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STUDIES ON SEASONAL VARIATION IN PROXIMATE COMPOSITION IN A TELEOSTEAN FISH, *CHANNA MARULIUS* (HAM.)

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ABSTRACT

Studies on seasonal variations in proximate composition have been made in a teleostean air breathing fish, Channa marulius(Ham.) in relation to ambient water temperature. Minimum values of percent water, protein, lipid, carbohydrate content and calorific values (K.cal/g) were recorded in the months of November, March, August, June and February respectively while maximum values of above noted parameters were recorded respectively in the months of July/August, June, December, May and June. The statistical relationships between ambient water temperature Vs. proximate composition fractions were established by two separate regression lines one between 18.5 to 29.0^{0}C and another between 29.0^{0}C to 33.4^{0}C. The details have been discussed in this paper.

Key words : *Proximate composition, Ambient water temperature, Calorific values, Channa marulius (Ham.)*

INTRODUCTION

A knowledge of the chemical composition of the fish body is of paramount importance for evaluating its nutritive values. Studies on proximate composition (water lipid, protein, carbohydrate and ash content) of fish tissues are also of considerable interest for evluating their physiological needs during different periods and stages of life. A perusal of literature indicates that our information regarding the changes in biochemical constituents and energy content in relation to season in Indian murrel is scanty (Singh et al., 2009; Sinha and Singh, 2017) as such the present work has been taken into account in a fresh water murrel fish, *Channa marulius* (Ham.)

MATERIALS AND METHODS

Live specimens of *Channa marulius* (Ham.) were procured through local fish dealers at Gaya for a period of twelve months. They were transported to the laboratory in big glass container and were kept in big cemented tank fitted with aerator for proper acclimatization in the laboratory for about a week. The unhealthy/diseased/infected fishes were discarded and the healthy fishes were washed in 0.5% $KMNO_4$ solution for about 30 minutes to get rid of ectoparasites, if any. In the laboratory they were fed daily (*ad libitum*) with fish meal (purchased from local market).

The details of the methods employed in the determination of biochemical constituents and calorific values were those as followed by Alok and Mistry (2013), Prasad and Kumar (2013) and Sinha and Singh (2014).

RESULTS

The data showing ambient water temperature, day length, GSI (ovary weight), percent water, protein, lipid, carbohydrate, ash content and calorific values (K. Cal/g) in twelve months in *Channa marulius* (Ham.) are presented in Table 1 and their statistical relationship with ambient water temperature in this fish are presented in Table 2. The statistical relationships between ambient water temperature Vs. various proximate composition fractions were established by two separate regression lines one between 18.5 to 29.0°C and another between 29.0°C to 33.4°C.

DISCUSSION

Cycle of active feeding with storage of fat and protein and long period of starvation are characteristics of many species of fishes (Tomlison et al. 1967).

Water as a body component of fish, plays a major part in the changes taking place during procession and storage. Water participates in the biochemicals reaction and the diffusion process of the fish body. The water content of the fish body varies within limited range in different species of fishes. In *Hilsa ilisha* (63.7%) it is very low while in *Cyprinus carpio* (88.8%) and *Tinca tinca* (90.2%) it is comparatively higher (vide The Wealth of India. 1962). In hatchery trout the water content various between 75-80%. (Phillips, 1964, 1965, 1966). The amount of water in fish body is higher than that in birds or mammals (Maynard and Loosli, 1962). Water is very important for the life of fishes. Maynard and Loosli (1962) reported that an animal may lose practically all of its fat and half of its protein and live, but a loss of only 10% of its water causes death. Water is inversely proportional to lipid content (Jafri and Khwaja, 1970) and therefore any change in lipid content of body will ultimately reflect the body moisture. Since, the fattening of the body is cyclical, hence the body moistures also undergo cyclical changes. Sen and Chaluvaiah (1968) have reported higher moisture content in June-July in *Sardinella longiceps.* In the present investigation in *Channa marulius* (Ham.) also, a higher water content has been found in July/August.

The wide disparity in the fatness of the fishes in different months of the year is a matter of great economic and industrial importance. The lipid content in different species varies within wide limits. *Rhinoptera sewelli* (0.50%), *Sillago sihama* (0.60%) and *Cirrhina mrigala* (0.80%) are supposed to have minimum lipid content while *Hilsa ilisha* (19.4%) *Silonia silondia* (12.1%) and *Pangasius pangasius* (10.8%) have maximum lipid content (The Wealth of India, 1962). Annual cycle of fattening with incrased fat appreciable quantity of fat in India oil sardine in September which suddenly shoot up in October and continued to maintain the rise in November also, only to decrease as rapidly as it rose up during the subsequent months ending in minimum production in June. Almost similar investigation has been made by Sen and Chaluvaiah (1968) in Indian oil sardine (*S. longiceps*). They reported maximum fat content (11.0-15.7%) during September to December and minimum (2.7-4.4%) during June-July. Banerjee and Bagchi (1969) have reported comparatively lower fat content during breeding season (June-July) in *Labeo rohita* (Ham.). In the present investigation in *C. marulius* minimum fat was observed in July/August (i.e. Summer) and maximum in the month of November-January (i.e. winter) and thus the finding in this species (*C. marulius*) is almost similar to that reported by Sen and Chaluviah (1968) in *s. longiceps* and Banerjee and Bagchi (1969) in*Labeo rohita*.

