ISSN 0254-380 X

भाकृ अनुप
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समुद्री मात्स्यिकी सूचना सेवा
MARINE FISHERIES INFORMATION SERVICE

No. 145 NOVEMBER, DECEMBER 1996

तकनीकी एवं विस्तार अंकावली
TECHNICAL AND EXTENSION SERIES

केन्द्रीय समुद्री मात्स्यिकी अनुसंधान संस्थान कोचिन, भारत
CENTRAL MARINE FISHERIES RESEARCH INSTITUTE COCHIN, INDIA

भारतीय कृषि अनुसंधान परिषद
INDIAN COUNCIL OF AGRICULTURAL RESEARCH

DISTRIBUTION AND EXPLOITATION OF OYSTER RESOURCES ALONG THE SOUTHEAST AND SOUTHWEST COASTS OF INDIA*

The oysters are sedentary bivalve molluscs which are gregarious and found in aggregates attached by their right shell valve to hard substrata, forming oyster beds or oyster banks in varied environments, intertidal and subtidal zones in shallow coastal waters, bays, creeks, lagoons, backwaters and estuarine environment. In India, natural stocks of oysters are exploited on a small scale at a number of places as a subsistence fishery and oysters are not cultured commercially. Among cultivable molluscs along the Indian coasts, oysters are of considerable importance as there are very good possibilities of the culture of this highly nutritious shellfish. Recognising the large scope for augmenting oyster production by farming, the Central Marine Fisheries Research Institute carried out intensive studies on the biology, ecology and culture techniques of the oyster, *Crassostrea madrasensis* which is distributed along the east and southwest coasts and developed low cost methods for the culture of the species. The Institute made yet another major breakthrough by evolving hatchery techniques for large scale production of seed of *C. madrasensis*. For planning oyster farming in India, a knowledge of the magnitude of natural oyster resources including seed availability is an essential prerequisite. The Central Marine Fisheries Research Institute has taken up research programme on these aspects and a survey was conducted on the natural oyster resources in (1) Tamil Nadu, (2) Pondicherry, (3) Andhra Pradesh and (4) Kerala during 1987-'90 using the Mobile Laboratory facility of the Institute.

1. TAMIL NADU

Pulicat Lake

Oysters are an important molluscan resource in Pulicat Lake, the second largest coastal lake in India, with an area of 461 sq. km. Large oyster beds were located in the Lake at a distance of 4 km from the mouth (Fig. 1). The oysters were found in heaps in the bed area projecting one metre high from the bottom. Scattered distribution was also found in several areas on the granite stones of the sluice gates of Buckingham Canal and other underwater structures found in the lake. There are rich settlement of oysters in the southernmost region of Pulicat Lake. The oysters also occur on the walls of the road bridge at Sri Harikota and sparsely distributed in Dugarajapatnam area. The oysters are flat and long and majority of them oblong and narrow. The standing crop of oysters in the Lake has been estimated to be 10.4 t (Table 1). The size of oysters varied between 18 and 167 mm with a mean total weight and meat weight 77 and 5.3 g respectively. Along with parent oysters, spat were found in good densities of 300 - 1,500 spat/sq.m. *C. madrasensis* was in large numbers and *Saccostrea cucullata* formed about 1%. Oysters are fished from the Lake periodically for lime production and occasionally by fisherfolk and tribal people for oyster meat.

The bottom of the lake is flat, hard muddy, and free from strong wave action. The barmouth is open throughout the year and there is regular replenishment of sea water. The settling of oyster spat in good numbers and their rapid growth are the favourable factors for oyster culture in Pulicat Lake.

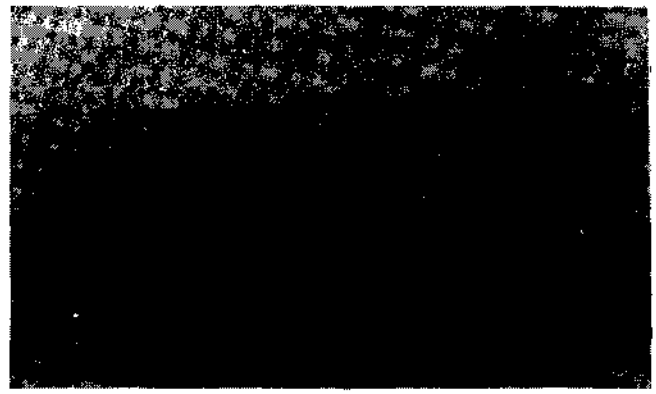

Fig. 1. The oyster, *Crassostrea madrasensis* resources of Pulicat Lake slightly exposed at low tide.

Ennore Estuary

The Ennore Estuary is rich in oyster resources (Table 1). *C. madrasensis* was found distributed to a distance of about 0.5 km from the mouth of the Ennore estuary. The oyster beds were found in patches near Ennorekuppam village. Large continuous beds were observed for a distance of 1 km, stretching to about 500 m

*This work was carried out by K.S. Rao, P.V. Sreenivasan, P. Muthiah, R. Sarvesan, P. Natarajan, M.E. Rajapandian, C.T. Rajan, R. Thangavelu, D. Sundararajan and P. Poovannan, Central Marine Fisheries Research Institute, Cochin - 682 014.

TABLE 1. *Environmental parameters and oyster resources of coastal water bodies of Tamil Nadu and Pondicherry*

