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Original Research Article

Nutritional Composition of Selected Marine Fish Species of East Coast of India

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Abstract: Species diversity in East coast of India includes various important fish that contribute to the diet of many human population. These include Clupeids, Nemipterids, Lutjanids, Leiognathids, Lethrinids, Engraulids, Labrids, Serranids, Scombrids and Carangids. Their proximate composition are discussed in this study. Fish samples were collected from the landing centres of Thoothukudi and Tharuvaikulam during pre monsoon, monsoon, post monsoon and summer to assess the proximate composition. Among the five species, carbohydrate content was between 5.2±0.18% (*Pseudorhombus elevates*) and 2.82±0.11% (*Stolephorus waitei*); protein content was between 80.25±0.71% (*Stolephorus waitei*) and 53.25±0.12% (*Terapon puta*); ash content was 1.40±0.2% (*P. elevatus*) and 0.51±0.04% (*Stolephorus waitei*) and the lipid was between 14.89±0.34% (*Stolephorus waitei*) to 7.55±0.24% (*Pseudorhombus elevatus*). It was observed that the variation of proximate composition related with the season and the seasonal changes also observed in water and lipid content. When the moisture content declined in fish, lipid content evidently increased in almost all fishes. This study demonstrates that several of the underutilised trash/low cost species are able to compete with more commercially utilised species in terms of nutritional value, and they can definitely also compete when it comes to taste. Data on the sensory quality of these marine species are mainly limited and further development of tools for sensory analysis is required.

Key words: Lipid, marine fish, nutritional composition, protein

Introduction

The fish and fishery products consumption is increasing with the growth of population. Carbohydrates, protein, fat and water content (Proximate composition) of fish is important. Nutritional value and seasonal variations are considered important in processing (Murray and Burt, 2001). Nutritional composition is also important as an aspect of quality of raw material, sensory attributes and storage stability (Sikorski *et al.*, 1990), and gives an idea about maturity stage (Connell, 1975; Huss, 1988; 1995). Fish is one of the main food constituents in our diet as it includes essential fatty acids, amino acids and some of the principal vitamins and minerals in sufficient amounts for healthy living (Borgstrom, 1961). Furthermore, some nutritional components of fish have functional effects on human health. In India, more studies on the proximate composition of marine fishes and demonstrates their reproductive cycle and their energy value. Earlier reports are available on the proximate composition of fishes landed in the East Coast and West coast of India (Das and Sahu, 2001; Ravichandran *et al.*, 2011; Kumaran *et al.*, 2012; Palani kumar *et al.*, 2014)

The aim of the present study was to highlight compositional differences of five different trash/low cost fishes and to find

the suitable time for consumption. This study also provides valuable information on variations in proximate composition of fish species for all the seasons and make a choice based on that information from a consumer point of view.

Materials and methods

The fish samples were collected from Thoothukudi and Tharuvaikulam landing centres of Tamilnadu in four different seasons like pre monsoon, monsoon, post monsoon and summer for the period one year (May 2018-April 2019). All season available dominantly landed five fish species with the size group of 13-14 cm Total length(TL) for *Pseudorhombus elevates*; 11-11.5cm (TL) for *Leiognathus equulus*; 12-13cm (TL) for *Terapon puta*; 25-26 cm (TL) for *Platycephalus indicus*; 10.5-11 cm (TL) for *Stolephorus waitei* were selected for the present study (Fig.1). White muscle of five individuals in each species was taken and mixed well for further analysis. All the samples were analysed in triplicate. Male and female were identified by dissection microscopic examination of testis and ovary (Clarke, 1934; Bunag, 1956)

The moisture content of the fish was estimated by drying a known weight (1 g) of fish muscle in a hot air oven at 105°C for 24hrs. The difference in weight before and after drying is the amount of moisture present and the results are expressed in percentage of wet weight of the muscle (AOAC, 2000). The Folin-Ciocalteu Phenol method of Lowry *et al.* (1951) was used for the determination of the total protein in the tissue. The lipid content was estimated by the procedure given by Folch *et al.* (1956). The total carbohydrate was estimated by Phenol- Sulphuric acid method described by Dubois *et al.* (1956) and all the value was expressed in terms of dry weight basis. The ash content was estimated by burning oven-dried sample in a muffle furnace at 550°C (AOAC, 2000).

