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Diversity of *Puntius* sp. (Cyprinidae: Cypriniformes) collected from Banshlai River, Birbhum, West Bengal, India

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Abstract

Puntius species are marked by various morphometric characters and colour pattern. The present study describes the morphometric variations and colour pattern of five species of *Puntius*, viz. *P. gelius*, *P. ticto*, *P. conchoni*, *P. sophore*, and *P. chola* collected from Banshlai River of Birbhum district, West Bengal, India. Among five species *P. chola* is quite different in respect to body marking, presence of rostral barbels and other morphometric characters like minimum eye diameter (35.35% HL), caudal peduncle depth (14.37% SL), caudal fin length (26.97% of SL), preventral length (46.81% SL) and predorsal length (51.30% SL). Both *P. gelius* and *P. conchoni* have black spot on caudal peduncle but length of dorsal fin base in *P. gelius* is greater compared to that of *P. conchoni* (19.47% SL vs. 17.15% SL), but reverse is true in case of body depth (25.38% SL vs. 27.40% SL). Both *P. ticto* and *P. sophore* have serrated dorsal spine and orange anal fin in common, but the values of prepectoral length and interorbital distance is greater in *P. ticto* compared to *P. sophore* (29.09% SL vs. 26.38% SL and 52.27% HL vs. 48.51% HL respectively), but snout length and dorsal fin base length is greater in *P. sophore* (36.36% HL vs. 33.65% HL and 21.59% SL vs. 19.49% SL).

PCA and heatmap are used to establish the identity of five species of *Puntius* sp. A key to five species of *Puntius* sp. is presented here.

The variation of morphometric characters from earlier studies of different workers outside West Bengal may be due to variations of different environmental factors that govern the growth and morphometry of a particular species.

Keywords: Banshlai River, *Puntius* sp., morphometry, meristic counts, five species, PCA, Heat map

Introduction

Historically, the morphological characteristics of fishes have been the primary source of information due to non-availability of genetic, physiological, behavioral and ecological studies. Naturally, the systematic ichthyologists continue to depend heavily on morphology for taxonomic characters. Species have characteristic shapes, sizes, colour pattern, disposition of fins and other external features that aid in recognition, identification and classification. In addition there are important characters that can be examined by dissection or by other means for an internal study. The taxonomic descriptions and important morphological characters of the genus *Puntius* as described by Jayaram^[1] has been given to lay a basis for succeeding of this work.

There has been considerable inconsistency and confusion in adapting the name *Barbus*, Cuvier^[2] and / *Puntius*, Hamilton^[3]. Hamilton placed some species under the division *Cyprinus*, as a separate genus or a subgenus. *Barbus* comprises of about 600 species in its range which extends from Africa, Asia and Europe, to Central China, the Philippines and East Indians. Gunther^[4] subdivided the genus into several sections on geographical ground. Day^[5] used the name *Barbus* in a wide sense, although in his key he utilized the Bleekerian names without any definite indications of their status. Hora^[6], Hora *et.al.*^[7], Hora and Law^[8], Hora and Nair^[9] treated *Puntius* as a subgenus of *Barbus*. De Witt^[10] kept the species under *Barbus*. Myers^[11] suggested that the name *Barbus* be retained in its broad sense. Misra^[12] used *Puntius* for all species described in his work. Probably he followed the work of Weber and De Beaufort^[13] who recognized *Puntius* as a valid genus. In recent years many authors adopt the *Barbodes*, Bleeker for accommodating *Puntius* as a genus of *boranicus*, *sarana orphoides*, *sarana*

sarana, sarana subnasutus [14-16]. Kottelat [17] described *Barbodes* as a junior synonym. Considering the above reasons, it can be followed that the name *Barbus* is used for the barbs for the European Continent and *Puntius* for the Asiatic especially for the Indian fishes. Day [5] utilized this Bleekarian name for separating the large complex of *Puntius* sp. However, opinions differ since there is no comprehensible revision and/ study on *Puntius* sp.

Fishes included under the genus *Puntius*, Hamilton [3] are of very common in our country. *Puntius* recognized as “catch all genus” [17] is suspected to be polyphyletic [18]. Despite the revision of the genus *Puntius* by Jayaram [19] the taxonomy of the genus continues to be ambiguous. The genus *Puntius*, Hamilton [3] comprises more than 140 species [20] mainly of Western and Eastern Ghats as well as Eastern Himalayas. However, 12 species of genus *Puntius* from north east India and seven species from Brahmaputra valley zone, were reported by Sinha [21] and Sarma et al. [22]. Barman [23] reported 10 species from West Bengal. Due to abundance and species

variations of *Puntius* sp. collected so far, and lack of comprehensive reports from West Bengal especially from the district Birbhum, the present study is aimed to revise the whole scenario of the species concerned. So the present report provides information on morphometric measurements, meristic counts and body design of five species of *Puntius* sp. collected from Banshlai River.

