

BEACH CHANGES AT VISAKHAPATNAM DUE TO THE CYCLONE OF MAY 1979

P. CHANDRAMOHAN AND B. PRABHAKARA RAO

*Regional Centre of National Institute of Oceanography,
Andhra University Campus, Waltair, Visakhapatnam-530 003*

ABSTRACT

The impact of the May, 1979 cyclonic storm on Visakhapatnam beach and the observations made on beach profiles, waves and littoral currents prior to and during the storm are discussed. In general, at Visakhapatnam beach accretion trend starts with onset of northeast monsoon by May and beach becomes more stable with well developed berm owing to the calm weather that prevails during this month. The storm of May 1979 has caused severe erosion all along this beach. Before the onset of the southwest monsoon certain parts of the beach that have not recovered fully are likely to experience additional erosion and thereby may cause anxiety and threat to the properties along the coastline.

Key words : Cyclone, Visakhapatnam, beach profile, waves, erosion.

INTRODUCTION

Earlier to the construction of Visakhapatnam Outer Harbour, parts of the beach north of harbour was reported to have undergone erosion. After the construction of outer harbour about 0.45×10^6 m³ of sand is being pumped from southern side, every year to improve the process of littoral drift, into the northern side of the harbour. The stability of the beach at present has created the confidence to the municipal authorities to make monitory investment for developing gardens and parks in the beach and for widening the existing beach road. The cyclonic storm occurred in May 1979 caused severe erosion along the Visakhapatnam beach and it has become a question whether this beach would be stable enough to face such natural calamities. The depression formed in Bay of Bengal about 1200 km. southeast off Madras on 5th May, 1979 moved towards north-west developed into a severe cyclonic storm and crossed the coast on 12th May, 1979 about 600 km south of Visakhapatnam. Immediately after the recession of storm on 14th May, beach profiles were taken at 16 places covering from Kailasa range hill tip to coastal battery. This was compared with the pre-storm observations on beach profiles taken on March 1979 to assess the damage to the beach due to the storm. The beach profiles taken in June 1979 were compared with May 1979 profiles to study the behaviour of the beach in one month after the storm had recessed. The observed wind and wave characteristics and the longshore current pattern during the storm are discussed.

METHOD AND OBSERVATIONS

Changes in the beach levels were recorded at 16 stations (Fig. 1). Along each profile, readings were taken for every 5 m interval till low tide water line. Dumpy level, 4 m long telescopic wooden levelling staff and 2.5 m long ranging rod were used for

measuring beach profiles. Approximate height of the breaker were noted visually. Wave periods were measured by noting the average time elapsed between ten consecutive waves beyond breaker zone. The average magnitude and direction of the longshore current was measured by releasing neutrally buoyant rubber balls in the surf zone and the distance travelled in two minutes noted.

The east coast of India is subjected to the effects of depressions or storms originating in the Bay of Bengal. The largest number of cyclonic storms occur during months of October and November (Anon., 1964). The cyclonic storm occurred in May 1979 is a pre-monsoon type and the track of this cyclonic storm is given in Fig. 2. Along the Visakhapatnam coast usually, during the month of the May, waves are from south (Sastry, 1958). This generates longshore current towards northeast. On 9th and 10th May, a change in the direction of wave approach from south to northeast was observed. Particularly, on 10th sea was very rough due to strong winds. Maximum wind speed recorded at Cyclone Warning Centre, IMD, Visakhapatnam on that day was 51 kmph with direction 90° N. Breakers of height 0.65–1.65 m with period 6–8 sec were observed. Associated with this the longshore currents with speeds from 60 to 120 cm/sec directed towards southwest were recorded. The severe effect of the waves on the Visakhapatnam beach started from 11th afternoon and prevailed till 12th afternoon. During this period waves approached this stretch of the coast from

