

OBSERVATIONS ON THE FOOD AND FEEDING HABITS OF *SARDINELLA GIBBOSA* FROM VIZHINJAM

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ABSTRACT

Studies at Vizhinjam show that *Sardinella gibbosa* feed mainly on copepods, *Lucifer* and diatoms. From a predominantly crustacean diet in the early stages, the fish seem to change to a diet of crustaceans and phytoplankton with the attainment of 80mm length. Notes on the variations in the food elements and intensity of feeding in relation to length and maturity are given. The earlier works on the subject are briefly discussed.

INTRODUCTION

Except for a brief note by Chidambaram (1942), the existing information on the food and feeding habits of the Indian sprat, *Sardinella gibbosa*, relates exclusively to the east coast of India (Devanesan 1932, 1942; Chacko 1946, 1949 and 1956; Devanesan and Chidambaram 1948; Ganapati and Rao 1957; Kuthalingam 1961 and Sekharan 1971). The present study carried out at Vizhinjam on the west coast of India attempts to find out the areas of similarity and dissimilarity, if any, as compared to the earlier studies on the east coast.

MATERIAL AND METHOD

The stomachs of 734 specimens ranging from 62 to 181 mm in total length collected during September 1969 to August 1971 form the material of the study. Out of these, 54.5% were obtained from the gillnet (*Chala vala*), 24.5% from the shoreseine (*Kara madi*), 19.6% from the boatseine (*Thattu madi*) and 1.4% from the hooks-and-line (*Achil*) operations. Ten samples were examined in fresh condition twice a week. Total length, weight, sex, stage of maturity and condition of feed of each fish were recorded prior to the removal of the stomach. The intensity of feeding was determined by the degree of fullness of the stomach and was expressed as 'good' when the stomach was gorged, full and $\frac{3}{4}$ full; 'moderate' when it was $\frac{1}{2}$ full and $\frac{3}{4}$ full; and 'poor' when the stomach was empty or the contents very little. From the total number of fish examined, the monthly percentage occurrence of fish in each condition of feed was determined. The number method was employed in the

analysis of food elements and the relative importance of various food elements was expressed as percentage of the total. Items which occurred very rarely and unidentified minor elements were grouped as 'miscellaneous'. The monthly catch was estimated on the basis of twice-weekly observations following the conventional method. The fishery extends almost throughout the year with two intensive periods, one during April to July and another during September to November (Table 1).

TABLE 1. *Relation between feeding intensity and catch in Sardinella gibbosa.*

	1969-78		1970-71	
	Landings in kg.	Percentage of fish in 'good' and 'moderate' feeding	Landings in kg.	Percentage of fish in 'good' and 'moderate' feeding
September	25875	26.7	256	
October	28064	25.6	950	56.7
November	1084	48.4	5354	30.0
December	77	—	—	—
January	—	—	132	*
February	—	—	165	85.0
March	3610	48.0	237	70.0
April	28574	*	46583	7.1
May	61516	12.9	70096	24.3
June	21046	27.2	—	—
July	—	—	529	*
August	1658	*	6663	*

* = Empty stomachs only

FOOD

The monthly fluctuations in the major food constituents of *S. gibbosa* for the two years is given in Fig. 1. No information could be obtained for the months of January, July and August either for want of material or due to incidence of empty stomachs. By far the most dominant group of food item was crustaceans which were found during almost all the months and in all the size groups of fish. Copepods formed the major element in this group in which *Oithona oculiata*, *O. plumifera*, *O. setigera*, *Corycaeus giesbrechti*, *Microsetella rosea*, *Temora stylifera*, *Euchaeta marina*, *Corycella* sp., *Copilia* sp. and *Labidocera* spp., mentioned in the order of their abundance, were identified. *Lucifer* formed the second important item in the diet, occasionally forming the entire stomach content. It was mainly seen during February to June and November.

Amphipods were encountered twice, in October 1970 and March 1971. Crustacean young ones were noticed only during March 1971. The phytoplankters, that were next in importance, started appearing in the stomach contents only in fish 80 mm and above. The diatoms formed the bulk and were noticed during September to November and March to May. They were represented by the species of *Coscinodiscus*, *Fragilaria*, *Rhizosolenia*, *Nitzschia* and *Chaetoceros*. The blue-green alga, *Trichodesmium erythraeum*, was observed only once in October 1970 in a very small quantity. The occasional piscivorous habits could be discerned from the occurrence of young ones of *Saurida* spp., *Stolephorus* spp. and *Leiognathus* spp., generally during February to May and November in fish of 120 mm length and above. In slightly smaller fish, from 100 mm onwards, fish eggs were encountered either in large numbers as in May and October or in stray numbers during November and December. Large-sized fish scales were also noticed during March and October in the catches of shore seine and boat seine in the larger sized fish above 130 mm. The crustacean larval forms and veliger larvae occurred in fish of 80 mm length and above during September to November and again in February, March and May. The miscellaneous elements consisting of unidentified minor elements, sand grains, gastropod shells and the chaetognaths formed less than 7% of the total food items in all the months except December 1969 when it was 93%.