Materials and Methods

Study Site

Palsa (24°27'49"N and 87°51'00"E) is situated in the Rampurhat Sub-division of Birbhum District of West Bengal and on the bank of Banshlai, the first tributary of Bhagirathi of Gangetic River basin (Fig.1). Banshlai River flows through Godda district of Jharkhand and Birbhum and Murshidabad districts of West Bengal before entering the Bhagirathi north of Jangipur (Murshidabad district). The river Banshlai covers a distance of 112 Km. Only 17% of Banshlai River is within West Bengal.

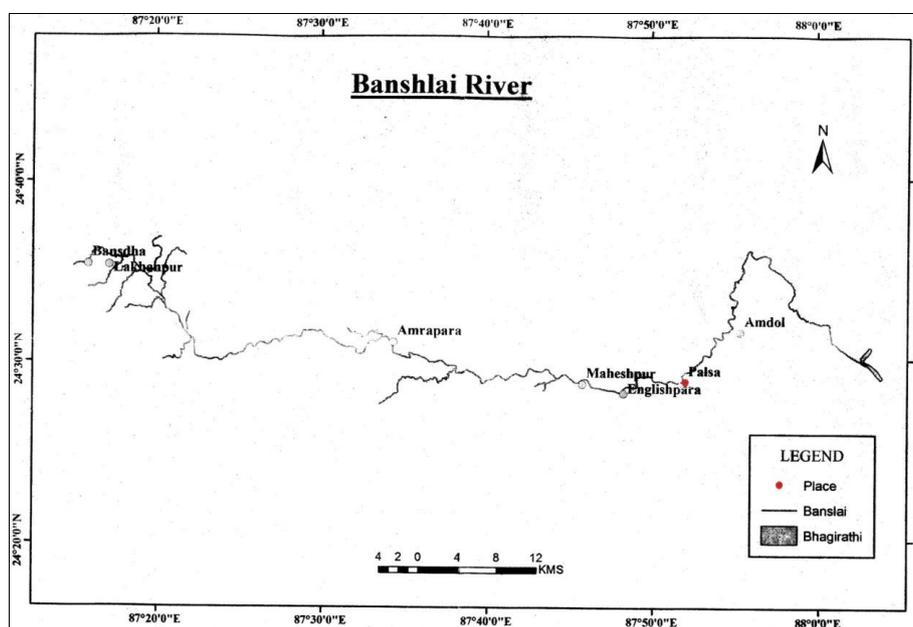


Fig 1: Sampling site at Palsa (marked as •) of Banshlai River.

Collection

The samples were collected during day time on seasonal basis (especially in the rainy season) from June'15 to June'16. These fishes were caught by means of traditional fishing gears like Jhanki (Cast-net) and Tar-jal (Lift-Net). The samples were mopped by filter paper to remove excess water from their body surface and there after the colour variations, different blotches present, if any and total length of the specimens were recorded. Then the specimens were brought to the laboratory in ice-box.

Measurements

For each individual, morphometric measurements were done by using dial-calipers with 0.1mm accuracy. Measurements were taken only in the left side of each individual. Morphometric measurements and meristic characters were recorded following Jayaram [1] Talwar and Jhingram [24], Viswanath and Santa Kumar [25] and Hubbs and Lagler [26].

Body measurements were expressed as percentage of standard length (%SL) and head measurements were expressed as percentage of head length (%HL).

Statistics

PCA and Heat map were done to separate five species of *Puntius* sp. PCA (Principal Component Analysis) is a statistical tool by which a high dimensional multivariate data set is linearly transferred into a set of uncorrelated low dimensional linear variables. In PCA, first two principal components (PC1 and PC2) often show large amount of variations.

Heatmap is a graphical presentation of data matrix to visualize data through variation in colour. Here, numerical data is presented in colour scale which blends from one colour to another that represent the differences in high and low value and categorical data is colour coded. The dendrogram along both sides of heatmap show how the variables (species) and the rows (characters) are independently clustered. Both PCA and heatmap generation are performed using on line graphical user interface Clust Vis [27, 28].

Results

Five species of *Puntius* were identified and recorded in the present study (Plate- 1). Comparative morphometric and meristic data of all these five species are presented in Table

1A, 1B and 2. *P. gelius* (Hamilton, 1822).

