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Excavations in 2001 and 2005 at Hammersmith Embankment in West London uncovered the remains of two glass furnaces with associated wasters relating to the manufacture of drawn glass beads during the second quarter of the 17th century. The site is significant as it represents the first archaeological evidence for the production of glass beads in post-medieval England. A preliminary study of the recovered material reveals the presence of 43 different bead varieties, many with stripes and multiple layers. While a number have not yet been observed elsewhere, a few have correlatives at a contemporary bead production site in Amsterdam, as well as aboriginal sites in northeastern North America. Comparisons of the chemical compositions of the Hammersmith beads with those of beads from the Amsterdam factory and other loci reveal a number of similarities as well as differences indicating that it will be difficult to identify Hammersmith beads at other sites around the world.

INTRODUCTION

A number of European nations are known to have manufactured glass beads during the post-medieval period but until recently, England was not among them. This all changed when the Museum of London Archaeology (MOLA) conducted excavations at Hammersmith Embankment, a parcel of land on the east bank of the Thames in the Borough of Hammersmith and Fulham, West London, which was to be developed as an office complex. Conducted in 2001 and 2005, the archaeological investigations revealed the remains of two brick furnaces with glass-encrusted crucible fragments and a large quantity of beadmaking wasters in association. Historical documentation and the recovered artifacts reveal that a glassworks for the manufacture of drawn glass beads had stood here during the second quarter of the 17th century. This is a very significant find as it represents the first recorded evidence for the manufacture of glass beads in England during the post-medieval period (Jamieson 2007:7-8).

What is now known as Hammersmith Embankment was the former site of Brandenburgh House, the private estate of Sir Nicholas Crisp (1598-1666), a wealthy London merchant (Figure 1) who was deeply involved in the West African trade. His involvement with the Company of Adventurers of London, better known as The Guinea Company, began

Figure 1. Sir Nicholas Crisp (published in 1795 by Cadell and Davies, London).

in 1625; three years later Crisp owned a controlling interest in the company. In 1631, he and his partners were granted monopolies to conduct trade on the west coast of Africa from Cape Blanco (at the border between what is now Mauritania and Western Sahara) and the Cape of Good Hope. The company principally traded in ivory, hides, gold, redwood (for dyes), and slaves. Beads appear to have been an important commodity in this trade and around 1635, Crisp was granted a patent for "the making and vending of Glass beads and Beugles" (Jamieson 2007:8). Unfortunately, this endeavor was short lived as Parliament forced him to surrender these monopolies in 1640 (Jamieson 2006:11). Nonetheless, Crisp continued to be involved in the African trade for many years thereafter, but it is unknown if the production of beads at Hammersmith was ever revived.

THE HAMMERSMITH EMBANKMENT BEADS

While a full report on the archaeological findings at Hammersmith Embankment has not been published as yet, color images of some of the recovered beads and production tubes appeared in several short printed and Internet articles on the site (e.g., Jamieson 2007; Moss 2007). The beads (Figure 2) appeared to be very similar to specimens encountered in early-17th-century beadmaking wasters excavated in Amsterdam (Karklins 1985) and at several contemporary aboriginal sites in eastern North America. In hopes that an examination of the Hammersmith material might help differentiate beads produced in London from those manufactured in Holland and elsewhere, Karklins obtained permission to examine the collection over a two-day period in January of 2013 while in England to attend an archaeological conference. Although it was possible to examine all the recovered bead-related material, time constraints did not permit a quantitative study of the collection. It was, however, possible to determine that there were at least 43 varieties of drawn glass beads in the collection (Figure 3). These are described using an expanded version (Karklins 2012) of the classification system developed by Kenneth and Martha Kidd (1970). Varieties not represented in the Kidd's system are designated by an asterisk (*) with a sequential letter for ease of reference. Dimensions are in millimeters. D = Diameter; L = Length.

