J. Mar. Biol. Ass. India, **49** (2) : 183 - 187, July - December 2007

Deep sea fish catch from 16 stations off southeast coast of India

U. Sreedhar, G. V. S. Sudhakar and [1]B. Meena Kumari*

Research Centre of Central Institute of Fisheries Technology, Ocean View Lay out, Pandurangapuram, A. U. (PO), Visakhapatnam-530 003, India. E-mail: usreedhar@rediffmail.com
*[1]Central Institute of Fisheries Technology, Willington Island, Matsyapuri P.O, Cochin-682 029, India. *E-mail: meenakumarib@gmail.com*

Abstract

The deep sea demersal fish resources in the southeast coast of India were surveyed in 16 stations by using EXPO model fish trawl, HSDT II Crustacean Version and HSDT Fish Version on board FORV *Sagar Sampada*. A total of 2,031 kg were caught during the survey. HSDT crustacean version contributed to 72.0% of the catch followed by EXPO model (21.5%) and HSDT fish version (6.5%). The catches were dominated by eels (21.3%) followed by the shark *Echinorhinus brucus* (13.3%) and the rest were miscellaneous demersal species. The catch was 122.3 kg/h within 199 m depth, 66.41 kg/h between 200-299 m depth, 119.4 kg/h between 300-399 m and 248.5 kg/h between 400-499 m. Maximum CPUE of 477.3 kg/h was at 637 m depth and minimum (62.8 kg/h) was beyond 700 m depth. Thirty nine varieties of demersal organisms are reported.

Key words: Demersal resources, southeast coast of India, unconventional protein source, bottom trawling

Introduction

It is estimated that 1.6 million tonnes could be exploited annually from the deep-sea and oceanic waters of India, from where the present level of exploitation is very low (Somavanshi, 2001). A systematic study on the deep sea demersal fishery resources of the southeast coast of India is meagre, as the bottom is uneven and not suitable for bottom trawling. The present study is an attempt to explore the deep water resources in a few sampling stations of the southeast coast of India by using FORV *Sagar Sampada*.

Materials and methods

Data were collected during the cruises 176 (August, 1999) and 247-II (August, 2006) of FORV *Sagar Sampada*. A randomized sampling design was used along the southeast coast, between 11^0 and 18^0 N lat. and 79^0 and 84^0 E long. at depths ranging from 160 m to 770 m (Fig. 1). Prior to experimental operations, the sea bottom was thoroughly scanned using an echo sounder to find out suitable trawling grounds. Trawling was carried

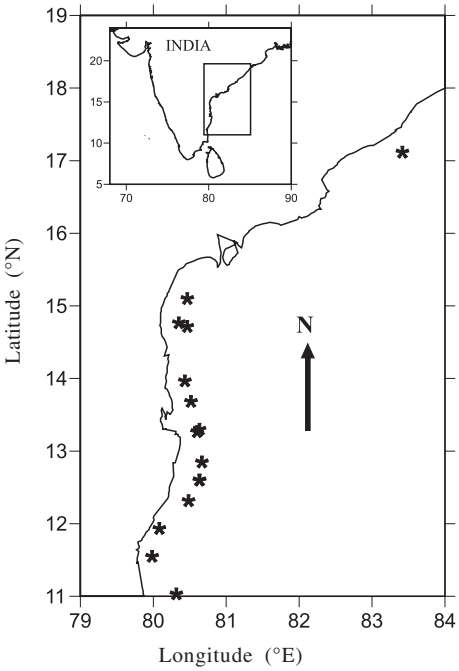

Fig. 1. Sampling stations

Table 1. *Stationwise catch details*

Latitude (°N)	Longitude (°E)	Gear	Fishing depth (m)	Fishing effort (h)	Total catch (kg)
13⁰ 58'	80⁰ 26'	EXPO MODEL	200	1	5.6
14⁰ 43'	80⁰ 28'	EXPO MODEL	165	1	430.6
11⁰ 33'	79⁰ 59'	HSDT II (CV)	360	1	19.4
11⁰ 56'	80⁰ 05'	HSDT II (CV)	219	1	1.9
12⁰ 19'	80⁰ 29'	HSDT II (CV)	215	1	2.5
12⁰ 36'	80⁰ 38'	HSDT II (CV)	160	1	29.3
13⁰ 15'	80⁰ 36'	HSDT II (CV)	300	1	149.9
13⁰ 18'	80⁰ 38'	HSDT II (CV)	400	1	248.5
14⁰ 46'	80⁰ 21'	HSDT II (CV)	180	1	28.5
15⁰ 06'	80⁰ 28'	HSDT II (CV)	232	1	190.6
13⁰ 41'	80⁰ 31'	HSDT II (CV)	318	1	188.7
17⁰ 06'	83⁰ 25'	HSDT II (CV)	770	1	25.6
11⁰ 00'	80⁰ 20'	HSDT II (CV)	760	1	100
10⁰ 57'	80⁰ 21'	HSDT II (CV)	637	1	477.3
12⁰ 51'	80⁰ 40'	HSDT II (FV)	235	1	131.5
12⁰ 36'	80⁰ 38'	HSDT II (FV)	165	1	1.0

