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Lepidocephalichthys balios, a new species of loach from central Laos (Teleostei: Cobitidae)

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Abstract. *Lepidocephalichthys balios*, new species, is described from the Nam Mang watershed, a tributary of the Mekong, in central Laos. It is a small-sized species (largest known specimen 32.6 mm SL) distinguished from all congeners (except *L. eleios*) in having the last two rays of the pectoral fin in the male adjacent, without membrane between them but not fused, and without dorsal flange or projections (vs. unbranched parts fused and forming a thick rigid rod, with a dorsal projection). The body is entirely covered by isolated randomly distributed pigments, at places concentred in a midlateral row of 5–10 weakly contrasted irregular blotches and 6–9 irregular saddles, and the black basal caudal pattern made of two vertically elongated blotches. The species was collected in leaf litter and in vegetation at the bottom of a pool in a slow flowing stream.

Key words. Cobitoidei, Mekong River, sexual dimorphism, pectoral rod

INTRODUCTION

Loaches of the genus *Lepidocephalichthys* typically inhabit slow flowing streams, lakes and marshes, where they mainly occur on muddy bottoms, among leaf litter or in peat. The genus presently includes 19 valid species (pers. obs., updated from Kottelat, 2012, 2013). It is widely distributed in Southeast and South Asia, from Sundaland and the Mekong drainage westwards to the Indus drainage and Sri Lanka. The species from the Malay Peninsula were revised by Kottelat & Lim (1992); Havird & Page (2010) and Havird et al. (2010) revised the genus and described additional species. Sudasinghe et al. (2023) researched the phylogeny of the genus.

A survey of the Nam Leuk, a small tributary of the Nam Mang, which enters the Mekong at Thabok (Fig. 2), conducted in 1997 obtained an unnamed species of *Lepidocephalichthys*. The species exhibits no conspicuous characters distinguishing it from other species, and its description lagged behind, awaiting the collection of more material likely to present more characters. This having now lasted for more than 25 years, and the species having escaped other researchers as well, it is described here.

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MATERIAL AND METHODS

Measurements and counts follow Kottelat (1990) and Kottelat & Freyhof (2007). Head length is the lateral head length of Kottelat (1990). The last dorsal and anal-fin ray articulating on the same pterygiophore as the preceding ray is noted as "½". The last two posterior rays (6 and 7th branched rays) of the pectoral fin, when fused, are called 'pectoral rod'. Terminology for mouth parts, see Figure 1; the lower lip is interrupted in the middle; each half is made of a fleshy lobe in medial position ('mental lobe'), which ends in a point, may have a number of indentations on the medial side, and is separated from the lateral portion by a small notch; the lateral portion ('postlabial flange') is the area between the mental lobe and the base of the maxillary barbel; the postlabial flange is thin, extends backwards, its posterior part is free from the throat and its posterior edge usually lobed or fringed (Fig. 1). Toponymy is as obtained in the field and on the 1:100,000 topographic map (Service Géographique d'État, 1985, sheet E 48–51); names or spellings differing from the map are noted in square brackets, except for Nam Ngiep (Nam Gniap on map). Abbreviations used: CMK, collection of the author; MHNG, Muséum d'Histoire Naturelle, Genève; and ZRC, Lee Kong Chian Natural History Museum, Singapore.

Lepidocephalichthys balios, new species

(Figs. 3–5)

Holotype. MHNG 2792.020, 28.8 mm SL; Laos: Vientiane Province: confluence of Nam Leuk and Nam Gnong, 18°22′04″N 103°05′27″E; M. Kottelat et al., 24 February 1997.

Paratypes. CMK 13249, 36, 16.5–32.6 mm SL; ZRC 65919, 10, 18.5–27.0 mm SL; same data as holotype.

Fig. 1. Mouth parts in *Lepidocephalichthys berdmorei* (left; CMK 25927, 71.1 mm SL) and *L. guntea* (right; uncat., 30 mm SL; photograph K. Conway), as examples for the genus; ventral view. Abbreviations: mb, maxillary barbel; ml, mental lobe of lower lip; pf, postlabial flange of lower lip; rbi, inner rostral barbel; rbo, outer rostral barbel; ul, upper lip.

Diagnosis. *Lepidocephalichthys balios* is distinguished from all other species of the genus (except *L. eleios*) by lacking any modifications of the pectoral-fin rays in males. The last two pectoral-fin rays of males are adjacent, with narrow or without membrane between them, but not fused, not forming a pectoral rod, and without dorsal or ventral projections. Additional characters useful to distinguish the species from congeners but not unique to it are: the body entirely covered by isolated randomly distributed pigments, at places concentrated in a midlateral row of 5–10 weakly contrasted irregular blotches and 6–9 irregular saddles, and the black basal caudal pattern made of two vertically elongated blotches; caudal fin with pigments on rays only, forming about 4 very irregular bars, irregularly in contact or anastomosed, leaving variously shaped unpigmented patches; postlabial flange concave, not reaching backwards to tip of mental lobe (Fig. 6); head scaleless; caudal fin truncate to slightly emarginate.

Lepidocephalichthys balios is distinguished from *L. eleios* by having the body entirely covered by isolated randomly distributed pigments (vs. few or no pigments on flanks in anterior half of body), at places concentrated in a midlateral row of 5–10 weakly contrasted irregular blotches (vs. an irregular midlateral row or irregularly set small spots, sometimes forming a stripe) and 6–9 irregular saddles (vs. 9–12 wide saddles), and the black basal caudal pattern made of two vertically elongated blotches (vs. an arched black band at base of principal caudal-fin rays); pelvic-fin origin more backwards, below dorsal-fin origin (vs. in advance of dorsal-fin origin; resulting in greater prepelvic length 53–58 % SL, vs. 47–51); anal fin more backwards (greater preanal distance, 76–81 % SL, 71–73); and smaller and stouter caudal peduncle (length 12–16 % SL, vs. 18–23; depth 1.2–1.6 times in length, vs. 1.7–2.3).

