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FOOD AND FEEDING OF THE TWO SPECIES OF *SCYLLA* (DE HAAN) (PORTUNIDAE : BRACHYURA)

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ABSTRACT

The natural food of the two important edible crabs *Scylla tranquebarica* (Fabricius) and *Scylla serrata* (Forsskal) in the Pulicat Lake chiefly consisted of the two shallow water gastropods (*Cerithidea cingulatus* and *Cerithidea fluviatilis*), prawns or fish. Like most crustaceans these two species were found to be nocturnal in their feeding activity.

INTRODUCTION

PEARSE (1932) was the first to report on the proportions of different food items in the stomach of *Scylla serrata* from Port Canning. Later Arriola (1940), Chacko (1956), Veeranan (1967) and Deshmukh (1968) merely reported the occurrence of varied items of food found in the stomachs of *S. serrata*. There is, however, not much published information on such aspects as feeding chronology and food composition, of the two important edible crab species *Scylla tranquebarica* (Fabricius) and *Scylla serrata* (Forsskal) of the Pulicat Lake. Consequently these aspects were studied and the results are reported and discussed herein.

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MATERIALS AND METHODS

Though the main aspects pertaining to this study was covered during the period from 1969 to 1972, certain field observations were extended till 1980. The gastricmills of a total number of 350 intermoult and recently moulted crabs of *S. tranquebarica* of 3.9 - 18.4 cm carapace breadth and of *S. serrata* of 3.2 - 12.3 cm carapace breadth, obtained from commercial crab-fishing, dragnets and burrow-probing during day time from all over the lake were examined. Since most of these crabs presented either fish-baits and cast-off exuvia or mostly empty gastric-mills, feeding chronology study with 133 numbers of hand-picked *S. tranquebarica* in the size range of 3.5 to 18.3 cm across the carapace and 172 numbers of *S. serrata* in the carapace breadth ranging from 3.0 to 12.3 cm over 24 hour periods, at nearly 3 hour intervals, in the southern portion of the lake was undertaken in June, 1972 near the lake mouth with a view to understanding both the feeding time and their important food items. The feeding intensity was fitted in a second degree curve, as portrayed in Fig. 1, where x represented sampling hours and y the feeding intensity. As for *S. tranquebarica* $y = 0.69 + 0.85\,x - 0.08\,x^2$ and for *S. serrata* $y = 0.86 + 1.60\,x\ 0.15\,x^2$, were obtained. Code numbers were used in the calculation in the place of sampling hours. In the volumetric food analysis method of Pillay (1952) employed, food volumes were totalled for each item in the series and expressed as a

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percentage of the total volume of food in the entire series (Tables 1 and 2).

RESULTS

It was noticed in the field that both *S. tranquebarica* and *S. serrata* feed on a wide variety such as dead and discarded fish and prawns, polychaetes, jellyfish and submerged aquatic weeds. The baits in crab fishing for capturing the species in the Pulicat Lake included tough-skinned and cheap elasmobranch and teleost fishes, soft mole crab *Hippa asiatica* and even entrails of chicken.

Difference in the food and feeding habits between juveniles that are below 5 cm across the carapace and that of sub-adults and adults measuring above 5 cm in carapace breadth were noticeable to some degree. The juveniles are so agils that they are able to pursue and capture fast moving preys like fish and prawns, hermit crabs, etc. The different food items observed both in abundance and incidence in the gastric-mills of both sub-adults and adults are presented in Tables 1 and 2.

In the feeding chronology study, the stomachs of *S. tranquebarica* were observed to be between ½ and ¾ full and full stomachs between 2100 and 0600 hrs (Fig. 1) reflecting its intensive feeding period. For *S. serrata*, the most intensively feeding period was found to be between 2000 and 0300 hrs. (Fig. 1).

