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THE EVOLUTION AND ORGANISATION OF PREHISTORIC SOCIETY IN POLYNESIA

Edited by Michael W. Graves and Roger C. Green

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MONOGRAPH

EVALUATING THE ORTHODOX DUAL SETTLEMENT MODEL FOR THE HAWAIIAN ISLANDS: AN ANALYSIS OF ARTEFACT DISTRIBUTION AND HAWAIIAN ORAL TRADITIONS

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Settling one of the most isolated areas on this planet, Hawaiians have long evoked inquiries concerning their origin. Hawaiian oral traditions, rich in stories of migrations and voyaging, were among the first sources used to address this question. These indicated the Society, Marquesan and Samoan island groups as possible departure points (Fornander 1969; Kalākaua 1972; Kamakau 1991; Malo 1951). For although the traditions most commonly refer to 'Kahiki' (Hawaiian morphological cognate of 'Tahiti') as the legendary Hawaiian homeland (e.g., Fornander 1969 I:180; Kamakau 1991:91; Malo 1951:6), 'Kahiki' is used to denote any foreign land abroad (Elbert and Pūku'i 1986:181; Ellis 1979:312; Fornander 1969 I:180; Kalākaua 1972:70; Kamakau 1991:90). Later, comparative linguistic studies of East Polynesian languages suggested Tahiti (Emory 1959, 1963), as well as the Marquesas (Elbert 1982; Emory 1963; Green 1966), as places from which Hawaiians originated (see Fig 3.1).

However, it was a series of articles by archaeologists Kenneth Emory and Yosihiko Sinoto in the 1960s and 1970s (e.g., Emory 1959, 1963, 1968; Emory and Sinoto 1964, 1965; Sinoto 1967, 1968, 1970 and 1979b) that laid the foundation for what has since become a widely maintained and accepted belief. This 'orthodox' model asserts that Hawaii was first settled from the Marquesas archipelago between A.D. 500 and 750 and then colonised by a second wave of migrants from the Society Islands around A.D. 1200 (Emory 1963:83; Emory and Sinoto 1965:103; Emory in Mitchell 1982:11). Subsequent writers on such varied aspects of Hawaii as its natural environment, history and native culture have since recounted all or part of that model in their works, thus giving it the status of a 'fact' (e.g., Cox and Davenport 1988:7; Krauss 1974:5; Lind 1982:9; Luomala 1965:1; Mitchell 1972:15, 1982:11; Mullins 1973:1, 1976:4; Nordyke 1977:7; University of Hawaii Department of Geography 1983:9, 92). Yet within the archaeological community from which Emory and Sinoto's model arose, repeated questions have emerged about the dual settlement of Hawaii as well as the larger Polynesian settlement model (e.g., Bellwood 1970; Cordy 1974; Finney *et al.* 1989; Hunt 1979; Irwin 1981, 1989, 1990, 1992; Kirch 1984, 1985, 1986; Rolett in press; Sutton 1987; Walter 1990).

This study provides a description and critical assessment of the settlement model for Hawaii as originally developed by Emory and Sinoto (1965) 28 years ago. Artefactual evidence of Hawaii's settlement used in region wide comparisons by Emory and Sinoto, as well as more recent information derived from studies in the Hawaiian, Marquesas, Society and Cook Islands, will also be evaluated in relation to the 'dual settlement' model.

Given that the Emory and Sinoto model remains largely unconfirmed, this study outlines the nature of archaeological analyses that will improve our ability to evaluate both the dual settlement model and an alternative 'interaction' model involving recurrent contact with the central East Polynesian (CEP) region. Hawaiian and Polynesian oral traditions are offered as another appropriate data set to evaluate both models. Consistent with current archaeological data, the analysis of oral traditions does not support the model of dual settlement for Hawaii, but reveals a pattern of recurrent contact between Hawaii and a larger CEP region.

THE ORTHODOX AND INTERACTION MODELS

In the 1960s, given then prevailing beliefs and available data, Emory and Sinoto developed a scenario of East Polynesian settlement which included the following major propositions (Emory 1963:83; Emory and Sinoto 1965:103; Emory in Mitchell 1982:11; Sinoto 1979b:112):

1. Ancestral Polynesian society developed out of a founding Lapita tradition in the western Polynesian 'homeland' (Tonga and Samoa) from the late second millennium B.C., through the ensuing 1500 years during which time no further attempts were made at eastward colonisation.
2. At *ca* A.D. 300 the first East Polynesian group, the Marquesas Islands, was colonised. Here common traits characterising archaic East Polynesian culture developed.

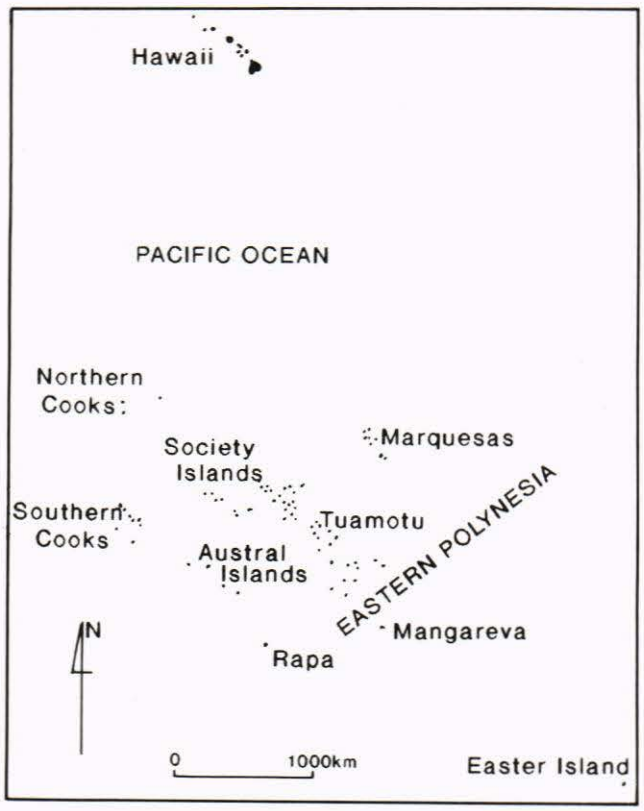

Fig 3.1. East Polynesia showing location of island groups.

3. The Marquesas subsequently served as a major dispersal centre whereby its inhabitants colonised the Society Islands soon after their arrival at the Marquesas, then settled Rapa Nui at *ca* A.D. 500, Hawaii *ca* A.D. 500-750 and New Zealand *ca* A.D. 750.

4. The Society Islands served as a secondary dispersal centre with migrants settling New Zealand at *ca* A.D. 1000 and Hawaii *ca* A.D.1250.

Focussing on Hawaii, both the orthodox model of dual settlement and the alternative interaction model can be described in relation to three basic components: the size of the geographic source for the populations who settled Hawaii, the frequency of population movement and the timing of initial discovery (Michael Graves pers. comm. 1992).

Emory and Sinoto's dual settlement model utilises relatively limited geographic homelands for founding populations, first the Marquesas and then Society archipelagos. Frequency in population movement is viewed as episodic and constrained to two distinct and unrelated periods of migration, first from the Marquesas and then from the Society Islands. Initial colonisation in this scenario is late, with the Marquesas Islanders settling Hawaii sometime between A.D. 500 and A.D. 750.

An alternative interaction model can be constructed by varying the states of the three components which underlie the dual settlement model. This new model proposes that the Hawaiian populace was comprised of individuals from the wide geographic region of central East Polynesia. Recurrent arrivals are seen as diminishing through time. The founding population in the interaction model may have arrived early in the first millennium A.D.

Various researchers have indicated problematic aspects of the orthodox Polynesian settlement model which have implications for the Hawaii dual settlement model. These involve sampling problems, unresolved questions regarding the Marquesas cultural sequence and meteorological evidence arguing against the Marquesas being the first East Polynesian archipelago settled (summarised in Table 3.1). Based on the sampling inadequacies alone, two parameters (island origin, frequency) of the dual settlement model cannot yet be confirmed. The lack of sufficient samples representing all Polynesian island groups through the first millennium A.D. illustrates why the orthodox view of relatively late Hawaiian settlement from a geographically limited region cannot be accepted given current evidence.

ASSEMBLAGE COMPARISONS AND EAST POLYNESIAN COLONISATION MODELS

Much of the empirical support for a Marquesas to Hawaii colonisation model derives from the work of Emory and Sinoto referenced above. Their articles promoting the dual settlement model were grounded in the basic premise that assemblage traits from early Hawaiian sites were similar to those dating to the period A.D. 500-750 in the Marquesas, and that artefacts from Hawaii sites dated to *ca* A.D. 1250 exhibited characteristics comparable to those dating to the same period from the Society Islands. The evaluation that follows of the dual settlement model for Hawaii focusses on this underlying proposition, clarifying the data and analyses Emory and Sinoto used in its construction.

The dual settlement model

The artefacts Emory and Sinoto employ in arguing for Hawaii's settlement, first from the Marquesas and later from the Society Islands, include fishhooks, trolling lures, fishhook manufacturing tools, adzes, pendant ornaments and quoits (Emory 1968; Emory and Sinoto 1964, 1965; Sinoto 1967, 1968, 1970, 1979b). In determining relationships of the Marquesas and Society Islands to one another, to West Polynesia and to New Zealand, a much wider array of artefacts were used. Data from these articles are summarised in Table 3.2, to which more recent data from the region including the Cook Islands are added for comparison. (This table will be further discussed later.)

Issue	Critique	Significance
Sample Size Samples used for analyses developing the model are treated as being representative of the potential archaeological record.	• Relatively few surveys and excavations have been conducted in such geographically critical areas as the Society and Cook Islands (Bellwood 1970; Irwin 1981; Kirch 1984,1986). • The Marquesas Islands' geomorphology is more stable than the Society Islands' which experience greater tectonic submergence, coastal aggregation and alluvial sedimentation making it more difficult to locate early sites there (Bellwood 1970; Kirch 1986). • Pottery sherds recently found on Ma'uke and Atiu in the South Cooks (Walter and Dickinson 1989), exemplify past and current sample size inadequacies.	Sample diversity is often a function of sample size (Grayson 1984). Differences in traits from various Polynesian assemblages used to infer cultural historic relationships may also be explained by problems of non-representative samples.
Marquesas Settlement Phase: West Polynesians are believed to have made their first East Polynesian landfall at the Marquesas (at *ca* A.D. 300).	• Suggs (1961:180) places the Marquesas settlement phase between 150 B.C. and A.D. 100 based on his Ha'atuatua data. • Sinoto's (1979b:112) determination that the Marquesas Islands were initially settled at *ca* A.D. 300 was based on Hane radiocarbon dates including samples that were probably contaminated or mistreated (Kirch 1986:23; Rolett 1989:86, Table 3.5). • Ottino (1985:33, 1990:3) documents early dates for an Anapua rockshelter (*ca* 95 B.C.) and a Ha'atuatua site (*ca* 150 B.C.). • Two possibly locally made pottery sherds from Atuona, Marquesas (Kirch *et al.* 1988:105), suggest earlier sites have not been found. • Hunt and Holsen (1991:158) argue that "78 early dates from seven islands might be suggestive of a human presence as early as the first century A.D." in Hawaii.	The timing in the Orthodox model for the settlement of East Polynesia and the specific settlement periods for each archipelago must be re-evaluated given current evidence.
Marquesas Development Phase: This phase is thought to have occurred between A.D. 600 and A.D. 1300 during which time it is believed Marquesans settled Hawaii and New Zealand.	• The timing and characterisation of this phase are inconsistent among researchers (see Suggs 1961; Sinoto 1979b; Rolett 1989). • Differing assemblage traits dated to this period may be a result of adaptations to varied environments (Reinman 1970) or due to the time required for stylistic traits to be replicated across space (Deetz and Dethlefsen 1965; Dunnell 1970).	The timing of this period and its characteristic artefact traits are not consistently described. Thus, a cited similarity of early Hawaiian and Maori assemblages with only one view of this phase is inconclusive.
Meteorological Factors The Marquesas, situated about 1,800 miles east by north of Samoa and 700 miles north-east of Tahiti (Finney 1985:16), is considered to be the first East Polynesian area settled from West Polynesia.	• Computer simulations of wind and current patterns suggest the North and South Cooks would be the most likely groups at which voyagers from West Polynesia would land (Levison, Ward and Webb 1973; Irwin 1989, 1990, 1992; cf. Finney 1985). • A settlement route through central East Polynesia traversing the Cook, Society, then the Marquesans Islands is more consistent with the preceding trajectory of colonisation in the south-west Pacific (Hunt 1979; Irwin 1989, 1990, 1992), which follows expectations based on meteorological factors. • Voyages of Hōkūle'a demonstrate how Polynesian navigators could have reached any East Polynesian group directly from West Polynesia using periodic westerly wind shifts (Finney *et al.* 1989).	Meteorological factors call into question the belief that the Marquesas is the dispersal centre for East Polynesia. A larger regional homeland, minimally including the Marquesas, Society and the Cook Islands, is more probable.

