GLACIAL KAME SANDAL-SOLE SHELL GORGETS: AN EXPLORATION OF MANUFACTURE, USE, DISTRIBUTION, AND PUBLIC EXHIBITION

A THESIS SUBMITTED TO THE GRADUATE SCHOOL

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE

MASTER OF ARTS

BY

CHRISTINE K. KELLER

Committee Approval:


Committee Chairperson

Date

Committee Member

Date

Committee Member

Date

Department Approval:


Department Chairperson

Date

Graduate Office Check:


Dean of Graduate School

Date

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DR. RONALD HICKS (THESIS CHAIR)

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ABSTRACT

THESIS: Glacial Kame Sandal-Sole Shell Gorgets: An Exploration of Manufacture, Use, Distribution, and Public Exhibition

STUDENT: Christine K. Keller

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This thesis focuses on 12 Glacial Kame sandal-sole shell gorgets in the Fort Recovery (OH) State Museum. The Glacial Kame culture was comprised of Late Archaic people who inhabited northwestern Ohio, neighboring states, and southern Ontario from 3000 to 500 B.C. Research centered on four questions:

- How were sandal-sole shell gorgets made?
- What was the purpose of sandal-sole shell gorgets?
- What was the distribution pattern within the Midwest of sandal-sole shell gorgets?
- How can we best interpret and portray the story of sandal-sole shell gorgets to the public?

The primary methods used include a comprehensive literature review, detailed metrical and morphological analyses of regional sandal-sole gorget collections, discussion with others researching Glacial Kame culture, personal museum visits, and local research to determine context of the museum’s collection. Research from this thesis contributes to the Glacial Kame literature that is currently available.
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Chapter One

Introduction and Problem Statement

Introduction

This thesis will focus on a collection of 12 Glacial Kame sandal-sole shell gorgets that are part of the collection at the Fort Recovery State Museum, an Ohio Historical Society Museum in Fort Recovery, Ohio. The Glacial Kame culture was comprised of Late Archaic people who inhabited what is now northwestern Ohio, parts of neighboring states, and southern Ontario from 3000 to 500 B.C. The diagnostic features of the Glacial Kame culture were 1) the use of glacial kames as burial sites and 2) the presence of sandal-sole shell gorgets and other distinctive artifacts in the burial sites (Converse 1978, 1979). A glacial kame is a gravel and sand deposit (sometimes very large) formed as the glaciers slowly receded in prehistoric times. Sandal-sole gorgets are named because they are shaped like the sole of a sandal or shoe but when observed with burials, they were said to be found in the head and chest area (Cunningham 1948). According to Nancy Knapke, the director of the Fort Recovery State Museum, at least part of their collection of sandal-sole shell gorgets is said to have been found years ago in a “mound” outside of town, which most likely was a Glacial Kame burial site.
Problem Statement

Research will center on four questions that are important to the local museum and their future work displaying these Glacial Kame sandal-sole gorgets. These questions are also very important on a state and regional level in helping us to understand the prehistory of the area. The questions to be addressed follow:

- How were Glacial Kame sandal-sole shell gorgets made?
- What was the purpose of Glacial Kame sandal-sole shell gorgets?
- What was the distribution pattern within the Midwest of Glacial Kame sandal-sole shell gorgets?
- How can we best interpret and portray the story of Glacial Kame sandal-sole shell gorgets to the public?

Sandal-sole shell gorgets are quite rare and, as such, very little detailed research has been done on this particular type of artifact. For this reason, the answers to the questions above are not readily available. The sandal-sole shell gorget collection in the museum catches the interest of serious collectors and visitors alike because of their fragile appearance, etchings, often unexplained use, and their general rarity.

Sandal-sole shell gorgets were made from *Busycon perversum* shells that were acquired with the Gulf Coast, presumably by trade (Converse 1978). However, preliminary research finds very little data available on how they were actually manufactured from these shells. Sandal-sole gorgets will sometimes have quite elaborate engravings or markings. For example, the Ohio Historical Society (Ohio Historical Society 2009) has a sandal-sole shell gorget with what appears to be a bear cub engraving.
and at least one of the Fort Recovery State Museum’s gorgets has engraved patterns and markings.

The function of prehistoric Native American gorgets in general and sandal-sole shell gorgets in particular, is not well understood. It is assumed they were suspended from the neck or worn on clothing for ornamental purposes, although many are drilled in a manner that would make this difficult. The actual sandal-sole shape is also intriguing because most gorgets associated with archaeological contexts are circular, oval, or rectangular (Brain and Phillips 1996; Converse 1978, 1979; Holmes 1883). It is not clear if there was a specific purpose for these sandal-sole shell gorgets. Further research is needed to understand how sandal-sole shell gorgets were used and the probable purpose for the gorgets in this collection.

The lack of current research on Glacial Kame sandal-sole gorgets is a primary reason for the selection of this thesis topic. The Fort Recovery State Museum knows that they have a rare and scientifically valuable collection but have very little research or background knowledge of these artifacts. The museum hopes to discover and tell the story of these gorgets, and they are eager to have these items analyzed in order to present these findings to the public in a new exhibit. Having more answers to the four previously mentioned questions will be valuable to not only the Fort Recovery State Museum and their visitors, but to other museums and collectors with sandal-sole shell gorgets in their collections, as well as contributing to our understanding of Midwestern prehistory.
General Literature Review

The current literature available on sandal-sole shell gorgets can be categorized to support the four research questions that form the core of this thesis. In addition, literature detailing Glacial Kame culture and similar regional cultures during the same time period will be used to form a background and foundation. Compiling and collating this material was an arduous task as there only two definitive works on Glacial Kame. Other information came from multiple journal articles (including numerous non-peer reviewed journal articles), regional and state archaeological overviews, various museum records and notes, and from both written and verbal collector accounts.

Wilbur Cunningham’s (1948) book *A Study of the Glacial Kame Culture in Michigan, Ohio, and Indiana* was the first summary of Glacial Kame sites and related artifacts. Cunningham’s book also included an appendix by Griffin (1948) interpreting the Glacial Kame culture. It was followed by Robert Converse’s 1979 book *The Glacial Kame Indians*, which gives an excellent overview of the Glacial Kame culture in Ohio. Both of these books served as the foundation of the research for this thesis. Both Cunningham’s and Converse’s works have several reviews available (Carter 1949; Murphy 1960; Strischek 2004), and these reviews have been helpful with their

The Glacial Kame burial complex is very similar to that of the Red Ocher (Wisconsin, northern Illinois, northern Indiana, southern Michigan) and Old Copper (Wisconsin) cultures. Red Ocher and Old Copper works by Byers (1999), Ritzenthaler and Quimby (1962), and Wittry and Ritzenthaler (1956) were also used for background cultural material. Because burial patterns and grave goods are similar for the Red Ocher and Glacial Kame cultures (Hall 1983; Strischek 2004), special attention was paid to the Red Ocher culture and its interaction with the Glacial Kame peoples. Hall’s “A Pan-Continental Perspective on Red Ocher and Glacial Kame Ceremonialism” (1983) was very valuable in this area. Converse (1979) and Dragoo’s *Mounds for the Dead* (1963) also make burial cult connections between Glacial Kame and Red Ocher, Old Copper and additionally the Meadowood complexes. Several reviews of these Red Ocher, Old Copper, and Meadowood works are also available (Jelks 1958; McGregor 1963). Red Ocher and Glacial Kame are normally distinguished spatially and by the presence of shell gorgets (indicative of Glacial Kame) or the presence of turkey-tail blades and other large caches of points (signifying Red Ocher).

Resources for general theoretical background include Brown (1977), Dragoo (1976), Griffin (1959), Kehoe and Kehoe (1973), Phillips and Willey (1953), Renfrew and Bahn (1996), and Stoltman et al. (1978). Other background information consulted included Echo-Hawk (2000), Mason (1962), Moorehead (1929), Trigger (1983), and
In general, earlier resources (Dragoo 1963; Moorehead 1909, 1929; Quimby 1952; Shetrone 1920) present Glacial Kame as a distinct and separate culture (as opposed to Red Ocher, for example) identified by sometimes lengthy trait lists, while more recent resources (Donaldson and Wortner 1995; Stothers and Abel 1993; Stothers et al. 2001) treat Glacial Kame as one of many regional burial complexes with slightly different regional cultural manifestations. This general literature review not only provided contextual information and a foundation for this thesis, but also provided a chronology of how the theoretical framework supporting Late Archaic burial complexes, including Glacial Kame, has developed and evolved over the past 100 years. This proved very helpful in understanding the thought processes of various Glacial Kame researchers and archaeologists working at different times.

**Research Question 1: Manufacture**

The manufacture of sandal-sole shell gorgets is touched upon in several resources. It is known that the sandal-sole shell gorget is made from univalve conch shells (whole or pieces) from the Gulf of Mexico with many suggesting that species associated with the *Busycon* genus was used (Converse 1979; Cunningham 1948). Other details regarding manufacture were found in several journal articles and presentations (Donaldson and Wortner 1995; Holmes 1883; Ritchie 1949; Vastano 2009; Wintemberg 1928) that are also listed as resources in the Distribution section of this literature review. Most helpful in understanding the manufacture of sandal-sole shell gorgets and other shell ornaments was on-line information from the University of Texas at Austin (Dreiss 2001) and data gathered from Grant Hall’s research at the Ernest Witte site in Allen’s Creek, Texas (Hall 1981). Although the Ernest Witte site is outside the core Midwest Glacial Kame area, the
shell artifacts were strikingly similar to sandal-sole shell gorgets and much detail was provided on possible manufacturing techniques. Dreiss (2001) and Hall (1981) also present detailed figures on *Busycon* terminology and pinpoint the exact portions of the shell used for sandal-sole shell gorgets. Holmes (1883) and Ritchie (1949) both address the grinding and shaping of the shells and the drilling of the perforations. Vastano (2009) proposes a sawing technique for sandal-sole shell gorget manufacture, based on a gorget preform found at the Zimmerman Site in Ohio.

It became apparent from the literature review that the reworking of sandal-sole shell gorgets was important, and both Donaldson and Wortner (1995) and Ritchie (1949) address the standardization of repair and reworking of sandal-sole shell gorgets at several sites. Both resources give details on identification of reworked sandal-sole shell gorgets that could be important for future research and re-analysis of Glacial Kame assemblages.

Various ethnographic accounts (Adair 1775; Lawson 1714) provided information on the effort needed to create shell ornament and beads and gave detailed accounts of shell manufacturing methods and tools. The Ohio Historical Society also had information and previously used museum interpretive panels that explained the manufacture of sandal-sole shell gorgets using lithic tools. A museum exhibit at The Cahokia Mounds State Historic Site demonstrated the drilling of holes or perforations into lithic materials using lithic materials. A similar method could have been used as the same technique for drilling the three holes of the sandal-sole shell gorgets. This is also supported by Barton et al. (2009) who used experimental archaeology to show that chert was by far the most efficient drill bit (as compared to wood, shell, or copper) when drilling perforations into *Spondylus* shell.
Research Question 2: Use

This research question has the most literature available to support gorget use in general and perhaps the most differing opinions. Use of prehistoric shell in general was addressed by Holmes (1883) and Wintemberg (1908). Possible use of sandal-sole shell gorgets was discussed by Converse (1979, 2003), Cunningham (1948), and Donaldson and Wortner (1995). Many other papers and journal articles discuss and give differing opinions on possible use of sandal-sole shell gorgets including Hoff and Hoff (2007, 2008), Ritchie (1955), Sciulli and Schuck (2001), Vastano (2009) and others sources listed in the Distribution section of this Literature Review.

The most common idea regarding the function of sandal-sole shell gorgets is use as a pendant or gorget based on hole wear in small sample sizes. However, several researchers believe the context within burials indicates that it was worn on the head or hair, and still others believe the sandal-sole shell gorget may have had mimicked the proposed functions of sandal-sole gorgets made from slate, which are discussed in the paragraph below. As an extreme example of conflicting views of possible use, Hall (1983) cites previous research that examines the holes drilled in sandal-sole gorgets for signs of wear. However, he discounts the wear use as insignificant and instead draws parallels between the alignments of the three drill holes with the constellation Orion suggesting a ceremonial use based on cosmology. He also makes a connection between Red Ocher and Glacial Kame ceremonialism and draw parallels between the two cultures’ use of material and their distribution system.

There are various types of stone gorgets from Glacial Kame and the Late Archaic with similar form to sandal-sole shell gorgets. The literature was reviewed for possible
clues regarding use, as perhaps sandal-sole shell gorgets performed the same function as
these stone gorgets (Bowen 1976; Curren 1977; Peets 1965; Starna 1979). Other
supporting material for stone gorget function included Brooks (1992), Converse (1978),
Ellis (2002), Fowke (1896), and Robertson (1878). Possible function of stone gorgets
based on these sources include use as an ornamental gorget strung around the neck, badge
of authority, wrist protector, cord sizer, or cord twister.

Ethnographic accounts of shell usage have been found and reviewed including
Adair (1775), Brickell (1737), Lawson (1714), Robertson (1878), Skinner (1912), and
Thomas (1891). Also reviewed was the photograph collection of the Smithsonian
National Museum of the American Indian (2009). These historical documents discussing
and displaying the use of various shell ornaments provided ideas on how sandal-sole shell
gorgets could have been used hundreds of years earlier. Several ethnographic accounts
described shell gorgets being engraved and worn on the chest or attached with a button to
clothing. Historic photographs (Smithsonian National Museum of the American Indian
2009) supported these accounts and also provided additional ways in which shell
ornaments were worn such as directly on the throat, suspended from cord attached to a
choker or second cord around the neck, or suspended in multiples from clothing. These
accounts and photographs were easily re-interpreted for feasible sandal-sole shell gorget
usage and provided extra evidence to support results from the hole-wear analysis.

Hall (1983) and Brown (1997) specifically discuss the ceremonial aspects of the
Glacial Kame culture. There were also numerous journal articles that reviewed more
specific aspects of Glacial Kame symbolism and ceremonialism. Glacial Kame animal
masks and headdresses and their associated ceremonialism was reviewed in the Ohio
Archaeologist (Baby 1961; Converse 2001; Galitza 1970). Symbolism and ceremonialism inherent in sandal-sole shell gorgets and other Glacial Kame artifacts were also addressed in the *Ohio Archaeologist*, the *Ontario Archaeologist*, and other publications (Carr and Case 2005; Converse 1976, 1997a, 2003; Donaldson and Wortner 1995; Ellis et al. 1990; Holzapfel 2006; Ritchie 1955; Robertson et al. 1999). These articles focus on and interpret the animal symbolism inherent in various Glacial Kame artifacts that also can be seen on the rare engraved sandal-sole shell gorgets.

**Research Question 3: Distribution**

Sandal-sole shell gorgets have been found in glacial kames in northwestern Ohio, northern Indiana, northern Illinois, southern Michigan, southern Wisconsin, and southern Ontario. The Glacial Kame burial complex itself is found in the same area – with the presence of sandal-sole shell gorgets as the prime diagnostic of the Glacial Kame culture (Converse 1979).

It has already been noted that Glacial Kame sandal-sole shell gorgets were made from conch shells from the Gulf of Mexico. How were the conch shells transported from the Gulf of Mexico to Ohio and other parts of the Midwest? Were the conch shells really transported or were the sandal-sole gorgets made close to the shell source and the gorgets themselves transported? What does the distribution pattern tell us about the trade and/or manufacture routes from the Gulf of Mexico to the Midwest?

In addition to Cunningham (1948) and Converse (1979), information concerning regional (Midwest) distribution of sandal-sole shell gorgets was gathered from many different sources. Professional site reports of Glacial Kame discoveries and excavations with sandal-sole shell gorgets were reviewed and included the Doetsch Site in Illinois.
(Young et al. 1961), the Isle La Motte Site in Vermont (Blakely 1996), the Reigh Site in Wisconsin (Baerreis et al. 1954; Ritzenthaler 1956), the Hind Site in Ontario (Donaldson 1973; Donaldson and Wortner 1995), the Sartori Site in Ontario (Donaldson and Wortner 1995), the Meredith-Goodall Site in Ontario (Donaldson and Wortner 1995), the Blackfriar’s Bridge Site in Ontario (Donaldson and Wortner 1995), the Finlan Site in Ontario (Donaldson and Wortner 1995), and the Picton Site in Ontario (Donaldson and Wortner 1995; Ritchie 1949).

General and site specific Glacial Kame information from Ohio was found in numerous Ohio Archaeologist journal articles (Anonymous 1962, 1963, 1964; Baby 1959; Bravard and Converse 1973; Burr 2008; Converse 1972, 1994, 1997b; Cunningham 1958; Dougherty 1956; Dunlap 1961; Dunn 1959; Galitza 1957a, 1957b, 1958a, 1958b, 1958c; Galitza and Dunn 1956; Holzapfel 1997; Meuser 1951; Morris 2005; Rummel 2005; Smith 1960; Starr 1958; Stothers 1992; Wachtel 1956). These articles were invaluable resources for early Glacial Kame sites and the associated artifacts, including sandal-sole shell gorgets. Articles in the Wisconsin Archaeologist (Brown 1913; Baerreis et al. 1954; Morse and Morse 1964; Ritzenthaler 1956) and the Ontario Archaeological Society’s Arch Notes (Donaldson 1966, 1973) and Ontario Archaeology (Donaldson and Wortner 1995) also detailed specific Glacial Kame sites and artifacts in those regional areas. Articles in other miscellaneous journals or publications that provided Glacial Kame site and sandal-sole shell gorget information include Abel et al. (2001), Anonymous (1977), Bravard (1973), Fowler (2004a, 2004b, 2004c), Galitza (1968), Lilly (1942), Mason (1897), Moorehead (1902), Pillars (1895), Prufer (1967, 1989), Ritchie (1949, 1955), Snodgrass (1894), and Vastano (2008). Not
only did these articles provide site specific Glacial Kame and sandal-sole shell gorget information, but they often times included the authors’ ideas on the use and manufacture of sandal-sole shell gorgets.

Information and original site notes from the Ohio Historical Society were very useful as they provided first-hand accounts of early Glacial Kame excavations (Bondley 1956, 1957; Long n.d.; Matson 1856). The on-line collection catalog of the Ohio Historical Society was also used to review specific provenience and statistics of their sandal-sole shell gorget collection (Ohio Historical Society 2009). Similar detailed notes were gathered from the Indiana State Museum and the University of Michigan for their collections that were a part of this thesis research.

Trade and exchange were explored from both a Midwest and Eastern Woodlands perspective. Important resources were Brose (1979, 1994), Claasen and Sigmann (1993), Fitting and Brose (1970), and Patterson (2004). Putty (2008) provided important Late Archaic lithic trade information that supports possible Glacial Kame exchange networks.

In an effort to understand distribution and exchange from a biological and cultural point of view, literature from Glacial Kame and Late Archaic biological and osteological skeletal remain studies was reviewed. This includes mitochondrial DNA analysis (Friends of America’s Past 2003; Lepper 2006; Mills 2003) and osteological and biological studies of Glacial Kame skeletal remains in Ontario (Pfeiffer 1977; Varney and Pfeiffer 1995), Vermont (Blakely 1996), and Ohio (Barret 2005; Holzapfel 1997; Schneider and Sciulli 1983; Scuilli et al. 1991; Sciulli et al. 1993; Scuilli et al. 1984; Sciulli and Heilman 2004; Sciulli and Mahaney 1986; Sciulli and Schneider 1985; Sciulli and Schuck 2001).
Literature from outside the core Glacial Kame area was also reviewed at a high level in order to understand how shell was used both in other regional locations during the Late Archaic (Texas, Poverty Point, Indian Knoll) and during other temporal periods (Southeastern Ceremonial Complex, Adena, Hopewell). This research also provided insights on shell ornaments with similar form and possible function to sandal-sole shell gorgets and ideas on possible exchange networks that provided the source of the shell in the Glacial Kame core area. Southeastern Ceremonial Complex resources included Brain and Phillips (1996), Claassen and Sigmann (1993), Sullivan (2001), and Thomas (1996). Other references consulted regarding the Southeastern Ceremonial Complex include Knight (2006), Knight et al. (2001), and King (2004). Literature exploring the possible connection between Glacial Kame and Adena and Hopewell includes Converse (1979, 1997a), Lepper (2005, 2006), Mills (2003), Webb and Baby (1957), and others also previously listed.

Resources used for reviewing shell usage in the Late Archaic in Texas include Dreiss (2001) and Hall (1981). Poverty Point and Indian Knoll resources include Gibson (2001), Sassaman and Anderson (1996), Webb (1982), and Webb (1974).

**Research Question 4: Public Exhibition**

The solution to this issue is dependent on answering the previous research questions. Because context is supposedly known for the Fort Recovery Museum’s collection of sandal-sole gorgets, research was conducted to determine the exact location of the glacial kame that these sandal-sole gorgets were buried in. As stated previously, the Fort Recovery State Museum is interested in updating the display on their sandal-sole shell gorgets. The information from this thesis will form the core of the sandal-sole
gorget display content. Additional research was done to see if there are other museums with sandal-sole shell gorgets or prehistoric collections that are exhibiting their collections in interesting ways.

Literature making specific reference to the provenience of the 12 sandal-sole shell gorgets found in the Fort Recovery State Museum collection and the two local Glacial Kame sites include works by Converse (1979, 2003) and Cunningham (1948), and journal articles, book chapters and presentations (Bravard and Converse 1973; Galitza 1968; Holmes 1883; Longley 1949; Mason 1881; Moorehead 1900; Pillars 1895; Vastano 2009). This literature helped construct the story of these local sandal-sole shell gorgets.

From a personal standpoint, this is the most important research question to address because of its application to the museum exhibit. Researching the three previous research questions will form the foundation for the exploration and analysis of this important public outreach. In addition to the more academic pursuits of this thesis, a practical application of this research will be used by the Fort Recovery State Museum, which is affiliated with the Ohio Historical Society. It was noted that the Fort Recovery Museum and Relic Room was opened on May 1, 1949, and “of special value is a collection of sandal-shaped gorgets, said to be the largest in the world” (Longley 1949:351). Assuming this statement is true, it is significant to the archaeology community and the public to exhibit and convey the story of these Glacial Kame sandal-sole gorgets in the most informed and archaeologically correct way possible.
Late Archaic Overview

The Late Archaic period in what is now northwestern Ohio, northeastern Indiana, southern Michigan, and southern Ontario (covering the majority of known Glacial Kame sites) is defined temporally as 3000 – 1000 B.C. The beginning of the Late Archaic in this geographic area was characterized by a change in climate that generally corresponds to our modern climate and natural environment. This climate change included increased and more frequent rainfall which created mixed forest conditions supplying nuts and berries. Excess nuts and wild plants were gathered and stored in pit features. The ability to store excess food supported a population increase that is apparent from the Middle Archaic. Horticulture commenced with the planting and cultivating of wild seeds and plants and became the basis for later agrarian societies. Hunting, fishing, and horticulture activities continued to be collective efforts and seasonal with planned movement to take advantage of each season’s and location’s resources (Converse 1979, 2003; Dragoo 1963; Griffin 1967; Indian Country Wisconsin 2008; Kellar 1983; Lepper 2005; Taylor 1999).

The Late Archaic tool set included ground stone axes, adzes, celts, and pestles; chipped lithic points, knives, and scrapers; and bone and antler tools, hooks, and handles. The introduction of the atlatl or wooden spear thrower increased hunting range and efficiency. Several Late Archaic artifacts may be directly related to the atlatl, including stemmed projectile points and bannerstones (hypothesized to be atlatl weights). Non-utilitarian artifacts include slate birdstones and tubular pipes, shell gorgets and beads, and copper beads and ornaments (Converse 1979, 2003; Dragoo 1963; Griffin 1967; Indian Country Wisconsin 2008; Kellar 1983; Lepper 2005; Taylor 1999).
Greater rainfall also meant that rivers became a major and dependable source of transportation. This may have led to the vastly increased trade and exchange present in the Late Archaic. Evidence of widespread Late Archaic trade networks in what is now the Midwest includes artifacts manufactured from copper originating from the Upper Great Lakes region, shell from the Gulf Coast, chert from Indiana, and galena from Illinois, Iowa, and Wisconsin. Increased trade obviously meant increased interaction with people from these outside regions and territories (Converse 1979, 2003; Dragoo 1963; Griffin 1967; Indian Country Wisconsin 2008; Kellar 1983; Lepper 2005; Taylor 1999).

