

## CHARACTERISTICS OF SEA WATER OFF MANDAPAM, 1950-1954<sup>1</sup>

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### INTRODUCTION

THE chemistry of sea water in Mandapam area has been described by Jayaraman (1954) on the basis of observations during 1950-1953. The data related to seasonal variations in salinity, dissolved oxygen and nutrient salts at two inshore stations in Gulf of Mannar and Palk Bay. The corresponding planktological characteristics were detailed by Prasad (1954 ; 1956) who also summarised the sequence of seasonal changes and indicated the factors governing the dynamics of phyto- and zoo-plankton populations.

In the present paper, data cited by Jayaraman and Prasad have been consolidated along with those obtained subsequently and analysed for trends by the method of moving averages. A preliminary examination indicated differences in the trends of dissolved oxygen and nutrient salts and prompted a study of the significance of these two variations in standing crop of phytoplankton.

### METHODS AND RESULTS

The procedure for the chemical determinations was the same as that described by Jayaraman. The plankton records were kindly placed at my disposal by Dr. R. R. Prasad to whom I wish to express my thanks. For facilitating handling of plankton data, the census figures, referring to the standardised subsample (Prasad, Bapat and Tampi, 1952) have been plotted logarithmically.

The trends in surface salinity, dissolved oxygen and phosphate and in phytoplankton are given in Figs. 1-4.

Salinity and dissolved oxygen were lower in Palk Bay than in Gulf of Mannar. A downward trend in salinity towards the end of 1952 was followed by similar decreases in oxygen towards the middle of 1953 and in phosphate towards the end of 1953. Differences were observed in the oxygen-phosphate relationship (Scatter diagrams, Figs. 5 and 6).<sup>2</sup> A general inverse relationship between phosphate and phytoplankton was noticed such as been reported in some coastal areas (vide Kalle, 1933). The range of fluctuation in phosphate in the Gulf of Mannar was more uniform than in Palk Bay. The standing crop of phytoplankton in the Gulf showed a tendency to increase, though the range of variation was higher in the Bay.

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<sup>2</sup>1 microgram. at. P/L. = 30.98 mg. P/M<sup>3</sup>. The scatter diagrams are similar to those described by Rochford (1951).

## DISCUSSION

From Figs. 3 and 4, it is seen that the patterns of variation in phosphate in the Gulf of Mannar and Palk Bay exhibit greater similarity than do the correspond-

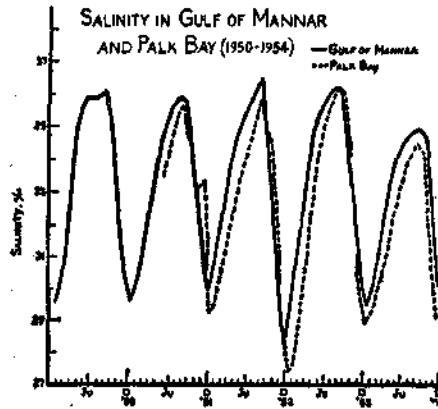


FIG. 1.

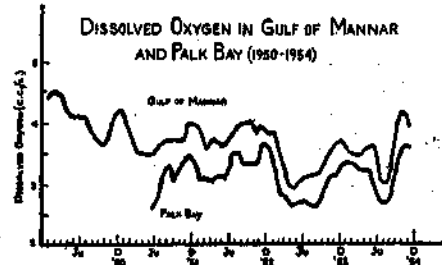


FIG. 2.

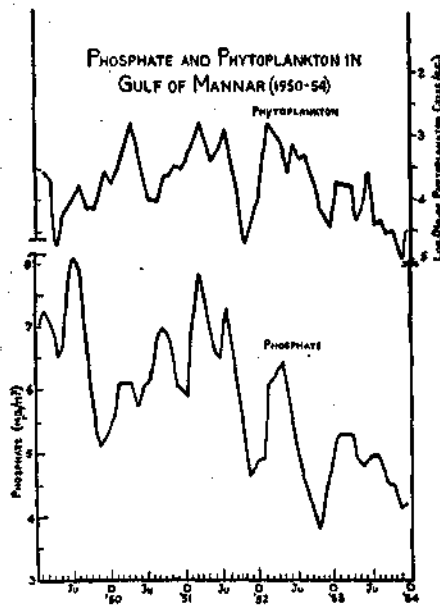


FIG. 3.

