

FOOD AND FEEDING HABITS OF THE SNAPPER, *LUTIANUS KASMIRA* (FORSKAL) FROM THE ANDAMAN SEA

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ABSTRACT

The paper deals with the food and feeding habits of the snapper, *Lutianus kasmira* (Forsk.), a common lutianid fish around Andaman Islands. Teleost fishes, juvenile crabs and megalopa, and young prawns constituted the chief items of the diet of the fish in that order. Isopods, amphipods, ostracods, polychaetes, stomatopods, asteroids, ophiuroids, gastropods, holothurians, hermit crabs, pteropods, lucifers, caprellids and cypris contributed an insignificant percentage to the diet. The major items of the diet of the fish did not differ significantly from year to year. No marked change in the diet of the fish as it grew from young to adult was noticed. Generally active feeding was noticed during April to October with a peak during April to August and a poor feeding during the rest of the period. The available data suggest a slackness in feeding during the spawning season and an active feeding after spawning. Small-sized food organisms were swallowed whole, while large-sized organisms were bitten and swallowed. *L. kasmira* is essentially a column feeder occasionally resorting to feeding at the bottom.

INTRODUCTION

The perches constitute an important fishery in Andaman Islands accounting for nearly one-third of the total fish landed every year. The fairly deep waters and the rocky coast around these islands afford an ideal habitat for perches. The majority of perches are caught by local fishermen by hooks and lines. The waters around these islands abound with various species of *Lutianus*, among which *Lutianus kasmira* the blue and yellow snapper, is fairly common contributing a significant percentage to the perch fishery. The fish is available almost throughout the year and grows to a maximum size of about 300 mm.

The most comprehensive work on the food and feeding habits of lutianids is by Job (1940) who during his investigation on the nutrition of the perches of the Madras coast has mentioned the food and feeding habits of *L. johnii*, *L. lineolatus*, *L. sanguineus* and *L. vaigiensis*. Chacko (1949) described the nutrition of the young stages of *L. lineolatus*. Venkataraman (1960) has made a brief reference to the food of *L. vaigiensis*. Rao (1964) gave an account of the food and feeding habits of

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L. johnii and *L. sanguineus*. The only reference that is available on the food and feeding habits of *L. kasmira* is by Basheeruddin and Nayai (1962) based on their preliminary study of the juvenile fishes of the coastal waters off Madras.

A detailed investigation on the biology of *L. kasmira* was undertaken at Port Blair, Andamans from April 1966 to December 1968 and the present paper deals with the food and feeding habits of the fish.

MATERIAL AND METHODS

During the course of this investigation a total number of 792 fishes, consisting of 352 females and 440 males and ranging in total length from 70 mm to 303 mm obtained from the fish market at Port Blair, have been examined.

The detailed analysis of the food of *L. kasmira* was made by employing the 'Index of Preponderance' method (Natarajan and Jhingran, 1961). The percentage occurrence of different items of food in various months was determined by summing the total occurrence of all items from which the percentage occurrence of each item was calculated. *L. kasmira* being a carnivorous feeder ingesting large sized organisms, the determination of the volume of each item of food could be made easily by the displacement method. The percentage volume of each food item was determined from the total volume of all the stomach contents. The 'Index of Preponderance' was then calculated for each item by applying the formula $\frac{V. O.}{\text{Sum } V. O.} \times 100$ where 'V' and 'O' represent the percentage volume and percentage occurrence of a particular item of food respectively.

The gravimetric method was also employed during this study. The total weight of food in each stomach was determined in a chemical balance in order to correlate the results obtained with those arrived by other methods.

The condition of food in various months was ascertained by noting the degree of fullness of the stomach before it was cut open. The stomach of the fish was graded into eight categories, i.e., everted, empty, trace, $\frac{1}{4}$ full, $\frac{1}{2}$ full, $\frac{3}{4}$ full, full and gorged. From the total number of fish examined in a month the percentage occurrence of different categories of stomach was calculated. The food components were usually grouped into different categories like fishes, prawns, crabs, polychaetes etc. and whenever possible the identification was carried up to the generic level.

