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A model-based age estimate for Polynesian colonization of Hawai'i

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Abstract

A model-based Bayesian calibration using ^{14}C data from paleoenvironmental cores and materials introduced to the islands by Polynesian colonists estimates that the islands were likely colonized sometime late in the first millennium AD. Two calibrations, one using ^{14}C dates on floral materials and the other using ^{14}C dates on floral and faunal materials, indicate that archaeological materials yield relatively imprecise estimates of the colonization event with 95% highest posterior density regions 3–5 centuries long. Materials introduced to the islands by Polynesians date to two periods, one that coincides with the colonization event, and another some 3–6 centuries later. A disparity between colonization and the first reliably dated archaeological evidence of human activity is identified and estimated to be 1–4 centuries long.

In the sixty years since an unexpectedly old age estimate was returned by the first ^{14}C date from Hawai'i (Libby 1951), archaeologists have used ^{14}C dating evidence to date compiled from site excavation reports, and evaluations of ^{14}C dates from paleoenvironmental investigations. All of these approaches have been implemented in an ad hoc way, without benefit of an explicit chronological model.

Early ^{14}C-based estimates of Polynesian colonization of Hawai'i were framed in the context of arguments for the ages of purportedly early sites. Arguments for an early establishment of three coastal sites were made, including Pu'u Ali'i, Site H1 (Emory and Sinoto 1969); Bellows, Site O18 (Pearson *et al.* 1971); and the Halawa Valley Dune, Site MO-A1-3 (Kirch and Kelly 1975), which was interpreted as somewhat later than the other two. At each of the three sites artifactual or structural evidence was found that differed from expectations based on the known ethnographic and museum records and which was interpreted as indicating some antiquity for the site: at Pu'u Ali'i this was a multi-faceted sequence of change in various types of fishing gear