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The islet of Ebeye, located at the southeastern corner of Kwajalein Atoll in the Marshall Islands, currently has one of the worlds highest population densities. This essay traces population change on the small islet throughout the twentieth century, focusing in particular upon the demographic processes that led to this dense concentration of people. In documenting the demographic history of Ebeye, the study contrasts the evolving population structure on this islet with similar developments on Majuro Atoll (location of the largest concentration of people in the Marshall Islands) and in the remainder of the Marshalls. The demography of Ebeye is evaluated in ecological and regional terms, in an attempt to assess the long-term impact of its extremely dense population.

Introduction

Micronesia has experienced several changes during the past four centuries as a consequence of interaction with other, more technologically advanced cultural systems. Of the numerous developments that occurred in this period, none have been more widespread, or have had a greater impact on the peoples of Micronesia, than changes in *demographic structure.* Early examples of such changes often took the form of population decline, with the most dramatic instances the result of diseases introduced by European and American explorers, whalers, and

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traders (Yanaihara 1940; Joseph and Murray 1951; Hezel 1983:141-149). More recently, Micronesia has experienced general population growth, usually as a consequence of increasing survivability and rising birth rates. In this region of frequent, substantial demographic change, one of the most striking cases of population growth has occurred on Ebeye, a small islet located at the southeastern corner of Kwajalein Atoll in the Marshall Islands. Claiming less than twenty inhabitants only one-half century ago, Ebeye currently is estimated to contain at least 8,000 people within its scant 0.12 square mile—making it one of the most densely populated places in the world.

In the following essay we examine the demographic evolution of Ebeye during the twentieth century. To help put this development in context, we also explore demographic change on Majuro Atoll—the present capital of the Republic of the Marshall Islands as well as the other major population center in the region—contrasting the population changes experienced at these two locations with those experienced in the remainder of the Marshalls. The article explores possible causes of population growth on Ebeye, evaluating this growth in terms of two fundamental issues. The first is the cultural change that has accompanied the increasing concentration of population on Ebeye—particularly with regard to land tenure, the traditional foundation for the authority structure in Marshallese society. The second issue examined concerns the adaptive pressures that have accompanied the growing population on Ebeye; such ecological concerns have broad regional implications, and ultimately challenge the Marshallese sociocultural system's ability to maintain itself.

The Foundation for Change: Colonization and Its Demographic Consequences

The Marshall Islands consist of twenty-nine atolls and five islands located between 5° and 15° north latitude, and 161° and 173° east longitude, in the central Pacific Ocean some 2,500 miles west of Hawaii. Situated in the eastern portion of Micronesia, the Marshalls comprise two chains running north-northwest to south-southeast: the western Ralik or "sunset" chain, and the eastern Ratak or "sunrise" chain. Kwajalein Atoll, the largest atoll in the world, consists of ninety-three islets surrounding an 839-square-mile lagoon in the Ralik chain (Bryan 1971). Two of the islets in Kwajalein Atoll are of interest in the present study: Kwajalein itself, the main islet in the atoll and since 1944 the site of a United States military installation; and Ebeye, a small islet lying

approximately four miles north of Kwajalein islet and currently the residence of virtually all Marshallese living within the atoll. Also of interest, for comparative purposes, is Majuro Atoll, a collection of fifty-seven islets (with population largely concentrated on two) in the Ratak chain, located some 270 miles southeast of Kwajalein Atoll (Figure 1).

As is the case with most of Micronesia, the demography and cultural history of the Marshall Islands in general and Ebeye in particular have been greatly affected by contact with other, more technologically advanced societies. This contact began more than four hundred years ago, yet the impact of outsiders on Marshallese demography has been quite recent for the most part. Although the Marshall Islands officially became part of the Spanish Empire in 1494, and various islands

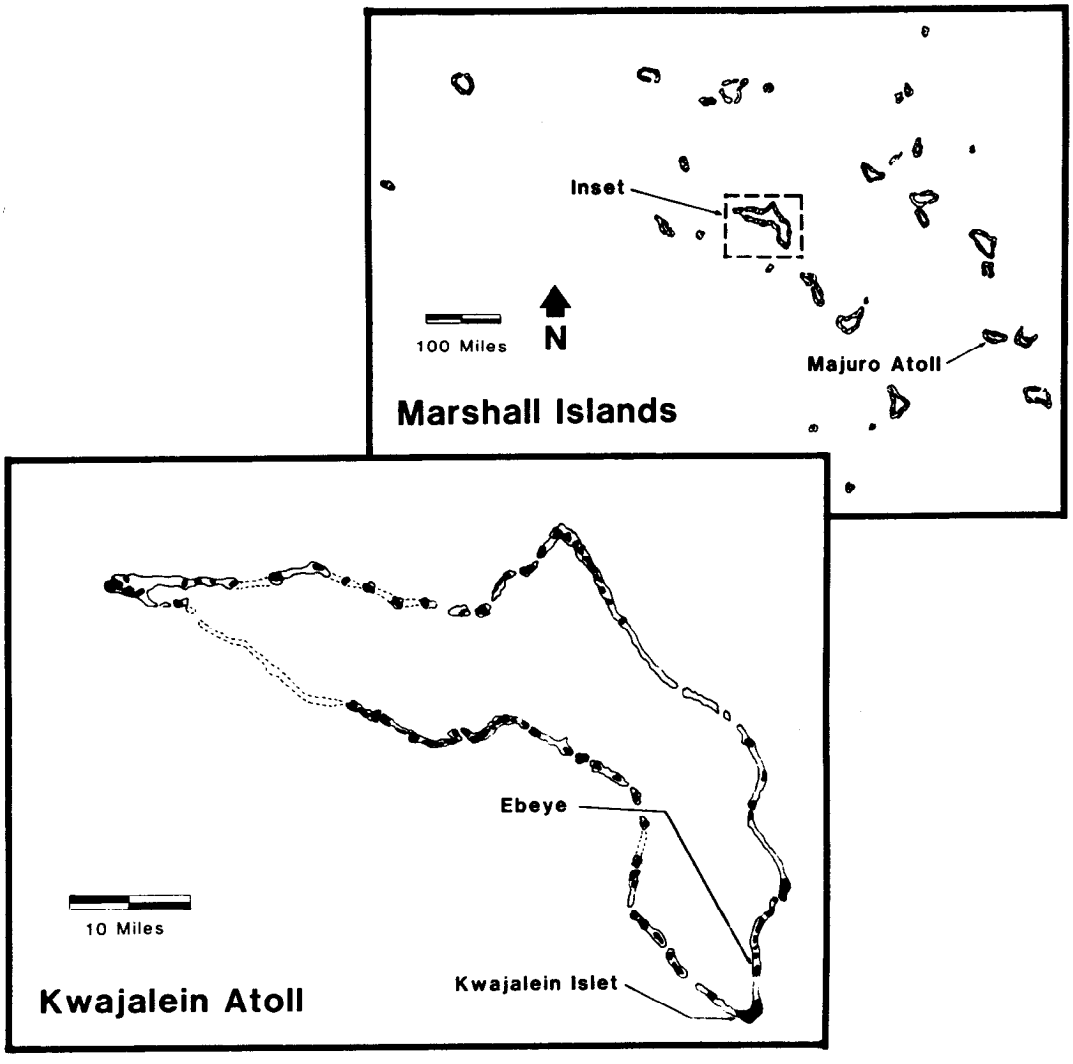


FIGURE 1. **The locations of Kwajalein Atoll, Ebeye, and Majuro Atoll within the Marshall Islands.**

throughout the Marshalls were sighted, described, and occasionally visited from as early as 1526, very little interaction between the Marshallese and Europeans occurred during the first three centuries following initial contact. Indeed, the islands were not even explored systematically until the early nineteenth century, when the northern Ratak chain was visited by a Russian naval expedition led by Kotzebue (Kotzebue 1967, 3:140-180). With the exception of a few missionaries scattered throughout the region beginning in the 1850s (Hezel 1983:201-210), prolonged contact with outsiders would not begin until the late nineteenth century when the Marshalls were colonized by Germany (see Hezel and Berg 1985:396-435).

After roughly two decades of competing with companies from other nations, in 1878 German traders established their dominance in the Marshalls with the negotiation of trade relations in the Ralik chain and the right to use the harbor at Jaluit Atoll (Shinn 1985:334). In 1885, Germany gained control of all of the Marshalls when the islands became a German protectorate. Germany's role in the Marshall Islands was an active one, as it attempted to develop the region economically. In general, the Germans tended to impose their will on the Marshall Islanders indirectly, through relatively few administrators who worked as much as possible within the traditional authority structure of the Marshallese culture (Oliver 1961:348-350). Despite the small number of Germans in residence, and apparent efforts to change native culture as little as possible, the population of the Marshall Islands appears to have declined by some unspecified amount during the period of German rule. This decline was due largely to a succession of diseases (venereal disease, pulmonary disease, and influenza) and a devastating typhoon during the first decade of the twentieth century (Kramer and Nevermann 1938: 172).

Japan began developing an interest in various portions of Micronesia during the late nineteenth century. In 1914, with Germany involved in World War I, Japan occupied the Marshall Islands militarily—its presence recognized officially first by the Treaty of Versailles in 1919 (Office of the Chief of Naval Operations 1943:13), and then by a Class C League of Nations mandate in 1920 (Clyde 1967; see also Hezel and Berg 1985:436-475). Japan attempted to expand the regional economic development begun under German rule, as well as introduce Japanese culture, education, and language to the area (Mason 1946:8). To achieve these goals, a number of Japanese administrators, businessmen, and teachers began to reside in the Marshalls. In contrast to the period of German rule, Marshall Islands population remained relatively stable

during thirty years of Japanese occupation (Office of the Chief of Naval Operations 1943:19), with the most notable demographic changes taking the form of additional foreigners in residence and the relocation of native Marshallese from certain areas during World War II (Mason 1946:9). Japanese administration of the Marshalls continued until 1944, when the islands were occupied by U.S. military forces.

