



Biochemical composition and caloric values of different body segments of the female mangrove crab (*Scylla olivacea*)

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ABSTRACT

Scylla olivacea is regarded as a nutritionally and economically demandable species, however, there lies a paucity of information on this mangrove crab. Therefore, the objective of the present study is to assess the biochemical composition and caloric values of different body parts of female *S. olivacea*. The crab samples (100-150g) were collected from a mangrove area of Bagerhat district, the Southern part of Bangladesh from November 2019 to February 2020. The biochemical composition (moisture, protein, lipids, ash, and carbohydrate) and the energy value of the samples were analyzed following standardized methods. The moisture content varied from 38.99±1.29g to 75.15±0.78g per 100g of crab. The carbohydrate level was in the range of 2.89g/100g to 27.77g/100g, while protein content ranging from 0.65±0.10g/100g to 19.24±0.90g/100g. Per 100g of crab, the lowest amount of fat (0.40±0.14g) was observed in the bone while the highest amount (1.79±0.17g) in claw meat. Bone provided the highest amount of ash (32.20±0.69g/100g) and energy (117.34kcal/100g) than other body parts of the crab. The present study reveals that female *S. olivacea* is high in protein and low in fat providing a good amount of energy. Hence, research on *S. olivacea* and other crabs commonly found in Bangladesh should be expanded to get more comprehensive knowledge of their nutritional profile and health benefits.

INTRODUCTION

Crab is considered as a vital member of decapod crustaceans belonging to the shellfish group and living in marine, brackish, or freshwaters habitat. Crabs can be extensively found in shallow waters, especially in mangrove areas and estuaries (Wan Yusof *et al.*, 2019). In Bangladesh, crabs particularly dwell in the estuaries, tidal rivers of the Sundarbans shrimp polders (Khan and Alam, 1992). Crabs are good exportable fishery

products and hidden valuable resources in Bangladesh (Ahmed, 1992). Nowadays it's become a popular fisheries item and a typical seafood product among other seafood in Bangladesh.

A total of Sixteen crab species has been reported from Bangladesh including *Scylla serrata*, *Scylla olivacea*, *Portunas pelagicus*, *P. sanguinolentus*, *Charybdis feriata*, *Charybdis rostrata*, *Matuta lunaris*, *M. planipes*, *Clappa lophos*, *C. pustulosa*, *Varuna litterata*, *Sartorina spinigera*, *Ocypoda cratophthalma*, and *Gelasimus annulipes* (Banglapedia, 2014). Studies found that crab is a good source of nutrition and a valuable fishery product, particularly for the two species known as *S. serrata* and *S. paramamosain* (Keenan *et al.*, 1998, Zafar *et al.*, 2004, Meng *et al.*, 2017)

S. olivacea is known as mangrove crab or olive crab, which is available in the mangrove area and seasonally in the coastal region. *S. olivacea* is considered to be nutritionally and economically demandable species, thus coastal people are more encouraged to culture this species commercially. Studies found that the biological properties of mangrove crabs consist of antimicrobial peptides and antioxidants that can be directly applied to the food, agriculture, and pharmaceutical industries (Sperstad *et al.*, 2011, Zhao *et al.*, 2015, Wan Yusof *et al.*, 2017). Consequently, biochemical composition among the different body segment of *S. olivacea* is necessary.

While the comparative study on the biochemical composition of other crabs (e.g., mud crab *S. serrata*) is available in the literature, there is little information found about *S. olivacea*. Therefore, we attempted to assess nutritional value in different body segments of mangrove crab, *S. olivacea*. We assume our study would be helpful for better understanding the nutritional value of these particular crab body meat and to compare the nutritional values of similar food and food products.

MATERIALS AND METHODS

Study area and sampling

The samples (7-10 crabs, 100-150g each) were collected from 7 different locations of mangrove area in Bagerhat district, the Southern part of Bangladesh from November 2019 to February 2020, as shown in Figure 1.

