

Thus, as a result of the recent observations of the R.R.S. *Discovery II*, the extent of the southward flow of the north Indian deep current appears to be a compromise between the views of MÖLLER and THOMSEN. Oxygen observations in particular show that this current can be traced southwards as a tongue of poorly oxygenated water sandwiched between Antarctic intermediate water and an eastward current of north Atlantic deep water.

REFERENCES.

- BUCHAN, A..... "Report on Oceanic Circulation", Summary of the Scientific Results of the Voyage of H.M.S. *Challenger*, 2, map 13; 1895.
- MATTHEWS, D.J..... "Temperature and Salinity Observations in the Gulf of Aden", *Nature*, 120, 512; 1927.
- MERZ, A. and WÜST, G. "Die Atlantische Vertikalzirkulation", *Z. Ges. Erdk. Berl.* 1-35, 1922.
- MÖLLER, L..... "Die Zirkulation des Indischen Ozeans", *Veroff. Inst. Meeresk. Univ. Berl.* 21, 1-48; 1929.
- MÖLLER, L..... "Zur Frage der Tiefenzirkulation im Indischen Ozean", *Ann. Hydrogr. Berl.* 61, 233-236; 1933.
- VAN RIEL, P.M. "Einige ozeanographische Beobachtungen im Roten Meer, Golf von Aden und Indischen Ozean", *Ann. Hydrogr., Berl.*, 60, 401-407; 1932.
- SCHMIDT, J. "Dana's Togat omkring Jordan 1928-1930", København; 1932.
- SCHOTT, G..... "Die Tiefenwasserbewegungen des Indischen Ozeans", *Ann. Hydrogr., Berl.*, 12, 417-431; 1926.
- THOMSEN, H..... "The Circulation of the Indian Ocean", *J. Cons. inst. Explor. Mer.*, 8, 73-79; 1933.
- THOMSEN, H..... "Entstehung und Verbreitung einiger charakteristischer Wassermassen in dem Indischen und südlichen Pazifischen Ozean", *Ann. Hydrogr., Berl.*, 63, 293-305; 1935.
- WÜST, G..... "Zweiter Bericht über die ozeanographischen Untersuchungen", *Z. Ges. Erdk. Berl.*, 231-250; 1926.

THE 1910 TO 1935 SURVEY OF THE CURRENTS OF THE INDIAN OCEAN AND CHINA SEAS.

Under this heading, Mr. E. W. BARLOW of the Marine Division, Meteorological Office of the Air Ministry, London, has published in *The Marine Observer*, Vol. XII, No 120, October 1935, page 153, a well-documented study on the currents of the Indian Ocean, the Eastern Archipelago and the China Seas south of Latitude 30° N.

The Indian Ocean differs entirely from the Atlantic and Pacific Oceans in two ways: firstly the area of the Indian Ocean north of the Equator is extremely small in comparison with other oceans, secondly the cold waters of the Arctic Ocean have no access to the Indian Ocean. Besides, the atmospheric pressures which prevail on the Indian Ocean round about the 35th parallel of southern Latitude differ from the corresponding regime in the Atlantic and Pacific Oceans.

The article describes, at the outset, the surface circulation of the Indian Ocean. Tables 1 and 2 appended to the article, give the various seasonal means (in miles per diem) in the Indian Ocean south and north of the Equator. For the circulation south of the Equator the article describes successively the various local currents such as the Agulhas Current, the Mozambique Current, the East African Current and the Counter-Equatorial Current. Two interesting diagrams with reference to them are reproduced.

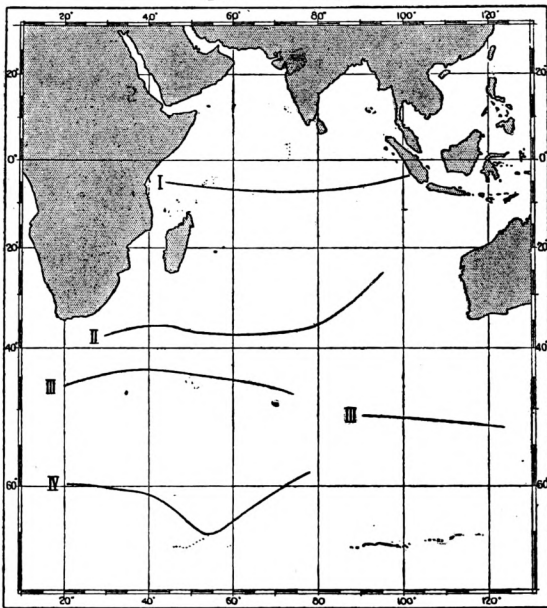
The writer then turns to the study of the seasonal monsoon circulation for the periods November-January, February-April and May-October. Next he moves on to the

study of the local currents in the Red Sea and Persian Gulf together with those of the Southern China Seas and the East Indian Archipelago. This chapter closes with a mention of the results obtained by means of drift bottles in the course of that year in the Indian Ocean.

