PROXIMATE COMPOSITION OF FISHES COMPRISING OF THREE FAMILIES ARIDAE, SCOMBRIDAE & STROMATEIDAE COLLECTED FROM GOPALPUR COAST, EAST COAST OF INDIA

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ABSTRACT

Marine fishes are rich source of metabolically essential protein, trace elements and poly unsaturated fatty acids, which is essential for human nutrition and disease prevention. The quality of fish was assessed from the biochemical composition. In the present study, an attempt has been made to examine the proximate biochemical composition of fishes under three families Aridae (*Tachysurus caelatus*, *T. dussumieri*, *T.sona*), Scombridae (*Rastrelliger kanagurta*, *R. brachyosoma*) & Stromateidae (*Pampus argenteus*, *P. Chinensis* and *Parastromateus niger*) which are considered as the commercially important fishes of the Gopalpur Coast. The average moisture content ranged from 73.3 to 76.6% and the fishes have protein contents between 17.9 to 21.5%. *Rastrelliger brachyosoma* have high protein content and *Tachysurus sona* have low protein content 17.9%. Lipid content varied widely from 1.5 to 5.6%. *Pampus argenteus* have high lipid content being 5.6% and *Rastrelliger kanagurta* have low lipid content of 1.5%. Ash content varied from 1.1 to 1.9%. High carbohydrate content was found in *Parastromateus niger* being 0.6% and low carbohydrate content was found in *Rastrelliger kanagurta* being 0.11%.

Keywords: proximate composition, fishes, Gopalpur Coast, India,

INRODUCTION

Fish is considered to be an excellent food item by a great majority of people due to its special culinary and nutritional properties. . Fish is a source of high quality, balanced and easily digestible protein, vitamins and polyunsaturated fatty acids which makes it an essential food source of human diet [1]. Fish is not only a source of proteins and healthy fats, but also a unique source of essential nutrients, including long-chain omega-3 fatty acids, iodine, vitamin B_{12}, and calcium [2]. Small fish taken in whole containing nutrients in the skin and bones is very much useful for young children who eat small meals due to their limited stomach capacity [3]. Omega-3 fatty acid found in fish can help to reduce blood pressure and improve other cardio vascular risk factor. For pregnant women and breastfeeding mother fish intake is important because it supplies Docosahexaenoic Acid (DHA), a specific omega-3 fatty acid that is beneficial for the brain development of infants [4]. Proximate biochemical composition of many commercially important fishes have studied by many workers [5-8]. However, variation of biochemical composition of fish flesh may also occur within same species depending upon the fishing ground, fishing season, age and sex of the individual and reproductive status. The spawning cycle and food supply are the main factors responsible for the variation [9, 10]. Fish is the main source of animal protein, and is essential for providing micronutrients to most of the vulnerable populations of developing countries. Therefore, proximate biochemical composition of a species helps to assess its nutritional and edible value in terms of energy units compared to other species.

India being a tropical country with a coast line of over 8,000 kms and Exclusive Economic Zone (EEZ) of 2 million square km having multi species fisheries in marine sector. India's total marine fish landing in 2016 was 3.63 million tonnes, out of that Odisha contributed 1.17 lakh tonnes of marine fish catch in 2016 [11]. Odisha has 482 kilometres of coastline along the Bay of Bengal on its east, from Balasore to Ganjam. Gopalpur is a small town and a Notified Area Council on the Bay of Bengal coast in Ganjam district in the southern part of Odisha. About 7088 households depend upon marine fisheries for their lively hood. The marine fisheries sector provides livelihood to nearly 8.06 lakh people of Odisha and meets the food and nutritional requirement of a significant proportion of the population [12]. Marine fishes are widely used as food in the urban and rural region. The demand for fish on the market has increased due to an increase in population and their perceived nutritional values by the local populations. Several work has been carried out on the proximate composition of fishes in India [13-19]. There remains no considerable studies on proximate composition of fishes from Gopalpur Coast. As the nutritional value of fishes changes from coast to coast. This study was therefore undertaken to create a base line data on the proximate composition of fishes belonging to family Aridae, Scombridae & Stromateidae landed in Gopalpur Coast of Odisha, East Coast of India. This information will be useful to the consumers for choosing fish as a part of food based on their nutritional values and guide policy & programmes to improve food and nutrition security among the people.

