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MARINE LIVING RESOURCES OF THE UNION TERRITORY OF LAKSHADWEEP —

An Indicative Survey With Suggestions For Development

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE
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Published by

P. S. B. R. JAMES
Director
Central Marine Fisheries Research Institute
Cochin 682031, India

Edited by

C. SUSEELAN
Scientist
Central Marine Fisheries Research Institute
Cochin 682031, India

9. MOLLUSCAN RESOURCES

K. K. Appukuttan, A. Chellam, K. Ramdoss, A. C. C. Victor and M. M. Meiyappan

INTRODUCTION

A critical review of literature on the fauna of Lakshadweep reveals that there is only scanty reports on the occurrence of molluscs from various islands (Smith, 1906; Appukuttan, 1973; Nair and Dharmaraj, 1983 and George *et al.*, 1986). A survey on the fisheries potential of Lakshadweep was undertaken by the scientists of Central Marine Fisheries Research Institute to provide adequate informations on the molluscan fisheries potential of the islands for future planning and development. The present status of fishery of potentially important molluscs, fishing methods, occurrence and abundance are dealt with in the present account. The island surveyed for molluscan resources are Minicoy, Suheli pear, Kalpeni, Kavaratti, Androth, Agathi, Bangaram, Amini, Kadamat, Kiltan, Bitra and Chetlat. To understand the distribution pattern, population density and habitat, transect method of sampling was adopted uniformly in all the islands. The sampling areas were broadly classified intointertidal area, lagoon, reef crest in the lagoon side and leward side and reef slopes of both sides. Quadret method of sampling for few bivalves and gastropods were done for quantitative estimates. By diving and hand-picking, samples were collected from various stations and relative abundance were noted by visual estimates. The maps of islands shows the distribution of commercially important molluscs.

PRESENT STATUS OF MOLLUSCAN FISHERY

As such, large-scale exploitation and utilization of molluscs from islands are remote. Three species of octopuses two species of cowries and one species of bivalve are being exploited at present in minor quantities. The details of fishery, exploitation method and utilization of these molluscs were studied and the occurrence and abundance of other commercially important molluscs are describe d.

CEPHALOPOD

1. *Octopus*

Three species of Octopuses *viz. Octopus vulgaris, O. membranaceus* and *O. cyaneus* are found to occur in various islands of Lakshadweep. The Octopus production from 1981-1985 and the average of each quarter of the year are given in Table 1 and Table 2 respectively. Though there is no information on species-wise catch composition, *O. vulgaris* seems to rank first in abundance followed by *O. cyaneus* and *O memoranaceus*. Fishing for Octopus is observed year round, the IInd and IIIrd quarter shows lesser landings which coinsides with the monsoon months. Active fishing for Octopus in each month is also confined to the days with good low tide, providing opportunity to fishermen to locate the hideouts of the animals. Men, women and children are involved in fishing and there is no full time Octopus fishermen in any of the islands and hardly 6 to 10 expert Octopus fishermen are observed in each island.

Octopus are cought during low tide from the crevices/burrows in the coral boulders in the reef flats on the lagoon side and also in the leward side Fig. I A. These crevices are easily detected by expert fishermen noting the presence of loosely kept coral stones in front of the crevices and also by the presence of discarded freshly eaten crab shells in the exposed reef flats during low tide. In deeper waters they use mask to detect the burrows before capturing them. The gear for capturing Octopus consist of 1 to 1.5 m long m. s. rods of 6-8 mm diameter having sharpend edges, sometime curved at the tip Fig. I B. When the Octopus is located, it is pinned down with one rod and retrieved with the other and an expert fisherman can take out the animal with a single rod locally known as 'appal kol'. As soon as the animal is caught, the mantle is turned inward out, popularly known as - turning the cap - and remove the ink sac and alimentary canal. It is understood from local fishermen that eels are

TABLE 1. *List of Molluscs collected from Lakshdweep Islands Duriug January to March 1987*

Family & Species	Mini-coy (1)	Suheli par (2)	Kalpeni (3)	Kava-ratti (4)	Androth (5)	Agatti (6)	Ban-garam (7)	Amini (8)	Kad-mat (9)	Kiltan (10)	Bitra (11)	Chetlat (12)
Gastropods												
Family Haliotidae												
Haliotis sp.	—	—	—	—	—	—	—	—	—	—	x	—
Family Patellidae												
Cellana radiata	x	—	—	x	—	x	x	x	x	x	x	x
Family Trochidae												
Trochus radiatus	x	x	x	x	x	xx	x	x	x	x	x	x
T. pyramis	xx	x	x	x	x	—	x	x	x	x	—	xx
T. stellatus	x	—	—	—	—	x	—	—	—	x	—	—
Family Turbinidae												
Turbo petholatus	x	—	—	—	—	x	x	—	—	—	x	—
Family Neritidae												
Nerita albicella	x	x	x	x	x	x	x	x	x	x	x	x
N. chameleon	x	—	—	—	—	xx	xx	x	—	x	xx	x
N. maura	x	—	—	—	—	x	x	—	—	x	x	—
N. plicata	x	x	xx	x	x	xx	xx	x	x	x	x	xx
N. polita	x	x	x	x	—	xx	xx	—	x	x	—	x
Family Littorinidae												
Littorina kraussi	x	x	x	xx	—	xx	xx	—	—	xx	x	xx
L. scabra	x	x	x	xx	—	xx	xx	—	—	xx	x	xx
L. undulata	x	x	—	—	—	x	x	—	—	xx	x	—
Nodilittorina Pyramidalis	x	—	—	—	—	x	x	—	—	—	xx	—
Family Planaxidae												
Planaxis virgatus	—	—	—	—	—	xx	—	—	—	x	—	—

Family & Species	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Family Cerithidae												
Cerithium articulatum	—	—	—	—	—	x	—	—	—	—	—	—
Cerithium asper	—	—	—	—	—	x	—	—	—	—	—	—
C. hanleyi	x	x	x	x	x	xx	xx	—	—	xx	xx	xx
C. nodulosum	—	—	—	—	—	x	x	—	—	—	x	—
C. obeliscus	—	—	—	—	—	x	—	—	—	—	x	—
Cerithium sp.	—	—	—	—	—	x	—	—	—	—	—	—
Family Strombidae												
Lambis chiragra	x	x	x	x	x	x	x	x	xx	xx	x	xx
L. lambis	x	x	x	x	—	xx	xx	xx	xx	xx	x	xx
L. truncata	xx	x	x	—	—	xx	xx	xx	xx	xx	xx	xx
Strombus gibberulus	xx	—	xx	—	—	xx	xx	x	x	x	xx	xx
S. lentiginosus	—	—	—	—	—	x	x	—	—	—	—	—
S. urceus	x	x	x	x	x	xx	xx	—	—	—	x	x
Strombus sp.	—	—	—	—	—	x	x	—	—	—	—	—
Family Cypraeidae												
Cypraea annules	—	—	—	—	—	x	—	—	—	—	—	—
C. arabica	x	—	x	—	—	xx	x	—	—	x	x	—
C. caputserpentis	x	—	x	—	—	xxx	xxx	—	—	xx	xx	xxx
C. coffea	—	—	—	—	—	x	—	—	—	x	—	—
C. erosa	—	—	—	—	—	x	x	—	—	x	x	—
C. histrio	—	—	—	—	—	—	—	—	—	x	—	—
C. isabella	—	—	—	—	—	x	—	—	—	x	—	—
C. lynx	—	—	—	—	—	x	—	—	—	x	—	—
C. moneta	xx	—	—	—	—	xxx	xxx	x	xx	xx	xx	xxx
C. nucleus	x	—	—	—	—	x	—	—	—	—	—	—
C. pulchra	—	—	—	—	—	—	—	—	—	x	—	—
C. scurra	—	—	—	—	—	x	—	—	—	—	—	—
C. tigris	x	—	—	x	—	x	x	—	—	—	x	x

