

THE FISHERY AND THE SOCIO-ECONOMIC ASPECTS OF MODHWA, GUJARAT*

RISHAD PRAVEZ, SMITA KRISHNAN, A. P. MANSURI, R. M. NAIK AND M. S. MURTHY
Department of Biosciences, Saurashtra University, Rajkot-360 005

ABSTRACT

Modhwa, a small fishing village in Gujarat, has in the past decade been contributing substantially to the total fish catch landed in Kachchh District, Gujarat. The catch landed at Modhwa on an average comprises of 92.9% fish and 7.1% prawn. The main fishes caught are Bombay-duck, golden anchovy, sharks, catfishes and mullets. The prawn fishery is supported more by penaeids than non-penaeids.

The peak season for fishing is September to April. Since the fishing is carried out in shallow waters using traditional crafts and gears, the percentage of juveniles caught every year is high. Mechanisation of locally used boats 'Machhuwas' has been suggested to encourage the fishermen to fish in deeper waters. Social and economic aspects of the fishing community at Modhwa have also been studied and recommendations to improve their standard of living have been proposed.

INTRODUCTION

MODHWA (22° 48' N and 69° 26' E) is situated in Kachchh (Kutch) District, Gujarat, 20 km east by southeast of Mandvi. Although, it is the most important fishing village in the Mandvi Taluk, there is no information regarding its socio-economic status. Studies so far made include a general survey of the prawn fishery of the Saurashtra Coast (Srivatsa, 1953) and its economic value for the Kachchh region (Lacumb, 1960) reporting of *Metapenaeus kutchensis* in the Gulf of Kachchh (George *et al.*, 1963), distribution of prawn species on the Kachchh Coast and the bionomics of the commercial prawn species of Kachchh Ramamurthy 1963 a, b, 1964, 1965), study of prawn grounds in the north-western region of India (Virabhadra Rao and Dorairaj, 1966) and observation on total

prawn catch of Saurashtra Coast (Kagwade, 1967). More recent informations include observations on prawn fishery in the Gulf (Deshmukh, 1975), studies on the fishery at Sukhper and Lakhpata areas in Kachchh (Sarvaiya, 1978), a survey of the prawn resource within the Exclusive Economic Zone around Kachchh (Bapat *et al.*, 1982) and the status of prawn fishery at Jakhau (Krishnan *et al.*, 1987).

The present paper analyses the prawn and fish catch landed during the last three years and fishery economy of Modhwa.

The studies were funded by the World Wildlife Fund-India. Thanks are due to the officials of Bhuj and Mandvi Unit of the Department of Fisheries, Government of Gujarat for providing the relevant data, to Mr. M. S. Muthu of CMFRI for helping in prawn identification, to Dr. Y. N. Rao for his encouragement and to Dr. Taej Mundkur

* Presented at the 'Symposium on Tropical Marine Living Resources' held by the Marine Biological Association of India at Cochin from January 12-16, 1988.

for his constant help during preparation of the manuscript.

MATERIALS AND METHODS

Fishing in Modhwa waters was studied from 1984 to 1987. Total catch in each year was estimated from the data obtained from Department of Fisheries, Government of Gujarat and catch of fish landed at Modhwa during the study period was collected from the fish traders. Data on the number of boats operating and their schedule, number of 'pagadia' (those who go on foot for fishing) and their fishing schedule, location of fishing grounds, quality and quantity of catch, expenses incurred in fishing, fisherman's monthly household expenditure and other general information were obtained by interviewing about 50% of the fishermen at Modhwa. The rainfall data as recorded in Mandvi was obtained from the office of Mamlatdar.

over the entire year. Since the fishermen have no alternative source of income other than that obtained from fishing, they subsist on this income for the whole year. Therefore, the monthly earnings are calculated by dividing the revenue earned in the peak season by 12 months of the year.

