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Food and Feeding Habits of *Upeneus vittatus* (Forsskal, 1775) from Visakhapatnam Coast (Andhra Pradesh) of India

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Abstract: Aspects of food and feeding habits of *Upeneus vittatus* collected from Visakhapatnam fishing harbour are reported in this paper. Analysis of their gut contents based on frequency of occurrence, revealed that crustaceans mainly shrimps and crabs (59.49%) and teleostean fishes (14.51%) made the bulk of the diet with bivalve mollusks (13.51%) being at times important. Frequency of occurrence of teleostean fishes was observed to be more in fishes above 163 mm in length while shrimps constituted the predominant food item through out the year. Thus the results revealed that *U. vittatus* mainly subsisted on crustaceans and teleosts.

Key words: *U. vittatus*, food and feeding habits, Visakhapatnam

INTRODUCTION

The fishes of the family Mullidae popularly called as goatfishes contribute to an important demersal fishery in Visakhapatnam fishing harbour landings. Study of food and feeding habits are of fundamental importance in understanding the growth rate, gonadal maturity and other metabolic activities. The present paper deals with food and feeding habits of *U. vittatus* which is based on material sampled from Visakhapatnam fishing harbour during January 2006 to December 2006. Among the goatfishes *U. vittatus* along with *U. moluccensis* occupies an important position in the trawl catches at Visakhapatnam fishing harbour.

Studies on some aspects of biology of goatfishes have been reported from various regions of the world as that of Munro (1983), Russel (1983), Boraey and Soliman (1984 and 1987), Wahbeh and Ajian (1985), Vassilopoulou and Papaconstantinou (1992), Reuben *et al.* (1994), Jayaramaiah *et al.* (1996), Labropoulou *et al.* (1997) Ali and Gopalakrishnan (1998) Bhargava and Somvanshi (1998) Platell *et al.* (1998) Ismen (2005 and 2006) and John and Michel (2006).

The striped goatfish, *U. vittatus* of Family Mullidae is a commercially important demersal species living mostly in sandy or muddy sand bottoms ranging from 5 to 100 m depth. Bulk of the catch is obtained from bottom trawls. In Upenoids the presence of a pair of barbels just below the symphysis of lower jaw, attached to the tip of ceratohyal suggests the bottom feeding habit of these fishes.

MATERIALS AND METHODS

Samples for the present study were collected at weekly intervals from the mechanized trawlers which were operated off Waltair and the catches were landed at the Visakhapatnam fishing harbour. The study is based on examination of 636 specimens collected during the study period i.e., from January 2006 to December 2006. The data on total length, weight, sex, stage of maturity of each fish were recorded immediately after collection of the sample. A total number of 636 guts were analysed for the food items. The stomachs were dissected out and each stomach was preserved in 5% formalin. The

contents of each stomach were washed in a petridish. Various methods are in prevalence in the studies of stomach analysis of fishes and these were critically discussed by Hynes (1950).

The identification of food organisms were based mainly on broken shell remains, partially digested crabs, prawns and teleostean fishes. The gut contents were grouped as shrimps, crabs, teleostean fishes, mollusc shells and unidentifiable food items. Some of the food items could not be identified due to mutilation and they were grouped under unidentifiable food items. Depending on the extent of distention of stomach and amount of food in it, the stomachs were classified as full, 3/4 full, 1/2 full, 1/4 full trace and empty and the points were allotted as 100, 75, 50, 25 and 0, respectively. The percentage occurrence of different food items was determined from the total number of occurrence of all items in each month. To evaluate the importance of each food item, the AIndex of Preponderance@ proposed by Natarajan and Jhingran (1961) was followed. The monthly averages obtained by Volumetric and Occurrence methods were substituted in the following formula and the AIndex of Preponderance@ values were worked out as

$$I = (100 * V * O) / \text{Sum of } (V * O).$$

Where, I is the Index of Preponderance of food items, V and O are its percentage of volume and occurrence, respectively. The specimens present in the present investigation with stomachs classified as full, : 3/4 full 1/2 full were considered as actively fed and those under the category of 1/4 full and empty were considered to be poorly fed.