No barbel; a continuous red line from operculum to the end of the fork; an inconspicuous black spot on the red line at the caudal peduncle; stipulated black band at the distal portion of the dorsal fin, only on 3-4 fin-rays near the fin-base; no black band at the rear margin of the dorsal fin. Dorsal spine is non-osseous. Pectoral fin is colorless. Ventral and anal fins are yellowish orange in color. Dorsal fin base length is 19.47% of SL. Head is moderately large, of about 26.91%, Pre dorsal length of about 52.04% and caudal peduncle length of about 20.74 % of SL. Incomplete lateral line ceases after six scales.

P. ticto (Hamilton, 1822)

No barbel; two black spots, one on a short distance from operculum and another in caudal peduncle; dorsal spine serrated. Tip of the ventral fin is orange in colour. Upper lip is slightly larger than lower lip. Head is of about 26.33% of SL. Snout length is 33.65% of HL. Eye diameter is 42.06% of HL. Pre dorsal length is of about 56.58% and caudal peduncle length of about 20.9% of SL. Lateral line complete.

P. conchoni (Hamilton, 1822)

No barbel. One black spot is at caudal peduncle. Operculum is red. Margin of the dorsal fin and caudal fin are black, though a few rays of caudal fin are red in colour at the base region. Ventral and anal fins are orange in colour. Non osseous dorsal spine; Head is of about 26.28% of SL. Eye diameter is of 42.20% of HL. Pre dorsal length is of about 52.46% of SL. Caudal peduncle length is of about 21.28% of SL. Reddish, incomplete lateral line ceases after 10th scale.

P. sophore (Hamilton, 1822)

No barbel; Body is silvery coloured with reddish tinge. Tip of the dorsal, anal, pectoral and caudal fins are orange in colour. Black blotch is present at the base of dorsal fin between 3rd and 6th branched rays. A black round spot is also present in the mid-region of the caudal peduncle. Dorsal spine is serrated. Head is of about 26.40% of SL. Snout length is of about 36.36% of HL. Eye-diameter is 40.90% of HL. Caudal peduncle length is 22.42% of SL. Pre dorsal length is of about 53.59% of SL. Lateral line complete.

P. chola (Hamilton, 1822)

Presence of one pair of maxillary barbel extended below the middle of eye; three black spots, one at the base of dorsal fin, one at the posterior end of operculum and one in caudal peduncle. Three or four rays at the fork region of caudal fin is red in colour, other portion of caudal fin is creamy white in colour. Operculum is crimson red. Dorsal side is dusky black while the ventral side is silvery white. Band is present in the periphery of dorsal, caudal, and anal fins. Anal fin is orange in colour. Origin of dorsal fin is slightly behind that of ventral fin. Head is moderately large and is of about 27.34% of SL. Snout is 31.53% of HL, Eye diameter is 35.35% of HL, Pre dorsal length is 51.30% of SL. Caudal peduncle length is of about 21.41% of SL. Lateral line complete and in the middle of both sides.

Comparative Study

Besides variations in external features like coloration, markings (blotches or spots, bands), barbel (presence or absence), scale counts etc. in these five species of *Puntius* sp., there are also morphometric variations among them.

Both in *P. gelius* and *P. conchoni*, black spot is present on caudal peduncle base. But the two species differ in various morphometric characters. In *P. gelius*, length of dorsal fin base and dorsal spine length is comparatively greater than

those of *P. conchoni* (19.47% SL vs. 17.15% SL and 17.34% SL vs. 15.39% SL respectively), but in case of body depth and snout length reverse is true (25.38% SL vs. 27.40% SL and 30.05% HL vs. 32.63% HL respectively).

Both *P. ticto* and *P. sophore* exhibit similar external features like serrated dorsal spine, orange anal fin, black peripheral band in both dorsal and caudal fins etc. But these two species differ in various morphological characters. In *P. sophore* some of the morphometric characters show higher values in respect to *P. ticto* like length of dorsal fin base (21.59% SL vs. 19.49% SL), pectoral spine length (14.37% SL vs. 12.68% SL), snout length (36.36% HL vs. 33.65% HL) and a few shows lower values like pre pectoral length (26.38% SL vs. 29.09% SL) and inter orbital distance (48.51% HL vs. 52.27% HL).

