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Comparative study on proximate composition of cuttlefish species from Thoothukudi coast

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Abstract
Proximate profiles such as protein, carbohydrate, lipid and moisture content is often necessary to ensure that they meet the nutritional requirements essential for the growth and health of a living being. Hence, in the present study, the proximate compositions of three cuttlefish species from Thoothukudi coast were evaluated. *Sepia prabahari* had highest moisture level with a value 85.08±0.32 and *S. ramani* showed the lowest value (81.41±0.21). Protein content was highest in *S. ramani* with a value 16.474±0.46 and *S. prabahari* showed the lowest value (12.59±0.49). Ash was found to be higher in *S. ramani* (1.20±0.21) than the other two species. Carbohydrates were high in *S. pharaonis* (1.35±0.42) and low in *S. ramani* (0.71±0.10). Fat content ranged from 0.58±0.05 to 0.751±0.04 in the cuttlefish species. Thus, the present study showed that among the three cuttlefish species, *Sepia ramani* with highest protein content is nutritionally preferred.

Keywords: Proximate composition, cuttlefish, nutrition, cephalopod

1. Introduction
Cephalopods form a major item in marine fishery export from India, with increasing demand from various parts of the world. Cephalopod landings increased steadily in the last 40 years, from 1617 tonnes (t) in 1970 to 1, 65, 394 t in 2010 [1]. Cephalopods are the second major seafood export item from India. More than 75% of the cephalopod landings along the south - west coast are generally represented by the squid, *Loligo duvauceli* and cuttlefish, *Sepia pharaonis.* All the cephalopod resources in the catch form an item of export from India, with *S. pharaonis* representing the major item. In India, in the year 2014-2015, frozen cuttlefish recorded a growth of 20% in quantity, 32.17% in rupee value and 31.81% in USD terms compared to the previous year. Unit value realisation also increased by 9.76% [2]. Cephalopods are a good source of protein and lipid which is the reason for this increasing demands [3], thus become a highly nutritious food that represents an alternative to finfish resources.
The measurement of some proximate profiles such as protein, carbohydrate, lipid and moisture content is often necessary to ensure that they meet the requirements of food regulations and commercial specifications [4]. However, most of the previous studies concentrate on the proximate composition and nutritional evaluation of many commercially important fishes and few species of cephalopods. At the same time there, few works has been carried out to compare the proximate composition of different species of cuttlefish. Therefore, the present study was undertaken to compare the proximate composition of cuttlefish species from Thoothukudi coast.

2. Materials and methods
The study was conducted during the period from August, 2015 to February, 2016

2.1 Raw materials
Three species of cuttlefish *viz*. *Sepia pharaonis, S. prabahari* and *S. ramani* were procured from Thoothukudi fishing harbor, Tamil Nadu, India. Cuttlefish were iced immediately at the ratio of 1:1 (fish: ice) placed in an insulated box and transported fresh to the laboratory within 15 min. Flake ice was used for chilling the fish during the transportation.

2.2 Analysis of proximate composition
Moisture and ash content of cuttlefish flesh were determined by the standard AOAC method (1995). The Nitrogen content of cuttlefish flesh was determined by the Micro kjeldahl method

(AOAC, 1995) using KEL-PLUS digestion and distillation apparatus. The protein content was calculated by multiplying nitrogen content with a factor 6.25. Crude fat content of cuttlefish flesh was determined by Soxhlet method (AOAC, 1995) using petroleum ether 60-80°C as solvent in a SOCS PLUS-SCS 12 system.

3. Results and Discussion

The proximate compositions of cuttlefish determined for *S. pharaonis*, *S. prabahari, and S. ramani* are given in figure 1, 2, and 3, respectively.

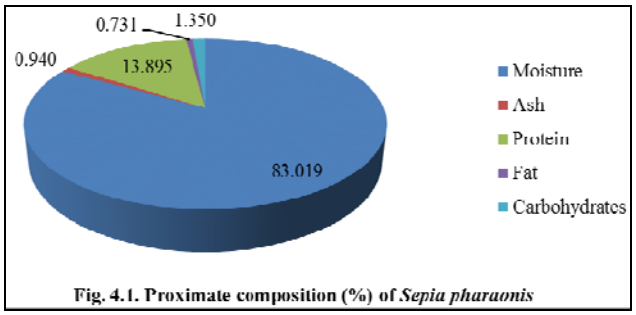

Fig. 4.1. Proximate composition (%) of *Sepia pharaonis*

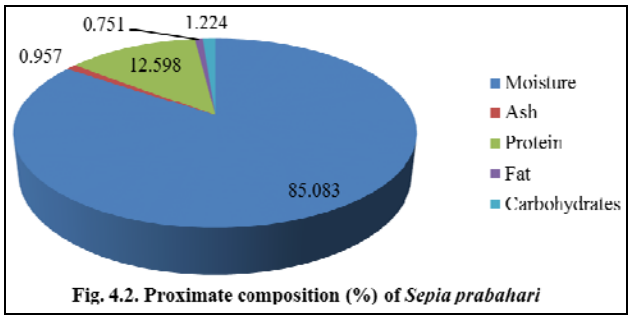

Fig. 4.2. Proximate composition (%) of *Sepia prabahari*

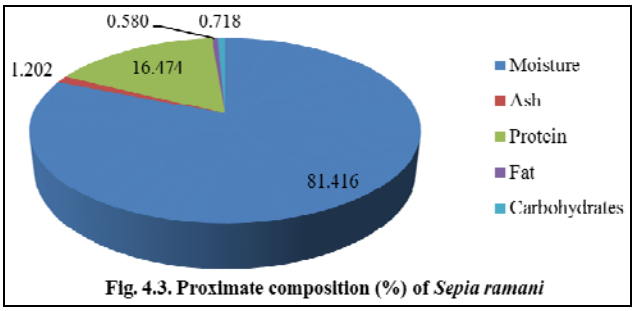

Fig. 4.3. Proximate composition (%) of *Sepia ramani*

The cuttlefish flesh, in general, had moisture greater than 81% with *S. prabahari* showing the maximum of 85%. The protein content in cuttlefish is quite lower compared to finfish and crustaceans; and it ranged from 12.59 to 16.47%. These values were similar to the reports of Thanonkaew *et al*. [5] for S. pharaonis (11.9–14.9% protein %) and Nurjanah [6] for *S. recurvirostra* (13.16 -13.51%). In the present study, *S. ramani* had the highest protein of 16.47%, followed by S. *pharaonis* (13.89%). The value obtained for *S. ramani* was in accordance with the protein content of S. *officinalis* (16.6%) as reported by Sykes *et al*. [7] Nevertheless, Lee [8] recorded much higher protein content of 18% in cephalopods, leaving only 3% of body mass for other biochemical compounds needed for life. This was evident through this study, as the fat, ash and carbohydrates of cuttlefish constituted less than 3%. Lipid content in cuttlefish is quite low <1% ranging from 0.58-0.75%. Ash content was around 1-1.2%, which was similar to *S. officinalis* (1.39%) as reported by Sykes *et al*. [7]

4. Conclusion

Food with high protein is generally considered to be nutritionally better and hence, *Sepia ramani* with highest protein content is nutritionally preferred among the three cuttlefish species.

5. Acknowledgement

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