Perhaps in response to both an increase in population and a correlating increase in sedentism, various regional burial practices began and thrived during the Late Archaic, including Glacial Kame, Red Ocher, Old Copper, and Meadowood. Per Dragoo, “Archaic people accorded special treatment to their dead as early as 3000 BC” (Dragoo 1976:16). Common to all of these burial complexes were flexed or partially cremated burials, the use of red ocher, inclusion of various grave goods, and multiple interment in a location. Often the distinguishing factor between regional burial customs was a unique set of grave goods, which many times contained evidence of ceremonialism and symbolism via engravings and inclusion of specific artifacts (Converse 1979, 2003; Dragoo 1963; Griffin 1967; Indian Country Wisconsin 2008; Kellar 1983; Lepper 2005; Taylor 1999).
Glacial Kame Overview

Glacial Kame is a Late Archaic regional burial complex found mainly in northwestern Ohio, parts of neighboring states and southern Ontario. People participating in Glacial Kame burial practices used naturally formed glacial kames or hills of gravel deposited by receding glaciers to bury their dead. Glacial Kame sites contain both cremated and flexed burials often accompanied by red ocher. It is theorized that the Glacial Kame burial ceremonialism could be similar to the Huron Feast of the Dead where regional burials took place at multi-year intervals (Quimby 1960). Based on the positioning of burials and absolute dating, Glacial Kame cemeteries appear to be used repeatedly over time (Abel et al. 2001; Ritchie 1949) and most likely represent relatively small bands of people (Spence and Fox 1986). Grave goods found in Glacial Kame burials include copper artifacts and beads; slate bannerstones, gorgets, and birdstones; and shell beads and gorgets, and relatively few points mostly of the Hind corner-notched series (Converse 1979; Cunningham 1948; Donaldson and Wortner 1995; Lepper 2005). Both slate and shell ornaments occasionally exhibit engraving or designs. The most diagnostic of these grave goods is the sandal-sole shell gorget (Converse 1979:50). Appearance of a sandal-sole shell gorget virtually guarantees a site of being classified as Glacial Kame, although there is at least one known exception of the Reigh Site in Wisconsin which is classified as Old Copper (Baerreis et al. 1954; Ritzenthaler and Quimby 1962).

The idea of a Glacial Kame culture was first discussed by Moorehead in 1909. Much of the early Glacial Kame literature concentrated on the creation and validity of Glacial Kame trait lists (Dragoo 1963; Moorehead 1909, 1929; Quimby 1952; Shetrone
Although some early literature assigned Glacial Kame to Early or Middle Woodland (Griffin 1948; Morgan 1952; Quimby 1952; Ritchie 1955), Glacial Kame is now understood to be part of the Late or Transitional Archaic as supported by radiocarbon dates at various sites (Converse 2003:112; Mason 1981:193; Pfeiffer 1977:102; Stothers and Abel 1993:28-29).

There are several very similar regional burial complexes (Red Ocher, Old Copper, and Meadowood) that flourished during the Late and Terminal Archaic. The most similar of these to Glacial Kame culturally and spatially is Red Ocher. Red Ocher sites are located in Wisconsin, Michigan, Illinois, Iowa, Indiana, and Ohio. Like Glacial Kame, this burial complex also contained flexed burials in pits on ridges of gravel, red ocher in the burials, copper artifacts, and marine shell beads. What sets Red Ocher apart from Glacial Kame are large ceremonial flint blades, distinctive turkey-tail blades of Indiana hornstone (Wyandotte chert), and large caches of ovate points (Ritzenthaler and Quimby 1962). Shell gorgets are very rarely found at Red Ocher sites; conversely caches of flint points are never found at Glacial Kame sites. Both Red Ocher and Glacial Kame people traveled great distances for the same exotic goods (copper and shell) and occupied the same general time and space, but for some unknown reason keep at least part of their unique cultural identity (sandal-sole shell gorget vs. turkey-tail blade) separate (Converse 1979).

Because of the similarities between Glacial Kame, Red Ocher, Old Copper, and other regional burial practices and the fact that these cultures are defined almost exclusively from mortuary sites, some archaeologists argued that these are not cultures at all but simply “material remains of a burial complex” or part of the same type of cultural
activity (Fitting 1970; Griffin 1948; Stothers et al. 2001). It was felt that separate trait lists for these burial complexes were too vague and general, and did not take into consideration the identity of the people associated with the artifacts and traits (Brown 1977; Morse and Morse 1964). Brose (1979), Fitting and Brose (1971), and Sciulli and Mahaney (1986) all proposed that the Late Archaic burial complexes and Early Woodland Adena were created by the same conditions that supported Hopewellian exchange in the Middle Woodland. Mason (1981) also supports this argument indicating that the cultural similarities of the Glacial Kame and other Late Archaic burial complexes far outweigh the slight artifact differences, and indicate common cultural ancestry and diffusion of this same cultural identity. The sharing of exotic raw materials by both Red Ocher and Glacial Kame as mentioned by Converse (1979) are also reiterated by Donaldson and Wortner as they explain the separate diagnostic artifacts of Red Ocher and Glacial Kame as “the physical manifestations of overlapping trade networks” (Donaldson and Wortner 1995:88) and not necessarily separate cultures. They point out that much of the current Glacial Kame data has been acquired “under less than ideal conditions” (Donaldson and Wortner 1995:88) and future research will help determine if Glacial Kame and Red Ocher will remain as separate cultures.

Much recent work has been done on redefining Glacial Kame and other regional burial complexes by David Stothers and others. These scholars acknowledge a complex exchange network throughout the Great Lakes region but support the idea of major trade axes (Stothers et al. 2001). They also propose associated workshop locations that manufactured items for trade (Stothers and Abel 1993). In addition, they recognize what they term trade fair centers where Big Men who controlled the economic resources
redistributed commodities acquired through the trade network (Abel et al. 2001; Stothers and Abel 1993). They also believe Glacial Kame, Red Ocher, and Old Copper are “fallacious archaeological constructs that have neither geographic boundaries nor precise sociocultural characteristics” (Stothers et al. 2001:261). Their ideas concerning exchange and distribution will be explored a bit more in the Results chapter of this thesis. However, for the purpose of this thesis, the idea of a Glacial Kame burial complex, will be used in understanding the function of sandal-sole shell gorgets.

The hypothesized ease of use of glacial kames as burial mounds in the Late Archaic has become an archaeological dilemma in modern times. Perhaps for the same easy and natural accessibility, glacial kames were also a much used source of gravel in the late 19th and early 20th-century. Almost all early Glacial Kame sites were accidental discoveries with little or no professional archaeology involvement. Glacial Kame sites are still being accidentally discovered today as evidenced by recent sites found in Champaign and Huron counties in Ohio (Converse 1997b; Fowler 2004a, 2004b, 2004c; Rummel 2005). Site reports are non-existent for the vast majority of Glacial Kame sites because they were often discovered accidentally and not recorded systematically. Information was often recorded via personal communication from participants at the time of the site’s discovery. The information from well documented and professionally excavated sites has become invaluable to further understanding Glacial Kame and its people (Barreis et al. 1954; Donaldson and Wortner 1995; Matson 1856; Ritchie 1949, 1955; Young et al. 1961).

Osteology and dental pathology studies on Glacial Kame remains have been conducted at various sites in Ohio including Storms Creek in Champaign County
(Holzapfel 1997), Kirian-Treglia in Allen County (Sciulli et al. 1993), Muzzy’s Lake in Champaign County (Sciulli et al. 1984, 1991), and the Baker II Site in Sandusky County (Stothers 1992). Skeletal studies have been performed on the skeletal remains from the Hind and Picton sites in Ontario and the Reigh Site in Wisconsin (Pfeiffer 1977; Varney and Pfeiffer 1995). These studies show that people participating in the Glacial Kame burial complex spent much of their time hunting, fishing, and gathering with no evidence of agriculture. Individuals were of short to medium build with a normal life span into the mid-thirties. Some populations showed improper bone growth that could suggest malnutrition, while others showed sufficient nutrition as evidenced by the general size and robustness of adults. Arthritis and bone injury was evident in these studies. (Holzapfel 1997; Varney and Pfeiffer 1995). A study of the mortuary treatment and paleopathology of individuals at the Isle La Motte site in Vermont reported similar results and indicated a population size well into the hundreds (Blakely 1996). Glacial Kame populations generally appear to be socially egalitarian, as personal status differences do not seem to be emphasized (Sciulli et al. 1993), although Isle La Motte did provide evidence of status differences based on gender and perhaps age (Blakely 1996). It is important to note that the Isle La Motte site is at the far eastern end of the distribution of Glacial Kame sites concentrated in northwestern Ohio and spreading eastward across the northern side of lakes Erie and Ontario. Isle La Motte contained burials with typical Glacial Kame artifacts, but also had less typical Glacial Kame artifacts such as over 125 lumps of galena and a Meadowood point (Ritchie 1969:132-134) that could indicate influences from other similar burial complexes.
It has long been inferred from similarities in burial ceremonialism, artifact form, and symbolism that Glacial Kame and other regional burial practices in Ohio were most likely predecessors to Adena (circa 800 BC to AD 1) and Hopewell (circa 100 BC to 550 AD) (Converse 1997a; Dragoo 1963, 1976; Lepper 2006; Ritchie 1955). This hypothesis has been recently confirmed in various mitochondrial DNA (mtDNA) (Lepper 2006; Mills 2003) and biological variation affinity studies in Ohio (Sciulli and Mahaney 1986) that demonstrate that people of the Hopewell culture descended from people of the Adena culture who then descended from Late Archaic cultures, including Glacial Kame. These biological variation and affinity studies also support the idea that Glacial Kame populations were related and interacted on a cultural and ceremonial level (Sciulli et al. 1984, 1993). Relatedness among Glacial Kame and other terminal Late Archaic populations in Ohio has been shown, with degree of relatedness determined by proximity (Sciulli and Schneider 1985).

Although there is no current and comprehensive Glacial Kame site list available since Converse (1979), there are hundreds of documented or suspected Glacial Kame burial sites with the vast majority reported in Ohio. See Figure 1 through Figure 5 for the various Glacial Kame site distributions as cited in the past hundred years of literature (Converse 1979; Cunningham 1948; Donaldson and Wortner 1995; Dragoo 1963; Mason 1897).
Mr. Moorehead has been able to give a preliminary account of the work in his report of 1897, of which the following is a summary:

In the entire State there are (records up to January 30, 1897)—

<table>
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<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Circles of the earth</td>
<td>143</td>
</tr>
<tr>
<td>Squares of the earth</td>
<td>74</td>
</tr>
<tr>
<td>Enclosures and fortifications of earth and stone</td>
<td>279</td>
</tr>
<tr>
<td>Series of groups of stone graves</td>
<td>115</td>
</tr>
<tr>
<td>Glacial kame or gravel-knoll burials</td>
<td>223</td>
</tr>
<tr>
<td>Village sites</td>
<td>174</td>
</tr>
<tr>
<td>Tumuli of earth and stone</td>
<td>1,835</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2,843</strong></td>
</tr>
</tbody>
</table>

O. T. Mason.

Figure 1: First account of Glacial Kame burials in Ohio (Mason 1897:347)

Figure 2: Map of Glacial Kame sites (Cunningham 1948:36)
Figure 3: Late Archaic and Early Woodland manifestations (including Red Ocher) in the Great Lakes and Ohio Valley regions (Dragoo 1963: 235)

Figure 4: Map of the "nuclear Glacial Kame area with sites known to be or suspected of being Glacial Kame" (Converse 1979:9)
Based on these maps and a review of the recent literature, known or suspected Glacial Kame sites can be estimated at several hundred in Ohio, twenty or less each in Indiana and southern Ontario, and five or less in eastern Illinois, southern Wisconsin, southern Michigan, and Vermont.

Sandal-Sole Shell Gorget Overview

As mentioned earlier, the sandal-sole shell gorget (Figure 6) is the defining artifact of the Glacial Kame burial complex. This particular form of shell ornament is unique to the Late Archaic and although there are similar shell ornaments in other regions of the country, the concentration of sandal-sole shell gorgets in the Glacial Kame burial complex make it a very important cultural marker for the Midwest Late Archaic.
The sandal-sole shell gorget is made from *Busycon perversum* shell from the Gulf Coast (Converse 1979). As seen in Figure 6 above, the classic sandal-sole shell gorget has three holes (also referred to as perforations) in alignment down the center of the piece, with one hole about midway (length-wise) and two holes near the widest end of the gorget. Sandal-sole shell gorgets range in length from 13 to 24 centimeters and in width from five to ten centimeters at the widest point of the gorget. Typical thickness is 0.3 to 0.6 centimeters. Because they are cut along the length of the shell, they take on the curvature and contour of the shell as seen in profile in Figure 7 above. Approximately ten percent of the known sandal-sole shell gorgets are engraved (Bravard and Converse 1973).
“The most unsatisfactory artifact names are those which imply some definite but essentially imaginary function” (Peets 1965:113). Such is the fate of the sandal-sole shell gorget. Not only is its name plagued by supposed function (gorget) that may or may not be totally correct, but it is also hindered by its initially described shape (sandal-sole) which also confusingly implies incorrect function to those unfamiliar with these types of shell artifacts. The first description of this unique type of shell gorget is in Matson’s excavation of the Richardson Site in Hardin County “on the head… was a conch shell plate resembling in shape the sole of a moccasin” (Matson 1856:5). In another early report, the writer describes the artifacts as “about ten pairs of the shell sandals of different sizes, and made to fit the right and left feet” (Holmes 1883:265). As Fowke (1896) and Smith (1961) point out, because the sandal-sole shell gorget is pierced with multiple holes and the holes show wear, it by default became a gorget, with implications that it was worn around the neck or throat.

Although the sandal-sole shell gorget is a common diagnostic of artifacts for Glacial Kame burial sites, there are many identified Glacial Kame sites without a sandal-sole shell gorget. There also have been very few, if not just one, documented cases where a sandal-sole shell gorget has been found at a site which would not be typically classified as Glacial Kame (Converse 1979:16). The Reigh Site in Winnebago County, Wisconsin has been categorized as part of the Old Copper Culture which falls into the same Late Archaic time period as the Glacial Kame burial complex. A sandal-sole shell gorget was professionally excavated from a burial there in 1953 (Baerreis et al. 1954).

It has been stated that only approximately 100 sandal-sole shell gorgets are known to exist (Converse 1978; Cunningham 1948:37). Sandal-sole shell gorgets have been
found in six states and southern Ontario with the bulk found in northwestern Ohio. This is almost a perfect subset of the Glacial Kame area as defined by Cunningham (1948) and then further detailed and expanded by Converse (1979) and Donaldson and Wortner (1995) as shown in Figure 2 through Figure 5 in the previous section. Table 1 below shows the sandal-sole shell gorget discovery inventory as compiled via a detailed literature search and personal museum visits. The table is sorted by state, county, and site. The number (#) of sandal-sole shell gorgets discovered at the site is listed with the number of sandal-sole gorgets analyzed as part of this thesis shown in parentheses. The discovery date (Disc. Date) is listed with UNK indicating an unknown discovery date. The earliest known reference is shown along with the current location of the sandal-sole shell gorget (SSSG Location), if known.

These 106 known sandal-sole shell gorgets (SSSG) represent approximately 41 Glacial Kame sites. Although the total number of discovered Glacial Kame sites is unknown, it can be safely estimated from the literature that at least 200 Glacial Kame sites have been discovered. Glacial Kame sites containing sandal-sole shell gorgets then represent no more than 20 percent (and most likely much less) of the total number of Glacial Kame sites.

<table>
<thead>
<tr>
<th>St</th>
<th>County</th>
<th>Site</th>
<th>#</th>
<th>Disc. Date</th>
<th>Earliest Reference</th>
<th>SSSG Location</th>
</tr>
</thead>
<tbody>
<tr>
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<td>Lake</td>
<td>Doetsch 11L1</td>
<td>2</td>
<td>1959</td>
<td>Young et al. 1961:21</td>
<td>ITARP</td>
</tr>
<tr>
<td>IL</td>
<td>Morgan</td>
<td>Illinois River</td>
<td>1</td>
<td>UNK</td>
<td>Cunningham 1948:26</td>
<td>PC</td>
</tr>
<tr>
<td>IL</td>
<td>Schuyler</td>
<td>Dixon</td>
<td>1</td>
<td>1917</td>
<td>Cunningham 1948:26</td>
<td>UNK</td>
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<tr>
<td>IN</td>
<td>Allen</td>
<td>“gravel pit”</td>
<td>2</td>
<td>UNK</td>
<td>Cunningham 1948:24</td>
<td>NMAI</td>
</tr>
<tr>
<td>IN</td>
<td>Dearborn</td>
<td>Dearborn</td>
<td>1</td>
<td>UNK</td>
<td>Converse 1979:138</td>
<td>UNK</td>
</tr>
<tr>
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<td>County</td>
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<td>#</td>
<td>Disc. Date</td>
<td>Earliest Reference</td>
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<tr>
<td>IN</td>
<td>Kosciusko</td>
<td>Cedar Point 12KO235</td>
<td>1</td>
<td>1941</td>
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<td>IN</td>
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<td>1905</td>
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<td>UM</td>
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<td>Harrison 20KZ50</td>
<td>2</td>
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<td>Darke</td>
<td>Butler Twp.</td>
<td>2(2)</td>
<td>1850-1900</td>
<td>Converse 1994</td>
<td>PC</td>
</tr>
<tr>
<td>OH</td>
<td>Erie</td>
<td>Erie County</td>
<td>2(2)</td>
<td>UNK</td>
<td>Converse 1979:126</td>
<td>OHS</td>
</tr>
<tr>
<td>OH</td>
<td>Hardin</td>
<td>Richardson 33HR1</td>
<td>3(3)</td>
<td>1856</td>
<td>Matson 1856</td>
<td>OHS</td>
</tr>
<tr>
<td>OH</td>
<td>Hardin</td>
<td>Spitzer</td>
<td>1(1)</td>
<td>1886</td>
<td>Snodgrass 1894:114</td>
<td>OHS</td>
</tr>
<tr>
<td>OH</td>
<td>Hardin</td>
<td>Otis Stiner</td>
<td>1</td>
<td>UNK</td>
<td>Cunningham 1948:19</td>
<td>OHS</td>
</tr>
<tr>
<td>OH</td>
<td>Hardin</td>
<td>Will Cruthers 33HR7</td>
<td>1</td>
<td>1920s</td>
<td>Converse 1979:130</td>
<td>OHS</td>
</tr>
<tr>
<td>OH</td>
<td>Hardin</td>
<td>Zimmerman 33HR2</td>
<td>23</td>
<td>1931</td>
<td>Cunningham 1948:11</td>
<td>OHS + PC</td>
</tr>
<tr>
<td>OH</td>
<td>Huron</td>
<td>Monroeville</td>
<td>4</td>
<td>2004</td>
<td>Rummel 2005</td>
<td>reburial</td>
</tr>
<tr>
<td>OH</td>
<td>Logan</td>
<td>Bowman</td>
<td>1</td>
<td>1967</td>
<td>Converse 1979</td>
<td>OHS</td>
</tr>
<tr>
<td>OH</td>
<td>Logan</td>
<td>Williams 33LO25</td>
<td>1(1)</td>
<td>1955</td>
<td>Baby 1959</td>
<td>PC</td>
</tr>
<tr>
<td>OH</td>
<td>Logan</td>
<td>Middleburg</td>
<td>2</td>
<td>c.1900</td>
<td>Converse 1979</td>
<td>UNK</td>
</tr>
<tr>
<td>OH</td>
<td>Mercer</td>
<td>Dublin Twp.</td>
<td>1(1)</td>
<td>UNK</td>
<td>Converse 1979: 136</td>
<td>OHS</td>
</tr>
<tr>
<td>OH</td>
<td>Mercer</td>
<td>Fox</td>
<td>??</td>
<td>1935</td>
<td>Cunningham 1948:21</td>
<td>FRSM, PC</td>
</tr>
<tr>
<td>OH</td>
<td>Mercer</td>
<td>Rammel</td>
<td>20</td>
<td>Pre-1880</td>
<td>Mason 1881 Holmes 1883:265</td>
<td>FRSM, NMAI, PC</td>
</tr>
</tbody>
</table>

The two sites above are just a mile or so apart and are often referred to as a single Fox-Rammel Site in the literature. Thus the actual number of sandal-sole shell gorgets found at the Fox Site are hard to verify.
Table 1: Sandal-Sole Shell Gorget Discovery Inventory

<table>
<thead>
<tr>
<th>St</th>
<th>County</th>
<th>Site</th>
<th>#</th>
<th>Disc. Date</th>
<th>Earliest Reference</th>
<th>SSSG Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>OH</td>
<td>Wood</td>
<td>Alexander</td>
<td>1</td>
<td>UNK</td>
<td>Converse 1979:118</td>
<td>UNK</td>
</tr>
<tr>
<td>OH</td>
<td>Wyandot</td>
<td>Reber</td>
<td>1(1)</td>
<td>1932</td>
<td>Converse 1979:102</td>
<td>OHS</td>
</tr>
<tr>
<td>VT</td>
<td>Grand Isle</td>
<td>Isle La Motte</td>
<td>3</td>
<td>1962</td>
<td>Ritchie 1969:132-134</td>
<td>ILM</td>
</tr>
<tr>
<td>WI</td>
<td>Winnebago</td>
<td>Reigh 47WN1</td>
<td>1</td>
<td>1953</td>
<td>Baerreis et al. 1954:27</td>
<td>WSHS</td>
</tr>
<tr>
<td>ON</td>
<td>Essex</td>
<td>Sartori AaHp-35</td>
<td>1</td>
<td>1974</td>
<td>Donaldson and Wortner 1995:30</td>
<td>UNK</td>
</tr>
<tr>
<td>ON</td>
<td>Kent</td>
<td>Meredith-Goodall AdHm-49</td>
<td>1</td>
<td>1964</td>
<td>Donaldson and Wortner 1995:44</td>
<td>CKM or PC</td>
</tr>
<tr>
<td>ON</td>
<td>Middlesex</td>
<td>Blackfriar’s Bridge</td>
<td>1</td>
<td>1849</td>
<td>Wintemberg 1908</td>
<td>ROMA</td>
</tr>
<tr>
<td>ON</td>
<td>Middlesex</td>
<td>Hind AdHk-1</td>
<td>1</td>
<td>1973</td>
<td>Donaldson 1973:3</td>
<td>UNK</td>
</tr>
<tr>
<td>ON</td>
<td>Northumberland</td>
<td>Finlan BaGK-1</td>
<td>1</td>
<td>1964</td>
<td>Donaldson and Wortner (1995:57)</td>
<td>PC</td>
</tr>
<tr>
<td>ON</td>
<td>Prince Edward</td>
<td>Picton</td>
<td>4</td>
<td>1912</td>
<td>Cunningham 1948:28 Ritchie 1949</td>
<td>CMC + RMSC</td>
</tr>
</tbody>
</table>

Approximate Total 106

The SSSG (Sandal-Sole Shell Gorget) Location column in Table 1 above is decoded as follows in Table 2.

