

## The Climate of Mackay.

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MACKAY is a port on the east coast of Australia, in the Colony of Queensland, on the Pioneer River, the centre of a rich and thriving sugar-growing district.

The landing-place at Flat-top Island, at the mouth of the river, is situated in lat.  $21^{\circ} 9' 19''$  south, and long.  $149^{\circ} 14' 11''$  east, which would give as the position of the centre of the town, lat.  $21^{\circ} 10' 25''$  south, and long.  $149^{\circ} 10' 35''$  east.

The district was discovered in 1861 by Mr. John Mackay, and the mouth of the Pioneer River was surveyed by Capt. Heath, R.N., in 1862.

*Meteorological Observations taken at "The Hollow" (Messrs. C. C. & E. S. Rawson).*

"The Hollow" is situated about 20 miles due west of the town of Mackay, on the right bank of the Pioneer River, and about 200 feet above sea-level.

Observations were instituted at the suggestion of the late Mr. John Waterhouse, F.R.S., F.M.S., &c., &c., of Well Head, Halifax, Yorkshire, England, who originally sent out the instruments.

Observations are taken daily at 8 a.m., and are confined to those of shade temperature, rainfall, and atmospheric moisture. Originally it was contemplated that observations of max. sun and min. grass temperatures, as well as those of barometric variations, should be taken, but the instruments were broken, and their replacement was a matter of difficulty.

At first the returns were regularly forwarded to Mr. Waterhouse, but on the death of that gentleman no further reductions were made, and although the observations were always carefully registered, on several occasions observations were omitted, hence the existence of breaks in the records. These breaks are:—

- |            |                                   |                                      |
|------------|-----------------------------------|--------------------------------------|
| In 1876... | From 17 to 30 June (incl.),       | all records.                         |
| " 1877...  | 28 April, dry and wet bulb therm. |                                      |
| " " ...    | 12 to 18 June (incl.),            | all records.                         |
| " 1878...  | Aug. to Dec. (incl.),             | minimum shade temp. (therm. broken). |
| " 1879...  | 2 to 7 Nov. (incl.),              | dry and wet bulb therm.              |
| " " ...    | 6 and 7 Nov.,                     | all records.                         |
| " " ...    | 10 to 13 Nov. (incl.),            | dry and wet bulb therm.              |
| " 1880...  | 13 Feb.,                          | all records.                         |
| " " ...    | 14 and 15 Feb.,                   | dry and wet bulb therm.              |
| " " ...    | 10 June,                          |                                      |
| " " ...    | 16 and 17 Nov.,                   | " " "                                |
| " " ...    | 23 to 27 Dec. (incl.)             | " " "                                |



On a cattle-station such breaks are almost unavoidable, as it is not possible always to be at home at a stated time daily. Matters have, however, been so arranged now that in future such breaks will not occur.

Since the beginning of the present year max. sun and min. grass temperature observations, as well as wind observations, have been taken.

Barometric observations being only recorded once daily, have not been reduced.

I have, however, now arranged with Mr. C. C. Rawson to gradually increase the number of instruments. One of Mr. Russell's barographs is being specially constructed for "The Hollow" and an anemometer will be erected this year.

At "The Alexandra" (J. Ewen Davidson, Esq.), the Rainfall for the past thirteen years (from 1868 up to date) has been recorded; otherwise only exceptional phenomena have been observed. The mean shade temperature taken at "Alexandra" during 1868 is as follows:—

	Max.	Min.		Max.	Min.
January .....	95·2	68·7	July .....	75·5	47·6
February .....	90·2	68·1	August .....	77·6	39·5
March .....	88·0	60·5	September .....	81·9	47·3
April .....	86·3	59·0	October .....	88·0	54·6
May .....	78·5	54·6	November .....	88·8	56·8
June .....	77·3	46·8	December .....	88·9	63·5

Wherever authentic notes concerning the climate have been obtainable I have made use of them, but I am more particularly indebted to the Messrs. Rawson and Davidson for the long list of figures and facts placed at my disposal.

### THE CLIMATE OF MACKAY.

The points in which the Mackay climate differs from the climates of other districts on the coast are due, beyond the actual situation of the district in latitude and longitude, to the peculiar position the coast range of hills occupies.

From Cape Palmerston the coast range takes an almost due westerly direction until at about 35 miles from the coast it changes its course and runs to the north, diverging slightly to the west, and approaching the coast again at Mount Dryander, near Cape Conway. That part of the district lying to the south of the Pioneer River, and between the coast and the range, consists of a large and slightly undulating lightly timbered plain. On the north side of the river the country is more undulating and much broken by isolated mounts and spurs, between which again there are small plains; originally the greater part of this portion of the country was heavily timbered.

The country, whilst thus exposed fully from the N.E. to the S.E., is sheltered to a great extent on the S., W. and N. by the



range and isolated mounts, and accordingly as easterly or westerly winds prevail so does the temperature rise and fall. Often when the rains are heavy on the coast below the range, over the range there is no fall at all; and whilst the country over the range is fully exposed to the westerly winds, Mackay only feels them when they blow strongly (chiefly at night); again, the broken nature of the country on the north side of the river causes a wide difference in the annual amount of the rainfalls there (Tables X and XI).

At the present moment there are eight rain-gauges in the district, as follows: at Homebush, the Alexandra, the Hollow, Nebo Telegraph Station, St. Helen's (started this year), Bloomsbury Telegraph Station, the Cedars, and at the Telegraph Station in town.

