

Preliminary Investigations of Demographic Features and Ecological Variables of a Micronesian Island Population¹

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In this paper the demography of Yap is described as an initial step toward a more complete analysis of the population genetics and ecology of this West Carolinian island in Micronesia. Some of the ecological variables influencing the composition, distribution, and structuring of the population are discussed. The data presented here were collected in the field during a total of eighteen months of residence on the Yap Islands. During this period, extensive census and genealogical surveys, anthropometric examinations, blood sample collection, ecological and nutritional research, and ethnographic studies were carried out. Collation and processing of population and demographic data were undertaken and are continuing at the University of Arizona, Tucson.²

Collection and sources of data

Census and genealogical information was collected from a variety of sources, and by several different methods. A census-genealogy form was completed for each individual examined in the course of an island-wide anthropometric study (exceeding 700 adults examined), including data on reproductive history for each female examined. Extant Clerk of the Court records were copied *in toto* for all recorded births and deaths, extending from ca. 1949 to the present. Church records were generously made available to me by Father F. X. Condon of the Sacred Heart Mission, Yap. A master index was constructed from the files maintained by Staff Anthropologist of the Trust Territory Administration, Yap, Francis Defngin. These files included names, birthdates in some cases, village of residence and village of birth. In addition, for several municipalities or districts, field assistants and I collected census-genealogical data for all residents, working with informants and

¹ Some of the material presented here was presented in a paper read in Washington, D.C., at the American Anthropological Association meetings in November 1967, as a Research Report.

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in direct house-to-house surveys. A complete island-wide survey of the population, by *tabinaw* (group of nuclear families related in the patrilineal line, plus out-marrying female siblings of these males), was prepared by my primary field associate, Giligaangin. Finally, a census-genealogy form, printed in Yapese, was distributed throughout the island, with the assistance of district magistrates and secretaries. These forms were collected and checked in the field, mainly by Francis Defngin, Andrew Faimau and Patrick Mangar.

Since returning from the field, I have extrapolated the data from these various sources to the master index cards and have been assisted by students at the University of California during the summer of 1967. This information, now corrected and collated, has been placed on punch cards for facility in handling. The present report; however, is based on analyses from the master cards, as completed for coding. There may be a few minor revisions required in the conclusions presented here as mechanical manipulations correct the more laborious handwork.

Ecological data was collected in the field by mapping of village areas, correcting existing Trust Territory village maps and the U.S. Geological Survey maps of ecological characteristics of the island. During the summer of 1965, M. V. Cushing carried out ethnobotanical studies. A complete set of plant samples collected during this period was sent to Dr. Raymond Fosberg, Smithsonian Institution, Washington, who generously provided taxonomic identification on the collection. Ethnographic studies were conducted during the entire period, with particular emphasis on the area of exploitative practices. Village land area data was calculated by planimeter, under the supervision of Mark Loochaz, Trust Territory Land Survey Office, Yap. Microenvironmental variability was also considered in the collection of weather and meteorological information from several field stations maintained on Yap. Nutritional studies were enhanced by the collection of sample diet records through the schools and by the collection of food items for nutritional analyses by Mrs. Nao Wenkam of the University of Hawaii.

Structural and demographic characteristics of the Yapese population

It is difficult to discern even the age and sex composition of the Yapese population from reports prior to 1946. The size of the pre-Contact population cannot be unequivocally determined, although I would accept the possibility that a figure of 40,000 total might have been a reasonable maximum estimate. Early German reports, showing some structural characteristics, are presented in Thilenius (1917):

Table 1. Population of Yap Islands, German Period

Year	Males	Females	Children	Others	Total
1902	3027	2962	1468		7464
1903	2752	2838	1571		7156
1911				140 (Chamorros)	6187

Table 2. Age and Sex Composition, by District, Yap 1966
Age Groups of Population

DISTRICT	Males N																TOTALS
	%	0	5	10	15	20	25	30	35	40	45	50	55	60	65 & above	other	
Females N	%																
Other N	%	4	9	14	19	24	29	34	39	44	49	54	59	64			
Total N	%																
GILIMAN		21	12	15	10	1	0	4	6	4	9	4	5	4	5	1	101
		10.9	6.2	7.8	5.2	0.5	0.0	2.1	3.1	2.1	4.7	2.1	2.6	2.1	2.6	0.5	52.5
		7	17	13	4	2	4	4	5	7	6	6	1	0	11	3	90
		3.6	8.8	6.7	2.1	1.0	2.1	2.1	2.6	3.6	3.1	3.1	0.5	0.0	5.7	1.5	46.5
		—	—	—	—	—	—	—	—	—	—	—	—	—	—	2	2
		—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.1	0.1
KANIFAY		28	29	28	14	3	4	8	11	11	15	10	6	4	16	6	193
		14.5	14.7	14.5	7.2	1.5	2.1	4.1	5.7	5.7	7.8	5.2	3.1	2.1	8.3	3.1	193
		15	16	18	13	5	2	7	6	7	8	10	6	3	9	0	125
		6.6	7.0	7.9	5.7	2.2	0.9	3.1	2.6	3.1	3.5	4.4	2.6	1.3	4.0	0.0	54.9
		12	12	15	9	2	5	6	4	7	7	6	2	3	10	0	100
		5.3	5.3	6.6	4.0	0.9	2.2	2.6	1.8	3.1	3.1	2.6	0.9	1.3	4.4	0.0	44.1
DALIPEBINAU		—	1	—	—	—	—	—	—	—	—	—	—	—	—	1	2
		—	0.4	—	—	—	—	—	—	—	—	—	—	—	—	0.4	0.4
		27	29	33	22	7	7	13	10	14	15	16	8	6	19	1	227
		11.9	12.8	14.5	9.7	3.1	3.1	5.7	4.4	6.2	6.6	7.0	3.5	2.6	8.4	0.4	
		37	26	15	13	9	7	11	9	8	3	7	2	5	3	6	166
		11.5	8.1	4.7	4.0	2.8	2.2	3.4	2.8	2.5	0.9	2.2	0.6	1.6	2.5	1.9	51.7
DALIPEBINAU		21	29	21	17	6	9	13	7	2	7	3	6	2	11	1	155
		6.5	9.0	6.5	5.3	1.9	2.8	4.0	2.2	0.6	2.2	0.9	1.9	0.6	3.4	9.3	48.1
		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
		58	55	36	30	15	16	24	16	10	10	10	8	7	19	7	321
		18.1	17.1	11.2	9.3	4.7	5.0	7.5	5.0	3.1	3.1	3.1	2.5	2.2	5.9	2.2	

