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Proximate composition of different fish species collected from Muthupet mangroves

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Abstract
The proximate composition such as carbohydrate, protein and lipid of muscle tissues was analysed 22 fish species collected from Muthupet mangroves. The carbohydrate content ranged from 2.87 mg/g to 4.26 mg/g and *Lutjanus fulviflamus* was conspicuous in possessing high content of carbohydrate (4.26 mg/g). The lowest carbohydrate content was found in *Stolephorus commersonii* (2.87 mg/g). The protein content ranged from 14.69 mg/g to 26.69 mg/g. However, in *Sillago sihama*, the protein content was very high (26.69 mg/g). The lowest was found in *Plotosus canius* (14.69 mg/g). The lipid content varied from 1.16 mg/g to 1.91 mg/g however, in *Liza parsia*, the lipid content was very high (1.91 mg/g) in the muscle when compared to other species. Among the 22 species, the lowest lipid level was observed in *Hemiramphus sp*., (1.16 mg/g).

Keywords: *Proximate composition, fish species and Muthupet mangroves*

1. Introduction
The fisheries sector makes an essential contribution to human development and food and nutrition security throughout the world, supplying vital nutrition to millions of people. Fish, as a source of "rich food for poor people", can play an important role in improving food security and nutritional status. Fish are an excellent source of high-quality protein, vitamins and other nutrients vital to good health, including iron, calcium, potassium and iodine. The fat content ranges from 0.2% to 25%. However, fats from fatty fish species contain the poly unsaturated fatty acids (PUFAs) namely EPA (eicosapentaenoic acid) and DHA (docosahexaenoic acid) (omega 3 fatty acids) which are essential for proper growth of children and prevent the cardiovascular diseases such as coronary heart disease. Especially for poor and food insecure populations, fish and fish products are often the only source of animal protein. In the present work, an attempt was made to estimate the proximate composition of some fishes collected from the Muthupet mangroves, south east coast of India.

2. Materials and Methods
In Muthupet mangroves (Lat.10 ° 46' N ; Long.79 ° 51'E), twenty two commercial species of fishes namely *Liza parsia, Sillago sihama, Etroplus maculates, Etroplus suratensis, Siganus java, Lutjanus fuluiflammus, Gerres filamentosus, Ambassis commersoni, Leiognathus equulus, Mystus gulio, Mugil cephalus, Arius sona, Trya Mystax, Scatophagus argus, Oreochromis mossambicus, Stolphorus commersonii, Carangoides species, Hemiramphus species, Polyrenus species, Chanos chanos, Arius maculates* and *Plotosus canius* were collected for proximate composition evaluation. The estimation of carbohydrate, protein and lipid content of fishes were carried out using the method suggested by Roe (1955) [19], Lowry *et al*. (1951) [17] and Folch *et al*. (1957) [12] respectively.

3. Results and Discussion
Fish is a major source of food for mankind all over the world from the times immemorial providing an important amount of animal protein in the diets of man (Agusa, 2007) [3]. The importance of fish as a source of high quality, balanced and easily digestible protein, vitamins and fatty acids is well understood now. Fish having energy depots in the forms of lipids will rely on this biochemical composition of the whole body indicates the fish quality. Therefore, the proximate biochemical composition of a species helps to assess its nutritional and edible value in terms of energy units compared to other species. Variations 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 this variation (Love *et al.*, 1980) [16].

Variation of biochemical composition in fish body relates closely to feed intake (Oyelese, 2006) [18]. Fish takes in a wide range of foodstuffs from which it obtains the required nutrients for its proper growth and development. The percentage of water in the composition is a good indicator of the relative energy, protein and lipid content; the lower the percentage of water, the greater the lipids and protein content and the higher the energy density of the fish (Aberoumad, and Pourshafi, 2010) [1]. Proteins are not only necessary for hormonal and enzyme development (Wilson, 1986), but are also an important source of energy (Halver and Hardy 2002) [13]. Fats provide much of energy and the essential body fatty acids, while the minerals are a major component of bones, blood, and osmoregulation (Watanabe *et al.*, 1997) [20].

The biochemical composition of fish varies from one species to another, depending on the number of factors, including feeding, breeding, fishing season and migration (Lall, 1994 and Islam and Joadder, 2005) [15, 14] The carbohydrate content ranged from 2.87 to 4.26 mg/g *Lutjanus fulviflamus* was conspicuous in possessing high content of carbohydrate (4.26 mg/g). The lowest content of carbohydrate was found in *Hemiramphus sp*., (2.69 mg/g). The carbohydrate content in fishes was in the order of *Lutjanus fuluiflammus* (4.26mg/g), *Arius sona* (4.16 mg/g), *Siganus java* (4.11 mg/g), *Etroplus suratensis* (3.91 mg/g), *Etroplus maculatus* (3.82 mg/g), *Sillago sihama* (3.71 mg/g), *Mugil cephalus* (3.71mg/g), *Mystus gulio* (3.66 mg/g), *Carangoides sp*., (3.41mg/g), *Polyrenus sp*., (3.41 mg/g), *Plotosus canius* (3.26 mg/g), *Trya mystax* (3.18 mg/g), *Chanos chanos* (3.14 mg/g), *Liza parsia* (3.13 mg/g), *Oreochromis mossambicus* (3.12 mg/g), *Gerres filamentosus* (3.11 mg/g), *Scatophagus argus* (2.98 mg/g), *Leiognathus equulus* (2.94 mg/g), *Arius maculates* (2.91 mg/g), *Ambassis commersonii* (2.89 mg/g), *Stolphorus commersonii* (2.87 mg/g) and *Hemiramphus sp*., (2.69 mg/g) (Table 1).

