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Proximate Composition of *Lates calcarifer* (Bloch, 1790) From Sarada and Varaha Estuarine Confluence Point, Visakhapatnam, Andhra Pradesh, India

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ABSTRACT
The major biochemical constituents which include moisture, proteins, lipids, carbohydrates and ash of Lates calcarifer were analyzed using standard analytical techniques. The Adult males and females of L. calcarifer were used for this study. The average moisture content ranged from 70.42±0.72% in adult male to 70.44±0.45% in adult female. The average protein content ranged from 19.03±1.12% in adult male to 19.21±1.02% in adult female. The average lipid content ranged from 5.12±0.24% in adult male to 5.35±0.32% in adult female. The average Carbohydrate content ranged from 0.74±0.05% in adult male to 0.75±0.07% in adult female. The average ash content ranged from 4.31±0.13% in adult male to 4.36±0.12% in adult female. Due to high protein content, this fish can be recommended as very good choice for people, those suffering from protein energy malnutrition.
Keywords: *L. calcarifer, Lipids, Carbohydrates, Proteins.*

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INTRODUCTION

Biochemical composition of fishflesh may vary within the same species of fish depending upon the fishing season, age, sex and habitat [1], and within different region of the body [2]. In fishes, proximate composition means the composition of fish flesh. Fish flesh contains four basic ingredients in varying proportions major nutrients such as water (70-80%), protein (18-20%), fat (5%) and minerals (5%) and minor nutrients such as vitamin, carbohydrate [3]. It has high nutritional value in terms of fats and proteins that are not commonly available in other foods. *L. calcarifer* contains polyunsaturated fatty acids (PUFA) enriched of omega-3 fatty acid, which play important roles in cardiovascular system to reduce the risk of heart attack [4]. Omega-3 fatty acids are helpful to reduce cholesterol level in blood and helpful in the prevention of hyperlipidemia, secondary cardiovascular disease and high blood pressure [5].
Kamruzzaman *et al.,* [6] studied on the proximate composition and nutritional value of *L. calcarifer* in different life stages. According to them the adult stages of the fishes have more nutritional values than juvenile and spent stages. Darwin *et al.,*[7] studied about the biochemical composition of Marine Gastropod *Purfura bufo* off Visakhapatnam coast. Harinath[8] studied on the variations in biochemical composition in liver of two fresh water prawns *Macrobrachium rosenbergii* and *Macrobrachium malcomsonii*. Ludiya Podili Rani [9] studied about the seasonal variations in protein content in muscle and intestine of *Penaeus indicus.* Krishna *et al.,* [10] studied about the comparative analysis of nutritive composition of wild and cultured seabass, *Lates calcarifer* from Krishna estuarine region. In their findings the biochemical constituents such proteins, carbohydrates, lipids, total ash and moisture content were

lower in both cage and pond cultured species when compare with wild *Lates calcarifer.* The purpose of the present study is to estimate the seasonal changes in the biochemical constituents of *L. calcarifer* in adult stages. The wild species were collected from the Sarada and Varaha Estuarine Confluence Point.

MATERIAL AND METHODS

*Lates calcarifer*is one of the important food fish and it has gained significance as a candidate species for aquaculture in the East coast of India. Keeping in view of this, a study has been carried out on seasonal changes in biochemical composition of *Lates calcarifer* at Sarada and Varaha estuarine confluence point of the East coast of India. The present study was carried out at Sarada and Varaha estuarine confluence point which is located near Bangarammapalem village. It is surrounded by hillocks on the beach. The Sarada and Varaha are two medium Riverine systems in the east coast of India that jointly flow into the Bay of Bengal near Bangarammapalem village in Andhra Pradesh, India (Latitudes $17^0$25‘10‘‘N and Longitudes $82^0$52‘13‘‘E).

The Sarada Riverine rises in the Eastern Ghats and run through the eastwards for a distance of 122 kilometers and joins the Bay of Bengal at Bangarammapalem village. The Varaha Riverine rises in Sannivaram Reserved Forest in Visakhapatnam and flows through Narsipatnam and Yellamanchili and finally meets with the Bay of Bengal at Bangarammapalem village. Before enter into the Bay of Bengal, the nutrient rich waters of the both Reverine systems merged together to form an estuarine confluence point which extends an area of several kilometers.

