Experience Paper No. 39

FOOD OF INDIAN TUNAS

By

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Abstract

The existing knowledge on the food of Indian tunas is only of a preliminary nature and relates to the following species: Auxis thazard, Auxis thynnoides, Euthynnus affinis affinis, Sarda orientalis, Kishinoella tonggol, Katsuwonus pelamis and Neothunnus macropterus. This has been briefly reviewed and compared with observations from other areas.

ALIMENTS DES THONS INDIENS

Résumé

Nos conaissances actuelles sur l'alimentation des thons indiens en sont encore à une étape préliminaire et concernent les espèces suivantes: Auxis thazard, Auxis thynnoides, Euthynnus affinis affinis, Sarda orientalis, Kishinoella tonggol, Katsuwonus pelamis et Neothunnus macropterus.

L'article traite brièvement de ces questions et compare les résultats avec les observations recueillies dans d'autres zones.

EL ALIMENTO DE LOS ATUNES DE LA INDIA

Extracto

Los conocimientos existentes del alimento que consumen los atunes de la India son tan sólo de naturaleza preliminar y se refieren a las siguientes especies: Auxis thazard, Auxis thynnoides, Euthynnus affinis affinis, Sarda orientalis, Kishinoella tonggol, Katsuwonus pelamis y Neothunnus macropterus. Se han hecho reseñas breves y comparaciones con observaciones de otras aguas.

1 INTRODUCTION

Investigations on the food and feeding habits and various other aspects of the biology of Indian tunas have been initiated only recently. Preliminary observations from Indian waters are available on the food of the frigate mackerels Auxis thazard (Lacépède) and Auxis thynnoides Bleeker, the little tunny Euthynnus affinis affinis (Cantor), the oriental bonito Sarda orientalis (Temminck and Schlegel), the oceanic skipjack Katsuwonus pelamis (Linnaeus), the northern bluefin tuna Kishinoella tonggol (Bleeker) and the yellowfin tuna Neothunnus macropterus (Temminck and Schlegel). Considerable work has been done in this field in other parts of the Indo-Pacific, especially on the oceanic skipjack and yellowfin tuna. The literature available is extensive. This paper attempts to bring together all the information available on the food of these species from Indian waters. An exhaustive discussion on the topic has not been attempted. A great deal of information has also accumulated in recent years on the bait fishes used in the tuna fishery in various parts of the Pacific ocean, the variability of response of tunas to bait fishes and similar aspects. In India, preliminary studies have been made on the tuna bait fish resources of the Laccadives and further work is in progress. In the present study, only the natural food of tunas has been considered.

2 THE LONG CORSELETTED FRIGATE MACKEREL Auxis thynnoides BLEEKER

The species was first recorded from Indian waters by Jones (1958a). It is caught, with A. thazard, from Malpe to Colachel on the west coast.

The food of this species, obtained by shore seines and boat seines at Vizhingam, an important tuna fishing center on the west coast, has been studied (Kumaran, 1962). The composition by volume of the various food items is given in Fig. 1. Fish ranged in size from 170 to 252 mm. Squids were the major food element by volume. Fish were next in importance, followed by crustaceans in small proportions. Species of Sardinella, Anchoviella and Leiognathus were represented in the food of the species.

The only other information available on the food of the species is from Japanese waters. A. thynnoides (= A. tapeinosoma) caught by pole and line in Japanese waters from December 1958 to April 1961, were observed to have fed on Scomber tapeinocephalus, Trachurus japonicus, Acinacea notha, Gonorhynchus abbreviatus, Elephenor macropus, Macrorhamphosus scolopax, Apogonichthys carinatus, Gnathagnus elongatus, lizard fishes, anchovy and cephalopods. Those caught by set nets had Scomber tapeinocephalus, Trachurus japonicus and lizard fishes as the major food items (Yokota et al., 1961).

