

**The Bird of the Next Dawn:**  
**The husbandry, translocation and transformation**  
**of the turkey**

Thesis submitted for the degree of  
Doctor of Philosophy  
at the University of Leicester

by

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August, 2012

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**Abstract**

This thesis follows the palaeopathological and social history of the turkey, *Meleagris gallopavo*, over a thousand years (AD 900- c. 1900) and illuminates the evolving nature of turkey-human relationships. Interdependent analyses of zooarchaeological data and historical documentary sources were undertaken for this project. Palaeopathological and metrical data were gathered from turkey elements excavated from archaeological sites in the American Southwest, the UK and Éire; these were used with published data from other archaeological assemblages with turkey pathologies. Spanish colonial sources, European literature and ethnographic records on Pueblo peoples were also employed to explore the contingent nature and impact of human perceptions of the turkey.

The zooarchaeological data from the American Southwest attest to variation in the purposes for which turkeys were kept and differences in their living conditions. Pathologies present suggest that live domestic turkeys were plucked, perhaps repeatedly, at some sites in the American Southwest. Metrical data demonstrate temporal variation in the size and proportions of domestic turkey across assemblages and differing population dynamics, including male-female ratios and percentage of juveniles. Other evidence indicates that the turkey was not consistently perceived only as a protein product and may have simultaneously occupied several strata of meaning.

Once in Europe, the turkey was almost universally categorised as poultry and rapidly stripped of all but economic significance. Whilst investigating post-medieval poultry husbandry, I found an association between women and poultry-keeping. Many UK poultry keepers were female and a historical lack of interest in the post-medieval poultry industry could be linked to this. Tibial dyschondroplasia is differentially diagnosed in the turkey; this provides firm skeletal evidence for 'improvement' of the species by the 19<sup>th</sup> century. This research shows that perception-driven translocation and transitions in husbandry methods have profoundly shaped the physical and conceptual transformation of the turkey.

## Acknowledgements

I have completed this work only with the support of others, and with apologies to Sir Isaac Newton, I say that if I have seen further, it is only by standing upon the scapulae of the giant terror birds who have come before me:

First and foremost, I am grateful for the time, expertise, assistance and tolerance of my supervisors, Richard Thomas and Dave Edwards. I am also thankful for the professional advice of the following individuals who have been of immense help: Cathy Cameron, Linda Cordell, Zombie Marie Curie<sup>1</sup>, Jonathan Driver, Chris Dyer, Karen Fothergill, Audrey Horning, Keith and Brenda Kintigh, Deirdre O'Sullivan, Camilla Speller and Kate Spielmann. Also, this project would not have been possible without access to assemblages of faunal remains, data and informational resources; for these reasons I am indebted to Wendy Bustard, Greg Cox and the Chaco Canyon NHP; Jonathan Driver; Cathy Cameron; Kathy Gore (formerly Durand, née Roler); Laura Elliff and the School of Advanced Research in Santa Fe; Nancy Espinoza and the Salmon Ruins Museum and Research Library; Kate Spielmann and Keith Kintigh of Arizona State University's School of Human Evolution and Social Change; James Morris of Museum of London Archaeology and the London Archaeological Archive and Research Centre; Kevin MacDonald and University College London. I am also thankful for Michelle Greene's intrepid assistance with the Salmon and Eleanor Ruin bones.

I myself am an "animal in exile", and some individuals were vital to my translocation and provided essential assistance at crucial times: my humblest thanks to Peter and Carol Johnson, Chris Hales, Roxana Raska and Deirdre O'Sullivan. The support of my families has been incredibly valuable in undertaking this research. I am grateful for the support, kind

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<sup>1</sup> see [www.xkcd.com/896](http://www.xkcd.com/896)

words and love of my families, the Cedars, the Bakers and the Fothergills, but am especially thankful for the long talks with my sister Siobhan and the cheerful notes and care parcels from my Mum. I am grateful to Darren Cedar, the "other geeky cousin", for his silly jokes and generosity of spirit; may he have peace at last. I must also thank the Sterrys for veterinary advice and articles, interesting ~~arguments~~ discussions and time away from Leicester. Locally and abroad, many friends and their cats have provided me with comfort, listened to numerous rants, driven me lots of places and/or generally been good company when things have been difficult. In no particular order, special mention goes to Sarah Newstead, Russell Foster and Kiviaq; Ruth Humphreys and Sushi; Ursula Arndt; Kelly Reed; Andy and Joana Valdez-Tullett, Maggie, Bagheera and Simão; Chantal Biemann; Chris Hales, Sammy, Bitá and PK; Mark Botarelli; Aiden Henessey; Rachel Carmichael; Kate and Steve Parks and William; Russell Patching; Emma Dwyer; Julia Farley; Rebecca Gordon; Meghann Mahoney; Tammy Macenka; Ma'at and Aoife; and all of the friends and Friends at the Leicester Quaker Meeting. Lastly and most importantly, I must extend my eternal gratitude to my beloved, Dr Martin Sterry, the cat whisperer, for his enduring love, patience, peaceful nature and incredible map-making skills.

Do mo sheanmháithreacha Éireannacha.



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## **Preface**

During the course of my Master's research on the faunal remains from the Bluff Great House (*c.* AD 1075 to 1250) in Utah I occasionally encountered pathological elements, the majority of which were present in elements from the domestic turkeys that had been kept at or near the site by the Ancestral Pueblo peoples. I wrote a chapter about them (Fothergill 2008), but became transfixed by their meaning as part of a greater whole. I came across two ulnae, both broken in a fashion which was unlikely to occur in an accident or as part of interspecies conflict. These pathologies were clearly not a singular event. Could they be physical evidence of a husbandry method used by the Ancestral Pueblo people? The presence of a well-healed fracture in a major weight-bearing bone, the tibiotarsus, suggested that some therapeutic intervention may have taken place and that the bird was likely protected from predators and supplied with water. Surely other, similar sites had pathological turkeys and perhaps a number of these lesions could be used in combination with other data to illuminate facets of animal-human relationships in the American Southwest. Following that, what happened to the species in the way of pathologies and otherwise once it departed North America? The research presented here originated from these questions.

# Chapter One. Introduction

## 1.1. Introduction

In following the turkey on a transatlantic journey through time, this thesis moves beyond repeating the established mantra that the First Nations peoples of the American Southwest kept domestic turkeys primarily as a protein source to exploit as a response to a scarcity of more desirable fare (Harris 2006, Lang and Harris 1984) and perhaps sometimes also as a source of feathers (Breitburg 1988, Clark 1998, Fothergill 2008, Moore 1994). Instead, I provide pathological evidence for specific husbandry practices, including the repeated plucking of these birds and highlight the possibility that they were perceived as a multifaceted creature. On the other side of the Atlantic, as an alternative to contextualising the turkey as a simple, meaty Christmas centrepiece, I pinpoint the dynamic, inconsistent and sometimes conflicting perceptions of the bird, detail aspects of Post-Medieval poultry husbandry, and differentially diagnose the presence of avian tibial dyschondroplasia, probable evidence for the Improvement of the species (Fothergill et al. in press).

This research draws upon multiple strands of evidence to chart the physical translocation and conceptual transformation of the turkey by using palaeopathological data to explore understandings of animal husbandry and human-animal relationships in the past. These sources include not only skeletal data, but also a host of literary and documentary sources which were analysed and interpreted in the hopes of achieving this goal. The pursuit of information originating from a single, unique species (*Meleagris gallopavo*) over a combined period of approximately a thousand years is ambitious and not without complications (see Chapter 3). This research is not only the first to undertake a systematic analysis of disease and injury in the bones of a North American species, it is also the first to consistently document pathology in any domestic species within the framework of



translocation. Additionally, no previous study exists which has analogous research aims, similar time depth or analytical orientation.

This project also considers the ways in which animals shape the human experience and influence human behaviour. There is a current, growing appreciation for the complexity of animal-human relationships and a trend for investigating the nature of animal agency through multiple, sometimes interdisciplinary approaches (Anderson 2004; Davis 2001; Ingold 1994; Kalof 2007; Kalof and Resl 2008; Moss and Erlandson 2002; Serpell 1996; Steward 2009). This project is embedded in this ongoing discourse and the idea of contingent relationships between humans and animals.

Within archaeology, some aspects of translocation, particularly with regard to the reception of live animals, have received less attention than others. Although the economic impact of trade in animals and their products has long been examined, social aspects of and reactions to animal introductions are sometimes overlooked (though see O'Connor and Sykes 2010). Comparative studies addressing the accompanying changes in human perception and husbandry of translocated species could help us to understand aspects of social history and human-animal relationships, but are sorely lacking. The disease impact of species translocation is also largely understudied despite the prevalence of zoonotic disease and the impact of many animal diseases on humans (e.g. rinderpest, swine and avian influenzas); in addition, the implications of this knowledge are of potential import with regard to the histories of animal welfare and veterinary medicine.

Within the spectrum of zooarchaeological analyses, mammals are a far more common research focus than avians; their skeletal elements are more likely to survive certain taphonomic processes, they are easily identifiable and their physiological resemblance to humans makes them an appealing subject of study. As previously noted, there are few spatially broad long-term single-species studies and fewer still which consider domestic birds as

a focus, which makes this research a unique contribution to zooarchaeology in general.

Palaeopathological study of faunal remains has the potential to reveal much about animal welfare, diet and animal husbandry, in addition to illustrating human attitudes toward animals (Udrescu and van Neer 2005). Animal palaeopathology has made a great deal of progress since Baker and Brothwell's seminal volume (1980). Despite this, the value of palaeopathology within zooarchaeology is still dismissed by some specialists (e.g. Lyublyanovics 2010:184) and no major monographs on the subject have been published since, although strides have been made (e.g. Thomas in prep.). There is a lack of palaeopathological study involving North American species (Shaffer and Baker 1997). Additionally, published palaeopathological studies on North American material are often asystematic and not standardised; they may include nothing more than lists of specimens without consideration of archaeological context, disease prevalence or cultural context. Differential diagnosis of pathologies is not involved and even the most tentative interpretation is rarely attempted. Few analyses of archaeological assemblages from the American Southwest include descriptions of pathological bones. Often, if interpretation of the fauna is made, the focus remains almost exclusively on matters of economy or subsistence. Past research on the turkey in the American Southwest has been overshadowed by studies of animals considered more appealing or exotic such as the dog or the macaw, though studies by Beacham and Durand (2007), Rawlings and Driver (2010) and Speller et al. (2009) indicate a recent increase in interest.

Despite the intensive archaeological research which has taken place in the American Southwest, sites and materials dating after European contact are also rather neglected by scholars (Gifford-Gonzalez 2010). Similarly, post-medieval zooarchaeological studies of European sites are rare due to a lack of data resulting in part from the perception that faunal assemblages from that period are somehow less valuable due to the availability of written

sources from that time (see Chapter 3). In this thesis, I dispute this and argue that documentary sources make faunal analysis more interesting and of greater interpretive value; the addition of cultural perceptions and social context can enhance the data and offer unexplored avenues for related research (Chapter 6). Used in tandem, these informational resources have the power to more accurately present the multifaceted, contested past.

The turkey is an excellent species to use in the exploration of translocation and related themes for a number of reasons. The species is relatively easy to identify osteologically, it was domesticated recently (see Chapter 2) and the bone preservation in the American Southwest is very good and archaeological sites in that region have been excavated to a high standard. There are also a number of colonial and later historical sources from the region that provide information on the post-medieval journey of the turkey (but see Chapter 3). The focus of this project is therefore ideal for examining not only the disease impact of differing husbandry methods on a single species over time, but also for further exploration of the parallel themes of animal translocation and changing human perceptions of animals.

The purpose of turkey husbandry in the American Southwest has as yet not been thoroughly debated in the faunal literature and can be a contentious subject. Animals in the past are sometimes viewed through a current-day lens and turkeys were (and continue to be) no exception. In order to derive meaningful interpretations from the skeletal and archival data, it is important to consider the changing human perceptions of the bird in the past. The turkey is now Christmas supper or Thanksgiving dinner (and has been such since the 17<sup>th</sup> and 19<sup>th</sup> centuries respectively). In modern times, consideration of any role for the bird other than as a source of meat may have seemed ridiculous, regardless of documentary and ethnographic support for other interpretations. Perhaps this perception has in turn affected interpretations of turkeys within the realm of archaeological study. The lack of burning, butchery marks and deliberate deposition of headless female turkeys in kivas (architecturally distinctive, often subterranean

rooms which are frequently ascribed a ritual function) along with the presence of turkey feather artefacts did not keep Hargrave (1965) from concluding that turkeys were primarily a food source. Beyond debating whether or not the turkey was domesticated at all, turkeys are commonly treated as no more than a supply of protein (Lang and Harris 1984, Harris 2006), possibly reflecting the emphasis on "meat weight" in many late 20<sup>th</sup>-century North American zooarchaeological publications.

However, there was not universal agreement on the reasons for which turkeys were kept. Akins (1985:381) made an economic point: the expense of raising a turkey is not justified if it is only to be eaten because it "takes only 20 days of feeding an adult bird to use up its equivalent in protein from corn." The point is a strong one, although this argument was embedded within the framework of human survival within a marginal past environment and does not consider the possibility that past people may have made less logical choices or used less economically driven strategies. It is most probable that the individuals who interacted with turkeys in the past did not view them in a way which resembles or coincides with modern perceptions or observations. Though it is ultimately impossible to resolve the viewpoints of the ancient First Nations peoples of the American Southwest, it is vital to recognise that they had one and that it may have been quite unlike those of later centuries.

Since material culture is innately patterned by human behaviour, the nature of past animal-human relationships can be partially clarified by thorough examination and careful interpretation of the archaeological record. An inclusive approach which allows for the full range of human-animal relationships, from those between the Nuer in Sudan and their cattle (Evans-Pritchard 1940; Hutchinson 1996) ranging to those present in the modern broiler chicken industry in the United Kingdom, is highly desirable. There is an increasing emphasis on the social lives of animals both as individuals and species in academic discourse as our understanding of animals changes over time. Domestic animals need no longer be

presented solely as products or objects, but are perceived as agents in their own right and can be interpreted within a framework of cultural biography (Kopytoff 1986; Morris 2011:167).

My research follows the pathological history of this single species in an attempt to investigate past patterns of animal disease and the relationship of these patterns to human management of animals. Apart from the palaeopathological focus of my work, this research shifts archaeozoological knowledge of the American Southwest in new directions and contributes to understandings of animal husbandry, domestication, and animal-human relationships. I avoid a particularist approach and instead use a broad temporal and geographic reach, which permits the use of a more sweeping research question.

### **1.2. Research question**

The overarching, general research question of this project was: How did the transatlantic translocation of the turkey affect the ways in which the bird was perceived and treated? The research aims discussed below address the interconnected questions which are innate to this central query.

### **1.3. Research aims**

My research aims derive from this question and were designed to engage with it through the objectives which follow and the use of the methods described in Chapter 3. Firstly, I set out to ascertain the nature of domestic turkey husbandry in the American Southwest. In parallel with this, I sought to clarify the social significance and roles inhabited by the birds in the same region. I then investigated the general character of post-medieval turkey husbandry in Europe (specifically in the United Kingdom and Éire) and the human perceptions of the bird after translocation.

### **1.4. Research objectives**

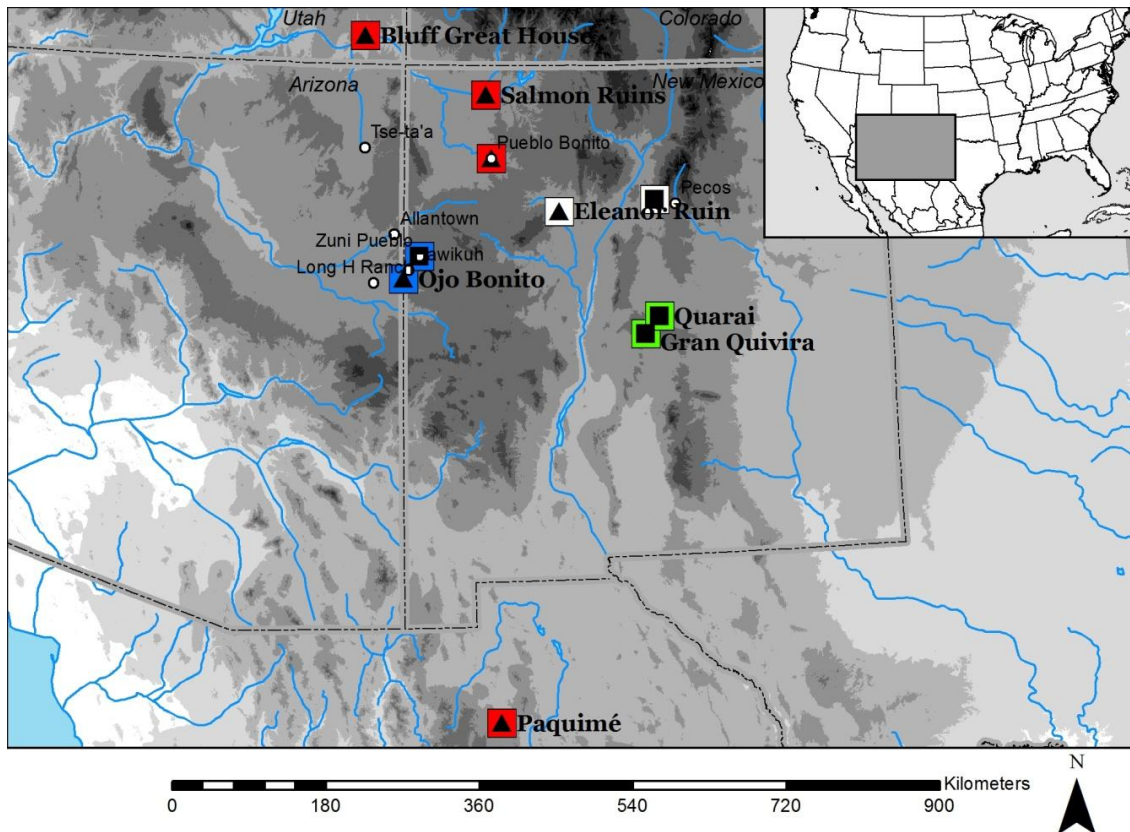
In order to achieve these aims, I undertook a series of zooarchaeological analyses of turkey assemblages in the American Southwest, the UK and

Éire and pursued a number of related research avenues. This approach included metrical analysis of skeletal elements and investigation of population dynamics (male to female ratios, percentage of juveniles) and changes in these dimensions over time in order to assess husbandry practices. The palaeopathological investigations were the primary driver of this research and were essential to the assessment of disease and injury present in turkey populations over a large temporal and geographic range. This study also encompasses multiple other lines of enquiry, including research of historic cookery and husbandry manuals, art historical sources, court records, literary and linguistic evidence and ethnographic reports to clarify the translocation-driven transformation in the perception and role of the turkey as well as diachronic changes in access to the bird.

## **1.5. Spatial and temporal scope**

### **1.5.1. New World material**

The American Southwest was chosen as the New World research area for a variety of reasons (see Chapters 2 and 3 for further detail) but primary among these are the excellent skeletal preservation, generally good curatorial practices and the cultural perception of faunal bone from the relevant regions and time periods as inherently valuable. The Bluff Great House data mentioned in the preface (with the permission and assistance of Jon Driver and Cathy Cameron) have been combined with data from assemblages originating from a much wider regional and temporal context. The inclusion of sites apart from Bluff was almost entirely a product of accessibility, although I attempted to include the broadest range of sites possible. The sites from the American Southwest which were used for this project are shown in Figure 1.1 and listed in Table 1.1. Sites with coloured markers were (re-)analysed or some palaeopathological data were available for the assemblage (Paquimé).



**Figure 1.1: Map of all North American sites used in this thesis**

Site Name	State	Site Date (AD)
Arroyo Hondo	New Mexico	1300 to 1420
The Bluff Great House	Utah	1075 to 1250
The Eleventh Hour Site (29SJ633)	New Mexico	900 to 1200
Eleanor Ruin	New Mexico	950 to 1350
Gran Quivira	New Mexico	1300 to 1672
Heshotauthla	New Mexico	1200 to 1350
Hinkson (Ojo Bonito)	New Mexico	1175 to 1225
Salmon Ruin	New Mexico	1088 to 1270
Quarai	New Mexico	1200-1300s to 1678
Allantown	Arizona	500 to 1350
Hawikuh	New Mexico	1400 to 1680
Long H Ranch	Arizona	No dates
Paquimé	Chihuahua	1250 to 1470
Pecos Pueblo	New Mexico	1300-1400 to 1800s
Pueblo Bonito	New Mexico	850 to 1150
Tse Ta'a	Arizona	950-1350
Zuñi	New Mexico	Various dates

**Table 1.1: List of all North American sites used in this thesis**

The start date for this research is determined by the earliest data gathered during analysis. No assemblages dating prior to *c.* AD 900 and only two which were occupied after European contact were available for examination (this is discussed further in Chapter 3). The latest New World sites in this study are the Salinas Pueblos (Gran Quivira and Quarai in New Mexico),

which were occupied until 1672 and 1678 respectively (see Chapter 4). All analysed assemblages, with the exception of the Bluff Great House, came from sites which were located in New Mexico, though sites in Arizona are known to have turkey present (McKusick 1986), and large numbers of pathological turkey elements were excavated farther south at Paquimé in Chihuahua, Mexico (Di Peso 1974).

### **1.5.2. European material**

Although I could easily locate documentary evidence of the turkeys' presence in Europe and sketch out the spread of the species across many countries, the bones were a different matter. To date, there is no accessible archaeological material evidence that the species, initially introduced to what is now Spain and Italy, was ever physically present in those countries. Other European countries were far better represented (see Chapter 6), but not consistently; nor were the faunal assemblages necessarily retained for further study. Thus, this research was limited in geographic scope to the United Kingdom and Éire primarily because of the presence and documentation of turkey specimens. Even this narrower regional breadth was problematic.

The date boundaries for the turkey in Europe were intended to range from the arrival of the species to the end of the 19<sup>th</sup> century. Specific dates were not available for the majority of bones included in this part of the study; however, the turkey elements from Éire, England, the Isle of Man and Scotland mainly date from the 16<sup>th</sup> to late 19<sup>th</sup> century. The bones from Wood Quay in Dublin are the sole exception to this, and were dated to the 11<sup>th</sup>-13<sup>th</sup> centuries (see Chapter 6). I initially intended to cover a much wider geographic range of sites (and therefore, pathologies) but was confronted by an overwhelming general neglect of post-medieval faunal material.



#### **1.5.2.1. *Cultural attitudes in Britain and Ireland***

Unlike some continental countries with a more positive view of poultry species (e.g. France has Le Coq Sportif and Portugal has O Galo de Barcelos) negative views of poultry-keeping and its dismissal as "women's work" appear to have dominated the post-medieval literature of these Isles (Thirsk 1997, 2006). As a result, some general interpretations of turkey husbandry have been limited. Due to the lack of attention to post-medieval faunal remains and related types of material culture, it is impossible to reconstruct some aspects of poultry production, transport, slaughter or marketing in a meaningful way, even for the turkey, a bird introduced as an exotic or luxury item. The countries within this geographic area are not described in the literature in a balanced fashion. England is dramatically over-represented in terms of British historical scholarship, and dominates the available source material for post-medieval animal husbandry in general. Further details, including site descriptions and maps, are presented in Chapters 4 and 6.

#### **1.6. Data**

The faunal data used for this project include metrical and palaeopathological data gathered during visits to various repositories in the American Southwest as well as the Museum of London and the London Archaeological Archive and Research Centre. Books, articles and manuscripts on turkey behaviour and biology, primarily Dickson (1992) and Schorger (1966), in addition to numerous veterinary and palaeopathological papers and articles, have been employed in order to explore aspects of turkey husbandry and disease, injury and healing. Spanish historical sources and ethnographic texts were employed in the discussion and interpretation of the material from the American Southwest. Sources used in pursuit of information on the turkey in Europe vary considerably and are described in Chapter 6; they include husbandry manuals, cookery books, paintings and historical literature in addition to site reports and other archaeological resources. Connected Histories ([www.connectedhistories.org/](http://www.connectedhistories.org/))

and London Lives (<http://www.londonlives.org/>), two online resources run cooperatively by the University of Hertfordshire, the University of London and the University of Sheffield and the Old Bailey Court Records (<http://www.oldbaileyonline.org/>) were also used, in addition to Locating London's Past (<http://locatinglondonspast.wordpress.com/>). Despite the apparent wealth of easily-accessible resources on the post-medieval period, a paucity of both data and lore is present with regard to the history of poultry husbandry specifically. Only books edited or written by Joan Thirsk make mention of the topic (1967, 1985, 1997, and 2006). This difficulty has not been entirely overcome and demonstrates the need for further study of archaeological materials to supplement the written record and strengthen interpretations of the past. Further details of materials are provided in Chapter 3.

## **1.7. Research themes**

Two major themes are essential to this research project: the use of palaeopathology as a lens through which human-turkey relationships are examined, and how the process of translocation transformed the turkey as a species.

### **1.7.1. Palaeopathology and animal-human relationships**

This is not the first study of pathological turkey elements from the American Southwest; however, it is the first synthesis of its kind. Charmion McKusick described the pathologies from Paquimé (in Di Peso 1974) as well as some from Gran Quivira (1981); Kathy and Steve Durand (2006) described pathologies in the turkeys from Salmon Ruin and Kathy Durand (née Roler) mentioned those present at Eleanor Ruin (Roler 1999); William Gillespie (1991) noted them in the turkey bones from The Eleventh Hour site; Lang and Harris (1984) note their presence at Arroyo Hondo and as previously mentioned, I discussed those from the Bluff Great House (Fothergill 2008).

However, animal-human relationships play no role in the interpretation of these pathologies in any of the above studies (if indeed interpretation is provided); if the pathologies are discussed within the context of husbandry methods or purposes, their consideration is often relatively brief. This is surprising as palaeopathological analysis of faunal remains provides an ideal approach for the examination of domestic animal health, husbandry methods and human-animal relationships. Animal palaeopathology has been embraced in Europe (albeit relatively recently), and a number of studies on individual sites and specific ailments in certain species have been published (for instance, Davies et al. 2005, Thomas and Miklíková 2008). The number of turkey elements recovered from post-medieval sites in the UK and Éire is much lower than the American Southwest (see Chapter 6), and no descriptions of pathological turkey elements from these countries has been published (but see Fothergill et al. in press). In fact, identification of the turkey in archaeological assemblages from this time period is difficult in the countries chosen for the study area due to the presence of similarly-sized galliformes such as the capercaillie (*Tetrao urogallus*) and guinea fowls (family Numididae). Although I selected assemblages by searching through previous identifications, the elements in question were sometimes misidentified as turkey or, alternatively, turkey elements were identified as other taxa. In spite of these complications, the presence of turkey in certain contexts is meaningful, as are their metrics and (in the case of elements from the Royal London Hospital, Chapter 6) their pathologies.

### **1.7.2. Translocation and transformation**

The twinned processes of translocation and transformation underpin this research; never has the movement of a domestic species been employed as the backstory for examinations of animal health and human-animal relationships. There is a scholarly understanding of translocation as a framework for archaeological analysis with regard to animal products and live animals, especially mammals. Studies of the movement of *garum*, or fish sauce, throughout the Roman Empire are common (Wilson 2009), as are

those which examine the trade of cured pork or other preserved meats in the post-medieval period (Edwards 2011). It is well-known that live animals accompanied colonists travelling to Australia and the Americas (Karskens 2003, Peckham 1889) as part of their provisions. Bendrey et al. (2009) have investigated the movement of horses in Iron Age Britain and beyond with the use of isotopic analysis and Bendrey has examined the introduction of horses to Britain more specifically (Bendrey 2010). Benecke's 1999 volume details the movement of various vertebrate species in Holocene Europe as a whole. Crawford has followed the global movements and production of several sets of poultry species including: chickens, turkeys, japanese quail, guinea fowl, ring-necked pheasants, ducks, muscovy ducks and geese (1990); chickens, turkeys and muscovy ducks (1992); and chickens, turkeys, ducks and geese (1995). The investigations of poultry species generally frame the birds as meat products. Crawford is clearly struck by the rapid spread of the turkey across Europe in the 16th century (1992:311), and yet does not consider the possibility that any quality apart from tastiness was responsible for their acceptance; as a result, he concludes that massive numbers of turkeys must have been exported to Europe from the New World (*ibid.*).

Consideration of the human perceptions of these animals when they are introduced to new lands is less frequent (though see Albarella 2002). Their impact upon local environments and vice versa is not regularly investigated (though see O'Connor and Sykes 2010). The implicit transformation of these creatures and their roles when translocation occurs is oft-overlooked and sometimes coloured by the current perceptions of a species.

The case of the turkey is not simple or straightforward in this regard, and I am sure that studies of other species would return a similarly complex result. In the North American literature, the turkey was perceived as fulfilling many roles. Initially framed solely as a protein source, some archaeologists argue for the use of turkey feathers for the creation of garments in the American Southwest. From the ethnographic literature, it

seems likely that it was viewed by First Nations peoples as comprised of many meanings which served varying purposes and symbolised different things (see Chapter 5). This multifaceted quality is not altered when the bird is translocated to Europe. The perception of the species is indeed changed and utterly different; however, the turkey was no mere poultry product upon introduction. Instead of becoming an immediate meaty success, the bird was rare and therefore an item of social display and quite possibly the subject of envy. Even in the later post-medieval period when the turkey becomes accessible to most classes of society and is linked with Christmas dinner, its exotic strutting behaviour, colourful display and irascible temperament were sufficiently unique and memorable to merit use as a linguistic device in several languages as well as literary and artistic fodder (Eiche 2004; Chapter 6).

## **1.8. Thesis structure**

Chapter 1 has justified the importance and intellectual contribution of this research project, provided the research question, aims and objectives which underlie the analysis and interpretation of the materials described in Chapters 4, 5 and 6 and has outlined the main themes of the study. The geographic and temporal boundaries of the assemblages and other research materials have also been described here.

Chapter 2 lays out the theoretical underpinnings, essential background information and context for this study, including some discussion of research areas and their cultural environment. The subjects of animal translocation, domestication and husbandry are also reviewed here.

Chapter 3 explains the materials, methodological framework and analytical considerations for this research; it also discusses the potential biases in this study and their possible effects upon interpretations.

Chapter 4 describes the project data from the American Southwest and the results of my analyses of these assemblages.

Chapter 5 focuses on the interpretations of the data gathered from the American Southwest.

Chapter 6 provides the zooarchaeological and historical data gathered from Éire, England, the Isle of Man and Scotland as well as the interpretations thereof.

Chapter 7 includes a summary of the interpretations and discussions provided in Chapters 5 and 6 and elaborates further on some of the trends described therein. The value of this research in contributing to multiple, under-examined realms of study is also described. I close by offering some suggestions for future research in promising areas, with particular attention to those which have been highlighted during the course of this project.

## **1.9. Discussion**

Although the analytical focus of this research is palaeopathology, archaeological knowledge of the historical period in the American Southwest and post-medieval period in the UK and Ireland is sorely lacking, particularly with regard to faunal remains and their interpretation. Despite the focus on a single species, certain trends are apparent in the zooarchaeological data gathered for this project. In terms of pathological analysis, there was an expectation that lesion types and frequency would vary in different circumstances and this is generally correct (see Chapter 6). However, the most apparent trend is truly the collapse of the archaeological record after *c.* 1750. Written sources are simply not adequate documentation of the past, nor are they flawlessly representational of societies in any given time period. Like all data collection processes in archaeology, faunal analysis can be subjective; however, it proves vital to the interpretation of the past, particularly when combined with multiple strands of evidence.

By focussing explicitly on these themes and using the approaches I have described in this chapter, I hope to enrich our knowledge of overlooked aspects of the discipline, illuminate some areas wanting in scholarly attention and emphasise the potential contributory power of

palaeopathology as a central research focus. Chapter 2 will provide the background and general research orientation of this project.

## **Chapter Two. Project Orientation**

### **2.1. Introduction**

In researching this project, sources from many disciplines have been drawn together and an inclusive, flexible theoretical framework has been used to incorporate them. Studying the movement (and human transport) of animals can be difficult even when vast distances, different environments and dramatically disparate cultural contexts are not involved. Animal-human relationships and human perceptions would have been at the core of the many, layered components of the translocation process. In making postulations regarding the husbandry practices operating within these relationships, I have attempted to be as flexible as possible whilst continuously maintaining a link with the skeletal material. This malleability stems in part from my orientation in approaching the material culture and written sources analysed for this project. When considering possibilities of interpretation, I have favoured those which inhabit an intersection of multiple lines of evidence rather than the most parsimonious or those which dovetail most seamlessly with the established literature.

The term "animal-human relationships" is used throughout this work to represent the multiplicity of ways in which animals and humans are connected or associated. These relationships, along with human perceptions of animals, would have varied widely in character and been inconsistent throughout human history. Indeed, they would have varied on an individual basis. Despite the probable depth of these interactions, little archaeological research has been conducted on the topic until recently and the field is certainly an emergent one. The Cultural History of Animals, a six-volume set edited by Linda Kalof and Brigitte Resl (2008) details human-animal relationships throughout history, but an archaeologically-grounded equivalent has not been developed. Some specific zooarchaeological research on the earliest keeping of pet tortoises by Richard Thomas has clarified certain aspects of the ever-changing role of animals in human life (2010)



and work by Tim Ingold (1994) has more generally illuminated the boundaries between animality and humanity while James Serpell (1996) has examined the spectrum of animal-human relationships in the past and in recent history. This chapter will address the following subjects: translocation and perception of animal species; domestication; the turkey in North America and within the American Southwest; European encounters with the turkey; and the European (specifically British and Irish) contexts into which turkeys were introduced.

## **2.2. Translocation and perception of animal species**

The movement of live members of any domestic species over a significant distance is the background against which the palaeopathological and historical facets of this research are set. Travel of animals in the past is a daunting topic, but some aspects of this undertaking are clear. Not every animal is easily parcelled for transit, behaves in a cooperative fashion or moves itself with great efficiency. The varying purposes for which animals were being moved would have changed the techniques employed for doing so. The necessity of animals arriving at their ultimate destination alive (let alone unharmed) would further complicate matters. Movement of animals from their area of origin is the broadest way to describe the concept of translocation. The state of being which results from this process has been characterised as "exile" by Umberto Albarella (2002):

"The term is reminiscent of a sense of angst and nostalgia for a lost homeland, and it is in this sense appropriate for the suffering of the exiled animal, alienated from its environment, climate and, in some cases, family or group. (*ibid.*: 133)"

Whether or not it is possible to identify with the animal(s) in question (and considering that the term may not seem equally appropriate for all species), a fair point is made, particularly as the most common archaeological identifications of translocated animals are as purposeful introductions to a

new area or as indicators or hallmarks of long-distance trade. Albarella lists four categories of animal exile:

- 1.) Animals introduced to improve local livestock
- 2.) Animals introduced accidentally, often becoming pests
- 3.) Animals introduced to the local countryside, generally for social or economic purposes
- 4.) Animals introduced to a new land as an exotic or a curiosity  
(*ibid.*: 134)

The first category essentially encompasses domestic species. There is historical speculation and modern data on the movement of different breeds or types of livestock as a result of attempts to improve or diversify a population through interbreeding (Armitage 1982). Zooarchaeological evidence certainly supports this (Thomas 2005). Category two includes the various insects, rodents and other animals perceived as destructive which have been unintentionally introduced to many areas in the company of humans. When considering the third category, fallow deer and rabbits are among the first examples to spring to mind in northern Europe (Sykes 2010, Sykes and Curl 2010). Interestingly, it is now difficult to conceive of a British landscape without these two species and in some cases, the origins of similarly categorised species (e.g. pheasants) are often forgotten or perceived as murky. Category four might include pets, menagerie or zoo animals and those given as auspicious gifts; the recent "gift" of pandas to Scotland by China provides a good example. Turkeys could qualify as an entry under categories three and four above; certainly they were initially considered exotic, luxury items which were introduced and acted as a symbol for display which transitioned to a product which can only be described as primarily economic in nature (see Chapter 6). Similar species have experienced comparable changes in human perception. The chicken, for instance, has had the roles of symbol, divinatory object, poultry product

and companion over the course of a long diaspora (MacDonald and Edwards 1993, Poole 2010, Serpell 1996).

Turkeys do not migrate and are territorial creatures. As the genetic complexity of the domestic turkey may support multiple locales of domestication (Speller et al. 2009), it seems highly probable that turkeys and other fauna were transported across the American Southwest. Little is known about how their transport may have been accomplished, but there is evidence for the transport of other avifauna such as macaws (Hargrave 1970) and there is some evidence for the use of basketry to contain birds (Creel and McKusick 1994). It also follows that turkeys would have been far more important to transport alive due to their usefulness in feather and egg production as well as their potential for general breeding. However, although the use of baskets may have been ideal for smaller species which are likely to take flight (such as macaws), it seems possible that turkeys would have been more amenable to herding en masse in a manner similar to medieval goose herding, provided they were allowed to sleep during hours of darkness. Given the general nature of turkey temperament (Schorger 1966; Dickson 1992) it seems unlikely that even juvenile turkeys would have cooperated sufficiently or arrived alive if they been transported in baskets. In addition to the use of basketry containers and herding, another possibility is that turkeys were tethered by a lead of some kind and "walked" to their destination. The benefits of "walking" or limiting the movement of the birds whilst travelling would have included greater control and perhaps their protection from predators or theft. If individuals with desirable feather colours (or other traits) were being transported, their value would have justified a degree of caution and protection.

Introducing birds to new environments may also have caused problems. Even on small scales, various problems could have arisen when turkeys were moved; certainly with regard to their transatlantic relocation, this would have been the case. The biology and behaviour of the turkey (Schorger 1966:132-160 Dickson 1992:46-65) could have posed problems (the

loss of the social structure in which individuals were embedded, failures to meet nutritional needs and the destructive tendencies of males, to name a few). Additionally, the environmental and climatic differences between southern North America and most parts in Europe are immense and these changes would have caused a great deal of stress (to say nothing of the strain and discomfort of travelling by sea). In the case of the turkeys imported to Europe, their husbandry would probably have differed dramatically from what they experienced in the American Southwest or Mexico. Differences in perception and culture are less easily established but could also have impacted the health of the translocated turkeys. A valuable fowl (or pair of birds for the purposes of reproduction) could have been worth some investment and care. Some art history sources portray turkeys in a similar fashion to other exotic fowl (see Chapter 6), and given the initial rareness of the bird and the unusual strutting behaviour of the male, it is probable that the display of turkeycocks (which likely served to indicate high social status) may have justified the importance of maintaining the bird's health.

It is worth considering human attitudes and the interactions between humans as these are crucial to the study of translocation within a zooarchaeological framework. The perceptions of turkeys must have been as diverse as the individuals and groups of people who interacted with the birds. The people who raised the turkeys prior to their translocation and sold or gave them to the people who then transported and possibly re-sold them to the final buyer at their ultimate destination all had differing perceptions and impressions of the bird. Each of these individuals may have intended different purposes for the animal; indeed, it is possible that a pair of turkeys raised for feathers was sold to someone who thought they would make fine, delicious centrepieces on a dinner table, but was ultimately purchased to live on as a decorative show of wealth for a castle garden. Each of these possibilities implies a different attitude toward the animal and

perhaps would require individual methods of husbandry for the desired end product.

With regard to the products of the turkey and the bird itself as a product, the time(s) at which the bird ceases to be conceptualised as an animal who produces and becomes a commodified product is innately linked to translocation and therefore of great interest. Although attitudes toward the bird varied among First Nations peoples (Wright 1914, 1915a, 1915b), an example is provided in Alexander Stephen's description of the Hopi and their turkeys (Stephen 1936). It is clear that the feathers from specific anatomical locations were required for certain ceremonies (Chapter 5). As the body of the living bird remained intact as an anatomical object within Hopi conceptualisations, it is probable that the feathers were considered the valuable, intended product and not necessarily the turkey itself. Another shift in perception is that of the "democratisation" of the turkey in the UK and Éire. When introduced, the turkey was a luxury good and an item which few people could obtain; later it became more widely available and by the 1950s it had evolved into a commodified, mass-marketed product.

Key to understanding the processes implicit in the translocation of the turkey are the historical background and archaeological evidence for its domestication, a topic which was debated until relatively recently. Also relevant are indicators of the husbandry methods employed in keeping the bird both prior to and following translocation. Domestication is a complex topic, and discussion can be fraught with dichotomous thinking and (depending upon the age of the publication and anticipated audience) an unwillingness to assess multiple lines of evidence in judging the status of certain species.

### **2.3. Domestication**

Domestication is the process by which captive animals adapt to humans and the environment which they provide; adaptation to the captive environment is achieved through genetic changes induced through artificial selection and

experiences during an animal's lifetime (Price 2002:10). Tameness and tameability are characteristics which are often selected for consciously or unconsciously on the part of humans when breeding domesticates (Price 2002). A tame animal (or a tameable animal) is not the same thing as a domestic animal. Tameness is a measure of the extent to which an individual animal is reluctant to avoid or motivated to approach humans, while tameability is the inherited capacity of an individual animal for tameness (*ibid.* 113-114). Not all tamed animals are easily domesticated. Although they may have little fear of human approach, other important qualifications for domestication (for example, reproductive success in captivity) may not be met; therefore even the most tameable creatures are not truly “self-domesticating.”

For successful domestication of any species to be possible, several criteria must be met (in addition to the appeal and desirability of the animal and/or its products). At a minimum, certain “pre-adaptations” must have taken place which render the creature in question more susceptible to human control. According to Price, “The degree to which a wild population of animals is pre-adapted for domestication depends on the degree of developmental plasticity of the species and the degree to which the captive environment allows for the development and expression of species-typical behavioural patterns compatible with husbandry techniques” (Price 2002:22). At a minimum, the potential domesticate must tolerate the presence of humans, not be excessively territorial, and lack a complex courtship ritual in order to be bred under human control (Serjeantson 2009:287). A species which can efficiently convert plant energy into meat or useful secondary products is ideal; one which has a naturally hierarchical social unit is also useful (Clutton-Brock 1999). According to Swabe, (discussed below) some animals themselves could directly benefit from their own domestication (1999).

When evaluated by Price’s list of behavioural traits favourable to domestication (2002:23), turkeys are a suitable and even ideal domesticate

due to their social organisation, sexual behaviour, parental behaviour, tameability and habitat choice. Schorger (1966:331-337) has commented at length on the ability of the turkey to withstand severe cold and its resistance to starvation. Pinkley (1965) is of the opinion that turkeys were not only self-domesticating, but an interfering annoyance. She theorises that the turkey so irritated the Ancestral Pueblo people of the American Southwest that they took to penning them in order to keep them out of their crops and workspace! Another theory discussed by Swabe (1999:36-37) is the possibility that cooperative associations with others were beneficial for animal species, and that the process of domestication could therefore be “regarded as a natural product of evolution, rather than the consequence of human innovation.” Whichever way it occurred, the turkey turned out to be an excellent and adaptable domesticate.

#### **2.4. The turkey in North America**

The turkey was present throughout most of North America and was known to virtually all of the First Nations that the European settlers of America and southern Canada encountered. Albert Hazen Wright reviewed early historical records and suggested that the turkey was tamed or partially domesticated by the aboriginal peoples of North America prior to its initial export to Europe. These groups had differing relationships with the turkey. They tamed it or it was perceived to be a type of pet (Wright 1914:353), hunted it on occasion (1915a:70), gathered its feathers for various purposes (1914:347, 1915a:66-68) gave it as a gift (1914:347, 1915a:77), tipped arrows with male turkey spurs (1915b:78) or may have avoided it altogether. There is mention of a group in the American Southwest who would not consume the flesh of the turkey at all, to the shock and bemusement of the European observers (Wright 1914). Wright observes that the turkey may have been used primarily for feathers prior to European contact, and his studies include many statements from early settlers, trappers, and explorers who observed the use of turkey feather blankets, mantles and headdresses by a variety of North American native peoples.

Though there are not many accounts from the American Southwest specifically, Spanish sources from AD 1520-1540 record that turkeys were used for feathers and food by native peoples in that region (Wright *ibid.*).

Six subspecies of wild turkey are native to North America (Figure 2.1). Each have distinctive current ranges and colourations, but are cross-fertile (Dickson 1992), and it is from these that the domestic turkey arose. *Meleagris gallopavo silvestris* is also known as the Eastern Wild Turkey; its range covers the eastern half of the United States of America as well as the southern regions of Manitoba, Ontario, Quebec, and the Maritime Provinces in Canada. The Osceola Wild Turkey or *Meleagris gallopavo osceola*, purportedly named after a Seminole chief, is limited in range to the Florida peninsula. *Meleagris gallopavo intermedia* or the Rio Grande Turkey, has a native range across the American Southwest states which also spans northwest into Oregon. *Meleagris gallopavo merriami*, or Merriam's Wild Turkey, ranges through the Rocky Mountains as well as the higher elevations of South Dakota and New Mexico. *Meleagris gallopavo mexicana*, or Gould's Wild Turkey, ranges from central to northern Mexico in addition to southern Arizona and New Mexico. *Meleagris gallopavo gallopavo*, or the Mexican Wild Turkey, ranges throughout much of Mexico (Dickson 1992). The ancient ranges of the different turkey sub-species are difficult to reconstruct due to the impact of hunting activity since European contact and the re-introduction of turkeys into various habitats throughout North America. The standard reconstruction of turkey ranges is still to be found in Schorger (1966:43, 49), which Speller et al. (2009) have adapted (see Figure 2.1 below).





**Figure 2.1: Reconstructed ranges of turkey sub-species (after Speller et. al. 2009)**

Upon encountering the turkey, European attitudes to the bird were far less diverse. The pioneers felt that "the breast of the wild turkey we were taught to call bread" (Howe 1873:210). The turkey was a delightful and unexpected creature to encounter in the New World. A member of the La Salle expedition encapsulates the European response to the presence and qualities of the species:

"the Plenty of wild Fowl, and particularly of Turkeys, whereof we killed many, was an ease to our Sufferings, and Help to bear our Toil with more Satisfaction" (Joutel 1713:82)

Turkeys were widely hunted and exploited as a food source whenever encountered; this took its toll. Wright repeatedly acknowledges (1915a, 1915b) the fact that the turkey was disappearing in the wake of colonists and others travelling westward. Quoting J.H. Hinton, an American topographer commenting on the state of the turkey:

“In Canada, and the now densely-peopled parts of the United States, they were formerly very abundant; but like the Indian and the buffalo they have been compelled to yield to the destructive ingenuity of the white settlers...” (Hinton 1832:177, cited in Wright 1915a:74).

By most accounts (Brant 1998 and Grivetti et al. 2001 being notable exceptions), the turkey was first domesticated in Mexico and the American Southwest prior to the arrival of the Spanish (Nordenskjöld 1893:95; Morris 1939; McGregor 1941; Schorger 1966; Breitburg 1988; Crawford 1992; Spielman and Angstadt-Leto 1996; Davis 2001; Driver 2002; Anderson 2004; Smith 2006; Beacham and Durand 2007; Speller et al. 2009). Brant (1998) is of the opinion that while the turkey may have originated in North America, there is no evidence for its domestication previous to European involvement. While he does state that Montezuma kept turkeys, Brant also writes:

“...he [Montezuma] had an extensive collection of animals resembling a zoo. A major source of food for the meat eaters was turkeys. It is probable that these birds were captive rather than domesticated. So there is little doubt that the real domestication of the turkey was first accomplished in Europe” (Brant 1998:366).

