



## STUDIES ON THE SEASONAL VARIATIONS IN PROXIMATE COMPOSITION OF LABEO BOGA

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### Abstract:

Studies were conducted on seasonal variations in the proximate composition of *Labeo boga* ranging from  $15 \pm 1.5$  cm L and  $110 \pm 15$  g W, collected from River Tawi. During pre monsoon period i.e from Mar-May, the protein, lipid and ash contents were observed to be maximum i.e  $17.54 \pm 0.31$  for protein;  $3.26 \pm 0.43$  for lipid and  $1.23 \pm 0.02$  for ash; whereas during monsoon period (June-Aug), these energy reserves shows significant ( $p < 0.05$ ) decline as compared to pre monsoon season, with protein, lipid and ash content observed to be  $16.46 \pm 0.64$ ,  $1.95 \pm 0.46$  and  $1.03 \pm 0.01$  respectively. Further, the values of these energy reserves showed an increasing trend during the post monsoon season i.e from Sep-Nov; and thus protein, lipid and ash contents observed to be  $17.21 \pm 0.17$ ,  $2.96 \pm 0.06$  and  $1.17 \pm 0.03$  respectively. However, moisture content was observed to be higher in winter season ( $83.11 \pm 0.6$ ) and least during pre monsoon season ( $77.22 \pm 1.98$ ) owing to the higher temperature during pre monsoon season i.e from March-May, and hence more water loss from the fish body. The data thus revealed that nutritional quality of fish varies according to the season and thus results are of immense importance for human dietary.

**Key Words:** Season, Protein, Muscle, Lipid, Proximate, Summer & Monsoon

### Introduction:

Fish plays a very prominent role in human nutrition and health. Fish provides a good source of readily digested high quality animal protein, fat, minerals and vitamins especially Vit. A, D, E. Principal composition of fish is 16-21% protein, 0.2-2.5% fat, 1.2-1.5% carbohydrate and 66-81% water (Love, 1970). Fish is one of the main food constituents in our diet as it includes essential fatty acids, amino acids and some of principal vitamins and minerals in sufficient amounts for healthy living (Borgstrom, 1961). People now are increasingly become aware of quality of food and it's implication on their health. In many regions of the world, the food security is provided by fish, thus providing healthy and valuable supplement for diversified and nutritious diets. The proximate composition of fish is used as an indicator of quality of fish. Proximate composition involves the estimation of protein, lipid, moisture and ash contents of fresh fish body. Body composition can give idea about the nutritional importance of fish.

The biochemical composition in fishes vary widely from specie to specie, from fish to fish and even among different body parts. At any given time, the biochemical composition of an individual fish is the result of complex interactions between physical and biological characteristics like size, temperature, food availability, reproductive/spawning period etc (Basade *et al* 2000). Protein occur in the body in the form of amino acids and other metabolites, which serve as a building block of body. Hence, protein content can be used as an important tool to evaluate physiological standards (Pilla *et al* 2014). Lipids are the best energy producers next to carbohydrates (Chezian *et al* 2010). Protein, fat and water content of fish is important to consumers, scientists and manufacturers from many aspects including nutritional values, seasonal variations and considerations regarding processing (Murray and Burt, 2001). The seasonal changes occur in the biochemical contents of fresh water fishes indicates that biochemical constituents in any organism vary with the variation of environmental changes (Ganeshwade *et al* 2016). Number of workers have studied the depletive effects of maturation and spawning in the chemical composition of fish (Pandey *et al.* 1976; Kiran and Puttaiah, 2005). Also, seasonal variation in the biochemical composition of fresh water fish has been studied by Venkatesan *et al* 2013, Jan *et al* 2012 and many others. Proximate composition of fish is directly affected by reproductive activity and this must be considered when assessing the biochemical indices of growth (Ashwini *et al.* 2016). In general, the proximate composition of fish are subject to marked seasonal changes. Knowledge of proximate composition of fish is of paramount importance to evaluate it in regard to nutritive value and physiological condition (Love, 1970; Brown and Murphy, 1991).