Description. See Figs. 3–5 for general appearance and Table 1 for morphometric data of holotype and 6 paratypes. Specimens are very small, soft, and difficult to handle; measurements and counts were limited to these seven specimens; other morphological characters were checked on the other paratypes. A moderately elongate cobitid with body depth almost equal from head to anal-fin origin, then decreasing gradually to end of anal-fin, then about uniform to caudal-fin base; depth of caudal peduncle 1.2–1.4 times in body depth at dorsal-fin origin. Dorsal profile with a slight concavity between head and body. Head and body very

Table 1. Morphometric data of holotype (H) and 6 paratypes of *Lepidocephalichthys balios*. Range and mean include holotype data.

	H	Range	Mean
Standard length (mm)	28.8	27.6–32.6	
Total length (mm)	35.3	33.2–41.0	
In percent of standard length			
Total length	122.8	120.2–126.5	123.6
Head length	21.9	19.1–22.6	21.3
Pre-dorsal length	54.2	53.1–57.7	54.9
Pre-pelvic length	53.7	53.1–57.6	54.8
Pre-anal length	77.2	75.9–81.0	77.9
Body depth at dorsal-fin origin	15.0	12.2–15.0	13.6
Depth of caudal peduncle	10.3	9.9–10.6	10.2
Length of caudal peduncle	12.2	12.2–16.0	14.6
Snout length	7.2	5.4–7.2	6.4
Eye diameter	4.9	4.1–5.3	4.7
Interorbital width	2.8	2.0–3.0	2.6
Length of pelvic fin	15.4	14.1–15.7	14.9
Length of pectoral fin	16.7	14.6–17.8	16.1
Length of caudal fin	23.6	22.1–24.3	23.2
In percent of head length			
Snout length	33	24–34	30.1
Eye diameter	22	19–25	22.2
Interorbital width	13	9–15	12.1

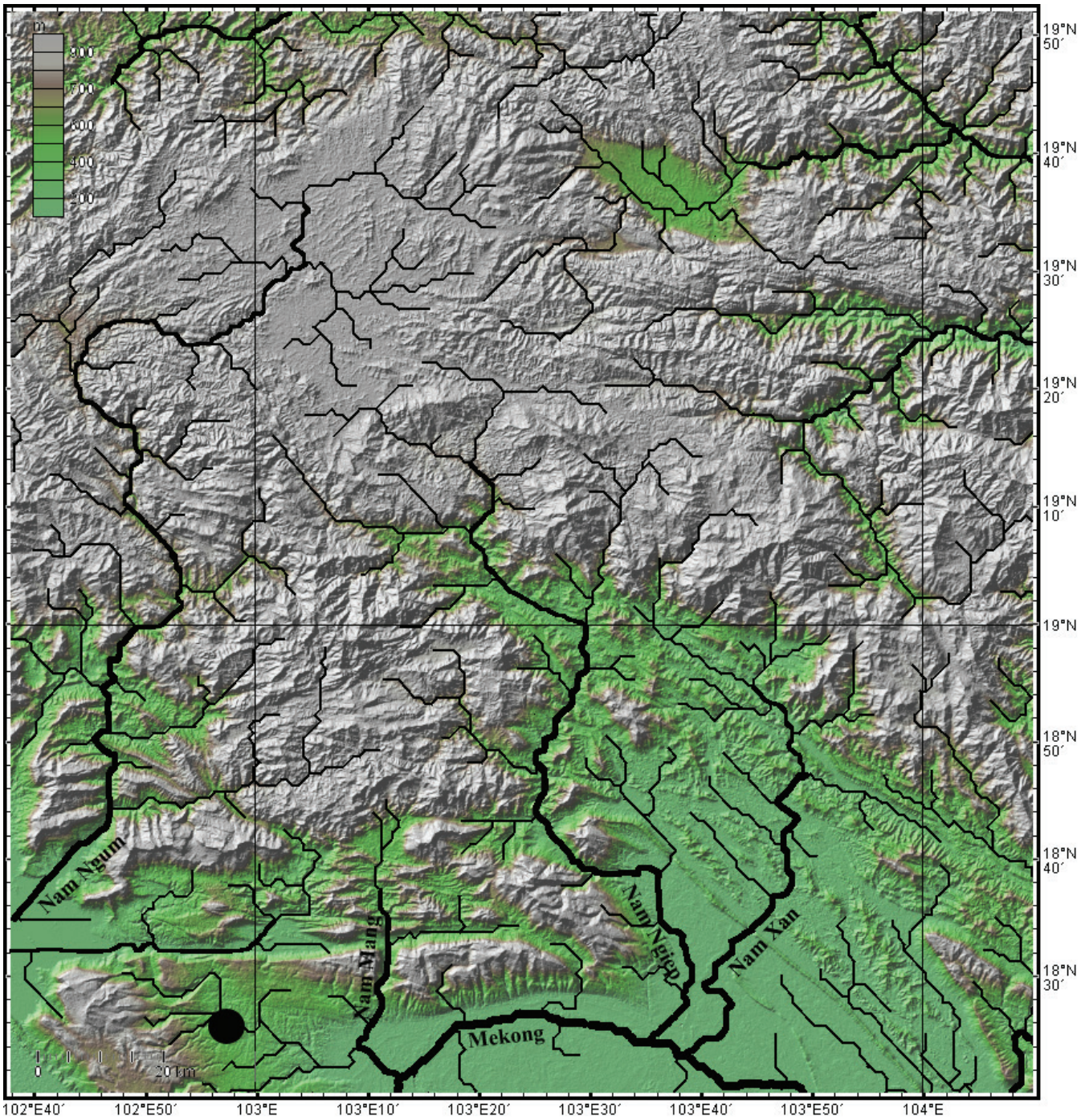

Fig. 2. Laos: Nam Ngum, Nam Mang, Nam Ngiep, and Nam Xan watersheds, showing type locality of *Lepidocephalichthys balios* (black dot).

compressed. Interorbital area slightly arched. Eye flushed with dorsal profile of head. Snout pointed, tip rounded, very soft (easily damaged when measuring). Suborbital spine bifid, posterior (inner) prong stout, short, slightly curved, length equal to about half of eye diameter, anterior (outer) prong shorter, stout, straight (Fig. 7). Caudal peduncle depth 1.2–1.6 times in its length. Largest recorded size 32.6 mm SL.