Figure 2. An assortment of production tubes and rejected beads from the Hammersmith Embankment excavations (courtesy of Museum of London Archaeology).

Ia2. Tubular; op. black. D: 1.7-12.6; L: 22.8-82.0.

Ia3. Tubular; tsp. light gray (colorless). D: 3.2; L: 26.0.

Ia18/19. Tubular; tsp. ultramarine to bright navy. D: 2.9-13.3; L: 26.4-58.3.

Ia21. Tubular; tsp. rose wine. D: 1.8-4.8; L: 18.6-42.0.

Ib*(a). Tubular; op. barn red with 8 op. white stripes. D: 20.3; L: 62.0.

Ibb*(a). Tubular; op. redwood with 4 op. black-on-white stripes. D: 11.5-12.7; L: 14.4-20.0.

Ibb*(b). Tubular; op. redwood with 4 tsp. ultramarine-on-white stripes. D: 12.4; L: 11.6-19.7.

Ibb*(c). Tubular; op. barn red with 8 op. black-on-white stripes. D: 13.2; L: 19.0.

Ibb*(d). Tubular; tsl. bright navy with 6 or 8 (likely) op. barn red-on-white stripes. D: 19.0+; L: 25.0.

Ic*(a). Tubular (square cross-section); tsp./tsl. bright navy. D: 13.5-13.8; L: 72.8.

IIa2. Circular; op. barn red. D: 3.0; L: 2.0.

IIa7. Circular; op. black. Many specimens are fused together. D: 3.3-6.1; L: 2.9-4.3.

IIa12. Circular; tsl. oyster white; flashed in clear glass. D: 2.7-3.7; L: 1.7-2.7.

IIa*(a). Circular; tsp. mustard gold. D: 3.2-6.8; L: 1.6-3.5.

IIa55. Barrel shaped; tsp. bright navy. D: 2.9; L: 6.3.

IIa56. Circular; tsp. bright navy. Many specimens are fused together. D: 2.4-5.7; L: 1.3-7.0.

IIa59. Circular; tsp. rose wine. D: 3.4-5.1; L: 2.5-3.6.

IIb*(a). Circular/globular; tsp. light gray with 6 op. internal white stripes ("gooseberry"). D: 3.0-3.2; L: 2.5.

Figure 3. The Hammersmith Embankment bead varieties; Ibb*(d), IIa12, and IVb*(c) are not illustrated (photos: Karlis Karklins).