TABLE 3.1. Critiques of the orthodox Polynesian settlement model relevant to the Hawaii dual settlement model.

As Emory and Sinoto do for the majority of comparisons made between the regions, Table 3.2 lists artefacts in relation to presence/absence and conflates stylistic and functional traits. Of these artefacts, the only ones with which Emory and Sinoto deal in quantitative terms and for which they provide significant chronological assessments are the fishing supplies.

Fishhook manufacture. The first issue in evaluating the validity of comparing fishing articles is differential sample size and its effect on the range of forms represented in the limited assemblages used in analysis. In the Marquesas, Sinoto found porpoise bone hooks only in the lower excavation levels, with later strata having only pearl-shell fishhooks (Sinoto 1967:348). Secondly, Sinoto discovered that some early Ka Lae (South Point), Ka'ū, Hawai'i Island fishhooks were also made of porpoise bone, while those in the Society Islands were made of pearl and *Turbo* shell (Sinoto 1967:348). From this, Sinoto concludes that Hawaii was first settled from the Marquesas.

Sinoto's second argument relates to fishhook manufacturing tools. Although he cautions that the Marquesan and Society Islands sites produced far fewer of these than Ka Lae, he continues to draw conclusions from the small samples (Sinoto 1967:349). A Marquesan settlement of Hawaii is inferred by the distribution of *Porites*, branch coral and sea-urchin spine files. *Porites* files were present in the assemblages of all three regions, but to a lesser degree in the Society Islands. Branch coral files were found only in the Society Islands (Sinoto 1967:Table 2; cf. Skjølsvold 1972:Fig. 18). Small numbers of sea-urchin files were retrieved from the Society and Marquesas Islands and large numbers from Ka Lae in Hawai'i (Sinoto 1967:350).

This argument is problematic since the absence of branch coral files in the Marquesas and Hawaii used to imply relatedness may simply be a sampling error or a reflection of differences in availability. Sinoto (1967:351) even acknowledges that "branch corals actually grow in the waters surrounding both groups, but much less extensively near the Marquesas and Hawaii than in the Society Islands", thus affecting its use. Nevertheless, since his experiments with branch and *Porites* files on pearl-shell suggested that branch coral was functionally superior to *Porites*, he believes the use of *Porites* files was a cultural choice transferred to Hawaii from the Marquesas (Sinoto 1967:351).

In relation to the sea-urchin spine files, Sinoto (1967:350) states that they "were predominantly used in Hawaii, but to a lesser extent and only in the early culture of the Marquesas." From this he surmises that "the choice of the file material suggests a cultural relation similar to that exhibited in the fishhooks of the two areas" of Hawaii and the Marquesas (Sinoto 1967:350). Yet he also states that a few sea-urchin spine files were recovered from the Society Islands, although he diminishes its significance by arguing that the sea-urchin spine files were used on "bone artifacts, such as human bone chisels, rather than on fishhooks" (Sinoto 1967:351).

Sinoto's next comparison is of fishhook manufacturing methods. In the initial processing of a blank, he makes no mention of Hawaii's relationship to other island groups except to say that "the filing and notching methods were used only in Hawaii and the Society Islands" (Sinoto 1967:353 and Fig. 6). From this he draws no explicit conclusion. Similarly, the size and an index indicating the ratio between the points and shanks of one-piece hooks provides little comparative significance as "an analysis of the total collection of jabbing and rotating hooks from the three areas reveals a different shank-to-point ratio for each island group" (Sinoto 1967:354). Despite this, Sinoto uses the smaller sample of non-barbed jabbing hooks to suggest that an average point-to-shank index of 1.92 for the "lower levels" of the Hane site is consistent with the "early" Ka Lae sites averages of 1.63, 1.76 and 1.80 (Sinoto 1967: Table 5). His "late period" Society Islands fishhooks from an unidentified source produced a 1.41 shank-to-point average index which he likens to those of 1.62 and 1.45 for the Ka Lae "middle" level assemblages (Sinoto 1967:Table 5). No shank-to-point indexes were provided for the "middle" period Marquesas or Society Islands assemblages. The uppermost levels of the Ka Lae sites provided shank-to-point indexes of 1.90 and 1.60. As is evident, this argument and these figures do not strongly support the necessary implications of the dual settlement model.

Sinoto then evaluates other aspects of fishhook morphology, specifically two-piece fishhooks as well as barbs and head types. He concludes that "two-piece hooks were developed in the fringe areas of East Polynesia", since none were found among the central Polynesian assemblages (Sinoto 1967:347; cf. Walter 1989:Table 1). He further believes barbs are "characteristic of the fringe areas of Polynesia" as "no barbed one- or two-piece hooks are found in Central Polynesia" (Sinoto 1967:347, 355; cf. Chikamori and Yoshida 1988:Fig. 17). However, he contends the "Hawaiian head types of the HT1 form were common in the bottom layer of H1 site [Pu'u Ali'i, Ka Lae]," and that "the early Marquesan bone fishhooks have the same type of heads" (Sinoto 1967:357). Moreover, "the most common head type, HT4 of Hawaii, rapidly increased in the later period and the type was introduced among the later Tahitian hook head types" (Sinoto 1967:357). While not explicitly stated, this affinity of Hawaiian fishhook head types to early Marquesan and later Tahitian ones is apparently used to

argue for the two migrations. Of all the evidence Emory and Sinoto provide, this is probably the most convincing, although similarity in possibly functional traits such as these cannot be presumed to imply genetic or historic relatedness (Dunnell 1978), and the limited and likely non-representative samples remain a problem.

Sinoto goes on to include trolling hooks in describing relationships between the island groups. He reveals that "there are three types of lure shanks in the three island groups" (Sinoto 1967:357), and that "by the time points with distal extensions were made, the shanks had all been changed to the slender-shoulder type," although "small shanks made of conus shell" have been found only in the Society Islands and Hawaii (Sinoto 1967:358). He makes no further point of the latter finding.

Adze manufacture. Emory's 1968 analysis of East Polynesian relationships as revealed through adzes provides similar uncertain conclusions. In his summary he describes the difficulties in "narrowing the time and point or points of origin of the Hawaiian, New Zealand and Pitcairn adzes... because of the fact that adze types introduced into those islands are found among the early adzes of both the Society Islands and the Marquesas" (Emory 1968:166). Regardless, he notes that "the marked angle of butt to tang in Hawaiian adzes has not yet been found in the Marquesas, but is met with in the Society Islands . . . [while] our earliest adzes from Kauai and Hawaii do not exhibit an angle of the butt beyond that which may be seen in Marquesan adzes." This argument is used to advocate for an early Marquesan settlement of Hawaii and a later colonisation by Society Islanders.

Sinoto also acknowledges the enigmatic nature of the adze data by saying that "from present evidence it seems that the differences between Hawaiian and Marquesan adzes are greater than between the adzes of Easter Island and the Marquesas, or those of the Societies and the Marquesas" (Sinoto 1979b:121).

Pendant ornaments. Sinoto (1979b:127) describes three types of related whale-tooth pendant ornaments found throughout Polynesia. Variety 1 is an unmodified whale tooth or simulated whale-tooth form. Variety 2 is a whale-tooth or other material pendant with a long and rounded stem. Variety 3 is made of shell or whale-tooth, shaped to a whale-tooth profile, flattened and has side perforations near the top.

Sinoto uses these varieties to suggest relationships within the region, noting that variety 1 is found in Hawaii, the Marquesas, Mangareva, Rapa Nui, Samoa and Tonga, but not in the Society Islands (Sinoto 1979b:127). Variety 2 is identified from Hawaii, Marquesas, New Zealand, Samoa and Tonga assemblages (Sinoto 1979b:127). This "distribution of whale-tooth pendants in East Polynesia suggests dispersal from the Marquesas" (Sinoto 1979b:129).

Quoits. Emory (1968) offers the notched basalt quoits found exclusively in the Society Islands and Hawaii as "concrete evidences" "of powerful Tahitian influence in forming Hawaiian culture" (Emory 1968:167).

Critique of the artefactual evidence

Two major flaws are evident in the artefactual analysis used to advance the dual settlement model. First, historical relationships inferred from the artefact data rely heavily upon the presumed absence of a given trait. However, the current absence of a trait in a site assemblage cannot be used to infer that it was absent from artefacts of that or surrounding areas (Grayson 1984). This is especially so in Polynesia where significant sampling problems exist.

Second, the paucity of unambiguous artefact correlations between island groups leads one to question the validity of the interpretations created from them. Although Emory and Sinoto include between them a description of similarities and differences of at least 54 artefact classes noted in Hawaii, Marquesas and the Society Islands (see Table 3.2), they offer only 13 classes as support for their Hawaii settlement model. They also use a small number of the other observed classes to focus on relationships between additional island groups. However, the majority of the classes only seem to serve a descriptive role.

Concerning the 13 traits relating to Hawaii, four of them (the filing and notching fishhook manufacturing method, two-piece fishhooks, presence of barbs on one-piece fishhooks and the form of trolling hooks) do not corroborate the dual settlement model. Similarly, the remaining nine traits (fishhook material, head types and point-to-shank height indexes, presence of small conus shell lure shanks, preferential use of sea-urchin or *Porites* coral files over branch coral files, the adze butt to tang angle, whale-tooth pendant ornaments and the presence of quoits) might assist in verifying their model if the artefacts retrieved were from temporally appropriate strata, represented homologous similarities, were not environmentally determined, and if the 'absence' of the traits used in the interpretations reflected the actual absence of those traits in the potential artefact record in the stipulated locales - all of which is yet to be determined. Still, Sinoto (e.g., 1979b:125-126, 1991:85) later refers to such comparisons of fishhook and trolling lure morphology, materials, and manufacturing methods as though they were well-established valid means for assessing chronological sequences of artefact assemblages throughout Polynesia as well as historical relationships of the groups who created them.