Dorsal fin with 3 unbranched rays (externally visible, presence of a very small 4th ray cannot be excluded) and 6½ branched rays; distal margin slightly convex; last 2 unbranched rays with space between them. Second branched ray longest. Pectoral fin falcate, pointed, with 1 unbranched and 7 branched rays; reaching about ⅖ to ½ of distance to pelvic-fin base; last two branched rays (6 and 7) not fused to form a pectoral rod but adjacent, with a narrow or without membrane between them, not thickened, without dorsal or ventral projection (in both sexes). Pelvic fin triangular, pointed, with 1 unbranched and 6 branched rays; reaching about ⅖ to ½ of distance to anal-fin origin; triangular; posterior margin straight; origin under simple dorsal-fin rays 1–2. Anus immediately in front of anal-fin origin. Anal fin with 3 unbranched and 5½ branched rays; distal margin slightly convex. Caudal fin with 7+7 branched rays; truncate to very slightly emarginate.

Body entirely covered by embedded scales. No scales on head. Anterior naris at tip of a truncate tube; posterior naris

Fig. 3. *Lepidocephalichthys balios*; MHNG 2792.020, holotype, 28.8 mm SL; Laos: Nam Leuk (right side, reversed).

as a slit, adjacent to anterior one. Mouth U-shaped, gape about as wide as long (Fig. 6). Upper lip with smooth or finely crenulated edge. Lower lip with long and thick mental lobe, without projections along medial edge, clearly thicker than postlabial flange). Postlabial flange starting before tip of mental lobe, with concave posterior edge, with or without short projections. Barbels short, thick. Inner rostral barbel not reaching corner of mouth; outer one reaching anterior margin of eye. Maxillary barbel reaching middle of eye.

Sexual dimorphism. There is no striking external sexual dimorphism, but in some specimens the last two branched pectoral-fin rays are broader than anterior ones, adjacent (but not fused), with no or only a narrow membrane between them (Fig. 8a). In other specimens all rays have the same diameter and all interradial membranes have similar width (Fig. 8b). These likely represent sexual dimorphism, males vs. females, and corresponds to the modified last two branched rays in males of other species of *Lepidocephalichthys* (which are often fused to form a pectoral rod). A rigid and laterally expanded pectoral fin is observed in most species of the loach families Cobitidae and Nemacheilidae and is a character of males. The fins are similarly not rigid in both sexes. No specimens had a stouter appearance that could suggest gravid females, and no eggs were observed by dissection.

Colouration. After fixation in formalin and 25 years storage in ethanol: head and body background colour pale yellowish brown; except otherwise stated, markings darker brown to blackish. Head with black stripe between eye and base of rostral barbel, and unsharp spots or blotches on nape and dorsal surface of snout. Body pattern non-descript, made of isolated dark pigments irregularly distributed on whole body, often more densely set and forming poorly contrasted narrow saddles on back and a row of irregular blotches in a midlateral row. 6–9 saddles (2–4 predorsal, 1–2 subdorsal, 1–4 postdorsal; most frequently 3+2+2) not extending downwards on flank (Figs. 2, 3a). 5–10 blotches, irregularly shaped and contrasted. Axial streak poorly distinct.

Black mark at caudal-fin base: two vertically elongated black blotches, upper one on base of upper branched rays 3 to 7; lower one positioned slightly more anterior, somewhat arched, on base of lower rays 1 to 6. Upper blotch distinct in all specimens, lower one variously expressed, in some cases hardly distinct. In several specimens, a dark mark at middepth at end of hypural plate, 2 scales before the two blotches. Blotches not ocellated.

Dorsal fin hyaline, with a small dark brown blotch at base of unbranched and first branched rays. Pigments on rays forming 3–4 rows of spots. Pigments restricted to rays, not or very little expending on membranes; location on rays variable, but in most cases corresponding to above branching points. Anal fin hyaline, with a row of dark brown pigments forming 1 or 2 rows of spots on rays, distal row located at branching points of rays. Pelvic fin hyaline, with a row of dots on rays at level of branching. Pectoral fin hyaline, with pigments along rays (not on rays) near branching point. Caudal fin hyaline, with pigments on rays (not on membranes) forming about 4 irregular bars, posterior one close to distal margin; bars irregularly in contact or anastomosed, leaving variously shaped unpigmented patches**.**

In life: body light purplish brown. A freshly preserved specimen is shown in Fig. 5.

Notes on biology. *Lepidocephalichthys balios* was observed at a single site, in a large pool at the confluence of the Nam Leuk and Nan Ngong, where the Nam Leuk arrives from gorges and enters the flood plain. The pool was about 50 m wide, at least 2 m deep (in February 1997). The current was very slow, the water clear (Fig. 9). The specimens were obtained from among vegetation and leaf litter. Thirty-seven species were collected in the same pool; among them were the following uncommon species: Sundasalangidae: *Sundasalanx mekongensis*; Cyprinidae: *Crossocheilus atrilimes*, *Hampala macrolepidota*, *Laocypris hispida*, *Mystacoleucus atridorsalis*, *Oreichthys parvus*, *Osteochilus striatus*, *Puntigrus partipentazona*, *Rasbora daniconius*, *R.*