Immediately after collection, the crabs were stored in an icebox and carried it to the laboratory of Glove Agroviet Limited, Mirwarishpur, Noakhali. Mud crabs were washed carefully with tap water. Then a dissection box and some other equipment were used to collect crab meat. The crab meat was collected from different segments of their body and kept it in a different tray. About 50-100g of crab meat was taken from each of the 7 locations and mixed together to prepare a composite homogenous mixture. At the end, these composite samples were used for biochemical analysis.

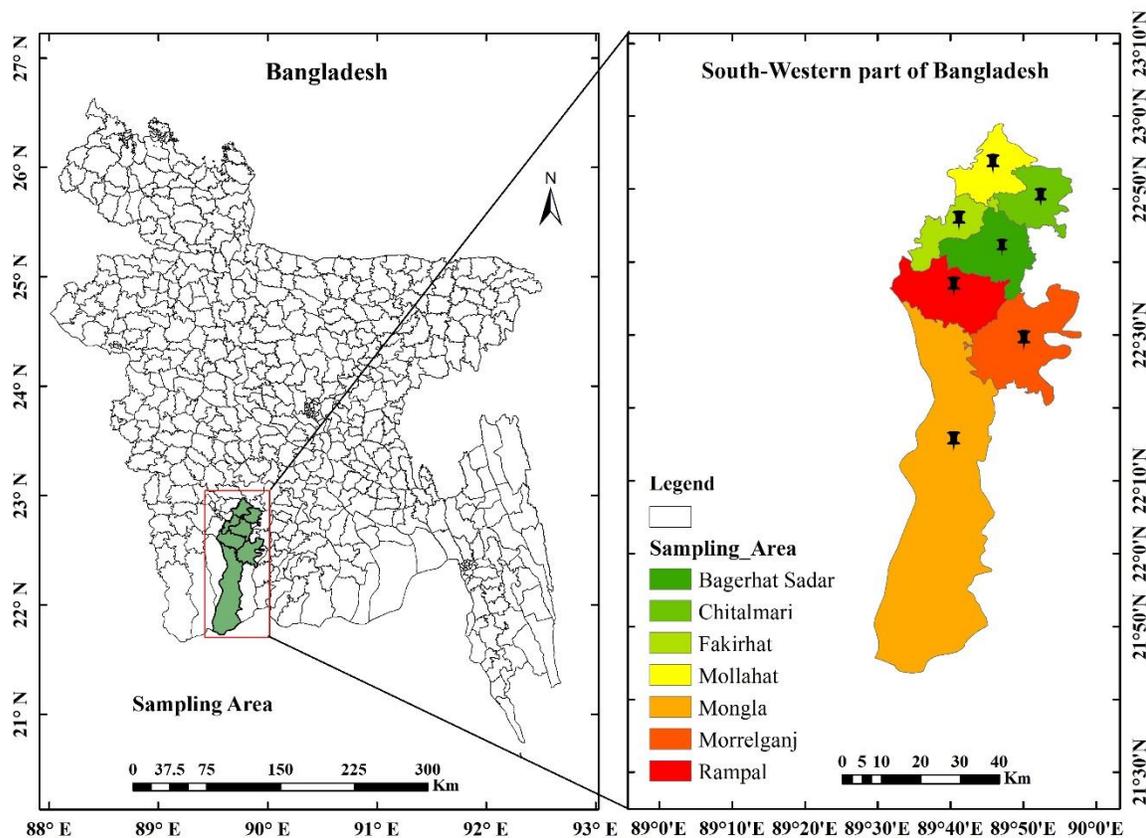


Figure 1. Location of the study area along with the sampling sites.

Determination of biochemical composition

Moisture content

The amount of moisture in different body segments of *S. olivacea* was determined by the AOAC method (AOAC, 1990).

Total ash

Total ash content was estimated following the AOAC method (AOAC, 1990).

Crude protein

The amount of crude protein was assessed by the Kjeldahl method (Bradstreet, 1965).

Total lipid

Lipid content was estimated by Soxhlet's method (Pearson, 1976).

Total carbohydrate

The total carbohydrate content was calculated by difference.

