

A review of the genus *Devario* in Sri Lanka (Teleostei: Cyprinidae), with description of two new species

Sudesh BATUWITA^{*1,2}, Madura DE SILVA³, Sampath UDUGAMPALA³

¹The Society for the Biodiversity Conservation, 63/4, Adikaramwatta, Yaggahapitiya, Kandy, Sri Lanka.

²College of Biology and Environment, Nanjing Forestry University, China.

³Wildlife Conservation Society, Biodiversity Research and Education Center, Hiyare Reservoir, Hiyare, Galle, Sri Lanka.

Corresponding author: *E-mail: sudesh.batuwita@gmail.com

Abstract

Six species of *Devario* Heckel are recognized from Sri Lanka. *Devario ceylonensis* (Günther) is shown to be a junior synonym of *D. malabaricus* (Jerdon); and *D. lineolatus* (Bleeker) a secondary homonym of *D. lineolatus* (Blyth), herein redescribed under the replacement name *D. monticola* nom. nov. In addition to *D. pathirana* (Kottelat & Pethiyagoda), two newly-discovered species are described from the island: *D. annnataliae* sp. nov. and *D. udenii* sp. nov. All six species are distinguished from one another by a suite of characters that include colour pattern; presence/ absence of infraorbital spine and its shape; pectoral-fin length; body depth; eye diameter; and relative position of the dorsal-fin origin. Through the designation of a common neotype, *Perilampus myсорicus* Jerdon is made an objective synonym of *D. malabaricus*. A key to the Sri Lankan species is also provided.

Keywords: Taxonomy, New species, Neotype, Identification key.

Zoobank: urn:lsid:zoobank.org:pub:727D9648-5227-4DD2-A981-30463592CF86
urn:lsid:zoobank.org:act:C5108556-30CA-406E-A1E3-826E69AAEDDE
urn:lsid:zoobank.org:act:FB2E0E46-EEE9-4365-9506-351403C679B7
urn:lsid:zoobank.org:act:49D9D83C-ABFB-4D6D-B184-75CA704B8009

Introduction

Fishes of the genus *Devario* Heckel were first reported from Sri Lanka by describing two species of *Danio*, *D. lineolatus* and *D. micronema* (Bleeker 1863). While Bleeker's subsequent illustrations (1864: fig. 2 & 3) (Fig. 1) suggest that they represent two distinct species; Günther (1868: 282) treated them as a single species endemic to Sri Lanka, noting that "Dr. Bleeker, l.c. distinguishes two species from Ceylon—an elevated form, *D. lineolatus*, with L. lat. 37 and A. 17–18, and an elongate form with L. lat. 34 and A. 15–16. These differential characters do not hold good, and happen to be exactly reversed in our specimens." Günther (1868) described a further new species, *Eustira ceylonensis*, from Sri Lanka for which he also created the new genus *Eustira* (treated as a synonym of *Devario* by Fang (2003)).

Day (1878) recognized from Sri Lanka only a single species of *Devario* (then *Danio*), which he identified as *D. malabaricus* (Jerdon 1849), and in the synonymy of which he placed *D. micronema*, while recognizing *D. ceylonensis* as valid (but in *Perilampus*). Silas (1957), however, showed that *D. ceylonensis* is in fact, a synonym of *D. malabaricus*.

Hora and Nair (1941) placed *D. malabaricus* in the synonymy of *D. aequipinnatus* (McClelland 1839), an action that was adopted by some authors of the Sri Lankan ichthyofauna (e.g., Munro 1955; Mendis and Fernando 1962), while others (e.g. Pethiyagoda 1991) paradoxically recognized both *D. malabaricus* and *D. aequipinnatus* from the island. Meanwhile, Kottelat and Pethiyagoda (1990) described *Danio pathirana*, a barred *Devario* from southern Sri Lanka, whose distinctive colour pattern immediately distinguished it from the striped Sri Lankan fishes identified as *D. malabaricus* and *D. aequipinnatus* by authors. Based on a study of toptotypical specimens of both species, Jayaram (1991) showed them to be markedly different, with *D. malabaricus* restricted to southern India and Sri Lanka.

The number of species of Sri Lankan *Devario* and their identity are thus in need of clarification and, to this end we made an extensive sampling of *Devario* populations from many parts of the island. An examination of

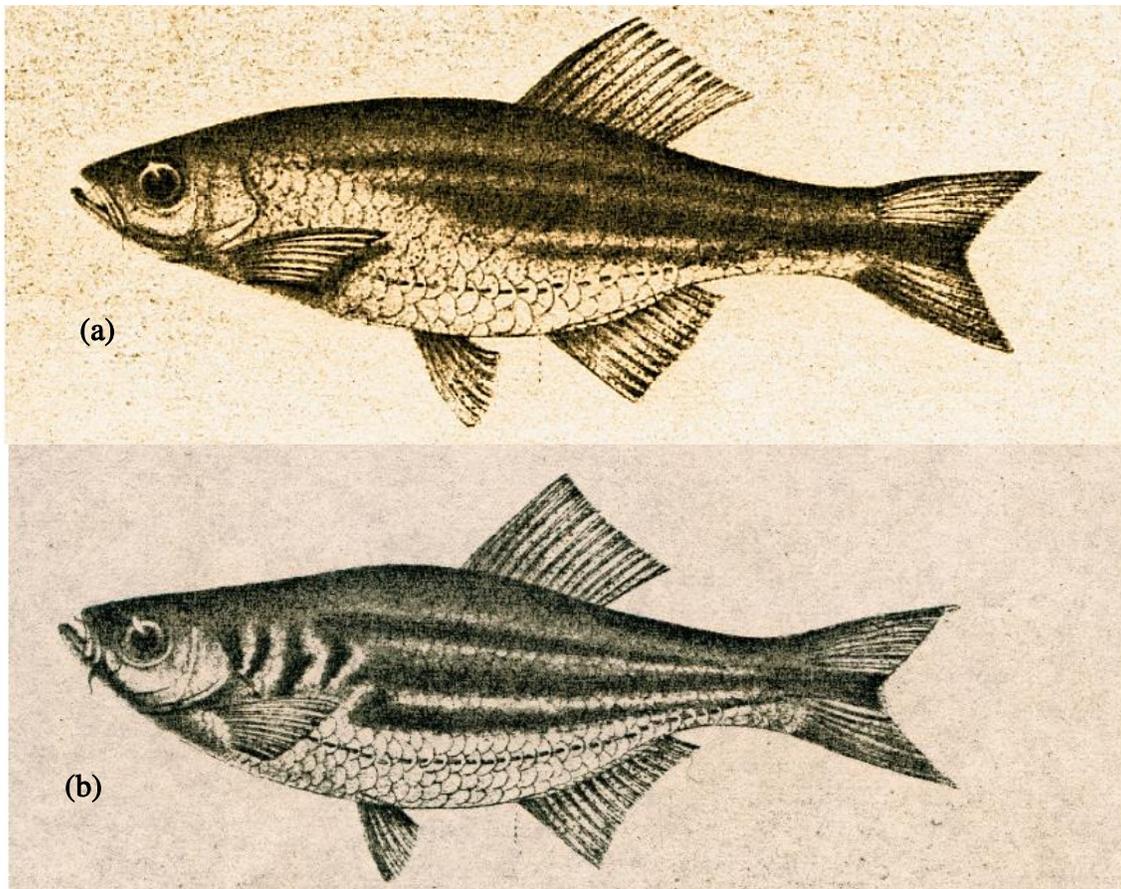


Figure 1. Original illustrations of (a) *Danio micronema* and (b) *Danio lineolatus* as reproduced by Bleeker (1863 and 1864).

this collection, and also of specimens previously collected by the Wildlife Heritage Trust, show that at least six species of *Devario* exist in Sri Lanka. Here, in addition to redescribing the previously known species of Sri Lankan *Devario*, we describe these two new species.

Material and Methods

Specimens referred to in this work are deposited in the collection of the Wildlife Heritage Trust of Sri Lanka (WHT), now in the National Museum, Colombo (NMSL); the Natural History Museum, London (BMNH); and the Australian Museum, Sydney (AMS). Additional specimens collected during the course of the national freshwater fish survey by the Wildlife Conservation Society (Galle) are deposited in NMSL.

Measurements were made using dial Vernier calipers to the nearest 0.1 mm. Methods for taking counts and measurements follow Fang (1997) except that standard length was measured from the snout-tip to the hypural notch. Body depth was measured at the dorsal-fin origin; and mid-ventral scales were counted from pelvic-fin origin to the anterior terminus of the isthmus. Colour-pattern terminology follows Fang (1998). The dorsal fin origin to hypural distance was measured as the distance between the dorsal-fin origin and hypural notch. Values in brackets following a count indicate the frequency of that count. An asterisk denotes the condition of the name-bearing type.

Specimens for osteological examination were cleared and stained (C&S) using alizarin red S following the single-stain procedure of Taylor and Van Dyke (1985). Presence of the danionin notch was determined from examination of cleared and stained specimens. Caudal vertebrae were counted from the first haemal-spine bearing vertebra to the last half-centrum supporting the hypural complex. Counts of abdominal vertebrae include those of the Weberian apparatus. When divided to the base but supported by a single pterygiophore, the last

dorsal and anal-fin rays were counted as 1½. Osteological terminology follows Fang (2003) and Sanger and McCune (2002). Unless otherwise stated, sex was determined by the more extensive distribution of nuptial tubercles in males.

All material is from Sri Lanka unless otherwise stated. Altitudes are given in metres above mean sea level; geographic coordinates were taken using topographic maps (1 inch: 1 mile, Survey Department, Colombo) and as well as from Google Earth and Google Maps.

Abbreviations: Australian Museum, Sydney, AMS; Cleared and stained, C&S; Head length, HL; Natural History Museum, London, BMNH; National Museum, Colombo, NMSL; Standard length, SL; Wildlife Heritage Trust of Sri Lanka, WHT.

Results

De Silva et al. (2015) mentioned existence of several species of *Devario* from Sri Lanka, however, all these names are invalid because the names given by authors were not validly published (ICZN, 1999; Art. 5.0, 5.1 & 28). In addition, no name-bearing types were fixed for the species (ICZN, 1999; Art. 72.3) and not indicated the names as intentionally new (ICZN, 1999; Art. 16.1).

General description (Sri Lankan *Devario*): Head and body laterally compressed. Body depth greatest at pelvic-fin origin. Females slightly deeper-bodied than males. Dorsal body profile slightly straighter than ventral body profile; mouth supraterminal; a rounded symphysial knob present on lower jaw, fitting into shallow groove on inner margin of upper jaw with mouth closed; two pairs of barbels: maxillary barbel very short, rostral barbel reaching short of anterior margin of orbit; dorsal surface of head with well-developed skin grooves along supraorbital shelves; minute nuptial tubercles present along upper margin of lower jaw.

Dorsal-fin with 3 unbranched and 9½–13½ branched rays; anal-fin with 3 unbranched and 12½–17½ branched rays; principal caudal-fin rays 9+8; pelvic-fin origin well in advance of dorsal-fin origin; posteriormost tip of pelvic-fin reaching to vertical through dorsal-fin origin when adpressed; dorsal-fin origin anterior to anal-fin origin; caudal-fin forked; lateral line complete, declining steeply for first 4–7 scales, perforating 30–40 scales in all; 13–19 predorsal scales. Abdominal vertebrae 16–17; caudal vertebrae 17–19; total vertebrae 33–38. Pharyngeal teeth in 3 rows, distally grooved; absence of blade-like fourth neural spine; four hypurals in upper lobe of caudal-fin; epural and neural arch of compound centrum are narrowly separated; either presence or absence of infraorbital process on first infraorbital; danionin notch present.

Devario malabaricus (Jerdon, 1849)

Perilampus malabaricus Jerdon, 1849: 325 (“Malabar” [present-day Kerala], India).

Perilampus mysoricus Jerdon, 1849: 325 (“Cavery” [= Cauvery River, India]).

Perilampus aurolineatus Day, 1865: 306 (“Cochin” [present-day Kochi in Kerala], India).

Eustira ceylonensis Günther, 1868: 331 (“Ceylon” [= Sri Lanka]).

