SL, DC-1517); HEPD-028, beam trawl in 115–124 m.

**REMARKS.**— The HEPD specimen follows Knapp's (1999:2414) description fairly well, except for a few minor items. The right P has 23 rays (*cf* 22–23 recorded by Knapp); preopercle spine 1 (*vs.* 2 or 3); a relatively large antrose preopercle spine (*vs.* small spine); and fin pigmentation patterns of D, P, A, and D differ. The maximum size of 13 cm TL reported is not much larger than the 11 cm TL of the HEPD specimen, so size may not be a factor in the pigmentation differences. The species has been recorded from the American Samoas, Marshall Islands, Moluccas, and west into the Indian Ocean; it is not known from the Philippines, so the identification of this specimen remains tentative.

*Thysanophrys chiltonae* (Schultz, 1966) (Fig. 104a–b)

**MATERIAL.**— CAS 235508 (94.0 mm SL, DC-1507); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— The single juvenile collected during the expedition appeared to lack iris lappets. According to Knapp (1999), the species has “lappets bearing short branches with bifurcate tips.” Otherwise, the HEPD specimen agrees well with his description. Widely distributed in the Indo-West Pacific.

## HOPLICHTHYIDAE (GHOST FLATHEADS)

*Hoplichthys langsdorfi* Cuvier in Cuvier and Valenciennes, 1829 (Fig. 105)

**MATERIAL.**— CAS 235513 (136 mm SL) and CAS 235800 (1, 123 mm SL, DC-1466); HEPD-021, beam trawl in 132–172 m. CAS 235525 (2, 105–147 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Previously recorded from southern Japan to the East China Sea and Taiwan (see Shao 2013); the HEPD specimens extend the range to the west coast of Luzon Is, Philippines.

## PSYCHROLUTIDAE (FATHEAD SCULPINS)

*Psychrolutes cf. occidentalis* Fricke, 1990 (Fig. 106)

**MATERIAL.**— CAS 234016 (137 mm SL, DC-1342); HEPD-011, otter trawl in 636–664 m.

**REMARKS.**— The absence of vomerine teeth, no cirri on head or body, D 22, P 23, and dark but not jet-black peritoneum agrees with those diagnostic characters for *Psychrolutes occidentalis* as given by Nelson (p. 2428 in Carpenter and Niem, 1999). However, the color pattern does not entirely agree with Fricke's (1990) original description. Fresh coloration of the HEPD specimen showed an overall uniformly brownish-gray color with blackish posterior part of body, black caudal fin, possibly pale caudal peduncle (but this may be an artifact of preservation with the skin stripped away), black pectoral fin but paler near base, with those fins lacking whitish margins, the eyes were not yellowish, and the belly was not whitish but grayish. Fricke's drawing of the holotype shows traces of diagonal bars on the body, which are lacking in our specimen. The known distribution of *P. occidentalis* is the Rowley Shoals off the northwestern coast of Australia. No member of the genus has hitherto been recorded from the Philippines.

## DACTYLOPTERIDAE (FLYING GURNARDS)

*Dactyloptena orientalis* (Cuvier, 1829) (Fig. 107)

**MATERIAL.**— CAS 235790 (101 mm SL, DC-1482); HEPD-022, otter trawl in 115–144 m. CAS 235470 (39.4 mm SL); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— A widespread Indo-Pacific species known from Africa to Hawaii, Society Islands, Pitcairn and Rapa, and Japan to Australia.

*Dactyloptena tiltoni* Eschmeyer, 1997 (Fig. 108)

**MATERIAL.**— CAS 235885 (86.5 mm SL, DC-1498); HEPD-022, otter trawl in 115–144 m. CAS 235469 (72 mm SL); HEPD-028, beam trawl in 115–124 m.

**REMARKS.**— A distinctive species of the family; so far known only from the Philippines.

## ACROPOMATIDAE (LANTERNBELLIES)

*Malakichthys elegans* Döderlein, 1883

**MATERIAL.**— CAS 235640 (2, 109.5–118.5 mm SL); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— A widely distributed bathypelagic fish found throughout the western Pacific and the eastern Indian Ocean.

*Synagrops japonicus* (Döderlein, 1883) (Fig. 109)

**MATERIAL.**— CAS 235380 (2, 70.2–74.1 mm SL, DC-1352), CAS 234012 (124 mm SL, DC-1319) and CAS 236024 (139 mm SL); HEPD-009, otter trawl in 322–336 m. CAS 236023 (85.2 mm SL) and CAS 235743 (44.7 mm SL); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— Of four Japanese species, *S. japonicus* is the only one to lack serrations along the leading edge of the pelvics-fin spine. It is a dark-colored species, with a head that is almost uniformly dark brown; in its color it is similar to *Synagrops bellus* (Goode and Bean, 1896). Widely distributed in Indo-West Pacific from east Africa to Hawaii.

*Synagrops philippinensis* (Günther, 1880) (Fig. 110)

**MATERIAL.**— CAS 236019 (81.9 mm SL, DC-1562); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— Widely distributed from India east to the western Pacific, including Japan, south through the Philippines and northern Australia (Arafura Sea).

*Synagrops* sp. (Fig. 111)

**MATERIAL.**— CAS 235736 (63.0 mm SL, DC-1430); HEPD-017, beam trawl in 282–428 m.

**REMARKS.**— We could not identify this specimen. It is deeper bodied than *S. philippinensis* and has well-developed serrations on the V spine, but none on the A or D spines.

## SERRANIDAE (SEABASSES)

*Plectranthias sagamiensis* (Katayama, 1964) (Fig. 112)

**MATERIAL.**— CAS 235596 (41 mm SL, DC-1502); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— Previously known only from southern Japan to Taiwan, and in southern Indonesia. The HEPD specimen represents the first record from the Philippines.

*Plectranthias* sp. (Fig. 113)

**MATERIAL.**— CAS 235681 (53 mm SL, DC-1458); HEPD-021, beam trawl in 132–172 m.

**REMARKS.**— We were unable to identify this specimen.

*Cephalopholis aurantia* (Valenciennes, 1828) (Fig. 114)

**MATERIAL.**— CAS 235460 (240 mm SL; DC-1504); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— A deepwater grouper usually captured in depths greater than 100 m. Distributed in tropical waters from islands of southcentral and western Pacific into Indian Ocean west to Madagascar and southern Africa.

*Epinephelus areolatus* (Forsskål, 1775) (Fig. 115)

**MATERIAL.**— CAS 235793 (131 mm SL, DC-1514); HEPD-028, beam trawl in 115–124 m.

**REMARKS.**— Widespread in Indo-West Pacific from southern Japan south to northern Australia, east to New Caledonia, and west to Africa, Red Sea, and Persian Gulf.

*Epinephelus fasciatus* (Forsskål, 1775)

**MATERIAL.**— CAS 234023 (144 mm SL); HEPD-012.5, hook and line in 40 m.

**REMARKS.**— Common, widely distributed grouper, known from islands throughout tropical and subtropical Indo-West Pacific, including the Red Sea, but not the Persian Gulf or the Hawaiian Islands.

## PRICANTHIDAE (BIGEYES, CATALUFAS)

*Priacanthus fitchi* Starnes, 1988 (Fig. 116)

**MATERIAL.**— CAS 235784 (3, 55.3–88 mm SL, DC-1543, -1544, -1545); HEPD-031, beam trawl in 183–188 m.

**REMARKS.**— Distributed from southern Japan and Philippines to northwestern Australia and Sumatra; also known from Mascarene Island in the western Indian Ocean, in 150–400 m.

*Priacanthus macracanthus* Cuvier, 1829 (Fig. 117)

**MATERIAL.**— CAS 235820 (53 mm SL, DC-1518); HEPD-029, trap in 60–77 m.

**REMARKS.**— Distributed from Japan south to Indonesia, northern and eastern Australia, Malaya, and Andaman Sea.

*Pristigenys nipponia* (Cuvier, 1829) (Fig. 118)

**MATERIAL.**— CAS 236407 (95.2 mm SL); HEPD-021, beam trawl in 132–172 m.

**REMARKS.**— A common, widely distributed species in the Indo-West Pacific from southern Japan to eastern Australia and east to Samoa, and Indian Ocean to South Africa and Red Sea, in depths of 80 to 100 m over rocky bottoms.

## APOGONIDAE (CARDINALFISHES)

*Jaydia carinatus* Cuvier, 1828 (Fig. 119)

**MATERIAL.**— CAS 235746 (100.0 mm SL, DC-1452); HEPD-021, beam trawl in 132–172 m. CAS 235571 (92.0 mm SL); CAS 235789 (88.4 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Lives over muddy bottoms; most often taken in trawls to about 50 m. Attains at least 15 cm TL. Known from Japan south to Taiwan, Hong Kong and the Philippines; also recorded from northwestern Australia. The HEPD specimens had a totally clear A, lacking blackish distal margin; the upper limb of its first gill arch has one or two developed rakers, although the upper of these was considerably smaller than the one nearest the angle.

*Jaydia* cf. *poecilopterus* Cuvier in Cuvier and Valenciennes, 1828 (Fig. 120)

**MATERIAL.**— CAS 236504 (2, 50.5–59.4 mm SL, DC-1465); HEPD-021, beam trawl in 132–172 m. CAS 236506 (16, 30–50 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— This species lacks the fin coloration of closely related species of *Jaydia* (black edging on anal fin, black spot on soft dorsal fin of *J. carinatus*; dorsal half of spinous dorsal fin black and thin dark stripes on soft dorsal fin of *J. poecilopterus*).

*Ostorhinchus* cf. *cheni* Hayashi, 1990 (Fig. 121)

**MATERIAL.**— CAS 236505 (52 mm SL, DC-1511); HEPD-028 in 115–124 m.

**REMARKS.**— *Ostorhinchus cheni* is a deepwater western Pacific species that is very similar in coloration to CAS 236505; however, *O. cheni* has a fainter snout stripe and lacks a fine black margin on its caudal fin. We follow Thomas H. Fraser (*in litt.*, October 2013) in recognizing *Ostorhinchus* and *Jaydia* as valid genera.

## EPIGONIDAE (DEEPWATER CARDINALFISHES)

*Epigonus ctenolepis* Mochizuki and Shirakihara, 1983 (Fig. 122)

**MATERIAL.**— CAS 235796 (160 mm SL, DC-1443); HEPD-019, beam trawl in 541–636 m.

**REMARKS.**— This HEPD specimen is only the fourth recorded of this species and the first from the Philippines (others taken off southern Japan) as well as the largest known. It agrees well with characters given by Okamoto and Fukui (2011) with the exception of having a GR count of 6+1+15 (22 total) vs. 24–25 total and 8 pyloric caeca (vs. 9–11).

## CARANGIDAE (JACKS AND POMPANOS)

*Decapterus kurroides* Bleeker, 1855 (Fig. 123)

**MATERIAL.**— CAS 236410 (165 mm FL, DC-1491); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Widely distributed, deeper-water schooling species usually found in depths of 100 to 300 m. Known distribution from western Indian Ocean and western Pacific from Japan south to Philippines, Indonesia and Australia. Our HEPD specimens were taken in an otter trawl in bottom depths of 63–79 m. It is most likely to be confused with *D. russelli* but differs in having slightly fewer gill rakers on first arch (36–41 total vs. 41–53 total) and reddish C (vs. hyaline to dusky brown).

## LUTJANIDAE (SNAPPERS)

*Pristipomoides argyrogrammicus* (Valenciennes, 1832) (Fig. 124)

**MATERIAL.**— CAS 236418 (87.7 mm SL, DC-1496); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— A common, wide-ranging species of the Indo-West Pacific; found over rocky bottoms in 70–350 m.

