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Population Structure of *Lepidocephalus Guntea* (Hamilton-Buchanan) from Khoh River, Garhwal Himalaya, India

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Abstract: The sex population status of the hill stream loach fish, *Lepidocephalus guntea* (Ham.) inhabiting the river Khoh in the foothills of Garhwal Himalaya, Uttarakhand is the central theme of the present study. The observed sex population ratio (1male:1.24 female) was found to be quite natural in *Lepidocephalus guntea* (Ham.).

Keywords: Sex-population • *Lepidocephalus guntea* • Lotic water • Foothills • Khoh River.

Introduction

A study on the sex population status of a fish was conducted since it is a very significant aspect of fish culture and management processes. In general, a male-female ratio of 1:1 indicates a healthy fish population in a particular aquatic environment. It is evident that the particular area has a natural population ratio with the abundance of any sex.

Several researchers and fish biologists have contributed to the literature on hill-stream fishes by conducting studies on sex population status and other associated parameters viz. sex -ratio (Sobhana and Nair, 1976; Islam and Hossain, 1990; Kumar and Siddiqui, 1991; Dobriyal et al., 2004; Beevi and Ramachandran, 2005; Kumar et al., 2006; Bahuguna et al., 2007, 2009, 2010 a-c, 2011; Shendge and Mani, 2009; Bahuguna and Kumar, 2011b; Krishna et al., 2011a; Bahuguna, 2013; Gogoi and Goswami, 2014; Joshi et al., 2014; Bahuguna and Balodi. 2015; Bahuguna and Dobriyal, 2019; Rayal et al., 2021c-d, 2022b), fecundity (Dobriyal 1988, 2012; Dobriyal and Singh, 1989; Dobriyal et al., 2010; Bahuguna et al., 2010 d; 2021a-c; Joshi et al., 2010, 2013; Bahuguna and Kumar, 2011a-c; Krishna et al., 2011b; Bahuguna, 2012; Rashid and Dobriyal, 2020; Rayal et al., 2020, 2021e-g, 2022a) and Sexual dimorphism (Badola et al., 1982; Dobriyal et al., 2007; Bahuguna et al., 2010f). The present research investigation aimed to gain an understanding of the male-female population and sex-ratio status of the fish *Lepidocephalus guntea* (Ham.-Buch.) in the Khoh River of Pauri Garhwal District, Uttarakhand.

Material and Methods

The mature specimens of *Lepidocephalus guntea* (Ham.-Buch.) were collected from June 2021 to May 2022 from the Khoh River, which is a spring-fed tributary of the Ramganga River. *Lepidocephalus guntea* (Ham.-Buch.), a fish was caught with traditional fishing gear suggested by Bahuguna et.al., 2010e; Bahuguna and Joshi, 2012; Bahuguna 2020 & 2021; Rayal et al., 2021 a-b. The specimens immediately after collection were preserved in 5% formalin. The total length (mm.) and weight (mg.) of fish were

also noted. Sex-population status was calculated for the entire period of study and its significance was tested by the Chi-square test (χ^2).

$\chi^2 = \Sigma (O - E^2) / E$, where χ^2 is chi-square, O is the observed value, and E is the expected value.

Results and Discussion

Table 1 shows the sex population status of *Lepidocephalus guntea* (Ham.) month by month. The lengths of the fish considered for this study ranged from 5.2cm to 10cm. The month-wise pooled data on sex population status are also presented in Table 1. The pool data of 130 specimens revealed 58 males (44.62%) and 72 females (55.38%), with a sex population ratio of 1:1.24 male and female. The Chi-square (χ^2) test indicated that the sex population status was generally normal, but during the commencement of maturity (in the summer season i.e. during the months of May and June), sex composition fluctuated significantly at the 5% level.

Lepidocephalus guntea (Ham.) is an ornamental fish of the Garhwal region; it is definitely conducive if developed as an aquarium fish. The basic knowledge of sex composition has been considered of immense importance in fish culture for obtaining information on the seasonal segregation of the sexes and their relative abundance in the breeding period.

