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THE HALAWA VALLEY PROJECT: TWO FIELD SEASONS IN RETROSPECT

Patrick Vinton Kirch,
Bernice P. Bishop Museum

INTRODUCTION

The Halawa Valley Project, a joint expedition of the Bernice P. Bishop Museum and the University of Hawaii, carried out its second field season from June through September 1970. An investigation of prehistory and human ecology in an Hawaiian valley, the Project is one of several archaeological programmes currently being conducted in the Hawaiian Islands (Green 1970a). The Project's first season was summarized previously in this Newsletter (Kirch 1970). My present purpose is to provide a preliminary account of the second campaign and to present a number of hypotheses generated by the findings of the entire programme to this point.

Co-directors of the second campaign were Thomas J. Riley (University of Hawaii) and myself. Archaeologists Gilbert Hendren (Harvard University) and Paul Rosendahl (University of Hawaii) were responsible for major portions of the fieldwork. Serving the expedition as consultants were: M. Morgenstein (Geology), Y. Sinoto (Archaeology), and D. Yen (Ethnobotany). The site supervisors were S. Suyat, M. Rodrigues, K. Alexander, and V. Nelson. Financial support for the second season came from the Hawaiian Homes Commission, the Bernice P. Bishop Museum, and the University of Hawaii.

The Halawa Project is centred around a systems approach to cultural adaptation. We view the investigation of early settlement sites, residence patterns, agricultural networks, temple architecture, and vegetational patterns, to name a few, as inter-related aspects of an overall attempt to arrive at a processual explanation of cultural adaptation in a particular Polynesian population. Practical considerations often require our results to be stated ideographically, however, the eventual aim is nomothetic explanation (Spaulding 1968: 34; Radcliffe-Brown 1952: 1). Halawa Valley and its archaeological legacy is our "laboratory" and in many ways it is a model location. Not only does the valley comprise a discrete physiographic unit, but ethnohistoric data indicate that it was occupied by a single social group - the ahupua'a (Handy and Pukui 1958: 4-5). Hence we have a basis for postulating hypotheses on the nature of aboriginal social grouping, and spatial interaction and patterning within the social group. Halawa is presently

an abandoned valley, alleviating the problem of modern structures covering or obliterating ancient sites. Historical data provide a modicum of control on the late period remains. Molokai Island, and Halawa Valley especially, have always been in the backwater of Historic period development and extraneous cultural traditions penetrated the valley only minimally.

The 1969 field season indicated another, not completely unexpected advantage of the study area: an extremely great time depth for the Hawaiian Islands. We now have strong evidence that the valley was permanently settled by the seventh century A.D.

The Polynesian centralized chiefdom, typified by proto-historic Hawaiian society, has been increasingly used as a model of socio-economic organization for other archaeological regions, especially Meso-America (cf. Sanders and Price 1968; Flannery and Coe 1968). The highly developed Polynesian chiefdom, often based on intensive irrigated agriculture, occupies the dividing point between the "tribe" and incipient "state" (Service 1962), a unique and theoretically important position. Unfortunately, analogies have been based solely on ethnographic data, particularly on the synthesis presented by Sahlins (1958). We contend that this is too loose a base for valid analogy: the ethnographic data simply do not present a clear picture of Polynesian society (cf. Kelly 1967). Hence projects such as ours in Halawa Valley are in a position to clarify this picture, and to test, archaeologically, a number of the extremely engaging hypotheses suggested by Sahlins and others.

MAJOR FIELD PROGRAMMES IN 1970

Coastal Excavations

Our first excavations concentrated on Site A1-4, a taluvial fan deposit situated against the southern valley wall of Halawa. Here were uncovered a sequence of geologic deposits, interspersed with archaeological material, representing a sequence of human-induced erosion. Indications are that clearing for slash-and-burn horticulture was the immediate cause of erosion, exposing the steep and unstable taluvium to run-off. Stratified outwash deposits at A1-4 contain thousands of endemic, non-marine gastropods (pulmonates and prosobranchs), representing 14 species in five families. None of these species inhabit the area presently. The fact that they are highly specialized to the endemic flora allows us to reconstruct to some extent the pre-settlement vegetation of coastal Halawa. The lower deposits at A1-4 have been isotopically dated to 750 $\pm$ 90 B.P. (GaK-2744).