out in 16 stations by using EXPO model fish trawl, HSDT II Crustacean Version, HSDT Fish Version (Panicker, 1990 Boopendranath *et al.,* 1996). Each haul lasted for an hour, at an average speed of 3 knots. The position, depth and catch pertaining to each station were recorded (Table 1). The organisers were collected and identified to the lowest possible taxon using standard keys (Goode and Bean, 1895; Smith and Heemstra, 1986). Meristic and morphometric data were recorded for further analysis.

Results and discussion

The total catch was 2031 kg from 16 fishing hawls. The percentage composition of catch is presented in Table 2. The CPUE of EXPO model fish trawl was 218.1kg/h, HSDT crustacean version was 121.9 kg/h and HSDT fish version was 66.3 kg/h. During 1985-1994, the Fishery Survey of India recorded the highest catch rate of 185.0 kg/h from depth range of 50-100 m along the upper east coast of India (Ramalingam *et al*., 2004). Earlier, Balasubramanian and Suseelan (2001), Venu and Kurup (2002), Bande *et al*. (1990), James and Pillai (1990) and Sivakami (1990) made surveys beyond 100m depths in the Indian EEZ.

The depthwise catch analyses revealed that a total of 122.3 kg/h of catch was caught up to 199 m in four samplings. A poor

Table 2. *Percentage composition of catch*

Groups	Catch (kg)	%
Finfishes		
Alepocephalus bicolor	6.4	0.3
Apogonidae	18.1	0.9
Apristurus investigatoris	168.1	8.3
Astronesthes indicus	2.3	0.1
Bathycluepa elongata	0.8	0.0
Bramidae	71.0	3.5
Lophiiformes	75.8	3.7
Chlorophthalamidae	148.3	7.3
Cynoglossidae	17.0	0.8
Echinorhinus brucus	270.0	13.3
Eel	432.5	21.3
Eridacnis radcliffei	6.4	0.3
Etmopterus pusillus	12.1	0.6
Gempylidae	1.3	0.1
Himantura sp.	15.0	0.7
Hydrolagus africanus	1.8	0.1
Macrouridae	22.5	1.1
Moridae	189.3	9.3
Nemipterus japonicus	25.7	1.3
Normichthys sp.	0.0	0.0
Notocathus sp.	0.1	0.0
Ophidiidae	54.1	2.7
Priacanthus hamrur	49.3	2.4
Rays	12.5	0.6
Uranoscopidae	20.2	1.0
Crustaceans		
Prawns	19.9	1.0
Nephropsis stewartii	3.0	0.2
Bathynomous gigantus	1.0	0.1
Crabs	3.0	0.2
Molluscs		
Octopus sp.	3.6	0.2
Gastropod shell	98.3	4.8
Squid	19.8	1.0
Others		
Jellyfish	122.4	6.0
Starfish	2.5	0.1
Holothurians	5.0	0.3
Hydrozoan colonies	0.7	0.0
Pennatulid coelenterates	0.0	0.0
Sponges	0.0	0.0
Discard	131.3	6.5
Total	2031.0	100.0

