



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2019; 7(3): 955-958

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Received: 04-03-2019

Accepted: 06-04-2019

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## Seasonal variation in nutritional quality of *Setipinna phasa* (Hamilton, 1822) in diamond Harbour of West Bengal, India

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### Abstract

The present study was to validate out the nutritional qualities of selected edible marine fish *Setipinna phasa* collected from Diamond Harbour fish landing center, West Bengal, during the period from July 2017 to March 2018 were assessed. The moisture content of *S. phasa* varied from  $74.12 \pm 0.04\%$  to  $77.56 \pm 0.42\%$ . The consequence of the proximate composition protein content of the fish varied from  $16.14 \pm 0.39\%$  to  $18.28 \pm 0.12\%$ . Higher lipid content was recorded during the breeding season and lowers during spent phase or post-breeding season. There were no significant changes ( $p > 0.05$ ) in the values of ash within the various months with higher values seen during the dry season.

**Keywords:** Proximate composition, seasonal variation, *Setipinna phasa*, West Bengal

### Introduction

Fish is an excellent source of protein for the human diet since fish protein has relatively high digestibility, biological and growth promoting values (Sujatha *et al.*, 2014) [14]. It is estimated that fishes account for about 15% of the animal protein for 4.3 billion people globally (CFI, 2016) [4]. World per capita apparent fish consumption increased from an average of 9.9 kg in the 1960s to 19.7 kg in 2013 (FAO, 2016) [5].

Diamond Harbour is one of the busiest and important landings cum assembly center in the district of South 24-Parganas. The landing center is 48 km away from Kolkata. Diamond Harbour fish landing center is a place where both estuarine and marine fishes are accumulated from estuaries and sea.

*Setipinna phasa* (Hamilton, 1822) (Family - Engraulidae) is popularly known as phasa fish and hair-fin anchovies. Among hair-fin anchovies, *S. phasa* is the most important food fish from a commercial point of view in the state of West Bengal. This fish is a major item from the artisanal catch in the Hooghly estuary (Talwar and Jhingran, 1991) [15].

Fish food is a very high nutritional quality. The proximate composition of fish is a good indicator of the nutritional quality of fish (Sonavane *et al.*, 2017) [13]. Fish is considered one of the cheapest sources of protein. Fish muscle protein contains 20 different amino acids (ten essential and ten non-essentials) of nutritional importance (King *et al.*, 1990) [7]. A good dietary protein is required for survival, growth, development, reproduction and good for health throughout life. Fish lipid is one of the most important natural sources of poly-unsaturated fatty acids. It is considerable demonstrated to have functional effects on the human diet (Rafflenbeul, 2001; Saoud *et al.*, 2008) [10, 12].

The present study was carried out in order to evaluate the seasonal variation in nutritional quality (water, protein, lipid and ash) of *Setipinna phasa* from Diamond Harbour, West Bengal, India.

### Materials and Methods

#### Sample collection

Fish samples were collected in early morning hours at monthly intervals from Diamond Harbour fish landing center. Around 20 samples of *S. phasa* were randomly selected at the time of unloading the fishes from fishing vessels of multi-day trips. Fishes were de-iced, washed and immediately packed in polystyrene boxes with ice in the ratio of 1:1 (w/w) and finally transported to the laboratory of Fish Processing Technology, Faculty of Fishery Sciences, WBUAFS, Kolkata. Seasonal variation in nutritional quality of *Setipinna phasa*

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collected from Diamond Harbour fish landing center, West Bengal, during the period from July 2017 to March 2018 were assessed.

### Proximate composition analysis

Determination of moisture content was done by the method described by AOAC (1995)<sup>[1]</sup> using a hot air oven. Protein content (%) was determined by the Kjeldahl method described by AOAC (1995)<sup>[1]</sup>. Lipid content was estimated through the method described by Bligh and Dyer (1959)<sup>[2]</sup> by using a Soxhlet apparatus. Ash content was determined by the method described by AOAC (1995)<sup>[1]</sup> using Muffle furnace.

### Statistical analysis

All the data were checked for normal distribution with normality plots prior to analysis of variance (ANOVA) to determine significant differences among means at  $\alpha = 0.05$  level, using statistical tools of Microsoft Office Excel (2007) and R software (Version 2.14.1). Tukey HSD was used to determine significant differences between samples.

### Results and Discussion

Fish is rich in protein, with an amino acid composition very well suited to human dietary requirements comparing favorably with egg, milk and meat in the nutritional of its protein (Olomu, 1995)<sup>[9]</sup>. The nutritional quality of fish varies due to physiological reasons and changes in environmental conditions (Boran and Karacam, 2011)<sup>[3]</sup>.

