GLASS TRADE BEADS FROM THE ENGLISH COLONIAL PERIOD IN THE SOUTHEAST, CA. A.D. 1607–1783

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The study of glass trade beads has contributed much to our chronological understanding of the colonial period in the Eastern Woodlands of North America. Indeed, this class of artifact has allowed archaeologists to identify and conduct research at important archaeological sites that never appeared in the European historical record. In the Southeast, the best chronological resolution established by current bead chronologies relates either to sixteenth- to mid-seventeenth-century Spanish-traded bead assemblages or eighteenth-century French-traded bead assemblages. There is a conspicuous gap, however, in glass bead chronologies associated with the seventeenth- and eighteenth-century English-Indian trade in the Southeast. In this paper, I address this gap by characterizing a large sample of trade beads (n = 35,309) found in individual mortuary assemblages recovered from a number of Southeastern Indian sites. This is the first time a regional synthesis of this scale has been conducted for the English colonial period in the Southeast. In order to begin to refine the bead chronology of this period, I also present the results of a quantitative seriation (using a technique known as correspondence analysis) of the same mortuary assemblages. While the results of this exploratory technique represent a preliminary stage in this process, they nevertheless identify a number of temporal trends that can be used to derive occupation date estimates for sites spanning the English colonial period in the Southeast (ca. 1607–1783).

The seventeenth and eighteenth centuries were an incredibly dynamic and pivotal time for Indian groups living in the Southeast. Repeated documentation by historians and archaeologists has highlighted the pervasiveness of demographic, economic, and social changes that racked communities across the region (e.g., Bowne 2005, 2006, 2010; Ethridge 2006, 2010; Gallay 2002; Marcoux 2010; Ramsey 2001, 2003; Smith 1987; Usner 1992; Worth 2006). These researchers have also demonstrated that while widespread, the changes did not amount to a singular process that affected all Southeastern Indian communities equally. Consequently, the focus of recent research has shifted to exploring how the history of this period was experienced on a local level.

While historians and archaeologists have made advances in tracing out local histories, gaining such nuanced understandings has proven difficult when research has been extended beyond historically documented sites (e.g., Knight 1994; Smith 1987, 1989, 1994, 2002a). Indeed, for most of this period, historical documents pertaining to the interior Southeast contain at best brief sketches of a few Indian communities. Archaeology has great potential to address how this tumultuous period played out among the untold number of historically undocumented Indian communities across the Southeast, but in order to do this, we must first create reliable ways of estimating the dates of seventeenth- and eighteenth-century occupations (e.g., Smith 1983, 1987; Waselkov 1989). In the Southeast, the best chronological resolution established by current bead chronologies relates to either sixteenth- to mid-seventeenth-century Spanish-traded bead assemblages or eighteenth-century French-traded bead assemblages (Deagan 1987; Brain 1979; Brown 1976; Little 2010; Smith 1983, 1987; Smith and Good 1982). We currently have a comparatively coarser understanding of the glass beads traded by the English during the seventeenth and eighteenth centuries. Considering the scope and significance of the English trade in the histories of Southeastern Indian groups, this constitutes a significant gap in our knowledge that needs to be addressed.

In this paper, I address this gap by characterizing a large sample of trade beads (n = 35,309) found in individual mortuary assemblages recovered from a number of Southeastern Indian sites. This is the first time a regional synthesis of this scale has been conducted for the English colonial period in the Southeast. In order to begin to refine the bead chronology of this period, I also present the results of a quantitative seriation (using a technique known as correspondence analysis) of the same mortuary assemblages. While the results of this exploratory technique represent a preliminary stage in this process, they nevertheless identify a number of temporal trends that can be used to derive occupation date estimates for sites spanning the English colonial period in the Southeast (ca. 1607–1783). I further verify these trends through a review of historical contexts, through a comparison with other, associated diagnostic artifacts and with a more traditional frequency seriation.

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Previous Efforts to Build Glass Trade Bead Chronologies

For Eastern Woodlands archaeologists, glass trade beads are among the small suite of artifacts that mark the watershed moment when Europeans first came into contact with Indian groups living in eastern North America. Indeed, it is widely known that glass beads accompanied Columbus on his first voyage to the New World and continued to be an integral part of Native American material culture assemblages well into the nineteenth century (Good 1983; Smith and Good 1982). For decades, research concerning glass beads has been pursued by archaeologists who see value in the ability of beads to aid in assigning occupation dates to historic sites. The alluring promise held by beads is understandable, for the combination of ubiquity in the archaeological record and celerity in style change is the stuff of robust artifact chronology. Research conducted over the last 50 years has gone a long way toward realizing the chronology-building potential of glass beads. This work can be summarized best geographically with regard to three regions of eastern North America: the Northeast, Midwest, and Southeast.

The Northeast

In the Northeast, archaeological literature concerning glass trade bead chronologies has been dominated by seriations of bead assemblages recovered from sixteenth- to eighteenth-century Dutch, English, Iroquois, and Huron contexts (e.g., Bennett 1983; Fenstermaker 1974; Huey 1983; Kent 1983; Kenyon and Kenyon 1983; Rumrill 1991; Wray 1983). The methods used in seriating the bead assemblages vary greatly among these researchers. On one end of the spectrum, there are quantitative seriations that emphasize changes in the relative percentages of different bead types through time (e.g., Huey 1983; Kent 1983). Kent (1983), for example, offered a frequency seriation of bead types (using the classification system developed by Kidd and Kidd [1970]) across numerous sites in the Susquehanna Valley whose occupation spans ranged from the 1570s to the 1760s. The results of his seriation evinced the classic ''battleship-shaped'' curves reflecting the monotonic increase and decrease in the popularity of particular bead styles through time. The seriation solution he offered highlighted a temporal trend from assemblages dominated by simple and compound tumbled beads in the late sixteenth and early seventeenth centuries, to those dominated by compound tubular beads in the early and mid-seventeenth century, to assemblages dominated by mandrel-wound beads in the late seventeenth and eighteenth centuries.

On the other end of the spectrum of seriation techniques used in the Northeast are those that construct chronologies by marking the presence or absence of certain bead types at sites dating to different time periods (e.g., Bennett 1983; Fenstermaker 1974; Kenyon and Kenyon 1983; Rumrill 1991; Wray 1983). These chronologies, which compose the majority of the published seriations in the Northeast, are more qualitative than quantitative. Researchers speak of the ''average'' assemblage that one finds on sites dating to a particular time period or of a particular type of bead that is unique to a certain period.

Wray's (1983) study of Seneca trade bead assemblages offers an example of this method. Wray presented a chronology of bead types (using Kidd and Kidd 1970) based on his reconstruction of the migration sequence of certain Seneca villages between 1550 and 1820. He divided the sequence into 15- to 20-year periods that roughly corresponded to the typical occupation span of a Seneca village. For each period, he provided a list of the key types of beads recovered from sites dating to this period. His method of seriation was especially adroit at identifying the introduction and ''dropping out'' dates of certain bead types through time.

Despite the difference between quantitative and qualitative methodologies, the chronologies of the Northeast share two premises. First, in all of the chronologies the archaeological site is used as the basic analytical unit. Thus each assemblage of beads represents the entire occupation span of that site. Furthermore, the arraying of these site-level bead assemblages proceeds from known occupation dates, determined by either reference to historical documentation or other temporally sensitive artifacts. Consequently, the chronological order of the assemblages is taken as a given, and the task of the researcher is to look for the differences in the bead types among the assemblages.

The Midwest

In the Midwest, attempts at glass trade bead chronology are best exemplified by Good's (1972) analysis of glass beads from the Guebert site in Illinois and Stone's (1974) analysis of the assemblage from Fort Michilmackinac in Michigan. Respectively, these archaeological contexts represent a Kaskaskia Indian village occupied between 1719 and 1833 and a French-then-English occupied colonial fort dating to between 1715 and 1781. Because the main goal for each author was to produce an archaeological site report, their analyses were necessarily focused on issues of taxonomy for a single assemblage rather than the chronological ordering of a group of site-level assemblages. As a result, the authors used a very different methodology for building a chronology of glass trade beads. Most important, Good (1972:95–98) and Stone (1974:88–90) made bead types rather than bead assemblages the focus of their chronology. Although their typologies were somewhat different, the authors (and virtually all researchers since) relied upon attributes of shape, color, method of manufacture, and decoration in creating these types. Ultimately, the goals of this classification were to establish a range of dates for the circulation of each bead type and to identify its European trading source (i.e., French or English). In order to fulfill these goals, they conducted comparative research by examining bead assemblages from other sites with established occupation dates and European colonial affiliations. From these comparisons, they were able to estimate a range of circulation dates and establish the likely trading sources for many bead types.

The Southeast

Researchers constructing glass bead chronologies in the Southeast have utilized a combination of seriation methods and type-based comparative methods (e.g., Blair et al. 2009; Brain 1979; Brown 1976; Deagan 1987; Polhemus 1983, 1985, 1987; Smith 1983; 1987). For his report on the Toqua site, Polhemus (1983, 1987) performed what he called a ''sequential seriation'' on glass bead assemblages recovered from individual burials at various sites in East Tennessee. The method used by Polhemus was novel in that he made the individual burial assemblage the basic unit of analysis in his chronology rather than the site-level assemblage or bead type. He argued that burial assemblages were best for his seriation because burial contexts represented short-duration closed contexts where the co-occurrence of bead types almost certainly represented their contemporaneity. The exact seriation methods Polhemus used are not clear, but in the resulting chronology he (1987:914) suggested that glass bead assemblages in eastern Tennessee dated to either the seventeenth or mid-eighteenth centuries.

Smith (1983), Deagan (1987), and Little (2010) have each offered glass bead chronologies that focus on the Spanish colonial period in the Southeast (ca. 1500–1700). In a manner similar to Good (1972) and Stone (1974), the authors traced the presence or absence of particular bead types across a chronologically ordered series of sites whose occupation dates were to a large extent known. These seriations resulted in estimated date ranges for the circulation of various bead types that are commonly found on Indian and Spanish colonial sites occupied between the sixteenth and eighteenth centuries. As in the case of the Northeast, their identification of the introduction and ''dropping out'' dates of particular bead types has been a great aid in dating bead assemblages recovered from undocumented sites. The so-called flush-eye bead, for example, which was found to have a relatively short circulation period, ca. 1575–1630, has become a good ''index fossil'' (Smith 1982).

In the lower Mississippi Valley, Brain's (1979) seminal typology and chronology of the large glass bead assemblage from the Trudeau site is very much in the same vein as the chronologies developed by Good (1972) and Stone (1974). Like these researchers, Brain was interested in establishing ranges of dates for the circulation of his bead types as well as identifying possible markers for particular European trading sources. Also, many of the bead types he identified from the mid-eighteenth-century Tunica village were the same as those likely traded by the French at the Guebert site and at Fort Michilmackinac. Brain (1979:114) assigned mean dates and date ranges for many of his bead types based on the occupation spans of numerous sites with comparative assemblages (see also Brown 1976 for a similar ''bracketing technique'' of dating assemblages). He also produced a series of regional maps depicting the geographical distribution of key bead types though time (Brain 1979:117–131). Today this typology and series of maps remain very important contributions to our knowledge of eighteenth-century beads, especially those beads traded by the French.

Blair et al. (2009) recently published the results of their analysis of European glass trade beads associated with the late-sixteenth- and seventeenth-century occupations at the Spanish mission site of Santa Catalina de Guale on St. Catherines Island, Georgia. The data set resulting from the study of some 70,000 specimens recovered in occupational and mortuary contexts is impressive. Rather than concentrating on chronology, the authors of the volume focused more on exploring potential geographic manufacturing sources of various bead types. Perhaps this emphasis resulted from the fact that the occupation span of the mission was largely known from historic records. With regard to chronology, the authors followed the practice of utilizing particular bead types identified in past research as ''index fossils'' (Blair 2009:157; Francis 2009a:12). Blair (2009:157) also discusses the use of chemical analyses to identify changes in the composition of opaque white and turquoise beads. In the Northeast, these changes in the ''recipe'' used to make glass beads have been shown to have temporal significance (Sempowski et al. 2000).

The preceding discussion is not meant to be exhaustive. There are indeed many additional reports in the literature, but the varied forums for their publication, which include research manuscripts, regional journals, and cultural resource management reports, make them somewhat difficult to track down. In the Southeast, these reports often deal with assemblages from individual sites with relatively small sample sizes (e.g., Polhemus 1985; Smith 1991, 1992, 2001, 2002b). The methods used in these reports are similar to those followed by Good (1972), Stone (1974), and Brian (1979) and involve classification and comparison to other assemblages with the goal of placing

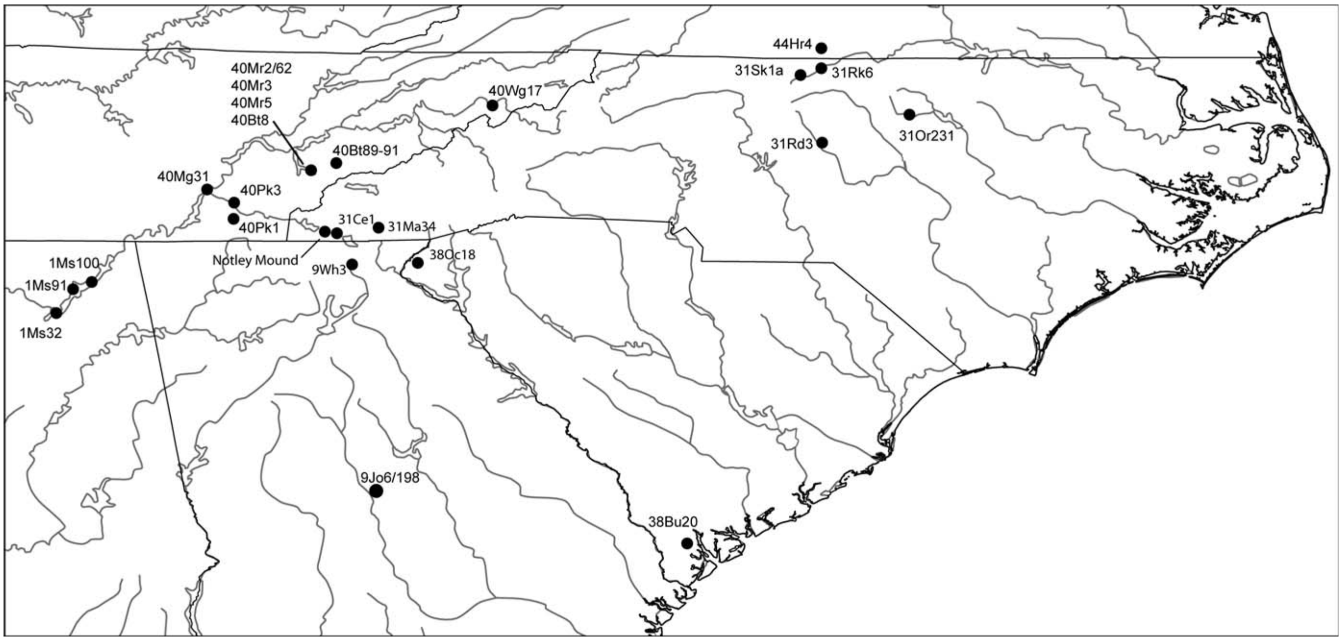

Figure 1. Locations of glass trade bead assemblages used in this study.

the study assemblage within a chronological and cultural context. Many of these reports contain very important insights that contribute to our growing knowledge of glass bead chronology in the Southeast. A synthesis of these insights is desperately needed.

