

Food and Feeding Habit of *Scylla serrata* and *Scylla tranquebarica* from Chilika Lagoon, East Coast of India

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ABSTRACT

Chilika Lagoon, situated on the east coast of India is one of the hot spot of biodiversity in the country. The lagoon is highly productive ecosystem with rich fishery resources. There are 34 species of crabs available in Chilika lagoon. The food and feeding of two mud crabs, namely *Scylla serrata* and *Scylla tranquebarica* have been studied during June 2007-May 2008 from Chilika Lagoon. The highest length was observed being 14.6 cm and 22.5 cm in *Scylla serrata* and *Scylla tranquebarica* respectively. Similarly the highest weight of *Scylla serrata* and *Scylla tranquebarica* was found to be 460 gm and 1.45Kg respectively. The food of crab includes Crustaceans, Fishes, Molluscas, Detritus, Plants and etc. The highest percentage of food was contributed by Crustaceans (22%-55%) followed by Fishes (18-35%), Molluscas (8-35%) and Detritus (0.5-8.3%) in both the crabs. Some food species could not be identified. The food and feeding habits of crab was dependent on the availability of the food in that area. There is no difference in feeding habits depending on the size of the crabs. The food and feeding habits of two crabs were analyzed from seven stations from Chilika Lagoon where the crabs are available through out the year. The food components for pre-monsoon, monsoon and post-monsoon were studied and discussed in detail in these two crabs from Chilika Lagoon.

INTRODUCTION

India is the 7th largest fish producing country in the world and accounts for 3.3% of total world fish production (Nayak and Padhi, 1998). The fish production include both the fin fish and shell fish. Fin fish accounts a major share in fish production where shell fish accounts for a minor share in quantity but in large amount in value. Shrimp and crabs are the main shell fish contributing to the foreign export. During the past few decades there has been an increasing demand for crab fisheries. The economic importance of crabs as food, fish meal and as an item of export trade calls for efficient approach towards management of crab fisheries along with establishment of ancillary industries. Millions of people from various parts of our country suffer from protein malnutrition. Protein deficiency may be minimized by making available cheaper fish meal item like crab which is rich in protein, vitamin A, vitamin D and minerals. Their meat contain considerable amount of glycogen and free amino acid, rendering their flesh sweet and tasty.

The ability of mud crab to grow fast and availability of suitable brackish water and estuarine area provide ample opportunities to the farmers to undertake its culture and its fattening in India. To increase the production of crabs, crab lets are being produced by MPEDA at RGCA (Rajiv Gandhi Center for Aquaculture) at Nagapattinam, Tamil Nadu. Crab seed production in a hatchery is first time seen in India. During the year 2006-07, 0.1 Million of crab seed are produced in the pilot scale hatchery set up by RGCA. The Production of mud crab hatchery seed is expected to enhance production of mud crabs for export through aquaculture in the year to come. (MPEDA year book, 2006-07).

Chilika is famous for its fishery resources. The fishery resources of this region are also diverse and varied comprising marine, freshwater and brackish water system. In Chilika 34 species of crabs are available. Out of these *Scylla* species is the most commercially important crab which has a great demand in India and abroad. Two species of *Scylla* are available in Chilika Lagoon i.e. *Scylla serrata* and *Scylla tranquebarica*. *Scylla serrata* is known as Red crab and is small in size whereas *Scylla tranquebarica* is generally known as Green crab and it is larger in size as compared to red crab.

Crabs emerge out of their hide outs and burrow at night and forage for food. Crabs are opportunistic omnivores, eating on a variety of food with a preference for animal food. The food consists of Crustaceans, Molluscas, Fish, Polychaetes, Detritus, Plant materials etc. (Nandi and Pramanik, 1994). A crab feeding on other crabs is also not uncommon. They rarely eat fish under natural condition since they lack the ability to catch them. Small gastropods, copepods and polychaetes worms also form an appreciable part of the food (Menon, 1952). Females responded significantly faster than males to the presence of food. Crabs without food are aggressive towards crab with food, which sometimes led to fighting and wounding (Skinner and Hill, 1986).

