

## SYNBRANCHIFORMES – swamp eels and allies

Fishes of the Synbranchiformes, usually confined to fresh- or brackish water areas from temperate to tropical regions, have a greatly elongate, soft eel-like body. Some have dorsal-fin spines and/or long-based dorsal/anal fins with soft rays, whereas the others have greatly reduced or no fins; the pelvic fins are absent in all synbranchiform fishes. See also the introduction of the similar-looking anguilliform eels (p. 46).

The Synbranchiformes comprises three families: Synbranchidae (swamp eels), Chaudhuriidae (earthworm eels), and Mastacembelidae (spiny eels). At least 13 species of these 3 families are known from the Indochinese Mekong, and all of them are shown in this book. Due to taxonomic confusions, the identification of some is merely provisional (see "Notes" of, e.g., *Monopterus albus*, *Ophisternon bengalense*, and *Mastacembelus armatus*).

*Ophisternon bengalense* McClelland, 1844

**Family:** Synbranchidae (FC: 300)

**Size:** 53.0 cm TL (Kottelat *et al.*, 1993: 101).

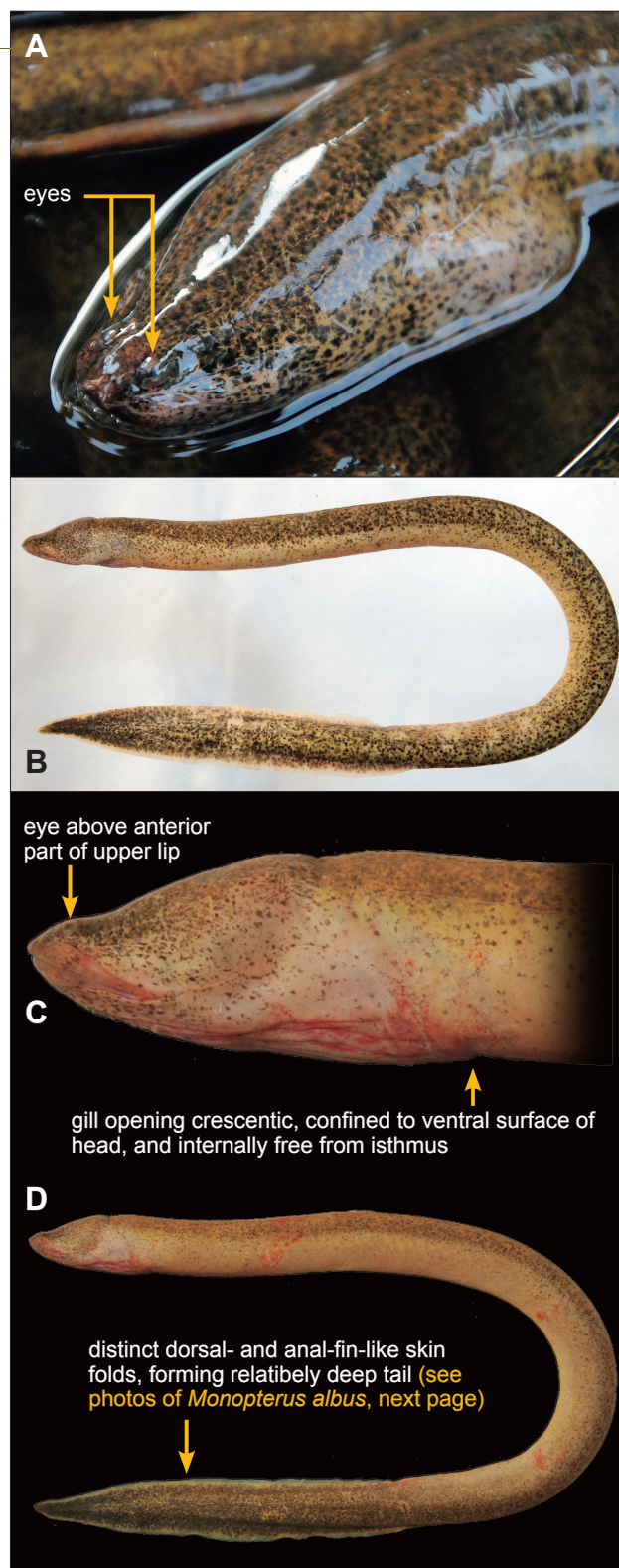
**Distribution:** Mekong Basin in southern Cambodia and Vietnam; Indo-West Pacific.

**Notes:** A medium to large-sized species of swamp eels, found in brackish estuaries and adjacent freshwater areas of large rivers; it is apparently non- or barely syntopic with similar-looking *Monopterus albus* (next page), which is usually found in freshwater areas with standing waters (e.g., swamps, lakes, reservoirs, and irrigation canals in paddy fields). *Ophisternon bengalense* is a popular food fish in the coastal regions of the Vietnamese Mekong, and is abundantly seen at the local markets (photo E).

Swamp eels of the Synbranchidae lack all fins, except for a greatly reduced caudal fin in some; many species have dorsal- and anal-fin-like, low rayless skin folds at the posterior part of the body. Three species, viz., *Monopterus albus*, *Ophisternon bengalense*, and *Macrotrema* sp. (p. 346), are known from the Indochinese Mekong; of these, *M. albus* is widely distributed in freshwater habitats throughout the Indochinese region, whereas the other 2 are usually found in brackish estuaries, particularly the mangrove creeks (*O. bengalense* can enter into freshwater areas of the lower reaches of large rivers).

*Ophisternon bengalense* is similar to *Monopterus albus*, but is readily distinguished based on the position of the eyes and development of the dorsal and anal skin folds (see photographs); these 2 swamp eels are also recognized as distinct species by local fishermen, and are almost always sold separately at the markets in the coastal provinces of Mekong Delta of Vietnam (where both species can be found).

