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Morphometric relationships and meristic characteristics of ticto barb *Pethia ticto* (Hamilton, 1822) from Gomti River, Uttar Pradesh

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Abstract
The present study aims to illustrate the morphometric relationships and meristic characteristics of ticto barb, *Pethia ticto* from Gomti River, Sultanpur, Uttar Pradesh. A total of 90 specimens ranging from 37-90 mm in total length and 0.82-10.37g body weight were used for morphometric and meristic studies. The sampling was done on monthly basis from June 2015 to May 2016 using different fishing gears as cast net, gill net and drag net having mesh size of about 1.0-2.0 cm. A total of 15 morphometric measurements and 8 meristic characters were considered for the present study. The standard length and fork length was found to be 77.98% and 89.27% of the total length, respectively. The head length, dorsal fin length, pectoral fin length, anal fin length and snout length were calculated as 24.17%, 20.96%, 16.64%, 13.76% and 7.04% of the total length respectively. The pre-orbital length and post orbital length was calculated as 7.07% and 11.78% of the total length, respectively. The fin formulae of *P. ticto* was found to be as dorsal, D III, 8; pectoral, P_1 I, 12-14; pelvic, P_2 III, 5; anal, A II-III, 5 and caudal, C X, 9-10. The present study will be helpful in identification of the species and linear measurements can be used to determine population dynamics and health status of *P. ticto* in its natural habitat.

Keywords: *Pethia ticto*, Morphometric, Meristic, Gomti River

1. Introduction
A *Pethia ticto* (Ham. 1822) is small indigenous subtropical cyprinid fish species. It is commonly known as "ticto barb" or "two spot barb". It is native to India, Nepal, Myanmar, Bangladesh, Pakistan, Sri Lanka and Thailand [1]. It is found in still, shallow, marginal waters of lakes and rivers, usually with muddy bottoms. It is an omnivorous fish mainly feeding on small crustaceans, insects and plankton. It grows to a maximum length of 100 mm [1]. It is a very popular barb among freshwater ornamental fishes [1]. *P. ticto* is a considerable source of animal protein and micro-nutrients in the diet of rural poors and landless people [2]. *P. ticto* has been described as threatened species in Bangladesh [3] and in India the fish has been categorized as low risk near threatened [4, 5]. The fish has its own importance in maintaining the equilibrium of the ecosystem and plays a vital role in balancing the food chain of an ecosystem.

Identifying a fish is a preliminary approach to carry on any research. Morphometric measurements and meristic characters are considered as easiest and authentic methods for the identification of specimen which is termed as morphological systematics [6] and deriving statistical relationship among them are essential for taxonomic work [7] and taxonomic status [8]. These characters are helpful for species recognition and classification [9-11]. The morphometric characters of a fish species are also used to compare life history and morphological trends of populations across regions [12-14]. These relationships between various body parts of fish can be used to assess the well being of individuals and to determine the possible difference between separate unit stocks of the same species [15]. Length – length relationship are still scarce for most of the tropical and subtropical fish species [16-18]. The body measurements of different fish species and different fish stock may differ considerably. The objective of the present study is to assess the well being of fish in the study area in Gomti river, Uttar Pradesh through morphometric, meristic characteristics and length- length relationship.

2. Materials and Methods

2.1 Study area

The present study was carried out between latitude $26^0$29N and longitude $81^0$44E, 751m (msl) in Gomti River near Jagdishpur of Sultanpur district Uttar Pradesh, India.

2.2 Collection of specimen and sampling schedule

The study was conducted from June 2015 to May 2016. A total of 90 specimens were used in the present study for the aforesaid purpose. There different types of fishing gears such as cast net, gill net and drag net with a mesh size of about 1.5-2.0 cm were employed to collect the fish species. Simple random sampling method has been used for the collection of specimens. The freshly landed specimens were immediately preserved in 10% formaldehyde solution and were labeled properly.

2.3 Morphometric measurements and meristic counts

The specimens were then brought to the college laboratory to examine morphometric and meristic characters following the methodology as per [19, 20]. Total length was measured from anterior most part of snout to the longest part of caudal fin. Standard length was measured from snout to the origin of caudal fin. Length from snout to the point of bifurcation of caudal fin was recorded as fork length. Head length was measured as length from snout to posterior most part of operculum. Distance from tip of upper jaw to anterior margin of fleshy orbit is snout length. Dorsal/Pectoral/Anal fin length was measured straight between origin point of these fins to their extreme tip. Pre-orbital length was recorded as the straight line distance from the tip of the snout to the anterior margin of the orbit while post-orbital length was the straight line distance measured from the posterior margin of the eye to the tip of opercular bone. Specimens were measured using scale up to the nearest 0.1 cm. The total number of the fin rays and scales in different body parts (including the lateral line) were counted by using the magnifying glass.

