

Population History of Nauru: A Cautionary Tale

JANE H. UNDERWOOD

Department of Anthropology, University of Arizona, Tucson, AZ 85721

Abstract—Available records relating to Nauruan population attributes are critically evaluated to develop a reconstructed population history of this native Micronesian people. Historical evidence consists of documentation of the effects of diseases and modern warfare and more recent behavioral changes traceable to altered economic conditions. Unpredictable and dramatic fluctuations in population characteristics throughout the historic period are revealed, precluding the use of standard population models. Even structural similarities at widely separated time periods are shown to be insufficient evidence of stable population conditions, a cautionary finding for paleodemographers, archaeologists, and others working throughout the Pacific.

Introduction

In most cases, reports and information about native populations are particularly incomplete for the peoples inhabiting the smaller islands and atolls which comprise the majority of Pacific islands, especially in the area of Micronesia. Yet these are the populations whose continued survival and persistence in the precarious island habitat would have necessitated the most sensitive adjustments of demographic processes and interactions (Underwood, 1981). Among these were the populations inhabiting the most geographically isolated of Micronesian islands, Nauru and Banaba (Ocean). That isolation was effectively ended with the commercialized development of the islands, particularly of their phosphate deposits, and was accompanied by the accumulation of a wealth of population records and census returns, particularly those pertaining to Nauru.

I propose here to review and evaluate population records and census materials relating to the native population of Nauru, to describe the plausible kinds and levels of dynamic interactions which produced these population characteristics, and to develop a revised population history of Nauru which incorporates the results of this study. Finally, I will examine some of the limitations of applying population models in studies of anthropological populations which have experienced frequent and repeated episodes of major demographic disturbances.

Demographic and ecological models are essential tools in studies of anthropological populations, critical for moving beyond mere description to analyses of process. Part of refining these methods and establishing areas of proper application are tests of limits, limits beyond which the post-Contact population history of Nauru Island stands. The nature and extent of population data now available for Nauruans, the ecological features and historical events there—which preclude the use of model life tables or other analytical techniques assuming underlying stable vital rates—all these are similar to such conditions and events among many other Pacific island populations, suggesting extreme caution in broad

application of demographic models to reconstructing Pacific island population histories and dynamics. The present study suggests the very real dangers of uncritical applications of demographic models to studies in Oceanic prehistory: one need only imagine the conclusions which the archaeologist or paleodemographer of future centuries would logically and erroneously draw from comparing the structural similarities of the native populations of Nauru in 1908 and 1988.

Population Data and Dynamics

THE PRE-COLONIAL PERIOD

Because of its geographic isolation, some 165 miles west of Ocean Island, and an encircling reef which precluded ready shore landing, Nauru apparently provided a relatively secure haven for those few alien castaways and escaped convicts who had begun arriving at this remote site by at least the 1830s. The consequences of their presence upon the native population, as reported in the century following Nauru's reputed discovery in 1798 by Captain Fearn of the whaler, *Hunter*, were dramatic. Although Fearn did not land, he reported that he saw some 300 people in canoes and more on the beaches. By the 1830s, a dozen or more foreigners apparently lived on the island, and, in 1843, Commander T. B. Simpson of the *Giraffe* recorded from one of them the history of a reign of terror imposed upon natives and foreigners by John Jones, an escapee from the notorious Norfolk Island penal colony, who resided on Nauru until 1842. Simpson estimated the number of natives residing on the island as about 1,400, and he collected from George Lovett, a resident European, a list of seven other resident foreigners (Simpson, 1844). Captain Andrew Cheyne (1852) found the island "thickly peopled," but reported only two resident white men at the time of his visit in 1845. At about this period, there apparently took place the first of several attempts led by beachcombers to attack and take over visiting ships. By 1852, however, the Nauruans appear rather to have enlisted the aid of beachcombers in their own retaliation against the captain and crew of the brig, *Inga*, and in several subsequent attacks (Jones, 1861).

With the growing ill-repute of the Nauruans, rare visitors to the island in succeeding decades seldom collected or reported population estimates. One of these, recorded in *The Friend* (Anon., 1853), reported that a Mrs. M. D. Wallis who visited the island on August 9 (1852?) had been told by a foreign resident that the native population numbered some 1,500. Few clues to the population history of the Nauruans are found in those occasional reports which appeared thereafter and prior to the date of the first census in 1889. Captain E. B. Brown of the *Nightingale* reported the presence of three whites and a few Negroes at the time of his visit in October 1864, and he concluded that venereal disease was widespread among the natives (quoted in Hambruch, 1915). At least two reports refer to dispersals in the 1870s, involving the arrival of 23 Gilbertese on Nauru (Kretzschmer, 1913) and the presence of some 20 half-castes from Nauru on Kusaie (Wood, 1875). According to the reconstruction of old Nauruan lifeways prepared by Reverend and Mrs. Phillip A. Delaporte, who established a permanent mission on the island in November 1899, informants claimed that abortion had not been practiced, although senilicide had

been resorted to during periods of drought and starvation (Delaport, 1920). By 1879, shortly after the beginning of a protracted period of warfare on Nauru, Reverend E. T. Doane wrote (American Board of Foreign Missions, Letters, August 6, 1879) that Nauru possessed a “population six times that of Strong’s Island” (Kosrae), or roughly 1,200. The latter figure was probably closer to actual numbers than the estimated 1,500 to 1,800 reported in 1884 by Kapitän Geiseler (in Hager, 1886). In 1888, the German gunboat *Eber* arrived at Nauru to effect the formal German annexation of the island and the pacification of the warring factions of the population.

The first enumeration of the island’s residents conducted by the German administration reported a total native population in 1889 of 1,294, including 435 adult males, 573 adult females, 139 boys and 147 girls. Kretzschmer (1913) interpreted these figures as reflecting the decremental effects of epidemics, particularly on the 15–30 age cohort, and the consequences of differential mortality from warfare on males. Similarly, Viviani (1970, p. 23) states: “The Nauruan population had declined, mostly from epidemics and disease, but the number of men killed in the ten-year war contributed to a population imbalance.” Others, including Hambruch (1915) and Kayser (1918), questioned the mortality effects of native warfare practices, while Eckert (1935) claimed that a skewed adult sex ratio characterized the native population of (pre-war) generations.

