

Monthly wave characteristics of the Bay of Bengal

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ABSTRACT. The monthly wave characteristics of the Bay of Bengal are reported, based on an analysis of the wave data published in the *Indian Daily Weather Reports* of the India Meteorological Department for the period 1960-64. March is the calmest and June, the roughest month in the area. In June the average wave height is 1.75 m although the maximum number of depressions and cyclones occur during the month of October.

1. Introduction

In a previous paper (Srivastava *et. al* 1968) the monthly wave characteristics of the Arabian Sea are reported, based on an analysis of the wave data published in the *Indian Daily Weather Reports* of the India Meteorological Department for the period 1960-64. The present paper which is in continuation of the above mentioned paper gives the monthly wave characteristics of the Bay of Bengal. Recently HMSO, U.K. has published ocean wave statistics of the world's ocean (Hogben and Lumb 1967). It does not give any detailed analysis of the waves in the Bay of Bengal as the entire area has been chosen as a single unit for purposes of statistical analysis. In the present analysis the Bay of Bengal has been divided into two-degree square zones. Statistical analysis of waves for each of the zones is presented.

2. Analysis of the data

The details of the procedure followed for the analysis of the data are similar to that of Hogben and Lumb (*loc. cit.*). The wave data for each month were grouped for each 2° square. The average of the significant wave height, the standard deviation of the significant wave height, the predominant wave period and wave direction were determined for each zone. Maps depicting the average significant wave height, the standard deviation of the same, the predominant wave period and wave direction were prepared for each month. A typical map for the month of June is presented in Fig. 1.

The highest 10 per cent waves, which could possibly occur in 2° square were calculated for each month and were plotted for each zone for each month and contoured. A typical map for the month of June is presented in Fig. 2. The areas

shown by dots in the map represent the low wave activity areas and the value given therein represents the lowest value reported. The shaded areas represent the high wave activity and the value given therein represents the highest value reported.

The monthwise average wave height taking the whole of Bay of Bengal as a single unit, is presented in Table 1.

3. Results and Discussions

A complete set of 24 maps depicting the monthly wave characteristics of the Bay of Bengal is presented in the NPOL Departmental Report (unpublished).

By studying the average wind pattern for fifty years as presented in the IMD Wind Atlas, the Bay of Bengal can be divided into following four seasons for the study of waves—

- (a) *Northeast monsoon* (November to February)—Wind mostly northeasterly,
- (b) *Pre-monsoon* (March-April)—Anticyclonic wind pattern,
- (c) *Monsoon* (May-September)—Wind mostly southwesterly.
- (d) *Post monsoon* (October)—Variable wind pattern.

(a) *Northeast monsoon* (November to February)—The waves in general follow the northeast direction of the northeasterly wind pattern, except around the Nicobar group of islands, where the wave direction is variable during the month of January and November (Figs. 3 and 4). The wave amplitudes during the northeast monsoon period are in general lower than during the southwest monsoon (Figs. 1, 5 and 6).

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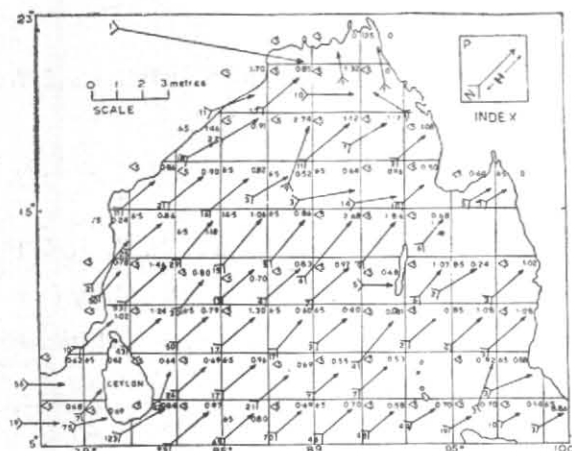


