

Pethia arunachalensis, a new species of small barb (Teleostei: Cyprinidae) from Arunachal Pradesh, India

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Abstract

Pethia arunachalensis, a novel cyprinid species, is described from the Nao-dhing River, Brahmaputra Basin, Arunachal Pradesh, India. The new species is diagnosed in having an incomplete lateral line, 6-7 lateral-lined pored scales, absence of barbels and a distinct black caudal spot. A key to the species of the genus *Pethia* established in the Ganga-Brahmaputra drainage is provided.

Keywords: Brahmaputra Basin, India, Nao-dhing, *Pethia*

Introduction

The cyprinid genus *Pethia* Pethiyagoda *et al.*, 2012 includes small freshwater fishes distributed in India, Bangladesh, Bhutan, Myanmar, Nepal, Pakistan, and Sri Lanka. Members of the genus are characterised by the distinctive colour form comprising of a spot on humeral and caudal peduncle; absence of rostral barbels; absent or minute maxillary barbels; dorsal-fin with 3 to 4 simple and 8 branched rays, last simple dorsal-fin ray rigid and serrated posteriorly; 3 simple and 5 branched anal-fin rays; and lateral line complete, interrupted or incomplete with 19–24 scales in lateral series (Pethiyagoda *et al.*, 2012). Currently, 39 species of the genus *Pethia* are considered valid (Katwate *et al.*, 2018).

Northeast India forms an idyllic home for the genus *Pethia*. Presently, there are 18 valid species viz., *P. aurea*, *P. canius*, *P. conchoni*, *P. gelius*, *P. guganio*, *P. phutunio*, *P. shalynius*, *P. ticto* distributed in the Brahmaputra; *P. atra*, *P. khugae*, *P. manipurensis*, *P. meingangbii*, *P. ornata*, *P. poiensis*, *P. yuensis*, *P. stoliczkana* in the Chindwin; *P. expletiforis* and *P. rutila* in the Kaladan and Karnaphuli River drainages of Northeast India (Shangningam and Vishwanath, 2018).

During a freshwater faunal survey in the Arunachal Pradesh, eight specimens of *Pethia* were collected in the Nao-dhing River at Miao. Further examination and comparison with known members of *Pethia* revealed the species to be unnamed and new to science, which we herein described as *Pethia arunachalensis* sp. nov.

Material and Methods

Fishes were fixed in 10% formalin and preserved in 70% ethanol. Measurements were taken on the left side of specimens point to point with a digital calliper to the nearest 0.1 mm. Measurements and counts usually followed Kullander (2008). However, head length was measured from the snout tip to the posterior margin of opercle. Fin rays and statistics of scales were counted using a Leica stereo-zoom transmitted light microscope. Statistics in parentheses after a precise count designate the frequency of that count. Two paratypes (30.1–31.1 mm SL) were cleared and stained for vertebral count following Hollister (1934). Total vertebral count comprises the four Weberian vertebrae and the compound centrum. Head length and additional morphometric data are stated as proportions of standard length (SL) and subunits of the head as extents of Head Length (HL). The holotype and

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seven paratypes of the novel species are deposited in the Zoological Survey of India, Kolkata (ZSI).

***Pethia arunachalensis* sp. nov.**

(Figure 1)

Common name: Arunachal barb.

Material examined: Holotype: 34.0 mm SL, India, Arunachal Pradesh, Changlang District, Nao-dhing River near Miao (Brahmaputra River drainage), 27°30' 16" N 96°10' 51" E, 230 m above sea level, 12-XI-2009, coll. J.K. Dey and party (Regd. No. ZSI FF 7162). Paratypes. 7 ex., 30.1–33.0 mm SL, same data as holotype, two paratypes, 30.1–31.1 mm SL were dissected for osteology (ZSI FF 7163).

