



A Review of Food and Feeding Habits of Carangids Occurring Along the Indian Coast

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Abstract

This review article provides a comprehensive overview of the feeding habits of fishes belonging to the family Carangidae occurring in Indian waters. Carangids are commonly known as jacks, trevallies, scads, queen fishes, runners, amberjacks and pompanos. They are well distributed in tropical and subtropical regions of Atlantic, Pacific and Indian oceans. Carangids are carnivorous fishes primarily feeding on crustaceans, small teleostean fishes, molluscs and polychaetes. Some species are known to exhibit cannibalism. Ontogenic shift in food and feeding is noted in carangids. Young ones prefer zooplankton and crustaceans, whereas adults mainly feed on small teleostean fishes. The intensity of feeding is higher in smaller individuals. Considerable seasonal variation in the type of prey consumed by the carangids is observed. Fishes with empty stomachs are noted mostly during peak spawning season.

Keywords:

Carangids, food and feeding habits, feeding intensity

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Introduction

The family carangidae encompasses a diverse group of marine fishes commonly known as jacks, trevallies, scads, queen fishes, runners, amberjacks and pompanos. The queen fishes and jacks grow to a comparatively large size (Reuben *et al.*, 1992; Devaraj *et al.*, 1997; Kasim, 2003). Carangids are well distributed in tropical and subtropical regions of Atlantic, Pacific and Indian oceans (Poojary *et al.*, 2010; Sasidharan *et al.*, 2018; Rakhunde *et al.*, 2022). A total of 147 species belonging to 30 genera are described by Nelson (2016). Approximately 62 species are reported from Indian coast including 14 major species of commercial importance (Sasidharan *et al.*, 2018). Carangids are found in good concentration up to a depth of 100 m along entire coastline of our country. They support lucrative fisheries round the year particularly along the coasts of Andhra Pradesh, Tamil Nadu, Kerala, Gujrat, Maharashtra and Karnataka (Nair and Radhakrishnan, 2000; Devaraj *et al.*, 1997). Carangids are exploited by a multitude of gears including boat seines, shore seines, bottom trawls, hook and lines, gillnets, ring seines and purse seines (Reuben *et al.*, 1992; Nair and Radhakrishnan, 2000; Kasim, 2003; Sasidharan *et al.*, 2018; Pillai *et al.*, 2007). In recent years there has been a significant increase in the production of the carangids contributing to about 6.7 % of the total marine fish landings in India (Anon, 2022). Carangids are having good demand in the domestic market and recently larger species are also exported in frozen form (Pillai *et al.*, 2007). Carangid fishery of India is supported by

several commercially important species such as *Alectis indicus*, *A. ciliaris*, *Alepes djedaba*, *A. para*, *Decapterus russellii*, *D. kurroides*, *D. dayi*, *Megalaspis cordyla*, *Scomberoides lysan*, *S. commersonianus*, *S. tala*, *S. tol*, *Trachinotus blochii*, *T. baillonii*, *T. botla*, *Selar boops*, *S. crumenophthalmus*, *Atropus atropos*, *Caranx sexfasciatus*, *C. carangus*, *C. ignobilis*, *C. kalla*, *C. para*, *Carangoides armatus*, *C. malabaricus*, *C. oblongus*, *Atule mate*, *Seriolina nigrofasciata*, *Parastromateus niger* and *Selaroides leptolepis* (Sivakami, 1996; Nair and Radhakrishnan, 2000; Kasim, 2003). Studies of Food and feeding habits of carangids from Indian coast have been reported by different authors including Sajana et al. (2019), Bandkar et al. (2022), Smith-Vaniz (1984), Sivakami (1990), Raje (1993) for *A. djedaba*; Poojary et al. (2010), Manojkumar (2007)

Jaiswar et al. (1999), Devaraj et al. (1962), Basheeruddin and Nayar (1962) for *D. russellii*; Fischer and Bianchi (1984), Raje (1994), Rajesh et al. (2017) for *A. atropos*; Kingston et al. (1999), Sasidharan et al. (2018) for *A. mate*; Sreenivasan (1979) for *D. dayi*; Basheeruddin, and Nayar (1962) for *S. mate*; Sreenivasan (1974), Jaiswar and George (1991), Devaraj et al. (1962), Shivakami (1995) for *M. cordyla*; Abdussamad et al. (2008) for *C. ignobilis* etc. The present review on the food and feeding habits of carangids from Indian waters may facilitate probable interventions to enhance species-specific fisheries using the preferred food items as a measuring tool.