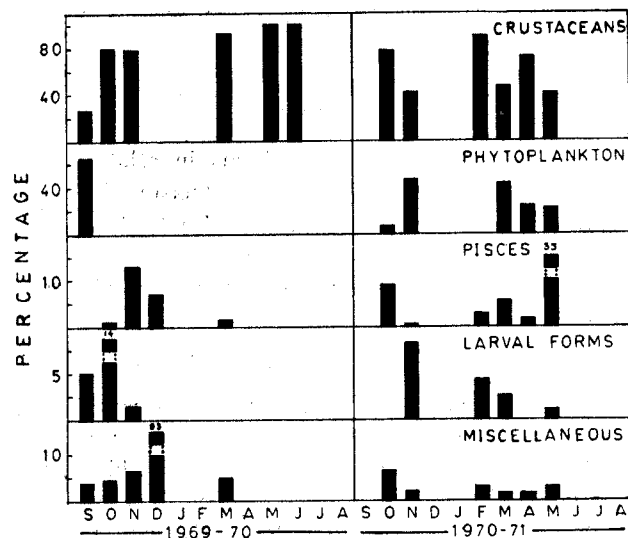


FIG. 1. Monthly fluctuations of the food constituents of *Sardinella gibbosa* at Vizhinjam.

Food and feeding intensity in relation to gears: Copepods, *Lucifer*, fish eggs and larvae, crustacean larval forms were common in the food of fish caught by all the gears. However, the copepod, *Euchaeta marina* and veliger

larvae were met with in the stomach of fish caught by hooks and line only. Fish scales were seen in the catch of shore seine and boat seine while sand grains were found in the catch of shore seine and gill net only. In all the samples other than those from the hooks and line the feeding intensity was generally 'poor'. The percentage of fish in 'good', 'moderate' and 'poor' feeding intensity in the various gears were respectively as follows: gill net 4%, 8% and 88%; boat seine 3%, 10% and 87%; shore seine 20%, 21% and 50% and hooks and line 60%, 10% and 30%.

Feeding intensity in relation to maturity: Indeterminate fish seem to feed more actively than fish in other stages of maturity. The percentage of fish in 'good', 'moderate' and 'poor' feeding were respectively 33, 0 and 67 for the indeterminates; 11, 15 and 74 for the immature; 12, 17 and 71 for the maturing; 5, 12 and 83 for the ripe and 6, 8 and 86 for the spent fish. There was no appreciable difference in the intensity of feeding between sexes.

Feeding intensity in relation to months: 'Moderate' to 'good' feeding was observed only during October 1970 and February and March 1971. During the rest of the period the feeding intensity was generally 'poor'.

Feeding intensity in relation to catch: The feeding intensity was 'moderate' to 'good' when the catches were low and 'poor' when they were good. Only rarely, as in May 1971, 'good' and 'moderate' feeding coincided with good landings (see Table 1).

DISCUSSION

From the observations on the food items in relation to size, it appears that the fish changes from a predominantly crustacean diet to a mixed one of crustaceans and phytoplankton after attaining about 80 mm. This change in the diet has been considered by Kuthalingam (1961) and Sekharan (1971) as due to the effect of increasing number of gill rakers which attain almost the full complement as in adults in sizes above 70 mm.

According to Devanesan (1932), the bulk of the diet of *S. gibbosa* consists of crustaceans composed of zoea larvae, copepods and *Lucifer*. The investigations at Vizhinjam also show the same items forming the bulk with a slight change in their order of abundance. Though the blue green alga, *Trichodesmium erythraeum*, has been reported as a favourite food item of this species (Devanesan 1932, 1942; Chacko 1946, 1949; Devanesan and Chidambaram 1948), it was observed only in one month during the entire period of present observation. Chidambaram (1942) also found this alga only as an occasional food item of this sardine.

Chacko (1956) suggested the possibility of juveniles showing a bottom feeding habit in the inshore regions. The presence of sand grains, gastropod

shells and fish scales without any trace of fish bone during the present study also appears to indicate that the fish, both juveniles and adults, may occasionally resort to bottom feeding.

Ganapati and Rao (1957) while studying the food of this sardine off the Waltair coast noticed that young prawns, larvae of *Acetes* and *Alpheus* are the common food elements forming a very large proportion of the food throughout the year whereas off Vizhinjam, *S. gibbosa* feeds mainly on copepods, diatoms and *Lucifer*.

The dominance of fish with empty stomachs over the fish in other condition of feeding in all except the hooks and line samples may be the result of disgorging of food by the fish when entangled in the gear. The scarcity of such instances in fish caught by hooks and line may appear to support this, since it is likely that immediate hauling of the fish as soon as it is hooked may prevent it from disgorging.

The predominance of the copepod, *Euchaeta marina* and veliger larvae in the stomachs of fish caught by hooks and line only may probably indicate greater occurrence of these items in the deeper waters.

ACKNOWLEDGEMENTS

My grateful thanks are due to Dr. S. Z. Qasim, Director, CMFRI, Cochin for the encouragements, to Dr. M. D. K. Kuthalingam for the guidance, to Dr. B. T. Antony Raja for his helpful criticism and corrections in finalising the paper and to Shri. G. Luther for his various helps.

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