But *P. chola* is quite different among five species both in external characters as well as in morphometry. Some of the important external features like rostral barbel, three black spots on different regions, blackish anal fin end, reddish tinge on fork are unique in this species. Both *P. sophore* and *P. chola* have a black blotch at dorsal fin base, but in *P. chola* the blotch is at the 1st to 4th branched rays while in *P. sophore*, it is at the base of 3rd to 6th branched rays. Morphometrically though *P. chola* is large in respect to SL (74.20 mm.) and HL (22.50 mm.) but other characters like fork length, pre ventral length, caudal fin length, caudal peduncle depth and eye diameter show lower values compared to other four species. Caudal peduncle depth in caudal peduncle length is minimum in *P. ticto* (1.23) but maximum in *P. chola* (1.49). (Table: 1A and 1B).

Number of fin rays in all fins is almost equal but lateral line scales varies (22-23 in *P. gelius* to 26-28 in *P. chola*) (Table: 2).

A key to the five species of *Puntius* sp.

1. With barbell..... *P. chola*
Without barbel..... 2
2. Two blotches..... 3
One blotch..... 4
3. One of the blotches near operculum..... *P. ticto*
One of the blotches in dorsal fin base.....*P. sophore*
4. Conspicuous blotch..... *P. conchoni*
Inconspicuous blotch..... *P. gelius*

PCA provides a summarization of variations of 22 morphometric characters among five species of *Puntius*. PC1 explains 52.2% variation among species whereas, PC2 explains 22.1%. Despite forming a discrete group of PC1 vs. PC2, *P. gelius* overlaps with *P. conchoni* on PC1 axis, but PC2 axis shows no overlapping (Fig. 3).

Heatmap shows variation of morphometric characters among five species of *Puntius*. A single species is distinctly separated from other four species on the basis of one or more characters. Among all the five species, *P. chola* is distinct on the basis of several characters as represented by greater number of lighter blocks while *P. ticto*, *P. sophore* and *P. chola* are distinctly separated from all other species by a single character like pre dorsal length (PDL), pre pectoral length (PPL) and head length (HL) respectively (Fig. 2).

Dendrogram shows two pairs of closely related species viz. *P. gelius* – *P. conchoni* and *P. ticto* – *P. sophore*. *P. chola* is related with the first pair but is distantly related with the second pair (Fig. 2).

Table 1A: Morphometric data of five species of *Puntius sp.* (% of SL).

| Parameters | <i>P. gelius</i> n=59 | <i>P. ticto</i> n=52 | <i>P. conchonius</i> n=46 | <i>P. sophore</i> n=67 | <i>P. chola</i> n=25 |
|---------------------------------|--------------------------|-------------------------|------------------------------|---------------------------|-------------------------|
| Total length | 126.85±0.39 | 127.47±0.41 | 126.53±0.67 | 127.05±0.34 | 124.15±0.58 |
| Standard Length(SL)(mm) | 55.60±0.45 | 45.50±0.89 | 58.30±0.78 | 41.60±0.39 | 74.20±0.63 |
| % SL | | | | | |
| Pre dorsal length(PDL) | 52.04±0.41 | 56.58±0.41 | 52.46±0.37 | 53.59±0.29 | 51.30±0.31 |
| Fork length(FL) | 111.72±0.38 | 108.42±0.34 | 115.42±0.21 | 112.01±0.17 | 106.68±0.18 |
| Pre anal length(PAL) | 73.01±0.42 | 74.08±0.67 | 73.13±0.39 | 74.40±0.45 | 72.44±0.31 |
| Length of dorsal fin base(DFBL) | 19.47±0.51 | 19.49±0.29 | 17.15±0.36 | 21.59±0.12 | 19.30±0.16 |
| Dorsal spine length(DSL) | 17.34±0.45 | 19.49±0.36 | 15.39±0.13 | 19.99±0.18 | 15.62±0.17 |
| Anal spine length(ASL) | 9.57±0.61 | 9.83±0.67 | 8.82±0.21 | 9.59±0.18 | 9.70±0.17 |
| Pectoral spine length(PSL) | 14.20±0.52 | 12.68±0.42 | 13.72±0.19 | 14.37±0.21 | 12.02±0.38 |
| Pre ventral length(PVL) | 48.68±0.49 | 49.99±0.37 | 49.70±0.68 | 52.78±0.49 | 46.81±0.37 |
| Pre pectoral length(PPL) | 28.04±0.38 | 29.09±0.29 | 27.08±0.32 | 26.38±0.41 | 28.06±0.43 |
| Pectoral fin length(PFL) | 22.04±0.25 | 19.85±0.41 | 20.58±0.42 | 21.59±0.46 | 19.96±0.37 |
| Caudal fin length(CFL) | 31.16±0.78 | 29.79±0.38 | 29.41±0.36 | 30.42±0.37 | 26.97±0.43 |
| Caudal peduncle length(CPL) | 20.74±0.81 | 20.92±0.42 | 21.98±0.32 | 22.42±0.51 | 21.41±0.52 |
| Body depth at anus(BDA) | 25.38±0.52 | 28.61±0.51 | 27.40±0.37 | 29.59±0.43 | 25.65±0.71 |
| Caudal peduncle depth(CPD) | 15.75±0.62 | 16.99±0.35 | 15.39±0.30 | 17.59±0.29 | 14.37±0.51 |
| Head length(HL) | 26.91±0.34 | 26.33±0.32 | 26.28±0.48 | 26.40±0.52 | 27.34±0.42 |
| Head depth(HD) | 17.20±0.58 | 16.30±0.45 | 17.99±0.39 | 16.79±0.42 | 17.54±0.25 |
| CPD in CPL(CPDL) | 1.32 | 1.23 | 1.43 | 1.27 | 1.49 |