Theoretical and methodological problems

Emory and Sinoto's approach to determine relatedness amongst prehistoric populations, and hence the direction and location of colonisation within East Polynesia, generally falls within a culture history paradigm originally established in archaeology to develop chronologies (Dunnell 1986:29). In this approach, items of material culture from different temporal and/or spatial units are compared and similar traits (e.g. fishhook forms) viewed as a function of relatedness (Dunnell 1978). This research strategy may produce ordered descriptions of archaeological units indicating relationships (e.g. in the orthodox East Polynesian settlement model). As Graves and Erkelens (1991:5) suggest, culture historians have treated differences among spatial units as the outcome of history. Thus time is inferred from spatial relations involving comparisons of forms or attributes of material culture. If this approach is followed on stylistic traits (after Dunnell 1978), it can produce testable conclusions that may be revised and refined.

However, Sinoto's use of this paradigm is not typical (Michael Graves pers. comm. 1992). He first characterises a given phase based on a few sites with dated assemblages (e.g., 'early' Hawaiian fishhook forms from the Ka Lae assemblages), then presumes that when he encounters similar assemblages at other sites that they are 'dated' to the same time as his referent assemblage. Alternatively, if a new assemblage he encounters is dissimilar to his referent one, he assumes it does not fall within the time span of his referent assemblage. This obviates any testing and refinement of his originally defined artefact traits used to characterise a phase, and does not address the issue of environmentally influenced traits or the time lag involved for stylistic traits to spread across space.

Yet even when this paradigm is scrupulously followed, a major inadequacy remains in that it cannot account for independent evolution of analogous forms. This could cause interpretive inaccuracies if two geographically separated cultures independently exhibit a given trait (e.g., preference for using inner-barbed fishhooks). Culture historians might infer the trait appears in the two assemblages due to members of one tradition influencing the other.

A further flaw of this paradigm is its inability to differentiate between contact (e.g., two-way voyaging between Hawaii and other East Polynesian island groups) and migrations leading to true genetic relatedness (e.g., Emory and Sinoto's proposed Marquesan and Society Islanders' settlement of Hawaii). Thus, similarities due to common ancestry or continued contact cannot be discriminated except for the instance of initial colonisation where the homeland can be inferred.

Another criticism of the culture history approach, as applied by Emory and Sinoto, involves their trait selections used for comparisons (Terry Hunt pers. comm. 1991). Dunnell (1978) describes the need to differentiate between style and function. Stylistic traits are those imparting no adaptive value to an object and which exhibit a unimodal frequency distribution through time or space. Functional characteristics are those constrained by the functional performance of an object (traits imparting an adaptive value), and which vary in frequency through time and space but do not exhibit a unimodal frequency distribution (Dunnell 1970).

In most culture history time/space charts, such stylistic traits as pottery designs are used since they are thought to have little adaptive value while being likely indicators of historical relatedness. However, Emory and Sinoto inadvertently rely most heavily on functional traits (e.g., presence of a barb on fishhooks or a given index of shank-to-point ratio for fishhooks). Such uniformity may be a result of independent invention or from a group adopting a trait after even brief contact with another group. In the same light, differences in fishhook size, form and material might actually reflect disparate environmental conditions (e.g., access to reef or deep sea fishing and availability of pearl-shell) (Reinman 1970) more than a postulated distant relationship between the two cultures. In short, Emory and Sinoto's application of culture history assumptions to Polynesian prehistory conflates stylistic (homologous) and functional (analogous) traits. This manifests itself in their research in that they fail to realise that similarity in fishhook forms or other artefact traits may not imply historic relatedness of the groups who use them.

These problems are exacerbated by the limited samples from which Emory and Sinoto made their interpretations wherein the Society Islands are poorly represented and the Cook Islands not considered. For instance, Sinoto shows concern regarding the validity of his comparison of early and late fishhook forms from the Hawaiian, Marquesan and Society Islands stating that "the reliability of the data is not very high, especially for the Society Islands, because the early level is represented only by a **single** hook" (Sinoto 1967:354-355; emphasis added). Here Sinoto recognises the sample inadequacy, but does not discount the conclusion derived from the problematic assemblage. One can assume this sample of stratigraphically defined Society Islands fishhooks did not dramatically change since his subsequent excavations at Fa'ahia, Huahine, resulted in the retrieval of a single fishhook and portions of two trolling hooks (Sinoto 1979a:10), and at Vaito'otia, Huahine, he excavated only seven fishhooks (Sinoto 1983:588).

While Sinoto did have 59 other Society Islands

fishhooks in his analysed assemblage (Sinoto 1967:342), this is a far smaller sample than the 780 fishhooks from Hane, Ua Huka, Marquesas and the 1911 fishhooks from Ka Lae, Hawai'i (Sinoto 1967:342). As the diversity within assemblages (or their similarity) is often directly related to differences in sample size (Grayson 1984), it is likely that inferences from presence/absence or fishhook measurements from the three island groups are problematic. Further, even if the sites provide similar sample sizes, they represent only small localities within island chains which thus skews the assemblages to reflect local raw material resources and fishing conditions (Reinman 1970).

The artefacts which Emory and Sinoto employ to substantiate their model are derived from biased samples, are not systematically analysed within an explicit or consistent theoretical framework and hence lack unambiguous interpretive value. Equally important is that artefact evidence in Polynesia is changing rapidly. Additional artefact classes from Hawaii, Marquesas and the Society Islands have since been documented, many of which are now also known from the Cooks (see Table 3.2).

Given the location of the Cooks directly east of Samoa and Tonga (see Fig. 3.1), as well as Allen and Steadman's (1990:30) assessment that "significantly earlier deposits remain to be identified in the Southern Cooks," future work on Hawaiian origins will have to address Cook Islands information unavailable to Emory and Sinoto. Indeed, Levison, Ward and Webb's (1973) computer simulation of meteorological conditions in Polynesia indicated the northern and southern Cooks as the two East Polynesian locations at which voyagers from West Polynesia would most likely land. Irwin's (1989, 1990, 1992) more recent analyses support this viewpoint as he determined that the southern and northern Cooks and Society Islands would in all probability be settled prior to the Marquesas group given their locations and size as archipelago wide voyaging 'targets,' and the prevailing weather conditions in the region (cf. Finney 1985). The voyages of Hōkūle'a demonstrate how early Polynesian navigators would have been able "to sail a voyaging canoe from west to east across Polynesia by using westerly wind shifts", such that "all the central East Polynesian archipelagos could have been reached directly from West Polynesia" (Finney *et al.* 1989:291, 293).

Considering all the above critiques, it is safe to conclude that at present no compelling artefactual evidence exists to warrant the belief that Hawaii was settled first from the Marquesas and then colonised in a second episode from the Society Islands. There is even less evidence to conclude that such migrations occurred at the late dates suggested.

NEW ANALYSES OF EXISTING MODELS

Additional research is needed to provide a more precise and accurate answer to the question of Hawaiian origins. A first step towards addressing the issue is to identify the expectations of models which could be evaluated as new studies are completed. The dual settlement and interaction models are two that should be tested in the future. Archaeological data as well as Hawaiian and Polynesian oral traditions can be utilised; the following section evaluates the two models and lays a foundation for future research.

Archaeological expectations of the models

Implicit in Emory and Sinoto's settlement model for Hawaii is the notion that traits recorded in its early assemblages are more similar to those of the Marquesas from that same period than to assemblages from other central East Polynesia island groups of the time. Thus, frequency or occurrence distributions of various traits recorded for Marquesas assemblages should closely resemble frequency or occurrence distributions of the same traits from slightly later Hawaiian assemblages. This delay is necessary to account for the time lag associated with the movement of stylistic traits across space (Deetz and Dethlefsen 1965; Dunnell 1970). Emory and Sinoto's Society Island trait frequency distributions dated to their proposed second migratory period *(ca* A.D. 500-750) should be similar to Hawaiian assemblages of a somewhat later period. The time lag involved the creation of Society Islands' traits within a Hawaiian society (composed at that time of at least two separate cultural traditions, a third possibly being the evolving and unique Hawaiian culture), of a rather long duration because different communities accept new ideas at varying rates (Dunnell 1970).

The orthodox model may be evaluated by comparing frequency seriations on appropriate analytical units. Following the timing set out in Emory and Sinoto's model (Emory 1963:83; Emory and Sinoto 1965:103; Emory in Mitchell 1982:11; Sinoto 1979b:112), a set of seriations, using traits from numerous Hawaiian sites representing the earliest period, should most closely resemble seriations of the same traits from A.D. 500-750 Marquesan assemblages if their model is accurate. Likewise, seriations of Hawaii assemblage traits for the period *ca* A.D. 1250 should most closely match seriations of the same traits from Society Island assemblages of a slightly earlier period following the dual settlement model.

An underlying assumption in the interaction model is that much contact was occurring within CEP (central East Polynesia) prior to and as populations became established in

Hawaii, as well as during the period contact was maintained with that group. If this is so, then the earliest assemblages should display traits found in different areas across CEP, and the individual CEP island groups assemblage traits will show similarities with one another as well. Numerous authors advocate a CEP regional homeland (e.g., Finney *et al.* 1989; Irwin 1981, 1989, 1990, 1992; Kirch 1986; Rolett in press; Sutton 1987; Walter 1990). Some preliminary empirical support for this model is indicated in Table 3.2 wherein the shared proportions of traits between the major CEP archipelagos suggest that any one or all of them could serve as the homeland for Hawaiians. This table was developed to systematically compare the artefact traits included in articles Emory and Sinoto use to substantiate their dual settlement model (Emory 1968; Emory and Sinoto 1964, 1965; Sinoto 1967, 1968, 1970, 1979b). Thus, one should note that stylistic as well as functional traits are represented in the group. Nevertheless, even this preliminary data set provides greater initial support for the expectations of the interaction model than that of dual settlement.

In the case of the Marquesas and Society Islands, 36 of 54 listed traits (67%) are held in common. The Marquesas and Cook Islands share 28 of 29 identified traits (97%) listed for the Cook Islands, while the Society and Cook Islands have 26 of 29 traits (90%) in common. Hawaii shares 35 (65%) and 32 (59%) of 54 traits with the Marquesas and Society Islands respectively, and 26 of the 29 traits (90%) listed for the Cook Islands. As more archaeological research in the Cooks Islands is conducted, the percentage of shared traits between the Cooks and other groups will likely diminish. Nevertheless, these summary indices of archaeological variability all point to high intra-regional (CEP) similarity, as well as inter-regional (CEP and Hawaii) similarity. This is not the pattern of variation one would predict under the dual settlement model.

In order to test the implication that artefact traits among the CEP groups will exhibit high similarity, an island (or island group) population originating from CEP, which is known to have existed in relative isolation, would need to be used for comparative purposes. In addition, this population would need to have been isolated during a relatively early period of the various CEP cultural sequences, thus allowing one to distinguish the difference between cultural traits originating from that tradition in isolation, and other traits recorded within CEP which may have been spread through interaction. Assemblages from Rapa Nui might provide a fair example of such isolation (Michael Graves pers. comm. 1992) given its location 2000 km from Pitcairn and almost 4000 km from the Peru and Chile coasts (Bellwood 1987:111).

