

Two new species of fishes of the genus *Schistura* McClelland (Cypriniformes: Balitoridae) from Western Ghats, India

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Two new fish species of the genus *Schistura* McClelland (Cypriniformes: Balitoridae) from Western Ghats, India

Abstract

Schistura nagodiensis and *S. sharavathiensis* are the new fish species of *Schistura* described from Sharavathi river, central Western Ghats. These species are distinct from their closest congeners in *Schistura*, which are evident from variations in the combination of characters such as processus dentiformis, barbels, bars on body, extent of lateral line with pores, marks on lower lip, ray counts, shape of caudal fin, caudal bar, adipose crest, etc. Distinct clusters of Principal Components based on morphometric variables (PCA) further substantiate that these are significantly different from their closest congeners.

Keywords: Two new species, *Schistura*, Western Ghats, Nemacheiline fishes, Sharavathi river, Principal Component Analysis (PCA)

Abbreviations used: CES–Centre for Ecological Sciences, IISc–Indian Institute of Science, ZSI–Zoological Survey of India, SRS–Southern Regional Station, WGBIS–Western Ghats Biodiversity Information System, SL–Standard length.

Introduction

The freshwater fish family, Balitoridae has been divided into two sub-families; Balitorinae and Nemacheilinae. Balitorinae consists of genera *Bhavana*, *Homaloptera*, *Travancoria* and *Balitora*, whereas *Aborichthys*, *Triplophysa*, *Acanthocobitis*, *Yunnanilis*, *Neonemacheilus*, *Nemacheilichthys*, *Oreonectes*, *Longischistura*, *Physoschistura*, *Schistura*, *Mesonemacheilus* and *Nemacheilus* belong to Nemacheilinae. Of these, *Schistura* McClelland, 1838 has the largest assemblage of Nemacheiline species (Jayaram 1999), which inhabits mainly hill streams, waterfalls and also penetrates into sub-terranean region (Vidhayanon 2003), having wide distribution throughout South, Southwest and Southeast Asia. Western Ghats of India with a distinct biogeographical regime, has six taxa, namely *S. semiarmatus*, *S. denisoni denisoni*, *S. nilgiriensis*, *S. kodaguensis*, *S. denisoni mukambbikaensis* and *S. denisoni pambaensis* (Jayaram 1999). Recent discoveries of fish species in Western Ghats conforms Dahanukar et al., (2005) highlight that there are many more unexplored species in the region, which requires detailed field investigations.

Ichthyodiversity and species distribution studies carried out in Sharavathi river basin, Western Ghats (Figure 1) covering all seasons and microhabitats over a period of 36 months has led to the discovery of two new species of *Schistura* in ecologically sensitive habitats as well as provided insight into habitat preference of many endemic and rare species.

Materials and Methods

Specimens were collected using a 1 m × 2 m net, dragging at the bottom of the streams and preserved in 6% formaldehyde, and were deposited at the Southern Regional Station, ZSI and CES, IISc. These specimens were classified as per Jayaram (1999) and compared using Menon (1987); Kottelat (1990); Talwar and Jhingran (1991); Kottelat, (2004); Vishwanath and Shanta, (2004); and Vishwanath and Nebeshwar, (2004); Vishwanath and Sharma, (2005). Menon, (1987); Kottelat, (1990); and Jayaram, (2002) were referred for terminologies and Kottelat (1990) for counts and measurements. Morphological measurements were done with a slide caliper (0.1 mm precision). Thirty one (26 nophometric and 5 meristic) characters of new species and congeners were analysed using Principal Component Analysis (STATISTICA, 1999).

