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Studies on the reproductive potential of *Schizopyge niger* (Heckel, 1838) from Kashmir

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Abstract
Fecundity of fish is one of the important components of fishery biology as it has direct bearing on fish production, stock recruitment and stock management. The present investigation was carried out to estimate the fecundity of one of the most important indigenous fish of Kashmir, *Schizopyge niger*, locally called as 'Ael Gad'. The results showed that absolute fecundity of the fish varied from 3559 to 15712 ova, while relative fecundity (per gram of body weight) ranged from 30.52 to 63.45 ova. The average absolute fecundity recorded was 7698.4 ova whereas the average relative fecundity was 43.85 ova per gram body weight. Fecundity was found to have a strong correlation with total weight (R^2=0.6375), total length (R^2=0.5379), ovary weight (R^2=0.5804), while low correlation was observed with ovary length (R^2=0.2880).

Keywords: *Schizopyge niger*, schizothoracids, fecundity, recruitment potential, snow trout, Kashmir

Introduction
Jammu and Kashmir is rich in aquatic resources ranging from ponds, pools, streams, wetlands, springs and rivers to the voluminous lakes in the plains and in the higher altitudes. The water bodies of Kashmir valley support a wide variety of indigenous and exotic fish species. The major ichthyofauna of Kashmir is represented largely by central Asiatic fauna in which *Schizothorax* group is predominant (Sunder *et al.*, 1979) [24]. Fishes belonging to family Cyprinidae, Cobitidae, Siluridae, Poeciliidae, Sisoridae and Salmonidae are found in the valley (Balkhi, 2007) [4]. Yousuf (1996) [26] documented 42 fish species from Kashmir waters while Balkhi (2007) [4] recorded only 40 species. However, not more than 22 species were documented by Kullander *et al.*, 1999 [13]. The Cyprinidae are mostly represented by the Schizothoracines (snow trout). A comprehensive survey to access the potential of Schizothoracines from various lakes and streams of Kashmir valley was made by Raina *et al.*, 1985 [20]. These are indigenous fish species and are commercially important with wide market demand. Most fish species present in Kashmir waters are exploited in one way or the other and are facing immense pressure due to pollution and human interferences (Balkhi, 2007) [4].
Schizothoracids (snow trouts) are indigenous fish species and inhabit both lentic as well as lotic water bodies of Kashmir. They are high valued fish preferred to other fish species. With the introduction of common carp which has invaded all the meandering rivers, floodplain lakes and wetlands, the Schizothoracids have been under tremendous pressure for survival. Among Schizothoracids, *Schizopyge niger* proves to be one of the most important food fish from the commercial point of view. *Schizopyge niger*, locally called as 'Ael Gad' is a prized fish of Kashmir. The fish belongs to family Cyprinidae and is a lacustrine fish occurring in lakes of Kashmir in good numbers including Dal Lake.
Fecundity of fish is one of the important components of fishery biology as it has direct bearing on fish production, stock recruitment and stock management. It is often referred to as total, absolute or individual fecundity and is generally defined as the number of ripening oocytes and mature ova or eggs just prior to spawning (Snyder, 1983) [23]. Apart from its biological significance and being a major reproductive capacity of the females, the fecundity data and its relation with other morphological characters like size, age and weight often provides a reliable index of density dependent factors affecting the size of population. In general, fecundity increases with increase in the size of female (Bagenal, 1978) [3]. This means that larger fish produce considerably more eggs than smaller fish. Fecundity data are used to estimate survival, determine the number of fish required for brood stock, characterize specific races, populations or stocks of fishes and plan proper hatchery and nursery operations (Bagenal, 1978; Habib, 1979; Lasker, 1985) [3, 9, 14].

Materials and Methods

For the present study, 20 female fish specimens ranging from 92.5 to 333.0 g in total weight and 132.93 to 288.73 mm in total length were collected randomly from commercial catches of Dal Lake Kashmir.

The gravimetric method was used for studying fecundity, which is based on the relation between ovary weight and the oocyte density in the ovary (Hunter and Goldberg, 1980; Murua and Saborido, 2003) [16]. Fecundity was estimated by counting the number of mature ova from a known weight of mature/ripe ovary. The ovary subsamples were obtained from the anterior, middle and posterior regions of both the ovaries (James *et al*., 1978) [11]. The subsamples were spread evenly on a counting slide with a few drops of water and the number of mature ova was counted and average number of three portions was used to determine the fecundity by the following formula:

$$\text{Absolute Fecundity} = \frac{\text{No. of Ova in Sub} - \text{sample x Total Ovary Weight}}{\text{Weight of Sub} - \text{sample}}$$

Relative fecundity i.e. number of eggs per gram of body weight (unit body weight) was obtained by dividing absolute fecundity with total weight of fish (in grams).

$$\text{Relative Fecundity} = \frac{\text{Absolute Fecundity}}{\text{Total Weight of Fish}}$$

The relation of Absolute fecundity (F) with total length of the fish (TL), total weight of the fish (TW), ovary weight (OW) and ovary length (OL) was established by formula given by Bagenal (1978) [3].