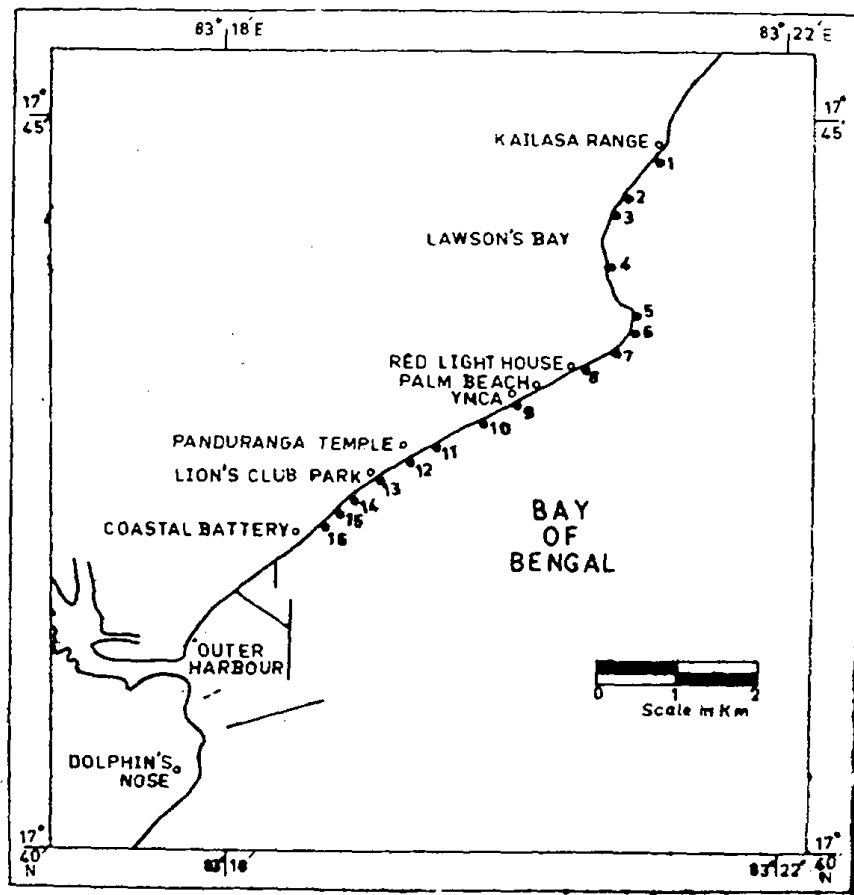


Fig. 1. Location map of Visakhapatnam Beach.

southeast in contrast to that on 9th and 10th May. All along the beach breakers with heights of 1.5 to 2.5 m with period 5 to 6 sec making an angle to the shore lead to an increase in the longshore currents (100 to 160 cm/sec) towards northeast. A similar cyclonic storm that occurred in November 1969 over the Bay, Dattatri and Vijaya Kumar (1974) had predicted shallow water wave heights of 3 to 7 m while the recorded wave heights during that period were of 2 to 4 m. During May 1979 cyclone, multiple breakers (in rows) with heights of 1.5 to 2.5 m were observed. They were breaking first at 100 to 150 m away from the shore and the surf zone was very turbulent. It increased the width of the littoral drift zone to

