

GASTEROSTEIFORMES – sticklebacks and allies

Three gasterosteiform families (*sensu* Nelson, 2006) with a body armored by bony plates are found in the Mekong: Indostomidae, Pegasidae, and Syngnathidae. Of these, fishes of the Pegasidae (see silhouette in key to families, p. 13) were not collected during our surveys of the Mekong fishes in 2007–2013, and are not shown

in this book. Within the Pegasidae, only a single species *Pegasus volitans* was recorded from the delta region as indigenous by Vidthayanon (2008); this fish typically inhabits sandy or sandy-mud bottoms in shallow coastal waters to 73 m depth (Palsson & Pietsch, 1989: 27; Senou *in* Nakabo, 2013: 608).

Indostomus spinosus Britz & Kottelat, 1999

Family: Indostomidae (FC: 292)

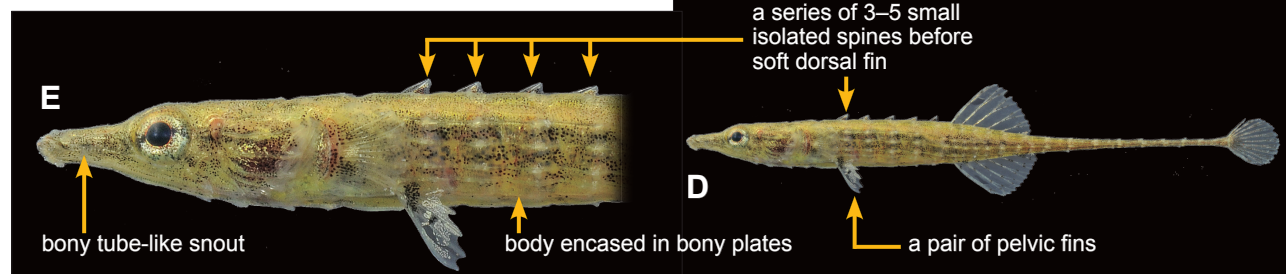
Size: 3.0 cm SL (Kottelat, 2001a: 146).

Distribution: Mekong Basin in Laos, Thailand, and Cambodia.

Notes: A minute species of the gasterosteiform fishes, found amongst the dense aquatic vegetation in standing waters (e.g., swamps, lakes and flooded plains) or slow-flowing streams and adjacent temporary pools; it is frequently collected together with the other diminutive fish, *Chaudhuria caudata* (p. 347). The photograph below shows a habitat in southern Laos, where *Indostomus spinosus* was collected.

Indostomus, a solo genus of the South and Southeast Asian fish family Indostomidae, has been considered as monotypic comprising *Indostomus paradoxus* (so that fishes of this group are commonly known as "paradox fish"), until Britz & Kottelat (1999b) added 2 species, viz., *I. crocodilus* (Malay Peninsula in Thailand) and *I. spinosus* (Thai and Lao Mekong). *Indostomus spinosus* is the only species of the genus found in the Mekong.

Its peculiar appearance, including elongate body encased in bony plates, bony tube-like snout, a series of isolated spines before the soft dorsal fin, and a pair of distinct pelvic fins, readily distinguishes *I. spinosus* from the other Mekong fishes.



A) One of UNMF specimens, just after captured (photo: KS); B and C) NUOL-P 1213 (photo: KU); D and E) NUOL-P 1218 (photo: KU)

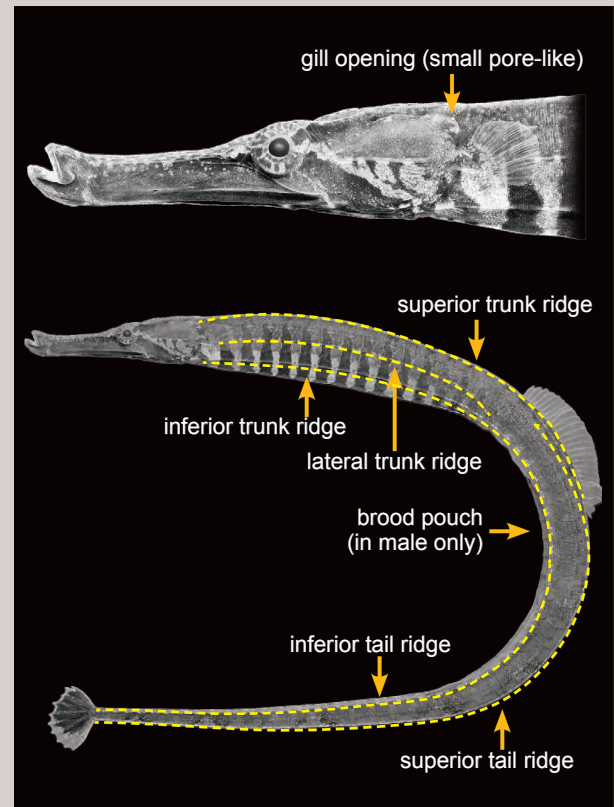


A freshwater swamp at flooded plain in Savannakhet, Laos (photo: KS)

Pipefishes and Seahorses

Fishes of the Syngnathidae typically have an greatly-elongate body covered by a series of bony rings and long tube-like snout, and thus are commonly called as pipefishes. A part of this family, having no caudal fin and a "horse-like" head perpendicular to the body axis, is well-known as seahorses (genus *Hippocampus*). Pelvic fins are always absent. Many of the syngnathids are found in marine waters, but some can enter into, or spend their whole life in, freshwater habitat. Females of the syngnathids lays eggs on the undersurface of the body of the male (modified into a pouch-like structure, called "brood pouch", in many species), and then the male cares for the eggs. The position of the brood pouch (*i.e.*, trunk vs. tail) and the condition of the head and body ridges are useful characteristics for identifying the syngnathid genera. The names of the selected ridges on the body, as well as the brood pouch, are shown in the right photograph.