### Material and Methods:

During the present course of investigation, the live samples of *Labeo boga* were collected from the River Tawi. The average length and weight of fish were in the range of  $15 \pm 1.5$  cm L and  $110 \pm 15$  g W respectively. Muscle samples were collected and then subjected to biochemical analysis by using the following methods, each parameter was estimated in triplicate and mean value was calculated for protein, lipid, ash and moisture.

**Proximate Composition Analysis:**

- **Protein:** The protein content was determined by Lowry’s method (1951). The amount of protein /g was calculated by obtaining standard curve prepared in Bovine Serum Albumin (BSA) protein (0-100mg) and finally calculating in percent basis.
- **Lipid:** The lipid content was determined by Folch’s method. 5g of muscle was taken and then left in the dark overnight to extract lipid in 50 ml of chloroform /methanol (2:1). After about 18 hrs the mixture was filtered using Whatman paper 1. The filtrate was then given washing with 0.9% saline solution to remove the non-lipid contaminants and allowed to separate, using separating funnel. The lower phase was then taken and dried, and then weight was taken.

$$\text{Lipid} = \frac{\text{Weight of residue (mg)}}{\text{Weight of sample taken (mg)}} \times 100$$

- **Moisture:** Moisture content was estimated by the method of AOAC (1995). The moisture content was determined by drying 5g of sample in oven for 18hrs at 105±1°C. Then sample was cooled and again weighed to take dry weight of sample.

Calculations-

$$\text{Moisture} = \frac{\text{Weight Loss (mg)}}{\text{Original weight of sample taken (mg)}} \times 100$$

- **Ash:** The ash content was determined by the method of AOAC (1995). 2g of muscle was taken in crucible and then burnt out by placing the sample in hot plate. The crucibles were kept in muffle furnace raising the temperature to 600°C. Sample then ignited for 4 hrs at 600°C and then transferred to dessicator for cooling and then was weighed

$$\text{Ash} = \frac{\text{Weight of residue (mg)}}{\text{Weight of sample taken (mg)}} \times 100$$

- **Statistical Analysis:** The results so obtained were then statistically analysed using t-test. Level of significance was set to alpha level of 0.05.

**Results and Discussion:**

The results of present findings are given in Table 1-2 and Fig. 1-2 which clearly reveal the seasonal variation of proximate composition in *Labeo boga*.

| Months | Protein%   | Lipid%     | Moisture%  | Ash%      |
|--------|------------|------------|------------|-----------|
| Sep    | 17.32±0.02 | 2.89±0.02  | 80.25±0.02 | 1.14±0.01 |
| Oct    | 17.29±0.01 | 3.01±0.01  | 81.82±0.01 | 1.20±0.02 |
| Nov    | 17.01±0.01 | 2.98±0.012 | 82.14±0.03 | 1.18±0.02 |
| Dec    | 16.92±0.02 | 2.21±0.02  | 82.40±0.03 | 1.00±0.04 |
| Jan    | 15.98±0.03 | 2.35±0.01  | 83.82±0.04 | 1.09±0.02 |
| Feb    | 16.33±0.02 | 2.45±0.04  | 83.12±0.01 | 1.11±0.01 |
| Mar    | 17.21±0.01 | 2.84±0.02  | 79.52±0.02 | 1.22±0.03 |
| Apr    | 17.45±0.02 | 3.25±0.03  | 76.14±0.04 | 1.25±0.03 |
| May    | 17.84±0.03 | 3.70±0.01  | 76.02±0.03 | 1.24±0.03 |
| Jun    | 17.18±0.03 | 2.45±0.01  | 77.84±0.01 | 1.04±0.01 |
| Jul    | 15.94±0.02 | 1.52±0.01  | 78.62±0.02 | 1.02±0.02 |
| Aug    | 16.28±0.01 | 1.88±0.02  | 79.41±0.01 | 1.04±0.01 |

