

**A BIOARCHAEOLOGICAL APPROACH TO LOOTING**  
Differential Fragmentation and Social Implications at the Periphery of Kerma

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## ABSTRACT

Criminalized burial disturbance, looting, is ubiquitous in mortuary spaces and in the archaeological record, however the heavy moral and ethical ideologies surrounding looting in the modern world encourage archaeologists to reject sites that are heavily looted. Using contemporary research on looting and grave robbing in conjunction with textual evidence from the Egyptian New Kingdom, I propose a theoretical framework for understanding ancient grave disturbance activity in the context of dynamic social, religious, and political landscapes. Similar to studies of modern looting, ancient looting yields much information about the social and political context in which it occurs. Unlike modern looting, ancient looting was a crime against the individual and the state--warranting capital punishment, and disturbing a grave was destructive to the deceased person's afterlife. Through bioarchaeological analysis of the fragmented human remains from Al-Widay, an archaeological site from the periphery of the Kerma Empire, and spatial analysis of disturbance patterns, I demonstrate the effects of ancient looting during a dynamic and shifting political period. The removal of bodily adornment from the post-mortem body creates distinctive patterns on the skeletal remains of individuals at Al-Widay, which can be used to predict grave condition and the cultural knowledge base of the disturbers. The presence or absence of the skull, mandible, and neck are especially robust for predicting whether or not a grave is disturbed or undisturbed. The material from Al-Widay supports these conclusions and provides an interesting case study for examining the post-mortem condition of human remains and how this condition changes through time.

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## INTRODUCTION

New Kingdom Egyptian texts from over 3,000 years ago describe some of the first recorded instances of grave robbing in the world, including the names of tomb robbers, the materials and objects they retrieved, and the punishments meted out by the Egyptian courts. The emphasis on the criminalization of disturbing burials, a word translated by scholars as “looting,” has led some scholars to argue that looting was among the first social crimes to warrant capital punishment (Muhlestein 2008).

The concept of looting has strong political and social associations, which ultimately provide archaeologists and social theorists with a morally charged understanding of how cultural heritage has been managed throughout history. The negative attitudes towards looting limit how material and visual culture are conceptualized in terms of cultural and social value. Even less charged terminology that appears in the rhetoric around disturbance at cemeteries such as “revisit,” and especially language like “vandalize, plunder, and rob” has heavy moral and ethical connotations that inherently bias how disturbance behavior is interpreted. The aim of this analysis is not to minimize the underlying social and ethical issues that accompany looting in contemporary ethics, but rather to examine the information about cultural values and social life that is revealed through patterns in disturbance activity in the ancient world. Here, I use the word loot(ing) loosely to indicate disturbance activity motivated by socio-political ideology and economic situations.

Modern scholarly work on looting and its prevalence in contemporary socio-political landscapes often cites the breakdown of law enforcement, increases in systematic poverty, and regional political crises as factors that promote and produce looting behavior (Azam 2002; Al-Houdalieh 2012). Although the plundering of archaeological sites is of key interest to the

archaeological community, in many ways this ethical concern is rooted in contemporary understandings of science, education, and cultural heritage. Commercial looting and the theft of art works are important aspects of looting because they provide important insight into the practices and motivations of looting behavior and are therefore appropriate sources of information for constructing a theoretical framework for thinking about looting.

There are two motivations for disturbing graves (excluding archaeological endeavors): to obtain grave goods or to remove human remains. The ideological reasons for criminalizing grave robbing and the movement of the materials after their removal from the grave are dependent on cultural values, economic conditions, and political landscapes.

In archaeological research, a looted cemetery is considered useless for understanding the people who used the cemetery and the people who visited it later. This pervasive idea has led to numerous excavations that have gone unpublished or have been considered to be limited in the scope of their research capabilities. Although there are limitations to working with a “looted dataset” the possibilities for research into looting chronologies, religious and cultural ideology, and political and economic landscapes. I examine the behavioral remnants and social context of grave robbing in Ancient Nubia, modern day Sudan in order to begin the scholarly conversation on what the practice of looting in the Ancient World can contribute to archaeological (re)constructions of past cultures. Historically Kush is understood in relation to Egypt and is conceptualized of as a cultural by-product of the Egyptian kingdom. In my research I use textual information available from Egypt and what is known of the *Kerma Moyen* (Middle Kerma) and *Kerma Classique* (Classic Kerma) periods to examine the political landscape at the periphery of the Kingdom of Kush. Through my analysis of human remains and spatial patterning at Al-Widay, a site in Northern Sudan, I provide a methodology for inspecting the complex



relationship between the mortuary landscape's inhabitants and how their activity affects the condition of some anatomical regions of the human remains present at the site during excavation.

## **PREVIOUS RESEARCH**

Cultural heritage takes many forms: tangible, intangible, and natural (UNESCO 2014). Tangible heritage includes architecture, literature, fine arts, and artifacts; intangible heritage includes folklore, language, and knowledge; and natural heritage includes culturally significant landscapes and biodiversity (UNESCO 2014). Cultural heritage management privileges the preservation of heritage in order to pass it on to future generations, and the rhetoric that accompanies these values describes heritage as irreplaceable, unique, important, and singular (Meskell 2012; Meskell 2013; Brodie and Renfrew 2005). This discourse situates cultural heritage within a heavily constructed ethical framework, which inherently places the standard for heritage management in preservation. The international legal establishment of the importance of maintaining cultural heritage for future generations coincides with movements in the global academic community to salvage cultural heritage that is in danger of being destroyed or disappearing, especially in the cases of Sudan and Egypt where salvage archaeology projects dominate fieldwork. The attention cultural heritage management receives in political and social spheres ensures that scholars view looting and post-depositional disturbance as inherently and ethically wrong and in opposition to archaeological research; a perspective that is often erroneously applied to ancient people's value systems as well.

In the case of Ancient Nubia, looting, grave robbing, and re-use of materials from historic and archaeological sites are greatly affected by the religious ideologies of the area. These ideologies changed through time, especially with the introduction of Christianity and much later,

Islam (Bianchi 2004); these shifts in religious ideology mark significant changes in local beliefs about the proprietorship of other people's graves and remains. Modern ethnographic data shows that Christians and Muslims have fewer ideological barriers to re-visiting pre-Christian (ancient) graves that remain part of the landscape (Kennedy 1978; Al-Houdalieh 2012).

The word "loot" as it is used in contemporary English found its way into the language during the early 1800s in order to describe the activities taking place in the British colonies in India. The word has Hindi and Sanskrit origins and was used specifically to refer to the forcible removal of goods of considerable value from the enemy in the context of violent colonization (Oxford English Dictionary 1903). It is important to note that in its original sense, looting designated an "enemy," which is still preserved in its modern usage—an aspect of "looting" that emphasizes its political and social nature. Looting has taken place for millennia for a variety of reasons; "looting" at archaeological sites and in conflict zones is ubiquitous, with most academic research focusing on the political economy of it. As a socio-cultural phenomenon looting incorporates cultural values and political ideologies into its practice and application. Although I will often use the term "looting" in its contemporary sense during my discussion of current scholarship, for the purposes of continuity and comparability, it is important to acknowledge the ethical complications associated with the rhetoric of cultural heritage and so-called looting. In non-modern and theoretical discussions I critique the relevance of the term "looting" and investigate the applicability of a less charged terminology that is more nuanced by the practice itself (eg., disturbance, re-visitation, re-purposement), rather than aligning it with modern practice and intent.

Looting as a cultural phenomenon is situated within an economic and political landscape; my analysis of patterns in grave disturbance and the specific practice at the periphery of Ancient

Kush will help reveal the economic and political atmosphere of Ancient Kush during the transition period between the *Kerma Moyen* (2050-1750 BCE) and *Kerma Classique* (1750-1480 BCE) periods (Emberling and Williams 2008; Emberling and Williams 2010; Emberling 2011). Understanding the dynamic relationship between social actors and material cultural heritage is relevant to understanding the ways in which these actors engage with political structures, economic systems, and religious ideology about death. By applying an anthropological lens to the information available on looting, and by using bioarchaeological methods to analyze fragmentary human remains, it is possible to systematically evaluate the processes and patterns operating behind grave disturbance activities. By constructing looting as a social phenomenon, traditional anthropological and sociological frameworks help access the minute tendencies and interconnectedness of the various aspects of looting at different societal and cultural levels.

When considering the history of looting, scholarship generally considers ancient “looting” to primarily consist of grave robbing and raiding as evidenced by the Hammurabi Code, Law 25, from circa 1750 BCE (Harper 1904; Laessøe 1950) and a collection of papyri from New Kingdom Egypt circa 1100 BCE, known as “The Great Tomb-Robberies of the Twentieth Egyptian Dynasty” (Botti and Peet 1928; Peet 1930). Based on these sources, scholars understand that grave robbing and looting were prominent crimes and social problems for the Babylonian kings as well as the Ramesside pharaohs. The Hammurabi code is one of the earliest dockets to outline what looting is and how it should be punished; looting is conceptualized of as an important social crime worthy of severe punishment during the earliest stages of legal development in history.

The Abbott papyrus<sup>1</sup> deals with an inspection of the robbed royal and elite tombs and the

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<sup>1</sup> BM 10221, which dates to the 16<sup>th</sup> Year of Neferkere

event thereafter; another papyrus<sup>2</sup> refers to the Neferkere era tomb robberies (Peet 1930). Yet another papyrus<sup>3</sup> deals with the quantities of gold, silver, copper, and other materials recovered from the tomb robbers (Botti and Peet 1928; Peet 1930). Two additional papyri<sup>4</sup> refer to robberies associated with temples in Thebes and Medinat Habu (Peet 1930). Peet (1930) addresses a fifth group of papyri, which focus i) on the thefts from the Necropolis, ii) on the trial of these thieves, iii) additional information on the trials of the thieves, iv) the proceedings of the trials. Finally, the Mayer B Papyrus contains fragments of confessions from thieves, although the date on this papyrus is lost and the names of the people involved are indiscernible.

The contents of these papyri are useful for cross-cultural examination of the objects that are robbed from tombs; provide insight into the thieves' motivations for robbing the tombs, and supply concrete evidence for the legal system's social infrastructure in Ancient Ramesside Egypt. The context within which these robberies and trials occurred is equally as important as the information conveyed in the papyri; the Ramesside period in Egypt is characterized by continual resistance to the growing power of the Hittite Empire, the so-called "Sea Peoples," and the Libyans (Bianchi 2004). Less than a hundred years before these trials took place Ramesses II<sup>5</sup> was successful against the Hittites at the Battle of Qadeš; later, Ramesses III<sup>6</sup> was assassinated. The internal economy failed shortly after the assassination of Ramesses III; administrative corruption and political strife followed the collapse of the economy (Bianchi 2004; Muhlestein 2008). It is at this time the tomb robberies were recorded and seem to have been a pervasive force against political stabilization. This intensification of criminalized grave disturbance

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<sup>2</sup> BM 10054, Verso 5-6 lists the thieves involved, Recto p. 3 deals directly with thefts by priests from temple buildings

<sup>3</sup> BM 10068, which dates to Year 17 of Neferkere

<sup>4</sup> BM 10053 and BM 10383

<sup>5</sup> Ramesses II reigned from 1279-1213 BCE

<sup>6</sup> Ramesses III reigned from 1184-1153 BCE

indicates an increase in the institutionalization of the afterlife and funerary rituals.

