

A REVIEW OF THE BARBS OF THE *PUNTIUS FILAMENTOSUS* GROUP (TELEOSTEI: CYPRINIDAE) OF SOUTHERN INDIA AND SRI LANKA

Rohan Pethiyagoda

Wildlife Heritage Trust of Sri Lanka, 95 Cotta Road, Colombo 8, Sri Lanka
Email: rohan@wht.org

Maurice Kottelat

Route de la Baroche 12, Case Postale 57, CH-2952 Cornol, Switzerland
Honorary Research Associate, Raffles Museum of Biodiversity Research, Department of Biological Sciences,
National University of Singapore, 10 Kent Ridge Crescent, Singapore 119260
Email: mkottelat@dplanet.ch

ABSTRACT. – The *Puntius filamentosus* (Valenciennes) group of medium-sized (< 115 mm SL) cyprinids from southern India and Sri Lanka is reviewed. The group is characterised by adult males of most species developing filament-like extensions to the branched dorsal-fin rays and the distinctive ontogenic colour pattern of three black bars on the side of the body. *Puntius singhala* (Duncker), *P. arulius* (Jerdon), *P. srilankensis* (Senanayake) and *P. tambraparniei* (Silas) are considered valid species within this group. The name *Puntius assimilis* (Jerdon), hitherto in the synonymy of *P. filamentosus*, is re-validated and *P. lepidus* Day, and *P. maderaspatensis* (Jerdon) are treated as junior synonyms of *P. assimilis* and *P. filamentosus*, respectively. A new species, *P. exclamatio*, is described from the Kallada River, southern Kerala State; adults of this species differ from all other Indian and Sri Lankan Cyprinidae by their unique colour pattern: a black blotch 2–3 scales wide commencing on and above scale 6 or 7 of lateral-line series; and another horizontally-elongate, black, tear-shaped blotch about 1½ scales high commencing on lateral line slightly anterior to or above anal-fin origin, on about lateral-line scale row 13 and continuing to base of caudal fin. *Puntius filamentosus* is shown to have a wide distribution throughout the lowlands of southern India, while *P. assimilis* is known from disjunct populations in the Netravati River, southern Karnataka State, and the Chalakudy and Kallada Rivers, Kerala State. *Puntius singhala* and *P. srilankensis* are endemic to Sri Lanka.

KEY WORDS. – *Puntius filamentosus*, India, Sri Lanka, Kerala, Cyprinidae, taxonomy.

INTRODUCTION

The medium-sized barbs (< 115 mm SL) hitherto referred to *Puntius filamentosus* (Valenciennes, 1844) in southern India and Sri Lanka are among the most common cyprinids in the lowland rivers and reservoirs of these areas. They form an important part of the local food and ornamental fishery (Pethiyagoda, 1991; Talwar & Jhingran, 1991), and are easily recognised by the elongated, filament-like extensions of the branched dorsal fin-rays in adult males.

Exploration of the freshwaters of Kerala and in part, Tamil Nadu and Karnataka (the southernmost states of the Indian peninsula) between 1991 and 1998 brought to light several additional species of filamented-fin barbs clearly diagnosable from *P. filamentosus*. The recognition of the Western Ghats (which includes all of Kerala) and Sri Lanka as a global biodiversity hotspot (Myers et al., 2000) makes it imperative that these fishes are described and named so that their conservation could be assured. Several taxonomic problems exist, however, which need to be resolved prior to new species

being added to this group: type material is not known for *P. maderaspatensis*, *P. assimilis* and *P. arulius* (Jerdon, 1849); and the status of *P. lepidus* (Day, 1868) has not hitherto been established by reference to its syntype series.

In Jayaram's (1991) revision of the Indian species of *Puntius* Hamilton, 1822, he concluded that *P. srilankensis* (Senanayake, 1985) was a subspecies of *P. arulius*. However, the fact that *P. srilankensis* is restricted to a stretch of only a few kilometres of a single river in Sri Lanka, separated from the Cauvery River basin (to which *P. arulius* is restricted) by a distance of ~ 500 km, several intervening basins and the 20 km wide Palk Strait that separates India from Sri Lanka, suggests that the two nominal species deserve closer comparison. Likewise, the status of *P. arulius tambraparniei* (sensu Jayaram, 1991), from a drainage well separated from the Cauvery River basin, to which *P. a. arulius* is restricted, also warrants clarification.

De Silva et al. (1981) added *P. singhala* (Duncker, 1912) to the synonymy of *P. filamentosus*, but without reference to the

TAXONOMY

type material of either species. As the type locality of the former is Wakwella, in southern Sri Lanka, and that of the latter Alleppey in Kerala, India, this synonymy too, needs to be reassessed.

Puntius mahecola (Valenciennes, 1844), which has been considered a synonym of *P. filamentosus* by many recent authors (e.g. Jayaram, 1991; Talwar & Jhingran, 1991) was shown by Pethiyagoda & Kottelat (2005, this volume) to be a valid species that has hitherto been confused with *P. amphibius* (Valenciennes, 1842).

In this paper, through an examination of the relevant type material and using fresh collections made in India and Sri Lanka, we attempt to clarify the taxonomy of these fishes which, for convenience we label as the *P. filamentosus* group. The grouping is supported by two apparent synapomorphies: the distinctive colour pattern of juveniles, common to the included species for which young specimens are available; and the dorsal-fin ray extensions of mature males in most included species. We also describe all the valid species in the group, to which is added a new one, *P. exclamatio*, discovered in the course of this study.

The material referred to in this paper is largely from Kerala (India) and Sri Lanka, with only minimal representation from Karnataka and Tamil Nadu. It is possible that more species within the group may occur in southern peninsular India, particularly in streams draining the eastern face of the Western Ghats (see Discussion, below).

MATERIALS AND METHODS

Specimens referred to in this paper belong to The Natural History Museum, London (BMNH); the Muséum Nationale d'Histoire Naturelle, Paris (MNHN); Zoologisches Museum und Zoologisches Institut, Hamburg (ZMH); Zoological Survey of India, Calcutta (ZSI) and its Southern Regional Station, Chennai (ZSI-SRS); the Collection of Maurice Kottelat, Cornol, Switzerland (CMK); and the Wildlife Heritage Trust of Sri Lanka, Colombo (WHT).

Measurements follow those of Kottelat (2001), in addition to which postorbital head length is measured from the posterior rim of the orbit to the posterior bony edge of the opercle; eye diameter is the maximum horizontal diameter of the eye; post-dorsal length (D-CP) is the distance from the base of the first dorsal-fin ray to the base of the hypural complex; interorbital width is the distance between the uppermost points of the orbits. The transverse scale count is taken as the number of scale rows between the base of the anteriormost dorsal fin ray counted diagonally backwards to the lateral line + 1 + the number of scale rows counted diagonally forwards to the base of the pelvic fins; a scale extending to either side of the dorsal and ventral mid-lines is denoted by ½.

Spellings for Indian and Sri Lankan place names follow the "Map for Southern India including Sri Lanka" by Nelles Verlag, München (ISBN 3-88618-606-7; no year of publication).

The *Puntius filamentosus* group

Definition. – The *Puntius filamentosus* group is here restricted to those south Indian and Sri Lankan barbs that exhibit (a) a juvenile (<48.0 mm SL) colour pattern consisting of three vertical bars on the side of the body, approximately positioned as follows: one beneath the dorsal-fin base; one above the anal-fin base; and one at the base of the caudal fin; and (b), in the adult males of some of the species (*P. filamentosus*, *P. singhala*, *P. srilankensis*, *P. tambraparniei* and *P. assimilis*), filament-like extensions of the branched dorsal-fin rays.

Diagnosis. – Members of the group are distinguished from other peninsular Indian and Sri Lankan *Puntius* with vertical bars on side of the body at any life-history stage as follows (based on data from Kottelat & Pethiyagoda, 1991; Jayaram, 1991 and Talwar & Jhingran, 1991): from *P. fasciatus* (Jerdon, 1849) and from *P. narayani* (Hora, 1937) by having 4 scales between mid-dorsal row and lateral line (vs. 3 in *P. fasciatus* and *P. narayani*); from *P. nigrofasciatus* (Günther, 1868) by having anteriormost bar located beneath origin of dorsal fin (vs. immediately behind the gill opening in *P. nigrofasciatus*); from *P. cuningii* (Günther, 1868) and *P. bandula* Kottelat & Pethiyagoda, 1991, by having a complete lateral line (vs. lateral line incomplete, perforating < 11 scales); and from *P. phutunio* (Hamilton, 1822) by having a smooth last unbranched dorsal fin ray and a complete lateral line (vs. last unbranched dorsal ray serrated and lateral line incomplete in *P. phutunio*).

Characters common to adults of all species. – Head and body compressed. Angle of mouth not extending farther back than level of anterior orbit. Mandibular barbels absent. Rostral fold present, sometimes overhanging upper lip. Upper and lower lips smooth. Dorsal-fin origin slightly closer to snout than to base of caudal fin, with 4 simple rays (the first one minute and exposed only in the larger specimens; the last simple ray weak, smooth, not serrated) and 8½ branched rays (= 9 rays, last two articulating on same pterygiophore). Posterior profile of dorsal fin slightly concave and emarginate in females and immature males. Anal fin with 3 simple and 5½ branched rays. Pelvic fin with 1 simple and 8 branched rays. Pectoral and pelvic fins short, not reaching pelvic and anal-fin origins respectively. Caudal fin with 1+9+8+1 principal rays, deeply forked, lower lobe slightly longer than upper, longest rays more than twice as long as median ones. Caudal peduncle longer than deep. Lateral line complete. Transverse scales from dorsal-fin origin to mid-ventral scale row ½4+1+3½; 2½ scales between lateral line and pelvic-fin origin. Scales in transverse line on caudal peduncle ½5½. An axillary pelvic scale present, its exposed length about equal to snout length.

Colour stages. – The colour stages of juvenile *P. filamentosus* and *P. singhala* are closely correlated with those described by De Silva et al. (1981) whom we follow (referred to as De Silva stages in the text).

Field key to adult specimens (> 48.0 mm SL) of the *Puntius filamentosus* s.l. group

| | | |
|---|---|------------------------------|
| 1 | mouth inferior | 2 |
| - | mouth subterminal | 3 |
| 2 | lower lip adnate to jaw, absent medially; body with three vertically-elongate black blotches; maxillary barbels short, less than ¼ eye diameter | <i>Puntius srilankensis</i> |
| - | lower lip free, entire, not adnate to jaw; body with no prominent markings in advance of anal-fin origin; maxillary barbels long, more than ½ eye diameter | <i>Puntius assimilis</i> |
| 3 | adults with no prominent markings on body anterior to anal fin origin | 4 |
| - | adults with one or more dark blotches on body, at least 1 scale high and 2 scales wide, anterior to anal-fin origin | 5 |
| 4 | each caudal fin lobe with a transverse black band near tip | <i>Puntius filamentosus</i> |
| - | no distinct markings on caudal fin lobes | <i>Puntius singhala</i> |
| 5 | body markings limited to a black blotch 2–3 scales wide commencing on and above scales 6 or 7 of lateral-line series and a black stripe 5–6 scales long commencing on scales 13–15 of lateral line series in advance of anal-fin origin | <i>Puntius exclamatio</i> |
| - | body with three dark blotches | 6 |
| 6 | mouth terminal; maxillary barbels < ¼ eye diameter; dorsal rays of males not prolonged into filament-like extensions .. | <i>Puntius arulius</i> |
| - | mouth subterminal; maxillary barbels > ½ eye diameter; dorsal rays of males prolonged into filament-like extensions | <i>Puntius tambraparniei</i> |

***Puntius filamentosus* (Valenciennes, 1844)**
(Figs. 1–3, Table 1)

Leuciscus filamentosus Valenciennes, 1844: 96, pl. 492.
Systemus maderaspatensis Jerdon, 1849: 319.

