J. Mar. biol. Ass. India, 1965, 7 (1): 169-173

SOME OBSERVATIONS ON THE CONTINENTAL SHELF WATERS ALONG THE EAST COAST OF INDIA*

By D. S. Rao, N. Madhavan and P. A. Abraham

Central Marine Fisheries Research Sub-station, Ernakulam-6

Introduction

The hydrographic investigations of the shelf waters along the East coast of India (in the Bay of Bengal) were conducted during the month of March 1963 from Vishakhapatnam coast to Point Calimere coast on board the Research Vessel *VARUNA*. Due to the limited period available it was not possible to work out any planned linear sections for dynamic studies and hence the ship had to resort to a zig-zag track covering the shelf as far as possible within a duration of one week. Observations of temperature and salinity at all the 164 stations were done at 0, 5, 10, 20, 30 and 50 metres. Since the data collected do not permit to have a detailed study of water masses along the East coast, the temperature and salinity characteristics were subjected to a frequency distribution study and discussed in the following text. Moreover, the whole area has been arbitrarily divided into four regions, viz., Vishakhapatnam to Kakinada, Kakinada to Kottapatam, Kottapatam to Madras and Madras to Point Calimere ; and the average temperature and salinity conditions at selected isobaric levels have been discussed.

Collection of Data and Mode of Treatment

The temperature and salinity are subjected to frequency distribution study as has been done earlier by Rama Sastry (1959), with selected class intervals for each parameter. Figure I, represents this percentage frequencies of the arbitrarily chosen water masses, i.e., with 1° temperature range and 1‰ salinity range. The total percentage frequency for each temperature and salinity ranges is also presented in the vertical and horizontal axes respectively.

Figure 2, shows the geographical locations of the oceanographic stations investigated. In figure 3, is represented the average conditions of the oceanographic parameters at different isobaric levels (computed by averaging the values in the whole region at particular depth), in four regions selected.

Discussion

At surface (Fig. 1a) the maximum frequency is for the temperature range 27°-28°C. and for salinity range 33-34‰. This water mass appears again to pervade half of the area of the whole coastal belt. During March compared to the genera

* Published with the kind permission of the Director, Central Marine Fisheries Research Institute, Mandapam Camp.

coastal features of the Bay of Bengal the salinity appears to be slightly higher, the fresh water influx from rivers being not so prominent. During September to November, Ganapati *et al.* (1959) had reported that the salinity is lowest along