At least 9 species of the Syngnathidae were hitherto recorded from the Mekong (Kottelat, 1989a; Rainboth, 1996b; Vidthayanon, 2008; our surveys in 2007–2013): *Doryichthys boaja*, *Doryichthys deokhatoides*, *Hippichthys spicifer*, *Hippichthys penicillus*, *Hippocampus kuda*, *Ichthyocampus carce*, *Microphis brachyurus*, *Microphis contiguus*, and *Syngnathoides biaculeatus*. All but *M. brachyurus* are shown in this book. The enigmatic seahorse *Hippocampus arnei* is not included here, due to its doubtful origin (see "Notes" of *H. kuda*, below).



Hippocampus kuda Bleeker, 1852

Family: Syngnathidae (FC: 295)

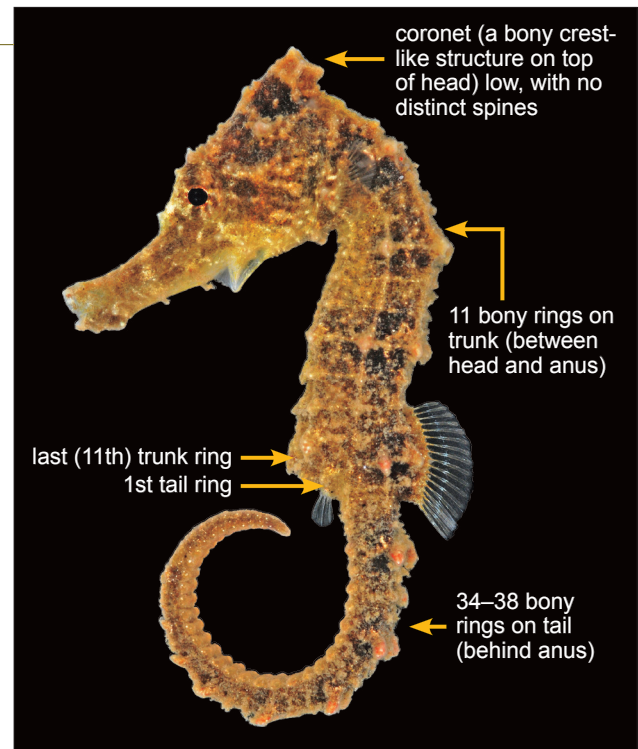
Size: 17 cm in height from top of head (coronet) to tip of tail when straightened (Lourie *et al.*, 1999: 109).

Distribution: Mekong Basin in Vietnam; Indo-Pacific.

Notes: A relatively large-sized species of seahorses, found in brackish estuaries and adjacent inshore waters. We could not collect any specimens of seahorses from the Mekong during our research on 2007–2013, although Vidthayanon (2008) recorded this species (*H. kuda*) from the Mekong Delta. The photographed specimen (young) shown here was collected from the shallow *Zostera* zone in the Ryukyu Islands, Japan.

Several similar-looking Indo-Pacific seahorses have been confused under a single name *Hippocampus kuda* (see Lourie *et al.*, 1999). In particular in the Western Pacific region (including southern Vietnam), this species seems to be most easily confused with *H. kelloggi*, but it differs in having fewer tail rings (34–38 vs. 39–41 in *H. kelloggi*). *Hippocampus kelloggi* is a relatively deep-water species (Lourie *et al.*, 1999: 107), known from rocky reefs at the depths of 8–40 m (Senou in Nakabo, 2013) or trawled from depths of 18–156 m (Lourie *et al.*, 1999).

An enigmatic seahorse *Hippocampus arnei*, described by Roule [1916a, as *H. aimei*, a typographic error (Roule, 1916b)] from the Mekong between Savannakhet and "Kong" in Laos, but the species were not collected again since its description (Kottelat, 1989a: 16). Lourie *et al.* (1999: 164–165) noted that the habitat recorded (*i.e.*, 300 km upstream of waterfalls) was unlikely, and that its collecting locality was "Mekong River, Vietnam". Due to its doubtful origin, the species is not included as a Mekong fish shown in this book. Syntypes of *Hippocampus arnei* contain 2



Non-Mekong specimen (Ryukyu Islands, Japan, photo: Toshiyuki Suzuki)

species (see Lourie *et al.*, 1999), and the species was currently considered as a junior synonym of *H. barbouri* (Lourie *et al.*, 1999) or a distinct species (Kuitert, 2009). In any cases, *H. arnei* (or *H. barbouri*) is readily distinguished from *H. kuda* by having conspicuous spines on its head and body (*vs.* no distinct spines in *H. kuda*).

