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A REVISED LATE HOLOCENE CULTURE HISTORY FOR MOLOKA'I ISLAND, HAWAI'I

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ABSTRACT. Building directly upon a previous summary of 45 dates (Weisler 1989), this paper presents radiocarbon age determinations for 175 samples from archaeological and natural contexts and a revised culture history of Moloka'i Island, Hawai'i (cal AD 800 and 1795). Significant culture historical trends include an early settlement pattern apparently generalized with respect to ecozone; a remarkably long initial period of marine and endemic bird exploitation; strong material evidence for the concurrent intensification of subsistence economies, population increase, and the structuring of the social landscape through ritual; and links between island politics as described in oral traditions and site construction. Moreover, these results support a late chronology for the colonization of Hawai'i and demonstrate the value of spatial technology for building large chronometric databases.

INTRODUCTION

This review presents a list of 175 radiocarbon dates from archaeological (n = 137) and natural science research (n = 38) on Moloka'i Island, Hawai'i, between 1989 and 2006, and proposes a revised late Holocene island culture history (Figure 1). This work adds to Weisler's (1989) invaluable previous summary of 48 dates reported between 1959 and 1988, bringing the combined total number of annotated samples summarized to 223, including 182 archaeological and 41 geological samples (Figures 2 and 3). Annotated lists such as these are especially important in reconstructing prehistory in East Polynesia, given the absence of ceramics and rarity of artifacts with temporally diagnostic stylistic characteristics, such as fishhooks and stone tools. In this case, Geographic Information Systems software (ESRI's ArcGIS 9.1) was especially helpful in organizing, storing, and retrieving data on ^{14}C dates spanning nearly 50 yr of research.

Since the last consideration of the island's prehistoric sequence was published, a major revision has been advanced for the age of the Hālawa Dune site, previously thought to have been the island's earliest archaeological site (McCoy and Kirch 2006; Kirch and McCoy, forthcoming). New studies have helped refine our knowledge of southern coast prehistory within the traditional Kona district (Tomonari-Tuggle 1990; Tuggle 1993; Dye 1998; Heidel et al. 1998; McGerty and Spear 1999; Bush et al. 2001; Kirch and Sharp 2005) as well as the Kaluako'i (Dixon et al. 1994) and Kala'e (Weisler et al. 2006) regions (Figure 1). There has also been a surge in archaeological research on the northern coast in the Ko'olau district (Ladefoged 1990, 1993; Goodwin 1994; Anderson 2001; Kirch 2002; Kirch et al. 2003; McCoy 2005a,b,c, 2006, 2008; McElroy 2004, 2006; Manning and Neller, forthcoming; Neller n.d.). Further, geological and geoarchaeological research has revealed significant trends in Moloka'i's Holocene environmental history (Fletcher 1992; Denham et al. 1999; Engles et al. 2004).

Methodologically, over the past 17 yr ^{14}C has remained the preferred dating method for archaeologists working on Moloka'i, although there has been a remarkably higher frequency of dating, improved care in sample selection, and more regular use of accelerator mass spectrometry (AMS). Over this same period, volcanic glass hydration has been all but abandoned due to apparent problems with calibration (see Hommon 1993). However, a novel application of ^{230}Th dating has recently produced unprecedented chronometric precision for the age of artifacts and holds great promise for future studies (Kirch and Sharp 2005; Weisler et al. 2006). Overall, as our body of chronometric evidence has grown and gained precision, a greater synthesis of material evidence and native Hawaiian oral traditions dated by genealogical reckoning continues to emerge (Summers 1971; Tuggle 1993; Kirch 2002; Kirch and Sharp 2005; McCoy 2005a, 2006).

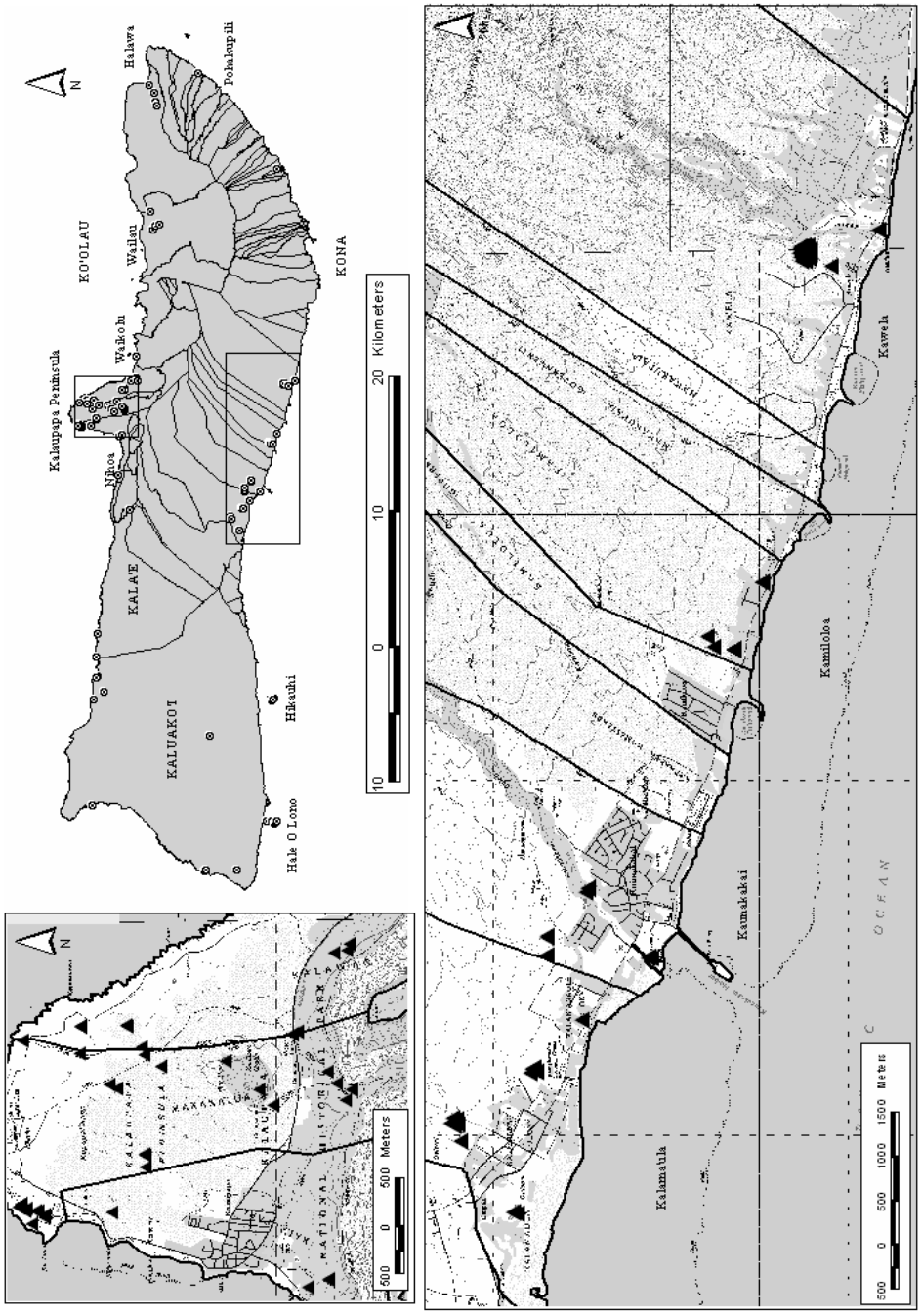

Figure 1 Locations of ^{14}C-dated samples, Moloka'i Island, Hawai'i. Traditional community territory (*ahupua'a*) boundaries shown.

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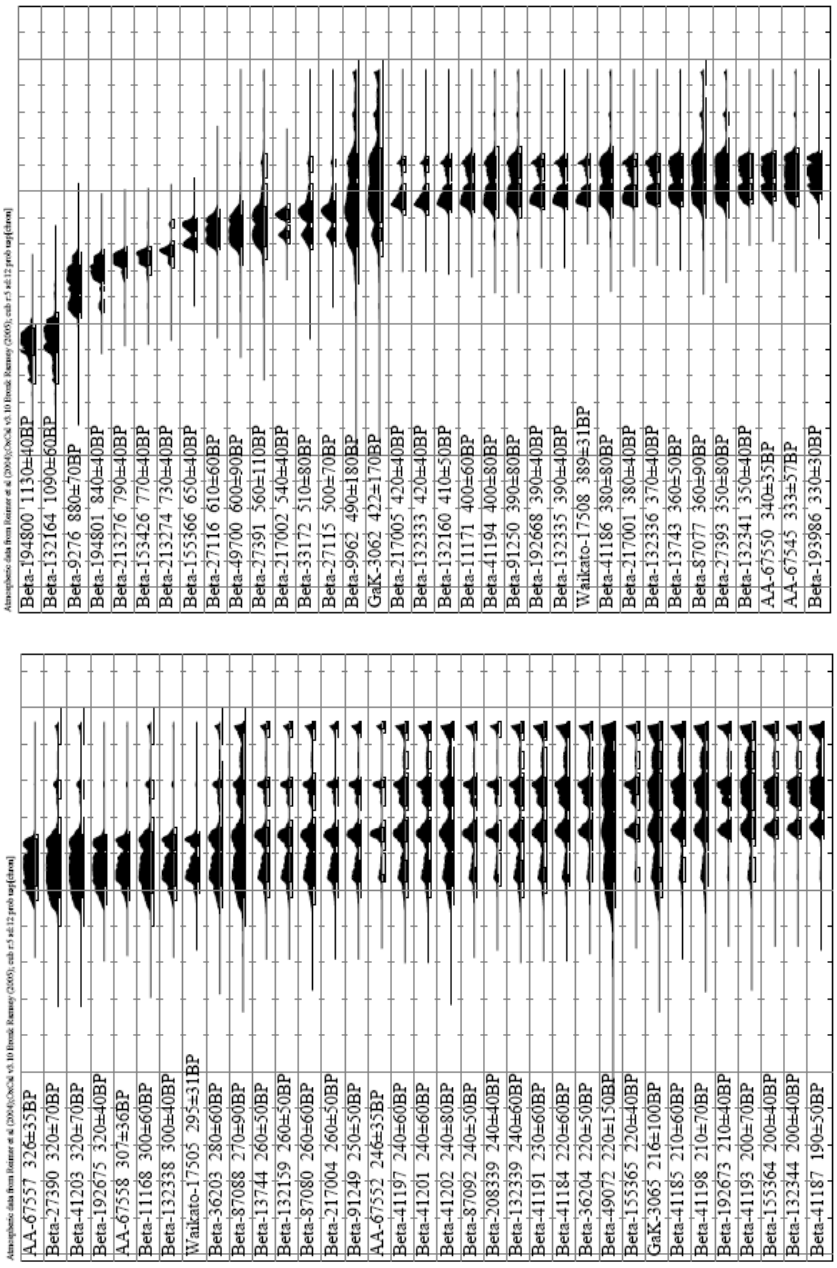

Figure 2a–b Moloka'i archaeological ^{14}C dates (2 σ; $n = 138$) (OxCal v 3.10; Bronk Ramsey 1995, 2001). Samples not represented in this graphic include geological dates, dates on marine shell and fishbone, % modern dates, charcoal dates with CRA not reported, and 1 unsound early date (GaK-2743).

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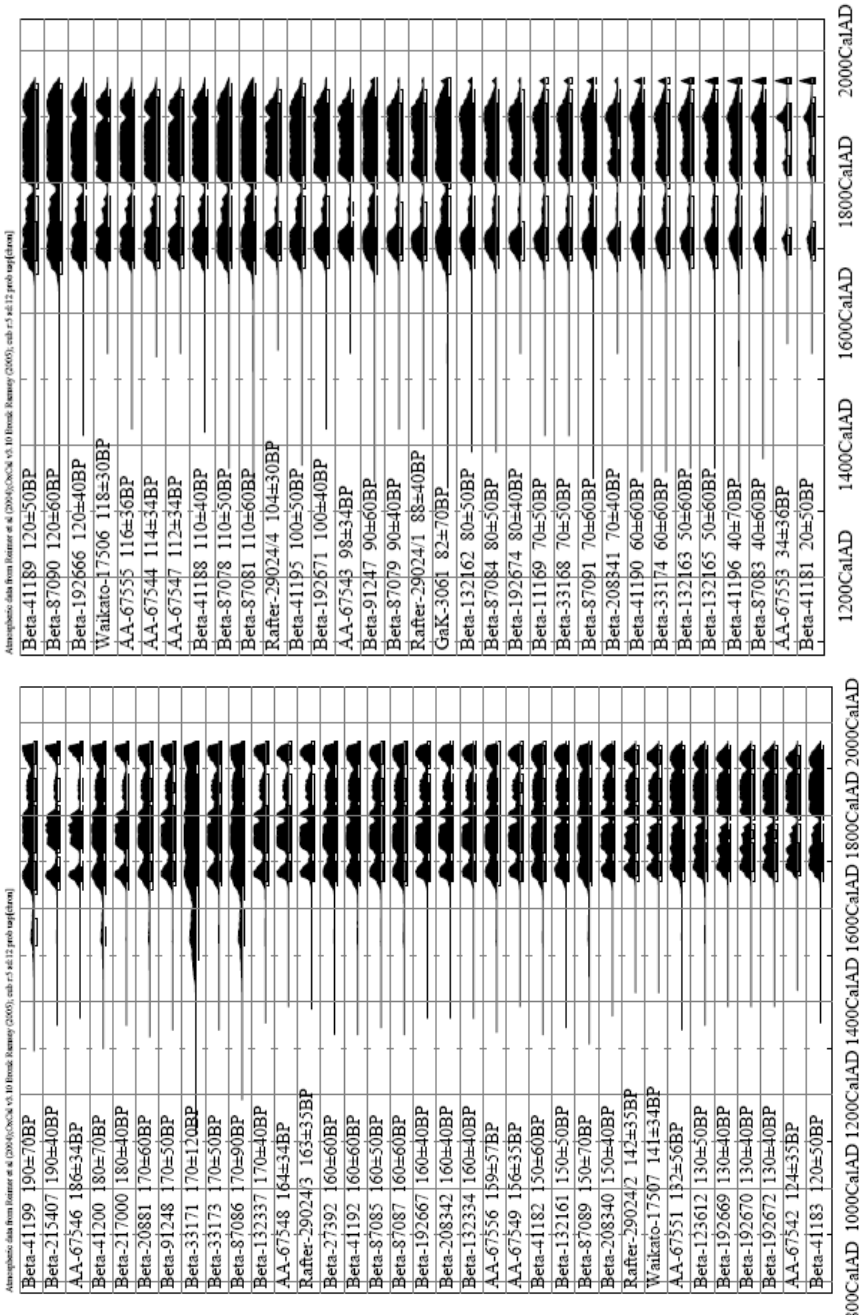

Figure 2c–d Moloka'i archaeological ^{14}C dates (2 σ; n = 138) (OxCal v 3.10; Bronk Ramsey 1995, 2001). Samples not represented in this graphic include geological dates, dates on marine shell and fishbone, % modern dates, charcoal dates with CRA not reported, and 1 unsound early date (GaK-2743).

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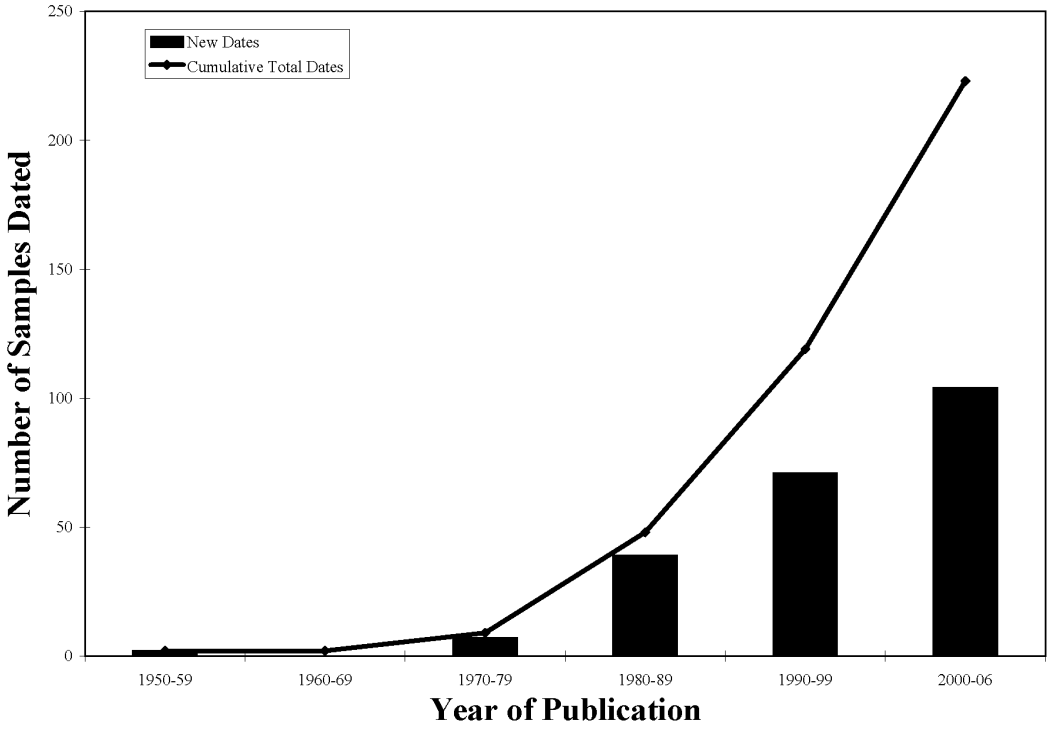

Figure 3 ^{14}C dates reported between 1959 and 2006, Moloka'i Island, Hawai'i. Bars show number of reported dates per decade; the line shows cumulative trend. Total: 223, December 2006.

The body of dates summarized here highlights improvements and continued challenges in employing ^{14}C in Hawaiian archaeology over the past 2 decades. For example, to limit the "old wood" problem the selection of charcoal from short-lived plant species and use of AMS to date single samples has become a regular practice (see Dye 1998, 2000). Other changes include a continued trend toward dating a greater range of sites and dating basal samples collected directly under stone foundations to ascertain a terminus post quem (Weisler and Kirch 1985; Tuggle 1993; Dixon et al. 1994; Kirch and Sharp 2005; McCoy 2005a, 2006; Weisler et al. 2006). Nonetheless, in terms of reporting, archaeologists continue to struggle with the "gray literature" problem (Weisler 1989:121). In addition, while archaeologists tend to avoid ^{14}C dating of marine shell, coral, and fish bone, this review again underlines the need to develop a consensus on how to resolve the marine reservoir effect for the Hawaiian Islands (see Dye 1994).

