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# First record of *Encheloclarias* (Teleostei: Clariidae) from Brunei Darussalam with notes on the taxonomic status of *E. baculum* Ng & Lim, 1993, and *E. prolatus* Ng & Lim, 1993

Heok Hui **Tan**[1,2*], Rahayu Sukmaria **Sukri**[3], Rafhiah **Kahar**[3] & René **Dommain**[4,5]

**Abstract.** The rare clariid catfish genus *Encheloclarias* is recorded for the first time from the peat swamp habitat in Brunei Darussalam, representing its northernmost record on the island of Borneo. Upon detailed examination, the Brunei species is keyed out to *E. baculum*. Using fresh material from Brunei and Sarawak (Malaysia, Borneo), the taxonomic status of *E. prolatus* is reviewed, and is herein synonymised with *E. baculum*, as first reviser's action. An updated key for all *Encheloclarias* species is provided, and ecological notes on the Brunei material discussed.

**Key words.** *Encheloclarias*, peat swamp, Siluriformes, Borneo, taxonomy

## INTRODUCTION

The bladefin catfishes, *Encheloclarias*, often associated with acid-water and peat swamp habitats, are the only Southeast Asian clariid catfishes with an adipose fin (Ng & Lim, 1993). However, there are two other clariid genera with adipose fins known from Africa — *Heterobranchus* and *Dinotopterus*, in addition to two species of African *Clarias* (subgenus *Dinotopteroides*) (fide Teugels, 1983, 1986).

The first species of bladefin catfish described for Southeast Asia was *Heterobranchus tapeinopterus* by Bleeker in 1853, from the island of Bangka. Later, the genus *Encheloclarias* was erected for *E. tapeinopterus* by Herre & Meyers (1937). Later, Fowler (1941) considered *Encheloclarias* a junior synonym of *Heterobranchus*. However, these two genera are distinct, as the neural spines penetrate into the adipose fin in *Heterobranchus* (and *Dinotopterus*), whereas the neural spines stay within the body proper in *Encheloclarias* (Roberts, 1989; see Fig. 1).

Subsequent records of *Encheloclarias* (post-Bleeker) were identified as *E. tapeinopterus* (see Bleeker, 1853, 1858; Günther, 1864; Weber & de Beaufort, 1913; Herre & Meyers, 1937; Hora & Gupta, 1941; Roberts, 1989) until Ng & Lim (1993) revised the genus, and described four new species — *E. baculum* from Sambas in West Kalimantan, *E. prolatus* from Kuching in Sarawak, *E. kelioides* from Pahang in Peninsular Malaysia, and *E. curtisoma* from Selangor in Peninsular Malaysia. Ng & Lim (1993) also included a key to the species, and brief notes on the habitat of the different species. Ng & Tan (2000) described *E. velatus* based on specimens from a local market in Sumatra and subsequently Ng (2012) described *E. medialis*, based on a single specimen from southern Borneo.

The discoveries of Ng & Lim (1993), Ng & Tan (2000), and Ng (2012) also highlighted the conservation challenges of peat swamps forests and their biodiversity in Southeast Asia. These unique habitats have been poorly surveyed for aquatic organisms but are being altered rapidly as a result of urbanisation, plantation agriculture and industrialisation (Miettinen et al., 2011).

*Encheloclarias* are enigmatic catfishes with a very specialised niche, which makes them very difficult to collect and study. Very few specimens of *Encheloclarias* are available in museum collections as a result, and three species (*E. baculum*, *E. prolatus*, and *E. medialis*) are known only from the holotype.

We document the discovery of *Encheloclarias* from the Sultanate of Brunei Darussalam (termed Brunei henceforth), which extends the known distribution of *E. baculum* by over 400 km to the northeast and describe fresh material from Brunei and Sarawak.

*Accepted by: Kevin Conway*

[1]Lee Kong Chian Natural History Museum, National University of Singapore, 2 Conservatory Drive, Singapore 117377, Republic of Singapore; Email: heokhui@nus.edu.sg (*corresponding author)

[2]Institute of Biodiversity and Environment, Universiti Malaysia Sarawak, 94300 Kota Samarahan, Sarawak.

[3]Institute for Biodiversity and Environmental Research, Universiti Brunei Darussalam, Jalan Tungku Link, BE 1410, Brunei Darussalam.

[4]The Asian School of the Environment, Nanyang Technological University, 50 Nanyang Avenue, Singapore 639798, Republic of Singapore.