Table 2. Continued

DISTRICT	Males	N	%	Females		N	%	Other		N	%	Total		N	%	65 & other	TOTALS
	0	5	10	15	20	25	30	35	40	45	50	55	60	65 & above			
FANIF	23	38	33	22	15	11	17	13	16	13	7	6	8	15	7	244	
	4.8	7.9	6.9	4.6	3.1	2.3	3.5	2.7	3.3	2.7	1.5	1.3	1.7	3.1	1.5	50.9	
	39	36	25	21	5	13	12	14	12	11	8	4	6	18	4	228	
	8.1	7.5	5.2	4.4	1.0	2.7	2.5	2.9	2.5	2.3	1.7	0.8	1.3	3.8	0.8	47.6	
	4	—	—	—	—	—	—	—	—	—	—	—	—	—	3	7	
	0.8	—	—	—	—	—	—	—	—	—	—	—	—	—	0.6	1.5	
	66	74	58	43	20	24	29	27	28	24	15	10	14	33	14	479	
13.8	15.4	12.1	9.0	4.2	5.0	6.0	5.6	5.8	5.0	3.1	2.1	2.9	6.9	2.9			
WELOY	23	26	31	20	10	15	5	9	10	9	9	4	3	20	6	200	
	5.8	6.5	7.8	5.0	2.5	3.8	1.2	2.3	2.5	2.3	2.3	1.0	0.8	5.0	2.3	50.3	
	23	23	28	22	9	7	11	7	12	8	5	5	5	9	11	185	
	5.8	5.8	7.0	5.5	2.3	1.7	2.8	1.7	3.0	2.0	1.2	1.2	1.2	2.3	2.8	46.3	
	—	2	1	—	—	—	—	—	—	—	—	—	—	—	11	14	
	—	0.5	0.2	—	—	—	—	—	—	—	—	—	—	—	2.8	3.5	
	46	51	60	42	19	22	16	16	22	17	14	9	8	29	28	399	
11.5	12.8	15.0	10.5	4.8	5.5	4.0	4.0	5.5	4.3	3.5	2.3	2.0	7.3	7.0			
RULL	58	73	48	28	14	11	15	18	13	16	11	10	13	36	3	367	
	8.6	10.9	7.1	4.2	2.1	1.6	2.2	2.7	1.9	2.4	1.6	1.5	1.9	5.4	0.4	54.6	
	41	41	42	23	11	12	21	14	19	13	14	9	8	21	11	300	
	6.1	6.1	6.2	3.4	1.6	1.8	3.1	2.1	2.8	1.9	2.1	1.3	1.2	3.1	1.6	44.6	
	1	—	1	—	—	—	—	—	—	—	—	—	—	—	3	5	
	0.1	—	0.1	—	—	—	—	—	—	—	—	—	—	—	0.4	0.7	
	100	114	91	51	25	23	36	32	32	29	25	19	21	57	17	672	
14.9	17.0	13.5	7.6	3.7	3.4	5.4	4.8	4.8	4.3	3.7	2.8	3.1	8.5	2.5			

GAGIL	36	40	38	29	16	22	12	9	15	15	14	8	6	16	1	277
	6.6	7.3	7.0	5.3	2.0	4.0	2.2	1.6	2.7	2.7	2.6	1.5	1.1	2.9	0.2	50.8
	43	34	28	18	12	11	14	16	14	11	8	13	6	23	12	263
	7.9	6.2	5.1	3.3	2.2	2.0	2.6	2.9	2.6	2.0	1.5	2.4	1.1	4.2	2.2	48.3
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	5
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	0.9	0.9
TOMIL	79	74	66	47	28	33	26	25	29	26	22	21	12	39	18	545
	14.5	13.6	12.1	8.6	5.1	6.1	4.8	4.6	5.3	4.8	4.0	3.9	2.2	7.2	3.3	
	35	48	44	45	23	17	19	10	21	16	19	13	14	20	2	346
	5.4	7.4	6.8	6.9	3.5	2.6	2.9	1.5	3.2	2.5	2.9	2.0	2.2	3.1	0.3	53.4
	46	42	31	30	14	17	11	16	15	25	11	9	6	20	3	296
	7.1	6.5	4.9	4.6	2.2	2.6	1.7	2.5	2.3	3.9	1.7	1.4	0.9	3.1	0.5	45.7
MAP	—	1	—	—	—	—	—	—	—	1	1	—	—	2	1	6
	—	0.1	—	—	—	—	—	—	—	0.1	0.1	—	—	0.3	0.1	0.9
	81	91	75	75	37	34	30	26	36	42	31	22	20	42	6	648
	12.5	14.0	11.6	5.7	5.2	4.6	4.0	5.6	6.5	4.9	3.4	3.1	3.1	6.5	0.9	
	21	33	31	22	11	6	3	8	16	14	7	8	4	19	4	207
	5.3	8.3	7.8	5.5	2.8	1.5	0.2	2.0	4.0	3.5	1.7	2.0	1.0	4.8	1.0	51.9
RUMUNG	16	28	28	17	9	4	11	14	10	10	5	10	6	11	2	181
	4.0	7.0	7.0	4.3	2.3	1.0	2.8	3.5	2.5	2.5	1.2	2.5	1.5	2.8	0.5	45.4
	—	1	1	3	—	—	—	—	—	—	—	—	—	—	6	11
	—	0.2	0.2	0.8	—	—	—	—	—	—	—	—	—	—	1.5	2.7
	37	62	60	42	20	10	14	22	26	24	12	18	10	30	12	399
	0.3	15.5	15.0	10.5	5.0	2.5	3.5	5.5	6.5	6.0	3.0	4.5	2.5	7.5	3.0	
RUMUNG	18	13	4	6	3	5	9	8	5	1	3	3	3	9	0	90
	9.6	6.9	2.1	3.2	1.6	2.7	4.8	4.3	2.7	0.5	1.6	1.6	1.6	4.8	0.0	47.9
	11	16	16	6	2	7	8	1	4	9	2	4	3	6	0	95
	5.8	8.5	8.5	3.2	1.1	3.7	4.3	0.5	2.1	4.8	1.1	2.1	1.6	3.2	0.0	50.5
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	3	3
	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1.6	1.6
29	29	20	12	5	12	17	9	9	10	5	7	6	15	3	188	
15.4	15.4	10.6	6.4	2.7	6.4	9.0	4.8	4.8	5.3	2.7	3.7	3.2	8.0	1.6		

Table 3. Population and Land Area, by Village and District—Yap 1966

DISTRICT	VILLAGE	ACREAGE (Sq. Acres)	POPULATION				ACREAGE PER PERSON
			Males	Females	Others	Total	
GILIMAN	Gachlau	41.90	6	5		11	3.81
	Matbuw	38.41					
	Zabez	97.77	37	30	1	68	1.44
	Maruru	143.16					
	Towawai	202.52	15	13		28	7.23
	Anoz	209.50	14	19		33	6.35
	Magchagil	157.13	16	7		23	6.83
	Guror	349.17	13	16	1	30	11.64
Total		1239.56	101	90	2	193	6.42
DALIPEBINAU	Gaanipan	20.95					
	Magaf	202.52	11	13		24	8.44
	Binau	17.46	4	7		11	1.59
	Kanif	331.71	48	28		76	4.36
	Aringel	258.39	46	51		97	2.66
	Tagegen	136.18	9	10		19	7.17
	Fedoor	202.52	18	29		47	4.31
	Yeboch others	206.01	21	9		30	6.87
Total		1375.74	166	155		321	4.29
KANIFAY	Tafniz	69.83	27	23		50	1.40
	Fara	129.19	9	7		16	8.07
	Nel	115.23	22	15	1	38	3.03
	Nef	202.52	17	15		32	6.33
	Gal	80.31	20	13		33	2.43
	Malay	73.33	26	26	1	53	1.38
	others		4	1		5	
Total		670.41	125	100	2	227	2.95
FANIF	Runu	481.86	21	18		39	12.35
	Ayrech	97.77	0	4		4	24.44
	Yin	174.59	13	17	1	31	5.63
	Gilfiz	412.02	27	28		55	7.49
	Bunuknuk	62.85					
	Wulu	122.21	16	10		26	4.70
	Molway	471.38	8	8		16	29.46
	Rang	331.71	24	16	1	41	8.09
	Tabelang	45.39					
	Gurung	579.63					
	Bulochang	48.88					
	Rumu	331.71	102	92	2	196	1.69
	Mereniw	167.60					
	Atilu	586.67	33	34	1	68	8.63
	Tafgif others	303.78			1	2	3
Total		4218.05	244	228	7	479	8.81

