

## SHORTER CONTRIBUTION

## A NOTE ON SEA WATER TEMPERATURES AT MACQUARIE ISLAND

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It has frequently been suggested that widespread climatic variations might be caused by changes in the heat content of the sea. Compared with the atmosphere the sea has a high heat-storing capacity; it can influence the temperature of large volumes of air without big changes of its own temperature. For the same reason anomalies of the sea temperature tend to be relatively longlived and might thus be used for forecasting trends in the temperature conditions of the air. It has in particular been stated that variations in the extent of the pack ice of the southern waters and changes in the water temperature might provide an indication of simultaneous or subsequent climatic variations on the southern continents.

Systematic observations of sea water temperatures in the southern seas are rare. During the years 1912 - 15 and 1951 - 54 such observations have been taken at the station at the northern end of Macquarie Island. During the first period they were made twice daily, at 9 a.m. and 3 p.m. local time, in the second once at 9 a.m. The afternoon observations were in the mean .2 to .3°C warmer than the morning ones. Table 1 gives the mean monthly morning temperatures for the two periods.

Table I Mean Monthly 9 a.m. Sea Temperature at Macquarie  
Island (a) 1912 - 14 (b) 1951 - 54

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Y
(a)	43.4	41.9	41.1	40.5	38.9	38.2	37.9	38.2	38.6	39.0	40.7	43.0	40.1
(b)	45.1	45.0	44.1	42.4	40.5	38.8	38.5	38.3	38.8	38.9	41.8	44.1	41.4

The second period has appreciably higher temperatures, particularly during the summer. The difference applies also to individual months. It is not likely that the temperature differences are caused by differences in the time or manner of observation. During both periods the observations have been taken at the same place. There is then a strong suggestion that the summer temperatures of the sea in the second period have in fact been higher. During the same period a similar increase occurred over a wide part of the arctic and subarctic seas. It is probably only a chance coincidence that at the only station with a long record of sea temperatures in higher southern latitudes Laurie Island, the first period was also one of relatively low values.

In winter of 1954 the temperatures of both air and water were quite abnormally low. In winter 1951 some icebergs appeared off Macquarie Island, a very rare event; but the temperature of the sea remained slightly above the mean.

At Macquarie Island a close connection exists between the simultaneous temperatures of the water and the air. The 47 deviations of the monthly temperatures from the mean of the month in the period give a coefficient of correlation of  $+0.61$  with a standard deviation of the water of  $.46^{\circ}\text{C}$  and  $.74^{\circ}\text{C}$  of the air. At Laurie Island in the South Orkneys water and air temperatures for 47 years are available. The annual means have a coefficient of correlation of  $+ .72$  with standard deviations of  $.21^{\circ}$  for the water,  $1.03^{\circ}$  for the air.

The seasonal temperatures of the water at Macquarie Island (January - March etc) have been compared with the air temperatures at Hobart (1912 - 15) and Cape Bruni and Invercargill (New Zealand) (1951 - 54). No significant correlation has been found between the water temperature at Macquarie Island and the simultaneous or subsequent air temperatures in Tasmania or southern New Zealand. This lack of correspondence is not surprising in view of the normal distribution of winds and oceanic currents, but it rules out the suggested use of the oceanic temperatures at Macquarie Island as a means of fore-shadowing the seasonal variations in southern Australia or New Zealand.

The water temperatures at Macquarie Island 1951 - 54 have been supplied by the Bureau of Meteorology. Mr. R.K. Sticht, Observer at Macquarie Island in 1951 and 1954 has kindly supplied some information.