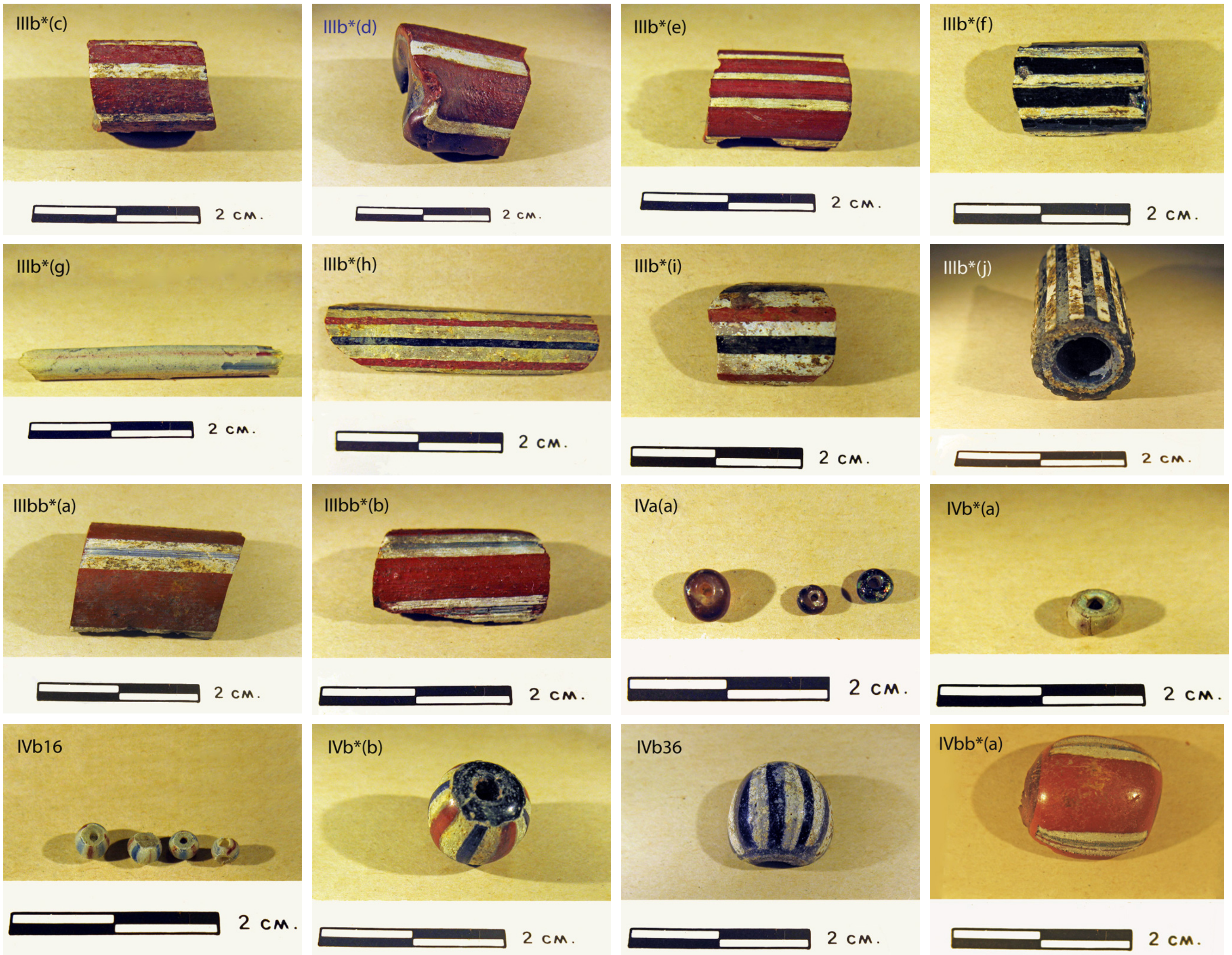

Figure 3, continued. The Hammersmith Embankment bead varieties.

IIbb3. Globular to barrel shaped; op. barn red with 4 tsp. ultramarine-on-white stripes. D: 14.8-19.5; L: 14.1-16.7.

IIbb'*(a). Globular; op. barn red with 4 tsp. ultramarine-on-white spiral stripes (the spiral nature may be due to deformation during the rounding process). D: 17.4; L: 16.3.

IIIa3. Tubular; op. barn red exterior/ tsp. green core. D: 2.1; L: 5.4.

IIIa7. Tubular; tsp. light gray exterior/ op. white middle layer/ tsp. light gray core. D: 5.9; L: 93.5.

IIIa*(a). Tubular; tsp. bright navy exterior/ op. white middle layer/ op. barn red core. D: 7.3; L: 81.5.

IIIa*(b). Tubular; tsp. rose wine exterior/ tsp. light gray core. D: 3.6-3.8; L: 34.1.

IIIb*(a). Tubular; op. barn red exterior with 8 op. white stripes/ op. taupe brown core. D: 10.4-15.0; L: 15.1-21.7.

IIIb*(b). Tubular; op. barn red exterior with 8(?) op. white stripes/ tsp. aqua blue core. D: 17.3; L: 42.5.

IIIb*(c). Tubular; op. barn red exterior with 7 op. white stripes/ op. white middle layer/ op. taupe brown core. The middle layer has a distinct bluish tint on one specimen. D: 11.6-12.9; L: 15.6-25.2.