Name of the water body	Date of survey	Depth (m)	Nature of substratum	Environmental parameters				Oyster resources	
				Turbidity	Salinity (ppt)	Temp. (°C)	Dissolved Oxygen (ml/l)	Total area of beds (ha)	Total stock (t)
Pulicat Lake	15 Mar. '90	0.3	Hard-muddy	Less	34.00	31.0	4.30	10.3	10.4
Ennore Estuary	15 Mar. '90	2.5	Hard-muddy	High	31.00	29.5	3.91	45.8	14379.0
Adayar Estuary	11 Aug. '88	0.5	Muddy	High	38.00	33.0	1.14	NA	NA
Kovalam backwater	11 Aug. '88	1.0	Hard-muddy	Less	31.00	34.0	4.14	3.1	4.2
Edayar backwater	09 Aug. '88	2.1	Hard-muddy	High	36.00	32.0	4.24	2.0	3.5
Alambaru Estuary	08 Aug. '88	0.5	Hard-muddy	Moderate	46.00	31.0	5.10	11.0	715.0
Chunnambaru Estuary	06 Aug. '88	2.0	Muddy	Less	39.40	31.2	3.00	54.4	2219.6
Pennaiyar Estuary	06 Sep. '88	1.0	Sandy-muddy	Less	42.84	31.7	2.91	NA	NA
Gadilam Estuary	05 Sep. '88	3.5	Sandy-muddy	High	31.00	32.0	2.07	8.9	29.5
Uppanar Estuary	05 Sep. '88	3.0	Sandy-muddy	High	28.16	31.5	3.18	9.0	64.1
Vellayar Estuary	07 Sep. '88	2.0	Sandy-muddy	High	28.13	31.2	3.34	50.1	456.9
Coleroon Estuary	08 Sep. '88	4.0	Muddy	High	26.05	30.6	2.94	30.5	391.5
Uppanar Estuary	09 Sep. '88	3.0	Sandy	High	34.20	30.2	2.81	3.3	8.0
Vellayar Estuary	09 Sep. '88	2.0	Sandy-muddy	High	32.60	29.8	3.25	2.4	5.0
Vettar Estuary	09 Sep. '88	2.5	Sandy-muddy	High	13.20	30.4	3.42	1.4	2.6
Poravidayam Estuary	09 Sep. '88	2.5	Sandy-muddy	High	17.70	30.2	3.38	NA	NA
Uppanar Estuary	09 Sep. '88	3.5	Sandy-muddy	High	32.15	30.7	3.45	6.4	75.0
Transquebar	07 Oct. '88	5.0	Muddy-sandy	High	22.06	30.5	5.80	0.6	25.6
Ammanar Estuary	07 Oct. '88	1.5	Sandy-muddy	High	21.75	31.5	5.60	live oysters	nil
Arasalar Estuary	08 Oct. '88	4.0	Muddy-sandy	High	17.02	28.5	3.88	live oysters	nil
Thirumullai Rajanar	09 Oct. '88	1.5	Muddy-sandy	High	15.92	27.0	3.97	live oysters	nil
Thammaperumal Estuary	05 Feb. '89	5.0	Muddy	High	16.45	28.9	4.10	live oysters	nil
Periyar Estuary	05 Feb. '89	3.0	Sandy-muddy	High	38.80	25.5	3.96	live oysters	nil
Pasipattinam	05 Feb. '89	2.0	Muddy-sandy	High	29.40	28.5	9.20	oysters	nil
Manimutharu	06 Feb. '89	0.5	Muddy	High	NA	NA	NA	oysters	nil
Chittaru Estuary	06 Feb. '89	1.0	Muddy	High	NA	NA	NA	NA	NA
Agniaar	09 Feb. '89	2.0	Muddy	High	39.90	27.0	4.82	population	sparse
Varikkal	08 Feb. '89	1.0	Muddy	High	37.80	26.0	6.51	population	sparse
Pambaru Estuary	07 Feb. '89	2.0	Sandy	High	37.80	27.5	4.36	oysters	nil
Athankarai Estuary	10 Feb. '89	4.0	Sandy-muddy	High	32.50	28.5	5.29	1.7	380.8
Kanjirangudi Estuary	25 Jul. '90	2.0	Muddy	High	33.26	31.0	4.25	0.2	3.0
Kallar Estuary	27 Jul. '90	1.0	Muddy	High	35.74	30.0	3.88	0.1	1.0
Karapad Creek	05 Sep. '90	1.0	Sandy-muddy	High	33.50	26.5	5.32	0.5	84.9
Korampallam Creek	05 Sep. '90	2.0	Muddy	High	34.00	27.0	4.31	1.1	272.0
Palayakayal Estuary	09 Aug. '90	2.0	Muddy	High	30.50	31.0	4.85	0.2	2.6
Pinnakkayal Estuary	09 Aug. '90	2.0	Muddy	High	29.20	27.0	4.54	0.6	31.4
Manapadu Estuary	28 Jul. '90	3.0	Sandy-muddy	High	31.20	29.0	4.00	NA	NA
Thengapattinam	30 Jul. '90	2.0	Sandy-muddy	High	18.60	29.8	4.40	NA	NA

NA = not available

beyond the railway bridge. The beds were about 1 m in height. The oysters were found also on the piers of the Railway bridge, granite stones and wooden planks of the sluice gate.

The resource consists of *C. madrasensis* which forms the bulk of the biomass and the rock oyster, *Saccostrea cucullata* was found in small numbers on the granite stones, concrete piers and amongst the clusters of the former species. The total oyster stocks in the Estuary have been estimated to be 14,379 t, the largest in Tamil Nadu. The size of the oysters ranged between 24 and 208 mm, with a mean weight of 95 g

and meat weight of 6.2 g. There is spatfall in the estuary during October-December. Spat were available in densities of 90-1,800/sq.m. Live oysters are fished regularly for oyster meat. There is also large scale exploitation of oyster shells and subfossil deposits of oysters in the estuary for lime production. The annual shell-on oyster production from Ennore Estuary varies from 1,062 to 7,115 t.

The bar mouth is kept open throughout the year by dredging the sand by the Ennore Thermal Power Station, Madras. There are plenty of mother oysters, good settlement of spat and suitable environmental parameters and the oysters grow well. Suitable bottom for culture is available in the northern part of the estuary which is connected with the Pulicat Lake. However, discharge of domestic sewage and industrial effluents pollute the area.

Adayar Estuary

In earlier times there were beds of the oyster *C. madrasensis* in this estuary. Now they are not found in this estuary due to heavy pollution by way of discharge of domestic sewage and industrial wastes from the surrounding areas of the southern Madras and the estuary is unsuitable for oyster culture.

Kovalam Backwater

The oyster beds were found situated at a distance of 0.75 km from the mouth of the backwater. Extensive oyster beds are present on the western side of the road bridge. Granite rocks on the southern part of the backwater provide suitable substratum for the settlement of spat and growth. Dense populations of the oysters are found on the piers of the road bridge, Kovalam bridge, and Kunnukadu bridge areas. The beds are found in heaps on the western side and underneath the bridge (Fig. 2).

The size of the oysters ranged between 22 and 143 mm with mean weight of 68 g and mean meat weight of 4.9 g. Spatfall takes place during October-December. Spat were available in densities of 48 to 420/sq.m. in the oyster beds. The oysters are collected periodically for consumption in nearby hotels and are sometimes supplied to hotels in Madras. Good quantities of oysters are also collected for the lime industry. Subfossil deposits of oysters and other molluscan shells are quarried regularly from the backwater. Once in four years about 80% of the oysters are removed for manufacture of lime used in building construction.

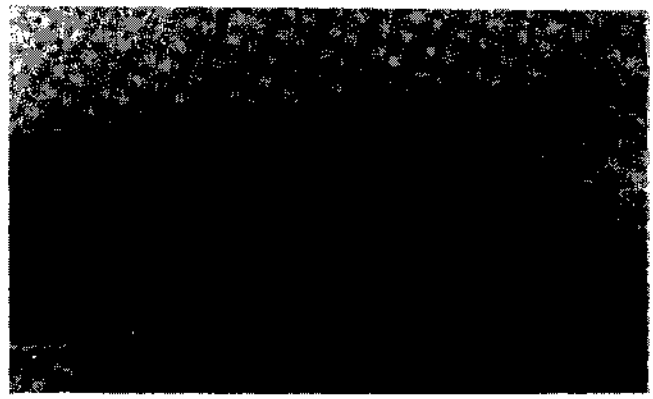

Fig. 2. *C. madrasensis* fished and kept on the western bank of Kovalam Backwater.

The bottom of the backwater is flat and maximum depth is 2.5 m. The salinity, temperature and other parameters are conducive for the growth of oysters. The parental stock and seed oysters are also moderately available. Tidal effect is felt in the backwater, which favours the heavy settlement of spat during the breeding season of oysters. Because of the above reasons, the backwater can be used for intensive oyster culture.

Edayur Backwater

Edible oysters are distributed at a distance of about half a kilometre away from the mouth of the backwater. Two beds, one on the eastern side of the road bridge across the backwater and the other 750 m away from the mouth were located. The oysters are attached to the small rocks submerged in the backwater and in small patches in the first bed. The bottom of the second bed is muddy. Oysters are also found on the piers of the bridge.

C. madrasensis is the predominant species. *S. cucullata* was found in stray numbers only. The size range, mean weight, and meat weight were 36-177 mm, 89 g and 5.6 g respectively. There were very few oyster spat in the backwater. Oysters are fished from the estuary for making lime.

