

## CHARACTERISTICS OF IDENTIFIED MORPHOLOGY OF GENUS *SCHISTURA* MCCLELLAND, 1838 IN THE GIANH RIVER BASIN FROM VIETNAM

Ho Anh Tuan

*Vinh University, Nghe An province, Vietnam*

### Rezumat

Genul *Schistura* McClelland, 1838 este reprezentat de 193 specii, dintre care 29 specii sunt răspândite, cu precădere, în sectoarele superioare ale râurilor din Vietnam. În urma studiului au fost supuse analizei 248 exemplare a genului *Schistura* McClelland, 1838 capturate în bazinul r. Gianh, Vietnam. S-au identificat 4 specii: *Schistura finis* Kottelat, 2000; *Schistura hingi* (Herre, 1934); *Schistura kottelati* Tuan et al, 2015; *Schistura pervagata* Kottelat, 2000. Două specii: *Schistura finis* Kottelat, 2000 и *Schistura kottelati* Tuan et al, 2015 sunt semnalate în premieră.

*Cuvinte-cheie:* ihtiofauna, biodiversitate, caractere morfometrice, ecosisteme acvatice.  
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*Adresa pentru corespondență:* Ho Ahn Tuan, Universitatea de Stat din Moldova, str. Alexe Mateevici 60, MD-2009 Chișinău, Republica Moldova; e-mail: hoanhtuan18@gmail.com ; tel. (+373) 68 347 121

### Introduction

According to Maurice Kottelat (2012), Genus *Schistura* McClelland, 1838 consists 193 species, in which 29 species mainly distribute in the upper small parts of stream and rivers in Vietnam. In all studies of genus *Schistura* McClelland, 1838 mentioned that their species are mainly endemic and limited distribution, rare species in common distribution [8, 1]. In the Gianh river basin, different studies of genus *Schistura* McClelland, 1838 showed different species composition results, such as Nguyen Thai Tu at al (1999) reported 2 species: *Schistura fasciolata* and *Schistura incerta* [12]; Nguyen Thai Tu & Ho Anh Tuan (2003) showed 2 species: *Schistura fasciolata*, *Schistura incerta* and 18 phenol. And Ngo Sy Van & Tran Anh Tuan (2003) indicated 3 species: *Schistura caudofurca*, *Schistura fasciolata*, *Schistura incerta* and 1 phenol [13]. In the mainstream of Gianh River, Mai Thị Thanh Phuong et al indicated 7 species: *Schistura aramis*, *Schistura huongensis*, *Schistura carbonaria*, *Schistura psittacula*, *Schistura hingi*, *Schistura susannae*, *Schistura fasciolata* and 1 phenol [11]. Moreover, Freyhof & Serov (2011) pointed that 2 species of this genus in the Gianh river: *Schistura hingi* and *Schistura pervagata* [1]. Due to these different results genus *Schistura* McClelland, 1838 of ichthyologists, we have already exchanged specimens and analysed data with Maurice Kottelat and Freyhof to solve problem. From that condition, we strengthen to research the project “Characteristics of identified morphology of genus *Schistura* McClelland, 1838 in the Gianh river basin from Vietnam”

### Material and methods

Fish specimens were collected mainly from fishing men in these survey regions. Fishing tools are fishnets, rackets, casting – net, multi size fishing – rods and also professional tools of fish men such as: fishing basket, fishing traps, etc. Some other specimens was bought from local people. All samples were given full information in field trip diary, sampling notes, taking pictures and fixed with formaline 8- 10% and reserving with formaline 5% in Animal Laboratory of Department of Biology, Vinh University.

Note of figure 1: A: Standard length; B: Total length; C: Dorsal head length; D: Lateral head length; E: Predorsal length; F: Pre-pelvic length; G: Pre-anus length; H: Preanal length; K: Head depth (at eye); L: Head depth (at nape); M: Body depth; N: Depth of caudal peduncle; O: Length of caudal peduncle; I: Snout length; Q: Head width (at nares); R: Body width (dorsal origin); S: Body width (anal origin); T: Eye diameter; U: Interorbital width; V: Height of dorsal fin; Z: Length of upper caudal lobe; W: Depth of anal fin; X: Length of pelvic fin; Y: Length of pectoral fin; CC: Barbel length; AA: Lateral head length; BB: Not lateral head length.