(Fig. 2)

Neotype (here designated, ICZN (1999), Art. 75.3. and 75.3.1-4., 75.3.6.): AMS I.46342-001, 73.6 mm SL; India, Kerala, Chalakudy River, Panamkulam, 26 km from Chalakudy, on road to Valparai; R. Pethiyagoda, 26 Apr 1992. Topotypes (all from India). — AMS I.46342-001, 2, 66.4, 66.4 mm SL; same location data as neotype. — WHT 309, 60.0 mm SL; Kerala: 5 km south of Pathanamtitha; R. Pethiyagoda, 13 Apr 1992. — NMSL WHT 317, 54.8 mm SL; Muwattupuzha River, 1 km south of town; R. Pethiyagoda, 17 Apr 1992. — NMSL WHT 298, 2, 60.5–71.0 mm SL; Kerala: Panamkulam: Chalakudy River 26 km from Chalakudy on Valparai road; R. Pethiyagoda, 27 Apr 1992.

Other material (all from Sri Lanka): — NMSL WHT 9802, 10, 46.1–56.1 mm SL; Galle: Ma Dola at Hiyare,

6°03.32'N 80°18.56'E, S. Batuwita, S. Udugampala, 2 Mar 2013. — NMSL WHT 8, 53.2 mm SL; Labugama: Waga, 6°54'N 80°07'E, K. Manamendra-Arachchi, D. Gabadage, 6 Aug 1993. — NMSL WHT 49, 2, 47.6–54.2 mm SL; Puttalam: Mee Oya, 8°00'N 79°46'E, K. Manamendra-Arachchi & D. Gabadage, 9 Oct 1993. — NMSL WHT 9803, 7, 63.7–82.2 mm SL; Matugama: Walallawita, 6°26'10"N 80°11'35"E, S. Udugampala et al., 9 Oct 2012.— NMSL WHT 76, 2, 49.9–50.4 mm SL; Pallegama, Knuckles Range, 7°32'N 80°49'E, R. Pethiyagoda et al., 16 Oct 1993. — NMSL WHT 1869, 8, 49.1–69.8 mm SL; Knuckles Range: Puwakpitiya, 7°34'N 80°45'E, D. Gabadage & M.M. Bahir, 3 Sep 1996. — NMSL WHT 1868, 2, 50.9–58.9 mm SL; Bibile: Ratugala, 7°17'N 81°24'E, D. Gabadage & M.M. Bahir, 2 Oct 1996. — NMSL WHT 9804, 3, 51.0–59.6 mm SL; Nilgala: Punmadialla Oya, 7°09'08"N 81°16'09"E, M. de Silva et al., 23 Feb 2013. — NMSL WHT 9805, 5, 51.7–58.7 mm SL; Bibile, 7°09'20"N 81°13'26"E, M. de Silva et al., 23 Feb 2013. — NMSL WHT 11018, 1, (C&S), Anuradhapura, 8°27'N 80°15'E, NMSL WHT 11014, 1, (C&S), Kuruwita, 6°46'N 80°26'E. — NMSL WHT 11015, 1, (C&S), Puttalam: Mee Oya, 8°00'N 79°46'E, S.V. Nanayakkara, 25 May 2005. — NMSL WHT 11016, 1, (C&S), Knuckles Range: Puwakpitiya, 7°34'N 80°45'E, D. Gabadage & M.M. Bahir, 3 Sep 1996.

Diagnosis: *Devario malabaricus* is distinguished from all other members of the genus by the combination of the following characters: no process on 1st infraorbital; body depth 27–35 %SL; predorsal scales 15–17; branched dorsal-fin rays 11½–12½; branched anal-fin rays 12½–17½; danionin notch present; dorsal fin origin to hypural distance when carried forward falling well short of posterior border of eye; pectoral-fin tip almost reaching pelvic-fin origin when adpressed; snout length subequal to or greater than eye diameter; P stripe originating level with origin of pelvic-fin, 1–2 scale-widths anterior to dorsal-fin origin; P-1 stripe less than half width of P stripe, bifurcated anteriorly by a more or less broken whitish line; anterior half of body with 5–6 dark, irregular, vertical bars. No nuptial tubercles in both sexes.

Description: For general appearance see Figure 2. Morphometric and meristic data are provided in Table 1. Snout short, its length equal to or slightly less than eye diameter. Dorsal-fin with 3 unbranched and 9½–13½ (9½ [7], 10½ [12], 11½ [16], 12[1], 12½*[9], 13½ [2]) rays; first unbranched ray hidden, only just visible, second one half length of third. Anal-fin with 3 unbranched and 12½–17½ (12½ [4], 13½ [10], 14½ [11], 15½*[15], 16½ [6], 17½ [1]) rays. Pelvic-fin with 1 unbranched and 6*–7 branched rays; pectoral-fin with 1 unbranched and 12–13* branched rays. Pectoral-fin just reaching pelvic-fin origin when adpressed (Fig. 2c). Anal-fin origin beneath insertion of 3rd branched dorsal-fin ray, its distal margin straight to convex.

Lateral line complete, declining steeply for first 5–7 scales, perforating 30–37 (30[2], 31[6], 32[3], 33[3], 34*[10], 35[11], 36[10], 37[2]) body scales. Circumpeduncular scales 12–14; scales in transverse line between dorsal-fin origin and mid-ventral scale row ½7/1/1½ [7], ½7/1/2½ [1], ½8/1/1½ [24], ½8/1/2½* [12], ½9/1/1½ [1]; predorsal scales 14–19 (14[4], 15[15], 16*[19], 17[4], 18[4], 19[1]); preanal scales 18–24 (18[1], 19[5], 20[11], 21[5], 22[5], 23[12], 24[2]). Anteroventral-most point of supraorbital entering orbit (Fig. 2d). Abdominal vertebrae 16–17; caudal vertebrae 18–19; total vertebrae 34–36. Pharyngeal teeth in 3 rows (5,4,2;2,3–4,5), distally grooved. Danionin notch present.

Coloration: In preservative (Fig. 2a), body background colour light olive dorsally, light cream ventrally. A bluish-black cleithral spot present. 5 or 6 irregular black bars on anterior half of body. P stripe originating level with origin of pelvic-fin, about twice as wide as P-1 stripe, bifurcated anteriorly by an olive line or series of spots. P+1 stripe separated from P stripe by a narrow interspace, originating at posteriormost bar. P-1 stripe originating level with P stripe, continuing to origin of caudal peduncle. Median fins with light scattering of melanophores on interradiial membranes. Paired fins unpigmented. In life (Fig. 2c), dorsal surface of body light brown with a greenish metallic sheen, ventral surface light-brownish white with a silvery sheen. Anterior vertical bars, P- stripe, P+1 stripe and P-1 stripe metallic blue; interspaces golden-yellow. Medial 5–6 caudal-fin rays bluish-black; caudal-fin bright orange in male specimens.

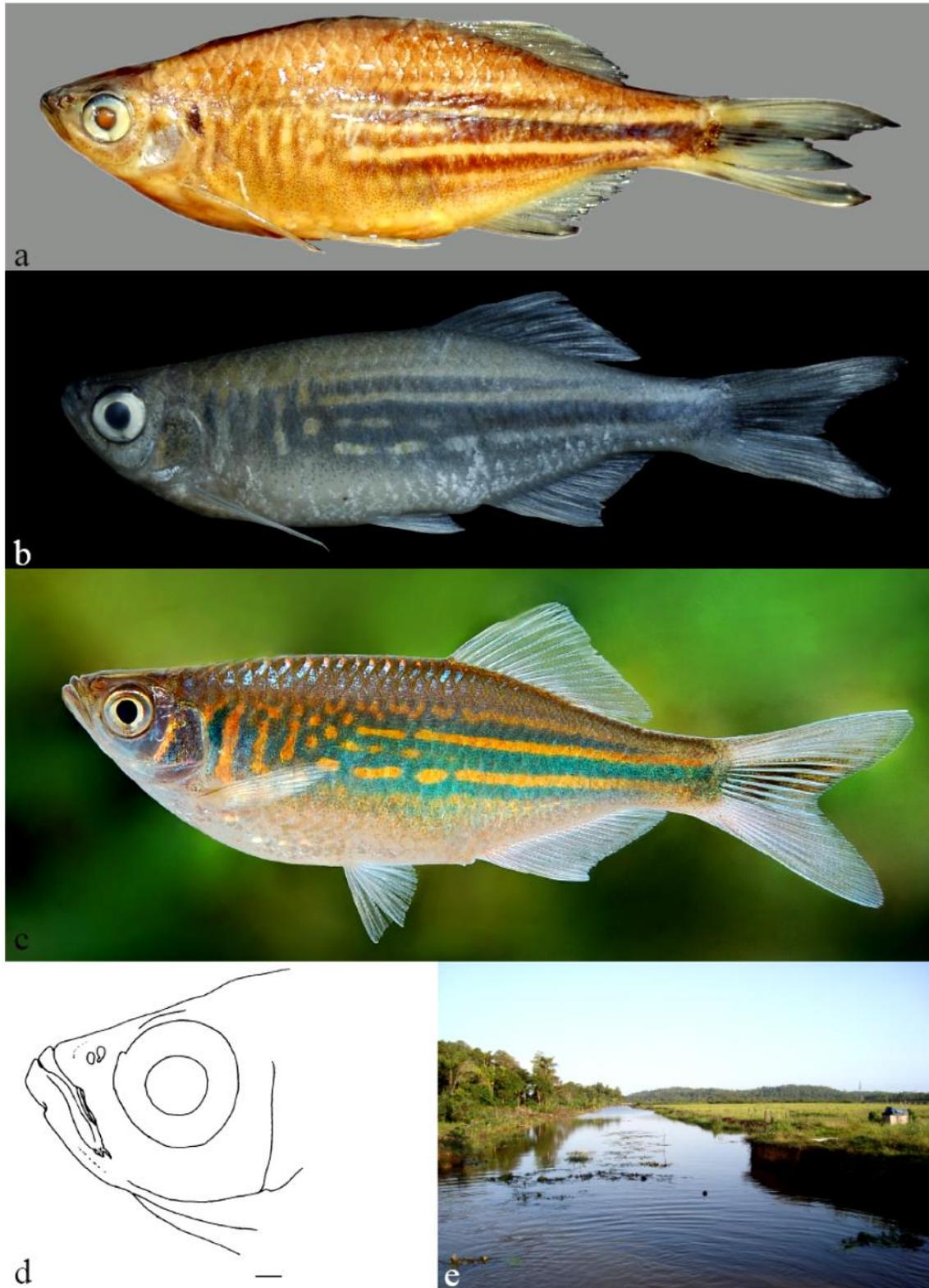


Figure 2. *Devario malabaricus*: (a) AMS I.46342-001, neotype, 73.6 mm SL; Chalakudy River, Kerala, India, (b) NMSL WHT 9830, male, 64.5 mm SL; Madola, near Hiyare, Sri Lanka, (c) in life, Walallawita, near Matugama, Sri Lanka, (d) lateral view of head of NMSL WHT 9802, 55.5 mm SL; Ma Dola at Hiyare and (e) habitat at Wakwella wet zone swamp, Sri Lanka (Scale bar 1 mm).

Table 1. Morphometric data of *Devario malabaricus* (Neotype, AMS I.46342-001, 73.6 mm SL; AMS I. 46342-001, 2, 66.4 mm, 66.4 mm SL; WHT 309, 60.0 mm SL; WHT 317, 54.8 mm SL; WHT 298, 2, 60.5–71.0 mm SL; NMSL WHT 9802, 10, 46.1–56.1 mm SL; WHT 8, 53.2 mm SL; WHT 49, 2, 47.6–54.2 mm SL; NMSL WHT 9803, 7, 63.7–82.2 mm SL; WHT 1868, 2, 50.9–58.9 mm SL; NMSL WHT 9804, 3, 51.0–59.6 mm SL; NMSL WHT 9805, 5, 51.7–58.7 mm SL; WHT 76, 2, 49.9–50.4 mm SL; WHT 1869, 8, 49.1–69.8 mm SL).