MOLOKA'I ISLAND CULTURE HISTORY

The following revised culture history uses the basic structure established by Kirch (1985) for the Hawaiian Islands, and refined by Weisler (1989) specifically for Moloka'i, with slightly different dates bracketing 5 periods: *Foundation period (AD 800–1200); Early Expansion period (AD 1200–1400); Late Expansion period (AD 1400–1650); Proto-Historic period (AD 1650–1795);* and *Historic period (1795–1900).*[1] Table 1 is a summary of samples assigned to these periods, excluding a

[1]Since the Hawaiian cultural sequence is relatively short and recent, the years used to bracket prehistoric era were chosen based on natural breaks in calibrated ^{14}C date probability distributions. In the historical era, the years AD 1795 and 1900 represent turning points in the rise and fall of the Hawaiian Kingdom.

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recently rejected early date (GaK-2743; McCoy and Kirch 2006; Kirch and McCoy, forthcoming). The largest change in the chronology is the addition of the generically named "Foundation period" (cal AD 800–1200) in the place of "Colonization" and "Developmental" periods to divorce the difficult problem of interpretation from the straightforward assignment of material evidence to culture historical periods. For example, initial human colonization of the Hawaiian Islands, permanent settlement of Moloka'i, and the development of a style of material culture and architecture unique to the archipelago, each mark significant phases in the island's culture history. However, archaeologists rarely encounter deposits in the Hawaiian Islands dated to this early period and many known sites have been redated to centuries later than previously estimated (Dye 1992; Tuggle and Spriggs 2000; Kirch and McCoy, forthcoming). A more generic term offers latitude to study the poorly documented period pre-AD 1200 and refine interpretations as more is learned about island colonization, settlement, and cultural development from both early sites and paleoenvironmental evidence (Denham et al. 1999; Athens et al. 2002).

Table 1 ^{14}C dates, Moloka'i Island, Hawai'i. Estimated locations are given in UTM, Zone 4N, NAD83.

Lab ID	Sample	Source	Easting	Northing
Archaeological dates (182 samples)				
Rejected early sample				
Gak-2743	Hālawa Dune site (A1-3)	Weisler (1989)	735015	2341403
Foundation period (cal AD 800–1200) (4 samples)				
Beta-9276	Kalawao (03-312)	Weisler (1989)	711470	2346354
Beta-11172	Kalama'ula (03-800)	Weisler (1989)	703149	2335469
Beta-132164	Kalama'ula (03-1753)	Bush et al. (2001)	703705	2334569
Beta-194800	Kalawao (03-2270)	McCoy (2005a)	713192	2342795
Early Expansion period (cal AD 1200–1400) (19 samples)				
Gak-2741	Hālawa Dune site (A1-3)	Weisler (1989)	735015	2341403
Gak-2744	Hālawa Valley (A1-4)	Weisler (1989)	734452	2341030
Beta-7564	Kaunakakai (03-630)	Weisler (1989)	704609	2333491
Beta-27391	Kaunakakai (03-887)	Weisler (1989)	705247	2334381
Beta-9962	Kalawao (03-312)	Weisler (1989)	711470	2346354
Beta-27115	Kipu (03-885)	Weisler (1989)	703676	2342858
Beta-27116	Kipu (03-885)	Weisler (1989)	703684	2342851
M-767	Kawa'aloa Bay (02-21)	Weisler (1989)	691308	2345369
Beta-20906	Kawa'aloa Bay (02-21)	Weisler (1989)	691311	2345369
Beta-49700	Kaluakoi (B6-161)	Dixon et al. (1994)	677112	2334959
Beta-153426	Waikolu Valley (03-2027)	Kirch et al. (2003)	715002	2342400
Beta-155366	Kalawao (03-312)	Kirch et al. (2003)	711470	2346354
Beta-33172	Kalaupapa (03-1803)	Ladefoged (1990)	709713	2346495
Beta-194801	Kalaupapa (03-2303)	McCoy (2005a)	709146	2343450
AA-67545	Kalawao (03-2296)	McCoy (2006)	711686	2343770
Beta-217002	Hālawa Dune site (A1-3)	Kirch and McCoy (forthcoming)	735015	2341403
Beta-217003	Hālawa Dune site (A1-3)	Kirch and McCoy (forthcoming)	735015	2341403
Beta-213274	Wailau Valley (04-272)	McElroy (2006)	724295	2341102
Beta-213276	Wailau Valley (04-272)	McElroy (2006)	724632	2340915
Late Expansion period (cal AD 1400–1650) (45 samples)				
Gak-2742	Hālawa Dune site (A1-3)	Weisler (1989)	735015	2341403
Gak-2739	Hālawa Valley (A1-770)	Weisler (1989)	733723	2340934
Gak-2740	Hālawa Valley (A1-790)	Weisler (1989)	733485	2340900
Beta-2278	Kawela Mound (04-144)	Weisler (1989)	713216	2330644
Beta-3364	Kawela (03-722)	Weisler (1989)	712909	2331529
Beta-3365	Kawela (03-724)	Weisler (1989)	712949	2331545

Table 1 ^{14}C dates, Moloka‘i Island, Hawai‘i. Estimated locations are given in UTM, Zone 4N, NAD83. *(Continued)*

Lab ID	Sample	Source	Easting	Northing
Beta-7563	Kaunakakai (03-630)	Weisler (1989)	704589	2333511
Beta-27390	Kaunakakai (03-886)	Weisler (1989)	705034	2334381
Beta-27393	Kaunakakai (03-888)	Weisler (1989)	705244	2334382
Beta-11171	Kalama‘ula (03-801)	Weisler (1989)	703115	2335433
Beta-11168	Kalama‘ula (03-801)	Weisler (1989)	703196	2335442
Beta-11169	Kalama‘ula (03-801)	Weisler (1989)	703187	2335397
Beta-13743	Mo‘omomi (02-24)	Weisler (1989)	690253	2344789
Beta-13744	‘Amikopala (02-85)	Weisler (1989)	686992	2336937
M-1183	Kalani (02-26)	Weisler (1989)	689665	2345494
Beta-41186	Kapa‘akea (03-980)	Tuggle (1993)	707432	2332812
Beta-41187	Kapa‘akea (03-925)	Tuggle (1993)	707326	2332770
Beta-41194	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41202	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41203	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-36203	Kalama‘ula (03-1711)	Tomonari-Tuggle (1990)	702902	2335646
Beta-49072	Kaluakoi (B6-76)	Dixon et al. (1994)	677088	2337260
Beta-91249	Kaunakakai (03-895)	Heidel et al. (1998)	705791	2333917
Beta-91250	Kaunakakai (03-895)	Heidel et al. (1998)	705797	2333922
Beta-105798	Kalama‘ula (03-1661)	Dye (1998)	704311	2333993
Beta-132159	Kalama‘ula (03-1748)	Bush et al. (2001)	703751	2334546
Beta-132160	Kalama‘ula (03-1752)	Bush et al. (2001)	703751	2334546
Beta-87077	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87080	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87088	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-192668	Makanalua (03-2265)	McCoy (2006)	711148	2345708
Beta-192675	Makanalua-Kalawao (03-2298)	McCoy (2006)	711465	2346013
Beta-193986	Wailau Valley (04-272)	McElroy (2004)	725642	2341349
Beta-208339	Kalawao (03-288)	McCoy (2006)	713327	2342386
Waikato-17505	Kalawao (03-2296)	McCoy (2006)	711686	2343770
Waikato-17508	Makanalua (03-2416)	McCoy (2006)	711095	2344176
AA-67550	Kalawao (03-2051)	McCoy (2006)	712532	2343264
AA-67552	Makanalua (03-2301)	McCoy (2006)	711100	2343210
AA-67557	Makanalua (03-292)	McCoy (2006)	711276	2343468
AA-67558	Kalaupapa (03-2303)	McCoy (2006)	709146	2343450
GaK-3062	Hālawa Dune site (A1-3)	Kirch (1975)	735015	2341403
GaK-3065	Hālawa Dune site (A1-3)	Kirch (1975)	735015	2341403
Beta-217001	Hālawa Dune site (A1-3)	Kirch and McCoy (forthcoming)	735015	2341403
Beta-217004	Hālawa Dune site (A1-3)	Kirch and McCoy (forthcoming)	735015	2341403
Beta-217005	Hālawa Dune site (A1-3)	Kirch and McCoy (forthcoming)	735015	2341403
Proto-Historic period (cal AD 1650–1795) (89 samples)				
Beta-2273	Kawela Mound (04-144)	Weisler (1989)	713216	2330644
Beta-2274	Kawela (03-730)	Weisler (1989)	712996	2331551
Beta-2275	Kawela (03-730)	Weisler (1989)	713030	2331526
Beta-2276	Kawela (03-720)	Weisler (1989)	713039	2331489
Beta-3363	Kawela (04-142)	Weisler (1989)	713036	2331448
Beta-3366	Kawela (04-142)	Weisler (1989)	712999	2331420
Beta-3367	Kawela (04-142)	Weisler (1989)	712946	2331417
Beta-3368	Kawela (03-717)	Weisler (1989)	712902	2331430
Beta-3369	Kawela (03-732)	Weisler (1989)	712868	2331470
Beta-2277	Kawela (03-731)	Weisler (1989)	712871	2331514
Beta-2279	Kawela (03-731)	Weisler (1989)	712952	2331517
Beta-3362	Kawela (03-710)	Weisler (1989)	712996	2331520
Beta-3802	Kaunakakai (03-631)	Weisler (1989)	704589	2333472
Beta-27392	Kaunakakai (03-887)	Weisler (1989)	705038	2334382
Beta-9275	Kalawao (03-312)	Weisler (1989)	711470	2346354

Table 1 ^{14}C dates, Moloka‘i Island, Hawai‘i. Estimated locations are given in UTM, Zone 4N, NAD83. *(Continued)*

Lab ID	Sample	Source	Easting	Northing
Beta-11170	Kalama‘ula (03-801)	Weisler (1989)	703130	2335395
Beta-5700	Kawa‘aloa Bay (02-629)	Weisler (1989)	691345	2345211
Beta-20881	Kawakiu Nui (01-1610)	Weisler (1989)	681822	2345634
Beta-41182	Kamiloloa (03-912)	Tuggle (1993)	708014	2332252
Beta-41184	Kamiloloa (03-912)	Tuggle (1993)	708038	2332271
Beta-41185	Kamiloloa (03-912)	Tuggle (1993)	708018	2332275
Beta-41191	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41192	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41193	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41195	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41197	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41198	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41199	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41200	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41201	Kapa‘akea (03-945)	Tuggle (1993)	707139	2332500
Beta-36204	Kalama‘ula (03-1716)	Tomonari-Tuggle (1990)	702940	2335360
Beta-49071	Kaluakoi (B6-73)	Dixon et al. (1994)	676946	2337355
Beta-91248	Kaunakakai (03-895)	Heidel et al. (1998)	705799	2333914
Beta-123612	Pohakupili (05-236)	McGerty and Spear (1999)	735815	2337795
Beta-132161	Kalama‘ula (03-1752)	Bush et al. (2001)	703774	2334523
Beta-132162	Kalama‘ula (03-1752)	Bush et al. (2001)	703751	2334546
Beta-132163	Kalama‘ula (03-1753)	Bush et al. (2001)	703751	2334546
Beta-132165	Kalama‘ula (03-1753)	Bush et al. (2001)	703728	2334500
Beta-155364	Kalawao (03-312)	Kirch et al. (2003)	711470	2346354
Beta-155365	Kalawao (03-312)	Kirch et al. (2003)	711470	2346354
Beta-33171	Kalaupapa (03-1811)	Ladefoged (1990)	709788	2346365
Beta-33173	Kalaupapa (03-1812)	Ladefoged (1990)	709810	2346367
Beta-33170	Kalaupapa (03-1816)	Ladefoged (1990)	709858	2346437
Beta-33169	Kalaupapa (03-1821)	Ladefoged (1990)	709858	2346464
Beta-33168	Kalaupapa (03-1824)	Ladefoged (1990)	709849	2346567
Beta-33174	Kalaupapa (03-1826)	Ladefoged (1990)	709884	2346552
Beta-192665	Makanalua (03-2248)	McCoy (2006)	710299	2345340
Beta-192666	Makanalua (03-2259)	McCoy (2006)	710440	2345348
Beta-192667	Makanalua (03-2259)	McCoy (2006)	710422	2345340
Beta-192669	Makanalua (03-2267)	McCoy (2006)	711105	2345627
Beta-192670	Makanalua (03-2232)	McCoy (2006)	711453	2345354
Beta-192671	Kalawao (03-2087)	McCoy (2006)	711536	2345377
Beta-192672	Kalawao (03-2080)	McCoy (2006)	711748	2345514
Beta-192673	Kalawao (03-2080)	McCoy (2006)	711752	2345530
Beta-192674	Kalaupapa (03-2110)	McCoy (2006)	706234	2343693
Beta-94999	Kalama‘ula (Core 11)	Denham et al. (1999)	702130	2334720
Beta-208340	Kalawao (03-2297)	McCoy (2006)	711594	2346588
Beta-208341	Kalawao (03-2270)	McCoy (2006)	713192	2342795
Beta-208342	Kalawao (03-2295)	McCoy (2006)	711671	2343820
Rafter-29024/1	Kalawao (03-2295)	McCoy (2006)	711671	2343820
Rafter-29024/2	Makanalua (03-2255)	McCoy (2006)	710986	2343280
Rafter-29024/3	Kalawao (03-294	McCoy (2006)	711337	2345181
Rafter-29024/4	Makanalua (03-293)	McCoy (2006)	710941	2344024
Waikato-17506	Makanalua (03-2301)	McCoy (2006)	711100	2343210
Waikato-17507	Makanalua (03-1894)	McCoy (2006)	711393	2344509
AA-67542	Kalawao (03-2270)	McCoy (2006)	713192	2342795
AA-67543	Kalawao (03-2295)	McCoy (2006)	711671	2343820
AA-67544	Makanalua (03-293)	McCoy (2006)	710941	2344024
AA-67546	Makanalua (03-2301)	McCoy (2006)	711100	2343210
AA-67547	Kalaupapa (03-2193)	McCoy (2006)	709069	2343670
AA-67548	Kalaupapa (03-2193)	McCoy (2006)	709069	2343670
AA-67549	Makanalua (03-2248)	McCoy (2006)	712590	2343242

Table 1 ^{14}C dates, Moloka'i Island, Hawai'i. Estimated locations are given in UTM, Zone 4N, NAD83. *(Continued)*

Lab ID	Sample	Source	Easting	Northing
AA-67551	Kalawao (03-2056)	McCoy (2006)	713228	2342255
AA-67553	Kalaupapa (03-2303)	McCoy (2006)	709146	2343450
AA-67555	Kalaupapa (03-2299)	McCoy (2006)	709834	2345680
AA-67556	Kalawao (03-2047)	McCoy (2006)	712503	2343403
AA-67560	Kalawao (03-2297)	reported here	711594	2346588
GaK-3061	Hālawa Dune site (A1-3)	Kirch (1975)	735015	2341403
Beta-217000	Hālawa Dune site (A1-3)	Kirch and McCoy (forthcoming)	735015	2341403
Beta-132339	Pala'au (02-2421)	Weisler et al. (2006)	692767	2345328
Beta-132341	Pala'au (02-2421)	Weisler et al. (2006)	692767	2345328
Beta-132337	Pala'au (02-18)	Weisler et al. (2006)	692767	2345328
Beta-132338	Pala'au (02-18)	Weisler et al. (2006)	692767	2345328
Beta-132334	Pala'au (02-16)	Weisler et al. (2006)	694527	2345249
Beta-132335	Pala'au (02-16)	Weisler et al. (2006)	694527	2345249
Beta-132336	Pala'au (02-16)	Weisler et al. (2006)	694527	2345249
Beta-132333	Pala'au (02-2433)	Weisler et al. (2006)	692767	2345328
Beta-132344	Pala'au (02-841)	Weisler et al. (2006)	692767	2345328
Beta-215407	Wailau Valley (04-272)	McElroy (2006)	724739	2340631
Historic period (cal AD 1795–1900) (24 samples)				
Beta-41181	Kamiloloa (03-912)	Tuggle (1993)	708027	2332254
Beta-41183	Kamiloloa (03-912)	Tuggle (1993)	708038	2332248
Beta-41188	Kapa'akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41189	Kapa'akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41190	Kapa'akea (03-945)	Tuggle (1993)	707139	2332500
Beta-41196	Kapa'akea (03-945)	Tuggle (1993)	707139	2332500
Beta-91247	Kaunakakai (03-896)	Heidel et al. (1998)	705752	2333946
Beta-87078	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87079	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87081	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87082	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87083	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87084	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87085	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87086	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87087	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87089	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87090	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346609
Beta-87091	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346608
Beta-87092	Kalaupapa (03-1801)	Neller (n.d.)	709919	2346608
AA-67554	Makanalua (03-2302)	reported here	711163	2343380
AA-67559	Kalaupapa (03-2303)	reported here	709146	2343450
GaK-3063	Hālawa Dune site (A1-3)	Kirch (1975)	735015	2341403
GaK-3064	Hālawa Dune site (A1-3)	Kirch (1975)	735015	2341403
Geological dates (41 samples)				
Beta-5122	Kawela (04-143)	Weisler (1989)	712804	2331177
Beta-12903	Puko'o	Weisler (1989)	728815	2332019
GX-2672	Kalani	Weisler (1989)	689658	2345497
Beta-55476	Kalaupapa (Sample Kalau-343)	Fletcher (1992)	709889	2346635
Beta-55474	Kalaupapa (Sample Kalau-156)	Fletcher (1992)	709891	2346634
Beta-55475	Kalaupapa (Sample Kalau-161)	Fletcher (1992)	709889	2346630
Beta-55473	Kalaupapa (Sample Kalau-coral 2)	Fletcher (1992)	709886	2346632
Beta-94996	Kalama'ula (Core 11)	Denham et al. (1999)	702142	2334760
Beta-94998	Kalama'ula (Core 11)	Denham et al. (1999)	702142	2334760
NOSAMS H18-D1-T	Hale O Lono (Core Sample 1A)	Engels et al. (2004)	680664	2332719
NOSAMS H18-D3-B	Hale O Lono (Core Sample 1B)	Engels et al. (2004)	680664	2332719

Table 1 ^{14}C dates, Moloka'i Island, Hawai'i. Estimated locations are given in UTM, Zone 4N, NAD83. *(Continued)*

