

13. | **The Industrious Exiles: An Analysis
of Flaked Glass Tools from the
Leprosarium at Kalawao, Molokaʻi**

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Abstract: Archaeological investigation of the leprosarium at Kalawao, Molokaʻi, Hawaii, recovered a small assemblage of flaked glass tools, used by people diagnosed with Hansen’s disease (leprosy) and exiled to the remote Kalaupapa peninsula between 1866 and 1969. Flaked glass is commonly documented on postcontact archaeological sites in Oceania and elsewhere and can be considered an expression of indigenous tool technologies in an introduced material. The Kalawao assemblage is remarkable because it contains artifacts that represent innovations over traditional Hawaiian tool forms. This study considers precontact volcanic glass tools in Hawaii and their potential for informing postcontact glass tool technologies. An analytical approach to understanding worked bottle-glass artifacts based on context and macroscopic properties is suggested, using the Kalawao assemblage as an example. The bottle-glass tools from Kalawao are not simply adaptations of precontact volcanic glass tool forms to a new material type but innovations involving the institutional context of Kalawao, differential availability of resources among the exiles, and physical disabilities related to the effects of Hansen’s disease on the human body.

Introduction

Archaeological studies of hybridity, the creation of new cultural forms in situations of contact and colonialism (Bhabha 1993), can benefit from a process-oriented approach, where hybridization, that is, the emergence of hybrid forms, is

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an important cultural phenomenon that can inform interpretations of the material culture of past peoples (Van Dommelen 2005). According to such an approach, no piece of material culture in situations of contact belongs purely to one culture or another; rather these objects are entangled in emerging identities and networks of exchange produced in situations of contact (Stein 2005). One aspect of these situations is the reinterpretation of exotic materials in local contexts, a phenomenon that has been observed in many times and places, from the first millennium B.C. Mediterranean (Dietler 1998) to nineteenth-century Australia (Harrison 2006). In this volume, chapters by Cordell, Card, Brezine, Griffiths, Ehrhardt, and Hayes explore various possible indigenous interpretations of foreign material culture in innovative and useful ways. One material that was commonly reinterpreted in colonial contexts from the fifteenth century onward was the bottle glass carried by European traders and explorers, which was utilized by many indigenous groups as a raw material for cutting and scraping tools.

During recent archaeological research on the late nineteenth- and early twentieth-century leprosarium at Kalawao, an ahupua'a¹ on Kalaupapa peninsula, Moloka'i Island, Hawaii (Figure 13-1), the Archaeology of the Recent Past at Kalawao (Flexner 2010, 2012), or ARPK, field project recovered a small assemblage of bottle-glass artifacts showing evidence of retouch and use. This assemblage lies at the intersection of multiple processes of hybridization, based on the creation of social differences, both colonial (Torrence and Clarke 2000) and institutional (Hubert 2000). In addition to the colonial context of nineteenth- and twentieth-century Hawaii, these artifacts come from an institutional context, a quarantine settlement intended to isolate people with Hansen's disease (caused by *Mycobacterium leprae* and commonly known as leprosy). Flaked bottle glass represents a "hybrid material culture," as an adaptation of indigenous technologies, originally developed for volcanic glass, to a newly introduced material. These artifacts are also interpreted in terms of the debilitating physical effects of Hansen's disease, as well as the difficulty of acquiring tools in Kalawao, where resources were limited. Innovations in cutting and scraping tools made of bottle glass indicate a unique adaptation to physical disabilities and institutional difficulties by toolmakers and users living in Kalawao. This case study involves an emerging technology that is simultaneously Hawaiian, introduced, and adaptive to disability, adding an additional facet to possible interpretations of hybridized material culture. The historical context of the leprosarium at Kalawao thus provides new understandings of the complexity involved in interpreting material culture in colonial and postcolonial situations.

Archaeological Approaches to Flaked Bottle Glass

Archaeological and anthropological investigations of colonialism have noted numerous examples of introduced materials being adopted into indigenous contexts based on form, function, or contexts of exchange, among other characteristics (Cusick 1998; Gosden 2004; Kirch 1992; Mills 2002, 2003; Murray 2004; Smith 2007; Thomas 1991). Many studies have found that bottle glass was used as a raw material for toolmaking, both in indigenous contexts, such as in Australia (Allen