Like the other brackish-water swamp eel *Macrotrema*, Vidthayanon (2008) noted that *Ophisternon bengalense* recorded from Southeast Asia may consist of multi-species. We here tentatively identify our fish as *O. bengalense*, following Rosen & Greenwood (1976).



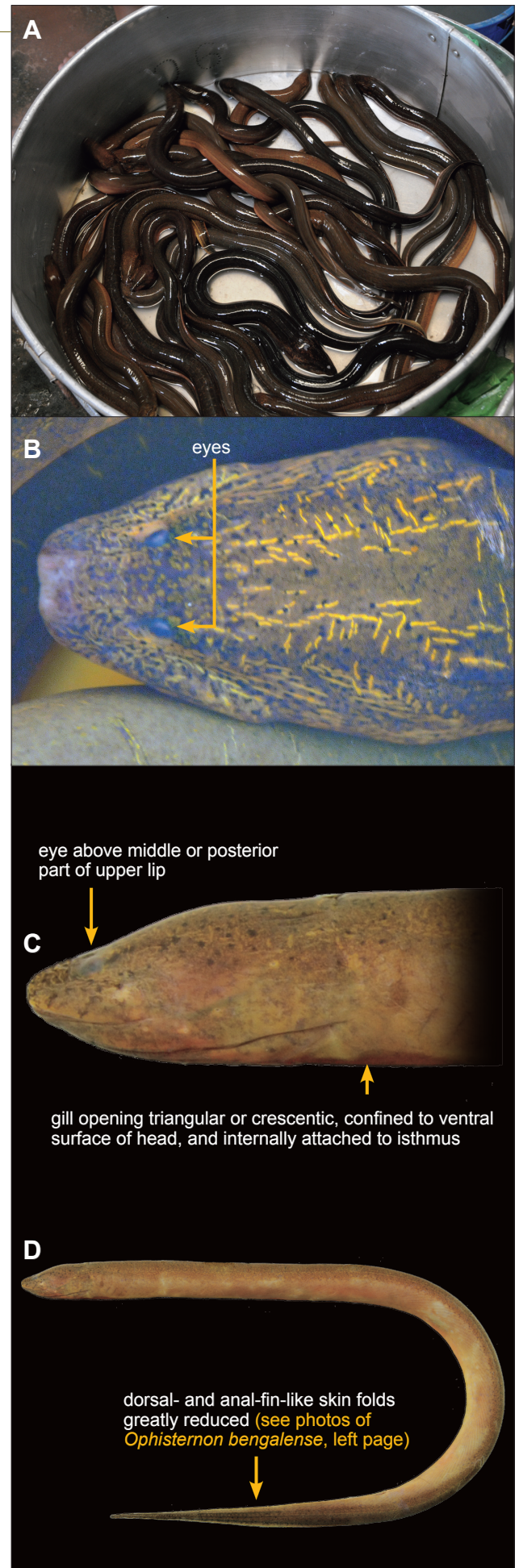
A) Close-up of head of marketed fish (not preserved, Bén Tre, Vietnam, photo: KS); B) CTU-P 1390 (photo: LXT); C and D) CTU-P 1392 (photo: LXT); E) marketed fish (not preserved, Cà Mau, Vietnam, photo: KS)



*Monopterus albus* (Zuiew, 1793)**Family:** Synbranchidae (FC: 300)**Size:** 87.5 cm SL (Kottelat, 2001a: 146).**Distribution:** Mekong Basin in China (Yunnan), Laos, Thailand, Cambodia, and Vietnam; East and Southeast Asia.**Notes:** A medium to large-sized species of swamp eels, found in various kinds of habitat in the freshwater areas, particularly in swamps, reservoirs, lakes, paddy fields, and irrigation canals. *Monopterus albus* is a popular food fish in the Indochinese countries, and is abundantly seen at the local markets.

Like the other 2 swamp eels in the Mekong, the present identification of the Mekong species to *Monopterus albus* is merely tentative, due to its taxonomic confusion. As pointed out by Kottelat (2001b: 58), at least some species are considered to be confused under this name. According to the molecular analysis by Matsumoto *et al.* (2010), 3 distinct geographic populations are recognized: China-Japan population, Ryukyu Islands population, and South-east Asian population; Matsumoto *et al.* (2010: 75) regarded that these are 3 distinct species, although they did not provide respective specific names. These species are distributed allo-patrically, except for in Taiwan, where 2 species (China-Japan and Southeast Asian populations) are found. *Monopterus albus* was first described by Zuiew (1793, as *Muraena alba*) based on specimens possibly from Asiatic Russia (Nichols, 1943: 27; Rosen & Greenwood, 1976: 57). If *M. albus* could be identified as the China-Japan population of Matsumoto *et al.* (2010), then *Monopterus javanensis* Lacepède, 1800, described from Java, may be applied to the Southeast Asian species (see synonymy of *M. albus* shown by Rosen & Greenwood, 1976: 57). However, the original descriptions of both *M. albus* and *M. javanensis* (Zuiew, 1793, as *Muraena alba*; Lacepède, 1800) do not provide sufficient information to differentiate these, and the type specimens of these 2 nominal species appear to be no longer in existence (Rosen & Greenwood, 1976: 57). Kottelat (2013c: 308) applied *M. javanensis* to the Southeast Asian species, but he stated, "The Southeast Asian populations may in fact represent several species." Comprehensive taxonomic revision is clearly needed for the species currently identified as *M. albus*. In order to avoid unnecessary confusions, we tentatively apply *M. albus* to the Indochinese population, as previous researchers did.