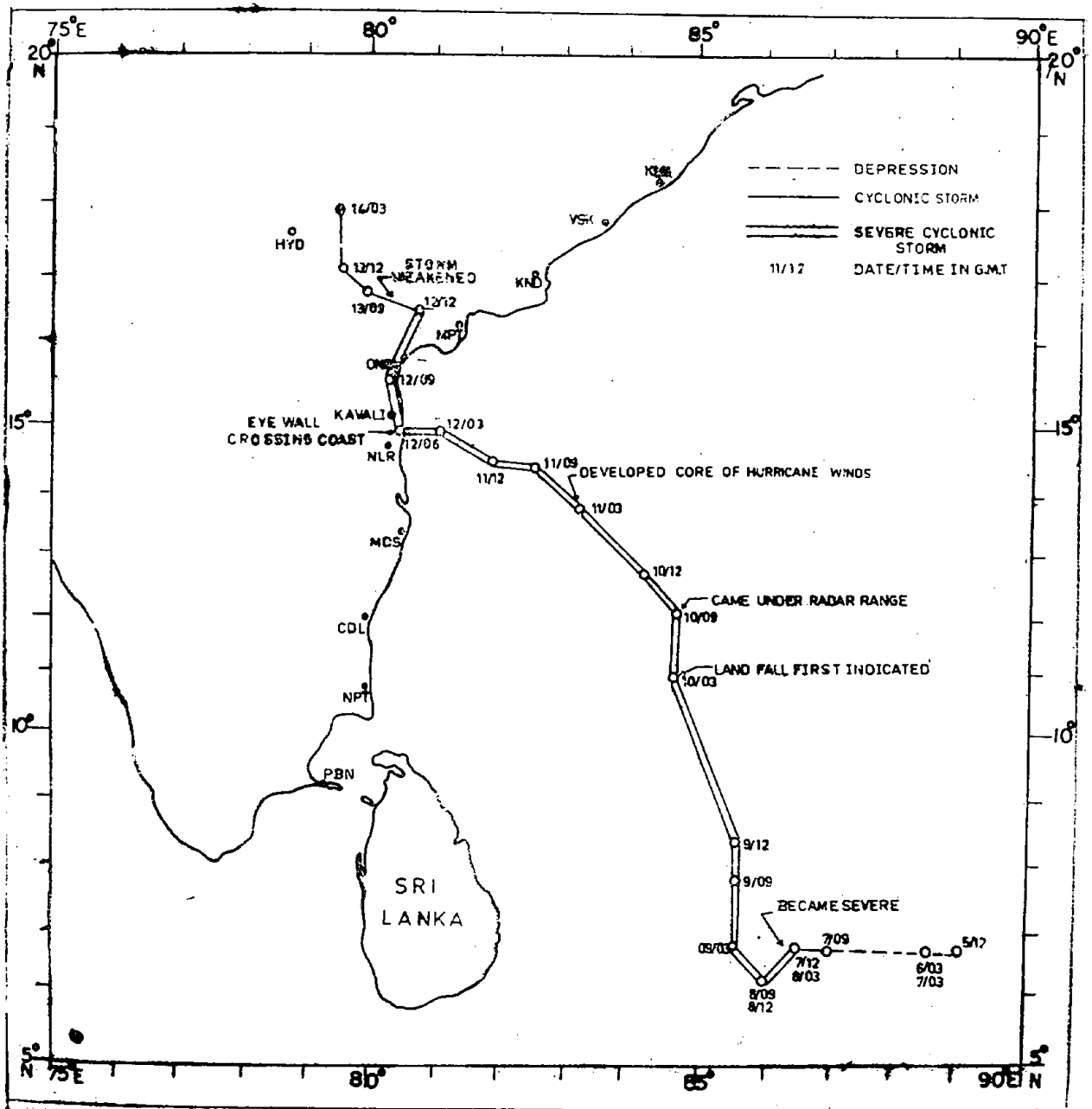


Fig. 2. Track of the cyclonic storm.

approximately 500 m. During this period the swash on the beach face reached the berm level and affected severely the berm. This resulted in the damages of the dunes present on the backshore. All the finer and lighter sands were carried off-shore and alongshore leaving behind the heavy black mineral sands on the beach. All along the beach heaps of dead crabs were found.

