Identification and Analysis of Utilized Glass in Early Colonial Contexts: A Case Study from 17th-Century Rhode Island

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ABSTRACT

Utilized bottle glass—wine bottle sherds reused in ways similar to lithic tools—is often identified on 19th-century archaeological sites around the world. These artifacts are less frequently recognized within earlier artifact assemblages, however. Existing macroscopic and low-power microscopic approaches are evaluated to identify and analyze utilized bottle glass from two 17th-century Anglo-colonial house sites in Rhode Island. Macroscopic visual inspection of a working edge was used to identify 15 examples of utilized glass tools. Attempts to ascertain the types of activity and substrate upon which the tools were used through low-power microscopy were only occasionally successful because of the weathering patina on the glass. These mixed results suggest a combination of methods is most appropriate for studying utilized glass in early colonial contexts.

Introduction

Since the mid-20th century, archaeologists have repeatedly recovered utilized bottle glass—reused, worked, chipped, and knapped bottle sherds—on historical sites around the globe, including sites of European colonialism (Griffin 1949; Shaeffer 1961; McCary 1962; Allen 1969, 1973), slave plantations and maroon communities (Wilkie 1996; Sayers 2007:154; Ahlman et al. 2014), and colonies of exiles with Hansen's disease (Flexner and Morgan 2013). On colonial period sites, which represent the focus of this article, archaeologists have most often, though not always (Clark 1981), attributed utilized glass tools to native peoples who applied traditional methods of stone tool manufacture to create new tools from industrially manufactured and imported glass bottles (Hayden and Nelson 1981; Hayden and Deal 1987; McEwan 1991; Robbins et al. 2004; Pedrotta and Bagaloni 2005; Allen 2008; Conte and Romero 2008; Ulm et al. 2009; Flexner and Morgan 2013). In colonial contexts, utilized glass artifacts may not only manifest the presence of indigenous peoples, but also demonstrate the persistence of their cultural traditions through innovation during and after European contact. Archaeological study of utilized glass has focused, however, on 19th-century sites where specimens are found in greater numbers and in better states of preservation in comparison to those from 17th- and 18th-century sites. This paper addresses some of the challenges and possibilities of studying utilized glass recovered from early colonial sites using methodologies previously applied to later sites.

For the past half century, many archaeological studies of utilized glass have focused on the problem of distinguishing intentionally worked or utilized glass from so-called pseudotools—sherds that closely resemble, but were never used as, tools (Wilkie 1996; Martindale and Jurakic 2006; Allen 2008). The most obvious examples of utilized glass tools emulate preexisting stone tools in form and knapping technique (MacCord 1973; Harrison 2003; Flexner and Morgan 2013). Several hafted glass tools collected as ethnographic curiosities in Australia are also curated in museum collections (Allen 2008:87). Yet, such specimens are rare to nonexistent on most archaeological sites. More often, utilized glass tools are difficult to identify because glass containers break on impact into sherds that resemble traditional lithic forms, such as scrapers, knives, and burins. Furthermore, fortuitous fragmentation leaves conchoidal flake scars resembling those created by cutting, scraping, and chopping activities (Martindale and Jurakic 2006). Finally, postdepositional disturbances such as trampling of archaeological sites chip the edges of broken glass in ways that closely resemble the traces left by tool use (Cooper and Bowdler 1998; McBrearty et al. 1998; Martindale and Jurakic 2006). Recognizing the utilization of bottle glass as an extension of lithic technologies, historical archaeologists have drawn on and applied longstanding methods of lithic analysis common to prehistoric archaeology to more accurately and consistently identify and analyze utilized glass. Historical archaeologists have often turned to the study of the glass tool's working edge—the sharpened edge of the sherd used for various cutting and scraping

activities (Hayden and Nelson 1981; Wilkie 1996; Cooper and Bowdler 1998). Following the trajectory of ever more refined usewear analysis, archaeologists have more recently applied low-power microscopy of less than 100× magnification to more conclusively identify utilized glass tools, the specific types of activities for which they were used, and the substrates against which they were applied, such as leather, wood, or bone (Martindale and Jurakic 2006; Conte and Romero 2008).