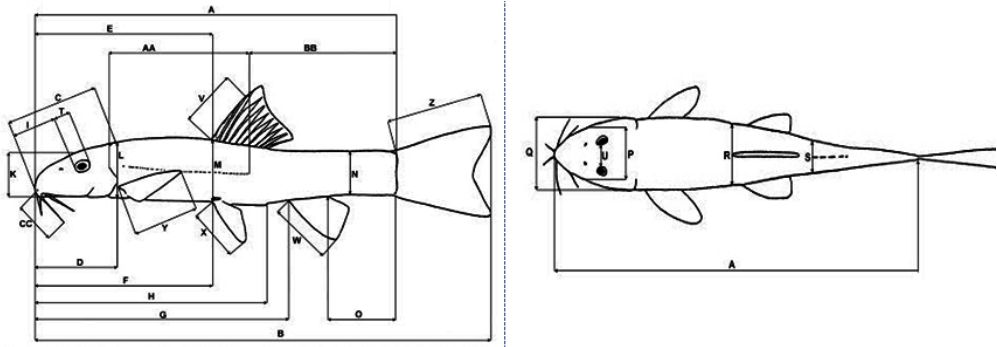


Figure 1. Measurements taken on *Schistura* species by Maurice Kottelat.

**Results and discussion**

By the time of sample collection, identification, and exchange specimens and thankful helps of Maurice Kottelat and Freyhof, we have already identified 4 species of genus *Schistura* McClelland, 1838 in the Gianh river basin from Vietnam. They are described in morphological characteristics as below

**2.1. *Schistura finis* Kottelat, 2000 (n = 86)**

**Diagnosis**

Distinguished from all other species of the genus in Southeast Asia by the following combination of characters: body and head massive, cylindrical; snout blunt; cheeks slightly swollen in individuals larger than about 80 mm SL; no median notch in upper lip; lower lip with a median incision; lower jaw with a median notch. (Figure 2, Table 1)

**Table 1. Morphometric data of *Schistura finis* & *Schistura hingi*.**

Morphometric data	<i>Schistura finis</i> (n = 86)				<i>Schistura hingi</i> (n = 64)			
	Mean	Min	Max	SD	Mean	Min	Max	SD
In percents of SL								
<i>l</i>	2	3	4	5	6	7	8	9
Total length	120.5	119.8	121.2	0.7	120.4	118.7	123.4	1.7
Dorsal head length (HL)	19.5	19.1	20.0	0.4	22.0	21.1	23.7	0.8
Lateral head length	21.9	21.7	22.1	0.2	24.4	23.8	25.0	0.4
Predorsal length	53.3	52.2	54.3	1.0	53.6	51.3	55.7	1.3
Pre-pelvic length	51.3	51.2	51.4	0.1	54.6	53.7	56.3	1.1
Pre-anus length	68.2	67.5	69.0	0.8	69.3	67.6	72.6	1.6
Preanal length	77.4	77.1	77.7	0.3	79.1	77.2	82.5	1.7
Head depth (at eye)	9.6	9.5	9.8	0.2	11.4	10.6	12.4	0.6
Head depth (at nape)	12.2	11.9	12.5	0.3	13.9	12.6	14.7	0.8
Body depth	17.9	16.8	18.9	1.0	18.0	15.2	20.9	2.0
Depth of caudal peduncle	11.9	11.4	12.3	0.5	15.0	12.8	17.2	1.6
Length of caudal peduncle	17.4	17.0	17.7	0.4	14.8	13.5	15.8	0.8
Snout length	9.4	9.3	9.6	0.2	11.6	11.1	12.2	0.4

Table 1 (Continued)