Lab ID	Sample	Source	Easting	Northing
NOSAMS H23-D1-T	Hale O Lono (Core Sample 2A)	Engels et al. (2004)	680674	2332393
NOSAMS H28-D3-B	Hale O Lono (Core Sample 2B)	Engels et al. (2004)	680674	2332393
NOSAMS H46-1-D2-B	Hale O Lono (Core Sample 3A)	Engels et al. (2004)	680540	2332163
NOSAMS Hale46-2A	Hale O Lono (Core Sample 4A)	Engels et al. (2004)	680540	2332163
NOSAMS Hale58-1A	Hale O Lono (Core Sample 5A)	Engels et al. (2004)	680595	2332064
NOSAMS H58-1-D2-B	Hale O Lono (Core Sample 5B)	Engels et al. (2004)	680595	2332064
NOSAMS Hale69-1A1	Hale O Lono (Core Sample 8A)	Engels et al. (2004)	680654	2331964
NOSAMS Hale69-1A2	Hale O Lono (Core Sample 8A)	Engels et al. (2004)	680654	2331964
NOSAMS H69-1-D2-B	Hale O Lono (Core Sample 8B)	Engels et al. (2004)	680654	2331964
NOSAMS R13-D1-B	Hikauhi (Core Sample A1)	Engels et al. (2004)	689703	2332493
NOSAMS R13-D4-B	Hikauhi (Core Sample A2)	Engels et al. (2004)	689703	2332493
NOSAMS R13-D5-B	Hikauhi (Core Sample A3)	Engels et al. (2004)	689703	2332493
NOSAMS R18-2-D1-T	Hikauhi (Core Sample C1)	Engels et al. (2004)	689708	2332438
NOSAMS R18-2-D1-T	Hikauhi (Core Sample C1)	Engels et al. (2004)	689708	2332438
NOSAMS R18-2-D2-B	Hikauhi (Core Sample C2)	Engels et al. (2004)	689708	2332438
NOSAMS R18-2-D2-B	Hikauhi (Core Sample C2)	Engels et al. (2004)	689708	2332438
NOSAMS R20-D2-M(1)	Hikauhi (Core Sample D1)	Engels et al. (2004)	689563	2332418
NOSAMS R20-D2-M(2)	Hikauhi (Core Sample D2)	Engels et al. (2004)	689563	2332418
NOSAMS R20-D2-B	Hikauhi (Core Sample D3)	Engels et al. (2004)	689563	2332418
NOSAMS R20-D3-M	Hikauhi (Core Sample D4)	Engels et al. (2004)	689563	2332418
NOSAMS R20-D4-M	Hikauhi (Core Sample D5)	Engels et al. (2004)	689563	2332418
NOSAMS R20-D4-B	Hikauhi (Core Sample D6)	Engels et al. (2004)	689563	2332418
NOSAMS R32-D2-T	Hikauhi (Core Sample I1)	Engels et al. (2004)	689710	2332293
NOSAMS R2-D2-B	Hikauhi (Core Sample I2)	Engels et al. (2004)	689710	2332293
NOSAMS R32-D4-B	Hikauhi (Core Sample I3)	Engels et al. (2004)	689710	2332293
NOSAMS R42-D1-B	Hikauhi (Core Sample K1)	Engels et al. (2004)	689713	2332211
NOSAMS R42-D2-B	Hikauhi (Core Sample K2)	Engels et al. (2004)	689713	2332211
NOSAMS R42-D4-B	Hikauhi (Core Sample K3)	Engels et al. (2004)	689713	2332211
NOSAMS R65-D2-B	Hikauhi (Core Sample N1)	Engels et al. (2004)	689610	2332251
NOSAMS R65-D3-B	Hikauhi (Core Sample N2)	Engels et al. (2004)	689610	2332251

Foundation Period (AD 800–1200)

Only 4 dates can be assigned to this earliest period (Beta-132164, -11172, -194800, and -9276) (Weisler 1989; Bush et al. 2001; McCoy 2005a, 2006). Two dates are on samples from multi-component sites (Beta-132164 and -11172) with the remaining 2 from non-site context lacking direct association with other evidence of human activity (Beta-194800; Beta-9276) (Weisler 1989; Bush et al. 2001; McCoy 2005a, 2006). This low frequency of early dates is common in Hawaiian archaeology, as seen in a recent review of Kaua'i, where only 7 dates could be bracketed to between cal AD 800 and 1200 out of 141 securely pre-European contact dates (i.e. dates pre-cal AD 1650) (Carson 2005: Tables 1–5; see also Carson 2006).

Regrettably, all Foundation period dates from Moloka'i could be rejected under strict chronometric hygiene standards (Spriggs and Anderson 1993). Three of the 4 samples are charcoal of unknown taxa (Beta-132164, -194800, and -194801), and the remaining date is from marine shell (Beta-9276). Indeed, it should also be noted that Denham et al. (1999:56) have recalibrated the latter date using ΔR of 110 ± 80 (Dye 1994:51), to cal AD 1260–1490. Context in all cases is at best vaguely known and intrasite chronologies do not allow a secure association between these dates and artifacts. However, other evidence suggests all these dates need not be rejected out of hand.

Our current understanding of Moloka'i's paleoenvironmental record suggests human presence about AD 800–1200 (Denham et al. 1999). Denham et al.'s (1999) coastal wetland coring shows a clear transition from an endemic dry-mesic forest (Zone A; 500–160 cm bs) where *Pritchardia* was the

dominate species, to a decline in tree and shrub pollen, the arrival of indicators of forest disturbance (e.g. *Cibotium*), and the first occurrences of charcoal (Zone B; 65–160 cm bs) (Denham et al. 1999: 42). Further, this early period is followed by a shift to sedge and grass pollen taken to "indicate the demise of the disturbed forest and shrub canopy," in turn reflecting "more intensive agricultural clearance associated with gardening" (Zone C; 20–65 cm bs) (Denham et al. 1999:54). In sum, the authors note that while "limited dating ... will not support detailed chronological interpretations ... the disappearance of the lowland forest does conform to the time frames established on O'ahu" from approximately AD 800 to 1200 (Denham et al. 1999:54).

In the lowest charcoal-bearing deposits in Kaupikiawa Cave (30–50 cm bs), a collapsed lava tube on the Kalaupapa Peninsula, there is evidence of plant species similar to the 'Ōhi'apilo Wetland core (65–160 cm bs), but depositions in these 2 locations appear to correspond to quite different lengths of time. Using the average rates of deposition from other portions of the 'Ōhi'apilo Wetland core (0.15 to 0.20 cm per yr)—an estimate consistent with contemporary deposition rates at Kaupikiawa Cave—the transition from an undisturbed endemic forest to disturbed forest apparently occurred over 450–650 yr between AD 800–1000 and AD 1450 (Layer III, 40–46 cm bs; Beta-94996; cal AD 1320–1660, 2 σ) (Denham et al. 1999). Nonetheless, these results are consistent with Athens et al.'s (2002) model for the arrival of the Polynesian rat (*Rattus exulans*) as a primary cause of early-period, large-scale disturbance of native ecosystems.

Early Expansion Period (AD 1200–1400)

While human colonization appears to have occurred between AD 800 and 1200, there is good evidence within the group of 19 samples from 14 sites assigned to the Early Expansion period (AD 1200–1400) for an established population with settlements that appear to be placed without regard to ecozone. This scenario was first suggested by Athens (1985:98) when he proposed that "early inhabitants of Moloka'i were making use of the entire island at an early time period—presumably by AD 1200 or perhaps earlier." This model contrasts with the expected trajectory of early populations expanding out from wet, windward locations (Weisler 1989:126). Domestic architecture dated to this period is diverse, ranging from small C-shaped shelters to what have been interpreted as permanent house sites.[2] These sites include the earliest component of the Hālawa Dune site, as well as the "first evidence of temporary occupation along the leeward coast ... in a sandy midden on the alluvial plain, east of Kaunakakai Stream and just inland from the shore (Beta-7564)" (Weisler 1989: 126). In addition, the use of basalt quarries on the island's west end have been dated to AD 1260–1440 (Beta-49700), leading Dixon et al. (1994:6) to suggest "raw material procurement and adze blank manufacture may even predate the majority of semi-permanent coastal settlement" in the area.

Weisler (1989:127) notes that the "first evidence for exploitation of marine resources … and land birds" dates to this period. Indeed, 1 sample (cal AD 1176–1296; Beta-20906) is associated with a "pit feature containing predominately fishbone, with much lesser amounts of turtle and birdbone" (Weisler 1989:139–40; $\Delta R = 115 \pm 50$). In addition, this site "clearly documents bones of endemic Hawaiian goose (*Nesochen sandvicensis*), historically unknown on Moloka'i, and prehistoric cultural material." There are few references to turtle remains in deposits dated later than this phase (e.g. the latest known example comes from Site -18A dated by Weisler et al. [2006:279] using uranium series to AD 1417 ± 3). Nonetheless, at the Hālawa Dune site (Kirch 1975:76), we find evidence of

[2]Dates used to interpret the age of architecture within this period include 1 basal date from the previous period (Beta-194801, Site 03-2303, McCoy 2005a, 2006) and 5 dates from within this era: Beta-20906 (Site 02-21, Weisler 1989); Beta-7564 (Site 03-630, Weisler 1989); Beta-49700 (Site B6-161, Dixon et al. 1994); Beta-217003 (Site A1-3, Kirch and McCoy, forthcoming); and Beta-27115 (Site 03-885, Weisler 1989).

heavy emphasis on marine resources early in the history of the site's occupation, but no evidence for turtle or extirpated birds.

In addition to Early Expansion period marine resource and native avifauna exploitation, limited wetland and dryland cultivation are attested to by ^{14}C evidence.[3] For example, at the mouth of the Waikolu Valley, a date of cal AD 1180–1290 (2 σ; Beta-153426) on charcoal from under pondfield deposits suggests possible clearing ahead of wetland cultivation early in this period or perhaps late in the previous period (Kirch 2002). Similar aged dates on charcoal beneath pondfields have also been reported for the Wailau Valley (Beta-213276 and -213274). Unfortunately, the evidence for "burning for shifting cultivation on the colluvial slopes of Hālawa Valley" noted in previous descriptions of the Early Expansion period is based on suspect results (Weisler 1989:126; Gak-2744). Nonetheless, the apparent extirpation of a limpet (*Neritina granosa* or *hīhīwai*) in Hālawa Valley that today is "common in the fast-flowing sections of many *undiverted* Hawaiian streams" (Fitzsimons et al. 2005:277, emphasis added) may also be a proxy indicator of pondfield agriculture in the valley bottom.

Evidence for dryland agriculture, primarily charcoal recovered in non-site context, suggests widespread cultivation during this period. Weisler (1989:126–7) has noted "shifting cultivation above the [leeward coast] flood plain ... by cal AD 1280 (Beta-27391)," as well as clearing in the "upland forest at Kipu (335 m asl) ... probably to feed an expanding population." More recently, the first evidence for small-scale cultivation on the dry Kalaupapa Peninsula has been dated to this same period (Kirch 2002). This evidence is consistent with a secondary introduction of the sweet potato (*Ipomoea batatas*) to Hawai'i; however, there are no signs of *intensive* agriculture until the following period (see Green [2005] and Ladefoged et al. [2005] for more on the arrival of the sweet potato).

Late Expansion Period (AD 1400–1650)

Late Expansion period (AD 1400–1650) dates, including 45 samples from 34 sites, suggest a dramatic, simultaneous change in prehistoric population size, economy, and society. First, if there is a direct relationship between the frequency of ^{14}C dates within a period and population size—a method of estimate population change pioneered in Hawai'i by Clark (1988), Dye and Komori (1992), and others—then Late Expansion period population growth was remarkably rapid. Indeed, available data sets from Moloka'i and Kaua'i exhibit a similar historical pattern with this period, accounting for 62% and 66% of all pre-cal AD 1650 dates, respectively. A larger, archipelago-wide review of ^{14}C dates is necessary to put these findings in regional perspective.

Second, during the Late Expansion period there is strong evidence for the intensification of resources, especially those located in dry environments. Around AD 1450–1550, we see the expansion of the Kalaupapa Field System, a 9-km^2 landscape of contiguous rain-fed plots defined by low walls built, in part, to shelter sweet potatoes (*Ipomoea batatas*) and other cultigens from tradewinds across the Kalaupapa Peninsula, Hawai'i (Ladefoged 1990, 1993; Kirch 2002; McCoy 2005a,b). At the Hālawa Dune site—the most extensively excavated site from this period—a marked shift occurs in subsistence from marine resources to domestic animals, signifying an increased importance of agriculture. In addition, Dixon et al. (1994:13) describe a kind of "superabundant production" of adzes (Hommon 1980), indicated by an increase in the density of flaked basalt in quarries (50-Mo-B6-185; AD 1410–1955, 2 σ; Beta-49072), interpreted as the "regional impact of agricultural inten-

[3]These dates include Beta-153426, Site 03-2027, Kirch (2002), Kirch et al. (2003); Beta-155366, Site 03-312, Kirch (2002), Kirch et al. (2003); Beta-27391, Site 03-887, Weisler (1989); Beta-27116, Site 03-885, Weisler (1989); Beta-9962, Site 03-312, Weisler (1989); Beta-33172, Site 03-1803, Ladefoged (1990); and Beta-94996, Site 03-891, Denham et al. (1999).

sification" on Moloka'i (Dixon et al. 1994:1). Perhaps even more importantly, current evidence of Moloka'i's uniquely well-developed south shore fishpond aquaculture—although admittedly difficult to date directly—first appears sometime during this period, perhaps around AD 1450 (AD 1320–1660, 2 σ; Beta-94999) (Denham et al. 1999).

Finally, in concert with these dramatic changes in population and subsistence economy, the first strong evidence for major social change dates to cal AD 1400–1650. While the first occupants of the island undoubtedly brought with them the beliefs and religious practices that would eventually evolve into traditional Hawaiian religion, the first evidence of ritual on Moloka'i dates to the Late Expansion period (Kirch and Sharp 2005; McCoy 2006; Weisler et al. 2006). In Hawai'i, as in other Polynesian island groups, the identification of ritual sites relies primarily on a direct historical approach aided by ethnographic and ethnohistoric evidence. For example, Weisler et al. (2006:279) report the use of a fishing shrine (*ko'a*) (Site -18A) dated by uranium series to AD 1417 ± 3, currently our earliest evidence of religious ritual on the island. Using the less precise method of ^{14}C dating, McCoy (2006:264) has described an "establishing phase" in the evolution of the ritual landscape in the Kalaupapa region marked by the creation of the area's first ritual sites between AD 1440 and 1650. Remarkably, both ^{14}C and uranium series studies have shown the existence of different kinds of ritual sites in the Late Expansion period that range in size from small shrines to temples over 600 m^2 in surface area. One of the largest sites is an example of the distinctive notched temple architecture style best known on Maui (Kolb 1991, 1994; Kirch and Sharp 2005). Indeed, oral traditions suggest that the southern Kona district was linked to the ruling chiefs of Maui after the collapse of Moloka'i's first ruling dynasty of chiefs, whose genealogical placing suggests reigned between AD 1360 and 1460 (McCoy 2005a; see also Summers 1971).

Proto-Historic Period (AD 1650–1795)

While there is another major increase in the frequency of dates over the previous period (including 89 samples from 58 sites), a previous archipelago-wide study and a more detailed analysis of habitation dates based on this database both suggest there was probably little population growth or possibly slight decline between AD 1650 and 1795 (Dye and Komori 1992; McCoy 2006). However, over this same period settlement shifts have been detected by 3 major settlement pattern studies: Weisler and Kirch's (1985) survey of upland Kawela; Tuggle's (1993) survey of lowland Kamiloloa; and McCoy's (2006) survey of the Kalaupapa Peninsula. These shifts have been associated with larger social and economic phenomena. According to oral traditions, this was a remarkably active time when the political scene changes from "Fragmentation" (AD 1460–1720) to "Internal Competition" (AD 1720–1740) to renewed "Unification" (AD 1740–1780) and finally to "Occupation" (AD 1780–1795) by outside forces (McCoy 2005a:342). Tuggle (1993:240) suggests that the apparently sudden and brief use of lowland Kamiloloa in the Kona district may be explained by agricultural intensification or fishpond construction concurrent with the occupation of the island by armies from neighboring islands, or the harvesting of sandalwood. In the Ko'olau district, McCoy (2006) has attributed a similar late prehistoric occupation of the barren Kalaupapa Peninsula to the greater power of chiefs over daily life and events in the island's political history. Overall, these and other recent works suggest an even greater synthesis of native Hawaiian oral traditions and archaeology is possible.

As Weisler and Kirch (1985) have demonstrated, material evidence of life in the Proto-Historic period holds enormous potential in terms of developing a more sophisticated social archaeology. However, one of the major methodological challenges many archaeological surveys face is to devise some measure of the relative permanence and rank of families that occupied habitation sites repre-

sented by clusters of free-standing stone architecture. For example, Weisler and Kirch (1985) took an approach that used native Hawaiian oral traditions to make predictions regarding material patterns and then used survey and excavation results to identify traditional households (*kauhale*). Later, Tuggle (1993) took a different approach, employing a series of indices and close attention to site formation processes to quantify labor investment and relative midden concentration (g per excavated liters) and area (g per m^2) as measures of permanence and rank. Tuggle (1993) found fewer households and ritual sites in lowland Kamiloloa when compared with upland Kawela, but more testing is necessary to determine if these represent contracting community patterns or intracommunity variation, specifically dense settlement near the coast and in the uplands leaving the intermediate lowlands comparatively less occupied (Kirch et al. 2004; Vitousek et al. 2004). With the results of these studies in mind, McCoy (2006) used a simple frequency size distribution on the Kalaupapa Peninsula to show the northern tip was dominated by small shelters, as opposed to the mix of site sizes found over most of the area, suggesting it too was a zone clearly used for agriculture but never permanently occupied.

The intensive subsistence economic system documented in the previous period likely continued through the Proto-Historic period, but few published studies of material evidence offer direct measures of productivity, labor, or trade. In terms of the latter, a lithic sourcing study based primarily on artifacts collected in Proto-Historic period context has shown direct access to a natural raw material source across historically known community boundaries on the Kalaupapa Peninsula, suggesting these same social boundaries may not always have presented effective barriers to native Hawaiian economic activities (McCoy 2006). Further, in this same area there appears to have been harvesting pressure on local limpets (‘*opihi*) consistent with a dense human population (McCoy 2006, 2008). Overall, more artifact analyses are necessary to refine understanding of these aspects of Hawaiian prehistory.

Historic Period (AD 1795–1900)

Only 7 sites produced samples with dates within the Historic period. The identification of Historic period sites and deposits in the Hawaiian Islands, like much of the New World, relies primarily on the presence or absence of artifacts made of Old World metal, glass, and ceramics and a shift toward larger, Western-styled architecture (for Moloka‘i examples, see Anderson 2001; Flexner 2006). Regrettably, due to the distinctive size and shape of historic architecture, abandoned structures have occasionally been mistaken for prehistoric ritual sites by professionals, land mangers, and the public, especially when no clearly historic period artifacts are visible on the surface (see Goodwin 1994: 193–222). Only through excavation have such sites been definitively identified as belonging to the post-contact period.