RESULTS

Historical background

Modhwa formerly called 'Mathal' was a camping site for the migratory fishermen from Gundiali village (Fig. 1) for 8 months in a year. About 60 years ago, few families began staying at Modhwa throughout the year and thus the village came into existence.

Fishery

There are 254 active fishermen (41 boat owners, 24 resident pagadia fishermen and 189 pagadia fishermen from Gundiali) who

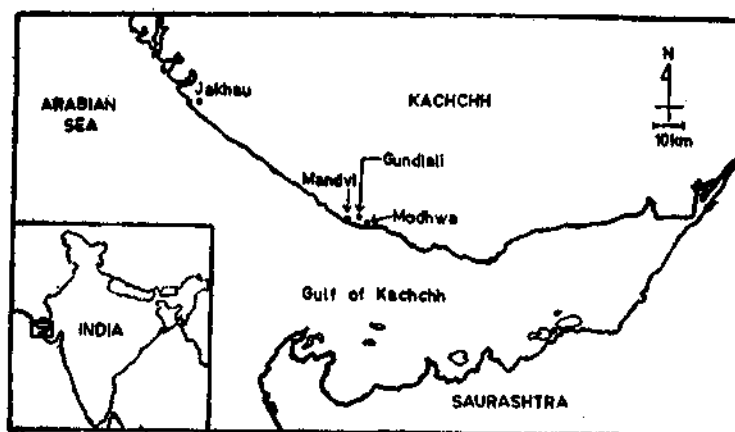


Fig. 1. The Gulf of Kachchh. Inset: India, where rectangle shows the location of the Gulf of Kachchh.

Effort is defined as the number of boats operating in a year. Catch per unit effort (CPUE) is the catch by one vessel or a pagadia fisherman in unit time (1 trip).

Fishing by boats at Modhwa being seasonal, the income like the catch is not evenly spread

carry out fishing in Modhwa waters. There is a Modhwa fishermen's Co-operative Society having 120 members, but it is totally inactive.

The peak fishing season at Modhwa extends from September to April during which non-mechanised boats locally known as 'Kachchhi

Machuwas' are operated at depths of 10-12 m. Fishing is done for about 25 days in a month. During the season a boat makes 15-17 trips each of 28-30 hours duration involving 12 hours of actual fishing per trip. On an average 41 boats, each having a crew of two, are operational. Most of the fishing is carried out day and night within a radius of 10-15 km off the coast. Among the fishermen, on an

average 213 of them go on foot for fishing every day throughout the year.

During the monsoon, sea is very rough and wind speed is high, so that the boats cannot be operated and the fishermen owning boats carry out fishing on foot, along with the pagadia in inshore waters.