It is unclear how Brant reaches the conclusion that all of the estimated 365,000 turkeys required yearly by Montezuma’s household (Davis 2001:36) were merely captive and not domestic. Similarly, Grivetti et al. (2001) state unequivocally that the turkey was never domesticated in the Americas. However, the evidence against domestication supplied by Brant and Grivetti et al., or rather, a lack thereof, appears to amount to a dearth of knowledge of the archaeological and historical literature, and not an argument supported by data.

## **2.5. The American Southwest**

The American Southwest includes a region called 'The Four Corners' (the meeting points of Utah, Colorado, Arizona and New Mexico; see Figure 1.1

in Chapter 1). This area is home to the "Chaco Phenomenon," a regional network which may have included one of the centres for turkey domestication.

Table 2.1 illustrates the Pecos Classification, the division of all known Ancestral Pueblo culture groups into chronological phases that archaeologists in the American Southwest generally use, often with slight modifications based upon their material specialisation or theoretical orientation. Domestic turkey has not been recovered prior to what is termed the Basketmaker II period (Breitburg 1988:24), and the chronology presented will begin at that point.

Name	Period	Material Characteristics
<b>Basketmaker II</b>	1200 BC-AD 500	Woven basketry, pithouses, use of atlatl, maize cultivated, beans and squash by <i>c.</i> 200 BC
<b>Basketmaker III</b>	AD 500-750	Ceramic production, pithouses, use of bow and arrow, turkey husbandry, proto-kivas appear (see below)
<b>Pueblo I</b>	AD 750-900	Masonry or jacal (similar to wattle-and-daub) structures built, kivas as well (see below), shells and turquoise imported
<b>Pueblo II</b>	AD 900-1150	Terraced and irrigated agriculture, large multiple-story masonry pueblos built in Chaco Canyon, copper bells and macaws imported, intensification of turkey production
<b>Pueblo III</b>	AD 1150-1350	Cliff dwellings and towers more common; large-scale abandonment/migration at <i>c.</i> AD 1300.
<b>Pueblo IV</b>	AD 1350-1600	Large pueblos with central courtyard, cotton introduced
<b>Pueblo V</b>	AD 1600-Present	The Spanish arrive, long-occupied sites such as Gran Quivira are taken over

**Table 2.1: The Pecos Classification**

The term "Chaco Phenomenon" was initially coined by Cynthia Irwin-Williams in a paper she presented at the 1975 Pecos Conference. It is used here to describe not only the large masonry structures of the Chaco Canyon proper, but also the idea and conceptualisation of Chaco as a regional social system, involving hundreds of great house communities and with links to a number of other contemporary cultural groups within the American Southwest and northern Mexico. The term is also used for a very broad set of physical and cultural traits ascribed to the Ancestral Pueblo regional system centred in Chaco Canyon, New Mexico.

Within Chaco Canyon, 22 large masonry structures called great houses have been identified. The largest of these had 700 rooms and possibly as many as four stories. These great houses are considered a hallmark of the Ancestral Pueblo peoples, and have a number of unique architectural characteristics in common. Scattered across the landscape in Utah, Colorado, Arizona and New Mexico are around 200 smaller great houses with similar architecture, often called “outliers”; many of them are interpreted as centres of local unit pueblo communities. Distinctive artefacts are associated with great houses within Chaco Canyon, and often those outside of it. Rare and distantly-acquired shell, lithic materials and ceramics along with imported copper bells and macaw remains are the most commonly mentioned exotica (Doyel 1991; Toll 1991; Mathien 1993). In addition to the imported material culture and great houses, the Ancestral Pueblo peoples created a calendar and practised astronomy (Marshall and Sofaer 1986; Sofaer and Sinclair 1987; Malville and Putnam 1993), constructed a long-distance signal network (Lekson 1999), and built a system of roads (Frazier 2005).

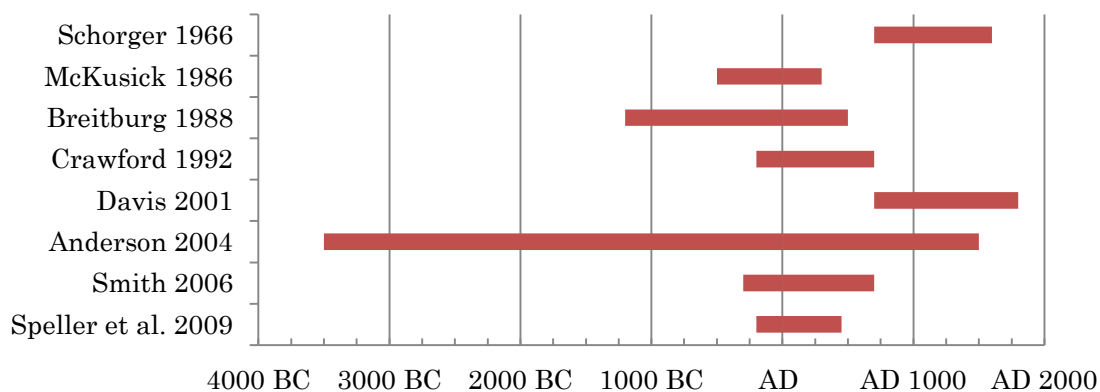
Kivas are another significant Ancestral Pueblo feature; they are round rooms possessing a set of regionally-variant architectural characteristics. These appear at some point in Basketmaker III (see Table 2.1), were commonly constructed below ground surface and are now sometimes described as “socially integrative features” (e.g. Adler 1993). Many great houses outside of Chaco Canyon have embedded kivas, which may be instead of or in addition to a great kiva (a much larger kiva outside and possibly some distance from the pueblo).

The height of the Chaco Phenomenon (during which associated settlement systems were most extensive) and occurs during Pueblo II (Table 2.1). It is in this period that turkey production intensifies in many regions throughout the American Southwest (Akins 1987; Windes 1987; Munro 1994; Driver 1996; Muir 1999; Durand and Durand 2006; Badenhorst and Driver 2009). Research on later, historical assemblages in the area is uncommon (Gifford-Gonzalez 2010), but a study by Tarcan and Driver reveals a decrease in the

proportion of turkey in a Zuñi faunal assemblage after Spanish contact (2010).

## 2.6. The turkey in the American Southwest

A. W. Schorger wrote the first and only treatise on the subject of turkey domestication, *The Wild Turkey: Its History and Domestication* (1966); he estimated that the range of the wild turkey (*Meleagris gallopavo*) spanned 102,300 square miles across parts of Arizona, Colorado, New Mexico, and Utah (Figure 2.1). Schorger concluded that the turkey from archaeological sites in the American Southwest was a domesticated creature. Dates for the incipient domestication of the turkey in the American Southwest vary widely, but there appears to be general consensus that the bird was domesticated prior to AD 500 or the end of the Basketmaker II period. Scholars have suggested varying dates with different levels of specificity for the domestication of the turkey in the American Southwest. For example, Swabe (1991:35) supplies “??” as the domestication date for the turkey, but states that the bird was domesticated in North America. McKusick (1986) gives a date of introduction and not domestication as she theorised that the turkey was introduced into the American Southwest in an already-domestic state. The following chart (Figure 2.2) summarises a sample of suggested domestication date ranges.



**Figure 2.2: Dates of turkey domestication, various authors**

### **2.6.1. Archaeological evidence for domestic turkeys in the American Southwest**

There is firm archaeological support for the domesticate status of the turkey in the New World. This evidence mainly consists of organic material studies (analyses of turkey bones, aDNA, eggshell, dung etc.), as well as descriptions of architectural features. Although I am of the opinion that the domesticate status of an animal cannot be derived purely from skeletal metrics (in agreement with Breitburg 1988 and Munro 1994), I include some of these studies as they have been undertaken in pursuit of the origin of the domestic turkey in the American Southwest.

According to Breitburg (1988), archaeological support for turkey domestication in the American Southwest was first described in the works of Hargrave (1939), Reed (1951) and Schorger (1961, 1966, and 1970). In an early study, Hargrave noted the presence of many turkey bones in assemblages originating in the Kayenta region of Arizona and Utah; the sites (AD 1272 -1300) were in areas where the turkey was not known to exist after European contact. Reed's study documented turkey feathers and eggshell as well as skeletal remains in later components of large sites such as Chaco Canyon, Kiet Siel, and Mesa Verde (Reed 1951). He interpreted the presence of enclosures with large deposits of turkey droppings in them as evidence for domestication. Reed argued that the turkey was probably used only for feathers prior to AD 900, but began to be incorporated into the aboriginal diet between AD 900 and 1200. Evidence for this was drawn from his own investigations as well as Hargrave's 1939 study. Turkey eggshell and unhatched clutches have been used to suggest domestication, as control over breeding is often presupposes domestication. A recent study on turkey eggshell from Salmon Ruin in New Mexico by Beacham and Durand (2007) has concluded that intensive, purposeful breeding of captive turkey populations took place by AD 1200; Room 128 at the same site has been interpreted as a turkey pen.

McKusick's (1980) study of 6,713 turkey remains from across the American Southwest concluded that there were three forms of turkey present on aboriginal sites: the Small Indian Domestic (*M. g. tularosa*), the Large Indian Domestic, and Merriam's Wild Turkey (both *M. g. merriami*). The Small Indian Domestic was seen as originating from the Mogollon region of New Mexico and dated from 500-100 BC, while the Large Indian Domestic was thought to be from northeast Arizona and appear on the scene around AD 400. McKusick (1980) believed that the Small Indian Domestic was kept in the Eastern Pueblos until approximately AD 1670, and the Large Indian Domestic until the AD 1720s. While McKusick suggested that the turkey was introduced to the American Southwest in a domesticated form, others have argued that domestication occurred independently in the American Southwest (Breitburg 1988, Yang and Speller 2006, Speller *et al.* 2009).

Since the forms McKusick described were identified using size, it is possible that these do not represent separate domestications of the turkey, but rather that the earlier form is smaller as an effect of domestication itself (though this size reduction as a hallmark of the early domestication process is debated; see Zeder 2006). Additionally, Breitburg (1988:37-38,70) contends that it is statistically impossible to differentiate subspecies based upon metrical analyses such as those conducted by McKusick. Munro (1994) also argues that osteological changes during the early phases of turkey domestication would not be discernable, and concluded that turkey bone from archaeological sites cannot be used to pinpoint the domestication of the species.

Although metrical analyses have not successfully identified the ancestor of the domestic turkey (Munro 1994; Serjeantson 2009:292), a pioneering ancient DNA project has reported that several sub-species contributed to the turkey remains present in faunal assemblages from the American Southwest (Speller and Yang 2006). Speller *et al.* (2009) completed mitochondrial ancient DNA analysis of turkey remains and coprolites from pre-contact sites in the American Southwest and Mexico. They concluded

that there were probably two incidences of turkey domestication in the New World, one in Mesoamerica, and one in the American Southwest; a notable reduction in genetic diversity is interpreted as evidence for breeding and selection. In addition, the same matriline persists and there is a broad homogeneity to the genetic signature of Southwestern turkeys over at least a thousand years, which supports the idea of intensive husbandry (Speller *et al.* 2009:4) but could also indicate multiple, frequent exchanges of animals and only very limited contact with wild turkeys.

### **2.6.2. Husbandry and diachronic change in the presence of domestic turkey**

Despite the lack of agreement on locations or dates of domestication, the archaeological, historical, and ancient DNA literature appears to agree that the turkey was domesticated some hundreds of years prior to the arrival of the Spanish (See Figure 2.2). Breitburg (1988:24) observes that turkey remains are not recovered from sites pre-dating Basketmaker II (1200 BC to AD 500, Table 2.1). The evidence for husbandry methods from early periods is scant, although it is clear that the birds occur in burial contexts and references are made to items created with their feathers. Morris (1939) recovered turkey feather blankets from Grand Gulch, Utah, Durango, Colorado, and Canyon del Muerto (Canyon de Chelly), Arizona in Basketmaker II contexts. Moreover, from Canyon de Chelly a small, headless, dessicated turkey with vegetal cordage around its neck (dating to approximately AD 250) was discovered. Turkey feathers dating to the Basketmaker II period from Fresnal Cave in New Mexico were found in a partially-processed condition in preparation for feather cordage production (Breitburg 1988:23). Four small turkeys dating to approximately 300 BC were recovered from Tularosa Cave (Martin *et al.* 1952) along with quantities of eggshell (Rea 1980).

Although turkey finds remain uncommon, the measurements of turkey skeletal elements increase from Basketmaker III times (AD 500 to 750), as evidenced by the specimens recovered from Mesa Verde, Colorado and



Canyon de Chelly, Arizona (Breitburg 1988:24). Turkeys are known to have been buried whole throughout Basketmaker III (Rea 1980). Additionally, during Basketmaker III, structures described as “pen-like” were built at Tseahatso in Arizona (Morris 1933), a site from which over 300 dessicated birds were recovered (Breitburg 1988). While few details were recorded, these birds appear to have died of old age, and one had a fractured leg bone which had been bound and splinted, though which element was affected is not recorded (McKusick 1980).

Turkey remains continue to be comparatively scarce during the Pueblo I period, but some were recovered from Mesa Verde and Favorino (both in south eastern Colorado) as well as Tse Ta’a (in north eastern Arizona). The continuing absence of butchered and/or burned turkey bones at this time suggests that the birds may indeed have remained a source of feathers (Breitburg 1988:25).

During the Pueblo II period (AD 900 -1150), the pattern of turkey utilisation appears to change as evidence for the species becomes widespread throughout the American Southwest and parts of northern Mexico. The proportion and overall number of turkey bones recovered in faunal assemblages increases (Akins 1987; Windes 1987; Munro 1994; Driver 1996; Muir 1999; Durand and Durand 2006) The contexts from which turkeys are excavated are sometimes similar to those from earlier periods. Brand et al. (1937) note that the bodies of headless female turkeys are found buried in kivas at Chaco Canyon sites during Pueblo II, which may hint at a little-changed or somewhat consistent perception of the animal. At the end of the Pueblo II period and throughout Pueblo III (AD 1150 -1350) the pattern of turkey production shifted and intensified, as evidenced by an increase in the occurrence of feathered textiles, eggshell, gizzard stones, and accumulations of turkey dung. This change has been noted at Chaco Canyon (Akins 1985), Mug House (Rohn 1971), Aztec Ruin (Morris 1939), Step House (Nordenskjöld 1893), and Paquimé/Casas Grandes (Breitburg 1988). At approximately AD 1215, structures which are interpreted as turkey pens

were constructed at Pindi Pueblo in New Mexico (Stubbs and Stallings 1953). The fill of these enclosures consisted of disintegrated turkey dung mixed with eggshell and turkey bones, and some previously abandoned rooms in the pueblo appear to have been converted to coops. Theories on the motivation for this amplification of turkey production include increased utilisation as a meat product (Rohn 1971), the use of live turkeys as a form of pest control in corn fields (Stiger 1979), and the use of their bones as a source of raw material for tool production (Breitburg 1988).

In Pueblo IV (AD 1350 -1600), a larger form of the domestic turkey (McKusick's Large Indian Domestic) is present in high numbers at sites in the Northern Rio Grande Basin in New Mexico, including Arroyo Hondo, Pueblo Encierro, and Alfred Herrera (Lang and Noble 1978, Lang and Harris 1984). Between AD 1400 and 1500, a larger form of the domestic turkey also appears at Paquimé/Casas Grandes (Breitburg 1988). At Arroyo Hondo, twenty-three structures interpreted as pens (apparently constructed for the purpose of containing turkeys) were present. The fill of these pens contained turkey dung, eggshells and unhatched egg clutches (Lang and Harris 1984). The turkey droppings from Arroyo Hondo contained pine and piñon in addition to domestic plant pollen; this could be evidence for turkey herding. The turkey's increased importance at Arroyo Hondo is said to parallel the rapid growth of the community from about AD 1315 to 1340. Lang and Harris (1984) are of the opinion that this reflects an increase in production in response to declining populations of hunted mammals, and they interpret the turkey as primarily a meat product. In central New Mexico at Pueblo Pardo and Tompiro, the use of turkey persists through the Pueblo IV period, but disappears from the archaeological record by 1670 (Breitburg 1988).

When the Spanish arrived in the American Southwest, turkeys were still kept by the Pueblo peoples in the northern Rio Grande region. Schorger (1966) refers to Spanish sources which documented the presence of domestic turkeys used by aboriginal peoples of the American Southwest. These early

reports document large-scale turkey husbandry by the Pueblo peoples, and turkeys have traditionally been considered a minor resource until the end of the Pueblo II period when production intensified and the bird is tacitly assumed to have been converted to a meat product (Breitburg 1988; Beacham and Durand 2007). Somewhat at odds with this record of intensification are other sources which claim that certain groups of Pueblo peoples would not eat turkeys and bred them for secondary products only (Wright 1914; Schorger 1966). There are records which describe Pueblo turkey-keeping into the 19<sup>th</sup> and 20<sup>th</sup> centuries. Frank Hamilton Cushing, in his ethnographic work at Zuñi in the 1880s (further discussed in Chapter 5), described the herding and plucking of turkeys. This practice could relate to the later herding and plucking of sheep (1979). Gunn (1917), writing decades after Cushing, noted that the people of Laguna and Acoma pueblos herded flocks of turkeys in a manner akin to the herding of goats and sheep.

## **2.7. European encounters in the New World**

By all published accounts, the first Europeans to encounter the turkey in the New World were the Spanish (Wright 1914; Schorger 1966). Some sources state that the turkey was being returned to Spain for breeding by 1511 based upon the survival of a recorded demand made by the Bishop of Valencia that each ship returning from the West Indies bring back male and female turkeys in equal proportions (Schorger 1966:9). However, there is no evidence for the raising of turkeys in the West Indies prior to 1520 and very few ships were travelling there from Spain during that period (Smith 2006:16). The earliest certain date by which the Spanish could have come across the turkey in the New World was 1518 when Columbus landed at Point Caxinas (Cabo de Honduras) and was presented with native fowl which were referred to as *gallinas de la tierra* and described as better than those of Spain (Colón 1947:278). It is therefore entirely possible that the first European to see the turkey was Columbus (Smith 2006). Unfortunately, the loose terminology which was used to describe the birds of

the New World does not allow a precise identification of the first European encounter with a turkey. In all likelihood, however, it took place in Mexico.

The Aztecs did not domesticate the turkey, but rather readily adopted them upon their settlement in the central valley of Mexico, where they had been domesticated previously by other groups (Smith 2006:9). Hence, when the Spanish arrived in Mexico, they encountered both the domestic turkey (*Meleagris gallopavo*) as well as the ocellated turkey (*Meleagris ocellata*), which was never domesticated. The turkeys of Mexico impressed the Spanish, and were described as larger, better tasting, and sometimes more beautiful than their Spanish counterparts (Schorger 1966:13): “The flesh of these turkeys is very good and incomparably better and more tender than that of the peafowls in Spain” (Oviedo y Valdes 1950:172).

Upon the arrival of Cortés and his men in Mexico in March of 1519, they were offered turkeys along with other agricultural produce by a number of native people during their march to Tenochtitlán (Smith 2006). In 1520, Cortés wrote: “[t]here is a street for game in which are sold all kinds of native birds such as turkeys, partridges, quails, [and] wild ducks” (Schorger 1966:12). Some authors estimate that between menagerie, sacrifice, and household needs, approximately 365,000 turkeys were consumed yearly by Montezuma (*ibid.*:11, Davis 2001:36). Schorger notes that Cortés was given 1,500 turkeys as part of the estate he demanded from Montezuma (1966:11).

Later on and further north, the fact that turkey meat was considered a secondary product or avoided altogether by many of the Pueblo peoples seems to have confused the Spanish. The Pueblo people of Zuñi reportedly told Coronado that they kept turkeys only for feathers:

“We found fowls, but only a few, and yet there are some. The Indians tell me that they do not eat these in any of the seven villages, but keep them merely for the sake of procuring feathers. I do not believe this, because they are very good and better than those of Mexico” (Ramusio 1606:302, trans. by Schorger 1966:34).

### 2.7.1. The sacred turkey

The Aztecs deified the turkey as Chalchiuhtotolin (also known as ‘Jade Turkey’ or ‘Jewelled Bird,’ see Figure 2.3 below), a god of disease and plague associated with Tezcatlipoca, the nemesis of Quetzacoatl (Schorger 1966, Young 2000). According to Young’s review of the *Codex Borbonicus* (2000), Chalchiuhtotolin was said to have the ability to cleanse humans of contamination and absolve guilt.



**Figure 2.3: Chalchiutotolin, from the Codex Borbonicus**

Turkey remains have also been recorded from Mexican contexts of a sacred nature and documented as part of ceremonial activities. Breitburg mentions that skeletal elements from a female turkey were recovered from an altar in the city of Oaxaca and that the Zapotec people of central Mexico sprinkled the blood of a turkey on newly planted fields (1988:97). He also theorises that the turkeys at the site of Paquimé in northwestern Mexico were acquired from a variety of areas around the American Southwest and bred exclusively for ritual and tribute purposes (*ibid.*:86). In the American Southwest, the turkey was symbolic of the earth and was buried whole, possibly sacrificed, and its feathers were used extensively for the creation of

sacred objects such as masks, prayer sticks, and headdresses (Davis 2001). In these cultures, turkey feathers were associated with bringing rain (Schorger 1966:362) and according to Schroeder (1968:99), sticks adorned with turkey feathers were placed in fields and in pools of water by Pueblo people of the Galisteo Basin in order to bring rain. In addition to religious uses, turkey feathers were used by many Pueblo people in the creation of blankets, clothing, objects of adornment, and pouches (Schorger 1966:360). This tradition carried on until at least the end of the 16<sup>th</sup> century. In 1598, Oñate noted that the inhabitants of Hawikuh still offered turkey feathers to their "idols" (Bolton 1916:235).

The thematic recurrence of feathers as an important resource is likely not coincidental; later ethnographic accounts (see Chapter 5) do appear to confirm that a primary function of the turkey at the Pueblos in what was later New Mexico was to produce feathers for symbolic and mundane purposes alike.

### **2.7.2. Problematic nomenclature**

In 1758, Linnaeus gave the turkey the classification *Meleagris gallopavo*, essentially naming it a "guinea fowl-chickenlike peacock" (Davis 2001:26). The complexity evident in this classification may have stemmed from the innate confusion surrounding the origin and naming of the turkey. The word 'turkey' or 'turkey-cock' was used in Europe to describe fowl approximately three centuries prior to the introduction of *Meleagris gallopavo* (Schorger 1966:3). During the 16<sup>th</sup> century while the turkey was first imported from North America, the guinea fowl (*Numida meleagris*) was also being imported to Spanish dominions from Africa through Turkey (Davis 2001:28). The popular misconception that the turkey came from Turkey persisted long after it was known that the bird originated in the New World, probably at least in part because contemporary authors perpetuated the Turkish origin story (Wright 1914). Willughby (1678:160) wrote that the English called the bird *turkey* because it was thought to have been brought from Turkey.

Samuel Johnson's 1755 *A Dictionary of the English Language* described the turkey as originating in Turkey (quoted in Schorger 1966:16).

## **2.8. Europe and the turkey**

While we know that turkeys were being taken to Europe by the Spanish from the early 16<sup>th</sup> century, much uncertainty (due to a lack of data and their confusion with other birds) remains surrounding their dispersal. The lack of data from the post-medieval period has narrowed potential regional selections; these issues are discussed further in Chapter 3. Confusion regarding the introduction of the turkey to Europe still exists among specialists, and although at least one monograph on the subject is in the process of being generated by Eduardo Corona Martínez (pers. comm. 2011), erroneous dates (possibly resulting from issues of inconsistent nomenclature or a lack of understanding of shipping routes of the period) have been innocently distributed on the ZOOARCH e-mail list as recently as September, 2011.

### **2.8.1. Post-medieval Europe**

The use of the term "post-medieval" is sometimes considered to be contentious. Some scholars prefer using "historical" or "later historical" either in response to the political meanings perceived in the use of the term "post-medieval" or for other reasons. While I believe that many critiques of the term are valid, I have chosen to use "post-medieval" out of a desire for consistency with publications which use archaeological data or have an archaeological focus.

The post-medieval period in Ireland and Britain can be characterised as a time of intense social change and a great deal of literature has been published on specific aspects of the period such as the Reformation, the monarchy and the expansion and development of industry. Although Britain and Ireland have a comparatively well-researched post-medieval record, the extreme paucity of zooarchaeological and related data from the period (Thomas 2009) requires heavy use of historical sources. While a thorough

review of this material is beyond the scope of this thesis, an extremely brief overview of the broad context into which the turkey was introduced is provided here, with expanded discussion of relevant themes and developments in Chapter 6.

Vast, sweeping social changes resulting from the Reformation and the impact of the Renaissance are seen as major hallmarks of the early post-medieval period in Britain, while industrialization and improvement (Tarlow 2007) appear to mark the terminal stages. The increase in overall population, the effect of the practice of enclosure and shrinkage of villages as many people migrated into cities is discussed from both archaeological and historical angles in general texts (Crossley 1990, Collinson 2002) as well as elsewhere. These developments are more recently seen as part of a spectrum of multiscalar changes occurring at different rates. Social changes are not suddenly switched on at any specific year in reaction to any one event, and volumes have been published which attempt to tease out the specifics of a period characterised by transition (Gaimster and Stamper 1997). Enclosure of portions of landscape resulted in new boundaries which effectively increased the number of landless labourers from 20-30 percent of the population in 1524 to 60-70 percent in 1688 (Johnson 1996:75). Use of land was disassociated from community practice and became the sole responsibility and business of the owner of the estate; as a part of this process, modern social perspectives begin to emerge.

"Put very broadly, the enclosing farmer moved away from production for subsistence and limited local markets. The local and regional cultural identities that went with shifted in parallel, to be replaced by class and national affiliations." (Johnson 1996:77)

Additionally, the concomitant globalisation of trade networks and rise of consumerism were influential developments which led to sweeping social changes and may have led to rapid transitions in the perception of goods (including animals) and their subsequent commodification (Johnson 1996).



Beginning in this same period, the establishment of distant colonies not only reshaped the areas newly encountered by Europeans, but fundamentally altered social aspects within Europe (Steinmetz 2003). It is into this cultural *mêlée* that the turkey is introduced and quite probably used to great effect in delineating and reinforcing class structure, at least in England. Although the islands of Britain and Ireland would have shared a great deal of continuity, the modern, all-pervasive concept of Great Britain was not truly formed until the 18<sup>th</sup> century (Collinson 2002:2) and while factors such as enclosure had an effect outside of England, discussions in the literature are overshadowed by other events in the history of individual countries (e.g. Plantation in Ireland, the Highland Clearances in Scotland, etc.). Though the events described above may not have had a direct impact on the introduction of livestock and other animals, they form an integral part of the context of the period into which they were introduced.

### **2.8.2. The diaspora of the turkey in Europe and beyond**

The peoples of the New World and the Spanish evidently perceived the turkey in entirely different ways, and the bird was introduced to post-medieval Europe metaphorically plucked bare of any previous symbolic meaning. The first definitive exportation of the turkey to Europe took place by 1520, when Alessandro Geraldini, then bishop of Hispanola and an ardent supporter of Columbus's explorations in the New World, sent a pair of turkeys to Lorenzo Pucci, the Florentine cardinal in Rome, with directions to admire the birds but not eat them (Eiche 2004:21-22). These instructions may indicate that the turkey was extremely rare in Europe at that time. By 1557, the city of Venice passed a sumptuary ordinance limiting the consumption of turkey (*ibid.*), but it was apparently rapidly adopted by the middle and lower classes of Italy despite this legislation (Smith 2006:19) as most sumptuary laws were difficult to enforce. This suggests that at least some downward social distribution was occurring relatively soon after the introduction of the bird.

Initially, the turkey was associated with the peacock due to the tail-spreading behaviour; this association was likely of high importance in terms of it becoming culturally linked with desirable fare. It quickly overcame the peacock in popularity among the upper classes in many European countries, possibly because the turkey was easier to raise and better-tasting than the peacock (*ibid*:17). The turkey arrived in Germany by 1530 (*ibid*:20). In 1549, Catherine de Medici hosted a banquet in Paris at which seventy turkeys were served, and when Charles IX passed through Amiens, the magistrates of the city presented him with twelve turkeys (*ibid*:21). From Spain, Italy, France and Germany, turkeys were disseminated across the globe; by 1541 the turkey was being raised in England and by 1550 it had reached Scandinavia (Smith 2006:24). It is possible that the rapid, widespread acceptance of the turkey occurred because it could easily be substituted into extant recipes and was subject to preparation methods used for other fowl (see Chapter 6). Some crops introduced to Europe from the New World during the 'Columbian Exchange', including tomatoes, potatoes, and corn were accepted over varying periods of time (Brandes 1992) while the turkey may have been such an immediate success due to its resemblance to familiar animals.

The turkey arrived in England by at least 1541 (Smith 2006) if not earlier. It was probably being referred to when the Archbishop of Canterbury, Thomas Cranmer, proclaimed that only one large fowl such “as Crane, Swan, or Turkeycocke” should be served at meals for ecclesiastics (Leland 1770:38), though there is a possibility that the document refers to the guinea fowl. With regard to its possible occurrence in this elite context, the turkey was probably still relatively rare in England by that date, but it remains difficult to determine its more general dispersal due to a lack of material on the subject. However, by the 1560s, laws were passed to prevent poulterers from allowing their turkeys to roam the streets of London as their destructive eating habits created havoc; by 1577 English turkey farmers were raising flocks which were then driven to market like cattle

(Smith 2006:28). By 1615, access to the turkey may have broadened as although it was still associated with “great feasts”, it was also present at “more humble feasts” (Markham 1623:123). East Anglia had a reputation for the highest concentration of turkey farms (see Chapter 6). In the late 17<sup>th</sup> century, the author Daniel Defoe observed that turkeys filled the roads from East Anglia to London every autumn and estimated that between ninety and three hundred thousand turkeys travelled along just one of the many routes into London (Defoe 1928:59-60). Due to the success of turkey breeding efforts in England, a glut of turkeys was regularly available in the late autumn, and as their surplus meant a lower cost, they became popular Christmas fare.

Though the celebration of Christmas was challenged by some aspects of the Reformation, the turkey returned to the Christmas supper-table sometime before 1792, as observed and described by John Gay in his book *Fables* (Gay 1792:39): “From the low peasant to the lord/The Turkey smokes on every board”. Although he undoubtedly held a privileged position, Samuel Pepys records enjoying turkey no fewer than thirteen times between 1659 and 1665 and nine of these occurrences were within one week of Christmas day. The custom of giving ones’ employees a Christmas turkey was well established by at least the late eighteenth century, though the practice may have occurred much earlier. Indeed, Pepys enjoyed turkey regularly and was first given live turkeys from Denmark by a servant of Admiral Sir Edward Montague in 1659-1660 and later was sent individual turkeys in December of 1661 and 1664 (though he ate turkey far more frequently than those occasions). Smith (2006:38) surmises that the turkey that Charles Dickens received from his lawyer may have inspired him to create the scene in *A Christmas Carol* wherein Scrooge gives a prize turkey to Bob Cratchit on Christmas. It is possible that the preservation of the popularity of turkey at Christmas was partially thanks to its presence in *A Christmas Carol*. In 1861, Isabella Beeton of cookery book fame stated that “a Christmas dinner, with the middle classes of this empire, would scarcely be a Christmas dinner

without its turkey” (Beeton 1861:506). Access by most classes of society was probably achieved by the mid-20<sup>th</sup> century, and the turkey remains a celebrated Christmas dinner centrepiece in England as well as North America.

The recommendations given to late 19<sup>th</sup>-century English colonists moving to North America included advice to bring along both male and female turkeys (Peckham 1889:271). Apparently, the authorities involved were unaware that enormous populations of large wild turkeys were already present in North America.

## **2.9. Discussion**

From the available archaeological and documentary sources, it is clear that the perception of the turkey has varied a great deal over only a span of two thousand years, a much shorter time than humanity has been accompanied by other domesticate species. While some perspectives on the topic are easily dismissed, an interpretation of the bird's ontological journey over such a time span will be challenging but revealing. Although the turkey is frequently encountered in archaeological assemblages from the late first millennium BC in the American Southwest and was clearly a common creature, some analyses of its remains have been dominated by metrical studies and appear to be orientated toward the prevailing paradigm focussed on distilling a "meat weight" interpretation of the bird. As James Morris notes in a recent article, (2010) archaeological interpretations of animals and their bones change with the prevailing paradigm. The utility of turkey feathers, along with the subjects of turkey palaeodiet (Rawlings and Driver 2010), their dung and eggshells (Beacham and Durand 2007) have become topical. More recently, ancient DNA studies and isotope analysis (Speller et al. 2009) are advancing our understanding of the turkey as a domesticate in other directions. The nature of day-to-day animal-human relationships, however, remains under-researched. When it has been examined, the agents involved are sometimes characterised as fettered to the most parsimonious course of action. This seems unlikely to accurately

represent past human actions since the complexity of individual perceptions and the effects thereof are not considered, to say nothing of other factors such as personal choice.

Knowledge of the translocation and introduction of the turkey to Europe is even more opaque, made somewhat inaccessible by a lack of attention to post-medieval materials and additionally problematic by cryptic naming practices. Through the use of metrical and qualitative analysis as well as historical research of a single, familiar species, this project is ideal for exploring the themes of translocation and introduction. With palaeopathological analysis at the heart of this project, the relationships between humans and turkeys on both sides of the Atlantic Ocean will be further illuminated in the chapters that follow.

## **Chapter Three.        Materials and Methods**

### **3.1. Introduction**

This chapter sets out the methodology which was employed throughout this research project. It is explicitly orientated toward an extraction of data which will answer the research question and associated aims set out in Chapter 1. These research goals are intended to maximise the potential knowledge contribution of palaeopathological research by combining it with other data sources. For the most part, zooarchaeological and palaeopathological data gathering was a priority (see data collection and methods discussions below); however, site and excavation-specific contextual information is also necessary for the appropriate interpretation of the faunal remains. In addition, there are often archival, ethnographic, anthropological and historical sources which are pertinent to various facets of the research at hand; this is particularly true for the later assemblages (see Chapters 5 and 6).

In ascertaining the impact of domestication on the frequencies of disease and injury present in turkey populations from the American Southwest and northern Mexico, the incidence and nature of pathologies in domestic turkeys from archaeological sites has been recorded in detail. The assessment of diachronic change in the incidence of disease and injury with respect to turkey husbandry and the driving factors behind it required a comparison of the presence and prevalence of pathologies in archaeological domestic turkey populations across as long a span as possible, in this case, from approximately AD 900 to 1678. In attempting to determine the skeletal impact of the translocation of the turkey to Europe in the 16<sup>th</sup> century, a broad but multifaceted comparison of New World and European turkeys is made (Chapter 6).

Reaching any understanding of the husbandry methods employed in managing the species in the post-medieval period necessitated more archival and historically-orientated research than lab-based analysis.

Whilst the skeletal remains of European domestic turkeys surely reveal the impact of human behaviour, attempting to clarify the translocation-driven transformation in the perception and role of the turkey (as well as diachronic changes in access to the bird) required a thorough review of diverse documentary sources.

The comparisons made when pursuing the research question set out in Chapter 1 include not only details of metrical variation and pathological prevalence, but also environmental and cultural factors which may have influenced the data. In addition, the cultural context and human perception of the turkey were carefully considered with respect to each line of inquiry.

## **3.2. Materials**

### **3.2.1. Non-archaeological materials**

Although the majority of this chapter is dedicated to archaeological materials and zooarchaeological methods, faunal remains were not the only source of data used for this project. Whilst animal bones were at the core of the research undertaken, a diverse collection of materials from a variety of disciplines were assembled in an attempt to form the most complete and coherent picture possible of human-turkey relationships in the past. These included ethnographic observations from the Pueblos of Hopi and Zuñi, the writings of English diarists, cookery books, poetry, verse and other literature, animal husbandry manuals, court records, newspapers, historical accounts, art historical sources and various portrayals of the turkey.

Caveats regarding these materials are many: they are generally subjective sources and were coloured by the various biases of their origin and time period. The application of ethnographic analogy and/or ethnology to archaeology in particular has been debated (Hodder 1982; Peregrine 1996; Wobst 1978; Wylie 1985), and I avoided direct comparisons and conclusions in many instances. I do not, however, believe that skeletal analysis is an entirely objective process, nor am I of the opinion that these materials are of

less value than measurements of bones. I have done my best not to compound human biases through the use of these sources and feel that their inclusion has the potential to liven our impressions of the past and enhance our knowledge.

### 3.2.2. Site and assemblage selection

The selection of archaeological sites and associated assemblages which I have used for the purposes of this research was driven by the objectives outlined above and chosen for a number of reasons. Primary among these was the status and accessibility of the assemblage; negotiating and acquiring access to collections of archaeological bone can be time-consuming and extremely difficult. I also chose assemblages which overlapped spatially and chronologically in an attempt to represent as comprehensively as possible the relevant regions and time periods (AD 900-1950). For the American Southwest, I aimed to access and analyse specimens from large assemblages which were well-dated and had been previously reported. For Europe, accessible assemblages which were known (from published sources, databases and personal communications) to have turkey present were selected. In addition to these factors, some of the assemblages had published mentions of pathological elements or individuals which had often not been recorded or investigated in a thorough or meaningful way. A summary of the study sites is presented in Tables 3.1 and 3.2 below.

Site Name	Site Location	Site Date (AD)	Total Site NISP	NISP Turkey (Analysed)	Publications
Arroyo Hondo	New Mexico, U.S.A.	1300 to 1420	1,336	129	Lang and Harris 1984
The Bluff Great House	Utah, U.S.A.	1075 to 1250	5,273	629	Fothergill 2008
The Eleventh Hour Site (29SJ633)	New Mexico, U.S.A.	900 to 1200	2,585	121	Gillespie 1991
Eleanor Ruin	New Mexico, U.S.A.	950 to 1350	3,470	150	Roler 1999
Gran Quivira	New Mexico, U.S.A.	1300 to 1672	13,669 (2,302)	88	Clark 2003 (McKusick 1986)



<b>Heshotauthla</b>	New Mexico, U.S.A.	1200 to 1350	213	72	Unpublished Report by Homer Thiel
<b>Hinkson (Ojo Bonito)</b>	New Mexico, U.S.A.	1175 to 1225	222	63	Clark 1998
<b>Salmon Ruin</b>	New Mexico, U.S.A.	1088 to 1270	3,874	157	Harris 2006, Durand and Durand 2006
<b>Quarai</b>	New Mexico, U.S.A.	1200-1300s to 1678	17,019	186	Moore 1994

**Table 3.1: Sites used in this study from the American Southwest**

Site Name	Country	Site Date (AD)	Publications
Wood Quay, Dublin	Éire	13 <sup>th</sup>	MacDonald et al. 1993
BOS87 Bishopsgate, London	UK	c.1700	MOLA database
CH75 Chaucer House, London	UK	No date	MOLA database
FNB02 Finsbury Avenue, London	UK	c.1800	MOLA database
GHT00 Blossoms Inn, London	UK	c.1710-1800	MOLA database
GWO05 St. Bartholomew's Medical College, London	UK	c.1660	MOLA database
KEW98 Newgate St., London	UK	No date	MOLA database
MCF06 Mariner's House	UK	1650-1660	MOLA database
NGT00 Laud House Forecourt (Newgate St.), London	UK	c.1900	MOLA database
RLP05 Royal London Hospital	UK	c.1840	MOLA database, Morris 2010
SQU94 Spital Square, London	UK	c.1730-1800	MOLA database
SRP98 Spitalfields, London	UK	c. 1770-1820	MOLA database

**Table 3.2: Sites used in this study from the UK and Éire**

### 3.3. Methods

#### 3.3.1. Zooarchaeological methodology

Primary analysis was carried out for each accessible assemblage irrespective of the content and nature of previously published studies; this was undertaken for several reasons. Pathologies have frequently been

glossed over as interesting anomalies (Thomas and Mainland 2005:1); research and interpretation of lesions in animal bones is rare and very little investigation of inter- and intra-site variation has occurred, primarily due to the fact that the prevalence of pathologies is not recorded. Additionally, many zooarchaeologists are unfamiliar with palaeopathology, and this has resulted in many lesions going unrecorded (Upex and Dobney 2012; Vann and Thomas 2006). Apart from these reasons, some faunal data have been published using only Minimum Number of Individuals (MNI), a derived measurement, rather than any sort of element count (see discussion that follows under Quantification).

#### **3.3.1.1. Contextual interpretation and data**

Contextual information is vital to the interpretation of every pathological specimen. In addition to recording the site location, name and number, I have also tracked the repository context of each item with accession numbers, shelf and box numbers. In combination with the metrical and palaeopathological analyses, I have recorded archaeological context information from each site whenever possible. The spatial location within the site, type of depositional context, context number, context description, associated finds and time phase and period were recorded when these were available. Furthermore, some pathologies occurred in turkeys which were part of Associated Bone Groups (ABGs) (Morris 2010); in this case, the position of the individual and other associated elements or ABGs was also noted. Each assemblage (and each pathology present therein) was a unique case and was therefore considered and interpreted independently prior to site and regional comparisons of pathologies (see Chapter 4). Unfortunately, there were several cases in which no more precise data on faunal bone context than general site dates.

#### **3.3.1.2. Zooarchaeological data**

The data which I used for this project derived from the primary analysis of pathological turkey specimens from stratigraphically secure archaeological contexts which were already identified to species and element (with the

exceptions of Heshotauthla and Ojo Bonito, which I have identified). Depending upon the storage facility in question, some of these specimens had been selectively retained and separated from the rest of the assemblage; this is the case if re-analysis has occurred as in the case of faunal remains from the Salmon Ruin (Durand and Durand 2006) or if special attention was paid to pathological bones, as in the case of the fauna from Bluff (Fothergill 2008). The reported NISP for some sites sometimes far exceeded the number that the repository had available for examination (e.g. Arroyo Hondo, The Eleventh Hour Site). This created some difficulties with regard to the calculation of element and zone prevalence of pathologies as I was unable to access all turkey specimens (see Methodological Challenges, below).

In collecting data, each assemblage was systematically analysed; following the structure of the project database (see below), a number of taphonomic aspects were recorded as well as metrics. Taphonomy is an important consideration when gathering data because it can affect the representation and prevalence of pathologies. In addition to the state of preservation of each element, butchery type and location, gnawing, burning and root etching were noted and considered in the interpretations made.

All identifiable turkey elements were sided and element fragments were recorded, whether or not they were pathological, using Cohen and Serjeantson's zoning method (1996:110-111), which divides each bone into eight zones (see Figures 3.3 and 3.4). This ensured that my calculations of the prevalence of specific pathologies were precise not only by element, but also in terms of the location of the pathology on the element. If the articular ends of skeletal elements appeared spongy or porous, the element was recorded as originating from a juvenile individual, and these were not measured or sexed. When possible, turkey sex was determined using measurements and the state of tarsometatarsal spur formation and the spur length was recorded. Spurs or spur scars on the tarsometatarsus indicate that the element probably came from a male turkey; females only rarely develop them. However, it is still possible that a tarsometatarsus without a

spur originated from a male turkey whose spurs had not developed or were not yet fused to the bone. Complicating such matters is the fact that is not known whether or not turkeys were caponised (castrated) prior to their export to Europe. The absence of a spur was therefore not used to determine sex in this study. Though there is a great deal of size variation in domestic turkeys, McKusick (in her study of turkey remains from sites throughout the American Southwest (1986)) found that there is no overlap in size between male and female turkeys with regard to certain elements. Where possible, these measurements were used to sex individuals. Table 3.3 is an adaptation from McKusick (1986:54) and lists the ranges of maximum lengths for three elements in male and female turkeys. In addition, the metrics published in *Avian Osteology* (Gilbert et al. 1996:8) were used to supplement these ranges. Only length measurements have been published and correlated with sex. In the case of pathological elements, this means that sex could often not be determined due to foreshortening or deformation.

Element	Male, in mm.	Female, in mm.
<b>Humerus</b>	136.37-159.00	112.89-123.15
<b>Tibiotarsus</b>	210.27-233.00	169.22-184.50
<b>Tarsometatarsus</b>	144.79-174.00	116.80-138.50

**Table 3.3: Maximum element length ranges in male and female domestic turkeys**

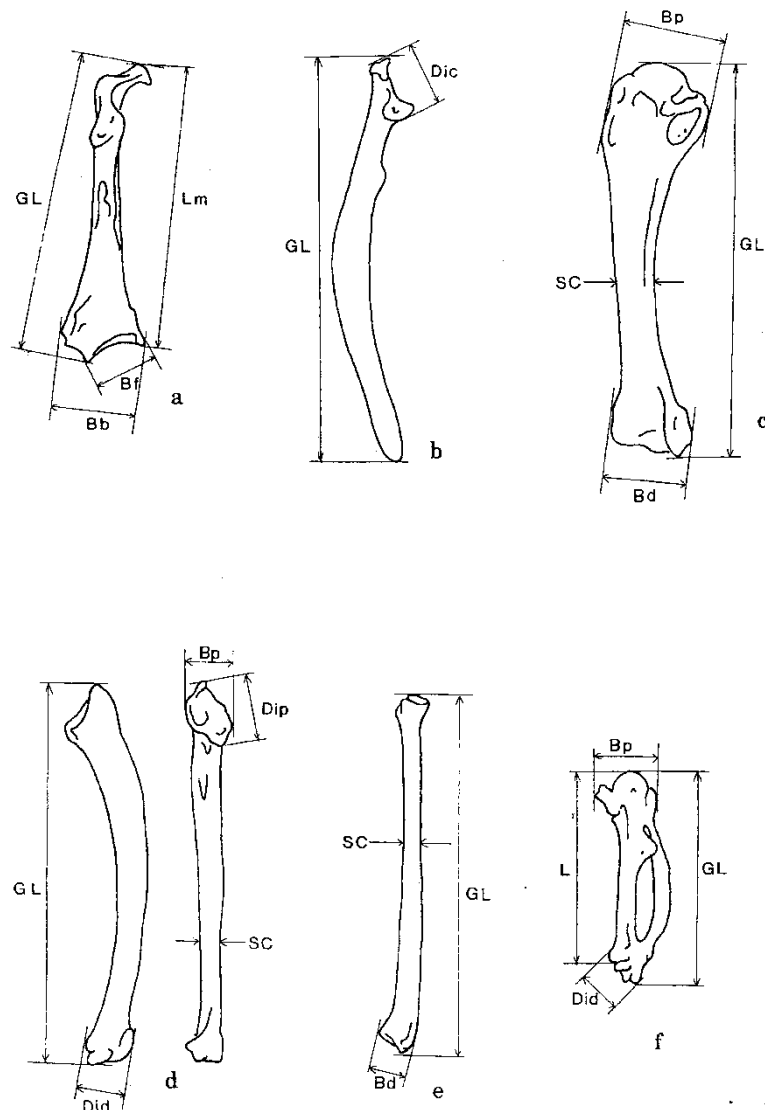
For comparative purposes, the following general avian skeletal element measurements were taken (Table 3.4 below, adapted from Cohen and Serjeantson 1996:106). These measurements permitted an analysis of element shape as well as size.

