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– ARTICLE –

Fishhooks and Adzes: The pointed and edgy nexus of culture, technology, and early capitalism in Hawai'i

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ABSTRACT

The political economy of European contact, emergent colonialism, and the construction of culture are understudied topics of Pacific archaeology. This study examines the dynamic nature of Hawaiian technologies as they were materialized in the persistence of shell fishhooks and stone adzes after the arrival of Europeans in AD 1778. Archaeological site records and documentary accounts reveal that Hawaiians continued to make shell fishhooks and stone adzes after the introduction of iron counterparts. While iron fishhooks and adzes circulated through both traditional and newly adopted capitalist modes of exchange, some Hawaiians continued using hooks and adzes made from local raw materials. A complex set of factors accounts for this phenomenon. Political and economic factors constrained access to shell (for making hooks), and iron (for making adzes), but cultural imperatives also limited the initial desire for iron tools. These patterns underscore the importance of research on technology for understanding cultural consequences of world capitalism in Oceania's indigenous societies.

Keywords: contact, colonialism, technology, exchange, Hawai'i

INTRODUCTION

Patrick Kirch and Marshall Sahlins' (1992) publication of *Anahulu: The Anthropology of History in the Kingdom of Hawaii* was a milestone for studying Oceania's local and global pasts. Their 1992 book foreshadowed – by a generation – a growing interest among today's archaeologists in early modern colonialism (e.g., Flexner 2014; Lawrence and Shepherd 2006; Rogers 2005; Stein 2005). Kirch and Sahlins (1992) emphasized the cultural imperatives and agencies of European contact in Hawai'i as a case study. Their research illustrated the kinds of profound insights that can spring forth from an historical anthropology that integrates archaeological and documentary sources. The 'structure of the conjuncture' (Sahlins 1992: 67) between Hawaiians and non-Hawaiians (e.g., Europeans, Asians) in contact-period Hawai'i entailed complex negotiations (sensu Giddens 1984) among individuals and groups with conflicting desires and ambitions. Both Hawaiians and non-Hawaiians operated with cultural frameworks that were themselves dynamic, mutable, and subject to revision.

Accordingly, this study of Hawaiian fishhooks and adzes echoes the approach of Kirch and Sahlins (1992) to understanding the political economy that governed the development of technology in decades that followed European contact in AD 1778. Each of these technologies is accessible in archaeological and documentary records; their production and use was central to the subsistence and political economies of Hawaiian society. The persistent use of shell fishhooks and stone adzes after AD 1778 was driven by cultural, political, and economic factors that initially constrained access to – and limited desire for – iron hooks and iron adzes. Hawaiians manufactured shell fishhooks as late as ca. AD 1850; adzes made of stone were used at least until AD 1864, and probably a decade longer.

These findings illustrate how 'cultural entanglements' (sensu Alexander 1998: 485–86; Thomas 1991) between populations with different cultural frameworks instigated technological change in Oceania's island societies. To situate this particular analysis, I first review Hawai'i's traditional society with respect to three interrelated domains: political economy, subsistence economy, and craft economy. My usage of the term 'political economy' foregrounds the institutional rules that govern the production, circulation, and consumption of materials in a society. This approach provides a context for focusing on the cultural imperatives and agencies that influenced technological changes in Hawaiian fishhooks and adzes.

HAWAIIAN SOCIETY IN AD 1778

Scholars agree that contact-period Hawai'i housed some of the most complex polities across Oceania. Its eight major islands were divided into at least three major polities that have been variously described as 'complex chiefdoms,'

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'archaic states,' or 'states' (e.g., Hommon 1986, 2013; Kirch 2010). Irrespective of the terminology used to refer to these contact-period polities, pan-Hawaiian political economies centered on a stratified hierarchy of kings, chiefs and administrators of local territorial communities. Subsistence economy focused on agricultural production and animal husbandry, fishing and aquaculture. Agriculture involved irrigated and non-irrigated systems for taro, sweet potato, banana, and sugar cane (Allen 1991; Ladefoged *et al.* 2003). Coconut and breadfruit were cultivated via arboriculture.

Hawai'i's traditional craft economy used raw materials such as stone, shell, bone, feathers, wood, and other plant fibers to craft a variety of goods: adzes, fishhooks, containers, canoes, anthropomorphic images, cordage, baskets, nets, mats, clothing, games, ornaments, musical instruments, and weapons (Abbott 1992; Summers 1999). Fishhooks and adzes, which were fundamental tools in traditional Hawaiian society, are abundant in the archaeological record. Fishhooks were vital for securing animal protein and adzes were used to work wood (e.g., build canoes and houses) and till compact soils in agricultural fields.