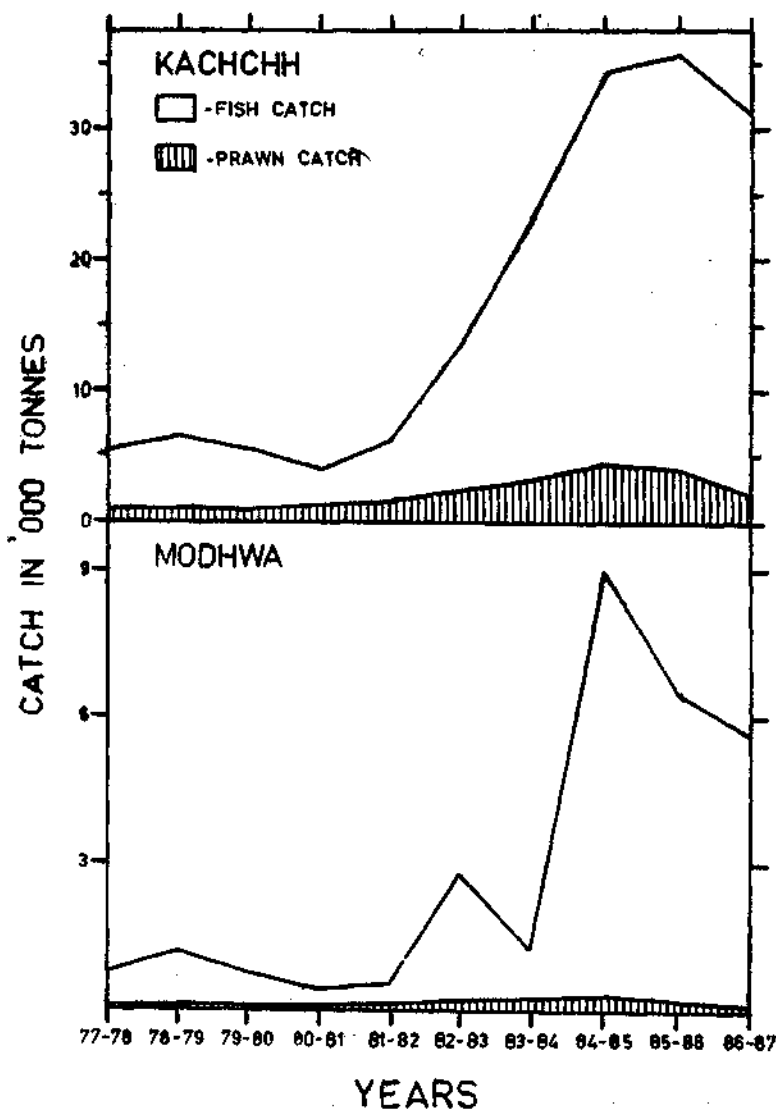


Fig. 2. Total fresh fish and prawn catch for Kachchh District and Modhwa during 1977-1987.

Catch statistics

Fig. 2 gives the total fresh fish and prawn catch landed in Kachchh District and at Modhwa alone during 1977 to 1987. In 1984-85, the total catch of Kachchh was 34,288 tonnes, out of which Modhwa contributed 9,075 t.

The proportion of different groups of fresh fish landed during 1984-87 is presented in Fig. 3. The group, other groups comprises of clupeids, Jewfish, small sciaenids, Indian salmon, Hilsa, Silver-bar and Seerfish. Miscellaneous group consists of trash fish which is dried and sold as crude fertilizer.

proportion of different prawn sale groups in the total prawn catch landed at Modhwa during 1984 to 1987. The proportion of tiny prawns increased from 79.9% in 1984-85 to 80.7% in 1986-87 (Fig. 4), while the jumbo and medium group prawns showed a decline suggesting overfishing of juvenile stock. The CPUE for boat and pagadia fishermen showed a clear decline during the last 3 years (Table 2).

Infrastructure

Infrastructure for fishery at Madhwa is highly inadequate. There is no jetty at Modhwa so that the fishermen have to drag the boats