The mouth of the backwater is closed during the summer months due to formation of sand bar. The oyster bed is very small. The bottom is sandy-muddy in several places and submerged,

uneven rocks present do not favour bottom culture. Tidal effect is not so adequate for growth of oysters and therefore this area does not offer much scope for culture.

Alambaru Estuary

Four oyster beds were recorded at a distance of 2 km away from the mouth of the estuary, of which three were large and one small. Oysters were observed on the old demolished brick bridge. They were also found in scattered manner in the northern peripheral region. The oysters were in large heaps upto a height of 90 cm in the former bed. The resource consisting of *C. madrasensis* and *S. cucullata* was found on the submerged portions of pillars of the road bridge (Figs. 3 & 4). The total estimated oyster stock in the Estuary is 715 t. Empty shells were common. This might be due to the overexposure of oyster beds during low tides. The length range of oysters was 30-77 mm for *C. madrasensis* and 21 - 58 mm in *S. cucullata*. The mean weight and meat weight were 36 and 2.1 g respectively. The spat were observed in moderate densities of 120-250/sq.m. Oyster shells and subfossil deposits are collected in large quantities for lime burning.

Fig. 3. Oyster exploitation in Alambaru Estuary, Tamil Nadu for shell lime.

The backwater gets periodically disconnected from the sea during summer by a sand bar. As a result the oyster beds get exposed for prolonged duration and mortality occurs to a large population of oysters. Mother oyster stocks are abundant and seeds are also found in moderate numbers. Some areas near the mother oyster stocks are suitable for culture. However, closure of the mouth of backwater during summer is a constraint.

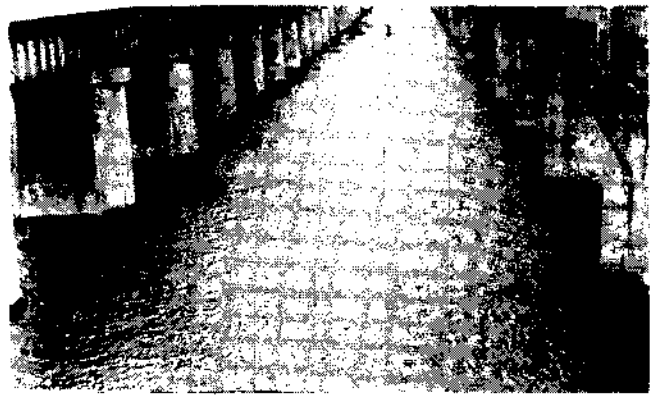

Fig. 4. Oysters adhering to the base of pillars of road bridge across Alambaru Estuary near Marakkanam.

Pennaiyar Estuary

This is a small estuary of 1 km long and 200 m wide and having connection with the sea only during years of heavy flood. Due to this, extreme hydrographic conditions prevail in the estuary. Sand bar was almost 1 km in length. Therefore, there was total absence of oyster and other molluscan population in the estuary. Because of such extreme conditions, the estuary does not offer much scope for oyster culture.

Gadilam Estuary

Oyster population in Gadilam estuary at Cuddalore was found on the pillars of the breakwater of the Cuddalore Harbour, concrete structures, side walls, and also in the middle of the estuary. While the formation of the oyster bed is vertical and thin layered on the walls and other structures, it is multi-tier, dense and massive on the bottom. Oyster populations are found 3 km from the estuary mouth.

C. madrasensis dominated the population to the extent of 90% and the rest of the population was *S. cucullata*. Size range of *C. madrasensis* was 29-126 mm with a mean size of 74 mm. Average shell-on weight and meat weight of the oysters were 71.2 and 3.1 g respectively. In the case of *S. cucullata*, the size range was from 23 to 66 mm and the mean length, average total weight and meat weight were 41 mm, 2.9 g and 1.1 g respectively.

Spat ranging in size from 15 to 34 mm of *C. madrasensis* were recorded in the population regularly. There is a small fishery for oysters in the area for meat as well as shells. Oyster

meat is used as bait in the hooks and line fishery and also for human consumption.

Gadilam Estuary is well connected with sea and periodical dredging by harbour authorities also helps in maintaining continuous connection with the sea. The area has a good oyster population and availability of spat also is good. These factors indicate the suitability of the area for oyster culture. However, fishing and other allied activities pose a problem particularly regarding the space availability.

Uppanar Estuary

Scattered patches of oyster populations were found throughout this estuary but in small clusters and were constituted by a population of *C. madrasensis* (68.2%) and *S. cucullata* (31.8%). Size of the former species varied from 31 to 109 mm with a mean size of 66 mm. Average shell-on weight of the oysters was 58 g and the meat weight 4.2 g. In the case of *S. cucullata*, the size range, mean size, average total weight and average meat weight were 15 - 70 mm, 59 mm, 2.5 g and 1.1 g respectively. Only a few spat of both the species were recorded in the population. There is no regular fishing for oysters. Occasionally oysters are fished along with other molluscs such as clams for lime making.

The estuary is perennially connected with sea near mouth of Gadilam Estuary. The tidal influence is strong. In spite of such advantageous factors, the limited oyster population in the estuary appeared to be due to the nature of bottom, i.e., sandy which is not conducive to the formation of oyster beds. Spat availability was also limited. Therefore, the area appears to offer limited scope for oyster culture.

Vellar Estuary

Natural populations of oysters in Vellar estuary were found in large quantities in two areas, one near Buckingham Canal and another near Customs Jetty. A moderate population was found on the walls of railway bridge, boat jetty and other hard structures. Scattered distribution was found at the bottom near the mouth area. Heaps of oysters were found in the bed at Buckingham canal and Customs jetty. *C. madrasensis* (90%) and *S. cucullata* (10%) were the species present. The oyster resources of Vellar Estuary have been estimated to be 456.9 t (Fig. 5).

Fig. 5. Oysters exploited from Vellar Estuary for lime production.

Size of the oysters ranged from 27 to 123 mm with a mean size of 72 mm. The mean shell-on weight was 70 g and the mean weight 3.4 g. Oysterlings availability was limited to the area near Buckingham Canal and their size varied from 19 to 38 mm.

There is limited exploitation of oysters by landless agriculture labourers for oyster meat in off-season. Quarrying of oyster shells for lime making is in vogue.

The Vellar Estuary is connected to the sea either directly through the mouth near Porto Novo or through the mouths of Karithurai or Coleroon River. Due to this, marine conditions prevail in the estuary in most part of the year. Availability of parental stock and spat along with the suitable hard bottom in several areas of the estuary indicate that the estuary is suitable for oyster farming.

Coleroon Estuarine Complex

The area extends from Mudasudai in the north to Chinnavayakal in the south and includes the mangrove biosphere of Pichavaram area. Oyster beds were found on the bottom near Mudasudai, Karithurai and in the network of canals within the mangrove area. Oysters were also found attached to the roots of mangrove plants. *C. madrasensis*, *S. cucullata* and *C. rhizophorae* are the species found. Totally five beds were demarcated and the oysters were in several layers in heaps on the bottom of the backwater. Oysters were also present attached to the roots of mangroves.

Oyster beds where located at Chinnavaykal point, Kottaimedu point, Vettar connection and

in the Pazhayar Harbour area. Oysters were found on the bottom in the former three places and on the concrete wall and pier structures of the harbour. Oysters were found upto 3 km from the mouth of the estuary. The density of the oyster population was scarce at harbour, heavy at Chinnavaykal and moderate at Vettar connection area. *C. madrasensis* was the only species recorded.