Element	Measurements
<b>Coracoid</b>	GL (Greatest length), Lm (Length of the medial side), Bb (Basal breadth), Bf (Breadth of the articular facet)
<b>Scapula</b>	GL (Greatest length), Dic (Greatest cranial diagonal)
<b>Humerus</b>	GL (Greatest length), Bp (Greatest breadth of proximal end), SC (Smallest breadth of the corpus), Bd (Greatest breadth of the distal end)
<b>Ulna</b>	GL (Greatest length), Bp (Greatest breadth of proximal end), Dip (Diagonal of proximal end), SC (Smallest breadth of the corpus), Did (Diagonal of distal end)
<b>Radius</b>	GL (Greatest length), SC (Smallest breadth of the corpus), Bd (Greatest breadth of the distal end)
<b>Carpometacarpus</b>	GL (Greatest length), L (Length of metacarpus II), Bp (Greatest breadth of proximal end), Did (Diagonal of distal end)
<b>Synsacrum and</b>	GL (Greatest length), LS (Length of sternum), LV (Length along

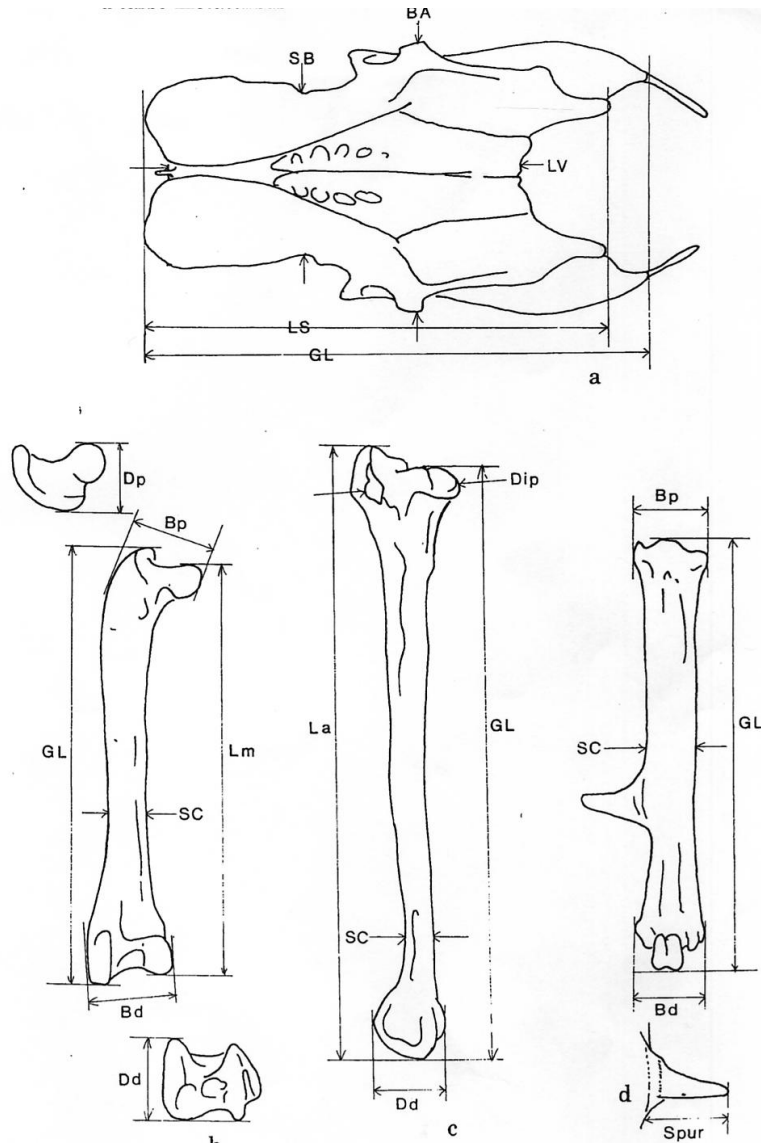
<b>Pelvis</b>	synsacral vertebrae), SB (Smallest breadth of the Partes Glutea), BA (Breadth in the middle)
<b>Femur</b>	GL (Greatest length), Lm (Length of the medial side), Bp (Greatest breadth of proximal end), Dp (Greatest depth of the proximal end), SC (Smallest breadth of the corpus), Bd (Greatest breadth of the distal end), Dd (Greatest depth of the distal end)
<b>Tibiotarsus</b>	GL (Greatest length), La (Axial length), Dip (Diagonal of proximal end), SC (Smallest breadth of the corpus), Dd (Greatest depth of the distal end)
<b>Tarsometatarsus</b>	GL (Greatest length), Bp (Greatest breadth of proximal end), SC (Smallest breadth of the corpus), Bd (Greatest breadth of the distal end), Spur length

**Table 3.4: Measurements used in this project**

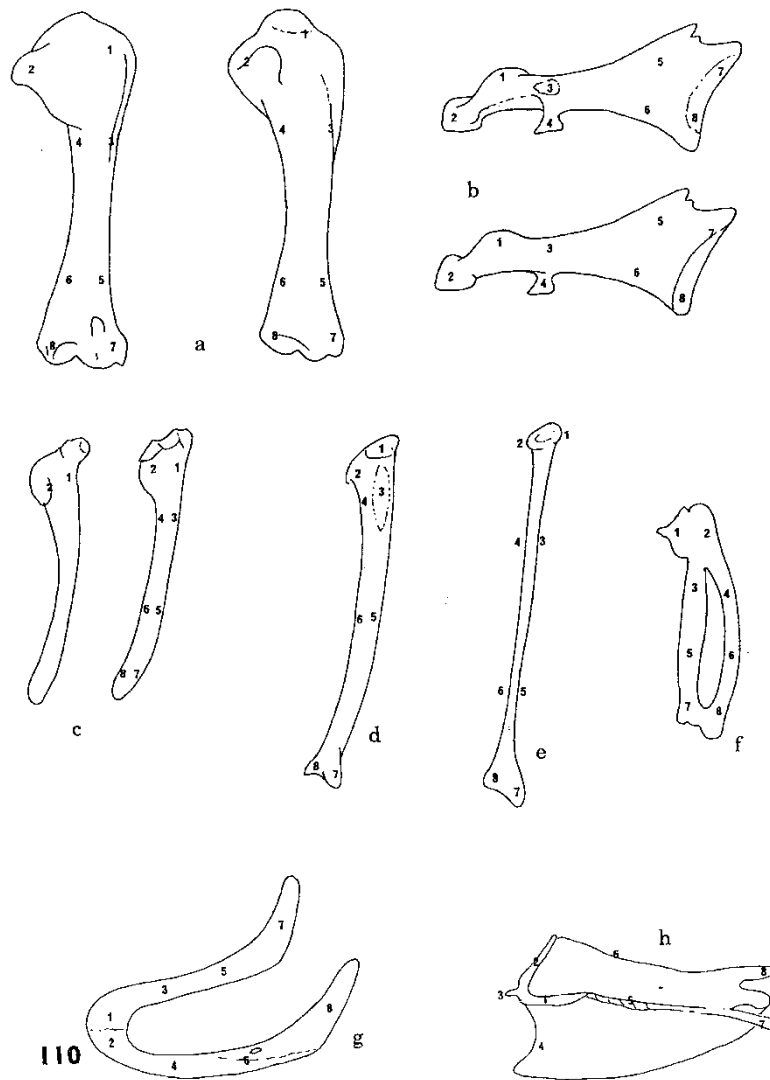
The following figures (3.1, 3.2, 3.3 and 3.4) from Cohen and Serjeantson (1996:107-111) illustrate the locations of the measurements described in Table 3.4 as well as zones used to calculate pathological prevalence.



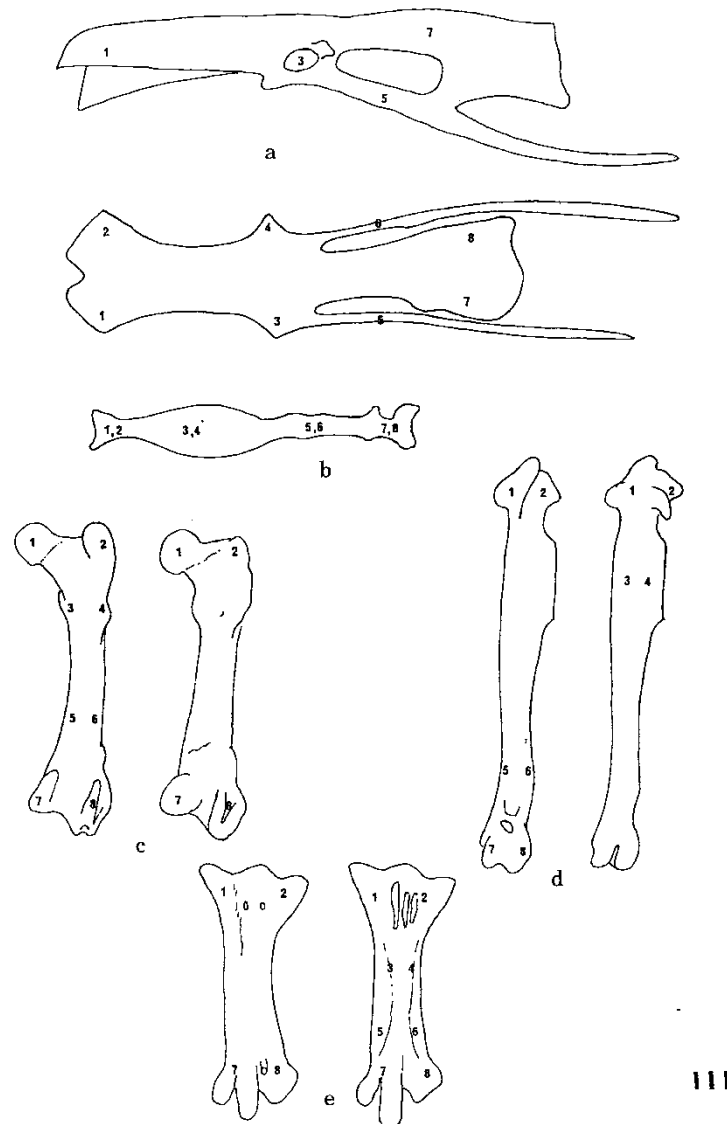
**Figure 3.1: Forelimb measurements**



**Figure 3.2: Hindlimb measurements**



**Figure 3.3: Forelimb zones**



**Figure 3.4: Hindlimb zones**

### 3.3.1.2.1. Quantification

The numerical data from some assemblages with recorded pathologies was published using MNI rather than NISP. NISP (number of identified specimens) is a tally of the number of elements and element fragments identified to taxon. MNI (minimum number of individuals) is the smallest possible number of individual animals that could account for the bones present in the faunal assemblage and is not calculated consistently between analysts as different factors are sometimes taken into account (Ringrose 1993). Though the same can be said of NISP with regard to the elements recorded and the number of bones in different taxa, there is a distinct



difference between the two measures. MNI can be derived from NISP, but the reverse is not true. While both NISP and MNI are relative measures of abundance, NISP is an observational unit, as distinguished from derived or interpretive units such as MNI, which are defined by some mathematical relation between fundamental measurements (Lyman 1994). Though different quantification methods are often necessary in order to answer differing research questions, derived measurements do have certain weaknesses (Lyman 2008). According to Lyman (1994:37), derived measurements such as MNI can have “non-explicit, unclear, or only weakly established relations to theoretical or interpretive concepts.” I based all quantified measures on NISP for the purpose of these analyses and it was determined independently for each assemblage.

#### **3.3.1.2.2. Statistical Methods**

Some statistics were used for this project using the methods described in Shennan (2004). Statistical significance was calculated using the chi-squared test, and Spearman's  $\rho$  (coefficient of rank correlation) was also used to determine positive, negative or unrelated correlations between data sets. Additionally, the coefficient of variation was calculated when a standardised measure of dispersion was required (see Chapter 4).

I also used a multivariate statistical technique called principal components analysis (PCA), to provide a visual illustration of the data by showing the distribution of pathology types and pathological prevalence by element for sites in the American Southwest (see Chapter 5).

#### **3.3.1.3. *Palaeopathological data***

The terminology and description of pathologies recommended by Vann and Thomas (2006) and Vann (2008) was used to record signs of disease and injury. This system was developed to overcome the lack of a standardised recording system applicable to all animal palaeopathology. It was designed not only to describe pathological lesions, but to explicitly build upon these descriptions in order to attempt differential diagnosis. Employing this

framework in my project has effectively served as a test of the recording system, and although I have chosen to use more specific descriptive terms in some cases (see Chapter 4), it did fully enable me to complete the comparisons and calculations which my research questions required. In addition to recording the zone(s) in which pathologies occurred (following Cohen and Serjeantson 1996:109-112), bone formation and destruction processes present on the element, any fractures, and any detectable alteration of size or shape was noted. The size, extent, shape and margin of each pathological alteration is described in detail. Specific, standardised terms were applied when undertaking description of pathological lesions. Table 3.5 below is based on Vann and Thomas's recording protocols (2006; Vann 2008), and presents the descriptive categories and terms used in the project database for designating pathological lesions along with additional information that is recorded for each lesion. Though these terms are specific, the database allowed flexibility with the inclusion of the term "Other" and a large free text field for notation of each lesion and for discussing possible diagnoses.

Differential diagnosis is the process of distinguishing one pathological condition from others which have similar characteristics and was attempted whenever possible. However, the emphasis of this analysis was on thorough, consistent description of pathological conditions and not on identifying specific diseases. This is due to the fact that even a rough diagnosis or designation to a broad class of pathology (i.e. trauma, arthropathy, infection) grants increased interpretive value beyond description, no matter how detailed. Despite this, difficulties in diagnosis can also arise from the descriptive categories used since the categories themselves vary.

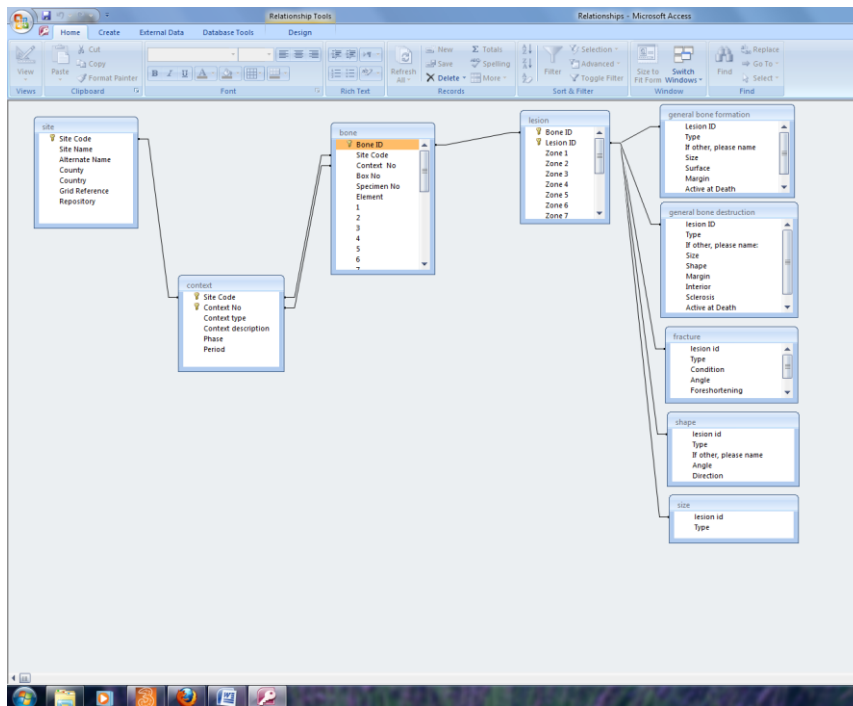
Pathology Type	Descriptive Terms	Lesion Recording
Bone formation	Ankylosis, Bone ridge, Callus, Enthesophyte, Exostosis, Osteophyte, Periostosis, Syndesmophyte	Size, Extent, Shape, Margin, Nature of surface
Bone destruction	Articular Depression, Articular Destruction, Articular Grooves, Cavity, Cloaca, Hypervascularity, Osteopenia, Porosity, Necrosis	Size, Extent, Shape, Margin, Nature of surface, Interior, Sclerosis
Fracture	Comminuted, Greenstick, Hairline, Impacted, Incomplete, Oblique, Spiral, Transverse	Type, Condition (Fresh, Healing, or Healed), Angle, Foreshortening, Compound
Alteration of size	Enlarged or Reduced	
Alteration of shape	Articular Extension, Bowing, Diaphyseal expansion, Displacement, Epiphyseal expansion, Epiphyseal thickening	Angle, Direction, Foreshortening
Other	Failure to form bone, Eburnation	Activity at death (for all pathology types)

**Table 3.5: Pathological categories and terms from Vann and Thomas (2006)**

Each pathological element has been photographed and described in detail (see Chapters 4 and 6); multiple lesions occurring on the same element were recorded separately unless they resulted from the same pathological process (e.g. bone formation and destruction during fracture repair). In the cases of pathologies present in some tibiotarsi from the Royal London Hospital, differential diagnosis required radiographic analysis of the elements (see Chapter 6).

#### **3.3.1.4. Database**

The data resulting from these analyses was recorded in an Access database, adapted from a version of the system developed by Vann (2008). Built into this database are the Cohen and Serjeantson (1996) measurements and zoning framework, as well as the standard palaeopathological recording system (Vann and Thomas 2006; Vann 2008). The structure of this database (see Figure 3.5 below) has allowed me to comprehensively record all turkey elements from the assemblages and was constructed explicitly for palaeopathological analysis of avians.



**Figure 3.5: Table relationships from project database**

The main elements of the database include site information, context details and pathological descriptions and diagnoses. The faunal analysis component is embedded within the palaeopathology element of the database. Figure 3.6 below shows the data entry form for skeletal elements.

**Figure 3.6: Element form from project database**

### **3.3.1.5.      *Making use of the data***

In terms of using the data generated, I have focussed first on the presence and percentage of turkey in assemblages, examined the metrics taken throughout the course of analysis and moved on to calculating the prevalence of pathological conditions. The frequency of a particular ailment and which individuals, elements and parts of elements were affected carries a great deal more meaning than a decontextualised list of pathological conditions by site and region. Prevalence has been calculated by affected element(s), by zone(s) within the affected element(s), and by site. Comparisons between turkey percentages, element metrics and rates of prevalence are then used to draw conclusions about the population itself as well as overall patterns of disease and injury and diachronic changes present. Though the main focus is on palaeopathological prevalence, additional factors are also taken into account in the data analysis. The biological context (i.e. sex and age) of pathological individuals, if determinable, is considered with regard to discussion and interpretation of the data collected to produce an epidemiological profile of pathologies. Archaeological context was also vital to the interpretation of these pathologies, and past human attitudes were incorporated when possible. Diachronic and spatial patterns in the prevalence of pathologies were examined in order to elucidate the links between disease and injury, past human-animal interactions and husbandry practices. In presenting and interpreting the data, I divided the sites spatially into three geographic regions within the American Southwest and also by temporal association (see Chapter 4). This framework of interpretation was meant to facilitate the identification of long-term husbandry trends and palaeopathological patterns. Due to excavation strategies and trends in research foci which have biased the available sample against retention of relevant materials, it was not possible to make a similar series of regional comparisons with the post-translocation turkey specimens (see below).

### **3.3.2. Methodological challenges and biases**

As with any project, there are challenges and biases which have affected these analyses. It is important to acknowledge these and to consider the implications and limitations that they have presented. Here I outline the major challenges and conclude this section by examining some of the site-specific issues.

#### **3.3.2.1.      *Limitations of zooarchaeological palaeopathology***

There is a set of general challenges which are typically present when analysing and interpreting any faunal assemblage. Animal remains are rarely fully articulated, making some pathologies difficult to identify and designation of a pathological condition impossible (Thomas and Vann 2006), though broad categories are still useful for general interpretations (e.g. Bartosiewicz 2008). Designation of a pathological lesion can also be affected by issues of equifinality because bone remodelling is limited to formation and destruction and similar effects can be produced by a taphonomic agent. For example, Bartosiewicz (2008) observed that the appearance of carnivore and pig gnaw marks can resemble necrosis in excavated specimens. Pseudopathology presents another analytical challenge as entirely different disease processes can be responsible for similar responses in bony tissue, although these should be determinable during the processes of analysis and differential diagnosis.

It is possible that diseased animals were removed from the population before sufficient identifiable development of a condition occurred; differential disposal of such remains, if seen as unfit for consumption or other use, may also have biased the assemblage. In addition, animal remains are susceptible to destructive taphonomic processes such as burning and gnawing; pathologies that decrease bone density or mass can make fragile bony material even more vulnerable to these (e.g. osteomalacia or poorly-healed fractures). Conversely, some pathological conditions such as spavin and osteopetrosis which lead to increased bone density or mass can ensure a disproportionate survival of affected elements (Bartosiewicz

2008), and certain elements have a higher natural survivability due to their size or density. The 'osteological paradox' also has affects palaeopathological research: many conditions that may have affected a population would have left no trace on osseous tissue; furthermore, diseases which do modify bone often do not do so until a late stage (Wood et al. 1992).

Age and the purposes for which an animal is kept also affect the preservation of pathological lesions. Not only does bone density increase with advanced age, thus increasing the probability of survival, but animals are increasingly likely to develop pathologies as they age (Bartosiewicz 2008). Animals used for meat alone will be slaughtered at a relatively young age compared to those which are kept for secondary products. Since the turkey was kept for feathers and possibly also eggs in addition to meat (or, at times, instead of meat) within the context of the American Southwest, it is probable that this has resulted in a bias in the proportion of pathologies present in these assemblages.

#### **3.3.2.2      *Collections and access***

As mentioned previously, access to collections of faunal remains can be difficult to negotiate for a variety of reasons; this is particularly true when time differences and language barriers are an additional factor. Even when access is successfully obtained and all bureaucratic hurdles have been cleared, the time that one is able to spend analysing the faunal material is often limited by the institution as well as finances. In North America, the amount of time available for data collection on this project was only four weeks; the cost of travel greatly restricted my capability to investigate assemblages within the UK and Éire. As a result of these factors, I focussed on specific groups of repositories and the collections held by the Museum of London and the London Archaeological Archive and Research Centre rather than travelling to distant locales. In addition, there were cases where a collection housed by a repository was physically inaccessible for reasons such as storage areas being re-located or the unavailability of a specific staff member. Thus, the self-funded nature of this research, the workings of the

repositories in question and the status of individual collections had an effect on the data extracted and interpreted for this project.

### **3.3.2.3.      *Site selection and regional biases***

Ideally, my analysis of these materials would have included earlier assemblages and continued through the historical occupation of the American Southwest. Unfortunately, a lack of accessible early assemblages and little zooarchaeological attention to the later time period (combined with complications arising from issues of cultural ownership and urban development) have prevented the inclusion of such material. Unfortunately, many excavated sites in the American Southwest and Mexico have not been published. Of the sites which have been excavated and published, zooarchaeological analysis and/or retention of faunal material may not have been a priority, particularly with regard to sites excavated prior to 1960. To a degree, this is also true of the European assemblages (though the caveats are somewhat different), and my analysis was limited by whether or not faunal material was kept after excavation. Moreover, the turkey only became available in Europe in the 16<sup>th</sup> century (though see discussion on the bones from Wood Quay in Chapter 6). The archaeology of the post-medieval period is sometimes labelled as “post-interesting” and is not often a primary excavation focus (Thomas 2009). The sites that are excavated tend to be either those that lie above older archaeological remains or those that are underneath major developments and as such are generally located in towns (Thomas 2009:135). As an illustration of the often institutionalised neglect of later post-medieval material, I offer the following encounter which I experienced during some general research unrelated to this thesis. When I arbitrarily searched the WOSAS (West of Scotland Archaeology Service) website for the term 'bird,' a single result (involving a misspelling of Kilbride) was returned for a watching brief with the following note: “No *significant* (pre-18<sup>th</sup> century) archaeological deposits were encountered during the watching brief, and the excavation advised that no further work was required” (emphasis mine).



When faunal remains are retained from post-medieval sites, they may not be fully analysed, depending upon the focus of the project. Thomas (2009:134) notes that between 1998 and 2006, the journal *Post-Medieval Archaeology* contained 23 excavation reports; only four of these included detailed faunal reports. Faunal analysis in the post-medieval period is not perceived as making a significant contribution to knowledge due to the existence of written historical records. Considering the bias implicit in most historical accounts, data resulting from faunal analyses contributes an independent parallel narrative against which archival writings could be compared in the pursuit of meaningful queries (Thomas 2009:136-137). Yet, despite the potential of this knowledge source, it appears that such a small number of assemblages have been analysed and reported that any synthetic interpretive attempts are challenged by a lack of data.

#### **3.3.2.4.      *Site size and assemblage size***

The size of an archaeological site and that of an assemblage affects the character of analysis in a number of different ways; this project is no exception. Excavation of large and obvious sites has often been prioritised in the past; while this results in larger faunal assemblages being recovered and more pathologies may therefore be found (but see Bartosiewicz 2008), it can also create a somewhat false impression of the past. Turkeys from Ancestral Pueblo great houses or British castles may not have led the same existence as those turkeys kept by unit pueblo dwellers or rural villagers and the interpretations made during the course of this research may be affected by this bias.

#### **3.3.2.5.      *Use of old data***

The use of data from previous analyses and publications has been necessary during the course of this project. To differing degrees, I have made use of information that was gathered and recorded using methods different to my own for nearly all the sites. For Salmon, this was necessary because not all of the assemblage was available for study. Previous work by Kathy Durand (2006) quantified the assemblage in enough detail that I was able to use it

in combination with my own analyses to describe and interpret the pathologies. Similarly, only portions of the Gran Quivira, Arroyo Hondo and the Eleventh Hour materials were accessible. It was not possible to access the assemblage at Paquimé, and therefore the data gathered by McKusick (in DiPeso et al. 1974) was used in my discussion of the pathologies recorded in that assemblage. In addition, known pathologies present in other assemblages (many of which I was unable to see in person but were kindly photographed by Jonathan Driver) are also described in Chapter 4, accompanied by whatever details I could acquire on their origin and context.

#### **3.3.2.6.      *Project design***

As the process of site and assemblage selection was designed to rely very heavily on published material, a certain set of implications follows. This project was limited by research materials available; unpublished reports could not be used to locate assemblages containing pathological bones. However, known specimens have been included in this project whenever possible, and I have reviewed all accessible grey literature. I have pursued all references to similar assemblages and pathologies whenever possible. In addition, matters of time and finance discussed above have ensured that I was prevented from pursuing a large number of parallel investigations which would have the potential to support my research goals. As mentioned previously in his chapter, I instead attempted to use a number of sources from multiple disciplines as support for my interpretations (see Chapters 5 and 6).

#### **3.3.2.7.      *Sampling and excavation strategies***

Excavation strategies have a marked impact on the structure of the resultant faunal assemblage. Excavation directors, individual excavators, the project design, the type of excavation and the institutions involved in an archaeological investigation can all affect what parts of an archaeological site receive the most attention and therefore what animal remains are recovered. As mentioned previously, there was a history of targeting large, monumental structures or areas of symbolic significance for excavation in

the American Southwest, which may exclude living and working spaces or the dwellings of non-elites from study. For example, rubbish heaps and kitchen middens are often excellent sources of faunal material. However, the species and proportions thereof which may be represented in the rubbish heap of a small unit pueblo and a Chacoan Great House, no matter their proximity to each other, will likely differ in a meaningful way. In addition, the training of the excavators and types of equipment used during excavation can also affect the condition of the bones when they are ultimately analysed, and therefore the proportion of material that is identifiable as well as the overall result of any analysis. Bones are frequently damaged and broken during excavation and subsequent transportation, and this can diminish their usefulness for the purposes of analysis and how well they survive during curation, which in turn affects their potential for future research. Depending upon the time period during which the excavation was carried out, the research framework of the director, and the standards of the discipline at the time, there will have been a broad and varied set of approaches to the treatment of faunal remains. For instance, clusters or groups of animal bones (ABGs) with a significant interpretive potential may have gone entirely unrecorded or the context of faunal remains may not have been noted or subsequently lost. It has not always been common to retain the animal bones from an excavation due to limitations of a financial or temporal nature and in some parts of the world, faunal remains continue to have a very low retention priority. A failure to screen all excavated material can bias the animal bone assemblage toward large, easily noticed, recognisable elements while smaller or less familiar elements and bone fragments can be passed over (Payne 1975). The use of larger mesh sizes when screening also results in a loss of small bones, though probably to a lesser extent.

Any of the above-discussed effects obviously changes the makeup of the faunal assemblage in some way, and will likely therefore have affected the results of my research. I attempted to overcome these biases whenever

possible, and make clear any specific issues linked to excavation strategies and sampling.

#### **3.3.2.8.      *Repositories, storage, and cataloguing***

In the fortunate case that the entire faunal assemblage from an excavation has been retained and curated, there are a number of issues which can cause challenges and biases in the analysis of faunal remains. Often, an assemblage has not been thoroughly catalogued by the excavation team or was only broadly divided into material culture types for a cursory sort (such as in the cases of Heshotauthla and Ojo Bonito). Depending on the mission of the museum, archaeological assemblages can be stored as part of a collection of material culture types (i.e. divided into ceramics, lithics, bone) and not retained together. As mentioned above, faunal remains excavated from the same site are not always curated by the same institution. This can lead to a loss of relevant information. Basic faunal analysis may not have been completed, in which case no bone counts may have been taken and the bagging of specimens in archival materials may not have taken place. In the cases of some sites described in Chapter 4, only the most essential contextual information was retained (e.g. "Zuñi"). Storage conditions may also present another source of interpretive difficulties as they can lead to degradation of material which not only inhibits identification of elements, but can prohibit the description of subtle pathology. However, with regard to this study specifically, no degradation resulting from the conditions in which the bones were kept was discerned.

#### **3.3.3. Assemblage-specific challenges**

Every faunal assemblage presents particular interpretive opportunities implicit in a unique data set. In addition, they also offer individual sets of methodological challenges. Below I discuss the sites and assemblages for which exceptions to the project methods described above had to be made.

### **3.3.3.1.      *The Bluff Great House***

I analysed the faunal remains from the Bluff Great House for part of my Master's research at Simon Fraser University (Fothergill 2008), during which standard regional analysis protocols were followed (Driver 2005). These differ from those used for other assemblages in this study and as a result, I have converted the original data to the format employed in the present project. Though no general loss of data occurred as a result of this conversion, one of the pathological elements is not zoned by Cohen and Serjeantson's method and therefore the prevalence calculation for the sternal rib differs from the other elements.

### **3.3.3.2.      *Salmon Ruin, Arroyo Hondo, The Eleventh Hour (29SJ633)***

My re-analysis of the turkey bone assemblages from Salmon, Arroyo Hondo and the Eleventh Hour did not include parts of the faunal collections from those sites. As all of these sites had published faunal reports (Durand and Durand 2006; Lang and Harris 1984; Gillespie 1991), details of the assemblages and NISPs provided were used for interpretive purposes and in calculations that required total faunal counts.

## **3.4. Summary**

In addition to the usual complications of zooarchaeological and palaeopathological analysis, this project has a number of different methodological obstacles to surmount. Whenever possible, the challenges and biases described above are taken into account and attempts have been made to overcome and balance the complications implicit in this type of research. Despite the limitations described here, the patterns present in the data which have been collected and the interpretation thereof are still valid and make a much-needed contribution to neglected areas of research. These data are the subject of the next chapter.

## **Chapter Four. Data and Description**

### **4.1. Introduction**

In this chapter, the data are presented and described. The primary objective of (re-)analysing these assemblages was to determine the presence of pathologies and their prevalence; however, other data which can also be used to interpret husbandry methods and illuminate past human-turkey relationships were also generated. These data include details of turkey size, turkey age, sex and bone modifications; they are presented before the description and illustration of the pathological bones from each site. For some sites, few details about the sites themselves, contextual information of the faunal remains or data from previous zooarchaeological analyses were available; any accessible details are provided. Photographs are used to show lesions present in the turkey elements from each assemblage. These are arranged by site and diagrams illustrating the presence of pathologies are grouped toward the end of the chapter for comparative purposes.

Some pathologies which are known from other sources are also described in this chapter; though they are not included in most of the data tables, diagrams or parts of the discussion, they are still important for the general interpretation of pathologies in turkeys in the American Southwest and northern Mexico. Whilst the majority of interpretation will be reserved for the following chapters (Chapters 5 and 6), a summary of the key patterns evident in the data is included here.

### **4.2. Non-palaeopathological data**

As noted in the previous chapter, assemblages from nine archaeological sites in the American Southwest were analysed (or partially analysed depending upon accessibility and other constraints; see Chapter 3, Materials and Methods, for details). Some of these assemblages have had a full zooarchaeological analysis performed in the past (twice, in the case of Salmon) while Gran Quivira was analysed in two portions, only one of which was accessible. Others had only received a cursory examination and count.

With the exception of the Bluff Great House, where I converted the data from a different recording method used earlier, I employed the methods described in Chapter 3 for analysis of all assemblages.

### 4.3. The American Southwest

The American Southwest was and is still home to many First Nations peoples, and in beginning analyses, it seemed possible that these groups kept the turkey in different ways and that this might be evident from the pathologies and other modifications present in the assemblages. To that end, three broad regional divisions are used throughout this and subsequent chapters (See Figure 4.1) for the purpose of illuminating patterns which could highlight distinctions in practice between areas and possibly indicate the use of different husbandry methods. These regions were chosen mainly by geographic association (in the case of the San Juan sites) or known cultural connection (Zuñi, Salinas). Arroyo Hondo and Eleanor Ruin, as the sole representatives of their respective geographic regions, are grouped together as "Other Sites". The regions are illustrated by Figure 4.1, which shows the San Juan sites outlined in red, the Zuñi sites in blue and the Salinas sites in green, as well as the locations of Arroyo Hondo and Eleanor Ruin outlined in white. In addition, all sites have been grouped into what are loosely termed "early" and "late" groups in order to distinguish diachronic changes in comparable aspects of the assemblages. Sites which were occupied primarily before AD 1300-1350 make up the first group, whilst the second consists of sites which were first occupied at approximately AD 1300-1350 up to AD 1750. This temporal division is more of a gradient and was selected as it included the most frequent starting or ending periods represented within this group of assemblages.

Marker Colour	Region	Marker Shape	Time period
Red	San Juan Basin	Triangle	Prior to AD 1300-1350
Blue	Zuñi	Square	AD 1300-1350 through 1750
Green	Salinas		
White	No specific region		

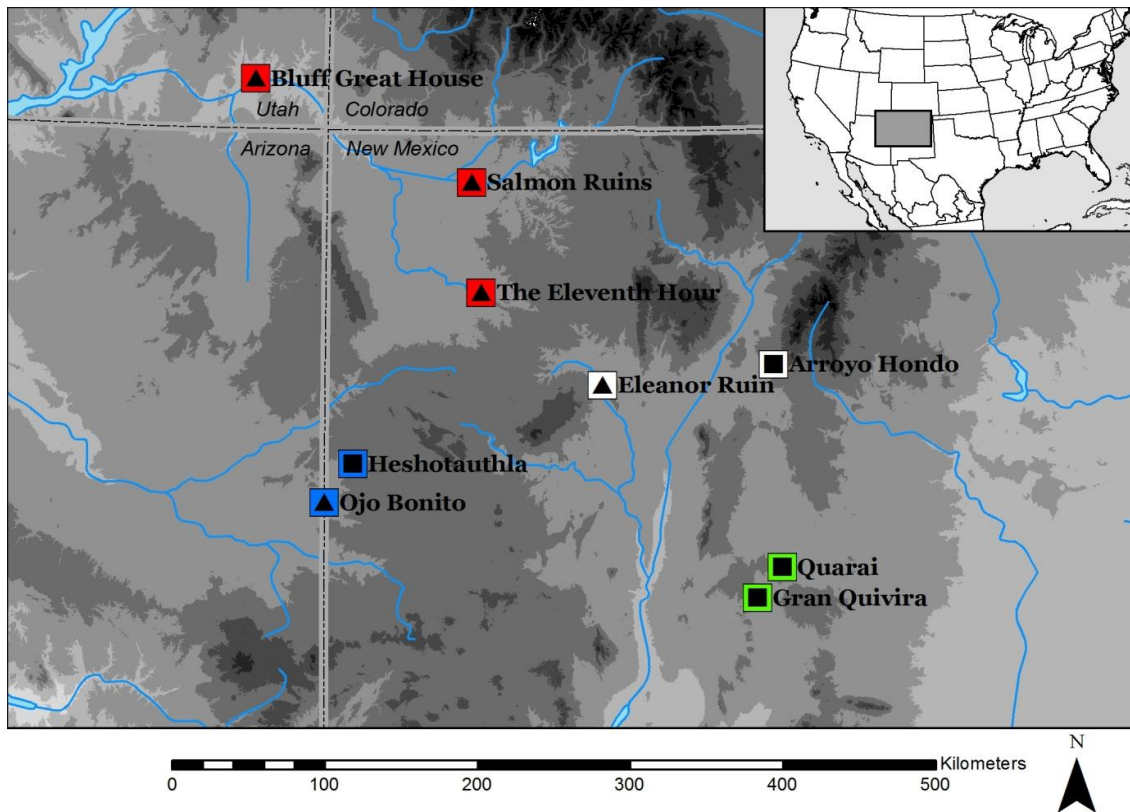


Figure 4.1: Map of (re-)analysed sites in the American Southwest

#### 4.3.1. Turkey prevalence

Turkeys are present in large numbers in all assemblages described here, but make up rather different percentages of each assemblage. Table 4.1 shows the total turkey NISP (Number of Identified Specimens) from all sites grouped by time period, and includes bones which were identified as "probable turkey" or were otherwise deemed likely to be turkey by the analyst. Unidentified faunal remains were not included in these totals. The percentage given for Arroyo Hondo is based on MNI, as total NISP was not provided.

	Total Assemblage Turkey NISP	Percent Turkey
<i>"Early" sites</i>		
Eleventh Hour	766	29.6%
Salmon Ruin	358	15.5%
Bluff Great House	1,523	28.9%
Eleanor Ruin	376	10.8%
Ojo Bonito	329	26.3%
<i>"Late" sites</i>		
Heshotauthla	213	9.5%
Arroyo Hondo	1,336 (MNI 384)	8.6%
Quarai	245	1.4%
Gran Quivira	113	0.8%

Table 4.1: Total turkey NISP and percentage NISP by site



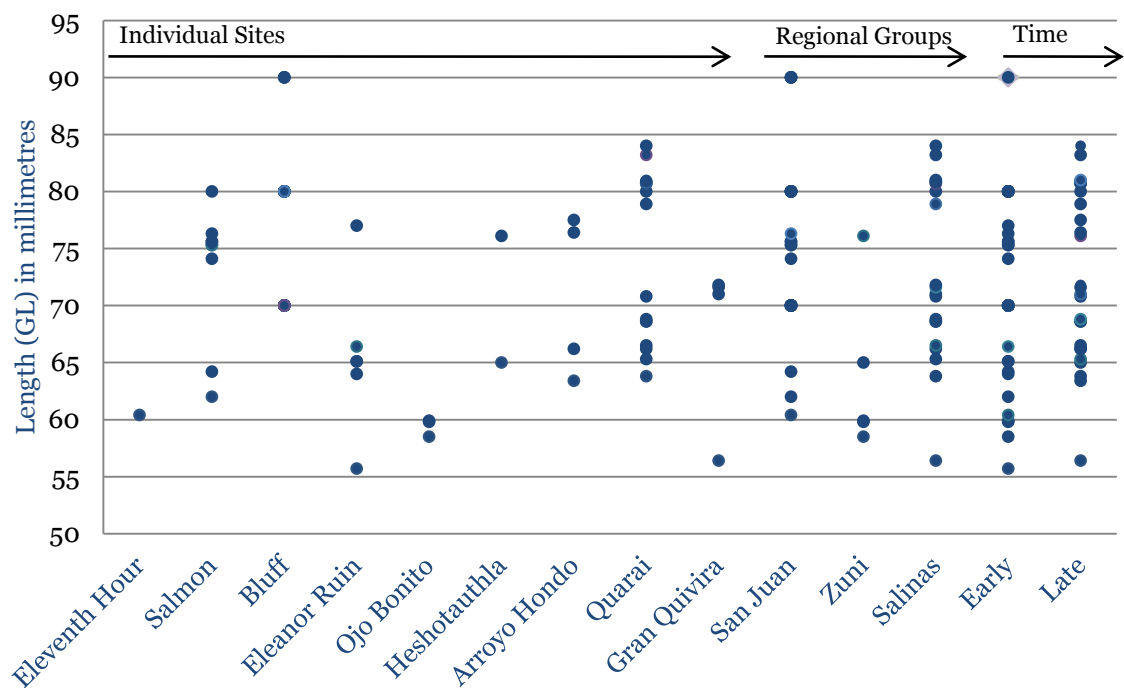
These assemblages differ with regard to the percentage of turkeys present; there are lower proportions of turkeys at later sites. Under the assumption that individual observations are independent and with a null hypothesis of no variation between assemblages and eight degrees of freedom, the percentage of turkey in these assemblages varies significantly at a level of 0.001 ( $\chi^2 = 6,832.865$ ). In addition, there is a very striking change over time in the general presence of turkeys at these sites. When considering all assemblages grouped into the aforementioned "early" and "late" categories, the decrease in turkey presence over time is statistically significant at ( $\alpha = 0.001$ ;  $\chi^2 = 4861.332$ ;  $v = 1$ ).

#### **4.3.2. Turkey size**

Turkey size varies from site to site and also changes over time, but not in straightforward or consistent ways; measurements considered here are not an avian version of withers height, but rather single element metrics which can be used to roughly estimate limb proportions. Figures 4.2-4.10 illustrate the ranges in greatest length measurement (GL) for adult elements from each site. Although GL is the greatest length of the tibiotarsus, La was used due to the frequent absence of the proximal portion of the cnemial crest. The Bluff measurements are somewhat problematic as they were taken to the nearest centimetre whilst the measurements from other assemblages were taken to the nearest millimetre. It is likely that this has inflated the lengths of the elements from the Bluff site and obscured subtle size differences between male and female elements. Not all sites contain all elements and in the case of the fibula, insufficient numbers were present (and measurable) and therefore that element is not included for comparison. It was not possible to plot GL against SC due to the small number of bones with both measurements. Fragmented bones are not included in the figures below. With the exception of the femur, it is possible to identify two groupings in the bone measurements for each site; this undoubtedly represents sexual dimorphism in the turkey. In the case of the femur, it is not a straightforward matter to identify the split in length data which should be

apparent from the sexual dimorphism present in turkeys. Each plot also has five additional categories for the element in question; these are the "early" and "late" time periods as well as the three regional groups (in which Arroyo Hondo and Eleanor Ruin are not included as they are the sole representatives of their broad geographic areas). Table 4.2 (which follows the measurement plots below) shows all average GL values for sites, regional groups and time periods.

Beginning with wing element measurements, the longest carpometacarpi are at Bluff and Quarai with shorter average measurements at Eleanor, the Zuñi sites and Gran Quivira (Figure 4.2). At the Eleventh Hour site, however, only one carpometacarpus was measured and only four from Zuñi sites were measurable. The Eleventh Hour measurement and those from Eleanor Ruin are a bit smaller than those from Bluff.



**Figure 4.2: GL measurements of carpometacarpi**

These observations must be tempered by the sexual dimorphism of turkeys, although the longer carpometacarpus of the two from Heshotauthla is still smaller than those from Bluff and Quarai and similar in length to some mid-range Salmon elements. With regard to mean average values, the San

Juan lengths are the longest, followed by Salinas and then Zuñi with an extremely slight upward trend in length over time.

With regard to the coracoid bones (Figure 4.3), a similar pattern emerges: one of the longest GL measurements is present at Bluff with other long coracoids at Eleanor and Quarai; some diversity in length is evident in the elements from the northern sites. Salmon and the Eleventh Hour elements are a bit shorter than those from Bluff, with those from Eleanor measuring a bit longer than those from northern sites. Shorter measurements were taken from bones from the Zuñi sites and Gran Quivira. Fewer measurements were possible from the Zuñi sites and the Salinas Pueblos. Even so, considering their similar site histories (see assemblage discussions which follow), there remains a somewhat surprising disparity between the Quarai and Gran Quivira measurements. Again, the San Juan has the greatest lengths, followed by Salinas and then Zuñi with a trend toward shorter lengths from the "early" to "late" periods.

