

## Type locality and synonymy of *Paracanthocobitis marmorata* and notes on *Acanthocobitis* (Teleostei: Nemacheilidae)

Maurice Kottelat<sup>1\*</sup> & Waikhom Vishwanath<sup>2</sup>

**Abstract.** *Paracanthocobitis marmorata* was originally described from the Brahmaputra drainage in Manipur. The locality information in the original description is erroneous and the type locality is, in fact, in the Irrawaddy (Chindwin) drainage. *Paracanthocobitis tumitensis* is a junior synonym of *P. marmorata*; in addition, the name is possibly not available because there is no indication that it satisfies the criteria of art. 8.5.3 of the International Code of Zoological Nomenclature. Morphological differences between *Acanthocobitis* and *Paracanthocobitis* are discussed (especially morphology of lips and suborbital flap). The genus *Acanthocobitis* includes at least two species.

**Key words.** loaches, Manipur, Chindwin River, Irrawaddy River, taxonomy

### INTRODUCTION

Nemacheilid loaches of the genus *Acanthocobitis* Peters, 1861 occur in South and Southeast Asia. They are characterised by their long dorsal fin with 9½–19½ branched rays, their papillated lips, the presence of an ocellus at the upper extremity of the base of the caudal fin, and, in most species, the presence of a suborbital flap or groove in adult males (Kottelat, 1990, 2012a, b; Bănărescu & Nalbant, 1995). Grant (2007) placed all but one in a distinct, new subgenus, *Paracanthocobitis*, but the published information gave little justification for recognising two subgenera, one of them monotypic. The genera were revised by Singer & Page (2015), and Singer et al. (2017) described additional species, some of which present taxonomic problems. We correct herein errors in the original description of *P. marmorata* Singer, Pfeiffer & Page, 2017, and we revisit the characters that diagnose *Acanthocobitis* and *Paracanthocobitis*.

### MATERIAL AND METHODS

Measurements and counts follow Kottelat (1990) and Kottelat & Freyhof (2007). The last branched dorsal and anal-fin rays articulating on the same pterygiophore as the preceding ray is noted as “½”. Abbreviations used: CMK, Collection of first author; GU, Department of Zoology, Gauhati University,

Gauhati, India; MCSNG, Museo Civico di Storia Naturale, Genova, Italy; MUMF, Manipur University Museum of Fishes, Canchipur, India; NRM, Naturhistoriska Riksmuseet, Stockholm, Sweden; SMF, Senckenberg Museum, Frankfurt, Germany; ZMA, Instituut voor Taxonomische Zoölogie, Amsterdam, now in Naturalis, Leiden, The Netherlands; ZMB, Zoologisches Museum, Berlin, Germany; ZRC, Lee Kong Chian Natural History Museum, National University of Singapore, Singapore; ZSI, Zoological Survey of India, Kolkata, India.

### RESULTS AND DISCUSSION

***Paracanthocobitis marmorata*.** Singer et al. (2017) described *Paracanthocobitis marmorata* from “India: Barak drainage, 24.799N 93.782E”. The description was based on 4 specimens (ZMA 119.972 [holotype], ZMA 250.182 [3 paratypes, 1 now UF 188251]). They considered that the type locality is in the “Barak drainage of Assam”, in the Brahmaputra drainage. We show here that this is erroneous and that the species is native to the Chindwin watershed in the Irrawaddy drainage in Manipur.

The holotype and paratypes of *P. marmorata* had earlier been examined by Kottelat (1990: 36) and identified as *Acanthocobitis zonalternans* (Blyth, 1860). Kottelat’s figure 17d shows the holotype of *P. marmorata* in an earlier state of preservation 30 years earlier. The locality information of the specimens were given in full as on the label: “streams in Kangjupkhul Hills; received from ZSI”. The specimens are part of material described by Hora (1921: 199, pl. 10 fig. 3; 1929: 319). Kottelat (1990: 36) also mentioned MCSNG 17114 (3 specimens) also received from ZSI. Hora (1921: 166, 167, 171) stated that his material of *A. zonalternans* were from Loktak Lake, Manipur Valley and “southern watershed of the Naga Hills”, all in the Chindwin watershed.