Total oyster resource in Mudasudai-Chinnavaykal area including mangrove biosphere has been estimated to be 431 t with the living oysters forming 30.3%. *C. madrasensis* formed the major portion to the extent of 90% while *S. cucullata* and *C. rhizophorae* accounted for the rest. Size range of the oyster, *C. madrasensis* varied from 14 to 148 mm with a mean size of 82 mm, mean weight of oyster 74.5 g and meat weight 4.02 g. Spat ranging in size from 10.0 to 31.6 mm were present in the bed in Mudasudai-Karithurai area. There is no fishing of oysters in the area.

The size of *C. madrasensis* ranged from 10 to 112 mm and the average size was 44 mm. The average shell-on weight of oysters was 54.2 g and average meat weight 2 g. Oyster spat were available in the harbour area and Kottaimedu in densities of 4-10/sq.m. and the size range was 10 to 22.5 mm. Exploitation of oyster resources is limited to collection of shells for lime making. Consumption of oyster meat by humans does not prevail in the area.

Vellar-Coleroon Estuarine Complex is perennially connected to the sea at three points. Tidal flow is moderate to strong. However, due to mud flats in the mangrove area, the water is turbid except in the outer mangrove region. Bottom is hard at many places and offers sites for culture of oysters. Parental stock and spat availability are other advantageous factors. Hydrographic conditions also favour oyster growth in the area.

The Coleroon Estuary has perennial connection with the sea and the tidal influence is strong and felt even upto 3 km inwards. Because of this, water is less turbid in the estuary. As parental stock and spat are present, the estuary is considered suitable for oyster culture. Areas near Kottaimedu and Chinnavaykal point can be used for oyster farming since they have hard bottom, and oysters can be cultured by bottom culture method.

PONDICHERRY

Chunnambaru Estuary

There are very rich oyster resources in Chunnambaru Estuary which is located by the side of Chinnaveerampattinam village, 12 km south of Pondicherry city. A very extensive oyster bed is present in this estuary, about 750 m away from the mouth. The bed is extended for as long as 4 km towards the upper part of the estuary. There are five other beds of which three are comparatively large in size. The oyster bed near the mouth of the estuary is very wide extending for about 500 m in length. The other beds are more than 750 m in length and 60 to 200 m in width. The oyster heaps were of about 0.3 - 1 m height. Scattered oysters were also observed along the southern bank of the estuary. Oysters were found attached to the walls of the culvert about 5 km away from the mouth and on the boulders on the northern bank adjacent to road bridge, across the estuary.

The estuary has an estimated total stock of 2,219.6 t. The resource consisted mainly of *C. madrasensis*. *S. cucullata* occurred in small quantitites. The former species was present in the beds in the open estuary and the latter restricted to the culvert and granite stones of the road bridge along with the population of *C. madrasensis*. The size of *C. madrasensis* ranged from 12 to 128 mm with a mean length at 88 mm and shell-on weight and mean meat weight at 76.4 and 3.4 g respectively. The density of oyster spat varied from 160-3,010/ sq.m indicating good settlement. The oysters are fished once in four years for lime burning. Occasionally fishing is conducted by local people for consumption of oyster meat.

Chunnambaru Estuary is suitable for oyster farming as there are extensive beds of mother oysters which are good source of oyster spat. The area is conducive for the growth of oysters as it is evident from the luxuriant oyster beds. Since the bottom of the estuary is muddy and firm with sufficient depth, it is possible to culture oysters by on-bottom as well as off-bottom culture methods.

Uppanar Estuary

Near the mouth of the estuary the oysters *C. madrasensis* and *S. cucullata* were found

attached to the boulders and concrete wharves of the harbour. Oysters were distributed upto a distance of 2 km in the estuary. The density of oyster population was moderate.

The size of *C. madrasensis* ranged from 24 to 40 mm with an average size of 30 mm. The average shell-on weight of oysters was 40 g and average meat weight 4 g. Here the oysters are not exploited.

Vellayar Estuary

Oysters are distributed in this estuary from the mouth to a distance of 7 km. There were three oyster beds but the population was sparse.

Average size of *C. madrasensis* was 106 mm with a minimum size of 58 mm and maximum of 163 mm. The average shell-on weight of oysters was 148 g. The wet meat weight varied from 4 to 12 g. The oysters are not exploited. During monsoon, fresh water influx causes mortality.

Vettar Estuary

Oysters, mostly *C. madrasensis* were found distributed along the banks as well as in the middle of the estuary upto a distance of 3 km from the mouth.

The size of the oysters ranged from 31 to 121 mm with an average size of 58 mm. The average shell-on weight of oysters was 52 g and wet meat weight 8 g. Oysters are exploited by hand picking and are utilised by the local fisherfolk for their consumption alone.

Poravidayam Estuary

This estuary located at Vanchiyoor has sandy bottom and salinity 17.7‰. The bar mouth remined closed. Only dead oysters were present.

Uppanar Estuary

In this estuary at Thirumullaivasal, *C. madrasensis* was distributed upto a distance of 2 km from the bar mouth which was closed. The density of the population was 300/sq.m.

The size of oysters varied from 47 to 130 mm with an average size of 84 mm. The average shell-on weight was 120 g with an average meat weight of 7 g. Oysters are exploited by hand picking and are used for local consumption. During monsoon season there is freshwater influx into the estuary but this area is suitable for carrying out oyster culture.

At Kaveripoompattinam and Nandalar there were no oyster populations.

Tranquebar Estuary

C. madrasensis formed the major species in the oyster beds occurring 1.5 km away from the bar mouth.

The size range of *C. madrasensis* was 55-124 mm with an average size of 75 mm. The average total weight was 76 g and meat weight 8 g. During rainy season there is freshwater influx in to the estuary.

In Ammanar Estuary at Chinnangudi, Arasalar at Karaikal and Thirumullairajanar at Pattinacherry, there were no oyster populations. Only dead oysters were observed. In all these areas, the bottom was muddy and sandy and the salinity ranged from 15.9 to 21.75‰.

In the region from Pudukottai to Athankarai surveyed for oyster resources, there were no oyster populations at Thondi, Thammaperumal Estuary, Periyar, Pasipattinam, Manimuthar and Chittar. In Agniaar Estuary where there was a sparse population, the size of the oysters ranged from 70 to 116 mm with an average shell-on weight of 94 g and average meat weight of 5.8 g.

In Varikkal, the size of *C. madrasensis* ranged from 59 to 71 mm. The average shell-on weight was 44 g with meat weight of 3.8 g.

Athankarai Estuary

C. madrasensis was found 1 km away from the mouth with a total estimated stock of 380.8 t distributed in an area of 1.7 ha (Fig. 6). The size of *C. madrasensis* ranged from 61 to 138 mm with an average size of 95 mm. The average total weight of the oysters was 128 g with meat weight of 8 g. Oysters were exploited for shells. The estuary is suitable for oyster culture.

Kanjirangudi Estuary

In the area between Mandapam and Kilakarai, oyster resources were available at Kanjirangudi estuary to a limited extent. The mouth of the

Fig. 6. Beds of *C. madrasensis* in Athankarai Estuary Ramanathapuram District.

Fig. 7. A bed of *C. madrasensis* in Korampallam Creek, Tuticorin.

estuary is always open. *C. madrasensis* beds occur about 0.5 km from the mouth.

