THE EVOLUTION OF REGIONAL DEMOGRAPHY IN THE MARSHALL ISLANDS

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Over the past 180 years, the Marshall Islands have experienced several dramatic changes as a consequence of interaction with other, more technologically advanced societies. The following essay examines one of the most important of these changes-the evolution of regional demography. Two aspects of Marshall Islands demography are emphasized here: change in the total population and change in the geographical arrangement of population, First, interaction with non-Micronesian societies and the demographic impacts of this interaction are briefly summarized. The evolving geographic distribution of population in the Marshalls is then documented, focusing on ten censuses conducted during the twentieth century and exploring the shifts in fertility, mortality, and migration that led to these changes. Finally, demographic trends are examined in terms of regional cultural ecology—revealing a decreasing correspondence between population and productivity potential coupled with a lack of systematic patterning in the regional arrangement of population-pointing up fundamental adaptive and economic challenges facing this emerging island nation.

Introduction

Of the many changes that occurred throughout Micronesia during 450 years of contact with people from outside Oceania, few have had a greater impact on native culture and society than demographic change.

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The nature of this population change has differed during the course of the interaction. Due largely to diseases introduced by Westerners, early impacts tended to take the form of depopulation. Between the sixteenth and late nineteenth centuries, the populations of several places were decimated--particularly those islands that experienced the greatest contact with missionaries, explorers, whalers, and traders (Yanaihara 1940:40-45; Hezel and Berg 1979: 196-197; Hezel 1983: 141-149). More recently, population throughout most of Micronesia has increased, primarily due to the introduction of modern medical technology and health care during the present century. Although this resurgence usually began slowly, in many island groups the rates of demographic growth increased over time to yield populations much larger than any previously known (see Gorenflo and Levin 1991, 1992; Gorenflo 1993a, 1993b).

This essay examines one of the most dramatic cases of demographic change in Micronesia during the twentieth century--population growth in the Marshall Islands. With about 10,000 Pacific Islanders in residence as recently as 1935, by 1988 this small group of coralline islands and atolls contained more than 43,000 persons. Two changes in the demography of the Marshalls are particularly noteworthy: *population growth* throughout the area as a whole, and shifts in the *geographic distribution* of population. In the pages below, we examine the evolving demography as recorded by the ten censuses of the region (between 1920 and 1988), thus drawing upon the only reliable demographic data available for all component island units. To help understand the processes underlying change in regional demography, we examine the age structure of the populations involved, as well as supplemental data on fertility, mortality, and mobility when available. In addition, we explore ecological aspects of regional demographic change--both in terms of the correspondence between population distribution and the productivity potential of the natural environment and in terms of the evolving geographical arrangement of population over time--providing insights on the adaptive and economic challenges facing this small island nation.

A Brief Overview of Contact with Non-Micronesians

The Marshall Islands consist of twenty-nine atolls and five coral islands located between 5° and 15° north latitude, and between 161º and 173° east longitude, in the central Pacific Ocean (Bryan 1971). The Marshalls lie in two chains that run north-northwest to south-southeast: the

western Ralik or "sunset" chain, and the eastern Ratak or "sunrise" chain (Figure 1). Although colonized by migrants from the New Hebrides area as early as 3,000 years ago (Hezel 1983:3; Dye 1987:9), the Marshall Islands were unknown outside Oceania until the arrival of Spanish explorers in the early sixteenth century (Bryan 1972:173). During the 450 years that followed these initial sightings, the amount of contact between the Marshalls and more technologically advanced societies ranged from periods of complete isolation to those of extremely active colonization. Because interaction with societies from outside

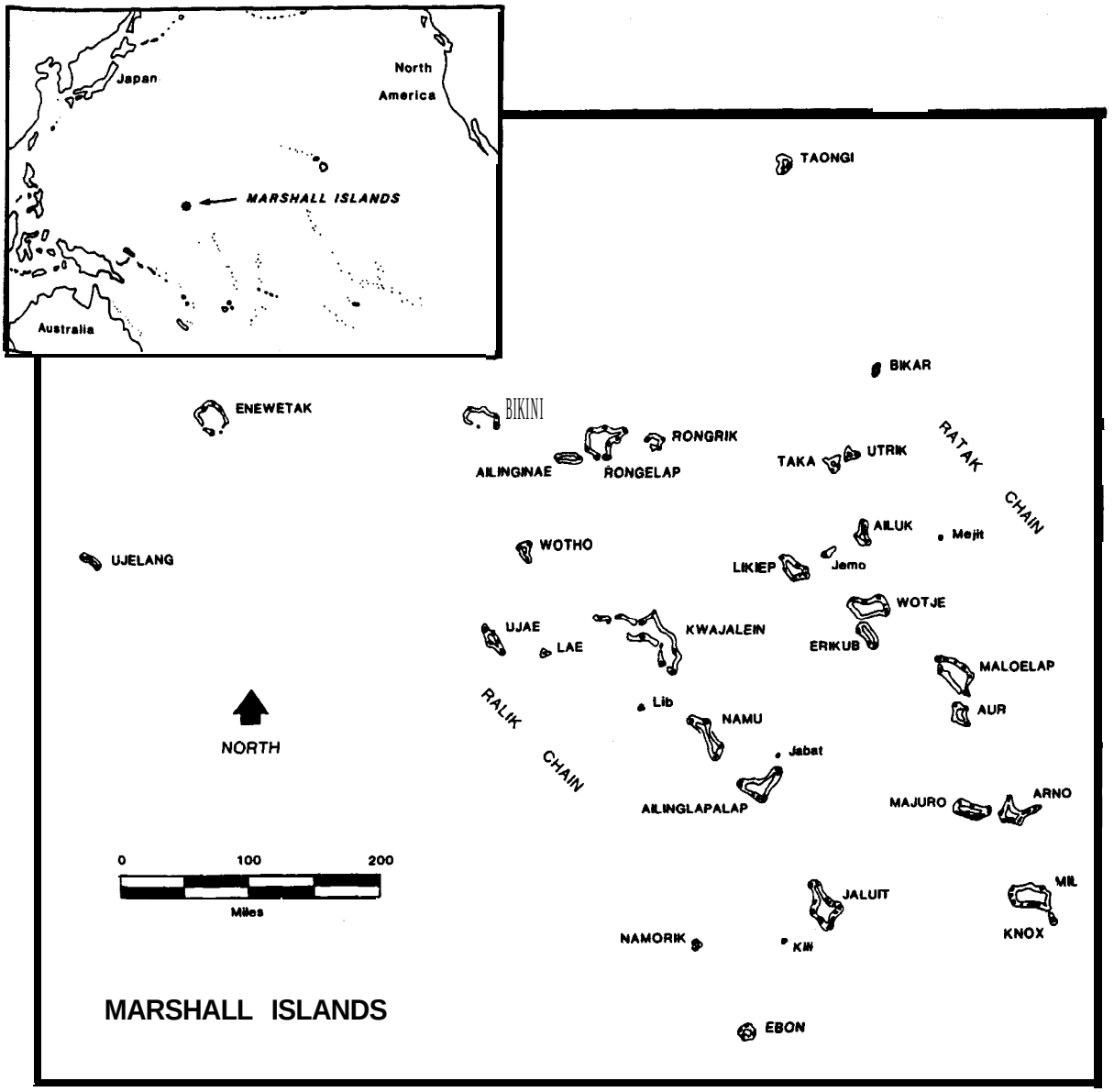


Figure 1. The Marshall Islands.

Oceania often coincided with major population change in the Marshall Islands, we briefly summarize the history of this contact before turning to examine available demographic data.

Despite sightings and visits by Spanish ships as early as the 1520s, the Marshall Islands attracted little attention from the then rapidly expanding Spanish empire (Bryan 1972: 173-177; Hezel 1983: 13-35). Following a few brief visits by Spanish explorers during the mid-1560s, Europeans apparently forgot about the Marshalls. More than 200 years would pass before the reestablishment of Western contact with the Marshall Islands--through their rediscovery by a series of English naval and commercial expeditions beginning in the 1760s (Bryan 1972:177-178). Interaction between the Marshalls and outsiders was limited and sporadic throughout the eighteenth and early nineteenth centuries, mostly consisting of brief visits by English and American vessels in search of food and fresh water. A pair of Russian naval expeditions led by Kotzebue during the early nineteenth century were the first to explore any of the Marshall Islands systematically, visiting several places in the Ratak chain in 1817 and again in 1824-1825 (see Kotzebue 1967, 3: 140-180). The islands encountered by Kotzebue were virtually untouched by outsiders, save a few encounters with residents from other Micronesian island groups whose canoes occasionally washed up on Marshallese shores (Hezel 1983:92, 102-103).

Shortly after Kotzebue's second visit, the Marshall Islanders developed a reputation for fierceness towards outsiders, attacking several ships between the mid-1820s and the early 1850s (Hezel 1983: 197-200). This reputation led most Western ships to avoid the Marshalls for several decades, excepting some whalers wishing to recuperate while on long ocean hunts (Dye 1987: 11). Interaction between Euroamericans and Marshallese did not change markedly until missionary activities began in the area, with initial visits in 1852 eventually leading to the establishment of a Christian mission on Ebon Atoll five years later (Office of the Chief of Naval Operations 1943: 15; Hezel 1983:201-202). Eventually, the Marshallese became less hostile to outsiders and interaction with whalers and traders increased beginning in the 1850s.

Throughout these first centuries of sporadic contact, visitors to the Marshall Islands recorded little information on demography, with the exception of population estimates for certain places during the early and mid-nineteenth century (see Kramer and Nevermann 1938: 172-174). Population levels received careful attention from the natives themselves, and most Marshallese families practiced infanticide after the birth of a third child (Kotzebue 1967, 3:173; Pollock 1975:257-258).

Warfare also served to reduce population, the few conflicts with people from other island groups such as Kiribati (Office of the Chief of Naval Operations 1943:30) overshadowed by incessant warfare between rival Marshallese factions (Kotzebue 1967, 3: 166-167, 170-172; Kiste 1974: 4; Hezel 1983:92-94, 209). Marshall Islanders were very mobile during traditional times, though movement both within the Marshalls as well as to other places (e.g., Kiribati and Kosrae) tended to be temporary (see Office of the Chief of Naval Operations 1944:22; Hezel 1983:201-203). Certain activities of outsiders also affected Marshall Islands demography. "Blackbirding," as well as more legitimate types of labor recruitment, occurred in several places during the 1860s and 1870s (e.g., Ailinglapalap Atoll; see Hezel 1983:237-240). Population was also affected by natural disasters such as the tidal wave that struck Ujelang Atoll sometime before 1870, killing an unknown number and forcing all survivors to relocate to Jaluit Atoll (Naval Intelligence Division 1945:412).

The greatest demographic impacts during the first centuries of contact with non-Micronesians, however, resulted from diseases introduced from outside Micronesia. For those few portions of the Marshalls where details on introduced diseases exist, one encounters a grim story. For example, Ebon Atoll suffered through successive waves of influenza (1859), measles *and* influenza (1861), typhoid (1863), and amoebic dysentery (throughout the 1870s)--each illness taking an unknown number of lives (Office of the Chief of Naval Operations 1943:70; Rynkiewich 1972:29, 169; Hezel 1983:206). Smallpox also swept through the Marshalls during the second half of the nineteenth century, killing untold numbers, while gonorrhea and syphilis became widespread problems likely affecting both mortality and fertility (see Hezel 1983: 141-149). As a result of these several factors, the population declined by an unknown amount between Kotzebue's first visit and the late 1870s--with much of the depopulation probably occurring after 1860, corresponding to increased interaction with outsiders.

Sustained, widespread contact between Europeans and Marshall Islanders began in the late nineteenth century, when the Marshalls became a German colony, German entrepreneurs established a permanent trading station on Ebon Atoll in the early 1860s to compete with Portuguese, English, and American traders in the region (Office of the Chief of Naval Operations 1943:14; Mason 1946:8, 62). Over the ensuing two decades, Germany's trading activities grew substantially throughout the region (see Hezel 1983:210-226). The German grip on trade tightened in 1878 when a treaty with local chiefs guaranteed pro-

tection to German trading companies in the Ralik chain, as well as exclusive rights to use the harbor at Jaluit Atoll (Office of the Chief of Naval Operations 1943: 12; Firth 1977:7; Hezel 1983:298-299; Shinn 1984:334). In 1885 Germany signed a treaty with the paramount chiefs of the Marshalls, in essence annexing the entire region (Fischer and Fischer 1957:36). Spain formally ceded sovereignty to Germany in 1886 (Office of the Chief of Naval Operations 1943:12), and the Marshall Islands officially became a German protectorate (Mason 1946:62-63; Firth 1977: 15-16).

Germany developed the Marshalls economically, primarily through the promotion of copra production and trade (Office of the Chief of Naval Operations 1943: 14-15; Kiste 1974: 13). But the Germans generally approached their various administrative tasks indirectly, administering the Marshalls through the traditional authority structure of the Marshallese culture (see Office of the Chief of Naval Operations 1943: 13; Oliver 1961:348-350; Kiste 1974: 13; Firth 1977:16). This strategy required the actual presence of relatively few German citizens (Peattie 1988:154), most of whom lived at the newly established administrative center on Jaluit Atoll. Nevertheless, changes in Marshallese demography occurred during the period of German rule, as the native population continued to decline at least through the 1890s. Diseases remained the main culprits, with tuberculosis (arriving in 1879), chicken pox (introduced in 1887), influenza (particularly the epidemics of 1895 and 1904), dysentery, and measles (notably the major outbreak in 1905-1906) all killing "considerable numbers" of natives (Office of the Chief of Naval Operations 1943:69; see also Steinbach 1893; Erdland 1914: 17; Kramer and Nevermann 1938: 172). Warfare between native factions persisted into the 1880s, though the number of deaths directly resulting from war continued to be minimal (see Kramer and Nevermann 1938:204; Hezel 1983:293-295). Natural disasters also contributed to increased mortality, primarily from a pair of typhoons that devastated several southern atolls in 1905 and caused the death of many islanders both directly and indirectly (through ensuing famine and disease) (Jeschke 1905; Kramer and Nevermann 1938:172; Office of the Chief of Naval Operations 1943:19; Spoehr 1949: 17; Hezel 1991: 255-256).

Roughly fifty years of German presence in the Marshall Islands ended in 1914 when Japanese military forces occupied the region (see Hezel and Berg 1979:436-475; Peattie 1988:42). Motivated in part by economic interests rooted in late-nineteenth-century trade (Peattie 1988: 16), Japan's presence remained largely military until 1918 when the

Civil Department of the Naval Administration took over (Office of the Chief of Naval Operations 1943: 13). Japanese authority throughout Micronesia obtained international recognition in 1920 through a Class C League of Nations mandate (Clyde [1935] 1967), with the Marshalls forming the *Jaluit District* of the Mandated Territory.[1] The Japanese took a particularly active interest in the region, in part hoping to develop the economic potential of the Marshalls. To achieve this aim, the Japanese leadership administered the area more directly--undermining the traditional authority structure in the process (Office of the Chief of Naval Operations 1943:13). The copra industry flourished under the Japanese, leading to important changes in village life to meet increasing demands for labor (Peattie 1988:101, 121). Japan also saw great military value in the Marshalls' geographical placement and as potential locations for airfields (Peattie 1988:231-232). Despite the number of changes in the Marshall Islands during thirty years of Japanese administration, the native population remained relatively constant. Prior to the buildup associated with World War II, the greatest demographic changes consisted of the occasional relocation of islanders to provide labor. A major typhoon in 1918 caused many deaths (more than 200 on Majuro Atoll alone), as well as considerable disruption of food and copra production (Spoehr 1949:21; Rynkiewich 1981:31). Relatively few Japanese nationals migrated to the Marshall Islands prior to the war, other than to Jaluit Atoll, largely because of the limited resources of atoll and coral-island environments (Peattie 1988: 158,186).

