



Diversity Of Fishes Under the Genus *Schistura* McClelland 1838 (CYPRINIFORMES: NEMACHEILIDAE) From Kaladan Drainage of Mizoram, Northeastern India.

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Abstract

A survey on the diversity of *Schistura* species in the Kaladan drainage of Mizoram during the year 2022 revealed the presence of five species within the genus: *Schistura andrewi*, *Schistura porocephala*, *Schistura koladynensis*, *Schistura scyphovecteta*, and *Schistura nebeswari*. Among these, *Schistura andrewi* was found at only one study site, while the other species exhibited a broader and more dominant distribution throughout the Kaladan drainage of Mizoram.

Key words: *Schistura*, Mizoram, Kaladan drainage.

Introduction

Fishes under the genus *Schistura* McClelland are small size that possesses medially interrupted lower lip, presence of moderately arched mouth, and black bar on base of caudal fin (Kotellat, 1990). They inhabit well aerated hill Stream Rivers and are found in Asia, Europe and Ethiopia. Northeast India harbours several species under the genus *Schistura* and there are approximately 230 species under the genus *Schistura* (Lokeshwar & Vishwanath, 2012)

The genus *Schistura* McClelland is a diverse group of small-sized freshwater fishes belonging to the family Nemacheilidae, commonly referred to as stone loaches. Members of this genus are characterized by specific morphological features that aid in their identification and adaptation to their habitat. These features include a medially interrupted lower lip, which is a key diagnostic characteristic, as well as the presence of a moderately arched mouth suited for bottom-dwelling and feeding behaviours (Suvanaraksha, 2015). Additionally, they display a distinctive black bar on the base of the caudal fin, a trait often used to differentiate them from other genera (Kotellat, 1990).

Schistura species are typically found in well-aerated hill stream rivers, environments characterized by clear, fast-flowing waters with rocky or gravel substrates. These habitats provide the oxygen-rich conditions necessary for their survival and support their benthic lifestyle (Kotellat, 2017). Geographically, species of *Schistura* are distributed across a wide range, encompassing parts of Asia, Europe, and Ethiopia. This broad distribution underscores the ecological adaptability and evolutionary success of the genus.

Northeast India is renowned for its rich biodiversity and distinct aquatic ecosystems, making it a significant hotspot for *Schistura* species. The region is home to numerous species within this genus, many of which are endemic to the area. This high diversity is a testament to the intricate and varied riverine systems present in the region. Lokeshwar and Vishwanath (2012) reported that the genus *Schistura* encompasses approximately 230 recognized species. This exceptional diversity establishes *Schistura* as one of the most species-rich genera within the family Nemacheilidae.

The ichthyofauna of Mizoram, located in northeastern India, remains largely underexplored. Consequently, recent studies have led to the discovery and description of several new species within the genus *Schistura*. These include *Schistura aizawlensis* (Lalramliana, 2012), *Schistura koladynensis* (Lokeshwar & Vishwanath, 2012), *Schistura maculosa* (Lalronunga, Lalnunluanga & Lalramliana, 2013), *Schistura nebeswari* and *Schistura scyphovecteta* (Lokeshwar & Vishwanath, 2013), *Schistura porocephala* (Lokeshwar & Vishwanath, 2012), *Schistura paucireticulata* (Lokeshwar, Vishwanath & Kosygin, 2013), and *Schistura andrewi* (Solo, Lalramliana, Lalronunga & Lalnunluanga, 2014).

Material and Methods

Specimens were collected from the Kolodyne River and its tributaries —Sala, Ngengpui, Tuisi, Tuichang, Mat, and Tiau—within the Kolodyne drainage area of Mizoram during the year 2022. Field collections were conducted three times a year, spaced four months apart, to maximize fish diversity. Counts and measurements followed the methodology of Kottelat (1990). Measurements were taken point-to-point on the left side of each specimen using digital calipers with an accuracy of 0.1 mm. Fin rays were counted under a stereomicroscope. Specimens were preserved in 10% formalin solution in the field, then transferred to the laboratory for morphometric and meristic analyses. Photographs of each specimen were taken on the left side while fresh. The type specimens are housed in Pachhunga University College Museum of Fish (PUCMF), Mizoram, India.