Table 1: showing the monthly percental variation (Mean±S.D) in proximate composition of *Labeo boga*

| Season                          | Protein %<br>Mean ± S.D | Lipid%<br>Mean ± S.D   | Moisture%<br>Mean ± S.D | Ash%<br>Mean ± S.D     |
|---------------------------------|-------------------------|------------------------|-------------------------|------------------------|
| Post Monsoon<br>(Sep, Oct, Nov) | 17.21±0.17 <sup>a</sup> | 2.96±0.06 <sup>a</sup> | 81.40±1.01 <sup>a</sup> | 1.17±0.03 <sup>a</sup> |
| Winter<br>(Dec, Jan, Feb)       | 16.41±0.47 <sup>b</sup> | 2.33±0.12 <sup>b</sup> | 83.11±0.6 <sup>b</sup>  | 1.06±0.05 <sup>b</sup> |
| Pre Monsoon<br>(Mar, Apr, May)  | 17.54±0.31 <sup>c</sup> | 3.26±0.43 <sup>c</sup> | 77.22±1.98 <sup>c</sup> | 1.23±0.02 <sup>a</sup> |
| Monsoon<br>(June, July, Aug)    | 16.46±0.64 <sup>b</sup> | 1.95±0.46 <sup>d</sup> | 78.62±0.78 <sup>c</sup> | 1.03±0.01 <sup>b</sup> |

Table 2: showing the mean percental proximate variation in different seasons in muscle tissue of *Labeo boga* (Values are Mean ± SD) Within columns, Values with different letters as superscript represent significant variation (p<0.05)

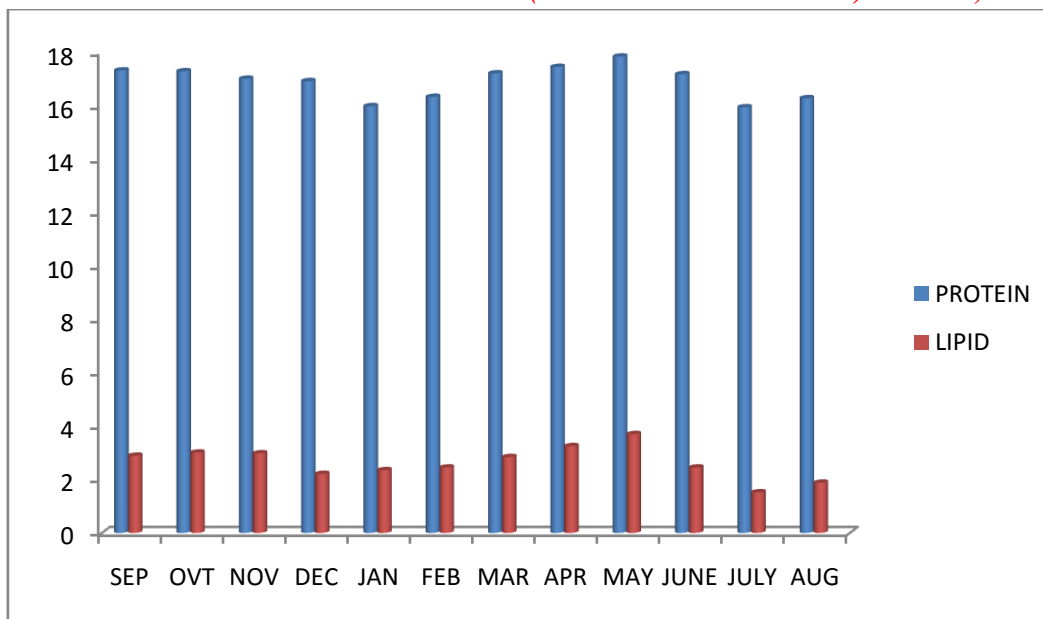


Figure 1: Showing the monthly percental variation of protein and lipid in muscle tissue of *Labeo boga*

