

# Bottling Paradise: The Future of Glass Bottle Archaeology in Hawai'i

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*As common-place consumables bearing the marks of datable production techniques and often durable labeling, glass bottles are a goldmine for any archaeologist equipped with the right analytical toolkit. By learning to decipher the age, sources, and uses of glass bottles, archaeologists not only gain a valuable tool for dating historic sites, they open a window into the trade networks and consumption patterns of the past, topics that are perennial favorites of the discipline. In analyzing glass bottle assemblages, certain aspects of a bottle's life can be determined from close inspection of the bottle itself. These include: date of manufacture, place of manufacture, intended function, particular lip shape (i.e., bottle type), intended content, and place of bottling.*

**Keywords:** Hawai'i, bottle glass, artifact analysis, historic archaeology

## Introduction

Humans have fashioned objects from glass for thousands of years, first into small ornaments and later into hollow-bodied vessels. Glass bottle production made its way down to the present from the ancient kilns of Mesopotamia, through the farthest reaches of the Roman Empire, into the woods of medieval Europe, and across the world's oceans to East Asia and the Americas through Early Modern European missionization and colonization (Corning Museum of Glass 2002a, 2002b; Chopinet 2019). Glass bottles accompanied Europeans and Euro-Americans as they first encountered and later missionized the Hawaiian Islands. As Hawai'i entered ever further into global trade and political networks, glass bottles—used in canning, chemical storage, scientific research, and beverage bottling, often made specifically for the Hawai'i market—became ubiquitous in Hawaiian life, and subsequently the archaeological record of the islands (Elliott & Gould 1988). As common-place consumables bearing the marks of datable production techniques and often durable labeling, glass bottles are a goldmine for any archaeologist equipped with the right analytical toolkit. By learning to decipher the age, sources, and uses of glass bottles, archaeologists not only gain a valuable tool for dating historic sites, they open a window into the trade networks and consumption patterns of the past, topics that are perennial favorites of the discipline.

With the right training, and a healthy dose of curiosity, glass identification and analysis proves no more difficult than the study of any artifact class. In effect, the goal is to reconstruct the life of a bottle to whatever extent possible. In North America, this pursuit has been facilitated by print publications like *The Parks Canada Glass Glossary*

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(Jones & Sullivan 1989), the *Intermountain Antiquities Computer System (IMACS) User's Guide* (University of Utah et al. 1992), and the *History of Drug Containers and Their Labels* (Griffenhagen & Bogard 1999). These sources are augmented by the Society for Historical Archaeology website, which hosts *Bottles on the Border* (Lockhart 2010), the *Historic Glass Bottle Identification & Information Website* (Lindsey 2021a), and the *History of Drug Containers and Their Labels* (Griffenhagen & Bogard 1999). On a more limited scale, work has also been done on Japanese bottling (Ross 2009).

While some bottles recovered from sites in Hawai'i can be found in these overseas resources, no reference currently tells the whole story of bottles in Hawai'i from an archaeological perspective. It is important to note that while no bottles were ever manufactured in Hawai'i, numerous bottlers were known to exist. Furthermore, in the opinion of the authors, bottles discovered archaeologically in Hawai'i are a strong indication of local consumption, because they were almost certainly utilized in Hawai'i. Therefore this article will refer to bottles found archaeologically in Hawai'i, whether they were filled by local bottlers or not, despite the fact they were not manufactured in Hawai'i, as Hawaiian bottles. The two major books on Hawaiian bottles were written for collectors and last updated more than 30 years ago (Millar 1986; Elliot & Gould 1988). Although providing a useful entry to the world of bottling in Hawai'i, neither text offers the depth of information needed to fully flesh out the life of a bottle. What the archaeologist working in Hawai'i is left with is an incomplete understanding of their glass assemblages, particularly those bottles made specifically for the market in Hawai'i, and local bottling of beverages meant to cater to island tastes. How then can archaeologists improve glass bottle analysis in Hawai'i? What insights into the islands' past and present can be gained from such research? This short commentary will attempt to answer these questions by exploring the current strengths and weaknesses of glass bottle analysis in Hawai'i. The discussion will then shift to how this research might proceed in terms of individual, group, and institutional involvement both within and beyond the academy and profession of archaeology.