Hornell and Nayudu (1924) correlated the maximum fat deposit during October to December with the specific food intake by *Sardinella* especially the dinoflagellates and infusorians. In the present investigation the lipid or fat cycle could not be related with the food intake. Phillips et al. (1951) have reported that fat is deposited at the expense of water and have further observed that in trout certain high levels of body fat usually have lower levels of body water. In *C. marulius* similar relationship has been observed. The maximum fat in winter (December) and minimum in summer (August) are very well inversely related to water content in these months (Table 1).

Fattening in most of the fishes occurs during gonadal regression and after sexual activities have been curtailed and thus fattening seems to be closely associted with gonadal cycle. Banerjee and Bagchi (1969) have reported in *L. rohita* that during breeding season (June-July) fat was comparatively less. In *C.*

marulius the fat content was minimum in breeding season (June-July). This may probably be as a result of high metabolic and physical activity of the animal during this period. In post spawning period (October-December) when the gonads were regression the fat content gradually increased till preparatory period (January-March). Slight increase in lipid content in March-April (Table 1) may be due to active feeding because in these months air as well as water temperatures increase and make the animal metabolically active at high temperatures. Some relationship between fat content and temperature has also been reported. Hoar and Cottle (1952) reported that gold fish with a hard body fat are less tolerant to temperature changes than those with soft body. Lovern (1938) found that the body fat of eel is less saturated at higher water temperature than at lower. In spawning or breeding period the lipid content further decreases steadily. Hahn (1967) and Walker and Wilhoft (1970) have explained the decline in fat body size during reproduction in *C. batrachus* during breeding period can be explained on similar basis (Hahn, 1967; Walker and Withoft, 1970). However it becomes clear that the fat content have some correlation with breeding cycle in this fish (*C. marulius*) which is in agreement with the findigns of Banerjee and Bagchi (1969) in *L. rohita.* The protein fraction did not show any specific trend with gonadal or sexual cycle, a view consistent with the finding of Alok and Mistry (2013). The values obtained for energy content (K.cal/g) in this fish were similar to that obtained by Alok and Mistry (2013).

Table-1 : Seasonal variations in biochemical composition in *Channa marulius* (Ham.)
N=10 in each month : Body Wt. 65±5.0g

S.No.	Months	Water temp. ^{0}C	Day Length (h)	GSI	Water content %	Protein %	Lipia %	Carbohydrate %	Ash %	Calorific values (K.cal.g)
1	January	18.5	10.31	1.157	73.43	20.12	3.17	2.08	1.20	5.685
2	February	23.5	10.38	1.722	73.69	19.09	3.24	2.10	1.88	5.322
3	March	26.2	11.18	1.911	73.92	18.96	3.18	2.11	1.93	5.496
4	April	30.3	12.34	2.450	74.51	19.89	3.1	2.13	0.46	5.773
5	May	31.5	13.00	6.473	74.86	19.99	2.58	2.16	0.41	5.891
6	June	33.4	13.35	12.907	74.07	20.14	2.97	1.82	1.00	6.215
7	July	29.0	13.12	10.140	75.42	19.67	1.25	1.98	1.48	5.467
8	August	29.5	12.44	8.811	75.08	19.65	1.23	1.91	2.23	5.331
9	September	29.2	12.20	4.184	72.88	19.54	3.21	1.92	2.45	5.338
10	October	28.1	11.28	2.758	72.82	19.36	2.71	1.98	3.13	5.490
11	November	24.0	10.36	1.747	73.21	19.83	2.21	2.05	2.70	5.669
12	December	19.4	10.25	1.669	73.97	19.83	3.38	2.06	0.84	5.501

Table-2 : Equations showing the relationship between seasonal variations in ambient water temperature Vs. seasonal changes in various biochemical constituents in *Channa marulius* (Ham.)

S.No.	Parameters Water Temp. ^{0}C Vs	Equation Y = a + bx Range 18.5-29.0^{0}C	Correlation Coefficient 'r'	Equation Y = a + bx Range 29.0-33.4^{0}C	Correlation Coefficient 'r'
1	Protein	Y = 21.52 - 0.084.X	-0.638	Y = 16.47+0.111.X	0.946
2	Moisture	Y = 71.86+0.079.X	0.960	Y = 67.71+0.223.X	0.965
3	Lipid	Y = 5.765-0.123.X	-0.875	Y = 5.116-0.106.X	-0.975
4	Ash	Y = 1.332+0.134.X	0.774	Y = 7.770 - 0.217.X	-0.680
5	Cabohydrate	Y = 2.28-0.009.X	-0.620	Y = 2.906-0.029.X	-0.652

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