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DEEP-SEA FISHES FROM THE ANDAMAN SEA BY R/V CHAKRATONG TONGYAI DURING 1996–2000. PART 7: ORDER STOMIIFORMES

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ABSTRACT: Stomiiform fishes collected by the project team of the Biodiversity of the Andaman Sea Shelf (BIOSHELF) during 1996–2000 were identified as 28 species belonging to 5 families in 2 suborders. This study represents the first records of the following 11 species from the Andaman Sea: *i.e.*, 1 species of Diplophidae: *Manducus greyae* (Johnson, 1970); 1 species of Phosichthyidae: *Pollichthys mauli* (Poll, 1953); 9 species of Stomiidae: *Astronesthes formosana* Liao, Chen and Shao, 2006, *Astronesthes indopacifica* Parin and Borodulina, 1997, *Borostomias mononema* (Regan and Trewavas, 1929), *Bathophilus pawneei* Parr, 1927, *Eustomias* (*Haploclonus*) *bifilis* Gibbs, 1960, *Leptostomias multifilis* Imai, 1941, *Melanostomias melanops* Brauer, 1902, *Photonectes* (*Photonectes*) *albipennis* (Döderlein, 1882) and *Idiacanthus fasciola* Peters, 1877.

Key words: Diplophidae, Gonostomatidae, Sternoptychidae, Phosichthyidae, Stomiidae, Thailand, BIOSHELF

INTRODUCTION

Deep-sea fishes collected by the project team of the Biodiversity of the Andaman Sea Shelf (BIOSHELF) (see details in Aungtonya *et al*. 2000) have been studied taxonomically as following orders (*sensu* Nelson 2006): Scorpaeniformes by Kawai *et al*. (2017) and Kishimoto *et al*. (2019), Beryciformes and Stephanoberyciformes by Kimura *et al.* (2019a; b), Albuliformes, Ateleopodiformes and Lampriformes by Kawai *et al.* (2020a), Argentiniformes by Senda *et al*. (2020), Perciformes by Kawai *et al*. (2020b) and Pleuronectiformes and Tetraodontiformes by Kawai *et al*. (2020c). Following the aforementioned studies, species of Stomiiformes (*sensu* Nelson 2006) are newly reported in this study.

MATERIALS AND METHODS

All specimens, which were caught from deep-sea waters of the Andaman Sea by BIOSHELF (Aungtonya *et al.* 2000), have been kept in 70% ethyl alcohol after fixation by 10% formalin. These specimens have been deposited at the Reference Collection of Phuket Marine Biological Center, Phuket, Thailand (PMBC). Several specimens were transferred to the Hokkaido University Museum, Hakodate, Japan (HUMZ). Comparative materials are deposited at PMBC and HUMZ.

Counts and measurements follow Hubbs and Lagler (1958) for Diplophidae, Gonostomatidae and Phosichthyidae, Baird (1971) for *Argyropelecus* (Sternoptychidae), Harold (1994) for *Polyipnus* (Sternoptychidae), Haruta and Kawaguchi (1976) for *Sternoptyx* (Sternoptychidae) and Gibbs *et al*. (1983) for Stomiidae. Photophore terminology follows Grey (1964) and Johnson (1970) for Diplophidae, Gonostomatidae and Phosichthyidae, Baird (1971) for *Argyropelecus* (Sternoptychidae), Harold (1994) for *Polyipnus* (Sternoptychidae), Haruta and Kawaguchi (1976) for *Sternoptyx* (Sternoptychidae) and Morrow (1964a) and Weitzman (1986) for Stomiidae. Barbel terminology of Stomiidae follows Morrow and Gibbs (1964) and Gibbs *et al*. (1983). Standard and head lengths are abbreviated as SL and HL, respectively. Measurements were made to the nearest 0.1 mm with digital caliper. Vertebrae were counted from radiographs. Specimens without detailed examination, meaning only species identification and measurement of SL, are tagged with asterisk after catalog number.

Differences of some characters of each species between the present and previous studies are treated as intraspecific variations. This is because these differences are too small for interspecific differences and other characters are congruent with diagnoses of each species.

SPECIES LIST

Suborder Gonostomatoidei
Family Diplophidae
Diplophos cf. *taenia*

Fig. 1

Diagnosis. Anal-fin rays 65; IC photophores 104; LLP photophores 104; dorsal-fin base situated at middle of body; two photopuncts present ahead of SO photophore; last two AC photophores grouped, not separated (present study).

Materials. PMBC 30562, 1 specimen, 72.4 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, otter trawl, 473–494 m depth, 18 Feb. 2000; PMBC 30563*, 1 specimen, SL unmeasured due to damage, St. E7, 8°30′N 97°01′E to 8°29′N 97°03′E, Agassiz trawl, 449–446 m depth, 8 Feb. 2000.

Distribution. Andaman Sea (present study).

Remarks. These specimens are close to *Diplophos australis* Ozawa, Oda and Ida, 1990 and *Diplophos taenia* Günther, 1873 in having 65 anal-fin rays (61–67 in the former species *vs*. 59–72 in the latter: Grey 1964; Mukhacheva 1978; Ozawa *et al.* 1990; Koeda and Ho 2019). Although these two species can be almost distinguished by the number of vertebrae (33–37 + 50–54 = 84–91 *vs*. 37–41 + 52–60 = 90–100: Ozawa *et al*. 1990), those of the present specimens could not be examined due to their poor condition. *Diplophos taenia* is reported from tropical to temperate waters in world oceans including the Andaman Sea, while *D. australis* only from South Atlantic and South Pacific south from 40°S (*e.g*., Ozawa *et al*. 1990; Rajan *et al*. 2013; Kenaley and Stewart 2015a; Villarins *et al*. 2022). Therefore, this study tentatively identified these specimens as *Diplophos* cf. *taenia*.

Manducus greyae (Johnson, 1970)

Fig. 2

Diagnosis. Anal-fin rays 55–59; total vertebrae 76; IC photophores 83–89; dorsal-fin origin nearer to snout than caudal peduncle; 4–5 photopuncts present ahead of SO photophore, arranged in irregular posteriorly directed series; last two AC photophores not grouped, distance between last two AC photophores equal to or wider than that of proceeding AC photophores (Johnson 1970; Mukhacheva 1978).

Material. PMBC 30564, 1 specimen, 104.8 mm SL, St. E7, 8°30′N 97°07′E to 8°29′N 97°40′E, otter trawl, 435–444 m depth, 9 Feb. 2000.

Distribution. Indian Ocean off Sumatra and Java islands, and western Pacific from South China Sea to Papua New Guinea (Johnson 1970; Mukhacheva 1978; Ozawa and Oda 1986; Kailola 1987; Harold 1999; Gloerfelt-Tarp and Kailola 2022) including Andaman Sea (present study).

Remarks. In the Indian Ocean, this species has been known only from off Sumatra and Java islands (Mukhacheva 1978; Gloerfelt-Tarp and Kailola 2022). Therefore, this study is the first record of the species from the Andaman Sea.

Triplophos hemingi (McArdle, 1901)

Fig. 3

Diagnosis. Dorsal-fin rays 9–11; anal-fin rays 54–63; gill rakers on first gill arch 8–9 + 11–16 = 23–25; branchiostegal rays 11–17; total vertebrae 58–62; BR photophores 8–14; IV photophores 24–30; VAV photophores 5–7; IC photophores 68–76; premaxilla well elongated more than toothed portion of maxilla and forming most of lower margin of upper jaw; mouth and opercular bones oblique; dorsal-fin base situated well ahead of middle of body; anal-fin base longer than half of SL; SO photophore present; small photophores arranged in a line along upper jaw; photophores present on isthmus; four or five lines of photophores present on lateral body (McArdle 1901; Brauer 1902; Poll 1953; Grey 1964; present study).

Materials. PMBC 30502*, 7 specimens, 136.2–180.3 mm SL, St. Z4, 7°34'N 97°03'E to 7°35'N 97°04'E, 660–633 m depth, otter trawl, 25 Jan. 1999; PMBC 30565, 1 specimen, 138.9 mm SL, St. G8, 8°00'N 97°06'E to 8°00'N 97°04'E, 508–518 m depth, otter trawl, 20 Nov. 1999; PMBC 30566*, 1 specimen, 94.2 mm SL, PMBC 30567, 1 specimen, 72.9 mm SL, St. J8, 7°15'N 97°33'E to 7°15'N 97°30'E, 473–494 m depth, otter trawl, 18 Feb. 2000; PMBC 30568, 6 specimens, 81.7–114.8 mm SL, St. L8, 6°46'N 97°33'E to 6°44'N 97°35'E, 513–501 m depth, otter trawl, 22 Feb. 2000; PMBC 30569, 4 specimens, 152.5–171.0 mm SL, St. J10, 7°20'N 97°14'E to 7°22'N 97°13'E, 655–651 m depth, otter trawl, 28 Jan. 1999; PMBC 30570, 6 specimens, 70.6–96.6 mm SL, PMBC 30571, 2 specimens, 73.7–92.7 mm SL, PMBC 30572, 12 specimens, 62.3–94.9 mm SL, St. Z2, 7°42'N 97°28'E to 7°42'N 97°18'E, 464 m depth, otter trawl, 23 Jan. 1999; PMBC 30573*, 9 specimens, 94.4–161.7 mm SL, St. Z3, 7°42'N 97°20'E to 7°42'N 97°18'E, 493–322 m depth, otter trawl, 24 Jan. 1999.