Results

The moisture compositional variations of five fishes for all the seasons are presented in Fig.2. The moisture content was fluctuated between 68.35±0.25% to 78.77±0.22%. The highest moisture content was found in *L. equulus, P. indicus* (pre monsoon), *P. elevatus, T. puta*, *S. waitei* (monsoon), *P. elevatus*, (post monsoon) and *P. indicus* (summer) for both the sexes and the lowest level of moisture content were found in *T. puta* (pre monsoon), *L. equulus*, *P. indicus* (post monsoon) *P. elevatus*, *T. puta*, *S. waitei* (summer) for both the sexes. Male showed the higher value of moisture than female for most of the seasons in most of the species.

Fig. 1. Selected fish species used in this study

Variation in lipid content estimated in five fishes for all the different seasons are presented in Fig.3. The lipid content was varied between 14.89±0.34% to 7.55±0.24%. The highest lipid content was during pre monsoon in *S. waitei*, during post monsoon in *L. equulus* and *P. indicus*, and during summer in *P. elevatus, T. puta*, and *S. waitei* in both the sexes. The lowest level of lipid content was found during pre monsoon in *L. equulus* and *P. indicus*, during monsoon in *P. elevatus, T. puta*, and *S. waitei* and during post monsoon and summer in *P. elevatus*. Female showed the higher value of

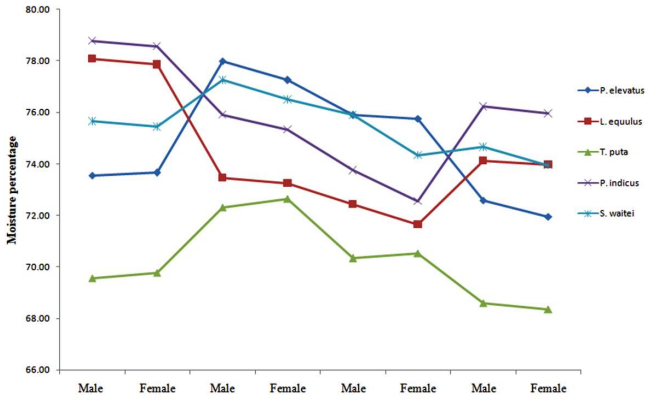

Fig. 2. The percentage composition of moisture contents of male and female of the selected species for the different seasons (pre monsoon, monsoon, post monsoon and summer, respectively). Male showed the higher value of moisture than the female for most of the seasons in most of the species.

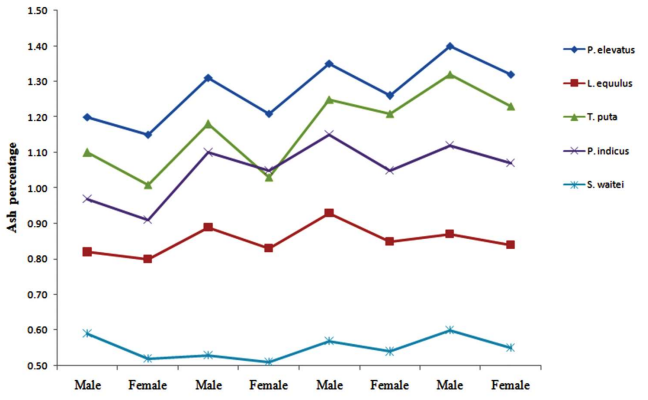

Fig. 5. The percentage composition of ash content of male and female of the selected species for the different seasons (pre monsoon, monsoon, post monsoon and summer, respectively). Male showed the higher value of ash content than female for most of the seasons.