[5]National Museum of Natural History, Smithsonian Institution, Washington, DC 20013, USA


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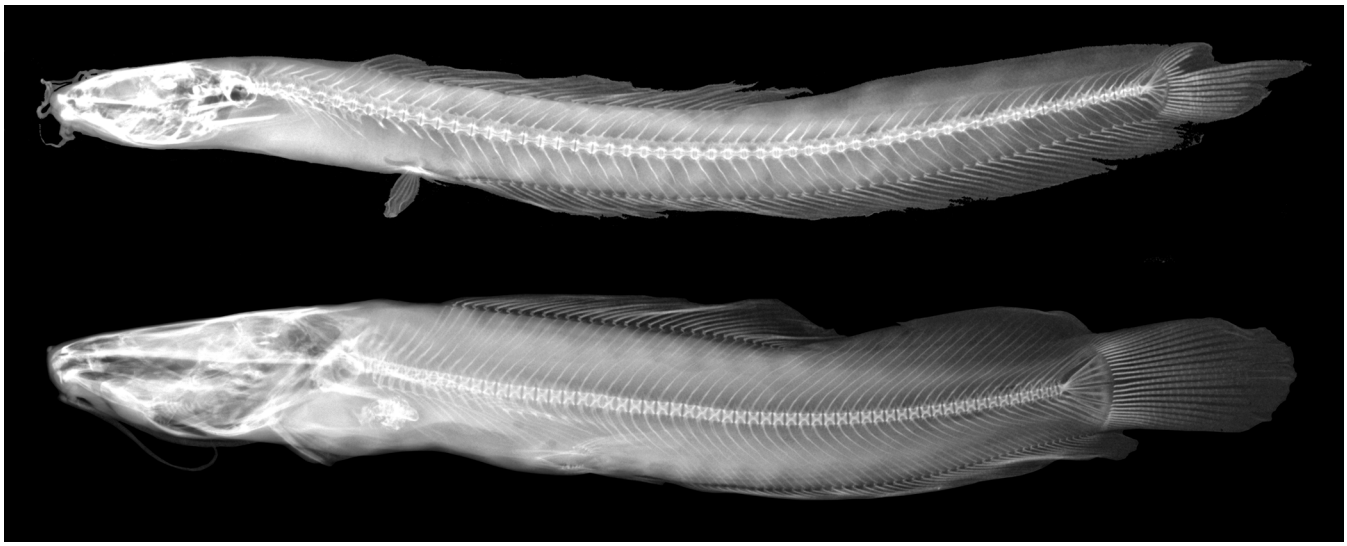

Fig. 1. Composite radiographs of *Encheloclarias baculum* (above), ZRC 63175, 75.0 mm SL, Brunei; and *Heterobranchus longifilis* (below), ZRC 38289, 119.4 mm SL, Africa. This composite shows the extension of neural spines into the adipose fin in *Heterobranchus*.

## MATERIAL AND METHODS

Specimens from Brunei were obtained from baited (with cat kibbles) bottle traps (45 cm length, 8 cm opening with 0.5 cm mesh), set in tip-pools in the Badas peat dome habitat. Additional specimens from Sarawak were obtained from aquarists and donations. All specimens examined are housed within the Natural History Museum (BMNH), London, United Kingdom; Sarawak Museum (SM), vertebrate collection, Kuching, Sarawak; Zoological Reference Collection (ZRC) of the Lee Kong Chian Natural History Museum, at the National University of Singapore, Singapore.

Fin-ray number (unpaired) and vertebral count were counted from radiographs, following Ng & Lim (1993). Pectoral-fin spine terminology follows Kubicek et al. (2019).

