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Breeding Biology Of Cyprinus Carpio Communis

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ABSTRACT:

The article discusses the breeding biology of Cyprinus carpio communis.The fish is a late spring spawner and has only one spawning period during the year.Gonad growth coincides with gradual increase in water temperature and day length.30 specimens were collected from Dal(Srinagar) and Wular(Sopore)lakes from March 2021 to July 2022 with the help of local fisherman.The specimens ranged from 26.560 to 180.14 gm in weight,11.8cm to 28.1 cm in total length.The fecundity varied from from 7710 in a fish measuring 11.8cm(TL) to 110,585 in a fish measuring 28.1cm(TL).The results indicates that the fish is a high fecund one and is thus well establish fish in lakes of Kashmir.

Keywords: Breeding biology, Spawning season, Cyprinus carpio communis, Kashmir.

INTRODUCTION

The genus is represented by a single species Cyprinus carpio, which is restricted to eastern and central Europe, and which has been introduced in numerous locations particularly in Europe.

Cyprinus carpio was introduced in the Kashmir valley in 1995(Jhingran,1991)or 1956(Das and Subla;Fotedar and Qadri,1974),although Saxena and Koul (1966) insist on 1953.Cyprinus carpio commonly called punjabe gad is a deep bodied ,laterally compressed fish.Among the genus Cyprinus,some individuals are having enlarged scales,representing the cultured variety called mirror carp.Knowledge about fecundity of a fish is essential for evaluating the commercial potentialities of its stock,life history,culture and management of the fishery(Lagler,1956;Karim and Hossain 1972;Shafi and Mustafa,1976;Islam and Hossain,1984;Bhuyian and Rahman,1984).The present study was undertaken with a view to determine the biology,fecundity and relationship between fecundity and total body length(TL),total body weight(TW),ovary length(OL) and ovary weight(OW) of Cyprinus carpio communis and making it easier thereby to increase the yield of fish species ,stock management and assessment in any water body by studying the relationship of fecundity with the above mentioned body parameters.

MATERIALS AND METHODS

During the present study 30 specimens of Cyprinus carpio communis were procured from Dal and Wular lakes.Each fish was eviscerated after taking various morphometric measurements.The total length(TL),total weight(TW)Ovary length(OL) and ovary weight were measured from intact specimens.For determining the fecundity the ovaries were removed and pat dried and weighed to the nearest gram.The ovaries were then placed in in jars containing Gilsons fluid.The fluid facilitated the break down and fixation of ovarian tissue.A sample of 1gm of ovary was placed in 4-5%formalin after

clearing with a stream of water.The samples to be counted were placed in a petridish and by means of pointed fine dissection needle the ova were counted under the low power stereoscopic binocular microscope.The total fecundity was calculated by taking a fraction of the ovary weighing it and counting the mature ova from the weighed portion of the ovary by random sampling method.The total number of eggs in each ovary was then calculated by multiplying the number of eggs in the ovarian sample by the ratio of the weight of total ovary/the weight of the ovarian fraction.The relative fecundity was detected by the ratio of total number of ova to total weight of fish.

For histological examinations the gonads were fixed in different fixatives(Bouins fixative,Zenkers fluid and Cornoy's fixative).Small pieces of gonads were put into the fixative after removal from the fresh fish .The fixed material was then washed in running water for a couple of hours and the dehydrated in the usual alcoholic grades(50%,70%,90% and 100%).Cleared in xylol for about 1-2 hours,until the material sunk.The matrial was transferred to a mixture consisting of approximately equal parts of paraffin and xylol(1:1).The mixture was placed in the oven at a temperature of about 58-60^{0}c,for about 4-6 hrs.Sections were cut off from embedded material in blocks at the thicknessof 6-8µ and spread on the slides.The sections were dehydrated,stained and then examined under low and high power microscope.The fecundity in relation to various morphometric measurements was also studied to establish the relationship between total length(TW),total weight(TW) and ovary weight,least square method was followed.

RESULTS:

The ovaries are two elongated structures fused caudally.The ovaries are attached to the air bladder by thin mesovaria.The ovaries of the fish are not covered by means of black peritoneum as in other fish speciesbut instead by a thin membrane of peritoneum.The ova remain attached to the thin folds of ovigerous lamellae.The size,shape and colour as wellas the volume and weight of the ovaries changes seasonally according to the degree of maturity of the fish.In accordance with its general appearance and histological peculiarities in different seasons,the ovary of the fish shows five stages of maturing namely:

1.Immature phase:which extends from July-August.During this phase ,the inactive ovaries are long,slender,thread like translucent and slightly fleshy in texture.The ova are not visible to the naked eye.The ovaries show prominent ovigerous folds and numerous immature oocytes of variable size.The oocytes present are observed to be in orimary growth phase,the more advanced ones get covered by a follicular epithelium as revaled by light microscopy.