During the past decades, archaeologists have continually refined their methods of identifying and analyzing utilized glass artifacts, but these methods remain largely untested on glass bottles manufactured before the 19th century. Utilized glass tools from 17th- and 18th-century sites of colonization pose two additional challenges to analysis and interpretation. First, they are frequently found in small quantities—often fewer than 10—on early colonial archaeological sites (MacCord 1969, 1973; Reinhart 1993; Heite and Blume 2008:247–269). Second, glass manufactured during these centuries decomposes quickly in situ because its chemical composition, which differs from glass produced in later centuries, weathers to create a thick and fragile patina, or crust, on the glass surface (Herremens et al. 2014). In light of these challenges, this study evaluates the effectiveness of existing macroscopic and low-power microscopic approaches on bottle glass assemblages from two 17th-century Anglo-colonial house sites in the state of Rhode Island that were places of long-standing interaction between natives and colonists. Among several hundred previously excavated bottle glass sherds, 15 specimens between the two sites were identified macroscopically as utilized tools. When combined with other strands of historical and archaeological evidence, these tools suggest Native Americans were present on these sites and using bottle glass as a raw material to create lithic-like tools. Attempts to identify the activities for which the tools were used and the substrates on which these activities were performed by applying methods of low-power microscopy were, however, generally unsuccessful because of glass degradation. Loss of the patina along the working edge caused a loss in detail, making these determinations impossible. These findings suggest that an approach relying primarily on visual inspection and supplemented, when possible, by low-power microscopy may be of greatest use in the study of utilized glass on early colonial archaeological sites. This combination of techniques can prove to be a quick, inexpensive, and robust method of producing new findings from existing artifact collections.

Historical and Archaeological Context

Bottle glass, along with pipe stems, ceramic sherds, and iron nails, is one of the most frequently recovered artifact types on colonial archaeological sites across the world. The ubiquity of bottle glass in these contexts is the result of rapid technological innovation and commercialization in the glassmaking industry during the early colonial period (Noël Hume 1969:60–71; Jones and Sullivan 1989; Jones 2011; Herremens et al. 2014). Glass is primarily composed of silica, but requires the addition of both an alkali to lower the melting point of the silica and a nonalkaline base to stabilize the finished glass product. During the early 17th century, English glassmakers developed the means to mass produce inexpensive glass bottles for the colonial marketplace through the introduction of high-temperature coal-fired furnaces and a high-lime low-alkali (HLLA) glass recipe (Jones 2011; Herremens et al. 2014). As a result of these developments, English glassmakers, as well as a smaller number of their Dutch and French counterparts, flooded the market with two types of dark green colored bottles: free-blown globe-shaped bottles and mold-blown square-bodied bottles, often referred to as "case bottles" (Noël Hume 1969:60–71). Yet, when buried in the soil for centuries, bottle glass manufactured with the HLLA recipe is especially susceptible to decomposition, or weathering (Herremens et al. 2014). A thick, laminated crust or patina often forms on the surface of the glass as a result of a chemical reaction between the glass and the environment, although the rate of decomposition varies greatly with the precise chemical composition of the glass bottle and the exact conditions of its deposition (Jones and Sullivan 1989:15).

Europeans not only consumed the alcohol contained in the glass bottles, but also traded it with the native peoples they encountered near their colonial outposts. Once entered into native cultural practices, glass bottles held particular significance as spiritual items, often appearing as grave goods (Rubertone 2001) or as raw materials used to create tools. Some archaeologists have suggested that the substitution of glass for stone as a raw material,

and a subsequent loss in knapping skill over time, marks the acculturation of native peoples in favor of European cultural practices (Hayden and Deal 1987). Others argue that the recovery of utilized glass, when woven together with other strands of historical, ethnographic, and archaeological evidence, helps to refute the model of "quick replacement," that is, the idea that the importation of European manufactured objects to colonial sites caused native peoples to abandon indigenous correlates (Harrison 2003, 2005; Silliman 2004:34, 2010; Rodríguez-Alegría 2008). Although glass tools were often expedient (Silliman 2004:187; Allen 2008:87), many native knappers carefully selected their materials and applied formal production techniques. For example, comparative study of utilized glass in 19th-century Australia demonstrated that knappers reduced, or broke apart, glass bottles in particular sequences according to local preferences. Specific bottle components, such as a bases, bodies, and necks, were selected to create specific tool forms because of the thickness and curvature of the glass sherds (Allen and Jones 1980; Cooper and Bowdler 1998; Harrison 2000; Allen 2008). Findings from 19th-century Native American sites close to Russian colonial outposts in North America have suggested that knappers scavenged particular bottle components from refuse piles (Lightfoot et al. 1993:171; Silliman 2004:190–191; Allen 2008:88). Similar findings from early colonial contexts in North America have offered preliminary evidence that glass knappers often preferred the thick base fragments of globe-shaped bottles over thinner-walled case bottles (Heite and Blume 2008:255–256).