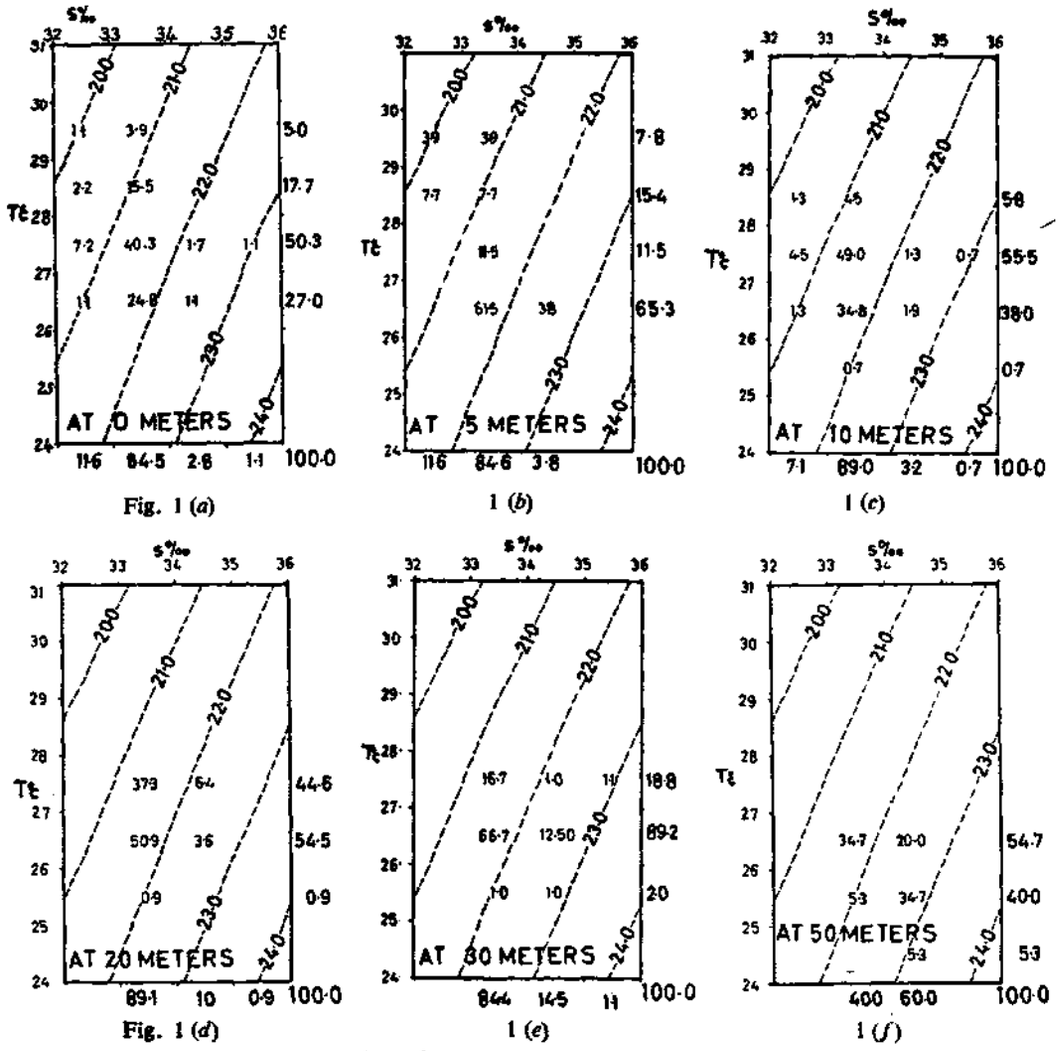

Fig. 1 (*a*) 1 (*b*) 1 (*c*)

Fig. 1 (*d*) 1 (*e*) 1 (*f*)

Fig. 1 *a-f*. Frequency distribution of sea water characteristics at different depths during March

the East coast, value being between 17-24‰. Again the same authors have reported that the northerly current during December compensates for the salinity decrease. Thus salinities during March as evidenced from our observations are high. The total percentage frequency of the waters whose salinity is less than 33‰ is only 11.6, as can be seen from the figure.

With an expected lowering of temperature the same salinity range predominates at 5 metre level also. Thus the maximum frequency at the 5 metre level is for the water mass defined by 26°-27°C. (temp. range) and 33-34‰ (salinity range).

The inversions noticed in temperature structure at some stations again increase the percentage frequency of the higher temperature class interval (27°-28°C.) in contrast to the 5 metre level. But the frequency of the 26°-27°C. class interval is also comparatively high. As a whole the water mass defined at the surface level is again the most common at 10 metre also.