In recent history, human remains and mummies are used in Egypt to make the medicinal product: *mummia/mumia*. This involves grinding the mummy into a powder, which can be consumed to improve general health, as a cure for some diseases, and as an aphrodisiac (Dannenfeldt 1985). The difference between grave robbing and body snatching is minute but significant: grave robbing is focused on the grave as a conglomerate of materials and often the removal of these materials is more focused on the non-skeletal remains, although in some cases the removal of skeletal remains for ritual or medicinal purposes accompanies grave robbing. By contrast, body snatching occasionally involves the removal of objects buried with an individual, but is primarily focused on the removal of the body—usually in order to re-purpose the body for medical or educational purposes (Shultz 2005). Based on the literature available on grave robbing and body snatching (Frank 1976; Shultz 2005; Highet 2005), grave robbing has an extended legacy—stretching thousands of years, while body snatching seems to be isolated to specific cultural trends that require dead bodies for educational, ritual, or political use (Shultz 2005).

In the contemporary global context, looting affects a variety of public and private institutions. During the past hundred years looting has primarily taken place in the aftermath of conflicts and natural disasters, in colonial situations, times of economic crisis, and through artifact/object collecting in archaeological contexts. The type of material looted seems to be dependent on the context of the activity, however there are limitations to what can be looted, usually these are: works of art, commercial items (non-ritualized consumables, such as food or technological devices), archaeological antiquities (including jewelry), and/or human remains (mummified, skeletonized, or fleshed). Each of these types of looting (commercial, art,

archaeological, and human remains-oriented) reveals commonalities in their cause, practice, and punishment; a dynamic system dictates that looting occurs where there is political, social, and economic unrest; what materials are looted; and what social systems relegate as appropriate punishment, if any. With regards to punishment for looting, a comparative approach across many crimes and their punishments is useful for understanding how crimes are conceptualized relative to each other; for example when looting punishments mirror the punishments for homicide, I conjecture looting is considered an equally grave crime.

Looting in the context of conflict zones, civil wars, multi-nation wars, and genocides is ubiquitous; many of the documented cases of commercial looting, art looting, and even archaeological antiquities looting come from this context. Generally, it is accepted that looting involves the appropriation of property (Mac Ginty 2004); characterizing this appropriation further requires knowledge about the degree of organization with which the action is executed, the societal level of operation, the scale of the activity, and the economic and cultural value of materials or objects looted (Mac Ginty 2004). These specific questions are mostly inaccessible archaeologically—although these criteria help situate the kinds of research questions that are relevant with regards to looting. In the past century, the most infamous cases of material culture appropriation are Nazi art looting in Europe during the 1930s and 40s, the raiding of the Iraqi National Museum in Baghdad at the start of the Iraq war in 2003, and commercial looting that took place in New Orleans, Louisiana, after Hurricane Katrina in 2005 (Berge et al. 2006; Rothfield 2009; Bengner 2003; Waxman 2009; Polk and Schuster 2005; Dawdy 2006). These major world events are just a few well-known examples of looting that is associated with the violence of political conflict and the chaos that ensues after natural disasters.

During the Colonial era of European and American history, the display of “exotic” people

alongside materials associated with their culture was a popular academic and business venture (Fuentes 1997). Africa, especially North Africa, was not free of this collecting: antiquities removal became increasingly prevalent during the same time. Palestinian cultural heritage-focused Al-Houdalieh (2012) defines three situations that cultivate antiquities looting: conflict or war zones, economic failure or extreme recession, and/or poor law enforcement or weak government infrastructure for enforcing rules and/or ethics. In the case of the Colonial Era in North Africa and the Mediterranean, antiquities removal was encouraged by the lack of infrastructure in place to prevent it and the economic value for locals from tourist collecting—a situation that is familiar in many regions of the world (Sneddon 2002; Webb and Frankel 2009).

Immediately, comparisons between modern looting and ancient grave robbing reveal comparable circumstances and frameworks. The patterns evident in modern looting are applicable to the archaeological data available on ancient grave robbing; anecdotal support from New Kingdom papyri and Mesopotamian dockets further reinforces the parallels between the ancient and modern activity. Often modern looting is merely thought of in relation to the disturbance of archaeological material and as detrimental to the archaeological record, rather than as a model for ancient grave robbing and looting practices. Archaeological interpretation often necessitates the use of anthropological models for interpreting the material past, and modern looting provides a relevant and comprehensive framework for interpreting and predicting past behaviors. In the context of ancient grave robbing some of the time depth is lost or compressed into what appears to be singular instances; it is impossible to develop a chronology for disturbance behavior on the scale possible for modern activity. In the interest of robust conclusions and analysis, larger scale patterns and events will be focused on in my interpretations and analysis.

The practice of revisiting graves in the past is well documented (Kuijt et al. 2009; McAnany 2010; Millaire 2004), however, there has been considerably less research on criminalized disturbance activity, grave desecration, and grave robbery (Webb and Frankel 2009; van Velzen 2010; Sneddon 2002; Peet 1930; Muhlestein 2008). The degree and nature of the disturbance activity at graves demonstrate the poverty and violence resultant from the tenuous political, economic, and religious landscapes of the time period. It is evident from the importance given to grave and tomb robbing in the Hammurabi Code and during the New Kingdom legal system that looting is both a social and spiritual crime; the language used to describe disturbance activity indicates that it was an offence against the deceased persons memory (in the world of the living) as well as their after life (Harper 1904; Laessøe 1950; Peet 1930; Winlock 1924). The (re)construction of mortuary materials and practices at a given mortuary site, based on disturbance activity alone, is unlikely as conclusions about the presence or absence of grave goods are impossible to make without substantial evidence of the exact nature and frequency of artifacts removed from the grave. Bioarchaeological analyses of skeletal fragmentation, as well as thorough skeletal inventories provide useful strategies for evaluating how human activity at graves effects the post-mortem human skeleton, and how these effects can be measured and quantified.

Using quantitative analyses I aim to i) define quantitative counterparts to the current qualitative designations used to measure the effects of looting on human remains; ii) identify regions of the body that provide the most relevant data for understanding looting and taphonomy and define the method for evaluating these regions; iii) evaluate the results of these analyses to gain insights into the conditions under which looting occurred.



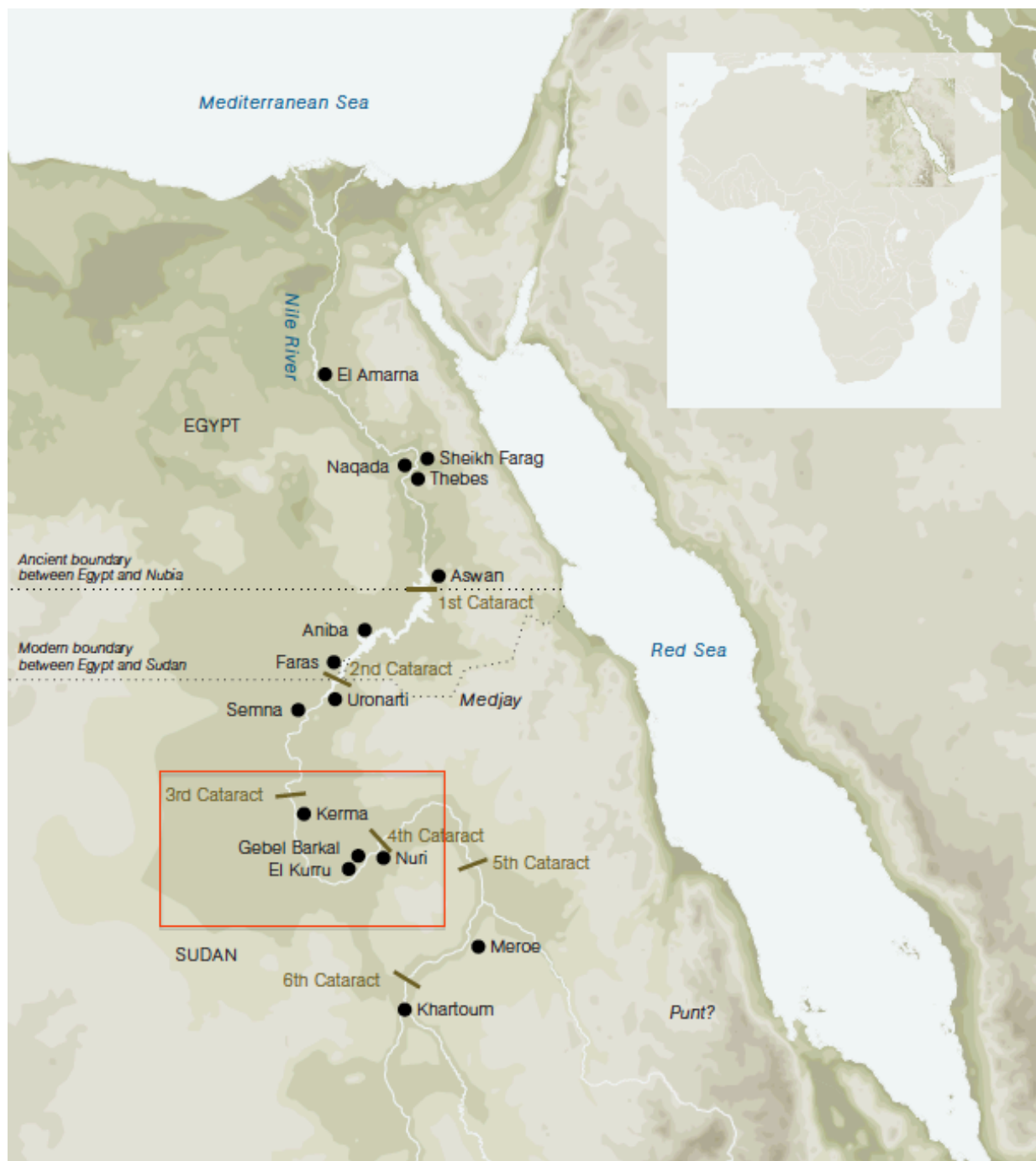
## RESEARCH

### *OINE Salvage Project 2007-2008*

To examine questions about ancient looting, I utilize data from the Ancient Nubian cemetery, Al-Widay, which was excavated as part the Merowe Dam Salvage Project. Salvage projects in Egypt and Sudan consist of previously identified target sites or regions, which are assigned to an archaeological team. These teams are created as a result of offers or calls for archaeological teams in response to the salvage project, which historically have resulted from dam constructions along the Nile River both in Sudan and Egypt. The impending destruction of the site and general time constraints for the project frame the research and archaeological work completed at the site in a manner akin to that of Cultural Resource Management (CRM) in the United States. CRM and salvage projects face many similar challenges and obstacles that form from excavation intention; research, corporate, institution and government agendas; and financial limitations (Emberling and Williams 2010).