Material examined. – Lectotype (present designation) - female, 82.7 mm SL, MNHN 3908, “Alipey (Inde)” [= Alleppey, present-day Alappuzha, situated between Vembanad Lake (a brackish-water estuary) and the Arabian Sea, 9°20'N, 76°25'E, Kerala State, south-western India].

Paralectotypes - 2 females, 76.4, 85.4 mm SL; 7 males, 88.7–107.5 mm SL, MNHN 3908, same locality data as lectotype.

Topotypes - 5 females, 63.6–88.6 mm SL; 2 males, 76.0, 83.1 mm SL, WHT 6242, Kumarakom, near Kottayam, Vembanad “Lake”, Kerala, India, 20 Mar.1996. 5 females, 64.3–77.0 mm SL; 2 males, 83.2, 90.2 mm SL, WHT 6244; 1 male, 92.6 mm SL, WHT 0306; Vembanad Lake, on road from Changanacherry to Alleppey, Kerala, India, 28 Mar.1992.

Others - 1 male, 74.7 mm SL, WHT 6243, Chalakudy River at Parambikulam, 26 km from Chalakudy on Valparai road, Kerala, India, 14 Mar.1996.

Diagnosis. – Adults of *P. filamentosus* are distinguished from all other South Asian *Puntius* by a combination of the following characters: branched dorsal-fin rays prolonged into filament-like extensions (in adult males only); a black band about as wide as the eye near tip of each caudal-fin lobe; lower lip continuous; a caudal blotch on 2–5 scales, commencing posterior to anal-fin origin; no distinct markings on body in advance of anal-fin origin. Additionally, *P. filamentosus* is distinguished from *P. assimilis* by having a subterminal mouth (vs. inferior); maxillary barbels shorter, 0.5–2.2% of SL (vs. 5.5–9.3%); post-orbital head length 11.0–12.1% of SL (vs. 8.7–10.4%); and interorbital width 11.2–12.2% of SL (vs. 10.0–11.1%).

Description. – For general body shape and appearance see Figs. 1–2. Morphometric data for 15 topotypes are given in Table 1. Dorsal and ventral profiles almost equally rounded, a

slight hump behind nape, more evident in larger specimens. Snout short, slightly longer than eye diameter, less than interorbital width (eye diameter exceeds snout length in specimens of < ~ 65 mm SL). Mouth subterminal, arched, angled at about 40° to horizontal. Angle of mouth anterior to eye, almost directly beneath nares. Upper and lower lips closely adnate to jaws; lower jaw not visible with mouth closed. Postlabial groove of lower lip interrupted medially. In mature males, area between upper lip, anterior naris and eye densely tuberculated with large, conical tubercles; minute, widely-spaced tubercles on cheek. A pair of maxillary barbels, less than ¼ eye diameter long.

Dorsal-fin origin over seventh or eighth lateral-line scale. Branched dorsal-fin rays extend into trailing filaments in mature males, sometimes reaching farther back than caudal-fin base. Pectoral fin with one simple and 14 (11 examples) or 15 (4) branched rays.

Lateral line complete, with 18 (3), 19 (10) or 20 (2) scales on body, extending 1–3 scales on to caudal-fin base, curving downward from origin until about 7th pored scale, then ascending to middle of caudal peduncle. Predorsal scales 7½. Transverse scales from dorsal fin origin to mid-ventral scale row ½4+1+3½; 2½ scales between lateral line and pelvic fin origin. Scales in transverse line on caudal peduncle ½5½.

Coloration. – Adult specimens in alcohol (Fig. 2) dark brownish olive on back, becoming lighter on sides to silvery white on ventral surface. Scale pockets on body dark, particularly above lateral line; scale margins dark, clearly defining scales, giving a criss-cross appearance. A well-defined black, horizontally-elongate blotch above anal fin, falling at least in part on 4 or 5 lateral-line scales, starting on pored scale 13, 14 or 15, bisected symmetrically by lateral line. Dorsal, anal, pectoral and pelvic fins hyaline (in mature males, filamentous extensions of branched dorsal-fin rays grey to black). Base and outer margins of caudal fin dusky, each lobe with a transverse black band about ½ eye diameter wide, close to but not reaching lobe tip, edged in white on proximal and distal sides.

Table 1. Morphometric data of *Puntius filamentosus* topotypes (WHT 6242, 7, 63.6–88.6 mm SL; WHT 6244, 7 ex., 64.3–90.2 mm SL; and WHT 0306, 1 ex., 92.6 mm SL).

| | % SL | | | % HL | | |
|----------------------------|-------|---------------|------|------|-------------|------|
| | mean | range | S.D. | mean | range | S.D. |
| Standard length [mm] | | 63.6 – 90.3 | | | | |
| Total length | 135.3 | 131.9 – 139.2 | 1.7 | | | |
| Head length | 27.1 | 26.0 – 28.1 | 0.7 | | | |
| Dorsal-fin length | 35.0 | 26.5 – 53.7 | 7.7 | | | |
| Maxillary barbel length | 1.5 | 0.8 – 2.2 | 0.5 | 5.6 | 2.8 – 8.1 | 1.7 |
| Snout length | 8.6 | 8.3 – 9.0 | 0.2 | 31.7 | 30.2 – 33.2 | 0.8 |
| Eye diameter | 7.9 | 7.2 – 8.6 | 0.4 | 29.2 | 27.1 – 31.3 | 1.2 |
| Postorbital head length | 11.4 | 11.0 – 12.1 | 0.3 | 42.2 | 40.2 – 43.5 | 1.1 |
| Interorbital width | 11.5 | 11.2 – 12.2 | 0.3 | 42.4 | 40.5 – 44.3 | 1.2 |
| Internarial width | 7.1 | 6.6 – 7.8 | 0.3 | 26.0 | 24.9 – 29.1 | 1.1 |
| Predorsal length | 52.0 | 49.1 – 54.0 | 1.2 | | | |
| Dorsal to hypural distance | 56.0 | 54.5 – 57.5 | 1.0 | | | |
| Maximum body depth | 36.9 | 32.6 – 39.9 | 2.1 | | | |
| Caudal peduncle length | 17.1 | 15.6 – 18.5 | 0.8 | | | |
| Maximum body width | 18.1 | 16.8 – 20.8 | 1.1 | | | |
| Caudal peduncle depth | 14.3 | 12.9 – 15.7 | 0.9 | | | |

In life (Fig. 1), head and dorsum greenish grey; sides iridescent golden-green above lateral line, white below. A horizontally-elongate, dark blotch 3–4 scale-widths wide commences slightly behind anal-fin origin. Fins hyaline, but branched rays of dorsal fin, proximal parts of pectoral and pelvic fins and upper and lower margins of caudal-fin lobes dusky. Caudal fin-tips red, bisected by a black transverse band about half as wide as eye. The entire body suffused with red in mature males.

Juvenile specimens (Fig. 3) 11.4–16.0 mm SL (the smallest ones available, De Silva stage b), with three black bars on body: first bar about 4 scales wide centred at origin of dorsal fin, gradually narrowing and descending to origin of pelvic fins; second bar above anal fin base, ringing entire body, about 4 scales wide at lateral line; third bar on two rows of scales on caudal-fin base. A dark transverse band on occiput and between posterior orbits. Fins hyaline, but anterior parts of interradiial membranes of dorsal, anal and caudal densely spotted with closely-spaced melanophores. A narrow, black band near (but not at) tip of each caudal-fin lobe.

First (anteriormost) body bar begins clearing from pelvic-fin end in slightly larger (20 mm SL) specimens; in examples 26.3 and 27.0 mm SL, separated from pelvic-fin origin by two scale rows (De Silva stage c). By 30–35 mm SL first and third bars very diffuse, second bar diffusing at its upper and lower ends, forming into a circular spot; black bands on caudal-fin lobes wider, more distinct (De Silva stage e). In larger specimens (35 mm SL) first and third body bars gradually disappear, second bar takes on a horizontally-elongate shape; adult colour pattern established at around 40 mm SL (De Silva stage g).

Distribution. – *Puntius filamentosus* is widely distributed throughout the coastal floodplain of Kerala, Tamil Nadu and at least southern Karnataka (Fig. 4). It occurs in lowland



Fig. 1. *Puntius filamentosus*, in life, WHT 6014, 74.7 mm SL, Chalakudy River, Kerala.



Fig. 2. *Puntius filamentosus*, lectotype, MNHN 3908, 82.7 mm SL, Alleppey, Kerala, India.

rivers and also in estuaries, reservoirs and marshes (Kortmulder et al., 1990; present study). It is often found very close to the sea (e.g. the type locality, Alleppey) in brackish water, together with typically estuarine fishes, and is a species commonly seen in Kerala fish markets.

***Puntius singhala* (Duncker, 1912)**
(Figs. 5–7; Table 2)

Barbus singhala Duncker, 1912: 263.

Puntius sinhala Deraniyagala, 1930 (erroneous subsequent spelling).

Material examined. – Lectotype - juvenile, 24.0 mm SL, ZMH 364, Yakvella (Wakwella), Gin River basin, near Galle, Sri Lanka.



Fig. 3. *Puntius filamentosus*, WHT 340, juveniles, 15.5–34.0 mm SL, Kumarakom, Vembanad Lake, Kerala, India.

Paralectotypes - 2 juveniles, 20.2–24.0 mm SL, ZMH 365; 1 juvenile, 27.0 mm SL, BMNH 1913.5.24.7, same locality data as lectotype.

Topotypes - 4 ex., 54.1–63.3 mm SL, WHT 6245, Wakwella near Galle (Gin River), Sri Lanka, 20 Apr. 1994.

Others - 7 ex., 60.2–69.2 mm SL, WHT 6246, Bellanwila wetland, near Colombo (Kelani River basin), Sri Lanka, 06 Mar. 1995. 1 female, 81.1 mm SL; 1 male, 80.9 mm SL, WHT 6247, Mahiyangana (Mahaweli River basin), Sri Lanka, 19 Aug. 1996. 3 males, 83.2–90.5 mm SL, WHT 6248, Tabbowa Reservoir near Mannar, Sri Lanka, 23 Oct. 1997. 2 females, 72.5, 75.7 mm SL, WHT 2128, Kalu River (tributary of Mahaweli River), Puwakpitiya, foothills of Knuckles Mountains (Mahaweli River basin), Sri Lanka, 10 Sep. 1997.

Diagnosis. – Adult *Puntius singhala* (> 60 mm SL) are diagnosed from all other species of the *P. filamentosus* group by a combination of the following characters: no distinct marks on caudal fin lobes or on body in advance of anal fin origin; length of maxillary barbels less than $\frac{1}{4}$ eye diameter; mouth subterminal.



Fig. 4. Principal localities mentioned in the text; solid circles represent type localities, open circles represent other locations from which material is available. 1, *P. filamentosus*; 2, *P. singhala*; 3, *P. exclamatio*; 4, *P. assimilis*; 5, *P. arulius*; 6, *P. tambraparniei*; 7, *P. srilankensis*.