Nguyen & Nguyen in Nguyen (2005) described 2 new species of *Monopterus* based on a few specimens from Vietnam: *M. bicolor* (2 specimens) and *M. dienbienensis* (4 specimens) from Khánh Hòa and Điện Biên provinces, respectively. According to them, these 2 and their *M. albus* can be separated from one another based on, e.g., vertebrae counts (139–140, 150, and 123–124 in *M. albus*, *M. bicolor*, and *M. dienbienensis*, respectively). Rosen & Greenwood (1976: 10, table 2), who examined many specimens from China, Japan, Myanmar and Java, reported extensive variation of the vertebral counts in *M. albus* (abdominal+caudal elements = 88–102+45–74). Taxonomic status of *M. bicolor*, *M. dienbienensis* and *M. albus* of Nguyen & Nguyen in Nguyen (2005) is currently ambiguous, and Kottelat (2013c: 308) regarded both *M. bicolor* and *M. dienbienensis* as "Species inquirendae" (i.e., species of doubtful identity; see Kottelat, 2013c: 9) of *Monopterus*.



A) Marketed fish (not preserved, Cần Thơ, Vietnam, photo: KS); B) close-up of head of marketed fish (not preserved, Bến Tre, Vietnam, photo: KS); C and D) CTU-P 1393 (photo: LXT)





### *Macrotrema* sp.

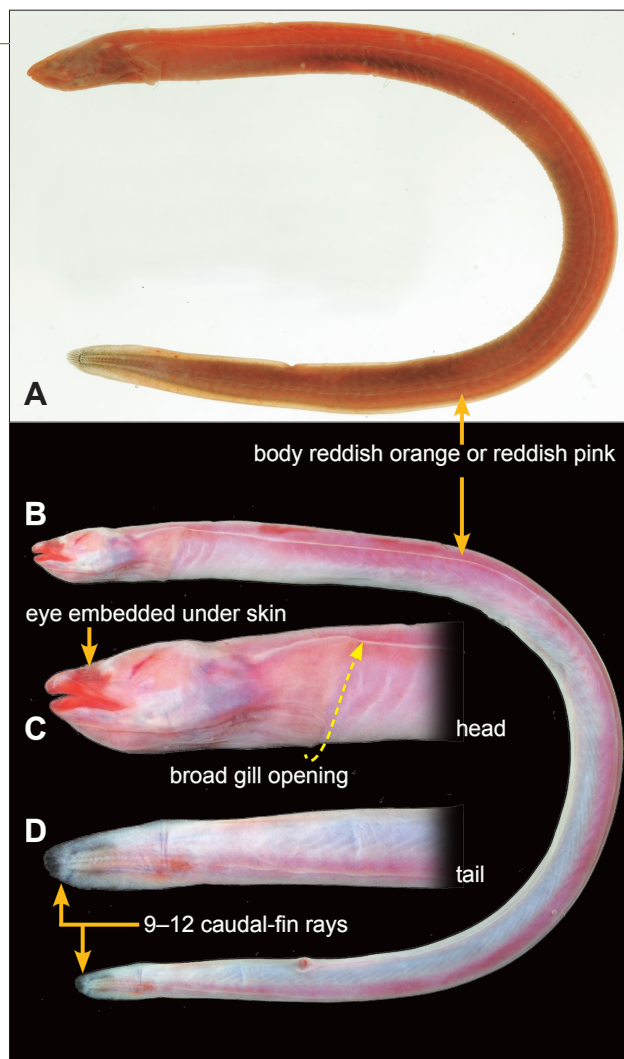
**Family:** Synbranchidae (FC: 300)

**Size:** (not measured).

**Distribution:** Mekong Basin in Vietnam and southern Cambodia (Tonle Sap River).

**Notes:** A small-sized species of swamp eels, usually found in brackish estuaries particularly mangrove creeks with a soft mud bottom (but it is also collected from Tonle Sap River in southern Cambodia); it is much less common than the other 2 swamp eels in the Mekong. Its reddish coloration readily distinguishes this species from the other Mekong swamp eels, even in a small specimen. The photograph above shows a mangrove creek in the Vietnamese Mekong, where this species was collected.

*Macrotrema* is peculiar within the Synbranchidae by having broad gill opening extending dorsally on the side of the body (vs. confined to the ventral surface of the head in the other genera), a small caudal fin with 9–14 rays (vs. caudal fin absent or, if present, with 7 or fewer rays), and posterior nares anterior to the eye (vs. medial to eyes) (Rosen & Greenwood, 1976). The genus is currently known only by a single species, *Macrotrema caligans*, from peninsular Malaysia (Penang, the type locality), Singapore, Thailand, and Vietnam (Rosen & Greenwood, 1976; Kottelat, 1989a; Mai *et al.*, 1992; Nguyen, 2005; Vidthayanon, 2008), although the species needs taxonomic revision as implied by Vidthayanon (2008: 174). For example, according to Rosen & Greenwood (1976), the specimens from the Malay Peninsula have a notch between the caudal fin and dorsal/anal skin folds, but the Mekong specimens lack a such notch.



