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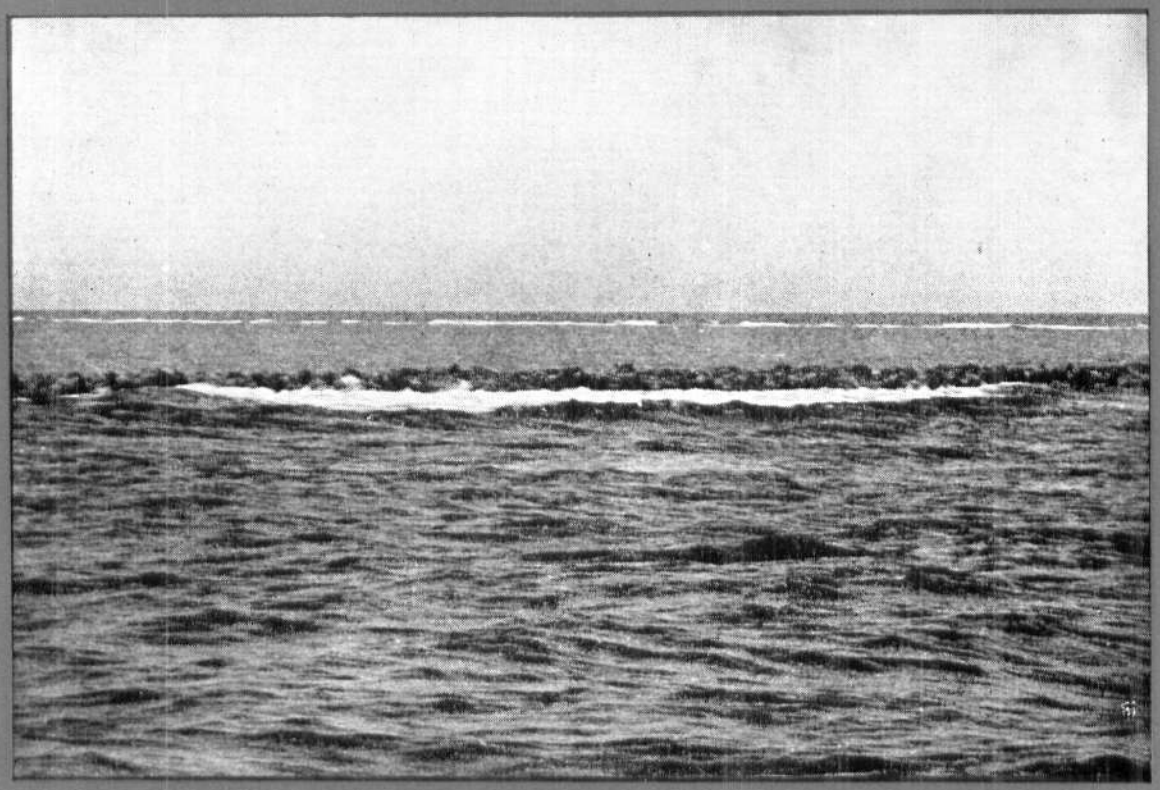

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TIDAL WAVES CAUSE DAMAGES TO COASTAL VILLAGES IN KERALA*

The nature very often takes people by surprise and causes hardships by way of natural calamities. The incidence of such calamities are relatively more in the coastal areas. Every change in nature is reflected some way or the other along the sandy sea shores. One such instance occurred along the Kerala coast between Aarattupuzha (Alleppey District) in the south and Nattika (Trichur District) in the north for a distance of about 150 km. In the midnight of 10th October, 1987 when the coastal dwellers were peacefully sleeping after a day's hectic fishing activities, giant tidal waves started mounting in the sea and struck hard against the shore and rolled over the sandy beach. The water spilled over the sand mounds as if from a bowl filled to the brim. The sea water freely entered the thatched huts on the sea shore and filled them with knee deep or more water. The fishermen ran helter-skelter for their lives and properties.