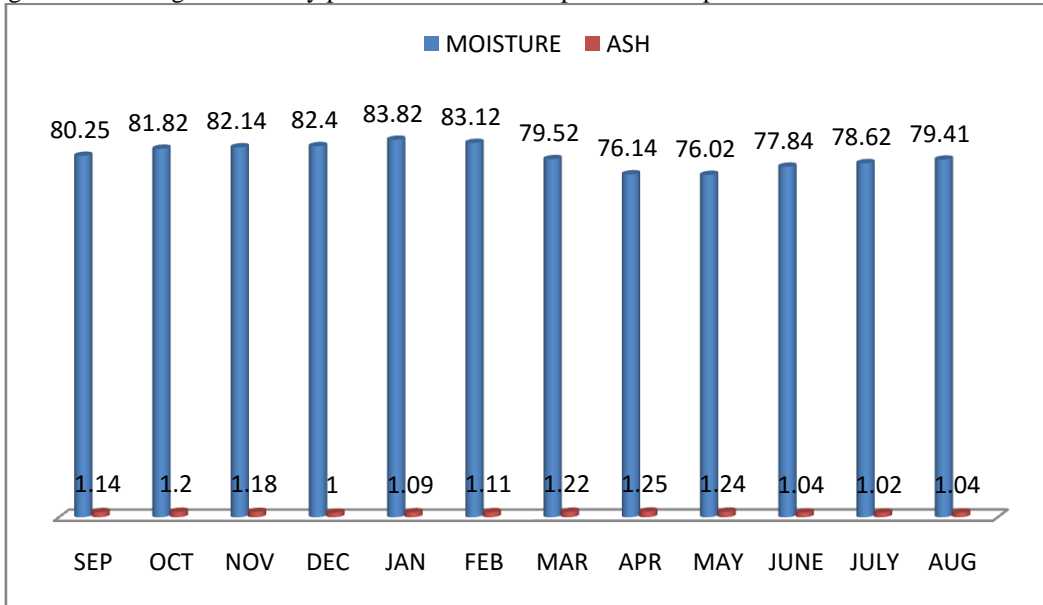


Figure 2: Showing the monthly percental variation in the moisture and ash content of *Labeo boga*

Seasonal variation in proximate composition of *Labeo boga* has been examined. The average percental protein content observed during post monsoon, winter, pre monsoon and during monsoon season were  $17.21 \pm 0.17$ ,  $16.41 \pm 0.47$ ,  $17.54 \pm 0.31$  and  $16.46 \pm 0.64$  respectively. The protein content observed to be highest during the pre monsoon season ( $17.54 \pm 0.31$ ) which corresponds to the preparatory phase of fish, while the low values were observed in the monsoon season ( $16.46 \pm 0.64$ ). Such results with increased protein content during pre monsoon (preparatory phase) and decreased protein content during the monsoon (spawning) period were in conformity with the findings of Ganeshwade *et al.* (2016) in *Mystus Cavasius*. Similar results obtained by Bruce (1924) in the muscles of Herrings. Any seasonal change in the body composition is associated with the growth. During the period of heavy feeding, the protein content of muscle tissue increases slightly; also fish may have starvation periods for natural or physiological reasons (spawning or migration) or because of external factors such as shortage of food as was observed by Ashwini *et al* (2016). During the post spawning season, rise in the protein content observed which indicates the voracious feeding by the fishes after spawning (1983) in *Garra mully* (Sykes) and Geetha *et al* (1991) in *Heteropnuestes fossilis* (Bloch). Mahdi *et al* (2006) and Jan *et al* (2012) studied seasonal variation in the protein content in the muscles of *Shizothorax esocinus* and recorded highest value of protein content during the pre monsoon season and lowest in monsoon season. The contradictory results for the maximum values for the protein during the monsoon and minimum during the post monsoon were reported by Pilla *et al* 2014 in the muscle of *Lutjanus Johnii*, a commercially important fish. Parulekar (1969) also reported increased protein content during spawning and minimum during early maturation phases; such

observation contradicted the present findings. Statistical analysis confirmed the differences in protein composition in fish muscle between different seasons were significant at  $p < 0.05$  level.

The average percental lipid content observed during post monsoon were  $2.96 \pm 0.06$ ; during winter  $2.33 \pm 0.12$ ; during pre monsoon  $3.26 \pm 0.43$  and monsoon were  $1.95 \pm 0.46$ . The lipid content observed to be maximum in the months of May and April (pre spawning period) while significant decline ( $p < 0.05$ ) in the lipid content in fish muscle was observed during the monsoon season than the pre monsoon season which could be due to possible utilization of lipid as an energy source and it's possible mobilization from the muscle into gonad during spawning. Reduction in the lipid content during the spawning season has also been recorded in *Bragmaceros melellandi* by Parulekar and Bal, (1969); in *Mugil cephalus* by Das and in *Ambassis commersoni* by Bumb, (1972). Also, high values of lipid content were observed during the post monsoon period (Sep-Nov) and pre monsoon (Mar-May) period which might be due availability of food ; as lipid values depend upon the food availability, feeding factor as well as feeding condition of fish. Similar observations were reported by Ganeshwade *et al.* (2016) and Huss; 1988, 1995. Piggott and Tucker (1990) observed the differences in these values could be due to many factors as fat content in fish may vary according to the seasons, specie and geographical variations. Also, differences in the total lipid content could be due to the age variation and maturity within same specie as also suggested by Ashwini *et al* (2016). Such a seasonal trend of variation in the lipid content shows that fishes like other animals store lipid in the muscle for the supply of energy during starvation, reproductive phases and infestation period. Statistical analysis confirmed the differences in lipid composition in muscle tissue of fish between different seasons were significant at  $p < 0.05$  level.