	Neotype, AMS I.46342-001	range	mean	S.D.
Standard length (mm)	73.6	46.1–82.2	58.1	9.1
In percent of standard length				
Total length	130.8	121–135	128	3
Body depth	32.6	25.0–35.6	30.6	2.1
Head length	23.9	23.0–28.5	25.5	1.3
Predorsal length	60.9	53.1–60.9	57.2	2.0
Dorsal fin origin to hypural distance	43.3	40.9–50.1	46.0	2.0
Dorsal-fin base length	22.0	16.2–24.5	20.0	1.8
Dorsal-fin height		17.4–24.3	20.8	1.7
Anal-fin base length	22.7	17.7–26.7	22.6	1.9
Anal-fin height		15.5–20.1	17.9	1.2
Pelvic-fin length	16.0	13.2–18.5	15.5	1.2
Pectoral-fin length	23.6	19.0–26.3	22.7	1.7
Preanal length	66.7	57.8–67.7	63.2	2.2
Prepelvic length	47.3	43.8–49.2	46.6	1.6
Caudal peduncle length	13.9	11.7–20.4	14.7	2.2
Caudal peduncle depth	11.1	9.1–12.3	11.0	0.7
Length of upper caudal-fin lobe		20.7–32.4	27.2	2.5
Length of lower caudal-fin lobe		24.0–31.0	27.6	2.0
Length of medial caudal rays		12.6–20.7	16.3	1.8
In percent of head length				
Snout length	27.3	23.8–32.8	27.7	2.4
Orbital diameter	29.0	28.9–39.2	32.8	2.8
Interorbital width	41.5	35.0–46.9	39.4	2.5
Internarial width		16.9–24.8	21.0	1.8
Upper jaw length		26.6–38.4	31.7	2.7
Lower jaw length		32.0–44.8	39.4	2.8
Maxillary barbel length		1.4–8.5	4.1	1.6
Rostral barbel length		7.5–20.0	13.1	2.6

Distribution and habitat: In Sri Lanka, *Devario malabaricus* is widely distributed across the western lowlands (Fig. 2e), from approximately the Gin Ganga to the Mee Oya basins (approximately from Galle in the south to Puttalam in the northwest), to an elevation of about 500 m (Fig. 3). It is also widely distributed in Kerala State of southern India.

Remarks: *Devario malabaricus* is easily distinguished from all other species of Sri Lankan *Devario* by having the P stripe anteriorly bifurcated (vs. entire, not bifurcated). Additionally, it is distinguished from *D. pathirana* by having the P, P+1 and P-1 stripes proceeding anterior to the pelvic-fin origin (vs. P+1 and P-1 stripes absent, P stripe restricted to caudal peduncle in *D. pathirana*). It differs from *D. monticola* by having the P stripe about twice as wide as P-1 stripe (vs. about the same width) and the pectoral-fin, when adpressed, just reaching (vs. falling well short of) the pelvic-fin origin.

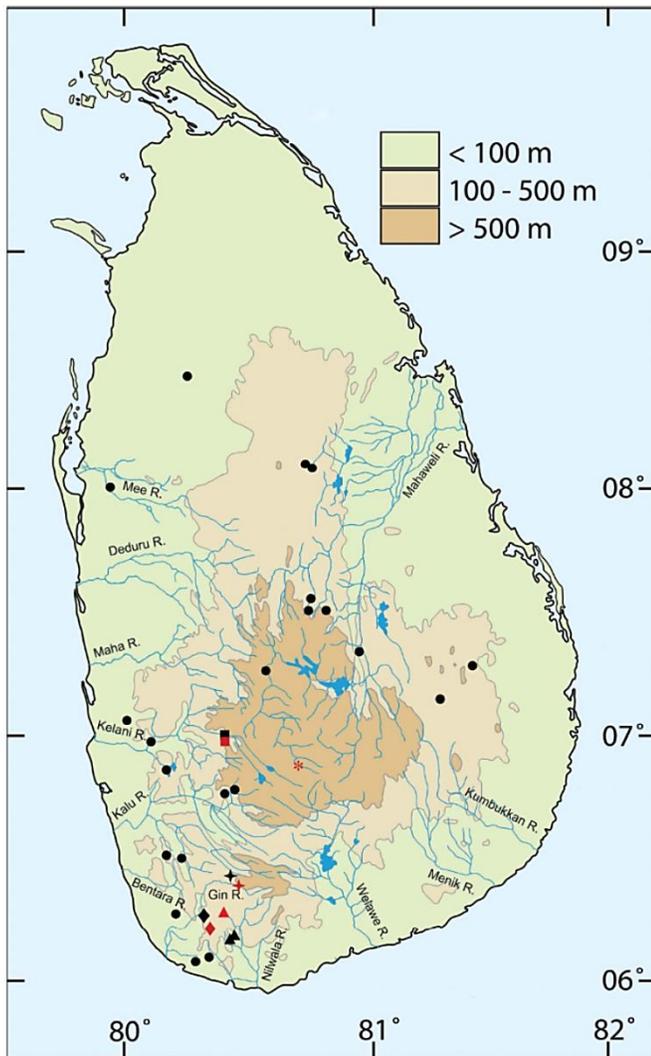


Figure 3. Distribution of the species of *Devario* in Sri Lanka (type localities in red): *Devario malabaricus* (circle), *Devario pathirana* (triangle), *Devario micronema* (square), *Devario udenii* (diamond), *Devario monticola* (asterisk) and *Devario annataliae* (star).

Devario malabaricus is distinguished from *D. udenii* by having the distance from the dorsal-fin origin to the hypural notch greater than that from the dorsal-fin origin to the posterior margin of eye; pectoral-fin just reaching (vs. reaching well past) pelvic-fin origin when adpressed; P-1 stripe originating anterior to (vs. posterior to) anal-fin origin; and a snout length equal to or greater than eye diameter (vs. snout length less than eye diameter). It differs from *D. micronema* by the absence (vs. presence) of a square-shaped infraorbital process and having the P stripe about twice as wide as (vs. equal in width to) the P-1 stripe.

Devario malabaricus differs from *D. annataliae* by having a deeper body (27–35 vs. 24–27 %SL), a greater internarial width (26–33 vs. 17–25 %HL) and having the P-1 stripe originating anterior (vs. posterior) to the pelvic-fin origin.

***Devario pathirana* (Kottelat and Pethiyagoda, 1990)**

Danio pathirana Kottelat and Pethiyagoda, 1990

(Fig. 4)

Topotypes: NMSL WHT 9801, 5, 55.7–60.0 mm SL; Akuressa, Opatha, Weerapana (Nilwala River basin), 6°16'N 80°24'E, R. Krishantha & S. Darshana, 19 Dec 2012. — NMSL WHT 11017, 1, (C&S), same location data as above; S. Batuwita, 10 Jun 2002.

Diagnosis: *Devario pathirana* is distinguished from all other species of the genus by the combination of the following characters: 8–9 dark, irregular bars on body between pectoral-fin origin and caudal-peduncle origin;

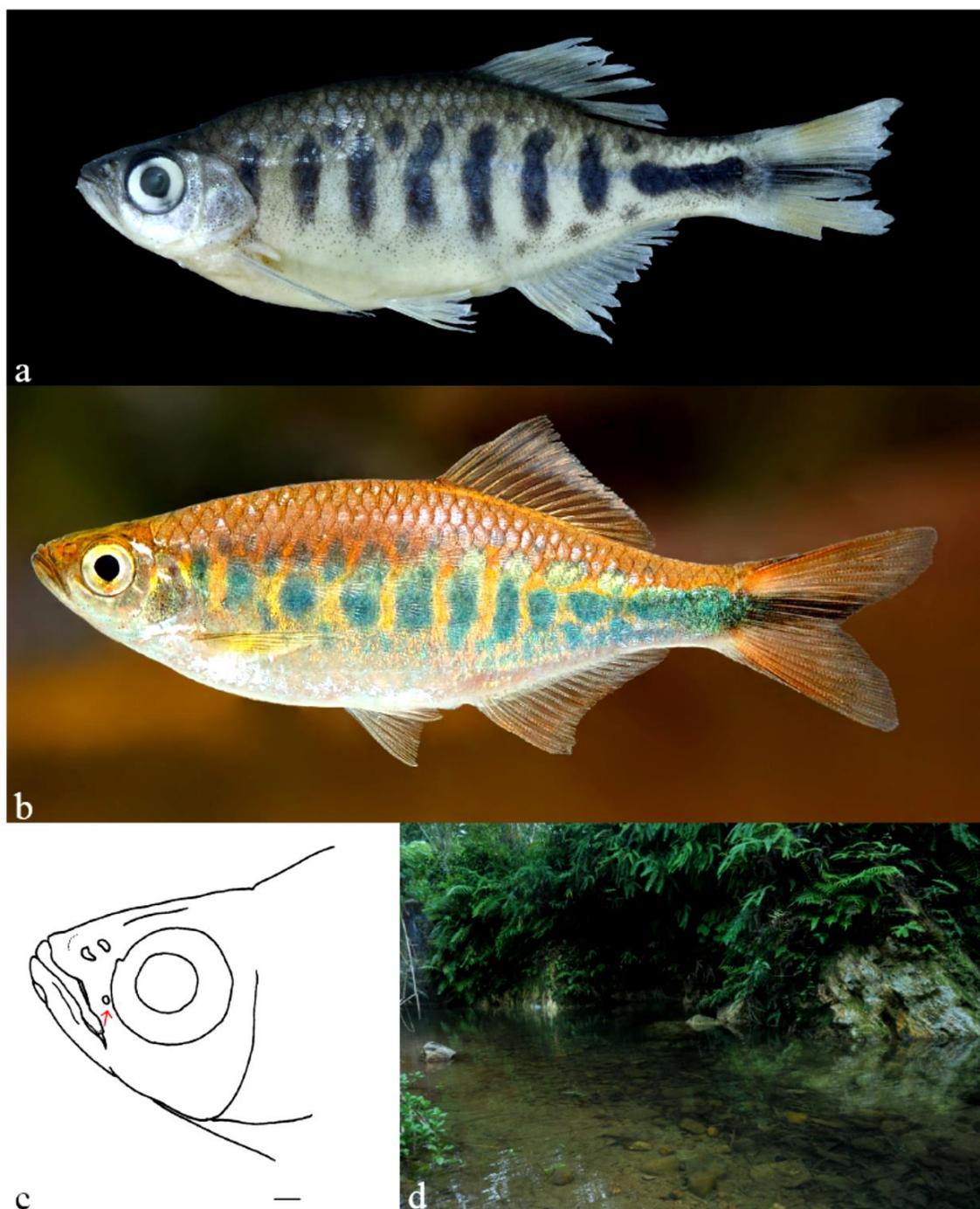


Figure 4. *Devario pathirana*. (a) NMSL WHT 9820, female, 55.7 mm SL; Weerapana, Opatha, Sri Lanka, (b) in life, Opatha, (c) lateral view of head of NMSL WHT 9801, 52.2 mm SL; Weerapana Sri Lanka (red arrow head point the infraorbital process), and (d) habitat at Opatha (Scale bar 1 mm).

P+1 and P-1 stripes absent; body depth 30–33 %SL; snout length less than eye diameter; 14–15 predorsal scales; $11\frac{1}{2}$ – $12\frac{1}{2}$ branched dorsal-fin rays; $14\frac{1}{2}$ branched anal-fin rays; a blunt, knob-like process on 1st infraorbital; danionin notch present; dorsal fin origin to hypural distance when carried forward reaching middle of eye; pectoral-fin, when adpressed, just reaching pelvic-fin origin.

Description: For general appearance see Figure 4. Morphometric and meristic data are provided in Table 2. Snout length distinctly less than eye diameter. Dorsal-fin with 3 unbranched and $11\frac{1}{2}$ – $12\frac{1}{2}$ (11[3], 12[2]) rays; first unbranched ray minute, only just visible, second one half length of third. Anal-fin with 3 unbranched and

Table 2. Morphometric data of *Devario pathirana* (NMSL WHT 9801, 5, 55.7-60.0 mm SL).

	range	mean	S.D.
Standard length (mm)	55.7–60.0	58.0	1.8
In percent of standard length			
Total length	124–127	126	2
Body depth	30.2–33.0	32.1	1.2
Head length	24.5–25.9	25.3	0.5
Predorsal length	54.3–57.6	55.4	1.4
Dorsal fin origin to hypural distance	46.4–49.6	47.8	1.2
Dorsal-fin base length	19.0–22.3	20.7	1.5
Dorsal-fin height	18.8–21.7	20.3	1.2
Anal-fin base length	17.3–22.0	19.9	1.7
Anal-fin height	13.5–21.6	17.2	3.0
Pelvic-fin length	14.3–16.7	15.3	1.0
Pectoral-fin length	22.7–23.7	23.3	0.4
Preanal length	60.2–64.8	62.1	1.9
Prepelvic length	45.7–46.3	46.0	0.3
Caudal peduncle length	15.6–17.4	16.6	0.8
Caudal peduncle depth	10.6–11.2	10.9	0.3
Length of upper caudal-fin lobe	25.5–25.9	25.7	0.3
Length of lower caudal-fin lobe	25.7–28.3	27.0	1.9
Length of medial caudal rays	12.7–15.2	14.1	0.9
In percent of head length			
Snout length	24.0–32.6	28.5	3.1
Orbital diameter	33.3–35.7	34.3	1.1
Interorbital width	40.8–43.8	42.5	1.2
Internarial width	22.4–24.3	23.0	0.8
Upper jaw length	29.3–34.0	31.0	2.1
Lower jaw length	37.3–43.5	40.3	2.7
Maxillary barbel length	1.6–3.8	2.7	1.0
Rostral barbel length	10.7–12.6	11.6	0.9

14½ rays. Pelvic-fin with 3 unbranched and 7 branched rays. Pectoral-fin with 3 unbranched and 10–11 branched rays. Pectoral-fin tip reaching pelvic-fin origin when adpressed. Pelvic-fin, when adpressed, reaching vertical through dorsal-fin origin.