IIIb*(d). Tubular; op. barn red exterior with 6 or 8 op. white stripes/ op. white middle layer/ op. barn red core. D: 22.0; L: 23.0.

IIIb*(e). Tubular; op. barn red exterior with 12 op. white stripes/ op. white middle layer/ op. barn red core. D: 10.6-11.4; L: 15.1-21.0.

IIIb*(f). Tubular; op. black exterior with 12 op. white stripes/ op. white middle layer/ op. barn red core. D: 11.1-19.5; L: 17.0-26.0.

IIIb*(g). Tubular; tsp. light gray exterior/ op. white middle layer with 3 op. barn red and 3 tsp. bright navy stripes/ tsl. pale blue core. D: 4.7; L: 33.6.

IIIb*(h). Tubular; op. white exterior with 6(?) op. redwood and 6(?) op. black stripes/ op. barn red core. D: 7.9; L: 31.3.

IIIb*(i). Tubular; op. white exterior with 4 op. redwood and 4 op. black stripes/ op. redwood layer/ op. white layer/ op. barn red core. D: 12.0; L: 13.5.

IIIb*(j). Tubular; tsp. bright navy exterior with 10-12 op. white stripes/ op. white middle layer/ tsp. bright navy to ultramarine core. D: 9.3-12.7; L: 8.0-32.7.

IIIbb*(a). Tubular; op. barn red exterior with 4 tsp. ultramarine-on-white stripes/ tsp. light gray core. D: 14.0; L: 22.2.

IIIbb*(b). Tubular; op. barn red exterior with 4 tsp. ultramarine-on-white stripes/ tsp. aqua blue core. D: 11.9-12.1; L: 18.6-19.5.

IVa*(a). Circular; tsp. rose wine exterior/ tsp. light gray core. D: 2.4-4.4; L: 2.4-3.5.

IVb*(a). Circular; tsp. light gray exterior/ op. white middle layer with 6 op. barn red stripes/ tsp. light gray (bluish tint) core. D: 4.9; L: 3.2.

IVb16. Circular; tsp. light gray exterior/ op. white middle layer with 3 op. barn red and 3 tsp. bright navy stripes/ tsl. pale blue core. D: 3.5; L: 2.0.

IVb*(b). Globular; op. white exterior with 5 op. barn red and 5 op. black stripes/ tsp. bright blue core. D: 11.7; L: 11.5.

IVb*(c). Globular; op. white exterior with 4 op. barn red and 4 tsp. navy blue stripes/ op. barn red layer/ op. white layer/ op. barn red core. D: 13.0+; L: 10.0+.

IVb36. Globular to barrel shaped; tsp. bright navy to dark navy exterior with 10-12 op. white stripes/ op. white middle layer/ tsp. bright navy to ultramarine core. D: 10.4-14.7; L: 8.0-15.0.

IVbb*(a). Globular to barrel shaped; op. barn red with 4 tsp. ultramarine-on-white stripes/ op. taupe brown core. D: 12.5-14.0; L: 14.0.

COMPARISONS

To determine if the Dutch were producing similar beads, the Hammersmith assemblage was compared to beadmaking wasters from site Asd-Kg10 in Amsterdam (Karklins 1984). Originally believed to have been deposited between 1590 and 1610 (Karklins 1985:37), the wasters have recently been attributed to the first Two Roses glasshouse which operated on the Keizersgracht from 1621 to 1657 (Hulst 2012; James Bradley 2015: pers. comm.). Of the 43 Hammersmith varieties, 20 had correlatives in the wasters, 13 among the undecorated beads and 7 among the striped varieties. An additional 5 varieties resembled Hammersmith beads but differed either in shape, the number of stripes, or core color.[1]

That roughly 50% of the Hammersmith varieties are represented in the Dutch wasters is not surprising as it is likely that the Hammersmith beadmaking concern was established with the help of an expatriate Venetian as was the case with the Dutch industry (Baart 1988). It may even have been someone from the Dutch beadmaking industry. In any case, the recipes, techniques, and styles would therefore be essentially the same for all three manufacturing centers. It does, however, appear that some experimentation went on at Hammersmith and some unique varieties were produced there.