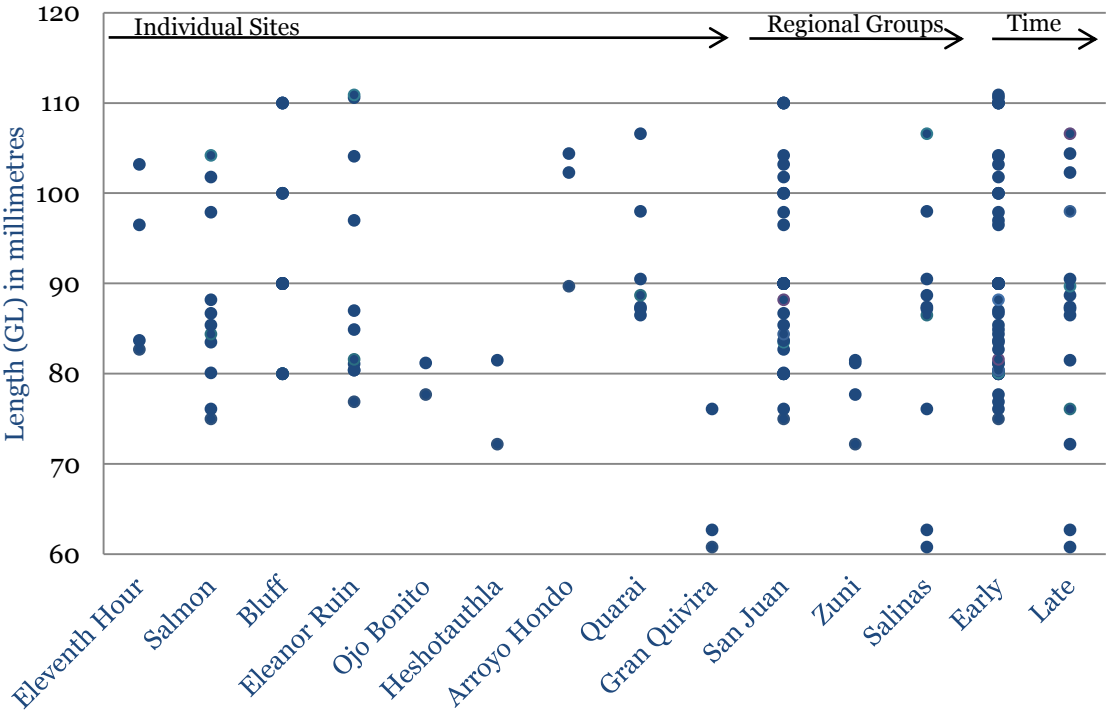
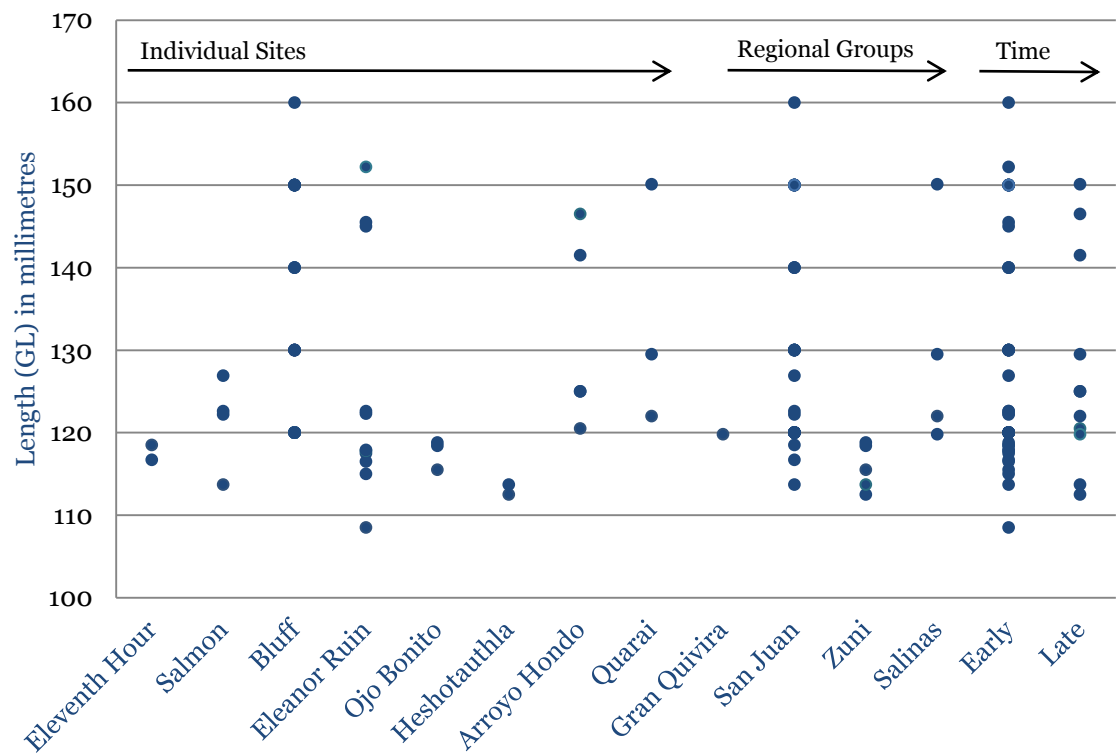


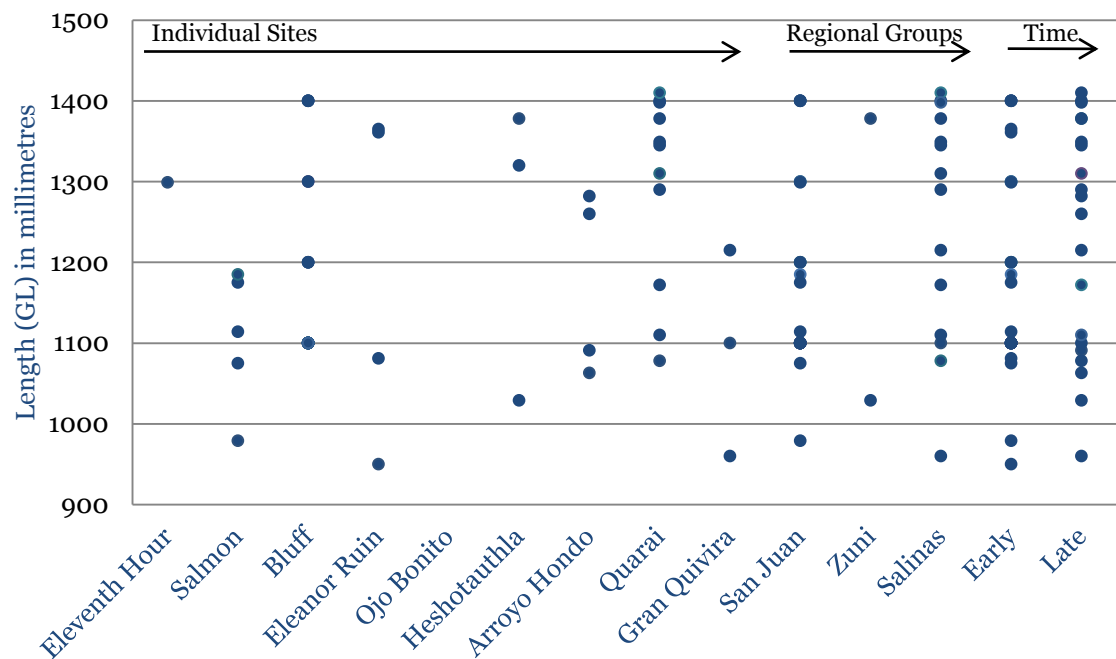
Figure 4.3: GL measurements of coracoids

The humeri in Figure 4.4 show less diversity in lengths across the northern sites, though the Salmon and Eleventh Hour elements are shorter than those from Bluff. The Zuñi elements are again smaller than most other sites and the shortest Quarai humerus is slightly longer than the only Gran Quivira measurement. San Juan lengths are again highest on mean average, followed by the Salinas pueblos and Zuñi has the shortest. There also appears to be reduced variation in length in the later period assemblages.



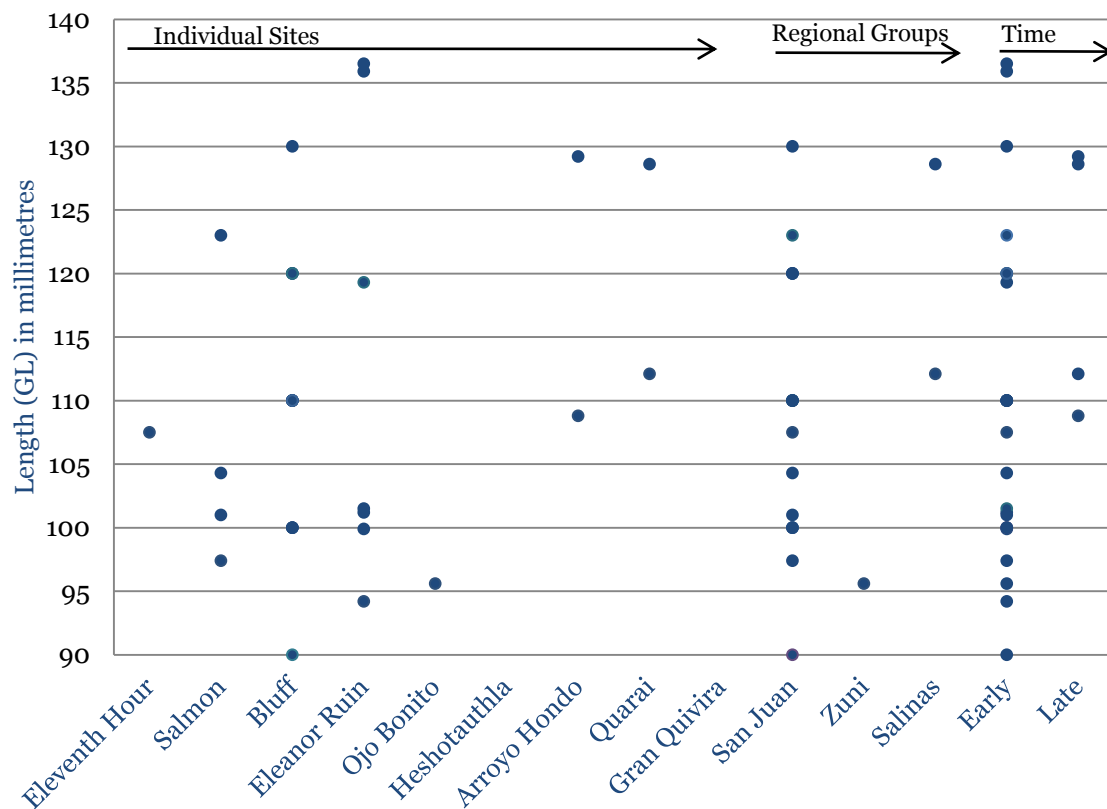
**Figure 4.4: GL measurements of humeri**

Radii are few in number, probably due to the fragility of the element, and no length measurements of the Ojo Bonito radii were possible. However, it is still possible to see that in Figure 4.5, the Bluff lengths are larger (based on mean average) than those from the Eleventh Hour and Salmon. Arroyo Hondo does not differ much from Bluff or Quarai. The Heshotauthla radius lengths are similar to other sites and the Gran Quivira lengths are smaller than Quarai. The Salinas humeri are longest on mean average with San Juan and then Zuñi following, and a slight increase in length over time.



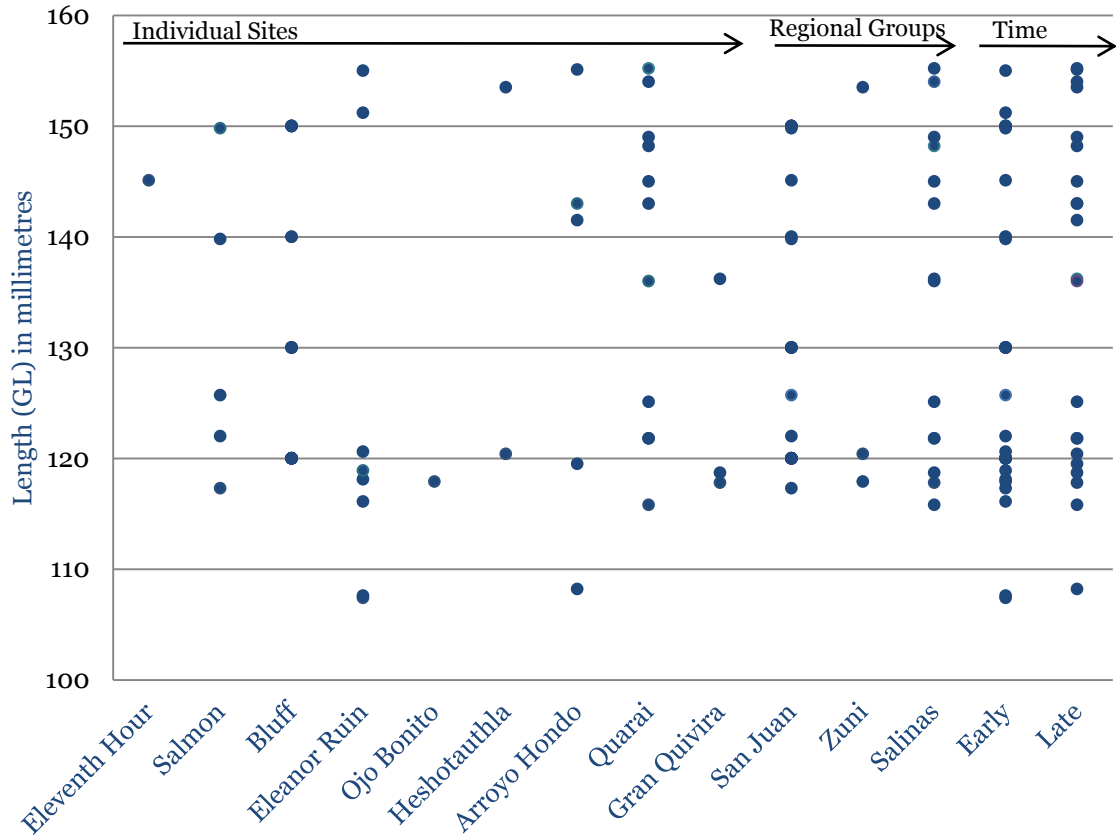
**Figure 4.5: GL measurements of radii**

Few scapulae were measurable across all sites (Figure 4.6), with no GL measurements possible for the bones from Heshotauthla and Gran Quivira. Despite this, it is possible to see that the Eleanor Ruin elements are longer than those from Bluff, which are in turn longer than those from the rest of the northern San Juan sites. The single scapula from Ojo Bonito ranks near the low end of the graph, and Arroyo Hondo and Quarai have similarly-sized elements. Zuñi has the smallest mean average measurement (but is represented by only one element); the San Juan measurements are larger and the Salinas measurements are larger still. There is a slight increase in length over time on average, though the late period is represented by very few elements.



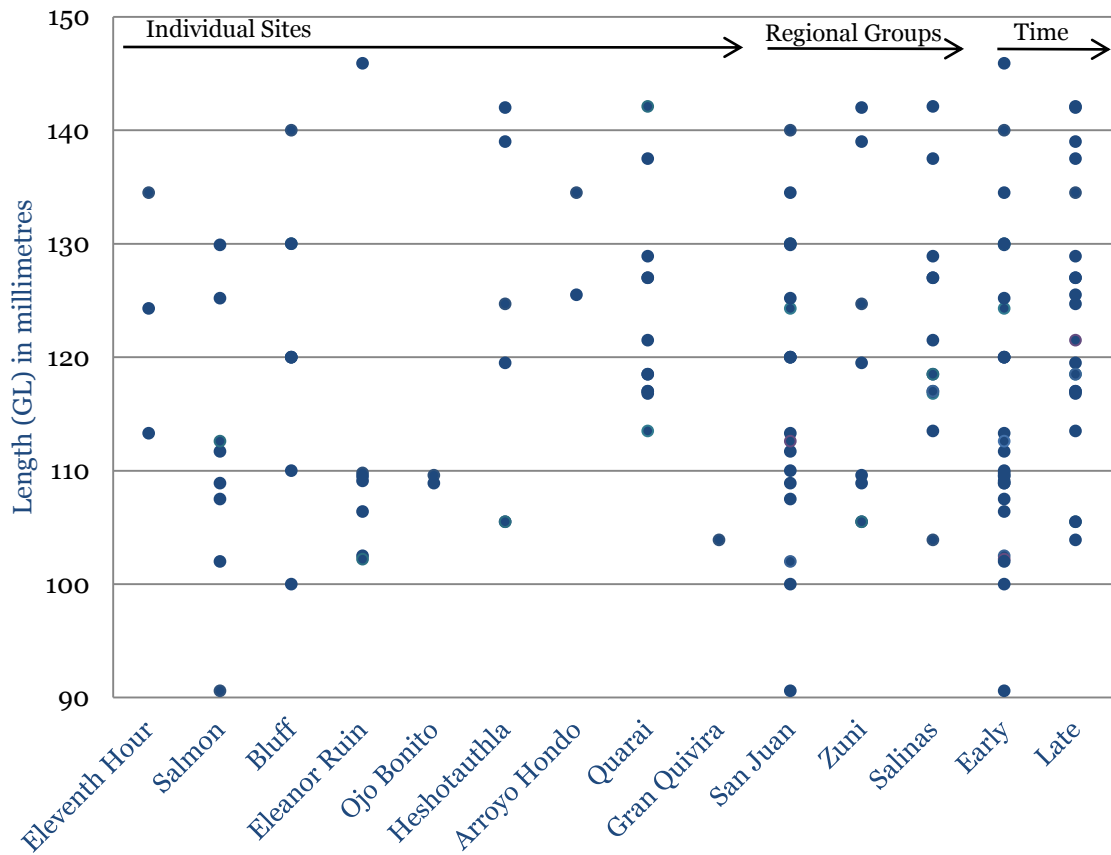
**Figure 4.6: GL measurements of scapulae**

The ulnae (Figure 4.7), like the radii, show relatively little diversity in length across all sites. The Eleanor ulnae are a bit larger than the ulnae from the Eleventh Hour site, Salmon and Bluff. The single ulna length measurement from Ojo Bonito is comparable to the smaller ulnae from most of the sites, whilst the Heshotauthla ulnae fit neatly at the top and bottom of the ranges respectively. Arroyo Hondo and Quarai have some measurements about as long as Eleanor Ruin and the Gran Quivira elements are again shorter than those from Quarai. There is little regional variation, though Salinas have the longest measurements, followed by the San Juan and then the Zuñi elements. A small increase over time in the mean average of ulnar length is apparent (Table 4.2).



**Figure 4.7: GL measurements of ulnae**

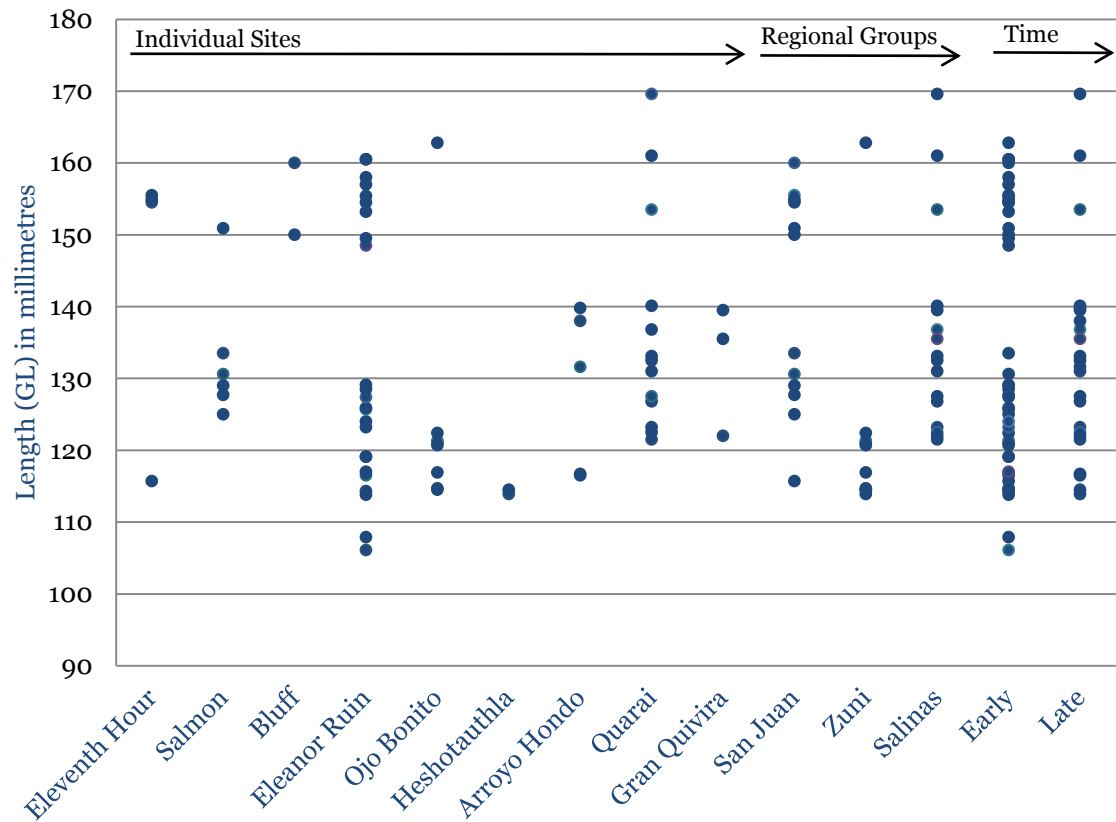
Eleanor Ruin (Figure 4.8) has the longest femur measurement and Bluff has the longest measurements of the northern San Juan sites. Ojo Bonito has a couple of shorter femora and Heshotauthla has measurements very similar to Quarai, which has longer measurements than Gran Quivira, though only one femur GL was taken from the Gran Quivira assemblage. The Salinas region has the longest femur measurement, followed by Zuñi and then the San Juan. There is a slight decrease in femoral length over time, though the measurements are clustered more tightly, indicating a diminished length range.



**Figure 4.8: GL measurements in femora**

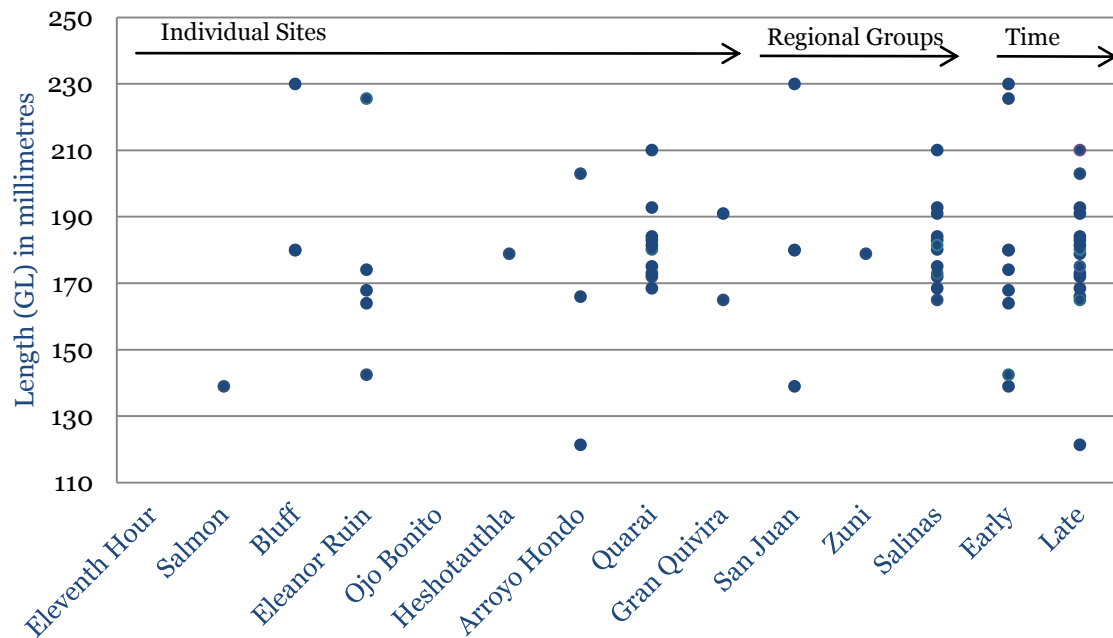


In the tarsometatarsi (Figure 4.9), the measurements from Eleanor and the northern San Juan sites are very similar, with Eleventh Hour and Salmon a bit shorter than Bluff. Ojo Bonito has one measurement which is longer than those from Eleanor, and the two measurements from Heshotauthla are toward the small end. Arroyo Hondo and Gran Quivira have similarly short lengths with their largest at about 1400 millimetres. Quarai has the longest tarsometatarsi of all sites, with the shortest of these being at least 100 mm longer than the shortest tarsometatarsi from other sites. The longest tarsometatarsi on mean average are from Salinas, followed by the San Juan and then Zuñi. Over time, there is again a reduction in the range of tarsometatarsal lengths, but an increase in length.



**Figure 4.9: GL measurements in tarsometatarsi**

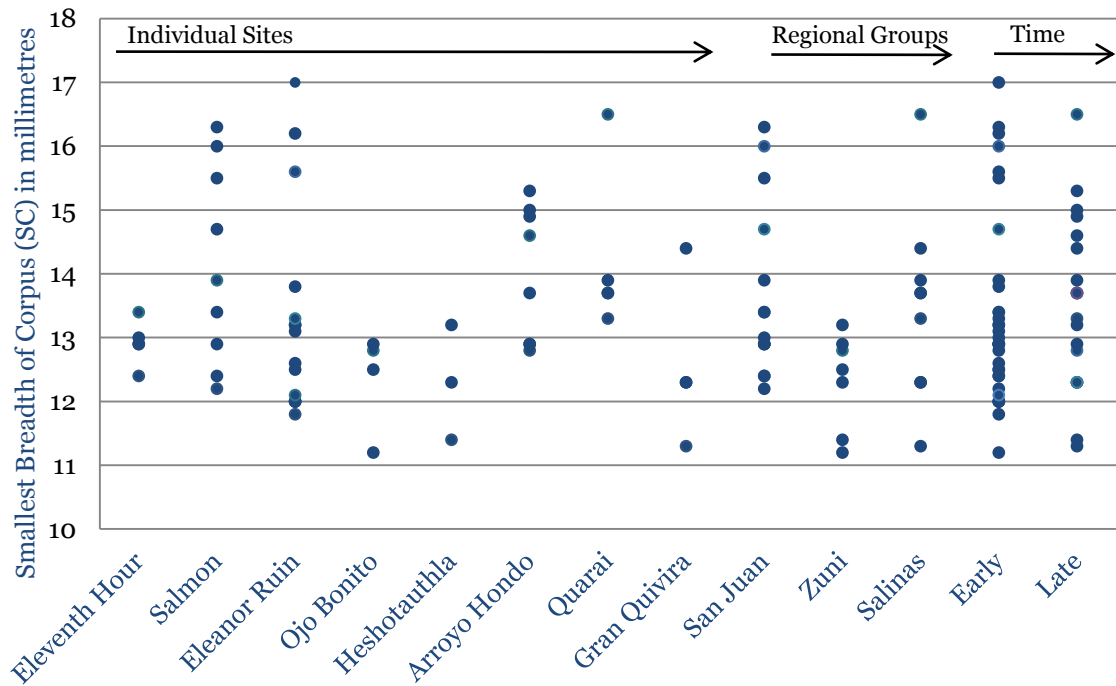
Measureable tibiotarsi (Figure 4.10) were limited in number, and La was used instead of GL due to regular absence of the most proximal portion of the articulation. No specimens from the Eleventh Hour or Ojo Bonito were measureable, with only one bone from Salmon and Heshotauthla. In this case, the highest numbers come from Bluff and Eleanor respectively, with Quarai having longer elements than Arroyo Hondo and Gran Quivira. With regard to mean average, the San Juan has the longest tibiotarsi, followed by Salinas and then Zuñi. There is a slight decrease in mean average tibiotarsal GL from the "early" to late" periods, but the sample size is very small.



**Figure 4.10: La measurements in tibiotarsi**

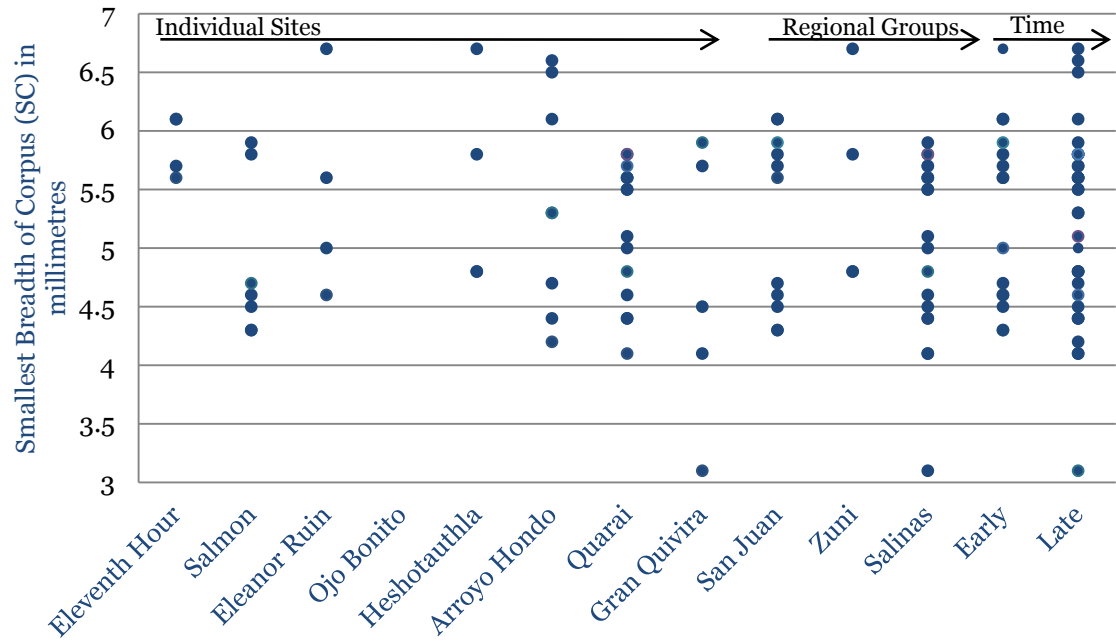
Figures 4.11-4.16 show the ranges in SC (smallest breadth of corpus, generally taken along the diaphysis or metaphysis, see Figures 3.2 and 3.3 in Chapter 3) for all elements with an SC measurement. Since no SC measurements were taken during the analysis of the faunal remains from Bluff, this site is not included in these figures. Further, Ojo Bonito had no radii or tibiotarsi for which SC was measurable. Table 4.3 shows all mean average SC values for sites, regional groups and time periods.

Figure 4.11 shows the SC measurements for humeri. On mean average, humeral SC increases over time, though only very slightly. Eleanor Ruin and Salmon have the widest range of measurements; Eleventh Hour has the narrowest. The Zuñi sites and Gran Quivira have the lowest SC values, and the overall range of measurements does decrease over time.



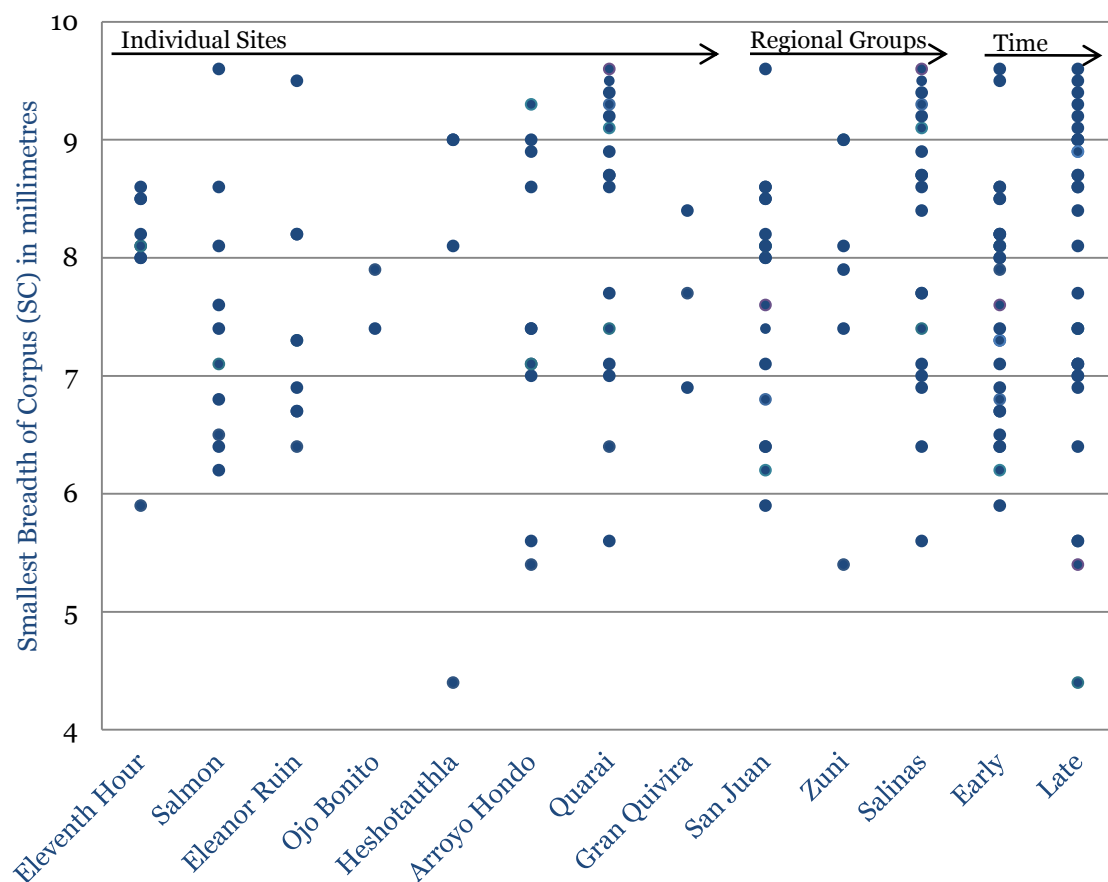
**Figure 4.11: SC measurements in humeri**

The SC measurements for radii (Figure 4.12) are completely different; while Eleanor still has some large measurements, Heshotauthla has the largest and Arroyo Hondo is not far below. The Eleventh Hour measurements are larger than Salmon, and Gran Quivira has a largest SC and a wider variety of lengths than Quarai. Zuñi has the largest mean average radius SC, followed by the San Juan and then Salinas; radii decrease in size slightly over time.



**Figure 4.12: SC measurements in radii**

The story is much the same with regard to Figure 4.13 and the SC measurements for ulnae. This is a slightly larger data set, probably because the ulna has a higher general survival potential than the radius. This being said, the plots are still very similar, although Salmon is a bit closer to Eleanor and has larger and more varied SC measurements than the Eleventh Hour. Heshotauthla again has the highest mean average SC value and Arroyo Hondo still falls between Quarai and Gran Quivira. The Salinas pueblos have the highest average SC, followed by Zuñi and then the San Juan sites. Ulnae exhibit a small increase in SC over time.



**Figure 4.13: SC measurements in ulnae**

In Figure 4.14, Eleanor Ruin has the highest individual SC for the femur, followed by Quarai. Salmon has much more varied and slightly larger SC values than the Eleventh Hour, which is very similar to Arroyo Hondo. Heshotauthla has the highest mean average SC and the Ojo Bonito values are near the bottom of the same range. Gran Quivira is represented by a single measurement which is as small as the smallest element from Salmon and much smaller than the measurements from Quarai. The Salinas pueblos have the highest mean average SC, but the San Juan and Zuñi have extremely close average SC values (See Table 4.3). Over time, there is an increase in the SC of femora.

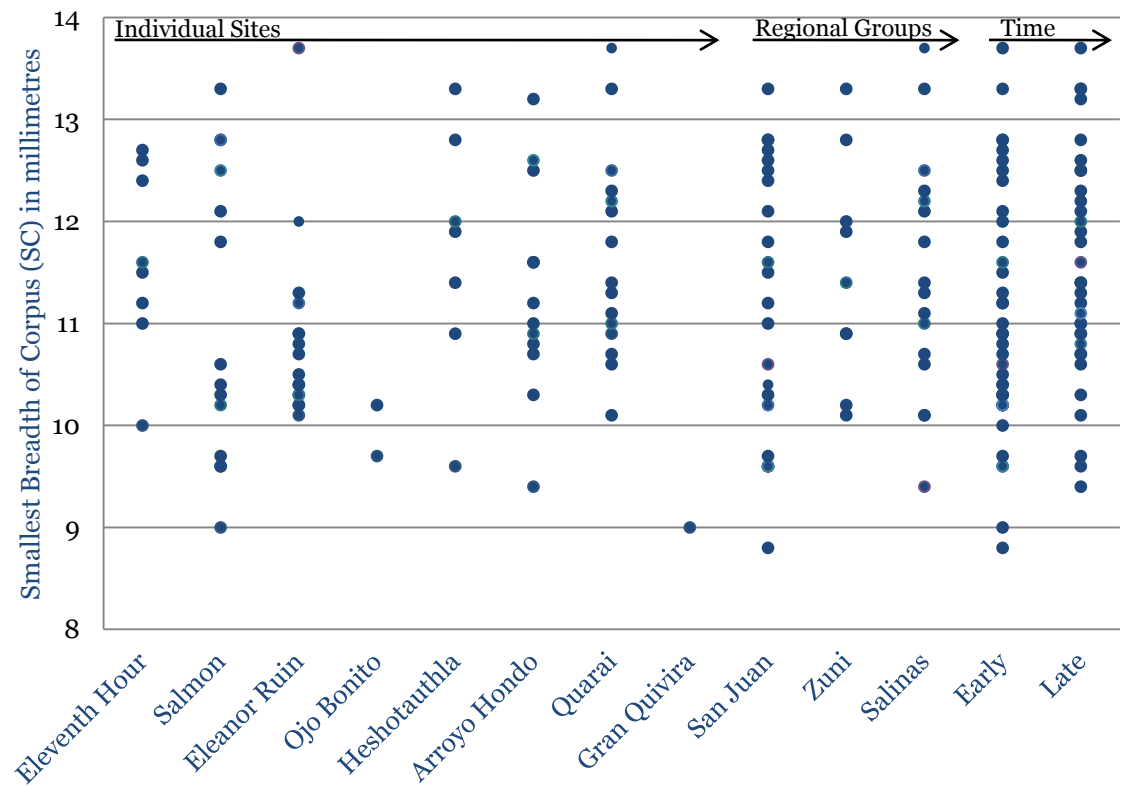
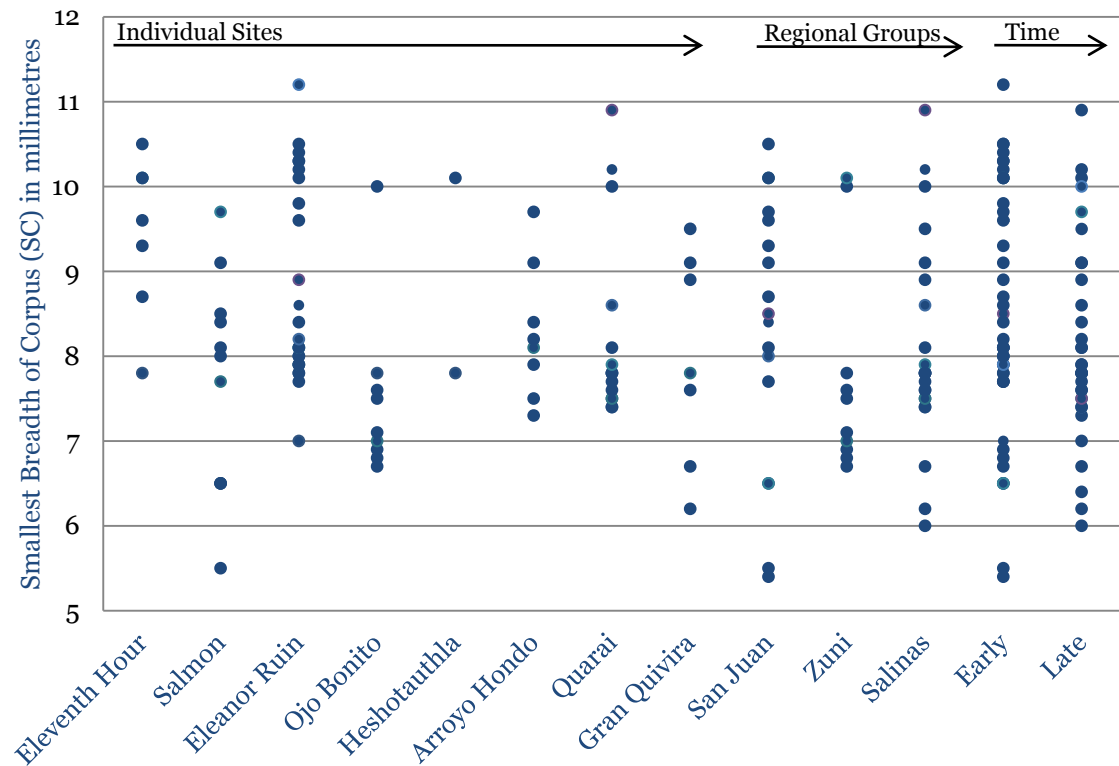


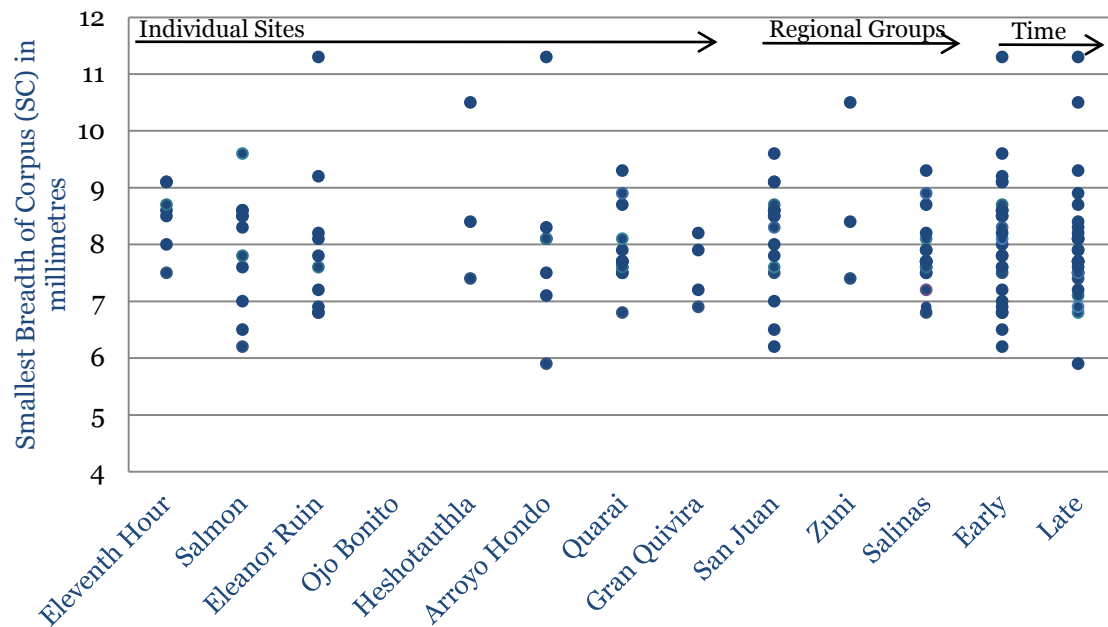
Figure 4.14: SC measurements in femora

With regard to tarsometatarsal SC (Figure 4.15), the Eleventh Hour has a larger high value and mean average value than Salmon and Eleanor has the highest overall SC measurement as well as the highest top value. Ojo Bonito and Heshotauthla fit into the middle of the spectrum with Arroyo Hondo (though Ojo Bonito has several low measurements). The measurements from Quarai are again larger than those from Gran Quivira. The San Juan sites have the highest mean average SC, followed by Salinas and then Zuñi. From the "early" to the "late" period, there is a decrease in average SC, and a narrower range in the late period.



**Figure 4.15: SC measurements of tarsometatarsi**

For the tibiotarsus (Figure 4.16), no SC values were available from Ojo Bonito. Salmon has a wide range of measurements with a higher top value than the Eleventh Hour site, which is in turn lower than that of Eleanor Ruin. Heshotauthla's low values are at about the mean average for other sites and it has the highest average SC of all sites. Arroyo Hondo has quite a high top value, but falls between Quarai and Gran Quivira when mean average is considered. Gran Quivira, as appears to be the typical case, has much smaller values and a smaller mean average than Quarai. Zuñi has the highest mean average tibiotarsal SC, followed by the San Juan and then Salinas. There is a slight decrease in the average SC measurement for this element over time.



**Figure 4.16: SC measurements of tibiotarsi**



The tables below (Tables 4.2 and 4.3) give the mean average values for GL and SC measurements from all sites, divided up by regional group and time periods.

Average GL (mm)	Coracoid	Scapula	Humerus	Radius	Ulna	CMC	Femur	TBT	TMT
Eleventh Hour	91.6	107.5	117.6	129.9	145.1	60.4	124.0	N/A	145.2
Salmon Ruin	87.6	106.4	121.4	110.6	130.9	73.2	111.1	139.0	132.8
Bluff Great House	91.8	110.0	132.5	118.0	130.0	75.9	121.3	196.7	155.0
Eleanor Ruin	90.4	112.6	125.5	118.9	124.4	65.6	112.2	174.8	133.1
Ojo Bonito	79.5	95.6	117.6	N/A	117.9	59.4	109.3	N/A	124.3
Heshotauthla	76.9	N/A	113.1	124.2	137.0	70.6	122.7	178.9	114.2
Arroyo Hondo	98.8	119.0	131.7	117.4	133.5	70.9	130.0	163.5	128.6
Quarai	92.1	120.4	133.9	129.5	137.7	74.6	123.8	182.0	136.9
Gran Quivira	66.5	N/A	119.8	109.2	124.2	67.7	103.9	178.0	132.3
<i>By region</i>									
San Juan	90.7	109.1	130.5	117.0	130.7	74.8	117.4	182.3	129.9
Zuñi	78.2	95.6	115.8	84.6	130.6	63.9	119.3	178.9	122.3
Salinas	84.4	120.4	130.4	125.1	134.8	73.3	122.2	181.4	136.0
<i>By period</i>									
Early	90.2	109.5	128.7	117.3	129.0	72.7	115.5	178.1	133.6
Late	86.3	119.7	127.8	117.8	132.1	72.7	123.1	177.9	132.5
Average by element	89.4	110.9	128.6	119.8	131.1	72.7	118.8	177.9	133.2

**Table 4.2: Mean average GL measurements by site, region and time period**

Average SC (mm)	Humerus	Radius	Ulna	Femur	Tibiotarsus	Tarsometatarsus
Eleventh Hour	12.9	5.9	8.2	11.7	8.5	9.4
Salmon Ruin	14.1	4.9	7.4	11.0	7.9	7.6
Eleanor Ruin	13.4	5.5	7.5	10.9	8.0	8.9
Ojo Bonito	12.4	N/A	6.9	9.6	N/A	7.3
Heshotauthla	12.3	5.5	8.5	11.8	8.8	9.0
Arroyo Hondo	14.0	5.4	7.4	11.3	8.0	8.1
Quarai	14.2	5.2	8.2	11.6	7.9	8.2
Gran Quivira	12.6	4.7	7.2	9.4	7.6	7.7
<i>By region</i>						
San Juan	13.7	5.2	7.8	11.3	8.2	8.3
Zuñi	12.3	5.5	8.0	11.3	8.8	7.6
Salinas	13.5	5.1	8.0	11.4	7.8	8.0
<i>By period</i>						
Early	13.4	5.3	7.6	11.0	8.1	8.4
Late	13.5	5.2	7.9	11.5	8.0	8.1
Average by element	13.4	5.2	7.8	11.2	8.0	8.3

**Table 4.3: Mean average SC by sites, region and time period**

From the above plots of GL and SC (Figures 4.2-4.16 above), a number of trends are evident. These will be discussed briefly first by regional group and then with respect to diachronic change for all sites.

In considering the San Juan sites (which all belong to the "early" period and are the most northerly), there is a great deal of variety in element lengths with the longest average GL measurements present at the Eleventh Hour site (radii and ulnae) and Bluff (carpometacarpi, tibiotarsi and tarsometatarsi). The Eleventh Hour site also has the highest SC average for radii and tarsometatarsi. Salmon generally trails behind these sites with regard to most measurements and has the smallest average GL for tibiotarsi. Many of Salmon's average measurements are not far above the lowest with regard to SC, though the humerus SC is above mean average for all sites.

The Zuñi sites both have comparatively short elements; this is particularly true of those from Ojo Bonito. Both male and female elements, when sex has been determinable, tend to be shorter. In fact, for the scapula, humerus, ulna and carpometacarpus, the shortest average length measurements are from Ojo Bonito. The shortest tarsometatarsus average measurement is from Heshotauthla. Of all the Zuñi average GL measurements, only Heshotauthla's femora and tibiotarsi averages are longer than the average from all of the sites. For SC, Ojo Bonito follows a similar pattern; all measurements are well below the all-site average and the tarsometatarsal average is the lowest of all sites. Heshotauthla's SC averages are far different; though the humeral SC is lowest, it is not much lower than Ojo Bonito or Gran Quivira. In addition, Heshotauthla has the highest average values for SC in the ulna, femur and tibiotarsus. The later Zuñi turkey elements may have been short but broadly built.

