

FOOD AND FEEDING OF THE MARINE CATFISH
TACHYSURUS DUSSUMIERI (VALENCIENNES) ALONG
THE DAKSHINA KANNADA COAST, KARNATAKA

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ABSTRACT

Results of the study on the food and feeding habits of the marine catfish *Tachysurus dussumieri* along the Dakshina Kannada Coast from September 1975 to May 1976, indicated that *Squilla* sp. was the most important item of food of fish above 300 mm total length (TL). Other important items of food were oilsardine, crabs and molluscs. Fish above 530 mm seem to prefer oilsardine and those below 300 mm feed mainly on polychaetes, prawns, unidentifiable fishes, *Squilla* sp., crabs, crustacean remains, small bivalves and copepods. Fish above 300 mm feed both at bottom and surface, whereas those below 300 mm feed mainly at the sea bottom. The feeding intensity of fish above 300 mm was high from January to March and low from October to December, April and May. The feeding intensity of fish below 300 mm size was high in all the months. Diurnal vertical migration of the species appear to be associated with diurnal movements of the food organisms.

INTRODUCTION

MARINE catfishes, one of the important groups of food fishes constitute about 5% of the marine fish production of India. Substantially high catches come from Kerala, Andhra Pradesh and Tamil Nadu Coasts followed by those from Gujarat, Karnataka, West Bengal and Orissa (Sekharan, 1968). The annual catfish landings from Karnataka Coast vary between 2.95 and 6.62 % of the marine fish production of Karnataka (Narayana Kurup *et al.*, 1987). These fishes are consumed fresh or after curing (Salt curing and Sun drying). Eight species of catfishes occur along the Dakshina Kannada Coast, of which *Tachysurus dussumieri* is one of the dominant species. Very limited work is done on the biology of this species (Menon and Muthiah, 1987).

This paper deals with the food and feeding habits of the species.

MATERIAL AND METHODS

Weekly gearwise samples of *T. dussumieri* were collected from fish landing centres at Mangalore, Malpe and Gangolli from September 1975 to May 1976. The food of 1874 fishes was analysed both qualitatively and quantitatively. Fishes above 300 mm total length and below 300 mm total length were treated separately. Since the stomachs of fish below 300 mm contained smaller food organisms in very small quantities, the stomach contents were analysed by 'Points volumetric method' (Hynes, 1950). Since food items consumed by fish above 300 mm were sufficiently large, they are analysed by 'Volume displacement' method (Pillay, 1952). The relative importance of the items was judged by the 'Index of Preponderance' as given by Natarajan and Jhingran (1961).

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The variations in the food of the fish collected from different gears and in relation to size of the fish (age) were analysed separately.

To ascertain the condition of feed in various months, the degree of fullness of the stomach was noted in relation to the length of the fish, before the stomach was actually cut open.

The food items were usually identified upto generic level. The term 'fishes' used in the study includes all the fishes which had undergone partial digestion and which could not be identified. The feeding habits were inferred from the nature of the food organisms (pelagic or benthic) consumed by fishes of various sizes.

RESULTS AND DISCUSSION

The percentage occurrence of various food items consumed by *T. dussumieri* captured in trawl nets off Mangalore and Gangolli, in gill nets off Malpe and in hook and lines off Gangolli in different months and size groups are presented in Tables 1 to 3 respectively.

From Table 1, it is clear that in fish captured by trawl nets off Mangalore and Gangolli, semidigested organic matter consisting of fish scales, animal tissues mixed with mud constituted a high percentage of the diet. Polychaetes formed considerable portion of the diet with peak occurrence in September. Larvae and juveniles of prawns was recorded in all months. Prawns dominated over other items in December and May with peak occurrence in December. Crabs also formed good portion of the diet of fish with peak occurrence in December. *Squilla* sp. started appearing in the diet of fish from January in appreciable quantities with peak occurrence in February. Crustacean remains such as appendages of crabs, prawns and *Squilla* sp. occurred in considerable quantities from December to May. Semidigested fish and their remains

occurred in considerable quantities from December to May with peak occurrence in February.

Copepods were recorded in minor quantities from March to May. Brittle-stars were also recorded in minor quantities in April and May. Items such as *Lucifer*, gastropods and euphausiids formed only negligible portion of the diet. Other food items such as *Stolephorous* sp., *Cynoglossus* sp., *Sciaena* sp. and phoronids were recorded occasionally.