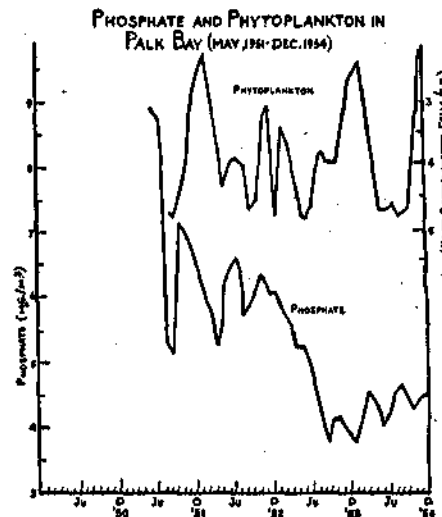


FIG. 4.

ing responses in the standing crop. Judging from the gradients of the phosphate and plankton curves at the points of maximum decrease and increase respectively in

each year (Fig. 7), it would appear that the increase in plankton per unit decrease in phosphate is the same at both the stations. The differing trends in standing crop are obviously due to dissimilar rates of replenishment of phosphate. The regeneration of phosphate in the Gulf is, in general, quicker, more uniform and extensive than in the Bay. A possible reason for this may be that, unlike the phytoplankton

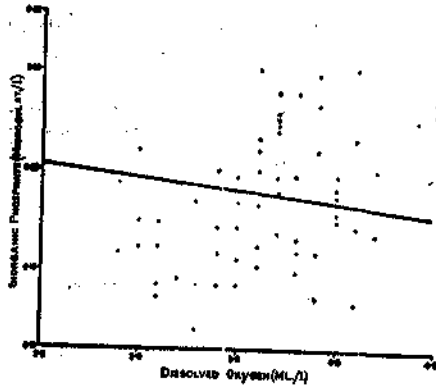


FIG. 5. Phosphate and dissolved Oxygen in the Gulf of Mannar.

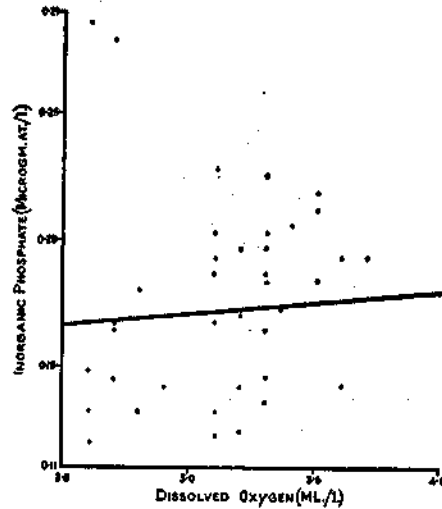


FIG. 6. Phosphate and dissolved Oxygen in the Palk Bay.

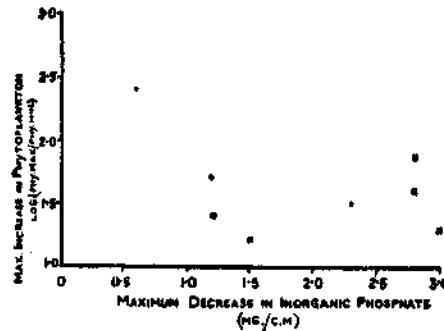


FIG. 7. Changes in phosphate and phytoplankton in the Gulf of Mannar (X) and Palk Bay (O).

minimum in the Gulf of Mannar, the corresponding minimum in Palk Bay coincides with the predominant northeast monsoon in this region. The adverse effects of turbulence on regeneration and utilisation of nutrients are hence likely to be more pronounced in the Bay.

The relationship between metabolic phosphate and oxygen, both in photosynthesis and in oxidation of organic matter, has been described by Redfield (1948). A variety of factors are admittedly involved in the reaction and a direct regression between inorganic phosphate and dissolved oxygen cannot possibly be expected (Rochford, 1951). Nevertheless, in view of the association observed in the present instance among the variations in oxygen, phosphate and phytoplankton, it would be of interest to study in greater detail the oxygen-phosphate relationship with reference to the standing crop of phytoplankton.

#### SUMMARY

Some of the chemical and biological characteristics of sea water off Mandapam have been analyzed for trends.

Salinity and dissolved oxygen were lower in Palk Bay than in the Gulf of Mannar. Oxygen-phosphate relationship and likewise trends in phytoplankton were different; it is considered likely that this association is of some significance.

#### ACKNOWLEDGEMENTS

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#### REFERENCES

- JAYARAMAN, R. 1954. Seasonal variations in salinity, dissolved oxygen and nutrient salts in the inshore waters of the Gulf of Mannar and Palk Bay near Mandapam (S. India). *Indian J. Fish.*, **1** : 345-364.
- KALLE, K. 1933. Phosphat und Gesamtphosphor in Beziehung zu Temperatur, Salzgehalt und Plankton an der Oberfläche der islandischen Küstengewässer. *Ber. dtsh. komm. Meeresforsch.*, **6** : 274-299.
- PRASAD, R. R. 1954. The characteristics of marine plankton at an inshore station in the Gulf of Mannar near Mandapam. *Indian J. Fish.*, **1** : 1-36.
- PRASAD, R. R. 1956. Further studies on the plankton of the inshore waters off Mandapam. *Ibid.*, **3** : 1-42.
- PRASAD, R. R., BAPAT, S. V. AND TAMPPI, P. R. S. 1952. Observations on the distribution of plankton at six inshore stations in the Gulf of Mannar. *J. zool. Soc. India.*, **4** : 141-151.
- REDFIELD, A. C. 1948. The exchange of oxygen across the sea surface. *J. Mar. Res.*, **7** : 347-361.
- ROCHFORD, D. J. 1951. Studies in Australian estuarine hydrology. *Aust. J. Mar. Freshw. Res.*, **2** : 1-116.