2.Maturing phase:which extends from September and October.There is further increase in the weight and volume of the ovaries.The ovigerous lamellae are full of small rounded microscopic oocytes which are not seen to the naked eye through the ovarian wall.The small immature oocytes are of oval or irregular shape with large rounded nuclei.Svveral nucleoli are seen adjacent to the nuclear membrane.Afew oocytes are visible externally.

3.Mature phase:which extends from November –December.This period is the preparatory phase for maturation of ovaries.The ovaries consist of numerous sets of oocytes in the ovigerous lamellae having yellowish colour.The ovary is filled with pale ova visible externally.The anterior divergent portions of the ovaries and the oviduct and lose their distinctness.They occupy half the length of the body cavity.

4.Prespawning phase: In the months of January –early March the ovaries do not show any further change in the development and remain all most in the same stage of maturation (winter diapauses),the growth is arrested.No doubt ovaries are in the maturing condition with a negative stripping stage.The ova are highly packed and are orange yellow in colour.

5.Ripe and Spawning phase:which extends from late March to May.The ovaries are greatly enlarged attaining their maximum weight and filling up the entire body cavity and they are now full of ripe and heavily loaded yolked eggs,which extrude out by slight pressure if applied on the abdomen and the abdomen is seen to buldge out.At this stage the ova are not closely packed together as in the prespawning stage.The eggs are fully grown and completely packed with yolk mass.

6.Spent phase:is observed from July to August ,is postspawning period of the ovaries.This stage is represented by shrunken flaccid,blood spot appearing ovary.At this stage little space is occupied in the body cavity by the ovaries.The ovary can be seen with dark red spots,and it is due to degenerating ova seen at the surface.The anterior divergence of the two ovaries is again marked and the oviduct is again distinct.

Gonad growth is noted to coincide with gradual increase in water temperature and day length. Cyprinus carpio communis is observed to be late spring spawner and spawns once and in full (synchronous type).

The fecundity varies from 7,710 in a fish measuring 11.8cm(TL)to 110,585 in a fish measuring 28.1cm(TL).The relationships are expressed as:
1.Relationship between Fecundity(F) and Fish length(TL): Table 1 provides data for the two variable i.e Fecundity and total length.For a fish measuring 28.1cm(TL),the max.no.of ova was estimated to be 110,585,while the minimum was,7,710(F) for a fish of 11.8cm (TL)in length.
The equationis expressed as:

$$\text{Log } F=1.390+2.405\text{LogTL}$$

Where F=Fecundity and TL=Total length in cm.

The relationship between fecundity and total length was found to be linear and the correlation coefficient(r) was 0.7021, which shows significant correlation.(fig 1).

2.Relationship between Fecundity (F) and Fish Weight (TW): Table 1. Provides data for the two variables i.e Fecundity and Fish weight.The number of ova varied from 110,585 at weight of 180.141gm to 7,710 at 26.560gm.
The equation is expressed as:

$$\text{Log } F=2.516+1.030\text{LogTw}$$

The number of eggs per female is directly proportional to fish weight.The correlation coefficient (r) was found to be 0.744.

3.Relationship between Fecundity (F) and ovary weight(ow): Table **1** provides data for the two variables i.e Fecundity and ovary weight.The fecundity (F) ranged from 110,585 in an ovary weighing 14.998 gm to 7,710 in an ovary of 1.0 gm.
The equation is expressed as:

$$\text{Log } F=4.002+0.733\text{Log Ow}$$

Where F=fecundity and Ow =ovary weight.
The correlation coefficient was found to be=0.712

4.Relationship between Fecundity (F) and Ovary length (Ol): Table 1provides data for fecundity and ovary length.The fecundity ranged from 110,585 with an ovary length of 14.8cm in a fish to 7,710 with an ovary length of 3.0cm .