RESULTS AND DISCUSSION

The studies on the Visakhapatnam Beach indicate that the time of maximum erosion during an year occur at different places in different months as indicated by the observed lowest elevation of the beach profile (Fig. 3). This difference in the times of maximum erosion over 7.5 km long stretch was attributed to the presence of rock outcrops in the littoral zone (Reddy, 1962). In general, the Visakhapatnam beach undergoes erosion during southwest monsoon and accretion during north-east monsoon (LaFond and Prasada Rao, 1954). Considering the level of the maximum erosion of the year as datum, the quantity of material deposited along unit length of the beach in May 1978; March, May and June 1979 are calculated and given in Table I. The changes in beach levels during these months are plotted in Fig. 3. From Table I, it is inferred that at stations 8, 10, 11 and 13 the beach experienced severe erosion, quantitatively more than the annual maximum erosion. From Fig. 3, it can be observed that along this stretch of the beach berm height was lowered by 1 to 2 m. The dunes on the backshore experienced erosion due to the increased wave runup leading to vertical cuts of 1 to 3 m. Particularly erosion was very high between Red Light House and Palm Beach Hotel (stn. 8 and 9) and near Lion's Club Park (stn. 13). The condition of the eroded beach on 14th May near Red Light House and Lion's Club Park are shown in Figs. 4 and 5 respectively. Beach berm at these places completely scoured off and near Palm

Table I. Quantity of sand deposited along unit length of the beach above the minimum beach level for the year.

Station No.	Month of minimum level in the year	Quantity of sand per unit length of the beach in cubic metres.			
		May 1978	March 1979	May 1979	June 1979
1	Jan.	70	55	14	-13
2	Oct.	118	118	26	34
3	Aug.	107	94	20	42
4	Aug.	37	104	54	49
5	Jun.	24	45	34	47
6	Feb.	42	80	15	67
7	Aug.	121	83	12	100
8	Sep.	64	105	-11	-49
9	Jan.	61	58	8	-1
10	Jun.	69	22	-28	-12
11	Nov.	105	100	-6	23
12	Oct.	111	171	93	101
13	Nov.	102	104	-43	-2
14	Oct.	6	52	12	11
15	Oct.	146	176	127	67
16	Aug.	106	118	51	37

Beach Hotel, erosion was so severe that the rocks usually buried 1 to 2 m below beach level were exposed (Fig. 6). Since the beach near Palm Beach Hotel was naturally stabilised well and backed with high backshore dunes, the impounded large quantity of sand fed itself to the attacking storm waves and the severe erosion was tackled by the beach itself without causing damage to the adjacent properties. Consequently near stations 10 to 13 where the width of the beach is comparatively narrow (free from sand dunes) the heavy action of the waves eroded the whole berm and the waterline approached close to the beach road retaining wall. At this stage, the storm receded and further calamity to the existing properties was averted.

