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Assessment of Lobster Resources Along Kanyakumari (South East Coast of India)

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Abstract: Lobsters are considered as a delicacy all over the world especially in countries like Japan, USA, France, UK, Netherlands etc. The total marine fish production of India was estimated to be 2.42 mt in 1999. It was 9.3% less compared to the landings in 1998. In that lobsters contributed 2,093 t as against 2,611 t in 1998, indicating a decreasing trend. The demand for the Indian lobsters led to increased exploitation and the stocks are under tremendous fishing pressure. Any fishery requires up-to-date information on population dynamics to improve long term forecasts, to plan catches and to develop rational ways of fishing and conserving the stocks. In order to manage the fishery resources, proper assessment of fish stocks is essential. The present study was undertaken for a period of one year from January to December 2000 for assessing the lobster resources along the coastline of Kanyakumari district. In this study the spiny lobsters, *Panulirus ornatus*, *P. homarus*, *P. versicolor* and *P. longipes*, deep sea lobster *Puerulus sewelli* and the sand lobster *Thenus orientalis* were recorded. Among the 38 fishing villages surveyed, the Catch Per Unit Effort (CPUE), species diversity, richness and evenness were calculated. Results showed that in Arockiapuram it was 1.30 to 8.06, 1.172, 0.504 and 0.739, respectively. It was found to be higher than in the other stations. The lobster stocks seem to deplete in the natural habitat because of the indiscriminate exploitation of baby lobsters and berried females. Lack of knowledge about relationship between adult stock and subsequent recruitment remains an important barrier for the management of lobster fisheries along this area.

Key words: Lobster, resource assessment, catch per unit effort and diversity

INTRODUCTION

Lobsters are valued as one of the prime seafood all over the world. Lobster fishing in India assumed considerable commercial importance in recent years. Among crustaceans, exported lobsters stand fifth by virtue of their abundance. They are exported in live as well as frozen forms. The demand for lobsters as a seafood delicacy in the majority of hotels and tourist-oriented restaurants has increased dramatically and is expected to continue to rise. The management of lobster fisheries is facing serious problems because of limited knowledge of the fishery, biology and ecology of the species. The majority of countries in the world are unable to organize and carry out a regional program for lobster research and management. Earlier lobster resource assessment was carried out by several researchers like, Dow (1965), Jonklass (1965), Nair *et al*. (1973), Morgan (1974a,b and 1979), Pollock (1991), Elner and Campbell (1991), Kagwade (1994), Rajamani and Manickaraja (1997) and Manisseri *et al*. (1998-1999 and 1999-2000). In order to manage the fishery resources, the proper assessment of fish stocks in the wild is essential. Hence the present study was undertaken for a period of one year from January to December 2000 for assessing the lobster resources along the coastline of Kanyakumari district, which is known as best landings for lobsters in India.

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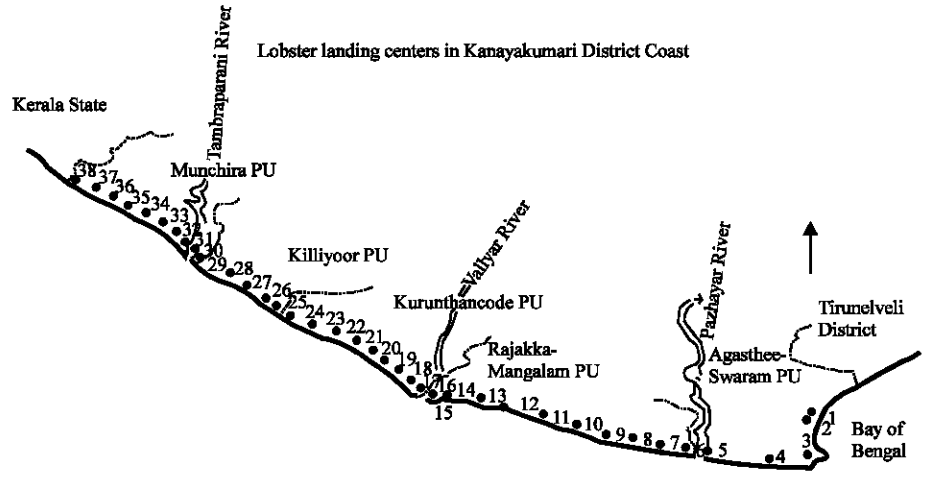
MATERIALS AND METHODS