Syngnathoides biaculeatus (Bloch, 1785)

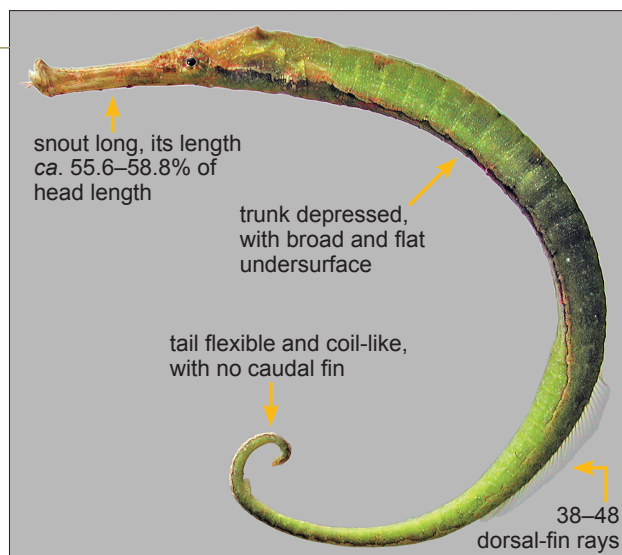
Family: Syngnathidae (FC: 295)

Size: 30.0 cm TL (Paulus, 1999: 2276).

Distribution: Mekong Basin in Vietnam; Indo-Pacific.

Notes: A relatively large-sized species of pipefishes, typically found in seagrass or algal beds and bays in shallow sheltered coastal waters. Vidthayanon (2008) recorded this pipefish from the Mekong Delta, although we were not able to collect any specimens during our surveys in 2007–2013. The specimen shown here was taken from the Andaman coast of southern Thailand.

Like seahorses, *Syngnathoides biaculeatus* lacks a caudal fin, and can hold an object (e.g., seagrasses/algae and mooring ropes) using its flexible coil-like tail. Its peculiar appearance, including a long snout, depressed trunk with broad and flat undersurface, long-based dorsal fin and flexible coil-like tail with no caudal fin, readily distinguishes *S. biaculeatus* from the other Indo-Pacific pipe fishes.



Non-Mekong specimen (Andaman Sea, Thailand, NSMT-P 65962, photo: KS)

Doryichthys deokhatoides (Bleeker, 1854)

Family: Syngnathidae (FC: 295)

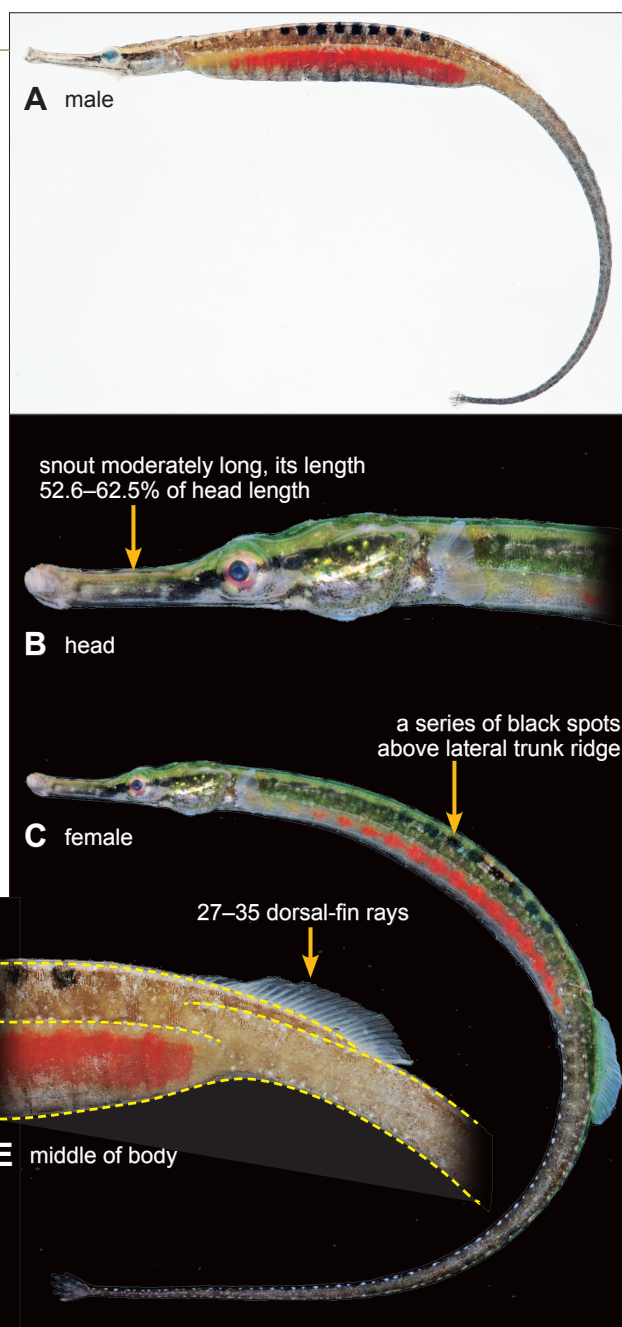
Size: 16.0 cm SL (Dawson, 1985: 56).

Distribution: Mekong Basin in Cambodia and Vietnam; Malay Peninsula, Sumatra and Borneo.