European contact, beginning with Captain James Cook's first visit to Hawai'i in January of AD 1778, entailed the introduction of non-local goods and raw materials like iron, glass, and ceramics; new technologies like iron forging were also introduced through trade and interaction. Cook's men reported seeing iron during their first visit to Hawai'i and the strong desire for it among Hawaiians (Kamakau 1992: 92) corroborates the hypothesis of their prior experience with using it. Although such iron could have been acquired from as-yet undocumented Spanish shipwrecks that pre-dated AD 1778, the British introduction of iron is well-documented in both indigenous (i.e., Hawaiian) and non-indigenous (i.e., British) documentary sources. Hawaiian use of the term 'pahoa' (fighting dagger) during Cook's visit (Kamakau 1992: 92–93) suggests a prior familiarity with iron. So does John Young's description of his arrival on Maui in 1790. Young arrived on the 'Eleanora,' a ship from Liverpool, England, that was stolen by Hawaiians and '….broken up, and the iron taken for fishhooks, adzes, drills, daggers, and spear points' (Kamakau 1992: 145).

The introduction of British iron and other materials via world trade, along with a new system of valuation (i.e., capitalist market economy), presaged significant changes in the organization of Hawai'i's traditional craft economy. Although Hawaiian political economy shaped the consequences of early contact with Europeans and Americans, it did not determine it. Rather, fishhooks and adzes were a nexus of culture, technology, and early capitalism that is best comprehended through the interrogation of documentary and archaeological sources.

HAWAIIAN FISHHOOK TECHNOLOGY

Contact-period Hawaiian fishhooks were made of shell, turtle shell, wood, human and animal (pig, dog) bone. Pearl shell was the most prized material for making fishhooks (Figure 1a) until it was eventually replaced by iron a few decades after contact with Europeans. Two kinds of pearl shell are present in Hawaiian waters: *Pinctada radiata* and *Pinctada margaritifera* (Pfeffer 2001: 87). Large populations of *Pinctada radiata* pearl shell oysters were once present on O'ahu, Pearl Harbor (Pfeffer 2001: 87). In its color and iridescence, pearl shell resembles the small fish that were prey for the large fish that Hawaiian fishermen sought (Hiroa 1957; Kahaulelio 1902; Pfeffer 2001: 82). Pearl shell was also valued for its mechanical properties: unlike bone, pearl shell is comprised of alternating laminations that lack planes of weakness (Allen 1996: 109; Kirch 1985: 201).

Documentary perspectives

More than 200 years before James Cook arrived in Hawai'i, England was the center of the world's iron fishhook industry (Larson 2007: xxii). Many Hawaiians continued to make and use fishhooks of shell and bone long after iron was first brought to the islands in the late 18th century. In the 1950s, Te Rangi Hiroa (1957: 328) hypothesized that the abundance of turtle-shell hooks in Bishop Museum collections signaled their production for barter in the early days of contact with Europeans; such artifacts are arguable evidence of an early 'tourist' economy. Moreover, Marshall Islanders who worked on Hawaii's sugarcane plantations made their fishhooks with pearl shell, and their hooks resembled those made by their Hawaiian neighbors (Hiroa 1957: 337). The earliest non-Hawaiian Pacific Islanders to work on Hawaii's sugar plantations arrived in 1859, suggesting that local pearl shell fishhook manufacture continued well into the 19th century.

Other documentary sources shed light on the factors behind the eventual replacement of traditional Hawaiian fishhooks by their iron counterparts. Some Hawaiian women pursued iron through sexual encounters with English sailors in the early years of contact:

> Many Hawaiian women boarded the ships coming to port here. They did not think that such associations were wrong, for there was no education in those days. The husbands and parents, not knowing that it would bring trouble, permitted such association with foreign men because of a desire for clothing, mirrors, scissors, knives, iron hoops from which to fashion fishhooks, and nails ('I'i 1959: 87).

