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N. G. Menon and P. P. Pillai

Central Marine Fisheries Research Institute, Cochin

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Creation of artificial habitat for spiny lobsters in the sea off Vellapatti, Gulf of Mannar

M. Rajamani
Tuticorin Research Centre of CMFR Institute, Tuticorin-628 001

ABSTRACT

An experimental artificial habitat for spiny lobsters was created in the sea off Vellapatti, a fishing village near Tuticorin in the Gulf of Mannar during June 1997. A total of 49 modules fabricated out of 147 stoneware pipes were used to create the artificial habitat which covered a floor area of approximately 1000 sq. m. Inhabitation of lobsters in the artificial habitat was recorded for the first time three months after the installation of the modules. Both Panulirus ornatus *and* P.homarus *were encountered in bottom set gill net catches operated in the vicinity of the artificial habitat.*

P.ornatus *was the dominant species constituting on an average 76.8 % of the total lobster catches. The size (total length) of the lobsters captured from the artificial habitat ranged from 115 to 255 mm and from 135 to 165 mm in* P.ornatus *and* P.homarus *respectively. The importance of artificial habitat in the production, conservation and optimum exploitation of the spiny lobster resources from the sea is discussed in the paper.*

Introduction

Spiny lobsters are valued as one of the prime sea foods all over the world standing second only to shrimps in terms of their commercial importance. The increased demand for live lobsters and frozen lobster tails in the export market has given a new thrust to lobster fishing along Indian coasts recently. There are six species of spiny lobsters in Indian waters, out of which only two species namely the Ornate spiny lobster *Panulirus ornatus* and the Scalloped spiny lobster *P.homarus* contribute to the commercial fishery along Tuticorin coast. Their life cycle is complex requiring diverse marine habitats ranging from open ocean to inshore seagrass beds and coral reefs (Cobb and Phillips, 1980). The juveniles of spiny lobsters are gregarious in nature and concentrate around rocky outcrops, groups of urchins and sponges and feed on echinoids and small molluscs mostly during night time (Khandker, 1964; Davis, 1971 and 1978; Berrill, 1975). The availability of suitable shelters adjacent to the foraging area is the major limiting factor for the survival of juvenile lobsters. Such natural ecosystem has been damaged along Indian coast to a very great extent both by adverse environmental conditions and human interference resulting in a gradual decline in the population of spiny lobsters in Indian waters over the years (Kagwade *et al.*, 1991; CMFRI, 1995). It is in this context that the Central Marine Fisheries Research Institute has undertaken various research activities to replenish the population and increase the production in the sea as part of its various research programmes in mariculture. Development of artificial reefs is one of such programmes.

The technology of artificial reef is primarily based on the simple principle that the crevices present in the artificial structures provide shelter and thus protect the organisms from predators. Incidentally, such objects also serve as base for the development of algae and for the attachment of various sedentary organisms which ultimately results in the formation of a fertile feeding ground for the organisms while they themselves taking shelter in the crevices. However, later it was found out by various investigators that the instinctive behaviour of the organism is one of the major factors that constitute the fundamental linkage between the object and the organism. The present paper gives an account on the creation of artificial habitats (artificial reefs) for spiny lobsters in the sea off Vellapatti, a coastal village near Tuticorin in the Gulf of Mannar, involving artisanal fishermen.

Vellapatti is a small fishing village about 10 km north of Tuticorin on the south-east coast of Tamil Nadu. Fishing is the main avocation of the villagers with nearly 95% of the population engaging in activities connected with fishing. They operate mostly bottom-set gill nets for fishing crabs and lobsters at a depth of about 5 to 10 m. The craft used for the fishery is vallam (plank-built boat). Although fishing activities are going on round the year, their income from the fishing is meagre most of the months due to poor catch and most of the villagers live below poverty line. In order to create an awareness among the traditional fishermen on the importance of artificial habitat as a tool to increase spiny lobster production in the sea, Vellapatti was selected as the sea off Vellapatti was found to be suitable for creation of artificial habitat for spiny lobsters and also as the fishermen were cooperative. Detailed discussions were held with the fishermen and members of the fishermen society of Vellapatti and the role of artificial habitats in increasing the lobster resources in the sea was explained to them before actually commencing the work.

Materials and methods

A total of 147 stone- ware pipes, each pipe with a length of 60 cm and a diametre of 20 cm were used, out of which 49 modules were

fabricated on the shore at Vellapatti during the last week of May, 1997. Each module consisted of three pipes i.e two pipes were placed at the bottom horizontally over which the third pipe was placed. All the three pipes were tied firmly with a nylon rope. They were loaded into five vallams (country boats) belonging to the fishermen and were transported to the sea off Vellapatti in the morning on 1st June 1997. After locating the suitable ground the modules were carefully lowered into the sea and placed on the floor at a depth of about 6 metres between Van Island and Karsewar Island. After all the modules were released, their position was observed by a SCUBA diver. The area covered by the modules is estimated to be approximately 1000 sq. m.