This study identified and analyzed utilized glass within artifact assemblages previously excavated from two 17th- to 18th-century English colonial house sites—the Cocumscussoc archaeological site (RI-375) and the Jireh Bull House site (RI-926)—in what is now Rhode Island in the northeastern United States (Figure 1). Both sites are located in Narragansett Country, the ancestral homeland of the Narragansett Indian tribe, in the southern half of the state. The region has a rich archaeological record dating back at least 12,000 years (Bernstein 1993; Robinson 1994; Robinson and Taylor 2000). European adventurers first described the coastline and its friendly indigenous inhabitants in 1524, but the English and Dutch traders who colonized the region beginning in 1637 found the Narragansetts to be the largest confederacy in native New England and resistant to colonial incursions (Simmons 1986; Robinson 1990; Bragdon 1996; Rubertone 2001). Between 1675 and 1676 the region became the "geographic epicenter" of King Philip's War, which engulfed the native and colonial populations of New England (DeLucia 2012). During the conflict, English colonists designated particular houses as places of communal defense from and counterattack against native raids, including the two house sites in this study. These so-called "garrison houses" proved poorly suited to military purposes, and natives razed many of them during the war. Colonists rebuilt and expanded them after the war ended, however, and they continued to be places of interaction between natives and colonists for decades afterward (Porter 2013, 2014). Since the early 19th century, antiquarians and archaeologists have excavated garrison houses across New England, including both sites in the study, in attempts to recover material traces of colonial warfare (Isham 1918). Instead of revealing traces of battles from King Philip's War, these sites have produced artifact assemblages consistent with agricultural enterprises established in the aftermath of the conflict (Fitts 1996). The study of utilized glass from the two sites was part of a larger survey of previously excavated artifact assemblages from both sites to identify material culture traces of Native Americans living and working at rebuilt garrison house sites (Porter 2013).

The Cocumscussoc archaeological site, named after its Narragansett Indian place-name, is a 23-acre National Historic Landmark in North Kingstown, Rhode Island (Rubertone 2001, 2009; Dunay et al. 2003). In 1637 Roger Williams, a Puritan exile and the founder of the colony of Rhode Island and Providence Plantations, erected a trading post in the vicinity of the site, which he operated until selling it to his countryman, Richard Smith, Jr., in 1651. During King Philip's War, colonial forces temporarily garrisoned Smith's dwelling, which was burned down by the Narragansetts once the garrisoned soldiers had abandoned it. Today, the site is located on the front lawn of Smith's Castle, a two-and-a-half-story Georgian house believed to include portions of the "great house" built by Smith in the aftermath of King Philip's War. Since 1949, the house and surrounding historic site have been owned by the Cocumscussoc Association at Smith's Castle, an historic preservation society, which opens the house and grounds seasonally. Several pothunters unearthed at least