The sex ratio has been studied by fishery biologists in different freshwater species. Normally the mature healthy population has a ratio of 1:1. In the course of their research on *Puntius sarana*, Sobhana and Nair (1976) noted that the sex ratio was 1:2. In the river Simshang in Meghalaya, *Puntius clavatus* has a 1:1 sex composition (Nasar and Biswas 1987). Islam and Hossain (1990) noted a 1:1 sex ratio in *Puntius stigma* from the river Padma in Bangladesh and noted that in the natural habitat, the ideal sex ratio is 1:1, however, it might be limited to a particular age and size group in this species. According to Rautela (1999), the sex ratios of *Glyptothorax telchitta* and *Garra lamta* in the Khoh River were 1:1.052 and 1:1.18 (Male: Female). The sex ratio of the Mandakini River's *Crossocheilus latius latius* is 1 male to 1.028 female, which is quite close to the ratio found in nature (Dobriyal et al., 2004). Jameela Beevi and Ramachandran (2005) stated that there were 1 male and 2 female *Puntius vittatus* in the freshwater body of Ernakulam (Kerala). The sex composition in *Botia dayi* Hora has been reported by Kumar et al. (2006) from the Khoh River to be 1:1.04 (Male: Female). According to Bahuguna et al. (2007), the sex ratio in *Puntius conchonius* from the Mandal River was 1 Male: 1.17 Female, which was considered to be fairly normal. During their investigation of the *Barilius vagra*, Bahuguna et al. (2009) observed a sex composition of 1.29 Males: 1 Female. The ideal sex composition, according to Nikolsky (1956, 1980), might differ greatly depending on a variety of factors and may also rely on the various populations that inhabit different regions.

In the present investigation, the sex ratio was not found in equal proportion throughout the year. A total of 130 specimens were examined which showed an overall sex ratio of 1:1.24 with 44.62% male (58) and 55.38% (72) females. Female fishes were found more throughout the year except in December (45.46%), January (44.44%) and April (42.86%), but during the month of October, November, and May sex ratio was found in equal proportions of 50% M: 50% F. The percentage of male and female fish varied significantly between the months of February (75%) and June (66.67%). In these months, substantially more females than males were found. Overall data interpretation and statistical analysis revealed that the sex population status i.e. 1Male: 1.24Female observed during the current study on *Lepidocephalus guntea* was comparable to the natural one.

Table 1: Population structure in *Lepidocephalus guntea* (Hamilton-Buchanan) from June 2021 to May 2022 from Khoh River

Month	Total No. of fish	Male	Female	% of Male	% of Female	Ratio		χ^2	Remark
						M	F		
Jun	15	05	10	33.33	66.67	1.00	2.00	1.67	NS
Jul	10	04	06	40.00	60.00	1.00	1.50	0.40	NS
Aug	12	05	07	41.67	58.33	1.00	1.40	0.33	NS
Sep	09	04	05	44.44	55.56	1.00	1.25	0.11	NS
Oct	08	04	04	50.00	50.00	1.00	1.00	0.00	NS
Nov	10	05	05	50.00	50.00	1.00	1.00	0.00	NS
Dec	11	06	05	54.54	45.46	1.20	1.00	0.09	NS
Jan	09	05	04	55.56	44.44	1.25	1.00	0.11	NS
Feb	12	03	09	25.00	75.00	1.00	3.00	3.00	NS
Mar	08	03	05	37.50	62.50	1.00	1.67	0.50	NS
Apr	14	08	06	57.14	42.86	1.33	1.00	0.29	NS
May	12	06	06	50.00	50.00	1.00	1.00	0.00	NS
Total	130	58	72	44.62	55.38	1	1.24	1.51	NS

χ^2 = Values are not significant at either level (d.f.1., on p= 0.05 in 3.84)
M = Male, F = Female, S = Significant, NS = Non significant

References

Badola, S.P., Singh, H.R. and Dobriyal, A.K. (1982). Note on sexual dimorphism in *Barilius bendelisis* (Ham) Indian *J. Anim. Sci.* **52:** 1284-1286.

Bahuguna, P. (2012). Observation on Reproductive capacity of Wild carp *Labeo dyochelius* from Kumaun Himalaya, India. *Essence J.* **3(1):** 1-7.

Bahuguna, P. (2013). Sex population structure of *Macrobrachium assamense peninsularie* (Tiwari) (Crustacea, Decapoda, Palaemonidae) in Khoh River, Uttarakhand, India. *Int. J. Curr. Microbiol. App. Sci*. **2(10):** 382-390.

Bahuguna, P. (2020). Fish diversity in different habitats in the 1st, 2nd and 3rd order stream of Kyunja Gad from Garhwal Himalaya, India. *Uttar Pradesh Journal of Zoology*. **41(3):** 24-29.

Bahuguna, P. (2021). Distribution pattern of Ichthyofauna diversity in different habitats in the first second and third order stream of Randi Gad from Garhwal Himalaya, India. *Natl. Acad. Sci. Lett.* **44(5):** 393-395.