The Alexandra rain-gauge gives probably the fairest idea of the mean annual rainfall, that gauge being situated almost in the middle of the district, and having registered daily since 1868. The rainy season usually commences about the end of December, and continues, with alternate two or three weeks dry and wet, until April, and occasionally into May. In June and July there is usually a small amount of rain; the fall in the latter month last year (1880) was exceptional, being 8·55 in. at the Alexandra and 8·26 inches at the Hollow, and over 10 inches in town, at the Cedars, and Homebush. August is least supplied with rain; in September there is a slight increase, and this increase continues in October, when thunderstorms set in, until December brings the rainy season on again. During the last three years the rainy season has been a month or more late. The greatest rainfall recorded in twenty-four hours at any of the rain-gauges was in town, on 10th March, 1878, when 16·81 inches fell; at the same time 15·85 inches fell at the Cedars and 14·07 at the Alexandra.

In December, 1874, there occurred at Foulden Plantation (about 4 miles from town on the north side of the river) an extraordinary local fall of rain, 15 inches falling in twenty-four hours:—

On December 4, at 9 a.m., 0·70 inches were recorded.

"	"	4, at 6 p.m., 9·50	"	"	"	} 15 inches in twenty-four hours.
"	"	5, at 9 a.m., 5·50	"	"	"	
"	"	6, at 9 a.m., 0·70	"	"	"	

At Alexandra, at the same time, the fall was as follows:—

On December 4, at 8 a.m., 2·70 inches were recorded.

"	"	5, at 8 a.m., 6·83	"	"	"
"	"	6, at 8 a.m., 0·22	"	"	"

During this time it rained throughout the district, but only locally heavily at Foulden, where at the back the creek was as swollen as in flood-times, although the river only rose slightly (Rainfall tables I, VII, IX, X, XI).



There have been five hurricanes recorded in Northern Queensland since 1860 :—

Jan. 20, 1860.				
Feb. 9, 1864.				
Mar. 2, 1867, at Townsville	(see Messrs. Rawson's notes).			
Jan. 22, 1874, at Broadsound	"	"	"	"
Feb. 22, 1875, at Bowen	"	"	"	"

The floods in the river, on record, are those of 1864, 1867, 1874, and 1875, synchronous with the hurricanes and heavy rainfalls. In March, 1878, the river rose up to within 4 feet of the 1875 flood-marks. The ooze deposited by the floods is great ; after the flood of March, 1881, this year, I measured cakes of ooze varying from  $\frac{3}{4}$  to  $1\frac{7}{8}$  in. in thickness.

In July, 1880, there was a storm, the records of which taken at the Alexandra are as follows :—

July 11.	Velocity of wind in 24 hours,	56	miles;	rainfall	1.26	inches.
" 12.	"	"	"	54.3	"	3.73 "
" 13.	"	"	"	30	"	1.14 "

The climate is very humid ; the Hollow observations, reduced, give the humidity as 83.1 (that of Sydney 1859–1875 is 73.1). The humidity depends largely on the winds as well as naturally on the rains ; it rises gradually from January to June, falls rather more rapidly, attaining its mean lowest point in November, then rises slightly in December and rapidly in January. When the atmosphere is highly saturated, books, clothes, furniture, &c., are covered with mildew, and the greatest care is requisite to prevent their destruction ; lightly bound books must at such times be carefully handled, otherwise their backs come off ; in dry weather, on the contrary, book-covers will curl up. Extreme dry atmosphere is exceptional, seldom lasting above a few days, but extremely saturated atmosphere lasts for three weeks or more occasionally.

The mean shade temperature for the four years 1876, 1877, 1879, and 1880, reduced from the maximum and minimum daily observations at the Hollow, is 73.1° F.; that of Sydney, 1856 to 1875, is 62.5. The mean minimum is 62.7, and the mean maximum for five years is 81.6. The mean temperature for April (four years) being 73.4, is the nearest approach to the annual mean. Previous to 1876 the only temperature observations on record are those of the year 1868, taken by Mr. Davidson at the Alexandra.

December is the hottest month, the mean temperature decreasing slowly until March, when the decrease is at the rate of four degrees per month, until the lowest mean (60.6) is reached in July, when the rise is at the rate of five degrees per month until the mean of October is attained ; the rise is rapid in November, whose mean is only 1.2 degrees less than that of December.



Light frosts are occasionally felt, but no systematic observations with grass thermometer have been made at the Hollow. At the Alexandra, however, the days on which the minimum thermometer on grass registered freezing-point, or under, are as follow :—

1872. July 29.....	31°	1875. July 29.....	29°
,, 30.....	29°	1876.   ,, 22.....	29°
,, 31.....	30°	,, 23.....	28°
Aug. 1.....	28°	,, 29.....	28°
,, 2.....	30°	1877.   ,, 29.....	32°
,, 3.....	30°	,, 30.....	30°
1873. July 15.....	32°	1878. June 11.....	31°
1874. No frosts.		1879. July 11.....	32°
1875. June 27.....	30°	1880. June 22.....	32°
July 6.....	29°		

The mean diurnal range, as reduced from observations taken at the Hollow, is tolerably great for the locality ; it is 21·8 degrees ; it is greatest in September ; during August, October, and November it is also great. In March the mean diurnal range amounts to 14·5 degrees only ; the range throughout that month fluctuates very little, and it is in that month that the heaviest rainfalls are annually recorded. There appears to be, throughout, a certain connection between diurnal range of temperature and moisture (and rainfall) ; with further observations this may show itself more definitely.

The extreme range of temperature recorded at the Hollow, from 114·5° in the shade on 31st December, 1877, to 35° in the shade on 11th June, 1878, is 79·5°

It is much to be regretted that the winds have not been recorded, as so very much depends on them.

The climate is healthy ; the less healthy periods are towards the end of the year, before the wet weather sets in, and during and after the wet seasons. From August to the middle of November the climate is genial.

CONDENSED notes on the climate previous to 1876 (when the continuous meteorological observations were instituted), extracted from the diaries of Messrs. C. and E. Rawson :—

1866. Dec.	7 to 26 incl...	Rain more or less daily. On 23rd the river rose.
1867. Jan.	3 to 5   ,, ...	The shade thermometer up to 110° daily.
,,	12 .....	Heavy dew.
,,	20 .....	Hurricane.
,,	21 .....	Rain and thunderstorm.
Feb.	4 .....	Two thunderstorms.
,,	8 .....	Rain.