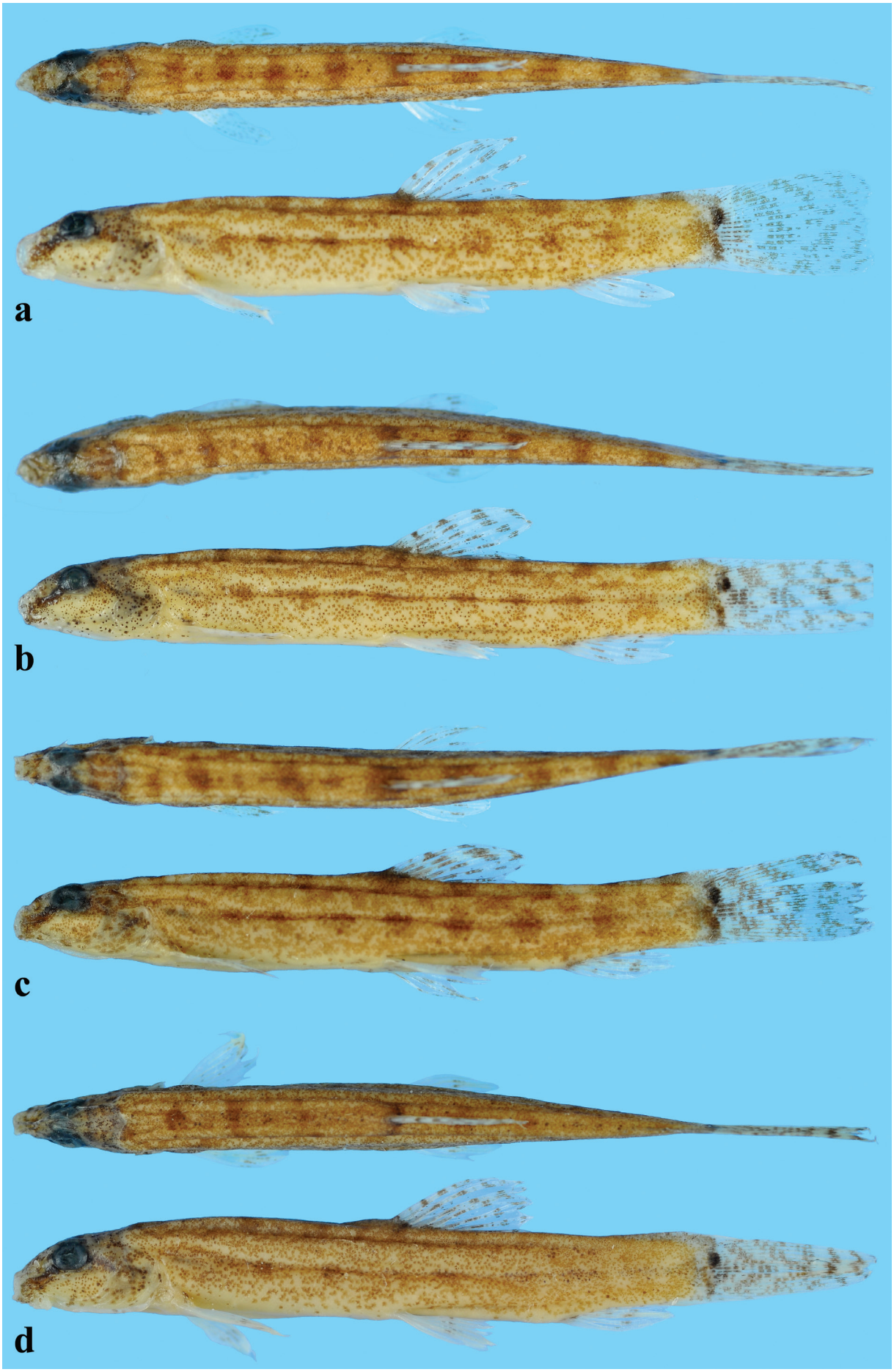

Fig. 4. *Lepidocephalichthys balios*, CMK 13249, paratypes; Laos: Nam Leuk; a, 26.8 mm SL; b, 27.1 mm SL; c, 27.4 mm SL; d, 32.6 mm SL.

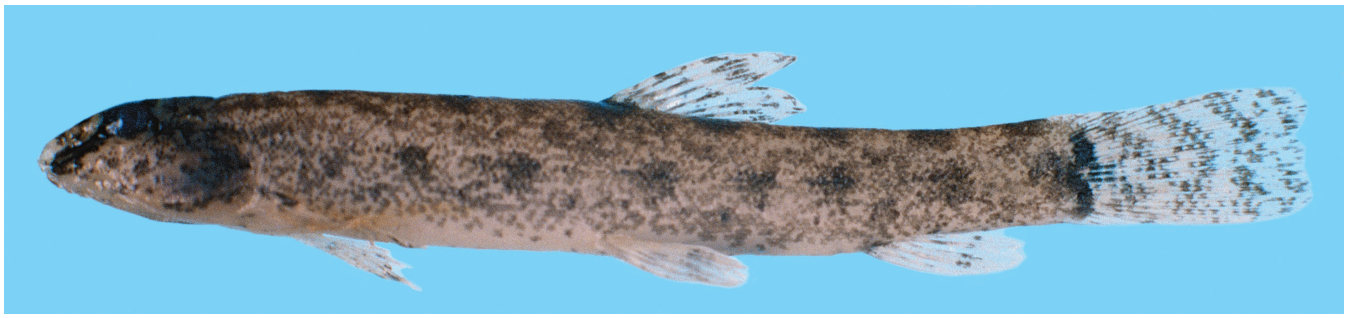

Fig. 5. *Lepidocephalichthys balios*, CMK 13249, paratype, 28.1 mm SL; Laos: Nam Leuk. Shortly after fixation, scanned from a slide prepared in 1997. Right side, reversed.

