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Short communication

Determination of the proximate composition of most sought-after crab species from Devi estuary, Odisha, India

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Two species of Portunid crabs, *Portunus pelagicus* (Linnaeus, 1758) and *P. sanguinolentus* (Herbst, 1783) abundant in Devi estuary, Astaranga, Odisha were analyzed for key nutrients (carbohydrates, proteins, and lipids) through standard protocols. Findings revealed high protein content in the females than in the male species. Furthermore, the body muscles were richer in protein than the chelate tissues of the species examined. The crab *P. sanguinolentus* was nutritionally productive with significantly ($p < 0.05$) higher protein (173.58 mg/g) and other nutrients (carbohydrates 5.23 mg/g; and lipids 22.95 mg/g) than *P. pelagicus* (protein 59.58 mg/g; carbohydrate 4.2 mg/g; and lipid 19.93 mg/g). Notably, muscle tissues of female crabs were higher in nutrients than that of males. Further, nutrient content in body muscles was greater than in the chelate appendages. Given the near absence of data on the nutrient composition of palatable crabs from the Devi estuary, Astaranga, it is contended that the information obtained could be decisive in addressing the nutritional needs of the coastal populace and aid judicious utilization and marketing of the species.

[**Keywords**: Estuary; Odisha, Portunid crabs, Proximate composition]

Introduction

Seafood as a superior source of various nutrients, like protein, amino acids, fatty acids (omega 3), vitamins, and minerals[1] has helped ease food crises in many developing countries, thereby providing valuable supplements to diverse and nutritious diet[2]. Amongst fin and shellfish from marine/ estuarine/ mangrove resources, crustaceans such as crabs have been in demand given the much-favoured palatability. Furthermore, based on the national nutrient database report for standard reference[3], edible crab meat is a source of protein, carbohydrate, lipid, unsaturated fatty acids, and key vitamins such as retinol, ß-carotene, B12, and C[(ref. 4)]. Additionally, the clinical significance of crab components in treating asthma, chronic fever, and other ailments[5] makes such shelled crustaceans the most sort after group worldwide.

The mangrove-fringed Devi estuary at Astaranga (19°58'45.16" N – 86°20'32.54" E) in Odisha, India, is well documented for brachyuran crabs[6]. Fishers from adjoining villages venture into the estuary, mangrove creeks, and the sea for harvesting fish and crabs. Their daily sustenance and livelihood depend on the availability/ harvest and export potential of fin and shellfish catch – notably Portunid crabs like *Portunus pelagicus* (Linnaeus, 1758), and *P. sanguinolentus* (Herbst, 1783) (Fig. 1). Therefore, considering the above, the study's main objective was to assess the proximate composition of three key nutrients such as carbohydrates, proteins, and lipids in the two most abundant and commercially valued crab species. Given that such reports from the Devi estuarine region are almost non-existent, the study assumes significance.

Materials and Methods

Males and females of two sought-after, edible, viable species, for example, *P. pelagicus* and *P. sanguinolentus* with a carapace width of 90 – 110 mm, were collected from Devi estuary. The specimens were transported in a frozen condition to the laboratory, washed, blotted, weighed and morphometrics measured with Vernier calipers. The procedure was followed by separate removal of muscle tissue from the cephalothorax and chelate legs, respectively. For analysis, the tissues were dried (50 °C), weighed, homogenized, followed by storage in airtight vials at -20 °C for further analysis. Carbohydrate was estimated by the Anthrone method[7], protein and total lipids by methods as outlined by Lowry *et al*.[8] and Folch *et al*.[9].

Results and Discussion

Findings revealed maximum quantities of nutrients, for example, protein (173.58 mg/g), carbohydrate (5.23 mg/g), and lipid (22.95 mg/g) in *P. sanguinolentus* than in *P. pelagicus* (protein, 59.58 mg/g; carbohydrate, 4.2 mg/g; lipid, 19.93 mg/g) (Table 1; Fig. 2), in agreement with other studies on the aforementioned species[10,11]. Protein