Table 3. Continued

DISTRICT	VILLAGE	ACREAGE (Sq. Acres)	POPULATION				ACREAGE PER PERSON
			Males	Females	Others	Total	
WELOY	Makal	174.50					
	Dugor	240.93	32	21	3	56	4.30
	Okau	446.94	36	24	1	61	7.33
	Numunung	52.38	16	14	1	31	1.69
	Adibuwe	136.18	20	17	4	41	3.32
	Miley	115.23					
	Maa	104.75					
	Alog	286.32					
	Gatimoon	171.10					
	Kaday	412.02	35	30	1	66	6.24
	Mabu	185.06	11	10		21	8.81
	Mulroo	139.67	9	16		25	5.59
	Nimar	226.96	32	33	3	68	3.34
	Keng	115.23	8	18	1	27	4.27
	others			1	2		3
Totals		2807.36	200	185	14	399	7.04
RULL	Worwoo	174.59	79	70	1	150	1.16
	Balebat	233.95	71	55	3	129	1.81
	Benik	132.69	4	13		17	7.80
	Ngolog	209.50	30	25		55	3.81
	Talguw	216.49	7	6		13	16.65
	Dachngar	233.95	5	13		18	13.00
	Dinay	279.34					
	Gitam	349.17	23	14		37	9.44
	Baanmount	122.21					
	Tora	97.77					
	Mer	185.06					
	Fanalily	34.92					
	Yinuf	377.11	26	25		51	7.39
	Luech	488.84	20	15		35	13.97
	Firigau	27.93					
	Lamer	314.26	14	10		24	13.09
	Darikan	62.85	0	4		4	15.71
	Ngof	157.13	1	4	1	6	26.19
	Madargil	129.19					
	Tabnify	146.65	12	5		17	8.63
	Dulkan	172.56	17	10		27	6.39
	Ngary	192.05	44	21		65	2.96
	Ley	181.57	5	3		8	22.70
Wugem	48.88						
Others			9	7		16	
Totals		4568.66	367	300	5	672	6.80

Table 3. Continued

DISTRICT	VILLAGE	ACREAGE (Sq. Acres)	POPULATION			Total	ACREAGE PER PERSON
			Males	Females	Others		
GAGIL	Makiy	1396.69	31	25	1	57	24.50
	Ley	363.14					
	Ru'	202.52					
	Amun	69.83	18	9		27	2.59
	Miyub	55.87	19	17	1	37	1.51
	Mululow	34.92					
	Mey	31.43	3	9		12	2.62
	Riken	272.36	13	10		23	11.84
	Goochol	20.95					
	Wonyan	349.17	71	73	1	145	2.41
	Gachpar	391.03	47	44	1	92	4.25
	Binau	27.93	3	3		6	4.65
	Tenfar	157.13	10	9		19	8.27
	Leng	307.27	37	40	1	78	3.94
	Lebinau	293.31	14	17		31	9.46
	Darcha	150.14	5	3		8	18.77
Ul	191.40						
	Others		1	12	5	18	
Totals		4315.09	277	263	5	545	7.92
TOMIL	Madlay	213.00	6	7		13	16.38
	Thol	52.38	41	32		73	0.72
	Ma	115.23	39	29		68	1.69
	Dilag	34.92					
	Dechmur	115.23	26	18		44	2.62
	Bugol	268.86	62	51		113	2.38
	Af	122.21	31	26		57	2.14
	Teb	628.51	33	39	5	77	8.16
	Meerur	279.34	52	49		101	2.77
	Domchuy	34.92	12	17		29	1.20
	Gacham	1246.55					
	Deboch	443.45	12	9		21	21.12
	Gargei	530.74	31	15		46	11.54
	Others		1	4	1	6	
Totals		4085.34	346	296	6	648	6.30
RUMUNG	Buluol	296.80	4	3		7	42.40
	Mechool	268.86	15	18		33	8.15
	Gaanaun	80.31	17	24	1	42	1.91
	Eng	55.87					
	Riy	97.77	21	19		40	2.44
	Fal	83.80	22	22		44	1.90
	Wenfara	52.38	8	8	1	17	3.08
	Amin-Mp	94.28					
		Others		3	1	1	5
Totals		1030.07	89	94	3	186	5.54

Table 3. Continued

DISTRICT	VILLAGE	ACREAGE (Sq. Acres)	POPULATION			Total	ACREAGE PER PERSON
			Males	Females	Others		
MAP	Amin	359.65	23	17		40	8.99
	Bechiel	132.69	3	6		9	14.74
	Toru	178.04	13	12		25	7.12
	Nulul	31.22	1	0		1	31.22
	Waref	17.46					
	Waned	97.77	23	19		42	2.33
	Dingin	66.34					
	Wochlab	209.50	11	8		19	11.03
	Chool	202.52	15	9		24	8.44
	Waloy	192.05	35	33	3	71	2.70
	Numdul	17.46	6	4	1	11	1.59
	Molway	34.92					
	Malon	185.06	7	2	2	11	16.82
	Talngiz	178.08	16	21		37	4.81
	Wurile	132.69	10	10	2	22	6.03
	Plau	314.26	42	33	3	78	4.03
	Michew	209.50	2	7		9	23.28
Totals		2559.21	207	181	11	399	6.41
Sum—villages occupied in 1966, total acreage 21, 388.12							
population in 1966							4,071
Acreage per person:							
Range—0.72 to 42.40							
Mean—5.25							
Mode—6.34							

Under Japanese administration (ca. 1918 to 1945), reports to the League of Nations showed total population figures as follows:

1935	5830
1936	5683
1937	5559.

By 1946, Useem (1946) reported a total of 2478 Yapese; by 1948, this number had increased to 2625 (Peabody Museum Expedition, 1948).

Table 2 shows the age and sex composition of the Yapese population, by administrative district or municipality, as of June 1966. In Table 3, the sex composition of the population, village land area, and acreage per person, by village and district, is presented.

NONRANDOM DISTRIBUTION OF POPULATION

A view of population distribution, as shown in Map 1, indicates the non-random distribution of the Yapese population in 1966. Continuing trends, observed in 1948, are, in part, accountable for the present patterns of distribution. Hunt (1950) particularly noted the declining membership of the lower social classes whose residential areas were generally inland. That the consequent intensification

of population settlement in shore-strand areas has continued may be readily seen by walking through inland areas and counting unoccupied house sites, some still in habitable condition. This trend is also but less drastically, observed in a comparison of figures showing occupied and unoccupied villages in 1966 and 1948 (Table 4) and from a review of the village 1966 population-acreage map (Map 1). However, the association of social class position and habitat (i.e., lower class villages occupy inland sites) prevents an immediate decision as to the specific causality involved.