From Table 2 and 3, it is clear that the common food items of fish captured by gill net and hook and line are *Squilla* sp., crabs, gastropods and fishes (unidentifiable). *Squilla* sp. dominated over other food items during January, March and April. The fish captured by hook and line was found to feed mainly on *Squilla* sp., from January to April. This indicates that irrespective of the gear and place of capture, *Squilla* sp. was the dominant item of food in the same period. Crabs formed a considerable portion of the food, where as gastropods and fishes were recorded in minor quantities in the stomachs of fish captured at both the places.

The items such as oilsardine, bivalves, squids, fish eggs, octopi, prawns, crustacean remains and polychaetes were found only in the diet of fish captured by gill nets. Excepts for the oilsardine, which constituted a high percentage during February and April. Other items were found in minor quantities.

Food in relation to age

Percentage occurrence of food items in various size groups of fish captured by trawl nets off Mangalore and Gangolli (Table 1) indicate that polychaetes formed the important food item of fish ranging in size from 50-260 mm with peak occurrence of 56.25% of the diet of fish of size 110 to 140 mm. Next in importance was prawns and their larvae, which occurred in the diet of all fishes upto 260 mm

TABLE 1. Percentage occurrence of food items of *T. dussumieri* captured by trawl nets

	No. of fish	Semi digested matter	Fish scales	Poly-chaetes	Brittle stars	Cope-pods	Crabs	Prawns	<i>Squilla</i> sp.
September, '75	.. 5	14.29	..	85.71	..	..	..	..	..
October	.. 22	19.91	15.45	57.27	..	0.09	..	0.91	..
November	..	—Fish not available for Study—							
December	.. 14	30.58	5.26	3.51	..	..	10.53	28.82	..
January 1976	.. 77	73.97	2.42	1.45	..	..	4.18	1.94	11.08
February	.. 46	20.73	..	..	..	..	4.15	2.07	18.13
March	.. 125	29.64	14.01	26.82	..	4.91	1.12	2.94	2.54
April	.. 191	41.15	12.59	7.49	10.21	2.49	..	3.86	0.63
May	.. 264	22.53	12.86	10.33	5.63	1.78	2.39	18.59	2.09
<i>Size groups (mm)</i>									
50—80	.. 296	31.92	22.38	7.80	..	7.22	0.25	11.60	0.18
80—110	.. 78	36.85	13.59	14.70	..	0.64	..	7.67	3.56
110—140	.. 25	21.34	15.18	56.25	..	0.09	..	0.89	..
140—170	.. 28	47.75	16.83	3.66	..	..	9.46	11.60	..
170—200	.. 82	48.64	1.58	3.77	4.88	..	..	10.50	15.28
200—230	.. 175	22.23	..	14.92	11.86	..	5.80	4.87	5.78
230—260	.. 76	20.31	..	8.13	28.20	..	4.65	7.96	2.56
260—290	.. 1	20.00	..	..	..	..	..	..	..

with peak occurrence (11.6%) in the size groups viz., 50-80 mm and 140-170 mm. Fish remains were recorded in appreciable quantities in fish of all sizes. *Squilla* sp. formed considerable portion of the diet of fish of all sizes. Their proportion was quite high (15.28%) in fish of size 170 to 200 mm. Crabs also formed important item of food of fish of size 140 to 170 mm (9.46%). Bivalves were found in minor quantities in the diet of fish of all sizes captured by trawl nets. Fish scales were also recorded in appreciable quantities in fish of size 50-200 mm.

The stomachs of fish captured by gillnets off Malpe (Table 2) and hook and line off Gangolli (Table 3) showed that *Squilla* sp. is the major item of food of all sizes above 320 mm forming almost 100% of the diet of fish captured in hook and line off Gangolli.

In fish of size 530 to 710 mm, captured by gillnets off Malpe, oilsardines formed an important item of food along with *Squilla* sp. and it was the most important item of food in fish of size 650-710 mm.

Crabs formed a notable portion of the diet of fish of size 470-710 mm, with maximum occurrence in the size group 680-710 mm, captured in gill nets off Malpe. Crabs also formed considerable portion of the diet of fish of size 530-620 mm, captured in hook and line off Gangolli. Gastropods were recorded in minor quantities in food of fish of size 560-620 mm. Items such as bivalves, fish eggs, prawns, crustacean remains, octopi and squids were recorded in minor quantities. Brittle-stars were recorded only from the diet of fish captured by hook and line off Gangolli.