Figure 1. *Diplophos* cf. *taenia*, PMBC 30562, 72.4 mm SL. Scale bar 10 mm.

Figure 2. *Manducus greyae*, PMBC 30564, 104.8 mm SL. Scale bar 10 mm.

Figure 3. *Triplophos hemingi*, PMBC 30565, 138.9 mm SL. Scale bar 20 mm.

Distribution. Tropical to subtropical waters in Atlantic, Indian and western Pacific Oceans (*e.g.*, Grey 1964; Schaefer *et al*. 1986a; Quéro *et al*. 1990a; Harold 1999; 2002; Randall and Lim 2000; Psomadakis *et al*. 2019; Koeda 2020a; Sutton *et al*. 2020; Villarins *et al*. 2022).

Remarks. The characters of present specimens are different from those of previous descriptions in the followings: 9–11 dorsal-fin rays in the present specimens (*vs.* 10–11 in previous descriptions), 20–23 total gill rakers on the first arch (*vs*. 23–25), 14–17 branchiostegal rays (11–14) and 11–14 BR photophores (8–11) (McArdle 1901; Brauer 1902; Poll 1953; Grey 1964). However, other characters of them are congruent with diagnosis of *T. hemingi: e.g.*, premaxilla well elongated more than toothed portion of maxilla; dorsal-fin base situated well ahead of middle of body; 4–5 lines of photophores present on lateral body (McArdle 1901; Brauer 1902; Poll 1953; Grey 1964). Therefore, we tentatively identified the present specimens as *T. hemingi.*

Grey (1964) indicated intraspecific variations in this species between the Indian and Atlantic Oceans: IV photophores 29–30 and VAV photophores 5–6 in Indian Ocean *vs*. 24–25 and 7 in Atlantic. However, the present study rejects Grey's (1964) hypothesis because of findings of specimens having 24 IV photophores (one individual of PMBC 30568) and 7 VAV photophores (one individual of PMBC 30572). On the other hand, present study regards the morphological differences of the following characters as the geographical variations between both oceans: *i.e.*, total gill rakers on the first gill arch 20–23, branchiostegal rays 14–17 and BR photophores 11–14 in the Indian Ocean *vs.* 23–25, 11–14 and 8–11 in the Atlantic (McArdle 1901; Brauer 1902; Grey 1964; present study).

Family Gonostomatidae

Cyclothone acclinidens Garman, 1899

Fig. 4

Diagnosis. Maxillary teeth on posterior series oblique at acute angle, enlarged posteriorly, not alternated with shorter teeth; vomerine teeth present; gill rakers between upper and lower limbs of first gill arch 2; gill rakers on hypobranchial of first gill arch 5–6; gill filaments on hypobranchial not fused; anus situated at just middle between pelvic-fin base and anal-fin origin, or slightly nearer to pelvic-fin base; supracaudal luminous gland well developed, reaching dorsal-fin base; area just anterior to anal-fin origin transparent or sparsely pigmented (Mukhacheva 1964; 1974; 1980; Kawaguchi 1971; Badcock 1982; Miya 1994a).

Materials. PMBC 30574, 2 specimens, 24.1–25.6 mm SL, St. B10, 9°11′N 96°12′E to 9°10′N 96°14′E, 689–549 m depth, otter trawl, 11 Feb. 1997.

Distribution. Tropical to temperate waters of world oceans (*e.g*., Mukhacheva 1964; 1974; 1980; Kawaguchi 1971; Badcock 1984a; Quéro *et al*. 1990a; Harold 2002; Paxton *et al.* 2006a; Sutton *et al.* 2020).

Remarks. Some of the diagnostic characters of *C. acclinidens* could not be checked in the present specimen because of its damage: *e.g.*, extension of supracaudal luminous grand to dorsal-fin base, and transparent or sparsely pigmented region anterior to anal-fin origin. However, the present study identified the specimen as *C. acclinidens* based on the morphology of teeth on upper jaw, the number of gill rakers, the morphology of gill filament, and the situation of anus (see diagnosis).

Cyclothone alba Brauer, 1906

Fig. 5

Diagnosis. BR photophores 8; OA photophores 6; vomerine teeth absent; gill raker between upper and lower limbs of first gill arch 1; gill filaments on hypobranchial fused; series of OA photophores not reaching behind pelvic-fin base; photophores on anal-fin base 9; body mostly transparent except dorsal head with V-shaped pigmented area (Mukhacheva 1964; 1974; Bond and Tighe 1974; Miya 1994a).

Materials. PMBC 30501*, 1 specimen, SL unmeasured due to damage, PMBC 30575, 1 specimen, 22.5 mm SL, PMBC 30576, 1 specimen, 21.8 mm SL, St. J8, 7°15′N 97°30′E to 7°15′N 97°33′E, 473–494 m depth, otter trawl, 18 Feb. 2000.

Distribution. Tropical to temperate and subarctic waters of Atlantic, Indian Ocean, western and central Pacific, and eastern Pacific off Chile (*e.g*., Kawaguchi 1971; Mukhacheva 1974; Badcock 1984a; Quéro

et al. 1990a; Harold 2002; Paxton *et al*. 2006a; Fricke *et al*. 2009; Kenaley and Stewart 2015b; Sutton *et al*. 2020).

***Cyclothone pallida* Brauer, 1902**

Fig. 6

Diagnosis. Maxillary teeth on posterior series moderately oblique, moderately enlarged posteriorly; enlarged teeth on posterior series of maxillary alternated with small teeth (male) or without them (female); vomerine teeth present; gill rakers between upper and lower limbs of first gill arch 2; gill rakers on hypobranchial of first gill arch 4; gill filaments on hypobranchial not fused; anus closer to pelvic-fin base than anal-fin origin; supracaudal luminous

Figure 4. *Cyclothone acclinidens*, PMBC 30574, 24.1 mm SL, Scale bar 5 mm.

Figure 5. *Cyclothone alba*, PMBC 30576, 21.8 mm SL. Scale bar 5 mm.

Figure 6. *Cyclothone pallida*, PMBC 30083, 29.2 mm SL. Scale bar 5 mm.

gland not well developed; pigmentation on snout region in dorsal head, and on dorsal- and anal-fin bases; area anterior to anal-fin origin usually transparent and sometimes sparsely pigmented (Kawaguchi 1971; Mukhacheva 1974; Badcock 1982; Miya 1994a; b).

Material. PMBC 30083, 1 specimen, 29.2 mm SL, sex unknown due to damage of maxilla, St. J10, 7°20′N 97°15′E to 7°22′N 97°13′E, 655–651 m depth, otter trawl, 28 Jan. 1999.

Distribution. Tropical to temperate and subarctic waters of world oceans (*e.g*., Kawaguchi 1971; Mukhacheva 1974; Badcock 1982; 1984a; Quéro *et al*. 1990a; Miya 1994b; Harold 1999; 2002; Paxton *et al*. 2006a; Kenaley and Stewart 2015b; Sutton *et al*. 2020).

Remarks. Morphology of the teeth on upper jaw and the supracaudal luminous gland could not be checked in the present specimen due to its damage, which is one of the diagnostic characters of *C. pallida*. However, the present study identified the specimen as *C. pallida* based on the number of gill rakers, the morphology of gill filament, the situation of anus, presence of pigmentation on snout and dorsal- and anal-fin bases, and presence of transparent area anterior to anal-fin origin (see diagnosis).

***Sigmops elongatus* (Günther, 1878)**
Fig. 7

Diagnosis. VAV photophores 4–5; supracaudal and infracaudal luminous glands 1 and 2, respectively; anus closer to anal-fin origin than middle between pelvic-fin insertion and anal-fin origin; dorsal-fin origin situated above anal-fin origin; pectoral-fin tip not reaching behind pelvic-fin base; pelvic-fin tip not reaching anus; adipose fin present; numerous tiny photophores present on body and head; circle luminous glands present under each OA photophore except first OA photophore (Grey 1964; Mukhacheva 1972).