The average percental moisture content observed in the undertaken study during post monsoon, winter, pre monsoon and monsoon were  $81.40 \pm 1.01$ ,  $83.11 \pm 0.6$ ,  $77.22 \pm 1.98$  and  $16.46 \pm 0.64$  respectively. The results revealed that moisture content observed to be lowest in the pre monsoon season i.e Mar- May ( $77.22 \pm 1.98$ ) and increases significantly through the spawning to the post spawning season and thus showing maximum value in winter season ( $83.11 \pm 0.6$ ). This is an accreditation to the findings of various authors (Basade *et al* 2000; Dygert, 1990). Also, the moisture content of the fish muscle shows an inverse relationship with lipid and proteins as has also been observed by Lone and Matty, (1980); winfre and Stickney, 1981. Ash content represents the total inorganic matter as mineral constituents in the tissue. The average percental ash content observed during the post monsoon, winter, pre monsoon and monsoon were  $1.17 \pm 0.03$ ,  $1.06 \pm 0.05$ ,  $1.23 \pm 0.02$  and  $1.03 \pm 0.01$  respectively. The ash content in fish showed slight changes only with respect to seasons. The Ash content decreases during the monsoon/spawning period while higher values observed in the pre monsoon and post monsoon season. Such findings are in line with the findings of Basade *et al*, 2000. Muscle ash content is known to be influenced by season, sex, food as has been reported by Vinograov, (1953); Nataranjan and srinivasan (1961). During the pre monsoon season and post monsoon period, ash content observed to be higher which indicates greater mineral requirements during the growth phases i.e pre monsoon and post monsoon period. Similar observation reported by Khwaja, (1966).

#### **Conclusion:**

Such studies on the nutritional composition of fish reveals the nutritional status of fish under study also provide information on the health condition of fish. The proximate composition values obtained for *Labeo boga* would be useful to the consumers in choosing the fish based on it's nutritional importance.

#### **References:**

1. Ashwini L, Benakappa S, Anjanayappa H.N and Akshay L (2016). Seasonal changes in the proximate composition of *Decapterus russelli* from the managaluru coast. IJESC: 6(6).
2. Basade Y, Kapila S and Kapila R (2000). Changes in the muscle composition and energy contents of Golden Mahseer, *Tor putitora* (Hamilton) in relation to it's spawning cycle. Indian journal of fisheries 47(1):37-41.
3. Bruce JR (1924). Changes in the chemical composition of tissues of the herring in relation of age and maturity. Biochemical J. 18:469-485.
4. Bumb, S (1992). Studies on the biology of Commersoni's Glassy perchlet *Ambassis commersoni* (Cuvier). Ph.D Thesis Submitted To Goa University, 214.
5. Chezian, A. Kabilan, N., Kumar, S.T., Senthamilselvan, D. and Sivakumari, K (2010). Impact of common mixed Effluent of spicot industrial Estate on histopathological and biochemical changes in estuarine fish *Lates calcarifer*. Curr Research J of Biol Sciences, 2(3), 201-209.
6. Das, H.P (1978). Maturity and spawning in *Mugil cephalus* Linnaeus in Goa waters. Ibid, 11, 63-71.
7. Dygert, P (1990). Seasonal changes in energy content and proximate composition associated with somatic growth and reproduction in a representative age-class of female English sole. Transactions of the American Fisheries Society 119, 791-801.
8. Ganeshwade R M, Ghanbahadur Ashwini G and S. R Sonawane (2016). Seasonal biochemical changes in the muscle of fresh water fish *Mystus Cavasius* (Ham.) Bioscience Discovery, 7(1):34-40.