RESULTS

A preliminary segregation of stomach contents revealed that the food items mainly include shrimps (31.56%) crabs (27.93%), teleostean fish remains (14.51%), bivalve molluscs (13.51%) and the remaining (12.49%) consisted of unidentified food items. The prawns encountered in the stomachs were mainly *Acetes* sp. Some of the teleostean fish remains were identified as fry of *Megalaspis* sp. But most of the teleostean fish remains could not be identified since they were found in advanced stage of digestion with only the skeletal remains.

Monthly Variations in Feeding Habits

Shrimps formed the main and important food item throughout the year, crabs were found to be the dominant food item during the month of October while bivalve molluscs formed the major food item during the month of January, February and December. The occurrence of bivalve mollusc shells was not noticed during any other month of the study period.

Variations in Food and Feeding Habits in Relation to Size

It was observed that the food items were less diverse in smaller size groups. Shrimps i.e., *Acetes* sp. and crabs formed the major food items in the fishes below 135 mm in length. Whereas in fishes above 163 mm, food items mainly constituted shrimps i.e., *Acetes* sp., crabs and teleostean fishes. The study revealed that the frequency of intake of shrimps i.e., *Acetes* sp. and crabs were more or less same among various size of fishes but the incidence of teleostean fishes were more in fishes above 163 mm in total length.

Intensity of Feeding

For the study of intensity of feeding, the guts of the fishes were classified into various categories designated as full, : 3/4 full, 1/2 full, 1/4 full and empty depending on the degree of fullness. Percentage occurrence of guts in various degrees of fullness is given in Table 1.

Table 1: Percentage occurrence of guts in various degrees of fullness in *U. vittatus* from January 2006 to December 2006

Month	Full	3/4 full	1/2 full	1/4 full	Empty
January	39.32	23.09	-	19.72	17.87
February	-	19.01	31.69	24.37	24.93
March	-	-	29.61	39.23	31.16
April	-	-	28.00	32.00	40.00
May	-	-	35.00	10.00	55.00
June	13.04	-	34.78	21.75	30.43
July	-	-	61.11	-	38.89
August	-	29.03	16.14	29.03	25.80
September	-	37.84	32.43	16.22	13.51
October	30.55	-	16.66	27.77	9.00
November	-	37.50	25.00	12.50	25.00
December	-	50.00	-	16.67	33.33

Table 2: Percent frequency of dominant food components from January 2006 to December 2006

Month	<i>Acetes</i> sp.	Crabs	Teleostean fishes	Bivalve molluscs	Unidentifiable food items
January	17.93	13.82	25.02	43.23	-
February	20.75	18.69	24.09	36.47	-
March	34.38	24.32	27.97	-	13.33
April	37.53	32.31	3.38	-	26.78
May	33.34	22.22	-	-	44.44
June	60.00	40.00	-	-	-
July	56.52	39.13	-	-	4.35
August	-	45.83	8.34	-	45.83
September	31.57	36.86	31.57	-	-
October	43.24	35.14	5.41	-	16.21
November	36.84	21.05	42.11	-	-
December	6.56	5.790	5.20	82.45	-

Fishes with high percentage (39.32%) of full guts were found mainly during the month of January of the study period. Thus the fishes seem to have actively fed during the month of January. Fishes with average feeding intensity (50.00%) were found during December of the study period.

Percentage Frequency of Food Items

Percentage occurrence of individual food items is calculated separately and is given in (Table 2).

Shrimps (*Acetes* sp.)

The percentage frequency of *Acetes* sp. was highest with 60.00% during June = 06 and lowest with 6.56% during December = 06.

Crabs

During August = 06 the percentage frequency of crabs was highest with 45.83% and lowest with 5.79% during the month of Dec = 06. Among crustaceans shrimps and crabs formed the main food of this species in almost all the months.

