Review: ANN F. RAMENOFSKY
UNIVERSITY OF NEW MEXICO

By developing a new and substantially higher estimate of native Hawaiians at the time of European contact, David Stannard has made an important contribution to the paleodemography of Hawaii and opened a new avenue of research in the Pacific that can be pursued for years to come.

Although I view Stannard's estimate of 800,000 Hawaiians in 1778 as plausible, I am reluctant to accept it, My hesitancy is not a function of the size of the estimate. Instead, my concerns are related to the number of assumptions required to build and justify the new value. The weight of assumptions coupled with tautological reasoning raise suspicions about the estimate itself.

Although science is a way of knowing, it is not free of bias. Science is an intellectual enterprise composed of ideas and phenomena. Scientists use their biases in the form of assumptions and hypotheses to evaluate the fit between the world of ideas and the world of the senses. The lack of fit between ideas and empirical phenomena pushes researchers to

refine their ideas. Within this framework it is crucial not only to separate ideas from phenomena, but to have multiple, independent tests for the confirmation or rejection of ideas.

Viewing Stannard's work from the perspective of science exposes its fundamental difficulties, Paleodemographic reconstructions are most successful within an interdisciplinary framework. There, lines of evidence drawn from different disciplines can be used to confirm, reject, or modify assumptions and estimates. Rarely is such an approach taken. Instead, paleodemographic reconstructions usually depend on the researcher's assumptions regarding the nature of earlier estimates. If these estimates are seen as conservative, then adjustments upward must be made. If initial estimates are assumed to be inflated, then adjustments downward are required. Initial assumptions make such reconstructions speculative and controversial.

Stannard's basic assumption in *Before the Horror* is that all previous estimates have been too conservative. Moreover, these estimates have become smaller with time. In 1778, Lieutenant James King of the *Discovery* estimated 400,000 native Hawaiians; Robert Schmitt, current state statistician of Hawaii, recommended no more than 250,000 people. Because Schmitt assumed that King's estimate was inflated, he reduced the total by nearly 50 percent. To derive a new total population count of 800,000, Stannard also modifies King's assumptions.

First, King did not visit all the islands; he projected his total estimate for all islands from populations in certain areas, especially Kealakekua Bay. According to Stannard, the estimate for Kealakekua Bay was conservative. Contemporaries of King counted more houses and, therefore, more people in Kealakekua Bay. Second, King assumed that the density of people in the region was comparable to all inhabited coastlines of Hawaii; 75 percent of all coasts were inhabited. Finally, King assumed that inland areas were vacant.

To obtain a higher estimate for Kealakekua Bay, Stannard accepts the higher house counts of the region as accurate; he then uses King's conversion factor of six people per house to obtain an estimate for Kealakekua Bay. In projecting outward from this baseline, Stannard draws a distinction between leeward and windward districts. Kealakekua Bay is located on the leeward side of Hawaii island and, historically, leeward districts had larger territories than windward districts. Stannard assumes windward districts supported higher population densities because of access to fresh water and sophisticated irrigation technologies. To justify this assumption, Stannard employs Dobyns's "principle of military parity" (1983) developed from the Timucua test case in Flor-

ida. Dobyns argued that populations in adjacent regions must have supported a comparable number of warriors to maintain a military balance of power. Using historical documents and archaeological surveys as support, Stannard assumes that 90 percent of all coastlines and most inland areas were inhabited.

Stannard's disagreement with King's demographic assumptions needs examination. Although the modifications of King's assumptions are consistent with Stannard's bias in favor of more people, the question is whether or not the new assumptions are correct. Are the higher house counts for Kealakekua Bay more likely? If boundaries between leeward and windward districts were established after the decimation that Stannard describes, do they pertain to 1778? Does Dobyns's principle of military parity strengthen the leeward-windward assumption? Dobyns's principle is, in fact, an assumption that was not tested in the Timucua case. Dobyns simply adopted the ratio of warriors as 35 percent of total population from Cook and Simpson's research in Central Mexico (1983: 174-189). He assumed the ratio held for the Timucua. Finally, what percentage of the coasts were inhabited? Why not 87 percent or 95 percent?