Table 2: Known Sandal-Sole Shell Gorget Locations

<table>
<thead>
<tr>
<th>Code</th>
<th>Institution and Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACHS</td>
<td>Allen County Historical Society Museum, Lima, OH</td>
</tr>
<tr>
<td>BOON</td>
<td>Boonshoft Museum of Discovery, Dayton, OH (formerly Dayton Museum of Natural History)</td>
</tr>
<tr>
<td>CKM</td>
<td>Chatham-Kent Museum, Chatham, ON</td>
</tr>
<tr>
<td>CLEV</td>
<td>Cleveland Museum of Natural History, Cleveland, OH</td>
</tr>
<tr>
<td>CMC</td>
<td>Canadian Museum of Civilization, Gatineau, QC</td>
</tr>
<tr>
<td>FRSM</td>
<td>Fort Recovery State Museum, Fort Recovery, OH</td>
</tr>
<tr>
<td>ILM</td>
<td>Isle La Motte Historical Society, Isle La Motte, VT</td>
</tr>
<tr>
<td>INSM</td>
<td>Indiana State Museum, Indianapolis, IN</td>
</tr>
<tr>
<td>ITARP</td>
<td>Illinois Transportation Archaeological Research Program, University of Illinois, Urbana, IL</td>
</tr>
<tr>
<td>NMAI</td>
<td>Smithsonian National Museum of the American Indian, Washington, D.C.</td>
</tr>
</tbody>
</table>
There have been several reports of Glacial Kame sites with additional sandal-sole gorgets that have not been verified by researchers. These are listed in Table 3 for reference only. These possible gorgets are not considered as part of the 106 total sandal-sole shell gorgets that have been excavated and documented.

**Table 2: Known Sandal-Sole Shell Gorget Locations**

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NMO</td>
<td>National Museum of Ottawa, Ottawa, QC</td>
</tr>
<tr>
<td>OHS</td>
<td>Ohio Historical Society, Columbus, OH</td>
</tr>
<tr>
<td>PC</td>
<td>Private Collector, Various Locations</td>
</tr>
<tr>
<td>RMSC</td>
<td>Rochester Museum and Science Center, Rochester, NY</td>
</tr>
<tr>
<td>ROMA</td>
<td>Royal Ontario Museum of Archaeology, Toronto, ON</td>
</tr>
<tr>
<td>UMMA</td>
<td>University of Michigan Museum of Anthropology, Ann Arbor, MI</td>
</tr>
<tr>
<td>UNK</td>
<td>Unknown (most likely Private Collector)</td>
</tr>
<tr>
<td>WSHS</td>
<td>Wisconsin State Historical Society, Madison, WI</td>
</tr>
</tbody>
</table>

**Table 3: Possible Sandal-Sole Shell Gorget Sites (Unsubstantiated)**

<table>
<thead>
<tr>
<th>St</th>
<th>County</th>
<th>Site</th>
<th>#</th>
<th>Disc. Date</th>
<th>Earliest Reference(s)</th>
<th>Current Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>IL</td>
<td>Fulton</td>
<td>Morse</td>
<td>1</td>
<td>1962</td>
<td>Morse and Morse 1964:93</td>
<td>UNK</td>
</tr>
</tbody>
</table>

Although this shell ornament was described as a “classic shaped 2-hole sandal-sole gorget”, a photograph of the ornament more closely matches shell bar gorgets as defined by Converse 1979; no other future reports.

| IN | Shelby | Unknown | 1  | UNK | Kellar 1983:32 | UNK |

Could not find a reference for this in any other literature or site report.

| IN | Wayne | Unknown | 15-20 | UNK | Moorehead 1900:344 | Wintemberg 1928:192 | Cunningham 1948:35 | UNK |

The above site was unsubstantiated by Cunningham with no other future reports.

| OH | Darke | Unknown | 2  | 1856 | Matson 1856:7 | UNK |

The site above most likely represents the same site as Darke Co. – Butler Twp.

| OH | Wyandot | Wyandot | 1  | UNK | Ohio Historical Society | OHS |

The site above most likely represents the same site as Wyandot Co. - Reber.
### Table 3: Possible Sandal-Sole Shell Gorget Sites (Unsubstantiated)

<table>
<thead>
<tr>
<th>St</th>
<th>County</th>
<th>Site</th>
<th>#</th>
<th>Disc. Date</th>
<th>Earliest Reference(s)</th>
<th>Current Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>WI</td>
<td>Winnebago</td>
<td>Hill of the Dead</td>
<td>1</td>
<td>UNK</td>
<td>Brown 1913:62</td>
<td>UNK</td>
</tr>
</tbody>
</table>

By the description given, it appears this shell gorget is very similar to, but not truly a sandal-sole shell gorget; no other future reports.

| ON | Essex   | “somewhere near the centre of the county” | 2 | 1950       | Donaldson and Wortner 1995:66 | UNK              |

“Tom Lee (1952:66) mentions a site in Essex County belonging ‘to Glacial Kame, yielding several sandal-sole gorgets’…. our efforts to obtain more information have not been met with success” (Donaldson and Wortner 1995:66)
Chapter Three

Research Methods

In addition to the literature review listed in the previous section, the primary methods used for this thesis were detailed analysis of both the local sandal-sole shell gorget collection and other regional sandal-sole gorgets, discussions with others interested in and researching Glacial Kame culture, various personal museum visits, and local research to determine provenience and context of the Fort Recovery State Museum’s collection of 12 sandal-sole gorgets.

Detailed Gorget Analysis - Sample

To better understand the manufacture and purpose of sandal-sole shell gorgets, detailed analysis took place on 59 sandal-sole shell gorgets from the Fort Recovery State Museum (n = 12), Ohio Historical Society (n =27), Indiana State Museum (n = 2), University of Michigan (n = 7), and three private collectors (n = 11). These particular resources were chosen because of their regional location, research availability, the number of sandal-sole gorgets available at each location, and the interest of the curator or private collector in Glacial Kame. The ultimate goal was to gather as much detailed information as possible on sandal-sole shell gorgets in the most efficient and effective manner.
Accessing the collection at the Fort Recovery State Museum was the easiest to arrange as I had previously completed an internship to organize and catalog their large prehistoric collection during the summer of 2008. I coordinated my visits in March 2009 to analyze the sandal-sole shell gorgets with Nancy Knapke, the director of the museum. The Fort Recovery State Museum has 12 sandal-sole shell gorgets as part of their Glacial Kame collection (see Table 4). These gorgets were found at one of the two known local Glacial Kame sites in Mercer County, Ohio, the Fox Site and the Rammel Site. However, it is not known which specific gorgets were found in which specific site, being that the sites are less than two miles apart and are often referred to in documentation as a single site, Fox-Rammel (Converse 1979; Cunningham 1948). Eleven of the gorgets (FRSM-01 through FRSM-11) were easily accessible for photographs and analysis; however the twelfth (FRSM-12) was in a permanent display case and could only be photographed and analyzed through the glass. Although the Fort Recovery State Museum did not have original documentation regarding these gorgets, information on the Fox and Rammel Sites and gorgets was found in Bravard and Converse (1973), Converse (1979), Cunningham (1948, 1958), Holmes (1883), Longley (1949), Mason (1881), and Pillars (1895).

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Provenience</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRSM-01</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>FRSM-02</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>FRSM-03</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>FRSM-04</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>FRSM-05</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>FRSM-06</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>FRSM-07</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>FRSM-08</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
</tbody>
</table>
Table 4: List of 12 Sandal-Sole Shell Gorgets at Fort Recovery State Museum (FRSM)

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Provenience</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRSM-09</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>FRSM-10</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>FRSM-11</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>FRSM-12</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
</tbody>
</table>

The Fort Recovery State Museum has also previously made their collection available to Brian Vastano of Russia, Ohio, a collector with in-depth knowledge and a great interest in Glacial Kame. After contacting Vastano, he was more than happy to talk to me about his sandal-sole shell gorget collection and make it available to me for analysis. We met at an Archaeology Society of Ohio (ASO) meeting in November 2008 in Columbus, Ohio, where he had his collection and two other private collections available for my review and analysis. These three private collections totaled 11 sandal-sole shell gorgets representing at least four different Glacial Kame sites in Ohio, with a possible site in Michigan or Wisconsin, and two with unknown provenience (see Table 5). Vastano had quite a bit of documentation on most of these gorgets and shared that information with me. I made notes of his documentation, original sources, and personal knowledge of each of these gorgets.

Table 5: List of 11 Sandal-Sole Shell Gorgets from three private collections (COL1, COL2, COL3)

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Provenience</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL1-001</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>COL1-002</td>
<td>Clifford Williams Site, Logan County OH – 33LO25</td>
</tr>
<tr>
<td>COL1-003</td>
<td>Unknown, possible site in Michigan or Wisconsin</td>
</tr>
<tr>
<td>COL1-004</td>
<td>Unknown</td>
</tr>
<tr>
<td>COL1-005</td>
<td>Unknown</td>
</tr>
<tr>
<td>COL1-006</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>COL1-1378</td>
<td>Fox or Rammel Site, Fort Recovery, Mercer County OH</td>
</tr>
<tr>
<td>COL2-208</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
</tbody>
</table>
Four trips were made to the Ohio Historical Society (OHS) and Ohio History Center in Columbus, Ohio, from September 2008 to January 2009, with my main contact being Martha Otto, Curator of Archaeology. I initially contacted Otto via email and submitted my thesis proposal for her review. Because the Fort Recovery State Museum is affiliated with the Ohio Historical Society, Otto was familiar with Fort Recovery’s collection and its significance. My first trip consisted of discussing my thesis proposal with her, signing OHS’ research agreement, and reviewing their Glacial Kame collection. Subsequent trips were made to conduct detailed analysis on their sandal-sole shell gorgets. OHS has 27 sandal-sole shell gorgets in their collection (see Table 6) and 20 of these were available for my detailed analysis. Of the seven that were not available, four were on display at the Ohio History Center, two were off-site at another museum, and one was being repaired. Six of the seven gorgets physically not available for analysis had photographs on the OHS’ Online Collection Catalog (Ohio Historical Society 2009). I did some cursory analysis using these six pictures and by viewing the four gorgets on display at the Ohio History Center, leaving only one gorget that I could not view at all. These 27 OHS gorgets represent at least eight different Glacial Kame sites throughout Ohio and Indiana. The associated paperwork and field notes for each site were also reviewed and copies made as needed. Old issues of the Ohio Archaeologist journal also contained site and provenience information about these sandal-sole shell gorgets and

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Provenience</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL3-001</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>COL3-3065</td>
<td>Butler Township, Darke County OH</td>
</tr>
<tr>
<td>COL3-3066</td>
<td>Butler Township, Darke County OH</td>
</tr>
</tbody>
</table>

Table 5: List of 11 Sandal-Sole Shell Gorgets from three private collections (COL1, COL2, COL3)
copies were made of the appropriate articles at OHS. Additional information was found in Converse (1979, 2003), Cunningham (1948), and Lepper (2005) concerning these sites and gorgets. Specific details about each gorget were also available on the Ohio Historical Society’s Online Collection Catalog (Ohio Historical Society 2009).

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Provenience</th>
</tr>
</thead>
<tbody>
<tr>
<td>OHS-A190/3</td>
<td>Pleasant Township, Hardin County OH</td>
</tr>
<tr>
<td>OHS-A1956/10</td>
<td>Dublin Township, Mercer County OH</td>
</tr>
<tr>
<td>OHS-1956/9</td>
<td>Wyandot County OH</td>
</tr>
<tr>
<td>OHS-A3738/1.1</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-A3738/1.10</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-A3738/1.11</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-A3738/1.12</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
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<td>OHS-A3738/1.1Z-4</td>
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</tr>
<tr>
<td>OHS-A3738/1.2</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-A3738/1.3</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
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</tr>
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<td>OHS-A3738/1.5</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-A3738/1.6</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-A3738/1.7</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
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<td>OHS-A3738/1.8</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-A3738/1.9</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-A3738/4</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-37350/1.1</td>
<td>Richardson Site, Hardin County OH – 33HR1</td>
</tr>
<tr>
<td>OHS-37350/1.2</td>
<td>Richardson Site, Hardin County OH – 33HR1</td>
</tr>
<tr>
<td>OHS-3750/1.3</td>
<td>Richardson Site, Hardin County OH – 33HR1</td>
</tr>
<tr>
<td>OHS-3875/1</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-3875/2</td>
<td>Zimmerman Site, Hardin County OH – 33HR2</td>
</tr>
<tr>
<td>OHS-A60/265.1</td>
<td>Mulen Burial, Randolph County IN</td>
</tr>
<tr>
<td>OHS-A60/265.2</td>
<td>Mulen Burial, Randolph County IN</td>
</tr>
<tr>
<td>OHS-A60/265.3</td>
<td>Mulen Burial, Randolph County IN</td>
</tr>
<tr>
<td>OHS-A806/37.1</td>
<td>Erie County Kame, Erie County OH</td>
</tr>
<tr>
<td>OHS-A806/37.2</td>
<td>Erie County Kame, Erie County OH</td>
</tr>
</tbody>
</table>

The Indiana State Museum (INSM) has two sandal-sole gorgets (see Table 7) and analysis of these gorgets was arranged through Michele Greenan, Archaeology and Natural History Collections Manager, in January 2009. Per INSM’s catalog
documentation, both of these gorgets are from a gravel pit near Noblesville, Indiana. These two sandal-sole shell gorgets or this site has not been reported in any literature and very little information was available at INSM. A copy of the Indiana State Museum’s catalog documentation was made for my records.

<p>| Table 7: List of 2 Sandal-Sole Shell Gorgets at Indiana State Museum (INSM) |</p>
<table>
<thead>
<tr>
<th>Identifier</th>
<th>Provenience</th>
</tr>
</thead>
<tbody>
<tr>
<td>INSM-X1233/1</td>
<td>Noblesville, Hamilton County IN</td>
</tr>
<tr>
<td>INSM-X4108/20</td>
<td>Noblesville, Hamilton County IN</td>
</tr>
</tbody>
</table>

The University of Michigan Museum of Anthropology (UMMA) has seven sandal-sole shell gorgets as part of their William Cunningham collection from the Burch Site (see Table 8). I did not physically analyze these gorgets but had access to high quality pictures of this collection that I reviewed and analyzed (Vastano, personal communication, 2008). The Burch Site has been documented in Cunningham (1948) and Converse (1979). There was also additional information on the UMMA Digital Image Database (University of Michigan Museum of Anthropology 2009).

<p>| Table 8: List of 7 Sandal-Sole Shell Gorgets at University of Michigan (UMMA) |</p>
<table>
<thead>
<tr>
<th>Identifier</th>
<th>Provenience</th>
</tr>
</thead>
<tbody>
<tr>
<td>UM-58797</td>
<td>Burch Site, Branch County MI – 20BR1</td>
</tr>
<tr>
<td>UM-58805</td>
<td>Burch Site, Branch County MI – 20BR1</td>
</tr>
<tr>
<td>UM-58806</td>
<td>Burch Site, Branch County MI – 20BR1</td>
</tr>
<tr>
<td>UM-58808</td>
<td>Burch Site, Branch County MI – 20BR1</td>
</tr>
<tr>
<td>UM-58809</td>
<td>Burch Site, Branch County MI – 20BR1</td>
</tr>
<tr>
<td>UM-58817</td>
<td>Burch Site, Branch County MI – 20BR1</td>
</tr>
<tr>
<td>UM-58818</td>
<td>Burch Site, Branch County MI – 20BR1</td>
</tr>
</tbody>
</table>

In total, 52 sandal-sole shell gorgets were physically analyzed with an additional seven analyzed via high quality digital pictures. A total of 12 or 13 known Glacial Kame sites and three unknown proveniences are represented by these 59 gorgets (see Table 9).
These 12 or 13 known sites cover northwest Ohio, eastern Indiana, and southern Michigan and are part of the core Glacial Kame area as defined by Converse (1979), Cunningham (1948), Converse (1979), Donaldson and Wortner (1995), and Dragoo (1963). This selection of 59 gorgets is an approximate 56 percent sample of the known 106 sandal-sole shell gorgets (Table 1) and represents an approximate 37 percent sample of the 41 Glacial Kame sites that contained at least one sandal-sole shell gorget.

<table>
<thead>
<tr>
<th>State</th>
<th>County</th>
<th>Site Information</th>
<th># SSSG</th>
</tr>
</thead>
<tbody>
<tr>
<td>IN</td>
<td>Hamilton</td>
<td>Noblesville</td>
<td>2</td>
</tr>
<tr>
<td>IN</td>
<td>Randolph</td>
<td>Mulen Kame</td>
<td>3</td>
</tr>
<tr>
<td>MI</td>
<td>Branch</td>
<td>Burch Site – 20BR1</td>
<td>7</td>
</tr>
<tr>
<td>OH</td>
<td>Darke</td>
<td>Butler Township</td>
<td>2</td>
</tr>
<tr>
<td>OH</td>
<td>Erie</td>
<td>Erie County Kame</td>
<td>2</td>
</tr>
<tr>
<td>OH</td>
<td>Hardin</td>
<td>Pleasant Township</td>
<td>1</td>
</tr>
<tr>
<td>OH</td>
<td>Hardin</td>
<td>Richardson Site – 33HR1</td>
<td>3</td>
</tr>
<tr>
<td>OH</td>
<td>Hardin</td>
<td>Zimmerman – 33HR2</td>
<td>20</td>
</tr>
<tr>
<td>OH</td>
<td>Logan</td>
<td>Clifford Williams – 33LO25</td>
<td>1</td>
</tr>
<tr>
<td>OH</td>
<td>Mercer</td>
<td>Dublin Township</td>
<td>1</td>
</tr>
<tr>
<td>OH</td>
<td>Mercer</td>
<td>Fort Recovery, either Fox or Rammel Site</td>
<td>13</td>
</tr>
<tr>
<td>OH</td>
<td>Wyandot</td>
<td>Unknown</td>
<td>1</td>
</tr>
<tr>
<td>MI/WI?</td>
<td>Unknown</td>
<td>Unknown Provenience</td>
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<tr>
<td>Unknown</td>
<td>Unknown</td>
<td>Unknown Provenience</td>
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</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td><strong>59</strong></td>
</tr>
</tbody>
</table>

The map in Figure 8 below shows the approximate location of all Glacial Kame sites where sandal-sole shell gorgets were found. A filled-in circle notates a site that contains at least one sandal-sole shell gorget. A hollow circle indicates a site that contains at least one sandal-sole shell gorget and either part or all of this site’s sandal-sole shell gorget collection was used as part of this thesis research.
Figure 8: Location of Glacial Kame sites where sandal-sole shell gorgets were found. Hollow circles indicate site locations where gorgets were used in this research.
Detailed Gorget Analysis – Process

The detailed analysis of the sandal-sole shell gorgets included three steps: taking standard metrical measurements of each gorget, taking color digital photographs, and analyzing each gorget under the microscope looking for specific wear patterns and other characteristics. Each step was documented using several methods. This data, along with data from past research, was reviewed for any patterns concerning the use, manufacture, and distribution of sandal-sole shell gorgets.

Standard Measurements

As step one of the detailed analysis, standard measurements were taken (see Figure 9) for each sandal-sole shell gorget: length of the gorget: width of the gorget (measured at the widest point); length from the widest end of the gorget to the top of the first, second, and third holes. The sandal-sole gorgets are of various sizes, so the measurements of three holes will be used to calculate hole alignment ratios to see if any patterns emerge. Figure 9 shows the measurements taken for each sandal-sole gorget and the worksheet used to track the data. Table 10 shows the measurement data that was gathered. In a few cases, standard measurements could not be taken due to the gorgets not being available, broken sandal-sole gorgets, or the lack of time with the private collections.
For consistency sake, it is important to understand the nomenclature used when referring to pictures, measurement data, and hole-wear data. The sandal-sole shell gorget pictured in Figure 9 is shown with its concave side facing up. It is placed with the widest end towards the “top” which in almost all cases is the end with two holes. In some old reports this is called the “toe” end in reference to the sandal-sole or “moccasin” shape. The smaller end is at the “bottom” or the “heel,” as referred to in old reports. The same
alignment was used when analyzing the convex side. The widest end with the two holes is considered the “top,” and the narrow end is considered the “bottom.” This is not meant to imply any type of use for the gorget but was simply done for ease and consistency of record keeping. This positioning was used for all sandal-sole gorgets when configuring the measurement data. The data was then entered into an Excel 2007 spreadsheet with sample data shown in Table 10.

Table 10: Sample Measurement Data gathered from Sandal-Sole Shell Gorget Analysis

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Top to 1st hole (cm)</th>
<th>Top to 2nd hole (cm)</th>
<th>Top to 3rd (cm)</th>
<th>Length (cm)</th>
<th>Width (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL1-001</td>
<td>1.5</td>
<td>4.1</td>
<td>12</td>
<td>23.5</td>
<td>4.5</td>
</tr>
</tbody>
</table>

The measurement data was further analyzed in Excel 2007 by calculating ratios in order to accurately compare the hole measurements given the different sandal-sole shell gorget lengths. To further investigate similarities or differences of sandal-sole shell gorgets by site, single factor ANOVA P-values (measuring analysis of variance) were calculated in Excel 2007. The sample for the ANOVA tests was the three sites from which seven or more sandal-sole shell gorgets were analyzed as part of this thesis.

**Digital Photographs**

In addition to standard measurements, photographs were taken of each side of the gorget (Figure 10). For analysis purposes, these pictures were labeled as concave and convex views based on the way the shell curved. It is normally presented that the concave side is the “front” of the gorget, but I purposely did not perpetuate what may or may not have been the original use. These photographs were taken with a Canon PowerShot S500 Digital Elph 5.0 megapixel digital camera attached to a copy stand with
the best lighting that could be arranged at the location. All photographs were taken by the author with the exception of the University of Michigan Cunningham collection and several of the Ohio Historical Society gorgets. The Cunningham collection was available via high quality digital pictures and several of the Ohio Historical Society gorgets were on display and unavailable for research, so photographs from their web site were used. Each photograph was taken on a black background with a scale and gorget identification. See Appendix A for all sandal-sole shell gorget pictures taken by the author.

![Digital photograph of typical sandal-sole shell gorget (concave side) with scale and identification](image)

**Figure 10**: Digital photograph of typical sandal-sole shell gorget (concave side) with scale and identification

**Microscopic Analysis**

The final step of the detailed analysis was reviewing each sandal-sole gorget under the microscope and looking specifically at hole wear, side wear, and any etchings or engravings on the gorget. A Bausch & Lomb 0.7x – 3x microscope borrowed from the Applied Archaeology Laboratories, Ball State University was used for this purpose.
Each gorget was analyzed on both the concave side and convex side under the microscope. Two aspects of hole wear were noted - the amount of hole wear and the location of the hole-wear.

It quickly became apparent that the hole wear was quite variable and required a specific description in order to be consistent and provide the needed detail for analysis. In order to meet that need, the description of the hole wear was coded on the SSSG Data Sheet as follows:

- NW = No Wear
- SW = Slight wear, noticeable only with magnification (Figure 11)
- W = Noticeable wear, no notching (Figure 12)
- HW = Heavy wear, often with notching (Figure 13)

The location of the hole wear required the same type of detailed and consistent description in order to analyze this data effectively. The location of the hole wear was coded on the SSSG Data Sheet as follows:

- B = Bottom of drilled hole
- T = Top of drilled hole
- L = Left side of drilled hole
- R = Right side of drilled hole
- Even = Even wear (could be due to wear or hole manufacture)
The data from this analysis was marked on the SSSG Data Sheet and then transferred to an Access database and an Excel spreadsheet. An example of hole wear data is presented in Table 11 below. This example shows slight wear on the bottom of the first hole, slight wear on the top of the second hole and no wear on the third hole of the concave side. And noticeable wear on the top of the first hole, noticeable wear on the bottom of the second hole and no wear on the third hole of the convex side.

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Concave</th>
<th>Convex</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL1-001</td>
<td>1st hole</td>
<td>2nd hole</td>
</tr>
<tr>
<td></td>
<td>B-SW</td>
<td>T-SW</td>
</tr>
</tbody>
</table>

There are a few sandal-sole shell gorgets that have repair holes that were used to string two or more pieces of the gorget back together (Figure 14). These repair holes were not analyzed for wear because of time constraints. There are also a few sandal-sole shell gorgets that have more than three holes in alignment down the center of the gorget (Figure 15). The three holes that were the most logically aligned to a “normal” sandal-sole shell gorget were used for hole wear analysis.

