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ON THE FOOD HABITS OF THE FISHES OF THE FAMILY CARANGIDAE — A REVIEW

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ABSTRACT

An attempt has been made in this paper to review the food habits of the fishes of the family Carangidae, Carangids are pelagic carnivores feeding mainly on crustaceans and fishes. Species such as *Megalaspis cordyla, Alepes djedaba* and *Decapterus dayi* show a preference for young fishes especially *Stolephorus* spp. and the correspondence in the season of their landings can be utilised in enhancing the fishery of carangids preferably using *Stolephorus* spp. as baits in gears like hooks and line. Carangids exhibit variations in food preference in juvenile and adults, the former preferring planktonic crustaceans and the latter mainly fish juveniles. Feeding intensity was found more in juveniles and immature fish than in breeders. The carangids are observed to feed more during night probably orientating their food using their visual organs and lateral line system. This higher rate of feeding during light may be made use of in capturing them during the late hours using artificial light.

INTRODUCTION

THE CARANGID group of fishes is one of the much demanded food fishes of the Indian coast. These shoaling pelagic group forms about 3% of the annual marine fish production of India (Bal and Rao, 1990). Being caught in a variety of gears such as trawlers, drift gill net, purse seine and hooks and line, these fishes are exploited from different levels of the water column both during day and night. As is true with any other shoaling group of fishes, carangids also migrate in pursuit of better feeding and breeding grounds. Food and feeding habits of these fishes therefore become interesting and informative from the view point of their distribution and abundance in time and space. Considering the importance of food studies in carangids, Kuthalingam (1955) has rightly remarked that 'much work has to be done regarding the food of horse mackerels'.

The carangid fishery along the west and east coast of India is supported by several groups such as horse mackerel (*Megalaspis cordyla*), scads (*Decapterus spp.*), and trevallies (*Alepes djedaba, A. kalla, Atule mate, Caranx carangus, Carangoides malabaricus, Atropus atropus* and *Selaroides leptolepis*). Taxonomically, these carangids, are characterised by having the first 2 anal fin spines detached from the rest of the fin and by the presence of enlarged scutes along the lateral line (Fischer and Bianchi, 1984). Some species have detached finlets and resemble true mackerel. Food and feeding habits of various species of carangids were studied by Chidambaram and Venkataraman (1946), Devanesan and Chidambaram (1948), Chacko (1949), Chacko and Mathew (1954), Datar (1954), Kuthalingam (1955 '59) Tandon, (1959, '60), Reuben (1968), James (1967), Sreenivasan (1974, '79), Kagwade (1971), Munasinghe (1972), Belinger and Avault (1971), Venkataramani and Natarajan (1983, '88), Sivakami (1988, '95) and Shameem (1992). A review of literature shows that carangids exhibit preferential feeding with varying intensity during different months and also during day

and night using their sense of sight in capturing their prey. It is also obvious that their selective feeding habits can be made use of in capturing them in gears such as hooks and line, where their preferred food items can be used as bait. This review on the food habits of carangids is therefore taken up with a view to suggest probable measures to enhance their fishery using their preferred food as a tool.

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ANALYSIS AND FINDINGS

(a) Food composition

A review of literature shows that carangids are generally pelagic carnivores, feeding mainly on juveniles of fishes (*Stolephorus* spp., *Leiognathus* spp., *Sardinella* spp.), crustaceans (Penaeid prawns, *Acetes* spp., *Squilla* spp., Alima larva, megalopa, *Temora* spp., *Pontella* spp., *Labidocera* spp., *Lucifera* spp., Zoea and mysis stages for prawns, crab juveniles, appendages of shrimps and ostracods). Food items such as polychaetes, chaetognaths, algal matter etc formed insignificant portions of the food spectrum.