Lateral line complete, declining steeply for first 5–6 scales, perforating 33–36 (33[1], 34[1], 35[1], 36[1]) body scales along its length. Circumpeduncular scales 12–14, scales in transverse line between dorsal-fin origin and mid-ventral scale row ½8/1/1½ (4), ½8/1/2½ (1); predorsal scales 14–15 (14[4], 15[1]); mid-ventral scales 21–24 (21[2], 22[1], 23[1], 24[1]). Abdominal vertebrae 16; caudal vertebrae 18; total vertebrae 34. Pharyngeal teeth in 3 rows (5,4,2;1,4,5), distally grooved. Danionin notch present. Process present on posterior edge of 1st infraorbital. Anteroventral-most point of supraorbital entering orbit (Fig. 4c).

Coloration: In preservative (Fig. 4a), body background colour light olive dorsally, light cream ventrally. A dark cleithral spot present at posterodorsal corner of opercular opening, which is almost equal in height of other vertical bars. 8 or 9 dark, irregular, vertical bars on body anterior to caudal peduncle. P stripe short, restricted to caudal peduncle, extending on to caudal-fin. Median fins with a light scattering of melanophores on interradiar membranes. Paired fins unpigmented. In life (Fig. 4b), dorsal surface of body light brown with a metallic sheen,

lateral and ventral surface of body with a silvery sheen; sides of body with 7–11 irregular, dark metallic blue bars with yellow interspaces. P stripe restricted to caudal peduncle and medial caudal-fin rays.

Distribution and habitat: *Devario pathirana* is restricted to the Nilwala basin in Sri Lanka's south-western wet zone (Fig. 3). It has been recorded from Opatha and Weerapana near Akuessa, and from the Dediyaigala Forest Reserve (Fig. 4d). The species does not occur syntopically with any other species of *Devario*.

Remarks: *Devario pathirana* is easily distinguished from all its congeners by its short P stripe and the absence of the P+1 and P-1 stripes (vs. P, P+1 and P-1 stripes present anterior to caudal peduncle in all congeners).

Devario micronema (Bleeker, 1863)

Danio micronema Bleeker, 1863: 250 ("Ceylon" [= Sri Lanka]).

(Fig. 5)

Recent material: NMSL WHT 9809, 53.8 mm SL; Kelani River, Parawalatenna bridge near Kitulgala (adjoining the Kelaniweli Forest Reserve), 6°59'N 80°24'E, M. de Silva & S. Batuwita, 2 May 2012. — NMSL WHT 9810, 11, 41.3–55.1 mm SL; Kelani River, Parawalatenna bridge near Kitulgala (adjoining the Kelaniweli Forest Reserve), 6°59'N 80°24'E, M. de Silva & S. Batuwita, 2 May 2012.

Other material: NMSL WHT 11004, 1, (C&S), Kelani River, Parawalatenna bridge near Kitulgala (adjoining the Kelaniweli Forest Reserve), 6°59'N 80°24'E, S. Batuwita, 10 Jan 2006.

Diagnosis: *Devario micronema* is distinguished from all other species of the genus by the combination of the following characters: body depth 29–30 %SL; snout length equal to or greater than eye diameter; 3–5 irregular, vertical bars on anterior half of body; P stripe broader than P+1 and P-1 stripes; 14–17 predorsal scales; 10–11 branched dorsal-fin rays; 12½–14½ branched anal-fin rays; a prominent, square-shaped process on posterior edge of first infraorbital; danionin notch present; dorsal fin origin to hypural distance, when carried forward, reaching to reaching posterior border of eye; pectoral-fin, adpressed, just reaching pelvic-fin origin.

Description: For general appearance see Figure 5. Morphometric and meristic data are provided in Table 3. Snout distinctly shorter than eye diameter. Nuptial tubercles absent along upper margin of lower jaw in both sexes. Dorsal-fin with 3 unbranched and 10(7)–11 (5) branched rays. Anal-fin with 3 unbranched and 12–14 (12[3], 13[4], 14[5]) rays. Pelvic-fin with 3 unbranched and 6 branched rays. Pectoral-fin with 3 unbranched and 12 branched rays. Pectoral-fin when adpressed just reaching pelvic-fin origin.

Lateral line complete, declining steeply for first 4–6 scales, perforating 33–38 (33[1], 34[3], 35[5], 36[2], 37[0], 38[1]) body scales along its length. 12–14 circumpeduncular scales, ½8/1/1½ (12) scales in transverse line between dorsal-fin origin and mid-ventral scale row; 14–17 (14[6], 15[3], 16[2], 17[1]) predorsal scales; 19–23 (19[2], 20[4], 21[4], 22[1], 23[1]) mid-ventral scales. Abdominal vertebrae 16; caudal vertebrae 19; total vertebrae 35. Pharyngeal teeth in 3 rows (4,4,2; 2,3,5), distally grooved. A prominent square-shaped process present on posterior edge of 1st infraorbital (Fig. 5c). Anteroventral-most point of supraorbital entering orbit. Danionin notch present.

Coloration: In preservative (Fig. 5a), body background colour light olive dorsally, whitish ventrally. A dark blue-black cleithral blotch present. 3 or 4 dark blue-black, irregular, vertical bars, on anterior half of body. P stripe broader than P+1 and P-1 stripes. P+1 originating between pectoral and pelvic-fin origins; P-1 stripe originating level with P stripe. P+1 and P-1 stripes both not extending on to caudal peduncle. Interradial membranes of all fins scattered with minute melanophores. In life (Fig. 5b), dorsal surface of body light-yellowish brown with a metallic sheen, lateral and ventral surfaces of body with a silvery sheen. Anterior vertical bars, P- stripe, P+1 stripe and P-1 stripe metallic blue; interspaces bright yellow. Fins hyaline.

Distribution and habitat: *Devario micronema* was collected in the vicinity of Kitulgala, on the borders of the Kelaniweli Forest Reserve (Fig. 3). It occurred predominantly in well-shaded areas of shallow, slow-flowing

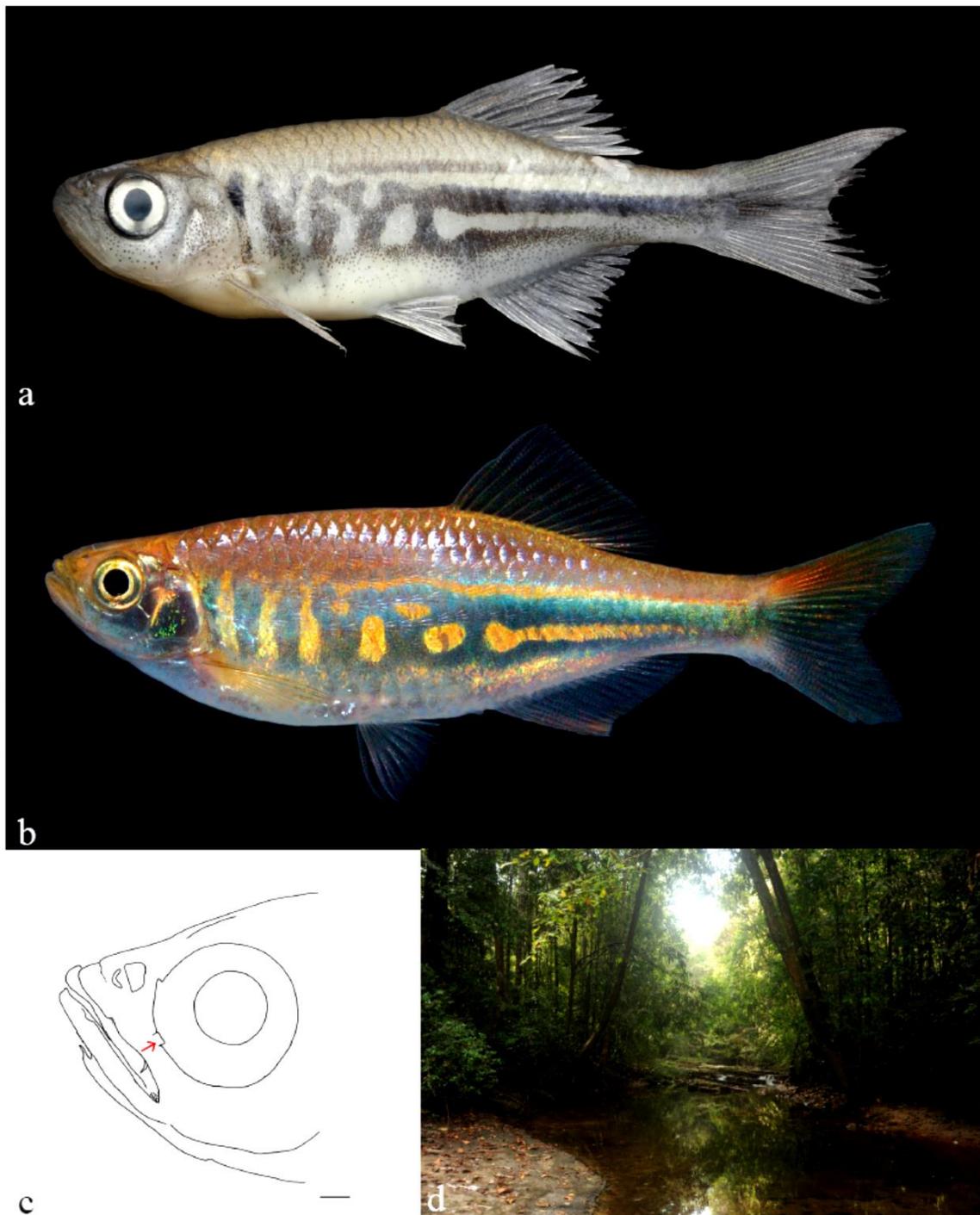


Figure 5. *Devario micronema*. (a) WHT 9816, male, 50.2 mm SL; Parawalatenna near Kitulgala, (b) in life, from Parawalatenna, (c) lateral view of head of NMSL WHT 9809, 55.1 mm SL; Kelani River at Parawalatenna (red arrow head point the infraorbital process) and (d) habitat at Parawalatenna (Scale bar 1 mm).

streams (Fig. 5d).

Remarks: *Devario micronema* can be distinguished from all other Sri Lankan *Devario* by the prominent square-shaped process on its first infraorbital. When present in the other Sri Lankan species, the infraorbital process is blunt and knob-like. The species differs from *D. pathirana* and *D. udenii* by having the dorsal fin origin to hypural distance, when carried forward, not reaching the posterior border of the eye (vs. reaching the middle of the eye).

Table 3. Morphometric data of *Devario micronema* (NMSL WHT 9809-9810, 12, 41.3–55.1 mm SL).

	range	mean	S.D.
Standard length (mm)	41.3–55.1	47.7	4.1
In percent of standard length			
Total length	124–131	128	3
Body depth	27.6–30.0	29.1	0.8
Head length	25.8–28.4	27.1	0.8
Predorsal length	53.2–56.1	54.5	0.8
Dorsal fin origin to hypural distance	45.4–49.1	46.7	1.1
Dorsal-fin base length	18.5–20.5	19.7	0.5
Dorsal-fin height	21.3–26.1	23.1	1.4
Anal-fin base length	19.0–22.9	20.7	1.4
Anal-fin height	18.5–20.7	19.6	0.7
Pelvic-fin length	13.6–16.9	15.6	1.1
Pectoral-fin length	20.9–24.5	22.7	1.2
Preanal length	60.0–64.9	62.4	1.5
Prepelvic length	45.6–51.6	47.7	1.7
Caudal peduncle length	13.4–17.2	14.9	1.2
Caudal peduncle depth	9.5–11.2	10.5	0.4
Length of upper caudal-fin lobe	25.9–29.8	27.7	2.0
Length of lower caudal-fin lobe	25.4–31.1	27.3	2.0
Length of medial caudal rays	14.8–19.5	17.1	1.6
In percent of head length			
Snout length	24.4–32.4	26.5	2.5
Orbital diameter	32.0–36.8	34.7	1.5
Interorbital width	38.0–42.3	40.9	1.5
Internarial width	19.5–26.8	22.1	2.1
Upper jaw length	31.3–40.6	34.8	2.7
Lower jaw length	33.6–41.4	36.7	2.4
Maxillary barbel length	0.7–6.8	3.6	1.7
Rostral barbel length	12.0–13.5	12.5	0.5

***Devario udenii*, new species**

(Fig. 6)

Holotype: NMSL WHT 9806, 58.2 mm SL; Udugama Ela (stream), Homadola, 6°13'N 80°20'E; S. Batuwita & S. Udugampala, 23 Feb 2012.

