



# Fecundity Variation of *Labeo rohita* (Hamilton, 1822) in Lentic Freshwater Systems in Purnea District, Bihar, India

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## Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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## ABSTRACT

The appropriateness of any fish species for successful culture and seed production depends upon proper growth reproduction and it also needs strong management. The present study was conducted to investigate the fecundity (Egg laying capacity) of an Indian Major Carp, *Labeo rohita* (Ham) in pond condition in district Purnea, Bihar. Female brood fishes were identified and purchased from permanent fishermen. Fishes were dissected out and fecundity was estimated by using standard technique and formula. Length and body weight of the fishes were measured systematically. Average mean of length and weight of fishes was recorded as 39.28 ( $\pm 0.39$ ) cm and 800.8 $\pm$ 52.59 gm respectively. Mean weight of the ovaries was found around 158.05 $\pm$ 13.80 gm. The absolute fecundity was also determined of the selected fishes. The absolute fecundity was 135192 which ranged from 114047 to 166549. The fecundity of *Labeo rohita* was found to be increased with

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the increase of ovary weight. The highest fecundity was seen in the month of June in compared to other three months. Ovary weight has been considered as a better index to measure the fecundity of fish species as depicted by the present investigation.

**Keywords:** Indian major carp; fish; reproductive potential; fecundity; Bihar; India.

## 1. INTRODUCTION

Carp culture is the widely and extensively used practices of sensual aquaculture all over the world, [1, 2]. Indian major carp (Catla, Rohu and Mrigal) are prized food fishes of India. However, it is presently facing a tough competition in Indian water against the exotic fishes. Fecundity and gonadosomatic index (GSI) are essential biological parameters to comprehend the reproductive dynamics of specific fresh & marine water fish species as these attributes the accomplishment of their maturity and spawning activity [3,4,5]. Fecundity is known as the total number of oocytes possibly laid by an individual brood female fish in its breeding period, [6,7]. In the present changing scenario, in the direction of fish culture and effective management, it is important to know the fecundity of fish [8]. Fecundity is helpful to evaluate the number of offspring produced in a spawning season, so that it could be utilized for the stock assessment of the species [4] *Labeo rohita* is a very tasty fresh water food fish and its demand is very higher. Consumers are always ready to pay a choicable price, because it is very delicious as well as nutritious along with its high market value [9]. *L. rohita* is an annual breeder, and it attends maturity at the end of second year [10]. However, under pond condition fishes were found to be mature at the end of first year of life in Indian subtropical environment [11]. In Bihar the published literature on the different reproductive aspects of this fish species is vary scanty and unsystematic. Few researchers have studied the fecundity of tropical water fishes by Joshi and Khanna [12], Nautiyal [13], Bahuguna and Khatri, [14], Bhat [15], Hasan, et al. [4]. There is no much data available on fecundity and reproductive potential of *Labeo rohita* under pond condition in Bihar.

In this background, the present work was mainly aimed to evaluate the fecundity and spawning season of Rohu fish collected from the ponds in Purnea, Bihar.

## 2. MATERIALS AND METHODS

Total 40 (Ten each months) gravid Rohu fish (*L. rohita*) were collected from permanent fish pond

located in the Bhola Paswan Shastri Agricultural College, Purnea, Bihar and brought to Biodiversity Lab. The gravid females were selected on the basis of external morphology or the gravid fishes had large and bulged abdomen and smooth pectoral fin and red cloaca [16,5]. Fishes were washed with clean tap water before examination. After that total length and total weight of fish specimen was measured and recorded. All the fish taken were dissected out and ovaries were carefully removed from the abdominal cavity. Length and weight of the ovaries were measured individually and preserved in 5% formalin solution for 24 hours [14]. Ten samples of one gram portion of ovary from each lobe were weighed an electronic balance (Model No- BW-320). Sample of eggs were put in petri dish along with total number of eggs in each sample were counted as well as recorded. Absolute fecundity was calculated according to the formula adopted by Lone and Hussian, [17].

$$F = \frac{nG}{g}$$

Where,

F= fecundity, n = mean number of eggs in all sample, G = weight of ovary, g = weight of sample.

