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SEX- RATIO STRUCTURE OF P*untius ticto* IN SPRING FED RIVER AASAN FROM DISTRICT-DEHRADUN, UTTARAKHAND, INDIA

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AUTHORS' CONTRIBUTIONS

This work was carried out in collaboration among all authors. Authors RR and PB designed the study, performed the statistical analysis and wrote the protocol as well as the first draft of the manuscript. Authors VS and DM collected the fish sample, managed the analysis of the study and literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The present study was conducted to assess the sex ratio of the fish, *Puntius ticto* in the spring fed river Aasan in western Doon valley for a period of one year. Being an economically important but ignored species, its sex ratio assessment will help in understanding its occurrence and abundance in this area. During the study a total of 109 individuals were collected and their sex determined. In monthly study, the sex ratio varied from 1.66 male:1.00 female in the month of June to 1.00 male:1.60 female in the month of July, whereas in seasonal study it was recorded highest in spring season as 1.22 male:1.0 female and lowest in monsoon season as 1.00 male:1.56 female.

Keywords: *Puntius ticto; s*ex ratio; River Aasan; Doon valley.

1. INTRODUCTION

Fundamental information on the sex-ratio assessment of fishes is significant in the administration practices of fishery science. It is important to determine methods for guaranteeing relative fishing between the two sexes. The Indian minor carp*, Puntius ticto* of the Aasan River, is a little sized fish. Because of absence

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of sufficient biological data of the fish, this species is not considered economically significant in the Uttarakhand. Considering its importance, the present study was performed to assess their sex ratio. The Sex-ratio structure study depicts the abundance of any sex at a particular time [1]. Generally, in a sound healthy fish population the sex ratio is considered as 1:1. Some hill-stream fishes and prawn showed dimorphic nature [2,3]. Sexual dimorphism in *Puntius ticto* has been accounted from Kumaun Himalayan, India [4]. In a preliminary investigation, the sexual dimorphic nature of *Puntius ticto* (Ham.–Buch.) in River Aasan from Doon valley was also noticed.

So, the current investigation was performed on Indian minor carp, *Puntius ticto* in spring fed River Aasan from western Doon valley, District-Dehradun, Uttarakhand, India, during a time period of one year. Some fish scholar reported on Sex-Ratio investigations of Indian freshwater fish fauna [5-20]. The Present work was in continuation with prior investigations and it comprising of understanding of the sex populace ratio of freshwater fish *Puntius ticto* in the foothill area of western Doon valley from River Aasan, India.

2. MATERIALS AND METHODS

For the present examination, 109 specimens of the freshwater fish*, Puntius ticto* were collected during April 2020 to March 21 from Aasan stream of $30^{o}22'53.1''$ N $77^{o}47'51.9''$ E from the local boys who caught them by the conventional fishing gears [21,22,23]. All collected samples were sexed by gonad observation under a binocular microscope to identify the mature females. For every sample, morphometrics were recorded. Total length (TL) and Standard length (SL) were estimated to the nearest mm. Body weight (BW) was taken on a digital balance with 0.001 g precision. After compiling morphometrics information of the fish, the samples were preserved in 5% formalin.

The numbers of fish sample were segregated on the basis of their sex (male and female) to determine the percentage composition of each sex. This helped to understand the distribution of sexes in different months, season and pooled data wise sex population structure. Sex-ratio was resolved for entire period of study and their significance was tested by Chi-Square test (χ^2) using the following equation [1]:

$$\chi^2 = \Sigma (O-E)^2/E,$$

Where;

O = Observed value

E = Expected value.

Significance was determined by using table value at $F_{0.05}$ variable.

3. RESULTS

Out of 109 individuals 57 were females and rest 52 were males. Maximum fish were collected in the month of July (13 individuals) and minimum in the months of May, September and January (07 individuals in each). Only in the month of April and June the male ratio was higher than the female ratio. In the rest of the months, female ratio was found equal (October, November and February) or dominant over the males. The highest sex ratio was recorded as 1.66male: 1.00 female in the month of June whereas the lowest was observed as 1.00male: 1.60 female in the month of July. Season wise data showed that maximum individuals (26) were collected in the winter season and minimum (15), in summer season. The sex ratio in spring season was 1.22male: 1.00 female and in monsoon season 1.00male: 1.56 female.