Description. – (In view of the type series having comprised only juveniles, this description is based on the adult topotypes and Other Material referred to as above). For general body shape and appearance see Figs. 5, 6. Morphometric data for 17 specimens are given in Table 2. Ventral profile rounded. Snout short, slightly shorter than eye diameter, about two-thirds of interorbital width. Mouth subterminal, arched, angled at about 40° to horizontal. Angle of mouth anterior to eye, slightly behind nares. Upper and lower lips closely adnate to jaws; lower jaw not visible with mouth closed. Area between upper lip, anterior naris and eye densely tuberculated in mature males (> ~ 80 mm SL). One minute pair of maxillary barbels, < $\frac{1}{4}$ eye diameter.

Dorsal-fin origin over seventh lateral-line scale. In mature males (> ~ 80 mm SL) branched dorsal fin rays (particularly branched rays 2–6) extended into trailing filaments, sometimes reaching farther back than caudal-fin base. Pectoral fin with one simple and 14 branched rays. Pectoral fin short, not reaching pelvic-fin origin. Pelvic fin long, sometimes just reaching anus but never reaching anal-fin origin.

Lateral line complete, with 20 (10) or 21 (8) scales on body, extending 1–3 scales on to caudal-fin base, curving downward from origin until about 7–8th pored scale, and then ascending to middle of caudal peduncle. Predorsal scales $7\frac{1}{2}$.

Coloration. – In alcohol (Fig. 6), adult specimens dark brownish olive on back, becoming lighter on sides to silvery white on ventral surface. Scale pockets on body, particularly above lateral line, with dark margins, clearly defining scales. A well-defined black, horizontally-elongate blotch, more rounded in some

Table 2. Morphometric data of *Puntius singhala*, topotypes (WHT 6245, 4 ex., 54.3–63.2 mm SL) and other material from Sri Lanka (WHT 6246, 7 ex., 60.2–69.2 mm SL; WHT 6247, 2 ex., 80.9–81.1 mm SL; 2 ex., 90.3–92.5 mm SL; and 2 ex., 72.5–75.7 mm SL).

| | % SL | | | % HL | | |
|----------------------------|-------|---------------|------|------|-------------|------|
| | mean | range | S.D. | mean | range | S.D. |
| Standard length | | 54.3 – 92.5 | | | | |
| Total length | 135.3 | 131.7 – 138.5 | 1.8 | | | |
| Head length | 27.7 | 25.2 – 29.1 | 1.0 | | | |
| Dorsal-fin length | 33.1 | 28.8 – 43.9 | 3.7 | | | |
| Maxillary barbel length | 0.5 | 0.0 – 1.3 | 0.3 | 1.9 | 0.0 – 5.1 | 1.3 |
| Snout length | 8.8 | 7.6 – 10.5 | 0.6 | 32.0 | 28.7 – 38.3 | 2.2 |
| Eye diameter | 8.3 | 6.8 – 9.3 | 0.7 | 29.9 | 24.9 – 33.0 | 2.0 |
| Postorbital head length | 11.6 | 10.3 – 12.7 | 0.6 | 41.8 | 38.2 – 45.3 | 2.1 |
| Interorbital width | 11.8 | 10.7 – 12.7 | 0.5 | 42.5 | 40.7 – 46.2 | 1.4 |
| Internarial width | 6.6 | 5.8 – 7.2 | 0.4 | 24.0 | 21.8 – 26.0 | 1.2 |
| Predorsal length | 51.8 | 49.9 – 54.1 | 1.1 | | | |
| Dorsal to hypural distance | 56.3 | 54.9 – 58.0 | 0.9 | | | |
| Maximum body depth | 37.2 | 33.8 – 39.4 | 1.5 | | | |
| Caudal peduncle length | 18.6 | 17.9 – 19.9 | 0.6 | | | |
| Maximum body width | 17.8 | 15.6 – 20.0 | 1.1 | | | |
| Caudal peduncle depth | 13.8 | 12.8 – 14.8 | 0.5 | | | |

specimens, about one scale-width high commencing on scale row 14 or 15, tapering thereafter, above anal fin, on lateral-line scales 14–18 or 15–19, bisected symmetrically by lateral line. Dorsal, anal, pectoral and pelvic fins hyaline; dorsal fin of mature males black. Caudal fin hyaline, lobes slightly darker, but lacking any distinctive markings.

In life (Fig. 5), dorsally dark greenish-grey, laterally olive above lateral line, pinkish-white below. Fins hyaline in females and immature males. In mature males, dorsal fin dusky grey, elongate filaments reddish grey to black. Anal fin hyaline.

Pectoral and pelvic fins dark grey, tips hyaline. Caudal fin suffused with grey, upper and lower margins of lobes darker.

Juvenile specimens, 12.5 mm SL (WHT 213, De Silva stage a), with three vertical, black bars on body: first bar about 4 scales wide, commencing anterior to dorsal-fin origin, extending backwards on to bases of first 2–3 branched rays and downwards to anterior part of pelvic fins and between them; second bar about same width as first, commencing at base of anal fin and ringing entire body, including anterior ¾ of anal fin; third bar at base of caudal fin, narrower than bars 1 and 2

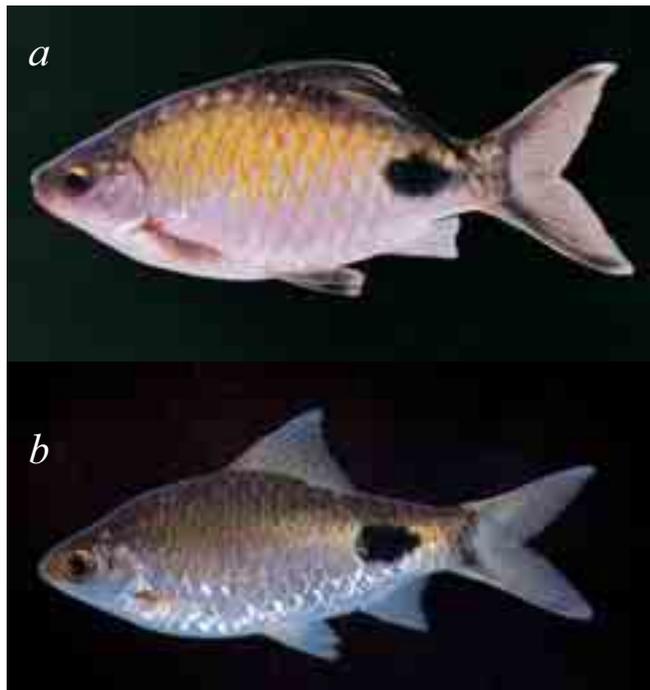


Fig. 5. *Puntius singhala*, in life, not preserved; a, male, ~ 80 mm SL; b, female, ~ 65 mm SL, Nuwara Wewa (reservoir), Anuradhapura, Sri Lanka.



Fig. 6. *Puntius singhala*, WHT 6248, 83.2 mm SL), Tabbowa Reservoir near Mannar, Sri Lanka.



Fig. 7. *Puntius singhala*, lectotype, ZMH 364, 24.0 mm SL juvenile, Gin River at Wakwella, Sri Lanka.

(about 2 scales wide). Area between interorbital and nape black, extending down around back of eye, diffusing to scattered melanophores in postorbital area and below it.

At 15.5 mm SL (WHT 29, De Silva stage b), first bar begins to narrow towards its lower end, disappearing around base of pelvic fins, no longer visible between them. By 19.5 mm SL (WHT 29, De Silva stage c), first bar disappears below lateral line, second bar becomes lighter ventrally, a slight widening being visible in region of lateral line (vestigial tail-spot). At 28.5 mm SL (WHT 29, De Silva stage e), first bar very faint and visible only above lateral line (Fig. 7); second bar faint, giving way to a circular spot 3 scales wide, centred on lateral line above anal-fin base; caudal-fin tips darken slightly. At 36 mm SL (WHT 213, De Silva stage f) dark bands near tips of caudal-fin lobes clearly visible. Dark bands on caudal-fin lobes begin to fade at ~ 60 mm SL (De Silva stage g), caudal blotch lengthens over $3\frac{1}{2}$ scales; anteriormost bar on body disappears altogether.

Distribution. – *Puntius singhala* occurs in low-country rivers and reservoirs throughout Sri Lanka (Pethiyagoda, 1991: as *P. filamentosus*) (Fig. 4). It is a much-exported aquarium fish and one of the most common cyprinids in Sri Lanka, forming a small but significant part of the fishery in the reservoirs of the island's dry zone.

Puntius exclamatio new species

(Fig. 8, Table 3)

Material examined. – Holotype - male, 70.4 mm SL, WHT 6255, Kallada River, 3 km downstream of Thenmalai Dam, on Thenmalai–Trivandrum Road, Kerala, India, 21 Mar. 1996.

Paratypes - 3 ex., 62.3–71.9 mm SL, WHT 6249, collected with holotype. 44 ex., 37.1–83.4 mm SL, CMK 8808, procured from Alleppey fish market, Kerala, India, 28 Apr. 1992. 11 ex., 20.3–63.1 mm SL, CMK 18477, Kallada River, 1 km downstream of Thenmalai Dam, on Thenmalai–Trivandrum Road, Kerala, India, 12 Apr. 1992.

Diagnosis. – Adults of *Puntius exclamatio* differ from all other Indian and Sri Lankan *Puntius* by their unique colour pattern: a black blotch 2–3 scales wide commencing on and above scale 6 or 7 of lateral line series; and another horizontally-elongate, black, tear-shaped blotch about $1\frac{1}{2}$ scales high commencing on lateral line slightly anterior to or above anal-fin origin, on about lateral-line scale row 13 and continuing to base of caudal fin.

Description. – General body shape and appearance is shown in Fig. 8. Morphometric data for holotype and 11 paratypes are given in Table 3. Ventral profile rounded. Dorsal profile of head straight, somewhat humped posterior to nape, almost horizontal at origin of dorsal fin. Snout length subequal to eye diameter, just short of interorbital width. Mouth subterminal, arched, angled at about 45° to horizontal, angle of gape just reaching vertical of anterior margin of eye. Rostral fold present, sometimes entirely overhanging upper lip, which is otherwise partly exposed. Upper and lower lips smooth, adnate to jaws. Postlabial groove of lower lip widely



Fig. 8. *Puntius exclamatio*, holotype, in life, WHT 6255, 70.4 mm SL, Kallada River, Kerala, India.

interrupted medially. Area between upper lip, anterior naris and eye tuberculated in mature males, tubercles not extending up to infraorbital region or gape. A single pair of maxillary barbels $\frac{1}{2}$ – $\frac{3}{4}$ eye diameter; mandibular barbels absent.

Dorsal-fin origin over eighth lateral-line scale, closer to snout than to base of caudal fin. Posterior profile of dorsal fin slightly concave and emarginate in both males and females, the branched rays not extending into filaments. Posterior margin of anal fin straight or slightly concave. Pectoral fin with one simple and 14 (6) or 15 (6) branched rays. Pectoral and pelvic fins short, not reaching pelvic-fin origin or anus respectively.

Lateral line complete, with 20 (8), 21 (3) or 22 (1) pored scales, curving downward from origin until about 10th pored scale (under origin of fifth branched dorsal-fin ray), then ascending to middle of caudal peduncle; 2–3 pored scales on base of caudal. Predorsal scales $7\frac{1}{2}$.