Family & Species	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Family Naticidae												
Polyuices mammilla	x	—	x	x	—	x	x	—	—	x	x	xx
Family Cassididae												
Casmaria erinaceus	—	—	—	—	—	x	—	—	—	—	—	—
Cassis cornuata	x	—	x	—	—	x	—	x	—	—	—	—
Cypraecassis rufa	x	—	x	—	—	x	—	x	—	—	—	x
Family Cymatiidae												
Charonia tritonis	—	—	—	—	—	x	—	x	—	—	—	x
Cymatium lotorium	—	—	—	—	—	x	—	—	—	—	—	—
Cymatium sp.	—	—	—	—	—	x	—	—	—	—	—	—
Family Tonnidae												
Malea pomum	—	—	—	—	—	x	—	—	—	—	—	—
Family Muricidae												
Murex ramosus	—	—	—	—	—	—	—	—	—	—	x	x
Drupa heptagonalis	xx	x	—	—	—	xx	xx	x	—	x	xx	xx
D. lobata	—	—	—	—	—	x	—	—	—	—	—	—
D. margariticola	x	—	x	x	—	—	x	—	—	x	—	x
D. morum	x	—	—	—	—	x	x	—	—	xx	x	x
D. ricinus	—	—	—	—	—	x	—	—	—	—	—	—
D. tuberculata	x	—	—	—	—	x	—	—	—	xx	—	x
Thais intermidia	—	—	—	—	—	x	—	—	—	—	—	—
T. rudolphi	—	—	—	—	—	x	—	—	—	x	—	—
T. rugosa	—	—	—	—	—	—	—	—	—	x	x	—
Family Buccinidae												
Phos senticosus	—	—	—	—	—	x	—	—	—	—	—	—
Engina mendicaria	x	x	x	x	x	xxx	xxx	—	—	xx	xxx	xx
E. pulchra	—	x	—	—	—	x	—	—	—	—	x	x
E. zonalis	x	—	x	—	—	xx	xx	—	—	—	x	—
Pisania ignea	—	—	—	—	—	x	—	—	—	—	—	—

Family & Species	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Family Pyrenidae												
Pyrene versicolor	x	x	—	—	—	xx	xx	—	—	—	x	xx
Family Nassaridae												
Nassarius arcularius	x	x	x	x	x	xx	xx	—	—	—	xx	x
N. fidus	—	—	—	—	—	x	—	—	—	—	x	—
N. gemmulatus	—	—	—	—	—	x	—	—	—	—	—	—
Family Fasciolariidae												
Fasciolaria filamentosa	—	—	—	—	—	x	—	—	—	—	—	—
Family Olividae												
Oliva erythrostoma	—	—	—	—	—	x	—	—	—	—	—	—
O. nobilis	x	—	—	—	—	x	—	—	—	—	—	—
Family Mitridae												
Vexillum exasperatum	—	—	—	—	—	X	—	—	—	—	—	—
Mitra mitra	X	X	X	—	—	X	—	—	—	—	—	—
Family Visidae												
Vasum ceramicum	X	X	X	X	X	X	X	—	X	—	X	—
V. turbinellum	X	X	X	X	X	X	X	—	X	—	X	—
Family Conidae												
Comus arenatus	—	X	—	—	—	X	X	X	X	XX	—	X
C. capitaneus	—	—	—	—	—	X	—	XX	XX	XX	—	XX
C. chaldeus	X	—	—	—	—	X	—	—	—	—	—	—
C. cinereus	—	—	—	—	—	X	—	—	—	—	—	—
C. coronatus	—	—	—	—	—	X	—	—	—	—	—	—
C. distans	X	—	—	—	—	X	—	—	—	—	—	—
C. ebraeus	X	—	—	—	—	X	—	—	—	X	—	—
C. eburneus	—	—	—	—	—	X	—	XX	XX	XX	X	XX
C. flavidus	X	X	X	—	X	—	—	—	—	—	—	—
C. geographus	—	—	—	—	—	X	—	—	—	—	—	—
C. glans	—	—	—	—	—	—	—	—	—	X	—	X

Family & Species	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
C. gubernator	X	X	—	X	—	X	—	—	—	—	—	—
C. imperialis	—	—	—	—	—	X	—	—	—	—	—	—
C. leopardus	XX	X	X	X	X	XX	XX	XX	X	X	XX	X
C. litteratus	X	X	X	X	—	XX	XX	—	—	—	—	—
C. lividus	—	X	—	—	—	X	—	—	—	X	—	—
C. miles	—	—	—	—	—	—	—	—	—	X	—	—
C. monile	—	—	X	X	X	—	—	—	—	X	—	—
C. mustelinus	—	—	—	—	—	x	—	—	x	—	—	x
C. tessulatus	—	—	—	—	—	x	—	—	—	—	—	—
C. textile	x	x	—	—	—	x	—	—	—	—	—	—
C. vexillum	—	—	x	x	—	x	—	—	—	—	—	—
C. vitulinus	—	—	—	—	—	—	—	—	—	x	—	—
C. zonatus	—	x	—	x	x	x	—	x	xx	x	—	xx
Family Terebridae												
Terebra affinis	x	—	x	—	—	x	x	—	—	—	—	—
T. areolata	—	—	—	—	—	x	x	—	—	—	—	—
T. cerethina	x	x	x	—	—	x	x	—	—	—	—	—
T. dimidiata	—	—	—	—	—	x	x	—	—	—	—	—
T. maculata	x	—	x	—	—	x	x	—	x	x	x	x
T. subulata	x	—	x	—	—	x	—	—	—	—	—	x
T. crenulata												
Family Bulliade												
Bulla ampulla	x	—	—	—	—	x	x	—	—	—	x	x
Bivalvia												
Family Arciadae												
Arca complanata	x	—	—	—	—	xx	—	—	—	x	x	x
Family Mytilidae												
Brachiodontus modiolus	—	—	—	—	—	—	—	xx	x	x	—	xx
Lithophaga nigra	x	—	—	—	—	x	x	—	x	x	x	x

