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***Research Article** (Open Access)*

A STUDY ON FOOD AND FEEDING HABITS OF *SILLAGO SIHAMA* (FORSSKAL, 1775) – A CANDIDATE SPECIES FOR MARICULTURE FROM COCHIN WATERS

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ABSTRACT
Analysing the feeding habits in fishes is of great importance. The present analysis of stomach content of *Sillago sihama* shows that the species consume a variety of food items. Crustacean including copepods, lucifers comprised the maximum part of the food of *S. sihama.* Polychaetes formed the second most important food item of *S. sihama.* Digested and semi digested matter was also recorded in the present study. Nematode worms, Foraminifera, and other organisms are also occurred in the stomach of *S. sihama.* The feeding behaviour of *S. sihama* was found to be changed with season as well as maturity stages. High feeding intensity was observed during the months of February-May (Pre-monsoon). *S. sihama* can be classified as euryphagous carnivores, feeding on a wide range of food of planktonic and benthic organisms. Relative Length of Gut (RLG) and Gastro somatic index were calculated. The RLG was less than 1 which indicates its carnivorous habit.

Keywords: *Food, Feeding Habits, Sillago sihama, Cochin*

INTRODUCTION
Feeding ecology is an important aspect to understand the functional role of the fish within their ecosystems (*Blaber*, 1997; *Cruze Escalona et al*., 2000; *Hajisamae et al*., 2003; *Abdul Azizand Gharib*, 2007) knowledge of the food requirements, feeding behaviour pattern and predator-prey relationships, helps to understand the predicted changes that might result from any natural or anthropogenic intervention (*Hajisamae et al.,* 2006). The nutritional and energy status of a fish can be studied by analysing the biochemical constituents of fish.
Various scientists including *Radhakrishnan (*1957*), Shrivastava et al.,* (2001), *Rhizkalla et al., (1999),Krishnamurthy(1969), Safi and khan* (2005) *Hoda and Khan* (1995) and many others have worked on food and feeding habits of teleosts. Scientists including *Hynes* (1950), *Pillay* (1952), *Das and Moitra* (1955,1956), *Ahmed and Akhtar* (1967), *Windel* (1968), *Windel and Bowen* (1978), *Nargis and Hussain* (1987) described various methods of analysis of stomach contents in fishes. Food and feeding habits of *Sillago sihama* was explained by *Chacko* (1949). Study on the diet of fishes helps to understand how animals live and grow, what food may influence their abundance and distribution and the relative quality of feeding conditions. It also helps in the study of length-weight relationship, reproductive biology as well as fecundity. Fecundity of a species is defined as the number of eggs released by an individual fish during a spawning season. Study on nutritional requirements is also helpful to obtain the best growth at least period (*Royce*, 1984) in aquaculture.
Scanty information is available about the biology of *Sillago sihama.* Available information on its biology in Indian waters is mainly by to the works of *Radhakrishan* (1957) in Gulf of Mannar and *Palk Bay* and *Palekar* and *Bal* (1960; 1961) in Karwar waters and also from Taiwan (Lee, 1976) and North Queenland, Australia (*Gunn* and *Milward*, 1985). For understanding the overall ecology of Sillaginids and determining their future management, study on the feeding habits of Sillaginids is necessary.
The main objectives of this study were to analyse the stomach contents of *S.sihama* on monthly basis , to determine the feeding intensity and the condition of the stomach.

MATERIALS AND METHODS

The stomach was dissected out, fixed in 5% formalin. Using quantitative and qualitative methods (*Hynes*, 1950; *Natarajan* and *Jhingran*, 1961) the gut contents were analysed. The occurrence of various food items in each stomach and volume (displacement method) were recorded. On the basis of fullness of stomach, monthly variations in feeding index were obtained to assess the feeding intensity. Depending on the relative fullness and the space occupied by the food contents fish were classified as gorged, full, ¾ full and ½ full as actively fed whereas those with ¼ full, trace and empty as poorly fed. Sedgwick – Rafter counting cell is used for counting plankton.

The feeding habits of the fish was determined by the using the relationship of relative length of the gut (RLG), where RLG > 3 represents herbivore, RLG < 1, carnivore and 1-3 RLG value represents omnivore (*Odum*, 1970).

The relative length of gut was determined by the following method:

$$\text{Relative length of gut (RLG)} = \frac{\text{Length of gut}}{\text{Length of the Total Body}}$$

Using the method adopted by *Desai* (1970), Gastro Somatic index (Ga.S.I) was calculated.

The following formula was employed for this purpose,

$$\text{Ga.S.I} = \frac{\text{Weight of the stomach contents}}{\text{Weight of the fish}} \times 100$$

RESULTS AND DISCUSSIONS

The RLG value and the various food items recorded from the stomach of *S. sihama* during the study period are presented in table 1 & figure 1 respectively. Generally, the food items found inthe examined stomachs were crustacean, polychaetes, fish, nematodes, mollusca, sand grains,digested matter, and miscellaneous.