Coloration. – Adult specimens in alcohol dark brownish-olive on back, becoming lighter on sides to silvery white on ventral surface. Most specimens with an irregular black “V”, “M” or “W”-shaped blotch, 1–4 scales wide, 1–2 scales high, on side, extending from lateral-line scales 6–9 (lower part of blotch on lateral-line scale row, upper part on row above it). A well-defined and elongate, black, tear-shaped blotch about $1\frac{1}{2}$ scales high commencing on lateral line slightly anterior to or above anal-fin origin, on about lateral-line scale row 13, continuing to base of caudal fin, tapering to a height of about $\frac{1}{2}$ -scale at its posterior end. Dorsal, anal, pectoral and pelvic fins hyaline. Base and margins of caudal-fin lobes dusky; no distinctive markings on fin or fin lobes.

In life (see Fig. 8), greenish olive above lateral line, darker on dorsal side of head and body. Mature males pinkish white below lateral line, females and immature males white. Lower half of head suffused with red in mature males; fins dark pink to red. Body markings as for colour in alcohol.

Etymology. – The species-name is a reference to the colour pattern of this fish, which if viewed “snout-down,” resembles an exclamation mark: *exclamatio*, Latin, = an interjection, an exclamation; used here as a noun in apposition.

Distribution. – *Puntius exclamatio* was found in clear-water, rock and pebble substrate areas of the Kallada River (Fig. 4), between the steep cascades that descend from the Western

Table 3. Morphometric data of *Puntius exclamatio*, holotype (WHT 6255, 70.4 mm SL) and 11 paratypes (CMK 8808, 8, 58.5–83.4 mm SL; WHT 6249, 3, 62.3–71.9 mm SL).

| | % SL | | | % HL | | |
|----------------------------|-------|---------------|------|------|-------------|------|
| | mean | range | S.D. | mean | range | S.D. |
| Standard length [mm] | | 51.6 – 83.4 | | | | |
| Total length | 135.9 | 133.9 – 138.3 | 1.4 | | | |
| Head length | 28.7 | 28.3 – 29.6 | 0.3 | | | |
| Dorsal-fin length | 32.0 | 30.1 – 33.5 | 1.0 | | | |
| Maxillary barbel length | 4.5 | 2.1 – 6.2 | 1.1 | 15.8 | 7.5 – 21.6 | 3.7 |
| Snout length | 8.8 | 8.2 – 9.6 | 0.4 | 30.8 | 28.7 – 33.2 | 1.3 |
| Eye diameter | 9.0 | 8.0 – 9.7 | 0.5 | 31.4 | 28.2 – 33.5 | 1.7 |
| Postorbital head length | 11.4 | 10.4 – 12.2 | 0.5 | 39.6 | 35.9 – 43.1 | 1.9 |
| Interorbital width | 10.3 | 9.3 – 11.0 | 0.5 | 36.0 | 32.4 – 38.7 | 1.9 |
| Internarial width | 6.2 | 5.7 – 6.5 | 0.2 | 21.6 | 19.9 – 22.6 | 0.9 |
| Predorsal length | 50.6 | 48.7 – 51.7 | 0.9 | | | |
| Dorsal to hypural distance | 56.0 | 54.3 – 58.2 | 0.9 | | | |
| Maximum body depth | 33.5 | 30.1 – 35.3 | 1.7 | | | |
| Caudal peduncle length | 18.9 | 16.9 – 19.8 | 0.7 | | | |
| Maximum body width | 16.6 | 14.9 – 19.3 | 1.3 | | | |
| Caudal peduncle depth | 12.1 | 11.3 – 13.1 | 0.6 | | | |

Ghat mountains of Kerala, at Tenmalai, about 12 km upstream of the area where this river meets the coastal floodplain. The fish were found to inhabit both slow-flowing pools and relatively fast-flowing areas up to 1.5 m deep. The species was collected both upstream and downstream of the Tenmalai Reservoir on the Kallada River, and since our first collections were made in April 1992, a further dam has been built across the river, downstream of the Tenmalai Dam referred to above. These dams do not appear to pose a threat to this species as they form a drought refuge and also ensure a perennial flow of water in the river (many Kerala rivers were observed to be completely desiccated in periods of drought, e.g. March 1996).

Puntius assimilis (Jerdon, 1849)

(Figs. 9–13, Table 4)

Systomus assimilis Jerdon, 1849: 319.

Puntius [Capoeta] lepidus Day, 1868.

Material examined. – Topotypes - 5 subadults, 43.3–53.2 mm SL, WHT 6250, Nethravati River, 42 km from Madikeri, on the Mangalore–Mysore road (former “South Canara”), Karnataka State, India, 16 Mar.1996.

Others - 6 subadults, 43.9–56.1 mm SL, WHT 6251; 5 adult males, 64.3–81.2 mm SL; 6 adult females, 61.0–85.6 mm SL, WHT 0336, Chalakudy River at Parambikulam, 26 km from Chalakudy on Valparai road, Kerala, India, 27 Mar.1992. 1 ex., 74.7 mm SL, WHT 6243, Chalakudy River at Parambikulam, 26 km from Chalakudy on Valparai road, Kerala, India, 14 Mar.1996. 1 adult male, 111.5 mm SL, WHT 0296, Chalakudy River immediately downstream of Kanjirappally waterfall, on Valparai road, Kerala, India, 27 Mar.1992. 2 ex., 76.9–79.9 mm SL, CMK 9331, a small tributary of Chalakudy River, 38 km on road from Chalakudy to Valparai, Kerala, India, 13 Nov.1992. 8 ex., 47.0–64.3 mm SL, WHT 6252, Kallada River, 3 km downstream of Thenmalai Dam, on Thenmalai–Trivandrum Road, Kerala, India, 21 Mar.1996. 1 subadult, 44.4 mm SL, BMNH 1868.10.27.22, Bowani [Bhavani] River at Mettapolliam [now Mettuppalayam (11°18'N, 76°57'E) in Tamil Nadu State]”, India.

Diagnosis. – Adults (> 43.3 mm SL) of *P. assimilis* are distinguished from all other South Asian *Puntius* by a combination of the following characters: a black band about as wide as eye across each caudal-fin lobe (faint or absent in adults of the Kallada River population); lower lip continuous; a caudal blotch on 2–5 scales, commencing posterior to anal-fin origin; no prominent markings on body in advance of anal-fin origin. In adult males of the Chalakudy and Kallada River populations, branched dorsal rays prolonged into filament-like extensions. Additionally, adult *P. assimilis* may be distinguished from *P. filamentosus* by having mouth inferior (vs. subterminal) and maxillary barbels 23.5–33.3 % HL (vs. 2.8–8.1%).

Description. – For general body shape and appearance, see Fig. 9. Morphometric data for 5 subadult topotypes, and 11 adult and 6 subadult examples from Chalakudy river, are given in Tables 4, 5. Head and body compressed. Ventral profile of head moderately rounded, thorax and abdomen more markedly so. Dorsal profile of head straight, humped posterior to nape, more distinctly in larger examples. Snout slightly longer than eye diameter, slightly shorter than interorbital width. Mouth inferior, almost horizontal (Fig. 10), its angle falling vertically between nostril and eye. Rostral fold present, not entirely overhanging upper lip, which is exposed; jaws exposed, not completely covered by lips (Fig. 11). Lips smooth. Lower lip continuous, swollen and slightly folded backwards in larger specimens, resulting in a continuous postlabial groove, thinning medially. Snout with scattered tubercles; dorsal part of head with minute, widely-spaced tubercles in mature males. One pair of maxillary barbels, length approximately equal to eye diameter.

Dorsal-fin origin over seventh lateral-line scale. Dorsal-fin origin closer to snout than to base of caudal fin. Posterior profile of dorsal fin slightly concave in females; in mature males, branched rays extend into trailing filaments. Posterior

Table 4. Morphometric data of *Puntius assimilis* from Chalakudy River (WHT 6251, 6 ex., 43.9–56.1 mm SL); putative topotypes from Netravati River (WHT 6250, 5 ex., 43.3–53.2 mm SL); from Kallada River (WHT 6252, 8 ex., 47.0–65.5 mm SL); and syntype of *P. lepidus* (BMNH 1868.10.27.22, 1 ex., 44.4 mm SL), expressed as a percentage of standard length.

| | <i>P. assimilis</i> (Chalaky R.) | | | <i>P. assimilis</i> (Netravati R.) | | | <i>P. assimilis</i> (Kallada R.) | | | <i>P. lepidus</i> syntype |
|----------------------------|-------------------------------------|---------------|------|---------------------------------------|---------------|------|-------------------------------------|---------------|------|------------------------------|
| | mean | range | S.D. | mean | range | S.D. | mean | range | S.D. | |
| Standard length [mm] | | 43.9 – 56.1 | | | 43.3 – 53.2 | | | 47.0 – 65.5 | | 44.4 |
| Total length | 137.0 | 132.0 – 140.8 | 3.7 | 139.0 | 138.2 – 139.7 | 0.6 | 135.2 | 133.0 – 137.9 | 1.7 | 132.2 |
| Head length | 26.2 | 25.2 – 27.6 | 0.9 | 27.2 | 26.1 – 28.3 | 0.8 | 26.0 | 25.2 – 27.4 | 0.8 | 25.5 |
| Dorsal-fin length | 31.7 | 29.4 – 35.0 | 2.2 | 31.9 | 30.9 – 33.3 | 0.9 | 35.1 | 33.0 – 39.3 | 2.1 | 34.0 |
| Maxillary barbel length | 8.7 | 7.0 – 10.2 | 1.2 | 7.5 | 6.0 – 8.5 | 1.0 | 7.6 | 5.5 – 9.3 | 1.3 | 4.3 |
| Snout length | 8.6 | 8.1 – 9.3 | 0.5 | 8.2 | 7.5 – 8.8 | 0.5 | 8.4 | 7.8 – 8.9 | 0.3 | 7.3 |
| Eye diameter | 9.0 | 8.5 – 9.8 | 0.5 | 9.2 | 8.6 – 9.5 | 0.3 | 8.5 | 7.9 – 9.1 | 0.4 | 9.2 |
| Postorbital head length | 8.4 | 8.2 – 8.7 | 0.2 | 8.7 | 8.2 – 9.0 | 0.3 | 9.6 | 8.7 – 10.4 | 0.5 | 9.5 |
| Interorbital width | 10.4 | 9.4 – 11.2 | 0.7 | 11.2 | 10.9 – 11.8 | 0.4 | 10.8 | 10.0 – 11.1 | 0.3 | 10.1 |
| Caudal peduncle width | 6.3 | 5.6 – 6.8 | 0.5 | 6.4 | 6.0 – 6.9 | 0.4 | 6.4 | 6.0 – 6.7 | 0.3 | 5.9 |
| Predorsal length | 50.6 | 49.9 – 51.3 | 0.5 | 52.0 | 50.7 – 52.4 | 0.7 | 51.9 | 50.9 – 52.7 | 0.8 | 52.0 |
| Dorsal to hypural distance | 53.8 | 52.8 – 54.7 | 0.7 | 55.5 | 54.2 – 57.3 | 1.1 | 56.4 | 55.5 – 57.5 | 0.6 | 57.4 |
| Maximum body depth | 37.2 | 34.8 – 39.2 | 2.1 | 38.8 | 36.2 – 41.9 | 2.1 | 35.6 | 34.7 – 36.2 | 0.5 | 40.8 |
| Internarial width | 17.6 | 16.9 – 20.0 | 1.3 | 0.0 | 0.0 – 0.0 | 0.0 | 18.8 | 17.3 – 19.8 | 0.9 | 15.5 |
| Maximum body width | 14.4 | 13.7 – 15.3 | 0.7 | 14.3 | 13.8 – 14.6 | 0.3 | 17.8 | 16.8 – 18.9 | 0.7 | 14.9 |
| Caudal peduncle depth | 26.5 | 23.5 – 29.1 | 2.1 | 28.3 | 27.5 – 29.6 | 0.9 | 13.0 | 12.4 – 13.4 | 0.3 | 27.0 |

margin of anal fin concave. Pectoral fin with one simple and 14 branched rays. Pectoral fin moderately long, its tip separated from pelvic-fin base by about 1 scale-width. Pelvic fin long, reaching anus or anal-fin origin. Caudal peduncle deep, depth 67.4–85.4 of length.

