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CHARACTERISTICS OF SEA WATER NEAR THE LIGHT HOUSE, BOMBAY*

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As part of a programme of work on the distribution of surface temperatures and salinities in the Indian Ocean, sea water samples were collected regularly since 1936 near Prongs Reef Light House, Bombay (18° 53'N, 72° 48' E). Besides temperature measurements and salinity determinations, estimations of dissolved oxygen, inorganic phosphate and total phosphorus, using standard methods (*vide*, Harvey, 1955), were also carried out on the samples. The results are shown graphically in Figs. 1 to 7.

The results appear to be of considerable interest since significant annual variations can be detected which can be correlated with similar variations in meteorological conditions. This applies, in particular, to the density of surface water which varies inversely with rainfall in the monsoon months (S.W. Monsoon) and with wind velocity during these months. The dominance of the south west monsoon and the influence of heavy rains along the west coast of India in decreasing the salinity of the surface water is well known and mention has been made of this by George (1953). Malurkar, Chaubal and Rao (1958) also found a close inverse correspondence between sea density (determined hydrometically) and the rainfall in the area when moving average values were used for comparison of the conditions prevailing at Alibag and Colaba. However, there was a time lag between high rainfall and the dilution to low density. This was attributed by these authors partially to a dynamic effect.

In the present instance, it is observed that wind velocity is possibly the more dominating factor. While the minimum in sea density corresponding to maximum

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in wind velocity is very sharp and characteristic, there is only one minimum instead of two which could be expected if rainfall were to be the more decisive factor (Fig. 6a). It is thus seen that the dilution and consequent reduction in density is due to an intrusion caused by winds rather than a localized effect due to rainfall. From a comparison of the hydrological and meteorological data for the two years 1958 and 1959 for Bombay and the corresponding data for the same years at Calicut, it is noted that at Calicut the minimum temperature was recorded in July while near Bombay this was observed in January and February. Further the lower range of surface salinity close to shore off Calicut—4°/$_{oo}$ (Subrahmanyan, 1959) stands out sharply against the corresponding range of 10°/$_{oo}$ and more for the Bombay region. These differences in salinity and temperature are probably related to variations in strength of shoreward drift (of course, caused by winds) of highly saline off-shore waters at the two places during the period of the South-West Monsoon (Jayaraman and Gogate, 1957).