Bahuguna, P. and Balodi, V.P. (2015). Sex composition observation of *Labeo dyocheilus* (McClelland) from western Ram Ganga River, Uttarakhand, India. *International Journal in Physical and Applied Sciences.* **2(5):** 75-81.

Bahuguna, P. and Dobriyal, A.K. (2019). Biology of the ornamental fish *Puntius conchonius* (Ham.-Buch.). Narendra Publishing House, Delhi (India). 1-228.

Bahuguna, P. and Joshi, H.K. (2012). A study on fish and fisheries of river Kalapani from Kumaun Himalaya, India. *J. Mountain. Res.* **(7):** 67-71.

Bahuguna, P. and Kumar, R. (2011a). Breeding capacity observation of snow-fed water catfish *Pseudechenies sulcatus* (McClelland) of the eastern Ram Ganga River from Kumaon region, Uttarakhand. *Aquacult.* **12(1):** 93-98.

Bahuguna, P. and Kumar, R. (2011b). Sex composition analysis of a Himalayan cold-water catfish *Pseudochenies sulcatus* (McClelland) in the eastern Ram Ganga River, Uttarakhand, India. *J. Natcon*. **23(1):** 105-110.

Bahuguna, P. and Kumar, R. (2011c). Fecundity of freshwater Prawn *Macrobrachium assamense peninsularie*

from Khoh River, India. *Essence J.* **2(1):** 1-7.

Bahuguna, P., Joshi, H.K. and Dobriyal, A.K. (2010e). Conventional and Non-conventional fishing techniques used by rural folk in Mandal Valley, Uttarakhand. *Uttar Pradesh J. Zool.* **30(2):** 221-223.

Bahuguna, P., Joshi, H.K. and Dobriyal, A.K. (2007). Fecundity and sex ratio in *Puntius conchonius* (Pisces; Cyprinidae) from Garhwal Himalayas. *Environmental Conservation Journal*. **8(1-2):** 37-43.

Bahuguna, P., Joshi, H.K. and Kumar, R. (2011). Sex population status of *Lepedocephaluthus guntea* (Hamilton) in the lotic water body of Pauri Garhwal District, Uttarakhand. *Uttar Pradesh J. Zool.* **31(1):** 349-353.

Bahuguna, P., Joshi, H.K., Bharti, S., Badola, S. and Dobriyal, A.K. (2021c). Reproductive capacity and sex-ratio of *Noemacheilus multifasciatus* Day from Mandal River, India. *J. Mountain. Re.* 11-419.

Bahuguna, P., Kumar, R. and Bhatia, D. (2010b). Estimation on the sex composition of *Barilius bendelisis* (Hamilton – Buchanan) (Pisces: Cyprinidae) from Kumaun Region of Central Himalayas, India. *India J. Environ. and Ecoplan*. **17(1-2):** 85-88.

Bahuguna, P., Kumar, R. and Joshi, H.K. (2010a). Studies on the reproduction capacity and Sex ratio in a hill–stream loach fish *Noemacheilus denisoni* Day from river Mandal of Garhwal Himalaya, Uttarakhand. *Uttar Pradesh J. Zool.* **(30):** 71-76.

Bahuguna, P., Kumar, R. and Sha, K.K. (2009). Breeding power and Sex ratio in *Barilius vagra* (Ham.) from spring-fed river Mandal, Garhwal Himalaya, India. *Aquacult.* **(2):** 279-283.

Bahuguna, P., Kumar, R., Bhatia, D. and Kumar, S. (2010d). Breeding capacity observation of the hill stream minor carp Barilius bendelisis (Ham-Buch) (Pisces: Cyprinidae) from mountain region of central Himalaya, India. *J. Curr. Sci.* **15 (1):** 145-150.

Bahuguna, P., Kumar, R., Joshi, H.K., Balode, V.P., Kotnala, C.B. and Bhatia, D. (2010c). Sex composition status in sucker head Gadale, *Garra lamta* (Ham.–Buch.) in the spring-fed water bodies of Pithoragarh District, Uttarakhand, India. *J. Natcon.* **22(1):** 19-24.

Bahuguna, P., Kumar, S., Kumar, R., Joshi, H.K. and Verma, R. (2010f). Studies on Sexual dimorphism in the Cyprinidae fish *Puntius ticto* (Hamilton-Buchanan) from Kumaun Himalaya, India. *Essence. J.* **1(2):** 88-93.

Bahuguna, P., Saklani, S., Rayal, R. and Madan, S. (2021a). Assessment of breeding capacity and sex-ratio of *Barilius barna* (Hamilton) in spring-fed Tamsa stream, Garhwal region, India. *Uttar Pradesh Journal of Zoology*. **42(16):** 1-8.