1867.	Feb.	23 .....	Raining heavily.
	"	24 .....	Rain.
	Mar.	2 to 6 incl. ...	Raining heavily. On 4th flood in river
	"	11 .....	Rain.
	"	12 and 13 .....	River going down, but still high.
	"	21 .....	Rain.
	"	28 to 31 incl. ...	"
	April	1 to 6 ,, ...	Rain more or less daily. River very high on 2nd and 5th.
	"	8 to 12 ,, ...	" more or less daily.
	"	21 to 24 ,, ...	" " " " "
	May	9 .....	Drizzle all day.
	"	13 .....	Slight rain.
	"	15 to 18 incl. ...	Rain.
	"	27 and 28 .....	"
	June	12 and 13 .....	"
	"	18 and 19 .....	"
	"	20 to Sept. 16.	No records.
	Sept.	17 .....	Rain.
	"	24 .....	Heavy rain. River rose 15 feet by 12 o'clock.
	Oct.	12 .....	All hands on sick list with fever.
	Dec.	4 .....	Thunderstorm.
	"	5, 1867, to 31	Jan., 1871, no records.
1871.	Feb.	1 .....	Rain.
	"	25 to 27 incl. ...	"
	Mar.	5 and 6 .....	"
	"	10 .....	"
	"	14 .....	Three showers.
	April	1 .....	Rain.
	"	19 .....	Too wet to brand.
	May	23 .....	Rain.
	Aug.	4 .....	"
	"	17 .....	"
	Sept.	20 .....	" off and on.
	"	21 .....	" hard.
	Oct.	4 to 6 incl. ...	" "
	"	18 .....	"
	"	22 to 23 incl. ...	" hard.
	"	28 .....	Wet.
	Nov.	3 .....	Heavy thunderstorm
	"	18 .....	Rain hard.
	"	19 to Dec. 11.	No records.
	Dec.	12 .....	Eclipse of sun.
	"	27 to 31 incl. ...	Rain more or less daily.
1872.	Jan.	4 to 18 ,, ...	" " " "
	"	20 .....	"
	"	22 to Feb. 1 incl. ....	" " " " " On 23rd January ther-
	Feb.	5 .....	Thermometer 95° in the shade during rain
	"	12 to 16 incl. ...	Thermometer 102° in shade.
	"	24 to 28 ,, ...	Rain. On 14th river rose very high
	Mar.	4 .....	"
	"	7 to 9 incl. ...	"
	May	21 .....	" heavily—it was much needed
	Sept.	3 and 4 .....	"
	Nov.	10 .....	Heavy thunderstorm.
	"	11 and 12 .....	Rain, heavy.



1872. Nov. 13 .....	Rain, heavy, and thunderstorm.
" 14 and 15 .....	"
" 19 to Dec. 5 inc. ....	" more or less daily.
Dec. 27 to .....	
1873. Jan. 18 incl. ....	" for twenty-three days continuously. River up on 13th January, and very high on 16th January.
Jan. 21 to 31 incl...	" occasionally very hard.
Feb. 1 .....	Showery.
" 3 and 4 .....	Rain.
" 6 .....	Showery.
" 13 to 17 incl...	Rain more or less daily.
" 19 to 22 " ...	" " " "
" 24 to 26 " ...	" " " "
" 28 .....	" hard.
Mar. 1 to 3 incl. ....	"
" 9 and 10 .....	"
" 13 to 20 incl...	"
April 3 to 7 .....	"
" 26 to 27 .....	"
May 14 to 17 incl...	"
" 19 .....	"
" 23 to 26 incl...	"
" 29 and 30 .....	"
June 2 to 4 .....	"
" 9 to 13 incl...	" River up on 13th.
" 16 and 17 .....	"
" 25 .....	"
" 27 .....	"
" 30 .....	"
July 5 .....	"
" 19 .....	"
" 30 and 31 .....	"
Aug. 1 .....	Showery.
" 2 .....	Rain.
" 21 .....	" hard.
Oct. 15 .....	Light showers.
Nov. 2 to 4 incl...	Rain.
" 24 .....	Heavy thunderstorm at night.
" 25 .....	" " at 4 p.m.
" 26 .....	" " at night.
" 27 .....	" "
" 28 .....	Thunderstorm.
" 29 .....	"
" 30 .....	" in afternoon.
Dec. 1 .....	Heavy thunderstorm as usual at 4 p.m.
" 2 .....	Thunderstorm at 8 p.m.
" 3 .....	Usual thunderstorm.
" 5 .....	Thunderstorm in evening.
" 6 .....	" again.
" 7 .....	Slight rain.
" 22 and 23 .....	Rain.
" 30 .....	"
1874. Jan. 1 to 4 incl. ....	"
" 8 to 17 " ...	" river pretty high on 15th
" 22 to 25 " ...	" hard on 25th.
" 31 .....	Very heavy storm.
Feb. 2 and 3 .....	Rain.



