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Seasonal variation in muscle glycogen and moisture content of *Garra mullya* and *Rasbora daniconius*

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Abstract
The indigenous fish species *Garra mullya* and *Rasbora daniconius* from Kanher dam was studied in relation to the seasonal variation in Muscle Glycogen content and Moisture. The variation observed was related to the season, habitat, sex and maturation cycle of the fish. The percentage of glycogen and moisture obtained in both male and female species are more or less identical.

Keywords: Kanher dam, Seasonal Variation, muscle glycogen and moisture.

1. Introduction
Fish is an important source of food for mankind all over the world from the times immemorial. The importance of fish as source of high quality, balanced and easily digestible protein, vitamins and polyunsaturated fatty acids is well understood now. Fishes have significant role in nutrition, income, employment and foreign exchange earning of the country. They are the most diverse group among all living vertebrates with more than 24,600 extant species currently known. They are identified by their morphological characters like appearance, shape, scales and fins etc.

Small indigenous fish species are valuable source of macro and micronutrients and play an important role to provide essential nutrients. Small indigenous fish like mola, punti, garra, amali have high nutritional value in terms of proteins and vitamins that are not commonly available in other foods. They were once abundant in rivers, streams, canals, beels, and ponds. They are usually caught by a large number of subsistence fishermen and provide a major source of biochemical constituents to poor households. The variation in the chemical composition of fish is closely related to feed intake, migratory swimming and sexual changes in connection with spawning. Fishes are most important source of animal protein and have been widely accepted as a good source of protein and other elements for the maintenance of healthy body [1, 21]. So it is essential to know the proximate composition of the fish to report their nutrient composition from the public health point of view.

Glycogen is a vital source of muscle energy of live animal and it is utilized during muscular action and stored up during rest. Glycogen in different tissues shows remarkable difference. Nutritive value of fish is recognized all over the world. It is therefore obvious that an understanding of chemical composition and nutritive value of fish which are used as food. Bruce [3] observed that the variation in the composition of herring was related to age and sexual maturation. Riegol AF [9] Observed seasonal variation in fat, moisture and protein content of Sardine were related to the quantity of plankton on which the fish feed. Investigations on chemical composition of fish from Indian water have been reported by many workers. Basu Ka, Chindurwar AB [4, 5] estimated the crude protein, water and fat in Labeo rohita and Clupea ilisa. Sreenivasa A [10] Studied the variations in the composition of skeletal muscle and gonads of fresh water Labeo fimbriatus. He reported that there were seasonal patterns in the variation of protein, glycogen, water and fat content of the muscle.

2. Material and Methods
The experimental material required for present study was collected from June 2012 to May 2013 from freshwater habitat Kanher dam. It is a medium irrigation project constructed by Irrigation Department, Government of Maharashtra on Venna river near Kanher of Satara district. It is situated on latitude 17°44" 16°02"N and longitude 73°53" 43°10" E. (Google Earth, 2009). The water from dam is used for drinking, domestic purpose and irrigation as

well as fishing practices (culture and capture fishery) are carried out under fishery development office Satara, (Kanher).
The freshly caught fishes were first acclimatized to the laboratory conditions. After sacrificing the fish scales, skin and bones were removed and only the flesh was used for analysis of glycogen. Glycogen was estimated by using Anthrone reagent method of [6] The percentage values of glycogen were calculated on the wet weight basis. The quantity of glycogen was calculated by using standard graph and multiplying by the glycogen factor 0.648. The moisture content was estimated by a hot air oven method. All obtained values were expressed in percentage.