## NEMIPTERIDAE (THREADFIN BREAMS)

*Nemipterus bathybius* Snyder, 1911 (Fig. 125)

**MATERIAL.**— CAS 236018 (100 mm SL, DC-1484) and CAS 236408 (162 mm SL); HEPD-022, otter trawl in 115–144 m. CAS 236025 (134 mm SL, DC-1521); HEPD-028, beam trawl in 115–124 m.

**REMARKS.**— A common commercial species in the western Pacific, ranging from southern Japan to northern Australia, Indonesia, and into the westernmost Indian Ocean, in depths of 42–300 m. *Nemipterus* species are often difficult to distinguish because of their overall similarities in counts and proportional measurements. Live color pattern is often the best feature one can use to identify specimens, and we are fortunate that David Catania (CAS) took color photographs of almost all the species collected during the HEPD cruise. His photographs of these specimens allowed us to identify them with high confidence.

*Nemipterus peronii* (Valenciennes, 1830)

**MATERIAL.**— CAS 235632 (4, 97.6–143.8 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Widespread in Indo-West Pacific.

*Nemipterus virgatus* (Houttuyn, 1782)

**MATERIAL.**— CAS 235633 (95 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Distributed in the western Pacific Ocean from southern Japan to northwestern Australia.

*Parascalopsis inermis* (Schlegel in Temminck and Schlegel, 1843) (Fig. 126)

**MATERIAL.**— CAS 236496 (84 mm SL, DC-1486); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— A common fish distributed from southern Japan south through Indonesia and into the eastern Indian Ocean.

## MULLIDAE (GOATFISHES)

*Upeneus subvittatus* (Temminck and Schlegel, 1843) (Fig. 127)

**MATERIAL.**— CAS 235576 (5, 128–151 mm SL); HEPD-022, otter trawl in 115–144 m. CAS 236409 (149 mm SL, DC-1485); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— Widespread from southern Japan to Indonesia, Red Sea and Mozambique. Our specimens of this species display a prominent yellow stripe on the body, much as in *U. moluccensis* (Bleeker, 1855), but the dark stripes on both lobes of the caudal fin in *U. subvittatus* contrast with the dusky orange stripes on the upper lobe only of *U. moluccensis*. Additional differences between the two species include the longer barbel of *U. subvittatus* (barbel falls short of preopercle margin in *U. moluccensis*) and the presence of a black-tipped 1D in *U. subvittatus* (absent in *U. moluccensis*).

## BATHYCLUPEIDAE (DEEPSEA HERRINGS)

*Bathyclupea argentea* Goode and Bean, 1896? (Fig. 128)

**MATERIAL.**— CAS 233990 (87 mm SL, DC-1297); HEPD-004, otter trawl in 154–245 m. CAS 234030 (3, 125–136 mm SL); HEPD-009, otter trawl in 322–336 m.

**REMARKS.**— This group is in need of revision. Dick (1972) provided a cursory review and recognized six species, but provided little new information on them. Our specimens agree relatively well with *B. argentea* Goode and Bean, 1896, described from off Nevis Is. (not *Neris sic* Goode and Bean, 1896:190, nor *Neirs sic* Dick, 1973:543), in the Leeward Islands, West Indies. Two specimens (CAS 56867 and CAS uncat.) that we examined for comparison are also from off Nevis. The HEPD specimens, however, have a smaller eye diameter (34–36% HL *cf* 39–40%), slightly shorter upper jaw (41–42% HL *cf* 42–45%), and a slightly shallower body depth (22–23% SL *cf* 23–27%). All specimens examined had the A origin in the anterior half of the body, although the original illustration of *B. argentea* shows the A origin in the posterior half of the body. We have examined numerous specimens of *Bathyclupea* from the Gulf of Mexico and Caribbean Sea, but none matched *B. schroeder* Dick, 1962, which was described from the holotype taken off Cal Sal Bank off northern Cuba (not in the Caribbean as stated in the original description) and nine paratypes, four of which were taken with the holotype, another at almost the same locality; one in the Antilles off St Croix I., and two in the western Caribbean east-northeast off the Nicaragua-Honduras border.

## CHAMPSODONTIDAE (CROCODILE TOOTHFISHES)

*Champsodon atridorsalis* Ochiai and Nakamura, 1964

**MATERIAL.**— CAS 235529 (111.5 mm SL); HEPD-030, beam trawl in 190–201 m. CAS 235785 (100 mm SL, DC-1541); HEPD-031, beam trawl in 183–188 m

**REMARKS.**— Most similar to *Champsodon longipinnis* Matsubara and Amaoka, 1964 from Japan and Philippines but lacking forked eye cirrus and body blotches, and the fully scaled belly and sides of that species. *Champsodon vorax* Günther, 1867 and *C. nudivittis* (Ogilby, 1895) differ in having only four transverse papillae between posterior margin of pterotic ridges. Distribution from Vietnam, Philippines, south to Indonesian waters and northwestern Australia, in 0–326 m.

*Champsodon nudivittis* (Ogilby, 1895)

**MATERIAL.**— CAS 236628 (32, 15.9–42.1 mm SL); HEPD-026, beam trawl in 82–86 m. CAS 235536 (3, 59–84 mm SL); HEPD-030, beam trawl in 190–201 m. CAS 236629 (31.0 mm SL); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— The smaller specimens from HEPD-026 and HEPD-036 are tentatively referred to this species because some of the diagnostic characters (notably squamation features) did not appear to be adequately developed. *Champsodon nudivittis* is most similar to *C. guentheri* Regan, 1908 but lacks a fully scaled chest and has fewer gill rakers (10–12 on lower limb, vs. 12–14); *C. vorax* and *C. longipinnis* differ in having a branched eye cirrus and the gular and chest regions mostly or fully scaled; *C. longipinnis* also has its 1D black distally. Broadly distributed from Philippines, Indonesia, south to warm waters of Australia and Madagascar, in 0–335 m.

## PINGUIPEDIDAE (SANDPERCHES)

*Parapercis* sp. (Fig. 129)

**MATERIAL.**— CAS 236013 (89 mm SL, DC-1524); HEPD-030, beam trawl in 190–201 m.

**REMARKS.**— We could not identify this specimen.

## TRICHINOTIDAE (SAND-DIVERS)

*Pteropsaron dabfar* Iwamoto, 2014 (Fig. 130)

**MATERIAL.**— CAS 236400 (holotype, 33.6 mm SL); HEPD-026, beam trawl in 82–86 m. CAS 236667 (paratype, 33.0 mm SL; DC-1508; preserved in 95% EtOH) and CAS 236560 (paratype, 30 mm SL); same data as for holotype.

**REMARKS.**— This species is described in this volume.

***Pteropsaron levitoni* Iwamoto, 2014 (Fig. 131)**

**MATERIAL.**— CAS 236401 (holotype, 23.7 mm SL), CAS 236399 (6 paratypes, 19.8–28.8 mm SL) and CAS 236402 (24.5 mm SL, cleared and stained); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— This species is described in this volume.

***Pteropsaron springeri* Smith and Johnson, 2007? (Fig. 132)**

**MATERIAL.**— CAS 236668 (35.0 mm SL, DC-1509), HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— This specimen is too fragile to allow a conclusive examination of its fin-ray and scale conditions. (Radiographs were attempted but were ineffective for making median fin counts.) It is very similar in appearance and coloration to the female specimen from Flores, Indonesia, illustrated in the original description (Smith and Johnson, 2007: fig. 5) and even more similar to the female from Bali, Indonesia, illustrated in Allen and Erdman (2012: 759). Our specimen differs in having two fewer slender orange bars along its body. This species is known from Indonesia, Philippines, and Palau in 18–86 m.

## PERCOPHIDAE (DUCKBILLS)

***Bembrops caudimacula* Steindachner, 1876 (Fig. 133)**

**MATERIAL.**— CAS 235272 (186 mm SL, DC-1273); HEPD-003, beam trawl in 272–291 m. CAS 235734 (99.0 mm SL, DC-1429); HEPD-017, beam trawl in 282–428 m. CAS 235507 (2, 185–190 mm SL, DC-1548, -1556); HEPD-033, beam trawl in 225–347 m.

**REMARKS.**— CAS 235272 from HEPD-003 agrees rather well with the description of the species provided by Thompson and Suttkus (2002:287–288), although the P count is slightly higher (27–28 vs. 23–27,  $\bar{x} = 25.97$ ) and its spinous D is black over most of the first three or four membranes, and with clear membranes posteriorly. The two specimens from HEPD-033 lack black membranes, the 1D is entirely dusky, and only the ventral margin of the C is black; the lateral-line scale counts are also on the high side (54 and 55 vs. 42–54). Thompson and Suttkus (2002) found variation in populations between the eastern and western Indian Ocean in pigmentation and some proportional measurements. The female (CAS 235734) from HEPD-017 agrees in most characters, although its lateral-line scale count is slightly on the high side at 59.

***Bembrops curvatura* Okada and Suzuki, 1952 (Fig. 134)**

**MATERIAL.**— CAS 235735 (94.5 mm SL, DC-1464); HEPD-021, beam trawl in 132–172 m.

**REMARKS.**— The abrupt dip in the lateral line and the small black caudal spot are distinctive among the *Bembrops* spp. of the region. Distributed in the western Pacific from southern Japan to Indonesia and northern Australia.

***Bembrops nelsoni* Thompson and Suttkus, 2002 (Fig. 135)**

**MATERIAL.**— CAS 235272 (2, 90–164 mm SL); HEPD-003, beam trawl in 272–291 m.

**REMARKS.**— Distributed from the Philippines south to Indonesia (south coast Java) and northern Australia (Arafura Sea) in 265–333 m.

***Chironema chlorotaenia* McKay, 1971 (Fig. 136a–b)**

**MATERIAL.**— CAS 235512 (146 mm SL), HEPD-033, beam trawl in 225–347 m.

**REMARKS.**— Broadly distributed in the western Pacific from southern Japan to Indonesia and Australia.

## URANOSCOPIDAE (STARGAZERS)

***Kathetostoma* sp.**

**MATERIAL.**— CAS 236422 (38.6 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— This little specimen was collected together with one “*Uranoscopus* sp. 2” and two similar-sized individuals of another unidentifiable *Uranoscopus*. The narrow interorbital fossa, the absence of a spinous dorsal fin and supracleithral spines differentiate the specimen from members of *Uranoscopus*. (We do not know if the lack of supracleithral spines in this specimen reflects a juvenile stage.) Three other genera found in the area have members lacking a spinous D, but they differ as follows: in *Xenocephalus* the lat-



eral line does not run close to the dorsal-fin base; *Genyagnus monopterygius* (the only recorded species of the genus in the area) has a small chin barbel; and *Ichthyoscopus* lacks dermal appendages on the oral valve, has a relatively compressed head and body, has dermal folds on the belly, its basipterygium is not visible, and its upper cleithral spine has fringed dermal flaps. There are other uranoscopids lacking a spinous D fin that are known from outside the general area. Based on Pietsch's (1989) comprehensive study of phylogenetic relationships of the family, the HEPD specimen agrees most closely with his diagnosis of *Kathetostoma*, a genus containing seven species from western North Atlantic (2 spp.), tropical eastern Pacific (1 sp.), New Zealand (1 sp.), and southern Australia and Tasmania (3 spp.). If the specimen proves to be a *Kathetostoma*, it would be the first record of the genus in tropical waters of the western Pacific. It is beyond the scope of this report to attempt a species identification based on a single juvenile.