Several work has been carried out on food and feeding of *S.serrata* and *S. tranquebarica*. Prasad and Neelkantan (1988) have worked on the food and feeding of *S. serrata*. Sanjeevraj and Joel (1986) have worked on the food and feeding of two species of *Scylla*. Hill (1976) has worked on the natural food, foregut clearance rate and activity of the crab. No work has been done on the food and feeding of *S.serrata* and *S.tranquebarica* from Chilika Lagoon. This is an attempt to study the food and feeding habits of *Scylla serrata* and *Scylla tranquebarica* from Chilika Lagoon.

MATERIALS AND METHODS

Chilika is the largest brackish water lagoon of India situated in latitudes 19° 28' to 19° 54' N and longitudes 85° 05' to 85° 38' E (Fig-1). To study the food and feeding habit of crabs, seven stations were chosen for specimen collection from Chilika lagoon where the crabs were available. The crabs were collected after two days of full moon during high tide. The crabs were collected with the help of local fishermen and brought to the laboratory. The sampling was done in each month during June 2007 to May 2008. Total of 120 number of crabs were dissected to study the food and feeding habit of

crabs. The specimens were thoroughly cleaned and washed in tap water. The crabs were identified using different literature like Bal and Rao (1984), Nandi & Pramanika (1993), Deb (1995) and the length, weight and sex of each crab was determined. The length of each crab was measured to the nearest mm using the Vernier Calliper and the

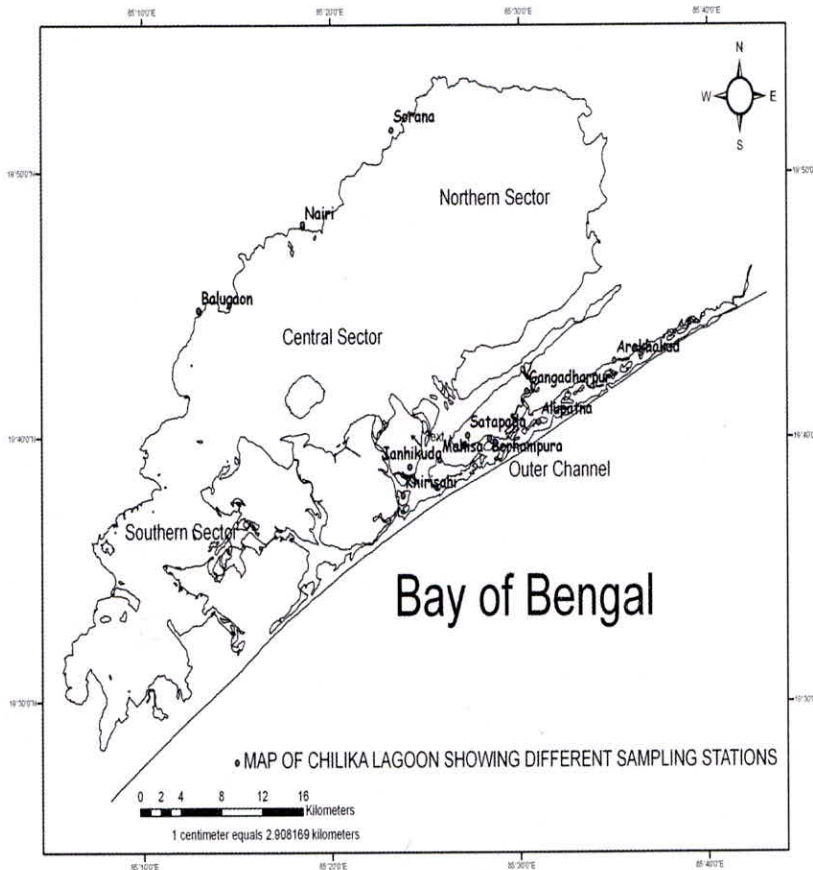


Fig. 1 : Map of Chilika lagoon showing sampling stations

weight was measured using the spring balance. The length and weight of crab was expressed in centimeter (cm) and gram (gm) respectively. After that the crab was dissected and the gut content was kept in a Petri dish. Then this gut content was examined by a microscope. Percentage of occurrence of different food items were determined by the total number of occurrences of all items for each month.

