

Food and Feeding Habits of *Tenualosa ilisha* (Hamilton, 1822) From India's Largest Brackish Water Lagoon



Fisheries

KEYWORDS : *Tenualosa ilisha*, stomach content, copepod, Chilika

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ABSTRACT

A study on stomach content analysis of Tenualosa ilisha was conducted from Chilika, the largest brackish water lagoon of India during 2012. The specimens were collected seasonally and analyzed to know the preferred food items of the species in the lagoon. The study revealed that the food items recovered from the stomachs consisted of Copepods, detritus, algae, mysis, molluscan larvae, diatoms, rotifers and mud and sand particles. Out of which copepods are found the most preferred food items in all seasons. From the overall food items recovered from the stomachs of the species, copepods alone constitute 34.94% followed by detritus (29%), algae (10.47%), mysis (10.29%), molluscan larvae (4.76%). Diatoms and rotifers also observed very rarely constituted together only 3% of all food items. So, the present study indicated that Tenualosa ilisha is a microphagus and bottom feeder preferred copepods most than other food items.

Introduction

Tenualosa ilisha (Family Clupeidae), the Indian Shad Hilsa is commonly known as 'lishi' or 'Pill' in Chilika. The species is distributed globally (mostly tropical) inhabits chiefly in marine coastal waters i.e., coastal shelf, estuaries etc. But also found in freshwater rivers of India, Pakistan, Bangladesh, Myanmar, Iraq and Iran. Hilsa Shad is anadromous in nature, breeds in rivers and after spawning in freshwater returns to marine habitats. Hilsa is regarded as one of the most delicious fish and the commercial value is very high.

Food is the main source of energy and plays an important role in determining the population levels, rate of growth and condition of fish. Food and feeding habits of fish have a great significance in aquaculture practice. It helps to select such species of fishes for culture which will utilize all the available potential food of the water bodies without any competition with one another but will live in association with other fishes (Begum *et al.*, 2008). Knowledge of food and feeding habits of various fish species is advantageous in their proper management and exploitation (Khan and Fatima, 1994). The food and feeding habits of fish vary with the time of the day, season, size of fish, various ecological factors and different food substances present in the water body (Hynes, 1950). The success of planning and management of fishery depends on the knowledge of their biology in which food and feeding habits include a valuable portion. The occurrence, distribution and abundance of fish stock mainly depend on the availability of food. Hence the quantum of fish production is directly related with the nutrition available to it (Arthi *et al.*, 2011).

A considerable amount of study have been reported on the biology and life history of Indian Shad Hilsa by various researchers as Hora (1938), Hora and Nair (1940), Pillay and Rao (1962), Pillay (1955 and 1958), Mathur (1964), Gopalakrishnan (1969), Bhanot (1973), De and Dutta (1990). But there seems to be very few information available on food and feeding habits of the species in Indian water i.e., Hora (1938), Jones and Sujansingani (1951), Pillay and Rao (1962), Khan and Fatima (1994), De *et al.* (2013). In Chilika, Jhingran and Natarajan (1966), Ramakrishnaiah (1972) have given some aspect of preferred food items of the species and afterwards no such considerable studies have been reported.

The present study was undertaken with a view to provide information on preferred food items for *Tenualosa ilisha* which will

helpful for the management and sustainability of Hilsa fishery in Chilika.

Materials and Methods

Chilika Lagoon, the largest brackish water lagoon of India lies in the east coast of India, situated between latitudes 19°28'-19°54' North and longitude 85°05'-85°38' East. It is designated as an important Ramsar site (No.229) of India on October 1981. The water spread area of the lagoon varies between 906 km² to 1165 km² during summer and monsoon respectively. The estuarine lagoon is a unique assemblage of marine, brackish and fresh water eco-systems. The lagoon is divided into four ecological sectors namely; the southern sector, the central sector, the northern sector and the outer channel sector (Fig 1). Basically, the northern sector is fresh water dominated zone, central sector is a brackish water zone and southern sector is a higher saline area. The outer channel sector is marine in nature with saline water but during monsoon, the water becomes fresh due to discharge of flood water of the lagoon to the sea through this area.

A total of 38 fish specimens were collected from Balugaon and Kalupada ghat fish landing centre of Chilika lagoon during April (for pre-monsoon season), August (for monsoon season), December (for post-monsoon season) of 2012. Specimens were collected from fishing boats in fresh conditions immediate after arriving in the landing centres and then specimens were transported to research laboratory in polythene bags for analysis. The specimens were selected randomly in spite of their size, maturity and sex groups.

In the laboratory, specimens were washed and cleaned properly with tape water. The total length (TL) in mm, body weight (in gram) of each specimen were recorded and then dissected by scissors to remove the guts. At that time, the sexes of the specimens were recorded. Then, each gut was preserved immediately in separate polythene bags with 10% formalin solution to prevent the breakdown of the food materials. The polythene bags were labeled with respective length, weight, sex, date of collection etc. The qualitative and quantitative analyses of stomach contents of each specimen were done by percentage of frequency of occurrence methods as followed by Dewan and Shaha (1979). The different food items eaten by the fishes were identified under microscope. To study the constituent food items, each stomach was analyzed separately. The contents of the stomach were clearly mentioned that the 'Numerical Method' in which number of each food items was expressed as the percentage of

the total number of food items found in the stomachs (Costal *et al.*, 1992 and Kariman *et al.*, 2009).