Paratypes: NMSL WHT 9807, 9, 49.5–68.1 mm SL; same collection data as holotype.

Other material: NMSL WHT 11034, 1, 49.0 mm SL; — NMSL WHT 11049, 1, 56.3 mm SL (C&S), same location data as holotype, S. Batuwita & S.V. Nanayakkara, 25 Apr 2005.

Diagnosis: *Devario udenii* is distinguished from all other species of the genus by the combination of following characters: body depth 26–36 %SL; snout length less than eye diameter; colour pattern consisting of 5–6 dark, irregular, broad, vertical bars anterior to level of dorsal-fin origin; 14–17 predorsal scales; 9½–12½ branched dorsal-fin rays and 12½–15½ branched anal-fin rays; danionin notch present; dorsal fin origin to hypural distance, when carried forward, reaching middle of eye; pectoral-fin, when adpressed, reaching pelvic-fin origin; P-1 stripe subequal in width to P stripe.

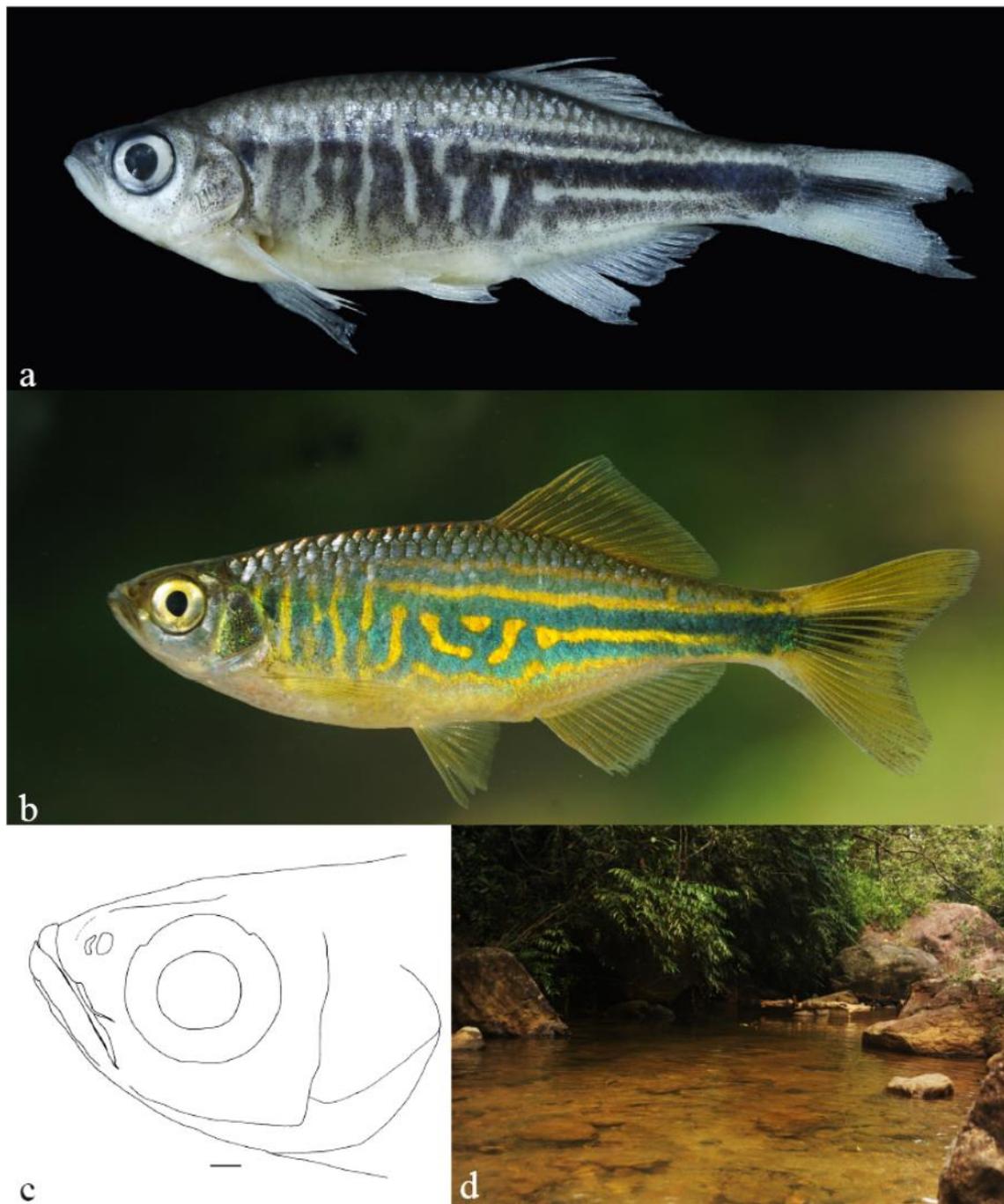


Figure 6. *Devario udenii*: (a) NMSL WHT 9818, female, paratype, 57.4 mm SL; Homa Dola near Udugama, (b) in life, from Homadola, (c) lateral view of head of NMSL WHT 9806, paratype, 58.2 mm SL; Homadola, near Udugama and (d) habitat at Homadola Estate (Scale bar 1 mm).

Description: For general appearance see Figure 6. Morphometric and meristic data are provided in Table 4. Snout length less than eye diameter. Minute nuptial tubercles present along upper margin of lower jaw. Dorsal-fin with 3 unbranched and $9\frac{1}{2}$ – $12\frac{1}{2}$ ($9\frac{1}{2}$ [1], $10\frac{1}{2}$ [2], $11\frac{1}{2}$ [3], 12[1], $12\frac{1}{2}$ [3]) branched rays; first unbranched ray minute, only just visible, second one more than half length of third. Anal-fin with 3 unbranched and $12\frac{1}{2}$ – $15\frac{1}{2}$ (12 *[3], 13[3], 14[3], 15[1]) branched rays. Pelvic-fin with 3 unbranched and 6 branched rays. Pectoral-fin with 3 unbranched and 12 branched rays. Pectoral-fin, when adpressed, reaching pelvic-fin origin (Fig. 6b).

Lateral line complete, declining steeply for first 6–7 scales, perforating 34–38 (33[1], 34*[5], 35[1], 36[0],

Table 4. Morphometric data of holotype (NMSL WHT 9806, 58.2 mm SL) and paratypes (NMSL WHT 9807, 4, 49.5–68.1 mm SL) of *Devario udenii*.

	holotype	range	mean	S.D.
Standard length (mm)	58.2	49.5–68.1	57.9	5.5
In percent of standard length				
Total length	127.3	124–130	128	2
Body depth	25.8	25.8–35.5	30.3	3.8
Head length	24.2	22.0–26.3	24.8	1.2
Predorsal length	57.6	53.5–58.0	56.6	1.3
Dorsal fin origin to hypural distance	45.7	45.7–51.0	47.8	1.5
Dorsal-fin base length	18.7	18.7–23.8	20.6	1.4
Dorsal-fin height	19.6	19.6–22.6	21.2	1.1
Anal-fin base length	12.5	19.7–23.2	21.5	1.1
Anal-fin height	17.0	15.7–19.2	17.3	1.4
Pelvic-fin length	13.7	13.7–16.0	15.0	0.8
Pectoral-fin length	19.9	18.4–23.7	21.3	1.6
Preanal length	64.4	63.4–66.8	64.4	0.9
Prepelvic length	46.9	46.1–49.9	47.4	1.1
Caudal peduncle length	15.6	11.5–16.2	14.7	1.4
Caudal peduncle depth	9.6	9.6–11.8	11.1	0.7
Length of upper caudal-fin lobe	24.7	24.7–28.6	26.8	1.4
Length of lower caudal-fin lobe	23.5	23.5–26.2	25.2	1.2
Length of medial caudal rays	14.8	14.8–17.0	15.8	0.8
In percent of head length				
Snout length	28.4	23.7–28.5	26.5	1.0
Orbital diameter	33.3	30.7–37.4	33.3	2.2
Interorbital width	36.9	35.3–41.3	39.0	2.0
Internarial width	19.9	15.6–22.3	20.0	2.1
Upper jaw length	36.2	29.6–36.7	33.3	2.5
Lower jaw length	39.0	37.3–44.2	40.9	2.2
Maxillary barbel length	4.3	1.5–4.7	2.9	1.2
Rostral barbel length	10.6	6.3–11.7	9.1	1.8

37[2], 38[1]) body scales along its length. 12–14 circumpeduncular scales, $\frac{1}{2}7/1/1\frac{1}{2}$ (5), $\frac{1}{2}8/1/1\frac{1}{2}$ * (5) scales in transverse line between dorsal-fin origin and mid-ventral scale row; 14–17 (14[1], 15[3], 16[3], 17*[3]) predorsal scales; 19–26 (19[3], 20*[1], 21[3], 22[1], 23[0], 24[0], 25[1], 26[1]) mid-ventral scales. Abdominal vertebrae 16–17; caudal vertebrae 19; total vertebrae 35–36. Pharyngeal teeth in 3 rows (5,4,2;2,4,5), distally grooved; danionin notch present. Infraorbital process present on posterior edge of 1st infraorbital. Anteroventral-most point and posteroventral-most point of supraorbital entering orbit (Fig. 6c).

Coloration: In preservative (Fig. 6a), body background colour light olive dorsally, light cream ventrally. A dark cleithral spot present at posterodorsal corner of opercular opening. 5-6 dark, irregular, vertical bars, restricted to body anterior to dorsal-fin origin. P+1 stripe separated from P stripe by a narrow interspace, originating level with posteriormost vertical bar, tapering to end of caudal peduncle, extending to medial caudal-fin rays. P-1 stripe originating at or behind anal-fin origin, continuing to caudal-fin base. Median fins with light scattering of minute melanophores on interradiial membranes. Paired fins unpigmented. In life (Fig. 6b), dorsal surface of body with bluish-metallic sheen, lateral and ventral surfaces of body with a silvery sheen. Anterior vertical bars,

P stripe, P+1 stripe and P-1 stripe metallic blue; interspaces yellow. Medial caudal rays dark blue.

Distribution and habitat: *Devario udenii* was recorded only from Homadola stream, a tributary of the Gin River, close to Udugama town in the Galle District (Fig. 3). It was observed in fast-flowing water within moderately shaded areas (Fig. 6d).

Etymology: The species name is in honour of Udeni Edirisinghe (Professor of Animal Science of the University of Peradeniya, Sri Lanka), for his enormous contributions to ichthyology of Sri Lanka; and for continuing support of biodiversity research and education in Sri Lanka.

Remarks: *Devario udenii* is distinguished from all other Sri Lankan *Devario* except *D. pathirana* by having the dorsal fin origin to hypural distance, when carried forward, reaching the middle of the eye, and the anterior half of the body with narrow, vertical interspaces between much broader blue bars (Fig. 6b). It is distinguished from *D. pathirana* by having $\frac{1}{2}7/1/1\frac{1}{2}$ (vs. $\frac{1}{2}8/1/1\frac{1}{2}$) scales in transverse line on body, 12–13 (vs. 14) branched anal-fin rays, shorter pectoral-fin (18–23 vs. 23–24 %SL), shorter internarial width (16–22 vs. 22–24 %HL), the P stripe originating a little in advance of the dorsal-fin origin (vs. P stripe restricted to caudal peduncle) and the presence of P+1 and P-1 stripes (vs. absent in *D. pathirana*).

***Devario monticola* nom. nov.**

Danio lineolatus Bleeker, 1863: 253 (“Ceylon” [= Sri Lanka]).