A) CTU-P 5204 (photo: HVN); B–D) CTU-P 1349 (photo: LXT); E) CTU-P 3150 (photo: LXT)





A freshwater swamp in Savannakhet, Laos, where *Chaudhuria caudata* was collected (photo: KS)

### *Chaudhuria caudata* Annandale, 1918

**Family:** Chaudhuriidae (FC: 301)

**Size:** 3.8 cm SL (Kottelat, 2001a: 147).

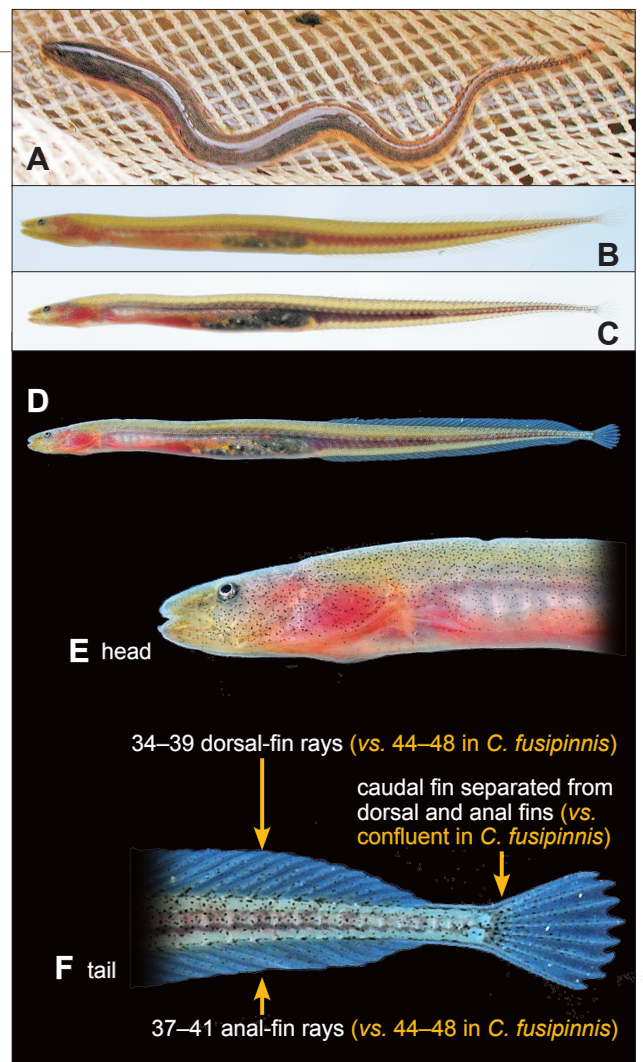
**Distribution:** Mekong Basin in Laos, Thailand, Cambodia, and Vietnam; Chao Phraya Basin, Malay Peninsula, and Myanmar.

**Notes:** A small-sized species of chaudhuriid fishes, found in lakes, reservoirs, swamps, and small canals with dense aquatic vegetation; it is frequently collected together with a paradox fish *Indostomus spinosus* (p. 336). The photograph above shows a shallow freshwater swamp with dense aquatic vegetation in Savannakhet, Laos, where *Chaudhuria caudata* was collected.

Earthworm eels of the Chaudhuriidae are similar to juveniles of the synbranchid eels (swamp eels, pp. 344–346) in general appearance, but has distinct dorsal, anal, caudal, and pectoral fins. Ten species from South and Southeast Asia are known in the family, and, of these, 2 species of the genus *Chaudhuria* (viz., *C. caudata* and *C. fusipinnis*) have been recorded from the Mekong. *Chaudhuria caudata* differs from the other Mekong species *C. fusipinnis* (not shown in this book, see schematic illustration below) in having caudal fin, which is separated from dorsal and anal fins (vs. caudal fin fused with dorsal and anal fins in *C. fusipinnis*) (Britz & Kottelat in Kottelat, 2000; Kottelat, 2001a).



▲ Schematic silhouette of 2 species of *Chaudhuria* (top, *C. caudata*; bottom, *C. fusipinnis*). Arrow indicates confluent dorsal, anal and caudal fins in *C. fusipinnis*.



A) A fish in scoop net, just after collected (not preserved, Savannakhet, Laos, photo: KS); B) NUOL-P 1216 (photo: TP); C–F) NUOL-P 1215 (photo: TP)



## Spiny eels

Fishes of the family Mastacembelidae have an elongate soft body with many small, isolated dorsal-fin spines, and thus they are commonly known as "spiny eels". In the Indochinese Mekong, at least 8 species of 2 genera (*viz.*, *Macrognathus* and *Mastacembelus*) are found. Spiny eels are a popular food fish throughout the region, and are marketed both fresh and dried. The right photograph shows fried *Macrognathus siamensis*.



### *Macrognathus siamensis* (Günther, 1861)

**Family:** Mastacembelidae (FC: 302)

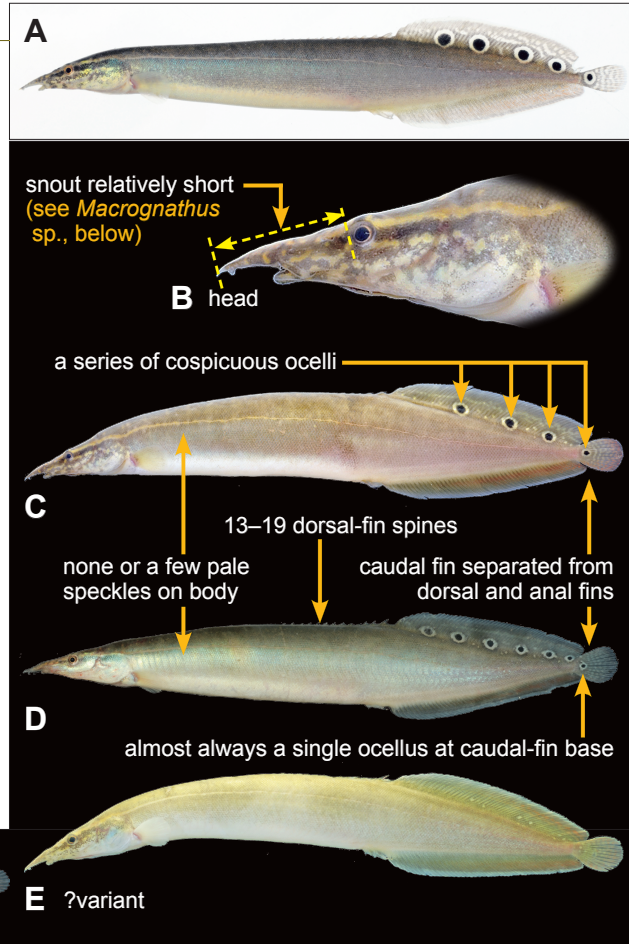
**Size:** 20.0 cm SL (Kottelat, 2001a: 149).

