along with other features for these "forms" gives a clue to separate speciation. In fact, Munroe (1961) revived "f. *diphilus*" as the type species of the genus concerned. Presently, however, all the specimens are considered under sp. *aristolochiae*, but without being referred to any of the aforesaid "forms" after Talbot (*loc. cit.*).

Summary

The paper incorporates a faunistic list and account of species and their infraspecific forms of Papilionidae from the state of Orissa in India. The material including new records of nine species have been collected from different districts of the state by several parties of Zoological Survey of India. One table and map have also been provided to highlight the distribution of the fauna.

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FOOD AND FEEDING HABITS OF *CARANGOIDES MALABARICUS* (BLOCH AND SCHN.) AND *ALEPES KALLA* (CUV. AND VAL.) OFF PORTO NOVO COAST. *

By

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(With 2 Text-figures and 8 Tables)

INTRODUCTION

Knowledge of what the fish eats, its natural growth rate, its nutritional needs and its general trophic ecology are of paramount importance in any mariculture venture. Fish farming cannot be a success without a knowledge on food and feeding habits of particular fish used in culture. The food habits of fishes provide information on their shoaling and migratory habits and feeding adaptation as well. Therefore any information on this subject will contribute to knowledge needed for optimum management of fish stocks.

Our knowledge regarding the food and feeding habits of carangid fishes of India were confined to some detailed observations made by Tandon (1960) on *Selaroides leptolepis* from the east coast of India, by Kagwade (1971) on *Caranx kalla* and by Sreenivasn (1974) on *Megalaspis cordyla* from the west coast of India. Other works were mostly confined to observations on a few specimens with casual remarks. The present study deals with the food and feeding habits of two commercially important carangid fishes, *Carangoides malabaricus* and *Alepes kalla* occurring along Porto Novo coast.

MATERIAL AND METHODS

The materials for the present study were collected weekly from the commercial trawl catches of Porto Novo. A total of 1274 specimens of *C. malabaricus* (441 females, 380 males & 453 juveniles) and 1314 specimens of *A. kalla* 578 females, 406 males & 330 juveniles) were examined. The specimens were weighed, T. L. of each specimen as also its sex and maturity stage were noted. The stomach was then removed and preserved in 7% neutral formalin for study. The stomach was here defined as that part of the gut between the last gill arch and the pyloric

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caecae. The intestines were not examined (Randall, 1967 ; Kionka and Windell, 1972 ; Gannon, 1976).

Special attention was given to the regurgitation problem. Shrunken stomachs containing mucus were considered as empty whereas completely empty stomachs with expanded walls were identified as regurgitated and hence discarded (Dann, 1973).

Numerous methods have been employed for analysing the food habits of fishes. Pillay (1952) suggested that the method to be adopted must depend entirely on the particular diet of the fish. The Index of preponderance' method as suggested by Natarajan and Jhingran (1962) and adopted by James (1967) for ribbon fishes and by Ramanathan (1977) for flat fishes, was found to be suitable for carnivorous fishes feeding on fishes, prawns, other crustaceans, molluscs etc. and was therefore employed in the present study. The index of preponderance was worked out by using the formula :

$$I = \frac{VO}{\epsilon VO} \times 100$$

(where 'V' and 'O' represent the percentage of volume and occurrence of each item of food respectively and 'I' the index). The index provides a definite and measurable basis for grading the various food elements since it gives a combined picture of frequency of occurrence as well as bulk. The volume of each food item was measured by the volumetric (displacement) method and the percentage volume for different items was calculated from the total volume of all the items of food.

The food items were identified upto generic level depending on their digested state. Their occurrence was noted and the percentage was calculated. All the unidentifiable fishes were included in the category 'fishes'. The presence of sand grains is considered only accidental although taken into consideration in the analysis, but was actually left out while grading the various food items.

To ascertain feeding intensity during various months, all the stomachs were classified into 'gorged' when the stomach was full of food with its wall being thin or transparent and 'full' when the stomach was filled with food, its wall being thick and intact. Similarly, they were classified '$\frac{3}{4}$ full' '$\frac{1}{2}$ full' '$\frac{1}{4}$ full' depending upon their relative fullness and the space occupied by the stomach contents. A stomach was designated and termed 'little' when the contents occupied less than one fourth the capacity of the full stomach. Those stomachs which were termed 'empty' contained practically nothing and only little mucus was present in them. Such empty stomachs had only shrunken walls.

To find the food preference during different maturity stages, four categories were considered (Venkataramani, 1979). They were categorised as immature (Stage I in males and females), maturing (Stages II and II in females ; stage II in males) mature (stage IV in females and stage III in males) and spent and recovering (stage VII in females and stage IV in males) to detect the food preference if any, during different levels of maturity. The males and females were treated separately. Female specimens with fully mature gonads (Stages V and VI), which occupied the entire body cavity, had only empty stomachs and were not included.

RESULTS AND DISCUSSION

Carangoides malabaricus

Food composition : The food components of *C. malabaricus* were grouped into crustaceans, fishes, molluscs, polychaetes, diatoms and foraminifers. Crustaceans were the major food item and fishes ranked next while molluscs, polychaetes, diatoms and foraminifers were consumed in smaller quantities. Among crustaceans, *Lucifer* spp., *Acetes* spp. and mysids were consumed more. Among juvenile fishes, *Leiognathus* spp., *Stolephorus* spp. and *Thrysa* spp. were predominant. Molluscs were eaten less and that too only *Cresis* spp. was preferred. Polychaetes, diatoms and foraminifers were consumed in meagre quantities.

From Table 1, it was evident that the food of *C. malabaricus* consists mostly of planktonic forms. It seems to prefer planktonic crustaceans most as its food.

Food of juveniles and adults : The food of juveniles and adults were analysed separately to know about the variations if any. From Tables 1 & 2, it could be seen that the juveniles mainly feed on crustaceans, particularly *Acetes* spp., prawn larvae and mysids. It feeds on other food items such as molluscs, foraminifers and diatoms have been recorded only occasionally.

Adults were sexed and their stomach contents were separately analysed. The results (Table 1) showed that there was not much variation in the food between males and females of *C. malabaricus*. Among crustaceans, *Acetes* spp., *Lucifer* spp., prawns and mysids formed the major food items. Other crustaceans such as larval crabs, *Squilla* larvae, amphipods, prawn larvae etc. were also cosumed in lesser quantities. Among teleostean fishes, *Leiognathus* spp., *Thryssa* spp., *Stolephorus* spp. and *Thrissina* spp. were consumed in appreciable amounts in certain months ; *Drepane* spp., *Pomadasys* spp., *Johnius* spp. etc. were found in traces. Molluscs like *Cresis* spp., *Sepia* spp., etc. were

found occasionally. The food of adults clearly showed that besides crustaceans as major food, fishes were also eaten in appreciable numbers.

Seasonal variations in the food of juveniles and adults : Seasonal variations in the food of juveniles and adults of *C. malabaricus* were presented in Tables 1 & 2.

Acetes spp. and mysids formed the food of juveniles during most of the year. *Lucifer* spp., formed the major food item in May. Prawn larvae appeared in moderate amounts during January and February. Other planktonic crustaceans, fishes and molluscs were found in lesser amounts in the food of juveniles during other months of the year.

In adults, *Acetes* spp., mysids, and *Lucifer* spp. were the major food items during most of the months. Other crustaceans like, prawn larvae, juvenile prawns and *Squilla* larvae could be found in appreciable quantities in certain months. Among fishes, *Leiognathus* spp. formed the important food item in February. *Thryssa* spp. was recorded in appreciable quantities in January, April and October. Beside this, other teleostean fishes were also recorded in lesser quantities, during various months of the year. Foraminifers occurred in the gut contents in July and also from October to February.

Food preferences during maturity stages : The food preference during maturity stages of males and females were analysed separately to study the variations if any.

Males

Immature specimens fed mainly on *Acetes* spp. and *Lucifer* spp., while maturing specimens preferred *Leiognathus* spp. and mysids and specimens with mature testis fed mainly on *Lucifer* spp. and *Acetes* spp. In spent and recovering specimens *Stolephorus* spp. and *Acetes* spp. were more in the gut contents (Table 3).