FOOD AND SEASONAL VARIATIONS

An analysis of the stomach contents of *L. kasmira* collected from April 1966 to December 1968 revealed that fishes formed the chief item of food (Table 1). In certain months fishes constituted the exclusive diet of the fish. Juvenile crabs and megalopa generally occupied the second rank in the diet. Young prawns were noticed in the diet in most of the months, rarely forming the chief item of food.

TABLE 1. *Relative importance of the three major food items in different months in the stomach of L. kasmira during 1966 - 68*

Items of food	Jan.	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1966												
Fishes	—	—	—	6.06	40.45	25.82	57.91	10.25	25.53	40.57	94.90	49.75
Megalopa and Crabs	—	—	—	37.80	42.50	61.13	27.15	59.18	12.83	40.90	0.34	39.09
Prawns	—	—	—	51.57	16.39	12.34	14.39	27.67	45.37	17.93	2.04	0.49
1967												
Fishes	71.97	99.69	57.00	57.05	90.32	76.77	—	99.45	100.00	100.00	69.97	93.90
Megalopa and Crabs	4.95	—	11.31	27.44	5.34	19.61	—	0.39	—	—	14.14	5.63
Prawns	21.07	0.31	30.77	14.31	—	2.36	—	0.08	—	—	15.07	—
1968												
Fishes	98.41	80.75	0.32	89.38	98.44	43.6	98.16	57.31	71.35	12.42	94.87	98.33
Megalopa and Crabs	1.45	16.83	95.38	10.31	1.56	15.05	1.19	41.33	18.19	6.21	1.71	0.56
Prawns	—	2.23	2.57	0.09	—	40.19	0.50	1.27	9.75	55.90	3.42	1.11

Other items of food like isopods, amphipods, ostracods, polychaetes, stomatopods, gastropods, hermit crabs etc., though present in many months, contribute an insignificant percentage to the diet of the fish. Parasites like nematodes and trematodes were occasionally seen in the stomach contents.

The analysis of stomach contents of *L. kasmira* during these three years revealed that the diet was essentially similar. Fishes were present in the diet throughout the year forming the chief diet of the fish during most of the months. In certain months, especially during February, August, September and October 1967, fishes formed almost exclusively the diet of the fish.

Crabs and megalopa occupied the first rank in the diet during May, June, August, and October 1966 and March 1968. During the rest of the period they ranked either second or third in the diet. Young prawns occupied the first place in the diet during April and September 1966 and October 1968. Amphipods formed a small percentage of the diet in many months during 1966 and 1968 but were almost absent during 1967. Ostracods were seen in small percentage during many months in 1966 but were almost absent in 1967 and 1968. Lucifers were present only in June 1966 but were absent in 1967 and 1968. Caprellids were noticed in May and September 1966 but were absent in 1967 and 1968. Similarly cypris was noticed in September 1966 only, being absent during the rest of the period.

Asteroids and ophiuroids were occasionally present during 1966 and 1967 but were completely absent during 1968. Holothurians were seen only in May 1966 and November 1967 but were absent in 1968.

Pteropods were noticed in July 1966 and June 1967 but were absent in 1968.

Thus from the data presented in Table 1 it is clear that the major items in the diet of *L. kasmira* did not differ significantly from year to year although the relative importance of a particular item may slightly vary between years.

FOOD IN RELATION TO DIFFERENT SIZE GROUPS

The percentage occurrence of various food organisms in the stomach contents of *L. kasmira* in the different size groups is given in Table 2. All sizes of fish feed heavily on fishes which constitute the chief item of the diet. Similarly fishes of all size groups from 70 to 239 mm consume young prawns, crabs and megalopa in large percentage. However, these items occurred in higher percentage in the size groups 70 to 129 mm than in higher size groups. Smaller fishes of the size groups 70 to 129 mm generally feed heavily on small-sized organisms like amphipods, ostracods hermit crabs, lucifers and polychaetes. Large sized fishes above 200 mm generally feed on larger organisms like stomatopods, asteroids, ophiuroids, gastropods etc.

Small organisms like young prawns, hermit crabs and lucifers occurred in higher percentage in smaller size groups and larger items like fishes, crabs, isopods, stomatopods, asteroids, ophiuroids and gastropods in larger size groups. Generally it may be stated that *L. kasmira* is highly piscivorous feeding mainly on fishes belonging to the families Clupeidae and Engraulidae.