With the preparation for war, life in the Marshall Islands changed markedly. The Japanese swept entire villages for laborers to work on construction projects throughout the district, particularly to construct airfields on Kwajalein, Majuro, and Wotje atolls beginning in 1939 (Mason 1946:9; Peattie 1988:251-252). When war began, Japan sent many troops to the Marshalls--their numbers reaching roughly 13,000 by the end of 1943 (Peattie 1988:263; see Crowl and Love 1955:207). American forces bombarded those atolls that contained Japanese bases, including Enewetak, Kwajalein, Jaluit, Maloelap, Mili, and Wotje (Shaw, Nalty, and Turnbladh 1966:216-219; Peattie 1988:271, 279, 305); although U.S. forces landed only on the first two (along with Majuro Atoll) in early 1944, destruction was substantial and many islanders undoubtedly died (see Carucci 1989:83-85; Hezel 1991:269). In addition, late in the war Japanese forces killed hundreds of Marshallese on Jaluit, Maloelap, Mili, and Wotje atolls, apparently as punishment for acts against the Japanese war effort (Heine 1979; see Hezel

1991:274-275). Hardships continued in the wake of the attacks, as resident Japanese soldiers and natives faced starvation on islands and atolls cut off from supply lines (Peattie 1988:305). Only those places excluded from the Japanese military effort escaped such trials, the major change during the war years usually comprising a return to subsistence agriculture and fishing from copra production. Japan's administration of the Marshall Islands ended when it surrendered to allied forces in September 1945. Between 1920 and 1935 the number of Pacific Islanders living in the Marshalls remained about 10,000 persons; the number of Marshallese decreased during the war, though by an unknown amount.

Unquestionably the most dramatic demographic and cultural changes in the Marshall Islands occurred during the extended American presence in the region following World War II (see Gale 1978; Alexander 1984). For the first six years after their capture from the Japanese, a military government under the U.S. Navy administered the Marshalls. In 1947 the islands became part of the Trust Territory of the Pacific Islands (TTPI)--a strategic territory established by the United Nations, with the United States named as "administering authority" (Shinn 1984:303). The American government introduced several cultural changes to the Marshall Islands, including widespread democracy, a cash economy, improved health care, Western education, and increasing amounts of modern amenities. Among the more dramatic demographic changes during the American presence in the area was the relocation of entire populations from Bikini and Enewetak atolls during the late 1940s to enable nuclear testing (Mason 1954; Kiste 1968, 1974, 1977; Tobin 1967). But perhaps the most significant, long-term impact of the American presence was the steady population growth that occurred throughout most of the Marshall Islands--particularly on Majuro Atoll and on the islet of Ebeye in Kwajalein Atoll (Alexander 1978; Heine 1984; Gorenflo and Levin 1989). Due largely to the availability of improved health care introduced by the United States, both fertility and survivability increased through 1980. The population of the region roughly tripled during the same time period.

In May 1979 the Marshall Islands became a self-governing republic, as a first step towards reestablishing independence (Shinn 1984:332). The Republic of the Marshall Islands and the United States ultimately agreed to a Compact of Free Association between their two nations, enacted in January 1986. Despite growing Marshallese political autonomy, strong U.S. influence in the region persists--particularly through continued activities at the U.S. military installation on Kwajalein Atoll and the large amount of money that the United States pays for the use of

that facility and to support development under the compact (Mason 1987:23-24). The Republic of the Marshall Islands conducted a census in late 1988, the first since the reestablishment of self-rule (Republic of the Marshall Islands 1989). Results of this census indicate a continuation of the rapid population growth experienced throughout the period of U.S. administration, along with a continued concentration of people at the urban centers of Majuro and Ebeye.

Changing Regional Demography in the Marshall Islands

Little demographic data exist for the Marshall Islands prior to 1920, the year that the Japanese Nan'yō-chō (South Seas Bureau) conducted the first systematic census of the Mandated Territory. Population data are available from as early as 1800 for certain atolls, initially collected by various explorers and missionaries, and later by German administrators in the region (see Kramer and Nevermann 1938: 172-174). But demographic data preceding 1920 usually comprise estimates prepared at irregular dates; due largely to the constant flow of islanders between places (Kramer and Nevermann 1938: 172), coupled with the geographical extent of the Marshalls, no single set of estimates covered all island units at one particular time (Table 1). Most figures place Marshall Islands population between 10,000 and 13,000 persons at the onset of German presence in the 1870s (see Hager 1889:33; Office of the Chief of Naval Operations 1943: 19), with estimates ranging from 7,000 to 16,000 (Finsch 1893:123; Krämer and Nevermann 1938:172; Yanaihara 1940:44). Official German figures of 9,267 in 1909, 9,163 in 1911, and 9,546 in 1913 (Yanaihara 1940:44) probably are the first *reasonably* accurate estimates of population in the Marshalls.

To date, agencies from different governments have conducted ten systematic censuses of the Marshall Islands: four by the Japanese Nan'yo-chō (1920, 1925, 1930, and 1935), two by the TTPI administration (1958 and 1973), one jointly by the Peace Corps and the University of Hawaii School of Public Health (1967), two by the U.S. Bureau of the Census (1970 and 1980), and one by the Republic of the Marshall Islands Office of Planning and Statistics (1988). Table 2 presents the total populations of the Marshalls recorded by these ten censuses, supplemented in the post-World War II years by population estimates prepared by various U.S. government agencies. Two trends in the overall Population are apparent: a relatively constant population of approximately 10,000 Pacific Islanders from 1920 through 1935 (until 1948, if

TABLE 1. Early Population Estimates for the Marshall Islands

Area	1800	1817	1860[a]	1878	1880[b]	1895	1900	1903	1906	1907	1910
Marshall Islands			10,460								
Ralik Chain			4,670								
Ailinginae											
Ailinglapalap			200		220						
Bikar											
Bikini			50		30						
Ebon			1,000		1,000		1,000		2,000		
Enewetak			30		40	<60			35		
Jabat			50		26				50		
Jaluit			500	1,006	700	1,100				955	
Kwajalein	210		100		200						
Lae			500		200				200		169
Lib			50		55				25		
Namorik			400		400						
Namu			50		150						
Rongelap			120		18				18		
Rongrik			80		10						20
Taongi											
Ujae			500		300				200		
Ujelang			1,000	6							
Wotho			40		25				30		
Ratak Chain			5,790								
Ailuk			200		200						
Arno			l,000		1,000	>l,000	1,000		1,600		

Aur		1,000	1,000				300	
Erikub	3	-				30		
Jemo		200						
Kili		-						
Likiep		300	1,000				19	
Majuro		1,000	1,000	1,200	2,600	1,604	1,900	1,417
Maloelap		1,000	1,000					
Mejit		50	50					
Mili		700	700		1,044		700	
Taka		20						
Utrik		20	40				25	
Wotje	100	300	300				350	

Sources: Gulick 1862; Kramer and Nevermann 1938; Witt 1881; Kuhn 1882; Hager 1889; Jeschke 1906; Hermann 1909; Spennemann 1992.

Notes: Certain population figures, as well as dates, are approximations. Middle values are presented for population figures listed as ranges. Empty cells signify unavailable data. For all tables, "-" denotes zero or a percentage that rounds to less than 0.1; "NA" = not available; ". . ." = not applicable.

[a]Gulick (1862:358-361) provides no dates for his population estimates. Although he does note that his data on geographical location, native island name, and population are "the result of eight years' research" (Gulick 1862:358)--thus ***possibly*** pushing his demographic figures to the early 1850s--many of the figures have other years associated, though their association with population (as opposed to the date of an earlier visit) is unclear. Given the uncertainty of Gulick's estimates and the 1862 date of their publication, we have listed them under 1860 to provide a basic point of reference.

[b]Most of the 1880 figures presented in this table come from Kramer and Nevermann (1938:172-174). Although those authors provided no source for their 1880 data, it appears that most came from Hager (1889:35-53), who in turn acquired his data from Witt or Kuhn. The uncanny agreement between the 1860 and 1880 estimates for eight island units in the Ratak chain and two island units in the Ralik chain suggests that Gulick (1862:358-361) may ultimately have been their origin, though neither Witt nor Kuhn cite Gulick's work. Note that Witt (1881:527-533) provides different population figures for Ebon (1,200), Lae (250), Ailuk (120), and Majuro (1,500) than presented above. Although the dates of these and other figures from Witt are uncertain, they probably come from about 1880. Kuhn (1882: 147-152) provides different population figures for Ebon (1,200-1,300), Arno (3,000), and Majuro (3,000) than presented above. His estimates date between May and June 1881.

one considers official estimates), followed by sustained, often rapid population growth from the 1958 census onward (Figure 2).[2]

Closer examination of available data reveals that in addition to an increase in the total population of the Marshall Islands over time, shifts in the regional distribution of population also occurred--with some atolls becoming relatively more important demographically and others becoming relatively less important. Table 3 presents evidence of these regional demographic changes for the ten census years of interest. Complementing data on the number of inhabitants are changing population densities throughout the Marshalls (Table 4). These two tables provide much of the foundation for the remainder of this study. We now briefly explore the changing regional demography of the Marshalls, organized within seven sections: one examining the Japanese period, considering the censuses of 1920 through 1935, when the regional demography of the area was fairly constant; and one section for each of the remaining six censuses (1958, 1967, 1970, 1973, 1980, and 1988), when the greatest changes in regional demography occurred. Limitations of space preclude detailed discussions of each census period; rather, we confine ourselves to a presentation of relevant data, pointing out significant demographic shifts and potential causes of population change when possible.

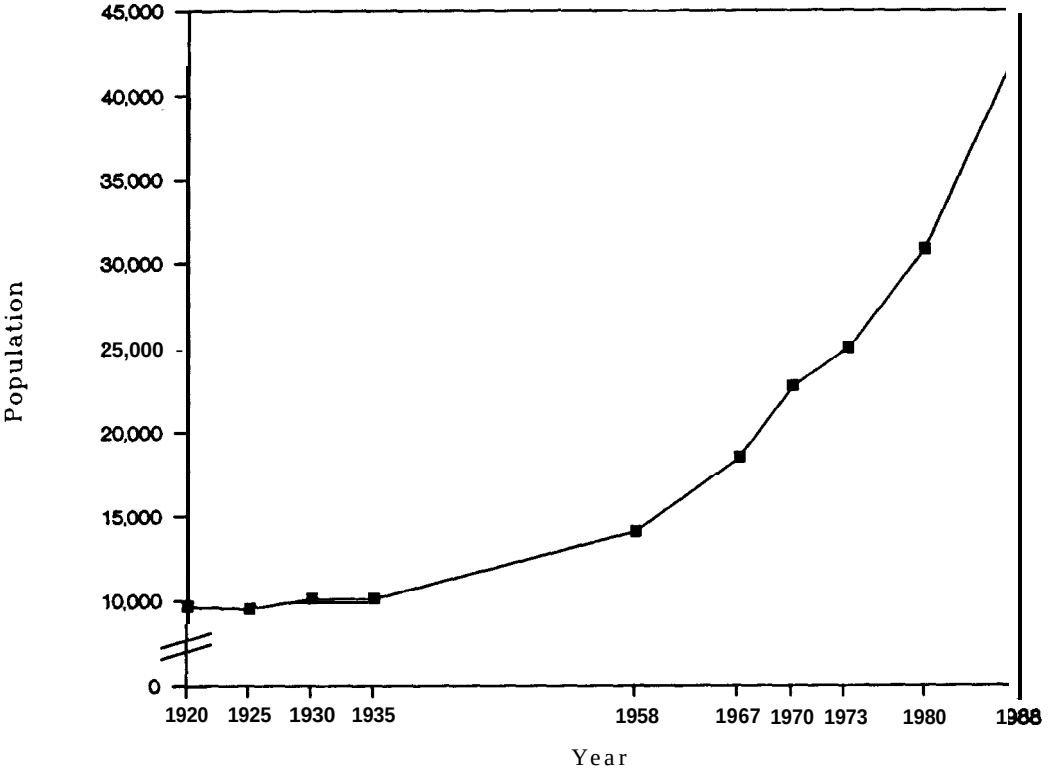


FIGURE 2. Change in the Marshall Islands population over time (1920, 1925, 1930, and 1935 data are for Pacific Islanders only).

TABLE 2. **Population of the Marshall Islands by Year, Showing Population Change between Census Years: Select Years**

Year	Population	Change from Previous Listed Census Yr.	Average Annual Change from Previous Listed Census Yr.	Source
1909	9,267	…	…	Yanaihara 1940
1911	9,163	…	…	Yanaihara 1940
1913	9,546	…	…	Yanaihara 1940
1920	**9,693**	**…**	…	**Nan'yō-chō 1937**
1925	**9,538**	**-155**	**-0.3%**	**Nan'yo-cho 1927**
1930	**10,130**	**592**	**1.2%**	**Nan'yo-cho 1931**
1935	**10,126**	**-4**		**Nan'yo-cho 1937**
1945	9,471	…	…	Dean 1947
1948	10,495	…	…	U.S. Dept. of the Navy 1948
1949	10,802	…	…	U.S. Dept. of the Navy 1949
1950	11,033	…	…	U.S. Dept. of the Navy 1950
1951	11,299	…	…	U.S. Dept. of the Navy 1951
1954	11,878	…	…	U.S. Dept. of State 1956
1955	14,260	…	…	U.S. Dept. of State 1956
1956	13,984	…	…	U.S. Dept. of State 1957
1957	13,231	…	…	U.S. Dept. of State 1958
1958	**14,163**	4,037	1.5%	**Office of the High Commissioner 1959**
1959	14,290	…	…	U.S. Dept. of State 1960
1960	14,907	…	…	U.S. Dept. of State 1961
1961	15,399	…	…	U.S. Dept. of State 1962
1962	15,710	…	…	U.S. Dept. of State 1963
1963	17,363	…	…	U.S. Dept. of State 1964
1964	18,205	…	…	U.S. Dept. of State 1965
1965	18,062	…	…	U.S. Dept. of State 1966
1966	18,239	…	…	U.S. Dept. of State 1968
1967	18,578	4,415	3.1%	**School of Public Health n.d.**
1968	18,998	…	…	U.S. Dept. of State 1969
1969	19,328	…	…	U.S. Dept. of State 1970
1970	22,888	4,310	7.2%	**U.S. Bureau of the Census 1972**
1971	23,166	…	…	U.S. Dept. of State 1972
1972	24,248	…	…	US. Dept. of State 1973
1973	25,045	2,157	3.0%	**Office of Census Coordinator 1975**
1975	26,569	…	…	U.S. Dept. of State 1977
1977	25,457	…	…	U.S. Dept. of State 1979
1980	30,873	5,828	3.0%	**U.S. Bureau of the Census 1983a**
1981	32,104	…	…	U.S. Dept. of State 1984
1982	33,339	…	…	U.S. Dept. of State 1984
1984	34,923	…	…	U.S. Dept. of State 1985
1988	43,380	12,507	4.3%	**Republic of the Marshall Islands 1989**

Notes: Census years in **boldface.** Data for 1920-1935 are for Pacific Islanders only. Intercensal estimates are du jure population; census data are de facto population.

TABLE 3. Population by Area: Census Years

Island Unit	1920	1925	1930	1935	1958	1967	1970	1973	1980	1988
Marshall Islands	9,693	9,538	10,130	10,126	14,163	18,578[a]	22,888	25,045[b]	30,873	43,380
Ralik Chain	4,919	4,778	5,308	5,292	6,644	8,732	12,159	10,692	13,684	17,502
Ailinglapalap	678	712	684	694	1,288[c]	1,195[c]	1,106[c]	1,100	1,385	1,715
Bikini	152	90	127	159	-	-	-	75		10
Ebon	787	552	602	649	819	836	575	740	887	741
Enewetak	104	96	149	128	-	-	-	-	542	715
Jabat	NA	75	48	39	NA	NA	NA	70	72	112
Jaluit	1,680	1,885	2,141	1,989	1,098	1,113	492	925	1,450	1,709
Kili	NA	17	32	27	267	NA	281	360	489	602
Kwajalein	469	395	438	500	1,284	3,540[d]	7,818	5,469	6,624	9,311
Lae	129	82	79	88	165	131	173	154	237	319
Lib	NA	49	73	68	44	142	103	98	98	115
Namorik	382	331	399	378	523	547	367	431	617	814
Namu	232	239	254	271	482	597	565	493	654	801
Rongelap	113	66	92	92	264	189	144	165	235	-
Rongrik	NA	13	11	6	-	-	-	-	-	-
Ujae	119	109	143	117	167	191	178	209	309	448
Ujelang	NA	20	11	40	172	251	302	342	-	-
Wotho	74	47	25	47	71	**NA**	55	61	85	90

Ratak Chain	4,774	4,760	4,822	4,834	7,519	9,758	10,729	14,334	17,189	25,878
Ailuk	538	266	304	285	419	384	341	335	413	488
Arno	1,197	990	1,055	942	1,037	1,273	874	1,120	1,487	1,656
Aur	300	251	252	278	241	361	315	300	444	438
Likiep	293	435	467	495	636	430	245	406	481	482
Majuro	526	685	753	779	3,415	5,249	7,401	10,290	11,791	19,664
Maloelap	550	608	446	484	454	494	421	432	614	796
Mejit	443	399	318	324	346	320	228	271	325	445
Mili	523	613	548	523	412	582	327	538	763	854
Utrik	NA	155	145	134	198	269	220	217	336	409
Wotje	404	358	534	590	361	396	357	425	535	646

Sources: Nan'yō-chō 1927, 1931, 1937; Office of the High Commissioner 1959; School of Public Health n.d.; U.S. Bureau of the Census 1972, 1983a; Office of Census Coordinator 1975; Republic of the Marshall Islands 1989.