Diagnosis: *Pethia arunachalensis* sp. nov. differs from all recognized congeners of *Pethia* by the combination following characters: small body-size (30.1–34.0 mm SL), incomplete lateral line with 6–7 lateral line pored scales, predorsal scales 8–9, last simple dorsal-fin ray osseous and serrated posteriorly with 16–18 serrae, circumpeduncular scales 12 and a distinct black caudal spot encompassing the 17th–19th lateral line scale.

Description: General body shape in Figure 1. Morphometric data for the types provided in Table 1. Body short, moderately deep, its depth at dorsal-fin origin (40.4–44.0 % SL), compressed laterally. Predorsal contour convex, rising gradually from snout tip to dorsal-fin origin, then sloping moderately towards caudal-fin base. Caudal peduncle elongated, its depth slightly less than or equal to its length, concave in both dorsal and ventral profiles. Ventral profile convex, from tip of snout up to base of pelvic-fin origin, running slightly conventional to anal-fin origin then slanted downward from anal-fin origin near posterior end of anal-fin base, then almost straight to caudal-fin base.



Figure 1. *Pethia arunachalensis* sp. nov., (Holotype, ZSI FF 7162, 34.0 mm SL).

Table 1. Morphometric data of holotype and seven paratypes of *Pethia arunachalensis* (ranges include holotype data)

| | Holotype | Range | Mean± SD |
|----------------------------------|----------|-----------|----------|
| Standard length (mm) | 34.0 | 30.1–34.0 | |
| In percentage of standard length | | | |
| Head length | 29.7 | 28.0–31.2 | 29.6±0.8 |
| Body depth | 41.1 | 40.4–44.0 | 42.6±1.4 |
| Body width at dorsal-fin origin | 13.8 | 13.3–14.6 | 14.1±0.4 |
| Body width at anal-fin origin | 10.5 | 09.2–11.3 | 09.9±0.7 |
| Length of caudal peduncle | 16.1 | 14.8–18.4 | 16.7±1.4 |
| Depth of caudal peduncle | 13.2 | 13.1–15.2 | 14.1±0.7 |
| Width of caudal peduncle | 03.5 | 03.5–04.3 | 03.9±0.2 |
| Length of dorsal-fin base | 20.5 | 17.0–21.0 | 18.3±1.1 |
| Length of pectoral fin | 22.9 | 20.0–25.0 | 21.8±1.9 |
| Length of pelvic fin | 20.5 | 20.0–23.1 | 21.7±1.2 |
| Length of anal fin | 19.4 | 18.6–20.5 | 19.7±0.6 |
| Dorsal-fin spine length | 19.4 | 19.4–22.1 | 21.2±1.1 |
| Pre-dorsal length | 55.0 | 51.8–55.7 | 54.4±1.3 |
| Pre-pectoral length | 26.5 | 25.7–29.0 | 27.5±1.3 |
| Pre-pelvic length | 52.9 | 51.3–55.0 | 53.6±1.3 |
| Pre-anal length | 74.7 | 74.7–77.0 | 76.2±0.9 |
| % Head length | | | |
| Head depth at occiput | 76 | 72–84 | 78.4±4.4 |
| Snout length | 29 | 27–31 | 30.1±1.7 |
| Eye diameter | 31 | 28–34 | 31.5±2.0 |
| Inter-orbital width | 35 | 34–37 | 35.4±1.1 |
| Head width at eye | 39 | 38–54 | 42.0±6.1 |
| Internarial width | 23 | 22–25 | 24.0±1.2 |

Head small, laterally compressed, its length 28.0–31.2% SL. Snout rounded, smooth, longer than to eye diameter, its length (27–31 % HL). Eyes small, its diameter 13–15 % HL, dorso-laterally positioned, nearer to the tip of snout

than to the operculum. Mouth small, subterminal, angle of gape almost reaching vertical through anterior margin of orbit. Upper lip fairly thicker and fleshy than the lower lip, lower lip intermittent medially. Barbels absent.