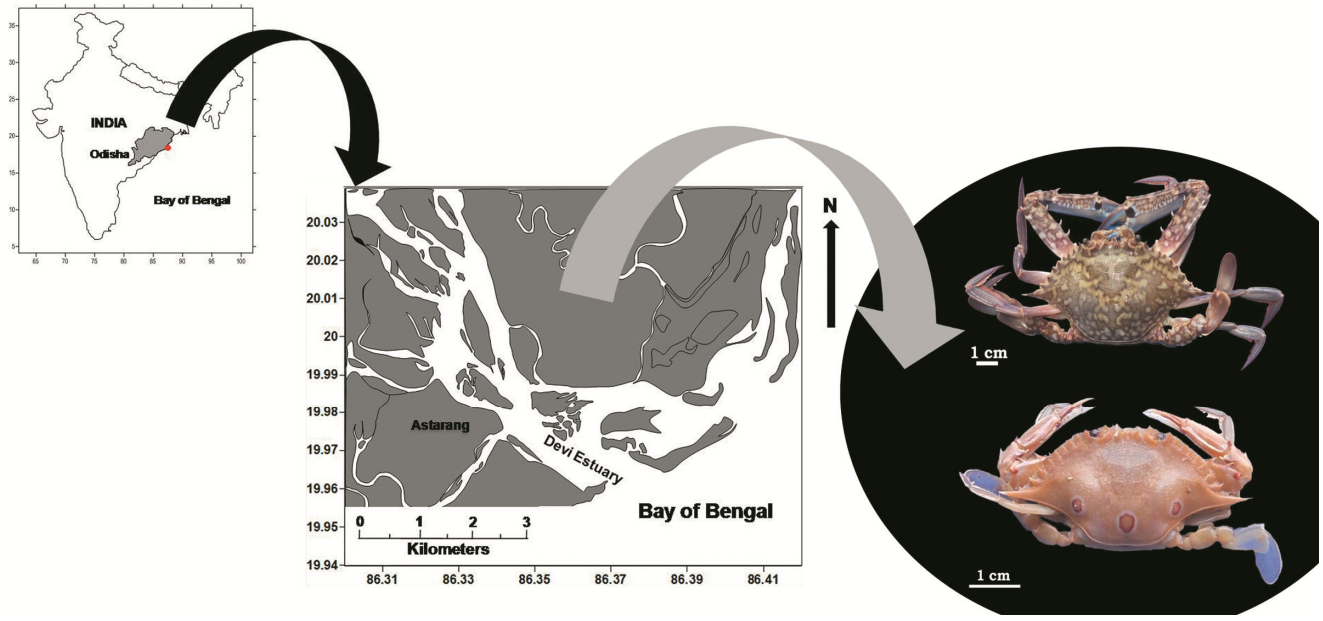

Fig. 1 — Maps showing the Devi estuary and sampling location of *Portunus pelagicus* (top) and *P. sanguinolentus* (bottom)

Table 1 — Proximate composition and morphometrics of two commercially important species of crabs from Devi estuary and adjacent mangrove habitats 2014-17

Species /Sex/No. designation	Carapace (Length× Width) mm	Body weight (g)	Body protein (mg/g)	Chelate leg protein (mg/g)	Total protein (mg/g)	Body carbohydrate (mg/g)	Chelate leg Carbohydrate (mg/g)	Total carbohydrate (mg/g)	Body lipid (mg/g)	Chelate leg lipid (mg/g)	Total lipid (mg/g)
Portunus sanguinolentus male 1	70×102	145	115.0	41.5	156.5	2.1	1.7	3.8	12.4	2.8	15.2
P. sanguinolentus male 2	58×103	120	50.5	37.0	87.5	1.4	3.4	4.8	17.6	5.4	23.0
P. sanguinolentus male 3	66×110	140	82.8	39.3	122.0	1.8	2.6	4.3	15.0	4.1	19.1
P. sanguinolentus female 1	68×104	120	143.0	94.0	237.0	5.0	4.3	9.3	20.3	7.3	27.6
P. sanguinolentus female 2	62×100	90	152.8	60.5	213.3	2.0	1.0	3.0	19.2	6.8	26.0
P. sanguinolentus female 3	81×106	210	147.9	77.3	225.2	3.5	2.7	6.2	19.8	7.1	26.8
Mean		137.5	115.3	58.3	173.6	2.6	2.6	5.2	17.4	5.6	23.0
SD			41.2	23.4	55.7	1.4	1.2	2.1	3.1	1.8	4.5
Portunus pelagicus male 1	68×110	150.0	25.3	39.0	64.3	2.3	1.8	4.1	1.7	9.7	11.4
P. pelagicus male 2	59×95	80.0	22.5	22.5	45.0	1.3	1.5	2.8	5.4	8.6	14.0
P. pelagicus male 3	63×108	100.0	23.9	30.8	54.7	1.8	1.7	3.5	3.6	9.2	12.7
P. pelagicus female 1	62×105	130.0	54.0	30.5	84.5	1.5	1.8	3.3	8.2	20.9	29.1
P. pelagicus female 2	58×91	90.0	26.5	18.0	44.5	4.5	2.1	6.6	9.6	15.6	25.2
P. pelagicus female 3	55×90	109.0	40.3	24.3	64.5	3.0	2.0	5.0	8.9	18.3	27.2
Mean		109.8	32.1	27.5	59.6	2.4	1.8	4.2	6.2	13.7	19.9
SD			12.5	7.5	13.7	1.2	0.2	1.3	3.2	5.3	7.4