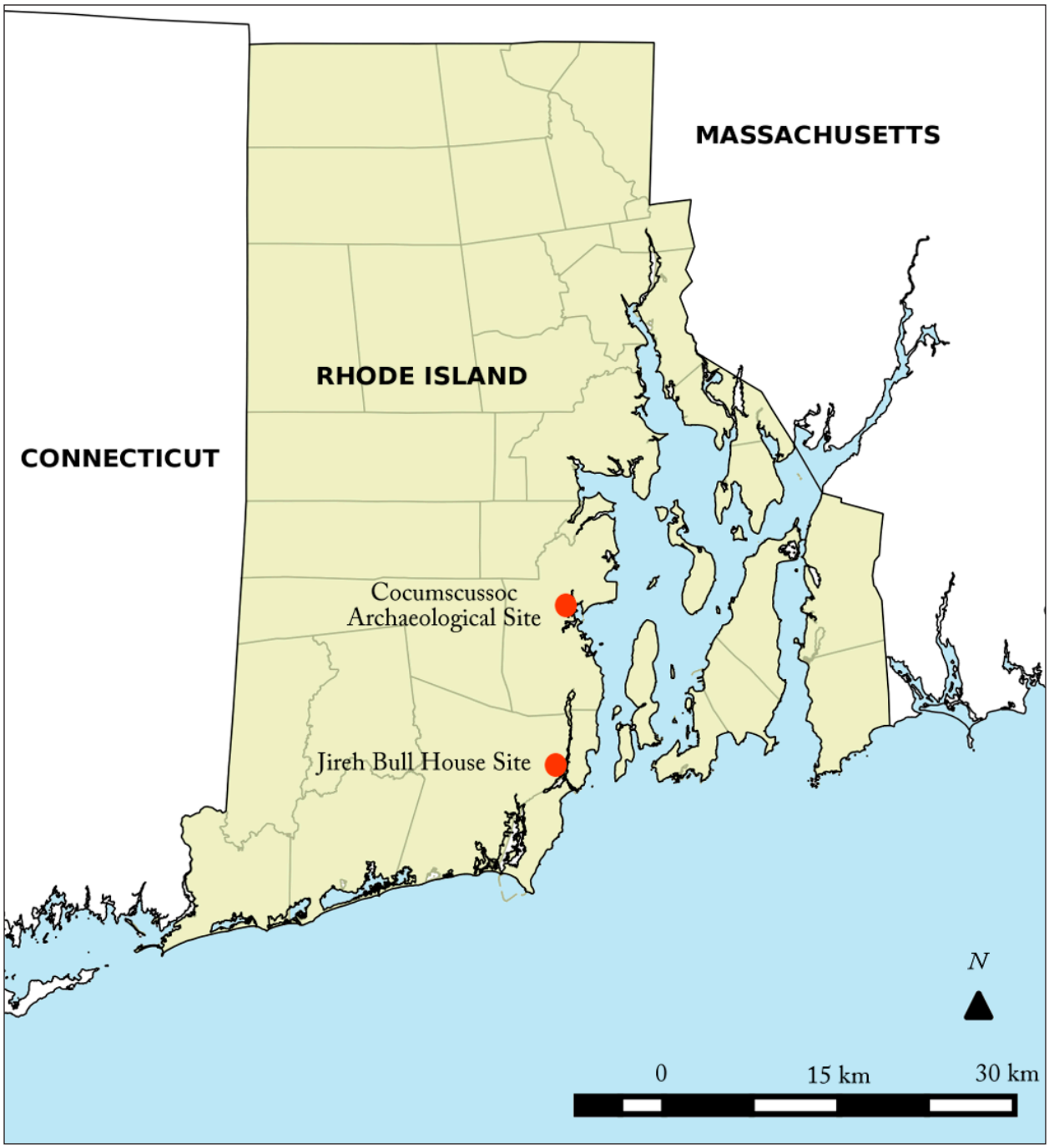

Figure 1. Map of Rhode Island showing the locations of the Cocumscussoc archaeological site and the Jireh Bull House site. (Graphic by author, 2014.)

one contact-period Native American grave on the site in 1879 and 1880, when it was part of a dairy farm, containing a variety of English trade goods (Rubertone 2009:127). Beginning in 1972, archaeologists from the University of Rhode Island began a systematic survey of the site, which archaeologists from Brown University continued from 1989 to 2012 (Rubertone and Fitts 1990, 1991; Rubertone and Taylor 1992). Artifacts from the site, numbering more than 50,000, are curated in the Giddings Anthropology Laboratory at Brown University. The diverse collection

contains a small assemblage of lithic projectile points dating from the Archaic period through the Woodland period; an array of artifacts relating to trade, such as lead bale seals, whelk cores used to make wampum, and glass beads; and a wealth of domestic and agricultural refuse from the 17th through 20th centuries (Rubertone 2001, 2009; Porter 2013). Precise dating of many artifacts based on their contextual relationships is limited by the poor stratification of the site's soils, however, which have been disturbed by centuries of farming, landscape modification, and the encroaching coastline.