MATERIALS AND METHODS

The fishes were collected from Gopalpur coast located on Lat 19.26'N Long 84.86'E (Figure: 1). Gopalpur is a small fishing village which is about 16 Kms from Berhampur town and 5 Kms from Berhampur University. Fish samples were collected from three families namely Aridae (*Tachysurus caelatus*, *Tachysurus dussumieri* and *Tachysurus sona*), Scombridae (*Rastrelliger kanagurta* and *Rastrelliger brachysoma*) and Stromateidae (*Pampus argenteus*, *Pampus chinensis* and *Parastromiateus niger*) during January 2016 to December 2017 using gill net with help of the fishermen from the study area The fish samples were brought to laboratory, washed thoroughly and analysed. The specimens were identified by referring standard books [20-22].The identified fishes were cleaned and skin was removed. For the proximate analysis, muscle tissues were taken just below the dorsal fin and above the lateral line for experiment. The fish tissue used for the experiment were in good condition. The muscle tissue was weighed and required quantity of weighed tissue was taken for the estimation of protein, carbohydrate, lipid, moisture and ash.

Figure 1: Map of Gopalpur coast showing study area.

Estimation of total Protein:

The Folin-Ciocalteu Phenol method of [23] was adopted for the estimation of total protein in the tissue.

Estimation of total Carbohydrate:

The estimation of total carbohydrate content, the procedure of [24] using Phenol-Sulphuric Acid was followed.

Estimation of total Lipid:

The chloroform-methanol extraction procedure of [25] was used for extracting lipid from the

various body parts.

Moisture content:

The moisture content of the fish was estimated by drying a known weight (1g) of fish tissue in a hot air oven at 105^0C for 24 hrs. The differences in weight before and after drying are the amount of moisture present and the results are expressed in percentage of wet weight of the tissue [26].

Ash content:

The ash content was estimated by burning oven-dried sample in a muffle furnace at 550^0C [26].

RESULTS

The proximate composition (%) such as protein, carbohydrate, lipid , moisture and ash contents of *Tachysurus caelatus*, *T. dussumieri*, *T.sona*, *Rastrelliger kanagurta*, *R. brachyosoma*, *Pampus argenteus*, *P. chinensis* and *Parastromateus niger* in Table-1. The results of the present study revealed that the protein composition were high (18.2, 18.3, 17.9, 19.39, 21.5, 18.6, 19.05, 19.6%) compared to lipid (1.9, 1.6, 2.2, 1.5, 3.1, 5.6, 2.7, 3.6%) and carbohydrate (0.26, 0.29, 0.4, 0.11, 0.2, 0.3, 0.35, 0.6%). The moisture content (75.6, 76.1, 76.6, 76.5, 72.9, 73.3, 75.8, 73.8%) and ash values (1.3, 1.2, 1.9, 1.5, 1.3, 1.2, 1.1, 1.4%) for the above mentioned fishes are also determined. Minimum protein (17.9%) in *T.sona* recorded and the maximum (21.5%) was obtained in *R. brachyosoma*. Minimum lipid (1.5%) in *R. kanagurta* was recorded and the maximum (5.6%) was noticed in *P.argenteus*. Minimum carbohydrate (0.11%) in *R. kanagurta* was observed and the maximum (0.6%) was recorded in *P.niger*. Minimum moisture (72.9%) in *R. brachyosoma* and maximum moisture (76.6%) was recorded in *T. sona*. Minimum ash (1.1%) in P. chinensis wasrecorded and the maximum (1.9%) was recorded in *T. sona.*