(off Mangalore and Gangolli) in various months and size groups

Lucifer	Crustacean remains	Euphausiids	Gastropods	Bivalves	Stolephorous sp.	Cynoglossus sp.	Sciaena sp.	Fish remains	Phoronids	Mud and sand	Otoliths of fish
..
..	..	..	..	3.64	..	..	..	..	2.73	2.73	..
..	5.51	..	..	..	..	..	..	15.79	..	..	..
..	4.94	..	..	..	..	..	..	..	..	..	..
..	2.07	..	..	..	5.18	..	..	39.90	..	7.77	..
0.06	1.64	..	1.11	0.87	4.67	..	..	0.51	..	6.42	2.15
0.44	4.87	..	..	5.78	..	..	..	5.30	..	3.22	1.57
0.74	4.33	1.43	0.78	3.81	0.82	2.72	1.36	5.56	0.73	..	0.18
0.65	2.73	3.04	1.00	3.84	..	..	..	3.79	..	4.31	..
..	1.87	3.56	..	6.20	..	..	..	10.78	..	..	..
..	..	..	..	3.51	..	..	..	0.09	..	2.68	..
..	4.98	..	..	..	..	..	..	2.72	2.73	..	..
..	1.58	..	..	2.73	..	..	..	9.79	..	0.58	..
..	1.77	0.63	..	1.84	3.06	..	..	17.41	1.72	4.75	3.25
..	1.86	..	0.08	1.66	2.99	6.63	4.98	8.63	0.99	0.25	..
..	..	..	..	80.00	..	..	..	..	..	..	..

Venkataraman (1960) found that Juveniles of *T. dussumieri* (23 to 145 mm) captured off Calicut mainly fed upon polychaetes, ophiuroids, bivalves and seaweeds. Singh and Rege (1970) found that *T. sona* was feeding mainly on fishes and crustaceans. Small fish were recorded only from fish above 243 mm. Among crustaceans, crabs, prawns and *Squilla nepa* formed the important food items. Mojumder (1969) found that the catfish *T. thalassinus* mainly feeds on crustaceans such as crabs, prawns and *Squilla* sp. followed by teleosts and molluscs. These observations also indicate a general dominance of crustaceans in the food of marine catfish of the genus *Tachysurus*.

Feeding intensity

The data on percentage occurrence of stomachs of *T. dussumieri* captured by various

gears at different places are presented in Table 4. The data from gill net catches indicate high feeding intensity of *T. dussumieri* in January and February which may be due to intensive feeding of the spent fish and fish in early stages of maturity (Stage I to IV) occurring during these two months. The low feeding intensity during March and April might be due to the complete cessation in the feeding intensity of majority of males, since they provide parental care to the developing embryos (Vasudevappa and James, 1980). During these two months males were more than females in commercial catches. However, the low feeding intensity during October, November and December could not be explained.

Similarly the high feeding intensity of fish captured on hook and line during February

TABLE 2. Percentage occurrence of food items of *T. dussumieri* captured

		No. of fish	<i>Squilla</i> sp.	Oil sardine	Gastro- pods	Bivalves
October '75	..	31	..	38.73	2.82	..
November	..	54	..	94.84	0.16	0.16
December	..	46	8.24	..	..	..
January 76	..	120	71.72	12.92	0.12	..
February	..	125	36.32	53.61	..	..
March	..	119	93.69	..	4.50	1.80
April	..	173	52.54	46.55	..	..
<i>Size groups (mm)</i>						
380—410	..	2	100	..	..	..
410—440	..	11	100	..	..	..
440—470	..	27	100	..	..	..
470—500	..	17	91.72	..	..	5.52
500—530	..	30	45.45	..	..	..
530—560	..	80	38.60	22.81	7.02	..
560—590	..	111	47.77	33.01	..	0.78
590—620	..	152	29.69	54.72	0.15	..
620—650	..	118	67.71	31.16	..	..
650—680	..	54	30.30	62.87	..	..
680—710	..	35	29.27	56.10	..	..
710—740	..	11	57.50	..	..	..
740—770	..	5	..	..	..	..

and March may be due to the high feeding intensity of spent and spent recovering females and immature and maturing males. The very low feeding intensity during April and May could be attributed to the cessation of feeding of males, since they provide parental care to the developing embryos.