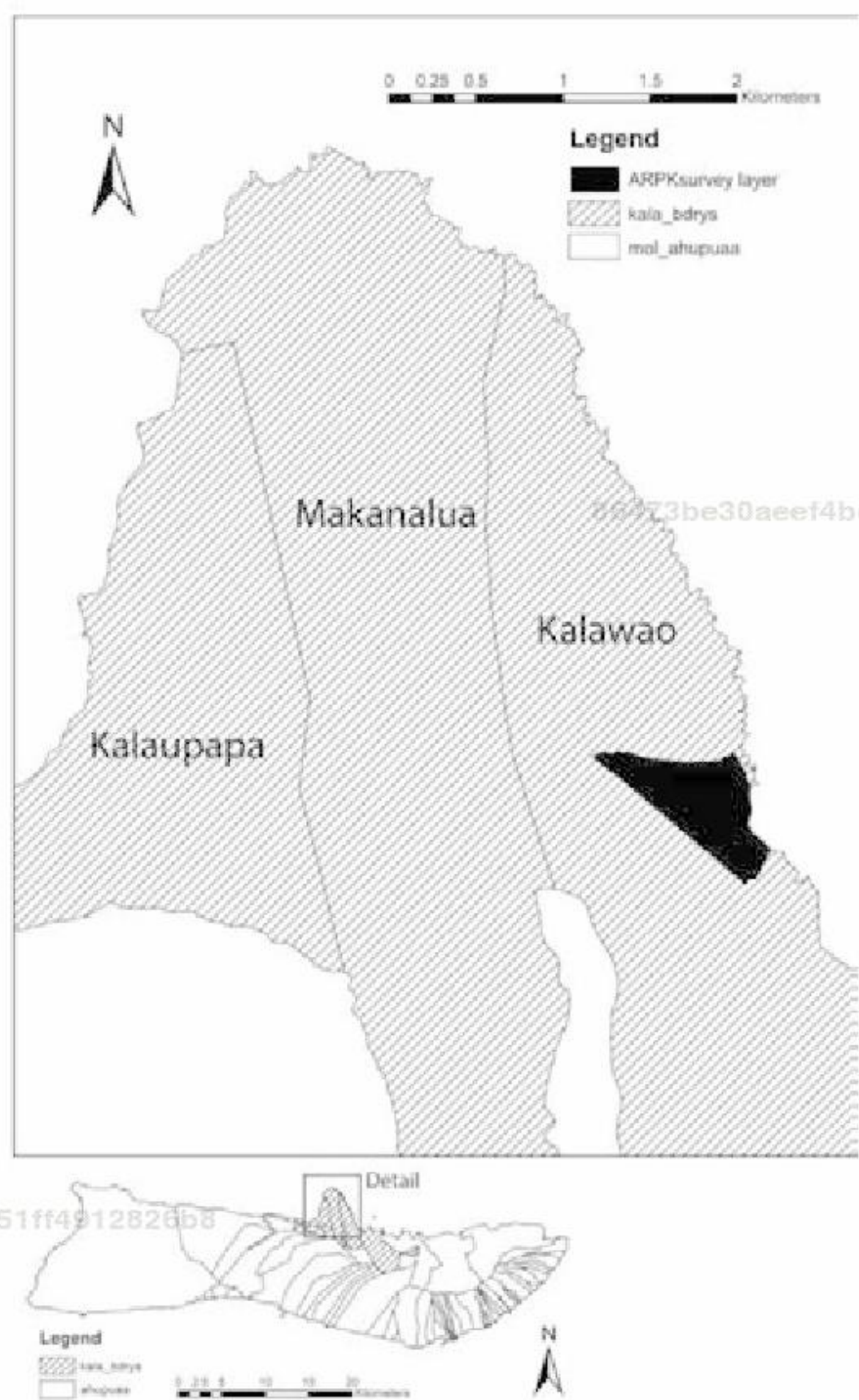


Figure 13-1. Map of Kalaupapa National Historical Park, with the ahupua'a boundaries and names.

1973; Harrison 2002, 2004, 2006), South America (Conte and Romero 2008), and California (Lightfoot et al. 1991; Lightfoot et al. 1998; Shackley 2000; Silliman 1997, 2001a), and in other colonial situations, such as on plantations in the American South (Wilkie 1996). In excavations at the River L' Abbe Mission, a French Catholic mission station located on Monk's Mound, Cahokia, Illinois, "all of the bottleglass sherds from the southwest sector show evidence of aboriginal re-use as tools, particularly scraping implements" (Walthall and Benchley 1987:46).

Many archaeological studies of worked glass have interpreted these materials in terms of the identities of the toolmakers. Research on worked glass among Australian Aborigines has been particularly productive. Allen's (1973) pioneering work in Oceanic historical archaeology at Port Essington, in the far north of Australia, documented flaked glass tool technologies among local Aboriginal people, revealing a preference for the bottle bases, which were thicker and could withstand more flaking and retouch. Worked glass analyses have flourished alongside lithic analyses in the archaeology of colonial-era sheep stations in the Australian Outback, where toolmaking may have been an important aspect of Aboriginal identity (Harrison 2004). One important development has been recent work on Kimberley spear points, named for the region of northwestern Australia from which they originated. These glass spear points have been interpreted as markers of masculine identity among Aboriginal men (Harrison 2002), as well as objects of intense desire for Western consumers looking for a piece of "authentic" Aboriginal culture (Harrison 2006). While connected to Aboriginal stone-tool technologies, some innovation in the techniques used to make Kimberley points date to the colonial period, a response both to newly available material culture and to changing contexts of subsistence, exchange, and identity (Harrison 2006). Recent work by Gibbs and Harrison (2008) on a worked-glass procurement site at the Geraldine Mine in western Australia has emphasized the importance of context in interpreting worked-glass assemblages, a theme discussed below.

Archaeological research in colonial California has also linked glassworking and Native Californian identity. Shackley (2000) indicated the complexity underlying contemporary and historical identity politics in a study of early twentieth-century bottle-glass and obsidian tool assemblages associated with Ishi, a Native Californian who knapped stone and glass tools for the entertainment of visitors to the Museum of Anthropology at the University of California, Berkeley. Fort Ross, a site of intensive archaeological investigations, revealed many glass artifacts that show evidence of retouch or use-wear (Lightfoot et al. 1991:227–229; Silliman 1997). Worked glass appears throughout the Native Alaskan Village site (Lightfoot et al. 1997) and the Fort Ross Beach site (Lightfoot and Schiff 1997). Glass and European and Asian ceramics from indigenous contexts at Fort Ross are interpreted as coming from "secondary contexts," taken from already fragmented vessels elsewhere in the settlement and used to make beads, pendants, and in the case of glass artifacts, "flakes, scrapers, and bifaces" (Lightfoot et al. 1998:214). Silliman's (2001b) practice-oriented approach at Rancho Petaluma situated lithic knapping activities in terms of practical politics and labor for Native Californians.

Finally, a study of a Bureau of Indian Affairs boarding school in Arizona revealed artifacts of flaked glass and ceramic (Lindauer 1997), which represent not only the identity of the toolmakers but also resistance to an institution designed to crush that identity. This last study is particularly pertinent to our discussion, as it is set in an institutional context (*sensu* Foucault 1995; Goffman 1962). The study of worked-glass tools in total institutions, that class of social phenomena meant to isolate, reform, discipline those seen as threatening or unwanted by

society, can provide useful interpretive material concerning the daily lives of the institutionalized.

Traditional Glass Tools of Hawaii

As mentioned above, many studies of worked bottle-glass tool technologies have focused on the adaptation of traditional or indigenous technologies to an introduced material type, so a brief discussion of traditional Hawaiian volcanic glass tools is in order. Volcanic glass artifacts are “[p]robably the most ubiquitous artifacts in Hawaiian archaeology . . . which have been found in densities as great as 1,350 pieces per cubic meter of cultural deposit” (Kirch 1985:194). These tools are found throughout the Hawaiian Islands and are generally produced by bipolar reduction, as the nodule size is too small for other methods of production (Schousboe et al. 1983). Barrera and Kirch (1973:185–186) characterize volcanic glass tools from Hawaii in terms of a variety of cutting and scraping activities, including woodworking, concluding that volcanic glass flakes functioned as a kind of “prehistoric pocketknife.” These artifacts are usually a few centimeters in diameter, as volcanic glass nodules in Hawaii tend to be small. Only the largest flakes were used with the majority of volcanic glass flakes representing unused shatter from the bipolar reduction process (Kirch 1985:195–197).

