OBSERVATIONS ON THE FOOD AND FEEDING OF THE INDIAN MACKEREL, RASTRELLIGER CANAGURTA (CUVIER)*

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The present communication relates to observations made on the food and feeding of the Indian mackerel, Rastrelliger canagurta (Cuvier), which occupies a high rank amongst the food fishes of India and enjoys a wide distribution in the Indo-Pacific area. Except for a few brief notes on the nature of the food by Devanesan and John (1940), John and Menon (1942), Chidambaram (1944) and Chacko (1949) there is no detailed account especially of the seasonal fluctuations in the food elements and the feeding intensity. In a recent paper Chidambaram and others (1952) have given an account of the fat variations and certain biological aspects of the mackerel. The problem of the food and feeding of the European mackerel, Scomber scombrus has been studied by Allen (1897 and 1909), Bullen (1908), Ehrenbaum (1914), Steven (1949) and Sette (1950). The present study is only a preliminary investigation and it is hoped that this may form the basis for a more comprehensive work on the subject.

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MATERIAL AND METHODS

This study is based on biweekly examination of mackerel landed during January 1949 to January 1950. The species were obtained partly from the departmental collections and partly from the commercial catches made in the 6–10 fathom area near Calicut. During 1950 mackerels were examined once in a fortnight and this was helpful in verifying the results obtained during 1949. A total of 395 specimens were examined of which 321 were adults and 74 juveniles. During the period of this investigation mackerels were available near about Calicut practically throughout the year, though the peak season of its fishery was from September to December. The data obtained as a result of the study of triweekly plankton collections made at

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this research station from the 8 fathom area have been used to compare the food environment of the mackerel with its food constituents as seen from the examination of the stomach contents.

The size of the fish\(^1\) and its gonad condition were noted with a view to finding if any correlation existed between these factors and the intensity of feeding of the fish. The stomach was carefully removed, was split open and the contents washed with water into a petri dish. The displacement volume of the total stomach content was determined in each case by making up the volume to 10 ml. and filtering it through No. 60 bolting silk. The difference between the initial volume and the filtrate was recorded as the volume of the gut content. One ml. of the made-up gut content, which was well stirred up, was taken by means of a graduated pipette and spread over a counting slide. This material was examined under a binocular microscope and the number of each species of organism was counted and recorded.\(^2\) The rest of the gut content was preserved in 5\% formalin for further study. The food organisms were, in most cases, very well preserved facilitating easy identification, often up to species. The non-identifiable fractions were almost always negligible.

In determining the relative importance of the various groups of organisms constituting the food of the mackerel two methods were followed: (1) the number method and (2) the points method (Hynes, 1950). It was found that the number method which gives the total number of each type of food organism in the stomach content does not really express the percentage volume of the various organisms in the total food, as there are wide differences in sizes between various food organisms. For instance, some of the diatoms are very small compared to the size of a copepod. The determination of the volumetric percentage value of the different food elements has been attempted by the points method. Hynes (1950) in his review of methods used in studies of the food of fishes has described the method of estimating the percentage composition of various organisms in the food of fishes by the points method as followed by Swynnerton and Worthington. In this method, the percentage composition is calculated by allotting points to the various organisms based on their relative sizes as determined roughly under a binocular microscope by visual estimation. The points so allotted are then tabulated and the percentages calculated. After careful practice for sometime it is possible to calculate the percentage values with a fair degree of accuracy.

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\(^1\) Total length from the tip of the snout to the end of dorsal fluke of the caudal fin when it is brought in alignment with the long axis of the body, has been taken.

\(^2\) In case of certain phytoplankton forms each colony or chain is reckoned as a unit.
AN ACCOUNT OF THE FOOD AND FEEDING

The food of the mackerel was composed mainly of copepods, cladocerans, diatoms, peridinians and larvae and adults of decapods. Among the lesser elements were the appendicularians, polychæte larvae, post-larval bivalves, pteropods, cirripede nauplii and fish eggs and larvae. On a few occasions sand grains and fish scales were noticed in the stomach content. The mackerel was observed to feed exclusively on planktonic organisms.

Fig. 1 shows variations in the average number of individuals of different major groups of organisms forming the food of the mackerel during different periods of the year as determined by the number method. A brief account of the different groups of food elements is given below.