On receiving the news a team of scientists from the Central Marine Fisheries Research Institute, Cochin visited the southern area between Thottappally & Aarattupuzha for an on-the-spot assessment of the situation. It was found that the tidal waves had caused considerable damages to houses and crops between Pallana (south of Thottappally Spillway) and Aarattupuzha (north of Kayamkulam bar mouth) especially where the sea walls were absent. It is a fact that in this area, as is the case with major portion along the Kerala coast, the land behind the beach is much lower than the mean sea level and therefore the tidal waters once crossed over the beach could find a convenient way into the coastal road and inundate agricultural lands thereby causing considerable destruction to the crops and filling fresh water wells in the villages with saline water.

At least 10 houses have been damaged in this area mainly due to heavy deposition of sand. In some houses it was found that at least a metre of sand had got deposited (Figs. 1 and 2). The sand found entry into these thatched houses through the side protections which are also made of coconut leaves. The team of scientists could witness people removing sand from inside the houses.

Over a stretch of 17 km, the coastal road was found cut across at three places namely Pallana, Mangalam and Aarattupuzha due to the tidal flow. Deep trenches were formed across the road which disrupted the traffic Figs. 3 and 4. However, local people made alternate means to make good the way.

Several low lying areas were inundated with knee deep or more sea water especially at Mangalam. Fortunately these are areas where coconut trees are grown and hence no destruction to such crop has occurred due to saline water. In order to find out whether any alarming situation has been developed on account of inundation, water samples were collected for the analysis of environmental parameters including primary productivity and bacteriology. Simultaneous to this, samples were collected from the sea side also for a comparative idea. The parameters analysed and the results obtained are given in Table 1.

Table 1. *Details of the environmental and biological parameters analysed for the inundated and surf waters*

	Diss. O_2 (ml/l)	Salinity (‰)	Primary productivity (mgC/m³/day)	Microbial parameters: Yeast (No/ml)	*E. coli* (No/ml)	Heterotrophs (No/ml)
Inundated water	3.52	23.6	500	22	2	78.4×10^5
Surf water	5.05	33.3	114	296	64	96.8×10^6

The results showed that the salinity of the inundated water was less by 10‰ than the sea water and this was due to its dilution with rain water. There was a marked difference in the rate of dissolved oxygen, being less in the stagnant inundated water but this was in no way less than the minimum required level for existence of life. The primary productivity value showed high rate of production in the over flowed water. As far as the bacterial flora was concerned the yeast and heterotrophs were seen in greater numbers in the inundated water