$F = a\ TL^b$ $F = a\ TW^b$ $F = a\ OL^b$ $F = a\ OW^b$

where, a & b are constants and TL, TW, OL, OW are total length of fish, total weight of fish, ovary length and ovary weight respectively.

Results

Fecundity

The estimates of absolute and relative fecundity as well as length and weight of individual fish and ovaries is presented in Table 1. Absolute fecundity was estimated at 3559 to 15712 ova, while relative fecundity (per gram of body weight) varied from 30.52 to 63.45 ova. The average absolute fecundity was recorded at 7698.4 whereas the average relative fecundity was recorded at 43.85 ova per gram body weight.

Relationship between fecundity and total length

A straight-line relationship was observed when fecundity was plotted against total fish length (Fig. 1) which could be shown with the help of the following regression equation:

Log F = 0.6078 + 1.3633Log L (R^2 = 0. 5570)

Relationship between fecundity and total weight

When fecundity was drawn against total fish weight a straight line (Fig. 1) relationship was observed for which the Regression equation could be shown as:

Log F = 1.8147 + 0.9184Log W (R^2 = 0.6451)

Relationship between fecundity and ovary weight

A straight-line relationship was observed when fecundity was plotted against ovary weight (Fig. 1) which could be shown with the help of the following regression equation:

Log F = 2.8410 + 0.6801Log OW (R^2 = 0.5782)

Relationship between fecundity and ovary length: When fecundity was plotted against ovary length, a straight-line relationship was observed (Fig. 1) which could be shown as:

Log F = 2.3269 + 0.7143Log OL (R^2 = 0.2863)

Table 1: Absolute and relative fecundity of *S. niger*

S. No.	Total length of fish (mm)	Total weight of fish (g)	Total weight of ovary (g)	Total length of ovary (mm)	Absolute fecundity	Relative fecundity (per gram body wt.)
1	270.31	234.5	47.5	188.55	9505	40.53
2	270.00	212.0	47.0	123.33	11545	54.45
3	278.30	147.0	44.5	188.30	8127	55.28
4	274.28	193.0	16.0	120.14	6023	31.20
5	260.18	147.0	34.5	109.82	6959	47.34
6	280.31	247.6	39.0	195.11	15712	63.45
7	267.73	154.0	33.5	105.79	7296	47.37
8	277.00	214.0	32.7	106.33	7503	35.00
9	279.00	184.0	27.3	124.70	7496	40.73
10	275.00	168.0	38.2	121.32	7620	45.35
11	288.73	333.0	72.5	177.00	11222	33.69
12	227.28	160.5	26.0	175.80	9282	57.83
13	132.93	109.5	19.0	91.90	3559	32.50
14	277.31	234.5	47.5	177.90	8505	36.26
15	179.94	165.5	17.0	91.80	5052	30.52
16	225.51	139.0	34.5	181.30	6763	48.65
17	229.62	124.0	21.5	170.30	5123	41.38
18	223.73	154.0	35.0	169.40	7095	46.07
19	202.00	92.5	21.5	111.90	4364	47.18
20	224.00	123.5	24.5	167.90	5217	42.24
				Average	7698.40	43.85