4. DISCUSSION

In the present study, an average sex ratio of 1.00male: 1.10female was found in *Puntius ticto* from Aasan River. Bahuguna and Dobriyal [20] reported a 1male: 1.17female proportion in *Puntius conchonius* from river Mandal of Garhwal Himalaya. The male female sex proportion in *P. vittatus* was observed as 1:2 [6]. The presence of more females in the majority of the months might be due to the susceptibility of females as reported by Bhatnagar [24]. Sobhana and Nair [25] showed a 1:2 proportion in *P. sarana*, however Kumar and Siddiqui [26] noticed a 1:1 proportion. This deviation from the report of Sobhana and Nair [25] might be attributed to the distinction in populaces occupying in various locality as observed by Nikolsky [27]. Islam and Hossain [5] found a 1:1 proportion in *P. stigma*.

Dobriyal et al. [28] observed the sex ratio of 1.00 male: 1.028female during their study in *Crossocheilus latius latius* from the river Mandakini which was very close to the natural population ratio. The sex ratio of *Puntius vittatus was* 1 male: 2 female as noticed by Jameela Beevi and Ramachandran [6] from Ernakulam district, Kerala. The male: female ratio of 1:1.15 was observed in *Cirrihina reba* by Shendge and Mani [29]. Bahuguna et al. [9] noticed the sex ratio of 1.29 male: 1.00female during their study in *Barilius vagra.* A male: female ratio of 1.00: 1.24 in *Garra lamta* from the Kalapani spring fed stream was observed by Bahuguna et al. [12].

Table 1. Month wise sex ratio of *Puntius ticto* during April 2020 to March 2021 from spring fed river Aasan

Month	Total no. of fish	F	M	% of F	% of M	Sex Ratio F	Sex Ratio M	χ^2	Remarks
April 2020	09	4	5	44.44	55.56	1.00	1.25	0.056	NS
May	07	4	3	57.14	42.86	1.33	1.0	0.071	NS
June	08	3	5	37.5	65.5	1.00	1.66	0.25	NS
July	13	8	5	61.54	38.46	1.60	1.0	0.346	NS
August	10	6	4	60	40	1.50	1.00	0.2	NS
September	07	4	3	57.14	42.86	1.33	1.00	0.071	NS
October	10	5	5	50	50	1.00	1.00	0	NS
November	08	4	4	50	50	1.00	1.00	0	NS
December	11	6	5	54.55	45.45	1.2	1.00	0.045	NS
January 2021	07	4	3	57.14	42.86	1.33	1.00	0.071	NS
February	08	4	4	50	50	1.00	1.00	0	NS
March	11	5	6	45.45	54.55	1.00	1.2	0.045	NS
Total	**109**	**57**	**52**	**52.29**	**47.71**	**1.10**	**1.00**	**0.115**	NS

F – Female fish; M – Male fish; χ^2 – Chi square value; NS- Not significant;

Table 2. Season wise sex ratio of *Puntius ticto* during April 2020 to March 2021 from spring fed river Aasan

Season	Total no. of fish	F	M	% of F	% of M	Sex Ratio F	Sex Ratio M	χ^2	Remarks
Spring (Mar. & Apr.)	20	9	11	45	55	1.00	1.22	0.1	NS
Summer (May & June)	15	7	8	49.67	53.33	1.00	1.14	0.033	NS
Monsoon (Jul. & Aug.)	23	14	9	60.87	39.13	1.56	1.00	0.544	NS
Autumn (Sep., Oct. & Nov.)	25	13	12	52	48	1.08	1.00	0.02	NS
Winter (Dec., Jan. & Feb.)	26	14	12	53.85	46.15	1.16	1.00	0.077	NS

F – Female fish; M – Male fish; χ^2 – Chi square; NS- Not significant

Bahuguna and Balodi [19] reported a 1.71male: 1.00female sex ratio in *Labeo dyocheilus* from the western Ram Ganga River which was significant. Allison et al. [30] suggested that the sex ratio divergence might also be explained by partial segregation of ripe forms through preference school formation rendering one sex more vulnerable to capture. Although, the preponderance of males have also been reported for some other fish species such as *Parailia pellucida* [31].

As indicated by Nikolsky [32], the ideal sex proportion may shift radically because of being influenced by various factors. He revealed the predominance of females in fishes, particularly in fishes where the males produce various patches of sperms yet females produce just one bunch of ova. Various populaces hindering various locations show distinctive sex proportions [27].