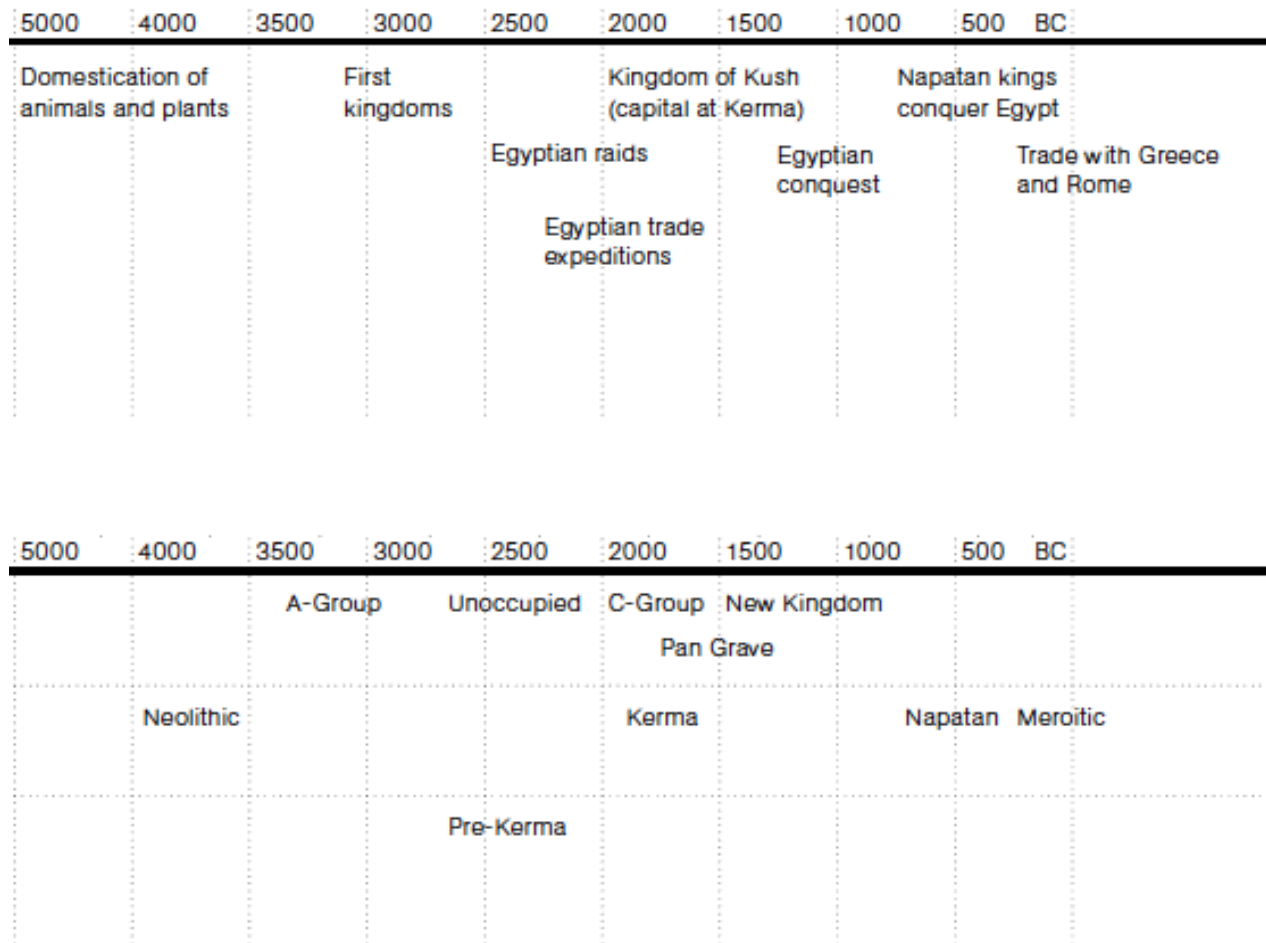
The Oriental Institute's Nubian Expedition (2007 – 2008) began as part of an international effort to salvage the archaeological remains in the Fourth Cataract region of the Nile River in modern-day Sudan. This project was funded in part by the Packard Humanities Institute. In 2007, thirty-two graves were excavated from the *Kerma Moyen* and *Kerma Classique* periods; the aim of the 2007 season was to excavate both the tombs and the area around the tombs in order to identify mortuary deposits outside the tombs (Emberling and Williams). During the 2008 season seventy-six burials were excavated, most of them from the *Kerma Moyen* period (2050-1750 BCE). Additionally, smaller scale excavations took place at sites from the Neolithic, Kerma, Napatan, and Christian Periods. Currently these sites are submerged under the Nile River as a result of the Merowe Dam Project.

Figure 1.1 Map of Egypt and Sudan, Major Sites and Landmarks



*Map adapted from Emberling 2011, Nubia: Ancient Kingdoms of Africa*

Figure 1.2 Timeline of Egypt, Upper Nubia, and Lower Nubia (from top to bottom)



Map adapted from Emberling 2011, *Nubia: Ancient Kingdoms of Africa*

*Al-Widay: Case Study*

The site contained 114 individuals in 105 graves; burials containing multiple individuals were either composed of two adults or an adult and juvenile/fetus (Emberling and Williams 2010; Ingvoldstad 2009). The age distribution of individuals represented at the site follows the expected distribution of ages for an archaeological cemetery: high proportions of juveniles, lower proportions of young adults, and increasing proportions in older age stages (Ingvoldstad 2009). This mortality curve suggests a growing population with high fertility, which is reflected in the mortuary population as high juvenile mortality (Bocquet-Appel et al. 2006). Nearly 40% of the individuals from Al-Widay I are juveniles; the proportion of male to female individuals is approximately 1:1, which is expected in a normal population (Ingvoldstad 2009).

The majority of burials excavated during the 2008 field season appear to be from the *Kerma Moyen* period, while four graves are clearly identified as *Kerma Classique* (Emberling and Williams 2010). These period classifications are based on burial and ceramic typologies; local contemporary sites have corroborating radiocarbon dates (Emberling and Williams 2010). *Kerma Moyen* burials typically have a round burial shaft lined with stone and have a “cushion-shape” superstructure outlined by small boulders (Emberling and Williams 2010). A typical mortuary ceramic assemblage includes a cup, a bowl or jar, and a small pot that most likely contained incense (Emberling and Williams 2010). Some *Kerma Moyen* graves also contained the remains of a goat or the horns of a goat (Emberling and Williams 2010). A notable difference in the *Kerma Classique* graves is the shift in the form of the burial shaft, from round in the *Kerma Moyen* period, to rectangular during the *Kerma Classique* period. The *Kerma Moyen* burials dominate the northern part of the cemetery; Emberling and Williams 2010 note that as time passes new burials are added to the southern side of the cemetery (see Appendix A). Al-

Widay I also contains a large mortuary structure that dates to the Napatan Period (950-270 BCE), which was determined by the presence of distinctive Napatan-style burials, beads, and amulets (Emberling and Williams 2010). This grave is located in the northern most section of the cemetery (see Burial A [1] in Appendix A).

The field osteologist for the Oriental Institute's Nubian Expedition noted that the skeletal material from the sites excavated was extremely friable (Ingvaldstad 2009). While the bones remained in situ, many were considerably more intact than they were when processed in the laboratory. The result of these destructive taphonomic processes is confounding fragmentation of many long bones and ribs that were difficult to remove from the matrix. Aside from taphonomic processes that affect the remains, some were also noted as "looted in antiquity" by the excavators, and some of the remains were transformed by the weight of the stones placed on top of the burials. This placement has a compression effect on the bones that caused deformation, crushing, and breakage in many of the bones (Ingvaldstad 2009). This breakage resulted in some remains being too fragmentary for age or sex estimation. Because of such taphonomic factors, in some analyses the age category is merely "adult". In order to access the socio-cultural context of the disturbed and undisturbed areas of the Al-Widay cemetery, I applied a combination of various bioarchaeological methods to the remains in order to evaluate fragmentation and taphonomy, as well as the relationship between these two factors.

The presence of the Egyptian military and Egyptian cultural practices is contested and not well understood. The archaeological remains at Al-Widay I provide some evidence for an Egyptian cultural and/or military presence in the Fourth Cataract region. Egyptian scarabs, wedjat amulets, and Egyptian ceramic vessels are found at Al-Widay I; Emberling and Williams (2010) note an Egyptian scarab inscribed with the rank of an Egyptian military officer is

particularly important for understanding the Egyptian presence in Nubia during this time period, indicating the exchange or presence of Egyptian military members. The Egyptian vessels recovered from Al-Widay suggest that commercial or cultural exchange took place between the Egyptians and Nubians during the living social memory of the people buried with the vessels.

#### *Disturbance Patterns, and “Looter’s Material”*

Using ArcGIS and base layers created by the spatial specialist for the OINE team, the distribution of disturbed and undisturbed tombs at Al-Widay was analyzed in order to better understand how potential looting affected different areas of the cemetery (see Appendix B). Field recorded data points were coded as “Disturbed,” “Undisturbed,” or “Unknown,” where no data was available; these designations were based on the grave condition noted by the excavators during the field season. Some graves are marked as unknown where their condition was not noted in the field or the field notes were unable to be recovered. It is evident from the visual representation of grave condition that although looting is ubiquitous across all regions of the cemetery, the undisturbed graves are concentrated in the southern-most part of the cemetery (see Appendix B). Based on burial typologies, the southern area of the cemetery was used primarily during the (later) *Kerma Classique* period.

During excavation, “digging sherds” were recovered in some of the looter’s cuts and shafts that perforate the cemetery. The excavators present these re-worked sherds as the looter’s tools, which were presumably left behind during the disturbance activity. The function of the looter’s sherds makes it difficult to evaluate the significance of their location and presence: the deposition of these sherds might be indicative of accidental loss, purposeful disposal, or incidental deposition while the looters were leaving the cemetery. Out of the 11 instances where

looting paraphernalia was recovered, eight (~70%) locations co-occurred with disturbed burial contexts (see Appendix C). Additionally, out of these 11 instances, seven are clustered in the southeast corner of the cemetery (located closest to the Nile), and three are located in the northern section of the cemetery (see Appendix C). Predictably the digging sherds are associated with contexts that were disturbed; in the case of the undisturbed context finds, the sherds were associated with the surface level or were found in close proximity to the grave, but not in the grave or in its fill. One of the recovered sherds was a type of distinctive Egyptian pottery made from marl clay, which was typically used in Upper Egypt to make decorative wares; the combination of clay and lime creates a prized light cream color.