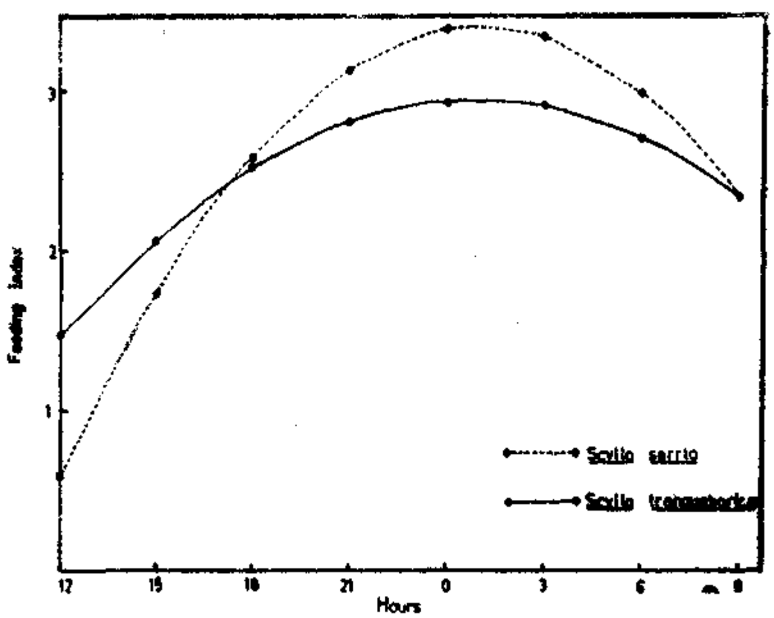

Fig. 1. Diurnal feeding intensity of the two species of *Scylla*.

DISCUSSION AND CONCLUSION

Conforming to the observations made in this study, the two species of *Scylla* are reported to have the ability to deal with a wide variety of foods (Pearse, 1932; Arriola, 1940; Chacko, 1955-'56; Veeranan, 1967). Though these crabs

TABLE. 1. *Percentage of total volume of different food items in* Scylla tranquebarica

Size and number	Percentage of empty stomachs	Algae	Hermit crabs	Prawn	Carapace of crabs	Species of *C. fluviatilis* and *C. cingulatus*	Other gastropods	Shell bits	Fish remains	Sand
Carapace breadth 3. 5–5.0cm *No. of crabs examined* : 25										
Intermoult crabs - 22	–	–	–	0.34	2.0	53.04	0.35	33.95	8.52	1.80
Soft crabs - 3	33.3	–	–	–	–	–	–	–	100.00	–
Carapace breadth 5-10 cm *No. of crabs examined* : 80										
Intermoult crabs - 68	13.15	0.22	–	8.19	–	58.42	–	1·88	29.75	1.54
Soft crabs - 12	–	–	–		96.32	0.66	2.75	–	0.22	0.05
Carapace breadth 10-15 cm										
Intermoult crabs - 17	35.29	10.80	4.54	27.0	8.96	27.00	–	4.54	4.54	12.62
Soft crabs - 5	–	–	–	–	95.64	–	–	–	2.90	1.46
Carapace breadth above 15cm *No. of crabs examined* : 6										
Intermoult crabs - 6	20.0	2.78	–	20.83	–	–	–	69.44	6.95	–
Soft crabs - 0	–	–	–	–	–	–	–	–	–	–

TABLE 2. *Percentage of total volume of different food items in* Scylla serrata

Size and number	Percentage of empty stomachs	Algae	Poly-chaetes	Hermit crab	Prawn	Carapace of crabs	Species of *C. fluviatilis* and *C. cingulatus*	Shell bits	Fish remains	Sand	Beetle
Carapace breadth 3-5cm *No. of crabs examined:* 37											
Intermoult crabs - 19	5.26	5.28	–	–	48.81	2.18	24.03	8.02	3.46	8.22	–
Soft crabs - 18	–	0.91	–	–	–	27.39	21.60	32.42	7.52	10.16	–
Carapace breadth 5-10cm *No. of crabs examined:* 128											
Intermoult crabs - 101	12.8	0.58	3.00	0.03	45.12	0.84	25.50	1.16	22.85	0.42	0.5
Soft crabs - 27	7.4	0.03	–	–	1.08	92.18	0.84	–	5.63	0.24	–
Carapace breadth above 10 cm *No. of crabs examined :* 7											
Intermount crabs - 4		–	–	–	76.34	–	5.34	12.98	–	5.34	–
Soft crabs - 3	33.3	–	–	–	–	90.00	–	10.00	–	–	–

exhibit tendencies for animal food, yet their diets are unspecialised. Consequently, they catch and feed on a wide variety of preys and food. Warmer (1977) is also of the opinion that crabs carry over the primitive habit of being opportunistic omnivores with a preference for animal food in conjunction with predatory propensity. This feeding pattern is still followed by the majority of portunid crabs and extreme specialisation is relatively rare. Though they may eat carrion, this, of course forms only a very small and accidental part of their diet. The two dimorphic chelipeds are perhaps, ines sence, armoured differently to deal with different kinds of prey and for material.