3. Result and Discussion

Most of fish species are seasonal breeders and the breeding period is marked by complex physiological process in the body which results in remarkable biochemical changes in fish tissues. The proximate composition and seasonal variation of glycogen, moisture in body muscle of fresh water Rasbora and Garra were recorded in twelve months. Result indicated that proximate composition of fish depends season but also to a great extended in relation to sex and reproductive cycle.
Seasonal fluctuations in the glycogen content of muscle have been studied in both the sexes. In muscle the glycogen percentage showed fluctuating between 0.286% to 0.586% in female and 0.346% to 0.593% in male. (Table. 1, 2 and Fig.1, 2) It indicates that the glycogen percentage depleted in November and December month. Both sexes show more or less identical values. The observations are in concurrence with the earlier findings of [8, 12, 18, 17].
The major component of fish muscle is moisture. It was found that the moisture content in different months varied from 82.32 % to 70.22% of male and 82.65% to 70.45% Table (1, 2). It has been shown that the moisture content of female fish increased during summer and late autumn which was breeding season of fish. The average moisture content was higher in female fish (82.62%) than male (80.64%). The major component of fish was moisture that varied monthly both in male and female fish. (Table 1 & 2). Indicates that on an average value of moisture content was higher in female fish as compared to male fish both in spawning peak and off peak season.Corresponds to their onset spawning time and post breeding period in female. Such variation in composition might be due to age and size difference. This findings coincides with observation of [13, 19, 20, 22] in serval freshwater fish species.
Among the fish protein 85-95% digestible part contains all dietary essential amino acids. Chindurwar AB, FAO [5, 7] has reported that normally fish contains 72% water, 19% protein, 8% fat, 0.5% calcium and 0.1% vitamin A, D, B, and C etc. Love RM, Stansby ME [14, 15] observed that fishes contain 76.8% water, 19% protein, 5% fat, and 1.2% ash. Borgstrom G [2] observed that chemical contents in fish depend upon some factors as size, age, sex, seasonal change, migratory behavior, breeding cycles and habitat. Lovern JA [13] Estimation from the flesh of hernings and valves were 73.5% moisture, 19.2% protein 2.9% fat respectively. Stansby ME [15] observed that fishes contained 76.8% moisture, 19% protein, 5% fat. The variation in proximal composition of fish flesh may vary with species variation, size, age, sex, seasonal changes and feeding habits of fish [15, 16].

4. Conclusion

1. Results clearly indicated a marked monthly fluctuation in glycogen and moisture content both in male & female fish species.
2. The variation in the glycogen and moisture is also linked to their habitat and nutritive values.
3. Knowledge of Biochemical composition of fish assists in elucidating its environmental physiological and nutritive status. This data can be helpful for better management of inland fisheries and prevention of fish capture in breeding season to conserve the diversity of fish.
4. The knowledge of biochemical composition of fish muscles is of great help in evaluating not only its nutritive values but also helps in quality assessment and optimum utilization of these natural resources.

5. Acknowledgement

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Table 1: Monthly Variation in the % of Glycogen and Moisture of *Garra mullya*

Month	Male		Female	
	Glycogen	Moisture	Glycogen	Moisture
June,12	0.693 ± 0.0464	74.34	0.532 ± 0.0482	74.72
July,12	0.573 ± 0.0332	70.22	0.586 ± 0.0362	76.60
August,12	0.487 ± 0.0630	70.28	0.413 ± 0.0624	78.72
September,12	0.742 ± 0.060	72.32	0.408 ± 0.0512	80.82
October,12	0.482 ± 0.0510	71.06	0.366 ±0.0112	80.35
November,12	0.356 ± 0.0312	70.22	0.286 ± 0.0132	82.62
December,12	0.363 ± 0.0394	74.63	0.321 ± 0.0324	70.64
January,13	0.375 ± 0.0474	72.48	0.382 ± 0.0487	74.30
February,13	0.457±0.0259	70.32	0.434 ± 0.0256	73.48
March,13	0.341 ± 0.0555	78.54	0.451 ± 0.0552	77.55
April,13	0.662 ± 0.0473	80.32	0.468 ± 0.0332	75.84
May,13	0.751 ± 0.0342	80.64	0.522 ± 0.0672	72.45