The assessment of lobster resources was made every month from 38 landing centers along the Kanyakumari region (Fig. 1) during January to December 2000. The crafts used for catching lobsters, include traditional catamarans, vallam, thoni and trawlers. Gears employed were trammeling net, bottom set gill net and traps (Palmyra and iron frames). The numbers and the weight of the lobsters were recorded for the statistical analysis Vijayanand (2001). The catch per unit effort was calculated by using the Schaefer model as given by Bal and Rao (1984) and King (1995). The number of individuals were counted and expressed as individuals/effort and the biomass were expressed as kilograms/effort. The method used presently was basically the same as that of Reys (1964 and 1968), Reys and Salvat (1971) and Holme and Mc Intyre (1971) for biomass on a worldwide basis. The Shannon and Wiener (1949) for species diversity index, Simpson's index for richness and Pielou (1966) evenness index was calculated by using the computer programmer (BASIC), written by Bakus (1989).

$$H' = \frac{3.3219(N \log N - \sum n_i \log n_i)}{N} \text{ for species diversity}$$

where:

H' = Species diversity
n_i = No. of individuals of the ith species
N = Total No. of individuals in the collection and Σ = sum.



1	Arockiapuram	14	Azhikal	27	Enayam
2	Chinnamuttom	15	Muttom	28	Enayamputhen Thurai
3	Kayakumari	16	Kadiapattinam	29	Thengapattinam
4	Kovalam	17	Chinnavilai	30	Mullorthurai
5	Keezhamanakudy	18	Periyavilai	31	Erayumanthurai
6	Mela Manakudy	19	Puthoor (Mandaikadu)	32	Marthandam Thurai
7	Pallam	20	Kottilpadu	33	Poothurai
8	Puthenthurai	21	Colachel	34	Thoothoor
9	Kesavanputhen Thurai	22	Simon colony	35	Chinna Thurai
10	Banakkamangalam	23	Kodimunai	36	Vallavilai
11	Pozhikarai	24	Vaniyakudy	37	Kollencode
12	Periacadu	25	Kurumpanai	38	Neerodi
13	Pillathoppu	26	Midalam		

Fig. 1: The study area

$$P_i = \frac{n_i}{N} \text{ for species richness}$$

where:
n_i = No. of individuals of the ith species
N = Total No. of individuals.

$$J = \frac{H'}{\text{Log } 2^S} \text{ for evenness}$$

where:
J′ = Evenness,
H′ = Species diversity
s = Total No. of species.

For the species diversity index studies, the entire study period was divided into four distinct seasons namely; post monsoon (January-March), summer (April-June), pre monsoon (July-September) and monsoon (October-December) and the results are discussed in relation to these four seasons.

RESULTS AND DISCUSSION

In the present study three species of spiny lobsters namely *Panulirus ornatus*, *P. homarus*, *P. versicolor* and *P. longipes* were recorded in all the 38 landing centers, one species of spiny lobster *P. longipes* was recorded rarely in all the seasons along Rajakamangalam and Puthoor landings. Deep sea lobster *Puerulus sewelli* was recorded in Chinnamuttom during the monsoon and post monsoon period. The sand lobster, *Thenus orientalis* was recorded in Colachel during the summer period and in chinnamuttom during the monsoon and post monsoon period.

The Catch per Unit Effort (CPUE) for mean density and biomass was higher at Arockiapuram and in decline of mean density and biomass was observed at Marthandamthurai (Table 1). High species diversity, richness and evenness were obtained in Chinnamuttom during the post monsoon and monsoon period respectively. Low species diversity, richness and evenness were obtained in Neerodi during post monsoon seasons (Table 2-4).

