INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH & DEVELOPMENT

***ISSN: 2278 – 0211 (Online)***

# Length-Weight Relationship And Breeding Biology Of Puntius Conchonius (Hamilton, 1822) From Dal Lake, Kashmir

**Shaheena shafi**
Department: Centre of Research For Development: (190006), University of Kashmir, India
**A.R.Yousuf**
Department: Centre of Research For Development: (190006), University of Kashmir, India
**Muni Parveen**
Department: Centre of Research For Development: (190006), University of Kashmir, India

***Abstract:***

*The length-weight relationship and fecundity ofPuntius conchonius were investigated on samples collected from Dal Lake, Kashmir. The analysis of this fish species was based on 150 specimens ranging in size from 38mm to 84mm and in weight from 1.42g to 10.712g. The regression values obtained for male, female and for pooled sexes (2.97, 2.93 and 2.94). The regression co-efficient was found to depart significantly from the cubic value. The computed value of correlation coefficient (r) for males, females and pooled ones were as r = 9.22, r = 9.36 and r =9.35 respectively, which were closer to 1 indicating that there is high positive correlation between the two variables i.e.lenght and weight.*

*The fecundity studies on Puntius conchonius revealed that there is a relationship between length of the fish with fecundity, weight of the fish and ovary with fecundity. The length and fecundity exhibited a straight line relationship between fecundity and body weight. Fecundity and ovary weight also exhibited linear relationship.*

**1.Introduction**

ThePuntius conchonius which is locally known as ‘’bloz and with English name Rosy barb.” It is a deep bodied cyprinid fish species and is characterized by the presence of dark black rounded spot at the base of the caudal peduncle. It is widely distributed in lakes, rivers and small streams in Kashmir valley. Cyprinus carpio was introduced in Kashmir around 1955-1956, and it is likely that puntius conchonius were introduced at the same time. It is of less economic importance an and is mostly used in aquarium.

The Dal Lake is situated between 34º 5' and 34º6'N latitude and 74º 8' and 74º12' E longitude at an altitude of 1584m above sea level. It has been an important fishery resource to the people of the valley, especially to Srinagar since ancient times. It is a shallow open drainage type water body spread over an area of 11.4km$^2$, divided into five basins viz. Hazratbal, Nishat, Gagribal, Nigeen and Brarinumbal.

No scientific study of the Kashmir fish fauna seems to have been undertaken till early nineteenth century. It was Mr. Von Hugel, a visitor to Kashmir during 1830-1832 who found the fish of the valley somewhat different from those of the plains of India as well as Europe, and collected samples of different fish and handed them over to Mr. J.J. Heckel in Germany for identification. Heckel studied the samples thoroughly and on the basis of taxonomic features described sixteen species of fishes for the first time from the valley, all new to science (Heckel, 1838). Based on origin, the ichthyofauna of Kashmir has been categorized into three groups, viz., species of central Asiatic origin, those of Indian origin and exotic species introduced in recent past (Das & Subla, 1963).

Knowledge of the fecundity of a species is an important factor in fish stock management. It is used to calculate the reproductive potential of a stock and the survival from egg to describe a fish which is spawning for the first time.

**2.Materials And Methds**

The fishes used for the study were collected during December 2007 to December 2008 from the Dal Lake. The traditional fishing gears were used(gill net and cast net).The randomly selected samples were shifted to laboratory for further biological measurement. Identification of species was made based on Day (1878); Kullander et al., (1999).The fishwere collected from the Lake, and after various body measurements the fishes were dissected and ovaries were collected cautiously and moisture was removed with the help of blotting papers. The length and weight of ovaries was noted down. The collected ovaries were then placed in 10% formaldehyde for at least 24 hours to bring hardness of

eggs, so as to make correct calculation of sticky eggs.This was followed by drying of eggs on blotting paper for 1 – 2 hours, three sub-samples of one gram each from anterior, middle and posterior parts of ovary were weighed on a sensitive mono-pan balance (Anamed-Modal No.Mx-730) and then eggs were counted carefully by gravimetric method.

