

RECORDS OF THE MACQUARIE ISLAND STATION.

INTRODUCTORY REMARKS.

I.—RELATING TO THE REDUCTION AND TABULATION OF THE METEOROLOGICAL RECORDS OF THE EXPEDITION.

(By B. W. NEWMAN.)

By arrangement with Mr. H. A. Hunt, Director of the Commonwealth Meteorological Service, the tabulation of all the meteorological data of the expedition was performed in the Adelaide Bureau in 1923 and 1924 by a staff of temporary employees under my supervision. The data is exhaustive, and the records were well taken considering the rigorous climatic conditions to which the instruments were subjected. In this respect the Macquarie Island instruments did not suffer to the extent to which those at the Antarctic bases were affected, owing to the added trouble there of drifting snow transported by hurricane winds.

All *Barometer Readings* were corrected for Index Error and reduced to M.S.L., standard gravity and 32° Fahrenheit. The Daily Mean appearing in the tables is the twenty-fourth part of the sum of the values for hours 1 a.m. to 11 p.m., plus half the sum of the 0 a.m. and 24 hour (midnight) reading.

The records from a Pastorelli and Rapkin weekly instrument were used to obtain hourly pressures, the visual observations at 9 a.m., 3 p.m., and 9 p.m. having been used as fiducial points. The traces on the whole were good, and as there were at times large ranges in pressure this data is considered to be highly valuable. Oscillations were shown at times in the traces during heavy gales.

The *Thermograph Records* were at times mediocre, and, on one or two occasions, the instrument was clogged with snow.

Hourly *Vapor Pressures* given in Table IV were taken to three places to be consistent with present methods, but the reader is reminded of the probable errors involved.

From Simpson's Indian Tables a table was constructed with Relative Humidity and Dry Bulb as ordinates, from which the Vapor Pressure was obtained. Relative Humidities from dry and wet bulb thermometers were calculated for the visual observations, and used as correction points for obtaining hourly values from the hygograph. Then from these hourly values and those of dry-bulb temperature obtained in a similar manner, the hourly vapor pressure was deduced from the constructed table.

Any erratic working of the self-recording instruments could only be adjusted accordingly from corrections at fiducial points. It was in consequence of such probable errors, accentuated by absence of wet-bulb readings and failure of the hygrograph through snow drift that I suggested the futility of tabulating hourly vapor-pressure for Adelie Land.

Hourly Wind Velocities were obtained from a Dines' Pressure Tube Instrument (Anemobiograph), taking the velocity as the mean of the ribbon. For a short time a small Robinson Cup Anemometer was in use and the total 24-hour run is given in the table.

Maximum gusts appearing in some of the months are rather doubtful records. The registrations were obtained from different devices constructed by the meteorologist on the island, and were of a somewhat experimental nature.

Table VI Percentage Frequency, Wind Direction and Velocity may require some explanation. The column after midnight named "Frequency Percentage of Whole Day" was obtained from the total of the Hourly Percentage Frequencies divided by the number of hours of observations, giving the Mean Hourly Percentage Frequency.

The next column, "Velocity Average of Greatest Frequency" is the velocity at that hour at which the percentage frequency was the greatest. If two or more hours had equal maximum frequencies, then the mean velocity at these hours was taken, viz., north wind in March, 1915, at 11 a.m. and noon, the frequencies are the same and the highest of all hours; the velocity of 23.4 is then the mean of 21.8 and 25.0 miles per hour.

The Monthly Summary (Table VII) was obtained from Table VI, column per column, viz., the monthly set of columns in the summary was obtained from the last set of columns from Table VI. The hourly columns in the Monthly Summary give that wind direction which had the greatest percentage frequency at that hour in the given month together with its velocity.

In the monthly columns the frequency is that of the wind with the greatest mean daily frequency. The principle in this table is to emphasise the prevailing wind direction and to give the conditions of velocity of this prevailing wind, as preferable to giving Resultant and Mean Wind which are often misleading.

Hourly Sunshine is given chiefly for consistency of tabulation. Although it is obvious that very little sunshine was experienced, the results do not indicate the true conditions of this element. In the first place, the sunshine cards were only the 12-hour type; secondly, the intensity of insolation was often so weak that the cards failed to burn; and, thirdly, in midwinter a hill some 400 feet high prevented the sun from shining on the station until almost noon. Mr. Tulloch, however, removed the sunshine recorder to Wireless Hill during his régime in 1915.