(Fig. 7)

Given its preoccupation in *Devario* by *Leuciscus lineolatus* Blyth, 1858 (Fang Kullander 2001; Kottelat 2013), we here provide the replacement name *Devario monticola*, nomen novum, for *Danio lineolatus* Bleeker, 1863 (see Discussion).

Recent material: WHT 5350, 52.6 mm SL (male); Agra Oya (Mahaweli River basin), near Torrington Estate, Agarapatana, 6°51'51.7"N 80°42'11.4"E, 1200 m; S. Batuwita, S.V. Nanayakkara, 27 May 2001. — NMSL WHT 5350, 4, 51.5–56.9 mm SL (females); Agra Oya (Mahaweli River basin), near Torrington Estate, Agarapatana, 6°51'51.7"N 80°42'11.4"E, 1200 m. — NMSL WHT 9813, 5, 67.3–73.7 mm SL (females); Agra Oya (Mahaweli River basin), near Torrington Estate, Agarapatana, 6°51'51.7"N 80°42'11.4"E, 1200 m, S.V. Nanayakkara, 3 Mar 2013. Other material. — WHT 11012, 1, (C&S), Agra Oya (Mahaweli River basin), near Torrington Estate, Agarapatana, 6°51'51.7"N 80°42'11.4"E, 1200 m.

Diagnosis: *Devario monticola* is distinguished from all other species of Sri Lankan *Devario* by the combination of following characters: body depth 26–29 %SL; snout length equal to or greater than eye diameter; 4 or 5 dark, irregular, vertical bars restricted to anterior half of body; P-1 stripe narrower than P stripe, originating level with P stripe, extending to origin of caudal peduncle; 13–19 predorsal scales; $9\frac{1}{2}$ – $11\frac{1}{2}$ branched dorsal-fin rays, $12\frac{1}{2}$ – $15\frac{1}{2}$ branched anal-fin rays; a process on first infraorbital; danionin notch present; dorso-hypural distance when carried forward falling well short of posterior border of eye; and pectoral-fin, when adpressed, not reaching pelvic-fin origin.

Description: For general appearance see Figure 7. Morphometric and meristic data are provided in Table 5. Snout short, its length subequal to eye diameter. Dorsal surface of head with well-developed skin grooves along supraorbital shelves. Numerous nuptial tubercles present along upper margin of lower jaw. Dorsal-fin with 3 unbranched and $9\frac{1}{2}$ – $11\frac{1}{2}$ (9[2], 10[6], 11[2]) branched rays. Anal-fin with 3 unbranched and $12\frac{1}{2}$ – $15\frac{1}{2}$ (12[1], 13[1], 14[5], 15[3]) branched rays. Pelvic-fin with 3 unbranched and 6 branched rays, pectoral-fin with 3 unbranched and 13 branched rays. Pectoral-fin not reaching pelvic-fin origin when adpressed (Fig. 7a, b).

Lateral line complete, declining steeply for first 4–5 scales, perforating 33–37 (33[1], 34[4], 35[2], 36[2], 37[1]) body scales along its length, excluding scales on base of caudal-fin. 12–14 scale rows around caudal peduncle, $\frac{1}{2}7/1/1\frac{1}{2}$ (7), $\frac{1}{2}8/1/1\frac{1}{2}$ (3) scales in transverse line between dorsal-fin origin and mid-ventral scale

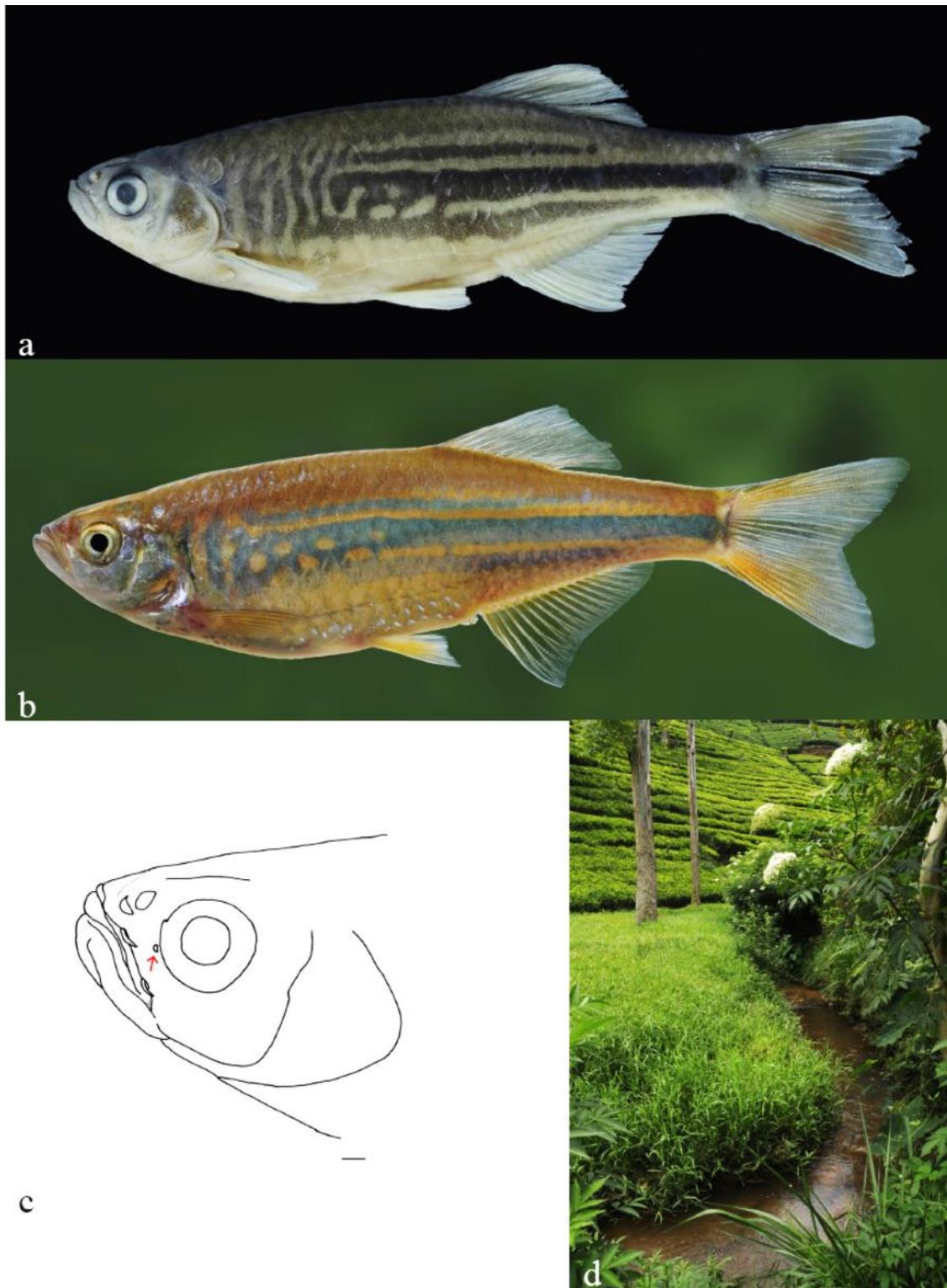


Figure 7. *Devario monticola*: (a) NMSL WHT 9817, female, 70.0 mm SL; Agra Oya near Torrington Estate, Agarapatana, (b) in life, from Agra Oya, (c) lateral view of head of NMSL WHT 9813, 70.0 mm SL; Agra Oya (red arrow head point the infraorbital process) and (d) habitat at Agarapatana (Scale bar 1 mm).

row; 13–19 (13[1], 14[0], 15[1], 16[1], 17[5], 18[1], 19[1]) predorsal scales; 18–26 (18[1], 19[0], 20[5], 21[3], 22[0], 23[0], 24[0], 25[0], 26[1]) mid-ventral scales. Abdominal vertebrae 16–17; caudal vertebrae 17–18; total vertebrae 33–35. Pharyngeal teeth in 3 rows (5,3–4,1–2; 1–2,3–4,4), distally grooved. A process present on posterior edge of 1st infraorbital. Anteroventral-most point of supraorbital entering orbit (Fig. 7c).

Table 5. Morphometric data of *Devario monticola* (WHT 5350, 61.0 mm, NMSL WHT 9808, 4, 51.5–56.9 mm SL and NMSL WHT 9813, 5, 67.3–73.7 mm SL).

	range	mean	S.D.
Standard length (mm)	51.5–73.7	62.7	8.6
In percent of standard length			
Total length	123–130	126	2
Body depth	26.1–29.0	27.1	0.9
Head length	21.9–26.6	24.0	1.2
Predorsal length	52.2–56.8	55.4	1.3
Dorsal fin origin to hypural distance	44.2–47.5	46.3	1.2
Dorsal-fin base length	16.6–21.7	19.4	1.6
Dorsal-fin height	19.6–22.0	21.0	0.8
Anal-fin base length	18.1–23.2	21.0	1.5
Anal-fin height	15.9–18.8	17.5	1.0
Pelvic-fin length	13.5–15.1	14.5	0.5
Pectoral-fin length	16.9–20.6	19.2	1.2
Preanal length	60.1–65.5	62.7	2.1
Prepelvic length	43.1–50.7	46.4	2.1
Caudal peduncle length	14.3–17.0	15.8	0.9
Caudal peduncle depth	10.1–11.4	10.6	0.5
Length of upper caudal-fin lobe	22.1–27.9	25.3	1.9
Length of lower caudal-fin lobe	22.8–27.0	25.0	1.5
Length of medial caudal rays	13.2–18.1	16.1	1.3
In percent of head length			
Snout length	26.7–30.9	28.3	1.4
Orbital diameter	27.9–32.4	29.7	1.7
Interorbital width	34.3–42.6	38.8	2.7
Internarial width	17.3–22.9	20.8	1.7
Upper jaw length	29.3–37.2	34.3	2.5
Lower jaw length	35.0–43.0	38.0	2.5
Maxillary barbel length	2.3–5.5	3.5	1.1
Rostral barbel length	6.3–13.8	9.8	2.7

Coloration: In preservative (Fig. 7a), body background colour light olive dorsally, whitish ventrally. A cleithral spot present. 4 or 5 dark, irregular, vertical blue-black bars on anterior half of body, between pectoral-fin and pelvic-fin origins. P stripe originating a little in advance of pelvic-fin origin. P-1 stripe originating about level with P stripe. P+1 stripe much narrower than P stripe, originating about level with P stripe and P-1 stripe, just extending to caudal peduncle. Dorsal and pectoral-fins lightly sprinkled with minute melanophores; other fins unpigmented. In life (Fig. 7b), dorsal surface of body light-yellowish brown with a metallic sheen, lateral and ventral surface of body with a silvery sheen. Vertical bars, P- stripe, P+1 stripe and P-1 stripe metallic blue; interspaces yellow.

Distribution and habitat: *Devario monticola* is apparently confined to the Agra Oya (Fig. 7d), a tributary of the Mahaweli River, in the central hills of Sri Lanka (Fig. 3), an area completely deforested for tea cultivation in the 19th century.

Etymology: The species name, ‘monticola’, is Latin for ‘inhabitant of the mountains’, an allusion to the type locality, Agarapatana, Nuwara Eliya District, Sri Lanka.

Remarks: *Devario monticola* is distinguished from all other Sri Lankan *Devario* by having the pectoral-fin, when adpressed, not reaching (vs. reaching or passing) the pelvic-fin origin. It is further distinguished from *D. pathirana* and *D. udenii* by having the dorso-hypural distance, when carried forward, falling well short of the posterior border of the eye (vs. reaching the middle the eye). It differs from *D. pathirana* by having the P stripe originating well in advance of the dorsal-fin origin (vs. P stripe restricted to caudal peduncle); and from *D. malabaricus* by having the P stripe anteriorly entire (vs. bifurcated). *Devario monticola* is distinguished from *D. micronema* by lacking (vs. possessing) a square-shaped process on the first infraorbital.

***Devario annataliae*, new species**

(Fig. 8)

Holotype: NMSL WHT 9811, 66.3 mm SL; Gin River, Brahmana Ella falls in Sinharaja World Heritage Site, near Lankagama, 06°22'29.1"N 80°27'11.7"E, R. Krishantha, 2 Jan 2011.

Paratypes: NMSL WHT 9812, 11, 48.6–64.3 mm SL; same collection data as holotype.

Other material: NMSL WHT 9814, 1, 69.1 mm SL (C&S): same data as holotype.