Lateral line complete, with 19 (5) or 20 (12) scales, curving downward from origin until about 8th pored scale, then ascending to middle of caudal peduncle; 2 pored scales on base of caudal fin. Predorsal scales 7½.

Coloration. – Adult specimens in alcohol brownish-olive on back, becoming lighter on sides and ventral surface. A horizontally-elongate, black, pear-shaped blotch 1 scale high at its highest point commences on lateral line slightly posterior to anal-fin origin, on about 14th pored lateral-line scale, continuing on to about 18th lateral-line scale. Dorsal, anal, pectoral and pelvic fins hyaline. Caudal fin dusky, darker at base and proximal half of margins of fin lobes; a black band about as wide as eye bordered in white across each caudal-fin lobe (faint or absent in examples from the Kallada River), on principal ray and outer 3–4 branched rays; caudal-fin tips white.

Juveniles (see Fig. 12), at 44.5 mm SL (De Silva stage e), a black bar about 2 scales wide extends on side from dorsal-fin origin to within one scale row of pelvic-fin origin; a black, circular spot bisected by lateral line immediately above anal-fin base; occipital area and tail base black. At 51.7 mm SL (De Silva stage j), mid-body bar is a diffuse, horizontally-elongate blotch 6–7 scales wide; blotch above anal fin also horizontally elongate, 4 scales wide, tapering posteriorly. Adult coloration at 63.5 mm SL (Fig. 9).

Distribution. – In the Netravati River, *P. assimilis* was found to occur in slow-flowing areas close to the banks, where the substrate was muddy. In the Chalakudy River (Fig. 4) however, the species occurred in clear-water, rock substrate areas between the steep cascades that descend from the Western Ghat mountains, about 18 km upstream of the area where these rivers meet the coastal flood plain. The fish were found to inhabit relatively fast-flowing waters, and were collected in areas 1–3 m deep close to the base of Kanjirappally waterfall (see also Pethiyagoda & Kottelat, 1994). In the Kallada River, *P. assimilis* were collected about 3 km downstream of Tenmalai (see Fig. 4), in clear, shallow, slow-flowing water (< 50 cm deep) among granite boulders, where they occurred together with *P. exclamatio*. The species was absent however, at Minmutti, upstream of Thenmalai on the Kallar River, about 30 km north-east of Trivandrum and at Punalur, downstream of Thenmalai, the only other locations sampled in the Kallada basin. The upstream impoundments of the Chalakudy and Thanmalai Rivers may actually have had a beneficial effect on these fishes as they assure a perennial flow in the river: many of Kerala's rivers tend to dry up almost entirely during the dry season (November–April).

Remarks. – No type material is known for this species; type locality: “a river in Canara” (Karnataka State, India).

Jerdon (1849) described *Systomus assimilis* as follows: “Very closely allied to the last [species, i.e. *P. filamentosus*], the same general proportions, number of scales, &c.; 1st, 2nd, 3rd and 4th soft rays of the dorsal prolonged, the 3rd the longest, the 4th the shortest, and the rest rapidly diminishing to the 7th; second dorsal spine short, not more than half the length of the membrane; green above, reddish silvery beneath;



Fig. 9. *Puntius assimilis*, in life, WHT 6252, 63.5 mm SL, male, Kallada River, Kerala, India.



Fig. 10. *Puntius assimilis*, WHT 0336, 81.2 mm SL, Chalakudy River: lateral aspect of head showing position of mouth.



Fig. 11. *Puntius assimilis*, WHT 0336, 81.2 mm SL, Chalakudy River: ventral aspect of head showing exposed lower jaw.



Fig. 12. *Puntius assimilis*, CMK 18477, 40.5, 51.7 mm SL juveniles, Kallada River: note faint black markings on caudal-fin tips.

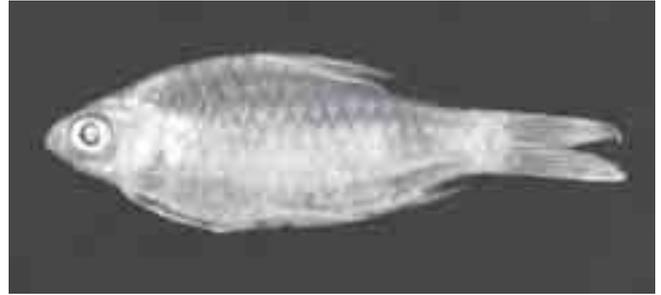


Fig. 13. *Puntius lepidus*, syntype, BMNH 1868.10.27.22, subadult, 44.4 mm SL, Bhavani River at Mettapolliam, Tamil Nadu, India.

black spot on the tail more diffuse than in the last [i.e. *P. filamentosus*]. Cheeks golden orange; dorsal fin with the membrane yellow; 2nd dorsal spines [sic] red, other rays blueish. Caudal pale reddish yellow, with a bright red spot at each tip, and black at the base and sides. Pectoral rosy, ventral and anal transparent, tinged black at the base—D. 10, A. 7, &c. I procured this fish in a river in Canara. It appears to differ from *S. filamentosus* in the formation of the dorsal fin, colors, &c.”

The Nethravati River traverses “South Canara”, now southern Karnataka State, India. The availability of the name *P. assimilis* for a species from Canara consistent with Jerdon’s description of a fish resembling but immediately distinguishable from all other species of the *P. filamentosus* group led us to assign this name to the present species. The subadult topotypes (no adult topotypes were collected) differ significantly from Jerdon’s description only with respect to the elongation of dorsal-fin rays, which in any case is evident only in adult males of the *P. filamentosus* group. In adult males of the Chalakudy and Kallada specimens, the branched dorsal-fin rays are indeed elongated into filaments (Fig. 9).

Given the absence of adult specimens from Canara, we are unable to establish unequivocally that the Nethravati and Chalakudy/Kallada populations in fact represent the same species. Indeed, this would be surprising given that the two rivers are separated by some 180 km, which includes the biogeographically significant Palghat Gap (Pascal, 1988); despite making collections in many of the intervening basins, however, we recorded *P. assimilis* nowhere else. In the absence of adult specimens from the Nethravati drainage, we for the present treat these three populations as conspecific. It is noteworthy however, that in adults of the Kallada population, the black band on the caudal-fin lobes is faint (Fig. 12) or absent (Fig. 9); our identification of this population as *P. assimilis* is tentative, pending the availability of a larger sample of adult specimens from the various drainages in which these fishes occur.

The type locality of *P. lepidus* Day, 1868 (Fig. 13) is the east-flowing Bhavani River. In addition to common morphological and meristic characters, the examined subadult syntype shares with *P. assimilis* the same mouth and snout shapes, position of caudal blotch and caudal-fin markings. We therefore place it tentatively in the synonymy of *P. assimilis*.

Table 5. Morphometric data of *Puntius arulius* (BMNH 1980.11.25:73–74, 2 ex., 88.0–90.9 mm SL; BMNH 89.2.1.664–5, 2 ex., 67.1–67.6 mm SL; and WHT 6253, 2 ex., 50.7–54.7 mm SL).

| | % SL | | | % HL | | |
|----------------------------|-------|---------------|------|------|-------------|------|
| | mean | range | S.D. | mean | range | S.D. |
| Standard length | | 50.7 – 90.9 | | | | |
| Total length | 136.3 | 133.0 – 138.3 | 1.5 | | | |
| Head length | 29.7 | 28.9 – 31.7 | 1.4 | | | |
| Dorsal-fin length | 30.4 | 28.0 – 32.7 | 3.3 | | | |
| Maxillary barbel length | 3.7 | 2.5 – 4.5 | 0.9 | 12.4 | 8.5 – 15.7 | 3.1 |
| Snout length | 9.5 | 8.6 – 11.0 | 1.1 | 31.7 | 29.1 – 34.7 | 2.6 |
| Eye diameter | 8.4 | 7.9 – 9.2 | 0.6 | 28.2 | 27.4 – 29.1 | 0.8 |
| Postorbital head length | 11.9 | 11.5 – 12.6 | 0.5 | 40.2 | 36.2 – 43.7 | 3.1 |
| Interorbital width | 9.6 | 8.8 – 10.2 | 0.6 | 32.3 | 27.7 – 35.4 | 3.3 |
| Internarial width | 7.5 | 7.3 – 7.7 | 0.3 | 26.3 | 24.7 – 28.0 | 2.4 |
| Predorsal length | 51.5 | 50.0 – 52.5 | 1.1 | | | |
| Dorsal to hypural distance | 55.7 | 55.0 – 57.6 | 1.3 | | | |
| Maximum body depth | 38.7 | 36.4 – 41.5 | 2.5 | | | |
| Caudal peduncle length | 13.7 | 13.1 – 14.3 | 0.5 | | | |
| Caudal peduncle depth | 13.3 | 12.4 – 14.1 | 1.2 | | | |

***Puntius arulius* (Jerdon, 1849)**

(Fig. 14; Table 5)

Systemus arulius Jerdon, 1849: 317.

Material examined. – 2 ex., 88.0, 90.9 mm SL, BMNH 1980.11.25:73–74), Cauvery River at Coorg, near Siddapur, Karnataka State, India, coll. [K.] Kortmulder (maintained in aquarium prior to preservation). 2 ex., 67.1, 67.6 mm SL, BMNH 89.2.1.664–5, Wynaad, Kerala State, India, coll. [F.] Day. 2 ex. (50.7, 54.7 mm SL) (WHT 6253), Cauvery River at Coorg, Karnataka State, India, coll. Andrew Rao, Dec.1998.

Diagnosis. – Adults of *P. arulius* are distinguished from *P. filamentosus*, *P. singhala* and *P. assimilis* by having prominent black markings on body anterior to anal-fin origin. They differ from *P. exclamatio* by lacking an elongate, tear-shaped black blotch above anal fin. *Puntius arulius* differs from *P. srilankensis* by having mouth subterminal and lower lip entire (vs. mouth inferior and lower lip medially absent). It differs from *P. tambraparniei* by lacking branched dorsal-fin rays elongated into filaments in adult males (vs. present) and by having a pair of maxillary barbels <0.5% SL (vs. 2.4–4.7%).

Description. – For general body shape and appearance see Fig. 14. Morphometric data for 6 specimens are given in Table 5. Head and body compressed. Ventral profile gently arched; dorsal profile rising steeply to base of dorsal fin. Snout short, slightly longer than eye diameter. Mouth subterminal, arched, angled at about 45° to horizontal. Angle of gape anterior to nostrils. A rostral fold present, not overhanging upper lip. Jaws not visible with mouth closed. Lips smooth; lower lip entire, not interrupted medially. In mature males, area between upper lip, anterior naris and eye densely and finely tuberculated. A pair of maxillary barbels present, their length less than ¼ eye diameter; no mandibular barbels.

