

ATOLL RESEARCH BULLETIN

No. 60

Climate and Meteorology of the Gilbert Islands

by

Marie-Hélène Sacht

Issued by

THE PACIFIC SCIENCE BOARD

National Academy of Sciences--National Research Council

Washington, D. C.

October 31, 1957.

Climate and Meteorology of the Gilbert Islands ^{1/}

by Marie-Hélène Sachet

The climate of the Gilbert Islands is an oceanic tropical one, devoid of great fluctuations in temperature and almost without severe storms. There is a gradient from high rainfall to low, from north to south; rainfall is seasonal and sporadic. Recorded data are quite inadequate for any satisfactory statistical or long-term considerations. A summary of probable weather conditions, with some meteorological information assembled in tabular form, is presented below. Accurate, dated observations to augment this record are greatly to be desired.

Atmospheric pressure

All of the Gilbert Islands lie close to the Equator, and are within the equatorial belt of low pressures; there is very little seasonal change, and diurnal changes, although regular, are also of small magnitude.

Wind direction

Prevailing winds are easterly, their direction varying slightly with seasons: they blow from NE and ENE from January to April, then shift to E to SE during the northern summer; from October to January, they revert to E, ENE and NE; this is true for all the islands, although the occurrence of ESE and SE winds is slightly greater in the southern islands. This prevailing wind is the NE trade wind.

In northern winter, N and W winds occur occasionally, as an extension of the Australian monsoon; this is more frequent over the southern, than the northern islands. Westerly winds can occur occasionally in the other months, and are very variable. Owing to the lack of large land areas, there are really no such things as land or sea breezes over the Gilberts, and winds vary little in direction during the day.

Wind strength

Winds are usually light or moderate, the strongest winds occurring mostly during the northern winter: see table A. The irregular westerly winds are often accompanied by squalls, bringing heavy rains. Calms are not very frequent; the Gilberts lie well to the west of the Doldrums.

^{1/} This summary of available data on the weather and climate of the Gilbert Islands was prepared for the use of the Onotoa Expedition in 1951 but was never given general distribution. Since rainfall tables for only a short period of years were provided in the original manuscript of the report by Dr. Catala it was thought best to bring the 1951 compilation up to date and issue it at this time for the benefit of those who are interested in the Gilbert Islands. -- Ed.

Storms and Cyclones

There is no record of thunderstorms in the southern islands, and table B shows that they are rare in the northern islands.

"Only one hurricane is definitely known to have occurred. This damaging storm crossed the Gilbert Islands on December 4-5, 1927, where it was observed in the extraordinarily low latitude of 3°N., at longitude 173°E. On Makin Island severe southeasterly gales lasted for nearly 12 hours" (Weather summary for Naval Air Pilot). The British Colonial Report (no. 1460, 1929) dates this storm January 1928, and says "the islands of Butari-tari [= Makin] and Little Makin were visited by a hurricane which did considerable damage to property and coconut trees, but there was no loss of life".

Air temperature on land

Temperature varies very little throughout the year, and the daily variation is only of a very few degrees; the mean temperature is about the same for all the islands, very slightly higher for the southern ones.

Air temperature at sea

This is also very even, with very little daily or seasonal variation; the mean is very slightly higher in the southern islands than in the northern ones, and only very slightly lower than the average temperature on land.

Sea water temperature

The temperature of ocean surface water, judging by the brief records of the "Neptun" (Prager, 1903), is almost constant throughout the year, with lowest temperatures from February to May; the yearly average is almost the same as the average for air temperature at sea.

Visibility

The sky in the Gilberts is usually characterized by scattered or broken clouds; fog is unknown; haze is rare (see table A). "The days with 2 tenths or less cloudiness are, however, very rare on the average, although deep blue skies and brilliant sunshine are a particular feature of the Gilbert Islands climate..... During monsoon weather in open weather, the cristallinity of the air among the islands has received specific mention..." (Weather Summary for Naval Air Pilot). See tables A and B.

Vapor pressure and relative humidity

What little data are available are so inadequate that no generalization is possible, beyond the fact that these factors vary from island to island; information is very much needed.

Rainfall

Rainfall varies greatly from island to island, being highest in the northern Gilberts, and diminishing steadily southward, to reach a minimum in the southernmost Gilberts and northernmost Ellice Islands. Further south, it starts increasing again.

Generally, the driest months are October, then November and September; but yearly totals are quite variable, and according to the British Colonial Reports, many years differ from "normal conditions"; periods of drought are not infrequent; here are some notes on them from the British Colonial Reports.

Rept. 1369 (1928): "The 14 Gilbert Islands lying between 2° North and 3° South latitude are visited by periodical droughts, of which the cycle appears to be five to seven years. Butaritari and Little Makin, about 3° North of the Equator are unaffected by this condition.... during droughts on central and southern Gilbert Islands, it average yearly rainfall is sometimes as low as 3 inches.

"Drought conditions threatened during the early part of the period 1924-25, and towards March 1925, were fully established. No rain fell on any part of the 14 affected islands between April and December 1925. The drought then broke, and the coconuts, which had ceased to bear, put out fresh spathes of blossom. When the spathes opened, however, rains fell with such torrential force that the young blossom was beaten from the stalks, and though the trees thrived, the first coconut crop was a failure. The result was a drop of about 1500 tons in the amount of copra exported that year from the Gilbert Islands."

Rept. 1387 (1928) "Drought conditions prevailed on the Gilbert group for the whole of the period 1926-27" (See figures for that year for Tarawa, extracted from this report, in table D).

Rept. 1460 (1929): "The drought which prevailed throughout the Gilbert group during 1926 and 1927 passed away, and from November 1927, to February 1928, the group received most beneficial rains. The strong westerly gales which may be expected during that same period of the year were exceptionally severe and seriously interfered with shipping."

Rept. 1879 (1939): "The rainfall during the year 1937 was below average, and drought conditions were experienced in the central and southern Gilbert Islands...."