Artefact	Hawaii	Marquesas	Society Islands	Cook Islands	Source(s)
Pottery sherds	0	*	0	*	Sinoto 1970; Walter and Dickinson 1989
Adzes					
Untanged	*	*	*	*	Emory 1968; Bellwood 1978
Tanged	*	*	*	*	Emory 1968; Duff 1974
Quadrangular cross section	*	*	*	*	Emory 1968; Duff 1968
Triangular cross section	*	*	*	*	Emory 1968; Duff 1968
Reversed triangular cross section	*	*	*	*	Emory 1968; Duff 1968
Trapezoidal cross section	*	*	*		Emory 1968; Cleghorn 1982
Reversed trapezoidal cross section	*	*	*	*	Emory 1968; McCoy 1991; Duff 1974
Plano-convex cross section	*	*	*		Emory 1968
Oval cross section	*	*	*	*	Emory 1968; Cleghorn 1982; Walter 1987
Lenticular cross section	*	*	0	*	Emory 1968; Cleghorn 1982; Walter 1987
Chipped	*	*	*	*	Sinoto 1970; Duff 1974
Ground	*	*	*	*	Sinoto 1970; Duff 1974
Pecked/Bruised	*	*	*	*	Sinoto 1970; Duff 1959, 1968
Stone pounders					
Conical - plainhead	*	*	*	*	Sinoto 1979b; Trotter 1974
Conical - elaborated head	0	*	*		Sinoto 1979b
Stirrup	*	0	0		Sinoto 1979b
Ring	*	0	0		Sinoto 1979b

Other Tools					
Stone flake saw	*	*	*		Sinoto 1967
Porites coral file	*	*	*	*	Sinoto 1967; Allen and Schubel 1990
Branch coral file	0	*	*	*	Sinoto 1967; Skjølsvold 1972; Walter 1987
Sea-urchin spine file	*	*	*	*	Sinoto 1967; Walter 1987
Stone whirls for pump drill	*	*	0		Sinoto 1967
Fishhooks					
One-piece	*	*	*	*	Sinoto 1967; Bellwood 1978
Two-piece	*	*	*	*	Sinoto 1967; Chikamori & Yoshida 1988
Jabbing	*	*	*	*	Sinoto 1967; Walter 1989
Rotating	*	*	*	*	Sinoto 1967; Walter 1989
Knobbed head	*	*	*	*	Sinoto 1967; Walter 1989
Notched head	*	*	*	*	Sinoto 1967; Allen and Schubel 1990
No barb	*	*	*	*	Sinoto 1967; Bellwood 1978
Barb	*	0	0	*	Sinoto 1967; Chikamori & Yoshida 1988
Bone	*	*	0		Sinoto 1967
Pearl-shell	*	*	*	*	Sinoto 1967; Bellwood 1978
Filed and notched	*	*	*		Sinoto 1967:Fig. 6, Table 3
Filled-out	*	0	0		Sinoto 1967
Simple-drilled	*	*	*	*	Sinoto 1967; Chikamori & Yoshida 1988
Double-drilled	*	0	0		Sinoto 1967
Drilled-out	0	*	0		Sinoto 1967
Chipped and notched	0	*	0		Sinoto 1967
Trolling lures					
Point - base extended proximally	*	*	*	*	Sinoto 1967; Bellwood 1978
Point - base extended distally	*	*	*		Sinoto 1967, 1991
Point - no base extension	*	0	0		Sinoto 1967
Shank - slender shouldered	*	*	*	*	Sinoto 1967; Chikamori & Yoshida 1988
Shank - small, conus shell	*	0	*		Sinoto 1967
Harpoon heads	0	*	*		Sinoto 1979b
Octopus lure stone sinkers	*	*	*		Emory & Sinoto 1964; Rappaport *et al.* 1967
Ornaments					
Pearl-shell breast plate/pendant	0	*	*	*	Sinoto 1970; Chikamori & Yoshida 1988
Conus shell disks	0	*	*		Sinoto 1970
Unmodified whale-tooth pendant	*	*	0		Sinoto 1970
Lenticular shaped wh.th. pendant	0	*	*		Sinoto 1970
Long rounded stem wh.th. pendant	*	*	0		Sinoto 1967
Lei niho palaoa type pendant	*	0	0		Sinoto 1979b
Reel-like shaped bone	0	*	0		Sinoto 1968
Notched basalt quoits	*	0	*		Emory 1968

0 = Absent * = Present

Note: Where absence of an artefact may be due to the preliminary nature of the data for the Cook Islands, it is left blank. Absent is for those cases where it is recorded as such in articles forwarding the dual settlement model.

TABLE 3.2. Comparison of archaeologically documented artefacts included in literature supporting the Marquesas as the dispersal centre for East Polynesia.

Although there is still no direct archaeological record for the initial migration or next few centuries of settlement in Rapa Nui (Kirch 1984:266), there is "supporting evidence for early colonisation by an as yet largely undifferentiated Archaic East Polynesian population" (McCoy 1979:145). Such indications include the retention of the Proto-Polynesian velar nasal in the indigenous language (Kirch 1984), the presence of early East Polynesian adze forms (Emory 1968; McCoy 1979), and an absence of widespread Polynesian material cultural items known to be of later origin (McCoy 1979:145). Most significantly, there is no clear evidence to indicate that Rapa Nui was settled or contacted by later Polynesians or South Americans (Bellwood 1987; Kirch 1984; McCoy 1979). Even the presence there of the sweet potato of South American origin is perhaps best explained as resulting from its Polynesian settlers bringing it with them as part of their initial cultural repertoire (Yen 1974:311).

Therefore, pairs of comparisons between the Marquesas, Society Islands, Cook Islands and Rapa Nui should indicate the degree of similarity that each exhibited with one another, and hence a relative measure of the degree of contact that occurred between CEP island groups. If appropriate stylistic traits noted from dated Rapa Nui assemblages and temporally comparable ones from the Marquesas, Society and Cook Islands are all equally divergent, one could conclude that the respective populations developed in isolation. However, if traits from CEP island groups artefacts show a high affinity to one another, and Rapa Nui assemblage traits appear anomalous, this could be used to infer that contact occurred between CEP archipelagos, as predicted by the interaction model.

If this first assumption of the interaction model is fulfilled, the next which should be evaluated is the expectation that traits from Hawaii assemblages ought to display similarities with comparably dated CEP regional artefact stylistic characteristics over a considerable time span. The number of shared traits should be the greatest during the time of most intense contact, then decline with decreasing contact. The period when contact ceases should be discernible by the appearance of new stylistic traits that arise in one archipelago and are absent elsewhere.

A potential problem in testing the interaction model is that even if the two primary expectations are fulfilled, one might question the ability to determine if the voyages to Hawaii were from one, two or more CEP island groups. For as long as contact was maintained within the CEP region during the same period as travel was occurring to and from Hawaii, and the same traits that were being transferred to and from Hawaii were likewise moving amongst CEP islands, the shared influence of any one CEP island group and Hawaii might be confounded in the transfer of traits within CEP. However, this assumes that traits were equally exposed to populations in Hawaii and all CEP groups, and that individuals on each island group were equally receptive to new styles. Given the nature of stylistic traits, such a scenario is unlikely (Dunnell 1970). Therefore, it is possible to determine if contact was made between a specific locale and Hawaii by the exclusive presence of one or more stylistic traits within Hawaiian assemblages and that of another CEP set of temporally comparable artefacts. The interaction model would predict that such shared affinities would be present between Hawaii and CEP island groups, and that uniquely shared affinities between Hawaii and any one of the CEP island groups might also be present.

Hawaiian voyaging traditions and model expectations

Adequate data are not yet available to fully test the archaeological expectations of the dual settlement or interaction models. However, for decades an independent body of evidence which can be applied to evaluate both models has been ignored. These are the rich Polynesian oral traditions of voyaging. A few decades ago such accounts may have been considered fanciful fiction. In recent years, however, the extensive successful travel routes of Hōkūle'a prove that such story lines are plausible and even probable (Finney 1979a, 1979b; Finney *et al.* 1989).

Hawaiian oral traditions recount numerous migratory, recreational and exploratory voyages (Fornander 1969; Kalākaua 1972; Kamakau 1991) which provide independent means to evaluate the orthodox and interaction models. Even so, these traditions have not been used as a data base for Hawaiian origins research since the 19th century works of early historians (e.g., Fornander 1969; Kamakau 1991; Malo 1951). Perhaps later scholars believed the traditions to be inconsistent, purely 'fictionalised', lacking sufficient detail and hence assumed them not worthy of serious analysis regarding such topics as Hawaiian origins (e.g., Cordy 1974:68-69). And indeed, the details of all Polynesian voyaging traditions do not perfectly conform to one another. Nevertheless, an analysis of those traditions show clear patterns which have significant implications for research regarding the settlement of Hawaii. Therefore, this section will not focus on comparing place names in Hawaiian legends of migrations against other Polynesian place names, nor will it attempt to date voyages through genealogical calculations and an arbitrary generation length. It will instead employ oral traditions of voyaging as data that collectively represent evidence addressing the question of whether Hawaii was settled in an episodic manner from only the Marquesas and Society Islands as the orthodox model suggests, or in a recurrent fashion from a larger CEP region as the interaction model proposes.

If Hawaii was settled during two episodic migratory periods from the Marquesas and then the Society Islands, one would expect legends to reflect this dual nature. The arrival of a new group from the Society Islands, after a period of about 500 years isolation for the Marquesan initial settlers, would be well-remembered, incorporated in oral tradition and passed down as a notable event accompanied by great excitement. New ideas, practices, material culture and cultigens might also be documented to have come with new arrivals.

If Hawaiians are descendants of voyagers from a larger central East Polynesian region arriving over a period of recurrent contact through time, new cultural influences would likewise be recorded in oral tradition, as additional voyagers probably brought with them novel and valued cultural features worthy of recall. However, the impact of new arrivals would not be as predominant in the oral traditions; instead a notion of long-standing voyaging and contact with locations in the south would prevail.

Table 3.3 summarises recorded Hawaiian oral traditions of voyaging, excluding Pan-Polynesian deities Hawaiians remember as arriving from Kahiki (for a partial listing of these see Kamakau 1991:112). To assess how much this list reflects the settlement of Hawaii, as opposed to legends brought to Hawaii by migrants recounting settlements of their homelands, it is necessary to determine which individuals are remembered elsewhere in Polynesia. A list of these common migratory personages is presented in Table 3.4. Eight of 66 individuals listed in Table 3.3 were identified through a survey of Polynesian myths and legends (although other common personages perhaps exist in additional Hawaiian and other Polynesian oral traditions). The eight commonly remembered personages may indicate that the stories of those individuals were brought to Hawaii as part of a cultural repertoire, or equally plausibly that certain figures were noted in various locales because they voyaged to and influenced more than one area. 'Olopana may be an example of such a chief, as he is said to have lived in and ruled over Waipi'o, Hawai'i, as well as Moa'ula, Ra'iatea (Kalākaua 1972:120-121).

Still, Table 3.3 must be considered incomplete. A more in-depth search of legends will likely reveal additional voyagers. More importantly, journeys described in the literature generally recall personages who were powerful chiefly progenitors of later ruling families, and are associated with the arrival of new and important items (e.g., Kaha'iaho'okamali'i bringing the breadfruit, see Kamakau 1991:110). Migrants or visitors who brought little that was considered noteworthy, or who aligned with chiefly (or commoner) families whose lives were not as celebrated by the 19th century, may not be reflected in the literature.

On the other hand, a more conservative view might question the inclusion of mythical, god-like individuals on the list (e.g., the Pele family). Yet most of these personages are not known elsewhere in the Pacific (see Table 3.4). Thus, their role in Hawaiian oral tradition may originate from the extraordinary acts they accomplished during their lives which resulted in their later deification. At the same time, it should be recognised that the list does not necessarily represent 66 separate voyages as some of the individuals mentioned are said to have travelled together.