The high percentage of opercula of both *C. cingulatus* and *C. fluviatilis* together and their high incidence in the hand-picked *S. tranquebarica* suggest them as their natural food in the southern part of the lake, near the mouth, where the crabs were collected for this study. The distribution of *C. cingulatus* and *C. fluviatilis* in the Pulicat Lake is found restricted in the southernmost region of the lake and their absence to the northern portion is conspicuous. Hence, it may be possible that these crabs might resort to other available gastropod species found among the shallow weedy bottom composed chiefly of *Halophila ovalis* and *Cymodocea isoetifolia*. For, though, unidentifiable shell-bits were observed in commercially caught crabs lured by fish-baits, hand-picked crabs analysed from this region were few and far between.

The chelae and certain mouth parts are suitably adopted to feed on the molluscs (bivalves- and gastropods). The blunt large teeth of the dactylus and five other lower teeth, the first four of which are so arranged in rows of two, as to position the shells for crushing. Consequently, there is a discernible wear and tear of the teeth. As reported and quoted by Ropes (1969) various crab species *viz. Carcinus maenas, Cancer irroratus, Ovalipes occellatus* and *Callinectus sapidus* are reported to feed on the edible bivalve *Mya arenaria*. The relative abundance of *S. serrata* in and around the oyster beds in the southern part of the Pulicat Lake and the presence of calcareous shell-bits in the majority of crabs are perhaps because it feeds on young oysters and the co-occurring animal organisms. The maxillipeds and mandibles of these species have the ability to skillfully manipulates the meat portion of the crushed gastropod and bivalve shells.

The observed ability of the juveniles to capture the fast-moving preys like fish, prawns, etc. may be linked to the long, slim and sharp toothed chelae with a relatively high proportion of fast contracting muscles that are well adapted for the rapid snapping movements. Equally, the thrust delivered by the swimming paddles is sufficiently great to chase prey through the water or to dart from the bottom and seize it. Warmer (1977) has recorded such differences of preying ability between adult and juvenile crabs. The relatively small size range of *S. serrata* (maximum size only 12.6 cm of carapace breadth) compared to *S. tranquebarica* (maximum size 19.0 cm across the carapace), may possibly be the reason for its showing greater incidence of prawns and fish in their stomachs.

Well pronounced cannibalistic tendency among these two species of crabs was quite evident when they were kept crowded together without food. Generally the stronger ones attacked the weaker ones, including soft and smaller crabs. Generally, in the gastric-mills of these crabs, shell remains of the gastropods make up a good proportion of the food present. It is difficult, however, to determine whether these were taken alive or merely as shells since soft crabs soon after moulting ingest their own exuvia. Hickman (1946), George (1957) and Fielder (1965) found similar predominance of calcareous food in certain lobsters. Hickman (1946) suggested the preferential feeding of calcareous food for the hardening of their soft exoskeleton. Yet it is not clear as to explain the presence and use of calcareous matter present all through the moult cycle. As for the presence of crab exuvia, it may be viewed that chitin as such is a calorifically rich food with adequate level of calcium. But, whether the crabs have the ability to digest chitin is not clear.

High intensity of feeding was recorded for both the species from 2100 hrs till 0600 hrs as evidenced by feeding chronology study. Conceivably, the gut was invariably empty during day time, but for some semidigested calcareous matter. The feeding hours of the two species of *Scylla* during night correspond well with their locomotor activity. It has also been observed that during the course of our study, crabbing was more rewarding at nights. Allen (1916) and Fielder (1965) hold out the same view for lobsters. Optimum light is perhaps the most dominant single critical factor in the daily apatial and temporal distribution of these crabs. These nocturnal crabs when foreging for food move towards the shallow shore in the evening where plantiful food supply is available and return back to deeper portions in the morning. May be they require a certain quantum of darkness for renewed feeding activity again. Warner (1977) also observed that activity rhythm in crabs is associated with feeding rhythm. The possible roles of high tide and turbid waters, obviously dim light, in providing a boost directly to their normal locomotor activity and indirectly to feeding activity, as observed by relatively increased catch per unit effort is a supportive evidence in this regard. The effects of such super-imposed activity reflects similarity to the daily and especially tidal rhythms, as reported by Naylor (1957) for the shore-crab *Carcinus maenas.*

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