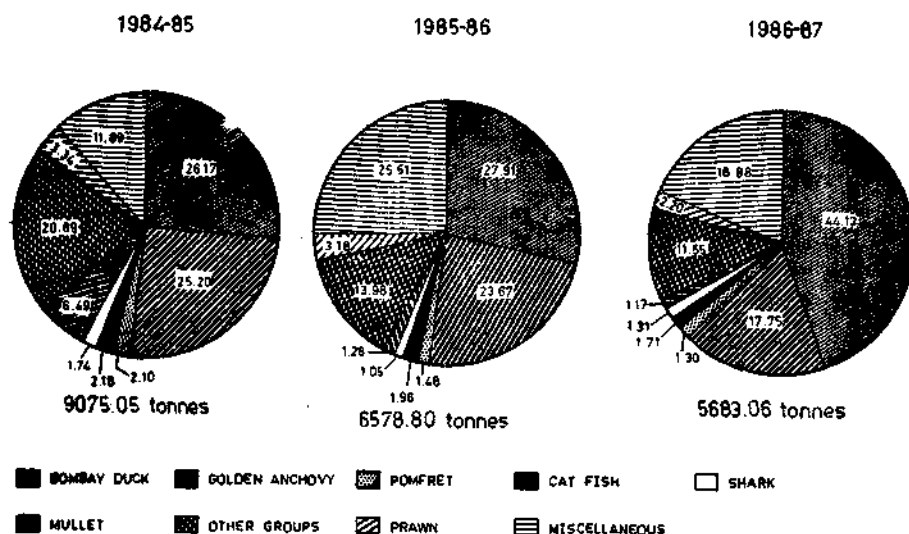


Fig. 3. Proportion of different fish groups and prawns in the total fresh catch landed at Modhwa during 1984-1987.

Of the total Bombay-duck catch landed in 1984-85, 45% were juveniles (150 to 180 mm) and 55% were adults (250 to 290 mm). Table 1 gives the proportion and catch obtained from the traders who buy the fish (dry+wet) from the fishermen and from which the CPUE is calculated.

About 15 species of prawns are caught and these are sorted into 3 groups for sale in decreasing order of size and price namely Jumbo, medium and tiny. Fig. 4 gives the average

high up on the beach to prevent them from getting damaged by rough seas and storing winds. There is no cold storage facility at the village. The road from Gundiali to Madhwa (10 km) is dirty, rough and unfinished which makes transportation difficult and time consuming, especially during the monsoon when the road gets flooded with rain water. Though electricity and government health services are available at Modhwa, centralised water supply is totally lacking; the villagers get water from shallow wells.

TABLE 1. *Proportion of different fish and prawn in the catch of boat owners and pagadia fishermen at Modhwa*

Period	Catch in tonnes	Class of fishermen	Proportion in p rcentage										
			Bombay duck ^a	Golden anchovy ^a	Pomfret ^a	Catfish ^a	Shark ^a (fins)	Mullet ^a	Other ^a groups	Miscella- neous ^a	Prawn ^a		
											jumbo	medium	tiny
1984-85	1,415.36	B	6.71	19.39	6.70	5.58	2.00	16.64	26.79	7.62	0.70	1.00	6.86
	3,250.77	P	4.38	12.66	2.92	3.65	—	10.87	46.66	13.27	0.45	0.66	4.48
1985-86	840.18	B	8.74	22.24	5.80	6.12	1.33	3.95	21.89	19.98	0.91	1.32	7.71
	2,098.70	P	5.25	13.35	2.32	3.68	—	2.37	35.06	32.00	0.55	0.79	4.63
1986-87	983.40	B	10.20	12.31	3.77	3.95	1.46	4.06	13.35	45.82	0.40	0.57	4.11
	1,848.35	P	8.14	9.82	2.01	3.15	—	1.44	28.41	42.97	0.32	0.46	3.28
Σ	1,079.65	B	8.55	17.98	5.42	5.22	1.60	8.22	20.68	24.47	0.67	0.96	6.23
	2,399.27	P	5.92	11.94	2.42	3.49	—	4.89	36.71	29.41	0.44	0.64	4.13
s.d.	299.43	B	1.75	5.11	1.50	1.13	0.36	7.30	6.80	19.49	0.26	0.38	1.88
	747.97	P	1.97	1.87	0.46	0.30	—	5.20	9.24	15.02	0.12	0.17	0.74

B: Boat owner; P: Pagadia fisherman; ^aDry catch; ^aFresh catch

Socio-economics of fishing community

The total population of Modhwa is 531, of which 278 are males and 253 are females, constituting 65 families, each of 7 to 9 persons, staying in 50 houses. There are 390 children (209 males and 181 females) between 1 to 14, age group and 11 elderly people (4 males 7 females) in the village. All of them are muslim. The houses are widely spaced and built on the seashore. There are two types of houses, some are made of bamboo and dry mesquite (*Prosopis juliflora*) branches with sand flooring and thatched, covered with plastic sheets to prevent the rain water from entering the houses, whereas the other houses are of brick and mortar with tiled roof. Each house has 4-5 rooms with an open verandah.

household chores of cooking and looking after children, go out for collecting firewood, sort and dry the catch brought in by men, and go out to sell fresh fish (rejected by the traders due to small size) at the market at Mandvi.