Kanyakumari region has the influence of two monsoons namely south west monsoon from May to July and the north east monsoon from September to December. The monsoon plays an important role in the lobster fishery. The south west monsoon initiates the lobster catch progresses and attains a peak period during the north east monsoon. In some stations along the west coast traps are used to catch the lobsters during the months of January to March. During these months the brown mussel, *Perna indica* was used as baits to catch the lobsters. The intertidal region of this area was covered by rocks; these rocks provide shelter as well as the feeding ground. Arockiapuram landing center contributes more lobster landings because of the rocky shore, a ship has submerged in this area and it act as an aggregating device and provides a suitable breeding ground for the lobsters. During the south west monsoon period small sized organisms are caught in large quantities. The lobster catch was found to be high from Arockiapuram to Pallam because of the rocky shore, the lobster catch decline from Puthenthurai to Azhikal and Erayumanthurai to Neerodi because of the less rocky shore area. The lobster catch increased from Muttom to Mullorthurai because of the presence of in huge quantities brown mussels.

Table 1: Catch per unit effort values during October and April months

Stations	Mean density/Effort	Mean biomass/Effort	Mean density/Effort	Mean biomass/Effort
Arockiapuram	8.06	3.57	1.30	0.58
Keezhamanakudy	5.61	1.51	0.81	0.22
Kanyakumari	4.32	1.92	0.66	0.29
Kadiapattinam	4.01	1.08	1.15	0.31
Muttom	3.62	0.98	0.78	0.21
Melamanakudy	2.67	0.72	0.46	0.12
Chinnamuttom	2.61	0.99	1.15	0.38
Enayam	2.56	0.69	0.75	0.20
Kovalam	2.41	0.65	0.55	0.15
Kurumpanai	1.37	0.35	0.00	0.00
Enayamputhenthurai	1.95	0.53	0.62	0.17
Midalam	1.82	0.49	0.00	0.00
Pallam	1.52	0.41	0.00	0.00
Periacadu	1.42	0.38	0.00	0.00
Colachel	0.85	0.23	0.43	0.12
Puthoor	1.27	0.34	0.00	0.00
Mullorthurai	1.24	0.33	0.00	0.00
Thengapattinam	1.12	0.30	0.00	0.00
Kesavanputhenthurai	1.09	0.29	0.00	0.00
Kottilpadu	1.09	0.29	0.00	0.00
Pozhikarai	1.08	0.29	0.00	0.00
Periyavilai	1.07	0.29	0.00	0.00
Simon colony	1.05	0.28	0.00	0.00
Vaniyakudy	1.04	0.28	0.00	0.00
Puthenthurai	1.02	0.27	0.00	0.00
Rajakamangalam	1.02	0.28	0.00	0.00
Kodimunai	1.01	0.27	0.00	0.00
Azhikal	1.01	0.27	0.00	0.00
Chinnavilai	0.98	0.26	0.00	0.00
Pillaithoppu	1.00	0.27	0.00	0.00
Chinnathurai	0.96	0.26	0.00	0.00
Erayumanthurai	0.95	0.26	0.00	0.00
Poothurai	0.92	0.25	0.00	0.00
Vallavilai	0.88	0.24	0.00	0.00
Thoothoor	0.85	0.23	0.00	0.00
Kollencode	0.83	0.22	0.00	0.00
Neerodi	0.83	0.22	0.00	0.00

Table 2: Species diversity of lobsters in terms of density

Stations	Post monsoon	Summer	Pre monsoon	Monsoon
Arockiapuram	1.172	1.172	1.172	1.172
Kezhamanakudy	1.337	1.337	1.336	1.337
Kanyakumari	1.173	1.175	1.171	1.172
Kadiapattinam	1.337	1.336	1.333	1.337
Muttom	1.336	1.339	1.336	1.337
Melamanakudy	1.337	1.338	1.336	1.337
Chinnamuttom	1.712	1.353	1.353	1.712
Enayam	1.336	1.335	1.336	1.337
Kovalam	1.337	1.338	1.337	1.336
Kurumpanai	1.336	1.342	1.338	1.337
Enayamputhenthurai	1.336	1.334	1.335	1.338
Midalam	1.336	1.324	1.338	1.337
Pallam	1.336	1.336	1.336	1.338
Periacadu	1.333	1.332	1.338	1.334
Colachel	1.335	1.336	1.337	1.337
Puthoor	1.337	1.324	1.341	1.339
Mullorthurai	1.342	-	1.336	1.337
Thengapattinam	1.336	-	1.337	1.338
Kesavanputhenthurai	1.334	1.342	339.000	1.338
Kottilpadu	1.339	1.314	1.334	1.338