Dorsal-fin originating vertically opposite to the origin of pelvic-fin, its origin slightly nearer to the caudal-fin base, last ray almost crossing to about vertical of base of anal-fin. Dorsal-fin with three unbranched and $8\frac{1}{2}$ branched rays, last unbranched dorsal-fin ray strong and serrated posteriorly by 16–19 serrae. Pectoral-fin with one unbranched and 10 (5) or 11 (3) branched rays, its tip somewhat pointed, attaining 1–2 scales front to pelvic-fin origin. Pelvic fin with one unbranched and seven branched rays, its tip attaining anal opening when adpressed. Anal-fin with three unbranched and $5\frac{1}{2}$ branched rays, distal border slightly straight, its tip reaching two or three scales anterior to caudal-fin base when adpressed. Caudal-fin forked, lobes subequal, upper lobe slightly longer with 10+9 principal rays, dorsal procurent 4(6) or 5(2) and ventral procurent 4(8) rays.

Lateral line incomplete with six (3) or seven (5) pored scales, 22 (6)–23(2) scales in lateral sequence, running slightly curve ventrally in middle of the body. Scales between dorsal-fin origin and lateral line $4\frac{1}{2}$, between lateral line and pelvic-fin origin $4\frac{1}{2}$. Predorsal scales 8 (5) or 9 (3), pre-anal scales 17(2)–18(6), circumpeduncular scales 12 (8). Dorsal-fin base covered with seven scales. Pelvic axillary scale present, reaching to one-third of adpressed pelvic-fin length. Total number of vertebrae 4+27–28. Gill rakers two on epibranchial, one at angle, and six on ceratobranchial.

Colour: In preservative, dorsum light brown, predorsal midline dark brown. Body background reddish brown laterally, lower parts of body behind lateral line whitish pale, snout greyish and lower part of head pale yellow. A black distinct caudal spot covering over lateral-line scales 17th and 19th above the posterior end of the anal-fin base. Fins hyaline without pigmentation.

Distribution: *Pethia arunachalensis* is currently known only from the Nao-dhing River near Miao, Changlang District, Arunachal Pradesh, India (Figure 2 and 3).

Etymology: The species is christened after the state Arunachal Pradesh, the type locality.

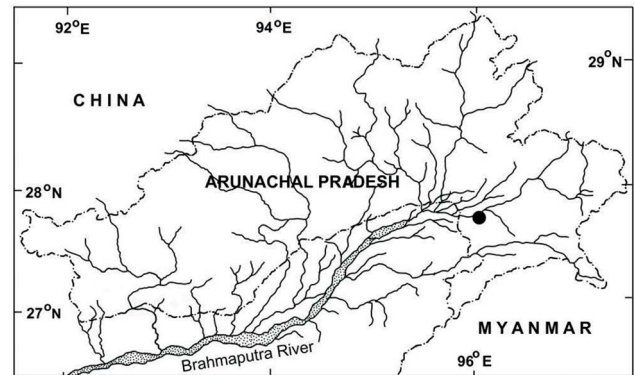


Figure 2. Map showing type locality of *Pethia arunachalensis*.



Figure 3. Nao-dhing River, type locality of *Pethia arunachalensis*.

Discussion: *Pethia arunachalensis* sp. nov. is compared with existing 39 congeners in the genus. A total of eight species are considered valid in the Ganga-Brahmaputra drainage viz., *P. aurea*, *P. canius*, *P. conchoni*, *P. gelius*, *P. guganio*, *P. phutunio*, *P. shalynius* and *P. ticto*. For the genus *Pethia*, the arrangement and position of the lateral line forms a significant diagnostic character with variances in scale arrangement, and the complete or incomplete lateral line being used as noteworthy characters for distinguishing species (Kottelat and Pethiyagoda, 1991; Meegaskumbura *et al.*, 2008).