Blue Book for 1940 and 1941 (issued 1944): "Exceptionally heavy rainfall in 1940, following severe drought of 1938 and 1939. Trade wind almost absent: frequent westerly squalls during the year, and violent westerly gales in November and December in the Gilberts."

Rept. for 1952 and 1953: "During 1952 the effects of a drought in 1950 were wearing off, and by the end of 1953 the increased rainfall of the previous two years was being reflected in the higher tonnage of copra being produced."

Rept. for 1954 and 1955: "While in 1953 copra production was good, a reflection of the good rainfall in 1952 and 1953, 1954 saw the beginning of a drought in the Colony which increased in severity in 1955. Copra production has not been severely hampered, but 1956 production will undoubtedly be low, owing to the fifteen months or so which it takes for rainfall, or its lack, to affect production. Towards the end of 1955 production was falling, and the people in the Southern Gilbert and Phoenix Islands were again storing nuts for food, rather than turning them in copra." The same report elsewhere mentions that the drought appeared likely to continue into 1956. Figures for that year, or for the current one, are not available.

Sources for text and tables

1. U. S. Hydrographic Office
Weather summary for H.O. 272. Naval Air Pilot. Southwest Pacific.
1-140, Washington, D. C., 1943.
2. Great Britain Colonial Office
Colonial Reports: Annual.
3. Gilbert and Ellice Islands Colony
Blue Books.
1931-1941, Suva, 1933-1944.
4. Heidke, P.
Meteorologische Beobachtungen
Mitt. deutsch. Schutzgeb. 30: 3-170, 1917.
5. Prager, M.
Zur Meteorologie der Gilbert-Inseln
Ann. Hydrogr. 31: 348-354, 388-395, 1903.
6. Great Britain, Hydrographic Dept., Admiralty
Pacific Islands Pilot.
2: 1943.
7. Gilbert and Ellice Islands Colony
Medical and sanitary reports for the year...
8. Cloud, P. E., Jr.
Preliminary report on geology and marine environment of Onotoa
Atoll, Gilbert Islands.
Atoll Res. Bull. 12: 1-73, 1952.

Table A

Area 1: 0°- 5° N, 170°- 175° E
 Area 2: 0°- 5° S, 170°- 175° E
 Area 3: 0°- 5° S, 175°- 180° E

Type of data	Units, or ways of tabulating data	Area 1	Area 2	Area 3
Distribution of wind forces for February	% of total wind observations recording:			
	calms	* 0	* 4	* 7
	Beaufort ¹ 1 to 3 incl.	50	35	71
	Beaufort 4 to 6 incl.	50	61	22
Same, for May	calms	* 0	* 12	3
	Beaufort 1 to 3	75	76	61
	Beaufort 4 to 6	25	12	36
Same, for July	calms	* 0	* 0	* 4
	Beaufort 1 to 3	60	25	79
	Beaufort 4 to 6	40	75	17
Same, for Oct.	calms	* 0	* 0	* 4
	Beaufort 1 to 3	88	67	67
	Beaufort 4 to 6	12	33	29
Same, for Dec.	calms	13	0	* 0
	Beaufort 1 to 3	65	69	50
	Beaufort 4 to 6	19	31	45
	Beaufort 7-8	3	0	5
Factors affecting ² visibility for February	% of observations with:			
	lower type clouds	* 33	* 74	* 73
	exceptional visibility	0.0	0.0	0.0
	haze	0.0	0.0	0.0
Same, for May	lower type clouds	* 60	* 100	76
	exceptional visibility	0.0	11.1	4.8
	haze	0.0	0.0	0.0
Same, for July	lower type clouds	* 80	* 75	65
	exceptional visibility	0.0	0.0	11.5
	haze	0.0	0.0	0.0
Same, for Oct.	lower type clouds	* 39	* 100	52
	exceptional visibility	11.1	50.0	8.0
	haze	0.0	0.0	0.0
Same, for Dec.	lower type clouds	35	86	84
	exceptional visibility	2.7	0.0	8.0
	haze	0.0	3.4	0.0

* Indicates less than 25 observations for the month in this area.

¹ Average velocity: Beaufort 0-3 = 0 to 10 knots
 " 4 = 11 to 16 knots

² No observations recorded fog
 Source: adapted from 1.

Table B

	Air Temp. °F.					Relative Humidity (percent)		Cloud Amt. (0 to 10)	Rainfall			Wind									Average No. of days with thunder	
	Mean			Ex-treme					Average amount (inches)	No. of rainy days 1/	Max. 24 hours (inches)	% of observations from -										
	Monthly	Max.	Min.	Max.	Min.	0700	1400					N	NE	E	SE	S	SW	W	NW	Calm		
Butaritari 1903-04																						
January	84	89	78	90	76	-	-	72	3.8	2.9	15.0	-	-	-	-	-	-	-	-	-	-	
February	83	87	78	93	74	-	-	76	6.0	6.5	16.0	-	-	-	-	-	-	-	-	-	-	1
March	83	89	78	93	75	-	-	75	4.8	8.8	15.5	-	-	-	-	-	-	-	-	-	-	0
April	84	89	78	94	75	-	-	76	4.4	8.4	14.5	-	-	-	-	-	-	-	-	-	-	0
May	84	90	79	93	75	-	-	74	5.3	8.8	16.5	-	-	-	-	-	-	-	-	-	-	0.5
June	84	90	78	92	74	-	-	74	5.6	8.8	16.0	-	-	-	-	-	-	-	-	-	-	2.0
July	84	90	78	92	71	-	-	74	5.5	8.6	19.0	-	-	-	-	-	-	-	-	-	-	0.5
August	84	90	78	92	72	-	-	71	5.9	11.8	20.0	-	-	-	-	-	-	-	-	-	-	0
September	85	92	79	96	74	-	-	74	4.6	5.6	9.5	-	-	-	-	-	-	-	-	-	-	0
October	86	93	79	95	76	-	-	69	4.2	0.4	2.0	-	-	-	-	-	-	-	-	-	-	1.0
November	84	89	78	94	73	-	-	73	4.8	3.1	6.0	-	-	-	-	-	-	-	-	-	-	0
December	84	89	78	91	76	-	-	-	-	6.0	11.0	-	-	-	-	-	-	-	-	-	-	0
Mean	84	90	78																			
Total										77.7	161											
Extreme				96	71																	
Abaiang 1905-07																						
January	82	-	77	-	72	68	59	-	7.2	13.6	18											0
February	82	-	77	-	72	66	59	-	7.3	6.0	10											0
March	82	-	78	-	71	67	58	-	6.0	8.0	13											0
April	82	-	78	-	73	68	59	-	6.6	11.1	17											0
May	83	-	78	-	73	67	58	-	5.5	6.6	11											0
June	83	-	78	-	72	65	57	-	5.6	6.9	13											0.3
July	82	-	77	-	73	64	55	-	5.6	6.8	12											0
August	83	-	77	-	70	63	51	-	4.8	2.9	9											0
September	84	-	78	-	72	62	52	-	4.5	2.1	7											0
October	83	-	78	-	72	66	55	-	6.2	10.2	13											0
November	83	-	77	-	72	65	56	-	6.6	6.6	13											1.0
December	83	-	78	-	72	65	57	-	6.6	7.3	17											0
Mean	83	-	78	-		66	56	-	6.0													
Total										88.1	153											1.3
Extreme					70						8.0											

