MARINE FISHERIES INFORMATION SERVICE

No. 75
SEPTEMBER 1987

Technical and Extension Series

CENTRAL MARINE FISHERIES RESEARCH INSTITUTE

COCHIN, INDIA

INDIAN COUNCIL OF AGRICULTURAL RESEARCH

BEACH EROSION AT KOVALAM FISHING VILLAGE, TAMIL NADU, WITH SOME COMMENTS ON THE SEASONAL SHIFTS IN THE COASTLINE ALONG THE KOVALAM BAY*

Introduction

Kovalam village (Lat. 12°46′; Long. 80° 18′), 36 km south of Madras city, is a small hamlet overlooking the southern end of the picturesque bay (Fig. 1). The main settlement, consisting of thatched, as well as 'pukka' houses, is located very close to the sea on a sand mound of 2 m high. These houses were hidden behind a thick grove of coconut palms (Fig. 2) until calamity in the form of severe sea erosion struck the village during May–June, 1986. Over 150 coconut palms and 13 houses were destroyed (Fig. 3 & 4) and several others damaged severely, affecting the livelihood of many households. Temporary relief came in the form of piles of sand bags (Fig. 5) to prevent further damage. The sea receded by the last week of June and there was no further threat to the village.

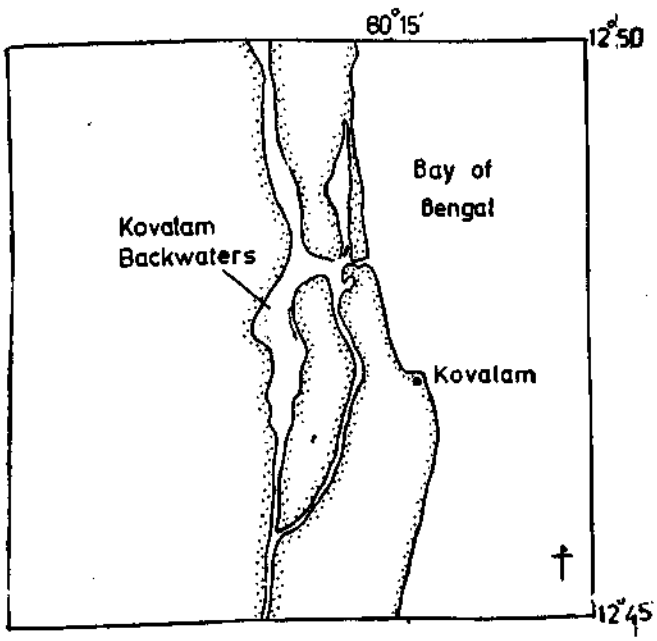

Fig. 1. The geographical position of Kovalam Bay and backwaters.

It is reported that eighteen years' ago, in 1968, similiar erosion occurred here during which several palm trees and thatched huts as well as over ten 'pukka' houses further north were destroyed. The incursion of the sea at that time pushed back the village limit by about 50 m, as it has now been pushed back by another 60 m.

The Kovalam Bay

The general features of the Kovalam Bay are indicated in the map (Fig. 1). The shape of the bay is determined both by the crop of rocks located at the southern tip of the head-land and the Kovalam backwaters which drain into the bay 4 km north of these rocks. The coastline bordering the bay is a constantly

*Prepared by Geeta Bharathan and E. V. Radhakrishnan, Madras Research Centre of CMFRI, Madras.

Fig. 2. The Kovalam beach in July, 1985. Note the flat profile of the beach compared to the sand mound in Fig. 10.

