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Studies on sexual dimorphism in the cyprinidae fish *Puntius ticto* (Hamilton – Buchanan) from Kumaun Himalaya, India

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Abstract

The present work is related to the sexual dimorphic nature of ornamental fish Puntius ticto (Ham.-Buch.) species from Rocky Rai stream in Kumaun Himalaya, India. This is important for taxonomy, breeding biology and pheromone biology *etc*.

Key words: *Sexual dimorphism* | *Puntius ticto* | *Rocky Rai stream* | *Kumaun Himalaya* | *India*

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Introduction

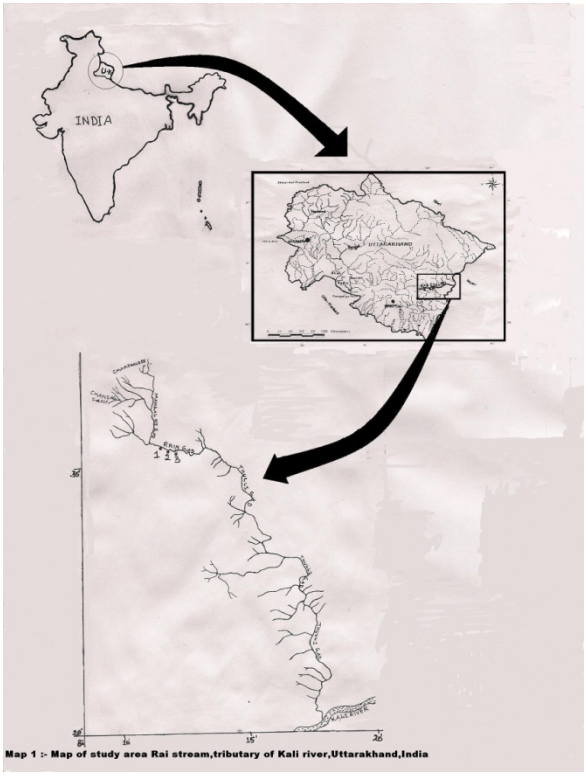
A large number of rivers, rivulets and streams from a vast network in the Kumaun Himalaya and abode a large number of indigenous fish species. The Rai stream is situated in the Central Himalayan Zone in the Uttarakhand state of India. The study of sexual dimorphism is very important in taxonomy, bionomics and breeding biology related research works. South and South East Asia is rich in small sized, often colorful species currently referred to the catchall Asian Cyprinid genus *Puntius. Puntius ticto* (Ham. – Buch.) is the most beautiful and ornamental fish among the *Puntius* species. It has been reported from various parts of Indian territory (Day. 1878; Talwar and Jhingran, 1991).

Of the large no of fish species, sexual dimorphism has been worked out only in a few species of fresh water fishes. Sexual dimorphism in fish has already been reported in different species by Thabias (1974),

Swarup and Swarup (1975), Tilak (1975), Pathani (1978), Rita Kumari and Nari (1979), Badola et. al., (1982), Inasu (1993), Tessy *et al*., (1997) and Dobriyal *et al*., (2007). Present works deals with the sexual dimorphic nature of *Puntius ticto* (Ham. – Buch.) from rocky hill stream of Kumaun Himalaya, India.

Materials and Methods

The present sampling site area study was conducted on the hill stream Rai in latitude 29º36´ N - 80º12´ E at an elevation of about 730 to 750 meters. The Rai spring fed stream is the tributary of river Kali in the upland of Kumaun Himalayan. The present work was done during the period of July 2009 to September 2009. Three sampling sites were selected in the water body of the stream. The personal collections of the fish were from different catching sites along the spring fed streams. They were preserved into 8% formalin solution and identified with the help of keys provided by Day (1878), Talwar and Jhingran (1991) and Jaya Ram (2002). Measurements were taken point to point with rounding to the nearest 0.1 mm. Total length, standard length; head length and snout length were taken from the tip of the snout to the caudal fin base, posterior opercular margin and intera orbital length respectively. Pre-dorsal, pre-pelvic and pre-anal lengths were taken from the tip of snout to the anterior base of the each fin. Lateral line is abbreviated, includes the lateral lines scales and posterior scales in the same horizontal row. Dorsal, ventral, anal and caudal fin counts and other descriptive features were noted in the present study. Local topology is used in descriptions of collecting the sampling sites (Map.1).