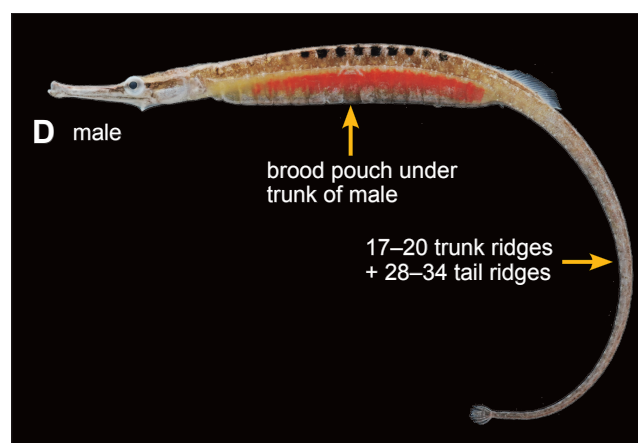
Notes: A medium-sized species of pipefishes, found in the lower reaches of large rivers.

Like *Microphis* (p. 340) and *Syngnathoides* (above), *Doryichthys* is one of the trunk-pouch pipefish genus; namely, the male of *Doryichthys* carries eggs under his trunk (not tail as in *Hippichthys* and *Ichthyocampus*, pp. 341–342). *Doryichthys* is similar to *Microphis*, but the lateral trunk ridge of the former is not confluent with the inferior tail ridge (vs. confluent in *Microphis*, see p. 340) (Dawson, 1981). Taxonomy of the genus *Doryichthys* was revised by Dawson (1981), who recognized the following 4 species: *D. boaja*, *D. deokhatoides*, *D. heterosoma*, and *D. martensii*. Of these, at least 2 species, *D. boaja* (next page) and *D. deokhatoides*, were found in the Mekong.

Within the genus, *D. deokhatoides* resembles *D. martensii* in having relatively fewer trunk rings (20 or fewer vs. 22 or more in *D. boaja* and *D. heterosoma*). *Doryichthys deokhatoides* differs from *D. martensii* in having relatively long and slender snout (vs. snout is shorter in *D. martensii*), 17–20 trunk rings (vs. 15–17), and a series of black spots located above the lateral trunk ridge (vs. located on the ridge) (Dawson, 1981). This similar species *D. martensii* is currently known from Sumatra, Borneo, Malaysia, and Thailand, but is not from the Mekong.



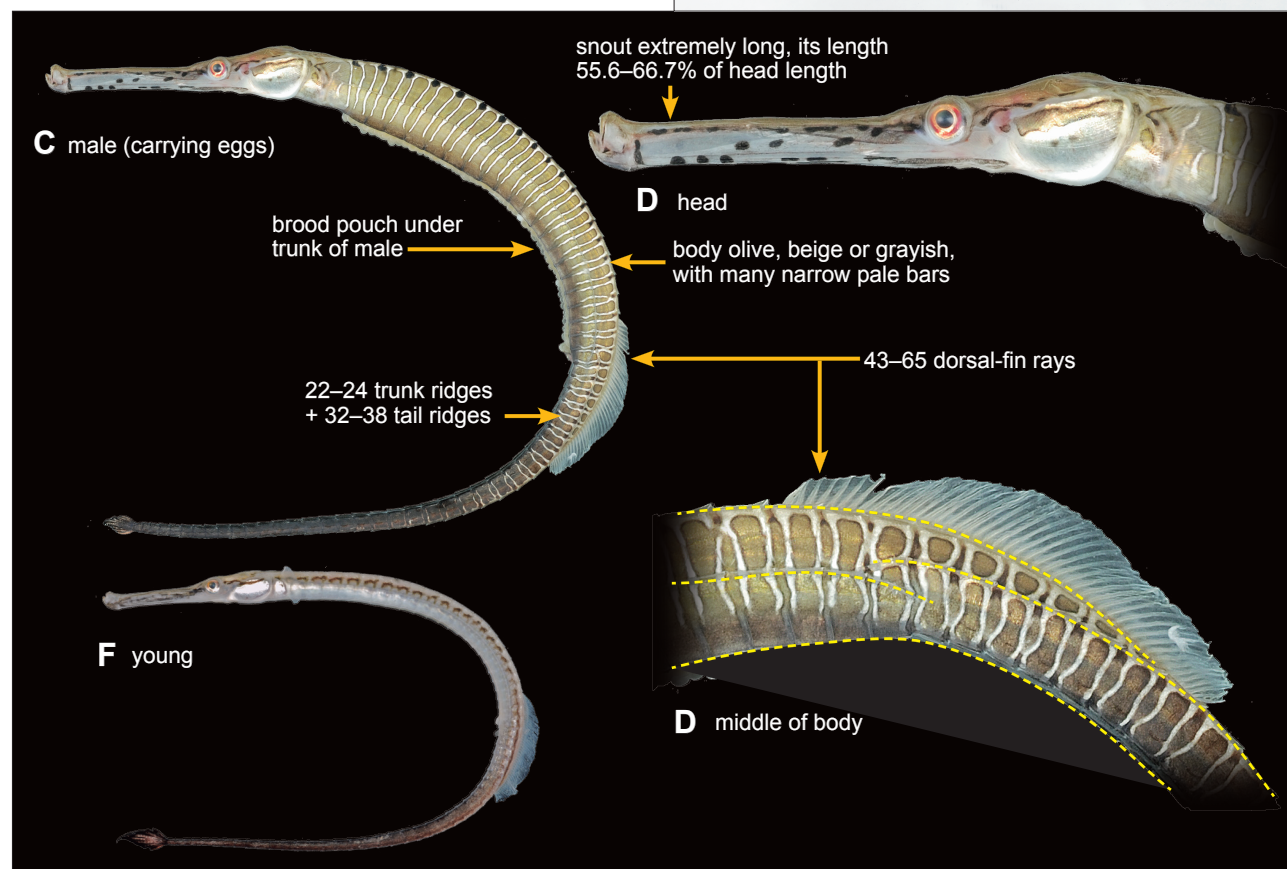
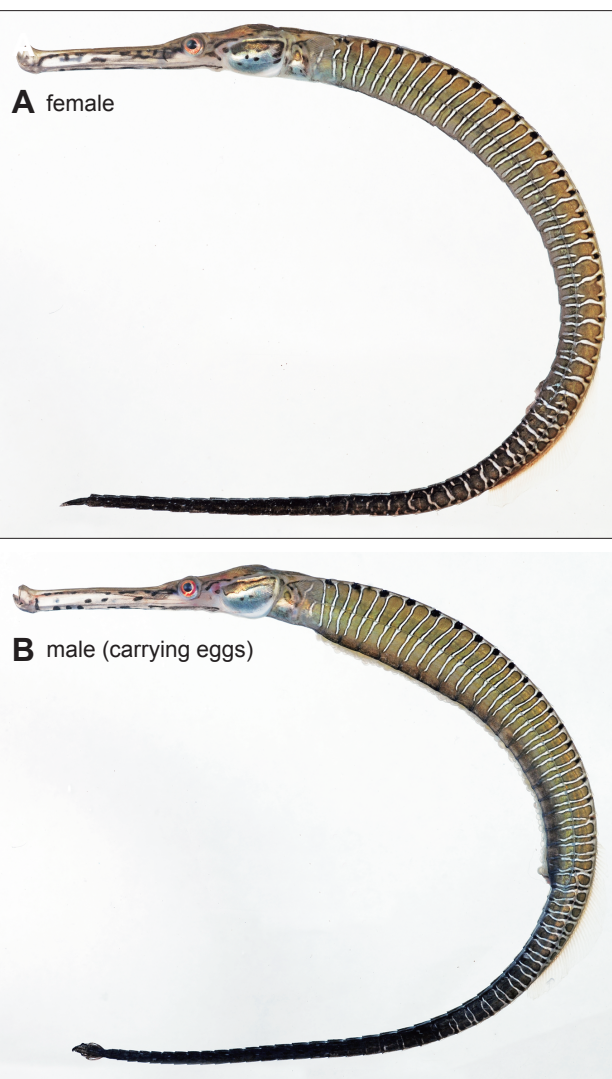
A, D, and E) IFREDI-P 1222 (photo: PT); B and C) CTU-P 3638 (photo: LXT)