3 THE SHORT CORSELETTED FRIGATE MACKEREL Auxis thazard (LACEPEDE)

Juveniles of A. thazard ranging in size from 49 to 132 mm were examined for food (Kumaran, 1962). They were also obtained by shore seines and boat seines at Vizhingam. Those from 49 to 75 mm had fish as the major item, followed by crustaceans, while fish and crustaceans were found in almost equal proportions in the larger size group (Fig. 1).

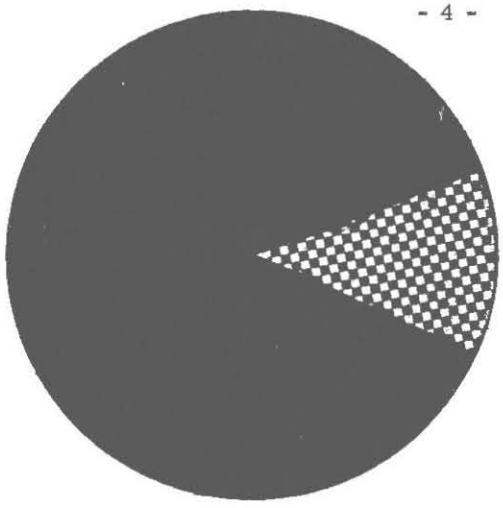
Tester and Nakamura (1957) observed that megalopa, stomatopod larvae and anomura larvae formed the food of the species from Oahu, Hawaii.

The food of A. thazard caught by trolling lines in Japanese waters during June 1959 consisted of skipjack, frigate mackerel, jack mackerel, flying fishes, file fishes, Mene maculata, Spratelloides japonicus, anchovy and squids (Yokota et al., 1961).

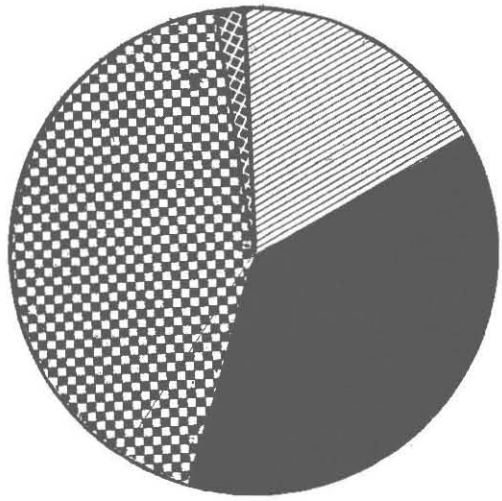
4 THE OCEANIC SKIPJACK Katsuwonus pelamis (LINNAEUS)

Studies on the food of the oceanic skipjack from Minicoy, the southernmost island of the Laccadive Archipelago during 1958 and 1959 have been made by Raju (1962) and for the season 1960-61 by Thomas (1962a). An important fishery for the species exists in Minicoy and the only gear employed is the pole and line, using live-bait fishes (Jones, 1958b; Jones and Kumaran, 1959). The fish studied ranged from 280 to 720 mm in length. Crustaceans (53.3 percent), fish (23 percent) and cephalopods (18 percent) were reported as the major items during 1958 and 1959 (Fig. 2). However, during the 1960/61 fishing season, fish (58.8 percent) and crustaceans (37.1 percent) were the major elements, while cephalopods formed only an insignificant item (Fig. 3). The fishes belonged to the families Exocoetidae, Dactylopteridae, Syngnathidae, Balistidae, Monacanthidae, Carangidae, Gempylidae, Ostraciontidae, Apogonidae, Dussumieriidae and Pomacentridae. The crustaceans were mainly represented by stomatopod larvae, megalopa, mysids and Acetes indicus.