#### *Ancient Egypt's Material Culture and Political Presence at the Periphery*

The presence of Egyptian culture infiltrates many aspects of Kushite/Nubian mortuary behavior, material culture, art, and religion. During the time leading up to the collapse of the Egyptian Middle Kingdom, which corresponds with centralizing power in Nubia, Egyptian military officers and their civilian families were transplanted to fortresses along the Nile. The fortresses were constructed during the 12th Dynasty; Adams (1977) equates the fortresses with the pyramids of the Old Kingdom and Karnak Temple during the New Kingdom. The fortresses are iconic in contemporary Egyptological/Nubian Studies scholarship, and although they might not have been as significant for the Egyptians or Nubians, they were undoubtedly a part of the political and environmental landscape. These forts were built in an architectural form as monumental and symbolic as many other iconic Egyptian temples and palaces; it is accepted among scholars that these structures were intentionally inserted into the Nubian territory as a symbol of Egyptian power and control. It is likely that any direct contact the people at the

periphery of Kerma had with Egypt or the Levant was mediated by the capital itself (Bianchi 2004).

Mortuary analysis based approaches to evaluating status and funerary behaviors at archaeological sites have proven successful for many research projects, however in my analysis of looting at Al-Widay this type of methodology is not useful for understanding or predicting where looting occurred at the site. Utilizing bioarchaeological methods for analyzing fragmented human remains and their disturbance provide an avenue for examining disturbance activity in ancient and historical contexts. As a peripheral site, I am interested in how the presence of the Egyptian Empire and the Kingdom of Kush extends (or does not) to the peripheries of the region especially during periods of political instability. During the Second Intermediate Period, Upper Egypt was taken over by the Hyksos and the Kingdom of Kush gained power and autonomy, perhaps creating the instable political environment necessary for large-scale looting.

Although Al-Widay is a mortuary site that is located near a gold production settlement, there are only two instances where gold beads were recovered from the cemetery, which implies that gold is being exported—most likely to the center of the empire. It is possible that more gold was present at the site before it was looted. However, the paucity of disarticulated gold beads and jewelry does not support this idea. Most of the Egyptian material is centralized in the lower portion of the cemetery; although data is not yet available for many of the *Kerma Classique* (rectangular) burials in the most southern part of the cemetery, it appears that the distribution of Egyptian materials is relatively localized (see Appendix C).



### *Identifying Culturally Significant Anatomical Regions*

One of the most important tasks in establishing a criterion for analyzing the skeletal material from Al-Widay involved developing a methodological strategy that allowed for a culturally relevant analysis of the remains. Due to limited time for analysis it was especially important to establish specific parameters for informative fragmentation analysis and inventory. To maintain lexical continuity and to provide accurate descriptions of remains I used the language outlined for recording taphonomy in Standards (Buikstra and Ubelaker 1994).

Before recording information on the bone fragments, I needed to identify regions of the body that would yield the most information relevant to disturbance based on looting. I used ethnographic and archaeological information to predict regions likely to be looted in antiquity, ie. regions of the body where valuable (looting-worthy) adornments may have been placed or worn in death. I have constructed a profile of Culturally Significant Anatomical Regions (CSARs) relevant to pre-Islamic Nubian burials based on the ethnographic data available from the Old Nubians (Kennedy 1978) and archaeological data from Kerma and Al-Widay I (Reisner 1923; D'Auria 1982; Emberling and Williams 2010). I combined the results of the ethnographic data with known archaeological components in order to be as comprehensive as possible with my analysis and interpretation (see Figure 2.1). The regions identified by this research are: cranium, neck, hands, and feet, which directly correspond with areas of the body that are typically adorned when the body is interred throughout pre-Islamic Nubia and currently in some rural areas of Sudan (Kennedy 1978; Bianchi 2004).

Figure 2.1 Culturally Significant Anatomical Regions at Al-Widay

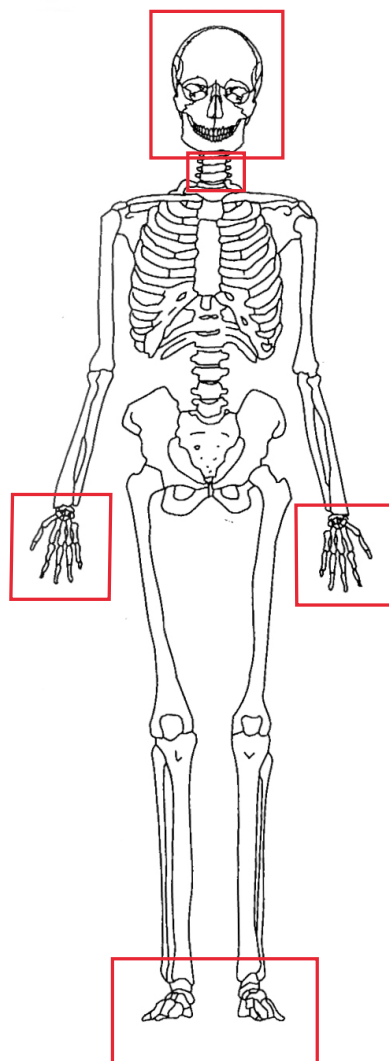


Figure adapted from *Standards* (Buikstra and Ubelaker 1994)

Table 1.1 Identified Culturally Significant Anatomical Regions

CSAR	Elements Included*
Head	Cranial bones, except facial bones (vomer, ethmoid, palatines, lacrimals) and auditory ossicles
Mandible	Mandible, without dentition
Neck	Atlas, Axis, and Cervical 3 – 6
Hands	Scaphoid, Lunate, Triquetral, Pisiform, Trapezium, Trapezoid, Capitate, Hamate; Metacarpals 1 – 5; Proximal, Intermediate, and Distal Manual Phalanges
Feet	Calcaneus, Talus, Navicular, Cuboid, 1 <sup>st</sup> – 3 <sup>rd</sup> Cuneiform; Metatarsals 1 – 5; Proximal, Intermediate, and Distal Pedal Phalanges

\* Right and Left sides where applicable

In order to develop a method for assessing fragmentation in a descriptive and quantitative manner, I categorized the observable differences between different types of bone breakage on a macroscopic level. Category labels: absent, crushed, disarticulated, fragmentary, and present are efficient and effective for underlining the important differences between various forms of fragmented human remains (see Table 2.3).

Table 1.2 Categories for Understanding Fragmentation, Presence, and Absence

Category	Quantitative	Qualitative
<b>Absent</b>	Less than 25% of anatomical region/ bone present in the laboratory	Anatomical region/bone appeared absent from the archaeological matrix
<b>Crushed</b>	Greater than 25% of anatomical region/bone present in the laboratory	Anatomical region/bone appears present but crushed in the archaeological matrix
<b>Disarticulated</b>	Greater than 25% of anatomical region/bone present in the laboratory	Anatomical region/bone was not recovered in situ during excavations
<b>Fragmentary</b>	25-50% of anatomical region/bone present in the laboratory	Anatomical region/bone is present but destroyed post-mortem but prior to excavation
<b>Present</b>	Greater than 50% of an anatomical region/bone present in laboratory	Anatomical region/bone appears present in the archaeological matrix
<b>No Data</b>	Based on individual's age estimation (<2 lunar years) elements were not expected to be present and/or ossified and therefore not considered for analysis in the above categories	

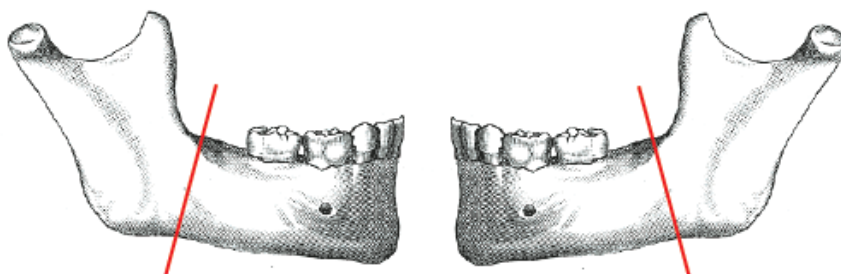
The quantitative documentation of each category was accomplished through a standard skeletal inventory of the remains from Al-Widay, housed at the Osteology Lab at New York University's Center for the Study of Human Origins. Using methods set forth in *Standards* (Buikstra and Ubelaker 1994), percentage of region present was assessed. This task was completed first, in order to decide which categories were applicable to the anatomical region.

The methodology was adapted from the skeletal inventory section of *Standards* (Buikstra and Ubelaker 1994), and feature-based fragmentation analysis, which was developed for processing commingled remains (Outram and Knüsel 2004). The analysis of cranial remains was completed by size sorting all cranial fragments into 10mm size categories, ranging from >10mm to 100+mm. After each individual's cranial remains were sorting into size categories, they were weighed to the quarter of a gram using a digital kitchen scale. These weights were recorded for each size category in addition to the number of fragments for each category. For the purposes of applying the fragmentation categories (absent, crushed, disarticulated, fragmentary, or present) it was necessary to estimate percentages of completeness less than 25%, 25-50%, and greater than 50%. These percentages were calculated less precisely for the cranium, due to the irregular and unique composition of the cranial bones. The qualitative descriptors and photographs were relied upon more heavily for this analysis, especially because transportation and storage (post-excavation fragmentation) heavily affect the condition of the remains. Photographs of human remains often show the cranial region particularly well, which makes the qualitative method more reliable for evaluating presence or absence.

The mandible was relatively easy to evaluate compared to the cranium; percentage completeness was measured based on presence or absence of four regions: the right and left ascending ramus (2) and the anterior portion divided into two regions based on the symphysis

menti, the medial mandibular suture that typically fuses between 6 and 9 months of age (Scheuer and Black 2000; Schaefer et al. 2009). Each portion was equally weighted as 25% of the mandible.

Figure 2.2 Mandible Regions for Percentage Completeness



*Image adapted from Gray's Anatomy Lithograph 1918 (public domain)*

For the analysis of cervical vertebrae observable units were marked and completeness was assessed per Standards recommendations: “Bodies/Centra: Complete = >75%; Neural Arches: Complete = at least two articular facets observable” (Buikstra and Ubelaker 1994:7). Neck completeness was measured based on observable elements present in C1-6, C7 was not considered because of its anatomical location. The percentages from Table (with categories for measurement) were measured in the cervical vertebrae so that 1.5 vertebrae equaled 25%; percentage of individual vertebrae was measured through the number of quadrants observed.