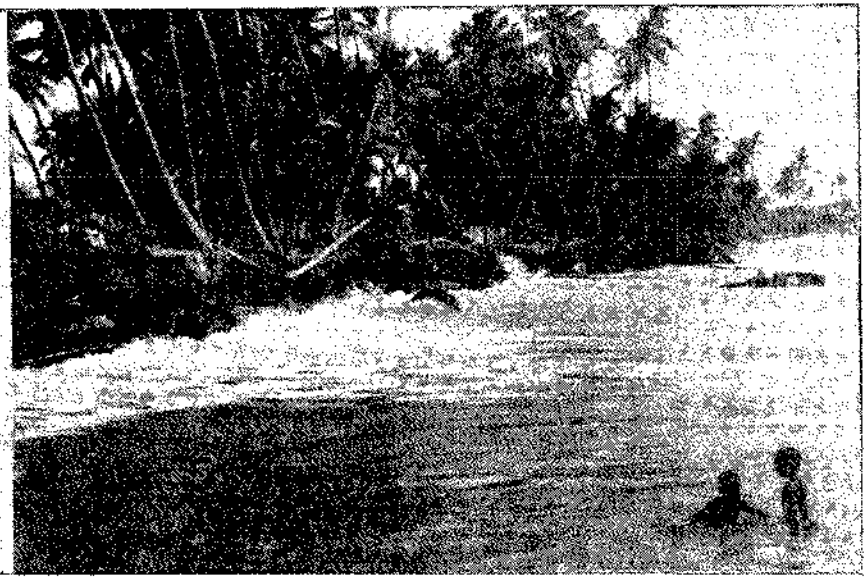

Fig. 3. View of erosion of palm grove as on 30th May, 1986.

Fig. 4. Close-up view of erosion, 30th May, 1986.

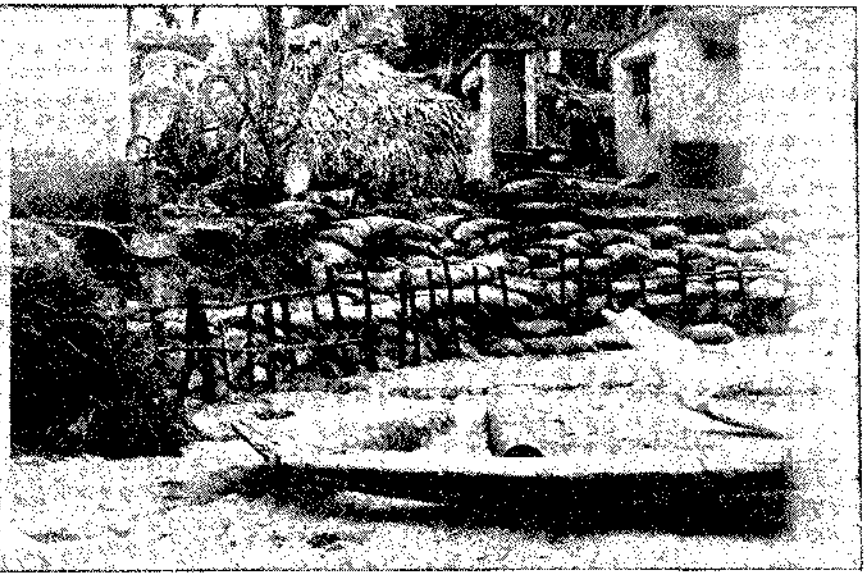

Fig. 5. Sand bags stacked on eroded beach infront of the houses for temporary protection.

shifting one which alters the contour and position in accordance with changes in the direction of current along the east coast.

No detailed studies have been conducted on current patterns in the Kovalam Bay, although hydrological features have been described by Muthusamy (*Indian J. Fish.*, **24**, 1980). The current pattern in the Bay of Bengal has been studied extensively and was reported to be southward during October and December, and northward during February and March (Ganapathy and Murthy, *Andhra Univ. Ser., No.* **49**, 1954). A similar pattern was reported by Srivastava and George (*J. mar. biol. Ass. India*, **18**, 1976).

Observations of local fishermen conform broadly to the above pattern. Daily records maintained at the Field Laboratory, Kovalam during 1979–'80, revealed that the current was southward during the period October–January. A short period of transition towards the end of January was followed by a reversal, the current then flowing in a northward direction from February until October.

Shifts in the coastline parallel these changes in current pattern. This annual cyclical shift in the coastline is represented in Fig. 6. Thus the sea retreats after April, and until October is at an approximate distance of 180–200 m from the road. During this period the prevailing current is northward. After October the sea starts moving southward into the land, eroding a large portion of the beach and by January–February it is at a distance of 100–120 m from the road. During this period the current is mostly southward.

There was a slight change in the above pattern during 1985–'86 when compared with the seven year period 1977–'84. The sea came very close to the road (upto 20 m) during early February, 1985 and receded after March. It started moving again in November, 1985 and was only 10 m from the road in March, 1986 (Fig. 7). Such close proximity of the sea had been observed by the authors only during the cyclone of May, 1979. The other time the sea came so close in the recent past was in 1968 when erosion occurred. At that time the road itself is said to have been submerged.