CONDITION OF FEED

Fishes with gorged, full and $\frac{3}{4}$ full stomachs were considered to have actively fed, those with $\frac{1}{2}$ full stomachs as moderately fed and those with $\frac{1}{4}$ full and trace as poorly fed. The pooled data on the condition of feed in various months during these three years are given in Table 3.

Generally a higher percentage of actively fed fishes occurred during the period April to October. There after till March the percentage of actively fed fish was rather low. Fishes with gorged stomach were quite common during April to August and few or completely absent during the remaining period. The data indicated generally a high feeding activity from April to October with a peak feeding activity during April to August which coincided with the post-spawning period of the fish.

The variations in the feeding intensity were also studied based on the actual volume of food measured by displacement and the total weight of food estimated gravimetrically. The data are given in Table 4. It may be seen from the data that generally the average volume and weight of food are higher than the average for the whole year during April to August and low during the remaining period.

The variations in the feeding intensity were further analysed based on the maturity of the fish. Since over fifty per cent of the fish was found to be mature at 200 mm total length (Rangarajan, M.S.) they were grouped into immature (below

TABLE 2. *Percentage occurrence of food items in different size groups of L. kasmira*

Size groups mm	No. of fish	Fishes	Crabs and megalopa	Prawns	Isopods	Amphipods	Ostracods	Polychaetes	Stomatopods	Asteroids and Ophiuroids	Gastropods	Pteropods	Lucifers	Hermit crabs	Caprellids	Cypris	Radiolarians
70—79	4	75.0	66.7	100.0	33.3	33.3	—	—	—	—	—	—	—	—	—	—	—
80—89	3	100.0	100.0	100.0	—	—	33.3	33.3	—	—	—	—	—	33.3	—	—	—
90—99	8	75.0	87.5	75.0	—	12.5	25.0	—	12.5	—	—	—	—	12.5	—	—	—
100—109	8	75.0	100.0	75.0	25.0	37.5	12.5	12.5	—	12.5	12.5	—	12.5	12.5	—	—	12.5
110—119	9	88.8	88.8	77.7	11.1	22.2	33.3	33.3	22.2	22.2	22.2	—	—	11.1	—	—	—
120—129	22	40.9	86.4	72.7	4.5	45.5	18.2	13.6	—	—	—	—	—	22.7	4.5	—	22.7
130—139	20	80.0	50.0	40.0	—	15.0	—	5.0	10.0	—	—	—	—	—	—	—	5.0
140—149	47	83.0	38.3	21.3	2.1	6.4	—	2.1	—	—	—	—	—	2.1	—	—	4.3
150—159	30	80.0	63.3	40.0	3.3	3.3	3.3	3.3	6.7	—	6.7	—	—	10.0	—	—	3.3
160—169	80	81.2	41.2	30.0	5.0	6.2	3.7	6.2	12.5	1.2	1.2	—	—	2.5	1.2	1.2	2.5
170—179	60	88.3	48.3	20.0	6.7	3.3	5.0	3.3	3.3	—	1.7	1.7	—	3.3	—	—	—
180—189	52	65.4	55.8	3.8	9.6	3.8	1.9	3.8	9.6	1.9	—	—	1.9	1.9	—	—	1.9
190—199	38	76.3	55.3	34.2	2.6	10.5	2.6	—	2.6	—	2.6	2.6	—	13.2	2.6	2.6	—
200—209	24	70.8	62.5	41.7	16.7	20.8	8.3	—	16.7	8.3	—	—	—	8.3	—	—	8.3
210—219	21	95.2	42.9	38.1	9.5	4.8	14.3	4.8	14.3	—	4.8	—	—	4.8	—	—	4.8
220—229	12	66.7	66.7	50.0	16.7	16.7	—	—	8.3	16.7	16.7	—	—	8.3	—	—	8.3
230—239	4	75.0	75.0	50.0	25.0	25.0	—	25.0	25.0	25.0	25.0	—	—	—	—	—	—
240—249	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
250—259	1	100.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
260—269	1	—	100.0	—	—	—	—	—	—	—	—	—	—	—	—	—	—