Bahuguna, P., Sharma, V., Rayal, R. and Negi, S. (2021b). Reproductive potential of *Puntius ticto* in foothill river Aasan from Doon Valley, India. *Env. Bio- Sci.* **35(1):** 21-24.

Beevi Jameela, K.S. and Ramachandran, A. (2005). Sex ratio in *Puntius vittatus* Day in the freshwater bodies of Ernakulam District, Kerala. *Zoos Print Journal.* **20(9):** 1989-1990.

Dobriyal A.K. (1988). Fecundity of the Chinese silver carp *Hypophthalmichthys molitrix* (Val.) from Gujaratal Fish Farm, Jaunpur, U.P. *Proc. Indian Acad. Sci. (Anim. Sci.)*. **97(2):** 169-173.

Dobriyal, A.K. (2012). Conservational biology of cobitid fish *Lepidocephalus guntea* (Hamilton-Buchanan): Reproductive potential. *J. Sustn. Env. Res.* **1(2):** 101-105.

Dobriyal A K (2011).Conservational biology of cobitid fish *Lepidocephalus guntea*

(Hamilton-Buchanan): Population Structure. *J. Mountain Res.*, Vol- 6 pp.29 -36,

Dobriyal, A.K. and Singh, H.R. (1989). Ecology of rhithrofauna in the torrential water of Garhwal Himalaya, India: Fecundity and sex ratio of *Glyptothorax pectinopterus* (Pisces). *Vest. Cs. Spolec. Zool.* **53:** 17-25.

Dobriyal, A.K., Bahuguna, P., Uniyal, S.P. and Joshi, H.K. (2007). Sexual dimorphism in the Cyprinidae fish *Puntius conchonius* (Ham-Butch). *J. Bom.Nat. Hist. Soc.* **104(2):** 227-228.

Dobriyal, A.K., Negi, K.S., Joshi, H.K. and Bisht, K.L. (2004). Breeding capacity of *Crossocheilus latius latius* (Pisces: Cyprinidae) in the river Mandakini of Garhwal, Uttaranchal. *Flora and Fauna*. **10:** 151-153.

Dobriyal, A.K., Thapliyal, A., Joshi, H.K., Bahuguna, P. and Balodi, V.P. (2010). Biology and growth dynamics of hill stream catfish *Pseudecheneis sulcatus* (McClelland) from Uttarakhand, India. *Essence J.* 1(2): 34-42.

Gogoi, R. and Goswami, U.C. (2014). Length-weight relationship and sex ratio of freshwater fish Amblypharyngodon mola from Assam. *International Journal of Fisheries and Aquatic Studies.* **4:** 68-71.

Islam, M. S. and Hossain, M. A. (1990). The fecundity and sex ratio the common punti, *Puntius stigma* (Cuvier and Valenciennes) form the river Padma near Rajshahi in Bangladesh. *University Journal of Zoology*. **9:** 69-74.

Joshi, A., Kumar, P. and Bahuguna, P. (2013). Fecundity of *Noemacheilus montanus* from kumaon region. *J. Mountain. Res.* **(8):** 29-36.

Joshi, A., Kumar, P., Kujwal, S.S. and Bahuguna, P. (2014) Sex ratio of *Neomacheilus montanus* (McClelland) from Pithoragarh district, Uttarakhand, India. *Int. J. Curr. Microbiol. App. Sci.* **3(12):** 761-767.

Joshi, H.K., Bahuguna, P., Kotnala, C. B. and Kumar, R. (2010). Reproduction power of the hill stream loach sune machi, *Lepedocephalythys guntea* (Hamilton) from mountain region of Garhwal, Central Himalaya, India. *Aquacult.* **11(1):** 115-118.

Krishna, R., Dobriyal, A. K., and Bahuguna, P. (2011b). Fecundity of *Amblyceps mangois* (Hamilton- Buchanan) from Garhwal Himalaya. *J. Mountain. Res.* **(6):** 121-128.

Krishna, R., Dobriyal, A. K., Bisht, K. L., Kumar, R. and Bahuguna, P. (2011a). Population ecology of the Indian torrent catfish, *Amblyceps mangois* (Ham. – Buch.) from Garhwal, Uttarakhand, India. *Int. J. Environ. Rehabi. and Conserv.* **2(1):** 23-28.

Kumar, F. and Siddiqui, M.S. (1991). Reproductive biology of the carp, *Puntius sarana* (Ham.) from some riverine ecosystems of North India. *J. Freshwater Bio. Bhagalpur*. **3(3):** 209-215.