**Figure 14: Sandal-sole shell gorget with repair holes; OHS-A3738/1.9**
Data Collection

In addition to the hole wear and hole measurement data tracked in the Excel spreadsheets, all of the data and photographs were transferred into a Microsoft Access database. See Figure 16 for an example of a typical database record. The database tracked the following data elements: gorget owner, gorget ID, alternate ID, provenience, length, width, hole measurements, concave and convex view pictures, engraving data, hole wear data, edge wear data, other wear data, and additional notes. Microsoft Access 2007 was chosen so that all of the data (including pictures) could be viewed on a single page or screen for each gorget. All data was easily exported to and imported from Microsoft Excel 2007 for additional analysis such as measurement averages and standard deviations. As part of the results section, this information will be compared and analyzed with the data from existing literature to see if it supports past hypotheses on manufacture, use, and distribution or if new hypotheses emerge.

Figure 15: Sandal-sole shell gorget with more than 3 holes; FRSM-08
In addition to the literature review, additional Glacial Kame and sandal-sole shell gorget knowledge was acquired through personal discussions, conferences, and presentations. I made initial contact with Vastano, who has shown much interest in the Fort Recovery State Museum’s sandal-sole shell gorget collection, when I gave a presentation on my thesis topic at the Fort Recovery State Museum in May 2008. Vastano has a great interest in Glacial Kame and sandal-sole shell gorgets and has personally located 61 sandal-sole shell gorgets. Vastano gave me several tips on the locations of various gorgets and the availability of general Glacial Kame resources in nearby libraries and museums. Vastano and I frequently traded emails and information on sandal-sole shell gorgets.

In May 2008, I attended the Archaeological Society of Ohio’s Symposium 2008 in Columbus, Ohio where Robert N. Converse (collector and author of numerous Glacial Kame resources) spoke on the Glacial Kame Culture. Converse’s presentation gave me

### Glacial Kame Discussions

![Figure 16: Sample of sandal-sole shell gorget database record](image)

<table>
<thead>
<tr>
<th>Owner:</th>
<th>GHS</th>
</tr>
</thead>
<tbody>
<tr>
<td>ID:</td>
<td>A60/265.3</td>
</tr>
<tr>
<td>Other ID:</td>
<td></td>
</tr>
<tr>
<td>Provenience:</td>
<td>Mulen Burial, Randolph County, IN</td>
</tr>
<tr>
<td>Length:</td>
<td>19.6</td>
</tr>
<tr>
<td>TopTo1st:</td>
<td>0.5</td>
</tr>
<tr>
<td>TopTo2nd:</td>
<td>2</td>
</tr>
<tr>
<td>TopTo3rd:</td>
<td>10.2</td>
</tr>
<tr>
<td>Width:</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Engraving: Stylized reaper on "upper" 2/3 of gorget, containing all 3 holes
1st Hole Wear: Convex - no really any wear, gunky holes
2nd Hole Wear: Convex - top wear
3rd Hole Wear: Convex - bottom left slight wear
Convex - wear all around hole

Hole Diameter: 0.6
Other Wear: |

In May 2008, I attended the Archaeological Society of Ohio’s Symposium 2008 in Columbus, Ohio where Robert N. Converse (collector and author of numerous Glacial Kame resources) spoke on the Glacial Kame Culture. Converse’s presentation gave me...
several new leads on Glacial Kame sites with sandal-sole shell gorgets and clarified some of the topics in his books (Converse 1979, 2003). I introduced myself to Converse and explained my thesis project to him. I also made contact with Tony DeRegnacourt who presented a historical topic at the conference. DeRegnacourt had done work with the Fort Recovery State Museum previously, including identifying and organizing the existing sandal-sole shell gorgets, Glacial Kame and prehistoric exhibits at the museum.

At the invitation of Brian Vastano, I attended the November 2008 Archaeological Society of Ohio meeting in Columbus, Ohio. In addition to analyzing his and other personal collections (as discussed previously), I had time for discussion with Vastano and other collectors. I took notes on site specific information, ideas on manufacture and use, and contact names of others interested in Glacial Kame or owning sandal-sole shell gorgets. Vastano and I discussed the hole-wear pattern that seemed prevalent and brainstormed ideas on how that might have formed. We shared resource and contact information with each other for future research.

In February 2009, Nancy Knapke (the director of the Fort Recovery State Museum) and I attended an Archaeological Society of Ohio meeting in Bellefontaine, Ohio, where Brian Vastano gave an hour-long presentation on the Glacial Kame Culture. Vastano’s presentation was very detailed and informative and added even further to my Glacial Kame understanding. He had details on numerous Glacial Kame sites, including the Fox and Rammel Sites, which are the provenience of the Fort Recovery State Museum’s sandal-sole shell gorget collection. He also presented his ideas on the symbolism inherent in Glacial Kame artifacts, including sandal-sole shell gorgets. There
was a short discussion period after Vastano’s presentation where others shared their thoughts and ideas on Glacial Kame (Vastano 2009).

**Personal Museum Visits**

As stated previously, numerous visits were made to museums with sandal-sole shell gorgets in their collection. These include multiple visits to the Ohio Historical Center, Fort Recovery State Museum, and Indiana State Museum for detailed research on their sandal-sole shell gorgets. Additionally, visits to museums with prehistoric exhibits and various shell artifacts in their collections also contributed to the general background of this thesis. These visits included Fort Meigs (March 2008), the Garst Museum (April 2008), the Ohio Historical Center (October 2008), Fort Ancient State Memorial (July 2008), and the Allen County Museum (September 2009) in Ohio, and Cahokia Mounds State Historic Site (August 2009) and the Center for American Archaeology Museum (August 2009) in Illinois.

Because the fourth research goal of this thesis is how to best analyze and portray the story of Glacial Kame sandal-sole shell gorgets to the public, special attention was paid to the overall prehistoric exhibits at museums that were visited. I took numerous pictures of interesting and clever ways that these museums exhibited their prehistoric artifacts. The visit and tour of the Garst Museum was prior to a grand opening of their museum redesign, and I talked to their exhibit design team and made contacts with people who could help with future exhibit work at the Fort Recovery State Museum. Of particular importance were exhibits that had a local component to them, i.e., the Koster exhibit at the Center for American Archaeology Museum, the local artifact displays at Fort Ancient, and multiple fascinating and educational exhibits at Cahokia. I gathered
many ideas from these exhibits to use to help tell the story of the sandal-sole shell gorgets at the Fort Recovery State Museum.

**Local Glacial Kame Research**

Research was done at the Fort Recovery State Museum and with local amateur archaeologists to try and piece together the story of the discovery and original location of these specific sandal-sole gorgets. This information will enhance the story of these gorgets and will give visitors a sense of context and local flavor. An intensive literature review included locating all original sources cited in Cunningham (1948) and Converse (1979), and reviewing all back issues of the *Ohio Archaeologist*, looking for additional details regarding the sandal-sole shell gorgets in the Fort Recovery State Museum.
Chapter Four

Analysis and Results

The results from the previously described literature review, research, and detailed sandal-sole shell gorget analysis can be summarized and grouped so they logically support this thesis’ four research questions to be discussed and analyzed in Chapter 5. The hole measurement results, hole wear results, and information gathered on engraved sandal-sole shell gorgets will support discussion and analysis of the manufacture and purpose of sandal-sole shell gorgets. The contextual information results, research on proposed used and information gathered on symbolism and ceremonialism will also be used to examine the purpose of sandal-sole shell gorgets. Manufacturing techniques used in shell ornament creation will be used to hypothesis how sandal-sole shell gorgets were made. Trade and distribution results will be used in the discussion and analysis of the distribution pattern within the Midwest of Glacial Kame sandal-sole shell gorgets. Finally, data gathered on the two local Glacial Kame sites, the Fox Site and Rammel Site, will support how we can best portray the story of Glacial Kame sandal-sole shell gorgets to the public.

Hole Measurement Results

The measurement data gathered from the sandal-sole shell gorget analysis is presented in Table 12. In a few cases, measurement data could not be gathered due to broken sandal-sole shell gorgets or a gorget not fully available because it was on display.
The length of the sandal-sole shell gorgets analyzed ranged in length from 13 to 29 centimeters and in width from 5.3 to 9.9 centimeters. The average length and width of the sandal-sole shell gorgets was 19.43 (sd = 2.60) by 7.08 (sd = 0.89) centimeters and the hole diameters ranged from 0.3 to 0.5 centimeters with most being in the 0.3 to 0.4 centimeters range. Typical thickness of a sandals sole shell gorget is 0.3 to 0.6 centimeters.

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Top to 1st hole (cm)</th>
<th>Top to 2nd hole (cm)</th>
<th>Top to 3rd hole (cm)</th>
<th>Length (cm)</th>
<th>Width (cm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>COL1-001</td>
<td>1.5</td>
<td>4.1</td>
<td>12.0</td>
<td>23.5</td>
<td>6.7</td>
</tr>
<tr>
<td>COL1-002</td>
<td>1.5</td>
<td>4.6</td>
<td>12.2</td>
<td>22.0</td>
<td>8.7</td>
</tr>
<tr>
<td>COL1-003</td>
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<td>20.0</td>
<td>7.8</td>
</tr>
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</tr>
<tr>
<td>COL1-005</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COL1-006</td>
<td>Unfinished Preform</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COL1-1378</td>
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<td>11.0</td>
<td>18.5</td>
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<td></td>
</tr>
<tr>
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<td>4.0</td>
<td>11.0</td>
<td>18.5</td>
<td>7.1</td>
</tr>
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<td>COL3-3065</td>
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<td>4.0</td>
<td>12.0</td>
<td>21.5</td>
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</tr>
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<td>COL3-3066</td>
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<td>12.0</td>
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<tr>
<td>FRSM-01</td>
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<tr>
<td>FRSM-02</td>
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<td>5.5</td>
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<tr>
<td>FRSM-03</td>
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<tr>
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<tr>
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<td>6.8</td>
</tr>
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<td>FRSM-11</td>
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<td>12.3</td>
<td>22.4</td>
<td>7.5</td>
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<td></td>
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<tr>
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<td>4.3</td>
<td>11.5</td>
<td>20.5</td>
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</tr>
<tr>
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<td>4.6</td>
<td>11.8</td>
<td>22.1</td>
<td>7.9</td>
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<tr>
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<td>N/A</td>
<td>N/A</td>
<td>19.0</td>
<td>7.2</td>
</tr>
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</table>
Table 12: Measurement Data gathered from Sandal-Sole Shell Gorget Analysis

<table>
<thead>
<tr>
<th>Identifier</th>
<th>Top to 1st hole (cm)</th>
<th>Top to 2nd hole (cm)</th>
<th>Top to 3rd hole (cm)</th>
<th>Length (cm)</th>
<th>Width (cm)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>8.0</td>
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<td>12.2</td>
<td>16.3</td>
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<td>OHS-A3738/1.1</td>
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Average 1.39 3.99 10.97 19.31 7.08
Standard Deviation 0.63 0.87 1.33 2.69 0.89
Table 13 shows the ratios calculated from this measurement data. Six ratios were calculated: the three ratios of the measurements from the top of each hole as compared to the length of the gorget, the ratio of the width compared to the length, the ratio of the distance between the first and second holes compared to the distance between the second and third holes, and the distance between the first and third holes compared to the length. In some cases ratios were not calculated due to a zero value for one or more measurements. For each of the six ratios the range (minimum and maximum), mean, and standard deviation were calculated and are presented at the end of Table 13.

When observing sandal-sole shell gorgets, there seems to be a pattern regarding hole placement. The hole measurement results confirm statistically what generally can be seen in individual sandal-sole shell gorgets with casual analysis. On average, the first hole of a sandal-sole shell gorget is drilled approximately 7 percent of the way down from the top of the gorget with a standard deviation of 3 percent. The second hole is located approximately 21 percent from the top of the gorget with a standard deviation of 4 percent. The third hole averages 57 percent from the top of the gorget (often described as the middle or center), with a bit more variability as indicated by its standard deviation of 7 percent. On average, the width of a sandal-sole shell gorget is 37 percent of its length with a standard deviation of 5 percent, meaning that most are about one-third as wide as they are long. The ratio of the distance between the first and second holes compared to the distance between the second and third holes produced the most variability with a mean of 38 percent with an 11 percent standard deviation. Finally, the ratio of the distance between the first and third hole as compared to the length averaged 50 percent with a 7 percent standard deviation. In general, this data is very consistent and
presents very few outliers given the fact that, in a normal distribution, 68 percent of the sandal-sole shell gorgets would fall within the relatively small standard deviations of each calculated ratio. This data will be discussed further in Chapter 5: Discussion and Conclusions.

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<th>Width / Length</th>
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Table 13: Ratios from Measurement Data from Sandal-Sole Shell Gorget Analysis

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Minimum 0.03 0.10 0.41 0.27 0.17 0.35
Maximum 0.15 0.32 0.81 0.48 0.66 0.69
Mean 0.07 0.21 0.57 0.37 0.38 0.50
Standard Deviation 0.03 0.04 0.07 0.05 0.11 0.07

To further examine these hole measurements and ratios, the three Glacial Kame sites with the greatest number of analyzed sandal-sole shell gorgets were compared. These three sites are the Burch Site (n=7), the Fox-Rammel Site (n=12), and the
Zimmerman Site (n=16), which are geographically separated from each other by at least 60 miles. The ANOVA single-factor P-value was calculated for each unique pair of sites (Burch to Fox-Rammel, Fox-Rammel to Zimmerman, and Zimmerman to Burch). A P-value of less than or equal to 0.05 is significant and indicates that the two sites in the pair are statistically different and unique. A P-value of greater than 0.05 is not significant and indicates that the two sites in the pair are not statistically different. Table 14 lists the P-values for each of the six calculated ratios from Table 13, plus the P-values for the length and width. The four significant P-values (all involving the Burch Site) are shaded.

| Table 14: ANOVA Single-Factor P-Value Results from Sandal-Sole Shell Gorget Analysis |
|-------------------------------------------------|-----------------|-----------------|-----------------|
| Ratio - Top of 1\(^{st}\) Hole : Length          | 0.110611        | 0.527315        | 0.03984 significant |
| Ratio - Top of 2\(^{nd}\) Hole: Length           | 0.965344        | 0.257267        | 0.366714         |
| Ratio - Top of 3\(^{rd}\) Hole: Length           | 0.665102        | 0.371535        | 0.73792          |
| Ratio – 1\(^{st}\) to 2\(^{nd}\) hole : 2\(^{nd}\) to 3\(^{rd}\) hole | 0.267808        | 0.881519        | 0.35492          |
| Ratio – 1\(^{st}\) to 3\(^{rd}\) hole : Length   | 0.230588        | 0.492307        | 0.43878          |
| Ratio - Width : Length                            | 0.175003        | 0.1753882       | 0.009604 significant |
| Measurement – Length                              | 0.366306        | 0.093051        | 0.784503         |
| Measurement - Width                               | 0.011365 significant | 0.400927        | 0.020354 significant |

Table 15 lists other sandal-sole shell gorget dimensions as found in the literature. These sandal-sole shell gorgets all fit within the size range that was described as part of Table 12. It is interesting to note that there is one sandal-sole shell gorget in Table 15
from the McKee site that has the holes upside down, as the two closest holes are near the smaller end of the gorget and the third hole near the middle is towards the larger end.

This is the only known sandal-sole shell gorget with this anomaly.

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<th>Site, County, State</th>
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**Hole Wear Results**

Some Glacial Kame literature reports no hole wear in sandal-sole shell gorgets or no distinct wear pattern, which may be perfectly reasonable for a specific sandal-sole shell gorget or a very small sample size, especially if viewing with the naked eye. Analysis of such a small sample size may have led to erroneous conclusions. Hall points out that the holes sometimes show signs of wear, but “in fact, there was no real pattern of use which could be inferred from the wear” (Hall 1983:90). The hole-wear data results amassed from the literature and this thesis’ analysis seems to refute Hall’s statement of no real pattern of use.

The hole-wear data is presented in Table 16 below. Of the 59 sandal-sole shell gorgets that were part of this research, 51 were analyzed for hole wear. Eight could not
be analyzed due to various reasons listed in Table 16. The asterisk (*) behind the Identifier indicates that this gorget is also engraved. All sandal-sole shell gorgets show wear on at least one hole. A common hole-wear pattern (HWP) quickly emerges from this raw data. For discussion purposes, this will be known as hole-wear pattern 1.

Twenty-five (49 percent) of the sandal-sole shell gorgets (designated with HWP = 1S) show a strong common wear pattern with another twelve (24 percent) gorgets (designated with HWP = 1W) most likely having this same pattern, but just not fully formed and identified as weak. Sandal-sole shell gorgets with hole-wear pattern 1S show at least slight wear on the bottom of the first hole and the top of the second hole on the concave side with at least slight wear on the top of the first hole and bottom of the second hole on the convex side (see Figure 17 for an illustration of hole-wear pattern 1). Sandal-sole shell gorgets with hole-wear pattern 1W are missing wear on one of the top two holes on either the convex or concave side. A total of 73 percent of the sandal-sole shell gorgets analyzed show HWP 1S or 1W.

Another less common hole-wear pattern was evident in five (10 percent) of the sandal-sole shell gorgets. Sandal-sole shell gorgets with hole-wear pattern 2 (HWP = 2) show hole wear on the bottom of the first hole and the bottom of the second hole on the concave side. The wear pattern on the other holes is not consistent. The remaining nine (18 percent) sandal-sole shell gorgets show no consistent wear pattern and are designated as NWP.

Overall, the third hole shows the least wear of all, and the wear it does show is very inconsistent with no clear pattern emerging. The first hole shows the heaviest and most consistent wear, on the bottom of the hole on the concave side and the top of the
hole on the convex side. It has the highest incidence of heavy wear, and all sandal-sole shell gorgets but two show at least slight wear on the first hole.

To review the coding used for the hole wear data, the first half of the designation indicates the location of the hole wear as either B (bottom), T (top), L (left), or R (right), and the second half of the designation indicates the amount of hole wear as NW (no wear), SW (slight wear), W (wear), or HW (heavy wear). The HWP column indicates the hole-wear pattern assigned to the specific sandal-sole shell gorget.

### Table 16: Hole Wear Data gathered from Sandal-Sole Shell Gorget Analysis

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Table 16: Hole Wear Data gathered from Sandal-Sole Shell Gorget Analysis

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<tr>
<td>UM-58809</td>
<td>B-W</td>
<td>T-SW</td>
<td>NW</td>
<td>T-W</td>
<td>B-W</td>
<td>NW</td>
<td>IS</td>
</tr>
<tr>
<td>UM-58817</td>
<td>B-W</td>
<td>T-HW</td>
<td>All</td>
<td>T-SW</td>
<td>B-SW</td>
<td>NW</td>
<td>IS</td>
</tr>
<tr>
<td>UM-58818</td>
<td>B-W</td>
<td>R-HW</td>
<td>NW</td>
<td>NW</td>
<td>B-SW</td>
<td>B-HW</td>
<td>NWP</td>
</tr>
</tbody>
</table>

This hole-wear data supports findings in the literature as there are multiple reports of hole-wear pattern 1. One of the first reports of hole wear in sandal-sole shell gorgets is in the “Art of Shell of the Ancient Americans.” The description of a sandal-sole shell gorget from the Rammel Site in Mercer County, Ohio, includes detailed information about hole wear.

It bears evidence of considerable use and the two holes are much worn by a string or cord, which passing from one hole to the other on the concave side of the plate, gradually worked a deep groove between them… and that of such a character as to indicate the passage of a cord between the perforations in a position that would produce abrasion between the holes on the concave side of the plate, but would leave the back entirely unworn. This peculiar result could only be produced by attachment in a fixed position, concave side out, to some object perforated like the plate, the cord passing directly through both. [Holmes 1883:265]

Ritchie also examined the Picton gorgets and described a consistent pattern as follows:

In which the two holes near the larger end exhibit a faint grooving of the proximal margins of the concave surface, as though abraded by a single thong or cord forming the means of attachment. This fact suggests that the ornament was worn with the larger end uppermost, concave surface outward, and that a knotted thong passed from back to front, starting at the lower opening. The distal perforation or perforations, which show no trace of wear, might then have borne dangling ornaments, as previously hinted. [Ritchie 1949:37]
Converse (1979) also reports this standard pattern of hole wear:

From the wear around the holes on many examples, conclusions about the methods of fastening them have been made. It has been speculated that a cord or thong was knotted at one end and inserted through the lower hole from the concave side and through the lower ‘toe’ hole and back out through the upper one. These upper holes quite often are worn enough to say with certainty the direction which the cord followed. [Converse 1979:50]

These results also support previous microscopic analysis of smaller samples. Donaldson and Wortner examined the nine sandal-sole shell gorgets found in Ontario listed in Table 1. The hole wear of the gorget found at the Sartori site was described as follows and matches the findings of hole-wear pattern 1:

Under magnification, the… concave surface shows a well-defined wear pattern between the two holes closest to the ‘toe’ end of the specimen. On the convex surface of this specimen, the wear pattern on the ‘toe’ end hole is towards the ‘toe’, the wear on the middle hole is towards the ‘heel’. No definite wear pattern can be observed on the ‘heel’ end hole on either surface. [Donaldson and Wortner 1995:30]

The sandal-sole shell gorgets found at the Meredith-Goodall, Blackfriar’s Bridge, Hind, Finlan, and Picton sites were either described similarly, or it was specifically noted that they followed the “typical” wear pattern previously described in their report (Donaldson and Wortner 1995:30).

Hole-wear pattern 1 that is described in the literature and supported by this research is illustrated in Figure 17 below. There are no reports in the literature of analyzing hole wear that is different from hole-wear pattern 1, of comparing non-standard wear pattern by site, or of analyzing hole-wear patterns on engraved sandal-sole shell gorgets. These topics will be reviewed in Chapter 5: Discussion and Conclusions.
The in situ location of the sandal-sole shell gorget in relation to the skeleton has long been of interest to those documenting Glacial Kame sites. If sandal-sole shell gorgets were placed on or attached to the burials the same ways they were actually used, this contextual information becomes very important and perhaps can tell us a great deal about use.

Contextual Information Results

Figure 17: Illustration of hole-wear pattern 1 exhibited by 73 percent of examined sandal-sole shell gorgets (Donaldson and Wortner 1995:76)
As discussed previously, the vast majorities of Glacial Kame sites were accidental
discoveries from private gravel mining or construction and were not professionally
excavated. There are very few detailed site reports, and contextual information is often
not available. When it is reported, it is most often found in non-peer-reviewed journal
articles or via personal communication and not necessarily in formal site reports.
However, even the sporadic bits of contextual information can give us clues about the
possible use of sandal-sole shell gorgets and their social role as grave goods.

The earliest report of contextual information comes from John Matson’s 1856
report of the Richardson Site in Ridgeway Township, Hardin County, Ohio. He writes:

On the head of one of the second pair (of burials) was a conch shell plate
resembling in shape the sole of a mocassin. This plate had three holes through it.
I found it on top of the head with larger end back. Two other skeletons of these
two rows had similar plates on, differing only in size. [Matson 1856:5]

The sandal-sole gorgets were even labeled by Matson as a “headdress” (see
Figure 18).

Figure 18: Sandal-sole shell gorget from Richardson Site labeled with
“Headdress from Hardin Co. Mound, John Matson”
Excavation of the Dixon Mound in the 1920s in Schuyler County, Illinois, uncovered a sandal-sole shell gorget in a similar location. Charles Harris, the excavator of the mound, stated: “A second shell gorget, with three perforations, was about nine and on-half inches long, three and three-quarters inches wide, and shaped like a sandal-sole. This shell piece when found was on top of the skull, the large concave end cupping over the frontal bone and the more pointed end extending back over the crown of the skull” (Cunningham 1948:26).