Materials. PMBC 30500*, 9 specimens, 147.1–204.6 mm SL, St. Z4, 7°34'N 97°03'E to 7°35'N 97°04'E, 660–633 m depth, otter trawl, 25 Jan. 1999; PMBC 30577*, 3 specimens, 73.7–153.2 mm SL, St. B8, 9°09′N 96°16′E to 9°10′N 96°18′E, 489–504 m depth, otter trawl, 11 Feb. 1999; PMBC 30578, 4 specimens, 134.7–164.7 mm SL, St. B10, 9°11′N 96°12′E to 9°10′N 96°14′E, 689–549 m depth, otter trawl, 11 Feb. 1999; PMBC 30579, 1 specimen, 86.2 mm SL, PMBC 30580*, 2 specimens, 153.5–164.1 mm SL, St. E9, 8°28′N 95°59′E to 8°30′N 95°58′E, 649–550 m depth, otter trawl, 5 Feb. 1999; PMBC 30581, 1 specimen, 115.7 mm SL, St. G8, 8°00′N 97°04′E to 8°00′N 97°06′E, 508–518 m depth, otter trawl, 20 Nov. 1999; PMBC 30582, 1 specimen, 63.7 mm SL, station unknown, 25 Jan. 1999; PMBC 30583, 10 specimens, 60.0–94.4 mm SL, PMBC 30584*, 1 specimen, 53.2 mm SL, PMBC 30585, 8 specimens, 60.0–102.9 mm SL, PMBC 30586*, 1 specimen, 57.6 mm SL, PMBC 30587, 1 specimen, 71.0 mm SL, PMBC 30588*, 3 specimens, 56.8–65.5 mm SL, PMBC 30589*, 4 specimens, SL unmeasured due to damages, PMBC 30590*, 1 specimen, 60.5 mm SL, PMBC 30591*, 9 specimens, 62.0–92.3 mm SL, St. J8, 7°15′N 97°30′E to 7°15′N 97°33′E, 473–494 m depth, otter trawl, 18 Feb. 2000; PMBC 30592, 1 specimen, 66.6 mm SL, PMBC 30593*, 2 specimens, 143.3–152.6 mm SL, St. J10, 7°20′N 97°14′E to 7°22′N 97°13′E, 655–651 m depth, otter trawl, 28 Jan. 1999; PMBC 30594*, 1 specimen, 157.4 mm SL, St. J10, 7°14′N 97°15′E to 7°15′N 97°15′E, 689–687 m depth, Agassiz trawl, 19 Feb. 2000; PMBC 30595, 4 specimens, 109.1–189.5 mm SL, St. J10, 7°15′N 97°14′E to 7°15′N 97°16′E, 662–696 m depth, otter trawl, 19 Feb. 2000; PMBC 30596*, 2 specimens, 51.7–164.6 mm SL, PMBC 30597, 1 specimen, 72.9 mm SL, PMBC 30598, 5 specimens, 68.0–89.4 mm SL, PMBC 30599*, 1 specimen, 58.1 mm SL, St. L8, 6°46′N 97°33′E to 6°44′N 97°35′E, 513–501 m depth, otter trawl, 22 Feb. 2000; PMBC 30600*, 3 specimens, 55.4–67.5 mm SL, PMBC 30601*, 6 specimens, 46.2–71.1 mm SL, St. Z2, 7°42′N 97°28′E to 7°42′N 97°31′E, 464 m depth, otter trawl, 23 Jan. 1999; PMBC 30602*, 1 specimen, 89.1 mm SL, St. Z3, 7°42′N 97°18′E to 7°42′N 97°20′E, 493–322 m depth, otter trawl, 24 Jan. 1999; PMBC 30603, 1 specimen, 155.0 mm SL, station and date unknown.

Distribution. Tropical to temperate waters in world oceans (*e.g*., Grey 1964; Kawaguchi 1971; Mukhacheva 1972; Badcock 1984a; Quéro *et al*. 1990a; Harold 1999; 2002; Paxton *et al*. 2006a; Kenaley and Stewart 2015b; Psomadakis *et al*. 2019; Sutton *et al*. 2020).

Family Sternoptychidae
***Argyropelecus affinis* Garman, 1899**
Fig. 8

Diagnosis. Dorsal-fin rays 9; dorsal profile of body not significantly raised posterior to dorsal blade; dorsal blade low, its height less than one-third of its length; sphenotic spine absent on postorbital region; postabdominal spines 2; transparent region below abdominal photophores relatively narrowed; supra-abdominal, preanal, anal, and subcaudal photophores arranged regularly and straightly; photophores of anal and subcaudal series not grouped, separated from each other by small gaps (Schultz 1961; 1964; Baird 1971; Borodulina 1978).

Materials. PMBC 17705, 1 specimen, 45.0 mm SL, St. Z4, 7°34'N 97°03'E to 7°35'N 97°04'E, 660–633 m depth, otter trawl, 25 Jan. 1999; PMBC 17706, 1 specimen, 47.5 mm SL, St. B8, 9°10'N 96°18'E to 9°09'N 96°16'E, 489–504 m depth, otter trawl, 11 Feb. 1999; PMBC 17707, 1 specimen, 38.2 mm SL, St. J10, 7°15'N 97°16'E to 7°15'N 97°14'E, 662–696 m depth, otter trawl, 19 Feb. 2000; PMBC 30604*, 1 specimen, 39.0 mm SL, St. J8, 7°15'N 97°33'E to 7°15'N 97°30'E, 473–494 m depth, otter trawl, 18 Feb. 2000.

Distribution. Tropical to subtropical waters in world oceans (*e.g*., Schultz 1961; 1964; Baird 1971; 1986; Borodulina 1978; Badcock 1984b; Quéro *et al*. 1990b; Aizawa and Doiuchi 2013a; Satapoomin 2011; Sutton *et al*. 2020; Villarins e*t al*. 2022).

***Argyropelecus sladeni* Regan, 1908**
Fig. 9

Diagnosis. Dorsal-fin rays 9; total gill rakers on first gill arch 17–22; enlarged canine teeth on lower jaw absent; upper preopercular spine curved upward extending well beyond posterior border of preopercle; postabdominal spines 2, anterior

Figure 7. *Sigmops elongatus*. (A): PMBC 30579, 86.2 mm SL; (B): PMBC 30595, 189.5 mm SL. Scale bars 20 mm.

one squared and blunt; no spines on scales below subcaudal photophores; supra-abdominal, preanal, anal, and subcaudal photophores arranged irregularly, not straightly; subcaudal photophores well separated from anal photophores; no pigmentation on outermost caudal-fin rays (Schultz 1961; 1964; Baird 1971; Borodulina 1978).

Materials. PMBC 17708, 3 specimens, 31.8–45.0 mm SL, PMBC 17709, 6 specimens, 34.1–55.4 mm SL, St. J8, 7°15'N 97°33'E to 7°15'N 97°30'E, 473–494 m depth, otter trawl, 18 Feb. 2000; PMBC 17710, 1 specimen, 32.1 mm SL, St. J10, 7°15'N 97°16'E to 7°15'N 97°14'E, 662–696 m depth, otter trawl, 19 Feb. 2000; PMBC 17711, 1 specimen, 18.2 mm SL, St. L8, 6°46'N 97°33'E to 6°44'N 97°35'E, 513–501 m depth, otter trawl, 22 Feb. 2000.

Distribution. Tropical to temperate waters in world oceans (*e.g*., Schultz 1961; 1964; Baird 1971; 1986; Borodulina 1978; Quéro *et al*. 1990b; Paxton *et al*. 2006b; Satapoomin 2011; Aizawa and Doiuchi 2013a; Harold *et al*. 2015; Sutton *et al*. 2020; Villarins *et al*. 2022).

Polyipnus asper **Harold, 1994**

Fig. 10

Diagnosis. Anal-fin rays 15–17; gill rakers on first gill arch 5–6 + 12–14 = 17–20; ACB photophores 8–10; palatine teeth absent; posttemporal bone with serrate external keels; posttemporal spines 2; longitudinal parietal keel discontinuous; opposed median spines on posterior region of parietal 2; dentate scales present below PV, VAV and ACC photophores, respectively; dentate scales present or absent below ACB photophores; lateral dark pigment bar broad and long, not extending ventrally further than level of center of orbit (Harold 1994; Harold *et al*. 1998; present study).

Materials. PMBC 17712, 1 specimen, 48.8 mm SL, St. Z2, 7°42'N 97°28'E to 7°42'N 97°31'E, 464 m depth, otter trawl, 23 Jan. 1999; PMBC 17713, 2 specimens, 26.5–47.8 mm SL, St. C8, 9°00'N 96°15'E to 9°00'N 96°13'E, 478–480 m depth, Agassiz trawl, 3 Feb. 2000; PMBC 17714, 1 specimen, 55.5 mm SL, St. E7, 8°30'N 97°01'E to 8°29'N 97°03'E, 449–446 m depth, Agassiz trawl, 8 Feb. 2000; PMBC 17715, 4 specimens, 52.3–59.3 mm SL, St. E7, 8°30'N 97°07'E to 8°29'N 97°04'E, 435–444 m depth, otter trawl, 9 Feb. 2000; PMBC 21474, 3 specimens, 42.1–43.1 mm SL, PMBC 30605*, 1 specimen, 31.5 mm SL, station and date unknown.

Distribution. Andaman Sea (Harold 1994; Satapoomin 2011).

Remarks. *Polyipnus asper* has conspicuous dentate scales below ACB photophores based on previous descriptions (Harold 1994; Harold *et al*. 1998) and judged from the figure of the holotype (fig. 42 in Harold 1994). However, present specimens have very weak or invisible denticles on scales below ACB photophores. This suggests *P. asper* has intraspecific morphological variation of denticles on scales below ACB photophores.