Results and discussion

Stomach contents analysis of *Tenualosa ilisha* reveals that the food items consisted of Copepods, detritus, algae, mysis, molluscan larvae, diatoms, rotifers and mud and sand particles (Fig 2). Out of which copepods are the most important food items consumed by the species in all seasons. From the overall food items recovered from the stomachs of the species, copepods alone constitute 34.94% followed by detritus (29%), algae (10.47%), mysis (10.29%), molluscan larvae (4.76%). Diatoms and rotifers also observed in the stomachs but very rarely, constituted only 3% of all food items. Mud and sands also found in the stomachs which share a major portion of all food items i.e., 7.71%. Similar observations have been reported by Jhingran and Natarajan in 1966 from Chilika. They found, copepods as the most preferred food items followed by organic detritus, prosobranch and lamelibranch larvae and mysis. Ramakrishnaiah (1972) studied the food and feeding habit of *H. ilisha* from Chilika lake, size ranged from 50 to 150 mm consisting of organic detritus (48.56%), copepods (25.82%), algae (10.32%), molluscan larvae (7.85%), mysids (5.34%) and diatoms (2.1%). De *et al.* (2013) also reported copepods as one of the most preferred food items from marine, brackish and fresh water habitats. All these reports support the present findings.

Seasonal occurrence of food items (in %) in the stomachs of *Tenualosa ilisha* found during the present investigation is presented in figure 3. In pre-monsoon, copepods registered highest in percentage than monsoon and post-monsoon season. Copepods alone contribute 49.7% of all food items in pre-monsoon followed by detritus (17.5%), mysis (10.8%) and algae (7.2%). Mud and sand particles also found a visible amount followed by molluscan larvae (4.2%) in their stomachs. In monsoon, copepods and detritus were found about equally i.e., 31.6% and 29.7% respectively. Mysis, algae, mud and sand particles, molluscan larvae also contributed as preferred food items significantly. But in post-monsoon, detritus shared highest (i.e., 34.6%) of all food items recovered from the stomachs. Copepods and algae ranked second and third respectively. Among other, diatoms and rotifers also found in the stomachs of the species in all the seasons but their contributions to stomachs was very less. The seasonal variation of food items might be due to the availability of the resources.

Nelson (1967) studied on clupeid fish and reported as microphagous habits of the group. Some investigation on food and feeding habit of hilsa categorized hilsa shad as a filter feeder, feeds on plankton (Hora, 1938; Jones and Sujansingani, 1951). De and Datta (1990) observed that the stomach content analysis of fry, juvenile and adult hilsa revealed that copepods were the most important food items consumed by the fish of all sized groups. Hilsa prefers to reside in the brackish water region due to the presence of sub surface oxygen, relatively low salinity, strong tidal flow, high turbidity, heavy siltation, & rich growth of planktons. Here, majority of items in the stomachs were found in digested state. Algae and diatoms shared about 10% each in the fish stomachs. Diatoms also found as a major food items of *Tenualosa ilisha* by De *et al.* (2013) from marine, brackish as well as fresh water habitats of India. Mud and sand particles found about 8% of all food items recorded in the present investigation. Similar results also reported from various studies. De *et al.* (2013) found sand grains in all sized groups of hilsa from various habitats like marine, brackish and fresh waters. Sand particles (4.17 to 37.5% of total gut volume) observed in the guts of majority of the specimens, may be attributed to turbid habitat from where animals were caught (De *et al.*, 2013). But, Hora and Nair (1940) reported that, presence of sand grains in stomachs of only young hilsa might be due to bottom feeding habits of the fish.

De and Datta (1990) reported the presence of minute organisms like diatoms, rotifers and green algae in the stomach of *Tenualosa ilisha* from Hooghly water as found in the present study from Chilika. But they found the organisms frequently in adult specimens only. These minute organisms were either totally absent in the stomachs of fry or present poorly in the stomachs of juveniles (De and Datta, 1990).

So, the present study indicated that *Tenualosa ilisha* is a microphagous and bottom feeder preferred copepods most than other food items. But the preferences level depends less or more in the environmental conditions as well as the availability of resources in the water body.



Fig 1: Map of Chilika lagoon showing sampling stations.

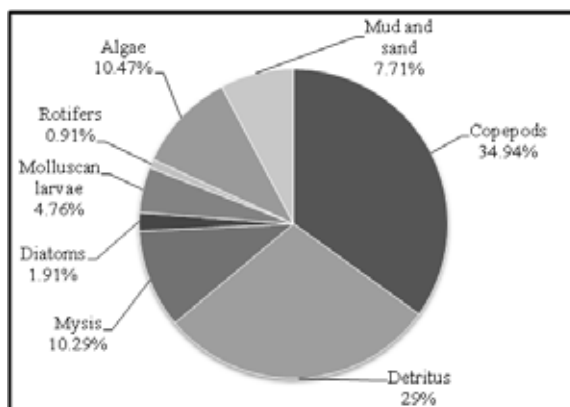


Fig 2: Composition (%) of food items in *Tenualosa ilisha* from Chilika lagoon.

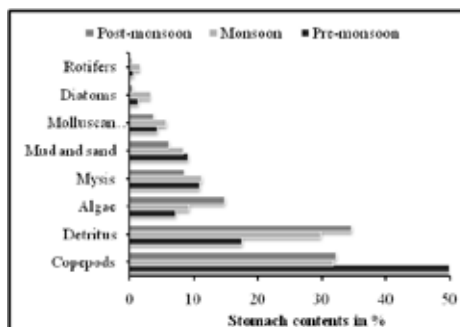


Fig 3: Seasonal variation of food items in *Tenualosa ilisha* from Chilika lagoon.

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