***Uranoscopus* sp. 2 (of Kishimoto, 2001) (Fig. 137a–b)**

**MATERIAL.**— CAS 236423 (98 mm SL, DC-1450); HEPD-016, otter trawl in 892–966 m. CAS 236421 (72 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— These specimens key out to “*Uranoscopus* sp. 2” in Kishimoto's key in the FAO Species Identification Guide (Carpenter and Niem, 2001, vol. 6), and they agree rather well with the figure of that species on p. 3529 of that work, especially in the pigmentation pattern of the fins, which, however, are somewhat paler in our specimens. They do not agree with any of the described species from Japan (Kishimoto, 1987; Nakabo 2000). *Uranoscopus* sp. 2 is known from the Philippines and Indonesia and attains a maximum size of 26 cm TL.

***Uranoscopus* sp. 3 (of Kishimoto, 2001) (Fig. 138a–b)**

**MATERIAL.**— CAS 236477 (2, 40–48 mm SL); HEPD-022, otter trawl in 115–144 m. CAS 236487 (2, 39.8–47.5 SL); HEPD-026, beam trawl in 82–86 m. CAS 236476 (58.1 SL, DC-1564); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— These specimens key out, more or less, to *Uranoscopus* sp. 3 in Kishimoto's key (*in* Carpenter and Niem, 2001, pp. 3520–3523), although there are discrepancies, especially in terms of color (no bands or minute black spots) and form of appendage on its oral valve. Also, the distribution of the species supposedly lies well to the east and south in Micronesia and the Coral and Arafura seas. It is possible that the differences may be attributable to the HEPD specimens being juveniles. The specimens also keyed out closely to *U. chinensis* Guichenot, 1882 using Nakabo (2000). Other species of *Uranoscopus* recorded from the Philippines include *U. bicinctus* Temminck and Schlegel, 1843, *U. cognatus* Cantor, 1849, *U. japonicus* Houttuyn, 1782, *U. kaianus* Günther, 1880, *U. tosa* Jordan and Hubbs, 1925, and *U. sp. 2* (of Kishimoto, 2001).

## GOBIIDAE (GOBIES)

***Hazeus* sp. (Fig. 139a–b)**

**MATERIAL.**— CAS 236631 (3, 32.2–35.5 mm SL); HEPD-026, beam trawl in 82–86 m over a hard-rocky bottom.

**REMARKS.**— These specimens appear to be within the genus *Hazeus*. They are very similar to *Obliquogobius*, however, the anterior spines of the first and second dorsal fin are thicker than the remaining fin spines and the nape and opercles appear to be partly scaled. All three specimens have a distinct V-shaped black mark above their caudal peduncle, vertical spots forming four faint bars along the caudal fin, a black spot at the base of the pectoral fin, a dark black spot between dorsal spines V and VI (much like in *O. megalops* and *O. sp. 3* in Shibukawa and Aonuma's [2007] Fig. 3), and numerous black spots symmetrically occurring on the snout and lower lip. We are advised by K. Shibukawa, H. Larson, and D. Hoese that they probably fall within *Hazeus*, a genus that is currently being revised.

***Obliquogobius* Koumans, 1941**

**REMARKS.**— The deepwater goby genus *Obliquogobius* was until recently known only from one central Indian Ocean and one Red Sea species. Shibukawa and Aonuma (2007) revised the genus, added three additional species from Japan and included in their key, but did not describe, three additional species (from the Gulf of Aden, Fiji, and New Caledonia). They also mentioned specimens of their new species *O. cirrifer* and *O. yamadai* collected from the Philippines, but did not include them as type specimens because of

minor differences that they possessed. An additional new species from the Ryukyu Islands was subsequently described by Chen, Jaafar and Shao (2012). It is yellowish in coloration and lacks any of the dark pigmentation of our specimens.

***Obliquogobius* cf. *cirrifer* Shibukawa and Aonuma, 2007 (Fig. 140)**

**MATERIAL.**— CAS 236632 (36.0 mm SL); HEPD-001, beam trawl in 238–252 m over sandy-mud bottom. CAS 236633 (31.0 mm SL); HEPD-036, beam trawl in 216–262 m over sandy-mud bottom.

**REMARKS.**— Our specimens were damaged during their trawl capture and have lost most of their scales. They were not photographed when fresh, however. The dark pigmentation of their body and fins persists. The two specimens are most similar in appearance to *Obliquogobius cirrifer* Shibukawa and Aonuma, 2007 but differ slightly in their coloration. In their description of *O. cirrifer*, Shibukawa and Aonuma (2007:P145–146) referred to four Philippine and four Fijian specimens that they were hesitant to include among the type material. The Philippine specimens differed in the location of the black spot above the posterior end of the anal-fin base; our specimens are intermediate in the location of the spot. The Fijian specimens had 10 rather than 9 segmented anal rays, ours have 8 and 9 segmented anal-fin rays. Photographs of the larger specimen were sent by email to Shibukawa who has advised us with our identification.

GEMPLYLIDAE (SNAKE MACKERELS, ESCOLARS)

***Neopinnula orientalis* (Gilchrist and von Bonde, 1924) (Fig. 141)**

**MATERIAL.**— CAS 233988 (125 mm SL, DC-127); HEPD-004, otter trawl in 144–245 m.

**REMARKS.**— Widespread in Indian Ocean from east Africa to India, Indonesia, and western Australia, and western Pacific from Japan south to Taiwan, and the Philippines.

***Promethichthys prometheus* (Cuvier, 1832) (Fig. 142)**

**MATERIAL.**— CAS 234028 (200 mm SL, DC-1401); HEPD-015, beam trawl in 757–836 m.

**REMARKS.**— Circumglobal in tropical to temperate waters except eastern Pacific.

NOMEIDAE (DRIFTFISHES)

***Cubiceps whiteleggii* (Waite, 1894) (Fig. 143)**

**MATERIAL.**— CAS 233986 (127 mm SL, DC-1276); HEPD-004, otter trawl in 154–245 m.

**REMARKS.**— The HEPD specimen agrees well with the description by Last (*in* Carpenter and Niem, 2001: 3776) except for the count of lateral-line scales (51+2 cf. 56–63 given by Last).

CALLIONYMIDAE (DRAGONETS)

***Callionymus* (*Calliurichthys*) *japonicus* (Houttuyn, 1782)**

**MATERIAL.**— CAS 235543 (4, 29–40.5 mm SL); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— The HEPD specimens are juveniles, but readily identified by the diagnostic characters. The species is widespread in the tropical western Pacific, from southern Japan south to the East China Sea and South China Sea, to Malaysia, Indonesia, throughout the Philippines, New Guinea and northern Australia (although those from the last two areas may represent a separate species). The species is treated by Nakabo (2000:1134) in the genus *Calliurichthys*, which Fricke (1983) recognizes as a subgenus.

CITHARIDAE (CITHARIDS)

***Citharoides macrolepidotus* Hubbs, 1915 (Fig. 144)**

**MATERIAL.**— CAS 235548 (138 mm SL, DC-1529); HEPD-031, beam trawl in 183–188 m

**REMARKS.**— Known from southern Japan, Korea, and Philippines in 121–240 m.

## BOTHIDAE (LEFTEYE FLOUNDERS)

*Arnoglossus elongatus* Weber, 1913?

**MATERIAL.**— CAS 235544 (2, 85–95 mm SL); HEPD-021, beam trawl in 132–172 m.

**REMARKS.**— These two HEPD specimens key out rather readily in Hensley and Amaoka's (2001) key to the species of *Arnoglossus*. Closer comparisons with other specimens, especially males, must be made before a more-definitive identification can be made. The species is known from Taiwan, Philippines, Madura (in Java Sea), and northwestern Australia, in 100–224 m.

*Arnoglossus japonicus* Hubbs, 1915 (Fig. 145)

**MATERIAL.**— CAS 235577 (13, 53–101 mm SL) and CAS 2355786 (127 mm SL, DC-1499); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Known distribution from southern Japan to Gulf of Tonkin and New Caledonia; the HEPD specimens represent the first record from the Philippines. Attains 17 cm TL.

*Arnoglossus oxyrhynchus* Amaoka, 1969 (Fig. 146)

**MATERIAL.**— CAS 235549 (150 mm SL, DC-1528); HEPD-030, beam trawl in 190–201 m.

**REMARKS.**— Possibly a junior synonym of *A. brunneus* (Fowler, 1934). It occurs in depths of about 100–300 m and is known from southern Japan (Kochi), with an unconfirmed record from New Caledonia. *Arnoglossus brunneus* is known only from the east coast of Luzon in 292 m. (Hensley and Amaoka, in Carpenter and Niem, 2001:3827)

*Kamoharaia megastoma* (Kamohara, 1936) (Fig. 147)

**MATERIAL.**— CAS 235542 (89 mm SL, DC-1473); HEPD-021, beam trawl in 132–172 m. CAS 235535 (88.5 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Previously known from southern Japan to Taiwan and in the Indo-Australian Archipelago in 300–500 m. The HEPD specimens are the first recorded from the Philippines, so far as we know.

*Laeops clarus* Fowler, 1934

**MATERIAL.**— CAS 235744 (125.2 mm SL, DC-1468); HEPD-021, beam trawl in 132–172 m.

**REMARKS.**— This specimen appears to be very similar to *Laeops* sp. from HEPD-036, agreeing rather well in meristic values and most other characters. However, the body is deeper, the eyes larger and have broad black margins along the mesial and posterior borders (light to medium brown in HEPD-036), and the branchiostegal membrane is black (compared with medium brown). The HEPD specimen may be only the second record of the species.

*Laeops* sp.

**MATERIAL.**— CAS 236558 (2, 106–120 mm SL); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— These specimens agree most closely with the Japanese species *L. kitaharae* (Smith and Pope, 1906) except for the deeper body (<3 times in SL) and the presence of fine spots in that species. *Laeops clarus* Fowler, 1934, apparently known only from the Philippines, has a slender body but the HL goes 5.7 times in SL and there are 10 GR on the lower limb of the first arch. *Laeops gracilis* Fowler, 1934, also known only from the Philippines, has higher counts of rays in its D (112) and A (93) and the HL goes about five times in SL.

*Parabothus taiwanensis* Amaoka and Shen, 1993 (Fig. 148)

**MATERIAL.**— CAS 235505 (107 mm SL, DC-1510); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— This specimen may represent the first record of the species outside Taiwan. Amaoka and Shen (1993) describe the teeth as biserial in its upper jaw, but that does not appear to be the case in the HEPD specimen; also they describe the body as pale purplish after removal of scales (vs. cream-colored). Otherwise the description fits our specimen rather well.

***Parabothus* sp.**

**MATERIAL.**— CAS 236630 (71, 16.0–56.5 mm SL); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— We were unable to identify these juvenile specimens.

***Psettina gigantea* Amaoka, 1963 (Fig. 149)**

**MATERIAL.**— CAS 235788 (105 mm SL, DC-1481); HEPD-021, beam trawl in 132–172 m.

**REMARKS.**— Distributed in the western Pacific from southern Japan through the South China Sea, Philippines, and Indonesia to the north coast of Australia.

***Taeniopsetta ocellata* (Günther, 1880) (Fig. 150)**

**MATERIAL.**— CAS 235823 (68.5 mm SL, DC-1554); HEPD-033, beam trawl in 225–347 m.

**REMARKS.**— This deepwater bothid is recorded from depths of 183–400 m in southern Japan, Western Australia, the Admiralty Islands, western Indian Ocean, and possibly New Caledonia. The HEPD specimen represents the first record from the Philippines and the South China Sea.

## PLEURONECTIDAE (RIGHTEYE FLOUNDERS)

***Poecilopsetta colorata* Günther, 1880 (Fig. 151)**

**MATERIAL.**— CAS 235551 (98 mm SL, DC-1535); HEPD-032, beam trawl in 223–369 m.

**REMARKS.**— Widely distributed from the eastern Indian Ocean to the South China Sea and Indonesia.

***Poecilopsetta plinthus* (Jordan and Starks, 1904) (Fig. 152)**

**MATERIAL.**— CAS 235545 (95 mm SL, DC-1469); HEPD-021, beam trawl in 132–172 m. CAS 235533 (93 mm SL); HEPD-022, otter trawl in 115–144 m. CAS 235550 (111 mm SL); HEPD-030, beam trawl in 190–201 m.

