J. Mar. Biol. Ass. India, **50** (2) : 134 - 138, July - December 2008

Food of some deep sea fishes collected from the eastern Arabian Sea

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Abstract

For determining the food of some deep sea fish in the eastern Arabian Sea, samples were collected with a High Speed Demersal Trawl (HSDT) from surveys on board FORV *Sagar Sampada* from 1998 to 2000. The sampling depth varied from 50 to 500 m and most of the fishes were collected from depths greater than 100 m. The eastern Arabian Sea has a good representation of deep sea fishes and the most dominant families were Chlorophthalmidae, Synodontidae, Nemipteridae, Carangidae, Gempylidae and Centrolophidae. Fish stomachs from 38 species were examined and pelagic shrimps, myctophids and *Bregmaceros* were the dominant food items. Among zooplankton, ostracods and copepods dominated.

Keywords: Deep sea fishes, food, eastern Arabian Sea, bottom trawl

Introduction

Exploitation of deep sea fishes is gaining importance in the Indian EEZ, as it has been realized that the scope for increasing production from coastal waters is limited (Vivekanandan, 2001). Exploratory fishery surveys conducted in the deeper waters of the Indian EEZ have indicated the presence of unexploited deep sea resources in the peripheral shelf area and continental slope, which have great scope for commercial exploitation. Gravely (1929), Venkataraman (1960), Rao (1964), Silas (1969), Qasim (1972), Joseph *et al*. (1976), Sudarsan and Somavanshi (1988), James and Pillai (1990), and Venu and Kurup (2002) have reported the existence of rich grounds of deep sea fish resources in the Indian EEZ. However, there is little knowledge on the resource characteristics and biology of these deep sea fishes.

The present study is aimed at determining the food of some deep sea fishes from the eastern Arabian Sea based on samples collected during the cruises of FORV *Sagar Sampada* (Ministry of Earth Sciences, Government of India).

Material and methods

The deep sea fishes were obtained from cruises of FORV *Sagar Sampada* during 1998 - 2000. Twenty eight stations between 07° 40'N - 20° 35'N lat. and 69° 00 E - 77° 00 E long. were covered (Fig.1). The gears used for the collection were the 38 m High Speed Demersal Trawl II (HSDT II) and 45.6 m HSDT. The depth of trawling was determined from time-depth recorders as well as from calculations involving length of wire out and wire angle. Trawling was conducted usually for one hour at each station. After recording the total catch, species composition etc, random samples were collected from each haul for biological investigations. For food and feeding study, the stomach contents were carefully removed and examined. The food elements were identified as far as possible up to species or genus or family, depending upon the status of the food and the extent of digestion (Smith and Heemstra, 1986). If the digestion had progressed to an advanced stage and the food organisms were mixed with large quantities of mucus making identification difficult, it was treated as digested matter. The intensity of feeding was classified based on the

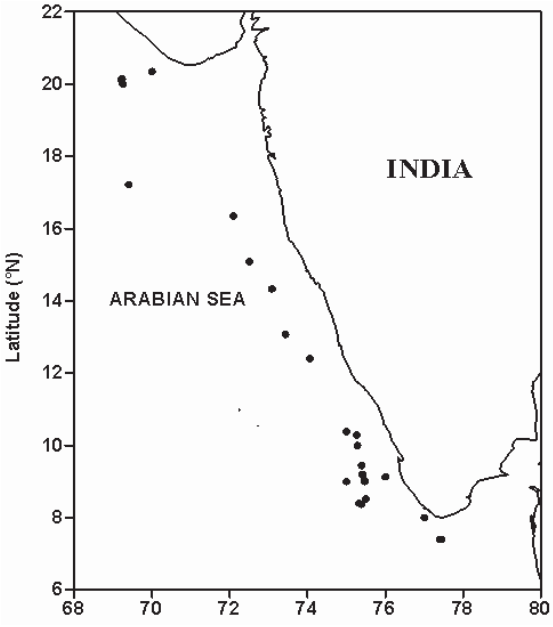

Fig. 1. Sampling stations in the eastern Arabian Sea in FORV *Sagar Sampada* cruises during 1998-2000

state of relative distension of stomach and the amount of food as empty, ¼ full, ½ full, ¾ full, full or gorged (Muthiah, 1994). The food items, size range, feeding intensity, depth of occurrence and distribution were recorded for all the species.