<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>	<i>7</i>	<i>8</i>	<i>9</i>
Head width (at nares)	10.1	10.0	10.1	0.0	13.3	10.9	14.8	1.2
Maximum head width	14.9	14.7	15.1	0.2	16.7	15.2	18.7	1.2
Body width (dorsal origin)	11.9	11.6	12.2	0.3	14.5	12.1	16.7	1.5
Body width (anal origin)	7.3	7.0	7.6	0.3	9.0	7.6	10.3	0.9
Eye diameter	3.9	3.6	4.2	0.3	4.2	3.7	4.9	0.4
Interorbital width	6.2	5.9	6.5	0.3	7.7	6.9	8.9	0.7
Height of dorsal fin	18.2	18.0	18.4	0.2	20.7	19.2	21.7	0.9
Length of upper caudal lobe	20.0	19.9	20.2	0.1	21.8	19.9	23.2	1.3
Length of lower caudal lobe	20.2	19.4	21.1	0.8	21.5	18.8	23.7	1.7
Length of median caudal rays	16.2	16.1	16.3	0.1	16.8	15.7	17.5	0.6
Depth of anal fin	15.6	14.9	16.2	0.7	16.7	15.9	18.0	0.7
Length of pelvic fin	15.2	14.7	15.6	0.5	17.3	16.1	18.6	1.0
Length of pectoral fin	18.2	17.5	19.0	0.7	19.5	17.9	21.2	1.2
Barbel length	7.2	6.6	7.8	0.6	8.4	7.0	9.7	1.0
In percents of HL								
Lateral head length	112.0	108.4	115.5	3.6	110.6	103.6	115.4	4.1
Head depth (at eye)	49.2	48.9	49.6	0.3	52.0	50.2	56.5	2.1
Head depth (at nape)	62.3	62.1	62.5	0.2	62.9	57.0	66.6	3.2
Body depth	91.7	84.3	99.1	7.4	81.5	68.8	92.3	7.5
Snout length	48.3	48.0	48.7	0.3	52.6	50.1	55.0	1.6
Head width (at nares)	51.6	50.3	53.0	1.3	60.1	49.2	64.0	5.2
Maximum head width	76.2	75.6	76.8	0.6	75.9	69.0	79.9	3.9
Eye diameter	19.8	18.8	20.8	1.0	18.9	17.1	22.1	1.8
Interorbital width	31.8	29.3	34.2	2.5	35.1	31.2	37.7	2.7
Height of dorsal fin	93.3	92.2	94.5	1.2	94.1	87.8	100.1	4.7
Depth of anal fin	79.6	77.9	81.3	1.7	75.8	71.7	82.7	3.7
Length of pelvic fin	77.5	76.9	78.2	0.6	78.7	70.9	85.5	6.1
Length of pectoral fin	93.3	91.6	95.0	1.7	88.5	81.3	97.0	6.0
Barbel length	37.0	33.1	40.8	3.9	38.0	31.8	45.8	5.0

### Colour pattern

Body greyish brown with poorly contrasted pattern in adults. Body with about 12 - 15 bars between dorsal-fin origin and caudal fin, additional bars present in front of dorsal-fin but indistinct, except upper extremities which do not reach dorsal midline but form two series of dark blotches parallel to dorsal midline or sometimes fused to form two stripes. Bars thinner than interspaces, usually irregularly shaped and organised in individuals 60 - 70 mm SL, quite regular above this size. Black bar at caudal-fin base more or less complete, with posterior projection at lower extremity, curved forward at upper extremity. Dorsal-fin base with a black spot anteriorly, followed by a hyaline patch

and a low elongate grey blotch. Caudal fin orange in life, with a red patch occupying from a few rays to most of upper lobe. In specimens about 30 - 50 mm SL, a series of very narrow bars on side, not reaching dorsal midline. In front of dorsal-fin origin, a longitudinal series of small irregular blotches on each side of dorsal midline.



Figure 2. *Schistura finis* Kottelat, 2000.

## 2.2. *Schistura hingi* (Herre, 1934) (n = 64)

### Diagnosis

The species identified here as *Schistura hingi* is distinguished from the other species of the genus in Vietnam by the combination of the following characters: 11 - 15 (mean 13) regular dark bars on body wider than interspaces; a complete black bar at caudal-fin base; predorsal back and belly densely covered with scales; lateral line complete;  $8\frac{1}{2}$  dorsal-fin rays; 9 + 8 branched caudal-fin rays; 8 pelvic rays; axillary pelvic lobe not reduced and not laterally fused with body; pelvic-fin origin below simple or first branched dorsal-fin ray; caudal peduncle 0.82 - 1.2 (mean 1.0) times longer than deep; lateral head length 103.6 - 115.4% HL (mean 110.6); median caudal-fin ray 71.8 - 83.2% HL (mean 76.6) of length of upper caudal-fin lobe; interorbital distance 31.2 - 37.7 % HL (mean 35.1); slender processus dentiformis and long barbels (outer rostral barbel 31.8 - 45.8 % HL (mean 38.0)). (Figure 3, Table 1)

### Colour pattern

Body yellowish-brown or grey, with 10 - 16 (mean 13) bars wider than interspaces, 2 - 4 (mean 3) predorsal, 2 - 3 dorsal and 3 - 6 postdorsal bars. Predorsal bars wider than postdorsal bars in most specimens. Some bars incomplete. Most bars meeting their homologues on back. Bars at anus and posterior to it usually meeting on ventral midline. Predorsal and dorsal parts of body not darker in adult specimens, and bars on anterior part of body remaining distinct in all adult specimens. Head dark brown with bright ventral side. No marbling or spots on head. A dark inner axial stripe faint and indistinct in most specimens, absent in life. A complete black bar at caudal-fin base, not reaching dorsal and ventral midlines. A black spot at base of simple and branched dorsal-fin rays 1-2, and another elongated dark marking at base of branched rays 4 - 8. A yellow spot at base of branched rays 2 - 3, sometimes embedded by surrounding dark marking. Dorsal-fin membranes hyaline, rays hyaline proximally with dark pigments. Caudal fin with hyaline membranes and dark rays. Some specimens with orange or red margins of upper and lower caudal-fin lobes. In small specimens, two vertical rows of spots on posterior half of caudal-fin rays. Other fins yellow or hyaline, with dark rays. Inner rostral barbel dark with white tips; outer rostral barbel dark grey and maxillary barbel whitish.