The moisture content of the *S. phasa* was observed to be low in the month of January ( $74.12 \pm 0.04\%$ ) and high in the month of July ( $77.56 \pm 0.42\%$ ) as represented in Figure 1. The variation in the moisture content was significant ( $p < 0.05$ ) within the months. Boran and Karacam (2011)<sup>[3]</sup> opined that lipid and moisture content are inversely related. A similar

observation is reflected in the present study wherein the higher moisture content during the dry period and lower moisture content during the rainy period is reflected.

*Setipinna phasa* recorded lower value of protein in the month of August ( $16.14 \pm 0.39\%$ ) and higher value in the month of February ( $18.28 \pm 0.12\%$ ) with no significant ( $p > 0.05$ ) variations (Figure 2). For marine organisms, body composition in fish is variable with respect to species, geographical location, time of year, size, maturity condition, sex, and feeding regime or ecological habits (Lawson *et al.*, 1998; Saadettin *et al.*, 1998)<sup>[8, 11]</sup>.

Significant differences ( $p < 0.05$ ) in the value of lipid during the month were reported, the highest value of lipid in the month of January ( $7.56 \pm 0.09\%$ ) and lowest value in the month of February ( $3.53 \pm 0.25\%$ ) as represented in Figure 3. The mobilization of lipids from other storage organs to ovaries suggests energy allocation or fuel transfer enable the organism to cope with reproductive efforts. Seasonal differences in the availability of food and changes in the reproduction cycle have a considerable effect on the tissue biochemistry of fish species, particularly lipid. According to Huss (1995)<sup>[6]</sup>, during periods of heavy feeding, at first, the protein content of the muscle tissue will increase to an extent depending upon how much it has been depleted, e.g., in relation to spawning migration.

Ash may be defined as the residue that lacks water and volatile constituents containing carbon dioxide, oxides of nitrogen, etc. The ash values recorded were  $1.03 \pm 0.13\%$  in the month of November and  $1.48 \pm 0.07\%$  in the month of February being the lower and upper limit during the study period (Figure 4). There were no significant changes ( $p > 0.05$ ) in the values of ash within the various months with higher values seen during the dry season.