## TAXONOMY

### Artificial key to species of *Encheloclarias*

1. Gill rakers on first arch 8–10; caudal vertebrae 37–50 .....2
– Gill rakers on first arch 6–7; caudal vertebrae 34–44 .....4
2. Pectoral-fin spine with 9–12 posterior serrae; head length 12–15% SL; anal fin confluent to caudal fin at base..... .....***Encheloclarias velatus*** (Central Sumatra, Bintan island)
– Pectoral-fin spine 3–6 posterior serrae; head length 14–20% SL; anal fin separate, incomplete, or fused with caudal fin ..3
3. Anal fin separate from caudal fin; caudal vertebrae 37–42; body height 13–15% SL; adipose-fin length 183–214% HL... .....***Encheloclarias curtisoma*** (Peninsular Malaysia: Selangor and Ayer Hitam in Johor)
– Anal fin partial to fully fused with caudal fin; caudal vertebrae 45–50; body height 9–11% SL; adipose-fin length 201–291% HL.....***Encheloclarias baculum*** (Brunei, Sarawak, and Sambas in West Kalimantan)
4. Anal-fin fused fully with caudal-fin; gill rakers on first arch 6; dorsal-fin length 26% SL..... .....***Encheloclarias tapeinopterus*** (Bangka Island)
– Anal-fin confluent at base with caudal-fin; gill rakers on first arch 7; dorsal-fin length 30–32% SL .....5
5. Pectoral-fin spine serrae 2; head length 19% SL; predorsal length .....***Encheloclarias medialis*** (Mentaya in Central Kalimantan)
– Pectoral-fin spine serrae 3–8; head length 15–17% SL; predorsal length 28–31% SL.....***Encheloclarias kelioides*** (Peninsular Malaysia: Pahang, Kota Tinggi in Johor; and Singapore)

### *Encheloclarias baculum* Ng & Lim, 1993
(Figs. 1–8)

*Encheloclarias baculum* Ng & Lim, 1993: 27; Ng & Tan, 2000: 538 (listed as comparative material); Parenti & Lim, 2005: 192; Tan & Ng, 2005: 83; Ferraris, 2007: 149; Ng, 2012: 116 (listed as comparative material); Sule et al., 2016: 429 (table).

*Encheloclarias prolatus* Ng & Lim, 1993: 29; Ng & Tan, 2000: 539 (listed as comparative material); Ferraris, 2007: 150; Ng, 2012: 116 (listed as comparative material); Sule et al., 2016: 429 (table).

**Material examined**. - BMNH 1863.12.11:162, 1 ex., 57.1 mm SL, holotype; West Kalimantan: Sambas (photographs and radiograph only; see Fig. 2). --- ZRC 63175, 1 ex., 75.0 mm SL; Brunei Darussalam: Belait District: Belait river basin; Badas peat dome, Badas; in a tip pool; Dommain R. & Zulkiflee R., 19–21 August 2022. --- ZRC 63817, 2 ex., 67.9–82.0 mm SL, 2 ex., 70.0–82.0 mm SL; Brunei Darussalam: Belait District: Belait river basin; Badas peat dome, Badas; in shallow water pools; Dommain R., Cobb A., Incham, J. M. & Zulkiflee R., 11–12 February 2023. --- ZRC 63818, 2 ex., 64.4–102.5 mm SL, ZRC 63819, 1 ex., 79.2 mm SL, ZRC 63820, 1 ex., 116.0 mm SL; Brunei Darussalam: Belait District: Belait river basin; Mendaram peat dome; in shallow water pools; Dommain R., Incham, J. M. & Zulkiflee R., 17–18 February 2023. --- ZRC 44215, 2 ex., 104.8–110.7 mm SL; Sarawak: Sibu, Sungei Kemayan peat swamps; Yong D., October 1998. --- ZRC 39748, 1 ex., 50.3 mm SL; Sarawak: Serian, peat swamp ca. 11 km into Gedong road; H. H. Tan & S. H. Tan, 16 January 1996. --- ZRC 56630, 2 ex., 67.3–69.5 mm SL; ZRC 56631, 1 ex., 54.1 mm SL; Sarawak: Kuching, Matang peat swamps; local fisher, 10 November 2017. --- ZRC 63516, 5 ex., 122.8–154.3 mm SL; Sarawak: Kuching; local fisher, December 2017.

Fig. 2. *Encheloclarias baculum*, BMNH 1863.12.11:162, 57.1 mm SL, composite of dorsal, lateral and ventral views of holotype; West Kalimantan: Sambas (Photograph: NHM, London).

Fig. 3. *Encheloclarias baculum*, ZRC 63175, 75.0 mm SL; composite of dorsal, lateral and ventral views of a preserved specimen from Brunei (Photograph: THH).

Fig. 4. *Encheloclarias baculum*, ZRC 63817, 82.0 mm SL, composite of dorsal, lateral and ventral views; showing individual with fully confluent anal- and caudal-fins; Brunei: Badas (mirror inverted) (Photograph:THH).

Fig. 5. *Encheloclarias baculum*, ZRC 6630, 67.3 mm SL; composite of dorsal, lateral and ventral views of a preserved specimen from Sarawak (Kuching: Matang) (Photograph: THH).