1/ Days with .01 inch or more

Source: Adapted from 1.

Table C

Area 1: 0° - 5° N, 170° - 175° E
 Area 2: 0° - 5° S, 170° - 175° E
 Area 3: 0° - 5° S, 175° - 180° E

Type of data	Units, or ways of tabulating data	Area 1	Area 2	Area 3
Frequency of various precipitations for February	% of observations recording: rain and showers thunderstorms squalls	0.0 0.0 0.0	34.8 0.0 21.7	13.3 6.7 6.7
Same, for May	rain and showers thunderstorms squalls	- - -	11.1 0.0 0.0	9.5 7.1 21.4
Same, for July	rain and showers thunderstorms squalls	0.0 0.0 30.0	0.0 0.0 25.0	3.8 7.7 11.5
Same, for Oct.	rain and showers thunderstorms squalls	22.2 0.0 5.6	50.0 0.0 0.0	4.0 8.0 4.0
Same, for Dec.	rain and showers thunderstorms squalls	10.8 0.0 5.4	17.2 3.4 0.0	12.0 4.0 16.0

Source: Adapted from 1.

Table D
 Rainfall Tables for the Gilbert Islands
 Monthly Rainfall in Inches

Island	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<u>1903</u> Butaritari		5.49	15.58	14.75	14.00	5.35	4.70	4.28	3.28	0.92	2.59	6.73	
<u>1904</u> Butaritari Abaiang	2.31	6.68	0.29	2.61	3.50	7.30	12.38	11.81	6.75		3.10	9.75	
<u>1905</u> Abaiang	14.64	14.91	20.51	23.20	18.07	12.63	13.20	5.72	5.80	24.15	8.13	9.16	171.13
<u>1906</u> Abaiang	21.18	0.78	5.13	5.86	1.27	3.58	0.99	0.98	1.13	0.85	0.20	8.86	52.84
<u>1907</u> Abaiang	4.09	1.86	0.88	2.59	0.39	5.34	4.85	2.14	0.55	8.96	6.16	6.04	43.87
<u>1908</u> Abaiang						6.77	3.80				0.62	4.68	
<u>1909</u> Abaiang	1.51	1.99											
<u>1926</u> Tarawa							2.34	2.00	0.27	0.00	0.54	1.57	
<u>1927</u> Tarawa	0.24	1.83	3.87	0.50	0.95	2.50	2.42	2.83	2.40	0.00	0.99	15.45	34.00
<u>1928</u> Tarawa	17.67	26.27	4.96	2.39	1.99	3.73	4.26	0.93	0.39	1.79	0.00	4.62	69.00
<u>1929</u> Tarawa	8.00	11.11	0.82	1.42	5.18	3.73	3.30	10.34	10.27	3.81	2.82	14.19	74.99
<u>1930</u> Tarawa	26.45	4.01	11.77	1.81	8.22	0.91							

Table D, cont'd.

Island	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<u>1931</u>													
Little Makin							15.14	4.95	1.60	9.43	2.03	1.71	
Butaritari							6.81	7.53	2.52	9.33	7.79	3.05	
Marakei							3.81	1.47	0.21	1.31	5.32	1.25	
Abaiang							0.88	0.93	0.14	0.87	1.89	0.00	
<u>1932</u>													
Little Makin	4.61	3.39	6.26	8.96	7.14	9.71	5.63	1.31	2.78	3.70	3.11	4.10	60.70
Butaritari	6.62	9.28	7.34	23.67	12.05	9.08	10.93	4.75	4.63	2.21	4.23	4.83	99.62
Marakei	6.49	5.62	16.81	11.52	13.43	10.61	6.73	2.04	2.66	1.33	0.66	0.25	91.65
Abaiang	2.44	4.38	18.51	24.16	8.42	4.99	6.78	1.18	0.27	0.00	0.16	0.10	71.39
Tarawa							16.55	1.43	0.00	0.00	0.19	0.16	
Maiana							2.17	1.84	0.00	0.00	0.81	1.75	
Abemama							1.90	2.84	0.07	0.00	0.48	0.00	
Kuria							1.58	1.28	0.00	0.00	0.70	0.00	
Aranuka							4.38	2.52	0.83	0.00	1.12	0.00	
Nonouti							1.76	1.78	1.67	0.00	1.97	0.00	
Tabiteuea							1.84	1.99	0.67	3.56	0.00	0.00	
Beru							2.16	1.24	2.28	0.00	1.35	0.00	
Nikunau							1.11	0.71	0.30	0.00	0.20	0.30	
Onotoa							1.96	2.02	2.25	0.19	0.50	0.00	
Tamana							4.03	1.95	1.61	0.14	0.90	0.00	
Arorae							4.70	1.83	2.27	0.00	0.70	0.00	
<u>1933</u>													
Little Makin	18.80	11.14	8.92	8.15	6.55	8.20							
Butaritari	12.68	11.56	14.01	17.43	15.99	12.20							
Marakei	10.53	4.26	7.85	8.22	11.84	5.98							
Abaiang	4.53	4.46	3.46	12.90	2.50	3.35							
Tarawa	7.74	0.22	1.08	11.14	10.26	1.48							
Maiana	0.00	1.28	1.73	6.86	9.79	2.02							
Abemama	9.32	0.28	0.74	3.79	3.45	3.07							
Kuria	16.63	0.17	0.29	8.35	1.45	2.24							
Aranuka	12.16	0.00	2.69	6.45	2.37	3.31							
Nonouti	0.00	0.53	1.50	9.44	2.70	2.34							
Tabiteuea	11.70	0.50	2.39	2.48	2.36	2.45							

Table D, Cont'd.