[a]1967 total includes populations for Kili Island and Wotho Atoll (not enumerated), other islands "not specified," and 19 individuals whose residence was "not specified."

[b]1973 total includes 19 individuals whose residence was "not specified."

[c]Includes population of Jabat Island.

[d]Ebeye only; data for the remainder of Kwajalein Atoll unavailable.

TABLE 4. Population Density by Area: Census Years (Persons per Square Mile)

Island Unit	1920	1925	1930	1935	1958	1967	1970	1973	1980	1988
Marshall Islands	139	137	145	145	207	283	348	381	470	660
Ralik Chain	137	133	147	147	191	274	381	335	429	549
Ailinglapalap	120	126	121	122	227	211	195	194	244	302
Bikini	66	39	55	69	-	-	-	32	-	4
Ebon	355	249	271	292	369	377	259	333	400	334
Enewetak	46	42	66	57	-	-	-	-	240	316
Jabat	NA	341	218	177	NA	NA	NA	318	327	509
Jaluit	384	430	489	454	251	254	112	211	331	390
Kili	NA	47	89	75	742	NA	781	1,000	1,358	1,672
Kwajaleina	74	62	69	79	254	1,603	3,541	2,477	3,000	4,217
Lae	230	146	141	157	295	234	309	275	423	570
Lib	NA	136	203	189	122	394	286	272	272	319
Namorik	357	309	373	353	489	511	343	403	577	761
Namu	96	99	105	112	199	247	233	204	270	331
Rongelap	37	21	30	30	86	62	47	54	77	-
Rongrik	NA	20	17	9	NA	NA	-	-	-	-
Ujae	165	151	199	163	232	265	247	290	429	622
Ujelang	NA	30	16	60	257	375	451	510	-	-
Wotho	44	28	15	28	43	NA	33	37	51	54

Ratak Chain	141	141	143	143	222	289	317	424	508	765
Ailuk	260	129	147	138	202	186	165	162	200	236
Arno	239	198	211	188	207	255	175	224	297	331
Aur	138	116	116	128	111	166	145	138	205	202
Likiep	74	110	118	125	161	109	62	103	121	122
Majuro	149	194	213	220	965	1,483	2,091	2,907	3,331	5,555
Maloelap	145	160	118	128	120	130	111	114	162	210
Mejit	615	554	442	450	481	444	317	376	451	618
Mili	91	106	95	91	71	101	57	93	132	148
Utrik	NA	165	154	143	211	286	234	231	357	435
Wotje	128	113	169	187	114	125	113	134	169	204

[a]Calculations account for US. government restrictions, beginning in the early 1950s, against the use of certain portions of the atoll as places of residence for natives--thus reducing the area available for habitation.

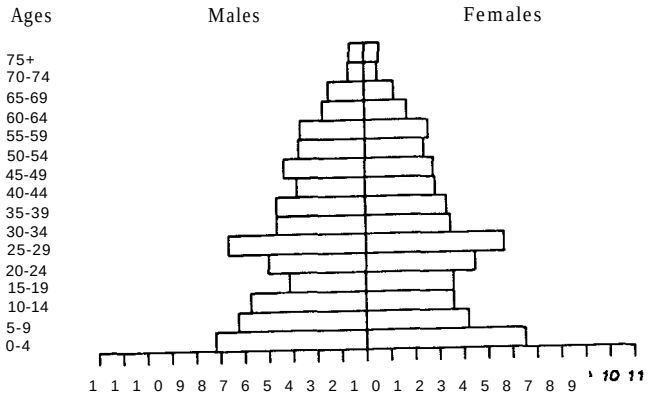
Regional Demography during Japanese Administration: 1920, 1925 1930, and 1935

The population of the Marshall Islands was about 10,000 Pacific Islanders between 1920 and 1935 (Nan'yo-cho 1927, 1931,1937; see Table 2).[3] With minor exceptions, the regional distribution of population living on particular islands and atolls (hereafter called "island units") remained relatively constant as well. In broad geographic terms, roughly equal numbers of Pacific Islanders lived in the Ralik and Ratak chains (see Table 3). Closer examination of regional trends reveals that slight growth occurred on some atolls, such as Jaluit, Likiep, Majuro, and Wotje--with Jaluit continuing as the main commercial and administrative center. Slight decreases in population occurred on other island units, including Ailuk, Arno, and Ebon atolls.

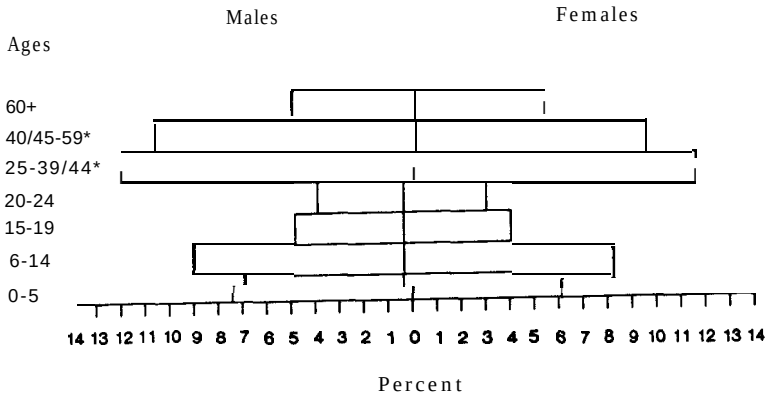
Data on the age composition of the Marshall Islands as a whole are available for 1925, 1930, and 1935. The large age groups employed for the latter two years, and the use of different age groups for the three census years, limit the comparability of these data. Nevertheless, general comparisons can be made through aggregating age groups--once again indicating slight fluctuations within a framework of a basically constant population (Figure 3). Between 1925 and 1935, we note in particular minor decreases in the proportion of individuals aged 14 and younger, and a slight increase in individuals aged 60 and older. The median age remained relatively constant over this ten-year period, increasing from 27.2 years in 1925 (calculated for the Jaluit District of the Mandated Territory) to 27.5 years in 1930, and then decreasing to 26.9 years in 1935.

Data on the age composition of individual island units are available for 1930 and 1935. Compared to data for the Marshall Islands as a whole in 1930, the Ralik chain contained proportionally more individuals younger than 25 years and proportionally fewer aged 60 years and older (Table 5). The age composition of individual island units in 1930 varied considerably. The demographic structure of some units (e.g., Ebon and Jaluit atolls) were broadly similar to that of the Ralik chain as a whole, while the composition of others was quite different--though much of the variability present in this year (and 1935) no doubt was a product of the small populations on many of the island units concerned. Compared to the Marshalls as a whole, data from the Ratak chain in 1930 indicate relatively fewer individuals aged 24 years and younger, and relatively more aged 60 years and older, due largely to the heavy representation of older individuals on Arno and Majuro atolls.

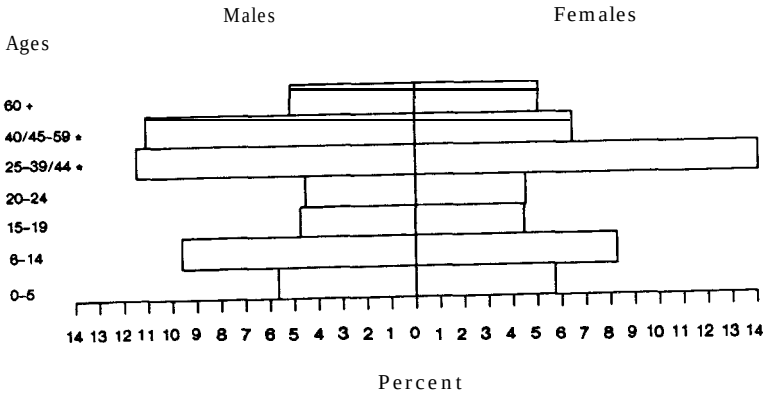
Age and Sex Distribution, Marshall Islands: 1925



Age and Sex Distribution, Marshall Islands: 1930



Age and Sex Distribution, Marshall Islands: 1935



*DIFFERENT ACE GROUPS USED FOR MALES (25-39, 40-59) AND FEMALES (25-44, 45-59)

FIGURE 3. Population pyramids (Pacific Islanders only, excluding Enewetak and Ujelang atolls): 1925, 1930, 1935.

TABLE 5. Pacific Islander Population by Age and Area: 1930

Island Unit	Total Persons	Age Group (Percentage) <15	15-24	25-59	60+
Marshall Islands	10,130	30.6	15.5	43.6	10.4
Ralik Chain	5,308	31.8	17.6	42.8	7.9
Ailinglapalap	684	28.1	18.6	44.3	9.1
Bikini	127	49.6	13.4	28.3	8.7
Ebon	602	30.9	14.8	44.7	9.6
Enewetak	149	34.2	17.4	40.9	7.4
Jabat	48	29.2	12.5	50.0	8.3
Jaluit	2,141	33.5	17.7	43.2	5.6
Kili	32	9.4	25.0	62.5	3.1
Kwajalein	438	29.0	19.2	38.6	13.2
Lae	79	35.4	16.5	43.0	5.1
Lib	73	38.4	6.8	49.3	5.5
Namorik	399	25.8	19.5	45.1	9.5
Namu	254	35.8	20.9	35.4	7.9
Rongelap	92	37.0	17.4	35.9	9.8
Rongrik	11	9.1	9.1	81.8	
Ujae	143	30.8	15.4	46.9	7.0
Ujelang	11	9.1	45.5	45.5	
Wotho	25	16.0	16.0	36.0	32.0
Ratak Chain	4,822	29.3	13.1	44.4	13.1
Ailuk	304	31.9	13.8	44.1	10.2
Arno	1,055	22.5	11.9	48.4	17.2
Aur	252	31.3	16.3	46.4	6.0
Likiep	467	34.0	17.3	41.3	7.3
Majuro	753	23.0	13.1	37.3	26.6
Maloelap	446	32.5	14.1	46.9	6.5
Mejit	318	31.1	11.6	50.9	6.3
Mili	548	21.4	13.1	48.7	16.8
Utrik	145	35.9	15.2	44.1	4.8
Wotje	534	48.1	9.4	38.2	4.3

Source: Nan'yō-chō 1931.

Note: Percentages in this and following tables may not sum precisely to 100% due to rounding.

The 1935 data suggest basic similarities with the 1930 data: The Ralik chain contained relatively more individuals aged 24 years and younger and relatively fewer aged 60 years and older than the Marshalls as a whole, with the opposite true for the Ratak chain (Table 6). Variability in the age composition of individual island units continued in 1935.

A limited number of vital statistics from the period of Japanese rule

TABLE 6. Pacific Islander Population by Age and Area: 1935

Island Unit	Total Persons	Age Group (Percentage) <15	15-24	25-59	60+
Marshall Islands	10,126	29.3	18.0	42.7	10.0
Ralik Chain	5,292	30.9	19.1	42.7	7.3
Ailinglapalap	694	24.4	21.2	45.7	8.8
Bikini	159	50.3	15.7	25.8	8.2
Ebon	649	27.9	17.6	46.2	8.3
Enewetak	128	37.5	14.1	39.8	8.6
Jabat	39	15.4	28.2	48.7	7.7
Jaluit	1,989	32.0	19.7	43.0	5.3
Kili	27	22.2	18.5	59.3	-
Kwajalein	500	32.4	17.4	41.4	8.8
Lae	88	33.0	19.3	38.6	9.1
Lib	68	35.3	17.6	38.2	8.8
Namorik	378	26.7	20.1	45.0	8.2
Namu	271	33.6	19.2	36.5	10.7
Rongelap	92	39.1	19.6	34.8	6.5
Rongrik	6	33.3	-	50.0	16.7
Ujae	117	31.6	15.4	42.7	10.3
Ujelang	40	20.0	27.5	52.5	-
Wotho	47	36.2	23.4	34.0	6.4
Ratak Chain	4,834	27.5	16.8	42.8	12.9
Ailuk	285	28.4	17.5	45.6	8.4
Arno	942	20.9	15.1	48.1	15.9
Aur	278	33.1	16.5	42.8	7.6
Likiep	495	32.9	22.0	38.2	6.9
Majuro	779	24.3	13.9	39.2	22.7
Maloelap	484	28.3	20.7	41.5	9.5
Mejit	324	27.2	17.0	45.4	10.5
Mili	523	17.6	17.4	49.5	15.5
Utrik	134	30.6	17.9	40.3	11.2
Wotje	590	42.2	14.4	35.9	7.5

Source: Nan'yō-chō 1937.

are available for the Marshall Islands. The crude birth rate for the Jaluit District of the Mandated Territory was 16.7 in 1925 (Japan 1926:94), increasing to an average of 17.0 between 1925 and 1929 and to 20.8 in 1935. The general fertility rate was 51.9 in 1926, 70.9 in 1929, and 98.6 in 1930. The crude death rate for the Jaluit District was 13.2 in 1925, increasing to an average of 16.7 between 1925 and 1929 and further increasing to 22.9 in 1935 (Yanaihara 1940:35, 46). At first glance, these

fertility and mortality rates provide a possible explanation of population change during the Japanese period. Fertility exceeded mortality between 1925 and 1929, with the general fertility rate showing marked increases between 1926 and 1930; as one might expect, overall population grew (by nearly 600 persons) during the last half of the 1920s. Mortality exceeded fertility in 1935, the reversal in the relationship of these two demographic mechanisms providing a possible clue for the slight population decrease between 1930 and 1935. However, upon closer examination annual births and deaths varied considerably in the Jaluit District during the Japanese administration--with births exceeding deaths one year and deaths exceeding births the next. For the years 1923-1929 and 1933-1936, average annual births exceeded average annual deaths, but by fewer than 10 individuals per year--allowing for very slow natural increase (Japan 1924-1930, 1934-1937). Only five infant (aged 2 years or less) deaths were recorded for the Jaluit District in 1935 (Japan 1937:95), suggesting that infant mortality was not a serious problem.

Additional data on fertility, mortality, and population during the Japanese administration are insufficient to explore vital rates further. The causes of the documented trends in fertility and mortality largely are open to speculation. Improved health care probably helped to reduce mortality; in turn, widespread venereal disease (see Office of the Chief of Naval Operations 1943:70) probably reduced fertility (particularly gonorrhea among women; see Morton 1966:54-60).

