

Study of Gonadosomatic Index and Maturation of An Indian Major Carp *Labio rohita* (Ham) in Bihar, India

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ABSTRACT

The systematic supervision for obtaining high yield of fish production ultimately calls the adequate and in-depth study of reproduction mechanism. Gonadosomatic index and correlation with ovary development is a tool for measuring the reproductive ability of animal. The present study was undertaken to sketch accurate spawning period of *Labeo rohita* in South Bihar. This is reported in terms of gonadosomatic index which convey the relative change in gonad weight to the percentage of body weight during the period of April, 2018 to August, 2018. Ovarian mean weight of the carp *L. rohita* ranges from 77.87 - 91.13 g. during the month of April and August. The present study showed that the gonad of the reported fish increases with the increase in size and weight of fish. The average weight and length of fish were ranged from 526.63 – 647.88 g and 32.34 - 38.43 cm, respectively. The gonad attained the maximum weight 141.63 in May and minimum 77.13 in August. The GSI value was observed maximum 26.98 gm in the month of June and minimum 16.42 gm in April. The peak value of GSI was observed only from May to June indicate only two months of spawning period of the said species. The present study indicates a new line and will help to plan an early seed production and culture of *L. rohita* in agro-climatic conditions of Bihar for better rural livelihood and nutritional security.

Keywords: Fresh water fish, *Labeo rohita* , gonado somatic index, spawning, Bihar

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INTRODUCTION

Fisheries and aquaculture is an important sector of food production, providing nutritional security to the food basket, contribute to the agricultural export and engaging about fourteen million people in different activities as well [14]. Fishes are very important source of protein for human, since human utilizes fishes as a food. Carps contribute significantly to the economy of Bihar state as several rivers flow through its circuit. Apart from this the reservoirs, Ox-bow-lakes, flood plains (Chauris) fishery and fish farming in this region is also worth mentioning. Carp culture is the largest and widely used practices of animal aquaculture over the world Desilva, [6]. The species of *L. rohita* is an important commercial major carp which do not breed in ordinary perennial tanks attempts to induce carp breeding by hypophysation have been made. Gonad morphology has been used for the understanding of the reproduction and the phylogenetically relationships among fishes Belova [4]. Estimation of accurate maturity & spawning period play a significant role to evaluate reproductive potential of fish. It also helps to understand the dynamics of fish population, productivity trends and spawning stock biomass for successful and profitable aquaculture Prasad *et al.*, [14]. Gonado somatic index (GSI) is one of the important parameters of the fish biology, which gives the detail idea regarding the fish reproduction and reproduction status of the species and help in ascertaining breeding period of fish [19]. Due to climate changes and industrialization, availability of agriculture land is reducing day

by day and 30 % of population is still suffering severely by malnutrition and health hazards, fish food may be useful to provide proteineous and easily digestible food item [2]. Indian Major Carp is a prized food fish of India but it is facing tough competition in Indian water against the exotic fishes. The GSI is considered as a percentage weight of ovary to the body weight has been used as a maturity index of fish. Environmental changes greatly influence the production of eggs varies not only among different species but also within the same species. It also depends upon the length and weight of the gonads [3] Gonado somatic index, an index of gonad size related to the fish size is a good indicator of gonad development of fish and it measures the cyclic changes in gonad weight in relation to total fish weight. It can also be used to determine spawning periods (Priyadharshni *et al.*, 2015). In the present study investigate the gonado somatic index and also tracing accurate spawning period of *Labeo rohita* in Bihar. This is reported in terms of gonado somatic index which express the relative change in gonad weight to the percentage of body weight. Hence the study would benefit the commercial aspect and would contribute to the economic aspect of fishery science.

MATERIAL AND METHODS

Study area

The present investigation was carried out on gonadosomatic index and maturation of *L. rohita* Dumraon (Buxar) from April 2010 to August 2018. Dumraon, Buxar lies between 25° 55N Latitude and 84° 15 E Longitudes at the average elevation of 61 metres (200 feet). It is located 1.5 km South of National High way (NH-44) (Arah- Buxar Highway). It is a sub-division of district Buxar and 100 km far-away from Patna.

Collection of specimens and measurements

The month wise healthy mature fish samples of *L. rohita* (female) were collected (A total of 20 collections) from fish ponds and fish markets and weighed individually at the sampling site, Dumraon, Buxar. The standard length and weight of the sampling fish were noted nearest accuracy by measuring centimeter scale and weighing balance along with visual observation. A total of 100 samples collected during the study period and simple random sampling technique was used [5].