Lilly’s account of the 1941 Cedar Point excavation in Kosciusko County, Indiana, shows a sandal-sole shell gorget on the chest. Figure 19 below shows this sandal-sole shell gorget in situ.

A sandal-sole shaped shell gorget 9 1/8” long with four perforations was on the chest…. just below the smaller end of the gorget and running underneath it, a very dark brown or black deposit interwoven with a fibrous substance like roots which may have been the last traces of some wooden implement or a tool handle. [Lilly 1942:32]

Figure 19: Cedar Point burial showing sandal-sole shell gorget on the chest (Lilly 1942:31)
The only known account of more than one sandal-sole shell gorget within a single burial is from the Doetsch Site in Illinois (see Figure 20). A female burial approximately 21 years of age was found with the first sandal-sole gorget on the chest and the second between the legs. (Young et al. 1961:23)

At the Reigh Site, Burial 13 of a young adult female (Pfeiffer 1977) contained a sandal-sole shell gorget. “Beneath the chin of this individual, one end actually projecting up into the mandible, was a gorget of “sandal-sole” shape made of marine conch shell. Since the burial was tightly flexed, however, the gorget may originally have been suspended on the chest” (Baerreis et al 1954:27). Burial 14 at the Hind Site, contained a
sandal-sole shell gorget at the right elbow of another young adult female (Pfeiffer 1977) as shown in Figure 21 (Donaldson and Wortner 1995:18)

![Figure 21: Hind Site burial 14 showing sandal-sole shell gorget in situ at right elbow (Donaldson and Wortner 1995:18)](image)

A complete listing of the contextual data is presented in Table 15. Unfortunately because of the accidental nature of most Glacial Kame discoveries and the common practice of looting early Glacial Kame sites, much of this context information is gone forever. However, a re-investigation of skeletal remains at several Glacial Kame Sites has clarified age and sex at the Reigh and Hind Sites, among others (Pfeiffer 1977). The data shows that sandal-sole shell gorgets were found in both male and female burials.
equally (three burials each), but due to the small sample size and large number of unknown sexes, this data is not entirely conclusive. However there does seem to be a pattern of young adult females as the three females were aged similarly: “15 to 18 years of age,” “young adult,” and “about 21 years of age” (Pfeiffer 1977:38, 1977:116; Young et al. 1961:23) with the no age given for the males. Sandal-sole shell gorgets were found in burials of young people, adults, and aged persons with many unknown ages. Although most sandal-sole shell gorgets are found with skeletons, there have been cases of inclusion with cremated or partially cremated remains (Converse 1979; Ritchie 1949).

The location of the sandal-sole shell gorget on the skeletal remains is quite variable. A synopsis of Table 17 shows that 10 sandal-sole shell gorgets were found in the head/skull area, five at the shoulders and neck, 19 at the chest and torso, and two at the legs. Three sandal-sole shell gorgets were simply found with the skeleton and two others were found with cremated remains. Two major issues could be influencing the validity of this data. Many of these older accounts are verbal descriptions that were passed down from non-professional observer to the researcher (Converse 1979; Cunningham 1948), often via second or third parties. They are only as accurate as someone’s recollections or in many cases, several person’s recollections. The second cause of variable data could be the nature of the Glacial Kame burials. Several reports mention that with tightly flexed burials, it is sometime hard to determine whether the original location of the sandal-sole shell gorget as placed on the burial is what is truly being seen during excavation. This can be even more misleading in the case of multiple flexed burials.
Table 17: Contextual Data gathered from Sandal-Sole Shell Gorget Research

<table>
<thead>
<tr>
<th>Location In Situ</th>
<th># SSSG</th>
<th>Sex</th>
<th>Age</th>
<th>Site</th>
<th>Reference</th>
</tr>
</thead>
<tbody>
<tr>
<td>On the head</td>
<td>3</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Richardson</td>
<td>Matson 1856</td>
</tr>
<tr>
<td>On top of the skull</td>
<td>1</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Dixon</td>
<td>Cunningham 1948:26</td>
</tr>
<tr>
<td>Near the head</td>
<td>5</td>
<td>Unknown</td>
<td>4 adults and perhaps at least one child</td>
<td>Burch</td>
<td>Cunningham 1948:7</td>
</tr>
<tr>
<td>Near the skull</td>
<td>1</td>
<td>Male</td>
<td>Unknown</td>
<td>Williams</td>
<td>Vastano 2008</td>
</tr>
<tr>
<td>Mostly about head, shoulders</td>
<td>3</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Mulen</td>
<td>Cunningham 1948:24</td>
</tr>
<tr>
<td>One on each shoulder</td>
<td>2</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Middleburg</td>
<td>Converse 1979:113</td>
</tr>
<tr>
<td>“on the front of the skeletons about the middle”</td>
<td>14</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Zimmerman</td>
<td>Cunningham 1948:11</td>
</tr>
<tr>
<td>Just below right elbow</td>
<td>1</td>
<td>Female</td>
<td>15 to 18 years of age</td>
<td>Hind Burial 14</td>
<td>Donaldson and Wortner 1995:15</td>
</tr>
<tr>
<td>Chest (below chin)</td>
<td>1</td>
<td>Female</td>
<td>Young adult</td>
<td>Reigh Burial 13</td>
<td>Baerreis et al 1954:27</td>
</tr>
<tr>
<td>Chest</td>
<td>1</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Cedar Point</td>
<td>Lilly 1942</td>
</tr>
<tr>
<td>Area of Torso</td>
<td>1</td>
<td>Unknown</td>
<td>Adult</td>
<td>McKee Burial 8</td>
<td>Anonymous 1977</td>
</tr>
<tr>
<td>Chest</td>
<td>1</td>
<td>Female</td>
<td>About 21 years of age</td>
<td>Doetsch Burial 1</td>
<td>Young et al. 1961:23</td>
</tr>
<tr>
<td>Between the legs</td>
<td>1</td>
<td>Female</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Among leg bones, close to pelvis</td>
<td>1</td>
<td>Unknown</td>
<td>Adolescent / young person</td>
<td>Picton Burial 10</td>
<td>Ritchie 1949</td>
</tr>
<tr>
<td>Accompanying the skeleton</td>
<td>2</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Harrison</td>
<td>Cunningham 1948:10</td>
</tr>
<tr>
<td>Accompanying the skeleton</td>
<td>1</td>
<td>Male</td>
<td>Unknown (Large Male)</td>
<td>Osmom</td>
<td>Anonymous 1962</td>
</tr>
<tr>
<td>Accompanying cremation</td>
<td>3</td>
<td>Unknown</td>
<td>Multiple Adults</td>
<td>Picton Burial 7</td>
<td>Ritchie 1949</td>
</tr>
<tr>
<td>Beneath the remains</td>
<td>1</td>
<td>Male</td>
<td>Unknown</td>
<td>Bowman Burial 5</td>
<td>Converse 1979:100</td>
</tr>
<tr>
<td>Unknown</td>
<td>2</td>
<td>Unknown</td>
<td>Aged person</td>
<td>Darke Co.</td>
<td>Matson 1865</td>
</tr>
</tbody>
</table>
Engraved Sandal-Sole Shell Gorgets

Engraving is rare on sandal-sole shell gorgets. “There are probably less than ten known engraved examples making them a rarity among rarities” (Bravard and Converse 1973:4). These artistic designs can give us very important clues about the culture of the people who made these engravings and the environment that they lived in. Eleven engraved sandal-sole shell gorgets are listed in Table 18 below and detailed in the following paragraphs. Seven of these engraved gorgets (as notated with an Identifier) were analyzed by the author.

Table 18: Engraved Sandal-Sole Shell Gorgets

<table>
<thead>
<tr>
<th>Site, County, State</th>
<th>Identifier</th>
<th>Type of Engraving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimmerman, Hardin Co., OH</td>
<td>OHS-A3738/1.10</td>
<td>Three incised lines of geometric design</td>
</tr>
<tr>
<td>Northern Ohio gravel pit</td>
<td></td>
<td>Three incised lines possibly representing snake</td>
</tr>
<tr>
<td>Erie Co., OH</td>
<td>OHS-806/37.2</td>
<td>Incised lines possibly representing snake</td>
</tr>
<tr>
<td>Meredith-Goodall, Kent Co., Ontario</td>
<td></td>
<td>Incised lines of geometric design</td>
</tr>
<tr>
<td>Mulen, Randolph Co., IN</td>
<td>OHS-A60/265.1</td>
<td>Incised parallel lines with Xs</td>
</tr>
<tr>
<td>Mulen, Randolph Co., IN</td>
<td>OHS-A60/265.3</td>
<td>Three incised lines representing stylized bird</td>
</tr>
<tr>
<td>Rammel, Mercer Co., OH</td>
<td></td>
<td>Bas-relief of stylized bird</td>
</tr>
<tr>
<td>Rammel or Fox, Mercer Co., OH</td>
<td>FRSM-010</td>
<td>Incised parallel lines with Xs</td>
</tr>
<tr>
<td>Spitzer, Hardin Co., OH</td>
<td>OHS-A109/3</td>
<td>Bas-relief of possible bear cub</td>
</tr>
<tr>
<td>Rockford, Mercer Co., OH</td>
<td></td>
<td>Spiral design of tiny indentations</td>
</tr>
<tr>
<td>Dublin Township, Mercer Co., OH</td>
<td>OHS-1956/10</td>
<td>Spiral design of tiny indentations</td>
</tr>
</tbody>
</table>

Zimmerman Site, Hardin County, Ohio

The engraved partial sandal-sole shell gorget pictured in Figure 22 is from the Zimmerman Site in Hardin County, Ohio, and was discovered in 1931 along with 22
other sandal-sole shell gorgets. “It is said that most of the sandal-sole gorgets were around the shoulders and necks of the skeletons” (Cunningham 1948:12). This engraving’s closely spaced three-line style (see Figure 23 for geometric design) is very similar to an engraved gorget found at the Mulen Kame in Randolph Co., Indiana, and another found in northern Ohio. The engraving covers at least the narrowest half of the concave side of the gorget with no engraving on the convex side.

![Figure 22: Engraved sandal-sole shell gorget from the Zimmerman Site, Hardin Co. OH; OHS-A3738/1.9](image)

**Figure 22: Engraved sandal-sole shell gorget from the Zimmerman Site, Hardin Co. OH; OHS-A3738/1.9**

![Figure 23: Geometric design (made with three closely incised lines) on engraved sandal-sole shell gorget from the Zimmerman Site, Hardin Co. OH; OHS-A3738/1.9 (Galitza 1958c:102)](image)

**Figure 23: Geometric design (made with three closely incised lines) on engraved sandal-sole shell gorget from the Zimmerman Site, Hardin Co. OH; OHS-A3738/1.9 (Galitza 1958c:102)**

The engraved partial sandal-sole shell gorget pictured in Figure 24 and Figure 25 is from a “northern Ohio gravel pit” (Moorehead 1910). It is engraved on at least the
widest two-thirds of the concave side with no engraving on the convex side. The engraving is thought to represent a snake with the triangular elements representing snake heads and the body represented by the intricate and closely spaced three lines (Converse 1979). This engraving could also be a geometric design as opposed to a snake, as it most closely resembles the geometric designs found on a sandal-sole shell gorget from the Meredith-Goodall Site in Ontario (Figure 27). It is also very similar to the engraved gorget at the Zimmerman site and the Mulen Kame stylized bird gorget.

Figure 24: Engraved sandal-sole shell gorget from northern Ohio (Moorehead 1910:124)

Figure 25: Drawing of detail engraving on sandal-sole shell gorget from northern Ohio (Converse 1979:43)
**Erie County, Ohio**

The engraved partial sandal-sole shell gorget pictured in Figure 26 is from an unknown site in Erie County, Ohio. It is engraved on at least the widest half of the concave side with no engraving on the convex side. Although these lines are poorly incised compared to other engraved sandal-sole shell gorgets, it is still posited that this design represents a snake with the familiar triangular head (Converse 1979:45).

![Figure 26: Engraved sandal-sole shell gorget from Erie County, OH; OHS-806/37.2](image)

**Meredith-Goodall Site, Kent County, Ontario**

The engraved sandal-sole shell gorget illustrated in Figure 27 is from the Meredith-Goodall Site in Kent County, Ontario, and was excavated in 1964. It was the only sandal-sole shell gorget found at the site and was found in Burial 14 just below the right elbow of a 15- to 18-year-old female (Donaldson and Wortner 1995; Pfeiffer 1977:38). As shown the geometric design graving is near the center of the gorget fully
covering the width of the concave surface and then overlapping the convex surface about one-third of the width on each side.

**Figure 27: Drawing of engraved sandal-sole shell gorget from the Meredith-Goodall Site, Ontario (Donaldson and Wortner 1995:76)**

**Mulen Kame, Randolph County, Indiana**

Figure 28 and Figure 29 shows an engraved sandal-sole shell gorget from the Mulen Kame in Randolph County, Indiana, and was discovered in 1885. It was found along with two other sandal-sole shell gorgets “placed mostly about the head and shoulders” (Cunningham 1948:24), with one other engraved. This gorget’s geometric
design of multiple Xs between parallel lines is on the smaller end of the concave side of the gorget, covering about one-third of the smaller end.

Figure 28: Engraved sandal-sole shell gorget from the Mulen Kame, Randolph County, IN; OHS-A60/265.1

Figure 29: Close-up of geometric design on sandal-sole shell gorget from the Mulen Kame, Randolph County, IN; OHS-A60/265.1

The engraved sandal-sole shell gorget pictured in Figure 30 is also from the Mulen Kame. This engraving’s closely spaced three-line style is very similar to an engraved gorget found at the Zimmerman Site in Hardin County, Ohio, and another found in northern Ohio. Per Cunningham, it “is similar to that employed on pottery
vessels of Natchezan style in the lower Mississippi Valley” (Cunningham 1948:24). The engraving covers the widest two-thirds of the concave side of the gorget with no engraving on the convex side. Although some literature describes this engraving as an “elaborate cross” (Cunningham 1948:24, Hall 1983:93), others envision it as a stylized bird with two heads, two tails, and four wings (see Figure 31). It is also noted that the head and tail treatment is similar to the engraved Bravard gorget (Converse 1979; Converse and Bravard 1973).

It is interesting to note that this engraving is similar to the three-line incised style used in Cox Mound gorgets from the late prehistoric and protohistoric Southeastern Ceremonial Complex (SECC). One of the Cox Mound style gorgets’ important iconographic elements is the looped square, which is the scroll-like design element composed of three or four lines (Figure 32). It closely resembles the three-line interwoven design of the Mulen Kame gorget. As used in Cox Mound gorgets, the looped square may represent wind (Buchner 1998). It is possible that the three-line interwoven design of the Mulen Kame gorget could be a stylized bird made with iconographic elements to also represent the wind.

Figure 30: Engraved sandal-sole shell gorget from the Mulen Kame, Randolph County, IN; OHS-A60/265.3
Figure 32: Cox Mound Gorgets showing the looped square design element (Buchner 1998:1)

*Rammel Site, Mercer County, Ohio*

The engraved sandal-sole shell gorget in Figure 33 is known as the Bravard gorget. It was presumed to be found in either the Rammel Site or Fox Site in Mercer County, Ohio, as it is marked “FT. RECOVERY OH” and was first mentioned in the
It is only one of two sandal-sole shell gorgets carved in bas-relief. The engraving (see Figure 34 and Figure 35) covers approximately the widest two-thirds of the concave side of the gorget with no engraving on the convex side. Per Bravard and Converse, it portrays a highly stylized bird with a head, tail, two wings, and clawed feet all pointing inward. The engraving of the head and tail are very similar to the engraving of the head and tail on the Mulen Kame gorget just previously mentioned. They also suggest that this design is similar to bird elements found on engraved tablets found in Adena mounds (Webb and Baby 1957:83-101) and to “outside in” treatment found on a human skull gorget from the Adena Florence mound (Converse 1979:39). It is suggested by Vastano (2009) that the bird representation could be a vulture. Instead of the “outside in” treatment as suggested by Bravard and Converse (1973), this could be a representation of several birds or turkeys in a flock or following each other.

Figure 33: Engraved sandal-sole shell gorget (Bravard Gorget) from the Fox or Rammel Site, Mercer County, OH (Converse 1979:38)
Similar to engraving found in one of the Mulen Kame gorgets (Figure 28 and Figure 29), the sandal-sole shell gorget in Figure 36 and Figure 37 appears to exhibit very faint incised parallel lines with Xs in between. This engraving is located across the gorget width on the bottom one-third of the gorget, about 2.5 centimeters below the third hole. It appears to be just a single set of parallel lines and accompanying Xs. This
engraving has not been reported in any other literature, most likely because of its faint
nature that is not visible as exhibited in the current display cases in the Fort Recovery
State Museum.

Figure 36: Engraved sandal-sole shell gorget from the Rammel or Fox Site, Mercer County, Ohio; FRSM-010

Figure 37: Close-up of engraving on sandal-sole shell gorget from the Rammel or Fox Site, Mercer County, Ohio; FRSM-010

Spitzer Site, Hardin County, Ohio

The other example of a bas-relief engraved sandal-sole shell gorget is from the
Spitzer Site in Hardin County, Ohio. It was found in 1886 and was first mentioned in
The Archaeologist (Snodgrass 1894). The engraving (see Figure 38 and Figure 39)
covers approximately the widest two-thirds of the concave side of the gorget with no
engraving on the convex side. The engraving is thought to be a bear (Converse 1979; Cunningham 1948; Snodgrass 1984), however there is disagreement over the appendage protruding from the animal and up and around the gorget. Some think it represents an umbilical with symbolic or legendary meaning (Converse 1979), while others think it is a tail and thus the engraving represents an unknown prehistoric animal (Snodgrass 1894). The original gorget is missing the piece that would show if the appendage is continuous or not and the Ohio Historical Society reconstruction of that missing piece is merely an assumption of the missing piece’s design. Snodgrass wrote in great detail about the workmanship of this carving:

In front of the animal’s head are plain and visible tracings of the instrument which was used to carve with; little notches in the mouth to represent teeth are visible; both eyes are on one side as represented in illustration and little depressions are hollowed out in the ears. The two forefeet are not the same shape – two toes, as will be seen on one foot, while there are none on the other; two toes of the hind foot can just be seen where the shell is broken off; two small holes are drilled through the shell, one just opposite the hind foot and between the toes, the other just below it and partly broken out by the lower fragment. The eye-holes are not drilled through, but the hole in front of the eyes, is, as well as the one in the right hand upper corner, beneath which is what I supposed to be intended for a tail to the animal and which, you can see, runs along the upper border of the shell, ending directly over the animal’s neck in a large bunch like a cat-tail; I mean the cat-tail that grows in swamps and marshy places, the Typhalatifolia. [Snodgrass 1894:114-115]
Mercer County, Ohio

There have been two sandal-sole shell gorgets engraved with very distinctive spiral punctuated designs found in two separate sites in Mercer County, Ohio. One was found in Dublin Township and is pictured in Figure 40 below. Tiny pinpoint depressions start in the center of the top two-thirds of the gorget and spirals outward covering the
whole concave side of the gorget. There is no engraving or depressions on the convex side. Three or four rows of these tiny holes create the spiral, as shown in Figure 41. The second sandal-sole shell gorget with a similar type of indentations or depressions was found in the Rockford Kame and is shown in Figure 42. Again, the design is on the concave side of the partial gorget.

Figure 40: Engraved sandal-sole shell gorget from Dublin Township, Mercer County, OH; OHS-1956/10

Figure 41: Close-up of engraving on sandal-sole shell gorget from Dublin Township, Mercer County, OH; OHS-1956/10
Monroeville, Huron County, Ohio

A Glacial Kame burial discovered in 2004 in Monroeville, Huron County, Ohio, revealed four sandal-sole shell gorgets. These gorgets were removed for reburial before they could be cleaned and analyzed, but quick pictures were taken. The pictures showed two gorgets covered with sand, however based on fragments of other shell gorgets, it is likely these two gorgets did exhibit engraving. The designs on the other shell fragments included angled lines and punctuates which are similar to other engraved sandal-sole shell gorgets (Rummel 2005).

Symbolism and Ceremonialism

Many early accounts of shell ornaments focused on the symbolism of the shell itself. For Late Archaic people living in the Midwest, a marine shell or shell ornament
from the sea so many miles away would have been mysterious and magical, treated with reverence and high esteem, and perhaps worn as a charm or used in religious ceremonies (Brown 1913; Holmes 1883; Rau 1876; Wintemberg 1908). Given the general prestige of shell, it could have been a marker of social status. Displaying shell, especially engraved or carved shell, as a body ornament could have been a sign of importance, as it symbolized a link to the sea and exotic places (Lepper 2005). It could also have been placed in burials to “allow the deceased access into the spirit world” (Dreiss 2001:1).

The *Busycon perversum* lightning whelk, the shell used for sandal-sole shell gorgets, is one of the few sinistral marine shells (spiraling to the left) and could have been regarded as sacred because of that left-handed nature (Milanich 1979; Wintemberg 1908). The act of burying shell ornaments with the dead, is in itself a very symbolic act with economic (restricting supply of a rare resource) and spiritual meaning (Dreiss 2001).

The eleven engraved sandal-sole shell gorgets detailed in the previous section show several examples of symbolism including two stylized birds, two possible representations of snakes, and a bas-relief of a bear or other animal with a symbolic umbilical cord or tail (Converse 1979). Incised geometric designs are also found on several of the engraved gorgets, most with three closely spaced lines. Because this same motif or pattern is found on slate gorgets, slate tubes, and other Glacial Kame artifacts (Converse 1976), it appears to be a known symbol or icon with special meaning. It is interesting to note from Table 18 that engraved sandal-sole shell gorgets with similar methods of design are found hundreds of miles apart. For example, the engraving on the sandal-sole shell gorget from the Meredith-Goodall Site in Ontario has incised engraving that is very similar in form to the engraved gorget found in a “northern Ohio” gravel pit.
Whatever these incised symbols and geometric patterns meant to the Glacial Kame people, it apparently had similar connation in a wide, regional context.

A similar example involves the two Mercer County, Ohio, sandal-sole shell gorgets with spiral depressions or punctuates covering the concave surface of the gorget. One could make the argument that these symbols do not have regional meaning (since they were found less than 15 miles apart), except when a similar shell ornament from Allen’s Creek, Texas, is taken into consideration. At least two shell ornaments from the Ernest Witte Site (41AU36) in Texas show the same type of depressions on the concave side of the shell, although in straight line patterns and not in spirals (Hall 1981:203). It could be possible that the symbolism inherent in the small pinpoint depressions on the shell are recognized and have meaning beyond the core Glacial Kame burial complex.

Animals were a popular symbolic element in Glacial Kame. In addition to animal mask-headdresses, and the engravings of stylized birds, snakes, and bears on sandal-sole shell gorgets, other Glacial Kame artifacts symbolized various animals. Turtle engravings and symbolism can be found on other shell and slate artifacts (Converse 2001; Holzapfel 2006). Birdstones are most likely symbolized representations of various bird or vultures (Vastano 2009). Various geometric designs possibly representing snakes are found on slate gorgets and tubes in addition to shell artifacts (Converse 1976). It appears animals and birds played an important part in Glacial Kame life and ceremonialism and perhaps were treated with a certain reverence (Bravard 1973; Galitza 1970).

Webb and Baby (1957:104-108) attempted to correlate symbols and art motifs across the Adena (Early Woodland in Ohio), Hopewell (Late Woodland in Ohio), and Southeastern Ceremonial Complex (Late Prehistoric in Southeast). In several of these
cases, Glacial Kame symbols could also be part of this continuum and could possibly be considered as ancestral to Adena, Hopewell, or Southeastern Ceremonial Complex symbology. These symbols include incised crosses, bi-lobed and tri-lobed designs, raptorial birds or ducks, and snakes. Converse (1979) also points out the similarities between the bas-relief raptorial bird engraving on the Bravard gorget (Figure 33) and the engraving on the Adena human skull gorget from the Florence Mound in Ohio (Webb and Baby 1957).