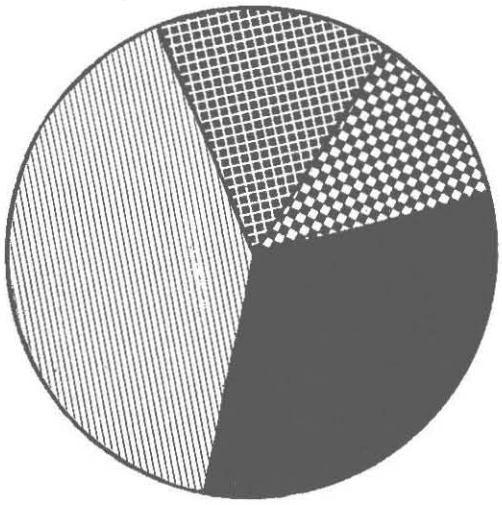
Variations in the volume of food in relation to fish size were studied by Raju (1962). It was found that there was increase in food volume with increase in length and decrease in stomach content per unit of body weight with increase in weight. During both the periods of observation it was found that smaller fish fed mainly on crustaceans and, to a smaller extent, on fishes. Larger size groups of the skipjack had fish as the major item of food and crustaceans were next in importance. Fish above 700 mm had cephalopods as the principal item, followed by fishes. Thus it is seen that the importance of crustaceans as food increases in smaller skipjack size groups.



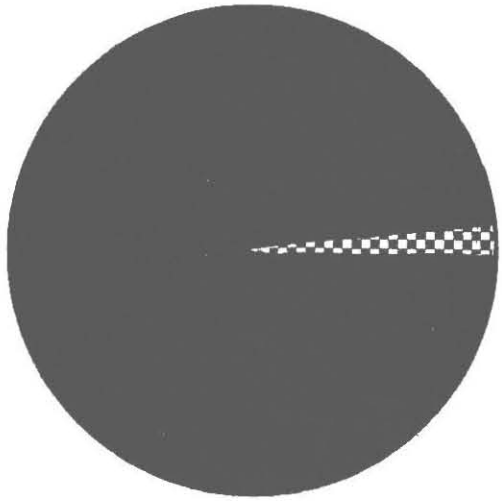
AUXIS THAZARD
49 - 75 MM



AUXIS THAZARD
76 - 132 MM



AUXIS THYNNOIDES
170 - 252 MM



SARDA ORIENTALIS
85 - 305 MM

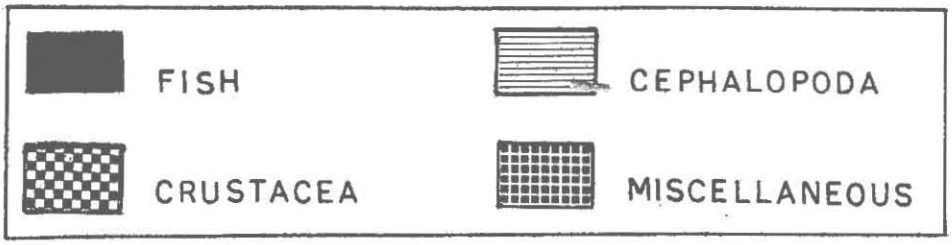


Fig.1. Diagrams illustrating the composition by volume of the stomach contents of Auxis thazard, A. thynnoides and Sarda orientalis