Fig. 1. Wave characteristics—June

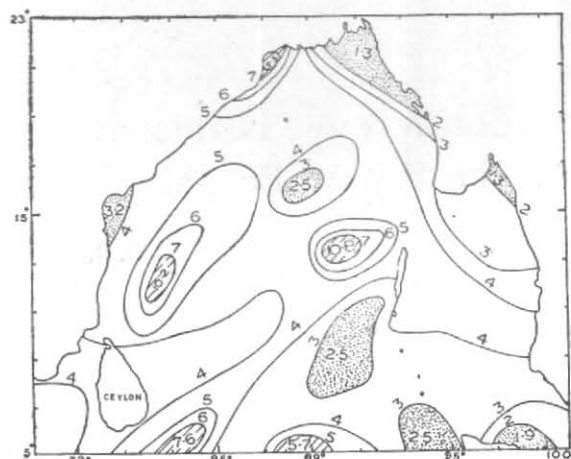


Fig. 2. Highest 10 per cent high waves—June

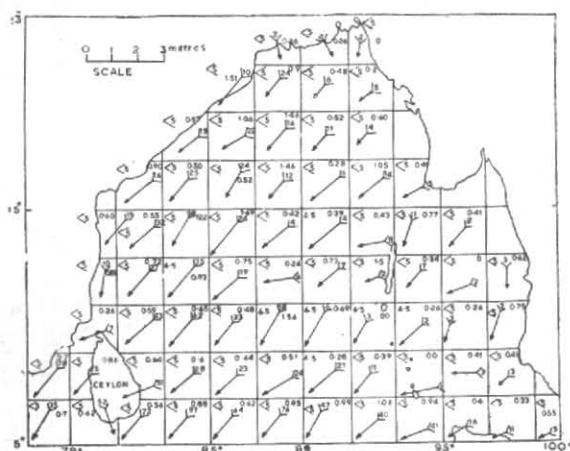


Fig. 3. Wave characteristics—January

H—Average significant wave height in metres;
S—Standard deviation of average height;

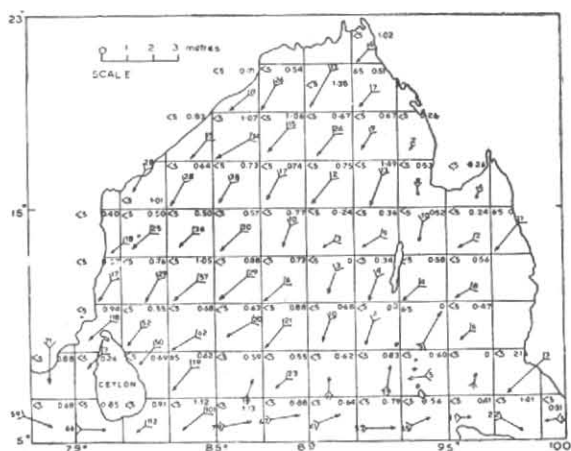


Fig. 4. Wave characteristic—November

P—Most predominant wave period in seconds
N—Number of observations

TABLE 1

Monthly average wave height taking Bay of Bengal as a single unit

Month	Average wave height (m)	Month	Average wave height (m)
January	1.13	July	1.39
February	1.04	August	1.41
March	0.84	September	2.20
April	0.87	October	0.97
May	1.19	November	0.97
June	1.75	December	1.05