Food composition

Environmental factors, which have an impact on the temporal and spatial fluctuation of food items in the diet composition, are the primary determinants of how food organisms are distributed in ecosystems (Bhakta et al. 2023). It was found that the diet of carangids varies with locality, food availability, life stage and species (Sivakami, 1996). A cursory look at Table 1 reveals the food and feeding habits of different species of carangids along the coast of India. Many species of

carangids were found to feed predominantly on *Acetes* spp. (Bandkar et al., 2022; Raje, 1993; Devaraj et al., 1962; Basheeruddin and Nayar, 1962; Raje, 1997; Rajesh et al., 2017; Jaiswar and George, 1991). Other than *Acetes* spp., along the both east and west coast of India, carangids feed on crustaceans such as *Penaeus* spp., *Metapenaeus* spp., *Penaeus indicus* and *Portunus pelagicus*, alima larvae, crabs, prawns, *Squilla* spp., *Lucifer* spp., *Temora* spp., *Pontella* spp., *Labidocera* spp., zoea, megalopa, *Macrosetella* spp. and mysids (Sreenivasan, 1974; Sajana et al., 2019; Raje, 1993; Sreenivasan, 1979; Venkataraman, 1960; Hamsa and Kasim, 1989; Basheeruddin, and Nayar, 1962) and teleosts including *Cynoglossus* spp., *Stolephorus* spp., *Leiognathus* spp., *Lactarius* spp., *Nemipterus* spp., *Saurida tumbil*, *Boleophthalmus* spp., *Polynemus indicus*, *Bregmaceros maclellandi*, *Polynemus heptadactylus*, *Trichiurus lepturus*, *Sardinella* spp., *Apogon* spp., *Tetrodon* spp., *Sciaena* spp., *Therapon* spp., *Decapterus* spp., *Trachinocephalus myops*, *Upeneus* spp., *Rastrelliger kanagurta*, *Platycephalus* spp., *Alectis* spp. etc. (Poojary et al., 2010; Manojkumar, 2007; Jaiswar et al., 1993; Sreenivasan, 1979; Abdussamad et al., 2008; Hamsa and Kasim, 1989; Rajesh et al., 2019; Sreenivasan, 1974; Jaiswar and George, 1991; Shivakami, 1995), cephalopods (*Sepia* spp., *Loligo* spp.), gastropods, amphipods, ostracods, polychaetes, stomatopods (Poojary et al., 2010; Manojkumar, 2007; Sreenivasan, 1979; Rajesh et al., 2017; Rakhunde et al., 2023; Rajesh et al., 2019; Kingston et al., 1999; Jaiswar and George, 1991). Occasional occurrence of plant material was also noticed in the diet of a few species (Kingston et al., 1999; Nazar et al., 2017). From the review, it is clear that the carangids are highly carnivorous fishes, feeding mainly on pelagic crustaceans, small fishes, molluscs, etc. Cannibalism though not frequently encountered in carangids is reported in *A. atropos* (Shameem, 1992); *D. russellii* (Jaiswar et al., 1993); *D. dayi* (Sreenivasan, 1979); *A. mate* (Kingston et al., 1999)

Table 1. Food and feeding habits of different species of carangids along the coast of India