Past research addressing English-traded beads in the Southeast has suffered from the use of small samples, which imposes two major limitations on temporal resolution (Smith 1983:147–148). First, in most cases bead assemblages from individual burials or features have had to be lumped together at the site level. In some cases, these sites were occupied for several decades or more. Second, because small samples preclude the possibility of seriating assemblages based on relative frequencies of bead types, researchers have been forced to rely solely on the presence or absence of particular diagnostic bead types at sites (index fossils) to assign occupation dates. The combination of using lumped site-level assemblages and presence/absence has resulted in chronologies with very large date ranges for many bead types (see mean dates and ranges for individual bead types in Brain [1979:114] for an example). I follow Smith (2002b:58) in arguing that we should strive to overcome these limitations and construct bead chronologies that take into account the total bead assemblage from a context or site rather than the presence of a single bead type. As I will discuss later, while individual bead types may be produced for centuries, the relative percentages of those types within individual assemblages fluctuate through time in patterned ways. Furthermore, assemblages should be derived from individual contexts where the chronological associations among the beads are certain: specifically, bead assemblages found in discrete mortuary contexts (Polhemus 1983). Below, I synthesize bead data from a sample of approximately 35,300 beads representing 95 individual mortuary contexts in order to characterize the types of glass beads traded within the English-Indian slave and deerskin trading system between 1607 and 1783 (Figure 1; Table 1). This is the first time a regional synthesis of this scale has been conducted for this period in the Southeast. I then use the same data set to perform a quantitative seriation employing a technique known as correspondence analysis. The exploratory technique orders mortuary assemblages by comparing the relative frequencies of various bead types found in each assemblage. The resulting order, I argue, highlights a number of temporal trends that can be used to refine the chronology of the period.

The Study Sample

This study focuses on a period that marks the English/British colonial presence in the Southeast bookended by the founding of Jamestown colony and the American Revolutionary War. I focus on this period for two principal reasons. First, I want to produce a bead chronology that complements, rather than duplicates, existing chronologies like Smith's (1983) important chronology of the preceding Spanish period or Brain's (1979) work with French-traded eighteenth-century Tunica bead assemblages. Second, there is a significant gap in our knowledge of English-traded bead assemblages dating to the seventeenth and eighteenth centuries.

Table 1. Sites with mortuary bead assemblages included in this study.

Site	State	Occupation Range	Median Date	References
Chota-Tanasee (40Mr2, 40Mr62)	TN	1700–1820	1760	Newman 1986
Tarver and Little Tarver (9Jo6, 9Jo198)	GA	1695–1715	1705	Pluckhahn 1996, 1997
Fredricks (31Or231)	NC	1680–1710	1695	Eastman RLA;[a] Ward and Davis 1993
Tallassee (40Bt8)	TN	1600–1780	1690	Cornett 1976; Waselkov 1989
Ocoee (40Pk1)	TN	1650–1715	1680	Lewis et al. 1995; Marcoux 2010; Smith 1987
Law's Site (1Ms100)	AL	1650–1715	1680	Fleming 1976; Smith 1987; Waselkov 1989
McKee Island (1Ms32)	AL	1650–1715	1680	Fleming 1976; Smith 1987; Waselkov 1989
Columbus City Landing (1Ms91)	AL	1650–1715	1680	Fleming 1976; Smith 1987; Waselkov 1989
Hiwassee Island (40Mg31)	TN	1650–1700	1675	Lewis and Kneberg 1946; Waselkov 1989
Upper Saratown (31Sk1a)	NC	1650–1690	1670	Eastman 1999; Ward and Davis 2001
Plum Grove (40Wg17)	TN	1600–1700	1650	Smith 1987, n.d.
Madison (31Rk6)	NC	1600–1690	1645	Eastman 1999; Ward and Davis 1993
Philpott (44Hr4)	VA	1620–1670	1645	Eastman RLA; Ward and Davis 2001
Brickyard (31Rd3)	NC	Unknown		Eastman RLA

[a] The unpublished bead data from these sites are taken from analyses performed by Jane Eastman for the Research Laboratories of Archaeology, University of North Carolina at Chapel Hill.

I limit my sample to mortuary assemblages because they represent virtually instantaneous deposition events (Steponaitis 1983). The contemporaneity of bead assemblages from pit features, surface collections, and middens is much less certain; more likely, these contexts are the result of accumulation over a longer period of time. That being said, we must still recognize that while the deposition of the beads in mortuary contexts was often instantaneous, each particular assemblage was interred as the result of a complex decision-making process carried out by mourners. The choice of burial clothing (the source of many seed beads) and adornments (e.g., necklaces, bracelets) was doubtless dependent upon specific cultural and personal dispositions. Furthermore, the specific bead styles appearing in mortuary assemblages also reflect supply-side factors including the production choices of European bead makers and the stock offered by the traders. There is also a possibility that the accumulation of the beads may have taken place over a long period of time (i.e., heirlooming).

All of these factors can and will introduce nontemporal variation, or ''noise,'' into the seriation solution; however, I argue that variability in the bead styles traded in the Southeast is hardly stochastic. First, variability in bead styles is largely discrete; as I discuss below, beads can readily be placed into exclusive groups based upon certain manufacturing characteristics. Second, variability in bead styles was further structured by a small number of production centers in Europe, most of which belonged to one of two artisan guilds with standardized production methods (Francis 2009b, 2009c, 2009d; Karklins 1983). Third, transactions between English traders and Indians involving glass beads were quite limited in time and space. Prior to the Yamasee War in 1715, the majority of traders made only two visits to interior Indian communities each year during the fall and spring (Ramsey 2008:24), and throughout the 1720s the trade with South Carolina was a government-run monopoly restricted to a handful of sanctioned factories (McDowell 1992:85–87). I argue that these three structuring factors raise the potential for glass trade bead assemblages to be ideal temporal markers—especially when contained within individual burials. Of course, as I demonstrate below with a large data set, any identified pattern thought to represent temporal change must be corroborated with supporting evidence.

The trade bead data set I employ in this study includes 95 mortuary assemblages from 14 sites containing 35,309 beads representing 41 bead types (Tables 2 and 3). The sites included in the sample are geographically diverse, incorporating Indian groups from Piedmont North Carolina and Virginia, eastern Tennessee, northern Alabama, and northern Georgia (see Figure 1). Table 1 lists the sites from which I draw the mortuary glass bead assemblages; the occupation ranges listed for each site are taken from published literature. While geographically diverse, the sample is temporally concentrated in the seventeenth and early eighteenth centuries. Some sites have well-documented occupational ranges. The Piedmont sites are historically known to have been abandoned by John Lawson's visit in the first decade of the eighteenth century; the settlement and abandonment of the Tarver sites in Georgia are part of a known migration of Creeks that was underway by 1695 and ended with the Yamasee War in 1715; and the sites of Tallassee, Ocoee (Amoye), Chota, and Tanasee appear in colonial maps and censuses throughout the eighteenth century. The occupations of the three sites in northern Alabama, Plum Grove, and Hiwassee Island, on the other hand, are poorly known to history. The occupation dates listed for these sites in Table 1 are based upon temporally diagnostic European trade items (Smith 1987; Waselkov 1989). My future research will be aimed at filling out the sample with occupations from the later part of the eighteenth century, especially sites dating to the period 1715–60.

I restrict the sample in the interest of fulfilling the data requirements of the seriation technique and in

Table 2. Glass bead types included in the study sample.

Bead Types	Type Description	N	%
Ia5	Untumbled opaque white tubular necklace bead (4–10 mm) of simple construction	202	0.57
Ia15	Untumbled translucent ‘‘‘‘brite’’’’ blue tubular necklace bead (4–10 mm) of simple construction	98	0.28
IIa6	Tumbled opaque black barrel-shaped necklace bead (4–12 mm) of simple construction	884	2.50
IIa13	Tumbled opaque white spherical or oval necklace bead (4–12 mm) of simple construction	2,935	8.31
IIa28	Tumbled transparent emerald spherical necklace bead (4–12 mm) of simple construction	47	0.13
IIa31	Tumbled transparent turquoise spherical necklace bead (4–12 mm) of simple construction	221	0.63
IIa40	Tumbled opaque turquoise spherical or oval necklace bead (4–12 mm) of simple construction	9,657	27.35
IIa44	Tumbled transparent cerulean blue spherical necklace bead (4–12 mm) of simple construction	264	0.75
IIa49	Tumbled opaque dark shadow blue spherical necklace bead (4–12 mm) of simple construction	848	2.40
IIa55	Tumbled transparent ‘‘‘‘brite’’’’ navy spherical necklace bead (4–12 mm) of simple construction	730	2.07
IIa61	Tumbled translucent burgundy spherical necklace bead (4–12 mm) of simple construction	132	0.37
IIb10	Tumbled opaque black spherical or oval necklace bead (4–12 mm) of simple construction with 3 or 4 white stripes	6	0.02
IIb27	Tumbled opaque white spherical or oval necklace bead (4–12 mm) of simple construction with 3 sets of 3 blue stripes	2	0.01
IIb32	Tumbled opaque white oval necklace bead (4–12 mm) of simple construction with alternating red and blue stripes	7	0.02
IIb39	Tumbled opaque white spherical or oval necklace bead (4–12 mm) of simple construction with alternating red, green, and blue stripes	19	0.05
IIb56	Tumbled opaque turquoise spherical or oval necklace bead (4–12 mm) of simple construction with 3 or 4 white stripes	11	0.03
IIb67	Tumbled translucent to opaque ‘‘brite’’ navy spherical or oval necklace bead (4–12 mm) of simple construction with 3 or 4 white stripes	1,158	3.28
IIb990	Tumbled translucent ‘‘brite’’ navy spherical necklace bead (4–12 mm) of simple construction with 2 white stripes	127	0.36
IIb1004	Tumbled translucent ‘‘brite’’ navy spherical necklace bead (4–12 mm) of simple construction with 8–10 thin white stripes	2	0.01
IIb′3	Tumbled opaque black spherical or oval necklace bead (4–12 mm) of simple construction with white spiraled stripes	4	0.01
IIb′6	Tumbled opaque white oval necklace bead (4–12 mm) of simple construction with red spiraled stripes	11	0.03
IIbb12	Tumbled opaque white spherical or oval necklace bead (4–12 mm) of simple construction with 3 blue on red stripes	46	0.13
IIbb15	Tumbled opaque white oval necklace bead (4–12 mm) of simple construction with 3 yellow on blue stripes	5	0.01
IIbb24	Tumbled opaque turquoise spherical or oval necklace bead (4–12 mm) of simple construction with 3 red on white stripes	19	0.05
IIbb27	Tumbled translucent ‘‘brite’’ navy spherical or oval necklace bead (4–12 mm) of simple construction with 3 red on white stripes	3	0.01
IIg	Tumbled opaque white spherical or oval necklace bead (4–12 mm) of complex construction with dark blue inlaid ‘‘eyes’’	35	0.10
IIj	Tumbled opaque black spherical necklace bead (8–12 mm) of simple construction with white or yellow wavy stripes	92	0.26
IIIa1	Untumbled tubular necklace bead (4–10 mm) of compound construction consisting of a transparent apple green inner layer and opaque red outer layer	109	0.31
IVa5	Tumbled spherical or oval necklace bead (4–10 mm) of compound construction consisting of a transparent apple green inner layer and opaque red outer layer	1,403	3.97
IVa5sd	Tumbled seed bead (1–4 mm) of compound construction consisting of a transparent apple green inner layer and opaque red outer layer	3,172	8.98
IVa11sd	Tumbled seed bead (1–4 mm) of compound construction consisting of a transparent light gray inner layer, an opaque white middle layer, and a transparent light gray outer layer	2,816	7.98
IVasd	Tumbled seed bead (1–4 mm) of compound construction consisting of a transparent light gray or aqua blue inner layer and an opaque white outer layer	6,398	18.12
IVb990	Tumbled spherical or oval necklace bead (4–10 mm) of compound construction consisting of a transparent light gray inner layer and an opaque white outer layer with blue stripes	29	0.08
IVbsd	Compound seed bead (1–4 mm) consisting of a transparent light gray inner layer, an opaque white middle layer, and a transparent light gray outer layer with six redwood stripes	514	1.46
IVbb3	Tumbled spherical necklace bead (4–10 mm) of compound and complex construction consisting of a transparent apple green inner layer and opaque red outer layer with black on white stripes	20	0.06
WIb	Large spherical mandrel-wound necklace bead (8–16 mm) of various colors	1,810	5.13
WIc	Large oval mandrel-wound necklace bead (8–16 mm) of various colors	632	1.79
WIIc	Large mandrel-wound marvered necklace beads (8–16 mm) of various colors with 8–10 pressed facets	273	0.77
WIId	Large mandrel-wound ‘‘raspberry’’ necklace beads (8–16 mm) of various colors	89	0.25
WIIe	Large mandrel-wound ‘‘melon-shaped’’ marvered necklace beads (8–16 mm) of various colors	4	0.01
WIcb	Small oval mandrel-wound necklace bead (2–6 mm) of various colors; also known as ‘‘barleycorn’’ or ‘‘rat turd’’ beads	475	1.35
	Total	**35,309**	

order to provide the clearest seriation solution possible. I do not include simple monochromatic seed beads because they compose such a significant portion of every assemblage that they drown out the chronologically significant variability in the other bead types. Seed beads of compound construction with clear or blue cores (described below), however, are left in the sample because their distribution across the assemblages is much more restricted, and they are more likely to be temporally diagnostic (Deagan 1987; Smith 1983). I also limit the sample to assemblages containing more than 20 beads. This threshold quantity is used because it alleviates most problems related to sample size while maximizing the number of assemblages that can be included in the analysis. The data requirements for the seriation technique further require limiting the sample to those assemblages containing two or more types of beads. Finally, I exclude a few large assemblages as outliers because their size and composition are so radically different from the rest of the sample that they drastically skew the results of the seriation[1]. Despite these steps, sample size differences are inevitable and do affect the seriation solution. For example, some bead types are incredibly rare (e.g., IIb27) and have little influence over the seriation solution, while others are quite numerous (e.g., IIa40) and have great influence (see Table 2). This will inevitably introduce error into the seriation and reduce the confidence associated with the temporal placement of certain bead styles (see notes 2 and 3). My goal in selecting the study sample was to be as inclusive as possible in the interest of identifying broad patterns, and I caution the reader to refrain from using the seriation solution as a means of selecting particular beads as ''index fossils.''