Kumar, K., Bisht, K.L., Dobriyal, A.K., Joshi, H.K., Bahuguna, P.K., Goswami, S., Balodi, V.P. and Thapliyal, A. (2006). Fecundity and sex ratio in a rare hill-stream fish *Botia dayi Hora* from Garhwal Himalaya, Uttaranchal. *Uttar Pradesh J. Zool.* **26 (3):** 271-276

Nasar, S.A.K. and Biswas, B. (1987). Studies on the length-weight relationships of *Puntius clavatus* (McClelland) from Simshang River, Meghalaya, India. *Matsya*. **8:** 59-62.

Nikolsky, G.V. (1956). Ecology of fishes. Academic Press, London. 1-352.

Nikolsky, G.V. (1980). Theory of fish population dynamics. Bishen Singh and Mahendar Pal Singh, India and Ottokoeltz Science Publishers (West Germany). 317.

Rashid, M. and Dobriyal, A.K. (2020). Fecundity analysis of A Freshwater Fish *Mastacembelus armatus* (Lacepede) From river Nayar, Uttarakhand. *J. Mountain Res.* **15:** 181-88.

Rautela, K.K. (1999). Ecological studies on the spawning biology on some cold water fishes from the Khoh stream. *D. Phil. Thesis H.N.B Garhwal University, Srinagar Garhwal.*

Rayal, R., Bhatt, A. and Bahuguna, P. (2021a). Fish fauna of River Yamuna from Doon Valley, Uttarakhand, India. *Journal of Experimental Zoology.* **24(2):** 973-977.

Rayal, R., Bhatt, A., Bahuguna, P. and Joshi, H.K. (2021b). Fish diversity of Mal Gad stream near Purola town from Uttarkashi district, Uttrakhand, India. *Uttar Pradesh Journal of Zoology*. **42(8):** 70-76.

Rayal, R., Goel, S., Joshi, H.K., Sharma, N. and Bahuguna, P. (2021e). Fecundity of the snow-fed minor carp *Barilius bendelisis* (Ham.-Buch.) (Pisces: Cyprinidae) from River Yamuna, India. *Uttar Pradesh Journal of Zoology.* **42(8):** 70-76.

Rayal, R., Goel, S., Sharma, N. and Rana, K.K. (2021d). Observation of Sex-Ratio *Barilius bendelisis* (Ham.) in Snow-fed River Yamuna from Doon Valley, Uttarakhand, India. *J.Env.Bio-Sci.* **35 (1):** 17-20.

Rayal, R., Joshi, H.K., Kapruwan, D. Shah, N., Bharti, S. and Saxena, S. (2022a)**.** Reproductive capacity of *Noemacheilus rupicola* and sex -ratio from river Yamuna, Uttarakhand, India. *The Scientific Temper.* **13(1):** 53-63.

Rayal, R., Rawat, A.S. Kapruwan, D. Rawat, S. and Thapliyal, A. (2022b). Sex ratio of *Garra lamta* (Hamilton) from Khoh river, Garhwal Himalaya, India. *J. Exp. Zool. India Vol.* **25(2):** 2485-2488.

Rayal, R., Saher, A., Bahuguna, P. and Negi, S. (2020). Study on the breeding capacity of snow-fed trout, *Schizothorax richardsonii* (Gray) from river Yamuna, Uttarakhand, India. *The Scientific temper.* 11(1-2): 87-93.

Rayal, R., Selakoti, A. and Bahuguna**,** P. (2021f). A comparison between Gonado-somatic Index (GSI) and Dobriyal Index (DI) for determination of sexual maturity in Puntius ticto from Aasan River, India. *Uttar Pradesh Journal of Zoology*. **42(15):** 60-66.

Rayal, R., Sharma, V., Bahuguna, P. and Mamgain, D. (2021c). Sex-ratio structure of P*untius ticto* in spring-fed River Aasan from District-Dehradun, Uttarakhand, India. *Uttar Pradesh Journal of Zoology*. **42(12):** 49-53.

Rayal, R., Singh, K.B., Sharma, N., Bharti, S. and Rai, R (2021g). Fecundity of *Noemacheilus denisonii* day from river Yamuna, India. *Uttar Pradesh Journal of Zoology*. **42(24):** 780-787.

Shendge, A.N. and Mani, U.H. (2009). Sex ratio of Cyprinidae fish *Cirrhina reba* (Hamilton). *Uttar Pradesh J. Zool.* **29(2):** 217-220

Sobhana, B. and Nair, N.B. (1976). Observation on the maturation and spawning of *Puntius sarana subnasutus* (Valenciennes). *Indian J. Fish.* **21(2):** 357-359.