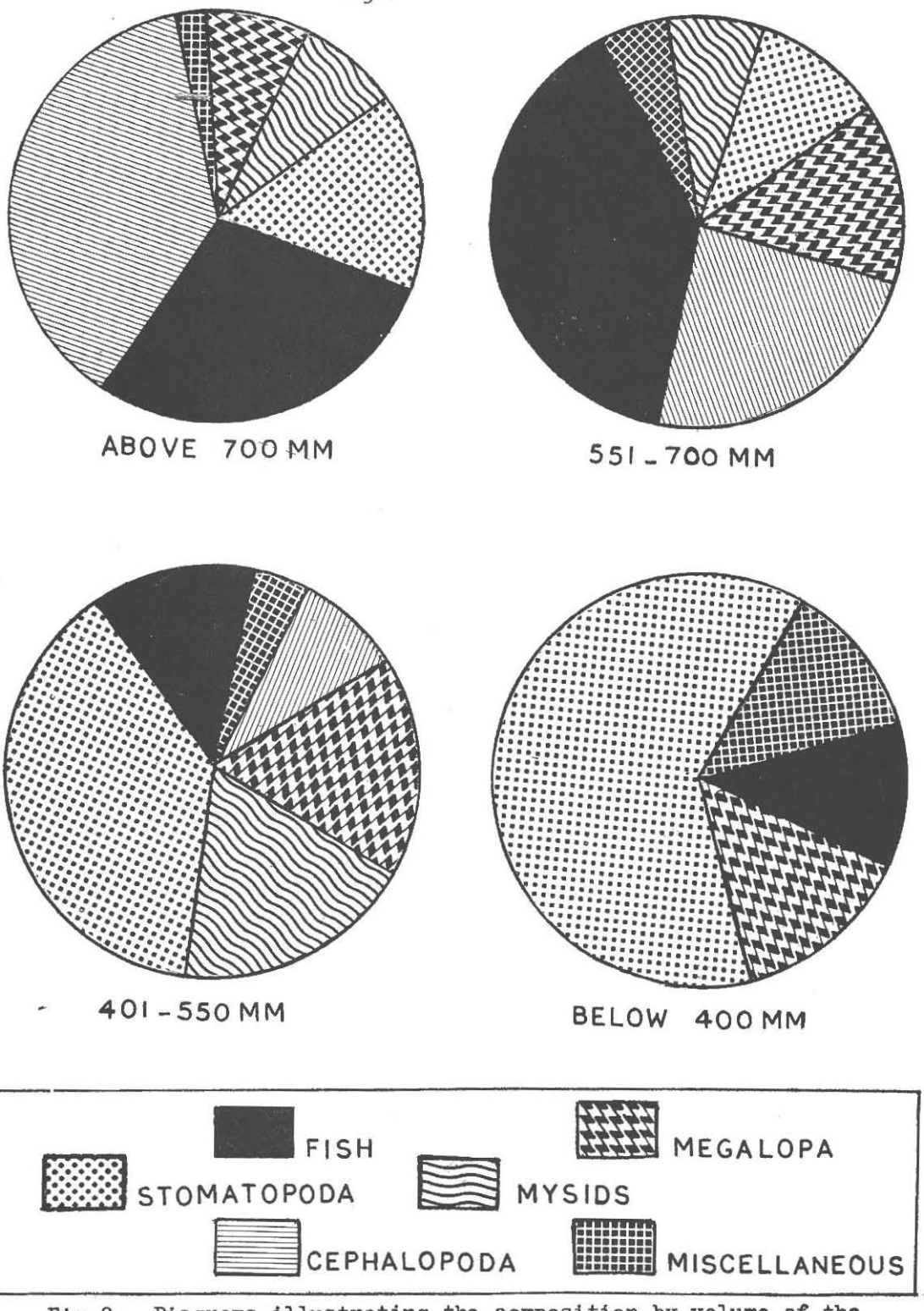


Fig.2. Diagrams illustrating the composition by volume of the stomach contents of Katsuwonus pelamis from Minicoy Island during the period 1958-59 (after Raju, 1962)