3. Result & discussion

Pethia ticto is a small sized fish having silver colour elongated and strongly compressed body. Mouth is small and terminal in position. The fish has thick lips and do not have barbels. The fish has two black spots, one above the pectoral fin and other on the central point of caudal peduncle. The first one extending over 3rd and 4th scales and second one over 18th and 19th scales of the lateral line. The maximum total length of the fish recorded to be 90 mm, while [1] have reported maximum total length upto 100 mm. In the present study, the total length varied from 37-90 mm (mean ± SD = 62.64 ± 9.90). The standard length and fork length were found to be 77.98% and 89.27% of the total length, respectively. Similar results were obtained by [21] wherein the standard length and fork length were calculated as 76.5% and 88.6% of total length, respectively. The head length, dorsal fin length, pectoral fin length, anal fin length and snout length was calculated as 24.17%, 20.96%, 16.64%, 13.76% and 7.04% of the total length respectively. The pre-orbital length and post orbital length were calculated as 7.07% and 11.78% of the total length, respectively. The different morphometric measurements and relationship have been presented in Table 1. The mean length of different morphometric traits is represented in Fig. 1.

Table 1: Morphometric measurements of *P. ticto* specimens (n=90) and relationship among them from Gomti River, Uttar Pradesh.

Measurement	Min. (mm)	Max. (mm)	Mean ± SD	% TL
Total Length	37	90	62.64 ± 9.90	-
Fork Length	34	79	55.87 ± 8.67	89.27
Standard Length	30	71	48.87 ± 7.98	77.98
Head Length	10	21	15.04 ± 2.09	24.17
Dorsal Fin Length	7	18	13.06 ± 2.20	20.96
Pectoral Fin Length	6	16	10.38 ± 1.78	16.64
Anal Fin Length	5	12	8.58 ± 1.47	13.76
Post Orbital Length	4	11	7.42 ± 1.64	11.78
Pre-Orbital Length	3	6	4.38 ± 0.71	7.07
Snout Length	3	6	4.36 ± 0.69	7.04

In the current investigation it was recorded that the lateral line is usually incomplete with 23-26 scales in a row whereas [21] reported 25-29 scales in the lateral line of *P. ticto* from the Ganges River in Bangladesh, moreover [22] reported 22-26 lateral line scales from *P. ticto* from Manipur, India. The fin formula of *P. ticto* was dorsal, D III, 8; pectoral, P_1 I, 12-14; pelvic, P_2 III, 5; anal, A II-III, 5 and caudal, C X, 9-10(Table 2). Similar results for *P.ticto* have been reported by [20, 22].

It is a well-known fact that morphological characters shows high plasticity in response to differences in environmental conditions, such as food abundance and temperature [23-26]. In general fish demonstrate greater variances in morphological traits both within and between populations than any other vertebrates and are more susceptible to environmentally induced morphological variations [27-28, 25]. During the present study, it has been also observed that the meristic counts are dependent on body size and there is a change in meristic counts as the fish increases in size. The difference in lateral line scales and fin rays count indicated that different locations and environment have a considerable impact on meristic characters.

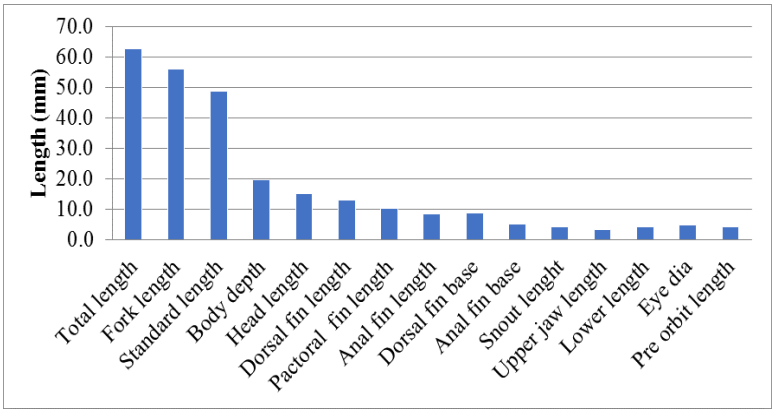

Fig 1: Mean length of the different morphometric traits of *P. ticto* (Ham.1822)

Table 2: Meristic counts of *P. ticto* specimens (n=90) from Gomti River, Uttar Pradesh

Meristic characters	Number
Dorsal fin rays	III, 8
Pectoral fin rays	I, 12-14
Pelvic fin rays	III, 5
Anal fin rays	II-III, 5
Caudal fin rays	X, 9-10
Lateral line scale	23-26
Pre dorsal scale	9-10
Pre anal scale	16

4. Conclusion

Screening of the literature suggest that limited information is available on the morphometric relationships and meristic characters of this species from Gomti River. The present investigation provides valuable information on the morphometric relationships, meristic counts and stock abundance of *P. ticto* in Gomti River. This study indicate that *P. ticto* population is surviving and growing well in the current study location. The *P. ticto* fish has been described as threatened species in Bangladesh [3] but in India the fish has been categorized as low risk near threatened [4, 5] species. The data presented in this study may contribute to a valuable database of the *P. ticto* fish species that is necessary for assessing its stock abundance in Gomti River.

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