Sternoptyx obscura **Garman, 1899**

Fig. 11

Diagnosis. Maximum body depth from base of first dorsal-fin ray to base of postabdominal spine less than 82% SL; posterior body depth from end of dorsal-fin base to ventral margin of anal photophores less than 33% SL; area between transparent region of anal-fin base and anal photophores not sphenoid in shape (Schultz 1961; 1964; Baird 1971; Haruta and Kawaguchi 1976; Borodulina 1978; Aizawa and Doiuchi 2013a).

Materials. PMBC 17716, 1 specimen, 28.5 mm SL, St. Z4, 7°34'N 97°03'E to 7°35'N 97°04'E, 660–633 m depth, otter trawl, 25 Jan. 1999; PMBC 17717, 1 specimen, 24.0 mm SL, PMBC 30692, 1 specimen, 21.1 mm SL, St. J10, 7°15'N 97°16'E to 7°15'N 97°14'E, 662–696 m depth, otter trawl, 19 Feb. 2000.

Distribution. Tropical to subtropical waters in Indian and Pacific Oceans (*e.g*., Schultz 1961; 1964; Baird 1971; 1986; Haruta and Kawaguchi 1976; Borodulina 1978; Satapoomin 2011; Aizawa and Doiuchi 2013a; Harold *et al*. 2015).

Suborder Phosichthyoidei
Family Phosichthyidae
***Pollichthys mauli* (Poll, 1953)**
Fig. 12

Diagnosis. Anal-fin rays 22–30; gill rakers on first gill arch 5 + 11–12 = 16–17; ORB photophores 2; OP photophores 3; photophores from isthmus to pectoral fin 9; AC photophores 18–21, with 13–15 on anal-fin base; anal-fin origin just below or slightly posterior to dorsal-fin origin; anal-fin base much longer than dorsal-fin base; SO photophore present; eighth and/or ninth IV photophores slightly elevated (Poll 1953; Grey 1964; Kawaguchi 1971).

Material. PMBC 30606, 1 specimen, 21.8 mm SL, St. L6, 6°45'N 98°06'E to 6°44'N 98°05'E, 303–313 m depth, Agassiz trawl, 23 Feb. 2000.

Figure 8. *Argyropelecus affinis*, PMBC 17706, 47.5 mm SL. Scale bar 10 mm.

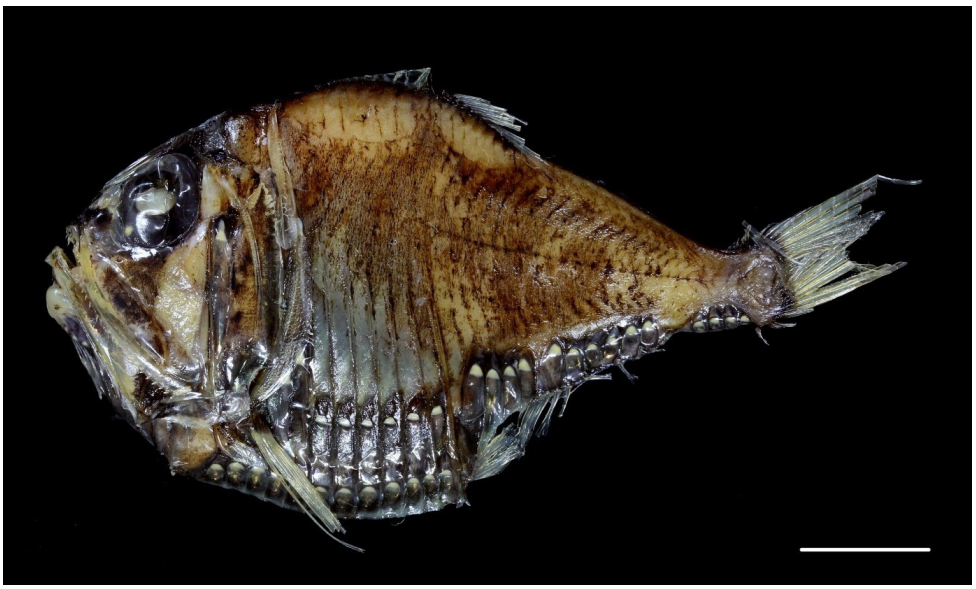

Figure 9. *Argyropelecus sladeni*, PMBC 17709, 55.4 mm SL. Scale bar 10 mm.

Distribution. Tropical to temperate waters in northern and eastern Atlantic, Indian Ocean off Réunion and Indonesia, tropical to subtropical waters in western Pacific (*e.g*., Grey 1964; Kawaguchi 1971; Badcock 1984c; Schaefer *et al*. 1986b; Quéro *et al.* 1990c; Harold 1999; 2002; Liao *et al*. 2008; Fricke *et al*. 2009) including Andaman Sea (present study).

Remarks. Situations of the dorsal- and anal-fin origins and pigmentation of the dorsal head of the present specimen well resembled those of juvenile of this species (Ozawa 1976: fig. 3F).

In the Indian Ocean, this species has been known only from off Réunion, Madagascar and Indonesia (Shcherbachev *et al*. 1986; Fricke *et al*. 2009; Gloerfelt-Tarp and Kailola 2022). Therefore, this study is the first record of the species from the Andaman Sea.

Vinciguerria nimbaria
(Jordan and Williams, 1895)
Fig. 13

Diagnosis. Gill rakers on first gill arch 17–26; total vertebrae 39–44; premaxilla with 6–10 small subequal teeth; ORB photophores 2; IV photophores 21–24; VAV photophores 8–11; summation of ventral two series of photophores 64–73; SO photophore present (Grey 1964; Kawaguchi 1971; Gorbunova 1972; Johnson and Barnett 1975; Johnson and Feltes 1984).

Materials. PMBC 30503*, 4 specimens, 18.8–22.5 mm SL, St. Z2, 7°42'N 97°28'E to 7°42'N 97°31'E, 464 m depth, otter trawl, 23 Jan. 1999; PMBC 30607, 1 specimen, 23.9 mm SL, St. J8, 7°15'N 97°33'E to 7°15'N 97°30'E, 473–494 m depth, otter trawl, 18 Feb. 2000.

Distribution. Tropical to temperate waters in northern Atlantic, western central Atlantic and Indian Oceans except Red Sea, and Pacific (*e.g*., Kawaguchi 1971; Gorbunova 1972; Badcock 1984c; Schaefer *et al.* 1986b; Quéro *et al*. 1990c; Harold 1999; Paxton e*t al*. 2006c; Kenaley and Stewart 2015c).

Family Stomiidae
Subfamily Astronesthinae
***Astronesthes formosana* Liao, Chen and Shao, 2006**
Fig. 14

Diagnosis. Dorsal-fin rays 17–20; anal-fin rays 13–15; gill filaments on first gill arch short, their number more than 40 pairs; total vertebrae 45–48; IC photophores 49–54; OA photophores 31–34; chin barbel well developed, length increasing with body growth, reaching 50–80% HL (specimens over 40–50 mm SL); tip of barbel slightly swollen or rounded; anal fin originating anterior to vertical through end of dorsal fin; anal-fin base shorter than dorsal-fin base; IV photophores arched outward on pelvic-fin base; dense aggregations of luminous tissue present on head and/or body; single luminous tissue present on opercle; luminous tissue absent on upper jaw and present on lower jaw; luminous tissue not developed on head and body; smear-like luminous patches or more than 1 pair of prominent luminous patches present on dorsal head behind upper nostril; no caudal light glands (Goodyear and Gibbs 1970; Parin and Borodulina 1997; 2003; Liao *et al*. 2006; Koizumi *et al*. 2021; Rajeev *et al*. 2022; present study).

Materials. PMBC 30366, 1 specimen, 57.3 mm SL, St. Z2, 7°42′N 97°28′E to 7°42′N 97°31′E, 464 m depth, otter trawl, 23 Jan. 1999; PMBC 30369, 1 specimen, 90.3 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, 473–494 m depth, otter trawl, 18 Feb. 2000; PMBC 30382, 1 specimen, 48.2 mm SL, HUMZ 230163, 1 specimen, 81.0 mm SL, St. E7, 8°30′N 97°07′E to 8°29′N 97°04′E, 435–444 m depth, otter trawl, 9 Feb. 2000.

Distribution. Arabian Sea, western Pacific around Taiwan and Japan (Liao *et al*. 2006; Koizumi *et al*. 2021; Rajeev *et al*. 2022) including Andaman Sea (present study).

Remarks. The number of total vertebrae of present specimens (45–46) are slightly different from that of previous descriptions (46–48: Liao *et al*. 2006; Koizumi *et al*. 2021; Rajeev *et al*. 2022).

In the Indian Ocean, this species has been known only from the Arabian Sea (Rajeev *et al.* 2022). Therefore, this study is the first record of this species from the Andaman Sea.

***Astronesthes indopacifica* Parin and Borodulina, 1997**
Fig. 15

Diagnosis. Dorsal-fin rays 17–20; anal-fin rays 13–16; gill filament on first gill arch short, their

Figure 10. *Polyipnus asper*, PMBC 17715, 58.9 mm SL. Scale bar 10 mm.