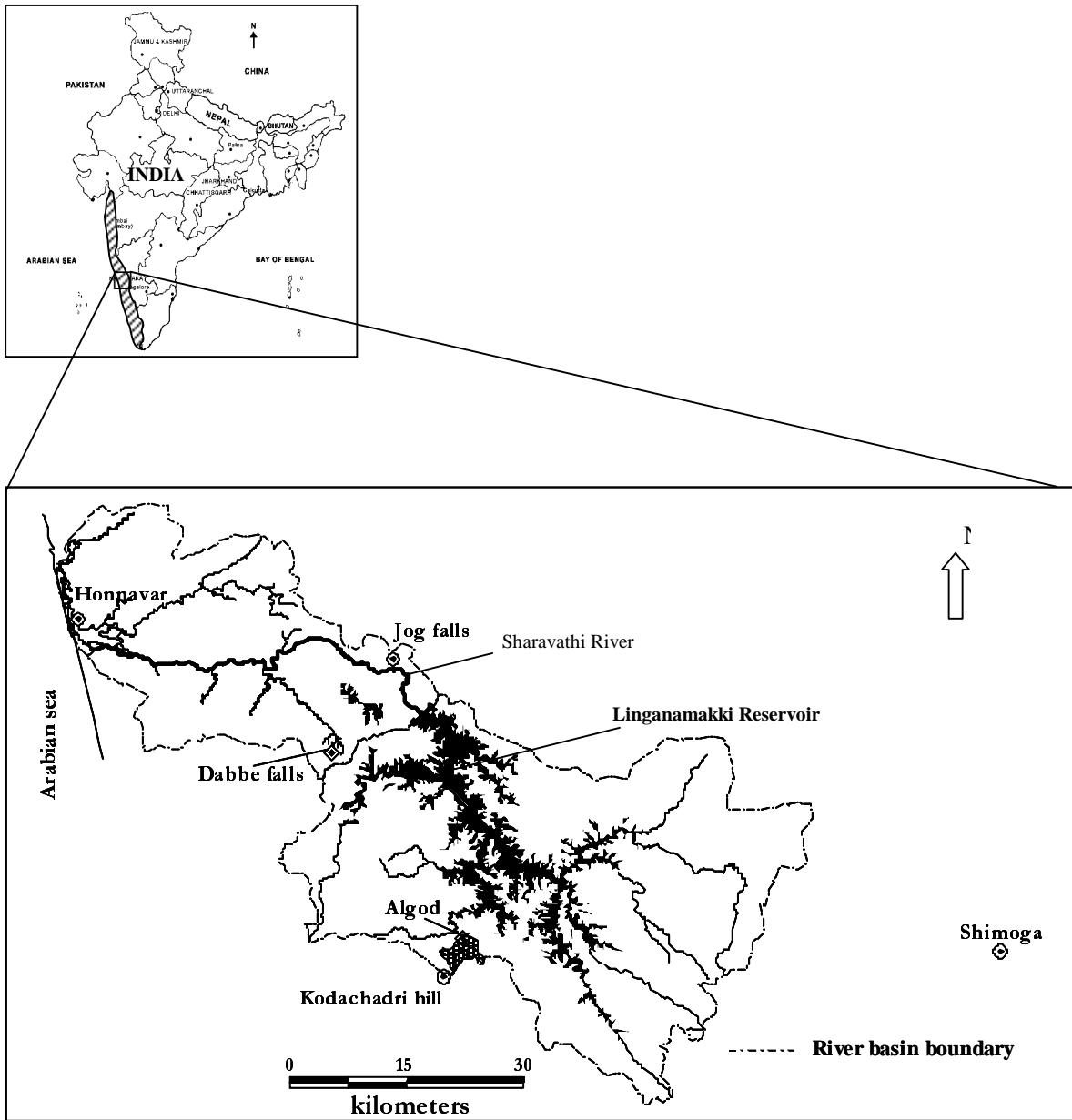


FIGURE 1. Sharavathi river basin with type localities of *Schistura nagodiensis* and *S. sharavathiensis* ().

***I. Schistura nagodiensis* sp. nov.**

Holotype: 26.xii.2003, Sharavathi river (13°54'40"N, 74°53'49"E), Algod, Shimoga, Karnataka, coll. Sreekantha and Vishnu D, F-7595 ZSI/SRS, 28.0mm SL.

Paratypes: 12 exs., 28.0mm SL and 25.0mm SL, F-7596 ZSI/SRS, 26.xii.2003; 25.0mm SL, 25.0mm SL, 26.0mm SL, 25.0mm SL, 26.0mm SL, 26.0mm SL, 25.0mm SL, 26.0mm SL, 25.0mm SL and 23.0mm SL IISc/CES/WGBIS: 3-5-3-5-007, locality and collectors as in holotype.

Diagnosis. A species of *Schistura* depicted in Figure 2, distinguishable from other members by the following combination of characters; processus dentiformis present; 6–9 broad dark brown bars on body, the anterior bars not reaching ventral side; males without a suborbital flap; posterior extremity of anterior nostril prolonged in a filament; incomplete lateral line extending to half length of pectoral with 8–10 pores; lower lip with a black mark on each side of median interruption (Figure 3); 8 ½ dorsal rays, 7–9 pectoral, 6 pelvic and 9+9 caudal rays; deeply emarginate or slightly forked caudal fin; black basal caudal bar, sometimes interrupted; caudal fin with two rows of spots; no axillary pelvic lobe; anus much nearer to anal fin; weakly developed adipose crest on peduncle.