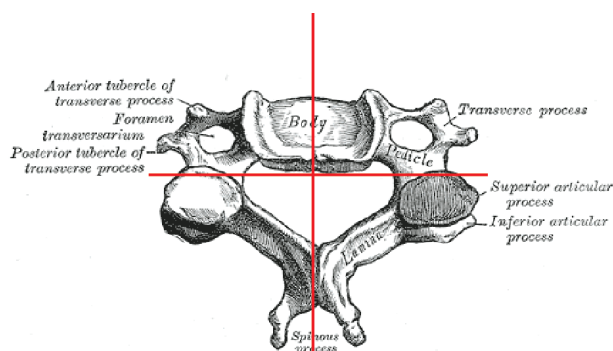
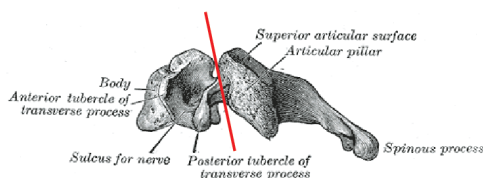


Figure 2.3 Vertebral Regions for Percentage Completeness Analysis

*Image adapted from Gray's Anatomy Lithograph 1918 (public domain)*



Completeness of the hand and foot regions was calculated based on the presence or absence of carpals/tarsals, metacarpals/metatarsals, and manual/pedal phalanges, which were inventoried as present, fragmentary, or absent before assessing completeness of the hand region. After sorting elements into their respective anatomical groupings (carpals together, tarsals together) the carpals and tarsals were inventoried as either present or absent for the right and left sides; many were heavily affected by weathering but remained identifiable by articular surfaces and contour.

The metacarpals and metatarsals were similarly evaluated for presence or absence; taphonomic processes systematically affected the distal portions of many metacarpals and metatarsals. The distal, intermediate, and proximal pedal and manual phalanges were sorted into manual or pedal initially, if more than half (14+) of any of the phalanges were present the phalanges were noted as complete. Left and right sides were not considered for phalanges. After each of these inventories was taken, overall completeness for broader analysis was determined based on a composite “score” for each hand or foot. This was derived from each of the elements based on their presence/absence. Using the above criteria to establish presence, or degree of presence, the system outlined in the chart below was used to calculate percentage completeness: points present for analysis/points possible, which yields an approximate percentage. The maximum possible points for the phalanges (3) was weighted based on the rows of phalanges (ie., distal, intermediate, proximal) in order to account for the uninformative variability in their presence.

The composite scoring system outlined in Table 2.6 works well to establish an objective evaluation of percentage of completeness, however in some instances it might be less efficient and less nuanced than a well-reasoned assessment by a trained osteologist. Detailed visual

inventories of the hands and feet would be useful in the future for more strategic analysis of how general taphonomic processes effect the preservation of the bones in the hands and feet.

Table 1.3 Composite Scoring for the Hand and Foot Regions

<b>Bone/Element</b>	<b>Present</b>	<b>Possible</b>	<b>Points</b>
Carpals	#	8 per side (16 total)	1 per bone
Metacarpals	#	5 per side (10 total)	1 per bone
Phalanges	Y/N	28 total	3 if Y, 0 if N
Tarsals	#	7 per side (14 total)	1 per bone
Metatarsals	#	5 per side (10 total)	1 per bone
Phalanges	Y/N	28 total	3 if Y, 0 if N
Up to 29 points possible for hands and 27 points possible for feet			
<b>Hands</b>		<b>Feet</b>	
7 points	~25%	7 points	~25%
14 points	~50%	13 points	~50%
22 points	~75%	20 points	~75%

### *Results of Analysis of Culturally Significant Anatomical Regions*

The results of my analyses of the various Culturally Significant Anatomical Regions demonstrate the differences in number and percentage for i) presence or absence of an anatomical region and ii) the types of fragmentation for each element.

Qualitative Category	Combined Context	Disturbed Context	Undisturbed Context
Absent	<b>9 (21%)</b>	<b>9 (41%)</b>	0 (0%)
Crushed	6 (14%)	3 (14%)	3 (20%)
Disarticulated	6 (14%)	<b>6 (27%)</b>	0 (0%)
Fragmentary*	2 (5%)	1 (5%)	0 (0%)
Present*	<b>19 (45%)</b>	3 (14%)	<b>12 (80%)</b>
No Data	0 (0%)	0 (0%)	0 (0%)
N	41	22	15

\* The distribution of four (4) sets of remains from an unknown context are not show here and account for the discrepancy between the “combined” context sample size and the sample sizes from “disturbed context” and “undisturbed context” remains

Crania are absent or disarticulated (found in looter’s fill or in another anatomical region), 68% of the time in disturbed contexts. This suggests that skulls are systematically targeted in looting/disturbance activity, or are removed incidentally in order to retrieve the objects that are of interest to the looter. In undisturbed contexts, 80% of crania were present and relatively intact during excavation and in the laboratory analysis. Most importantly, in the undisturbed context all crania are either crushed or present. The crushed crania at Al-Widay are the result of a religious practice where small boulders were placed directly above the head of the individual.

Qualitative Category	Combined Context	Disturbed Context	Undisturbed Context
Absent	<b>12 (29%)</b>	<b>12 (55%)</b>	0 (0%)
Crushed	5 (13%)	2 (9%)	3 (20%)
Disarticulated	5 (13%)	5 (23%)	0 (0%)
Fragmentary	1 (2%)	0 (0%)	1 (7%)
Present*	<b>17 (41%)</b>	3 (14%)	<b>10 (67%)</b>
No Data	1 (2%)	0 (0%)	1 (7%)
N	41	22	15

\* The distribution of four (4) sets of remains from an unknown context are not show here and account for the discrepancy between the “combined” context sample size and the sample sizes from “disturbed context” and “undisturbed context” remains



The mandible was analyzed as a separate element based on the differential preservation possible for its intactness based on decomposition at the time of disturbance. Additionally, dentition was not included in the analysis of the mandible; analysis of dentition as it relates to fragmentation and disturbance is discussed later. The mandible is easily dislodged and separated from the skull after soft tissues have decomposed; however the absence of the mandible does not necessarily indicate that the disturbance activity took place before skeletonization. In the sample population analyzed, 67% of undisturbed tombs had mandibles present and intact, while 78% of disturbed tombs had no mandible or had a disarticulated and fragmentary mandible. Mandibles pose an interesting problem for the fragmentation analysis; the mandible is a unique anatomical structure with high level of variation in the thickness of trabecular bone, easily fragmented protrusions such as the coronoid process and mandibular condyle, and robust portions—in particular the mental eminence and the gonial angle which were often the only portion of the mandible preserved when the mandible was “absent” during laboratory analysis. The additional damage due to general shipping and storage practices also affect the mandible because of its structural composition. Future research employing a feature-based approach (Outram and Knüsel 2004) may prove more informative for assessing the taphonomic processes affecting the mandible in disturbed contexts.

Qualitative Category	Combined Context	Disturbed Context	Undisturbed Context
Absent	<b>14 (34%)</b>	<b>14 (61%)</b>	0 (0%)
Crushed*	3 (6%)	1 (4%)	1 (7%)
Disarticulated	2 (5%)	2 (9%)	0 (0%)
Fragmentary	3 (6%)	3 (13%)	0 (0%)
Present*	<b>18 (44%)</b>	3 (13%)	<b>13 (86%)</b>
No Data*	2 (4%)	0 (0%)	1 (7%)
N	41	23	15

\* The distribution of four (4) sets of remains from an unknown context are not show here and account for the discrepancy between the “combined” context sample size and the sample sizes from “disturbed context” and “undisturbed context” remains

Of all the CSAR analyzed for associations between disturbance and presence/absence, the neck is the most predictably patterned anatomical region. For the sample population analyzed, 86% of undisturbed graves had an intact neck (cervical vertebrae); over half of the disturbed graves had fewer than two vertebrae present, indicating the neck region and the valuable objects placed near/around it were perhaps the target of disturbance activity. Additionally, the size of the cervical vertebrae implies that the vertebrae were easily disturbed if the cranium was disturbed; the proportion of graves with absent or disarticulated skulls is nearly equal to the proportion of necks that are absent or disarticulated.

Qualitative Category	Combined Context	Disturbed Context	Undisturbed Context
Absent	<b>13 (32%)</b>	<b>11 (50%)</b>	2 (13%)
Crushed	2 (5%)	0 (0%)	2 (13%)
Disarticulated	1 (2%)	1 (5%)	0 (0%)
Fragmentary*	<b>11 (27%)</b>	<b>6 (27%)</b>	3 (20%)
Present*	<b>13 (32%)</b>	4 (18%)	<b>7 (47%)</b>
No Data	1 (2%)	0 (0%)	1 (7%)
N	41	22	15

Qualitative Category	Combined Context	Disturbed Context	Undisturbed Context
Absent*	<b>11 (27%)</b>	<b>8 (37%)</b>	2 (13%)
Crushed	2 (5%)	0 (0%)	2 (13%)
Disarticulated	2 (5%)	2 (9%)	0 (0%)
Fragmentary*	11 (27%)	<b>6 (27%)</b>	3 (20%)
Present*	<b>14 (35%)</b>	<b>6 (27%)</b>	<b>7 (47%)</b>
No Data	1 (2%)	0 (0%)	1 (7%)
N	41	22	15

\* The distribution of four (4) sets of remains from an unknown context are not show here and account for the discrepancy between the “combined” context sample size and the sample sizes from “disturbed context” and “undisturbed context” remains

Overall, the extremities seem to be less indicative of grave condition than other anatomical regions. The right hand is absent in half of the disturbed context sample population, and present in half of the undisturbed context sample population. These proportions indicate that

the sample populations are too small to make conclusions as to their meaning. A larger sample population would clarify the results of this analysis and perhaps show more distinctive patterns; additionally, the effects of taphonomy on the hands are complex for reasons similar to the mandible and for this reason a feature-based method of analysis might be useful for looking at preservation. Based on my laboratory analysis of the remains, it is common that the less dense portions of the metacarpals are systematically not preserved, and it is difficult to discern the condition of the extremities from excavation photographs since they are often commingled with other hands and the carpals are embedded in the matrix.

Qualitative Category	Combined Context	Disturbed Context	Undisturbed Context
Absent	<b>10 (24%)</b>	<b>8 (37%)</b>	2 (13%)
Crushed	2 (5%)	0 (0%)	2 (13%)
Disarticulated	1 (2%)	1 (5%)	0 (0%)
Fragmentary*	<b>7 (26%)</b>	3 (13%)	1 (7%)
Present*	<b>20 (49%)</b>	<b>10 (45%)</b>	<b>9 (60%)</b>
No Data	1 (2%)	0 (0%)	1 (7%)
N	41	22	15

\* The distribution of four (4) sets of remains from an unknown context are not show here and account for the discrepancy between the “combined” context sample size and the sample sizes from “disturbed context” and “undisturbed context” remains

Qualitative Category	Combined Context	Disturbed Context	Undisturbed Context
Absent	<b>10 (24%)</b>	<b>8 (37%)</b>	2 (13%)
Crushed	2 (5%)	0 (0%)	2 (13%)
Disarticulated	1 (2%)	1 (5%)	0 (0%)
Fragmentary	<b>7 (26%)</b>	3 (13%)	1 (7%)
Present	<b>20 (49%)</b>	<b>10 (45%)</b>	<b>9 (60%)</b>
No Data	1 (2%)	0 (0%)	1 (7%)
N	41	22	15

\* The distribution of four (4) sets of remains from an unknown context are not show here and account for the discrepancy between the “combined” context sample size and the sample sizes from “disturbed context” and “undisturbed context” remains

My analysis of the feet, like the hands, is inconclusive—potentially due to a small sample size.