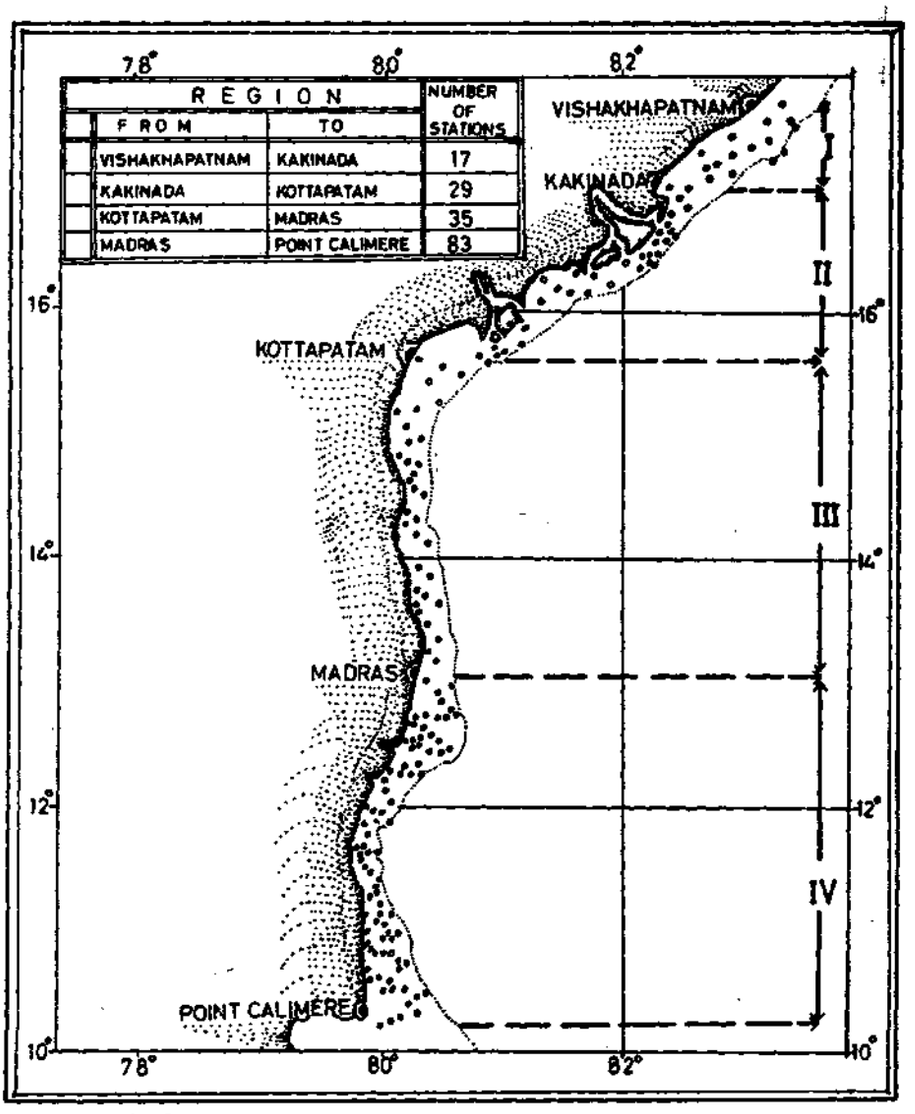

Fig. 2. Geographical location of hydrographic stations along the east coast of India. Zonal demarcations are also given.

Totally mixed conditions over the continental shelf are again seen from an examination of the frequency distribution patterns at 20, 30 and 50 metre levels. At all the three isobaric surfaces the maximum frequency is the same for the same

temperature and salinity range viz., 26°-27°C. and 33-34‰. Temperature inversions are again noticed at 20 and 30 metres, the frequencies of 27°-28°C. class interval being marked, (Fig. 1d & 1e). But due to the salinity ascendant noted depthwise the frequency of higher salinity class interval (34-35‰) increases and attains 10% at 20 metres and 14.5% at 30 metres. At 50 metres depth compared to the upper levels the percentage frequency of the colder water mass having a higher salinity range has increased markedly and attains 34.7%.

An examination of the average curves for the different parameters in the four regions specified reveals the space variation along the East coast. Regarding the thermal features (Fig. 3a) at the upper levels the temperature is found to increase gradually southwards, the southward ascendant being reduced considerably at 30 and 50 metres respectively. The mostly isothermal structure at the northernmost region is considerably disturbed when proceeding south. The slight discontinuity in temperature structure found between 5 and 10 metres is not so marked.

The southward ascendant noticed in the temperature is revealed in the case of salinity also, but such space differences are maintained at deeper levels also (Fig. 3b). This probably is to be attributed to the effect of fresh water influx in the northern regions which reduces the salinity considerably. The slight inversions found in salinity in the immediate surface layers, result in inversions of density (σ_t) too (Fig. 3c), which causes instability in the topmost 10 metre column but as a whole the space variation in density is not so marked as in the case of temperature and salinity. The vertical stratification of the 10-50 metres column is quite stable, the density ascendant being quite striking.

