

MODELS AND METHODS FOR INFERRING THE PREHISTORIC COLONISATION OF HAWAI'I

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ABSTRACT

The question of when the Hawaiian Archipelago was first colonised by Polynesians is a perennial one. There are now two distinct proposals for the timing of this event, which for simplicity's sake might be labelled the long and short chronologies. We describe the two models, the methods by which they estimate colonisation for Hawai'i, and the problems which pertain to each. Finally, we provide an alternative method for estimating prehistoric Polynesian occupation of Hawai'i and then place our findings within the context of a model which differentiates initial colonisation from population establishment.

INTRODUCTION

Perhaps no question elicits greater interest among archaeologists working in the Pacific (and elsewhere) as that pertaining to the timing of the prehistoric colonisation of the more remote islands of the region, in particular, those of Polynesia. Since the 1950s this topic has been addressed by a succession of archaeologists working in Hawai'i (e.g., Emory *et al.* 1959; Emory and Sinoto 1969; Hunt and Holsen 1991; Kirch 1974, 1985, 1986; Pearson *et al.* 1971; Sinoto, 1962; 1983; Spriggs and Anderson 1993). Two main chronological models are used in discussions of the Polynesian colonisation of Hawai'i. One of these is based on a relatively late date for the settlement of the eastern Pacific generally, and Hawai'i in particular. By late, we mean that Hawai'i was settled sometime after AD 500 (Bellwood 1978, 1979, Jennings 1979) and perhaps as late as AD 700–800 (Sinoto 1970, 1983). This view was recently restated by Spriggs and Anderson (1993). Alternatively, other archaeologists

(most notably, Kirch 1986) propose that the prehistoric colonisation of Hawai'i was significantly earlier, i.e., it occurred during the first half of the first millennium AD. For some (Kirch 1974; Tuggle 1979) a date just prior to AD 500 is suggested; while others (Hunt and Holsen 1991; Irwin 1992:216; Kirch 1985:66–68) envision colonisation possibly by AD 100 to 200.

What makes this debate more intriguing is that the two models employ much the same body of data: early prehistoric radiocarbon dates from archaeological sites in Hawai'i. What separates the two models, then, are aspects of archaeological method, in particular assumptions about the relative reliability of dates and the manner in which radiocarbon dates may be analysed for temporal patterning. At the same time, the proposers of these models come to different conclusions because no one has yet developed an explicit framework within which to conceptualise the process of island settlement in Polynesia. Here, we propose such a framework that separates potentially distinct components of island settlement in Hawai'i.¹

THE LONG AND SHORT CHRONOLOGIES FOR POLYNESIAN COLONIZATION

Archaeologists working in Hawai'i have generally accepted a short chronology for Polynesian settlement of the archipelago. The reasons for this are complex, and in Hawai'i they have had to do with: the uncritical use of oral traditions and historical linguistics; an assumption that there were few archaeological sites with stratified cultural deposits; a lack of evidence for temporal change in artifact assemblages; and a view of Hawaiian culture that emphasised its uniformity across the archipelago (Graves and Erkelens 1991). These so-called "facts" suggested that a relatively short duration of time separated

the Polynesian and European discoveries of Hawai'i (Graves and Erkelens 1991).

This view changed with the advent of radiocarbon dating and its application to materials from Hawaiian archaeological sites. Emory and Sinoto's (1961) research at Kuli'ou'ou on O'ahu demonstrated that the prehistoric occupation of Hawai'i extended at least 1000 years before present. Additional dates of even earlier age were soon reported for Hawai'i. These results were initially viewed (Emory *et al.* 1959; Sinoto 1962) as indicating an even earlier period of settlement. Later, with the synthesis of the orthodox model for the colonisation of all of East Polynesia (Emory 1963; Green 1966; Sinoto 1967, 1970), a short chronology for Hawai'i, based on initial settlement at approximately AD 700 was brought into conformance with it. In so doing, the early dates – those pre-dating AD 700 – were treated as erroneous or were ignored (Emory and Sinoto 1969).

Sinoto's method for inferring a late settlement date for Hawai'i is now used infrequently by most archaeologists. However, his conclusion about the late settlement of Hawai'i has recently been advanced again by Spriggs and Anderson (1993). They replace Sinoto's approach with a more rigorous analytic procedure in which individual radiocarbon dates are determined to be either acceptable or unacceptable based on a set of protocols.² These can be grouped into a few categories: 1) unreliable laboratory or laboratory procedures were used; 2) unreliable materials were sampled or dated; and 3) problematic archaeological contexts are represented by the dated samples. Out of the nearly 110 early prehistoric radiocarbon dates for Hawai'i, Spriggs and Anderson (1993:208) reject the vast majority of them.