One conclusion I confidently support based on the data and analysis provided is that hands and

feet are the least predictable anatomical regions involved in looting and disturbance activity. The occasional irregularity in burial position and the inability of looters to predict the location of the hands and feet, as well as the irregularity of adornment on the extremities probably contributes to this unpredictability.

*Bioarchaeological Analysis: The Dental Arcade and In Situ Dentition*

Previously I have not discussed the mandibular and maxillary dentition preserved in the remains at Al-Widay, or its role in predicting skeletal disturbance. During the inventories completed for CSAR analysis, a dentition inventory was taken in order to examine the completeness of the mandibular and maxillary dentition. The number of sockets present for analysis in the laboratory was noted, then the teeth in situ were counted, as well as the loose teeth associated with the individual. Percentage completeness was calculated for each individual based on the number of teeth encountered in situ<sup>7</sup> and the number of sockets present. Similar to the unpredictability of the extremities encountered in CSAR analysis, dental completeness does not follow a systematic trend in disturbed contexts, percentages of completeness range from 0% to almost 90%; in undisturbed contexts however, 50% or more of dentition is present in all individuals.

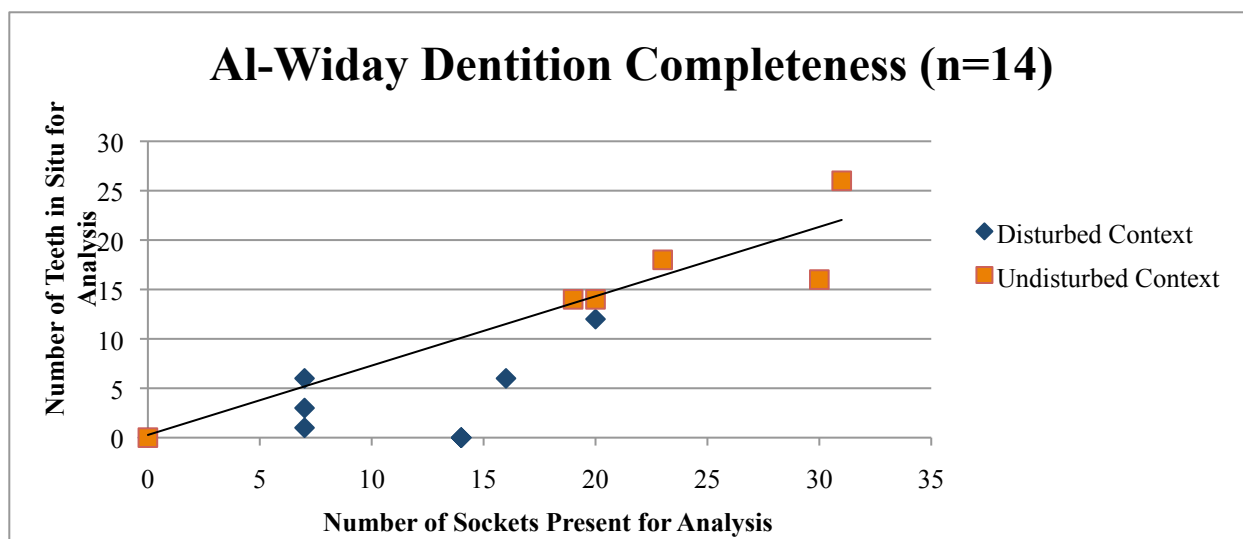
Two manners of increasing the viability of this method for disturbance analysis are increasing sample sizes and performing this analysis before excavation. In combination with another method developed by Outram and Knüsel (2004), which evaluates organic material remaining in the bone post-deposition (at various stages) through the analysis of fracture patterns,

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<sup>7</sup> A more robust version of this analysis would be completed before excavation in order to remove confounding excavation disturbance of the dental arcade.

it would be possible to understand how decomposition and skeletonization effect the relationship between intactness of remains and disturbance activity.

Figure 3.1 Measuring Post-Mortem Dental Completeness (Post-Excavation)



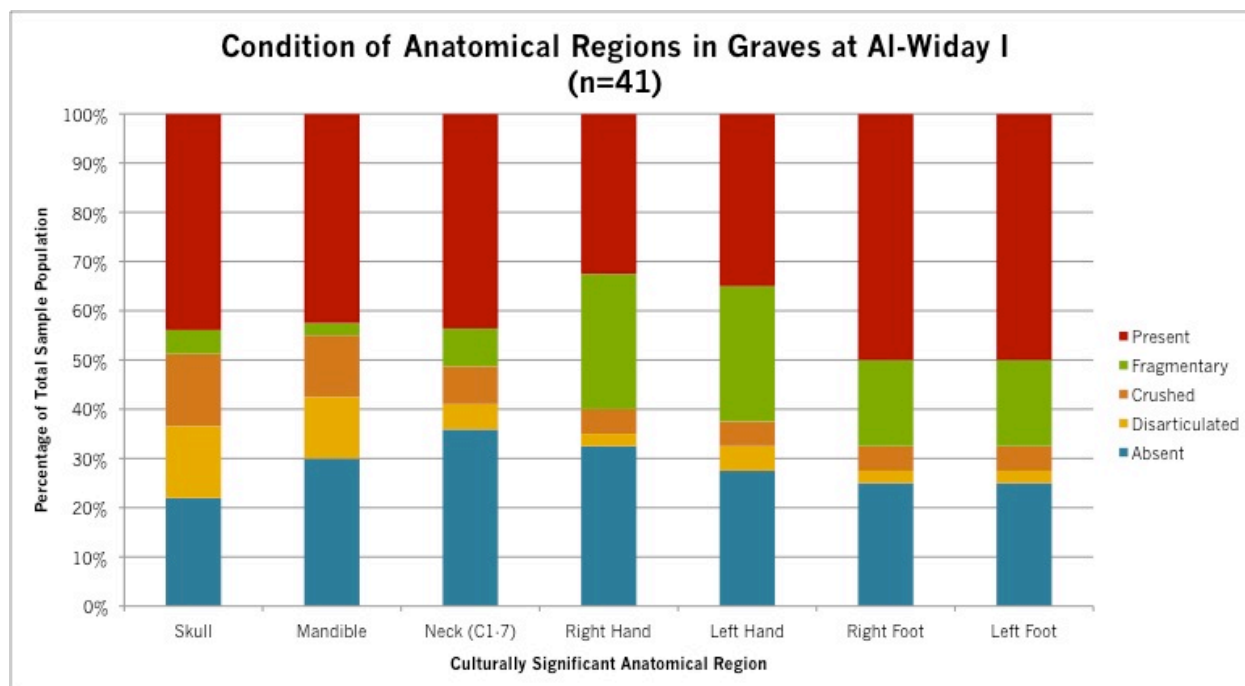
The trendline inserted into this chart shows that as the number of sockets present for analysis increases, the number of teeth in situ for analysis also increases. This trend is intuitively expected since the potential dental remains present increases when more of the mandibular and maxillary alveolar processes are intact.

## DISCUSSION

In Chart 5.1 (below), each anatomical region of interest is displayed in terms of the condition of the remains during analysis, according to the parameters outline in the above section on Culturally Significant Anatomical Regions. This graph is useful for examining overall trends in the condition of the remains from the random sample population from Al-Widay I; interesting the crania and hands have the most variability in fragmentation. Without accounting for grave condition (Disturbed, Undisturbed, Unknown) in Figure 5.1, it is both evident and interesting

that 50% of the right and left feet are present in any given context.

Figure 4.1 Condition of Anatomical Regions at **All Graves** at Al-Widay I  
(Disturbed, Undisturbed, and Unknown – combined)



The results of the various anatomical regions for disturbed graves at Al-Widay I show a distinctive pattern that deviates from the un-sorted context percentages (see Chart 5.2 below). In disturbed contexts, the skull, mandible, and neck regions had 14%, 14%, and 13% of the bone(s) present, a relatively small proportion for each, based on the percentage absent or in some fragmented form. Although in the disturbed context many individuals are missing the head and neck regions, there is also the most variation in condition of these remains. Overall, the distribution in condition in the disturbed graves is more variable than in the undisturbed graves. In undisturbed graves, the neck is either present or crushed 100% of the time. Out of 15 undisturbed graves analyzed, one individual had a crushed neck and another was unobservable due to age; the other 13 individuals had present and mostly intact necks.