**Copepoda.**—Copepods formed the dominant element in the gut content of the mackerel and they were present in the gut practically throughout the year. Copepod eggs and nauplii were common food elements in February and again in September and October. The maximum feeding on copepods was from January to May. During the monsoon months, June and July, the copepod fraction of the food was low, but increased again during October, November and December. The copepods in the stomachs were invariably in good state of preservation facilitating easy identification. *Paracalanus, Oithona, Acartia* and *Temora* were the dominant genera forming the food of the mackerel. *Centropages, Pseudodiaptomus, Corycaeus, Macrosetella, Euterpinia* and *Labidocera* and other genera were also observed but in lesser numbers. The following were the common species.

- *Paracalanus parvus* (Claus)
- *Oithona plumifera* Baird
- *Oithona rigida* Giesbrecht
- *Acartia erythrea* Giesbrecht
- *Temora turbinata* (Dana)
- *Centropages furcatus* (Dana)
- *Pseudodiaptomus* sp.
- *Corycaeus* sp.
- *Macrosetella gracilis* (Dana)
- *Euterpinia acutifrons* (Dana)
- *Labidocera acuta* (Dana)

**Cladocera.**—Next in importance to copepods as food of the mackerel were the cladocerans. While copepods were observed in the stomach almost throughout the year the cladocerans formed a substantial part of the diet during the period from August to December. It is during this period that they occurred abundantly in the plankton. They were in moderate numbers from January to March. Though only two species, *Evadne tergestina* Claus and *Penilia avirostris* Dana have been known to occur along this coast, they formed important planktonic food on account of their numerical abundance. *Evadne* started coming up in the plankton in the
FIG. 1. Variations in the numerical abundance of the major groups of food organisms in 1/10 part of the stomach content of a mackerel.
early part of the monsoon period and was followed by *Penilia* and both the species were dominant during the post-monsoon period. The cladocerans together with the copepods formed the main food of the mackerel during the mackerel season from October to January.

*Decapod crustacea.*—Larval and adult decapods were present in fair numbers in the stomach contents throughout the year except during the monsoon months of June and July. Larval stages of Penaeids, *Acetes* and larval and adult *Lucifer* formed the main decapod elements, contributing to a good percentage of the food of the mackerel from January to April and again in November and December. Zoa and mysis stages of *Acetes* and *Lucifer* were common during the earlier months of the year while eggs and zoa of *Metapenaeus dobsoni* were mainly responsible for the high percentage of the decapod fraction in the food in the latter half of November. Adult specimens of *Lucifer* were observed in the food in small numbers throughout the year. Brachyuran zoa, mostly of Portunids along with small numbers of zoea of *Emerita* were also observed in the stomach of the mackerel during summer months.

*Dinophyceae.*—These were found to occur almost throughout the year in the mackerel stomach although they indicated definite peak periods correlated with their abundance in the plankton. There was a minor peak in April when species of *Dinophysis* and *Peridinium* dominated, and a major one from June to September when practically all forms of Dinophyceae occurred abundantly. The following forms represent the dominant species of Dinophyceae in the food of the mackerel.

*Prorocentrum micans* Ehrenberg  
*Dinophysis caudata* Saville-Kent  
*Ornithocercus magnificus* Stein  
*Pyrophacus horologicum* Stein  
*Peridinium conicum* (Gran) Ostenfeld et Schmidt  
*P. depressum* Bailey  
*Ceratium furca* (Ehrenberg) Claparede et Lachmann  
*C. fusus* (Ehrenberg) Dujardin  
*C. massiliense* (Gourret) Jorgensen

*Bacillariophyceae* (*Diatomaceae*).—Mackerel feeds actively on diatoms during the latter half of south-west monsoon when the latter occur in great abundance. During the period from January to June the diatom fraction in the food of the mackerel was not appreciable but for a small rise in April due to the occurrence of large numbers of the species of *Pleurosigma* and *Coscinodiscus*. From July to October the general phytoplankton fraction
of the mackerel food was high with a peak in September. Species of *Fragilaria*, *Thalassiothrix*, *Nitzschia* and *Coscinodiscus* contributed to the bulk of the mackerel food during this period. *Biddulphia* and *Rhizosolenia* occurred in moderate numbers almost throughout the year. The following were the main species of diatoms contributing to the food of the mackerel.