Fishes	Protein	Carbohydrate	Lipid	Moisture	Ash
T. caelatus	18.2±0.45	0.26±0.14	1.9±0.03	75.6±0.37	1.3±0.04
T. dussumieri	18.3±1.03	0.29±0.6	1.6±0.07	76.1±0.27	1.2±0.07
T. sona	17.9±0.22	0.4±0.35	2.2±0.54	76.6±0.34	1.9±0.35
R. kanagurta	19.39±0.35	0.11±0.07	1.5±0.81	76.5±1.07	1.5±0.24
R.brachyosoma	21.5±0.05	0.2±0.27	3.1±0.63	72.9±0.79	1.3±0.37
P. argenteus	18.6±1.06	0.3±0.19	5.6±0.04	73.3±0.56	1.2±0.85
P. chinensis	19.05±0.28	0.35±0.08	2.7±0.17	75.8±0.43	1.1±0.54
P. niger	19.6±0.45	0.6±0.57	3.6±0.33	73.8±0.87	1.4±0.07

Table 1: Proximate Composition Of Fishes Comprising Of Three Families Aridae, Scombridae & Stromateidae In Percentage (%).
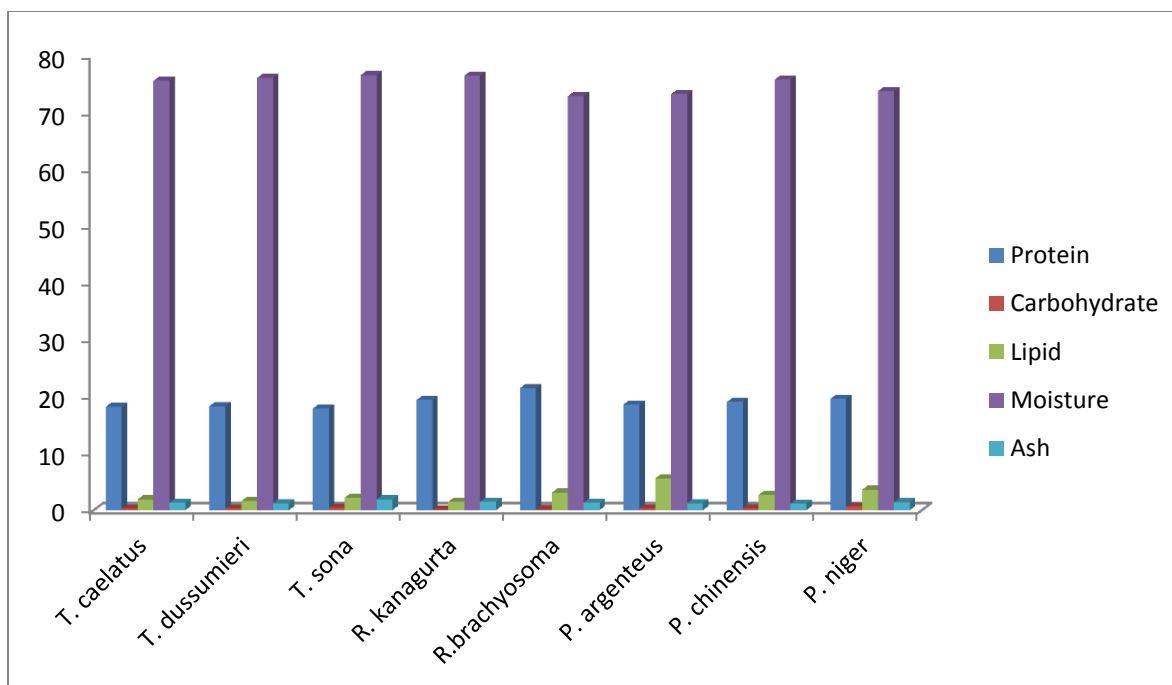
Graph 1: Graphical Represention Of Proximate Composition Value (%) Of Aridae, Scombridae & Stromateidae.