**Distribution:** Mekong Basin in southern Laos, Thailand, Cambodia, and Vietnam; Chao Phraya basin.

**Notes:** A relatively small-sized species of spiny eels, found in various freshwater habitats, *e.g.*, large rivers, streams, lakes, and reservoirs. *Macrognathus siamensis* is one of the most common species of spiny eel in the Indochinese Mekong, and is frequently seen in the local markets.

*Macrognathus* resembles *Mastacembelus* (pp. 349–351) in general appearance, but has fewer dorsal-fin spines (32 or less *vs.* 33 or more in *Mastacembelus*) (Roberts, 1986; Kottelat, 2001a); at maximum size, many of the fishes of *Macrognathus* are smaller than *Mastacembelus*. Four species of *Macrognathus* are known from the Indochinese Mekong, and all of these are shown in this book.

*Macrognathus siamensis* is very similar to *Macrognathus* sp. (below) in coloration, particularly a series of distinct ocelli along the dorsal- and caudal-fin base (rarely absent, see photo E), but differs from the latter in relatively shorter snout (*vs.* snout is longer and deeper in *M. sp.*), a caudal fin separated from dorsal and anal fins (*vs.* confluent), and none or a few pale speckles on the body (*vs.* numerous pale speckles on the body). The juvenile has many conspicuous dusky bars on body (photos F and G).



A) NUOL-P 1122 (photo: TP); B and C) IFREDI-P 2500 (photo: PT); D) CTU-P 701 (photo: LX); E) IFREDI-P 3873 (photo: PT); F) CTU-P 3998 (LXT); G) CTU-P 4000 (LXT)

### *Macrognathus* sp.

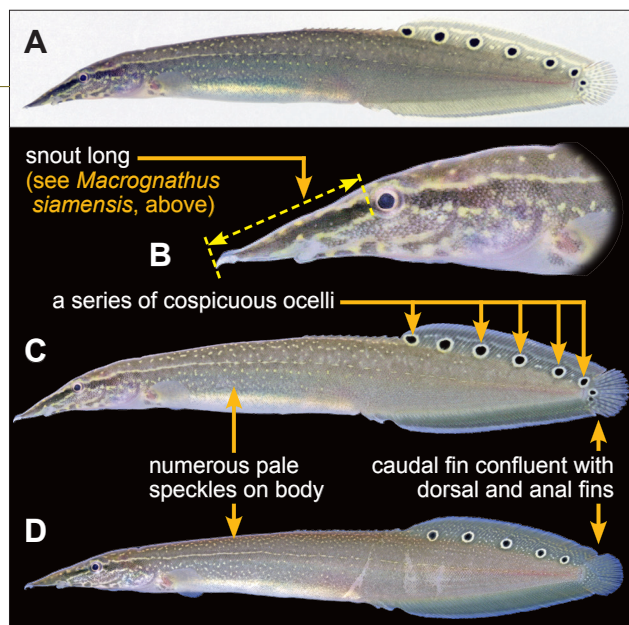
**Family:** Mastacembelidae (FC: 302)

**Size:** 43 cm SL (Kottelat, 2001a:149, as *Macrognathus* sp. long snout).

**Distribution:** Mekong Basin in southern Laos (downriver of Khone Falls), Thailand, and Cambodia.

**Notes:** A medium-sized species of spiny eels, found in large rivers; it appears to be uncommon, and is not or seldom seen at the local markets. "*Macrognathus* sp." of Rainboth (1996: 180, pl. 23, fig. 184) and "*Macrognathus* sp. long snout" of Kottelat (2001a: 149) are identical to this species.

Its long snout, confluent caudal fin with dorsal and anal fins and numerous minute pale speckles on the body readily distinguish this species from similar-looking Mekong congener *M. siamensis* (above). The number of ocellus (ocelli) at the caudal fin varies (usually 0–2) in this species, whereas it is almost always a single in *M. siamensis*.



A–C) UNMF 6237 (photo: CG); D) UNMF 6315 (photo: CG)



***Macrognathus semiocellatus* Roberts, 1986**

**Family:** Mastacembelidae (FC: 301)

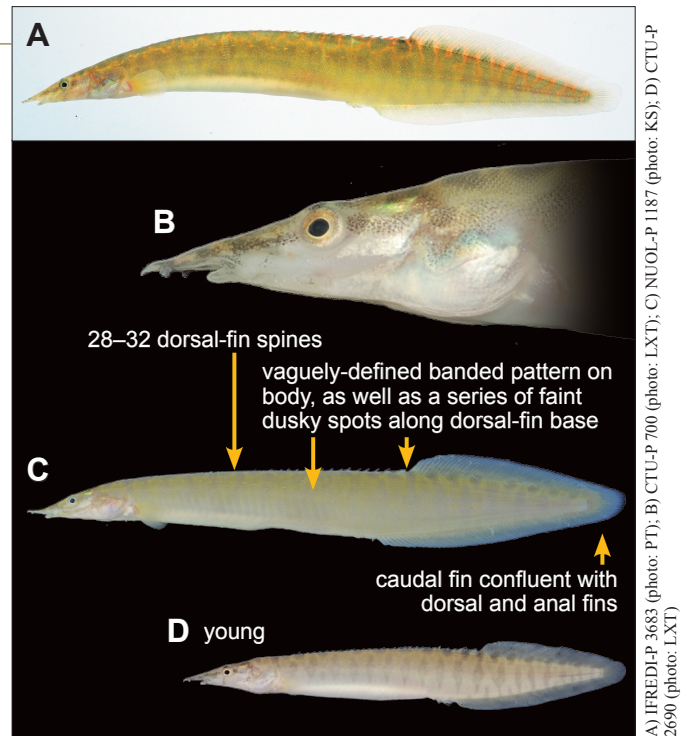
**Size:** 19.2 cm SL (Kottelat, 2001a: 149).