Without question, the greatest changes in population and culture in the Marshall Islands have occurred during the extended American presence in the area following World War II (Gale 1978). For much of the past forty years the United States was an active force in the region, administering the Marshall Islands and other island groups that comprised the Trust Territory of the Pacific Islands. Some of the changes linked to the American presence have been particularly dramatic, such as the relocation of entire populations from Bikini and Enewetak to enable nuclear tests at these atolls (Mason 1954; Kiste 1968, 1977; Tobin 1967; Alcalay 1984). But the most notable, long-term impact over the past four decades has been population growth throughout most of the region (see Gorenflo and Levin 1989), particularly on Ebeye. Demographic change on this small islet has been associated closely with American military activity in its immediate vicinity. The U.S. Navy established a military installation on the islet of Kwajalein immediately following the defeat of Japanese forces there. This installation remains active, providing at various times in its history important logistical support for atomic tests conducted in the Marshalls beginning in the late 1940s, a key research and development installation for various missile programs from the late 1950s to the present, and more recently a site for "demonstration/validation" testing of certain Strategic Defense Initiative ("Star Wars") technologies (Alexander 1984; Office of Economic Adjustment 1984:45; Strategic Defense Initiative Organization 1987). Since U.S. military activity began at Kwajalein, Marshallese natives have been hired to perform a variety of jobs at the installation. This source of employment, coupled with the availability of Western trade goods and other modern amenities, has attracted thousands of Micronesians to the small islet of Ebeye just north of Kwajalein.

Changing Population of Ebeye, Majuro, and the Marshall Islands

Population estimates were first compiled for portions of the Marshall Islands in the nineteenth and early twentieth centuries, in the form of records kept by missionaries and administrators, the notes of various explorers and traders, and portions of the studies prepared by a German

scientific expedition to the Marshalls between 1908 and 1910 (see Kramer and Nevermann 1938:172-174). But detailed population data for the Marshalls were not collected until the census conducted by the Japanese South Seas Bureau in 1920 (see Table 1). Such temporal limitations do not detract significantly from the current study, for it is the last fifty years that have witnessed the most dramatic population change in the Marshall Islands as a whole, and on Ebeye and Majuro Atoll in particular. Two aspects of this change are especially noteworthy. One is the absolute growth in population. During the half-century spanning 1930 to 1980, the populations of the Marshall Islands and Majuro Atoll increased by more than three and fifteen times, respectively; Ebeye, in turn, saw its population grow by more than 325 times during the same period, with the average annual increase exceeding 30 percent during one of the time spans examined (Figure 2; Tables 2 and 3). A second noteworthy aspect of demographic change in the Marshall Islands con-

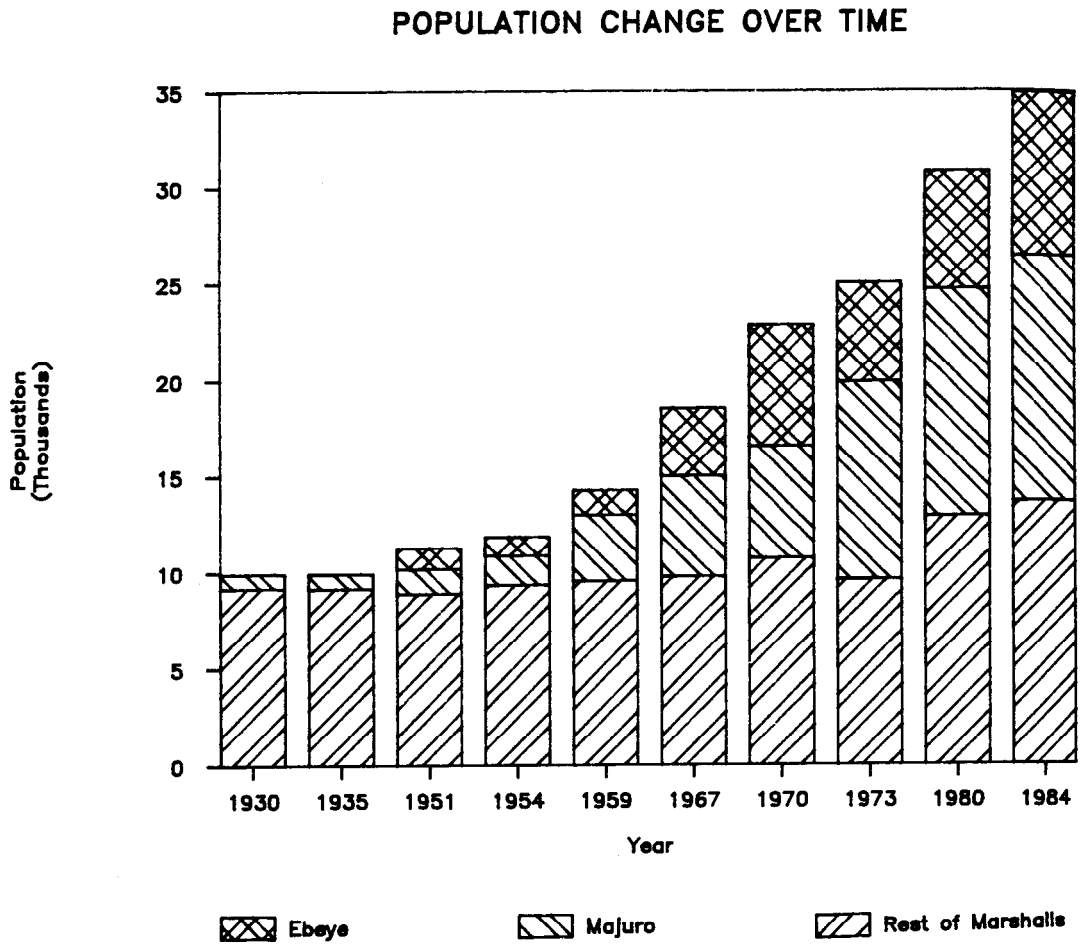


FIGURE 2. **The evolving populations of the Marshall Islands, Ebeye, and Majuro Atoll.**

cerns the regional distribution of population. In the same fifty years between 1930 and 1980, the populations of Ebeye and Majuro Atoll grew from less than 0.2 percent and 7.4 percent of the total population of the Marshall Islands to 20.0 percent and 38.2 percent, respectively (Figure 3; see also Table 2).

The number of inhabitants of the Marshall Islands appears to have remained relatively constant at approximately 10,000 people from 1874 until the late 1930s (Office of the Chief of Naval Operations 1943:19), although population figures ranging from 7,000 to 16,000 before the German occupation in the 1880s have been suggested (Kramer and Nevermann 1938:172). The first detailed demographic data for Ebeye, in addition to the rest of the Marshall Islands, come from the 1930 Japanese census of the region (Japan 1931; Table 4). These data as well as those from the following census (conducted in 1935, also by the Japanese; Table 5) confirm the notion of a stable population where the Marshall Islands as

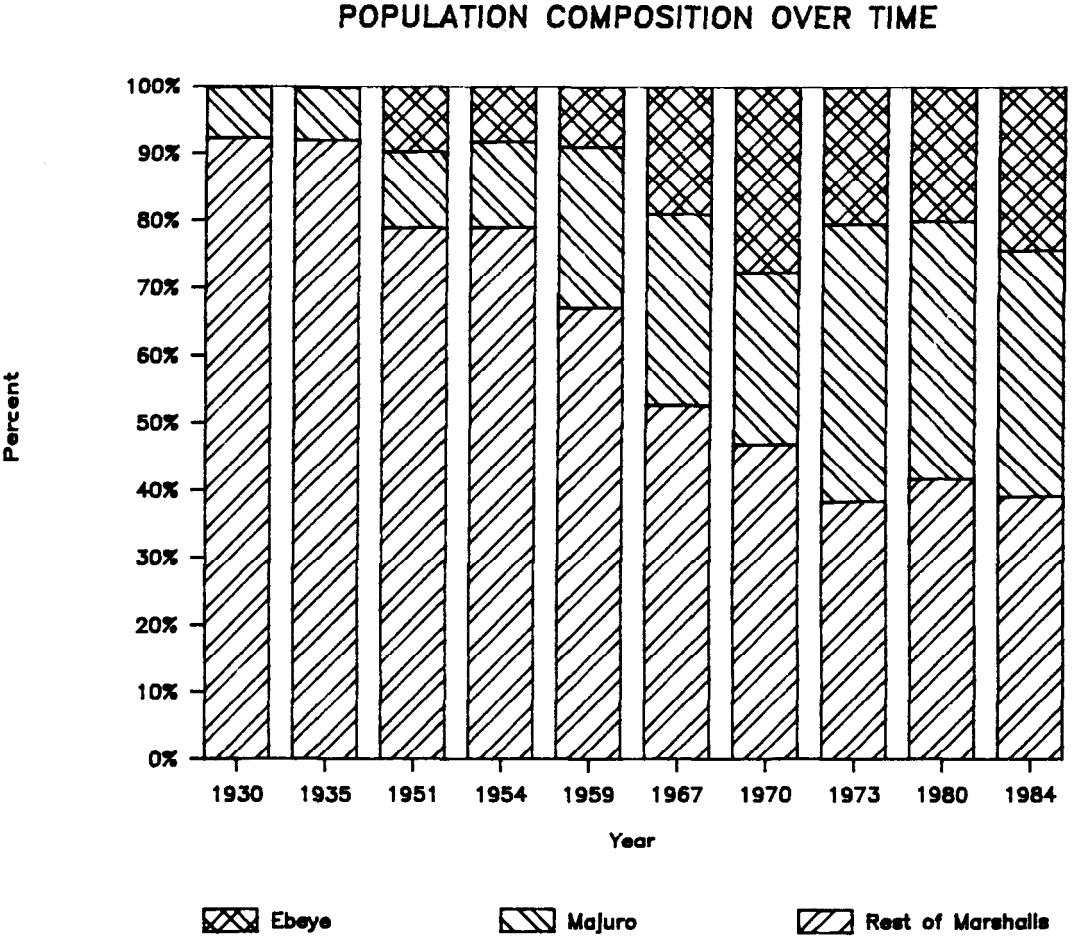


FIGURE 3. **Geographic composition of Marshall Islands population as it has evolved over time.**

Table 1. **Population Data for the Marshall Islands, Ebeye, and Majuro Atoll: Select Years**