Figure 11. *Sternoptyx obscura*, PMBC 17716, 28.5 mm SL. Scale bar 10 mm.

number more than 40 pairs; total vertebrae 45–49; IC photophores 50–54; OA photophores 31–34; chin barbel well developed, length increasing with growth, reaching 60–90% HL (specimens over 40–50 mm SL); tip of barbel simple, usually not swollen or rounded, or rarely swollen or rounded; anal fin originating anterior to vertical through end of dorsal fin; anal-fin base shorter than dorsal-fin base; IV photophores arched outward on pelvic-fin base; dense aggregations of luminous tissue present on head and/or body; single luminous tissue present on opercle; no luminous tissue on both jaws; luminous tissue not developed on head and body; smear-like luminous patches or more than 1 pair of prominent luminous patches present on dorsal head behind upper nostril; no caudal light glands (Goodyear and Gibbs 1970; Parin and Borodulina 1997; 2003; Liao *et al*. 2006; Koizumi *et al.* 2021; present study).

Materials. PMBC 30368, 1 specimen, 53.8 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, 473–494 m depth, otter trawl, 18 Feb. 2000; PMBC 30378, 1 specimen, 46.1 mm SL, St. G8, 8°00′N 97°06′E to 8°00′N 97°04′E, 508–518 m depth, otter trawl, 20 Nov. 1999.

Distribution. Tropical to temperate waters in Indian, and western and central Pacific Oceans (*e.g*., Parin and Borodulina 1997; Liao *et al*. 2006; Paxton *et al*. 2006d; Stewart and Kenaley 2015a) including Andaman Sea (present study).

Remarks. The number of anal-fin rays of present specimens (12–15) are slightly different from that of previous descriptions (13–16: Liao *et al*. 2006; Koizumi *et al*. 2021).

In the Indian Ocean, *A. indopacifica* has been known only from the western and central regions (*e.g*., Parin and Borodulina 1997; 2003). Therefore, this study is the first record of this species from the Andaman Sea.

Figure 12. *Pollichthys mauli*, PMBC 30606, 21.8 mm SL. Scale bar 5 mm.

Figure 13. *Vinciguerria nimbaria*, PMBC 30607, 23.9 mm SL. Scale bar 5 mm.

***Astronesthes martensii* Klunzinger, 1871**
Fig. 16

Diagnosis. Dorsal-fin rays 11–13; anal-fin rays 17–21; total vertebrae 50–52; IC photophores 58–64; OA photophores 35–38; anal-fin base longer than dorsal-fin base; length of chin barbel usually not less than HL; terminal bulb of barbel without appendages; depth of caudal peduncle 1.2–1.7 times in its length; 2–3 middle photophores in AC series elevated posterior to anal fin; no aggregations of luminous tissue on head; one black spot present on caudal peduncle behind anal fin; transverse pigment bands around accessory photophores present (Parin and Borodulina 1995; 2003).

Materials. PMBC 30693, 2 specimens, 70.2–73.2 mm SL, St. J7, 7°15′S 7°53′E to 7°16′S 7°52′E, 356–360 m depth, Agassiz trawl, 17 Feb. 2000.

Figure 14. *Astronesthes formosana*, PMBC 30369, 90.3 mm SL. Scale bar 10 mm.

Figure 15. *Astronesthes indopacifica*, PMBC 30368, 53.8 mm SL. Scale bar 10 mm.

Figure 16. *Astronesthes martensii*, PMBC 30693, 73.2 mm SL. Scale bar 10 mm.

Comparative materials. PMBC 30370, 1 specimen, 81.5 mm SL, HUMZ 230161, 1 specimen, 76.2 mm SL, eastern Indian Ocean, 300–400 m depth, otter trawl, 8 Sep. 1980.

Distribution. Tropical waters in Indian and western Pacific Oceans (*e.g*., Gibbs 1964a; 1986a; Parin and Borodulina 1995; 2003; Harold 1999; Psomadakis *et al*. 2019; Gloerfelt-Tarp and Kailola 2022).

Borostomias mononema
(Regan and Trewavas, 1929)
Fig. 17

Diagnosis. Anal-fin rays 14–19; IC photophores 65–74 (usually 70 or more); VAL photophores 21–25; OA photophores 46–49; postorbital organs 2; anterior part of both jaws with fangs not much larger than other teeth; teeth on both jaws curved; row of AC photophores straight, not curved upward behind anal-fin base (Gibbs 1964a; 1984a; 1986a; Borodulina 2008; present study).

Materials. PMBC 30367, 1 specimen, 76.8 mm SL, St. J8, 7°15′N 97°30′E to 7°15′N 97°32′E, 490–479 m depth, Agassiz trawl, 18 Feb. 2000; PMBC 30372, 1 specimen, 192.2 mm SL, St. J8, 7°21′N 97°26′E to 7°20′N 97°25′E, 520–531 m depth, otter trawl, 27 Jan. 1999; PMBC 30390, 1 specimen, 193.8 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, 473–494 m depth, otter trawl, 18 Feb. 2000; PMBC 30381, 2 specimens, HUMZ 230162, 1 specimen, SL unmeasured due to damage, station and date unknown.

Distribution. Tropical to temperate waters in eastern Atlantic, Indian and western Pacific Oceans (Gibbs 1964a; 1984a; 1986a; 1990a; Fujii 1983; Paxton *et al*. 2006d; Stewart and Kenaley 2015a; Sutton *et al.* 2020) including Andaman Sea (present study).

Remarks. The number of anal-fin rays and IC photophores of present specimens (14–18 and 70–74, respectively) are slightly different from those of previous descriptions (15–19 and 65–72: Gibbs 1984a; 1986a).

Borostomias mononema has been known from the eastern Indian Ocean (*e.g.*, Gibbs 1964a; Paxton *et al*. 2006d), but has not been recorded from the Andaman Sea (*e.g*., Monkolprasit *et al.* 1997; Satapoomin 2011; Rajan *et al.* 2013; Psomadakis *et al.* 2019). Therefore, this study is the first record of this species from the Andaman Sea.

Subfamily Stomiinae
***Stomias affinis* Günther, 1887**
Fig. 18

Diagnosis. Pectoral-fin rays 6–7; total vertebrae 66–72; premaxillary teeth 5–6; dentary teeth 9–12; small teeth on each side of dentary around symphysis 3–4; teeth on palatine 2; PV photophores 41–46; VAV photophores 5–9; IC photophores 73–82; OV photophores 40–46; VAL photophores 4–8; OA photophores 46–53; rows of hexagonal areas dorsal to lateral series of photophores 6; length from snout to pelvic-fin insertion 73.1–77.0% SL; distance between pelvic-fin insertion and anal-fin origin shorter than length of anal-fin base; barbel length usually about equal to HL; longest mandibular tooth shorter than longest premaxillary tooth (Ege 1934; Morrow 1964b; Gibbs 1969; Shcherbachev and Novikova 1976; Fink and Fink 1986; present study).

Materials. PMBC 30361, 1 specimen, 63.3 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, 549–689 m depth, otter trawl, 11 Feb. 1999; PMBC 30362, 3 specimens, 78.2–107.6 mm SL, station unknown, 25 Jan. 1999; PMBC 30373, 1 specimen, 82.2 mm SL, PMBC 30510*, 2 specimens, 69.6–82.2 mm SL, St. Z2, 7°42′N 97°28′E to 7°42′N 97°31′E, 464 m depth, otter trawl, 23 Jan. 1999; PMBC 30506*, 6 specimens, 41.4–118.4 mm SL, St. E7, 8°30'N 97°07'E to 8°29'N 97°04'E, 435–444 m depth, otter trawl, 9 Feb. 2000; PMBC 30507*, 1 specimen, 121.2 mm SL, St. B8, 9°10′N 96°18′E to 9°09′N 96°16′E, 489–504 m depth, otter trawl, 11 Feb. 1999; PMBC 30508*, 4 specimens, 78.9–143.2 mm SL, St. B10, 9°11′N 96°12′E to 9°10′N 96°14′E, 689–549 m depth, otter trawl, 11 Feb. 1999; PMBC 30509*, 2 specimens, 89.2–119.2 mm SL, PMBC 30513*, 4 specimens, 99.8–60.1 mm SL, PMBC 30515*, 1 specimen, 45.3 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N97°30′E, 473–494 m depth, otter trawl, 18 Feb. 2000; PMBC 30511*, 1 specimen, 141.4 mm SL, St. G8, 8°00′N 97°06′E to 8°00′N 97°04′E, 508–518 m depth, otter trawl, 20 Nov. 1999; PMBC 30512*, 2 specimens, 96.0–120.2 mm SL, St. J10, 7°20′N 97°14′E to 7°22′N 97°13′E, 655–651 m depth, otter trawl, 28

Jan. 1999; PMBC 30514*, 3 specimens, 102.3–139.8 mm SL, St. Z3, 7°42′N 97°20′E to 7°42′N 97°18′E, 493–322 m depth, otter trawl, 24 Jan. 1999; HUMZ 230157, 1 specimen, 119.1 mm SL, HUMZ 230158, 1 specimen, 145.0 mm SL, station unknown, 25 Jan. 1999.