Table 2: Continued

Stations	Post monsoon	Summer	Pre monsoon	Monsoon
Pozhikarai	1.339	1.350	1.337	1.339
Periyavilai	1.336	1.325	1.336	1.337
Simon colony	1.337	1.329	1.339	1.333
Vaniyakudy	1.351	1.324	1.337	1.331
Puthenthurai	1.337	1.339	1.340	1.337
Rajakamangalam	1.339	1.340	1.337	1.333
Kodimunai	1.340	1.105	1.337	1.340
Azhikal	1.332	1.341	1.340	1.338
Chinnavilai	1.330	1.328	1.332	1.346
Pillaithoppu	1.335	1.328	1.339	1.347
Chinnathurai	1.339	-	1.345	1.335
Erayumanthurai	1.338	-	1.336	1.338
Poothurai	1.329	-	1.331	1.335
Vallavilai	1.333	-	1.329	1.342
Thoothoor	1.338	-	1.335	1.337
Kollencode	1.337	-	1.343	1.336
Neerodi	1.332	-	1.339	1.341
Marthandamthurai	1.335	-	1.328	1.337

Table 3: Species richness of lobsters in terms of density

Stations	Post monsoon	Summer	Pre monsoon	Monsoon
Arockiapuram	0.504	0.504	0.504	0.504
Kezhamanakudy	0.565	0.566	0.565	0.565
Kanyakumari	0.505	0.506	0.504	0.504
Kadiapattinam	0.565	0.565	0.562	0.565
Muttom	0.564	0.566	0.565	0.564
Melamanakudy	0.565	0.566	0.565	0.565
Chinnamuttom	0.651	0.575	0.575	0.651
Enayam	0.565	0.565	0.565	0.565
Kovalam	0.564	0.566	0.565	0.565
Kurumpanai	0.565	0.573	0.566	0.565
Enayamputhenthurai	0.566	0.566	0.565	0.566
Midalam	0.565	0.567	0.566	0.565
Pallam	0.566	0.566	0.565	0.566
Periacadu	0.564	0.567	0.565	0.566
Colachel	0.565	0.565	0.565	0.565
Puthoor	0.567	0.568	0.568	0.566
Mullorthurai	0.568	-	0.566	0.566
Thengapattinam	0.566	-	0.567	0.566
Kesavanputhenthurai	0.565	0.573	0.567	0.566
Kottilpadu	0.567	0.568	0.565	0.567
Pozhikarai	0.568	0.580	0.566	0.566
Periyavilai	0.566	0.568	0.566	0.566
Simon colony	0.567	0.567	0.567	0.565
Vaniyakudy	0.569	0.567	0.566	0.564
Puthenthurai	0.566	0.569	0.565	0.566
Rajakamangalam	0.568	0.573	0.566	0.564
Kodimunai	0.568	0.503	0.566	0.567
Azhikal	0.566	0.569	0.567	0.567
Chinnavilai	0.564	0.569	0.564	0.570
Pillaithoppu	0.564	0.569	0.566	0.570
Chinnathurai	0.568	-	0.569	0.565
Erayumanthurai	0.567	-	0.568	0.566
Poothurai	0.564	-	0.565	0.565
Vallavilai	0.566	-	0.564	0.568
Thoothoor	0.567	-	0.567	0.566
Kollencode	0.567	-	0.569	0.567
Neerodi	0.565	-	0.567	0.568
Marthandamthurai	0.566	-	0.564	0.566