Following the traditional format for glass trade bead description (e.g., Deagan 1987; Karklins 1985; Kidd and Kidd 1970; Smith 1991, 1992, 2002b), my characterization of English colonial period trade beads is informed by method of manufacture, bead structure, and bead decoration. Table 2 contains a complete description of each bead type in the sample, and Table 3 contains count data for bead types in each assemblage.

There are two major methods of manufacture for glass trade beads. The first method is known as the drawn cane technique (Karklins 1985; Kidd and Kidd 1970). In this method, a mass of molten glass is removed from the furnace, blown into a hollow globe, and extruded. When the desired diameter of the bead is achieved, this drawn-out ''cane'' of glass is set aside to cool. The cooled canes are then broken into short tubular sections which can be left as they are (i.e., untumbled), or the beads can be tumbled in a heated barrel along with sand in order to produce a round or oval-shaped bead. The other manufacturing method, known as the ''wire-wound'' or ''mandrel-wound'' technique, involves winding a molten thread of glass around a metal mandrel until the desired diameter is achieved. Whereas beads are produced in batches using the drawn cane technique, they are individually manufactured using the mandrel-wound technique. In most cases, these two manufacturing processes are readily distinguishable (Kidd and Kidd 1970). Drawn cane beads are typically tubular, round, or oval in shape with a perceptible ''grain'' of air bubbles that runs parallel to the central perforation. Mandrel-wound beads, on the other hand, are more regular in shape (round or oval) and have a ''grain'' that runs circumferentially around the central perforation.

When applied to glass beads, the term structure refers to the composition of the bead body (Smith 1992). Beads of simple construction consist of a single layer of glass, whereas beads of compound construction are made up of multiple layers of glass, which in assemblages from the Southeast range from two to seven distinct layers. Compound bead structure is overwhelmingly associated with drawn beads rather than wound beads.

Bead decoration techniques include shaping, the addition of colored stripes, and much less frequently, the addition of inlaid decorations. Shaping is typically done while the bead is still in a plastic state and is accomplished with a mold or, more commonly, by applying pressure with a smooth or carved paddle while the bead lies on a flat stone or iron surface. This latter technique is called ''marvering'' (Kidd and Kidd 1970). The most common shaped glass beads in Southeastern assemblages are those with faceted sides, raspberry-shaped beads, and fluted or melon-shaped beads. Stripes are given to beads by applying canes of colored glass to the molten mass before it is extruded. Stripes can be of two types: simple and complex (Smith 1992). Simple-striped beads have stripes of monochromatic glass. Beads with complex stripes have individual stripes that consist of two (or more) different colors with one color appearing to be bordered on both sides by another color. The bordered effect is achieved by placing a narrow cane of glass on top of another, fatter cane of a different color. In the parlance of most classification systems, a red stripe bordered by white stripes would be called a ''red on white'' stripe. Inlaid decoration is the rarest form of decoration in Southeastern trade bead assemblages and typically occurs on mandrel-wound specimens. Materials used in the inlaying process include colored glass and in some cases precious metal, such as gold or silver gilt.

Table 2 presents the various bead types present in the sample. Small, drawn tubular untumbled opaque white and translucent blue seed beads of simple construction (Ia) compose a small minority of the study sample (n = 300, 0.9 percent). Untumbled monochromatic seed beads are typically found in glass trade bead assemblages spanning the second half of the eighteenth century (e.g., Baden 1983; Russ and Chapman 1983).

The most abundant beads in the sample are drawn monochromatic (simple construction) round or oval tumbled necklace beads (IIa) (n = 15,718, 44.5 percent). These are present in a number of colors, with opaque turquoise and white being the most common, followed by opaque black and dark blue, transparent blue, green, and burgundy (see Table 2). These types are by far the most ubiquitous beads found at seventeenth- and eighteenth-century Southeast and Midwest Indian sites. Their widespread distribution both within the study sample and across the Eastern Woodlands suggests that monochromatic drawn beads were heavily traded by the English, French, and Spanish throughout the entire period (Blair et al. 2009; Brain 1979; Good 1972; Smith 1992; Stone 1974).

The sample also includes drawn and tumbled spherical or oval necklace beads of simple construction with simple stripes (IIb and IIb') (n = 1,347, 3.8 percent). Most of these types are present in low frequencies ($n < 10$) among burial assemblages in the sample, with the exception of translucent to opaque ''brite'' navy beads with three or four white stripes (IIb67) and translucent ''brite'' navy beads with two white stripes (IIb990). Over 1,000 of the former type occur in two assemblages from the Upper Saratown site, and over 100 are present in one assemblage from the Tarver and Little Tarver sites (see Table 3).

Table 3. Glass trade bead frequencies in the study sample.

Assemblage	Cluster	Ia5	Ia15	IIa6	IIa13	IIa28	IIa31	IIa40	IIa44	IIa49	IIa55	IIa61	IIb10	IIb27	IIb32	IIb39	IIb56	IIb67	IIb990	IIb1004	IIb′3
44Hr4	1	0	0	0	0	0	0	54	0	0	0	0	0	0	0	0	0	0	0	0	0
Bt8-90	2	0	0	0	1	0	0	1	11	0	10	0	0	0	0	0	0	1	0	0	0
Jo6-31	2	0	0	53	161	0	0	2	0	0	3	0	0	0	0	0	0	0	0	0	0
Jo6-47	2	0	0	1	36	0	2	11	18	12	28	0	0	0	0	0	0	2	113	0	0
Jo6-49	2	0	0	1	375	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Jo6-50	2	0	0	1	0	0	0	1	0	0	20	0	0	0	0	0	0	0	0	0	0
Jo6-53	2	0	0	2	51	0	0	0	137	0	22	0	0	0	0	0	0	0	4	0	0
Jo6-78c	2	0	0	0	2	0	0	220	0	0	5	0	0	0	0	0	0	0	0	0	0
Jo6-78d	2	0	0	583	467	0	1	2,031	0	259	12	0	0	0	0	0	0	1	0	0	0
Jo6-78f	2	0	0	1	41	0	0	14	0	0	1	0	0	0	0	0	0	0	0	0	0
Jo6-78g	2	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mg31-10	2	0	0	1	10	0	0	30	0	0	0	0	0	0	0	0	0	0	0	0	0
Mg31-6	2	0	0	42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr2-10	4	62	0	0	8	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr2-2	2	0	0	0	17	0	0	7	0	0	0	0	0	0	0	3	0	0	0	0	0
Mr2-21	3	0	0	11	5	0	0	0	4	0	0	0	0	0	0	0	0	0	0	0	0
Mr2-29	4	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr2-32	2	0	0	4	54	31	0	190	17	0	0	0	0	1	0	1	0	0	0	0	0
Mr2-38	2	0	0	4	43	0	0	104	3	0	0	0	0	0	1	1	0	0	0	0	0
Mr2-42	4	64	77	13	42	0	0	4	6	18	0	0	0	0	1	1	0	0	0	0	0
Mr2-43	4	75	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr2-46	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr2-52	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr2-6	2	0	0	0	143	0	0	264	17	3	0	0	0	0	1	0	0	0	0	0	1
Mr2-65	2	0	0	0	34	0	0	888	0	0	0	0	0	0	0	10	0	0	0	0	0
Mr2-66	2	0	1	1	201	0	0	101	0	0	0	0	0	1	0	1	0	0	0	0	0
Mr2-7	2	0	0	0	78	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
Mr2-76	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr2-80	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr62-10	3	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr62-12	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr62-2	3	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Mr62-20	3	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr62-4	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mr62-6	2	0	0	0	51	0	205	190	2	1	0	0	0	0	0	0	0	0	0	0	0
Mr62-7	2	0	0	19	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	3
Mr62-9	3	0	0	6	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Ms100-13	2	0	0	0	2	0	0	3	0	0	334	0	0	0	0	0	0	0	0	0	0
Ms100-4	3	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ms100-56	2	0	0	0	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ms100-9	2	0	0	0	89	0	0	74	0	0	0	0	1	0	0	0	0	0	0	0	0
Ms32-13	2	0	0	0	0	0	0	216	0	0	4	0	0	0	0	0	0	1	0	0	0
Ms32-16	2	0	0	3	0	0	0	1,283	0	0	0	0	0	0	0	0	0	1	0	0	0
Ms32-22	2	0	0	1	0	0	0	30	0	0	10	0	0	0	0	0	0	0	0	0	0
Ms32-26	3	0	0	87	0	0	0	28	0	0	0	0	0	0	0	0	0	4	0	0	0
Ms32-27	2	0	0	0	0	0	0	309	0	0	2	0	0	0	0	0	0	0	0	0	0
Ms32-31	3	0	0	6	0	5	0	0	0	0	135	0	0	0	0	0	0	1	0	0	0
Ms32-42	2	0	0	3	0	1	0	31	0	0	0	0	0	0	0	0	0	3	0	0	0
Ms32-44	2	0	0	3	0	3	0	43	0	0	0	0	0	0	0	0	0	0	0	0	0
Ms32-48	2	0	0	0	0	0	0	245	0	0	0	0	0	0	0	0	0	0	0	0	0
Ms32-49	2	0	0	0	0	0	0	28	0	0	21	0	0	0	0	0	0	0	0	0	0
Ms32-68	2	0	0	3	0	2	0	109	0	0	0	0	0	0	0	0	0	1	0	0	0
Ms91-25	2	0	0	0	0	1	0	371	0	0	52	0	2	0	0	0	0	0	0	0	0
Ms91-44	3	0	0	0	0	0	0	199	0	0	0	0	0	0	0	0	0	0	0	0	0
Ms91-45	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Ms91-5	2	0	0	1	0	1	0	839	0	0	0	0	0	0	0	0	0	1	0	0	0
Or231-1	2	0	0	0	0	0	0	1	0	0	2	16	0	0	0	0	0	0	0	0	0
Or231-10	2	0	0	0	45	0	0	5	0	0	1	1	0	0	0	0	0	0	0	0	0

Table 3. Glass trade bead frequencies in the study sample (extended).

Assemblage	IIb′6	IIbb12	IIbb15	IIbb24	IIbb27	IIg	IIj	IIIa1	IVa5	IVa5sd	IVa11sd	IVasd	IVb990	IVbsd	IVbb3	WIb	WIc	WIIc	WIId	WIIe	WIcb	Total
44Hr4	0	0	0	0	0	0	0	0	0	0	0	119	0	9	0	0	0	0	0	0	0	182
Bt8-90	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25
Jo6-31	0	0	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	0	0	0	0	232
Jo6-47	0	0	0	3	1	0	0	32	95	3	0	0	0	0	3	0	0	0	0	0	0	360
Jo6-49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	377
Jo6-50	0	0	0	0	0	0	0	75	0	1,610	0	0	0	0	0	0	0	0	0	0	0	1,707
Jo6-53	0	1	0	4	0	0	0	0	0	4	0	0	0	0	1	0	0	0	0	0	0	226
Jo6-78c	0	0	0	2	1	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	233
Jo6-78d	0	0	0	0	0	0	1	0	2	3	0	0	0	0	0	0	0	3	87	1	0	3,451
Jo6-78f	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57
Jo6-78g	0	0	0	0	0	0	0	0	587	45	0	0	0	0	0	0	0	0	0	0	0	634
Mg31-10	0	6	0	0	0	0	0	0	0	25	0	0	0	0	0	0	0	0	0	0	0	72
Mg31-6	0	0	0	0	0	0	0	0	0	298	0	0	0	0	0	0	0	0	0	0	0	340
Mr2-10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71
Mr2-2	0	0	0	0	0	0	1	0	7	0	0	0	0	0	0	1	0	14	1	0	0	51
Mr2-21	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	34	0	1	37	95
Mr2-29	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	22	0	0	0	0	43
Mr2-32	1	7	4	1	0	0	0	0	0	129	0	0	0	0	0	0	0	0	0	0	0	440
Mr2-38	0	6	0	0	0	0	0	0	47	0	0	0	0	0	0	0	0	0	0	0	0	209
Mr2-42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	21	25	14	0	0	0	286
Mr2-43	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	22	0	0	0	0	0	97
Mr2-46	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	101	102
Mr2-52	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	11	0	12	0	0	0	34
Mr2-6	4	3	0	0	0	0	0	2	2	0	0	0	0	0	2	10	0	5	1	0	0	458
Mr2-65	4	4	1	0	0	0	0	0	0	0	0	0	0	0	0	0	43	0	0	0	0	984
Mr2-66	2	7	0	2	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	322
Mr2-7	0	0	0	0	0	0	31	0	0	0	0	0	0	0	0	12	0	23	0	0	0	152
Mr2-76	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	24	0	0	0	0	49
Mr2-80	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	19	0	28	0	0	0	47
Mr62-10	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	32	44	0	0	0	80
Mr62-12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	29	4	0	0	0	33
Mr62-2	0	0	0	0	0	0	0	0	34	2	0	0	0	0	0	6	11	2	0	0	0	58
Mr62-20	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	27	0	0	2	337	375
Mr62-4	0	0	0	0	0	0	0	0	4	77	0	0	0	0	0	0	0	0	0	0	0	81
Mr62-6	0	0	0	4	0	0	0	0	0	424	0	0	0	0	0	0	0	0	0	0	0	877
Mr62-7	0	0	0	0	1	0	6	0	0	2	0	0	0	0	2	0	0	2	0	0	0	43
Mr62-9	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	18	3	0	0	0	31
Ms100-13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	339
Ms100-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	174	0	0	0	0	175
Ms100-56	0	0	0	0	0	0	0	0	172	0	0	0	0	0	0	0	0	0	0	0	0	261
Ms100-9	0	1	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	176
Ms32-13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	223
Ms32-16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,287
Ms32-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
Ms32-26	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	4	175	0	0	0	0	299
Ms32-27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	311
Ms32-31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	144	4	0	0	0	0	295
Ms32-42	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	38
Ms32-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	5	0	0	0	0	67
Ms32-48	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	246
Ms32-49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49
Ms32-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	0	0	0	0	0	157
Ms91-25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	426
Ms91-44	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1,039	0	0	0	0	0	1,238
Ms91-45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	42	27	0	0	0	0	69
Ms91-5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	846
Or231-1	0	0	0	0	0	0	10	0	1	0	0	0	0	0	0	0	0	0	0	0	0	30
Or231-10	0	0	0	0	0	0	0	0	70	0	0	0	0	0	0	0	0	0	0	0	0	122

Table 3. Glass trade bead frequencies in the study sample (continued).