Sea erosion

In 1986 the sea did not retreat in April as it normally does, but remained close-by until May, exposing a new crop of rocks on the shore and eroding away different parts of the beach (Fig. 8). Shore seines landed large quantities of anchovies (about 2 tonnes) during this period. The sea became very rough during the lunar eclipse on April 24, 1986 and erosion increased. A huge anchor, 2 m high and weighing nearly 2 tonnes was uncovered by the sea (Fig. 9). Subsequently, by the second week of May, the sea started receding and a small sand mound was built up parallel to the coast on the beach infront of the Field Laboratory (Fig. 10).

The sea again became rough on May 23, full moon night and then started the process of erosion of the village. Apparently, erosion was severe because of the newly formed sand mound which deflected the surging sea away from the direction of the road into the village (Fig. 11). A large palm grove at the southern end of the village was destroyed and by May 29, much of the sand in that area was eroded away and two ancient sculptures were uncovered (Fig. 12). Similar monoliths had been removed in 1968 too (Fig. 13). The sea then moved further north, and entered the village to a distance of nearly 60 m from the normal water line, destroying 10 huts and 3 'pukka' houses (Fig. 14). It became calm by June 28 when no more damage was caused and by July it had receded well back (Fig. 15).

Kovalam backwaters

The Kovalam backwater is connected to the sea for only part of the year, usually during the period October–May. The mouth closes because of long-shore drift and is cut open by the Buckingham Canal Authority (PWD) when the water level in the canal exceeds 6.3 m. Examination of the annual rainfall at Kovalam and the total period of closure of the bar-mouth reveals a negative correlation ($r = -0.85$) between the number of months of closure and the total rainfall during the previous year (Table 1).

Unusually heavy rains in Chinglepet District during October, 1985 resulted in heavy flooding of the backwater, consequent to which the bar-mouth was forced

open very wide and deep. By April, 1986 water flow at the mouth became much reduced. Rough sea conditions during the eclipse in the end of that month cut the bar wide open again and it remained so until November, 1986. This is quite unusual since the mouth normally closes by June (Table 1).

Table 1. *Total annual rainfall* (1979–'85) *and dates of closure and opening of barmouth of Kovalam backwaters with total period of closure*

Year	Total rainfall f(mm)	Sand bar		Period closed (months)
		Date of closure	Date of opening	
1979	1204	17–9–'79	4–11–'79	2
1980	1175	8–5–'80	13–11–'80	6
1981	1036	19–4–'81	2–11–'81	7
1982	796	3–2–'82	4–11–'82	9
1983	1356	11–2–'83	1–9–'83	7
1984	1397	15–6–'84	6–10–'84	4
1985	1858	10–6 –'85	24–9–'85	3
1986	1005	—	—	2

During May–June 1986, the period of erosion, low tides did not uncover intertidal land masses in the backwater, eventhough the bar mouth was wide open. This situation continued until June 28, afterwhich intertidal patches were once again uncovered during low tide.

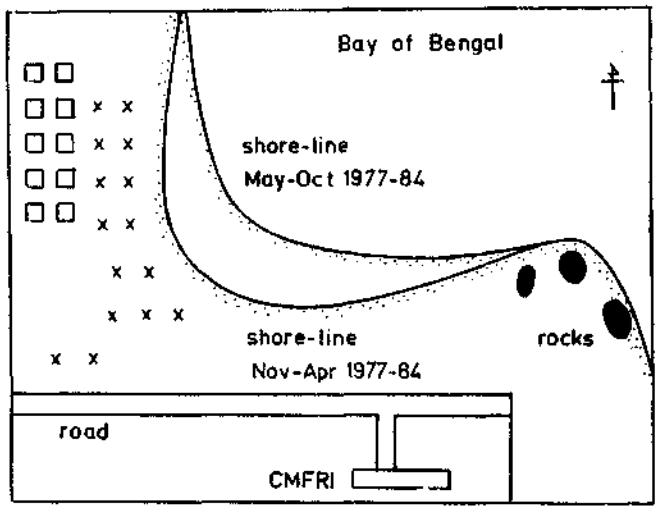

Fig. 6. Diagrammatic representation of southern end of bay showing seasonal shifts of coastline during 1977–'85. Lower line represents maximum limit of incursion and upper line shows extent of retreat by the sea (Not to scale).