*Coscinodiscus lineatus* Ehrenberg  
*C. gigas* Ehrenberg var. *prætexta* (Janish) Hustedt  
*Planktoniella Sol* (Wallich) Schutt  
*Lauderia annulata* Cleve  
*Rhizosolenia robusta* Norman  
*R. setigera* Brightwell  
*Bacteriaptrum varians* Lauder  
*Chætoceros coarctatus* Lauder  
*Ch. curvisetus* Cleve  
*Ditylum Sol* Grunow  
*Triceratium favus* Ehrenberg  
*Biddulphia sinensis* Greville  
*B. mobiliensis* Bailey  
*Hemidiscus Hardmannianus* (Greville) Mann  
*Fragilaria oceanica* (Cleve)  
*Thalassiothrix Frauenfeldii* Grunow  
*Asterionella japonica* Cleve  
*Pleurosigma Normanii* Ralfs  
*P. directum* Grunow var. *membranacea* Subrahmanyan  
*Nitzschia sigma* (Kutzing) W. Smith var. *indica* Karsten  
*N. seriata* Cleve

*Miscellaneous groups.*—The minor elements of mackerel food were composed of larval bivalves, polychæte larvæ, chaetognaths, appendicularians, larval cirripedes, pteropods, blue green algae and fish eggs and larvæ. Lamellibranch post-larvæ were found to occur in fair numbers in the stomach of the mackerel in March and again during July and August. There were, however, a few occasions when the fish were observed to have fed almost exclusively on the lamellibranch post-larvæ. Larval stages of *Mytilus* formed the bulk of the larval bivalves. The polychætes observed in the food were mostly larval spionids and were, more or less, limited to the latter half of the south-west monsoon period. *Prionospio* sp. was the most common polychæte occurring during the year. Chaetognaths were noticed in the diet on a few occasions although they were present in the plankton in appreciable numbers all through the year. Though eleven species of chaetognaths have been known to occur along this coast only two
species, *Sagitta bedoti* and *Krohnitta pacifica* were encountered in the food of the mackerel and that in very small numbers. That the chaetognaths are not favoured as food elements by the mackerel is evidenced by the fact that their number in the stomach content was negligible even during the period from October to December when their population was high in the coastal waters (George, 1952). The appendicularian, *Oikopleura* sp. was present in small numbers throughout the year, invariably with the tail severed from the head and occasionally *Fritillaria* was also present. *Pteropods*, particularly *Creseis* sp. were observed in fair numbers during the hot months. Cirripede nauplii were common from September to November and the cypris stage was also occasionally present. The blue-green algae *Oscillatioria erythraeum* and *O. thiebauti* were only nominally found in the stomach although they were present in plankton in swarming condition during the south-west monsoon period. Fish scales and sand grains were met with in the stomachs in small proportion during the post-monsoon period.

The fish eggs and larvae were observed occasionally in small numbers during the periods from January to April and September to December and they formed only a negligible part of the diet. The eggs mostly belonged to the species of *Caranx*, *Anchoviella* and *Kowala coval*. A few larvae of sciaenids, clupeids and carangids in their early larval stages, were also observed.

**Percentage Composition of Various Food Elements**

The volumetric percentage composition of the various groups of food organisms during the different months and the average percentage of each group for the year as determined by the points method is given in Table I.

It is admitted that the determination of the percentage composition of food organisms by the *points method* is arbitrary and that it provides only a rough estimate. Nevertheless, in the absence of a more accurate method, it gives a fair idea of the relative importance of the various food organisms. About 50% of the food of the mackerel was composed of copepods. The other main groups constituted 16% cladocerans, 12% larval and adult decapods, 11% phytoplankton forms, 5-5% lamellibranch larvae and 4% fish eggs and larvae. The monthly variations in the percentage values of the various groups can be seen in Table I. There was a close similarity between the values obtained by the number and points methods in respect of the seasonal variations in the abundance of the different groups of food elements (Fig. 1 and Table I).
TABLE I
Percentage composition of the food elements assessed by points method