**3.Result**

The length-weight relationship of this fish species was based on 150 specimens ranging in size from 38mm to 84mm and in weight from 1.42g to 10.712g. The regression equation computed from data for males, females and pooled or combined ones is presented as:

Male: Log w = -4.72+2.97 Log L (r =0.922)

Female: Log w = -4.60+2.93 Log L (r =0.936)

Combined: Log w = -4.63+2.94 Log L (r =0.935)

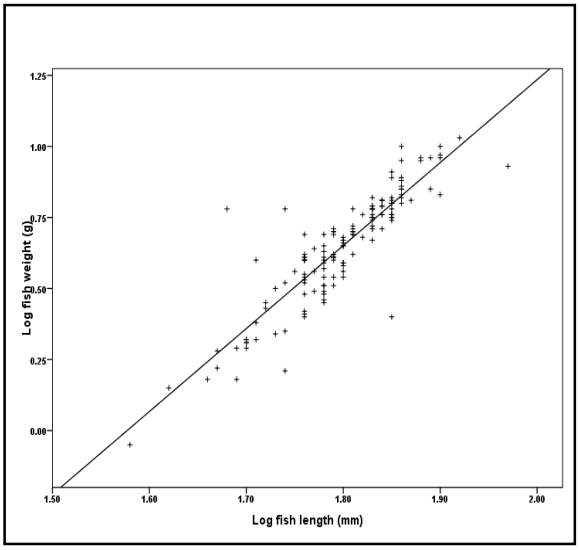


*Figure 1.1:Length-weight relationship of Puntius conchonius*

Mature specimens ranging in length from 45mm to 88mm and in weight from 2.60g to 10.71g were used. The ovary weight in the selected fish ranged from 0.22 to 2.41g. The absolute fecundity fluctuated from 154.07 to 7202.91 and the relative fecundity varied from 43.0 to 1268.0 with a mean value of 495.80

*3.1.Absolute fecundity and fish length and fish weight*

Absolute fecundity and fish length (Fig.4.73 and 4.74)) showed a significant linear relationship (r=0.509). The established relationship was expressed by the equation:

$F = 4600 + 1133$ $(r=0.509, p < 0.01)$

or

$\text{Log } F = -2.60+3.27 \text{ Log TL}$

A significant and linear relationship ($r=0.628$, $p<0.01$) existed between the fecundity and fish weight (Fig.4.74). It was represented by equation,

$F = 255 + 546 FW$ $(r=0.628\ p<0.01)$

or

$\text{Log } F = 2.29 + 1.43 \text{ Log FW}$

*3.2.Fecundity And Ovary Length*

Fecundity and ovary length recorded a low degree of relationship (Fig.4.75) and value of correlation coefficient (r=0.367) was also low. The equation representing the relationship was:

$F = -1509+204 OL$ $r = 0.367, p < 0.01)$

or

$\text{Log } F = 0.532 + 2.11\text{Log OL}$

*3.3.Fecundity And Ovary Weight*

The two parameters revealed a highly significant relationship (r=0.978), which is shown in scatter diagram (Fig.4.76). The relationship was expressed mathematically as,

$F = -829+3633OW$ $(r = 0.978, p<0.01)$

or

$\text{Log } F = 3.41 + 1.67 \text{ Log OW}$

*3.4.Ovary Weight And Fish Weight*

A significant linear relationship existed between the two parameters (r=0.669) as it is also evident from regression line (Fig.4.77). The established relationship was expressed by the equation:

$OW = 0.121 + 0.157 FW$ $( r = 0.669, p<0.01)$

or

$\text{Log OW} = -0.715 + 0.921 \text{ Log FW}$

*3.5.Ovary Length And Fish Weight*

A significant relationship existed between the two parameters (r=0.521). The fitted line in scatter diagram (Fig.4.78) also exhibited a linear relationship. The equation obtained was:

$$OL = 16.8 + 0.816\ FW \qquad (r = 0.521,\ p < 0.01)$$

or

$$\text{Log } OL = 1.18 + 0.197 \text{ Log } FW.$$

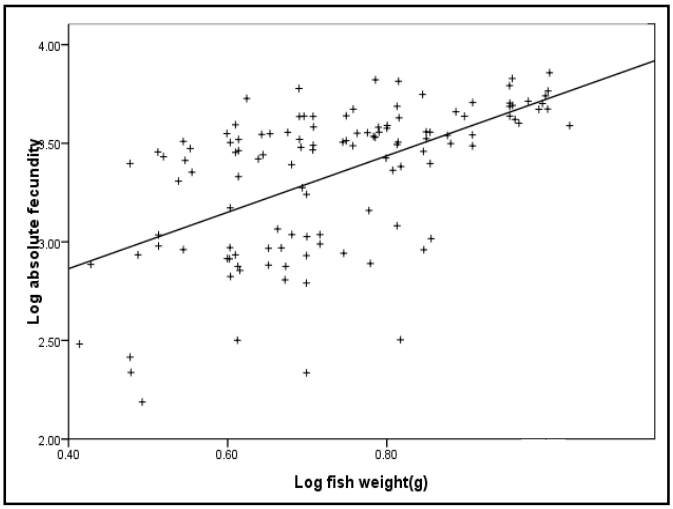


*Figure 1.2: Relationship between fish weight and fecundity in P. conchonius*

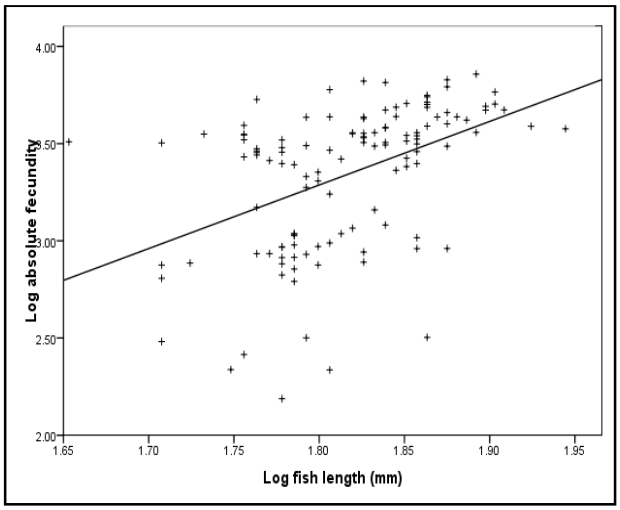


*Figure 1.3:Relationship between fish length and fecundity in P. conchonius*

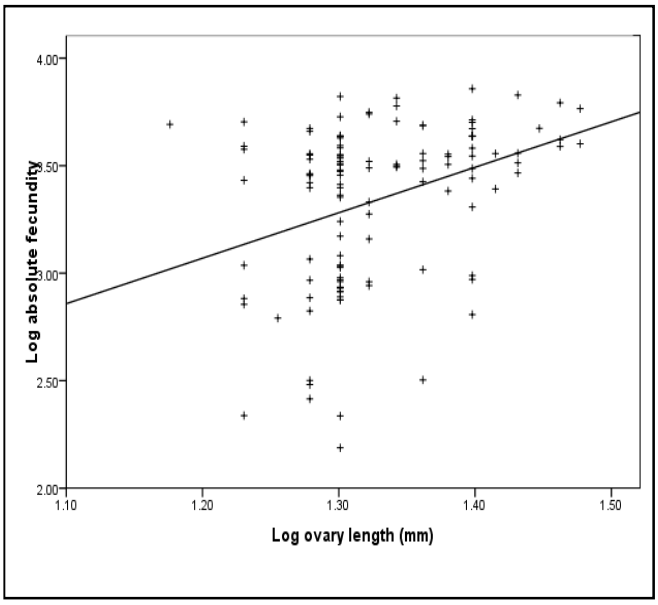


*Figure 1.4: Relationship between ovary length and fecundity in P. conchonius*

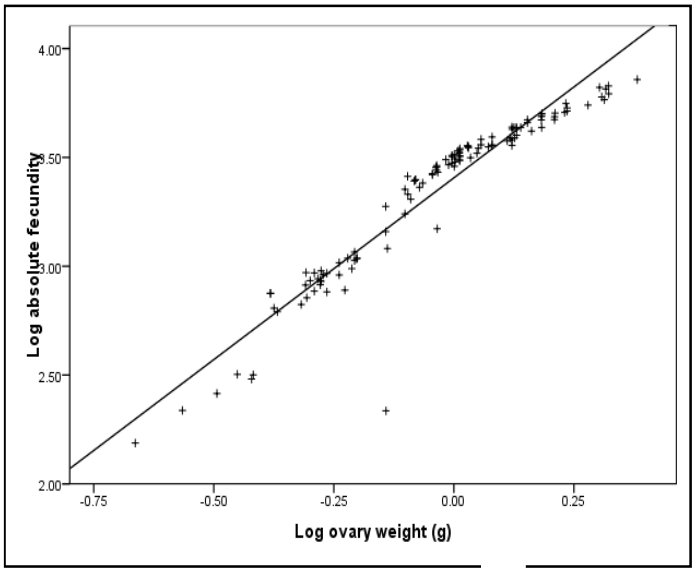