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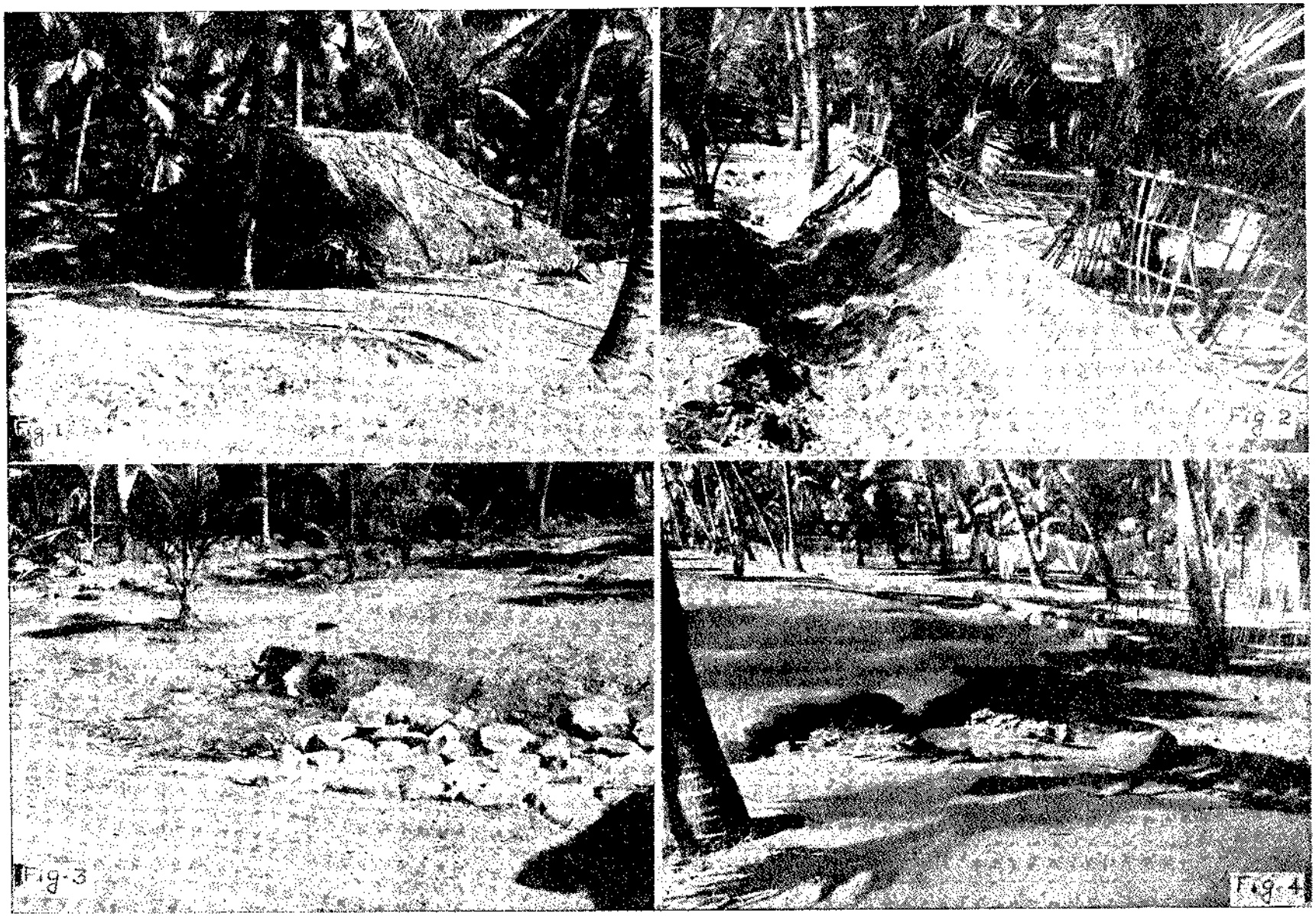

Fig. 1. The tidal waves have deposited sand upto the roof level of this hut (1987). Fig. 2. The fishermen have made sand ridges as a precaution against further erosion. Also please note the damaged fencing (1987). Fig. 3. A deep and wide cut across the road at Mangalam filled by people with granite stones for restoring traffic (1987). Fig. 4. Another view of the damaged road at Aarattupuzha (1987).

and *E. coli* though present in smaller numbers was relatively more. The large number of *E. coli* in sea water may be due to faecal matters found here and there in sea coast. The results obtained clearly indicated that the stagnant water was quite healthy and may not cause any health hazard to the local people.

The tidal waves as detailed above have swept the land at other places also namely Narakkal and nearby areas, and between Kodungalloor and Nattika on the same day and at almost the same time. According to reports, 2,000 houses have been affected of which 40 were totally destroyed and 100 partly in the Kodungalloor and Nattika taluks. The most affected area was between Kulimuttom and Kaippamangalam. The waves which rose to a height of 3 m caused havoc in a 10 km stretch of coast line in this area. In some places water reached upto the National High Way which is about 4 km away from the beach. The low lying areas were inundated to such an extent that the evacuated people had to be taken to safe place in canoes.