I conducted a second phase of excavations at Site A1-3, a stratified dune deposit containing the oldest known archaeological material in the valley, and presumably also one of the oldest sites in the entire archipelago. Site A1-3 straddles a geographically key position, as it is focal to interfaces between marine, littoral, taluvial, deltaic, and riverine environments. On an ecological basis alone, it can be posited that A1-3 is likely to mark the site of earliest settlement in Halawa Valley. Test excavations in previous seasons provided an outline of stratigraphy. Working outward from the 1969 sondage, we excavated approximately 50 square meters, by horizontal methods following natural stratigraphy. Layer IV, representing the prehistoric occupation, averaged 60 to 70 cm thick. Five separate whole or partial round-ended houses in Layer IV were identified from post mold patterns and stone foundations. This is the first occurrence, archaeologically, of round-ended houses in the Hawaiian Islands.

A large number of artifacts were recovered, including 28 pieces of fishing gear and five whole or broken adzes with diagnostic characteristics. The adze complex has close affinity with that described by Emory (1928) from Nihoa and Necker Islands. There is a large complement of manufacturing tools (e.g., coral and ecinoid spine abraders, hammerstones, grindstones) and ornaments (e.g., dog tooth pendants). A prepared core technique was used to produce small blades and flakes of trachytic glass. Large numbers of basaltic flakes (generally non-retouched) also show edge damage patterns, indicating utilization as tools.

Preliminary results on the quantitative analysis of faunal material from one sample grid unit (1 x 1 m) are given in Table 1. More significantly, detailed analysis of the bone remains, both from this unit and from the entire excavated area, reveals a decided temporal increase in domestic pig and dog bone, and a concomitant decrease in fish bone. A gradual shift in economic emphasis from marine resources to terrestrial, specifically agricultural and animal husbandry, resources would seem to be indicated.

The outline of an absolute chronology for Site A1-3 is now available, based on radiometric (C^{14}) and hydration-rind age determinations, discussed below. Tentatively, we may assign Layer IV a time range of roughly 600 to 1200 A.D.

Inland Investigations

While in 1969 investigations in the interior of Halawa concentrated on the land division of Kaio, operations were shifted in 1970 to Kapana, an area further inland. The settlement patterns of these two geographic

TABLE 1

Quantitative Analysis of Midden, Site A1-3

	0-10*		10-20		20-30		30-40		40-50		50-60	
	G	%	G	%	G	%	G	%	G	%	G	%
Shell	431	84.02	814	70.42	731	82.60	440	89.98	747	82.09	357	85.82
Bone	26	5.07	24	2.08	19	2.15	12	2.45	15	1.65	37	8.89
Echinoderm	6	1.17	18	1.56	12	1.36	8	1.64	21	2.31	5	1.20
Crustacea	1	0.19	2	0.17	1	0.11	1	0.20	2	0.22	2	0.48
Charcoal	13	2.53	25	2.16	21	2.37	12	2.45	21	2.31	11	2.64
Coral	22	4.29	49	4.24	3	0.34	1	0.20	17	1.87	0	0.00
Basalt	14	2.73	224	19.38	98	11.07	15	3.07	87	9.56	4	0.96
Total	513		1156		885		489		910		416	
Total midden											4369	

*Depth of Layer IV in centimeters

subdivisions, Kaio and Kapana, provide a comparative basis for the formulation of hypotheses on resource allocation, agricultural systems, and social grouping. The entire area of Kapana was mapped with telescopic alidade and plane table to a scale of 1:500 by Rosendahl. All cultural features, including residence sites and irrigated as well as non-irrigated terraces, were included in this intensive survey. At the same time Rosendahl also mapped a small system of irrigated terraces at the junction of Hipuapua and Halawa streams. The overall distribution of settlement in Kapana is characterized by dispersed habitation sites situated among non-irrigated terraces. These terraces, however, were situated so as to put to advantage the runoff pattern induced by local topography. It is possible that as well as providing planting areas, the terraces may have served an additional function of retarding erosion. The Kapana settlement pattern also included an irrigated pond-field component, undoubtedly for the production of taro (Colocasia esculenta). One structure in Kapana can be documented ethno-historically as a religious site associated with a local kin group. At least one structure may represent a shrine. Several enclosures likely served as pens, representing an animal husbandry component of the economic structure.

In an effort to clarify the developmental sequence and operation of the agricultural system in Kapana, Riley conducted excavations in both irrigated and non-irrigated terraces. Morgenstein performed mechanical and chemical analyses on the soil profiles produced by Riley's excavations. Riley also supplemented his 1969 investigations with additional work in Kaio.