Family & Species	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
L. gracilis	x	—	—	—	—	x	—	—	-	—	—	—
Modiolus metcalfei	—	—	—	—	—	-	—	—	—	x	—	—
M. tulipa	x	—	—	—	xx	xx	—	—	—	—	—	—
Family Pteriidae												
Pinctada sugillata	—	x	x	x	x	xx	xx	—	x	x	x	x
Family Pectinidae												
Pecten sp.	x	—	—	—	—	x	—	—	—	—	—	—
Family Spondylidae												
Spondylus layardi	x	—	—	—	—	x	—	—	—	—	x	—
Family Ostreidae												
Saccostrea cucullata	—	—	xx	xx	xx	xx	xx	xx	xx	xx	xx	xx
Family Lucinidae												
Lucina nassula	xxx	—	—	—	—	—	—	—	—	—	—	—
Codakia orbicularis	—	x	x	—	—	—	—	—	—	—	—	
Codakia punctata	x	—	—	—	—	—	—	—	—	—	—	—
Divaricella dentata	xxx	—	xx	—	—	—	—	—	—	—	—	—
Family Chamidae												
Chama sp.	x	—	—	—	—	x	—	—	—	x	x	—
Family Tridacnidae												
Tridacna maxima	xxx	xx	xx	xx	—	xx	x	xx	xx	xx	x	xx
T. squamosa	—	—	—	—	—	x	x	—	x	—	x	x
Family Mactridae												
Mactra cuneata	—	—	—	—	—	—	—	—	x	—	—	—
Femily Mesodsmalidae												
Mesodesma sp.	xx	xxx	xxx	xx	—	xxx	xx	x	x	x	xx	x
Family Tellinidae												
Tellina radiata	—	x	—	—	—	—	—	—	—	—	—	—
T. idae	—	x	x	—	—	—	—	—	—	—	—	—
Family Donacidae												
Donax faba	—	—	—	—	—	x	—	—	—	—	—	—

Family & Species	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Family Venaridae												
Asaphis deflorata	—	—	—	x	—	—	—	—	—	—	—	—
Venus reticulata	—	—	—	—	—	—	—	—	x	—	—	—
Tapes philippinarum	—	—	—	—	—	—	—	—	x	—	—	—
Family Petricolidae												
Petricola divergens	x	—	—	—	—	—	—	—	—	—	—	—
Family Gastrochaena												
Gastrochaena giqantea	x	—	—	—	—	x	—	—	—	—	x	—
Family Pholadidae												
Martesia sp.	—	—	—	—	—	x	x	x	—	—	x	—
Family Teredinidae												
Teredo sp.	—	—	—	—	—	x	—	—	—	—	x	—
Cephalopoda												
Family Loliginidae												
Sepioteuthis lessoniana	—	—	x	x	—	—	—	—	—	—	x	—
Family Octopodidae												
Octopus cyaneus	—	—	—	—	x	x	x	x	x	x	x	x
O. membranaceus	xx	—	—	—	—	xx	xx	x	x	x	xx	xx
O. vulgaris	xx	x	x	xx	—	xx	xx	xx	xx	x	xx	xx

— = Nil, X = rare, XX = Common, XXX = Abundant.

TABLE 2 *Octopus production (kg) in Lakshadweep Islands*

Island	1981	1982	1983	1984	1985	Average
Kadmat	5499	7917	3401	2680	1970	4294
Agatti	1325	5637	954	2421	2158	2499
Kalpeni	1365	1803	1412	2309	2662	1911
Kavaratti	1135	2830	850	998	1917	1547
Amini	3245	829	1469	1377	200	1424
Androth	894	970	2312	757	390	1065
Chetlat	480	1124	704	918	611	767
Kiltan	194	325	807	745	971	607
Bitra	108	555	200	999	216	416
Minicoy	25	30	12	165	—	46
Total	14,270	22,020	12,121	13,369	11,121	14,576

the predators of Octopus and often Octopus caught were not having all their arms intact due to eel attack.

Octopus locally known as 'appal' are considered as a delicacy in most of the islands and usually consumed fresh. The meat is also sundried (Fig I C) and is kept for longer periods especially by the fishermen of Agathi. The fresh meat is used as bait for the hooks and line and trolling. Island-wise occurrence of Octopus has shown that Kadamat ranks first in abundance and *Octopus vulgaris* and *O cyaneus* are usually caught from this island. At Agatti, all the three species were found to occur, of which *O. vulgaris* ranks first in abundance. The areas where Octopus fishing is done are marked in the map. One specimen of *O. cyaneus* measuring 75 mm in dorsal mantle length (DML) with 650 g weight and *O. membranaceus* measuring 70 mm in DML with 500 g were caught from the reef crest in the eastern side of Agathi. From Kalpeni specimens of *C. cyaneus* of 50 mm to 55 mm DML were collected. From Kavaratti *O. vulgaris* with 70-165 mm DML with weight ranging from 0.2 to 1.4 kg were collected during the survey. From Suheli paar live materials could not be

TABLE III *Quarterwise Octopus Production (kg) In Lakshadweep Islands*
(Averages for 1981-1985)

Island	I Q	II Q	III Q	IV Q	Total	% contribution to total production
Kadmat	1442	1219	897	736	4294	29
Agatti	723	465	479	832	2499	17
Kalpeni	496	354	451	610	1911	13
Kavaratti	437	214	382	514	1547	11
Amini	354	417	248	405	1424	10
Androth	205	233	172	287	1064	7
Chelat	230	143	223	172	768	5
Kiltan	189	65	111	242	607	4
Bitra	156	63	71	126	416	3
Minicoy	—	1	37	8	46	1
Total	4232	3174	3238	3932	14576	

collected but dried specimens of *O. vulgaris* were available with the islanders. At Androth *O. cyaneus* was found abundant and is caught in good numbers by the fishermen. At Minicoy there is no active fishing for Octopus, but *O. vulgaris* and *membranaceus* were found to occur in the reef flat. In general, Octopus weighing 0.5 kg to 3.5 kg are usually caught by the fishermen from all these islands for consumption.

Kadmat Island ranks first in the Octopus production followed by Agatti Kalpeni, and Amini. The average production for 5 years from 1981 to 1985 in each island is given in Table 2. The total production ranged from 11 to 22 t/year with maximum during 1982. The average total production was 14.6 t and the maximum share given by Chetlat (4.29 t). Quarter-wise analysis (Table 3) shows that January to March period contribute 29% of catch followed by October--December (27%) and the other two quarters contribute 22% each. The production rate shows a declining tendency from 1983 onwards and the lowest (11 t) was observed in 1985. Island-wise contribution of catch is as follows: Kadmat