**Distribution:** Mekong Basin in Laos, Thailand, Cambodia, and Vietnam; Chao Phraya and Meklong basins.

**Notes:** A relatively small-sized species of spiny eels, found in various habitats in both flowing and standing waters; it is commonly sold at the local markets in the Indochinese Mekong, but is less frequently seen compare to the other common congener *Macrognathus siamensis* (left page).

A combination of confluent caudal fin with dorsal/anal fins and vaguely-defined banded pattern on the body readily distinguishes *Macrognathus semiocellatus* from the other Mekong congeners. In the specimen with darkened coloration, a series of black spots may be found along the dorsal-fin base; these spots are, however, never modified into conspicuous ocelli as in *M. siamensis* and *M. sp.* (left page).

Rainboth's (1996b: 179, pl. 23, fig. 182) *Macrognathus taeniagaster* is identical to *M. semiocellatus* shown here, although Kottelat (2001a: 147) regarded *M. taeniagaster* as a junior synonym of *M. circumcinctus* (below).



A) IJERDLP 3683 (photo: PT); B) CTU-P 700 (photo: LXT); C) NUOL-P 1187 (photo: KS); D) CTU-P 2690 (photo: LXT)

***Macrognathus circumcinctus* (Hora, 1924)**

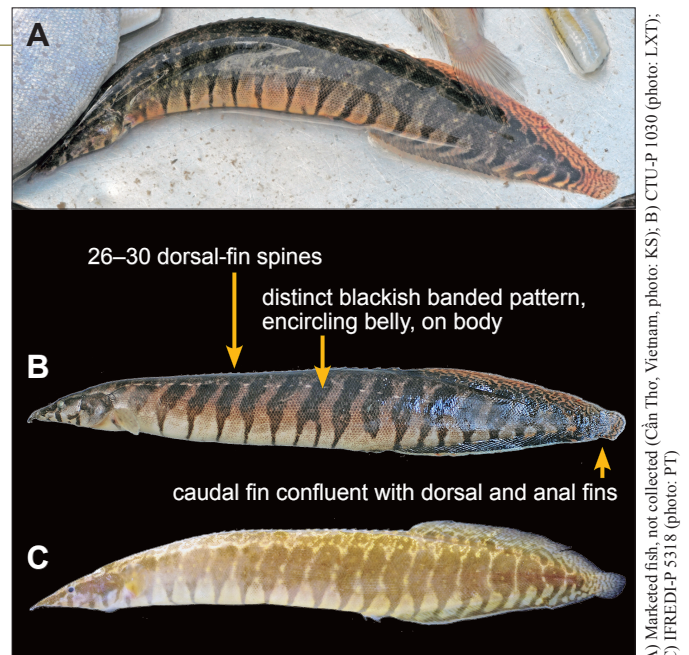
**Family:** Mastacembelidae (FC: 301)

**Size:** 15.5 cm SL (Roberts, 1986: 99).

**Distribution:** Mekong Basin in Thailand, Cambodia, and Vietnam; Phú Quốc Island of Vietnam, coastal basins of western Cambodia and southeastern Thailand, Chao Phraya Basin, Myanmar, Malay Peninsula, and Sumatra.

**Notes:** A relatively small-sized species of spiny eels, found in large rivers and adjacent lakes and swamps; it is frequently marketed fresh in the Mekong Delta in particular in the Vietnamese region (photo A), but is much less common than in the coastal basins of western Cambodia and Phú Quốc Island of Vietnam.

Its characteristic, vivid blackish banded pattern encircling the belly readily distinguishes *Macrognathus circumcinctus* from the other spiny eels in the Mekong. Juveniles of the congener *M. siamensis* also have a conspicuous banded pattern on body (see left page), but the bands do not reach the ventral midline of the belly (vs. reach there in *M. circumcinctus* even in small specimens) and the caudal fin is separated from the dorsal and anal fins (vs. confluent).



A) Marketed fish, not collected (Cần Thơ, Vietnam, photo: KS); B) CTU-P 1030 (photo: LXT); C) IJERDLP 5318 (photo: PT)

***Mastacembelus erythrotaenia* Bleeker, 1850**

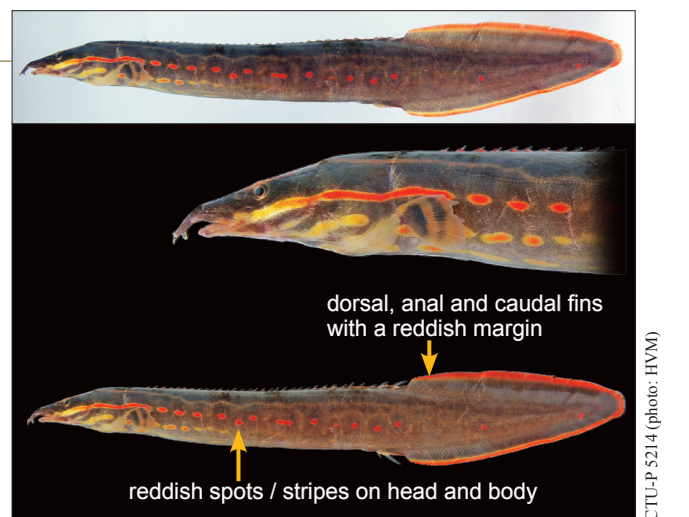
**Family:** Mastacembelidae (FC: 301)