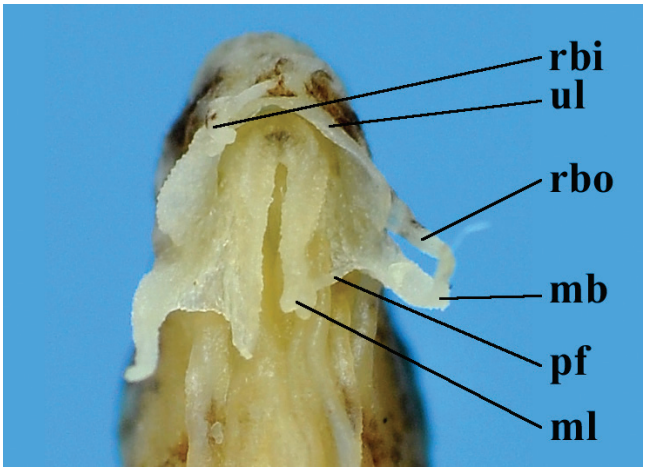

Fig. 6. *Lepidocephalichthys balios*; CMK 13249, 32.6 mm SL; mouth in ventral view. Abbreviations: mb, maxillary barbel; ml, mental lobe of lower lip; pf, postlabial flange of lower lip; rbi, inner rostral barbel; rbo, outer rostral barbel; ul, upper lip.

myersi, *R. trilineata*; Botiidae: *Yasuhikotakia longidorsalis*; Cobitidae: *Acanthopsoides gracilentus*, *Acantopsis* sp., *Pangio* cf. *fusca*, *P. longimanus*, *Pangio* sp.; Balitoridae: *Homalopteroides smithi*; Nemacheilidae: *Nemacheilus* aff. *pallidus*; Bagridae: *Hemibagrus filamentus*, *H. wyckioides*, *Mystus atrifasciatus*, *M. singaringan*, *Pseudomystus bomboides*; Belonidae: *Xenentodon canciloides*; Indostomidae: *Indostomus spinosus*; Syngnathidae: *Doryichthys contiguus*; Chaudhuriidae: *Chaudhuria caudata*, *C. fusipinnis*; Mastacembelidae: *Mastacembelus* aff. *armatus*; Ambassidae: *Parambassis siamensis*; Pristolepididae: *Pristolepis siamensis*; Odontobutidae: *Neodontobutis aurarmus*; Gobiidae: *Papuligobius ocellatus*; Channidae: *Channa limbata*; Tetraodontidae: *Pao cochinchinensis*. The situation probably changed after construction of the Nam Leuk dam, and the diversion of the water from the upper Nam Leuk towards the Nam Ngum watershed.

The species is expected to have a wider distribution in central Laos and Thailand, at foothill streams on the edge of the Mekong floodplain. The above-described habitat may not be the preferred habitat since the species has not yet been seen at numerous sites with similar conditions.

Two of the largest and stoutest specimens guessed to be females were dissected; ovaries were not visible. The sample was obtained in February. No specimen smaller than 17.2 mm SL was observed (mesh size was about 1 mm and they would have been collected).

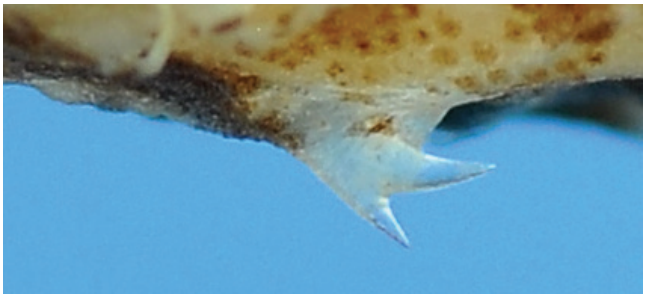

Fig. 7. *Lepidocephalichthys balios*; CMK 13249, 27.4 mm SL; suborbital spines, ventral view.

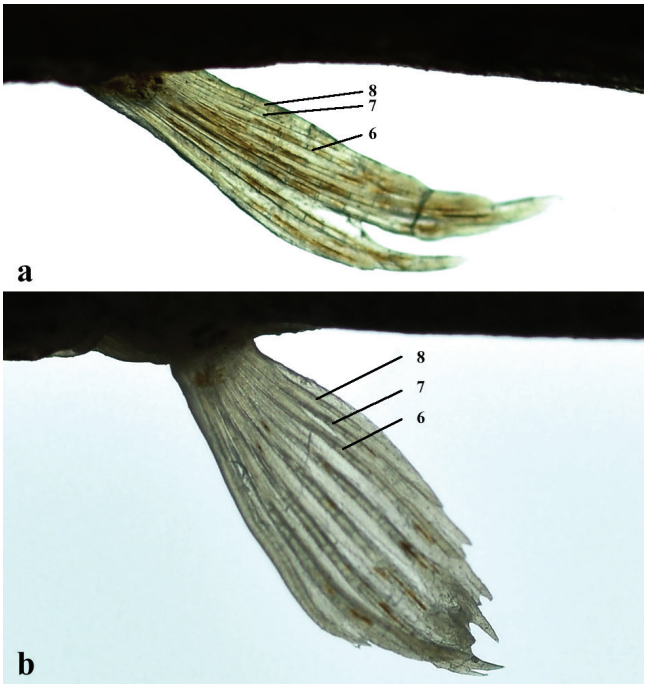

Fig. 8. *Lepidocephalichthys balios*; CMK 13249, pectoral fin, in dorsal view. a, male, 27.4 mm SL, with adjacent rays 7 and 8; b, female, 32.6 mm SL, with separate rays 7 and 8.

Distribution. *Lepidocephalichthys balios* is presently known only from the Nam Leuk, in the Nam Mang watershed in the Mekong drainage (Fig. 2). Its presence is expected elsewhere in adjacent watersheds, in Laos and Thailand. Its absence in other sampling sites in the area probably only reflects that it is present in a lowland, slow gradient habitat type, which

Fig. 9. Laos: Nam Leuk, pool at confluence with Nam Gnong; type locality of *Lepidocephalichthys balios*. 24 February 1997. Scanned from an old slide.