Figure 3. *Schistura hingi* (Herre, 1934).

### 2.3. *Schistura kottelati* Tuan et al, 2015 (n = 28)

#### Diagnosis

*Schistura kottelati* is distinguished from the other species of genus *Schistura* known from Vietnam and adjacent basins in Laos by the unique combination of the following characters: lateral line incomplete, reaching vertical of dorsal fin. a short caudal peduncle and tapered length 12.8 - 16.9 % SL (mean 14.8), depth 1.2 - 1.7 times in its length), a large eye 4.7 - 6.2% SL (mean 5.47), a large interorbital width 9.1 - 11.7 % SL (mean 10.1). (Figure 4, Table 2)

Table 2. Morphometric data of *Schistura kottelati* & *Schistura pervagata*.

Morphometric data	<i>Schistura kottelati</i> (n = 28)				<i>Schistura pervagata</i> (n = 70)			
	Mean	Min	Max	SD	Mean	Min	Max	SD
In percents of SL	2	3	4	5	6	7	8	9
Total length	126.1	122.9	128.7	1.69	121.7	115.7	123.8	2.0
Dorsal head length (HL)	23.1	21.1	25.7	1.12	21.1	19.4	23.1	1.1
Lateral head length	26.9	25.2	28.8	0.96	23.3	21.5	25.0	1.0
Predorsal length	57.4	56.1	58.6	0.75	52.7	49.8	56.4	1.7
Pre-pelvic length	56.5	51.1	58.5	1.77	53.1	48.3	56.0	1.9
Pre-anus length	72.0	69.3	74.3	1.66	68.0	64.2	71.2	1.7
Preanal length	78.5	76.8	80.5	1.12	77.6	73.1	82.3	2.1
Head depth (at eye)	13.0	11.4	16.5	1.41	10.4	9.4	11.5	0.6
Head depth (at nape)	15.9	14.7	16.9	0.67	12.6	11.4	14.3	0.7
Body depth	17.5	16.4	18.9	0.75	16.5	14.3	18.6	1.2
Depth of caudal peduncle	10.8	8.0	11.7	0.88	13.5	11.8	16.1	1.0
Length of caudal peduncle	14.8	12.8	16.9	1.17	15.4	13.3	17.2	0.9
Snout length	9.5	8.3	10.2	0.59	10.5	9.3	11.7	0.7
Head width (at nares)	10.2	9.2	11.0	0.55	11.3	9.8	13.9	1.2
Maximum head width	17.6	16.6	19.1	0.61	14.7	13.2	17.1	0.9
Body width (dorsal origin)	13.4	12.2	15.1	0.80	12.5	10.7	14.6	1.1

Table 2 (Continued)

Body width (anal origin)	8.7	7.8	9.9	0.60	7.9	5.9	9.6	1.1
Eye diameter	5.5	4.7	6.2	0.38	4.3	3.5	5.1	0.4
Interorbital width	10.1	9.1	11.7	0.64	7.0	5.6	8.6	0.8
Height of dorsal fin	19.1	17.3	21.5	1.24	20.0	17.3	22.3	1.2
Length of upper caudal lobe	25.1	23.2	28.5	1.34	21.9	20.0	24.4	1.2
Length of lower caudal lobe	24.4	22.2	26.3	1.31	22.1	19.5	23.9	1.1
Length of median caudal rays	16.8	14.8	19.0	1.26	17.3	15.8	19.2	1.1
Depth of anal fin	16.6	14.6	18.9	1.09	16.6	14.4	18.3	0.9
Length of pelvic fin	14.7	12.8	16.3	1.07	17.0	15.2	18.4	0.9
Length of pectoral fin	20.5	16.9	22.3	1.28	19.1	17.9	20.8	1.0
Barbel length	16.1	14.9	17.6	0.91	8.2	6.8	9.6	0.8
Lateral head length	116.5	110.7	123.7	4.36	110.4	103.7	117.8	3.0
Head depth (at eye)	56.5	49.1	70.9	6.99	49.4	44.3	53.0	2.4
Head depth (at nape)	69.0	61.9	75.2	3.49	59.8	54.6	66.5	2.7
Body depth	75.9	67.7	89.6	5.34	78.1	62.6	86.9	5.8
Snout length	41.4	35.3	45.9	5.53	49.6	45.6	54.6	2.6
Head width (at nares)	44.3	38.2	48.9	5.11	53.6	43.0	65.9	5.8
Maximum head width	76.4	70.3	84.0	3.68	69.6	59.7	75.8	4.6
Eye diameter	23.7	21.5	27.0	2.72	20.6	16.4	23.5	1.7
Interorbital width	43.9	35.4	49.0	4.10	33.4	25.1	38.6	3.6
Height of dorsal fin	82.7	73.4	94.2	5.20	94.9	86.7	104.9	5.3
Depth of anal fin	72.0	60.9	83.2	3.62	78.5	69.9	84.7	4.1
Length of pelvic fin	64.0	53.5	75.2	1.56	80.5	73.9	85.8	3.3
Length of pectoral fin	89.2	70.4	99.3	3.41	90.7	81.3	100.3	4.6
Barbel length	69.8	62.2	78.6	5.95	39.1	30.2	48.2	4.2