Assemblage	Cluster	Ia5	Ia15	IIa6	IIa13	IIa28	IIa31	IIa40	IIa44	IIa49	IIa55	IIa61	IIb10	IIb27	IIb32	IIb39	IIb56	IIb67	IIb990	IIb1004	IIb′3
Or231-11	2	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Or231-2	2	0	0	0	25	0	2	16	0	0	0	0	0	0	0	0	0	0	0	0	0
Or231-6	2	0	0	0	0	0	0	3	0	0	1	1	0	0	0	0	0	0	0	0	0
Pk1-1	2	0	0	1	0	0	0	26	0	220	0	0	0	0	0	0	0	0	0	0	0
Pk1-11	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Pk1-7	3	0	0	0	1	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0	0
Pk1-8	2	0	0	25	165	0	0	237	0	0	37	0	0	0	4	2	0	0	9	0	0
Rd3-1	2	0	0	0	1	0	0	36	0	0	3	0	0	0	0	0	0	0	0	0	0
Rk6-112	1	0	0	0	0	0	0	92	0	0	0	0	0	0	0	0	0	0	0	0	0
Rk6-33	1	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	1	0
Rk6-65	1	0	0	0	0	0	5	81	0	1	0	0	0	0	0	0	1	0	0	1	0
Rk6-93	2	0	0	0	11	0	0	16	0	0	0	0	0	0	0	0	2	0	0	0	0
Sk1a-1	2	1	0	0	38	0	0	4	0	5	0	18	0	0	0	0	0	0	0	0	0
Sk1a-109	2	0	0	0	3	0	0	1	0	165	0	11	1	0	0	0	8	933	0	0	0
Sk1a-13	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sk1a-19	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sk1a-22	2	0	0	0	0	1	3	12	8	0	4	0	0	0	0	0	0	0	0	0	0
Sk1a-24	2	0	0	0	84	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	0
Sk1a-35	2	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sk1a-36	1	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0
Sk1a-38	2	0	0	0	205	0	0	173	0	18	6	15	0	0	0	0	0	3	0	0	0
Sk1a-39	1	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Sk1a-43	1	0	0	0	0	0	0	30	1	42	0	0	0	0	0	0	0	0	0	0	0
Sk1a-48	2	0	0	0	133	0	0	179	0	0	0	43	2	0	0	0	0	205	0	0	0
Sk1a-50	2	0	0	0	0	0	0	15	0	7	0	18	0	0	0	0	0	0	0	0	0
Sk1a-51	1	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0	0	0
Sk1a-55	2	0	0	0	29	0	0	8	0	0	0	0	0	0	0	0	0	0	0	0	0
Sk1a-6	2	0	0	0	1	0	0	142	0	69	3	0	0	0	0	0	0	0	0	0	0
Sk1a-64	2	0	0	0	52	0	0	135	0	0	0	0	0	0	0	0	0	0	0	0	0
Sk1a-65	2	0	0	0	13	0	2	165	0	8	0	0	0	0	0	0	0	0	1	0	0
Sk1a-68	2	0	0	0	51	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0
Sk1a-76	1	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sk1a-84	1	0	0	0	1	0	1	40	0	0	0	0	0	0	0	0	0	0	0	0	0
Sk1a-9	2	0	0	0	1	0	0	194	0	12	0	0	0	0	0	0	0	0	0	0	0
Sk1a-95	2	0	0	0	65	0	0	0	0	0	0	4	0	0	0	0	0	1	0	0	0
Wg17-14	2	0	0	0	0	2	0	15	36	0	2	0	0	0	0	0	0	0	0	0	0
Wg17-33	1	0	0	0	0	0	0	67	0	0	2	0	0	0	0	0	0	0	0	0	0
Total		202	98	884	2,935	47	221	9,657	264	848	730	132	6	2	7	19	11	1,158	127	2	4

Table 3. Glass trade bead frequencies in the study sample (continued extended).

Assemblage	IIb′6	IIbb12	IIbb15	IIbb24	IIbb27	IIg	IIj	IIIa1	IVa5	IVa5sd	IVa11sd	IVasd	IVb990	IVbsd	IVbb3	WIb	WIc	WIIc	WIId	WIIe	WIcb	Total
Or231-11	0	0	0	0	0	0	0	0	232	0	0	0	0	0	0	0	0	0	0	0	0	233
Or231-2	0	0	0	1	0	0	0	0	0	96	0	0	0	0	0	0	0	0	0	0	0	140
Or231-6	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	0	0	0	0	22
Pk1-1	0	0	0	0	0	0	28	0	0	0	0	0	0	0	0	13	0	6	0	0	0	294
Pk1-11	0	0	0	0	0	0	2	0	0	445	0	0	0	0	0	380	12	52	0	0	0	892
Pk1-7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	26	0	0	0	36
Pk1-8	0	11	0	1	0	0	0	0	109	0	0	0	0	0	1	1	0	0	0	0	0	602
Rd3-1	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	46
Rk6-112	0	0	0	0	0	0	0	0	0	0	0	1,580	0	3	0	0	0	0	0	0	0	1,675
Rk6-33	0	0	0	0	0	0	0	0	1	2	0	2,190	0	440	0	0	0	0	0	0	0	2,651
Rk6-65	0	0	0	0	0	0	0	0	0	0	0	783	0	12	0	0	0	0	0	0	0	884
Rk6-93	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	40
Sk1a-1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66
Sk1a-109	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1,123
Sk1a-13	0	0	0	0	0	29	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	31
Sk1a-19	0	0	0	0	0	0	0	0	0	0	86	1,069	0	0	0	0	0	0	0	0	0	1,155
Sk1a-22	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28
Sk1a-24	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	97
Sk1a-35	0	0	0	0	0	0	0	0	0	0	0	1	23	0	0	0	0	0	0	0	0	25
Sk1a-36	0	0	0	0	0	0	0	0	0	0	1,011	48	0	0	0	0	0	0	0	0	0	1,061
Sk1a-38	0	0	0	0	0	2	0	0	0	0	0	0	4	1	0	0	0	0	0	0	0	427
Sk1a-39	0	0	0	0	0	0	0	0	0	4	14	2	0	0	0	0	0	0	0	0	0	22
Sk1a-43	0	0	0	0	0	0	0	0	0	0	1,646	246	0	11	0	0	0	0	0	0	0	1,976
Sk1a-48	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	563
Sk1a-50	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	41
Sk1a-51	0	0	0	0	0	0	0	0	0	0	0	0	0	38	0	0	0	0	0	0	0	41
Sk1a-55	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	40
Sk1a-6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	215
Sk1a-64	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	187
Sk1a-65	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	189
Sk1a-68	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
Sk1a-76	0	0	0	0	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	77
Sk1a-84	0	0	0	0	0	0	0	0	0	0	0	224	0	0	0	0	0	0	0	0	0	266
Sk1a-9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	207
Sk1a-95	0	0	0	0	0	2	0	0	0	1	0	6	0	0	0	0	0	0	0	0	0	79
Wg17-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55
Wg17-33	0	0	0	0	0	0	0	0	0	0	58	32	0	0	0	0	0	0	0	0	0	159
Total	11	46	5	19	3	35	92	109	1,403	3,172	2,816	6,398	29	514	20	1,810	632	273	89	4	475	35,309

Drawn and tumbled white or blue necklace beads of simple construction with complex stripes form a small minority of the assemblage (IIbb) (n = 73, 0.2 percent). The stripes on these beads are typically configured as red on white for blue beads, and blue on red for white beads. While these bead types are not present in large frequencies, they do exhibit a wide geographic distribution across late-seventeenth- and eighteenth-century Indian, English, French, and Spanish colonial sites from the Mississippi River valley, across the Appalachian Mountains and the Piedmont of Georgia, to the Atlantic Coast (e.g., Brain 1979; Pendleton et al. 2009; Fleming 1976; Good 1972; Stone 1974).

Drawn beads of compound construction are the second most common bead types in the sample (n = 14,461, 41 percent). This group includes undecorated tumbled beads (IVa), decorated tumbled beads (IVb and IVbb), and undecorated untumbled bead (IIIa), as well as both necklace and seed beads. Beads with two glass layers include those with transparent green cores and opaque red outer layers (IIIa1, IVbb3, IVa5 and IVa5sd), so-called Cornaline d'Allepo beads, and beads with clear cores and opaque white outer layers (IVasd and IVb990). Beads with three glass layers are all seed beads and include both undecorated (IVa11sd) and decorated (IVbsd) varieties. While Cornaline d'Allepo beads span the entire study period, compound seed beads appear to be limited to contexts dating to the first half of the seventeenth century (Deagan 1987; Pendleton et al. 2009; Smith 1983).

A sizable minority of the study sample is comprised of mandrel-wound (wire-wound) beads (n = 3,283, 9.3 percent). These beads represent a number of different shapes, including spherical, oval, faceted, raspberry-shaped, and fluted. These types are all present in English-, French-, and Spanish-traded bead assemblages at sites thought to date to the eighteenth century across the Southeast (e.g., Brain 1979; Fleming 1976; Good 1972; Pendleton et al. 2009; Stone 1974).

The sample also includes two rare but very distinct bead types that have garnered highly memorable nicknames. The first type characterizes tumbled, opaque white, spherical or oval necklace beads of simple construction with dark blue inlaid ''eyes'' (n = 35, 0.1 percent). These are the ''flush-eye'' beads mentioned above, which Smith (1982, 1983) dates to the period 1575–1630. The other type includes dark rose brown, tumbled, round necklace beads of simple construction with inlaid white or yellow wavy stripes (n = 92, 0.3 percent). This particular bead type appears black until held up to light and is often classified as opaque black. These distinctive beads, often referred to as ''Roman'' or ''rattlesnake'' beads, appear at sites occupied during the late seventeenth and early eighteenth centuries (Pluckhahn 1996, 1997; Schroedl and Breitburg 1986).

Taken as a whole, the beads traded during the English colonial period evince a great deal of variability in manufacturing technique, bead structure, and bead decoration (see Table 2). The key question of this study is whether this variability is patterned in such a way that might assist archaeologists in estimating the occupation dates of undocumented Southeastern Indian communities. The previous research discussed above has focused upon using tightly dated, historically documented sites to estimate the production ranges for specific bead types, which are then used as index fossils to date assemblages recovered from undocumented sites. This work has been quite successful and is crucial to furthering our understanding of the contact and colonial periods. In this study, I attempt a very different exploratory approach in which I am concerned with identifying broad patterns of temporal change within entire assemblages. In this approach, time is measured by the changing frequencies of different bead types composing entire trade assemblages rather than solely by the introduction and ''dropping out'' of particular diagnostic bead types. As I discuss below, this crucial difference in perspective results in a different type of product that can be used to test and complement the results of the more traditional method of analysis.

Seriation Method

As noted, the exploratory method used in this study differs significantly from methods used in the studies outlined above (e.g., Brain 1979; Deagan 1987; Polhemus 1983; Smith 1983). First, the large sample used in this study affords the opportunity to forgo combining assemblages at the site level and allows individual mortuary assemblages to become the unit of analysis. Second, the chronology developed in this study uses a quantitative multidimensional seriation method based on the relative frequencies of different bead types. Third, the seriation technique used in this study does not proceed from known occupation dates for sites. Instead, this study uses an exploratory and nonparametric seriation technique that attempts to identify patterns in a data set without any previous assumptions. Together, the combination of a large, new data set with an alternative seriation technique make this study ideal for testing some of the chronological trends that have been proposed by previous scholars. As will be shown, mine is necessarily a ''coarser'' perspective temporally; however, the twofold value of this seriation lies in its ability to (1) chart the ''big picture'' of stylistic change in English-traded glass bead assemblages throughout the seventeenth and eighteenth centuries and (2) provide an alternative method of estimating the occupation ranges of undocumented Indian sites in the Southeast by looking at the composition of entire assemblages rather than the production ranges of particular ''index fossils.''

In the Southeast, material culture seriations have historically been associated with ''Fordian'' frequency seriations of ceramic assemblages. This method results in classic figures portraying the ''battleship-shaped'' frequency distributions of chronologically ordered ceramic assemblages (Dunnell 1970; Phillips et al. 1951; see also below). Recently, authors have critiqued this traditional method of seriation citing the largely intuitive nature of the procedure, inherent problems of closure when using percentages, and the inability of the method to portray variability in more than one dimension (e.g., McNutt 2005; Mainfort 2005). For these reasons, I use an alternative multidimensional method of seriating glass bead assemblages as the foundation of the chronology.