Species	Locality	Main food items	Authors
<i>A. djedaba</i>	Cochin	Fishes (<i>Stolephorus</i> spp.), shrimps, shrimp larvae, ostracods and semi-digested matter.	Sajana et al., (2019)
	Ratnagiri	<i>Acetes</i> spp., small fishes, copepods, shrimp larvae, fish scales, fish eggs, small crustacean and polychaetes	Bandkar et al., (2022)
	Western Indian Ocean	Invertebrates, shrimps, copepods and larvae of decapod crustaceans	Smith-Vaniz (1984)
	Cochin	Fish juveniles (<i>Cynoglossus</i> spp., <i>Stolephorus</i> spp., <i>Leiognathus</i> spp.), ostracods (<i>Conchoecio</i> spp.), decapods (<i>Acetes</i> spp.), <i>Lucifer</i> spp., amphipods, cladocerans (<i>Evadna</i> spp.), stomatopods, nematodes	Sivakami (1990)
	Gujarat	<i>Acetes</i> spp., copepods, fish, <i>Myctophum</i> spp. and <i>Squilla</i> spp.	Raje (1993)
<i>D. russelli</i>	Mumbai	Crustaceans (<i>Acetes</i> spp, prawn, crab), fishes <i>L. lactarius</i> , silverbellies, myctophids, <i>Nemipterus</i> spp., <i>Saurida tumbil</i> , <i>Boleophthalmus</i> spp., <i>Polynemus indicus</i> , <i>Bregmaceros maclellandi</i> , <i>Polynemus heptadactylus</i> , <i>Cynoglossus</i> spp., <i>Trichiurus lepturus</i> , <i>Stolephorus</i> spp., eels. Penaeid prawns, cephalopods and crabs, Cephalopods	Poojary et al., (2010)
	Malabar coast	crustaceans (prawns, <i>Acetes</i> spp., <i>Lucifer</i> spp., amphipods, squilla, copepods, mysids and larvae of crabs.), fishes (<i>Leiognathus bindus</i> , <i>Secutor insidiator</i> , <i>Johnnieops sina</i> , <i>J. belangerii</i> , <i>J. macropterus</i> , <i>Encrasicholina devisi</i> , <i>Stolephorus waitei</i> , <i>S. indicus</i> , <i>L. Lactarius</i> , <i>Sphyræna obtusata</i>), polychaetes (<i>Nereis</i> spp.), salps, molluscs and miscellaneous items	Manojkumar (2007)
	Northwest coast of India	small fishes (<i>Nemipterus japonicus</i> , <i>Leiognathus</i> spp., <i>Apogon</i> spp., sciaenids, <i>Muraenesox</i> spp., <i>Therapon jarbua</i> , <i>Trichiurus</i> spp., and <i>Decapterus russelli</i>), Crustaceans (<i>Acetes indicus</i> , ostracods and prawns)	Jaiswar et al. (1993)
	East and west coast	<i>Acetes</i> spp., clupeids, diatoms, other crustaceans .	Devaraj et al., (1962)
	Madras coast	<i>Acetes</i> spp., and copepods, fishes	Basheeruddin and Nayar (1962)

<i>D. dayi</i>	Tuticorin	fishes (<i>Stolephorus</i> spp., <i>Sardinella</i> spp., <i>Leiognathus</i> spp., <i>Sphyraena</i> spp., <i>Apogon</i> spp., <i>Cynoglossus</i> spp., <i>Platycephalus</i> spp., <i>Diodon</i> spp., <i>Tetrodon</i> spp., <i>Decapterus</i> spp., <i>Saurida</i> spp., <i>Sciaena</i> spp., <i>Leptocephali</i>), crustaceans (<i>Penaeus</i> spp., <i>Acetes</i> spp., alima larvae, <i>Lucifer</i> spp.), copepods, molluscs and polychaetes	Sreenivasan (1979)
<i>A. atropos</i>	Western Indian Ocean	Shrimps, copepods, decapod crustaceans and small fish	Fischer and Bianchi (1984)
	Veraval	<i>Acetes</i> spp., cephalopods (<i>Loligo</i> spp., <i>Sepia</i> spp.), teleosts (larvae of ribbon fish, <i>Myctophid</i> spp.), squilla and copepods	Raje (1994)
	Mangalore	<i>Acetes</i> spp., semi-digested matter, fish juveniles, teleosts, cephalopods, and copepods	Rajesh et al. (2017)
	Ratnagiri	<i>Acetes</i> spp., small teleostean fishes, cephalopods, fish scales, squilla and semi-digested matter	Rakhunde et al. (2023)
<i>C. ignobilis</i>	Tamil Nadu	Juveniles of sardines, anchovies, and other finfishes, shrimps, crabs, amphipods, <i>Decapterus</i> spp. , other carangids, threadfin-brems, lizard fishes, silverbellies, goatfishes and crabs	Abdussamad et al. (2008)
<i>C. djedaba</i>	Malabar coast	Prawns and copepods	Venkataraman. (1960)
<i>C. carangus</i>	Tuticorin	Fish (<i>Stolephorus</i> spp., <i>Thrissocles</i> spp., <i>Sardinella</i> spp., <i>Leiognathus</i> spp.), <i>Metapenaeus</i> spp., <i>Penaeus indicus</i> and <i>Portunus pelagicus</i>	Hamsa and Kasim (1989)
<i>Seriolina nigrofasciata</i>	South-west coast	Teleosts (<i>Decapterus russelli</i> , <i>Nemipterus</i> spp., <i>Trachinocephalus myops</i> , <i>Saurida</i> spp., <i>L. lactarius</i> , <i>Upeneus</i> spp., <i>Rastrelliger kanagurta</i> , <i>Platycephalus</i> spp., <i>Trichiurus</i> spp. and <i>Alectis</i> sp.), cephalopods and crustaceans	Rajesh et al. (2019)
<i>Selar mate</i>	Madras coast	Young prawns, <i>Acetes indicus</i> and copepods	Basheeruddin, and Nayar (1962)
<i>A. mate</i>	Gulf of Mannar	Clupeids, leiognathids, sciaenids, fish remains, Crustacean remains, carangids, mollusc remains, carangids, algal remains	Kingston et al., (1999)
	South Andaman coast	copepods, shrimps, small fish and gastropods	Sasidharan et al. (2018)