Results and discussion

The study documented the presence of five valid *Schistura* species from the Kolodyne drainage in Mizoram during the year 2022. However, all these species are currently categorized as "Not Evaluated" on the IUCN Red List. This classification reflects the limited research and insufficient documentation regarding their geographical distribution and ecological characteristics. Notably, all the identified species are relatively recent discoveries, further emphasizing the knowledge gap surrounding them.

The lack of assessment underlines a critical need for focused studies to better understand these species, their habitats, and potential threats to their survival. Moreover, it highlights the importance of initiating conservation measures without delay, as unassessed species may face risks that remain undetected due to insufficient scientific attention. By prioritizing research and protection strategies, it would be possible to secure the long-term sustainability of these newly identified *Schistura* species.

Schistura andrewi (Solo, Lalramliana., Lalronunga, & Lalnuntluanga).

Schistura andrewi Beihrosa Solo., Lalramliana., Samuel Lalronunga & Lalnuntluanga, 2014. (type locality: Mat River, Mizoram)

Material examined: Holotype: PUCMF 14001, 50.5 mm SL; India: Mizoram, Mat River, a tributary of Kaladan River in the vicinity of Serchhip, Serchhip District, Mizoram.

Diagnosis. *Schistura andrewi* is distinct from other species of its genus found in the Kaladan basin and nearby basins due to a unique combination of morphological characteristics. This species features a prominently developed axillary pelvic lobe, a structure near the base of the pelvic fins. Its lateral line is fully developed, containing 82–95 pores, which is a distinguishing trait. The dorsal and anal fins each possess two unbranched rays, contributing to its fin morphology.

The body is marked by six to seven broad black bars that are noticeably wider than the pale interspaces between them, creating a striking appearance. The dorsal fin is adorned with two horizontal rows of black spots, adding to its distinct patterning. The caudal fin is deeply emarginate, meaning it has a pronounced notch, and is characterized by two vertical rows of black spots. This fin also contains a total of 17 branched rays, arranged in a 9 + 8 pattern.

Male individuals exhibit a sub-orbital flap, a specialized structure located below the eye, which is often associated with reproductive or territorial behaviours. Additionally, the intestinal configuration of this species is distinctive, looping behind the stomach, which may have functional or taxonomic implications. Together, these features set *Schistura andrewi* apart from its congeners in the region

Remarks: *Schistura andrewi* has been described as a new species from Mat River, a tributary of Kolodyne River from Mizoram, northeastern India (Solo *et al.*, 2014). *Schistura andrewi* has been reported first and only from Mat River of Kolodyne drainage within Mizoram and the endemic status is yet to ascertain with more research. Since no specific IUCN criterion is available for this species, it is still put under not evaluated category.

Schistura porocephala (Lokeshwor & Vishwanath)

Schistura porocephala Lokeshwor & Vishwanath, 2013 (type locality: Mat River, Mizoram)

Material examined: PUCMF 13001, 55.5 mm SL; India, Mizoram, Ianava River, a tributary of Kolodyne River in the vicinity of Lobo Village, Saiha District.

Diagnosis. *Schistura porocephala* is distinguishable from its congeners by a distinctive combination of morphological traits. This species exhibits a cephalic lateral line system with prominent pores and an incomplete lateral line containing 28–37 pores. The body is marked with 17–23 narrow olivaceous dark bars set against a yellowish-cream background, creating a striking appearance. The dorsal fin consists of three simple rays and 7½ branched rays, adorned with 2–3 rows of black spots. The caudal fin features 10+9 principal rays (including 9+8 branched rays), is slightly emarginate, and has lobes that are subequal, with the upper lobe being slightly longer than the lower. Additionally, the caudal fin is characterized by 5–6 rows of black spots. Males possess an elongated suborbital flap extending from the anterior tubular nostril to the anterior third of the eye, which is a key distinguishing feature.