The size of oysters of *C. madrasensis* varied from 19 to 123 mm with an average of 47 mm. The shell-on weight of the oysters was 46 g. The average meat weight was 8 g. Oysters are occasionally exploited for local consumption and the shells utilised for lime preparation.

Kallar Estuary

The Kallar Estuary joins the sea at Veppalodai. Three beds of *C. madrasensis* were present at a distance of 2 km from the mouth. The bottom was sandy and depth ranged from 1 to 2 m.

Oysters were of the size range of 61 to 103 mm with an average of 82 mm. The shell-on weight of the oysters varied from 20-125 g with an average weight of 85 g. The average meat weight was 5 g.

Tuticorin

In and around Tuticorin good resources of oysters occur in the creeks, lagoons and tidal inlets. In the natural bed in Karapad creek an extensive bed is present (Fig. 7). Oysters were also found attached to the pillars of the bridges over the creek. The oyster stocks of Karapad creek were estimated to be 84.9 t.

In the natural beds at Karapad creek, the size of *C. madrasensis* varied from 71 to 122 mm with a mean size of 93 mm. The shell-on weight ranged from 60 to 210 g with an average weight of 143 g. The mean meat weight was 9 g.

Korampallam Creek

The Korampallam Creek is much larger than Karapad creek and the estimated oyster resource was 272 t. The size of *C. madrasensis* ranged from 70 to 133 mm with an average size of 93 mm (Fig. 8). The total weight of the oysters varied from 95 to 200 g with an average weight of 136 g and meat weight of 9.5 g. The oysters are not exploited. The Karapad and Korampallam creeks are suitable for oyster farming as there is good growth of oysters.

Fig. 8. Oysters attached to a pillar of a bridge at Korampallam.

Palayakayal Estuary

Three oyster beds with limited resources of *C. madrasensis* were located in this estuary.

The size range of the oysters was 75-136 mm with an average of 105 mm. The shell-on weight varied from 50 to 280 g with a mean weight of 131 g and meat weight of 8 g.

Pinnakayal Estuary

The tributaries of Thambaraparni River with many branches join the sea. Oysters formed beds in the Pinnakayal Estuary and were also found attached to the pillars of the road bridge.

The size of *C. madrasensis* varied from 28 to 133 mm with an average size of 75 mm. The total weight of oysters ranged from 80 to 220 g. The average meat weight was 11 g. The Pinnakayal Estuary is suitable for oyster culture.

From Pinnakayal to Thengapattinam area, almost all the estuaries were dry and there were no oyster resources. In Manapad Estuary due to closure of the bar mouth, there were only dead oysters and the quantity of oyster shells was estimated to be 10 t.

ANDHRA PRADESH

Uppada Creek

There is no proper oyster bed as such in Uppada Creek (Table 2). *C. madrasensis* and *S. cucullata* occurred on the pillars of the road bridge across the creek. The bridge is about 800 m from the mouth of the creek.

The culvert bridge across the creek has four pillars each with a length of 2.5 and 0.5 m width. The attached oysters ranged in size between 12 and 117 mm with a modal size of 80-84 mm. Shells of dead oysters were found to be high in the population and this can be attributed to inundation of freshwater during the southwest monsoon. The creek had limited estimated oyster stocks of 17.6 t (Table 2).

The bottom of the creek is irregular and sandy-muddy and devoid of oyster population. The bar mouth closes during summer season resulting in higher temperature and seems to be not ideal for culture. Hence, the creek is not suitable for oyster culture.

Kakinada Harbour

The Kakinada Fisheries Harbour extends from the shore upto 1 km into the sea and has five wharves supported on 570 concrete pillars. Oysters are attached to these concrete pillars upto a depth of 1.5 m and on the walls of the wharves over a length of 3,000 m. Along with the oysters the green mussel *Perna viridis* is also attached to the submerged portions of pillars and wharves. *C. madrasensis* formed 70% and *S. cucullata* 30%. The oyster resources in the Harbour have been estimated to be 60 t.

Peddapatnam Revu Creek

Peddapatnam Revu Creek and Thallapalam Creek join together and open into the sea. Peddapatnam Revu has rich oyster resources with total estimated stocks of 486 t (Table 2). There are clam resources also in Thallapalam creek. The oyster distribution was found from a distance of 1.5 km from the bar mouth and extended for a distance of 3 km along the Peddapatnam Revu Creek. There are two oyster

TABLE 2. *Environmental parameters and oyster resources of coastal water bodies of Andhra Pradesh*

Name of the water body	Date of survey	Depth (m)	Nature of substratum	Environmental parameters				Oyster Resources	
				Turbidity	Salinity (ppt)	Temp. (°C)	Dissolved oxygen (ml/l)	Total area of beds (ha)	Total stock (t)
Uppada Creek	15 Sep. '90	2	Sandy-muddy	High	3.07	31.7	4.08	20.00	17.6
Kakinada Harbour	15 Sep. '90	2	NA	High	29.94	29.1	1.65	0.74	60.0
Kakinada Port	16 Sep. '90	2	Muddy	High	16.00	29.8	1.65	0.60	60.0
Peddapatnam Revu (Thallapalam Creek)	20 Sep. '90	3	Sandy-muddy	Less	12.70	30.7	3.09	0.25	486.0
Machilipatnam Creek (Harbour)	20 Sep. '90	4	Muddy	High	11.68	30.2	3.23	0.40	16.8
Mudugondi Estuary	21 Sep. '90	1.5	Hard-muddy	Low	31.20	28.4	3.29	1.26	85.0
Gundalakamma Estuary	22 Sep. '90	2	Muddy	Low	14.00	30.9	3.52	0.27	4.1
Pennar Estuary	18 Mar. '90	3	Sandy	Clear (low)	26.26	28.4	3.25	3.20	727.0
Kandaleru Estuary	20 Mar. '90	10	Sandy-muddy	Clear (low)	28.32	29.7	3.8	1.80	88.7
Swarnamukhi Estuary	22 Mar. '90	3	Muddy	Low	21.50	30.4	3.9	NA	7.3
Konderu Estuary	23 Mar. '90	1.5	Muddy	High	31.48	31.4	4.4	0.02	1.8

NA = not available

beds, one large and elevated to a height of 0.6 - 1.0 m while the second had scattered oyster distribution.

Oysterlings were observed adhering to the shell valves of adult oysters and their density was 135-272/sq.m.

Based on the observations made, this area appears to be suitable for culture as seed and mother oysters are available. There is good organic production and the bar mouth is open with regular flow of sea water.

Machilipatnam Creek

The Machilipatnam Creek also known as Harbour Canal extends for 2 km from bar mouth. Mangrove swamps are present on both sides of the canal. The mudflats of the mangrove area are rich in molluscs. There are no oyster beds as such in the canal. The rock oyster, *S. cucullata* was found on granite stones of the bunds of the canal, while there were patches of *C. madrasensis* in the middle of the canal.

The canal is used for navigation purpose and the bottom is muddy and slushy. Freshwater influx is high during the southwest monsoon season. Therefore the area is not congenial for oyster culture.

There was a single spindle shaped oyster bed in Mudugundi Estuary at a distance of 1 km from the bar mouth. Oysters were present in aggregate on this bed with dense clusters in the inner area and sporadic distribution in the peripheral parts.

Oyster size ranged from 28 to 59 mm. The spat were present along with adult oysters. The oysters are fished by local fishermen for consumption and lime preparation.