Table 4. Villages unoccupied in 1948 and in 1966

Villages unoccupied in 1948		Villages unoccupied in 1966	
Village and District	Acres	Village and District	Acres
Amin, Mp, Rumung	94.28	Gurung, Fanif	579.63
Eng, Rumung	55.87	Tafgif, Fanif	303.78
Woref, Map	17.46	Alog, Weloy	286.32
Dingin, Map	66.34	Frigau, Rull	27.93
Molway, Map	34.92	Guchol, Gagil	20.95
Ley, Gagil	363.14	Tabelang, Fanif	*45.39
Ru', Gagil	202.52	Total	1264.00
UI, Gagil	191.40		
Gacham, Tomil	1246.55		
Bunuknuk, Fanif	62.85		
Bulochang, Fanif	48.88		
Mereniw, Fanif	167.60		
Makal, Weloy	174.50		
Miley, Weloy	115.23		
Maa, Weloy	104.75		
Gatimoon	171.10		
Dinay, Rull	279.34		
Baanimount, Rull	122.21		
Tora, Rull	97.77		
Mer, Rull	185.06		
Fanaliliy, Rull	34.92		
Madargil, Rull	129.19		
Wugem, Rull	48.88		
Gaanipan, Dalipebinau	20.95		
Matbuw, Giliman	38.41		
Maruru, Giliman	143.16		
Total	4217.37		
Sum—planimeter village area, in acres		26,869.49	
acreage of villages			
occupied in 1948—22,652.12			
unoccupied in 1948— 4,217.37			
acreage of villages			
unoccupied in 1948— 4,217.37			
unoccupied in 1966— 1,264.00			
		5,481.37	
Sum acreage, villages occupied in 1966		21,388.12	

The possibility that the variable of social class membership is a prime determinant of population distribution is dispelled with further analysis. Table 5 presents data for population, village acreage, and population-acreage, for villages grouped by social class. It is clear that there is no simple association between social class of village and population density. In contrast, when the population density (Map 1) is compared to an ecological map showing distribution of plants important in the Yap dietary (Map 2)³, the similarities are striking. I believe this evidence supports the view that population distribution in Yap is primarily affected by ecological factors, and these have only a secondary relationship to the variable of social class.

Further examination and comparison of the two maps indicate one area of apparent lack of association between population and ecological factors—in the area of Weloy District. Here, a dense population resides in an area of relative ecological paucity. This area is the site and environs of the “port town” and administrative and religious center of Colonia. Numerous Yapese reside in this area but obtain much of their food supply from store purchases or from fields in outlying areas. This phenomenon was noted in 1948 and is wide-spread throughout the Pacific (Spoehr, 1963). A secondary factor affecting population distribution, then, appears to be that of incipient urbanization in the island setting.

Initially, I was surprised at the close association of ecological features and population in Yap, for the abundance of lands available to individuals of the depleted population is readily noted. On reflection, I believe this very favorable condition has, in part, led to the striking association. As studies of land tenure on Yap (Mahoney, 1958, Defngin, n.d.) have demonstrated, numerous options in usufruct and residence now exist for a Yapese, as a consequence of this availability of lands. As one Yapese told me: “My wife and I can work in all our eight taro plots. But we live near where the five are we can walk easily to. We do not care about the other three, and they are full of weeds. But we only need five, so why should we worry about the others?” Thus, bountiful conditions have permitted a selection which probably was not available when population was more numerous and individual land holdings more restricted.

I hypothesized, also, that the population should indicate favoring of the western and southwestern portions of the island for settlement, and that this would be particularly noticeable in regions (e.g. Giliman District) lacking year-round fresh water sources. Throughout Yap, coconuts provide a main source of liquid, and, where streams are at best seasonally intermittent, population distribution should be affected by conditions influencing availability of coconuts, the prime source of liquid. Heavy winds come primarily from the northeast and these may cause coconut destruction. I did not find this association, and I ascribe this finding to two

³ This map, drawn from ecological maps of the United States Geological Survey, shows distribution of the plant associations used in Yapese dietary, such as taro, banana, breadfruit, coconut. Not shown here are plant associations of minor import (e.g. mangrove, grasslands, pandanus, and grass, *et al*).

Table 5. Population, by Social Class, Yap 1966¹

Caste and Class	Village and District	Area (Acres)	Population	Acres per person
CASTE I				
Class 1	Guror, Giliman	349.17	30	11.64
	Naf, Kanifay	202.52	32	6.33
	Kanif, Dalipebinau	331.71	76	4.36
	Gilfiz, Fanif	412.02	55	7.49
	Okau, Weloy	446.94	61	7.33
	Ngolog, Rull	209.50	55	3.81
	Gachpar, Gagil	391.03	92	4.25
	Teb, Tomil	628.51	77	8.16
	2971.40	478	6.22	
Class 2	Anoz, Giliman	209.50	33	6.35
	Gal, Kanifay	80.31	33	2.43
	Balebat, Rull	233.95	129	1.81
	Bugol, Tomil	268.86	113	2.38
	Meerur, Tomil	279.34	101	2.77
	1071.96	409	2.62	
Class 3	Atilu, Fanif	586.67	68	8.63
	Runu, Fanif	481.86	39	12.35
	Yin, Fanif	174.59	31	5.63
	Dugor, Weloy	240.93	56	4.30
	Ley, Rull	181.57	8	22.70
	Ngof, Rull	157.13	6	26.19
	Wonean, Gagil	349.17	145	2.41
	Ma, Tomil	115.23	68	1.69
	Amin, Map	359.65	40	8.99
	Toru, Map	178.04	25	.712
	Woned, Map	97.77	42	2.33
	Fal, Rumung	83.80	44	1.90
	Riy, Rumung	97.77	40	2.44
	3104.18	612	5.07	
Class 4	Zabez, Giliman	97.77	68	1.44
	Malay, Kanifay	73.33	53	1.38
	Gurung, Fanif	579.63		
	Rang, Fanif	331.71	41	8.09
	Rummu, Fanif	331.71	196	1.69
	Dulkan, Rull	172.56	27	6.39
	Lamer, Rull	314.26	24	13.09
	Amun, Gagil	69.83	27	2.59
	Leng, Gagil	307.27	78	3.94
	Chool, Map	202.52	24	8.44
	Wochlab, Map	209.50	19	11.03
	2690.09	557	4.83	

t after class rankings in CIMA and Hunt.