Description

Morphological data and their proportionate values are listed in Tables 1 and 2 respectively. A relatively small species (largest 28 mm in SL) compared to other species of *Schistura* with moderately elongated body, rounded anteriorly to origin of dorsal fin, slightly compressed thereafter; head depressed; snout obtuse; mouth semi-circular; lips thin, upper lip with a small incision in the middle, lower lip with a black mark on either side of median interruption; anterior nostril pierced in the front, posterior extremity prolonged in a filament; eyes large, diameter equals inter orbital width; barbels-inner maxillary shorter than outer, outer maxillary shorter than nasal, not extending to margin of eye; processus dentiformis present; incomplete lateral line with 8–10 pores, extending to half length of pectoral fin; cephalic lateral line system with 6 supraorbital, 4+10 infraorbital, 9 preoperculo-mandibular

and 3 supratemporal pores; fin ray counts, dorsal $2/8^{1/2}$, pectoral 7–9, pelvic 1/6, anal 2/5 and caudal 9+9; dorsal fin equidistant from tip of snout to caudal fin base; distal margin of dorsal fin slightly convex; pelvic fin inserted slightly behind the origin of dorsal fin; anal fin at three quarters of SL, not reaching base of caudal fin; pectoral fin reaches half the distance to pelvic origin, pelvic fin extends beyond anus; caudal fin without axillary lobes, varies from deeply emarginate to slightly forked; weakly developed adipose crest on caudal peduncle.

Colour. Live specimens (in natural condition) light yellowish-brown with 6–9 dark brown cross bars, broader than interspaces; preserved specimens creamy white with black cross bars; bars broader along the lateral line, without reaching ventral surface and restricted to upper two third of body except near caudal peduncle; near caudal peduncle extend to ventral surface; head and snout mottled with dark black spots; a shade of wine red on entire body surface, intense on dorsal fin in live specimens; two rows of spots at one quarter and three quarters of the height of dorsal fin; band on caudal fin base varies from dot to dissociate to complete; a prominent dark black spot on each side of median interruption.

Specimen was collected from the Nagodi tributary, a perennial tributary of river Sharavathi with annual rainfall of over 5500mm. The catchment of this tributary is endowed with numerous torrential hill streams and vegetation cover (nearly 88%) (Figure 4a). Vegetation cover comprises of evergreen to semi-evergreen (36.54%), moist deciduous forests (20.04%), plantations (26.28%) and agricultural area (1.03%). The species is aptly named after the tributary to signify its occurrence as well as habitat preference.

Etymology

Named after its type locality, Nagodi tributary of Sharavathi river, Central Western Ghats.

Distribution

Sharavathi river basin, Central Western Ghats, Karnataka, India

Discussion

Characters such as elongated body with almost uniform depth, blunt snout, inferior mouth, dorsal fin inserted opposite to pelvic fin, with eight branched rays, emarginate caudal fin,

pelvic fins not extending up to anal fin, body with scales, a dark band on the base of caudal fin, presence of characteristic colour pattern on the body in terms of cross bands and a band at the base of caudal fin indicates that this species is a member of *Schistura* genus.

Diagnostic features highlight that the new taxon has unique combination of characters compared to any other species of *Schistura* reported so far in Menon (1987); Kottelat (1990); Talwar and Jhingran (1991); Kottelat, (2004); Vishwanath and Shanta, (2004); Vishwanath and Nebeshwar, (2004) and Vishwanath and Sharma, (2005). Comparison with the species of Western Ghats is provided in Table 3. *Schistura nagodiensis* is comparable only to *S. kodaguensis* Menon. However, it differs from *S. kodaguensis*, which has 11–14 bands, tapering below, caudal fin slightly emarginate, dorsal with a light margin bounded below by an arched black band and a dark base. It resembles to *S. robertsi* in the presence of black mark on the median part of lower lip, prolonged nasal filament, and banding pattern on the body, while differing in caudal fin (emarginate and with one row of dark pigments on the proximal area in *S. robertsi*), dorsal branched rays ($7\frac{1}{2}$), caudal rays (8–9+8 in *S. robertsi*). Plot of principal components (of PCA) gives distinct clusters indicating variations between *S. nagodiensis* and *S. kodaguensis* (Figure 4). Eigen value of PC 1 is 264.2 (accounts for 98.85% variability) and PC 2 is 2.63. Appendix-I provides identification keys to new species.