Summary

Hydrographic investigations were carried out along the East coast of continental shelf waters. The water characteristics of the upper layers are discussed in terms of frequency distribution studies. In general, the most predominant water mass in the region has the temperature range 27°-28°C. and salinity range 33-34‰. Wherever inversion in temperature occurs the range is slightly reduced to 26°-27°C, and with the same salinity range, the latter water mass predominates in the column 20-50 metres. A gradual increase in temperature and salinity is found southwards, and being a period when lateral transports are not conspicuous, the vertical stability from 10-50 metres is found to be quite good.

Acknowledgements

The authors wish to express their thanks to Dr. S. Jones for his keen interest in these investigations and to Dr. R. Raghu Prasad for his kind suggestions. They also wish to thank Sri A. V. S. Murthy and Sri C. P. Ramamirtham for their valuable suggestions and help rendered during the course of this work. They are also grateful to Sri T. S. Krishnan for the valuable help rendered during the course of analysis.

References

Ganapaty, P. N. and Rao, T. S. Satyanarayana. 1959. Some remarks on the hydrography and biology of the Bay of Bengal. *J. Mar. biol. Ass. India*, **1**, (2) : 224-227.

Rama Sastry, A. A. 1959. Water masses and frequency characteristics in the upper layers of the south eastern Arabian Sea. *Ibid.*, **1**, (2) : 233-246.

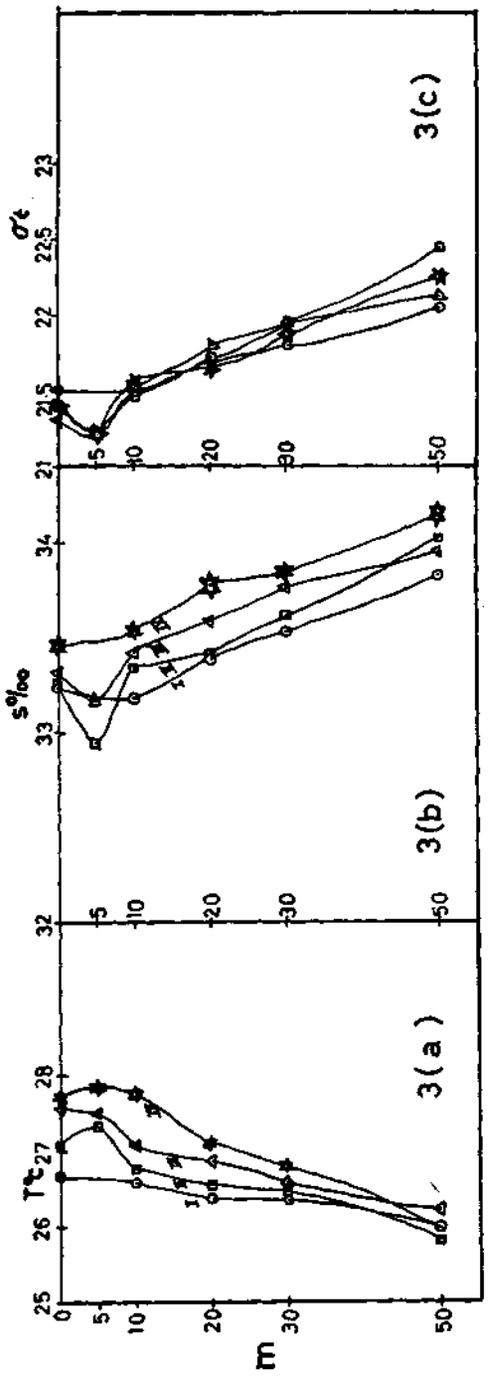

Fig. 3. Average Oceanographic conditions in specified zones in vertical, during March