Table 5. Continued

Caste and Class	Village and District	Area (Acres)	Population	Acres per person
CASTE II				
Class 5	Towai, Giliman	202.52	28	7.23
	Fara, Kanifay	129.19	16	8.07
	Aringel, Dalipebinau	258.39	97	2.66
	Magaf, Dalipebinau	202.52	24	8.44
	Tagegen, Dalipebinau	136.18	19	7.17
	Tafgif, Fanif	303.78		
	Adibue, Weloy	136.18	41	3.32
	Kaday, Weloy	412.02	66	6.24
	Dachngar, Rull	233.95	18	13.00
	Luech, Rull	488.84	35	13.97
	Ngary, Rull	192.05	65	2.96
	Worowa, Rull	174.59	150	1.16
	Lebinau, Gagil	293.31	31	9.46
	Riken, Gagil	272.36	23	11.84
	Af, Tomil	122.21	57	2.14
	Dechmur, Tomil	115.23	44	2.62
	Gargei, Tomil	530.74	46	11.54
	Bechyool, Map	132.69	9	14.74
	Malon, Map	185.06	11	16.82
	Plau, Map	314.26	78	4.03
	Talngiz, Map	178.08	37	4.81
	Weloy, Map	192.05	71	2.70
	Wurila, Map	132.69	22	6.03
	Buluol, Rumung	296.80	7	42.40
	Ganaun, Rumung	80.31	42	1.91
	Mechool, Rumung	268.86	33	8.15
		5984.86	1070	5.59
CASTE III				
Class 6	Magchagil, Giliman	157.13	23	6.83
	Tafnith, Kanifay	69.83	50	1.40
	Molway, Fanif	471.38	16	29.46
	Wulu, Fanif	122.21	26	4.70
	Alog, Weloy	286.32		
	Keng, Weloy	115.23	27	4.27
	Mabu, Weloy	185.06	21	8.81
	Mulroo, Weloy	139.67	25	5.59
	Nimar, Weloy	226.96	68	3.34
	Yinuf, Rull	377.11	51	7.39
	Tabnify, Rull	146.65	17	8.63
	Talangui, Rull	216.49	13	16.65
	Makiy, Gagil	1396.69	57	24.50
		3910.73	394	9.93

Table 5. Continued

Caste and Class	Village and District	Area (Acres)	Population	Acres per person
Class 7	Gachlau, Giliman	41.90	11	3.81
	Nel, Kanifay	115.23	38	3.03
	Binau, Dalipebinau	17.46	11	1.59
	Fedoor, Dalibepinau	202.52	47	4.31
	Yeboch, Dalipeinau	206.01	30	6.87
	Airech, Fanif	97.77	4	24.44
	Benek, Rull	132.69	17	7.80
	Gitam, Rull	349.17	37	9.44
	Frigau, Rull	27.93		
	Guchool, Gagil	20.95		
	Tenfar, Gagil	157.13	19	8.27
	Deboch, Tomil	443.45	21	21.12
	Dilag, Tomil	34.92		
	Domchui, Tomil	34.92	29	1.20
	Madlay, Tomil	213.00	13	16.38
Zol, Tomil	52.38	73	0.72	
Wenfara, Rumung	52.38	17	3.08	
		2199.81	367	5.99
Class 8	Tabelang, Fanif	45.39		
	Binau, Gagil	27.93	6	4.65
	Mey, Gagil	31.43	12	2.62
	Muyub, Gagil	55.87	37	1.51
	Michew, Map	209.50	9	23.28
	Nulul, Map	31.22	1	31.22
		401.34	65	6.17
Class 9	Numunung, Weloy	52.38	31	1.69
	Darikan, Rull	62.85	4	15.71
	Darcha, Gagil	15-.14	8	18.77
	Murru, Gagil	34.92	5	6.98
	Numdul, Map	17.46	11	1.59
		317.75	59	5.39
Totals, by Caste:				
	Caste I	9837.63	2056	4.78
	Caste II	5984.86	1070	5.59
	Caste III	6829.63	885	7.72
Totals, all Yap		22652.12	4011*	5.65

*—plus 60 without village identification

features of the environment: 1) severe damage caused by meteorological phenomena is rare in this area (tropical cyclones or typhoons), and, then, involving winds blowing in a circle, or from all directions; 2) Yap is a small and low volcanic island exhibiting a minor degree of microenvironmental variability, thus precluding major differences in degree of storm damage from one part of the island to another.

The net effect of trends in population distribution are the intensification of shore-strand occupation, and a consequent increase in relative population density. This represents an adaptation at present low population levels, reflecting cultural and personal preference more than carrying capacity of the environment. As population increases, the options available will become more limited and I would predict a wider dispersion of population outside the environs of Colonia in coming years.

POPULATION COMPOSITION AND STRUCTURE

Yap has long intrigued students of demography and population as an example of prolonged population decline. In addition, the composition and structuring of the depleted population was of concern to such students, as well as to the administrative and medical officials responsible for the well-being of these Micro-

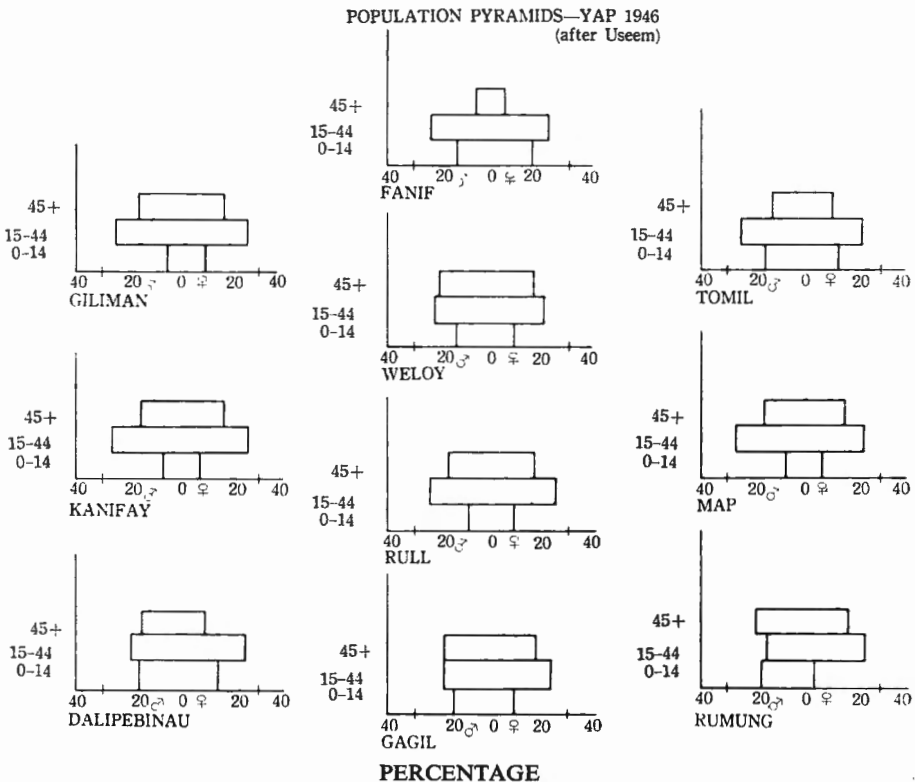


Fig. 1.

nesians. Population pyramids have been drawn from data presented by Useem (*op. cit.*) and may be seen in Figure 1. The most striking feature of these pyramids is the limited extent of the age group of 0 to 14 years, suggesting a low birth rate, high infant mortality, or both, were in operation. The Peabody Museum expedition team (*op. cit.*: 29-30) commented: "Whereas 9.14% of the Yaps are under 5 years of age, only 6.31% are age 5 to 9. [One suspects] . . . that the differential was due to a low birth rate and not due to an excessive infant and child death rate. . .". These authors suggested that this presumed low birth rate was due to the disrupted Yapese family life in that period. Other authorities in Micronesia (e.g. Lessa, 1955) have looked askance at, particularly, venereal disease, suggesting that penicillin treatment of yaws alleviated these conditions. The population pyramids drawn from 1966 census figures indicate a transitional stage to a growing population, as in some developing countries, and stands in marked contrast to those of the 1946 period (Figure 2).