The hard and muddy bottom has adult oysters. Hydrological conditions are favourable for oyster growth. The area with firm bottom is suitable for oyster culture.

Pennar Estuary

Oysters were found in this estuary in three areas, viz., on granite stones along the northern bank, in thirteen beds along the southern bank and on the pillars of road bridge across the estuary. *C. madrasensis* was the species found in this area and the total resources were estimated to be 727 t.

As the bottom is sandy with good phytoplankton production, rack culture method can be used in the estuary.

Kandleru Estuary

Oysters were found on beds located 2 km from the mouth of the estuary on the wharf of Krishnapatnam Fishing Harbour, on the locks of Buckingham Canal on the southern side and below the road bridge on the northern side. *C. madrasensis* was dominant forming 90% of the population followed by *S. cucullata*. The total oyster resources of the estuary estimated to be at 88.7 t (Figs. 9 & 10).

Fig. 9. Shells of oysters collected from Kandleru Estuary, near Nellore for use of oyster meat as prawn feed.

C. madrasensis was found in this estuary on the locks and pillars of the road bridge across the Buckingham Canal which is 1.5 km from the mouth of the estuary.

Fig. 10. Oysters fished from Kandleru Estuary for shell lime production.

Gundalakamma Estuary

C. madrasensis had scattered distribution in the central portion of the Buckingham Canal

which passes through this estuary near Gangapatnam (Fig. 11). There is sporadic occurrence of oysters in the northern peripheral region of the estuary. In addition oysters are found on the concrete and granite structures of the locks of the Buckingham Canal.

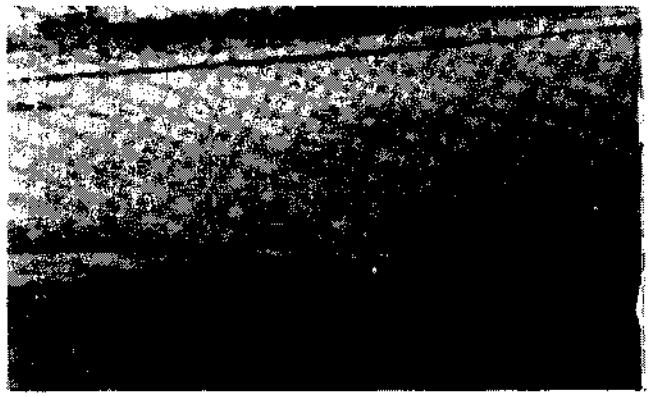

Fig. 11. Scattered distribution of oysters in Gundalakamma Estuary, Gangapatnam, Andhra Pradesh.

The oyster spat were found in limited numbers. The area can be used for oyster culture.

Swarnamukhi Estuary

Oysters were found in this estuary on the locks and pillars of the road bridge across the Buckingham Canal which is 1.5 km from the mouth of the estuary.

The area is muddy and water is clear. The depth varied from 0.5 to 3 m. Plankton production is low. Temperature, salinity, dissolved oxygen and pH were 28.9° - 32°C, 10 - 33‰, 3.1 - 4.0 ml/l and 7.2 to 8 respectively.

The biomass is limited and amounted to 7.3 t. As organic production is low, this estuary is not suitable for oyster culture.

TABLE 3. *Environmental parameters and oyster resources of coastal water bodies of Kerala*

Name of the water body	Date of survey	Depth (m)	Nature of substratum	Environmental parameters				Oyster Resources	
				Turbidity	Salinity (ppt)	Temp. (°C)	Dissolved Oxygen (ml/l)	Total area of beds (ha)	Total stock (t)
Chandragiri Estuary	22 Apr. '87	3	Sandy	Moderate	33.80	31.0	4.62	0.5	65.0
Shiriya Estuary	23 Apr. '87	2	Sandy	Moderate	34.62	31.2	4.35	0.2	23.0
Nileshwar	24 Apr. '87	3	Sandy-muddy	Moderate	36.50	32.5	4.18	0.4	40.0
Azhikal	25 Apr. '87	8	Muddy	Moderate	35.40	31.3	4.53	0.4	16.0
Murad Estuary	11 May '87	4	Sandy-muddy	Less	0.58	27.8	4.39	0.5	29.6
Korapuzha Estuary	13 May '87	12	Muddy	Less	12.36	27.9	3.53	27.0	3664
Beypore Estuary	12 May '87	20	Muddy	Less	13.59	29.7	2.20	0.2	13.2
Chaliyam Estuary	14 May '87	10	Muddy	High	16.80	29.0	3.70	0.4	50.3
Kallayi Estuary	15 May '87	4	Sandy	High	17.00	29.6	1.72	NA	NA
Kadalundi Estuary	10 Aug. '87	4	Sandy-muddy	Moderate	2.10	31.5	3.47	present	present
Puthuponnani Estuary	09 Aug. '87	4	Sandy-muddy	Less	1.00	29.6	3.56	present	present
Karagathipuzha	08 Aug. '87	6	Sandy-muddy	Less	11.80	29.0	2.64	NA	NA
Periyar Estuary (Azhikode)	06 Sep. '87	4	Sandy-muddy	Less	11.70	28.8	3.52	0.3	10.0
Periyar Kottapuram Bridge	07 Sep. '87	3	Sandy-muddy	Less	3.40	28.4	3.27	0.4	7.0
Thottappally Estuary	08 Sep. '87	4.5	Muddy	Moderate	18.72	29.4	2.54	0.2	5.0
Kayamkulam Pozhi	11 Oct. '87	2	Sandy-muddy	Less	19.90	30.0	3.51	0.3	15.0
Neendakara Estuary	12 Oct. '87	3	Sandy-muddy	Less	26.40	29.8	3.60	present	present
Pozhikara Estuary	13 Oct. '87	2.5	Muddy	Less	15.50	29.5	3.81	present	present
Mudakai Pozhi	04 Jul. '87	1	Sandy-muddy	Moderate	18.60	30.2	2.62	NA	NA
Veli Kayal	06 Jul. '87	1.5	Sandy-muddy	Moderate	15.20	30.8	2.25	NA	NA
Poonthura Pozhi	07 Jul. '87	1.5	Sandy-muddy	Moderate	16.40	31.2	2.34	NA	NA
Karichal	08 Jul. '87	2	Sandy-muddy	Moderate	10.70	31.0	2.26	NA	NA
Poovar	08 Jul. '87	1	Sandy-muddy	Moderate	11.20	31.4	2.73	NA	NA

NA = not available

Konderu Estuary

There are four small oyster beds about 2 km from the estuary mouth near the western bank. *C. madrasensis* was the only species recorded. Seed oysters were found in densities of 20-180/sq.m. As the productivity of the estuary is low, the area is not suitable for oyster culture.

KERALA

Chandragiri Estuary

C. madrasensis was found distributed upto 2 km from the estuary mouth and the resources are limited in extent (Table 3). Oysters were also found attached to the granite stones on the sides of the estuary.

The estimated oyster resources of the estuary amounted to 65 t. The size of the oysters collected ranged from 26-62 mm with a mean size of 38 mm. The shell-on weight of oyster ranged from 5 to 35 g with an average weight of 17 g. The average weight of oyster meat was 2 g.

Oysters are exploited by local fisherfolk. Usually boys are engaged in the collection of the oysters which is done by handpicking. The oysters are exploited for local consumption and for sale and the price is Rs. 9 to Rs. 12/- per kg.