Four hundred families who had to run away from their houses were given temporary shelter in the local schools at Kaippamangalam, Perinjanam and Aarattukadavu. There have been considerable damages to fishing nets and canoes. At Perinjanam six canoes have been swept away by the tidal waters. Several coconut trees and other trees have been uprooted in this area. Vast areas were inundated with sea water.

There was no apparent reason for such a natural calamity along the coast except for the fact that it was a full moon day on the 7th of October. The sky was rather clear and there was no wind of any mentionable velocity.

The heights of the highest high tides predicted for Cochin in different months in 1987 are given in Table 2 for the sake of understanding whether there could be any unusual high tides indicated for October which could rise above the usual heights. However, it is found that in October the highest high tide measured 0.99 only which was to occur at 0228 hrs on 25th and therefore no positive correlation could be made between the conventional tides and the one which occurred in the night of 11th October. Therefore, it may be concluded that the tidal waves would have been the result of some changes in the climatic or oceanic conditions in the open sea.

Table 2. *The height of spring tides and their details predicted for Cochin during* 1987

Month	Height of the spring tide (m)	Date	Time (hrs)
January	1.19	2	0239
February	1.17	1	0246
March	1.08	1	0137
April	1.03	29	1411
May	1.05	15	1419
June	1.03	12, 13, 14	1343,1424, 1505
July	1.00	13	1443
August	0.94	10, 11, 12	1407,1407, 1431
September	0.89	9	1309
October	0.99	25	0228
November	1.09	23, 24	0224,0303
December	1.16	22, 23, 24	0218,0252, 0328

There have been earlier cases of such sudden changes in the sea. One such instance occurred in the midnight of 29th August, 1980 when tidal waves rose over the beach between Alleppey and Quilon in the same manner as has happened at present. The waves swallowed considerable stretches of sandy beach. The greatest havoc was caused at the mud bank region in the Ambalapuzha–Thottappally area where tens of coconut trees were uprooted and seven houses were washed off leaving no signs of their existence. Two fish storage sheds built in bricks and cement were also completely destroyed at Ambalapuzha and heavy movement of sand occurred. Inundation of low lying areas also occurred.

The mud of the mud bank was completely dissipated over night and rough sea prevailed there. The dissipation of the mud bank aided by the tidal waves in 1980 was quite sudden and phenomenal unlike in the normal way which is a slow and gradual process. Part of the mud of mud bank was washed ashore along with fishes, shells and polychaete colonies and the rest was aggregated in the sea to form a platform of mud of about 3 km long and 0.5 km wide which could be seen above water level during the low tide. However, within 12 hours the aggregated mud was beaten away and thus the mud bank was completely dissipated causing rough sea in the area.