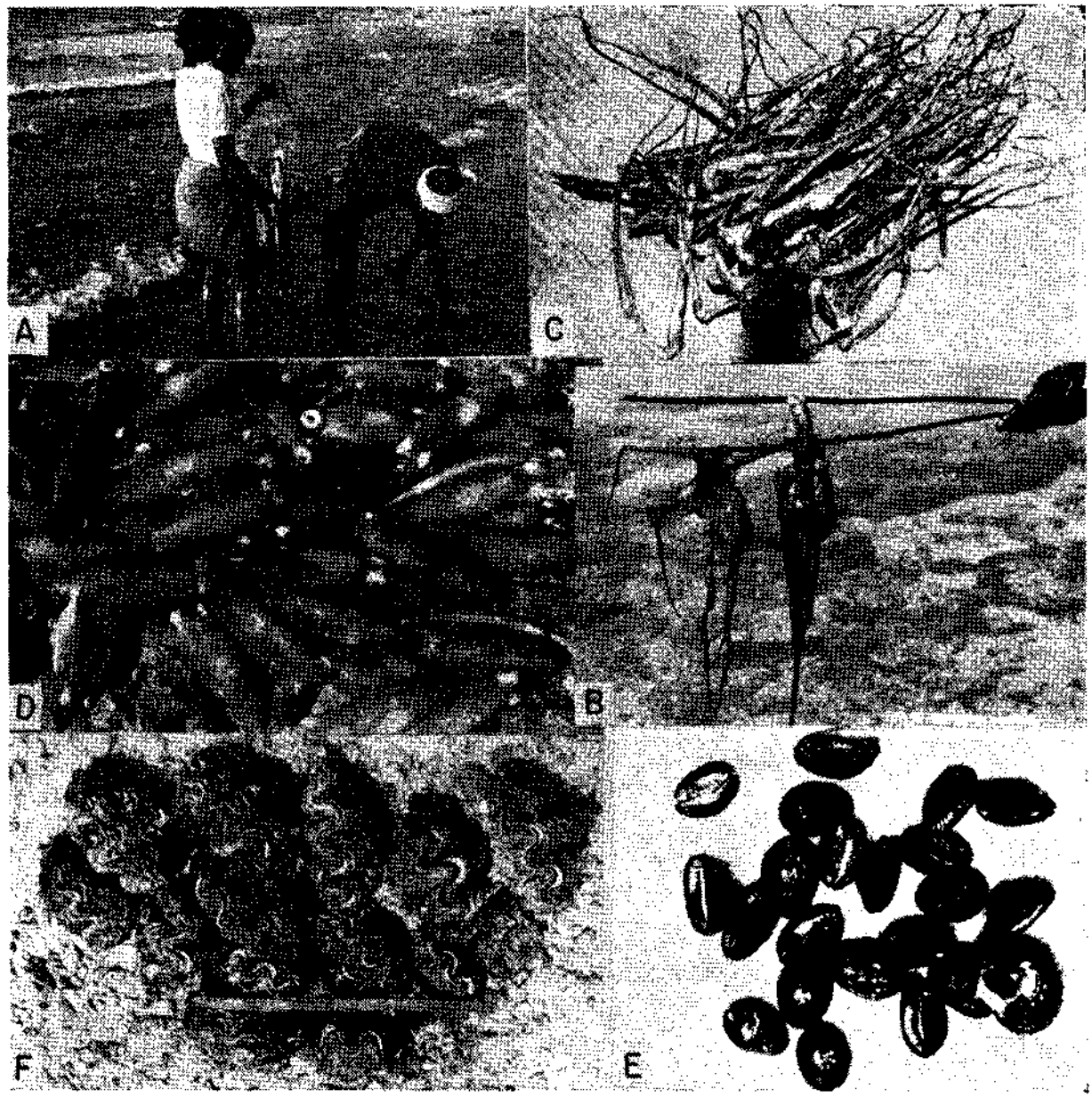


Fig. 1. A. Octopus being caught from the reef crest ; B. Octopus fishing gear - M S. rod with sharp bended end and octopus caught by this iron rod; C. Dried Octopus; D. *Sepeofeuthis lessoniana* caught from Bitra lagoon; E. *Cyprea caputserpentis* Snakehead cowry- F. *Tridacna maxima*.

29%, Agatti 17%, Kalpeni 13%, Kavaratti 11%, Amini 10% and all other islands together 20% of the total production. Good catches were obtained at Kadmat during the first two quarters and at Agatti, Kalpeni and Kavaratti first and the last quarters of the year are good.

2. *Sepioteuthis lessoniana* (*Palk Bay Squid*)

This squid was found in small shoals inside the lagoons of Kavaratti, Kalpeni and Bitra (Fig. I D). From Kalpeni about 50 numbers of squid with 90-180 mm DML were caught in drag net during March 1987. At Bitra 150 numbers of specimens ranging from 90-150 mm DML weighing 50-180 g were collected by drag net from the western side of the island in the lagoon area near the harbour jetty during February, 1987. Though squids are not being exploited from these islands, the very presence of this species is quite interesting since they are reported early from Vizhinjam and Veraval only in the west coast. The occurrence of this species in Lakshadweep indicate the distribution of the species to a wider area along the west coast of India.

The cuttle bones of *Sepia pharonis* and *S. aculeata*, ranging from 180-300 mm length were found washed ashore along the sandy shores of Androth, Agatti, Bengaram and Bitra indicating the presence of cuttlefishes in the nearby waters of Lakshadweep.

GASTROPODS

1. *Cowries*

Cyprea caputserpentis (Fig. I E), *C. moneta* and *C. tigris* are the important species of cowries exploited in a sustenance level for trade. Along with Octopus fishing, cowries are also collected by the island fishermen throughout the year with a peak from September to December and a lean season during southwest monsoon. Men, women and children go for cowry picking during low tide in the reef crest and usually go as a group in hired canoes and do the collection for 2-3 hours every day especially during days when there is good low tide, mostly 6-8 days every month The shells are collected from underneath the coral stones in the lagoon and reef crest. A Suheli Par the method of fishing involved, depositing coconut leaves in the lagoon water for few days, where the *Cyprea moneta* used to aggreate and attach to leaves. In reef area fishermen collect *C. caputserpentis* and *C. tigris* by diving. The shells collected by the fishermen everyday is deposited in closed cement tanks or sand pits for disintegration of body parts. After 10-15 days shells are cleaned and sold to the merchants.

Active fishing for cowries are noted at Agatti, Bangaram, Chetlat, Valiapanium, Thinnakara and Suheli Par At Agatti 30-40 persons are actively engaged in cowry picking during peak season, apart from the part time collection by women and children. At Bangaram fishermen from Agatti go usually and collect cowries during low tide. At Suheli Par there was once a flourishing fishery for *C. moneta*. But during the present survey, only few specimens were collected from this area. From enquiry it is understood that 3000-4000 numbers of *C. caputserpentis* per month for atleast 4 months every year and 24000-35000 numbers per month of *C. moneta* and 50-75 numbers per month of *C. tigris* are collected from Agatti-Bengram area. The estimated production of *C. moneta* varies from 5-7 lakh/year and *C. caputserpentis* 2-3 lakhs/year. The price of the first species ranges from Rs. 25-30/kg and for the latter Rs. 30-35/100 numbers. *C. tigris* which is fairly big is sold for Rs. 2-3/shell. The cowries collected by the merchants are taken to Mangalore and sold at higher value. Enquiry with local merchants reveal that bulk of the cowries taken to Mangalore come from Agatti-Bengaram area followed by Chetlat. Northeast side of Agatti and southwest side of Bangaram are potentially good areas for serpenthead cowry, *C. caputserpentis* and money cowry, *C. moneta*.