For Spriggs and Anderson, acceptable radiocarbon dates for the early prehistoric settlement of Hawai'i come from sites with stratified deposits in which the dating of the deposits is consistent with their layering or from sites with a consistent set of dates from the same layer. This analytic approach is similar to that used by many Americanist archaeologists to challenge the reliability of claims regarding pre-Clovis (i.e., Pre-Paleoindian) occupation of North and South America during the late Pleistocene.

The long chronology model has been based on two separate approaches. First, there are a number of radiocarbon dates from Hawai'i whose calibrated intervals most likely date prior to AD 700. Some of these are from sites in Hawai'i which have also produced other early dates, but which are usually dated to an interval after AD 700. There are still other dates which date to an interval prior to this, and often these dates are from a single archaeological feature or layer, or sometimes in association

with much later radiocarbon dates. Hunt and Holsen (1991) were the first to inventory all of the early dates, and to present them in sequential order for the entire archipelago and by island. The distribution of dates for the Hawaiian archipelago shows an increasing trend through time, beginning nearly 2000 years ago. The approach employed is an assemblage based methodology, in which no single date is analysed in detail, but rather, the collective distribution is displayed and interpreted. Thus, Hunt and Holsen (1991:159) suggest that colonisation of Hawai'i by Polynesian settlers could have occurred as early as AD 100.

This temporal pattern is linked to a second approach to resolve of the problem of early Hawaiian settlement. Both Kirch (1986) and Hunt and Holsen (1991) suggest that the number of early prehistoric sites will necessarily be small, given geomorphological considerations and an assumption about the relatively small size of the founding Polynesian population. This implies two correlative propositions: that well-stratified sites may not be common in Hawai'i and that the likelihood of finding pristine early prehistoric sites (and their associated material culture) is low. Early first millennium AD radiocarbon dates reported for Hawai'i may reflect the few early occupations of a small colonising population which have been progressively altered or disturbed through time. A variety of natural and cultural formation processes have operated over time to progressively change the archaeological context of these earliest sites and the dated samples associated with them.

A SETTLEMENT MODEL FOR PREHISTORIC HAWAI'I AND THE APPLICATION OF AN ANALYTICAL STRATEGY

Two models for the prehistoric settlement of Hawai'i have been proposed. Using similar data they come to different chronological conclusions. In our view, the differences between these two models are not only due to the different methods used to analyse radiocarbon dates, but also reflect conceptual problems in the development of a settlement model for Hawai'i and Polynesia. In the latest version of the short chronology, the discovery of a particular type of site (i.e., stratified) with consistent radiocarbon dates is taken as sufficient to resolve the settlement problem. Implicitly this model equates colonisation with the establishment of (relatively) continuously occupied sites. While this may be the case, it need not be so.

What we propose instead takes its inspiration from Irwin's (1992) recent book in which he suggests that the settlement of Pacific Islands may encompass two compo-

nents: exploration and colonisation. We add a third component, that of establishment. Exploration involves the purposeful search for, and possible discovery of, an island or set of islands. Colonisation represents the placement of human populations on discovered islands; whereas establishment represents the occupation of an island or archipelago by a population of sufficient size.³ Sufficient, in this context, means a population which has passed the threshold at which catastrophic accidents or reproductive bottlenecks would be likely to significantly affect its long term viability. We suggest this would involve a population of between 250 and 1000 individuals (i.e., with 75 to 250 adults).

Although it is possible that exploration, colonisation, and establishment may be relatively simultaneous in time, it is also possible that each of these components of the settlement process is separated in time. In fact, Irwin (1992) proposes that for the marginally located islands of Polynesia (i.e., Hawai'i, New Zealand, the Marquesas), exploration would by necessity precede colonisation. Given the vagaries of exploration, colonisation may have occurred a number of years after new islands were first discovered. We also note that if colonisation is achieved by a relatively small founding population(s), then it may take a number of generations (perhaps as many as 10) to achieve effective population size, especially in a place as large as Hawai'i.

With this conceptual model, we can vary the temporal spacing between the components and the numbers of individuals associated with each component. In the simplest version, exploration, colonisation, and establishment all occur simultaneously, with a relatively large number of individuals. Alternatively, there may be some temporal gap between the components, and the number of individuals associated with each of the components will increase through time. Irwin (1992:108–110) suggests that New Zealand may well have been settled along the lines of this model, with an initial phase of exploration and discovery, followed by multiple colonisation events and the rapid achievement of population establishment. By the protocols used to accept or reject radiocarbon dates, Spriggs and Anderson (1993) adopt a similar perspective on colonisation and establishment for Hawai'i, i.e., that the permanent occupation of the archipelago was nearly simultaneous in time with the establishment of sufficient population size.