<i>M. cordyla</i>	Vizhinjam	<i>Stolephorus</i> spp.; <i>Leiognathus</i> spp., <i>Gazza</i> spp., <i>Carangoides</i> spp., fish juveniles, fish larvae, <i>Squilla</i> spp., <i>Acetes</i> spp., amphipods, <i>Lucifer</i> spp., megalopa, prawn juveniles, copepods, euphausiids, pteropods, <i>Sepia</i> spp., and <i>Nereis</i> spp.	Sreenivasan (1974)
	North west coast	<i>Acetes indicus</i> and small fishes such as <i>Stolephorus</i> spp., juveniles of <i>Trichiurus</i> spp., <i>Apogon</i> spp., <i>Coilia</i> spp., <i>Sardinella</i> spp., <i>Nemipterus</i> spp., <i>Thryssa</i> spp., sciaenids spp., molluscs especially <i>Loligo</i> spp., and <i>Sepia</i> spp.,	Jaiswar and George (1991)
	East and west coast	Clupeids, crustaceans and post larval fishes	Devaraj et al., (1962)
	Cochin	<i>Stolephorus</i> spp.; <i>Leiognathus</i> spp., <i>Nemipterus</i> spp., flatfishes, perches, <i>Acetes</i> spp., <i>Squilla</i> spp., Alima larvae, cephalopods, <i>Morula</i> spp., <i>Nucula</i> spp., <i>Cavolina</i> spp.	Shivakami (1995)
<i>C. kalla</i>	Calicut	Copepods, cladocerans and decapod and molluscan post-larval forms. fish larvae, polychaete larvae, <i>Sagitta</i> spp., invertebrate eggs and fish eggs	Kagwade (1967)
	Calicut	Prawns and copepods	Venkataraman (1960)
	Malabar coast	Copepods, Prawns, lucifer, squilla, mysids, ostracods, crab megalopa, cirripede larvae and larval bivalves.	Venkataraman. (1960)
<i>T. blochi</i>	Madras coast	Young ones of Hippa (<i>Emerita</i> spp.) along with other crustaceans	Basheeruddin, and Nayar (1962)
	East and west coast	Crab, shrimp, squid, gastropod and bivalve, copepods, polychaetes, worms, invertebrates	Nazar et al (2017)

Food preference in relation to size

Ontogenic changes in feeding, refer to the change in organism's resource use pattern, as it increases in size from birth to its maximum (Jena et al., 2018). The diets of most fishes change with growth, but the timing of these changes varies from species to species and is often associated with changes in lifestyles or habitats (Blaber, 2000). The intraspecific variations observed in the food preference among carangids are attributed to the selective feeding in different age groups (Sivakami, 1996). The change in the food preference between juvenile and adult carangids may also be dependent upon the selectivity of the gill apparatus (Magnuson and Heltz, 1971). Carangids feed on planktonic crustaceans in the early stages of their life and on fish juveniles in the later stages (Sivakami, 1996). Table 2 reveals marked differences in feeding habits of several carangids with respect to size groups.