The study period was divided into three season of the year i.e., Monsoon (June 2007 to September 2007) ,Post- Monsoon (October 2007 to January 2008) and Pre-monsoon (February 2008 to May 2008). The seven stations are Sipakuda, Alapatana, Satapada, Berhampura, Mainsha, Janhikuda and Khirisahi.

RESULTS

Studies revealed that crabs are omnivorous feeding on a variety of food with a preference for animal food. The food of *Scylla serrata* and *Scylla tranquebarica* consist of detritus, crustaceans, molluscas, and polychaetes. The stomach content of *S. serrata* and *S. tranquebarica* were examined for one year under three seasons i.e. Pre-monsoon, Monsoon and Post-monsoon. The important food component were identified and expressed as percentage for three different season for both the species i.e. *Scylla serrata* and *Scylla tranquebarica*.

The length and weight of the two species of crabs were taken and the results were expressed in cm and gm respectively. The highest length was observed being 14.6 cm and 22.5 cm in *Scylla serrata* and *Scylla tranquebarica* respectively. Similarly the highest weight of *Scylla serrata* and *Scylla tranquebarica* was found to be 460 gm and 1.45 Kg respectively. The stomach content was examined. The food in the stomach was found in semi grinding condition. But it was difficult to identify the organism to species level. The food of both the crabs consists of crustaceans, molluscas, fishes, detritus and plants. Some amount of the food was unidentified.

From table 1, during monsoon season, crustaceans dominate the food having highest percentage i.e. 48.2% from Alupatana area in *S.serrata* and the lowest was 39.6% from Berhmapura station. Highest molluscan percentage was observed to be 25.1% from Berhampura station and the lowest percentage was observed to be 8.7% from Satapada station. Highest fish percentage was observed in Satapada area being 34.3% and lowest being 18.9% from Alupatana. The highest detritus content was 8.9% in Alupatana and lowest was from Janhikuda being 5.6 %. The highest plant content was 2.5% from Khirisahi and lowest was 0.8% from Mainsha station. The highest unidentified

Table 1 : Average food percentage of *Scylla serrata* from different stations during Monsoon Season from Chilika Lagoon.

Stations	Average % of food material in gut content of the crab					
	Crustacea	Mollusca	Fishes	Detritus	Plant	Unidentified
Sipakuda	40.1	17.9	23.5	8.6	1.8	9.1
Alupatana	48.2	20.8	18.9	8.9	1.2	2
Satapada	43.6	8.7	34.3	8.3	0.9	4.2
Berhampura	39.6	25.1	22.4	7.2	1.4	4.3
Mainsha	41.5	22.4	25.5	7.8	0.8	2
Khirisahi	46.8	16.7	24.8	6.8	2.5	2.4
Janhikuda	40.3	9.6	34.1	5.6	1.3	8.1

food content was observed from Sipakuda being 9.1% and the lowest was 2% from two stations Alupatana and Mainsha.

The food analysis of the crabs during Post monsoon season has been represented in table 2. The highest crustacean percentage was 44.6% from Mainsha and lowest was 40.9% from Khirisahi. Molluscan percentage was observed to be highest in Alupatana being 21.3% and the lowest being 13.2% from Mainsha station. The highest fish percentage was found to be 28.6% from Sipakuda and Mainsha and lowest was 18.5% from Janhikuda. The highest detritus was observed from Berhampura being 8.5% and lowest was 2.5% from Alupatana. Highest plant percentage was 6.6% from Mainsha and lowest was 1.5% from Alupatana. 7.9% was the highest unidentified from Janhikuda and the lowest was 1.3% from Sipakuda station.

From table 3, the highest crustacean percentage was found to be 45.2% during pre-monsoon season from Mainsha station and lowest was being 22.9 % from Sipakuda station.

Table 2 : Average food percentage of *Scylla serrata* in different stations during Post-Monsoon Season from Chilika Lagoon.