Fig. 6. *Encheloclarias baculum*, ZRC 44215, 110.8 mm SL; composite of dorsal, lateral and ventral views of a preserved specimen from Sarawak (Sibu: Kemayan) (Photograph: THH).

**Diagnosis.** *Enchelolarias baculum* can be differentiated from its congeners in having the following unique combination of characters: Anal and caudal fins confluent at their bases, fusion with caudal fin at times fully to ¾; highest number of caudal vertebrae amongst its congeners (45–50 vs. 34–45); long and slender body; 8–10 gill rakers; 3–5 serrae on posterior edge of pectoral-fin spine; dorsal-fin rays 25–29 (mode 26); anal-fin rays 53–65 (mode 56).

**Description.** Selected meristic and morphometric data listed in Table 1; see Figs. 1–8 for general body form. Body long, slender, cylindrical, gently tapering towards caudal peduncle. Dorsal profile rising gently from tip of snout to origin of dorsal fin, and thereafter straight to end of caudal peduncle, except gently convex along adipose fin. Ventral profile of head slightly convex, thereafter almost horizontal to end of caudal peduncle. Skin smooth. Lateral line complete and midlateral in position. Vertebrae 15–17 + 45–50 = 60–67 (n = 8).

Head relatively acutely depressed; predorsal profile slightly convex, ventral profile straight. Bony elements of dorsal surface of head covered with smooth, velvety skin; bones not readily visible. Frontal fontanelle longitudinally ovoid; located in interorbital region, with anterior tip reaching imaginary line connecting anterior margin of orbits. Occipital fontanelle ovoid; located at base of occipital process, slightly narrower than frontal fontanelle, posterior edge reaches imaginary line connecting base of pectoral-fin spines. Occipital process, broad, with rounded point. Eye ovoid, horizontal axis longest, subcutaneous; located dorsolaterally on head. Gill openings narrow, extending from dorsalmost point of the pectoral-fin base to isthmus. Gill membranes free from each other, only united across isthmus, with 9 branchiostegal rays. First branchial arch with 8–10 gill rakers (n = 6).

Mouth subterminal, with fleshy, plicate lips. Barbels in four pairs; long and slender with thick fleshy bases. Maxillary barbel typically longest and thickest at base, length 132–159% HL. Nasal barbel longer than inner mandibular barbel, length 94–149% HL. Inner mandibular barbel origin close to midline; length 89–121% HL. Outer mandibular barbel originating posterolateral of inner mandibular barbel, longer than inner mandibular barbel, length 99–143% HL. Anterior nostril at tip of long tube; tube extending beyond edge of mouth when directed anteriorly. Posterior nostril just anterior to eye, at base of nasal barbel, opening about eye diameter.

Dorsal fin with moderately short base, spanning middle one-third of body; with 25–29 (mode 26) rays covered by thick layer of skin and without spine. Dorsal-fin pterygiophore insertion at 9$^{th}$ to 12$^{th}$ vertebrae (mode 10, n = 6). Dorsal-fin margin relatively straight, parallel to dorsal edge of body. Adipose fin with gently convex dorsal margin; anterior point of origin contacting base of last dorsal-fin ray, gently curving posteriorly to fuse broadly with upper procurrent caudal fin rays. Anal-fin base long, with 53–65 (mode 56) rays, covered by thick layer of skin; margin straight, parallel to ventral edge of body. Anal-fin origin at vertical through seventh dorsal-fin ray, pterygiophore insertion at 15$^{th}$ to 18$^{th}$ vertebrae (mode 17, n = 6); confluent with caudal fin base,

Table 1. Selected biometric data for *Encheloclarias baculum* (information on type material of *E. baculum* and *E. prolatus* from Ng & Lim, 1993).