The equation is expressed as:

$$\text{Log } F=3.288+1.318\text{Log Ol}$$

Where F=fecundity and OL =ovary length

Linear relationship was observed between Fecundity and ovary length.The correlation coefficient(r) was found to be r =0.8006

5.Relationship between Fish weight (TW): Table 1provides data for fish weight and ovary weight.The fish weight(TW) ranged from 180.141 in a fish having ovary weight 14.998gm,while the minimum was 26.560(TW) for a fish having 1.0 ovary weight.
The equation is expressed:

$$\text{Log } W=1.429+0.732\text{Log OW}$$

Where W=weight of fish and ow =ovary weight

Linear relationship was observed between Fecundity and ovary length.The correlation coefficient(r) was found to be r =0.98

DISCUSSION:
The spawning season of this late spawning fish starts normally at the end of March and lasts upto the end of June.In the fish studied it is observed that the gradual increase of the ovary weight is from February up to the end of Juneattaining maximum by the end of may.The ovary weight is observed to be maximum during the prespawning and spawning phase and minimum during the recovery phase when discharged ova were resorbed and removed from ovaries.Such condition has also been reported by (Hoda and Qureshi,1989) in Mullet,Liza klunzeinger.

In the tropics there being no marked seasonal or climatic changes,a bimodal pattern of breeding is fairly common,but in temperate climates as in valley of Kashmir ,marked fluctuations occur in ambient temperature and photoperiod which affect breeding activity. With the onset of warmer temperatures and longer daylength in spring are very important and a prior conditionfor the rapid development of gonads.If the above said factors do not occur in time ,then the spawning is delayed to some extent.However, it has been noticed in some fishes that the spawning has been observed to occur even in February only if the winter is mild,thus making it clear that the species in temperate conditions are dependent upoun temperature and photoperiod for controlling maturation and breeding unlike carps of tropical waters where breeding is totally dependant on rains and monsoons (Alikunhi, 1966, Sinha et al 1974).The fish under study is not having any spawning migration from the lake.

In case of Cyprinus carpio communis neither a bimodal pattern of spawning nor asynchronization was seen.The fish belonged to the category of synchronism of (Marza,1938).Similar observations have been made earlier by (Fida,s.1983) in Schizothorax esocinus and (Jyoti et al.,1992) in Crossocheilus latiusGlyptothorax,Puntius sophore and Trichogaster fasciatus.

Further,the fecundity was found to increase linearly with the increase in total length body weight ovary length and ovary weight.These resultsare in agreement with the findings of Karim and Hosain(1972),Das(1977),Pathani(1981),Sunder(1984),Islam and Hossain (1984), Dobriyal (1988), Khan et al(1992),Rao and Hossain(2006),Bahuguna and Khatri(2009).

The correlation coefficient r value in the present study indicate that among the four parameters studied,closest correlation of fecundity was observed with the ovary length(r=0.80) followed by fish weight(r=0.74),ovary weight(r=0.712)and total fish length(0.702).

CONCLUSION:

Fecundity is of great importance in fishery science as it is having great influence onrecruitment in to fisheries.The present study revealed that the fish is annual breeder.Different stages of reproductive cycle will play an important role to the fisheries department and the young educated people who are rearing the fishes in their farm for obtaining eggs at right time so as to increase manifold production of fishes in their farm by procuring seeds at the proper time.

Table 1. Data for Absolute fecundity with other body parameters for gravid females.

	Body weight (g)	Body length (cm)	Ovary weight (g)	Ovary length (cm)	Absolute fecundity
1	70.800	17.8	3.54	6	20,999
2	33.250	14.7	1.5	3.4	9,000
3	126.985	25	8.12	11.2	75,019
4	44.250	15.5	2	6.2	18,849
5	75.840	18.6	4.1	9.3	39,408
6	148.320	22.7	9.999	13.2	77,400
7	44.000	15.9	2.891	5.1	17,504
8	79.999	18.9	3.9	9.84	42,843
9	163.210	23.5	10	13.4	89,540
10	180.141	28.1	14.998	14.8	110,585
11	57.250	16.3	2.181	5.5	19,541
12	80.450	19.4	4.54	10.4	42,369
13	71.432	17.1	3.438	5.9	21,787
14	26.560	11.8	1	3	7,710
15	181.320	27.9	14.995	13.9	11,541

