

Nutritional Evaluation of Indigenous Freshwater Crustaceans Consumed by the Santal Tribe in Dumka District, Jharkhand

Sumit Kumar Kisku^{1*}, Punam Hembrom²

¹Ph.D. Research Scholar, University Department of Zoology, S.K.M.University, Dumka, Jharkhand, India

²Assistant Professor, University Department of Zoology, S.K.M.University, Dumka, Jharkhand, India

sumitkisku@gmail.com, punamdumka02@gmail.com

Abstract

Indigenous foods of a tribe are defined as traditional foods that are locally sourced and native to the tribe's geographic region and cultural practices. Freshwater habitats are critical resources that are highly susceptible to extinction and require urgent conservation efforts from tribal communities. This study aimed to evaluate the nutritional value of two indigenous freshwater crustaceans, shrimp (*Macrobrachium lamarrei*) and crab (*Sartoriana spinigera*), consumed by the Santal tribe, by examining their proximate composition on a dry-weight basis. The analysis of the dried flesh revealed that protein levels differed significantly between the two species, with *Macrobrachium lamarrei* exhibiting a protein content of 55.26%, whereas *Sartoriana spinigera* exhibited a lower protein content of 30.25%. Conversely, the carbohydrate content was higher in *Sartoriana spinigera* (28.63 %) than that in *Macrobrachium lamarrei* (15.75 %). Both species are characterized by relatively low-fat content. This study also quantified the concentrations of minerals, including sodium, potassium, iron, zinc, calcium, and phosphorus in the dried crustacean flesh. The nutritional enhancement of these indigenous food sources has been recognized as an excellent source of protein and minerals for the Santal tribe community, thereby improving their food security.

Keywords: Crustaceans, Indigenous food, Nutritive value, Santal tribe.

I. INTRODUCTION

Indigenous foods play a crucial role in the lives of the Santal tribe by sustaining their health, culture, and livelihood. Traditional foods, such as locally available cereals, millets, leafy greens, tubers, wild fruits, and small fish or crustaceans, are typically rich in micronutrients and help prevent malnutrition (Narang & Shweta, 2025). These foods are closely linked to Santal ecological knowledge, agricultural practices, and forest-based livelihoods, reinforcing their connection to the land and biodiversity. Food-related rituals, festivals, and sharing practices strengthen social bonds and cultural identity. Simultaneously, the increasing dependence on market foods and the erosion of traditional food systems threaten both the nutritional security and cultural heritage of the Santal community, making the preservation and promotion of indigenous foods especially important.

Crustaceans play a crucial role in freshwater ecosystems by contributing to energy transfer and nutrient cycling (Bali et al., 2025). They consume algae, detritus, and smaller organisms and serve as an important food source for fish, amphibians, and aquatic birds. Their feeding activities help regulate primary production, maintain water quality, and support ecosystem stability and biodiversity.

Crustaceans play a significant role in enhancing food security among the Santal community by providing an accessible and nutrient-dense animal protein source that can be obtained from local freshwater bodies with minimal inputs. Their collection, processing, and sale also support household livelihoods and income diversification, thereby buffering Santal families against seasonal food shortages and fluctuations in agricultural yield. This study aimed to investigate the potential use of freshwater crustaceans as an alternative protein source and their economic significance in supporting Santal livelihoods.

II. MATERIALS AND METHODS

Collection and Preservation of Crustacean samples

Samples of indigenous crustacean species were collected from rivers and natural wetlands across various regions of Dumka district. Sampling was conducted during the monsoon season, when this species thrives. Specifically, crabs were hand-picked from burrows found in the mud banks of rice fields, and shrimp were captured using fine-mesh gill nets in the river stream.

Once collected from the study site, the samples were rinsed with clean water before being placed in a freezer for storage. The shrimp and crab samples were initially oven-dried and then crushed and pulverized into a powdered form, which was subsequently used for analysis. The powdered samples were kept in vials, which were placed inside desiccators for storage.

Determination of Proximate Composition

The IS-12711:2012 method was used to evaluate the moisture and mineral content of the flesh. Protein levels were analyzed according to the IS-7219:2012 method. The IS-12711:2012 method was used to determine the fat content. Carbohydrate levels were measured using the IS-1656:2007 standard method. Energy content calculations were based on the FAO(UN):2009 method. Sodium and potassium concentrations were assessed using the IS 9497(1980) method. The FSSAI LAB MANUAL 2016 method was used to evaluate the calcium and iron content. Zinc and phosphorus levels were determined using the FSSAI LAB MANUAL 9 (2015) and IS 7874-2(1975) methods, respectively.