In calculating marital and birth incidence rates, data pertaining to the anthropometric sample, numbering 707, is also used here. This sample contains the most accurate and complete data available on Yapese studied in 1966, and is representative of adult Yaps, i.e., aged 18 years and over. Marital and birth incidence

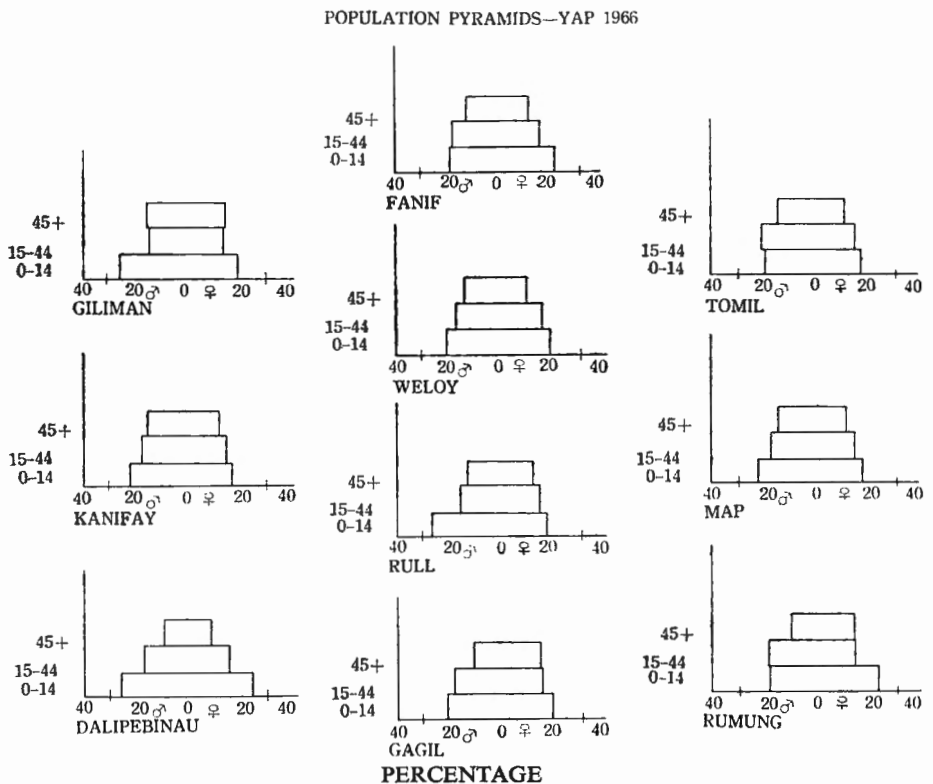


Fig. 2.

Table 6. Marital and birth incidence, based on sample of population of Yap, 1966

(1) Marital Incidence

Study		Number of times married													Mean	Mode	
		0	1	2	3	4	5	6	7	8	9	10	11	12			13
Yap, 1966	Males	14	56	59	60	56	28	9	9	2	1	2	0	0	1	3.01	3.00
	N	6	76	101	81	52	48	25	10	8	2	0	1	0	0	3.13	2.00
	Totals	20	132	160	141	108	76	34	19	10	3	2	1	0	1	3.08	2.00
Yap, 1946 ^a	Females	51	270	270	87	25	10	7							1.61	1.00	

^a Useem, 1946 Tables 42 and 43.

(2) Birth Incidence

Study		Number of children																	Mean		
		0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16		17	18
Yap, 1966	Males	78	42	30	24	20	24	18	15	12	9	7	4	5	4	1	0	1	0	1	3.78
	N	78	46	42	35	30	45	29	38	32	22	8	4	3	0	0	0	0	0	1	4.00
	Totals	156	88	72	59	50	69	47	53	44	31	15	8	8	4	1	0	1	0	2	3.80
Yap 1946 ^a	Females	—	165	99	64	46	25	8	4	0	0	1									2.36

^a Useem, 1946, Table 45

is shown in Table 6 and compared with data for 1946, compiled from Useem.

These figures indicate, first, a high rate of serial monogamous unions, showing a marked increase in frequency over 1946 figures. No confirmed instances of polyandrous unions were recorded on Yap for 1966, although instances of illicit relationships were attested in children reported as illegitimate to the recorder. Several polygynous unions, however, are now current and are of long standing. Second, the average number of children born to adult Yapese has increased markedly in the 20-year period. Strictly speaking, the 1966 and 1946 figures are not directly comparable, for Useem included females aged 14 years and over. Also, Useem's birth incidence rates (his Table 45) cover only women with children. Consequently, the differential in birth incidence is greater than that indicated by Table 6.

Estimated birth and death rates, based on official records, are shown in Table 7 and 8. These are probably slightly lower than actual rates, due to under-registration. For comparison, rates for such characteristics, as calculated for 1948 data, are also shown.

Birth rates have increased markedly for all age groups of women in Yap during the reproductive years. Surprisingly, this increase is more noticeable in older cohorts, beginning with that aged 25-29. The Peabody team predicted (*op. cit.*: 30)

Table II indicates that in 1961-63 there will be a smaller percentage of females in the age group with the highest specific fertility rate than there is at present. . . . If Yap specific fertility rates in 1961-63 are anything like the rates for 1946-48 the Yap crude birth rate will be extremely low in 1961-63.

However, the Yap crude birth rate today is extremely high, even in comparison to other native peoples of this part of the world. The crude birth rate and death rate for some other native populations is shown in Table 9 below.

Thus, while the Yapese crude birth rate exceeds that of all other listed populations, the crude death rate is also higher. An examination of the specific mortality

Table 7. Estimated Birth Rates, all Yap Islands Population

(1) Age-specific birth rates for Yapese women, 1965				
Ages	Number of births	Female Population	Birth Rates (2/3 × 1000)	Age-specific Birth Rates, Yap 1947 ^a
15-19	21	167	125.74	102.14
20-24	19	72	263.88	233.51
25-29	31	89	348.31	144.00
30-34	29	111	261.26	109.74
35-39	16	98	163.26	105.33
40-44	5	102	49.01	31.90
45-49	3	107	28.03	14.68
(2) Crude birth rate = $\frac{P}{B}(k) = \frac{551}{4071}(1000) =$			47.40	27.9
(3) General fertility rate = $\frac{B}{P_i}(k) = \frac{551}{639}(1000) = 862.30$				

^a Peabody Museum Report, 1950.