The only means of evaluating the accuracy of Stannard's assumptions is to use independent evidence to test each. Although Stannard is clearly aware of the need for independent evidence, he does not test his initial assumptions. Instead, he attempts to justify his estimate in two ways. First, he continually asserts that his assumptions and mathematical manipulations lead to a minimal estimate. In fact, he challenges researchers who support lower estimates to justify their claims: "it is now incumbent on those who would hold this position to demonstrate--*in specific scholarly detail* --precisely how it came to be less than what all evidence suggests is a minimum" (pp. 80, 142).

Second, Stannard uses other lines of evidence to corroborate his population value of 800,000, including growth rates of the founding Hawaiian population, the carrying capacity of Hawaiian environments, the timing of population decline, and the health of the precontact populations. The problem is that each justification involves additional assumptions as difficult to support as those initially employed. Moreover, in each justification Stannard chooses the estimate that is most similar to his own. Consequently, no test is truly independent. A brief example will demonstrate this problem.

Stannard's growth model for the islands assumes that the Hawaiian population was gradually increasing until European contact. The model he chooses is the worst case scenario developed by McArthur,

Saunders, and Tweedie (1976) in a simulation study of Pacific island peopling and growth. Because the size of Hawaii's founding population is not known, Stannard adopts conventional wisdom; he assumes that approximately 100 people with an equal sex ratio settled Hawaii. He then assumes an initial growth rate of 0.9 percent for the first three hundred years of colonization; this growth rate drops to 0.52 percent during the next 1,270 years. According to Stannard, these values are all extremely conservative, but they result in a total island population of more than one million by 1778.

Simulations are useful exercises for generating testable hypotheses that can be employed to evaluate assumptions. Stannard, however, is not generating hypotheses. He is confirming his estimate of precontact population size. Although mutual confirmation of population size through historical documents and computer stimulations may create a plausible estimate, the methodological structure is tautological. Moreover, plausibility is not the business of science. We need to know whether or not the estimate is in the right ballpark. Evaluating assumptions that produced the estimate against independent bodies of data is the most direct method of making such an assessment.

Because the archaeological record is a record of people, it could be used to provide the independent evidence crucial for rejection or confirmation. Moreover, one archaeologist (Kirch 1984) has projected a population growth curve for all of Hawaii that relies on archaeological house counts from western Hawaii. According to Kirch, native Hawaiians had a logistical growth curve. Population increased slowly until A.D. 1200. From that point until A.D. 1600, there was a steep increase followed by a decline that began approximately one hundred years before European contact.

Despite the use of independent data, Kirch's model is no more correct than Stannard's. It is flawed by two assumptions that bias the shape of his house-count curve. Kirch assumes that preservation of habitations is constant through time. Thus, houses from the earliest period of settlement are just as well preserved as those from A.D. 1600. Yet it is an archaeological truism that preservation varies with age. The best-preserved record is typically the most recent. Consequently, it could be argued that Kirch's curve reflects preservation, not population.

In addition, Kirch assumes that the duration of occupation of houses between temporal periods is constant. If duration varied temporally, then periods where occupation is shorter will have more houses (and more people) than periods where occupation is longer. Quite simply, a family who relocates ten times in ten years will leave a house record that

is ten times as large as a family who remains in the same habitation for a decade. Without controlling for duration of occupation (Ramenofsky 1987), house-count curves cannot be accepted as curves of population growth.

The example of Kirch's model of population growth demonstrates that independent evidence does not guarantee that conclusions are correct. All science operates from assumptions, and these must subjected to careful scrutiny. Although Stannard's and Kirch's models have contradictory conclusions about growth rates and timing of native decline, each could be treated as a hypothesis and evaluated against archaeological and historical records. Under appropriate assumptions, archaeological data could determine whether Stannard's or Kirch's model of population growth is correct. History and archaeology could independently confirm or reject the timing of the decline.

Although I have exposed a number of fundamental problems underlying Stannard's estimate, several aspects of his scholarship deserve high praise. Many of the arguments against conventional assumptions of low estimates are logically powerful. Schmitt, for instance, uses current agricultural classification of soils to argue that the Hawaiian land base could not have supported 800,000 people. Stannard counters that contemporary classifications of soils are based on contemporary crop requirements. Traditional taro cultivation thrived on soils that currently have the worst agricultural rating.