Despite the extremely close temporal and spatial association between Quarai and Gran Quivira, their respective element measurements appear to be quite different. Quarai's elements have a longer GL and SC in every case. Quarai boasts the longest average scapula and humerus GL as well as the highest humeral SC. Conversely, Gran Quivira has the shortest humerus, radius and femur GL averages of all sites. Gran Quivira also has the narrowest SC averages for the radius, ulna, femur and tibiotarsus. There is

a striking contrast between the metrics of the two turkey populations. Between the two sites, the regional average values are very close to the averages for all sites.

Eleanor Ruin has the largest SC with Salmon and Quarai following, which somewhat mirrors the GL of several elements discussed above. The Eleventh Hour is represented mainly by smaller values, and Ojo Bonito and Heshotauthla have the lowest average values. The Arroyo Hondo measurements fall between Quarai and Gran Quivira, (which again has much lower average values than neighbouring Quarai). The San Juan has the largest average values, followed by Salinas and then Zuñi. There is also an increase in SC from the "early" to "late" periods, though the range does narrow. As shown in Tables 4.4 and 4.5, most measurements have less variance in the "late" period (with the exception of the coracoid, radius and ulna). These differences may derive in part from sexual dimorphism and other factors, perhaps along with a perceived difference in value of the wing elements or accompanying feathers. This narrower range may more generally indicate less cross-breeding with wild birds or a closer management of reproduction.

There is some change over time evident in the average values for element measurements. With regard to average size in upper-body and wing elements, the coracoid and humerus generally decrease in length whilst the scapula, radius, ulna and carpometacarpus increase in length. The humerus and ulna SC increase over time and the radius shows a slight decrease. The leg elements show a more straightforward trend. Though the femur increases in length and SC, both the tibiotarsus and tarsometatarsus decrease in GL as well as SC.

Coefficient of Variation	Coracoid	Scapula	Humerus	Radius	Ulna	CMC	Femur	TBT	TMT
Early	0.113	0.116	0.105	0.106	0.106	0.115	0.113	0.178	0.133
Late	0.161	0.090	0.100	0.236	0.146	0.102	0.093	0.111	0.108
Change over time	+0.048	-0.026	-0.005	+0.13	+0.04	-0.013	-0.02	-0.067	-0.025

**Table 4.4: Coefficients of variation in GL values for "early" and "late" periods**

Coefficient of Variation	Humerus	Radius	Ulna	Femur	TBT	TMT
Early	0.110	0.145	0.123	0.106	0.133	0.163
Late	0.098	0.156	0.170	0.097	0.134	0.143
Change over time	-0.012	+0.011	+0.047	-0.009	+0.001	-0.02

**Table 4.5: Coefficients of variation in SC values for "early" and "late" periods**

These data show a diversity in the general morphology of turkey populations across different sites and illustrate the possibility these shapes do change over time, perhaps even without consideration for inter-site variation. The observed narrowing of measurement ranges over time may reflect a change in husbandry strategies over time, perhaps indicating greater control over breeding.

#### **4.3.3. Turkey age and sex**

Population data on the age and sex of turkeys is provided in this section. Understanding the population dynamics in general, particularly sex ratios and mortality data, is key to interpreting aspects of animal husbandry. Table 4.6 shows the aging and sexing data by site. Turkeys were classed as juveniles if the articular ends of elements were spongy or porous. The metrics generated by McKusick (1986) and Gilbert et al. (1996) in combination with the presence of a tarsometatarsal spur were used to determine sex for complete elements. Absence of a tarsometatarsal spur was not used to determine sex (see Chapter 3). In total, 400 elements were sexed; juvenile elements were not sexed. The number of juvenile elements is included after the percentage in parentheses.

	Analysed Assemblage Turkey NISP	Sexable Elements	Percentage Male	Percentage Juvenile (NISP)
Eleventh Hour	121	13	53.85%	0.83% (1)
Salmon Ruin	157	43	30.23%	20.38% (32)
Bluff Great House	629	135	34.07%	0.79% (5)
Eleanor Ruin	150	69	31.88%	0 (0)
Ojo Bonito	63	18	5.56%	4.76% (3)
Heshotauthla	72	14	35.71%	2.77% (2)
Arroyo Hondo	129	31	38.71%	17.05% (22)
Quarai	186	65	36.92%	11.83% (22)
Gran Quivira	88	12	8.34%	31.82% (28)
Totals/Averages	1,595	400	32.75%	7.15% (115)

**Table 4.6: Analysed turkey NISP, sex and age by site**

These data, as well as those reported elsewhere in this chapter, are ultimately affected by sample size, which in turn reflects the interaction of many variables, including taphonomic factors and the excavation and analytical strategies employed. Juvenile bones can be particularly vulnerable to certain taphonomic factors and are often more difficult to identify (Spencer et al. 2003). Table 4.7 shows the same data by region and time period; though Arroyo Hondo and Eleanor Ruin are not part of the regional totals or averages, they are included in their respective time periods.

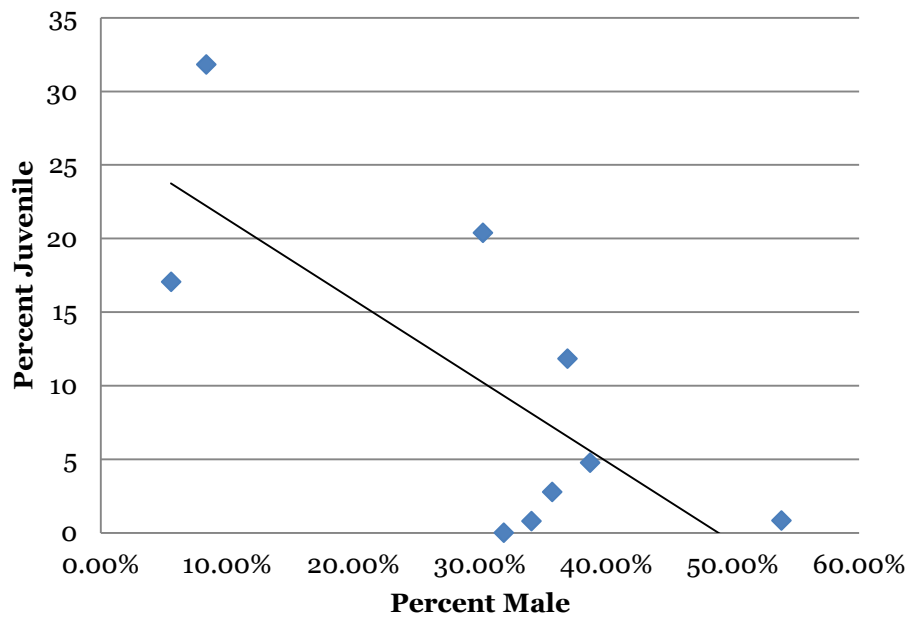
	<b>Analysed Assemblage Turkey NISP</b>	<b>Sexable Elements</b>	<b>Percentage Male (mean)</b>	<b>Percentage Juvenile (NISP)</b>
<b>San Juan Sites</b>	907	191	39.38%	4.19% (38)
<b>Zuñi Sites</b>	135	32	20.64%	3.70% (5)
<b>Salinas Sites</b>	274	77	22.63%	18.25% (50)
<b>Early Sites</b>	1120	278	31.12%	3.66% (41)
<b>Late Sites</b>	475	122	29.92%	15.16% (72)

**Table 4.7: Analysed turkey NISP, sex and age by region and time period**

Despite the small sample sizes, consistent patterns emerge which are unlikely to derive entirely from a paucity of data. With regard to the general presence of juveniles, no single assemblage has anything close to an "average" percentage. Instead, Gran Quivira, Salmon Ruin and Arroyo Hondo all have percentages between 17% and 32%, Quarai has just over ten percent, and all other assemblages have less than five percent juveniles. In the case of Eleanor Ruin, no juvenile elements were identified during the course of this analysis.

In the case of most sites, female elements outnumber those from males with an approximate 2:1 ratio as the average. The majority of assemblages comprise between 30% and 40% males, though at Ojo Bonito and Gran Quivira the percentage drops to below ten. Only at the Eleventh Hour site do male elements outnumber those from females by a very small margin, and very few elements from this assemblage were sexable. The plot below (Figure 4.17) shows the percentage of juveniles against the percentage of

males at each site; an inverse relationship is evident. Thus, sites with fewer identified males tend to have a higher proportion of juveniles.



**Figure 4.17: Percentage of juvenile elements versus percentage of male elements**

A Spearman's  $\rho$  of -0.48 indicates a slight inverse relationship between the percentage of males and the percentage of juveniles.

Although the ratio of males to females does not vary significantly from the average of all sites (using chi squared at the 0.05 level of significance with eight degrees of freedom), these ratios do differ significantly from a natural 1:1 ratio ( $\chi^2 = 29.64$ ). This means that while the samples sizes may be small and the sites do not vary significantly in their composition by sex, the number of males is non-random; this may in some way reflect their symbolic importance or a shared husbandry practice. No correlation between the percentage of males and the overall site pathological prevalence was found.

#### **4.3.4. Bone modifications**

Three grades of burning were recorded for this project: calcined, or completely greyish white or blue; burnt, or blackened and singed, a localised form of burning. Again, the figures are rather polarised (Table 4.8). Gran Quivira had no elements with any form of burning present, and nearly a third of the Eleventh Hour assemblage had burning present. This has some

possible implications for different deposition, processing and/or use of turkey elements.

	Turkey NISP	Calcined	Burnt/Black	Singed	Percentage Burned (NISP)
<b>Eleventh Hour</b>	121	0	4	29	27.27%
<b>Salmon Ruin</b>	157	3	10	1	8.92%
<b>Bluff Great House</b>	629	10	23	13	7.31%
<b>Eleanor Ruin</b>	150	0	0	3	2.0%
<b>Ojo Bonito</b>	63	1	1	1	4.76%
<b>Heshotauthla</b>	72	1	0	8	12.5%
<b>Arroyo Hondo</b>	129	0	3	9	9.30%
<b>Quarai</b>	186	2	8	2	6.45%
<b>Gran Quivira</b>	88	0	0	0	0.00%
Totals	1,595	17	49	66	8.28%

**Table 4.8: Burned turkey elements at analysed sites**

Although there is evidence for butchery at every site, it does not appear to have been frequent within these assemblages as a whole (Table 4.9). Fewer than ten elements bore marks of butchery in each assemblage and in the case of Salmon Ruin, the Eleventh Hour site and Gran Quivira, only one butchery mark was recorded.

	Turkey NISP	Cut Marks	Chop Marks	Cut and Chop	Total Butchery
<b>Eleventh Hour</b>	121	0	1	0	1
<b>Salmon Ruin</b>	157	1	0	0	1
<b>Bluff Great House</b>	629	5	0	0	5
<b>Eleanor Ruin</b>	150	2	0	0	2
<b>Ojo Bonito</b>	63	1	1	0	2
<b>Heshotauthla</b>	72	2	0	0	2
<b>Arroyo Hondo</b>	129	5	1	1	7
<b>Quarai</b>	186	2	4	0	6
<b>Gran Quivira</b>	88	0	1	0	1
Totals	1,595	18	8	1	27

**Table 4.9: Butchered turkey elements at analysed sites**

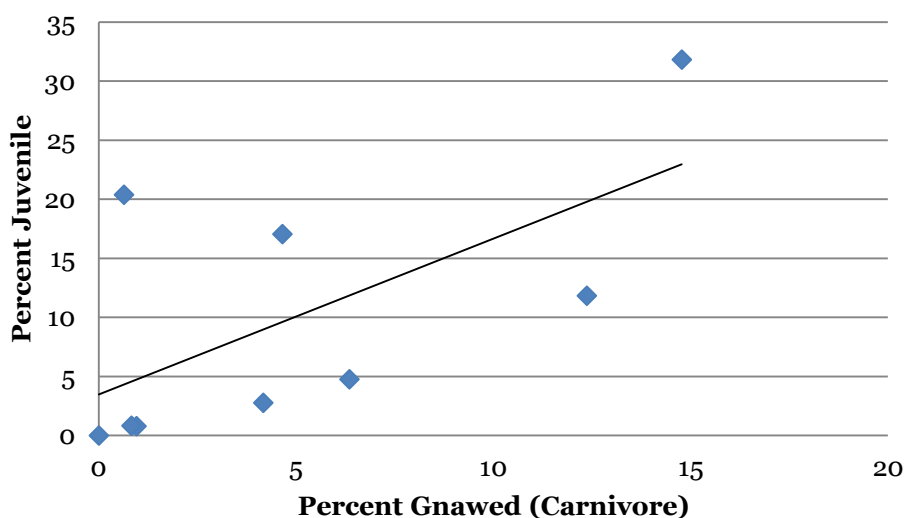
Other taphonomic alterations recorded included carnivore and rodent gnawing as well as root etching (Table 4.10). Whilst carnivores and rodents both impacted these assemblages, there is no evidence for rodent activity at the Eleventh Hour or Gran Quivira and no evidence for carnivore gnawing at Eleanor Ruin. All sites were affected by rootlet etching to varying degrees, however. Nearly a third of all elements examined during the course of this analysis had rootlet etching present.

	Turkey NISP	Carnivore Gnawing	Rodent Gnawing	Root Etching
Eleventh Hour	121	1	0	7
Salmon Ruin	157	1	11	18
Bluff Great House	629	6	19	128
Eleanor Ruin	150	0	26	16
Ojo Bonito	63	4	9	51
Heshotauthla	72	3	6	29
Arroyo Hondo	129	6	35	48
Quarai	186	23	15	111
Gran Quivira	88	13	0	31
Totals	1,595	57	121	439

**Table 4.10: Gnawing and rootlet etching on turkey elements at analysed sites**

All of these taphonomic effects are destructive and can affect skeletal elements in different ways. As juvenile elements are particularly fragile and may therefore be more vulnerable, I have plotted the percentage of juveniles in each assemblage against the percentage which have carnivore gnawing, rodent gnawing and root etching in order to clarify any possibly relationship between these factors (Figures 4.18-4.21).

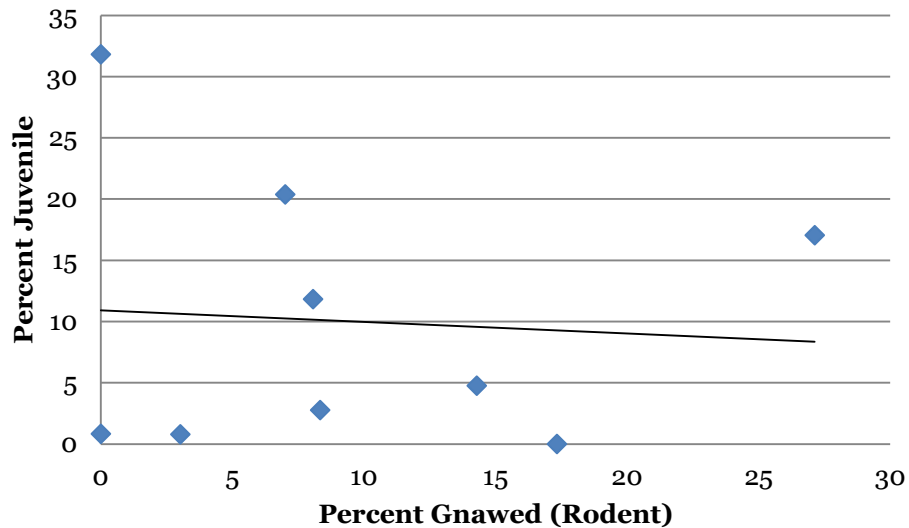
With regard to carnivore gnawing (Figure 4.18), a Spearman's  $\rho$  gives a result of 0.58, which represents a very slight direct correlation. This is the reverse of what might be expected in the case of juvenile elements being more vulnerable to carnivore destruction, and may not indicate any relationship between the two variables. There is no evidence here to suggest that predators or domestic dogs within settlements have impacted the number of juveniles recovered archaeologically.



**Figure 4.18: Percentage of juveniles versus percentage of elements with carnivore gnawing**

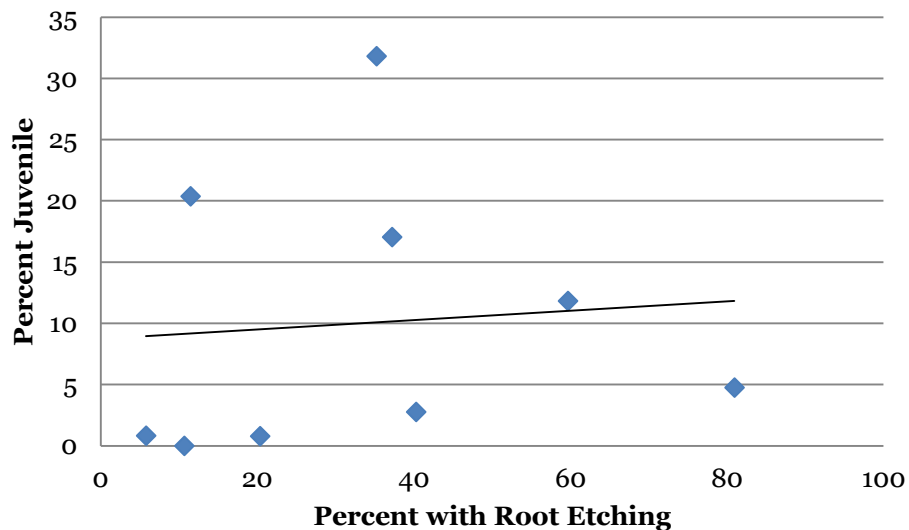


Rodent gnawing (Figure 4.19), with a Spearman's  $\rho$  of -0.15, shows no observable relationship with the percentage of juveniles present in these assemblages.



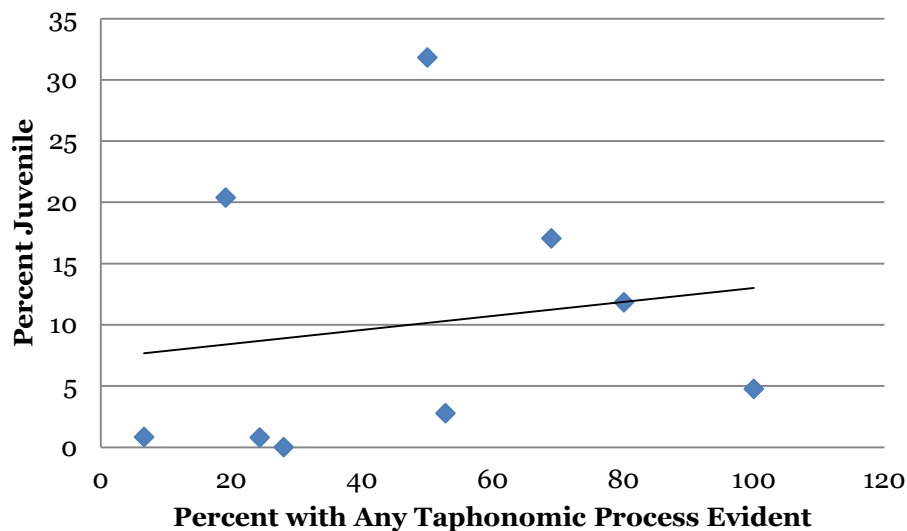
**Figure 4.19: Percentage of juveniles versus percentage of elements with rodent gnawing**

Figure 4.20 shows no apparent relationship between the root etching and the relative abundance of juveniles (Spearman's  $\rho$  of 0.33).



**Figure 4.20: Percentage of juveniles versus percentage of elements with root etching**

When combining all three of these taphonomic factors and plotting their presence against the percentage of juvenile bones (below), the Spearman's  $\rho$  result is 0.25. No observable relationship is present between the united taphonomic processes and the percentage of juveniles in each assemblage.



**Figure 4.21: Percentage of juveniles versus percentage of elements with any gnawing or root etching**

This is not to deny that these factors affected these assemblages with regard to their composition, but that no discernible relationship between them and the percentage of juveniles could be observed.

#### **4.4. Assemblage descriptions and pathologies**

This section will describe the assemblages and associated pathologies which were analysed during the course of this research. While terms such as "fracture" are in common use and each lesion will receive individual attention in the text, other terms may be less familiar and these are briefly discussed below. The term trauma includes not only fractures, but also a number of other skeletal responses which result from any sort of physical injury to soft and hard tissue.

Hypervascularity occurs in elements from several assemblages which were examined during this project. It is characterised by an increase in the number of small holes that seem to be vascular channels. It fits within the very broad "bone destruction" category, but differential diagnosis cannot be carried very far as there are a number of probable aetiologies for the condition. These changes could accompany a number of ailments including joint disease, inflammation or metabolic bone disease. The visual appearance of hypervascularity is a patch or series of patches of small

ellipsoid holes on the cortex of an element, often on the metaphysis in proximity to a joint, but never on an articular surface.

Necrosis is a general term for tissue death (which may accompany a fracture or infection, for instance), and occurs when the blood supply is disrupted. Necrosis is characterised by resorption (bone loss) unless mentioned otherwise, it is applied here to osseous tissues only.

Periostosis is the inflammation of the periosteum on the cortical surface of bone and can have a variety of aetiologies (e.g. infection, trauma) and varies in appearance but is characterised by plaques of woven new bone on the metaphysis and diaphysis which become smoothed during bone remodelling. Osteomyelitis is an inflammation of the medullary cavity which is often secondary to infection; it can originate either from adjacent tissues or direct contact with pathogens, and is characterised by bone destruction including cloacae (draining passages) and the formation of nodular periostosis. Osteomyelitis can also alter the shape of bone when there is purulent accumulation.

An exostosis is a very general term for a lump of new bone formation, and is applied when no precise term is determinable. Osteophytes are bone formations around the edge of the articular surface of an element (and may accompany joint disease, among other conditions). Enthesophytes are new bone formations specifically at the attachment site of a ligament or tendon.

Two specific conditions merit brief mention here. Osteomalacia and rickets both result from a mineral imbalance or deficiency, most commonly phosphorus or vitamin D. This imbalance or deficiency in turn prevents proper absorption of calcium which then impedes the normal process of bone mineralisation during growth and remodelling. Deformation of elements, characterised by a warped or bowed appearance, occurs as a result of weight being placed upon bones with insufficient biomechanical strength; weight-bearing elements are more likely to be affected. The only difference between osteomalacia and rickets is that the former affects adult animals and the

latter affects growing animals. Although multiple factors are responsible for the condition, inadequate sunlight and a lack of calcium in the diet of avians have been identified as causes of rickets (Lacey and Huffer 1982; Long et al. 1984a, 1984b, 1984c).

Avian tibial dyschondroplasia is also typified by angular deformity of skeletal elements. However, these alterations of shape result from the accumulation of growth plate cartilage in the metaphyseal region of the tibiotarsus and occur in fast-growing strains of modern poultry (Orth and Cook 1994). The exact aetiological factors that cause the disease are complex, and may involve dietary and genetic factors in addition to mechanical stress caused by rapid weight gain (Leach and Monsonego-Ornan 2007).

#### **4.4.1. The Eleventh Hour site (29SJ633)**

The Eleventh Hour site is located within Marcia's Rincon on the southern side of Chaco Canyon, an UNESCO World Heritage Site. The excavation of the site took place at the very end of the Chaco Project in 1978, and is unusual because most of the excavations in Chaco Canyon were focussed on large great houses on the north side of the canyon. The sites on the southern side were built and occupied whilst the great houses were in use, but have been less frequently excavated or otherwise investigated. The Eleventh Hour Site was occupied from AD 900-1200, though a possible brief hiatus between AD 1150-1175 (during a period of drought) may have occurred (Mathien 1991:29).

The total NISP from the site was 2,585; 766 of these specimens (29.6%; see Table 4.1) are turkey. A number of different MNI calculations are given, along with meat weight; the turkey made up 23.4% of the available meat weight for the site and in the overall faunal analysis, is tacitly assumed to have been a food source (Gillespie 1991). The analyst, however, does point out that turkeys were probably not just food items (Gillespie 1991:291). No articulated turkeys were reported from the site, and the majority of turkey

elements were recovered from floor fill contexts, with a higher concentration originating from later contexts. Turkey bones were found associated with one of the burials at the site, Burial 3. In the original analysis, a right ulna and a left tibiotarsus were found to be pathological and are described by Gillespie in his report: "...premortem breaks that had healed. Such instances are clearly suggestive of birds kept in captivity rather than hunted wild birds" (*ibid.*:292). Five pathologies in four elements were located during re-analysis. This includes two pathologies which are likely to have been those described above, as well as two additional pathological elements, a scapula and a tibiotarsus (see Figures 4.22, 4.23 and 4.25). The scapula has an oblique fracture, an enthesophyte and new bone formation present. It is possible that the latter two developments are secondary lesions resulting from altered biomechanics caused by the physical trauma. One of the pathological tibiotarsi has a well-healed but deviated fracture (Figure 4.24), and the other shows a slight bowing of the diaphysis (Figure 4.25). The ulna, broken during excavation, has a healed fracture with a large callus (Figure 4.26). The portion of the assemblage available for re-analysis included a turkey NISP of 121. The presence of pathology in this re-examined sample was 3.3%. If Gillespie's turkey NISP is used (and the remaining assemblage is entirely lacking pathologies) the overall prevalence falls to 0.52% (Table 4.11). This possibility seems unlikely, however, as pathologies which were not noted by Gillespie were present in the sample that I examined.

Figure 4.22 shows the aforementioned scapula; one side has a great deal of remodelling, the texture of the new bone formation is rough and may signify a localised infection that accompanied an injury.

There is also an enthesophytic formation present along the diaphysis toward the proximal articulation of the same element (Figure 4.23).



**Figure 4.22: Left scapula with healed fracture**



**Figure 4.23: Same element as above with enthesophytic formation**

Figure 4.24 shows a healed spiral fracture to the diaphysis of a left tibiotarsus (zones 5 and 6), with the distal portion of the element having been twisted laterally. The element deviates from the anatomic axis by about 15 degrees. It appears (from the rather extreme angle of deviation) that there would have been some foreshortening in this element, though the exact amount of foreshortening was not determinable due to the absence of zones 7 and 8.



**Figure 4.24: Left tibiotarsus with healed fracture; possibly identified initially by Gillespie (1991)**

Zones 5 and 6 of the tibiotarsus shown in Figure 4.25 have been bowed in a medial direction by approximately 8 degrees, though it is difficult to ascertain this because of the absence of zones 7 and 8.



**Figure 4.25: Left tibiotarsus with bowing**

There is a (possibly oblique) fracture to zones 5 and 6 of an ulna (Figure 4.26) but the associated new bone formation extends across the majority of this bone fragment; in addition, some endosteal new bone formation is also present. There is no axial deviation and little foreshortening, which probably indicates that the radius acted as a successful natural splint. The proliferative nature of the callus is suggestive of a compound fracture (a type of fracture in which a broken bone pierces the skin, thus increasing pathogen exposure).





**Figure 4.26: Right ulna with healed fracture; possibly identified initially by Gillespie (1991)**

#### **4.4.2. Salmon Ruin**

Salmon Ruin is a Chacoan Great House situated in north-western New Mexico on an alluvial terrace of the north bank of the San Juan River in the present-day city of Bloomfield. Based on dendrochronological dates, Salmon was built between AD 1088 and 1094 and abandoned after *c.* AD 1270 when a large fire burned throughout the site and destroyed its Great Kiva. The last date for construction activity at Salmon Ruin is in AD 1264, when the Great Kiva was rebuilt (Windes and Bacha 2006:1173).

Though analysis of the faunal bone from Salmon Ruin was undertaken in the 1970s (Harris 2006), a later re-analysis of large portions of the assemblage was performed (Durand and Durand 2006). Both publications report the presence of turkeys in notable numbers; they make up between 9 and 23% of the MNI (Harris 2006) and if large birds which are likely to be turkey are used, approximately 15% of the total faunal NISP (Durand and Durand 2006) respectively. The initial faunal report used only MNI, a quantitative unit with limited application in archaeozoology and considered to have serious theoretical flaws (Grayson 1984; Lyman 2008; Ringrose 1993), and the interpretations made in the first report are limited in scope. The original discussion concludes with a remark stating that almost no diachronic change was reflected in the assemblage (Harris 2006), despite



the fact that Salmon was occupied during a time of dynamic environmental and cultural change in the region. The interpretations resulting from the re-analysis (Durand and Durand 2006), though only part of the assemblage was examined, are rather more complex. In contrast to the initial report on the Salmon fauna, turkeys are interpreted as having both ritual and economic significance (Durand and Durand 2006). In addition, one of the two pathologies they identified in the assemblage (a healed fracture in a humerus; see Figure 4.32) was in a juvenile turkey which was buried articulated within the structured fill of one room. This was one of two turkey burials in that particular room, and it was found in close proximity to an articulated macaw, also considered an intentional burial. In the American Southwest, the macaw is widely considered to be an exotic 'ritual fauna' species (Hargrave 1970), and Tyler (1991) considers the turkey to be on the same perceived level of symbolic importance as the eagle.

Re-analysis of 157 turkey elements from Salmon Ruin (of 358 total) revealed a total of seven pathological elements including those previously described by Durand and Durand (2006). These included a tarsometatarsus with hypervascularity of the proximal metaphysis (Figure 4.27), a radius with a healed fracture (Figure 4.28), an ulna with a healed fracture (Figure 4.29), a femur with hypervascularity near the distal diaphysis (Figure 4.30), a coracoid with osteophytic lipping (Figure 4.31), a humerus with a healed fracture (Figure 4.32) and a carpometacarpus with an osteophyte (Figure 4.33). The overall pathological prevalence for the Salmon Ruin assemblage (derived from the published data) was 1.9% whilst the re-examined sample prevalence is 4.4% (see Table 4.11).

The hypervascularity evident in this proximal tarsometatarsus fragment (Figure 4.27) is located in zones 1 and 2. A band of hypervascularity approximately 75 mm in length is immediately distal and adjacent to the proximal articular surface of the bone; this is particularly apparent near the vascular foramina.



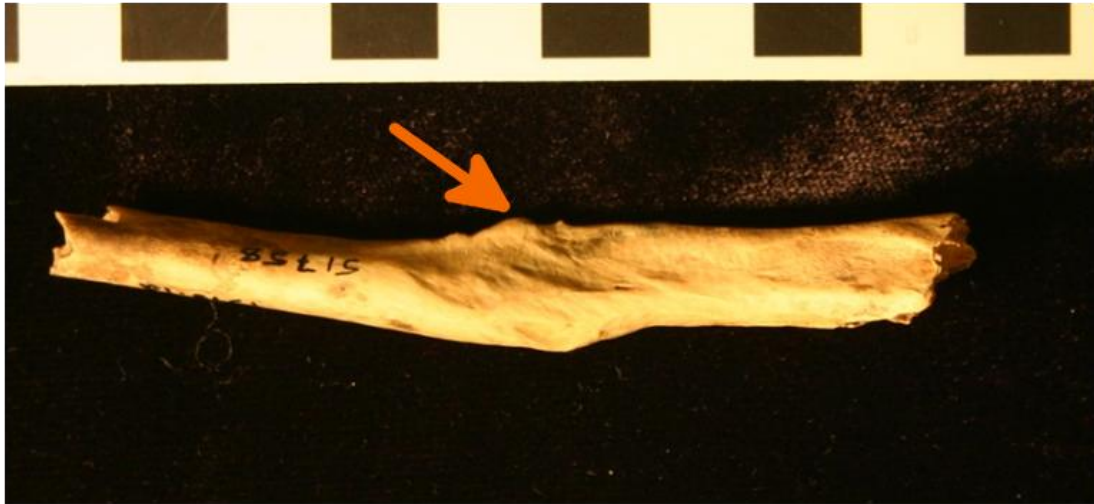
**Figure 4.27: Left tarsometatarsus with hypervascularity**

Figure 4.28 illustrates an extremely well-healed fracture of unknown type, though perhaps it was greenstick in nature (i.e. received when the individual was a juvenile), to the proximal diaphysis (zones 3 and 4) of a radius. The cortical surface is very smooth with minimal roughening and the curve of the shaft is somewhat subtle. The angle of deviation is approximately 5 degrees.



**Figure 4.28: Right radius with healed fracture**

Figure 4.29 below presents a well-healed transverse fracture to the diaphysis (zones 3 and 4) of an ulna; there is a smooth callus and no evidence of infection. Very little anatomical deviation is visible, but that may be due in part to the absence of articular ends.



**Figure 4.29: Ulna with healed fracture**

In Figure 4.30, bands of hypervascularity are present on the periarticular surface of a distal right femur in zones 7 and 8; small holes resemble pinpricks in the bone surface and are particularly evident on the sulcus intercondylaris (between the lateral and medial condyles).



**Figure 4.30: Right femur with hypervascularity**

There is a ridge of bone, possibly more accurately described as lipping, present in zone 2 (on the ligament attachment for the acrocoracohumeralis) of the coracoid pictured in Figure 4.31.



**Figure 4.31: Left coracoid with lipping around joint surface**

Figure 4.32 shows the juvenile ABG associated with a well-healed spiral fracture present in a humerus. The fracture is mid-diaphysis (affecting zones 3-6) with a smooth callus; it is offset laterally with a deviation of approximately 15 degrees and about 70mm of foreshortening; there is no evidence that the break was compound. The articular surfaces and nearby elements were unaffected by similar trauma.



**Figure 4.32: Juvenile turkey ABG with fractured left humerus**

Figure 4.33 shows a carpometacarpus with an exostosis (resembling a small, tubular loop) directly adjacent to the intermetacarpal process (roughly zones



3 and 4). The spongy appearance is reminiscent of infected tissue, but there is no evidence for infection in the adjacent bone.



**Figure 4.33: Right carpometacarpus with exostosis**

#### **4.4.3. Bluff Great House**

The Bluff Great House is located on the northern edge of the current town of Bluff in what is now south-eastern Utah north of the San Juan River. The site was excavated through a number of field seasons from 1995-2004 by Cathy Cameron and Stephen Lekson of the University of Colorado, the University of Colorado Field School, members of the Southwest Heritage Foundation, and volunteers (Cameron 2009).

Dendrochronological and ceramic dates place the construction and initial occupation of the Bluff Great House at AD 1075-1150, around the time at which the Chacoan regional system reached its greatest extent. Bluff was a Chacoan outlier, a large site which possessed certain architectural and material culture characteristics that reflect a kind of connection to the grand great houses of Chaco Canyon in New Mexico despite being hundreds of kilometres distant. Of the more than 200 total great houses throughout the American Southwest outside of Chaco Canyon, Bluff is unusual because the site was occupied throughout the period of Chacoan collapse and may have been used beyond AD 1250 (Cameron 2002).

The faunal remains recovered from the Bluff Great House broadly resemble what can be termed a “Chacoan” assemblage with regard to the species

present, the proportions thereof and some of the diachronic changes that have been observed (Fothergill 2008). The fauna recovered from Bluff include local wild species as well as the dog and the turkey, both domestic species kept by the Ancestral Pueblo people. Bluff is typical of many Chacoan sites in that turkey makes up a large percentage of domestic animal remains. The most frequent taxa present by NISP in the faunal assemblage were *Meleagris gallopavo* (NISP of 1,523), *Sylvilagus spp.* (cottontail rabbit; NISP of 1,156), members of the order Artiodactyla (NISP of 922), and *Lepus spp.* (jackrabbit; NISP of 553).

In terms of *Meleagris gallopavo* remains at the Bluff Great House, no evidence of burial or ritual treatment was discovered, and all turkey remains were disarticulated and originated from a variety of midden contexts, which suggests disposal of food waste. The total NISP of 1,523 includes only elements identified as turkey and not large birds which are likely to be turkey. Turkey elements make up 28.9% of the total assemblage NISP. One of the most critical requirements for palaeopathological analysis is accurate calculation of prevalence, not only by element but also by anatomical location (Vann and Thomas 2006). In order to achieve this for Bluff, the sample was reduced to 629 specimens because only appendicular elements could be zoned using the system devised by Cohen and Serjeantson (1996).

The high percentage of turkey in the assemblage and the frequent presence of eggshell are consistent with the interpretation of the turkey as a domestic species, though no turkey pens were excavated (see Chapter 2 for more information on penning and other methods of restricting turkey movement). The Bluff Great House was not excavated entirely and turkey pens may not have been in areas selected for excavation. It is also possible that turkeys were primarily husbanded near the unit pueblos surrounding the great house (Jalbert 1998) rather than at the great house itself, or that an archaeologically ephemeral method of keeping the turkeys was practiced.

Eight pathologies were recorded in faunal material from the Bluff Great House. Six of these were noted in turkeys. These were a healed fracture in a left humerus; a neoplasm in a right humerus (Figures 4.34 and 4.35); a healed fracture in a right tibiotarsus (Figure 4.37); two fractured ulnae (Figure 4.38) and a healed fracture in a sternal rib (Figure 4.36). These pathologies date to the Pueblo III period (from AD 1150-1350) with the exception of the humeral fracture (Figure 4.34), which originated from a probable Pueblo III context. Approximately 0.39% of all specimens designated *Meleagris gallopavo* were pathological according to the original analysis; that percentage rises to 0.95% when only the elements included in this study are considered (Table 4.11). Pathologies from the Bluff Great House assemblage are shown in Figures 4.34-4.38.

The humerus fragment illustrated in Figure 4.34 has part of a well-healed fracture present in zones 5 and 6. It appears as though very little deviation from the anatomic axis took place although some foreshortening of the element occurred, but these changes are not possible to assess quantitatively as most of the element is absent.



**Figure 4.34: Left distal humerus with portion of healed fracture**

A neoplasm, measuring nearly 1 cm at its greatest extent, is present mid-diaphysis at the intersection of zones 3 and 5 of the humerus shown in Figure 4.35. The surface of the neoplasm is compact and organised in nature, and it is thereby possible that the lesion is an osteoma. For the same reason, it is unlikely that this lesion was a malignant tumour as these tend

to have a rough and disorganised appearance characterised by bone destruction as well as formation.



**Figure 4.35: Right humerus with neoplasia**

Figure 4.36 shows a healed fracture in a sternal rib. There is no evidence for a compound fracture or much anatomical deviation or foreshortening, and it is probable that the adjacent ribs gave the element adequate support during healing.



**Figure 4.36: Sternal rib with healed fracture**

A well-healed oblique fracture to zones 5 and 6 of a right tibiotarsus is presented in Figure 4.37. There is little deviation from the anatomic axis, and although it is possible that a small amount of foreshortening was present, the absence of the proximal portion of the element makes accurate measurement impossible. This pathology is remarkable due to the fact that the fibula does not serve well as an anatomic splint, and this bone would have been necessary for survival as the evolutionary line of galliforms has



favoured running over flying in many respects. Tibiotarsal fractures in other assemblages described here have healed differently.



**Figure 4.37: Right tibiotarsus with healed fracture**

This pair of fractured ulnae (Figure 4.38) were recovered from the same context at the Bluff Great House; they may have originated from a single individual, but that is not determinable since only the shafts of the elements are present. Both of them have large, rough calluses with prolific new bone formation affecting zones 3-6, and it is probable that these fractures were compound in nature. There appears to be a little deviation from the anatomic axis of the element, (particularly in the case of the tentatively sided element on the right) although it is difficult to tell because neither element is complete.



**Figure 4.38: A left and possibly right ulna with healed fractures**

#### **4.4.4. Eleanor Ruin**

Eleanor Ruin (ENM 883) is situated in the Rio Puerco Valley of New Mexico; it is the largest of thirteen sites which surround Guadalupe, a Chacoan Great House. Though it is estimated that about half of Eleanor Ruin was excavated, the estimated number of rooms varies from twelve to nineteen, with at least two embedded kivas (round, subterranean structures). The site was occupied at least twice, during periods which are termed "Chacoan" (AD 950-1150) and "Post-Chacoan" (AD 1150-1350). In the earlier faunal assemblage with a total NISP of 394, only a single turkey element was identified. In the later assemblage, however, the turkey NISP is 375 (plus an additional 353 which are likely to be turkey) out of a total NISP of 3076 (Roler 1999). This increase in the proportion of turkey does appear to mirror the pattern found at other sites from similar time periods in the northern parts of the American Southwest (Munro 1994). Dogs were not found in the faunal assemblage (Roler 1999), which correlates with a complete lack of carnivore gnawing on the turkey elements analysed for this project (See Table 4.10).

Pathologies present in the turkey elements from Eleanor Ruin included two tibiotarsi with similarly healed fractures (Figure 4.39), a scapula with a healed fracture (Figure 4.40), a femur with hypervascularity near the distal end (Figure 4.41), a tibiotarsus with slight bowing (Figure 4.42), a tarsometatarsus with possible periostosis and a fistula (Figure 4.43), a coracoid with articular destruction (Figure 4.44), a tibiotarsus with possible osteomyelitis (Figure 4.45) and an ulna with osteophytic formation which seems likely to have resulted from trauma (Figure 4.46). The Eleanor Ruin turkey assemblage had a pathological prevalence of 6.0% (Table 4.11).

The left and right tibiotarsi in Figure 4.39 have healed oblique fractures which bear some resemblance to the healed tibiotarsal fracture from the Bluff Great House. In both cases, the breaks have affected zones 3-6 of the element and the calluses are mainly smooth in appearance. The top element has 77 mm of foreshortening and 12 degrees of angular deviation with some

irregular, rough bone formation present. The second fracture has resulted in a very minor amount of deviation from the anatomic axis (2 degrees) and approximately 58 mm of foreshortening.



**Figure 4.39: Left and right tibiotarsi with healed fractures**

Figure 4.40 illustrates a healed transverse fracture to zones 3 and 4 of a right scapula; the callus of the fracture is smooth, and there is approximately 10 degrees of angular deviation from the anatomic axis.



**Figure 4.40: Right scapula with healed fracture**

In Figure 4.41, a band of hypervascularity around the distal articular end of a right femur is evident. This is characterised by the appearance of tiny sub-

rounded holes in the cortical surface of the sulcus intercondylaris and is mainly evident between the medial and lateral condyles.



**Figure 4.41: Right femur with hypervascularity**

Bowing (2-3 degrees) is present in zones 5 and 6 of the right tibiotarsus in Figure 4.42; in addition, there is a series of patches of pinhole-sized, possibly hypervascular bone adjacent to the proximal articulation.



**Figure 4.42: Right tibiotarsus with slight bowing**

In zone 8 of this tarsometatarsus (Figure 4.43), there is new bone formation which may be an enthesophyte resulting from a tendon or ligament strain. It may also be the result of a periosteal reaction to soft-tissue trauma near the joint (the adjacent articular surfaces do not appear to be affected).





**Figure 4.43: Right tarsometatarsus with new bone formation (possible enthesophyte)**

In zones 3 and 4 of the coracoid pictured in Figure 4.44, there is pitting present on articular surface accompanied by some lipping around the edges of the humeral articular facet.



**Figure 4.44: Left coracoid with articular destruction**

Periostosis is present in zones 5 and 6 of the tibiotarsus pictured in Figure 4.45. A small cloaca is present and rough, disorganised bone covers much of the extant diaphysis, but not the articular surfaces of the element. It is not possible to determine whether this lesion reflects a systemic or localised condition, although no other specimens with similar changes were recovered from the site.



**Figure 4.45: Right tibia with periostosis and small cloaca**

Zones 5 and 6 of the complete left ulna in Figure 4.46 are affected by a prolific, disorganised-appearing lesion, perhaps reflecting periosteal involvement in a soft-tissue injury; there is no evidence of fracture in the element.



**Figure 4.46: Left ulna with prolific bone formation which may have resulted from trauma**

#### **4.4.5. Ojo Bonito (Hinkson)**

The Hinkson site was excavated as part of the Ojo Bonito Archaeological Research Project, was occupied from AD 1175-1225 (Eckert 1995). Though the majority of the identified assemblage derives from leporid species (rabbits and hares), a total of 222 turkey bones (of 1,251 total NISP) were identified, with an additional 107 classed as “probable turkey” (Clark 1998). The turkey remains are interpreted as food waste, but Clark also states that

they may also have been kept for their feathers (1998:4). One room of the Hinkson site (H15) contained three articulated turkeys, though only a single turkey bone originated from the associated midden (Clark 1998:7). It was not possible during analysis to determine if the pathological specimen derived from one of these ABGs (Associated Bone Groups; see Chapter 3) or a different area of the site entirely. The pathological prevalence for the Hinkson Site is 1.58% (Table 4.11). A single pathology was identified in the assemblage: a right tarsometatarsus (Figure 4.47) with proximal articular destruction (zones 1 and 2) characterised by a pitted and roughened appearance and possible hypervascularisation of the adjoining metaphyseal area (zones 3 and 4).



**Figure 4.47: Right tarsometatarsus with proximal articular destruction**

#### **4.4.6. Heshotauthla**

Heshotauthla is located in Cibola National Forest, New Mexico, not far from the modern Pueblo of Zuñi. The site was occupied between AD 1200 and 1350. Unfortunately, the faunal report consists of a NISP species list and brief interpretations of the few artiodactyl remains from the site; lagomorphs dominate the assemblage. Turkeys represent 9.5% of the NISP

(213 of 2,235) and at least 7 individuals are represented. The pathological prevalence for Heshotauthla is 2.78% (Table 4.11). Figures 4.48 and 4.49 show the pathologies present in the Heshotauthla assemblage. One of these is a complete right carpometacarpus (Figure 4.48) with articular destruction; the process extensorius has a roughened, pitted appearance though the adjacent structures appear to be healthy.



**Figure 4.48: Right carpometacarpus with articular destruction**

The other pathology identified is a compact nodule of new bone near the edge of the trochantric crest (zone 2) of a complete left femur (Figure 4.49).





**Figure 4.49: Left femur with possible enthesophyte**

#### **4.4.7. Arroyo Hondo**

Arroyo Hondo is located in the northern Rio Grande basin of New Mexico, and was established at approximately AD 1300 during a moist interval following the Great Drought. Arroyo Hondo was probably occupied twice; at the least there was a severe decline in the human population from about AD 1345 to 1370. The pueblo's economy was supported primarily by agriculture, and it is probable that both irrigation and dry-farming techniques were employed (Lang and Harris 1984). The initial phase of occupation at Arroyo Hondo was named Component I; this dates from approximately AD 1300 to 1335 (when precipitation declines and the regional population is thought to have decreased as a result). During Component I, the pueblo was constructed and expanded rapidly. Hunting and trapping were the primary source of protein, but deer and elk appear to have been nearly extirpated by the end of this period, possibly due to heavy hunting activity. Concurrently, other meat sources such as lagomorphs and antelope became more prominent in the assemblage. Lang and Harris state that turkey husbandry intensified during this time period as well (1984:123).

Between AD 1340 and 1370, there is little evidence for occupation at the site, though perhaps a seasonal, transient population was present. At some

point during the AD 1370s, another period of increased precipitation occurred and the population increased once more. Another phase of construction incorporating parts of the site which were built previously began in the 1370s as well (Lang and Harris 1984:xix). Component II, as this probable re-occupation is termed, ends abruptly in the AD 1420s with a widespread conflagration (in the midst of an already-severe drought) which destroyed the pueblo.