Table 1B: Morphometric data of five species of *Puntius sp.* (% of HL).

| Parameters | <i>P. gelius</i> | <i>P. ticto</i> | <i>P. conchonius</i> | <i>P. sophore</i> | <i>P. chola</i> |
|-----------------------------|------------------|-----------------|----------------------|-------------------|-----------------|
| Head Length(HL) (mm) | 14.90±0.28 | 12.00±0.34 | 15.30±0.49 | 11.00±0.41 | 22.50±0.46 |
| % HL | | | | | |
| Snout length(SNL) | 30.05±0.21 | 33.65±0.27 | 32.63±0.31 | 36.36±0.34 | 31.53±0.27 |
| Inter orbital distance(IOD) | 50.61±0.22 | 52.27±0.21 | 53.30±0.16 | 48.51±0.14 | 46.97±0.16 |
| Internarial distance(IND) | 28.50±0.24 | 27.32±0.21 | 29.30±0.17 | 30.30±0.16 | 27.06±0.19 |
| Eye diameter(ED) | 39.43±0.12 | 42.06±0.11 | 40.20±0.16 | 40.90±0.17 | 35.35±0.19 |

Table 2: Meristic counts of five species of *Puntius sp.*

| Parameters | <i>P. gelius</i> | <i>P. ticto</i> | <i>P. conchonius</i> | <i>P. sophore</i> | <i>P. chola</i> |
|---------------------|------------------|-----------------|----------------------|-------------------|-----------------|
| Dorsal fin | ii(8-10) | ii(8) | ii(8) | ii(8) | ii(8) |
| Pectoral fin | I(9-11) | I(8) | I(9-11) | I(7-10) | I(9-11) |
| Ventral fin | I(7-8) | I(8) | I(7-8) | I(8) | I(7-8) |
| Anal fin | ii(4-5) | ii(5) | ii(5) | ii(5) | ii(5-6) |
| Lateral line scales | 22-23 | 22-25 | 26-27 | 25-26 | 26-28 |
| Pre dorsal scale | 8 | 9 - 11 | 9 | 8 - 10 | 9 - 11 |