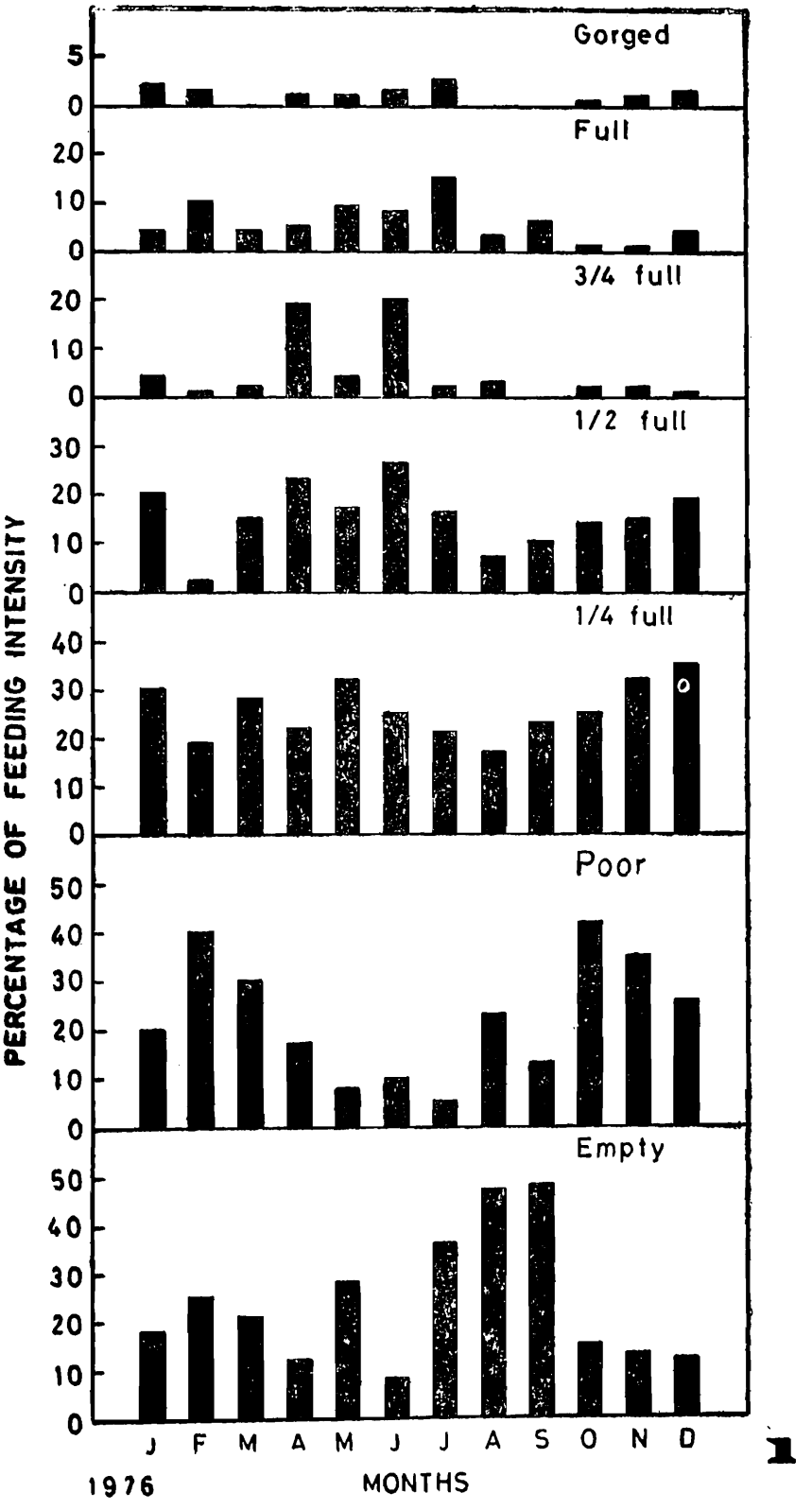
Females

Immature and maturing females seem to feed on *Acetes* spp. and juvenile prawns, while females with mature ovaries appeared to prefer *Acetes* spp. and *Lucifer* spp. When the ovaries occupied the full body cavity (Stages V and VI), the stomachs were found to be empty. Spent and recovering females prefer to feed on *Leiognathus* spp. and *Stolephorus* spp. (Table 4).

Thus in juveniles and in immature adults of both sexes, planktonic crustaceans dominated in the gut contents. When it attains maturation gradually, besides crustaceans, fishes were also supplemented. Spent

and recovering specimens preferred *Stolephorus* spp. and *Leiognathus* spp. in appreciable quantities as food.

Feeding intensity : The percentage occurrence of feeding intensities for *C. malabaricus* was shown in Text-fig. 1. The percentages of 'gorged' 'full' '¾full' were always less. The percentages of '¼ full' and '½ full' stomachs (combined) were more than 50%.



Text-fig. 1. Monthly percentage frequency of different feeding intensities in *Carangoides malabaricus*

The empty stomachs were found commonly in all the months of year and their percentages were more in the months of July, August and September which was the major spawning period for this species along Porto Novo coast (Venkataramani, 1979).

Alepes kalla

Food composition : The food components of *A. kalla* were grouped under six major categories i. e., crustaceans, fishes, molluscs, foraminifers, polychaetes and diatoms. Among crustaceans, copepods, *Lucifer* spp., *Acetes* spp. and crab larvae comprised the major food items. Among fishes it showed preference to *Leiognathus* spp. and *Thryssa* spp. Among molluscs *Cresis* spp. was preferred in certain months. Polychaetes, foraminifers, and diatoms appeared in traces.

Kagwade (1971) while studying the food habits of *Alepes kalla* (=*Caranx kalla* Cuv. and Val.) from the west coasts of India observed the occurrence of crustaceans as major food. Fishes were rare in his observation but in the present study they ranked next to crustaceans. Molluscs ranked next to crustaceans in his observation, which were rare in the present study except *Cresis* spp. which formed appreciable amount only during certain months. Dinoflagellates observed by Kagwade (1971) were not recorded presently.

Food of juveniles and adults : In order to know the variations in the food of juveniles and adults, their stomach contents were analysed separately (Tables 3 & 4).

From the results, it can be seen that juveniles preyed mainly upon planktonic crustaceans particularly *Lucifer* spp., *Acetes* spp. copepods and crab larvae. Teleosts, foraminifers and molluscs formed only a minor part of its food.

The results showed no significant variations in the food of males and females. Both the sexes preferred *Acetes* spp., copepods, *Squilla* larvae, crab larvae, *Lucifer* spp., *Leiognathus* spp., *Thryssa* spp. and *Johnius* spp. *Cresis* spp. formed a moderate amount in April for both sexes. Other food items were found in traces.

Seasonal variations in the food of juveniles and adults : Seasonal variations in the food of juveniles and adults of *A. kalla* were presented in Tables 5 and 6.

The juveniles seem to feed mostly on crustaceans like *Lucifer* spp., copepods, *Acetes* spp. and crab larvae during all the months. Fishes formed only a minor part of food in certain months of the year.

The adults also, like juveniles, were found to feed mostly on *Acetes* spp., *Lucifer* spp., copepods. *Squilla* larvae and larval crabs formed major bulk of the food in November and December. Copepods, *Acetes* spp. and crab larvae formed major bulk of the food in October. *Acetes* spp. was the most common food from June to October with peaks in July and September. *Lucifer* spp. formed the major food item in May. Copepods and *Cresis* spp. were found in appreciable quantities, in April, copepods and *Leiognathus* spp. in March and *Squilla* larvae and crab larvae in February and January.

Among fishes, juveniles of *Thryssa* spp., *Johnius* spp. and *Leiognathus* spp. were found in appreciable quantities in certain months of the year. Other teleostean fishes, molluscs, diatoms, polychaetes and foraminifers were recorded in lesser quantities.

Copepods were found to be one of the main food items of this species as observed by Kagwade (1971) from the west coast of India. The occurrence of *Acetes* spp. was encountered only in August by Kagwade (1971) in adults. Presently *Acetes* spp. was found to be the major bulk of the food in adults and in juveniles. Fishes were considered as of minor importance in the observation of Kagwade (1971), but in the present study, fishes were next in importance to crustaceans. *Leiognathus* spp. and *Thryssa* spp. were found in moderate amounts in the gut contents. The occurrence of fishes was more in adults compared to juveniles.

Food preference during maturity stages

Males

Copepods and *Lucifer* spp. formed the major food items of specimens with immature testis. *Thryssa* spp. and *Lucifer* spp. appeared as major food items in specimens with maturing testis. *Leiognathus* spp. and *Squilla* larvae were more in mature specimens and in spent and recovering specimens *Acetes* spp. and *Squilla* larvae formed major food items (Table 7).