Pethia arunachalensis is unique from all known congeners except *P. ticto* occurring in the Ganga-Brahmaputra drainage in having more scales around caudal peduncle (12 vs. 8–10 in *P. aurea*, *P. canius*, *P. conchoni*, *P. gelius*, *P. guganio*, *P. phutunio* and *P. shalynius*). Although *Pethia arunachalensis* is similar

to *P. ticto* in having same scale count around the caudal peduncle, *P. ticto* has a distinct black humeral spot encompassing 4-5 lateral line scale which is absent in the new species. *Pethia arunachalensis* can be further distinguished from *P. ticto* by having more transverse scale rows between lateral line and pelvic-fin origin ($4\frac{1}{2}$ vs. 4), more prepelvic (9-10 vs. 5-7) and preanal (17-18 vs. 11-14) scales.

The new species *Pethia arunachalensis* is notable in having lateral line scales (22-23 vs. 20-21 in *P. canius* and *P. phutunio*; 24-26 in *P. conchoni*; 25-26 in *P. aurea*; 28-29 in *P. guganio*), more principal caudal-fin rays (10+9 vs. 9+8 in *P. aurea*, *P. canius* and *P. gelius*), absence (vs. presence of black band encircling the caudal peduncle in *P. aurea*, *P. canius* and *P. gelius*). It is more notable in having fewer branched pectoral-fin rays (10-11 vs. 12-14 in *P. conchoni*, *P. gelius*, *P. phutunio* and *P. shalynius*), transverse- scale rows between lateral line and pelvic-fin origin ($4\frac{1}{2}$ vs. 2 in *P. canius*, $2\frac{1}{2}$ in *P. gelius*, $3-3\frac{1}{2}$ in *P. aurea*, *P. phutunio*, $2\frac{1}{2}-3\frac{1}{2}$ in *P. shalynius*; $5\frac{1}{2}$ in *P. conchoni* and *P. guganio*) and absence (vs. presence of a streak along mid-body in *P. guganio* and *P. shalynius*).

Currently, there are 15 valid species of *Pethia* recognised from the Chindwin-Irrawaddy drainage: *P. atra*, *P. didi*, *P. erythromycter*, *P. khugae*, *P. macrogramma*, *P. manipurensis*, *P. meingangbii*, *P. nankyweensis*, *P. padamya*, *P. poiensis*, *P. stoliczkana*, *P. tiantian*, *P. ornata*, *P. thelys* and *P. yuensis*. *Pethia arunachalensis* can be straightforwardly notable from *P. macrogramma*, *P. stoliczkana* and *P. tiantian* by the presence of incomplete (vs. complete) lateral-line scales, absence (vs. presence) of humeral spot and fewer (10-11 vs. 12-14) branched pectoral fin rays. *Pethia arunachalensis* share similar character in having an incomplete lateral-line with the rest twelve species. However, it can be distinguished from them in having lateral-line scales (22-23 vs. 19-20 in *P. didi*; 25-29 in *P. atra*; 28-30 in *P. khugae*), absence (vs. presence of a longitudinal stripe along the lateral-line scale in *P. atra*, *P. khugae* and *P. poiensis*), absence (vs. presence of humeral mark in *P. didi*, *P. meingangbii*, *P. manipurensis* and *P. padamya*), absence (vs. presence of maxillary barbels in *P. didi*, *P. nankyweensis* and *P. padamya*), absence (vs. presence of a dark band encircling the caudal peduncle in *P. erythromycter*, *P. nankyweensis*, *P. ornata*, *P. thelys* and *P. yuensis*), preanal scale (17-18 vs. 12 in *P. meingangbii*; 14 in *P. yuensis*; 16 in *P. manipurensis*; 19

in *P. atra*), more circumpeduncular scales (12 vs. 8 in *P. manipurensis*; 10 in *P. poiensis*), transverse scale rows between lateral line and pelvic-fin origin ($4\frac{1}{2}$ vs. $2\frac{1}{2}$ in *P. ornata*; $3\frac{1}{2}$ in *P. erythromycter* and *P. thelys*; $5\frac{1}{2}$ in *P. khugae*), shorter caudal peduncle (14.8-18.4% SL vs. 18.9-21.9 in *P. erythromycter* and *P. didi*; 19.0-22.2 in *P. khugae* and *P. thelys*; 21.6-23.2 in *P. nankyweensis*).