Hendren excavated several prehistoric residence sites in Kapana, providing data to amplify the picture provided by the surface survey of structural remains. Inland residences consist generally of stone-outlined terraces, upon which stone platforms are sometimes situated. A large stone-lined pit, originally probably for storage and later utilized as an oven was excavated at Site A1-765, and is analogous to similar features excavated in Kaio. At inland sites midden is scarce, and portable artifacts include whole or partial adzes, grindstones, and basalt and trachytic glass flakes.

Rosendahl conducted a limited excavation at Site A1-30 in Kapana, an ethno-historically documented temple (heiau). The trench on the site's upper terrace revealed an oven pit filled with fire-cracked stones, charcoal and ash. The surrounding terrace fill yielded shell and mammal bone, coral, two adze fragments, a single piece of trachytic glass with edge damage patterns, and several utilized basalt flakes. The site was apparently re-occupied in historic times as a habitation.

ABSOLUTE DATING

A primary objective confronting the Halawa Project is the chronological ordering of excavated sites, a prerequisite to establishing a sequence for the valley. The problem is made particularly acute by the dearth of diagnostic artifacts and meaningful stratigraphy in inland sites. Six radiocarbon age determinations were run on charcoal collected during 1969 from four sites (two coastal and two inland). In addition, Morgenstein provided hydration-rind datings of basaltic glass (trachyte) artifacts from two sites. As a result, the bare outline of a sequence is emerging.

Radiocarbon Age Determinations

Results of the first six radiometric age determinations from Halawa are presented in Table 2. Five additional samples are being processed at Gakushuin University and two by Isotopes, Inc. In this report no attempt has been made to correlate the C^{14} ages with true sample ages (Stuiver and Suess 1966), a process which will be undertaken when all dates have been received. However, a few general remarks may be stated.

TABLE 2

Radiocarbon Age Determinations*

Lab. No.	Museum No.	Site	C^{14} Age, B.P.	A.D. Range
GaK-2739	HRC-176	A1-770	350 ± 80	1520-1680
GaK-2740	HRC-177	A1-790	440 ± 80	1430-1590
GaK-2741	HRC-179	A1-3	820 ± 80	1050-1210
GaK-2742	HRC-180	A1-3	230 ± 120	1600-1840
GaK-2743	HRC-181	A1-3	1380 ± 90	480-660
GaK-2744	HRC-182	A1-4	750 ± 90	1110-1290

*All determinations made on charcoal. Calculation of C^{14} age based on original Libby half-life of 5570 years. To convert to new half-life of 5730 years multiply by 1.03.

Age determinations for the two inland sites (A1-770 and A1-790), both located in Kaio, indicate approximate contemporaneity. They suggest that the settlement pattern represented at Kaio may date from the 15th to 17th Centuries. At Site A1-3, GaK-2742 is from an instrusive oven, and is not indicative of the age of Layer IV. However, samples GaK-2743 and GaK-2741 may be taken as roughly representative of the initial occupation and abandonment of the site, respectively. I would tentatively posit a time span for the prehistoric occupation of Site A1-3 of 600 to 1200 A.D. Sample GaK-2744 gives an indication of the age of the lower taluvial deposits at Site A1-4.

Hydration-Rind Dating

The method of hydration-rind dating used by Morgenstein on flake tools of basaltic glass (trachyte) is based on the theory of palagonitization (Morgenstein 1969) and on a least squares analysis of known-age lava flow hydration-rind thicknesses. The average total rate formula is: $R_p = (N-2)\ Q/T$ where R_p = rate of palagonitization, N = number of palagonite bands, Q = thickness of each band, and T = age in years. For Halawa, the hydration rate is 11.77 microns per 1,000 years. Morgenstein has reported the following age estimates for two sites:

A1-3 (Layer IV, 30-40 cm):	1026 ± 54 A.D.
A1-3 (Layer IV, 40-50 cm):	895 ± 69 A.D.
A1-1001 (Kaio):	1605 ± 70 A.D.

The geologic age of the trachytic glass is roughly 13,000 years, indicating a late Quaternary source area, possibly Hooniki Island (Fig. 1), a volcanic cone composed largely of palagonite tuff.