1874.	Feb.	10 to 13 incl...	Rain.
	"	21 .....	"
	"	23 .....	"
	Mar.	3 to 5 incl...	"
	"	23 to 25 " ..	"
	"	28 to 31 " ..	"
	April	8 to 12 " ..	"
	"	18 to 20 " ..	"
	May	10 and 11 .....	" heavily.
	"	26 .....	" very hard.
	June	3 .....	"
	"	5 to 8 incl...	"
	"	12 to 14 " ..	"
	"	20 .....	" heavily at 5 a.m.
	"	23 .....	"
	July	3 and 4 .....	Rain hard.
	"	19 and 20 .....	"
	"	22 .....	Showers.
	"	28 to 30 incl...	Rain hard.
	Sept.	26 .....	" "
	Oct.	8 .....	"
	"	18 to 21 incl...	"
	"	26 and 27 .....	"
	Dec.	2 to 8 incl ...	" hard daily ; thunderstorm on 7th.
	"	10 to 17 " ..	" " "
1875.	Jan.	19 .....	Rain steadily all day.
	"	20 .....	" hard ; river up 25 feet.
	"	28 to 31 incl...	" more or less ; on 31st river pretty high.
	Feb.	1 and 2 .....	" hard.
	"	4 .....	" "
	"	13 to 16 incl...	" " river very high indeed.
	"	20 and 21 .....	"
	"	22 .....	Very high wind and rain.
	"	23 .....	Blowing a gale, with rain ; river very high.
	"	24 .....	Weather broke for a couple of hours ; rain harder than ever.
	"	25 .....	Rain heavily ; river higher than ever seen ; s.s. "Tinonee" seven days coming from Bowen to Mackay, usually a fifteen hours' passage.
	Mar.	1 to 6 incl. ...	Rain heavily.
	"	7 .....	Showers.
	"	10 .....	Rain.
	"	11 to May 18.	No records.
	May	19 .....	Rain.
	"	26 to 27 incl...	" hard.
	June	1 .....	"
	"	4 .....	"
	"	5 .....	" hard.
	"	15 .....	" "
	"	23 .....	"
	July	1 .....	Heavy thunderstorm.
	"	2 .....	Rain.
	"	8 .....	"
	"	11 .....	"
	"	13 .....	"
	Sept.	25 .....	"
	Nov.	3 .....	Thunderstorm at night, but very little rain.
		8 .....	Heavy rain.



1875. Nov 11 ..... *Earthquake.* Shocks were felt and heard in town and on the banks of the river. At "The Hermitage," on the river bank, about 2 miles from the wharves in town, two distinct shocks were felt, the second immediately succeeding the first. At Branscombe, 8 miles from "The Hermitage," and 3 from Alexandra, the direction of the earthquake was observed to be from N. to S. across the river. One shock continuous was felt and heard at "The Hollow," but at the "Nyth," about 400 yards further up and on the same (south) side, nothing was noticed, whilst at "Hamilton" Station, about  $1\frac{1}{4}$  mile beyond "The Hollow," the shocks were distinctly noticed. Mr. Harry Black, the Manager of the Station, gives the time of the occurrence as about 2 minutes to 9 p.m. (H.L.R.)

" 30 ..... Rain.  
Dec. 2 and 3 ..... "  
" 21 ..... " hard.  
" 25 ..... "  
" 30 ..... Heavy shower at 4 p.m.

TABLE I.

RAINFALL.—Receiving surface of Rain-gauge 8 inches, at a height of 3 ft. 1 in. from the ground, and about 200 feet above sea-level.

Month.	1876.		1877.		1878.		1879.		1880.		Average.
	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	Inches.	Days.	
Jan....	8·34	16	8·85	19	5·63	16	10·88	22	11·63	21	9·066
Feb....	8·92	12	9·90	22	9·18	14	7·89	12	25·96	20	12·370
Mar...	23·36	14	19·88	30	34·70	30	18·03	27	4·04	13	20·002
April..	2·20	9	3·12	19	0·98	8	10·99	19	10·97	21	5·652
May...	11·56	18	0·05	5	3·02	11	1·85	6	0·99	10	3·494
June..	4·05	13	2·77	11	5·35	4	2·05	6	1·71	4	3·186
July...	2·30	7	0·67	8	0·66	6	1·41	5	8·26	14	2·660
Aug...	0·29	7	0·21	3	0·09	2	4·16	9	0·04	1	0·958
Sept...	0·67	6	2·70	10	1·76	10	1·67	5	0·20	3	1·400
Oct....	2·74	8	0·01	1	4·32	4	3·76	12	1·07	6	2·380
Nov...	2·22	8	1·53	4	3·57	7	0·15	1	1·64	9	1·822
Dec....	3·58	9	3·62	9	10·72	15	1·22	4	6·60	11	5·148
Totals	70·23	127	53·31	141	79·98	127	64·06	128	73·11	133	68·138

Annual average rainfall, 68·138 inches.

" " number of rainy days, 130.

Average fall on each rainy day, 0·519 inches.

Greatest average monthly fall of rain was in March, 20·002 inches.

Least " " " " August, 0·958 "

Greatest monthly fall of rain was 34·70 inches, in March, 1878.

Least " " " " 0·01 " " October, 1877.



Heavy falls in twenty-four hours :—

8.00	inches	on	22	March,	1876.
3.95	"	"	23	"	"
4.30	"	"	24	"	"
5.50	"	"	6	May	"
4.00	"	"	21	February,	1877.
8.98	"	"	10	March,	1878.
6.64	"	"	9	"	"
4.74	"	"	3	"	"
4.17	"	"	10	October,	1878.
3.50	"	"	9	March,	1879.
4.03	"	"	23	January,	1880.
5.63	"	"	5	February,	"
5.35	"	"	6	"	"
5.81	"	"	18	"	"

In September, October, November, and partly December, rains are almost always due to thunderstorms from the south-west, which finish in the south-east.

The rainy season rains, from December to April, and even into May, are brought up from the east, chiefly the south-east.

Northerly and westerly rains are exceedingly rare.

The rainfall in July, 1880, was exceptional—it came up from the south-east.

TABLE II.

DEGREE OF HUMIDITY (Absolute Saturation—100).

OBSERVATIONS taken at 8 a.m. daily from dry and wet bulb thermometers, the reductions being made by means of Glaisher's Tables.