**Size:** 76.0 cm TL (Kottelat *et al.*, 1993: 168).

**Distribution:** Mekong Basin in Vietnam (and ?Cambodia); coastal basins of Thailand, Malaysia, Sumatra, and Borneo.

**Notes:** A large-sized species of spiny eels, found in brackish estuaries and adjacent freshwater areas of large rivers; it appears to be uncommon in the Mekong, but is sometimes marketed fresh at the local markets in delta region of Vietnam. This brilliant fish is also frequently seen in the aquarium fish trade, although it is not so popular due to its barbarous habit.

Its characteristic red-spotted/striped patterns of the head and body, as well as similarly-colored distal margins of the dorsal, anal and caudal fins, readily distinguish *Mastacembelus erythrotaenia* from the other spiny eels in the Mekong.



CTU-P 5214 (photo: HVM)





## *Mastacembelus armatus* (Lacepède, 1800)

**Family:** Mastacembelidae (FC: 301)

**Size:** 70 cm TL (Kottelat, 2001a: 149).

**Distribution:** Mekong Basin in China (Yunnan), Laos, Thailand, Cambodia, and Vietnam; South and Southeast Asia from Pakistan to Indonesia.

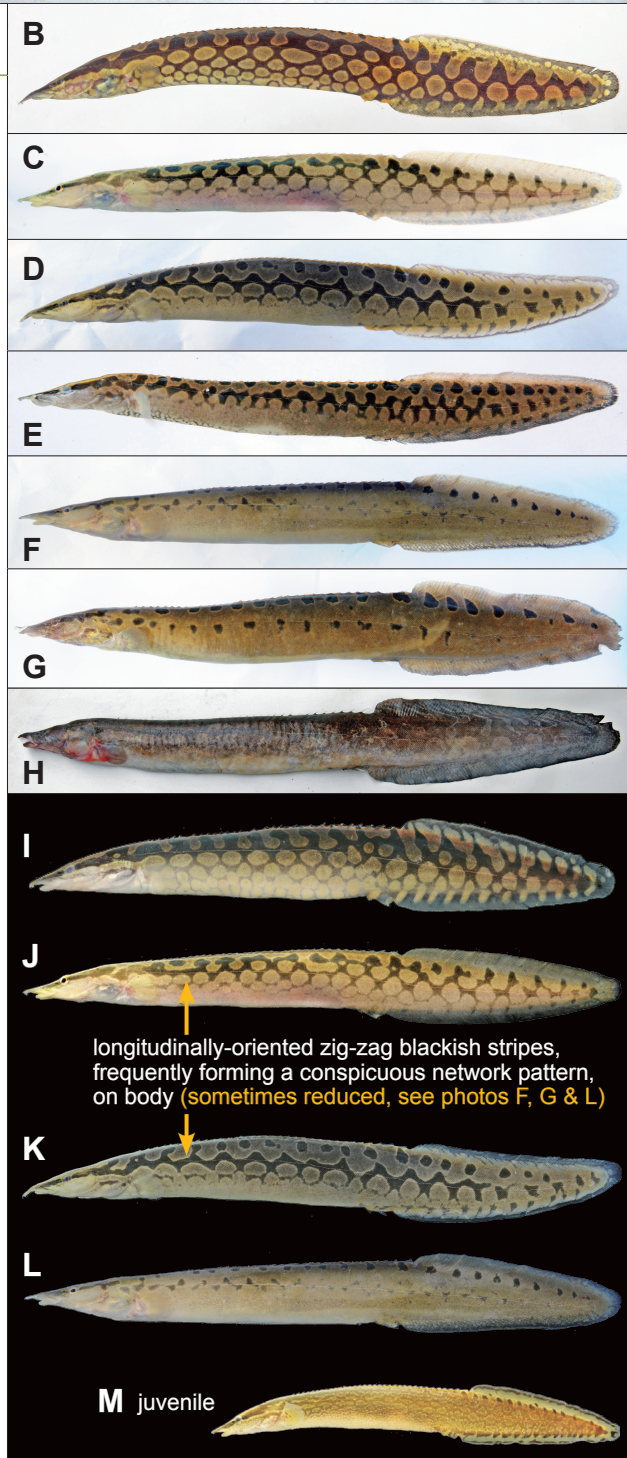
**Notes:** A large-sized species of spiny eels, found in various kinds of freshwater habitats, e.g., rivers, streams, lakes, and reservoirs. *Mastacembelus armatus* is the most common species of the genus in the Indochinese Mekong, and is frequently seen at the local markets.

*Mastacembelus* is similar to *Macrognathus*, but can be distinguished by having 33 or more isolated dorsal-fin spines (vs. 32 or fewer in *Macrognathus*) (Roberts, 1986; Kottelat, 2001a). In maximum size, many of the fishes of *Mastacembelus* are larger than *Macrognathus*; it is also true of the case of the Mekong species.

*Mastacembelus armatus* differs from the other congeners in the Mekong in having longitudinally-oriented zig-zag blackish stripes, frequently forming a conspicuous network pattern. However, the pattern is highly variable in this species; we collected specimens having merely a longitudinal series of blackish spots from Savannakhet, Laos (photos F, G, and L), and Roberts (1986: 106) reported specimens with "almost no color pattern at all".