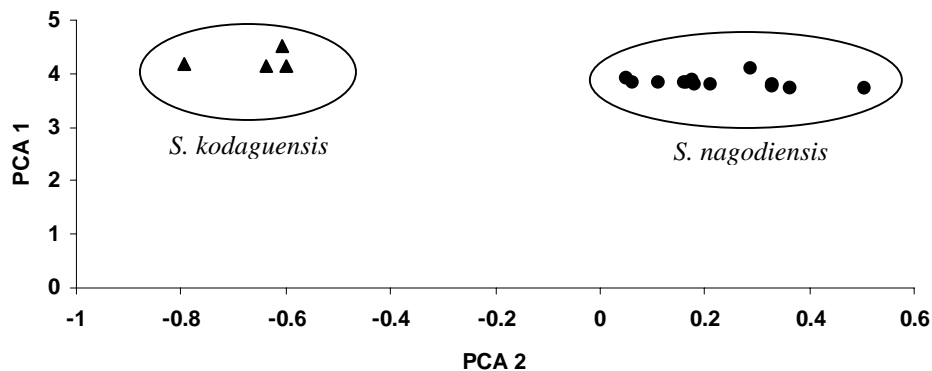


FIGURE 2. Plot of principal components of 31 morphological parameters - *Schistura nagodiensis* and *S. kodaguensis*

Comparative Material

Schistura kodaguensis: 06.x.2004, Kootu Holé (12°26'59"N, 75°42'46"E), about 8 km northwest of Mercara, Coorg, Karnataka, 2 exs. 23.0mm SL and 29.0mm SL, coll. Sreekantha, Vishnu D. and Gururaja K.V., IISc/CES/WGBIS: 3-5-3-5-005.

Schistura nilgiriensis: 06.xi.2003, Sharavathi river, Niluvase (13°44'18"N, 75°06'30"E), Shimoga, Karnataka, 2 exs. 39.0mm SL and 43.0mm SL, coll. Sameer Ali, Gururaja KV and Vishnu D, IISc/CES/WGBIS: 3-5-3-5-004.

Schistura denisoni denisoni: 21.xi.2003, Sharavathi river (13°52'44"N, 75°03'64"E), Jayanagar, Shimoga, Karnataka, 2 exs. 31.0mm SL and 39.0mm SL, coll. Sreekantha and Vishnu D, IISc/CES/WGBIS: 3-5-3-5-001.

Schistura semiarmatus: 23.xi.2003, Sharavathi river (75°03'52"N, 13°52'45"E) Suttha, Shimoga, Karnataka, 2 exs. 32.0mm SL and 34.0mm SL. Coll. Sreekantha and Vishnu D, IISc/CES/WGBIS: 3-5-3-5-006.

II. *Schistura sharavathiensis* sp. nov.

Holotype: 26.iii.2004, Sharavathi river (14°8'15"N, 74°44'30"E), Kalkatte tributary, 1km upper to Dabbe falls, Shimoga, Karnataka, 29.0mm SL, coll. Sreekantha and Vishnu D. F-7597 ZSI/SRS.

Paratypes: 26.iii.2004, 3 exs., 26.0mm SL and 24.0mm SL, ZSI/SRS F-7598, 28.vii.2004; 26.0mm SL, IISc/CES/WGBIS: 3-5-3-5-008, locality and collectors as in Holotype.

Diagnosis. A species of *Schistura* depicted in Figure 5, distinguishable from other members by the following combination of characters: processus dentiformis well developed; 16–18 almost regular brown bars on body, narrower than interspaces; males without suborbital flap; nasal tube with a prolonged barbel, long with unculi; lateral line with 5–6 pores, reaching one third of pectoral fin; lower lip with a median interruption, each side with 4–5 deep furrows; 8½ dorsal, 9 pectoral, 7 pelvic and 7–8+8 caudal rays, slightly emarginate caudal fin; black basal caudal bar with a darker central spot; caudal fin plain; no axillary pelvic lobe; pelvic origin below dorsal or slightly behind; anus much nearer to anal fin; a long and high adipose crest from just behind dorsal fin, a shorter ventral crest.

Description. Morphological and proportionate values of *Schistura sharavathiensis* are listed in Tables 1 and 2 respectively. Body moderately elongate, depth increasing to dorsal fin and thereafter tapering posteriorly; mouth semi-circular; both lips fleshy, median incision in upper lip and lower lip interrupted in the middle with 4–5 deep furrows on each side (Figure 6); processus dentiformis well-developed; nasal tube with a prolonged barbel; head length slightly greater than depth; barbels well-developed, long with unculi; nasal barbel prolonged as in members of the genus *Oreonectes* of the same family; lateral line incomplete, ending at mid level of mid region of pectoral fin, with 5–6 pores, cephalic lateral line system with 6 supraorbital, 4+8 infraorbital, 9 preoperculomandibular and 3 supratemporal pores; fin ray counts include, dorsal $8\frac{1}{2}$, pectoral 9, pelvic 1/7, anal 2/5 and caudal 7–8+8; dorsal fin equidistant from tip of snout to caudal fin base; dorsal fin with convex distal margin; pelvic fin does not reach vent and separated by a wide distance; no axillary pelvic lobe; anal fin not reaching caudal fin base; pectoral fin reaches half the distance to pelvic origin; pelvic fin reaches half the distance to anal fin without reaching anus; caudal fin slightly emarginate with rounded lobes and upper lobe longer than lower; long ventral and dorsal adipose crest present.