Weisler’s (1990) study of West Moloka’i characterized potential geological sources for volcanic glass and documented several sources for archaeological volcanic glass tools in basaltic dikes. This study was meant to encourage research into precontact exchange patterns in the Hawaiian chiefdoms. More recent work by Mark McCoy (personal communication 2009) has expanded the number of documented potential geological sources for volcanic glass in pyroclastic cones and basaltic dikes on Moloka’i, though these sources have yet to be tested. Archaeological excavations at 35 sites on Kalaupapa peninsula recovered an assemblage of 104 volcanic glass flakes (7.5 percent of the total flaked stone assemblage, with 90.5 percent basalt and 2 percent chert), with a 3.3 to 1 ratio of “waste” flakes to potentially usable tools (McCoy 2006:389–390). The focus of McCoy’s lithic analysis was basalt artifacts, though the study does document a significant presence of volcanic glass tools in Kalaupapa during the precontact period. A small number of volcanic glass tools were recovered during research on the Hansen’s disease period at Kalawao, circa 1866–1932 ($N = 9$; Table 13-1). Significantly for this study, a volcanic glass flake was recovered in an excavated context with late-nineteenth-century materials including a flaked brown bottle-glass shard (Figure 13-2). This finding suggests that volcanic glass and bottle glass flaking using traditional tool forms may have happened together in the leprosarium at Kalawao, a continuation of traditional Hawaiian practices using different materials. However, an analysis of flaked glass tools from throughout the settlement suggests that worked glass was not always produced according to traditional forms, so additional interpretation of this assemblage is warranted, especially given the historical context of the assemblage within Hawaii’s Hansen’s disease settlement.

Figure 13-2. Flaked glass artifacts recovered from the same stratigraphic context in a domestic midden deposit in Kalawao. Note the much larger size of the brown bottle glass flake (left) compared with the volcanic glass flake (right).



Historical Archaeology in the Leprosarium of Kalawao

In 1865, the Kingdom of Hawaii passed An Act to Prevent the Spread of Leprosy, which included a provision for the establishment of a leprosy settlement on Kalaupapa peninsula, on the north shore of Moloka'i Island (Greene 1985:12). Kalaupapa was chosen as an ideal place of isolation—a low peninsula set at the base of cliffs that rise to 1,000 m in places. By 1866, less than a century after the earliest recorded European contact with the Hawaiian Islands,² the Native Hawaiian population had been reduced by 70 to 93 percent, depending on the estimate of population at contact (Cordy 2007; Inglis 2004:69; Kirch 2007; Schmitt 1971; Stannard 1989). This dramatic decline was caused by introduced diseases such as influenza, smallpox, measles, and syphilis, for which indigenous populations had no natural immunity, a process that was ubiquitous in the Pacific Islands (Kirch and Rallu 2007). The decision to establish a quarantine station for people with Hansen's disease was also informed by Western stigma attached to leprosy in a Hawaiian government increasingly influenced by Europeans and Americans (Inglis 2004; Moblo 1998; Osorio 2002). The earliest quarantine settlement was established in the ahupua'a of Kalawao, the easternmost of the three ahupua'a comprising Kalaupapa peninsula, in January 1866 (Greene 1985:51). Over the next 35 years, thousands of individuals diagnosed with Hansen's disease and torn from their families and homes would be exiled to Kalawao, which would grow to become a community of around 1,100 people by the 1890s. Shortly thereafter, the settlement at Kalawao was gradually abandoned in less than a decade in favor of preferable land in Kalaupapa ahupua'a, which has a milder climate, is less prone to high winds and surf from the dominant northeasterly trades, and has a better natural harbor. The only remaining permanent residents of Kalawao after 1900 were the quarantined orphans of the Baldwin Home for Boys, which was finally abandoned around 1932 (Greene 1985:216–238), although analysis of bottle glass

Table 13-1. Volcanic Glass Artifacts Recovered during ARPK Field Research

Kala Catalog #	Field Coll #	Material Type	Object Name	Count	Color	Measurements	Description	Site
14758	0003_1_2_59	Volcanic glass	Flake	4	Black	<1cm	Small pieces of volcanic glass	Cistern area north
18699	0001_Op1_4	Volcanic glass	Flake	1	Black	0.7cm Long	Small volcanic glass flake	Bakery area
19074	PN5_Bag2_2	Volcanic glass	Flake	1	Black	NR	Tiny volcanic glass flake	Bakery area
19093	PN6_Bag2_1	Volcanic glass	Flake	1	Black	NR	Small volcanic glass flake	Bakery area
19227	PN19_Bag5_1	Volcanic glass	Flake	1	Black	NR	Small volcanic glass flake	Bakery area
19365	PN44_Bag4_1	Volcanic glass	Flake	1	Black	NR	Tiny volcanic glass flake	Store area

from Kalawao suggests that residents of the later settlement at Kalaupapa also may have continued to visit the old settlement (Flexner 2011).

While archaeological evidence for habitation of the Kalaupapa peninsula dates back over 600 years, the relatively short, intensive occupation of Kalawao as a Hansen’s disease settlement, followed by abandonment over the course of a few years, created an ideal scenario for archaeological research on the early period of exile in the leprosarium (Kirch 2002; McCoy 2005). Following a brief reconnaissance of the area in 2005, a more intensive archaeological survey was carried out from 2006 to 2008 as part of the ARPK project (Flexner 2010), consisting of two years of site recording, mapping, and surface collection and a final season of surface investigations and test excavations. This field research focused on an area interpreted as the core of the Hansen’s disease settlement between 1866 and 1900, documented a total of 15 previously unrecorded archaeological sites, and recovered over 8,000 individual artifacts. Included within this assemblage are bottle-glass artifacts showing evidence of retouch and use, a surprising but informative finding for this settlement.