The Hammersmith assemblage was then compared to beads excavated at several early to mid-17th-century aboriginal sites in eastern North America to see if there might be similar varieties there. A number of correlatives were found, especially in the former Iroquois territory of New York state, a region under Dutch control at that time. An examination of the bead inventories of several sites in the Mohawk region of east-central New York state that were occupied between 1615 and 1646 (Rumrill 1991) revealed 8 undecorated correlatives and 6 striped ones, with an additional 7 striped varieties being similar to Hammersmith varieties.[2] A similar number of correlatives were found further west in Seneca territory at the Dutch Hollow and Factory Hollow village sites which were inhabited from 1605 to 1625 (Sempowski and Saunders 2001). Here the count was 7 undecorated correlatives, 9 striped ones, and 3 similar varieties.[3] Aside from some undecorated seed bead varieties, few correlatives were encountered elsewhere, especially among the striped multi-layered specimens that distinguish the Hammersmith assemblage.[4]

Finding correlatives in 17th-century West African bead assemblages has so far been hampered by a lack of well-dated bead collections of that period, and generally poor descriptions of the beads, especially in early reports, that make comparative studies difficult. It is hoped that this article will result in researchers identifying possible correlatives in their African bead collections.

HAMMERSMITH BEAD CHEMISTRIES

In an attempt to differentiate the beads produced at Hammersmith Embankment from like beads found elsewhere in the world, 70 glass samples representing the more numerous bead varieties at the site were investigated by Ron Hancock of P. & R. Hancock Consulting Services Inc., Toronto, Ontario, using instrumental neutron activation analysis (INAA) at the McMaster Nuclear Reactor in Hamilton, Ontario (Hancock 2013). This revealed that the beads were all composed of soda-lime-silica glass with compositions generally compatible with glass beads found at sites in northeastern North American dating to before the end of the first half of the 17th century. Determination of the exact composition of the different colored glasses was, however, hampered by the multi-colored nature of many of the submitted samples since neutron activation analysis lumps the compositions of all the different glasses together.

To establish a better compositional description of the glasses, 37 of the samples, along with 20 specimens of bead wasters from site Kg10 in Amsterdam, were subsequently analyzed by Laure Dussubieux of the Elemental Analysis Facility, The Field Museum, Chicago, using laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) which can pinpoint specific glasses on multi-colored specimens. Her analysis confirmed that the specimens from London were all composed of soda-lime glass produced using halophytic (salt-tolerant) plant ash as a flux. Furthermore, four groups could be differentiated based on the concentrations of the constituents (Dussubieux and Karklins 2015).

Group 1 is the most populous and includes beads representing all recorded colors except purple. It has an average soda concentration of 13.6% and an average lime concentration of 11.1%. Group 2 is characterized by lower lime (7.8% average) and higher soda (15.6% average) concentrations. This group incorporates dark blue beads and one purple bead. Represented by five purple beads, Group 3 has the highest soda (18.5% average) concentrations but also the lowest lime (5.6% average) content. It also has the lowest manganese (1.9% average) and the highest potash (3.6% average) concentrations. Group 4 has low soda (9% average) concentrations but lime concentrations are fairly similar to those in Group 1. This group has the highest alumina (3.5% average) concentrations. It is represented by one dark blue and two white specimens.

Comparison of glass Groups 1, 2, and 3 reveals that the soda concentrations in these glasses are higher while the concentrations of lime and manganese are lower. This may be due to the use of different types of soda plant ash or the use of ash with different degrees of purity.

The variation of trace element concentrations for such elements as zirconium and niobium, two elements believed to be associated with the sand used to produce the glass, exhibits different trends with a correlation for Groups 4 and 1 distinct from that of Groups 2 and 3. This suggests the use of at least two types of sand containing different types of minerals. (For full details of the analysis, *see* Dussubieux and Karklins 2015.)