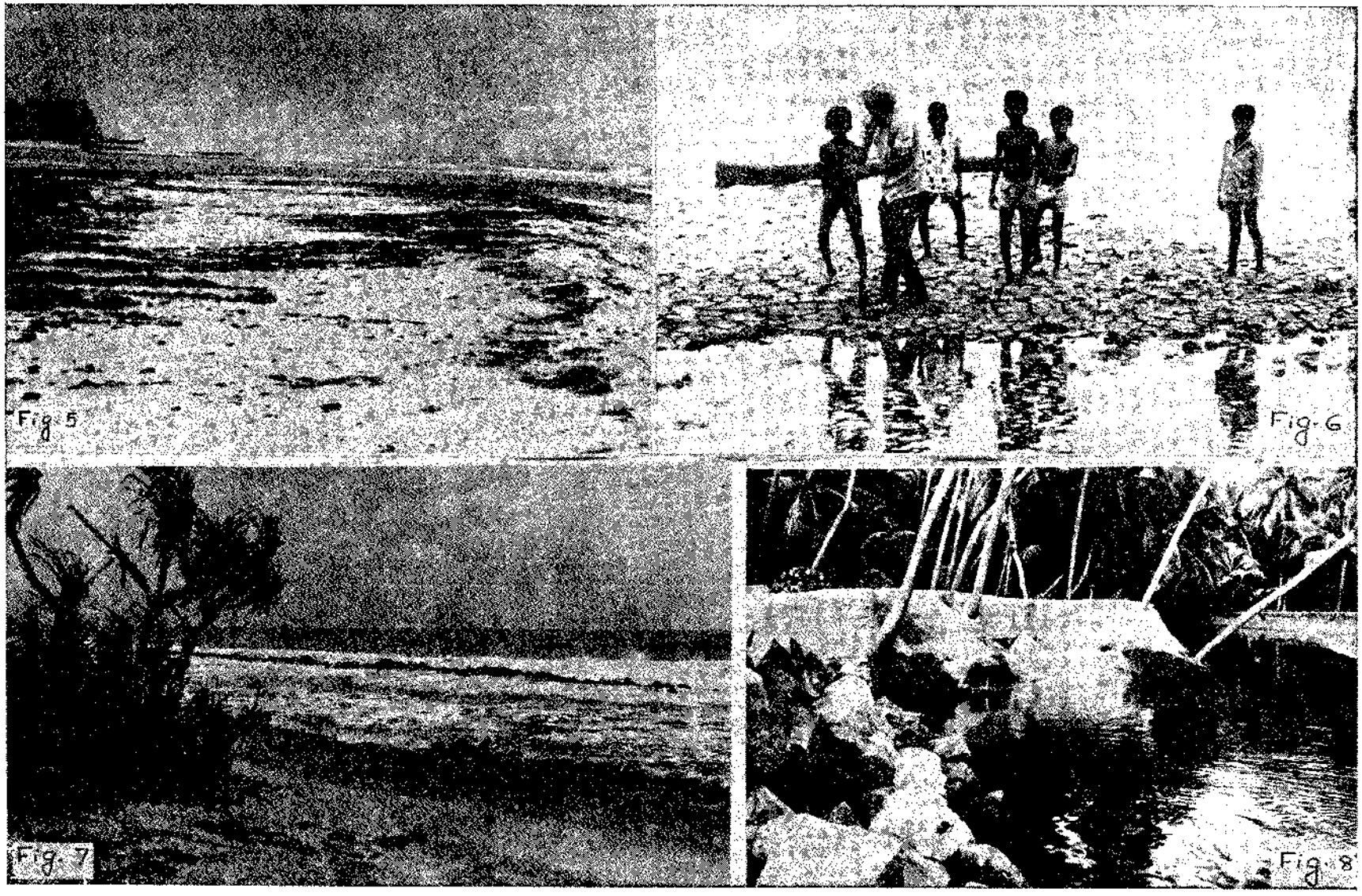

Fig. 5. Streaks of mud seen on the beach at Purakkad mud bank area. Major part of the mud is covered by sand (1980). Fig. 6. The mud thrown on to the beach at Purakkad after being baked in the sun (1980). Fig. 7. The sea has come far interier into the land. In the water is seen the sea wall which was no barrier to the roaring tidal waves. A scene at Ambalapuzha (1980). Fig. 8. Vast areas of unprotected beaches were eroded along the Alleppey–Quilon coast and the sea had come to the coconut plantations. A scene at Purakkad (1980).

In the present case since normality returned after about 24 hours when the team visited the tidal wave hit areas it could see normal life prevailing everywhere including fishing operations except in the case of damaged houses.

Eventhough of a short duration, such tidal waves can cause considerable damages and miseries to the coastal populace. It is extremely difficult to predict such happenings. One thing noticed was that damages were minimum wherever sea walls are present. Therefore the practical solution to such sudden natural calamities is to protect the coast line by constructing sea wall wherever the same is not present. These would save the land and other properties even during other times especially the southwest monsoon when heavy coastal erosion takes place as a regular phenomenon.

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