Study Methodology

Artifact analysis for ARPK was carried out in curatorial facilities in Kalaupapa National Historical Park, according to a standing agreement with the National Park Service. During the 2006 and 2007 field seasons, each individual artifact was cleaned and given its own catalog number, recorded according to a standard protocol, illustrated, and photographed. In 2008, we were able to accelerate the

rate at which we recorded and analyzed much larger assemblages, as prior experience allowed us to group artifacts together (e.g., nondiagnostic green bottle-glass fragments from one location). During these analyses, we recognized bottle-glass artifacts that appeared to show evidence of retouch and/or use-wear, notably in the form of conchoidal fracturing along the artifact edge. Because these artifacts were scattered throughout the research area, a more systematic approach to the study of these artifacts was not carried out until 2008, when a large assemblage of worked glass was recovered from a single stone terrace.

The discovery of this assemblage led to an intensive investigation of worked glass tools from Kalawao (Figure 13-3). Microscopic analyses, potentially critical for understanding retouch in glass (Conte and Romero 2008), were not possible in Kalaupapa's curatorial facilities. A strictly macroscopic approach is used here, though future studies of worked glass from the leprosarium at Kalawao may include a microscopic component. Microscopic studies may not always be strictly necessary in situations where contextual information (Gibbs and Harrison 2008) and glass artifacts with clear evidence of flaking provide a basis for analyzing worked glass technologies, and we argue that this assemblage represents such a situation, though microscopic analyses would potentially provide some interesting insights. A standard suite of phenomena were recorded for worked glass artifacts (color, presence of seams, diagnostic marks, and so on). In addition, the macroscopic approach used here stems from analyses of the location of retouch and/or use-wear on the artifact in relation to bottle anatomy, an approach used in Wilkie's (1996) analysis of worked glass tools from a Louisiana plantation. This includes axes of variability such as the original location of the artifact in relation to a whole bottle (e.g., base, neck, etc.) and whether evidence for retouch or use-wear appeared on the inside or outside of the bottle shard.

Flaked Glass in the Settlement

Initial surface collections for ARPK consisted primarily of a series of randomly spaced, systematically aligned transects, ranging from 5m x 5m up to 5m x 25m, depending on the size and orientation of the feature being surface collected. A total of 26 artifacts exhibiting conchoidal fracturing or other evidence of retouch and/or use-wear were identified using this methodology in 2006 and 2007. Two bottle glass bases that appear to be cores for glass blades produced by percussion flaking have also been recovered in an area of Kalawao to the east of the ARPK research area, which was also known to have been inhabited during the Hansen's disease period (Erika Stein, personal communication 2009; see Figure 13-4). An additional 295 worked glass artifacts were identified in 2008 in household-scale operations, which consisted of intensive surface collections and test excavations targeting specific domestic structures. Of these worked glass artifacts, 151 came from ARPK_0055 Op. 3, a single operation to be discussed below, while the remaining 144 were scattered across the other features where operations were carried out. From this assemblage, the bottles with diagnostic seams and other marks were primarily mold-made and machine manufactured, indicating

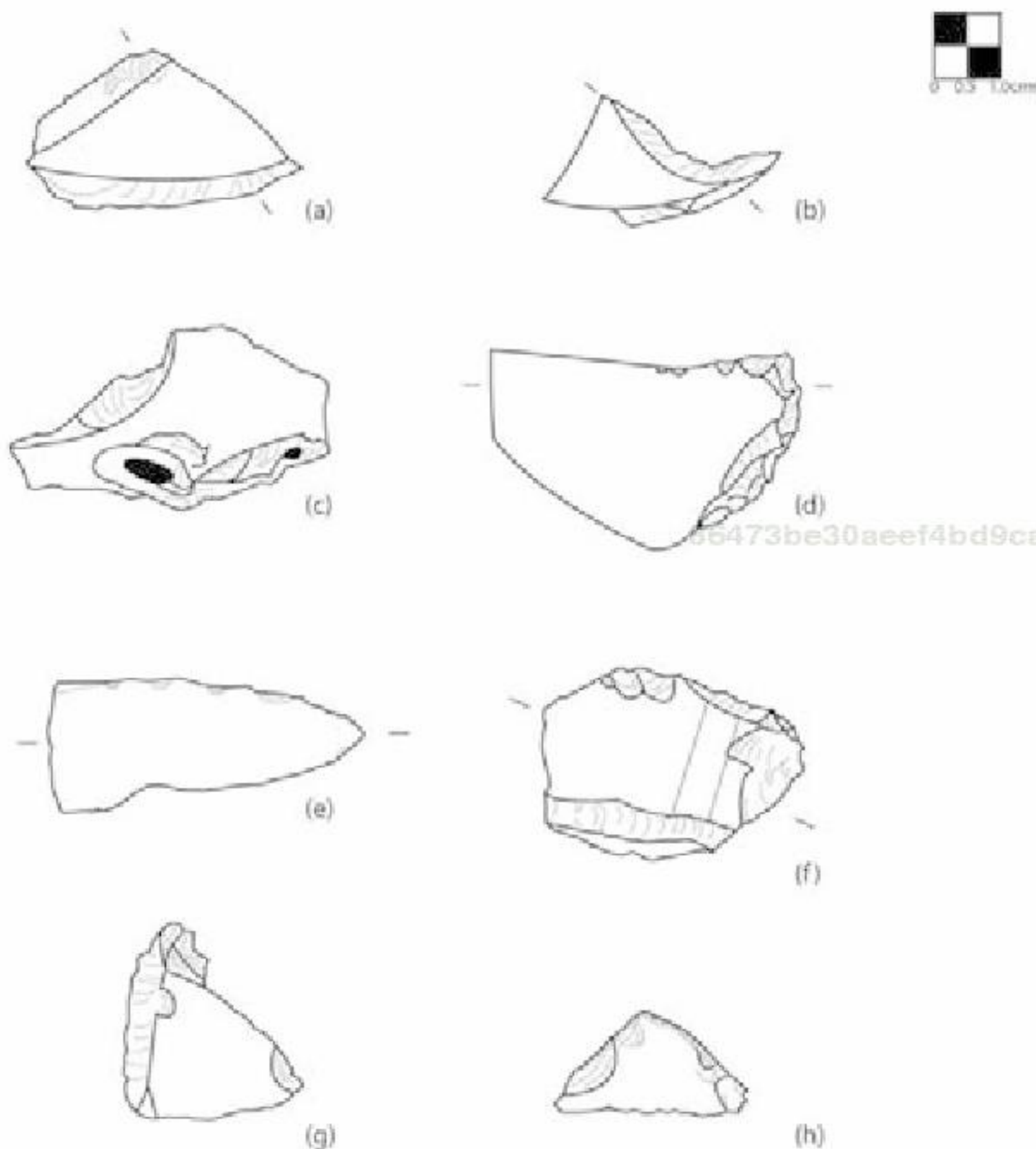


Figure 13-3. *Flaked glass artifacts from Kalaupapa: (a) green glass scraper, outside view, (b) clear glass scraper, inside view, (c) clear glass scraper on melted bottle glass, (d) green glass scraper, outside view, (e) clear glass scraper, inside view, (f) aquamarine glass scraper, inside view, (g) clear glass scraper, outside view, (h) clear glass scraper, inside view. Lines outside of artifacts indicate the orientation of the circumference of the whole bottle, when it could be determined.*