AMSTERDAM BEAD CHEMISTRIES

All but three of the beads from Kg10 in Amsterdam are composed of soda-lime glass. The exceptions are three opaque yellow beads. Two of these contain high concentrations of lead (72-73%), low levels of silica (23-24%), and significant concentrations of tin oxide (~2%). The third specimen has a very different composition with more silica, soda, lime, manganese, and alumina, but lower levels of lead.

The other beads seem to have soda and lime concentrations that vary in the same way as those of the London glass samples in Groups 1, 2, and 3. The identification of discrete groups is more difficult, however. There is no equivalent to London Group 4 in the Amsterdam sample.

Trace elements, especially zirconium and niobium, that were found useful in distinguishing different types of sand, correlate for most of the samples in a similar way as for London Group 1, but lower concentrations of both these elements suggest the use of a similar type of sand but from a different source.

The findings, combining major, minor, and trace elements, suggest that most of the Amsterdam glass samples were manufactured using very similar recipes compared to the glass used in London but the glasses found at the two sites were manufactured with different raw materials.

DISCUSSION

There is a certain intra-site heterogeneity in the compositions of the glass beads from both London and Amsterdam. This is apparent in the very singular composition of the yellow glass from Amsterdam that contains high concentrations of lead. Other glass samples have similar compositions but different coloring recipes. The color of the opaque red tubes from Amsterdam was obtained by mixing very different ingredients. This would make it unlikely that the glass was produced on-site even if it cannot be excluded that these variations in the coloring recipes were due to experimentation, testing, or constant improvement of the recipes. It is possible, more especially for the Hammersmith Embankment site, that the different colored glasses were procured from different sources elsewhere in Europe in the form of ingots, possibly even Venice.

Then there is the overlap of compositions between the two sites. A Group 3 glass bead is present in the London assemblage as well as in that from Amsterdam. Group 1 glass from London has a composition that overlaps with most of the compositions identified in Amsterdam even if it seems that lower zirconium and niobium concentrations are associated more specifically with Amsterdam. The high-trace-element Group 1, and the Group 2 and 4 compositions appear unique to London but the analysis of additional samples may alter this perception.

Comparing the Hammersmith glass compositions to those of glass beads recovered from contemporary sites in northeastern North America reveals similarities as well as differences. Tin is present in the Hammersmith white glass samples in significant quantities (4.5-21.5%). This is compatible with glass beads found at sites in the Northeast that were occupied before the end of the first half of the 17th century (Hancock et al. 1997; Sempowski et al. 2000). The Group 2 dark blue beads from Hammersmith colored with cobalt are similar, but not identical, to cobalt-rich beads recovered from the Grimsby (ca. 1625-1639?) and Ossossane (ca. 1636?) sites in southern Ontario. There are also similarities with red beads from archaeological sites in Ontario and New York state but no exact matches (Sempowski et al. 2001). Turning to the purple (rose wine) beads, there are no similarities with North American specimens but this is based on only two samples so this is hardly conclusive (Hancock 2013).

The similarities and differences in the compositions of the glass beads from London, Amsterdam, and northeastern North America reveal that identifying beads produced in London in other parts of the world will be challenging but may be possible in some cases.

CONCLUSION

The glass bead business at Hammersmith Embankment was initiated by Sir Nicholas Crisp to supply these colorful baubles for the West African trade. If historical documents are correct, the factory only functioned for about five years, from 1635 to 1640. It is unknown how prolific the concern was but it produced at least 43 different varieties.

Based on the recovered material, the principal products were undecorated beads of various colors and sizes, and generally large to very large striped beads with one or more layers. Body colors included red, dark blue, white, gray (colorless), black, purple, and gold (deep yellow) with the first three being employed for the bulk of the varieties with gold being restricted to one variety. Stripe colors were limited to white, black, dark blue, and red. It still remains to be determined if the glass used to produce the beads was made on site or imported from elsewhere.