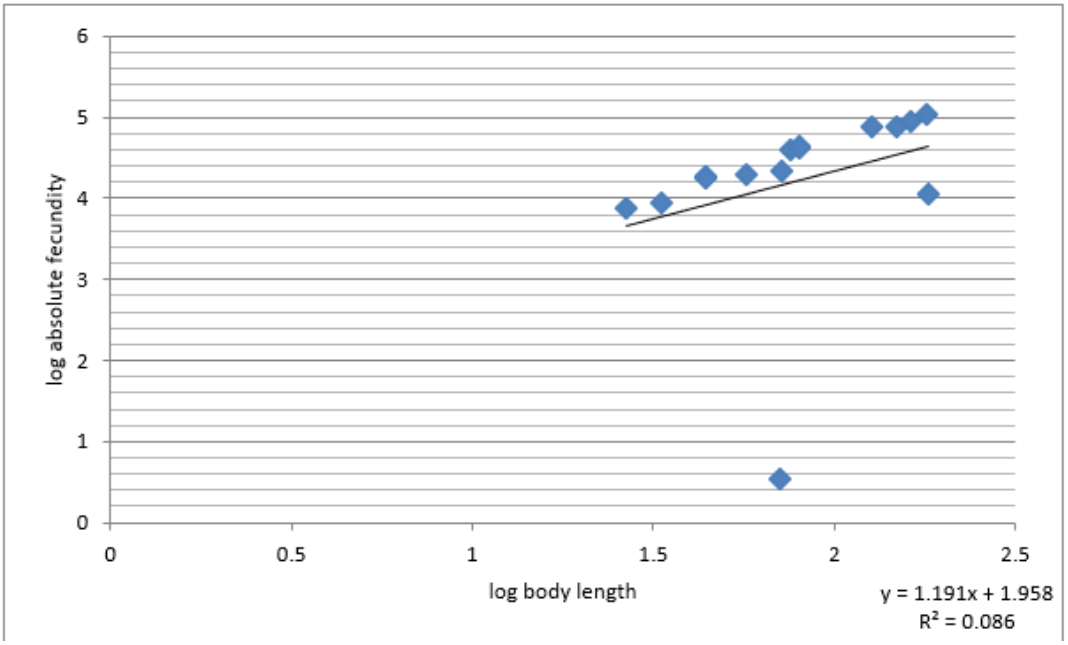

Fig1. Relationship between fecundity(f) and total body lengthin Cyprinus carpio communis.

