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Breeding Capacity of *Lepidocephalus guntea* (Hamilton-Buchanan) from Khoh River, Garhwal Himalaya, India

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ABSTRACT

Lepidocephalus guntea, a foot hill-stream fish, was collected from the Khoh River in the Garhwal Himalaya for the present investigation, which examines the fish's breeding capacity. 35 mature female fishes were included as the subject of the investigation. In fish measuring between 63 and 85 millimeters, the total breeding capacity was found to be between 321 and 4120. Fish weight (0.9862) and ovary length (0.9827), rather than other fish body parameters, were found to have a greater influence on breeding capacity.

Keywords: Breeding Capacity, *Lepidocephalus guntea*, Khoh River, Garhwal Himalaya.

INTRODUCTION

Generally breeding capacity is defined as the number of ova that are likely to be laid by a fish during its spawning season (Bahuguna and Dobriyal, 2019). It is dependent on several variables, including age, fish size, rainfall, and water salinity. It can also vary amongst races of the same species. An essential component of fish biology that must be understood in order to both explain the population-level variation and make attempts to improve fish harvest is a fish's capacity for reproduction.

Lepidocephalus guntea in the River Khoh, Uttarakhand, India, does not exhibit sexual dimorphism. Dobriyal et al. (2007) from the Garhwal Himalaya have documented sexual dimorphism in *Puntius conchonius*, a freshwater fish. By Bahuguna et al. (2010) in the Kumaun area of Uttarakhand, sexual dimorphism in *Puntius ticto* was noted.

Numerous fish biologists have contributed to the understanding of maturation biology, breeding ecology, breeding capacity, and sex ratio in Indian rivers (Bhatnagar 1964; Sinha 1972; Stauffer (1976); Agarwal et al., 1988; Joshi and Khanna 1980; Pathani 1981; Singh et al., 1982; Somvanshi (1985); Dobriyal and Singh 1987,1989; Islam and Hossain 1990; Bisht et al., 2005; Kumar et al., 2006a-b; Bahuguna et al., 2007, 2009, 2010a-b-c-d; 2021a-b-c-d; Beevi and Ramchandran 2005; Dobriyal et al., 2000, 2003, 2004b,2010; Joshi et al., 2010, 2013; Bahuguna and Kumar 2011a-b-c; Krishna et al., 2011a-b; Bahuguna 2012, 2013a-b; Rayal et al., 2020, 2021a-b-c-d-e-f; Rayal et al., 2022a-b). The current study looks at the spawning potential of a hill-stream fish, *Lepidocephalus guntea*, obtained from the River Khoh in the Garhwal Himalaya's foothill zone.

MATERIAL AND METHODS

From June 2021 to May 2022, mature individuals of *Lepidocephalus guntea* (Ham.-Buch.) were collected from the Khoh River, a spring-fed tributary of the Ramganga River. Lepidocephalus guntea (Ham.-Buch.), a fish, was captured using traditional fishing gear as described by Bahuguna et al., 2010d; Bahuguna and Joshi, 2012;

Bahuguna 2020; Bahuguna 2021; Rayal 2021c-e. The specimens were kept in 5% formalin immediately after collection, and breeding capacity was determined in proportion to the total length, body weight, ovary length, and ovary weight of the fish using the gravimetric count technique. A binocular microscope was used to count the quantity of ova in 100 mg samples collected from the center, anterior, and posterior parts of the ovary. The formula B.C. = S * OW / 100 was used to compute breeding capacity (fecundity), where B.C. = breeding capacity, S = average number of eggs taken from three separate 100 mg. samples, and OW = total weight of the ovary. A digital electronic balance was used to get total weights with ovary (TW to the closest 0.001gm). The least-square test was performed to determine the relationship between breeding capacity and other body parameters, as Y = a + bx, where Y = (Breeding Capacity, dependent variable), x = Body parameters (independent variables), a = Slope, and b = Intercept.

OBSERVATIONS

Table 1 represents the summarised data on the breeding capacity of *Lepidocephalus guntea* from the Khoh River from June 2021 to May 2022. Most hill-stream fishes are monsoon breeders and breed between July and August. It grew to a maximum length of around 85cm. Various relationships were determined between breeding capacity and body parameters (fish length, fish weight, ovary length, and ovary weight). Regression analysis was used to express these correlations.

Fish length and breeding capacity: The obtained regression equation for this relationship was: BC = -7309.9 + 119.74 FL, r = 0.9788; r^2 = 0.9581. A fish with a total length of 84 mm had a maximum breeding capacity of 4120, while a fish with a total length of 63 mm had a minimum breeding capacity of 321.

Fish weight and breeding capacity: The statistical equation for this relationship is as follows: BC= -1278 + 0.659 FW, r = 0.9862; r^2 = 0.9727. The result of the equation demonstrated that it had the closest relationship among all other body parameters under study. When the fish weight was 2645 mg and 6698 mg, the minimum, and maximum breeding capacities were recorded as 321 and 4120, respectively.