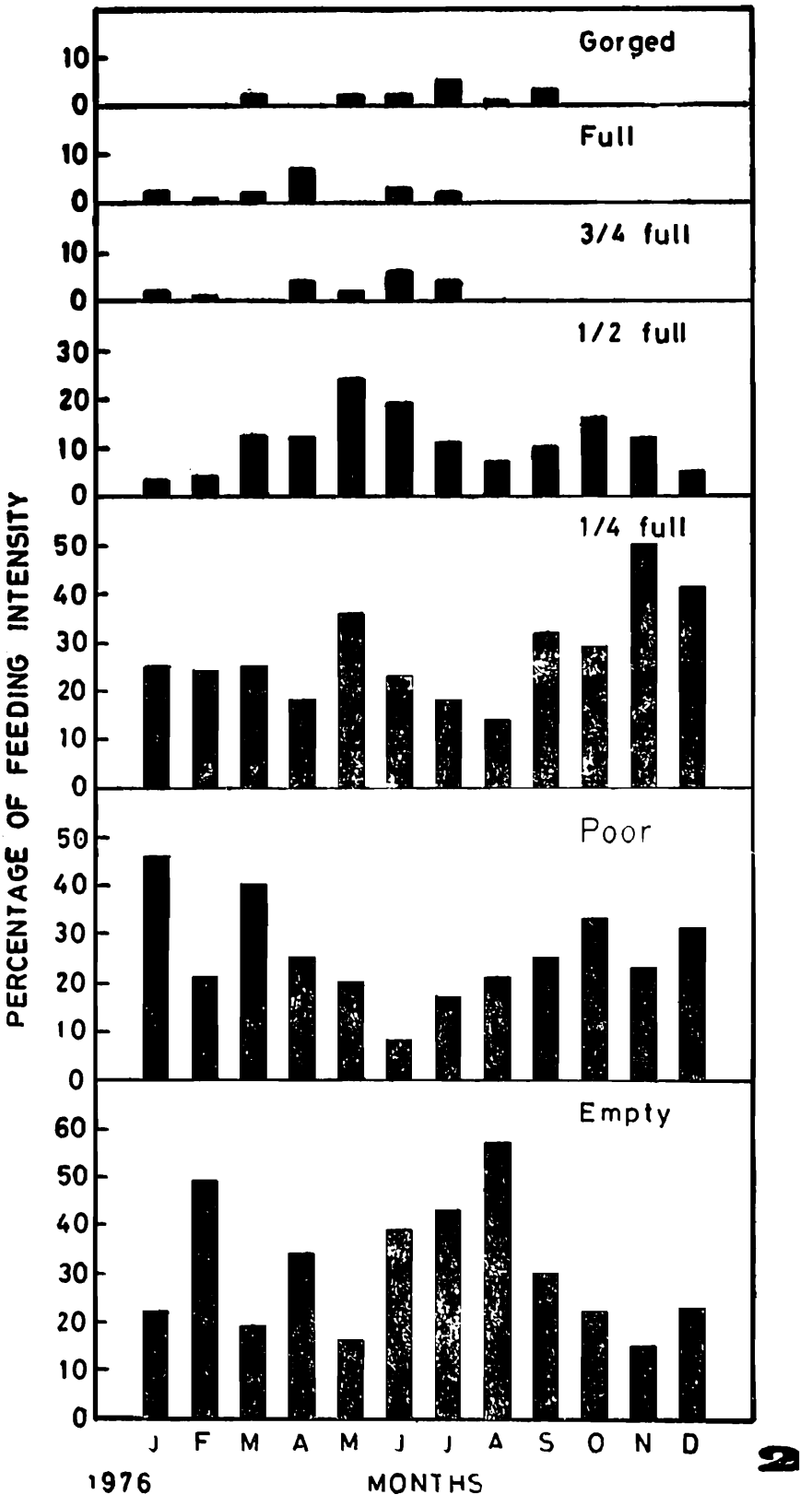
Females

Specimens with immature and maturing ovaries fed more on *Acetes* spp. and *Lucifer* spp. specimens with mature ovaries fed more on *Squilla* larvae and specimens with spent and recovering ovaries fed on *Acetes* spp. and *Squilla* larvae. During advanced maturity stages of the ovary, only empty stomachs with little mucus were encountered (Table 8).

Feeding intensity : The feeding intensity during different months was shown in Text-fig. 1. In *A. kalla* the percentages of 'gorged' 'full' and

'$\frac{3}{4}$ full' were much less. The '$\frac{1}{4}$ full' and '$\frac{1}{2}$ full' (combined) were more than 50% and were more than stomachs with 'little' food during most of the months.

The empty stomachs appeared in higher percentage during major spawning season from June to August and in February (Venkataramani, 1979). Similar observation has been made by Kagwade (1971) also in this species during peak spawning season from Calicut waters.



Text-fig. 12. Monthly percentage frequency of different feeding intensities in *Alepes kalla*

GENERAL REMARKS

From the above observations, it is evident that juveniles and adults of both the species are carnivores, planktonic crustaceans being the major food items supplemented by juvenile teleostean fishes in adults. The molluscs, diatoms, polychaetes and foraminifers were rarely eaten. The present observation on the food habits of the two species were in agreement with other carangid species studied by Chacko (1949), Datar (1954), Tandon (1960) and Kagwade (1971).

No plant material was recorded presently in the gut contents of both the species as also by earlier workers in other carangid species (Lebour, 1918 ; Chacko, 1949 ; Tham Ahkow, 1950 ; Datar, 1954 ; Mitani, 1960 ; Bellinger and Avault, 1971 ; Kagwade, 1971 ; Sreenivasan, 1974). But Tandon (1960) and Chabanne Jacques (1972) recorded vegetable matter in *S. leptolepis* and *Caranx* spp. respectively.

Reuben (1968) in his preliminary study on the food of *C. malabaricus* recorded euphausiids on examining 24 specimens from Waltair (North east coast of India). Presently on examining more than 1200 specimens, euphasusiids could not be found in the gut contents.

In both the species teeth were minute though pharyngeal teeth were well developed. Well developed gill rakers and minute teeth indicate that *A. kalla* and *C. malabaricus* were adapted to feed mainly on smaller organisms, as confirmed by the present and earlier observations. Thus, *A. kalla* and *C. malabaricus* are primary carnivores feeding mainly on crustaceans and juvenile fishes.

The stomach with 'little' food was recorded during all the months. This may be due to the fact that most of the specimens were examined from commercial landings in the morning from 7 to 11 a. m. This suggests the possibility of the fish feeding during the night and the process of digestion being much advanced by the time they were obtained in the commercial catches. Hence the occurrence of food items in most of the stomachs in partially digested condition.

In the present investigation empty stomachs were recorded during all the months. Such frequent occurrence of empty stomachs is dependent on the ratio between the size of the fish and size of the prey as cited by Allen (1935) or on the calorific value of the diet as explained by Longhurst (1957). Presently, in all fully matured specimens in both the species, stomachs were found to be empty containing little mucus. This suggests that the voluminous ripe ovaries press on the wall of the stomach leaving them empty (Thomas, 1969 ; Sobhana, 1976). Hence in the major spawning months in both the species, empty stomachs appear in good percentages.

TABLE 1. Percentage of index of various food items of *C. malabaricus* during different months of the year 1976. (M-Male ; F-Female ; J-Juvenile)

Food items	January			February		
	M	F	J	M	F	J
Lucifer	—	1.60	—	—	0.36	5.98
Crab larva	—	0.53	—	—	—	—
Prawn larva	9.17	7.48	30.00	3.94	0.69	61.56
Prawn	17.44	3.91	—	10.10	3.44	—
Acetes	31.38	12.10	35.00	3.00	0.39	13.67
Copepods	—	—	—	0.78	3.05	—
Amphipods	—	—	—	3.42	—	—
Cymathoa	0.35	—	—	—	—	—
Mysids	—	1.07	—	0.52	—	13.67
Squilla larva	0.09	—	10.01	—	—	—
Fish larvae	—	—	—	—	—	—
Sciaenids	—	—	—	1.18	0.62	—
Caranx	—	—	—	0.26	0.37	—
Gobids	—	—	—	2.29	—	—
Leiognathus	0.27	25.69	—	20.46	12.15	—
Drepane	—	—	—	13.06	1.84	—
Pomadasys	0.80	1.07	—	—	1.66	—
Stolephorus	7.69	8.89	—	—	55.27	5.12
Johnius	—	—	—	—	0.37	—
Thryssa	16.23	—	—	26.24	8.17	—
Gazza	—	—	—	—	1.54	—
Thrissina	0.36	34.80	—	—	—	—
Setipinna	—	—	—	0.53	—	—
Pterois	—	—	—	—	0.80	—
Trichiurus	—	0.19	22.49	—	0.62	—
Lutjanids	—	—	—	2.10	0.62	—
Therapon	—	—	—	2.10	—	—
Alepes	—	—	—	—	—	—
Cepola	—	—	—	1.05	—	—
"Fishes"	1.76	1.60	2.50	3.28	1.54	—
Platycephalus	—	—	—	—	0.18	—
Bivalve juveniles	—	—	—	1.04	1.18	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	0.91	1.37	—
Sepia	—	0.89	—	—	—	—
Gastropod veligers	—	—	—	1.18	—	—
Turritela	—	0.18	—	—	—	—
Polychaetes	0.70	—	—	0.52	—	—
Diatoms	—	—	—	—	—	—
Foraminifers	13.75	—	—	1.32	2.59	—

TABLE 1. *Continued*

Food items	March			April		
	M	F	J	M	F	J
Lucifer	0.31	—	—	93.24	26.50	6.37
Crab larva	—	4.70	—	—	—	—
Prawn larva	13.76	9.41	0.67	—	0.85	0.36
Prawn	—	—	—	—	0.48	16.78
Acetes	—	32.95	26.68	2.96	1.20	39.45
Copepods	0.29	14.11	0.26	0.43	4.81	0.18
Amphipods	0.08	—	—	—	0.36	—
Cymathoa	—	—	—	—	—	—
Mysids	45.63	17.64	72.25	1.40	31.24	26.96
Squilla larva	—	—	0.07	—	—	0.67
Fish larvae	—	—	—	—	—	—
Sciaenids	—	—	—	—	—	—
Caranx	—	—	—	—	—	—
Gobids	—	—	—	—	—	0.27
Leiognathus	38.59	—	0.07	—	—	—
Drepane	—	—	—	—	—	—
Pomadasys	—	—	—	—	—	—
Stolephorus	0.21	—	—	—	—	1.41
Johnius	—	—	—	—	—	2.79
Thryssa	0.21	21.19	—	0.17	32.62	4.47
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Pterois	—	—	—	—	—	—
Trichiurus	0.42	—	—	—	—	0.20
Lutjanids	—	—	—	—	—	—
Therapon	—	—	—	—	—	—
Alepes	—	—	—	1.80	—	—
Cepola	0.05	—	—	—	—	—
"Fishes"	—	—	—	—	0.96	0.09
Platycephalus	—	—	—	—	—	—
Bivalve juveniles	0.08	—	—	—	—	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	—	—
Sepia	—	—	—	—	—	—
Gastropod veligers	0.21	—	—	—	0.98	—
Turritela	—	—	—	—	—	—
Cresis	—	—	—	—	—	—
Polychaetes	0.16	—	—	—	—	—
Diatoms	—	—	—	—	—	—
Foraminifers	—	—	—	—	—	—