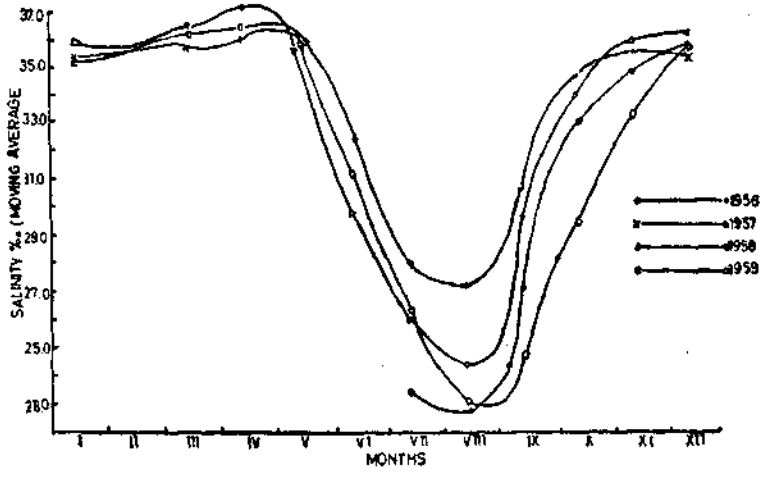

FIG. 1

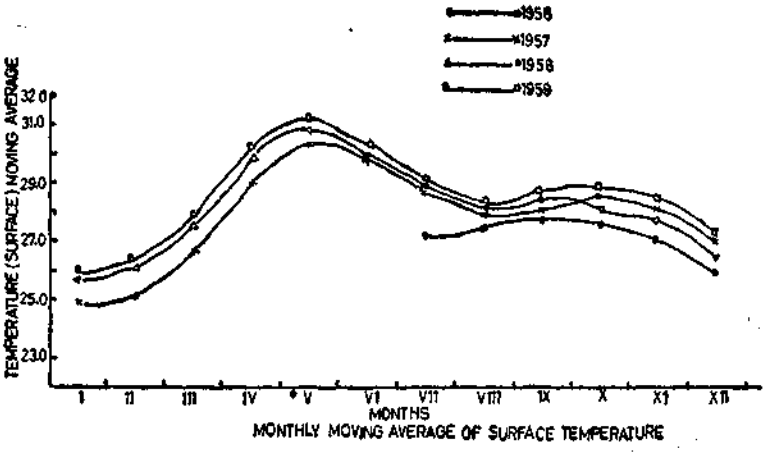

FIG. 2

From the close association of such drift with rainfall, wind velocity and surface salinity, it would appear that low winds promote high surface salinities against the opposing dilution effect of rainfall. At Calicut wind velocity is small while off Bombay the wind velocity is much higher. The influence of wind velocity is confirmed by differences noticed in Bombay between conditions prevailing in 1958 and 1959.

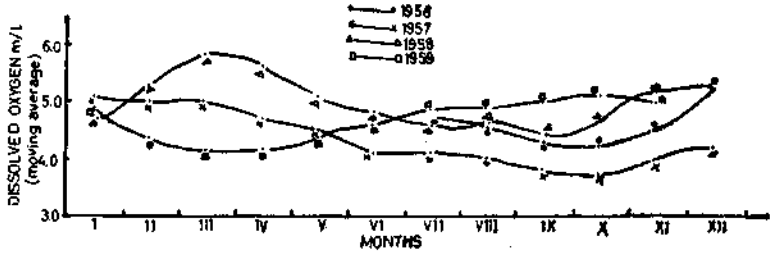

FIG. 3

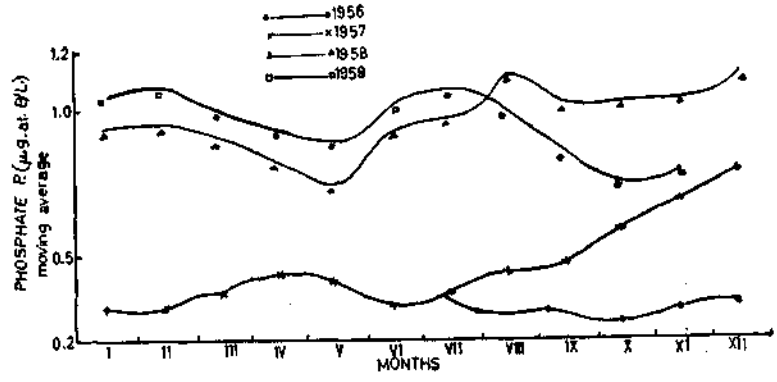

FIG. 4

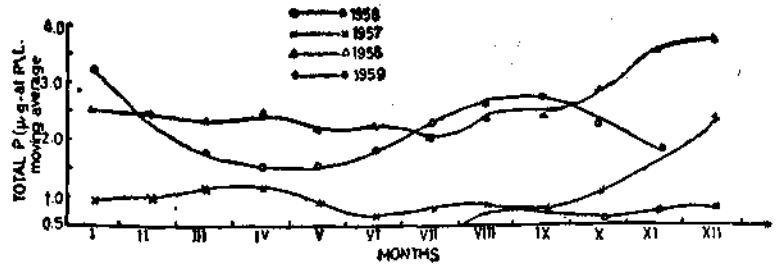

FIG. 5

FIGS. 1-5. Show the monthly variations (moving averages) in salinity, surface temperatures, dissolved oxygen, inorganic phosphate and total phosphorus respectively, in the inshore waters near Prongs Reef Light House, Bombay.

It is noteworthy that differences in meteorological conditions are reflected also in variations in biologically important compounds such as phosphates, dissolved oxygen, etc., (Figs. 1-5). These variations are of significance in view of their importance to