## 3. RESULTES AND DISCUSSION

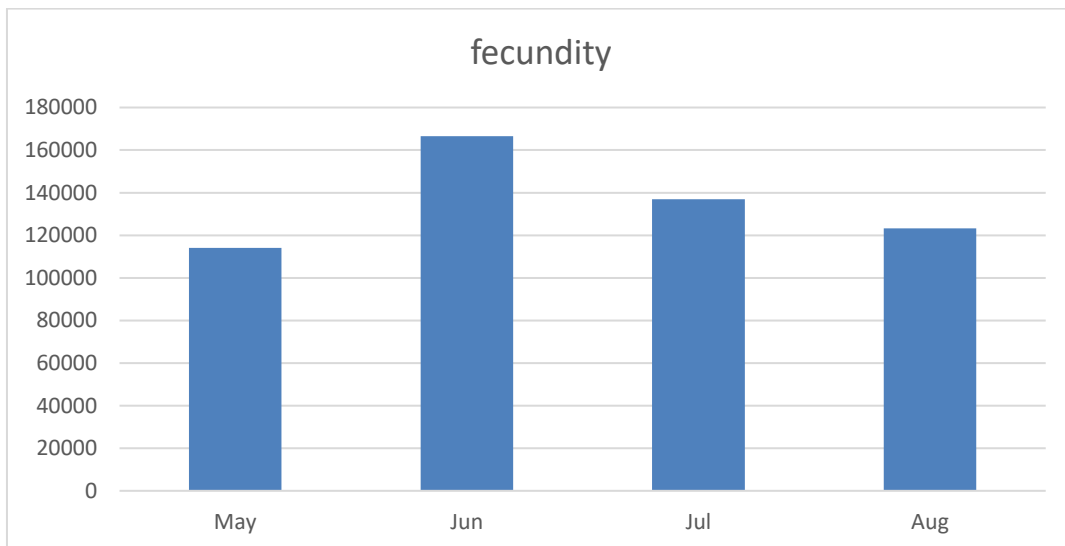
The ovaries of *Labeo rohita* were paired elongated and sac like structure lying ventral to the kidney in the abdominal cavity. Both the ovaries were full of matured as well as immature oocyte (eggs) were slightly tapering interiorly but broader posteriorly. This marks a bulky yellowish brown to light brown in colour remain attached with conspicuous superficial blood vessel. Fig. 1 (a&b) The study of fecundity evaluation was based on 40 matured fish specimens of female of *L. rohita* sample during May to August. The mean length of fishes ranged from 38.75 to 30.37 cm and SD 39.28±0.39 in total length. Whereas total weight of fishes ranges from 726.4 to 813gm and SD 800.85±52.59 in respective weight of fish.



Fig. 1(a&b). Showing matured ovary inside and outside of abdominal cavity of *Labeo rohita*

Table 1. Monthly recorded body parameter and fecundity range of *Labeo rohita* (During May 2022- August 2022)

Months	Length of fish (cm)	Weight of fish (gm)	Gonad weight (gm)	Fecundity
May	39.3 ± 3.75	726.4 ± 8.05	139.9 ± 23.32	114047
June	39.7 ± 2.15	812.8 ± 107.36	171.7 ± 26.60	166549
July	38.75 ± 5.71	813.5 ± 399.47	165.1 ± 95.47	136950
August	30.37 ± 2.64	850.7 ± 125.26	155.5 ± 41.41	123225
Mean ± SD	39.28 ± 0.39	800.85 ± 52.59	158.05 ± 13.80	135192



Graph 1. Showing the maximum Fecundity in the month of June in *L. rohita*

The number of ova in the present study was found from 114047 to 166549 eggs. The maximum fecundity was observed from a fish with a gonad weight of 171.7 gm and total weight of fish 812.8 gm and the minimum were observed from a fish with a total length of 39.3 cm and gonad weight of fish 139.9 with ova 114047 were recorded in the month of May 2022. It was noted that the fecundity increased with the increases in total weight of gonad of the fish detailed presented in Table 1 and Graph 1.