This seriation method is called correspondence analysis (CA) (see Baxter 1994; Shennan 1997). CA is a powerful multivariate statistical technique that has been used widely for seriating artifact assemblages in European archaeology (e.g., Bech 1988; Madsen 1988). Until fairly recently, CA was rarely encountered in the archaeological literature of North America (see Duff 1996 and Smith and Neiman 2007 for notable examples). The relative obscurity of CA is curious given that the technique is based on straightforward and fundamental statistical logic—essentially the same logic that underlies the chi-square test. Unlike other multivariate techniques, it requires no assumptions of the data and works directly on untransformed artifact frequencies (counts); and like the chi-square test, CA is resistant to differences in sample sizes.

One of the largest obstacles to constructing a comprehensive glass bead chronology for the Southeast has been finding techniques that can simultaneously account for variability along dozens of dimensions representing the different bead types. The data set (data matrix) in this study, for example, consists of 95 mortuary assemblages and 41 separate bead types, each representing a single dimension of variability (see Table 3). It is impossible to ascertain any patterns simply by inspecting the data matrix alone. While one could easily plot the mortuary assemblages in terms of the frequencies of two or perhaps three bead types in the same figure, one cannot simultaneously visualize the 41 dimensions that represent all of the bead types. CA is an ordination technique that seeks to represent as accurately as possible the relationships between cases (i.e., individual mortuary assemblages) and between variables (i.e., glass bead types) using a small number of dimensions. Thus CA solves the dilemma by providing the analyst with a way to visually explore and present multivariate data by reducing the dimensionality of a data matrix. This technique is particularly suited to seriation because one of the major dimensions of variability among artifact assemblages tends to be time.

In this study, the correspondence analysis is carried out using the ''correspondence analysis'' module of the Bonn Archaeological Software Package (BASP). This program takes input in the form of a frequency matrix and returns output in the form of distributional biplots. One of the benefits of this program is that it depicts the distribution of individual mortuary assemblages and bead types together in a single biplot. In interpreting the combined biplots in the following discussion, one can infer that mortuary assemblages and bead types located near one another in the biplot are, in relative terms, temporally associated.

A few caveats about the procedure are in order before delving into the results. First, I must stress that my use of CA in this paper is exploratory, as an initial step in identifying patterns of association among certain bead types across nearly 100 assemblages. As with any seriation technique, the assemblages will be placed in an order based upon similarities and differences in particular attributes (in this case, the relative frequencies of different bead types). Whether the order that results is chronological in nature I will assess using other historic and archaeological evidence.

There are also a couple of important issues associated with this study sample that doubtless affect the results of the seriation. First, there is the fact that the classifications of the beads in the sample are made by numerous researchers. While the Kidd and Kidd (1970) classification system greatly increases the objectivity of taxonomic procedures, a subjective element always remains. As such, the study sample may include misclassifications made by the original researcher as well as mistranslations on my part. Second, the study sample contains an overrepresentation of bead assemblages that were likely traded during the late seventeenth and early eighteenth centuries. As such, the seriation results will likely be less accurate for earlier and later time periods.

Results of the Seriation

The results of the CA seriation are presented in Figures 2, 3, and 4. The seriation solution accounts for 22.1 percent of the variance in the entire data matrix using two components (eigenvalue = 0.887). While this figure may seem unimpressive at first glance, it represents a significant amount of variance given that there are 95 cases and the number of dimensions is reduced from 41 to only two. Furthermore, as an exploratory technique, the success of this seriation should be judged primarily on its ability to order the assemblages chronologically, which must be assessed independently and not strictly by the amount variance

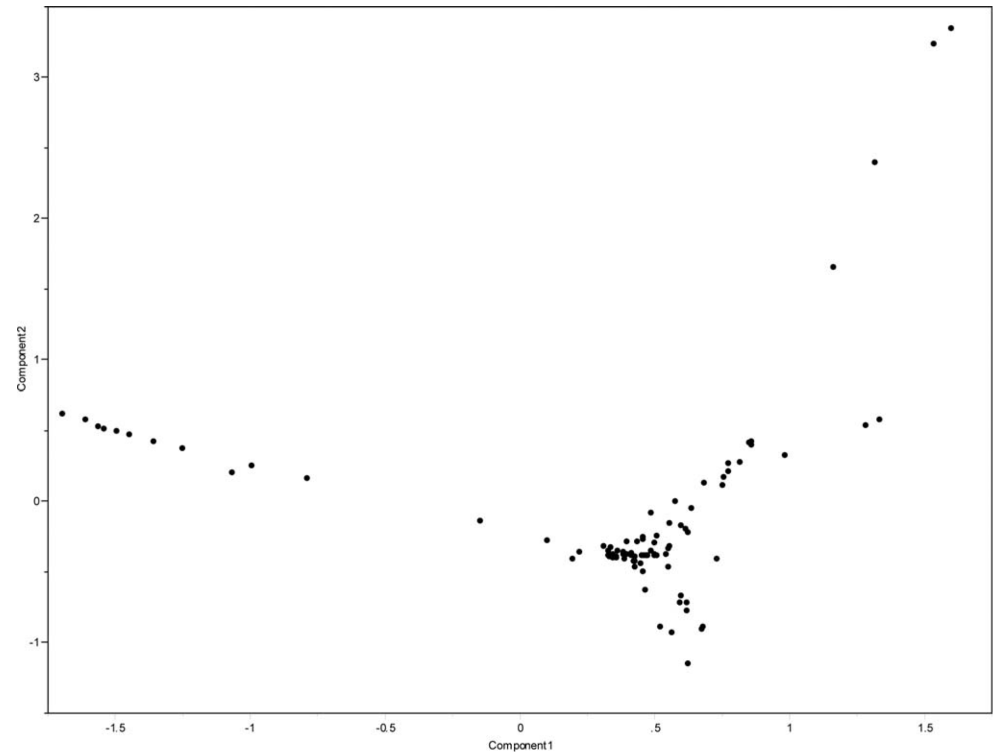

Figure 2. Biplot depicting the results of the correspondence analysis seriation of mortuary assemblages.

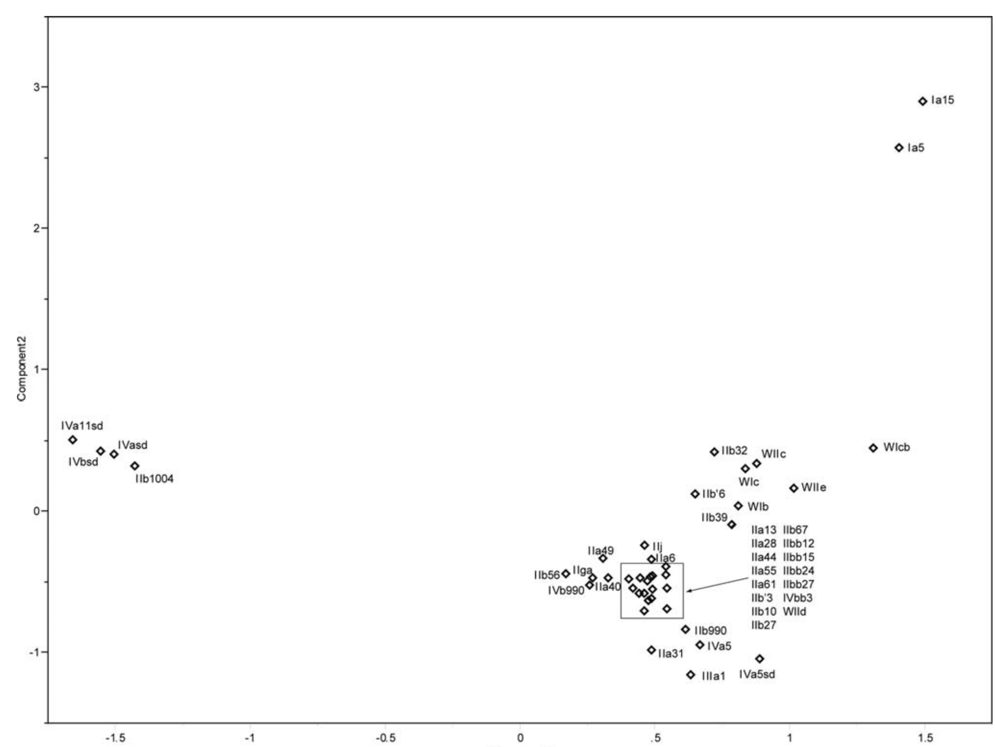

Figure 3. Biplot depicting the results of the correspondence analysis seriation of bead types.

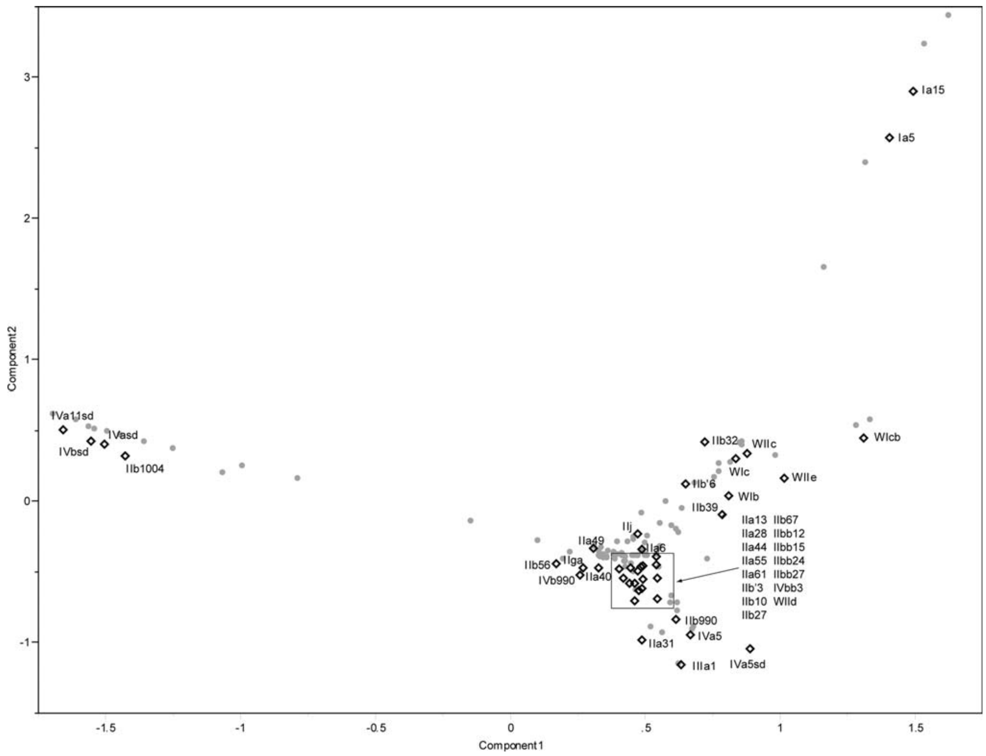

Figure 4. Combined biplot depicting the results of the correspondence analysis seriation of mortuary assemblages and bead types.

explained in the data matrix. Indeed, in a textbook case study addressing the use of CA in seriating Iron Age Danish Hoards, the first two dimensions account for 30 percent of the variance in the data matrix (Shennan 1997:331).

A biplot depicting the relationships among the individual glass bead mortuary assemblages reveals two important distributional patterns (see Figure 2). First, the distribution of the glass bead assemblages has the classic parabola or ''twisted one-dimensional object'' shape that is the hallmark of chronological seriation using multidimensional techniques (Cowgill 1972; Kendal 1971; Steponaitis 1983). Second, the distribution of glass bead assemblages appears to form distinct clusters along the x-axis—the axis that likely represents time. The same pattern describes the distribution of bead types (see Figure 3). When the distributions of individual assemblages and bead types are plotted together, the redundancy of the patterns suggest that there are ''meta-assemblages'' of glass beads marked by the consistent associations of particular bead types (see Figure 4).

A K-means cluster analysis of the CA component scores (i.e., the coordinates of each point in the CA biplot) of each glass bead assemblage provides another means to identify and test the feasibility of the glass bead ''meta-assemblages.'' K-means cluster analysis is a nonhierarchical iterative clustering procedure that many archaeologists have used to identify patterns in spatial distributions (Duff 1996; Kintigh and Ammerman 1982; Shennan 1997). The method begins with the analyst defining the number of clusters desired. The procedure then undertakes an iterative process of calculating the cluster centers and boundaries with the goal of minimizing dispersion within the clusters and maximizing dispersion between clusters. After numerous trials, I chose a four-cluster solution (Figure 5). The ellipsoids around each cluster in the biplot represent 95 percent confidence intervals, and with the exception of a single assemblage within both Cluster 2 and Cluster 3, the lack of overlapping in the clusters indicates that these are statistically discrete phenomena.