Following the arrival of Christian missionaries to Honolulu in 1820 (Daws 2006), Hawaiians increasingly turned to other strategies to secure iron and other non-local goods. Constraints on access to iron, even in port towns like Lahaina, Maui, drove Hawaiians to innovate by using sewing needles or fine steel wire from women's

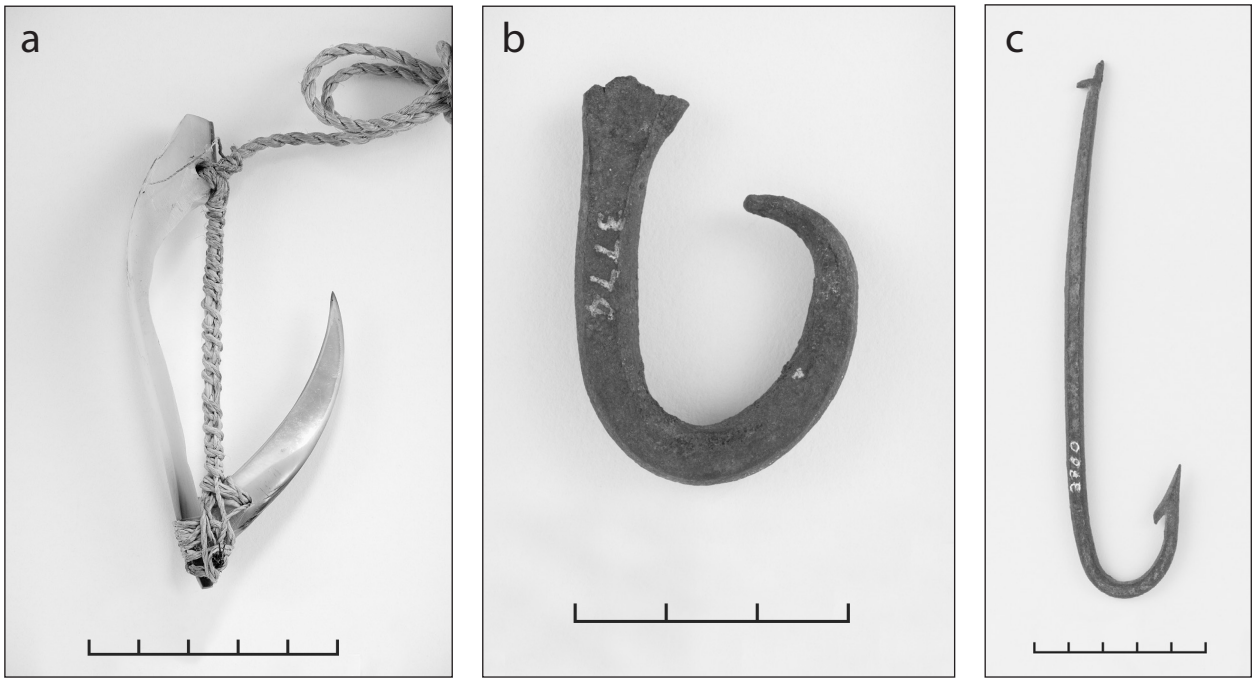

Figure 1. a) Hawaiian two-piece pearl-shell fishhook [Bishop Museum artifact #B.02783] (Photo courtesy of Bishop Museum); b) Iron fishhook made on Hawai'i Island from bent nail (J.S. Emerson Collection, Bishop Museum artifact #03774) (Photo courtesy of Bishop Museum); c) Iron fishhook from Hawai'i Island, probably made from hoop iron (Bishop Museum artifact #03760) (Photo courtesy of Bishop Museum). Scales in centimetres.

umbrellas to make fishhooks. These needles and umbrella wire were shaped into hooks by '…heating in a *kukui* lamp or charcoal to prevent its breaking in two and wasting all that labor' (Kahāʻulelio 2006:142–143). Kahāʻulelio (2006:143) added that hooks made in this fashion were 'all alike' and that the small hooks '…were like the barbed hooks sold in shops.'

Kahāʻulelio's passage reveals three details about fishhooks in mid-19th century Hawaiʻi:1) iron hooks were apparently sold in shops in Lahaina, 2) some Hawaiian fisherman made their own iron hooks, and 3) fishermen who made their own iron fishhooks emulated the standardized hooks that were sold in retail shops. Although iron fishhooks circulated in the market economy of mid-19th century Hawaiʻi, not everyone used them. Perhaps some fishermen preferred to make their own hooks, and others lacked the capital to purchase them.

Archaeological perspectives

Fishhooks made of traditional materials have been reported from at least eleven Hawaiian archaeological deposits that post-date AD 1778 (Table 1). Some of the best documented evidence comes from Nuʻalolo Kai, Kauaʻi (Graves *et al.* 2005), where iron and other Western goods are abundant in the archaeological record. Chronometric dating of this locale confirmed that it was occupied as late as 1850. Notably, the uppermost layers of this early-to-mid 19th century deposit yielded both traditional and non-traditional artifacts, including fishhooks made of pearl shell, bone, and iron. These same deposits included European buttons, cloth, and trade beads, along with stone adzes and many other traditional items.