TABLE 3. Condition of feed in *L. kasmira* in various months during 1966 - 1968

Months	1966				1967				1968			
	N	Poor	Moderate	Active	N	Poor	Moderate	Active	N	Poor	Moderate	Active
Jan.	—	—	—	—	22	40.9	13.6	13.6	24	29.2	8.3	12.5
Feb.	—	—	—	—	11	36.4	18.2	9.1	25	24.0	8.0	24.0
Mar.	—	—	—	—	24	4.2	4.2	24.9	10	40.0	10.0	10.0
Apr.	27	37.0	11.1	40.7	29	13.8	10.3	13.7	30	33.3	13.3	46.6
May.	40	35.0	7.5	20.0	20	10.0	5.0	30.0	5	40.0	20.0	—
Jun.	51	47.0	9.8	21.5	22	13.6	9.1	27.2	39	10.3	—	15.4
Jul.	36	25.0	8.3	11.2	—	—	—	—	48	37.4	8.3	12.5
Aug.	29	20.7	55.2	10.3	39	10.3	10.3	20.4	14	35.7	—	28.5
Sep.	45	13.4	6.7	13.3	11	—	9.1	9.1	28	42.8	21.4	17.9
Oct.	27	22.2	3.7	22.2	11	18.2	—	—	8	12.5	—	12.5
Nov.	14	35.7	—	14.2	38	39.4	10.5	29.0	14	7.1	—	21.4
Dec.	21	33.3	9.5	4.8	10	30.0	—	20.0	20	55.0	—	10.0

TABLE 4. Average volume and weight of food in *L. kasmira* during 1966 - 1968

Months	1966			1967			1968		
	N	Av. vol. ml	Av. wt. g	N	Av. vol. ml	Av. wt. g	N	Av. vol. ml	Av. wt. g
Jan.	—	—	—	16	0.35	0.43	15	0.44	0.49
Feb.	—	—	—	11	0.22	0.33	18	0.55	0.54
Mar.	—	—	—	8	1.56	1.88	6	0.33	0.32
Apr.	27	0.66	0.84	14	0.51	0.69	30	1.00	1.15
May.	30	0.59	0.66	10	0.86	1.22	4	0.14	0.21
Jun.	41	0.65	0.68	15	0.79	1.06	11	0.68	0.71
Jul.	18	0.52	0.63	—	—	—	31	0.42	0.48
Aug.	25	0.42	0.46	23	0.80	1.01	10	0.72	0.79
Sep.	22	0.36	0.40	3	0.72	0.55	27	0.45	0.55
Oct.	15	0.65	0.93	3	0.10	0.69	3	0.29	0.37
Nov.	9	0.30	0.41	36	0.54	0.66	4	0.51	0.57
Dec.	14	0.14	0.17	6	0.46	0.58	20	0.19	0.23
Grand total and average	201	0.52	0.61	145	0.63	0.80	179	0.53	0.60

200 mm) and mature (above 200 mm). The average volume and weight of food in each month for the two groups are given in Table 5. The average volume and weight of food in mature fishes were generally higher than the average for the whole year during April to August and low during the remaining period. The immature fishes also revealed more or less the same pattern.

The spawning period in *L. kasmira* is spread over a period of four or five months from November to March (Rangarajan, M.S.). The peak feeding intensity observed during April to August in mature fishes appeared to coincide with the post-spawning period of the fish. The poor feeding observed during the spawning period may probably be due to the fact that the gonads enlarge greatly and occupy most of the space in the body cavity during the spawning season virtually squeezing out the stomach.

FEEDING HABITS

The analysis of the stomach contents of *L. kasmira* revealed the occurrence of the following species of fishes; *Thrissina baclama*, *Ilisha* sp., *Harengula* sp., *Ambassis dayi*, *Apogon quadrifasciatus*, *Archamia lineolatus*, *Istiblennius* sp., *Parupeneus* sp., *Dascyllus* sp., *Dactyloptena* sp. and fishes belonging to the family Syngnathidae.