Remarks: *Schistura porocephala* was described as a new species in 2013 by Lokeshwor and Vishwanath. The species was discovered in a stream that feeds into the Mat River near Thualthu village in the Kolodyne basin of Mizoram, India. It has been recorded at four out of seven surveyed sites and is commonly found in its habitat, where it demonstrates a dominant presence in the local river systems.

As a relatively newly described species, the conservation status of *Schistura porocephala* remains unclear. It has not been evaluated under the IUCN Red List criteria due to insufficient research on its distribution and diversity across other drainages. Further studies are necessary to assess its ecological status, potential threats, and population trends to determine its conservation needs. For now, it is categorized as "Not Evaluated" under the IUCN framework.

Schistura koladyneensis (Lokeshwor & Vishwanath)

Schistura koladyneensis Lokeshwor & Vishwanath, 2012 (type locality: Kolodyne River, Mizoram)

Material examined: PUCMF 13064, 60.5 mm SL; India, Mizoram, Tuisi river, a tributary of Kolodyne River in the vicinity of Khopai Village, Saiha District.

Diagnosis. *Schistura koladyneensis* is a distinctive species, differentiated from its congeners by a unique set of morphological characteristics. The lateral line system is fully developed, consisting of 85–100 pores. The body is adorned with 9–11 dark brown saddles, which transition into lateral bars along the sides. In the caudal peduncle region, these saddles often separate from the bars, adding to its unique appearance. A prominent basicaudal dark bar is present,

further distinguishing the species. The caudal fin features 4–5 vertical rows of dark spots, with two rows located anterior to the fork and 2–3 rows radiating posteriorly from the fork.

Remarks: This species was first described in 2012 by Lokeshwor and Vishwanath, based on specimens collected from the Kolodyne River near Kawlchaw Village in the Lawngtlai District of Mizoram, India. *Schistura koladynensis* is commonly found in rivers within the study area and has been recorded at all surveyed sites during every season, indicating its widespread presence and ecological dominance. Among the Nemacheiline loaches, it is the most prevalent species, demonstrating its adaptability and significant role within its habitat.

Despite its dominance and frequent occurrence, the conservation status of *Schistura koladynensis* remains unclear due to insufficient research. Its IUCN status is currently categorized as "Not Evaluated," highlighting the need for further studies on its distribution, population dynamics, and potential threats. Enhanced research efforts are essential to assess its ecological significance and establish appropriate conservation strategies to ensure the species' long-term survival.

Schistura scyphovecteta (Lokeshwor & Vishwanath)

Schistura scyphovecteta Lokeshwor & Vishwanath, 2013 (type locality: Ka-ao River near Serkawr Village, Mizoram)

Material examined: PUCMF 130027, 60mm SL; India, Mizoram, Ngengpui River, a tributary of Kolodyne River in the vicinity of Khawmawi Village, Lunglei District.

Diagnosis. *Schistura scyphovecteta* is a distinct species, identified by a unique combination of morphological features. It possesses a fully developed lateral line system and exhibits 5–6 dark brown stripes on its body. These stripes extend onto the flanks, forming globular-shaped bars, which are a defining characteristic of the species. The dorsal fin base is marked by two black spots, while the basicaudal bar is incomplete. Another distinguishing feature is the absence of a median notch on the lower jaw, setting it apart from related species.

Remarks: Described as a new species in 2013 by Lokeshwor and Vishwanath, *Schistura scyphovecteta* was discovered in the Ka-ao River near Serkawr Village within the Kolodyne basin of Mizoram, India. The species is relatively widespread, having been recorded at most of the surveyed sites, except for one. However, it is not a dominant species, as only a few individuals were collected during each sampling effort, suggesting a relatively low abundance within its habitat.

Currently, *Schistura scyphovecteta* has been reported exclusively from the Kolodyne drainage in Mizoram, and its presence in other drainage systems remains unconfirmed. This limited known distribution raises questions about its potential endemism, although its status as an endemic species has not yet been conclusively determined due to insufficient studies on its diversity and distribution.