Fig. 14. *Puntius arulius*, BMNH 1980.11.25:73–74, 88.0 mm SL, Cauvery River at Coorg, near Siddapur, Karnataka State; *n.b.*, specimen maintained in aquarium prior to preservation.

Dorsal-fin origin over ninth lateral-line scale. Dorsal-fin origin slightly closer to snout than to base of caudal fin. Posterior profile of dorsal fin slightly concave in both sexes. Pectoral fin with one simple and 15 branched rays, just reaching origin of pelvic fin; pelvic fins just reach anal-fin origin. Caudal peduncle longer than deep, its depth 74.3–81.6% of its length.

Lateral line complete, with 20(1) or 21 (5) scales on body + 2 scales on caudal-fin base, curving downward from origin until about 9th pored scale, then proceeding linearly to middle of caudal peduncle. Predorsal scales 7½.

Coloration. – Adult specimens in alcohol (see Fig. 14) dark brownish olive on back, becoming lighter on sides to white on ventral surface. A black, vertically-elongate blotch on mid-body, above pelvic-fin origin, on and above lateral-line scales 8–10, about three scale-rows high. Another vertically-elongate blotch above anal fin, on lateral-line scales 14–16, also about 3 scale-rows high. A further blotch or bar on caudal-fin base, less-well defined than those on body. Dorsal, anal, pectoral, pelvic and caudal fins hyaline.

Distribution. – All the known material of *P. arulius* is from the upper reaches of the Cauvery basin. The only recent collections have been at Coorg (present-day Kodagur), upstream of the type locality (Srirangapatam, in Karnataka State, India), just above which the river has been dammed (Fig. 4). No specimens of *P. arulius* were found in the Cauvery at Srirangapatam, however, despite an extensive search made in March 1996. Local fishermen failed to recognise photographs of the fish or the local-name “aruli” mentioned by Jerdon (1849: 317).

Remarks. – No type material is known (type locality: Seringapatam [=Shrirangapatana], on the Cauvery River).

***Puntius tambraparniei* (Silas, 1954)**
(Figs. 15, 16; Table 6)

Puntius arulius tambraparniei, Silas, 1954.

Material examined. – Paratype - female, 68.7 mm SL, ZSI 735/2 (?) (see Discussion for type-status of this specimen), “Stream 7 miles from the town of Kalladi Kuruchi on road to Singarupathi Range, Tambraparni watershed, Tirunelveli District, 9/1949”, Tamil Nadu State, India.

Topotypes - 2 females, 52.9, 64.6 mm SL, ZSI-SRS 4452, Agasthiyar Aruvi, Tirunelveli, Kattabomman District, Tamil Nadu State, India, coll. M. B. Rhagunathan, 07 Apr 1995. 1 male, 46.4 mm SL, 3 females, 47.3–51.6 mm SL, ZSI-SRS 4452, Kodaimel Azhakian Anicut, (Tambraparni River basin) Tirunelveli, Kattabomman District, Tamil Nadu State, India, coll. M. B. Rhagunathan, 09 Apr. 1995.

Diagnosis. – Adults of *P. tambraparniei* are distinguished from *P. filamentosus*, *P. singhala* and *P. assimilis* by having prominent black markings on body anterior to the anal-fin origin. They differ from *P. exclamatio* by lacking a horizontally-elongate, tear-shaped black blotch above the anal fin. *Puntius tambraparniei* differs from *P. srilankensis* by having lower lip entire (vs. medially absent). It differs from *P. arulius* by having branched dorsal rays elongated into filaments in adult males (vs. dorsal fin concave and emarginate) and by having a pair of maxillary barbels 2.4–4.7% of SL (vs. <0.5%).

Description. – For general body shape and appearance see Figs. 15, 16. Morphometric data for 7 specimens are given in Table 6. Head and body compressed. Ventral profile gently curved; dorsal profile arched. Snout short, its length subequal to eye diameter. Mouth small, subterminal, arched, angled at about 45° to horizontal, its angle anterior to nares. A rostral fold present, not overhanging upper lip. Jaws not visible with mouth closed. Lips smooth; lower lip entire, not interrupted medially. In mature males area between upper lip, anterior naris and eye densely and finely tuberculated. A pair of maxillary barbels present, their length almost ½ eye diameter.

Dorsal-fin origin above eighth or ninth lateral-line scale. Dorsal-fin origin slightly closer to snout than to base of caudal fin. Posterior profile of dorsal fin slightly concave



Fig. 15. *Puntius tambraparniei*, paratype (?), ZSI 735/2, 68.7 mm SL, Tambraparni watershed, Tirunelveli District, Tamil Nadu State, India.



Fig. 16. *Puntius tambraparniei*, ZSI-SRS 4452, a, male, 46.4 mm SL and b, female, 47.7 mm SL, Kodaimel Azhakian Anicut, (Tambraparni River basin) Tirunelveli, Kattabomman District, Tamil Nadu State, India.

and emarginate in both sexes, branched rays 2–5 prolonged into filament-like extensions in mature males. Pectoral fin with one simple and 15 branched rays. Pectoral fin just reaching pelvic fin origin; pelvic fin just reaching anal-fin origin. Caudal peduncle longer than deep, its depth 68.2–77.3% of its length.

Lateral line complete, with 19 (1) or 20 (4) or 21 (2) scales + 2, curving downward from origin until about 9th pored scale, and then proceeding linearly to middle of caudal peduncle. Predorsal scales 7.

Coloration. – Adult specimens in alcohol (see Figs. 15, 16) dark brownish olive or black on back, becoming lighter on sides to white on ventral surface. A black, vertically-elongate blotch under dorsal-fin origin extending on to and above lateral-line scales 8–10, about three scales high. A second blotch on posterior-most scales of dorsal sheath, extending 2–3 scales down, becoming progressively fainter. A third vertically-elongate blotch above anal fin, on and above lateral-line scales 14–16, about 3 scales high. A further blotch or bar on caudal-fin base, less-well defined than those on body. Dorsal, anal, pectoral, pelvic and caudal fins hyaline.

Distribution. – The species appears to be restricted to the mid-reaches of the Tambraparni River basin, which drains the eastern face of the Western Ghats mountains of southern peninsular India, into the Bay of Bengal.

Table 6. Morphometric data of *Puntius tambraparniei* paratype (ZSI 735/2, 68.7 mm SL) and putative topotypes (ZSI-SRS 4452, 2 ex., 46.4–64.6 mm SL).

| | % SL | | | % HL | | |
|----------------------------|-------|---------------|------|------|-------------|------|
| | mean | range | S.D. | mean | range | S.D. |
| Standard length [mm] | | 46.4 – 68.7 | | | | |
| Total length | 133.8 | 131.0 – 135.6 | 2.0 | | | |
| Head length | 28.4 | 27.1 – 30.4 | 1.2 | | | |
| Dorsal-fin length | 33.1 | 29.8 – 36.4 | 2.7 | | | |
| Maxillary barbel length | 3.7 | 2.4 – 4.7 | 0.8 | 13.1 | 7.8 – 16.7 | 3.0 |
| Snout length | 9.2 | 8.4 – 9.7 | 0.5 | 32.4 | 27.7 – 34.1 | 2.5 |
| Eye diameter | 8.6 | 7.7 – 9.5 | 0.7 | 30.3 | 28.6 – 31.8 | 1.3 |
| Postorbital head length | 11.0 | 10.4 – 11.9 | 0.5 | 38.9 | 37.1 – 40.7 | 1.3 |
| Interorbital width | 10.9 | 9.6 – 11.8 | 0.9 | 38.3 | 34.7 – 43.0 | 3.4 |
| Internarial width | 6.0 | 5.7 – 6.7 | 0.3 | 21.2 | 20.0 – 22.0 | 0.8 |
| Predorsal length | 52.0 | 49.7 – 54.1 | 1.5 | | | |
| Dorsal to hypural distance | 55.1 | 52.9 – 57.6 | 1.5 | | | |
| Maximum body depth | 35.8 | 34.6 – 38.8 | 1.5 | | | |
| Caudal peduncle length | 19.1 | 17.8 – 20.8 | 1.1 | | | |
| Maximum body width | 18.1 | 16.2 – 19.9 | 1.6 | | | |
| Caudal peduncle depth | 13.9 | 13.6 – 14.2 | 0.2 | | | |

***Puntius srilankensis* (Senanayake, 1985)**

(Figs. 17–19; Table 7)

Barbus srilankensis Senanayake, 1985.

Material examined. – Holotype - male, 79.0 mm SL, BMNH 1976.2.10.1, Kalu Ganga (river), ~3 miles north of Pallegama, North Central Sri Lanka, coll. R. Senanayake.

Paratype - female, 63.3 mm SL, BMNH 1976.2.10.2, same locality data as holotype.

Other material - 8 ex., 64.3–77.8 mm SL, WHT 2126, Kalu River (tributary of Mahaweli River), Puwakpitiya, foothills of Knuckles Mountains (Mahaweli River basin), Sri Lanka, 10 Sep. 1997.

Diagnosis. – Adults of *P. srilankensis* are distinguished from *P. filamentosus*, *P. singhala* and *P. assimilis* by having prominent black markings on body anterior to anal-fin origin. They differ from *P. exclamatio* by lacking an elongate, tear-shaped black blotch above anal fin. *Puntius srilankensis* differs from *P. arulius* and *P. tambraparniei* by having mouth inferior and lower lip medially absent (vs. mouth subterminal, lower lip entire).

Description. – For general body shape and appearance see Figs. 17–19. Morphometric data for 8 specimens are given in Table 7. Dorsal profile gently arched to base of dorsal fin; ventral profile gently convex to anal-fin base. Snout short, slightly longer than eye diameter; snout and cheeks densely tuberculated in mature males. Mouth inferior, lower jaw posterior to upper with mouth closed. Angle of mouth beneath nares. A rostral fold present, not overhanging upper lip (Fig. 19a). Jaws visible ventrally with mouth closed (Fig. 19b). Lips smooth; lower lip broadly interrupted medially. A rudimentary pair of maxillary barbels present, their length less than ¼ eye diameter.

Dorsal-fin origin over ninth lateral-line scale. Dorsal-fin origin slightly closer to snout than to base of caudal fin. Posterior profile of dorsal fin slightly concave in females; branched rays 3–5 produced into long, filament-like extensions in mature males. Pectoral fin with one simple and 15 branched rays. Pectoral fin just reaching pelvic-fin origin; pelvic fin just reaching anal-fin origin. Caudal peduncle longer than deep, its depth 56.5–68.5% of its length.

Lateral line complete, with 22(5) or 21 (3) on body, with 1–2 scales on caudal-fin base, curving downward from origin until about 12th pored scale, and then proceeding linearly to middle of caudal peduncle. Predorsal scales 7½.

Coloration. – Adult specimens in life (see Fig. 17). Body brownish olive or black above, becoming lighter below to silvery white. A dark band commencing on opercle and extending over nape. A black, vertically-elongate blotch under dorsal-fin origin extending to lateral-line scales 8–10, 4–5 scales high. Posterior-most scales of dorsal sheath black, extending 1–1½ scale-rows down, becoming progressively fainter. A third vertically-elongate blotch above anal-fin base, about 3 scales wide, commencing on lateral-line scale rows 15–17 and extending across back. A further black blotch or bar on caudal-fin base, less-well defined than those on body. Fins hyaline, the rays grey or black, especially in males in breeding condition, which have deep red scale pockets and caudal-fin lobes. Upper- and lower-most 1–2 branched caudal-fin rays in mature individuals black.