DICUSSION

Changes in Protein content:

The result of the present study revealed that the protein composition were 18.2, 18.3, 17.9, 19.39, 21.5, 18.6, 19.05, 19.6% (Table- 1) & (Graph- 1). Highest protein 21.5% were recorded in *Rastreliger brachyosoma*. Similarly [27] obtained a higher value in protein content 21.1% in *Rastreliger brachyosoma* from Gulf of Thailand. [28] recorded protein value ranged between 16.65 to 20.09% in Indian Mackerel *Rastreliger kanagurta* from Karachi Coast. Whereas in Andhra Pradesh Coast protein content of *Rastreliger kanagurta* was 16.1% [29] and in Maasiyan water it showed an increasing value of 22.4% [30]. In the present study the protein content of *Rastreliger kanagurta* is 19.39% which falls in between the highest and lowest value. The protein content was recorded in *Pampus argenteus* 18.6% in Gopalpur Coast Odisha. Such value was recorded by [31] and concluded that protein content of silver pomfret was less i.e, 17.6% than black pomfret i.e, 18.7% which coincide with the present study. [32] reported that muscle protein of *P.niger* was 16.9% to 20.7% in Ratnagiri Coast which is in agreement with the present study. Protein content of *P.niger* is 19.6% from Gopalpur Coast. The lowest value of protein content was observed in *Tachysurus sona* is 17.9% from Gopalpur Coast Odisha. Similar values of protein 17.1% in *Tachysurus sona* was observed in Kuduvaiyr Estuary in South East Coast of Tamil Nadu [33]. Proteins are the major structural component of muscle and

body tissue. They are used to produce hormones, enzymes and haemoglobin and can also be used as energy by metabolizing into their simplest form, amino acid [34]. The total protein content in fish species ranged from 11.9 to 20.6 g/100g and can be assumed to be of high dietary quality being an animal source protein [35].

Changes in Lipid content:

The average lipid content of fishes ranged between 1.5 to 5.6% (Table-1) & (Graph-1). Highest lipid content was recorded in *Pampus argenteus* 5.6% and lower value 1.5% in *Rastreliger kanagurta*. [27] also have an higher value 6.8% fat content of *P. argenteus* from Thailand Coastal water. According to [32] lipid value for *Parastromateus niger* from Ratnagiri Coast ranged from 3.1 to 6.7%. In Gopalpur Coast fat content of *P.niger* is 3.6%. [30] discussed that *P.argenteus* has higher value of fat than *P.niger* and *P.chinesis* which coincide with the present result. Fishes are classified according to the amount of lipid content in the body. They are categorised into four categories namely lean fish (<2%), low fat (2-4%), medium fat (4-8%) and high fat (>8%) [36]. In the present study low value 1.5% fat was observed in *Rastreliger kanagurta* [37] also reported such a low value 0.7% of fat in *R. Kanagurta*. [29] also obtained low value of lipid in *R. Kanagurta* 1.8% from Andhra Pradesh Coast. In the present study lipid content of *R. brachyosoma* is 3.1%. [27] obtained 3.8% of lipid for *R. brachyosoma* from Gulf of Thailand. [38] concluded that total lipid content of fishes were affected by endogenous factor especially reproduction and exogenous factor especially diet. The dietary pattern of the fishes depend upon the availability of nutrient on that region. Which is the cause of change of lipid content of same fish from region to region and season to season. In the present study lipid content of *Tachysurus sona* is 2.2% in Gopalpur Coast. Whereas lipid content of *T.sona* in Andhra Pradesh Coast was 1.4% [29] and in Kuduvaiyr Estuary in South East Coast of Tamil Nadu lipid content of *T.sona* was 1.8% [33]. The difference in the lipid content in fishes may be due to climatic conditions in different places.