2. *Edible gastropods*

During the present survey it was found that meat of *Strombus* sp. and *Nerita plicata* are extracted for edible pupose at Kalpeni. These gastropods are found occurring in the reef crest, intertidal area and lagoons of all the islands surveyed. *Strombus* sp. was found to occur in 2-3/m^2 in a area of 200x200 m at Kalpeni lagoon *Nerita plicat* was found 5 numbers/m^2 in the reef crest, whereas at Agatti and Bitra reef crest the concentration was 10-15 numbers/m^2.

3. *Ornamental gastropods*

A variety of large shells especially Cone shells, cowries, spider conchs, scorpion shells, trumpet shells, Murex shells, top shells and helmet shells, are available in the reef crests of the islands surveyed. 24 cone shells were found to occur in various islands and among them *Conus leopardus* and C. *litteratus* are common in most of the islands. These shells reache 10-14 cm in size. Out of the 13 species of cowries recorded, 2 forms sustenance fishery and 2 species of larger cowries *viz.* *Cyprea tigris* and *Cyprea arabica* are also collected for ornamental purposes. Three species of Spider conchs, *Lambis lambis*, *L. truneata* and *L. chiragra* are recorded from the reef crests and lagoons of various islands. *L. truncata* was found to aggregate in good numbers at Minicoy. Larger shells of *L. lambis* and *L. truncata* are abundant in Minicoy, Agatti Bengaram, Bitra, Kadmat, Kalpeni and Suheli Par. *Cassis cornuata* and *Cyprea rufa* are two rare and beautiful shells found in the reefs of Minicoy, Agatti, Kalpeni and Amini. Trumpet shell, *Chaonia tritonis* is also very rare and found to occur in Agatti, Amini and Chetlat. This is used for blowing in mosques. Among top shells, *Trochus pyramis* reaches larger size and has got a thick nacreous layer, which is similar to *Trochus niloticus*. found in Andaman and Nicobar Islands. Murex shells and olive shells were also found rarely in few islands. Among all these shells, none of them was found to occur in a commercially exploitable quantity.

BIVALVES

1. *Edible bivalves.*

Mytilid bivalve *Modiolus tulipa* found in the reef flats of few islands are considered as edible and known locally as 'Kallumaikai'. This is recorded from Minicoy, Androth and Agatti. The density of population at Androth was 15 numbers/m^2 and at Agathi 5 numbers/m^2. From enquiry with fishermen it was understood that in the lagoon side there were good settlement of this species at Minicoy in certain years. During lean fishing season *Modiolus* is collected and then boiled meat is extracted and eaten by the islanders. The size of *Modiolus* collected ranged from 16-40. 4 mm. *Mesodesma* sp. a venerid bivalve, which is also considered as edible is widely distributed in the islands surveyed. The density of population observed at Minicoy was 20 numbers/m^2, at Suheli Par 2 numbers/m^2, at Kalpeni 100 numbers/m^2, at Agatti 32-205 numbers/m^2, at Bangaram 5-15 numbers/m^2 and 10-35 numbers/m^2 at Bitra. The size of this bivalve collected ranged from 6-33.9 mm. Another bivalve found in good concentration was *Tellina idea* in the lagoon of Kalpeni Islands. The denisty was 40 numbers/m^2. It is understood that during lean period local fishermen consume the meat of this bivalve. The size ranged from 44.3-67.2 mm. At Minicoy and Kalpeni lagoon *Lucina nassula* was found at a density of 100-1000 numbers/m^2 with a size range of 3.85-12.24 mm. Though this is not being consumed, the concentration of this species in the lagoon is quite interesting. *Donax faba*, a wedge clam known as an edible bivalve was found along with *Mesodesma* sp at Agati with a size range of 19-27.4 mm. The density was 2 3 numbers/m_2 *Saccostrea cucullata* the common rock oyster was found to occur in all the islands in the concrete pilings and other harbour structures in the intertidal areas. *Tridacna maxima* Fig. 1F and T. *squamosa* were found in good numbers in the reef crests of all the islands, the former species being abundant. The density veries from 1-10 numbers/ 100 m^2. Though all these species were found to occur in various density, there was no possibility of large-scale exploitation of them from any of the islands.

2. *Pearl oysters*

The occurrence of pearl oyster *Pinctada sugillata* spat in good numbers in 10 islands surveyed indicate the possibilities of farming pearl oysters in Lakshadweep for commercial pearl production. Already preliminary experiments are being done by the Fisheries Department in this line. The spat collected during the present survey ranged from 6.2-28.6mm with a density ranging from 1-50 numbers/100m^2. This was often found attached to dead coral colonies and over the *Tridcana* shells, which are common in the lagoon and reef crest.

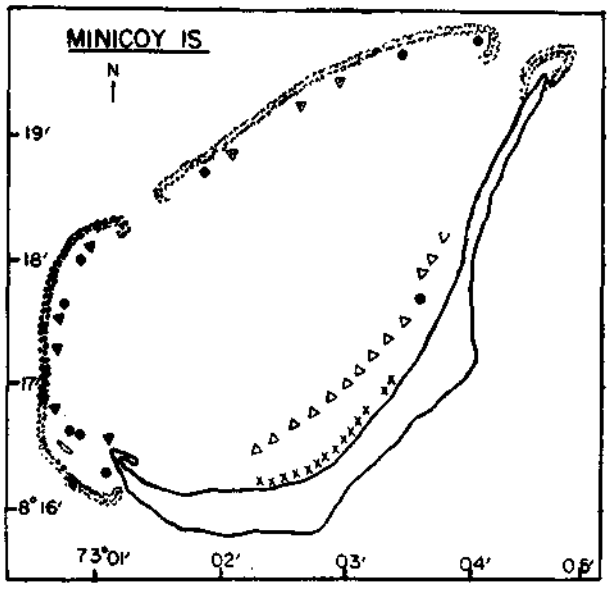
3. *Boaring bivalves*:

Teredo sp., *Lithophaga* spp, *Gastrochaena* sp., *Petricola* sp and *Martesi* a sp. were the common wood and coral boring bivalves recorded during the present survey. They cause

considerable amount of destruction to the harbour timber structures and also to the corals in the reefs, by boring deep into them and creating burrows.

DISTRIBUTION OF MOLLUSCS IN VARIOUS ISLANDS

Table I shows the abundance of gastropods, bivalves and cephalopods in 12 islands surveyed. Out of the 141 molluscs collected at present from these islands, 108 numbers were gastropods, 28 bivalves and 4 cephalopods. It is quite evident that gastropods rank first in the number of species and the analysis of occurrence indicate that gastropods are more abundant in all the islands. The distribution of molluscs is indicated by abundant (XXX), Common (XX), rare (X) and absent (—). The areas where the commercially important molluscs occur are marked in the maps (Figs. 2-13). The maximum number of molluscs collected were from Agatti followed by Minicoy, Chetlat and Kiltan. The maximum number of species was found in reef crests of various islands. The dead and live corala afford an excellent habitat for a variety of gastropods viz., Trochidae, Neritidae, Littorinidae, Cerithidae, Cypracidae Cassididae, Muricidae, Buccinidae, Pyremidae, Conidae,



X - *Mesodesma* sp.; O - Cowries; △-Ornamental molluscs, ● - *Tridacna* spp.; ⊙-*Sepioteuthis lessoniana*; ◎- *Modiolus tulipa*; □-*Tellina idae*; ⊗-Octopuses; ▲- Pearl oyster, *Pinctada sugillata*; △-*Lucina nassula*

Fig. 2. Distribution pattern of commercially important molluscs at Minicoy.