Iron fishhooks are also relatively abundant in Bishop Museum's cultural collections but information on their provenience and age is limited (Figures 1b and 1c). At least one specimen was made of a bent nail (Figure 1b). In any event, the limited supply of iron during the early contact period (i.e., late 18th century) in Hawaii is suggested by the archaeological recovery of only a single iron fishhook from the multi-building residence of John Young, a British sailor who was stranded in Hawaiʻi in 1790 but became a trusted advisor of King Kamehameha I (Bayman 2010:138). Although John Young apparently had limited access to commercially-manufactured fishhooks from Britain, excavations revealed almost 200 nails (Bayman 2010:138). Such nails could have been used to make fishhooks, or to trade with fisherman who wished to make their own.

The value of pearl shell fishhooks, several decades after contact, is further illustrated in the 1849 probate records of the William P. Leliohoku estate. Leliohoku was a high-ranking member of Hawaiian royalty; his estate included land on Oʻahu, Hawaiʻi, and Maui, and an abundance of goods, houses, and livestock (sheep, cattle, horses) (Sahlins 1992:220–224). A partial inventory of his estate includes dozens of fishhooks made with pearl shell, turtle shell, and

Table 1. *Selected archaeological sites in Hawai'i with fishhooks recovered from reported post-AD 1778 occupations. Note: this tally does not include seven hook blanks of pearl shell and five hook blanks of bone at Kaloko (Cordy et al. 1991:509; Table 171) or the numerous hooks blanks at Nu'alolo Kai.*

Island	Site Name, No. and/or Context	Site Type	Shell Hook	Bone Hook	Metal Hook	Selected Foreign Artifacts	Occupation Span	Reference
Kaua'i	Nu'alolo Kai, K3b, Level II	Residential	34	37	–	Trade bead (3), metal finger ring (1), wire (1), metal frags (3), pottery (1), porcelain (1)	Historic and protohistoric	Graves *et. al.* 2005:161–165, Table 3; Table 8
	Nu'alolo Kai, K3b, Level III	Residential	72	58	1	Metal frag (1), European cloth (1), porcelain (1)	AD 1700 to 1850	Graves *et al.* 2005:161–165, Table 3; Table 8
	Nu'alolo Kai, K5a, Level II	Residential	4	3	–	Trade bead (5), European cloth (12), glass (2), newspaper frag. (1), metal (18)	Historic and protohistoric	Graves *et al.* 2005:175–178, Table 6; Table 8, page 185
	Nualolo Kai, K5a, Level III	Residential	6	2	–	Trade bead (2), European cloth (8), metal (8), metal rifle ball (1)	AD 1700 to 1850	Graves *et al.* 2005:175–178, Table 6; Table 8, page 185
O'ahu	Ke'eke'e Iki , OA-D6–36	Rockshelter	6	–	–	Glass bottle frags., glass beads, and gun flints		Kirch 1992:36, Tables 2.2 and 2.3, 39–40
	Kē'ae Rockshelter, OA-D6–52, Layer II	Rockshelter	3	–	–	Gun flints (11), glass beads (6), glass frags. (4)	Early 19th century	Kirch 1979:38–49; Carter 1979:71
	Ke'eke'e Nui Rockshelter, OA-D6–58	Rockshelter	4		–	Glass bottle frags., flint flakes, iron frags., glass & ceramic beads	Between 1778 and 1804	Kirch 1992:36, Tables 2.2 and 2.3, and page 39
	Kuolulo Rockshelter, OA-D6–60 Rockshelter	Rockshelter	5	–	–	Glass bottle frags., iron nail (49), ceramic sherds (40), glass beads (17)		Kirch 1992:36, Table 2.1, Table 2.2 and Table 2.3
Hawai'i	Kaloko, D13–12, Fea. A, Layer 1 (0–30 cm)	Habitation platform	1	1	1	Glass, ceramics, metal, wood, porcelain button	Early 1800s	Cordy *et al.* 1991:506, Table 168; 519, Table 174
	Kaloko, D13–15, Fea. B, Layer Ib (40–130 cm)	Habitation	–	10	1		Post-AD 1778	Cordy *et al.* 1991:83, and 79, Table 16
	Kaloko, D13–15, Fea. D, Layer 1 (11–15 cm)	Habitation enclosure	–	1	1		AD 1800s	Cordy *et al.* 1991:88–89; 91, Table 21
Total Count			**135**	**112**	**4**			

metal (including silver), as well as stone adzes, and high-value goods from Europe, China, and the United States like gold jewelry, silk clothing, Spanish saddles, Chinese dishes and furniture, and wine glasses.