Map 1 :- Map of study area Rai stream,tributary of Kali river,Uttarakhand,India

Results

During the present study of the fish *Puntius ticto* (Ham.–Buch.) reach a maximum total length of 68mm for male and 70mm for female. Fish small in sized 37mm for male and 38mm for female could not be recorded in the entire study. The morphometric data on the some different body measurements is presented in the Table 1.

The meristic analysis of fish was noticed on 118 specimen and the values obtained were as follow: Fin formula D11 (3/8), P13, V9, A8 (3/5), C19, barbals are absent in mouth parts. The sales are small or medium about 20 to 25 in the lateral line; however the lateral line cases after 4 to 10 scales.

There is a dark black blotch on 15-20 scales just above the anal fin on both the sides.

During the fish biological investigations on the fish collected from Rai spring fed stream, from Kumaun Himalaya, some impression sexual dimorphism difference were observed. Our observations on the sexual dimorphism in *Puntius ticto* (Ham.–Buch.) is based on the study of 58 females and 60 male specimens, collected between, July 2009 to September 2009. The fish were segregated on the mentioned sexual dimorphic characters and dissected for conformation. We got hundred percent conformations and then decided to report it for an addition to the specific knowledge based on the study of morphometric characters.

The detailed morphometric and meristic of both male as well as female fish was studied (Table1), but no striking difference was seen. The differences are :- (1). Male with slight black blotch on the dorsal fin and some times in ventral fins, absent in female (fig. 1and 2). (2.) Upper portion of the body shinning light olive green, middle portion of the body slight blue in both the sexes; but there is dark pinkish color in the lower portion of the male on both the sides, in females there is slightly pinkish and dark yellow colour in the lower portion on both the sides. (3.) Dorsal, ventral and anal fins are dark pinkish and slight orange in male fishes but slight pinkish color shows in female fishes.


Fig. 1 :- Male Fish Puntius ticto


Fig.2 :- Female Fish Puntius ticto

Discussion

Sexual dimorphism is very significant in biodiversity assessments and also very important in biometry, breeding biology, induced breeding, breeding, pheromone biology and other related works. Well-marked structural differences are seen in the two sexes in some species, especially during the breeding season, and these are not related to copulation. In most teleost the female is larger in size than the male, and has a rounded belly during breeding season. The male have brighter color of the body and fins. Dobriyal et.al, (2007) reported that in male fish dark black shade the dorsal, ventral and anal fins but is absent in female fishes in *Puntius conchonius*. These characteristics are primary sexual dimorphic nature of *Puntius conchonius.* The upper portion of the body shinning olive green and lower portion silvery in both sexes; but there is pinkish colour in male between these two portions, which is not visible in the female fishes.

Horny tubercles are seen on the head of male in some cyprinids viz. *Tor putitora* and *Tor tor* (Pathani, 1978) and *Barilius bendelisis* (Badola et al,1982), and these are more prominent during the breeding season, this they of nature is called secondary sexual dimorphic characters. Talwar and Jhingran (1991) noticed that the arching reddish in the dorsal fin of the male *Puntius ticto* easily distinguishes the species and the dorsal fin of the female *Puntius ticto* female is pale, except for a faint rose at breeding time.