These observations indicate heightened sea level during the period from April 24 to June 28.

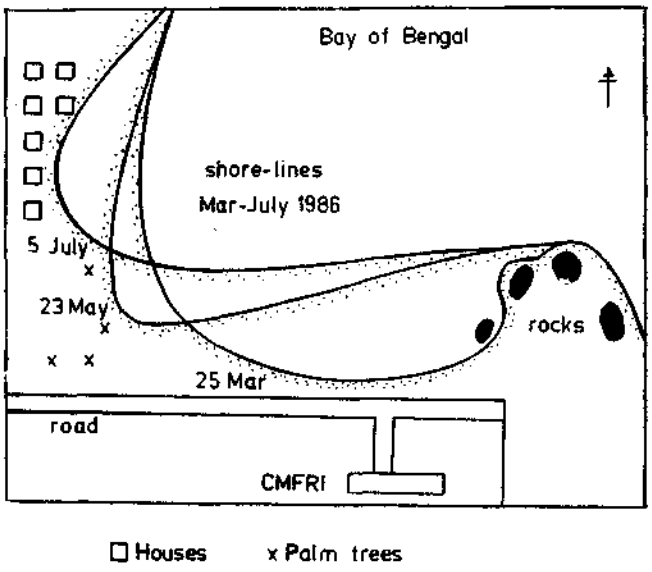

Fig. 7. Diagrammatic representation of southern end of bay showing shifting of coastline and erosion during 1986. The different lines indicate position of the sea on the dates depicted in the diagram. (Not to scale).

Drift organisms

Many bottom-dwelling and sessile animals such as gorgonians, sponges, ophiuroids, asteroids and crabs were washed ashore during May, 1986, and this is very unusual. The only other time in the recent past when significant quantity of sea life drifted ashore was in 1985. During that year a large amount of *Sargassum* and gorgonians was observed in July. This phenomenon lasted for over one week and was accompanied by a very strong northward current. *Sargassum* is not reported from the flora of rocks at Kovalam or Mahabalipuram and it is likely that these algae came from somewhere further south.

Fishery

The fishery off Madras during the period March–July, 1986 appears to have been somewhat different from the normal pattern. Apart from the heavy anchovy catches in March, 1986 mentioned earlier, unusually heavy landings of lesser sardines were observed at Kovalam during the first half of July. Similarly, off Madras too, heavy catches of mackerel and *Doryteuthis* sp. took place during April–June which was, indicative of changes in the sea conditions, since both species form major fishery on the west coast but are rarer on the east coast.

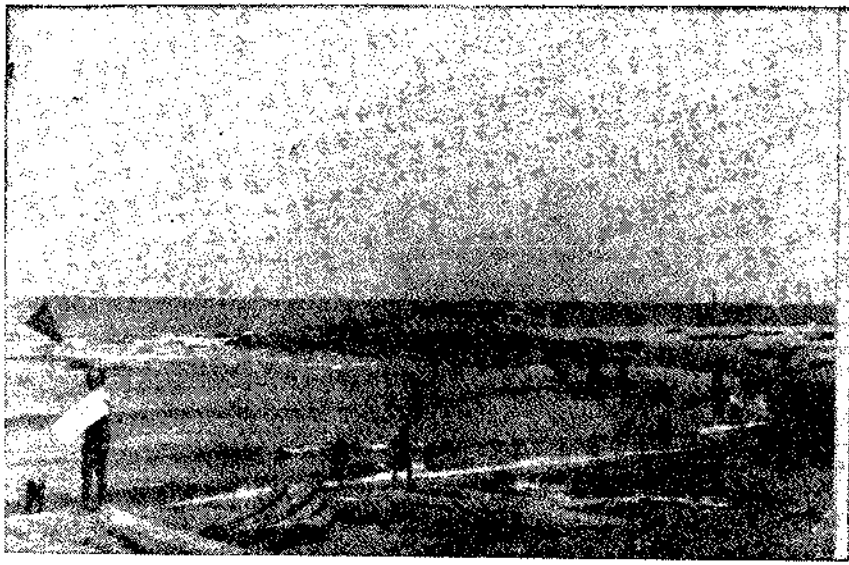

Fig. 8. Incursion of sea. Arrow indicates new crop of rocks exposed.