*Figure 1.5: Relationship between ovary weight and fecundity P. conch*

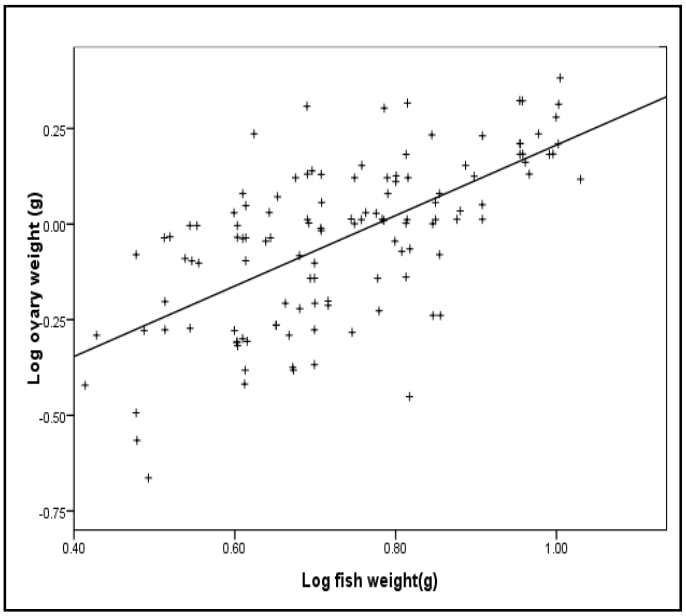


*Figure 1.6: Relationship between fish weight and ovary weight in P. conchonius*

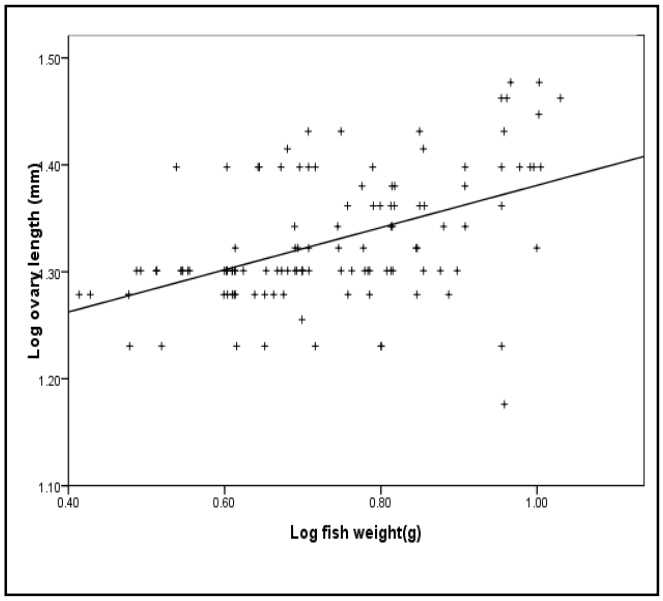


*Figure 1.7: Relationship between fish weight and ovary length in P. conchonius*

*3.6.Gonadosomatic Index*

This index was recorded only in few months when fish gonads were in mature conditions .The fish attained the maximum Go. S.I. in May (12.10). as shown in Table 1.1.