The total weight and length of fish *L. rohita* ranged from 726.4±8.05 to 850.7 ±125.26 gm and 30.37 ± 2.64 to 39.7± 2.15 cm respectively. The weight of ovary ranged from 139.9± 23.32 to 165.1±95.47 gm. The absolute fecundity of *L. rohita* were observed in the present investigation was varied from 114047 to 166549. The weight of ovaries, number of eggs per fish and number of eggs per kg body weight of fishes were higher in June than July and May. In month of June and July, the water temperature in the fish pond rises

up to 31.3 to 31.7°C the photoperiod was maximum in these month. These results were found similar to that of Jain and Mitra [18] who reported a high relative fecundity of Indian Major Carps, *Labeo rohita* and *Cirrhinus mrigala* in semi- arid climate i.e. 307±29 eggs/g fish. Lone and Hussain, [17] observed 2012.55 eggs/g ovary and 469.93 eggs/g fish. Whereas, Ujjania, [19], reported relative fecundity of *L. rohita* in southern Rajasthan was highest (2.158 ± 0.192) in number of eggs in lakh/kg body weight. This difference in fecundity may be attributed to the level of fish pond management at two sites.

Some researchers have been reported regarding water temperature and photoperiod have been correlate with the gonad weights [20, 21,17, 22, 7,4]. In freshwater fishes especially Indian major carps it was observed that in summer, when water temperature was high and period of day time was long, both play a key role in initiating the development as well as maturation of gonad and conducting the spawning season [17]. Prasad and Kanaujia [23]; Prasad, [24] reported that the total weight of the eggs per female as well as the mean number of eggs were increased with increasing length and weight.

#### 4. CONCLUSION

This study showed that *L. rohita* have high reproductive dormant and fecundity in the month of June. According to Simpson [25], the fecundity of an individual's female fishes varies in relation to many factors including age, size, species and environmental conditions such as food availability, water temperature and salinity. In the present study fecundity increased with the increase ovary weight in *Labeo rohita*. The ovary weight found as the better index to estimate the fecundity than other body parameters.

#### DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

#### REFERENCES

1. Desilva S. Carps culture In: Aquaculture Farming Aquatic Animals and Plants (eds J.S. Lucas and P.C, Southgate) Fishing News Book, UK. 2003;68-73.
2. Priyadharshini R, Damodaran R, Kavitha P. Gonadosomatic index and fecundity of an Indian major carp *Labeo rohita* (Ham), International journal of current research. 2015;7(03):14221-14224.
3. Rasheed S, Mustaqim J. Size at sexual maturity, breeding season and fecundity of three-spot swimming crab *Portunus sanguinolentus* (Herbst, 1783) (Decapoda, Brachyura, Portunidae) occurring in the coastal waters of Karachi, Pakistan. Fisheries Research. 2010;103(1-3):56-62.
4. Hasan M, Hosen MHA, Miah MI, Ahmed ZF, Chhanda MS, Shahriar SIM.. Fecundity, length at maturity and gonadal development indices of river catfish (*Clupisoma garua*) of the old Brahmaputra River in Bangladesh. Egyptian Journal of Aquatic Research. 2024;6(2020):259- 263.
5. Prasad S, Nath P. Study of Gonadosomatic Index and Maturation of an Indian Major Carp *Labeo rohita* (Ham) in Bihar, India, International Archive of Applied Sciences and Technology. 2020;11(1):37-41.
6. Hossain MY, Rahman MM, Abdallah EM. Relationship between body size, weight, condition and fecundity of the threatened fish *Puntius titco* (Hamilton, 1822) in the Ganga River, north-west Bangladesh. Sains Malaya. 2012;41:803-14.
7. Iqbal Z, Batool A. Fecundity of *Labro rohita* (Teleostei: Cyprinidae) reared in earthen pond in Lahore. Canadian journal of pour &applied science, 20137(2):2391-2395.
8. Mishra S, Saksena, DN. Gonadosomatic index and fecundity of Indian major carp *Labeo calbasu* in Gohad reservoir. The bioscan. 2012;7(1):43-46.
9. Prasad S, Choudhary DN, Bhanu S. To determine the marketing system of fish in Purnea, North Eastern Bihar, India.