Kretzschmer noted the presence of eight white traders at the time of the German takeover (four English, two German, one American, and one Dutch), Viviani reported the arrival of a Gilbertese native pastor at about this time, and German records for 1889 also list eleven non-Nauruan “colored men” and thirteen non-Nauruan “colored women.” Succeeding years witnessed the publication at increasingly shorter intervals of census reports providing limited information from which to estimate the early post-Contact population history of Nauru. Before proceeding to that task, however, it is essential to evaluate the scant framework of reports from the pre-1890 period.

Despite McArthur’s cautions (1968, 1970) about the questionable reliability of many early population estimates, the figure of 1,400 presented by Captain Simpson in 1843 was probably reasonable. It is even somewhat surprising that a Nauruan population of (at least) 1,294 remained to be counted in the German census of 1889, after a half century which included at least a decade of internecine native warfare, the probable spread of venereal diseases, and the likely effects of epidemic diseases introduced by sporadic visitors. Scattered reports suggest that the loss of small numbers of Nauruans who sailed or were swept off at sea to other Pacific islands was at least partially balanced by the arrival of similarly displaced refugees from other islands. A few later scholars (Delaport, 1906–07, 1920; Hambruch, 1915; Hassert 1910; Kretzschmer, 1913; Viviani, 1970; *inter alia*) even sought to identify native practices which might have constrained population growth in the pre- and early-Contact period. Unfortunately, there appear to be no detailed records from this period of those recurrent droughts, since amply documented, which undoubtedly influenced mortality and emigration rates. Finally, it should be noted that the average population density, 66 persons per square kilometer, calculated from Simpson’s (1844) population estimate, falls well below the range (230 to 680 per square kilometer) calculated by Bayliss-Smith (1974) for five Melanesian atolls relatively unaffected by European influence, or for most inhabited Micronesian coral islands and atolls prior to 1945 (Hainline, 1964).

While any reconstruction is necessarily highly speculative, ecological considerations and limited ethnohistorical materials do support the merits of applying an "atoll-type" model (Underwood, 1981) to sketch out broad outlines of the probable population history of Nauru in the pre-Contact period. In brief, this model envisages the post-settlement period as characterized by episodes of rapid population growth, interspersed with interludes of sudden declines occasioned by the effects of the sporadic droughts which periodically wrack the island, and, perhaps too, in consequence of outbreaks of warfare.

If, as some writers have suggested (see above), the Nauruans practiced infanticide or senilicide in efforts to limit population size and growth during stress periods, the longer-term results would have been limited at best. Increased infant death rates, by removing postpartum sexual taboos (Petit-Skinner, 1981, p. 53) and the anovulatory effects of lactation, may have actually facilitated rapid recovery from episodes of population decline, while senilicide, by definition, would have no long term demographic effects. In contrast, however, migration of younger cohorts would have represented a significant loss, not only of individuals, but of their reproductive potential. While such losses in numbers may have been partially counter-balanced by the occasional arrival of migrants, it is most unlikely that the composition of migrant groups or the timing of their arrival would have corresponded regularly with structural conditions or periods of demographic instability on Nauru. Post-Contact informants, as noted above, denied that abortion had been practiced and Simpson's concern about the high birth rate of Nauruans in 1843 seems to belie Hassert's claim that intentional infanticide removed all children of third or higher birth order born to native couples.

These considerations suggest a pre-Contact history of long term post-settlement population increase, despite episodic declines, resulting from persistently high levels of fertility, generally low to moderate death rates, and balanced mainly by the demographic consequences of occasional migrations, whether forced or voluntary. It seems quite possible, in this framework, that Nauru previously supported a more numerous population than the 1,400 estimated by Simpson in 1843, a decade or more after European foreigners had settled on Nauru.

THE COLONIAL PERIOD

The colonial period of Nauru's history, formally ushered in by the signing of the Anglo-German Convention of 1886, became visible to the Nauruans only with the arrival there from Jaluit Island, seat of the German Protectorate of the Marshall Islands, of Imperial commissioner Sonnenschein and Deputy Commander Emsmann on the *Eber* on October 1, 1888. Several census summaries and a few other reports containing information relating to native Nauruan population characteristics for the years between the date of the first German census (1889) and the official surrender of the German administrator on November 6, 1914, have been located. Comparisons of these census data and of several crude indices derived from them, supplemented by available population reports (Table 1), reveal some critical features of Nauruan native population history during the German colonial era: (1) an insignificant overall increase in total numbers by the end of the period, from 1,294 in 1889 to 1,310 in 1913; (2) a growing youthfulness of the total population,

as evidenced by the increasing ratio of children to adults, particularly to adult women; and (3) a continuing low sex ratio, or preponderance of females, among adults. In fact, total numbers may have increased almost 20 percent over the first fifteen years of this era, but disease epidemics (dysentery in 1907, poliomyelitis in 1910) contributed to the reversal of any such trend during the final decade of German administration. At the same time, the increasing ratio of children to adults suggests that mortality from these epidemics did not differentially affect younger cohorts nor critically impede the potential for future growth implied by the necessarily broadening base of the native population pyramid. The rapid restoration of a more balanced adult sex ratio, evident by the 1920s, is not clearly associated with significant changes between 1889 and 1920 in sex-differential mortality risks. This trend may also reflect the gradual demise of older cohorts in which aberrant sex ratios may have been established during earlier periods of warfare, native seafaring, and emigration.

However, a singular chain of events began during the period of German colonial administration which was to alter irrevocably the course of the island's subsequent history and to change dramatically the composition of the population residing there. The details of the discovery of commercially valuable phosphate deposits on Nauru and on its closest neighbor, Ocean Island, are described by Ellis (1936), while Viviani (1970) has presented a comprehensive analysis of the development of phosphate mining activities and the resulting long term effects on Nauru's social and political history. Suffice it here to note that a brief attempt in 1906–07 to utilize Nauruans as the primary labor source for mining operations was apparently deemed unsuccessful, and laborers were brought in from other German-administered Micronesian islands, New Guinea, and, to lesser extent until after World War I, from China, via Hong Kong. By 1913, the non-native resident population included 50 Whites, 100 Chinese, and 650 non-Nauruan Pacific Islanders.

Australia's assumption of *de facto* administrative control in November 1914 at first had more noticeable effects on the composition of the foreign segment than on the native part of Nauru's resident population. Nearly all of the thirty resident Germans were promptly deported, replaced by an Australian military governor and garrison (Anon., 1914), and a British staff was brought in to run the phosphate operation. At first the numbers of Chinese and non-Nauruan Pacific Islanders living on Nauru steadily declined (Table 2) until 1920, after which increasingly large numbers of Chinese laborers were hired, constituting thereafter a primary mainstay of the phosphate works labor force.