Fig. 10. *Lepidocephalichthys berdmorei*; a, CMK 25927, 71.1 mm SL; Laos: Mekong drainage: Nam Youan; b, CMK 25430 59.3 mm SL; Myanmar: Tenasserim: Lenya drainage.

is infrequently sampled during surveys focusing on higher gradient habitats.

Etymology. From the classical Greek βαλιός (balios) meaning dappled (marked with many small spots), speckled. An adjective, indeclinable.

Remarks. The genus *Lepidocephalichthys* is distinguished from all other genera of the family Cobitidae by having the pectoral-fin with 1 unbranched and 7 branched rays, of which, in males, the last two rays are fused, forming a pectoral rod thicker than the other rays, with a variously developed projection, at about midlength of the dorsal side, ranging from a small swelling (pectoral rod swelling) to an elevated, thin, vertical flange (pectoral rod plate); in one species (*L. zeppelini*) there is also a vertical flange along the ventral side of the ray (Nalbant, 1963; Kottelat & Lim, 1992; Havird & Page, 2010). Other characters are: slender

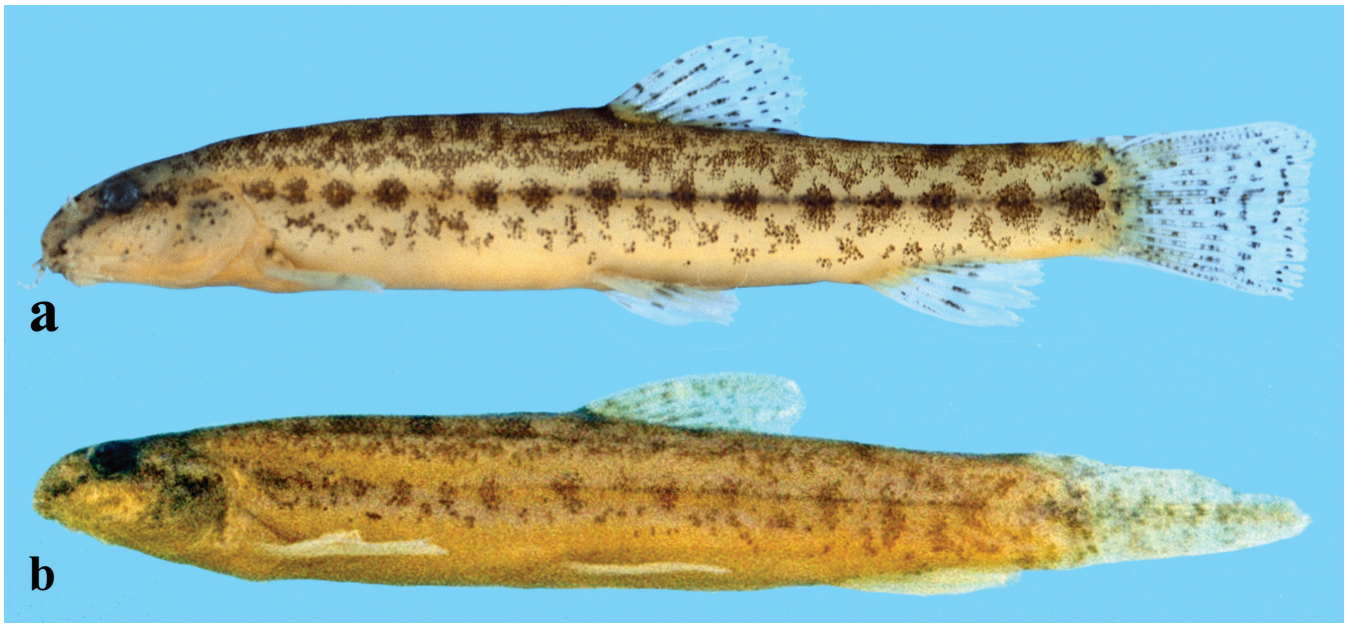

Fig. 11. *Lepidocephalichthys hasselti*; a, CMK 19805, 37.2 mm SL; Laos: Mekong drainage: Nam Theun; b, MHNG 1372.40-50, 28.4 mm SL; Indonesia: Java: Sukabumi.

body; absence of lateral line; dorsal fin with 3–4 unbranched and 6½ branched rays; pelvic fin with 1 unbranched and 6 branched rays; anal fin with 3 unbranched and 5½ branched rays; caudal fin with 14 branched rays; three pairs of barbels (2 rostral and 1 maxillary); each half of lower lip (Fig. 6) with a pointed mental lobe separated from postlabial flange by a small notch, posterior margin of flange and medial edge of lobe denticulated, crenulated or fringed; anterior naris at tip of a short tube (not extended into a 'nasal barbel').

Lepidocephalichthy balios is, however, missing the main character diagnosing *Lepidocephalichthys*, the presence of the pectoral rod in males. Sexual dimorphism provides very efficient characters to identify lineages in Cobitidae (Nalbant, 1963, 1994, Šlechtová et al., 2008; Kottelat & Tan, 2008; Kottelat, 2012: 138, 2017). In specimens of *L. balios* identified as males, the last two pectoral rays are not fused into a rod but close to each other, without a membrane between them, they are slightly thickened, and there is neither a dorsal nor a ventral flange. As is described above, all the other characters used to diagnose the genus are present in *L. balios* and show a similar appearance as in the other species of *Lepidocephalichthys*. The organisation of the last two pectoral-fin rays in close contact in male *L. balios* is shared with *L. eleios* and considered either as a plesiomorphy or as precursor stage to the fusion into a pectoral rod, and is possibly related to an incomplete development resulting from the relatively small size of the species (i.e., developmental trunction), as observed in many miniature fishes (see, e.g., Britz & Kottelat, 2003, 2008; Kottelat et al., 2006; Britz & Conway, 2009; Britz et al., 2014; Conway & Kottelat, 2023).