The Glacial Kame burial complex shows evidence of ceremonialism not only from the treatment of their burials (Quimby 1960), but from the accompanying grave goods. At least four animal headdresses have been found at Glacial Kame sites. These include a wolf headdress at the Clifford M. Williams Site in Logan County, Ohio (Baby 1961), a bear skull mask altered to fit a human skull at a different Williams Site in Wood County, Ohio (Stothers and Abel 1993), an almost identical altered bear skull mask at the Hind Site in Ontario (Donaldson and Wortner 1995), and a wolf headdress from the Minter Site (Converse 2001). Also found at the Hind Site was an altered skull of a fisher. The ceremonial use of animal masks as part of burials in Glacial Kame may have been a precursor to the ceremonialism and shamanism in Adena and Hopewell. As both Adena and Hopewell also used animal mask-headdresses in their burial rituals and shamanism (Baby 1956; Webb and Baby 1957), it seems logical that this continued a progression from Late Archaic Glacial Kame societies use of the same type of artifacts for burial ceremonialism (Carr and Case 2005). Brown (1997) notes that the earliest archaeological context of shamanism that flourishes in the Middle and Late Woodland is found in the
Late Archaic, and he specifically mentions the red ocher frequently found in Glacial Kame burials as evidence.

The most elaborate explanation of ceremonialism and symbolism involving sandal-sole shell gorgets is from Hall. In “A Pan-Continental Perspective on Red Ocher and Glacial Kame Ceremonialism” (Hall 1983), he argues that the drilled holes in certain sandal-sole shell gorgets (those without perfectly aligned holes) represent the three stars that form the “sword” in the constellation Orion. He goes on to explain the importance of these three “sword” stars and the mystical relationship they have to the Big Dipper. He draws a parallel between the sandal-sole shell gorget and its diagnostic counterpart in Red Ocher, the turkey-tail flint blade, which he hypothesizes is used as a bull-roarer. He also draws associations between both artifacts to the uterus and placenta and sees them both as being “talismans used in the acquisitions of visions or spirit powers or as material tokens of the powers, blessings, or patronage of mystical supernaturals as ancestors or ancestresses of descent groups, originators of tribal or lineage rituals and/or initiators of youths in puberty rites” (Hall 1983:102). He believes the sandal-sole shell gorget is a precursor to two-holed stone gorgets of the later Woodland periods, which were used as a protective charm.

**Proposed Gorget Use**

Sandal-sole shell gorgets have been assigned many functions. In the earliest reports, they were actually interpreted as being worn on the feet as stated by a Mr. Whitney in 1880, “about ten pairs of the shell sandals of different sizes, and made to fit the right and left feet” (Mason 1881:448). Holmes took note of the peculiar perforations and the fact that the spacing of the holes (especially the third hole) was “not designed for
ordinary suspension, but placed near the middle of the specimen as if for fixing it to the person or costume by means of cords” (Holmes 1883:265). Other late 19th-century reports and articles support the use of sandal-sole shell gorgets as typical gorgets or ornaments hung around the neck, badges of authority, armor plates, wrist protectors when using a bow, or as implements for sizing sinews, twisting cords, or evening bowstrings (Holmes 1883; Fowke 1896). Arguments for ornamental neck-wear came mostly from the fact that they were thought to be generally found on the breast of a skeleton. Holmes (1883) concluded they were personal decoration because the rarity of the shell would be too valuable to use for utilitarian purposes, and there was no sign of obvious wear to support any non-ornamental use. Fowke (1896) concluded that if they were ornamental, they could have been suspended as follows:

If they were to be worn at the belt or on any part of the dress they could easily have been fastened by a knotted string, or if the wearer desired he could have an ornamental button of some kind. If suspended around the neck, in order to make them lie flat against the breast they probably had a short cord passed through the perforation and tied above the top of the object, the suspending cord being passed through the loop thus formed. [Fowke 1896:117]

Other suggested uses include a pendant or orget where the sandal-sole shell gorget is worn with the “toe” end at the top and the concave surface out. A single cord or thong was threaded through the third hole on the “heel” end from the concave surface, passed upward along the back or convex side, and then threaded through the second and out first hole for attachment or suspension (Donaldson and Wortner 1995; Ritchie 1949:36). Ritchie also proposes that feathers, claws, or fur strips could have been attached to the third hole. Curren (1977) suggests that they were used to shape ceramics,
which is refuted by Starna (1979) as he proposes that they represent trade goods or status items.

In addition to sandal-sole shell gorgets being found on the chest and torso, they were often found on the skull. This led to Cunningham’s conclusion that they may have been used to “decorate or dress the hair, but were of greater importance and value to the wearer than ordinary hair ornaments, since powers of magic, protection, or authority were undoubtedly attributed to them” (Cunningham 1948:32). Although there were no sandal-sole shell gorgets found at the Glacial Kame Duff cemetery in Ohio, circular shell gorgets there were shown to have functioned as part of a barrette to position hair and worn at the back of the head (Sciulli and Schuck 2001). It is also known that beads were used for hair ornaments, “Formerly, four deer-skins was the price of a large conch-shell bead, about the length and thickness of a man’s fore-finger; which they fixed to the crown of their head, as an high ornament – so greatly they valued them” (Adair 1775:170). Sandal-sole shell gorgets may have performed similar functions ornamental functions in the hair. Hall notices the variability in location of the sandal-sole shell gorgets on the burial remains and concluded there were not enough occurrences of sandal-sole shell gorgets on the head to recommend “exclusive function such as that of the bone roach-spreader of historic times” (Hall 1983:90) or to suggest exclusive use as a pendant or gorget.

It is important to note that sandal-sole shell gorgets often seem to have been repaired or reworked into smaller pendants when they were broken. Details on the repair technique can be found in the subsequent Shell Manufacturing Techniques section, and Figure 53 shows an example of a sandal-sole shell gorget with repair holes. Sandal-sole
shell gorgets were also often reworked into smaller pendants if they could not be repaired. These reworked partial sandal-sole shell gorgets could become triangular pendants as found at the Hind Site in Ontario, identifiable only by the original hole-wear pattern and hole diameters (Donaldson and Wortner 1995; Ritchie 1949:36). Per Converse (1979), the high incidence of broken and subsequently repaired shells indicates that were commonly or frequently worn (and not just kept for ceremonial purposes), and that they were so rare and valuable that their meaning was not diminished by being repaired or reworked.

Historical and ethnographic accounts of shell usage in the Eastern United States may provide some clues on the use and manufacture of sandal-sole shell gorgets. Various historical references support shell usage as a pendant or gorget around the neck. John Lawson, who travelled through North and South Carolina in the year 1700, reports that “the Indians often times make of a certain large sea-shell a sort of gorge, which they wear about their neck with a string, so it hangs on their collar, whereon is sometimes engraved a cross or some odd sort of figure which comes next in their fancy” (Lawson 1714:315). John Brickell’s account of North Carolina Indians reports similar usage as:

They frequently make of these shells several sorts of figures, in imitation of gorges, crosses, stars, or any other odd kind of figure that their imagination suggests. These they wear about their necks and arms tied with a string; there are some of these gorges that will sell for three or four buckskins ready drest, whilst others are only valued and sold for one doe skin. [Brickell 1737:337]

In his account of American Indians in the southeast, James Adair reports that the natives “wore a breastplate made of a white conch-shell, with two holes bored in the middle of it, through which he put the ends of an otter-skin strap and fastened a buck-horn button to the outside of each” (Adair 1775:170). These same quotes are used in
other early American Indian ethnographic studies (Fowke 1896; Thomas 1891) to support Native American shell usage and importance. This buck-horn button supports Fowke’s idea of a belt or clasp on the body fastened with an ornamental button. Beverley states in *History and Present State of Virginia* (1705:4) that “At his Breast is a Tablet of fine Shell, smooth as polish’d Marble, which sometimes also has etched on it a Star, Half Moon, or other Figure, according to the maker’s fancy.” Also supporting ornamental wear on the chest is Kalm’s *Travels into North America* (1773:321), “others have a large shell on the breast, of a fine white colour, which they value very high and is very dear.”

Circular shell gorgets were almost certainly suspended from the neck based on hole-wear pattern and ethnographic evidence (Rau 1876:71). Rau also reports that “shell-matter was wrought into a variety of other ornaments designed for suspension or attachment. In most instances the fastening was effected by perforations” (Rau 1876:71). Research showed quite a few examples of circular shell gorgets being used at the neck and chest, but no historical drawings or photographs of anything resembling a sandal-sole shell gorget being used.
Stone gorgets, given their similar form to several types of shell gorgets, can also give important ethnographic clues. “The single-holed form was used generally as a pendant by Iroquois owners; the double-holed variety served as a hair ornament among the Delawares” (Skinner 1912:394). Robertson (1878) refutes stone gorgets being used as shuttles or cord gauges as they show no signs of wear from this type of usage and do not have varying sizes of holes. He also relays an ethnographic account from a former clerk of a fur trader for the Miamis who reports he had “often seen them in use and they were worn on the left wrist to ward off the blow of the bowstring in hunting” (Robertson 1878:100). Peets (1965) also supports the use of stone gorgets as archery guards. Ellis (2007) suggests that the term “gorget” is a functional misnomer and that archaeological
evidence shows that a prehistoric gorget may or may not have the same functionality as a historic gorget, and in fact, prehistoric gorgets may have been used many different ways.

**Shell Manufacturing Techniques**

Sandal-sole shell gorgets are manufactured from *Busycon perversum* shell (Converse 1979:50; Holmes 1883:265), also known as lightning whelk. This same shell type was also referred to as *Fulgur perversa* (Wintemberg 1928), *Fulgur (Busycon)* *perversus* (Brown 1913) and unio shell (Moorehead 1910) in early literature and is also synonymous with *Busycon contrarium* (Hall 1981; Hoff and Hoff 2008). The lightning whelk is a sinistral shell (see Figure 45) meaning it coils or spirals in a left-handed direction, and it ranges in size from 10 to 45 centimeters. Given the maximum length of sandal-sole shell gorgets (up to 24 centimeters), the size of the lightning whelks used were estimated to be up to 45 centimeters long and almost 30 centimeters in diameter (Converse 1979). The lightning whelk is native to the coast of southeastern North America and found from North Carolina south to Florida and the Gulf of Mexico (Dreiss 2001; Hall 1981).
Multiple types of Glacial Kame shell ornaments and beads were made from various parts of *Busycon perversum*, using all parts of the shell. The sandal-sole shell gorget’s unique curved length indicates it was made from the body whorl portion (see Figure 46 and Figure 47) of the shell. In addition to using the body whorl, portions of the anterior canal on one end of the shell and the penultimate suture on the other end were sometimes used in order to give the sandal-sole shell gorget the longest length possible. In these cases, traces of the natural sinistral spiral of the shell can be seen in the sandal-sole shell gorget (Dreiss 2001).

Figure 45: *Busycon perversum* (Frank and Lee 1998:1)
Actual manufacture of the sandal-sole shell gorget would have involved cutting the shell with various lithic tools as demonstrated below in Figure 48. The initial form would then have been abraded on the exterior surface of the shell, removing any outer spines (Hall 1981). The edges of the sandal-sole shell gorget would then be smoothed and rounded (Wintemberg 1928) using a grinding tool as shown in Figure 48. The ends would also be formed, rounded and smoothed to give a classic sandal-sole shape. As
reported by Holmes when describing a sandal-sole shell gorget from the Rammel Site in Mercer County, Ohio, “the back had been slightly ground to take off the rougher ridges of growth, the edges are even and rounded and in many places quite thin” (Holmes 1883:265). The finished thickness of a sandal-sole shell gorget is typically between 0.3 and 0.6 centimeters. Perforations or holes were then drilled into the sandal-sole shell gorget using a flint point. Holes are typically 0.3 to 0.5 centimeters in diameter.

![Figure 48: Steps in making sandal-sole shell gorgets (Ohio Historical Society 2008)](image)

Figure 49 and Figure 50 show a possible bow drilling technique that could have been used for creating the perforations in the sandal-sole shell gorgets. Experimental archaeology (Barton et al. 2009) concluded that this was the most efficient and effective drilling method for *Spondylus* shell. Examining the sandal-sole shell gorgets from the Picton Site in Ontario, Ritchie (1949) states:
The perforations on these gorgets are prevailingly countersunk from one face and the nature of the aperture suggests the use of a stone drill, probably of chipped flint. The periphery of our specimens… is polished and rounded, and the objects convey the impression of having been painstakingly made, according to a definite traditional pattern which admitted of minor individual variations, and highly regarded as valuable possessions. [Ritchie 1949:37]

Figure 49: Demonstration of stone drill that may have been used to drill shell perforations (The Cahokia Mounds State Historic Site)

Figure 50: Demonstration of bow drill used for drill testing in *Spondylus* shell (Barton et al. 2009:6)
The only known example of a sandal-sole shell gorget preform is shown in Figure 52 and Figure 51. This preform is from the Zimmerman Site in Hardin County, Ohio, and is now owned by a private collector. It is not found in any previous Glacial Kame literature. Based on this specimen, the collector’s theory on manufacture of sandal-sole shell gorgets is that holes were drilled into the *Busycon perversum* shell along the outline of the gorget. The shell was then “sawed” between the holes with a piece of flint to eventually release the gorget preform from the shell (Vastano 2009). The gorget edges could then be finished using flint points and abrasives for smoothing and polishing.

Figure 51: Sandal-sole shell gorget preform from Zimmerman Site (convex); COL1-006

Figure 52: Sandal-sole shell gorget preform from Zimmerman Site (concave); COL1-006
Manufacturing techniques can also be gleaned from various historical accounts. When speaking of shell beads and gorgets, Adair reports that they are “made out of conch-shell, by rubbing them on hard stones, and so they form them according to their liking” (Adair 1775:170). The abrasion of rubbing the shell on hard stones matches the manufacturing techniques described above by Hall (1981) and Dreiss (2001). Lawson’s account of drilling shell beads gives us an idea of the amount of time it must have taken to form and fashion a sandal-sole shell gorget:

But the drilling is the most difficult to the Englishman, which the Indians manage with a nail stuck in a cane or reed. Thus they roll it continually on their thighs, with their right hand holding the bit of shell with their left, so in time they drill a hole quite through it, which is a very tedious work. [Lawson 1714:316]

In addition to a standard design and three-hole pattern of sandal-sole shell gorgets, repair of broken sandal-sole shell gorgets was standardized. The repair of broken sandal-sole shell gorgets typically consisted of opposing sets of repair holes that were drilled very close to the break at regular intervals (see Figure 53). It is assumed a cord was woven through these repair holes to keep the two pieces of the sandal-sole shell gorget together. Sandal-sole shell gorgets using this repair technique were found in Erie County, Ohio (OHS-A806/37.1), the Osmon Site in Allen County, Ohio (Converse 1979:119), the Zimmerman Site in Hardin County, Ohio (OHS-A3738-1.9), the Mulen Kame in Randolph County, Ohio (OHS-A60/265.3) and the Picton Site in Ontario (Ritchie 1949).
Figure 53: Example of broken sandal-sole shell gorget with repair holes from the Picton Site, Ontario (Cunningham 1948:Plate V)

It is important to note that broken sandal-sole shell gorgets were sometimes not repaired but reworked into smaller pendants. This was the case at the Picton Site in Ontario for four broken and reworked sandal-sole shell gorgets as “the adaptation has consisted in the regrinding of certain of the broken edges and the drilling of a new perforation near one edge of the fragment” (Ritchie 1949:36).

**Trade and Exchange**

Renfrew and Bahn recognize various “materials of prestige value” that vary among cultures yet have common qualities of rarity, durability, and of being visually conspicuous. They specifically point out shell of large marine molluscs as “being highly prized in many cultures for millennia” (Renfrew and Bahn 1996:34). It is then no wonder that the sandal-sole shell gorget, its raw material, and its standard form were objects of trade and exchange.

The distribution of Glacial Kame sites and a sub-set of those sites with sandal-sole shell gorgets and Glacial Kame’s relationship with Red Ocher and Old Copper all
have been discussed in the Background chapter of this thesis. The use of exotic raw materials (shell, copper, galena, flint) during the Late Archaic and as part of the Glacial Kame burial complex supports vast Late Archaic trade networks (Brose 1994; Fitting and Brose 1971; Ford 1974). Early researchers and discoverers of Glacial Kame sites recognized the evidence of these trade networks from the *Busycon* shell artifacts (Holmes 1883; Matson 1856; Rau 1876; Wintemberg 1908).

The literature supports the source of sandal-sole shell gorget raw material as *Busycon perversum* from the Gulf Coast. However, there is much debate on how the shells were actually transported from as far away as Florida into Ohio and other Glacial Kame locales and whether the raw material was moved as whole shells, preforms, or finished sandal-sole shell gorgets. Several researchers assume that the shells were cut into sections or the columnella removed so the shells could be more easily packed and moved (Converse 1979:48; Hoff and Hoff 2007). While this may be true in some cases, there are also discoveries of whole shells at the Zimmerman, McKee, Mt. Calvary, and Rockford Glacial Kame sites in Ohio (Converse 1979; Cunningham 1948) in addition to a sandal-sole shell gorget preform found at the Zimmerman site as shown in Figure 52 and Figure 51 above (Vastano 2009). These items indicate that at least some whole shells were being transported to Ohio Glacial Kame sites where actual sandal-sole shell gorget manufacture was taking place.

Various types of exchange networks could have facilitated the movement of either raw material (shell) or finished goods (sandal-sole shell gorgets) from the Gulf Coast northward into the core Glacial Kame area. Renfrew and Bahn (1996:352) present multiple types of exchange based on where the exchange is taking place, who is
controlling the trade, and how many people are involved in the trade. Although at first glance it seems that multiple types of exchange networks could apply to Glacial Kame, the evidence of shell ornaments similar to sandal-sole shell gorgets outside the standard Glacial Kame area but not at the source of *Busycon* shell seems to point to networks involving multiple people. This could include down-the-line-trade, central place redistribution and market exchange, and middleman or emissary trading.

Archaic *Busycon* shell artifacts very similar to sandal-sole shell gorgets have been documented in Alabama, Kentucky, Tennessee, Florida and Texas (Converse 1979; Hall 1981; Hoff and Hoff 2007, 2008; Ritchie 1955). Ritchie saw this as possible evidence of northern Alabama, southern Tennessee, and Indian Knoll contributing to Glacial Kame culture. Figure 54 shows a four-holed shell gorget from Watt’s Cave, Christian County, Kentucky. Other artifacts from Watt’s Cave are very similar to Glacial Kame grave goods. Figure 55 is one of numerous shell artifacts found at the Ernest Witte site (41AU36) in Allen’s Creek, Texas, with similarities to sandal-sole shell gorgets. The Witte Site showed other similarities with Glacial Kame including contextual location of the shell artifacts on the neck and chest and a shell artifact similar to Figure 55 that was repaired in exactly the same manner as Glacial Kame sandal-sole shell gorget repairs.
Past research support the idea of the Late Archaic trade networks being a precursor to and setting the stage for Adena trade and the Hopewell exchange system (Brose 1979; Fitting and Brose 1971; Hall 1981 from Griffin letter 1975; Sciulli and Mahaney 1986). Per Hall, the evidence of similar shell gorgets in Florida, Tennessee, Kentucky, Alabama, and Texas support the idea of Archaic trade networks setting the
stage for later trade routes as part of the Hopewell exchange system (Hall 1981 from Griffin letter 1975).

Biological and osteological studies are now helping us to understand the biological relationship of various Glacial Kame sites. Numerous studies by Sciulli and others have shown relatedness among Glacial Kame and other terminal Late Archaic populations in Ohio (i.e., Red Ocher). The proximity of sites to each other (not necessarily the assigned cultural affiliation of the site) determine the degree of relatedness – the nearer the sites, the more biological exchange regardless of the cultural dissimilarities (Sciulli and Schneider 1985). However, this degree of relatedness doesn’t necessarily apply when comparing Glacial Kame sites in the core area of Ohio with “outlier” Glacial Kame sites outside that region. For example, the Reigh Site in Wisconsin (where a sandal-sole shell gorget was found), was found to have no special relationship to selected Glacial Kame sites in northern Ohio from a biological perspective. The researchers state that “cultural similarity does not necessarily indicate biological relatedness, and that significant variation exists within each of the two major clusters” (Schneider and Sciulli 1983:7). They concluded that cultural traditions don’t necessarily represent biologic relatedness within Glacial Kame, which is also supported by the findings of biological studies on Late Archaic sites done by Pfeiffer (1979).

This biological data supports exchange ideas put forth by Spence and Fox (1986). Given the wide range of Glacial Kame (both spatially and temporally), they see Glacial Kame groups participating in the widespread Archaic exchange network to different degrees, picking and choosing the physical manifestations and social factors of burial ceremonialism. They use this idea to explain the continuum of differences in grave
goods, burial treatments, and grave offerings by age and sex found at Glacial Kame cemeteries. Donaldson and Wortner (1995) also point out overlapping trade networks that were “managed by many loosely connected local bands” as creating Glacial Kame and Red Ocher ‘cultures’ that may not be separate cultures at all but simply slightly different materializations and interpretations of the same traditions and customs.

Ford (1974) sees the increasing importance and value of trade in the Late Archaic as a way to explain increased similarity in exotic grave goods across long distances while maintaining local variations. Exchange of exotic ceremonial items such as sandal-sole shell gorgets for food or subsistence items became a type of insurance policy against environmental changes. As small, local Late Archaic groups became more sedentary, they depended more on local resources for subsistence and settlement, yet had access to exotic shell, copper, and flint. Ford sees this as introducing “a homogeneity in socio-ceremonial items, while subsistence technology was becoming heterogeneous” because of the increase in small, localized bands” (Ford 1974:394). His approach to Archaic trade can be used to explain the variations seen in Glacial Kame and the similarities with Red Ocher.

“Subsistence insurance” was also part of Brose’s (1979) exchange theory. He proposed that Late Archaic populations developed a sense of identity by returning seasonally to a specific area for fishing, hunting and gathering. Territories were marked by cemeteries, and trade of exotic goods was conducted with people in neighboring territories. This exchange created mutual dependencies between groups that ensured assistance and cooperation during times of environment changes and hardships.
As stated in the Glacial Kame overview, Stothers supports the idea of major trade axes and associated workshop locations that manufactured items for trade (Stothers and Abel 1993; Stothers et al. 2001) that were part of a complex and wide-ranging Late Archaic exchange system. In addition, he recognizes “trade fair” centers along the major trade axes where Big Men who controlled the economic resources redistributed commodities acquired through the trade network (Abel et al. 2001; Stothers and Abel 1993). He proposes that certain Late Archaic sites in the Glacial Kame region (the Williams Mortuary complex in Wood County, Ohio, and the Hind Site in Middlesex County, Ontario) were major “trade fair” centers much like Indian Knoll in Kentucky and Poverty Point in Louisiana, representing the highest social level in the regional area. He believes the exchange of ceremonial goods was controlled and goods distributed among at least three levels of social groups based primarily on the proximity to the trade centers (regional band, local band, and band segment), all with associated cemetery and mortuary complexes. Frequency of the highest value ceremonial goods from exotic raw material and the lowest value goods from local sources occurred in relation to the social level. Thus major “trade fair” centers would have the highest frequency of high value exotic ceremonial items which were less frequently dispersed to the other two lower social levels. (Abel et al. 2001; Stothers et al. 2001) Stothers’ proposed trade model is shown in Figure 56. He identifies Poverty Point, Indiana Knoll, Williams and Hind all as major trade centers, with Williams and Hind being classified as typical “Glacial Kame” sites.
Figure 56: A model for regional band interaction c. 1000 B.C., showing material source locations and major regional band configurations (Stothers and Abel 1993:84)

Please note that although Figure 56 shows Indiana Hornstone (more commonly known as Wyandotte chert) in the slightly incorrect location and shows only the core
Glacial Kame area in northwestern Ohio, it does give a good overview of possible trade exchange networks during the Late Archaic that would support Glacial Kame trade and the results of this thesis. Stothers’ interaction and trade model supports down-the-line trade, considered the most common type of long distance trade in the prehistoric eastern United States (Patterson 2004). As part of down-the-line trade, commodities travel across large distances spanning successive territories while being exchanged multiple times. Often, down-the-line trade is identified only as the end result of an exotic raw material being found many miles from its original sources. Intermediate exchange points facilitate the distribution of goods but often show little archaeological data on types of materials and goods traded. Patterson notes that “Poverty Point culture….of the Late Archaic period is an extreme example of intensive trade of many exotic materials.”