III. RESULTS

Proximate Composition

The flesh of *Macrobrachium lamarrei* had a moisture content of 4.72%, whereas *Sartoriana spinigera* showed a slightly higher moisture content of 5.14%. In the comparison of these two crustaceans, *Sartoriana spinigera* was identified to have a greater mineral content (33.01%). Regarding protein levels, *Macrobrachium lamarrei* had a higher protein content (55.26 %) than *Sartoriana spinigera* (30.25 %). The average carbohydrate content in the flesh of these crustaceans was 22.19 mg per 100 g of dried sample. This study revealed that these crustaceans have a low fat contribution, with *Sartoriana spinigera* containing 2.97% fat and *Macrobrachium lamarrei* containing 4.55%. The findings of this analysis are presented in Table 1.

Table 1. Proximate composition of the dried flesh.

Species	Moisture (%)	Mineral Content (%)	Protein (%)	Fat (%)	Carbohydrate (%)	Energy (Kcal/100 g)
<i>Macrobrachium lamarrei</i>	4.72	19.72	55.26	4.55	15.75	324.99
<i>Sartoriana spinigera</i>	5.14	33.01	30.25	2.97	28.63	262.65

Mineral Composition

These indigenous crustaceans exhibit significant levels of sodium and potassium. Specifically, *Macrobrachium lamarrei* had a higher sodium concentration (518.14 mg per 100 g) than *Sartoriana spinigera* (293.14 mg per 100 g). Similarly, regarding potassium content, *Macrobrachium lamarrei* had a greater concentration of 590 mg per 100 g, whereas *Sartoriana spinigera* had a lower concentration of 300.07 mg per 100 g.

These native crustaceans are rich in iron and contain small amounts of zinc. *Sartoriana spinigera* boasts a higher iron content, measuring 29.05 mg per 100 g, whereas *Macrobrachium lamarrei* has 15.38 mg per 100 g. On average, the zinc level in these crustaceans was 5.72 mg per 100 g of dry sample. Moreover, calcium and phosphorus were found at moderate levels, with average concentrations of 3.33% for calcium and 1.71% for phosphorus. Table 2 displays the results of this analysis.

Table 2. Mineral composition found in the dried flesh.

Species	Sodium (mg/100 g)	Potassium (mg/100 g)	Iron (mg/100 g)	Zinc (mg/100 g)	Calcium (%)	Phosphorus (%)
<i>Macrobrachium lamarrei</i>	518.14	590.78	15.38	5.24	4.21	2.17
<i>Sartoriana spinigera</i>	293.14	300.07	29.05	6.20	2.45	1.26

IV. DISCUSSION

The current study revealed that these indigenous crustaceans possess sufficient nutritional content and naturally flourish in local rivers and wetlands inhabited by Santal communities. In this study, the protein content of *Macrobrachium lamarrei* was approximately 55% without any feeding supplements found in their natural habitat. This study is the first investigation of the nutrient composition of indigenous crustaceans consumed by the Santal tribe. This study provides important insights into the potential of these crustaceans as a cost-effective protein source, which could improve food security within the Santal community.

(Venkatesh et al., 2025) reported protein contents of 69.4% and 62.8% in *Macrobrachium lamarrei* reared on CP 30% commercial pellet and tilapia fish meat (TM), respectively. Similarly, (Sultana & Talukder, 2026) documented 67.8% and 60.4% for these species. In contrast, this study identified 55.26% protein content in specimens from their natural freshwater habitats with natural dietary habits. This discrepancy represents the most significant difference between these studies, and the protein content differences may be due to the region, diet, and environment.

The protein content of *Sartoriana spinigera*, as reported by (Pati et al., 2012), was 33.32%. This finding supports the conclusion of the current study that this crustacean species contains a significant proportion of protein (30.25%). According to (Ravichandran S, 2013), the average protein content in male, female, and berried crabs of the species *Podopthalmus vigil* is 21.97%. In contrast, the present study indicated that *Sartoriana spinigera* exhibits a higher protein content.

V. CONCLUSION

The results of this study indicate that the indigenous crustaceans consumed by the Santal tribe are rich in minerals, with shrimp and crabs containing approximately 55% and 30% protein, respectively, in their natural habitat and diet. Cultivating these species in a supplemented dietary environment may enhance their nutritional value. Such enhanced cultivated crustaceans could serve as a cost-effective protein source to address malnutrition in the Santal community.

Enhancing public awareness is crucial for advancing the cultivation of these indigenous crustaceans using supplementary diets, including 30% commercial CP pellets and tilapia fish meat (TM), which enhances their nutritional value. This approach can ensure food security and economic sustainability of the Santal tribe.

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