Relative length of Gut (RLG)

Table 1: Relative length of gut (RLG) & fullness of stomach in *S. sihama*

Sl. No.	Months	Length of fish(cm)	Length of gut(cm)	RLG
1	January	19.3	10.5	0.54
2	February	22.6	10	0.44
3	March	28.9	12.5	0.43
4	April	23	15.9	0.69
5	May	22	11.8	0.53
6	June	26.7	16	0.59
7	July	27.4	16.4	0.59
8	August	26	16.2	0.62

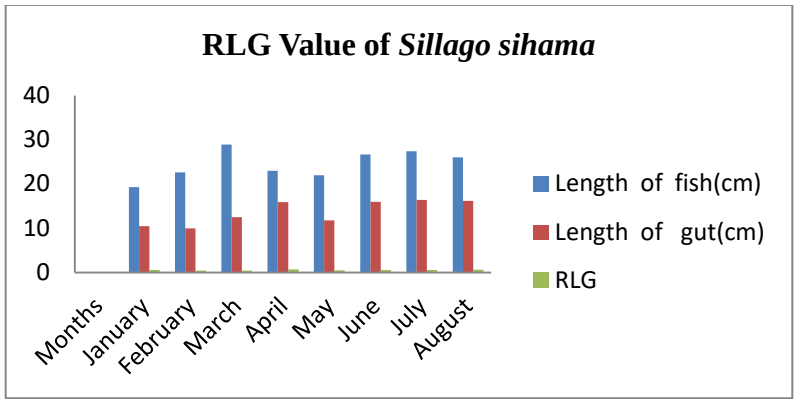

Figure 1: RLG Value of *S. sihama*

Monthly variation of food composition

The variation in the composition of food items in *S. sihama* during 6 months are shown in table 2. It shows that composition of different food items varied in different months according to their availability and preference of fish.

Table 2: Monthly variation of composition of food in the stomach of *S. sihama* during January 2014 – August 2014

Food categories	January (%)	February (%)	March (%)	April (%)	May (%)	June (%)	July (%)	August (%)
Crustacean	50	18	38	40	45	10	15	13
Polychaetes	15	25	20	22	10	25	20	23
Fishes	5	7	4	4	5	9	10	10
Sagitta	12	15	14	10	7	10	9	10
Foraminifera	0	10	5	12	10	6	6	7
Nematodes	13	20	16	10	18	15	20	10
Digested matter	5	5	3	2	5	25	20	27

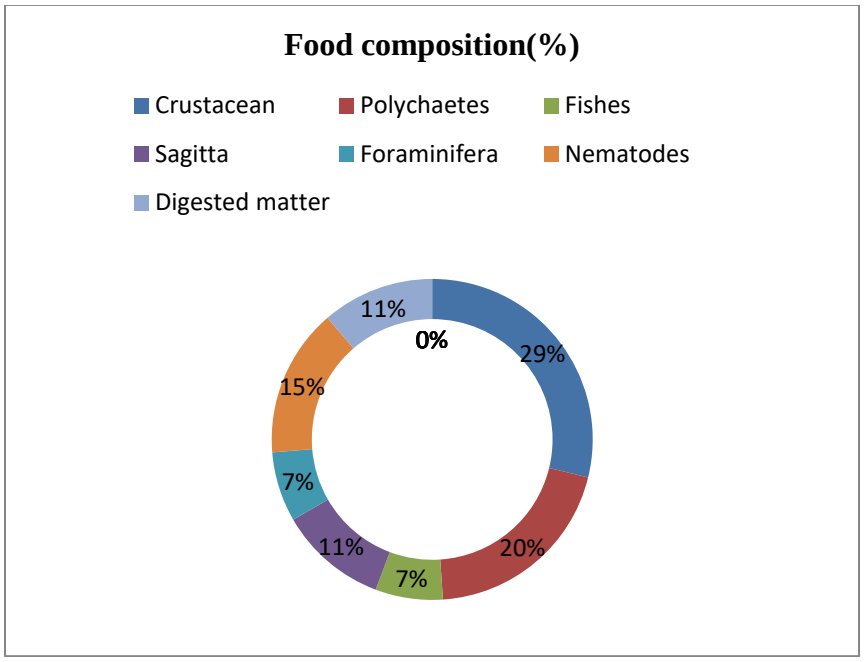

Figure 2: The average percentage of main food items in the stomach of S.sihama.

Figure 3: Nematodes from the gut of S. sihama in the month of July Feeding intensity

The condition of stomach and feeding intensity of the fish for different month are given in the table 3 and figure 4. A fully filled gut was found in the month of July is shown in figure 5.
Monthly examination of the gut showed that *S. sihama* fed actively during February to May. It was observed that there is sudden decrease in the feeding activity in the month of June. In the month of July the feeding intensity increased followed by a decrease in August.