High feeding intensity of fish captured off Mangalore in trawl nets during December and February to May, may be due to the year round availability of food organisms at the sea bottom. Due to inadequate data, the low feeding intensity in September and January could not be explained and fish were not available for study in October and November.

The data obtained from trawl catches off Gangolli revealed high feeding intensity during October, January and March to May. Here also the year round availability of food organisms at sea bottom might be responsible for the high feeding intensity. During November, December and February fish were not available for study.

Observations made by Singh and Rege (1970) in the case of *T. sona* revealed high feeding intensity during the post-spawning months (September to February) and at the beginning of monsoon (May/June). Mojumder (1969) found that fluctuations in the intensity of feeding of *T. thalassinus* generally showed

by gillnets off Malpe in various months and size groups

Fishes	Fish eggs	Octopus	Squids	Prawns	Crustacean remains	Crabs	Polychaetes	Semi-digested matter	Mud and sand
..	..	..	17.61	..	..	15.14	3.52	6.34	15.85
4.84	..	..	..	..	..	..	..	..	..
..	61.18	..	..	..	..	8.24	..	22.35	..
1.25	0.44	..	..	0.94	3.87	6.24	..	2.49	..
..	..	9.99	..	..	..	0.01	..	..	..
..
0.30	..	..	..	..	..	..	..	0.60	..
..
..
..
..	..	..	..	..	..	1.38	..	1.30	..
53.64	..	..	..	..	..	..	..	..	..
..	..	..	..	5.26	..	3.51	3.51	3.51	15.79
..	2.91	..	..	..	3.40	7.48	..	2.91	1.75
..	0.74	9.56	1.84	..	0.37	0.15	..	2.79	..
0.38	..	..	..	..	..	..	..	0.76	..
..	..	..	..	..	..	2.99	..	3.83	..
..	..	..	..	..	..	14.63	..	..	..
..	42.5	..	..	..	..	..	..	..	..
40.00	..	..	..	..	50.00	..	..	..	..

similar trends both in small (below 36 cm TL) and large (above 36 cm TL) fish. Pantulu (1961) found high feeding intensity in August and November and low feeding intensity in June and July in case of *Mystus gultio*.

Feeding habits

The food of *T. dussumieri* of size below 300 mm (Table 1) mainly consisted of polychaetes, prawns and their larvae, fish remains, *Squilla*, crabs, brittle-stars, bivalves, gastropods and crustacean remains. This indicates that the fish of the size 50 to 300 mm mainly feed at or near sea bottom. Other bottom dwelling forms like phoronids, fishes such as

Oynoglossus sp., *Sciaena* sp. and pelagic forms such as *Stolephorus* sp., copepods, *Lucifer* and euphausiids were also recorded in minor quantities. Venkataraman (1960) also indicated the bottom feeding habits of *T. dussumieri* of the size range 23 to 145 mm.

The occurrence of *Squilla* sp., crabs and molluscs in the stomachs of fish above 300 mm (Table 2, 3) indicate their bottom feeding habits. The occurrence of oilsardine, in fish above 530 mm captured off Malpe (Table 2) indicates the surface feeding habits of such large fish. Therefore *T. dussumieri* may be feeding both at surface and bottom.

TABLE 3. Percentage occurrence of the food items of *T. dussumieri* captured by hook and line of Gangolli in various months and size groups

	No. of fish	<i>Squilla</i> sp.	Crabs	Gastro-pods	Fishes (unidentifiable)	Semi-digested matter	Otoliths of fishes	Brittle stars
Jan. '76	19	64.71	35.29	..	..	..	..	..
Feb.	158	95.62	..	..	3.35	..	1.03	..
Mar.	167	95.54	1.92	0.44	..	0.11	..	..
Apr.	77	56.45	43.55	..	..	..	..	..
May	14	85.37	..	..	..	..	..	14.63
<i>Size groups (mm)</i>								
320-350	2	100.00	..	..	..	..	..	..
350-380	1	100.00	..	..	..	..	..	..
380-410	8	100.00	..	..	..	..	..	..
410-440	23	100.00	..	..	..	..	..	..
440-470	46	100.00	..	..	..	..	..	..
470-500	49	100.00	..	..	..	..	..	..
500-530	41	100.00	..	..	..	..	..	..
530-560	69	86.76	8.82	0.88	..	..	..	3.53
560-590	99	92.11	..	..	7.89	..	..	..
590-620	63	92.11	6.21	..	..	..	0.87	..
620-650	23	87.11	..	..	..	..	12.89	..
650-680	4	100.00	..	..	..	..	..	..
680-710	4	100.00	..	..	..	..	..	..