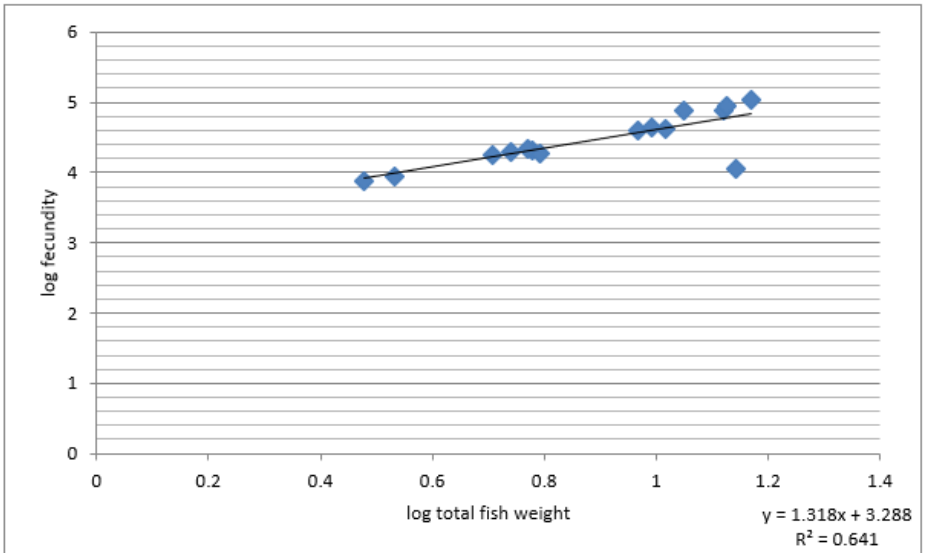

Fig2. Relationship between fecundity (f) and total fish weight

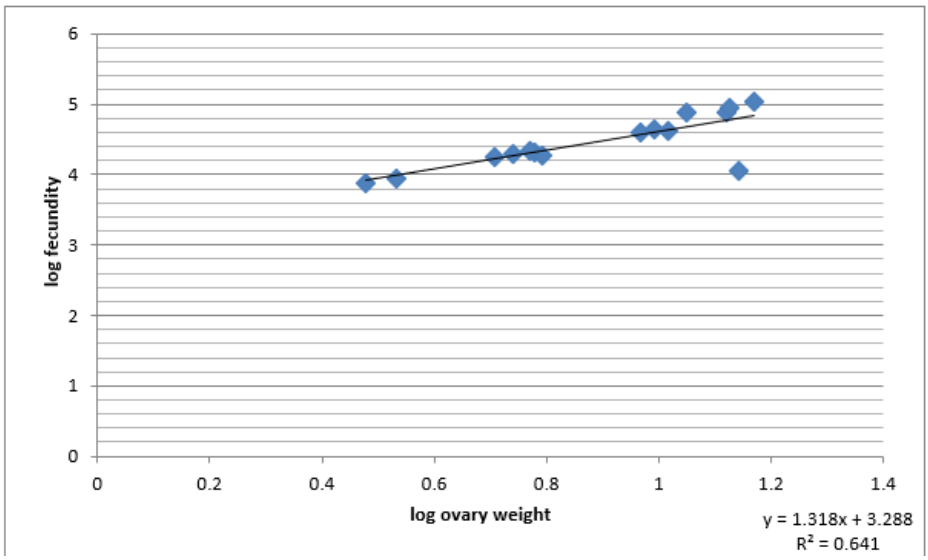

Fig3. Relationship between fecundity(f)and ovaryweight(ow) in Cyprinus carpio communis

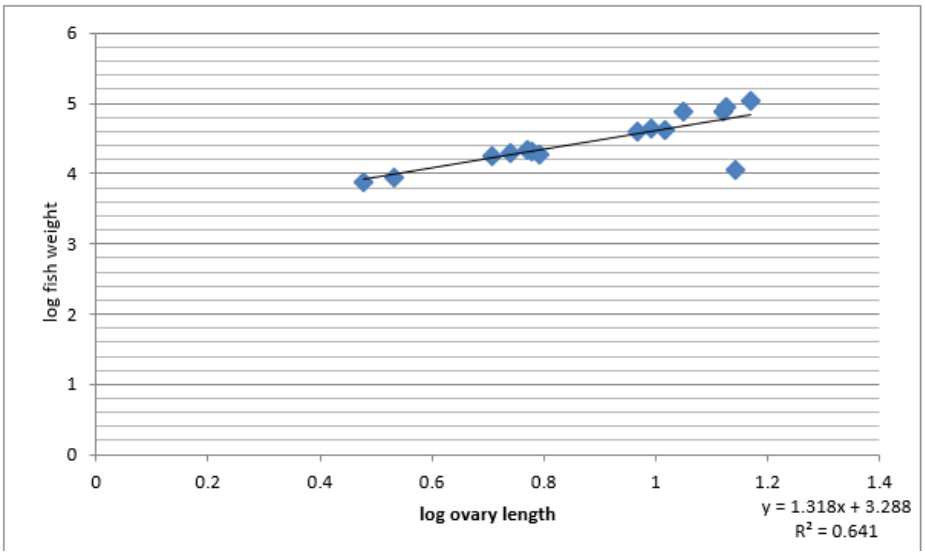

Fig4. Relationship between fecundity(f) and ovary length (ol) in Cyprinus carpio communis

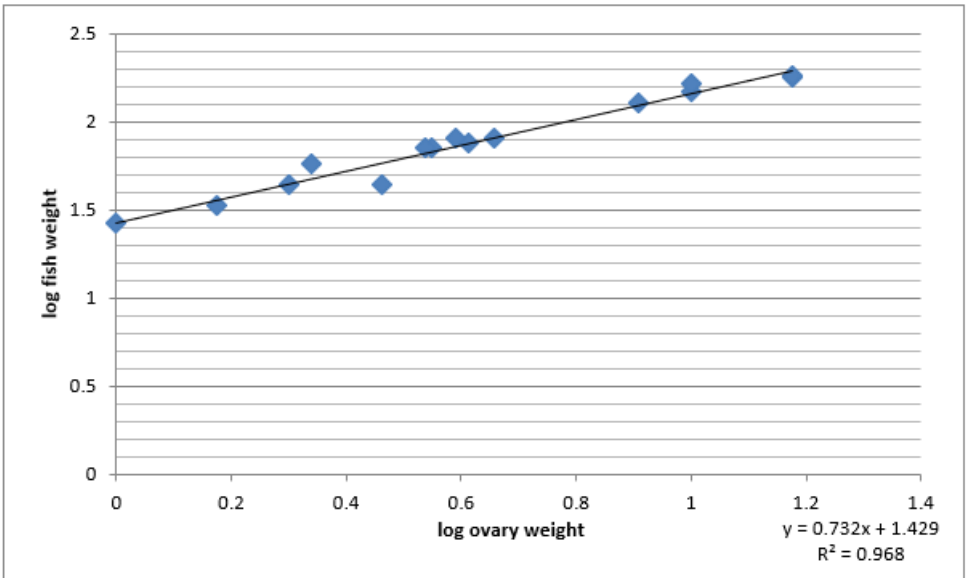

Fig 5. Relationship between total weight(tw) and ovary weight (ow) in Cyprinus carpio communis

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