In addition to the use of historic artifacts as temporal markers, the application of ^{14}C dating at sites initially interpreted as belonging to the Historic period has in fact shown some limited utility. For example, 1 case revealed earlier components that otherwise would have been indistinguishable from post-European contact features (Beta-91248, -91249, and -91250; Site 03-895; Heidel et al. 1998), while in another case a feature that lacked typical diagnostic historic artifacts nonetheless appears based on ^{14}C evidence to have been used in the historic period (AA-67554; Site 03-2302; McCoy 2006). Naturally, post-depositional contamination could have been an issue in the latter case.

SUMMARY

In sum, there is limited but convincing evidence for initial human colonization of Moloka'i Island during what is called here the Foundation period (AD 800–1200). This is followed by a generalized settlement pattern with respect to natural resources in the Early Expansion period (1200–1400), and a Late Expansion period (1400–1650) increase in population, intensification of subsistence economies, and social change marked by the earliest evidence of ritual sites. In the Proto-Historic period (1650–1795), we find a shift toward the occupation of dry areas in the absence of evidence for underlying demographic pressures for expansion. This and other changes in late prehistoric life on Moloka'i have been linked to larger themes in the political history of Hawai'i attested to oral traditions.

These results have wider implications for Oceanic prehistory. First, this research demonstrates the utility of large ^{14}C databases for detecting island-scale variation in Hawai'i (see also Kirch 1990). In this case, Moloka'i's earliest periods vary from larger neighboring islands in settlement pattern and exploitation of marine resources. Second, on a regional level, this study supports a late chronology for the colonization of the Hawaiian Islands (see Tuggle and Spriggs [2000:166–7] for a recent review). Like other remote Oceanic islands, paleoenvironmental evidence for changes in the local ecosystem, rather than direct dating of artifacts or deposits containing artifacts, is our best proxy for the initial presence of humans. Moreover, with renewed research on the timing, location, and nature of prehistoric contacts between Oceania and the Pacific coast of the Americas, revisions to dates for the colonization of Eastern Polynesia are central to the study of culture contact (Jones and Klar 2005, 2006; Anderson 2006; Arnold 2007).

Finally, while the focus of this paper has been on presenting an updated ^{14}C list and revised culture history, this study is a good example of how archaeologists are moving beyond the novelty of GIS and other spatial technologies and using these applications to build, store, and retrieve georeferenced data. A recent study of the peopling of the New World centering on 114 dates from late Pleistocene Alaskan sites further underscores the continued value of cumulative ^{14}C databases, regardless of the geographic or temporal span (Bever 2006). However, as larger GIS databases representing thousands of dates are constructed and made available to the wider scientific community, it will be critical for archaeologists to find ways to continue to convey contextual information traditionally only available in reports and annotated lists.

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APPENDIX

ARCHAEOLOGY SAMPLES

Lab identifications used in the following summary are as follows: University of Arizona AMS Laboratory (AA-), Beta Analytic, Inc. (Beta-), National Ocean Sciences AMS Facility (NOSAMS-), Rafter Radiocarbon Laboratory (Rafter-), and Waikato Radiocarbon Dating Laboratory (Waikato-). UTMs given in some cases are best estimates rather than precise site locations. The Hawaiian term for community territory (*ahupua‘a*) is used throughout to indicate when place names refer to a specific named territory. Hawaiian State Historic Places Register site identification numbers are shortened throughout (i.e. Site 50-60-03-312 is simply Site 03-312).

Kona District

The Kona district, centered on the southern, leeward coast of Moloka‘i, is divided into 45 typical coast-to-upland community territories from Kalama‘ula *ahupua‘a* in the west to Kepukaloa *ahupua‘a* in the east as well as several other land units on the western district boundary with the Kaluako‘i and Kala‘e regions. Major environmental zones are defined here by elevation: coastal (0–60 ft asl; 0–18.2 m asl); lowland (60–300 ft asl; 18.2–91.4 m asl); and upland (+300 ft asl; +91.4 m asl). Since Weisler’s (1989) dating summary, 39 new ^{14}C dates have been reported from this district for a total of 66. Most dates are from excavations at sites within a 12-km portion of the coast on the western half of the district between Kalama‘ula and Kawela. However, historic records suggest the poorly documented eastern half of Kona was a major population center in prehistory (Coulter 1931).

Coastal Kalama‘ula

Only 2 dates are available on samples from coastal archaeological sites in Kalama‘ula *ahupua‘a*: a coral sample from the wall of a fishpond (Beta-94999; 03-861) dated to the Proto-Historic period and a charcoal sample from a firepit (Beta-105798; 06-1660) dated to the Early Expansion period (Dye 1998; Denham et al. 1999) (see also ‘Ōhi‘apilo Wetland Paleoenvironmental Core Series).

‘Ōhi‘apilo Pond (03-891) is an abandoned fishpond roughly 880 m (W-E) × 600 m (N-S) on the western coast of Kalama‘ula *ahupua‘a* immediately upslope of the slightly smaller Kahokai Pond (Monsarrat 1886). Following a series of shovel test pits, a section of the pond’s wall was exposed by Denham et al. (1998, 1999) in a 5 × 0.7-m-wide × 113-cm-bs-deep trench excavation. However, since the investigators dated pond deposits to the Late Expansion period (Beta-94996; 970 ± 70 BP, cal AD 1320–1660, 2 σ) the sample described below (Beta-94999) may have been incorporated in the wall during the Proto-Historic period repair rather than primary construction (Denham et al. 1999:55).

Site 06-1660 is “a petroglyph gallery and limestone quarry with an associated cultural deposit” (Dye 1998:1), approximately 2.25 km east of ‘Ōhi‘apilo Pond. A single date from the site (Beta-105798) suggests it was in use during the Late Expansion period, cal AD 1430–1680; however, it is “unlikely that the dated scoop firepit represents the oldest feature at the site” (Dye 1998:58). Materials recovered from test excavations “provide evidence for dancing, shoal water fishing, shellfishing, cooking, eating, and stone tool manufacture or refinishing” (Dye 1998:58).

Beta-94999 ‘Ōhi‘apilo Pond (03-891) **775 ± 60**
Coral (*Pocillipora* sp.), not waterworn, collected from within cross-section of fishpond wall exposed by Stratigraphic Test Trench 1, Feature 1 (wall) (Denham et al. 1998, 1999). Easting 702129, Northing 2334719, NAD83, Zone 4N. Collected/submitted 1998 by T Denham, Garcia and Associates.

Comment: cal AD 1660–1950 (2 σ). Stuiver and Braziunas (1993); CALIB 3.0, marine curve; ΔR of 188 ± 80 (Nees and Williams 1993), for *Porites* sp. $\delta^{13}C = 1.3‰$.

Beta-105798 Kalama‘ula (06-1660) 340 ± 80

Charcoal identified as *Scaevola* sp. (11.0 g) collected from “charcoal concentration at the base of a pit dug from Layer II into and through Layer III” (Dye 1998:37) interpreted as a firepit (TU 1; Feature 2; 40–58 cm bs). Site 06-1660 is “a petroglyph gallery and limestone quarry with an associated cultural deposit” (Dye 1998:1). This sample represents “the first date on an identified material from an archaeological site on the south coast of Moloka‘i” (Dye 1998:46). Easting 704310, Northing 2333993, NAD83, Zone 4N. Method: AMS. Collected/submitted 1998 by T S Dye, International Archaeological Research Institute, Inc.

Comment: cal AD 1430–1955 (2 σ); cal AD 1454–1654 (1 σ). (Stuiver and Pearson 1993). $\delta^{13}C = –20.3‰$.

Lowland Kalama‘ula Series

In the lowland zone of Kalama‘ula *ahupua‘a*, 2 sites with deposits dated to the Foundation period (cal AD 800–1200) are located 0.6 km (03-1753) and 1.5 km (03-801) from the coast. The first of these sites recorded, Site 03-801, has been interpreted by Athens (1985:98) as evidence that “early inhabitants of Moloka‘i were making use of the entire island at a early time period – presumably by A.D. 1200 or perhaps earlier.” This interpretation was based on a date of 1450 ± 60 BP, cal AD 1011–1172, 1 σ, ΔR of 115 ± 50 (Beta-11172) on marine shell found in a “shell lens of food refuse from a large terrace” (Weisler 1989:126). Weisler (1989:126) notes that this date is some 4 centuries earlier “than four wood charcoal samples from the same complex (Beta-11168 and -11171).” In addition, Denham et al. (1999:56) have recalibrated this sample using Dye (1994:51), ΔR of 110 ± 80, to cal AD 1260–1490.

Closer to the coastal zone, Site 03-1753 was reported by Bush et al. (2001:i) simply as having been “used in several different phases from pre-contact to modern.” Bush et al.’s site map shows a substantial, double enclosure approximately 16 m long by 5 m wide; however, most of the 29 test units excavated were placed within a single row outside of the standing structure (Bush et al. 2001: Figure 55). The authors describe the site’s midden as “plentiful” including “fish, bird and mammal bones” (Bush et al. 2001:i). “Most of the identified bird bone was chicken but the locally extinct *Gallinula chloropus* (Common Moorhen or *‘Alae ‘Ula*)” and sea turtle were found; however, it is unclear which component of the site’s occupation these remains are associated with (Bush et al. 2001:126–7).

Finally, samples from cultural deposits found at sites 03-1711 and 03-1716, habitation sites located immediately west of Site 03-801, have returned dates in the Late Expansion period (Tomonari-Tuggle 1990), suggesting these sites were contemporaneous with a dated coastal site in the same *ahupua‘a* (Site 06-1660, Dye 1998).

Beta-132159 Kalama‘ula (03-1748) 260 ± 50

Charcoal collected from Tr. 4, Stratum III, 14–30 cm bs. Site 03-1748 is interpreted as “a temporary or recurrent use habitation or shelter” (Bush et al. 2001:129). Easting 703751, Northing 2334546, NAD83, Zone 4N. Collected/submitted 1999 by A B Bush, Cultural Services Hawai‘i.

Comment: cal AD 1480–1810 (2 σ); cal AD 1510–1680 (1 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C = –25.8‰$.

Beta-132160 Kalama'ula (03-1752) **410 ± 50**
Charcoal collected from Feature A, Tr. 14, Stratum II, 75–93 cm bs. Site 03-1752 is a terrace interpreted as a "possible permanent or recurrent habitation" (Bush et al. 2001:i). Easting 703751, Northing 2334546, NAD83, Zone 4N. Collected/submitted 1999 by A B Bush, Cultural Services Hawai'i.

Comment: cal AD 1410–1640 (2 σ); cal AD 1430–1520 (1 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -14‰$.

Beta-132161 Kalama'ula (03-1752) **150 ± 50**
Charcoal collected from Feature A, Tr. 2, 74–91 cm bs. Site 03-1752 is a terrace interpreted as a "possible permanent or recurrent habitation" (Bush et al. 2001:i). Easting 703751, Northing 2334546, NAD83, Zone 4N. Collected/submitted 1999 by A B Bush, Cultural Services Hawai'i.

Comment: cal AD 1660–1955 (2 σ); cal AD 1720–1880 (1 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -26.7‰$.

Beta-132162 Kalama'ula (03-1752) **80 ± 50**
Charcoal collected from a hearth, Feature A, Tr. 9, 74–91 cm bs. Site 03-1752 is a terrace interpreted as a "possible permanent or recurrent habitation" (Bush et al. 2001:i). Easting 703751, Northing 2334546, NAD83, Zone 4N. Collected/submitted 1999 by A B Bush, Cultural Services Hawai'i.

Comment: cal AD 1675–1955 (2 σ); cal AD 1690–1930 (1 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -24.9‰$.

Beta-132163 Kalama'ula (03-1753) **50 ± 60**
Charcoal collected from Tr. 3, Feature 1, 7–26 cm bs. Site 03-1753 is an enclosure interpreted as a "possible permanent or recurrent habitation" (Bush et al. 2001:i). Easting 703751, Northing 2334546, NAD83, Zone 4N. Collected/submitted 1999 by A B Bush, Cultural Services Hawai'i.

Comment: cal AD 1675–1955 (2 σ); cal AD 1690–1930 (1 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -26.6‰$.

Beta-132164 Kalama'ula (03-1753) **1090 ± 60**
Charcoal collected Tr. 6, Stratum II, 63–68 cm bs between enclosure and row of upright stones. Site 03-1753 is an enclosure interpreted as a "possible permanent or recurrent habitation" (Bush et al. 2001:i). Easting 703705, Northing 2334569, NAD83, Zone 4N. Collected/submitted 1999 by A B Bush, Cultural Services Hawai'i.

Comment: cal AD 790–1030 (2 σ); cal AD 890–1000 (1 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -13.7‰$. One of 4 dates from the Foundation period (AD 800–1200).

Beta-132165 Kalama'ula (03-1753) **50 ± 60**
Charcoal collected Tr. 9, Stratum II, 104–133 cm bs between enclosure and row of upright stones. Site 03-1753 is an enclosure interpreted as a "possible permanent or recurrent habitation" (Bush et al. 2001:i). Easting 703728, Northing 2334500, NAD83, Zone 4N. Collected/submitted 1999 by A B Bush, Cultural Services Hawai'i.

Comment: cal AD 1675–1955 (2 σ); cal AD 1690–1930 (1 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -24.7‰$.

Beta-36203 Kalama'ula (03-1711) **280 ± 60**
Charcoal (11.2 g) collected from a cultural deposit (Feature D, Stratum II, Lv 4, 20–30 cm bs; Sample Kalama-11) in the interior of semi-enclosure (Feature D, Site 03-1711). Easting 702902, Northing 2335646, NAD83, Zone 4N. Collected 1989 and submitted 1990 by M Tomonari-Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1450–1803 (2 σ); cal AD 1450–1676 (1 σ). Stuiver and Reimer (1986). $\delta^{13}C$ = –23.2‰.

Beta-36204 Kalama'ula (03-1716) **220 ± 50**
Charcoal (22.0 g) collected from bulk sediment screening of cultural deposit (Stratum II, 27–40 cm bs; Sample Kalama-21) of a terrace (Feature A, Site 03-1716). Easting 702940, Northing 2335360, NAD83, Zone 4N. Collected 1989 and submitted 1990 by M Tomonari-Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1520–1955 (2 σ); cal AD 1622–1814 (1 σ). Stuiver and Reimer (1986). $\delta^{13}C$ = –21.6‰.

Lowland Kaunakakai Series

Moloka'i Island's major harbor and Kaunakakai town are located within the boundaries of a community territory of the same name. Dates have been previously been reported on coastal (Beta-3802, 03-631; Beta-7563, 03-630; Beta-7564, 03-630) and lowland sites (Beta-27390, 03-886; Beta-27391, 03-887; Beta-27392, 03-887; Beta-27393, 03-888) in the area. Recently, 4 samples have been dated from 2 historic period sites about 1.23 km inland from the southern coast located near the Kaunakakai Stream (03-895, 03-896). Late Expansion period dates on "isolated charcoal samples from deeper deposits within Site -895 which were not associated with cultural material or corresponding features" and are interpreted as "agricultural clearing activities which preceded the construction of Site -895" (Heidel et al. 1998:35).

Beta-91249 Kaunakakai (03-895) **250 ± 50**
Charcoal (8.4 g) collected from Trench 5, Stratum II, 50–60 cm bs (Sample C-6), underlying historic period structure (03-895). Interpreted as corresponding to Late Expansion period agricultural clearing. Easting 705791, Northing 2333917, NAD83, Zone 4N. Collected/submitted 1998 by M Heidel, Cultural Services Hawai'i.

Comment: cal AD 1480–1690 (2 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C$ = –28.2‰.

Beta-91250 Kaunakakai (03-895) **390 ± 80**
Charcoal (5.1 g) collected from Trench 7, Stratum II, 40–60 cm bs (Sample C-10), underlying historic period structure (03-895). Interpreted as corresponding to Late Expansion period agricultural clearing. Easting 705797, Northing 2333922, NAD83, Zone 4N. Collected/submitted 1998 by M Heidel, Cultural Services Hawai'i.

Comment: cal AD 1400–1660 (2 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C$ = –26.2‰.

Beta-91248 Kaunakakai (03-895) **170 ± 50**
Charcoal (28.9 g) collected from Trench 4, Stratum II, 40 cm bs (Sample C-3), underlying historic period structure (03-895). Interpreted as corresponding to Late Expansion period agricultural clearing. Easting 705799, Northing 2333914, NAD83, Zone 4N. Collected/submitted 1998 by M Heidel, Cultural Services Hawai'i.

Comment: cal AD 1650–1890 (2 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C$ = –26.6‰.

Beta-91247 Kaunakakai (03-896) **90 ± 60**
Charcoal (18.1 g) collected from Trench 7, Stratum I, 15–20 cm bs (Sample C-15), within historic structure (03-896) and interpreted as corresponding to occupation of the site. Easting 705752, Northing 2333946, NAD83, Zone 4N. Collected/submitted 1998 by M Heidel, Cultural Services Hawai'i.

Comment: cal AD 1795–1890 (2 σ). OxCal 3.0 (Bronk Ramsey 1995, 2001). $\delta^{13}C$ = –26.0‰.

Lowland Kamiloloa Series

East of Kalokoeli Fishpond (Summers 1971, Site 133), a series of 23 dates from 4 well-studied, habitation sites within the *ahupua'a* of Kamiloloa suggest this portion of the lowland ridge zone of the central south coast was occupied briefly in the Proto-Historic period, cal AD 1650–1795 (03-921; 03-925; 03-945; 03-980) with possible earlier ritual use of the area in the Early Expansion period (Beta-41194). Only 2 sites recorded resemble the size and complexity of *kauhale* household complexes: Site 03-945 and Site 03-925 (Tuggle 1993:239). Primary occupation is assumed to have been located in the coastal plain zone.

Site 03-945 is a habitation complex situated on the boundary between the coastal and lowland zones and includes a ritual feature interpreted as possibly "a temple for a larger community" (945-A) that may have been in use before the occupation of the lowland zone (400 ± 80 BP, cal AD 1404–1660 [2 σ]; Beta-41194, 945 F.4) (Tuggle 1993:236). Excavations at the site revealed artifacts consistent with ritual offerings but little to suggest the presence of a men's house (Tuggle 1993:236–7). Site 03-925 is a second, smaller, habitation complex located upslope from of Site 03-945, roughly 0.15 km to the north. The remaining dated habitation sites include a lithic workshop (03-921) and single-use camp (03-980) likely part of a larger informal dryland agricultural complex.