The political economy of post-contact Hawaiian fishhook technology is further illustrated in the agency of King Kamehameha I. A Russian explorer who visited Hawai'i in 1816 observed that Kamehameha exerted a sumptuary *kapu* on pearl shell at Pearl Harbor and its environs (Kotzebue 1821). Kamehameha worked in partnership with a Spanish merchant with the goal of establishing a monopoly on Hawaii's pearl trade to make a fortune on the world market.

It is also possible that a reduction in the use of pearl shell, at least on Hawai'i Island (Emory *et al.* 1968), was driven by constraints on the importation of raw material from islands like Kaua'i where it was more abundant. Well-developed reefs on geologically older islands (e.g., Kaua'i) provided better habitats for pearl shell than younger islands (e.g., Hawai'i). The escalation of warfare during the 17th and 18th centuries that is described in traditional accounts (summarized in Hommon [2013] and Kirch [2010])

would have further disrupted the free-market circulation of pearl shell to islands in the archipelago where it was relatively scarce, like Hawai'i Island.

Access to pearl shell in the archipelago was likely also constrained by ongoing degradation of shellfish habitat. Hawaiian forest clearance and agricultural production could have instigated soil erosion (see Athens *et al.* 1992:26) that would have harmed shellfish in locales like Pearl Harbor (Ziegler 2002:356). In short, the eventual replacement of shell hooks with iron hooks was due to a variety of cultural, political, and economic factors. However, the eventual adoption of iron fishhooks did not change the general design and sizes of hooks since they were used for similar kinds of fishing, like angling. For that reason, Kirch and Yen (1982) were able to use the known functions and sizes of 'modern' (i.e., 20th century) iron hooks to infer the functions of ancient archaeological fishhooks from Tikopia. Modern hooks that are less than 20 mm in length were used for in-shore angling, whereas larger hooks were used for other fishing techniques designed to capture other, larger prey.

DISCUSSION

Documentary accounts of contact-period trade note that Hawaiians exhibited a strong desire for European nails and other iron implements, but iron fishhooks were not superior to traditional hooks in capturing prey. Pearl shell's coloration and other qualities remained the preferred material for making fishhooks. For example, hooks made of pearl shell did not require bait (Pfeffer 2001), as did hooks made of iron. However, the application of bait on iron hooks (e.g., Nordhoff 1930; Pfeffer 2001:82; Reinman 1967) may have neutralized the disadvantage of their color for attracting prey. In either case, the uneven distribution of pearl shell among the different islands must have instigated an increased reliance on the fabrication or importation of iron fishhooks, particularly after Kamehameha issued his *kapu* on pearl shell gathering in 1816.

HAWAIIAN ADZE TECHNOLOGY

Stone adzes were fundamental in Hawaii's subsistence and political economy; Hawaiians relied on them to clear forests for agricultural fields, build canoes and houses, and carve wood containers, weapons, and religious idols (Kamakau 1976). Due to their functional versatility and durability, stone adzes are commonly recovered from archaeological sites (e.g., Bayman and Moniz-Nakamura 2001; Cleghorn 1986). Archaeologists have long acknowledged the value of stone adzes to Hawaiian society, and yet rarely study the use of stone tools after the introduction of iron in AD 1778.

Recent research confirms that stone adze technology persisted for several decades after European contact and the introduction of iron (Figure 2) (Bayman 2003, 2009). The idea of some archaeologists (e.g., McCoy 1990:92–93) that iron adzes would quickly replace stone adzes reflects the fact that metal adzes are indeed more efficient for cutting wood (e.g., Coutts 1977:80–82; Mathieu and Meyer 1997; Townsend 1969). However, this study confirms that the replacement of stone with iron was not so rapid. Below is a brief review of documentary and archaeological information on the gradual demise of the traditional stone adze technology.

Documentary perspectives

This persistence of stone adze technology into the mid-19th century is attested in documentary accounts (Cheever 1851). Although contact-period Hawaiian chiefs accumulated 'more iron than they knew what to do with' by 1793 (Bell 1929:63), documentary sources reveal that iron tools were not widely used by commoners until the mid-nineteenth century. Particularly intriguing is a 19th century observation by William Brigham that was published in 1902:

> …In watching the shaping of a canoe I have seen the old

Figure 2. Hafted stone adzes from Hawai'i Island: *left*) a stone swivel adze, used for working the interior of canoes; *right*) a regular stone adze (J.S. Emerson Collection) (Photo courtesy of Bishop Museum).