The nutrient composition was found varied to other authors for the same fish (Deka *et al.*, 2012) [10]. The proximate composition of a particular species often varies from one to another region (Afroza Begum *et al.*, 2013) [2]. The main cause of change in proximate composition may be due amount and feed intake, season, size and habitat of fishes (Deka *et al.*, 2012; Begum *et al.*, 2012 and Begum and Minar, 2012) [10, 6, 7, 6, 7].

Among all the three major constituents studied the protein is a major constituent in the body of fish, which is essential for all living organisms. The protein content ranged from 14.69 to 26.69 mg/g. However, in *Sillago sihama*, the protein content was very high (26.69 mg/g). The lowest was found in *Plotosus canius* (14.69 mg/g). The protein content in fishes was in the order of *Sillago sihama* (26.69 mg/g), *Stolephorus commersonii* (23.67mg/g), *Hemiramphus* sp., (22.91mg/g), *Lutjanus fulviflamus* (21.63mg/g), *Liza parsia* (21.52mg/g), *Carangoides sp*., (20.89mg/g), *Chanos chanos* (20.67mg/g), *Gerres filamentosus* (20.38mg/g), *Mugil cephalus* (19.62mg/g), *Signus java* (19.62mg/g), *Polyrenus sp*., (18.85mg/g), *Ambassis commersoni* (18.82mg/g), *Trysa mystax* (18.21mg/g), *Mystus gulio* (17.1mg/g), *Oreochromis mossambicus* (16.71mg/g), *Arius maculates* (16.31mg/g), *Etroplus suratensis* (16.18mg/g), *Leiognathus equulus* (16.16mg/g), *Etroplus maculates* (15.32mg/g), *Arius sona* (15.21mg/g) and *Plotosus canius* (14.69mg/g) (Table 1).

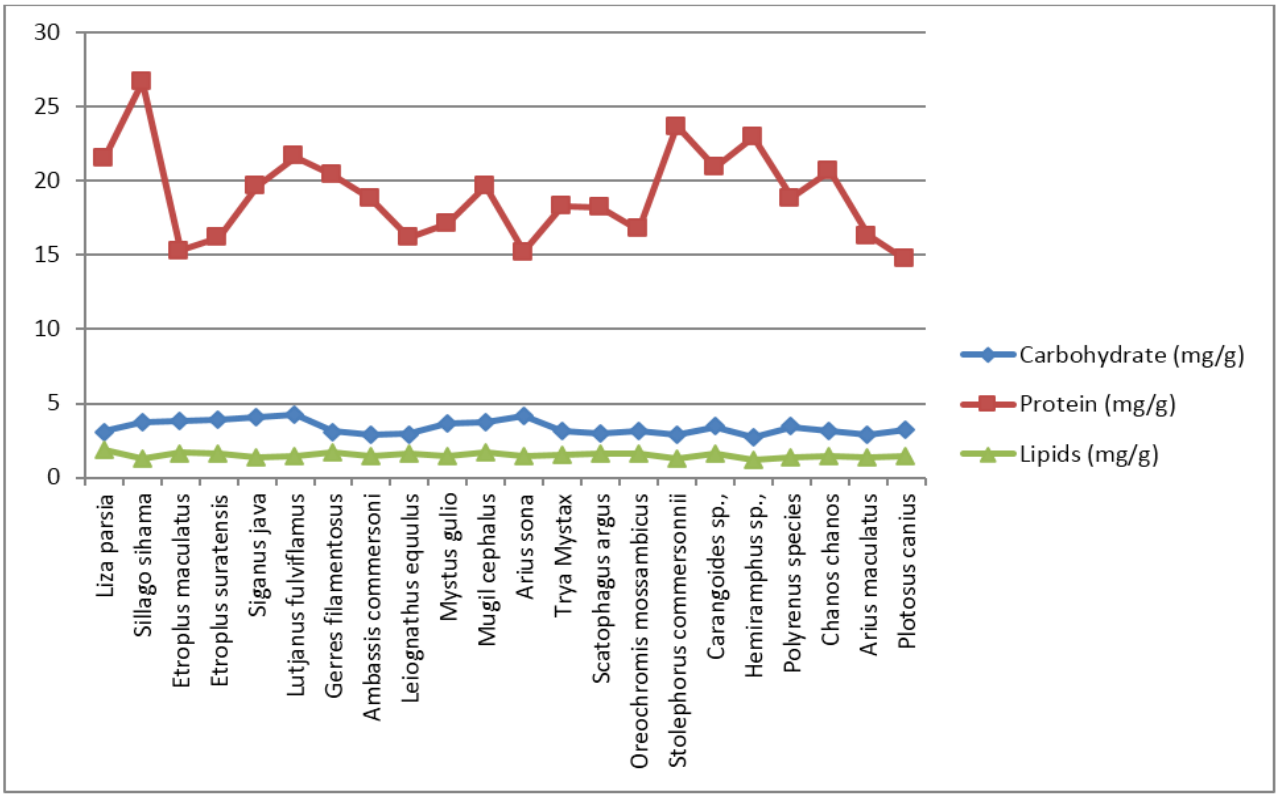
The variation of protein in different species might be influenced by their feeding and breeding capabilities (Islam and Joadder, 2005) [14]. Council of Scientific and Industrial Research (CSIR), India (1962) [9] found 20.04% and 16.92% protein content in whip ray and *Himantura uarnak* respectively which is close agreement with the result of the present study. Similar observation was also reported in different fish species in Brackish water pond (Ali *et al.*, 2005) [4].