| **Taxon** | ***Encheloclarias baculum*** | | | ***Encheloclarias prolatus*** |
|---|---|---|---|---|
| **Catalogue number** | ZRC 63175 | ZRC 44215 (2)<br>ZRC 56630 (2)<br>ZRC 56631 (1) | BMNH 1863.12.11.162 holotype | SM 5686 holotype |
| **Location** | Brunei: Belait, Badas peat dome | Sarawak: Sibu, Kemayan; and Kuching, Matang | West Kalimantan: Sambas | Sarawak: Kuching |
| **Standard Length (mm)** | 75.0 | 52.8–110.8 | 57.1 | 85.5 |
| **MERISTICS** | | | | |
| **Dorsal-fin rays** | 26 | 25–29 | 26 or 27 | 29 |
| **Anal-fin rays** | 56 | 53–61 | 54 or 55 | 65 |
| **Pectoral-fin spine serrae** | 5 | 3–5 (mode 3) | 4 | 3 |
| **Gill rakers (first arch)** | 8 | 8 (n=3) | 10 | 8 |
| **Vertebral count** | 16 + 48 (total 64) | 15–17 + 45=47 (total 60–64, mode 61) | 17 + 48 (total 65) | 17 + 50 (total 67) |
| **MORPHOMETRICS** | | | | |
| **% Standard Length** | | | | |
| **Head length** | 14 | 15–18 | 15 | 16 |
| **Head width** | 11 | 12–14 | 14 | 12 |
| **Occipital process to dorsal-fin origin** | 13 | 14–16 | 16 | 17 |
| **Body width** | 5 | 7–8 | 11 | 9 |
| **Body depth** | 7 | 9–11 | 10 | 9 |
| **Pre-dorsal fin length** | 27 | 28–33 | 32 | 32 |
| **Dorsal-fin length** | 34 | 30–34 | 31 | 33 |
| **Adipose-fin length** | 37 | 34–43 | 38 | 39 |
| **Pre-anal fin length** | 37 | 36–42 | 40 | 40 |
| **Anal-fin length** | 62 | 57–75 | 63 | 60 |
| **% Head Length** | | | | |
| **Pre-dorsal fin length** | 191 | 182–197 | 202 | 196 |
| **Anal-fin length** | 440 | 319–449 | 435 | 386 |
| **Pre-anal fin length** | 264 | 223–257 | 250 | 257 |
| **Adipose-fin length** | 261 | 201–291 | 264 | 253 |
| **Nasal barbel length** | 94 | 97–149 | – | – |
| **Maxillary barbel length** | 132 | 143–159 | – | – |
| **Mandibular barbel length** | 99 | 112–143 | – | – |
| **Inner mandibular barbel length** | 94 | 89–121 | – | – |
| **% Dorsal-fin length** | | | | |
| **Pre-dorsal fin length** | 80 | 91–103 | 97 | 97 |
| **Adipose-fin length** | 109 | 105–143 | 123 | 120 |
| **% Pre-anal fin length** | | | | |
| **Anal-fin length** | 166 | 136–179 | 159 | 150 |

Fig. 7. *Encheloclarias baculum*, ZRC 63817, 82.0 mm SL, live colouration (Brunei: Badas) (Photograph: THH).

Fig. 8. *Encheloclarias baculum*, ZRC 63516, 105.1 mm SL, live colouration (Sarawak: Matang). Note discolouration on body due to collection artefacts (Photograph: THH).

sometimes fully fused to ¾. Caudal fin long and rounded or truncate, with 15 fin rays, anterior-lowermost procurrent caudal ray longer than last few anal-fin rays.

Pectoral fin broad, abruptly and sharply pointed at tip, with I,8 rays. Anterior margin of spine smooth; posterior margin of spine serrated, with 3–5 (mode 3) inward directed serrae (n = 8). Pectoral-fin margin weakly convex anteriorly, gently convex posteriorly. Pelvic-fin origin at vertical through base of third to fourth dorsal-fin ray, pterygiophore insertion at 13$^{th}$ to 16$^{th}$ vertebrae (mode 14 or 15, n = 6), with i,6 rays and convex margin; tip of fin reaching base of second anal-fin ray. Anus and urogenital openings located at vertical through middle of pelvic fin.

**Preserved colouration.** See Figs. 2–6. Overall colour of the Brunei specimen is black to dark purple (Sarawak material appear dark brown to grey) on dorsum to lateral, fading to brownish-purple on venter. Unpaired fins uniformly black, except for areas with recovery from damage, which is hyaline or grey. Paired fins light grey to hyaline. Posterior margin of opercle pale brown. Specimens from Sarawak have similar colouration.

**Live colouration.** See Figs. 7–8. Overall colour of both Brunei and Sarawak populations is dark brownish-purple. Area behind eye and opercular region brighter reddish-brown. Barbels brown proximally, lightening to white distally. Pectoral and pelvic fins lighter brown. Adipose fin uniform dark brown. Caudal fin lighter brown. Both dorsal and anal fins with proximal one-third dark brown, distal portion lighter brown. Lateral line pattern on body appearing as an interrupted white line.