Varieties visually similar to the Hammersmith beads were noted at contemporary Iroquois sites in New York state. Do these similarities intimate that beads manufactured at Hammersmith Embankment reached a part of North America that was dominated by Dutch traders? This is highly improbable and the likelihood is that both Crisp and the Dutch (and likely the Venetians as well) were producing similar types of beads using similar recipes but ingredients from different sources. It is, however, possible that some Hammersmith beads made it to the southeastern United States or the Caribbean via African slaves or as surplus cargo unloaded on this side of the Atlantic. It will be interesting to see if any of the distinctive Hammersmith striped and multi-layered varieties are eventually found in either region. Chemical analysis may then be able to indicate which beadmaking center they originated from.

There is still very much to be learned about Crisp's bead business and its products. It is hoped that continued research will reveal more details, and that funding will soon be forthcoming so that the full archaeological report on this significant English beadmaking site may be published by MOLA and distributed.

ENDNOTES

1. The Amsterdam correlatives include undecorated varieties Ia2, Ia3, Ia18/19, Ia21, Ic*(a), IIa2, IIa7, IIa12, IIa55, IIa56, IIa59, IIIa3, and IIIa7; striped varieties Ib*(a), Ibb*(b), IIbb3, IIIb*(g), IIIb*(j), IVb*(a), and IVb16; and similar varieties IIa*(a), IIb*(a), IIbb'*(a), IIIb*(h), and IVb36. It should be mentioned that since Hammersmith Embankment is a bead production site, for comparative purposes, the tubular varieties were considered to be both beads and production tubes for heat-rounded beads. Consequently, heat-rounded Amsterdam varieties were considered as correlatives to their tubular counterparts in the Hammersmith assemblage.

2. The Mohawk site correlatives include undecorated varieties Ia2, Ia19, IIa2, IIa7, IIa55, IIa56, IIIa3, and IIIa7; striped varieties Ib*(a), Ibb*(b), IIbb3, IIIb*(g),

IVb16, and IVb36; and similar striped varieties IIb*(a), IIIb*(j), IIIbb*(a), IIIbb*(b), IVb*(a), IVb*(b), and Ivbb*(a).

3. The Seneca site correlatives include undecorated varieties Ia2, Ia19, IIa2, IIa7, IIa55, IIa56, and IIa59; striped varieties Ibb*(d), IIbb3, IIIb*(b), IIIb*(g), IIIb*(j), IVb*(a), IVb16, IVb*(b), and IVb36; and similar varieties IIb*(a), IIIa3, and IIIa7.

4. The sites or site groupings that were checked include Bead Period III sites in Ontario, ca. 1615-1609 (Kenyon and Kenyon 1983), Susquehannock sites in Pennsylvania, 1600-1645 (Kent 1984), St. Catherines Island, Georgia, late 16th and 17th centuries (Blair, Pendleton, and Francis 2009), and Indian sites under English influence in the Southeast, 1607-1783 (Marcoux 2012).

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REFERENCES CITED

Baart, Jan
1988 Glass Bead Sites in Amsterdam. *Historical Archaeology* 22(1):67-75.

Blair, Elliot H., L.S.A. Pendleton, and P. Francis, Jr.
2009 The Beads of St. Catherines Island. *American Museum of Natural History Anthropological Papers* 89.

Cook, Gregory D.
2012 The Maritime Archaeology of West Africa in the Atlantic World: Investigations at Elmina, Ghana. Ph.D. dissertation. Department of Anthropology, Syracuse University.

Dussubieux, Laure and Karlis Karklins
2016 Glass Bead Production in Europe during the 17th Century: Elemental Analysis of Glass Material found in London and Amsterdam. *Journal of Archaeological Science: Reports* (in press).