The faunal report (Lang and Harris 1984) from Arroyo Hondo focusses almost exclusively on matters of economy and subsistence. Turkeys are interpreted as a meat product, and no evidence of burial or their symbolic status is described, though it is noted that turkey feathers were used in the creation of clothing and blankets. Lang and Harris rely heavily on McKusick's ideas (McKusick 1980, 1986) concerning the purported existence of two discrete domestic turkey breeds in the American Southwest: the Small Indian Domestic and the Large Indian Domestic. They also are of the opinion that it is possible to identify distinct subspecies of the turkey by osseous features alone (Lang and Harris 1984:93), and depend upon this in reaching some of their conclusions regarding trade and turkey husbandry. Many archaeozoologists would disagree that identification of subspecies using skeletal remains is even possible (Munro 1994), and some authors find fault with McKusick's turkey breed categories (Breitburg 1988, Yang and Speller 2006). Though the faunal data are unfortunately given primarily in MNI (384 total), some NISP figures are given (1,336) and the presence of pathologies in six turkey appendicular elements (the tibiotarsus, humerus, and four ulnae) is noted.

No description, photographs, or interpretation of the pathological elements are offered in the original report. The presence of pathologies is used only as evidence to support an argument for a well-developed turkey husbandry complex at the site. Other evidence for turkey husbandry includes the presence of turkey pens at the site; these were apparently characterised by deep layers of turkey dung and unhatched egg clutches. The number of

turkey bones present in the assemblage, local ethno-historical references to turkey herding, and botanical remains sampled from the turkey dung were also used to support the idea that the Arroyo Hondo turkeys were domestic (Lang and Harris 1984). Despite the use of pathologies as another form of evidence for husbanded domestic turkeys at the site, these specimens were not further discussed and their archaeological context was not stated. All turkeys in the Arroyo Hondo assemblage were from midden contexts; no burials or notable placement of skeletal elements was noted.

Arroyo Hondo pathologies identified during my re-examination of the assemblage included possible periostosis in a fragmentary ulna (Figure 4.50), an ulna with articular destruction and lipping (Figure 4.51), a juvenile tibiotarsus with bowing (Figure 4.52), a humerus with an unhealed fracture (Figure 4.53), a fragment of a femur diaphysis with possible periostosis (Figure 4.54), an ulna with an unhealed necrotic fracture (Figure 4.55), two ulnae with healed fractures (Figures 4.56 and 4.57), a healed fracture in a scapula (Figure 4.58), hypervascularity in a distal femur (Figure 4.59) and a coracoid with an osteophyte (Figure 4.60). The overall pathological prevalence for Arroyo Hondo, based on counts in the original report, is 0.82%; the available pathological prevalence, based on my observations, is much higher (6.2% or 8.53%; see Table 4.11). The first figure has been adjusted to compensate for the fact that some specimens were selectively chosen by staff at the School for Advanced Research prior to analysis. For the purpose of comparison, the selection of these specimens did not change the overall relationships between Arroyo Hondo and the other assemblages with regard to pathology types (Figure 5.2). The Arroyo Hondo lesions are shown in Figures 4.50-4.60.

Figure 4.50 shows a fragment of a right ulna with a smooth small area of crater-like new bone growth present where the most distal primary feather papilla would have been located (zone 6). It is possible that a plucking-related incident inflamed the periosteal bone and resulted in a reaction from the adjacent osseous tissue.



**Figure 4.50: Right ulna with periosteal inflammation, possibly resulting from trauma to the periosteum**

Figure 4.51 shows a fragmentary ulna with lipping present in zones 1 and 2 near the proximal articular surface. There is a plaque of new bone formation adjacent to the articular surface itself and some articular destruction in the form of pitting.



**Figure 4.51: Right ulna with articular pitting and lipping**

The juvenile left tibiotarsus illustrated in Figure 4.52 is bowed medially by about 10 degrees; this change has affected the shape of the entire element.



**Figure 4.52: Left juvenile tibiotarsus with bowing present (appx. 10 degrees)**

This left humerus fragment (Figure 4.53) has a spectacularly unhealed compound fracture with probable necrosis and possible infection present in zones 3 and 4. The distal end of this element is not present, and therefore, the angle of anatomical deviation and possible foreshortening are not measurable. There is some evidence of necrosis and callus formation has failed; there is no detectable joining of the proximal fragment of the broken bone to the distal portion.



**Figure 4.53: Left humerus with unhealed fracture**

Figure 4.54 shows only zone 5 of a femur fragment. This specimen exhibits profuse new bone formation on both the periosteal and endosteal surfaces of



the bone, covering the entire fragment; the woven appearance of the new bone suggests that this lesion may have been active at the time of death. No fracture is detectable due to the fragmentary nature of this bone. Element designation of this bone was only possible due to presence of the vascular foramen.



**Figure 4.54: Femur with periosteal new bone formation**

Like the humerus in Figure 4.53, the right ulna in Figure 4.55 has an unhealed fracture (probably compound) in zones 5 and 6; the distal end of the element is missing. Callus formation has failed, and necrosis is evident. The periosteal surface of this bone has a generally roughened appearance, particularly near the fracture.



**Figure 4.55: Right ulna with unhealed fracture**

Figure 4.56 shows an ulna which has been fractured near the distal metaphysis. The bone and callus tissue are both spongy in appearance; perhaps healing was active at the time of death or the individual was a juvenile. Because of this as well as a significant amount of abrasion, it is difficult to ascertain much about the nature of the fracture; there may have been multiple fractures or a complex spiral fracture. As this is only a shaft fragment, it is not possible to tell whether there was significant deviation from the anatomic axis or foreshortening present.



**Figure 4.56: Ulna with healed fracture**

Figure 4.57 illustrates an oblique fracture in zones 5 and 6 of an ulna which has healed with a great deal of new bone proliferation; the callus is not smooth and has an inconsistent, lumpy appearance. A small depression is also present distal to the fracture, and from the disturbed nature of the periosteal reaction, it is possible that the fracture was compound. There is no evident foreshortening, but the diaphysis has been significantly displaced from the anatomic axis by approximately 11 degrees.



**Figure 4.57: Right ulna with healed fracture**

Zones 4, 5 and 6 of the scapula fragment in Figure 4.58 have been affected by a transverse fracture which was probably compound. This fracture has healed only with a great deal of new bone formation, and it seems likely (from the anatomical location) that soft tissue may also have been affected by whatever trauma may have caused it. It is impossible to tell whether or not any foreshortening took place as only the shaft of the bone remains, but the shaft itself deviates from the appropriate axis by an angle of approximately 3 degrees.



**Figure 4.58: Right scapula with fracture**

Zones 7 and 8 of the right femur in Figure 4.59 have a patch of hypervascular bone present on the sulcus intercondylaris. The size of these small, ellipsoid holes varies from barely visible to just over 1.4 mm, the largest of those during the course of this research.





**Figure 4.59: Right femur with hypervascularity**

Zone 2 of the left coracoid in Figure 4.60 has a prominent osteophyte present; it overlaps at least 2 mm in excess of the usual proximal articulation.



**Figure 4.60: Left coracoid with osteophyte**

#### **4.4.8. Quarai**

Quarai, one of the Salinas Pueblos, was initially occupied in AD 1200 through the mid 1300s, at which time it was probably abandoned; the pueblo was later re-occupied at some point prior to Spanish contact and abandoned in 1678. The Spanish encountered Quarai first in the early 1580s, and had established a permanent settlement there by 1598 (Wilson

1973). Quarai has a long excavation history. Parts of the site were excavated in 1913 by Edgar Lee Hewett, in 1934 by Donovan Senter, in 1934-1935 and 1958 by Albert Ely, in 1935-1936 by Ele Baker, in 1939-1940 by Wesley Hurt Jr., in 1990 by W.K. Wait and P.J. McKenna and most recently by Katherine Spielmann in 1992-1993. Only in last two cases were faunal remains discussed, and only the materials from the Spielmann excavation were accessible. Moore (1994) states that the fauna from the 1992-1993 seasons derived from a variety of contexts, all of which could be considered midden deposits. Antelope and lagomorphs form the majority of the assemblage. Although turkey elements constitute only 1% of the NISP from the site, turkey is ranked fifth in terms of NISP and bone weight overall. In her interpretation of these fauna, Moore (1994:59) concludes that these proportions indicate that turkeys "may have been kept primarily for feathers."

Pathologies present in the Quarai assemblage included a hypervascularised distal humerus metaphysis (Figure 4.61), a humerus with periostosis around the vascular foramen (Figure 4.62), a femur with an enthesophyte (Figure 4.63), three femurs with osteophytes (Figures 4.64-4.66), a distal tibiotarsus fragment with evidence of a healing fracture (Figure 4.67), a warped juvenile ulna (Figure 4.68), a radius with a well-healed fracture (Figure 4.69), and a radius with proximal articular destruction (Figure 4.70). The pathological prevalence for the assemblage from Quarai is 5.38%.

Figure 4.61 shows a left humerus fragment with very small patches of hypervascularity surrounding the distal articulations in zones 7 and 8.



**Figure 4.61: Left humerus with hypervascularity present**

Figure 4.62 shows a complete right humerus with a raised, inflamed area surrounding a normally-occurring vascular foramen in zone 4 of the element.



**Figure 4.62: Right humerus with inflammatory formation**

The juvenile femur illustrated in Figure 4.63 has a small, roughened enthesophyte present in zone 1 just distal to the acetabular articulation.



**Figure 4.63: Left femur with enthesophyte**

Zone 2 of the complete left femur in Figure 4.64 has an osteophytic formation characterised by irregular bone formation along the crista trochanteris and fossa trochanteris.



**Figure 4.64: Left femur with osteophytic formation**

Figure 4.65 shows extensive lipping in zone 2 along the crista trochanteris of a complete left femur.





**Figure 4.65: Left femur with osteophytic formation**

This right femur (Figure 4.66) also has new bone formation in zone 2 with lipping again present along the crista trochanteris.



**Figure 4.66: Right femur with osteophytic formation**

A left tibiotarsal fragment bears evidence of a compound fracture in zones 5 and 6, though the bony changes associated with this event would likely have extended well beyond the area represented by this fragment (Figure 4.67). What survives is the distal portion of an unhealed oblique fracture. While parts of the callus are smooth, ongoing new bone formation was extensive and may have been active at the time of death and involved infection. It is

impossible to tell the angle or foreshortening of the element as the remainder of the element is missing.



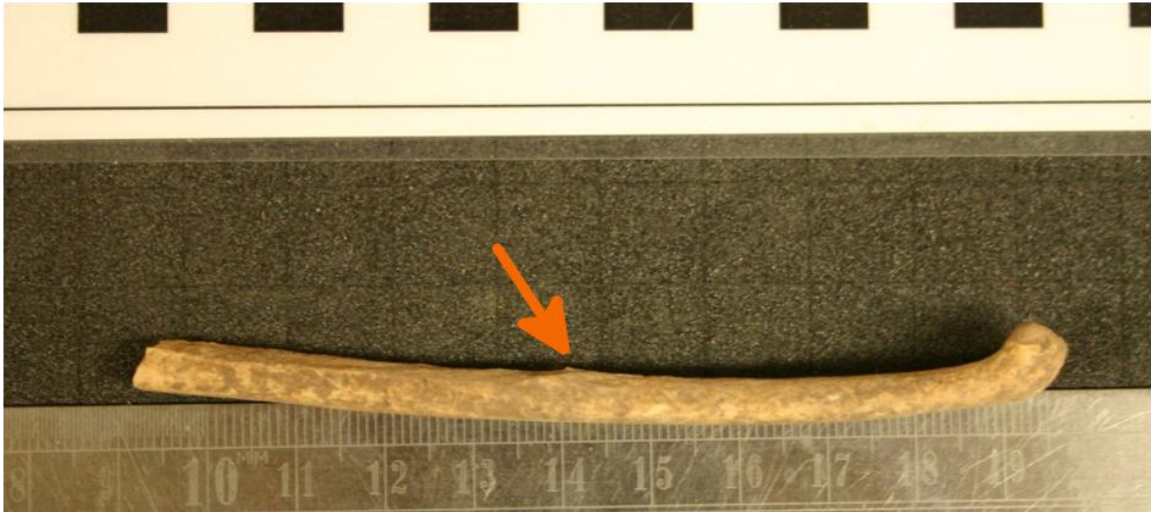
**Figure 4.67: Left tibiotarsus with healed fracture**

This right juvenile ulna (Figure 4.68) has been warped approximately 15 degrees from the anatomic axis. As the bone is skeletally immature, it is possible that this condition would have been remedied over time.



**Figure 4.68: Warped right juvenile ulna (left) and average adult right ulna for comparison (right)**

The radius fragment in Figure 4.69 has a well-healed fracture to zones 5 and 6 immediately distal to the interosseous attachment; no displacement from the anatomical axis has taken place.



**Figure 4.69: Left radius with healed fracture**

Zones 1 and 2 of a complete right radius (Figure 4.70) have been affected by articular destruction. The articular surface itself has pitting present, with some lipping present around the margin.



**Figure 4.70: Right radius with articular destruction**

#### **4.4.9. Gran Quivira**

Gran Quivira is situated in central New Mexico, and is part of the Salinas Pueblo Missions National Monument. In the area of Gran Quivira, which is also called Las Humanas, some pithouse structures have been dated to the AD 800s, but the pueblo itself was not constructed until approximately AD 1300. Gran Quivira was occupied at the time of Entrada, and during the

period of Spanish contact and was not abandoned until 1672. The site has a complex excavation history, and I was only able to access the most recently excavated portions of the assemblage. Previously excavated assemblages from the same site were analysed by McKusick and are discussed later in this chapter.

According to the final report made on the materials which I re-examined, turkeys represent 0.8% of the total faunal assemblage from Gran Quivira with a NISP of 113, though this does not include any "probable turkey" specimens (Clark 2003). Although turkeys are classed in the report solely as food fauna (the turkey bones are interpreted in the context of nutritional compensation for a decline in local artiodactyl populations (Clark 2003:33)), the possibility that the turkeys may have been raised for feathers is also mentioned. The context for the turkey remains is not given, nor are any articulated skeletons or partial skeletons noted. No pathologies are described in the Clark report; however, their presence in the inaccessible portion of the assemblage had been previously documented by McKusick (1986). During this analysis, a total of four pathologies were encountered; these include a coracoid with osteophytes and articular destruction (Figure 4.71), a scapula with osteophytic lipping and articular destruction (Figure 4.72), a greenstick fracture in a juvenile femur (Figure 4.73), and massive new bone formation in a tibiotarsus which may have been secondary to a fracture or other trauma (Figure 4.74). The pathological prevalence for Gran Quivira is 4.55% (Table 4.11).

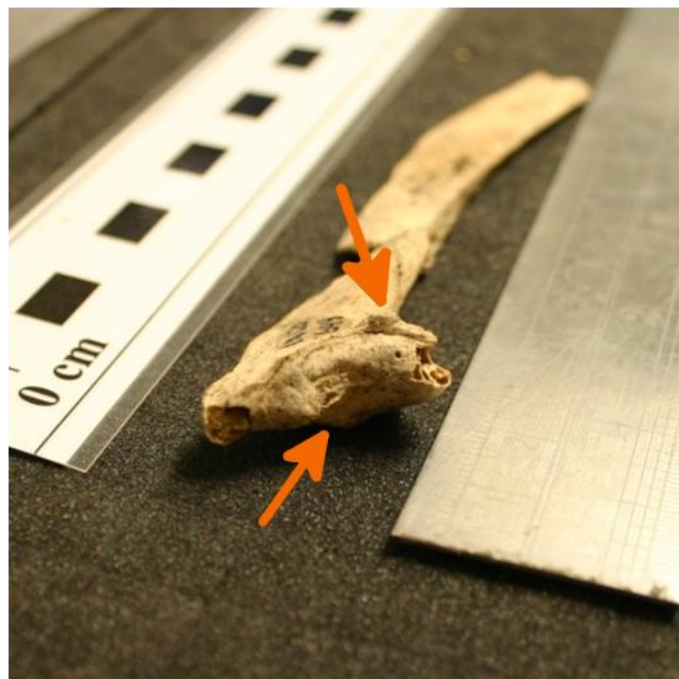
In figure 4.71, zones 1 and 2 of a right coracoid fragment have extensive lipping and new bone formation bordering the proximal articular surfaces; small irregularly-shaped cavities are present in the new bone and cover much of the proximal portion of the element.





**Figure 4.71: Right coracoid with lipping and articular destruction**

Similarly, zones 1 and 2 of this right scapula (Figure 4.72) have extensive lipping present on the margins of the articular surface, in combination with pitting on the surface itself.



**Figure 4.72: Right scapula with osteophytic lipping and articular destruction**

A healed greenstick fracture in zones 5 and 6 of a femur is shown in Figure 4.73. The lesion has a smooth callus, and an accompanying exostosis opposite. Any foreshortening is impossible to detect due to the absence of

the remainder of the element and the juvenile state of the individual, but there is a deviation of 10 degrees from the anatomic axis of the bone.



**Figure 4.73: Greenstick fracture in a left juvenile femur**

Figure 4.74 shows periosteal new bone formation in zones 5 and 6 of a left tibiotarsus. The new bone formation is very rough in appearance and if a fracture was present there was little deviation from the anatomical axis; however, like element foreshortening, it is difficult to determine as the element is broken mid-pathology. Furthermore, the distal portion of the pathology ceases very abruptly; it is possible that this portion of the lesion was broken off during excavation or post-excavation.



**Figure 4.74: Periosteal new bone formation in a left tibiotarsus, possibly secondary to trauma**

#### 4.5. Assemblage comparison: pathologies and prevalence

While all of these assemblages share a number of common traits, there are both subtle and striking differences when they are considered as a set. Table 4.11 shows the available NISP and pathological prevalences for each assemblage discussed. For Arroyo Hondo, the figures have been adjusted for the selection of pathological elements by School of American Research staff, with the unadjusted numbers provided in parentheses. Table 4.11 uses the most conservative figures and the site descriptions and other tables describe the lesions in the appropriate context.

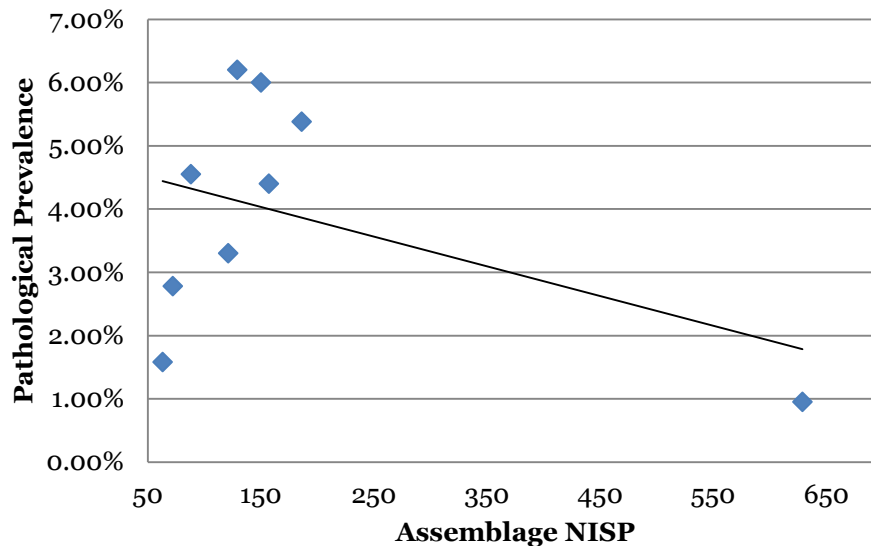
	Turkey NISP	Number of Lesions	Pathological Prevalence (Available)
Eleventh Hour	121	5	3.3%
Salmon Ruin	157	7	4.4%
Bluff Great House	629	6	0.95%
Eleanor Ruin	150	9	6.0%
Ojo Bonito	63	1	1.58%
Heshotauthla	72	2	2.78%
Arroyo Hondo	129	8 (11)	6.2% (8.53%)
Quarai	186	10	5.38%
Gran Quivira	88	4	4.55%
Total/Average	1,595	52 (55)	3.90% (4.16%)

**Table 4.11: Pathological prevalence by assemblage**

All assemblages examined were included in the above table; even those with a considerably low NISP have pathologies present. Some assemblages (Heshotauthla, Ojo Bonito/Hinkson and Quarai) were analysed due entirely to their accessibility and not the advance knowledge of pathologies present in the turkey elements. The Bluff Great House has the lowest overall prevalence of pathologies by a wide margin, though non-zonable fragments of bone were frequently recovered and identified during the analysis of the Bluff assemblage (which may have deflated the overall pathological prevalence) and excavation and collection strategies vary. Despite these factors it seems unlikely that these differences can be wholly explained away through excavation and analytical practices.

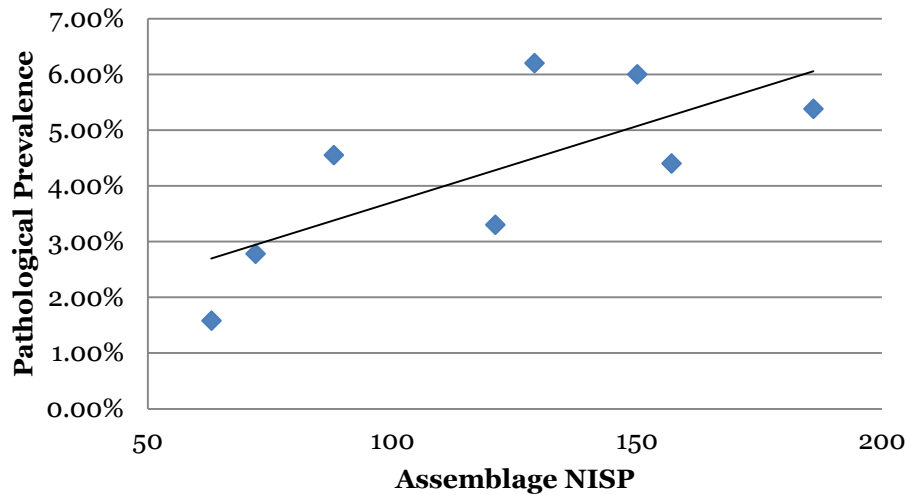
Figure 4.75 shows the NISPs of all assemblages against the pathological prevalence. Patterns in the lesion data are tested using Chi-squared tests

for independence. As the skeletal elements were all disarticulated (with the exception of one individual from Salmon Ruin), it was generally not possible to ascertain whether or not elements or fragments thereof derived from the same animal; therefore it is possible that type I or type II statistical errors have occurred. With a null hypothesis of a standard pathological prevalence for each site (this was calculated as the total number of pathologies divided by total analysed bones) and eight degrees of freedom, the chi squared result is 21.71. Differences between the assemblages are significant at the 0.05 level, and a slight negative correlation is visible ( $r=-0.43$ ). An  $r^2$  value of 0.189 indicates that only 19% of the variation in pathological prevalence could be related to the assemblage NISP.



**Figure 4.75: Pathological prevalence versus assemblage NISP ( $r=-0.43$ )**

However, it is clear from Figure 4.75 that Bluff is distant from the other sites. Figure 4.76 below shows the same plot without Bluff included.



**Figure 4.76: Pathological prevalence versus assemblage NISP, without Bluff ( $r=0.73$ )**

Once the data from Bluff are removed, the chi-squared result (seven degrees of freedom) is 3.26 and the differences between the sites are not statistically significant. The data shown in Figure 4.76 have an  $r$  value of 0.73 (reflecting a positive correlation) and, accordingly, an  $r^2$  value of 0.536. This means that 53.6% of the variation in the pathological prevalence could be related to the assemblage NISP. A positive correlation between pathological prevalence and assemblage NISP is commonly observed in other assemblages (Bartosiewicz 2008) and is also seen here. Though the excavation and analysis of Bluff was not identical to other sites and assemblages, these are not likely to be the only factors influencing the disparity between Bluff and the other sites. If the Bluff data is removed from the dataset and the average pathological prevalence is calculated from the other sites (4.76%) and used to calculate an expected NISP based on the number of recovered pathologies, the Bluff turkey assemblage would be expected to have a NISP of 126. This would mean that if taphonomy and collection strategies were the main factors leading to the observed data, then 503 or roughly 80% of the turkey bones collected would have been missed at other sites. Based on my experience of examining all of these assemblages, I do not believe this to be the case. It is therefore likely that other factors are responsible for the much lower pathological prevalence in the Bluff assemblage and the resulting disparity.

## **4.6. Other sites and pathologies**

Before summarising the pathologies present in the analysed assemblages, brief consideration must be given to another set of assemblages. The following seven sites and associated turkey bone lesions are presented here for the sake of completeness as they are relevant to some interpretations presented subsequently in Chapter 5. These are Allantown, Hawikuh, Long H, Paquimé, Pecos, Pueblo Bonito, Tse ta'a and Zuñi. Apart from the Paquimé and Tse-ta'a bones, these specimens are kept at the Ornithology Department at the Smithsonian Institution. Photographs of specimens from Allantown, Hawikuh, Long H Ranch, Pecos, Pueblo Bonito and Zuñi are used here courtesy of Dr. Jonathan Driver of Simon Fraser University, Canada. Most of them are from unknown contexts and in the particular cases of those under the subheading "Zuñi", the exact sites from which the pathological elements were excavated are unknown. Despite the potentially problematic nature of these specimens, all pathologies were either described or photographed and their inclusion is necessary in considering the known spectrum of turkey pathologies in the American Southwest and northern Mexico. Although these sites are not shown on the regional map in this chapter (Figure 4.1), they are included on the general map provided in Chapter 1 (Figure 1.1).

### **4.6.1. Paquimé**

Paquimé, also called Casas Grandes, (an UNESCO World Heritage Site) located along the Rio Casas Grandes in the state of Chihuahua in northern Mexico. Paquimé is located within the southern boundaries of the Mogollon and Mimbres cultural region and the northern reaches of Mesoamerica. Paquimé is commonly interpreted as a centre for the breeding of turkeys and macaws, and also housed large numbers of assorted passerine species. The presence of breeding boxes for macaws and pens for turkeys, along with skeletal remains representative of a breeding population and large numbers of avian remains recovered, supports this conclusion. Due to the ritual status ascribed to the turkey and macaw, Di Peso et al. (1974) are of the

opinion that both birds were kept to supply feathers for purposes of trade and ritual, and were not eaten.

The start and end dates published in the formal report on Paquimé (DiPeso 1974) are incorrect, though the relative dates and associations within that temporal framework are generally accurate. The original dates, derived by Charles Di Peso, suggested that the site was occupied primarily from AD 1060 to 1340 with occupation as late as the 1500s, but the early dates resulted from dendrochronological analysis of finished wood which had the outer layers removed during processing. It has been suggested that Di Peso stretched the Paquimé dates in order to argue for a temporal association with Chaco Canyon (Lekson 1999:107). Dean and Ravesloot (1993:96-98) re-examined the relevant chronological material and re-dated the site origin to some time prior to AD 1250 to 1470 with the latest possible dates ranging into the late AD 1470s. There are three phases within that period: the Viejo ("old"), Medio ("middle"), and erroneously titled Españoles ("Spanish") phases. The Españoles period was named under the assumption of a Spanish presence, which was not the case. For the purposes of examining turkey pathologies, and indeed, the aspects of avian husbandry present at the site, the dates for the Medio period are most relevant (AD 1250-1450), as only one individual from the Viejo period was excavated; none originated from the Españoles period (Di Peso et al. 1974:274).

Though some fragmented elements were recovered from midden contexts, most turkey remains at Paquimé were from articulated turkey burials. The majority of these were in discrete locations with 70.1% of all turkeys recovered from one excavation unit, the so-called House of the Dead or Unit 13 (Di Peso et al. 1974:267). Since 57.7% of all macaw remains were excavated from the House of the Macaws (Unit 12), and 38.8% of wild bird remains were from the House of the Well (Unit 8), it appears that burial of certain species or groups of birds in specific locations is a distinguishing feature of the site. Turkeys and macaws (36.8% and 53.9% respectively) together made up 90.7% of all bird remains recovered from Paquimé (Di

Peso et al. 1994:273). An overall MNI of 344 is given for the turkeys; unfortunately no raw data are published. All other birds were represented by disarticulated elements and none were purposefully buried. There were several different types of turkey ABGs present at the site; some of these were buried in the company of humans or macaws, and some of them were headless. Regardless of their accompaniment, turkeys were not only buried in a flexed position, but also with wings and legs outstretched (Di Peso et al. 1974:288-289).

Based upon her examinations of the turkey remains, McKusick (in Di Peso et al. 1974) comes to the conclusion that the turkeys bred at Paquimé were the result of a "polyglot gene pool" which probably had contributors from three different subspecies (Di Peso et al. 1974:275-276). Pathologies are noted, though McKusick concludes that they are unrelated to human behaviour (Di Peso et al. 1974:280). These pathologies are reviewed with extreme brevity, in contrast to the thorough review of the 284 macaw pathologies which follows, and indeed, the detailed description of macaw development which is also included in the avian report. There appear to have been a total of 21 identified fractures in various elements from the turkeys at Paquimé (Table 4.12) and rachitic warping (possibly characteristic of osteomalacia or rickets) was present in three specimens (*ibid.*). From the burial descriptions, it was possible to determine elements affected by pathological modification; these were largely appendicular and included the foot digits. For whatever reason, foot digits are always recorded as occurring in sets of three; five of these sets were documented. In Table 4.12, I list the counts which I derived from McKusick's description of turkey elements with pathological modification present (Di Peso et al. 1974).



Element	Count
Furcula	1
Scapula	1
Ulna	11
Radius	3
Carpometacarpus	1
Wing digits	2
Sacrum	1
Femur	5
Tibiotarsus	1
Tarsometatarsus	4
Foot digits	15
Pygostyle	1
Total	46

**Table 4.12: Pathological elements from Paquimé**

Importantly, it seems that more than one pathology was present in at least six individuals; however, this is difficult to determine with any degree of certainty as pathologies present in individuals from group burials are not distinguished separately. Descriptions of the pathologies vary from clinically precise to vague and are often brief in nature, though McKusick does conclude that “As a whole, the turkeys were very healthy” at Paquimé (Di Peso et al. 1974:280). It is entirely possible that some pathologies present in the assemblage may have been missed, given the fact that there is no mention of any evidence indicating the presence of other likely pathologies (periostosis, for example). Unfortunately, this assemblage could not be examined as part of this project.

#### **4.6.2. Allantown**

The site of Allantown in eastern Arizona was excavated in 1931 by Frank H. H. Roberts under the auspices of the Bureau of American Ethnology. The excavated materials range in date from AD 500-1350 and include two healed oblique mid-shaft fractures in right humeri with large calli, patches of necrosis, substantial foreshortening and deformation. One element originated from a mature individual and one from a juvenile (Figure 4.77).



**Figure 4.77: Two fractured humeri from Allantown, photo courtesy of Jon Driver**

#### **4.6.3. Hawikuh**

The site of Hawikuh is located near the modern-day Pueblo of Zuñi and was excavated in 1917-1923 by Frederick Webb Hodge. The site was occupied by approximately AD 1400, and was conquered in 1540 by Francisco Vásquez de Coronado and a mission established there. Though the Spanish mission was repeatedly burned down, Hawikuh was occupied until the Great Pueblo Revolt of 1680, at which point it was finally abandoned. Two bowed tibiotarsi were recovered during excavation (Figure 4.78); as they are from opposite sides, these may be paired elements.



Figure 4.78: Two bowed tibiotarsi from Hawikuh, photo courtesy of Jon Driver

#### 4.6.4. Long H Ranch

Long H Ranch is located in eastern Arizona and was excavated in 1929. A turkey humerus exhibiting a mid-shaft fracture with less deviation than the Allantown specimens was recovered from this site (Figure 4.79).



Figure 4.79: Possible trauma in a humerus from Long H Ranch with normal humerus for comparison, photo courtesy of Jon Driver

#### 4.6.5. Pecos

From 1915 to 1929, A. V. Kidder, creator of the Pecos Classification (a ceramic-based chronological framework still used to date archaeological materials in the American Southwest) excavated a pueblo near Pecos, New Mexico in what is now known as Pecos National Historic Park. A bowed turkey tibiotarsus (Figure 4.80) was present in this assemblage.



**Figure 4.80: Bowed tibiotarsus from Pecos with normal tibiotarsus for comparison, photo courtesy of Jon Driver**

#### 4.6.6. Pueblo Bonito

Pueblo Bonito is located on the north side of Chaco Canyon. It is the largest Great House in Chaco Canyon and is perceived as the "heart of hearts" of the Chaco Phenomenon. This site had at least four stories and approximately 700 rooms; a great deal of the architecture has been preserved for public viewing by the National Park Service and the canyon itself, which contains more than twenty similarly-constructed great houses, is an UNESCO World Heritage Site. It was still possible to visit a complete, plastered room inside Pueblo Bonito until 2005 when damage from vandalism necessitated reconstruction and the authorities closed off that section of the great house. The site was initially excavated from 1896-1900 by Richard Wetherill and George Pepper of the American Museum of Natural History, and although their report contains mention of exotic



materials, little attention focussed on the faunal remains. Neil Judd later reported on the material culture of Pueblo Bonito (Judd 1954) and Nancy Akins incorporated Pueblo Bonito in her 1985 chapter on faunal utilisation in Chaco Canyon inasmuch as was possible (Akins 1985). Akins makes a very clear argument that although turkeys are the most common bird species at Chaco, they were not the most economically viable source of food due to the fact that they would be competing with humans for nutrition and require water at least twice daily. They can also be very curious and destructive to crops, and would have required a great deal of human maintenance as the local environment would have provided insufficient forage for their needs. The only data available on the turkeys from Pueblo Bonito are reported by Akins (1985:378) and originated from an undated manuscript by Lyndon Hargrave. The number given for turkey elements is 109, of which 6.4% are said to be juvenile. It is not known what proportion of the assemblage this represents. Though turkey "burials" or ABGs (including deposition of headless female turkeys in similar contexts within kivas) are relatively common at the great houses within Chaco Canyon (Akins 1985), none were reported from Pueblo Bonito. This may reflect the excavation strategy employed at the site rather than actual absence.

A complete ulna with rough new bone formation on the metaphysis and diaphysis was recovered from Room 334 of Pueblo Bonito (Figure 4.81). This room is in the older portion of the site, and was constructed during what Judd terms the "Old Bonitian" phase in the AD 900s, but the fill inside the room was dated (based upon ceramic chronology) to AD 1150-1350 ("Late Bonitian") (Judd 1954). When the floor and subfloor were sampled, however, the majority of sherds were from the earlier Old Bonitian time period. The fill from which this pathological element was recovered contained a bone projectile point and number of other animal bones, mostly complete or nearly-complete crania. These were from a bobcat (*Lynx rufus*), a grey fox (*Urocyon cinereoargenteus*), two red foxes (*Vulpes vulpes*), a domestic dog (*Canis familiaris*), and three coyotes (*Canis latrans*). Some limb bones from

a bobcat, a fox and a coyote were also present in the same fill (Judd 1954). Judd's report does not mention this ulna, nor any other bones, and it is possible that other skeletal elements were present in the same contexts but unreported or were otherwise not of interest. It is also possible that a portion of this assemblage may still be extant in the ornithological collections of the Smithsonian Institution.



**Figure 4.81: Ulna from Pueblo Bonito with slight bowing and new bone formation on metaphysis and normal ulna for comparison, photo courtesy of Jon Driver**

#### **4.6.7. Zuñi**

The bones presented in Figures 4.82 and 4.83 were found in assemblages excavated by Frank H. H. Roberts. Both pathological elements are tibiotarsi; one is bowed and the other has a healed fracture with a large callus and significant displacement from the anatomic axis of the element. Though their provenience is officially unknown, it is possible that these elements are from Hawikuh.



**Figure 4.82: Bowed tibia from an unknown Zuni site with a normal tibia for comparison, photo courtesy of Jon Driver**



**Figure 4.83: Healed break in a tibia from an unknown Zuni site with a normal tibia for comparison, photo courtesy of Jon Driver**

#### **4.6.8.Tse-ta'a**

Excavated from 1949-1950 by Charlie R. Steen, Tse-ta'a is situated in north-eastern Arizona within Canyon de Chelly at the base of a sandstone cliff. The site has a long history of periodic occupation (AD 50 onward) and was in continued use by Navajo people (whose date of arrival in the American Southwest is uncertain) at the time it was excavated. The greatest proportion of materials recovered are reportedly from AD 900 to 1350. The faunal assemblage was analysed by Thomas W. Mathews and was primarily composed of turkey elements (NISP 326), which made up 68% of the identified faunal assemblage (Steen 1966). One articulated turkey ABG was also reported; this included ossified tendons and other material which led the excavator to conclude that the bird, interpreted as a male for reasons which are not supplied, had been interred whole sometime between AD 50 and AD 750 (Steen 1966:144). Also in this assemblage were two pathological turkey elements from female individuals: a fractured right ulna and a right coracoid (Figure 4.84, A and G). The ulna has healed completely, but the coracoid has been displaced significantly and a great deal of new bone formation is present. Though the quality of the photo is poor, it was taken some time prior to 1968 and may represent the first formal publication of turkey pathologies in archaeological assemblages from the American Southwest.



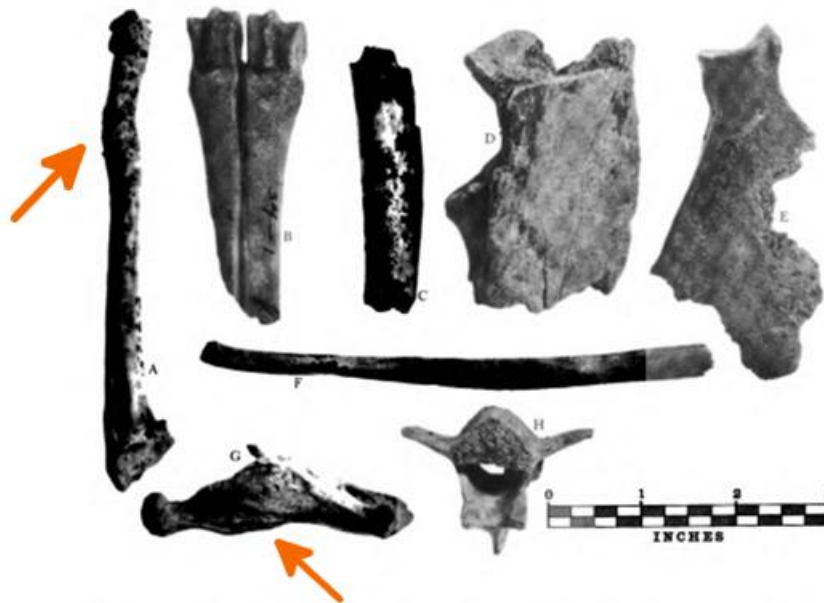


PLATE 1. *Examples of modified skeletal elements from the Tse-ta'a faunal collection.*

**Figure 4.84:** Faunal elements from Tse-ta'a, including pathologies, photo by R. G. Vivian

#### **4.6.9. Gran Quivira: previous study on earlier excavated material**

I was not able to access a large number of previously analysed turkey bones excavated from Gran Quivira. In her report on these faunal remains (from excavations prior to Kate Spielmann's in the 1990s), Charmion McKusick divides the turkeys present into two different sub-species of domestic turkey, "Small Indian Domestic" and "Large Indian Domestic." This division is based primarily upon size differences and is detailed further in her book *Southwest Indian Turkeys* (McKusick 1986); I have chosen not to employ this framework (See discussion in Chapter 2) and will not differentiate between these categories in discussing the Gran Quivira turkeys.

Turkeys are reported to have made up 41% of the assemblage (McKusick 1981). McKusick briefly notes the presence of turkey ABGs in her discussions on turkey bone derived artefacts and gizzard stones (1981:50-51). The presence of turkey ABGs, articulated joints and individual elements in human burials and cremations is also mentioned as an aside when describing a general lack of burning in the turkey assemblage. Roughly equal numbers of male and female turkeys are present (388 males

and 373 females with 162 of unknown sex) and although five stages of aging are used, 33.8% of the elements are classed as juvenile and 66.2% as adult. The high proportion of turkeys living to adulthood is interpreted as evidence for turkeys being kept for feathers, but the recovery of complete heads and articulated feet from "trash" is presented as evidence for the use of turkeys as food.

McKusick (1981) describes two types of pathologies present in the bones of domestic turkey at Gran Quivira. "Porosis," described as "metabolic malfunction" and interpreted as contributing to premature death in young turkeys, is the main type of pathology discussed at length in this report. Porosis, presumably osteoporosis in this case, is widely described in the veterinary literature (Whitehead and Fleming 2000) and can be either primary (due to age, for example) or secondary (resulting from a metabolic bone disease). Osteoporosis results from a number of vitamin or mineral deficiencies or imbalances, mainly those involving vitamin D, manganese, phosphorus and calcium. Although it is implied that "porosis" was common in the population, no counts or estimations of prevalence are given for the condition. Other pathologies include the fractures in Table 4.13 (reproduced from Table 24 in Hayes 1981).

Element	Healed with malunion	Healed with nonunion
Humerus	3	4
Coracoid	3	
Scapula	1	
Radius	1	
Tibiotarsus	1	
Tarsometatarsus	1	
Pedal phalanx	1	

**Table 4.13: McKusick's table of fractures in turkey elements from Gran Quivira**

McKusick states that all fractures present had healed, but uses the terms "malunion" (healed but with displacement) and "nonunion" (with pseudoarthrosis or no connection between fractured segments of bone) and does not mention any well-healed fractures. Moreover, all fractures are interpreted as accidental, either resulting from humans treading on the turkeys or "panic flight" (McKusick 1981:52).

## 4.7. Types of pathologies

This section presents and describes the palaeopathological data in detail; the interpretation of this material takes place in Chapters 5 and 6. For the purposes of this analysis, only broad categories of pathologies are considered due to the implicit difficulty of designating specific disease processes. Five general groups of lesions exist for broad nosological classification (Thomas, in prep.). These include Trauma, Joint Disease, Infectious Disease or Inflammation, Metabolic Disorders, Developmental Disorders and Neoplasia, though the use of "Other" as a category is also valid. Of these categories, Metabolic and Developmental Disorders are not used here when considering the lesions described as no certain instance of their occurrence was recorded. Instead, hypervascularity and bowing or warping (the latter two of which may result from metabolic disorders) are classed in the "Other" columns. It is worth noting that these lesions may have resulted from a combination of aetiologies. Lengthier names of some elements have been shortened for spatial considerations (Table 4.14). Table 4.15 shows the pathologies categorised by probable primary lesion;. When it has been possible to determine the type of lesion present in an element, I have included other sites that I was not able to personally access.

Abbreviation	Element
CMC	carpometacarpus
TBT	tibiotarsus
TMT	tarsometatarsus

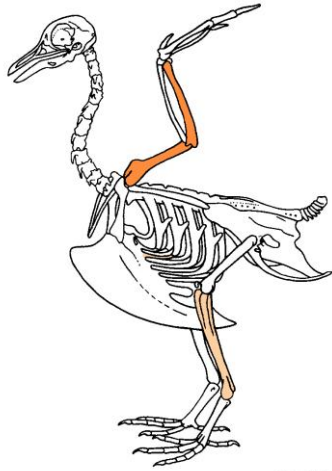
**Table 4.14: Key to terms used in Tables 4.15 and 4.18-4.20**

	Trauma	Joint Disease	Infectious or Inflammation	Exostosis	Hyper-vascularity (Other)	Bowing (Other)
<b>Eleventh Hour</b>	Fracture in scapula Fracture in TBT Fracture in ulna			Enthesophyte in scapula		In TBT
<b>Salmon Ruin</b>	Fracture in radius Fracture in ulna Fracture in humerus	In coracoid		Osteophyte in CMC	In TMT In femur	
<b>Bluff Great House</b>	Fracture in humerus Fracture in sternal rib Fracture in TBT Fractures in ulnae (2)			Osteoma in humerus		
<i>San Juan Region</i>	11	1	0	3	2	1
<b>Ojo Bonito</b>		In TMT				
<b>Heshotauthla</b>		In CMC		Enthesophyte in femur		
<i>Zuñi Region</i>	0	2	0	1	0	
<b>Quarai</b>	Fracture in TBT Fracture in radius	In radius	In humerus	Enthesophyte in femur Osteophytes in femur (3)	In humerus	In ulna
<b>Gran Quivira</b>	Fracture in femur Trauma in TBT	In coracoid In scapula				
<i>Salinas Pueblo</i>	4	3	1	4	1	1
<b>Eleanor</b>	Fractures in TBT (2) Fracture in scapula Trauma in ulna	In coracoid	In TBT	Enthesophyte in TMT	In femur	Bowing in TBT
<b>Arroyo Hondo</b>	Trauma in ulna Fracture in humerus Fractures in ulna (3) Fracture in scapula	In ulna	In femur	Osteophyte in coracoid	In femur	In TBT
<i>Other Total</i>	10	2	2	2	2	2
Total (above)	<b>25</b>	<b>8</b>	<b>3</b>	<b>10</b>	<b>5</b>	<b>4</b>
<b>Allantown</b>	Fracture in humeri (2)					
<b>Hawikuh</b>						In TBT (2)
<b>Long H Ranch</b>	Trauma to humerus					
<b>Pecos</b>						In TBT
<b>Pueblo Bonito</b>			In ulna			
<b>Zuñi</b>	Fracture in TBT					In TBT
<b>Tse t'a</b>	Fracture in ulna Fracture in coracoid					
Grand Total	<b>31</b>	<b>8</b>	<b>4</b>	<b>10</b>	<b>5</b>	<b>8</b>

**Table 4.15: Categories of pathologies present at all sites**

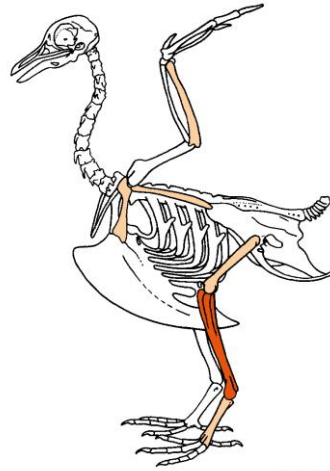
Pathologies are somewhat evenly distributed across the elements considered in this analysis. The most pathologies to occur in one element in a single re-analysed assemblage is five (in the Arroyo Hondo ulnae) followed closely by the tibiotarsus (four from Eleanor Ruin). Six out of nine sites have pathologies present in the ulna, and six out of nine sites have pathological tibiotarsi; only one of these sites does not also have a pathological ulna. There is a disparity between the numbers of ulnae and radii; only three pathological radii were found compared to eleven ulnae. This may result in part from the fact that the radius is a more slender, fragile bone than the ulna and therefore more vulnerable to a number of bone density-related taphonomic factors, or that the ulna was impacted by pathologies which would not have affected the radius. Trauma is the most common type of pathology across all sites, though it does not occur in either of the Zuñi assemblages analysed.

The diagrams below (Figures 4.85-4.93) show the presence of pathologies in turkey elements at each site. Darker colour indicates a higher number of lesions present on that specific element within that assemblage. An element with one pathology is coloured light peach, pale orange marks elements with two pathologies, dark orange represents four pathologies and an element with five lesions is dark brown (no element had three pathologies present at any given site). Elements with no recorded pathology remain uncoloured.