Table 8. Estimated Dath Rates for all Yap Population

(1) Age-specific dath rates					
Ages	Population	Adjusted Population	Deaths (1965)	Death Rates	Yap 1948 ^a
0-4	551	567	15	26.45	19.27
5-9	608	625	2	3.20	3.76
10-14	527	542	0	0	2.73
15-19	378	389	0	0	0
20-24	179	184	2	10.86	11.48
25-29	185	190	0	0	21.02
30-34	213	219	1	4.56	16.41
35-39	194	199	5	25.12	32.53
40-44	217	223	1	4.48	39.98
45-49	212	218	4	18.34	22.52
50-54	160	165	2	12.12	30.98
55-59	128	132	2	15.15	9.84
60-64	108	111	3	27.02	61.77
65+	299	307	23	74.91	(74.50 (91.26 (109.82 (241.45
(2) Crude death rate = $\frac{D}{P}(k) = \frac{60}{4071}(1000)$				14.70	24.1

^a Yap 1948, Peabody Museum Report

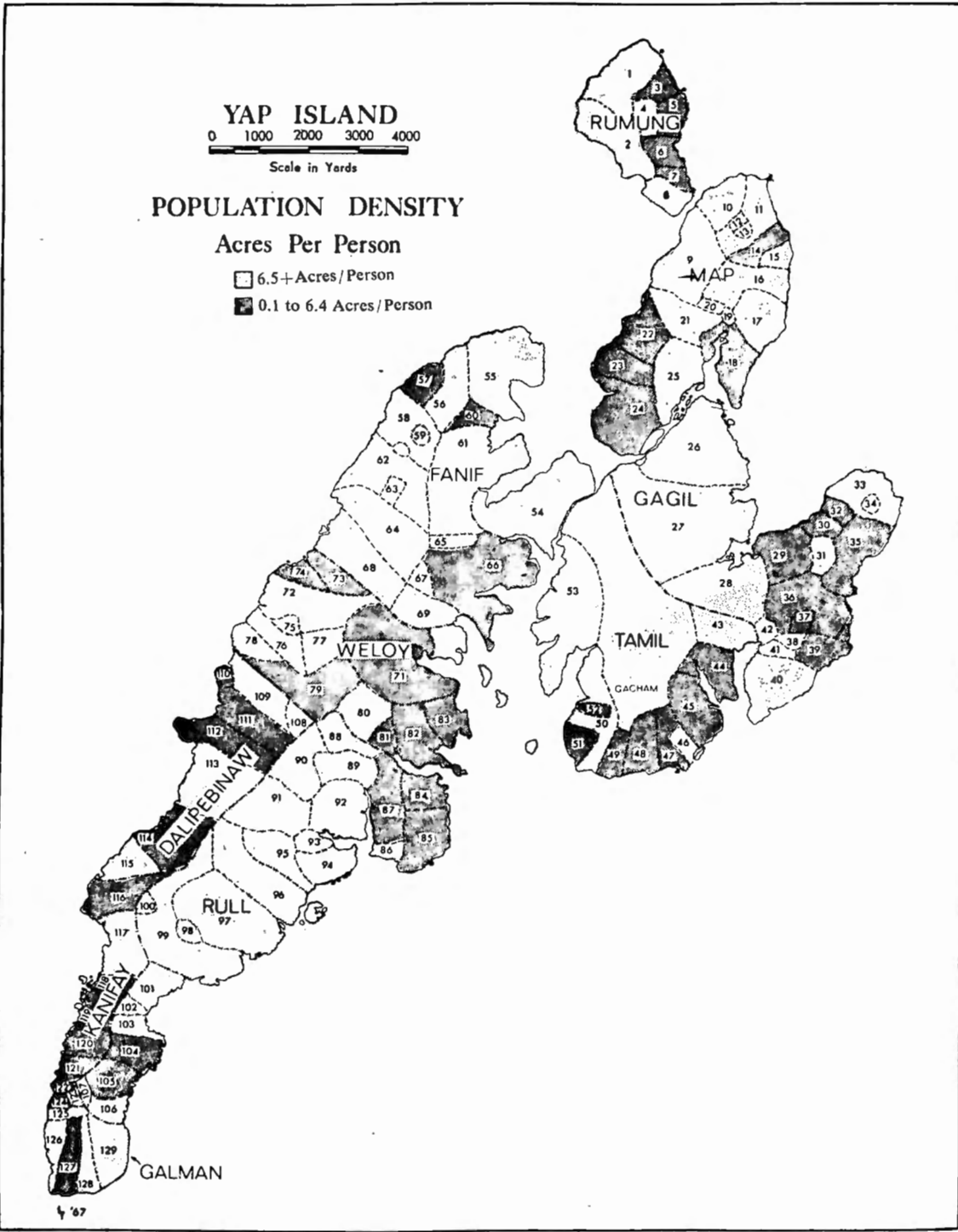
Table 9. Comparison of crude birth and death rates for selected populations

Group	Source	Crude birth rate	Crude death rate
Yap, 1966	Present study	47.40	14.70
Ceylon 1964	U.N. Demographic Yearbook, 1964.	32.6	8.7
American Samoa, 1963	<i>Ibid.</i>	42.4	6.6
Fiji Islands, 1964	<i>Ibid.</i>	37.8	6.1
Tonga, 1963	<i>Ibid.</i>	32.6	4.2

Table 10. Estimated age-specific fertility rates in Oceania^a

Age group	Fijian 1956	American Samoa, 1950	Yap 1966
10-14	not stated	not stated	0
15-19	53	64	126
20-24	274	310	264
25-29	285	341	348
30-34	206	275	261
35-39	142	200	163
40-44	62	56	49
45-49	19	17	28

^a (McArthur, 1961:51)



RUMUNG MUNICIPAL

- 1 Buluol
- 2 Mechool
- 3 Gaanaun
- 4 Eng
- 5 Riy
- 6 Fal
- 7 Wenifara'
- 8 Amin-Map

MAP MUNICIPAL

- 9 Amin
- 10 Bechiel
- 11 Toruw
- 12 Nulul
- 13 Waref
- 14 Waned
- 15 Dingin
- 16 Wacholab
- 17 Chool
- 18 Waloy
- 19 Numdul
- 20 Maloway
- 21 Malon
- 22 Talngiz
- 23 Warile'
- 24 Plau
- 25 Michew

GAGIL MUNICIPAL

- 26 Makiy
- 27 Lay
- 28 Ru'
- 29 Amun
- 30 Miyub
- 31 Mulolow
- 32 Mey
- 33 Riken
- 34 Goochol
- 35 Wanyan
- 36 Gachapar
- 37 Binaw
- 38 T'enifar
- 39 Leng
- 40 Lebinaw
- 41 Darcha'
- 42 UI

TAMIL MUNICIPAL

- 43 Madelay

- 44 Thol
- 45 Maa'
- 46 Dilag
- 47 Dechmur
- 48 Bugol
- 49 Aff
- 50 Teb
- 51 Meerur
- 52 Deemchuy
- 53 Deboch
- 54 Gargey

FANIF MUNICIPAL

- 55 Runuw
- 56 Ayrech
- 57 Yiin
- 58 Gilifith
- 59 Bunuknuk
- 60 Wluu
- 61 Maloway
- 62 Rang
- 63 Tabelang
- 64 Gurung
- 65 Bulochang
- 66 Rumu'
- 67 Me'reniw
- 68 Ateliw
- 69 Tafgif