Overall, while these sites appear to be contemporaneous with those recorded in upland Kawela, Tuggle (1993:25, 240) notes that "habitation and agriculture was very brief (one or two seasons)" and there is "no evidence for permanent habitation." Several other significant differences include a lack of evidence for elite habitations, fewer ritual sites, and poorer agricultural lands. Further, the author notes a correlation between size of house compounds and community size, suggesting "variation in low ridge habitation complexes is due to community size, rather than rank or permanence" (Tuggle 1993:25). The brief use of area remains poorly understood, but may have been part of agricultural intensification or fishpond construction associated with larger late prehistoric or early historic trends such as the occupation of the island by armies from neighboring islands or the harvesting of sandalwood (Tuggle 1993:240).

Beta-41188 Kamiloloa (03-945) **110 ± 40**
Charcoal (21 g; KC-255) identified as *Chamaesyce* collected from platform fill (945-A, T1/2, I/I) and paired with Beta-41195. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1674–1955 (2 σ); cal AD 1803–1823 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.2‰$.

Beta-41189 Kamiloloa (03-945) **120 ± 50**
Charcoal (23 g; KC-260-1) identified as *Dodonaea* and *Chamaesyce* collected from a concentration in pavement layer (945-A, F.4, T1/3, II), pre-platform construction. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1665–1955 (2 σ); cal AD 1798–1938 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -24.8‰$.

Beta-41190 Kamiloloa (03-945) **60 ± 60**
Charcoal (16 g; KC-272) identified as *Chenopodium* and *Chamaesyce* collected from scatter in Pavement-L1 (945-A, F.4, T3/7A, II/1). Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1677–1955 (2 σ); cal AD 1800–1944 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.1‰$.

Beta-41191 Kamiloloa (03-945) **230 ± 60**
Charcoal (19 g; KC-275) identified as *Myoporum* and *Dodonaea* collected from concentration, base of trash pit, beneath Pavement-1 (945-A, F.3). Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1515–1954 (2 σ); cal AD 1620–1940 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -26.2‰$.

Beta-41192 Kamiloloa (03-945) **160 ± 60**
Charcoal (12 g; KC-287) identified as *Chamaesyce* collected from concentration, base of ash pit (945-A, F.2). Paired with Beta-41193. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1647–1955 (2 σ); cal AD 1660–1820 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -24.7‰$.

Beta-41193 Kamiloloa (03-945) **200 ± 70**
Charcoal (10 g; KC-288) identified as *Nototnchium* and *Chamaesyce* collected from concentration, base of ash pit (945-A, F.2). Paired with Beta-41192. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1520–1955 (2 σ); cal AD 1630–1890 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -24.3‰$.

Beta-41194 Kamiloloa (03-945) **400 ± 80**
Charcoal (9 g; KC-289) identified as *Erythrina* collected from concentration, base of hearth (945-A, F.4). Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1404–1660 (2 σ); cal AD 1410–1955 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.4‰$.

Beta-41195 Kamiloloa (03-945) **100 ± 50**
Charcoal (22 g; KC-300) identified as *Chamaesyce* collected from platform fill (T1/2, I/I). Paired with Beta-41188. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1671–1955 (2 σ); cal AD 1801–1660 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.1‰$.

Beta-41196 Kamiloloa (03-945) **40 ± 70**
Charcoal (7 g; KC-318) identified as *Chamaesyce* collected from concentration, base of hearth (945-D, F.8). Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1677–1955 (2 σ); cal AD 1800–1940 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -22.7‰$.

Beta-41197 Kamiloloa (03-945) **240 ± 60**
Charcoal (8 g; KC-322) identified as *Ipomoea* collected from concentration, base of hearth (945-N, F.2). Paired with Beta-41198. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1510–1954 (2 σ); cal AD 1610–1940 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.5‰$.

Beta-41198 Kamiloloa (03-945) **210 ± 70**
Charcoal (13 g; KC-324) identified as *Diospyros* collected from concentration, base of hearth (945-N, F.2). Paired with Beta-41197. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1515–1955 (2 σ); cal AD 1630–1820 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.8‰$.

Beta-41199 Kamiloloa (03-945) **190 ± 70**
Charcoal (18 g; KC-326) identified as plant charcoal collected from concentration, base of hearth (945-V, F.1). Paired with Beta-41200. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1524–1955 (2 σ); cal AD 1630–1955 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.7‰$.

Beta-41200 Kamiloloa (03-945) **180 ± 70**
Charcoal (13 g; KC-327) identified as plant charcoal collected from concentration, base of hearth (945-V, F.1). Paired with Beta-41199. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1529–1955 (2 σ); cal AD 1640–1955 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -26.8‰$.

Beta-41201 Kamiloloa (03-945) **240 ± 60**
Charcoal (9 g; KC-329) identified as *Chamaesyce* and *Erythrina* collected from concentration, base of trash pit (945-W, F.3). Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1510–1954 (2 σ); cal AD 1610–1820 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -20.2‰$.

Beta-41202 Kamiloloa (03-945) **240 ± 80**
Charcoal (8 g; KC-333) identified as monocot tuber(?) collected from concentration, base of hearth (945-W, F.3). Paired with Beta-41203. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1471–1955 (2 σ); cal AD 1490–1820 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -26.1‰$.

Beta-41203 Kamiloloa (03-945) **320 ± 70**
Charcoal (7 g; KC-334) identified as monocot tuber(?) collected from concentration, base of hearth (945-W, F.3). Paired with Beta-41202. Easting 708493, Northing 2332273, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1440–1954 (2 σ); cal AD 1440–1680 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.6‰$.

Beta-41187 Kamiloloa (03-925) **190 ± 50**
Charcoal (16 g; KC-246) identified as *Chamaesyce* collected from concentration, base of hearth (925-C, F.2). Easting 708518, Northing 2332504, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1644–1955 (2 σ); cal AD 1649–1670 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -22.5‰$.

Beta-41181 Kamiloloa (03-921) **20 ± 50**
Charcoal (22 g; KC-212) identified as *Diospyros* and *Nototnchium* collected from scatter from base of ash pit (921-D, F.1). Paired with Beta-41182. Easting 709239, Northing 2331958, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1702–1955 (2 σ); cal AD 1881–1927 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.0‰$.

Beta-41182 Kamiloloa (03-921) **150 ± 60**
Charcoal (20 g; KC-KC-214) identified as *Diospyros* and *Nototnchium* collected from scatter from base of ash pit (921-D, F.1). Paired with Beta-41181. Easting 709239, Northing 2331958, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1670–1955 (2 σ); cal AD 1670–1900 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -24.2‰$.

Beta-41183 Kamiloloa (03-921) **120 ± 50**
Charcoal (20 g; KC-225) identified as *Chamaesyce* and *Diospyros* collected from concentration, base of ash pit (921-H, F.2). Paired with Beta-41184. Easting 709239, Northing 2331958, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1665–1955 (2 σ); cal AD 1798–1944 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -22.8‰$.

Beta-41184 Kamiloloa (03-921) **220 ± 60**
Charcoal (9 g; KC-226) identified as *Chamaesyce* and *Diospyros* collected from concentration, base of ash pit (921-H, F.2). Paired with Beta-41183. Easting 709239, Northing 2331958, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1520–1955 (2 σ); cal AD 1630–1890 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.1‰$.

Beta-41185 Kamiloloa (03-921) **210 ± 60**
Charcoal (10 g; KC-227) identified as *Nototnchium* collected from concentration, base of hearth (921-H, F.3). Easting 709239, Northing 2331958, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1524–1955 (2 σ); cal AD 1630–1890 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -25.6‰$.

Beta-41186 Kamiloloa (03-980) **380 ± 80**
Charcoal (9 g; KC-234) identified as *Chamaesyce* collected from concentration, base of hearth (980-A, F.1). Easting 708624, Northing 2332578, NAD83, Zone 4N. Collected/submitted 1989 and reported 1990 by H D Tuggle, International Archaeological Research Institute, Inc.

Comment: cal AD 1409–1952 (2 σ); cal AD 1410–1890 (1 σ). CALIB 3.0 (Stuiver and Reimer 1993). $\delta^{13}C = -16.8‰$.

Coastal Pohakupili

The only reported date from a Kona district archaeological site on the southeastern coast between Kawela and the boundary with the Ko'olau district is an isolated a Proto-Historic period date on an agricultural terrace (05-236) in the *ahupua'a* of Pohakupili (McGerty and Spear 1999).

Beta-123612 Pohakupili (05-236) **130 ± 50**
Charcoal collected from shovel test pit (SP-2) on "cut-and-filled terrace deposits," interpreted as "consistent with ... agricultural activities ... on the slope ... before and during the Mahele" (McGerty and Spear 1999:42). Easting 735815, Northing 2337795, NAD83, Zone 4N. Collected/submitted 1999 by L McGerty and R L Spear, Scientific Consultant Services, Inc.

Comment: cal AD 1660–1950 (2 σ); cal AD 1680–1940 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001).

Ko'olau District

The Ko'olau district is divided into 7 community territories centered on deep, windward valleys along the north coast of Moloka'i. On the eastern half, we find typical wetland valleys with sheltered bays; broad, flat valley bottoms; and steep colluvial valley slopes rising to more than 3000 ft above sea level (914.4 m asl) in many places. On the western portion of the district, valleys become progressively smaller toward the low, flat Kalaupapa Peninsula, which provides a broad lowland environment not found in other communities in Ko'olau. Extremely high cliffs and rough winter seas makes travel within the district difficult. The only significant coral reef development in this area is on the western coast of the Kalaupapa Peninsula. Over the past 20 yr, we have seen an extraordinary improvement in our knowledge Ko'olau (Ladefoged 1990; Kirch 2002; McElroy 2004, 2006; McCoy 2005a,b,c, 2006). Below, 86 dates are summarized, bringing the total to 95.

Coastal Hālawa

The Hālawa Dune site (A1-3) has come to hold an iconic place in Hawaiian archaeology as a rare example of a developmental phase site with well-preserved domestic architecture, faunal assemblages showing a transition to from fishing to farming, and artifact style that appears to have been transitional between early and late prehistory (Kirch and Kelly 1975; Kirch 1985; Dye and Steadman 1990). Weisler (1989) reported several dates from this coastal dune site (Gak-2743, A1-3; Gak-2741, A1-3; Gak-2742, A1-3) and several lowland sites (Gak-2744, A1-4; Gak-2739, A1-770; Gak-

2740, A1-790) in Hālawa Valley. A hearth at the base of the Layer IV deposit (Feature 57) yielded a date of 1421 ± 90 BP, AD 470–830 (2 σ); cal AD 560–740 (1 σ) (Gak-2743), and was taken as evidence for initial site occupation in the 5th or 6th centuries AD making it the oldest site on the island (Note: Hālawa Valley dates reported in Weisler [1989] are based on the 5568 ^{14}C half-life.)

Recently, Kirch and McCoy (forthcoming) report 6 new dates on material from the Hālawa Dune site (A1-3) collected during the original excavations that show Gak-2743 is an unreliable outlier, and it is unlikely that the site was settled prior to cal AD 1300 with the main occupation in the Early Expansion period, cal AD 1400–1650. In addition to these new dates, several dates from the original study are described below (GaK-3061, -3062, -3063, -3064, and -3065).

Beta-217000 Hālawa Dune Site (A1-3) **180 ± 40**
Pig incisor (4.3 g, 55 mm length) in good condition matches jaw with 2 intact incisors collected from Layer IV, Lower sector (Site A1-3); 2.2 g submitted for AMS (A1-3-RC-1). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 2006 by P V Kirch, University of California, Berkeley.

Comment: cal AD 1640–1960 (2 σ); cal AD 1660–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -19.8‰$.

Beta-217001 Hālawa Dune Site (A1-3) **380 ± 40**
Dog maxillary fragment (1.9 g, 39 mm length) in good condition with 1 partial premolar collected from Layer IV, Lower sector (Site A1-3). AMS method (A1-3-RC-2). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 2006 by P V Kirch, University of California, Berkeley.

Comment: cal AD 1440–1640 (2 σ); cal AD 1140–1620 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -21.8‰$.

Beta-217002 Hālawa Dune Site (A1-3) **740 ± 40**
Scarus sp. fish bone (2.3 g, 28 mm length, 35 mm width) identified as lower pharyngeal grinding plate in good condition collected from Quantitative Square 1 (H8), 50–60 cm bs (Site A1-3). AMS method (A1-3-RC-3). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 2006 by P V Kirch, University of California, Berkeley.

Comment: cal AD 1210–1390 (2 σ); cal AD 1225–1290 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -12.2‰$. Terrestrial curve used due to underdeveloped marine curve for the Hawaiian Islands and high freshwater contribution to Hālawa Bay.

Beta-217003 Hālawa Dune Site (A1-3) **540 ± 50**
Charcoal identified as twig-small branch collected from Layer IV, Lower sector (Site A1-3). Part retained for wood identification. AMS method (A1-3-RC-4). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 2006 by P V Kirch, University of California, Berkeley.

Comment: cal AD 1290–1450 (2 σ); cal AD 1320–1440 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -10.2‰$.

Beta-217004 Hālawa Dune Site (A1-3) **260 ± 50**
Charcoal identified as twig-small branch collected from Layer IV, Lower sector (Site A1-3). Part retained for wood identification. AMS method (A1-3-RC-5). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 2006 by P V Kirch, University of California, Berkeley.

Comment: cal AD 1480–1960 (2 σ); cal AD 1520–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -10.9‰$.

Beta-217005 Hālawa Dune Site (A1-3) **420 ± 40**
Charcoal identified as twig-small branch collected from Layer IV, Upper sector (Site A1-3). Part retained for wood identification. AMS method (A1-3-RC-6). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 2006 by P V Kirch, University of California, Berkeley.

Comment: cal AD 1410–1630 (2 σ); cal AD 1430–1620 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -10.4‰$.

GaK-3061 Hālawa Dune Site (A1-3) **82 ± 70**
Charcoal collected from Layer IV, Upper sector (Feature 54, 10–20 cm bs, Site A1-3). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 1975 by P V Kirch, Bernice Pauahi (B.P.) Bishop Museum.

GaK-3062 Hālawa Dune Site (A1-3) **422 ± 170**
Charcoal collected from Layer IV, Lower sector (Feature 56, 40–50 cm bs, Site A1-3). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 1975 by P V Kirch, B.P. Bishop Museum.

GaK-3063 Hālawa Dune Site (A1-3) **$\delta^{13}C = 50 ± 10‰$**
Charcoal collected from Layer IV, Upper sector (Feature 59, 0–10 cm bs, Site A1-3). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 1975 by P V Kirch, B.P. Bishop Museum.

GaK-3064 Hālawa Dune Site (A1-3) **$\delta^{13}C = 25 ± 23‰$**
Charcoal collected from Layer IV, Upper sector (Feature 55, 0–10 cm bs, Site A1-3). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 1975 by P V Kirch, B.P. Bishop Museum.

GaK-3065 Hālawa Dune Site (A1-3) **216 ± 100**
Charcoal collected from Layer IV, Upper sector (Feature 49, 15–25 cm bs, Site A1-3). Easting 735015, Northing 2341403, NAD83, Zone 4N. Collected 1970 and submitted 1975 by P V Kirch, B.P. Bishop Museum.

Upland Wailau

Based on recent surveys and excavations in Wailau Valley, McElroy (2004, 2006) reports dates from features within the Wailau Agricultural Complex (04-272) from the Early Expansion period (Beta-213274, Beta-213276), Late Expansion period (Beta-193986), and Proto-Historic period (Beta-215407) that when combined with historic documents suggests "Wailau Valley was cultivated for a substantial period of time, roughly 700 years, from the Thirteenth Century AD to the 1930s" (McElroy 2006:114). A further 15 samples have been submitted for dating as part of McElroy's dissertation research.

Beta-193986 Wailau Valley (04-272) **330 ± 30**
Charcoal identified as *Chamaesyce* sp. collected from scattered charcoal below pondfield terrace wall (TU 2, Site 04-272) located near Kahawaiiki Stream in a small section of Wailau Valley within Hālawa *ahupua'a*. Bayesian techniques were employed to interpret date of lower wall construction sometime prior to AD 1724 and construction of upper terrace wall to AD 1635–1914 based on the

discovery of a metal nail fragment and historic documents (McElroy 2004:23). AMS method. Easting 725642, Northing 2341349, NAD83, Zone 4N. Collected and submitted 2004 by W K McElroy, T.S. Dye & Colleagues, Archaeologists, Inc.

Comment: cal AD 1470–1650 (2 σ); cal AD 1490–1640 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -10.8‰$.

Beta-213274 Wailau Valley (04-272) 730 ± 40
Charcoal (0.3 g) identified as *Dodonaea viscosa* (*A'ali'i*) collected from scattered charcoal below pondfield terrace wall (TU 2, E-33, Site 04-272) located in Upper Eliali'i section of Wailau *ahupua'a*. AMS method. Easting 724295, Northing 2341102, NAD83, Zone 4N. Collected and submitted 2005 by W K McElroy, University of Hawai'i, Mānoa.

Comment: cal AD 1210–1390 (2 σ); cal AD 1250–1295 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -27.7‰$.

Beta-213276 Wailau Valley (04-272) 790 ± 40
Charcoal (0.02 g) identified as *Scaevola* sp. (*Naupaka*) collected from scattered charcoal below pondfield terrace wall (TU 19, E-23, Site 04-272) located in Lower Eliali'i section of Wailau *ahupua'a*. AMS method. Easting 724632, Northing 2340915, NAD83, Zone 4N. Collected and submitted 2005 by W K McElroy, University of Hawai'i, Mānoa.

Comment: cal AD 1170–1290 (2 σ); cal AD 1215–1270 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -26.3‰$.

Beta-215407 Wailau Valley (04-272) 190 ± 40
Charcoal (0.07 g) identified as *Osteomeles* (*'lei*) collected from scattered charcoal below pondfield terrace wall (TU 18, L-2, Site 04-272) located in Lahokea section of Wailau *ahupua'a*. AMS method. Sample submitted for dating after Beta-213275 "did not produce enough carbon for accurate counting" (McElroy 2006:111, 113). Easting 724739, Northing 2340631, NAD83, Zone 4N. Collected and submitted 2005 by W K McElroy, University of Hawai'i, Mānoa.

Comment: cal AD 1640–1960 (2 σ); cal AD 1660–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -23.9‰$.

Coastal Waikolu

The investigation of a wave-cut bank at the mouth of the Waikolu Valley revealed a "stratified sequence of pondfield activity" that included "a classic set of oxidation-reduction zones" (Kirch 2002:42). An Early Expansion period date of 770 ± 40 BP (cal AD 1200–1290, 2 σ; cal AD 1240–1280, 1 σ) on a fragment of *Pritchardia* sp. found in the lowest layer of pondfield deposits (Layer VI) has been interpreted as having "derived from a burning or land clearance event pre-dating the construction of the pondfields" rather than a direct date on pondfield cultivation (Kirch 2002:46).