TABLE 1. *Continued*

Food items	May			June		
	M	F	J	M	F	J
Lucifer	64.41	81.50	45.77	3.27	1.47	0.15
Crab larva	—	—	0.05	0.40	0.03	0.12
Prawn larva	—	—	—	5.56	0.15	1.38
Prawn	0.54	—	0.40	0.97	0.10	0.20
Acetes	11.41	16.09	22.37	39.75	97.70	92.91
Copepepods	0.27	—	—	—	0.04	—
Amphipods	—	—	—	—	—	—
Cymathoa	—	—	—	—	—	—
Mysids	16.31	0.50	31.13	19.62	0.28	4.60
Squilla larva	0.61	0.72	0.14	29.44	0.13	0.62
Fish larvae	0.47	—	—	—	—	—
Sciaenids	—	—	—	—	0.02	—
Caranx	—	—	—	—	—	—
Gobids	—	—	—	—	—	—
Leiognathus	—	—	—	—	—	—
Drepane	—	—	—	—	—	—
Pomadasys	—	—	—	—	—	—
Stolephorus	5.91	0.54	—	—	—	—
Johnius	—	—	—	—	—	—
Thryssa	—	0.57	—	0.66	0.02	—
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Pterois	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Lutjanids	—	—	—	—	—	—
Therapon	—	—	—	—	—	—
Alepes	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
"Fishes"	0.07	0.08	0.14	0.33	—	0.02
Platycephalus	—	—	—	—	—	—
Bivalve juveniles	—	—	—	—	—	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	0.06	—
Sepia	—	—	—	—	—	—
Gastropod veligers	—	—	—	—	—	—
Turritela	—	—	—	—	—	—
Cresis	—	—	—	—	—	—
Polychaetes	—	—	—	—	—	—
Diatoms	—	—	—	—	—	—
Foraminifers	—	—	—	—	—	—

TABLE 1. *Continued*

Food items	July			August		
	M	F	J	M	F	J
Lucifer	57.55	3.04	—	93.14	—	—
Crab larva	—	—	—	—	—	—
Prawn larva	—	—	—	—	—	—
Prawn	20.23	4.29	—	—	0.38	—
Acetes	9.07	89.86	35.50	1.74	84.97	—
Copepods	0.22	—	—	0.18	0.78	—
Amphipods	—	0.09	—	0.06	—	—
Cymathoa	—	—	—	—	—	—
Mysids	3.79	1.05	62.13	4.88	11.14	—
Squilla larva	—	—	—	—	—	—
Fish larvae	—	—	—	—	0.78	—
Sciaenids	—	0.04	—	—	0.65	—
Caranx	—	0.04	—	—	—	—
Gobids	—	—	—	—	—	—
Leiognathus	—	—	—	—	—	—
Drepane	—	—	—	—	—	—
Pomadasys	—	—	—	—	—	—
Stolephorus	1.04	—	—	—	—	—
Johnius	—	—	—	—	—	—
Thryssa	1.63	—	—	—	0.26	—
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Pterois	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Lutjanids	—	—	—	—	—	—
Therapon	—	—	—	—	—	—
Alepes	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
"Fishes"	—	—	—	—	—	—
Platycephalus	—	—	—	—	—	—
Bivalve juveniles	—	—	—	—	—	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	0.11	—	—	—	—
Sepia	—	—	—	—	—	—
Gastropod veligers	—	—	—	—	—	—
Turritela	—	—	—	—	—	—
Creeis	1.04	0.21	—	—	—	—
Polychaetes	—	—	—	—	1.04	—
Diatoms	0.45	—	—	—	—	—
Foraminifers	4.98	1.28	2.37	—	—	—

TABLE 1. *Continued*

Food items	September			October		
	M	F	J	M	F	J
Lucifer	0.35	22.65	0.64	—	31.70	1.28
Crab larva	—	0.89	—	—	—	—
Prawn larva	—	0.33	—	—	—	—
Prawn	—	1.77	2.03	—	—	3.24
Acetes	82.64	56.61	48.03	13.74	8.12	79.16
Copepods	1.20	—	4.07	3.92	—	3.19
Amphipods	9.00	8.00	1.78	—	—	0.22
Cymathoa	—	—	—	—	—	—
Mysids	1.20	4.88	41.68	44.43	0.97	9.46
Squilla larva	5.61	4.43	—	—	—	0.15
Fish larvae	—	—	1.02	—	—	—
Sciaenids	—	—	—	—	—	—
Caranx	—	—	—	—	13.03	—
Gobids	—	0.44	—	—	—	—
Leiognathus	—	—	—	—	—	—
Drepane	—	—	—	—	—	—
Pomadasys	—	—	—	—	—	—
Stolephorus	—	—	—	3.92	0.64	0.64
Johnius	—	—	—	—	—	—
Thryssa	—	—	—	2.61	41.44	0.12
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Pterois	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Lutjanids	—	—	—	—	—	—
Therapon	—	—	—	0.65	—	—
Alepes	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
"Fishes"	—	—	0.50	0.65	0.70	0.09
Platycephalus	—	—	—	—	—	—
Bivalve juveniles	—	—	—	—	—	0.05
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	—	—
Sepia	—	—	—	—	—	—
Gastropod veligers	—	—	—	—	—	—
Turritela	—	—	—	—	—	—
Cresis	—	—	—	10.46	2.27	2.00
Polychaetes	—	—	0.25	1.31	—	—
Diatoms	—	—	—	—	—	—
Foraminifers	—	—	—	18.31	1.13	0.40

TABLE 1. *Concluded*

Food items	November			December		
	M	F	J	M	F	J
Lucifer	—	0.68	0.16	0.38	0.17	0.66
Crab larva	—	—	—	—	—	—
Prawn larva	0.18	30.19	0.18	13.89	0.59	30.31
Prawn	0.12	7.28	0.19	4.95	5.50	0.33
Acetes	93.95	10.05	88.01	61.73	87.31	30.18
Copepods	0.09	0.58	—	0.51	—	—
Amphipods	—	5.41	0.21	5.41	0.03	—
Cymathoa	—	—	—	—	0.04	—
Mysids	0.28	29.60	6.42	7.84	1.04	8.45
Squilla larva	0.02	—	0.03	0.06	0.12	0.82
Fish larvae	—	—	—	—	—	—
Sciaenids	—	1.17	0.14	—	—	4.97
Caranx	—	—	—	—	—	1.25
Gobids	—	0.10	—	—	—	1.99
Leiognathus	4.05	11.70	0.96	—	3.34	12.93
Drepane	—	—	—	—	—	0.08
Pomadasys	—	—	—	—	—	1.74
Stolephorus	0.07	0.19	0.46	—	—	—
Johnius	—	—	—	—	—	—
Thryssa	1.23	0.97	2.27	0.06	0.47	1.00
Gazza	—	—	—	2.33	—	—
Thrissina	—	—	—	—	0.62	—
Setipinna	—	—	0.55	—	—	—
Pterois	—	—	—	—	—	—
Trichiurus	—	—	—	—	0.07	—
Lutjanids	—	—	—	—	—	—
Therapon	—	—	—	—	—	—
Alepes	—	—	—	—	—	—
Cepola	—	—	—	—	—	0.82
"Fishes"	—	0.39	0.18	2.58	0.04	2.98
Platycephalus	—	—	0.18	—	—	—
Bivalve juveniles	—	—	—	—	—	0.34
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	—	—
Sepia	—	—	—	—	—	—
Gastropod veligers	—	—	—	—	—	—
Turritela	0.01	—	—	—	—	—
Cresis	—	0.77	—	—	—	—
Polychaetes	—	—	—	0.26	0.03	—
Diatoms	—	—	—	—	—	—
Foraminifers	—	0.92	—	—	0.13	0.53

TABLE 2. Ranks obtained by the various food items of *C. malabaricus* during different months of the year 1976.