Results and Discussion

Nine fish species *viz*., *Chaunax pictus, Decapterus kurroides, Psenes squamiceps, Nemipterus metopias, N. bipunctatus, Saurida tumbil, Upeneus vittatus, Acanthurus tennenti* and *Johinus glaucus* were feeding exclusively on pelagic shrimps (Table 1). The dominance of pelagic shrimps seems to be widespread and as many as 210 species spend their complete life in the pelagic realm (Omari, 1974). They play a vital role in the food chain either as prey or predator to oceanic pelagics.The pelagic shrimps formed an integral part of the deep scattering layer, which were recorded in the shelf, slope and deep waters with depths above 300 m (Karuppasamy *et al*., 2006). Another 13 species, namely, *Chlorophthalmus agassizi, C. bicornis, C. punctatus, Atule mate, Diaphus watasei, Priacanthus hamrur, Parascolopsis boesemani, Nemipterus bleekeri, Sorsogona tuberculata, Saurida undosquamis, U. bensasi, Decapterus russelli* and *D. macarellus* also fed on pelagic shrimps along with fishes and other organisms. Philip (1994) reported 28 types of food items in the *Priacanthus hamrur* found along the northeast coast of India.

Fistularia petimba, Epinephelus diacanthus, Ruvettus pretiosus and *Trachycephalus myops* fed mainly on fishes. Fishes such as *C. agassizi, C. bicornis, C. punctatus, Atule mate, Diaphus watasei, P. hamrur, Parascolopsis boesemani, N. bleekeri, S. tuberculata, Saurida undosquamis, U. bensasi, D. russelli* and *D. macarellus* fed on fishes like myctophids and phosichthyids along with shrimps and other organisms. Myctophids and shrimps were the dominant food items in *Neoepinnula orientalis* and *Psenes squamiceps*. In deep waters, the abundance of prey population is very less compared to the shallow depths and coastal areas (Venu and Kurup, 2006). All fishes obtained from the trawl catches cannot, however, be reckoned as bottom feeders, since some of them were found to feed predominantly on plankton. For instance, two species *Emmelichthys nitidus* and *Ambassis natalensis* fed mainly on planktonic ostracods and copepods. The stomach contents of *Centrolophus niger, Neoepinnula orientalis, Rexea prometheoides, Psenopsis cyanea* and *Neoscopelus microchir* were found in digested condition and the contents could not be identified. Stomachs of *Chascanopsetta lugubris, Parascolopsis aspinosa, Pristipomoides filamentosus, Polyipnus indicus* and *Sphyraena obtusata* were empty. Many large predators feed only infrequently, and are often found with empty stomachs (Gartner *et al.,* 1997).

Acknowledgements

The authors thank the Scientist-in-Charge, Regional Centre, National Institute of Oceanography, Kochi for encouragements and to the Director, Central Marine Fisheries Research Institute, Kochi for providing facilities for the study.

Table. 1. Feeding intensity and food of a few deep sea fishes

Species	Sample	Length range (cm)	Depth (m)	Fullness of stomach					Food
				Empty	1/4	1/2	3/4	Full	
Sternoptychidae *Polyipnus indicus* Schultz, 1961	32	4.8-7.2	250-260	100	-	-	-	-	-
Chlorophthalmidae *Chloropthalmus bicornis* Norman, 1939	23	13-16	60-460	100	-	-	-	-	-
C. agassizi Bonaparte, 1840	41	14-22	300-400	59	29	5	5	2	Shrimps and fishes
C. punctatus Gilchrist, 1904	195	20-21.5	60	26	47	11	8	8	Shrimps and fishes
Synodontidae *Saurida undosquamis* (Richardson, 1848)	35	5-268	60-70	59	29	5	5	2	Fishes (*Saurida* sp. *Playtycephalus* sp. goatfishes, shrimps, cephalopods (*Sepia* sp.)
S. tumbil (Bloch, 1795)	5	20.2-23.6	65	-	-	-	-	100	Shrimps
Trachycephalus myops (Forster, 1801)	35	14-23.5	60-70	32	27	9	-	32	Fishes (*Saurida*, *Trachycephalus myops*, nemipterids, *Platycephalus*, *Pterois* sp.), crabs
Myctophidae *Diaphus watasei* Jordan and Starks, 1904	98	2.5-7.1	330-360	44	26	7	2	21	Shrimps (*Plesionika* sp.), fishes, squids (*Sepioteuthis* sp.)
Neoscopelidae *Neoscopelus microchir* Matsubara,1943	17	10.2-2.1	330	100	-	-	-	-	-
Chaunacidae *Chaunax pictus* Lowe, 1846	21	15.3-19.5	330	-	-	-	-	100	Shrimps
Fistulariidae *Fistularia petimba* Lacepeda, 1803	10	38.5-63	60-70	-	40	10	10	40	Chaetognaths, fish scales
Platycephalidae *Sorsogona tuberculata* (Cuvier, 1829)	33	8.5-20	70-400	40	17	-	26	17	Shrimps, megalopa, molluscan shells, fish scales, crab.
Ambassidae *Ambassis natalensis* Gilchrist & Thompson, 1908	10	5.5-7.5	50	80	10	-	10	-	Planktonic ostracods, copepods
Priacanthidae *Priacanthus hamrur* (Forsskll, 1775)	142	14.5-25.5	60-330	5	21	17	10	47	Shrimps, euphasids, fishes (Myctophids, *Benthosema* sp., *Bregmaceros*), leptocephalus, squids
Serranidae *Epinephelus diacanthus* Valenciennes in Cuvier & Valenciennes, 1828	16	19.5-34	20-60	85	-	8	-	7	Fishes (*Platycephalus* sp.).