We propose a third model for Hawai'i. This model posits fewer separate colonisation events⁴ and a longer gap between colonisation and the establishment of a sufficient population size for the archipelago. This model

has the following implications for the settlement of Hawai'i:

- 1) The initial discovery of the islands by Polynesians would have left little archaeological signature, and might be detectable only by the purposeful (and possibly, accidental) introduction of new biota to Hawai'i;
- 2) The colonisation of Hawai'i, under this model, might also be difficult to detect, especially if the contextual protocols for radiocarbon dates proposed by Spriggs and Anderson are used.

Colonisation would be difficult to infer based on the protocols developed by Spriggs and Anderson because if it involved relatively small numbers of people across a number of islands, relatively few settlement locations of fairly ephemeral nature might be expected.⁵ Similarly, the recovery of material for radiocarbon dating from this component of settlement may not occur in the kind of context (i.e., a well-stratified site) that Spriggs and Anderson suggest is necessary to confirm human occupation of East Polynesian archipelagos. Only with the establishment in Hawai'i of Polynesian populations in continuously and relatively permanently occupied locations would the proper conditions be met for the subsequent recovery of radiocarbon samples in a consistent stratigraphic sequence or within an unambiguous cultural layer from an archaeological site.

Posed in this manner, we see how different methods for analysing radiocarbon dates may lead us to particular conclusions about the settlement history of Polynesia. Hunt and Holsen use radiocarbon dates that very likely do include anomalous estimates and there is no procedure provided for recognising them. Spriggs and Anderson, on the other hand, may have excluded samples that do, in fact, date an extended phase of colonisation prior to population establishment in Hawai'i.

We suggest an alternative approach for analysing the radiocarbon dates from Hawai'i. We offer this as a first step towards resolving the problem of the earliest Polynesian settlement of Hawai'i. Following Hunt and Holsen we adopt an assemblage-based approach to the analysis of Hawaiian radiocarbon dates. However, for our purposes here, we limit our discussion to the Islands of O'ahu and Hawai'i, the only two in the archipelago with sufficient numbers of early radiocarbon dates to be useful for this type of analysis (Fig. 1). Also, we inspect the date assemblages for temporal clustering(s) of dates. Following Spriggs and Anderson, we include only on those dates which meet the following criteria: 1) are on wood charcoal; 2) have a range of less than 900 years 2

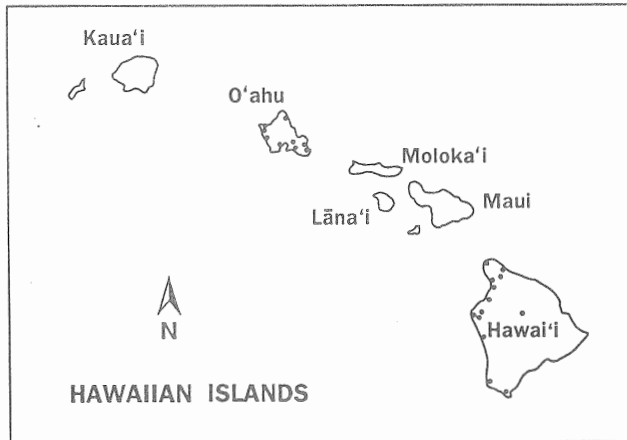


Figure 1. A map of the Hawaiian Islands showing the locations of sites on O'ahu and Hawai'i Islands with early prehistoric radiocarbon dates.

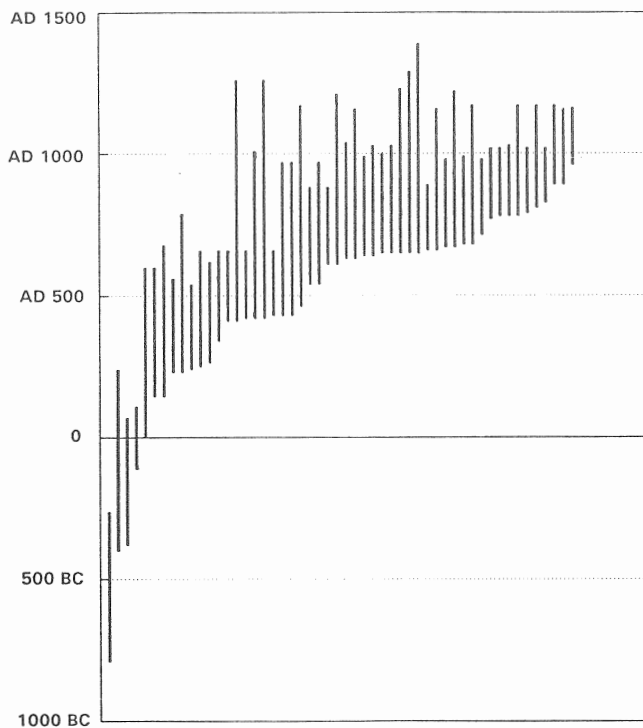


Figure 2. Calibrated early prehistoric radiocarbon dates (at 2σ) on wood charcoal for O'ahu and Hawai'i Islands.