There are other reasons for my excitement about the book. To date, most research on the demographic and cultural consequences of European contact has focused on the Americas (Cook 1981; Crosby 1972; Dobyns 1966, 1983; Ramenofsky 1987). With the exception of Crosby's overview of European contact in New Zealand (1986), no one working in the Pacific has seriously investigated the question of disease introduction and resulting demographic catastrophe (Ramenofsky 1989 has a brief discussion of the point). Yet such an investigation in the Pacific region is clearly important for several reasons.

First, because islands have definite spatial boundaries, they have been viewed, since the mid-nineteenth century, as laboratories of evolutionary processes. Yet historical analysis of the behavior of introduced pathogens among island populations has been largely overlooked (see Black 1966 for an exception). As Stannard's work suggests, the data that can be gleaned from historical research read like textbook examples of epidemics. As Stannard notes, within seven years of Cook's landing, venereal disease had spread to Maui, an island not visited by Cook.

In addition, European contact with Hawaiians is two centuries later

than with Native Americans. During that time, Europeans became skilled demographers and developed the germ theory of disease. Both developments have implications for the reliability of initial estimates and for tracking the nature of introduced diseases. Cook, for instance, understood the etiology of smallpox. He required that the crew of the *Discovery* be immunized against or recovered from the disease (Beaglehole 1967). Not surprisingly, Stannard does not list smallpox as, a major killer of native Hawaiians.

Because the documentary record of Hawaii is more complete, the temporal conjunction between disease introduction and the demographic catastrophe cannot be ignored. It must be integrated into historical studies of Hawaiians, and that integration has implications for world studies of biological and cultural termination of native peoples at European contact, Although anthropologists readily admit that native peoples died from introduced disease, they either underestimate the magnitude of the decline or they assume that the disaster postdated initial documentation and settlement. Stannard's analysis is successful in demonstrating that neither approach is supportable in the Hawaiian case. Despite a better understanding of disease processes, pathogens still spread to native Hawaiians, causing a maximum decline of 80 percent in the first fifty years of contact. The catastrophic winnowing of native peoples was not limited to the Americas.

In summary, although the number of untested assumptions makes me skeptical of Stannard's estimate, his paleodemographic research is crucial for developing a research topic with implications beyond the particular case. I support Stannard's efforts and am hopeful that researchers in demography, anthropology, archaeology, and history will respond to the challenges presented in this work.

REFERENCES CITED

Beaglehole, J,. ed.
1967 *The Journals of Captain James Cook an His Voyages of Discovery.* Vol. 3, *The Voyages of the* Resolution *and* Discovery, *1776-1780.* Cambridge: Hakluyt Society and Cambridge University Press.

Black, F. L.
1966 "Measles Endemicity in Insular Populations: Critical Community Size and Its Evolutionary Implications." *Journal of Theoretical Biology* 11:207-211.

Cook, N. D.
1981 *Demographic Collapse: Indian Peru, 1520-1620.* Cambridge: Cambridge University Press.

Crosby, A.
1972 *The Columbian Exchange: Biocultural Consequences of 1492.* Westport, Conn.: Greenwood Press.
1986 *Ecological Imperialism: Biological Expansion of Europe, 900-1900.* Cambridge: Cambridge University Press.

Dobyns, H. F.
1966 "An Appraisal of Techniques for Estimating Aboriginal American Population with a New Hemispheric Total." *Current Anthropology* 7:395-416.
1983 *Their Number Become Thinned.* Knoxville: University of Tennessee Press,

Kirch, P. V.
1984 *The Evolution of Polynesian Chiefdoms.* Cambridge: Cambridge University Press.

McArthur, N., I. W. Saunders, and R. L. Tweedie
1976 "Small Population Isolates: A Micro-Simulation Study." *Journal of the Polynesian Society* 85:307-326.

Ramenofsky, A. F.
1987 *Vectors of Death: The Archaeology of European Contact.* Albuquerque: University of New Mexico Press.
1989 "Another Perspective on Acculturation and Health in Highland New Guinea." *Current Anthropology* 30:67-68.