Dissection of fish and examine

The specimens of *L. rohita* were careful dissected with at the sampling site revealed that the posterior aperture opened in to coelomic cavity and examined Fig-1 & 2. Gonads were removed from the fish. Thereafter dissected fish were also weighted. Gonads were kept in a transparent glass sheet. The ovaries were examined by using a hand lens. Their degree of maturation was judged by the naked eye on the basis of color and size. The appearances of ova, at different stages of ovary were examined microscopically as well as by using a hand lens and classified them in different groups according to Nikolsky, [12]. Weights of the fish gonads (ovary) were measured using a weighing balance (Kurl model). The gonads were preserved in 5% formalin and they were brought to the deptt. of Entomology & Zoology, laboratory at VKS College of Agriculture, Dumraon for further investigation.



Figure:1. Mature specimen of *Labeo rohita* collected from sampling site Dumraon,



Figure:2. Posterior aperture opened in to coelomic cavity of *L. rohita* at sampling site

Gonadosomatic Index (GSI):

Percentage of gonado weight in relation to the total body weight was calculated by using the following formula.

$$\text{GSI} = \frac{\text{Weight of gonad (g)}}{\text{Weight of fish (g) - Gonad weight (g)}} \times 100$$

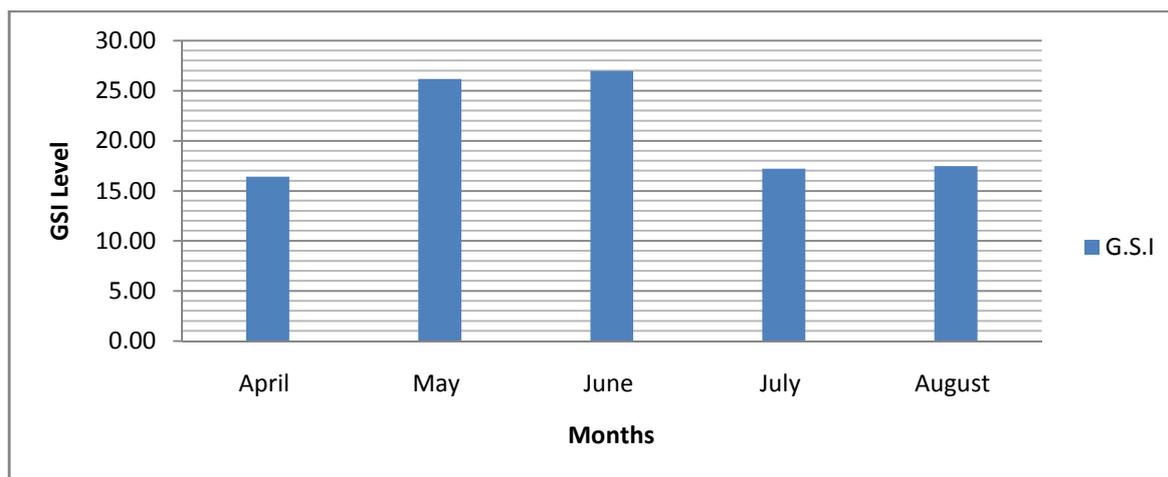
RESULTS AND DISCUSSION

The ovaries of the *L. rohita* are paired elongated sac like structures, lying in the posterior half of abdominal cavity ventral to the air bladder. The ovaries are covered by an outer peritoneum membrane and inner ovarian wall. The ovarian wall is distinguished into an outer tunica albuginea and inner germinal epithelium (Fig-1&2). Gonadal development was studied by using the gonado somatic index of fishes. Variation in gonad weight observed month wise and sample of Indian Major Carp, (IMC) *L. rohita* have been analyzed and computed the facts and figure of samples are shown in Table-1 and Graphs-1&2. During pre-spawning phase, female *L. rohita* ovary shows rapid increase the oocytes indicating rapid growth and maturation. In the present investigation most of the ovaries were found in the month of April in pre-matured phase ranges between 75 to 89%, whereas % of gonads in the body cavity was recorded in mean value 83.43 %. High gonado somatic indices were recorded for *L. rohita* in this study from May to June which in turn suggested that the spawning period of *L. rohita* was May to June, the peak value being in May to June. During this period ovaries are large fill the entire peritoneal cavity and contain fully matured oocytes laden with yolk. More or less similar observations have been made [16]; Gupta [10] in *C. reba* and Gadekar [9] in *L. rohita*, respectively. Gonad undergoing regular seasonal cyclic changes in weight, particularly in females which help to indicate the spawning season [7]. In present investigation in the month of May mean body weight 647.88 gm and gonad weight 141.63 gm were recorded, where as GSI value was 26.17 gm in the month of May and 26.98 gm in June. This was highest and spawning period of these months. In Indian major carp *Labeo calbasu* the mean gonado somatic index increased gradually from May and reach to peak in July and then decreases in August as reported by Mishra and Saksena, [11]. The GSI of *L. rohita* was estimated month wise for females and the values are expressed in percentages. It increases from 16.42 gm in April to 26.98 gm in June indicating the peak period of the maturity in the month of May to June.