The Jireh Bull House site is a 0.7-acre archaeological site in South Kingstown, Rhode Island, owned by the Rhode Island Historical Society (RIHS). In 1663 Jireh Bull, a young Anglo-American from Newport, purchased a 20-acre house lot from a group of land speculators and built a small stone house and farm on the site. In 1675, military forces garrisoned Bull's house, which he and his family subsequently abandoned for safer quarters in the city of Newport (Porter 2014). Bull's decision to leave the property proved fortuitous. Narragansett Indians attacked the garrison, razed the structure, and killed most, if not all, of those sheltering inside in December 1675 (Porter 2014). Excavated in 1917 (Isham 1918) and 1981 (Mrozowski 1981), the archaeological site includes the remains of three small stone structures—living quarters, barn, and outbuilding—partially surrounded by a stone wall, and more than 2,000 associated artifacts (Porter 2012). These foundations were initially believed to represent the ruins of the house attacked and burned in 1675 (Isham 1918; Grumet 1995:135). Indeed, the architectural layout evokes a "bawn," a fortified dwelling house used during the English colonization of Ireland and reinterpreted in colonial architecture in America (St. George 1982, 1990). Dates derived from domestic ceramics, pewter spoons, and pipe stems and bowls recovered from inside the foundations suggest, however, that the complex was rebuilt and expanded by Bull after the war had ended (Porter 2013:182–184). The artifact assemblage is consistent with a frontier farm, rather than a military outpost, and composed primarily of artifacts relating to architecture, particularly nails and window glass; agriculture, such as an ox shoe and stirrup; and fragments of domestic items, including coarse and refined ceramics, stemware, and cooking utensils (Monahon 1961; Reid 1987; Porter 2012). Archaeologists also recovered a small assemblage of lithic artifacts—a broken pestle, 27 pieces of debitage, and a graphite nodule—that vaguely indicate a Narragansett Indian presence at the site. Unfortunately, excavators recorded little provenience information during the earlier (1917) and much larger excavation of the three foundations, and the spatial and stratigraphic relationships within the artifact collection are unknown.

Research Methods

Conventional methods of analysis in historical archaeology attempt to identify the date of manufacture and function of glass bottles on the basis of observable characteristics, including vessel form, glass color, finishes, and production indicators (Jones and Sullivan 1989; Noël Hume 1969). Archaeologists are also increasingly cognizant of bottle reuse; until the early 20th century, glass bottles were a scarce resource and reused repeatedly as beverage containers (Busch 1987; Stuart 1993; Hull-Walski and Walski 1994). Archaeologists have further noted that bottle glass has been recycled for a wide range of different functions, including as a building material (Adams 2002). Analysis of utilized glass has built on existing practices of glass analysis and incorporated theories of glass reuse by integrating methods of usewear analysis common to the analysis of lithic tools. The incorporation of usewear analysis helps to better understand the ways in which broken bottle sherds were reused for various cutting and scraping activities. Following conventions established decades ago (Clark 1981), the term "utilized glass" is here used to designate broken glass bottle sherds that were reused in the manner of lithic tools, such as projectile points, scrapers, burins, and perforators, among other tool types. By definition, all bottle glass was in a sense utilized in that it served to contain liquid before the breakage of the bottles.

Archaeologists studying utilized glass initially concerned themselves with developing methods to distinguish glass tools from pseudotools by focusing on their working edges rather than relying on macromorphological features. Through experimental analysis of modern glass bottle sherds, these archaeologists repeatedly observed that the use of bottle glass in cutting or scraping activities creates edge damage that cannot be produced

by either natural fragmentation or postdepositional taphonomy (Runnels 1975, 1976; Allen and Jones 1980; Clark 1981). Archaeologists subsequently refined their study of the working edge to consider, first, whether it had been retouched and, second, the angle of the edge, which could be used to differentiate low-angle (less than 35°) cutting activities from high-angle (greater than 35°) scraping activities (Wilkie 1996; Cooper and Bowdler 1998). More recent archaeometric analysis has further revealed that different types and sequences of activities and different substrates produce identifiable microwear patterns along the working edge of utilized glass, and that these patterns are identifiable microscopically (Martindale and Jurakic 2006; Conte and Romero 2008).