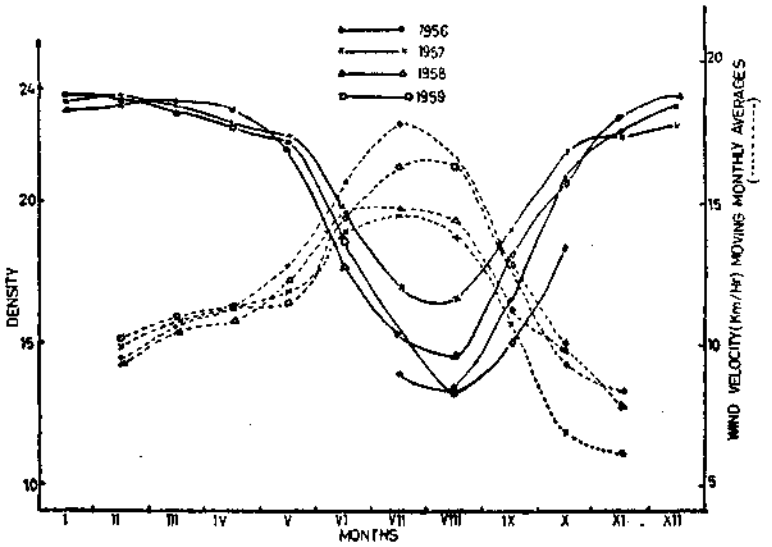

FIG. 6(a). Shows the comparative values for wind velocity and sea density in the different months near Bombay.

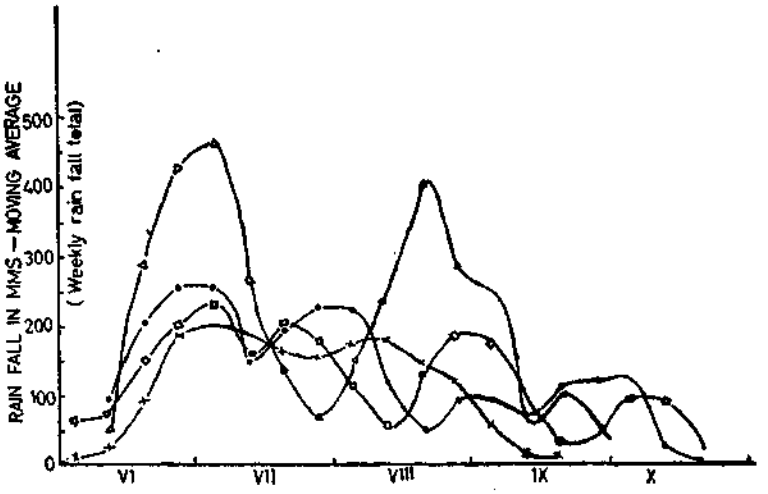

FIG. 6(b). Shows the total weekly rainfall during the period of the southwest monsoon near Bombay.

plankton, plankton feeders and fisheries in general since it would appear that in certain regions there is a certain amount of correspondence between high rainfall and high fishery production (Dietrich and Kalle, 1957 ; Subrahmanyan, 1959).

SUMMARY

An account of the hydrological conditions of the inshore waters off Prongs Reef Light House, Bombay is presented and discussed. Significant annual variations (between 1956 and 1959) in temperature, salinity and other biologically important

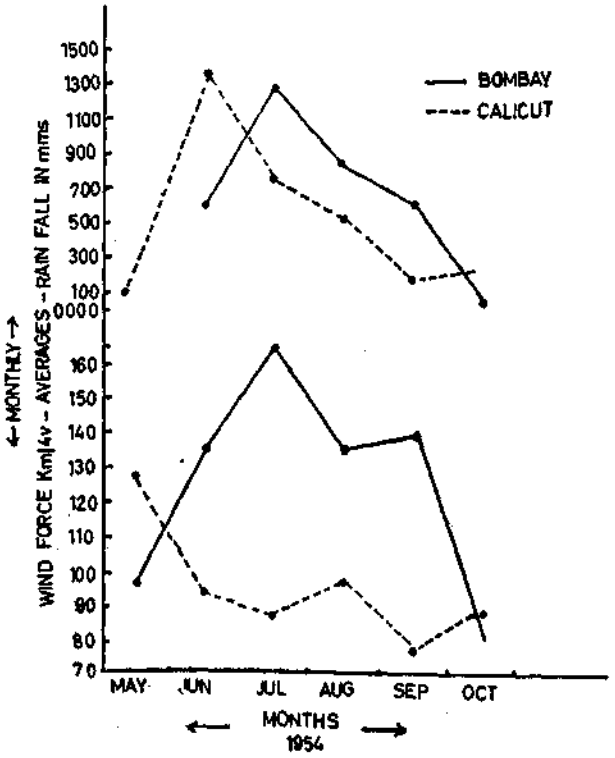

FIG. 7. Shows the comparison of wind velocity and rainfall data for Bombay and Calicut.

factors are recorded. It is seen that these variations are related to the prevalent meteorological conditions, such as rainfall, winds, etc. There appears to be a greater degree of association between winds and variations in the hydrological condition.

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