Colour. Body light yellowish-brown with 16–18 almost regular thin cross bars, narrower than interspaces, dark brown in live specimens and dull white in preserved specimens, the bars reach ventral surface behind dorsal fin; dorsal fin with a row of spots at three quarters height; caudal fin plain with dissociated band at base with a central spot; other fins without any prominent colour pattern.

Habitat

The tributary with ecologically rich habitats traverses through undulating terrain before joining the river Sharavathi. The species collected has been named after the river to appportion the significance of the rich ecological heritage of the region. The catchment area of the type locality (Figure 4b) has evergreen to semi-evergreen forests (35.63 %), moist deciduous forests (13.84 %), plantation (15.27 %), water body (17.64 %), agriculture (2.66 %) and open land (6.35 %).

Etymology

Named after its type locality, Sharavathi river, Central Western Ghats.

Distribution

Sharavathi river basin, Central Western Ghats, Karnataka, India.

Discussion

Schistura sharavathiensis resembles the species of the genus *Longischiatura* Banareescu and Nalbant, only in the presence of a long adipose crest extending from a short distance behind dorsal fin to caudal base; but differs with respect to 10 dorsal rays, deeply forked caudal fin, complete to almost complete lateral line in *Longischiatura* genus. It also resembles genus *Indoreonectes* in long nasal barbel (*Oreonectes* genus, Kottelat 1990) and adipose crest on the caudal peduncle. However, it differs from *I. keralensis* and *I. evezardi* in the presence of rounded and banded caudal fin, broad and incomplete, irregular vertical bands or mottled all over the body. The identity of the species is confirmed based on the available literatures of *Schistura* in South-Asian region (Menon, 1987; Kottelat, 1990; Talwar and Jhingran, 1991; Jayaram, 1999; Kottelat, 2004; Vishwanath and Nebeshwar, 2004; Vishwanath and Shanta, 2004; and Vishwanath and Sharma, 2005). Table 3 shows the comparison between the six recorded taxa of Western Ghats, which reveals that *S. sharavathiensis* differs significantly from the congeners, except for *S. nilgiriensis*. It differs in the presence of 5–14 vertical bands and a black spot at anterior base of dorsal fin in *S. nilgiriensis*. Appendix-I gives the identification keys for species. Plot of principal components (of PCA) shows different clusters indicating variations between *S. sharavathiensis* and *S. nilgiriensis* (Figure 7) with eigen values of 159.29 for PC 1 (accounts for 96.48% variability) and 5.42 for PC 2.

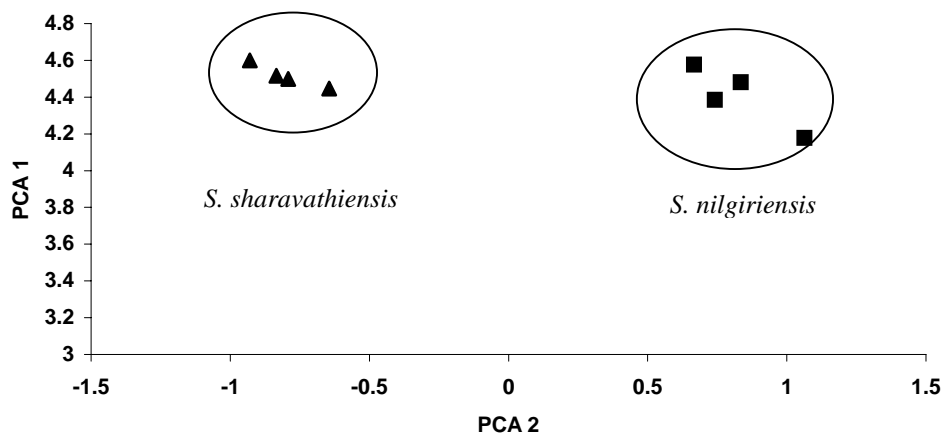


FIGURE 3. Plot of principal components of 31 morphological parameters -
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Comparative Material

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Acknowledgements

We are grateful to Dr. K.C. Jayaram, Chennai for invaluable suggestions during discussions. We acknowledge the financial assistance from the Ministry of Environment and Forests, Government of India. We thank the officials of Karnataka Forest Department and Karnataka Power Corporation Limited, Government of Karnataka for co-operation during the field investigation. We thank the Director and colleagues at ZSI, Southern Regional Station, Chennai for the support in identification of specimens. Suresh S., Vishnu D.M., Karthick B. and Ravindra assisted in specimens collection and Saveer Ahmed in digitizing mouth portion of specimens.