content was the highest, followed by lipid and carbohydrate in both species reported from India[10,12]. Notably, the trawl catch landings at Astaranga were dominated by abundant hauls of *P. sanguinolentus*. Considering its relatively higher protein content and palatability, this brachyuran crab species was identified as nutritionally beneficial. Furthermore, it is lucratively marketed by the local fishing community owing to the preferred flavour.

Gender wise, females of both the species examined were richer in nutrients than males (Table 1; Fig. 3). For instance, proteins (225.15 mg/g), carbohydrates

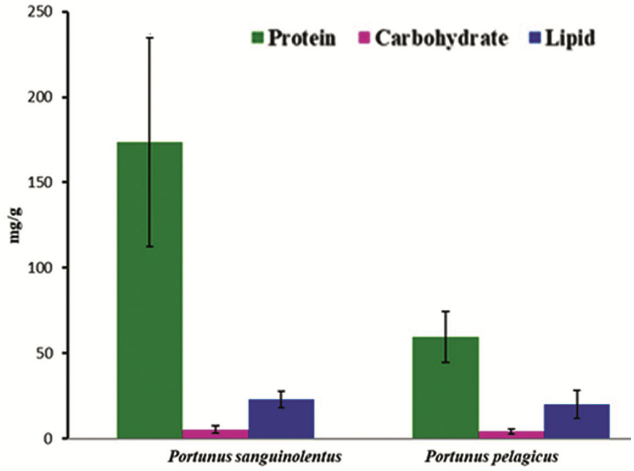

Fig. 2 — A comparison of nutrients analysed in *Portunus sanguinolentus* and *P. pelagicus* from Devi estuary, Astaranga. *** $p < 0.05$ between protein contents

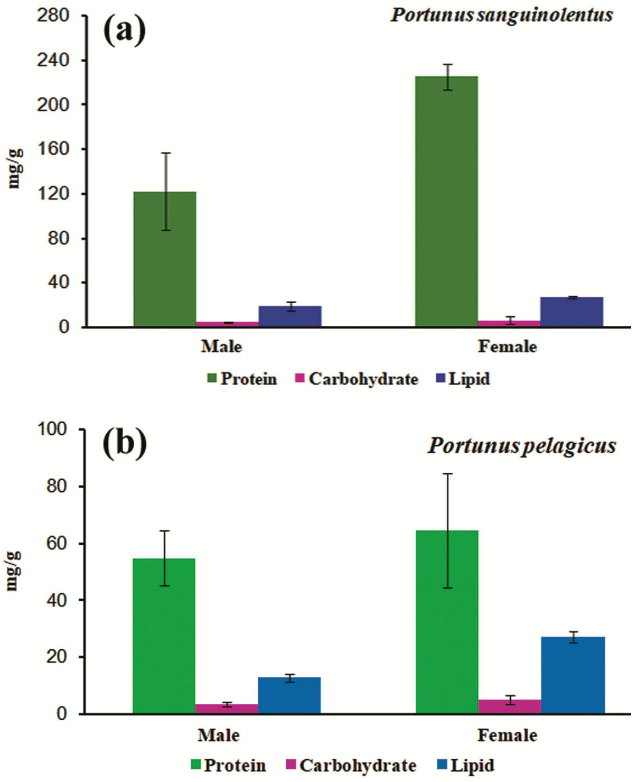

Fig. 3 — A comparison of nutrients between the sexes of (a) *Portunus sanguinolentus* *** $p < 0.0001$ between protein contents, and (b) *P. pelagicus* from Devi estuary, Astaranga

(6.15mg/g), and lipids (26.8mg/g) in females of *P. sanguinolentus* were distinctly higher in contrast to that of males (protein 122 mg/g; carbohydrate 4.3 mg/g; lipid 19.1 mg/g). Remarkably, females of *P. pelagicus* (protein 64.5 mg/g; carbohydrate