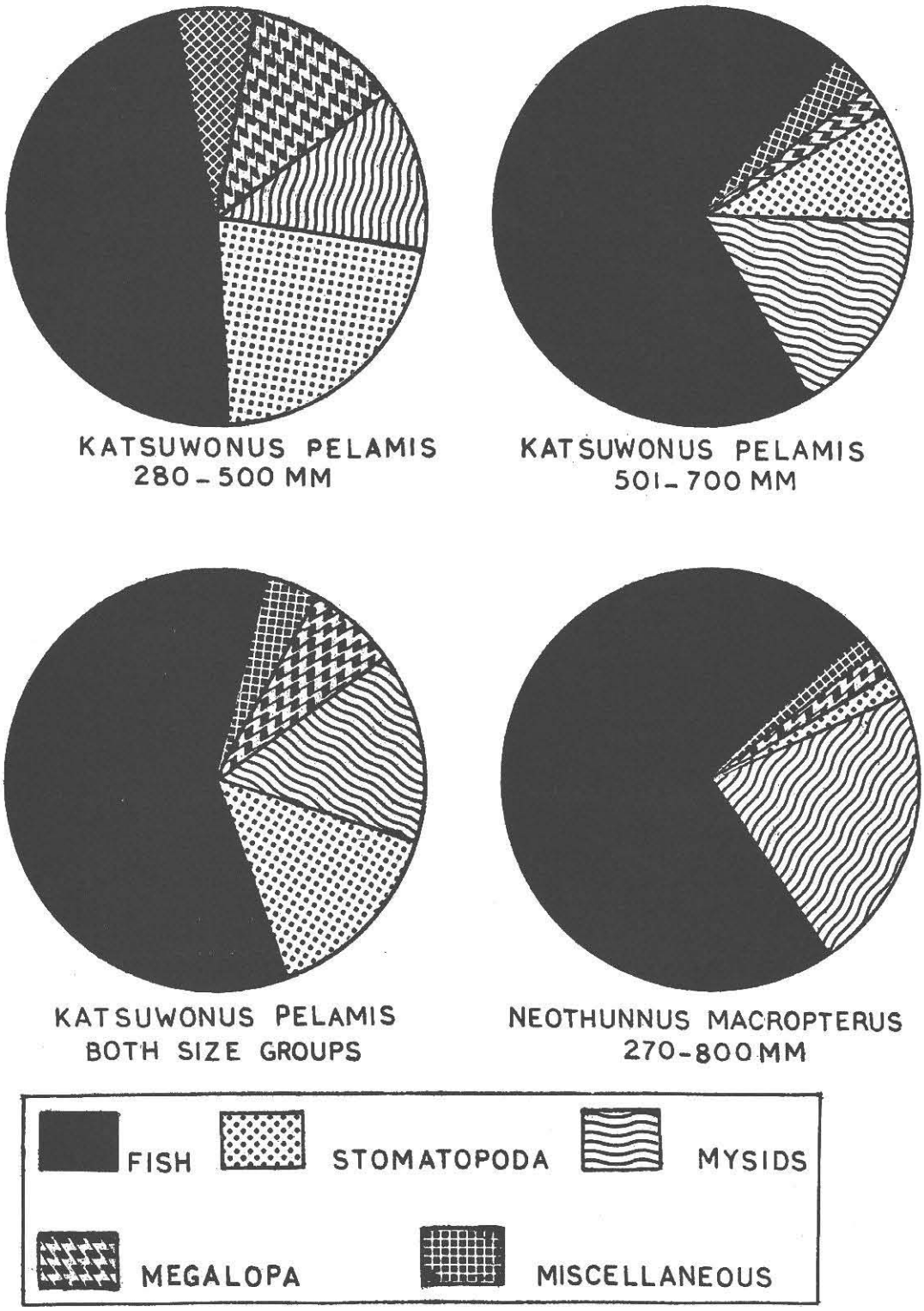


Fig.3. Diagrams illustrating the composition by volume of the stomach contents of Katsuwonus pelamis and Neothunnus macropterus from Minicoy during the season 1960-61 (after Thomas, 1962)

They are not represented in the food of the largest size group. The percentage of fish with empty stomachs was very high during both periods. In fish containing food, the food volume was very low -- in a high percentage, measuring below one cc. This may be because they are drawn from large surface shoals.

Studies have been made on bait fishes recovered from stomachs of oceanic skipjack and the relation of these to the natural food. It was seen that natural food was less than 10 percent of the stomach contents, the rest being formed by bait fish supplied (Raju 1962).