Ovary length and breeding capacity: The regression equation obtained for this study was: BC = -1053.6 + 97.873 OL, r = 0.9827; r^2 = 0.9658. It showed that the number of ova produced is directly proportional to the ovary length. In fish measuring ovary length from 14mm to 42mm, the overall breeding capacity varied from 321 to 4120.

Ovary weight and breeding capacity: The regression data of this relationship was BC= -105.32 + 1.995 OW, r = 0.9815; r^2 = 0.9635. In this analysis, the ovary's minimum and highest weights were 300 mg and 2538 mg, respectively. Fish had a reproductive capacity that varied from 321 to 4120, respectively.

DISCUSSION

One of the vital factors that affect fish's capacity to reproduce as well as the quality and percentage of fertilization is food (Nikolsky, 1961). Along with food, additional ecological factors are extremely important to fish physiology and directly influence fish growth, development, maturity, and fertility. The fecundity of coldwater fish is often observed to be low due to specific biological factors in hill streams, such as decreased food supply and low-temperature range (Bahuguna et al 2007). Fish length (0.7840), fish weight (0.7282), ovarian length (0.8073), and ovary weight (0.7685) all had a good association with the breeding capacity of fish in the current study, which examined fish with breeding capacities ranging from 321 to 3895. Fish weight (0.9862) and ovary length (0.9827) were shown to be more closely associated with fertility than the other fish body parameters.

According to Bahuguna et al. (2009), the fecundity of *B. vagra* from the Garhwal region ranges from a minimum of 510 to a maximum of 7214 in the length group ranging from 55-89mm. The fish *Crossocheilus latius latius* (Ham.) measuring from 170mm to 263mm, from the river Mandakini has a life span of more than four years and a reproduction capacity of 21,589 to 79,630 (Dobriyal et al, 2004a). When studying *Glyptothorax telchitta*, Rautela (1999) noted that fish have a reproductive capacity of 1208 to 7472 in a body length range of 71 to 133 cm.

In their investigation of the fecundity of *Puntius conchonius* and the correlation of that fecundity with several body characteristics, Bahuguna et al. (2007) found that all of the body parameters exhibited a general linear relationship with fecundity. *Puntius ticto* ranged in length from 50 to 78mm and weight from 2519.86 to 8212.37mg. Fish measuring 50mm and weighing 2519.86 mg had the lowest reproductive potential, whereas fish measuring 78mm and weighing 8212.37 mg had the highest reproductive potential (Bahuguna et al., 2021b).

In fishes, habitat and area, as well as other factors such as seasonal effect, availability of the food like microzoobenthos population (Pesic et al., 2019a-b, 2020a-b; Bahuguna et al., 2019; Bahuguna and Dobriyal, 2020; Bahuguna et al., 2020a-b; Negi et al., 2021a-b), macrozoobenthos population (Dobriyal et al., 2009, 2011; Bahuguna and Negi, 2018; Bahuguna et al., 2019;

Mamgani et al., 2021) periphyton (Baluni et al., 2017, 2018; Bahuguna and Baluni 2019; Baluni 2020; Baluni et.al, 2020a; Bahuguna et al., 2021e), the influence of riparian vegetation (Baluni 2015; Sagir et al., 2018; Baluni and Chandola, 2019; Baluni et.al, 2020b, 2021; Baluni and Kuriyal, 2020), gonad maturity (Bahuguna and Kumar, 2011; Bahuguna and Dobriyal, 2013; Rayal et al., 2020; 2021b), Ageing biology (Tesch, 1971; Dobriyal et al., 2004b; Bahuguna 2013b; Bahuguna and Balodi, 2015; Joshi et al., 2017; Bahuguna and Dobriyal, 2019), sex, health and differences in the estimated length range of the fish, etc. may affect the length-weight relationship (Bahuguna et al., 2005, 2009a-b, 2017, 2021a-b, Kumar et al., 2006c; Bahuguna and Joshi, 2010; Joshi et al., 2009, 2014; Rashid et al., 2019). Four linear relationships were observed for *Lepidocephalus guntea* (Hamilton-Buchanan) in the present study, which had a high correlation coefficient value. Fish weight was considered to be more significant than any other body parameter in determining breeding capacity.