Limited data also exist on population mobility during the Japanese administration. As noted above, traditionally Marshall Islanders were quite mobile, a cultural practice greatly restricted by the Japanese (Office of the Chief of Naval Operations 1943:91). Movement into and out of the Marshall Islands as a whole appears to have been minimal in 1930 (Table 7). Table 7 also presents detailed data on lifetime mobility for residents of the individual island units as of 1930, as indicated by relocation after registration by the Japanese administration. Although the vast majority of individuals resided in the district where registered, nearly one-third of the population in 1930 lived at a location within the Marshalls different from their place of registration. The data show that this mobility varied greatly. Some island units that experienced notable population growth between 1920 and 1930, such as Jaluit and Likiep atolls, apparently experienced relatively heavy in-migration as well, with about half the resident populations on each originally registered elsewhere in the Marshalls. In contrast, other island units whose populations also grew considerably over the same decade, such as Majuro

TABLE 7. Pacific Islander Population by Area, According to Place of Registration: 1930

Island Unit	Total Number	Place of Registration (Percentage)			
		Same Locality	Same District[a]	Outside District[a]	Other Location[b]
Marshall Islands	10,130	65.7	33.0	0.7	0.5
Ralik Chain	5,308	59.9	38.6	1.1	0.3
Ailinglapalap	684	59.1	39.8	0.9	0.3
Bikini	127	99.2	0.8	-	-
Ebon	602	76.9	21.1	1.0	1.0
Enewetak	149	63.1	31.5	5.4	-
Jabat	48	68.8	31.3	-	-
Jaluit	2,141	47.1	51.3	1.4	0.3
Kili	32	3.1	93.8	3.1	-
Kwajalein	438	65.3	34.0	0.2	0.5
Lae	79	68.4	31.6	-	-
Lib	73	-	100.0	-	-
Namorik	399	78.7	18.5	2.3	0.5
Namu	254	77.2	22.8	-	-
Rongelap	92	71.7	28.3	-	-
Rongrik	11	63.6	36.4	-	-
Ujae	143	77.6	22.4	-	-
Ujelang	11	-	100.0	-	-
Wotho	25	68.0	32.0	-	-
Ratak Chain	4,822	72.2	26.8	0.3	0.7
Ailuk	304	79.6	20.4	-	-
Arno	1,055	80.3	18.7	0.2	0.5
Aur	252	75.0	25.0	-	-
Likiep	467	50.3	48.2	1.5	-
Majuro	753	83.0	15.1	-	1.9
Maloelap	446	67.3	32.1	0.7	-
Mejit	318	90.3	9.7		
Mili	548	74.1	23.9	0.2	1.8
Utrik	145	78.6	21.4	-	-
Wotje	534	44.0	55.6	0.4	-

Source: Nan'yo-cho 1931.

[a]Refers to major island districts within the Mandated Territory (e.g., Jaluit District, which was roughly equivalent to the Marshall Islands).

[b]Refers to locations outside the Mandated Territory.

[c]Part of the Pohnpei District during the Japanese administration; "same district" and "outside district" thus refer to that administrative area.

Atoll, experienced much less in-migration. Note that the data presented do not record all instances of mobility during the Japanese administration, including most instances of short-term migration. Temporary relocations of 100 to 225 Marshallese laborers annually to the sugar plantations of Saipan occurred during the early 1920s (Office of the Chief of Naval Operations 1943: 102). Increased labor recruitment occurred late in the Japanese administration, often for military-related construction projects but also for economic purposes (see Kiste 1974:18-19), though such mobility once again generally involved short periods. Actual militarization, in contrast, often brought about long-term relocation--such as the evacuation of all natives from Taroa Islet in Wotje Atoll to allow a military buildup (Office of the Chief of Naval Operations 1943:20). The other three Japanese censuses unfortunately did not record data on residence by place of registration or other indicators of mobility.

Regional Demography in 1958

Japan's involvement in World War II interrupted the systematic collection of demographic data in the Marshall Islands. Regrettably, the next census of the Marshalls was not conducted until 1958 (Office of the High Commissioner 1959). In contrast to the relatively constant population during the period of Japanese administration, a number of changes occurred during the twenty-three years preceding the 1958 census. Most notable were a substantial increase in population and the beginning of major shifts in the age composition of the region.

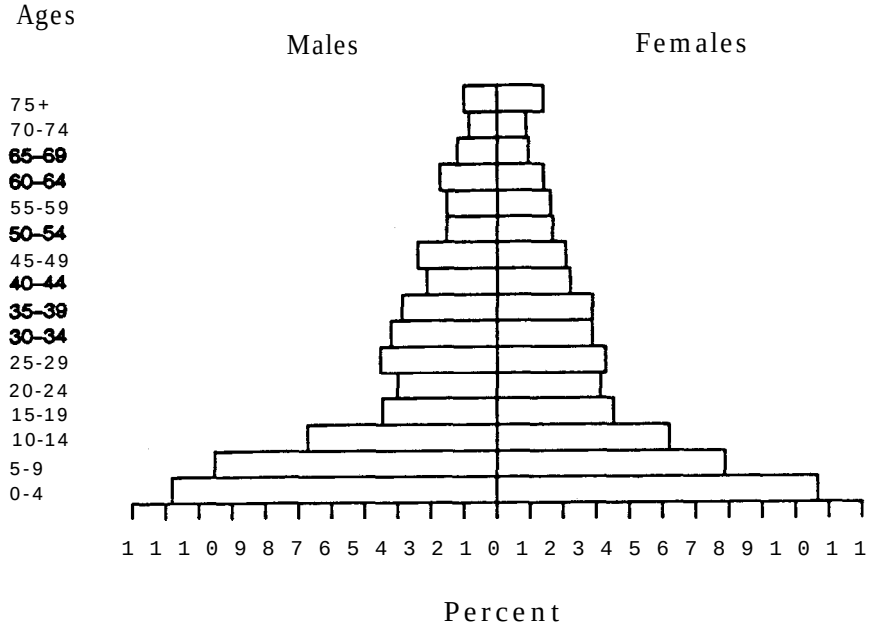
Between the 1935 and 1958 censuses, the population grew by nearly 40 percent. This growth represents an average annual increase of about 1.5 percent, which is not extraordinarily rapid. However, demographic estimates for the Marshalls shortly after World War II indicate that significant population growth probably did not begin until the late 1940s (see Table 2), suggesting that a much more substantial average annual rate of growth (2.8 percent) occurred over the decade preceding the 1958 census. Both island chains saw their respective populations grow, with the increase experienced in the Ratak chain particularly notable (see Table 3). Different trends in local population change also emerged. Most island units gained population between 1935 and 1958, particularly Ailinglapalap, Kwajalein, Ujelang, and Majuro atolls. The increases on Kwajalein and Majuro atolls deserve special attention, not only because of the growth experienced, but also because of dramatic increases in population density (see Table 4). In addition to a substantial increase in population by 1958, the high population density on Kwaja-

lein Atoll in part was due to the establishment of Kwajalein Islet, the largest islet in the atoll, as a U.S. military installation beginning in 1951 --removing it as a potential location of Marshallese residence (Tobin 1954). The majority of the indigenous Kwajalein Atoll population has lived on the small islet of Ebeye since 1951, subjecting most residents to densities appreciably greater than those calculated for the remaining portions of the atoll (see Gorenflo and Levin 1989). Majuro Atoll also played special roles at the end of World War II, both as the location of a U.S. government installation (first a U.S. naval base, then the headquarters of the U.S. Navy Civil Government for the southern Marshalls) and as a destination for Marshallese evacuated from other atolls because of the war (Spoehr 1949:28-30, 43-44). Although evacuees were repatriated shortly after the war, the emerging role of Majuro Atoll as the center of Marshall Islands government and dealings with the United States, as well as the location of commercial activities and Western amenities such as a modern school (Hezel 1991:278), was important in attracting large numbers of Marshallese from elsewhere.

In contrast to places that experienced population growth, some island units lost people between 1935 and 1958. The greatest depopulation occurred on Jaluit Atoll, the former German and Japanese administrative center. This atoll suffered heavy damage during the war; despite efforts to reestablish some of Jaluit's prewar regional importance, by 1958 it had not rebounded to population levels documented in 1935 (see Connell 1983: 16). The U.S. government evacuated Bikini and Enewetak atolls during this period, relocating their inhabitants to enable nuclear tests during the late 1940s (Hines 1962:20-49, 78-111). The U.S. Navy moved inhabitants of Bikini first to Rongrik Atoll (March 1946), then to Kwajalein Atoll (March 1948), and eventually to Kili Island (November 1948) (Mason 1954; Kiste 1974:30-34, 88, 103). The inhabitants of Enewetak, in turn, were relocated to Ujelang Atoll (December 1947), thus accounting for the demographic growth on Ujelang documented by the 1958 census (Hines 1962:81; see Tobin 1967).

Accompanying the overall growth in Marshall Islands population between 1935 and 1958 was a substantial change in its age composition (Figure 4). This change is evident particularly among younger persons: In contrast to prewar statistics, when the median age hovered around 27 years, the median age in 1958 was 18.3 years (TTPI citizens only) (U.S. Department of State 1981:8). Given the growing representation of young persons in the Marshall Islands, it is likely that increased fertility was responsible for much of the population growth. Unfortunately, we have available no reliable vital statistics or mobility data with which

Age and Sex Distribution, Marshall Islands: 1958



Age and Sex Distribution, Marshall Islands: 1967

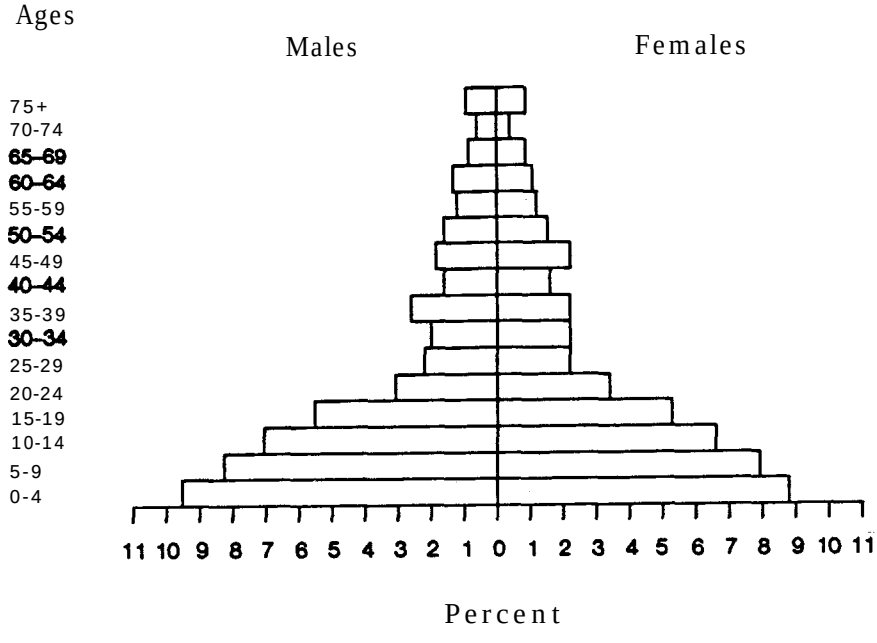


FIGURE 4. Population pyramids: 1958, 1967.

to explore the causes of demographic change that followed World War II.

Regional Demography in 1967

Population growth continued between 1958 and 1967--the average annual rate of change during this period increasing to roughly 3.1 percent for the region as a whole as well as for both major island chains (School of Public Health n.d.) (see Table 2). Despite this overall growth, data on the populations of individual island units indicate that the number of inhabitants on each remained generally constant between 1958 and 1967, with two major exceptions: The population of Kwajalein Atoll grew by nearly 2,300 persons, and the population of Majuro Atoll grew by more than 1,800 persons (see Table 3). The population of Lib Island more than tripled over the same nine years, though adding fewer than 100 people. Local population densities increased accordingly (see Table 4). The calculation of density on Kwajalein Atoll once again accounts for a reduction of potential places of residence, with islets and the lagoon area in the central portion of the atoll being reserved for U.S. military purposes beginning in the mid-1960s (Office of Economic Adjustment 1984:48).

The trend towards an increasingly youthful population, which began between 1935 and 1958, continued into 1967 (see Figure 4), with median age decreasing to 15.2 years. Data on the age composition of individual island units once again are available for 1967 (Table 8). Substantial variability in the age structure of island units is evident. Kwajalein and Majuro, the two atolls that experienced the greatest population increases during this period, contained relatively fewer individuals in both the young and old age groups examined than did the Marshall Islands as a whole. The relatively greater representation of individuals in the central age groups, particularly those aged 20 through 39 years, probably indicates people migrating to these atolls in search of employment.

Data on fertility are available for 1967 and for the remaining census years examined (Table 9). Fertility in the Marshalls was high in 1967, offering one explanation for the continuing rapid population growth throughout the region. The crude birth rate in 1967 was roughly twice that found during the Japanese administration. Data on fertility also are available for individual island units (Table 10); these data provide a means of comparing different places, though for island units with relatively small populations fertility measures can fluctuate greatly and

TABLE 8. Population by Age and Area: 1967

Island Unit	Total Persons	Age Group (Percentage) <15	15-24	25-59	60+
Marshall Islands	18,578[a]	47.8	16.8	25.4	6.7
Ralik Chain	8,732	48.7	16.9	25.2	6.5
Ailinglapalap[b]	1,195	50.5	15.9	23.8	8.5
Bikini					
Ebon	836	51.6	15.0	21.3	10.5
Enewetak					
Jabat[b]	NA	NA	NA	NA	NA
Jaluit	1,113	45.1	19.8	23.4	11.0
Kili[c]	NA	NA	NA	NA	NA
Kwajalein[d]	3,540	47.6	17.1	27.8	3.7
Lae	131	51.9	12.2	26.0	9.9
Lib	142	49.3	18.3	30.3	1.4
Namorik	547	46.1	17.0	22.7	9.7
Namu	597	53.3	16.1	25.0	4.2
Rongelap	189	49.7	14.8	24.9	8.5
Rongrik					
Ujae	191	55.0	14.1	23.6	7.3
Ujelang	251	48.6	19.1	21.1	0.4
Wotho[c]	NA	NA	NA	NA	NA
Ratak Chain	9,758	47.0	16.6	25.6	6.9
Ailuk	384	51.3	16.1	24.0	8.1
Arno	1,273	46.0	16.9	25.7	8.8
Aur	361	52.4	17.2	22.2	7.5
Likiep	430	48.4	15.1	26.5	6.7
Majuro	5,249	45.9	17.5	25.7	5.4
Maloelap	494	50.0	14.4	24.1	9.5
Mejit	320	49.4	10.6	24.7	10.9
Mili	582	48.1	13.6	27.3	7.9
Utrik	269	49.4	11.2	28.6	9.3
Wotje	396	46.5	19.2	24.7	8.8

Source: School of Public Health n.d.

[a]Total includes populations for Kili and Wotho (not enumerated), other islands "not specified," and 19 persons with residence "not specified." Total for each island unit includes persons whose ages were "not specified" and "foreign born" individuals (whose ages similarly were not specified).

[b]Population of Jabat Island included in Ailinglapalap Atoll.

[c]The 1967 census included Kili Island and Wotho Atoll, but the final report does not enumerate these data.

[d]Includes only those individuals living on Ebeye Islet; other islets in the atoll were not included in the final census report.

TABLE 9. Measures of Fertility for the Marshall Islands: Select Census Years

Year	Total Persons	Total Births	Crude Birth Rate	General Fertility Rate	Total Fertility Rate
1967	18,578	774[a]	41.7	225.8	7,888
1970	22,888	909	39.7	200.8	6,769
1973	25,045	1,028	41.1	210.0	6,433
1980	30,873	1,130[a]	36.6	183.9	5,131
1988	43,380	2,137	49.3	244.0	7,237

Sources: School of Public Health n.d.; U.S. Bureau of the Census 1972, 1983a, 1983b; U.S. Dept. of State 1981; Office of Census Coordinator 1975; Republic of the Marshall Islands 1989, 1990.

[a]Measures for 1967 and 1980 differ from those in Table 10 due to conflicting data. The data here are reported births for each year (except 1988, which are estimated births for that year), and thus should be comparable across years. Unfortunately, these same data are not available for each island unit, forcing us to employ different data sources for Table 10.

thus provide only limited insights. Although the population of the Ratak chain was greater than that of the Ralik chain in 1967, fertility was slightly greater in the latter for the three measures calculated. Considering the general and total fertility rates, which are more sensitive measures of reproduction than the crude birth rate, fertility on Kwajalein Atoll in 1967 was greater than that of the Marshalls as a whole, while fertility on Majuro Atoll was lower.