Turning to the composition of the four clusters or meta-assemblages, it is clear that the CA seriation identified some substantive associations among bead types. These clusters are not based on the presence and/or absence of particular bead types; instead, they represent consistent associations of bead types within assemblages. It is completely possible, therefore, for bead types of different clusters to show up in the same assemblage. For example, assemblage Mr2-42 is classified as part of Cluster 4, based on significant frequencies of monochromatic untumbled drawn seed beads (Ia), even though the assemblage also contains some Cluster 2 beads. In this way, the clusters identified here are similar in composition to ceramic phases, where pottery types may occur across several phases but where the relative frequencies of types are the most important

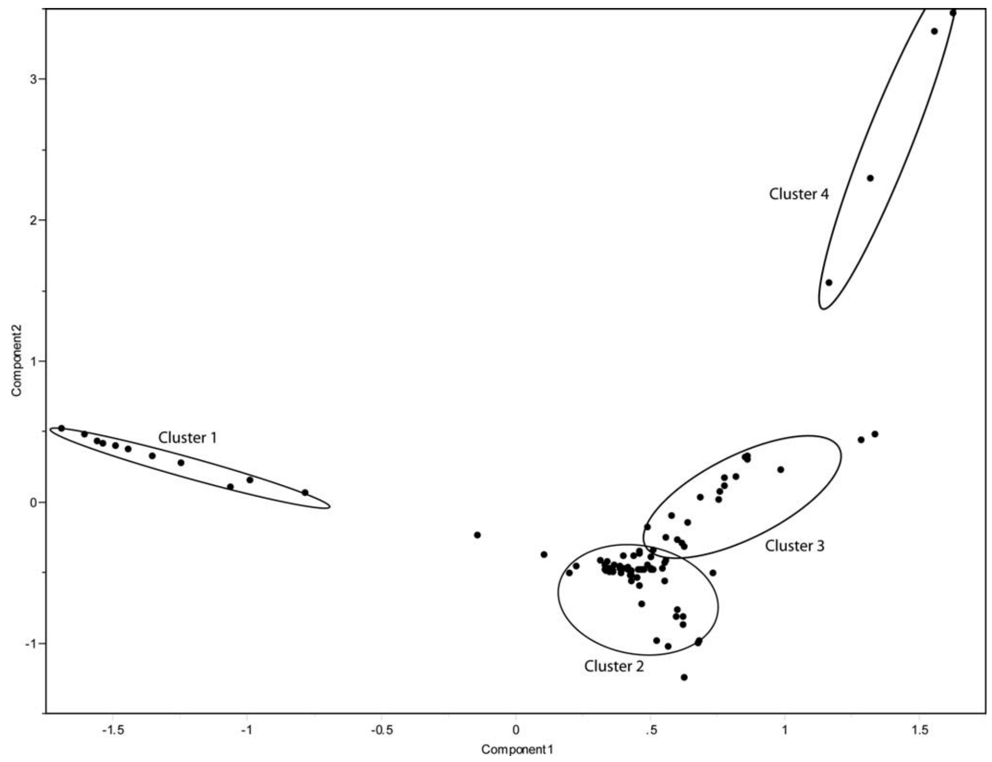

Figure 5. Biplot depicting the results of the K-mean cluster analysis.

determinants in the assignment of particular ceramic assemblages to specific phases.

Table 4 lists the key bead types and mortuary assemblages composing each of the four clusters. As I detail below, the distinct composition of each of the four clusters evinces considerable internal consistency with respect to method of manufacture, bead structure, and bead decoration. I interpret this as additional evidence that the clusters are tracking real historical associations among certain bead types.

Cluster 1 assemblages are dominated by drawn compound seed beads constructed of two or three layers of glass with clear or light blue translucent cores and opaque outer surfaces (IVasd). These are not to be confused with Cornaline d'Allepo seed beads, which have translucent green cores and opaque red outer surfaces (Figure 6). In addition, while a very small minority in the study sample, the distribution of drawn translucent navy blue beads with 8–10 white stripes (IIb1004) is limited to this cluster. The mortuary assemblages included in this cluster are limited to sites in the North Carolina Piedmont as well as the Plum Grove site in eastern Tennessee.

Cluster 2 is a large and diverse meta-assemblage. The dominant bead types in these assemblages are drawn monochromatic necklace beads and necklace beads with simple and complex stripes (IIa, IIb, and IIbb) (see Figure 6). Cluster 2 also contains all of the Cornaline d'Allepo seed, tubular, and necklace beads (IVa5, IVa5sd, IVbb3, IIIa1). Interestingly, the distribution of these types forms a subset within Cluster 2 in the biplot (see Figure 3). This cluster also contains distinct bead types, including ''rattlesnake'' beads (IIj), ''eye beads'' (IIg), and mandrel-wound raspberry-shaped beads (WIId). Virtually every site in the sample is represented in Cluster 2, indicating that this combination of bead types was a mainstay of English traders in the Southeast.

Cluster 3 is a meta-assemblage containing nearly all mandrel-wound beads (WIb, WIc, WIIc, WIIe, WIcb) along with three types of drawn beads with simple stripes (IIb'6, IIb32, and IIb39) (see Figure 6). Mortuary assemblages in this cluster are from Columbus Landing, McKee Landing, Law's Site in Alabama, and Ocoee and Chota-Tanasee in East Tennessee.

The mortuary assemblages in Cluster 4 are primarily comprised of small diameter monochromatic untumbled (i.e., tubular) seed beads (see Figure 6). Aside from a single specimen found at Upper Saratown, all of the beads of this type are from the Chota-Tanasee site in East Tennessee.

Discussion of Chronological Significance

Employing CA seriation and K-means cluster analysis, I have identified four clusters or meta-assemblages of bead types, each of which is characterized by distinct combinations of methods of manufacture, bead

Table 4. Composition of clusters identified in the CA seriation.

Cluster	Key Bead Types		Mortuary Assemblages		
4	Ia5	Ia15	Mr2-10	Mr2-42	
			Mr2-29	Mr2-43	
3	IIb′6	WIIe	Mr2-46	Mr62-10	Ms91-44
	IIb32	WIb	Mr2-52	Mr62-12	Ms91-45
	IIb39	WIc	Mr2-76	Mr62-20	Ms100-4
	WIIc	WIcb	Mr2-80	Mr62-2	Pk1-7
			Mr2-21	Ms32-26	Pk1-11
			Mr62-9	Ms32-31	
2	IIa6	IIb′3	Jo6-31	Ms100-13	Sk1a-22
	IIa13	IIbb12	Jo6-47	Ms100-9	Sk1a-13
	IIa28	IIbb15	Jo6-49	Ms100-56	Sk1a-24
	IIa31	IIbb24	Jo6-50	Ms32-13	Sk1a-35
	IIa40	IIbb27	Jo6-53	Ms32-16	Sk1a-38
	IIa44	IIg	Jo6-78c	Ms32-22	Sk1a-48
	IIa49	IIj	Jo6-78d	Ms32-27	Sk1a-50
	IIa55	IIIa1	Jo6-78f	Ms32-42	Sk1a-55
	IIa61	IVa5	Jo6-78g	Ms32-44	Sk1a-6
	IIb10	IVa5sd	Mg31-6	Ms32-48	Sk1a-64
	IIb27	IVbb3	Mg31-10	Ms32-49	Sk1a-65
	IIb56	IVb990	Mr2-2	Ms32-68	Sk1a-68
	IIb67	WIId	Mr2-32	Ms91-25	Sk1a-9
	IIb990		Mr2-38	Ms91-5	Sk1a-95
			Mr2-6	Or231-1	Wg17-14
			Mr2-65	Or231-2	Bt8-90
			Mr2-66	Or231-6	Pk1-1
			Mr2-7	Or231-10	Pk1-8
			Mr62-4	Or231-11	Rd3-1
			Mr62-6	Sk1a-1	Rk6-93
			Mr62-7	Sk1a-109	
1	IIb1004	IVasd	Rk6-33	Sk1a-36	Sk1a-76
	IVa11sd	IVbsd	Rk6-65	Sk1a-39	Sk1a-84
			Rk6-112	Sk1a-43	44Hr4
			Sk1a-19	Sk1a-51	Wg17-33

structure, and decoration. Furthermore, the assumption is that the order of the clusters (moving from left to right along the x-axis in Figures 2, 3, 4, and 5) is chronological. The ''devil in the details'' of seriation, however, lies in demonstrating whether one's solution is, in fact, tracking time. Indeed, any multivariate ordination technique (e.g., correspondence analysis, multidimensional scaling, or principal components analysis) will place data points in some order with respect to two axes. The issue, then, is determining whether the structuring principle shaping that order is time. Do Clusters 1–4 track temporal changes in English-traded bead assemblages throughout the period 1607–1783? In what follows, I answer this question in the affirmative based on the published estimates of date ranges for the sites in the sample, on historical evidence, on previous research regarding the chronology of various bead types, and on associations with other well-dated European artifact types (e.g., Deagan 1987; Smith 1982, 1983, 1987, 2002b; Waselkov 1989). I propose that the four clusters represent temporally associated bead styles that were traded during four different periods within the English colonial trade.

The earliest cluster in the CA seriation (Cluster 1) features assemblages dominated by multilayered (i.e., compound) seed beads with clear or transparent blue cores and opaque white outer surfaces. Within the study sample, Cluster 1 beads were recovered from sites whose occupations are limited to the seventeenth century (Madison, Upper Saratown, Philpott, Plum Grove) (see Table 1) (Eastman 1999; Smith n.d.; Ward and Davis 1993). Indeed, we know from John Lawson's voyage through Piedmont North Carolina that the region's sites were all but abandoned at the turn of the eighteenth century (Ward and Davis 2001). In his analysis of sixteenth- and seventeenth-century bead assemblages from across the Southeast, Marvin Smith (1983) has found this type of bead to be largely an early- to mid-seventeenth-century phenomenon. Also, Blair's (2009:157–159) analysis of Spanish-traded bead assemblages from Mission Santa Catalina de Guale concurs with this time range. Thus it appears that Cluster 1 marks assemblages dating to the first half of the seventeenth century. Given this timing, and the location of the sites in Cluster 1, it is reasonable to associate this cluster with beads circulating through trade with Virginians. First, this period predates the 1670 founding of Charles Town, which according to published literature (Smith 2001) and my own examination of the current bead sample from the area's earliest colonial sites, has yet to produce a single specimen of a Cluster 1 bead type. Excavations at the site of Jamestown (ca. 1607–23), on the other hand, have recovered numerous Cluster 1 specimens, as well as other two- and three-layered seed beads in a variety of color combinations (Lapham 2001:Figure 1).

The majority of the mortuary assemblages in Cluster 2 were recovered from sites with occupations dating to

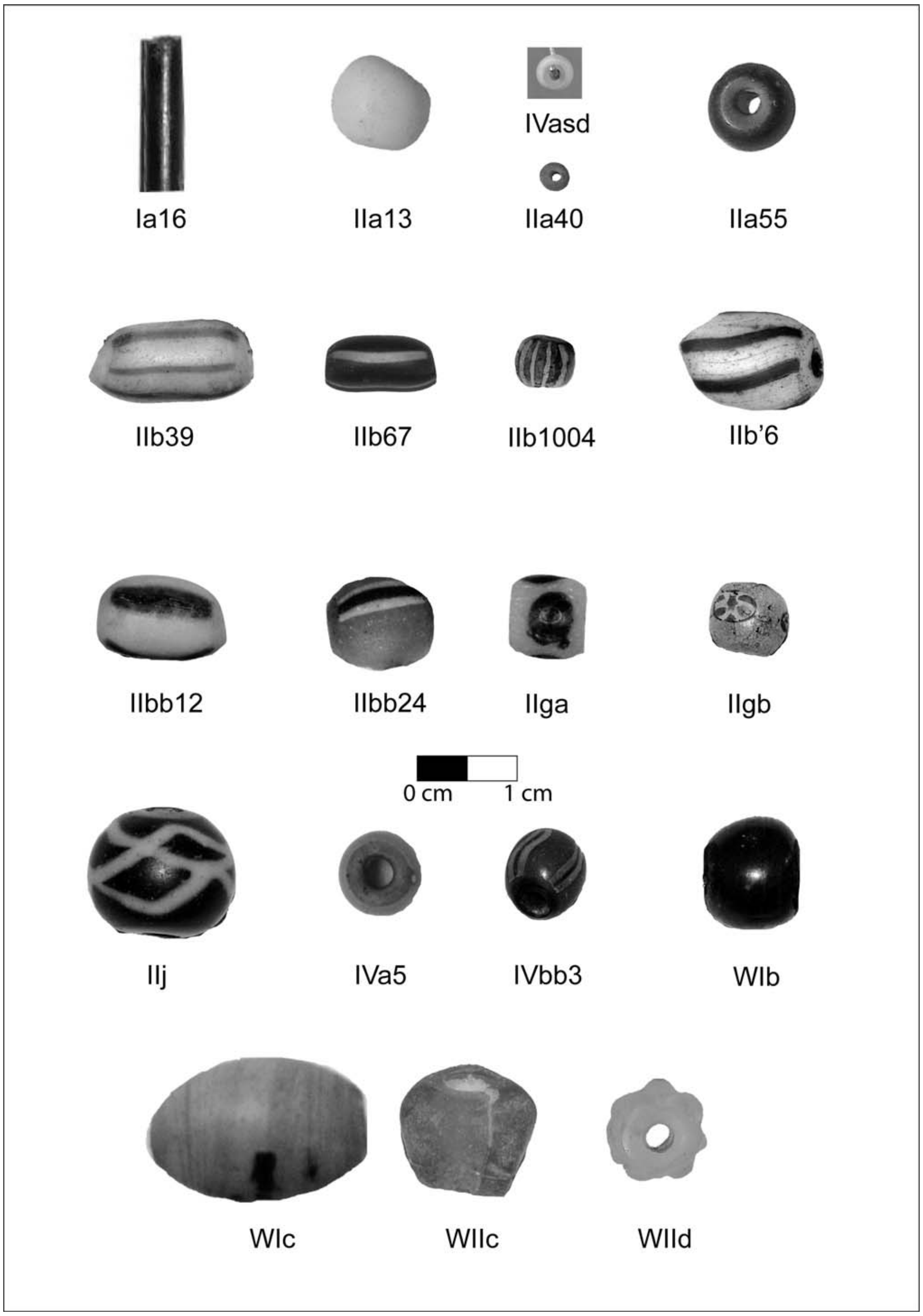

Figure 6. Bead types typically found in seventeenth- and eighteenth-century glass trade bead assemblages. Photograph of type IVasd courtesy of the RLA at the University of North Carolina at Chapel Hill. Types used in this study are based on the classification system pioneered by Kidd and Kidd (1970).

between 1650 and 1715. These include Upper Saratown and Fredricks in the North Carolina Piedmont (Eastman 1999; Ward and Davis 1991, 1993, 2001); Columbus Landing, McKee Landing, and Law's Site in the middle Tennessee River valley of northeastern Alabama (Fleming 1976; Smith 1987); Tarver and Little Tarver in central Georgia (Pluckhahn 1996, 1997); and Plum Grove (Smith n.d.), Hiwassee Island (Lewis and Kneberg 1946), Ocoee (Lewis et al. 1995), Tallassee (Cornett 1976), and Chota-Tanasee (Newman 1986) in eastern Tennessee. In addition to the Piedmont North Carolina sites discussed above, historical evidence suggests that the occupations of some of the other Cluster 2 sites end sometime in the second decade of the eighteenth century. The Tarver and Little Tarver occupations are associated with the historically documented 1690s migration of Creek Indians to central Georgia that ended with the Yamasee War in 1715 (Pluckhahn 1996, 1997). While not certain, the Alabama sites could very likely be the villages depicted in the middle Tennessee River valley on the 1701 De l'Isle map (Crane 1916; Swanton 1930). The absence of these villages on the 1711 Crisp map inset and the 1715 Barnwell map suggest that the region had been abandoned by this time (Cumming 1998).