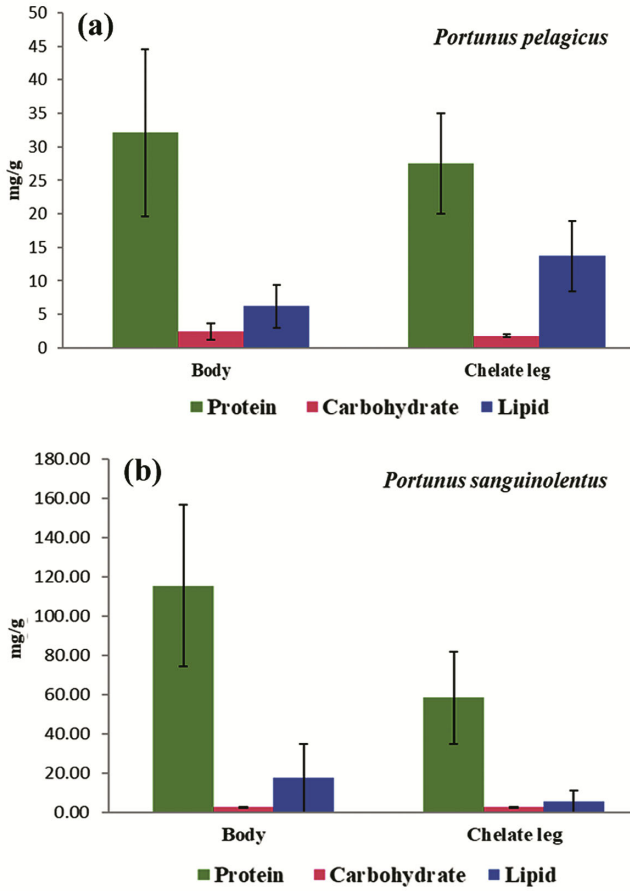

Fig. 4 — Comparison of nutrients between the Body and chelate leg of (a) *P. Pelagicus* Chelate leg lipid and Body lipid significant ** $p < 0.05$, and (b) *P. sanguinolentus* from Devi estuary, Astaranga. Significant difference between Body lipid and Chelate leg lipid**; Body Protein and Chelate leg Protein * $p < 0.05$

4.95 mg/g; lipid 27.15 mg/g) were additionally nutritive than the males (protein 54.65 mg/g; carbohydrate 3.45 mg/g; lipid 12. 7 mg/g). Relatively high protein and fat content in female *P. pelagicus* were likewise reported from the Southern coast of India[13].

Comparative nutrient analysis of major edible portions of crabs, such as the body and chelate legs, revealed *P. pelagicus* with protein (body 32.08 mg/g; chelate leg 27.5 mg/g) and carbohydrate (body 2.4 mg/g; chelate leg 1.8 mg/g) to be maximum in body meat than the chelate leg meat as stated for the same species from the southeast coast of India[14]. Likewise, in *P. sanguinolentus*, the protein, carbohydrate, and lipid content were maximum in body meat (protein 115.3 mg/g; carbohydrate 2.63 mg/g; lipid 17.38 mg/g) as compared to the chelate leg (protein 58.25 mg/g; carbohydrate 2.6 mg/g; lipid 5.58 mg/g) (Fig. 4).

The present study indicated much higher protein content in the crab meat, although lipid and carbohydrate percentages were low. Therefore, crabs as available food resources abundant in the mangrove-fringed estuarine region of Astaranga are of value. As a result, Portunids, for example, *P. sanguinolentus* and *P. pelagicus* should be the much-preferred dietary additions expected to contribute to the economic sustenance of the fishing communities.

Conclusion

In recent times, marine resources have been explored for human consumption globally. Thus, various organisms, primarily crustaceans, are increasingly recognized for their flavour and nutritional health benefits. Given the abundant availability of crabs from the mangrove-fringed environment of Devi estuary at Astaranga, Odisha, it is imperative to formulate fisheries policies to address food malnutrition degrees and augment the commercial viability of the aforementioned brachyuran crab species from the region.

Acknowledgments

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Conflict of Interest

There is no conflict of interest.

Author Contributions

Specimen acquisition & photographs - BM; Laboratory analysis and figures - SRJ, JN & AS; Preparation of map - SSR & BD; Writing - DR & BM. Funding acquisition - DR.

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