Accepted by: Tan Heok Hui

<sup>1</sup>Rue des Rauragues 6, CH-2800, Delémont, Switzerland (address for correspondence); and Lee Kong Chian Natural History Museum, National University of Singapore; Email: mkottelat@dplanet.ch (\*corresponding author)

<sup>2</sup>Department of Zoology, Manipur University, Canchipur-795003, Manipur, India; Email: wvnath@gmail.com

It is not clear where Singer et al. (2017) got the information that the specimens had been caught in Barak drainage. It is also not clear how with that vague locality information they could give such accurate coordinates as “24.799°N 93.782°E”. This point is on the western side of the Manipur Valley, in the Nambol River catchment, which originates in Kangchup hills and flows to Loktak Lake.

Kangjup as used by Hora (1921) is Kangchup. Hora visited the area when a British Political Agent was in Manipur. He was assisted by the then administration and his assistants probably did not pronounce or spell as the Manipuris do. Hora (1921: 202) also described *Schistura kangjupkhulensis* from Kangchup Hills.

Hora's description of his *P. zonalternans* agrees with the type series of *P. marmorata* (examined by the first author in the late 1980s), as well as with specimens MCSNG 17114 as reported by Kottelat (1990). In 35 years of work in Manipur, the second author has never observed fishes of the *P. zonalternans* group in the Barak drainage (also in Vishwanath et al., 2007: 99). Hora (1921) did not report his *P. zonalternans* from the Barak slope of Manipur. Hora & Mukerji (1935: 384) explicitly reported *P. zonalternans* from the Chindwin slope and that it was missing on the Brahmaputra slope of Naga Hills. Shangningam & Vishwanath (2015: 131) mentioned material of the *P. zonalternans* group only from Chindwin drainage and explicitly excluded Barak from the distribution range of the species. The following publications include lists of fishes from Barak watershed but do not mention the presence of *P. zonalternans*: Hora (1935, 1936), Menon (1952), and Nebeshwar & Vishwanath (2011).

***Paracanthocobitis tumitensis*.** *Paracanthocobitis tumitensis* Arunkumar & Moyon, 2019 was described from specimens collected in Tunit River at Chumbang village [p. 102; Purum Chumbang, p. 103]. Tunit is a tributary of Chakpi River, itself a tributary of Manipur River, in Irrawaddy drainage; Chumbang is located at 24°25'17"N 94°00'52"E. We do not see differences between the description of *P. tumitensis* and *P. marmorata*. The differences reported by the authors are overlapping morphometrics given with inconsistent units, or grossly impossible (eye diameter, interorbital distance), or show misunderstanding of morphology (e.g., branched anal-fin rays, pectoral-fin rays). Besides, the reported difference in the number of pelvic-fin rays (9 vs. 5 or 6) in fact does not exist because the data in the description of *P. marmorata* seem erroneous: Singer et al. (2017) reported 5 or 6 pelvic-fin rays in the types of *P. marmorata*, while we counted 8 in the material we examined (MUMF 22001–22016 [16], MCSNG 17114 [3]); 5 or 6 would be an exceptional number of pelvic-fin rays in Nemacheilidae.

In addition, the availability of the name *P. tumitensis* is not clear. The name is not available from the electronic version of the paper because it has not been registered in ZooBank (no LSID is mentioned in the paper) (International Code of Zoological Nomenclature, art. 8.5.3). Although the journal has an ISSN for both a print and an electronic version, we are unable to find evidence that a print version exists and

our search on-line did not find a library with this journal in its holdings. If only the electronic version exists, the name is not available and has no nomenclatural existence.

In conclusion, the name of the species of *Paracanthocobitis* in the Chindwin drainage in Manipur is *P. marmorata*, *P. tumitensis* is a junior subjective synonym (or probably an unavailable name), and there is no known species of the *P. zonalternans* group in the Barak drainage.

***Acanthocobitis* vs. *Paracanthocobitis*.** Nemacheilid loaches from South and Southeast Asia with a long dorsal fin (9½–19½ branched rays), papillated lips, an ocellus at the upper extremity of the base of the caudal fin, colour pattern variable, but usually body with somewhat oblique bars, or a midlateral row of blotches connected to or alternating with saddles, and rows of spots on the dorsal and caudal fins, and, in most species, the presence of a suborbital flap or groove in adult males, had been placed in the genus *Acanthocobitis* (e.g., Menon, 1987; Kottelat, 1990, 2012a, b; Bănărescu & Nalbant, 1995) (also as subgenus of *Nemacheilus* or *Schistura*). Grant (2007) felt necessary to distinguish two subgenera, *Acanthocobitis* sensu stricto (restricted to the type species *A. longipinnis* Peters, 1861) and *Paracanthocobitis* (all other species), based on the examination of photographs. In the absence of an adequate justification for the recognition of subgenera, Kottelat (2012b: 74) tentatively treated *Paracanthocobitis* as a junior synonym of *Acanthocobitis*.

