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ABSTRACT: During the project of the Biodiversity of the Andaman Sea Shelf in 1996–2000, 73 fish specimens of the orders Beryciformes and Stephanoberyciformes were collected from deep-sea waters of the Andaman Sea by R/V Chakratong Tongyai. These specimens were identified as a single diretmid Diretmoides veriginae Kotlyar, 1987, three trachichthyids Gephyroberyx darwinii (Johnson, 1866), Hoplostethus confinis Kotlyar, 1980 and Hoplostethus melanopus (Weber, 1913), and four melamphaids Melamphaes polylepis Ebeling, 1962, Poromitra macrophthalma (Gilchrist, 1903), Scopelogadus mizolepis mizolepis (Günther, 1878) and Scopelogadus unispinis Ebeling and Weed, 1963. This study represents the first records of M. polylepis, P. macrophthalma, S. mizolepis mizolepis and S. unispinis from the Andaman Sea.

Keywords: Diretmidae, Trachichthyidae, Melamphaidae, Thailand, BIOSHELF

INTRODUCTION

The Biodiversity of the Andaman Sea Shelf (BIOSHELF) project was carried out in cooperation of Phuket Marine Biological Center (PMBC), Thailand and the Zoological Museum, University of Copenhagen (Denmark) during 1996–2000 (Aungtonya et al., 2000). A number of deep-sea fish specimens collected by R/V Chakratong Tongyai during the project are deposited at PMBC, but a large part of the collection had not been examined in detail. This paper is a part of comprehensive species list of deep-sea fishes collected by the BIOSHELF project (see Kawai et al., 2017) and reports the orders Beryciformes and Stephanoberyciformes (sensu Nelson, 2006).

MATERIALS AND METHODS

All specimens were collected from the Andaman Sea off Thailand during the BIOSHELF project. Detailed sampling stations are shown in Aungtonya et al. (2000). Those specimens are preserved in 70% ethanol after 10% formalin fixation, and currently deposited at the Reference Collection of PMBC. Comparative specimens examined in this study are deposited at the PMBC Reference Collection and the Hokkaido University Museum, Hakodate, Japan (HUMZ).

Counts and proportional measurements follow Hubbs and Lagler (1958) for Diretmidae, Kotlyar (1996) for Trachichthyidae, and Ebeling and Weed (1963) for Melamphaidae. Standard length is abbreviated as SL. All measurements were made to the nearest 0.1 mm with digital calipers. Vertebrae were counted from radiographs.
**SPECIES LIST**

**Order Beryciformes**

**Family Diretmidae**

*Diretmoides veriginae* Kotlyar, 1987

![Image](image_url)

**Diagnosis.** Anus located about midway between pelvic-fin base and anal-fin origin; each side of dorsal- and anal-fin rays armed with one row of equal sized spines; pelvic fin reaching anal-fin origin; and total gill rakers on first gill arch 21–24 (Kotlyar, 1988).

**Materials.** 80 specimens (93.9–157.9 mm SL). PMBC 30229 (12 specimens, 118.3–150.2 mm SL), PMBC 30230 (7 specimens, 116.6–140.0 mm SL), PMBC 30231 (5 specimens, 122.3–157.9 mm SL), PMBC 30232 (9 specimens, 121.3–147.8 mm SL), St. E8, 8°32′N, 96°04′E to 8°31′N, 96°07′E, 488–478 m depth, 6 Feb. 1999; PMBC 30233, 13 specimens, 115.0–133.6 mm SL, St. J8, 7°21′N, 97°26′E to 7°20′N, 97°26′E, 520–531 m depth, 27 Jan. 1999; PMBC 30234, 1 specimen, 93.9 mm SL, St. J8, 7°15′N, 97°30′E to 7°15′N, 97°32′E, 490–479 m depth, 18 Feb. 2000; PMBC 30235, 2 specimens, 131.7–137.3 mm SL, St. L8, 6°46′N, 97°33′E to 6°44′N, 97°35′E, 513–501 m depth, 22 Feb. 2000; PMBC 30236 (1 specimen, 154.9 mm SL), PMBC 30237 (1 specimen, 148.8 mm SL), PMBC 30238 (1 specimen, 155.5 mm SL), further locality and date unknown; PMBC 30340, 1 specimen, 122.5 mm SL, St. Z2, 7°42′N, 97°28′E to 7°42′N, 97°31′E, 464–464 m depth, 23 Jan. 1999; PMBC 30341, 27 specimens, 114.9–139.6 mm SL, St. Z3, 7°42′N, 97°20′E to 7°42′N, 97°18′E, 493–322 m depth, 24 Jan. 1999.