Doryichthys boaja (Bleeker, 1850)**Family:** Syngnathidae (FC: 295)**Size:** 41.0 cm SL (Kottelat, 2001a: 146).**Distribution:** Mekong Basin in Laos, Thailand, Cambodia, and Vietnam; Chao Phraya Basin, Malay Peninsula, Sumatra, Java, Borneo, and Sulawesi.**Notes:** A large-sized species of pipefishes, found in large rivers. This is one of 2 freshwater pipefishes found in the Thai and Lao Mekong, although also common in Cambodia and Vietnam. Due to its attractive coloration, *Doryichthys boaja* is frequently found in aquarium fish trade.

Its extremely long snout and conspicuous barred pattern on the body of adults readily distinguish *Doryichthys boaja* from the other pipefishes in the Mekong. This barred pattern is not obvious in small specimens (photo F), but, even in juveniles and young, it can be easily identified based on its long snout. The caudal fin appears to become shorter along with growth, although distinct for the whole life. A similar-looking Indonesian congener *Doryichthys heterosoma* (known only by 4 specimens collected prior to 1854) has 25–26 trunk rings (vs. 22–24 in *D. boaja*) (Dawson, 1981, 1985). Dawson (1981: 14) reported the geographic variations in counts of dorsal-fin rays in *D. boaja*; namely, according to him, specimens from Cambodia, Thailand, and peninsular Malaysia have 43–54 dorsal-fin rays, whereas there are 48–64 in the Indonesian specimens. See also "Notes" of *Doryichthys deokhatoides* (p. 338).

Rainboth (1996b) noted, "*D. boaja* and three other species of the genus are found in the lower Mekong or nearby parts of Thailand and the Malay Peninsula." His species may comprise 3 species of *Doryichthys*, viz., *D. boaja*, *D. deokhatoides*, and *D. martensii* (not yet recorded from the Mekong, but known from the Malay Peninsula) and *Microphis contiguus* (see next page).



A) CTU-P 2597 (photo: LXT); B–E) CTU-P 2587 (photo: LXT); F) CTU-P 694 (photo: LXT)

Microphis contiguus (Kottelat, 2000)

Family: Syngnathidae (FC: 295)