dates ranging from the late nineteenth to the early twentieth century. Among the worked glass artifacts, the dominant colors of glass were clear aqua (39 percent) and clear (25 percent), followed by brown (14 percent) and green (13 percent), with the remainder of artifacts comprising a variety of other colors. Compared with the total glass assemblage from 2006 to 2008, in which clear glass accounts for 73 percent of the total glass assemblage, followed by brown (9 percent) and clear aqua (8 percent), clear glass was much less dominant in the worked glass assemblage. From our observations of color, morphology, and manufacturing marks, we were able to determine that the bottles originated from a variety of sources and that their primary use had ranged from containers for medicine, condiments, and cleaning agents to soda and beer bottles (Flexner 2010:216–227, 2011).



Figure 13-4. *Knapped glass bottle base “core” with evidence of percussion flaking (image courtesy Kalaupapa National Historical Park/NPS, S. Eminger).*

The criteria for determining whether a glass artifact should be interpreted as a possible tool were based on the presence of conchoidal fracturing, ranging from a single conchoidal fracture to intensive flaking and retouch, and the presence of use-wear, especially on the artifacts from ARPK_0055 Op. 3. In some cases, artifacts are simply described as “possibly worked,” given that we must be cautious in attributing conchoidal fracturing on the surface of the glass to retouch and tool use (Conte and Romero 2008). Small flakes of glass recovered during excavation, where all sediment was screened through 1/8” mesh, generally fell into this category, as it is difficult to distinguish retouch flakes from general glass shatter in a midden context, though some clear examples of worked glass were recovered from test units in Kalawao domestic structures (Table 13-2).³

These artifacts came from 3 test units, out of 17 test units excavated at 4 separate domestic structures. One unit that contained worked glass was located outside of the collapsed remains of a stone wall footing for a thatch domestic structure built in traditional Hawaiian style, which was inhabited until at least 1893, based on a date from a coin in the associated midden deposit. The other flaked glass artifacts recovered from excavations were located outside a late nineteenth-century house with a standing masonry chimney. One of these artifacts, an amber bottle-glass flake that was recovered alongside a volcanic glass flake, was mentioned above. The other artifacts were recovered from deposits located outside a flat stone paving next to the standing chimney (Flexner 2010:160–181).

Informal experimental archaeology with modern glass carried out by the ARPK team showed that even brief use in simple activities, such as peeling fruit, resulted in notable use-wear, even on unretouched artifacts (Figure 13-5).⁴ In other cases, glass artifacts from the settlement have clearly been retouched, showing evidence for intentional flaking in the creation of a sharp edge. Examples of this kind of artifact include an intensively flaked scraper, a bottle base that appears

Table 13-2. *Flaked Glass Recovered during Archaeological Excavations in Kalawao*

<i>Kala</i> <i>Cat. #</i>	<i>Field Coll. #</i>	<i>Material</i>	<i>Object</i> <i>Name</i>	<i>Count</i>	<i>Color</i>	<i>Description</i>
19073	PN5_Bag2_1	Glass	Flake	1	Amber	Flake Of Brown Bottle Glass With Use-Wear
19392	PN47_Bag1_1	Glass	Flake	1	Olive	Black Bottle Glass (Olive), Used/Worked
19393	PN47_Bag1_2	Glass	Flake	8	Green	Green bottle glass, used/ worked
19395	PN47_Bag1_4	Glass	Flake	15	Brown	Brown bottle glass, used/ worked
19416	PN50_Bag1_1	Glass	Core	1	Green	Green bottle glass core, used/worked
19418	PN50_Bag3_1	Glass	Flake	6	Brown	Brown bottle glass, used/ worked
19420	PN50_Bag3_3	Glass	Flake	2	Green	Green bottle glass, used/ worked
19429	PN53_Bag3_1	Glass	Bottle	27	Clear aqua	Clear aqua bottle glass, including crown-top bottle neck, possibly used/worked
19433	PN53_Bag3_5	Glass	Bottle	15	Amethyst	Amethyst bottle glass, possibly used/worked
19441	PN54_Bag1_1	Glass	Bottle	60	Clear aqua	Clear aqua bottle glass, including crown-top bottle neck, possibly used/worked
19454	PN55_Bag1_1	Glass	Scraper	1	Green	Green bottle glass scraper, used/worked

to have been used as a glass core similar in form to volcanic glass cores known from elsewhere in Hawaii, and a glass scraper (Figure 13-6). These kinds of flaked glass tools are scattered throughout Kalawao, though in a fairly low concentration. Worked glass was considered anomalous in our investigations until 2008, when a large assemblage was discovered on a site complex in the research area.

ARPK_0055 Operation 3: An Activity Area in the Leprosarium

In 2008, one focus of detailed surface investigation and test excavations was the site complex known as ARPK_0055. Surface architecture and artifact assemblages suggested that this feature would provide valuable information about domestic life in Kalawao during the Hansen’s disease period. One part of the complex at ARPK_0055 was a small stone terrace with a scattering of artifacts on the surface,



Figure 13-5. *Peeling an avocado during experimental archaeology with a shard of glass, which resulted in the formation of microfracturing on the cutting edge.*