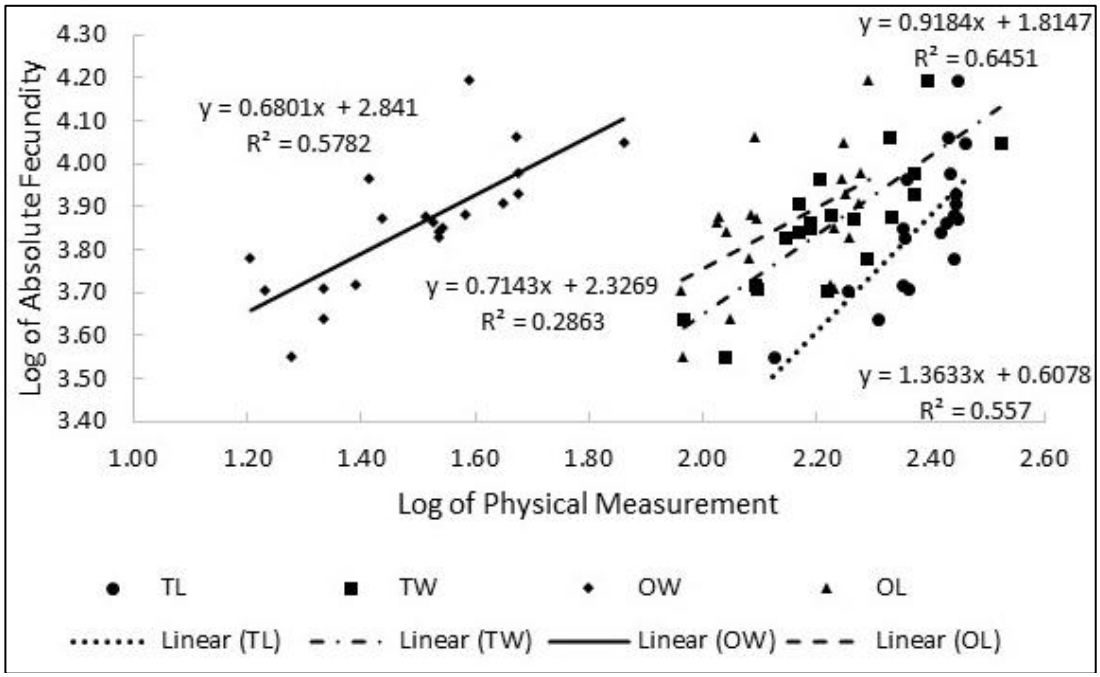

Fig 1: Logarithmic relationship between Absolute Fecundity and different physical measurements in *S. niger*

Discussion

Fecundity is the most usual measure of reproductive potential in fishes. In order to maintain the population of any species in an environment, it is required to reproduce to such an extent that would enable it to counteract all the physical and biological hazards such as predation, critical stages of its life history, food supply, fishing mortality, etc. (Qasim and Qayyum, 1963) [19]. Different relationships have been found to exist between fecundity and above parameters by various workers. As far as *Schizothorax* species are concerned various workers including Jyoti and Malhotra (1972) [12], Raina (1977) [21], Misra (1982) [17] and Qadri *et al*. (2015) [18] correlated fish weight with fecundity and found straight line relationship between the two. Over other factors, length has an advantage as a fish does not shrink significantly although it can lose weight during spawning season (Bagenal, 1967) [2]. Clark (1934) [5] suggested that the fecundity of a fish increased in proportion to the square of its length. A direct proportional increase in the fecundity with increase in the fish weight has been noted by Simpson (1951) [25] and Lehman (1953) [15]. Linear relationship between fecundity and total length was observed by Chonder (1977) [6]. Fishes inhabiting cold water streams and lakes have comparatively less fecundity. Das and Subla (1969) [7] recorded the fecundity of *Crossocheilus diplocheilus* from 6424 to 21432 in the length group of 95mm to 128mm. Absolute fecundity of brown trout ranged from 160-761 eggs per female (Garcia and Brana, 1988) [8]. Asifa (2018) [1] estimated the average fecundity of rainbow trout from Kashmir at 1746.9 eggs. A straight-line positive relationship was recorded between absolute fecundity and fish weight, fish length, gonad weight and gonad length. In the present study fecundity showed better relationship with fish length, fish weight and ovary weight, while weak relationship was observed with ovary length. Similar results have been obtained by Shah *et al*., 2018 [22] in oil sardine from the west coast of India.