The trade of lithic material can also be analyzed to support Glacial Kame exchange networks beyond the obvious trade of copper and shell. Putty (2008:137,143) shows substantial quantities of Late Archaic and Terminal Archaic lithic material from Kentucky and Tennessee present at Crib Mound in southern Indiana. This movement of lithic material parallels the possible exchange that is evidenced by shell gorgets found in Kentucky and Tennessee that are strikingly similar to Glacial Kame sandal-sole shell gorgets (Figure 54 and Figure 55). The trade routes that were responsible for bringing lithics north into Indiana could have also been used to exchange shell and Glacial Kame cultural ideas from Kentucky and Indiana into southern Indiana and then northward again into the core Glacial Kame area with its southern edge in east central Indiana and west central Ohio. This again supports down-the-line trade as proposed by Patterson (2004) and detailed by Renfrew and Bahn (1996:352).
Fox and Rammel Sites, Sharpsburg, Ohio

As stated previously, two local sites are the sources of the 12 sandal-sole shell gorgets in the Fort Recovery State Museum’s collection. These sites were both accidental discoveries, one pre-1880 and one in 1935, with no official site report or article summarizing the sites. Details are sketchy, however the results of this thesis research allows the story of these two sites to be pieced together from various sources.

In 1880, a letter was sent to the Smithsonian Institution by a Mr. J. L. Whitney from Rose Hill, Ohio, that reports the following findings:

Copper axes and shell objects from a mound half a mile from Sharpsburg, Mercer County, Ohio. Ten pairs of shell relics were found resembling the bottoms of sandals. The mounds at this point are composed of sand and gravel. A large quantity of shell beads, a copper axe, and the skeleton of a tall man were recovered from the same mound. There are several mounds at this point composed of sand and gravel. The largest contains a quantity of very fine grayish-white sand, very hard, and streaked with bands of pure white sand. [Mason 1881:448]

This correspondence was in response to the Smithsonian Institution’s Circular No. 316, which asked the public to report the “permanent remains of the country, such as shell-heaps, mounds, circumvallations, pueblos, etc.” (Mason1881:441). Mr. Whitney’s correspondence was published the following year in “Abstracts of the Smithsonian Correspondence Relative to Aboriginal Remains in the United States” (Mason 1881). The site Mr. Whitney refers to is almost certainly the Rammel Site cited in future literature, located in Gibson Township, Mercer County, Ohio, one-quarter mile southeast of the unincorporated village of Sharpsburg and 5 miles southeast of the closest incorporated village, Fort Recovery (Galitza 1968).
A photograph of one of the sandal-sole shell gorgets from the Rammel Site appeared in “Art in Shell of the Ancient Americans” in 1883. W.H. Holmes gave the most complete and detailed description of a sandal-sole shell gorget up to that time as follows:

A remarkable specimen of this class is given in Figure 5. It is made from the body of a large *Busycon perversum*, and is nine and one-half inches long by three inches in width at the widest part. The concave surface has been highly polished, but is now somewhat roughened by weathering; the back has been slightly ground to take off the rougher ridges of growth; the edges are even and rounded to give it very much the appearance of the sole of a sandal. The perforations are three in number, one being near the middle and the others near the broader end, about one and one-half inches apart; they are very neatly made and are slightly bi-conical and a little countersunk. There appears to be no evidence whatever of abrasion by use. It was found associated with human remains in a mound at Sharpsburg, Mercer County, Ohio. A similar specimen from the same locality is nearly nine inches in length. As in the specimen illustrated, one perforation is placed near the middle and two others near the broader end. This specimen is highly polished on the broader part of the back, and is evenly smoothed on the concave side. It bears evidence of considerable use, and the two holes are much worn by a string or cord, which, passing from one hole to another on the concave side of the plate, gradually worked a deep groove between them. On the back of the convex side, the perforations show no evidence of wear. The central perforation is not worn on either side. The letter of Mr. Whitney transmitting this relic to the National Museum, states that there were in the mound ‘about ten pairs of the shell sandals of different sizes, and made to fit the right and left feet’. From the latter remark, I should infer that some were made from dextral and others from sinistral shells; the two described are made from the *Busycon perversum*. [Holmes 1883:265]

Another possible Rammel Site gorget surfaced in 1895 and was inscribed with “Found by John Smith, in gravel bank or mound, Mercer County, Ohio” and was marked with the number 2812 (Moorehead 1900; Pillars 1895).

The next account of the sandal-sole shell gorgets from the Fort Recovery area is in Cunningham’s *A Study of the Glacial Kame Culture in Michigan, Ohio, and Indiana* (1948). He reports that the “Fort Recovery Banking Company has in its collection ten sandal-sole shell gorgets” (Cunningham 1948:21). He gives other details of the artifacts
and their discoveries at the site and states that “some of the artifacts in this collection were in the Alex Fox gravel pit, and the rest were in the Leonard Rammel gravel pit” (Cunningham 1948:21). This is the first mention of the Fox Site and is one and a half miles northwest of the unincorporated village of Sharpsburg and three miles southeast of the closest incorporated village, Fort Recovery (Galitza 1968). It is less than two miles from the Rammel Site discovered before 1880. Of the Fox Site, Cunningham reports that “this find was made accidently about 1935 in a glacial gravel deposit, and the information obtained is hearsay” (Cunningham 1948:21).

It is assumed that the “hearsay” that Cunningham is referring to is the actual details of the Fox Site and not the discovery itself. A picture from the Fort Recovery Banking Company (Figure 57 and Figure 58) confirms the ownership of these sandal-sole shell gorgets and Glacial Kame artifacts by the bank. It was reported that the whole lot of Glacial Kame artifacts was purchased by the bank for $25 and was displayed at the bank for many years (Converse 1979), as evidenced by the display case at the front entrance. The bank donated the artifacts to the Fort Recovery Historical Society sometime prior to May 1949. In announcing the grand opening of the museum that year, the president of the Fort Recovery Historical Society writes:

The museum and relic room of the society was opened Sunday, May 1 (1949). There was no formal program, but open house was maintained from one o’clock until eight, with tea served from two to five. The museum is located in the public library at Fort Site Park and houses a fine collection of Indian and pioneer relics. Of special value is a collection of sandal–shaped gorgets, said to be the largest in the world. [Longley 1949:351]
Figure 57: Fort Recovery Banking Company (ca. 1930-1940) with sandal-sole shell gorgets and other Glacial Kame artifacts on display

Figure 58: Close-up of sandal-sole shell gorgets (top shelf) in Fort Recovery Banking Company display case
The 12 sandal-sole shell gorgets and associated Glacial Kame artifacts shown in Figure 57 and Figure 58 have remained in the collection of the Fort Recovery Historical Society since 1949. They were housed in the same display case in the museum located on the second floor of the public library building until the 1960s. At that time, the library moved into a different building and the Fort Recovery State Museum was established. Since the establishment of the Fort Recovery State Museum, the sandal-sole shell gorgets and other Glacial Kame artifacts have been displayed as part of a 1000-plus piece prehistoric artifact collection in the prehistoric room of the museum.

In addition to the 12 sandal-sole shell gorgets in the Fort Recovery State Museum collection that are presumably from the Fox or Rammel Sites, there are at least four other sandal-sole shell gorgets in private collections marked with “Fort Recovery” (Bravard and Converse 1973; Cunningham 1948:21-22). It is assumed that these also came from the Fox or Rammel Sites. One such gorget is the Bravard Gorget (see Figure 33) with the unique bas-relief engraving of a stylized bird. Bravard theorized that this engraved gorget was owned privately and not made available for public display or review until it came into his possession in the early 1970s (Bravard and Converse 1973). It is also reported that a sandal-sole shell gorget from Sharpsburg, Ohio, is in the Museum of the American Indian, Heye Foundation (now in the collection of the National Museum of the American Indian division of the Smithsonian Institution) (Cunningham 1948:20), bringing the total to at least seventeen sandal-sole shell gorgets that are most likely from the Fox or Rammel Sites. There are rumors of several other sandal-sole shell gorgets from these sites in at least two private collections locally (however, they want to remain
private) and undoubtedly there are other sandal-sole shell gorgets from these two sites in private collections throughout the country.
Chapter Five

Discussion and Conclusions

“As is usual in the case of accidental finds, and especially those made many years ago, it is difficult to learn much of scientific value from this material” (Cunningham 1948:10). Cunningham’s lament about the Harrison Site in Kalamazoo County, Michigan, where site information, typical of many early Glacial Kame sites, was passed down from the site discoverer in 1910 to family members to a friend to the author in the 1940s, holds true for many early Glacial Kame sites. Because of their accidental discovery and early non-professional practices concerning artifacts and skeletal remains, there certainly has been much scientific value lost from Glacial Kame sites over the years. However, as this thesis shows, there is scientific value that can still be gleaned from Glacial Kame sites, both professionally excavated and accidental discoveries. Much of this scientific value comes from viewing Glacial Kame sites and their associated grave goods as a whole and not focusing on specific sites or artifacts.

The results of this thesis will be analyzed by the four original research questions:

- How were Glacial Kame sandal-sole shell gorgets made?
- What was the purpose of Glacial Kame sandal-sole shell gorgets?
- What was the distribution pattern within the Midwest of Glacial Kame sandal-sole shell gorgets?
• How can we best interpret and portray the story of Glacial Kame sandal-sole shell gorgets to the public?

Research Question 1: Manufacture

The basic sandal-sole shell gorget manufacturing process gathered from the various methods of research and presented in the Shell Manufacturing Techniques section seems to be accurate and plausible. There does seem to be some difference of opinion concerning the exact species of the lightning whelk used for sandal-sole shell gorgets (Busycon perversum vs. Busycon contrarium), however that seems fairly esoteric in nature and could be resolved by further sourcing studies. The taxonomic literature indicates clear disagreement between these two Busycon species as evidenced by the detailed review in “Busycon Taxonomic Travail” (Frank and Lee 1996).

The Zimmerman preform (Figure 52 and Figure 51) gives us some new information about the manufacture of sandal-sole shell gorgets. Traditional thought is that the sandal-sole gorget was cut or carved from the shell with a flint point (see Figure 48). As stated in the results, the owner of this preform believes that the holes around one edge indicate that the holes were drilled into the whole shell before the preform was actually released from the shell. It was then “sawed” between the holes to release the shell. Although this does seem like a reasonable manufacturing technique, and one that should be explored further, there has not been consistent evidence in other analyzed sandal-sole shell gorgets to support this technique. Some of the gorgets examined had edges that were not fully smoothed and had notches or cuts on the edges of the gorget, but it was difficult to determine if these were naturally occurring from wear or human-
made. Additional analysis could look for patterns of side wear, or experimental archaeology with shell could help clarify this proposed manufacturing technique. It is interesting to note that this preform has a hole drilled before it is finished as a sandal-sole shell gorget. This is most likely the second hole from the top of the gorget. This may indicate that the hole was drilled into the shell first and that the design and final shape of the sandal-sole shell gorget was determined by the natural shape and curvature of the shell. At the very least, it shows that the design and final shape were being contemplated before the preform was fully finished and that the natural curvature and contours of the shell played a large part in final form.

There seems to be a general consensus on the technique of drilling holes into the sandal-sole shell gorget. A lithic drill was used and the holes were bi-conical (drilled from both sides). There was little mention of any type of template or standard ratio for the holes in previous literature besides what could be seen with casual observation. The hole measurement results and accompanying statistical analysis of various measurement ratios support a consistent pattern of hole manufacture. The low standard deviations of the six calculated ratios indicate that the makers of sandal-sole shell gorgets understood the idea of relative spacing and adjusted their hole spacing to the size of the shell and the resulting gorget. This standardization seems to indicate either sandal-sole shell gorgets were being made in a central location and were distributed to outlying areas or that a mental template was shared among Glacial Kame groups. The idea of a shared template is very interesting given that the overall length and width of sandal-sole shell gorgets are quite variable while the hole measurement ratios are relatively standard, meaning that the idea of relative spacing in relation to the template must have been shared as well. The
hole measurement ratios cannot be used to support Hall’s (1983) hypothesis that the three holes on a sandal-sole shell gorget represent the sword in the constellation Orion (Figure 59) as the three stars are much more evenly spaced than the typical holes on a sandal-sole shell gorget.

![The three stars in the constellation Orion's sword](image)

Figure 59: The three stars in the constellation Orion's sword

In all 11 cases of engraved sandal-sole shell gorgets, the engraving was found on the concave side. In addition, the geometric design on the concave side of the Meredith-Goodall sandal-sole shell gorgets did wrap around to partially cover the convex side of the gorget. The exclusive use of the concave side for engraving seems to clearly indicate that the concave (or inside of the shell) becomes the front of the sandal-sole shell gorget.
that is seen when used. The engraving in the five most elaborately engraved gorgets only covered approximately the top two-thirds to top half of the gorget, as the engraving did not extend below the third hole, or in one case, extended just below the third hole. Engraving technique is not specifically addressed in the literature, although it is assumed to have been achieved through the normal set of lithic tools with points, drills, and abraders used to create the depressions or punctuations, points for the incised lines and the bas-relief engravings.

Both Donaldson and Wortner (1995) and Ritchie (1949) contend that triangular pendants at the Hind Site and Picton Site were reworked broken sandal-sole shell gorgets as evidenced by shape, hole wear, and hole placement. Donaldson and Wortner suggest that Glacial Kame artifacts be re-examined for this “recycling” technique. With this in mind, two artifacts from the Burch Site in Michigan titled “unusual shell gorgets” now appear to be triangular gorgets reworked from broken sandal-sole shell gorgets (Converse 1979:105). They show evidence of repair holes and are the shape of one end of a sandal-sole shell gorget. The number of sandal-sole shell gorgets would undoubtedly rise if collections were re-examined with this reworking process in mind.

The historical literature and ethnographic accounts gave a few clues to the laborious nature of working with shell. It is obvious that large amounts of time were required to create a sandal-sole shell gorget. My research did not uncover any examples of experimental archaeology results from the actual manufacture of sandal-sole shell gorgets, although that would be a useful area for further research and could help to support or refute the proposed manufacturing techniques.
Where these sandal-sole shell gorgets were actually manufactured will be addressed in Research Question 3: Distribution.

**Research Question 2: Use**

Possible uses of sandal-sole shell gorgets can be put forward by analyzing several different sets of results: hole wear, contextual information, engraved sandal-sole shell gorgets, and symbolism and ceremonialism.

Variability was observed in the hole-wear pattern, however the most prevalent pattern was hole-wear pattern 1. This pattern was seen in 73 percent (37 out of 51) of sandal-sole shell gorgets as either a strong (49 percent) or weak (24 percent) pattern. An illustration of hole-wear pattern 1 can be seen in Figure 17. The weak pattern exhibited partial criteria of hole-wear pattern 1 while not conforming to any other pattern. There does not seem to be any wear pattern or wear anomaly specific to a site or within a site as the 73 percent is spread across the majority of the sites represented. Hole-wear pattern 1 is supported by many reports in the literature using smaller samples. The weave cord or thong configuration that is most likely to cause this hole-wear pattern 1 is illustrated on a photograph of a sandal-sole shell gorget in Figure 60. Other hole-wear data supports this weave configuration. With only two exceptions, the first hole always shows wear with the first hole having the highest incidence of heavy wear. This seems to indicate that the pressure on the first hole was the greatest, which would lead to the conclusion that this is almost certainly the top of the gorget.
Hole-wear pattern 2 is present in five (10%) sandal-sole shell gorgets and exhibits wear on the bottom of the first hole and the bottom of the second hole on the concave side. Hole wear on the other two holes are inconsistent. Hole-wear pattern 2 seems to preclude the weave configuration that could lead to hole-wear pattern 1. The cord configuration that could cause hole-wear pattern 2 is somewhat of an enigma as the wear on the first two holes suggests a much different use than with hole-wear pattern 1. The five gorgets with hole-wear pattern 2 and the nine gorgets with no consistent wear pattern
show that there were other uses for sandal-sole shell gorgets that caused hole wear inconsistent with hole-wear pattern 1.

The third hole shows the most sporadic and inconsistent wear. In numerous cases, there is no wear at all on the third hole. In other cases, the wear is skewed toward the right or left and not at the top or the bottom of the hole like it is in the first and second holes. Sometimes the third hole wear is at the top, sometime at the bottom, sometime the wear is slight and sometime it is heavy. Ritchie (1949) suggests that feathers, claws, or fur strips could have been attached to the third hole. The hole wear results on a few gorgets support hanging items (such as claws) from the third hole as that would exhibit hole wear on the bottom of the third hole on both sides of the gorget. If the items hanging from the third hole were loose, this would also support the data showing sporadic hole wear. Attaching feathers to the third hole might have caused wear on the top of the concave side and the bottom of the convex side, which is also present in the data. An ethnographic account (Adair 1775) also talks about using a buckhorn button for attachment, which could translate to using shell beads for attachment-also causing sporadic and non-consistent hole wear. Another possibility is that the string was knotted at the third hole on the concave side either directly on the sandal-sole shell gorget or by using a shell bead as a button. Again sporadic hole wear could be the result of this type of attachment.

A somewhat obvious conclusion of the hole wear data is that sandal-sole shell gorgets were used, and in some cases used enough to create some deep grooves and notches (heavy wear) in the holes. These were not simply ceremonial items worn occasionally. This common use is also evidenced by the high number of broken,
repaired, and reworked sandal-sole shell gorgets. Glacial Kame people weren’t just keeping these for “show” or burial ceremonialism; perhaps they were even using these as every day symbols of an important person or an important group.

The contextual information is not entirely conclusive. Part of this is due to incomplete (or completely missing) records kept at the time of discovery, which has led to a relatively small sample size and questionable accuracy in some of the earlier accounts. Sandal-sole shell gorgets were found in the area of the skull (n = 10), near the shoulders and neck (n = 5), at the chest and torso (n = 19), and at the legs (n = 2). It was sometimes reported that the tightly flexed burials made determining the exact location where the gorget was worn a bit difficult. Only one burial (at the Doetsch Site) was buried with two sandal-sole shell gorgets, where every other burial contained just a single gorget. This data could certainly support use on the chest or the head, assuming the gorgets were placed on the burial as they were actually used.

Equally inconclusive is the age and the sex of the burials. As mentioned in the results, three males of unknown age were identified with sandal-sole shell gorgets and three young adult females. Interestingly, the Doetsch Site burial with two sandal-sole shell gorgets (one at the chest and one between the legs) was of a young adult female. But again, with the tightly flexed burials, the leg location could also be interpreted as the lower abdomen (see Figure 20). Based on this information, the use does not appear to be age or gender related.

Of the 11 known engraved sandal-sole shell gorgets, six were analyzed as part of this thesis. The hole wear on these specimens is very interesting as two of the engraved gorgets do exhibit the most prevalent hole-wear pattern 1, but one engraved gorget
exhibits hole-wear pattern 2, and three engraved gorgets exhibit no hole-wear pattern. This calculates to only 33 percent (2 out of 6) of engraved gorgets showing hole-wear pattern 1 as compared to 78 percent (35 out of 45) of non-engraved analyzed specimens exhibiting hole-wear pattern 1. Other hole wear observations did not yield any notable patterns, and on average, engraved gorgets show less wear than non-engraved sandal-sole shell gorgets. This could mean that engraved sandal-sole shell gorgets were used differently and less often than non-engraved gorgets. Perhaps engraved gorgets were kept for ceremonial occasions and used less often.

As was previously discussed in the analysis of how sandal-sole shell gorgets were made, the engraving always appears on the concave side leading to the conclusion that the concave side is the front or the side facing outward to be viewed. The symbolism inherent in engraved sandal-sole shell gorgets does not really give us any clue regarding use, except to suggest perhaps engraved gorgets were more valuable and special, and thus used less often than those without engraving. The engravings do tell us that Glacial Kame people represented the world around them (possible snakes, birds, vultures, turkeys, bears) with a few standard design elements (three closely spaced incised lines, highly stylistic renditions, and geometric patterns).

The analysis of the engravings on sandal-sole shell gorgets show evidence of artistic elements that can be found in the late prehistoric and protohistoric Southeastern Ceremonial Complex (SECC). Geometric patterns of three incised lines representing birds, animals, and snakes can be found on circular shell gorgets in the Cox Mound and Citico Mound classification with proveniences of Alabama and Tennessee (Brain and Phillips 1996). These Cox Mound and Citico Mound designs tend to be a bit more
complex than the Glacial Kame incised line representations, but the underlying fundamental design elements are eerily similar. In addition to Glacial Kame symbolism and ceremonialism most likely being a foundation for Adena and Hopewell, it appears that there could be a possible link with SECC design.

Of the possible uses of sandal-sole shell gorgets given by past researchers the most credible seem to be those where the shell is suspended from the neck (not a true gorget worn at the neck) or worn attached to or in the hair. This opinion is based on using two main criteria to rule out the other suggested options (ceramic tool, wrist protectors, shuttle, and cord twister). The first criterion is the high occurrence of a hole-wear pattern 1 that does not support any of these alternative uses. The other criterion is the fact that imported shell seems too valuable and too exotic to be used for utilitarian functions such as those listed.

The use of shell gorgets for hair ornaments as suggested by a few researchers (Cunningham 1948; Sciulli and Schuck 2001) piqued my interest as perhaps they were a precursor to historic roach spreaders. However, since the hole-wear pattern and engraving indicates that the concave side was the “front” of the sandal-sole shell gorget, it seems like hair attachment might be difficult. Also, the hole-wear pattern indicates quite a bit of pressure on the holes, and it seems a bit unlikely that the amount of pressure to create deep notching could be due to hair attachment. Sciulli and Shuck reported (2001) that they planned to publish evidence that circular shell gorgets functioned as hair barrettes at the Glacial Kame Duff Site in Ohio, but no such publication seems to have appeared. Those results will be interesting to review and analyze with respect to sandal-sole shell gorgets.
Another idea for use not seen in the literature was as a clasp or ornament worn diagonally across the body. After viewing the hole wear results, this no longer seems reasonable due to the inconsistent wear on the third hole. This sort of attachment would have produced consistent and noticeable wear at the bottom of the third hole on the concave side and also on the bottom edge of the gorget itself on the concave side.

After ruling out various uses based on the data, the most plausible sandal-sole shell gorget function is being hung on the chest (more as a pendant than a gorget) using the standard weave pattern illustrated in Figure 60 and suspended on a another cord that is then hung around the neck or sewn to clothing. In this way, the cord woven through the sandal-sole shell gorget is positioned straight up and down, creating hole-wear pattern 1 observed on most gorgets. To create the pressure needed to create some of the deep notching seen in the first (and sometimes second) hole, I propose that the cord coming out of the third hole was knotted on the concave side but that a length of cord was left. On this length of cord extending beyond the length of the gorget, some material such as shell and copper beads (ubiquitous in Glacial Kame burials) could have been strung thus adding weight and pressure and creating the heavy notching present on the upper holes. The movement of the shell beads on the extended cord covering the bottom half of the gorget and the knotting at the third hole could have caused the sporadic hole wear seen on the third hole. This proposed use is supported by ethnographic accounts and historical pictures of shells and beads on the chest, often attached to each other. The attached beads could also explain why the most elaborately engraved sandal-sole shell gorgets only have the engravings on the upper two-thirds of the gorget (above or just below the third hole) as the hanging beads would obscure engraving on the bottom part of the gorget. At the
bottom of the hanging beads, the cord could have hung free thus causing the non-
consistent and lesser amount of hole wear found on the third hole.