Diagnosis: *Devario annataliae* is distinguished from all Sri Lankan *Devario* by the combination of following characters: body depth 24–27 %SL; snout length equal to or greater than eye diameter; 5 or 6 irregular, dark blue vertical bars on anterior half of body; P stripe, originating just anterior to origin of dorsal-fin; 16–17 predorsal scales; 10½ branched dorsal-fin rays; 11½–14½ branched anal-fin rays; a minute process on first infraorbital; danionin notch present; dorsal fin origin to hypural distance, when carried forward, falling well short of posterior border of eye; pectoral-fin, when adpressed, just reaching pelvic-fin origin.

Description: For general appearance see Figure 8. Morphometric and meristic data are provided in Table 6. Snout length slightly less than eye diameter. Mouth supraterminal. Danionin notch present. Anteroventral-most point of supraorbital entering orbit (Fig. 8c). Dorsal-fin with 3 unbranched and 10½ (12) branched rays. Anal-fin with 3 unbranched and 11½–14½ (11[1], 12[0], 13*[7], 14[3], 15[1]) branched rays. Pelvic-fin with 3 unbranched and 6 branched rays, pectoral-fin with 3 unbranched and 12 branched rays. Adpressed pectoral-fin just reaching pelvic-fin origin.

Lateral line complete, declining gently for first 5–7 scales, perforating 35–38 (35*[3], 36[6], 37[0], 38[1], 39[1], 40[1]) body scales along its length. 14 circumpeduncular scales, ½8/1/1½* (9), ½8/1/2½ (2), ½9/1/2½ (1) scales in transverse line between dorsal-fin origin and mid-ventral scale row; 16–18 (16[4], 17*[7], 18[1]) predorsal scales; 20–24 (20[3], 21[0], 22*[2], 23[5], 24[2]) mid-ventral scales. Abdominal vertebrae, 17; caudal vertebrae, 19; total vertebrae, 36. Pharyngeal teeth in 3 rows (5,4,2; 2,4,5), distally grooved; a minute infraorbital process on first infraorbital.

Coloration: In preservative (Fig. 8a), body background colour dusky olive dorsally, whitish ventrally. A dark cleithral spot present at posterodorsal corner of opercular opening. 5 or 6 dark blue, irregular, vertical bars on anterior half of the body. P stripe originating slightly anterior to origin of dorsal-fin, at about same level as P-1 and P+1 stripes, both of which taper on to caudal peduncle. A light scattering of melanophores on interradiation membranes of all fins. In life (Fig. 8b), dorsal surface of body light yellow with a metallic sheen, lateral and ventral surface of body with a silvery sheen. Anterior vertical bars and all stripes metallic blue; interspaces bright yellow. Medial caudal rays often dark blue, other fins hyaline or orange.

Distribution and habitat: This species was recorded only from torrents close to the foot of Brahmana Ella waterfall (Fig. 8d) in the Sinharaja World Heritage Site (Fig. 3).

Etymology: The species is named to honour of wildlife enthusiast Natalie Ann Ratnaweera (14 Feb 1990–23 Jun 2012).

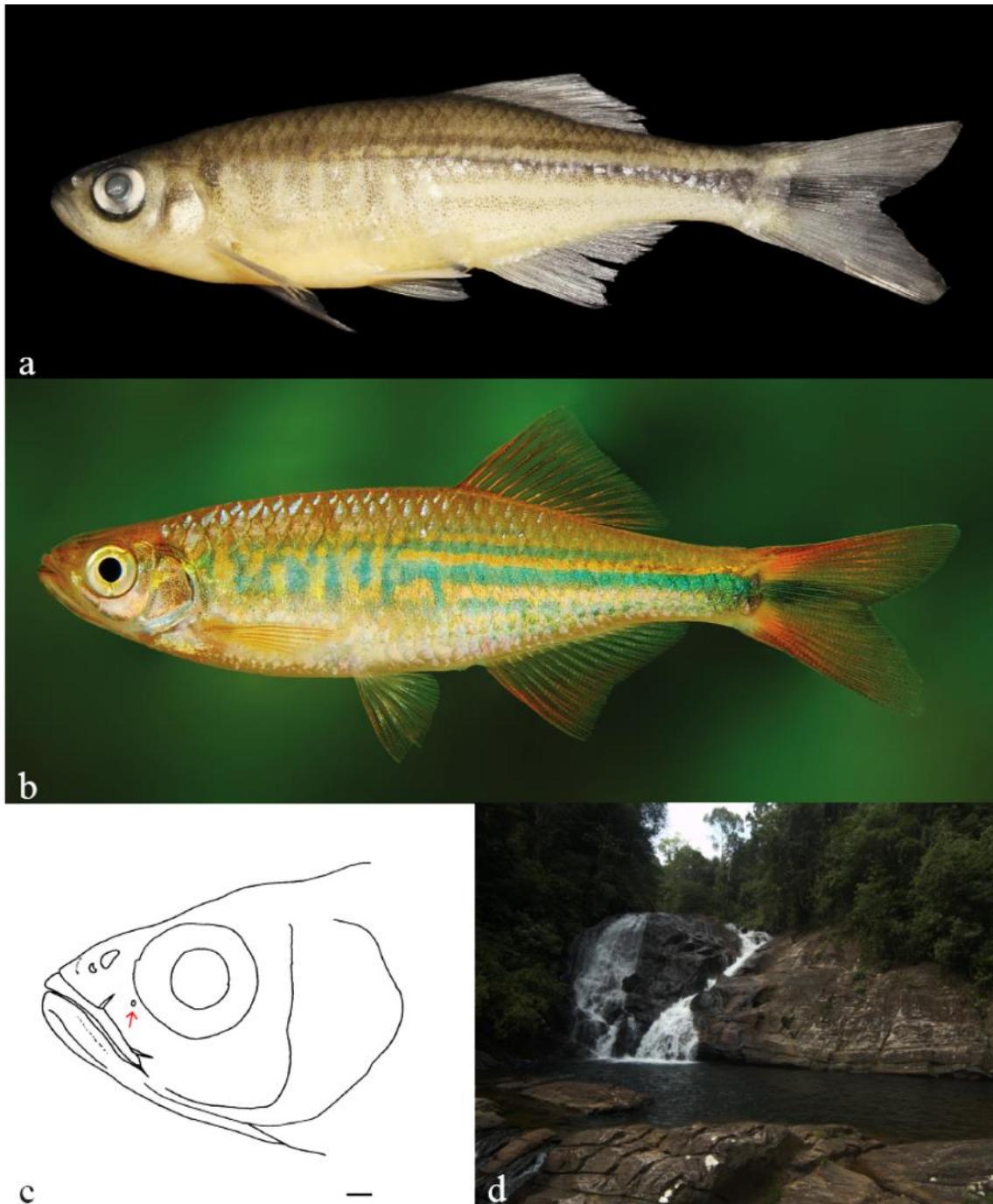


Figure 8. *Devario annataliae*: (a) NMSL WHT 9819, female, 56.2 mm SL; Brahmana Ella Falls in the Sinharaja WHS, (b) in life, from Brahmana Ella, (c) lateral view of head of NMSL WHT 9811, paratype, 66.3 mm SL; from Brahmana Ella (red arrow head point the infraorbital process) and (d) habitat at Brahmana Ella Falls (Scale bar 1 mm).

Remarks: *Devario annataliae* is easily distinguished from *D. pathirana* by possessing a P+1 stripe and P-1 stripe (vs. both absent in *D. pathirana*). It is distinguished from *D. udenii* by having the dorsal-fin origin to hypural distance, when carried forward, just reaching the posterior border of the eye (vs. middle of eye) and the adpressed pectoral-fin just reaching (vs. reaching well beyond) the pelvic-fin origin. It differs from *D. monticola* by having the adpressed pectoral-fin just reaching (vs. falling well short of) the pelvic-fin origin. *Devario annataliae* is distinguished from *D. micronema* by the absence (vs. presence) of a square-shaped process on the 1st infraorbital; and from *D. malabaricus* in having P stripe anteriorly entire (vs. bifurcated), shorter body depth

Table 6. Morphometric data of holotype (NMSL WHT 9811, 59.2 mm SL) and paratypes (NMSL WHT 9812, 11, 48.6–66.3 mm SL) of *Devario annnataliae*.

	range	mean	S.D.
Standard length (mm)	51.5–73.7	62.7	8.6
In percent of standard length			
Total length	123–130	126	2
Body depth	26.1–29.0	27.1	0.9
Head length	21.9–26.6	24.0	1.2
Predorsal length	52.2–56.8	55.4	1.3
Dorsal fin origin to hypural distance	44.2–47.5	46.3	1.2
Dorsal-fin base length	16.6–21.7	19.4	1.6
Dorsal-fin height	19.6–22.0	21.0	0.8
Anal-fin base length	18.1–23.2	21.0	1.5
Anal-fin height	15.9–18.8	17.5	1.0
Pelvic-fin length	13.5–15.1	14.5	0.5
Pectoral-fin length	16.9–20.6	19.2	1.2
Preanal length	60.1–65.5	62.7	2.1
Prepelvic length	43.1–50.7	46.4	2.1
Caudal peduncle length	14.3–17.0	15.8	0.9
Caudal peduncle depth	10.1–11.4	10.6	0.5
Length of upper caudal-fin lobe	22.1–27.9	25.3	1.9
Length of lower caudal-fin lobe	22.8–27.0	25.0	1.5
Length of medial caudal rays	13.2–18.1	16.1	1.3
In percent of head length			
Snout length	26.7–30.9	28.3	1.4
Orbital diameter	27.9–32.4	29.7	1.7
Interorbital width	34.3–42.6	38.8	2.7
Internarial width	17.3–22.9	20.8	1.7
Upper jaw length	29.3–37.2	34.3	2.5
Lower jaw length	35.0–43.0	38.0	2.5
Maxillary barbel length	2.3–5.5	3.5	1.1
Rostral barbel length	6.3–13.8	9.8	2.7

(24–27 vs. 27–35 % SL) and shorter internarial width (17–25 vs. 26–33 %HL).

Key to the Sri Lankan species of *Devario*

- 1 P stripe restricted to caudal peduncle; P+1 and P-1 stripes absent (Fig. 4a).....*Devario pathirana*
- P stripe extending onto body anterior to caudal peduncle; P+1 and P-1 stripes present (Fig. 2a).....2
- 2 Infraorbital process absent; P stripe anteriorly bifurcated (Fig. 2a–c).....*Devario malabaricus*
- Infraorbital process present; P stripe anteriorly entire (not bifurcated).....3
- 3 Infraorbital process large, prominent, square-shaped (Fig. 5c).....*Devario micronema*
- Infraorbital small, acute or knob-like (Fig. 7c).....4
- 4 Dorsal fin origin to hypural distance greater than distance between dorsal-fin origin and posterior margin of eye; anterior half of the body with narrow, yellow vertical interspaces between much broader blue bars (Fig. 6a).....*Devario udenii*
- Dorsal fin origin to hypural distance less than distance between dorsal-fin origin and posterior margin of eye; anterior half of the body with yellow vertical interspaces equal to blue bars (Fig. 7a).....5
- 5 P-1 stripe originating anterior to pelvic-fin origin; adpressed pectoral-fin falling well-short of pelvic-fin origin (Fig. 7a, b); eye diameter 30–32 %HL; internarial width 17–30 %HL.....*Devario monticola*

- P-1 stripe originating posterior to pelvic-fin origin; adpressed pectoral-fin just reaching pelvic-fin origin; eye diameter 33–39 %HL; internarial width 21–33 %HL.....*Devario annataliae*

Discussion

According to Bleeker (1863, 1864), *Danio lineolatus* had short maxillary barbels, a P stripe extended up to the median caudal-fin rays and a longer standard length (74.0-80.0 mm). The combination of these characters supports its generic placement in *Devario* sensu Fang (2003). *Leuciscus lineolatus* Blyth, 1858 (type locality Darjeeling, Sikkim, India) is a synonym of *Perilampus aequipinnatus* McClelland, 1839 (Day 1878; Barman 1991). Subsequently, Fang Kullander (2001) assigned *P. aequipinnatus* in *Devario*, hence, *Danio lineolatus* Bleeker, 1863 (type locality Sri Lanka) becomes a secondary homonym in *Devario* of *L. lineolatus* Blyth, 1858. Recently, the synonymy of *L. lineolatus* Blyth, 1858 under *Perilampus aequipinnatus* McClelland, 1839 was also accepted by Kottelat (2013). The holotype of *Danio lineolatus* Bleeker appears to be lost. Therefore, its identity remains to be elucidated through the discovery of its population in Sri Lanka. Bleeker (1863, 1864) illustrated this species as having bars on the anterior part of its body, distinguishing it further from *D. micronema* described by him due to the presence of an obtuse infraorbital process and in having a pectoral fin that does not reach the pelvic fin ('ventralibus multo longioribus sed eas non attingentibus'). The only Sri Lankan species of *Devario* with the above distinct characters is found in the population collected from Agarapatana. Thus, the Agarapatana population is hereby assigned to *D. lineolatus* Bleeker, 1863 and is provided a replacement name *Devario monticola*.