**REMARKS.**— Distributed from Japan, Taiwan, China mainland, and the Philippines. Hensley (*in* Carpenter and Niem, 2001:3866) cites an unconfirmed record from Manila Bay, Philippines. The HEPD specimens confirm its presence in the Philippines.

***Samarus cristatus* Gray, 1831 (Fig. 153)**

**MATERIAL.**— CAS 235527 (3, 67–122 mm SL); HEPD-028, beam trawl in 115–124 m.

**REMARKS.**— Widely distributed from southern Japan, Taiwan, South China Sea, Philippines, Indonesia, northern Australia, New Caledonia, and throughout the Indian Ocean.

## SOLEIDAE (SOLES)

***Aseraggodes kobensis* (Steindachner, 1896) (Fig. 154)**

**MATERIAL.**— CAS 235733 (2, 89–96 mm SL); HEPD-036, beam trawl in 216–262 m.

**REMARKS.**— Maximum size attained about 10 cm SL. Known previously from southern Japan and the South China Sea; the HEPD specimens represent possibly the first record from the Philippines.

***Aseraggodes* sp. (Fig. 155)**

**MATERIAL.**— CAS 236701 (5, 84–1158 mm SL, DC-1530, -1531, -1538, -1539, -1540); HEPD-031, beam trawl in 183–188 m.

**REMARKS.**— Munroe's chapter on the soles in FAO-WCP [*in* Carpenter and Niem, 2001, vol. 6, part 4:3878–3889] does not include a key to the species, and there does not appear to be a synoptic treatment of the taxon. Munroe lists 11 spp. of the genus from the WCP.

## CYNOGLOSSIDAE (TONGUEFISHES)

***Cynoglossus* cf. *gracilis* Günther, 1873 (Fig. 156)**

**MATERIAL.**— CAS 23662 (166 mm SL); HEPD-001, beam trawl in 264–278m.

**REMARKS.**— This single specimen had counts of D 126, A 106, LL about 133, C about 8; body depth 24% of SL; upper eye almost equally aligned with lower eye, the posterior corner of upper jaw about on same vertical as posterior margin of lower eye. These characters place the specimen in either *Cynoglossus abbreviatus* (Gray, 1834) or *C. gracilis* using the keys provided by Nakabo (2000:1390) and Munroe (2001 in Carpenter and Niem, 2001: 3891–3894). Neither of these species has been reported from the area, however, we tentatively assign the HEPD specimen to *C. gracilis* because of the more slender body, the relative positions of the eye, and the LL scale count.

***Cynoglossus* sp. (Fig. 157a–b)**

**MATERIAL.**— CAS 236661 (5, 122–160 mm SL); HEPD-021, beam trawl in 132–172 m. CAS 236660 (4, 132–148 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— We could not identify these specimens. Using Munroe's treatment of the family in the FAO Western Central Pacific volume (Carpenter and Niem, 2001: 3890–3901), the specimens keyed out to *C. microlepis* or *C. mccullochi* based on the presence of 3 lateral lines, pigmented peritoneum and other characters. Specimens from HEPD-022 had somewhat lower counts of D (107–111 vs. 111–115), A (86–87 vs. 86–90). Color on eyed side is light to medium brown with black median fins, and no other markings.

TRIACANTHODIDAE (SPIKEFISHES)

***Triacanthodes ethiops* Alcock, 1894 (Fig. 158)**

**MATERIAL.**— CAS 235886 (73.4 mm SL, DC-1483); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— Distribution widespread from Japan, Philippines, Indonesia, and east coast of Africa in depths of about 100–250 fm. *Triacanthodes ethiops* closely resembles *T. anomalus* (Temminck and Schlegel, 1850) from Japan and the China coast but differs in having fewer olfactory lamellae, a less convex interorbital space, and slight differences in the pattern of stripes on body.

BALISTIDAE (TRIGGERFISHES)

***Pseudobalistes flavimarginatus* (Rüppell, 1829)**

**MATERIAL.**— CAS 236493 (28 mm SL); HEPD-006, otter trawl in 454–457 m.

**REMARKS.**— This is a widespread coastal, reef, and estuarine species found through most of the Indo-West Pacific, from the coast of Africa east to the Tuamotus in the South Pacific, and north to Japan. The single juvenile taken during the HEPD cruise was likely taken in near-surface waters.

MONACANTHIDAE (FILEFISHES)

***Cantherhines* sp.**

**MATERIAL.**— CAS 236484 (2, 41–43 mm SL); HEPD-030, beam trawl in 185–190 m.

**REMARKS.**— The pelvic fin of the smaller specimen is absent (damaged). These specimens cannot be identified with any certainty.

**?*Cantherhines* sp.**

**MATERIAL.**— CAS 236486 (17 mm SL); HEPD-026, beam trawl in 82–86 m.

**REMARKS.**— This specimen is too small to identify to genus or species.

***Paramonacanthus* cf. *curtorhynchus* (Bleeker, 1855) (Fig. 159)**

**MATERIAL.**— CAS 236485 (2, 48.5–54.0 mm SL, DC-1475); HEPD-021, beam trawl in 132–172 m. CAS 233262 (female, 41.3 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— This juvenile specimen has the proportions and coloration of *Paramonacanthus japonicus* (Tilesius, 1809) (see Masuda et al. 1984: pl. 3265a), formerly considered to be widespread from the Bay of Bengal to Fiji, Australia, the Philippines, and throughout the East Indian Region. Allen and Erdman (2012: 1075) limit the distribution of that species to Japan and recognize previous identifications of individuals extralimital to Japan to be *P. curtorhynchus* (Bleeker, 1855). Our specimen has D II,25, A 25, and P 12,

well within the range of *P. japonicus* as listed by Masuda et al, but less than the counts of *P. curtiorhynchus* (D II,33–36, A 30–32, and P 11–13) listed by Allen and Erdman.

**?*Pervagor* sp.**

**MATERIAL.**— CAS 236492 (2, 37–43 mm SL); HEPD-006, otter trawl in 454–457 m.

**REMARKS.**— Presuming that these are *Pervagor*, we are unaware of any species in that genus with a barred tail pattern such as seen in these specimens.

***Thamnacornus tessellatus* (Günther, 1880)? (Fig. 160)**

**MATERIAL.**— CAS 235682 (45.0 mm SL); HEPD-022, otter trawl in 115–144 m. CAS 236406 (146 mm SL, DC-1536); HEPD-032, beam trawl in 223–369 m.

**REMARKS.**— The morphological and meristic characters (29 anal fin rays) are correct for the species, but these specimens lack the facial spots. Maximum size about 28 cm. Distributed from Japan to the Philippines and off northwestern and northeastern coasts of Australia, in Indonesia, and New Caledonia. Depth range between 120 and 236 m.

TETRAODONTIDAE (PUFFERS)

***Arothron immaculatus* (Bloch and Schneider, 1801) (Fig. 161)**

**MATERIAL** examined.— CAS 236559 (25.1 mm SL); HEPD-022, otter trawl in 115–144 m.

**REMARKS.**— This juvenile Immaculate puffer, like several of its congeners, is often melanistic at this size (*in litt.* Keiichi Matsuura, October 2013). It has the appropriate morphometric features (small spinules on head and body except around eyes, gill openings, fins, and posterior C peduncle) and counts (D 10, A 10, P 17) of this species. *Arothron immaculatus* lives above silt bottoms near reefs in 3–30 m from East Africa and the Red Sea to the Philippines (Allen and Erdman 2012: 1087). If our specimen was collected by the net when it was on the bottom (115–144 m) rather than during the descent or ascent of the trawl, it would represent a deeper capture than has been previously reported for the species.

***Sphoeroides pachygaster* (Müller and Troschel, 1848) (Fig. 162)**

**MATERIAL.**— CAS 235459 (147 mm SL, DC-1270); HEPD-003, beam trawl in 272–291 m.

**REMARKS.**— Widespread in tropical to subtropical waters.

***Tylerius spinosissimus* (Regan, 1908)**

**MATERIAL.**— CAS 236500 (41.4 mm SL); HEPD-O26, beam trawl in 82–86 m.

**REMARKS.**— Widespread in the Indo-West Pacific. It is the only species in the genus, which is characterized in part by D 8–9, A 7–8, small spinules over all of head and body except the C peduncle, no lateral line ventrolaterally on the C peduncle, and a mouth situated below the level of the upper edge of the P base.

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(\*—Note: This is not a literature cited; instead it is a list of many [but not all] of the references we used to arrive at our identifications.)

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**Images of Fishes Collected During  
the HEPD Deep-Water Cruise of the  
*M/V DA-BFAR***

**All images are based on freshly  
preserved specimens.  
Photographs by David Catania  
unless otherwise stated.**



Plate I



FIGURE 5. *Myxine* cf. *formosana*, CAS 233680, 440 mm TL.



FIGURE 6. *Eptatretus luzonicus*, CAS 233675, 563 mm TL.

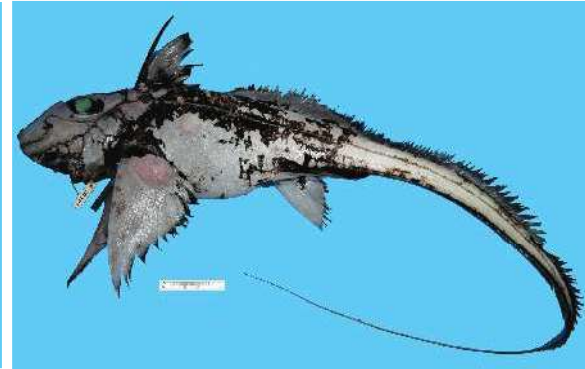


FIGURE 7. *Hydrolagus deani*, CAS 235485, 730 mm TL.



FIGURE 8a. *Apristurus platyrhynchus*, CAS 234027, 225 mm TL.



FIGURE 8b. *Apristurus platyrhynchus* CAS 234027, 225 mm TL.

## Plate II

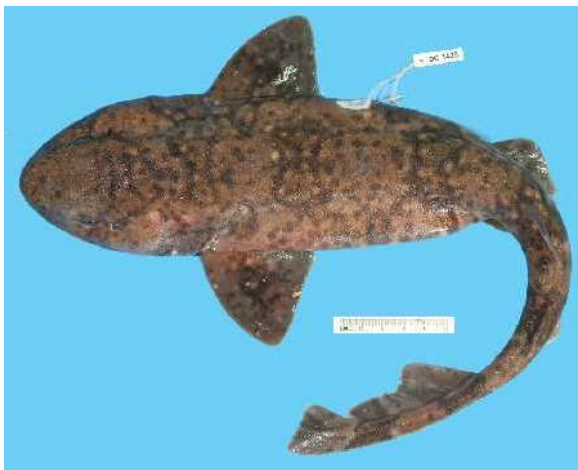


FIGURE 9a. *Cephaloscyllium* sp, CAS uncat., female, 625 mm TL., dorsal view.



FIGURE 9b. *Cephaloscyllium* sp, CAS uncat., female, 625 mm TL., ventral view.



FIGURE 9c. *Cephaloscyllium* sp, CAS uncat., immature male, 395 mm TL.