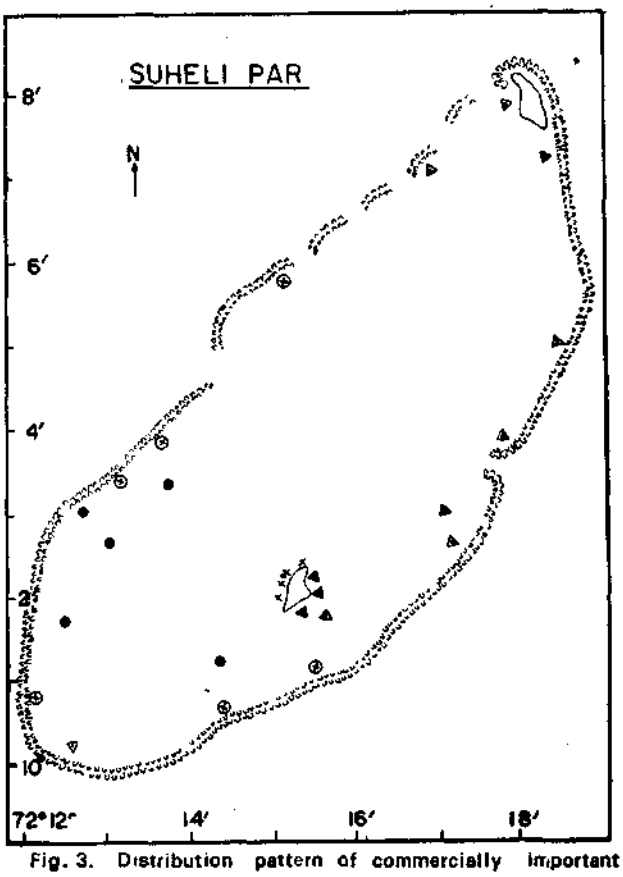


Fig. 3. Distribution pattern of commercially important molluscs at Suheli Par.

Arcidae, Mytilidae, Pteridae, Spondylidae, Tridacnidae, Petricolidae and Octopodidae. From the lagoon area, species belonging to Cerithidae, Strombidae, Cypracidae, Muricidae, Nassaridae, Olividae, Mitridae, Conidae, Teribridae, Pteridae, Lucinidae, Tridacnidae and Tellinidae were collected. In the intertidal sandy area *Mesodesma* sp was very common; in the rocky area members of Neritidae, Littorinidae and Ostracidae were present in good numbers.

DISCUSSION

Present survey has revealed that except Octopus and cowry fishing, there is no attempt for exploitation of molluscan resources from Lakshadweep. The observation on the occurrence and abundance of molluscs also indicate that large-scale exploitation of any of the commercially important species from this area is remote. The presence of pearl oyster spat (*Pinctada sugillata*) in the reef and lagoon of few islands and the successful rearing of *Pinctada fucata* in the lagoon of Bangaram and Agatti brought from Tuticorin indicate possibilities of initiating pearl oyster farming at Lakshadweep for taking

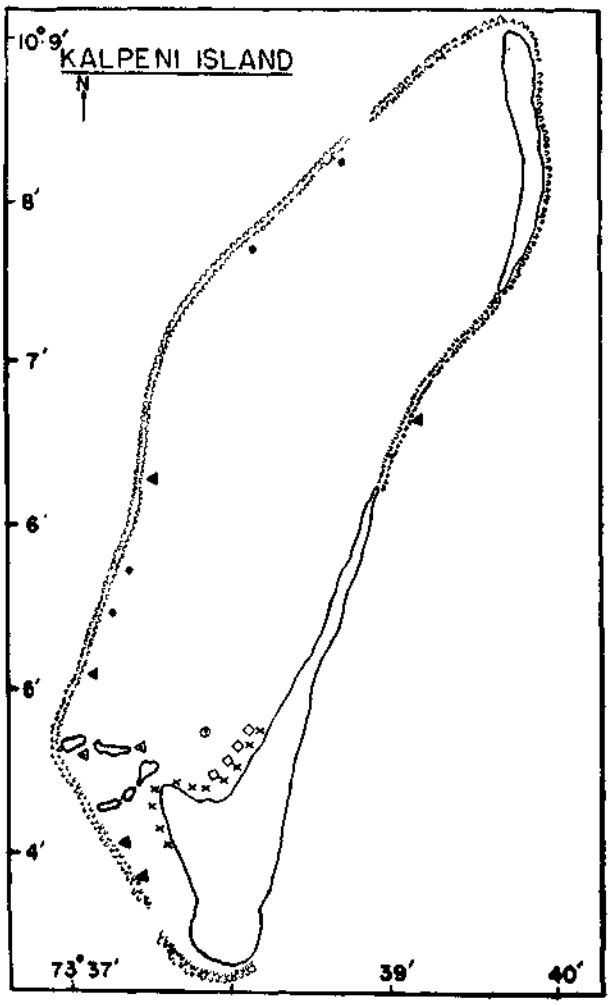


Fig. 4. Distribution pattern of commercially important molluscs at Kalpeni.

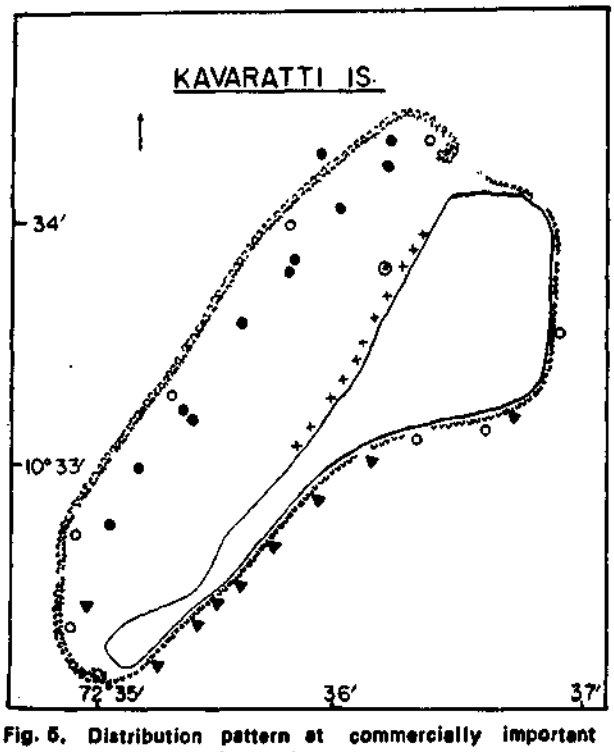


Fig. 5. Distribution pattern at commercially important molluscs at Kavaratti.