## Reference Assemblage

The Hawaiian bottles referenced throughout this commentary include both those encountered during cultural resource management (CRM) archaeology in Honolulu, which were collected from a sizable historic trash dump dating to the early twentieth century (Figures 1–5), and select items from the private collection of Stan Fuller (Figures 6 and 7).

The archaeological assemblage from Honolulu comprised 894 artifacts, of which 353 are glass containers. The earliest bottles in the assemblage had *terminus post quem* (TPQ; i.e., earliest possible production dates) from the late 1800s onward ( $n = 37$ ). Most of the bottles had TPQ from 1900 to 1925 ( $n = 160$ ) and 1925 to 1949 ( $n = 107$ ). The smallest portion of bottles had TPQ falling between 1950 and 1968, with 1968 being the cut-off date for the collection of artifacts at the time of the project ( $n = 13$ ). The age and general content of bottles was relatively well understood across the assemblage, with a 90%-or-better rate of identification for both types of information. The point of origin (place of bottle manufacture) and bottling location (place where bottles were filled) were more difficult to ascertain, with identification only possible for a quarter or a third of the bottles, respectively. There is clearly room for improvement here, but we must first look at how

bottle identifications are made in terms of the strengths and weaknesses in bottle research as it stands today.

## Strengths

In analyzing glass bottle assemblages, certain aspects of a bottle's life can be determined from close inspection of the bottle itself. These include: date of manufacture, as derived from historical developments in method of manufacture and required markings on bottles; place of manufacture, from maker's marks; intended function, related to overall body and particular lip shape (i.e., bottle type); intended content, as indicated by decoration and labeling; and place of bottling, that is, where bottles were filled with contents.

A good place to start is with the manufacturing technique used to make a bottle, which can reveal its age (University of Utah et al. 1992; Miller & Sullivan 2000; Schulz & Allen 2016; Lindsey 2021b). Every method of bottle production leaves behind evidence on some portion of the resulting bottle—whether it be a seam, the general shape, a scar, or its polish. Taken together, these clues reveal the processes used to create a particular bottle. Current knowledge about the history of developments in bottle manufacture enables the tight dating of bottle TPQs from the nineteenth and twentieth centuries. For instance, a certain small patent medicine bottle from the assemblage (Figure 1) was definitely produced after 1905 on an Owens Automatic Bottle Machine, given the pronounced suction scar on its base.

Another feature that helps to date glass bottles is the regulatory marks that governments sometimes made manufacturers emboss onto bottles intended for specific uses. For instance, from 1935 up until 1964, the U.S. required all alcohol bottles to bear the words “FEDERAL LAW FORBIDS SALE OR RE USE OF THIS BOTTLE” (Whitten 2021). A Hiram Walker and Sons liquor bottle from the reference assemblage (Figure 2) is embossed with this exact turn of phrase, thus dating it to between 1935 and 1964. More locally, the embossed letters “T.H.” can be used to date bottles to the territorial era in Hawai'i (1900–1959) (Figure 3) (Elliot & Gould 1988).

Over time, manufacturers increasingly printed information about themselves (i.e., maker's marks) and the manufacturing process directly on the bottles, often due to regulatory intervention (Lindsey 2021c). These often-stylized markings reveal everything from the company that made the bottle, to the bottle's year of manufacture, and even the bottle's factory of origin and mold that produced the bottle. Such markings further reveal that the small patent medicine bottle with a pronounced suction scar mentioned above was actually produced by the Owens-Illinois Glass Company in Newark, Ohio in 1939 (Figure 1). With companies like Owens-Illinois, bottles are typically printed with the plant code to the left, the company logo in the middle, and the year of manufacture on the right (Lockhart & Hoinig 2018). This pattern is not universal, however, and each glass manufacturer established their own system (Lindsey 2021c).

The particular shape and decoration of a bottle can be used to infer its intended use (i.e., its probable content). For instance, a liquor flask (Figure 2) looks quite different from a milk bottle (Figure 5). Known as a “Dandy flask,” this type of liquor flask achieved popularity in the very early 1900s, despite being continuously produced to this day (Lindsey 2021d). The milk bottle, on the other hand, is a round half-pint of the bottle style that was more typical before square-sided milk bottles came into vogue in the 1940s (Lindsey 2021e). We can therefore infer from its shape and markings that this bottle was produced between 1905 (when machines for making bottles became fully automatic) and the 1940s.