Age-specific mortality data are also available for 1967 as well as for the remaining four census years examined. Focusing upon key age groups, data for 1967 indicate lower infant mortality (in terms of proportion of total deaths) than the average for the five census years examined (Table 11). In contrast, mortality among individuals aged 70 years and older was greater. Age-specific death rates in 1967 varied when compared to the average for the five census years. Although the Marshalls apparently experienced lower infant mortality in 1967 than the five-year average, the mortality rate for individuals aged 70 years and over also was lower in 1967 than for the five years combined (Table 12).

Demographic data for 1967 suggest that the population of the Marshall Islands grew rapidly following the 1958 census. Available evidence suggests that high fertility and low mortality caused this growth,

TABLE **10. Fertility Measures by Area: 1967 and 1980**

Island Unit	1967					1980				
	Total Persons	Total Births[a]	Crude Birth Rate	General Fertility Rate	Total Fertility Rate	Total Persons	Total Births	Crude Birth Rate	General Fertility Rate	Total Fertility Rate
Marshall Islands	18,578	728	39.2	184.7	6,626	30,873	1,329	43.0	216.3	7,051
Ralik Chain	8,732	357	40.9	203.4	7,178	13,684	682	49.8	260.5	8,108
Ailinglapalap	1,195	53	44.4	261.1	8,846	1,385	78	56.3	333.3	9,102
Ebon	836	28	33.5	188.4	6,900	887	60	67.6	405.4	13,898
Enewetak	-	-	-	-	-	542	30	55.4	263.2	8,775
Jabat	NA	NA	NA	NA	NA	72	1	13.9	83.3	1,667
Jaluit	1,113	29	26.1	139.2	5,219	1,450	53	36.6	208.7	6,731
Kili	NA	NA	NA	NA	NA	489	28	57.3	252.3	7,962
Kwajalein[b]	3,540	157	44.4	194.3	6,790	6,624	334	50.4	248.3	7,601
Lae	131	8	61.1	347.8	12,595	237	12	50.6	333.3	7,750
Lib	142	4	28.2	142.9	4,762	98	3	30.6	150.0	7,381
Namorik	547	21	38.4	193.5	7,566	617	51	82.7	542.6	18,657
Namu	597	31	51.9	259.6	7,367	654	17	26.0	121.4	4,018
Rongelap	189	12	63.5	342.9	15,125	235	7	29.8	170.7	5,500
Ujae	191	7	36.6	185.2	6,750	309	5	16.2	89.3	3,237
Ujelang	251	7	27.9	162.8	4,000	-	-	-	-	-
Wotho	NA	NA	NA	NA	NA	85	3	35.3	230.8	5,000

Ratak Chain	9,758	367	37.6	168.0	6,124	17,189	602	35.0	170.8	5,853
Ailuk	384	13	33.9	191.2	7,381	413	7	16.9	92.1	2,415
Arno	1,273	35	27.5	142.2	5,850	1,487	4	2.7	15.5	315
Aur	361	9	24.9	140.6	4,271	444	17	38.3	202.4	6,227
Likiep	430	9	20.9	106.1	3,790	481	16	33.3	188.2	5,708
Majuro	5,249	228	43.4	175.8	6,150	11,791	430	36.5	168.2	5,909
Maloelap	494	18	36.4	173.9	5,960	614	28	45.6	231.4	6,780
Mejit	320	13	40.5	220.0	10,248	325	13	40.0	224.1	7,068
Mili	582	15	25.3	126.2	4,702	763	53	69.5	392.6	11,995
Utrik	269	12	44.6	196.4	8,625	336	11	32.7	164.2	6,090
Wotje	396	15	37.9	180.6	6,747	535	23	43.0	270.6	9,845

Sources: School of Public Health n.d.; U.S. Bureau of the Census 1983b.

Note: Includes infants born to mothers aged <15, >49, and of unknown age; the "unknown" group is used for crude fertility rate but not for general or total fertility rates.

[a]1967 fertility based on infants 1 year old and younger, and thus excludes those who died during the first year of life.

[b]Ebeye only; data for the remainder of Kwajalein Atoll unavailable.

TABLE 11. Registered Deaths in the Marshall Islands, Percentages by Age Group: 1967, 1970, 1973, 1980, and 1988

Age Group	1967	1970	1973	1980	1988	Average
	Number					
Total Deaths	100	134	151	81	380	113
	Percentage					
All Ages	100.0[a]	100.0	100.0	100.0	100.0	100.0[a]
<l	16.0	16.4	33.1	25.9	27.6	25.3
l-4	5.0	3.7	9.3	8.6	16.8	11.2
5-9	2.0	2.2	1.3	-	3.7	2.5
10-14	2.0	1.5	2.6	2.5	2.4	2.2
15-19	4.0	2.2	2.0	2.5	2.6	2.6
20-24	-	1.5	2.0	3.7	3.2	2.4
25-29	1.0	-	0.7	2.5	2.9	1.8
30-34	3.0	3.0	2.0	3.7	2.6	2.7
35-39	-	0.7	3.3	1.2	2.6	2.0
40-44	2.0	3.7	3.3	1.2	2.1	2.5
45-49	3.0	5.2	2.6	7.4	1.8	3.2
50-54	4.0	5.2	5.3	4.9	2.1	3.7
55-59	4.0	10.4	6.6	7.4	2.6	5.2
60-64	7.0	4.5	3.3	12.3	3.7	5.0
65-69	4.0	9.0	4.0	3.7	5.0	5.2
70-74	9.0	9.7	5.3	2.5	5.8	6.4
75+	21.0	20.9	13.2	9.9	12.4	14.7

Sources: 1967 calculations based on data on deaths in the 11.5 months preceding the 1967 census, as presented in School of Public Health n.d.; 1970 and 1973 calculations on data on deaths for each calendar year in U.S. Dept. of State 1981; 1980 calculations based upon data on deaths in the 1980 calendar year in U.S. Dept. of State 1982; 1988 calculations based on data (estimated deaths) in Republic of the Marshall Islands 1990.

[a]Does not sum to 100.0 percent due to inclusion in total of 13 individuals whose age at death was "not specified."

both in the region as a whole and on island units that experienced the greatest increases in population. Although data on migration within the Marshalls are unavailable in the 1967 census, the relatively large proportions of individuals in central age groups on Kwajalein and Majuro suggest that relocation to these atolls in part may have been responsible for their exceptionally large populations. Mobility almost certainly played an important role elsewhere in the Marshalls as well, likely accounting for depopulation on some island units and population growth on others.

TABLE 12. Age-Specific Death Rates in the Marshall Islands: 1967, 1970, 1973, 1980, and 1988

Age Group	1967	1970	1973	1980	1988	Average
Total	5.4[a]	5.9	6.0[a]	2.6	8.8	6.0[a]
<1	21.8	20.3	46.9	13.6	59.5	34.5
1-4	1.9	1.6	3.7	1.4	9.3	4.5
5-9	0.7	0.9	0.5	-	1.8	0.9
10-14	0.8	0.7	1.3	0.5	1.5	1.0
15-19	2.0	1.2	1.1	0.7	2.4	1.5
20-24	-	1.2	1.4	1.2	3.4	1.8
25-29	1.3	-	0.6	0.9	3.6	1.7
30-34	3.9	3.4	2.8	1.7	3.8	3.1
35-39	-	0.8	5.4	0.9	4.6	2.7
40-44	3.3	4.6	5.9	1.2	5.4	4.3
45-49	4.1	6.8	5.2	7.4	7.2	6.3
50-54	7.0	8.8	10.8	5.7	10.8	8.7
55-59	9.7	21.1	15.2	9.0	14.7	14.3
60-64	17.2	15.3	9.7	15.6	22.0	16.2
65-69	13.9	37.4	16.8	7.1	34.9	22.8
70-74	45.5	73.4	31.4	8.2	59.0	43.3
75+	60.2	113.8	53.5	26.9	137.8	77.2

Sources: See Table 11.

[a]Includes individuals whose age group was listed as "not stated'; 1967 total death rate also includes individuals whose age ***at death*** was "not stated."

Regional Demography in 1970

In 1970, the U.S. Bureau of the Census conducted the first of its two censuses of the Marshall Islands (U.S. Bureau of the Census 1972). Sources of inaccuracy have been identified in this census for certain portions of the TTPI--notably problems with persons moving from one place to another during the census, complicated by possible undercounts in some areas. Although researchers have not identified such problems in the Marshall Islands data, some of the 1970 results are highly questionable, as discussed below.

Dramatic changes in Marshall Islands population occurred in the three years between 1967 and 1970. The most obvious was population growth (see Table 2); the population of the Marshalls increased by 23.2 percent over the three years examined, at an average annual rate of 7.2 percent.[4] The greatest increase occurred in the Ralik chain (see Table 3). Surprisingly, most island units in this chain actually lost population

between 1967 and 1970; the population of Jaluit Atoll, for instance, decreased by more than 600 persons. But demographic growth on Kwajalein Atoll countered these widespread losses, the population increasing by roughly 4,300 persons over the same period; once again, most of this increase occurred on the small islet of Ebeye. The population of the Ratak chain also grew between 1967 and 1970. As was the case in 1967, many island units in this chain lost population. The main exception was Majuro Atoll, where population increased by nearly 2,200 persons. Together, Kwajalein and Majuro atolls accounted for more than 66.4 percent of the Marshalls' total 1970 population. The population densities on these two atolls were much greater than any previously documented in the region (see Table 4).

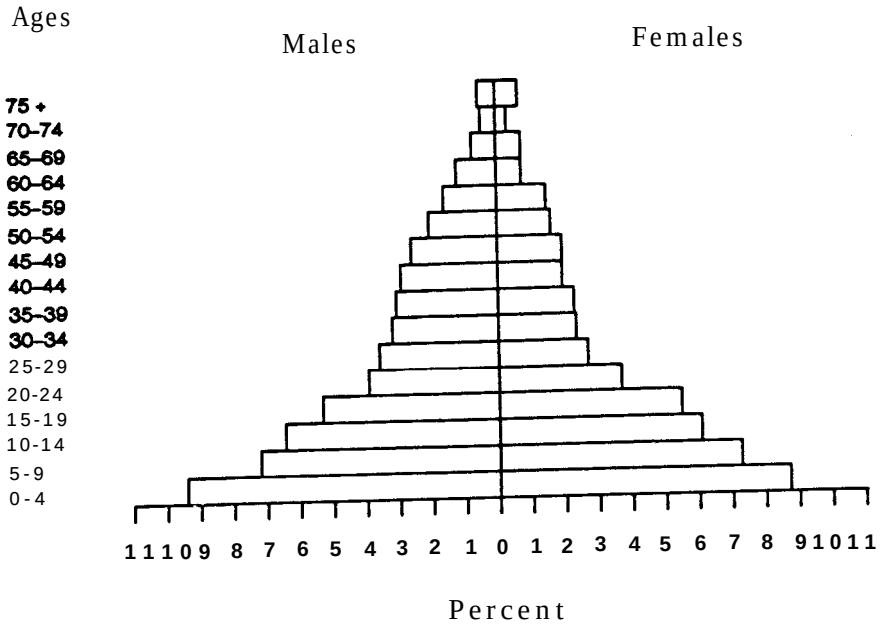
Data on the age composition of the Marshall Islands as a whole in 1970 indicate relative decreases both in individuals aged 14 years and younger and in individuals aged 60 years and older (Figure 5), with the median age increasing from that recorded in 1967 to 17.5 years (U.S. Bureau of the Census 1972: 15). The decrease in the proportion of the population aged 4 years and younger suggests a likely decline in fertility --which is consistent with available vital statistics (see Table 9) but inconsistent with the rapid population growth documented during the three years preceding the 1970 census.

The crude death rate increased between 1967 and 1970, although infant mortality apparently fell slightly (see Table 12). This decrease in infant mortality in part would have countered the decrease in fertility indicated between 1967 and 1970. Because data on mobility in 1970 are unavailable, the degree to which this process contributed to population growth throughout the Marshalls, and particularly on Kwajalein and Majuro atolls, is uncertain--though most of the population growth experienced on these two atolls almost certainly would have been due to in-migration.

Regional Demography in 1973

Because of likely problems with the 1970 census data, the Trust Territory High Commissioner authorized another census in 1973 (Office of Census Coordinator 1975). The results of this census indicated that the population of the Marshall Islands continued to increase rapidly (see Table 2), though the 3.0 percent average annual growth evident in the early 1970s was considerably slower than the rate of increase suggested for the late 1960s. Available data indicate that the Ralik chain lost pop-

Age and Sex Distribution, Marshall Islands: 1970



Age and Sex Distribution, Marshall Islands: 1973

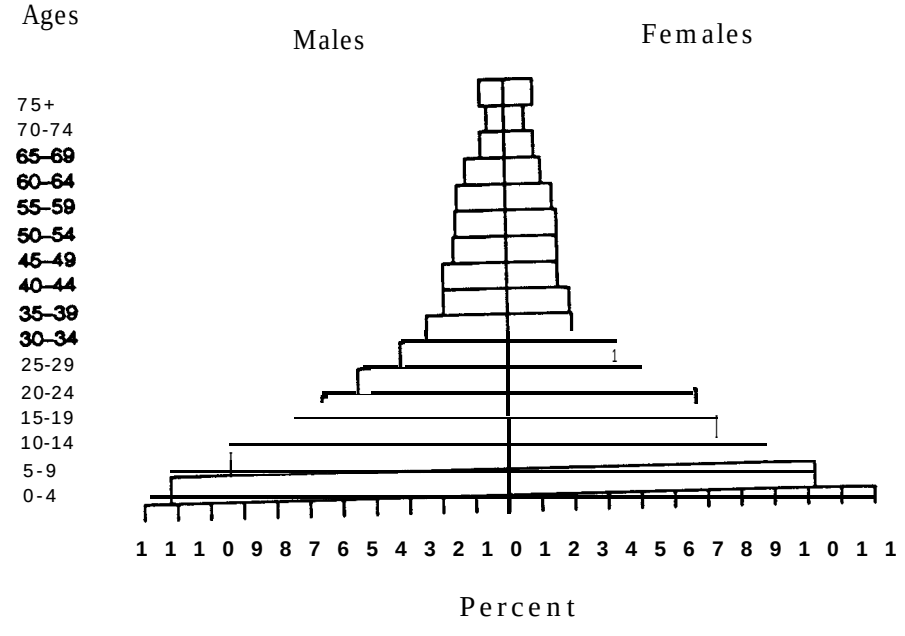


FIGURE 5. Population pyramids: 1970, 1973.

ulation between 1970 and 1973 (see Table 3). Although the population on several island units in this chain declined, the main decrease in population apparently occurred on Ebeye in Kwajalein Atoll. In contrast, the number of inhabitants on Jaluit Atoll apparently grew markedly over the same time period. The population of the Ratak chain increased substantially during the early 1970s. Of the several island units that shared in this population growth--including Arno, Likiep, and Mili atolls--Majuro Atoll grew most rapidly with the addition of nearly 2,900 persons.

Pertinent data indicate that the age composition of the Marshall Islands in 1973 was similar to that of 1967--most notably in the proportion aged 14 years or younger, the proportion aged 60 years or older (see Figure 5), and the median age of 16.0 years. In a slight shift from earlier years examined, the Ralik chain contained larger proportions of both the younger *and* older age groups than did the Marshall Islands as a whole (Table 13). The age composition of the individual island units varied greatly once again. Focusing on the atolls that experienced the greatest change since 1970, note that Kwajalein Atoll contained proportionally more younger individuals (aged 14 years and less) than the Marshalls as a whole, and fewer older ones (aged 60 years-plus), while Majuro contained proportionally fewer of both groups. Compared to data from 1967, the relative representation of the youngest and oldest age groups increased on Kwajalein Atoll and decreased on Majuro Atoll by 1973.

Data on fertility for the Marshall Islands as a whole indicate a slight increase between 1970 and 1973 in all measures but total fertility rate (see Table 9). Crude death rate also increased slightly (see Table 12). Changes in regionwide mortality during the early 1970s included in particular a substantial increase in mortality during the first year of life and a decrease in mortality among individuals aged 55 years and older.