Character in ratio	Female	Male
SL in ratio of TL	1.25 - 1.46* 1.30 ± 0.04	1.25 - 1.60* 1.33 ± 0.07
CL in ratio of TL	3.14 - 4.92 4.25 ± 0.37	2.64 - 5.00 4.13 ± 0.49
PAL in ratio of TL	1.64 - 1.85 1.18 ± 0.05	1.76 - 1.95 1.81 ± 0.06
PDL in ratio of TL	1.51 - 2.73 2.40 ± 0.25	2.15 - 2.83 2.53 ± 0.15
PVL in ratio of TL	1.57 - 2.92 2.61 ± 0.28	1.95 - 2.95 2.64 ± 0.22
HL in ratio of TL	6.18 - 10.00 7.35 ± 1.02	6.16 - 9.25 7.48 ± 1.06
ED in ratio of TL	12.60 - 25.50 17.39 ± 3.86	10.25 – 19.00 14.61 ± 2.48
MBD in ratio of TL	2.66 - 4.00 3.24 ± 0.29	3.07 - 3.72 3.43 ± 0.35
Snt.L in ratio of TL	20.00 - 54.00 29.46 ± 10.95	19.00 – 39.00 26.92 ± 7.75
CL in ratio of SL	2.14 - 3.92 3.25 ± 0.37	1.64 - 4.00 3.11 ± 0.48
PAL in ratio of SL	1.20 - 1.44 1.34 ± 0.05	1.09 – 1.43 1.36 ± 0.07
PDL in ratio of SL	1.03 - 2.07 1.83 ± 0.22	1.64 - 2.08 1.90 ± 0.12
PVL in ratio of SL	1.07 - 2.29 1.99 ± 0.25	1.52 - 2.21 1.99 ± 0.15
HL in ratio of SL	4.90 - 7.60 5.61 ± 0.80	4.14 - 7.25 5.62 ± 0.73
ED in ratio of SL	9.66 - 19.50 13.30 ± 3.15	8.00 - 15.00 10.99 ± 1.83
IOL in ratio of SL	5.00 - 18.00 9.47 ± 4.81	3.83 - 7.33 6.16 ± 0.86
MBD in ratio of SL	2.40 - 2.65	1.66 - 2.81

	2.47 ± 0.23	2.53 ± 0.35
Snt L in ratio of SL	15.00 - 41.00 22.40 ± 8.15	14.00 – 29.00 20.12 ± 5.44
ED in ratio of HL	1.60 - 3.33 2.31 ± 0.51	1.33 - 2.66 1.97 ± 0.33
Snt L in ratio of HL	2.50 - 8.00 4.01 ± 1.43	2.50 - 7.00 3.61 ± 1.05
IOL in ratio of HL	1.00 - 3.00 1.62 ± 0.83	0.60 - 1.75 1.09 ± 0.25
MBD in ratio of HL	0.40 - 0.63 0.44 ± 0.07	0.33 - 0.60 0.47 ± 1.24

Table-1: Some important taxonomic characters in male and female of *Puntius ticto* (Ham.-Buch)

Inasu (1993) observed that males are larger then females of the same age group in *Tetradone travencooricus* (Hora and Nair) but Tessy and Inasu (1997) observed that in the edibal perch *Priacanthus hamrus* (Cur. and Val.) females are more than two times larger and heavier than the males of the same age group. Kurian and Inasu (1997) noticed that female are dominance is observed in *Ompak bimaculatus* (Bloch) also, since female is more or less two times larger and five times heavier than the males of the same age group but in *Horabagrus brachysoma*(Gunther) the males are found slightly larger and heavier than the females of the same age group. Arunanchalam and Johnson (2002) observed that sexual dimorphism in *Puntius kannikattiensis*, males deep black, tubercles on front of snout, and extended laterally below the eyes, also on the lower jaw. Black blotches on the body not clear. Fins and lips deep black. In female; snout was plain, and no tubercles found on snout or lower jaw. Lips are white, fins pale yellow to dull white; entire body blackish –brown, blotches distinct.

In the present study a significant sexual dimorphism was notices in the fish *Puntius ticto*. The male fish have slight black blotch on the dorsal and ventral fins, which were not found in any of the female fish. There was a well marked dark pinkish colour in lower portion of the male on both the side. In female, there is slightly pinkish and dark yellow color found in both the sides. The dorsal, ventral and anal fins are dark pinkish and slight orange in the male while slight pinkish and dark orange color found in female fishes. In the present investigation, statistical analysis of morphometric data revealed that certain characters slightly differ in male and females.

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