Adult specimens in alcohol (see Fig. 18). Body brownish-black above, becoming lighter below to light brown. A dark, vertically-elongate blotch commencing immediately anterior to dorsal fin, becoming 2–3 scales wide, descending to scale row above lateral line. Posterior-most 2–3 scales of dorsal sheath black. A second vertically-elongate blotch above anal-



Fig. 17. *Puntius srilankensis*, topotype, in life, not preserved, approx. 70 mm SL.



Fig. 18. *Puntius srilankensis*, holotype, male, BMNH 1976.2.10.1, 79.0 mm SL, Kalu Ganga (river), Pallegama, Sri Lanka.

fin base, about 3 scales wide, commencing on lateral-line scale rows 15–17 and extending across back. A further black blotch or bar 2–3 scales wide on caudal fin base, less-well defined than those on body. Fins hyaline. Upper- and lower-most branched dorsal-fin rays dark grey.

Distribution. – The species is known only from a short stretch (~ 5 km) of the Kalu River, a tributary of the Mahaweli, upstream of Pallegama, on the eastern slopes of the Knuckles Hills of Sri Lanka. Senanayake (1985) and Pethiyagoda (1991, 1994) considered it to be endangered because of habitat alteration.

DISCUSSION

Pethiyagoda & Kottelat (2005) show that *P. mahecola* Valenciennes, 1844, hitherto in the synonymy of *P. filamentosus* (see Jayaram, 1991; Talwar & Jhingran, 1991), is one of the species referred in the current literature to *P. amphibius* (Valenciennes, 1842), evidently following a misidentification by Day (1878). As evidenced by its type series, *P. mahecola* does not resemble, and is not even closely related to, the *P. filamentosus* group.

Selvaraj & Abraham (1987) had diagnosed two species from a collection of *P. filamentosus*-like fishes from the Aliyar



Fig. 19. *Puntius srilankensis*, WHT 2126, 75.3 mm SL, Kalu River at Puwakpitiya, Sri Lanka; *a*, lateral aspect of head, showing position of mouth; *b*, ventral aspect of head, showing lower lip medially absent and minute maxillary barbels.

Reservoir (within an east-flowing drainage of southern India) in Tamil Nadu, which they assigned to *P. filamentosus* and *P. mahecola*. They did not refer to the type material of these species however, and overlooked also two other available names for *P. filamentosus*-like barbs: *Systemus assimilis* (type locality Canara [= Karnataka]) and *S. maderaspatensis* Jerdon, 1849 (type locality Sreepermatoor, near Madras [= Chennai], Tamil Nadu). As the whereabouts of the material examined by these authors is not known, we are unable to comment on the identity of the species they had before them, which evidently represented species of the *P. filamentosus* group.

Jerdon (1849) stated that both *P. assimilis* and *P. maderaspatensis* were akin to *P. filamentosus*, and referred specifically to the elongation of the dorsal-fin rays. While we have not examined material from the vicinity of Chennai (formerly Madras), we note that the name *P. maderaspatensis* is available for the fish presently assigned to *P. filamentosus* from there, if this turns out to be a distinct species.

Day (1878) placed *P. lepidus* Day, 1868 in the synonymy of *P. mahecola*. The type locality of *P. lepidus* is the east-flowing “Bowany [Bhavani] River at Mettapoliam.” The two syntypes of this species at the ZSI could not be traced during visits to that institution in 1993 and 1996. The BMNH syntype (BMNH 1868.10.27.22; 44.4 mm SL) however, is clearly a member of the *P. filamentosus* group (see Fig. 13): its inferior mouth and

Table 7. Morphometric data of *Puntius srilankensis*, topotypes (WHT 2126, 8 ex., 64.3–77.8 mm SL).

| | % SL | | | % HL | | |
|----------------------------|-------|---------------|------|------|-------------|------|
| | mean | range | S.D. | mean | range | S.D. |
| Standard length | | 64.3 – 77.8 | | | | |
| Total length | 130.3 | 128.0 – 131.4 | 1.3 | | | |
| Head length | 25.6 | 24.8 – 26.7 | 0.8 | | | |
| Dorsal-fin length | 33.0 | 25.4 – 63.4 | 12.5 | | | |
| Maxillary barbel length | 0.3 | 0.0 – 0.5 | 0.2 | 1.1 | 0.0 – 1.8 | 0.7 |
| Snout length | 8.1 | 6.4 – 9.0 | 0.8 | 31.5 | 25.9 – 34.2 | 2.5 |
| Eye diameter | 7.4 | 6.8 – 7.9 | 0.5 | 28.8 | 25.5 – 30.4 | 1.8 |
| Postorbital head length | 10.9 | 10.4 – 11.8 | 0.5 | 42.6 | 39.5 – 45.4 | 2.2 |
| Interorbital width | 10.5 | 10.1 – 10.9 | 0.3 | 41.0 | 37.8 – 42.5 | 1.4 |
| Internarial width | 6.0 | 5.3 – 6.4 | 0.3 | 23.2 | 21.5 – 24.4 | 1.1 |
| Predorsal length | 50.9 | 49.5 – 52.6 | 1.3 | | | |
| Dorsal to hypural distance | 54.5 | 52.6 – 55.5 | 0.9 | | | |
| Maximum body depth | 29.9 | 28.0 – 31.9 | 1.4 | | | |
| Caudal peduncle length | 19.7 | 18.5 – 21.4 | 0.9 | | | |
| Maximum body width | 17.1 | 16.2 – 19.3 | 1.1 | | | |
| Caudal peduncle depth | 12.5 | 10.9 – 13.3 | 0.8 | | | |

prolonged maxillary barbels identify it tentatively as *P. assimilis*, to the synonymy of which we here refer it.

Although Duncker (1912) recorded “*P. filamentosus*” from Sri Lanka, he did not realise that his *Barbus singhala* series consisted entirely of juveniles closely related to the former species, with a strikingly different colour pattern to that of adults. Day (1878) identified the Sri Lankan taxon as *P. mahecola* while Pertwee (1913) recorded both *P. filamentosus* and *P. mahecola* from Sri Lanka (basing his identification probably on males and females of *P. singhala*). Although Deraniyagala (1930) referred adult specimens of *P. singhala* (which he misspelled *sinhala*) to *P. filamentosus*, Deraniyagala later (1949), without giving reasons, considered *P. singhala* to be a subspecies of *P. melanampyx* (Day, 1865a), which itself does not occur in Sri Lanka: in fact, Day (1878) had previously relegated *P. melanampyx* to the synonymy of *P. fasciatus*. Nevertheless, subsequent authors (e.g. Munro, 1955; Senanayake, 1980; Pethiyagoda, 1991) continued to treat the Sri Lankan taxon as *P. filamentosus*.

De Silva et al. (1981) studied the ontogeny of Sri Lankan specimens and concluded that *P. melanampyx singhala* (sensu Deraniyagala, 1949) was in fact the juvenile of “*P. filamentosus*.” This position was adopted without comment also by subsequent authors, including Pethiyagoda (1991). *Puntius singhala* is however, a distinct species, apparently endemic to Sri Lanka.

While Senanayake (1985) considered *P. srilankensis* to be “closely allied to *P. filamentosus*” [i.e. *P. singhala*], Jayaram (1991) treated it as a subspecies of *P. arulius*. *Puntius srilankensis* is restricted to a few kilometres of the Kalu River (a tributary of the Mahaweli River) at Pallegama, Sri Lanka, while *P. arulius* is restricted to the upper reaches of the east-

flowing Cauvery drainage in Tamil Nadu, India, some 500 km to the north.

Senanayake (1985: 400) wrote: “The colour pattern of *B. srilankensis* bears some similarity to the Indian species *B. arulius* and *B. fasciatus*. Comparison with material in the British Museum demonstrated *B. srilankensis* to differ from *B. arulius* on ten meristic characters when compared on a two-way t-test”, but he did not specify what these ten characters were. *Puntius fasciatus* however, is distinguished from members of the *P. filamentosus* group by having a pair of mandibular barbels approximately as long as eye; a pair of maxillary barbels larger than eye diameter; $\frac{1}{2}3$ scales between the mid-dorsal scale row and lateral line; and a prominent black band across the occiput from the posterior orbit on each side (vs. mandibular barbels absent; maxillary barbels smaller or equal to eye diameter; $\frac{1}{2}4$ scales between the mid-dorsal scale row and lateral line; and no black band across occiput).

Jayaram (1991) distinguished his *P. arulius srilankensis* from *P. a. arulius* by its shorter head (3% shorter than *P. arulius* in the single specimen he examined), and its having one less scale row between the lateral line and pelvic fin origin ($2\frac{1}{2}$ vs. $1\frac{1}{2}$ in *P. arulius*). In all the examples of *P. arulius* and *P. srilankensis* examined by us however, there are $2\frac{1}{2}$ rows of scales between the lateral line and the pelvic fin origin, and $3\frac{1}{2}$ rows of scales between the lateral line and the mid-ventral scale row.

Puntius arulius is not represented by any type material. In March 1996 one of us (RP) made collections from the Cauvery River at Shrirangapattana (thought to be the location Jerdon (1849) referred to as ‘Seringapatam’), just north of Mysore in Karnataka State, India. Despite sampling the river at several

locations, no specimens of *P. arulius* were obtained. A colour photograph of *P. arulius* was shown to several local fishermen and aquarium fish collectors, who were agreed that it did not occur in the vicinity of Shirangapattana. It seems possible therefore that *P. arulius* has been extirpated in this locality, shortly upstream of which the river has been impounded. We obtained however, two specimens of *P. arulius* collected in 1998 further upstream, at Coorg (WHT 6253).

A review of Senanayake's type material of *P. srilankensis* at the BMNH and comparison of this with specimens of *P. arulius* from Wynaad, Coorg and Sakaleshpur, three widely-separated localities in the Cauvery River basin, showed the two species to be significantly distinct. Although the colour pattern of *P. srilankensis* resembles those of *P. arulius* and *P. tambraparniei*, it is distinguished by several characters, most strikingly by its inferior mouth and by having the lower lip medially absent (vs. mouth subterminal and lower lip entire in all examples of *P. arulius* and *P. tambraparniei* examined), which were not remarked on by either Senanayake (1985) or Jayaram (1991). Further, in none of the specimens of *P. arulius* examined are rays of the dorsal fin elongated into filament-like extensions; neither is there any reference in the literature to such extensions (e.g. Jerdon, 1849; Day, 1878; Mukerji, 1932; Jayaram, 1991; Talwar & Jhingran, 1991). Mature males of *P. srilankensis* and *P. tambraparniei* however, often have branched dorsal fin rays 3–5 elongated into filament-like extensions (see Fig. 18 and Silas, 1954, fig. 4) and have a colour pattern similar to that of De Silva stage d of *P. singhala* (in females of *P. srilankensis* the second bar extends to the anal fin base, as in De Silva stage c). These characters demonstrate that *P. srilankensis* and *P. tambraparniei* do indeed have a close relationship to the other fishes of the *P. filamentosus* s.l. group.