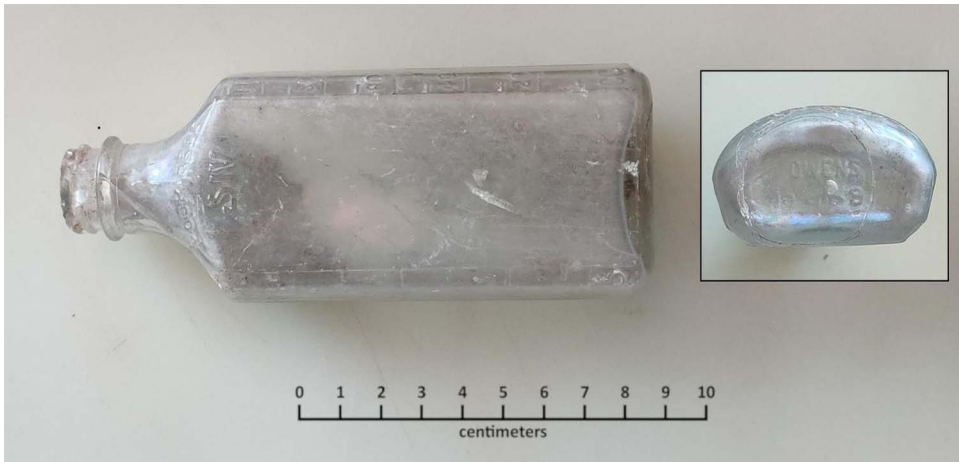


Figure 1. A small patent medicine bottle, machine made in Newark, Ohio in 1939.

The decoration and labeling of bottles also speak to their intended contents while potentially revealing the date and location where those contents were added (i.e., bottled) (Griffenhagen & Bogard 1999; Lockhart & Brown 2019). With the aid of research into corporate histories and evolutions in bottle shape and labeling, an archaeologist can derive the place and date of bottling. At present, this has been done primarily for national brands in relation to other regions in the continental United States (Lockhart & Miller 2007; Lockhart 2010; Lockhart & Porter 2010). Such research into The Coca-Cola Company enabled the



Figure 2. A Hiram Walker and Sons liquor bottle, machine made between 1935 and 1964, as evidenced by the regulatory marks embossed across the bottle's upper body.



Figure 3. A machine-made soda bottle with “T.H.” embossed on the bottle’s shoulder, dating this bottle to the territorial era in Hawai‘i’s history.

dating of one bottle from the assemblage to between 1938 and 1951 (Figure 4). More locally, the half-pint milk bottle previously mentioned (Figure 5) bears a label from the Honolulu Dairymen’s Association, a large conglomerate operating in the islands in the



Figure 4. A Coca-Cola bottle produced between 1938 and 1951.



Figure 5. A Honolulu Dairymen's Association milk bottle, machine-made between 1905 and 1940.

early twentieth century, within the same timeframe as indicated by the bottle's form (Allen 1979; Duchemin 1999; Young 2018).

The full breadth of information described above can only be obtained from archaeologically-recovered glass bottles with the aid of sufficient preexisting research into corporate histories of bottle manufacturing and content bottling. In the continental United States, these sources are increasingly available as part of the growing body of research being conducted by the Bottle Research Group (Lindsey 2021c) and other scholars (Love 1983; Lockhart 2010; Lockhart & Porter 2010), comprising a diverse group of academics, professional archaeologists, and collectors interested in the history of glass. This robust body of scholarship on glass bottles is not yet matched in Hawai'i.