Month.	1876.	1877.	1878.	1879.	1880.	Means.
January .....	82.9	81.5	77.1	81.0	83.4	81.2
February .....	82.4	83.1	82.0	81.1	85.0	82.7
March.....	88.0	88.5	90.2	88.0	79.6	86.9
April .....	86.6	88.0	89.6	88.2	89.9	89.8
May .....	89.8	89.1	91.9	88.8	89.8	89.9
June .....	89.4(?)	93.5(?)	93.2	88.4	90.0	90.9
July .....	83.9	91.6	88.7	89.4	90.0	86.4
August .....	89.7	87.4	89.4	88.9	88.7	88.8
September.....	78.9	83.7	86.3	79.8	77.0	81.2
October .....	70.9	75.7	73.4	80.6	74.6	75.0
November .....	71.3	79.7	69.6	70.7	67.5	71.8
December .....	71.6	76.2	78.5	64.6	77.1	73.0
Means.....	82.2	84.8	84.2	82.5	82.7	83.1

The relative average humidity at 8 a.m. is therefore 83.1.

The month in which there is least humidity is November, the average being 71.8.

The month in which there is most humidity is June, the average being 90.9(?)

The year 1877 was the most humid, although in that year there was the least rainfall. That rainfall was, however, spread over 141 days, or over fourteen days more than in 1878, the year next highest in point of humidity. In 1877 on twelve days only did the humidity fall below  $\frac{2}{3}$  of saturation, and the minimum it descended to was 55.

The moisture in May, June, July, and August, is largely due to fogs and heavy dews; the dryness in September, October, November, and December,



to westerly winds and occasional dry northerly winds (on this point, however, continuous observations have not been made). In November, 1878, owing to westerly wind, the humidity fell on the 7th to 40, and again from same cause to 40 on 27th November, 1879. On 28th September, 1880, it fell to 36, the lowest on record.

Saturation was reached four times in March, 1876; once in February, March, and October, and twice in December, 1877; thrice in March, eight times in June, and once in September, 1878; once in January and August, 1879; once in February and May, 1880.

Humidity fell below  $\frac{2}{3}$  of saturation 30 times in 1876.

"	"	"	12	"	"	1877.
"	"	"	26	"	"	1878.
"	"	"	36	"	"	1879.
"	"	"	25	"	"	1880.

TABLE III.

MEAN MINIMUM SHADE TEMPERATURE (self-registering thermometer).

Month.	1876.	1877.	1878.	1879.	1880.
January .....	72·9	71·9	71·6	70·8	72·3
February .....	70·2	69·9	72·4	70·5	73·4
March .....	70·4	69·7	71·5	71·1	71·3
April .....	63·1	62·9	64·4	65·9	68·8
May .....	62·6	55·9	59·2	52·9	56·7
June .....	56·6(?)	53·9(?)	49·7	50·8	50·1
July .....	48·9	47·9	49·6	49·8	50·1
August .....	52·6	47·1	.....	55·9	50·9
September .....	54·7	56·5	.....	58·2	55·9
October .....	58·6	59·6	.....	64·0	62·9
November .....	65·3	68·4	.....	67·6	70·5
December .....	68·3	71·0	.....	72·6	70·3
Year .....	62·0	61·2	.....	62·5	62·7

TABLE IV.

MEAN MAXIMUM SHADE TEMPERATURE (self-registering thermometer).

Month.	1876.	1877.	1878.	1879.	1880.
January .....	90·4	90·6	93·1	90·7	84·7
February .....	85·3	87·5	96·2	92·4	84·3
March .....	85·1	84·4	86·2	85·2	85·9
April .....	81·2	83·5	87·1	80·5	81·1
May .....	76·9	83·9	80·4	77·9	76·8
June .....	72·9(?)	75·8(?)	75·1	72·3	72·3
July .....	69·1	75·9	78·5	73·8	69·6
August .....	75·3	81·9	81·0	79·1	76·7
September .....	84·9	84·8	86·9	86·4	81·6
October .....	94·0	91·8	91·5	81·8	85·7
November .....	99·8	97·5	94·6	90·2	92·1
December .....	97·4	98·8	96·6	93·9	88·5
Year .....	84·4	86·4	87·2	83·6	81·6



TABLE V.

MEAN SHADE TEMPERATURE (reduced from the maximum and minimum daily temperatures) for *four* years.

Month.	1876.	1877.	1879.	1880.	Mean.
January .....	81.6	81.2	80.7	78.5	80.5
February .....	77.7	78.7	81.4	78.9	79.2
March .....	77.7	77.0	77.1	78.6	77.9
April .....	72.1	73.3	73.2	74.6	73.4
May .....	70.1	70.0	65.4	66.8	68.0
June .....	64.7(?)	64.8(?)	61.5	61.2	63.1
July .....	58.9	61.9	61.8	59.9	60.6
August .....	63.9	64.5	67.5	63.8	65.0
September .....	69.9	70.6	72.3	68.9	70.3
October .....	76.3	75.7	72.9	74.3	74.8
November .....	82.5	82.9	78.9	81.3	81.4
December .....	83.2	84.9	83.3	79.4	82.6
Year .....	73.2	73.8	73.0	72.2	73.1

The mean shade temperature is 73.1 degrees.

The highest mean is reached in December, 82.6 degrees.

The lowest „ „ July, 60.6 degrees.

TABLE VI.

MEAN DIURNAL RANGE OF TEMPERATURE IN SHADE, reduced from the self-registering maximum and minimum thermometers.

Month.	1876.	1877.	1878.	1879.	1880.	Mean 4 yrs. 1876, '77, '79, and '80.
January .....	17.5	18.6	22.5	19.9	12.5	17.1
February .....	15.1	17.6	23.9	21.8	10.9	16.3
March .....	14.8	14.7	14.7	14.2	14.6	14.5
April .....	18.1	20.6	22.7	14.5	12.3	16.4
May .....	14.4	27.9	21.2	25.0	16.9	21.1
June .....	16.2	21.8	25.4	21.5	22.2	20.4
July .....	20.2	27.9	28.8	23.9	19.6	22.9
August .....	22.7	34.8	...	23.2	25.8	26.6
September .....	30.2	28.3	...	28.3	26.0	28.2
October .....	35.4	32.2	...	17.8	22.8	27.1
November .....	34.4	29.1	...	22.6	21.6	26.9
December .....	29.0	27.8	...	21.3	18.2	23.4
Year .....	22.3	25.2	...	21.2	18.7	21.8

The mean diurnal range for four years is 21.8 degrees.