5. CONCLUSION

On the basis of the above results, it may be concluded that a 1.00male: 1.10female sex ratio population in *Puntius ticto* is present in Aasan River. The maximum collection of July (13 fish), a part of monsoon, did not correlate with the maximum collection of winter (26 fish). Thus, a further detailed study with several spots of collection with several replications is recommended.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Bahuguna P. Sex population structure of *Macrobrachium assamense peninsularie* (Tiwari) (Crustacea, Decapoda, Palaemonidae) in Khoh River, Uttarakhand, India. Int. J. curr. Microbiol. App. Sci. 2013;2(10):382-390.
2. Dobriyal, A.K., Bahuguna, P.K., Uniyal, S.P. and Joshi, H.K. Sexual dimorphinism in the Cyprinidae fish *Puntius conchonius* (Ham.-Buch.). J. Bom. Nat. Hist. Soc. (2007);104 (2): 227-228.
3. Bahuguna, P. and Kumar, R. Studies on sexual dimorphism in fresh water prawn, *Macrobrachium assamense peninsularie* from Garhwal Himalaya, India. *Int. J. Environ. Rehabi. and Conserv.* (2013);4(2): 11-14.
4. Bahuguna P, Kumar S, Kumar R, Joshi HK, Verma R. Studies on sexual dimorphism in the Cyprinidae fish *Puntius ticto* (Hamilton-Buchanan) from Kumaun Himalaya, India. Essence. J. 2010a;1(1):39-44.
5. Islam MS, Hossain MA. The fecundity and sex ratio of the common punti, *Puntius stigma* (Cuvier and Valenciennes) from the river Padma near Rajshahi in Bangladesh. University Journal Zoology. 1990;9:69-74.
6. Jameela Beevi KS, Ramachandran A. Sex ratio in *Puntius vittatus* Day in the fresh water bodies of Ernakulam District, Kerala. Zoos Print Journal. 2005;20(9):1989-1990.
7. Kumar K, Bisht KL, Dobriyal AK, Joshi HK, Bahuguna P, Goswami S, et al. Fecundity and sex ratio in a rare hill stream fish *Botia dayi* Hora from Garhwal Himalaya, Uttaranchal. Uttar Pradesh J. Zool. 2006;26(23):271-276.
8. Bahuguna P, Joshi HK, Dobriyal AK. Fecundity and sex ratio in *Puntius conchonius* (Pisces; Cyprinidae) from Garhwal Himalayas. Environmental conservation Journal. 2007;8(1-2):37-43.
9. Bahuguna P, Kumar R, Shah KK. Breeding power and sex ratio in *Barilius vagra* (Ham.) from spring fed river Mandal, Garhwal Himalayas, India. Aquacult. 2009;10(2):279-283.
10. Bahuguna P, Kumar R, Bhatia D. Estimation on the sex composition of *Barilius bendelisis* (Hamilton – Buchanan) (Pisces: Cyprinidae) from Kumaun Region of Central Himalayas, India. India J. Environ. and Ecoplan. 2010b;17(1-2): 85-88.
11. Bahuguna P, Kumar R, Shah KK. Studies on the reproductive capacity and sex ratio in a Hill stream local fish *Noemacheilus denisoni* Day from river Mandal of Garhwal Himalayas, Uttarakhand. Uttar Pradesh J. Zool. 2010c;30(1):71-76.
12. Bahuguna P, Kumar R, Joshi HK, Balode VP, Kotnala CB, Bhatia D. Sex composition status in sucker head Gadale, *Garra lamta* (Ham.–Buch.) in the spring fed water bodies of Pithoragarh District, Uttarakhand, India. J. Natcon. 2010d;22(1):19-24.
13. Bahuguna P, Joshi HK, Kumar R. Sex population status of *Lepedocephaluthus guntea* (Hamilton) in the lotic water body of Pauri Garhwal District, Uttarakhand. Uttar Pradesh J. Zool. 2011;31(1):349-353.
14. Dobriyal AK, Thapliyal A, Joshi HK, Bahuguna P, Balodi VP. Biology and growth dynamics of hill stream catfish *Pseudecheneis sulcatus* (McClelland) from Uttarakhand, India. Essence J. 2010;(1):34-42.
15. Bahuguna P, Kumar R. Sex composition analysis of a Himalayan cold-water cat fish *Pseudochenies sulcatus* (McClelland) in the eastern Ram Ganga River, Uttarakhand, India. J. Natcon. 2011;23(1):105-110.
16. Krishna R, Dobriyal AK, Bisht KL, Kumar R, Bahuguna P. Population ecology of the Indian torrent catfish, *Amblyceps mangois* (Ham. – Buch.) from Garhwal, Uttarakhand, India. Int. J. Environ. Rehabi and Conserv. 2011;2(1):23-28.
17. Gogoi R, Goswami UC. Length-weight relationship and sex ratio of fresh water fish Amblypharyngodon mola from Assam. International Journal of Fishries and Aquatic Studies. 2014;4:68-71.
18. Joshi A, Kumar P, Kujwal SS, Bahuguna P. Sex ratio of *Neomacheilus montanus* (McClelland) from Pithoragarh district, Uttarakhand, India. Int. J. Curr. Microbiol. App. Sci. 2014;3(12):761-767.
19. Bahuguna P, Balodi VP. Sex composition observation of *Labeo dyocheilus* (McClelland) from western Ram Ganga River, Uttarakhand, India. International Journal in Physical and Applied Sciences 2015;2(05):75-81.