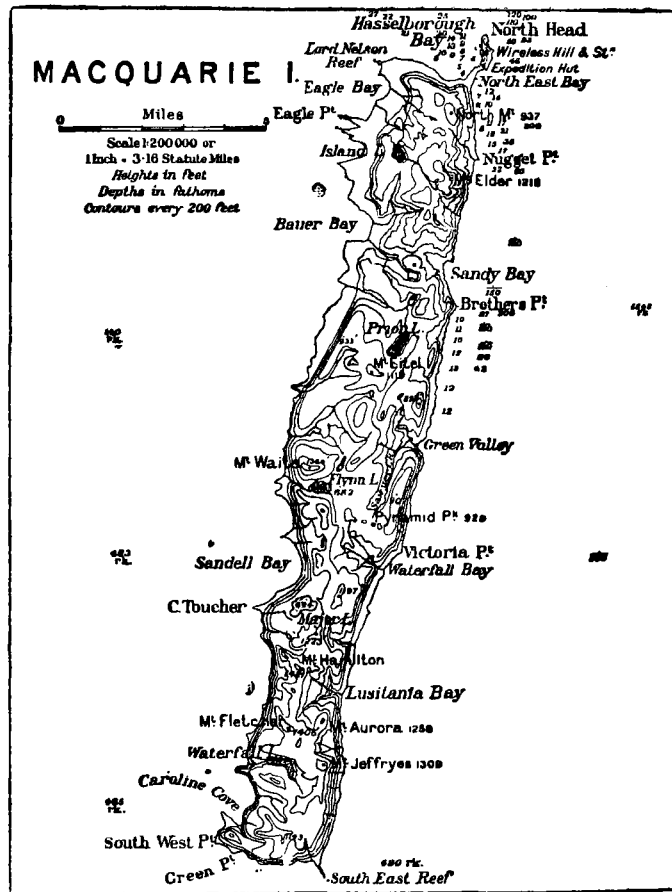


Fig. 1.—Map of Macquarie Island.