Species	Sample	Length range (cm)	Depth (m)	Fullness of stomach					Food
				Empty	1/4	1/2	3/4	Full	
Lutjanidae *Pristipomoides filamentosus* (Cuvier & Valenciennes, 1830)	5	21-25	120	100	-	-	-	-	-
Mullidae*Upeneus bensasi* (Temminck and Schlegel, 1843)	50	10-17.8	60-70	6	30	54	4	6	Shrimps, fishes, fish scales
U. vittatus (Forsskal, 1775)	22	15-19.5	65	-	-	-	-	100	Shrimps
Nemipteridae *Parascolopsis aspinosa* (Rao & Rao 1981)	5	16-18	120	100	-	-	-	-	-
P. boesemani (Rao & Rao 1981)	10	12.9-15.8	250	-	25	25	50	-	Fish and shrimps
Nemipterus metopias (Bleeker, 1857)	5	24-26	56	100	-	-	-	-	-
N. bleekeri (Day, 1875)	36	13-22	55-60	11	3	50		36	Shrimps, fishes, crabs
N. bipunctatus (Ehrenberg, 1830)	15	16.2-18.4	65	-	50	-	-	50	Shrimps (*Sergestes*)
Sciaenidae *Johinus glaucus*	5	24.3-28	65	-	-	-	-	100	Shrimps
Emmelichthyidae *Emmelichthys nitidus* Richardson, 1845	20	6.5-10.5	55	-	-	-	-	100	Planktonic ostracods, copepods
Acanthuridae *Acanthurus tennenti* Günther, 1861)	6	41.2-42.3	60	-	-	-	-	100	Shrimps
Sphyraenidae *Sphyraena obtusata* Cuvier, 1829	9	22.2-26.7	250	100	-	-	-	-	-
Bothidae *Chascanopsetta lugubris* Alcock , 1894	35	26-30	332	100	-	-	-	-	-
Carangidae *Decapterus kurroides* Bleeker, 1855	5	19.5-.5	60-70	-	50	50	-	-	Shrimps
D. macarellus (Cuvier, 1833)	8	17.5-20.2	60-120	34	32	-	-	34	Ostracods (planktonic forms), fish scales molluscan shells
D. russelli (Ruppel, 1830)	28	15.5-19.8	56-120	29	29	14	7	21	Ostracods (planktonic forms), shrimps, fish scales
Atule mate (Cuvier & Valenciennes, 1833)	20	18.2-25.5	56	100	-	-	-	-	-
Gempylidae *Neoepinnula orientalis* (Gilchrist & von Bonde, 1924)	9	11.5-23.5	60	71	29	-	-	-	Fully digested matter
Rexea prometheoides (Bleeker, 1856)	5	16-19.5	60	80	-	20	-	-	Fully digested matter
Ruvettus pretiosus (Cocco, 1833)	12	20-25	330	-	-	-	100	-	Fish
Centrolophidae *Centrolophus niger* (Gmelin, 1789)	8	17-20	60	12	50	38	-	-	Fully digested
Psenopsis cyanea Alcock, 1890	62	14.3-19	60-500	66	10	20	2	2	Fully digested (fish scales were found)
Psenes squamiceps (Lloyd, 1909)	56	9-18.3	260-400	84	5	-	11	-	Fully digested (fish scales were found)

The authors are also grateful to the Ministry of Earth Sciences, New Delhi, for funding the project and providing facilities onboard FORV *Sagar Sampada*. The first author is grateful to the C.S.I.R for providing financial assistance of Senior Research Associateship.

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Received: 29 August 2008
Accepted: 24 November 2008