Table 4: Species evenness of lobsters in terms of density

Stations	Post monsoon	Summer	Pre monsoon	Monsoon
Arockiapuram	0.739	0.739	0.739	0.739
Keezhamanakudy	0.843	0.843	0.890	0.843
Kanyakumari	0.740	0.741	0.739	0.739
Kadiapattinam	0.843	0.843	0.841	0.843
Muttom	0.843	0.845	0.843	0.843
Melamanakudy	0.843	0.844	0.844	0.843
Chinnamuttom	0.856	0.739	0.739	0.856
Enayam	0.842	0.843	0.843	0.843
Kovalam	0.841	0.844	0.843	0.843
Kurumpanai	0.843	0.847	0.844	0.844
Enayamputhenthurai	0.843	0.842	0.842	0.844
Midalam	0.843	0.835	0.844	0.843
Pallam	0.843	0.843	0.843	0.844
Periacadu	0.841	0.841	0.844	0.845
Colachel	0.842	0.843	0.843	0.844
Puthoor	0.843	0.835	0.846	0.845
Mullorthurai	0.847	-	0.843	0.844
Thengapattinam	0.843	-	0.843	0.844
Kesavanputhenthurai	0.842	0.847	0.845	0.844
Kottilpadu	0.845	0.829	0.841	0.844
Pozhikarai	0.845	0.852	0.843	0.845
Periyavilai	0.843	0.846	0.843	0.844
Simon colony	0.844	0.843	0.838	0.845
Vaniyakudy	0.846	0.835	0.844	0.840
Puthenthurai	0.843	0.845	0.846	0.844
Rajakamangalam	0.845	0.846	0.843	0.841
Kodimunai	0.845	0.697	0.844	0.845
Azhikal	0.841	0.846	0.845	0.844
Chinnavillai	0.839	0.838	0.841	0.849
Pillaithoppu	0.842	0.838	0.845	0.845
Chinnathurai	0.845	-	0.848	0.843
Erayumanthurai	0.844	-	0.843	0.844
Poothurai	0.838	-	0.840	0.842
Vallavilai	0.841	-	0.839	0.847
Thoothoor	0.844	-	0.842	0.844
Kollencode	0.843	-	0.848	0.843
Neerodi	0.840	-	0.845	0.846
Marthandamthurai	0.842	-	0.838	0.844

Diversity indices are helpful in detecting and evaluating the status of a population. The species diversity of lobsters in Chinnamuttom was higher during the monsoon and postmonsoon than in all the other stations. The species richness indices of lobsters i.e. the total number of species in the community showed a trend parallel to that of species diversity index. Species evenness index is a measure of the uniformity in the distribution of individuals among species. The distribution of lobsters in Chinnamuttom was higher during the monsoon and postmonsoon than in all the other stations. Manisseri *et al.* (1999-2000) investigated the total landings of lobsters in India during 1999. In that the fishery shows a decreasing trend of 2,093 t as against 2,611 t in 1998 and 2,787 t in 1997. Cockcroft and Mackenzie (1997) studied the recreational fishery for the west coast rock lobster *Jasus lalandii* in South African waters. The total recreational catch of rock lobster decreased from 469 t in 1992/93 to 379 t in 1995/96 due to the increase in the length of the season and a decrease in the minimum legal size limit.

CONCLUSIONS

The lobster stock seems to deplete in the natural habitat because of indiscriminate exploitation of baby lobsters and berried females. The indiscriminate exploitation of these breeding populations will

have strong repercussions on the fishery in the long run. The degree of protection to brood-stock required to guarantee adequate recruitment has long been a central issue of concern for fisheries managers. The most common regulatory measures are those aimed at protecting the small-sized individuals, prohibition of berried females and the establishments of closed seasons have been imposed in attempts to maintain an adult stock large enough to ensure sufficient egg and larval production. It has been a long battle to eradicate the problem of illegal capture, local sale and export of lobsters. The high price fetched locally and particularly in neighboring Martinique provides a temptation to local fisherman and other sea farmers. Public education effort and close monitoring of large-scale purchasers (hotels, restaurants and retail outlets) have paid off in terms of a marked reduction in the incidence of illegal sales. The effect of fishing somewhat resembles that of those predators that take mainly mature fish. Fishing not only reduces the population but also alters its intraspecific and interspecific relationships. Competent management is able to adjust the level of fishing by controlling the quantity of fish caught and the areas fished, as well as by using measures such as artificial rearing where appropriate. In this way it can improve population productivity and increase catches. Control of the fishery therefore appears as a factor in the environment of the species, which does not necessarily destroy the conditions of life but in some cases, actually improves them. The population then survives and the numbers and mass may actually increase. On the other hand, the fishing may destroy the adaptive relation of the species to its environment, in which case the population will decrease in numbers and may even vanish. Unless new fishing grounds are located, there is very limited scope for improving the catch.

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