TABLE VIA.  
MEAN DIURNAL RANGE, 1880.

January .....	12·5	Max. 19·0 on 25th	Min. 4·0 on 23rd
February .....	10·9	„ 20·0 „ 9th	„ 4·0 „ 21st
March .....	14·6	„ 24·0 „ 29th	„ 6·5 „ „
April.....	12·3	„ 31·5 „ 5th	„ 3·0 „ 14th
May .....	16·9	„ 30·0 „ 27th	„ 9·0 „ 8th
June .....	22·2	„ 29·5 „ 17th	„ 7·0 „ 15th
July .....	19·6	„ 33·0 „ 25th	„ 5·5 „ 13 and 15
August .....	25·8	„ 37·5 „ 11th	„ 10·0 „ 17th
September .....	26·0	„ 36·5 „ 19, 24 & 31	„ 14·5 „ 10th
October.....	22·8	„ 38·0 „ 6th	„ 7·0 „ 28th
November .....	21·6	„ 28·0 „ 2nd	„ 18·0 „ 29th
December.....	18·2	„ 26·0 „ 15th	„ 6·5 „ 20th
Year .....	18·7	.....	.....

TABLE VIB.

No. OF DAYS on which Temperature in Shade went up to and over 90°.

Month.	1876.	1877.	1878.	1879.	1880.	Mean.
January.....	21	16	26	16	3	16
February .....	5	11	25	17	4	12
March .....	2	5	5	7	4	5
April .....	...	2	8	...	3	3
May .....	...	3	1	1	...	1
June .....	...	...	...	...	...	...
July .....	...	...	...	...	...	...
August .....	...	2	...	...	...	...
September.....	6	7	13	9	1	7
October .....	26	20	21	2	6	15
November.....	30	30	26	18	22	25
December .....	29	29	27	26	12	25
Year .....	119	125	152	96	55	109







TABLE VIII.  
RAINFALL at Alexandra Plantation (J. Ewen Davidson, Esq.,) Mackay.

Year.	Jan. In.	Feb. In.	March. In.	April. In.	May. In.	June. In.	July. In.	Aug. In.	Sept. In.	Oct. In.	Nov. In.	Dec. In.	Total Inches.
1868	1.50(?)	20.00(?)	6.12	2.96	11.23	1.41	4.57	0.62	0.10	0.89	1.28	4.72	55.40
1869	5.96	12.27	21.37	8.37	4.53	2.31	0.47	0.81	0.63	0.54	2.03	5.97	65.26
1870	29.63*	21.82*	17.62*	11.68*	2.01	1.94	2.14	2.39	1.70	4.67	6.26	6.14	108.00
1871	28.47	7.10	10.93	1.99	1.90	2.92	.....	0.27	2.75	9.12	4.23	10.62	80.30
1872	15.40	12.13	2.07	.....	2.95	0.60	0.35	0.75	0.48	0.07	4.47	6.87	46.14
1873	21.53	6.18	8.64	4.44	2.39	5.24	1.38	1.32	0.68	0.19	2.25	14.82	69.06
1874	19.14	6.99	14.42	6.05	5.12	3.58	4.14	.....	2.89	4.65	1.50	14.38	82.86
1875	18.33	33.97	1.49	26.70	12.63	1.54	3.75	0.89	0.35	0.05	2.12	3.60	105.42
1876	8.60	6.50	13.42	2.25	8.57	3.74	2.26	0.16	0.15	1.39	1.91	4.06	53.01
1877	9.42	14.01	32.39	4.35	0.06	3.88	0.82	0.13	0.88	0.84	1.66	3.80	72.24
1878	5.95	5.69	42.95	1.00	3.74	5.05	0.27	0.49	2.00	3.14	3.69	11.49	85.46
1879	19.38	8.56	20.25	11.24	1.56	1.68	1.21	3.63	1.71	4.74	0.09	0.83	74.88
1880	12.63	21.71	8.46	14.21	1.16	1.29	8.55	0.10	0.11	1.62	3.87	7.39	81.10
Sums.....	195.94	176.93	200.13	95.24	57.85	35.18	29.91	11.56	14.43	31.91	35.36	94.69	979.13
Means 13 years.	15.07	13.61	15.39	7.33	4.45	2.71	2.30	0.89	1.11	2.46	2.72	7.28	75.32

Or 0.48 inch above mean of previous twelve years.

The least amount of rain fell in 1872 ... 46.14 inches.  
 „ greatest „ „ „ „ 108.00 „

\* Glass gauge broken—only totals recorded.



Diameter of receiving-surface of rain-gauge, 8 inches.

Height of receiving-surface of the gauge above ground, 4 ft. 6 inches.

Approximate height of ground above the level of the sea, 60 feet.

Approximate distance from town, 6 miles, in a due westerly direction.

The greatest fall of rain occurred on the 10th March, 1878, when 14·07 in. fell in twenty-four hours.

The following are some of the heavier falls of rain in twenty-four hours:—

1868.	May 15	.....	4·57 inches.
1870.	Nov. 16	.....	4·11 „
1871.	Jan. 6	.....	5·48 „
1872.	„ 12	.....	3·55 „
„	Dec. 4	.....	3·82 „
1873.	Jan. 14	.....	4·74 „
„	Dec. 24	.....	5·22 „
1874.	Jan. 22	.....	3·98 „
„	Dec. 5	.....	6·83 „
1875.	Jan. 21	.....	4·11 „
„	Feb. 16	.....	4·50 „
„	„ 23	.....	6·42 „
„	Apl. 18	.....	10·25 „
„	„ 19	.....	5·75 „
„	May 26	.....	4·70 „
„	„ 27	.....	5·00 „

„ In this year there were fourteen days on which above *three* inches of rain fell, on six of which days above *four* inches fell.