Fig. 9. Tip-up pool within Badas peat dome at Brunei, in which *Encheloclarias baculum* (ZRC 63175) was collected (Photograph: RD).

**Field biology notes.** The first specimen of *Encheloclarias baculum* from Brunei (ZRC 63175) was obtained in a bottle trap, placed over two nights (19–21 August 2022) in a tip-up pool within *Shorea albida* peat swamp forest on the Badas peat dome (see Fig. 9). A tip-up pool forms by uprooting of a falling tree. The uprooting creates a pit in the waterlogged peat swamp forest floor, which quickly fills with water (Dommain et al., 2015). Tip-up pools are some of the most permanent aquatic habitats on peat domes where water is continuously flowing to the peat dome margin, and the peat surface may dry out periodically during periods without rain (Cobb et al., 2017). The tip-up pool from which *Encheloclarias* was collected had the following dimensions and abiotic parameters — size: 2.3 m × 1.0 m; water depth: 15 cm; water temperature 26.1°C; pH 3.9 (readings taken on 27 May 2022); and a dissolved $O_2$ concentration of 2.56 mg/L (2 June 2022). Syntopic fishes included *Rasbora kottelati* (Danionidae), *Ompok borneensis* (Siluridae), *Clarias leiacanthus*, and *C. nieuhofii* (Clariidae).

In the pristine Mendaram peat swamp forest, *Encheloclarias baculum* was collected from very shallow pools (6–8 cm water depth) with pH 3.7–3.9 and dissolved $O_2$ concentrations of 2.4–2.9 mg/L (readings on 18 February 2023), but not found in tip-up pools with more than 28 cm water depth. Syntopic species were *Rasbora kottelati* and *Clarias nieuhofii*.

A juvenile specimen of *Encheloclarias baculum* (ZRC 39748) was obtained from a flooded peat swamp at Gedong (Sarawak), in ca. 10–20 cm water depth amongst submerged leaf litter and peat deposits. During a survey in January 1996, many specimens of *Betta brownorum* were also obtained along with other syntopic species (see Tan & Ng, 2005: 83). A subsequent trip in August of the same year yielded only *Betta ibanorum*, from deeper waters. Another follow up trip in June 1998 was attempted, but the forest had been clear felled and drained, and no fish were obtained (Tan HH, pers. obs.).

Two specimens of *Encheloclarias baculum* from Kemayan peat swamps near Sibu (Sarawak) were obtained from a kind donation in 1998. These were caught using a hand net as juveniles and maintained in captivity for a few months. The habitat was revisited in May 2008 but was badly disturbed and used as a city dump.

Specimens obtained from Matang peat swamps near Kuching (Sarawak) were obtained via bait angling by hobbyists in 2017. *Encheloclarias baculum* was not the main target fish, as they were angling for *Channa* spp. The habitats in this area were remnant patches of peat swamp forest, which had been more extensive in the past.

**Distribution.** For details on the type locality of *Encheloclarias baculum*, please refer to Ng & Lim (1993). *Encheloclarias baculum* is recorded to date from Sambas (West Kalimantan), southern part of Sarawak (Kuching to Sibu) and Brunei (Belait area, Badas peat dome). This is the most widespread species currently known.

See Fig. 10 for distribution of all known species of *Encheloclarias*. The genus *Encheloclarias* is restricted to coastal peat swamp forests and freshwater swamp forest habitats within Southeast Asia. Only *E. velatus* and *E. kelioides* were found in syntopy in Jambi, however this is likely to be an artefact of sampling, as they were obtained from a food market, and very likely to have been sourced from nearby peat swamp habitats and pooled together for sale (pers. obs.).

**Comparative notes.** *Encheloclarias baculum* can be further differentiated from its congener *E. tapeinopterus* by the greater number of gill rakers on the first arch (8–10 vs. 6), greater number of anal-fin rays (53–65 vs. 50), smaller pre-dorsal fin length (27–33% SL vs. 34; 80–103% HL vs. 131), larger dorsal-fin length (30–34% SL vs. 26), smaller inner mandibular barbel length (89–121% HL vs. 141); from *Encheloclarias curtisoma* in the greater number of anal-fin rays (53–65 vs. 47–50), smaller head width (11–14% SL vs. 15–17), smaller body width (5–11% SL vs. 13–14), smaller body depth (7–11% SL vs. 13–15); from *Encheloclarias kelioides* in the greater number of gill rakers on the first arch (8–10 vs. 7); from *Encheloclarias velatus* by having fewer serrae along the posterior edge of the pectoral-fin spine (3–5 vs. 9–12); and from *Encheloclarias medialis* in having fewer serrae along the posterior edge of the pectoral-fin spine (3–5, vs. 2) and fewer gill rakers on the first arch (8–10 vs. 7).