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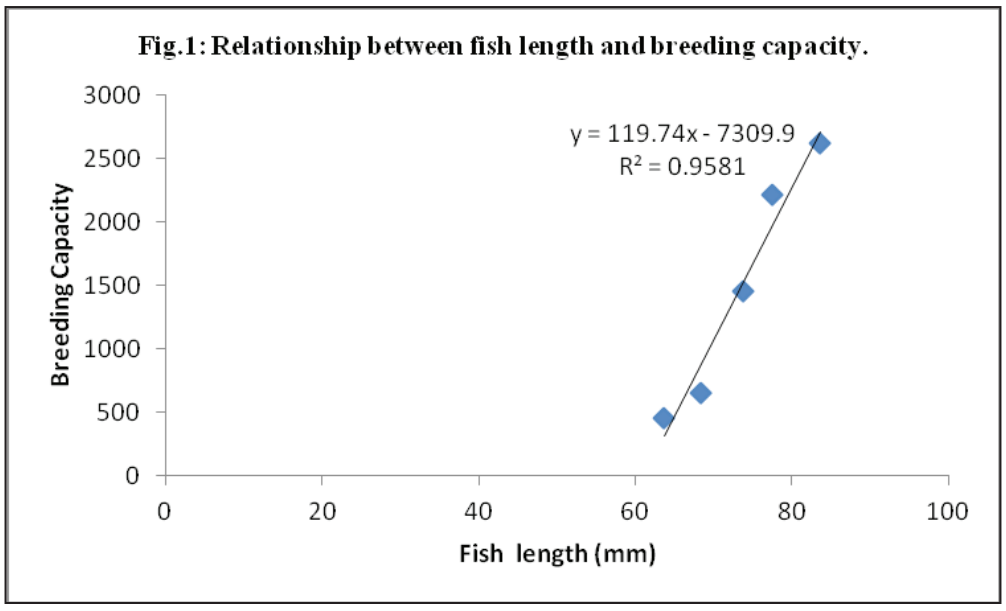
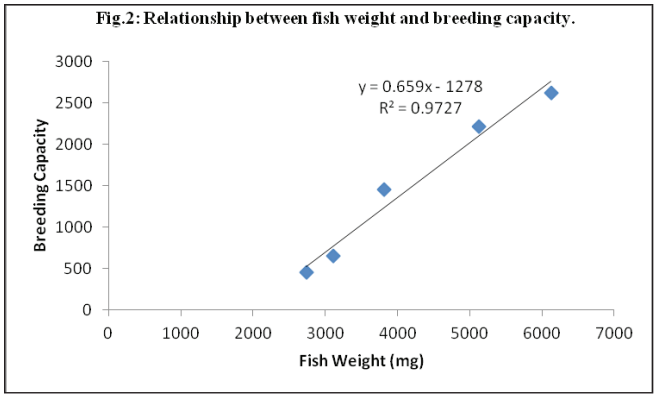
Declaration: *We also declare that all ethical guidelines have been followed during this work and there is no conflict of interest among authors.*

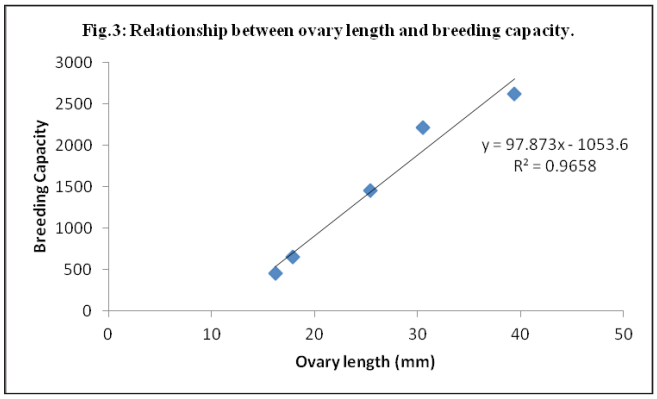
Table-1. Summarized data on the breeding capacity of *Lepidocephalus guntea* (Hamilton-Buchanan) from Khoh River from June 2021 to May 2022.

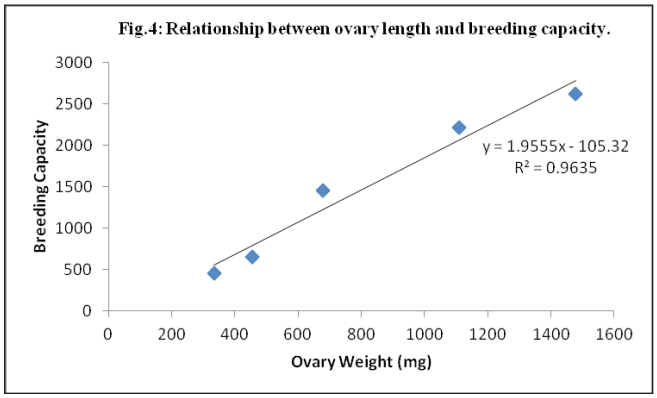
Fish length (mm)	Fish weight (mg)	Ovary length mm)	Ovary weight (mg)	Breeding capacity
63-64*	2645-2896	14-17	300-390	321- 504
63.70±1.21	2735.15±101.45	16.2±0.50	334.5±27.36	453.5±60.90
67-70	2955-3432	15-19	320-589	376-786
68.45±2.40	3115.25±174.15	17.9±0.70	454.6±40.69	652.0±89.50
71-74	3710-4019	20-30	372-974	541-2517
73.80±3.55	3820.42±140.95	25.41±3.82	678.3±190.30	1453±810.75
76-79	4469-5846	23-36	591-1690	582-3417
77.45±4.35	5130.40±612.90	30.52±4.31	1108.25±430.09	2219.15±1230
82-85	4908-6698	33-42	695-2538	832-4120
83.65±1.75	6129.10±418.8	39.42±4.24	1478.65±753.00	2624±945.50

Minimum-Maximum Average ± SD*









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