Distribution. Tropical to temperate waters in world oceans (*e.g*., Ege 1934; Morrow 1964b; Gibbs 1969; 1990b; Shcherbachev and Novikova 1976; Paxton *et al*. 2006e; Rajan *et al*. 2013; Kenaley and Stewart 2015d; Koeda 2020b; Sutton *et al*. 2020).

Remarks. The number of OA photophores of present specimens (46–48) is slightly different from that of previous descriptions (48–53: Gibbs 1969; Shcherbachev and Novikova 1976).

Stomias nebulosus Alcock, 1889

Fig. 19

Diagnosis. Pectoral-fin rays 6–7; total vertebrae 59–65; premaxillary teeth 16–25; dentary teeth 9–16; teeth on palatine 2–3; PV photophores 33–38; VAV photophores 5–9; IC photophores 66–73; OV photophores 32–38; VAL photophores 5–9; OA photophores 40–45; rows of hexagonal areas dorsal to lateral series of photophores 6; length from snout to pelvic-fin origin 66.7–70.6% SL; distance between pelvic- and anal-fin origins shorter than length of anal-fin base; barbel length usually about equal to HL; longest mandibular tooth longer than longest premaxillary tooth (Ege 1934; Morrow 1964b; Gibbs 1969; Shcherbachev and Novikova 1976; Fink and Fink 1986; present study).

Materials. PMBC 30360, 5 specimens, 64.1–91.9 mm SL, PMBC 30526*, 1 specimen, 99.1 mm SL, St. B10, 9°11'N 96°12'E to 9°10'N 96°14'E, 689–549 m depth, otter trawl, 11 Feb. 1999; PMBC 30364, 2 specimens, 51.1–59.9 mm SL, PMBC 30517*, 44 specimens, 42.7–98.0 mm SL, PMBC 30518*, 3 specimens, SL unmeasured due to damage, PMBC 30520*, 3 specimens, 72.0–103.6 mm SL, PMBC 30525*, 1 specimen, 93.8 mm SL, St. E7, 8°30'N 97°07'E to 8°29'N 97°04'E, 435–444 m depth, otter trawl, 9 Feb. 2000; PMBC 30516*, 44 specimens, 50.6–101.5 mm SL, PMBC 30521*, 3 specimens, 36.0–107.3 mm SL, PMBC 30522, 6 specimens, 48.2–82.0 mm SL, PMBC 30527*, 6 specimens, 40.7–75.3 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N97°30′E, 473–494 m depth, otter trawl, 18 Feb. 2000; PMBC 30519*, 1 specimen,

Figure 17. *Borostomias mononema*, PMBC 30367, 76.8 mm SL. Scale bar 10 mm.

88.8 mm SL, PMBC 30528*, 1 specimen, 106.1 mm SL, St. G8, 8°00′N 97°06′E to 8°00′N 97°04′E, 508–518 m depth, otter trawl, 20 Nov. 1999; PMBC 30523*, 1 specimen, 70.5 mm SL, St. Z2, 7°42′N 97°28′E to 7°42′N 97°31′E, 464 m depth, otter trawl, 23 Jan. 1999; PMBC 30524*, 1 specimen, 77.2 mm SL, St. L8, 6°46′N 97°33′E to 6°44′N 97°35′E, 513–501 m depth, otter trawl, 22 Feb. 2000; HUMZ 230155, 1 specimen, 66.3 mm SL, HUMZ 230156, 1 specimen, 63.5 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, 549–689 m depth, otter trawl, 11 Feb. 1999.

Distribution. Tropical to temperate waters in Indian and western and central Pacific Oceans (*e.g.*, Ege 1934; Morrow 1964b; Gibbs 1969; 1986b; Shcherbachev and Novikova 1976; Rajan *et al.* 2013; Koeda 2020b).

Remarks. The number of teeth on the anterior end of the palatine of the present specimens (2–3) is slightly different from that of previous descriptions (2: Gibbs 1969; Shcherbachev and Novikova 1976).

Chauliodus sloani Bloch and Schneider, 1801

Fig. 20

Diagnosis. Total vertebrae 53–62; VAV photophores 22–28; IC photophores 64–72 (rarely 62 or 63); OA photophores 43–48 (rarely 42 or 49); rows of hexagonal areas dorsal to lateral series of photophores 5; fourth premaxillary tooth longer than third; dorsal-fin origin over fifth to nineth (rarely fourth or tenth) OV photophore; postorbital photophore round or nearly so; postorbital photophore present below or anterior to vertical through posterior edge of eye (Morrow 1961; 1964a; Gibbs and Hurwitz 1967; Parin and Novikova 1974).

Materials. PMBC 30359, 3 specimens, 118.0–144.8 mm SL, PMBC 30534*, 17 specimens, 74.9–167.8 mm SL, PMBC 30553*, 1 specimen, ca. 55 mm SL, PMBC 30560*, 100 specimens, 69.5–170.7 mm SL, PMBC 30561*, 87 specimens, 65.3–173.9 mm SL, St. J8, 7°15'N 97°33'E to 7°15'N 97°30'E, 473–494 m depth, otter trawl, 18 Feb. 2000; PMBC 30535*, 17 specimens, 61.3–137.9 mm SL, St. L8, 6°46'N 97°33'E to 6°45'N 97°35'E, 513–501 m depth, otter trawl, 22 Feb. 2000; PMBC 30536*, 13 specimens, 102.9–158.2 mm SL, St. Z3, 7°42'N 97°20'E to 7°42'N 97°18'E, 493–322 m depth, otter trawl, 24 Jan. 1999; PMBC 30537*, 3 specimens, 120.7–146.3 mm SL, PMBC 30554*, 1 specimen, 111.2 mm SL, PMBC 30556*, 1 specimen, 108.1 mm SL, PMBC 30558*, 1 specimen, 95.7 mm SL, St. G8, 8°00'N 97°06'E to 8°00'N 97°04'E, 508–518 m depth, otter trawl, 20 Nov. 1999; PMBC 30538*, 132 specimens, 62.3–158.2 mm SL, PMBC 30539*, 34 specimens, 108.9–152.5 mm SL, St. E7, 8°30'N 97°07'E to 8°29'N 97°04'E, 435–444 m depth, otter trawl, 9 Feb. 2000; PMBC 30540*, 30 specimens, 52.9–168.0 mm SL, St. B10, 9°11'N 96°12'E to 9°10'N 96°14'E, 689–549 m depth, otter trawl, 11 Feb. 1999; PMBC 30541*, 1 specimen, 126.1 mm SL, St. C10, 9°00'N 96°15'E to 9°00'N 96°13'E, 478–480 m depth, Agassiz trawl, 3 Feb. 2000; PMBC 30542*, 1 specimen, 124.7 mm SL, St. J8, 7°15'N 97°30'E to 7°15'N 97°32'E, 490–479 m depth, Agassiz trawl, 18 Feb. 2000; PMBC 30543*, 2 specimens, 105.4–149.0 mm SL, PMBC 30546*, 1 specimen, 70.1 mm SL, PMBC 30548*, 1 specimen, 131.8 mm SL, St. J10, 7°20'N 97°14'E to 7°22'N 97°13'E, 655–651 m depth, otter trawl, 28 Jan. 1999; PMBC 30544*, 4 specimens, 71.3–120.9 mm SL, station unknown, 25 Jan. 1999; PMBC 30545*, 10 specimens, 45.7–85.3 mm SL, PMBC 30557*, 1 specimen, 60.1 mm SL, PMBC 30559*, 21 specimens, 76.2–157.0 mm SL, St. Z2, 7°42'N 97°'28E to 7°42'N 97°31'E, 464 m depth, otter trawl, 23 Jan. 1999; PMBC 30547*, 2 specimens, 99.4–ca. 105 mm SL, St. K11, 7°00'N 97°18'E to 7°00'N 97°21'E, 828–684 m depth, Agassiz trawl, 16 Nov. 1999; PMBC 30549*, 1 specimen, 111.5 mm SL, station and date unknown; PMBC 30550*, 1 specimen, 134.3 mm SL, St. L8, 6°45'N 97°36'E to 6°44'N 97°34'E, 482–507 m depth, Agassiz trawl, 22 Feb. 2000; PMBC 30551*, 4 specimens, 113.9–143.5 mm SL, St. C8, 9°00'N 96°15'E to 9°00'N 96°13'E, 478–480 m depth, Agassiz trawl, 3 Feb. 2000; PMBC 30552*, 1 specimen, 150.4 mm SL, St. E7, 8°30'N 97°01'E to 8°29'N 97°03'E, 449–446 m depth, Agassiz trawl, 8 Feb. 2000; PMBC 30555*, 2 specimens, ca. 125–158.5 mm SL, St. E9, 8°30'N 95°58'E to 8°28'N 95°58'E, 649–650 m depth, otter trawl, 5 Feb. 1999; HUMZ 230153, 1 specimen, 165.0 mm SL, HUMZ 230154, 1 specimen, 169.6 mm SL, St. J10, 7°15′N 97°16′E to 7°15′N 97°14′E, 662–696 m depth, otter trawl, 19 Feb. 2000.

Figure 18. *Stomias affinis*, PMBC 30362, 107.6 mm SL. Scale bar 10 mm.