Hancock, R.G.V.
2013 Analysis of Glass from the Hammersmith Embankment Site (W1Z05). Manuscript on file. P. & R. Hancock Consulting Services Inc., Toronto, Ontario.

Hancock, R.G.V., S. Aufreiter, and I. Kenyon
1997 European White Glass Trade Beads as Chronological Markers. *In* Materials Issues in Art and Archaeology V, edited by James R. Druzik, John F. Merkel, John Stewart, and Pamela B. Vandiver, pp. 181-191. *MRS Proceedings* 462.

Hulst, Michel, Jerzy Gawronski, Ranjith Jayasena, and Jørgen Veerkamp
2012 Glasshouse De Twee Rozen (Amsterdam, Netherlands): 17th Century Glass Production in Venetian Style. *In* Le Verre en Lorraine et dans les régions voisines, edited by Véronique Arveiller and Hubert Cabart. *Monographies Instrumentum* 42.

Jamieson, David
2006 Glass Works at Hammersmith Embankment, London, UK. *Bead Study Trust Newsletter* 48:11 (Winter).
2007 Beady Eye on Crisp. *Hammersmith & Fulham Historic Buildings Group Newsletter* 16:7-8.

Karklins, Karlis
1984 Catalogue of Glass Beads from Site Asd/Kg10, Amsterdam. Report on file with the author.
1985 Early Amsterdam Trade Beads. *Ornament* 9(2):36-41.
2012 Guide to the Description and Classification of Glass Beads found in the Americas. *Beads: Journal of the Society of Bead Researchers* 24:62-90.

Kent, Barry C.
1984 Susquehanna's Indians. *Pennsylvania Historical and Museum Commission, Anthropological Series* 6.

Kenyon, Ian T. and Thomas Kenyon
1983 Comments on 17th Century Glass Trade Beads from Ontario. *In* Proceedings of the 1982 Glass Trade Bead Conference, edited by Charles F. Hayes III, pp. 59-74. *Rochester Museum and Science Center, Research Records* 16.

Kidd, Kenneth E. and Martha Ann Kidd
1970 A Classification System for Glass Beads for the Use of Field Archaeologists. *Canadian Historic Sites: Occasional*

Papers in Archaeology and History 1:45-89. Reprinted in 2012 in *Beads: Journal of the Society of Bead Researchers* 24:39-61.

Marcoux, Jon B.
2012 Glass Trade Beads from the English Colonial Period in the Southeast, ca. A.D. 1607-1783. *Southeastern Archaeology* 31(2):157-184.

Moss, Richard
2007 Fulham & the Slave Trade – Faces of Freedom at Fulham Palace. Culture24; http://www.culture24.org.uk/history-and-heritage/art49975, accessed 24 June 2015.

Rumrill, Donald A.
1991 The Mohawk Glass Trade Bead Chronology: ca. 1560-1785. *Beads: Journal of the Society of Bead Researchers* 3:5-45.

Sempowski, M.L., A.W. Nohe, R.G.V. Hancock, J.-F. Moreau, F. Kwok, S. Aufreiter, K. Karklins, C. Garrad, and I. Kenyon
2001 Chemical Analysis of Seventeenth Century Red Glass Trade Beads from Northeastern North America and Amsterdam. *Archaeometry* (4):503-515.

Sempowski, M., A.W. Nohe, J.-F. Moreau, I. Kenyon, K. Karklins, S. Aufreiter, and R.G.V. Hancock
2000 On the Transition from Tin-Rich to Antimony-Rich European White Soda-Glass Trade Beads in Northeastern North America. *Journal of Radioanalytical and Nuclear Chemistry* 244(3):559-566.

Sempowski, M.L and L.P. Saunders
2001 Dutch Hollow and Factory Hollow: The Advent of Dutch Trade Among the Seneca. *Charles F. Wray Series in Seneca Archaeology* 3, *Rochester Museum and Science Center, Research Records* 24.

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