Sample Collection

To find out the concentration of moisture, protein, lipid, carbohydrates and ash in *Lates calcarifer* freshly caught specimens were collected from the Sarada and Varaha estuarine confluence point. The collected fish were kept in the ice box and transferred to the laboratory. They were thoroughly cleaned under the running tap water; the excess water was removed with blotting paper. Then the specimens were dissected immediately to avoid decomposition. Muscle tissue was removed and their weights were taken immediately. For the analysis, muscle tissue was taken just below the dorsal and above the lateral line is used. The tissue was kept in hot air oven at 60^0C for about a week to dry the material. After drying the tissue samples were pulverized and ground into a fine powder with the help of a porcelain mortar. The powder was preserved in desiccators for later use. Individually weighed powder samples were used for the quantitative estimation of proteins, lipids, carbohydrates, moisture and ash in muscle tissue.

Proximate composition analysis

Moisture, protein, lipids, carbohydrate and ash contents of the sample were determined by the AOAC methods [11]. The experiments were performed in triplicate and values are expressed as mean ± standard deviation.

RESULTS AND DISCUSSION

Table 1.Monthly changes in biochemical composition of male *L. calcarifer*during the year 2018

Months	Moisture %	Proteins %	Lipids %	Carbohydrates%	Ash %
January	67.50±0.85	22.48±1.03	4.58±0.21	0.91±0.02	4.94±0.07
February	67.26±0.39	21.72±0.09	4.36±0.33	0.85±0.06	4.87±0.01
March	68.62±0.76	21.62±2.01	4.27±0.17	0.74±0.02	4.73±0.12
April	69.11±0.92	17.38±1.19	4.97±0.29	0.67±0.09	4.38±0.08
May	72.69±0.66	17.26±1.09	6.25±0.42	0.71±0.10	3.98±0.21
June	71.39±0.72	16.32±1.23	5.99±0.19	0.62±0.08	3.87±0.17
July	72.77±0.88	18.94±1.14	6.23±0.15	0.66±0.01	3.92±0.09
August	72.78±0.58	18.03±0.91	6.25±0.30	0.59±0.07	4.34±0.10
September	69.78±0.94	16.23±0.82	4.94±0.41	0.67±0.04	3.89±0.31
October	71.75±0.99	18.57±1.05	5.32±0.22	0.86±0.12	4.32±0.13
November	71.09±0.38	20.02±1.17	4.27±0.19	0.78±.0.05	4.45±0.24
December	70.41±0.57	19.84±1.73	4.05±0.11	0.92±0.04	4.14±0.07
Year wise Average	70.42±0.72	19.03±1.12	5.12±0.24	0.74±0.05	4.31±0.13

Table 2. Monthly changes in biochemical composition of female *L. calcarifer* during the year-2018

Months	Moisture %	Proteins %	Lipids %	Carbohydrates %	Ash %
January	66.89±0.28	22.72±0.92	4.43±0.11	0.94±0.05	5.02±0.09
February	68.31±0.34	21.68±1.07	4.21±0.34	0.87±0.02	4.93±0.11
March	68.67±0.44	21.59±1.25	4.12±0.17	0.79±0.10	4.85±0.23
April	69.41±0.56	18.34±0.87	5.94±0.25	0.68±0.07	4.63±0.17
May	71.52±0.67	17.29±0.76	6.69±0.09	0.73±0.09	3.99±0.21
June	72.25±0.87	17.54±1.21	6.99±0.32	0.68±0.11	3.84±0.10
July	72.49±0.49	16.84±0.78	7.09±0.57	0.61±0.15	3.97±0.08
August	71.82±0.23	17.21±1.02	5.99±0.41	0.63±0.06	4.35±0.12
September	71.60±0.38	17.84±0.91	5.09±0.28	0.57±0.12	3.90±0.05
October	70.86±0.55	18.53±1.19	5.38±0.55	0.89±0.05	4.34±0.16
November	70.37±0.21	20.12±1.34	4.22±0.62	0.77±0.02	4.52±0.07
December	71.10±0.47	20.87±0.99	4.10±0.18	0.89±0.07	4.04±0.13
Year wise Average	70.44±0.45	19.21±1.02	5.35±0.32	0.75±0.07	4.36±0.12

It is evident from the present results, the minimum percentage of moisture content of males and females were observed as 67.26±0.39 and 66.89±0.28 in the months of February 2018 and January 2018 during post-monsoon period and maximum 72.78±0.58 and 72.49±0.49 in the months of August and July 2018 during the monsoon period and spawning period of Male and Female *Latescalcarifer.* The year wise average moisture content was observed as 70.42±0.72% for males and 70.44±0.45% for females during the study period i.e. January 2018 to December 2018 (Table 1 and 2).