> canoe-maker use for the rough shaping and excavating an ordinary foreign steel adze, but for the finishing touches he dropped the foreign tool and returned to the adze of his ancestors, and the blunt looking stone cut off a delicate shaving from the very hard koa wood and never seemed to take too much as the foreign adze was apt to do.

Brigham's observation implies that aesthetics were a matter of concern among canoe artisans who preferred stone adzes for certain steps of canoe-making. If so, the eventual demise of canoe-making aesthetics in the late 19th century was noted by John Cobb in 1900:

> …the older ones [canoes] are very handsome in design and workmanship, the old-time native boat builders having been especially expert in their manufacture. The present generation has sadly deteriorated, however, and the canoes made now (late–1880s) by natives rarely show very much skill in design and workmanship… (Holmes 1981: 42).

Brigham noted also that, while stone adze production began to wane a few decades after the introduction of iron, stone adzes were still used as late as 1864, and perhaps a century after contact. Although all Hawaiians eventually adopted iron adzes, some people acquired iron adzes more quickly than others. An early European in Hawai'i, George Byron (1826), noted that stone adzes were 'becoming rare' by 1825 in the town of Honolulu. However, as Kirch and Sahlins (1992) noted, rural areas remained isolated from the international market economy until the middle of the nineteenth century. Hawaiians in Waimea (Hawai'i Island) still used stone adzes in 1847 (Doyle 1953: 145). Stone adzes were likely used in other remote districts and islands without major seaports.

There are also indications that iron was differentially distributed among social classes, since the chiefly elite monopolized trade with Europeans. When Cook and his men stopped at Kaua'i for fresh water in March of 1779, one Hawaiian demanded iron adzes for every barrel of water he supplied (King 1967: 586–587). Chiefs also used traditional prerogatives to confiscate commoners' possessions and enforce a sumptuary restriction on the use of foreign goods by commoners. In the late 1700s, Nathaniel Portlock (1789) watched a chief who demanded bits of iron from a commoner who had bartered with foreigners.

In short, commoner Hawaiians often had difficulty in securing iron, but once they did they were quite resourceful. In the late 19th century Joseph Emerson noted that iron blades from woodworking planes were sometimes reused by hafting them onto handles that once held stone adzes (Summers 1999: 58). Moreover, Hawaiians hafted 'hoop iron,' once used to hold together the staves of wooden barrels, onto wooden handles that formerly held stone adzes (Figure 3) (Summers 1999: 58).

Archaeological perspectives

The pace of technological change accelerated rapidly in the islands following the introduction of iron tools from Europe in the late 1700s. Nonetheless, traditional stone adze technology persisted for almost a century after European contact. Thus far, stone adzes have been reported in at least twenty-three archaeological sites in Hawai'i that post-date AD 1778 (Table 2). Of course, it is possible that some sites dated with chronometric techniques actually pre-date AD 1778; radiocarbon dating is not sufficiently precise for estimating the age of samples as recent as the 18th century. However, contexts with stone adzes also included Western artifacts (e.g., glass, ceramics) that substantiate the use of stone adzes after contact. Of course, it is possible that at least some stone adzes were ancient tools that were kept as heirlooms, or perhaps recycled for purposes other than felling trees, carving wood, or tilling soils in agricultural fields. Still, the repeated recovery of stone adzes from these post-contact Hawaiian sites confirms that certain facets of traditional technology persisted long after European contact. No less than three habitation sites with stone adzes were occupied into the late 19th century.

DISCUSSION

Factors that underlay the persistence of stone adze technology were varied and stemmed from the reorganization of the political economy as Hawaiians engaged with

Figure 3. *Left*: Adze made on Moloka'i Island from barrel hoop iron (Bishop Museum artifact #B.02125) (Photo courtesy of Bishop Museum); *Right*: Adze made from hoop iron (Bishop Museum artifact #10041) (Photo courtesy of Bishop Museum). Scale in centimetres.

world capitalism. Indeed, stone adzes were actually preferred for certain steps of canoe-making. Securing iron adzes was also difficult in remote locales away from the coastal trade centers. Perhaps most importantly, powerful Hawaiian rulers dominated access to iron and other non-local goods and materials that entered the island port towns. The rapid but short-lived 19th century sandalwood economy encouraged chiefs who once restricted access to iron adzes to loosen their grip, so that their subjects could harvest sandalwood more efficiently. However, the aesthetics of canoe construction favored the continued use of stone adzes because of the value for skillfully carving the hulls of canoes.