Roberts (1986) considered the fish with a well-developed network pattern, extending over the entire abdomen as well as the entire length of body (like specimens in photos B and I) as a distinct species, *Mastacembelus favus*, originally described from Chao Praya River by Hora (1923); the Roberts' (1986) identification is followed by Rainboth (1996b: 180). Kottelat (1998: 117), however, disagreed with Roberts' (1986) identification, since there was considerable color variation including intermediate ones in his samples from the Nam Theun and Xe Bangfai basins (tributaries of the Mekong), and identified all his specimens as *M. armatus* tentatively. We concur with Kottelat's (1998) identification; note that *M. armatus* of his subsequent book on the fishes of Laos (Kottelat, 2001a: 149, fig. 423) contains *M. armatus* and *M. sp. (cf. tinwini)* (next page) shown here.

*Mastacembelus armatus* currently identified is widely distributed in South and Southeast Asia, and shows a large differences in vertebral counts among the different geographic regions (Britz, 2007). According to Britz (2007: 266), a large scale revision of the *M. armatus* complex is underway.



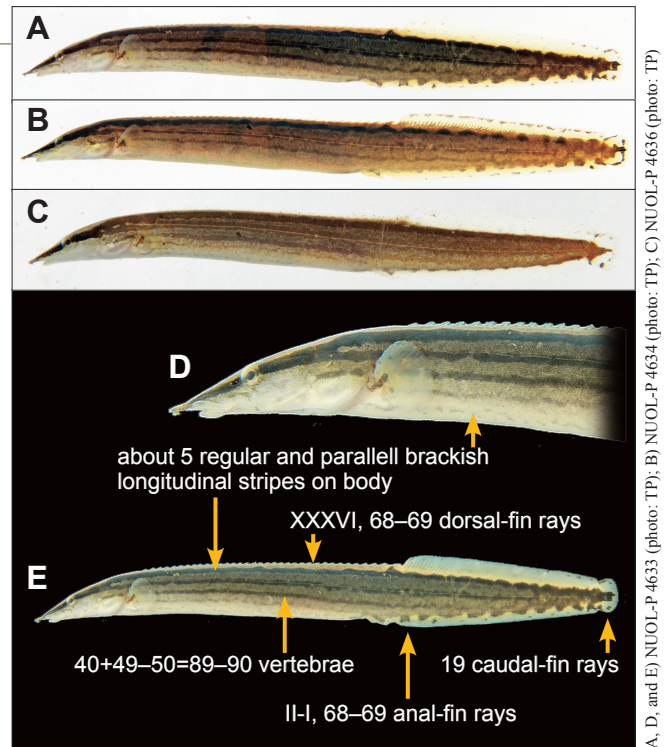
A) Marketed fish (not preserved, Vientiane, Laos, photo: KS); B) CTU-P 3619 (photo: LXT); C and J) NUOL-P 1840 (photo: TP); D and K) NUOL-P 1419 (photo: TP); E) IFREDI-P 1189 (photo: PT); F & L) NUOL-P 1141 (photo: TP); G) NUOL-P 1138 (photo: TP); H) CTU-P 91 (photo: LXT); I) CTU-P 591 (photo: LXT); M) IFREDI-P 3130 (photo: PT)



*Mastacembelus* sp. (cf. *tinwini*)**Family:** Mastacembelidae (FC: 301)**Size:** (not measured).**Distribution:** Mekong Basin in northern Laos.

**Notes:** Presumably a medium-sized species of spiny eels, collected from a fast flowing stream with gravel bottom in Luang Prabang Province, Laos; it was collected together with a small specimen of common congener *Mastacembelus armatus* (left page). The specimen in the bottom photograph of Kottelat's (2001a: 148, fig. 423) *M. armatus* looks identical to this species.

Its regular and parallel blackish longitudinal stripes (rather than zig-zag stripes in sympatric congener *M. armatus*) on the body resemble those of a congener known from the Salween Basin in Myanmar, *Mastacembelus tinwini* (see Britz, 2007). The Mekong fish, however, differs from the Myanmar specimens of *M. tinwini* by having 40 abdominal vertebrae (vs. 41–43 in the latter) and the last dorsal-fin pterygiophore that is inserted behind the neural spine of 42nd or 43rd vertebra (vs. 44th, 45th, 46th or 47th vertebra). Dorsal, anal, and caudal fins lack the whitish margin in the Mekong specimens (vs. with whitish margin in *M. tinwini*), but this condition may be owing to its small size; the above-noted specimen of Kottelat (2001a: 148, bottom photograph of fig. 423) that looks larger than our specimens has a distinct whitish margin of these fins.

*Mastacembelus* sp. (cf. *pantherinus*)**Family:** Mastacembelidae (FC: 301)**Size:** (not measured).**Distribution:** Mekong Basin in northern Laos.

**Notes:** A putative undescribed species, known only by a single specimen from a fast-flowing stream with gravel bottom and boulders in the Luang Prabang Province of Laos. The photograph below shows the habitat in the collecting locality.

This slender spiny eel somewhat resembles the congener *Mastacembelus pantherinus* from Lake Indwagyi of Myanmar in coloration, but has fewer vertebrae (34+46=80 vs. 42–44+54–57=97–100 in *M. pantherinus*) and dorsal (33 spines and 60 soft rays vs. 37–40 spines and 82–92 soft rays), anal (3 spines and 63 soft rays vs. 3 spines and 79–81 soft rays), and caudal-fin rays (14 vs. 17–20) [data of *M. pantherinus* is referred from Britz, 2007].