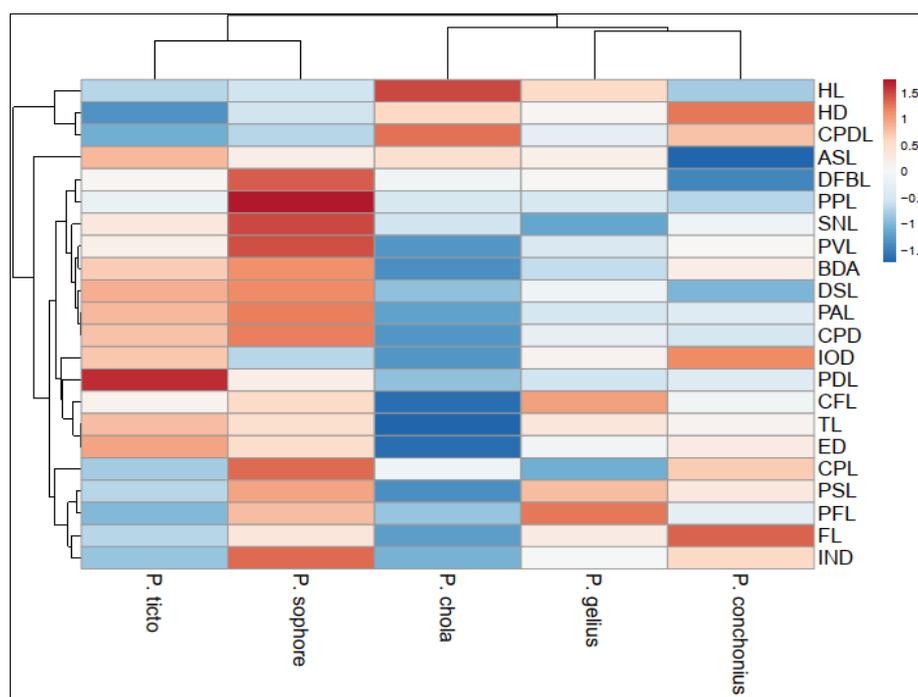


Fig 2: Heatmap generated using indexes (along each row) for five different species of *Puntius sp.* (All the names in the figure are scientific names).

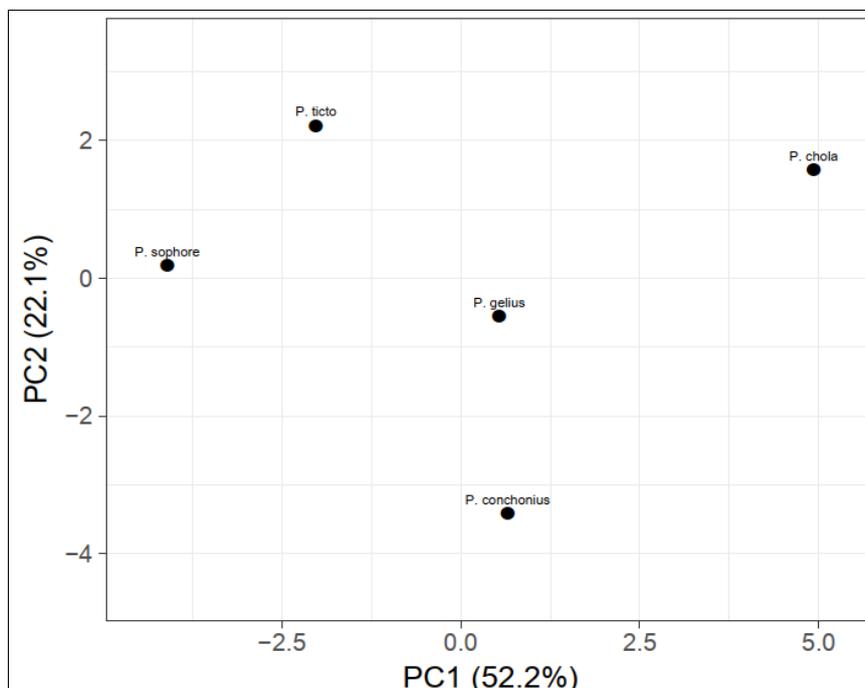


Fig 3: Five different species of *Puntius* sp. is separated from each other along first two principal components PC1 and PC2. (All the names in the figure are scientific names).

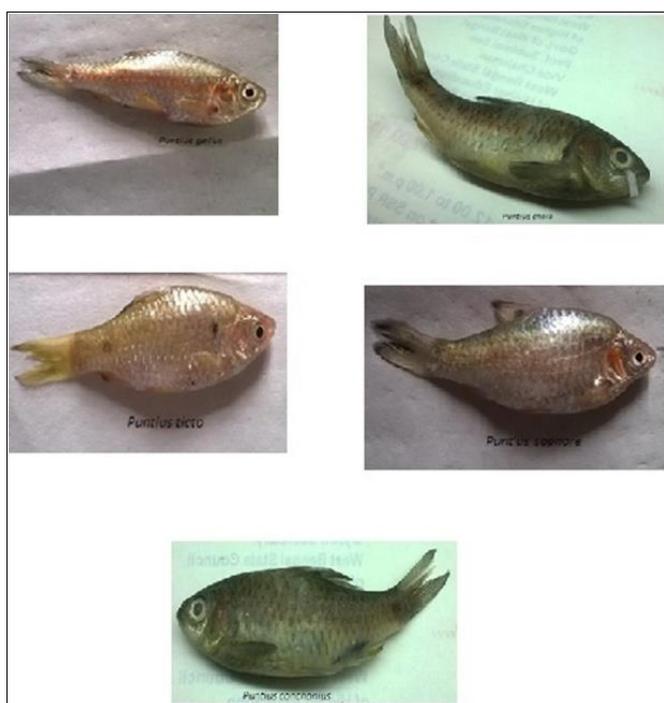


Plate 1: Five species of *Puntius* sp.