WELOY MUNICIPAL

- 70 Makal
- 71 Dugor
- 72 Okau
- 73 Numnung
- 74 Adbuwe'
- 75 Miley
- 76 Maa'
- 77 Alog
- 78 Gatimoon
- 79 Kaday
- 80 Mabu'
- 81 Mulro'
- 82 Nimar
- 83 Keng

RULL MUNICIPAL

- 84 Worowa'
- 85 Balebat
- 86 Benik

- 87 Ngolog
- 88 Talguw
- 89 Dachanger
- 90 Dinay
- 91 Gitam
- 92 Baanimout
- 93 Tora'
- 94 Mer
- 95 Fanaaliliy
- 96 Yinuf
- 97 Luwech
- 98 Firigaau
- 99 Lamer
- 100 Darikan
- 101 Darikan
- 102 Madargil
- 103 Tabinfiy
- 104 Dulkan
- 105 Ngariy
- 106 Lay
- 107 Wugem

D,BINAW MUNICIPAL

- 108 Gaanipan
- 109 Magaf
- 110 Binaw
- 111 Binaw
- 112 Aringel
- 113 Tagegin
- 114 Tagegin
- 115 Yaboch

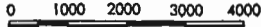
KANIFAY MUNICIPAL

- 116 Tafnith
- 117 Fara'
- 118 Nel
- 119 N'ef
- 120 Gal'
- 121 Mala'y

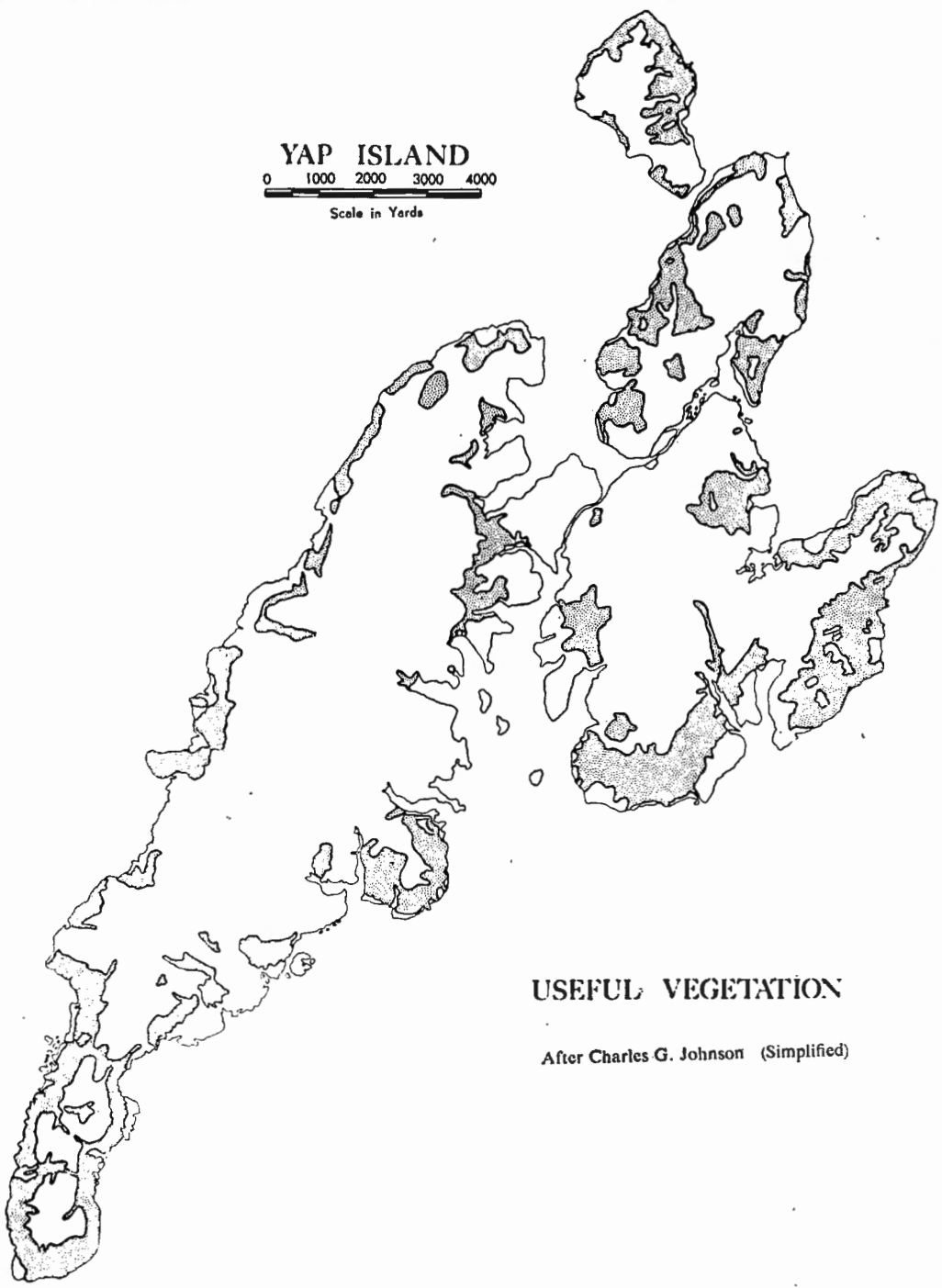
GALMAN MUNICIPAL

- 122 Gachalaw
- 123 Mat'buw
- 124 Zabeth
- 125 Muruuru
- 126 Tawoway
- 127 Anoth
- 128 Magachgil
- 129 Guror

YAP ISLAND



Scale in Yards



USEFUL VEGETATION

After Charles G. Johnson (Simplified)

table for Yap suggests this is partly due to continuing high infant mortality. Increasing and improved medical services may be expected to reduce this rate appreciably and to result in an even greater rate of natural increase in the forthcoming twenty years. This prediction is borne out by a comparison of age-specific fertility rates in several Oceanic peoples (Table 10).

Summary

Comparisons of population and demographic data to the results of studies in 1946 (Useem) and in 1947-48⁴ (Hunt, 1950; Peabody Museum, *op. cit.*) are indicated in tables showing:

1. Sex and age composition, by village, by district, for all Yap;
2. Sex and age composition, by social class and caste;
3. Marital, birth data and crude rates; *inter alia*.

The nonrandom distribution of the Yapese population is considered in relation to some probable influencing factors:

1. Geographic-ecological:
 - a. Access to diverse habitats (strand vs. inland settlement);
 - b. Access to limited resources (water, crop lands);
 - c. Exposure to wind and storm damage effects.
2. Population:
 - a. Effect of earlier population composition;
 - b. Demographic limitations.
3. Psychological-sociological:
 - a. Dynamics of class mobility;
 - b. Incipient urbanization ("port towns").

The growth patterns of one human population are discussed. These initial findings provide a basis for more sophisticated and pertinent handling of genetic and ecological data, for studies in identification of the microisolate, for research in genetical demography. The results of these inquiries indicate the need for continuing analyses, currently underway.

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