20. Bahuguna P, Dobriyal AK. Biology of the ornamental fish *Puntius conchonius* (Ham.-Buch.). Narendra Publishing House, Delhi (India). 2019;1-228.
21. Bahuguna P, Joshi HK, Dobriyal AK. Conventional and Non- conventional fishing techniques used by rural folk in Mandal Valley, Uttarakhand. Uttar Pradesh J. Zool. 2010e;30(2):221-223.
22. Bahuguna, P. Fish diversity in different habitats in the 1st, 2nd and 3rd order streams of Kyunja Gad from Garhwal Himalaya, India. *Uttar Pradesh Journal of Zoology*. (2020);41(3): 24-29.
23. Bahuguna, P. Distribution pattern of Ichthyofauna diversity in different habitats in the first-, second- and third order streams of Randi Gad from Garhwal Himalaya, India. Natl. Acad. Sci. Lett. 19 January (2021). https://doi.org/10.1007/s40009-020-01032-9
24. Bhatnagar GK. Maturity, fecundity, spawning season and certain related aspects of *Labeo fimbriata* (Bloch) of river Narmada near Hoshangabad (M.P.). Journal of Inland Fish Society of India, 1972;4:26-37.
25. Sobhana B, Nair NB. Observation on the maturation and spawning of *Puntius sarana subnasutus* (Valenciennes). Indian Journal of Fish**.** 1976;21(2):357-359.
26. Kumar F, Siddique MS. Reproductive biology of the carp, *Puntius sarana* (Ham.) from some riverine ecosystems of north India. Journal of Freshwater Biology Bhagalpur**.** 1991;3(3):209-215.
27. Nikolsky GV. Ecology of fishes. Academic Press, London. 1956;1-352.
28. Dobriyal AK, Negi KS, Joshi HK, Bisht K.L. Breeding capacity of *Crossocheilus latius latius* (Pisces: Cyprinidae) in the river Mandakini of Garhwal, Uttaranchal. Flora and Fauna. 2004;10: 151-153.
29. Shendge, A. N. and Mani, U. H. Sex ratio of cyprinidae fish *Cirrhina reba* (Hamilton). Uttar Pradesh J. Zool.2009;29(2):217-220
30. Allison ME, Gabriel UU, Abowei JFN, Inko-Tariah MB. Some aspect of the reproductive biology of Cynoglossus canariensis (Steind) and Cynoglossus goreensis (Steind) of Qua Iboe and Cross rivers systems off south east coast,Nigeria Part I: Niger Delta Biologia. 1999;2(02):104-116.
31. Allison ME, Sikoki FD, Vincent-Abu IF. Fecundity, sex ratio, maturity stages, size at first maturity, breeding and spawning of *Parailia pellucida* (Boulenger, 1901) in the lower Nun River, Niger Delta,Nigeria. Caderno de Pesquisa serie Biologia, Universidade de Santa Cruz do Sul. 2008; 20(02):31-37.
32. Nikolsky GV. Theory of fish population dynamics. Bishen Sigh Mahendra Pal Singh, India and Ottokoeltz Science Publishers (W. Germany). 1980;317.