Lepidocephalichthys balios cannot be a member of the other genera of Cobitidae as it does not have the characters distinguishing them from *Lepidocephalichthys* either. To mention only the genera present on mainland Southeast Asia: the lamina circularis in males of *Cobitis* and *Misgurnus*; the serrated edge of the 2nd ray of the pectoral-fin in males of *Kottelatlimia*; the strongly elongated body and snout and very ornamented lips with large conical and laciniated projections along the edges of *Acantopsis*; the slender to anguilliform body, the backward position of the dorsal fin and the curled pectoral fin in males of *Pangio*; the deep and uniformly dark brown body, small eye and poorly distinct or missing mental lobe of *Lepidocephalus*; the four barbel-like projections of the lower lip and the keeled and vertically distorted caudal peduncle in males of *Microcobitis*; and the ridges of papillae along the barbel and lips and the slender translucent to whitish body of *Acanthopsoides*.

Kottelat & Lim (1992) described sexual dimorphism in the Sundaic and some Indochinese species of *Lepidocephalichthys*. Havird & Page (2010) reported sexual dimorphism in most species of *Lepidocephalichthys*, but with an erroneous terminology. They identified the fused last two rays of the pectoral-fin of the male as 'lamina circularis', a structure present in some genera of Cobitidae. When present, the 'real' lamina circularis (also called Canestrini scale) is formed on the second (sometimes also third) pectoral-fin ray or is absent. To refer to just any sexually dimorphic modification of the pectoral rays in Cobitidae as 'lamina circularis' is erroneous as the structures compared are not homologous (a structure on fin rays 7 and 8 in *Lepidocephalichthys* vs. a structure on ray 2 in *Cobitis* etc.). The lamina circularis is a laminar, usually but not always circular, posterior projection of the first (proximal-most) segment of the dorsal hemitrichium of the first branched pectoral-fin ray (see, e.g., Nalbant, 1963: 356; Kottelat & Freyhof, 2007: 301, fig. 61; Kottelat & Tan, 2008: 66). A second lamina circularis may also be present on the second branched ray in some species.

Lepidocephalichthys balios has similarities with *L. eleios*, the only other species of the genus without modified pectoral-fin rays. *Lepidocephalichthys eleios* is presently known only

from swamp areas around Lake Indawgyi, in the Irrawaddy drainage in northern Myanmar. The two species also share the traits of small size and a slender body. They are distinguished as mentioned above under Diagnosis.

Four other species of *Lepidocephalichthys* have been observed in the Mekong drainage in central Laos, *L. berdmorei*, *L. hasselti*, *L. kranos*, and *L. zeppelini*. In all, the last two pectoral-fin rays are fused into a pectoral rod in adult males. *Lepidocephalichthys berdmorei* is a large species (up to 80 mm SL) found in small streams with moderate to fast current, usually with pebble to stone bottom. It has a stout body, yellowish brown colouration with numerous small black spots, a midlateral row of irregular small black blotches, a black blotch on base of branched caudal-fin rays 3–7; the caudal fin has 3–6 thin black bars; the last two pectoral-fin rays are fused into a thick cylindrical rod. *Lepidocephalichthys hasselti* has a median longitudinal stripe or row of adjacent black spots on the body, with an unpigmented stripe above it and the pectoral-fin rays 7–8 of the male fused, forming a vertically orientated flange at about midlength of the ray. *Lepidoephalichthys kranos* is distinguished from the other species of *Lepidocephalichthys* in the Mekong drainage by having scales on top of the head (vs. without visible scales) and pectoral-fin rays 7–8 of the male fused, forming a small, dorsally projecting flange along the proximal third of the rays. *Lepidocephalichthys zeppelini* is a small-sized species reaching 26 mm SL, a forked caudal fin and pectoral-fin rays 7–8 of the male fused, forming a large vertically orientated plate, with a large dorsally projecting rectangular-rounded flange with finely serrated upper edge, and a smaller ventrally projecting rounded flange.

The variability in the colour pattern in both *L. berdmorei* and *L. hasselti* suggests that several species might be hidden under these names. It is beyond the scope of the present paper to investigate the composition of these two species, but it is necessary to mention that *L. balios* has been compared with material of these two species obtained in the middle Mekong drainage in Laos and Thailand. The type localities of these species are Myanmar (Tenasserim) for *L. berdmorei* (Fig. 10) and Java for *L. hasselti* (Fig. 11). Sudasinghe et al. (2023) investigated the relationships within *Lepidocephalichthys*. They included several populations of *L. hasselti*, including material from Java and the Mekong drainage, based on other's sequences. They found that they constitute a single clade, but they did not investigate it in more detail. Their analysis also included several populations of *L. berdmorei* and they found that they are not a monophyletic taxon; instead, these sequences belong to four lineages and potentially are distinct species; their study included material from Tenasserim but unfortunately none from the Mekong drainage.