Fig. 9. Anchor recovered from sea bed in the eroded area, May, 1986.

Fig. 10. View of beach showing sand mound formed after retreat of sea, 30th May, 1986.

Fig. 11. Damages caused to the houses, 24th June, 1986

Fig. 12. Sculptures (Monoliths) recovered from sea bed in eroded area, 30th May, 1986.

Fig. 13. Sculptures recovered from sea bed during previous episode of erosion in 1968.

Fig. 14. A view of the village after destruction of houses and coconut palms taken place on 24th June, 1986. Compare the sparse stand of trees with the dense grove in Fig. 2.

Fig. 15. Retreat of sea and deposition of sand, covering rocks earlier exposed. Compare with Fig. 6. Arrow indicates portion of these rocks.

Table 2. *Monthly averages of tidal height (in metres) off Madras for the years* 1983–'87

Year	J	F	M	A	M	J	J	A	S	O	N	D
1983	1.31	1.16	1.12	1·18	1.23	1.25	1.22	1.22	1.26	1.32	1.44	1.40
1984	1.27	1.19	1.16	1.20	1.26	1.20	1.19	1.24	1.31	1.36	1.29	1.34
1985	1.26	1.19	1.15	1.19	1.29	1.27	1.17	1.18	1.26	1.43	1.51	1.44
1986	1.27	1.14	1.12	1.25	1.29	1.24	1.19	1.18	1.21	1.32	1.47	1.47
1987	1.35	1.17	1.10	1.15	1.23	1.23	1.22	1.22	1.26	1.36	1.42	1.35

Discussion

Sea erosion on the east coast of India is fairly common during the northeast monsoon and has been recorded as far back as 1859 (Ahmed, *Coastal Geomorphology of India,* Orient Longman, 1972). However, its occurrence during the period May-August, as occurred in a wide-spread manner during 1986 is unusual. Erosion was observed, for instance, at Elliott's Beach in Madras city and was reported from Cuddalore also.

Erosion that occurred at Foreshore Estate, Madras, during August, 1977 was said to be the consequence of the flooding of Adayar River during November, 1976, followed by the formation of a sand bar in the sea. This bar deflected the direction of waves, causing them to strike the shore head-on, thus leading to erosion (Meenakshisundaram, Superintending Engineer, Madras Port Trust, personal communication). General observations indicate that a combination of unusual events may have been responsible for the erosion at Kovalam. The cumulative effect of the flooding of the backwaters during October, 1985 and probable deposition of silt, the formation of a sand mound on the beach as described earlier, and the rough, heightened sea conditions during May–June, 1986 might have led to the events described here.

The following observations indicate an elevation of the sea level during April–June, 1986.

1. The submergence of normally exposed inter-tidal flats observed during April–June, 1986.

2. High water level during the period April–June, 1986 observed in the ponds at the Mariculture Centre, Muttukkad, when compared to the previous year (Annual Reports of Project MBO/MP/1.2, 1985–'86, '86–'87).

3. A steep rise in neap tide height during April, when it rose from 1.12 to 1.25 metre (Table 2). This rise was more steep and earlier in 1986, than during other years. The normal pattern of a rise during May–June, has been pointed out by Prasad and Reddy (*Indian J. Mar. Sci.*, **14**: 206-209, 1986).

Data of the Meteorological Department do not reveal any significant difference in the pattern of wind speed over the years, 1983–'86 (Jayanthi, Met. Dep. Madras, personal communication).

Conclusions

It is evident from our report that we need to have a fuller understanding of the hydrological parameters and current pattern of the Kovalam Bay than we have at present. The fishery and also the conditions in the farm of Mariculture Centre, Muttukkad are greatly influenced by events in the Bay. It is clear that a deep knowledge of conditions in the Bay would be of great value in studying the capture as well as culture fisheries of this area. Moreover, events like erosion could be predicted and preventive measures taken by the authorities concerned. The unearthening of old sculptures from the sea bed is of archaeological interest. Thus, extensive as well as intensive studies in this area would be of great value in the future.

Edited by Dr. K. J. Mathew, Mr. I. David Raj and Mr. G. S. D. Selvaraj. Published by Dr. K. J. Mathew on behalf of the Director, Central Marine Fisheries Research Institute, Cochin-682 031. Printed at PAICO, Cochin-31