Studies show that the smaller individuals of *C. carangus* prefer crustaceans and become more ichthyophagous with age (Hamsa and Kasim, 1989; Kasim, 2003). Rakhunde et al. (2023) found that the young ones of *A. atropos* feed mostly on *Acetes* spp., fish scales and cephalopods while adults preferred small teleostean fishes and squilla. Abdussamad et al. (2008) studied food and feeding habits of different size groups of *C. ignobilis* and noted no significant difference in food item between different size groups, though the occurrence of teleosts was more common in larger individuals. The juveniles of *D. russelli*, fed on *Acetes* spp., copepods and other crustaceans (Devaraj et al., 1997). The diet of juveniles of *C. kalla* mainly consisted of copepods, cladocerans and molluscan larvae while adults fed on fish larvae, polychaete larvae, *Sagitta* spp., invertebrate eggs and fish eggs (Kagwade, 1967). Several studies reported that in the younger

stages, carangids primarily feed on crustaceans, predominantly shrimps and once mature they show piscivorous tendency as reported by Bandkar *et al.* (2022) in *A. djedaba*, Manojkumar (2007), Basheeruddin and Nayar (1962) and Jaiswar *et al.* (1993) in *D. russelli*, Sreenivasan (1979) in *D. dayi*, Kingston *et al.*, (1999) and Sasidharan *et al.* (2018) in *A. mate*. Poojary *et al.* (2010) observed that the juveniles of *D. russelli* feed on *A. indicus* and sometimes

on plankton, whereas the adults feed on *A. indicus* and teleosts. The food items of young ones of *A. djedaba* mainly consists of smaller fishes, decapods, ostracods, amphipods, alima, while those of adults consisted crustaceans, fishes and insects (Sivakami, 1990). In *M. cordyla*, young ones were observed to feed mostly on crustaceans and fish juveniles (Basheeruddin and Nayar, 1961).

Table 2. Feeding habits of several carangids with respect to size groups

Species	Food preference		Author(s)
	Young ones	Adult	
<i>A. djedaba</i>	zooplankton, <i>Acetes</i> spp., shrimp larvae, copepods and fish eggs	juveniles of small fishes.	Bandkar et al. (2022)
<i>A. djedaba</i>	smaller fishes, decapods, ostracods, amphipods, alima	Crustaceans, fishes, insect,	Sivakami (1990)
<i>D. russelli</i>	plankton and digested matter	<i>A. indicus</i> , fishes, cephalopods, prawns and other crustaceans.	Poojary et al, (2010)
<i>D. russelli</i>	Crustacean	Crustacean, fish, polychaetes, molluscs, salps	Manojkumar (2007)
<i>D. russelli</i>	ostracods and <i>Acetes indicus</i>	fishes	Jaiswar et al. (1993)
<i>D. russelli</i>	<i>Acetes</i> , copepods and other crustaceans.	clupeids, diatoms, copepods and other crustaceans.	Devaraj et al., (1962)
<i>D. russelli</i>	crustaceans like <i>Acetes</i> spp. and copepods.	Fishes	Basheeruddin and Nayar (1962)
<i>D. dayi</i>	Planktonic crustaceans	fishes	Sreenivasan (1979)
<i>A. atropos</i>	<i>Acetes</i> spp., semi-digested matter, fish scales and cephalopods	small teleostean fishes and squilla.	Rakhunde et al. (2023)
<i>A. mate</i>	Crustacean remains, fish remains, mollusc remains	Clupeids, leiognathids, sciaenids, fish remains, Crustacean remains carangids, algal	Kingston et al., (1999)
<i>A. mate</i>	Crustaceans	Fishes	Sasidharan et al. (2018)
<i>M. cordyla</i>	Polychaetes, crustaceans, fishes	Fishes, crustaceans, molluscs	Sreenivasan (1974)