The species has not been evaluated under the IUCN Red List criteria, reflecting a lack of comprehensive research on its population status, habitat requirements, and threats. Its classification as "Not Evaluated" highlights the urgent need for targeted conservation efforts and further scientific studies. Without appropriate action, *Schistura scyphovecteta* faces the risk of population decline, emphasizing the importance of proactive measures to safeguard its future and prevent potential extinction.

Schistura nebishwari (Lokeshwor & Vishwanath)

Schistura nebishwari Lokeshwor & Vishwanath, 2013 (type locality: a stream near Phura village in the vicinity of Palak lake, Mizoram)

Material examined: PUCMF 130026, 68mm SL, Mizoram, Tiau River, a tributary of Kolodyne River in the vicinity of Zokhawthar village, Champhai District.

Diagnosis. *Schistura nebishwari* is distinguished from its congeners by a distinct combination of morphological features. This species exhibits a dorsal adipose crest on the caudal peduncle and is marked by 11–16 dark olivaceous bars along the body. Numerous small melanophores are present on the ventral side of the head, giving it a speckled appearance. The lateral line is incomplete, and the dorsal fin base features three black spots. A dark, prominent basicaudal bar is present, along with a shallow median notch in the lower jaw. Unlike some related species, males lack a suborbital flap. Additional distinguishing traits include inflated cheeks and a deep caudal peduncle.

Remarks: *Schistura nebishwari* was described in 2013 by Lokeshwor and Vishwanath based on specimens collected from a stream near Phura Village close to Palak Lake in the Kolodyne basin of Mizoram, India. The species has been recorded at all surveyed sites within the study area and is notably dominant among the *Schistura* species found in the Kolodyne drainage.

Currently, *Schistura nebishwari* has been reported exclusively from the Kolodyne drainage in Mizoram, and its potential endemic status remains uncertain. Further research is needed to confirm its distribution and diversity. Due to the limited scope of studies conducted so far, the species has not been evaluated under the IUCN Red List criteria and is categorized as "Not Evaluated." This highlights the need for additional research and conservation efforts to better understand its ecological role and ensure its protection.



A) *Schistura porocephala*



B) *Schistura andrewi*



C) *Schistura scyphovecteta*



D) *Schistura koladynensis*



E) *Schistura nebewhari*

Figure 1 (A-E): fish species under the genus *Schistura* from kolodyne drainage of Mizoram

Table 1. List of *Schistura* fishes from Kolodyne drainage of Mizoram and IUCN (2022) status.

S.No	Name	Genus	IUCN
1	<i>Schistura andrewi</i>	<i>Schistura</i>	NE
2	<i>Schistura porocephala</i>	<i>Schistura</i>	NE
3	<i>Schistura koladynensis</i>	<i>Schistura</i>	NE
4	<i>Schistura scyphovecteta</i>	<i>Schistura</i>	NE
5	<i>Schistura nebewhari</i>	<i>Schistura</i>	NE

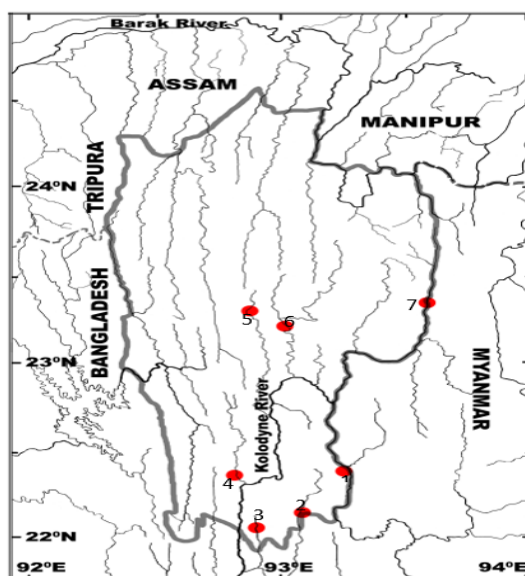


Figure 2. Study areas. 1) Kolodyne; 2) Tuisi; 3) Sala; 4) Ngengpui; 5) Mat; 6) Tuichang; 7) Tiau

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