Data on mobility of TTPI-born persons in the Marshall Islands in 1973 describe a population that was quite mobile within the Marshalls. Slightly more than half the TTPI-born persons living in the Marshalls in 1973 were Marshall Islanders residing in an island unit other than their home area (Table 14). Mobility was less pronounced in the Ralik than in the Ratak chain. Most island units contained a majority of individuals who considered that unit their home. Major exceptions to this tendency were Kwajalein and Majuro atolls, suggesting that in-migration had been extremely important to population growth there (until 1973 for Majuro Atoll and previously for Kwajalein Atoll). Two other exceptions

TABLE 13. Population by Age and Area: 1973

Island Unit	Total Persons	Age Group (Percentage)[a] <15	15-24	25-59	60+
Marshall Islands	25,045[b]	47.7	19.8	26.4	6.0
Ralik Chain	10,692	50.7	15.3	27.5	6.5
Ailinglapalap	1,100	50.1	17.5	24.9	7.5
Bikini	75	26.7	24.0	45.3	4.0
Ebon	740	49.7	15.0	22.4	12.4
Jabat	70	51.4	18.6	20.0	10.0
Jaluit	925	50.8	13.1	24.1	12.0
Kili	360	46.9	18.1	29.2	5.8
Kwajalein	5,469	49.4	15.7	30.6	4.2
Lae	154	57.8	11.0	20.8	9.7
Lib	98	62.2	13.3	20.4	4.1
Namorik	431	54.1	12.1	21.3	11.8
Namu	493	57.6	13.0	24.7	4.7
Rongelap	165	58.2	9.1	23.6	9.1
Ujae	209	56.5	13.9	22.0	7.7
Ujelang	342	53.5	16.7	25.4	4.4
Wotho	61	62.3	11.5	21.3	4.9
Ratak Chain	14,334	45.4	23.1	25.5	5.7
Ailuk	335	59.1	10.1	23.3	7.5
Arno	1,120	50.6	16.2	25.0	8.2
Aur	300	55.0	14.7	23.7	6.3
Likiep	406	53.9	14.5	24.4	7.1
Majuro	10,290	42.4	26.4	26.1	4.9
Maloelap	432	49.1	19.0	24.5	6.7
Mejit	271	55.4	11.1	22.5	11.1
Mili	538	54.3	15.6	23.2	6.7
Utrik	217	55.8	12.9	23.5	7.4
Wotje	425	53.6	13.9	23.8	8.7

Source: Office of Census Coordinator 1975.

[a]Percentages may not sum to precisely 100.0 due to the exclusion of 47 individuals whose ages were "not specified."

[b]Includes 19 individuals whose residence was "not specified."

are Bikini and Ujelang atolls. On the former, people evacuated in the late 1940s to permit nuclear testing had begun to move back (in 1972). On Ujelang Atoll, the large percentage of residents claiming a home district elsewhere in the Marshalls probably consists largely of people evacuated from Enewetak Atoll in the late 1940s (again to permit nuclear testing), though this figure seems excessively high.

TABLE 14. **TTPI-born Population by Area of Usual Residence, According to Home District: 1973**

Usual Residence	Total Persons	Home District (Percentage)			
		Same Island Unit	Elsewhere in Marshalls	Elsewhere in TTPI	Outside of TTPI
Marshall Islands	24,258	41.2	55.9	2.2	0.6
Ralik Chain	10,522	52.4	44.4	2.5	0.8
Ailinglapalap	1,098	85.2	14.6	0.3	-
Bikini	66	16.7	71.2	12.1	-
Ebon	736	79.3	20.2	0.4	-
Jabat	70	64.3	35.7	-	-
Jaluit	906	79.8	19.5	0.7	-
Kili	360	56.1	43.9	-	-
Kwajalein	5,342	29.5	64.6	4.3	1.6
Lae	154	89.6	10.4	-	-
Lib	98	83.7	16.3	-	-
Namorik	425	87.0	12.0	0.9	-
Namu	493	95.5	4.5	-	-
Rongelap	163	81.6	17.8	0.6	-
Ujae	208	91.3	8.7	-	-
Ujelang	342	0.3	98.5	1.2	-
Wotho	61	80.3	19.7	-	-
Ratak Chain	13,736	32.7	64.8	2.0	0.5
Ailuk	335	94.6	5.4	-	-
Arno	1,112	67.7	32.2	0.1	-
Aur	300	79.0	21.0	-	-
Likiep	406	73.9	26.1	-	-
Majuro	9,735	15.7	80.8	2.7	0.7
Maloelap	428	83.6	16.1	0.2	-
Mejit	270	89.6	10.4	-	-
Mili	514	72.0	28.0	-	-
Utrik	217	70.0	30.0	-	-
Wotje	419	57.8	41.8	0.5	-

Source: Office of Census Coordinator 1975.
Note: Calculations do not include one individual whose home district was "not stated."*

Regional Demography in 1980

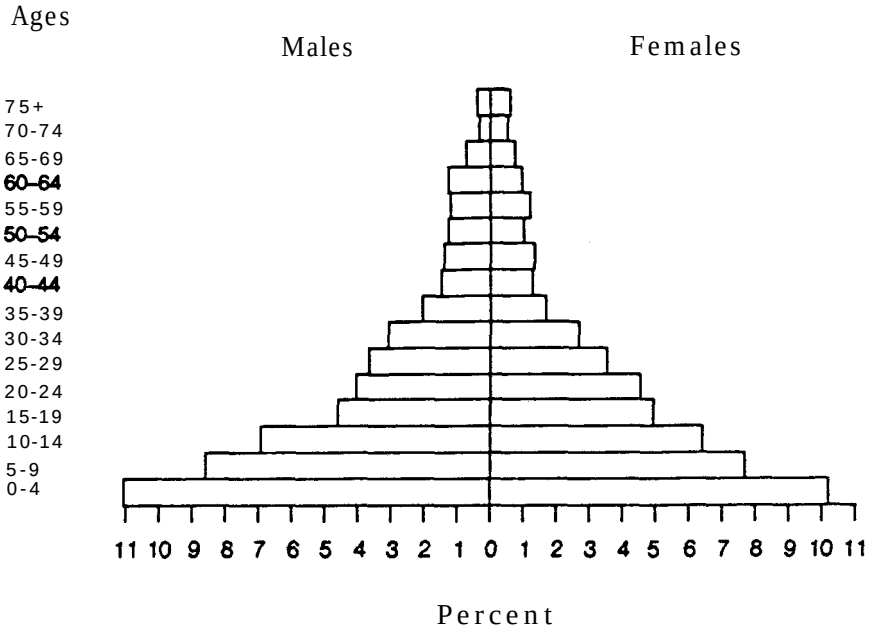
Data from the 1980 census suggest that 3.0 percent annual population growth in the Marshall Islands continued from 1973 until the end of the decade (U.S. Bureau of the Census 1983a) (see Table 2). Some concern exists that the 1980 census was an undercount; if so, population growth would have been greater during the mid- and late 1970s than the

recorded data suggest. The data available indicate that both the Ralik and Ratak chains grew similarly, with increases tending to be more dispersed among island units than previously seen (see Table 3). Kwajalein and Majuro atolls once again experienced the greatest absolute growth between 1973 and 1980. But changes deserving mention as well include substantial increases in population on Arno and Jaluit atolls and the resettlement of Enewetak Atoll for the first time since its evacuation during the late 1940s (Mason 1989:36).

Previously identified trends in the changing age composition of Marshall Islands population continued through the last part of the 1970s: an increase in the relative number of young persons and a decrease in the relative number of old persons (Figure 6). As one would expect, the median age decreased accordingly, to 14.8 years (U.S. Bureau of the Census 1983a:8). Once again, proportionally more individuals aged 14 years and younger, and proportionally fewer aged 60 years and older, lived in the Ralik chain than in the Marshalls as a whole (Table 15). Compared to the entire region in 1980, Kwajalein Atoll contained a slightly greater proportion of individuals belonging to the younger age group and a lesser proportion of individuals belonging to the older age group--the former increasing and the latter decreasing since 1973. Majuro Atoll, in turn, contained proportionally fewer young and old persons than the region as a whole in 1980, though the magnitude of change from 1973 once again was slight. The age profiles for Arno and Jaluit atolls both indicate greater relative representation of young and old than in the Marshalls as a whole.

Compared to similar data from the preceding three census years, fertility decreased in 1980 (see Table 9), though different data sources present conflicting results (see also Table 10, and notes on each table) and persisting high fertility is likely given the demographic structure of the republic. A comparison of fertility for individual island units in 1967 and 1980 indicates an increase for most places in the Marshalls, more so for the Ralik than Ratak chain. Fertility on Majuro Atoll in 1980 was comparable to that documented for the atoll in 1967; however, Kwajalein Atoll apparently experienced a marked increase in fertility. Mortality in the Marshall Islands as a whole was much lower in 1980 than in any of the other census years considered in this study (see Table 12). Unfortunately, the 1980 mortality measures are excessively low in comparison to the values one might expect in Micronesia during the latter half of the twentieth century, causing one to question their accuracy (see, for instance, the graph of *estimated* crude death rates in the republic [Republic of the Marshall Islands 1990:76]).

Age and Sex Distribution, Marshall Islands: 1980



Age and Sex Distribution, Marshall Islands: 1988

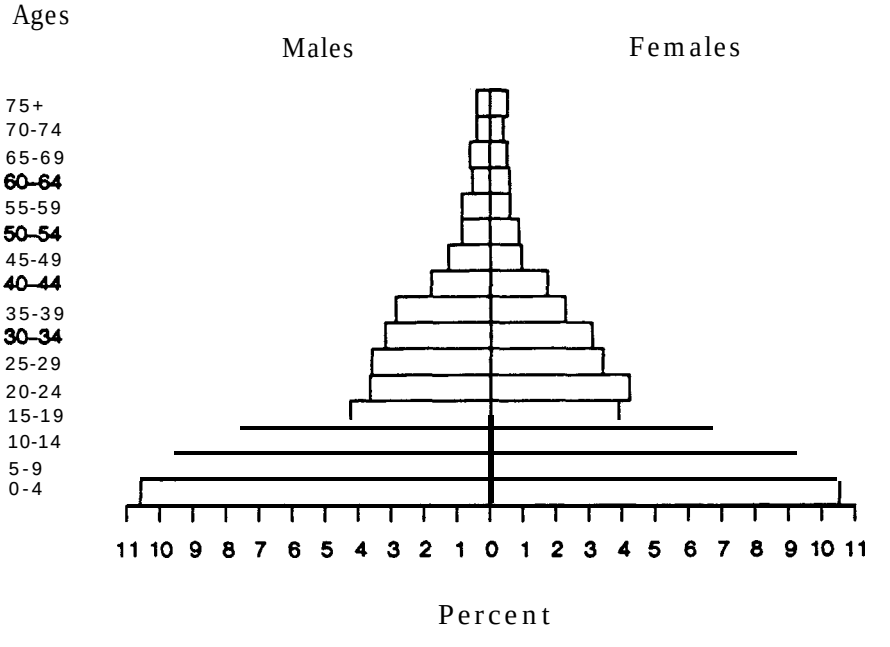


FIGURE 6. Population pyramids: 1980, 1988.

TABLE 15. Population by Age and Area: 1980

Island Unit	Total Persons	Age Group (Percentage) <15	15-24	25-59	60+
Marshall Islands	30,873	50.5	18.0	26.3	5.2
Ralik Chain	13,684	52.3	16.7	26.0	5.0
Ailinglapalap	1,385	55.4	15.5	22.4	6.7
Ebon	887	52.2	15.6	24.0	8.2
Enewetak	542	50.7	18.8	27.5	3.0
Jabat	72	58.3	11.1	22.2	8.3
Jaluit	1,450	52.8	16.1	23.4	7.6
Kili	489	46.6	17.2	32.1	4.1
Kwajalein	6,624	50.8	17.0	28.4	3.8
Lae	237	55.7	17.7	20.3	6.3
Lib	98	55.1	20.4	23.5	1.0
Namorik	617	61.1	10.7	22.0	6.2
Namu	654	50.2	21.4	23.5	4.9
Rongelap	235	57.4	14.9	22.6	5.1
Ujae	309	55.3	20.7	18.1	5.8
Wotho	85	62.4	12.9	23.5	1.2
Ratak Chain	17,189	49.0	19.1	26.6	5.3
Ailuk	413	52.3	15.0	26.6	6.1
Arno	1,487	54.8	13.8	25.2	6.2
Aur	444	53.6	19.4	23.0	4.1
Likiep	481	51.4	17.9	23.5	7.3
Majuro	11,791	47.1	20.1	27.8	5.0
Maloelap	614	53.9	17.1	25.2	3.7
Mejit	325	54.2	15.1	23.7	7.1
Mili	763	51.9	20.3	22.0	5.8
Utrik	336	47.9	21.1	22.9	8.0
Wotje	535	53.3	16.4	23.4	6.9

Source: U.S. Bureau of the Census 1983a.

Data on mobility in 1980, although not strictly comparable to those from 1973 (short-term versus lifetime mobility, respectively), indicate that a major change in the movement of people occurred sometime during the mid- and late 1970s--describing a population that had become less mobile than before. For the Marshalls as a whole, as well as for both major island chains, roughly 90 percent of the population aged 5 years and over resided on the same island unit in 1980 as in 1975 (Table 16). With a few minor exceptions, this evidence of a less mobile population holds for major island units throughout the Marshalls. Thus the wide-

TABLE 16. **Population by Area, According to Place of Residence in 1975: 1980**

Island Unit	Total Persons[a]	Place of Residence in 1975 (Percentage)			
		Same Island Unit	Elsewhere in Marshalls	Elsewhere in TTPI	Outside of TTPI
Marshall Islands	22,963	89.4	9.2	0.3	1.0
Ralik Chain	9,947	91.3	8.1	0.2	0.4
Ailinglapalap	962	90.4	9.3	0.2	0.1
Ebon	632	99.7	-	0.3	-
Enewetak	306	0.7	99.0	-	0.3
Jabat	56	58.9	41.1	-	-
Jaluit	1,105	94.7	4.8	-	0.5
Kili	384	99.7	0.3	-	-
Kwajalein	4,848	95.0	4.1	0.3	0.6
Lae	182	97.8	2.2	-	-
Lib	74	89.2	10.8	-	-
Namorik	443	90.7	9.3	-	-
Namu	493	91.7	8.1	-	0.2
Rongelap	177	93.8	5.1	0.6	0.6
Ujae	222	92.8	7.2	-	-
Wotho	63	68.3	30.2	-	1.6
Ratak Chain	13,016	88.0	10.1	0.4	1.5
Ailuk	289	95.5	4.5	-	-
Arno	1,053	92.8	7.0	0.1	0.1
Aur	339	92.3	7.7	-	-
Likiep	322	88.5	10.9	0.3	0.3
Majuro	9,120	87.1	10.4	0.5	2.0
Maloelap	433	89.8	9.7	-	0.5
Mejit	249	83.9	15.3	0.8	-
Mili	536	83.0	15.5	0.2	1.3
Utrik	256	98.8	1.2	-	-
Wotje	419	86.2	13.6	-	0.2

Source: U.S. Bureau of the Census 1983b.

[a]Includes only those individuals more than 5 years old; excludes 39 individuals whose place of residence in 1975 was not given.

spread population increases for various island units throughout the Marshall Islands between 1973 and 1980 apparently were due to natural increase as opposed to movement of people between places. Although migration to Kwajalein Atoll was relatively low between 1975 and 1980, relocation to Majuro Atoll in 1975 or later accounted for nearly 13 percent of its 1980 population aged over five years.

Regional Demography in 1988

The most recent census of the Marshall Islands, conducted in November 1988 (Republic of the Marshall Islands 1989), indicates that total population increased by more than 40.5 percent from 1980--the result of average annual growth approaching 4.3 percent (see Table 2). Such a rate of increase is quite rapid, and it bears noting once again that in part this high value may be a product of an undercount in the 1980 census. Much of this apparent increase occurred in the Ratak chain, though the population of virtually every island unit in the region grew by some amount (see Table 3). Majuro and Kwajalein atolls once again experienced the greatest absolute growth between 1980 and 1988. The population of Majuro Atoll increased by nearly 7,900 persons between 1980 and 1988, and together with Kwajalein Atoll accounted for more than 84.4 percent of regional demographic growth over these eight years; by 1988, slightly more than two-thirds of the republic's total population resided on these two atolls. The number of inhabitants on Ailinglapalap, Arno, and Jaluit atolls each grew to roughly 1,700 persons by 1988, while the populations of Namorik and Namu atolls grew by large relative amounts. The Greenpeace ship *Rainbow Warrior* relocated the population of Rongelap Atoll to Kwajalein Atoll in 1985 (Mason 1989: 36) because of persisting radioactive pollution initially blown in from a nearby nuclear test during the 1950s (Hines 1962:165-180; Alcalay 1984: 30-31)--accounting for part of the population increase on Kwajalein.