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Figures

Figure 1: Sharavathi river basin with type localities of *Schistura nagodiensis* and *Schistura sharavathiensis*

Figure 2. Plot of principal components of 31 morphological parameters - *Schistura nagodiensis* and *S. kodaguensis*

Figure 3. Plot of principal components of 31 morphological parameters - *Schistura sharavathiensis* and *S. nilgiriensis*

Figure 4: Classified Image of the corresponding watersheds of the collection localities.
(a): Catchment of Algold (b): Catchment of Dabbefalls

Image 1: *Schistura nagodiensis* sp. nov.(SL 26.0mm) paratype from type locality,(IISc/CES/WGBIS : 3-5-3-5-007

Image 2: *Schistura nagodiensis* - Ventral view of head

Image 3: *Schistura sharavathiensis* sp. nov.(SL 32.0mm) paratype from type locality,(IISc/CES/WGBIS : 3-5-3-5-008

Image 4: *Schistura sharavathiensis* - Ventral view of head

Appendix I. Identification keys for *Schistura* of the Western Ghats (modified after Jayaram, 1999).

1. Lateral line complete; body with bands and conspicuous black spots. ...*S. semiarmatus*
 - Lateral line incomplete; body with only bands. ...2
2. Black spot at anterior base or slightly above on dorsal fin...4
 - No black spot at anterior base or slightly above on dorsal fin...3
3. 11–14 black bars on body, black markings on lower lip absent, feeble if present, caudal fin emarginate...*S. kodaguensis*
 - 6–9 black bars on body, two black markings on lower lip, caudal fin deeply emarginate or slightly forked ...*S. nagodiensis* sp.nov
4. Caudal fin slightly emarginate, without rows of spots ...5
 - Caudal fin deeply emarginate or slightly forked, with 3 or 4 rows of spots ... 6
5. 11–12 brown bars, broader than interspaces; black spot at base of dorsal fin; moderately long nasal barbels... *S. nilgiriensis*
 - 16–18 brown bars, narrower than interspaces; black spot at 1/4th height of dorsal fin; very elongated nasal barbel...*S. sharavathiensis* sp.nov.
6. Body slender, about 6.5 times in SL; pelvic fin separated from anal opening by a considerable distance. ... *S. denisoni pambaensis*
 - Body deeper, about 5 to 5.5 times in SL; pelvic fin reaching or almost reaching anal opening ...7
7. Pelvic fin reach anal opening; caudal fin deeply emarginate with several rows of spots; dorsal with rows of spots ...*S. denisoni denisoni*
 - Pelvic fin falling short of anal opening; caudal fin slightly emarginate without conspicuous spots; dorsal with a dark base and a dark band at distal end ... *S. denisoni mukambbikaensis*

Figures



Image 1: *Schistura nagodiensis* sp. nov. (SL. 26.0 mm) paratype from type locality, (IISc/CES/WGBIS: 3-5-3-5-007).



Image 2: *Schistura nagodiensis* - Ventral view of head



Image 3: *Schistura sharavathiensis* sp. nov. (SL. 32.0 mm) paratype from type locality, (IISc/CES/WGBIS: 3-5-3-5-008).