Island	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<u>1936</u>													
Little Makin	7.57	4.67	6.37	12.87	10.16	7.43	7.84	9.36	2.95	7.44	7.78	4.96	88.90
Butaritari	13.50	6.16	14.46	13.13	24.26	11.42	15.88	9.81	5.12	9.26	14.62	12.81	154.19
Marakei	17.82	8.97	6.47	10.78	7.58	7.52	5.85	4.08	2.24	6.77	5.33	3.70	87.05
Abaiang	14.67	9.06	9.62	10.36	9.06	8.10	7.15	5.15	1.12	3.59	11.85	6.48	97.01
Tarawa	12.57	9.68	6.36	7.21	4.65	1.97	3.47	5.30	1.97	3.42	12.90	8.93	78.43
Maiana	16.43	3.24	8.95	5.50	5.31	4.76	2.26	5.66	1.48	1.32	10.16	8.92	73.99
Abemama	11.05	11.97	11.53	2.01	2.57	0.00	2.30	0.60	1.18	0.00	0.20	10.91	54.32
Kuria	14.43	8.89	11.71	2.13	1.63	0.86	1.89	4.74	1.77	0.25	2.00	9.18	59.48
Aranuka	5.43	10.10	10.36	2.25	2.97	2.20	2.86	3.38	1.98	0.95	2.78	8.50	53.76
<u>1937</u>													
Little Makin	8.96	0.35	9.19	12.25	6.54	3.82	6.26	6.60	- *	1.35	1.76	5.00	*
Butaritari	7.26	1.40	6.04	8.24	12.17	6.14	10.56	5.56	2.08	1.66	3.46	3.17	67.74
Marakei	14.37	0.95	7.17	8.17	2.97	1.69	7.49	3.80	0.49	0.69	10.29	2.91	60.99
Abaiang	7.03	3.67	6.54	7.32	0.85	1.85	2.30	1.67	1.75	0.82	5.87	2.23	41.90
Tarawa	7.49	3.47	4.29	0.59	0.96	1.39	5.62	2.46	1.34	0.64	5.35	1.45	35.05
Maiana	5.59	4.51	4.36	0.39	1.15	1.11	5.31	4.97	1.40	0.64	2.33	1.97	33.73
Abemama	7.37	2.27	0.49	0.24	0.09	0.71	3.99	2.87	0.93	0.79	1.79	0.95	22.51
Kuria	11.67	3.81	1.06	0.47	-	1.42	3.81	1.66	1.08	0.51	0.32	0.50	
Aranuka	9.18	5.68	1.36	0.24	0.29	0.57	4.60	1.68	0.11	0.73	1.20	0.38	26.02
Nonouti	6.28	5.79	1.53	0.22	-	0.91	1.53	1.96	0.96	2.68	0.36	2.34	
Tabiteuea	5.96	8.61	0.65	0.44	0.65	1.04	2.48	2.33	0.91	0.78	1.10	0.83	25.78
Beru	10.47	5.99	0.28	0.57	0.03	0.64	2.25	1.83	0.77	1.32	0.15	0.16	24.46
Nikunau	11.66	12.00	1.28	0.03	0.46	1.18	3.67	0.15	1.47	0.08	0.03	0.05	31.56
Onotoa	5.34	12.85	3.44	1.02	0.36	0.83	4.11	3.63	1.39	1.93	3.24	0.37	38.51
Tamana	17.07	16.41	0.60	-	0.43	5.76	7.43	9.25	9.08	0.38	2.64	-	
Arorae	11.71	12.02	-	0.72	1.03	2.01	3.66	1.97	1.40	1.88	1.18	-	
<u>1938</u>													
Little Makin	9.35	3.00	9.04	13.74	7.46	13.94	11.20	6.19	0.79	3.60	12.44	17.58	108.33
Butaritari	5.20	4.19	2.23	4.93	2.92	4.36	4.03	2.47	0.46	0.55	7.10	14.30	52.74
Marakei	6.40	3.19	1.34	2.03	0.98	3.06	3.71	3.85	0.25	0.27	8.63	10.61	44.32
Abaiang	4.33	5.41	0.48	3.43	0.28	1.18	0.87	2.00	-	-	8.10	16.85	
Tarawa	7.64	3.27	0.21	3.30	0.94	0.33	1.73	0.87	1.82	-	2.76	5.57	

*In a number of cases, it was not obvious whether absence of data for a month indicated no rainfall, or no data on it. In such cases, yearly totals have been omitted here, and in Table E.

Table D, cont'd.