1876.	Jan. 27	.....	4·75 inches.
„	Mar. 16	.....	3·53 „
1877.	Feb. 20	.....	4·35 „
„	Mar. 14	.....	9·53 „
„	„ 24	.....	4·66 „
1878.	Mar. 9	.....	4·65 „
„	„ 10	.....	14·07 „
„	„ 29	.....	4·19 „
„	Dec. 31	.....	3·32 „
1879.	Jan. 14	.....	6·73 „
„	Feb. 1	.....	3·68 „
„	Mar. 9	.....	3·24 „
„	„ 10	.....	3·56 „
1880.	Jan. 23	.....	4·63 „
„	Feb. 5	.....	7·02 „
„	„ 18	.....	4·20 „
„	July 12	.....	3·73 „

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\* \* For Table IX, see Plan attached.

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TABLE X.

RAINFALL, Mackay District, for March, 1878.

Day.	Town.	Alexandra.	Cedars.	Hollow.
1	4.38	2.71	4.88	1.24
2	4.74	3.40	5.42	3.07
3	2.81	2.35	2.17	4.74
4	1.01	1.39	0.95	1.29
5	0.62	0.63	1.18	1.11
6	0.43	0.30	0.52	0.01
7	0.11	0.00	0.00	0.01
8	0.48	0.60	0.94	0.28
9	7.14	4.65	3.93	6.64
10	16.81	14.07	15.85	8.98
11	4.90	2.63	2.87	0.70
12	0.09	0.03	0.00	0.72
13	0.14	0.22	0.00	0.28
14	0.43	0.71	0.63	0.64
15	0.17	0.30	0.52	0.45
16	0.17	0.45	0.58	0.05
17	0.12	0.12	0.06	0.14
18	0.00	0.00	0.00	0.00
19	0.09	0.27	0.00	0.09
20	0.59	0.32	1.39	0.45
21	0.45	0.19	0.32	0.69
22	0.26	0.37	0.16	0.06
23	0.07	0.22	0.42	0.35
24	0.20	0.02	0.19	0.17
25	0.07	0.24	0.06	0.06
26	0.10	0.09	0.00	0.13
27	0.52	0.37	0.00	0.23
28	0.05	0.20	0.00	0.09
29	2.26	4.19	3.45	0.46
30	2.47	1.91	1.13	1.53
31	0.00	0.00	0.05	0.04
Total .....	51.68	42.95	47.67	34.70
No. of Wet Days	29	28	23	30



TABLE XI.

RAINFALL, Mackay District, for February, 1880.

Day.	Town.	Hollow.	Alexandra.	Cedars.	Home-bush.	Blooms-bury.	Nebo.
1	0·00	0·14	0·13	0·49	0·38	0·11	
2	0·48	0·37	0·43	0·74	0·12	0·47	
3	0·25	0·09	0·14	0·43	0·06	0·15	
4	0·15	0·12	0·15	0·30	3·92	0·32	
5	7·50	5·63	7·02	11·55	5·34	5·80	
6	5·24	5·35	2·70	3·51	0·11	3·72	
7	0·00	0·00	0·00	0·12	0·13	0·00	
8	0·00	0·01	0·00	0·00	0·00	0·00	
9	0·00	0·00	0·00	0·63	0·00	0·00	
10	0·64	0·00	0·00	0·00	0·42	0·00	
11	0·24	0·30	0·00	0·00	0·04	0·52	
12	0·00	0·21	0·00	0·00	0·00	0·13	
13	0·08	0·00	0·00	0·00	0·00	0·09	
14	0·00	0·07	0·15	0·00	0·00	0·00	
15	0·00	0·00	0·00	0·00	0·00	0·00	
16	0·00	0·00	0·10	0·00	1·36	0·00	
17	0·00	0·01	0·12	0·00	4·08	0·00	
18	6·38	5·81	4·20	6·27	2·11	0·87	
19	2·29	1·67	1·75	2·12	1·21	2·38	
20	1·25	2·14	2·15	1·87	2·90	5·30	
21	1·80	2·18	2·12	2·20	2·12	2·90	
22	0·87	0·91	0·15	0·78	0·73	0·11	
23	0·80	0·59	0·00	1·00	0·18	0·16	
24	0·04	0·28	0·12	0·00	0·11	0·13	
25	0·05	0·07	0·00	0·28	0·00	0·15	
26	0·00	0·01	0·11	0·18	0·00	0·00	
27	0·00	0·00	0·17	0·00	0·00	0·00	
28	0·00	0·00	0·00	0·00	0·00	0·00	
29	0·00	0·00	0·00	0·00	0·00	0·00	
Total.....	28·06	25·96	21·71	32·47	25·32	23·31	3·95
No. of Days.	16	20	17	16	18	17	?



## RAINFALL, Mackay District, for the year 1880.

Month.	Town.	Hollow.	Alexandra.	Cedars.	Home-bush.	Blooms-bury.	Nebo.
January ..	10·20	11·63	12·63	8·68	15·33	9·38	4·82
February.	28·06	25·96	21·71	32·47	25·32	23·31	3·95
March ...	5·04	4·04	8·46	5·52	6·31	1·52	0·00
April.....	19·29	10·97	14·21	14·61	14·62	9·75	4·05
May .....	1·79	0·99	1·16	1·44	1·64	0·00	0·13
June .....	1·14	1·71	1·29	2·20	3·57	0·50	0·86
July .....	10·08	8·26	8·55	10·06	10·57	6·50	12·57
August ...	0·00	0·04	0·10	0·15	0·00	0·00	0·00
Sept. ....	0·38	0·20	0·11	0·37	0·83	0·00	0·00
October...	3·05	1·07	1·62	2·67	1·03	1·33	0·98
Nov. ....	6·67	1·64	3·87	4·50	1·91	1·28	9·67
Dec. ....	10·61	6·60	7·39	10·37	6·94	6·25	1·73
Total Inches.	96·31	73·11	81·10	93·04	88·07	59·82	38·76

Town rain-gauge at Telegraph Office, 8 ft. 4 in. above ground, with 8 in. receiving surface; about 3 miles from the coast.