Discussion

Morphometric study of *P. gelius* is scanty. Choudhury and Dutta [29] reported HL, Pre-anal length, Pre ventral length 25.10, 72.83, 49.17 in % of SL respectively and eye diameter 39.31 in % of HL. In the present study the values of those morphological parameters are almost same i.e. 26.91, 73.01, 48.68 in % of SL and eye diameter 39.43 in % of HL (Table: 1).

There is no report on morphometry of *P. ticto* from eastern region particularly from West Bengal. Though, a few studies on this species have been reported from Tamil Nadu [30] and Assam [26, 31]. Acharjee and Sengupta [31] reported caudal peduncle length of *P. ticto* 21.00 in % of SL, but in the present study the value is 20.92 in % of SL. Choudhury and

Dutta [29] reported pre dorsal length and pre ventral length of *P. ticto* as 53.45 and 50.63 in % of SL respectively. In the present study, though pre dorsal length is slightly higher (56.58% SL) but pre ventral length is almost same (49.99% SL). Rajasekaran and Sivakumar [30] reported range of the values (Minimum and maximum) of different morphometric characters like pre ventral length (48.9 – 54.3% SL), caudal fin length (29.4 – 37.1), caudal peduncle depth (12.1 – 18.4), Head length (27.3 – 31.4) in % of SL. In the present study, the values of those morphometric characters are within the range (49.99, 29.79, 16.99 and 26.33 % SL respectively) (Table 3). Study of morphometry of *P. conchoniuis* has been reported by a number of authors from different regions of India. Values of seven morphometric characters of *P. conchoniuis* viz. pre dorsal length, pre anal length, pre pectoral length, caudal peduncle depth, inter orbital distance, inter narial distance and eye diameter of the present study are within the range of values as reported by Rajasekaran and Sivakumar [30]. More over the values of caudal peduncle depth and pre dorsal length of *P. conchoniuis* in the present study are in concurrence with the reports of other authors [29, 32]. Choudhury and Dutta [29] reported pre ventral and pre dorsal length of *P. conchoniuis* are 46.06 and 52.72 % of SL respectively. In the present study the values of those two parameters are 49.70 and 52.75% SL respectively. In our study head length of *P. conchoniuis* is 26.28 % of SL which is close to the study of Choudhury and Dutta [29] and Acharjee and Sengupta [31], while Saroniya *et al.* [32] reported head length and caudal peduncle depth in % of TL 22.49 and 12.29, which are 20.73 and 12.23 respectively in our study (Table: 3).

Hamilton [3] described *P. sophore* as having four very minute barbels which were not depicted in his figure. But Mc Clelland [33] and Gunther [4] reported this species without barbel. Day [5] inferred that the report as presented by Hamilton was referable to *Barbus stigma*. Chaudhuri [34] considered Hamilton's reference of having four barbels as a mistake or over-sight. He also concluded that Day's information is incorrect and *B. stigma* is a synonym of *B. sophore*. Later Hora [6], Misra [12] Srivastava [35] followed

Chaudhuri^[34] and considered *B. sophore* as barbelless which is also at par with our study (*Barbus* is synonymous to *Puntius*). Fork length of *P. sophore* in the present study is 112.01% SL and 88.11% TL which are almost same with the study of Choudhury and Dutta^[29] and Saroniya et al^[32] from India and Ahmed et al^[36] from Bangladesh. Rajasekaran and Sivakumar^[30] reported wide variation of pre pectoral length, caudal peduncle depth and head length in *P. sophore*. In the present study, all these values are within the ranges mostly towards the maximum limit (Table: 3).

In *P. chola*, the pre pectoral length, pre ventral length in % of SL and eye diameter in % of HL are almost the same to our study as reported by Choudhury and Dutta^[29]. The head length in % of SL reported by Acharjee and Sengupta^[31] is 27.0, which is almost similar (27.34) to our study. Saroniya et al.^[32] also studied the head length (22.40) fork length (87.34)

and caudal peduncle depth (12.29) in% of TL, those remains close vicinity to our report i.e. 21.99, 86.13 and 11.48 respectively (Table: 3).