Year	Marshall Islands	Ebeye	Majuro Atoll	source
1920	9,693	NA	526	Japan 1937
1925	9,528	NA	685	Japan 1926
1930	10,130	19	753	Japan 1931
1935	10,126	16	779	Japan 1937
1945	9,471	NA	1,237	Dean 1947
1947[a]	7,843	NA	NA	U.S. Dept. of the Navy 1948
1948	10,495	NA	NA	U.S. Dept. of the Navy 1948
1949	10,802	NA	1,479	U.S. Dept. of the Navy 1949
1950	11,033	NA	1,295	U.S. Dept. of the Navy 1950; Tobin 1954
1951	11,299	1,095[b]	1,292	U.S. Dept. of the Navy 1951
1954	11,878	981	1,522	U.S. Dept. of State 1955; Tobin 1954
1955	14,260	1,622[b]	3,053	U.S. Dept. of State 1955
1956	13,984	1,371[b]	2,706	U.S. Dept. of State 1956
1957	13,231	1,387[b]	2,921	U.S. Dept. of State 1957
1958	14,163	1,284[b]	3,415	Office of the High Commissioner 1959
1959	14,290	1,292[b]	3,429	U.S. Dept. of State 1959
1960	14,907	1,576[b]	3,603	U.S. Dept. of State 1960
1961	15,399	1,443[b]	3,900	U.S. Dept. of State 1961
1962	15,710	1,971[b]	3,933	U.S. Dept. of State 1962
1963	17,363	2,388[b]	3,940	U.S. Dept. of State 1963
1964	18,205	2,663[b]	4,612	U.S. Dept. of State 1964
1965	18,062	3,249[b]	4,516	U.S. Dept. of State 1965
1966	18,239	2,879[b]	5,187	U.S. Dept. of State 1967
1967	18,578	3,540	5,249	School of Public Health n.d.
1968	18,998	3,702	5,602	U.S. Dept. of State 1968
1969	19,328	3,841	5,957	U.S. Dept. of State 1969
1970	22,888	6,320	5,829	U.S. Bureau of the Census 1973
1971	23,166	5,064	8,541	U.S. Dept. of State 1971
1972	24,248	5,604	9,059	U.S. Dept. of State 1972
1973	25,045	5,123	10,290	Office of Census Coordinator 1975
1975	26,569	NA	NA	U.S. Dept. of State 1976
1977	25,457	4,577	10,087	U.S. Dept. of State 1978
1980	30,873	6,169	11,791	U.S. Bureau of the Census 1982a
1981	32,104	6,889[b]	12,261	U.S. Dept. of State 1983
1982	33,339	7,165[b]	12,751	U.S. Dept. of State 1983
1984	34,923	8,500	12,747	U.S. Dept. of State 1984

NA = not available.

Note: Data for 1920-1935 are for natives only; remaining data are for de facto population.

[a]Estimate based upon partial census records, and believed to be inaccurate.

[b]Population for "Kwajalein Atoll," virtually all of which resided on Ebeye during these years.

TABLE 2. **Population of the Marshall Islands as a Whole, Ebeye, Majuro Atoll, and the Remainder of the Marshall Islands: Select Years**

	Number				Percentage in Each Area		
Year	Total	Ebeye	Majuro	Elsewhere in Marshalls	Ebeye	Majuro	Elsewhere in Marshalls
1930	10,130	19	753	9,358	0.2	7.4	92.4
1935	10,126	16	779	9,331	0.2	7.7	92.1
1951	11,299	1,095	1,292	8,912	9.7	11.4	78.9
1954	11,878	981	1,522	9,375	8.3	12.8	78.9
1959	14,290	1,292	3,429	9,569	9.0	24.0	67.0
1967	18,578	3,540	5,249	9,789	19.1	28.3	52.7
1970	22,888	6,320	5,829	10,739	27.6	25.5	46.9
1973	25,045	5,123	10,290	9,632	20.5	41.1	38.5
1980	30,873	6,169	11,791	12,913	20.0	38.2	41.8
1984	34,923	8,500	12,747	13,676	24.3	36.5	39.2

Sources: Japan 1931, 1937; U.S. Department of State 1955, 1959, 1984; U.S. Department of the Navy 1951; Tobin 1954; U.S. Bureau of the Census 1973, 1982a; Office of Census Coordinator 1975; School of Public Health n.d.

TABLE 3. **Population Change over Time for the Marshall Islands as a Whole, Ebeye, Majuro Atoll, and the Remainder of the Marshall Islands: Select Years**

	Number				Average Annual Percentage			
	Total	Ebeye	Majuro	Elsewhere in Marshalls	Total	Ebeye	Majuro	Elsewhere in Marshalls
1930								
1935	-4	-3	26	-27	0.0	-3.4	0.7	-0.1
1951	1,173	1,079	513	-419	0.7	30.2	3.2	-0.3
1954	579	-114	230	463	1.7	-3.6	5.6	1.7
1959	2,412	311	1,907	194	4.2	5.7	17.6	0.4
1967	4,288	2,248	1,820	220	3.3	13.4	5.5	0.3
1970	4,310	2,780	580	950	7.2	21.3	3.6	3.1
1973	2,157	-1,197	4,461	-1,107	3.0	-6.8	20.9	-3.6
1980	5,828	1,046	1,501	3,281	3.0	2.7	2.0	4.3
1984	4,050	2,331	956	763	3.1	8.3	2.0	1.4

a whole, Ebeye, Majuro Atoll, and the remainder of the Marshall Islands are concerned. Population totals remained roughly constant over time, as did the age and sex structure for each area (Figure 4).

As noted in Table 1, several estimates of Marshall Islands population were prepared in the years immediately following World War II. These

TABLE 4. **Population by Age for the Marshall Islands as a Whole, Ebeye, Majuro Atoll, and the Remainder of the Marshall Islands: 1930**

	Number				Percentage			
Age	Total	Ebeye	Majuro	Elsewhere in Marshalls	Total	Ebeye	Majuro	Elsewhere in Marshalls
Total	10,130	19	753	9,358	100.0[a]	100.0	100.0	100.0
< 1	278	0	24	254	2.7	0.0	3.2	2.7
1-5	1,091	4	82	1,005	10.8	21.1	10.9	10.7
6-14	1,734	1	67	1,666	17.1	5.3	8.9	17.8
15-19	869	4	46	819	8.6	21.1	6.1	8.8
20-24	697	3	53	641	6.9	15.8	7.0	6.8
25-39	2,383	1	150	2,232	23.5	5.3	19.9	23.9
40-59	2,029	5	131	1,893	20.0	26.3	17.4	20.2
60 +	1,049	1	200	848	10.4	5.3	26.6	9.1

Source: Japan 1931.

[a]Totals in this and following tables may not sum to 100%, due to rounding.

TABLE 5. **Population by Age for the Marshall Islands as a Whole, Ebeye, Majuro Atoll, and the Remainder of the Marshall Islands: 1935**

	Number				Percentage			
Age	Total	Ebeye	Majuro	Elsewhere in Marshalls	Total	Ebeye	Majuro	Elsewhere in Marshalls
Total	10,126	16	779	9,331	100.0	100.0	100.0	100.0
<1	231	0	21	210	2.3	0.0	2.7	2.3
1-5	943	2	71	870	9.3	12.5	9.1	9.3
6-14	1,788	2	97	1,689	17.7	12.5	12.5	18.1
15-19	916	2	57	857	9.0	12.5	7.3	9.2
20-24	907	3	51	853	9.0	18.8	6.5	9.1
25-59	4,327	5	305	4,017	42.7	31.3	39.2	43.1
60 +	1,014	2	177	835	10.0	12.5	22.7	8.9

Source: Japan 1937.

data suggest that the overall population of the Marshalls remained at about 10,000 persons through the 1940s, the apparent decrease recorded in 1945 quite likely a result of war-related deaths and relocation to remote areas of the region during the war. Immediately following the defeat of Japanese forces on Kwajalein in early 1944, approximately 300 Marshallese and Pohnpeians were recruited to help clear battle debris

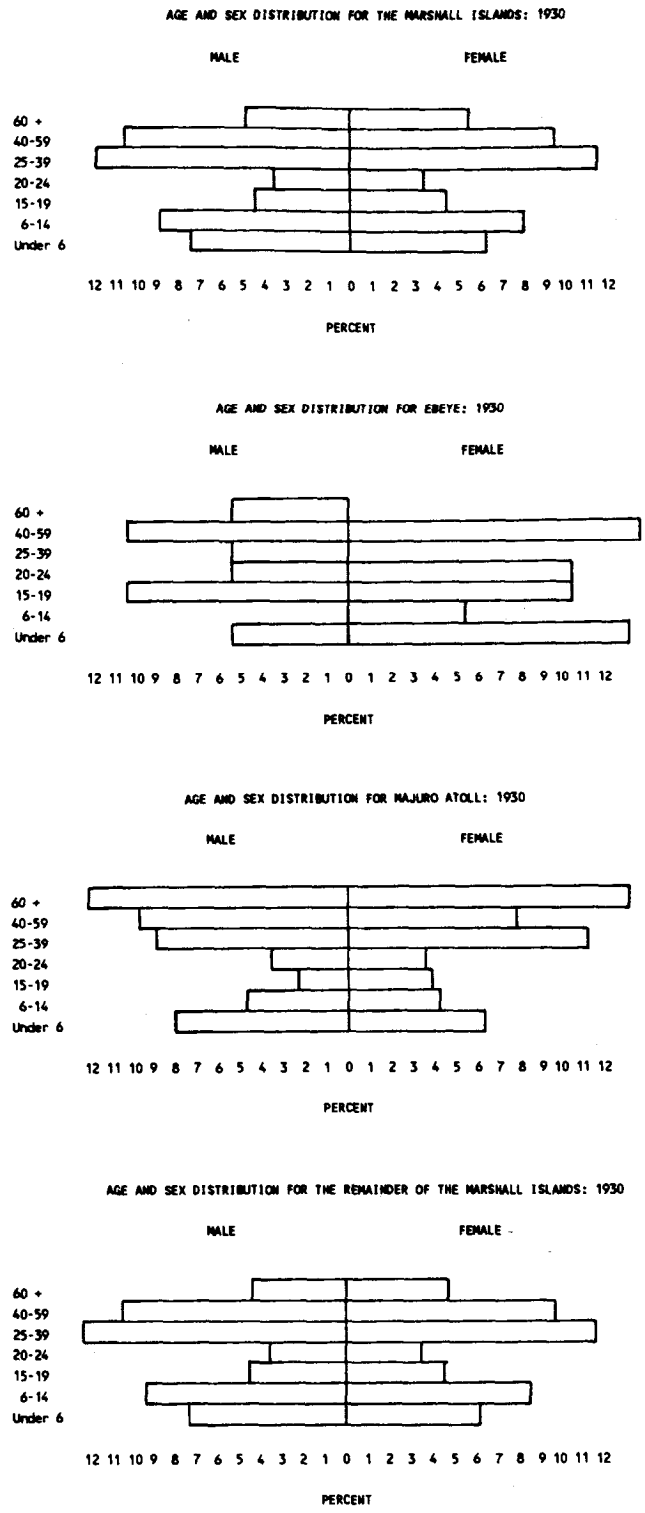


FIGURE 4. **Population pyramids for the Marshall Islands as a whole, Ebeye, Majuro Atoll, and the remainder of the Marshall Islands: 1930.**