A preliminary survey on the tuna bait fish resources of the Laccadive area has shown the occurrence of a number of species which may be used as tuna live bait. The possibility of using Spratelloides delicatulus, which occurs in large shoals in the area, as a tuna live-bait fish has been indicated (Jones, 1958a, 1958b, 1960a, 1960b, 1962; Thomas 1962b).

The food of skipjack taken by longlining in East African waters has been reported to be made up of squids, fish and planktonic organisms (Williams, 1962). The literature available on the food of skipjack from various parts of the Pacific is extensive (Kishinouye, 1923; Welsh, 1949; Hotta and Ogawa, 1955; Yuen, 1959; Schaefer, 1960; and Yokota et al., 1961). There is general agreement between these and the observations from Indian waters.

5 THE YELLOWFIN TUNA Neothunnus macropterus (TEMMINCK AND SCHLEGEL)

The food of yellowfin tuna ranging from 280 to 800 mm from Minicoy during the 1960/61 season was composed of the same groups of organisms as that of the skipjack caught with them -- fish (72 percent) and crustaceans (26.3 percent) (Fig. 3). This may be owing to the similarity in the habitats of the two species (Thomas, 1962a).

Yellowfin tuna caught on troll lines in the Gulf of Mannar off Tuticorin during July and August 1961, ranging from 560 to 860 mm had fish as the major natural food element, consisting mainly of balistids, and clupeids in small quantities. The second major item was squids (Loligo sp.). Crustacean remains were seen only in traces. About 10 percent of the stomachs were empty (Silas, 1962).

The food of yellowfin tuna from the Central Pacific has been studied in detail and the extensive literature has been reviewed by Reintjes and King (1953). Comparison of yellowfin food with food of the bigeye tuna Parathunnus sibi from the Central Pacific has since been made (King and Ikehara, 1956). Observations are also available from South African and East African waters (Talbot and Penrith, 1960; Williams, 1962) and from Japanese waters (Yokota et al., 1961). It is seen that fishes form the principal item of the food of the species in all the regions.

6 THE NORTHERN BLUEFIN TUNA Kishinoella tonggol (BLEEKER)

K. tonggol caught by trolling in the Gulf of Mannar off Tuticorin from June to September 1961 were found to have crustaceans as the major element of natural food. Digested remains of fishes were seen in the stomachs occasionally (Silas, 1962).

The only other information available on the food of the species is from western, northern and eastern coasts of Australia (Serventy, 1942; 1956). Specimens caught by trolling usually had empty stomachs or the food remains were in an advanced stage of digestion. Most of the fish which contained freshly-captured food in the stomachs were net-caught fish. A wide variety of food organisms were recorded, but pelagic forms predominated. The food consisted mainly of pilchards Sardinops neopilchardus with insignificant numbers of mackerel, Scomber australasicus in specimens from Port Hacking, New South Wales. In Western Australia no particular food preferences were indicated. In Northern Australia, Harengula, pilchards and anchovy predominated among the food items; leatherjackets, garfish, flying fish, Rastrelliger kanagurta, Mugil compressa, Gerres ovatus and various plectognaths also formed the food of the species. Crustacea, particularly stomatopod larvae and prawns were common and cephalopods were frequent among the stomach contents.

7 THE LITTLE TUNNY Euthynnus affinis affinis (CANTOR)

Juveniles of E. affinis affinis caught by boat seines and shore seines and adults caught by hooks and lines at Vizhingam on the west coast and Tuticorin on the east coast have been examined for the food (Kumaran, 1962). Juveniles ranging from 41 to 150 mm had fishes such as Anchoviella tri, A. commersonii, Megalaspis cordyla, Decapterus russelli, Leiognathus insidiator and L. bindus as the major elements of the food. Squids formed a minor item. Squids formed the major constituent of the food of the adults, followed by fishes (Fig. 4).