Figure 19. *Stomias nebulosus*, PMBC 30360, 91.9 mm SL. Scale bar 10 mm.

Figure 20. *Chauliodus sloani*, PMBC 30359, 144.8 mm SL. Scale bar 10 mm.

Distribution. Tropical to temperate waters in world oceans (*e.g*., Morrow 1961; 1964a; Gibbs and Hurwitz 1967; Parin and Novikova 1974; Gibbs 1984b; 1986c; Parin 1990; Paxton *et al.* 2006e; Rajan *et al*. 2013; Stewart 2015; Psomadakis *et al*. 2019; Sutton *et al*. 2020).

Subfamily Melanostomiinae
***Bathophilus pawneei* Parr, 1927**
Fig. 21

Diagnosis. Pectoral-fin rays 2 (rarely 1); total vertebrae 45; body depth 9.6–17.8% SL; pelvic-fin base situated equidistant between dorsal and ventral profiles of body (Morrow and Gibbs 1964; Barnett and Gibbs 1968).

Material. PMBC 30375, 1 specimen, 32.6 mm SL, St. Z2, 7°42′N 97°28′E to 7°42′N 97°31′E, 464 m depth, otter trawl, 23 Jan. 1999.

Distribution. Tropical to temperate waters in Atlantic, Indian and western Pacific Oceans (*e.g*., Morrow and Gibbs 1964; Barnett and Gibbs 1968; Gibbs and Barnett 1990; Paxton *et al*. 2006f; Aizawa and Doiuchi 2013b; Koeda 2020b; Sutton *et al*. 2020; Villarins *et al*. 2022) including Andaman Sea (present study).

Remarks. Barnett and Gibbs (1968) included the Indian Ocean in the distribution of *B. pawneei*. However, this species has never been known from the Andaman Sea (*e.g*., Monkolprasit *et al*. 1997; Satapoomin 2011; Rajan *et al*. 2013; Psomadakis *et al*. 2019). Therefore, this study is the first record of this species from the Andaman Sea.

***Eustomias* (*Haploclonus*) *bifilis* Gibbs, 1960**
Fig. 22

Diagnosis. Pectoral-fin rays 3; pelvic-fin rays 7; total vertebrae 56–59; premaxillary teeth 6–10; mandibular teeth 6–10; IC photophores 65–68; OC photophores 59–62; main stem of barbel ending in single bulb; barbel having long single branch with one distal bulb; slender barbel stem without external pigmentation; single row of black spots present along part of barbel stem; deep groove on ventral body absent (Gibbs 1960; Morrow and Gibbs 1964; Parin and Pokhilskaya 1974; Gibbs *et al*. 1983; Prokofiev 2018; present study).

Material. PMBC 30388, 1 specimen, 46.2 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, 473–494 m depth, otter trawl, 18 Feb. 2000.

Distribution. Tropical to temperate waters in Indian and western and central Pacific Oceans (*e.g*., Gibbs 1960; Parin and Pokhilskaya 1974; Fujii 1982; Paxton *et al*. 2006f; Aizawa and Doiuchi 2013b; Koeda 2020b; Gloerfelt-Tarp and Kailola 2022) including Andaman Sea (present study).

Remarks. Although *E.* (*H.*) *bifilis* is widely distributed in the Indian Ocean (Parin and Pokhilskaya 1974), this species has never been recorded from the Andaman Sea (*e.g*., Monkolprasit *et al*. 1997; Satapoomin 2011; Rajan *et al*. 2013; Psomadakis *et al*. 2019). Therefore, this study is the first record of this species from the Andaman Sea.

***Leptostomias multifilis* Imai, 1941**
Fig. 23

Diagnosis. Dorsal-fin rays 19–21; anal-fin rays 24–27; base of barbel stem with filaments; bulb of barbel with one pair of filaments near its base; bulb of barbel not split; distal part of bulb of barbel with brush of many short filaments (Imai 1941; Morrow and Gibbs 1964; Fujii 1984).

Materials. PMBC 30374, 1 specimen, 159.3 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, 473–494 m depth, otter trawl, 18 Feb. 2000; PMBC 21475, 1 specimen, 66.8 mm SL, PMBC 30504*, 1 specimen, 184.6 mm SL, station and date unknown.

Distribution. Around Taiwanese and Japanese waters and southern Kuril Islands (*e.g*., Imai 1941; Parin and Sokolovsky 1976; Fujii 1984; Savinykh *et al*. 2004; Liao *et al*. 2008; Aizawa and Doiuchi 2013b) and Andaman Sea (present study).

Remarks. *Leptostomias multifilis* has been known only from Taiwan, Japan and Kuril Islands (*e.g*., Imai 1941; Parin and Sokolovsky 1976; Savinykh *et al*. 2004; Liao *et al*. 2008). Therefore, this study is the first record of this species from the Indian Ocean.

Figure 21. *Bathophilus pawneei*, PMBC 30375, 32.6 mm SL. Scale bar 10 mm.

Figure 22. *Eustomias* (*Haploclonus*) *bifilis*, PMBC 30388, 46.2 mm SL. Scale bar 10 mm.

***Melanostomias melanops* Brauer, 1902**
Fig. 24

Diagnosis. IC photophores 60–64; OA photophores 39–41; no luminous tissue on dorsal head; distal part of barbel expanded; core of barbel stem continuing in tip of barbel as an axis; tip of barbel with terminal filament and with/without single bulb beside axis; barbel stem heavily pigmented only on its base, sparsely pigmented beyond base (Regan and Trewavas 1930; Morrow and Gibbs 1964; Parin and Pokhilskaya 1978).

Material. PMBC 30387, 1 specimen, 51.6 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, 473–494 m depth, otter trawl, 18 Feb. 2000.

Distribution. Tropical to subtropical waters in world oceans (*e.g.*, Morrow and Gibbs 1964; Parin and Pokhilskaya 1978; Gibbs 1984c; Gibbs and Barnett 1990; Aizawa and Doiuchi 2013b; Kenaley and Stewart 2015e; Sutton *et al.* 2020) including Andaman Sea (present study).

Remarks. *Melanostomias melanops* is widely distributed in the Indian Ocean except the Andaman Sea (Morrow and Gibbs 1964; Parin and Pokhilskaya 1978; Monkolprasit *et al.* 1997; Satapoomin 2011; Rajan *et al*. 2013; Psomadakis *et al*. 2019). Therefore, this study is the first record of this species from the Andaman Sea.

***Melanostomias valdiviae* Brauer, 1902**
Fig. 25

Diagnosis. IC photophores 56–59; OA photophores 36–39; no luminous tissue on dorsal head; distal part of barbel not expanded except tip; core of barbel stem continuing in tip of barbel as an axis; tip of barbel without terminal filament, with 3–4 bulbs beside axis (1–2 bulbs on each side of axis); barbel stem entirely pigmented except tip (Regan and Trewavas 1930; Morrow and Gibbs 1964; Parin and Pokhilskaya 1978; Aizawa and Doiuchi 2013b).

Materials. PMBC 30389, 1 specimen, 57.1 mm SL, St. B8, 9°10′N 96°18′E to 9°09′N 96°16′E, 489–504 m depth, otter trawl, 11 Feb. 1999; PMBC 30376, 1 specimen, 139.0 mm SL, St. Z3, 7°42′N 97°20′E to 7°42′N 97°18′E, 322–493 m depth, otter trawl, 24 Jan. 1999; PMBC 30377, 1 specimen, 111.1 mm SL, St. J10, 7°15′N 97°33′E to 7°15′N 97°30′E, 444–473 m depth, otter trawl, 18 Feb. 2000; PMBC 30385, 1 specimen, 148.8 mm SL, St. J10, 7°21′N 97°33′E to 7°20′N 97°32′E, 520–532 m depth, otter trawl, 27 Jan. 1999; PMBC 30505*, 1 specimen, 143.5 mm SL, station and date unknown.

Distribution. Tropical to subtropical waters in world oceans (*e.g.*, Gibbs 1960; 1984c; 1986d; Morrow and Gibbs 1964; Parin and Pokhilskaya 1978; Gibbs and Barnett 1990; Paxton *et al*. 2006f; Aizawa and Doiuchi 2013b; Kenaley and Stewart 2015e; Koeda 2020b; Sutton *et al*. 2020).

***Photonectes* (*Photonectes*) *albipennis* (Döderlein, 1882)**
Fig. 26

Diagnosis. BR photophores 5–7; IV photophores 37–38; premaxillary teeth biserial; premaxillary and dentary teeth heterogenous in juvenile and homogenous in adult; vertical fins not covered with skin; pectoral fin absent; elongate barbel with a minute terminal bulb and a single terminal filament (sometimes with secondary bulblets); dorsal branch of barbel absent; barbel stem entirely pigmented; 1–2 white luminous shoulder spots present above gill opening; blue luminous tissue absent on head and body; IP photophore origin at middle of isthmus; all VAV photophores equally spaced (Klepadlo 2011; Prokofiev 2019; Prokofiev and Frable 2021).