This study evaluated existing macroscopic and low-power microscopic approaches to identifying and analyzing utilized glass using specimens previously excavated from the Cocumscussoc archaeological site and the Jireh Bull House site. The study sample comprised 121 fragments of bottle glass from between the two sites. To date, archaeologists have recovered 2,047 glass bottle fragments from Cocumscussoc, and had previously set aside 20 fragments as potentially having been worked, based on possible evidence of usewear or morphological similarity to preexisting lithic tool forms. No attempt had been made, however, to test the validity of these designations or ascertain the type or extent of reuse (Ryzewski 2006). To those potentially utilized tools from Cocumscussoc were added the entire collection of 101 glass bottle fragments recovered from the Jireh Bull House site, none of which had been screened for evidence of usewear. Each of the 121 glass artifacts was first subjected to a visual inspection to identify a working edge or edges on the basis of usewear, evidence of retouch or intentional chipping of the edge by percussion or pressure flaking, and the general nature of the activity for which the tool was used—either scraping or cutting. Second, those working edges that could be positively identified were subjected to low-power microscopy to ascertain the activity for which the tool was used and the substrate on which the activity was performed based on specific usewear patterns (Martindale and Jurakic 2006). It is recognized that not all use was of sufficient intensity to leave indicators on glass artifacts, and the methods outlined eliminated from study many artifacts that may have been used or were associated with utilized fragments.

Study of the two artifact collections was completed primarily during the summer and autumn of 2012 in the Giddings Anthropology Laboratory and the Haffenreffer Museum of Anthropology at Brown University. Low-power microscopy (10–50× magnification) of the specimens was completed in a single afternoon at the Manning Hall Gallery at Brown University using a Dino-Lite USB digital microscope equipped with LED illumination and connected to an iMac desktop computer. No additional light source beyond the light from the microscope and the ambient light in the research space was used.

Study Results and Discussion

Of the 121 artifacts in the study sample, only 15 glass fragments—10 from the Cocumscussoc archaeological site and five from the Jireh Bull House site—were confirmed as utilized tools on the basis of a working edge. Several of these tools also revealed intentional retouching of the working edge. Most of artifacts in the sample, including half of the glass from Cocumscussoc that had been provisionally labeled utilized, were culled upon systematic review because they lacked any evidence of a working edge, or because a possible working edge either had an irregular chipping pattern consistent with postdepositional trampling or striations better explained as a result of fortuitous fragmentation rather than usewear. The differences between utilized glass tools and pseudotools were particularly evident on three fragments of glass from the same bottle recovered from the Jireh Bull site, only one of which had a definitive working edge (Figure 2). The condition of the positively identified artifacts also varied considerably: approximately half had developed a thick weathering patina produced by the chemical decomposition of the glass, environmental conditions of deposition, and length of time in the soil. The patina often remained intact along the larger, smooth interior and exterior surfaces of the containers, but had delaminated from the working edge—apparently taking with it any evidence of microchipping or usewear patterns discernible under low-power microscopy. As could be expected, the weathering patina affected only the dark green globe-shaped bottles and not the two utilized glass tools made from colorless bottles made of glass manufac-

Figure 2. Three fragments from the same globe-shaped wine bottle recovered from the Jireh Bull House site showing the difference between a utilized tool (*center* [#948]) and pseudotools (*left* [#949] and *right* [#946]). (Photo by author, 2012.)

tured with a different chemical composition and likely at a later date.

The largest group of utilized glass from Cocumscussoc was made up of six terminal neck fragments from dark green, globe-shaped wine bottles, all with a single string rim and flaring neck shape consistent with a late 17th- to early 18th-century date of manufacture (Figure 3). The morphological similarity among the group—the string rim approximately bisected each tool—suggests that a similar reduction trajectory was used to create these tools: each glass bottle neck had been split down its length to create two curved, unifacial scrapers. In no case was a tool recovered that had been made from the second half of a bottle neck. That is, each split neck is represented by only one tool. The lower edge (i.e., that nearest the body) had been used as a working edge on each of the artifacts. Three of the scrapers also showed additional usewear on the edge facing the finish. All of the glass scrapers had deteriorated as a result of weathering, but they displayed a range of weathering effects, from dulling of the glass surface, to the development of an iridescent, opaque patina, to pitting or corrosion of the glass surface. Low-power microscopy was not a successful technique to analyze this group of artifacts because of glass degradation. When placed under the microscope the working edges of these scrapers were not well enough preserved to reveal a specific usewear pattern comparable to those in published studies.

The second group of glass tools from Cocumscussoc consisted of four body fragments—two green colored and two colorless—from unidentifiable vessel types that had also been used as scrapers. These tools were smaller, more rectilinear in shape, and better preserved than the utilized neck fragments. The lighter colors and better condition of the glass suggested they were also manufactured and deposited at relatively later dates, but insufficient evidence of vessel form exists to indicate a particular date range. Low-power microscopy of this group was partially successful. Under 35–75× magnification, the two green sherds revealed evidence of retouch (larger flake scars) and microchipping (smaller flake scars) along the working edges (Figure 4) consistent with sharpening and subsequent use of the tools as scrapers (Martindale and Jurakic 2006:421). The colorless glass sherds showed evidence of microchipping but not retouch, indicating that they were

Figure 3. Group of six wine bottle neck scrapers from the Cocumscussoc archaeological site. (Photo by author, 2012.)