E. a. affinis measuring from 15 to 70 cm obtained by shore seines, driftnets and hooks and lines at Vizhingam from July 1960 to October 1961 had as food Leiognathus splendens, Sardinella fimbriata, Anchoviella spp., Dussumieria hasselti, Decapterus russelli, Rastrelliger canagurta and Sepia sp. Among these, young clupeids occurred to a far greater extent than other organisms (Bennet, 1962).

Observations on the food of the species from East African waters show that according to the

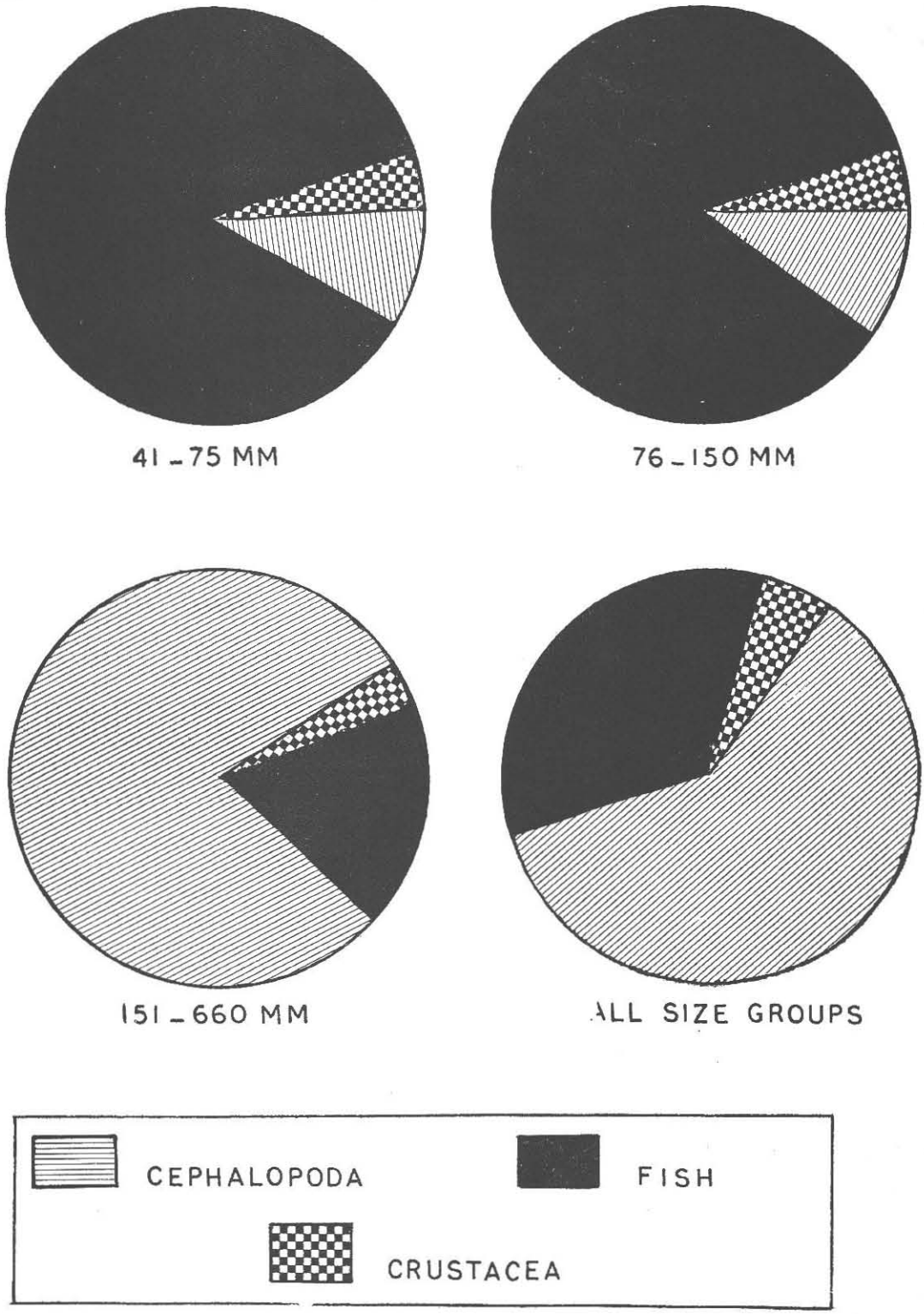


Fig.4. Diagrams illustrating the composition by volume of the stomach contents of Euthynnus affinis affinis