During the same time, Nauru experienced a severe drought, when less than twenty inches of rain were recorded in 1916 and, again, in 1917. Although local vegetation, particularly coconut trees, was severely affected, access to imported foods seems to have effectively prevented starvation or severe malnutrition. Rather, the effects of introduced diseases continued to pose a major constraint on population growth until at least 1921. Active cases of leprosy, possibly introduced by a Gilbertese woman in 1911 or 1912 (Morgan, 1922), began to appear among the Nauruans, until 193 cases were recorded in 1924 (Millard, 1935). Epidemic diseases were decisive in preventing any increase in native population numbers until 1921: "Epidemics of influenza, dysentery, and, in one case, of meningitis, . . . have taken heavy toll of them . . ." (Pope, 1921, p. 6). The influenza pandemic of 1918–19 reportedly resulted in the deaths of 230 Nauruans, or 18 percent of

Table 1. Summary of census reports, native Nauruan population, 1889–1913

Census Date	Total Numbers	Men	Women	Boys	Girls	Ratio ¹ K/A	Ratio ² K/W	Total Males	Total Females	Total Sex Ratio	Adult Sex Ratio
1889	1294	435	573	139	147	28.4	49.9	574	720	79.7	75.9
1893	1377	388	620	177	192	36.6	59.5	565	812	69.6	62.6
1908	1397	411	495	266	225	54.2	99.2	677	720	94.0	83.0
1910	1387	397	476	284	230	58.9	108.0	681	706	96.5	83.4
1913	1310	363	440	275	232	63.1	115.2	638	672	94.9	82.5

$${}^1\text{Ratio K/A} = \frac{\sum (N_{\text{boys}} + N_{\text{girls}})}{\sum (N_{\text{men}} + N_{\text{women}})} \times 100$$

$${}^2\text{Ratio K/W} = \frac{\sum (N_{\text{boys}} + N_{\text{girls}})}{N_{\text{women}}} \times 100$$

Data sources: Reiches Kolonialamt Berichten (RKA), 1911–14; Hambruch (1915); Hassert (1910); Hahl (n.d.); Holtzsch (1934); Kretzschmer (1913); Meyer (1910); Steinbach, in Eckert (1935); Viviani (1970); Wedgewood (1936).

Table 2. Resident population of Nauru Island, by ethnic category, 1916–1920
(from Report on the Administration of Nauru during the Military Occupation and until 17th December 1920, Parliament of the Commonwealth of Australia, 1923)

Ethnic Category	1916	1917	1918	1919	1920
Europeans	90	86	88	88	91
Chinese	278	195	136	134	599
Non-Nauruan Pacific Islanders	449	384	241	275	227
Nauruans	1,284	1,269	1,273	1,279	1,086
TOTALS	2,101	2,934	1,738	1,776	1,985

the native population in 1919 (*Annual Report to the League of Nations on the Administration of Nauru*, 1922), but this tragedy essentially marked a critical turning point in the population history of the Nauruans, the beginning of an epidemiologic transition, and the native population entered a period of steady growth after 1920 which was not interrupted until the Japanese occupiers of the island in 1943 forcibly exiled 1,201 Nauruans to Truk, where nearly 500 of them died during World War II (Ellis, 1946; Robson, 1950).

Fertility levels probably remained moderately high throughout the entire period of colonial administration. In the earlier years of German colonial administration, several optimistic reports noted an overall increase in numbers, of 4.6 percent between 1890 and 1893, and of 3.9 percent from 1893 to 1894 (Jung, cited in Hambruch, 1915). Deeken (1912, pp. 17–18) claimed a 12 percent increase over the preceding decade, and, as late as 1907, Hassert (1910) reported that the numbers of births exceeded the number of deaths for that year. However, scattered reports, beginning with records for 1908, repeatedly note an excess of the numbers of deaths over births, commencing with Hassert's report of 169 deaths and 50 births in that year. Throughout this time, until 1920, as noted above, this high level of mortality was ascribed to the effects of epidemic diseases, and this mortality experience was probably a primary control on population growth.

Soon after the island of Nauru was officially made a League of Nations Class "C" mandate to the British Empire on December 17, 1920, the Administrator began submitting annual reports to the Commonwealth of Australia for inclusion in the latter's *Report to the League of Nations on the Administration of Nauru* (Anon., 1922–1941). Population and vital statistics from these reports for the first decade of Australian administration under Mandate status are shown in Table 3. Each year was marked by an excess of births over deaths, and the crude birth rate never fell below 41 births per 1,000 persons throughout the decade. It should be noted that the crude reporting categories ("adult men," "adult women," "children") actually obscure the high prevailing levels of fertility recorded during this and the following decade.

For the years (1921–28) for which the number of "adult females" was reported, slightly fewer than 350 women, on average, constituted the entire potential maternal progenitor pool of the 410 children born over these years. The *effective* size of this pool, of course, was even smaller, and the larger total figure of all adult women should be reduced by the exclusion of post-menopausal women and of women not exposed to risk (e.g., ab-

Table 3. Nauru—native population, births, deaths and crude rates 1921–1930

Census Date	Adult Men	Adult Women	Children	Total	Births	Crude Birth Rate	Deaths	Infant ^a Crude Death Rate	Death Mortality Rates
12/31/21	303	330	451	1,084					
12/31/22	324	342	420	1,086 ^b	59 ^c	53.0	16	14.7 ^c	101.7
12/31/23	337	342	500	1,179	54	45.8 ^c	31	26.3 ^c	257.0
12/31/24	344	355	520	1,219	56	46.0	34	27.0	357.0
12/31/25	361	338	540	1,239	65	52.0	34	27.4	339.3
4/1/26	380	345	526	1,251	52	41.6	41	32.8	365.8
4/1/27	396	352	518	1,266	57	45.0 ^c	23	18.2 ^c	
4/1/28	390	356	551	1,297	68	52.4	18	13.9	
4/1/29				1,365	60	44.0	26	19.0	
4/1/30				1,411	59	41.8 ^c	29	20.6 ^c	

Data from Anon. 1922–1941

^a 1922 and 1923 Figures represent number of deaths of children under one year of age per 1,000 births, while figures for subsequent years represent number of deaths of such children per 1000 deaths.