Changes in Carbohydrate content:

Carbohydrate is an important constituent of the organism. Carbohydrate is present within the cell in a form of polysaccharide glycogen and in the circulating fluid in the form of glucose[39]. Fishes generally have very low levels of carbohydrate [40]. The low values of carbohydrate is due to the fact that glycogen in marine animals does not contribute much to the reserve in the fish body tissue [41] because it is utilised to meet the energy requirement when needed by anaerobic glycolysis [42]. The carbohydrate content of the fishes in the present study was 0.26, 0.29, 0.4, 0.11, 0.2, 0.3, 0.35, 0.6% (Table-1) and (Graph-1). The minimum carbohydrate was recorded in *R. kanagurta* i.e,0.11% and maximum was recorded in *P.niger* i.e,0.63%. Similar values of low carbohydrate content 0.112% in *R. kanagurta* was found by [43] in the Thoothukudi Coast of India. The carbohydrate content of *P.niger* in Malasiyan water was 0.6% which coincide with the present study. The result of Table-1 showed that fishes are poor source of carbohydrate. Many authors

concluded that [44, 45] carbohydrate content in fish is practically considered to be zero.

Changes in Moisture content:

Water is the main constituent of fish flesh which accounts for about 80% of the weight of a fresh white fish fillet [46]. In fresh fish muscle water is tightly bound to the proteins in such a way that it cannot readily be expelled even under high pressure. However frozen fish that are stored at too high a temperature, will less retain the water and consequently quality of the fish will deteriorated. So water content of the muscle help to estimate the condition of the fish. The result of the present study revealed that the moisture content of the marine fishes was 75.6, 76.1, 76.6, 76.5, 72.9, 73.3, 75.8, 73.8% (Table-1) and (Graph-1). The result showed that water is major constituent of the fish body. Moisture content of fishes were reported to be between 70-80% of the total weight [47] and present study also have the similar values. In our study *P.chinesis* has higher value of moisture content 75.8% than *P.argenteus* 73.3% and *P.niger* 73.8% . Similarly [30] has greater moisture content in *P.chinensis* 84% than *P.argenteus* 61% and *P.niger* 75%. [48] recorded moisture content of the Indian mackerel *R. kanagurta* was 75.2% which coincide with the present study 76.5% in Gopalpur Coast. [29] reported 80% moisture content in *R. kangurta* from Andhra Pradesh Coast. Moisture content of *R. brachyosoma* was72.9% reported by [27] from Gulf of Thailand which coinside with the present result 72.9% of moisture in *R. brachyosoma* from Gopalpur Coast. *T. sona* has 76.6% of moisture content in Gopalpur coast whereas 75.5% of moisture content was recorded by [29] from Andhra Pradesh Coast.

Changes in Ash content:

Ash content is a measure of mineral content and other inorganic matter in a food [37]. Minerals are important in human nutrition, which are essential for body maintenance and some are a part of enzymes. [38]. So the ash value of fish gives an idea about the mineral content of the fishes. The ash content results of the present study are 1.3, 1.2, 1.9, 1.5, 1.3, 1.2, 1.1, 1.4% (Table 1) & (Graph 1). Highest ash content was recorded in *T.sona* 1.9% and lowest value was observed in *P. chinensis* 1.1%. Similarly [29] also recorded a higher value of ash content 2.0% from Andhra Pradesh Coast. According to [27] *P. niger* has higher ash content 1.2% than *P. argenteus* 1.0% which coincide with the present study. Mackerel has ash content which ranged from 1.3% to 1.6% [27,29] in accordance with our present study *R.kanagurta* has ash content of 1.5% and *R. brachyosoma* has ash content of 1.3%. Depending on the feeding habit , environment and migration mineral content that contribute to the total ash content of the fishes may change from place to place [50].

CONCLUSION

From this study, it was inferred that proximate composition of fishes varied considerably for all the fishes. The protein content was highest in mackerel species *R.brachyosoma*. Stromateidae species *P.argenteus*

showed the highest value of lipid and *P.niger* showed the highest value of carbohydrate. The moisture and ash content was highest in Aridae species *T.sona*. From the above observation it is clear that the fishes of the Gopalpur coast are highly nutritious. The base line data on the proximate composition of the commercially available fishes along the Gopalpur coast provide information on the biochemical constituent which helpful to the nutritionist, society and researchers.

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