Beta-153426 Waikolu Valley (03-2027) 770 ± 40
Charcoal identified as *Pritchardia* sp. collected from scattered charcoal within pondfield deposits Layer IV (Section B, WK-1, Site 03-2027). Sample is interpreted as indicating "burning or land clearance event pre-dating the construction of the pondfields" rather than a direct date on cultivation (Kirch 2002:46). AMS method. Easting 715002, Northing 2342310, NAD83, Zone 4N. Collected and submitted 2000 by P V Kirch, University of California, Berkeley.

Comment: cal AD 1200–1290 (2 σ); cal AD 1240–1280 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.7‰$.

Kalaupapa Peninsula

Kalaupapa Peninsula, located at the western end of the Ko'olau district, is a low, flat, triangular-shaped landmass jutting out from the base of coastal cliffs. The peninsula's environment is dry (900–1300 mm annual rainfall) and generally more similar to lowland, leeward Moloka'i than the adjacent colluvial zone at the cliff's base and neighboring Waialeia and Waihanau valleys. The area is divided among 3 community territories: Kalawao *ahupua'a*, which includes the eastern coast, a third of the peninsula, and the Waialeia Valley; Makanalua *ahupua'a*, in the center of the peninsula, which includes Kauhakō Crater and Waihanau Valley; and Kalaupapa *ahupua'a*, which includes the western coast and probably the isolated Nihoa landshelf to the west. From 1866–1969, this portion of Moloka'i was home to a government-funded leprosarium (Green 1985). Since 1980, natural and cultural resources in the region have been managed as part of Kalaupapa National Historical Park. Today, a small community of patients remains in Kalaupapa. Public access is limited out of respect for residents' privacy.

Over the past 15 yr, Kalaupapa has gone from a relatively poorly known region of Moloka'i to one of the best studied thanks to US National Park Service-sponsored projects (Ladefoged 1990; McCoy 2005c; McCoy et al. 2005; Manning and Neller, forthcoming) and academic research (Kirch 2002; Kirch et al. 2003; McCoy 2005a, 2006, 2008, forthcoming; McCoy and Hartshorn 2007; Neller n.d.). This work has centered on Kaupikiawa Cave (03-312) (Pearson et al. 1974; Weisler 1989; Kirch 2002; Kirch et al. 2003: Beta-9275, -9276, -9962), the remarkably well-preserved 9-km^2 dry-land agricultural field system (Ladefoged 1990; Kirch 2002; Kirch et al. 2003; McCoy 2005a), settlement patterns (Ladefoged 1990; McCoy 2005a, 2006), and ritual (Kirch 2002; McCoy 2006, forthcoming). Below, 69 dates are described that span the Foundation period (n = 1); Early Expansion period (n = 3); Late Expansion period (n = 14); Proto-Historic period (n = 43); and Historic period (n = 8) in all 3 community territories.

Beta-155364 Kalawao (03-312) **200 ± 40**
Charcoal identified as *Sida* sp. associated with habitation (03-312, Unit A, Ly IIA) located in Kaupikiawa Cave, Kalawao *ahupua'a* (Kirch 2002:95). AMS method. Easting 771744, Northing 2345998, NAD83, Zone 4N. Collected and submitted 2000 by P V Kirch, University of California, Berkeley.

Comment: cal AD 1640–1960 (2 σ); cal AD 1650–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -24.8‰$.

Beta-155365 Kalawao (03-312) **220 ± 40**
Charcoal identified as *Chenopodium* sp. associated with habitation (03-312, Unit A, Ly IV/V) located in Kaupikiawa Cave, Kalawao *ahupua'a* (Kirch 2002:95). AMS method. Easting 771744, Northing 2345998, Zone 4N. Collected and submitted 2000 by P V Kirch, University of California, Berkeley.

Comment: cal AD 1520–1960 (2 σ); cal AD 1640–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -26.4‰$.

Beta-155366 Kalawao (03-312) **650 ± 40**
Charcoal identified as *Antidesma* sp. associated with agriculture (03-312, Unit B, Ly VIB) located in Kaupikiawa Cave, Kalawao *ahupua'a* (Kirch 2002:95). AMS method. Easting 771744, Northing 2345998, NAD83, Zone 4N. Collected and submitted 2000 by P V Kirch, University of California, Berkeley.

Comment: cal AD 1270–1400 (2 σ); cal AD 1280–1390 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -24.8‰$.

Beta-192671 Kalawao (03-2087) **100 ± 40**
Charcoal identified as *Chamaesyce* associated with habitation (03-2087, Site F, TU 1, Layer I, Level 1) located near western boundary of Kalawao *ahupua'a* (McCoy 2005a). AMS method. Easting 711535, Northing 2345376, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1670–1940 (2 σ); cal AD 1690–1920 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -12‰$.

Beta-192672 Kalawao (03-2080) **130 ± 40**
Charcoal identified as *Chenopodium* associated with habitation (03-2080, Site H, TU 1, Layer I, Level 1) located in Kalawao *ahupua'a* (McCoy 2005a). AMS method. Easting 711747, Northing 2345514, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1660–1950 (2 σ); cal AD 1680–1940 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.5‰$.

Beta-192673 Kalawao (03-2080) **210 ± 40**
Charcoal identified as *Chenopodium* associated with agriculture (03-2080, Site H, TU 2, Layer I, Level 1) located in Kalawao *ahupua'a* (McCoy 2005a). AMS method. Easting 711751, Northing 2345530, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1630–1960 (2 σ); cal AD 1640–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.7‰$.

Beta-208340 Kalawao-Makanalua (03-2297) **150 ± 40**
Charcoal associated with ritual (03-2297, KLW-29, TU 1, Ly II, Lv 3) located on coast at boundary between Kalawao and Makanalua *ahupua'a* (McCoy 2006). AMS method. Easting 711594, Northing 2346587, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1660–1960 (2 σ); cal AD 1660–1950 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -24.8‰$.

Beta-208342 Kalawao (03-2295) **160 ± 40**
Charcoal associated with ritual (03-2295, KLW-27, TU 1) located in Kalawao *ahupua'a* (McCoy 2006). AMS method. Easting 711671, Northing 2343820, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1660–1960 (2 σ); cal AD 1660–1950 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.5‰$.

Rafter-29024/1 Kalawao (03-2295) **88 ± 40**
Charcoal associated with ritual (03-2295, KLW-27, TU 2) located in Kalawao *ahupua'a* (McCoy 2006). Paired with AA-67543. AMS method. Easting 711671, Northing 2343820, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy for National Park Service (NPS).

Comment: cal AD 1680–1940 (2 σ); cal AD 1690–1920 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.5‰$.

Rafter-29024/3 Kalawao (03-294) **163 ± 35**
Charcoal identified as burned *kukui* nut shell associated with ritual (03-294, TU 1, Fea. 1) located in Kalawao *ahupua'a* (McCoy 2006). AMS method. Easting 711336, Northing 2345181, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy for NPS.

Comment: cal AD 1660–1960 (2 σ); cal AD 1660–1950 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.7‰$.

Waikato-17505 Kalawao (03-2296) **295 ± 31**
Charcoal associated with ritual (03-2296, KLW-28, TU 1, Ly I, Lv 7) located in Kalawao *ahupua'a* (McCoy 2006). AMS method. Easting 711686, Northing 2343770, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy for NPS.

Comment: cal AD 1490–1660 (2 σ); cal AD 1520–1650 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.3‰$.

AA-67543 Kalawao (03-2295) **98 ± 34**
Charcoal identified as *Pandanus* associated with ritual (03-2295, KLW-27, TU 1, basal) located in Kalawao *ahupua'a* (McCoy 2006). Paired with Rafter-29024/1. AMS method. Easting 711671, Northing 2343820, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1680–1940 (2 σ); cal AD 1690–1920 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -26.4‰$.

AA-67545 Kalawao (03-2296) **333 ± 57**
Charcoal identified as *Chamaesyce* associated with ritual (03-2296, KLW-28, TU 1, Ly I, Lv 7) located in Kalawao *ahupua'a* (McCoy 2006). AMS method. Easting 711686, Northing 2343770, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1440–1660 (2 σ); cal AD 1480–1640 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -9.7‰$.

AA-67550 Kalawao (03-2051) **340 ± 35**
Charcoal identified as *Scaevola* associated with habitation (03-2051, Site M, TU 1, Ly I, Lv 1) located in Kalawao *ahupua'a* (McCoy 2006). AMS method. Easting 712532, Northing 2343264, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1460–1650 (2 σ); cal AD 1480–1640 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -26.6‰$.

AA-67556 Kalawao (03-2047) 159 ± 57
Charcoal identified as *Dicot*. twig associated with ritual (03-2047, KA-1, TU 1, Ly II, Lv 1) located in Kalawao *ahupua'a* (McCoy 2006). AMS method. Easting 712503, Northing 2343403, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1650–1960 (2 σ); cal AD 1660–1950 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -26.1‰$.

AA-67560 Kalawao-Makanalua (03-2297) **623 ± 47**
Fish mandible associated with ritual (03-2297, KLW-29, TU 1, Ly II, Lv 3) located at boundary between Kalawao and Makanalua *ahupua'a* (reported here). AMS method. Easting 711594, Northing 2346587, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1540–1820 (2 σ); cal AD 1620–1810 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). Marine04.14c (Hughen et al. 2004), ΔR of 115 ± 50. $\delta^{13}C$ = –9.3‰.

Beta-194800 Waialeia Valley, Kalawao (03-2270) 1130 ± 40
Charcoal associated with agriculture (03-2270, KLW-2, basal) located in Waialeia Valley, Kalawao *ahupua'a* (McCoy 2005a). AMS method. Easting 713192, Northing 2342794, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 770–1000 (2 σ); cal AD 880–980 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C$ = –28.1‰. One of 4 dates from the Foundation period (cal AD 800–1200).

Beta-208339 Waialeia Valley, Kalawao (03-288) 240 ± 40
Charcoal associated with ritual (03-288, TU 1, Ly I) located in Waialeia Valley, Kalawao *ahupua'a* (McCoy 2006). AMS method. Easting 713326, Northing 2342385, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1510–1960 (2 σ); cal AD 1520–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C$ = –11.2‰.

Beta-208341 Waialeia Valley, Kalawao (03-2270) 70 ± 40
Pig tooth associated with ritual (03-2270, KLW-2, TU 1, Ly II, Lv 1) located in Waialeia Valley, Kalawao *ahupua'a* (McCoy 2006). Paired with AA-67542. AMS method. Easting 713192, Northing 2342794, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1680–1940 (2 σ); cal AD 1690–1920 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C$ = –19.5‰.

AA-67542 Waialeia Valley, Kalawao (03-2270) 124 ± 35
Charcoal identified as *Osteomeles* associated with ritual (03-2270, KLW-2, TU 1, Ly II, Lv 1) located in Waialeia Valley, Kalawao *ahupua'a* (McCoy 2006). Paired with Beta-208341. AMS method. Easting 713192, Northing 2342794, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1670–1950 (2 σ); cal AD 1680–1930 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C$ = –25.7‰.

AA-67551 Waialeia Valley, Kalawao (03-2056) 132 ± 56
Charcoal identified as *Chamaesyce* associated with habitation (03-2056, Site O, TU 1, basal) located in Waialeia Valley, Kalawao *ahupua'a* (McCoy 2006). AMS method. Easting 713228, Northing 2342255, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1660–1950 (2 σ); cal AD 1680–1940 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C$ = –10.8‰.

Beta-192675 Kalawao-Makanalua (03-2298) 320 ± 40
Charcoal identified as *Scaevola* associated with agriculture (03-2298, Test pit S-48, Layer I). Sample found at boundary between Kalawao and Makanalua *ahupua'a* (McCoy 2005a). AMS method. Easting 711465, Northing 2346012, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1460–1650 (2 σ); cal AD 1510–1650 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C$ = –26‰.

Beta-192665 Makanalua (03-2248) **200 ± 40**
Charcoal identified as *Chenopodium* associated with habitation (03-2248, Site A, TU 1, Layer I, Level 1) located in Makanalua *ahupua'a* (McCoy 2005a). AMS method. Easting 710298, Northing 2345340, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1640–1960 (2 σ); cal AD 1650–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -24.5‰$.

Beta-192666 Makanalua (03-2259) **120 ± 40**
Charcoal identified as *Chamaesyce* associated with ritual (03-2259, Site B, TU 1, Layer I, Level 1) located in Makanalua *ahupua'a* (McCoy 2005a). AMS method. Easting 710440, Northing 2345347, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1670–1950 (2 σ); cal AD 1680–1930 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -12.8‰$.

Beta-192667 Makanalua (03-2259) **160 ± 40**
Charcoal identified as *Poaceae* associated with agriculture (03-2259, Site B, TU 2, Layer I, Level 1) located in Makanalua *ahupua'a* (McCoy 2005a). AMS method. Easting 710421, Northing 2345340, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1660–1960 (2 σ); cal AD 1660–1950 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -11.6‰$.

Beta-192668 Makanalua (03-2265) **390 ± 40**
Charcoal identified as an unidentified *Dicot*. twig associated with agriculture (03-2265, Site C, TU 2, Layer I, Level 1) located in Makanalua *ahupua'a* (McCoy 2005a). AMS method. Easting 711148, Northing 2345708, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1430–1640 (2 σ); cal AD 1440–1620 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -24.1‰$.

Beta-192669 Makanalua (03-2267) **130 ± 40**
Charcoal identified as *Chamaesyce* associated with habitation (03-2267, Site D, TU 1, Layer I, Level 3) located in Makanalua *ahupua'a* (McCoy 2005a). AMS method. Easting 711104, Northing 2345627, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1660–1950 (2 σ); cal AD 1680–1940 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -11.6‰$.

Beta-192670 Makanalua (03-2232) **130 ± 40**
Charcoal identified as *Osteomeles* associated with agriculture (03-2232, Site E, TU 2, Layer I, Level 1) located in Makanalua *ahupua'a* (McCoy 2005a). AMS method. Easting 711453, Northing 2345353, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1660–1950 (2 σ); cal AD 1680–1940 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.5‰$.

Rafter-29024/4 Makanalua (03-293) **104 ± 30**
Charcoal associated with ritual (03-293, TU 1) *holua* sled platform located on the southern slope of Kauhakō Crater in Makanalua *ahupua'a* (McCoy 2006). Paired with AA-67544. AMS method. Easting 710940, Northing 2344024, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy for NPS.

Comment: cal AD 1680–1940 (2 σ); cal AD 1690–1920 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -26.9‰$.

AA-67544 Makanalua (03-293) **114 ± 34**
Charcoal identified as *Chamaesyce* associated with ritual (03-293, TU 1, Ly I, Lv 1) *holua* sled platform located on the southern slope of Kauhakō Crater in Makanalua *ahupua'a* (McCoy 2006). Paired with Rafter-29024/4. AMS method. Easting 710940, Northing 2344024, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1670–1940 (2 σ); cal AD 1680–1930 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -10.2‰$.

AA-67549 Makanalua (03-2248) **156 ± 35**
Charcoal identified as *Chamaesyce* associated with habitation (03-2248, Site A, TU 2, Ly II, Lv 2) located in Makanalua *ahupua'a* (McCoy 2006). AMS method. Easting 712590, Northing 2343242, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1660–1960 (2 σ); cal AD 1660–1950 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -9.9‰$.

AA-67554 Makanalua (03-2302) **1.0050 ± 0.0042**
Charcoal identified as *Aleurites* branch ext. found in earth oven pit (*imu*) (03-2302, Site R, TU 1, Ly II, Lv 7) located near the mouth of the Waihanau Valley in Makanalua *ahupua'a* (reported here). AMS method. Easting 711163, Northing 2343380, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: Results are post-bomb. $\delta^{13}C = -24.4‰$. Contamination or historic period use of feature may account for results.

AA-67557 Makanalua (03-292) **326 ± 35**
Charcoal identified as *Aleurites* endocarp associated with ritual (03-292, TU 1, basal) located in Makanalua *ahupua'a* (McCoy 2006). AMS method. Easting 711275, Northing 2343468, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1470–1650 (2 σ); cal AD 1510–1640 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.1‰$.

Waikato-17507 Kauhakō Crater, Makanalua (03-1894) **141 ± 34**
Charcoal associated with ritual (03-1894, Fea EN, TU 1) located within Kauhakō Crater in Makanalua *ahupua'a* (McCoy 2005b). AMS method. Easting 711393, Northing 2344509, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy for NPS.

Comment: cal AD 1660–1950 (2 σ); cal AD 1670–1940 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -27.1‰$.

Waikato-17508 Kauhakō Crater, Makanalua (03-2416) **389 ± 31**
Charcoal associated with ritual (03-2416, TU 1, Ly I, Lv 1) located within Kauhakō Crater in Makanalua *ahupua'a* (McCoy 2006). AMS method. Easting 711094, Northing 2344175, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy for NPS.

Comment: cal AD 1440–1640 (2 σ); cal AD 1440–1620 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -24.9‰$.

Rafter-29024/2 Waihanau Valley, Makanalua (03-2255) **142 ± 35**
Charcoal associated with ritual (03-2255, MKL-28, TU 1) located in Makanalua *ahupua'a* (McCoy 2006). AMS method. Easting 710986, Northing 2343280, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy for NPS.

Comment: cal AD 1660–1950 (2 σ); cal AD 1670–1940 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -10.2‰$.

Waikato-17506 Waihanau Valley, Makanalua (03-2301) **118 ± 30**
Charcoal associated with habitation (03-2301, Site Q, TU 1, Ly II, Lv 3) located in Makanalua *ahupua'a* (McCoy 2006). Paired with AA-67546. AMS method. Easting 711100, Northing 2343210, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy for NPS.

Comment: cal AD 1680–1940 (2 σ); cal AD 1680–1930 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.2‰$.

AA-67546 Waihanau Valley, Makanalua (03-2301) **186 ± 34**
Charcoal identified as *Chamaesyce* associated with habitation (03-2301, Site Q, TU 1, Ly II, Lv 3) located in Makanalua *ahupua'a* (McCoy 2006). Paired with Waikato-17506. AMS method. Easting 711100, Northing 2343210, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1640–1960 (2 σ); cal AD 1660–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -10.6‰$.

AA-67552 Waihanau Valley, Makanalua (03-2301) **246 ± 35**
Charcoal identified as *Chamaesyce* associated with agriculture (03-2301, Site Q, TU 2, Ly II, Lv 1) located in Makanalua *ahupua'a* (McCoy 2006). AMS method. Easting 711100, Northing 2343210, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1520–1960 (2 σ); cal AD 1520–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -9.4‰$.