^b Corrected – original total = 1,156.

^c Calculated from total births, deaths and population at end of report period (not mid-year population).

stinent widows, divorcees or unmarried women). Then, too, perhaps 50 or more women each year, post-partum and/or lactating mothers, could be expected to have lowered fecundity levels. Consequently, I would estimate that between 50 and 60 live births each year were produced by an effective maternal breeding pool of no more than 200–250 adult women. However, this estimate falls well below maximum fertility potential (and post-1945 fertility performance), suggesting the continuing fertility-suppressing effects of venereal diseases (see also James, 1979).

Despite the high infant mortality rate prevailing throughout the 1920s and 1930s (Tables 3 and 4) a high rate of population increase was recorded for this period. The total size of the native population increased from 1,084 at the end of 1921 to 1,411 on April 1, 1930, a 30 percent overall increase, for an average annual increase in excess of 3 percent. Improvements in sanitation and other public health measures, in availability of medical care, and in education doubtless played a role in the lowering of the crude death rate, especially noticeable between 1927 and 1933. The inevitable (but unreported) change in age structure, toward a larger proportion of subadults, would contribute to the slight decrease during the 1930s in the average annual rate of increase (2.5 percent) in total population size, from 1,411 in 1930 to 1,761 in 1940, for which years available official reports provide no information on age distribution. Fortunately, Camilla Wedgewood, an anthropologist who worked on Nauru for several months in 1935, reported the gross age-sex distribution of the native population at that time, confirming the predictable change (Wedgewood, 1936). While subadults comprised 41.6 percent of the total population in 1921 and 42.5 percent of all Nauruans in 1928, 47 percent of the entire population was less than 16 years of age in 1935.

The mandate years witnessed not only a remarkable change in the total size and age distribution of the native population but also a dramatic shift in the numbers and ethnic composition of the non-native segment of the residential population of the island. During the latter years of German colonial administration, laborers included Pacific Islanders, mostly from other Micronesian islands under German administrative control, as well as a lesser number of Chinese, while fewer than 100 Europeans also resided on the island. Between 1916 and 1919, the numbers of Chinese and non-Nauruan Pacific Islanders decreased from 278 and 449, respectively, in 1916, to 134 and 275 by the end of 1919, and more extensive recruitment of Chinese laborers was instituted thereafter. A short-lived attempt was made in 1921 to use New Guinea native laborers in place of those Micronesians who were returned to their home islands, by then part of a League of Nations Mandate to Japan, but this experiment had essentially ended by 1924. Instead, Chinese workers became the mainstay of the phosphate industry labor force, and, by 1939, their numbers (1,512) nearly equaled those of the total native population (1,733).

The indenture agreement by which Chinese laborers were brought to Nauru stipulated a 3-year contract, subject to renewal, but excluded permanent residence on Nauru, and prohibited the laborer from bringing his family to the island. As a result, the Chinese segment of the residential population was composed of adult males, yet there appear to be no reports of serious conflict between Chinese and Nauruans, nor of intergroup marriages or mixed offspring in these years. Despite a required pre-employment medical examination and a mandatory quarantine period for new arrivals, Chinese workers provided a source for the continuing introduction of at least those diseases (tuberculosis, leprosy) not readily detected by these screening procedures. The European community, including spouses and children, numbered less than 200 in any year, and lived in relative isolation from the Chinese laborer settlements and from native settlements.

Despite several successful attacks in 1940 by German raiders on allied shipping near Nauru, the island itself was first bombed by Japanese airplanes in December 1941. In the latter part of February 1942, all non-natives except 7 Europeans and 194 Chinese were evacuated from the island, but no attempt was made to repatriate resident Gilbert Islanders who had been brought to the island in increasing numbers since 1938 to augment the labor force there. The Japanese occupied the island in August 1942, and by June 1943, Japanese and Koreans on the island numbered nearly 3,000, while the only remaining Europeans were two priests (Table 5). During the latter half of 1943, additional Japanese, as well as 659 Ocean Islanders, were brought to Nauru, while 1,201 Nauruans, 7 Chinese and 2 surviving European priests were removed to the Truk Islands. A severe drought in 1943, as well as the increasingly effective results of Allied bombing attacks on the island and of the Allied shipping blockage, resulted in severe food scarcity. An Australian occupation force arrived on Nauru in September 1945, and the surviving Nauruans in the Truk Islands, where 463 Nauruans died in the war years, were returned to their native home on January 31, 1946 (Ellis, 1946; Robson, 1950).

By the end of 1946, the native population numbered 1,369, nearly 500 less than recorded in 1942 (1,848), and included only 15 individuals over the age of 60 years, or 1 percent of the total number, compared with 62 elderly persons, or 4 percent of the total native population of 1,581 in 1935. This decline in part represents differential mortality

Table 4. Native population^a, births, deaths, and crude rates, 1930–1940 (from Anon., 1930–1938, 1941)

Year	Males	Females	Total	Number of Births	Crude Birth Rate	Number of Deaths	Crude Death Rate	Infant Deaths (under 1-year)	Infant Deaths per 1000 Births
1930	721	690	1,411	59	] 45	29	] 18	5	] 67
1931	734	692	1,426	64		24		2	
1932	757	718	1,475	63		26		6	
1933	789	738	1,527	81	] 45	24	] 26	5	] 202
1934	803	764	1,567	58		33		7	
1935	827	776	1,603	86	] 47	48	] 29	23	] 163
1936	850	801	1,651	73		46		18	
1937			1,638 ^b	76		50		19	
1938			1,661	87		55	17		
1939			1,733						
1940			1,761						

^a Census taken 1 April each year, except 31 December, 1939.

^b 34 Nauruans temporarily absent.