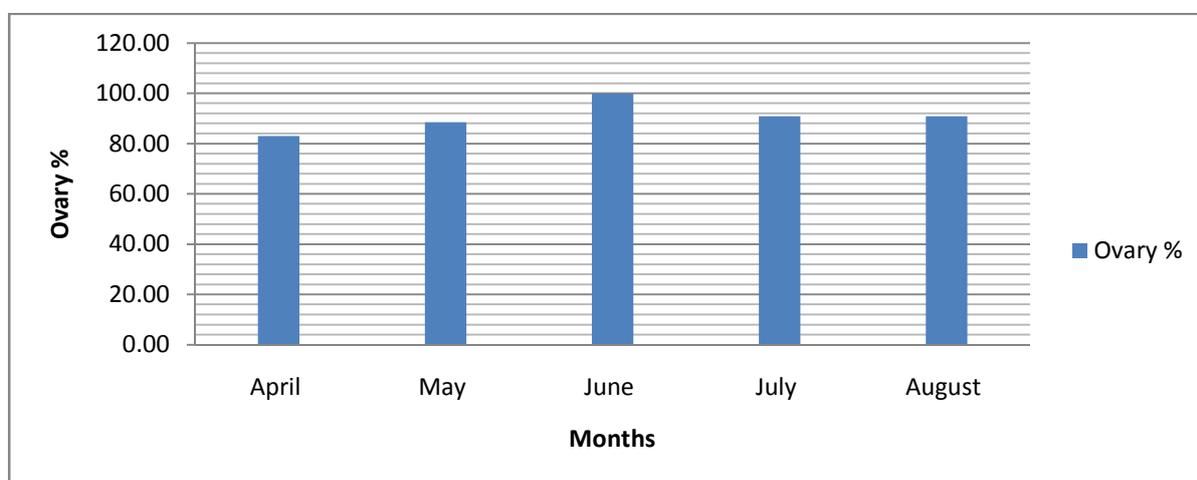
Table:1. Mean morphometric measurements and Gonadosomatic index (GSI) of *L. rohita* collected from pond in different months

Months	B.Lt. cm.	B. Wt. gm	H.Lt cm.	Girth cm.	Gonad gms	F. wt. after dissect	Ovary %	G.S.I.
April	37.04	640.25	6.61	9.13	91.13	548.88	83.00	16.42
May	38.43	647.88	5.55	5.68	141.63	465.13	88.46	26.17
June	34.58	645.25	5.50	5.68	136.63	459.88	99.89	26.98
July	32.34	527.38	6.46	7.59	81.00	429.63	90.88	17.56
August	34.58	526.63	6.46	7.59	77.87	429.63	90.88	17.29

B.Lt.= Body length, B. wt.= Body weight, H. Lt.= Head length, F. wt= Fish weight after dissection



Graph:1. Month wise mean Gonadosomatic index (GSI) of *L. rohita* collected from pond



Graph:2. Month wise mean ovary percentage of *L. rohita* collected from pond.

There is gradual decrease in GSI from 17.56 gm in July to 17.29 gm in August indicating the onset of spawning and most of the ovaries were found in reabsorbing condition. According to [2] high GSI were recorded for trout sweet lip grunt, *Plectorhynchus pictus* from March to May. This was in contrast to the results obtained in this study. Priyadarshini *et al.*, [15] reported higher values of GSI from June to August in the range of 8.80 gm to 11.05 gm. After extrusion of ripe gonads, the gonads were weighted from July to August indicate the decline of GSI after spawning. Females having matured & pre-spawning phase of gonads were first observed in the month of May, with 88.46 % ovaries approaching maturity during pre spawning period, their volume and vascular supply increases significantly. The gonadosomatic index increased with the maturation of fish and reaches to its maximum at the peak period of maturity. Its sharp decline decrease indicates the beginning of spawning. During spawning period, the ovaries grow considerably in size occupying larger area in the posterior half of the body. It increased from 26.17 to 26.98 in the month from May to June respectively. Ovaries became very large, fill the entire peritoneal cavity and contain fully matured oocytes laden with yolk. However, Gadekar, [8] had seen few oocytes at peri-nucleolar and yolk vesicle stage which was present in the peripheral areas of the ovary. The percentage of maturation of ovary & eggs increased sharply from May to June during the spawning periods. Percent values of the ovaries rises from April tune (83.00 %) to 88.46-in May & 99.89% June during in the spawning phase. It shows peak spawning period. After that it gradually decreases to 90.88% in the month of July & further declined in August. Our study confirms and supports the observations of earlier workers like Suksena [19]; Selvaraj *et al.*, [17]; Priyadarshini *et al.*, [15].

CONCLUSION

From the present investigation, it is concluded that the fish *L. rohita* has only one spawning season with short duration of May to June as indicated by the peak of gonado somatic index and percent maturation of ovary.

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