| Go. S. I | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Month** | **Jan.** | **Feb.** | **March** | **April** | **May** | **June** | **July** | **Aug.** | **Sept.** | **Oct.** | **Nov.** | **Dec.** |
| Male | * | * | 6.95 | 7.59 | 11.79 | 6.02 | * | * | * | * | * | * |
| Female | * | * | 6.98 | 11.17 | 12.41 | 5.12 | * | * | * | * | * | * |
| Comb. | * | * | 6.97 | 9.38 | 12.10 | 5.57 | * | * | * | * | * | * |

*Table.1.1: Monthly fluctuations in Go. S.I. of P. conchonius*

*Note *absent*

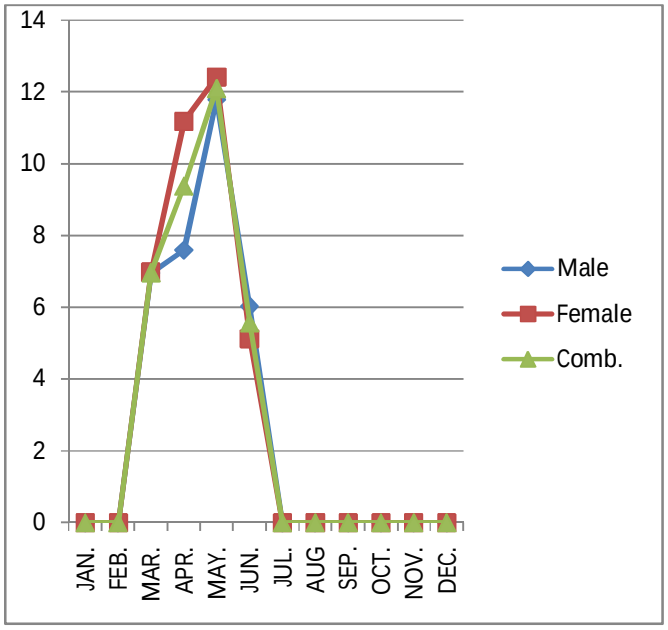


*Figure 1.8: Monthly fluctuations in Go. S.I. of P. conchonius*

**4.Discussion**

The study of length-weight relationship is of great importance in fishery science, as It is a powerful tool in understanding the general well- being and growth patterns in a fish population and it also throws light on theenvironmental conditions of the aquatic ecosystem in which the

fish is residing as Basheer et al. (1993) opined that length- weight relationship of fish varies depending upon the condition of life in aquatic environment.

Ideally, the regression coefficient 'b' of a fish should be very close to 3.0 (Allen, 1938), however the cube law does not hold good throughout the life period and the weight gain in a fish may not be always cube of its length gain . Hile (1936) and Martin (1949)

opined that the value of 'b' may range between 2.5 and 4.0. Antony Raja (1967) recorded the value of 'b' within a range of 2.0 to 5.4.LeCren (1951) pointed out that the variation in 'b' value is due to environmental factors, season, food availability, sex, life stage and other physiological factors.

The males and females revealed significant differences in the value of 'b' in this species. In P. conchonius males recorded higher exponential value, while opposite trend was observed in some other fishes. High 'b' values in case of males were also reported by Sunder et al. (1984), Yousuf et al. (2001). However Hatikaktoa and Biswas (2004) and Rao and Sreeramullu (2006) reported higher values of 'b' in females.

The present work revealed that studied fish does not followed the cube law completely. Similar departure from cube law has been observed by Subla and Sunder (1981), Sunder et al. (1984), Rao and Sreeramullu (2006) and Singh and Gupta (2008). The present data make it quite clear that the relationship was influenced by environmental conditions like food and physiological parameters Sandhya and Shameem, 2003).

Study on the fecundity forms an important part of fishery science as it has direct bearing on fish production and exploitation. Nikolskii (1965) stated that "fecundity is a specific feature that arises during the evolution of a new species adapted to a certain environment and is directed towards the continuance of the species". A lot of work has been done in this field in recent years (Pathani 1981; Singh and Srivastav 1982; Agarwal et al., 1988; Yousuf and Pandit 1992 Shatunovskii 2006; Bhuiyan et al., 2006.