**Comments.** The specimens from Matang in Sarawak (ZRC 56631), Gedong (ZRC 39748) and Kemayan (ZRC 44215) were initially keyed out to *E. baculum*, and Matang (ZRC 56630) to *E. prolatus* based mainly on the observable extent of confluence between anal and caudal fins — a major morphological character differentiating *E. baculum* from *E. prolatus*. This initial identification was perplexing as it suggested that either both species were syntopic or mis-identified. Adding to this initial confusion, both these taxa were described based on single poorly preserved specimens, both collected in the late 1800s. Ng & Lim (1993: 28–29) already noted the similarities between *E. baculum* and *E. prolatus*, but without access to a series of fresh specimens, they concluded that each was a distinct species. The extent

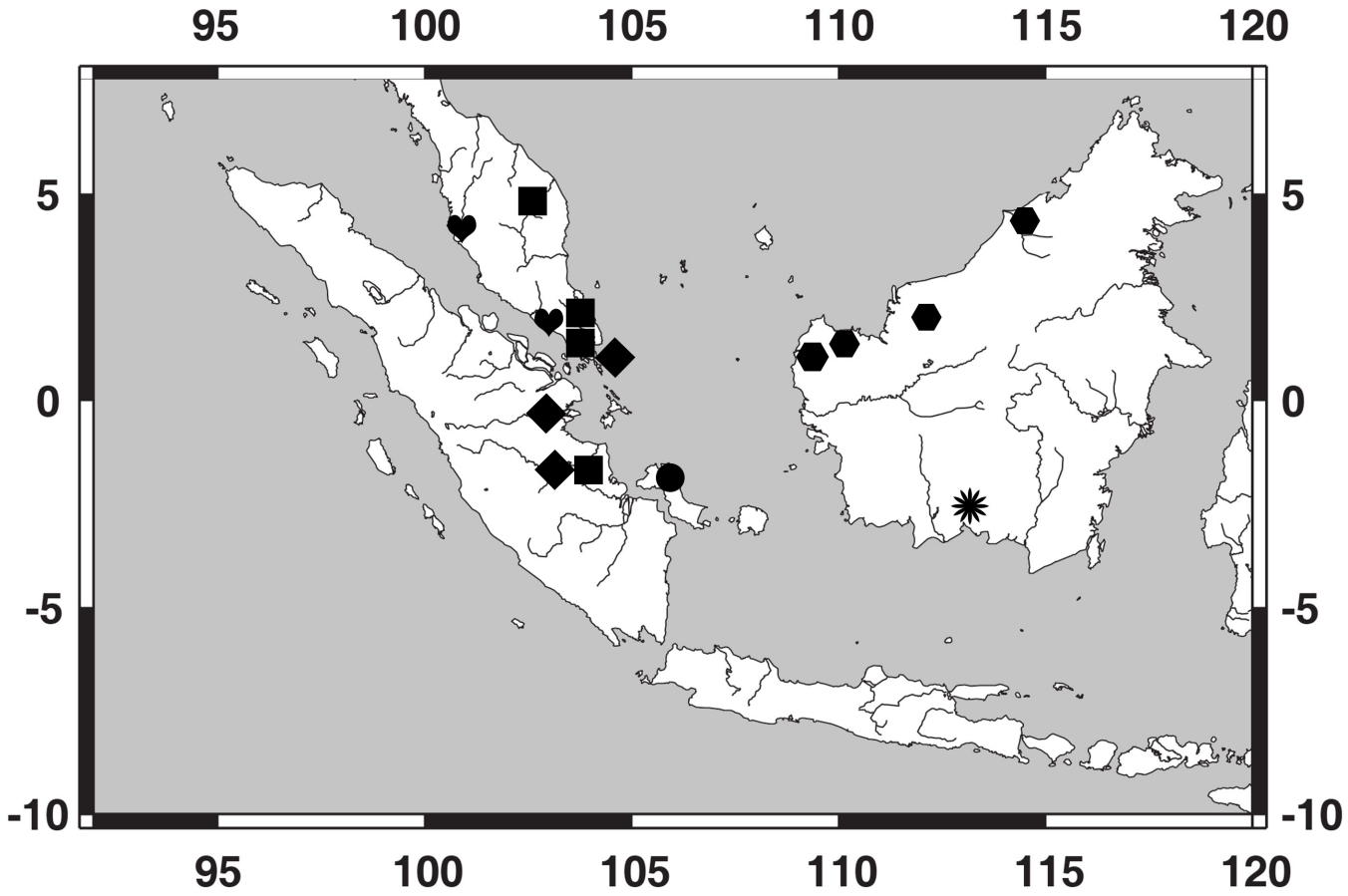


Fig. 10. Map showing the distribution of *Encheloclarias*: circle for *E. tapeinopterus*, hexagon for *E. baculum*, square for *E. kelioides*, heart for *E. curtisoma*, diamond for *E. velatus*, and star for *E. medialis* (each symbol may represent more than one location).

of confluence between the anal and caudal fins has now been shown to be variable, ranging from nearly full fusion to around ¾ fusion.

Based on our examination of *Encheloclarias baculum* (eleven fresh specimens from Sarawak and Brunei), and the information on *E. prolatus* available from the original description (Ng & Lim, 1993), we are unable to identify characters that would distinguish the two species. We conclude that both names apply to the same species and as first revisers select *E. baculum* as the valid name. *Encheloclarias prolatus* should be considered a junior synonym of *E. baculum*.

A preliminary search through the wet collection of vertebrate animals in the Sarawak Museum was conducted in December 2022 (Tan HH, pers. obs.). The holotype of *E. prolatus* could not be located and is most likely presumed lost.

This study highlights the challenges in clearing the identity and distribution of rare and uncommon taxa, whose descriptions are based on one, or very few specimens.

## GENERAL REMARKS

The distribution of *Encheloclarias baculum* along a 660 km long stretch of the coastal lowlands of northwest Borneo overlaps with the distributional range of the dipterocarp tree *Shorea albida* (see Dommain et al., 2015), which dominates the peat swamp forests of this region. *Encheloclarias baculum* is perhaps a typical faunal component of the *Shorea albida* peat swamp forests, which should be confirmed