and reconstruct the airstrip and hangars on Kwajalein islet (Tobin 1954). Once this work was completed, the Pohnpeians were sent home; Marshallese women, in turn, were allowed to join their men, and the Kwajalein Labor Camp was formed. By early 1950 the population of this camp had swelled to 559, and the Navy decided to move it to nearby Ebeye. In 1954 another systematic census was conducted—this time under the direction of the district anthropologist and focusing solely on Ebeye (Tobin 1954). Despite the rapidly growing number of people living in conditions greatly removed from traditional Marshallese culture, the 1954 census of Ebeye suggests that its population structure remained roughly similar to that of the prewar Marshall Islands as a whole (Table 6; Figure 5). However, two changes are evident in this first detailed documentation of Ebeye's emerging role as a population center, providing early clues to the demographic future of this small islet: a relative increase in the number of children, particularly ages 1-4, probably due to a combination of rising fertility and declining infant mortality; and a relative increase in individuals aged 20-29, providing possible evidence of migration to Ebeye in search of employment.

TABLE 6. **Population by Age and Sex for Ebeye: 1954**

	Number			Percentage		
Age	Total	Males	Females	Total	Males	Females
Total	981	523	458	100.0	100.0	100.0
<1	27	16	11	2.8	3.1	2.4
1-4	134	68	66	13.7	13.0	14.4
5-9	110	65	45	11.2	12.4	9.8
10-14	57	27	30	5.8	5.2	6.6
15-19	44	18	26	4.5	3.4	5.7
20-24	117	63	54	11.9	12.0	11.8
25-29	110	65	45	11.2	12.4	9.8
30-34	68	32	36	6.9	6.1	7.9
35-39	85	53	32	8.7	10.1	7.0
40-44	77	32	45	7.8	6.1	9.8
45-49	51	28	23	5.2	5.4	5.0
50-54	29	13	16	3.0	2.5	3.5
55-59	17	9	8	1.7	1.7	1.7
60-64	37	25	12	3.8	4.8	2.6
65-69	10	5	5	1.0	1.0	1.1
70-74	5	2	3	0.5	0.4	0.7
75+	2	1	1	0.2	0.2	0.2
Not Stated	1	1	0	0.1	0.2	0.0

Source: Adapted from Tobin 1954.

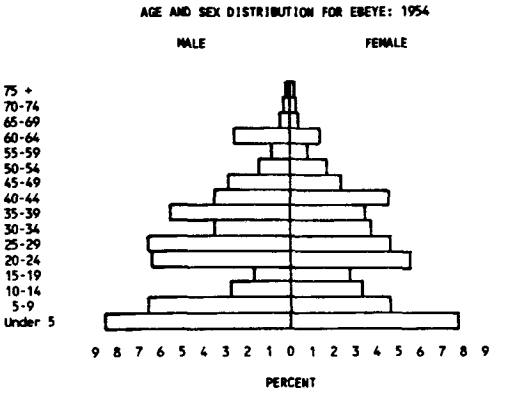


FIGURE 5. **Population pyramid for Ebeye: 1954.**

Several population estimates for the Marshall Islands, Ebeye, and Majuro Atoll were prepared by the U.S. Navy and the U.S. State Department following World War II, in the process of providing annual reports to the United Nations on the administration of the Trust Territory. However, it was not until 1958 that another detailed census of the Marshall Islands was conducted—as part of a census of the Trust Territory organized by the Office of the High Commissioner (Office of the High Commissioner 1959). Only total populations for each administrative subdivision are available from the 1958 census (see U.S. Bureau of the Census 1982a:6). Much of the data necessary for the current study, such as the population of Ebeye and the age and sex composition of the Marshall Islands population by geographic area, unfortunately are absent. But the 1958 census does provide the first systematically collected evidence of population growth throughout the Marshalls following the war. Since the last systematic census of the region in 1935, Marshall Islands population had grown by 39.9 percent, with much of this growth apparently occurring after 1948 (see Table 1).

Another detailed census of the Marshalls was conducted in 1967, the result of a joint effort by the Peace Corps and the University of Hawaii School of Public Health (School of Public Health n.d.; Table 7). Population pyramids constructed from the 1967 data for the entire region, and for the geographic components of present interest, suggest a continuation of relatively high fertility (Figure 6). The population of Ebeye in particular continued to grow rapidly, increasing to over 3.5 times the total recorded by the 1954 census of the islet.

Data from the 1970 census conducted by the U.S. Bureau of the Census indicate that during the late 1960s population growth continued throughout the Marshall Islands, with particularly marked increases in

TABLE 7. **Population by Age for the Marshall Islands as a Whole, Ebeye, Majuro Atoll, and the Remainder of the Marshall Islands: 1967**

	Number				Percentage			
Age	Total	Ebeye	Majuro	Elsewhere in Marshalls	Total	Ebeye	Majuro	Elsewhere in Marshalls
Total	18,578	3,540	5,249	9,789	100.0	100.0	100.0	100.0
<1	734	157	233	344	4.0	4.4	4.4	3.5
1-4	2,649	516	744	1,389	14.3	14.6	14.2	14.2
5-9	2,977	529	780	1,668	16.0	14.9	14.9	17.0
10-14	2,523	484	652	1,387	13.6	13.7	12.4	14.2
15-19	1,959	343	589	1,027	10.5	9.7	11.2	10.5
20-24	1,157	264	332	561	6.2	7.5	6.3	5.7
25-29	766	172	234	360	4.1	4.9	4.5	3.7
30-34	767	150	239	378	4.1	4.2	4.6	3.9
35-39	875	208	275	392	4.7	5.9	5.2	4.0
40-44	601	126	158	317	3.2	3.6	3.0	3.2
45-49	725	134	186	405	3.9	3.8	3.5	4.1
50-54	575	104	160	311	3.1	2.9	3.0	3.2
55-59	414	92	99	223	2.2	2.6	1.9	2.3
60-64	407	49	105	253	2.2	1.4	2.0	2.6
65-69	288	42	64	182	1.6	1.2	1.2	1.9
70-74	198	18	41	139	1.1	0.5	0.8	1.4
75+	351	24	72	255	1.9	0.7	1.4	2.6
Not Stated	288	48	114	126	1.6	1.4	2.2	1.3
Foreign	324	80	172	72	1.7	2.3	3.3	0.7

Source: School of Public Health n.d.

the populations concentrated on Ebeye and Majuro (U.S. Bureau of the Census 1973; Table 8). The 1970 data provide the first evidence that the population of Ebeye had surpassed that of Majuro Atoll and that the populations of these two centers together exceeded the population in the rest of the Marshalls. The demographic structures characterizing the areas were broadly similar, and although half of the inhabitants were in their teens or younger the age distributions for all areas were slightly less skewed toward younger ages than the 1967 distributions (Figure 7).

Because of certain weaknesses in the 1970 census—namely problems in some areas with "misplaced persons" (persons being moved from one island to another during the process of tabulation) and undercounts—another census was conducted in 1973. The problems with the 1970 census do not appear to affect the Marshall Islands data; nevertheless, the 1973 census organized by the High Commissioner's Office in conjunction with the South Pacific Commission covered the entire Trust Terri-

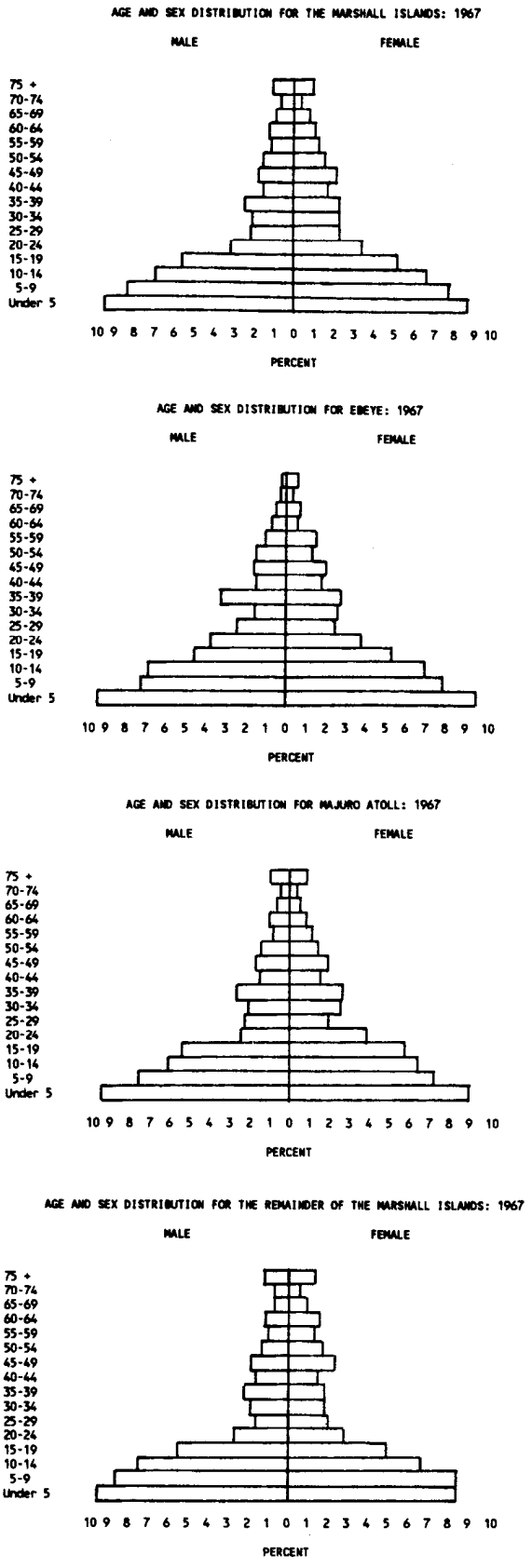


FIGURE 6. **Population pyramids: 1967.**

TABLE 8. **Population by Age for the Marshall Islands as a Whole, Ebeye, Majuro Atoll, and the Remainder of the Marshall Islands: 1970**