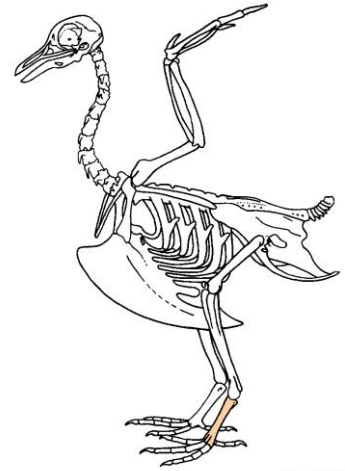
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**Figure 4.85: Bluff**



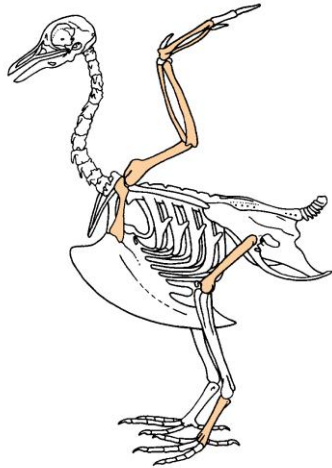
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**Figure 4.88: Eleanor**



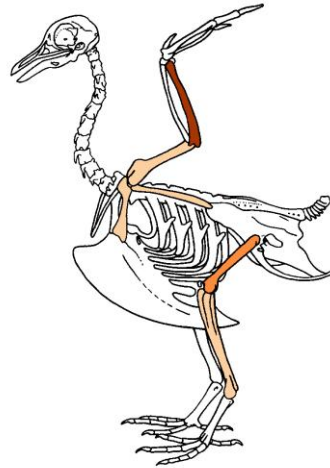
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**Figure 4.91: Hinkson**



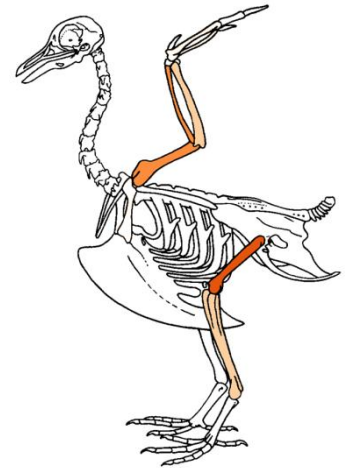
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**Figure 4.86: Salmon Ruin**



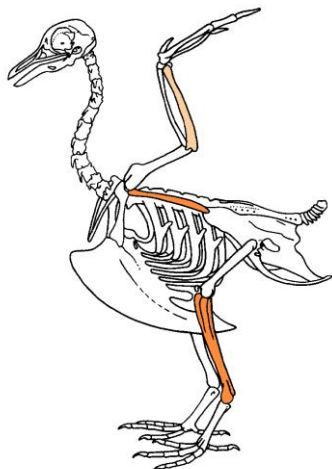
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**Figure 4.89: Arroyo Hondo**



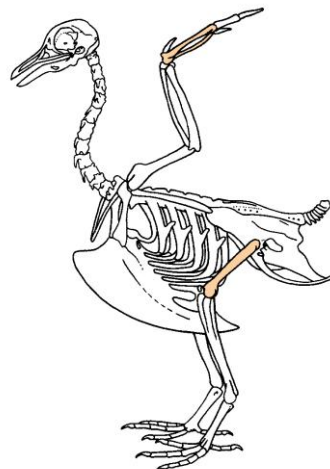
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**Figure 4.92: Quarai**



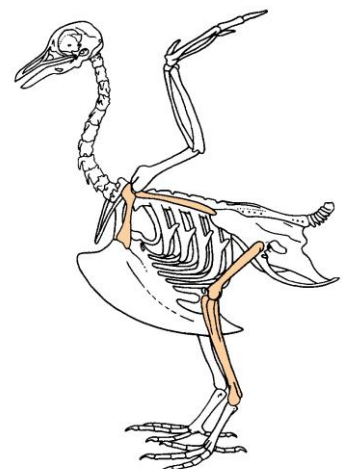
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**Figure 4.87: Eleventh Hour**



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**Figure 4.90: Heshotauthla**



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**Figure 4.93: Gran Quivira**

A broad range of pathologies and differences in prevalence exists across all assemblages; the following sections present them by broad time period and geographical region.

#### 4.7.1. Pathologies by region

As stated earlier in this chapter (See Figure 4.1), seven of the nine assemblages considered have been split into broad regional groups. The tables which follow (Tables 4.16 and 4.17) show all pathological prevalences and general pathology types for all assemblages, grouped by region when possible. A summary of some of the more noticeable patterns present in these data is given at the end of this chapter.

##### *Regional prevalences*

	Analysed Assemblage NISP	Number of Lesions	Pathological prevalence
<b>San Juan Basin</b>			
Eleventh Hour	121	5	3.3%
Salmon Ruin	157	7	4.4%
Bluff Great House	629	6	0.95%
<b>Total and Average</b>	<b>907</b>	<b>18</b>	<b>2.88%</b>
<b>Zuñi Region</b>			
Ojo Bonito	63	1	1.58%
Heshotauthla	72	2	2.78%
<b>Total and Average</b>	<b>135</b>	<b>3</b>	<b>2.18%</b>
<b>Salinas Pueblos</b>			
Quarai	186	10	5.38%
Gran Quivira	88	4	4.55%
<b>Total and Average</b>	<b>274</b>	<b>14</b>	<b>4.97%</b>
<b>Other Sites</b>			
Eleanor Ruin	150	9	6.0%
Arroyo Hondo	129	8 (11)	6.2% (8.53%)
<b>Grand Total and Average</b>	<b>1,595</b>	<b>52 (55)</b>	<b>3.90% (4.16%)</b>

**Table 4.16: NISP and prevalences by site and region**

Table 4.17 below shows the number of pathologies and pathological prevalence by element for all sites, with regional sub-totals (and a sub-total for the non-grouped sites). The number of pathologies is given, followed by the number of all appropriate identifiable elements from that site or region in parentheses.

	CMC	Coracoid	Humeri	Radius	Scapulae	Ulnae	Sternal Rib (Bluff)	Femora	TMT	TBT	Total
<b>Eleventh Hour</b>	0 (3)	0 (17)	0 (12)	0 (7)	2 (14)	1 (17)		0 (11)	0 (17)	2 (21)	<b>5</b>
<b>Salmon Ruin</b>	1 (18)	1 (17)	1 (17)	1 (10)	0 (13)	1 (18)		1 (19)	1 (25)	0 (20)	<b>7</b>
<b>Bluff Great House</b>	0 (43)	0 (78)	2 (95)	0 (63)	0 (52)	2 (86)	1 (8)	0 (59)	0 (37)	1 (87)	<b>6</b>
<i>San Juan Region Total</i>	1 (1.6%)	1 (0.89%)	3 (2.42%)	1 (1.25%)	2 (2.53%)	4 (3.31%)	1 (12.5%)	1 (1.12%)	1 (1.26%)	3 (2.34%)	<b>18</b>
<b>Ojo Bonito</b>	0 (5)	0 (11)	0 (10)	0 (2)	0 (8)	0 (3)		0 (4)	1 (13)	0 (6)	<b>1</b>
<b>Heshotauthla</b>	1 (3)	0 (4)	0 (13)	0 (5)	0 (4)	0 (12)		1 (11)	0 (7)	0 (12)	<b>2</b>
<i>Zuñi Region Total</i>	1 (12.5%)	0	0	0	0	0	0	1 (6.67%)	1 (5.0%)	0	<b>3</b>
<b>Quarai</b>	0 (26)	0 (12)	2 (17)	2 (16)	0 (9)	1 (24)		4 (19)	0 (30)	1 (28)	<b>10</b>
<b>Gran Quivira</b>	0 (6)	1 (15)	0 (13)	0 (4)	1 (4)	0 (7)		1 (10)	0 (14)	1 (8)	<b>4</b>
<i>Salinas Pueblo Total</i>	0	1 (3.7%)	2 (6.67%)	2 (10%)	1 (7.69%)	1 (3.22%)	0	5 (17.24%)	0	2 (5.56%)	<b>14</b>
<b>Eleanor</b>	0 (7)	1 (20)	0 (20)	0 (4)	1 (14)	1 (10)		1 (16)	1 (31)	4 (27)	<b>9</b>
<b>Arroyo Hondo</b>	0 (9)	1 (16)	1 (18)	0 (9)	1 (13)	5 (17)		2 (19)	0 (10)	1 (14)	<b>11</b>
<i>Other Sites Total</i>	0	2 (5.56%)	1 (2.63%)	0	2 (7.41%)	6 (22.22%)	0	3 (8.57%)	1 (2.44%)	5 (12.19%)	<b>20</b>
<b>All Sites</b>	<b>2 (1.67%)</b>	<b>4 (2.1%)</b>	<b>6 (2.79%)</b>	<b>3 (2.5%)</b>	<b>5 (3.82%)</b>	<b>11 (5.67%)</b>	<b>N/A</b>	<b>10 (5.95%)</b>	<b>3 (1.63%)</b>	<b>10 (4.48%)</b>	<b>55</b>

**Table 4.17: Pathologies and prevalences by element for individual sites and regions**

Broadly speaking, the most pathological element is the femur, followed very closely by the ulna. The San Juan and Salinas region have a more diverse spread of pathologies by element, but this may be due to sample size more than anything else. The San Juan region as a whole has the lowest prevalences, and the Salinas Pueblos have the highest; it should be noted, however, that Eleanor Ruin and Arroyo Hondo together do have the highest percentage of pathological coracoids, ulnae and tibiotarsi, though they do not constitute a regional group. Though there are pathological femora in every group, their pathological prevalence is particularly high in the Salinas Pueblo group. Few lesions were identified in carpometacarpi (1.67%) and tarsometatarsi (1.63%). Ulnae, femora and tibiotarsi are the most frequently pathological element among all groups; this may be partially due to the fact that these bones survive reasonably well because of their comparatively large size and sometimes higher bone density than other elements (Ericson 1987). It also bears consideration that macaw ulnae recovered from Pueblo Bonito are frequently described as "roughened" by Hargrave (1970) and the sketches (which are few in number) show bony changes which resemble those in the turkey ulna from the same site (Figure 4.81).



#### 4.7.2. Pathologies by time period

In order that changes over time in the prevalence of pathologies can be identified, the assemblages have been divided into two broad groups (discussed at the beginning of this chapter) for comparison as not all assemblages fit neatly into the traditionally-employed Pecos Classification and the dating for some assemblages is approximate. The following table (Table 4.18) presents the pathological prevalences by element, grouped by "early" and "late" time periods.

	CMC	Coracoid	Humeri	Radii	Scapulae	Ulnae	Sternal Rib (Bluff)	Femora	TMT	TBT	Total/Avg.
<b>Early Sites</b>	1 (76)	2 (143)	3 (154)	1 (86)	3 (101)	5 (134)	1 (8)	2 (109)	3 (123)	7 (161)	28
<b>Early Prevalence</b>	1.31%	1.39%	1.95%	1.16%	2.97%	3.73%	12.5%	1.83%	2.44%	4.35%	2.56%
<b>Late Sites</b>	1 (44)	2 (47)	3 (61)	2 (34)	2 (30)	6 (60)	0	8 (59)	0 (61)	3 (62)	27
<b>Late Prevalence</b>	2.27%	4.25%	4.92%	5.88%	6.67%	10.0%	N/A	13.56%	0%	4.84%	5.89%
<b>All Sites</b>	2 (1.67%)	4 (2.1%)	6 (2.79%)	3 (2.5%)	5 (3.82%)	11 (5.67%)	N/A	10 (5.95%)	3 (1.63%)	10 (4.48%)	55
<b>Change in %</b>	+0.96	+2.86	+2.97	+4.72	+3.7	+6.27	N/A	+11.73	-2.44	+0.49	+3.33

**Table 4.18: Pathological prevalences by element for "early" and "late" sites**

In Table 4.18, it is clear that a number of changes over time do occur; foremost among these trends is a general increase in pathological prevalence despite a much lower overall NISP from later sites. The most immediate pattern that emerges when examining changes over time in the pathologies present at all sites is the difference between the "early" prevalence of 3.25% and the "late" prevalence of 4.72%. With a null hypothesis of no variation in pathological prevalence over time and one degree of freedom, the chi squared result for early sites as compared to late sites (6.66) is significant at the 0.05 level. The only negative change over time in pathological prevalence occurs in the tarsometatarsus; no pathologies were noted in this element in the later assemblages. The most drastic increases in prevalence are in the femora and ulnae (an increase of 11.73% and 6.27% respectively) whilst the average overall increase was 3.33% and the tibiotarsus and carpometacarpus prevalences increase by less than 1%.

As fractures are by far the most common lesion type, Table 4.19 provides specific data and prevalence for fractures by element; tibiotarsi, ulnae and scapulae are the most frequently affected. Shown in Table 4.20 are the fracture prevalences by specific element as well as the changes over time in these values. The sternal rib fracture from Bluff is not included in these prevalences due to a lack of comparative material across all sites, and in Table 4.20, the totals without the sternal rib are provided in parentheses.

	CMC	Coracoid	Humeri	Radius	Scapulae	Ulnae	Sternal Rib (Bluff)	Femora	TMT	TBT	Total (all elements)
<b>Eleventh Hour</b>					1	1				1	3
<b>Salmon Ruin</b>			1	1		1					3
<b>Bluff Great House</b>			1			2	1			1	5
<i>San Juan Region Total</i>	0	0	2	1	1	4	1	0	0	2	11
<i>San Juan Prevalence (%)</i>	-	-	0.22	0.11	0.11	0.44	0.11	-	-	0.22	1.21%
<b>Ojo Bonito</b>											0
<b>Heshotauthla</b>											0
<i>Zuñi Region Total</i>	0	0	0	0	0	0	0	0	0	0	0
<i>Zuñi Prevalence (%)</i>	-	-	-	-	-	-	-	-	-	-	N/A
<b>Quarai</b>				1						1	2
<b>Gran Quivira</b>								1		1	2
<i>Salinas Pueblo Total</i>	0	0	0	1	0	0	0	1	0	2	4
<i>Salinas Prevalence (%)</i>	-	-	-	0.36	-	-	-	0.36	-	0.73	1.46%
<b>Eleanor</b>					1					2	3
<b>Arroyo Hondo</b>			1		1	3					5
<i>Other Sites Total</i>	0	0	1	0	2	3	0	0	0	2	8
<i>Other Sites Prevalence (%)</i>	-	-	0.36	-	0.72	1.07	-	-	-	0.72	2.87%
<b>All Sites Total</b>	<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>7</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>6</b>	<b>23</b>
<b>All Sites Fracture Prevalence (by element)</b>	-	-	<b>1.39</b>	<b>1.67</b>	<b>2.29</b>	<b>3.61</b>	-	<b>0.6</b>	-	<b>2.70</b>	<b>1.44%</b>

**Table 4.19: Fracture prevalences across all sites by element**

It is clear from Table 4.19 above that the Zuñi sites are fracture-free, the San Juan has the most diverse selection of fractured elements but lags behind in terms of overall fracture prevalence and that despite a relatively low NISP, Eleanor Ruin and Arroyo Hondo have relatively high numbers of fractures, though only in four elements.

Total/Avg.	TBT	TMT	Femora	Sternal (Bluff only)	Rib	Ulnae	Scapulae	Radii	Humeri	Coracoid	CMC	
14 (13)	4	0	0	1	0	4	2	1	2	0	0	Early Total Sites
1.25% (1.16%)	2.48	-	-	12.5	-	2.99	1.98	1.16	1.3	-	-	Early Prevalence by element (%)
9	2	0	1	0	1	3	1	1	1	0	0	Late Total Sites
1.89%	3.24	-	1.69	-	1.69	5.0	3.33	2.94	1.64	-	-	Late Prevalence by element (%)
+0.64 (+0.73)	+0.76	-	+1.69	-	+1.69	+2.01	+1.35	+1.78	+0.34	-	-	Prevalence change over time by element

**Table 4.20: Fracture prevalences over time by element**

The changes over time displayed in Table 4.20 above are striking. When prevalence is considered by element, an increase over time is evident in every case apart from the sternal rib, which was only present at Bluff. It would be revealing to compare these results with similarly-sized data sets resulting from analysis of fractures in other avian populations, perhaps even those involving modern poultry. Unfortunately, I have thus far been unsuccessful in my attempts to locate any comparable numerical data despite the fact that fractures appear to have been commonplace in the past. Additionally, although the publication of palaeopathological data is increasing, I have not yet found research which presents the prevalence of fractures or traumatic pathology in an avian population.

## 4.8. Summary

With regard to the number and percentage of turkey bones in these assemblages, a pattern does emerge despite the wide variation in figures. There are no fully post-AD 1300 sites with turkeys making up more than 10% of their total NISP, while none of the assemblages with "early" dates are composed of less than 10% turkey. In other words, turkeys become relatively less abundant. There is also a great diversity in the size of adult

turkeys from these assemblages. However, once the regional categories are considered, it appears that the San Juan generally has the widest variety of element sizes and also the largest elements while the Salinas turkeys are typically a bit smaller, and the Zuñi turkeys are smaller still. Juvenile elements make up a widely-varying percentage of most of these assemblages. Gran Quivira has the highest proportion of juveniles, followed by Salmon and Arroyo Hondo, which are both at least 10% lower. Approximately 10% lower still is the percentage of juveniles at Quarai. All other sites have a percentage of juveniles less than 5%. Notably, none of the elements from Eleanor Ruin were classed as juvenile, though this may be due in part to the selection of elements which could be zoned. In all cases apart from the Eleventh Hour assemblage, female turkeys outnumber males; in fact, the number of juveniles appears to be inversely related to the number of males (Figure 4.17). This does not appear to fit the standard reproductive pattern in terms of brood sex ratio for turkeys as there is typically an even split of sexes (Dickson 1991), but juveniles cannot be sexed and it is therefore likely that any under-represented males are part of the juvenile assemblage. This disparity will be discussed further in Chapter 5.

Burning affected each of the assemblages to differing degrees; while nearly a third of elements from the Eleventh Hour site were burned in some way, the Gran Quivira turkey elements had no evidence of burning whatsoever. Butchery, in the strict sense of cut and chop marks, appears to have had little overall impact on the turkey elements from most assemblages, though these marks can be easily obscured by the effects of other taphonomic processes (and turkeys could have been cooked whole). Of all bones included in this study, only 1.7% had any evidence of butchery. Rootlet etching was very common with nearly a third of all bones affected in some way. Rodent gnawing was only absent from two assemblages, and while carnivore gnawing was evident in all assemblages but Eleanor Ruin, it was much less frequent overall (See Tables 4.8-4.10). As gnawing and root etching can influence assemblage composition, the number of juveniles was plotted

against these factors in Figures 4.19-4.22; no discernible relationship was evident.

Both pathological prevalences and types of pathologies evident in the assemblages show a complexity of trends. Regionally, Zuñi (with one site in each time period) has the lowest pathological prevalence and the San Juan sites are not much higher; the Salinas sites have slightly more than twice the prevalence of the San Juan sites. It should be noted that both Arroyo Hondo and Eleanor Ruin have general prevalences higher than the Salinas sites. There seems to be a general trend for the Salinas assemblages and those from later sites to have a higher pathological prevalence whilst the more northern and "early" sites have lower prevalences on average. This pattern could result in part from the site and temporal distributions sampled rather than past practices alone. With regard to the types of pathologies present in the assemblages when grouped by region, the San Juan sites have a diverse set of pathologies. This could result in part from the much higher NISP of that area when compared to Zuñi and Salinas. See Bartosiewicz (2008) for a discussion of the relationships between NISP and pathological frequency (Figures 4.75 and 4.76). Trauma is the most common type of pathology in many of these assemblages (Table 4.14), and the San Juan is no exception. Moreover, all of the San Juan sites have pathologies involving bone formation present and at least one fractured ulna; both Bluff and the Eleventh Hour sites have fractured tibiotarsi as well. Of the San Juan sites, joint disease and hypervascularity occur only at Salmon Ruin, and bowing was present only at the Eleventh Hour site. Scapular fractures with a similar appearance were noted in the Eleventh Hour (Figure 4.23), Eleanor Ruin (Figure 4.40) and Arroyo Hondo (Figure 4.58) assemblages. At Zuñi, both assemblages had elements affected by possible joint disease, but little else. The Salinas pathologies are diverse in type; both sites have evidence of trauma and joint disease. Tibiotarsi at both Gran Quivira and Quarai have trauma present (Table 4.14). Trauma is also common among the pathologies from Arroyo Hondo and Eleanor Ruin; hypervascularity and

bowing are also present at these sites. In the assemblages which I did not analyse, hypervascularity was not detected (though this may not be 'pathology', *sensu stricto*); however, like the assemblages which I did examine, trauma was the most common lesion type and bowing was also present.

The "early" period is represented by more than twice as many elements as the "late," a pattern which might be expected to produce a higher prevalence in the "early" period--and does not. Each of these periods include sites which have higher and lower prevalences than the overall average, but the "early" period does include all of the San Juan sites and the "late" has both Salinas sites. In the "early" period assemblages, trauma occurs at 4 out of 5 sites, especially in the ulna and tibiotarsus, and hypervascularity occurs in three leg elements. In the "late" period, there are a number of pathologies affecting the femur; trauma and joint disease remain relatively common. Apart from a high number of fractured ulnae at Arroyo Hondo, no particular element appears to have been specifically affected by trauma.

Though I have separated the data into regional areas for purposes of comparison, the strongest trends appear to be temporal. Considering that the regional divisions, with the exception of Zuñi, are strongly divided along temporal lines, this is unsurprising, and it can be argued that these temporal trends indicate possible differences in social and natural environment as well as husbandry practices or the purposes for which these birds were husbanded. Interpretations of the data presented here are the subject of the next chapter.

## **Chapter Five. The Turkey in the American Southwest**

### **5.1. Introduction**

This chapter is dedicated to the examination and interpretation of the turkey in the North American Southwest, and will incorporate not only skeletal data (described in Chapter 4) but also anthropological, ethnographic and historical sources. As set out in Chapter 1, some of the main goals of this research were to elucidate the histories of human turkey husbandry and the nature of the animal-human relationships involved in past practice. Accordingly, this chapter will include discussion of the pre-translocation data as well as the late 17<sup>th</sup> century data from the historic Zuñi and Salinas Pueblo sites. When possible, human perceptions of the bird and the socio-political context within which the turkey and its keepers would have been situated will be highlighted and drawn upon to clarify the impact of less tangible aspects of past turkey husbandry.

In order to draw justifiable conclusions regarding the lives of turkeys in the past and the possible behaviours of their keepers, the essential biology and behaviour of the turkey must be taken into account. These are factors which have the potential to influence, skew and obscure the patterns present in the faunal assemblage and any subsequent interpretation thereof. Turkeys not only require relatively frequent access to water and food, but their curiosity (Schorger 1966:149) and territoriality would have necessitated a certain degree of control on the part of their keepers, especially during breeding and egg-laying. "Gobbling" behaviour on the part of the turkey cock and the associated breeding season lasts from January to March (with a possible peak in February), though it may continue until mid-April. Turkeys are capable of parthenogenesis (reproduction from an ovum without fertilisation) and typically lay eggs once a year; these generally hatch in May (Schorger 1966). The clutches are very sensitive to environmental and nutritional conditions. The hens must incubate the eggs for 28-30 days and young poults are quite vulnerable to temperature changes (Dickson 1992).

Chilling is a common cause of death in young turkey poults and may have been frequent as May is a cool month in parts of the North American Southwest. Akins (1985:374) uses these factors to suggest that the turkey hens were provisioned with food, water (and presumably, shelter). Schorger states that male turkeys in particular are known to be pugnacious, irritable and truculent; they have been known to break eggs and kill young poults and probably would have to have been restrained from brooding hens (Schorger 1966:155). Despite these deleterious tendencies, turkeys rarely inflict severe injuries on each other, though when they do occur, they are more likely to target the head and neck during the highly competitive breeding season (Dickson 1992; Schorger 1966). Though some have argued that the turkey is self-domesticating (Pinkley 1965) and others have suggested that it was useful as a form of insect control in fields of maize (Lang and Harris 1984), it seems more likely that turkeys would have required focussed management and were probably more destructive than beneficial to crops (see Chapter 6 for a description of the impact of turkey flocks on 16<sup>th</sup>-17<sup>th</sup>-century London).

In making the interpretations that follow in this chapter and the next, I will attempt to take into account social and environmental considerations, the biology and behaviour of the turkey and the human and taphonomic effects on the assemblages as well as the transformation in human perception of the turkey itself.

## **5.2. Archaeological evidence: depositional context**

The depositional contexts of the turkey elements from assemblages included in this research vary by site and are sometimes extremely vague or lacking entirely. Where noted, an ABG is an "associated bone group", after Morris (2010). Table 5.1 below gives a summary of these contexts and their bibliographic source.



Re-Examined Assemblages	Contexts of turkey elements	Source
<b>The Eleventh Hour (29SJ633)</b>	1 ABG, floor fill, human burial (Figure 5.1)	Gillespie 1991
<b>Salmon</b>	2 articulated ABGs near macaw ABG, midden, room fill	Durand and Durand 2006
<b>The Bluff Great House</b>	Middens, room fill	Fothergill 2008
<b>Eleanor Ruin</b>	Midden, room fill	Roler-Durand 1999
<b>Ojo Bonito (Hinkson)</b>	Three articulated ABGs, midden	Clark 1998
<b>Heshotauthla</b>	Not known	N/A
<b>Arroyo Hondo</b>	Midden	Lang and Harris 1984
<b>Quarai</b>	Midden	Moore 1994
<b>Gran Quivira</b>	Midden	Clark 2003
<b>Other Assemblages</b>		
<b>Paquimé</b>	Human burials, sometimes with macaw ABGs	McKusick in DiPeso et al. 1974
<b>Pueblo Bonito</b>	Room fill with carnivore elements	Judd 1954, Akins 1985
<b>Tse ta'a</b>	Articulated male turkey ABG	Steen 1966
<b>Gran Quivira</b>	ABGs, midden and human burials	McKusick 1981

**Table 5.1: Table of turkey element contexts**

Turkeys are found in other types of depositional contexts at other sites in the American Southwest (e.g. in walls and beneath floors (Hodge 1923)) but those context types are not noted in any reports from the sites featured here. If the contexts from which turkey bones were excavated indicate anything about human attitudes to the bird in death, it is that these attitudes were not temporally or spatially consistent. Middens and room fills are a common source of disarticulated turkey elements across all sites and at sites such as Bluff, these elements form the main component of faunal assemblage. In contrast, turkey bones are only recovered as ABGs in association with human burials and macaw ABGs at Paquimé; and there is a distinct lack of turkey elements from midden contexts. Turkey elements appear to have been deposited in a variety of ways and in a number of different places. Even so, the appearance of turkey elements in more than one type of context at several sites may indicate different uses for animals of the same species (or their body parts) or changes in perception of the animal by one group of people. Although the ABGs listed above may not be purposeful burials, their presence indicates something about the condition of at least part of the body (if not a complete corpse). This could reflect the intentional retention of an intact form for a symbolic purpose, an attitude toward the bird in death, or other factors entirely (e.g. disposal of a diseased

animal). It is also possible that some purposeful depositions of complete turkeys reflect personal attitudes toward individual animals; a remarkable colour, size or even personality may have caused selection for different treatment upon death. In essence, the burial of an articulated animal could reflect a specific perception (or set of perceptions) of the individual creature in question.



**Figure 5.1: Burial 3 from the Eleventh Hour site, photograph used courtesy of Chaco Culture NHP**

Macaws are also recovered from archaeological sites in the same regions and occupied during the same time periods as those considered here. Like the turkey, their skeletal elements are excavated as both disarticulated remnants and discrete burials or ABGs (Hargrave 1970). Unlike the turkey, however, they have been interpreted in a rather different manner because of their status as a long-distance trade item originating in Mesoamerica and the fact that their presence at these sites is relatively rare (and possibly in part because they have never been considered a food item by those studying them). Dogs are also found both as ABGs and individual elements, but are generally presumed to have been hunting partners and possible sources of companionship and warmth. Neither the macaw nor the dog were so numerous as the turkey at these sites, however. Perceptions of the turkey in death could have been very complex with multiple layers of meaning

involved. Although it is possible that the bird inhabited the role of symbolic feather provider and then transitioned to the position of delicious meat-bearer in the minds of past peoples, the varying types of deposition suggests a more complicated conceptual position. Past attitudes toward the turkey in life are ultimately impossible to ascertain (see *Ethnographic and Anthropological Evidence*), but a hint of later 19<sup>th</sup>-century Zuñi perceptions is contained within Frank Hamilton Cushing's description of the way they kept the birds (Cushing 1979:36; see discussion below).

### **5.3. Archaeological evidence: non-pathological skeletal data**

A great deal of skeletal data were collected from the (re-) analysed assemblages (see Chapter 4); in interpreting these, past turkey population dynamics and possible management strategies are suggested. In this section, I will discuss these data specifically, and provide some possible interpretation of the patterns evident therein.

I constructed some simple temporal and spatial frameworks to categorise the analysed assemblages. An "early" period and a "late" period were created and these were split by a gap in the site occupation histories in an attempt to examine broad diachronic change. I also grouped the sites regionally, expecting that assemblages originating from the San Juan may not be that similar as it is a very large region and anticipating that the sites which are very close to each other (the ancestral Zuñi sites and the Salinas pueblos) might bear some resemblance to each other.

With regard to the temporal division, aspects of population dynamics have emerged as the strongest correlations between sites in the same time period. There is more similarity between sites of common time periods rather than region with regard to the proportion of turkey in each assemblage, the percentage of males and the percentage of juveniles present. Regionally, there is less consistency across sites. Until such a time as it is possible to include some later assemblages from the northern regions and earlier assemblages from the south, the comparison will be unbalanced by a high

number of early sites in the north and later sites in the south. As the ancestral Zuñi sites were the only regional group spanning both time periods, I had hoped that a comparison of their assemblages would be particularly revealing. Even in this particular case, it does seem that some temporal trends are stronger than regional trends.

### **5.3.1. Proportion of *Meleagris gallopavo* in assemblages**

In examining the general role of the turkey as part of the daily lives of these past groups, consideration must be given to the basic proportions of turkey in the faunal assemblages. Though the skeletal fragments recovered from an archaeological site are a time-averaged accumulation subject to a multitude of taphonomic factors which can thus never fully represent the animals that lived in a particular place and time, some apparent trends have emerged from testing these proportions against each other (See Table 4.1 in Chapter 4).

The percentage of turkeys (relative to the entire faunal assemblages by NISP) decreases substantially over time, regardless of region or individual site occupation history (see Chapter 4 for a description of "early" versus "late" assemblages). This is not due to a decline in ABGs, which would artificially deflate the percentage of turkey by NISP. It is possible, however, that a large increase in the number of other animals rather than a decline in turkey numbers could be responsible. The relative abundance of turkey shifts substantially, and appears to be replaced by other fauna including lagomorphs, artiodactyls, and later, various domestic livestock from Europe. In fact, were no change over time expected, this decrease is statistically significant ( $\alpha = 0.001$ ;  $\chi^2 = 4861.332$ ;  $v = 1$ ). This shift in assemblage proportion contrasts with the expected results. An increase in the presence of turkey at archaeological sites in the American Southwest from Basketmaker III and Pueblo I through Pueblo II and Pueblo III has been documented and discussed at great length in the relevant literature (Breitburg 1988, Munro 1994). Lekson (1999) mentions "industrial-scale" turkey breeding at Paquimé, which could have taken place up until the end

of occupation at around AD 1450; there is no known similar site farther north. Since no early assemblages were available from the south and two of the four later assemblages originate from the Salinas area, it is possible that this pattern is due in part to regional differences in the use of turkeys or different phenomena entirely. Rawlings and Driver do mention a greater occurrence of turkey interments to the south at certain times (2010), though turkey ABGs (see Chapter 3) are certainly not unknown at Chaco Canyon and other northern sites (Akins 1985). Although the Spanish encounter the domestic turkey at contact and thereafter, very large flocks of turkeys are not mentioned, nor are any specific husbandry methods detailed. Tarcan and Driver (2010) have found that the Zuñi pragmatically replaced their domestic turkey with European domestic species after Spanish missions were established. What happened to the turkeys in the intervening time period is not clear; perhaps there was a decline in turkey numbers before the Spanish arrived and the introduction of new livestock was merely the endpoint in a downward trend that involved the replacement of the turkey with other species (Tarcan and Driver 2010).

### **5.3.2. General skeletal morphology**

Although the turkeys in the American Southwest were relatively homogeneous on a genetic level, which is consistent with most domestic species (Speller 2009), the overall shape of these birds does vary across time and space (See Figures 4.2-4.16 in Chapter 4). As in this study, Gillespie noted a great deal of size variation in the turkey elements from the Eleventh Hour (1991) and the Bluff data reveal a similar diversity in element length (Fothergill 2008). The Eleventh Hour has quite long wing elements for the most part and Salmon Ruin has relatively short leg elements. The wing elements from Bluff are just below average, whilst the leg elements are comparatively long. Eleanor Ruin has no high or low values for any measurement; these turkeys exhibit middling limb proportions. This may speak to their genetic diversity or intentional breeding for a variety of traits or purposes. Alternatively, it may suggest the presence of

environmental clines within the turkey population in the American Southwest (groups exhibiting varying levels of gradation in one or more characteristics within a species).

The Zuñi sites have some of the shortest elements found at all sites (with the exception of some Gran Quivira elements), but there is a temporal difference present. While the Ojo Bonito elements are short and slender with low GL and SC values, the bones from Heshotauthla have higher SC values. Specifically, Heshotauthla has the thickest ulnae, femora and tibiotarsi of all sites. The later Zuñi elements remain short, but appear to become more robust in breadth over time. Perhaps this change reflects environmental change in the region or dietary improvement, thus allowing the birds to maximise their genotypic potential.

The Salinas pueblos present a great contrast: the Quarai elements tend to be rather long and thick whilst the Gran Quivira elements are short and slender, exceeding the Zuñi elements in slenderness in many cases. The varying wing and leg lengths indicate a generally diverse morphology, though the body proportions observed may be the result of the differing numbers of males and females present. Although the majority of elements (including juveniles) could not be sexed, this influence cannot be mediated. The Eleventh Hour, Quarai and Arroyo Hondo turkeys had proportionately larger wings but rather short leg elements, whilst there were longer-legged turkeys at Bluff and perhaps also Heshotauthla and Gran Quivira.

There are several possible reasons for this differentiation in size and shape. Environmental differences could have led to the formation of clines which were better adapted to certain regions. In addition, it is probable that the variation is the unintended consequence of a combination of local diet, environmental conditions and husbandry practices. The possibility also exists that intentional breeding or adoption of similar husbandry practices led to a development of certain desirable characteristics. A general trend in support of this interpretation is the reduction in element size variation at

later sites. Pursuit of certain feather colours, for example, could have produced unintended skeletal effects. More standardised or focussed management and breeding may have caused the birds to vary less in size and shape. As the sex ratios at most sites are statistically non-random and non-natural (see below), it seems possible that selection through breeding for individual traits may have been practised.

### **5.3.3. Population dynamics: age and sex**

Less than a third of the elements included in this study could be sexed; juvenile elements were not sexed. The average ratio of females to males was approximately 2:1. Ojo Bonito and Gran Quivira's male elements number far below this ratio and the Eleventh Hour site has more male elements than female. Generally speaking, there is an inverse relationship between the number of male elements in an assemblage and the number of juvenile elements identified (see Figure 4.17). While sample size may be small and the sites do not vary a great deal according to sex composition, the number of males is non-random and differs from a natural ratio significantly (see Chapter 4). In an absence of other possibilities, this probably reflects one aspect of turkey husbandry practice that was shared among the assemblages examined.

As discussed earlier in the chapter, males can be very destructive to eggs and poults, and their numbers may have been limited in order to reduce the risk posed to the rest of the flock. In addition, Richard Phillips has suggested that a higher-than-natural ratio of hens to gobblers is essential when attempting to increase turkey populations in the wild (Phillips 2008), and it is possible that the ratios in these assemblages reflect a similar trend. Perhaps in the cases of Ojo Bonito and Gran Quivira, the low percentages of male elements indicate more severe attempts to increase the turkey population or the slaughter of larger numbers of young males. Though the entire assemblage was not accessible and only a small number of bones in the assemblage could be sexed, the Eleventh Hour sex ratios stand out (53.85% male). It may well be that a different husbandry method (e.g. not

culling males) was practiced at this site and that this is at least partially responsible for the unusual sex ratio, or that a non-economic driving factor was present. If the sex ratios at other sites do indeed indicate a facet of husbandry methods, perhaps male turkeys (or some turkeys, regardless of sex) were not husbanded at the Eleventh Hour site but acquired in another manner. These birds may have been wild individuals which were hunted (it is not known with any certainty if wild turkey populations were extant in Chaco Canyon at the time), or domestic animals brought from other areas. Alternatively, male turkeys produce feathers with a different appearance and texture than female turkeys, and the exact colour and origin of feathers is of great importance when creating objects such as masks and prayer sticks (Cushing 1979, Stephen 1936). Though this was also true of macaw feathers, members of the genus *Ara* show no obvious sexual dimorphism and therefore a comparison cannot be drawn. It is possible that the male turkeys at the Eleventh Hour site were husbanded differently or tolerated due to their vibrant plumage or were desirable for another reason, such as display.

#### **5.3.4. Bone modifications**

The amount of burning present in these assemblages varies greatly (See Table 4.8 in Chapter 4) but is uncommon on average (8.28% of all bones). Generally, it seems that the least intense burning was the most common (singeing or localised burning), followed by bone which was burnt black and then bone which had been burnt to a calcined state (burnt white or blue-grey). None of the bones from Gran Quivira were burnt in any way, though burning is present at Quarai nearby. Unfortunately, there is no information available on the amount of burning present on other artefacts from the same assemblages and it is therefore not possible to see if the burnt bones differ significantly. There does not appear to be any preference for certain elements or zones. Diverse processing and disposal techniques are most likely responsible for these patterns, though in the case of the Salmon assemblage, there were multiple burning events at the site which may have affected the proportion of burned elements.



Butchery marks of any kind were very rare across these assemblages (1.69% of all elements), and the majority of these were cut marks, as opposed to chop marks which were comparatively rare. Only one element (from Arroyo Hondo) had both a cut and chop mark present. This absence could reflect processing and culinary methods which do not require much cutting; it is also possible that some turkeys were not dismembered with tools. Additionally, some individual birds may not have been butchered or processed at all (for instance, cut marks were not present on any portion of the turkey ABG from Salmon Ruin).

Gnawing by carnivores also had a limited impact on the analysed elements and was completely absent at Eleanor Ruin. Rodent gnawing was far more common, but not present at the Eleventh Hour site or Gran Quivira. Root etching was present on elements at all sites and varied in severity but was common to all assemblages. The presence of rodent gnawing and root etching is likely to be related to the environment and history of the site itself after occupation ended, and may not be contemporary with deposition. The carnivore gnawing may very well relate to human behaviour as the First Nations people of the American Southwest did keep domestic dogs, though the possibility that wild carnivores (e.g. coyotes, foxes and wolves) could have gnawed the bones cannot be excluded. Depending upon how these dogs were kept as well as how and where the turkey remains were deposited or disposed of, the turkey elements may not have been accessible to the dogs. These decisions could have been made at a community, group or individual level and could therefore have had diverse and varying impacts on the faunal assemblages. Figure 4.21 in Chapter 4 shows no correlation between the taphonomic effects described above and the number of juveniles present.

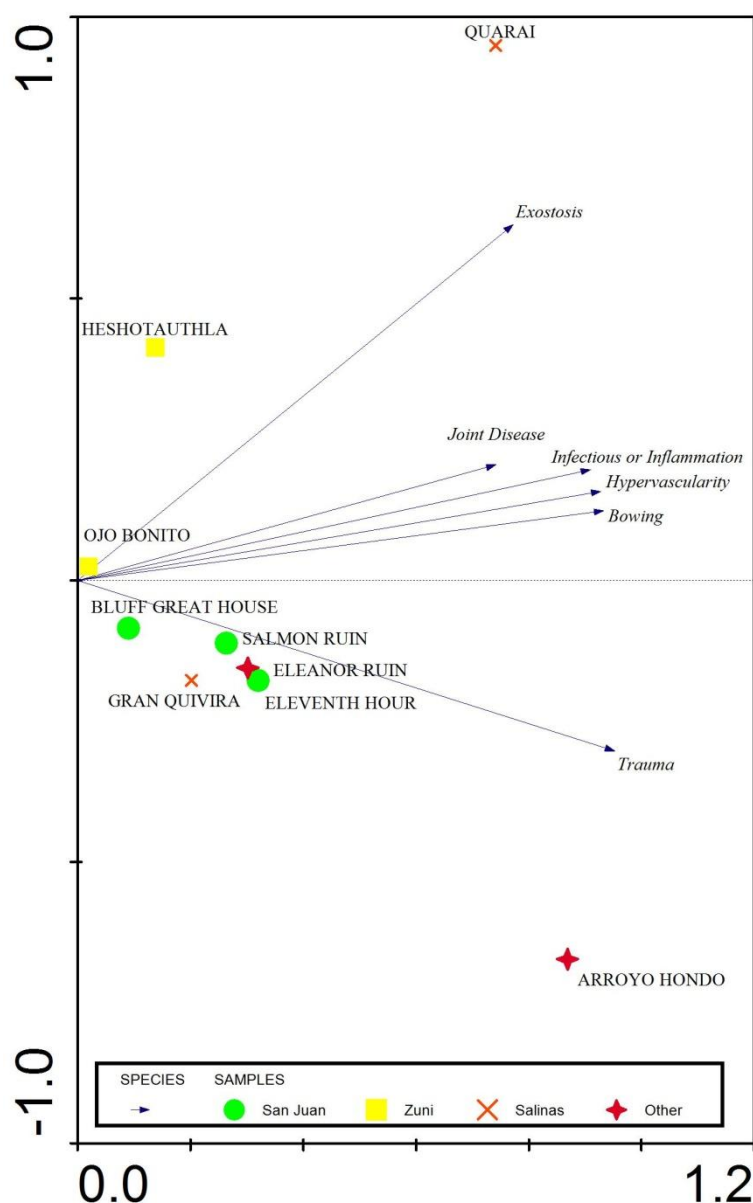
#### **5.4. Archaeological evidence: palaeopathological data**

The palaeopathological data are set out in Chapter 4 and are discussed further here, though interpretation is somewhat limited by sample size.

Interpretation of site and assemblage-specific patterns is presented first, followed by consideration of individual elements and lesion types.

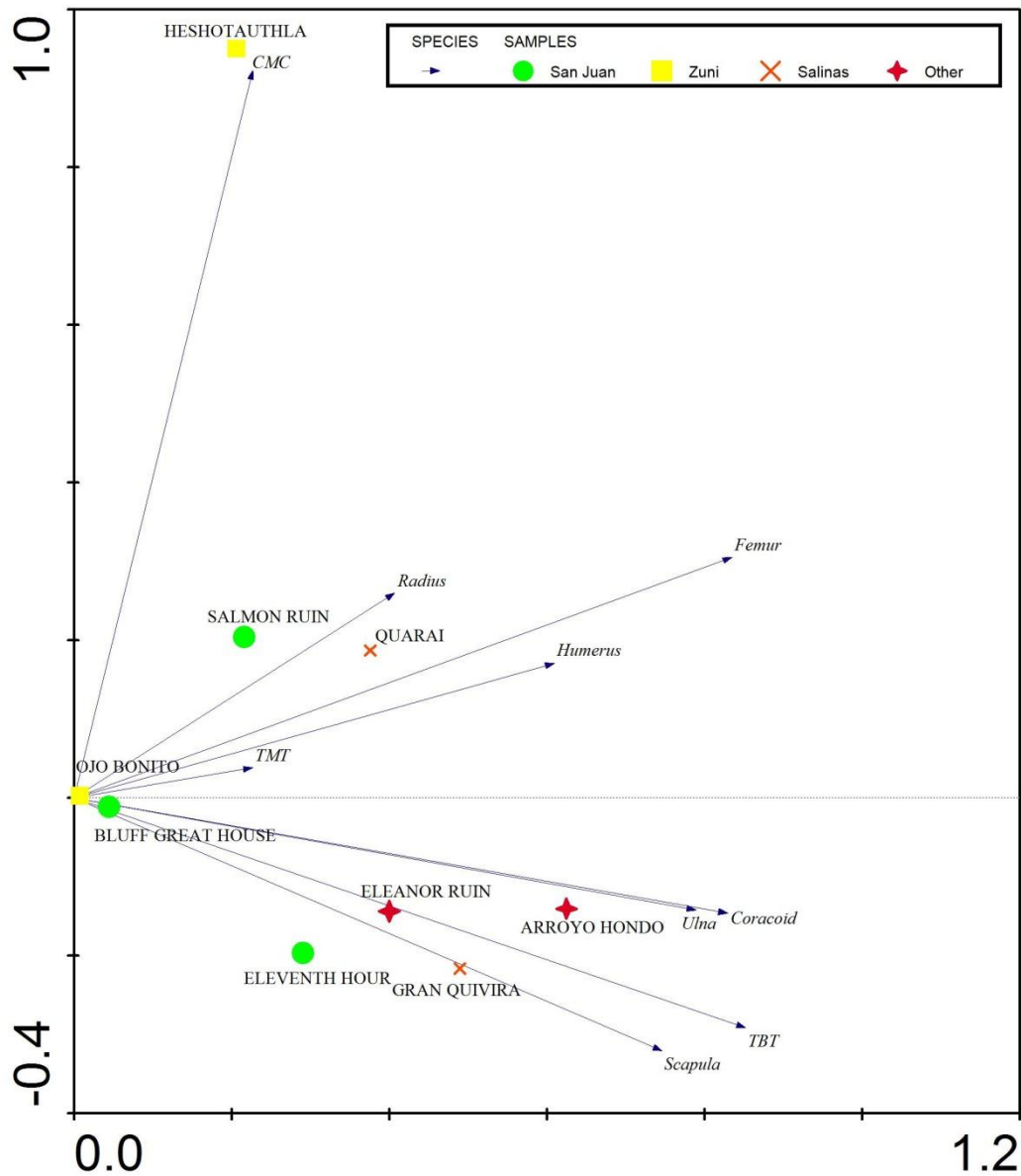
In an effort to produce a general snapshot of a portion of the palaeopathological data, a principal components analysis (PCA) was used with pathological prevalence data by lesion category derived from Table 4.14. These PCAs were conducted in Canoco 4.5 with scaling focussed on inter-sample correlations; these sample scores were divided by standard deviation with no further centring or standardisation. This process enables the information to be presented in a visually comprehensible manner. All pathology types are correlated with the horizontal axis to some degree (Figure 5.2), reflecting the mixed character of assemblages and demonstrating that the presence of one type of lesion does not reduce the presence of others. Those assemblages found furthest along the horizontal axis have the highest overall pathological prevalence values.

Quarai and Arroyo Hondo, with high pathological prevalences, stand out in this respect. Compared to other sites and lesions, Arroyo Hondo has a number of traumatic lesions and Quarai has many exostoses. The vertical axis generally correlates with distribution of different pathology types. The arrows show the differing correlations of each pathology type, and the site symbols are situated nearest to the most closely-associated pathologies. There is less possible joint disease than trauma overall, for example, and Heshotauthla and Ojo Bonito have joint disease present. Trauma, in addition to infection/inflammation, hypervascularity and bowing affected birds at a number of sites. Gran Quivira and the Bluff Great House have a diverse, but comparatively low number of pathologies.