PROBLEMS AND HYPOTHESES

At this point it is appropriate to present some of the hypotheses which we have reached after two seasons of intensive fieldwork, and also some of the problems. One of the Project's first aims has been to establish a chronological sequence, as is necessary in any region where archaeological work is in its infancy. Based on "absolute" dates, not to mention artifactual comparisons, Site A1-3 must be ranked among the earliest settlements in the Hawaiian archipelago. Roughly contemporary sites are H1 and H8 on Hawaii Island (Emory and Sinoto 1969) and 018 on Oahu Island (Pearson, Kirch, and Pietrusewsky n.d.). Unfortunately, between the abandonment of Site A1-3 in roughly 1200 A.D. and the occupation of inland surface sites in Kaio and Kapana, probably after

1400 A.D., there is a gap of at least 200 years, for which at present we have no representative sites. The closing of this gap must be a necessary consideration for future fieldwork in Halawa.

The discovery of round-ended houses at Site A1-3, as well as early forms of diagnostic artifacts, forces upon us the question of the origins of the initial settlers of Halawa Valley. On the basis of linguistic and archaeological evidence, Emory and Sinoto postulated a two-phase colonization of the Hawaiian Islands, with primary settlers coming from the Marquesas and a later group from the Society Islands (Emory 1963; Green 1966; Emory and Sinoto 1965). The significance of the round-ended house form in this picture is not yet clear. Such houses are quite widespread in Polynesia, and have a lengthy documented prehistory in Western Polynesia (Samoa) at least (Green 1970b: 24). Berthal (1959), Tischner (1934), and Suggs (1961) all suggested an eventual Melanesian influence for the Polynesian round-ended house form. Suggs (1961) reported ovoid houses at Ha'atuatua in the Marquesas, but one must view his data with uncertainty (Sinoto 1970: 105-106). To date, the earliest example of such houses in Eastern Polynesia is on Moorea, from the 13th Century (Green et al. 1967: 166). Artifacts from A1-3, particularly adzes and fishhooks, have close cognate forms in other early Eastern Polynesian assemblages, such as those from Hana (Marquesas), Maupiti (Societies), and Wairau Bar (New Zealand). In sum, the "Halawa Dune Site is indicative of a culture showing incipient adaptation to the local environment but still retaining close ties with early cultural assemblages in other parts of East Polynesia" (Kirch, in press). It is my opinion that the data from Site A1-3 lend credence to Bellwood's thesis (1970: 96) of an early polythetic assemblage in East Polynesia, the immediate origins of which are still unclear.

The thick taluvial deposits at Site A1-4 have provided data for the solution of another enigma: specifically, defining the pre-settlement ecology of Halawa Valley. This is an extremely important consideration in providing a comparative base by which to judge the scale of later human alteration of the valley ecosystem. Sub-fossil terrestrial gastropods at A1-4 indicate that originally the low-level flora of Halawa probably consisted of a climax forest of Acacia koa and Chenopodium, perhaps interspersed with Eugenia, Pandanus, and Metrosiderous. The local microclimate was certainly more humid than at present, likely due to greater retention of soil moisture. However, by at least 1200 A.D., if not earlier, extensive clearing, probably by burning (and possibly related to swidden cultivation) had set off a cycle of local erosion on the valley's coastal slopes, with apparently disastrous effects on local ecology. The abandonment of Site A1-3 may be related to this phenomenon. Whether there is any relation between

such clearing activity here, and elsewhere on East Molokai, and the shift from hygrophytic and xero- (± meso-) phytic pollen spectra documented by Selling (1948) for the upper level of Pepeopae bog remains an important problem for future consideration.

Outlining the development of the valley's economic structure was a primary concern from the Project's outset. The ethnohistoric endpoint of the economic system centred around intensive pond-field cultivation of taro. More than 40 acres of alluvial bottomland were intensively cultivated in 1900, under a traditional technological regime. Population density in early historic times was greater than 500 persons per square kilometer of cultivated land (including non-irrigated areas), a figure comparable to that cited by Gourou (1936) for the Tonkin delta. Similar agricultural systems in other parts of Hawaii have led Sahlins (1968: 43) to refer to the Polynesian centralized chiefdom as an "incomplete or primitive analogue" of Wittfogel's despotic "Oriental Society".