### Colour pattern

Freshly preserved specimens: body sides brownish, darker color on the dorsal side and lighter on belly. The color of specimen become white after a few days preserved in formalin. Dorsal midline covered by a quite thick and yellow stripe from posterior of head, via dorsal-fin base, to caudal-fin base. Head laterally somehow purplish without any kind of pigmentation or patterns. Caudal base with a thin and faint dark bar, thicker at upper and lower extremities, very weak in middle area and not reaching dorsal and ventral midlines. Fins hyaline, without pigments on rays and membranes.

Juveniles: overall coloration as mature individuals but a series of dark blotches on flanks, varying in number (3 - 7) and shape. Particularly, in some juveniles, a chain of tiny black dots along lateral line and dorsal midline.

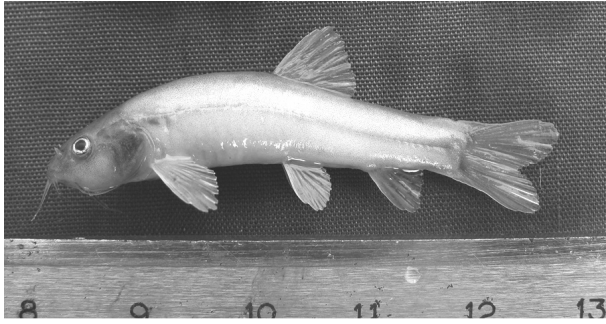


Figure 4. *Schistura kottelati* Tuan et al, 2015.

#### 2.4. *Schistura pervagata* Kottelat, 2000 (n = 70)

##### Diagnosis

Distinguished from all other species of the genus in Southeast Asia by the following combination of characters: lateral head length 21.3 – 25.0 % SL (mean 23.3); predorsal distance 49.8 - 56.4 % SL (mean 52.7); prepelvic distance 48.3 - 56.0 % SL (mean 53.1); body depth 14.3 - 18.6 % SL (mean 16.5); caudal peduncle length 13.3 – 17.2 % SL (mean 15.4); depth 11.8 – 16.1 % SL (mean 13.5); 0.82 - 1.42 (mean 1.15) times in length; no median notch or only very shallow notch in upper lip; a median incision in lower lip; no median notch in lower jaw; cheeks swollen in specimens larger than 70 mm SL. (Figure 5, Table 2)

##### Colour pattern

Top of head vermiculated. Body with 8 - 13 bars, as wide as or wider than interspaces, from quite regular to irregularly shaped and organised, but usually very few incomplete or branched bars. In predorsal area, bars either continuous across back, alternating or dissociated into small blotches.

Black bar at caudal-fin base more or less complete, usually not reaching dorsal and ventral midlines, often with posterior projections at upper and lower extremities. Dorsal-fin base with black spot anteriorly, followed by a pale patch and a low, elongate grey blotch.



Figure 5. *Schistura pervagata* Kottelat, 2000.

##### Conclusion

Analysis and identification of 248 specimens of genus *Schistura* McClelland, 1838 in the Gianh river basin from Vietnam. We have classified four species: *Schistura finis* Kottelat, 2000; *Schistura hingi* (Herre, 1934); *Schistura kottelati* Tuan et al, 2015; *Schistura pervagata* Kottelat, 2000. Which has species: *Schistura finis* Kottelat, 2000



& *Schistura kottelati* Tuan et al, 2015 was first discovered in the in the Gianh river basin from Vietnam.

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