Pethia arunachalensis is compared with other two known species of *Pethia* described from Mizoram, northeast India: *P. expletiforis* from Kaladan and *P. rutila* from Karnaphuli River drainages respectively. The new species shows differences from the two by the presence of incomplete (vs. complete) lateral line, fewer (10-11 vs. 12-13) branched pectoral-fin rays, more ($4\frac{1}{2}$ vs. $3\frac{1}{2}$) transverse scale rows amongst lateral line and pelvic-fin origin.

Pethia arunachalensis is notable from other nine species of *Pethia* occurring in the southern India in possessing an incomplete lateral line (vs. complete in *P. lutea*, *P. punctata*, *P. setnai* and *P. striata*), absence (vs. presence of humeral spot in *P. longicauda*, *P. nigripinna*, *P. pookodensis*, *P. sahit* and *P. sanjoymoluri*) and transverse scale rows $4\frac{1}{2}/1/4\frac{1}{2}$ (vs. $4\frac{1}{2}/1/2-2\frac{1}{2}$ in *P. nigripinna* and *P. sahit*; $3\frac{1}{2}/1/3\frac{1}{2}$ in *P. longicauda* and *P. pookodensis*; $4\frac{1}{2}/1/4$ in *P. sanjoymoluri*).

Pethia arunachalensis differs from other known five Sri Lankan congeners in the absence (vs. presence of a large vertically-elongated humeral band in *P. bandula*, *P. cumingii* and *P. reval* and three black bars with the addition of vertical bar beneath the dorsal-fin base in *P. nigrofasciata*), an incomplete lateral line (vs. complete in *P. nigrofasciata*) and more transverse scales rows $4\frac{1}{2}/1/4\frac{1}{2}$ (vs. $2\frac{1}{2}/1/2\frac{1}{2}$ in *P. melanomaculata*; $3\frac{1}{2}/1/3\frac{1}{2}$ in *P. cumingii* and *P. reval*).

Key to the species of the genus *Pethia* occurring in the Ganga-Brahmaputra drainage

1. Lateral line complete.....*P. guganio*
- Lateral line incomplete.....2
2. Body with a humeral spot.....*P. ticto*
- Body without humeral spot.....3
3. Caudal peduncle with two black blotches.....*P. shalynius*

- Caudal peduncle with one blotch/spot/ band.....4
- 4. Scales around the caudal peduncle 8.....5
- Scales around the caudal peduncle 9–12.....6
- 5. Transverse scale rows between the lateral line and pelvic-fin origin 2; longer snout length 8.9–11.8 % SL.....*P. canius*
- Transverse scale rows between the lateral line and pelvic-fin origin 2½; shorter snout length 6.1–8.4 % SL.....*P. gelius*
- 6. Scales along the lateral line series 20–21.....*P. phutunio*
- Scales along the lateral line series 22–26.....7
- 7. Presence of a band around the caudal peduncle; a black spot under dorsal-fin origin and above anal-fin origin.....*P. aurea*
- Presence of a black caudal spot; no black spot beneath dorsal- and above anal-fin origin.....8
- 8. Lateral line series scales 24–26; transverse scale rows from dorsal-fin origin to lateral line 5½; branched pectoral-fin rays 12–12.....*P. conchoniis*
- Lateral line series scales 22–23; transverse scale rows from dorsal-fin origin to lateral line 4½; branched pectoral-fin rays 10–11.....*P. arunachalensis*