Food items	January			February		
	M	F	J	M	F	J
Lucifer	—	7	—	—	17	3
Crab larva	—	10	—	—	—	—
Prawn larva	5	5	2	5	13	1
Prawn	2	6	—	4	4	—
Acetes	1	3	1	8	15	2
Copepods	—	—	—	16	5	—
Amphipods	—	—	—	6	—	—
Cymathoa	10	—	—	—	—	—
Mysids	—	8	—	—	—	—
Squilla larva	12	—	4	19	—	2
Fish larva	—	—	—	—	—	—
Sciaenids	—	—	—	12	14	—
Caranx	—	—	—	20	16	—
Gobids	—	—	—	9	—	—
Leiognathus	11	2	—	2	2	—
Drepane	—	—	—	—	7	—
Pomadasys	8	8	—	3	8	—
Stolephorus	6	4	—	—	1	4
Johnius	—	—	—	—	16	—
Thryssa	3	—	—	1	3	—
Gazza	—	—	—	—	9	—
Thrissina	10	1	—	—	—	—
Setipinna	—	—	—	18	—	—
Pterois	—	—	—	—	12	—
Trichiurus	—	11	3	—	14	—
Lutjanids	—	—	—	10	14	—
Therapon	—	—	—	10	—	—
Alepes	—	—	—	—	—	—
Cepola	—	—	—	13	—	—
Platycephalus	—	—	—	—	18	—
"Fishes"	7	7	5	7	9	—
Bivalve jhveniles	—	—	—	14	11	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	15	10	—
Sepia	—	9	—	—	—	—
Gastropod veligers	—	—	—	12	—	—
Turritella	—	12	—	—	—	—
Cresis	—	—	—	17	11	—
Polychaets	9	—	—	19	—	—
Diatoms	—	—	—	—	—	—
Foraminifers	4	—	—	11	6	—

TABLE 2. *Continued*

Food items	March			April		
	M	F	J	M	F	J
Lucifer	5	—	—	1	3	4
Crab larva	—	6	—	—	—	—
Prawn larva	3	5	3	—	8	9
Prawn	—	—	—	—	9	3
Acetes	—	1	2	2	5	1
Copepods	6	—	4	5	4	12
Amphipods	9	4	—	—	10	—
Cymathoa	—	—	—	—	—	—
Mysids	1	3	1	4	2	2
Sguilla larva	—	—	5	—	—	8
Fish larva	—	—	—	—	—	—
Sciaenids	—	—	—	—	—	—
Caranx	—	—	—	—	—	—
Gobids	—	—	—	—	—	10
Leiognathus	2	—	5	—	—	—
Drepane	—	—	—	—	—	—
Pomadasys	—	—	—	—	—	—
Stolephorus	7	—	—	—	—	7
Johnius	—	—	—	—	—	6
Thryssa	7	2	—	6	1	5
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Pterois	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	11
Lutjanids	4	—	—	—	—	—
Therapon	—	—	—	—	—	—
Alepes	—	—	—	3	—	—
Cepola	10	—	—	—	—	—
Platycephalus	—	—	—	—	—	—
"Fishes"	—	—	—	—	7	13
Bivalve juveniles	9	—	—	—	—	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	—	—
Sepia	—	—	—	—	—	—
Gastropod veligers	7	—	—	6	—	—
Turritella	—	—	—	—	—	—
Cresis	—	—	—	—	—	—
Polychaetes	8	—	—	—	—	—
Diatoms	—	—	—	—	—	—
Foraminifer	—	—	—	—	—	—

TABLE 2. *Continued*

Food items	May			June		
	M	F	J	M	F	J
Lucifer	1	1	1	5	2	6
Crab larva	—	—	6	8	9	7
Prawn larva	—	—	—	4	4	3
Prawn	6	—	4	6	6	5
Acetes	3	2	3	1	1	1
Copepods	8	—	—	—	8	—
Amphipods	—	—	—	—	—	—
Cymathoa	—	—	—	—	—	—
Mysids	2	6	2	3	3	2
Squilla larva	5	3	5	2	5	4
Fish larva	7	—	—	—	—	—
Sciaenids	—	—	—	—	10	—
Caranx	—	—	—	—	—	—
Gobids	—	—	—	—	—	—
Leiognathus	—	—	—	—	—	—
Drepane	—	—	—	—	—	—
Pomadasys	—	—	—	—	—	—
Slotephorus	4	5	—	—	—	—
Johnius	—	—	—	—	—	—
Thryssa	—	4	—	7	10	—
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Pterois	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Lutjanids	—	—	—	—	—	—
Therapon	—	—	—	—	—	—
Alepes	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
Platycephalus	—	—	—	—	—	—
"Fishes"	9	7	5	9	—	8
Bivalve juveniles	—	—	—	—	—	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	7	—
Sepia	—	—	—	—	—	—
Gastropod veligers	—	—	—	—	—	—
Turritella	—	—	—	—	—	—
Cresis	—	—	—	—	—	—
Polychaetes	—	—	—	—	—	—
Diatoms	—	—	—	—	—	—
Foraminifers	—	—	—	—	—	—

TABLE 2 *Continued*

Food items	July			August		
	M	F	J	M	F	J
Lucifer	1	3	—	1	—	—
Crab larva	—	—	—	—	—	—
Prawn larva	—	—	—	—	—	—
Prawn	2	2	—	—	6	—
Acetes	3	1	2	3	1	—
Copepods	9	—	—	4	4	—
Amphipods	—	8	—	5	—	—
Cymathoa	—	—	—	—	—	—
Mysids	5	5	1	2	2	—
Squilla larva	—	—	—	—	—	—
Fish larva	—	—	—	—	4	—
Sciaenids	—	9	—	—	5	—
Caranx	—	9	—	—	—	—
Gobids	—	—	—	—	—	—
Leiognathus	—	—	—	—	—	—
Drepane	—	—	—	—	—	—
Pomadasys	—	—	—	—	—	—
Stolephorus	7	—	—	—	—	—
Johnius	—	—	—	—	—	—
Thryssa	6	—	—	—	7	—
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Pterois	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Lutjanids	—	—	—	—	—	—
Therapon	—	—	—	—	—	—
Alepes	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
Platycephalus	—	—	—	—	—	—
"Fishes"	—	—	—	—	—	—
Bivalve juveniles	—	—	—	—	—	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	7	—	—	—	—
Sepia	—	—	—	—	—	—
Gastropod veligers	—	—	—	—	—	—
Turritella	—	—	—	—	—	—
Crésis	7	6	—	—	—	—
Polychaetes	—	—	—	—	3	—
Diatoms	8	—	—	—	—	—
Foraminifers	4	4	3	—	—	—

TABLE 2 *Continued*

Food items	September			October		
	M	F	J	M	F	J
Lucifer	5	2	7	—	2	6
Crab larva	—	7	—	—	—	—
Prawn larva	—	9	—	—	—	—
Prawn	—	6	4	—	—	3
Acetes	1	1	1	3	4	1
Copepods	4	—	3	5	—	4
Amphipods	2	3	5	—	—	9
Cymathoa	—	—	—	—	—	—
Mysids	4	4	2	1	7	2
Squilla larva	3	5	—	—	—	10
Fish larva	—	—	6	—	—	—
Sciaenids	—	—	—	—	—	—
Caranx	—	—	—	—	3	—
Gebids	—	8	—	—	—	—
Leiognathus	—	—	—	—	—	—
Drepane	—	—	—	—	—	—
Pomadasys	—	—	—	—	—	—
Stolephorus	—	—	—	5	9	7
Johnius	—	—	—	—	—	—
Thryssa	—	—	—	6	1	11
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Pterois	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Lutjanids	—	—	—	—	—	—
Therapon	—	—	—	8	—	—
Alepes	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
Platycephalus	—	—	—	—	—	—
"Fishes"	—	—	8	8	8	12
Bivalve juveniles	—	—	—	—	—	13
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	—	—
Sepia	—	—	—	—	—	—
Gastropod veligers	—	—	—	—	—	—
Turritella	—	—	—	—	—	—
Cresis	—	—	—	4	5	5
Polychaetes	—	—	9	7	—	—
Diatoms	—	—	—	—	—	—
Foraminifers	—	—	—	2	6	8

TABLE 2 *Concluded*

Food items	November			December		
	M	F	J	M	F	J
Lucifer	—	11	10	9	8	12
Carb larva	—	—	—	—	—	—
Prawn larva	5	1	9	2	6	2
Prawn	6	5	8	5	2	14
Acetes	1	4	1	1	1	1
Copepods	7	12	—	8	—	—
Amphipods	—	6	7	4	13	—
Cymathoa	—	—	—	—	12	—
Mysids	4	2	2	3	4	4
Squilla larva	9	—	12	11	10	11
Fish larva	—	—	—	—	—	—
Sciaenids	—	7	11	—	—	5
Caranx	—	—	—	—	—	9
Gobids	—	15	—	—	—	7
Leiognathus	2	3	4	—	3	3
Drepane	—	—	—	—	—	15
Pomadasys	—	—	—	—	—	8
Stolephorus	8	14	6	—	—	—
Johnius	—	—	—	—	—	—
Thryssa	3	8	3	11	7	10
Gazza	—	—	—	7	—	—
Thrissina	—	—	—	—	5	—
Setipinna	—	—	5	—	—	—
Pterois	—	—	—	—	—	—
Trichiurus	—	—	—	—	11	—
Lutjanids	—	—	—	—	—	—
Therapon	—	—	—	—	—	—
Alepes	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
Platycephalus	—	—	9	—	—	11
"Fishes"	—	13	9	6	12	6
Bivalve juvenile	—	—	—	—	—	14
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	—	—
Sepia	—	—	—	—	—	—
Gastropod veligers	—	—	—	—	—	—
Turritella	10	—	—	—	—	—
Cresis	—	10	—	—	—	—
Polychaetes	—	—	—	10	13	—
Diatoms	—	—	—	—	—	—
Foraminifers	—	9	—	—	9	13

TABLE 3. Percent index of various food of *C. malabaricus* in different maturity stages—female.