## Weaknesses

Despite the interpretive potential of glass bottles presented above, and a community interest in the historic glass bottles of Hawai'i, there is still a notable underrepresentation of archaeologically-relevant into this artifact class. For example, the most in-depth references that exist on the subject of Hawai'i-filled soda bottles were written by and for bottle collectors (Millar 1986; Elliot & Gould 1988). Additionally, there is a general lack of archaeologically-relevant research. One example is the absence of company histories, like those found in the Bottle Research Group, that would indicate when and where local bottlers in Hawai'i were in business. With that being said, more recent publications do cover the history of brewing in Hawai'i, but even these do not focus on bottles (Schmitt 1997; Kan 2021). There is even less information for Hawaiian dairy bottles, as there are few resources for identification. Researchers instead rely on scattered internet references to gather ad hoc information on local company histories and bottle evolutions ranging from collectors' forums and blogs to archived newspaper articles (Allen 1979; Duchemin 1999; Young 2018). In other words, the minimal and disproportionate availability and accessibility of bottle research on various types of bottles further complicates the process of analysis. These references not only lack the historical rigor of the Bottle Research Group's work, but they are also ephemeral postings on the internet that may be taken down without warning. Nonetheless, this is what currently exists.

One perfect example encountered in the reference assemblage is a milk bottle bearing the marks of the Honolulu Dairymen's Association (Figure 5). Such old milk bottles, embossed with the names of long-vanished local dairies, are commonly encountered during archaeological investigations across the Hawaiian Islands. As discussed above, this particular bottle can be dated to between 1905 and 1940 based on its form and other physical evidence of how it was manufactured. cursory research revealed that the Honolulu Dairymen's Association was a powerful business consortium that controlled milk sales and distribution on O'ahu in the late nineteenth and early twentieth century (Allen 1979; Duchemin 1999; Young 2018). If more precise information was known and compiled into an easily digestible form, the dating of this artifact could be tightened up. In knowing when and where this association was bottling under its own name, we could also potentially learn the company's patterns of circulation around O'ahu. At present, however, there is no source that consolidates such corporate bottle histories. The same holds true for most bottles imported to Hawai'i from Asia, as well as those originating from the Western U.S.

There are a number of factors that contribute to this absence of adequate archaeological reference material in Hawai'i. The apparent need for consistent, high-quality engagement with glass bottles at the university level makes it hard for students to learn both the interpretive potential and the skills to identify such artifacts. Furthermore, based on the authors' experiences, archaeologists working in the Islands interact with and perceive glass bottles as everything from a nuisance to a curiosity and, at best, a personal passion they pursue for themselves in their free time. In a circular manner, serious scholarship into the subject lacks necessary encouragement due to a general lack of institutional advocacy—from regulatory agencies and professional organizations—in support of bottle research in Hawai'i.

There is also a profound disconnect between glass bottle enthusiasts in the local community and their archaeological counterparts. Judging by easily accessible internet sources like the Hawaiian Historical Bottle Collectors Club (<https://hawaiiancollectables.org/bottle-club>), many members of our local community have a deep connection to Hawaiian bottles. This particular bottle group has regular monthly meeting where members gather to share their mutual interest in what they term 'Hawaiian bottles.' From these meetings, many of their members have developed a profound knowledge of the subject. Friction arises between archaeologists and collectors over the question of "bottle hunting," which amounts to looting in the eyes of archaeologists. When any artifact is taken from the ground without archaeological recordation, information is permanently and irrevocably lost. But can collectors be blamed if archaeologists fail to express the proper amount of professional interest in what is a bona fide artifact class? Although there have been CRM reports utilizing bottle analysis as a part of their research, as of now, these data are still largely held in grey literature, which is difficult for both laypeople and archaeologists to access and use. They are especially difficult to use for analysis and offer little in terms of local engagement. By refusing to engage with non-archaeological interests in glass bottles, a great deal of knowledge is subsequently lost while no progress is made in curtailing bottle hunting.

## Possible Solutions

A good place to start in addressing deficiencies in our knowledge of historic glass bottles in Hawai'i is to look at how similar research is done in the continental United States. Research accessible through the Society for Historical Archaeology's

Historic Glass Bottle Identification & Information Website was undertaken by individuals and small groups working towards filling gaps in knowledge related to particular glass makers and regional beverage bottlers (Lockhart 2010; Lindsey 2021c). How can such an approach be translated to Hawai‘i, and what support would aid in this localized endeavor?