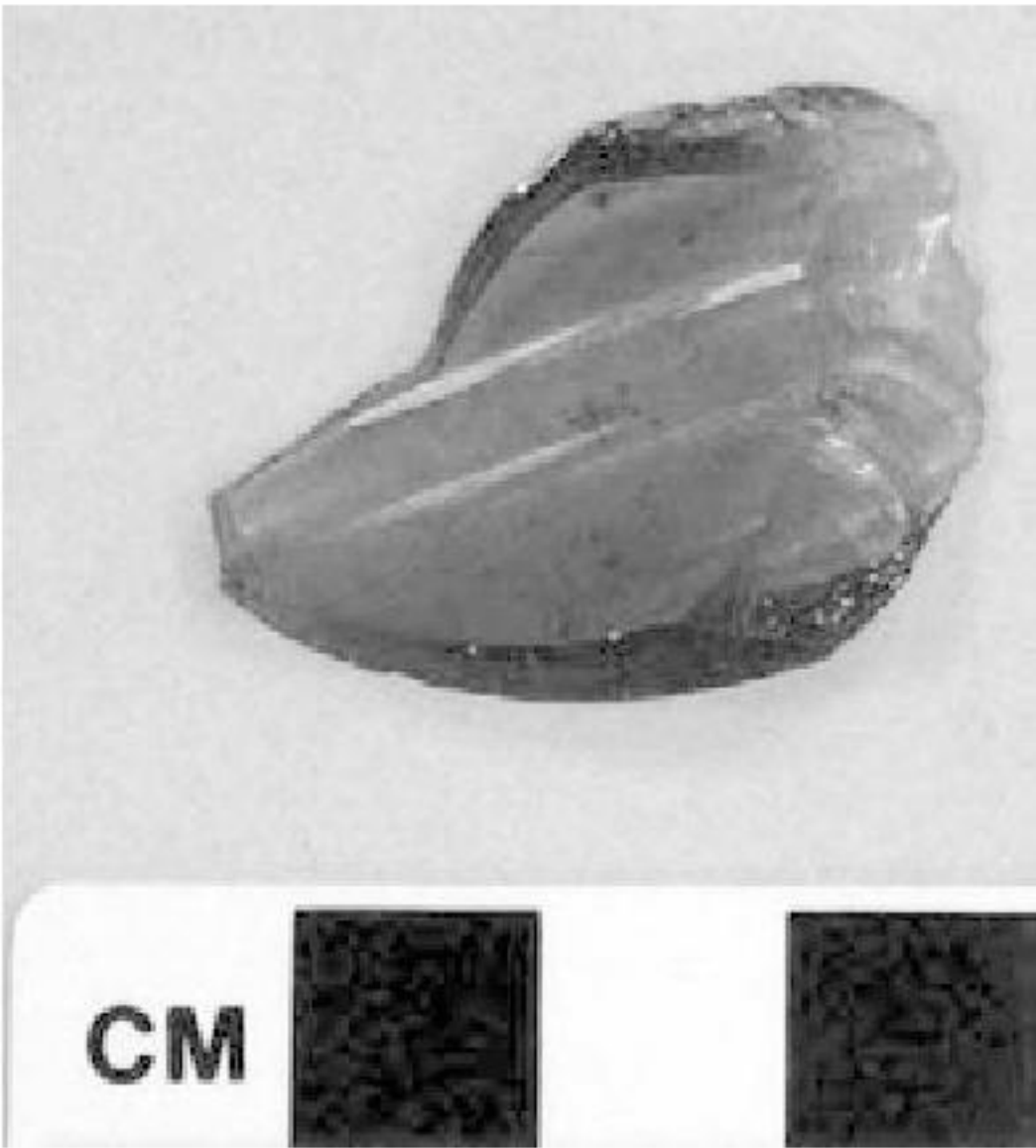


Figure 13-6. *Green bottle-glass scraper recovered during ARPK field research.*

including a diagnostic brown glass Clorox bleach bottle neck. During an investigation meant to document the context of this artifact, another diagnostic artifact was encountered: a clear glass “blade” with substantial edge damage (Figure 13-7). This elongated flake, produced by hard hammer percussion, is reminiscent of lithic core technologies not present elsewhere in the Hawaiian Islands, pre- or postcontact. Because of the apparent presence of important diagnostic artifacts, a surface collection was carried out in an 8 m x 5 m area, referred to below as ARPK_0055 Op. 3. This operation included the stone terrace mentioned above. All artifacts were piece-plotted, and a total of 333 glass, metal, faunal, and ceramic objects were recovered. Artifacts in this surface collection clustered heavily to the eastern part of the area, largely behind the stone terrace, suggesting a relatively concentrated refuse area, and the glass assemblage was highly fragmented (Figure 13-8).

Many of the glass artifacts showed evidence of retouch or use-wear. Of 257 glass artifacts recovered from ARPK_0055 Op. 3, 21.8 percent ($N = 56$) showed clear evidence of retouch and/or use, 37 percent ($N = 95$) showed possible evidence, and 41.2 percent ($N = 106$) showed no such evidence. Of the 56 definite cases, 69.6 percent ($N = 39$) had only use-wear, one had only been retouched, and 28.6 percent ($N = 16$) showed evidence of both. Other documented bottle scatters, such as those at ARPK_0026 and ARPK_0054 contained many more complete or nearly complete bottles in the same depositional environment, so the explanation for the higher level of fragmentation at ARPK_0055 Op. 3 should be based in human activity in the past.⁵ Furthermore, the presence of at least one clearly flaked bottle-glass artifact allowed us to interpret macroscopic conchoidal fracturing in terms of retouch. Small flakes and shatter were not present in the assemblage from ARPK_0055 Op. 3, though future excavations in the area with fine mesh screens may recover smaller artifacts not generally represented in surface collections. Regardless of whether these glass tools were manufactured in the area, the presence of a high percentage of worked glass artifacts exhibiting use-wear (98.2 percent; 55 out of 56) suggests that the stone terrace at ARPK_0055 Op. 3 is an activity area where worked glass tools were utilized intensively. Future microscopic analysis of these artifacts could clarify the specific activities for which they were used.