SUMMARY AND CONCLUSIONS

Rates of technological change and their consequences varied among fishhooks and adzes in Hawai'i after AD 1778. Fishhooks made of traditional materials such as shell and bone were made and used for a few decades after the first Europeans visited Hawai'i. The innovative reuse of iron nails and sewing needles to make fishhooks in the first decades after contact highlights the high value and limited supply of iron and commercially-manufactured fishhooks that was imported from Britain and the United States. As I noted earlier, perhaps some fishermen preferred to use hooks made with pearl shell since they did not require bait and iron was initially difficult to acquire. Future research

Table 2. *Selected archaeological sites in Hawai'i with stone adzes recovered from reported post-AD 1778 occupations.*

Island	Site Name, No. and/or Context	Site Type	Stone Adze Artifacts	Selected Foreign Artifacts	Occupation Span	References
Kaua'i	Nu'alolo Kai, K3b, Level II	Residential	15 whole or frags.	Trade bead (3), metal finger ring (1), wire (1), metal frags (3), pottery (1), porcelain (1)	Historic and protohistoric	Graves *et al.* : 161–165, Table 3; Table 8
	Nu'alolo Kai, K3b, Level III	Residential	43 whole or frags.	Metal frag (1), European cloth (1), porcelain (1)	AD 1700 to 1850	Graves *et al.* 2005: 161–165, Table 3; Table 8
	Nu'alolo Kai, K5a, Level II	Residential	5 whole or frags., 1 adze flake	Trade bead (5), European cloth (12), glass (2), newspaper frag. (1), metal (18)	Historic and protohistoric	Graves *et al.* 2005: 175–178, Table 6; Table 8, page 185
	Nualolo Kai, K5a, Level III	Residential	5 whole or frags.	Trade bead (2), European cloth (8), metal (8), metal rifle ball (1)	AD 1700 to 1850	Graves *et al.* 2005: 175–178, Table 6; Table 8, page 185
O'ahu	C4–265	House	Adze flakes (numerous), grinding stone fragment	China, metal, glass	Pre-1850 to late 19th century	Riconda 1972: 14–20
	D6–36	Rockshelter	1 adze frag., 15 adze flakes	Glass, metal, gun flints	AD 1650 to after contact	Kirch 1992: 36, 39–40; page 47, Fig. 2.11
	D6–52	Rockshelter	1 adze and 29 adze flakes	Glass, metal, gun flints	AD 1500 to after contact	Kirch 1992: 33–35, 36; page 47, Fig. 2.11
	D6–58	Rockshelter	1 adze and 39 adze flakes	Glass, metal, ceramics	AD 1325 to after contact	Kirch 1992: 37–39, 36; page 47, Fig. 2.11
	D6–60	Rockshelter	1 adze preform, 1 adze frag., 29 adze flakes	Glass, metal, ceramics, gun flints	AD 1450 to after contact	Kirch 1992: 35–37, 36; page 47, Fig. 2.11
	D6–27	House	6 polished flakes (adze flakes)	Iron, glass, flint flake	AD 1804–1815 and AD 1845–1880	Kirch 1992: 86; page 166, Fig. 5.1
	D6–33	House	Adze frag., 2 adze flakes	Glass, metal, ceramic, flint, slate	AD 1804–1825	Kirch 1992: 76; page 166, Fig. 5.1
	D6–34	House	Adze, adze flakes, hammerstone	Glass and flint	AD 1804–1885	Kirch 1992: 71–72; page 166, Fig. 5.1
	D6–40	House	Adze, 3 adze flakes	None	AD 1804–1815	Kirch 1992: 64; page 166, Fig. 5.1
	50–80–14–2456	Habitation	3 adze frags 3 adze preforms	Glass, ceramics, metal, flint	Early post-contact to mid-19th century	Riford 1997: 64; Table 5.2; Lebo 1997: 177, Table 11.1