While the 82 mm total-length holotype of *D. micronema* (Bleeker 1863) is apparently lost, its description facilitates its identity namely the presence of square-shaped suborbital spine ('osse suborbitali anteriore oblong tetragono oblique deorsum directo,'). Although the precise location from which this species was collected is unknown, it has been suggested (e.g., Pethiyagoda, 2007: 114) that Bleeker was the collector of this species during his stop in Sri Lanka en route to the Netherlands in 1860. Bleeker (1865) writes that he found, in the Natural History Museum in Leiden, a few species of these families, originating from Ceylon and in a perfect state of preservation. In addition, he has listed following four species: *Garra ceylonensis*, *Systemus pleurotaenia*, *Puntius bimaculatus* and *Schistura notostigma*. All these dwell in the streams and rivers draining the foothills into the coastal floodplain of the island's west, from which the living population of *Devario micronema* was rediscovered. Moreover, the square-shaped suborbital spine was consistently found in all the materials referred to *D. micronema* from Kitulgala. Hence, our conclusion is further established based on its morphology.

Pethiyagoda (1991: 65) illustrated as "*Danio aequipinnatus*", from the collection of Maurice Kottelat (CMK), a species of *Devario* said to be from Pallegama, on the eastern slopes of the Knuckles Hills of Sri Lanka, which possesses an infraorbital process. Collections of this study obtained from Pallegama, however, consisted only of *D. malabaricus* (in few examples with minute infraorbital process). Further, as shown by Jayaram (1991), the identification of *D. aequipinnatus* (McClelland 1839) from Sri Lanka by earlier authors (Munro 1955; Pethiyagoda 1991) was clearly an error: its type locality is Assam, northern India and its occurrence in Sri Lanka is very unlikely.

The only other species of *Devario* recorded from Sri Lanka prior to 1990 was *Eustira ceylonensis* Günther, 1868 (precise locality unknown). While the colour of its six syntypes - all evidently juveniles - are faded, the illustration and partial description of the "holotype" provided by Silas (1957) suggest it to be *D. malabaricus*. It has the dorsal fin origin to hypural distance greater than distance between dorsal-fin origin and posterior margin of eye, a character shared only by *D. malabaricus*, *D. monticola* and *D. annataliae*. *Eustira ceylonensis* Günther morphometrically differs from *Devario monticola* by having a pectoral fin reaching the base of pelvic fin. *Eustira ceylonensis* Günther also distinguished from *D. annataliae* by having a greater body depth (29 vs. 24-27 in

SL).

The type locality of *Perilampus aurolineatus* Day, 1865, Cochin (Kerala, India), lies within that of *D. malabaricus* (Malabar, now Kerala, India). Examination of the putative syntype of the former in the AMS (B.7834) shows it to be a juvenile *Devario*, the coloration of which is now completely faded. The illustration in Day (1865: pl. 17, fig. 2), however, shows it to be a striped species, lacking bars on the anterior part of the body, quite unlike any of the Sri Lankan species of *Devario*. Hence, in this study Fang (2003) is tentatively followed in treating it as a synonym of *D. malabaricus*.

Devario malabaricus itself is a widely distributed species that occurs throughout the lowest peneplains of both Sri Lanka and Kerala, India. It is the only species of Sri Lankan *Devario* shares with India. It shows considerable intraspecific variation (body colouration, variation in body depth) and it appears likely that future work might show it to comprise more than a single species. Given that its holotype is lost (types of fishes described by T.C. Jerdon did not survive) and its type locality is only vaguely defined as "Malabar". Hence, it is desirable that its identity be stabilised through the designation of a neotype. Therefore, in this study, designate the 73.6 mm SL specimen AMS I.46342-001 is designated as a neotype of *Perilampus malabaricus* Jerdon, 1949. A diagnosis inclusive of the neotype is provided in the account of *D. malabaricus*, which is consistent with the brief original description of this species. The neotype is from Panamkulam, on the Chalakudy River, which lies within the territory of "Malabar" as understood in the time of Jerdon.

Two further names published simultaneously by Jerdon (1849), namely *Perilampus canarensis* and *P. mysoricus*, have been treated as synonyms of *D. malabaricus* by Fang (2003). Material of these former species is unknown, and it is necessary that their identity too, be stabilized if the taxonomic status of *D. malabaricus* is to be stabilized. Therefore, AMS I.46342-001 was designated also as neotype *Perilampus mysoricus* Jerdon, 1849. Names of *P. mysoricus* and *P. malabaricus* now become simultaneous objective synonyms, among which precedence was given to *P. malabaricus*. According to Jerdon (1849), *P. canarensis* had 20 anal-fin rays; which was not observed in materials from Sri Lanka as well as for south Indian specimens (all from Kerala State; anal-fin ray count was 12–16). Hence, it is believed that *P. canarensis* may represent a separable species of *D. malabaricus* which will be discovered in future studies.

Sanger and McCune (2002) reported a *D. malabaricus*, MCZ 52399, which showed "a doubling of neural arches of the pleural vertebrae and on the compound centrum". However, this condition was not observed in any of the cleared and stained specimens (N. B.: Indian specimens could not be stained). Hence it is concluded that "*D. malabaricus*" examined by Sanger and McCune (2002) originated in Maharashtra State, several hundred kilometres north of "Malabar" might have represented a different species.

Sri Lankan endemic *D. pathirana* is a unique species because it is quite easily distinguished from all other Sri Lankan congeners based on its colouration (a barred-species). In addition, it is restricted to Nilwala River basin. A further assessment of the generic placement of this species and interrelationships of Sri Lankan members of the subfamily Danioninae work is in progress (Batuwita et al. in prep.).

Acknowledgments

We are grateful to R. Pethiyagoda (AMS) for providing data on AMS I.46342-001 and the holotype of *Perilampus aurolineatus*, and critically reviewing the early draft of the manuscript. We are also particularly grateful to G. Ott for access to historical literature, providing translations of Latin descriptions and the Figure 1; and to M. Kottelat for his critical comments on the nomenclatural issues. We thank N. Wickramasinghe, M. Goonatilake and C. Munasinghe (NMSL) for permission to access material in their care; and S. Nanayakkara (WHT) for hospitality at Agra Arboretum. We thank U. Edirisinghe (University of Peradeniya [UP]) and M. Meegaskumbura (UP) for providing laboratory facilities; and to N. Hapuarachch, R. Madushanka,

S. Deshaprema, T. Jayaratne, J. Gallangoda, S. Akmeemana, R. Krishantha, S. Darshana, K. Wewelwala and L. Siriwardene (WCSG) for field work. Finally, we thank the Department of Wildlife Conservation for permits (ref. WL/3/3/354) to conduct field work; and the Biodiversity Secretariat of the Ministry of Environment and Renewable Energy, the WHT, the Nagao Natural Environment Foundation, Japan (NEF), the Nations Trust Bank PLC and the Rainforest Ec lodge for financial support.

Literature cited

- Barman R.P. 1991. A taxonomic revision of the Indo-Burmese species of *Danio* Hamilton-Buchanan (Pisces: Cyprinidae). Records of the Zoological Survey of India. Occasional Paper 137: 1-91.
- Bleeker P. 1863. Description de quelques espèces nouvelles de Cyprinoïdes du Ceylan. Verslagen en Mededeelingen der Koninklijke Akademie van Wetenschappen. Afdeling Natuurkunde 15: 239-253.
- Bleeker P. 1864. Description de quelques espèces de Cobitoïdes et de Cyprinoïdes de Ceylan. Natuurkundige Verhandelingen van de Hollandsche Maatschappij der Wetenschappen te Haarlem (Ser. 2) 20: 1-23.
- Bleeker P. 1865-69. Atlas ichthyologique des Indes Orientales Néerlandaises, publié sous les auspices du Gouvernement colonial néerlandais. Tome V. Baudroies, Ostracions, Gymnodontes, Balistes. 152 p.
- Blyth E. 1858. Report of Curator, Zoological Department, May, 1858. Journal of the Asiatic Society of Bengal 27: 267-290.
- Day F. 1865. On the fishes of Cochin, on the Malabar Coast of India. Part II. Anacanthini. Proceedings of the Zoological Society of London 1865: 286-318.
- Day F. 1878. The Fishes of India, being a natural history of the fishes known to inhabit the seas and freshwaters of India, Burma and Ceylon. William Dawson and Sons, London. 778 p.
- De Silva M., Hapuarachchi N., Jayaratne, T. 2015. Sri Lankan Freshwater Fishes. Wildlife Conservation Society Galle, Sri Lanka. 391 p.
- Fang F. 1997. Redescription of *Danio kakhienensis*, a poorly known cyprinid fish from the Irrawaddy basin. Ichthyological Exploration of Freshwaters 7: 289-298.
- Fang F. 1998. *Danio kyathit*, a new species of cyprinid fish from Myitkyina, northern Myanmar. Ichthyological Exploration of Freshwaters 8: 273-280.
- Fang F. 2003. Phylogenetic analysis of the Asian cyprinid genus *Danio* (Teleostei, Cyprinidae). Copeia 714-728.
- Fang Kullander F. 2001. Introduction. In: Phylogeny and species diversity of the South and Southeast Asian cyprinid genus *Danio* Hamilton (Teleostei, Cyprinidae). Department of Zoology, Stockholm University, Sweden. pp: 7-26.
- Günther A. 1868. Catalogue of the fishes in the British Museum. Catalogue of the Physostomi, containing the families Heteropygii, Cyprinidae, Gonorhynchidae, Hyodontidae, Osteoglossidae, Clupeidae, Halosauridae, in the collection of the British Museum. 512 p.
- Hora S.L., Nair K.K. 1941. Notes on fishes in the Indian Museum. XLI. New records of freshwater fish from Travancore. Records of the Indian Museum (Calcutta) 43: 387-393.
- ICZN (International Commission for Zoological Nomenclature). 1999. International Code of Zoological Nomenclature. International Trust for Zoological Nomenclature, London. 306 p.
- Jayaram K.C. 1991. Systematic status of *Danio malabaricus* (Pisces: Cyprinidae). Ichthyological Exploration of Freshwaters 2: 109-112.
- Jerdon T.C. 1849. On the fresh-water fishes of southern India. Madras Journal of Literature and Science 15: 302-346.
- Kottelat M. 2013. The fishes of the inland waters of Southeast Asia: a catalogue and core bibliography of the fishes known to occur in freshwaters, mangroves and estuaries. Raffles Bulletin of Zoology 27:(Supplement) 1-663.
- Kottelat M., Pethiyagoda R. 1990. *Danio pathirana*, a new species of cyprinid fish endemic to southern Sri Lanka. Spixiana 12: 315-320.
- McClelland J. 1839. Indian Cyprinidae. Asiatic Researches 19: 217-471.
- Mendis A.S., Fernando C.H. 1962. A guide to the freshwater fauna of Ceylon, Fisheries Station Ceylon (Sri Lanka). 160 p.

-
- Munro I.S.R. 1955. The Marine and Freshwater Fishes of Ceylon, Department of External Affairs, Canberra. 351p.
- Pethiyagoda R. 1991. Freshwater fishes of Sri Lanka. Wildlife Heritage Trust, Colombo. 362 p.
- Pethiyagoda R. 2007. Pearls, spices and green gold: a history of biodiversity exploration in Sri Lanka. WHT Publications, Colombo. 241 p.
- Sanger T.J., McCune A.R. 2002. Comparative osteology of the *Danio* (Cyprinidae: Ostariophysi) axial skeleton with comments on *Danio* relationships based on molecules and morphology. *Zoological Journal of the Linnaean Society* 135: 529-546.
- Silas E.G. 1957. The Ceylonese cyprinid genus *Eustira* Günther considered a synonym of *Danio* Hamilton. *Copeia* 1957: 61-62.
- Taylor W.R., van Dyke, G.C. 1985. Revised procedures for staining and clearing small fishes and other vertebrates for bone and cartilage study. *Cybiurn* 9: 107-119.