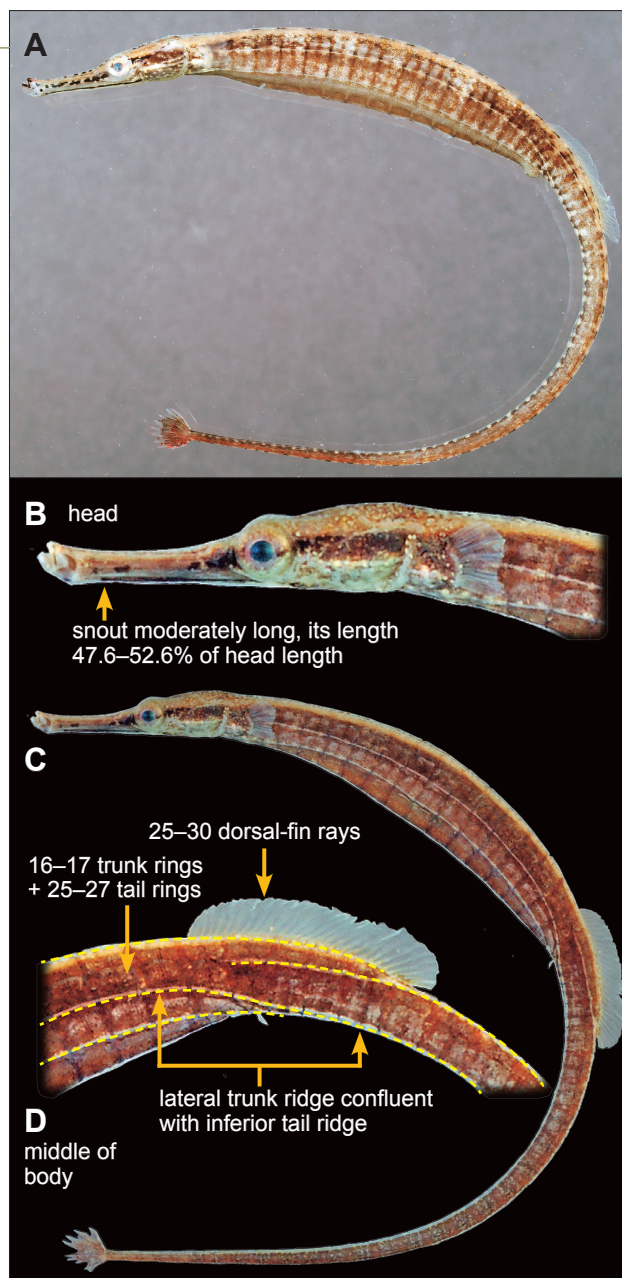
Size: 11.0 cm SL (Kottelat, 2001a: 146, as *Doryichthys contiguus*).

Distribution: Mekong Basin in southern Laos, Thailand, and Cambodia.

Notes: A medium to relatively small-sized species of pipefishes, found around submerged aquatic vegetation and roots of fallen trees in slow-flowing turbid rivers.

This species, hitherto known only from freshwater rivers of the Mekong Basin, was described by Kottelat (2000) as a species of *Doryichthys*. Kottelat (2000: 78) stated that this species is "distinguished from all other species of the genus by the following combination of characters: lateral trunk ridge deflected downwards and continuous with inferior tail ridge..." However, this character is not that of *Doryichthys*, but rather that of the other trunk-pouch pipefish genera, including *Microphis*. For example, in his revisional study of *Doryichthys*, Dawson (1981: 2) pointed out that the superficially similar genus *Microphis* (as well as its junior synonyms, e.g., *Coelonotus*, *Oostethus*, and *Paramicrophis*) is, unlike *Doryichthys*, characterized by having the lateral trunk ridge confluent with the inferior tail ridge. Following the key to genera of the Indo-Pacific pipefishes in Dawson (1985), actually, this Mekong species can be placed in *Microphis*. Our specimens from Laos and northern Cambodia agree well with Kottelat's (2000) description of *D. contiguus*, although the species should be placed in the genus *Microphis*.

Taxonomy of *Microphis* was revised by Dawson (1984, 1985), who recognized 19 species/subspecies in the Indo-Pacific region. Following the key in Dawson (1985), *Microphis contiguus* can be placed in the subgenus *Microphis*. However, the other species of this subgenus have more dorsal-fin rays (29–56 vs. 25–28 in *M. contiguus*) (Dawson, 1984, 1985). *Microphis brevidorsalis* of the other subgenus *Lophocampus* has similar count of dorsal-fin rays (25–29), but differs from *M. contiguus* in having much shorter snout (its length 37.0–45.5% of head length vs. 47.6–52.6% in *M. contiguus*) and a series of prominent blackish spots on the lateral trunk ridge (vs. absent).



A) IFREDI-P 680 (photo: KS); B–D) NUOL-P 149 (photo: KS)



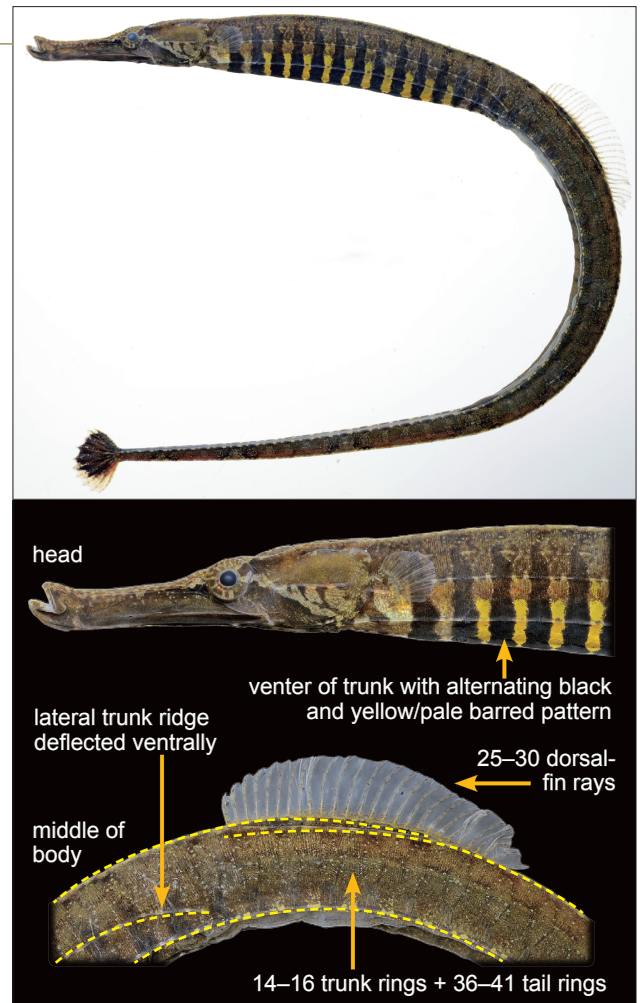
A slow-flowing, turbid river at Veun Theng, Laos, where *Microphis contiguus* was collected (photo: KS)