The present investigation revealed a significant linear relationship between absolute fecundity and fish weight, fish length, ovary weight and ovary length. Linear relationships of fecundity with body measurements were also reported by Rao et al. (1979), and Desai (1973); Pathani, (1981); Jyoti et al. (1992) categorized the fishes of Jammu and Kashmir State in to three groups on the basis of gametogenesis. Both the varieties of C. carpio belong to gametogenic group III, S. niger belongs to group II, while C. diplochilus and P. conchonius belong to gametogenic group I (Malhotra, 1965; Jyoti, 1973 and Agarwal, 1988).

Different reproductive capacities have been shown by different fish in terms of fecundity. Molva produces as many as 28,361,000 eggs; Gadus 6,652,000, while in case of Stickle backs the number of eggs ranges from 30 to 100 per female per season(Norman and Greenwood 1963). Fecundity is also known to vary within species with latitude and location (Cushing 1968; Mann et.al., 1984) and also with spawning time (Ware, 1975).

According to Murua Saborido-Rey, (2003) different fish species reflect marked differences in their reproductive patterns. Different fishes exhibit different reproductive potential in terms of fecundity. During present investigations fecundity showed variations throughout the year. Fecundity ccccccccand relative fecundity of fishes are found to be influenced mainly by fish size, egg diameter and gonad index, Mekkawy and Hassan (2012**)**). He further added that fecundity varied with age, length and months in the same locality and it also exhibited fluctuations with time and habitat. Further, Fecundity of fishes was reported to vary depending on many factors, according to Murua et al. (2003) variation in reproductive characteristics of a species is influenced by variation in environmental conditions, such as temperature, food availability, habitat and predation intensity; with age, sex, size weight, gonad weight and locality (Mekkawy and Hassan,(2011).

The assessment of fecundity is one of the important components of the reproductive biology, since it is not a stable character due to changes in environmental conditions and species specific factors (Nikolskii 1963; Khallaf, and Authman, 1991. Mature specimens ranging in length from 45mm to 88mm and in weight from 2.60g to 10.71g were used. The ovary weight in the selected fish ranged from 0.22 to 2.41g. The absolute fecundity fluctuated from 154.07 to 7202.91 and the relative fecundity varied from 43.0 to 1268.0 with a mean value of 495.80

The present work revealed that smaller- length groups were less fecund than larger ones similar condition was reported by Bhuiyan et.al (2006) in case of Puntius gonionotus and Rheman et al. (2002) in grey mullet Liza parsia..

The present work revealed thatthe fish is Partial (heterochronal) spawners‘Partial spawners’are those in which spawning by individuals takes place over a long period of time and in which ripening eggs at very different stages of development can be found at any one time in the same ovary both before and during spawning. Being a batch spawner its spawning extend from Mid of May with peaks in June andJuly in the Dal lake. Multiple spawning or batch spawning is also observed by Mekkawy and Hassan (2012**)** in Mormyrus kannume in the Nile at Assiut and Shinkafi et al.(2011) in Auchenoglanis occidentalis in river Rima, Nigeria**.** According to Lambert and Ware (1984) batch spawning reproductive strategy may be associated with increase in probability of progeny survival.

Various relationships have been found to exist between length and fecundity of different fish species. The perusal of present data revealed a positive linear significant correlation

between absolute fecundity and various body parameters like total weight, total length, ovary weight, ovary length and between ovary weight and fish weight and ovary length ant fish weight. The findings of Sarker et.al. (2002) are in agreement with the present findings who also reported an increase in fecundity with the increase in size, weight and gonad weight in Mystus gulio. The present results also coincide with the work of Rheman et al. (2002); who reported linear significant relationship of various body parameters in Liza parsia**;** Saifullah et al.,(2004) in Hilsa ilisha; Lawson, (2011) in Periophthalmus papilio. Likewise, the similar results were noticed by Naeem et al. (2005) (a positive influence of body weight on absolute fecundity) in Catla catla and by Begum et.al., (2010); Rheman et al. (2002)

**5.Conclusion**

In conclusion, it can be said that Puntius conchonius is a moderately fecund fish showing fluctuations in fecundity and the variations in fecundity are closely associated with, fish length, weight and gonad weight and length. In order to save this fish species legally recommended fishing gears with suitable mesh size which suits the size of the fish should be utilized.