Island	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<u>1938, cont'd.</u>													
Maiana	6.11	1.63	0.05	1.94	0.98	0.04	1.07	1.20	1.22	-	1.64	1.48	
Abemama	6.93	0.38	-	0.83	0.54	0.35	0.67	0.62	2.98	0.07	2.67	1.19	
Kuria	3.12	0.52	-	0.96	0.24	0.45	1.83	0.93	0.53	-	1.03	1.37	
Aranuka	4.06	1.07	0.08	1.52	0.80	1.10	1.42	1.81	1.31	--	1.30	1.59	
Tabiteuea	2.05	0.08	0.04	0.04	1.35	0.63	1.77	0.47	0.30	0.52	1.22	1.28	9.75
Nonouti	4.46	0.15	-	0.54	1.10	0.96	0.80	0.94	0.96	0.15	1.53	0.94	
Beru	2.34	0.09	0.20	-	0.60	2.23	1.33	0.53	2.78	-	1.05	1.61	
Nikunau	1.47	0.05	0.03	0.03	1.13	0.55	3.20	0.25	3.99	0.40	2.30	1.57	14.61
Onotoa	1.18	0.04	1.54	0.13	1.45	1.77	1.89	1.82	3.44	0.81	2.27	0.75	17.09
Tamana	-	0.84	-	2.43	0.36	2.20	4.90	3.18	0.54	0.40	1.70	-	
Arorae	1.23	2.79	-	-	1.09	0.16	0.75	1.25	2.58	-	7.44	1.80	
<u>1944</u>													
Onotoa	12.40	0.19	2.73	2.75	0.00	4.58	3.40	3.09	2.31	0.76	6.10	0.00	37.55
<u>1945</u>													
Onotoa	1.20	0.00	0.29	1.05	2.88	8.61	5.61	2.59	1.08	0.58	3.50	0.00	27.39
<u>1946</u>													
Little Makin	7.96	3.29	10.76	6.57	2.37	2.37	2.17	0.50	0.33	0.19	4.84	8.94	50.19
Butaritari	10.88	5.04	23.43	30.09	6.42	13.72	11.72	11.61	6.59	7.55	17.14	13.38	157.57
Marakei	8.49	7.65	7.79	8.25	5.61	6.40	2.48	2.17	2.91	2.14	13.60	13.61	81.10
Abaiang						No rain gauge							
Tarawa	12.13	1.17	2.00	19.08	11.00	13.10	9.75	5.35	1.75	No. data			
Tarawa, Be- tio I.		No data					13.68	4.22	1.56	5.19	9.28	11.24	
Maiana	15.47	0.82	3.52	13.42	8.42	14.43	14.12	8.40	3.51	2.12	7.66	5.59	97.48
Abemama	16.30	4.73	3.77	13.60	11.34	12.90	7.52	7.26	3.13	4.18	4.63	8.40	97.76
Kuria						No rain gauge							
Aranuka	13.33	5.08	5.96	23.34	12.90	9.92	9.98	12.96	2.45	1.21	9.13	8.94	115.19
Nonouti	10.82	2.23	4.53	12.50	12.21	8.61	16.31	9.18	3.40	4.50	2.98	8.57	95.84
Tabiteuea	11.48	2.35	5.35	10.63	10.84	12.12	9.87	8.07	-	1.61	3.57	9.30	
Beru						No rain gauge							
Nikunau	6.01	-	3.25	8.33	5.39	14.87	9.92	9.51	2.19	3.73	4.51	0.10	
Onotoa	2.46	2.78	3.93	9.68	6.94	12.53	8.33	8.21	5.94	3.61	1.92	18.76	75.09
Tamana	1.82	7.34	8.00	6.60	10.94	8.65	6.48	1.89	6.50	6.31	2.01	13.69	80.23
Arorae	1.40	6.56	4.79	13.01	12.09	7.75	8.69	9.00	2.60	1.99	3.65	11.76	83.29

Table D, Cont'd.

Island	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<u>1947</u>													
Little Makin	17.59	3.47	3.29	14.37	7.40	3.44	2.70	2.76	0.60	4.76	2.80	6.46	50.54
Butaritari	35.76	6.74	17.77	18.52	23.03	9.10	7.85	8.33	6.07	6.48	9.00	7.64	156.29
Marakei	14.63	6.04	8.48	3.69	5.18	5.54	2.60	1.81	2.74	0.88	4.88	7.49	63.96
Abaiang		N o d a t a			6.33	6.92	3.49	2.71	0.55	5.62	5.81	8.97	
Tarawa	18.49	3.09	4.33	3.72	9.97	8.19	3.21	2.26	0.81	2.47	4.77	10.83	72.14
Maiana	15.00	0.79	0.98	4.42	2.25	4.57	1.40	2.53	2.29	-	0.60	11.94	
Abemama	26.67	3.30	0.87	1.61	1.06	2.91	1.13	1.24	0.36	4.48	0.57	5.76	49.96
Kuria						N o r a i n g a u g e							
Aranuka	16.40	N o d a t a				2.73	2.42	1.64	0.49	1.49	1.40	8.35	
Nonouti	25.63	0.85	N o d a t a			2.35	1.55	1.95	-	1.75	1.78	6.40	
Tabiteuea	29.39	-	-	0.96	0.92	3.67	0.92	2.34	0.27	1.94	5.25	3.73	
Beru		N o d a t a				1.16	1.75	0.37	0.40	1.58	3.15	3.56	
Nikunau	16.33	3.84	0.24	-	2.23	1.83	-	1.21	-	0.90	2.89	6.46	
Onotoa	16.06	0.23	0.52	0.56	1.22	3.32	0.49	1.26	0.17	0.00	3.21	3.46	30.51
Tamana	17.19	1.87	0.70	-	1.29	6.02	1.23	1.75	0.14	1.20	1.40	8.27	
Arorae	17.65	2.84	0.85	-	2.96	2.61	-	0.38	4.59	0.12	6.54	4.17	
<u>1948</u>													
Little Makin	22.72	6.22	6.26	3.52	11.77	4.94	5.47	0.34	3.03	1.55	3.10	4.55	73.47
Butaritari	13.62	10.40	25.12	9.58	18.00	13.54	15.68	9.95	5.35	2.88	7.86	13.05	145.03
Marakei						N o r a i n g a u g e							
Abaiang	16.58	6.58	16.70	16.11	12.36	8.22	9.64	3.23	0.96	2.46	4.63	12.88	110.35
Tarawa	21.21	9.35	18.02	15.97	8.43	8.99	6.04	4.69	1.11	1.28	5.31	15.09	115.49
Maiana	13.97	15.43	23.94	13.58	9.10	10.67	5.93	4.17	0.57	2.46	3.07	11.37	114.26
Abemama	18.42	4.13	5.15	7.23	4.83	8.36	3.08	1.40	0.30	0.09	1.10	8.03	62.12
Kuria						N o r a i n g a u g e							
Aranuka	15.22	11.62	8.61	7.21	8.70	8.53	2.18	-	0.26	0.40	2.67	5.70	
Nonouti	17.65	5.90	9.70	3.70	7.45	3.10	3.68	0.50	0.85	0.10	2.75	11.51	66.89
Tabiteuea	14.46	13.11	6.91	8.69	6.84	5.10	4.00	1.81	0.63	0.30	4.08	11.33	77.26
Beru	15.03	28.88	2.37	7.33	7.38	4.57	5.13	0.77	1.47	0.78	3.16	10.62	87.49
Nikunau	14.62	8.44	14.43	1.97	10.10	3.60	4.38	1.46	1.54	1.06	2.02	6.01	69.63
Onotoa	11.40	20.51	8.62	13.72	7.97	5.42	2.32	1.53	0.95	1.43	3.34	22.29	99.50
Tamana	12.34	8.11	3.29	9.03	5.85	9.37	5.89	1.29	1.35	0.37	4.15	15.59	76.63
Arorae	17.80	11.14	2.65	16.49	1.20	5.83	2.11	3.89	1.86	0.57	3.13	15.28	81.95