9. Geetha S, Sreenarayanam H and Nair N B (1991). On the nature of variations of the biochemical constituents during the breeding cycle in *Heteropneustes fossilis* (Bloch). *Proc. Nat. Acad. Sci. India* 61(B):311-375.
10. Huss, H.H (1988). Fresh fish. Quality and Quality Changes. *FAO Fisheries*, 29, [22]
11. Huss, H.H (1995) Quality and Quality Changes in Fresh Fish. *FAO*. Rome, 348.
12. Jan Ulfat, Mustafa Shah, Tahila Manzoor and Showkat Ahmad Ganie 2012. Seasonal and monthly variations of protein content in the muscle of fish *Schizothorax esocinus*. *Recent Research in Science and Technology*, 4(7): 05-07
13. Jorgensen, E.H., Johansen, S.J.S., Jobling, M (1997). Seasonal patterns of growth, lipid deposition, and lipid depletion in anadromous Arctic charr. *Journal of Fish Biology* 51, 312–326.
14. Khwaja, D.K (1966). Biochemical composition of the muscle of some freshwater fishes during prematurity phase. *Fish Tech.*, 3: 94-102.
15. Kiran BR and ET Puttaiah 2005. Biochemical composition of *Chela untrahi* from Bhadra reservoir, India. *Geobios*, 32: 93-95.
16. Lone, K.P., and Matty, A.J (1980). The effect of feeding methyl testosterone on the growth and body composition of common carp (*Cyprinus carpio*). *Gen. Comp. Endocrinol.*, 40(4): 409-424.
17. Love, R.M (1970). *The chemical Biology of Fishes*. Academic Press, Inc. London, U.K., 547pp.
18. Mahdi AA, MS Faddagh, AJ Tuman and TA Abdullah 2006. Biochemical composition and calorific value of six fresh waterfish species from southern Iraqi Marshes Marsh. *Bulletin* 1(1)47-53.
19. Murray, J. and Burt, J.R (2001). *The Composition of Fish*. Torry Advisory Note No. 38. Ministry of Technology. Torry Research Station, U.K., 14 pp
20. Nataranjan, M.V. and Sreenivasan, A (1961). Proximate composition of freshwater fishes. *Indian J. Fish.*, 8: 422-429.
21. Pandey BN, PK Pandey, BJ Choubey and JS Datta Munshi 1976. Studies on blood components of an air-breathing siluroid fish, *Heteropneustes fossilis* in relation to body size. *Folia Haematol*, 103: 101-116.
22. Parulekar, A.H. and Bal, D.V (1969). Observations on the seasonal changes in chemical composition of *Bregmaceros mccllellandi*. *J. Univ. Bom*, 38(65), 1969, 88-92.
23. Piggot, G.M. and Tucker, B.W., 1990. Weight-length relationship for 33 fish species in Greek waters. *Fish. Res.*, 21: 465-469
24. Pilla S, Ratnakala M, Vijayalakshmi M and Sreeramakulu K (2014). Biochemical compositions in the muscle and liver of Normal and infected fish of *Lutjanus johni* off Vishakhapatnam coast. *International Journal of Engineering and Sciences*; 4(9):38-42.
25. Somvanshi V S (1983). Seasonal changes in the biochemical composition of a hill stream fish *Garra mullya*(Sykes). *Indian Journal of Fisheries*. 30(1):55-60.
26. Srikar LN Keshavanath P and Peter M (1979). Changes in biochemical composition of *Clarias batarachus* in before and after spawning. *Mysore J. Agr.*
27. Venkatesan VV Gandhi and PU Zacharia (2013). Observations on the utilization of the biochemical constituents during maturation of the butterflyfish *Scatophagus argus* (L.1766) from Palk Bay, South east coast of India. *Ind. J. Geo-Marine Sciences*, 42 (1):75-81.
28. Vinogradov, A.P (1953). *Elementary chemical composition of marine organisms*. Seas Foundation for Marine Research. New haven. Conn.
29. Winfre, R.A. and Stickney, R.R (1981). Effect of dietary proteins and energy on growth feed conversion efficiency and body composition of *Tilapia aurea*. *J. Nutr.*, 111(6): 1001-1012.