Beta-33172 Kalaupapa (03-1803) **510 ± 80**
Charcoal (6.6 g) associated with agriculture (03-1803, Feature 8) located in Kalaupapa *ahupua'a* (Ladefoged 1990). Easting 709713, Northing 2346495, NAD83, Zone 4N. Collected 1989 and submitted 1990 by T N Ladefoged, International Archaeological Research Institute, Inc.

Comment: cal AD 1280–1630 (2 σ); cal AD 1300–1460 (1 σ). Stuiver and Reimer (1986). $\delta^{13}C = -15.2‰$.

Beta-33171 Kalaupapa (03-1811) **170 ± 120**
Charcoal (1.5 g) associated with agriculture (03-1811, Feature 12) located in Kalaupapa *ahupua'a* (Ladefoged 1990). Easting 709788, Northing 2346395, NAD83, Zone 4N. Collected 1989 and submitted 1990 by T N Ladefoged, International Archaeological Research Institute, Inc.

Comment: cal AD 1490–1960 (2 σ); cal AD 1650–1960 (1 σ). Stuiver and Reimer (1986). $\delta^{13}C$ = –15.4‰.

Beta-33173 Kalaupapa (03-1812) **170 ± 50**
Charcoal (29.3 g) associated with habitation (03-1812, Feature 13) located in Kalaupapa *ahupua'a* (Ladefoged 1990). Easting 709810, Northing 2346367, NAD83, Zone 4N. Collected 1989 and submitted 1990 by T N Ladefoged, International Archaeological Research Institute, Inc.

Comment: cal AD 1650–1960 (2 σ); cal AD 1660–1960 (1 σ). Stuiver and Reimer (1986). $\delta^{13}C$ = –22.8‰.

Beta-33170 Kalaupapa (03-1816) **100.4 ± 0.6% modern**
Charcoal (17.7 g) associated with shelter (03-1816, Feature 18) located in Kalaupapa *ahupua'a* (Ladefoged 1990). Easting 709857, Northing 2346437, NAD83, Zone 4N. Collected 1989 and submitted 1990 by T N Ladefoged, International Archaeological Research Institute, Inc.

Comment: $\delta^{13}C$ = –13.1‰.

Beta-33169 Kalaupapa (03-1821) **100.4 ± 0.9% modern**
Charcoal (9.2 g) associated with shelter (03-1821, Feature 23) located in Kalaupapa *ahupua'a* (Ladefoged 1990). Easting 709857, Northing 2346463, NAD83, Zone 4N. Collected 1989 and submitted 1990 by T N Ladefoged, International Archaeological Research Institute, Inc.

Comment: $\delta^{13}C$ = –17.2‰.

Beta-33168 Kalaupapa (03-1824) **70 ± 50**
Charcoal (35.7 g) associated with habitation (03-1824, Feature 28) located in Kalaupapa *ahupua'a* (Ladefoged 1990). Easting 709848, Northing 2346566, NAD83, Zone 4N. Collected 1989 and submitted 1990 by T N Ladefoged, International Archaeological Research Institute, Inc.

Comment: cal AD 1680–1960 (2 σ); cal AD 1690–1920 (1 σ). Stuiver and Reimer (1986). $\delta^{13}C$ = –27.8‰.

Beta-33174 Kalaupapa (03-1826) **60 ± 60**
Charcoal (22.3 g) associated with habitation (03-1826, Feature 31) located in Kalaupapa *ahupua'a* (Ladefoged 1990). Easting 709884, Northing 2346551, NAD83, Zone 4N. Collected 1989 and submitted 1990 by T N Ladefoged, International Archaeological Research Institute, Inc.

Comment: cal AD 1670–1960 (2 σ); cal AD 1690–1920 (1 σ). Stuiver and Reimer (1986). $\delta^{13}C$ = –15.1‰.

Beta-87077 Kalaupapa (03-1801) **360 ± 90**
Charcoal (8.34 g) associated with historic period homestead (03-1801, Feature 102, Grid Unit 21, Ly II, Lv 1, Cat 167) located in Kalaupapa *ahupua'a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, National Park Service (NPS).

Comment: cal AD 1415–1950 (2 σ); cal AD 1445–1650 (1 σ). Stuiver et al. (1993). $\delta^{13}C$ = –25.7‰.

Beta-87078 Kalaupapa (03-1801) **110 ± 50**
Charcoal (4 g) associated with historic period homestead (03-1801, Feature 105, Grid Unit 23, Ly I, Lv 1, Cat 236) located in Kalaupapa *ahupua'a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1670–1950 (2 σ); cal AD 1680–1935 (1 σ). Stuiver et al. (1993). $\delta^{13}C$ = –26.8‰.

Beta-87079 Kalaupapa (03-1801) **90 ± 40**
Charcoal (5.58 g) associated with historic period homestead (03-1801, Feature 102, Grid Unit 21, Ly II, Lv 1, Cat 239) located in Kalaupapa *ahupua'a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1680–1940 (2 σ); cal AD 1695–1920 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -27.8‰$.

Beta-87080 Kalaupapa (03-1801) **260 ± 60**
Charcoal (19.5 g) associated with historic period homestead (03-1801, Feature 105, Grid Unit 23, Ly II, Lv 1, Cat 243) located in Kalaupapa *ahupua'a* (McCoy 2005c). Easting 709919, Northing 2346608, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1485–1950 (2 σ); cal AD 1535–1950 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -11.5‰$.

Beta-87081 Kalaupapa (03-1801) **110 ± 60**
Charcoal (21.83 g) associated with historic period homestead (03-1801, Feature 105, Grid Unit 23, Ly II, Lv 1B, Cat 246) located in Kalaupapa *ahupua'a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1665–1950 (2 σ); cal AD 1680–1940 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -26.7‰$.

Beta-87082 Kalaupapa (03-1801) **100.7 ± 0.5% modern**
Charcoal (21.16 g) associated with historic period homestead (03-1801, Feature 107, Grid Unit 24, Ly II, Lv 1, Cat 265) located in Kalaupapa *ahupua'a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: $\delta^{13}C = -27.8‰$.

Beta-87083 Kalaupapa (03-1801) **40 ± 60**
Charcoal (9.54 g) associated with historic period homestead (03-1801, Feature 105, Grid Unit 23, Ly II, Lv 1, Cat 292) located in Kalaupapa *ahupua'a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1680–1935 (2 σ); cal AD 1890–1905 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -26.6‰$.

Beta-87084 Kalaupapa (03-1801) **80 ± 50**
Charcoal (8.38 g) associated with historic period homestead (03-1801, Feature 110, Grid Unit 49, Ly II, Lv 1, Cat 295) located in Kalaupapa *ahupua'a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1675–1940 (2 σ); cal AD 1695–1920 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -25.6‰$.

Beta-87085 Kalaupapa (03-1801) **160 ± 50**
Charcoal (4.01 g) associated with historic period homestead (03-1801, Feature 107, Grid Unit 24, Ly I, Lv 1, Cat 298) located in Kalaupapa *ahupua'a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1655–1950 (2 σ); cal AD 1670–1915 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -17.6‰$.

Beta-87086 Kalaupapa (03-1801) **170 ± 90**
Charcoal (2.07 g) associated with historic period homestead (03-1801, Feature 108, Grid Unit 24, Ly II, Lv 1, Cat 301) located in Kalaupapa *ahupua'a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1515–1950 (2 σ); cal AD 1655–1950 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -26.9‰$.

Beta-87087 Kalaupapa (03-1801) **160 ± 60**
Charcoal (8 g) associated with historic period homestead (03-1801, Feature 102, Grid Unit 21, Ly II, Cat 324) located in Kalaupapa *ahupua‘a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1650–1950 (2 σ); cal AD 1680–1935 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -25‰$.

Beta-87088 Kalaupapa (03-1801) **270 ± 90**
Charcoal (2.04 g) associated with historic period homestead (03-1801, Feature 113, Grid Unit 57–58, Ly I, Lv 2, Cat 361) located in Kalaupapa *ahupua‘a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1445–1950 (2 σ); cal AD 1505–1950 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -20.7‰$.

Beta-87089 Kalaupapa (03-1801) **150 ± 70**
Charcoal (9.94 g) associated with historic period homestead (03-1801, Feature 101, Grid Unit 23, Ly II, Lv 1, Cat 365) located in Kalaupapa *ahupua‘a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1645–1950 (2 σ); cal AD 1665–1950 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -14.2‰$.

Beta-87090 Kalaupapa (03-1801) **120 ± 60**
Charcoal (1.04 g) associated with historic period homestead (03-1801, Feature 113, Grid Unit 56, Ly II, Lv 1, Cat 370) located in Kalaupapa *ahupua‘a* (McCoy 2005c). AMS method. Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: $\delta^{13}C = -23.9‰$.

Beta-87091 Kalaupapa (03-1801) **70 ± 60**
Charcoal (0.94 g) associated with historic period homestead (03-1801, Feature 102, Grid Unit 21, Ly III, Lv 1, Cat 395) located in Kalaupapa *ahupua‘a* (McCoy 2005c). AMS method. Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: $\delta^{13}C = -18.4‰$.

Beta-87092 Kalaupapa (03-1801) **240 ± 50**
Charcoal (39.46 g) associated with historic period homestead (03-1801, Feature 117, Grid Unit 8, Ly I, Lv 1, Cat 458) located in Kalaupapa *ahupua‘a* (McCoy 2005c). Easting 709919, Northing 2346608, NAD83, Zone 4N. Collected 1991 by C Goodwin and submitted 1996 by E Neller, NPS.

Comment: cal AD 1520–1950 (2 σ); cal AD 1645–1950 (1 σ). Stuiver et al. (1993). $\delta^{13}C = -25.7‰$.

Beta-194801 Kalaupapa (03-2303) **840 ± 40**
Charcoal associated with habitation (03-2303, Site T, TU 1) located in Kalaupapa *ahupua‘a* (McCoy 2005a). AMS method. Easting 709146, Northing 2343450, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1040–1280 (2 σ); cal AD 1160–1255 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -28.7‰$. One of 4 dates from the Foundation period (AD 800–1200).

AA-67547 Kalaupapa (03-2193) **112 ± 34**
Charcoal identified as *Osteomeles* associated with agriculture (03-2193, Site S, TU 2, Ly I, basal) located in Kalaupapa *ahupua‘a* (McCoy 2006). AMS method. Easting 709069, Northing 2343670, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1670–1940 (2 σ); cal AD 1690–1930 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -27.4‰$.

AA-67548 Kalaupapa (03-2193) **164 ± 34**

Charcoal identified as *Chamaesyce* associated with habitation (03-2193, Site S, TU 1, Ly I, basal) located in Kalaupapa *ahupua'a* (McCoy 2006). AMS method. Easting 709069, Northing 2343670, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1660–1960 (2 σ); cal AD 1660–1950 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -11.4‰$.

AA-67553 Kalaupapa (03-2303) **34 ± 36**

Charcoal identified as *Chenopodium* associated with agriculture (03-2303, Site T, TU 2, Fea. 2) located in Kalaupapa *ahupua'a* (McCoy 2006). AMS method. Easting 709146, Northing 2343450, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1690–1960 (2 σ); cal AD 1690–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -26‰$.

AA-67555 Kalaupapa (03-2299) **116 ± 36**

Charcoal identified as *Dicot*. twig associated with habitation (03-2299, Site K, TU 2, Fea. 2) located in Kalaupapa *ahupua'a* (McCoy 2006). AMS method. Easting 709834, Northing 2345680, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1670–1940 (2 σ); cal AD 1680–1930 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -27.4‰$.

AA-67558 Kalaupapa (03-2303) **307 ± 35**

Charcoal identified as *Chenopodium* associated with habitation (03-2303, Site T, TU 1, Ly II, Lv 1) located in Kalaupapa *ahupua'a* (McCoy 2006). AMS method. Easting 709146, Northing 2343450, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1480–1660 (2 σ); cal AD 1520–1650 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -24‰$.

AA-67559 Kalaupapa (03-2303) **429 ± 33**

Marine shell (*Cellana exarata*; Hawaiian: *'opihi*) associated with ritual (03-2303, Site T, TU 1, Ly I, Lv 1) located in Kalaupapa *ahupua'a* (reported here). Using marine curve (ΔR of 115 ± 50) results suggest sample dates to the historic period. However, if the true age is closer to the age determined using the terrestrial curve then the sample is contemporaneous with AA-67558. AMS method. Easting 709146, Northing 2343450, NAD83, Zone 4N. Collected and submitted 2005 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1823–1950 (2 σ); cal AD 1875–1950 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). Marine04.14c (Hughen et al. 2004), ΔR of 115 ± 50. $\delta^{13}C = 3.6‰$.

Beta-192674 Nihoa (03-2110) **80 ± 40**

Charcoal identified as *Chenopodium* associated with shell midden (03-2110, Site J, Ly I, Lv 4) located on the Nihoa Landshelf in Kalaupapa *ahupua'a* (McCoy 2005a). AMS method. Easting 706234, Northing 2343693, NAD83, Zone 4N. Collected and submitted 2004 by M D McCoy, University of California, Berkeley.

Comment: cal AD 1690–1920 (2 σ); cal AD 1680–1940 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -25.6‰$.

Kala'e Region

The portion of Moloka'i known as Kala'e is primarily an upland environment at the summit of the north shore cliffs and part of the western half of the north coast (see Kipu Series, Weisler 1989). Recently, Weisler et al. (2006) have reported 9 ^{14}C dates from sites near Mo'omomi beach as part of their application of ^{230}Th dating method first developed by Kirch and Sharp (2005), bringing the total for this part of the island to 11. While the authors give excellent contextual information describing where in deposits these samples were collected, the larger 1999 survey is simply described as covering "a 5.5-km length of northern leeward coastline ... intensively mapped by Weisler with plane table and alidade and 115 structures identified" (Weisler et al. 2006:277).

Pala'au Series

^{14}C dates from 5 sites—a coastal midden (02-2421); fishing shrine (02-18); "small nucleated residential complex" with attached shrine and nearby temple (02-16) (Weisler et al. 2006:277); fishing shrine (02-2433); and an oven (02-841)—have recently been reported by Weisler et al. (2006) as part of a larger study employing ^{230}Th dating. High-precision dates on coral using the later method generally agree with ^{14}C dates and suggest features within Site 02-16 were occupied contemporaneously.

Beta-132339 Pala'au (02-2421) **240 ± 60**
Charcoal identified as *Aleurites* nut shell associated with pit (02-2421, 2421-N25W7/6-1) (Weisler et al. 2006). AMS method. Easting 692767, Northing 2345328, NAD83, Zone 4N. Collected 1999 by M I Weisler, University of Queensland.

Comment: cal AD 1480–1960 (2 σ); cal AD 1520–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). See also Weisler et al. (2006) ^{230}Th samples: 4–10.

Beta-132341 Pala'au (02-2421) **350 ± 40**
Charcoal identified as *Sida fallax* associated with oven (02-2421, 2421-N25W5/OVEN) (Weisler et al. 2006). AMS method. Easting 692767, Northing 2345328, NAD83, Zone 4N. Collected 1999 by M I Weisler, University of Queensland.

Comment: cal AD 1450–1640 (2 σ); cal AD 1470–1640 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). See also Weisler et al. (2006) ^{230}Th samples: 4–10.

Beta-132337 Pala'au (02-18) **170 ± 40**
Charcoal identified as *Chenopodium oahuense* associated with hearth (02-18, 18-1/1-1) (Weisler et al. 2006). AMS method. Easting 692767, Northing 2345328, NAD83, Zone 4N. Collected 1999 by M I Weisler, University of Queensland.

Comment: cal AD 1650–1960 (2 σ); cal AD 1660–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). See also Weisler et al. (2006) ^{230}Th samples: 14–18.

Beta-132338 Pala'au (02-18) **300 ± 40**
Charcoal identified as *Nototrichium* sp. cf. *sandwicense* associated with base (02-18, 18-1/3-1) (Weisler et al. 2006). AMS method. Easting 692767, Northing 2345328, NAD83, Zone 4N. Collected 1999 by M I Weisler, University of Queensland.

Comment: cal AD 1470–1670 (2 σ); cal AD 1510–1650 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). See also Weisler et al. (2006) ^{230}Th samples: 14–18.

Beta-132334 Pala'au (02-16) **160 ± 40**
Charcoal identified as *Osteomeles anthyllidifolia* associated with hearth (02-16, 16B-4/2-1) (Weisler et al. 2006). AMS method. Easting 694527, Northing 2345249, NAD83, Zone 4N. Collected 1999 by M I Weisler, University of Queensland.

Comment: cal AD 1660–1960 (2 σ); cal AD 1660–1950 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). See also Weisler et al. (2006) ^{230}Th samples: 1–3.

Beta-132335 Pala'au (02-16) **390 ± 40**
Charcoal identified as *Aleurites moluccana* associated with base (02-16, 16C-N9W3/2) (Weisler et al. 2006). AMS method. Easting 694527, Northing 2345249, NAD83, Zone 4N. Collected 1999 by M I Weisler, University of Queensland.

Comment: cal AD 1430–1640 (2 σ); cal AD 1440–1620 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). See also Weisler et al. (2006) ^{230}Th samples: 1–3.

Beta-132336 Pala'au (02-16) **370 ± 40**
Charcoal identified as *Senna gaudichaudii* associated with oven (02-16, 16C-N9W4/2-1) (Weisler et al. 2006). AMS method. Easting 694527, Northing 2345249, NAD83, Zone 4N. Collected 1999 by M I Weisler, University of Queensland.

Comment: cal AD 1440–1640 (2 σ); cal AD 1450–1630 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). See also Weisler et al. (2006) ^{230}Th samples: 1–3.

Beta-132333 Pala'au (02-2433) **420 ± 40**
Charcoal identified as *Nototrichium* sp. cf. *sandwicense* associated with base (20-2433, 2433A-1/3-1) (Weisler et al. 2006). AMS method. Easting 692767, Northing 2345328, NAD83, Zone 4N. Collected 1999 by M I Weisler, University of Queensland.

Comment: cal AD 1410–1630 (2 σ); cal AD 1430–1620 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). See also Weisler et al. (2006) ^{230}Th sample: 21.

Beta-132344 Pala'au (02-841) **200 ± 40**
Charcoal identified as *Senna gaudichaudii* associated with oven (02-841, 841E-1/3-1) (Weisler et al. 2006). AMS method. Easting 692767, Northing 2345328, NAD83, Zone 4N. Collected 1999 by M I Weisler, University of Queensland.

Comment: cal AD 1640–1960 (2 σ); cal AD 1650–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). See also Weisler et al. (2006) ^{230}Th samples: 11–13.