Moreover, a number of mortuary assemblages in Cluster 2 include diagnostic late-seventeenth-century European-made items such as brass arm bands and cut-out animal effigies (so-called ex-votos) (Waselkov 1989), cast bronze rumbler bells (crotals) (Butler 2000; Morris 1959), brass flushloop bells (Brown 1979), doglock muskets (Brown 1980; Fithian 1985; Puype 1985; Shumway 1985), iron hoes and axes (Egloff 1980; Kauffman 1994 [1972]; Waselkov 1989), and lateen spoons (Noël Hume 1969; Price 1908; Victoria and Albert Museum 1927; see also Gibson 1980; Rubertone 2001; Simmons 1970; and Turnbaugh 1984 for discussions of similar items among late-seventeenth-century Narragansett burial assemblages in New England[2]). Based on the quantities and widespread distribution of Cluster 2 beads among Southeastern Indian communities, I believe that this cluster marks the establishment and rapid expansion of the deerskin and Indian slave trade with the South Carolina colony that ended with the Yamasee War (ca. 1670–1715) (Ethridge 2010; Marcoux 2010).

The composition of bead assemblages in Cluster 3 is quite different from Cluster 2 in that it includes the significant presence of mandrel-wound beads. Sites containing Cluster 3 assemblages include Chota-Tanasee and Ocoee in Tennessee and Columbus Landing, McKee Landing, and Law's Site in Alabama. Historical and archaeological evidence suggest that Cluster 3 beads were likely traded around from the time of the Yamasee War in 1715 until 1750. The Chota-Tanasee site and the Ocoee site, which is most likely the Cherokee town of Amoye, appear on the 1715 Barnwell map (Cumming 1998) and the 1725 Herbert map (Herbert 1936 [1727]). Furthermore, the mortuary assemblages at Chota-Tanasee assigned to Cluster 3 lack silver trade goods. Trade silver has long been thought to arrive among the Upper Cherokee and other Indian groups after 1750 (Newman 1986:427). Marvin Smith (2002b:59) gives a similar date range for large mandrel-wound beads based on his analysis of numerous French colonial contexts. The shift in bead styles around 1715 may be associated with a major restructuring of the Indian trade and establishment of a governmental monopoly in the years immediately following the Yamasee War (Marcoux 2008; Ramsey 2008).[3]

Cluster 4 is the latest meta-assemblage in the seriation and is characterized by large quantities of untumbled monochromatic seed beads of simple construction. There is good reason to estimate the circulation of Cluster 4 beads to the second half of the eighteenth century. First, the only site in the study sample with Cluster 4 assemblages is Chota-Tanasee, which boasts the most recent median occupation date and an occupation that persists until Cherokee removal in the nineteenth century. Second, the Cluster 4 mortuary assemblages at Chota-Tanasee contain trade silver, which began to circulate among Southeastern Indian towns after 1750. Finally, the cluster includes the mortuary assemblage associated with the burial of Chief Oconostota (Mr2-10), whose funeral was recorded at Chota in 1783 (Schroedl and Breitburg 1986:136). Cluster 4 beads represent the peak of interaction between English traders and Southeastern Indian communities. Indeed, much higher frequencies of European-made goods are recorded at Southeastern Indian sites during this period compared to earlier periods (Baden 1983; Russ and Chapman 1983; Schroedl and Breitburg 1986; Waselkov 1993, 1998).

Thus both historical and archaeological evidence support the seriation order of the four clusters along the x-axis in Figures 2, 3, 4, and 5, and they provide us with some guidelines regarding their temporal ranges. The same general pattern of change in bead styles discussed above is apparent when we use a more traditional method to examine the relative frequencies of beads in the four clusters across sites in the study sample. Table 5 lists, for each of the sites in the study with sufficiently large samples, the total number of beads assigned to each cluster based on the results of the CA seriation. Using a classic Fordian frequency seriation technique, I ordered the site-level assemblages so that they portray the typical monotonic increases and decreases in relative frequency that are indicative of change through time. In the resulting figure (Figure 7), which proceeds from earliest at the bottom to latest at the top, one can see the initial dominance and disappearance of Cluster 1 assemblages, the growth of Cluster 2 assemblages followed by the introduction and increase in frequency of Cluster 3 assemblages, and the most recent appearance of Cluster 4 assemblages. While it is impossible to confirm the exact chronological order of the sites in Figure 7, the order is in general agreement with the occupation date ranges listed in Table 1.

Applying the Chronology

Returning to the goals outlined at the beginning of the paper, I believe that the seriation method presented here

Table 5. Relative frequencies of bead clusters across sites in the study sample.

Site	Cluster 1		Cluster 2		Cluster 3		Cluster 4		Total
	n	%	n	%	n	%	n	%	
Madison (31Rk6)	5,210	99.2	40	0.8	0	0	0	0	**5,250**
Plum Grove (40Wg17)	159	74.3	55	25.7	0	0	0	0	**214**
Law's Site (1Ms100)	0	0	776	81.6	175	18.4	0	0	**951**
McKee Island (1Ms32)	0	0	2,419	80.3	594	19.7	0	0	**3,013**
Columbus City Landing (1Ms91)	0	0	1,272	49.3	1,307	50.7	0	0	**2,579**
Upper Saratown (31Sk1a)	4,598	57.7	3,373	42.3	0	0	0	0	**7,971**
Ocoee (40Pk1)	0	0	896	49.3	922	50.7	0	0	**1,818**
Hiwassee Island (40Mg31)	0	0	412	100.0	0	0	0	0	**412**
Fredricks (31Or231)	0	0	547	100.0	0	0	0	0	**547**
Tarver and Little Tarver (9Jo6, 9Jo198)	0	0	7,277	100.0	0	0	0	0	**7,277**
Chota-Tanasee (40Mr2, 40Mr62)	0	0	3,617	72.0	904	18.0	504	10.0	**5,025**

can offer researchers a reasonably accurate method to aid in identifying undocumented seventeenth- and eighteenth-century Indian communities across the Southeast. Although this bead chronology needs improvement (and hopefully it will never be ''finished''), I believe that the general framework is sufficiently sensitive at this point to demonstrate the potential of this dating technique. As a way to demonstrate the feasibility of this chronology, I perform another seriation with 10 additional site-level bead assemblages from various Southeastern sites (Table 6).[4] These assemblages are not from individual mortuary contexts; instead, each represents an aggregation of beads recovered from surface collection, general excavation contexts, and archaeological features. The proveniences of the beads in the private collection from Hiwassee Old Town are most likely burials. I use these lumped assemblages from various contexts because they reflect the composition of bead assemblages that are commonly collected during academic and cultural resource management excavations. Hence these make ideal cases to demonstrate how the seriation technique works with typical (i.e., nonmortuary) bead assemblages. In order to make the CA seriation technique easier for others to replicate and the results easier to interpret, I modify the mortuary data set used above by lumping together the bead assemblages at the level of the cluster (Table 7). Combining the assemblages at this level has no effect on the overall seriation results, and the resulting biplot is ''cleaner'' and much easier to interpret. The resulting seriation solution depicts how the 10 site-level glass trade bead assemblages fall within the chronology presented above.

There are a couple of important issues that should be considered when using this technique. First, there are major differences between bead assemblages recovered from mortuary contexts and those recovered from surface collections, feature contents, or general excavations. Consequently, one needs to be aware of the likelihood that assemblages from these contexts are chronologically mixed. This technique will place a bead assemblage in the seriation based on the relative frequencies of the bead types in the entire assemblage; therefore, the results may mask earlier or later occupations. One easy way of determining this is to see whether the assemblage contains bead types from temporally distant clusters. For example, the presence of a few three-layered seed beads (Cluster 1) in a single site-level assemblage dominated by large mandrel-wound necklace beads (Cluster 3) indicates either a long occupation span or two separate occupations at the site. Also, one must remember that taxonomy is the axis around which this entire procedure revolves. As such, great care must be taken in analyzing glass bead assemblages to ensure that the classifications are consistent.

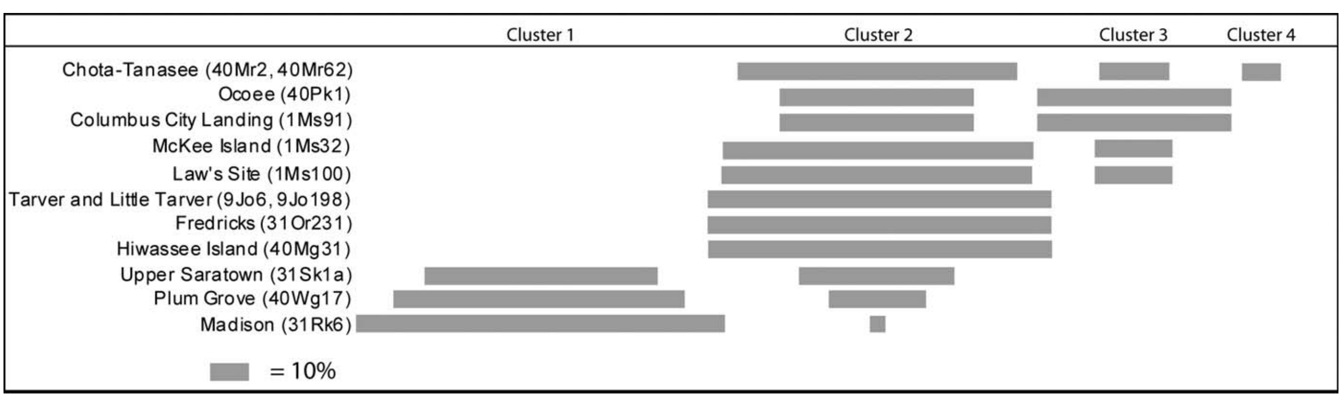

Figure 7. Frequency seriation of bead clusters across sites in the study sample.

Table 6. Sites included in the seriation of site-level bead assemblages.

Site	State	Occupation Range	Median Date[a]	References
Mialoquo (40Mr3)	TN	1760–1780	1770	Russ and Chapman 1983
Tomotley (40Mr5)	TN	1750–1776	1762	Baden 1983
Hiwassee Old Town (40Pk3)	TN	1700–1760	1730	Fenstermaker 1978
Altamaha Town (38Bu20)	SC	1700–1715	1707	Poplin personal communication 2007
Chattooga (38Oc18)	SC	1650–1740	1695	Schroedl 1994
Townsend (40Bt89-91)	TN	1650–1720	1685	Marcoux 2008, 2010
Peachtree Mound (31Ce1)	NC	1550–1780	1665	Setzler and Jennings 1941; Skowronek 1991
Nacoochee Mound (9Wh3)	GA	1600–1700	1650	Heye et al. 1918; Waselkov 1989
Coweeta Creek (31Ma34)	NC	1300–1740	1520	Marcoux 2008; Rodning 2004, 2010
Notley Mound	NC	Unknown		Turbyfill 1927

[a] Median dates are not weighted to reflect the varying intensity of multiple occupations of a site through time. This is apparent in the Peachtree Mound and Coweeta Creek sites, both of which have significant protohistoric and mid-eighteenth-century occupations. In both cases, the bead samples used in this study are associated with the eighteenth-century occupation.

The CA seriation solution of the site-level assemblages accounts for 67.1 percent of the variance in the entire data matrix using two components (eigenvalue = 0.72). The biplot resulting from the CA seriation depicts where these site-level assemblages fall among the combined clusters (Figure 8). The chronological distribution of the assemblages along the x-axis includes a single site and three groups of sites as one moves from left to right or from earliest to latest. First we have the bead assemblage from the Nacoochee mound in northern Georgia (Heye et al. 1918). Its position between Cluster 1 and Cluster 2 is based on significant frequencies of a blue bead with 8–10 white stripes (IIb1004) along with typical Cluster 2 drawn beads. This position suggests an occupation ca. 1600–1715, an occupation span corroborated by Waselkov's (1989:126) estimated range of occupation at Nacoochee based on the presence of diagnostic brass armbands (ca. 1600–1700).

The assemblages from the Notley mound, Altamaha Town, and the Townsend sites are very similar to Cluster 2. The Notley mound is a relatively unknown Cherokee site located in western North Carolina that was excavated in the 1930s by members of the Heye Foundation (Turbyfill 1927). Altamaha Town is a historically documented Yamasee town that was recently excavated as part of a large-scale cultural resource management project (Poplin 2007, personal communication). Historic documents indicate that this town was settled in the early eighteenth century (ca. 1700) and was destroyed during the Yamasee War in 1715 (Poplin 2007, personal communication). The Townsend site is a small Cherokee community located in Tuckaleechee Cove in eastern Tennessee. Diagnostic pottery at the site is consistent with a mid- to late-seventeenth-century occupation (Marcoux 2008, 2010). All of these sites contain a diverse array of simple and complex striped drawn beads that are the hallmarks of Cluster 2. Furthermore, mandrel-wound beads are absent in the case of Townsend and present in minor numbers in the Notley and Altamaha Town assemblages. These results indicate that the assemblages date as early as the mid-seventeenth century but probably do not postdate the second decade of the eighteenth century.

Moving along the presumed temporal dimension of the seriation (the x-axis in Figure 8) the next group of assemblages lies close to Cluster 3 and includes assemblages from the historic Cherokee sites of Chattooga (Schroedl 1994; Howard 1997), Hiwassee Old Town (Fenstermaker 1978), and Coweeta Creek (Rodning 2004, 2010). Chattooga is a Lower Cherokee town located in the foothills of the Appalachian Mountains in northwestern South Carolina, Coweeta Creek is a Middle Cherokee town located in the upper Little Tennessee River valley of western North Carolina, and Hiwassee Old Town is an Overhill Cherokee settlement located in the lower Hiwassee River valley of eastern Tennessee. The combined bead assemblages from Chattooga and Coweeta Creek were recovered from excavations of Townhouses and domestic structures. The assemblage from Hiwassee Old Town is a private collection that was presumably assembled from a number of burial contexts. These assemblages are closely associated in the seriation because they all include significant numbers of large mandrel-wound beads, small tubular beads, and lesser amounts of tumbled monochromatic beads. This position equates to a span from around the time of the Yamasee War to the mid-eighteenth century (ca. 1715–50), a range that is corroborated by the mean date (1739.5) I obtained from kaolin pipe stem measurements at Chattooga.