Right off the bat, the level of general enthusiasm surrounding glass bottles in Hawai‘i should be harnessed in undertaking this work. It is not only archaeologists that share this passion. For some time there has been a sizable community of collectors interested in local bottles. While bottle hunting can threaten archaeological sites, a lack of engagement with the collecting community will not make the problem go away. Working with the collector community to engage their knowledge, while educating them on the archaeological value of glass bottles and the threat posed by looting, is an approach that creates allies and expands public involvement with archaeology. It has been the experience of the authors of this paper that when the archaeological value of bottles is explained, community collectors are willing and eager to cooperate with archaeologists. A few enthusiastic professional archaeologists have also independently gathered a good deal of information on glass bottles where they live and work in Hawai‘i. However, there is no existing space where individuals can share information in an archaeological mode and thereby assist one another in scholarly research.

By providing such a moderated space—virtually and through the sponsorship of in-person meetings like workshops and symposia—organizations like the Society for Hawaiian Archaeology (SHA) can provide demonstrable support for glass bottle research in Hawai‘i. Academic institutions and museums can support such work by curating comparative collections of this local artifact type (even if only virtually). What is most important is that a permanent and public home be created for the sharing, accessing, and archiving of the findings from this research.

Meanwhile, academic archaeologists are positioned to strengthen glass bottle knowledge in Hawai‘i not only through their own research, but by encouraging undergraduate and graduate students to fulfill the research components of their degrees by exploring this artifact class. This should also involve building connections between archaeologists and other disciplines, particularly Asian language and area studies departments. Such interdisciplinary collaboration would greatly expand our ability to interpret Asian-sourced bottles, especially those with markings in non-Western scripts that appear in Hawaiian archaeological assemblages.

The sort of glass bottle reference material that Hawai‘i needs is best approached through the gradual accumulation of manageable units of research. These would, ideally, focus on individual bottling companies (i.e., soda works), breweries, and dairies throughout the islands and overseas. Research on corporate histories using sources like company records and newspaper advertisements (Love 1983) not only provides TPQ dates for artifacts bearing a company’s name or maker’s marks, but helps the archaeologist to build datable evolutions of bottle shapes and labeling (Lockhart 2010; Lockhart & Porter 2010). KIST (Figure 6) and Pacific (Figure 7) sodas are just two examples of the many locally-bottled brands that need more research to be done. The results of such research could be distributed in short publications (Lockhart 2010), or through a curated online database of Hawaiian glass bottles (cf. Lindsey 2021c).





Figure 6. A KIST Beverages bottle evolution, from the collection of Stan Fuller.



Figure 7. A Pacific [Soda Works] bottle evolution, from the collection of Stan Fuller.

## Relevance

While glass bottles are fragile, glass is a durable substance, making bottles and their fragments ideal candidates for archaeological recovery and analysis. As such, glass bottles are a great diagnostic tool for dating some archaeological sites. Additionally, their careful identification and analysis provides a window into the larger trade networks and smaller-scale consumption habits of past peoples in Hawai‘i. For example, bottles manufactured in foreign lands, produced for the wartime U.S. military, filled with Asian medicine, and sold by the dairy that once operated out of the University of Hawai‘i at Mānoa have stories to tell that deepen our understanding of the lived history of Hawai‘i.

Ultimately, these bottles speak to the Hawaiian Islands’ evolving dependence on imported goods. As evidenced in the archaeological and historical record, glass was once the container-of-choice for food and non-food products, with local contents often filling bottles that went on to circulate through multiple re-fillings in the local food system. As the need for sustainability becomes more acute, we can look to archaeological evidence of more circular past economies—in the re-use of things like glass bottles—to conceive of a less disposable future. Expanded knowledge of local provisioning systems from the more recent Hawaiian past can also help support and contextualize ongoing projects to promote local foods and beverages for local consumption. Such a model of researching the past for the sake of reimagining a cleaner future certainly presents itself with viable applications across Oceania as well.

## Conclusion

Historic glass bottles hold so much potential. They not only inform our understanding of the past, but inspire a more sustainable future. Yet despite such potential, there is work to be done. Much of the work involved in creating a comprehensive scholarly reference for Hawaiian bottles could be accomplished by individuals and small groups who are already enthusiastic. It is imperative to establish the groundwork for a strong repository of historic glass knowledge in Hawai‘i. Existing institutions and organizations can provide the advocacy and practical support needed to complete and maintain this ongoing work. Any such research must also engage with local communities of interest and provide educational outreach in an effort to gain allies in the protection of the archaeological record.

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