Grant diagnosed *Paracanthocobitis* from *Acanthocobitis* by: suborbital flap “horizontal” or not present (vs. “placed diagonally to almost vertically”); suborbital flap “not greatly enlarged” (vs. “greatly enlarged in some specimens”); caudal fin rounded, truncate or slightly emarginate (vs. pointed); anus closer to anal-fin origin than to base of anterior pelvic-fin ray (vs. closer to base of anterior pelvic-fin ray than to anal-fin origin); and body “comparatively more slender and elongated in *Acanthocobitis* sensu stricto”. This was based on the examination of photographs of the types of *A. pavonacea*, *A. longipinnis*, and one aquarium specimen. No material of *Paracanthocobitis* was mentioned.

Kottelat (2012b: 75) commented that the hypothesis that *A. pavonacea* might be a lineage distinct from the other species placed in *Acanthocobitis* was not unreasonable, but the hypothesis should be addressed by a proper study, based on examination of specimens. Especially, it implies demonstrating that each subgenus is monophyletic and that they are sister lineages. Unfortunately, by lack of specimens at that time, it was not possible to reach a conclusion on the validity of the characters said to distinguish the ‘subgenera’.

Singer & Page's (2015) revised *Acanthocobitis*, used *Paracanthocobitis* as a valid genus name, mentioned Kottelat's (2012b: 75) comments, but besides stating that *Paracanthocobitis* is “easily diagnosable from *Acanthocobitis*” did not add information that would justify the recognition of two genera, instead of a single genus, or instead of Grant's subgenera. No specimens were available to them.



Fig. 1. *Acanthocobitis longipinnis*, ZMB 4795, holotype, 156 mm SL; India: Ganges. Right side, reversed. (Photograph by P. Bartsch).



Fig. 2. *Acanthocobitis pavonacea*, NRM 40422, 96.6 mm; India: aquarium. (Photograph by M. Kottelat).

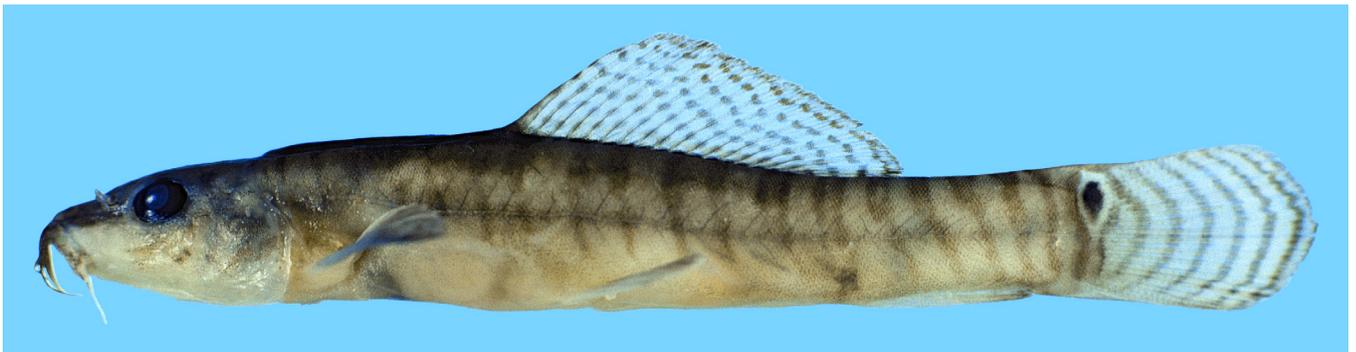


Fig. 3. *Acanthocobitis pavonacea*, CMK 5927, 58.9 mm SL; India: Assam: Dibru River. (Photograph by M. Kottelat).

Singer & Page (2015) mentioned the combination of characters distinguishing *Acanthocobitis* and *Paracanthocobitis* from the other genera of Nemacheilidae: lower lip with a large papillated pad on each side of a medial interruption; the upper lip with 2–5 rows of papillae and continuous with the lower lip, and an ocellated black spot on the upper half of the caudal-fin base. They distinguished *Acanthocobitis* from *Paracanthocobitis* by the shape of the caudal fin (pointed vs. emarginate or truncate), more branched dorsal-fin rays ( $17\frac{1}{2}$ – $19\frac{1}{2}$  vs.  $9\frac{1}{2}$ – $15\frac{1}{2}$ ), head shape (more triangular in lateral view, vs. rounded), orientation of suborbital flap (vertical vs. horizontal), width of medial interruption between papillated pads of lower lip (wide vs. narrow), position of anus between anal-fin and pelvic-fin ‘insertions’ [origin?] (“closer to anal-fin ‘insertion’ vs. closer to pelvic-fin ‘insertion’” [see below]).