Comparative study of five species of *Puntius* sp. showed morphological variation of a particular species in different locations in India and abroad. This is due to variation of different environmental factors that govern the morphometry and growth of species. Variation in the body proportions in the same species according to hydrographic conditions have also been reported by various authors^[37, 38]. According to Le Cren^[39] and Gould^[40] ratios between morphological characters of fish will not necessarily be constant for the organisms of the same species due to variation resulting from differences in sex, race and nutrition and/ or other environmental factors

Table 3: Comparison of different morphometric data of five species of *Puntius* sp. with works done by other authors.

| Species | Morphometric Parameters | Present Study (% S.L.) | References | | | | Present Study (% T.L.) | Reference Saroniya et al ^[32] |
|----------------------|-----------------------------|------------------------|---|-------------------------------------|---------------------------------------|------------------------------|------------------------|--|
| | | | Rajasekaran and Sivakumar ^[30] | Choudhury and Dutta ^[29] | Acharjee and Sengupta ^[31] | Ahmad et al. ^[36] | | |
| <i>P. gelius</i> | Head length | 26.91 | - | 25.1 | - | - | - | - |
| | Pre anal length | 73.01 | - | 72.83 | - | - | - | - |
| | Pre ventral length | 48.68 | - | 49.17 | - | - | - | - |
| | Eye diameter | 39.43 | - | 39.31 | - | - | - | - |
| <i>P. ticto</i> | Caudal peduncle length | 20.92 | - | - | 21.0 | - | - | - |
| | Pre dorsal length | 56.58 | - | 53.45 | - | - | - | - |
| | Pre ventral length | 49.99 | 48.9-54.3 | 50.63 | - | 48.49 | - | - |
| | Caudal fin length | 29.79 | 29.4-37.1 | - | - | - | - | - |
| | Caudal peduncle depth | 16.99 | 12.1-18.4 | - | - | - | - | - |
| | Head length | 26.33 | 27.3-31.4 | - | - | - | 20.69 | 20.92 |
| | Fork length | - | - | - | - | - | 85.00 | 89.12 |
| | SL | - | - | - | - | - | 78.45 | 76.53 |
| <i>P. conchonius</i> | Pre pectoral length | 28.36 | - | - | - | 29.09 | - | - |
| | Head length | 26.28 | - | 25.99 | 28.0 | - | 20.73 | 22.49 |
| | Caudal peduncle length | 21.98 | - | - | 18.0 | - | - | - |
| | Pre ventral length | 49.70 | - | 46.06 | - | - | - | - |
| | Pre dorsal length | 52.40 | 50-53.1 | 52.72 | - | - | - | - |
| | Pre anal length | 73.13 | 69.7-75.5 | - | - | - | - | - |
| | Pre pectoral length | 27.08 | 26.8-32.5 | - | - | - | - | - |
| | Caudal peduncle depth | 15.39 | 12.1-20.0 | - | - | - | 12.23 | 12.29 |
| | Inter orbital distance (HL) | 53.30 | 46.7-55.6 | - | - | - | - | - |
| | Inter narial distance (HL) | 29.30 | 26.7-33.3 | - | - | - | - | - |
| <i>P. sophore</i> | Eye diameter (HL) | 40.30 | 33.3-45.5 | - | - | - | - | - |
| | Standard length | - | - | - | - | - | 78.99 | 77.26 |
| | Pre pectoral length | 26.38 | 20.3-33.9 | - | - | - | - | - |
| | Caudal peduncle depth | 17.59 | 6.7-18.0 | - | - | - | - | - |
| | Head length | 26.4 | 21.6-29.6 | - | - | - | - | - |
| | Caudal peduncle length | 17.59 | - | - | 19 | - | - | - |
| | Fork length | 112.01 | - | 111.08 | - | 113.48 | 88.11 | 88.96 |
| | Snout length | 36.36 | 25.0-38.9 | - | - | - | - | - |
| <i>P. chola</i> | Inter orbital distance (HL) | 48.51 | 33.3-50.0 | - | - | - | - | - |
| | Inter narial distance (HL) | 30.3 | 21.4-33.3 | - | - | - | - | - |
| | Standard length | - | - | - | - | - | 78.70 | 77.73 |
| | Pre pectoral length | 28.06 | - | 28.35 | - | - | - | - |
| | Pre ventral length | 46.81 | - | 46.88 | - | - | - | - |
| | Caudal peduncle length | 21.41 | - | - | 18-19 | - | - | - |
| | Head length | 27.34 | - | - | 27.0 | - | 21.99 | 22.40 |
| Eye diameter (HL) | 35.30 | - | 35.6 | - | - | - | - | |
| <i>P. chola</i> | Caudal peduncle depth | - | - | - | - | - | 11.48 | 12.29 |
| | Standard length | - | - | - | - | - | 80.5 | 77.26 |
| | Fork length | - | - | - | - | - | 86.13 | 87.34 |

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