The number of whole organisms consumed by *T. dussumieri* was dependent on the size of the prey. A single large item of food such as *Octopus* can fill up the full volume of the stomach. The fish can also devour as many as 13 *Squilla* or 9 oilsardine at a time depending on their size.

Singh and Rege (1970) stated that *T. sona* feeds non-selectively on fish and crustaceans. Mojumder (1969) observed a rough correlation between the stomach contents and the availability of food items in the environment in the case of *T. thalassinus*. These data indicate the similarity in the feeding habits of three species of catfishes.

Diurnal variation in the feeding habits

The data collected from gill nets operated during night (Table 2) and hook and line operated during day (Table 3) indicate diurnal variations in the feeding habits. The fish captured by gill nets operated in surface during night were found to feed mainly on *Squilla* sp. and oilsardine, sometimes, oilsardines formed the major part of the stomach contents. This may be because the fish comes to surface at night to feed on pelagic forms like oilsardine, when it is caught in gill nets. *Squilla* sp. present in the stomach of such fish might have been eaten during day time when the fish was at or near the sea bottom. The occurrence of only *Squilla* sp., as the major food of fish

TABLE 4. Percentage occurrence of stomachs of *T. dussumieri* in various degree of fullness

	Sep. '75	Oct.	Nov.	Dec.	Jan. '76	Feb.	Mar.	Apr.	May
1. Gill net catches off Malpe									
No. of fish	..	31	54	46	120	135	119	173	..
Full	..	3.23	3.70	2.17	1.67	6.67	2.52	4.05	..
3/4 full	..	3.23	3.70	2.17	3.33	2.96	1.68	1.73	..
1/2 full	3.70	6.52	6.67	5.19	2.52	1.16	..
1/4 full	..	9.68	1.85	2.17	6.67	7.41	3.36	4.62	..
Little	5.00	..	..	1.16	..
Empty	..	83.87	87.04	86.96	76.67	77.78	89.92	87.28	..
2. Hook and line catches off Gangolli									
No. of fish	19	158	167	77	14
Full	0.63	0.60	..	..
3/4 full	5.26	3.80	5.99	1.30	..
1/2 full	8.23	7.78	2.60	..
1/4 full	5.26	17.09	13.17	2.60	21.43
Little
Empty	89.47	70.25	72.46	93.51	78.57
3. Trawl catches off Mangalore									
No. of fish	5	..	..	14	12	46	68	78	176
Full	7.14	8.33	6.52	2.94	2.56	4.54
3/4 full	20.10	..	..	..	8.33	6.52	4.41	2.56	2.84
1/2 full	14.28	16.67	10.87	11.76	8.97	11.36
1/4 full	20.00	..	..	42.86	16.67	21.74	29.41	32.05	31.82
Little	10.87	8.82	11.54	5.68
Empty	60.00	..	..	35.71	50.00	43.48	42.65	42.31	43.71
4. Trawl catches off Gangolli									
No. of fish	..	22	..	..	65	..	87	113	88
Full	2.30	1.77	3.45
3/4 full	..	9.09	..	..	1.54	..	5.75	1.77	3.41
1/2 full	..	13.64	..	..	7.69	..	14.94	12.39	9.09
1/4 full	..	31.82	..	..	36.92	..	34.48	33.63	27.27
Little	..	31.82	..	..	4.61	..	4.60	12.39	12.50
Empty	..	13.64	..	..	49.23	..	37.93	38.05	44.32

(320 to 710 mm size) capturing during day time, near the sea bottom on hook and line (Table 3) indicates that fish remains near the

sea bottom during day time when it feeds on bottom dwelling forms like *Squilla* sp., crabs, prawns and molluscs,

It has been reported by Perumal *et al.* (1974) that catfishes exhibit diurnal vertical migration which is not only associated with light, but also influenced by their feeding habits. It has been stated by them that the catfishes discent from the midwaters during the early hours of the day and then they get scattered over the sea bottom. They also stated that the upward movement during evening hours may

be due to the bottom living organisms also move up and spread during night. From the present study also it is evident that the catfish performs diurnal vertical migration, occurring at or near the sea bottom during day, feeding on bottom dwelling forms like *Squilla* sp., prawns and molluscs and migrating at night to surface waters, feeding on pelagic fishes like oilsardine.

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