Table D, Cont'd.

Island	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<u>1949</u>													
Little Makin	18.46	18.78	23.74	23.25	9.83	3.52	10.28	2.33	1.68	0.33	1.11	6.49	119.80
Butaritari	17.38	6.46	23.87	19.11	9.84	8.27	16.98	4.87	4.34	4.23	4.59	7.26	127.20
Marakei	3.60	7.50	19.45	15.42	4.26	18.49	12.88	1.11	0.74	0.74	-	1.46	
Abaiang	21.10	6.79	9.29	13.29	5.74	2.99	8.74	-	1.63	1.12	0.49	0.63	
Tarawa	30.04	8.07	11.08	15.96	2.77	2.89	14.74	0.13	2.28	0.36	1.59	1.27	91.18
Maiana	31.71	3.78	7.37	6.88	1.18	3.05	4.16	0.67	0.96	1.68	-	0.66	
Abemama	17.75	11.00	8.53	5.47	-	0.25	6.93	0.67	0.63	1.34	-	0.82	
Kurai	-	-	7.67	4.35	4.35	1.46	5.71	0.90	2.18	1.50	0.04	0.75	
Aranuka	15.19	N o d a t a				1.56	2.88	0.15	0.61	0.94	-	0.75	
Nonouti	26.98	5.69	6.81	2.46	0.94	1.02	2.21	-	1.07	0.24	-	0.14	
Tabiteuea	35.89	7.14	3.79	0.34	2.23	1.16	2.24	2.14	0.18	-	-	0.23	
Beru	28.70	5.47	5.37	0.45	2.45	1.69	1.22	1.27	0.48	0.98	0.10	0.11	48.29
Nikunau	19.08	5.24	7.93	1.22	-	0.75	2.29	1.21	0.36	-	-	0.89	
Onotoa	25.37	4.85	2.83	1.60	1.16	1.50	1.34	0.98	0.87	0.91	0.23	0.16	41.80
Tamana	12.05	3.30	5.07	-	2.95	3.10	1.73	1.27	1.27	3.39	-	0.18	
Arorae	16.52	6.53	6.16	0.54	0.76	3.07	1.76	2.49	0.80	4.10	0.33	0.28	43.34
<u>1950</u>													
Little Makin	0.30	7.31	3.93	5.18	2.46	6.92	6.24	4.13	4.23	4.02	3.80	1.77	50.29
Butaritari	1.41	4.53	4.10	6.01	3.44	3.78	7.55	5.40	5.23	8.92	2.28	4.20	56.85
Marakei	1.58	0.19	0.61	0.51	1.38	0.11	2.28	5.21	2.55	1.84	1.24	2.26	19.81
Abaiang	0.29	0.22	0.59	0.42	0.56	0.12	1.58	0.00	3.33	1.38	1.40	2.54	12.43
Tarawa	0.52	0.17	0.15	0.67	0.31	0.49	0.59	3.00	1.20	1.80	2.72	3.73	15.35
Maiana	0.59	0.00	0.07	0.00	0.40	0.14	0.09	2.57	1.15	1.39	2.31	1.28	9.99
Abemama	0.00	0.00	0.12	0.08	0.00	0.11	0.60	1.70	1.18	0.20	0.31	3.39	7.69
Kuria	0.25	0.000	0.13	0.18	0.10	0.35	0.39	2.53	1.60	0.20	0.71	1.76	7.57
Aranuka	0.84	0.00	0.11	0.45	0.00	0.30	0.00	1.07	0.00	1.45	0.95	0.70	5.87
Nonouti	0.10	0.00	0.05	0.18	0.04	0.12	1.33	1.89	0.76	0.55	0.63	0.81	6.46
Tabiteuea	0.11	0.00	0.00	0.00	0.19	0.79	1.47	2.15	0.93	0.43	0.49	0.91	7.47
Beru	0.03	0.00	0.09	0.08	0.01	0.33	1.10	2.69	1.34	1.23	1.26	1.61	9.77
Nikunau	0.85	0.00	0.00	0.00	0.00	0.36	1.03	1.57	0.00	0.76	0.87	0.95	6.39
Onotoa	0.00	0.00	0.00	0.00	0.00	0.00	1.80	2.76	0.00	0.00	0.43	1.27	5.54
Tamana	0.00	0.00	0.00	0.47	2.52	3.52	2.08	1.51	0.27	0.00	0.35	1.14	11.86
Arorae	0.00	0.00	0.26	1.50	1.20	2.49	2.52	1.14	1.51	0.00	0.00	0.81	11.43

Table D, cont'd.