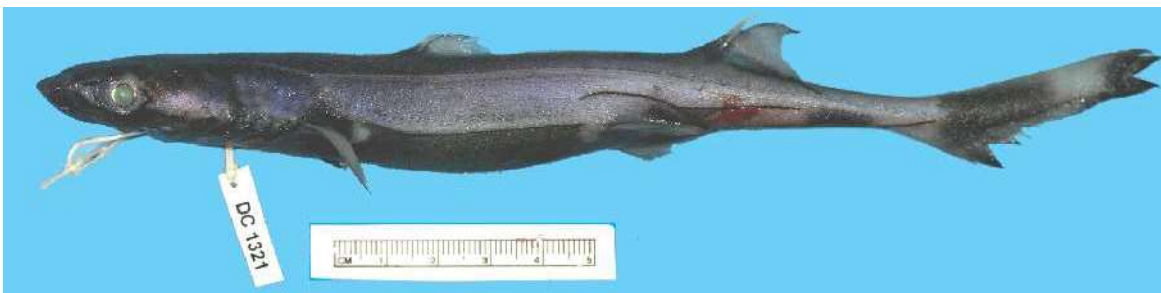


FIGURE 10. *Etmopterus brachyurus*, CAS 233994, 203 mm TL.

Plate III



FIGURE 11. *Hexatrygon bickelli*, CAS 233779, 620 mm TL.



FIGURE 12. *Aldrovandia phalacra*, CAS 236021, 213+ mm TL.



FIGURE 13. *Gymnothorax* cf. *johnsoni*, CAS 236625, 440 mm TL.



FIGURE 14. *Gymnothorax* cf. *nuttingi*, CAS 236626, 748 mm TL.

## Plate IV



Figure 15. *Dysomma anguillare*, CAS 235128, 557 mm TL.



FIGURE 16. *Synaphobranchus kaupii*, CAS 235497, 365 mm SL.

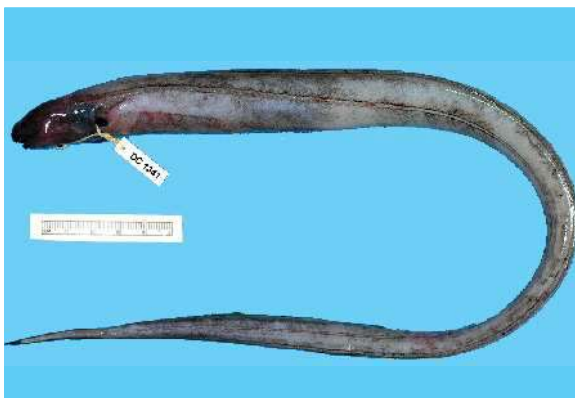


FIGURE 17a. *Simenchelys parasitica*, CAS 235457, 463 mm TL, lateral view.

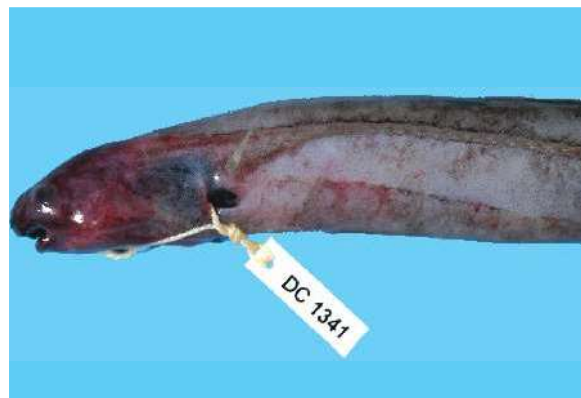


FIGURE 17b. *Simenchelys parasitica*, CAS 235457, 463 mm TL, head and trunk.



FIGURE 18. *Pylorobranchus hearstorum*, CAS 235464, holotype, 1218 mm TL.



FIGURE 19. *Ophichthus* cf. *urolophus*, CAS 236638, 570 mm TL.



Plate V

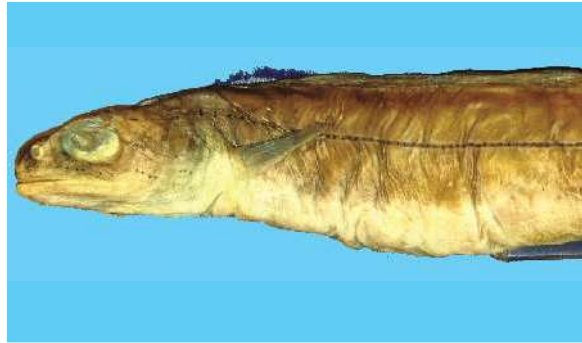


FIGURE 20. *Coloconger scholesi*, CAS 235482, 365 mm SL. Photo by John E. McCosker



FIGURE 21. *Ariosoma anago*, CAS 235453, 363 mm TL.



FIGURE 22. *Conger macrocephalus*, CAS 236634, 378 mm TL.



FIGURE 23. *Parabathymyrus brachyrhynchus*, CAS 235589, 268 mm TL.

## Plate VI



FIGURE 24. *Bathycongrus guttulatus*, CAS 235634, 417 mm TL. Photo by John E. McCosker.



FIGURE 25. *Bathycongrus retroinctus*, CAS 235456, 360 mm TL.



FIGURE 26. *Nansenia ardesiaca*, CAS 234013, 135 mm SL.



FIGURE 27. *Bajacalifornia erimoensis*, CAS 235451, 232 mm SL.



FIGURE 28. *Narcetes kamoharai*, CAS 235450, 276 mm SL.



FIGURE 29. *Polyipnus spinifer*, CAS 233991, 46.8 mm SL.

Plate VII



FIGURE 30. *Stomias nebulosus*, CAS 233992, 106 mm SL.



FIGURE 31. *Astronesthes ijimai*, CAS 25379, 107 mm SL.



FIGURE 32. *Astronesthes lucifer*, CAS 235257, 119 mm SL.

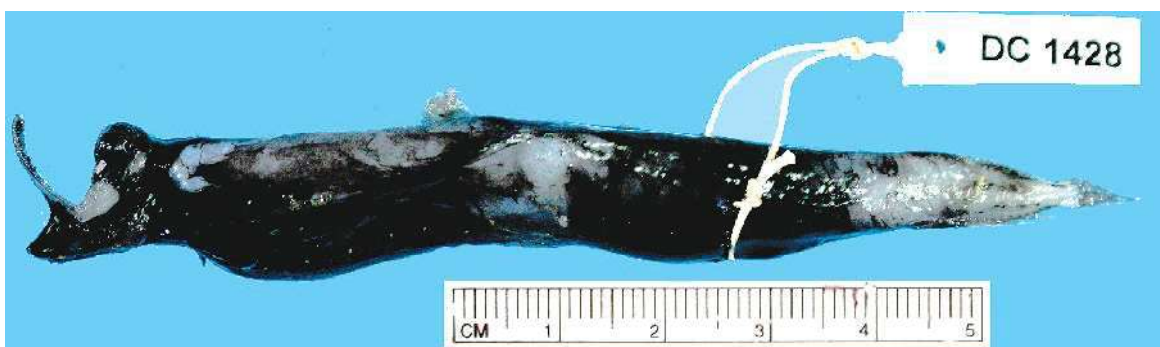


FIGURE 33. *Photonectes albipennis*, CAS 235547, 82.7 mm SL.

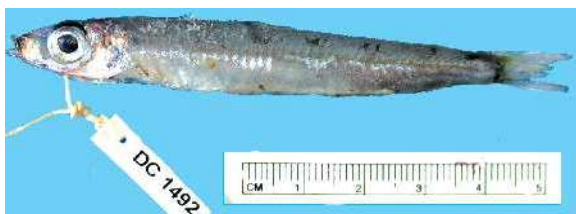


FIGURE 34. *Glossanodon* sp., CAS 236020, 77 mm SL.

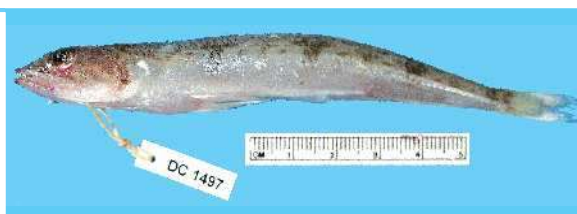


FIGURE 35. *Synodus oculus*, CAS 236488, 135 mm SL.



FIGURE 36. *Chlorophthalmus acutifrons*, CAS 235821, 134 mm SL.



FIGURE 37. *Bathypterois atricolor*, CAS 2355479, 150 mm SL.

## Plate VIII



FIGURE 38. *Bathypterois guentheri*, CAS 235452, 226 mm SL.



FIGURE 39. *Neoscopelus microchir*, CAS 235504, 114.5 and 115.0 mm SL.

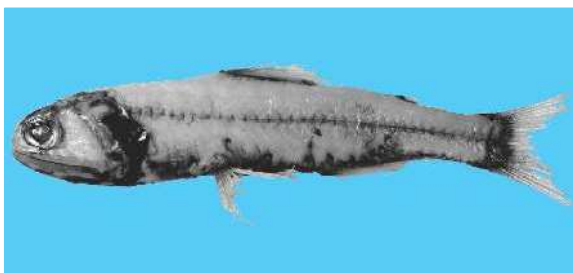


FIGURE 40. *Diaphus adenomus*, CAS 236623, 153 mm SL. Photo by Tomio Iwamoto

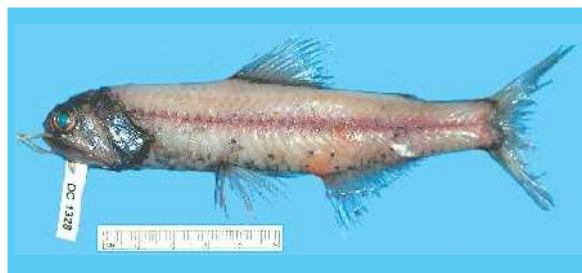


FIGURE 41. *Diaphus fragilis*, CAS 233999, 123 mm SL.



FIGURE 42. *Diaphus suborbitalis*, CAS 234003, 71.3 mm SL.



FIGURE 43. *Diaphus watasei*, CAS 233899, 156 mm SL.



FIGURE 44. *Diaphus* sp., CAS 236509, 83.5 mm SL.

Plate IX

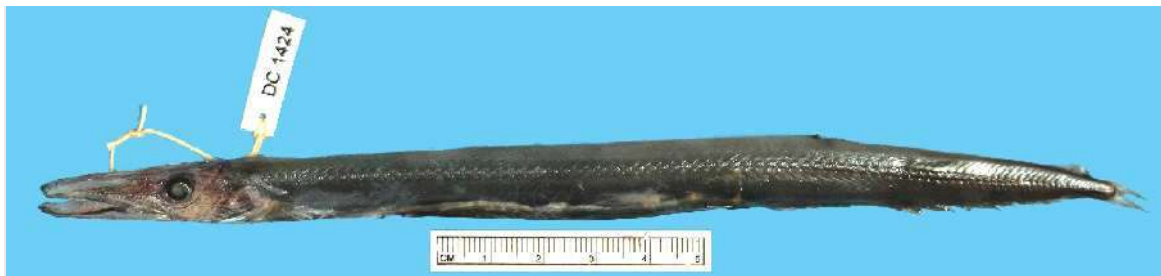


FIGURE 45. Paralepididae, CAS 236706, 196 mm SL.



FIGURE 46. *Polymixia berndti*, CAS 235791, 125 mm SL.

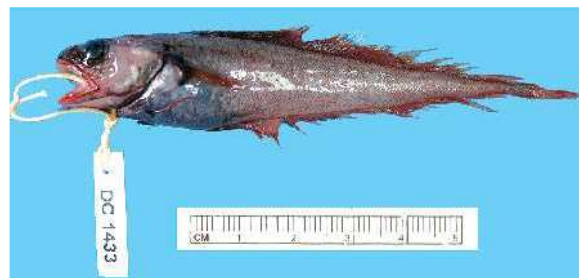


FIGURE 47. *Physiculus rhodopinnis*, CAS 235782, 85.0 mm SL.