Comparative Material and Sources

Pethia atra: paratypes, 5 exs, 53.0–58.0 mm SL, India, Manipur, Bamonkampu, Iril River (Chindwin River Basin) (MUMF 6102–6106). *Pethia conchoniis*: 2exs, 58.2–58.4 mm SL, India, West Bengal, Teesta River (ZSI FF 4700); 3exs, 44.6–47.8mm SL, India, Manipur, Barak River (MUMF 3027). *Pethia expletiforis*: holotype, 50.1 mm SL, India, Mizoram, Ka-ao River near New Serkawr village. (MUMF 27341); paratypes, 3 exs, 47.2–53.1 mm SL (MUMF 27342–27344). *Pethia gelius*: 2 exs, 36.4–43.2 mm SL; India: Assam: Dibrugarh. (MUMF 12078–12080). *Pethia khugae*: holotype, 45.5 mm SL, India, Manipur, Khuga River at Churachandpur (Chindwin River Basin) (MUMF 6112), paratypes, 3exs, 44.0–46.0 mm SL (MUMF 6113). *Pethia manipurensis*: 3 exs, 25.18–33.44 mm SL, India, Manipur, Imphal River at Mayang Imphal (Chindwin River Basin) (MUMF 22040–22042). *Pethia meingangbii*: holotype, 34 mm

SL, India, Manipur, Chandel District, Moreh Bazar (Chindwin River Basin) (MUMF 501/1A), paratypes, 11exs, 30–35 mm SL (MUMF 501/2A). *Pethia ornata*: holotype, 42.0 mm SL, India, Manipur, Chandel District, Lokchao River (Chindwin River Basin) (MUMF 3028), paratypes, 7 exs, 30.9–42.0 mm SL (MUMF 3028). *Pethia poiensis*: holotype, 42.5 mm SL, female, India, Manipur, Ukhrul District, Challou River at Poi Village (Chindwin River Basin) (ZSI FF 7153). *Pethia didi*: 28.4 mm SL, Myanmar, Myitkyina District, Rocky streams around Kamaing (Chindwin River Basin) (ZSI F10929/1). *Pethia shalynius*: 3exs, 32.2–41.2 mm SL, India, Meghalaya, Nongpok, Umiam River. (MUMF 12048–12050). *Pethia stoliczka*: 4 exs, 48.5–51.4 mm SL, India, Manipur, India: Manipur: Chandel District, Lokchao River at Moreh (Chindwin River Basin) (MUMF 3081). *Pethia rutila*: holotype, 44.6 mm SL, India, Mizoram, Aivapui River, in the vicinity of Phuldungsei Village (Karnaphuli River Basin), paratypes, 3 exs, 33.3–40.2 mm SL, (ZSI FF 5215, ZSI FF 5216). *Pethia ticto*: 48.5 mm SL, India, West Bengal, Murshidabad District, Mahananda River (ZSI FF 5563) -38 mm SL, India, Imphal West District, Jiribam District, Jiri River (Brahmaputra River Basin) (MUMF 6115). *Pethia yuensis*: paratypes, 4exs, 29.0–55.0 mm SL, India, Manipur, Chandel District, Moreh Bazar (Chindwin River Basin) (MUMF 500/4A).

Published information used for comparison: Knight (2013) for *Pethia aurea*, *P. canius* & *P. guganio*; Kullander and Britz (2008) for *Pethia padamya*; Kullander (2008) for *Pethia erythromycter*, *P. macrogramma*, *P. nankyweensis* & *P. thelys* and Kullander and Fang (2005) for *Pethia tiantian*; Katwate *et al.*, (2018) for *P. bandula*, *P. cimungii*, *P. longicauda*, *P. lutea*, *P. melanomaculata*, *P. nigripinna*, *P. nigrofasciata*, *P. pookodensis*, *P. punctata*, *P. sahit*, *P. snajaymoluri*, *P. setnai*, *P. striata* and *P. reval*.

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