Finally the writer passes on to the study of the sub-surface circulation and the origin of the surface currents in the Indian Ocean. He recalls the results of the investigations carried out by Dr. MÖLLER prior to the John MURRAY Expedition in 1933 to 1934 and the contribution made by 24 ships of the British Merchant Navy in collecting observations of temperature and water samples in that part of the ocean.

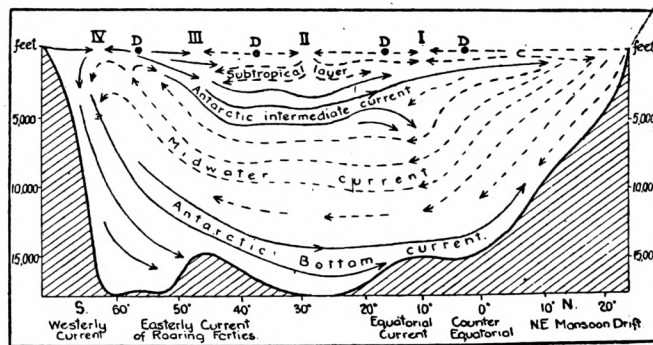
Although the results of the John MURRAY Expedition have not yet been published, the bathymetric study of the results yielded by the expedition has disclosed by means of echo-soundings, the presence of various important ridges, some of which had already been made known by Prof. SCHMIDT during his expedition in the *Dana*.

Regions of Convergence of Water in the Indian Ocean. [After Dr. Möller.]



- I Tropical Convergence.
- II Sub-tropical Convergence.
- III Sub-polar Convergence.
- IV Polar Convergence.

The Sub-surface Circulation of the Western Indian Ocean during the North-East Monsoon Period. [After Dr. Möller.]

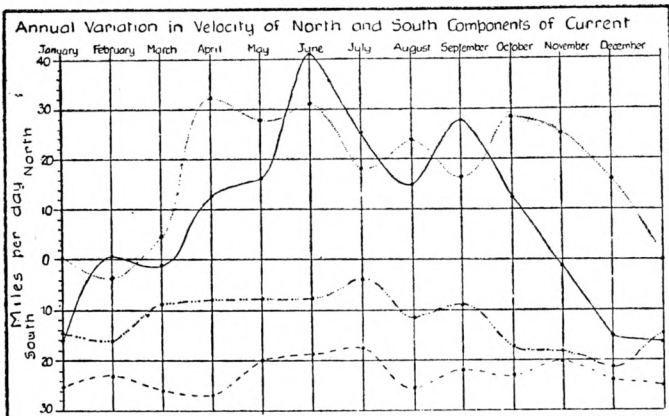
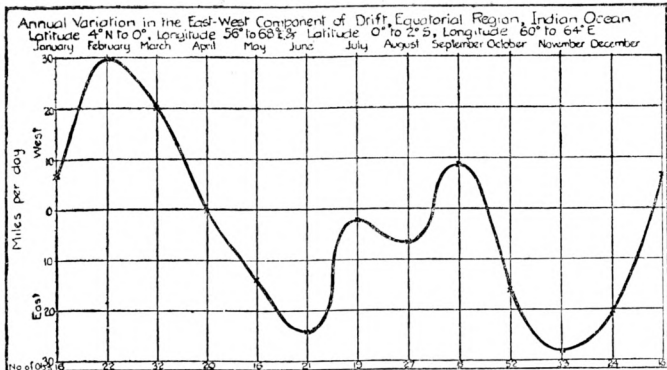


- I Tropical Convergence
- II Sub-tropical Convergence
- III Sub-polar Convergence.
- IV Polar Convergence.
- D Regions of Divergence.

The attached bathymetric sketch-map shows the general distribution of the depths according to the most recent soundings taken in H.E.M.S. *Mabahiss*.

In the same issue of *The Marine Observer*, page 152, will be found a study by Mr. H. KEETON on the distribution of sea surface temperatures in the Indian Ocean. This distribution takes the shape of a belt approximately parallel to the circles of latitude, which seems to indicate that the temperature of that sea is primarily due to the effect of solar heating at the various latitudes. However, the currents due to the South-West Monsoon and the East African Coast Current carry colder waters into the western part of the Arabian Sea during the South East seasonal monsoon.

In short, this article shows clearly by its details that the circulation system of an ocean is an extremely complicated phenomenon in which the interaction of various forces engendered by wind, temperature and salinity come into play.



- represents East African Coast Current, Cape Delgado to latitude 2°S
- represents East African Coast Current, Latitude 2°S to 6°N
- represents Mozambique Current, Latitude 10°S to 26°S
- represents Agulhas Current, Latitude 26°S to Longitude 24°E



CONTOUR CHART OF THE NORTH - WEST INDIAN OCEAN

Reproduced from a chart drawn by Lieutenant-Colonel R. B. Seymour Sewell, C.I.E. F.R.S., from soundings made by Lieut. Comdr. Farquharson, R.N. on board the H.E.M.S. *Mabahiss*.