Stations	Average % of food material in gut content of the crab					
	Crustacea	Mollusca	Fishes	Detritus	Plant	Unidentified
Sipakuda	43.9	20.7	28.6	3.2	2.3	1.3
Alupatana	42.6	21.3	28.4	2.5	1.5	3.7
Satapada	41.9	20.5	20.6	7.5	5.8	3.7
Berhampura	43.3	19.9	22.4	8.5	3.4	2.5
Mainsha	44.6	13.2	28.6	3.1	6.6	3.9
Khirisahi	40.9	19.3	25	4.6	6.5	3.7
Janhikuda	43.7	15.2	18.5	9.2	4.5	7.9

Table 3: Average food percentage of *Scylla serrata* in different stations during Pre-Monsoon Season from Chilika Lagoon

Stations	Average % of food material in gut content of the crab					
	Crustacea	Mollusca	Fishes	Detritus	Plant	Unidentified
Sipakuda	22.9	34.9	26.4	7.8	5.9	2.4
Alupatana	38.6	32.6	18.3	5.2	2.2	2.9
Satapada	41.8	18.1	26.1	3.5	6.4	4.1
Berhampura	38.2	18.2	20.4	11.2	4.6	7.4
Mainsha	45.2	23.9	18.8	4.7	3.8	3.6
Khirisahi	41.9	22.8	18.4	8.4	3.2	5.3
Janhikuda	39.4	22.7	21.3	13.3	0.9	2.4

Molluscan percentage was highest being 34.9% from Sipakuda and lowest being 18.1% from Satapada station. Fish percentage was highest from Sipakuda being 26.4% and lowest being 18.3% from Alupatana. Detritus percentage was highest from Janhikuda being 13.3% and lowest was 3.5% from Satapada. Plant percentage was highest in Satapada being 6.4 % and lowest was 0.9 % from Janhikuda. Unidentified food content was highest from Berhampura being 7.4% and lowest was 2.4% from Sipakuda and Janhikuda.

The food content in stomach of *S. tranquebarica* during monsoon season has been represented in table 4. The highest crustacean percentage was observed to be 46.1% from Satapada and lowest was 38.9% from Berhampura station. The highest molluscan percentage was 30.1% from Mainsha and lowest percentage was 20.5% from Satapada station. Fish percentage was highest from Janhikuda being 23.6% and lowest was 18.4% from Mainsha station. Detritus percentage was highest being 7.6% from Sipakuda and lowest was 3.5% from Khirisahi station. The plant percentage was highest being 1.8% from Berhampura and lowest being 0.8% from Khirisahi station. The highest unidentified food content was found from Janhikuda being 7.2% and lowest was observed to be 1.1 % from Mainsha station.

Table 4: Average food percentage of *Scylla tranquebarica* in different stations during Monsoon Season from Chilika Lagoon

Stations	Average % of food material in gut content of the crab					
	Crustacea	Mollusca	Fishes	Detritus	Plant	Unidentified
Sipakuda	43.2	21.9	23.3	7.6	1.6	2.4
Alupatana	41.6	25.8	20.4	5.6	1	5.6
Satapada	46.1	20.5	22.4	6.3	1.2	3.5
Berhampura	38.9	28.5	21.7	5.7	1.8	3.4
Mainsha	44.5	30.1	18.4	4.6	1.3	1.1
Khirisahi	40.6	29.4	21.8	3.5	0.8	3.9
Janhikuda	39.3	22.5	23.6	5.9	1.5	7.2

The food content of the stomach of *S. tranquebarica* during post-monsoon season has been represented in table 5. The highest crustaceans percentage were found to be 54.9% from Alupatana and lowest being 45.5% from Sipakuda. The highest Molluscan percentage was found to be 24.3% from Mainsha and lowest being 19.2% from Khirisahi. Fish percentage was highest from Janhikuda area being 22.4% and lowest was observed to be 15.8% from Khirisahi. The highest detritus percentage was 8.5% from Janhikuda and lowest was 0.6% from Alupatana. Plants were highest being 6.2% from Berhampura and lowest was observed to be 0.8% from Sipakuda. Highest unidentified food content was from Khirisahi being 7.2% and lowest was 0.5% from Sipakuda station.

