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Proximate composition of different organs in crabs of *Portunus sanguinolentus* (Herbst)

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Abstract
Crabs are not a targeted resource in India, although they are available in the local and international markets. The crab fishery in India is fast developing and there is a vast scope for the crab meat, both national and international markets. Crabs are an incidental catch in trawl and they are also caught in meager quantities by specialized gill nets, locally known as 'Nandu valai' in Tamil Nadu. The commercially important portunid crabs found along Nagappattinam coast *is Portunus sanguinolentus.* The fishery and stock characteristics of the dominant species of crab, *Portunus sanguinolentus* was studied along the Nagappattinam coast. Hence it will be pertinent to describe the fishery of this important resource and also to study the biochemical characters of the dominant species, *P. sanguinolentus* off Nagappattinum. The results of the present study concluded that the protein and carbohydrate content were higher in ovary followed by hemolymph, muscle and hepatopancrease while amino acid and lipids were higher in ovary followed by hemolymph, hepatopancrease and muscle. The rich source of biochemical (Protein, amino acid, carbohydrate and lipid) content was found in *P. sanguinolentus*.

Keywords: *Portunus sanguinolentus*, crabs, biochemical content, ovary, hemolymph, hepatopancrease and muscle

Introduction
Crabs are not a targeted resource in India, although they are available in the local and international markets. The crab fishery in India is fast developing and there is a vast scope for the crab meat, both national and international markets. Crabs rank third next to the shrimps and lobsters for their esteemed seafood delicacy and also the value of fishery they support (Mohammed Saved and Rajeev Rahavan, 2001) [9]. Crabs are an incidental catch in trawl and they are also caught in meager quantities by specialized gill nets, locally known as 'nandu valai' in the Tamil Nadu coast. The crab fishery off east coast is supported by *Portunus sanguinolentus, Podopthalmus vigil, Portunus pelagicus, Charybdis lucifera* and *C. natator*, all members of Portunidae family. The commercially important portunid crabs found along Nagappattinam coast *is Portunus sanguinolentus.* The fishery and stock characteristics of the dominant species of crab, *Portunus sanguinolentus* was studied along the Nagappattinam coast. The annual crab landings during the period 1998-2007 ranged from 236 t to 1,628 t with the catch rate fluctuating between 0.78 kg/h and 2.01 kg/h. There are several reports on the fishery and dynamics of crabs from both west and east coasts of India (Lalitha Devi, 1985; Telang and Tippeswamy, 1986; Sukumaran and Neelakantan, 1996a, 1997a; Jose and Menon, 2007 and Dineshbabu, 2011) [7, 20, 18, 19, 6, 2]. Besides, a general account of the crab fishery off east coast was given by Subramaniam (1998) [17] for the period 1985-95. There has been no published information on the stock characters of any species of crab from this coast so far. Hence it will be pertinent to describe the fishery of this important resource and also to study the biochemical characters of the dominant species, *P. sanguinolentus* off Nagappattinum.

Materials and Methods
Description of the experimental animal

Systematic Position

Phylum	:	Arthropoda
Order	:	Decapoda Latreille
Family	:	Portunidae Rafnesque
Genus	:	Portunus Weber
Species	:	*P. sanguinolentus* Herbst

Nomenclature : Common and vernacular names of P.sanguinolentus in India are given below:

Common Name: Tree spotted crab (or) Blood spotted crab

Tamil	:	Mukkannu nandu
Gujarathi	:	Karachla
Marathi	:	Khekhada
Kannada	:	Denji
Malayalam	:	Kavalan njandu
Telugu	:	Chukkala peeta
Oriya	:	Kankda/Cherala petta
Bengali	:	Lajjaboti kankra

In Tamil Nadu, the local fisherman calls as "Mukkannu nandu". Tis crab got its common name from three prominent red to maroon spots on the posterior part of the carapace. They are widely distributed in the Indo-pacifc region from the east coast of South Africa to Hawaician waters (Apel and Spiridonov, 1998) [1].