Image 4: *Schistura sharavatiensis* - Ventral view of head

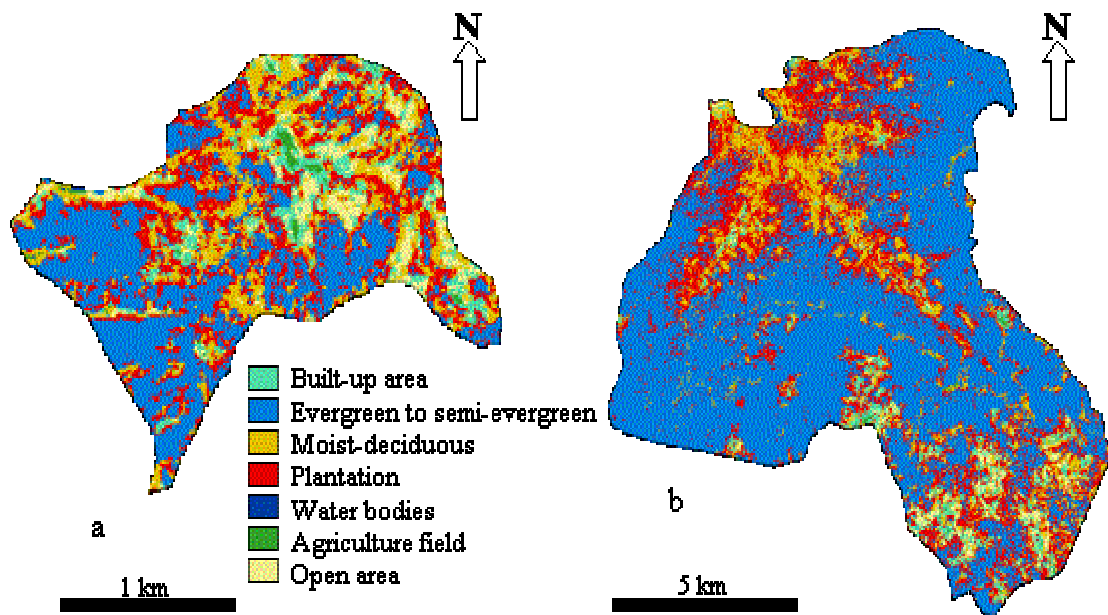


Figure 4: Classified Image of the corresponding watersheds of the collection localities (a) Catchment of Algod (b) Catchment of Dabbefalls

TABLE 1. Nophometric characteristics of *Schistura nagodiensis* and *S. sharavathiensis* (dimensions in mm)

Parameters	<i>Schistura nagodiensis</i>				<i>Schistura sharavathiensis</i>			
	Holotype	Range (n=13)	Mean	SD	Holotype	Range (n=4)	Mean	SD
Total length	34.0	28.0–34.0	30.9	1.2	35.0	31.0–35.0	32.5	1.7
Standard length	28.0	23.0–28.0	25.6	1.1	29.0	24.0–29.0	26.2	1.7
Body depth	3.7	3.0–5.0	3.9	0.6	4.4	3.7–4.4	4.0	2.1
Head length	6.0	5.0–6.0	5.4	0.5	5.4	5.3–5.9	5.6	0.3
Head width	3.8	2.7–3.8	3.2	0.3	3.5	3.2–4.3	3.7	0.3
Eye diameter	1.3	0.9–1.5	1.3	0.2	1.5	1.2–1.5	1.4	0.5
Inter orbital width	1.5	0.9–1.7	1.3	0.2	1.6	1.2–1.8	1.5	0.2
Width of mouth	1.8	1.4–1.9	1.6	0.2	1.9	1.9–2.4	2.1	0.2
Snout length	2.0	1.5–2.5	1.9	0.3	2.6	2.1–2.6	2.3	0.2
Ht. of head at occiput	2.8	1.9–3.1	2.6	0.3	3.3	3.0–3.4	3.2	0.2
Pre-dorsal length	14	11.7–14	12.7	0.6	14.0	12.0–14.0	13.2	0.2
Post dorsal length	13.5	12.0–13.5	12.6	0.5	13.7	12.0–13.7	12.9	0.9
Inter-nostril distance	1.4	0.6–1.5	1.2	0.3	1.1	0.9–1.5	1.2	0.7
Pre-pelvic distance	14.5	11.3–14.5	12.5	1.1	13.8	10.8–13.8	12.1	0.3
Ht. of dorsal fin	3.8	3.2–4.4	3.9	0.3	5.8	5.1–5.8	5.4	1.3
Length of base of dorsal fin	4.7	3.1–4.7	3.9	0.5	4.2	4.2–5.0	4.4	0.3
LCPD	4.3	3.3–4.5	3.7	0.4	3.6	3.6–4.3	4.0	0.4
HCPD	3.5	2.8–3.9	3.2	0.3	4.2	3.1–4.7	3.8	0.3
Length of base of anal fin	2.2	1.9–3.5	2.4	0.4	2.7	1.6–2.7	2.1	0.7
Length of pectoral fin	4.2	3.8–4.7	4.3	0.2	5.1	3.4–5.2	4.6	0.6
Length of pelvic fin	4.1	3.3–4.3	3.9	0.3	4.7	3.7–4.7	4.2	0.8
Pre-anal length	19.0	15.0–19.0	17.1	1.0	21.0	18.2–21.0	19.1	0.4
Pre-anus length	20.0	17.0–21.0	18.7	1.2	18.0	14.3–18.0	16.6	1.3

Note: HCPD - Height of caudal peduncle LCPD –Length of caudal peduncle

TABLE 2. Proportional values of morphometry of *Schistura nagodiensis* and *S. sharavathiensis*

S.