Jayaram (1991) retained *P. tambraparniei* as a subspecies of *P. arulius*, not having been able to trace the holotype and 12 paratypes of *P. tambraparniei*, ZSI F 735/2. One of us (RP) searched through the freshwater fish type collection at the ZSI in 1993 and 1996, and failed to locate material corresponding to this registration number. The type collection did contain however, a jar containing a single specimen of *P. tambraparniei*, 68.7 mm SL (Fig. 15), which had no registration number but contained a partly-illegible label which read: "*Puntius arulius tambraparniei*—stream 7 miles from the town of Kalladai Kuruchi on road to Singarupathi Range, Tambraparni watershed, Tirunelvely [? not clear] Dt., 9/1949". This corresponds well with the locality information given by Silas (1954), and this specimen apparently belongs to the type series.

It appears that *P. tambraparniei* is restricted to the Tambraparni River, an east-flowing drainage descending the Western Ghat mountains at their southern extremity, while *P. arulius* is restricted to the upper Cauvery River basin, some 300 km to the north and separated by several smaller river basins. Interestingly, *P. arulius*, *P. tambraparniei* and *P. srilankensis*, which share a unique adult colour pattern of three or four black blotches on body (vs. only a single blotch,

above anal-fin base), are all restricted to east-flowing drainages in southern India and Sri Lanka.

In his revision of the genus *Puntius*, Jayaram (1991) proposed several informal "complexes" of species based on an evidently arbitrary set of morphometric and chromatic characters. In addition to the nominate species, his "*filamentosus*" complex included *P. waageni* (Day, 1872); *P. vittatus* Day, 1865b; *P. muzzafarpurensis* Srivastava et al., 1976; and *P. coorgensis* Jayaram, 1982. His "*arulius*" complex contained *P. arulius*, *P. tambraparniei* and *P. srilankensis*. No evidence was offered to support monophyly among the species assigned to these complexes.

The present definition of the *P. filamentosus* group is based largely on two characters observed among the seven species here included in it: filamentous extension of branched dorsal-fin rays in males, and the triple-bar colour pattern of juveniles in all species for which juveniles are available; and we regard both these characters as synapomorphic.

Together with *Horadandia atukorali*, *P. filamentosus* and *P. singhala* are among the few notably eurhaline cyprinids in south India and Sri Lanka: their widespread distribution throughout the coastal plains of southern peninsular India and all of Sri Lanka is therefore not unexpected. The most closely related species to *P. filamentosus* here recognised appears to be *P. singhala*: the two species differ mainly in colour pattern.

Several of the nine species within the group occur in sympatry with one another: *P. filamentosus* occurs together with *P. assimilis*; *P. singhala* together with *P. srilankensis*; and *P. assimilis* together with *P. exclamatio*.

More recently, Indra (1992) illustrated a "colour variety" of *P. filamentosus* from Periyakulam Reservoir, Kanyakumari District, Tamil Nadu, which appears to be another undescribed species. Similarly, either or both "*P. filamentosus*" and "*P. mahecola*" of Selvaraj & Abraham (1987) could be new. Fishes resembling *P. arulius* but with highly filamented dorsal fins are also commonly illustrated in the aquarium literature. The *P. filamentosus* group of barbs is almost certainly not restricted to the seven species recognised here. The mountain streams of Kerala and Tamil Nadu are poorly explored, and more species will almost certainly be added to the fauna once further exploration takes place.

ACKNOWLEDGEMENTS

We thank J.-C. Hureau (MNHN), Darrell Siebert (BMNH), T.K. Sen (ZSI) and K. Rema Devi (ZSI-SRS) for permission to work at their institutions and the many courtesies extended while doing so. We are grateful to Darrell Siebert for a photograph of the syntype of *P. lepidus*, and Madhava Meegaskumbura for the photographs reproduced as Figs. 6, 10–12 and 19. We thank Cedric Martenstyn, Kelum Manamendra-Arachchi, Dinesh Gabadage and Mohamed M. Bahir for collections in

Sri Lanka and India. Our work in India benefited greatly from the assistance of M. K. Rajan of Beena Nursery, Vellayambalam, Trivandrum.

LITERATURE CITED

- Day, F., 1865a. *The fishes of Malabar*. Quaritch, London. 293 pp.
- Day, F., 1865b. On the fishes of Cochin, on the Malabar coast of India: Part 2. *Proceedings of the Zoological Society of London*, **1865**: 286–318.
- Day, F., 1868. On some new fishes from Madras. *Proceedings of the Zoological Society of London*, **1868**: 192–199.
- Day, F., 1872. Monograph of Indian Cyprinidae. *Journal of the Asiatic Society of Bengal*, **41**: 1–29; 171–198; 318–327.
- Day, F., 1878. *The Fishes of India; being a natural history of the fishes known to inhabit the seas and fresh waters of India, Burma and Ceylon*. Bernard Quaritch, London. Part 4: i–xx, 553–779; pls. 139–195.
- De Silva, S.S. K. Kortmulder & P. Maitipe, 1981. The identity of *Puntius melanampyx singhala* (Duncker, 1911) (Pisces, Cyprinidae). *Netherlands Journal of Zoology*, **31**: 777–785.
- Deraniyagala, P.E.P., 1930. The Eventognathi of Ceylon. *Spolia Zeylanica*, **16**: 1–41.
- Deraniyagala, P.E.P., 1949. Some vertebrate animals of Ceylon. *National Museum Pictorial Series*, **1**: 1–119.
- Duncker, G., 1912. Die Süßwasserfische Ceylons. *Jahrbuch der Hamburgischen Wissenschaftlichen Anstalten, Beiheft 2, Mitteilungen aus dem Naturhistorischen Museum in Hamburg*, **29**: 241–272.
- Günther, A., 1868. *Catalogue of fishes in the British Museum*, 7. British Museum, London. xxii+455 pp.
- Hamilton, F., 1822. *An account of the fishes found in the River Ganges and its branches*. Archibald Constable, Edinburgh; Hurst, Robinson, London. vii+405 pp, 39 pl.
- Hora, S.L., 1937. Notes on fishes in the Indian Museum. XXVI—On three collections of fish from Mysore and Coorg, South India. *Records of the Indian Museum*, **39**: 5–28.
- Indra, T.J., 1992. Report on the ichthyofauna of Kanyakumari District, Tamil Nadu. *Records of the Zoological Survey of India*, **92**: 177–192.
- Jayaram, K.C., 1981. *The freshwater fishes of India, Pakistan, Bangladesh, Burma and Sri Lanka—a Handbook*. Zoological Survey of India, Calcutta. 475 pp. 13 pl.
- Jayaram, K. C., 1982. On a new species of the genus *Puntius* (Pisces, Cyprinidae) from the cauvery river, Karnataka State, South India. *Matsya*, **7**: 47–49.
- Jayaram, K.C., 1991. Revision of the genus *Puntius* Hamilton from the Indian Region (Pisces: Cypriniformes, Cyprinidae, Cyprininae). *Records of the Zoological Survey of India, Occasional Paper* **135**: 1–178.
- Jerdon, T.C., 1848–49. On the freshwater fishes of southern India. *Madras Journal of Literature and Science*, **15** (1848): 141–149; **15** (1849): 302–346.
- Kortmulder, K., K. G. Padmanabhan & S. S. de Silva, 1990. Patterns of distribution and endemism in some cyprinid fishes as determined by the geomorphology of South-West Sri Lanka and South Kerala (India). *Ichthyological Exploration of Freshwaters*, **1**: 97–112.
- Kottelat, M. & R. Pethiyagoda, 1991. Description of three new species of cyprinid fishes from Sri Lanka. In: Pethiyagoda, R., *Freshwater fishes of Sri Lanka*. Wildlife Heritage Trust of Sri Lanka, Colombo. Pp. 299–313.
- Kottelat, M., 2001. *Fishes of Laos*. WHT, Colombo. 198 pp.
- McInerney, D. & G. Gerard, 1989. *All about tropical fish*. 4th Ed. Harrap, London. 480 pp.
- Menon, A. G. K., 1967. Taxonomy of *Puntius filamentosus* (Valenciennes), a cyprinid fish of south India and Ceylon. *Ichthyologica*, July–December **1967**: 147–153.
- Mukerji, D. D., 1932. On a small collection of fish from the Bhavani River (S. India). *Journal of the Bombay Natural History Society*, **35**: 162–171.
- Munro, I. S. R., 1955. *The marine and freshwater fishes of Ceylon*. Department of External Affairs, Canberra. 349 pp., 56 pls.
- Myers, N., R. A. Mittermeier, C. G. Mittermeier, G. A. B. de Fonseca & J. Kent, 2000. Biodiversity hotspots for conservation priorities. *Nature*, **403**: 853–858.
- Pascal, J. P., 1988. *Wet evergreen forests of the Western Ghats of India: ecology, structure, floristic composition and succession*. Institut Français de Pondichéry, Pondichery. 345 pp.
- Pertwee, A. H., 1913. Notes on the freshwater fishes of Ceylon, *Spolia Zeylanica*, **8**: 243–250.
- Pethiyagoda, R., 1991. *Freshwater fishes of Sri Lanka*. Wildlife Heritage Trust, Colombo. xiv+362 pp.
- Pethiyagoda, R., 1994. Threats to the indigenous freshwater fishes of Sri Lanka and remarks on their conservation. *Hydrobiologia*, **285**: 189–201.
- Pethiyagoda, R. & M. Kottelat, 1994. Three new species of fishes of the genera *Osteochilichthys* (Cyprinidae), *Travancoria* (Balitoridae) and *Horabagrus* (Bagridae) from the Chalakudy River, Kerala, India. *Journal of South Asian Natural History*, **1**: 97–116.
- Pethiyagoda, R. & M. Kottelat, 2005. The identity of the south Indian barb *Puntius mahecola* (Valenciennes, 1844) (Teleostei: Cyprinidae). In: Yeo, D. C. J., P. K. L. Ng & R. Pethiyagoda (eds.), Contributions to Biodiversity Exploration and Research in Sri Lanka. *The Raffles Bulletin of Zoology*, Supplement No. 12: 145–152.
- Selvaraj, C. & M. Abraham, 1987. Review of the taxonomic status of *Puntius mahecola* (Valenciennes), *Matsya*, **12–13**: 20–25.
- Senanayake, F. R., 1980. *The biogeography and ecology of the inland fishes of Sri Lanka*. Unpublished Ph.D. dissertation, Department of Wildlife and Fisheries Biology, University of California, Davis. 421 pp.
- Senanayake, F.R., 1985. *Barbus srilankensis*, a new species of cyprinid fish from Sri Lanka. *Ceylon Journal of Science (Biological Science)*, **15** (1982[1985]): 396–402.
- Silas, E.G., 1953. New fishes from the Western Ghats, with notes on *Puntius arulius* (Jerdon), *Records of the Indian Museum*, **51** (1953[1954]): 27–37.

Srivastava, G. J., K. P. Verma, & R. B. Sharma, 1976. A new species of the genus *Puntius* from Tirhut Division, Bihar. *Matsya*, **2**: 72–73.

Talwar, P.K. & A.G. Jhingran, 1991. *Inland fishes of India and adjacent countries*. Oxford & IBH, New Delhi. 1: liv+1–542; 2: 543–1158 pp.

Valenciennes, A., 1842. Vol. 16. In: Cuvier, G. & A. Valenciennes, *Histoire naturelle des poissons*. Levrault, Strasbourg, xx+472 pp., pls. 456–487.

Valenciennes, A., 1844. Vol. 17 In: Cuvier, G. & A. Valenciennes, *Histoire naturelle des poissons*. Levrault, Strassbourg, xxiii+497 pp., pls. 487–519.