Though the area is good for carrying out culture, fresh water influx during monsoon months lowers the salinity very much.

Shiriya Estuary

C. madrasensis is distributed in restricted quantities in the estuary upto a distance of 1 km from the mouth.

The size of the oysters ranged from 20 to 45 mm. As in Chandragiri Estuary, here also fisherfolk exploit the oysters for local consumption. During monsoon months, freshwater influx affects the oyster population causing mortality. The size of *C. madrasensis* varied from 18 to 35 mm with a mean size of 27 mm. *S. cucullata* ranged from 13 to 25 mm with an average size of 20 mm.

Nileshwar

C. madrasensis and *S. cucullata* were found distributed on both the banks of the estuary. The resources have been estimated to be 40 t. Among them *C. madrasensis* was dominant, forming 65% and *S. cucullata* 35%. The size of *C. madrasensis* ranged from 36 to 102 mm with an average size of 71 mm. The shell-on weight ranged from 10 to 150 g with an average meat weight of 6 g. The size of *S. cucullata* varied from 22 to 52 mm with shell-on weight of 10 to 40 g. Oysters are exploited by the local people using a small chisel for their consumption.

Azhikkal

C. madrasensis and *S. cucullata* were found attached to the boulders present along the banks of the estuary. The population is thickly distributed along the southern side upto a distance of 2 km from the mouth. Very thin population was observed along the northern side of the estuary.

C. madrasensis was dominant and the size ranged from 38.4 to 118.2 mm with an average size of 88 mm. The weight of oysters ranged from 20 to 250 g with average weight of 147 g. The average meat weight was 5.1 g. Oysters are exploited by local people only for their consumption and not for marketing. During monsoon, fresh water influx affects the oyster population.

Murad Estuary

A single oyster bed was located in the estuary at a distance of 2.5 km beyond Murad road bridge by the side of Kottakkal village. The oysters were seen present over a distance of 1.7 km and the width of distribution ranged from 2 to 4 m.

C. madrasensis ranged from 26 to 55 mm in size and *S. cucullata* 31 to 48 mm. In both the species males were dominant.

As water flow is fast plankton productivity is low and growth of oysters is poor and this estuary is not conducive for conducting oyster culture.

Korapuzha Estuary

There are four oyster beds in Korapuzha Estuary. Of these, one was located on the southwestern side of railway bridge, the second below the railway bridge, the third below the road bridge and the fourth on the eastern side of the road bridge. The first bed is the largest and is 1.1 km in length and 238 m in width. The fourth one is on the laterite boulders along the

northeastern bank of the estuary. The beds are at a distance of 2.4 km from the mouth of the estuary.

The oyster resources of Korapuzha Estuary estimated as 3,664 t, formed the highest for oysters in Kerala. 99.3% of the oyster biomass is in the bed on the southwestern side of railway bridge and the rest in the other three beds. The oysters thrive well in this estuary and the bed on the southwestern side with live oysters has a height of 1 m. The oysters ranged in size from 55 to 99 mm with a mean size of 72 mm. Oyster spat occurred in densities of 50-214/sq.m.

The oysters are fished regularly from the estuary to cater to the demand of the people from Calicut (Fig. 12). The price of shell-on oysters is Rs. 30/- per 100 and it is higher during the southwest monsoon season when sea fish are scarce.

Fig. 12. Oysters fished from Korapuzha Estuary for sale at Calicut, Kerala.

There are good possibilities for oyster culture in the Korapuzha Estuary as productivity is high and the hydrological conditions are favourable. The salinity falls steeply to near freshwater level during the southwest monsoon but oysters will not be affected much as the estuary is deep and there is good tidal oscillation.

Beypore Estuary

There is one oyster bed in the Beypore Estuary at a distance of 700 m from the mouth near the northern bank. Besides oysters are present attached to the walls of the port wharf over a length of 400 m. Most of the oysters belong to *C. madrasensis* forming 79% and the rest rock oyster. The total estimated oyster stock of Beypore Estuary is 13.2 t.

The water is turbid and organic production is not adequate and hence this estuary is not suitable for oyster culture.

Chaliyar Estuary

Chaliyar Estuary is to the south of Beypore Estuary and opens into the sea through a common mouth. There are two oyster beds in the estuary, one located around an islet, Kakathuruthu and another along Patteramedu islet. Both *C. madrasensis* and *S. cucullata* were found distributed in the beds. The former species is dominant and formed 79%. The oyster resources of the Chaliyar Estuary have been estimated to be 50.3 t.

C. madrasensis ranged in size from 17 to 94 mm with a mean size of 54 mm. *S. cucullata* were 7-48 mm in size. The oysters showed stunted growth with most of them below 50 mm. Oyster spat occurred in densities of 40-80/sq.m.

The Estuary is turbid, and hence is not suitable for oyster culture.

Kallayi Estuary

Timber logs are cured in the estuary and there is production of hydrogen sulphide. Oyster beds were absent in the estuary.

Periyar-Munambam-Azhikode

C. madrasensis was found attached to the stones laid for a distance of 4 km in the area. Presence of *S. cucullata* attached to the granite stones was also noticed. The oyster size ranged from 26 to 61 mm with an average size of 45 mm. The average shell-on weight was 20.4 g and the average meat weight 2 g. During the southwest monsoon season fresh water influx causes mortality.

Karagitapuzha

C. madrasensis and *S. cucullata* are distributed from the mouth to a distance of 2 km. They are mainly found attached to the stones in the estuary. Occasionally oysters are exploited by fisherfolk and utilised for their consumption.

The size of *C. madrasensis* ranged from 31 to 105 mm and that of *S. cucullata* from

30 to 48 mm. The average shell-on weight of *C. madrasensis* was 25 g. The average meat weight was 2 g.

Kadalundi Estuary

C. madrasensis are distributed on the rocks near the mouth of the estuary and also below the railway bridge. There is sporadic occurrence of *S. cucullata*. Due to monsoon rains the oyster population was very much limited and mortality occurred in the oyster bed following freshwater influx.

Puthuponnani Estuary

C. madrasensis were found attached to the granite stones along the banks of the estuary upto a distance of 1.25 km. The distribution was very sparse.

Due to low saline conditions oyster population was very thin. *C. madrasensis* and *S. cucullata* were recorded. Size of the *C. madrasensis* ranged from 32-51 mm and the average shell-on weight of an oyster was 25 g. The oysters are not exploited.

Both *C. madrasensis* and *S. cucullata* were found attached to the rocky substrata near the mouth and also below the railway bridge. Small numbers of *C. madrasensis* and *S. cucullata* were recorded. The size of *C. madrasensis* varied from 28 to 66 mm with an average size of 46 mm. The average weight of whole oyster was 16 g. The size of *S. cucullata* ranged from 38 to 52 mm. Oysters are exploited for local consumption during summer months when the meat condition is good compared to the rainy season.

Periyar Kottapuram Bridge

Both *C. madrasensis* and *S. cucullata* are found attached to the stones laid along the estuary banks. Oysters are distributed from the mouth to a distance of 3.5 km. The size of *C. madrasensis* ranged from 26 to 57 mm with an average size of 42 mm. *S. cucullata* ranged from 31-52 mm in size with a mean of 41 mm. The average shell-on weight of *C. madrasensis* was 17 g. Freshwater influx during the monsoon season causes mortality of oysters.