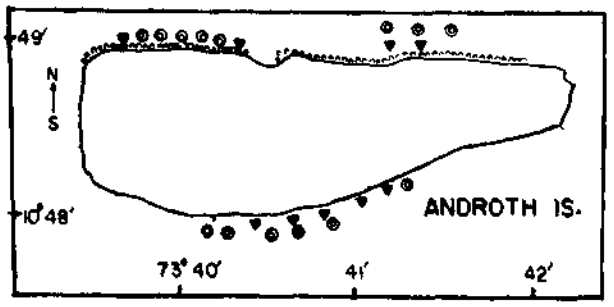


Fig. 6. Distribution pattern of commercially important molluscs at Androth.

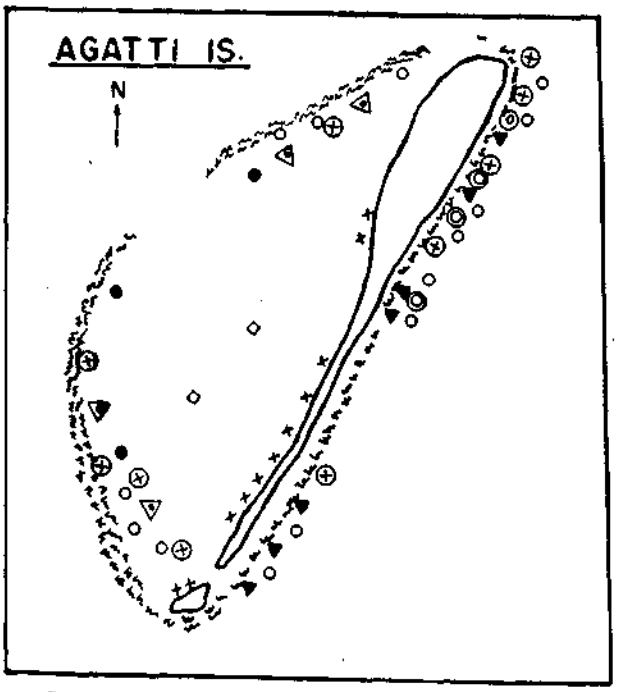


Fig. 7. Distribution pattern of commercially important molluscs at Agatti.

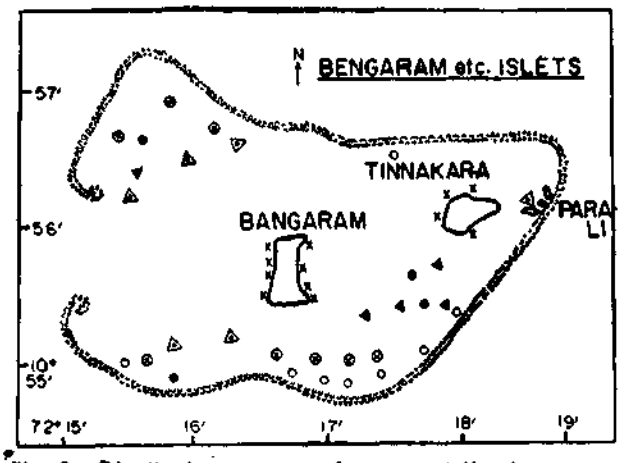


Fig. 8. Distribution pattern of commercially important molluscs at Bangaram, Tinnakara and Perali.

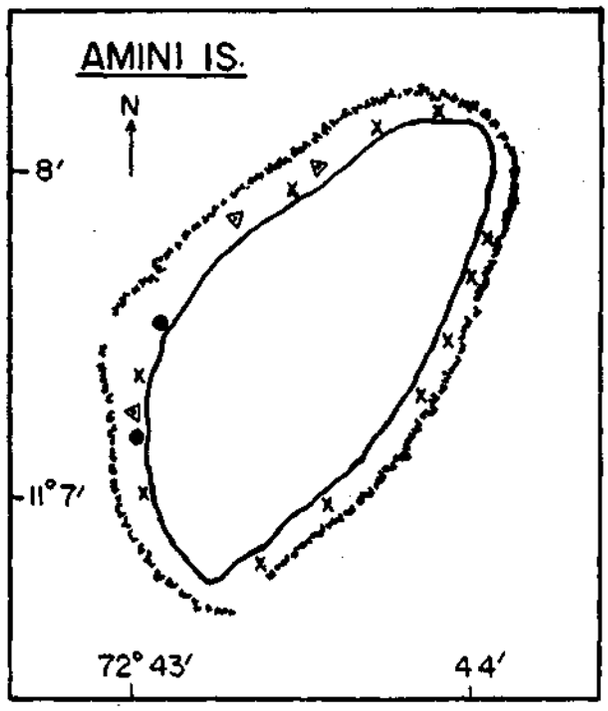


Fig. 9. Distribution pattern of commercially important molluscs at Amini.

up pearl culture. However, more serious efforts to conduct experiments on farming and raising a good stock of oysters is felt necessary to take up pearl culture at Lakshadweep especially in islands with larger lagoons like Bitra, Bangaram Agatti, Kalpeni and Minicoy. As *Modiolus tulipa* an allied species of mussel belonging to Mytilid is found in few islands, attempts to replant the spat of green mussel can be taken up in an experimental basis for initiating mussel farming in Lakshadweep. Female of *Octopus vulgaris* is known to produce 12,000 to 40,000 eggs. This species commands a good price in Japan market for fresh and dried meat. This is known to reach 1 kg in just 4 months and the maximum weight observed is 10 kg. *O. vulgaris* and *O. cyaneus* are found to occur in few islands of Lakshadweep and forms a sustenance fishery. As there is demand for fresh, frozen and dried and salted octopus meat, an attempt for octopus culture can be taken up to increase production. Silas (1985) has indicated that the availability of spawners and eggs of cephalopods in inshore waters, the rapid growth and short generation period and hardiness are some of the factors in favour of mariculture of cephalopods. Sea ranching programmes to increase the production of ornamental molluscs can also be done in selected islands. Smith (1906) recorded 87 molluscs from Minicoy, Appukuttan (1983) recorded 9 coral boring and Nair and bivalves Dharmaraj (1983) 19 woop boring bivalves from Lakshadweep. Many of the molluscs reported in the present paper are for the first reported time from Lakshadweep. As such there is not much variation in the molluscan fauna of various islands in Lakshadweep and the faunastic composition is almost similar to those seen in the southeast coast of India, especially the islands in the Gulf of mannar (Satyamurti, 1952). It is felt that more details on breeding behaviour of commercially important molluscs of the islands are to be collected for rational exploitation of molluscan resources.