Food items	Immature		Maturing		Mature		Spent & spent recovering	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank
Lucifer	5.07	3	5.82	5	24.57	2	—	—
Crab larva	0.17	18	—	—	0.54	16	—	—
Prawn larva	0.56	15	0.54	9	1.31	11	2.29	6
Prawn	10.54	2	31.86	2	0.95	14	6.85	4
Acetes	66.43	1	32.73	1	36.69	1	23.94	3
Copepods	0.56	15	0.17	13	1.13	13	0.07	12
Amphipods	0.43	16	0.32	12	0.90	15	0.06	13
Mysids	3.26	4	2.88	6	8.11	3	2.52	5
Squilla larva	1.68	6	—	—	2.14	8	—	—
Fish larva	0,12	20	—	—	—	—	—	—
Sciaenids	0.80	12	0.16	14	1.26	12	0.10	10
Caranx	0.16	19	0.11	15	2.03	9	—	—
Gobid	0.10	—	—	—	—	—	—	—
Leiognathus	1.59	7	15.57	3	3.88	5	30.46	1
Drepane	0.03	22	0.06	18	—	—	—	—
Pomadasys	0.87	10	0.11	15	—	—	0.08	11
Stolephorus	—	—	0.33	11	2.99	6	29.29	2
Johnius	1.46	8	—	—	2.86	7	—	—
Thryssa	1.07	9	6.18	4	7.77	4	2.29	6
Gazza	1.74	5	—	—	—	—	—	—
Thrissina	0.67	14	0.08	16	—	—	0.76	8
Setipinna	0.32	—	—	—	—	—	—	—
Pterois	—	—	0.08	16	—	—	—	—
Trichiurus	—	—	0.43	10	—	—	0.11	9
Lutjanids	—	—	0.16	14	0.06	18	—	—
Therapon	—	—	—	—	0.06	18	—	—
"Fishes"	0.67	14	0.06	17	—	—	0.06	13
Bivalve juveniles	—	—	—	—	0.84	16	—	—
Gastropod juveniles	0.13	21	—	—	—	—	—	—
Sepia	—	—	—	—	—	—	0.08	—
Gastropod veligers	—	—	0.11	15	—	—	—	—
Turritella	—	—	—	—	—	—	0.02	15
Cresis	0.75	13	0.79	8	—	—	—	—
polychaetes	—	—	—	—	0.48	17	0.05	15
Foraminifers	0.82	11	1.25	7	1.43	10	0.97	7

TABLE 4. Percentage index of various food items of *C. malabaricus* in different maturity stages—male.

Food items	Immature		Maturing		Mature		Spent & spent recovering	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank
Lucifer	28.82	2	6.76	6	78.87	1	3.33	8
Crab larva	0.04	18	—	—	1.61	5	0.30	16
Prawn larva	3.95	5	6.97	5	2.42	4	1.97	11
Prawn	6.17	3	0.67	13	—	—	13.26	3
Acetes	43.68	1	9.28	3	9.26	2	21.82	1
Copepods	0.33	14	8.18	4	—	—	0.72	15
Amphipods	0.77	11	0.27	18	—	—	1.36	13
Mysids	1.29	9	10.85	2	7.24	3	1.11	14
Squilla larva	3.60	6	0.40	15	—	—	4.56	6
Sciaenids	—	—	0.53	14	—	—	2.57	9
Caranx	0.02	20	—	—	—	—	—	—
Leiognathus	2.99	7	44.04	7	—	—	13.01	4
Pomadasys	—	—	0.27	18	—	—	0.14	19
Stolephorus	—	—	0.39	16	—	—	21.41	2
Johnius	2.02	20	0.72	11	—	—	—	—
Thryssa	4.53	4	1.72	8	—	—	5.69	6
Gazza	0.37	13	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—	4.06	7
Trichiurus	—	—	1.36	17	—	—	—	—
Lutjanids	—	—	0.70	12	—	—	—	—
Therapon	0.20	15	—	—	—	—	—	—
"Fishes"	0.45	12	0.09	21	—	—	0.30	16
Alepes	—	—	0.99	10	—	—	—	—
Cepola	0.03	19	—	—	—	—	—	—
Bivalve juveniles	—	—	0.18	20	—	—	—	—
Gastropod veligers	0.07	17	0.36	17	—	—	—	—
Cresis	0.85	10	1.07	9	—	—	—	—
Polychaetes	0.15	16	0.22	19	0.60	6	1.90	12
Forminifers	1.67	8	4.98	7	—	—	2.03	10
Gastropod juvenils	—	—	—	—	—	—	0.20	18

TABLE 5. Percentage of index of various food items of *A. kalla* during different months of the year 1976. (M-Male ; F-Female ; J-Juvenile).

Food items	January			February		
	M	F	J	M	F	J
Lucifer	—	—	—	—	6.64	—
Crab larva	15.51	28.46	—	23.09	2.83	—
Prawn larva	—	0.06	—	5.77	—	—
Prawn	0.22	0.03	—	53.82	9.64	—
Acetes	0.68	29.17	—	13.47	—	—
Copepods	0.84	0.21	—	—	—	—
Amphipods	0.22	0.80	—	—	0.78	—
Cymathoa	—	—	—	—	3.86	—
Mysids	—	0.16	—	—	—	—
Squilla larva	11.12	39.35	—	0.64	48.16	—
Fish larva	0.45	—	—	—	—	—
Sciaenids	—	0.13	—	—	—	—
Leiognathus	2.01	0.03	—	—	0.77	—
Pomadasys	—	—	—	—	—	—
Stolephorus	2.67	—	—	—	—	—
Johnius	3.34	—	—	—	23.12	—
Thryssa	46.50	—	—	—	—	—
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Anguilla	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
Caranx	—	—	—	—	—	—
Upeneus	—	—	—	—	—	—
"Fishes"	3.90	0.13	—	—	0.26	—
Lutjanids	—	—	—	—	—	—
Bivalve juveniles	—	—	—	0.65	5.65	—
Donax	—	—	—	1.28	2.05	—
Gastropod juveniles	—	—	—	—	0.13	—
Cresis	12.48	1.18	—	1.28	—	—
Polychaetes	—	—	—	—	1.02	—
Diatoms	—	—	—	—	1.09	—
Foraminifers	—	0.29	—	—	—	—

TABLE 5. *Continued*

Food items	March			April		
	M	F	J	M	F	J
Lucifer	0.91	0.38	—	8.22	—	7.69
Crab larva	—	1.71	—	0.33	3.11	—
Prawn larva	0.23	0.82	—	1.17	—	—
Prawn	0.61	—	—	1.96	0.16	87.18
Acetes	27.09	1.77	—	5.08	10.27	—
Copepods	32.15	20.25	—	26.01	15.26	—
Amphipods	0.15	10.88	—	—	—	—
Cymathoa	0.30	—	—	—	0.16	—
Mysids	0.23	0.69	—	0.39	—	—
Squilla larva	1.52	8.42	—	9.97	20.55	—
Fish larva	—	0.03	—	—	0.38	—
Sciaenids	—	—	—	2.61	—	—
Leiognathus	31.87	49.86	—	0.97	—	5.13
Pomadasys	—	—	—	—	—	—
Stolephorus	—	—	—	3.66	—	—
Johnius	—	—	—	—	—	—
Thryssa	—	—	—	14.66	0.47	—
Gazza	—	—	—	1.36	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	1.57	—	—
Trichiurus	—	0.19	—	—	—	—
Anguilla	—	0.13	—	—	—	—
Cepola	—	—	—	—	—	—
Caranx	—	3.79	—	0.78	—	—
Upeneus	—	—	—	0.38	—	—
"Fishes"	2.97	1.33	—	1.30	1.40	—
Lutjanids	—	—	—	—	—	—
Bivalve juveniles	—	0.06	—	—	—	—
Donax	—	—	—	—	—	—
Gastropod juveniles	1.75	0.17	—	—	—	—
Crestis	—	—	—	19.58	19.58	—
Polychaetes	0.22	0.02	—	—	—	—
Diatoms	—	—	—	—	—	—
Foraminifers	—	—	—	—	—	—

TABLE 5. *Continued*

Food items	May			June		
	M	F	J	M	F	J
Lucifer	71.61	53.76	89.17	14.09	9.45	5.66
Crab larva	9.97	3.58	0.41	0.76	37.12	1.20
Prawn larva	0.09	0.05	—	0.30	0.15	0.16
Prawn	0.04	—	0.03	—	—	—
Acetes	—	—	6.65	54.59	48.38	47.80
Copepods	3.98	0.09	1.77	24.57	1.02	35.61
Amphipods	—	—	—	—	0.10	—
Cymathoa	—	0.03	—	—	—	—
Mysids	—	14.03	—	—	0.47	9.17
Squilla larva	0.89	0.34	—	—	0.35	—
Fish larva	0.07	—	0.86	—	—	0.03
Sciaenids	—	—	—	0.45	—	—
Leiognathus	—	—	—	1.52	—	0.04
Pomadasys	2.24	—	—	—	—	—
Stolephorus	—	—	0.55	—	—	0.02
Johnius	—	—	—	—	—	—
Thryssa	—	25.46	0.29	—	—	0.02
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	1.90	—	0.02
Setipinna	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Anguilla	—	—	—	—	—	—
Cepola	—	—	0.17	—	—	—
Caranx	—	—	—	—	—	—
Upeneus	—	—	—	—	—	—
"Fishes"	0.11	—	—	1.82	2.90	0.27
Lutjanids	—	—	0.10	—	—	—
Bivalve juveniles	—	—	—	—	—	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	—	—
Cresis	11.00	2.66	—	—	—	—
Polychaetes	—	—	—	—	0.03	—
Diatoms	—	—	—	—	0.03	—
Foraminifers	—	—	—	—	—	—