Figure 61 below shows the possible attachment of a cord running through a
sandal-sole shell gorget and attached to a cord or choker around the neck. This would
allow the sandal-sole shell gorget to be suspended from the neck in a way that would
produce the hole-wear pattern 1. Figure 62 shows a mock sandal-sole shell gorget with
the proposed bead attachments extending beyond the third hole. This adds pressure to the
cord weaving through the sandal-sole shell gorget to produce the hole-wear pattern 1 and
heavy wear and notching seen in the hole-wear data.

Figure 61: Little Squint Eye, San Carlos Apache, showing attachment of
circular gorget suspended from the collar (Smithsonian National Museum
of the American Indian 2009: Catalog Number P09902)

Figure 62: Mock sandal-sole shell gorget with bead attachment below
3rd hole
**Research Question 3: Distribution**

It is apparent that the Late Archaic people had vast trade networks to acquire the exotic raw materials or the finished goods made from the exotic raw materials. Specifically, the Glacial Kame people had vast trade networks to acquire the shell from the Gulf Coast used to manufacture sandal-sole shell gorgets. Some researchers conclude that transporting whole shells would be cumbersome and most likely sections of cut shells or the sandal-sole shell gorgets themselves were traded northward. However, the few whole shells in Glacial Kame sites and the one known preform at the Zimmerman site show that at least some shell manufacturing activity was taking place in northern Ohio Glacial Kame sites.

The dominance of hole-wear pattern 1 and its representation across the vast majority of Glacial Kame sites where sandal-sole shell gorgets were found greatly supports the theory of wide-spread trade and shared cultural ideas. Hole measurement data also supports the fact that Glacial Kame sites were trading and sharing with each other or with central trading partners. Twenty out of the 24 ANOVA tests comparing the Zimmerman, Fox-Rammel, and Burch Sites showed that sandal-sole shell gorgets from these sites are not statistically different. This validates the idea that either the sandal-sole shell gorget themselves were made centrally and traded, or a mental template was shared among Glacial Kame groups. However, four out of the 24 ANOVA tests do show significance and statistical differences. All four of these significant ANOVA tests involve the Burch site, and three of the four involve the width of the sandal-sole shell gorget. This could be due to cultural variation as the Burch site is separated by a greater
distance than the other two sites or could possibly be due to a different type of shell being used.

The evidence of “southern-style” sandal-sole shell gorgets in Alabama, Kentucky, Tennessee, Florida, and Texas seems to fit well with Stothers and Abel’s (1993) regional band interaction theory as seen in Figure 56. If the shell and gorgets were travelling through regional trade centers, it makes sense that some goods could be dispersed to what Stothers calls local centers. This also supports Hall’s (1981) theory that the Busycon shell forms found at the Ernest Witte site in Texas, that look very much like Glacial Kame sandal-sole shell gorgets, were not locally sourced but were part of a trade network. It could possibly be the same trade network as the source of Glacial Kame Busycon. Also supporting this exchange network theory with the southern region are the similarities of Glacial Kame sandal-sole shell gorget engravings with temporally later SECC engravings on circular shell gorgets. The location of these similar design elements in Alabama and Kentucky (and nowhere else in the SECC), could indicate continuity in design influenced by Glacial Kame via these Late Archaic trade networks and could give us a clue as to the likely route.

Stothers’ theory of Late Archaic regional trade centers dispersing goods to local trade centers is also intriguing when examining sandal-sole shell gorget distribution in the core Glacial Kame area. A site or area is defined as a regional trade center based on larger population and abundance of exotic grave goods. He has identified the Williams Cemetery and the Hind Site as regional centers in the “Glacial Kame” area. I would also like to propose that the Zimmerman Site in Hardin County, Ohio, and the Fox and Rammel Sites in Mercer County, Ohio, could also be considered as regional trade centers.
Making this case is somewhat difficult as the Williams Cemetery in Wood County was professionally excavated, whereas the Zimmerman Site and the Fox and Rammel Sites were accidental discoveries with little formal documentation. However, based on the notes and artifacts from these two sites, they do certainly seem to match the regional trade center criteria for population and abundance of exotic grave goods. In addition to over 20 sandal-sole shell gorgets found at each site, over 250 skeletons were eventually found at the Zimmerman Site (Converse 1979:85) with a “great many burials” (Converse 1979:108) found at the Fox and Rammel Sites.

These two sites would also seem to fit the regional trade center concept from a geographic standpoint as the Zimmerman Site is approximately 60 miles south of the Williams Cemetery and the Fox and Rammel Sites are then another 60 miles southwest of the Zimmerman Site. Both Zimmerman and Fox/Rammel are surrounded by Glacial Kame sites, with the Fox and Rammel Sites towards the southern boundary of the core, traditionally defined Glacial Kame area. Based on the ANOVA tests summarized in Table 14, the hole measurements and ratios show strong similarities between the sites certainly supporting the idea that these two areas could have dealt closely and traded with each other.

The distribution of the engraved sandal-sole shell gorgets also gives credence to Zimmerman and Fox/Rammel being important or regional trade centers. Of the 11 known engraved sandal-sole shell gorgets, two came from the Rammel or Fox Site with another four engraved sandal-sole shell gorgets found at Glacial Kame sites within 20 miles (Rockford, Mercer County unknown site, and the Mulen Kame). The relationship between the Rammel and Fox Site and the Mulen Kame in Randolph County, Indiana, is
interesting both because of its proximity (20 miles away) and the concentration of engraved sandal-sole shell gorgets. The stylized bird found on the Bravard Gorget from the Rammel Site (Figure 33) is certainly similar in design and representation to the stylized bird found on the gorget from the Mulen Kame (Figure 30). The incised engraving of parallel lines and Xs found on a gorget from the Rammel or Fox Site (Figure 36) is certainly similar to the incised engraving of parallel lines and Xs found on a gorget from the Mulen Kame (Figure 28). It seems possible that there was a special relationship between these two sites with the Fox and Rammel Sites perhaps acting as a regional trade center for the Mulen Kame. The Zimmerman site had one engraved sandal-sole shell gorget with one other engraved gorget in close proximity from Hardin County.

All of this distribution evidence seems to support the opinion of many archaeologists (Donaldson and Wortner 1995; Stothers et al. 2001) that Glacial Kame is not an entity or culture in and of itself but is part of a much wider “core of religiosiy” as suggested by Ritchie (1955:75) as are other regional burial complexes such as Red Ocher, Old Copper, and Meadowood. Trade networks not only facilitated the exchange of material goods but of ideas and biological traits as well. The scattering of sandal-sole shell gorgets and other burial complex “diagnostic” artifacts beyond the core Glacial Kame area in all directions shows that people across the Eastern Woodlands were borrowing ceremonial and symbolic ideas from each other and incorporating them into their own cultures and daily lives.
Research Question 4: Public Exhibition

The 12 sandal-sole shell gorgets in the Fort Recovery State Museum collection are part of a larger Glacial Kame collection which in turn is part of a prehistoric collection numbering over one thousand artifacts covering all prehistoric periods. Several recent upgrades to the prehistoric collection (housed in a single room) include timelines and videos addressing the following questions that visitors to the museum often have:

- How did people use these prehistoric artifacts?
- How old are they?
- How were they made?

These three themes will be continued in creating an exhibit to showcase the local Glacial Kame artifacts, specifically the sandal-sole shell gorgets. In addition, because the artifacts have local provenience, the history of the artifacts and their discovery will be conveyed through the exhibit. The importance of this local collection to regional, state, and national prehistory will be emphasized. The village of Fort Recovery takes great pride in their local museum and in the prominent role the local area has played in both prehistory and history.

The 12 sandal-sole shell gorgets in the Fort Recovery State Museum collection are known to be from either the Alex Fox gravel pit or Leonard Rammel gravel pit, both of which are just a few miles from Fort Recovery. The museum does not have original documentation regarding these gorgets, but it is known that these were originally owned by the Fort Recovery Banking Company (Cunningham 1948:21). A picture owned by the bank documents this and will become part of the exhibit.
The Glacial Kame display will be in the existing upstairs room that holds the prehistoric artifact collection. The majority of artifacts are currently displayed very simply in horizontal, recessed cases (Figure 63) with labels identifying the artifact and time period. The sandal-sole shell gorgets are currently “hidden” amongst the other artifacts with no attention drawn to their significance or local provenience. To be able to tell the story behind these artifacts, it seemed best to have them highlighted in a separate display case. There is currently one vertical display case that will be used for the new Glacial Kame display (Figure 64). The historic rifles currently in this case will be removed and placed elsewhere in the museum as they are the only historic artifacts in this room and are obviously out of place. This vertical display case measures 69 inches wide by 46 inches high and is at least 8 inches deep. There is also an open wall space beside this case that is 44 inches wide by 34 inches high that can be used for a descriptive panel.

Figure 63: Current display case with Glacial Kame artifacts and sandal-sole shell gorgets in Fort Recovery State Museum
As used for the new Glacial Kame exhibit, this display case will house the collection of 12 sandal-sole shell gorgets, selected additional Glacial Kame artifacts from the Fox and Rammel Sites, and descriptive panels. One or more panels will be mounted on the open wall directly to the right of the display case. The specific artifacts and panels include:

- Twelve sandal-sole shell gorgets (see Appendix A photographs FRSM-01 through FRSM-08)
- Selected additional Glacial Kame Artifacts from the Fox and Rammel Sites (see Appendix B for photographs)
- Large Panel # 1 – Glacial Kame and Sandal-Sole Shell Gorgets
- Large Panel # 2 – Local Sandal-Sole Shell Gorgets
- Small Panel # 3 – 1880 Smithsonian Report
- Small Panel # 4 – 1949 Ohio Historical Society Report
- Small Panel # 5 - Bibliography
This exhibit upgrade will be done in conjunction with the Ohio Historical Society and their exhibit design team. The goal for implementation of this exhibit is May 2010, which would coincide with the opening of the museum for 2010 and the grand opening of other exhibit upgrades planned elsewhere in the museum. A mock-up of the proposed Glacial Kame exhibit can be seen in Figure 65. The text of each panel follows in Figure 66 through Figure 70.

Figure 65: Mock-up of the proposed Glacial Kame exhibit at the Fort Recovery State Museum
Glacial Kame and Sandal-Sole Shell Gorgets

The Glacial Kame burial complex was prominent in northwestern Ohio and surrounding areas in the Late Archaic period from 3000 to 1000 B.C. People in this area ceremonially buried their dead in hills of gravels that were left by receding glaciers (glacial kames). Included in Glacial Kame burials were artifacts of slate, shell, and copper. The most unique and rare Glacial Kame artifact is the sandal-sole shell gorget, as only approximately 100 are known to exist. The sandal-sole shell gorget was made from *Busycon perversum* shell from the Gulf Coast. The shell traveled from the Gulf Coast via extensive trade networks. The exact use of sandal-sole shell gorgets is unknown, although analysis of hole wear indicates that it was most likely suspended from the neck (a gorget) and could have been adorned with additional shell beads. This artifact’s name comes from being originally described as shaped like the sole of a sandal.

Figure 66: Large Panel # 1 - Glacial Kame and Sandal-Sole Shell Gorgets
Local Sandal-Sole Shell Gorgets

The 12 sandal-sole shell gorgets and other Glacial Kame artifacts displayed here are from two gravel pits, the Fox Site and the Rammel Site, in nearby Sharpsburg, Ohio. Some of these artifacts were discovered in 1880 with others found in 1935 when gravel was being dug from these glacial kames. This collection was purchased by the Fort Recovery Banking Company for $25 and was displayed in the bank until 1949 (picture at left) when it became part of the museum’s collection. Other sandal-sole shell gorgets from these same sites are now in private collections and museums throughout the country.

Figure 67: Large Panel # 2 - Local Sandal-Sole Shell Gorgets
**1880 Smithsonian Report**

From the Smithsonian Annual Report for the Year 1880.

“J.L. Whitney writing from Rose Hill, Ohio, speaks of copper axes and shell objects from a mound half a mile from Sharpsburg, Mercer County, Ohio. Ten pairs of shell relics were found resembling the bottoms of sandals”

**Figure 68: Small Panel # 3 - 1880 Smithsonian Report**

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**1949 Ohio Historical Society News**

From the Fort Recovery Historical Society, Iris Longley, President

“The Fort Recovery Historical Society museum and relic room of the society was opened Sunday May 1…. Of special value is a collection of sandal-shaped gorgets, said to be the largest in the world”

**Figure 69: Small Panel # 4 - 1949 Ohio Historical Society News**

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**Figure 70: Large Panel # 5 - Bibliography**
Chapter Six

Summary and Recommendations

Summary of Research Contributions

As touched upon in previous chapters, this research has archaeological significance on a local, state, and regional level. From a local perspective, the Fort Recovery State Museum and its visitors will now have a better understanding of the local sandal-sole shell gorget collection, its importance, and its value to further research. This research will allow the museum to tell the story of their collection in a much more meaningful and archaeologically and historically accurate manner. The museum and their visitors will gain an understanding of the background of these gorgets along with their possible use and manufacture. Most importantly, they will understand these sandal-sole gorgets in the larger context of the Glacial Kame burial complex and will recognize how Glacial Kame fits into the chronology of regional prehistory.

Because the Fort Recovery State Museum is an Ohio Historical Society (OHS) member museum, this research will be valuable at a state level. The sandal-sole gorget collection is owned by the Fort Recovery State Museum, but because it is actually displayed in a museum owned by the Ohio Historical Society, OHS takes great interest in this collection. As part of my research agreement, this thesis will be shared with OHS and perhaps can be a source of future collaboration between the Fort Recovery State
Museum and the Ohio Historical Society and their other partner museums, historical societies, and archaeological societies within Ohio.

The regional significance of this research centers on the Glacial Kame burial complex and its relationship within the Late Archaic to other similar burial complexes and to later temporal periods. Sandal-sole shell gorgets are one of the diagnostic artifacts of Glacial Kame, and as such, new research and information on sandal-sole shell gorgets is important to anyone with an interest in Glacial Kame. There have been two seminal works on Glacial Kame, *A Study of the Glacial Kame Culture* (Cunningham 1948) and *The Glacial Kame Indians* (Converse 1979), with very little detailed Glacial Kame specific research published since that time. Re-interpretation of available sandal-sole gorget data and analysis of new data gathered as part of this thesis project should be of great interest to Glacial Kame enthusiasts as a follow-up to Cunningham’s and Converse’s books.

Although these two works certainly highlighted sandal-sole shell gorgets, they were concerned with the entire Glacial Kame complex. There has never has been a detailed volume specifically focused on sandal-sole shell gorgets and interpreting Glacial Kame from the manufacture, use, and distribution of these artifacts. This thesis continues the sandal-sole shell gorget dialogue started by Cunningham (1948) and Converse (1979) and adds some invaluable detailed scientific research to the mix. In addition, this thesis contributed new research results and tools to the Glacial Kame and sandal-sole shell gorget body of knowledge.

The Sandal-Sole Shell Gorget Discovery Inventory listed in Table 1 is a valuable tool for anyone interested in sandal-sole shell gorgets. This information has been
gathered from many different primary and secondary resources and is the most up-to-date and comprehensive listing of Glacial Kame sites with sandal-sole shell gorgets. In addition to using information from Cunningham (1948) and Converse (1979), all primary sources were reviewed where available and all new information since 1979 has been updated. All discrepancies and confusing issues (i.e., site name changes, museum name changes, collections changing hands) have been resolved as much as possible.

Particularly helpful to future researchers is the current location of sandal-sole shell gorgets, if known. The information listed in Table 3: Possible Sandal-Sole Shell Gorget Sites (Unsubstantiated) is also very valuable because this information is often “lost” in the current literature and could prove important to future researchers.

The results of the detailed sandal-sole shell gorget analysis and other research methods are also unique as there has never been such a large and varied sample (covering over a dozen Glacial Kame sites) used for such detailed and controlled analysis. In addition to supporting this thesis’ discussion and analysis, it is hoped that the hole measurement results, hole wear results, digital photographs, and contextual information results can be helpful to future researchers and save them much time by their not having to compile this data from scratch and from personal analysis or primary resources. Although there have been previous reports of the standard “weave” hole-wear pattern reported on limited numbers of sandal-sole shell gorgets (Converse 1979; Donaldson and Wortner 1995; Ritchie 1949), there has never been a study that has analyzed such a large percentage of gorgets substantiating this wear pattern. Hole measurement data has been rarely reported and interpreted (Hall 1983), and the analysis potential of this data is endless. Although context information was collected from the various existing site
reports, articles, and books, it has never been detailed and consolidated in this manner. The presentation of this data should now make future context analysis much easier and more effective.

The information on engraved sandal-sole shell gorgets consolidated data from many different sources to provide a much more comprehensive and effective synopsis of decorated sandal-sole shell gorgets than previously available. A new engraved sandal-sole shell gorget (FRSM-10 from the Rammel Site or Fox Site) was discovered and presented as part of this research. Because of this consolidation, conclusions about the symbolism and ceremonialism inherent in sandal-sole shell gorgets can be more easily reached and supported in future research.

Data concerning shell manufacturing techniques were also pulled from many different sources and consolidated. The Zimmerman preform had never been discussed in previous literature and adds new data to support proposed manufacturing techniques. Also new was the information from Hall (1981) that provided much information on proposed manufacturing on shell ornaments from Texas that look very similar to sandal-sole shell gorgets.

By re-interpreting Glacial Kame distribution using Stothers’ Late Archaic regional trade center theory, the importance of the Zimmerman and Fox/Rammel Sites became apparent. The proposal of those two sites as regional trade centers will allow future researchers to better assess how other Glacial Kame sites fit into this distribution model. It also supports the idea of Glacial Kame being part of a much larger and much more interactive distribution and exchange sphere that allows a continuity of mortuary customs and beliefs with regional variations.
This new research contributed to a proposed use that was a variation on previous researchers’ ideas. The idea of a suspended gorget with beads attached to an extended cord borrowed ideas from past studies while adding a new twist based on the results of this thesis. As with all research, future studies may refute this new proposed sandal-sole shell gorget function based on additional data and new research.

A somewhat unintended but very important contribution of this thesis is the bibliography. Because it had been thirty years since the last major Glacial Kame volume, the exhaustive literature review uncovered many valuable journal articles, book chapters, and site reports that were written after Converse 1979. This thesis’ bibliography will serve as an important resource for those studying and researching Glacial Kame sites and artifacts in the future.

**Recommendations for Future Research**

As with all archaeological research, it seems as if new unanswered questions far outnumber any explanations or resolutions. The results of this thesis support numerous areas for future research.

Due to time and budget constraints, not all publicly available sandal-sole shell gorgets were analyzed as part of this thesis. It is hoped that the remainder of the accessible sandal-sole shell gorgets in museums and private collections can be examined and their statistics added to the existing hole wear and hole measurement data. It is also important for future research to include all newly identified sandal-sole shell gorgets in this data. The comprehensive list of sandal-sole shell gorgets in Table 1 should facilitate this task.
Sandal-sole shell gorgets are not the only Glacial Kame artifacts with a similar shape, three perforations and a distinct wear pattern. Three-holed cannel coal gorgets (Galitza 1958b) and slate sandal-sole gorgets (Converse 1979:69) often exhibit obvious wear patterns that could also be caused by the weaving of a cord through the holes (see Figure 72 and Figure 71). The concavo-convex design of the stone sandal-sole gorget emulates the contours of the sandal-sole shell gorget. Future studies of these artifacts’ hole measurements, wear patterns, context information, and engravings could provide clues to the purpose of sandal-sole shell gorgets, as perhaps the functionality was the same amongst these three types of artifacts with only the raw material being dissimilar.

Figure 71: Slate sandal-sole gorget (Converse 1979:69)  
Figure 72: Cannel coal gorget (Galitza 1958b:27)
As mentioned previously, there are shell artifacts found in Kentucky, Alabama, Florida, Tennessee, and Texas that are very similar to Glacial Kame sandal-sole shell gorgets (Cunningham 1948:37; Hall 1981; Hoff and Hoff 2007; Vastano 2008). This thesis concentrated on Glacial Kame sandal-sole shell gorgets in the Midwest, but certainly the similarities between the “southern” versions of these shell artifacts should be examined in the future and considered when discussing manufacture, use, and distribution.

There have been interesting studies done on the sourcing of *Busycon* shell artifacts (Claassen and Sigmann 1993) using atomic-absorption spectroscopy (AAS). These studies can help determine the original marine source of shell artifacts found inland. This particular set of studies did not involve any Glacial Kame shell artifacts but this could be an area for future exploration. Although the authors point out that determining the sourcing of shell does not necessarily equate to a study of trade as a cultural event, it would at least determine which sites are receiving shell from the same or nearby sources. This could in turn help determine points of down-the-line trade or direct procurement. This type of shell sourcing research could be coupled with detailed analysis of the “southern” version of the sandal-sole shell gorgets mentioned previously.

Various biological, osteological, and mitochondrial DNA studies were mentioned and provided very important information on the Glacial Kame people, their way of life, interactions between various Glacial Kame and non-Glacial Kame sites, and influence of Glacial Kame on descendants (i.e., Adena and Hopewell). However, not all available Glacial Kame Skeletal remains have been analyzed. It is hoped that this work continues to provide new results and findings to help us better understand Glacial Kame and its role
in prehistory. Continued biological studies of Glacial Kame remains can also help determine if sandal-sole shell gorgets truly are found more often in young adult female burials as preliminary findings might suggest.

This thesis has shown that a prevalent hole-wear pattern does exist among sandal-sole shell gorgets, however it is not known how much wear or use is needed to create such wear patterns in *Busycon perversum* shell. How much burden on the shell is needed and for how long to create notching that is evident in many sandal-sole shell gorgets? Is weight and stress on the shell or the amount of time exposed to this stress a bigger factor in notch creation? Shell wear metrics could help determine possible use by ruling out implausible causes of the typical sandal-sole shell gorget hole-wear patterns. Further research could also investigate the possible causes of hole-wear pattern 2, which shows bottom wear on the first hole and second hole on the concave sides. The categories of hole wear used in this thesis (slight, normal, and heavy) were fairly subjective and relative, and could be metrically defined in future research for greater precision in analysis.

As part of the hole measurement analysis, the ANOVA tests showed that the Burch Site examples showed differences in sandal-sole shell gorget width compared to those from the Fox-Rammel and Zimmerman Sites. Further research of the Burch Site, affiliated sandal-sole shell gorgets, and other artifacts could provide clues to the reason for this width uniqueness.

It has also been shown that there is evidence to support possible use of sandal-sole shell gorgets as hair ornaments. Chemically, the main component of marine shell is calcium carbonate. Future research could investigate the effect of shell and calcium
carbonate on the hair or bare skin. Adverse reactions and the time needed to cause these reactions could effectively rule out some possible uses of sandal-sole shell gorgets as hair ornamentation. Additional examination of hole-wear pattern 2 and inconsistent hole-wear patterns could also support or refute this use.

There are very few radiocarbon dates for Glacial Kame sites. The compilation of these dates and correlation with sandal-sole shell gorgets could possibly reveal new clues about the use, manufacture, and distribution of sandal-sole shell gorgets. Continuation of the recent Glacial Kame osteological studies should help in this area.

It was beyond the scope of this thesis to fully investigate the relationship between engravings on sandal-sole shell gorgets and shell engravings from later prehistoric periods and cultures (Adena, Hopewell, Southeastern Ceremonial Complex, etc.). There is certainly preliminary evidence that supports Glacial Kame art forms laying a foundation for future symbolism. This could be investigated in much more detail. Engraved Glacial Kame circular shell gorgets and slate gorgets and symbolism inherent in Glacial Kame birdstones should be included along with engraved sandal-sole shell gorgets as part of this future research.

It is hoped that the references and preliminary work of this thesis will be a foundation for the future work listed above.
ILLUSTRATION ACKNOWLEDGEMENTS

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