Table 5. Total residential population of Nauru, by ethnic category 1940–1950

Date	Native	European	Chinese	Pacific Islanders	Japanese & Koreans	Others	Total Non-Native	Total	Source
12/30/40	1,761	192	1,350	49			1,591	3,352	Anon. 1941
1941	1,827 ^a	68	1,429	193				3,517	Robson 1959
6/30/42	1,848	7	194	193			394	2,242	Viviani 1970
6/1/42	1,848	2	184	193	2,960		3,339	5,187	Viviani 1970
5/44	—	0	179		4,178	1,463 ^f	—	5,820	Ellis 1946
12/31/45	589 ^b	N/A	N/A	N/A	N/A			N/A	Anon. 1961
12/31/46	1,369	79	778	21			878	2,247	Anon. 1961
6/30/47	1,379	192	1,163	31			1,386	2,765	Anon. 1961
6/30/48	1,448 ^c	247	1,370	97			1,714	3,162	Anon. 1961
6/30/49	1,524 ^d	247	1,440	58			1,745	3,269	Anon. 1961
6/30/50	1,582 ^e	278	1,491	81			1,850	3,432	Anon. 1961

^a 7 Nauruans temporarily absent

^b 759 Nauruans temporarily absent

^c 2 Nauruans temporarily absent

^d 25 Nauruans temporarily absent

^e 29 Nauruans temporarily absent

^f includes Nauruans and other Pacific Islanders

experience of older cohorts during the war years. The number of births (101) in 1948 exceeded the peak number recorded before the war (87 in 1938), while, by 1949, the number of deaths (15) and the crude death rate (<10.0) fell well below pre-war levels.

De facto civil administration under an Australian administrator was established in November 1945, and was formalized after Nauru was named a United Nations Trust Territory in November 1947, when the governments of Australia, Great Britain and New Zealand designated Australia as the Administering Authority. As early as June 1946, the phosphate industry facilities had been sufficiently restored to resume operation, and European staff and Chinese laborers were brought into Nauru. The number of Chinese (1,370) in 1948 nearly equaled those of native Nauruans (1,448), while the number of Pacific Islanders (97), mainly from the Gilbert Islands and Ocean Island, were inconsequential at that time.

The decline in mortality levels which appeared after the war at first reflected to some extent the near-absence of the high risk group of elderly persons, but its continuance in succeeding decades resulted from dramatic and effective improvements in medicine and public health measures. Wartime vitamin deficiencies were quickly remedied and vitamin supplements thenceforth provided to infants and young children. Screening tests for leprosy and tuberculosis led to early diagnosis and treatment with more effective drugs, and the administration provided a small hospital and European-trained physician for the use of Nauruans, in addition to the medical facilities provided to employees of the phosphate operations. In 1948, virtually every able-bodied Nauruan adult male was gainfully employed for wages, and eligible recipients were beginning again to receive cash royalty payments, albeit in lower amounts than previously because of the lesser amounts of phosphate shipped abroad in 1948. Consequently, most native Nauruans were able by the end of the decade to purchase imported or locally-produced foods, as well as other amenities (Viviani, 1970).

The growth pattern of the native population which began in the latter part of the 1940s out of a combination of high birth rates and very low death rates accelerated during the following decade. The size of the population increased from 1,582 in 1950 to 2,328 in 1960 (Table 6), slightly more than 50 percent, an average annual growth rate of 5 percent. The increasing youthfulness of the native population is readily evident from a comparison of the proportion of the total number belonging to the younger age category (less than 16 years old) in 1950 (43 percent) and in 1960 (57 percent). By 1966, 52.39 percent of native Nauruans were less than 15 years old. At the other end of the age spectrum, the number of the elderly segment (those older than 60 years) more than doubled over this same period, although this age group constituted less than 2 percent of all native Nauruans in 1960 and just barely more than 3 percent in 1966.

While the total number of immigrants increased 16 percent between 1950 and 1960, from 1,850 to 2,147, their numbers were exceeded by those of native Nauruans in each year from 1958 until 1965. The relative numbers of the several ethnic groups varied over the years, so that the number of Chinese immigrants declined, from 1,491 in 1950 to less than half that figure, 715, in 1960. This trend was short-lived, however, and over 1,000 Chinese resided on Nauru when independence was achieved in 1968. The numbers of other Pacific islanders, mainly from the Gilbert and Ellice Islands, increased dramatically throughout this period, from 81 in 1950 to over 1,000 in 1960, and well over 1,500 by

Table 6. Total native population by sex, births, deaths, and crude vital rates, 1950–1960. Source: Anon. 1961.

Year	Males	Females	Total	Tempo- rarily Absent	Number Births	Calculated Crude Birth Rate	Number Deaths	Calculated Crude Death Rate
6/30/50	850	732	1,582	28	79	49.9	15	9.5
6/30/51	858	760	1,618	37	86	53.2	16	9.9
6/30/52	877	795	1,672	44	79	47.2	18	10.8
6/30/53	915	830	1,745	41	93	53.3	16	9.2
6/30/54	954	874	1,828	55	105	57.4	12	6.6
6/30/55	1,016	919	1,935	47	109	56.3	10	5.2
6/30/56	1,052	924	1,976	69	113	57.2	10	5.1
6/30/57	1,105	988	2,093	76	101	48.3	19	9.1
6/30/58	1,136	1,022	2,158	77	88	40.8	22	10.2
6/30/59	1,141	1,055	2,196	125	120	54.6	20	9.1
6/30/60	1,203	1,125	2,328	59	117	50.3	25	10.7

1968. Europeans, numbering 380 in 1968, remained the minority group. In addition to these changes in total relative numbers of the immigrant groups, the 1950s witnessed the immigration of families of some Chinese workers and of larger numbers of Pacific islanders to Nauru.

THE MODERN ERA

By the end of its first decade as an independent nation, the natives of Nauru had attained an economic status from the proceeds of phosphate sales approached only by the citizens of a few oil-producing countries in the Middle East. The native residential population reached 3,886 in 1977 (Table 7). While some Nauruans had left the island permanently, nearly 1,500 natives of neighboring Kiribati (Gilbert Islands) resided on Nauru in December 1978 (Anon., 1980), resulting in an extremely high population density on an island physically decimated by 80 years of mining operations.

According to United Nations estimates, an annual rate of population growth of 1.7 percent in 1976 was based on a crude birth rate of 22 and a crude death rate of 5 per 1,000 population. A more detailed study (Taylor and Thoma, 1983) suggests a less optimistic view of demographic conditions than these figures might imply, however. Comparing data from the 1976–81 period with those for the mid-1960s, these investigators conclude that adult male mortality had nearly doubled. They describe the major health problem on Nauru as excessive premature mortality among adult males, whose life expectancy at birth is only 49 years as compared to life expectancy of 62 years for newborn females.