	Number				Percentage			
Age	Total	Ebeye	Majuro	Elsewhere in Marshalls	Total	Ebeye	Majuro	Elsewhere in Marshalls
Total	22,888	6,320	5,829	10,739	100.0	100.0	100.0	100.0
<1	1,084	271	263	550	4.7	4.3	4.5	5.1
1-4	3,032	816	773	1,443	13.2	12.9	13.3	13.4
5-9	3,271	867	817	1,587	14.3	13.7	14.0	14.8
10-14	2,833	761	716	1,356	12.4	12.0	12.3	12.6
15-19	2,405	521	705	1,179	10.5	8.2	12.1	11.0
20-24	1,737	482	534	721	7.6	7.6	9.2	6.7
25-29	1,428	497	355	576	6.2	7.9	6.1	5.4
30-34	1,190	430	245	515	5.2	6.8	4.2	4.8
35-39	1,192	405	277	510	5.2	6.4	4.8	4.7
40-44	1,093	362	253	478	4.8	5.7	4.3	4.5
45-49	1,024	337	210	477	4.5	5.3	3.6	4.4
50-54	800	222	214	364	3.5	3.5	3.7	3.4
55-59	662	150	191	321	2.9	2.4	3.3	3.0
60-64	393	94	90	209	1.7	1.5	1.5	1.9
65-69	321	48	103	170	1.4	0.8	1.8	1.6
70-74	177	28	39	110	0.8	0.4	0.7	1.0
75+	246	29	44	173	1.1	0.5	0.8	1.6

Source: U.S. Bureau of the Census 1973.

tory (Office of Census Coordinator 1975). The data collected suggest that the population of the Marshall Islands continued to increase rapidly, particularly on Majuro Atoll, with a slight *decrease* in the population of Ebeye (Table 9). Ebeye apparently continued to experience high fertility—contributing to a demographic structure where nearly half of the population was younger than 14 years old (Figure 8).

The most recent census of the Marshall Islands was conducted in 1980, once again by the U.S. Bureau of the Census (U.S. Bureau of the Census 1982a). The results suggest a continuation of past trends: rapid demographic growth throughout the Marshall Islands, with the populations of Ebeye and Majuro Atoll increasing as well (Table 10). In general, the population structures remained similar to those of earlier censuses, with high fertility apparent throughout the Marshalls and age distributions skewed more heavily toward young ages for all areas (Figure 9).[1]

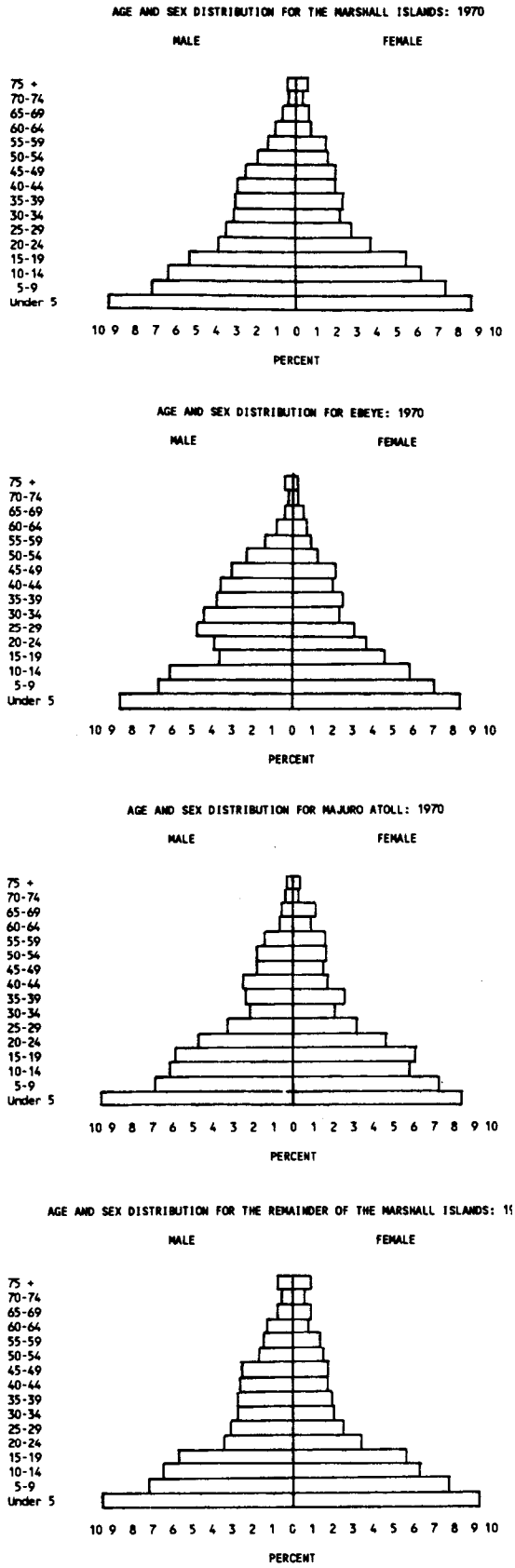


FIGURE 7. **Population pyramids: 1970.**

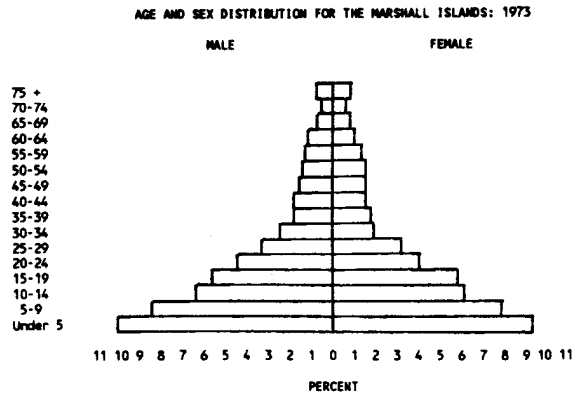
TABLE 9. **Population by Age for the Marshall Islands as a Whole, Ebeye, Majuro Atoll, and the Remainder of the Marshall Islands: 1973**

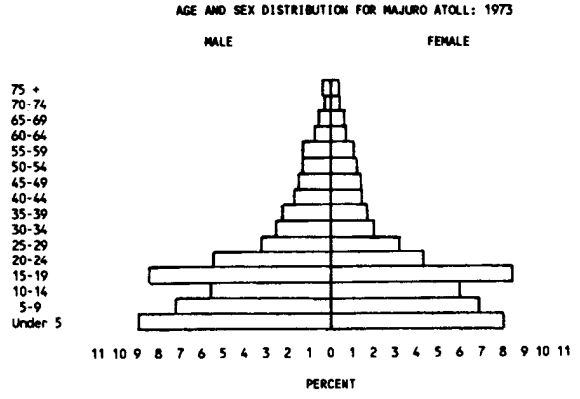
	Number				Percentage			
Age	Total	Ebeye	Majuro	Elsewhere in Marshalls	Total	Ebeye	Majuro	Elsewhere in Marshalls
Total	25,045	5,123	10,290	9,632	100.0	100.0	100.0	100.0
<1	1,067	250	387	430	4.3	4.9	3.8	4.5
1-4	3,743	828	1,360	1,555	14.9	16.2	13.2	16.1
5-9	3,983	849	1,424	1,710	15.9	16.6	13.8	17.8
10-14	3,135	620	1,187	1,328	12.5	12.1	11.5	13.8
15-19	2,835	322	1,743	770	11.3	6.3	16.9	8.0
20-24	2,119	458	973	688	8.5	8.9	9.5	7.1
25-29	1,603	422	645	536	6.4	8.2	6.3	5.6
30-34	1,059	250	433	376	4.2	4.9	4.2	3.9
35-39	929	198	400	331	3.7	3.9	3.9	3.4
40-44	847	208	348	291	3.4	4.1	3.4	3.0
45-49	772	188	318	266	3.1	3.7	3.1	2.8
50-54	741	185	277	279	3.0	3.6	2.7	2.9
55-59	659	124	266	269	2.6	2.4	2.6	2.8
60-64	519	89	178	252	2.1	1.7	1.7	2.6
65-69	358	44	143	171	1.4	0.9	1.4	1.8
70-74	255	45	79	131	1.0	0.9	0.8	1.4
75+	374	37	102	235	1.5	0.7	1.0	2.4
Not Stated	47	6	27	14	0.2	0.1	0.3	0.1

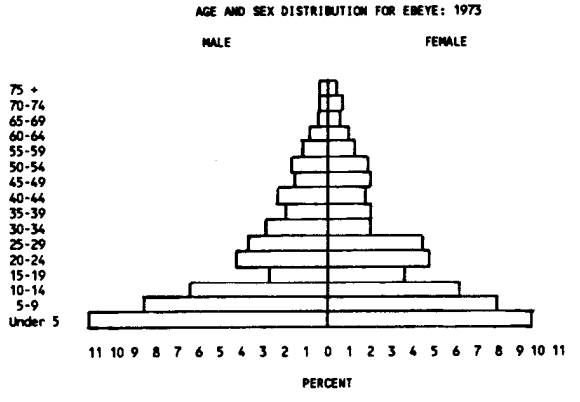
Source: Office of Census Coordinator 1975.