(b) Food preference in different species

Though a variety of food items are noticed in the diet of carangids, a major preference for fish food items has been reported in species such as *M. cordyla, A. djedaba* and *D. dayi*, while crustacean form the dominant food item in species such as *A. kalla* (Kagwade, 1971), and *A. atropus* (Raje, 1988). Of the different species of fishes preferred, *Stolephorus* spp. has been found to be highly relished by *M. cordyla, A. djedaba* and *D. dayi* (Sreenivasan, 1974, '79, Sivakami, 1988, '95). While preferential feeding has been established in carangids, various authors have observed intraspecific variations in the food preference. Tandon (1960) observed *S. leptolepis* off Palk Bay to prefer crustaceans especially *Acetes* spp. followed by fishes (*Anchoviella*) while Tham Ah Kow (1950) found the species off Singapore strait to feed selectively on zooplankton. According to Venkataramani and Natarajan (1988), juveniles of *S. leptolepis* off Tuticorin prefer planktonic crustaceans while adults fed more on juvenile fishes. Likewise, species such as *A. djedaba* is also reported to prefer crustaceans as major food by Venkataraman (1960) and Kuthalingam (1955), while according to Sivakami (1988), the preference of *A. djedaba* is for *Stolephorus* spp., *Cynoglossus* spp., and *Leiognathus* spp. *M. cordyla* as described by Sivakami (1995), Sreenivasan (1974), Chacko and Mathew (1954) and Tham Ah Kow (1950) subsists mainly on fish juveniles followed by crustaceans, while Datar (1954) concluded *M. cordyla* to be carnivorous feeding mainly on crustaceans. *D. dayi*, another species of carangids is found to be a pelagic carnivore, preferring fishes and crustaceans (Sreenivasan, 1979). While medium sized carangids were found to prefer either fishes or crustaceans as their staple diet, smaller species such as *A. kalla* was found to prefer mainly pelagic crustaceans followed by molluscan post larval forms. That carangids exhibit remarkable selectivity in feeding has been substantiated by the fact that in spite of a variety of organisms available in the plankton, they are absent in the gut contents of carangids (Shameem, 1992).

Exceptions to the normally preferred food items have been observed in certain species of carangids such as *Chorinemus lysen* feeding on *Hilsa* spp (James, 1967) and *Carangoides malabaricus* feeding on Euphausids (Reuben, 1968). This may be explained as an adjustability to the available food in the absence of the preferred food.

(c) Food preference in different size groups

The intraspecific variations observed in the food preference among carangids are attributable to the selective feeding in different

age groups. Thus, while Kuthalingam (1959) found that *M. cordyla* upto 220 mm size group fed on crustaceans and those above 220 mm from offshore region fed on fishes, according to Sreenivasan (1974), the species below 119 mm preferred crustaceans and those beyond this size limit fed mainly on fishes. A similar selectivity for crustaceans in the juvenile stages and fishes by adults is also reported in *S. leptolepis* (Venkataramani and Natarajan, 1988), and in *D. dayi* (Sreenivasan, 1979). Likewise, in *A. djedaba* a direct preference for fish as food is reported in all the stomach examined within the size groups of 150-199 mm and in about 83% of the fish within the size groups 240-319 mm, with crustaceans forming the preferred food item in the size group 200-239 mm (Sivakami, 1988). Though the destructive effect of preference for fish juveniles by carangids as suggested by Chacko (1949) cannot be ruled out, the possibility of using the preferred fish as bait in enhancing their catch deserves attention. Further, the preferential feeding on different food items in different size groups may be explained as avoiding direct competition and also because of the rich oil content available in the planktonic crustaceans which is essential for the developing gonad of the sub-adult stage. Another possible explanation for the change in the food preference may be related to a change in the ability to search out and capture larger more mobile prey such as fishes and a reduced ability by larger predators to catch smaller prey such as crustaceans. The change in the food pattern between juveniles and adult carangids may also be dependent upon the selectivity of the gill apparatus as demonstrated in allied Scombroid species (Magnuson and Heltz, 1971).

(d) Seasonal variations in feeding

The selectivity of different food items in carangids is often found varying during different seasons. In *M. cordyla*, a preference for fish especially *Stolephorus* spp. generally coincided with its landings at Vizhinjam (Sreenivasan, 1974) and at Cochin (Sivakami, 1995.). In *A. djedaba*, the preference for ostracods during July to November had a direct correlation with the abundance in the plankton off Cochin (Sivakami, 1988). Evaluating the food index which signifies the level of utilisation of a particular group of food organism by the population present in the habitat under consideration, Venkataraman (1960) observed that the occurrence of prawns in stomach contents of *Caranx djedaba* coincided with the seasonal abundance of prawns in the inshore region of Calicut. Likewise, the small shrimp *Acetes dispar*, Copepoda and fish juveniles and adults whose occurrence in the stomach contents of *C. djedaba* was in correspondence with their abundance in the catches (George, 1953, Bhimachar and Venkataraman, 1952).

(e) Feeding intensity

Season, availability of the preferred food items, breeding periodicity and time of fishing are the major factors which are found to influence the feeding intensity in various carangids. While in *M. cordyla* feeding intensity was better during the post monsoon months, with lesser percentage of empty stomachs in immature and juvenile fish (Srineevasan, 1974, Venkataraman, 1960), *D. dayi* exhibited higher feeding intensity during both the premonsoon (February-May) and post monsoon months (November and December). In this species, the frequent occurrence of empty stomachs with little contents is attributed to the ratio between the size of the fish and the size the prey as cited by Allen (1935) or to the higher caloric value of the fish diet which necessitates only a lesser intake as opined by Longhurst (1957) and quoted by Sreenivasan (1974).