Regardless of the exact number of voyages by historical individuals, the oral traditions of migrations indicate a Hawaiian notion of voyages and two-way interaction with a large geographic region to the south, especially since the homelands associated with named individuals include such place names as 'Upolu, Nu'uhiwa (Malo 1951:6), Bolabola (Kamakau 1991:90) and Ra'iatea (Kalākaua 1972: 129). These could correspond to 'Upolu in Samoa, Nuku Hiva in the Marquesas and Ra'iatea and Borabora in the Society archipelago. Moreover, the concept in Hawaiian culture of deities, beliefs, practices, material culture and people arriving from 'Kahiki' suggests a region from which Hawaii was influenced, given the meaning of "a foreign land abroad" applied to the term (Elbert and Pūku'i 1986:181; Ellis 1979:312; Fornander 1969 I:180; Kalākaua 1972:70; Kamakau 1991:90). Clearly the literature does not confirm the limited geographic parameters of only the Marquesas and Society Islands as the homelands of Hawaiians, as forwarded in the dual settlement model.

The literature also does not reflect the shocking arrival of a second group of foreigners as one might presume if the episodic character of the dual settlement model was accurate. The traditions conveyed by Kamakau (1991) and Malo (1959) do not indicate two episodic settlement periods. Fornander (1969 I:168) seems the first to articulate a dual settlement concept gleaned from the oral traditions. However, he describes a second migratory period as introducing "several parties of fresh emigrants from the Marquesas, Society and Samoan groups" who arrived over "the space of five or six generations," which is consistent with the interaction model.

Analysis of the relative time span during which voyages occurred provides another means to evaluate the different temporal aspects of population movement suggested by the two models. Eleven renditions of two major chiefly lineages (traced from the brothers Nana'ulu and 'Ulu) include twelve of the more renowned migratory individuals in Table 3.3. These are compared in Table 3.5. Genealogies such as these were recounted for the individual(s) at which the genealogical succession terminated, and hence originate at different points in time and trace relatedness through different lineages.

Personage	Homeland	Travelled to	Roundtrip	Source
Pele *	Kuaihelani, Kahiki	Hawaii		Emerson 1978:xxv-xxvi
Kamohoali'i	Kuaihelani, Kahiki	Hawaii		Emerson 1978:xxv-xxvi
Kāne'āpua	Kuaihelani, Kahiki	Hawaii		Emerson 1978:xxv-xxvi
Kānemiloha'i	Kuaihelani, Kahiki	Hawaii		Emerson 1978:xxv-xxvi
Hi'iaka sisters *	Kuaihelani, Kahiki	Hawaii		Emerson 1978:xxv-xxvi
Nāmakaokaha'i *	Kuaihelani, Kahiki	Hawaii	Δ	Emerson 1978:xxx
Kamapua'a	Hawaii	Kahiki	Δ	Dorton et al. 1979:6, 8a
Hawaii Loa	Ka'āinakaimelemeleakāne	Hawaii, Tahiti, south islands	Δ	Fornander 1916-1920 6:278
Makali'i	Ka'āinakaimelemeleakāne	Hawaii, Tahiti, south islands	Δ	Fornander 1916-1920:6:278
Nana'ulu	"southern islands"	Hawaii		Anderson 1969:45
Nanamaoa	Tahiti	Hawaii		Kalākaua 1972:70
Uli *	Tahiti	Hawaii		Kalākaua 1972:72
Kaulu (a.k.a. Ulu)	Hawaii	Haluluko'ako'a, Kahiki		Kamakau 1991:93
Hema	Hawaii	Ulupaupau, Kahiki		Fornander 1969 2:16
Kaha'inuiahema (a.k.a. Kaha'i)	Hawaii	Kahiki	Δ	Kamakau 1991:141-142
Paumakuaahuanuikalala'ila'i	"southern" region	Hawaii		Fornander 1969 2:23-24
Auakahinu (a.k.a. Ka'eka'e)	Kahiki	Hawaii		Fornander 1969 2:25
Auakamea (a.k.a. Maliu)	Kahiki	Hawaii		Fornander 1969 2:25
Malela	Kahiki	Hawaii		Fornander 1969 2:25
Kūkahau'ula	Kahiki	Hawaii		Fornander 1969 2:25
Kūkalepa	Kahiki	Hawaii		Fornander 1969 2:25
Hainapole *	Kahiki	Hawaii		Fornander 1969 2:25
Paumakuaalonoho'onewa	Hawaii	"All foreign lands"	Δ	Fornander 1969 2:24-25
Pā'ao	Wawau and 'Upolu	Hawaii		Kamakau 1991:97,100
Pilika'aiea (a.k.a. Pili)	'Upolu	Hawaii		Fornander 1969 2:38
Hina'auaku *	'Upolu	Hawaii		Fornander 1969 2:38
Makuaka'ūmana	Kahiki	Hawaii		Malo 1951:6
Kauma'ili'ula	Hawaii	Kuaihelani, Kahiki		Kamakau 1991:103
'Olopana	Hawaii	Ra'iatea		Kalākaua 1972:120-121
Lu'ukia *	Hawaii	Ra'iatea		Kalākaua 1972:120-121
Mo'ikeha	Hawaii	Kapa'ahu, Kahiki	Δ	Fornander 1969 2:19
La'amaomao	Ra'iatea	Hawaii		Kalākaua 1972:129
Kamahu'alele	Hawaii	Kahiki	Δ	Fornander 1969 2:9-10
Kila	Hawaii	Ra'iatea	Δ	Kalākaua 1972:132-133
Haulaninuiaiākea	Hawaii	Kahiki	Δ	Kamakau 1991:107-108
Ho'okamali'i	Hawaii	Kahiki	Δ	Kamakau 1991:107-108
La'amaikahiki (a.k.a. La'a)	Hawaii	Kapa'ahu, Kahiki	Δ	Fornander 1969 2:19
Kaha'iaho'omakali'i	Hawaii	'Upolu	Δ	Kamakau 1991:110
Kieleinahulu	Hawaii	'Upolu	Δ	Kamakau 1991:110
Malaihāne'e	Hawaii	'Upolu	Δ	Kamakau 1991:110
Kolina	Hawaii	'Upolu	Δ	Kamakau 1991:110
Woukohi	Hawaii	'Upolu	Δ	Kamakau 1991:110
Ka'ika'ikūpolō	Kahiki	Hawaii		Kamakau 1991:108-109
Kūkeaomihamiha	Kahiki	Hawaii		Kamakau 1991:108-109
Lūhaukapawa	Kahiki	Hawaii		Kamakau 1991:108-109
Kupa	Kahiki	Hawaii		Kamakau 1991:108-109
Mā'ulumaihea	Kahiki	Hawaii		Kamakau 1991:108-109
Ha'inokolo	Hawaii	Kuaihelani, Kahiki	Δ	Kamakau 1991:104
Leimakani	Kuaihelani, Kahiki	Hawaii		Kamakau 1991:104
Wahanui	Hawaii	Kahiki	Δ	Kamakau 1991:104-105
Kilohi	Hawaii	Kahiki		Kamakau 1991:104

Mo'opuaiki	Hawaii	Kahiki		Kamakau 1991:104
Kāne'āpua **	Kahiki	Hawaii	Δ	Kamakau 1991:104-105
Kalananu'unuikuamaomao	Keolo'ewa, Kahiki	Hawaii		Kamakau 1991:111
Humu	Keolo'ewa, Kahiki	Hawaii	Δ	Kamakau 1991:111
Kamaunuaniho *	Keolo'ewa, Kahiki	Hawaii		Kamakau 1991:111
Lonoka'eho	Kahiki	Hawaii		Kamakau 1991:111
Nana	Kahiki	Hawaii		Kamakau 1991:111
Ka'alaenuiahina	Kahiki	Hawaii		'Ī'ī 1983:47
Kahuilaokalani	Kahiki	Hawaii		'Ī'ī 1983:47
Kāneikaulanaula	Kahiki	Hawaii		'Ī'ī 1983:47
Pua	Kahiki	Hawaii		'Ī'ī 1983:47
Kapo	Kahiki	Hawaii		'Ī'ī 1983:47
Kamakanuiahailono	Kahiki	Hawaii		'Ī'ī 1983:47
Kamaunui *	"southern islands"	Hawaii		Kalākaua 1972:142
Huma	"southern islands"	Hawaii		Kalākaua 1972:142

* Female

** Not the same Kāne'āpua as listed on the previous page of this table

TABLE 3.3. Successful voyagers recounted in Hawaiian oral traditions.

Highly trained specialists retained such genealogies within chiefly circles (Malo 1951:54, 191-192), and these were later recorded in Hawaiian language newspapers between 1834 and 1920 (McKinzie 1983, 1986), as well as in the works of Hawaiian historians of that same era (e.g., Fornander 1969; Kamakau 1992; Malo 1951).

That the genealogists are not completely consistent with one another and "may be wrong in some instances, should not detract from their general accuracy and concern for detail" (McKinzie 1983:v). For indeed, the pattern of recurrent voyaging illustrated in Table 3.5 is consistent amongst the eleven genealogies which record numerous voyages occurring across the span of many generations. If Kamakau's somewhat anomalous version is excluded (genealogy 5), discrepancies regarding the number of generations between any pair of successional individuals in the genealogies do not exceed one generation.

The recurrent voyaging pattern evident in the Nana'ulu lineage (genealogies 1-7) ranges from 31 to 25 generations and includes eight voyaging personages. The 'Ulu line (Table 3.4 genealogies 8-11) includes five migratory individuals spanning 19 generations. The dual episodic population movement outlined in Emory and Sinoto's model is not supported by the oral traditions; a recurrent voyaging pattern is clear.

This conclusion is further strengthened when one considers the improbability that most Hawaiian traditions of migratory personages are only remembrances of stories told of those who travelled to and from a homeland distant in time and space from Hawaii. A review of Kapawa's life lends credence to the belief that key early migratory figures came to Hawaii, as opposed to only stories of their epic journeys elsewhere. Kapawa is an early individual in the genealogical succession (see Table 3.5) and hence predates many known voyagers, even some who are remembered in other Polynesian regions (e.g., Hema, Kaha'i, 'Olopana and Pili; see Table 3.4).

Kapawa's parents, Nanakāoko (father) and Kahihiokalani (mother), established the hallowed birthplace Kūkaniloko at Wahiawā, O'ahu, in preparation for his birth (Fornander 1969 II:20; Kamakau 1991:38). His birth chant commemorating that place and the event was the first of its kind, of a type later regularly composed for royalty (Kamakau 1991:136). The chant recounting Kapawa's birth and other specifics of his life further attest to his being a historical Hawaiian chief (see Kamakau 1991:136-137), hence establishing the likelihood that voyagers who postdate him in the genealogical succession lived in or visited Hawaii. Kapawa was known to be a chief of Waialua, O'ahu (Fornander 1969 II:21; Kamakau 1964:3, 39, 1991:136-137), and perhaps later in his life a chief on Maui (Beckwith 1970:377-378). He was the first to "establish the [*kapu*] of the chiefs and the [*kapu*] of the gods" and to create a "separation between the [*kapu*] of the chiefs and of the gods" (Kamakau 1964:12). Upon his death he was interred within the cave Kapelakapuokaka'e at 'Olopi'o, 'Iao Valley, Maui (Fornander 1969 II:220; Kamakau 1964:39, 1991:39, 137). Significantly, following Kapawa's birth at Kūkaniloko and interment at 'Iao, which initiated both those grounds for their purposes, the two places became renowned and sought after by high-ranking chiefly families through the 17th

century - Kūkaniloko as a place for the birth of their heirs and 'Iao as a final resting place upon the passing of their loved ones (Kamakau 1964:39, 1991:38-39).