Sample Collection

The sample used in this study was *Portunus sanguinolentus* collected directly from a Nagappattinum coast, Tamil Nadu India and transported immediately on ice to the laboratory and was stored in deep freezer.

Tissue Homogenate

The hepatopancrease, muscle and ovary of *Portunus sanguinolentus* were dissected out and washed with ice-cold physiological saline. The required amount was weighed and homogenized using a Teflon homogenizer. Tissue homogenate was prepared in 0.1 M Tris Hcl buffer (pH 7.4) and used for the estimation of various biochemical parameters.

Biochemical Analysis

The total carbohydrate content was estimated by the method of Hedge and Hofreiter, (1962) [5]. Protein was estimated by the method of Lowry *et al.* (1951) [8]. Total lipids in tissues were estimated by the method of Folch *et al.*, (1957) [3]. Amino acid in tissues were estimated by the method of Rosen (1957) [16].

Results and Discussion

Biochemical studies are very important from the nutritional point of view. The biochemical constituents in animals are known to vary with season, size of the animal, stage of maturity, temperature and availability of food etc. The protein, amino acid, carbohydrate and lipid contents were found to be higher in crabs of in ovary followed by hemolymph, muscle and hepatopancrease (Table 1 and fig 1 and 2). Carbohydrates constitute only a minor percentage of total biochemical composition. Carbohydrates in fishery products contain no dietary fiber but only glucides, the majority of which consist of glycogen. They also contain traces of glucose, fructose, sucrose and other mono and disaccharides (Okuzumi and Fujii, 2000) [12]. In the present study, carbohydrate content was higher in ovary followed by hemolymph, muscle and hepatopancrease. The previous studies were suggested that the carbohydrate in the muscle varied from 0.3 to 0.63% in P. vigil (Radhakrishnan and Natarajan, 1979) [14, 15], 2.4 to 3.4% in *C. smithii* (Balasubramanian and Suseelan, 2001), 0.17% in body meat, 0.24% in claw meat of *S. serrata* (Prasad and Neelakantan, 1989), 0.16 to 0.55% in *P. pelagicus* and 0.44 to 0.73% in P. sanguinolentus (Radhakrishnan, 1979) [14, 15]. In *S. tranquebarica,* the carbohydrate values of body meat, claw meat and the leg meat was 0.59 to 2.23%, 0.68 to 2.87% and 0.76 to 2.76% respectively (Thirunavukkarasu, 2005) [21]. Recently Murugesan *et al.* (2008) [10] reported that carbohydrate content of crabs (1.42%) of *C. lucifera* was little bit lower than eyestalk ablated crabs (1.45%).

Protein is essential for the sustenance of life and accordingly exists in the largest quantity of all nutrients as a component of the human body (Okuzumi and Fujii, 2000) [12]. Biological value of protein is obviously reflected upon its essential amino acids concentration. In genera l, the shellfish have a balanced distribution of all essential amino acids required for an adult per day. There are 20 amino acids found in fish proteins. Some of these are listed as essential amino acids (EA A), i.e. arginine, histidine, isolucine, leucine, lysine, methionine, phenylalanine, threonine, tryptophan and valine because these are not synthesized in the body. The essential amino acids are required for maintenance of life, growth, synthesis of vitamins and reproduction. The lowest level of any one of these essential amino acids in a protein source, which limits the utilization of that protein, makes it the "First limiting amino acid" (Paulraj and Sridhar, 2001). In the present study, protein content was higher in ovary followed by hemolymph, muscle and hepatopancrease while amino acid content was higher in ovary followed by hemolymph, hepatopancrease and muscle.