FIGURE 48. *Bregmaceros japonicus*, CAS 236708, 55 mm SL.



FIGURE 49. *Bathygadus entomelas*, CAS 233811, 178+ mm TL.

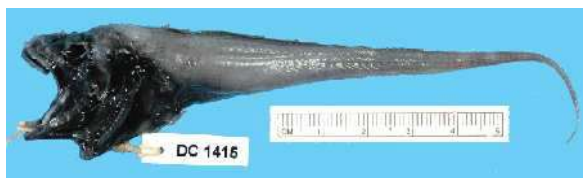


FIGURE 50. *Bathygadus spongiceps*, CAS 236494, 131+ mm TL.



FIGURE 51. *Gadomus multifilis*, CAS 235518, 294+ mm TL.

## Plate X

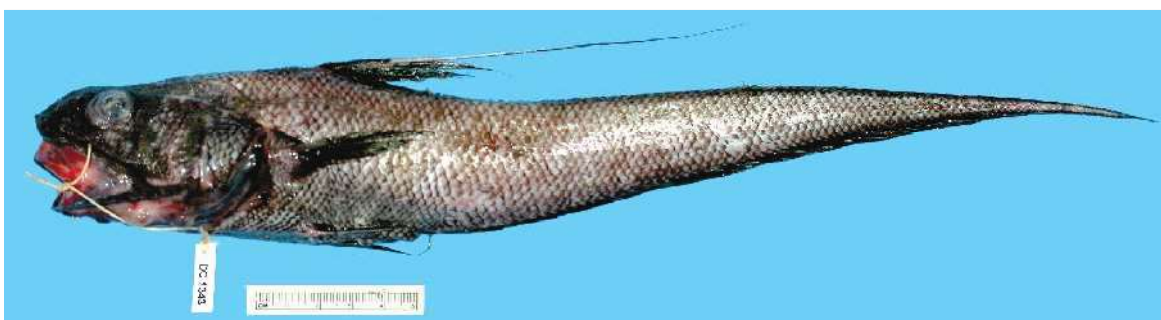
FIGURE 52. *Coelorinchus acantholepis*, CAS 233993, 160 mm TL.FIGURE 53a. *Coelorinchus carinifer*, CAS 235516, 287+ mm TL, lateral view.FIGURE 53a. *Coelorinchus carinifer*, CAS 235516, 287+ mm TL, dorsal view of head.FIGURE 54. *Coelorinchus smithi*, CAS 235519, 431+mm TL.FIGURE 55. *Coryphaenoides microps*, CAS 235552, 332+ mm TL.

Plate XI



FIGURE 56. *Hymenocephalus nascens*, CAS 233942, 85+ mm TL.

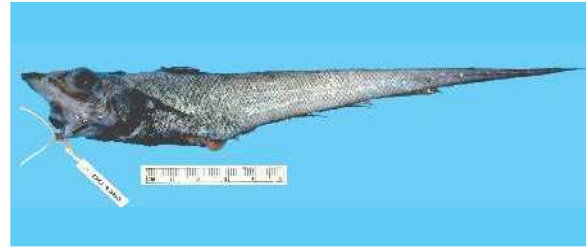


FIGURE 57. *Mataeocephalus cristatus*, CAS 234020, 210 mm TL.



FIGURE 58. *Nezumia spinosa*, CAS 235798, 220+ mm TL.

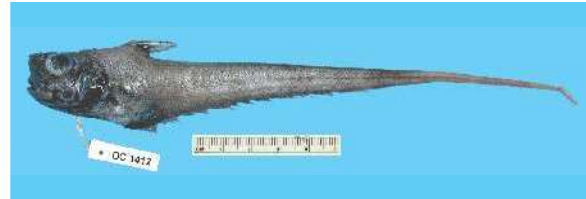


FIGURE 59. *Sphagemacrurus pumiliceps*, CAS 235732, 187+ mm TL.



FIGURE 60. *Trachonurus villosus*, CAS 235503, 345 mm TL.



FIGURE 61. *Ventrifossa longibarbata*, CAS 236398, 310+ mm TL.



FIGURE 62. *Ventrifossa saikaiensis*, CAS 235515, 287+ mm TL.



FIGURE 63. *Glyptophidium japonicum*, CAS 233982, 123 mm SL.



FIGURE 64. *Glyptophidium lucidum*, CAS 235801, 188 mm SL.



FIGURE 65. *Hoplobrotula armata*, CAS 235795, 207 mm SL.

## Plate XII

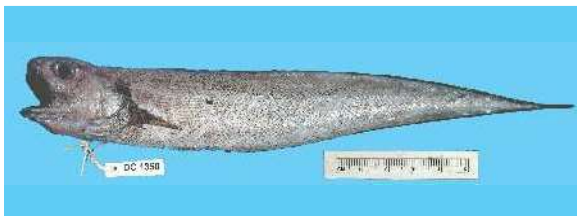


FIGURE 66. *Monomitopus pallidus*, CAS 234014, 207 mm SL.



FIGURE 67. *Neobythites macrops*, CAS235255, 151 mm SL.



FIGURE 68. *Neobythites unimaculatus*, CAS 235745, 137mm SL.



FIGURE 69. *Neobythites sivicola*, CAS 235480, 166 mm SL.



FIGURE 70. *Sirembo imberbis*, CAS 235742, 124-125 mm SL.



FIGURE 71. *Lophiomus setigerus*, CAS 236404, 142 mm SL.



FIGURE 72a. *Chaunax* sp. 1, CAS 235683, 33.2 mm SL., lateral view



FIGURE 72b. *Chaunax* sp. 1, CAS 235683, 33.2 mm SL., dorsal view



Plate XIII

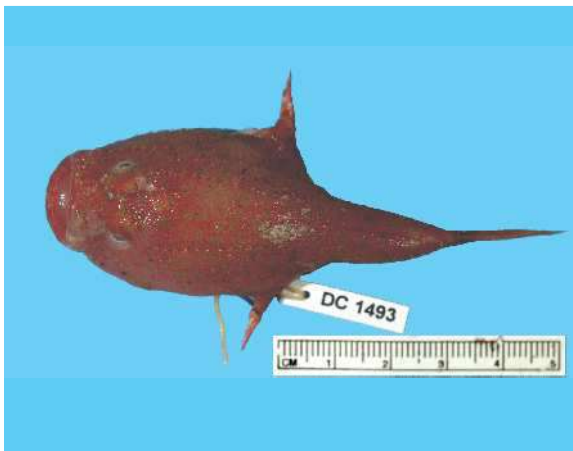


FIGURE 73. *Chaunax* sp. 2, CAS 236014, 69 mm SL.



FIGURE 74. *Dibranchius* sp., CAS 234021, 75 mm SL.



FIGURE 75. *Halicmetus* sp., CAS 234019, 58 mm SL.



FIGURE 76a. *Halieutaea* cf. *stellata*, CAS 236405, 120 mm SL, dorsal view.



FIGURE 76b. *Halieutaea* cf. *stellata*, CAS 236405, 120 mm SL, ventral view.

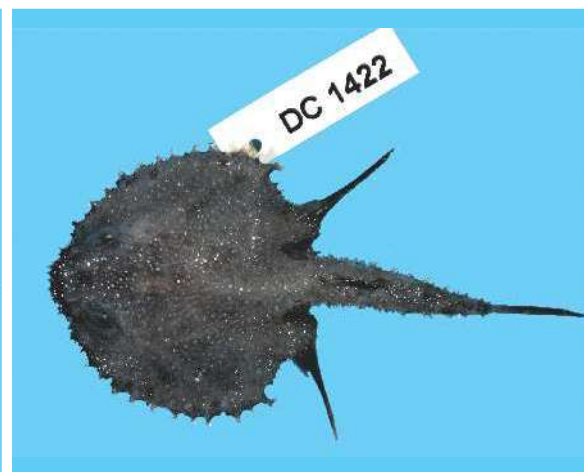


FIGURE 77. *Halieutopsis* sp. 1, CAS 235685, 48 mm SL.

## Plate XIV



FIGURE 78. *Halieutopsis* sp. 2, CAS 235684, 51 mm SL.

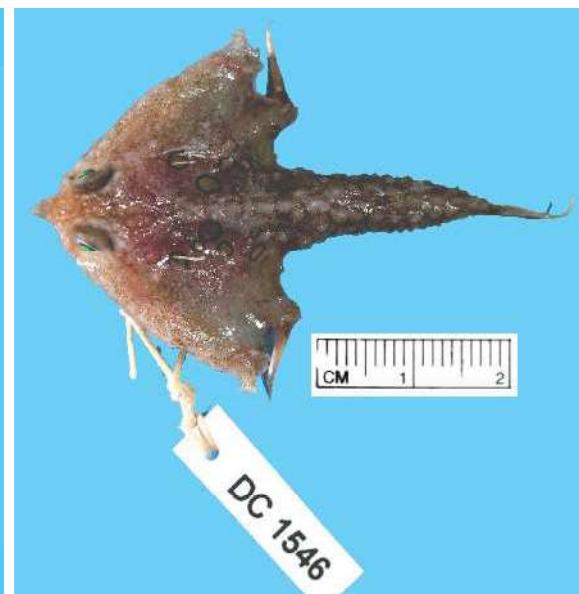


FIGURE 79. *Malthopsis annulifera*, CAS 235680, 46.5 mm SL.



FIGURE 80. *Malthopsis kobayashii*, CAS 235679, 79 mm SL.



FIGURE 81. *Ateleopus japonicus*, CAS 235794, 291 mm TL.



FIGURE 82. *Hoplostethus melanopterus*, CAS 234018, 00 mm SL.



FIGURE 83. *Myripristis hexagona*, CAS 235467, 127 mm SL.

Plate XV



FIGURE 84. *Ostichthys* cf. *japonicus*, CAS 2235783, 69 mm SL.



FIGURE 85. *Zenion hololepis*, CAS 235737, 48.8 mm SL.

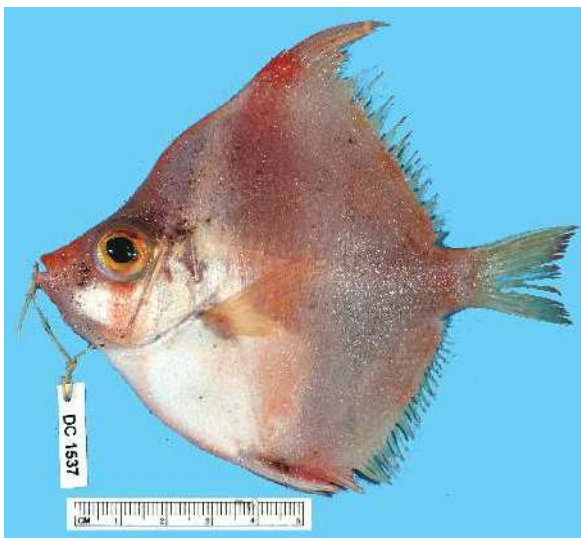


FIGURE 86. *Antigonía rubicunda*, CAS 235579, 98.5 mm SL.



FIGURE 87. *Fistularia petimba*, CAS 236412, 639 mm TL.



FIGURE 88. *Ebosia bleekeri*, CAS 235824, 96 mm SL.



FIGURE 89. *Ectreposebastes imus*, CAS 235751, 125 mm SL.

## Plate XVI



FIGURE 90. *Minous quincarinatus*, CAS 235738,  
77.2 mm SL.



FIGURE 91. *Neocentropogon aeglefinus*, CAS 235739,  
69 mm SL.