Thotapally Estuary

C. madrasensis was found attached to the stones present on either side of the Estuary. *S. cucullata* was also present. The size of *C. madrasensis* ranged from 40 to 75 mm with an average size of 53 mm. The average shell-on weight was 20 g and that of meat 4 g. Oysters are exploited for local consumption. Mode of harvesting is by handpicking. The oysters are sold at the rate of Rs. 8/- per 100 oysters.

Kayamkulam pozhi

C. madrasensis was the dominant species with *S. cucullata* less in abundance. The oysters were seen attached to the stones present on the banks of the estuary upto 0.25 km distance. Oyster beds were present on the muddy bottom and the resources amounted to 15 t.

The size of the oysters ranged from 31 to 73 mm with an average size of 51 mm. The weight of the oysters varied from 5 to 100 g with an average weight of 21 g. During May-June oysters were removed using chisel for marketing and local consumption.

Neendakara Estuary

Both *C. madrasensis* and *S. cucullata* are present and the latter was found more towards the mouth attached to the boulders. *C. madrasensis* occurred in the inner parts of the estuary. Oyster resources in the estuary were limited which may be due to pollution caused by large number of trawlers berthed there.

The size of *C. madrasensis* ranged from 30 to 52 mm with an average size of 36 mm. The average shell-on weight of an oyster was 12 g. The size of *S. cucullata* varied from 26 to 40 mm with an average of 33 mm. The average shell-on weight was 8 g. Oysters are exploited during summer using a chisel. The harvested oysters are marketed or consumed. The oysters are sold at the rate of Rs. 20-40/100 oysters.

Pozhikara Estuary

Oyster beds of *C. madrasensis* were observed on the bottom of the estuary upto a distance of 4 km from the lock. *S. cucullata* was found attached to stones in less numbers. The total estimated oyster stocks amounted to 38 t.

The oyster *C. madrasensis* ranged in size from 55 to 137 mm. Average size was 86 mm. The shell-on weight varied from 15 to 400 g and the average meat weight was 10 g/oyster. Size of *S. cucullata* varied from 51 to 65 mm with an average shell-on weight of 48 g. Oysters are collected by diving and sold at the rate of Rs. 50/- per 100 oysters.

In the southern estuaries Mudalaipozhi, Velikayal, Poonthurai pozhi, Karichal and Poovar there are no oyster populations.

Remarks

The foregoing account indicates that oyster resources are found in a large number of localities in Tamil Nadu, Pondicherry, Andhra Pradesh and Kerala. However, only in some localities they form large beds. Richest oyster resources exist in Tamil Nadu and Pondicherry. The Ennore Estuary north of Chennai has the maximum oyster resources, 14,379 t followed by Alambaru with 2,750 t and Pulicat Lake, with 1,037 t. In Pondicherry 3,143 t of oysters are present in a single water body, Chunnambaru, is unpolluted and undisturbed by human interference except for limited fishing of very small quantities of oysters for food.

The abundance of the resources in Tamil Nadu and Pondicherry is attributed to restricted rainfall and limited current action in the vicinity of oyster beds. The salinity is ideal in these areas for the breeding, spatfall and growth of oysters. The salinity is maintained by the bar mouth which remains open except in some years when it gets closed in summer causing increase of salinity.

In Andhra Pradesh oyster resources are limited in most of the localities due to turbidity and fast water flow. Only in three areas, namely Pennar Estuary, Peddapatnam Revu and Kandleru Estuary, the resources are present in significant quantities, 727 t, 486 t and 88.7 t respectively.

The oyster resources in Kerala are very restricted except for the Korapuzha Estuary, where the oyster biomass amounts to 3,664 t. The abundance of oyster resources in Korapuzha Estuary is due to the high organic production in the Estuary, a very large oyster breeding

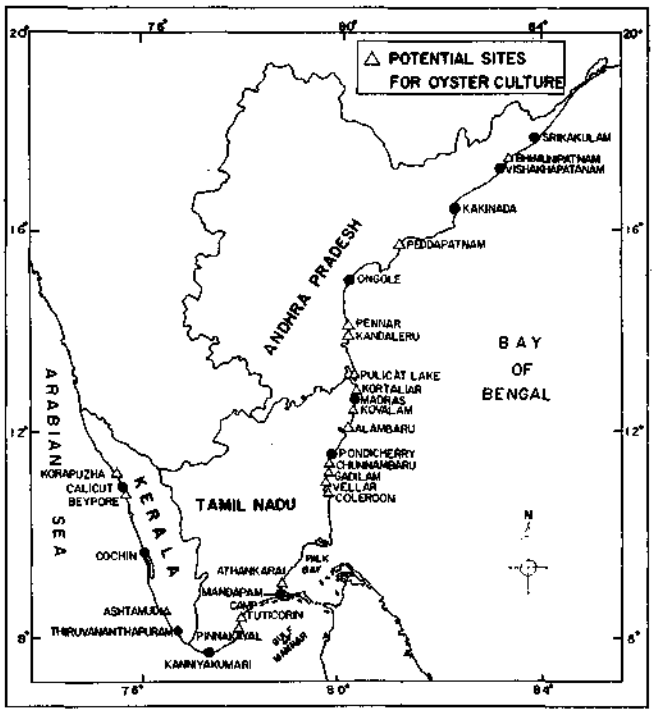

Fig. 13. Potential sites for oyster culture in Tamil Nadu, Andhra Pradesh and Kerala.

population and favourable hard substratum over which oysters flourish. In the other estuaries in the state, the resources are very much less due to low salinity for a prolonged duration during the southwest monsoon season, May-August and swift water movement during the period. Further the estuaries in Kerala are deep and the bottom is slushy which is not favourable for the settlement and survival of oyster populations.

There is very limited exploitation in most areas where oyster resources exist. Intensive oyster fishing takes place only in some areas in Ennore, Pulicat, Kovalam and Korapuzha estuaries. There is heavy exploitation of live oysters in Ennore Estuary and Kovalam backwaters and it should be prevented. Removal of oysters from natural beds on a large scale would affect the resources adversely. Exploitation has to be restricted to 50% of the present level of stocks. Culture practices have to be adopted to augment production substantially for meeting the demand for the shellfish.

The availability of natural oyster spat is very much restricted in the different areas in all the maritime states surveyed as the density of spat is not much as it is expected of the several tropical areas of the world. Investigations carried

out by the Central Marine Fisheires Research Institute at Tuticorin, Athankarai, Muttukad and Pulicat have shown that large quantities of oyster spat cannot be collected from nature by laying spat collectors due to low and erratic spatfall. Spat produced by hatchery techniques developed by C.M.F.R.I. could be used for conducting oyster farming.

The survey carried out suggests that there are prospects for carrying out oyster culture in Ennore, Pulicat, Kovalam, Alambaru, Gadilam, Vellar, Coleroon estuarine complex, Vellayar, Athankarai, Korampalam, Karapad and Pinnakayal in Tamil Nadu, Chunnambaru in Pondicherry, Peddapatnam, Mudugundi, Pennar and Kandleru in Andhra Pradesh and Korapuzha, Chaliyam and Neendakara in Kerala as biotic and environmental conditions in these areas are conducive for the growth of oysters (Fig. 14). Recently Ashtamudi Lake (Neendakara estuary) has been shown to be suitable for oyster farming.

The entire oyster production of India comes from exploitation of natural oyster stocks except for experimental and pilot scale production by the Central Marine Fisheries Research Institute. If farming is carried out by using suitable culture methods evolved by the CMFR Institute, oyster production can be stepped up to a much larger extent.