- Biological forum – An International Journal. 2023;15(10):980-985.
10. Jhingran VG, Pullin RSV. A hatchery manual of Chinese and Indian major carps. Asian Development Bank. Manila, Philippines. 1985;1-8.
  11. Prasad S, Prabhakar CS, Kumar A. Assessment of gonadosomatic index and maturation of an Indian major carp *Cirrhinus mrigala* (Ham). International Journal of Chemical Studies SP. 2018;4:203-206.
  12. Joshi SN, Khanna SS. Relative fecundity of *Labeo gonius* (Ham) from Nanak Sagar Reservoir. Proceedings of Indian Academy of Sciences. 1980;89:493-503.
  13. Nautiyal P. Fecundity of Garhwal Himalayan mahseer *Tor putitora* (Ham). Journal of Bombay Natural History Society. 1985;82(2):253-257.
  14. Bahuguna SN, Khatri S. Studies on fecundity of Hill stream loach *Noemacheilus montanus* (McClelland) in relation to total length, total weight, ovary length and weight. Our Nature. 2009;7:116-121.
  15. Bhat JA. Length- weight relationship and condition factor of *Labeo rohita* (cyprinidae) in Pahuj reservoir, Jhansi, UP, India. Journal of Experimental Zoology India. 2011;14(1)339-344.
  16. Das MK, Sharma AP, Tyagi RK, Saha PK, Pathak V, Suresh VR, De DK, Paul SK, Sett P, Chakrabarty M, Mondal K. Fish of river Ganga a Field identification manual, ICAR, CIFRI, Barrackpore, Bull. No165; 2010.
  17. Lone KP, Hussain A. Seasonal and Age-relative variation in the ovaries of *Labeo rohita* (Hamilton, 1822): A detailed gross and histological study of gametogenesis, maturation and fecundity, Pakistan. J. Zool. 2009;41(B):217-234.
  18. Jain AK, Mitra SD. Fecundity of *Labeo rohita* and *Cirrhinus mrigala* in semi- arid condition. Journal of Aquaculture in Tropics. 1994;9(1):43-48.
  19. Ujjania NC. Comparative performance of Indian major carps (*Catla catla*, *Labeo rohita* and *Cirrhinus Mrigala*) in southern Rajasthan,. Ph.D. thesis, CIFE, Mumbai. 2003;1-149.
  20. Dey R, Bhattachacharya S, Moitra Sk. Important of photoperiods in the regulation of ovarian activation in Indian major carp *Catla catla* in an Annual cycle: Journal in Biological Rythms 2005;20(2):145-158.
  21. Bhattacharyya S, Mitra SK. Environmental correlate of the testicular event in a major carp *Catla catla* in an annual reproductive cycle. Biological Rhythm Research. 2006;37:87-110.
  22. Iqbal Z, Kausar S. Fecundity of *Cirrhinus mrigala* (Hamilton) reared in earthen pond. Punjab Uni. J. Zool. 2009;24(1):3139.
  23. Prasad S, Kanaujia DR. An observation on reproductive potential of Ganga River prawn *Macrobrachium gangeticum* (Bate). Progressive Research - An International Journal. 2014;9(SP III):1028-1032.
  24. Prasad S. Maturation and fecundity of large freshwater prawn *Macrobrachium malcolmsonii* and *Macrobrachium gangeticum* in the Ganga River System in India. Current Journal of Applied Science and Technology. 202039(212): 148-155.
  25. Simpson AC. The fecundity of the Plaice fish. Invest, London. 1951;17:1-27.

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