An analysis of mortality causes shows accident and injuries as the most important cause of death in children and adults, with motor vehicle accidents listed as the most common cause of death from injury. Cardiovascular disease and diabetes appeared as the second most important cause of death in Nauruan adults, suggesting that the “good fortune of Nauru” (Howells, 1981) has not been an unmixed blessing for a population beset with the

Table 7. Age and sex composition of native population of Nauru, 1977
(from South Pacific Commission Statistical Bulletin No. 15)

Age Groups	Males	Females	Total	Birth Years
0-4	338	313	651	1973-77
5-9	285	259	544	1968-72
10-14	261	260	521	1963-67
15-19	269	257	526	1958-62
20-24	222	226	448	1953-57
25-29	161	153	314	1948-52
30-34	70	63	133	1943-47
35-39	85	70	155	1938-42
40-44	92	61	153	1933-37
45-49	90	68	158	1928-33
50-54	54	52	106	1923-27
55-59	30	36	66	1918-22
60+	65	46	111	1921—
Totals	2,022	1,864	3,886	

afflictions of affluence. Indeed, the adult sex ratio is beginning to resume the skewed distribution which reportedly characterized the native population of a century earlier.

Finally, and whether the Nauruans finally decide to purchase a habitable island to which they can migrate as a group or to make the heavy investment required to restore their devastated homeland into a more habitable site, it is unlikely that the permanently resident Nauruan community will continue to include a large proportion of children (40 percent under 15 years of age in 1966 and 44 percent in 1976). As elsewhere in Micronesia (cf. Marshall, 1979), it is likely that younger, more educated adults will choose to emigrate, taking with them their reproductive potential. Ironically, the resultant population pyramid may well come to resemble that reported for Nauru at the beginning of the German period of administration.

Toward a Revised Population History

Most early historical estimates of the Nauru native population show a high degree of consistency, suggesting that the number of Nauruans hovered around 1,300-1,400, at least through the 19th century. With the exception of one unlikely estimate of a native population of 1,500-1,800, German counts, beginning in 1889, confirm these earlier estimates but also revealed an unstable population structure in which children represented a very small proportion of total number and adult females greatly outnumbered adult males. The former finding, attributed by some observers to the effects of abortion and infanticide, contrasts with Captain Simpson's observations of large numbers of children on the island in the 1840s. The questionable efficacy of many native abortion practices (Underwood, 1973) and the absence of convincing reports of actual practices, lead me to suspect that lowered fertility was due in large measure to the effects of venereal diseases, which may have been introduced only a mere decade or so prior to Simpson's visit. Other diseases, introduced from visiting ships at sporadic intervals in the latter years of the pre-

Colonial period could only have spread rapidly and with devastating effects, especially among previously unexposed younger cohorts. It also seems questionable that the paucity of adult males was caused primarily by differential male mortality in native wars of the late pre-Colonial period, although native warfare may have been sufficiently lethal to augment adult male mortality from other and more long-standing causes, such as loss of life at sea, and migration, accidental or intentional.

The advent of resident colonial administration on Nauru was soon followed by an increase in the proportion of sub-adults in the total population, from 22 percent in 1889 to over 35 percent in 1908 and 47 percent in 1935. As elsewhere in the Pacific, more regular and continual exposure through foreign residents and visitors would preclude the growth of a sizable portion of the native population lacking antibodies to measles, chicken pox, or other “childhood diseases” endemic in most Western societies of the time. Attenuated pathogenicity of causative organisms often follows repeated passage through affected populations (coadaptation) and clearly preceded the introduction of inoculation programs at a later date on Nauru, thus contributing early in the colonial period to decreased mortality levels, especially in subadult cohorts. Of course, all cohorts remained at risk when exposed to new or rarely appearing diseases such as poliomyelitis (1910) or the B-virus influenza strain which appeared in 1919. The latter pandemic resulted in higher death rates among adult cohorts (excluding older age groups) in all parts of the world, including the Pacific (Underwood, 1984). Public health measures which contributed to declining mortality in Europe in the nineteenth century (McKeown and Record, 1963) played a similar role after being introduced on Nauru, and access to imported resources prevented deaths in all age groups from starvation or forced migration during the severe drought of 1916–17.

Expectably, in view of these changing disease patterns and effects the increasing proportion of subadult cohorts was accompanied by declining absolute (and relative) numbers of adults, from 1,008 in 1889 to 838 in 1935 and the adult sex ratio remained skewed in favor of females until 1925. The mean annual number of births (59) for the period 1922–30 implies moderate increase in fertility rates of smaller female cohorts in the 15–44 age category over those prevailing in 1908 when 50 births were recorded, further implicating the overwhelming role of declining mortality rates among younger cohorts to overall population growth, at least into the middle or latter 1930s.

Within a few years, this nascent beginning of a “takeoff phase” of population growth was interrupted by the events of World War II. Paradoxically, their forced removal by Japanese authorities likely prevented mass starvation and death of many Nauruans during the severe drought of 1943 on Nauru, a time when Allied activities essentially blocked all imports of food materials and water supplies to the island. In fact, wartime conditions became nearly as stringent on the Truk Islands (Hall and Pelzer, 1946) and the results are reflected not only in the limited number of Nauruans remaining to be repatriated in 1946 but also in the relatively few members of the 1942–46 birth cohort (see Table 7).

A period of explosive population growth quickly followed this setback, the total number of Nauruans exceeding the pre-war 1942 maximum of 1,848 by the end of 1954. In 1960, an effective maternal progenitor pool which obviously numbered many fewer than the reported 433 Nauruan women aged 16–60, produced 117 children, attesting to the very high fertility levels prevailing in these post-war decades. On the other side of the

demographic equation, the crude death rate had plummeted to levels (10.7 for 1960) never attained previously. While more properly the subject of full and detailed modern demographic analysis, more recent population data provide an invaluable measure for evaluating the reconstruction of earlier Nauruan population history based on incomplete reports and records. The observed dramatic increase in modern fertility levels tends to confirm the suggested impact of venereal diseases on fertility throughout the historical period when effective treatment (antibiotics) was not available. However, as noted above, the mere improvement in crude mortality rates for a youthful population with access to advanced medical care and technology obscures changing disease patterns and behavioral patterns which could produce some population characteristics (e.g., limited numbers of adult males, depleted young adult cohorts) of a past era, but resulting from wholly different causes.