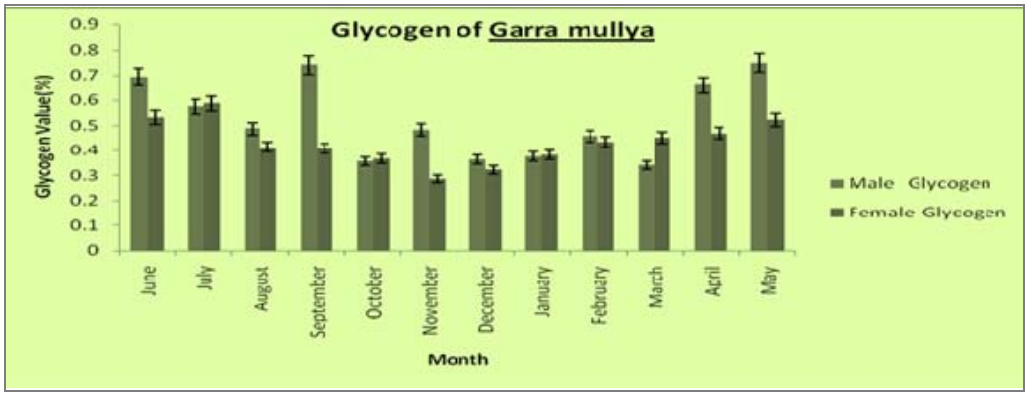

Fig 1: Variation in muscle glycogen content (%) of *Garra mullya*

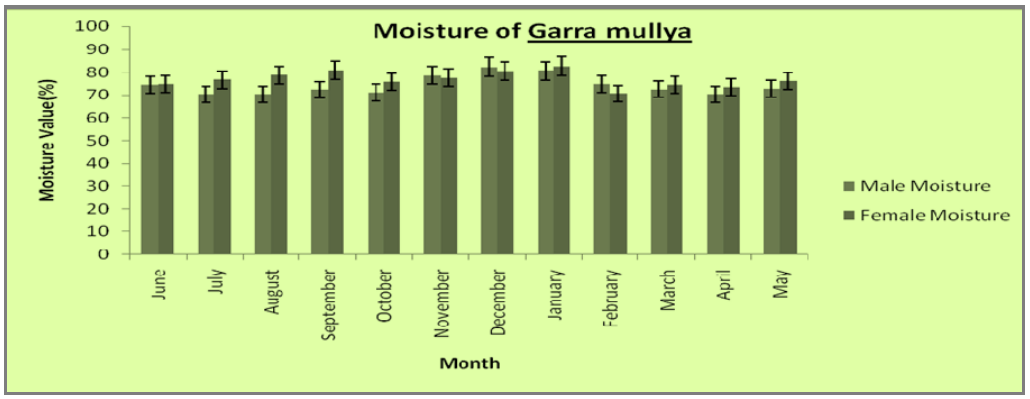

Fig 2: Variation in muscle moisture content (%) of *Garra mullya*

Table 2: Monthly Variation in the % of Glycogen and Moisture of *Rasbora daniconius*:

Month	Male		Female	
	Glycogen	Moisture	Glycogen	Moisture
June,12	0.825 ± 0.050	68.66	0.633 ± 0.032	70.48
July,12	0.512 ± 0.054	70.76	0.548 ± 0.048	71.36
August,12	0.667 ± 0.0466	72.34	0.593 ± 0.032	77.42
September,12	0.992 ± 0.0547	73.06	0.695 ± 0.042	80.32
October,12	0.762 ± 2.325	74.22	0.932 ± 0.039	81.06
November,12	0.641± 0.0256	74.18	0.965 ± 0.068	76.04
December,12	0.802 ± 0.0466	65.38	0.632 ± 0.082	72.32
January,13	0.405 ± 0.0273	65.00	0.725 ± 0.077	70.23
February,13	0.461 ± 0.0332	62.49	0.652 ± 0.038	66.45
March,13	0.528 ± 0.0256	77.63	0.548 ± 0.056	72.28
April,13	0.482 ± 0.0663	79.82	0.532 ± 0.034	72.00
May,13	0.872 ± 0.0526	80.48	0.468 ± 0.012	73.46