The relative increase in young persons, coupled with a relative decrease in older persons, continued in the Marshall Islands throughout the 1980s (Figure 6). As a result, the median age for the region decreased to 14.0 years (Republic of the Marshall Islands 1990:64). Similarly, the tendency for the Ralik chain to contain a greater proportion of individuals aged 14 years and younger, and a lesser proportion of individuals aged 60 years and older, persisted through 1988 (Table 17). Compared to the region, Kwajalein Atoll contained proportionally more individuals younger than 60 years; Majuro Atoll contained proportionally fewer inhabitants aged 60 years or less, though it contained relatively more individuals aged 15-59 years (in general, working ages) than did the region as a whole. By 1988, Ailinglapalap, Arno, Namorik, and Ujae atolls contained relatively large numbers of individuals aged 14 years and younger, suggesting the important role played by fertility in the recent growth of these four island units.

Fertility increased at a regional level between 1980 and 1988, as indi-

TABLE 17. **Population by Age and Area: 1988**

Island Unit	Total Persons	Age Group (Percentage) <15	15-24	25-59	60+
Marshall Islands	43,380	51.0	17.5	27.1	4.4
Ralik Chain	17,502	53.9	16.0	26.4	3.6
Ailinglapalap	1,715	60.9	12.1	22.9	4.1
Bikini	10	-	20.0	80.0	-
Ebon	741	59.8	11.3	24.2	4.7
Enewetak	715	52.4	17.5	26.9	3.2
Jabat	112	55.4	14.3	23.2	7.1
Jaluit	1,709	53.9	18.7	22.4	5.0
Kili	602	51.2	13.3	30.6	5.0
Kwajalein	9,311	51.4	17.0	28.6	3.1
Lae	319	58.0	17.2	22.3	2.5
Lib	115	53.9	9.6	33.0	3.5
Namorik	814	60.8	12.7	21.0	5.5
Namu	801	54.9	18.4	23.3	3.4
Ujae	448	61.4	12.7	24.1	1.8
Wotho	90	53.3	13.3	25.6	7.8
Ratak Chain	25,878	49.1	18.5	27.5	4.9
Ailuk	488	57.6	13.7	23.4	5.3
Arno	1,656	58.7	14.9	21.6	4.9
Aur	438	55.3	16.9	24.2	3.7
Likiep	482	54.6	13.1	24.5	7.9
Majuro	19,664	46.7	19.6	28.9	4.8
Maloelap	796	54.6	16.2	24.9	4.3
Mejit	445	54.2	12.6	28.3	4.9
Mili	854	56.8	15.1	23.3	4.8
Utrik	409	54.3	16.4	23.0	6.4
Wotje	646	56.7	17.5	22.0	3.9

Source: Republic of the Marshall Islands 1989.

cated by substantial growth in all three measures considered in this study (see Table 9). Mortality also increased markedly between 1980 and 1988, with the crude death rate as well as infant mortality exceeding the measures for any year after the mid-1960s (see Table 12). Note that this indication of increased mortality contrasts with estimates prepared by the republic's Office of Planning and Statistics, which suggest a steady *decrease* in mortality since 1974 (Republic of the Marshall Islands 1990:76). Increasing mortality also is inconsistent with the substantial population growth experienced in the Marshalls over the first eight years of the 1980s.

Data on population mobility are available for 1988, though once again they are not strictly comparable to the information presented above for earlier years, Information on population by place of birth indicates that the inhabitants living in the Marshall Islands in 1988 were very mobile throughout their lifetimes within the region itself: Though nearly 60.0 percent of the total inhabitants were born in the island unit in which they resided in 1988, 36.6 percent were born elsewhere in the Marshalls; conversely, only about 3.6 percent moved to the Marshall Islands from outside the region (Table 18). Majuro Atoll had the largest proportion of in-migrants for a highly populated place; Bikini and Enewetak both show signs of high in-migration, the result of resettlement by people born elsewhere during three decades of nuclear exile. In terms of migration within the Marshalls between 1980 and 1988, available data indicate that despite general growth throughout the region most island units experienced negative net migration during this time period (Table 18). Major exceptions to this trend once again were Majuro and Kwajalein atolls, the former gaining more than 1,400 persons through migration.

Regional Demographic Change in the Marshall Islands

In the preceding section, we presented data on the demography of the Marshall Islands throughout the twentieth century. Two types of demographic change characterized this republic over the past fifty years: population growth in the Marshalls as a whole, and changing geographical arrangement of population. The regional demographic evolution has been a complex process, with a number of possible causes yielding different configurations of population over time. Changing numbers and distributions of people in an area are important, on the one hand often signaling fundamental cultural and economic changes while at the same time representing basic adaptive challenges. With this latter thought in mind, we examine both the causes and the repercussions of regional demographic change in the Marshall Islands in greater detail.

Demographic Processes Underlying Population Change in the Marshall Islands

Although the precontact population of the Marshall Islands is completely open to speculation owing to lack of reliable data, the possible total of 15,000 to 16,000 persons (Kramer and Nevermann 1938:172) lies within the realm of possibility (see also Hermann 1909559). By

TABLE 18. Population by Area, According to Place of Birth and Internal (within Republic of the Marshall Islands) Net Migration: 1988

Island Unit	Total Persons	Place of Birth (Percentage)				Net Migration
		Same Island Unit	Elsewhere in Marshalls	Elsewhere in Micronesia	Outside of Micronesia	Within Marshalls 1980-1988
Marshall Islands	43,380	59.8	36.6	1.7	1.9	...
Ralik Chain	17,502	62.2	35.4	1.2	1.1	...
Ailinglapalap	1,715	74.9	24.1	0.7	0.3	-73
Bikini	10	-	80.0	-	20.0	-4
Ebon	741	80.0	19.6	0.1	0.3	-294
Enewetak	715	26.3	71.3	1.8	0.6	85
Jabat	112	36.6	63.4	-	-	28
Jaluit	1,709	42.3	55.9	1.1	0.8	-236
Kili	602	65.4	33.2	0.3	1.0	-26
Kwajalein	9,311	63.2	33.5	1.6	1.7	187
Lae	319	70.2	29.8	-	-	-6
Lib	115	46.1	53.9	-	-	-41
Namorik	814	73.5	24.6	1.6	0.4	-147
Namu	801	79.4	20.1	-	0.5	-77
Rongelap	-	-	-	-	-	-269
Ujae	448	54.0	45.8	-	0.2	62
Ujelang	-	-	-	-	-	-41
Wotho	90	37.8	61.1	-	1.1	-15

Ratak Chain	25,878	58.2	37.4	2.0	2.3	. . .
Ailuk	488	76.2	23.6	-	0.2	-81
Arno	1,656	69.9	29.2	0.4	0.5	-266
Aur	438	73.7	26.0	-	0.2	-90
Likiep	482	65.4	33.8	-	0.8	-83
Majuro	19,664	54.9	39.6	2.5	2.9	1,429
Maloelap	796	69.6	29.9	0.3	0.3	-50
Mejit	445	70.1	29.4	0.2	0.2	-58
Mili	854	62.3	35.4	1.9	0.5	166
Utrik	409	67.5	32.5	-	-	-53
Wotje	646	65.2	33.7	0.2	0.9	-47

Source: Republic of the Marshall Islands 1989.

1883 the population of the Marshalls had declined to about 11,000 (Jung 1893, 4:260), probably attributable to a combination of increased mortality (from the large number of introduced diseases and natural disasters, noted above) and decreased fertility (probably due primarily to gonorrhea, coupled with a possible decrease in persons of reproductive age; see Spennemann 1992:10). Although Finsch estimated 7,000-8,000 inhabitants in the Marshall Islands in the 1880s (roughly 4,000 in the Ratak chain and 3,600 in the Ralik chain) (Finsch 1893:123), his estimate appears excessively low and indicates more rapid depopulation than likely occurred (see Yanaihara 1940:44). Gradual population decline apparently continued throughout the nineteenth century, at some point (possibly early in the twentieth century) ceasing and beginning a slow recovery (Kramer and Nevermann 1938: 172). Although the lowest point of Marshall Islands population is unknown, after possibly a decade of demographic recovery total inhabitants numbered fewer than 9,300 in 1909 (Wiens 1962:465).

Slow population growth continued into the Japanese administration, probably interrupted by World War II and the increased mortality (as well as interruption to normal cultural activities, such as reproductive behavior) that accompanied it. Over the past fifty years, the Marshall Islands have experienced rapid demographic growth; the approximately 3.0 percent average annual rate of increase since World War II is similar to the growth that developing countries throughout the world continue to experience (Population Reference Bureau 1990). Typically, such dramatic growth may be explained in terms of a changing balance between fertility and mortality. Measures for both of these mechanisms tend to remain high in more traditional sociocultural systems, serving to counteract one another and produce a population whose size remains constant over time. Although the process of acculturation can have differing effects on the fertility and mortality of traditional sociocultural systems, conventional wisdom argues that its most dramatic direct impacts are on the latter--with improved health care and education on health-related matters decreasing mortality across all age groups. This situation was proposed for the Trust Territory as a whole from the Japanese period until the first postwar census in 1958, indicated by a slight rise in births and a major decrease in deaths (Taueber 1963:231). Similar processes apparently were under way in the Marshall Islands shortly after World War II (Spoehr 1949:25; Tobin 1967:61).

For the various census years examined, reliable vital statistics for the Marshall Islands often are unavailable. Nevertheless, the data collected suggest that certain changes in fertility and survivability (including lon-

gevity) may indeed account for the growth of Marshall Islands population. Crude birth rate figures, available beginning in the Japanese period, roughly doubled between 1935 and 1967, indicating about twice as many live births per thousand inhabitants in the latter year than in the former. The general fertility rate experienced a similar relative increase between the Japanese period (1930) and 1967. Comparable fertility data between 1967 and 1988 suggest that birth rates remained high through the latter year, though fluctuations in all measures considered are evident (see Table 9). Fertility varied between island units for the years when data are available. Of the places that experienced substantial population growth between 1967 and 1980, fertility was particularly high on Kwajalein Atoll--with other processes playing relatively greater roles in the population increase on Majuro Atoll (see Tables 10, 14, and 18).

To complement the overall increase in fertility, mortality in general declined at the regional level. Much of this probably was due to improved health care, coupled with the eradication of certain diseases and the development of natural immunity to others. Although natural disasters such as typhoons continued to claim some lives, major tropical storms are infrequent in the Marshalls (Fosberg 1990:9-10). Measured by crude death rate, mortality during census years 1967 through 1973 was roughly one-fourth that recorded during the period of Japanese administration, decreasing even further in 1980 (see Table 12) before resurging in 1988 (Republic of the Marshall Islands 1990:76). Comparing crude birth and death rates over time, we see a shift in the crude rate of natural increase from zero or slightly negative values during the Japanese administration to an annual gain of 33.8 to 40.5 persons per thousand between 1967 and 1988 (Figure 7). Although this *general* trend probably is accurate, once again one should avoid placing too much credence in the specific values of the measures, owing to questionable accuracy of certain vital statistics.

It is likely that declining infant mortality accounted for a large share of the overall decrease in mortality across the nearly seven decades examined. Unfortunately, information on infant mortality during the Japanese period is extremely limited. Results of a recently published study of infant mortality in the Marshall Islands indicate disagreement between direct and indirect methods of calculating this measure, though the authors make a compelling argument that infant mortality probably has decreased at least since 1973 (Levy and Booth 1988). Coupled with the relatively high crude rate of natural increase discussed immediately above, such shifts in infant mortality provide addi-

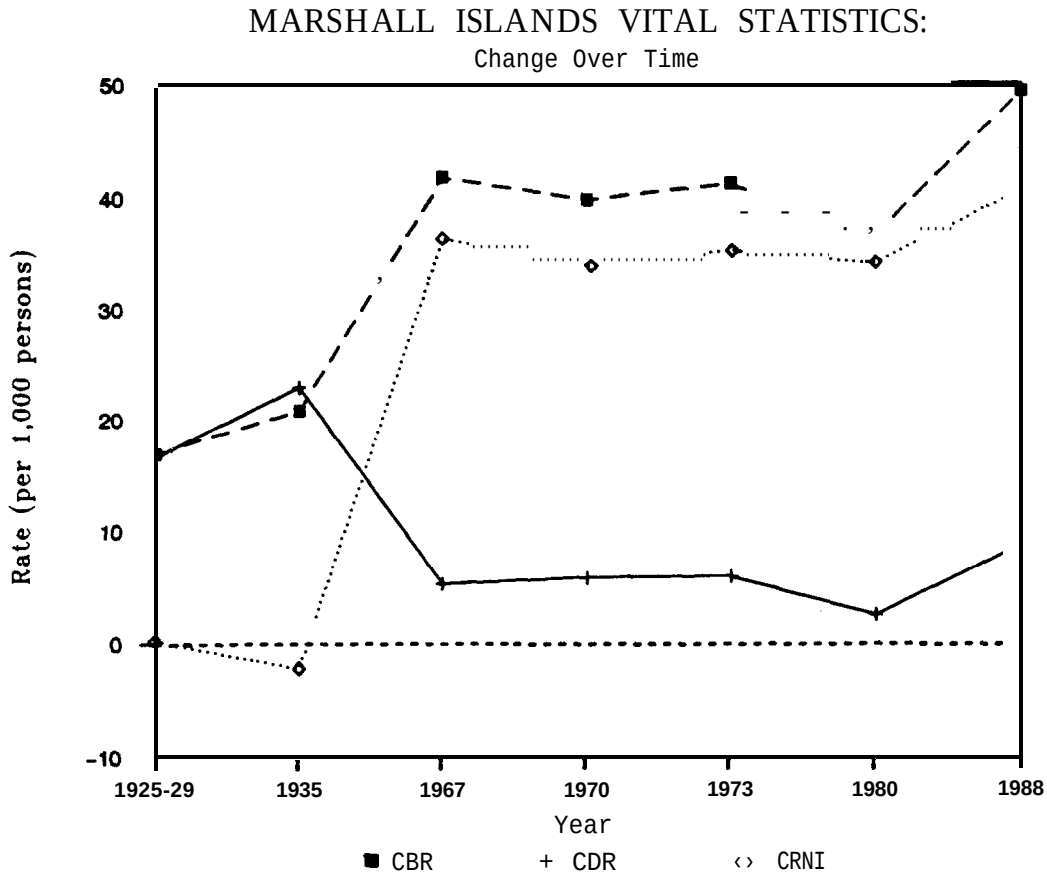


FIGURE 7. Change in crude birth rate (CBR), crude death rate (CDR), and crude rate of natural increase (CRNI) over time.

tional evidence that natural increase played a key role in Marshall Islands demographic growth.