FIGURE 92. *Neocentropogon affinis*, CAS 235749,  
81.4 mm SL.



FIGURE 93. *Neomerinthe* sp., CAS 236002, 66.0 mm SL.



FIGURE 94. *Ocosia zaspilota*, CAS 235825, 67 mm SL.



FIGURE 95. *Parapterois heterurus*, CAS 236010, 53 mm SL.

Plate XVII



FIGURE 96. *Pontinus rhodochrous*, CAS 235458, 190 mm SL.



FIGURE 97. *Pterois antennata*, CAS 235573, 105.5 mm SL.

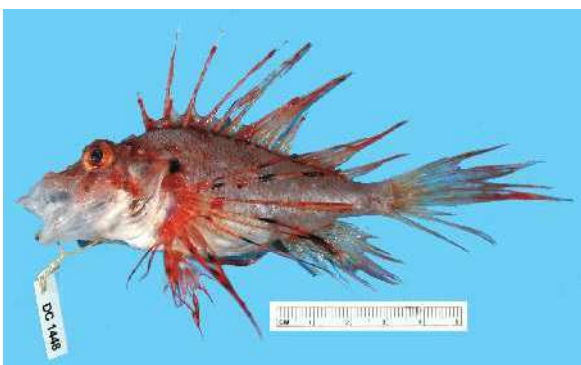


FIGURE 98. *Pterois lunulata*, CAS 235752, 91 mm SL.



FIGURE 99. *Setarches guentheri*, CAS 235642, 121 mm SL.



FIGURE 100. *Lepidotrigla abyssalis*, CAS 236411, 125 mm SL.

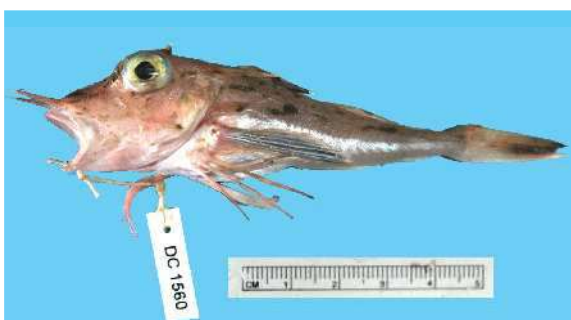


FIGURE 101. *Pterygotrigla* sp., CAS 236479, 96 mm SL.



FIGURE 102. *Peristedion* cf. *liorhynchus*, CAS 233996, 116 mm SL.



FIGURE 103a. *Rogadius welanderi*, CAS 235511, 87.6 mm SL, lateral view.

## Plate XVIII



FIGURE 103b. *Rogadius welanderi*, CAS 235511,  
87.6 mm SL, dorsal view.

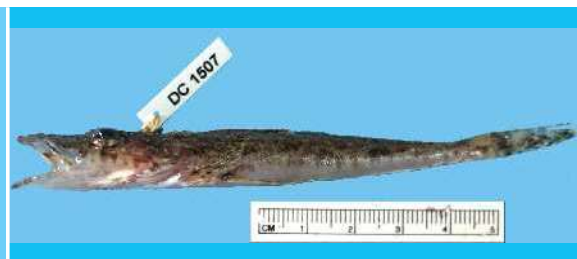


FIGURE 104a. *Thysanophrys chiltonae*, CAS 235508,  
94.0 mm SL, lateral view.



FIGURE 104b. *Thysanophrys chiltonae*, CAS 235508,  
94.0 mm SL, dorsal view.



FIGURE 105. *Hoplichthys langsdorfi*, CAS 135800,  
123 mm SL.



FIGURE 106. *Psychrolutes* cf. *occidentalis*, CAS 234016,  
137 mm SL.



FIGURE 107. *Dactyloptena orientalis*, CAS 235790,  
101 mm SL



FIGURE 108. *Dactyloptena tiltoni*, CAS 235885,  
86.5 mm SLmm SL.



FIGURE 109. *Synagrops japonicus*, CAS 234012,  
124 mm SL.

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FIGURE 110. *Synagrops philippinensis*, CAS 236019, 81.9 mm SL.



FIGURE 111. *Synagrops* sp., CAS 235736, 63.0 mm SL.

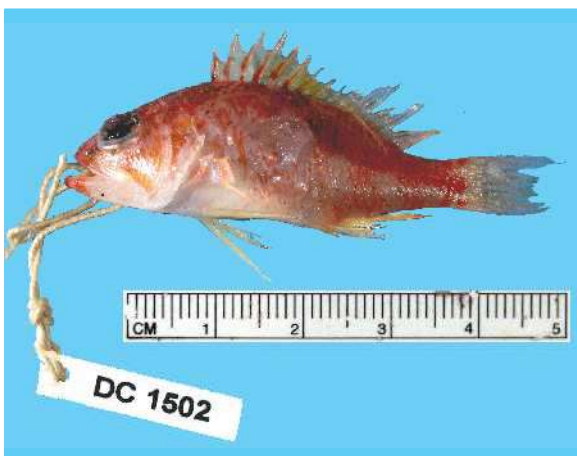


FIGURE 112. *Plectranthias sagamiensis*, CAS 235596, 41 mm SL.



FIGURE 113. *Plectranthias* sp., CAS 235681, 53 mm SL.



FIGURE 114. *Cephalopholis aurantia*, CAS 235460, 240 mm SL.

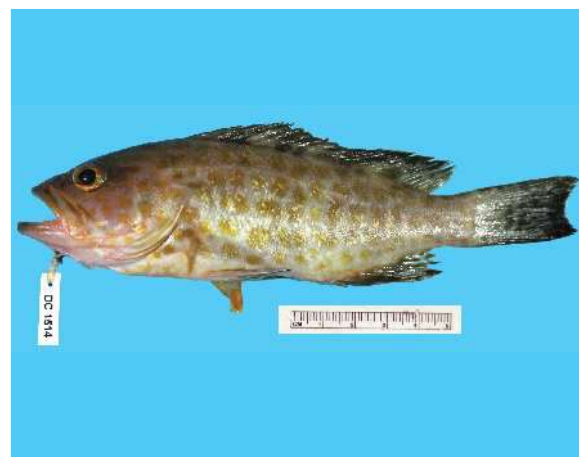


FIGURE 115. *Epinephelus areolatus*, CAS 235793, 131 mm SL.

## Plate XX

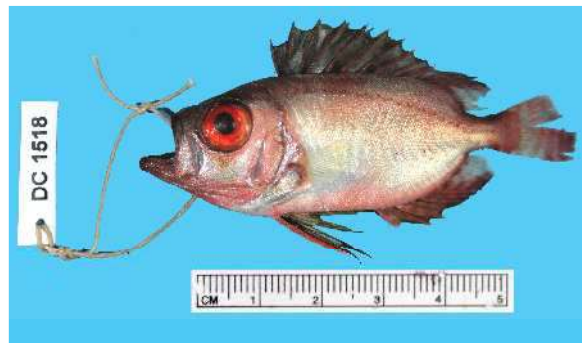
FIGURE 116. *Priacanthus fitchi*, CAS 235784, 88 mm SL.FIGURE 117. *Priacanthus macracanthus*, CAS 235820, 53 mm SL.FIGURE 118. *Pristigenys nipponia*, CAS 236407, 95.2 mm SL.FIGURE 119. *Jaydia carinatus*, CAS 235746, 100 mm SL.FIGURE 120. *Jaydia* cf. *poecilopterus*, CAS 236504, 59.4 mm SLFIGURE 121. *Ostorhinchus* cf. *cheni*, CAS 236505, 52 mm SLFIGURE 122. *Epigonus ctenolepis*, CAS 235796, 160 mm SL.



Plate XXI



FIGURE 123. *Decapterus kurroides*, CAS 236410, 165 mm SL



FIGURE 124. *Pristipomoides argyrogrammicus*, CAS 236418, 87.7 mm SL



FIGURE 125. *Nemipterus bathybius*, CAS 236025, 134 mm SL.



FIGURE 126. *Parasclopsis inermis*, CAS 236496, 84 m SL.



FIGURE 127. *Upeneus subvittatus*, CAS 235576, 149 mm SL.

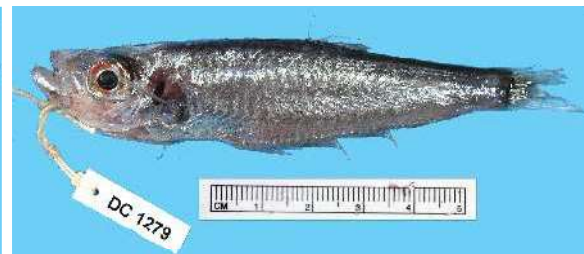


FIGURE 128. *Bathyclupea argentea?*, CAS 233990, 87 mm SL.

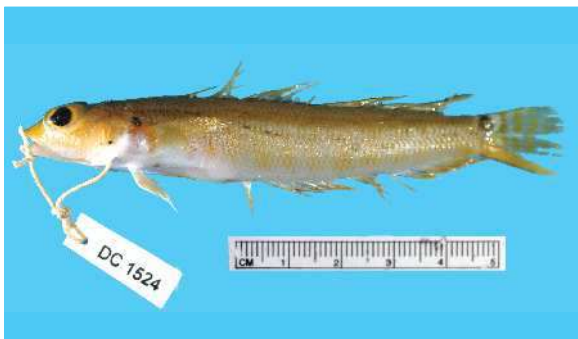


FIGURE 129. *Parapercis* sp., CAS 236013, 89 mm SL



FIGURE 130. *Pteropsaron dabfar*, CAS 236400, holotype 33.6 mm SL

## Plate XXII



FIGURE 131. *Pteropsaron levitoni*, CAS 236401, holotype  
23.7 mm SL.



FIGURE 132. *Pteropsaron springeri?*, CAS 236668  
35.0 mm SL.



FIGURE 133. *Bembrops caudimacula*, CAS 235272, 186  
mm SL.

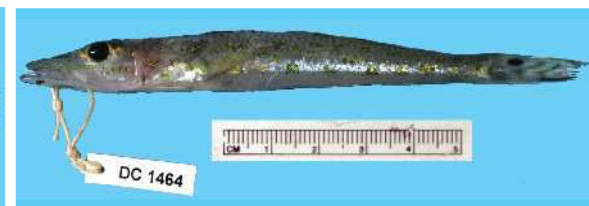


FIGURE 134. *Bembrops curvatura*, CAS 235735, 94.5 mm  
SL.



FIGURE 135. *Bembrops nelsoni*, CAS 235272, 164 mm SL.

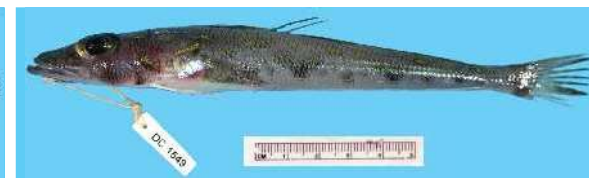


FIGURE 136a. *Chironema chlorotaenia*, CAS 235512,  
146 mm SL, lateral view



FIGURE 136b. *Chironema chlorotaenia*, CAS 235512, 146  
mm SL, dorsal view.



FIGURE 137a. *Uranoscopus* sp. 2 (of Kishimoto), CAS  
236423, 98 mm SL, lateral view.



FIGURE 137b. *Uranoscopus* sp. 2 (of Kishimoto), CAS  
236423, 98 mm SL, dorsal view.



FIGURE 138a. *Uranoscopus* sp. 3 (of Kishimoto), CAS  
236476, 58.1 mm SL, lateral view.

Plate XXIII



FIGURE 138b. *Uranoscopus* sp. 3 (of Kishimoto), CAS 236476, 58.1 mm SL, dorsal view.