Table 2 *continued.*

Island	Site Name, No. and/or Context	Site Type	Stone Adze Artifacts	Selected Foreign Artifacts	Occupation Span	References
Moloka'i	M-17	House	Adze, basalt flakes	Glass and ceramics	Late 19th century to early 20th C.	McElroy 2006:116
Hawai'i	7702	Not reported	Adze	Not reported	Post-AD 1800 (portions)	Lass 1994:72; Hay *et al.* 1986
	T1	Not reported	Adze	Not reported	Post-AD 1800	Bath and Rosendahl 1984; Lass 1984:72
	H2	Not reported	Adze	Not reported	Post-AD 1800	Emory and Sinoto 1969; Lass 1984:72
	2732	House	2 adzes, 8 adze flakes, 4 hammerstones, 24 basalt flakes	Metal, chert flake, plaster	Post-AD 1800	Clark and Kirch 1983; Lass 1994:72
	2776	House	165 adze flakes, 317 basalt flakes	None	Post-AD 1800	Clark and Kirch 1983; Lass 1994:72
	8824	House	1 adze, 5 adze flakes, 2 hammerstones, 24 basalt flakes	None	Post-AD 1800	Clark and Kirch 1983; Lass 1994:72
	303	Not reported	Adze	Not reported	Post-AD 1800	Barrera 1972; Lass 1994:72
	73	Not reported	Adze	Not reported	Post-AD 1800	Spear 1987

on this topic could analyze the relative availability of iron by studying documentary sources that contain statistical information on the timing, kinds, and numbers of iron fishhooks that were eventually imported to Hawai'i and traded or sold in the retail market through shops and stores. Such studies would profit from a careful review of shipping logs from the 18th and 19th centuries. Moreover, a study of records that were maintained by the Customs House of the Kingdom of Hawai'i offer another promising opportunity to determine the relative abundance or scarcity of iron fishhooks and adzes in the early development of capitalism in Hawai'i.

The timing of the eventual cessation of traditional fishhook-making is difficult to estimate precisely using current archaeological and documentary information. Archaeological materials that were deposited after AD 1778 have yielded shell and bone fishhooks have been relatively dated through their co-occurrence with historic artifacts such as glass, metal, ceramics, leather, and other non-traditional materials. Based on current archaeological information, shell and bone fishhooks were used into the early 19th century and perhaps as late as ca. AD 1850. The cessation of traditional fishhook use preceded the termination of stone adze use by at least a few years, and perhaps by a couple of decades.

At least one documentary source (Bingham 1902: 408–415) suggests that stone adzes were used slightly longer than shell and bone fishhooks, and as late as 1864. Perhaps the use of fishhooks and adzes that were made with traditional materials initially persisted in both cases because elites controlled access to their iron counterparts. However, their initial persistence may have also been due to cultural preferences and their utility for accomplishing the job at hand. Fishhooks made of pearl shell, unlike hooks made of iron, were effective for attracting prey without the addition of bait. Similarly, stone adzes were more effective than sharp iron adzes for delicately carving canoe hulls.

The continued use of traditional materials for making fishhooks and adzes was surpassed, however, by the even more protracted use of traditional thatch buildings in Hawai'i (Bayman 2009). Buildings made of traditional plant materials (e.g., *pili* grass) were still used into the early 20th century in some locales (e.g., Moloka'i). The more gradual adoption of non-traditional buildings in Hawai'i (relative to fishhooks and adzes) is not surprising since vernacular architecture is typically a 'conservative' technology that resists change (Bayman 2009:142).

This Hawaiian case study suggests that technological change was multi-dimensional, and that archaeologists working in the Pacific (e.g., Fitzpatrick *et al.* 2006) and elsewhere in the world (e.g., Ehrhardt 2005) have benefitted from examining categories of material on a case-by-case basis. The conventional assumption that Western technologies and materials were superior to their traditional counterparts is not supported by this study. Myriad cultural, political, and economic factors influenced the tempo and direction of technological change in the face of contact (see Salisbury 1962 and Sharp 1952 for classic discussions of this topic) and what I refer to as 'emergent colonialism.' I advance the term 'emergent colonialism'

to refer to a suite of temporal processes in a society that culminate in its loss of political autonomy. In the case of Hawai'i, emergent colonialism bridged the early contact period (i.e., 1778) and the overthrow of the Kingdom of Hawai'i in 1893. During this span of time, different categories of material culture were not uniformly altered by their engagement with world capitalism in the late 18th century and early 19th century. Events in Hawai'i exemplify the idea that 'culture contact is structured, but its outcomes are not determined' (Alexander 1998: 477). Hawaiian interaction with Europeans undoubtedly influenced trajectories of technological change, but so did interactions among (and between) elite and commoner Hawaiians whose agencies were governed, in part, by cultural imperatives. This process entailed a profound reorganization of Hawaii's political economy, and fishhooks and adzes were a nexus of this phenomenon.

The approach used in this study builds on an approach that was first applied in Hawai'i by Kirch (1992) a generation ago. His innovative synthesis of archaeological and documentary records offered insights on the consequences of contact in Hawai'i that could not be acquired using either source alone. Kirch's research has inspired a new generation of archaeologists to foreground material culture in studies of political economy and emergent colonialism in Oceania.

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