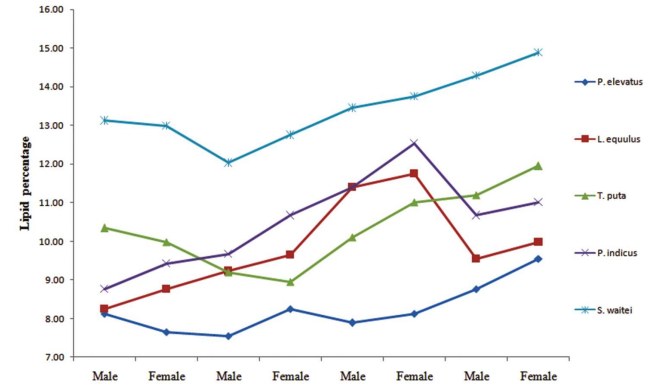

Fig. 3. The percentage composition of lipid contents (dry weight basis) of male and female of the selected species for the different seasons (pre monsoon, monsoon, post monsoon and summer, respectively). Female showed the higher value of lipid content than male for most of the seasons in all the species

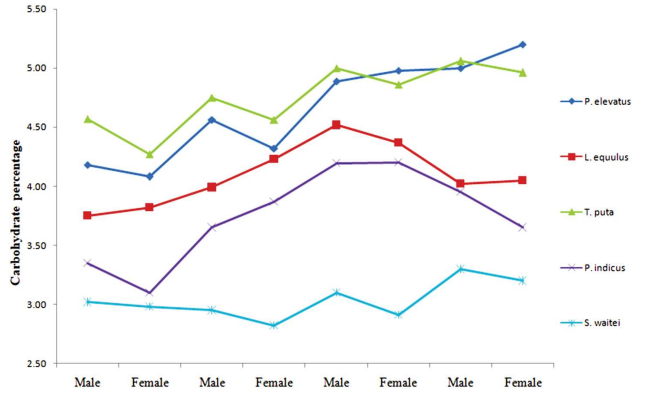

Fig. 6. The percentage composition of carbohydrate content (dry weight basis) of male and female of the selected species for the different seasons (pre monsoon, monsoon, Post monsoon and summer, respectively). Male showed the higher value of carbohydrate content than female for most of the seasons.

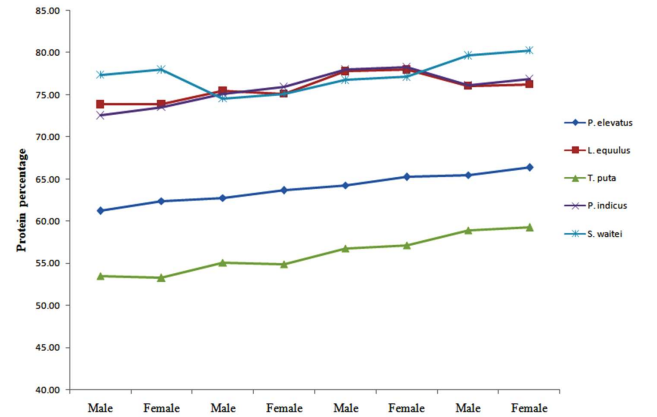

Fig. 4. The percentage composition of protein contents (dry weight basis) of male and female of the selected species for the different seasons (pre monsoon, monsoon, post monsoon and summer, respectively). Female showed the higher value of protein than male for most of the seasons.

lipid content than male for most of the seasons in all the species.

Variation in protein content estimated in five fishes for all the different seasons are presented in Fig.4. Among all the species, the protein content range was between 80.25±0.71% and 53.25±0.12%. The highest protein content was found during pre monsoon in *S. waitei* during monsoon in *P. indicus*, during post monsoon in *L. equulus* and *P. indicus* and during summer in *P. elevatus, T. puta* and *S. waitei.* The lowest level of protein content was found during pre monsoon in *P. elevatus, L. equulus, T. puta* and *P. indicus*, during monsoon in *S. waitei* , during post monsoon in *T.*

puta and during summer in *P. indicus*. Female showed the higher value of protein than male for most of the seasons.