Material. PMBC 30371, 1 specimen, 193.1 mm SL, St. J10, 7°20′N 97°14′E to 7°22′N 97°13′E, 585–655 m depth, otter trawl, 27 Jan. 1999.

Distribution. Tropical to temperate waters in Indian Ocean and western and central Pacific (*e.g.*, Morrow and Gibbs 1964; Fujii 1982; Paxton *et al*. 2006f; Aizawa and Doiuchi 2013b; Prokofiev 2019; Gloerfelt-Tarp and Kailola 2022) including Andaman Sea (present study).

Remarks. *Photonectes* (*Photonectes*) *albipennis* has been known from the eastern and western Indian Ocean (Paxton *et al*. 2006f; Prokofiev 2019; Gloerfelt-Tarp and Kailola 2022). However, this species has never been known from the Andaman Sea (*e.g.*, Monkolprasit *et al*. 1997; Satapoomin 2011; Rajan *et al*. 2013; Psomadakis *et al.* 2019). Therefore, this study is the first record of this species from the Andaman Sea.

***Photonectes* (*Photonectes*) *coffea* Klepadlo, 2011**
Fig. 27

Diagnosis. BR photophores 5–7; IV photophores 37–39; premaxillary teeth biserial; premaxillary and dentary teeth heterogenous in juvenile and homogenous in adult; vertical fins not covered with skin; pectoral fin absent; elongate barbel with two bulbs and a single terminal filament; dorsal branch of barbel absent; barbel stem entirely pigmented; 1–2 white luminous shoulder spots present above gill opening; blue luminous tissue absent on head and body; IP photophore origin at middle of isthmus; all VAV photophores equally spaced (Klepadlo 2011; Flynn and Klepadlo 2012; Prokofiev 2019; Prokofiev and Frable 2021).

Materials. PMBC 30379, 1 specimen, 71.7 mm SL, St. E7, 8°30′N 97°07′E to 8°29′N 97°04′E, 435–444 m depth, otter trawl, 9 Feb. 2000; PMBC 30380, 1 specimen, 89.5 mm SL, St. G8, 8°00′N 97°06′E to 8°00′N 97°04′E, 508–518 m depth, otter trawl, 20 Nov. 1999; PMBC 30383, 1 specimen, 91.5 mm SL, St. Z4, 7°34′N 97°03′E to 7°35′N

Figure 23. *Leptostomias multifilis*, PMBC 30374, 159.3 mm SL. Scale bar 10 mm.

Figure 24. *Melanostomias melanops*, PMBC 30387, 51.6 mm SL. Scale bar 10 mm.

97°04′E, 660–633 m depth, otter trawl, 25 Jan. 1999; PMBC 30384, 2 specimens, 89.3–134.0 mm SL, St. E8, 8°32′N 96°04′E to 8°31′N 96°07′E, 478–488 m depth, otter trawl, 6 Feb. 1999; PMBC 30386, 3 specimens, 109.5–182.5 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, 473–494 m depth, otter trawl, 18 Feb. 2000; HUMZ 230164, 1 pecimen, 135.3 mm SL, HUMZ 230165, 1 specimen, 125.8 mm SL, St. J8, 7°15′N 97°33′E to 7°15′N 97°30′E, 473–494 m depth, otter trawl, 18 Feb. 2000.

Distribution. Andaman Sea, and tropical to subtropical waters in western and central Pacific (Klepadlo 2011; Prokofiev 2019; Koeda 2020b).

Subfamily Idiacanthinae
Idiacanthus fasciola Peters, 1877

Figs. 28, 29

Diagnosis. VAV photophores 13–18; dorsal-fin origin anterior to pelvic-fin base; dorsal-fin origin at 22–25th vertebrae; anal-fin origin at 41–44th vertebrae; pelvic-fin insertion at 25–27th vertebrae; length from pelvic-fin insertion to anal-fin origin less than length of anal-fin base (Gibbs 1964b; 1984d; Hulley 1986; Gon *et al*. 2022).

Materials. PMBC 30363, 5 specimens, 73.1–122.2 mm SL, PMBC 30529*, 1 specimen, 90.2 mm SL, St. E7, 8°30′N 97°07′E to 8°29′N 97°04′E, 435–444 m depth, otter trawl, 9 Feb. 2000; PMBC 30365, 2 specimens, 244.8–267.9 mm SL, PMBC 30531*, 1 specimen, 209.5 mm SL, St. J10, 7°20′N 97°14′E to 7°22′N 97°13′E, 655–651 m depth, otter trawl, 28 Jan. 1999; PMBC 30530*, 1 specimen, 153.9 mm SL, St. J10, 7°15'N 97°16'E to 7°15'N 97°14'E, 662–696 m depth, otter trawl, 19 Feb. 2000; PMBC 30532*, 2 specimens, 234.1–257.3 mm SL, St. Z3, 7°42′N 97°20′E to 7°42′N 97°18′E, 493–422 m depth, otter trawl, 24 Jan. 1999; PMBC 30533*, 1 specimen, 156.1 mm SL, St. L8, 6°46′N 97°33′E to 6°44′N 97°35′E, 513–501 m depth, otter trawl, 22 Feb. 2000; HUMZ 230159, 1 specimen, 157.2 mm SL, HUMZ 230160, 1 specimen, 73.6 mm SL, St. E7, 8°30′N 97°07′E to 8°29′N 97°04′E, 435–444 m depth, otter trawl, 9 Feb. 2000.

Distribution. Tropical and subtropical waters in Atlantic, Indian and Pacific Oceans (*e.g*., Gibbs 1964b; 1984d; Hulley 1986; Krueger 1990; Harold, 1999; Randall and Lim 2000; Paxton *et al*. 2006g; Aizawa and Doiuchi 2013c; Stewart and Kenaley 2015b; Koeda 2020b; Sutton *et al*. 2020; Gon *et al*. 2022) including Andaman Sea (present study).

Remarks. Most of the present specimens have a pointed appendage and a terminal filament in the tip of the barbel (Fig. 29A), which is congruent with the morphology of the tip of the barbel of the previous description (Gibbs 1964b). On the other hand, one individual of PMBC 30363 has no appendage and terminal filament in the tip of the barbel (Fig. 29B). This study identified this individual as *I. fasciola* because the other characters of this individual are congruent with the diagnosis of *I. fasciola*: *e.g.*, dorsal-fin origin at 22–25th vertebrae; anal-fin origin at 41–44th vertebrae (Gon *et al*. 2022). The aberrant morphology of the tip of the barbel of this individual is possibly caused by damage or regeneration.

Although *I. fasciola* has been known from the western and eastern Indian Ocean (*e.g*., Hulley 1986; Paxton *et al*. 2006g), this species has never been known from the Andaman Sea (*e.g*., Monkolprasit *et al*. 1997; Satapoomin 2011; Rajan *et al*. 2013; Psomadakis *et al*. 2019). Therefore, this study is the new record of this species from the Andaman Sea.

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Figure 25. *Melanostomias valdiviae*, PMBC 30385, 148.8 mm SL. Scale bar 10 mm.

Figure 26. *Photonectes* (*Photonectes*) *albipennis*, PMBC 30371, 193.1 mm SL. Scale bar 10 mm.

Figure 27. *Photonectes* (*Photonectes*) *coffea*, PMBC 30386, 137.0 mm SL. Scale bar 10 mm.

Figure 28. *Idiacanthus fasciola,* PMBC 30365, 244.8 mm SL. Scale bar 10 mm.

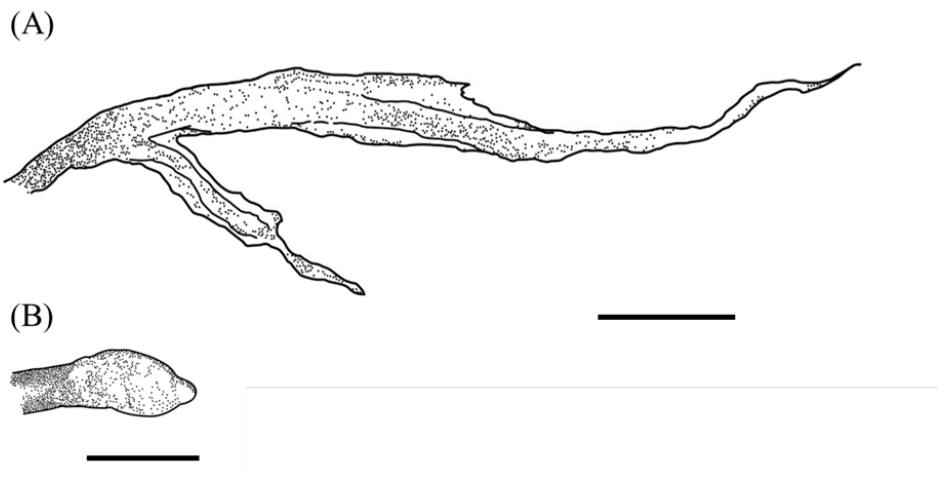

Figure 29. Tip of chin barbel in *Idiacanthus fasciola*. (A): PMBC 30363, 82.0 mm SL; (B): PMBC 30363, 148.7 mm SL. Scale bars 1 mm.

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