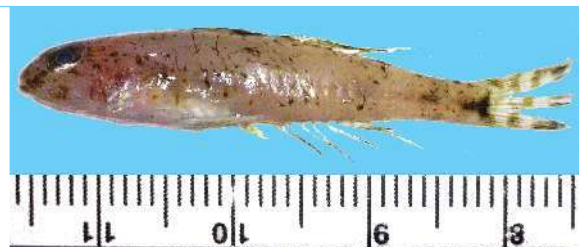


FIGURE 139a. *Hazeus* sp., CAS 236631, 35.5 mm SL, lateral view. Photo by Tomio Iwamoto.

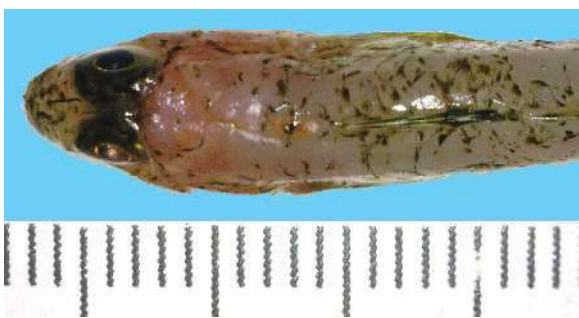


FIGURE 139b. *Hazeus* sp., CAS 236631, 35.5 mm SL, dorsal view. Photo by Tomio Iwamoto.



FIGURE 140. *Obliquogobius* cf. *cirrifer*, CAS 236632. Photo by John McCosker.



FIGURE 141. *Neopinnula orientalis*, CAS 233988, 125 mm SL.



FIGURE 142. *Promethichthys prometheus*, CAS 234028, 200 mm SL.

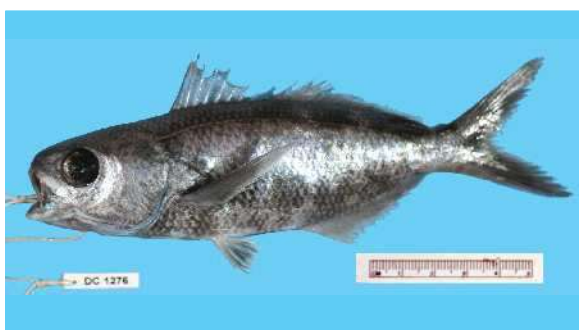


FIGURE 143. *Cubiceps whiteleggi*, CAS 233986, 127 mm SL.



FIGURE 144. *Citharoides macrolepidotus*, CAS 235548, 138 mm SL.

## Plate XXIV

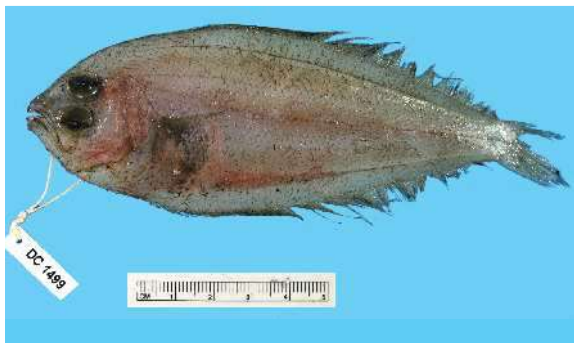


FIGURE 145. *Arnoglossus japonicus*, CAS 235578, 127 mm SL.

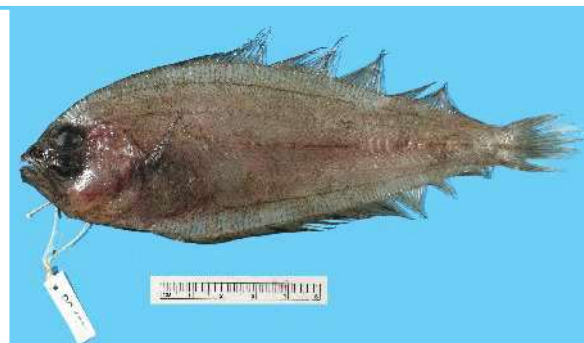


FIGURE 146. *Arnoglossus oxyrhynchus*, CAS 235549, 150 mm SL.

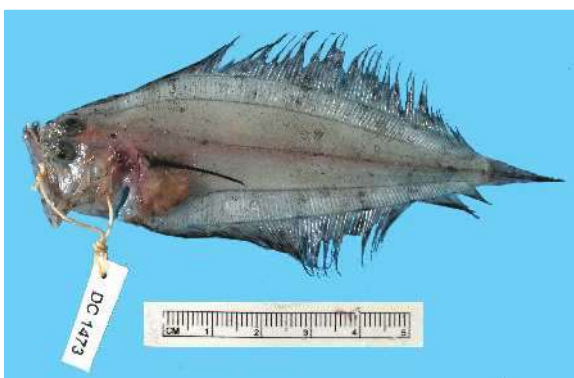


FIGURE 147. *Kamoharua megastoma*, CAS 235542, 89 mm SL.

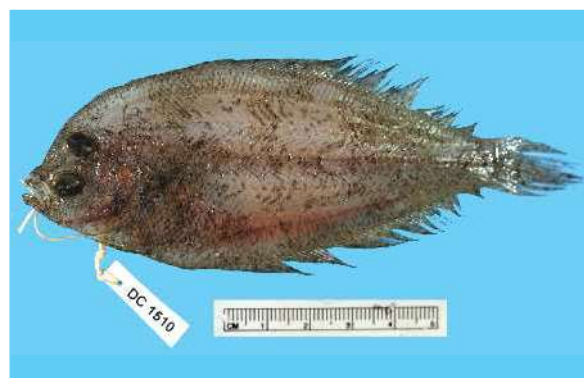


FIGURE 148. *Parabothus taiwanensis*, CAS 235505, 107 mm SL.



FIGURE 149. *Psettina gigantea*, CAS 235788, 105 mm SL.

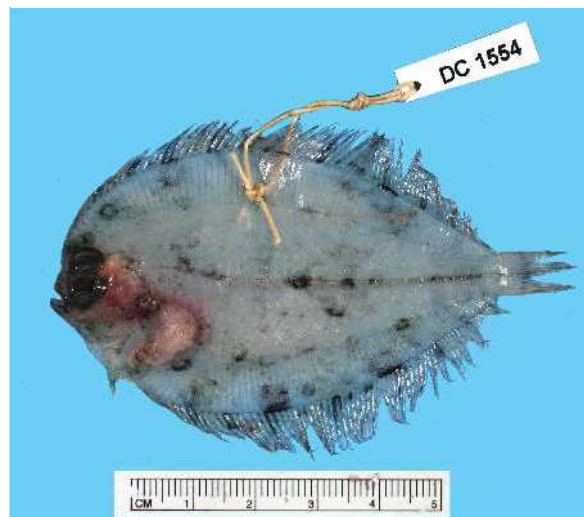


FIGURE 150. *Taeniopsetta ocellata*, CAS 235823, 68.5 mm SL.

Plate XXV



FIGURE 151. *Poecilopsetta colorata*, CAS 235551, 98 mm SL.



FIGURE 152. *Poecilopsetta plinthus*, CAS 235545, 95 mm SL.



FIGURE 153. *Samarus cristatus*, CAS 235527, 122 mm SL.



FIGURE 154. *Aseraggodes kobensis*, CAS 235733, 96 mm SL



FIGURE 155. *Aseraggodes* sp., CAS uncat.

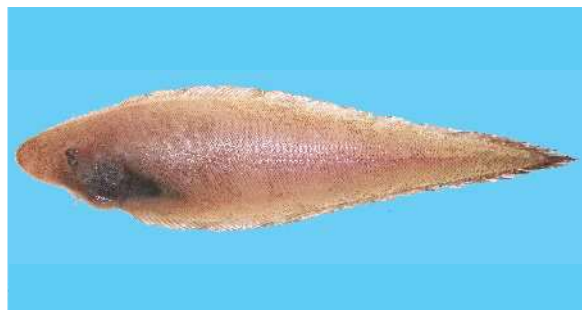


FIGURE 156. *Cynoglossus gracilis?*, CAS 236662, 166 mm SL



FIGURE 157a. *Cynoglossus* sp., CAS 236661, 160 mm SL, sinistral (eyed) side.

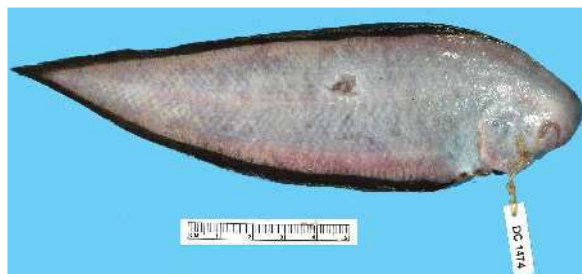


FIGURE 157b. *Cynoglossus* sp., CAS 236661, 160 mm SL, dextral (blind) side.

## Plate XXVI

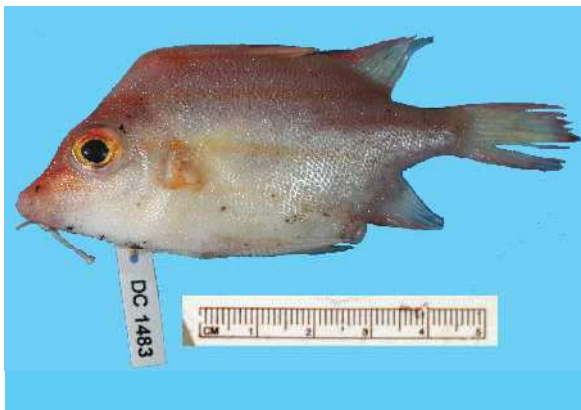


FIGURE 158. *Triacanthodes ethiops*, CAS 235886,  
73.4 mm SL

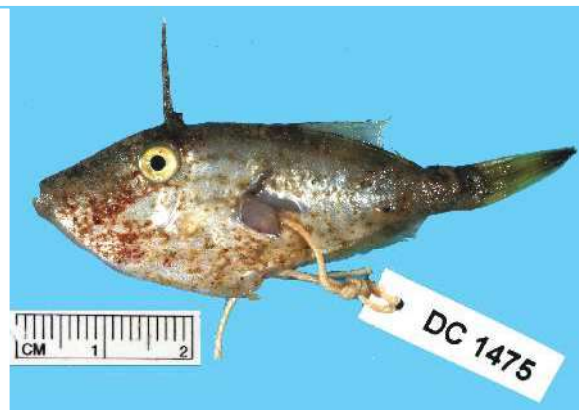


FIGURE 159. *Paramonacanthus* cf. *curtorhynchus*,  
CAS 236485, 48.5 mm SL.

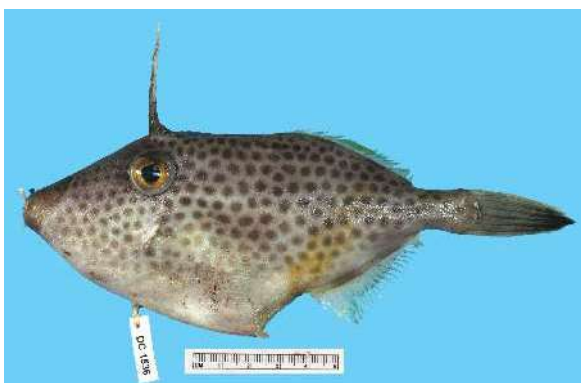


FIGURE 160. *Thamnacornus tessellatus*, CAS 235682,  
45.0 mm SL.



FIGURE 161. *Arothron immaculatus*, CAS 236559,  
25.1 mm SL. Photo by Jon D. Fong.



FIGURE 162. *Sphoeroides pachygaster*, CAS 235459,  
147 mm SL.