References

1. Asifa WB, Shah TH, Bhat BA, Balkhi MH, Bhat FA, Asimi OA *et al*. Fecundity estimates of rainbow trout *Oncorhynchus mykiss* Walbaum (Salmoniformes: Salmonidae) from Kashmir. SKUAST Journal of Research 2018; 20(1):63-67.
2. Bagenal TB. A short review of fish fecundity. In: The biological basis of fresh water fish production (Ed. S. D. Gerking), Blackwell Scientific, Oxford, 1967, 89-111.
3. Bagenal TB. Aspects of fish fecundity. In: Ecology of freshwater fish production, Blackwell Scientific Publications (Ed. S. D. Gerking) Oxford. UK. 1978, 75-101.
4. Balkhi MH. Fish diversity in Jammu and Kashmir and conservation measures. In: Kashmir Speaks (Riyaz A. Patloo Ed), 2007; 6:104-115.
5. Clark FN. Maturity of California Sardine (*Sardinella caerulea*) determined by ova diameter measurements: Fish. Bull. California, 1934, 42-49
6. Chonder SL. Fecundity and its role in racial studies of *Gadusia chapra*. Proceedings of Indian Academy of Sciences 1977; 86:245-254
7. Das SM, Subla BA. The mechanism of feeding in nine Kashmir fishes with comparative account of the standard mechanism in a herbivore, an omnivore and a carnivore. Kashmir Science 1969; 4(1, 2):121-130
8. Garcia A, Brana F. Reproductive biology of brown trout (*Salmo trutta L)* in the Allen River (Austurias, Spain). Polish Archives of Hydrobiology 1988; 35(3):373
9. Habib G. Reproductive biology of the pifferfish, *Uranostoma richei* (Plectognathi: Lagocephalidae), from Lyttelton Harbour, New Zealand Journal of Marine Freshwater Research 1979; 13(1):71-78.
10. Hunter JR, Goldberg SR. Spawning incidence and batch fecundity in northern anchovy, *Engraulis mordax*. Fish. Bull, U.S. 1980; 77:641-652.
11. James PSBR, Chandrashekhar-Gupta TR, Shanbhogue SL. Some aspects of biology of the ribbon-fish, *Trichuirus lepturus* (Linneaus). Journal of the Marine Biological Association of India. 1978; 290:120-137.
12. Jyoti MK, Malhotra YR. Studies on the fecundity of Schizothorax *niger* (Heckel) from Dal lake Kashmir. Journal of Experimental Biology 1972; 10:74-75.
13. Kullander SO, Fang F, Delling B, Ahlander E. The Fishes of Kashmir Valley. In: *River Jhelum, Kashmir Valley.*

Impacts on the Aquatic Environment (Lenart Nyman Ed.) 1999, 163.
14. Lasker R. An egg production method for estimating spawning biomass of pelagic fish: Application to the Northern anchovy, *Engraulis mordax*. U. S Department Comm, NOAA Technology Research 1985; 36:55-58.
15. Lehman BA. Fecundity of Hudson river shad. Res. Rep. Fish. Bull. US 1953, 121
16. Murua H, Saborido-Rey F. Female reproductive strategies of marine fish species of the North Atlantic. J. Northwest Atlantic Fish. Sci. 2003; 33:23-31.
17. Misra M. Studies on fishery biology of *Schizothorax richardsonii* (Gray) An economically important food fish of Garhwal Himalaya. PhD. Thesis, Garhwal University, Srinagar Garhwal, 1982.
18. Qadri S, Shah TH, Balkhi MH, Bhat BA, Bhat FA, Najar AM, *et al*. Studies on the absolute and relative fecundity of snow trout, *Schizothorax curvifrons* Heckel, 1838 in River Jhelum Kashmir. SKUAST Journal of Research 2015; 17:54-57.
19. Qasim SZ, Qayyum A. Fecundity of some freshwater fishes. Proceedings of the National Institute of sciences of India 1963; 29:273-382.
20. Raina HS, Vass KK, Sunder S, Moza U, Langer RK. Prospects and problems of snow trout culture in Kashmir. Zoologica Orientalis 1985; 2(1, 2):24-30.
21. Raina HS. Observations on the fecundity and spawning behavior of *Schizothorax esocinus* (Heckel) from Dal lake Kashmir. Indian Journal of Fisheries 1977; 24(1-2):201-203.
22. Shah TH, Chakraborty SK, Kumar T, Sadawarte RK. Observations on the fecundity of *Sardinella longiceps* from Ratnagiri waters off west coast of India. Journal of Experimental Zoology, India, 2018; 21(1):237-240.
23. Snyder DE. Fish eggs and larvae. In: *Fisheries Techniques* (Eds. L.A. Nielsen and D.L. Johnson). American Fishery Society, Bethesda, USA, 1983, 165-197.
24. Sunder SA. Review on the biological studies of Schizothoracids in J &K state and elsewhere in India and their cultural possibilities. Recent Researchers in Coldwater Fisheries 1979, 152-171.
25. Simpson AC. The fecundity of plaice: Fish. Inves. London, 1951; 17:1-27.
26. Yousuf AR. Fishery resources of Kashmir. In: Ecology, Environment and Energy (Eds. A.H. Khan and A.K. Pandit. University of Kashmir, Srinagar, 1996, 75-120