The Causes of Population Change on Ebeye

Two reasons for the increase in Ebeye's population were briefly discussed in the preceding section: high fertility rates and net in-migration. The heavy representation of young persons in the census years following World War II provides evidence of the high fertility rate for the Marshall Islands as a whole. The possible reasons underlying this skewed distribution of age classes include increased births, reduced infant mortality, or some combination of the two. As indicated in Table 11, although the data fluctuate it appears that the latter combination of factors characterized the Marshalls during the 1960s and 1970s. Table 11 also contains basic information on general mortality in the form of the crude death rate. Values of this measure decreased over time—and in conjunction with the changes in crude birth and infant mortality rates led to an expected increase in population, supporting the contention that shortly after World War II births began to exceed deaths in the







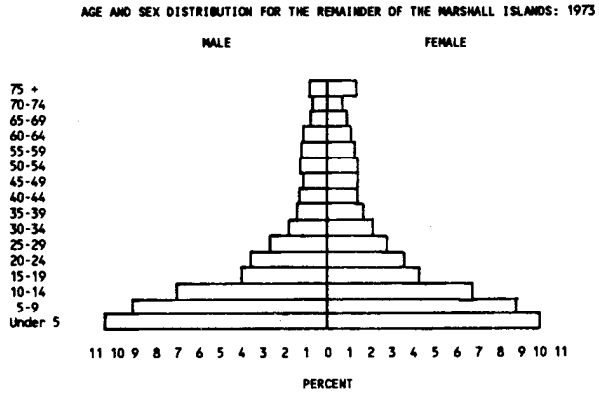


FIGURE 8. **Population pyramids: 1973.**

TABLE 10. **Population by Age for the Marshall Islands as a Whole, Ebeye, Majuro Atoll, and the Remainder of the Marshall Islands: 1980**

	Number				Percentage			
Age	Total	Ebeye	Majuro	Elsewhere in Marshalls	Total	Ebeye	Majuro	Elsewhere in Marshalls
Total	30,873	6,169	11,791	12,913	100.0	100.0	100.0	100.0
<1	1,545	321	520	704	5.0	5.2	4.4	5.5
1-4	4,957	1,019	1,694	2,244	16.1	16.5	14.4	17.4
5-9	5,023	1,021	1,753	2,249	16.3	16.6	14.9	17.4
10-14	4,054	768	1,590	1,696	13.1	12.4	13.5	13.1
15-19	2,956	527	1,329	1,100	9.6	8.5	11.3	8.5
20-24	2,601	511	1,039	1,051	8.4	8.3	8.8	8.1
25-29	2,225	454	874	897	7.2	7.4	7.4	6.9
30-34	1,779	395	708	676	5.8	6.4	6.0	5.2
35-39	1,136	275	464	397	3.7	4.5	3.9	3.1
40-44	819	158	365	296	2.7	2.6	3.1	2.3
45-49	809	175	321	313	2.6	2.8	2.7	2.4
50-54	699	169	285	245	2.3	2.7	2.4	1.9
55-59	664	138	256	270	2.2	2.2	2.2	2.1
60-64	642	112	241	289	2.1	1.8	2.0	2.2
65-69	423	68	165	190	1.4	1.1	1.4	1.5
70-74	244	28	101	115	0.8	0.5	0.9	0.9
75+	297	30	86	181	1.0	0.5	0.7	1.4

Source: U.S. Bureau of the Census 1982b.

Marshall Islands (U.S. Department of the Navy 1947) as well as the Trust Territory as a whole (Taueber 1961:231-232). The mortality characteristics for the Marshall Islands also can be broken into their age-specific components for certain years, though we average these measures for four census years to compensate for small values in some age groups (Table 12). None of the age-specific mortality rates appear to be excessively high for the region, with postchildhood mortality remaining in relative check until ages 55-59.

Unfortunately, the data needed to conduct detailed comparisons of fertility for Ebeye, Majuro Atoll, and the remainder of the Marshall Islands across several years are not available. We can, however, make such a comparison for the years 1973 and 1980. Table 13 provides information on the number of children ever born, surviving, and born in the preceding year for the areas of interest during 1973 (with Majuro defined only for the Djarrit-Uliga-Dalap [D.U.D.] Municipality, the

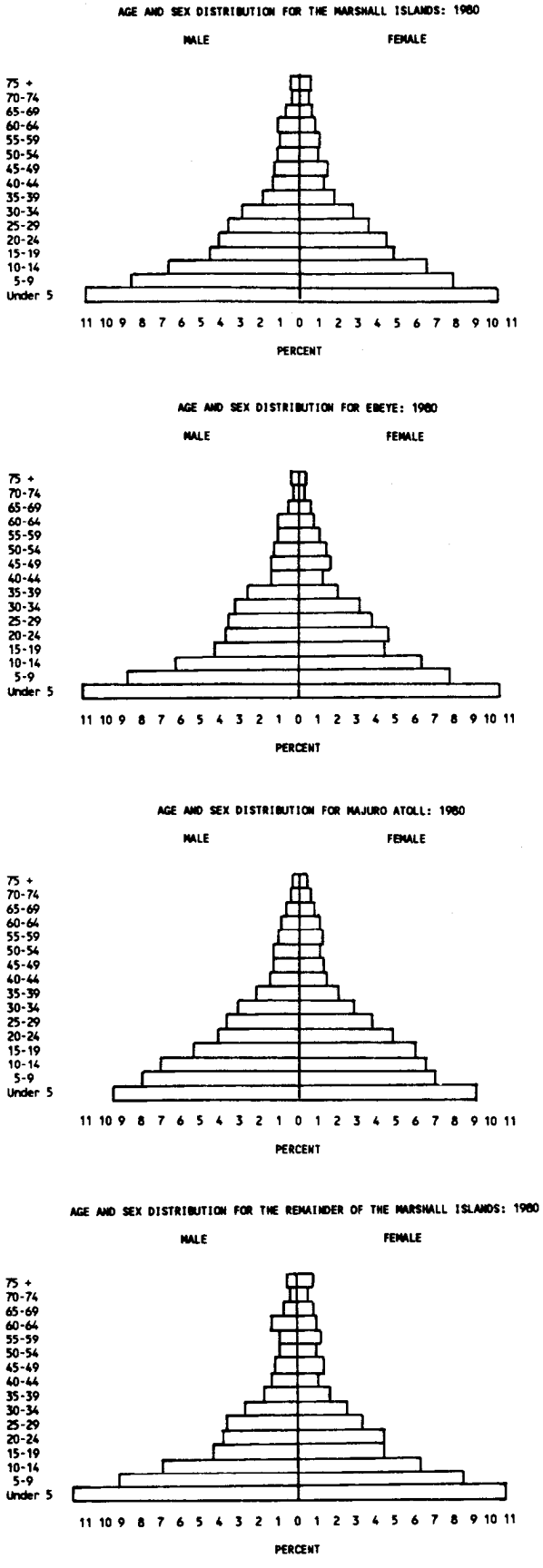


FIGURE 9. **Population pyramids: 1980.**

TABLE 11. **Crude Birth Rate, Death Rate, and Infant Mortality Rate for the Marshall Islands: 1963-1979**

Year	Crude Birth Rate	Crude Death Rate	Infant Mortality Rate
1963	35.8	6.7	65.9
1964	35.0	5.3	37.6
1965	38.3	6.3	34.7
1966	43.0	5.2	20.4
1967	41.0	6.4	27.1
1968	41.6	7.6	36.7
1969	42.3	6.0	22.0
1970	41.2	6.1	24.2
1971	39.4	4.3	34.4
1972	38.0	3.1	25.4
1973	42.6	6.4	27.3
1974	45.8	5.5	15.8
1975	43.3	5.0	33.4
1976	41.5	3.9	17.4
1977	41.4	6.1	44.6
1978	16.4	2.9	55.8
1979	35.2	3.0	24.7

Source: U.S. Dept. of State 1981.

Note: Infant mortality rate for 1973 refers to deaths per 1,000 infants less than 1 year of age; the remainder of infant mortality rates refer to deaths per 1,000 live births and thus are not strictly comparable with the 1973 figure (the latter being excessively low).

TABLE 12. **Age-specific Death Rates, Marshall Islands: Averaged for 1967, 1970, 1973, and 1980**

Age	Mortality Rate	Age	Mortality Rate
Total	4.7	35-39	1.7
<1	24.6	40-44	3.9
1-4	2.2	45-49	6.0
5-9	0.5	50-54	8.2
10-14	0.8	55-59	14.2
15-19	1.2	60-64	14.3
20-24	1.1	65-69	18.0
25-29	0.7	70-74	36.6
30-34	2.7	75+	60.7

TABLE 13. **Children Ever Born, Surviving, and Born in Last Year for Ebeye, Majuro Atoll, and the Remainder of the Marshall Islands: 1973**

Age	Females	Children Born in Preceding Year	Age-specific Fertility Rate	Children Ever Born (CEB)	Children Still Alive (CSA)	CEB Per Female	CSA Per Female	% Alive of CEB
Ebeye								
Total	1,009	251	7,894.5	4,010	3,514	4.0	3.5	87.6
15-19	173	21	121.4	64	61	0.4	0.4	95.3
20-24	239	71	297.1	370	332	1.5	1.4	89.7
25-29	221	85	384.6	893	786	4.0	3.6	88.0
30-34	97	37	381.4	557	505	5.7	5.2	90.7
35-39	97	26	268.0	786	689	8.1	7.1	87.7
40-44	87	11	126.4	664	561	7.6	6.4	84.5
45-49	95	0	0.0	676	580	7.1	6.1	85.8
Majuro (D.U.D. Municipality)								
Total	1,739	324	5,928.9	5,194	4,588	3.0	2.6	88.3
15-19	542	57	105.2	126	113	0.2	0.2	89.7
20-24	364	113	310.4	575	527	1.6	1.4	91.7
25-29	266	87	327.1	894	810	3.4	3.0	90.6
30-34	164	31	189.0	865	787	5.3	4.8	91.0
35-39	145	29	200.0	1,056	922	7.3	6.4	87.3
40-44	130	5	38.5	841	724	6.5	5.6	86.1
45-49	128	2	15.6	837	705	6.5	5.5	84.2
Remainder of Marshall Islands								
Total	2,148	485	7,832.9	7,557	6,649	3.5	3.1	88.0
15-19	705	83	117.7	222	203	0.3	0.3	91.4
20-24	398	145	364.3	738	668	1.9	1.7	90.5
25-29	309	119	385.1	1,291	1,164	4.2	3.8	90.2
30-34	206	63	305.8	1,247	1,115	6.1	5.4	89.4
35-39	206	52	252.4	1,553	1,366	7.5	6.6	88.0
40-44	164	17	103.7	1,347	1,186	8.2	7.2	88.0
45-49	160	6	37.5	1,159	947	7.2	5.9	81.7

Source: Office of Census Coordinator 1975.

area at the eastern end of the atoll containing most of its population). These data support the notion of continued high fertility throughout the Marshalls, with most values greater for Ebeye than for the other areas examined in this study. Fertility in general remained high in 1980, the values of some of the measures decreasing, and some increasing (Table 14). One point worth noting about these fertility measures is that values

TABLE 14. **Children Ever Born, Surviving, and Born in Last Year for Ebeye, Majuro Atoll, and the Remainder of the Marshall Islands: 1980**