Ash content varied among five fishes for all the seasons and are presented in Fig.5. Among all the species the ash content value was recorded between 1.40±0.2% and 0.51±0.04%. The highest ash content was found to be in pre monsoon in *P. elevatus*, during monsoon in *P. elevatus*, during post monsoon in *L. equulus* and *P. indicus* and during summer in *P. elevatus, T. Puta* and *S. waitei*. *S. waitei* showed the lowest level of ash content in all seasons. Male showed the higher value of ash content than female for most of the seasons.

Carbohydrate content differed in five fishes for all the seasons and is presented in Fig.6. Among all the species the value of carbohydrate content was between 5.2±0.18% and 2.82±0.11%. The highest level of carbohydrate was found to be in pre monsoon and monsoon in *T. puta* during post monsoon in *L. equulus* and *P. indicus* during summer in *P. elevatus, T. puta*, and *S. waitei.* Whereas in *S. waitei* the lowest level of carbohydrate content was recorded in all seasons. In all the species, male showed the higher value of carbohydrate content than female for most of the seasons.

Discussion

Proximate composition such as protein, fat and other nutritional components is used to assess the quality of fish condition prior to edible in fish tissues. The proximate composition varies with catching season. This is mainly because of physiological reasons and changes in environmental conditions such as spawning, migration and starvation or heavy feeding (Boran and Karacam, 2011). The present study shows the variation of proximate composition related with the season and also changes in water and lipid indicate that while there was a decline in water content, lipid content evidently increased. It is in good agreement with previous report of results by Huss (1988; 1995) and Boran and Karacam (2011).

In this present study the lipid level of *P. elevatus* was higher during summer month (male 8.77±0.33% and female 9.55±0.19%) and lower (male 7.55±0.24% and female 8.25± 0.09%) in November (post monsoon) and total of 45% of the species showed high value of lipid during the summer period and 33% of the species showed high value of lipid in pre monsoon period. Most of the species showed higher level of lipid content in the summer period and this result is supported by the study of (Elena *et al*., 2006) who found that the seasonal fluctuations of total lipid content and moisture, parameters inversely correlated were evident in the edible flesh of white fish from the three lakes.

Moisture content is usually inversely related to fat content (Perez- villareal and Pozo, 1990; Mendez and Gonzalez, 1997; Grigorakis *et al*., 2002). The fishes of the families, Carangidae, Clupeidae Lutjanidae and Nemipteridae had the average moisture contents between 71 and 75%. The oil sardines examined had 73.79% moisture (Palani kumar *et al*., 2014). But, Ravichandran *et al*. (2011) had reported 70.02%, moisture in oil sardine. The present study also have the same pattern that the higher moisture content of the analysed species inversely correlated with the lower content of lipid level and vice-versa. Total of 45% of the species showed high value of moisture content in the monsoon period and 23% of the species showed high value of moisture content in the post and pre monsoon seasons.

Generally, carbohydrate in fish contributes to the energy needs of the consuming organism (Tzikas *et al*., 2007). In the present study it showed that among all the species the carbohydrate content (dry weight basis) fluctuated between 5.68±0.3% and 2.82±0.11% and 45% of the species showed high value of carbohydrate during the summer period and 23% of the species showed high value of carbohydrate during the post and pre monsoon season. All the carbohydrate values have inverse relationship with moisture content. These finding supported by Tzikas *et al*. (2007).

Conclusion

Among the five selected fish species, carbohydrate content was more in *Pseudorhombus elevates* and low in *Stolephorus waitei.* Protein and lipid content was higher in *Stolephorus*

waitei and ash content was more in *P. elevatus*. This study demonstrates that several of the underutilised trash/low cost species are able to compete with more commercially utilised species in terms of nutritional value, and they can definitely also compete when it comes to taste.

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