Energy content

The energy content of different body parts of mangrove crab was determined using factors 4, 4, and 9 for carbohydrates, protein, and fat, respectively.

Statistical analysis

All analyses were carried out in triplicate. The Statistical Package for the Social Sciences (SPSS) software (version 26.0) for Windows (SPSS, Inc., Chicago, IL, USA) was used for data analyses. The results were presented as mean and standard deviation (SD).

Moreover, the differences in the mean of moisture, carbohydrate, protein, fat, and ash content, and energy level between different body parts of *S. olivacea* were compared using one-way analysis of variance (ANOVA) test. A P value of less than 0.05 was considered statistically significant for all tests.

RESULTS AND DISCUSSION

Biochemical analysis is imperative to generate knowledge on nutritional and biochemical composition and specific nutritional information like protein, fat, carbohydrate, and mineral content of mud crabs commonly found in Bangladesh is not well documented. In the present study, we conducted a biochemical analysis of mangrove crab *S. olivacea*. Table 1 shows the biochemical compositions of different body segments of female *S. olivacea*.

Table 1. Biochemical composition (g/100g) of different body segments of female *Scylla olivacea*.

	Moisture	Carbohydrate	Protein	Fat	Ash
Claw meat	75.15±0.78 ^a	2.96±0.54 ^a	18.86±0.76 ^a	1.79±0.17 ^c	1.24±0.12 ^a
Breast meat	74.94±1.14 ^a	2.89±0.40 ^a	19.24±0.90 ^a	1.46±0.09 ^a	1.46±0.20 ^a
Bone	38.99±1.29 ^b	27.77±1.39 ^b	0.65±0.10 ^b	0.40±0.14 ^b	32.20±0.69 ^b
Whole body	74.96±1.00 ^a	3.30±0.62 ^a	19.10±0.43 ^a	1.43±0.07 ^a	1.20±0.08 ^a

Data are mean±standard deviation. Values within the same column with different letters are significantly different (P<0.05).

The water content ranged from 38.99±1.29g in the bone to 75.15±0.78g in claw meat with 74.96±1.00g in whole-body per 100g of female crab. This finding is not consistent with the previously reported moisture content of *S. olivacea* (Lyla *et al.*, 2017, Wan Yusof *et al.*, 2019). Some previous studies on *S. serrata* and *S. tranquebarica* found similar moisture levels with the present study (George and Gopakumar, 1987, Zafar *et al.*, 2004, Paul *et al.*, 2015, Sreelakshmi *et al.*, 2016).

The carbohydrate level of female mangrove crab was the lowest in breast meat (2.89g/100g) and the highest in bone (27.77g/100g) where the whole-body carbohydrate content was 3.30±0.62 g/100g. A previous study on *S. olivacea* showed similar carbohydrate content (Wan Yusof *et al.*, 2019), however, the present finding is higher than another study on *S. olivacea* (Lyla *et al.*, 2017). Some studies on *S. serrata* also showed lower carbohydrate content than the present study (Zafar *et al.*, 2004, Vijaya Bharathi *et al.*, 2018).

All of the body parts of female *S. olivacea* contained a similar amount of protein as whole-body (19.10±0.43g/100g) except bone (0.65±0.10g/100g). The present findings corroborate those of other studies on *S. olivacea* and *S. serrata* (George and Gopakumar, 1987, Zafar *et al.*, 2004, Wan Yusof *et al.*, 2019). However, inconsistency in protein content was also observed with other studies on mud crabs (Sarower *et al.*, 2013, Sreelakshmi *et al.*, 2016, Lyla *et al.*, 2017, Vijaya Bharathi *et al.*, 2018)

The fat content varied within different body parts of the female crab i.e. the lowest amount observed in bone (0.40g/100g) while claw meat had the highest amount (1.79g/100g) and whole-body fat content was 1.43g/100g. This finding is in line with the lipid content of *S. serrata* and *S. tranquebarica* (George and Gopakumar, 1987, Sreelakshmi *et al.*, 2016). However, it is different in compared to other studies on *S.*

olivacea and other mud crabs (Zafar *et al.*, 2004, Sarower *et al.*, 2013, Paul *et al.*, 2015, Lyla *et al.*, 2017, Vijaya Bharathi *et al.*, 2018, Wan Yusof *et al.*, 2019)