Table 3. ***Species identified***

Order	Family	Species	Common Name
		Teleosts	
Anguilliformes	Congridae	*Bathyuroconger braueri* (Vaillant, 1888)	Large-toothed conger
	Colocongridae	*Coloconger raniceps* Alcock, 1889	Froghead eel
	Muraenidae	*Gavialiceps taeniola* Alcock, 1889	Morays
	Evermannellidae	*Evermannell indica* Brauer, 1906	Sabertooth fishes
Gadiformes	Macrouridae	*Coryphaenoides* sp.	Rattails
		Gadomus sp.	Rattails
		Malacocephalus laevis (Lowe, 1843)	Softhead grenadier
Lophiformes	Lophiidae	*Lophiomus* sp.	Angler fish
	Chaunacidae	*Chaunax pictus* Lowe, 1846	Pink frogmouth
Notocanthiformes	Notacanthidae	*Notocathus* sp.	Deep-sea spiny eels
Ophidiiformes	Ophidiidae	*Dicrolene* spp.	Cusk eels
		Epetriodus sp.	Cusk eels
		Hephthocara simum Alcock, 1892	Viviparous brotulas
		Lamprogrammus exutus Nybelin & Poll,1958 *1958*	Legless cusk eel
		Luciobrotula bartschi Smith & Radcliffe, 1913	Cusk eels
		Porogadus trichiurus (Alcock, 1890)	Cusk eels
Perciformes	Apogonidae	*Apogon* sp.	Cardinal fishes
	Bathyclupeidae	*Bathyclupea elongata* Trunov, 1975	
	Chlorophthalamidae	*Chlorophthalamus bicornis* Norman, 1939	Spinyjaw greeneye
		C. punctatus Gilchrist, 1904	Spotted greeneye
	Gempylidae	*Neopinnula orientalis* (Gilchrist & von Bonde, 1924)	Sackfish
		Rexea prometheoides (Bleeker, 1856)	Royal escolar
	Nemipteridae	*Nemipterus japonicus* (Bloch, 1791)	Japanese threadfin bream
	Priacanthidae	*Priacanthus hamrur* (Forsskål, 1775)	Moontail bullseye
	Uranoscopidae	*Uranoscopus* sp.	Stargazers
Pleuronectiformes	Cynoglossidae	*Cynoglossus carpenteri* Alcock, 1889	Hooked tonguesole
Salmoniformes	Alepocephalidae	*Alepocephalus bicolor* Alcock, 1891	Slickheads
	Platytroctidae	*Normichthys* sp.	Multipore searsid
Stomiiformes	Stomiidae	*Astronesthes indicus* Brauer, 1902	Barbeled dragonfishes
		Elasmobranchs	
Carcharhiniformes	Proscyliidae	*Eridacnis radcliffei* Smith, 1913	Pygmy ribbontail catshark
	Scyliorhinidae	*Apristurus investigatoris* (Misra, 1962)	Broadnose catshark
		Holohalaelurus punctatus (Gilchrist, 1914)	African spotted catshark
	Chimaeridae	*Hydrolagus africanus* (Gilchrist, 1922)	African chimaera
Rajiformes	Dasyatidae	*Himantura* sp.	
Squaliformes	Echinorhinidae	*Echinorhinus brucus* (Bonnaterre, 1788)	Bramble shark
	Etmopteridae	*Etmopterus pusillus* (Lowe, 1839)	Smooth lanternshark
		Decapod crustaceans	
Decapoda	Aristeidae	*Aristeus alcocki* Ramadan, 1938	Arabian red shrimp
	Nephropidae	*Nephropsis stewartii* (Wood-Mason, 1892)	Indian Ocean lobsterette
		Cephalopods	
Octopoda	Octopodidae	*Octopus* sp.	

catch of 66.4kg/h was recorded between 200-299 m depth in five samplings. The catch between 300-399 m registered a CPUE of 119.6 kg/h. Maximum CPUE of 477.3 kg/h was observed from a depth of 637 m. Minimum CPUE of 62.8 kg/h was caught beyond 700 m.

The catches were identified into 39 species (Table 3). Eels consisting of *Bathyuroconger braueri, Coloconger rancieps, Gavialiceps taeniola* and *Evermannell indica* contributed 21.3% to the total catch. Next in abundance to the eels were bramble shark *Echinorhinus brucus* (13.3%) and the broadnose cat shark *Apristurus investigatoris* (8.3%). In southern Africa, the bramble shark is processed into fishmeal and used in traditional medicine (Compagno *et al.,* 1989). The thorn-like denticles on the body of this species caused skin allergy to a scientist during sample collection. This indicates the pharmacological potential of this species. Other moderately abundant groups are Moridae (9.3%) and Chlorophthalamidae (7.3%). Jellyfish constituted 6.0% of the catch. Chlorophthalamidae consisted of *Chlorophthalamus bicornis* and *C. punctatus.* Discards formed 6.5% of the catch.

Somavanshi (1998) stressed the need for application of various fishing techniques *viz.*, bottom trawling for deep-sea finfishes, cephalopods, deep-sea shrimps and deep-sea lobsters; mid-water trawling for column species and longlining for oceanic tunas and allied species. Detailed long term studies should be carried out to work out the biomass and maximum sustainable yield (MSY) for sustainable exploitation of deep sea fish resources.

Some of the deep sea non-conventional fish species such as *Priacanthus hamrur, Chlorophthalmus agassizi, Neopinnula orientalis* and *Rexea prometheoides* are identified as potential unconventional food resources, but value added products need to be developed for these resources. Lekshmi *et al.* (1990 a, b) made attempts to prepare value added products from *P. hamrur* and *C. agassizi*. To exploit these unconventional protein sources, a detailed study on the biomass is necessary.

Acknowledgements

The authors are grateful to Dr. K. Devadasan, Director, Central Institute of Fisheries Technology for giving an opportunity to work in this project. The financial assistance from the Ministry of Earth Sciences (MoES), Govt. of India through the project 'Resource assessment and biology of deep-sea fishes along the continental slope of Indian EEZ' is thankfully acknowledged. Thanks are also due to the fellow participants, fishing masters and fishing hands of the cruise no. 176 and 247-II of FORV *Sagar Sampada*. They are also grateful to Prof. V. Ravindranathan, Former Director, Dr. V.N. Sanjeevan, Dr. T. Shanmugaraj of *Sagar Sampada* Cell, CMLRE, MoES, Cochin for providing facilities.