TABLE 5. *Continued*

Food items	July			August		
	M	F	J	M	F	J
Lucifer	9.68	10.84	98.67	2.60	8.26	0.13
Crab larva	—	—	0.08	0.05	0.75	0.51
Prawn larva	—	—	—	0.09	0.38	—
Prawn	—	0.82	—	—	—	—
Acetes	87.23	72.24	0.13	32.59	12.16	0.04
Copepods	0.16	9.13	0.30	62.01	55.66	99.15
Amphipods	—	—	—	—	0.33	0.11
Cymathoa	—	0.64	0.22	—	—	—
Mysids	0.29	1.07	—	0.29	17.90	—
Squilla larva	—	1.07	0.06	0.03	0.75	0.06
Fish larva	0.07	0.18	0.20	0.11	—	—
Sciaenids	0.32	—	—	—	—	—
Leiognathus	0.07	—	—	—	—	—
Pomadasys	—	—	—	—	—	—
Stolephorus	—	—	—	—	—	—
Johnius	—	0.36	—	—	—	—
Thryssa	0.54	0.43	—	—	—	—
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Anguilla	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
Caranx	—	—	—	—	—	—
Upeneus	0.16	—	—	—	—	—
"Fishes"	0.04	0.86	—	—	—	—
Lutjanids	—	—	—	—	—	—
Bivalve juveniles	—	—	—	—	—	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	1.22	—	—	—	—
Cresis	—	0.57	—	—	—	—
Polychaetes	—	—	—	1.90	—	—
Diatoms	—	—	—	—	—	—
Foraminifers	1.44	0.57	0.34	0.33	3.76	—

TABLE 5. *Continued*

Food items	September			October		
	M	F	J	M	F	J
Lucifer	0.66	3.50	3.72	5.75	—	—
Crab larva	0.06	0.06	36.85	8.63	15.25	11.77
Prawn larva	—	—	—	—	—	—
Prawn	—	0.25	0.05	—	0.08	8.40
Acetes	98.20	84.40	11.86	26.57	62.47	25.21
Copepods	0.32	10.44	47.02	36.42	3.30	37.83
Amphipods	—	—	—	—	0.45	8.39
Cymathoa	—	—	—	0.24	—	—
Mysids	0.33	0.15	—	—	0.75	—
Squilla larva	0.04	0.68	0.30	—	5.46	—
Fish larva	—	—	—	0.96	—	—
Sciaenids	—	—	—	—	—	—
Leiognathus	0.26	0.05	—	13.41	—	—
Pomadasys	—	—	—	—	0.50	—
Stolephorus	0.07	0.17	—	—	0.22	—
Johnius	—	—	—	—	0.22	—
Thryssa	—	0.25	—	—	0.17	—
Gazza	—	0.05	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Anguilla	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
Caranx	—	—	—	—	—	—
Upeneus	—	—	—	—	—	—
"Fishes"	—	—	0.20	4.79	0.34	8.40
Lutjanids	—	—	—	—	—	—
Bivalve juveniles	—	—	—	—	—	—
Donax	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	—	—
Cresis	—	—	—	2.15	10.73	—
Polychaetes	0.06	—	—	—	0.06	—
Diatoms	—	—	—	—	—	—
Foraminifers	—	—	—	1.08	—	—

TABLE 5. *Concluded*

Food items	November			December		
	M	F	J	M	F	J
Lucifer	—	—	5.73	—	0.64	—
Crab larva	4.77	85.71	45.70	2.18	21.31	—
Prawn larva	—	—	—	—	—	—
Prawn	—	—	—	—	0.49	—
Acetes	—	—	—	—	2.76	—
Copepods	—	—	48.57	0.35	1.62	—
Amphipods	—	—	—	—	0.99	—
Cymathoa	—	—	—	—	—	—
Mysids	—	—	—	—	—	—
Squilla larva	95.08	14.29	—	95.73	70.31	—
Fish larva	—	—	—	—	—	—
Sciaenids	—	—	—	—	—	—
Leiognathus	—	—	—	0.58	0.40	—
Pomadasys	—	—	—	—	—	—
Stolephorus	—	—	—	—	1.18	—
Johnius	—	—	—	—	—	—
Thrysea	—	—	—	1.16	—	—
Gazza	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—
Anguilla	—	—	—	—	—	—
Cepola	—	—	—	—	—	—
Caranx	—	—	—	—	—	—
Upeneus	—	—	—	—	—	—
"Fishes"	0.15	—	—	—	—	—
Lutjanids	—	—	—	—	—	—
Bivalve juveniles	—	—	—	—	—	—
Donax	—	—	—	—	0.15	—
Gastropod juveniles	—	—	—	—	—	—
Cresis	—	—	—	—	—	—
Polychaetes	—	—	—	—	0.15	—
Diatoms	—	—	—	—	—	—
Foraminifers	—	—	—	—	—	—

TABLE 6. Rank obtained by the various food items of *A. kalla* as during different months of the year 1976.

Food items	January			February			March		
	M	F	J	M	F	J	M	F	J
Lucifer	—	—	—	—	12	—	7	11	—
Crab larva	2	3	—	2	6	—	—	7	—
Prawn larva	—	10	—	4	—	—	10	9	—
Prawn	11	11	—	1	3	—	8	—	—
Acetes	9	2	—	3	—	—	3	6	—
Copepods	8	7	—	—	—	—	1	2	—
Amphipods	11	5	—	—	10	—	12	3	—
Cymathoa	—	—	—	—	5	—	9	—	—
Mysids	—	8	—	—	—	—	10	10	—
Squilla larva	4	1	—	7	1	—	6	4	—
Fish larva	10	—	—	—	—	—	—	—	—
Sciaenids	—	9	—	—	—	—	—	—	—
Leiognathus	7	11	—	—	11	—	2	—	—
Pomadasys	—	—	—	—	—	—	—	—	—
Stolephorus	6	—	—	—	—	—	—	—	—
Johnius	5	—	—	—	2	—	—	—	—
Thryssa	1	—	—	—	—	—	—	—	—
Gazza	—	—	—	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—	—	12	—
Anguilla	—	—	—	—	—	—	—	14	—
Cepola	—	—	—	—	—	—	—	—	—
Caranx	—	—	—	—	—	—	—	5	—
Upeneus	—	—	—	—	—	—	—	—	—
Lutjanids	—	—	—	—	—	—	—	—	—
"Fishes"	4	9	—	—	13	—	4	8	—
Bivalve juveniles	—	—	—	6	4	—	—	15	—
Cresis	3	4	—	—	—	—	—	—	—
Polychaetes	—	—	—	5	9	—	11	17	—
Diatoms	—	—	—	—	8	—	—	—	—
Foraminifers	—	6	—	—	—	—	—	—	—
Donax	—	—	—	5	7	—	—	—	—
Gastropod juveniles		-	—	—	14	—	5	13	—

TABLE 6. *Continued*

Food items	April			May			June		
	M	F	J	M	F	J	M	F	J
Lucifer	5	—	2	1	1	1	3	3	4
Crab larva	18	5	—	3	4	6	7	2	5
Prawn larva	13	—	—	8	8	—	9	8	7
Prawn	9	9	1	10	—	10	—	—	—
Acetes	6	4	—	—	—	2	1	1	1
Copepods	1	3	—	4	7	3	2	5	2
Amphipods	—	—	—	—	—	—	—	9	—
Cymathoa	—	9	—	—	9	—	—	—	—
Mysids	16	—	—	—	3	—	—	6	3
Sguilla larva	4	2	—	6	6	—	—	7	—
Fish larva	—	8	—	9	—	4	—	—	9
Sciaenids	3	—	—	—	—	—	8	—	—
Leiognathus	14	—	8	—	—	—	6	—	8
Pomadasys	—	—	—	5	—	—	—	—	—
Stolephorus	7	—	—	—	—	5	—	—	10
Johnius	—	—	—	—	—	—	—	—	—
Thryssa	3	7	—	—	2	7	—	—	10
Gazza	11	—	—	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—	4	—	10
Setipinna	10	—	—	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—	—	—	—
Anguilla	—	—	—	—	—	—	—	—	—
Cepola	—	—	—	—	—	8	—	—	—
Caranx	15	—	—	—	—	—	—	—	—
Upeneus	17	—	—	—	—	—	—	—	—
Lutjanids	—	—	—	—	—	9	—	—	—
"Fishes"	12	6	—	7	—	—	5	4	6
Bivalve juveniles	—	—	—	—	—	—	—	—	—
Cresis	2	1	—	2	5	—	—	—	—
Polychaetes	—	—	—	—	—	—	—	10	—
Diatoms	—	—	—	—	—	—	—	10	—
Foraminifers	—	—	—	—	—	—	—	—	—
Donax	—	—	—	—	—	—	—	—	—
Gastropod juveniles	—	—	—	—	—	—	—	—	—