Diagnostic manufacturers’ marks on the bottle glass in this assemblage generally postdate the historically recorded date when Kalawao supposedly was “abandoned.” Manufacturers represented in the assemblage include the Owens-Illinois Pacific Coast Company, which was operating in San Francisco, California, from 1920 to 1964, the Hazel Glass Company, operating in West Virginia from 1920 to 1964, and a mark used by the Adolphus Busch Glass Manufacturing Company, operating in St. Louis, Missouri, between 1904 and 1907 (Toulouse 1971:26, 239, 406). Furthermore, the Clorox bleach bottle must postdate the initial establishment of that company in 1913 (Clorox Company 2009). This pattern is reminiscent of Gibbs and Harrison’s (2008:65) observations of a worked glass assemblage that appears contextually to postdate abandonment of the Geraldine Mine site in western Australia. Specifically, they suggest that the presence of numerous fragments of sharp broken glass would have hindered movement in the area in question, making an area that was known to be abandoned a more desirable venue for knapping glass. Unlike that situation, where the worked glass assemblage was interpreted as



Figure 13-7. *Glass blade recovered from ARPK_0055 Op. 3.*

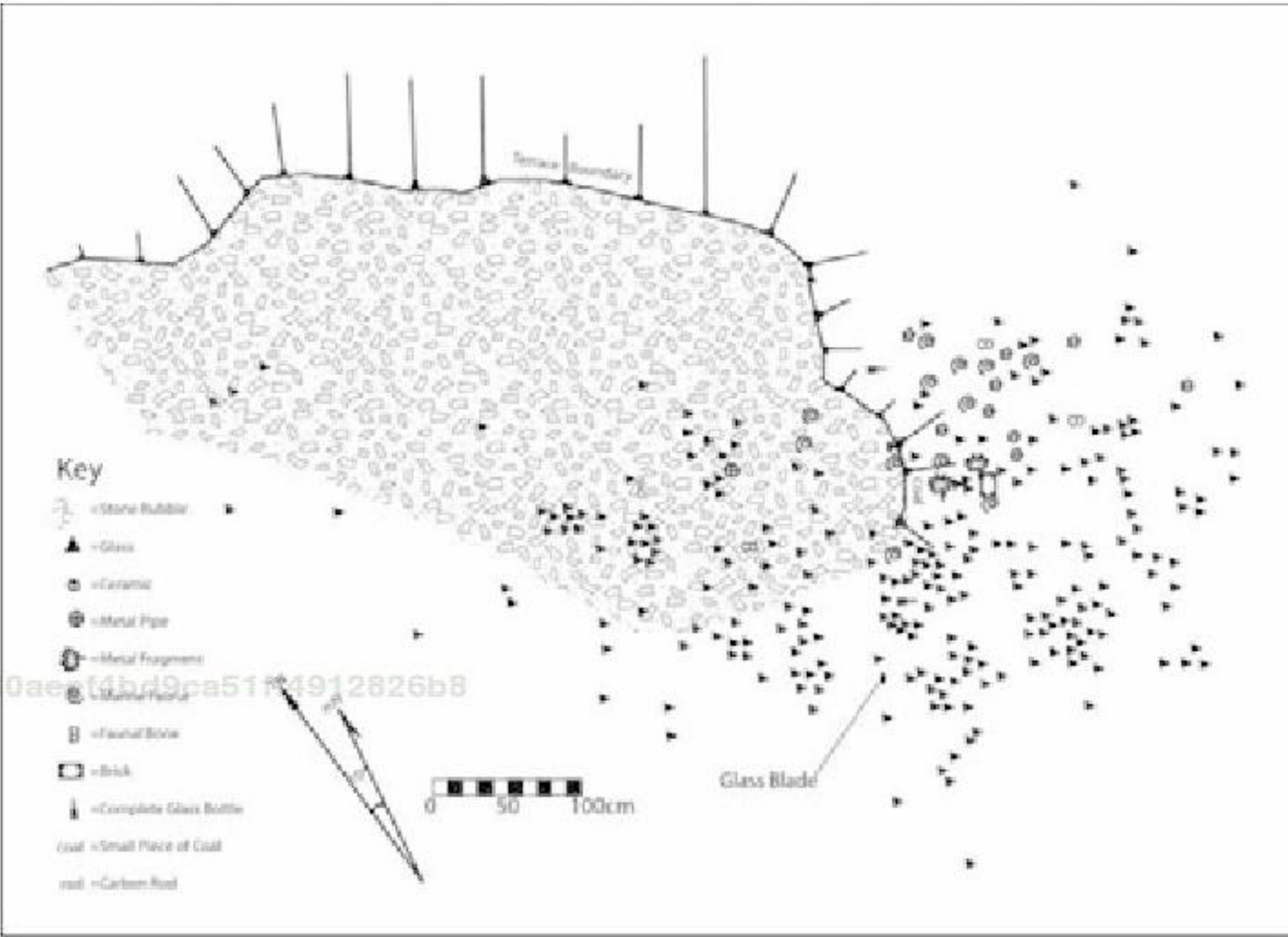


Figure 13-8. *Map of surface scatter at ARPK_0055 Op. 3.*

representing procurement activities for bottle glass after site abandonment, many of the worked glass artifacts from ARPK_0055 Op. 3 appear to have been used in the area. Thus, these artifacts must be interpreted in terms of “postabandonment” (abandoned here meaning no longer permanently inhabited) activities of orphans at the Baldwin Home for Boys or residents of Kalaupapa traveling to Kalawao, possibly to forage for fruits and vegetables growing in the recently abandoned part of the settlement (see Flexner 2011 for a wider discussion of bottle-glass dates

and the concept of abandonment in Kalawao). Regardless of the exact identity of the knappers, bottle glass in Kalawao shows evidence of extensive global trade networks with which the settlement was entangled in the Hansen's disease period through both official sources of charity and possibly illicit trade networks, despite the imposed isolation within which exiles lived. Yet the reuse of some glass artifacts as tools also suggests that certain materials, such as metal tools, were not so readily available.

In addition to containing more fragmented, retouched, or utilized glass than other parts of the ARPK research area, glass artifacts from ARPK_0055 Op. 3 revealed additional patterns not visible in the more scattered worked glass assemblage from elsewhere in Kalawao. There appears to be a greater tendency to use bottle bases and necks, with retouch or use-wear on the distal end of the tool, leaving the proximal "handle" smooth and unmodified. This pattern could be interpreted in terms of the properties of bottle glass as a raw material, though an alternative arises when considering the progression of Hansen's disease in the human body. Comparative study with other worked glass assemblages in Hawaii could clarify this possibility. *Mycobacterium leprae* attacks nerve tissue, resulting in the physical deformities associated with the disease, and more important for this study, a loss of feeling in the extremities (Britton and Lockwood 2004; Jacobsen and Krahenbuhl 1999), which would make it dangerous to handle small sharp artifacts such as glass blades. Thus these "base scrapers" and "neck scrapers" may provide evidence of adaptation of glass-tool technologies to the disabilities associated with Hansen's disease. This property of Hansen's disease in the human body may also further explain the discard of worked glass artifacts in the abandoned area of the peninsula, as those afflicted would not necessarily notice an injury caused by contact with shattered glass because of the anaesthetic quality of the nerve damage.