References

Balasubramanian, C. and C. Suseelan. 2001. Distribution and population structure of deep-water crab *Charybdis smithii* (Decapoda: Portunidae) in the Arabian Sea and Bay of Bengal. *Bull. Mar. Sci*., 68 (3): 435-449.

Bande, V. N., N. Gopinath Menon and K. Balachandran. 1990. Studies on the distribution and abundance of Bull's eye (*Priacanthus* spp.) in the EEZ of India. *In*: Mathew, K.J. (Ed.) *Proc. First Workshop Scient. Resul.* FORV *Sagar Sampada*, 5-7 June, Cochin, CMFRI, p. 233-238.

Boopendranath, M. R., P. A. Panicker, V. S. Kakati, S. G. Raje, G. K. Avhad, P. Pandian, P. Sulaiman and V. George. 1996. Evaluation of sampling gear for demersal resource surveys. *In*: Pillai, V. K, S. A. H. Abidi, V. Ravindran, K. K. Balachandran and V. Agadi (Eds.) *Proc. Second Workshop Scient. Resul.* FORV *Sagar Sampada,* Department of Ocean Development, *New* Delhi, p. 469-476.

Compagno, L. J. V., D. A. Ebet and M. J. Smale. 1989. Guide to the sharks and rays of southern Africa. New Holland (Publ.) Ltd., London. 158 pp.

Goode, G. B. and T. H. Bean. 1895. Oceanic Ichthyology. Indian reprint 1984, Narendra Publishing House, Delhi, India. 553 pp.

James, P. S. B. R. and V. N. Pillai. 1990. Fishable concentrations of fishes and crustaceans in the offshore and deep sea areas of the Indian exclusive economic zone based on observations made onboard FORV *Sagar Sampada*. *In*: Mathew, K. J. (Ed.) *Proc. First Workshop Scient. Resul.* FORV *Sagar Sampada,* 5-7 June, Cochin, CMFRI, p. 201-213.

Lekshmi, A. N., A. Vasanth Shenoy and R. Thankamma. 1990a. Value added products from *Chlorophthlamus agassizi* (Green eye), and unexploited fish from exclusive economic zone of India. *In*: Mathew, K.J. (Ed.) *Proc. First Workshop Scient. Resul.* FORV *Sagar Sampada,* 5-7 June, Cochin, CMFRI, p. 453-456.

Lekshmi, A. N., J. Stephen and K. Gopakumar. 1990b. Edible meat and fish meal from *Priacanthus hamrur*: chemical composition and nutritive value. *In*: Mathew, K. J. (Ed.) *Proc. First Workshop Scient. Resul.* FORV *Sagar Sampada,* 5-7 June, Cochin, CMFRI, p. 449-452.

Panicker, P. A. 1990. FORV *Sagar Sampada* and development of demersal trawls for Indian EEZ – A status paper on prospects and constrains. *In*: Mathew, K.J. (Ed.) *Proc. First Workshop Scient. Resul.* FORV *Sagar Sampada,* 5-7 June, Cochin, CMFRI, p. 427-434.

Ramalingam, L., N. Jagannadh, P. P. Pandian, J. C. Dhas, T. Subramanian, P. K. Bhar and M. V. Kumar. 2004. Distribution and abundance of commercially important demersal fishery resources in upper east coast of India EEZ. *In*: *Large marine ecosystems: Exploration and exploitation for sustainable development and conservation of fish stock.* p. 33-42.

Sivakami, S. 1990. Observations on the demersal fishery resources of the coastal and deep sea areas of the exclusive economic zone of India. *In*: Mathew, K.J. (Ed.) *Proc. First Workshop Scient. Resul.* FORV *Sagar Sampada,* 5-7 June, Cochin, CMFRI, p. 215-231.

Smith, M. M. and P. C. Heemstra. 1986. Smith's sea fishes. Springer-Verlag publishers, 1041 pp.

Somavanshi, V. S. 1998. Marine fisheries resources and sustainable utilization. *In*: *Symp. On Advances and priorities in Fisheries Technology,* Cochin (India), p. 1-5.

Somavanshi, V. S. 2001. Problems and prospects of deep sea and far sea fishing. *In:* Pandian, T. J. (Ed.) *Sustainable Indian fisheries*. National Academy of Agricultural Sciences, New Delhi, p. 71-87.

Venu, S. and B. M. Kurup. 2002. Distribution and abundance of deep sea fisheries along the west coast of India. *Fish. Tech*., 39(1): 20-26.

Received: 29 November 2007
Accepted: 12 December 2007