According to Krishna *et al.,* [10] the moisture content of *L. calcarifer* was 73.6±5.2, 75.3±5.6, 74.8±5.9 for wild, cage and pond reared fish respectively. The recorded values were slightly higher than the findings of the present study. In the present study, the year wise average moisture content of *L. calcarifer* found to vary from 70.42±0.72% to 70.44±0.45% for males and females respectively.

It is evident from the present results, the minimum percentage of the protein content of males and females were observed as 16.23±0.82 and 16.84±0.78 in the month of September and July 2018 during the monsoon and spawning period and maximum as 22.48±1.03 and 22.72±0.92 in the month of January 2018 during post-monsoon period. The year wise average protein content was observed as 19.03±1.12% for males and 19.21±1.02% for females during the study period i.e. January 2018 to December 2018 (Table 1 and 2).

Protein is one of the major nutrients in fish, and the percentage help to define their nutritional status of the fish. The highest protein content was found in adult female fishes (22.72±0.92) and lowest in male fishes in the month of September (16.23±0.82) (Table 1).According to Pervin*et al.,* [12]the protein content of *L. calcarifer*was 23.5% which was slightly higher than the findings of the present study. In the present study, the year wise average protein content of *L. calcarifer* found to vary from 19.03±1.12% to 19.21±1.02% for males and females respectively. The reported values were slightly lower than the protein of Ilisha (*Tenulosailisha*) (22.56%) as reported by Begum and Minar[13].

It is evident from the present results, the minimum percentage of the lipid content of males and females were observed as 4.05±0.11 and 4.10±0.18 in the month of December 2018 during post-monsoon and 6.25±0.42 and 7.09±0.57 in the months of May and July 2018 during pre-monsoon, monsoon and spawning period of *Latescalcarifer.*The year wise average lipid content was observed at 5.12±0.24% for males and 5.35±0.32% for females during the study period i.e. January 2018 to December 2018 (Table 1 and 2).

In the present study the mean percentage of lipids in *L. calcarifer* varied from 5.12±0.24 to 5.35±0.32 % in male and female fishes respectively (Table 1). Pervin*et al.,*[12] reported the lipid value of *L. calcarifer* was (5.7±0.3%). The lipid content as recorded in *L. calcarifer* is similar to that of Chapila (*G. chapra*, 4.55%) as reported by Begum and Minar[13]. According to studies of Ackman [14], *L. calcarifer* is a medium fat content fish (4-8%) and Siva Reddy *et al.,*[15] found that, the fat content of this species as 4.41%. The protein and lipid cycle appears to be having a strong correlation with feeding and spawning of female fishes reported in a number of fish species [16].

It is evident from the present results, the minimum percentage of the carbohydrate content of males and females were observed as 0.59±0.07 and 0.57±0.12 in the month of August and September 2018 during the monsoon and spawning period of *Lates calcarifer* and maximum 0.92±0.04 and 0.94±0.05 in the month of December and January 2018 during post-monsoon period*.* The average carbohydrate content was observed at 0.74±0.05% for males and 0.75±0.07% for females during the study period i.e. January 2018 to December 2018 (Table 1 and 2).

According to Krishna *et al.,* [10]the carbohydrate content in *L. calcarifer* was 1.35±0.11, 1.46±0.12, 1.88±0.10 for wild, cage and pond reared fish respectively. The recorded values were slightly higher than the findings of the present study. In the present study, the year wise average carbohydrate content of *L. calcarifer* found to vary from 0.74±0.05% to 0.75±0.07% for males and females respectively.

It is evident from the present results, the minimum percentage of ash content of male and female *Lates calcarifer* were observed as 3.87±0.17 and 3.84±0.10 in the month of June 2018 during pre-monsoon period and maximum as 4.94±0.07 and 5.02±0.09 in the month of January 2018 during post-monsoon period of Male and Female *Lates calcarifer.* The average Ash content observed was 4.31±0.13% for males and 4.36±0.12% for females during the study period i.e. January 2018 to December 2018 (Table 1 and 2).

In the present study the mean percentage of ash in *L. calcarifer* varied from 4.31±0.13 % to 4.36±0.12 % in male and female fishes respectively (Table 1). The reported ash content in *L. calcarifer* was similar to the findings of Pervin*et al.,*[12] who reported that the ash content of *L. calcarifer* was 5%.Siva Reddy *et al.,*[15] reported that the percentage of average ash content of *L. calcarifer* was 2.70% which was lower than the fat content of the present study.

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