Material used for comparison. *Lepidocephalichthys alkaia*: CMK 24128, 50; CMK 25618, 33; Myanmar: Lake Indawgyi basin. — CMK 14649, 7; Thailand: Salween drainage. *L. berdmorei*: CMK 24152, 2; CMK 24190, 1; Myanmar: Lake Indawgyi basin. — CMK 25430, 1; Myanmar: Tenasserim. — CMK 14648, 1; Thailand: Salween drainage. — CMK 25927, 8; CMK 25941, 3; Laos: Mekong drainage. *L. eleios*: data from Kottelat, 2017. *L. furcatus*: CMK 16516, 5; Thailand: Tapi drainage. *L.* cf. *goalparensis*: CMK 26462, 1; CMK 26518, 1; Myanmar: Irrawaddy drainage: Putao. *L. kranos*: ZRC 51543 (photographs of 2 of 6); Thailand: Mekong drainage: Ubon Ratchathani. *L. guntea*: CMK 5429, 1; India: Karnataka. *L. hasselti*: MHNG 1372.40-50, 11; Indonesia: Java: Sukabumi. — CMK 24894, 5; Myanmar: Tenasserim. — CMK 13249, 47; Laos: Mekong drainage. — CMK 7316, 1; Indonesia: Sumatra: Siak drainage. — CMK 20580, 1; Indonesia: Sumatra: Musi drainage. — CMK 8263, 21; Malaysia: Kelantan. — CMK 5124, 24; Thailand: Sai Buri. *L. jonklaasi*: CMK 12190, 29; Sri Lanka. *L. lorentzi*: CMK 6967, 2; Indonesia: Borneo: Kapuas drainage. *L. micropogon*: CMK 26657, 2; Myanmar: Irrawaddy drainage: Myitkyina. — CMK 25065, 1; CMK 25230, 1; Myanmar: Tenasserim. *L. thermalis*: CMK 7059, 10; Sri Lanka. — CMK 9340, 12; India: Kerala. *L. tomaculum*: CMK 8033, 6 paratypes; Malaysia: Selangor. — CMK 11273, 7; Indonesia: Sumatra: Batang Hari. — CMK 11927, 4; Indonesia: Bintan. *L. zeppelini*: CMK 7968, 2; CMK 23025, 2; Laos: Mekong drainage. — CMK 10749, 5; Thailand: Mekong drainage.

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LITERATURE CITED

Britz R & Conway KW (2009) Osteology of *Paedocypris*, a miniature and highly developmentally truncated fish (Teleostei: Ostariophysi: Cyprinidae). Journal of Morphology, 270(4): 389–412.

Britz R, Conway KW & Rüber L (2014) Miniatures, morphology and molecules: *Paedocypris* and its phylogenetic position (Teleostei, Cypriniformes). Zoological Journal of the Linnean Society, 172(3): 556–615.

Britz R & Kottelat M (2003) Descriptive osteology of the family Chaudhuriidae (Teleostei, Synbranchiformes, Mastacembeloidei), with a discussion of its relationships. American Museum Novitates, 3418: 1–62.

Britz R & Kottelat M (2008) *Paedocypris carbunculus*, a new species of miniature fish from Borneo (Teleostei: Cypriniformes: Cyprinidae). Raffles Bulletin of Zoology, 56(2): 415–422.

Conway KW & Kottelat M (2023) *Physoschistura mango*, a new miniature species of loach from Myanmar (Teleostei: Nemacheilidae). Raffles Bulletin of Zoology, 71: 681–701.

Havird JC & Page LM (2010) A revision of *Lepidocephalichthys* (Teleostei: Cobitidae) with descriptions of two new species from Thailand, Laos, Vietnam, and Myanmar. Copeia, 2010(1): 137–159.

Havird JC, Page LM, Tangjitjaroen W, Vidthayanon C, Grudpan C & Udduang S (2010) A new species of *Lepidocephalichthys* (Teleostei: Cobitidae) with distinctive sexual dimorphism and comments on relationships in southern lineages of Cobitidae. Zootaxa, 2557: 1–18.

Kottelat M (1990) Indochinese nemacheilines. A revision of nemacheiline loaches (Pisces: Cypriniformes) of Thailand, Burma, Laos, Cambodia and southern Viet Nam. Pfeil, München, 262 pp.

Kottelat M (2012) Conspectus cobitidum: an inventory of the loaches of the world (Teleostei: Cypriniformes: Cobitoidea). Raffles Bulletin of Zoology, Supplement 26: 1–199.

Kottelat M (2013) The fishes of inland waters of Southeast Asia: a catalogue and core bibliography of the fishes known to occur in freshwaters, mangroves and estuaries Raffles Bulletin of Zoology, Supplement 27: 1–663.

Kottelat M (2017) *Lepidocephalichthys eleios*, a new loach from Lake Indawgyi basin, Kachin State, Myanmar (Teleostei: Cobitidae). Raffles Bulletin of Zoology, 65: 707–714.

Kottelat M, Britz R, Tan HH & Witte KE (2006) *Paedocypris*, a new genus of Southeast Asian cyprinid fish with a remarkable sexual dimorphism comprises the world's smallest vertebrate. Proceedings of the Royal Society: Biological Sciences, 273(1589): 895–899.

Kottelat M & Freyhof J (2007) Handbook of European freshwater fishes. Kottelat, Cornol & Freyhof, Berlin, xiv + 646 pp.

Kottelat M & Lim KKP (1992) A synopsis of the Malayan species of *Lepidocephalichthys*, with descriptions of two new species (Teleostei: Cobitidae). Raffles Bulletin of Zoology, 40(2): 201–220.

Kottelat M & Tan HH (2008) *Kottelatlimia hipporhynchos*, a new species of loach from southern Borneo (Teleostei: Cobitidae). Zootaxa, 1967: 63–72.

Nalbant TT (1963) A study of the genera of Botiinae and Cobitinae (Pisces, Ostariophysi, Cobitidae). Travaux du Muséum d'Histoire Naturelle "Grigore Antipa", 4: 343–379, 4 pls.

Šlechtová V, Bohlen J & Perdices A (2008) Molecular phylogeny of the freshwater fish family Cobitidae (Cypriniformes: Teleostei): delimitation of genera, mitochondrial introgression and evolution of sexual dimorphism. Molecular Phylogenetics and Evolution, 47: 812–831.

Sudasinghe H, Dahanukar N, Raghavan R, Ranasinghe T, Wijesooriya K, Pethiyagoda R, Rüber L & Meegaskumbura M. (2023) The loach genus *Lepidocephalichthys* (Teleostei: Cobitidae) in Sri Lanka and peninsular India: multiple colonizations and unexpected species diversity. Hydrobiologia, 851: 1113–1131.