An example of what we have termed a "base scraper" is an aqua bottle base that has been broken off at an oblique angle and exhibits use-wear along the distal apex of the breakage. An off-center suction mark indicating machine manufacture suggests a post-1880s date for this bottle (Jones and Sullivan 1989:38–39). During our informal experiment with bottle breakage, we were able to replicate this pattern of breakage and noted the utility of leaving the base of the bottle intact to provide a large smooth surface with leverage to scrape or to gouge with the distal apex of the scraper (Figure 13-9). This smooth surface was large enough so that people with considerably decreased function in their hands could still manage the tool. There was also some evidence of use of bottle bases broken off at the manufacturing seams to provide a smaller scraper, albeit one with a sharp proximal edge. Neck scrapers had a broader morphology of types, with varying amounts of bottle neck preserved as a proximal handle. One of the types of neck scrapers, similar to the base scrapers, preserved a distal gouging apex with wear on both interior and exterior faces. This pattern occurred in a clear green soda bottle neck from this assemblage as well as in a clear patent medicine bottle recovered nearby. The other form of neck scraper featured vertical breakage along the manufactured seams of the bottle, with use-wear on exterior faces and a distinct lack of a smooth proximal surface (Figure 13-10).



Figure 13-9. *Peeling a breadfruit with a base scraper produced during experimental archaeology.*

Location of retouch on the original bottle was used effectively by Wilkie (1996) in her analysis of glass tools from a Louisiana plantation. Included in that study was an analysis of interior versus exterior contact edges, which showed that the exterior was generally used in the leading edge for glass tools. Wilkie suggests that this pattern “may represent a personal preference, as this decision [whether to use the interior or exterior as the leading edge] affects how one grips the tools” (Wilkie 1996:195). Among the 56 definite worked glass artifacts from Kalawao, the majority ($N = 35$) showed evidence for retouch and/or use-wear on both sides of the shard, while 12 showed evidence for use or retouch on the exterior and 9 for use or retouch on the interior of the shard. There are several possible explanations for this pattern, depending on the activity for which the tools were intended (i.e., scraping or cutting of animal or plant material), the personal preference and level of disease advancement for the tool user, and the personal preference of the toolmaker, though further research is necessary to clarify this pattern.



Figure 13-10. *Glass neck scrapers of the type broken along the vertical axis of the bottle.*

Conclusions: Glass-Tool Morphology, Innovation, and Disability

Worked glass recovered from Kalawao provides valuable information for understanding daily life for Hawaii’s early communities of Hansen’s disease exiles, both as individuals living on the Hawaiian Islands during a time of historical and material transformations and as individuals isolated by the Kingdom of Hawaii’s 1865 quarantine policy. Orthodox histories present the early years of life in the leprosarium at Kalawao in terms of drunkenness, death, and despair (Greene 1985:61; Tayman 2006). Improving conditions beginning in the late nineteenth century are usually attributed to the missionaries working in the settlement (Daws 1973; Stewart 2000; cf. Moblo 1997), but archaeology points to evidence of efforts by members of the local community to ameliorate the difficulties of their situation (Flexner 2010, 2012). The worked glass assemblage documented above represents significant innovation as well as continuity in tool technology driven by Hansen’s disease exiles in Kalawao, most of whom were Native Hawaiians. The presence of tool forms resulting from bifacial reduction of glass bottles, which were a much larger source of glass that could be flaked than the volcanic glass nodules of Hawaii, represent the successful adaptation of indigenous technology to a new medium. Innovation among this group of industrious exiles is represented by glass-tool forms that do not simply mimic traditional Hawaiian volcanic glass forms.

The presence of tool forms, such as base and neck scrapers and gouges, that may relate to disabilities associated with the progress of Hansen’s disease provides a valuable insight into the embodied connection of people to the material world, as mediated by the presence of a sensation-altering disease. The creation of some of these forms is connected to people’s adaptation to disabilities (Hubert 2000),

in this case, the loss of sensation in the hands, and thus the danger of using small sharp tools that could result in deep cuts that might not be noticed by the tool user. Furthermore, glass bottle cross-dating of this assemblage reflects the continuing use of Kalawao after permanent habitation shifted to Kalaupapa and the continued toolmaking and possibly foraging activities of exiles in the settlement well into the twentieth century.

A worked glass assemblage from the leprosarium at Kalawao provides new information about aspects of daily life in the institution. The toolmaking documented in this study belies the myth of laziness and dependence of Native Hawaiians on outside help in the early years of the settlement, which can be related to contemporary myths about leprosy and colonialism (Moblo 1997). The presence of unique forms of glass tools provides useful insights into material responses to disability as informed by the historical context of the leprosarium of Kalawao. In cases where archaeological worked glass does not follow traditional lithic forms, these tools may represent something other than the issues of contact, colonization, globalization, or indigeneity of the producers and users. The case of Kalawao suggests that disability and the embodied interaction of people and tools can represent parallel processes of hybridization alongside the use of introduced materials to produce traditional forms of technology. Accounting for the many historical processes affecting the people who produce hybrid material culture can provide new insights into the lives of people living in situations of cultural encounters and colonialism and the objects that structured those encounters.

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Notes

1. Ahupua’a are traditional Hawaiian land divisions.
2. The earliest documented contact between Europeans and Hawaiians was with Captain Cook and the ships HMS *Resolution* and *Endeavour* in January 1778, rumors of a sixteenth-century Spanish shipwreck notwithstanding (Beaglehole 1966).

- 3. The problem lies with the function of glass objects before flaking, as glass bottles, unlike nodules of volcanic glass, served a purpose other than raw material for tools. All volcanic glass shatter on a site can be interpreted in terms of tool production, while bottle glass shatter may simply be a result of discard.
- 4. Admittedly, modern glass composition differs from that of historic glass, but the experimental archaeology was carried out to determine generally whether certain activities, such as peeling fruit, would leave macroscopic use-wear on artifacts.
- 5. Archaeologists who have worked in Kalaupapa were consulted to ensure that these artifacts do not represent the activities of modern bottle knappers.

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