**Distribution.** Andaman Sea, northeastern Indian Ocean around Mentawai Ridge, Timor Sea, and South and East China seas at depths of 340–1300 m (Kotlyar, 1988; 2002; Okamoto and Hoshino, 2010; present study).

**Remarks.** Although Kotlyar (1988) included the “northwestern” part of the Indian Ocean in the distribution of the species, this is apparently a mistake for “northeastern,” considering the collection localities of the specimens he examined, and the map showing the distribution (Kotlyar, 1988: fig. 2).

**Comparative materials.** *Diretmoides veriginae.* PMBC 30239, 4 specimens, ca. 64.3–70.4 mm SL, Indian Ocean (further locality unknown), 300–400 m depth, R/V Dr. Fridtjof Nansen, otter trawl, 8 Sep. 1980.

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**Figure 1.** *Diretmoides veriginae,* PMBC 30231 (1 of 5 specimens), 157.9 mm SL. Scale bar 10 mm.
Deep-sea fishes from the Andaman Sea

Family Trachichthyidae

Gephyroberyx darwinii (Johnson, 1866)

Fig. 2

Diagnosis. Dorsal-fin spines 8, middle spine longest; lateral-line scales slightly larger than body scales; and prominent spine on opercle extending beyond posterior edge of opercle (Kotlyar, 1996; Roberts and Gomon, 2015).

Materials. PMBC 30240, 2 specimens, 159.9–165.1 mm SL, St. K6, 7°02′N, 98°10′E to 7°04′N, 98°09′E, 277–288 m depth, 1 Mar. 2000.

Distribution. Widespread in Indo-West Pacific, Atlantic and Mediterranean at depths of 9–1210 m (e.g., Kotlyar, 1996; Roberts and Gomon, 2015; Moore, 2016; present study).

Figure 2. Gephyroberyx darwinii, PMBC 30240 (1 of 2 specimens), 159.9 mm SL. Scale bar 10 mm.

Hoplostethus confinis Kotlyar, 1980

Fig. 3

Diagnosis. Pectoral-fin rays 15–16; total gill rakers on first gill arch 5–6 + 1 + 12 = 18–19; predorsal scales 18–20; lateral-line scales with single backward spine at middle; and body yellowish brown when preserved (Kotlyar, 1996; present study).

Material. PMBC 30241, 1 specimen, 111.2 mm SL, St. K6, 7°02′N, 98°10′E to 7°04′N, 98°09′E, 277–288 m depth, 1 Mar. 2000.

Distribution. Known only from the Andaman Sea at depths of 277–330 m (Kotlyar, 1996; present study).

Remarks. Kotlyar (1996) reported H. confinis has five upper gill-rakers and 18 predorsal scales based on two type specimens, while the present specimen has six and 20, respectively, which is considered as intraspecific variations of the species.

Roberts and Gomon (2012) identified two specimens collected from the eastern Indian Ocean off Indonesia (HUMZ 191395 and HUMZ 194238) as H. confinis. However, those specimens have remarkably thickened fin spines which are conspicuous diagnostic features of Hoplostethus robustispinus Moore and Dodd, 2010 [stated by Moore and Dodd (2010)], and many other characters of the two specimens resemble those of H. robustispinus (Katsuya Kimura pers. obs.). In this study, those specimens were identified as H. robustispinus, and the eastern Indian Ocean off Indonesia was not included in the distribution of H. confinis.