<table>
<thead>
<tr>
<th>Food organisms</th>
<th>Jan. 1949</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
<th>Average percentage for the year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phytoplankton</td>
<td>4.0</td>
<td>5.0</td>
<td>4.5</td>
<td>14.0</td>
<td>12.0</td>
<td>13.0</td>
<td>27.0</td>
<td>21.0</td>
<td>20.0</td>
<td>5.0</td>
<td>2.0</td>
<td>5.0</td>
<td>11.0</td>
</tr>
<tr>
<td>Copepods</td>
<td>65.0</td>
<td>68.0</td>
<td>62.0</td>
<td>67.40</td>
<td>61.0</td>
<td>52.0</td>
<td>46.3</td>
<td>32.3</td>
<td>33.0</td>
<td>43.0</td>
<td>31.5</td>
<td>39.0</td>
<td>49.6</td>
</tr>
<tr>
<td>Cladocerans</td>
<td>5.7</td>
<td>6.3</td>
<td>3.6</td>
<td>2.8</td>
<td>8.0</td>
<td>6.0</td>
<td>9.0</td>
<td>9.0</td>
<td>3.4</td>
<td>5.0</td>
<td>5.0</td>
<td>26.0</td>
<td>24.0</td>
</tr>
<tr>
<td>Decapods</td>
<td>21.2</td>
<td>10.5</td>
<td>15.0</td>
<td>8.0</td>
<td>9.0</td>
<td>18.0</td>
<td>3.4</td>
<td>3.4</td>
<td>5.0</td>
<td>5.0</td>
<td>26.0</td>
<td>24.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Fish eggs and larva</td>
<td>8.5</td>
<td>7.0</td>
<td>4.5</td>
<td>2.8</td>
<td>8.0</td>
<td>5.1</td>
<td>6.0</td>
<td>3.0</td>
<td>0.9</td>
<td>7.5</td>
<td>4.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamellibranch larva</td>
<td>5.0</td>
<td>1.6</td>
<td>9.0</td>
<td>3.6</td>
<td>0.8</td>
<td>6.2</td>
<td>13.5</td>
<td>10.5</td>
<td>6.5</td>
<td>1.0</td>
<td>1.8</td>
<td>5.7</td>
<td>5.5</td>
</tr>
<tr>
<td>Other forms</td>
<td>0.6</td>
<td>1.6</td>
<td>1.4</td>
<td>1.4</td>
<td>1.2</td>
<td>4.8</td>
<td>4.4</td>
<td>2.2</td>
<td>3.3</td>
<td>3.0</td>
<td>1.8</td>
<td>1.8</td>
<td>1.9</td>
</tr>
</tbody>
</table>

VOLUME OF FOOD

The total volume of food in the stomach ranged from 0.7 c.c. in August to 3.5 c.c. by the end of October. The feeding was good from January to May with an average volume of 2.1 c.c. The food volume came down to 1.5 c.c. during the period from May to August indicating poor feeding. The feeding was maximum from September to December when the average volume of food taken was 2.8 c.c. At no period of the year was there complete stoppage of feeding. Only two instances of almost empty stomachs were observed during the year. Two specimens in September and three in October were noticed with very little food in their stomachs, but other specimens examined on the same dates had normally fed. Fig. 2 indicates fluctuations in the extent of feeding, total volume of standard plankton samples taken from the inshore area near Calicut and the maturity stages of mackerel during different periods of the year.

GENERAL OBSERVATIONS AND DISCUSSION

Size and maturity condition of the mackerels and their relation to feeding.—The specimens obtained during January and February had a size range of 20 to 21.6 cm. and were immature with gonad condition not beyond Stage II.* By the latter half of March the specimens showed a more advanced

* The gonad stages referred to in this paper are after the maturity scales adopted by the International Council for the Exploration of the Sea.
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Fig. 2. Variations in the total volume of stomach content, total volumes of standard plankton samples and maturity stages of the mackerel.