Before further discussing the validity of *Paracanthocobitis*, it is necessary to discuss the identity of the type species of *Acanthocobitis*, *A. longipinnis* Peters, 1861. It has been treated as a junior synonym of *Cobitis pavonacea* M’Clelland, 1839 by most authors since Day (1878: 613). Peters (1861: 712) himself already hinted at that possibility, a point on which

Günther (1868: 348) agreed. Based on the photographs of the holotype of *A. longipinnis* (ZMB 4795) and one of the four known syntypes of *C. pavonacea* (SMF 68) published by Grant (2007), Kottelat (2012b: 75) doubted the synonymy and commented that the differences in body shape suggest that they are distinct species: body depth 19% SL [sic] in the holotype of *A. longipinnis*, vs. 12 [sic, values interverted] in the figured syntype of *C. pavonacea*; length of dorsal-fin base 27% SL, vs. 32 (1.6 times in the distance between the origins of the anal and pelvic fins, vs. 1.3); the shape of the caudal peduncle (depth 2.1 times in its length, vs. 1.1). Singer & Page (2015: 380) published a picture of a second syntype of *A. pavonacea* (SMF 9061).

Since then, we have examined the holotype of *A. longipinnis* (Fig. 1). Unfortunately, all other specimens of *A. longipinnis* available in collections seem to be *A. pavonacea* (e.g. Figs. 2–4). As well, all photographs available in the literature and on the internet show *A. pavonacea*. The holotype of *A. longipinnis* is distinguished from the specimens of *A. pavonacea* (NRM 40422, CMK 5927) by its more slender body (body depth at dorsal-fin origin 11% SL, vs. 14–17), a more slender caudal peduncle (depth 9% SL, vs. 11–12; 2.1



Fig. 4. *Acanthocobitis pavonacea*, MUMF 28443, 99.5 mm SL; India: Arunachal Pradesh: Tengapani River. (Photograph by W. Vishwanath).

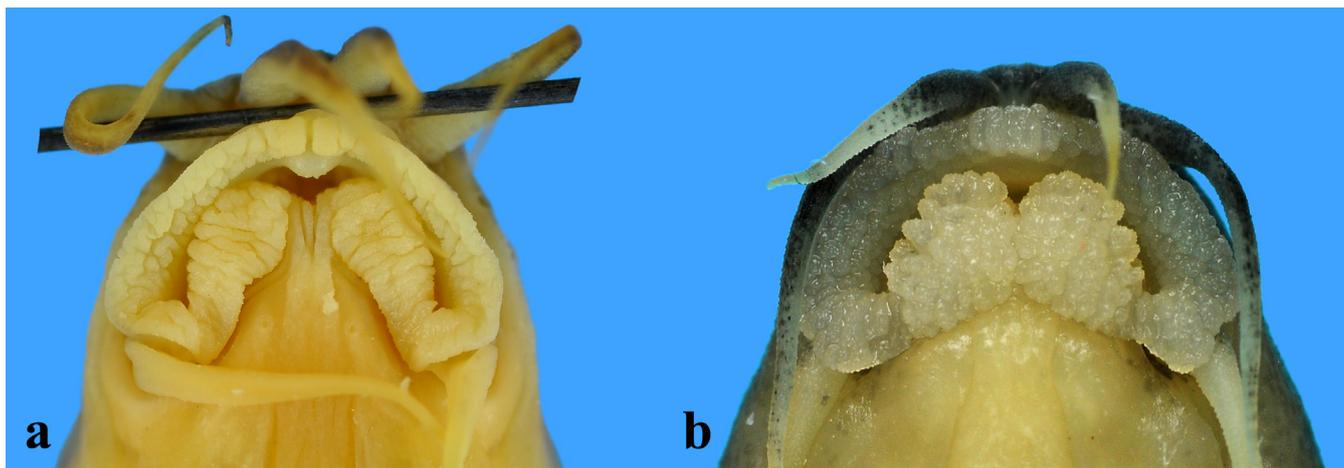


Fig. 5. Mouth of: **a**, *Acanthocobitis pavonacea*, NRM 40422, 96.6 mm SL; **b**, *Paracanthocobitis mandalayensis*, CMK 25619, 53.0 mm SL. (Photographs by M. Kottelat).

times in its length, vs. 1.3–1.5), and a shorter head (lateral head length 19% SL, vs. 22–27). From this we conclude that *A. longipinnis* and *A. pavonacea* are distinct species.