Figure 4.2 Condition of Anatomical Regions in **Disturbed Graves** Al-Widay I

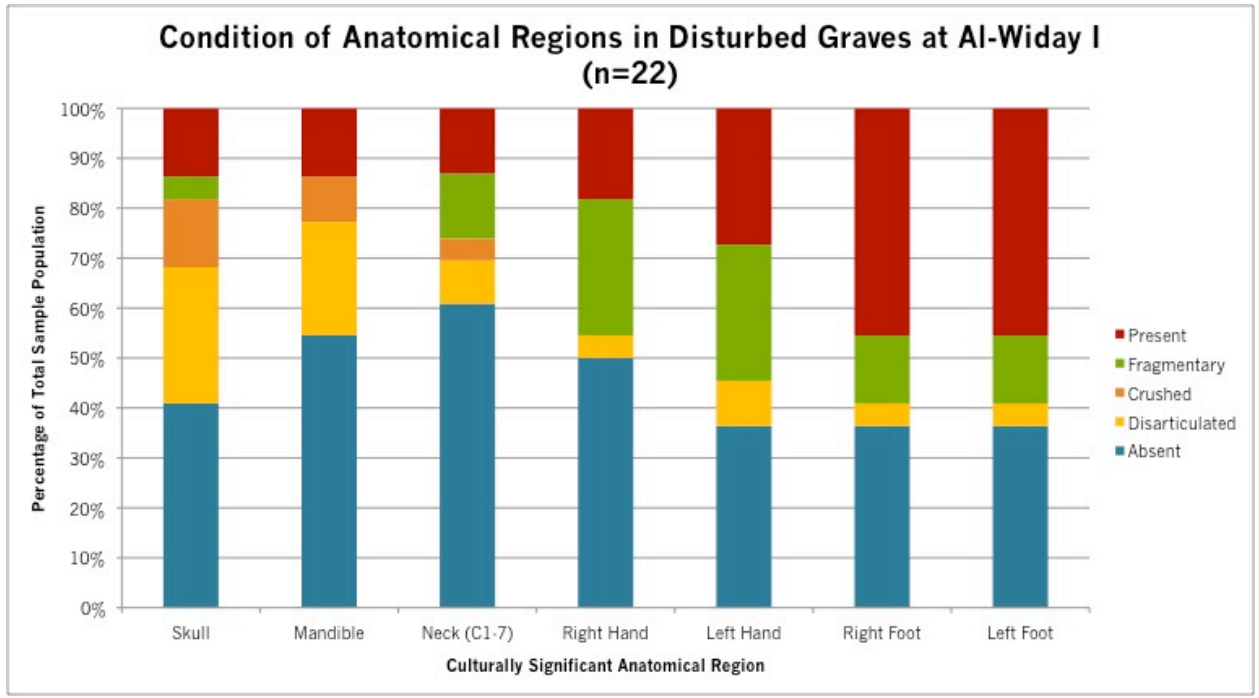
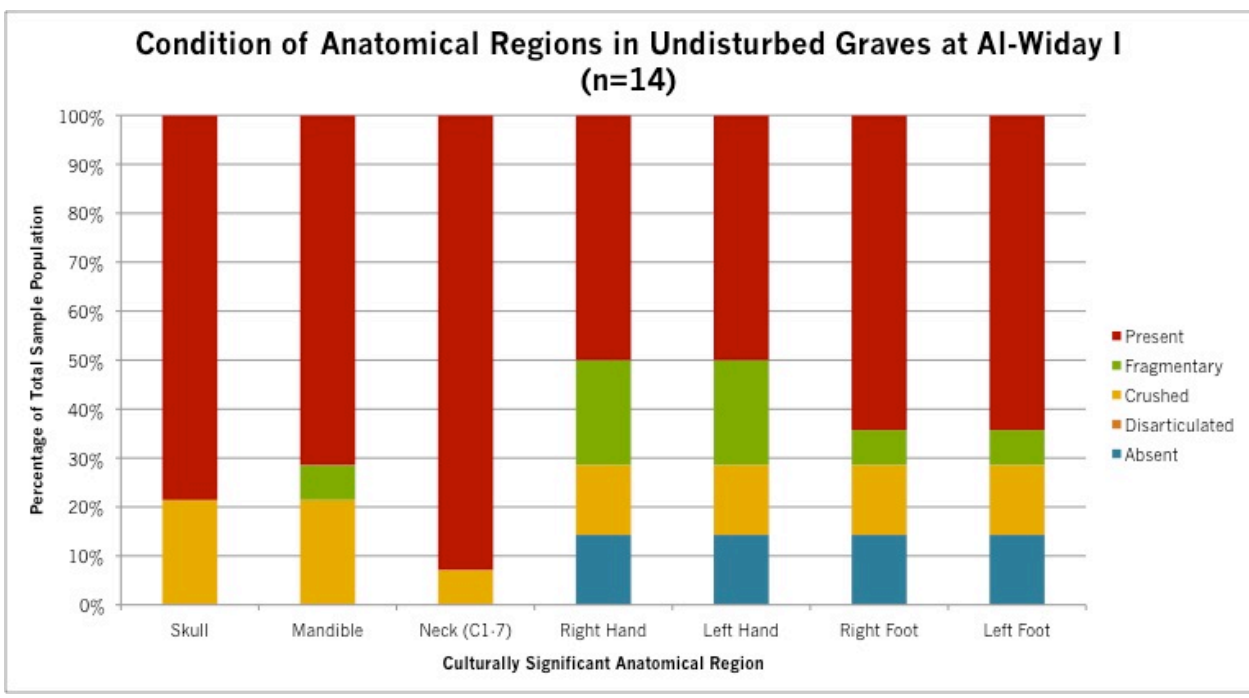


Figure 4.3 Condition of Anatomical Regions in **Undisturbed Graves** at Al-Widay I



## CONCLUSIONS

Based on the results presented above there appears to be a significant difference in the condition of human remains from disturbed and undisturbed graves; anatomical regions that are particularly affected are regions that are both easy to predict spatially in a grave and the most commonly adorned areas of the body. This indicates that through time, it is difficult to enforce to governmentally or socially sanction a cemetery, especially at peripheral locations. Changing religious and social ideologies affect the public and legal sentiments towards grave robbing; aside from spiritual understandings of the dead, there are many anecdotes from historical sources that offer that politics informs these taboos about disturbing the dead.

Future research studies on looting and how it affects the skeleton will include the pelvic region in the study of culturally significant anatomical regions; although populations with large numbers of juvenile individuals will require adapted methodologies. After further analysis of the remains at Al-Widay, it was apparent that there were semi-valuable objects placed over the pelvic region of some individuals, although age made it difficult to assess fragmentation. These archaeological remains are seen in some graves, however it is not apparent whether or not this region was targeted for disturbance based on the previously mentioned limitations. I predict that, if known, regions of the body adorned with the most valuable items will be targeted and systematically absent and/or disarticulated; this may indicate shared cultural knowledge or cultural memory of adornment practices. In situations where cultural memory has not preserved the location of adornments for mortuary rituals, I expect the regions of the body commonly adorned by the looter's culture to be targeted. Through this logic, understanding the regions of the body targeted for looting allows for investigation into the looter's cultural beliefs and mortuary customs—as the regions looted are most likely chosen either completely at random or



in a manner that privileges regions where valuable object would have been placed. Additionally, cross cultural comparisons would be exceptionally useful for understanding the nuances of cultural practice and memory in the process of grave disturbance.

Using the osteological methods set forth in this paper, and photographs of pre-excavation graves, predicting unknown condition (disturbed or undisturbed) burials is likely and a priority. This method allows researchers to use osteological and/or photographic data to conjecture the condition of a given grave. In future iterations of this research, blind test graves can be used to check the applicability and appropriateness of this methodology.

Among the disturbed grave individuals, there is much variation. This variation can be analyzed by recording the number and weight of fragments for anatomical regions or elements (as outlined in this paper for cranial fragmentation analysis). Based on laboratory observations, further investigation into the angle, degree, and nature of fracture patterning in the long bones (humeri, radii, ulnae, femora, tibiae, and fibulae) would approximate the relative time between death and fragmentation of the remains, which might help access the number of looting episodes that took place at the site on a large time scale.

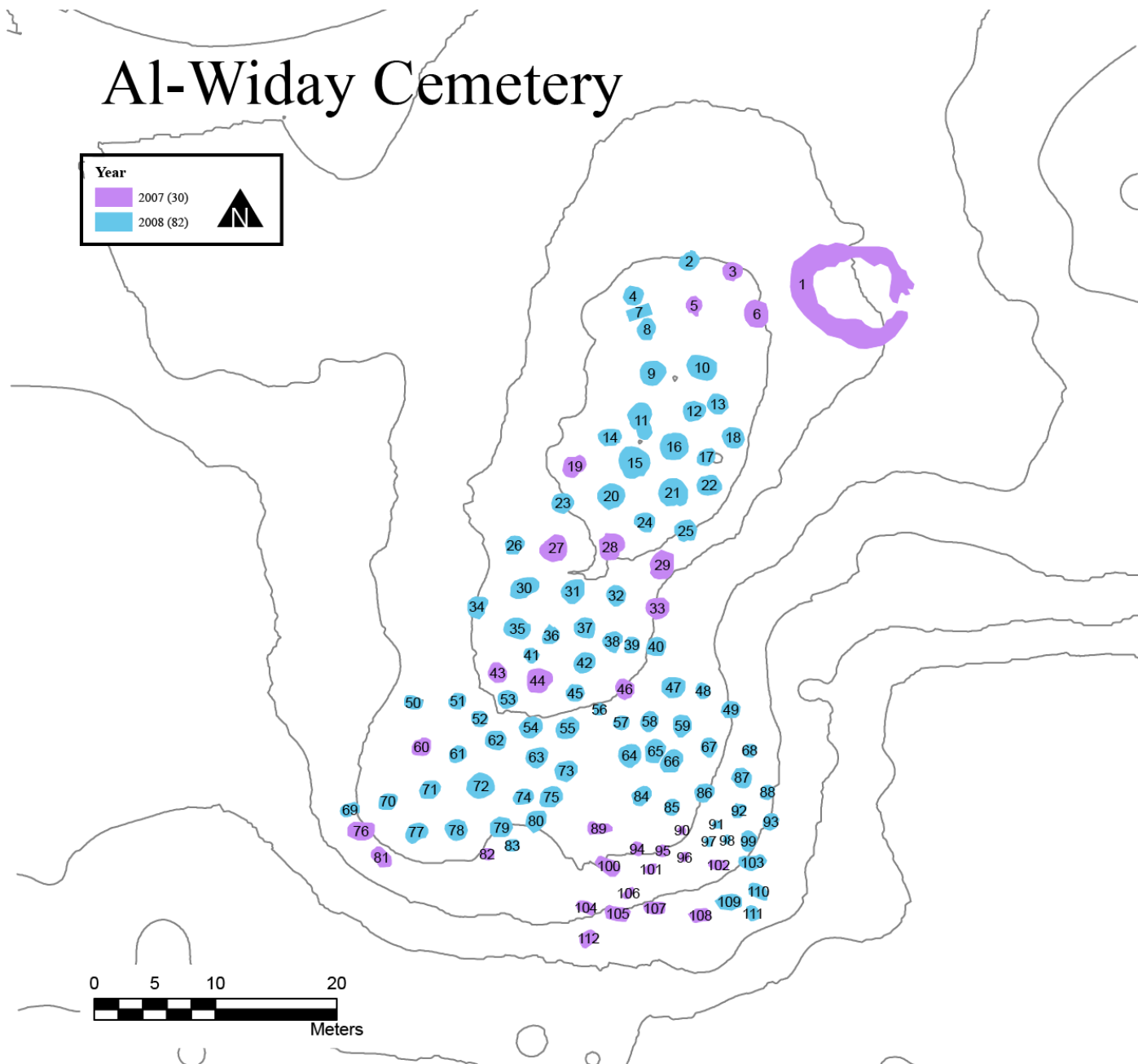
An important factor in looting occurrence and the process through which graves are located for disturbance is the visual landscape, or viewscape, component of the archaeological site. This aspect of disturbance activity is not addressed in this study, however inputting calculations of surface area, volume and height of tumuli into a GIS map as well as in a CAD reconstruction of the cemetery, visibility analysis could be completed to evaluate the possibility of patterning based on appearance. Disturbance and erosion over thousands of years are contributing factors that might make a robust version of this analysis difficult, however patterning between the disturbed graves and visibility would still yield interesting results. Due to

the complex nature of visibility through time, the interpretation of this data would need to be generalized and careful of assuming authority.