gonad condition. In April the gonads were found to occupy half to two-thirds the body cavity and the eggs were still opaque. The size range of the fish was, more or less, the same as that of the previous months. Mackerel was rare during May but, the few specimens obtained had a size range of 21·9 to 23·3 cm. and were fully mature reaching Stage V. The gonads filled practically the whole body cavity. In June the gonads showed further advanced condition with a few large transparent ova, a condition more or less similar to that in the ripe ovary of the European mackerel Scomber scombrus (Steven, 1950). During May and June, the specimens were very rare. These spawners, it is presumed, would have retreated to the offshore spawning grounds. The absence of mackerel eggs and larvæ in our inshore collections confirms this view. In the month of July there was recruitment of smaller size group, 10 to 13 cm. into the inshore area. They showed gonads which had hardly differentiated and even recognition of sexes was
difficult. During August still smaller size group from 5·6 to 8 cm. was abundantly caught. Only once during August a shoal of mackerel of 20·4 cm. size with gonads in Stage V was caught. This indicates that the mackerel have probably a prolonged spawning period. From September there was a steady increase in mackerel catches and continued to be so till the end of November after which there was a decline in the fishery during the year of study. October and November were peak months for the mackerel fishery. Majority of specimens ranged from 16 to 20 cm. size and were immature with gonad in Stage II. Whether these different size groups of mackerel caught in the coastal waters during different periods of the year belong to a single stock of mackerel in the sea or represent distinct stocks or contingents (Sette, 1950) has yet to be investigated.

There appears to be a distinct correlation between the maturity of the fish and its feeding intensity. From February to the middle of April when the mackerel were maturing, the feeding intensity was high. From the middle of April to June when the fish was mature with advanced gonad condition in Stage V the feeding was observed to be low. During July-August there was recruitment of juvenile sizes into the coastal waters and the feeding was also comparatively poor. Observation that the fish feeds less when they are in advanced stage of maturity during the spawning season is in agreement with the findings of other workers. Jesperson (1928) points out that “Herring feed as a rule to a slight extent immediately before and during spawning” and Ritchie (1937) states in regard to the feeding habits of the haddock that “An analysis of the volumetric data shows that, on an average, the intensity of feeding is much reduced during the spawning season”. Again during the post-monsoon period from September to December when the mackerel population was composed of immature fish the feeding intensity was comparatively high. Venkataraman and Chari (1951) and Chidambaram, et al. (1952) have shown that there are two peak periods in a year for fat formation in the mackerel, one in April-May and another in October-November and they attribute it to feeding activity. The period, February-March-April was characterised by abundance of copepods and decapods and to some extent, fish eggs and larvae and the period, October-November-December was marked by the dominance of cladocerans, decapods and copepods. The high percentage of fat formation by the mackerel during these two periods is perhaps due to its intense feeding on these zooplankton forms.

An examination of the gut contents of a large number of young mackerel of sizes from 5·5 to 7·5 cm. during August revealed that the food of the young mackerel does not radically differ from that of the adult,
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Correlation between mackerel food and composition of the plankton.—A close similarity between the food constituents and the planktonic elements in the coastal fishing ground was noticed during different seasons of the year except for the absence of certain groups of organisms in the food though they occurred in the plankton at the time. During the period of intense phytoplankton production especially in the latter half of the south-west monsoon period from July to September the mackerel food showed corresponding dominance in diatoms and peridinians (Table I). Similarly copepods which occurred in large numbers from January to May and again from September to December and cladocerans from August to December and decapods in January and November-December showed corresponding dominance in the food during the respective periods. The other minor forms such as larval bivalves, fish eggs and larvae, pteropods and appendicularians occurred in the food, more or less, in the same proportion in which they were present in the plankton during different periods of the year. A significant point noticed in this connection was the complete absence of noctiluca from the stomach content of the mackerel though it occurred very abundantly in the plankton from August to October, except in a single specimen in August in which six noctilucae were present in the stomach. Further, forms like salps, medusae, ctenophores, stomatopod larvae, chaetognaths and blue-green algae, though present in the stomach in negligible numbers, were never represented in the food in the same proportions in which they were present in the plankton. These organisms seem to be avoided by the mackerel. To this extent the mackerel does not feed indiscriminately on the plankton, but seems to discriminate edible from the non-edible elements. As to the exact manner by which the non-edible portion of the plankton is avoided is not clearly known. Practically all the non-edible elements especially noctilucae, are surface living forms and it is possible that the fish, at the regions of their concentrations, prefer to feed below the surface layers of water. On several occasions when the noctiluca was abundant in the plankton it has been observed that the food of the mackerel, as seen from examination of the stomach contents, matched more with the bottom than the surface plankton. The intense concentration of mackerel in the coastal waters from September to January may perhaps be due to the richness of the plankton during these months.