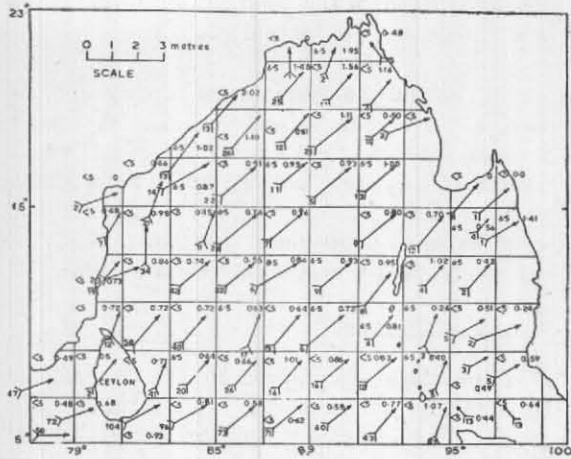


Fig. 5. Wave characteristics — July

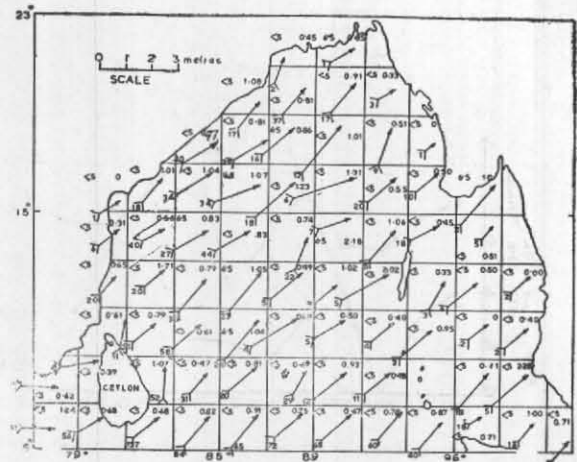


Fig. 6. Wave characteristics — August

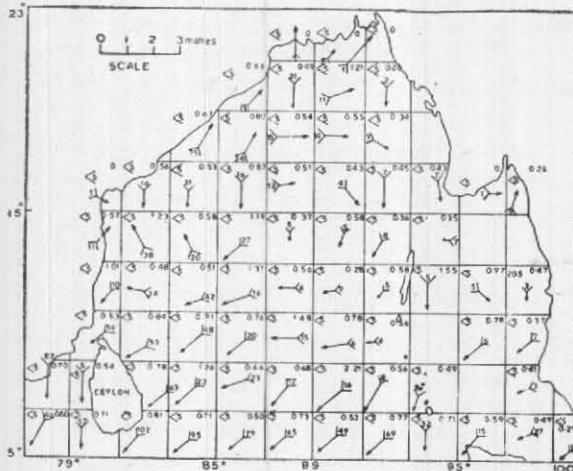


Fig. 7. Wave characteristics — March

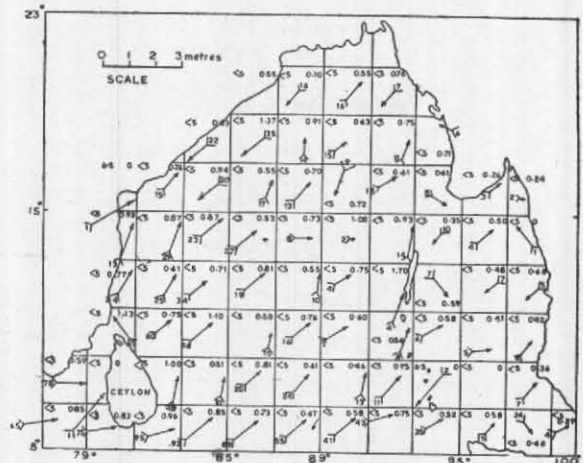


Fig. 8. Wave characteristics — October

H—Average significant wave height in metres; P—Most predominant wave period in seconds
S—Standard deviation of average height; N—Number of observations

(b) *Pre monsoon* (March to April)—The direction of wave is variable throughout the Bay of Bengal. The maps depicting the average wave conditions in the Bay of Bengal show that March (Fig. 7), is the calmest month in the area. The average height, taking Bay of Bengal as a single unit, is 0.84 m.

(c) *Monsoon* (May to September)—The direction of wave ranges between W and SW. The waves in the monsoons are in general higher than in any other seasons. June is the roughest month in the area (Fig. 1). The average height, taking Bay of Bengal as a single unit, is 1.39 m.

(d) *Post monsoon* (October)—The direction of wave is variable. The average height, taking Bay of Bengal as a single unit, is 0.97 m (Fig. 8).

The area southeast of Ceylon is rough throughout the year. The coastal area of East Pakistan is calm for the most part of the year.

A comparative study of the monthwise cyclones and depressions during the period 1960-64 and the monthly average wave height has been made (Fig. 9). It will be seen from the figure that maximum number of depressions and cyclones occur during the month of October, whereas the Bay of Bengal is roughest during the month of June. The reasons for this apparent anomaly are as follows—

(a) During the month of June, southwesterly wind is blowing steadily over a longer fetch giving rise to a steady state and this condition prevails

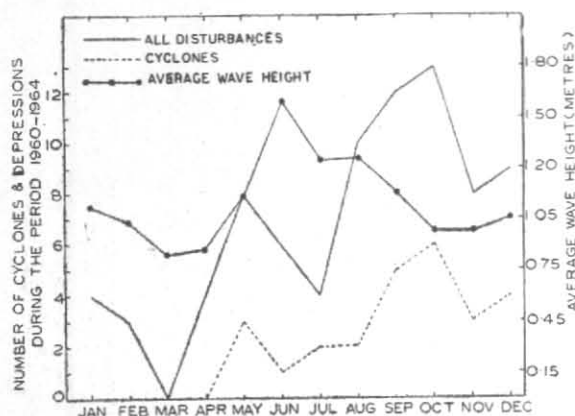


Fig. 9. Comparison of depressions and cyclones with average wave height

for most time of the month. Thus the roughest sea conditions are obtained.

(b) Though the wind under a cyclonic condition is of higher velocities, since the fetch is limited, the steady state condition is not reached. Besides the cyclonic pattern exists for a few days only. Hence in spite of the large number of cyclones and depressions, the wave heights are relatively smaller in October than in June.

4. Acknowledgements

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