Age	Females	Children Born in Preceding Year	Age-specific Fertility Rate	Children Ever Born (CEB)	Children still Alive (CSA)	CEB Per Female	CSA Per Female	% Alive of CEB
Ebeye								
Total	1,256	311	7,640.4	4,228	3,882	3.4	3.1	91.8
15-19	270	33	122.2	90	84	0.3	0.3	93.3
20-24	282	104	368.8	488	461	1.7	1.6	94.5
25-29	232	77	331.9	749	702	3.2	3.0	93.7
30-34	192	54	281.3	974	902	5.1	4.7	92.6
35-39	115	30	260.9	745	678	6.5	5.9	91.0
40-44	74	8	108.1	498	446	6.7	6.0	89.6
45-49	91	5	54.9	684	609	7.5	6.7	89.0
Majuro Atoll								
Total	2,556	430	5,908.7	7,437	6,859	2.9	2.7	92.2
15-19	692	43	62.1	186	180	0.3	0.3	96.8
20-24	547	129	235.8	816	768	1.5	1.4	94.1
25-29	430	98	227.9	1,319	1,206	3.1	2.8	91.4
30-34	339	77	227.1	1,571	1,465	4.6	4.3	93.3
35-39	217	50	230.4	1,366	1,283	6.3	5.9	93.9
40-44	175	19	108.6	1,125	1,015	6.4	5.8	90.2
45-49	156	14	89.7	1,054	942	6.8	6.0	89.4
Remainder of Marshall Islands								
Total	2,331	588	7,959.2	8,437	7,732	3.6	3.3	91.6
15-19	560	72	128.6	286	264	0.5	0.5	92.3
20-24	549	185	337.0	1,242	1,139	2.3	2.1	91.7
25-29	421	149	353.9	1,681	1,566	4.0	3.7	93.2
30-34	318	105	330.2	1,798	1,672	5.7	5.3	93.0
35-39	196	51	260.2	1,346	1,213	6.9	6.2	90.1
40-44	134	13	97.0	964	881	7.2	6.6	91.4
45-49	153	13	85.0	1,120	997	7.3	6.5	89.0

Source: U.S. Bureau of the Census 1982b.

for Ebeye are not excessive by Marshall Islands standards. As was observed in terms of population structure for these areas in the census years 1967 to 1980, although measures of Ebeye's demographic characteristics may vary slightly when compared to analogous values for Majuro and the remainder of the Marshall Islands, they do not indicate an entirely different demographic setting.

The reasons underlying recent trends in fertility and mortality in the Marshall Islands quite probably include a number of factors: less morbidity due to previously debilitating illnesses, particularly respiratory and venereal diseases (the latter often a cause of high infant mortality); the availability of better medicine and medical facilities; and education on health-related matters (Tobin 1967:61). It is unclear if current high fertility is also a consequence of changing cultural attitudes toward limiting population. Abortion and infanticide have been proposed as mechanisms for population control used in the past by some Micronesian cultures, including the Marshallese (Erdland 1914:124-127; Kramer and Nevermann 1938: 190; Kotzebue 1967, 3:173). However, at least for certain portions of the Marshall Islands, these and other cultural mechanisms appear to have been absent during aboriginal times—the effects of food shortages and typhoons instead acting as the main forces limiting population (Hainline 1965; Tobin 1967:61-63). Whatever the traditional methods might have been, particular types of cultural behavior do not serve to curb Marshallese demographic growth appreciably in modern times.

In-migration has been suggested as a second factor—indeed, possibly the main factor—underlying the excessive population growth on Ebeye. As with fertility and mortality, it is difficult to obtain detailed data on mobility throughout the time period being considered. However, by employing slightly different means of defining mobility we can conduct a rough comparison for 1930, 1954, 1973, and 1980 (Table 15). Although the sample for 1930 is small, the data clearly indicate that most of the individuals residing on Ebeye originated either on the islet itself or nearby. Largely the opposite is true for the 1954 and 1973 data, when many of the inhabitants of Ebeye claimed home areas elsewhere. Data for 1980 are not strictly comparable to the three earlier years; the census question asked residence in 1975. Nevertheless, they do indicate a reduction in mobility, with the great majority of individuals living on Ebeye in 1980 having lived there five years earlier.

There are several possible explanations for the heavy migration to Ebeye following World War II. For a number of years the opportunity for employment at the Kwajalein military installation has been suggested as the main reason underlying the movement of Micronesians to Ebeye. The relationship between jobs and in-migration is not entirely clear, however. Micronesian employment at the installation has varied over time, but the resident labor force on Ebeye has always been much larger than the number of jobs available (see Table 16). Ultimately more elusive cognitive factors, such as the *anticipation* of employment due to

TABLE 15. **Home Areas of Individuals Living on Ebeye: Select Years**

Home Area[a]	1930			1954			1973[b]			1980		
	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female
Total	19	8	11	981	523	458	5,342	2,771	2,571	4,518[c]	NA	NA
Summary												
Ebeye/Kwaj. Atoll	17	8	9	257	128	129	1,576	815	761	4,291	NA	NA
Elsewhere in Marshalls	2	0	2	718	393	325	3,452	1,784	1,668	186	NA	NA
Outside of Marshalls	0	0	0	6	2	4	314	172	142	41	NA	NA
By Island Group												
Kosrae	0	0	0	0	0	0	0	0	0	5	NA	NA
Marianas	0	0	0	0	0	0	2	1	1	0	0	0
Marshalls	19	8	11	975	521	454	5,028	2,599	2,429	4,477	NA	NA
Palau	0	0	0	0	0	0	7	5	2	5	NA	NA
Ponape	0	0	0	1	1	0	219	112	107	3	NA	NA
Truk	0	0	0	1	0	1	2	2	0	0	0	0
Yap	0	0	0	0	0	0	0	0	0	0	0	0
Outside TTPI	0	0	0	4	1	3	84	52	32	26	NA	NA
Not Stated	0	0	0	0	0	0	0	0	0	2	NA	NA

NA = not available; TTPI = Trust Territory of the Pacific Islands.

Sources: Japan 1931; Tobin 1954; Office of Census Coordinator 1975; U.S. Bureau of the Census 1982b.

[a]Definitions of home area: 1930: Place of origin (where "registered") 1973: Home area
1954: Home atoll 1980: Residence five years earlier

[b]Data are for population of Kwajalein Municipality as a whole, 95.9% of which resided at Ebeye.

[C]Includes only those individuals five years old or older.

TABLE 16. **Number of Micronesian Employees at Kwajalein Military Facility: Select Years**

Year	Total	Males	Females
1954	226	159	67
1955	226	159	67
1956	219	188	31
1957	107	106	1
1958	219	182	37
1959	108	108	0
1960	155	155	0
1961	174	162	12
1962	174	162	12
1963	710	410	300
1964	670	380	290
1965	670	380	290
1966	560	523	37
1967	500	463	37
1968	781	613	168
1969	692	526	166
1970	579	440	139
1971	577	447	130
1972	577	NA	NA
1973	578	NA	NA
1974	679	543	136
1975	539	444	95
1976	650	NA	NA
1977	686	NA	NA
1978	NA	NA	NA
1979	658	NA	NA

NA = not available.

Source: U.S. Department of State 1981.

increased activity at the installation, may underlie job-related migration to Ebeye. The limited data available support this tenuous conclusion. Activity at the Kwajalein military installation appears to have been high through the late 1960s and early 1970s, as is suggested by a nonindigenous staff of nearly 4,000 persons in 1970, reaching a maximum in 1972 of approximately 6,000 (U.S. Bureau of the Census 1973:11; Office of Economic Adjustment 1984:45). Corresponding to the high levels of installation staffing during the late 1960s, Ebeye's population increased at an average annual rate of 21.3 percent. Similarly, although the decrease in Ebeye's population between 1970 and

1973 *may* be a product of problems with the 1970 census, it may also indicate out-migration in response to the roughly 50 percent reduction in personnel at the military installation between 1972 and 1975 (Office of Economic Adjustment 1984:45). The apparent link between activity at the installation and in-migration to Ebeye has important implications for the near future, as the nonindigenous staff on Kwajalein is expected to grow substantially between 1988 and 1990 to support research and development activities connected with the Strategic Defense Initiative (Johnson 1988).

Other possible factors affecting in-migration include the designation in 1965 of the central portion of Kwajalein Atoll as a target for missiles launched from California (Office of Economic Adjustment 1984:48). As a result, approximately 350 persons living in the mid-atoll target area relocated to Ebeye. Moreover, several other individuals who had traditional land rights in the central atoll also moved to Ebeye during this time. An amendment to the U.S. Fair Labor Practices Act in 1968, guaranteeing U.S. minimum wage to all Micronesian employees at the Kwajalein military installation, also led to a burst of migration to Ebeye (Office of Economic Adjustment 1984:48). In addition to jobs on the military installation, as the population of Ebeye has grown additional employment opportunities on the islet itself have emerged (largely in the service sector), which also may have attracted people to the area. Finally, probably the most important consistent attraction to Ebeye over the last several decades is the availability of various amenities of modern Western culture. The allure of such amenities was confirmed recently by inhabitants of Ebeye (Alexander 1978:63-64; Alexander 1984: 18), as it has long been expressed by people from other portions of the Marshalls (e.g., Richards 1947:528).

Cultural and Ecological Consequences of the Demographic Growth on Ebeye

Whatever the causes of demographic change on Ebeye, at the time of the last census in 1980 its population density exceeded 50,000 persons per square mile. To help better understand the ramifications of such density, we briefly examine select aspects of Marshallese cultural ecology. Unfortunately, detailed knowledge of traditional Marshallese adaptive strategies before colonial times is limited. Many of the following statements on adaptation and associated cultural institutions are based ultimately upon the observations made by Kotzebue in the early nineteenth century (1967, 3:140-180), when the area was culturally

pristine (Hezel 1983:92); and upon the tendency of native culture to survive acculturation in some form, both in the Marshall Islands and throughout Oceania (Valentine 1970).