Fornander's scepticism regarding Kapawa's antiquity in Hawaii has perhaps fueled uncertainty regarding Kapawa's contemporaries and close descendants' arrival, as opposed to their stories being brought here (see Fornander 1969 I:200, II:20). Fornander's doubts arose because he believed Kapawa was the last reigning Hawai'i Island chief prior to Pā'ao bringing Pili from Kahiki to supplant Kapawa (Fornander 1969 II:22). This led Fornander to consider Kapawa "a contemporary of Paumakua" (Fornander 1969 II:21) and hence to assume that he was inserted by Kaua'i, O'ahu, Maui and Hawai'i genealogists "in the wrong place of the *Ulu* line" (Fornander 1969 I:200, II:21).

However, the seven 'Ulu lineage genealogies included in Table 3.5 (genealogies 1-7) all disagree with that position and place Kapawa much prior to Paumakua. Moreover, Malo (1951:6) states that "Paao arrived at Hawaii during the reign of Lono-ka-wai, the king of Hawaii [who] was the sixteenth in that line of kings, succeeding Kapawa." Similarly, Kamakau states that "Pā'ao came to Hawai'i in the time of the *ali'i* La'au," and that "Pili ruled as *mo'i* after La'au" (Kamakau 1991:100) who immediately follows Lonokawai on the 'Ulu lineage (McKinzie 1983:xxi, 4, 1986:2).

Either Fornander's information regarding Kapawa ruling Hawai'i during the time of Pā'ao and Pili is inaccurate, or an individual with the same name as the hallowed O'ahu and Maui chief was ruling Hawai'i Island at that time and has since been expunged from the oral traditions due to the "great crime or fault" he committed which led to his downfall and Pili's ascent as Fornander (1969 I:201) relates. However, if a ruler by the name of Kapawa was expelled from Hawai'i Island for his terrible deeds, this individual's birth and burial places would not be held in high esteem and continually used, nor would his deeds be recounted as is the case for the Kapawa described as following three generations after Nanamaoa and 19 generations prior to Pili (see Table 3.5). Even less likely is that Pili and his descendants would elevate the imposed chief Kapawa to a senior position on their lineage. Thus, one can conclude that if a Kapawa ruled Hawai'i Island in the time of Pā'ao, he was not the same individual as the Kapawa born at Kūkaniloko much prior.

Therefore, Kapawa's history and genealogy offer additional reasons to believe that Hawaiian oral traditions recording central migratory personages following him in the genealogical succession were of Hawaiian origin. Depending on which genealogical lineage is traced, voyagers are documented for 13 to 19 generations following Kapawa (see Table 3.5). Altogether the above arguments further forward the view taken in the interaction model that the settlement of Hawaii occurred in a recurrent pattern rather than in two unrelated episodes. The number of voyagers and their many homelands (see Table 3.3) also indicate the recurrent nature of population movement in Polynesia and the notion that Hawaii was settled from a larger geographic region than the two archipelagos described by Emory and Sinoto. This body of evidence is an important independent data set by which future conclusions drawn from the archaeological record may be evaluated. Research into early Polynesian settlement history should continue to integrate Polynesian oral traditions as a body of evidence. Patterns apparent in such traditions provide an especially appropriate comparison against the archaeological record in that they reflect a time frame and geographic region similar to the Polynesian archaeological record.

CONCLUSION

Methodology

This paper has presented numerous critiques of previous research addressing Hawaiian origins. However, the intention of this effort is not only to highlight the need to reevaluate the orthodox scenario, but to offer a methodology by which future rigorous analyses and more certain conclusions can be drawn. Such a methodology might include greater emphasis on multidisciplinary studies including oral traditions, as well as research from other disciplines (e.g., linguistics, botany and genetics) outside the scope of this analysis. Still, archaeological evidence has been and will likely remain a central focus in answering the question of Hawaiian origins. In order for future archaeological analyses to produce data amenable to developing testable hypotheses to be added to a body of cumulative evidence, careful attention will need to be given to aspects of archaeological analyses often taken for granted.

Since artefacts need to be interpreted and do not readily translate into 'evidence', a critical step in arriving at any answers will be identifying appropriate units of analysis. Selected units will affect the outcome of future studies as they have in the past when a small number of intuitively selected traits within poorly defined classes produced uncertain results. Systematic selection of traits used will improve the success of future research addressing Polynesian early settlement history.

At a general level, what is needed to evaluate the two models are artefact traits which can demonstrate that early Hawaiian assemblages are most similar to Marquesan assemblages of the same time period (supporting Emory and Sinoto's model), or that such assemblages are more similar to contemporaneous ones from the CEP region (supporting

	Polynesian names	Associated area	Source
1	Makali'i	Hawaii	Beckwith 1970:368
	Mataliki	Pukapuka	Beckwith 1970:369
	Li'i	Samoa	Beckwith 1970:368
2	Hema	Hawaii	Kamakau 1991:94
	Hema	Tahiti	Alpers 1970:118
	Hema	New Zealand	Anderson 1969:160, 183
	Hema	Mangareva	Alpers 1970:130
	Hema	Tuamotu	Stimson 1934:72
	Hema	Moriori	Beckwith 1970:254
	Ema	Rarotonga	Beckwith 1970:252
3	Kaha'i	Hawaii	Beckwith 1970:248
	Tahaki	Tahiti	Alpers 1970:118
	Tahaki	Tuamotu	Stimson 1934:73
	Tahaki	Mangareva	Alpers 1970:130
	Tawhaki	New Zealand	Anderson 1969:160, 183
	Tawhaki	Moriori	Beckwith 1970:254
	Taaki	Rarotonga	Beckwith 1970:253
	Tafa'i	Samoa	Steinen 1988:25-26
	Fai	Marquesas	Steinen 1988:25-26
4	'Olopana	Hawaii	Kamakau 1991:111
	Oropa'a	Tahiti	Beckwith 1970:360
	Koropanga	New Zealand	Anderson 1969:58
5	Lu'ukia	Hawaii	Kamakau 1991:102
	Rukutia	New Zealand	Anderson 1969:58
6	La'amaomao	Hawaii	Kalākaua 1972:129
	Rakamaomao	New Zealand	Anderson 1969:70
7	Pili	Hawaii	Fornander 1969 II:38
	Pili	Samoa	Stuebel 1976:22
8	Kupa	Hawaii	Kamakau 1991:108-109
	Tupa	Marquesas	Handy 1930:84

TABLE 3.4. Migratory figures in Hawaiian and other Polynesian traditions.

the interaction model). Similarly, Hawaiian artefacts from the period of *ca* A. D. 1250, when Emory and Sinoto suggest a second group of Society Islanders arrived, should be most like those of Society Island assemblages of that time, if the dual settlement model is correct. If the interaction model is more appropriate, Hawaiian assemblages of that period should closely resemble those representative of the CEP region or any one of the CEP island groups.

Given the need to understand spatial interaction of populations to evaluate either model, another requirement of future studies will be the use of stylistic analysis units (after Dunnell 1978) as described previously. Assemblages within which units are identified must also represent cultural sequences from all island groups, including the local environmental and cultural diversity within islands and archipelagos. Such assemblages need to derive from archaeological contexts which provide an independent means of chronologically ordering assemblages and their traits. Therefore, data from much larger and more representative samples must be acquired. Initially presence/absence analyses might be used to alleviate this difficulty until large enough samples are available to allow for more revealing ordinal analyses.

Another stipulation concerning units of analysis is that the stylistic traits be independent of environmentally conditioned preferences or constraints. For if presence or frequency of a trait is a factor of environmental resources available for its production, then similarities between two locations in the 'popularity' of a given trait (e.g., fishhooks made from pearl-shell) may be more a consequence of similar environments than common cultural beliefs regarding style. In addition, environmental circumstances may determine the stylistic properties of artefacts as well as the overall abundances of artefact types. For instance, Allen's

Personages	Genealogies 1	2	3	4	5	6	7	8	9	10	11
Nana'ulu	34•	34	15	14	17	14	16	14	2	1	1
		9••	9	9	9	9	9	10			
Nanamaoa	43	43	24	23	26	23	26	*	*	*	
		3	3	3	3	3	3	3			
Kapawa/Heleipawa **	46	46	27	26	29	26	29	*	*	*	
		3	3	3	3	3	3	3		17	17	17
Hema	49	49	30	29	32	29	32	*	17 *	*	
		1	1	1	1						
Kaha'inuiahema	50	50	31	30	*	*	*	*	*	*	
'Olopana	*	*	*	*	*	*	*	*	19	18	18
										0	1
Mo'ikeha	*	*	*	*	*	4 *	9 *	9 31	19	*	19
										1	2	1
Kila	*	9 *	9 *	9 *	9 *	*	*	*	2 20	*	20
										1		
Kaha'iaho'okamali'i	*	*	*	*	*	*	*	33	21	20	*
Paumakua (of Puna line)	*	*	*	*	36	38	41	*	*	*	*
Paumakua (of Hema line)	59	59	40	39	*	6 *	7 *	7 *	*	*	*
La'amaikahiki	*	6 *	6 *	6 *	6 42	45	48	*	*	*	*
Pili	65	65	46	45	*	*	*	*	*	*	*
Generations from first to last known voyager		31	31	31	31	25	31	32	19	19	19	19
Generations from Kapawa to last known voyager		19	19	19	19	13	19	19	NA	NA	NA	NA

- • The numeral 34 signifies that Nana'ulu is of the 34th generation in the succession recounted in genealogy 1.
- •• The numeral 9 signifies that the number of generations from Nana'ulu to Nanamaoa is 9 in genealogy 1.
- * This individual is not a part of the lineage traced in this genealogy.
- ** Kapawa is not recorded as an inter-archipelago voyager but is included to facilitate the text discussion of the information in this table. Kapawa is the father of Heleipawa (Kamakau 1991:136-137; Beckwith 1972:239) although the two are sometimes recorded to be the same individual (Fornander 1969 I:202, 1969 II:21; Beckwith 1970:328) e.g., genealogies 1, 2, 3 and 4. They are treated as the same individual in this table.

DESCRIPTION OF GENEALOGIES

	Originates at	Terminates at	Source
1	Kumuhonua	Liholiho, Keauikeaouli, Nahi'ena'ena	McKinzie 1983:xix-xxiii
2	Kumuhonua	Liholiho, Keauikeaouli, Nahi'ena'ena	McKinzie 1983:2-5
3	Wākea	Kamehameha Pai'ea	McKinzie 1986:1-3
4	Wākea	Kamehameha Pai'ea	Fornander 1969 I:190-192
5	Kūkalani'ehu	Kalanikauika'alaneokeōpūolani	Kamakau 1868:29 Feb.
6	Wākea	Kapi'olani	Fornander 1969 I:190-91, 194-95
7	Welaahilani	Liholiho, Keauikeaouli, Nahi'ena'ena	McKinzie 1986:6-8

8	Wākea	Kalākaua	Fornander 1969 I:188-189
9	Ki'i	Kākuhihewa	McKinzie 1986:14-19
10	Nana'ulu	Lā'ielohelohe	McKinzie 1983:12-13
11	Nana'ulu	Mo'ikeha	Malo 1827:19-20

TABLE 3.5. Generational comparison of voyaging personages recounted in eleven Hawaiian genealogies.