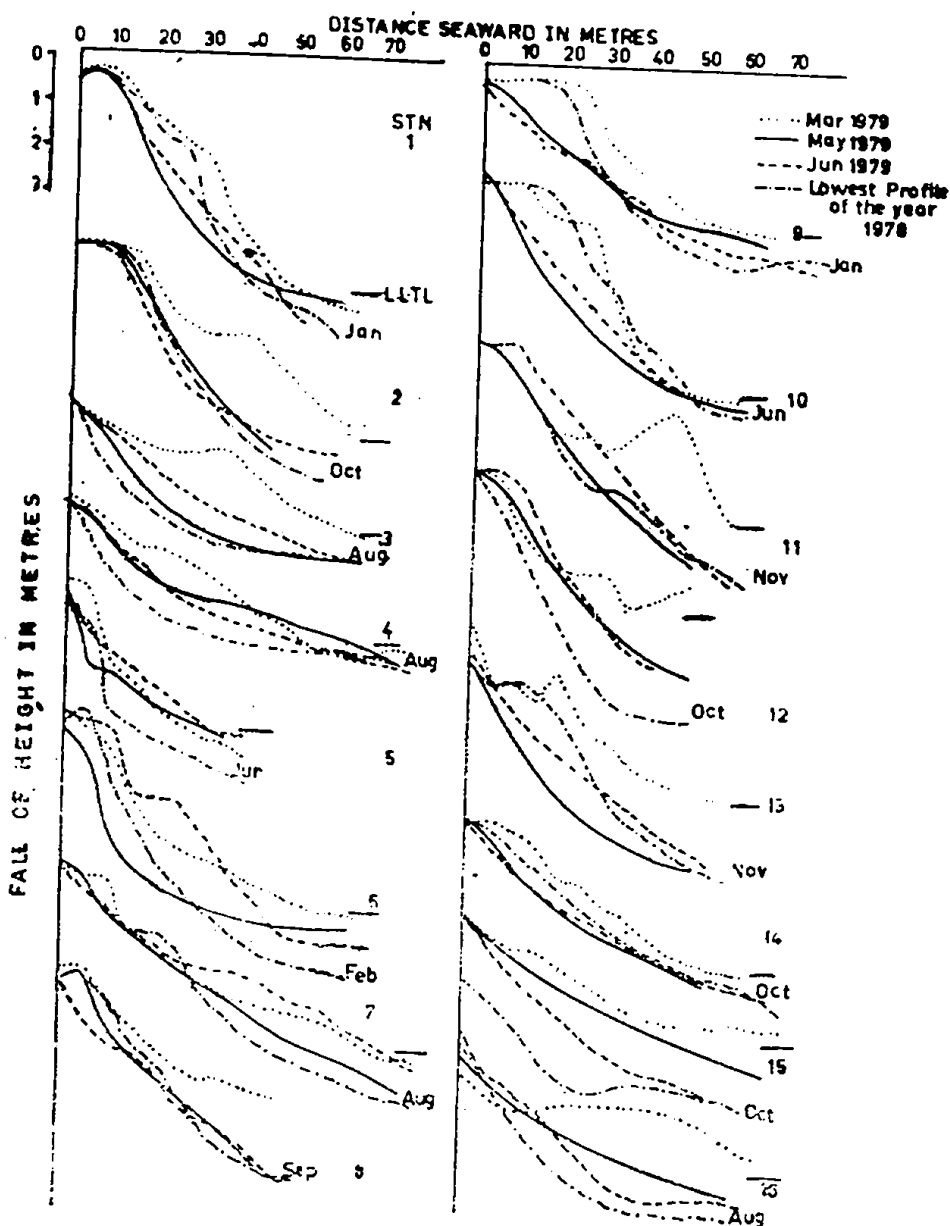


Fig. 3. Changes in the beach profiles.



Fig. 4. Erosion on backshore dunes near Red Light House.



Fig. 5. Erosion near Lion's Club Park.



Fig. 6. Exposed rocks near Palm Beach Hotel due to erosion.

The moderately affected places were Lawson's Bay (stn. 1 to 4) and between Ladies Hostel and Visakha Women's College (stn. 14 to 15). The stretch of the beach at these places has a well developed berm without any sand dunes. The impact of waves on the beach was restricted to the erosion of the berms (vertical cuts of 1 to 2 m were recorded). At station 5 erosion was not much pronounced.

The intruded high waterline into the beach was in the order of 10-20 m close to Casurina trees planted near Coastal Battery and 5-10 m close to the Lion's Club Park side wall. The high waterline touched the embankment wall of the newly constructed Municipal Park opposite to Panduranga Temple and also the front wall of the Red Light House. Soon after the recession of the storm, the foreshore at all the stations developed a very steep slope (1 : 10). Near stations 15 and 16 the steepness was comparatively less (1 : 20).

Comparing the quantity of beach sediments in May 1978 and March 1979 (Fig. 3 and Table I), it is understood that the beach had experienced severe erosion due to the cyclone. The loss of material is quite substantial. From the observation taken in June 1979 it is inferred that parts of the beach near stations 2, 3, 5 to 7 and 10 to 13 experienced little deposition and the beach started to restore in one month. Consequently in the remaining part of the beach erosion continued and the beach lost additional quantity of the sediment. During the forthcoming southwest monsoon, this part of the beach is likely to experience additional erosion.

The studies by Subba Rao and Madhusudana Rao (1970) at one location along the stretch of this beach immediately after a cyclonic storm affected the central east coast of India in Dec. 1965 indicated a high rate of deposition. In contrast, this study reveals significantly variable rates of deposition particularly after the beach is subjected to such severe cyclonic storms. This is probably due to the variation in the wave energy expended on the elastic boundary of the beach.

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