There is close correlation between the organisms in the gut contents of mackerel and those occurring in the plankton collections taken from the 8 fathom zone, both in respect of species and their relative abundance, indicating that they had presumably fed in the inshore area. The food organisms were invariably in fresh condition when the guts were opened for examina-
tion. On the other hand, there was considerable variation between the organisms in the gut content of the mackerel and those in the plankton collections taken from the 20 fathom area.

Food Environment.—From a combined study of both the food of the mackerel by the examination of the stomach contents and the plankton collections made near about Calicut it has been possible to assess to some extent the nature and composition of the food environment of the mackerel in the coastal waters. Owing to absence of facilities for offshore work it has not been possible, to examine the nature of the food environment in the offshore area and determine how far the migrations of the mackerel are governed by the food factor. We have at present no knowledge of either the wanderings of the mackerel in the offshore area or the feeding conditions there. Plankton food was available in the inshore area throughout the year though there were seasonal fluctuations in its abundance and composition. During the period from January to May the non-edible elements such as medusæ, ctenophores, chaetognaths, salps and other forms appeared in large numbers but a good percentage of the plankton was composed of copepods and decapod larvae which formed the main food of the mackerel during these months. Immediately after the commencement of the south-west monsoon in the third week of May there was a radical change in the physico-chemical condition of the inshore area. The plankton volume increased as a result of abrupt and abundant production of diatoms, dinoflagellates and other forms. The zooplankton fraction during this period was low. The phytoplankton bloom declined by the third week of June. From August to December there was a reduction in the phytoplankton population with a corresponding increase in forms of zooplankton in which the cladocerans and copepods dominated. These months represent peak period for the mackerel fishery along this coast and further, intense feeding was noticed among mackerel during the period. In addition to mackerel, other plankton feeding species of fishes were also abundant during the period, bringing about a severe competition for food. The slightly lower plankton volume observed in October and November (Fig. 2) is perhaps indicative of the intense grazing on the rich plankton by the plankton feeding fishes occurring abundantly during the period in the coastal waters. A similar conclusion has been arrived at by Kow (1950) in regard to the feeding relationship of the fishes of Singapore Strait.

From the account of the feeding habit given above, it is obvious that there is no period of the year when mackerel may be said to abstain from food. Similarly, there is also no time of the year when the planktonic organisms which form the food of the mackerel are altogether absent. In
the temperate waters on the other hand, there are very steep seasonal cycles in plankton production and in the consumption of food by plankton feeding fishes, which is reflected in the occurrence of feeding and non-feeding phases in their lives. The annual growth cycle and the formation of winter rings on the scales and otoliths of certain fishes are usually attributed to the feeding cycle. It is reasonable to expect that such growth checks would be less pronounced in tropical fishes feeding on plankton available throughout the year.

**Summary**

The study of the food and feeding of the mackerel, *Rastrelliger canagurta* was based on the periodical examination of stomach contents of the mackerel and the plankton of the coastal waters near Calicut during the years 1949 and 1950. The relative importance of various food elements have been determined by the number and the points methods.

The mackerel has been observed to feed almost exclusively on plankton organisms. The main food constituents were copepods, cladocerans, larval and adult decapods, peridinians and diatoms. Post-larval bivalves, fish eggs and larvae, polychaete larvae, cirripede nauplii, appendicularians and pteropods were minor elements in the food. There was no appreciable difference between the food of the young and that of the adult mackerels.

The composition of the food varied from season to season depending upon the fluctuations in the occurrence of various planktonic elements. There was a close correlation between the food constituents and the planktonic organisms of the inshore area.

Non-edible forms like salps, medusae, ctenophores, stomatopod larvae, chaetognaths and noctiluca were avoided and to that extent there was selective feeding. There was feeding throughout the year although the feeding intensity varied from season to season. There was no marked period of fasting.

The feeding intensity was low during the prespawning and spawning periods and comparatively high in the 16 to 20 cm. size group. It was maximum during the period from September to December when edible plankton was abundant.

**References**