frequency of occurrence fishes came foremost, being present in 71 percent of the stomachs containing food. Squids and crustaceans came next, each occurring in 21 percent of the stomachs, followed by zooplankton in 8 percent of the stomachs. The vast majority of the fish remains were of Atherina sp. and clupeids. Twenty-nine percent of the stomachs were empty (Williams, 1962).

Fishes were found to comprise the greatest volume of the food of E. yaito from Oahu, Hawaii; crustaceans next. Occasional gorging on stomatopods and megalopa has also been reported (Tester and Nakamura, 1957). Welsh (1949) observed that crustaceans predominated in the food of E. yaito and fishes came second in importance.

8 THE ORIENTAL BONITO Sarda orientalis (TEMMINCK AND SCHLEGEL)

Studies on the food of adult specimens of S. orientalis caught by hooks and lines and gillnets and of juveniles caught in shore seines and boat seines at centers between Cape Comorin and Trivandrum on the west coast, showed that inshore fishes of medium size formed the major item of the food. Anchoviella tri was the most common fish that occurred in the stomach contents. Squilla larvae formed a minor item (Kumaran, 1962).

S. orientalis caught by pole and line in Japanese waters during the period from February 1959 to October and November 1960 had saury, carangids, Sphyraena sp. and cephalopoda as food (Yokota et al., 1961).

9 GENERAL REMARKS

Only preliminary observations based on the analysis of the stomach contents of limited samples confined to one, or at the most, two areas, and spread over short periods, are available on the food of Indian tunas. The relation between the food organisms found in the stomachs and their availability in Indian waters has not received attention so far.

The examination of the food of A. thazard, A. thynnoides, E. affinis affinis and S. orientalis has shown their reliance on medium-sized inshore fishes such as species of Anchoviella, Sardinella and Leiognathus.

It is interesting to note that actively moving forms -- such as flying fishes and carangids -- and slow moving ones -- such as megalopa and pipe fishes -- are fed upon by the skipjack and yellowfin tuna. The food organisms range in size from small crustacean larvae to large fishes exceeding one-third the size of the fish itself. Inanimate objects such as rubber pieces and plant fibers are also occasionally encountered among the stomach contents. These must have been taken in accidentally.

Detailed studies on the food of tunas will be useful in finding out their preference to certain types of bait fishes. We have no information as to the reason for the lack of response of tunas to bait fish during certain seasons. Attempts are being made to evaluate the tuna bait fish resource of the Laccadive area with a view of expanding the tuna fisheries in this area, where large tuna stocks exist. The available information on the food of Indian tunas, though meagre would tend to show that there is much similarity, in general, with observations from other regions.

It is seen that information is lacking on the food of a few other species of tunas such as Parathunnus obseus mebachi and Gymnosarda unicolor from Indian waters. That more intensive studies have to be undertaken in this field needs hardly any emphasis.

10 SUMMARY

The information available on the food of Indian tunas has been briefly reviewed. The species dealt with are Auxis thazard, Auxis thynnoides, Euthynnus affinis affinis, Sarda orientalis, Kishinoella tonggol, Katsuwonus pelamis and Neothunnus macropterus. The composition of the food of all these species has been given and comparisons drawn with observations from other regions. The need for more intensive work in this field is stressed.

11 ACKNOWLEDGEMENT

Our thanks are due to the Marine Biological Association of India for permission to incorporate in this paper data and figures contained in the papers presented at the Symposium on Scombroid fishes held under the auspices of the Association at Mandapam Camp in January 12-15, 1962.