Kaluako'i Region

The dry, western half of the island, known as Kaluako'i, was previously described through a series of 7 dates (M-767, Kawa'aloa Bay, 02-21; Beta-13743, Mo'omomi, 02-24; Beta-13744, 'Amikopala, 02-85; Beta-5700, Kawa'aloa Bay, 02-629; Beta-20881, Kawakiu Nui, 01-1610; Beta-20906, Kawa'aloa Bay, 02-21; M-1183, Kalani, 02-26). Dixon et al. (1994:13) have reported 3 additional dates in their larger study showing "superabundant [stone adze] production" in the Early Expansion period (50-Mo-B6-185; AD 1410–1955, 2 σ; Beta-49072; see also Hommon 1980). This pattern is interpreted as part of a greater "regional impact of agricultural intensification" on Moloka'i (Dixon et al. 1994:1).

Beta-49700 Kaluako'i (B6-161) **600 ± 90**
Charcoal collected from lowest cultural deposits in a C-shaped shelter in a "lithic resource/workshop area" (50-Mo-B6-161, TU 1, Ly III, Lv 1, 13–18 cm bs) (Dixon and Major 1993; Dixon et al. 1994). Easting 677111, Northing 2334958, NAD83, Zone 4N. Collected and submitted 1993 by B Dixon, Anthropology Department, B.P. Bishop Museum.

Comment: cal AD 1220–1460 (2 σ); cal AD 1290–1410 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -17.5‰$.

Beta-49071 Kaluako'i (B6-73) **101.6 ± 1.3% modern**
Charcoal collected through excavation of a possible men's house (*hale mua*) (50-Mo-B6-73, TU 1, Ly IV, Lv 2, 21–26 cm bs); authors suggest modern date due to root disturbance (Dixon and Major 1993; Dixon et al. 1994). Easting 676945, Northing 2337354, NAD83, Zone 4N. Collected and submitted 1993 by B Dixon, Anthropology Department, B.P. Bishop Museum.

Comment: cal $\delta^{13}C = -24.5‰$.

Beta-49072 Kaluako'i (B6-76) **220 ± 150**
Charcoal collected from lowest cultural deposits in a C-shaped shelter in a "large habitation complex" (50-Mo-B6-76, TU 1, Ly III, Lv 1, 30–40 cm bs) (Dixon and Major 1993; Dixon et al. 1994). Easting 677088, Northing 2337259, NAD83, Zone 4N. Collected and submitted 1993 by B Dixon, Anthropology Department, B.P. Bishop Museum.

Comment: cal AD 1450–1960 (2 σ); cal AD 1520–1960 (1 σ). OxCal 3.10 (Bronk Ramsey 1995, 2001). $\delta^{13}C = -17.5‰$.

GEOLOGICAL SAMPLES

Until recently, there had been few geological, geoarchaeological, or paleoenvironmental studies on Moloka'i that employed ^{14}C (Weisler 1989: Beta-5122, Kawela, 04-143; Beta-12903, Puko'o; GX-2672, Kalani). Below, a total of 37 dates are summarized from a geoarchaeological study on the Kalaupapa Peninsula (Fletcher 1992), a paleoenvironmental core from the 'Ōhi'apilo Wetland (Denham et al. 1999), and a number of coral reef cores from the south shore at Hale O Lono and Hikauhi (Engles et al. 2004)

Kalaupapa Geoarchaeology Series

Within a larger study of Site 03-1801 (Goodwin 1994), geologist C H Fletcher (1992) reports 4 dates on coral used to put the sediment in the area in geomorphological context. The author suggests local "soil probably dates from the glacial lowstand of the sea around 18 ka; and the marine conglomerate layer is a product of overwash during the Kapapa Stand about 4 to 5 ka" (Fletcher 1992:6).

Beta-55476 Kalaupapa (Sample Kalau-343) **4870 ± 100**
Coral collected from coral lens between Ly II and III in geoarchaeological trench on northern tip of Kalaupapa Peninsula (Fletcher 1992). Easting 709888, Northing 2346634, NAD83, Zone 4N. Collected and submitted 1991 by C H Fletcher, University of Hawai'i, Mānoa.

Comment: 3350–2850 cal BC; 3270–2900 cal BC. ΔR of 115 ± 50 (Stuiver et al. 1986).

Beta-55474 Kalaupapa (Sample Kalau-156) **4640 ± 70**
Coral collected from Layer III in geoarchaeological trench on northern tip of Kalaupapa Peninsula (Fletcher 1992). Easting 709890, Northing 2346634, NAD83, Zone 4N. Collected and submitted 1991 by C H Fletcher, University of Hawai'i, Mānoa.

Comment: 2930–2550 cal BC; 2882–2644 cal BC. ΔR of 115 ± 50 (Stuiver et al. 1986).

Beta-55475 Kalaupapa (Sample Kalau-161) **4730 ± 80**
Coral collected from Layer IV near bedrock in geoarchaeological trench on northern tip of Kalaupapa Peninsula (Fletcher 1992). Easting 709889, Northing 2346630, NAD83, Zone 4N. Collected and submitted 1991 by C H Fletcher, University of Hawai'i, Mānoa.

Comment: 3100–2620 cal BC; 2963–2839 cal BC. ΔR of 115 ± 50 (Stuiver et al. 1986).

Beta-55473 Kalaupapa (Sample Kalau-coral 2) **4060 ± 70**
Coral collected from Layer 4a in geoarchaeological trench on northern tip of Kalaupapa Peninsula (Fletcher 1992). Easting 709885, Northing 2346632, NAD83, Zone 4N. Collected and submitted 1991 by C H Fletcher, University of Hawai'i, Mānoa.

Comment: 2210–1740 cal BC; 2112–1873 cal BC. ΔR of 115 ± 50 (Stuiver et al. 1986).

'Ōhi'apilo Wetland Paleoenvironmental Core Series

Two dates from a paleoenvironmental core within 'Ōhi'apilo Pond (03-891) have yielded limited, but tantalizing clues to the timing of anthropogenic environmental changes (Core 11; Denham et al. 1998, 1999). Pollen analysis shows a clear transition from an endemic dry-mesic forest (Zone A; 500–160 cm bs) where *Pritchardia* was the dominate species, to a decline in trees and shrubs, a rise in indicators of forest disturbance (e.g. *Cibotium*), and the "initial occurrence and subsequent rise in the frequency of charcoal particles" (Zone B; 160–65 cm bs) (Denham et al. 1999:42) estimated to have occurred over 450–650 yr between AD 800–1000 and perhaps AD 1450 (Layer III, 40–46 cm bs; Beta-94996; cal AD 1320–1660, 2 σ).

Beta-94996 Kalama'ula (Core 11) **970 ± 70**
Bulk sediment (marine) collected from paleoenvironmental core (Core 11; base of Layer III, 40–46 cm bs; Denham et al. 1998, 1999) in fishpond deposits. Easting 702141, Northing 2334759, NAD83, Zone 4N. Collected/submitted 1998 by T Denham, Garcia and Associates.

Comment: cal AD 1320–1660 (2 σ). Stuiver and Braziunas (1993); CALIB 3.0, marine curve; ΔR of 110 ± 80 (Dye 1994). $\delta^{13}C = -19.7‰$.

Beta-94998 Kalama'ula (Core 11) **3810 ± 90**
Bulk sediment (marine) collected from paleoenvironmental core (Core 11; middle of Layer VII, 502–510 cm bs; Denham et al. 1998, 1999) below fishpond deposits. Easting 702141, Northing 2334759, NAD83, Zone 4N. Collected/submitted 1998 by T Denham, Garcia and Associates.

Comment: 2470–1980 cal BP (2 σ). Stuiver and Braziunas (1993); CALIB 3.0, marine curve; 6000 BP data set; $\delta^{13}C = -24.4‰$.

South Coast Coral Reef Core Series

Engels et al.'s (2004:255) coral-algal reef accretion study on 2 locations along Moloka'i's southern shore, a coastline with the largest reef development in the Hawaiian Islands, suggests "exposure of Hale O Lono to north swell and the age of the sea floor there (~4800 cal BP), coupled with a lack of north swell incidence at Hikauhi and the continuous accretion that has occurred there over the last millennium, strongly supports the ENSO reef hypothesis as outlined by Rooney et al. (2003)." In short, it appears that the enhanced ENSO beginning about 5000 BP halted net reef accretion.

NOSAMS H18-D1-T Hale O Lono (Core Sample 1A) 4812 ± not reported
Coral collected from 5.72 m below modern sea level (^{14}C yr 4700 ± 30). Accretion rate 2.26 mm/yr (Engles et al. 2004). AMS method. Easting 680664, Northing 2332719, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 4614–4935 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C$ = –0.88‰.

NOSAMS H18-D3-B Hale O Lono (Core Sample 1B) 5427 ± not reported
Coral collected from 7.11 m below modern sea level (^{14}C yr 5160 ± 40) (Engles et al. 2004). AMS method. 680664, Northing 2332719, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 5279–5553 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C$ = –0.59‰.

NOSAMS H23-D1-T Hale O Lono (Core Sample 2A) 5648 ± not reported
Coral collected from 8.77 m below modern sea level (^{14}C yr 5420 ± 40). Accretion rate 1.86 mm/yr (Engles et al. 2004). AMS method. Easting 680674, Northing 2332393, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 5562–5840 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C$ = –1.89‰.

NOSAMS H28-D3-B Hale O Lono (Core Sample 2B) 6492 ± not reported
Coral collected from 10.34 m below modern sea level (^{14}C yr 6200 ± 40) (Engles et al. 2004). AMS method. Easting 680674, Northing 2332393, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 6370–6654 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C$ = –1.65‰.

NOSAMS H46-1-D2-B Hale O Lono (Core Sample 3A) 6719 ± not reported
Coralline algae collected from 14.99 m below modern sea level (^{14}C yr 6390 ± 30). Accretion rate 7.50 mm/yr (Engles et al. 2004). AMS method. Easting 680540, Northing 2332163, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 6591–6866 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C$ = 2.73‰.

NOSAMS Hale46-2A Hale O Lono (Core Sample 4A) 6667 ± not reported
Coral collected from 14.60 m below modern sea level (^{14}C yr 6350 ± 55) (Engles et al. 2004). AMS method. Easting 680540, Northing 2332163, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 6646–6977 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C$ = –0.34‰.

NOSAMS Hale58-1A Hale O Lono (Core Sample 5A) 7914 ± not reported
Coral collected from 17.81 m below modern sea level (^{14}C yr 7560 ± 35). Accretion rate 23.40 mm/yr (Engles et al. 2004). AMS method. Easting 680595, Northing 2332064, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 7824–8116 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C = 0.10‰$.

NOSAMS H58-1-D2-B Hale O Lono (Core Sample 5B) 7961 ± not reported
Coral collected from 18.91 m below modern sea level (^{14}C yr 7640 ± 40) (Engles et al. 2004). AMS method. Easting 680595, Northing 2332064, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 7844–8113 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C = 0.47‰$.

NOSAMS Hale69-1A1 Hale O Lono (Core Sample 8A) 8110 ± not reported
Coral collected from 21.27 m below modern sea level (^{14}C yr 7770 ± 65). Accretion rate 4.83 mm/yr (Engles et al. 2004). AMS method. Easting 680654, Northing 2331964, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 8041–8323 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C = –0.56‰$.

NOSAMS Hale69-1A2 Hale O Lono (Core Sample 8A) 8100 ± not reported
Coral collected from 21.27 m below modern sea level (^{14}C yr 7750 ± 35) (Engles et al. 2004). AMS method. Duplicate date. Easting 680654, Northing 2331964, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 7980–8325 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C = 0.06‰$.

NOSAMS H69-1-D2-B Hale O Lono (Core Sample 8B) 8147 ± not reported
Coral collected from 21.47 m below modern sea level (^{14}C yr 7800 ± not reported) (Engles et al. 2004). AMS method. Easting 680654, Northing 2331964, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 7992–8287 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C = 1.07‰$.

NOSAMS R13-D1-B Hikauhi (Core Sample A1) Not calibrated
Coral collected from 4.14 m below modern sea level (^{14}C yr >Mod) (Engles et al. 2004). AMS method. Easting 689703, Northing 2332493, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: Reported as "too young to calibrate." $\delta^{13}C = 0.15‰$.

NOSAMS R13-D4-B Hikauhi (Core Sample A2) 303 ± not reported
Coral collected from 6.34 m below modern sea level (^{14}C yr 795 ± 30). Accretion rate 6.04 mm/yr (Engles et al. 2004). AMS method. Easting 689703, Northing 2332493, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 229–463 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C = 1.42‰$.

NOSAMS R13-D5-B Hikauhi (Core Sample A3) 500 ± not reported
Coral collected from 7.53 m below modern sea level (^{14}C yr 995 ± 40) (Engles et al. 2004). AMS method. Easting 689703, Northing 2332493, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 394–618 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C$ = 1.04‰.

NOSAMS R18-2-D1-T Hikauhi (Core Sample C1) **Not calibrated**
Coral collected from 5.53 m below modern sea level (^{14}C yr >Mod) (Engles et al. 2004). AMS method. Easting 689708, Northing 2332438, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: Reported as "too young to calibrate." $\delta^{13}C$ = –2.41‰.

NOSAMS R18-2-D1-T Hikauhi (Core Sample C1) **Not calibrated**
Coral collected from 5.53 m below modern sea level (^{14}C yr >Mod) (Engles et al. 2004). AMS method. Duplicate sample. Easting 689708, Northing 2332438, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: Reported as "too young to calibrate." $\delta^{13}C$ = –2.00‰.

NOSAMS R18-2-D2-B Hikauhi (Core Sample C2) **282 ± not reported**
Coral collected from 6.84 m below modern sea level (^{14}C yr 755 ± 40) (Engles et al. 2004). AMS method. Easting 689708, Northing 2332438, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 126–431 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C$ = 0.96‰.

NOSAMS R18-2-D2-B Hikauhi (Core Sample C2) **251 ± not reported**
Coral collected from 6.84 m below modern sea level (^{14}C yr 690 ± 40) (Engles et al. 2004). AMS method. Duplicate date. Easting 689708, Northing 2332438, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 43–315 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C$ = 1.09‰.

NOSAMS R20-D2-M(1) Hikauhi (Core Sample D1) **Not calibrated**
Coralline algae collected from 7.63 m below modern sea level (^{14}C yr 395 ± 40) (Engles et al. 2004). AMS method. Easting 689563, Northing 2332418, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: Reported as "too young to calibrate." $\delta^{13}C$ = 2.72‰.

NOSAMS R20-D2-M(2) Hikauhi (Core Sample D2) **Not calibrated**
Coral collected from 7.70 m below modern sea level (^{14}C yr 500 ± 30) (Engles et al. 2004). AMS method. Easting 689563, Northing 2332418, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: Reported as "too young to calibrate." $\delta^{13}C$ = 0.16‰.

NOSAMS R20-D2-B Hikauhi (Core Sample D3) **60 ± not reported**
Coral collected from 8.21 m below modern sea level (^{14}C yr 580 ± 50). Accretion rate 2.67 mm/yr (Engles et al. 2004). AMS method. Easting 689563, Northing 2332418, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 0–237 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C$ = 2.44‰.

NOSAMS R20-D3-M Hikauhi (Core Sample D4) **277 ± not reported**
Coral collected from 8.79 m below modern sea level (^{14}C yr 745 ± 40). Accretion rate 3.28 mm/yr (Engles et al. 2004). AMS method. Easting 689563, Northing 2332418, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 109–426 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. δ^{13}C = 1.15‰.

NOSAMS R20-D4-M Hikauhi (Core Sample D5) **725 ± not reported**
Coral collected from 10.26 m below modern sea level (^{14}C yr 1310 ± 30). Accretion rate 1.30 mm/yr (Engles et al. 2004). AMS method. Easting 689563, Northing 2332418, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 648–871 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. δ^{13}C = 0.85‰.

NOSAMS R20-D4-B Hikauhi (Core Sample D6) **910 ± not reported**
Coral collected from 10.50 m below modern sea level (^{14}C yr 1470 ± 30) (Engles et al. 2004). AMS method. Easting 689563, Northing 2332418, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 760–1018 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. δ^{13}C = –2.54‰.

NOSAMS R32-D2-T Hikauhi (Core Sample I1) **Not calibrated**
Coral collected from 10.52 m below modern sea level (^{14}C yr >Mod) (Engles et al. 2004). AMS method. Easting 689710, Northing 2332293, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: Reported as "too young to calibrate." δ^{13}C = –2.38‰.

NOSAMS R2-D2-B Hikauhi (Core Sample I2) **140 ± not reported**
Coral collected from 11.18 m below modern sea level (^{14}C yr 640 ± 30). Accretion rate 4.19 mm/yr (Engles et al. 2004). AMS method. Easting 689710, Northing 2332293, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 43–263 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. δ^{13}C = 0.10‰.

NOSAMS R32-D4-B Hikauhi (Core Sample I3) **398 ± not reported**
Coral collected from 12.26 m below modern sea level (^{14}C yr 850 ± 30) (Engles et al. 2004). AMS method. Easting 689710, Northing 2332293, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 280–473 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. δ^{13}C = 0.56‰.

NOSAMS R42-D1-B Hikauhi (Core Sample K1) **Not calibrated**
Coral collected from 13.19 m below modern sea level (^{14}C yr >Mod) (Engles et al. 2004). AMS method. Easting 689713, Northing 2332211, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: Reported as "too young to calibrate." δ^{13}C = –2.49‰.

NOSAMS R42-D2-B Hikauhi (Core Sample K2) **Not calibrated**
Coral collected from 14.07 m below modern sea level (^{14}C yr 480 ± 35) (Engles et al. 2004). AMS method. Easting 689713, Northing 2332211, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: Reported as "too young to calibrate." $\delta^{13}C = -0.61‰$.

NOSAMS R42-D4-B Hikauhi (Core Sample K3) **300 ± not reported**
Coral collected from 15.56 m below modern sea level (^{14}C yr 790 ± 35) (Engles et al. 2004). AMS method. Easting 689713, Northing 2332211, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 222–458 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C = 0‰$.

NOSAMS R65-D2-B Hikauhi (Core Sample N1) **83 ± not reported**
Coral collected from 21.02 m below modern sea level (^{14}C yr 595 ± 40). Accretion rate 2.10 mm/yr (Engles et al. 2004). AMS method. Easting 689610, Northing 2332251, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 0–238 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C = -1.79‰$.

NOSAMS R65-D3-B Hikauhi (Core Sample N2) **502 ± not reported**
Coral collected from 21.89 m below modern sea level (^{14}C yr 1000 ± 30) (Engles et al. 2004). AMS method. Easting 689610, Northing 2332251, NAD83, Zone 4N. Collected/submitted 2004 by M S Engles, University of Hawaii, Mānoa.

Comment: 419–609 cal BP (2 σ). Stuiver and Reimer (1993); CALIB 4.12, marine curve; ΔR of 115 ± 50. $\delta^{13}C = 0.27‰$.