(1992:186) analysis of southern Cook Islands temporal and spatial distributions of pearl-shell and *Turbo* fishhooks suggests that "the diversity of hook forms and their abundance in East Polynesia seems to be strongly tied to the increased availability of a critical resource, namely pearl-shell." She further points out "that some combination of workability, properties of strength and resiliency, and possibly lure qualities made pearl-shell a superior raw material", which "translated into greater flexibility in hook design, fewer mechanical failures and lower replacement costs, and better capture rates" (Allen 1992:186). In addition it had an adaptive advantage for its users. In short, environmental factors can influence stylistic and functional trait characteristics and frequencies noted in the archaeological record, rendering environmentally circumscribed traits inappropriate as units of analysis for seriations comparing assemblages.

Few Polynesian artefacts provide adequate sample sizes for comparative studies or display traits meeting the criteria of being stylistic and not environmentally influenced. Presently, many artefacts within ethnological collections exhibit features that would be appropriate (e.g., styles of image sculpture, pendant shapes and decorative elements created on organic materials), but these are rare archaeological finds which present various dating dilemmas. Given these difficulties, identifying appropriate traits for analyses would be a large contribution towards defining the nature of Polynesian migrations and contact. Perhaps as more excavations and analyses are completed, the increased frequency of certain artefacts within collections may help to shape such trait choices. Regardless, before any systematic comparisons between traits exhibited by different island group assemblages begin, a study of what would meet the above criteria for units of analyses must be completed. This is especially so since a stylistic or functional trait cannot be discerned *a priori*, but must be identified through its unimodal pattern of temporal and spatial distribution.

Confounding the issue, most artefacts will include elements of style and function. An example is a functional or environmentally defined choice of material from which a fishhook is fashioned and the possibly stylistic element of its head type, illustrated by Sinoto's (1991:95, 98) HT1a versus HT1d. In addition, a set of traits may impart an adaptive advantage to its users (e.g., various fishhooks with barbs making them superior to non-barbed ones in certain circumstances) which might at first be considered functional. Yet the "alternative trait states [e.g., an inner point barb or an outer point barb] in which a trait can reside, can confer equivalent (or sometimes nonequivalent) adaptedness to the possessor" (O'Brien and Holland 1992: 47). Therefore, it is important to note traits which may affect the adaptedness of their users may not be under selective control; this would be demonstrated by variant but comparable states (styles) in what are otherwise adaptive (functional) traits (O'Brien and Holland 1992:47-48). In such cases, the adaptive/functional traits (e.g., fishhook barbs) analytically can be considered also to have stylistic trait states (e.g., type of barb). Hence, the complex issue of determining appropriate stylistic traits or trait states, must be rigorously researched and tested prior to their application to questions of settlement and interaction in Polynesia.

Refining models

Models are simplifications of reality. They are created to better understand a phenomenon as well as to facilitate and frame research hypotheses related to that phenomenon. As such, one who creates a model strives to optimise the qualities of generality, realism and precision (after Levins 1966) of that model. "Though each [quality] has clear virtues, one cannot pursue all three at once with equal vigor"; improving the generality or applicability of a model will entail a reduction in its realism and precision (Winterhalder and Smith 1992:13). Similarly, if realism (the ability of a model to fit the specifics of a particular case) and precision (the ability of a model to produce specific predictions) are increased, generality will be sacrificed.

The dual settlement model for Hawaii was created with an emphasis on the qualities of precision and realism for the three parameters of the model - the specific geographic homelands of Hawaii's founding populations were clearly identified as the Marquesas and Society Islands archipelagos, the frequency of contact was defined as two episodic events, and the initial and subsequent contact was dated to be at *ca* A.D. 500-750 and *ca* A.D. 1250 respectively. Emory and Sinoto's perhaps inadvertent attention to realism and precision seems partly due to the limited cases or assemblages upon which their model was based. Evidence to the contrary

of two of the orthodox model parameters has been presented above which provides a strong case for rejection given available data and analyses.

On the other hand, the interaction model, as currently described, emphasises generality - the Hawaiian Islands are seen as being populated from the CEP region through recurrent interaction between CEP and Hawaii, wherein the initial populations arrived sometime in the early first millennia A.D. When and if this simplification of Hawaii's settlement proves accurate in future research, the areas in which the model will be deficient are its lack of precision and realism. As more research is accomplished, the number and identification of specific islands and archipelagos from which early Hawaiian settlers left, and the timing of subsequent voyagers' arrivals at specific areas in Hawaii may be defined.

Emory and Sinoto's dual settlement model for Hawaii has never been adequately tested. At the same time, other models emphasising more interaction throughout various sectors of Polynesia (e.g., Finney *et al.* 1989; Irwin 1992; Kirch 1986; Rolett in press; Sutton 1987; Walter 1990) have likewise not been rigorously tested. This paper presents a methodology for assessing both models and specifies the elements necessary to confirm them. On the basis of a detailed critique of the artefactual evidence for the dual settlement model, and the limited data available to infer East Polynesian settlement patterns, it seems likely that future tests will confirm a model of earlier recurrent interaction between Hawaii and the central East Polynesian region as recorded in Hawaiian oral traditions.

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REFERENCES

Allen, M.S. 1992. Temporal variation in Polynesian fishing strategies: the southern Cooks in regional perspective. *Asian Perspectives* 31:183-204.

Allen, M.S. and S. Schubel. 1990. Recent archaeological research on Aitutaki, Southern Cooks: the Moturakau Shelter. *Journal of the Polynesian Society* 99:265-295.

Allen, M.S. and D.W. Steadman. 1990. Excavations at the Ureia Site, Aitutaki, southern Cook Islands: preliminary results. *Archaeology in Oceania* 25:24-37.

Alpers, A. 1970. *Legends of the South Seas: The World of the Polynesians Seen Through Their Myths and Legends, Poetry, and Art.* New York, Crowell.

Andersen, J.C. 1969. *Myths and Legends of the Polynesians.* Rutland, Vermont, C.E. Tuttle.

Beckwith, M. 1970. *Hawaiian Mythology.* Honolulu, University of Hawaii Press.

Beckwith, M. 1972. *The Kumulipo: A Hawaiian Creation Chant.* Honolulu, University of Hawaii Press.

Bellwood, P. 1970. Dispersal centers in East Polynesia, with special reference to the Society and Marquesas Islands. In R. Green and M. Kelly (eds), Studies in Oceanic Culture History, Vol. 1. *Pacific Anthropological Records* 11:93-104. Honolulu, Bernice P. Bishop Museum.

Bellwood, P. 1978. Archaeological Research in the Cook Islands. *Pacific Anthropological Records* 27. Honolulu, Bernice P. Bishop Museum.

Bellwood, P. 1987. *The Polynesians.* London, Thames and Hudson.

Chikamori, M. and S. Yoshida. 1988. *An Archaeological Survey of Pukapuka Atoll, 1985 (Preliminary Report).* Bulletin 6. Tokyo, Department of Anthropology and Ethnology, Keio University.

Cleghorn, P.L. 1982. The Mauna Kea Adze Quarry: Technological Analyses and Experimental Tests. Unpublished Ph.D. thesis, Department of Anthropology, University of Hawaii, Honolulu.

Cordy, R. 1974. The Tahitian migration to Hawaii *ca* 1100-1300 A.D.: an argument against its occurrence. *New Zealand Archaeological Association Newsletter* 17:65-76.

Cox, J.H. and W.H. Davenport. 1988. *Hawaiian Sculpture.* Honolulu, University of Hawaii Press.

Deetz, J.A. and E. Dethlefsen. 1965. The Doppler Effect and archaeology: a consideration of the spatial aspects of seriation. *Southwestern Journal of Anthropology* 21:196-206.

Dorton, L., M.K. Mai'oho, N. Bowden and L. Kahiwalani. 1979. An outline of Ka Mo'olelo Ka'ao o Kamapua'a, 'The Legendary Tradition of Kamapua'a' as published in the Hawaiian newspaper, Ka Leo o ka Lāhui, 22 June 1891 - 28 September 1891. Manuscript on file, Hawaiian Collection, Hamilton Library, University of Hawaii at Mānoa, Honolulu.

Duff, R. 1959. Neolithic adzes of Eastern Polynesia. In J.D. Freeman and W.R. Geddes (eds), *Anthropology in the South Seas*, pp. 121-147. New Plymouth, Thomas Avery and Sons.

Duff, R. 1968. Archaeology of the Cook Islands. In I. Yawata and Y. Sinoto (eds), *Prehistoric Culture in Oceania*, pp. 119-131. Honolulu, Bishop Museum Press.

Duff, R. 1974. The Cook Islands adze succession. In M. Trotter (ed.), Prehistory of the Southern Cook Islands. *Canterbury Museum Bulletin* 6:120-155. Christchurch.

Dunnell, R. 1970. Seriation method and its evaluation. *American Antiquity* 35: 305-319.

Dunnell, R. 1978. Style and function: a fundamental dichotomy. *American Antiquity* 43:192-202.

Dunnell, R. 1986. Five decades in American archaeology. In D.F. Meltzer,

D.D. Fowler and J.A. Sabloff (eds), *American Archaeology Past and Future*, pp. 23-49. Washington D.C., Smithsonian Institution Press.

Elbert, S. 1982. Lexical diffusion in Polynesia and the Marquesan-Hawaiian relationship. *Journal of the Polynesian Society* 91:499-518.

Elbert, S. and M.K. Pūku'i. 1986. *Hawaiian Dictionary*. Honolulu, University of Hawaii Press.

Ellis, W. 1979. *Journal of William Ellis: Narrative of a Tour of Hawaii, or Owhyhee; with Remarks on the History, Traditions, Manners, Customs, and Language of the Inhabitants of the Sandwich Islands*. Rutland, Vermont, C.E. Tuttle.

Emerson, N.B. 1978. *Pele and Hiiaka: A Myth from Hawaii*. New York, AMS Press.

Emory, K.P. 1959. Origin of the Hawaiians. *Journal of the Polynesian Society* 68:29-35.

Emory, K.P. 1963. East Polynesian relationships: settlement pattern and time involved as indicated by vocabulary agreements. *Journal of the Polynesian Society* 72:78-100.

Emory, K.P. 1968. East Polynesian relationships as revealed through adzes. In I. Yawata and Y. Sinoto (eds), *Prehistoric Culture in Oceania*, pp. 151-169. Honolulu, Bishop Museum Press.

Emory, K. and Y. Sinoto 1964. Eastern Polynesian burials at Maupiti. *Journal of the Polynesian Society* 73:143-160.

Emory, K. and Y. Sinoto. 1965. Preliminary Report on the Archaeological Excavations in Polynesia. Mimeographed Report Prepared for the National Science Foundation, Manuscript on file, Hawaiian Collection, Hamilton Library, University of Hawaii at Mānoa, Honolulu.

Finney, B. 1979a. Voyaging. In J.D. Jennings (ed.), *The Prehistory of Polynesia*, pp. 323-351. Cambridge, Harvard University Press.

Finney, B. 1979b. *Hōkūle'a: The Way to Tahiti*. New York, Dodd, Mead.

Finney, B. 1985. Anomalous westerlies, El Niño, and the colonization of Polynesia. *American Anthropologist* 87:9-26.

Finney, B., P. Frost, R. Rhodes and N. Thompson. 1989. Wait for the west wind. *Journal of the Polynesian Society* 98:261-302.

Fornander, A. 1916-20. Fornander Collection of Hawaiian Antiquities and Folk-lore. *Memoirs of the Bernice P. Bishop Museum*, vols. 4-6. Honolulu.