Data relevant to the initial structure of the valley's economy comes from Sites A1-3 and A1-4. The earliest material at A1-3 suggests marked dependence on marine resources, especially fish. This dependence was completely reversed to terrestrial orientation by ca. 1200 A.D., when the site was abandoned. Further, the later emphasis on pig and dog argues indirectly for a well-established agricultural regime. The integration of animal husbandry, particularly of suids, with tropical Pacific agricultural systems has been stressed by Yen (1968: 407, n.d. : 29), Brookfield (1968: 426), and others. A similar trend from maritime to terrestrial economic orientation has been documented for the Marquesan prehistoric sequence (Sinoto 1970). However, the presence of both dog and pig from the beginning of the sequence at A1-3 suggests that we may postulate, as Yen (n.d. : 5) has done for New Zealand, ". . . a developmental sequence whose steps in their relevance to subsistence reveal change in dominance rather than qualitative conversion from one base (hunting and gathering) to another (agriculture)." The kind of agricultural techniques practised during the first six to eight centuries in Halawa is open to some speculation, but the clearing activity represented at A1-4 is highly suggestive of swiddening, an important method in the agronomic repertoire of Polynesian cultivators (Barrau 1961).

The later prehistoric agricultural system has been the subject of investigation by Riley, and can be said to have composed two essential subsystems: irrigated pond-field cultivation and a form of swidden or non-irrigated gardening. Midden analysis as well as the remains of pens reveal that animal husbandry (pig and dog) was an essential part of the economic system. The two kinds of agricultural subsystems

indicated above for Halawa have been characterized by Geertz (1963: 12-37). Pond-field cultivation is highly specialized, has a low diversity species index, and is labour-intensive, while swiddening, essentially an imitation of the tropical forest that it replaces, has a high diversity index and is extensive. Odum (1969: 265) has compared the swidden adaptation to an imitation of a mature ecosystem and the irrigated terrace adaptation to the creation and maintenance of an immature ecosystem. The inclusion of both subsystems in the total agricultural regime in Halawa is reflected elsewhere in the archipelago. Thus, Yen, Kirch, Riley, and Rosendahl (n.d. : 55) have characterized prehistoric agriculture in Makaha Valley, Oahu, as comprising "mixed permanent field and swidden or dryland farming."

While the development of procurement systems in Halawa may be traced ideographically, as above, we are still a long way from explaining the causal processes for such development. Barrau (1961: 18) hypothesized that on Polynesian high islands "the development of taro growing on low-lying, hydromorphic soils and on irrigated terraces in the valleys" was a response to the "deterioration of both vegetation and soils" resulting from "shifting agriculture with bush-fallowing rotation". In this context, it is important to note the disastrous erosional cycle evidenced at Site A1-4 and apparently caused by clearing with fire (cf. Strahler 1956: 633; Blaut 1961: 59). Riley has suggested that increased soil erosion and terracing of the taluvial slopes in an effort to check erosion and maintain an equilibrium between the wet and dry subsystems may have retarded soil renewal resulting in a lesser dryland yield or necessitating a longer fallow period. This might act as a deviation-amplifying process (Maruyama 1963) contributing to an intensification of the pond-field subsystem. At the present, such hypotheses can form only a basis for future analysis.

Finally, we must consider the nature of prehistoric social groups in Halawa. The work of Handy and Pukui (1958) provides a model of aboriginal Hawaiian social organization and associated settlement pattern. It appears that in Halawa this model may be projected back in time quite successfully. Thus, we have hypothesized that the valley was occupied by approximately one dozen minimal nonunilineal descent groups (<u>'ohana</u>), each with usufructuary rights to an area of arable soil. Each of these corporate groups seems to have been associated with at least one communal structure, probably a combined religious shrine and men's house (e.g., Site A1-30 in Kapana). It is further posited that all of these nonunilineal descent groups were related genealogically to a common ancestor, and together formed a larger-order social grouping (<u>maka'ainana</u>). The refinement of these hypotheses and their testing in the light of archaeological criteria are continuing

aspects of the Project.

Although the ideas presented above must be regarded as highly tentative, and although we have perhaps raised more questions than answers, nevertheless we feel that the Halawa Valley Project has added a significant body of data bearing on East Polynesian prehistory. With each new investigation the outline of prehistory in this region becomes a bit clearer, and our questions more precise. And we should not be bothered that the questions never cease, for as Teilhard de Chardin once put it: "The farther and more deeply we penetrate into matter, by means of increasingly powerful methods, the more we are confounded by the interdependence of its parts" (1959: 44).

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