Results

Table 1: Proximate composition of ovary, hemolymph, hepatopancrease and muscle hepatopancrease in crabs of *P. sanguinolentus.*

S. No	Parameters	Muscle (mg/gm tissue)	Hepatopancrease (mg/gm tissue)	Ovary (mg/gm tissue)	Hemolymph (mg/L)
1.	Protein	139.44	99.60	179.28	159.36
2.	Carbohydrate	17.39	28.69	34.78	26.08
3.	Lipids	10	64	105	123
4.	Amino acid	42.85	53.57	96.42	67.85

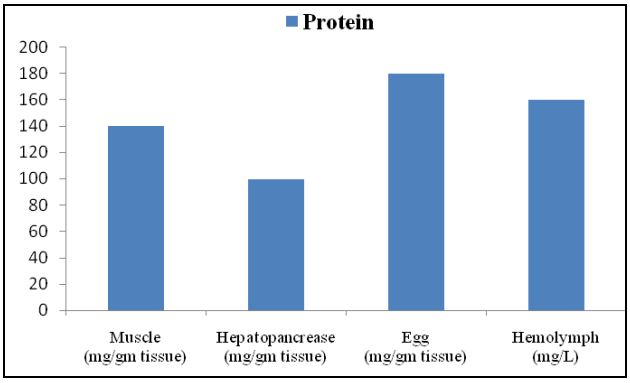

Fig 1: Protein composition of ovary, hemolymph, hepatopancrease and muscle hepatopancrease in crabs of *P. sanguinolentus.*

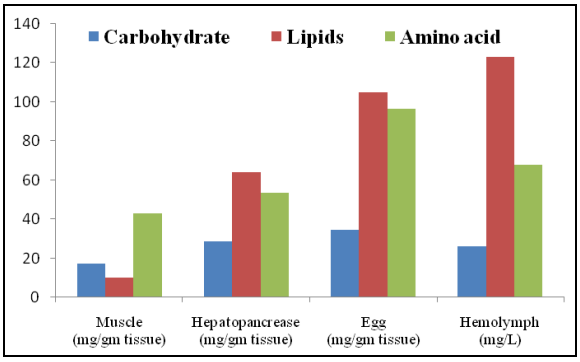

Fig 2: Carbohydrate, lipids and amino acid composition of ovary, hemolymph, hepatopancrease and muscle hepatopancrease in crabs of *P. sanguinolentus.*

Lipids are highly efficient as sources of energy and they contain more than twice the energy of carbohydrates and proteins (Okuzumi and Fujii, 2000) [12]. In the present study, protein content was higher in ovary followed by hemolymph, hepatopancrease and muscle. In *P. vigil* the lipid values assessed from 5.13 to 9.73% by Radhakrishnan and Natarajan (1979) [14, 15]. Balasubramanian and Suseelan (2001) recorded that the lipid values from 6.2 to 7.6% in *C. smithii.* In *Chaceon affinis*, the lipid values were 0.7% (Vasconcelos and Braz, 2001) [22] and in blue crab it was 1.5% (Anon, 1999). Prasad and Neelakantan (1989) [13] noticed that the lipid content in *S. serrata* from body meat was 1.65% and claw meat was 2.01%. George and Gopakumar (1987) assessed the lipid values in *S. serrata* with egg (0.43%), without egg (0.7%), body meat (1.07%) and claw meat (1.0%). In *P. pelagicus* the lipid value was 3.3 to 5.6% and *P. sanguinolentus* it was 3.8 to 5.5% (Radhakrishnan, 1979) [14, 15]. The lipid content of the body meat (0.9 to1.6), claw meat (1.83 to 2.06%) and leg meat (1.58 to 2.08%) was estimated by Thirunavukkarasu (2005) [21]. Recently Murugesan *et al.*, (2008) [10] reported that lipid conte nt of hard shell crabs (1.65%) of *C. lucifera* was little bit lower than eyestalk ablated crabs (1.85%). In crustaceans, lipids are not only the principal organic reserve and source of metabolic energy, but also indispensable in maintaining cellular integrity. Lipids as a general rule act as major food reserve along with protein and are subject to periodic fluctuations influenced by environmental variables like temperature (Nagabhushanam and Farooqui, 1982) [11].

Conclusion

The results of the present study concluded that the protein and carbohydrate content were higher in ovary followed by hemolymph, muscle and hepatopancrease while amino acid and lipids were higher in ovary followed by hemolymph, hepatopancrease and muscle. The rich source of biochemical (Protein, amino acid, carbohydrate and lipid) content was found in *P. sanguinolentus*.

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