The latest group of trade bead assemblages were recovered from the Peachtree mound and village site located near Murphy, North Carolina (Setzler and Jennings 1941) and the Overhill Cherokee towns of Tomotley and Mialoquo in eastern Tennessee (Baden 1983; Russ and Chapman 1983). These three assemblages consist of large numbers of simple monochrome tubular beads and mandrel-wound necklace and "barleycorn" beads. The main difference between the Peachtree and Tomotley assemblages, on the one hand,

Table 7. Glass trade bead frequencies in site-level seriation sample.

Site	IIIa1	IIa13	IIa28	IIa31	IIa40	IIa44	IIa49	IIa55	IIa6	IIa61	IIb′3	IIb′6	IIb10	II-b1004	IIb27	IIb32	IIb39	IIb56	IIb67	IIb990
Cluster 1	0	4	0	6	384	2	43	4	0	0	0	0	0	2	0	0	0	1	0	0
Cluster 2	109	2,701	53	215	9,149	420	567	706	691	139	4	11	6	4	2	2	16	10	1,154	118
Cluster 3	0	10	0	0	29	4	0	0	112	0	0	0	0	0	0	0	0	0	4	0
Cluster 4	0	51	0	0	6	7	18	0	13	0	0	1	0	0	0	1	1	0	0	0
Townsend (40Bt89-91)	0	7	0	0	14	1	0	1	1	0	0	1	0	0	0	0	0	0	0	0
Altamaha Town (38Bu20)	0	13	0	0	2	0	0	7	0	1	0	0	0	0	0	0	0	0	1	0
Nacoochee Mound (9Wh3)	0	4	0	0	77	0	0	0	1	0	0	0	0	3	0	0	0	0	0	0
Peachtree (31Ce1)	0	1	0	0	7	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Mialoquo (40Mr3)	0	0	0	0	4	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0
Notley Mound	0	152	3	0	241	0	0	14	19	0	0	0	0	0	0	0	0	0	2	0
Hiwassee Old Town (40Pk3)	1	13	0	6	5	7	0	7	5	0	0	2	0	0	0	2	1	0	0	0
Tomotley (40Mr5)	0	6	0	0	12	1	0	0	23	10	0	0	0	0	0	0	0	0	0	0
Chattooga (38Oc18)	1	84	1	41	74	14	4	8	39	0	2	0	0	0	0	0	0	0	0	0
Coweeta Creek (31Ma34)	0	53	0	0	61	0	0	25	12	0	0	0	0	0	0	1	0	0	0	0

Site	IIb-b12	IIb-b15	IIb-b24	IIb-b27	IIg	IIj	IV-a11sd	IVa5	IVa5-sd	IVas-d	IV-b990	IVbs-d	IVb-b3	Iasd	WIIc	WIId	WIIe	WIb	WIc	WIcb
Cluster 1	0	0	0	0	0	0	2,815	1	6	6,368	0	513	0	0	0	0	0	0	0	0
Cluster 2	29	5	17	9	37	49	1	1,291	2,396	29	29	1	19	2	50	89	1	1,270	67	0
Cluster 3	0	0	1	0	0	13	0	1	2	1	0	0	0	0	125	0	3	103	506	37
Cluster 4	0	0	0	0	0	0	0	1	0	0	0	0	0	293	16	0	0	44	47	438
Townsend (40Bt89-91)	1	0	1	0	0	1	0	4	6	0	0	0	0	0	0	0	0	0	0	0
Altamaha Town (38Bu20)	0	0	0	1	0	0	0	0	2	0	0	0	0	0	2	0	0	0	0	0
Nacoochee Mound (9Wh3)	2	0	0	0	3	1	0	1	0	0	0	0	0	0	0	0	0	0	1	1
Peachtree (31Ce1)	0	0	0	0	0	1	0	0	172	0	0	0	0	12	1	0	0	8	4	193
Mialoquo (40Mr3)	0	0	0	0	0	0	0	0	9	0	0	0	0	8	0	0	0	4	49	66
Notley Mound	5	0	5	0	0	5	0	10	2	0	0	0	1	0	5	0	0	0	1	0
Hiwassee Old Town (40Pk3)	0	0	3	0	0	5	0	4	3	0	0	0	0	7	17	18	1	15	4	3
Tomotley (40Mr5)	0	0	0	0	0	0	0	7	427	0	0	0	0	58	3	0	0	43	2	1,632
Chattooga (38Oc18)	3	0	1	0	0	5	0	29	0	0	0	0	1	34	17	1	0	1	2	0
Coweeta Creek (31Ma34)	0	0	0	0	0	1	0	6	127	0	0	0	0	56	1	0	0	5	0	0

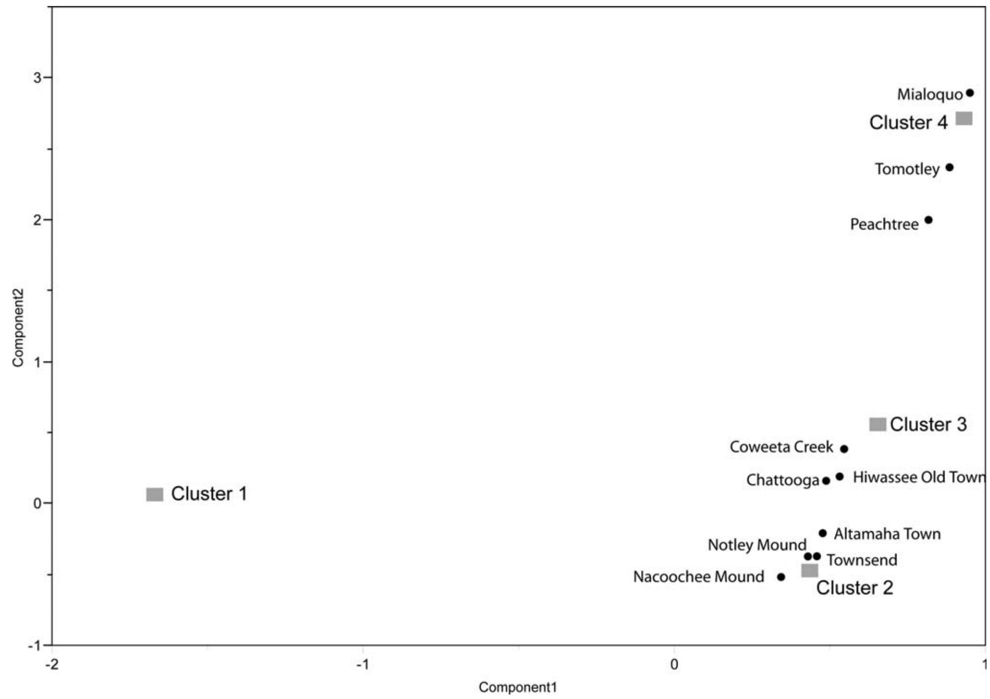

Figure 8. Biplot depicting the results of the correspondence analysis seriation of ten site-level glass bead assemblages.

and the Mialoquo assemblage on the other, is the number of Cornaline d'Allepo beads in the former. Based on archaeological data and historic accounts, researchers place the occupation of Tomotley between 1750 and 1776 and that of Mialoquo between 1760 and 1780 (Baden 1983; Russ and Chapman 1983:19, 134). With regard to the Peachtree site, the majority of glass trade bead data and diagnostic pottery call for a similar occupation span; however, some diagnostic pottery from the Smithsonian excavations and a large number of European-made artifacts in private collections also suggest the presence of an earlier late-sixteenth-century occupation (Skowronek 1991).

Conclusion

My goals in undertaking this study were twofold: to provide a general description of the types of beads that were traded by the English during the colonial period and to improve our understanding of temporal change within glass bead assemblages traded among Southeastern Indian groups. Utilizing CA seriation, I identified four clusters or meta-assemblages, each consisting of beads types with similar methods of manufacture, bead structure, and decoration. Furthermore, I demonstrated that these four clusters represent temporal changes in the composition of glass bead assemblages that were traded between English and Indian communities in the seventeenth and eighteenth centuries.

I put forth the proposition that these four clusters mark different periods of English-Indian trade relations. Cluster 1 is associated with English trade prior to the founding of Charles Town in 1670; Cluster 2 assemblages were traded between the founding of Charles Town and the Yamasee War in 1715, when the Indian slave trade was at its peak; Cluster 3 marks trade following the Yamasee War until about 1750; and Cluster 4 is associated with the trade from 1750 until the Revolutionary War. Of course, much future research is necessary to test this proposition, but I offer it now in order to begin to broaden our discussion of glass trade beads to include the historical and cultural forces underlying the movement of these curious artifacts.

Finally, I must reiterate my claim that in using the technique described in this paper with site-level assemblages, one must consider the entire assemblage and not simply point to one or two bead types as diagnostic of Cluster 1 or Cluster 2, and so forth. Also, it must be clear that this method is not offered in place of existing qualitative methods for constructing bead chronologies. The comparative work of Smith (2002b) and others is resulting in extremely accurate and fine-grained glass bead chronologies, such as the preliminary chronology for French colonial glass beads. Instead, the method offered here should be seen as an additional method that can be used in a complementary fashion as a first step or as an additional line of evidence.

Notes

Acknowledgments. This paper stems from my dissertation research at the University of North Carolina at Chapel Hill. I will forever be indebted to Brett Riggs for coming up with the idea of doing a seriation of glass trade bead assemblages and for sharing with me his encyclopedic knowledge of Cherokee written and oral history and archaeology, his wit, and his encouragement. My dissertation work was supported through a position funded by the Archaeological Research Laboratories (ARL) at the University of Tennessee. I am grateful to Boyce Driskell at the ARL and Gerald Klein at Tennessee Department of Transportation for allowing me to participate in the Townsend Archaeological Project and for giving me the freedom to pursue my research interests.

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[1] These data are obtained from published sources, collections records, and my own analyses. Given that other researchers generated the majority of the data in this study and because seriation is a comparative technique, issues of taxonomy are of utmost importance. This study employs the glass bead classification system pioneered by Kidd and Kidd (1970) because it is the most widely used and easily understood (e.g., Deagan 1987; Karklins 1985; Kidd and Kidd 1970; Smith 1991, 1992, 2002b). Victor Fleming (1976) uses a slightly different classification system in his analysis of bead assemblages from the Guntersville basin, as does Jane Eastman (1999) in her analyses of assemblages from sites in North Carolina. In these analyses, data regarding method of manufacture, size, shape, diaphaneity, and decoration are identical to the Kidd and Kidd (1970) classification system. The biggest obstacle to converting these data into the Kidd and Kidd (1970) taxonomy is the difference in color descriptions. Fleming (1976) includes Munsell values for bead colors, so translating these into the color values used by Kidd and Kidd (1970) is a relatively straightforward process using Karklins's (1985) color equivalency tables. This is not the case for the collections analyzed by Jane Eastman. For those assemblages, one week was spent at the RLA at the University of North Carolina in order to develop a method for converting color descriptions. I developed a consistent color conversion method by comparing a large sample of beads representing all of the color descriptions used in Eastman's (1999) analysis to the color charts in Kidd and Kidd (1970). The resulting database structure used in this study includes provenience, color, shape, size diaphaneity, decoration, and the related Kidd and Kidd (1970) bead type and number (e.g., IIa40, IIbb12). Unique codes are given to those beads that do not have an established number in the Kidd and Kidd classification system. In order to identify these beads easily, they are assigned values ranging from 990 to 1008 (e.g., IIb990, IIb1004).

[2] Researchers who use specific bead types as index fossils will doubtless argue with the chronological placement of at least two types in Cluster 2. First are the so-called ''eye-beads'' (IIg). Smith (1982, 1983) has argued that these typically occur in assemblage dating to the first half of the seventeenth century. In the study sample, the eye beads all occur in assemblages from the Upper Saratown site, whose occupation has been placed in the second half of the seventeenth century (Eastman 1999; Ward and Davis 1993). I am more inclined to agree with Smith's (1982, 1983) chronological placement, given that his is based upon multiple sites across the Southeast. It may be that the late appearance of eye beads in the Upper Saratown assemblages is the result of heirlooming practices.

The other problematic group includes compound beads with transparent green to almost black cores and opaque red outer layers - Cornaline d'Allepo beads. These are usually given a large date range spanning from the late sixteenth century to the mid-eighteenth century. The association of this type with Cluster 2 illustrates the difference between a chronology based on relative frequencies of bead types and a chronology based on the simple presence and absence of bead types. While it is true that Cornaline d'Allepo beads are present in assemblages across the entire study period, they only tend to be major constituents of bead assemblages during the period 1650–1715. Thus while not a good index fossil, this bead type becomes a valuable temporal indicator when the composition of entire assemblages is considered.

[3] The inclusion of so-called ''barleycorn'' beads in Cluster 3 (WIcb) is spurious, as attested to by this type's location outside of the confidence ellipse in Figure 5. This type more appropriately belongs later in the chronology as part of Cluster 4, as they are specifically mentioned in English trade records from 1758 until 1784 (Waselkov 1998:210).

[4] I analyzed the assemblages from five sites (Townsend, Altamaha Town, Peachtree, Notley Mound, and Nacoochee Mound); the data from Tomotley (Baden 1983) and Mialoquo (Russ and Chapman 1983) were obtained from a published excavation reports; the data from Chattooga were graciously supplied by Gerald Schroedl; the data from Coweeta Creek were obtained from Christopher Rodning's (2004) dissertation; and the data from Hiwassee Old Town were translated from descriptions and photographs in a published catalogue of a private collection from the site (Fenstermaker 1978). The sites in this sample were chosen initially for my dissertation research, which was focused on Cherokee communities. The assemblage from Altamaha Town was included because its occupation range was well known and the assemblage was easily accessed.

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