After the installation of the modules on the floor of the sea fishing was carried out by the commercial fishermen as and when the conditions were favourable and the catches were brought to the landing centre. The landing centre was visited weekly once and the catches of lobsters and other species landed from the artificial habitats were recorded. Only lobsters were measured for their total length and carapace length. The weight of the individual lobsters also was taken.

Results and discussion

Fishing was carried out in the artificial reef area by the fishermen of the Vellapatti village using bottom-set gill nets as and when the conditions were favourable for fishing. Regular fishing from the artificial reef area commenced during the month of September '97. Thereafter, fishing was carried out in the artificial reef area in October '97 and then in January and February '98. The catch of lobsters recorded during October, January and February was in the order of 5.4, 16.5 and 17.7 kg constituting 9.1 %, 5.0 % and 2.0 % of the total catches landed by the bottom-set gill nets during the three months respectively (Table 1). Both the species of spiny lobsters (*P.ornatus and P. homarus*) were encountered in the catches. *P.ornatus* was the dominant species with an estimated catch of 30.4 kg forming 76.8 % , the rest being formed by *P.homarus* (Table 2). From 1.19 kg the catch of *P.ornatus* increased to 16.2 kg in

January and then showed a marginal decline in February with an estimated catch of 13.0 kg. In the case of *P.homarus* the catch was more or less at the same level in October and February (4.2 and 4.7 kg) with an insignificant landing of 0.3 kg in January. It may be mentioned here that the composition of *P.homarus* was high initially i.e in October, forming 78.0 % of the total lobster catches. Although the catch was maintained at the same level in February also, its composition was only 26.6 % as *P.ornatus* became the dominant one.

Table 1. Catch and effort of spiny lobsters from the artificial reef area

Months	Fishing days	No. of Units	Estimated total catch (kg)	Lobsters kg	Lobsters %	C/E
October '97	27	9	59.4	5.4	9.1	0.6
November	No fishing					
December	No fishing					
January '98	16	24	326.5	16.5	5.0	0.7
February	24	48	869.7	17.7	2.0	0.4
March	No fishing					
Total	67	81	1255.6	39.6	3.2	0.49

Table 2. Species composition of lobsters in the artificial reef area (%)

Months	Estimated total catch of lobsters (kg)	*P.ornatus*		*P.homarus*	
		Kg	%	Kg	%
October '97	5.42	1.19	22.0	4.23	78.0
November	No fishing				
December	Nofishing				
January '98	16.5	16.2	98.4	0.27	1.6
February	17.7	13.0	73.4	4.7	26.6
March	No fishing				
Total	39.6	30.4	76.8	9.18	23.2

The size (total length) of *P.ornatus* collected from the artificial reef area ranged from 115 to 255 mm in male and from 155 to 235 mm in

female. Large-sized lobsters were recorded in the catches landed during January in both sexes.

Although detailed information is available on the creation of artificial habitats for fin fishes in various parts of the world, information on the creation of artificial habitat for spiny lobsters are rather limited. Chittleborough (1970) has reported that in Western Australia, juvenile populations of *P.cygnus* are limited by the availability of diurnal shelter near the centre of their range. According to Davis (1985) the structures provide a temporary shelter for the lobsters and a refuge from noise, turbidity and physical disruption during the marina construction. According to him shelter may become a limiting factor for lobster production only when there is high recruitment in the fishery. Otherwise such structures may simply invite population from other areas without any significant increase in the production. According to Herrnkind *et al.* (1975) the availability of shelters adjacent to the foraging area is the major limiting factor for the survival of the Florida spiny lobster, *P.argus*.

The resource potential of spiny lobsters in the fishing grounds along Tuticorin coast in the Gulf of Mannar has been studied in detail by Kagwade *et al.* (1991) and Rajamani and Manickaraja (1991; 1995; 1997a; 1997b). Kagwade *et al.* (1991) have warned that as the population of spiny lobsters in Indian waters is not dense enough to support a sustainable fishery, effort should not be increased to capture more of *P.ornatus* and *P.homarus* from the present fishing grounds. They have also suggested that trawling should be intensified in deeper waters as the concentration of lobsters in the shallow waters is very much limited. It is suggested, based on the results obtained from the present investigation, that artificial habitats may be created in shallow waters in certain selected places along Indian coast both for increasing the production and for conservation of the spiny lobster resources from over exploitation.

The investigation carried out in the sea off Vellapatti has clearly shown that after the installation of artificial shelters there is a remarkable increase in the landing of lobsters as admitted by the local fishermen. On seeing the effect of artificial shelters on lobster landing the

fishermen of the village are more enthusiastic and they want to take up the programme on a large scale. If vast areas are covered with several modules it becomes a commercial fishing ground. What has been created in the sea off Vellapatti is only one small unit. Many such small units form one group and several such groups form one zone. Such zones become the fishing ground for commercial fishing activities. The present investigation carried out by the Central Marine Fisheries Research Institute involving artisanal fishermen has clearly demonstrated that such artificial habitat attract spiny lobsters and become permanent habitats for them. As the installation of artificial habitats involves huge investment, both Government and non- Government Organizations should come forward to help the fishermen societies so that the programme can be taken up on a large scale covering many coastal villages so as to increase the production in the sea which will benefit the fisherfolk to a very great extent.

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