Population Models and Future Directions for Demographic Anthropology in the Pacific

In recent decades, and particularly following the publication of Weiss' critical work (1973) providing model life tables for the use of students of the demography of anthropological populations, anthropologists have turned to "modeling" approaches (Dyke and Morrill, 1980) to minimize the effects of fragmentary data in human population studies. Weiss has described the basic assumptions entailed in anthropological demography and attempted to evaluate the effects of major demographic disturbances on the presumably stable, underlying patterns of birth and death schedules in such populations, i.e., the underlying average vital rates presumably reflected in the census data available to anthropologists. The results of his simulation studies of the effects of major demographic disturbances, including concatenated disturbances of one-year duration occurring every decade, do not appear to preclude the use of stable population models, if suitable compensation is made. However, five-year major events occurring every decade as well as ten-year events ". . . would clearly distort the population beyond the claim that underlying rates had meaning . . ." (Weiss, 1975, p. 53).

For some Pacific island populations of the historic period, the assumption of underlying stable vital rates reflected in census data is simply untenable, even were there available accurate census data or population data amenable to appropriate correcting procedures. Concatenated disturbances resulting from very different causes (diseases, blackbirding, drought, tsunami and typhoon, forced resettlement, aerial and naval bombardments, etc.) of varied duration have produced irregularly and widely oscillating populations over the past few hundred years.

Even today, few of the smaller oceanic islands and atolls offer sufficient incentive or reward for foreigners to establish permanent colonies, and throughout most of the historical period these native populations shared their diminutive island homes at most with a small number of resident traders, a missionary or two, and the occasional castaway, penal colony escapee or beachcomber. Until the advent of modern forms of transportation, many of these groups were visited only rarely by passing foreign ships whose crews and passengers were potential vectors of new outbreaks of epidemic diseases. These, as also the venereal diseases infecting ship crews and penal colonies in Australia and the

Pacific, were certainly disseminated more widely by infected natives to the inhabitants of neighboring islands and atolls. I would suggest that the apparent absence of catastrophic epidemics during the early contact period in Kiribati and Tuvalu (Bedford et al., 1980) and, perhaps in Tonga (McArthur, 1966, 1968) may partly reflect the attenuated epidemiological consequences resulting from high levels of interisland contact and mobility among natives of these island groups.

Among native populations inhabiting the larger volcanic islands which early attracted permanent foreign settlement, the immediate effects of epidemic diseases among larger numbers of natives (some settled in port towns, church-villages or other aggregations formed in the early post-Contact period) were devastating in absolute number of deaths, but less likely to threaten the continued survival of the population. Even the forced or voluntary exile of an entire shipload of adults was unlikely to deplete the entire progenitor pool of succeeding generations, and, in any case, the high islands had long been the traditional refuge for entire (potential replacement) populations from atolls and small islands decimated by natural catastrophes. Then, too, the residents of high islands were not at such risk from the effects of tsunamis or typhoons which periodically destroyed the vegetation of entire atolls and islets, contaminating their very limited water resources. In general, survivors of population crises on the high islands supporting foreign colonies had earlier and greater access to western knowledge and medical care, were exposed more regularly to foreign influences and contacts, and had greater access to non-indigenous resources, especially during stress periods, than the inhabitants of distant atolls and small islands. Not surprisingly, the demographic recovery of such populations, in which structural instabilities were of lesser significance, generally followed a more predictable and well-documented course. For these anthropological populations, classical demographic models and the methodologies and techniques of historical demography can provide invaluable insights into population dynamics and history.

Recent advances in micro- and mini-computer technology and appropriate software (e.g., AMBUSH, KINPROGRAM, GENISYS, etc.) have greatly facilitated another approach to reconstructing population histories, genealogical demography. The use of genealogical data in studies of Pacific islands population dynamics and history has a venerable tradition, ranging from such older classic works as those by Hogbin (1930), Powdermaker (1931), and others, to those included in the more recent landmark publication edited by Carroll (1975). Increased computer memory and storage capacities now permit analyses in considerable time depth of genealogical and vital records data, even for the more numerous populations of larger volcanic islands (Rossmann, 1978; Underwood, in preparation). The rapid demise of older informants and the dispersal of younger native cohorts pose an urgent need immediately to collect genealogical data (and locate pertinent colonial and missionary records) for these more sophisticated analyses.

Acknowledgements

I should like to take this opportunity to express my deep appreciation to the Wenner-Gren Foundation for Anthropological Research, Inc., for the financial assistance which supported this study and to the staffs of the Mitchell Library, the Australian National Li-

brary, the Micronesian Area Research Center, Bernice P. Bishop Museum Library, and the University of Hawaii Pacific Research Library for their untiring and invaluable aid. I am most grateful for the suggestions of an anonymous reviewer for the improvement of the final version of this report.

References

- American Board of Foreign Missions. Letters and Papers. Honolulu (Microfilm): University of Hawaii, Pacific Collections.
- Anonymous. 1853. Pleasant Island. *The Friend*, July 1, 1853: 54–55.
- Anonymous. 1914. Commonwealth of Australia Government Gazette. Canberra.
- Anonymous. 1922–1941. Annual Reports to the League of Nations on the Administration of Nauru. Commonwealth of Australia, Canberra.
- Anonymous. 1947/48–1968. Report to the General Assembly of the United Nations on the Administration of the Territory of Nauru. Commonwealth of Australia, Canberra.
- Anonymous. 1980. Republic of Kiribati Report on 1978 Census. Tarawa, Kiribati.
- Bayless-Smith, T. 1974. Constraints on population growth: the case of the Polynesian outlier atolls in the pre-contact period. *Human Ecol.* 2: 259–295.
- Bedford, R., B. MacDonald, and D. Munro. 1980. Population estimates for Kiribati and Tuvalu, 1850–1900: review and speculation. *J. Polynesian Soc.* 89: 199–246.
- Carroll, V. (ed.). 1975. Pacific Atoll Populations. University Press of Hawaii, Honolulu.
- Cheyne, A. 1852. A Description of Islands in the Western Pacific Ocean. J. D. Potter, London.
- Deeken, R. 1912. *Die Karolinen*. Wilhelm Süsserott, Berlin.
- Delaporte, P. A. 1906–07. Nauru as it was and as it is now. *The Friend*.
- Delaporte, P. A. 1920. The men and women of old Nauru. *Mid-Pacific Mag.* 19: 153–156.
- Dyke, B. and W. T. Morrill, 1980. Ethnographic and documentary demography. In B. Dyke and W. T. Morrill (eds.), *Genealogical Demography*, pp. 1–10. Academic Press, New York.
- Eckert, G. 1935. *Der Einfluss des Geschlechts und Familienlebens auf die Bevölkerungsbe-
wegung Micronesischer Inseln*. Triltsch und Huther, Berlin.
- Ellis, A. F. 1936. *Ocean Island and Nauru: their Story*. Angus and Robertson, Sydney.
- Ellis, A. 1946. *Mid-Pacific Outposts*. Brown and Stewart, Auckland.
- Hager, C. 1886. *Die Marshall-Inseln in Erd- und Völkerkunde*. Handel und Mission. Mit einem Anhang: die Gilbert Inseln. Georg Lingke, Leipzig.
- Hahl, A. n.d. *Deutsch-Neuguinea*. Dietrich Reimer, Berlin.
- Hainline, L. J. 1964. *Human Ecology in Micronesia: Determinants of Population Size, Structure and Dynamics*. Ph.D. Dissertation, University of California, Los Angeles.
- Hall, E. T. and K. J. Pelzer. 1946. *The economy of the Truk Islands: anthropological and economic survey*. Typescript: United States Commercial Company Economy Survey, No. 7. Honolulu.
- Hambruch, P. 1915. *Nauru*. Band I, Halbband 1 & 2, Ergebnisse der Südsee Expedition, 1908–1910. L. Friederichsen, Hamburg.
- Hassert, K. 1910. *Deutschlands Kolonien Erwerbungs- und Entwicklungs* (2nd Auflage). B. G. Teubner, Leipzig.