Fornander, A. 1969. *An Account of the Polynesian Race; Its Origin and Migrations*, vols. 1-3. Rutland, Vermont, C.E. Tuttle.

Graves, M.W. and C. Erkelens. 1991. Who's in control? Method and theory in Hawaiian archaeology. *Asian Perspectives* 30:1-17.

Grayson, D. 1984. *Quantitative Zooarchaeology: Topics in the Analysis of Archaeological Faunas*. New York, Academic Press.

Green, R. 1966. Linguistic subgrouping within Polynesia: the implications for prehistoric settlement. *Journal of the Polynesian Society* 75:6-38.

Handy, E.S.C. 1930. Marquesan Legends. *Bernice P. Bishop Museum Bulletin* 69. Honolulu.

Hunt, T.L. 1979. Alternative Perspective for Early East Polynesian Prehistory. Unpublished paper presented at the New Zealand Archaeological Association Biennial Conference, Auckland. Manuscript on file, Department of Anthropology, University of Hawaii, Honolulu.

Hunt, T. and R. Holsen. 1991. An early radiocarbon chronology for the Hawaiian Islands: a preliminary report. *Asian Perspectives* 30:147-161.

'Ī'i, J.P. 1959. Fragments of Hawaiian History. *Bernice P. Bishop Museum Special Publication* 70, translated by M.K. Pūku'i and edited by D.B. Barrère. Honolulu.

Irwin, G. 1981. How Lapita lost its pots: the question of continuity in the colonisation of Polynesia. *Journal of the Polynesian Society* 90:481-494.

Irwin, G. 1989. Against, across and down the wind: a case for the systematic exploration of the remote Pacific islands. *Journal of the Polynesian Society* 98:167-206.

Irwin, G. 1990. Human colonisation and change in the remote Pacific. *Current Anthropology* 31:90-94.

Irwin, G. 1992. *The Prehistoric Exploration and Colonisation of the Pacific*. Cambridge, Cambridge University Press.

Kalākaua, D. 1972. *The Legends and Myths of Hawaii; the Fables and Folk-Lore of a Strange People*. Rutland, Vermont, C.E. Tuttle.

Kamakau, S.M. 1868. Ka Mo'olelo o Nā Kamehameha. *Ka Nūpepa Kū'oko'a, Helu 62*, 29 February 1868.

Kamakau, S.M. 1964. *Ka Po'e Kahiko; The People of Old*, translated by M.K. Pūku'i and edited by D.B. Barrère. Honolulu, Bishop Museum Press.

Kamakau, S.M. 1991. *Nā Mo'olelo a ka Po'e Kahiko; Tales and Traditions of the People of Old*, translated by M.K. Pūku'i and edited by D.B. Barrère. Honolulu, Bishop Museum Press.

Kamakau, S.M. 1992. *Ruling Chiefs of Hawaii*, translated by M.K. Pūku'i *et al.* Honolulu, Kamehameha Schools Press.

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

Kirch, P.V. 1985. *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory*. Honolulu, University of Hawaii Press.

Kirch, P.V. 1986. Rethinking East Polynesian prehistory. *Journal of the Polynesian Society* 95:9-40.

Kirch, P.V., W.R. Dickinson and T.L. Hunt. 1988. Polynesian plainware sherds from Hiva Oa and their implications for early Marquesan prehistory. *New Zealand Journal of Archaeology* 10:101-107.

Krauss, B.H. 1974. *Ethnobotany of the Hawaiians*. University of Hawaii Harold L. Lyon Arboretum Lecture 5. Harold L. Lyon Arboretum, University of Hawaii, Honolulu.

Levins, R. 1966. The strategy of model building in population biology. *American Scientist* 54:421-431.

Levison, M., R.G. Ward and J.W. Webb. 1973. *The Settlement of Polynesia: A Computer Simulation*. Minneapolis, University of Minnesota Press.

Lind, A.W. 1982. Immigration to Hawaii. *Social Process in Hawaii* 29:9-20.

Luomala, K. 1965. Hawaiian Oral Art: A Conjectural History. Manuscript on file, Hawaiian Collection, Hamilton Library, University of Hawaii at Mānoa, Honolulu.

Malo, D. 1827. He Buke no ka 'Oihana Kula. Manuscript on file, Hawaii State Archives, Honolulu.

Malo, D. 1951. Hawaiian Antiquities. *Bernice P. Bishop Museum Special Publication* 2, translated by N.B. Emerson. Honolulu.

McCoy, P.C. 1979. Easter Island. In J. Jennings (ed.), *The Prehistory of Polynesia*, pp. 135-166. Cambridge, Harvard University Press.

McCoy, P.C. 1991. *Survey and Test Excavations of the Puu Kalepeamoa Site, Mauna Kea, Hawaii*. Public Archaeology Section, Applied Research Group, Bernice P. Bishop Museum, Honolulu.

McKinzie, E.K. 1983. *Hawaiian Genealogies Extracted from Hawaiian Language Newspapers*, vol.1, I.W. Stagner, II (ed.). The Institute for Polynesian Studies, Brigham Young University Hawaii Campus, Lā'ie, Hawaii.

McKinzie, E.K. 1986. *Hawaiian Genealogies Extracted from Hawaiian Language Newspapers*, vol. 2, I.W. Stagner, II (ed.). The Institute for Polynesian Studies, Brigham Young University Hawaii Campus, Lā'ie, Hawaii.

Mitchell, D.K. 1972. *Resource Units in Hawaiian Culture*. Honolulu, Kamehameha Schools Press.

Mitchell, D.K. 1982. *Resource Units in Hawaiian Culture*. Honolulu, Kamehameha Schools Press.

Mullins, J.G. 1973. *Hawaiian Journey*. Honolulu, Mutual Publishing Company.

Mullins, J.G. 1976. *Hawaii: 1776-1976 The Bicentennial Years*. Honolulu, Mutual Publishing Company.

Nordyke, E.C. 1977. *The Peopling of Hawaii*. Honolulu, University of Hawaii Press.

O'Brien, M.J. and T.D. Holland. 1992. The role of adaptation in archaeological explanation. *American Antiquity* 57:36:59.

Ottino, P. 1985. Un site ancien aux Iles Marquises: l'abri sous-roche d'Anapua, Ua Pou. *Journal de la Société des Océanistes* 80:33-37.

Ottino, P. 1990. L'Habitat des anciens Marquisiens: architecture des maisons, evolution et symbolisme des formes. *Journal de la Société des Océanistes* 90:3-15.

R.A. Rappaport, A. Rappaport and R.C. Green. 1967. Descriptive and comparative analysis of portable artifacts recovered from coastal excavations. In Archaeology of Mo'orea, French Polynesia. *Anthropological Papers of the American Museum of Natural History*, Vol. 51, Pt. 2. New York.

Reinman, F.M. 1970. Fishhook variability: implications for the history and distribution of fishing gear in Oceania. In R. Green and M. Kelly (eds), Studies in Oceanic Culture History, Vol. 1. *Pacific Anthropological Records* 11:47-59. Honolulu, Bernice P. Bishop Museum.

Rolett, B.V. 1989. Hanamiai: Changing Subsistence and Ecology of Tahuata, Marquesas Islands, French Polynesia. Ph.D. thesis, Department of Anthropology, Yale University. Ann Arbor, University Microfilms.

Rolett, B.V. in press. Marquesan prehistory and the origins of East Polynesian culture. *Journal de la Société des Océanistes*.

Sinoto, Y. 1967. Artifacts from excavated sites in the Hawaiian, Marquesas, and Society Islands: a comparative study. In G. Highland *et al.* (eds), Polynesian Culture History: Essays in Honor of Kenneth P. Emory. *Bernice P. Bishop Museum Special Publication* 56:341-361. Honolulu.

Sinoto, Y. 1968. Position of the Marquesas Islands in East Polynesian prehistory. In I. Yawata and Y. Sinoto (eds), *Prehistoric Culture in Oceania*, pp. 111-118. Honolulu, Bishop Museum Press.

Sinoto, Y. 1970. An archaeologically-based assessment of the Marquesas Islands as a dispersal center in East Polynesia. In R. Green and M. Kelly (eds), Studies in Oceanic Culture History, Vol. 1. *Pacific Anthropological Records* 11:105-132. Honolulu, Bernice P. Bishop Museum.

Sinoto, Y. 1979a. Excavations on Huahine, French Polynesia. *Pacific Studies* 3:1-40.

Sinoto, Y. 1979b The Marquesas. In J. Jennings (ed.), *The Prehistory of Polynesia*, pp. 110-134. Cambridge, Harvard University Press.

Sinoto, Y. 1983. Archaeological excavations of the Vaito'otia and Fa'ahia sites on Huahine Island, French Polynesia. *National Geographic Society Research Reports* 15:583-607.

Sinoto, Y. 1991. A revised system for the classification and coding of Hawaiian fishhooks. *Bernice P. Bishop Museum Occasional Papers* 31:85-105. Honolulu.

Skjølsvold, A. 1972. Excavations of a habitation cave, Hanapete'o, Hiva Oa, Marquesas Islands. *Pacific Anthropological Records* 16. Honolulu, Bernice P. Bishop Museum.

Steinen, K.v.d. 1988. *Von Den Steinen's Marquesan Myths*, translated by M. Langridge and edited by J. Terrell. Canberra, Target Oceania/Journal of Pacific History.

Stimson, J.F. 1934. The Legend of Maui and Tahaki. *Bernice P. Bishop Museum Bulletin* 127. Honolulu.

Stuebel, C. 1987. *Tala o le Vavau; The Myths, Legends and Customs of Old Samoa*, translated by B. Herman. Auckland, Polynesian Press.

Suggs, R. 1961. Archaeology of Nuku Hiva, Marquesas Islands, French Polynesia. *Anthropological Papers of the American Museum of Natural History* Vol. 49, Pt. 1. New York.

Sutton, D.G. 1987. A paradigmatic shift in Polynesian prehistory: implications for New Zealand. *New Zealand Journal of Archaeology* 9:135-155.

Trotter, M.M. 1974. Archaeological Survey of Atiu, Cook Islands. In M. Trotter (ed.), Prehistory of the Southern Cook Islands. *Canterbury Museum Bulletin* 6:95-119. Christchurch.

University of Hawai'i at Mānoa, Department of Geography 1983. *Atlas of Hawaii*. Honolulu, University of Hawaii Press.

Walter, R.K. 1987. Preliminary excavation report, Anai'o, Ma'uke, Cook Islands, 1987. *New Zealand Archaeological Association Newsletter* 30:239-248.

Walter, R.K. 1989. An archaeological fishhook assemblage from the southern Cook Islands. *Man and Culture in Oceania* 5:66-77.

Walter, R.K. 1990. The Southern Cook Islands in Eastern Polynesian Prehistory. Unpublished Ph.D. thesis, Department of Anthropology, University of Auckland.

Walter, R. and W.R. Dickinson 1989. A ceramic sherd from Ma'uke in the southern Cook Islands. *Journal of the Polynesian Society* 98:465-470.

Winterhalder, B.P. and E.A. Smith. 1992. Evolutionary ecology and the social sciences. In E.A. Smith and B.P. Winterhalder (eds), *Evolutionary Ecology and Human Behavior*, pp. 3-23. New York, Aldine de Gruyter.

Yen, D.E. 1974. The sweet potato and Oceania: an essay in ethnobotany. *Bernice P. Bishop Museum Bulletin* 236. Honolulu.