A monthly balance sheet of a boat owner and pagadia is presented in Table 4. Over the last three years, income of the boat owning as well as pagadia families has decreased and their expenditure, despite frugal living, has increased. The pagadia families are the worst sufferers and at present they barely make two ends meet.

Mangroves and fuel requirement of fishermen

Presently only a few patches of mangroves, mainly *Avicennia marina* are seen in the vic-

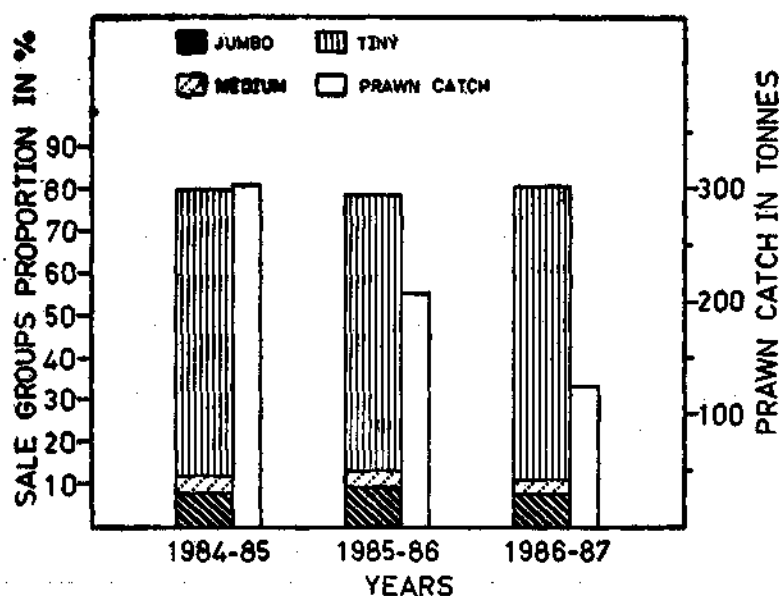


Fig. 4. Proportion of different sale groups in prawn catch at Modhwa.

Actual fishing is done by the men. Trading of fish with the traders camping at the village is also done by the men. During the monsoon, apart from fishing on foot, men spend time in repairing old nets and making new ones. The women besides doing the regular

nity of the village. *Prosopis juliflora* is used as firewood on fishing trips by boats and for cooking requirement in houses and as timber. A boat carries on an average 20 kg firewood in summer and 40 kg in winter per trip. An average fuel consumption of a

TABLE 2. *Summary of yearwise total catch at Modhwa*

Period	Boat			Pagadia		
	total catch in tonnes	number of boats	catch per unit effort (C.P.U.E.) in kg	total catch in tonnes	number of pagadia fishermen	catch per unit effort (C.P.U.E.) in kg
1984-85 ..	1415.36	40	276.44	3250.77	213	50.87
1985-86 ..	840.18	38	172.73	2098.70	213	32.84
1986-87 ..	983.40	45	170.73	1848.35	213	28.93
All years combined \bar{x}	1079.65	41.00	206.63	2399.27	213.00	37.55
s.d.	299.43	3.61	60.46	747.97	0.00	11.70

TABLE 3. *Selling price per kg of different fish and prawn*

Period	Bombay- duck*	Golden anchovy*	Pomfret (small)	Catfish	Shark (fins)	Mullet	Miscella- neous*	Other groups	Prawns		
									jumbo	medium	tiny
1984-85 ..	7.00	0.50	3.00	2.00	4.00	1.50	0.50	1.00	10.00	8.00	2.00
1985-86 ..	9.00	0.50	4.00	3.00	5.00	2.00	0.50	1.50	13.00	10.00	3.00
1986-87 ..	9.00	0.50	4.00	3.00	7.00	2.00	0.50	1.50	13.00	10.00	3.00
All years com- bined \bar{x}	8.33	0.50	3.67	2.67	5.33	1.83	0.50	1.33	12.00	9.33	2.67

* Price of dried Bombay-duck, golden anchovy, shark fins and miscellaneous fish.