Comparative materials. Hoplostethus robustispinus. HUMZ 191395, 1 specimen, 288.4 mm SL, Indian Ocean, off Sumatra, Indonesia, 3°29.03′N, 94°57.59′E to 3°29.23′N, 94°57.22′E, 760–790 m depth, 7 Oct. 2004; HUMZ 194238, 1 specimen, 276.2 mm SL, Indian Ocean, off Java, Indonesia, 8°19.07′S, 109°53.09′E to 8°19.00′S, 109°52.08′E, 864–950 m depth, 7 May 2005.
Figure 3. *Hoplostethus confinis*, PMBC 30241, 111.2 mm SL. Scale bar 10 mm.

*Hoplostethus melanopus* (Weber, 1913)

**Fig. 4**

**Diagnosis.** Body depth 1.7–2.0 in SL; ventral-keel scales slightly enlarged or absent; pectoral fin blackish, its tip reaching middle of anal-fin base; and body bright brown when preserved (Kotlyar, 1996; present study).

**Materials.** 9 specimens (40.8–124.9 mm SL). PMBC 30242, 1 specimen, 124.9 mm SL, St. L12, 6°45′N, 97°18′E to 6°45′N, 97°18′E, 940–988 m depth, 21 Feb. 2000; PMBC 30243, 2 specimens, 80.4–83.8 mm SL, St. J10, 7°20′N, 97°14′E to 7°22′N, 97°13′E, 655–651 m depth, 28 Jan. 1999; PMBC 30244, 1 specimen, 42.1 mm SL, St. K10, 7°01′N, 97°20′E to 7°03′N, 97°20′E, 690–684 m depth, 17 Nov. 1999; PMBC 30245, 1 specimen, 40.8 mm SL, St. L10, 6°45′N, 97°23′E to 6°44′N, 97°26′E, 707–651 m depth, 21 Feb. 2000; PMBC 30246, 4 specimens, 47.1–54.1 mm SL, St. C10, 8°59′N, 96°08′E to 8°56′N, 96°08′E, 691–684 m depth, 4 Feb. 2000.

**Distribution.** Indo-West Pacific, including Andaman Sea, and southeastern Atlantic at depth of 320–1060 m (e.g., Kotlyar, 1996; Hayashi, 2002; Moore, 2016; Vinu et al., 2017; present study).

**Remarks.** The present specimens have slightly deeper body (depth 1.7–1.9 in SL) than the description of the species by Kotlyar (1996) (1.8–2.0 in SL), which is considered as intraspecific variation of the species.

Figure 4. *Hoplostethus melanopus*, PMBC 30243 (1 of 2 specimens), 80.4 mm SL. Scale bar 10 mm.
Deep-sea fishes from the Andaman Sea

Order Stephanoberyciformes
Family Melamphaidae
Melamphaes polylepis Ebeling, 1962
Fig. 5

Diagnosis. Dorsal-fin soft rays 13–15; pectoral-fin rays 15; pelvic-fin soft rays 7; total gill rakers on first gill arch 20–22; abdominal vertebrae 11; post-temporal spines absent; and 2 ventrolateral-oriented spurs on hemal arch of first caudal vertebra (Ebeling, 1962; Kotlyar, 2011).

Materials. PMBC 30247, 3 specimens, 47.4–50.8 mm SL, St. Z4, 7°34′N, 97°03′E to 7°35′N, 97°04′E, 660–633 m depth, 25 Jan. 1999.

Distribution. Tropical and subtropical waters of Atlantic, Indian, and western and central Pacific oceans at depths of ca. 400–2250 m (e.g., Ebeling, 1962; Ebeling and Weed, 1973; Kotlyar, 2011; Aizawa, 2002; Mincarone et al., 2014; present study).

Remarks. In the eastern Indian Ocean, this species has previously been known only from south of Sri Lanka, west of Sumatra and south of Java (Ebeling, 1962; Kotlyar, 2011). The present specimens represent the first record of the species from the Andaman Sea.

Figure 5. Melamphaes polylepis, PMBC 30247 (1 of 3 specimens), 50.8 mm SL. Scale bar 10 mm.