Parameters	<i>S. nagodiensis</i> (N=13)		<i>S. sharavathiensis</i> (N=4)	
	Range	Mean \pm S.D.	Range	Mean \pm S.D.
Standard length (mm)	23.0–28.0	28.0 (max)	24.0–29.0	29.0 (max)
Total length (mm)	28.0–34.0	34.0 (max)	31.0–35.0	35.0 (max)
%Standard length				
Body depth	12.0–20.0	15.2 \pm 2.3	14.2–16.2	15.3 \pm 0.9
Head length	19.2–26.1	21.3 \pm 2.0	18.6–22.7	21.3 \pm 1.8
Snout length	6.4–10.0	7.5 \pm 1.1	8.1–9.6	8.8 \pm 0.6
Pre-dorsal length	47.6–52.0	49.8 \pm 1.4	48.3–53.1	50.3 \pm 1.9
Pre-pelvic length	45.2–56.0	48.9 \pm 3.0	43.5–47.7	45.9 \pm 2.0
Height of dorsal fin	12.8–18.7	15.3 \pm 1.6	19.6–22.9	20.8 \pm 1.5
Base of dorsal fin	11.9–17.2	15.4 \pm 1.7	14.5–19.2	16.9 \pm 2.1
Pectoral fin length	15.0–20.4	16.8 \pm 1.5	13.1–20.0	17.7 \pm 3.3
Pelvic fin length	13.2–16.5	15.1 \pm 0.9	14.2–18.3	16.0 \pm 1.7
Base of anal fin	7.6–12.6	9.3 \pm 1.4	6.5–9.6	8.0 \pm 1.6
Length of caudal fin	16.2–24.0	20.9 \pm 2.2	20.7–29.1	24.0 \pm 3.6
Length of caudal peduncle	13.2–17.3	14.7 \pm 1.2	12.4–17.1	15.4 \pm 2.1
Pectoral fin to pelvic fin distance	22.8–36.0	27.6 \pm 3.6	21.5–28.9	24.6 \pm 3.2
Pre-anal length	68.0–80.0	73.2 \pm 3.4	70.0–75.8	72.8 \pm 2.4
Other proportions (%)				
VA in PA	14.3–40.0	26.7 \pm 8.9	15.5–52.7	33.9 \pm 16.5
HCPD in LCPD	62.2–97.1	86.1 \pm 9.3	75.6–116.7	96.1 \pm 19.9
Eye diameter in Snout length	52.4–88.2	67.7 \pm 11.3	52.2–71.4	62.4 \pm 8.9
Snout length in Head length	28.3–50.0	35.4 \pm 6.5	36.8–48.1	41.4 \pm 5.4
IOW in Eye diameter	80.0–115.4	98.1 \pm 9.5	100.0–120.0	106.6 \pm 9.4
Eye diameter in Head length	15.0–30.0	23.7 \pm 4.2	22.6–27.8	25.5 \pm 2.2

Note: VA in PA–Vent to anal fin origin in pelvic fin to anal fin
HCPD in LCPD–Height of caudal peduncle in length of caudal peduncle
IOW – Interorbital width

TABLE 3. Comparison of morphological characters of *Schistura* of Western Ghats.

Species	SL (mm)	Pectoral fin rays	Black spot on Dorsal fin	Rows of spots on caudal fin	Lateral line	Caudal fin shape	Bars on body
<i>Schistura nagodiensis</i>	28	7–9	Absent	Feeble	Incomplete	Deeply emarginated	7–9
<i>S. sharavatbiensis</i>	29	9	1/4 th the height	Absent	Incomplete	Slightly emarginated	16–18 thin bands
<i>S. denisoni denisoni</i>	51.1	11	At the base	Present	Incomplete	Deeply emarginated	Variable
<i>S. denisoni pambaensis</i>	40	11	At the base	Present	Incomplete	Deeply emarginated	10–14
<i>S. denisoni mukambbikaensis</i>	36	10	At the base	Present	Incomplete	Deeply emarginated	5–6
<i>S. kodaguensis</i>	36	10	Absent	Present	Incomplete	Slightly emarginated	11–14
<i>S. semiarmatus</i>	56.5	11	At the base	Present	Complete	Slightly forked	9–10
<i>S. nilgiriensis</i>	51	10	At the base	Absent	Incomplete	Emarginated	11–13