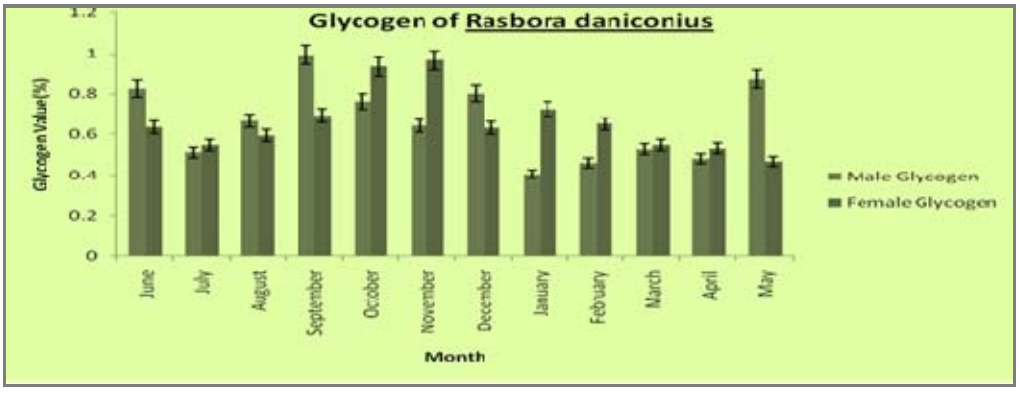

Fig 3: Variation in muscle glycogen content (%) of *Rasbora daniconius*

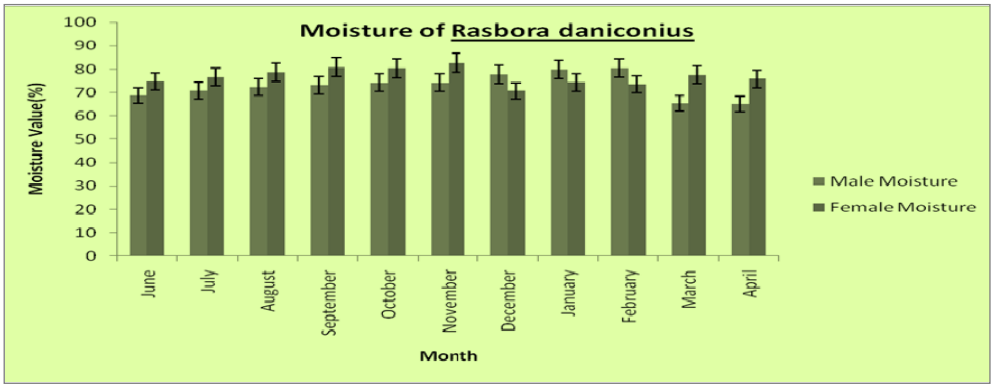

Fig 4: Variation in muscle moisture content (%) of *Rasbora daniconius*

6. Reference

1. Andrew AE. Fish Processing Technology. University of IIorin press Nigeria 2001, 7-8.
2. Borgstrom G. Fish as Food. Academic Press, New York, London, Tornoto, Sydney and San Francisco 1961, 1.
3. Bruce. Changes in chemical composition of tissues of herring in relation to age and maturity. Biochemical J 1924; 18:469-485.
4. Basu KP, De HN. Nutritional investigation of some species of Bengal fish. Indian J Med Res 1938; 226:117-196.
5. Chindurwar AB. Biology of Cyprinid fish Chela phulo Ph D. thesis Marathawada University Aurangabad (M.S.) 1980.
6. De-Zwaan A, Zandee DI. Glycogen estimation with Anthrone reagent Comp. Bio-chem Physiol 1972; 43B:53-55.
7. FAO. Fish for Food and Development, 1991, 1-49.
8. Millory TH. Changes in the Herring during the reproductive period. Biochem J 1908; 3:366-390.
9. Riegol AF. Seasonal Variation in the nutritive value of the Sardine. Chem Abstr 1948; 43, 31-51.
10. Sreenivasa A, Sounderraj RK, Lakshmiragahavan S. Variation in the composition of the skeletal muscle and gonads of fresh water fish, proc. Indian. Sci congr 1964; (3):453.
11. Somwanshi VS. Biology of *Garra mullya* from Marathwada region. Ph. D thesis, Marathwada University, Aurangabad India, 1983.
12. Sonawane SR, Sinha S, Khobragade BS, Deshmukh DR. Seasonal Variation in Muscle glycogen content in common carp, Cyprinus carpio. J Aqua Biol 2001; 16(1):68-70.
13. Lovern JA, Wood TH. Variation in the biochemical composition of Herring. J Marine Biol Assoc 1937; 22:281-285.
14. Love RM. The chemical Biology of Fishes. Academic Press, London, 1970.
15. Stansby ME. Composition of certain species of freshwater fish. Food Res 1954; 16:231-234.
16. Jacquot R. Organic constitutent. Of fish and other Aquatic Animals. Fish as Food (Ed. Borgstrom, (G), Academic press, New york and London, 1961; 145-209.
17. Jafri AK, Khawaja DK. Seasonal changes in the biochemical composition of the freshwater murrel Ophiocephalus punctatus (Bloch.). Hydrobiologia 1968; 32:206-213.
18. Somvanshi VS. Seasonal changes in the biochemical composition of a hillstream fish *Garra mullya* (syker). Indian J Fish 1983; 30:55-60
19. Marais JFK, Erasmus T. Body composition of Mugil cephalus, Liza dumerite, L. richardsoni and L. tricuspidus (Teleostei Mugilidue) Caught in the Swartkops Estuary. Aqua 1977; 10:75-86.
20. Nabi RM, Hossain MA. Seasonal variation in the chemical composition and Caloric content of macrognathus aculeatus (Bloch) from the chalan Beel water. J Asiatic Soc Bangladesh (Sc.) 1989; 15(2):103-110.
21. Pawar SM, Sonawane SR. Fish Muscle Protein Highest Source of Energy in International journal of Biodiversity conservation 2013; 5(7):433-435.
22. Salam MAN, Alam M, Nasiruddin RN, Howlader MZH. Biochemical composition of body muscles and its caloric contents of tawes (Puntius gonionotus, bleeker). Bangladesh J Sci Res 1995; 13(2):205-211.