σ^6 ; and 3) are not associated with potential laboratory error.

Inspection of the dates which fulfil these requirements for Hawai'i and O'ahu Islands, also confirms and extends Spriggs and Anderson's conclusion regarding the dating of early sites: that sometime after AD 600 there was the establishment of Polynesian populations across several different areas on these two islands (Figure 2). Thus, there is congruence here between a few dates which Spriggs and Anderson believe use to confirm early occupation of Hawai'i and a larger number of dates (based on the criteria listed above) whose temporal interval overlaps with this same time interval.

Yet, there are also a number of earlier dates from both islands which are unacceptable according to the protocols established by Spriggs and Anderson. Several of these dates are clearly anomalous, simply by virtue of showing almost no overlap in their ranges with the remaining set of radiocarbon dates. These anomalous dates typically extend back more than 2000 years BP. However, there are a series of dates from both islands; 11 altogether by our count, whose intervals are mostly contained within the interval between AD 200–600. They occur in depositional contexts which Spriggs and Anderson interpret as unreliable, but whose temporal clustering suggests some kind of systematic effect. We suspect these dates reflect a protracted phase of colonisation during the settlement of Hawai'i. Note that the characteristic which distinguishes these dates – their temporal clustering – is the same characteristic we used to match the post AD 600 dates with Spriggs and Anderson's establishment phase of settlement.

CONCLUSION

We would not wish to suggest that we have resolved the question of Hawaiian prehistoric settlement. What we do hope to have accomplished is to suggest that we must attend to the relationship between the analytic methods we use and the models which underlie our interpretations. Methods, in short, are not necessarily neutral with respect to the interpretations we produce about the past, and this can be especially problematic when our models are covert or implicit. For the settlement of Hawai'i, we propose that, with the available evidence, we can be relatively confident that the establishment of Polynesian populations in the archipelago was accomplished sometime after AD 600; colonisation of Hawai'i occurred at approximately the same time as establishment (and cannot currently be distinguished from it on the basis of radiocarbon dates). Alternatively (and more likely in our view), it took place during the interval AD 200–600 and is reflected by a suite of radiocarbon dates from this period. These dates derive from a variety of contexts (all of

which Spriggs and Anderson view as problematic), in different locations of at least two islands in the archipelago. While a "hygienic" analytical methodology may hold that individually each of the dates is uncertain, as an assemblage they challenge the late chronology model for the settlement of Hawai'i.

NOTES

1. This paper, first delivered at the IPPA Congress in Chiang Mai, is published here largely without change. An enlarged and more comprehensive paper (Graves and Addison 1994) on the topic of the prehistoric settlement of Hawai'i is under review.

2. Although in their article they identify three categories – including those assigned as questionable – for Hawai'i Spriggs and Anderson (1993) tacitly treat questionable radiocarbon dates as unacceptable.

3. Just as exploration may not always have been successful, colonisation may have also occasionally failed. This would account for some of the islands in Polynesia (including some in Hawai'i) which were once occupied but were abandoned prior to European contact. Yet, initial attempts at colonisation may also have failed to establish a sufficiently sized population on larger islands, only to have this achieved at a later date. Too often archaeologists presume that if establishment of a population occurred, it happened with the first colonisation event.

4. Alternatively, there may have been more colonisation attempts but they may have been spread out over a longer period of time. Cachola-Abad's (1993) recent study of Hawaiian oral traditions provides some support for this notion.

5. Mobility might also have played a greater role in early prehistoric Hawaiian settlement than has been previously acknowledged. With few competitors for territory, early Polynesian colonists may have moved across the islands' landscapes more frequently to obtain food resources.

6. Radiocarbon dates with intervals greater than 900 years provide relatively little information about the true age of the event on which they are based.

7. We cannot envision a natural process (e.g., the in built age effect) which could produce this type of temporal patterning. Nor do we believe all these dates are the result of laboratory errors since at least three different radiocarbon dating laboratories produced these dates.

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