Breeding periodicity was found to have a profound influence on the feeding rate in

S. leptolepis where the fish in maturing and spent recovering condition fed more than the juveniles and matured groups (Venkataramani and Natarajan, 1988). In *A. djedaba* also, highest feeding intensity was observed during the post spawning period (Sivakami, 1988). The influence of time of fishing on the feeding intensity has been discussed in *S. leptolepis* by Tandan (1960).

(f) Feeding in relation to breeding

Food habit is considered to be one of the factors interlinked with reproduction in fishes. Various species of carangids show profound interrelationships with feeding and breeding periodicity. Major carangids as a general rule were found to exhibit lesser feeding intensity during breeding season with a higher percentage of empty stomachs in mature specimens with the immature, developing and spent ones observed in an activily fed condition (Kagwade, 1971; Venkataramani and Natarajan 1983; Sreenivasan 1974; Raje, 1988 and Sivakami 1988). Nevertheless, Tandan (1960) noticed stomachs with food in mature specimens of *S. leptolepis* as has also been observed by Shameem 1992 that strikingly in carangids stomachs of immature and spent forms are empty.

(g) Diurnal variations in feeding

Diurnal rhythm of feeding depends on the method by which the fish orientates its food and is also very closely connected with the behaviour of food organisms and also the diurnal dynamics of the composition of the food. Light intensity appears to play an important role in the periodicity of abundance of the different food organisms. Carangid fishes are found to have a profound diurnal variations in feeding especially in species such as *M. cordyla* where the percentage contribution of heavy and moderate feeding was high in night samples than in day samples proving that search for food can be accomplished even in low light. The preference of this species to actively moving fishes like *Stolephorus* spp, *Leiognathus* spp. *Gazza* spp. and *Carangoides* spp. as food indicates that light plays an important role, while consuming coloured — in animate things without any smell points to the less developed olfactory sense (Sreenivasan, 1974). Confirming the habit of consuming more fish during night as a character common to carangids, Hobson (1988) stated that the possession of large eyes enable them to hunt and prey visually after dark particularly on fish shoals. While according to Monteifel and Radakov (1961)., the nocturnal predators also use olfactory sense organs and lateral line receptors to locate their prey. However, absence of food at night has been observed in the stomachs of *S. leptolepis* which is attributed to the influence of time of capture (Tandon, 1960).

(h) Cannibalism:

Cannibalism though not frequently encountered in carangids is reported in *A. atropos* (Karuna 1959, Shameem, 1992).

General Remarks

Carangid are carnivorous fishes feeding mainly on planktonic crustaceans in the early stages and on fish juveniles at a later stage of their lifespan. They possess moderate dentition, well developed gill raker apparatus and a distinct stomach characteristic of carnivorous fishes.

The first gill arch with long closely knit gill rakers, characteristic of scombroid fishes probably acts as an efficient filtering mechanism in carangids although the maximum distensibility of the mouth and oesophagus also would be expected to set limits on the range of food sizes eaten.

Carangid fishes feed selectively on a few food items despite the availability of other food organisms in the environment. This pattern of

selective feeding ensures lesser expenditure of energy which is accomplished through their shoaling behaviour, because fish in shoals consume food organisms more rapidly than single fish would.

Species like *M. cordyla, A. djedaba* and *D. dayi* which contributes to the bulk of the carangids landed, show a preference for young fishes especially *Stolephorus* spp. This preference with a coincidence in their landings may be made use of in forecasting the fishery of carangids. Further, it is possible that carangids fishery is improved by using *Stolephorus* spp. as bait in hook and line as is practiced elsewhere (Sreenivasan, 1974; Sivakami, 1995).

The variations in food preference during the young and adult stage in carangids may be considered as an adaptation, since fish in an advanced size group by feeding on easily available fish food tends to save energy which may be spared for growth and reproduction.

Feeding intensity in carangids was more in immature and juvenile fish with breeders possessing more of empty stomachs. This may be attributed to the very high food requirement in the young and fast growing fish with the nature fish possessing a distended gonad and lethargic movement tending to feed less.

Carangids exhibit higher rate of feeding during night which is attributable to their nocturnal migrations to the sea surface. This behaviour can be utilised to capture them using bag nets and trawlers along Indian coast also as is practiced off Manila Bay (Tiews, 1968).

Cannibalism is considered as an adaptation where the adult fishes, when unable to feed directly on plankton feed upon their planktivorous young ones (Moyle, 1982). In carangids, since the adults do not prefer a plankton diet, it is probable that the phenomenon of cannibalism is not of common occurrence.

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