<i>M. cordyla</i>	Post larval fish, juvenile prawns and other crustaceans	Clupeids and crustaceans	Basheeruddin and Nayar, 1961.
<i>M. cordyla</i>	<i>Acetes indicus</i> and juvenile of fishes	<i>Acetes indicus</i>	Jaiswar and George (1991)
<i>Caranx kalla</i>	Crustaceans, molluscs, polychaetes, diatoms, dinoflagellates	Fishes, crustaceans, molluscs, polychaetes, <i>sagitta</i> spp.	Kagwade (1967)
<i>C. ignobilis</i>	juvenile of sardines, anchovies and other fin fishes, prawns, crab stars and amphipods.	<i>Decapterus</i> spp., other carangids, silver bellies, thread fin breams, goat fishes, lizard fishes, crabs and prawns	Abdussamad et al. (2008)
<i>C. carangus</i>	Crustaceans	fishes, crabs belonging to <i>Portunus pelagicus</i>	Hamsa and Kasim (1989)
<i>C. carangus</i>	shrimps	fishes, prawns and crabs	Kasim (2003)
<i>T. blochii</i>	Copepods, benthic organisms including polychaetes	Molluscs, fish, crab, shrimp, squid, gastropod and bivalve	Nazar et al. (2017)

Seasonal variation in feeding intensity

The feeding intensity is determined by the degree of fullness of the stomachs in different months (Jayaprakash, 1974). 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 (Sivakami, 1996). Kuthalingam (1955) studied the feeding habit of *C. djedaba* from Madras coast. Low feeding intensity was noted in immature individuals. Feeding intensity was found to be reduced during October to December coinciding with the spawning season in *C. carangus* off Calicut and fully developed gonads ingested minimum food during such a time

(Hamsa and Kasim, 1989). According to Jaiswar and George (1991) feeding intensity of *M. cordyla* was noted to be moderate in maturing and spent individuals while ripe fishes were found with empty stomachs. Bandkar et al. (2022) reported that individuals of *A. djedaba* with empty stomachs were found during the spawning period and a gradual increase in feeding intensity was observed in subsequent months. High feeding intensity was noted in maturing individuals of *D. russelli* while immature individuals were recorded with empty stomachs (Jaiswar et al., 1993). Sajana et al. (2019) found low gastro-somatic index (GSI) and feeding intensity during spawning season in *A. djedaba* from the Cochin

Table 3 Seasonal variation in feeding intensity of some Indian carangids

Species	Author	Pre monsoon				Monsoon				Post monsoon			
		Mar	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb
<i>A. djedaba</i>	Bandkar et al. (2022)												
<i>A. djedaba</i>	Raje, (1993)												
<i>A. djedaba</i>	Sajana, (2019)												
<i>A. djedaba</i>	Sivakami, (1990)												
<i>A. atropos</i>	Rakhunde et al. (2023)												
<i>A. atropos</i>	Raje, (1994)												
<i>D. russelli</i>	Jaiswar et al. (1993)												
<i>D. russelli</i>	Manojkumar, (2007)												
<i>D. dayi</i>	Sreenivasan, (1979)												
<i>M. cordyla</i>	Sreenivasan, (1974)												
<i>M. cordyla</i>	Jaiswar & George (1991)												
<i>C. kalla</i>	Kagwade, (1967)												

coast. Low feeding during peak spawning season of the fishes may be attributed to the fully developed gonads which limit the fish from feeding more due to less space in abdominal cavity and are mostly observed in females compared to males (Sajana *et al.*, 2019; Raje, 1994; Sreenivasan, 1974; Kingston *et al.*, 1999). Highest feeding intensity in *A. djedaba* was observed during the post spawning period (Sivakami, 1988). Comparatively less feeding activity was observed in mature *D. dayi* (Sreenivasan, 1979). Feeding intensity in *A. atropos* was generally observed to be higher in maturing and spent individuals and lower in spawners (Rakhunde *et al.*, 2023). The mature specimens were observed to have a low GSI values in *A. mate* (Sasidharan *et al.*, 2018). Sreenivasan (1974) observed that the intensity of feeding decreased with the advancement of maturity and it was higher during night than by day.

Conclusion

The review of food and feeding habits indicated that carangids are generally pelagic carnivores feeding mainly on crustaceans, small fishes, molluscan larvae, etc. Occasional occurrence of plant matter was also noticed in the diet of a few species. Carangids are generally continuous feeders but diurnal and seasonal variations in the feeding habits do occur in certain species. Generally, carangids start by feeding on zooplankton and crustaceans (especially *Acetes* spp.) during their early stages. However, as they grow in size, their diet changes from a crustacean dominated diet to predominantly ichthyophagous in fully mature stages. The feeding intensity of carangids was found to be higher in the smaller and juvenile stages compared to the mature and adult stages.

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