**6.Reference**


1. Day, F. (1878). The Fishes of India, being a Natural History of the Fishes known to inhabit the seas and fresh waters of India, Burma and Cylone. Reproduced in 1958,London;Willaim Dowen and sons,778 pp.
2. Kullander, S. O. Fang, F.; Delling, B. and Ehlander, E. (1999). The fishes of the Kashmir Valley,pp. 99-168 In: River Jehlum, Kashmir valley, impacts on the aquatic environment. (Linhart Nyman eds.).
3. Allen, K. R. (1938). Some observations on the biology of the trout (Salmo truta) in Windermere. J. Anim. Ecol. (7) : 333-349.
4. Hile, R. (1936). Age and growth of the Cisco, Amloplites rupestris (Refineseque) in Nebish Lake, Wisconsin. Trans. Wis. Acad. Sci. Arts. Lett. (33): 189-337
5. Antony, R. P. T. (1967). Length weight relationship in the oil sardine Sardinella longicep. Val. Indian. J. Fish14: 159-190.
6. LeCren, E. D. (1951). The length weight relationship and seasonal cycle in gonadal weight and condition in Perch Perca fluviatilis. J. Anim. Ecology, 20: 201-209.
7. Sunder, S.; Kumar, K. and Raina, H. S. (1984). Food and feeding habits and length weight relaitonship of Cyprinus carpiospecularis of Dal Lake, Kashmir. Indian. J. Fish. 31(1): 90 – 99.
8. Yousuf, A. R.; Firdous, G. and Peerzada, J. K. (2001). Ecology and feeding biology of commercially important Cyprinid fishes of Anchar Lake with a note on their conservation, In: A. K. Pandit eds.). Natural Resources of Western Himalaya.
9. Hatikakota, G. and Biswas, S. P. (2004). Length-weight relationship and condition factor of Oreochromis mossambicus, from a domestic pond, Nazira, Upper Assam,In:223-232pp. Fishery Management:Arvind Kumar eds.S. K.M.Univrsity,Dumka,A.P.H.Publication corporations-New-Delhi-110 002
10. Subla, B. A. and Sunder, S. (1981). Biology of mirror carp (Cyprinus carpo) in a stretch of river Jehlum with reference to certain hydrobiological parameters. (The first Scientic Report 1981, C. S. I. R. Project, S. P. Colege, Srinagar.)
11. Singh,N. and Gupta,P. K. (2008). Length-weight relationship and condition factor of Gambusia holbrooki (Giard) in Nainital lake (Uttrakhand), India. J. Inland Fish. Soc. India, 40(1): 82-85