- Hogbin, H. I. 1930. The problem of depopulation in Melanesia as applied to Ongtong Java (Solomon Islands). *J. Polynesian Soc.* 39: 43–66.
- Holtzsch, M. 1934. Die Ehemaligen deutschen Südsee Kolonien im Wandel seit dem Weltkrieg. Inaugural-Dissertation der Phillips-Universität zu Marburg.
- Howells, William. 1981. The Good Fortune of Nauru. *Harvard Mag.* (November-December 1981): 40–43.
- James, W. H. 1979. The causes of the decline in fecundability with age. *Social Biol.* 26: 330–334.
- Jones, J. D. 1861. *Life and Adventure in the South Pacific by a Roving Printer.* Sampson Low, London.
- Kayser, A. 1918. Die Eingebornen von Nauru (Südsee). *Anthropos*, Bd. 13: 313–337.
- Kretzschmer, K. E. 1913. Nauru zum 2ten Oktober 1913. Papers, Australian National Library (no publisher).
- Marshall, M. 1979. Education and depopulation on a Micronesian atoll. *Micronesica* 15: 1–11.
- McArthur, N. 1966. Essays in multiplication: European seafarers in Polynesia. *Pacific History* 1: 91–105.
- McArthur, N. 1968. *Island Populations of the Pacific.* University of Hawaii Press, Honolulu.
- McArthur, N. 1970. The demography of primitive populations. *Science* 167: 1097–1101.
- McKeown, T. and R. G. Record. 1963. Reasons for the decline of mortality in England and Wales during the nineteenth century. *Population Studies* 16: 94–122.
- Meyer, H. (ed.). 1910. *Das Deutsche Kolonialreich.* Bibliographisches Institut, Leipzig.
- Millard, R. J. 1935. The decline of the leper. *Sydney U. Med. J.* 28: 158–163.
- Morgan, F. G. 1922. Report on the investigation of a number of cases of leprosy at Nauru, Central Pacific. Commonwealth of Australia Department of Health Service Publication, No. 25, Canberra.
- Petit-Skinner, S. 1981. *The Nauruans.* MacDuff Press, San Francisco.
- Pirie, Peter. 1972. The effects of treponematosi and gonorrhoea on the populations of the Pacific Islands. *Human Biology in Oceania* 1: 187–206.
- Pope, H. B. 1921. *Nauru and Ocean Island.* A. J. Mullett, Government Printer, Melbourne.
- Powdermaker, H. 1931. Vital statistics of New Ireland as revealed in genealogies. *Human Biol.*, 3: 351–375.
- Reiches Kolonialamt Berichten. 1911, 1912, 1914. Die deutschen Schützgebiete in Afrika und der Südsee, Amtliche Jahresberichte herausgegeben vom Reichs-Kolonialamt. Ernst Siegfried Mittler und Sohn. Berlin.
- Robson, R. W. 1932 *et seq.* *The Pacific Islands Year Book*, 1st ed. (1932); 3rd ed. (1939); 6th ed. (1950); 8th ed. (1959). Pacific Publications; Sydney and Melbourne Publishing Co., Sydney.
- Rossmann, D. L. 1978. Increased Fertility among Amyotrophic Lateral Sclerosis and Parkinsonism-dementia Complex Cases on the Island of Guam. Ph.D. Dissertation, University of Michigan.
- Simpson, T. B. 1844. Pacific navigation and British seamen. *Nautical Magazine and Naval Chronicle*, 13, London.

- South Pacific Commission. 1979. Population 1978. Statistical Bulletin of the South Pacific No. 15, Noumea.
- Taylor, R. and K. Thoma. 1983. Nauruan mortality, 1976–1981: and a review of previous mortality data. South Pacific Commission, Noumea.
- Underwood, J. H. 1973. The demography of a myth: abortion in Yap. *Human Biology in Oceania* 2: 115–127.
- Underwood, J. H. 1981. Changing patterns in the population ecology of Pacific Island peoples. In A. V. Sidorenko and N. A. Shilo (eds.), *Proceedings of the XIV Pacific Science Congress*, 314. Kabarovsk.
- Underwood, J. H. 1984. Effects of the 1918 influenza pandemic mortality experience on subsequent fertility of Neochamorro in Guam. *Micronesica* 19: 1–9.
- Viviani, N. 1970. *Nauru: Phosphate and Political Progress*. University of Hawaii Press. Honolulu.
- Wedgewood, C. H. 1936. Report on research work in Nauru Island. *Oceania* 6: 359–391; 7: 1–33.
- Weiss, K. M. 1973. Demographic Models for Anthropology. *Memoirs of the Society for American Archaeology*, No. 27.
- Weiss, K. M. 1975. Demographic disturbance and the use of life tables in anthropology. In A. C. Swedlund (ed.), *Population Studies in Archaeology and Biological Anthropology*, pp. 46–56. *Memoirs of the Society for American Archaeology*, No. 30.
- Weiss, K. M. 1976. Demographic theory and anthropological inference, *Ann. Rev. Anthropol.* 5: 351–382.
- Wood, C. F. 1875. *A Yachting Cruise in the South Seas*. Henry S. King, London.