Figure 4. Micrograph (45×) of utilized bottle glass from the Cocumscussoc archaeological site (SF #156) showing cross-cutting flake scars and microchipping along the leading edge. (Photo by author, 2012.)

Figure 5. Micrograph (75×) of utilized bottle glass from the Cocumscussoc archaeological site (SF #210) showing microchipping along the lower edge and Waller lines. (Photo by author, 2012.)

used but never sharpened (Figure 5). Striations along the leading edge—linear scars left by abrasion at the point of contact between the tool and the substrate against which it was applied—were not observed on any artifacts in this group. Hence, determining the substrate on which the tools was used was impossible. The presence of microchipping and the absence of striations indicate, however, that the scrapers were not used extensively prior to deposition; in experimental analysis, archaeologists have observed that striations generally appear in sequence after microchipping with sustained use (Martindale and Jurakic 2006:422).

Five additional examples of utilized glass were identified in the artifact assemblage from the Jireh Bull House site. The artifacts were all body fragments from at least several different dark green, globe-shaped wine bottles. The bottles' exact date of manufacture was difficult to identify because only a few diagnostic components—three small fragments with a single, applied string lip—were recovered during archaeological excavation. By contrast, body, base, and neck fragments from case bottles were recovered, but none of these sherds had been utilized. What evidence was

recovered about both types of glass bottles was consistent with a late 17th-century date range accumulated through other lines of material evidence, particularly pipe stem bore diameters and ceramic types. The largest, thickest, and most easily identifiable utilized sherd was an irregularly shaped body fragment with two working edges both having substantial microchipping and polish easily observable both macroscopically and microscopically. As in the case of the second group of scrapers from Cocumscussoc, no striations were observed. A second, slightly smaller body sherd had a smoothed and polished notch with a curvilinear working edge (Figure 6). Low-power microscopy on this specimen was successful because the specimen's thick patina remained intact on the working edge. Deep incised lines observable in the patina ran approximately 45° to the working edge in two directions, indicating its use as a bidirectional cutting tool. Based on experimental observations (Martindale and Jurakic 2006:422–423), the substrate was likely a hard material such as wood, bone, or antler because of the depth of the striations and extensive polishing on both sides of the edge.

Figure 6. Detail of glass edge from the Jireh Bull House site (#982) showing curvilinear notch with bidirectional striations. (Photo by author, 2012.)

The remaining three artifacts from the Jireh Bull House site were small, triangular-shaped scrapers (Figure 7). Based on a visual comparison of the glass color and thickness of the three specimens, two of the scrapers (Figure 7, left and center) may have come from the same bottle, but they did not refit with each other or any others in the collection. In addition to being morphologically similar, visual inspection of the three tools revealed similar evidence of use. All three of the tools showed extensive usewear on one point, and two of the three scrapers showed usewear along one side margin. Chipping and polishing of these working edges was easily observable macroscopically. Similar to the neck scrapers recovered from Cocumscussoc, all three scrapers had a thick and poorly preserved patina that had delaminated from some surfaces. Moreover, the patina on one of the three scrapers (Figure 7, right) appears to have been partially scrubbed away, possibly by someone

Figure 7. Three bottle glass scrapers (*left to right*: #1003, #989, and #967) from the Jireh Bull House site. (Photo by author, 2012.)

involved with the original archaeological investigation in 1917 attempting to reveal the transparent glass beneath. These various preservation factors prevented a low-power microscopic analysis of the usewear patterns to ascertain further information about the activities for which the tools were used.