through further survey work. Unfortunately, most *Shorea albida* forests have been converted to oil palm plantations over the past 20 years (Miettinen et al., 2011) and only a few intact forests remain, most of them in Brunei (Dommain et al., 2016). Protection and preservation of *Shorea albida* peat swamp forests should be considered a conservation priority for peat swamp forest fishes in northwest Borneo, including *E. baculum*.

*Encheloclarias* may have a wider distribution on Borneo and several undescribed species are also likely to occur. Though species of *Encheloclarias* are very rarely encountered in traditional surveys, the use of baited traps should help with the assessment of its abundance and distribution (present study; Tan et al., 2023). The recent discovery of *Encheloclarias* in Sebangau peat swamp forest (Central Kalimantan; Thornton et al., 2018) suggests that bladefin catfishes are more common than previously thought. In Thornton's ecological survey using baited traps over six months, *Encheloclarias* made up 8% of their forested stream catch, which equated to more than 300 individual specimens!

Nearly all records of *Encheloclarias* are from peat swamp forests or associated black water streams, indicating that members of this genus are peat swamp specialists, adapted

to highly acidic waters (pH < 4). A recent finding by Tan et al. (2023) suggests that mature acid-water swamp forest may harbour cryptic populations of *Encheloclarias*. In fact, *E. baculum*, together with *E. curtisoma*, *E. velatus*, and *E. medialis*, seem to be confined to peat swamp habitats (Ng & Lim, 1993; Ng & Tan, 2000; Ng, 2012). The aforementioned species occur in coastal peatlands of the Sunda region, which are known to have formed over the past 5,000 years only (Dommain et al., 2011). These species may have invaded these rather recent landscapes from a currently unknown peat swamp refugium or multiple refugia. Hence, *Encheloclarias* catfishes represent an ideal candidate to better understand the evolution and biogeography of peat swamp biodiversity, as is the case for other peat swamp specialists including, for example, labyrinth fishes (Anabantoidei) (Rüber et al., 2006).

**Comparative material.** Information on the holotypes of *E. baculum* and *E. prolatus*, *E. tapeinopterus*, *E. curtisoma*, and *E. kelioides* was obtained from Ng & Lim (1993). Information on type material of *E. velatus* and *E. medialis* was obtained from Ng & Tan (2000) and Ng (2012) respectively.

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