On the basis of the material we have examined, a number of differences exist between *A. pavonacea*, *A. longipinnis*, and the other species of *Acanthocobitis* sensu lato, that make possible to diagnose *Acanthocobitis* and *Paracanthocobitis*; in addition, molecular studies (see below) have shown that they do not form a monophyletic lineage; therefore we recognise them as distinct genera. It is, however, necessary to correct some of the characters listed by Singer & Page.

Singer & Page (2015: 379) reported that the anus is “closer to anal-fin ‘insertion’ than to pelvic-fin ‘insertion’” in *Acanthocobitis* vs. “closer to pelvic-fin ‘insertion’” in *Paracanthocobitis*. It is actually the reverse—in *Acanthocobitis* the anus is closer to pelvic-fin origin than to anal-fin origin. (‘Insertion’ is not defined in Singer & Page (2015). In a later paper (Singer et al., 2017), insertion of a median fin is the posteriormost point at which the fin connects to the body, which is misleading since a fin is inserted on the body on its whole base; it is better explicitly stated as the base or the insertion of the last ray.)

The examined specimens of *Acanthocobitis* have 16½–19½ branched dorsal-fin rays, vs. 9½–15½ in *Paracanthocobitis*.

Singer & Page (2015: 379) described the lips of *Acanthocobitis* as “heavily papillated”; the upper one with 2–5 rows of

papillae and continuous with the lower lip; and the lower lip with a large papillated pad on each side of a medial interruption. This was apparently based only on photographs of the types of both species. In the material we examined, the lower lip is wide, broadly connected to the lower jaw, continuous with the upper lip, the two halves regularly narrowing towards rictus, widely separated anteriorly, and crossed by a few sulci (Fig. 5a); if present, papillae are restricted to the anterior edge of the lip (on the gape side) (as visible on the figure of the holotype of *A. longipinnis* in Singer & Page (2015)). The upper lip has a single row of papillae anteriorly, and 2 or 3 near the rictus.

In *Paracanthocobitis*, the lower lip is thickened and swollen medially, densely covered by papillae, the two halves are in contact anteriorly, they are globulous medially, followed laterally until the rictus by a thin, narrow, and smooth part (Fig. 5b). The upper lip has several rows of papillae.

In *Acanthocobitis*, the male suborbital flap (the lower posterior extremity of the lateral ethmoid) is not movable in any direction, more or less vertical, mostly under skin, the exposed part restricted to below the anterior edge of the orbit, the extremity is globulose, not fleshy, and not covered by an unculiferous cap (Fig. 6a). In *Paracanthocobitis*, the suborbital flap is located more posteriorly, its extremity is under the middle of the eye and the lower edge of the lateral ethmoid is marked by a groove extending forwards beyond the nostrils (a flap is not present in all species, but a groove is always present) (Fig. 6b).