Discussion and Conclusion

Although only 15 utilized glass tools were identified in the archaeological collections from Cocumscussoc and the Jireh Bull House site on the basis of usewear, this number is consistent with the glass tool counts from many other colonial sites around the world (Harrison 2000:36). These tools reveal that glass bottles were used as a lithic-like raw material in Narragansett Country from at least the late 17th century to the early 18th century. The practice of reusing bottle glass as scraping tools may have continued much later at Cocumscussoc, as indicated by the colorless, utilized glass found there. Tool makers created a variety of tool forms, although the utilized glass was most often used as scrapers with one or two working edges. The majority of glass from both sites came from globe-shaped wine bottles, suggesting that tool makers not only preferred but also carefully selected these vessels over the thinner-walled case bottles that were also readily available. This finding corresponds to those from 19th-century Australia where native peoples selected especially thick portions of particular types of glass bottles for the ease with which they could be worked (Harrison 2000; Allen 2008:87–88). In contrast to the Australian context, tools from Narragansett Country were made from neck and body sections of bottles rather than vessel bases. The similar morphology of the six terminal neck fragments from Cocumscussoc indicates they may have been manufactured using the same technique of splitting apart the bottle neck. Further study of utilized glass in Narragansett Country, especially the identification and comparison of utilized glass found on contemporaneous Narragansett Indian sites and other European-colonial sites, as well as those from the northeastern United States, is necessary to illuminate patterns of utilized glass tool use across spatial, temporal, and cultural boundaries.

The assemblage of utilized glass from Narragansett Country is different from many other contexts in the colonial world where utilized glass has been recovered archaeologically because it came from European-colonial house sites rather than native settlements (Allen 2008; Conte and Romero 2008). Moreover, both settlements had been used as garrisons by colonial military forces and attacked and burned down in Narragansett Indian raids after decades of more peaceful intercultural engagement. Glass tool makers could have been native, African, or Anglo-Americans, all of whom were living in Narragansett Country during the late 17th century. However, similarities between material selection, tool morphology, and tool use at Cocumscussoc and the Jireh Bull House site—all of which parallel findings from other native sites in colonial contexts—suggest a strongest link to Narragansett Indian peoples. The link is strengthened by other lines of material evidence found at the sites, such as lithic artifacts and trade goods, and documentary evidence indicating these two sites became agricultural plantations during these years. The apparent return of native peoples to rebuilt garrison houses in the aftermath of King Philip's War resembles findings on long-term, cross-cultural encounters at other colonial military sites in Australia (Allen 2008) and South Africa (Schrire 1996) where evidence of native cultural practices was recovered among European colonial refuse. The entangled nature of these material assemblages reflects the ambiguities of cultural reengagements between former combatants on a postwar landscape.

Although archaeologists have most often studied utilized glass recovered from 19th-century sites to examine native peoples' material culture responses to European colonialism, this type of artifact has potential to illuminate earlier colonial encounters as well. This study shows that existing methods of identifying and analyzing utilized glass can prove useful, with some provisos, for 17th-century glass artifacts. Macroscopic methods are essential to initially identify glass tools on the basis of morphological characteristics and the presence of a working edge, and then determining the general activity for which they may have been used. Low-power microscopic methods can be useful in confirming macroscopic observations, such as identifying microchipping along the working edge difficult to see with the unaided eye. Yet, low-power microscopy was not able to consistently identify either the type of scraping activity or the substrate against which the tools were used because of the advanced degradation of many bottle glass artifacts. All other factors being consistent, glass from the

17th and 18th centuries will be more heavily patinated than that of the 19th and 20th centuries. Insofar as the weathering patina produced on early glass is the result of glass manufacturing processes and local environmental conditions, further comparative study of early colonial glass assemblages is needed from other geographic contexts and times to ascertain whether the limitations encountered in this study are widespread.

Although the quality of the early colonial glass bottles and the extent of deterioration of these artifacts may limit a fine-grained analysis of a working edge on utilized sherds, further study of these artifacts has the power to illuminate cultural patterns of material selection, production methods, tool form, and use across space and time. In particular, archaeologists have frequently commented that much may be learned by revisiting previously excavated artifact assemblages aided by new technologies and analytical techniques. As archaeologists increasingly recognize the presence of utilized glass around the world, curated collections from early colonial sites may quickly reveal a large number of specimens previously overlooked. This may be especially true for collections excavated from European-colonial house sites where the use of broken glass sherds as tools was never considered at the time of excavation. A combination of macroscopic and low-power microscopic approaches presents a low-cost, expedient, and effective method of identifying utilized glass within these archaeological assemblages. Armed with a notebook computer and an electronic microscope, an archaeologist may quickly sort through a collection of worked glass and capture visual data for later comparison and study, a task impossible a decade ago.

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