

WATER MASSES OF VISAKHAPATNAM SHELF

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ABSTRACT

The T-S relationships of shelf waters off Visakhapatnam in the Bay of Bengal are studied for the different seasons with the data collected during February 1979 to January 1981. The T-S relationships indicate distinct characteristics of the water masses in different seasons. Depending on the ranges of temperature and salinity the seasonal water masses are described.

INTRODUCTION

The present knowledge on the hydrography of the shelf waters off Visakhapatnam is largely due to the cruises conducted by Andhra University during 1952-58 (La Fond, 1957). The oceanographic investigations have thrown considerable light on horizontal and vertical water structure along the east coast of India (La Fond, 1958). The present paper is an attempt to identify the water masses in the shelf waters off Visakhapatnam from Temperature- Salinity (T-S) relationship.

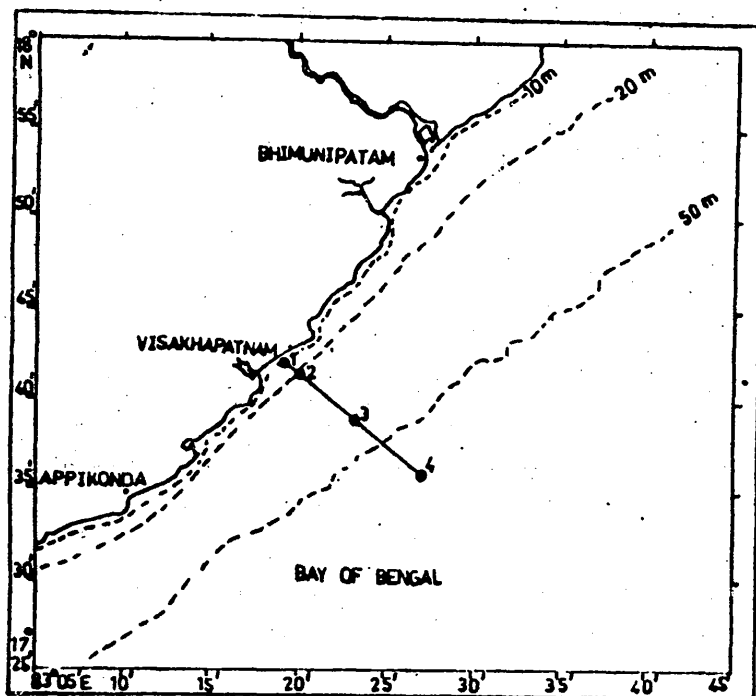


Fig. 1. Station location map.

DATA AND METHODS

Surface and sub-surface (10, 20, 40 and 60 m) water samples were collected along the Waltair transect from 4 stations (Fig. 1) during February 1979 to January 1981 at monthly intervals. Salinity was determined using standard analytical method (Anon, 1975). Temperature values were obtained using reversing thermometers.

RESULTS AND DISCUSSION

Temperature and Salinity diagram is useful tool for the identification of water masses and their physico-chemical characteristics. The water masses in shelf water are not entirely analogous to the deeper water masses and have been used to study water movement in localised areas (La Fond, 1954). An attempt has been made to identify them by T-S plot in the present study.