TABLE 4. *Monthly income, expenditure and savings (in Rupees) of a fisherman*

Period	Income		Expenditure		Savings	
	boat owner	pagadia	boat owner	pagadia	boat owner	pagadia
1984-85 ..	5314.34	1798.50	2205.00	1060.00	3109.34	738.50
1985-86 ..	4364.69	1447.75	2415.00	1125.00	1949.69	322.75
1986-87 ..	3758.93	1311.25	2760.00	1240.00	998.93	71.25
All years combined \bar{x}	4479.32	1519.17	2460.00	1141.67	2019.32	377.50
s.d.	784.02	251.35	280.22	91.15	1056.93	336.98

family in a day amounts to 40 kg. which gives an average of 1.2 t of fuelwood a month.

DISCUSSION

During 1984-85 to 1986-87, there has been a gradual decrease in the total catch landed at Modhwa. One important factor responsible for the decrease may be the prevailing drought conditions in the Kachchh District; mean rainfall during the years was 245 mm as compared to 449 mm of mean rainfall for previous 10 years. Qasim (1972) observed that during monsoon dilution of coastal waters takes place due to upwelling by which bottom waters from great depths are brought to the surface. The exuberance of fish and prawn stock is thus intimately related to the abundance of phytoplankton. Another factor responsible for the decrease in catch may be the oil pollution from Mandvi Port which is only 20 km from Modhwa. It is believed that heavy coatings of oil can affect slow moving crustaceans and inter-tidal marine life and also affect the gill filaments of fish (Canevari, 1969).

The decrease in the prawns landed at Modhwa from 1984-85 to 1986-87 could also be due to the cutting of mangrove vegetation and the increase in the Bombay-duck catch landed. Mangroves are considered as nursery grounds since many species of penaeid prawns and fish spend their early stage in shallow inshore waters. The juveniles feed on algae, minute organisms and organic detritus (Panikkar, 1952) which are readily available in the mangrove ecosystem. The decrease in prawn catch may be correlated to the increase in juvenile Bombay-duck catch landed at Modhwa. The food of juvenile Bombay-duck wholly consists of prawns, while that of the adult consists of 45% prawns, 37.8% fish and rest digested material (Bapat, 1948).

The dominance of juveniles in the Modhwa catch may be due to the inshore fishing carried

out there and smaller size of the mesh. The stock of fish and prawns are likely to be affected due to continued shallow water fishing.

The decrease in the monthly income of the fishermen in the last 3 years is due to the decrease in the total catch landed at Modhwa. The fishing at Modhwa being seasonal, the income obtained by the fishermen is not evenly spread over the entire year. The fishermen borrow money varying from Rs. 2,000 to Rs. 3,000 per boat from the traders for their essential needs during the lean season. Initial investments in purchasing crafts and gears are met with these loans and their savings. These loans have to be repaid in the next season in the form of their catch, at rates dictated by the traders. As a consequence, the fishermen receive only about 50 to 60% of the value of fish and prawn realised by the traders from wholesale markets. The fishermen are aware of the fact that the traders make a good profit on such loans, but they are apprehensive that by reorganising the mode of marketing and eliminating the traders, would result in the loss of an important source of quick credit. Also the high perishability of the product and the total lack of organised infra-structural facilities at the command of the fishermen put them in a very weak bargaining position and leaves them at the mercy of the traders.