Island	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<u>1951</u>													
Little Makin	4.15	9.60	8.49	11.82	19.27	19.18	9.26	30.00	9.27	14.02	11.55	16.74	153.35
Butaritari	6.51	6.22	11.77	10.91	18.91	13.08	16.54	11.83	8.76	12.35	14.33	22.62	153.83
Marakei	3.41	1.03	6.36	7.86	14.05	10.62	15.19	7.62	9.96	3.70	9.75	14.30	103.85
Abaiang	4.14	1.75	3.79	3.09	9.03	13.22	12.89	11.45	9.92	3.73	4.16	11.16	88.33
Tarawa	9.00	2.24	2.37	8.96	7.58	11.51	10.23	18.69	11.67	3.31	2.12	16.20	103.88
Maiana	6.10	0.02	3.44	3.90	15.59	15.70	7.95	19.96	10.74	1.58	1.06	15.17	101.21
Abemama	5.64	0.00	1.61	6.27	11.89	3.30	10.88	13.35	3.70	1.00	0.80	20.46	78.90
Kuria	5.61	0.09	4.66	1.73	9.75	11.31	8.27	13.79	5.32	1.68	1.50	11.01	74.72
Aranuka	4.80	0.20	3.41	1.86	11.52	8.56	8.17	12.11	6.70	0.55	2.02	14.36	73.26
Nonouti	4.89	0.00	1.20	0.46	6.31	9.35	8.16	12.22	3.57	2.08	2.98	10.23	61.45
Tabiteuea	5.15	0.25	1.74	2.48	10.48	7.35	6.75	6.33	3.67	2.52	1.28	8.21	56.21
Beru	1.69	0.27	1.31	4.13	7.83	5.65	15.07	11.02	4.46	2.23	1.36	6.33	61.35
Nikunau	2.78	0.16	1.23	1.81	10.18	6.35	11.23	8.79	0.07	2.83	1.16	3.74	50.33
Onotoa	7.62	0.50	2.74	2.47	11.99	7.83	12.47	9.35	7.40	1.33	1.59	9.39	74.68
Tamana	4.21	0.41	5.38	5.35	12.20	6.15	7.81	7.96	7.46	4.98	0.94	11.45	74.30
Arorae	11.03	1.74	2.56	9.84	11.33	4.01	12.54	8.73	7.06	2.89	1.42	9.67	82.82
<u>1952</u>													
Little Makin	34.70	15.26	11.53	9.06	2.52	1.02	5.09	5.43	1.81	16.50	15.70	12.80	131.42
Butaritari	30.56	12.19	13.81	11.15	7.11	16.82	8.08	11.86	5.26	4.16	15.71	12.36	149.07
Marakei	23.12	7.03	13.38	5.94	6.17	6.12	2.16	4.83	1.12	0.00	8.16	10.85	88.88
Abaiang	26.56	9.12	10.77	4.46	7.08	5.27	2.93	5.13	1.30	1.37	7.05	16.59	97.63
Tarawa	18.63	8.33	7.74	4.30	5.33	6.19	1.56	2.48	1.92	1.00	2.65	13.42	73.55
Maiana	24.74	7.52	6.62	7.72	3.52	4.05	2.38	0.81	4.62	3.46	0.64	13.68	79.76
Abemama	15.11	6.33	3.23	3.40	2.61	3.09	2.02	1.96	1.03	3.46	4.59	3.32	50.15
Kuria	12.66	8.35	2.35	5.58	1.75	5.12	1.98	2.23	1.33	1.51	1.35	11.71	55.92
Aranuka	11.87	8.96	1.98	4.56	2.11	2.76	1.91	1.45	1.50	1.95	3.00	7.01	49.06
Nonouti	11.38	2.30	5.22	2.30	2.20	3.45	2.14	3.14	2.76	0.90	0.10	5.01	40.90
Tabiteuea	8.15	0.34	2.75	5.11	3.88	5.34	4.52	2.14	2.23	1.41	0.45	3.81	40.13
Beru	13.78	1.02	2.87	4.45	4.13	2.20	3.69	3.23	2.72	3.60	0.98	2.76	45.43
Nikunau	13.30	0.46	5.73	1.32	3.31	2.78	0.98	3.24	3.13	0.87	2.39	3.53	41.04
Onotoa	0.17	0.70	4.11	1.04	4.46	5.06	3.07	3.62	3.84	6.50	1.16	3.17	36.90
Tamana	9.15	0.08	6.84	7.85	9.42	4.18	4.06	8.42	2.27	0.44	2.77	4.61	60.09
Arorae	19.66	1.38	5.32	7.74	6.31	3.38	3.73	8.33	1.83	2.12	1.74	6.39	67.93

Table D, Cont'd.

Island	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
<u>1955</u>													
Little Makin	1.38	3.50	4.46	9.71	6.55	2.55	4.12	7.98	6.70	2.65	0.00	0.18	49.78
Butaritari	7.89	1.78	0.54	10.18	7.64	6.24	6.41	4.68	5.66	1.93	6.93	0.51	60.39
Marakei	2.82	0.71	0.73	4.48	1.97	3.38	2.76	3.20	3.71	1.55	0.26	0.10	25.67
Abaiang	3.82	0.41	0.21	5.62	5.24	5.06	5.05	5.03	5.05	0.38	0.29	6.83	42.99
Tarawa	2.44	0.87	3.09	2.53	1.55	3.84	2.03	2.89	5.05	0.36	0.16	0.61	25.42
Maiana	2.13	0.09	1.18	2.33	0.55	1.33	2.01	2.24	5.49	0.20	0.02	0.12	17.69
Abemama	3.22	0.18	1.47	1.14	0.39	1.44	0.87	0.90	2.36	0.06	0.00	0.88	12.91
Kuria	0.64	0.00	0.55	0.98	0.48	1.89	1.01	0.89	1.81	0.59	0.00	0.00	8.84
Aranuka	1.37	0.00	0.97	1.59	0.54	2.00	1.53	1.66	1.92	0.00	0.00	0.00	11.58
Nonouti	4.26	0.14	0.32	0.97	0.22	1.14	2.45	0.77	0.63	0.03	0.00	0.01	10.94
Tabiteuea	1.74	0.00	0.55	5.07	1.18	3.78	2.77	1.06	0.60	0.00	0.14	0.23	17.12
Beru	4.49	0.00	1.76	1.38	0.60	0.47	0.99	2.57	1.41	0.35	0.17	1.05	15.24
Nikunau	3.67	0.58	3.01	2.19	1.06	0.71	1.25	1.98	1.41	0.69	0.12	0.08	16.75
Onotoa	5.09	0.38	0.43	1.90	0.19	2.95	0.79	1.13	1.69	0.13	0.16	2.23	17.07
Tamana	10.51	0.65	0.11	1.49	3.23	3.47	1.04	4.28	2.04	0.30	0.00	3.65	30.77
Arorae	10.60	0.30	0.57	0.98	2.40	1.85	1.10	1.50	0.68	0.79	0.02	1.76	22.55