TABLE 5. Average volume and weight of food in immature and mature *L. kasmira* during 1966 - 1968

Months	1966						1967						1968					
	Immature			Mature			Immature			Mature			Immature			Mature		
	N	Av. vol. ml	Av. wt. g	N	Av. vol. ml	Av. wt. g	N	Av. vol. ml	Av. wt. g	N	Av. vol. ml	Av. wt. g	N	Av. vol. ml	Av. wt. g	N	Av. vol. ml	Av. wt. g
Jan.	—	—	—	—	—	—	14	0.37	0.44	2	0.22	0.34	15	0.44	0.49	—	—	—
Feb.	—	—	—	—	—	—	11	0.22	0.33	—	—	—	15	0.64	0.63	3	0.12	0.13
Mar.	—	—	—	—	—	—	3	1.55	1.84	5	1.57	1.91	3	0.57	0.55	3	0.08	0.09
Apr.	18	0.60	0.71	9	0.79	1.12	14	0.51	0.69	—	—	—	30	1.00	1.15	—	—	—
May.	27	0.51	0.56	3	1.29	1.56	10	0.86	1.22	—	—	—	4	0.14	0.21	—	—	—
Jun.	37	0.50	0.50	4	2.03	2.32	15	0.79	1.06	—	—	—	5	0.35	0.39	6	0.95	0.97
Jul.	16	0.39	0.50	2	1.60	1.66	—	—	—	—	—	—	31	0.42	0.48	—	—	—
Aug.	24	0.43	0.47	1	0.10	0.15	20	0.57	0.71	3	2.37	3.02	9	0.39	0.48	1	3.75	3.83
Sep.	17	0.35	0.40	5	0.39	0.41	2	1.07	0.82	1	0.00	0.00	27	0.45	0.55	—	—	—
Oct.	9	0.45	0.59	6	0.96	1.43	3	0.10	0.09	—	—	—	1	0.71	0.91	2	0.07	0.09
Nov.	7	0.34	0.49	2	0.17	0.14	29	0.53	0.67	7	0.58	0.61	4	0.51	0.57	—	—	—
Dec.	9	0.53	0.50	5	0.31	0.37	5	0.54	0.67	1	0.05	0.10	20	0.19	0.23	—	—	—
Grand total and average	164	0.44	0.50	37	0.87	1.09	126	0.57	0.73	19	1.03	1.25	164	0.52	0.59	15	0.68	0.70

Sometimes the stomach contained exclusively of certain items like engraulid and clupeid fishes indicating the abundant availability and the preference shown for these items.

Large individuals of *Thrissina* and *Ilisha* were generally bitten and swallowed since parts of fish, either head or tail were very often found missing. However, in one instance a single specimen of *Thrissina baelama*, measuring 95, mm in total length was recovered from the stomach of *L. kasmira* measuring 258 mm in total length.

The nature of food found in the stomach revealed that *L. kasmira* was essentially a column feeder. The presence of certain items of food like fishes of the family Mullidae, asteroids, ophiuroids, holothruians and radiolarian shells indicated that the fish fed occasionally at the bottom also.

DISCUSSION

During a preliminary study of the juvenile fishes of the coastal waters off Madras city Basheeruddin and Nayar (1962) have recorded masses of tubiculous polychaetes in the gut contents of juveniles of *L. kasmira* ranging in total length from 20 to 50 mm. In the present observations polychaetes formed only a minor percentage of the diet in fishes of size range 70 - 303 mm. The predominance of polychaetes in the stomach contents of juveniles of *L. kasmira*, observed by Basheeruddin and Nayar, may probably indicate the preference of the same by very young individuals or may be due to the particular season or locality of collection.

Venkataraman (1960) reported the occurrence of a post-larva of *Caranx sexfasciatus* from the stomach of *L. vaigiensis*. According to Rao (1964) the food of *L. sanguineus* appeared to be varied and consisted of prawns, cypris, isopods, crabs cephalopods and fishes, the crustaceans forming a major percentage of the diet. From the present study it would appear that the food of *L. kasmira* was also as varied as that of *L. sanguineus* but the percentage composition of the food items showed difference, fishes ranking first in the diet while crabs and prawns occupy the second and third places respectively. Further, unlike in *L. sanguineus*, cephalopods were not encountered in the stomach contents of *L. kasmira* during this investigation.

The observation of poor rate of feeding during spawning season and an active feeding thereafter in *L. kasmira* agrees with those of Prabhu (1955) on *Trichiurus haumela* and Thomas (1969) on *Upeneus tragula*.

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