Ash content was higher in bone (32.20 ± 0.69 g/100g) than other body segments with whole-body ash content was 1.20 ± 0.08 g/100g in female crab. The ash content noted in the present study is comparable to previous findings on mud crabs (Zafar *et al.*, 2004, Sarower *et al.*, 2013), although some noted different results (George and Gopakumar, 1987, Paul *et al.*, 2015, Sreelakshmi *et al.*, 2016, Lyla *et al.*, 2017).

Figure 2 shows the energy content of different body parts of female *S. olivacea*. Bone provided the highest energy (117.34kcal/100g) and the whole-body energy level was 102.5kcal/100g of female mangrove crab.

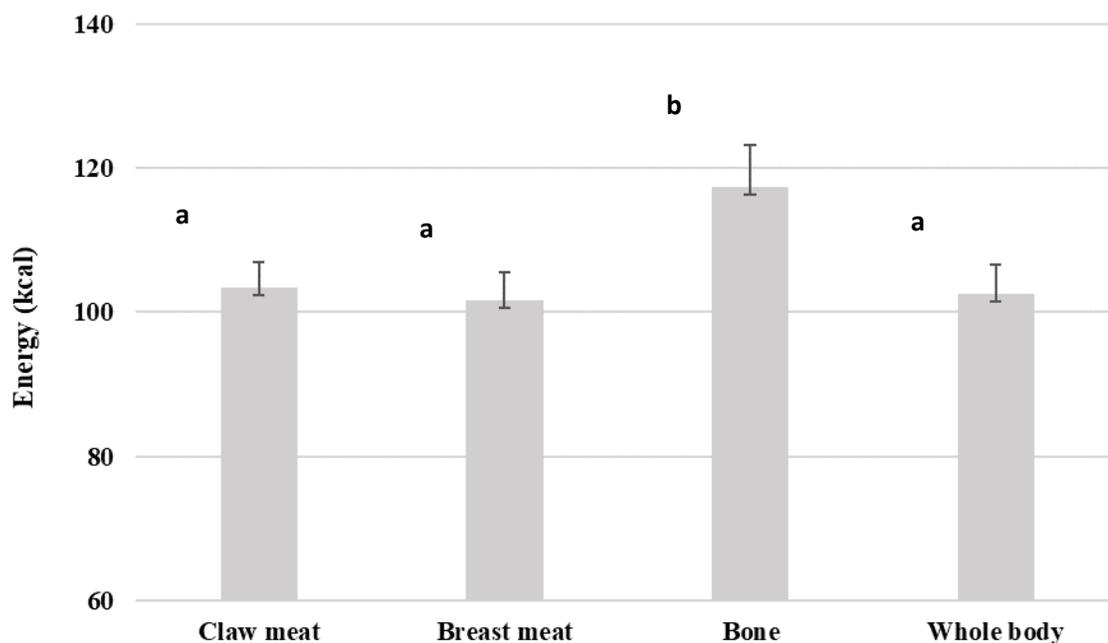


Figure 2. Mean (\pm SD) energy content (kcal/100g) of different body segments of female *Scylla olivacea*. Values within the same column with different letters are significantly different ($P < 0.05$)

The present study has some limitations. First, we conducted a biochemical analysis of female *S. olivacea* only. Analysis of both male and female crabs could provide gender differences in biochemical profiles. Second, the assessment of seasonal variation in biochemical composition could not be performed. Third, information like maturity, feeding practice, etc. were not collected which might affect the biochemical composition of crabs.

CONCLUSION

Crab is a good exportable fisheries product and a source of income for many people in Bangladesh. The results of the present study show that female *S. olivacea* is rich in protein and low in fat with a good source of energy, therefore, it can be a healthy choice for human consumption. It is thus recommended to enhance research on *S. olivacea* and

other crabs commonly found in Bangladesh to have a more comprehensive knowledge of their nutritional profile and health benefits.

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