Hippichthys spicifer (Rüppell, 1838)**Family:** Syngnathidae (FC: 295)**Size:** 17 cm SL (Dawson, 1985: 99).**Distribution:** Mekong Basin in Cambodia and Vietnam; Indo-Pacific.

Notes: A medium-sized species of pipefishes, found on sandy-mud bottoms of brackish estuaries and adjacent freshwater areas of rivers and streams. Although we were not able to collect any specimens during our field surveys in 2007–2013, this species was recorded by some researchers (e.g., Kottelat, 1989a; Rainboth, 1996b) from the Mekong. The specimen shown here was collected from Miyazaki, southern Japan.

Hippichthys is a tail-pouch pipefish genus; namely, male carries eggs under his tail (i.e., posterior part of body behind anus). *Hippichthys* somewhat resembles the other tail-pouch pipefish genus from the Mekong, *Ichthyocampus* (next page), but the superior trunk ridge is not confluent with superior tail ridge (vs. confluent in *Ichthyocampus*).

The taxonomy of *Hippichthys* was revised by Dawson (1978, 1985), who recognized 5 species in it; subsequently Jenkins & Mailautoka (2010) added a species from Fiji, and thus the total number of species in this genus is now 6. Of these, at least 2 species were hitherto recorded from the Mekong (e.g., Kottelat, 1989a; our surveys in 2007–2013): *H. spicifer* and *H. penicillus* (below). *Hippichthys spicifer* is readily distinguished from *H. penicillus* by having alternating black and pale/yellow barred pattern on venter of trunk. Condition of this barred pattern (e.g., width and/or coloration of each bar), however, appears to vary depending on the collecting localities; Kuitert (2000: 180) alluded to some geographical variations in this species that need further investigation.



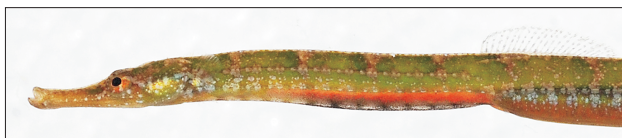
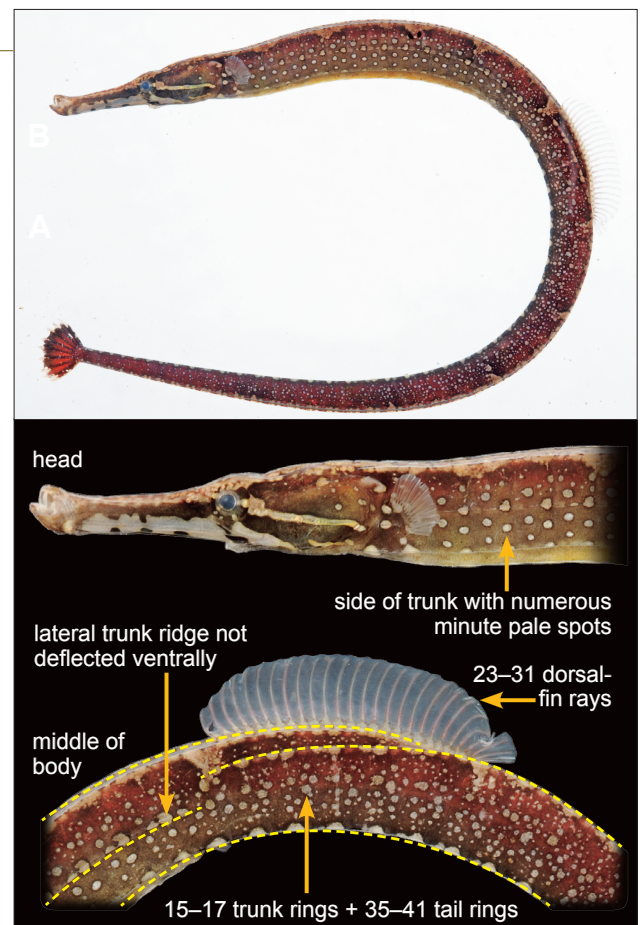
Non-Mekong specimen (Miyazaki, southern Japan, photo: KS)

Hippichthys penicillus (Cantor, 1849)**Family:** Syngnathidae (FC: 295)**Size:** 18.0 cm SL (Dawson, 1985: 101).**Distribution:** Mekong Basin in Vietnam; Indo-West Pacific.

Notes: A medium-sized species of pipefishes, found in brackish estuaries and adjacent freshwater areas of rivers and streams.