In the present study, the lipid content of different fish species varied from 1.16 to 1.91 mg/g however in *Liza parsia*, the lipid content was very high (1.91 mg/g) in the muscle when compared to other species. Among the 22 species, the lowest was observed in *Hemiramphus sp*., (1.16 mg/g).The lipid content in fishes was in the order of *Liza parsia* (1.91mg/g), *Gerres filamentosus* (1.69mg/g), *Mugil cephalus* (1.68mg/g), *Etroplus maculatus* (1.67mg/g). *Leiognathus equulus* (1.66mg/g), *Etroplus suratensis* (1.62mg/g), *Scatophagus argus* (1.61mg/g), *Thryssa mystax* (1.55mg/g), *Mystus gulio* (1.49mg/g), *Ambassis commersoni* (1.48mg/g), *Lutjanus fulviflamus* (1.47mg/g), *Arius sona* (1.46mg/g), *Chanos chanos* (1.42mg/g), *Arius maculates* (1.39mg/g), *Siganus java* (1.39mg/g), *Polyrenus sp*., (1.37mg/g) *Sillago sihama* (1.27mg/g), *Stolephorus commersonii* (1.25mg/g), *Hemiramphus sp*., (1.16mg/g) (Table 1). Borgstrom (1961) [8] observed that the fat content in fishes depend on some factors such as age, sex, seasonal changes and habitat. Barua *et al*. (2012) [5] reported the variations of fat content of different commercial marine fishes collected from Bay of Bengal from 0.99 in *Dasyatis pastinaca* to 2.01% in *Dasyatis americana*. Deradoss (1983) [11] studied on the nutritive values of sharks, skates and rays caught from the Proto Nova coast and they reported that the proximate composition varied from species to species and also different seasons. The present results are in good agreement with the above study with respect to the variations in the fat content among different fish species.

Table 1: Proximate composition in the muscle of fishes collected from Muthupet mangroves

Name of fish species	Carbohydrate (mg/g)	Rank	Protein (mg/g)	Rank	Lipids (mg/g)	Rank
Liza parsia	3.13	14	21.52	5	1.91	1
Sillago sihama	3.71	6	26.69	1	1.27	16
Etroplus maculatus	3.82	5	15.32	20	1.67	4
Etroplus suratensis	3.91	4	16.18	18	1.62	6
Siganus java	4.11	3	19.62	10	1.39	14
Lutjanus fulviflamus	4.26	1	21.63	4	1.47	11
Gerres filamentosus	3.11	14	20.38	9	1.69	2
Ambassis commersoni	2.89	19	18.82	12	1.48	10
Leiognathus equulus	2.94	17	16.16	19	1.66	5
Mystus gulio	3.66	7	17.1	15	1.49	9
Mugil cephalus	3.71	8	19.62	10	1.68	3

Arius sona	4.16	2	15.21	21	1.46	12
Thryssa Mystax	3.18	11	18.32	13	1.55	8
Scatophagus argus	2.98	16	18.21	14	1.61	7
Oreochromis mossambicus	3.14	13	16.71	16	1.66	5
Stolephorus commersonii	2.87	20	23.67	2	1.25	17
Carangoides sp.,	3.41	9	20.89	7	1.61	7
Hemiramphus sp.,	2.69	21	22.91	3	1.16	18
Polyrenus species	3.41	9	18.85	11	1.37	15
Chanos chanos	3.14	12	20.67	8	1.42	13
Arius maculatus	2.91	18	16.31	17	1.39	14
Plotosus canius	3.26	10	14.69	22	1.48	10



Graph shows the Proximate composition in the muscle of fishes collected from Muthupet mangroves

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