The final cause of population change considered is migration. For the years examined in this article, migration into the Marshalls from other regions was minimal--excluding Japanese in-migrants during the late 1930s and early 1940s, whom we did not consider in our study. Migration within the region, however, often was responsible for major population changes on various island units. We can propose four phases of intraregional migration similar to those found elsewhere in Micronesia (Gorenflo and Levin 1993). Phase 1 consists of the precontact period of Marshall Islands history, when frequent, short-term mobility characterized most if not all of the region. Phase 2, occurring during the period of Japanese occupation, featured moderate movement between island units through the late 1930s (see Table 7) and much greater mobility during the war years--with virtually all interisland movement con-

trolled by the Japanese administrators. Phase 3 was marked by heavy movement between island units, as individuals relocated frequently for long periods of time; data from 1973 suggest such a trend (see Table 14), although given the nature of population change throughout the region it probably began shortly after World War II and continued until the mid-1970s. Phase 3 mobility in particular affected places with rapidly increasing populations--namely Kwajalein and Majuro atolls--where in-migration was responsible for much of the population growth experienced after the war (Connell 1983:14; Hezel 1991:279-280). Apart from the obvious tendency for relocation from rural island units to the two population centers, few specifics of this mobility surge are known; there may have been a tendency for migrants to select the closest of the two destinations, though the trend to relocate to the place where relatives live eventually took precedence (Connell 1983:20). Substantial migration to Ebeye Islet in Kwajalein Atoll became such a concern that the postwar administrators of the Marshalls made several attempts during the past three decades to limit relocation there--their "Operation Exodus" in one form or another generally meeting with only minimal success (see Alexander 1978:61-64; Connell 1983:25-26). Finally, Phase 4 of intraregional migration appears first in the 1980 census data and continues until the present throughout most of the Marshalls (see Tables 16 and 18). This last phase features reduced mobility, indicating that the major population movement characterizing Phase 3 had slowed considerably--though a slight resurgence between 1980 and 1988 is suggested for certain places (particularly Majuro Atoll). The limited mobility characteristic of Phase 4 apparently includes emigration from the Marshall Islands to the Commonwealth of the Northern Mariana Islands (CNMI) and Guam, places that recently have received large numbers of migrants from the Federated States of Micronesia (FSM) (Rubinstein and Levin 1992; Gorenflo and Levin 1993). As of 1990, only 103 individuals born in the Marshall Islands resided in the CNMI (U.S. Bureau of the Census 1992a:16), with 88 persons born in the Marshalls living in Guam (U.S. Bureau of the Census 1992b: 15).

Repercussions of Population Change in the Marshall Islands

In areas where acculturation likely caused substantial change in a traditional sociocultural system, the study of demographic evolution ideally is rooted in population data that predate the influence of other societies --in essence providing a basis against which to compare subsequent changes in demographic structure. In the present study this is not possi-

ble. The Marshall Islands had virtually no contact with sociocultural systems outside of Micronesia when first visited by Kotzebue in 1817 (Hezel 1983:92). Unfortunately, Marshall Islands demography is poorly documented before the period of German colonization some six decades later and not really well documented until the initial Japanese census of the region in 1920. Available information indicates that by 1900 much of the Marshalls was heavily acculturated--a process that increased during the period of Japanese occupation (Mason 1946:62; Spoehr 1949: 68; Murai 1953:9, 86-90). In lieu of adequate precontact data, we examine the repercussions of regional demographic change in the Marshalls through applying certain basic principles of regional organization and simple statistics to the data available.

Before the arrival of Europeans, the Marshall Islands comprised a series of small chiefdoms (Kotzebue 1967, 3:169-171), the most common level of sociocultural integration found in the Pacific during precontact times (Sahlins 1958:249; see Service 1971:133-169). The regional composition of these polities apparently varied, with different Marshallese chiefdoms encompassing in some instances several island units, in other instances a single island unit, and in still other instances portions of a single island unit (Mason 1946:36-37; Hezel 1983:94, 202). The foundation of traditional territorial organization of the region was the individual community or settlement, where each settlement consisted of a collection of homesteads on an islet or island unit (Mason 1946:27-29). Each island unit usually contained one or more settlements, with those in multisettlement atolls organized into districts. One or more lesser chiefs usually administered a district, reporting in turn to paramount chiefs located at central districts *(centers,* in human geography terms [Haggett, Cliff, and Frey 1977:97-110]).

Two aspects of traditional Marshallese regional organization are important for present purposes: the geographic breadth of control of chiefdoms usually consisted of relatively small areas; and, despite the presence of social and regional hierarchies, the movement of goods (including subsistence goods) between settlements was limited at best. A number of reasons could explain these characteristics, including basic logistical problems encountered in frequent travel over open seas by traditional means of transportation, further complicated by seasonally rough weather (see Spoehr 1949:64); and the inherent instability of Marshallese chiefdoms, whose size and areas of control frequently fluctuated with the fortunes of war (Kotzebue 1967, 3:166-167). However, in all likelihood one important factor limiting the size and breadth of these chiefdoms was the inability to generate amounts of surplus subsis-

tence sufficient to support the large numbers of nonfood producers that tend to be found in highly centralized regional hierarchies (see Sahlins 1958:114).

The basis of these subsistence limitations lies largely in the environment of the Marshall Islands. In traditional times, subsistence consisted of food collected from the sea and food grown on land (Kotzebue 1967, 3:150-158; see Tobin 1967:98; Mason 1968:280; Bryan 1972:82-111, 126-134). Although marine resources were much more abundant, both played key roles in Marshallese survival, with competition for land fueling much of the warfare among islanders during traditional times (Kiste 1974:5; Hezel 1983:94). Moreover, research in a similar setting has shown that nutrients provided by food grown on land were extremely important to precontact atolls--in effect representing a limit to the population that could be supported (Bayliss-Smith 1974). Agricultural productivity on coralline atolls tends to be low, constrained by small amounts of land covered by poor soil, and climatic and microenvironmental conditions often not conducive to growing food (see Fosberg 1949, 1953; Fosberg 1960:13-21, 169-184; Fosberg 1990:8-19; Wiens 1959, 1962:363-381; Knudson 1970:56-57). Most atolls in the Marshalls probably produced only enough food to support their resident populations (Mason 1946:4-5), with Marshallese during Kotzebue's first visit citing food shortages as a major reason both for periodic warfare (to acquire additional subsistence) and for implementing population control through infanticide (Kotzebue 1967, 3:128-129, 173). Within traditional Marshallese chiefdoms, the most common tribute was not surplus energy (food) but rather services (e.g., see Kotzebue 1967, 3: 170-171), as documented for other portions of Micronesia (see Burrows and Spiro 1957:170-171). Chiefs received food when visiting areas under their authority, often in the company of subjects from the central district as a means of asserting chiefly power (see Hezel 1983:202-203), but these occasions apparently were infrequent and usually occurred in ceremonial contexts such as the time of first harvest.

The picture of traditional Marshallese regional organization thus is one where large centers supported by surrounding hinterlands were absent, lacking adequate mechanisms for surplus production as well as the broad redistribution network necessary to maintain such a system. In stark contrast to traditional regional organization, the entire area currently contains two major centers of population and economic activity. Inhabitants of these centers include thousands of people who have no traditional rights to reside there (Alexander 1978:103-104), as prescribed by the Marshallese land-tenure system (see Tobin 1958; Pollock

1974; Mason 1987). The centers require substantial economic support beyond that available locally in order to survive. As discussed immediately above, the sociocultural foundation for such large-scale regional organization was absent in the traditional Marshall Islands. Even if the basis for a broad redistribution system did exist, the populations concentrated in modern centers have reached levels well in excess of regional support capabilities--for any hinterland one cares to define within the Marshall Islands. Obviously, such a regional setting could not evolve within a closed system; the basis for this development was provided by other nations, predominantly the United States.

One can begin to appreciate the degree of change in the regional demographic organization of the Marshall Islands through the use of some simple statistics. Hainline (1964, 1965) explored the formal relationship between the population of island units in Micronesia and certain environmental variables (representing aspects of geological composition, meteorological conditions, and biotic characteristics) via linear regression, where population on a particular island unit was modeled as a linear function of the variables of interest. Here we employ a similar method in modeling population as a function of two key variables: land area and annual precipitation. In considering the former we attempt to account for differing amounts of productive area available throughout the Marshall Islands, with subsistence grown on land assumed to be an important constraint on population size. In considering rainfall, in turn, we acknowledge the substantial regional variation--becoming increasingly scanty, seasonal, and unpredictable towards the northern part of the region (see Fosberg 1960:65-67, 133-147; Fosberg 1990:9; Environmental Sciences Services Administration 1968:385-388; National Oceanographic and Atmospheric Administration 1981: 348-350; National Oceanographic and Atmospheric Administration n.d.)--and greatly influencing the types and amount of crops that can be grown (Kiste 1974:12). We model population with a multiple regression on both land area and precipitation for each of the ten census years examined. One would expect a stronger statistical relationship between population and these two variables for the earlier years examined, with natural factors becoming less important in determining population distribution as the influence of outside cultures increased. This expectation is borne out in the changing values of R^2--the percentage of variance in population size explained by the two variables considered--decreasing from more than 55 percent in 1920 to roughly 9 percent in 1988 (Table 19).

Thus, even when compared to the acculturated regional organization

TABLE 19. Results of Regressing Population of Major Island Units in the Marshall Islands on Land Area and Average Annual Rainfall: Census Years

Year	R^2	Statistical Significance
1920	.55	$p < .01$
1925	.56	$p < .01$
1930	.52	$p < .01$
1935	.55	$p < .01$
1958	.39	$p < .01$
1967	.19	$.05 < p < .10$
1970	.06	$p > .10$
1973	.10	$p > .10$
1980	.11	$p > .10$
1988	.09	$p > .10$

found during Japanese times--after the Marshall Islands already had witnessed more than forty years of focused interaction with Germany--the current setting shows evidence of considerable decline in the relationship between population and two variables that generally indicate differing traditional productivity. That most Marshallese, particularly those residing in population centers, no longer rely upon traditional subsistence and economy is certain; forgoing traditional ways is the only means by which such a regional system could merge and survive. The point to be made here is the degree of change in regional demography and organization experienced in the Marshall Islands in comparison to traditional times--in an area whose capability for economic production and self-support still rests very much at traditional levels.

Further support for the magnitude of changes in regional organization, as well as insights on the nature of these changes, comes from a separate study through the application of selected spatial statistics (Gorenflo 1990). These analytical tools indicated two periods of similarity in the geographic arrangement of population, separated by the twenty-three-year period spanning 1935 and 1958. Measures of local demographic change indicated strong correspondence between consecutive pairs of census years both before 1935 and after 1958. Measures of regional demographic change, in contrast, indicated a significant tendency for places with like populations to be proximal prior to World War II, a tendency that disappeared after the war. A comparison of both local and regional demographic patterns between 1920 and 1988

points up the lack of similarity between the first and most recent census of the Marshall Islands--with considerable change in the geographic arrangement of population having resulted from nearly seven decades of incremental shifts.

Conclusion

The Marshall Islands have witnessed major demographic changes, both in total population and in the regional distribution of population, throughout their history. Some of the most dramatic changes occurred during the present century, the population more than quadrupling between 1935 and 1988. Much of this recent growth occurred in two major regional centers of population that emerged shortly after World War II, which together in 1988 contained nearly 67 percent of the republic's residents. There appear to be two causes of these demographic changes. Relevant data indicate that growth in the overall population resulted from increased survivability and longevity (probably due to improved medical treatment), coupled with increased fertility. The changing geographic distribution of population, in turn, resulted largely from migration--particularly to Majuro Atoll and Ebeye Islet from elsewhere in the Marshalls in search of wage labor, education, improved health care, and the numerous modern amenities provided at these centers (Alexander 1978; Connell 1983:22-25). Similar instances of demographic change have occurred throughout the Pacific during the second half of the twentieth century (Connell 1984). The implications of this change for the future of coralline atolls in general, and the Marshall Islands in particular, are of fundamental importance (see Connell 1986; Pollard 1989).

Perhaps the greatest insights on the present regional demographic organization in the Marshall Islands lie in the basic nature of regional systems in general. Such systems are described in a number of different contexts, often in idealized forms. The best known is Central Place Theory, essentially a model of regional economic organization in terrestrial settings where a series of assumptions--including a featureless unbounded plain, equal supply and demand, and perfect competition--produces a nested hexagonal lattice of interacting communities in a hierarchical settlement system (Lösch 1954; Christaller 1966). In a paper discussing settlement types in the Pacific, Spoehr called centers of population and economic activity "port towns" (Spoehr 1960). Regionally, port-town systems comprise collections of islands that form groups; a main island or settlement, the port, serves each group by providing a

means of interacting with the outside world--exporting surplus goods elsewhere and importing goods and information.

A characteristic common to both of these regional constructs in their idealized forms is some sort of symbiosis between center and hinterland: In Central Place Theory, central places provide goods to a hinterland, which in turn provides the demand needed to support the centers; in a port-town setting, centers provide the means of funneling goods to and from the world market beyond, the hinterland providing either exportable goods or a market for imported goods. In regional systems accompanying chiefdoms, one may characterize symbiosis in less stylized terms as a higher order center providing administrative guidance, specialized goods, and certain specialized services to a hinterland that supports the center through the flow of tribute in the form of subsistence goods and services (e.g., Sahlins 1963).

The regional system that evolved in the Marshall Islands over the past five decades appears to be unstable in part because it has no historical or cultural underpinnings. Perhaps more fundamental, the present system lacks the center-hinterland symbiosis so fundamental to sustainable regional systems. Centers in the Marshall Islands do provide certain services to outer-island units, including certain port functions and special services such as advanced medical treatment. But the hinterlands provide little to their related centers, the requirements of the centers well beyond the hinterland support capability. Moreover, in the process of their demographic evolution over the past five decades, the resident populations of outer-island units at various times were depleted in both total numbers and members of certain age groups as individuals migrated to centers--reducing the capacity of hinterlands to sustain themselves, let alone support concentrated centers of population (Connell 1983:27; see Marshall 1979; Levin and Gorenflo 1994). It is towards increased regional symbiosis, preferably through controlled systematic decentralization, that the Republic of the Marshall Islands must evolve if it hopes to develop into a sustainable, increasingly self-reliant system (Gorenflo 1990). The means to this end, unfortunately, appear anything but clear as the Marshallese population continues its rapid growth and geographic concentration.

NOTES

Several insights on demographic change in the Marshall Islands, and the ramifications of this change, emerged over the years from conversations with H. M. Gunasekera, Fran Hezel, Jim Maragos, Len Mason, Mary McCutcheon, and Han Raggers, though none of

these individuals should be held responsible for the contents of this article. Mary Kay Davies and Mayda Riopedre, of the Smithsonian Institution Anthropology Library, made several rare references available. Anuja Parikh kindly provided assistance in translating a passage of German text. Gayle Gorenflo helped with data input, and Diane LaSauce provided editorial assistance in the final stages of manuscript preparation.

1. Note that during the Japanese occupation the Jaluit District did not include Enewetak and Ujelang atolls, which administratively were part of the Pohnpei District of the Mandated Territory. Certain census calculations (see Table 7) and vital statistics for the Jaluit District thus do not include data on these two places.

2. Population change similar to that experienced in the Marshall Islands is not unique, sharing key similarities with demographic change documented elsewhere in Micronesia during the Japanese and U.S. administrations. The demographic history of Chuuk State in the Federated States of Micronesia (FSM) is virtually identical to that of the Marshalls--that is, a generally constant population during the Japanese period followed by rapid population growth during the ensuing U.S. administration (see Gorenflo 1993a). Kosrae and Pohnpei states (likewise in the FSM) similarly experienced rapid population growth during the U.S. administration, though their populations also increased during the Japanese administration (Gorenflo and Levin 1992; Gorenflo 1993b).

3. Because this study seeks to examine demographic change within a functioning sociocultural system, we focus exclusively upon Pacific Islanders inhabiting the Marshall Islands for the years 1920, 1925, 1930, and 1935. The number of Japanese citizens in the Mandated Territory varied during the three decades that Japan controlled the area, growing dramatically in the late 1930s as part of Japan's military buildup; these fluctuating numbers of ***imposed*** in-migrants would cloud any understanding of regional demographic change.

4. Population growth averaging 7.2 percent annually is virtually impossible in the absence of ***massive*** immigration, which did not occur in the Marshall Islands between 1967 and 1970. One potential explanation is that the 1970 census of population, already noted as inaccurate for certain districts in the TTPI, may have overcounted the 1970 population for the Marshalls--possibly counting people twice as they moved from place to place or possibly combining places in the Trust Territory incorrectly (and hence attributing to the Marshalls people who in fact did not live there). Attempts to examine the 1970 census data more closely for evidence of such shortcomings were unsuccessful, as the data tapes no longer exist. A second potential explanation is that the 1967 census represents an undercount. Generally, undercounts are much more likely to be a source of census error than overcounts. Unfortunately, in the present setting it is unclear which is responsible for problems in the Marshall Islands data at the end of the 1960s.

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