TABLE 6. *Continued*

Food items	July			August			September		
	M	F	J	M	F	J	M	F	J
Lucifer	2	2	1	3	4	3	2	3	4
Carb larva	—	—	7	9	6	2	7	8	2
Prawn larva	—	—	—	8	7	—	—	—	—
Prawn	—	7	—	—	—	—	—	5	7
Acetes	1	1	6	2	3	6	1	1	3
Copepods	7	3	3	1	1	1	4	2	1
Amphipods	—	—	—	—	7	4	—	—	—
Cymathoa	—	8	4	—	—	—	—	—	—
Mysids	6	5	—	6	—	—	3	7	—
Squilla larva	—	5	8	10	6	5	8	7	5
Fish larva	8	12	5	7	—	—	—	—	—
Sciaenids	5	—	—	—	—	—	—	—	—
Leiognathus	8	—	—	—	—	—	5	9	—
Pomadasys	—	—	—	—	—	—	—	—	—
Stolephorus	—	—	—	—	—	—	6	6	—
Johnius	—	11	—	—	—	—	—	—	—
Thryssa	4	—	—	—	—	—	—	5	—
Gazza	—	—	—	—	—	—	—	9	—
Thriszina	—	—	—	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—	—	—	—
Anguilla	—	—	—	—	—	—	—	—	—
Cepola	—	—	—	—	—	—	—	—	—
Caranx	—	—	—	—	—	—	—	—	—
Upeneus	7	—	—	—	—	—	—	—	—
Lutjanids	—	—	—	—	—	—	—	—	—
"Fishes"	9	6	—	—	—	—	—	—	—
Bivalve juveniles	—	—	—	—	—	—	—	—	—
Cresis	—	9	—	—	—	—	—	—	—
Polychaetes	—	—	—	4	—	—	7	—	—
Diatoms	—	—	—	—	—	—	—	—	—
Foraminifers	3	9	2	5	5	—	—	—	—
Donax	—	—	—	—	—	—	—	—	—
Gastropod juveniles	4	—	—	—	—	—	—	—	—

TABLE 6. *Concluded*

Food items	October			November			December		
	M	F	J	M	F	J	M	F	J
Lucifer	5	—	—	—	—	3	—	7	—
Carb larva	4	2	3	2	1	2	2	2	—
Prawn larva	—	—	—	—	—	—	—	—	—
Prawn	—	12	4	—	—	—	—	—	—
Acetes	2	1	2	—	—	—	—	3	—
Copepods	1	5	1	—	—	1	5	4	—
Amphipods	—	8	5	—	—	—	—	6	—
Cymathoa	10	—	—	—	—	—	—	—	—
Mysids	—	—	6	—	—	—	—	—	—
Squilla larva	—	4	—	1	2	—	1	1	—
Fish larva	9	—	—	—	—	—	—	—	—
Sciaenids	—	—	—	—	—	—	—	—	—
Leiognathus	3	—	—	—	—	—	4	9	—
Pomadasys	—	7	—	—	—	—	—	—	—
Stolebhorus	—	10	—	—	—	—	—	5	—
Johnius	—	10	—	—	—	—	—	—	—
Thryssa	—	11	—	—	—	—	3	—	—
Gazza	—	—	—	—	—	—	—	—	—
Thrissina	—	—	—	—	—	—	—	—	—
Setipinna	—	—	—	—	—	—	—	—	—
Trichiurus	—	—	—	—	—	—	—	—	—
Anguilla	—	—	—	—	—	—	—	—	—
Cepola	—	—	—	—	—	—	—	—	—
Caranx	—	—	—	—	—	—	—	—	—
Upeneus	—	—	—	—	—	—	—	—	—
Lutjanids	—	—	—	—	—	—	—	—	—
"Fishes"	5	9	4	3	—	—	—	—	—
Bivalve juveniles	—	—	—	—	—	—	—	—	—
Cresis	7	3	—	—	—	—	—	—	—
Polychaetes	—	—	—	—	—	—	—	10	—
Diatoms	—	—	—	—	—	—	—	—	—
Foraminifers	—	—	—	—	—	—	—	—	—
Donax	8	—	—	—	—	—	—	10	—
Gastropod juveniles	—	—	—	—	—	—	—	—	—

TABLE 7. Percentage index of various food items of *A. kalla* in different maturity stages – female

Food items	Immature		Maturing		Mature		Spent & spent recovering	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank
Lucifer	40.56	2	34.00	2	11.67	4	0.95	4
Crab larva	4.50	4	3.81	5	3.37	6	5.81	3
Prawn larva	0.06	9	—	—	0.51	13	—	—
Prawn	—	—	0.18	11	0.90	10	0.68	6
Acetes	41.59	1	34.98	1	13.75	3	26.32	2
Copepods	11.20	3	19.88	3	0.54	12	0.32	11
Amphipods	—	—	0.46	8	0.42	15	0.23	13
Cymathoa	—	—	0.37	10	—	—	—	—
Mysids	0.52	5	0.76	6	1.41	9	0.30	12
Squilla larva	—	—	4.01	4	41.68	1	61.40	1
Fish larva	0.39	6	0.43	9	4.59	—	—	—
Sciaenids	—	—	0.10	13	—	—	—	—
Leiognathus	—	—	—	—	2.44	7	0.37	10
Stolephorus	0.39	6	—	—	—	—	0.88	6
Johnius	—	—	—	—	15.23	2	0.18	14
Thryssa	—	—	—	—	0.80	11	0.61	10
Gazza	—	—	—	—	—	—	0.68	6
Thrissina	0.10	8	—	—	—	—	—	—
Trichiurus	—	—	0.18	11	—	—	—	—
Anguilla	—	—	0.12	12	—	—	—	—
"Fishes"	—	—	—	—	—	—	0.09	15
Caranx	—	—	—	—	0.32	16	—	—
Bivalve juveniles	0.05	9	—	—	—	—	—	—
Donax	—	—	—	—	0.10	17	—	—
Gastropod juveniles	0.25	7	—	—	0.05	18	—	—
Cresis	—	—	—	—	1.72	8	0.62	7
Polychaetes	—	—	—	—	—	—	0.07	16
Foraminifers	0.39	6	0.72	7	0.50	14	0.39	9

TABLE 8. Percentage index of various food items of *A. kalla* in different maturity stage—male.

Food items	Immature		Maturing		Mature		Spent & spent recovering	
	Index	Rank	Index	Rank	Index	Rank	Index	Rank
Lucifer	16,09	2	14.85	2	3.91	7	1.57	6
Crab larva	9,36	4	1.16	13	0.59	12	0.72	8
Prawn larva	—	4	0.58	15	1.78	10	—	—
Prawn	0.75	10	0.77	14	3.24	8	—	—
Acetes	13.47	3	4.08	7	13.49	4	51.84	1
Copepods	39.66	1	3.01	8	1.07	11	0.53	9
Amphipods	—	—	0.20	17	0.41	15	0.05	14
Cymathoa	0.37	11	—	—	0.24	17	—	—
Mysids	1.22	9	2.33	9	8.70	5	0.43	16
Squilla larva	—	—	9.60	3	15.09	2	32.26	2
Fish larva	—	—	—	—	0.47	14	—	—
Sciaenids	—	—	8.53	5	—	—	—	—
Leiognathus	—	—	1.46	12	28.40	1	1.63	5
Pomadasys	2.24	8	—	—	—	—	—	—
Stolephorus	3.37	7	0.39	16	—	—	0.10	13
Johnius	5.23	6	—	—	—	—	—	—
Thryssa	—	—	31.42	1	—	—	6.91	3
Thrissina	0.75	—	—	—	—	—	—	—
"Fishes"	7.49	5	—	—	14.33	3	2.64	4
Caranx	—	—	1.35	12	0.30	16	—	—
Upeneus	—	—	—	—	2.14	9	—	—
Bivalve juveniles	—	—	—	—	0.18	18	—	—
Gastropod juveniles	—	—	2.23	10	—	—	—	—
Cresis	—	—	2.04	11	4.03	6	1.07	7
Polychaetes	—	—	6.79	6	0.06	19	0.15	11
Diatoms	—	—	—	—	0.51	13	—	—
Foraminifers	—	—	9.12	4	1.07	11	0.11	12

Summary

Analyses of the food and feeding in *Carangoides malabaricus* and *Alepes kalla* reveal that the juveniles feed on planktonic crustaceans, but the adults prefer juvenile fishes also in addition. In both the species no difference could be seen between the food of males and females. The stomach contents in general reveal that the fishes are carnivores. During maturation, preference to particular food items could be noted in *Carangoides malabaricus*. Juveniles and immature fishes of both sexes, feed more on the planktonic crustaceans, mature fishes consume both crustaceans and fishes, and spent and recovery specimens prefer more juvenile fishes like *Stolephorus* spp. *Leiognathus* spp. In both the species, in females, during the advanced maturity stages only empty stomachs with little mucus are encountered. The percentage occurrence of 'gorged' 'full' and '$\frac{3}{4}$ full' stomachs are always less in all the months.

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