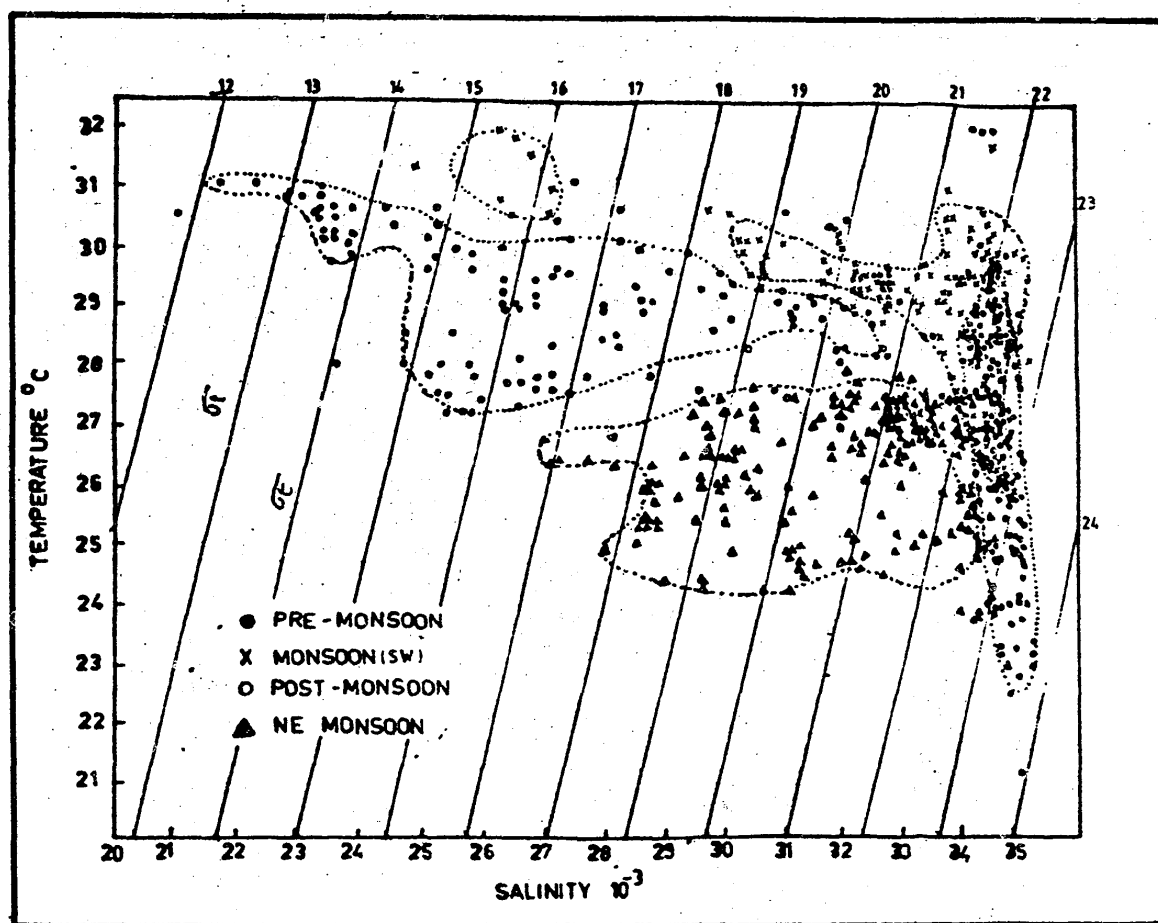


Fig. 2. Temperature-Salinity diagram.

Data on temperature and salinity from surface to 60 m depth at all stations during the study period is plotted in Fig. 2. Pooling of the data under different seasons clearly indicate water masses of distinct characteristics as the points on the T-S diagram fall with distinct ranges of temperature and salinity. The salient features of water masses in different seasons are described below:

i) Pre-SW Monsoon season (March-May)

T-S diagram shows the temperature variation between 22° and 30°C and salinity variation from 33.5 to 35.5 x 10⁻³ in the shelf waters during this season. The high range of temperature with lowest values for the entire year and high salinity values are indicative of the upwelled waters during this season. The density of these shelf waters varies between 22 and 23.5.

ii) Southwest Monsoon Season (June-September)

The temperature varies from 26° to 31°C while the salinity varies from 30.0 to 35.0 x 10⁻³ during this season. Continuation of relatively higher salinities (33.0 to 35.0 x 10⁻³) of the pre- southwest monsoon season in the bottom waters and the low temperature difference between surface and bottom are the marked features of the monsoon season. The clockwise circulation of surface waters in the Bay of Bengal (La Fond, 1958) during this season and the input of fresh water from the rivers may be responsible for a mixed water mass with a density range of 18.5 - 22.5.

iii) Post SW Monsoon Season (October-November)

This season marks the variation of temperature from 27° to 31°C with a wide range of salinity variation from 21.0 to 32.0 x 10⁻³. This large salinity variation is due to the dilution of surface waters by the southerly flowing northern river waters along the east coast of India (Ganapati & Murty, 1954). The monsoon temperature-salinity distribution (Fig. 2) is distinctly different compared to other seasons. The density varies from a lowest value of 12.0 to highest value of 20.5 during this season.

iv) NE Monsoon Season (December-February) This season is marked by the occurrence of low temperature (20° to 28°C) and intermediate salinities (27.0 to 34.5 x 10⁻³). The temperature and salinities are relatively low compared to post SW Monsoon season showing the movement of transition waters from south. The density varies between 17.5 and 22.5.

The distinct water characteristics viz., temperature and salinity ranges of different seasons along with the reported density values and water masses are shown in Fig. 2. La Fond (1957) classified the water masses of Visakhapatnam shelf waters extending to a depth of 100 metres entirely based on the density differences. As is well known, the water mass characteristics cannot be defined on density alone, especially in shelf waters, this classification gives rise to discrepancies as water masses of different seasons may have the same density. The T-S diagram shown in Fig. 2 gives a clear picture of the seasonal characteristics of shelf waters as all the points fall on distinct boundaries as demarcated by dashed lines. However, certain common temperature and salinity values occur during pre- monsoon and monsoon seasons probably because with the onset of monsoon, the southwest winds along this coast will continue to give rise to upwelled waters. The high temperatures (25° to 27°C) and low salinities (31 to 32 x 10⁻³) occasionally noticed in monsoon seasons may be due to the local heating and discharges from the Meghadri Gedda.

The shelf waters of Visakhapatnam are better described by T-S diagram in different seasons.

REFERENCES

- Anon (1975). Manual of Methods in Aquatic Environmental Research, *Technical Paper*, 137, FAO, Rome.
- Ganapati, P.N. and Murty, V.S.N. (1954). *Andhra University Memoirs*, L; 125-41.
- La Fond, E.C. (1957). *Proceedings of Indian Academy of Sciences*, 46, 1, 46.
- La Fond, E.C. (1958). '*Andhra University Memoirs in Oceanography*', 62, Vol. II, 1-11.
- La Fond, E.C. (1954). *Arctic*, 7, 2, 93-101.