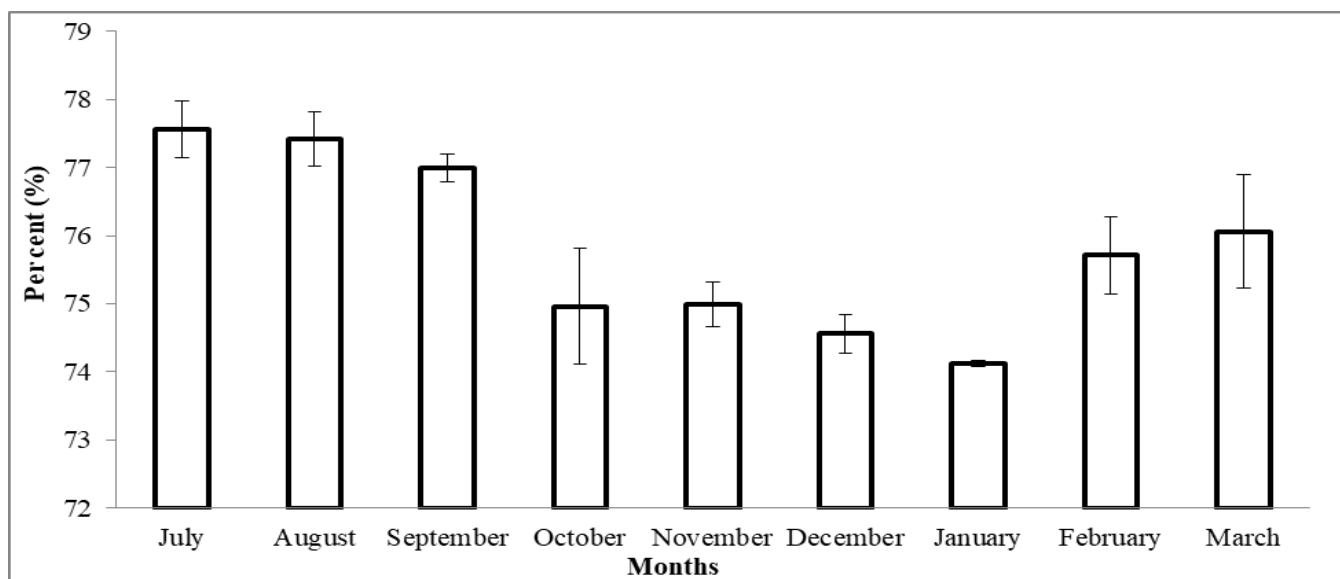


Fig 1: Variation in moisture content of *S. phasa*

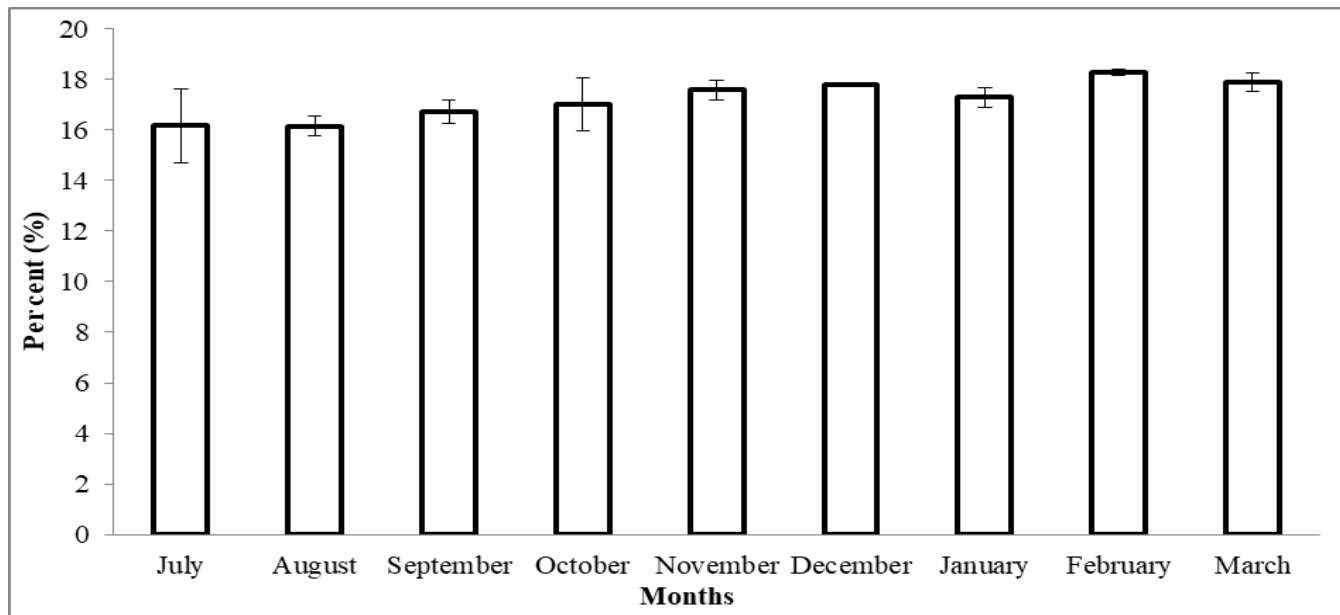


Fig 2: Variation in Protein content of *S. phasa*

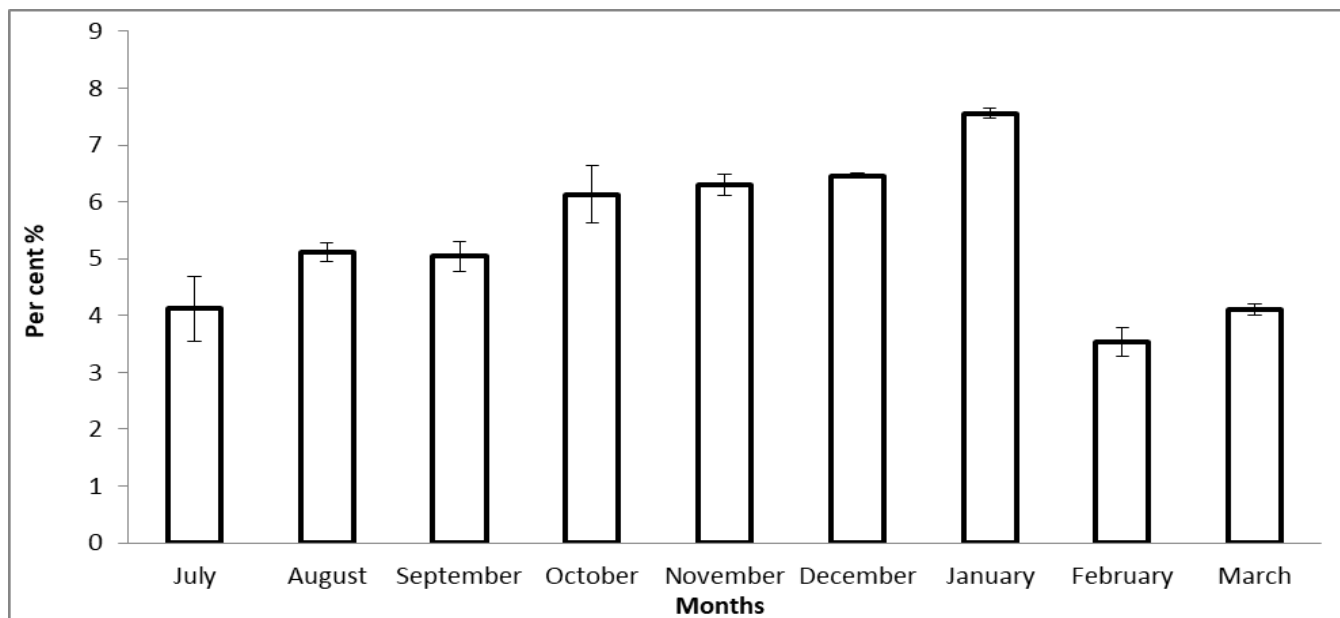


Fig 3: Variation in lipid content of *S. phasa*

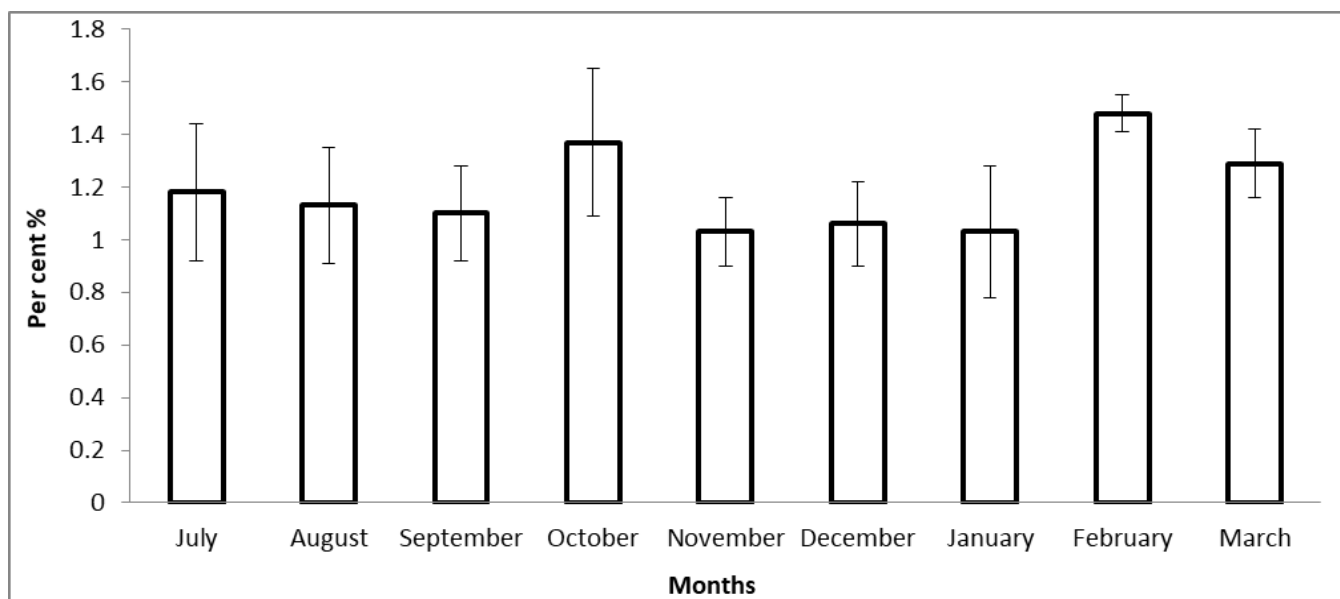


Fig 4: Variation in ash content of *S. phasa*

## Conclusions

The present study showed information on seasonal variations of the proximate composition of *Setipinna phasa*. This might be due to physiological reasons and changes in environmental conditions such as migration, spawning, feeding and starvation. The protein content of freshly landed fish was recorded higher protein content during post spawning season. Significant differences ( $p < 0.05$ ) in the value of lipid during the month for each species were reported. The higher lipid content was observed during the breeding season and lowers during post-breeding or the spent season. Therefore, it is recommended to consume *S. phasa* fish regularly as it could significant source of essential nutrient choice and essential fatty acid needed of a healthy body.

## Acknowledgement

The authors would like to thank the Dean, Faculty of Fishery Sciences, Kolkata, West Bengal, for providing facility and support to conduct the research work.

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