Its characteristic coloration, particularly the numerous minute pale spots on the trunk, readily disistinguishes *Hippichthys penicillus* from the other Mekong pipefishes.

Tran *et al.* (2013: 89) reported *Hippichthys heptagonus* from the Mekong Delta in Vietnam, but their fish is actually the other pipefish, *Ichthyocampus carce* (next page). *Hippichthys heptagonus* was recorded from the Malay Peninsula and Chao Phraya Basin by Kottelat (1989a: 16); although there are no exact records of this species from the Mekong, as well as for the similar-looking congener *H. cyanospilos*, the occurrence is highly expected from there. The photograph of a non-Mekong specimen of *H. cyanospilos* is shown below. *Hippichthys heptagonus* has 51 or more total rings including 14–15 trunk rings (vs. 45–48 and 12–14 total and trunk rings, respectively, in *H. cyanospilos*) and dorsal-fin origin located on the tail (vs. usually on the trunk) (Dawson, 1985).

Non-Mekong specimen of *Hippichthys cyanospilos* (Ryukyu Islands, Japan, photo: Toshiyuki Suzuki)

CTU-P 3167 (photo: LXT)

A small temporary pond in Cà Mau Province of Vietnam, where *Ichthyocampus carce* was collected (photo: KS)



Ichthyocampus carce (Hamilton, 1822)

Family: Syngnathidae (FC: 295)

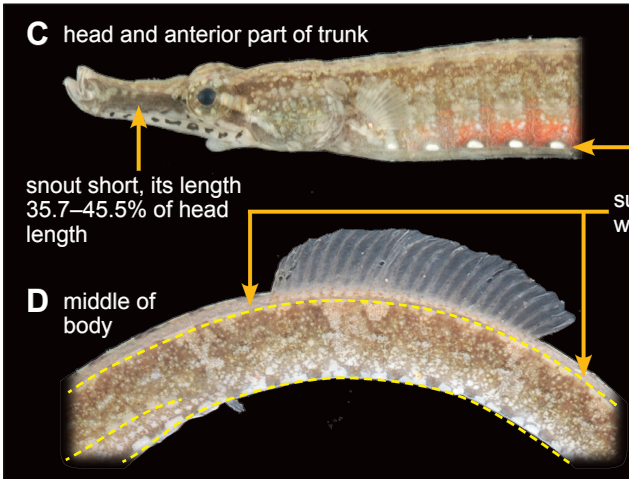
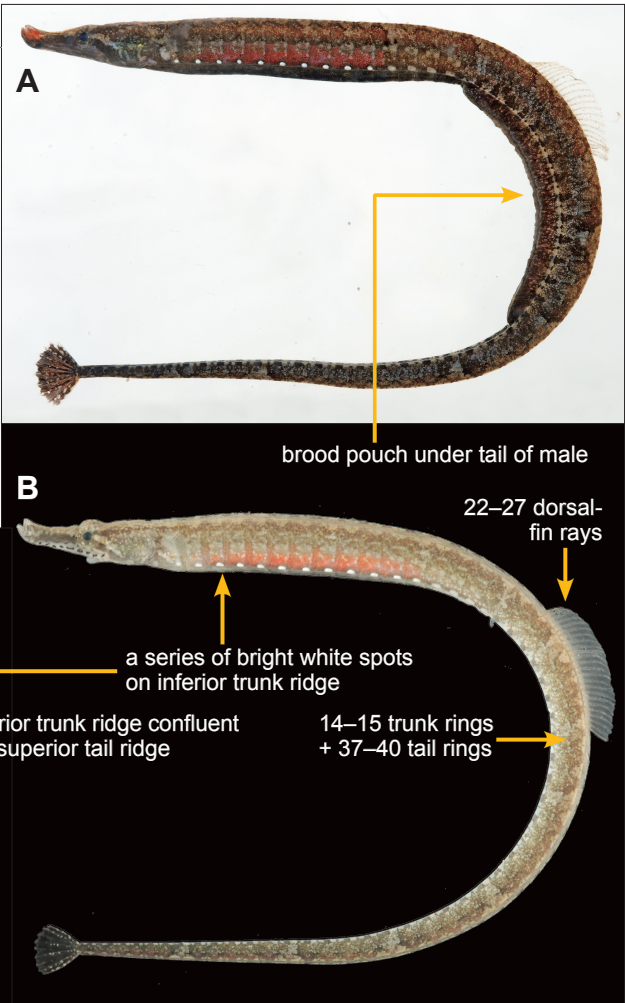
Size: 14.0 cm SL (Kottelat *et al.*, 1993: 99).

Distribution: Mekong Basin in Vietnam; South and Southeast Asia.

Notes: A medium-sized species of pipefishes, found in brackish estuaries and adjacent freshwater area. The photograph above shows a habitat that *Ichthyocampus carce* was collected.

Ichthyocampus is a tail-pouch pipefish genus, comprising only a single species *I. carce* (Dawson, 1977, 1985). It resembles *Hippichthys*, but the superior trunk ridge is confluent with the superior tail ridge (vs. not confluent in *Hippichthys*).

Hippichthys heptagonus in Tran *et al.* (2013) is a misidentification of *Ichthyocampus carce* (see "Notes" on *H. penicillus*).



A) CTU-P 2625 (photo: LXT); B-D) CTU-P 2289 (photo: LXT)



Dried pipefish of the genus *Trachyrhamphus* (a marine pipefish genus), sold at a market in Bến Tre, Vietnam (photo: KS)