Table 3: Monthly variation of stomach condition of *S. Sihama*

Month	No. of Fish	Active feeding			Moderate feeding	Poor feeding	Empty
		Gorged	Full	¾ full	½ full	¼ full	
Jan	10	1	2	1	3	2	1
Feb	15	1	2	3	5	3	1
Mar	13	2	1	1	4	2	3
Apr	15	5	2	1	5	2	0
May	13	2	2	2	2	4	1
Jun	10	0	2	1	2	2	3
Jul	15	1	5	2	3	3	1
Aug	10	1	2	1	1	2	3

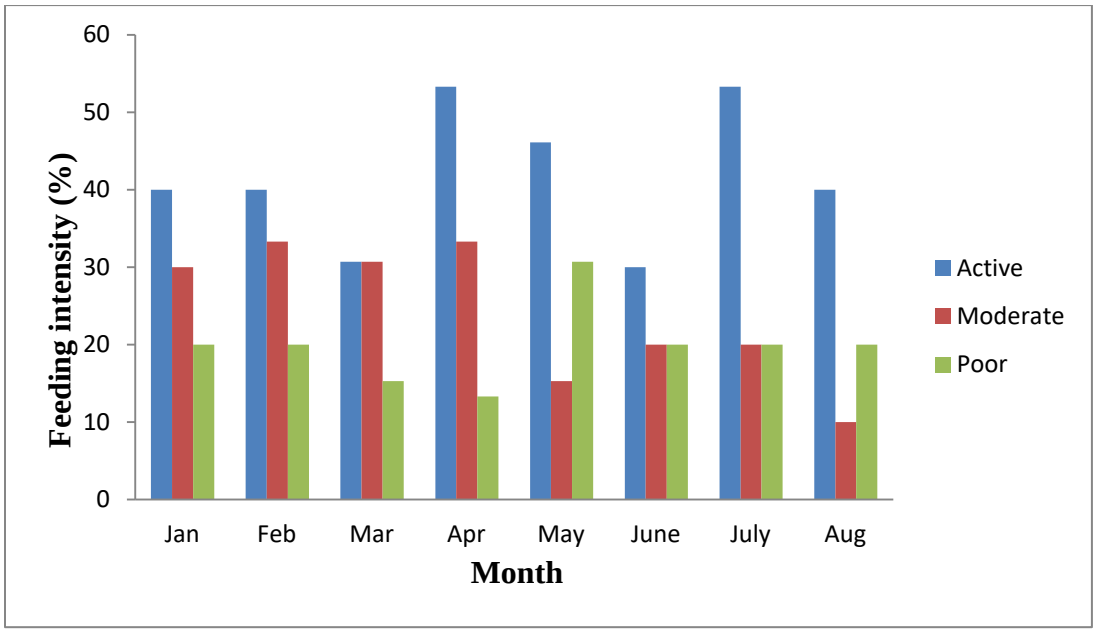

Figure 4: Monthly variation in feeding intensity in *S. sihama*.

Figure 5: Fully filled gut of *S. sihama* in the month of July Gastro Somatic Index (Ga.S.I.)

The Gastro Somatic Index (Ga.S.I.) in different months during the period of this investigation is illustrated in table 4 and figure 6 respectively. Ga.S.I is found high in the month of February. There was a relation between the monthly variation in gastro somatic index and feeding intensity based on stomach fullness.

Table 4: Monthly variation of GaSI of *S.Sihama*

Month	Weight of the Stomach Contents (gm)	Weight of the Fish (gm)	GaSI(%)
January	1.5	84.2	1.8
February	2.6	87.2	3
March	2	85.6	2.4
April	2.3	89.1	2.6
May	2.6	99.2	2.7
June	2	159.2	1.3
July	1.3	83.1	1.6
August	0.7	80.1	0.9

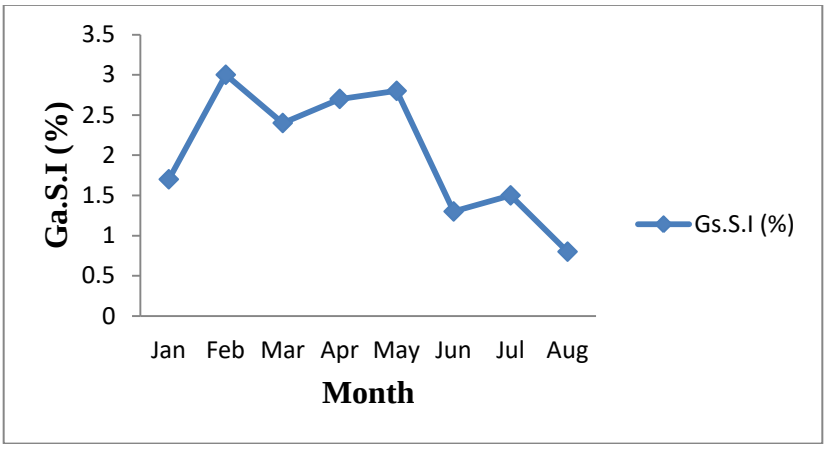

Figure 6: Monthly variation in Gastro-Somatic Index

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