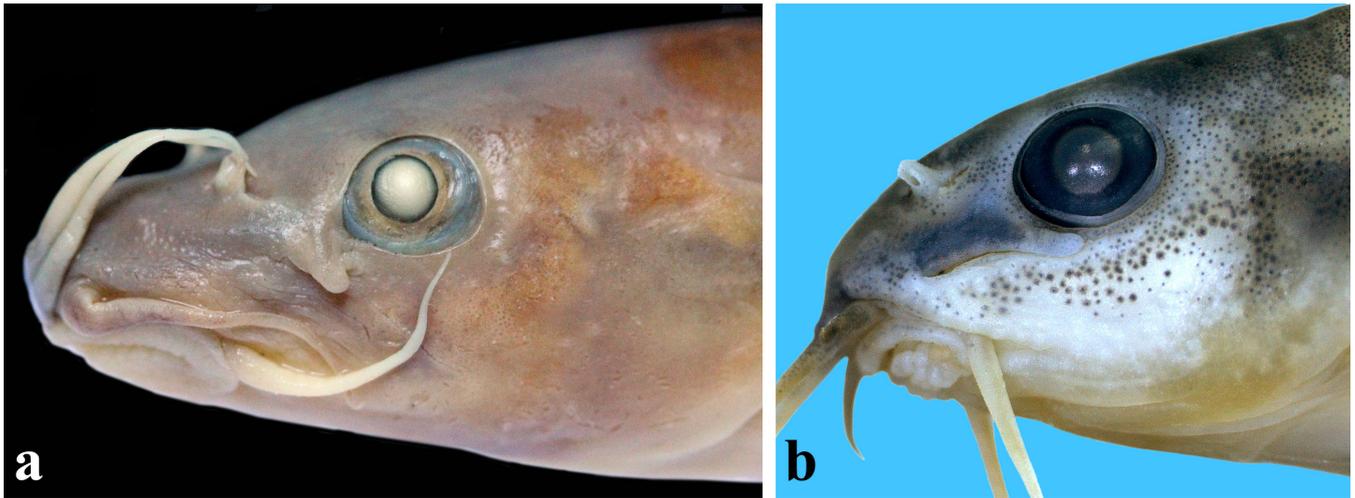


Fig. 6. Head and suborbital flap of: **a**, *Acanthocobitis pavonacea*, GU uncat., 119.0 mm SL; **b**, *Paracanthocobitis marmorata*, MUMF 22017, 42.7 mm SL. (Photographs by H. Choudhury (a), W. Vishwanath (b)).



Fig. 7. *Acanthocobitis* cf. *pavonacea*, CMK 28789, 114.1 mm; India: aquarium. (Photograph by M. Kottelat).

Molecular analyses show that a species identified as *Acanthobitis pavonacea* does not form a monophyletic lineage with the species of *Paracanthocobitis* (V. Slechtova & J. Bohlen, pers. comm.; Freyhof et al., 2016). A study of *P. zonalternans* and related species shows this same *Acanthocobitis* as sister-species to all species of *Paracanthocobitis* (Bohlen et al., 2020) [this study did not include representatives of other genera, so it is uninformative as to the monophyly of *Acanthocobitis* + *Paracanthocobitis*]. However, the material of *A. pavonacea* used by Bohlen et al. (2020) and Freyhof et al. (2016) seems to possibly belong to an unnamed species. We have examined one of the sequenced specimens (A1863, now CMK 28789; Fig. 7); it has a stouter appearance than the other specimens of *A. pavonacea* (even taking into account that it is a ripe female), and the anus is located closer to the anal-fin origin than to the pelvic-fin base (as in species of *Paracanthocobitis*) (distance from anus to anal-fin origin 35% of distance between pelvic and anal-fin origins, vs. 49–57 in *A. pavonacea*). It has 17½ branched dorsal-fin rays and the lower lip has numerous small sulci. For these reasons we identify it as a species of *Acanthocobitis*, probably unnamed. In the absence of locality information, it does not seem desirable to speculate further on its identity.

**Material examined.** *Acanthocobitis longipinnis*: ZMB 4795, holotype, 156 mm SL; India: Ganges.

*Acanthocobitis pavonacea*: GU uncat., 1, 119.0 mm SL (photographs); India: Guijan Ghat, Tinsukia, Brahmaputra River. — MUMF 28443, 1, 99.5 mm SL; India: Arunachal Pradesh: Namsai district: Tengapani River. — CMK 5927, 3, 58.9–89.5 mm SL; India: Assam: Dibru River; H. Bleher, 9 November 1987. — ZRC 54763, 2, 81.0–89.5 mm SL; India: Assam: Dibrugarh District; A. Rao, July 2001. — NRM 40422, 96.6 mm; India: Assam: Dibrugarh; F. Fang & A. Roos, 19 January 1998.

*Acanthocobitis* sp.: CMK 28789, 1, 114.1 mm SL; India: aquarium fish trade.

*Paracanthocobitis marmorata*: MUMF 22001–22016, 16, 30.6–42.7 mm SL; India: Manipur: Senapati District, Imphal River near Kalapahar township, 25°07'45"N 93°57'09"E, Chindwin drainage. — MCSNG 17114, 3, 27.4–31.7 mm SL; India: Manipur Valley, from ZSI [from Kottelat, 1990: 36]. — ZMA 119.972, holotype; ZMA 250.182, 3 paratypes, 28.9–33.5 mm SL; India: Manipur: Kanguipkhul Hills, from ZSI [from Kottelat, 1990: 36].

*Paracanthocobitis mandalayensis*: CMK 25619, 6, 45.4–62.6 mm SL; Myanmar: Kachin State: Nammaukkan Chaung, east shore of Lake Indawgyi; M. Kottelat & Nyein Chan, 5 December 2014.

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