The "Cedars" rain-gauge (M. Hume Black, Esq., M.L.A.), 18 inches above ground, with 8 in. receiving surface, situated about 5 miles from the town in a N.W. direction and about 250 ft. (?) above the level of the sea.

The "Homebush" rain-gauge (F. H. Myddleton, Esq.), 3 ft. 6 inches above ground, with 8 in. receiving surface, situated about 12½ miles from town in a S.W. direction, and about 120 ft. above the level of the sea.

The "Bloomsbury" rain-gauge (Tel. St.) is situated about 65 miles to the north of Mackay, within about 6 miles of the coast, at a tolerable elevation.

The "Nebo" rain-gauge is situated about 75 miles from Mackay across the range in a south-westerly direction, and therefore at a considerable elevation.

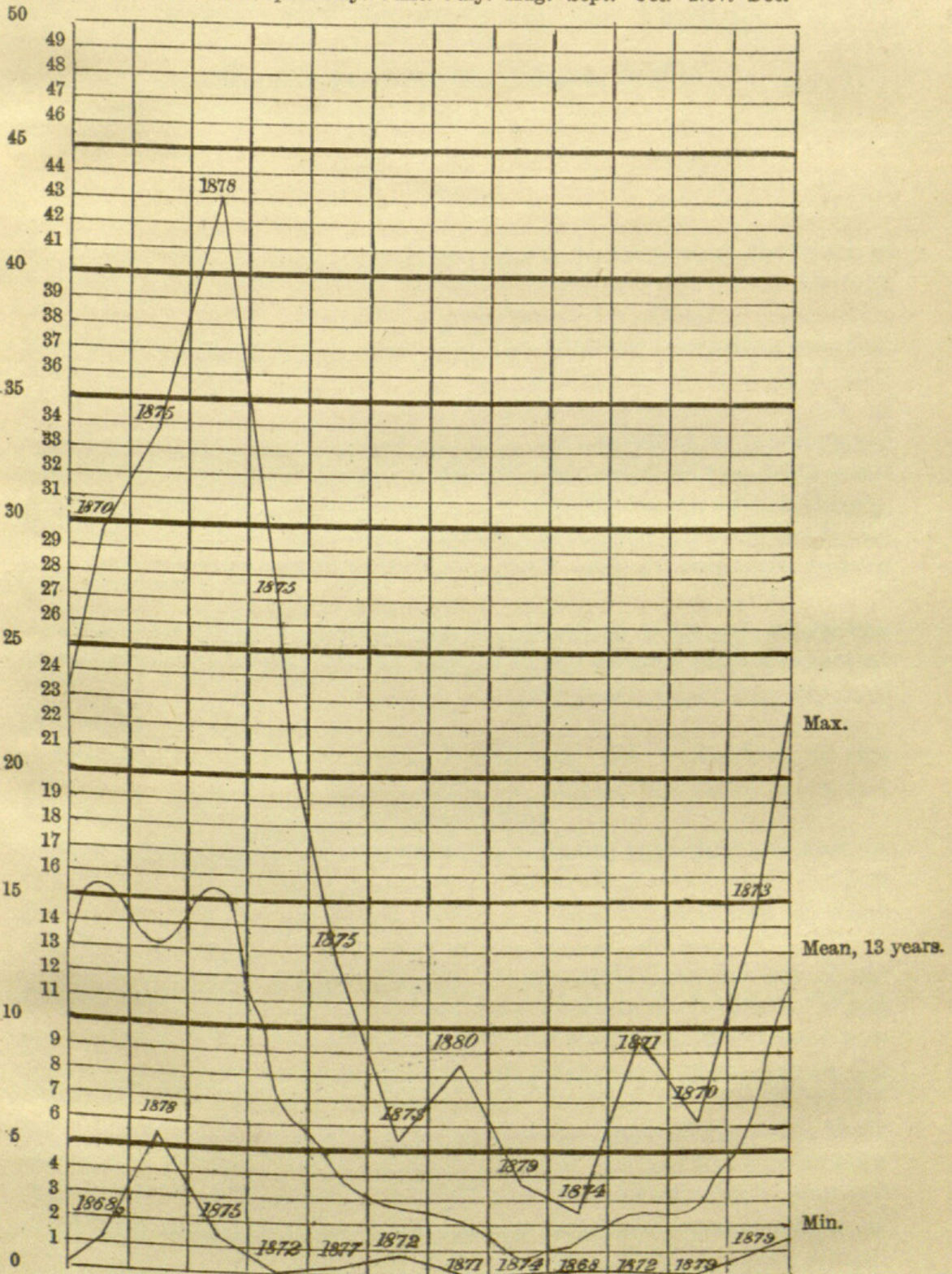
[Plan.]



TABLE IX.

CURVES of the Rainfall at Alexandra Plantation (J. Ewen Davidson, Esq.), Mackay.

Inches. Jan. Feb. Mar. April. May. June. July. Aug. Sept. Oct. Nov. Dec.



This curves-table shows at a glance the variability in the monthly distribution of the rainfall. The greatest fall of rain in any one month occurred in March, 1878, when 42.95 inches of rain fell. The least fall of rain in any one month occurred in October, 1875, when only 0.05 inches were registered. Only three months are on record during thirteen years in which no rain at all fell; these are April, 1872, July, 1871, and August, 1874.





Roth, Henry Ling. 1881. "The climate of Mackay." *Journal and proceedings of the Royal Society of New South Wales* 15, 21–40.

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