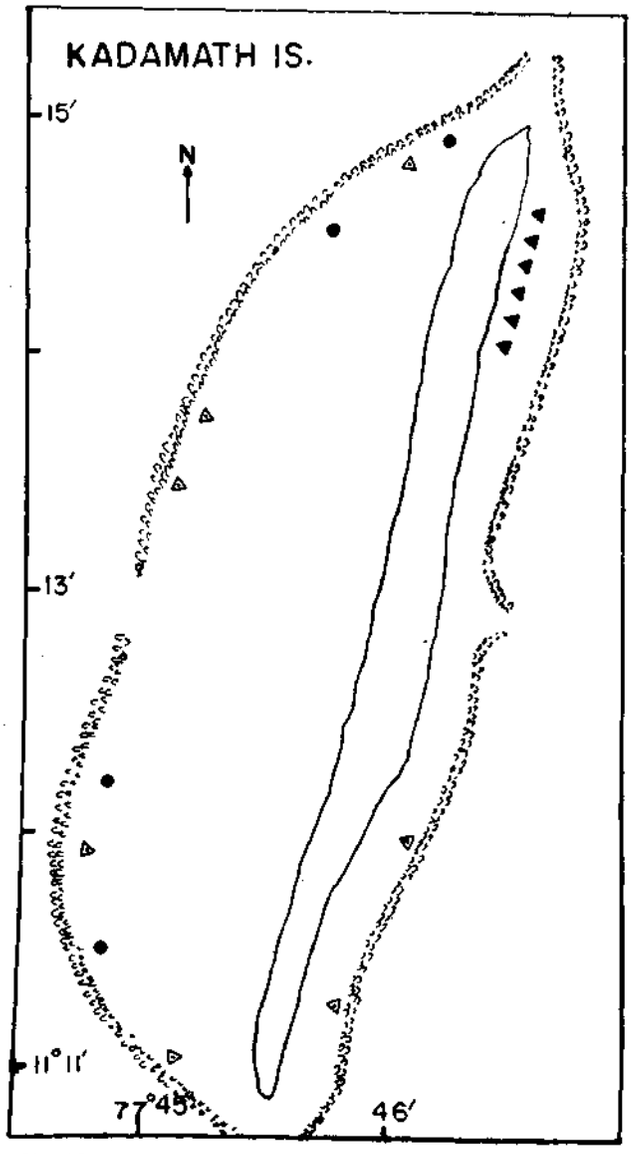


Fig. 10. Distribution pattern of commercially important molluscs at Kadmat.

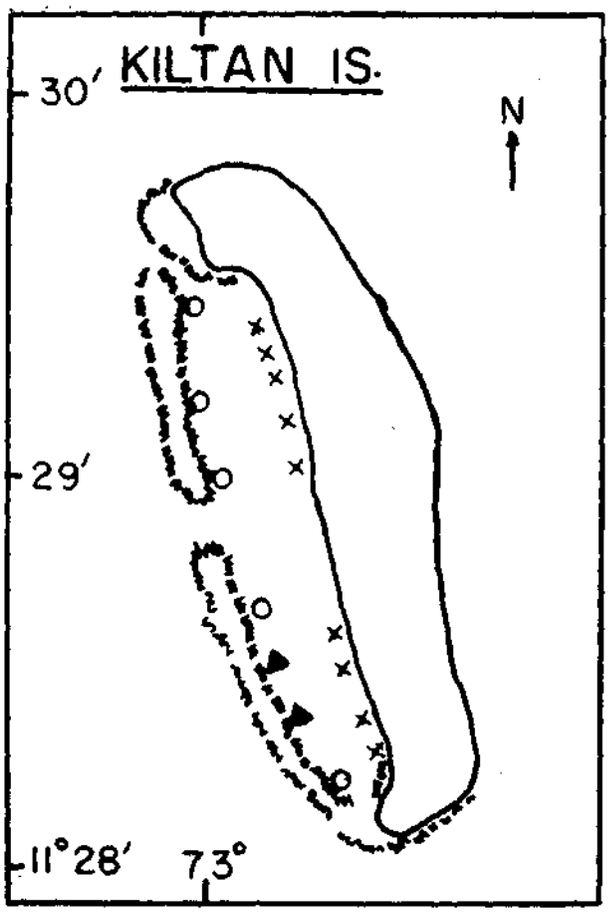


Fig. 11. Distribution pattern of commercially important molluscs at Kiltan.

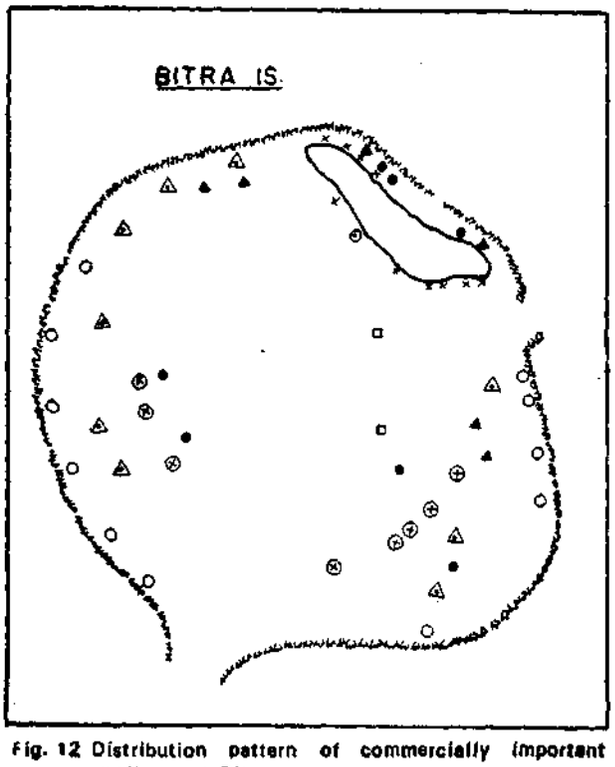


Fig. 12 Distribution pattern of commercially important molluscs at Bitra.

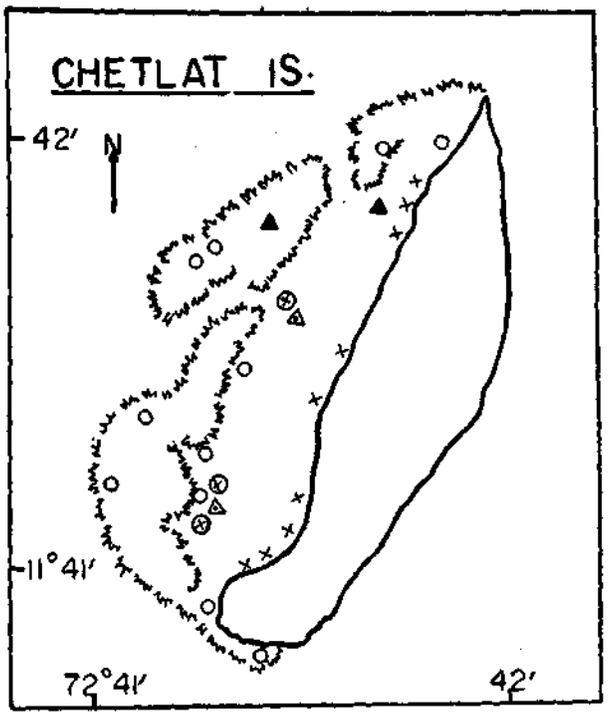


Fig. 13. Distribution pattern of commercially important molluscs at Chetlat.

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