Teleostean Fish Remains

Percentage frequency of teleostean fishes was higher with 42.11% during November = 06 and lowest during April = 06 with 3.38%.

Bivalve Molluscs

Percentage occurrence of bivalve molluscs was higher during December with 82.45% and lowest during February with 36.47%.

Unidentifiable Food Items

Certain food items during the study period could not be identified due to the advanced stage of digestion. This was noticed in the months of March, April, May, July, Aug. and Oct. during the study period.

DISCUSSION

The results of the present study revealed that *U. vittatus* is a carnivorous species feeding mainly on crustaceans and teleostean fishes and occasionally on bivalve molluscs. The various components of the food spectrum indicate that the species mainly feeds on benthic and sub-benthic organisms detected by chemoreceptor rich barbells present on the chin. Goatfishes feed on small benthic crustaceans, worms, molluscs and small fish (Vassilopoulou and Papaconstantinou, 1992; Labropoulou *et al.*, 1997; Platell *et al.*, 1998).

The composition of the diet indicated that the fully adult fishes were carnivorous, feeding on small crustaceans, mainly teleosts. Bivalve molluscs also contributed to the diet during some of the months of the study period.

Jayaramaiah *et al.* (1996) reported that *U. vittatus* from Mangalore coast is a carnivore feeding mainly on prawns and teleosts. In our present study, the same species from Visakhapatnam coast mainly feeds on shrimps, crabs, teleosts and bivalve molluscs. In both the coasts, *Acetes* sp. is the major component among shrimps. Fry of Megalaspis (teleosts) were found in *U. vittatus* from Visakhapatnam coast whereas *Stolephorus* sp., *Leiognathus* sp. and *Platycephalus* sp. were predominant from Mangalore coast.

The emptiness percentage and stomach fullness indices are very important to assess feeding intensity. Most mullids feed primarily on polychaetes and crustaceans; however considerable differences have been found in the diets of different species (Hobson, 1974; Platell *et al.*, 1998). Platell *et al.* (1998) reported that the crabs increased in importance for the mullid *U. lineatus*. Wahbeh and Ajain (1985) observed that the most important prey of *P. barberinus* were crustaceans and also that the bivalves became an increasingly important component of the diets of the larger size classes of mullid *Parupeneus barberinus* from Gulf of Aqaba. Russel (1983) studies on food and feeding habits of rocky reef fish of north-eastern New Zealand reported that *U. lineatus* feeds predominantly on small crustaceans.

Randall (1967) reported that the mullids feed primarily over muddy or sandy bottoms upon surface or sub-surface dwelling invertebrates. The long barbels are swept over or through the sediments and are presumably receptive to contacts with prey animals. He also observed that the stomach contents of *Parupeneus maculatus* consisted of crabs, shrimps in higher percentages, polychaetes relatively low percentage and in case of *Mullus martinicus* crabs, crab larvae, Pelecypods, shrimps, shrimp larvae and ophiuroids were observed.

The present investigation suggests that the nature of food of the species is size dependant to some extent. Fishes of bigger length groups, more often ingested crabs and teleosts in large quantities than those in smaller length groups. The occurrence of active mobile benthic organisms like shrimps, crabs and teleosts in bigger size fishes indicates that larger fish feed very close to or near the bottom. Slight differences in the feeding habits of mullids from various regions have been noticed, this can be attributed to the nature of substratum in each locality.

As seen from the results, it could be inferred that *U. vittatus* from Visakhapatnam coast mainly feeds on crustaceans, teleostean fishes, bivalve molluscs. The percentage occurrence of different food items in the diet shows that the fish selects its food among the bottom living organisms and the first preferable food item was the shrimp. Thus, the present investigation revealed that *U. vittatus* is a demersal carnivore, whose diet is mainly composed of crustaceans (shrimps and crabs), teleostean fishes and bivalve molluscs.

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