Poromitra macrophthalma (Gilchrist, 1903)
Fig. 6

Diagnosis. Supramaxillary bone present; preopercular margin armed with spines ventrally, but usually not posteriorly; and pelvic-fin base anterior to vertical through posterior end of pectoral-fin base (Kotlyar, 1996; present study).

Material. PMBC 29036, 1 specimen, 35.0 mm SL, St. J10, 7°15′N, 97°16′E to 7°15′N, 97°14′E, 662–696 m depth, 19 Feb. 2000.

Distribution. Tropical to temperate waters of Indian, and western and central Pacific oceans, with maximum depth of 3124 m (Kotlyar, 2010; Aizawa and Doiuchi, 2013; Stewart and Bray, 2015; present study).

Remarks. In the eastern Indian Ocean, this species was previously known only from off Sri Lanka, southern part of the Bay of Bengal and southwest of Sumatra (Kotlyar, 2010). The present specimens represent the first record of the species from the Andaman Sea.
**Scopelogadus mizolepis mizolepis** (Günther, 1878)

**Fig. 7**

**Diagnosis.** Supramaxillary bone absent; teeth on both jaws usually uniserial; total gill rakers on first gill arch almost always 25 or less; and length of longest gill filament opposite to first raker below angle on first gill arch usually less than 0.6 times (0.33–0.63) length of this raker (Ebeling and Weed, 1963).

**Materials.** 4 specimens (57.3–79.4 mm SL). PMBC 30248, 3 specimens, 57.3–79.4 mm SL, St. E9, 8°30′N, 95°58′E to 8°28′N, 95°58′E, 649–550 m depth, 5 Feb. 1999; PMBC 30249, 1 specimen, 72.5 mm SL, St. J10, 7°15′N, 97°16′E to 7°15′N, 97°14′E, 662–696 m depth, 19 Feb. 2000.

**Distribution.** Tropical to temperate waters of Atlantic, Indian, and western and central Pacific oceans at depths of ca. 500–1800 m (e.g., Ebeling and Weed, 1963; 1973; Aizawa, 2002; Mincarone et al., 2014; present study).

**Remarks.** In the northeastern Indian Ocean, this species was previously known only from eastern part of the Bay of Bengal, off Sri Lanka and west of Sumatra (Ebeling and Weed, 1963). The present specimen represents the first record of the species from the Andaman Sea.

**Figure 7.** *Scopelogadus mizolepis mizolepis*, PMBC 30249, 72.5 mm SL. Scale bar 10 mm.
Deep-sea fishes from the Andaman Sea

Scopelogadus unispinis Ebeling and Weed, 1963

Fig. 8

Diagnosis. Supramaxillary bone absent; teeth on both jaws usually uniserial; dorsal-fin spine 1; total gill rakers on first gill arch 24–29 (usually 26 or more); and vertebrae almost always 23 (Ebeling and Weed, 1963; present study).

Materials. 2 specimens, (55.8–65.1 mm SL): PMBC 30250, 1 specimen, 55.8 mm SL, St. J10, 7°15′N, 97°16′E to 7°15′N, 97°14′E, 662–696 m depth, 19 Feb. 2000; PMBC 30339, 1 specimen, 65.1 mm SL, St. K11, 7°00′N, 97°18′E to 7°00′N, 97°21′E, 828–684 m depth, 16 Nov. 1999.

Distribution. Tropical waters of Indo-Pacific between 15°N and 15°S at depth below ca. 300 m (Ebeling and Weed, 1963; present study).

Remarks. One of the present specimens (PMBC 30339) has fewer total gill rakers on the first gill arch (24) than those shown by Ebeling and Weed (1963) (25–29), which is considered as intraspecific variation of the species. In the northeastern Indian Ocean, this species was previously known only from southwest of Sri Lanka and west of Sumatra (Ebeling and Weed, 1963). The present specimens represent the first record of the species from the Andaman Sea.

Figure 8. Scopelogadus unispinis, PMBC 30250, 55.8 mm SL. Scale bar 10 mm.

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