Sources: 1, 2, 3, 4, 7, 8

There were occasional discrepancies between these sources, it is not known whether they represent typographical errors, or different original readings. Selection was made on the basis of any evidence available.

Table E

Annual rainfall totals for the Gilbert Islands

Island	1905	1906	1907	1924-25	1925-26	1926-27	1927
Little Makin				177.51	179.04		
Butaritari				178.19	172.70		
Marakei				38.63	54.78		
Abaiang	171.13	52.84	43.87	23.23	61.51		
Tarawa				23.13	63.80		
Maiana				24.12	64.12	16.61	34.00
Abemama				47.26	103.00		
Kuria				24.20	10.80		
Aranuka				23.15			
Nonouti				5.76	32.31		
Tabiteuea				29.39	31.16		
Beru				12.78	28.71		
Nikunau				11.72	61.39		
Onotoa				14.63	13.68		
Tamana				8.74	19.64		
Arorae				33.30	17.90		

Island	1927-28	1928	1928-29	1929	1929-30	1931-32	1932
Little Makin	117.33		96.33		117.16	74.93	60.70
Butaritari	125.02		113.61		101.70	105.07	99.62
Marakei	97.30		63.12		103.79	77.85	91.65
Abaiang	97.20		66.35		108.59	67.61	71.39
Tarawa	81.11	67.40	42.25	74.99	97.88	40.78	
Maiana	76.85		31.67		93.04	26.38	
Abemama	79.85		28.48		78.33	22.91	
Kuria	69.65		30.88		82.32	38.71	
Aranuka	72.74		32.82		77.76	41.50	
Nonouti	46.53		17.92		65.83	35.82	
Tabiteuea	40.03		16.14		45.93	50.66	
Beru	70.45		20.75		58.23		
Nikunau	61.44		15.24		58.72		
Onotoa	69.80		23.75		66.85		
Tamana	65.30		26.97		63.37		
Arorae	60.53		28.44		67.50		

Sources: Compiled from 1, 2, 3, 4, 7, 8

Table E, Cont'd.

Island	1932-33	1934	1935	1936	1937	1938
Little Makin	82.39	82.86	90.28	88.90		108.33
Butaritari	115.45	107.98	95.67	154.19	67.74	52.74
Marakei	62.35	57.63	69.54	87.05	60.99	44.32
Abaiang	39.69	49.98	59.01	97.01	41.90	
Tarawa	50.25	33.47	44.88	78.43	35.05	
Maiana	28.25	22.55	49.34	73.99	33.73	
Abemama	25.94	19.93	37.36	54.32	22.51	
Kuria	32.69	23.56	30.02	59.48		
Aranuka	35.83	23.08	42.35	53.76	26.02	
Nonouti	23.69	18.67	31.45	58.56		
Tabiteuea	29.94	16.03	37.44	78.18	25.78	9.75
Beru	20.88	25.27	38.89	61.52*	24.46	
Nikunau	14.83	15.66	26.24	72.01*	31.56	14.61
Onotoa	31.50	20.63	45.86	64.57*	38.51	17.09
Tamana	44.58	17.99	50.21	46.10*		
Arorae	32.25	23.08	51.18	53.59*		

Island	1940	1944	1945	1946	1947	1948
Little Makin	110.68			50.19	50.54	73.47
Butaritari	155.35			157.57	156.29	145.03
Marakei	151.62			81.10	63.96	
Abaiang	139.97					110.35
Tarawa	128.36				72.14	115.49
Maiana	128.02			97.48		114.26
Abemama	128.32			97.76	49.96	62.12
Kuria	108.05					
Aranuka	111.65			115.19		
Nonouti	115.10			95.84		66.89
Tabiteuea	128.92					77.26
Beru	140.42					87.49
Nikunau	148.16					69.63
Onotoa	155.45	37.55	27.39	75.09	30.51	99.50
Tamana	129.38			80.23		76.63
Arorae	128.14			83.29		81.95

*Figures taken from 3, those in 7 are discrepant.

Table E, cont'd.

Island	1949	1950	1951	1952	1955	Averages
Little Makin	119.80	50.29	153.35	131.42	49.78	100.23
Butaritari	127.20	56.85	153.83	149.07	60.39	121.50
Marakei		19.81	103.85	88.88	25.67	71.17
Abaiang		12.43	88.33	97.63	42.99	73.58
Tarawa	91.18	15.35	103.88	73.55	25.42	64.02
Maiana		9.99	101.21	79.76	17.69	57.32
Abemama		7.69	78.90	50.15	12.91	53.04
Kuria		7.57	74.72	55.92	8.84	48.37
Aranuka		5.87	73.26	49.06	11.58	49.72
Nonouti		6.46	61.45	40.90	10.94	43.18
Tabiteuea		7.47	56.21	40.13	17.22	40.98
Beru	48.29	9.77	61.35	45.43	15.24	45.29
Nikunau		6.39	50.33	41.04	16.75	42.10
Onotoa	41.80	5.54	74.68	36.90	17.07	45.83
Tamana		11.86	74.30	60.09	30.77	50.39
Arorae	43.34	11.43	82.82	67.93	22.55	52.30