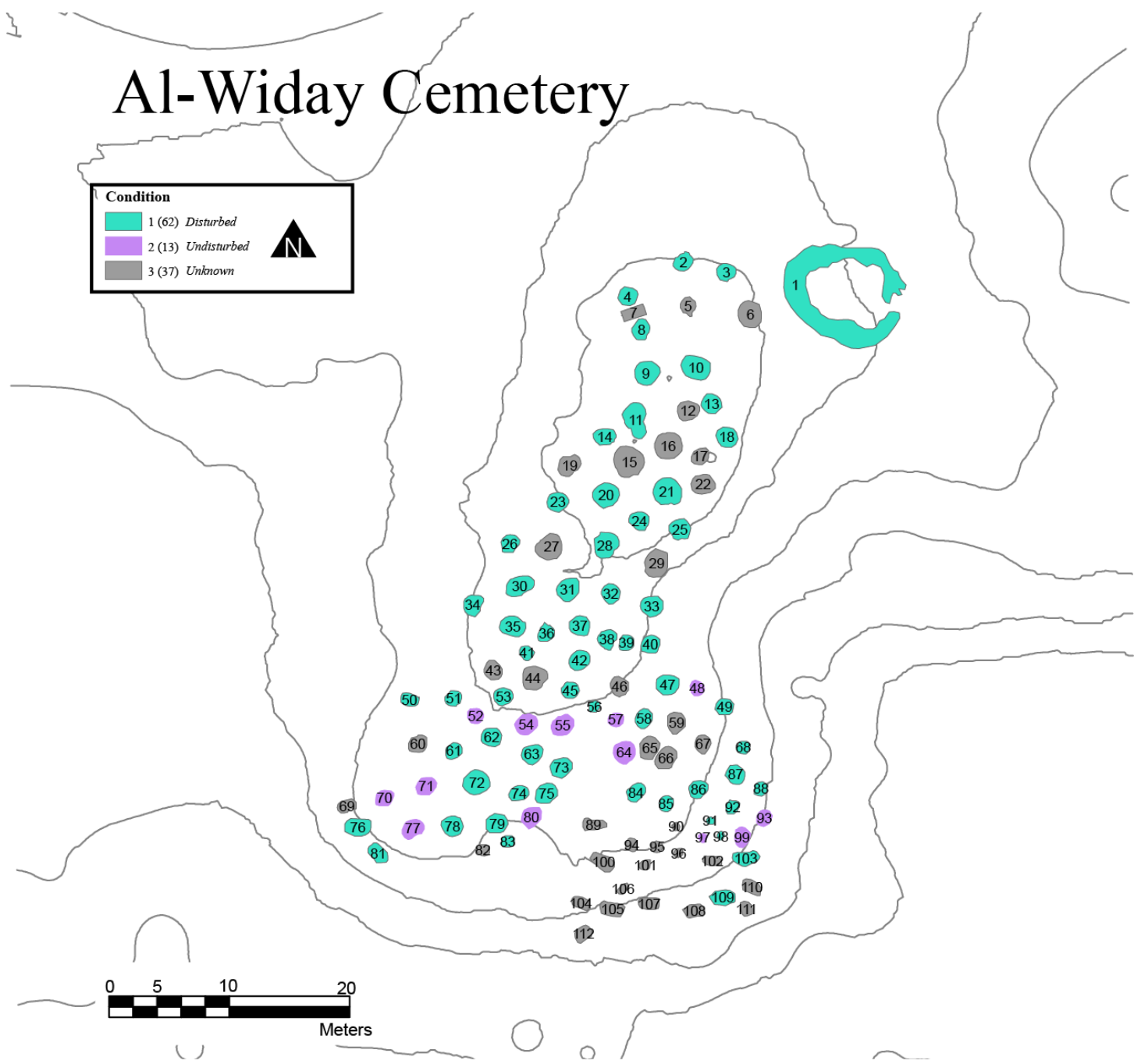
Finally, future iterations of this research will use statistical testing to confirm the statistical significance of findings between the fragmentation types of disturbed graves and undisturbed graves. Patterns are visible without statistical testing, however adding this component will inevitably increase the reliability and authority of the results determined through these methods.

APPENDIX

A – Map of Al-Widay



B – Map of Al-Widay by Context

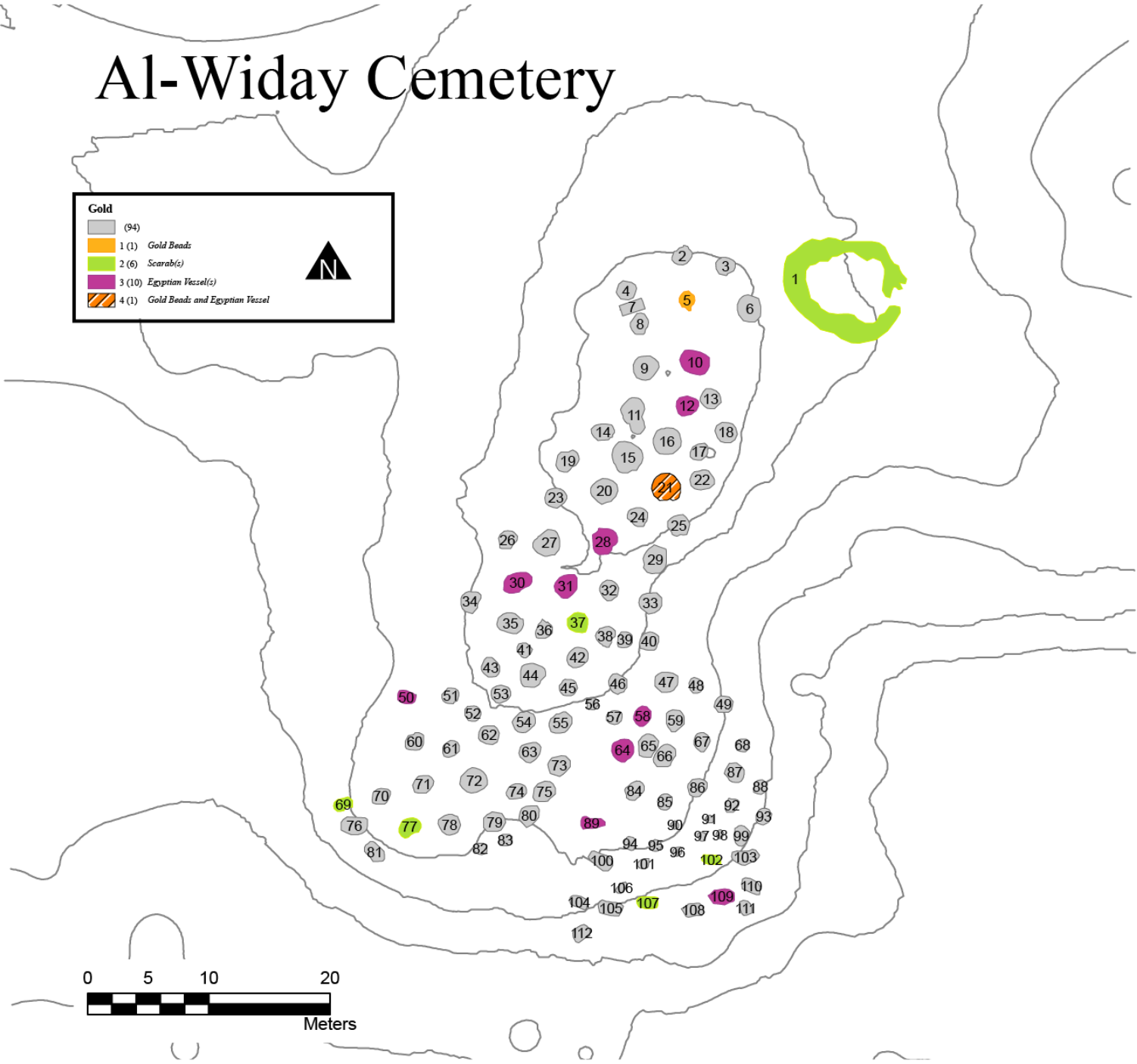



C – Distribution of Egyptian Materials at Al-Widay

# Al-Widay Cemetery

**Gold**

- (94)
- 1 (1) Gold Beads
- 2 (6) Scarab(s)
- 3 (10) Egyptian Vessel(s)
- 4 (1) Gold Beads and Egyptian Vessel



*D – Fragmentation Data, Refined*

<b>Grave Condition</b>	<b>Tomb ID</b>	<b>Tomb #</b>	<b>Skull</b>	<b>Mandible</b>	<b>Neck</b>	<b>R Hand</b>	<b>L Hand</b>	<b>R Foot</b>	<b>L Foot</b>
Looted	L-a		p	p	p	f	f	a	a
Looted	L-d		p	p	p	p	p	p	p
Looted	R-a	023	a	a	a	a	a	p	p
Looted	U-e	084	d	d	f	a	p	a	a
Looted	U-g	086	d	d	a	p	p	a	a
Looted	U-j	049	a	a	a	a	a	p	p
Looted	U-k	092	c	c	a	f	f	d	d
Looted	U-m	058	c	p	f	a	a	a	a
Looted	V-l	062	a	a	a	p	p	p	p
Looted	V-p	074	f	a	d	a	a	p	p
Looted	V-s	079	d	d	a	a	a	a	a
Looted	V-v	050	d	d	a	a	d	f	f
Looted	W-c	010	d	d	d	d	d	a	a
Looted	W-d	009	p	a	a	f	f	p	p
Looted	W-k	021	c	c	c	a	f	p	p
Looted	W-m	024	a	a	a	a	p	p	p
Looted	W-n	020	a	a	p	f	f	p	p
Looted	W-q	008	d	a	a	a	a	a	a
Looted	X-a	026	a	a	a	f	a	f	f
Looted	X-d	031	a	a	a	f	f	f	f
Looted	X-h	037	a	a	a	p	p	p	p
Looted	Y-h	041	a	a	a	a	a	a	a
Undisturbed	L-c	070	p	p	p	p	p	p	p
Undisturbed	L-e	077	p	p	p	f	f	p	p
Undisturbed	L-f	071	p	p	p	p	p	p	p
Undisturbed	U-c	066	p	p	p	p	p	p	p
Undisturbed	U-d	059	p	c	p	c	c	p	p
Undisturbed	U-n	064	p	p	p	a	a	a	a
Undisturbed	V-a	051	p	p	p	p	f	c	c
Undisturbed	V-b	052	p	p	p	p	p	p	p
Undisturbed	V-f	054	c	c	p	p	p	p	p
Undisturbed	V-h	055	c	c	p	f	p	p	p
Undisturbed	V-j	057	c		c	c	c	c	c
Undisturbed	V-t		p	p	p	a	a	a	a
Undisturbed	X-l	048	p	p	p	p	p	p	p
Undisturbed	Y-b	099	p	p	p	f	f	f	f
Unknown	H-j	106	f	f	f	f	f	f	f
Unknown	I	046	p	p	p	p	a	p	p
Unknown	Q	060	p	p	p	f	f	f	f
Unknown	W-r	007	p	p	c	f	f		
Unknown	H-f		p	p		p	p	f	f

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