12. Basheer, V. S.; Khan, A. A. and Sidiqqui, I. A. (1993). Length-weight relationship of Channa punctatus (Bloch) from the river Yamuna. Advances in Limnology. 241-246
13. Sandhya, V. and Shameem, U. (2003). Note on length-weight relationship and condition factor of Liza macrolepis (Smith) from polluted and unpolluted waters of Vishakapatanum. Indian J. Fish.50 (4): 543-546.
14. Nikolskii, G. V. (1963). The ecology of fishes. London and New York: Academic Press, 325pp.
15. Pathani, S. S. (1981). Fecundity of mahaseer Tor putitora. Proc. Indian. Acad. Sci. (Anim. Sci.). 90(2): 253 – 260.
16. Singh, V. and Shrivastava, P. (1982). Fecundity study of three Indian Major carps. Indian Journal. Zoology. 10 (1): 29 – 36.
17. Agarwal, N. K.; Singh, W. and Singh, H. R. (1988). Fecundity of snow trout, Schizothorax plagiostomus (Heckel) from Garhwal. HimalayanJournal of the Indian Fisheries Association. 18: 537-548.
18. Yousuf, A. R, and Pandit, S. K. (1989). Study of the ponderal Index in an endemic food fish of Kashmir (Heckel). Misra. J. Aqua. Trop. 4: 55-63.
19. Murua, H. and F. Saborido-Rey, 2003. Female reproductive strategies of marine fish species of the North Atlantic. J. Northwest Atlantic Fish. Sci., 33: 23-31.
20. Mekkawy, I.A.A. and A.A. Hassan, 2012. Reproductive Characteristics of the Elephant-snout Fish Mormyrus kannume Forsskal, 1775 from the Nile, Egypt. Journal of Biological Sciences, 12: 15-24.
21. Bhuiyan, A.S., K. Islam and T. Zaman, 2006. Fecundity and ovarian characteristics of Puntius gonionotus. J. Biol - Sci. 14: 99 - 102.
22. Shatunovskii, M. I. (2006). Some patterns of age and geographical variation in fish fecundity. Journal of Biology Bulletin. 33(2): 195-198
23. Mekkawy, I.A.A. and A.A. Hassan, 2011. Some reproductive parameters of Synodontis Schall (Bloch and Schneider, 1801) from the River Nile, Egypt. J. Fish. Aquat. Sci., 6: 456-471.
24. Cushing, D. H. (1968). A study in population dynamics. Fishery Biology: Madison, Milwaukee, and London. University of Wisconsin Press. 200.
25. Mann, R. H. K; Mills, C. A. and Crisp, D. T. (1984). Geographical variation in the life history tactics of some species of fresh water fish. In: pp. 17-186. Fish

reproduction strategies and tactics, (Potts, G. W.; Wooton, R. J., ed. London, Academic press).

26. Murua, H., G. Kraus, F. Saborido-Rey, P.R. Witthames, A. Thorsen and S. Junquera, 2003. Procedures to estimate fecundity of marine fish species in relation to their reproductive strategy. J. Northwest Atlantic Fish. Sci., 33: 33-54.
27. Khallaf, E. A. and M. Authman, 1991. Growth and mortality of Bagrus bayad (Forskal) in Bahr Shebeen Canal. J. Egypt. Ger. Soc. Zool., 4: 87-109.
28. Rheman, S., M.L. Islam, M.M.R. Shah, S. Mondal and M.J. Alam 2002. Observation on the Fecundity and gonadosomatic index(GSI) of grey mullet Liza parsia (Ham.). Online J. Biol. Sci., 2(10): 690-693.
29. Shinkafi, B.A., J.K. Ipinjolu and W.A. Hassan, 2011. Gonad Maturation Stages of Auchenoglanis occidentalis (Valenciennes 1840) in River Rima, North-Western Nigeria. Journal of Fisheries and Aquatic Science, 6: 236-246.
30. Lambert, T.C. and D.M. Ware, 1984. Reproductive strategies of demersal and pelagic spawning fish. Can. J. Fish. Aquat. Sci., 41: 1565-1569.
31. Begum, M., M.A. Islam, H.K. Pal and M.J. Aslam, 2010. Reproductive characteristics of <I>Liza parsia</I> (Ham.) inhabiting Southwest coast of Bangladesh.J.Bangladesh Agric. Univ., 8: 173-178.
32. Sarker, P.K., H.K. Pal, M.M. Rahman and M.M. Rahman, 2002. Observation on the Fecundity and Gonado-Somatic Index of Mystus gulio in Brackishwaters of Bangladesh. Journal of Biological Sciences, 2: 235-237
33. Saifullah, A.S.M., M. Sayedur Rahman and Y. Sharif Ahmed Khan 2004. Fecundity of Hilsa ilisha (Hamilton, 1822) from the Bay of Bengal. Pakistan journal of Biological Sciences 7 (8): 1394-1398
34. Norman and Greenwood (1963). A History of fishes. Lond. (Ernest Benn) 213-216.
35. Jyoti, M. K. (1973). Studies on the feeding and gonadal cycles of some fishes of Jammu and Kashmir State. Ph. D. Thesis. University of Jammu, 242.
36. Malhotra,Y. R. (1965). Seasonal variations in the morphology of the ovaries of Kashmir fish, Schizothorax niger (Heckel). Kash. Sci. 2: 27-39.