In view of the above, we make following recommendations to revitalise the fishing at Modhwa which is one of the important fishing centres of Kachchh: (1) The existing non-mechanised boats should be mechanised to enable the fishermen to fish in deeper waters. (2) The mesh size must be regulated to prevent the catching of juveniles. (3) Mangrove cutting should be banned totally, replantation of mangroves be taken up. (4) Social forestry may be undertaken in order to alleviate the pressure on the residual mangroves and to meet the fodder requirement. (5) The basic

infrastructural facilities for fishing must be provided at the village. (6) The existing co-operative is defunct and it should be reactivated.

REFERENCES

- BAPAT, S. V. 1948. *M.Sc. Thesis*. University of Bombay.
- , V. M. DESHMUKH, B. KRISHNAMOORTHY, C. MUTHIAH, P. V. KAGWADE, C. P. RAMAMIRTHAM, K. J. MATHEW, S. K. PILLAI AND C. MUKUNDAN 1982. Fishery resources of the Exclusive Economic Zone of the Northwest coast of India. *Bull. Cent. Mar. Fish. Res. Inst.*, 33 A : 13-21.
- CANEVARI, G. P. 1969. The role of chemical dispersants in oil clean-up. In : Hoult (Ed.) *Oil in the Sea*. D.P., New York, pp. 29-51.
- DESHMUKH, V. M. 1975. A note on the prawn fishery in the Gulf of Kachchh during 1962-1963. *Indian J. Fish.*, 22 (1 and 2) : 265-269.
- GEORGE, P. C., M. J. GEORGE AND P. V. RAO 1963. *Metapenaeus kutchensis* sp. nov. — A penaeid prawn from the Gulf of Kachchh. *J. mar. biol. Ass. India*, 5 (2) : 284-288.
- KAGWADE, P. V. 1967. Prawn catches by the mechanised vessels in the trawling grounds of Bombay and Saurashtra. *Proc. Symp. Crust., Mar. Biol. Ass. India*, 4 : 1348-1381.
- KRISHNAN SMITA, RISHAD PRAVEZ, A. P. MANSURI, M. S. MURTHY AND R. M. NAIK 1987. The status of prawn fishery and its projected management at Jakhu, Gujarat. Paper presented at the National Symposium on Research and Development in marine fisheries, held at Mandapam Camp.
- LACUMB, N. C. 1960. Prawn fishery of Kachchh, Gujarat State. *Souvenir*, The fishing industry of Gujarat. *Directorate of Fisheries, Gujarat*, pp. 49-54.
- PANNIKAR, N. K. 1952. Possibilities of further expansion of fish and prawn culture practices in India. *Curr. Sci.*, 21 : 29-33.
- QASIM, S. Z. 1972. Are there enough shrimps in the sea. *Seafood Trade Journal*, 4 (1) : 5-17.
- RAMAMURTHY, S. 1963 a. A note of prawn fishery of Kachchh. *J. mar. biol. Ass. India*, 5 (1) : 146-148.
- 1963 b. A note on prawn fishery at Adesar Camp. *Ibid.*, 5 (2) : 318-320.
- 1964. On a new record of *Metapenaeus stebbingi* Nogili in Indian waters. *Ibid.*, 6 (1) : 170-171.
- 1965. Studies on the prawn fishery of Kachchh. *Proc. Symp. Crustacea*, MBAI, 4 : 1424-1436.
- SRIVATSA, K. R. 1953. A survey and comparative analysis of the Prawn (shrimp) Fishery of the Gulf of Kachchh in Saurashtra in Western India. *Department of Industries and Supplies, Govt. of Saurashtra*.
- SARVAIYA, R. T. 1978. Prawn fisheries of Kachchh with special reference to Sukhper and Lakhpet. *Indian J. Fish.*, 25 (1 & 2) : 35-40.
- VIRABHADRA RAO, K. AND K. DORAIRAJ 1966. Prawn grounds on the continental shelf fished by trawlers (North Western Division). *Bull. Cent. Mar. Fish. Res. Inst.*, 14 : 217-219.