Table 5: Average food percentage of *Scylla tranquebarica* in different stations during Post- monsoon Season from Chilika Lagoon

Stations	Average % of food material in gut content of the crab					
	Crustacea	Mollusca	Fishes	Detritus	Plant	Unidentified
Sipakuda	45.5	24.2	21.5	7.5	0.8	0.5
Alupatana	54.9	18.5	18.7	0.6	5.2	2.1
Satapada	48	18.6	21.3	8.2	1.5	2.4
Berhampura	48.6	18.7	17.1	5.1	6.2	4.1
Mainsha	46.9	24.3	17.2	4.7	5.3	1.6
Khirisahi	48.7	19.2	15.8	4.9	3.8	7.2
Janhikuda	46.7	18.8	22.4	8.5	1.1	2.5

From table 6, during pre monsoon season the highest crustaceans percentage were found to be 44.1% from Khirisahi and lowest was found to be 36.9% from Satapada. Molluscans were highest from Satapada being 28.4% and lowest being 18.9% from Janhikuda. Fish percentage was highest from Alupatana being 26.8% and lowest being 22.5% from Sipakuda. 7.1% of detritus was found to be highest from Khirisahi and lowest was 3.9% from Satapada. Plants were highest being 2.2% from Satapada and lowest was 1.2% from Sipakuda. The highest unidentified food content was observed from Berhampura being 6.7% and lowest was 3.5% from Satapada station.

Table 6 -Average food percentage of *Scylla tranquebarica* in different stations during Pre-monsoon Season from Chilika Lagoon.

Stations	Average % of food material in gut content of the crab					
	Crustacea	Mollusca	Fishes	Detritus	Plant	Unidentified
Sipakuda	41.5	23.1	22.5	5.6	1.2	6.1
Alupatana	40.6	21.5	26.8	4.8	1.9	4.4
Satapada	36.9	28.4	25.1	3.9	2.2	3.5
Berhampura	41.3	20.1	25.7	4.6	1.6	6.7
Mainsha	43.2	20.3	22.6	6.9	1.4	5.6
Khirisahi	44.1	19.1	23.6	7.1	1.8	4.3
Janhikuda	42.8	18.9	25.4	5.3	1.6	6

DISCUSSION

The feeding behavior of crabs differs from place to place depending on availability of food materials. So difference in stomach content can be observed at different places during different season of the year. Crabs generally take one month to grow from 40mm to 60mm carapace length and 4 months to grow from 80 to 100mm carapace length (Satapathy, 2007). There is no relationship between percentage of food content in stomach and the length of the crab.

Hill (1975) has studied on the natural food, foregut clearance rate and activity of the crab in *Scylla serrata* from Australia. From his experiment, he observed that 50% stomach content was Mollusca and 21% was crustaceans. Fish remains were rarely found. They don't capture mobile forms such as fish and prawns. So fish remains were rare. This result differs from present study. In the present study crustaceans dominate the stomach content. This situation is observed due to availability of more crustaceans in Chilika Lagoon. Prasad and Nilakantan (1988) have worked on food and feeding of mud crab *Scylla serrata* from Karwar water. The principal dietary constituent based on occurrence were crustaceans, detritus, molluscas, fish and miscellaneous item. Detritus, fish and crustaceans were the major component comprising of 35.7%, 23.57% and 18.37% of total volume. In juvenile crabs the detritus was dominant but in sub adult and adult crustaceans and fishes were dominant. This result is quite similar to the present result as the crustaceans are dominant as the food constituent of Chilika crabs. This is due to the availability of crustaceans and fishes both in Karwar and Chilika Lagoon. The natural food of the two important crabs *Scylla serrata* and *Scylla tranquebarica* were studied by Joel and Sanjeevraj (1986) from Pulikate Lake in Tamil Nadu. The main constituents were the shallow water gastropodes, prawns, fishes and crustaceans. It is also quite similar to the present study. The stomach content doesn't carry any plant materials due to unavailability of plant in the Pulicat Lake.

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