An understanding of Marshall Islands cultural ecology must begin with an appreciation for the constraints on human adaptation inherent in the coralline atoll environment (see Wiens 1962). In general, atolls provide a small amount of land amidst vast expanses of ocean. Soil on atolls tends to be only slightly altered from limestone deposits, covered with a thin layer of humus and ranging in texture from coarse rubble to sand and silt (U.S. Army 1956:20). Surface water is scarce on atolls, as rain quickly seeps through the porous soil to collect in underground lenses. Rainfall can vary in different areas, with precipitation in the Marshall Islands becoming increasingly scanty and unpredictable toward the north (see Environmental Sciences Services Administration 1968:385-388; National Oceanographic and Atmospheric Administration 1981:348-350; National Oceanic and Atmospheric Administration n.d.). This general absence of fertile soil, in conjunction with other environmental problems such as inadequate fresh water and excessive salt spray, limits the density and kinds of plant life that atolls can support (Fosberg 1949, 1953; Mason 1968:277-279). Traditional subsistence strategies of atoll dwellers, including the Marshall Islanders, allowed for such limitations; food grown on the atoll was usually supplemented heavily by several types of food collected from the sea (Kotzebue 1967, 3:149-159; Bryan 1972: 125-134; see also Bayliss-Smith 1974).

The Marshallese sociocultural system seems to have evolved at least partially in response to this scarcity of land resources, with the indigenous social, economic, and political system ultimately based upon control of the land itself (Tobin 1958). This region apparently was organized in a series of chiefdoms before German colonization, with one or more chiefs inhabiting each atoll. These chiefdoms, in turn, were divided into a series of exogamous matrilineal clans (*jowi* in the Ralik chain), each composed of a number of lineages (the term *bwij* was most often used). The *bwij* were the building blocks of the sociocultural system. They provided the primary means for tracing one's identity. More importantly for ecological concerns, the lineages also formed the framework of land tenure—in essence land rights—with a piece of land owned by a particular matrilineage and used by its members. Geographically, land was divided into a series of plots called *watos.* Each *wato* usually comprised a strip running across an islet from the ocean to the lagoon (thus encompassing all microenvironments), and was inhab-

ited by a nuclear or extended family (Alexander 1978:18-20). Administration and authority ultimately were based upon allocating rights to these plots, the determination of access to land usually passing from a lineage head *(alab)* through a subchief to, ultimately, the paramount chief himself (Tobin 1967: 100-101).

In the face of ever-present threats of food shortage due to droughts and typhoons (Knudson 1970; see also Wiens 1962:476-478), the rights to land and the food grown upon it achieved an importance among the Marshallese that has been called "almost sacred" (Tobin 1967:72-74). The basic structure of the land tenure system persists today, on Ebeye (L. E. Mason, pers. com., 1988) and throughout the Marshall Islands (Mason 1987). In addition to providing a basis for access to land in outlying atolls, land tenure rights also serve as a basis for the distribution of rent payments received by the Marshallese from the U.S. Department of Defense for the use of sections of Kwajalein Atoll. And yet in many ways the demographic situation on Ebeye has begun to undermine key facets of Marshallese culture—including the land tenure system. These changes may be traced from the most basic components of Marshallese society to components that concern only the social elite (see Alexander 1978:82-84). We can begin at the household, a social unit traditionally defined by those who had residential access to a *wato.* This definition no longer holds for Ebeye, as most residents on the islet have no rights to the land upon which they reside. Local authority, previously in the hands of the *alab,* also has eroded. This change appears to be due at least in part to the reduction in *alab* authority over allocating rights to local plots of land. One direct consequence of such cultural changes on Ebeye is that the traditional unit of political organization, the village council, no longer consists entirely of *alabs.* In terms of secondary consequences, deterioration of authority at its very foundation ultimately affects the entire social hierarchy; even the paramount chief, who in modern times controls little of the economy, has limited authority and receives limited respect on the islet (Alexander 1978:78-79). Thus cultural mechanisms originally based upon the matrilineage and rights to a scarce resource are frequently overridden by other concerns on Ebeye—concerns often rooted in the money economy that has come to dominate the islet.

If increasing population on Ebeye has led to difficulties in integrating its inhabitants through mechanisms prescribed by Marshallese culture, it has created an even greater practical challenge in terms of subsistence. Regrettably we have no reliable data on the population of Ebeye, or any portion of the Marshall Islands, prior to their colonization by

Germany in the nineteenth century, Data from the Japanese censuses of 1930 and 1935 place the population of Ebeye at less than twenty persons —a number that in all likelihood could have been supported even during lean times. This in no way is true for the current population of the islet, estimated conservatively to exceed 8,000 people. The calculation of carrying capacity for Ebeye in the absence of empirically documented land-use patterns requires a number of major assumptions that at best would be open to challenge (see Wiens 1962:459). But through taking a different approach and assuming minimal energy requirements for the islet's inhabitants, we can estimate the amount of food that would be required to support the population on Ebeye both in the past and in the present—and provide an appreciation for the amount by which the islet has exceeded its demographic bounds.

In examining the energetics of Ebeye we follow the lead of Bayliss-Smith (1975:296), who concluded that atoll populations with medium birth and death rates would contain populations with average per capita daily requirements of 1,800 kilocalories (kcals) (see also United Nations Food and Agriculture Organization 1957). In the absence of evidence on early native agricultural practices on Ebeye, we shall assume that the environment of the islet would have led to an emphasis on coconuts and pandanus (see Wiens 1962:365-366; Knudson 1970:56-61). Seafood is assumed to have provided another key source of subsistence. The caloric content of each of these food sources can vary greatly —the first two depending on the form in which they are consumed and the latter on the species of seafood concerned. Although coconut palms yield edible nuts that change in nutritional value as they ripen, for the following calculations we focus upon the meat of mature nuts, yielding the greatest number of calories per unit of weight (4.21 kcals / gram) (Murai et al. 1958:52). The energy provided by pandanus likewise has been reported to vary, and once again we have selected the highest values (0.71 kcals / gram) for our calculations (Murai et al. 1958:76). For seafood we use here a value representative of several varieties of fishes and mollusks (1.10 kcals / gram). These three foods would likely have been the major sources of subsistence on an islet setting like Ebeye (see Murai et al. 1958:58-59, 79)—though under normal conditions they would have been eaten in some combination with one another, as well as with small amounts of other foods. In the absence of data on diet composition, our estimates of subsistence requirements treat each of the foods considered as if it were the only type available (Table 17). Even allowing for the combination of the different food types detracts little from the impact of subsistence requirements for the conservatively esti-

TABLE 17. **Estimated Amounts of Food Required to Sustain the Population of Ebeye at Minimal Energy Levels**[a]

	Requirements for 20 Persons (kg)		Requirements for 8,000 Persons (kg)	
Food Source	Daily	Annual	Daily	Annual
Coconut (mature)	9	3,121	3,420	1,248,456
Pandanus	51	18,507	20,282	7,402,817
Seafood	33	11,945	13,091	4,778,182

[a]1,800 kcals per day per person (Bayliss-Smith 1975:296).

mated present population of 8,000, when at the least more than three metric tons of food would be required daily.

Obviously the population of Ebeye survives through the purchase of imported food; it has no choice. Our calculations are not meant to challenge this fact, but rather to highlight the degree to which the islet's population has outgrown the bounds that would be placed upon it by traditional subsistence—and the impossibility of sustaining such a large number of people without substantial outside assistance. In the majority of complex societies, population centers tend to be maintained in part by their hinterlands through a regional system of settlement. In most basic terms, surrounding communities help to support the concentrations of population by providing subsistence goods, with the idealized regional patterning of this process in terrestrial settings resembling a hierarchical Central Place system (Losch 1954; Christaller 1966). Although tribute extraction by political elites has long been a part of Marshallese culture (Mason 1946:27-37; Kotzebue 1967, 3:170-171), a systematic regional means of supporting large concentrations of nonproducers of food is evident neither in the past nor the present. Moreover, heavy in-migration by individuals of working age to population centers such as Ebeye has modified the demographic structure of outlying areas —further reducing not only the potential to increase hinterland production, but also the ability of those outlying areas to sustain themselves (see Gorenflo and Levin 1989).

Conclusion

In the preceding pages, we have documented a particularly dramatic case of demographic change: the growth of population on Ebeye. The

number of people residing on this small islet in Kwajalein Atoll has increased from fewer than twenty inhabitants in 1930 to more than 6,000 in 1980, with current estimates exceeding 8,000. Although the population on Ebeye has grown rapidly, many characteristics of its demographic structure have remained similar to those of Majuro Atoll, the other main concentration of population in the Marshall Islands, as well as to those of the remainder of the Marshalls. Population has grown throughout the region since World War II due to a combination of increased fertility and survivability. In addition, Ebeye has experienced extremely high rates of in-migration, as Marshallese (mostly) have moved to the islet from other areas for a number of reasons: in search of employment at the nearby Kwajalein military installation; to find a place of residence after being forced to relocate from elsewhere; and to obtain access to various amenities of modern Western culture such as processed food, medical technology, and modern housing and facilities.

Two characteristics of the population of Ebeye make it particularly noteworthy: it has reached a density in excess of that found in most urban centers; and it has achieved this density without the support of a surrounding hinterland. The resulting demographic situation on Ebeye has generated a number of problems. In terms of practical considerations, this extremely dense concentration of people far exceeds the limits of self-support as well as broader regional support. Moreover, the concentration of population on Ebeye has produced major challenges to the maintenance of traditional Marshallese culture. Although these challenges in great part are linked to the exposure of relatively large numbers of Marshall Islanders to modern Western culture, they also are linked to the declining role of traditional land-tenure mechanisms, and the related authority structure upon which so much of the society was built.

History is replete with instances where a particularly large center dominates a region (Berry 1961). Examples of demographic change similar to that described for the Marshall Islands and Ebeye may even be found in Micronesia; the Gilbert Islands, for instance, also have experienced general population growth since World War II, with much of their population concentrated at Tarawa (Lundsgaarde 1966). But Ebeye is a particularly extreme case, both in the population density it has reached and in its lack of regional support. In the final analysis, places like Ebeye can exist solely through external support, such as that currently provided by the United States government. If the external support disappears, so too must the densely concentrated population.

NOTES

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1. The final draft of this essay was submitted before results were available of the November 1988 census of the Republic of the Marshall Islands. We have since examined the preliminary results of this census (Republic of the Marshall Islands 1988; *see* Gorenflo and Levin 1989). Available data indicate continued rapid growth in Marshall Islands population, the total of 43,335 persons resulting from an average annual increase of 4.3 percent between 1980 and 1988. Concentration of population also continued: Ebeye grew to 9,254 persons, or 21.4 percent of the total population of the Marshalls (essentially the same as in 1980); Majuro Atoll contained 19,695 persons, or 45.5 percent of the total for the region.

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