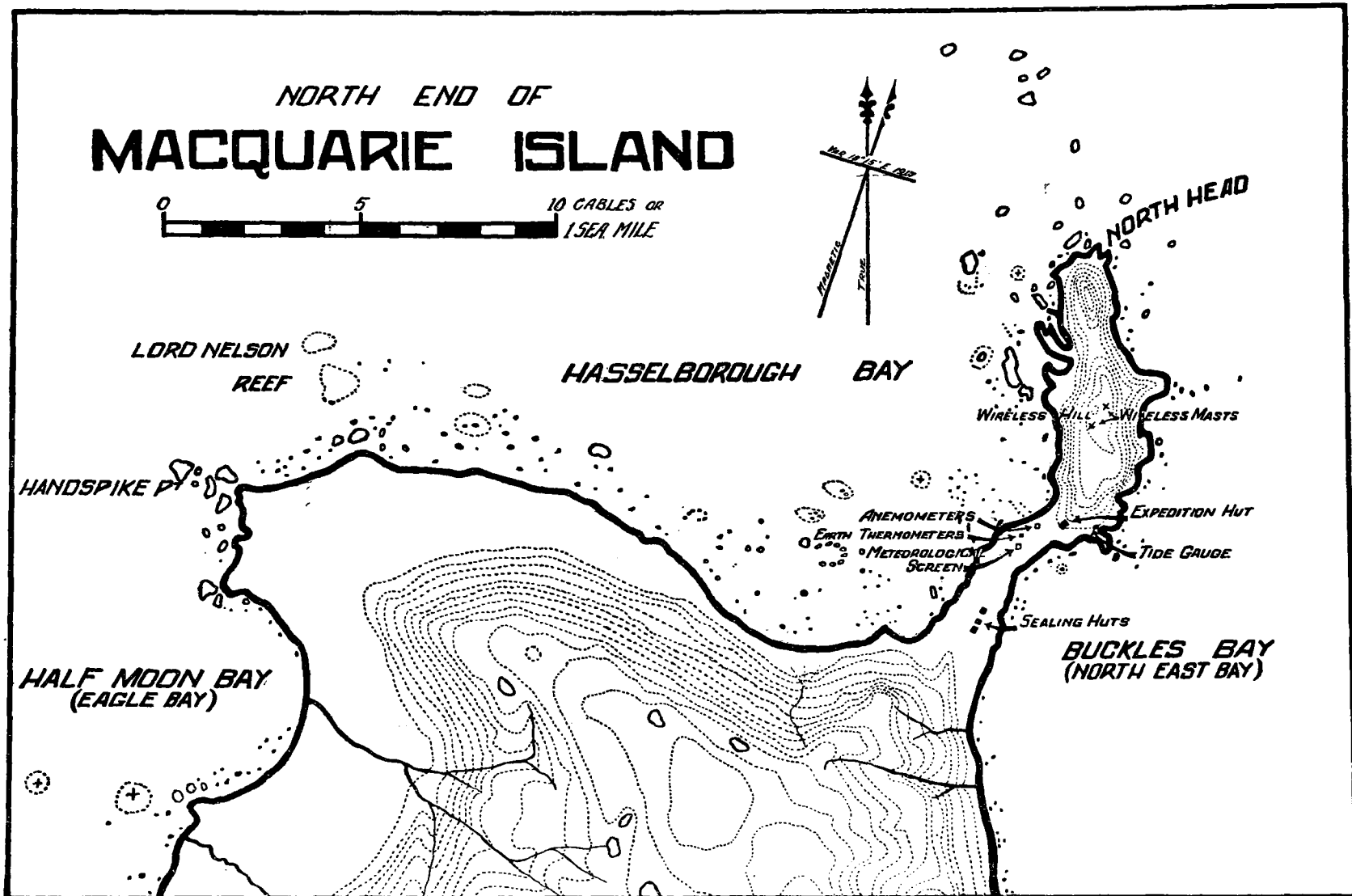


Fig. 2.—The North end of Macquarie Island, showing location of Instruments.

No *Rainfall Registrations* were available in the first period, but the frequency of rain days can be gathered from the daily weather synopses in Table XI. Mr. Tulloch in his report noted 339 rainy days in 1915, yielding 45.86 inches, the rain consisting for the most part of light misty showers and cold snow showers. Mr. Tulloch also remarked on the difficulty of obtaining accurate snow registrations owing to strong winds. The snow gauges originally provided in the expedition equipment had, in fact, been utilised by Mr. Ainsworth in the construction of a tide-gauge pipe.

With respect to rainfall, however, Mr. Tulloch, after close observation, found that the amount of moisture deposited in the rain gauge from sea spray was negligible, and was more than counter-balanced by loss of precipitation due to the wind, evidently a point previously responsible in part for the failure to take rain records.

Disparity in cirrus *Cloud Observations* was due to obscured view owing to prevalence of low cloud from the preceding storm.

The cloud nomenclature and cloud amount scale, 0 clear to 10 overcast are according to International Codex.

Table XIV consists of a number of records taken by Mr. L. R. Blake, geologist, while carrying out some field work on the south end of the island. The letters refer to survey marks, and, if desired, their localities may be found in the volume on Cartography.

In all the observations Mean Local Time was observed and directions are given true.

II.—THE LOCATION AND LAY-OUT OF THE MACQUARIE ISLAND STATION, (Notes by D. MAWSON).

The location of the meteorological observing station at Macquarie Island is shown on the accompanying map (Fig. 2). The island is some 22 miles in length, and has a maximum width of about $3\frac{1}{2}$ miles. The long axis is directed nearly north and south, and therefore across the direction of prevailing westerly winds and ocean current. Almost everywhere it rises abruptly from the sea to a height of about 700 feet, leading to a region of hills and valley lakes ranging onwards to an extreme height of 1,421 ft. in Mount Hamilton.

The island terminates at the north end in an isolated and abrupt eminence of moderate dimensions, known as Wireless Hill (350 ft.), which is connected with the main land mass by a low spit (Plate III, Fig. 1) largely constituted of shingle and gravel.

It was upon this spit that the living quarters of the Expedition Party were erected, and adjacent to it the various meteorological instruments were set up in suitable locations. On the summit of Wireless Hill, the "wireless" receiving and despatching

station was erected, from which the daily weather report was broadcasted. Plate III, Fig. 2, is a photograph taken from the foot of Wireless Hill looking south-west across a portion of the spit and over Hassleborough Bay to the towering main land mass. In the near view is seen the Expedition living hut ensconced in the lee of a projecting rocky outcrop. To the left, on the flat spit, in the middle view is the thermograph screen showing white in the picture.

Neither the Hut nor the Thermograph Screen appear in Plate III, Fig. 1, for the shoulder of Wireless Hill, forming the foreground on the left side of the picture, cuts off from view the north end of the spit.

The screen standing on the tussock grass-covered spit is well shown in Plate IV, Fig. 2. The screen was of the standard type employed in the Commonwealth Meteorological service.

The wind recording instruments were established some little distance away, where they were freely exposed to all winds. They are shown in Plate IV, Fig. 1, securely erected amongst a patch of rocks on the spit.

On the right is an anemo-biograph, and on the left a Robinson-type cup-anemometer.

The barometer and barograph were housed in the living hut at an elevation of 30 feet above sea-level.

The location of the station is approximately latitude $54^{\circ} 30'$, longitude $158^{\circ} 57'$, and Local Mean Time was observed.

The climate, though not glacial, is very wet and cold. The temperature ranges between narrow limits round about 40° F. The average temperature for the coldest month differing from that of the hottest by only about 6 degrees.

Mists and fogs are prevalent, and on this account mariners need to be careful in approaching the neighbourhood of the island, specially in winter time. In otherwise clear weather, it is a common occurrence to find a "tablecloth" spread over the highlands owing to condensation of vapour carried by moist winds as they blow up and over the island. This is well illustrated in Plate III, Fig. 2.
