The Specific Alkalinity in the Northern Indian Ocean during the Southwest Monsoon

by

G. S. Sharma*

Central Marine Fisheries Research Institute, Mandapam Camp

In a recent paper, Gupta and Pylee (1968) presented and discussed the specific alkalinity of samples from the Northern Indian Ocean during the southwest-monsoon cruises of INS Kistna in 1963. They concluded: "The specific alkalinity values along the equator in the Indian Ocean during the monsoon follows fairly well the modulations of the equatorial undercurrent, the high values almost coinciding with its core, and the dynamic topography of the ocean surface."

In support of their conclusion, they inadvertently quoted Knauss and Taft (1964) and reproduced figures 2 and 3 of Knauss and Taft (1964) along with Fig. 2 of Knauss and Taft (1963) as Gupta and Pylee's figure 4, and they omitted the captions of the original figures. Perhaps figure 4 was reproduced in its entirety from another paper by Taft and Knauss (1964), which was not referred to.

The first part of the figure (Knauss and Taft, 1964) is a set of transequatorial sections of current velocity, temperature and salinity prepared from the data collected on board RV Argo during 19–25 April, 1963 along 92°E. The second part (Knauss and Taft, 1963) represents the dynamic topography of the sea surface (referred to 1,000 db) in the southwest-monsoon of 1962.

Without considering the difference in time and place between their observations and those of Knauss and Taft (1964), Gupta and Pylee (1968, Fig. 3) compared their results based on the observations made during the southwest-monsoon, approximately along the equator from 71° to 75°E, with those of Knauss and Taft (1964). In my opinion there is little justification in making such a comparison. It is appropriate and reasonable to relate the alkalinity values of the surface waters of the Indian Ocean with dynamic topography of the sea surface (Knauss and Taft, 1963) and conclude that the alkalinity values increase with the eastward slope of the sea surface as both the results pertain to the southwest-monsoon season.

Further, Gupta and Pylee (1968) have not considered whether an Equatorial Undercurrent exists in the Indian Ocean during the southwest-monsoon season. The present author (Sharma, 1968) studied in detail the seasonal and longitudinal variation of the Equatorial

*Present address: Department of Earth and Planetary Sciences, Johns Hopkins University, Baltimore
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Undercurrent in the Indian Ocean by using the physical properties of the waters, on the lines suggested by Montgomery (1962). These results indicate the presence of the Undercurrent from the end of November to the end of May or the beginning of June with the associated features: 1. evidence of upwelling along the equator, 2. spreading of thermocline, 3. either a tongue or core of high salinity in the layers of thermocline spreading and 4. mixing of water with concentrated oxygen deep into the layers at the equator. The Undercurrent is absent during the rest of the year. These findings are in close agreement with those of Taft (1957), Taft and Knauss (1967) and Swallow (1934, 1937).

According to Taft and Knauss (1967), the sea surface slopes up toward the east in the Indian Ocean in July and the magnitude of the slope is comparable to that of the sea surface in the Atlantic and Pacific, but it is of opposite sign. Under these circumstances even from the theoretical point of view, the presence of an Equatorial Undercurrent in the Indian Ocean is improbable during the southwest-monsoon (Fofonoff and Montgomery, 1955; Hidaka, 1958, 1962; Hidaka and Nagata, 1958; Yoshida 1959; Arthur, 1960; Charney, 1960; Mamaev, 1931; Robinson, 1968). Using this fundamental hypothesis, Montgomery (1962) and Ichiye (1964) predicted the absence of the Undercurrent in the Indian Ocean during the southwest-monsoon and expected the Undercurrent to be present in the other phase of the monsoon when the pressure gradient reverses its sign and the conditions in the equatorial Indian Ocean are similar to the other major oceans. It is thus realised that the Equatorial Undercurrent in the Indian Ocean has a seasonal appearance and is absent during the southwest-monsoon when the conditions in equatorial Indian Ocean are quite dissimilar to those in the Pacific and Atlantic where the Undercurrent persists throughout the year (Montgomery, 1962).

It appears, therefore, that the statement of Gupta and Pylee (1968) quoted above should be reconsidered by treating conditions during one season at a time.

**Acknowledgments**

My thanks are due to Prof. R. B. Montgomery, Department of Earth and Planetary Sciences, Johns Hopkins University, Baltimore, for going through the manuscript and making valuable suggestions.

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