**Figure 5.2: Principal component analysis of pathology prevalence by lesion category**

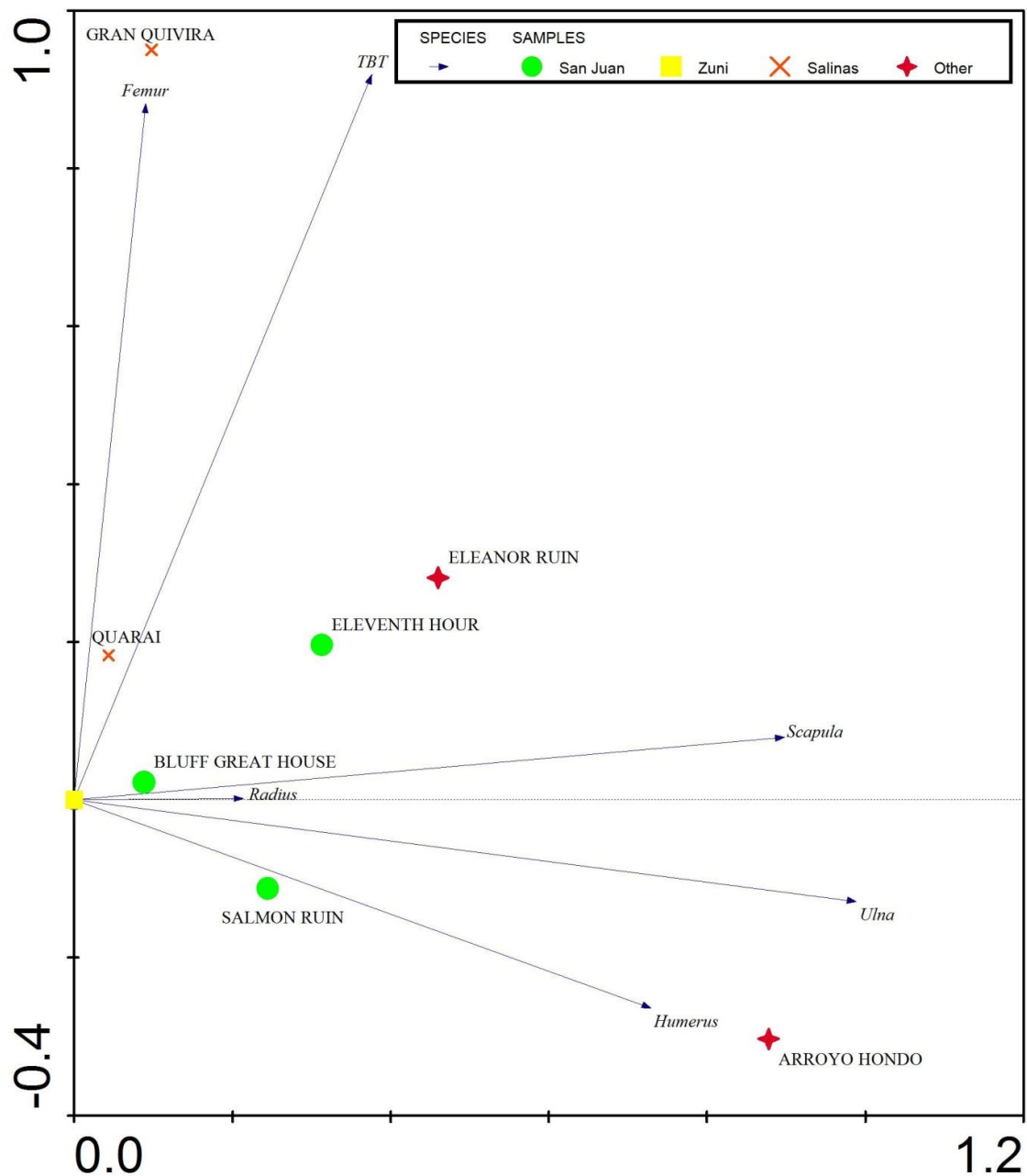
Figure 5.3 shows the results of PCA on pathological prevalence by skeletal element. Individual pathological elements are represented by arrows. The correlations evident here demonstrate which elements are the most pathological in each assemblage. For instance, Arroyo Hondo is shown near the ulna and Heshotauthla near the carpometacarpus. There is also an apparent correlation for the femur, radius and humerus (which are linked with Quarai and Salmon Ruin) and the ulna, coracoid, scapula and tibiotarsus (linked with Arroyo Hondo, Eleanor Ruin, Gran Quivira and the Eleventh Hour site).



**Figure 5.3: Principal components analysis of pathological prevalence by element**

A clearer understanding of the patterning can be reached when considering only traumatic injury (Figure 5.4). In this analysis, wing elements are strongly correlated with the horizontal axis and leg elements with the y-axis. These correlations reflect that a high incidence of trauma in one element is likely to occur with trauma in neighbouring limb elements, but that there is no relationship (positive or negative) between trauma in wing elements and trauma in leg elements. Some spatial associations are recognisable when considering the correlation of assemblages. Arroyo Hondo has a strong correlation to wing elements, the Salinas Pueblos to leg elements and the San Juan sites fall somewhere between these two broad

groupings. No trauma was recorded in the Zuñi assemblages analysed for this project; however, a fractured tibiotarsus from an unknown Zuñi site has been noted (see Figure 4.83).



**Figure 5.4: Principal components analysis of trauma prevalence by element**

Pathological prevalence itself varies enormously among the assemblages analysed, and attempts to interpret these differences run the risk of conflating causes attributable to either spatial or temporal differences. As mentioned in Chapter 4, the pathological prevalences differ significantly when all assemblages are considered, but that significance disappears when

the Bluff assemblage is removed. The disparity between the Bluff pathological prevalence and that present in other assemblages is probably due to a combination of factors including sampling strategy, excavation and analytical techniques as well as less quantifiable past patterns. The Bluff pathologies are similar to those at other sites in the high proportion of trauma and the types of elements with lesions present. The low prevalence of these pathologies and an absence of other types of pathologies could reflect different husbandry methods or attitudes toward turkeys. Perhaps the Bluff turkeys were kept away from dogs and other predators more effectively or there was more passive human intervention in maintaining the flock. The Bluff turkeys are also among the largest in the entire sample; a regular or more complete diet could have improved stature and prevented some deficiencies. Active human intervention may be another factor to consider. The tibiotarsus is the main weight-bearing bone in the turkey with very little support from the fibula; thus a traumatic injury to this element is likely to heal with considerable deviation and foreshortening, in contrast to the tibiotarsus from Bluff. The size of a fracture callus reflects not only the degree of fracture, but the amount of movement (i.e. lack of immobilisation) during the healing process. In contrast to the Bluff tibiotarsal fracture, similar fractures from Eleanor Ruin are foreshortened by 58 and 77 mm respectively with deviation of up to 12 degrees and the fractures in tibiotarsi from Quarai and Gran Quivira are characterised by prolific, disorganised bone growth and may have been affected by infection. There is a similar tibiotarsal fracture from an unknown Zuñi site (Figure 4.83) which, while healed, is spectacularly deviated and foreshortened. It may be that injured or diseased individuals were treated differently in some manner in order to facilitate convalescence. Examples of other injuries in domestic animals which may have necessitated human therapeutic intervention are uncommon, but not unknown (Udrescu and Van Neer 2005). To the best of my knowledge, avian species have not been investigated in this regard (but see Atherton et al. in press). Further comparisons to complete assemblages would be necessary to support any of the above hypotheses.

The Salmon turkeys are a bit smaller than those at the other San Juan sites, and hypervascularity is present in a femur and tarsometatarsus. The potential causes of hypervascularity are not known, but are probably indicative of an underlying ailment that included increased blood flow to the joint cavity, such as nutritional or joint diseases. At least one turkey pen was present at Salmon, but it is not known what proportion of the time turkeys would have been kept indoors or the nature of their diet.

The Eleanor Ruin assemblage has the second highest pathological prevalence in the study and a variety of lesions present. Along with the previously-discussed fractures in tibiotarsi and a scapula (discussed below), the articular destruction present in the coracoid (which may be age-related), combined with the complete lack of juveniles, may suggest that the majority of turkeys at this site made it to adulthood (if not beyond) and that they were therefore husbanded more for feather than flesh production.

Ojo Bonito and Heshotauthla are the only analysed assemblages without any traumatic lesions, though both of these sites have some evidence for joint disease. The aetiologies of these lesions are unknown, but the possibility exists that they are age-related due to the time required for arthropathies to affect skeletal tissue. Although these sites were not occupied at the same time, they are located near each other on ancestral Zuñi land and it is possible that husbandry in the immediate region was more directed toward feather or egg production (see Zuñi sites in Figure 5.2). Though other aspects of these assemblages change over time somewhat in step with the rest of the sites considered, the low percentage of juveniles and small size of the turkeys from these sites could also be hallmarks of how and why they were kept.

The Eleventh Hour assemblage was mainly affected by traumatic injury; the scapular fracture also had an osteophyte present, possibly secondary to trauma. Only elements with high overall pathological prevalences (when all sites are considered) were affected, including the tibiotarsus (discussed

above), ulna and scapula (discussed below). None of the lesions in this assemblage were particularly well-healed; it could be that either injuries resulted in death more frequently or that fewer injuries occurred overall due to careful management.

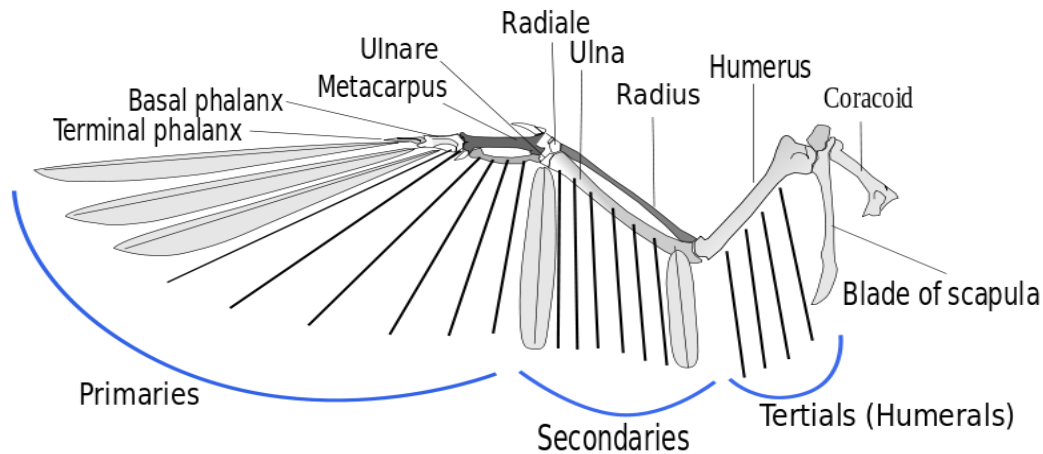
The analysed portion of the Arroyo Hondo assemblage has the highest pathological prevalence of the assemblages studied for this project and has a variety of pathologies present. This assemblage also has the only two examples of fractures with non-union: fractures which have failed to unite at the callus are present in both a humerus and an ulna (Figures 4.53 and 4.55). The bowed juvenile tibiotarsus is a possible candidate for rickets (though see discussion below), but is unfortunately not very well preserved. Arroyo Hondo has the third highest proportion of juveniles of all sites, and the second highest percentage of males (Table 4.6); it seems possible that a production strategy which required more intensive handling could have been in use.

#### **5.4.1. Pathological elements and more frequent pathologies**

The ulna is the most pathological element of all analysed; nine of the eleven pathological ulnae have lesions resulting from trauma (the most common lesion type). Ulnae make up 36% of all traumatic lesions across all analysed assemblages regardless of regional or temporal association. There are five pathological ulnae in the accessible portion of the Arroyo Hondo assemblage alone. When upper and lower skeletal elements are compared, more types of wing elements than leg elements were analysed; however, there are more occurrences of trauma in ulnae alone (10 total) than in all leg elements combined. In considering the lesions from sites which I did not have the opportunity to analyse, the ulna is again the most pathological single element in the Paquimé assemblage; two other sites (Pueblo Bonito and Tse Ta'a) had pathologies present in ulnae as well. It is my opinion, based upon firsthand observation of these injuries to the ulnae of the turkeys from six of nine analysed assemblages (as well as pathologies present in ulnae from the non-analysed assemblages) that these trends are not coincidental or



random. Some of the largest wing feathers, which would have been desirable for a number of purposes, insert at the papillae along the shaft of the ulna (Figure 5.5).



**Figure 5.5: Flight feather insertion diagram**

Trauma occurring during intentional harvesting of these feathers (or other wing feathers) could have caused some of these lesions; repeated inflammation of the periosteum results in new bone formation, and the phenomenon of roughened ulnae has been observed in macaws (Hargrave 1970). Observations by archaeologists (Akins 1985, Breitburg 1988, Munro 1994 and others) that the turkey was probably kept (at least in part) for feather production do correlate with Spanish observations that some Pueblo turkeys were bedraggled in appearance and lacking feathers (Davis 2001). Like sheep, it is also possible that some flocks were kept more for one product than others. Turkeys can live a conveniently long time (see Chapter 2) and some may have been continually plucked over the natural span of their lives. A lack of primary or secondary feathers could have had the additional effect of preventing the flight of the plucked individual.

Femora are the second most pathological element overall, and were affected by a more diverse set of pathologies than the ulna. Only one femur had trauma present (Gran Quivira) whereas the Quarai assemblage had four femora with an osteophyte or enthesophyte present in zone 2. The low numbers of femora with trauma may indicate either a poorer prognosis for survival or that the occurrence of traumatic injury was lower. Femora were

disproportionately affected by hypervascularity, primarily between the distal condyles. Unfortunately, as this condition could result from a number of aetiologies, this can be interpreted as either an indication that the joint in question is more likely to be affected or that it does indeed originate from a specific cause.

Scapulae from the Eleventh Hour site (Figures 4.22 and 4.23), Eleanor Ruin (Figure 4.40) and Arroyo Hondo (Figure 4.58) were fractured; all affected scapulae were fractured mid-shaft and had varying degrees of healing present. The similarity between the breaks present in these elements may suggest that they were broken in the same way, perhaps during feather harvesting.

Seven tibiotarsi have bowing present; three are from analysed sites and four are from other sites. One of the affected elements is juvenile. All of these tibiotarsi are bowed in a posterior or caudal direction. The exact aetiology of this pathology is not known (though see Chapter 4), and although osteomalacia or rickets are likely candidates, fracture, tibial dyschondroplasia, chondrodystrophy and angular deformities can also cause similar shape changes. Although radiographs would be necessary to rule out some potential causes and the incompleteness of some bowed elements prevents further diagnosis, tibial dyschondroplasia can be ruled out as the other hallmarks of the disease are not present (e.g. cavities created by distally-extended proximal growth plate cartilage). Osteomalacia or rickets could indicate the use of husbandry methods which limited the amount of sunlight to which the turkeys were exposed, or a diet lacking in the required minerals. As there is isotopic evidence that turkey diet in some areas of the American Southwest consisted mainly of maize (Rawlings and Driver 2010) and since maize is not a nutritionally complete food, it is possible that a dietary deficiency resulted in either rickets or osteomalacia.

Most changes over time in pathological prevalence by element (across all analysed assemblages) involve a small but notable increase (Table 4.17),

although there are two exceptions. The only element which has a decrease in pathological prevalence is the tarsometatarsus. Accompanying this is a large increase in the pathological prevalence of femora. Both of these elements are from the lower limb and are weight-bearing. The increase in pathological prevalence may indicate a change in the husbandry environment (such as keeping turkeys in pens rather than herding them, thus increasing the possibility of osteomalacia or another vitamin or mineral deficiency), though there is no direct evidence for this specifically. A change in husbandry technique could also be responsible.

Fractures are the most common type of pathology present in the materials examined for this project (See Tables 4.18 and 4.19), and there is a definite proportional increase over time in their occurrence. Fractures are not unique to turkeys among avians, and are present in macaws at similar sites in the American Southwest (Hargrave 1970) as well as in two hawks and one duck at Arikara sites in South Dakota (Parmalee 1977). The most common pathologies in the 3,744 mummified birds from Tuna el-Gebel in Egypt were also fractures (von den Driesch et al. 2005): species affected included the Sacred Ibis, among other water birds and birds of prey. In the latter study, fractures were most common in long bones (*ibid.*:226) and the most frequently affected elements were the humerus, tibiotarsus and tarsometatarsus; fractures to the radius, ulna and femur were rare (*ibid.*:227). These fractures were unhealed or had extensive callus formation (a complication which the embalmer had remedied by bandaging a limb post-mortem in at least one case), but the overall pathological prevalence in the assemblage did not exceed 0.5% (*ibid.*: 226). Harold Wood describes healed fractures in avian elements from a zoological analysis in Pennsylvania (Wood 1941). Fractures are present in the tibiotarsi, radii and ulnae of a Ruffed Grouse, two Marsh Hawks, two eastern goshawks, two red-tailed hawks, a ring-necked pheasant and a turkey. All fractures had healed poorly, and several had sprawling calluses, prolific bone formation, possible infection and/or necrosis. Only two fractures, both in radii, healed

without displacement or extreme shape change, probably due to the excellence of the ulna as an anatomic splint. Two of the tibiotarsi are healed with between 15 and 20 degrees of displacement from the anatomic axis (*ibid.* 1941:70). It is possible that these specimens were identified only because of their extreme appearance. However, these same elements were frequently affected by fractures in the Chapter 4 data: ulnae have the highest fracture prevalence (3.61%), followed by tibiotarsi (2.7%) and then scapulae (2.29%) and radii (1.67%). Perhaps those elements are generally vulnerable in avians, but the majority of those described in Chapter 4 possess more compact calluses with a smoother texture and far less anatomic deviation; only a single fracture (the juvenile humerus from Salmon) had a similar, 15 degree deviation from the anatomic axis of the element.

In contrast to the frequencies described above, Tiemeier found that the most vulnerable elements in the 6,212 wild bird skeletons he examined were the coracoid and scapula (1941:353). In their examination of wild Paraguayan birds, Goodman and Glynn describe the pectoral girdle as the most vulnerable to trauma (specifically the "clavicle", or furculum), but state that no coracoid lesions were encountered (Goodman and Glynn 1988). This could either reflect a poor prognosis of survivability (i.e. birds with trauma to the coracoid do not recover from that injury as well as they might from damage to other elements), or that *contra* Tiemeier, it is simply not vulnerable to trauma. As comparisons between wild birds and domesticated species must be undertaken cautiously and a great deal of temporal and spatial variation separates these studies, it is probable that trauma (or at least the evidence thereof) is highly context-specific. It might be argued that birds kept by humans suffered from higher rates of trauma than their wild counterparts in the past; the bird mummies from Tuna el-Gebel, for example, although they are archaeological specimens and often deposited as individuals (and thus could be expected to show evidence of systemic conditions) had a very low overall pathological prevalence (von den Driesch et al. 2005) compared

to the turkeys described in Chapter 4. They also exhibit a rather different pattern of fracture prevalence from the assemblages from the American Southwest (although the elements affected are limb elements), and contrast with the results from studies of museum skeletal collections. Although some argue that there are cases in which affected individuals are capable of full recovery from fractures without human intervention (Wood 1941, Marutani and Suzuki 2004), Gill (1988) states that such fractures (originating from museum collections) probably occurred when the animal was young and concludes that most injuries to adult birds in the wild would have been uncommon and fatal, and thus unrepresented in the samples.

The time required for an avian fracture to heal varies enormously and depends on factors including not only the type of fracture and its location, but also the temperament and behaviour of the bird (Tiemeier 1941). Fractures in birds are frequently open and comminuted, which can complicate the repair process (Bennett and Kuzma 1992). It is probable that providing isolation, provisions and shelter would have accelerated the recovery of a turkey suffering from a fracture, but little evidence for external coaptation (use of a sling, splint or bandage) exists. The sole mention of such a practice is by McKusick (1980) who states that a broken turkey leg, bound and splinted, was found at the site of Tseahatso in Arizona. Unfortunately, she does not describe the specimen further, and the affected element is not known. Lower-limb fractures are a common by-product of catching techniques still in use for retaining chickens and turkeys in the UK (Gregory et al. 1992; Prescott et al. 2000) and the prevalence of these is strongly linked to handling strategies; perhaps a change in practice increased their occurrence. Though turkeys are particularly adapted for running, there is a possibility that driving them over rough terrain or at high speeds could increase the risk of lower-limb fractures. The process of gathering feathers from the upper legs of turkeys (Cushing 1979:254) may also have caused trauma.

Though it is not possible to offer exhaustive interpretation of each individual assemblage discussed here, the metrical and palaeopathological data do indicate some trends which, in combination with some historical and ethnographic material, will be used to highlight possible explanations and suggested paths for future research.

### **5.5. Historical evidence: the Spanish Entrada**

As previously discussed in Chapter 2, a key aspect of the Spanish Entrada is the extent to which the Spanish, especially the Catholic church, affected Pueblo life. Sometimes termed "missionization," the process and product of Spanish colonial influence after the founding of the colony of New Mexico in 1598 affected the different pueblos to varying degrees. Four of the analysed assemblages originate from historic Pueblo areas: Ojo Bonito and Heshotauthla are both considered Zuñi sites while Gran Quivira and Quarai are both Salinas Pueblos. Of these, only the Salinas Pueblos were occupied at the time of European contact. Gran Quivira and Quarai are similar sites located in the same region, but the turkey assemblages are dramatically different in several ways (See Figures 4.2-4.16 and Tables 4.2 and 4.3). The most notable differences between the two assemblages are the sizes of the turkeys (with Quarai turkeys larger), the percentages of males and juveniles (with more males and fewer juveniles at Quarai); in addition, the Quarai turkeys have a higher pathological prevalence. These contrasts were unanticipated and may reflect the impact of intangible, possibly sociopolitical, forces. These sites are about 30 miles apart and are located in similar locations with access to comparable environmental resources. They were occupied during the same time period by people who spoke the same language. Although Gran Quivira is a bit larger, both sites were repeatedly raided by neighbouring Apache groups after the establishment of the missions and possibly prior to that time (Riley 1999, Kessell 2008). In addition, there was widespread famine in the late 1660s which is documented as affecting the Salinas missions. In a letter dated 11 April,

1669 which specifically mentions Gran Quivira (using the name Las Humanas) Fray Juan Bernal wrote:

"For three years no crop has been harvested. In the past year, 1668, a great many Indians perished of hunger, lying dead along the roads, in the ravines and in their huts. There were pueblos (as instance, Las Humanas) where more than four hundred and fifty died of hunger."

The major documented difference between these sites is that Quarai was the residence of three priests (serving the Spanish Inquisition) in New Mexico. Among these was Fray Estevan de Perea, sometimes called "The Father of the New Mexican Church" (Scholes 1932). This key difference may present one possible explanation for the observed data: perhaps the clergy had privileged access to resources. The Spanish did find the turkey a desirable food and those with clerical status may have demanded better quality foodstuffs; in addition, ownership or display of the birds may also have played a role in reinforcing personal status (particularly if the supply was dwindling). It is also possible that the portions of Quarai which might reflect this immense change were not excavated, or indeed that the famine affected the two pueblos in different ways. It seems possible that the Salinas pueblos could have been differently affected because there is mention that the Spanish moved their livestock to the third nearby Salinas pueblo, Abo (Kessell 2008). The records on the occupation of Quarai, especially from 1660 to the All-Pueblo Revolt of 1680 are patchy at best; however, the differences between these two sites have implications for the ways in which faunal assemblages are interpreted. At the heart of the colonial encounter is the fact that an outside, alien force has taken control of key resources: agricultural products and labour. As described by Michael Given (2004:4):

"There is little alienation in giving food as a contribution to your chief's feasting or in paying taxes to support the local services which you clearly need. It is very different when you are forced to

give food, money or your own labour to build a fortress which prevents you from rebelling or to glorify an imperial metropolis to which you will never go."

As the Spanish perceived the turkey primarily as a desirable meat product, it seems possible (if not likely) that the bird could have been taken as tribute prior to its replacement by European domestic species. Intensification of production for this purpose may have led to increased turkey size and perhaps also a rise in the proportion of pathologies.

## **5.6. Ethnographic and anthropological evidence**

Of all the Pueblos, Hopi and Zuñi were affected least and latest by the Spanish and the Anglo-Americans, probably because they were quite far west of the Rio Grande river. As a result, there is a bit more information on the people who lived at these pueblos after European contact. Possibly the best ethnographic source on a Pueblo group is the work of Frank Hamilton Cushing (Figure 5.6), an anthropologist and ethnologist who lived with the Zuñi from 1879 to 1884. He was employed by the Smithsonian Institution and the Bureau of Ethnology and although he was widely criticised as having "gone native," he was the first anthropologist to attempt the application of participant observation. The information recorded by Cushing is of vital historical importance. He eventually managed to gain access to sacred and intimate aspects of Zuñi life and was initiated to their warrior society. His letters and records, though not published until much later, are detailed and cover a broad spectrum of topical matter, including domestic animals and aspects of husbandry methods. Cushing waxes lyrical at points, and it is sometimes difficult to determine what proportion of his writings are the product of direct observation. The usual caveats when involving ethnographic comparison in archaeological study apply here and while this information is valuable, it is by no means a direct indication of what happened prior to and during European contact.





**Figure 5.6: Frank Hamilton Cushing (by Thomas Eakins)**

His description of late 19<sup>th</sup> century Zuñi provides potentially valuable insights into turkey keeping and its rationale. He states that the turkey was kept for its feathers, "the latter sacred but the bird no more so than is the soil on which is grown the sacred corn" (Cushing 1979:136), which highlights the multiple layers of meaning present in a single bird. In his discussion on the introduction of European domesticates to the Zuñi, he writes:

"The Zuñi was already a herder when sheep and goats were given to him. He had not only extensive preserves of rabbits and deer, but also herds—rather than flocks—of turkeys, which by day were driven out over the plains and mesas for feeding and at night housed near the towns or in distant shelters and corrals" (Cushing 1979:182).

He continues with a description of how sheep were husbanded after their introduction to the Zuñi:

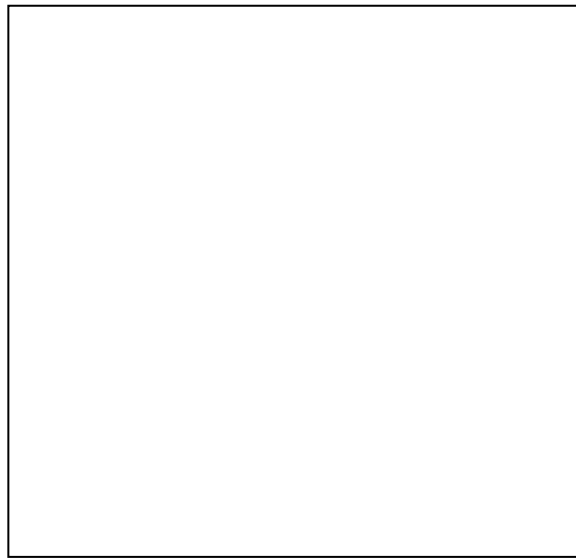
"When I first went to live with the Zuñis, their sheep were plucked, not sheared, with flat strips of band iron in place of the bone spatulae originally used in plucking the turkeys; and the herders always scrupulously picked up stray flecks of wool-calling it "down," not hair, not fur-and spinning it, knitting, too, at their long woolen leggings as they followed their sheep, all as their forefathers used ever to pick up and twirl the stray feathers and knit at their down kilts and tunics as they followed and herded their turkeys." (Cushing 1979:183)

Cushing is not alone in his descriptions of turkey herders. There is a Zuñi "Cinderella Story" tale about an orphaned girl who is called "The Turkey Girl"; the character is among the poorest in her village and although other, wealthier members of her people own turkeys, she looks after them. Her daily work involved supervising the turkeys almost constantly, and when she was not herding them, they were penned near her home (Pollack 1996).

In the Zuñi worldview, there are six directions with which certain symbolic animals are associated and there is a Zuñi clan, Tóna-kwe ("turkey people") for which the turkey is totemic. According to Cushing, "The turkey, which wakes with the dawn and helps awaken the dawn with his cries... ..is therefore grouped in the east." (Cushing 1979:187). As of yet, I have not encountered any documented evidence for turkey burials facing east or being placed in a consistent position. Turkey feathers from specific areas of the turkey were apparently of paramount importance in certain activities. When all earthworks created for the purpose of constructing a field are completed, an invocation is used to consecrate that field. The keeper of the sacred "medicine" of the appropriate clan or order "cuts and decorates a little stick of red willow with plumes from the legs and hips of the eagle, turkey and duck and with the tail-feathers from the Maximilian's jay, night-

hawk, yellow finch and ground sparrow, fastening them on one over the other, with cords of fine cotton." (*ibid.*:254) In the next passage, the down of the turkey is described as "cloud-inspiring," perhaps an important factor in determining its inclusion in the field creation invocation.

Zuñi fetishes are hand-carved stone representations of animals and icons (sometimes still of religious importance to their creators) which have been collected historically and are now sold as a form of contemporary art. The turkey, somewhat unsurprisingly, is a common but not popular fetish subject (Figure 5.7).



**Figure 5.7: Zuñi turkey fetish**

Neil Judd directed one of the major excavations at Pueblo Bonito; many of his workmen were from Zuñi. In 1939 during the week before Thanksgiving, they asked him to acquire and send them the turkey feathers from the butchers preparing birds for holiday dinners (Ferg 2007). A member of the Zuñi Nation, Edmund J. Ladd described the ethno-ornithology of the Zuñi (1998) and discussed the construction of prayer sticks during his own lifetime. Some feathers, which can be used in masks and other paraphernalia, are said to be inappropriate for use in prayer sticks because the birds they come from are not native species or are eaters of carrion. Planting of the prayer sticks takes place several times a year, and can involve hundreds of feathers from a single family over the course of the year; according to Ladd, the first feather must always be a turkey feather

and from two to four turkey feathers are used to represent individual family members (*ibid.*). Feathers (including turkey feathers) for religious purposes are currently provided to 29 of the 31 Pueblo villages by the Feather Distribution Project (Reyman 2007).

Hopi was another ethnographic research subject. Alexander Stephen was a Scottish graduate of the University of Edinburgh who painstakingly recorded life among the people at Hopi from 1890-1894. According to his *Hopi Journal* (1936), they also appear to have had a complex relationship with the turkey. Turkey feathers were of critical importance and were used to create a dizzying variety of garments, implements, masks and other regalia. During Stephen's stay, he also recorded several instances of turkey feather scarcity; sometimes travel and favours were required to obtain them (*ibid.*: 41, 605, 676, 696). Though it is implied that turkeys had been kept by the Hopi historically, no reason is supplied for the apparently regular lack of appropriate turkey feathers. Like at Zuñi, specific feathers were necessary for certain items:

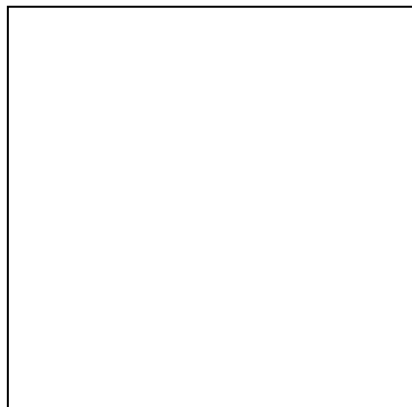
"Ka'kaptĩ took the northwest prayer-sticks, that is all the prayer-sticks made by those in kiva today, to be deposited for them, but not at a spring. (I must see as to this again.) If there had been more turkey feathers there would have been more prayer-sticks made. I gave them a note yesterday to get some turkey feathers from T.V.K. Is it possible they depend on this supply? This can not be, for they have turkeys here on the mesa, but this is what they say, they have no turkey. Further talk elicits the fact that the turkeys have already been plucked here, plucked bare of all the kinds of feathers appropriate for prayer-stick trimming."  
(Stephen 1936:605)

Among the Hopi, there is a turkey *katsina*. A *katsina* is, in western Pueblo tradition, a spirit; there are many *katsinim* and they are represented differently at different pueblos, each of which has a distinct group of them.

There are hundreds of *katsinim* which vary regionally, but not all of them are frequently created. They represent specific objects, places, people and concepts, among other ideas. Apart from being conceptualised as a spirit, *katsinim* are also represented when they are danced (and a masked person is dressed as that particular *katsina*), and as figures made of wood and other materials which were traditionally given to children in order to familiarise them with these spirits. The turkey *katsina* is one of the more commonly represented *katsinim* and like the Zuñi fetishes, these figures are now sold as objects of art in their own right (Figures 5.8 and 5.9).



**Figure 5.8: Carving of Hopi turkey katsina being danced**



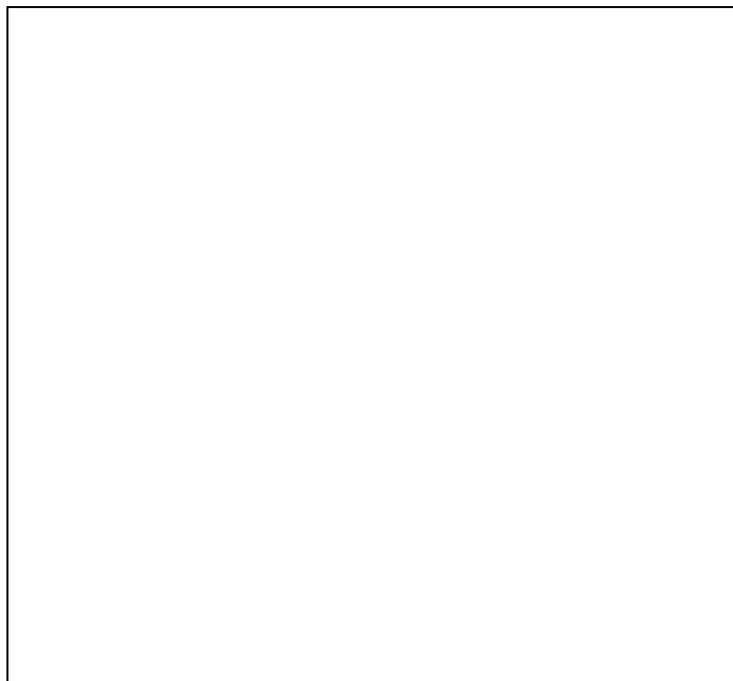
**Figure 5.9: Turkey katsina cradle doll**

Though the turkey was certainly still present in some Pueblos after the arrival of the Spanish, few excavations and fewer faunal reports on historical-period material have been undertaken. Future research in this

area would do much to clarify the changing role of the turkey in the New World after European contact.

## 5.7. Discussion and conclusions

The documented use of the turkey (especially with regard to feathers, Figure 5.10) at pueblos occupied in historic times shows their importance and the variety of ways in which they were utilised. In particular, Cushing's description of sheep husbandry methods at Zuñi and their direct derivation from those employed on turkey herds lends support to the possibility that feathers were more of a primary product than a by-product of an intensively-practiced meat industry. Yet, beyond this is also evidence for the use of the turkey as a symbol: a clan group, a fetish and a *katsina*. Whatever weight these ethnographic records may or may not possess, it is clear that the turkey was not perceived as a simple protein product but may have been conceptualised as an entity occupying strata of meaning apart from meat alone.



**Figure 5.10: Mid-19<sup>th</sup> century turkey feather fan**

The non-palaeopathological skeletal data show that the domestic turkey varied in size and shape throughout the assemblages sampled. Two major commonalities include the total percentage of turkey in the assemblage and

the low proportion of males to females (with the exception of the Eleventh Hour, discussed above), which contrasts with the natural sex ratio (1:1) and may have been used to increase herd size or was necessitated by turkey behaviour. Another clear trend is the significant downward shift over time in the proportion of turkey in these faunal assemblages. Although a direct explanation for this change is not evident, it is probable that environmental transitions, shifts in trade and social networks as well as the transformation of human perceptions could have contributed. Perhaps the spread of cotton cultivation across the American Southwest from AD 1100-1300 (Teague 1998) provided an alternative material for clothing which became more accessible over time.

Despite the wide variety of site locales, there appear to be more similarities between sites from common time periods than those located near each other, though further analysis of later northern and earlier southern assemblages would clarify this possible relationship. It seems to follow that some aspects of turkey husbandry may have been widely shared and that the dynamic changed over time rather than discrete areas making use of completely independent methods. The exact purposes for which these birds were husbanded may have been somewhat site-specific as there is considerable variation in the shape and size of turkeys when all assemblages are taken into account.

The palaeopathological data gathered indicate trends distinct from those present in the metrical data. While there are some broad commonalities between assemblages in some respects, the pathologies do not fall neatly into distinct groups by region or time period and instead represent a diverse array of lesions. Many of these lesions have complicated, multi-factorial aetiologies and differential diagnosis has not been possible. However, some patterns stand out, such as the prevalence of traumatic injury present in ulnae, tibiotarsi and scapulae and the repeated occurrence of hypervascularity as well as warping or bowing. The high proportion of trauma in ulnae, in combination with the recovery of turkey feather

garments, fans and masks from a number of sites in the American Southwest (Schorger 1966) and the association of specific turkey feathers with certain sacred objects (Cushing 1979, Stephen 1936), makes it seem appropriate to describe turkeys as a domesticate which was husbanded for a number of products (like sheep) rather than a meat source which also happened to produce feathers.

Bowing present in the tibiotarsi could be interpreted as indicative of specific husbandry conditions. Perhaps an afflicted individual had osteomalacia or rickets and the condition was due to insufficient sunlight; in this case, a lack of exposure to the outdoors would be a driving factor in the development of this pathology and one could conclude that at least some turkeys were kept almost entirely indoors. This method of keeping could have been due to a need to protect the turkey population from theft or other dangers, and is entirely unlike what Cushing observed at Zuñi (though surely some regional variation occurred). There does not appear to be standard housing type for the birds as there are descriptions of indoor turkey pens, corrals (akin to sheepfolds) and of turkeys being herded across the local landscape at various sites. It is most probable that a combination of these methods were used when convenient, and changed when circumstances required. Evidence for corrals would be somewhat ephemeral and most sites have been only partially excavated; of the sites discussed in this study, definitive turkey pens were excavated at Salmon Ruin, Arroyo Hondo and Paquimé.

Although the percentage of turkey in the Quarai and Gran Quivira assemblages is similar and the overall pathological prevalence is comparable, the size and shape of the turkeys themselves and the sex ratios present are very different. This difference could represent a thread in the complex fabric of materially imperceptible influences which may have shaped the two assemblages as a whole. As far as can be ascertained by analysis, it appears possible that tangible, measurable factors such as environmental, regional and temporal differences have impacted these assemblages to a lesser degree than human-driven dynamics, some of which



may be socio-cultural in nature. It is fundamental that all sites be considered in their local historically specific context as well as in their regional and temporal context. In essence, the animals (and hence, their skeletal remains) cannot be divorced from the varying whims of humanity. Certainly the Spanish colonial impact upon the Pueblo peoples in New Mexico is only one example. However, this event was unmistakably immense and almost every aspect of life would have been affected. The role of animals and animal products in the historical Pueblos represents a useful and underexplored theme (though see Tarcan and Driver 2010) which can and should be used for analysing changes in colonised societies.

Whatever the initial effects of colonisation were on the Salinas region specifically, the lives of the peoples who kept the turkey were forever altered and First Nations husbandry of turkeys appears to slowly cease after European contact. The turkey was successfully translocated to Europe relatively rapidly after the arrival of the Spanish and it is to the subject of *Meleagris gallopavo* in the Old World that the next chapter turns.

## **Chapter Six. The Isles and the Turkey**

### **6.1. Introduction and diaspora of the turkey throughout Europe**

The turkey spread rapidly across Europe (see Chapter 2 for an overview). In exploring the material remnants of the species' journey, many patterns emerge. Some of these are almost certainly not a reflection of past realities but are instead indicative of recent perceptions. Figures 6.1-6.4 illustrate the presence of turkey bones in continental Europe as well as the UK and Ireland, with an inset of turkey finds in London. These archaeological data stand in stark contrast to the documentary evidence, which collectively indicates that the turkey was first introduced to what is now Spain and Italy. The cookery literature alone suggests that the bird flourished in these parts of Europe and yet both of these countries (in fact, all Mediterranean countries apart from France) are absent from the maps of skeletal finds, in the company of many others. In viewing the arrangement of sites in Figures 6.1-6.4, it could be tempting to consider the possibility that relationships between communities near the North Sea fostered trade and movement of turkeys. However, the distribution more likely reflects the countries with widespread, somewhat standardised record-keeping practices and a greater tradition of post-medieval archaeology. The sites shown in these maps are listed in Tables 6.1-6.3 which follow them.



**Figure 6.1: Archaeological sites in Europe with turkey present prior to AD 1600, partially from BoneInfo and MOLA databases**



**Figure 6.2: Archaeological sites in Europe with turkey present AD 1601-1700, partially from BoneInfo and MOLA databases**





**Figure 6.3: Archaeological sites in Europe with turkey present AD 1701-1800, partially from BoneInfo and MOLA databases**



**Figure 6.4: Archaeological sites in Europe with turkey present AD 1801-1900, partially from BoneInfo and MOLA databases**

From Figures 6.1-6.4 above, it looks as though the turkey arrived in or near port cities before spreading inland, especially in the UK and Éire. However, part of this impression may be the result of an excavation bias toward the larger, more heavily developed areas in which ports are generally situated.

As detailed in Chapter 3, post-medieval material has often been neglected in favour of other periods; this is sometimes rationalised by the existence of documentary sources. However, given the clear disparities between textual and artefactual evidence (and considering the biases innate to both informational sources) this position hardly seems justified. Other limitations (cultural, structural and linguistic) also affect the accessibility of literature; however, these hurdles have been overcome in other cases and perceptions of material from this period are probably responsible in part for the lack of documentation.

### 6.1.1. Archaeological presence of *Meleagris gallopavo* in continental Europe

Although this chapter will focus primarily on turkey elements from archaeological sites in Éire and the United Kingdom, their presence has been recorded on post-medieval sites in other countries. As an illustration of the rapid spread of the species across space, the European sites which this research has encountered are provided in Table 6.1.

Site Name	Country	Date	Reference
Ivančice	The Czech Republic	1600-1623	Kratochvil 1985a, 1985b
Olomouc, Křižkovska Str.	The Czech Republic	16 <sup>th</sup>	Kratochvil 1985a
Obchodní dům Prior (Olomouc)	The Czech Republic	16 <sup>th</sup> -Early 17 <sup>th</sup>	Kratochvil 1985a
Brno, Dominikánská	The Czech Republic	1600-Early 18 <sup>th</sup>	Kratochvil 1990
La Charité-sur-Loire	France	16 <sup>th</sup> -17 <sup>th</sup>	Audoin-Rouzeau 1986
Jardins du Carrousel, Paris	France	Late 16 <sup>th</sup>	Pichon, unpublished 1989
Louvre-Cour Napoléon, Paris	France	Late 16 <sup>th</sup> -	Pichon, unpublished

		Early 17 <sup>th</sup>	1990
Lübeck, Königstraße	Germany	Late 15 <sup>th</sup> - Mid 16 <sup>th</sup>	Paul 1980
Lübeck, Heiliger Geist-Hospital	Germany	16 <sup>th</sup> - 18 <sup>th</sup>	Pudek 1980
Lübeck, Hundestraße	Germany	17 <sup>th</sup> - 18 <sup>th</sup>	Benecke 1994
Lübeck, Alfstraße	Germany	19 <sup>th</sup> - 20 <sup>th</sup>	Rheingans and Reichstein 1991
Eckhorst	Germany	14 <sup>th</sup> - 17 <sup>th</sup>	Putzar and Reichstein 1977
Osnabrück	Germany	12 <sup>th</sup> - 17 <sup>th</sup>	Huczko 1986
Schleswig	Germany	12 <sup>th</sup> - 17 <sup>th</sup>	Salman 1977
Wismar	Germany	17 <sup>th</sup> - 19 <sup>th</sup>	Benecke 1994
Havezate, Harreveld	The Netherlands	1400 - 1799	Laarman 1994
Burseplein, Deventer	The Netherlands	1600- 1700, 1700- 1800	Ijzreef and Laarman 1986
Hof Van Batenburg, Nijmegen	The Netherlands	1375- 1849	Laarman 1991
Catharinastraat, Breda	The Netherlands	1700- 1800	van der Lee 1992
Kasteel Van Eindhoven-Ravensdonck, Eindhoven	The Netherlands	1420- 1649	de Jong 1992
Koninklijke Militaire Academie, Breda	The Netherlands	1530- 1540	de Jong et al. 1997
De Gerner, Dalfsen	The Netherlands	1700- 1800	Jager 1982
Zuilingstraat/St. Agneteklooster, Den Haag	The Netherlands	1590- 1610	Zeiler 1996b
De Schans, Texel	The Netherlands	1500- 1949	Zeiler 1996a
Borenmouw, 's-Hertogenbosch	The Netherlands	1450- 1649	Esser 1997
Hof Van Heeckeren/SSR, Zutphen	The Netherlands	1600- 1700	Spitzers 1998
Postelstraat, 's-Hertogenbosch	The Netherlands	1575- 1649	Verhagen 1984
Sint-Hieronymusdal, Delft	The Netherlands	Modern	Esser and Beerenhout 2002
Kerklaan, Rijswijk	The Netherlands	17 <sup>th</sup>	Paalman et al. 2003
Het Oude Koningshuys, Sassenheim	The Netherlands	18 <sup>th</sup>	van Dijk 2005
Huis te Vleuten, Utrecht	The Netherlands	1650- 1750	van Dijk et al. 2005
Dominicanerplein, Maastricht	The Netherlands	1600-	Esser and

		1625	Rijkelijkhuizen 2006
<b>Havezate Werkeren, Zwolle</b>	The Netherlands	1600-1750	Grimm 2006
<b>Perlsteinterrein, Doetinchem</b>	The Netherlands	1550-1650	Zeiler and Brinkhuizen 2007
<b>Venlo</b>	The Netherlands	16 <sup>th</sup> -17 <sup>th</sup>	Esser et al. 2007
<b>Kerkbrink, Hilversum</b>	The Netherlands	1750-1820	Halici 2003
<b>Brussels</b>	Belgium	No date	Spitzers 1998
<b>Czluchów Castle</b>	Poland	16 <sup>th</sup> -17 <sup>th</sup>	Makowiecki and Gotfredsen 2002
<b>Stare Drawsko Castle</b>	Poland	16 <sup>th</sup> -18 <sup>th</sup>	Makowiecki and Gotfredsen 2002
<b>Komorowo Tavern, Poznań</b>	Poland	17 <sup>th</sup> -18 <sup>th</sup>	Makowiecki and Gotfredsen 2002
<b>Poznań, Szyperska St., Old Town Slaughter-house</b>	Poland	17 <sup>th</sup> -18 <sup>th</sup>	Makowiecki and Gotfredsen 2002
<b>Tykocin Town</b>	Poland	17 <sup>th</sup> -18 <sup>th</sup>	Nogalski and Kosińska 1991
<b>Bialogard Town</b>	Poland	18 <sup>th</sup> -19 <sup>th</sup>	Makowiecki and Gotfredsen 2002
<b>Poznań, Old Market 48</b>	Poland	18 <sup>th</sup> -19 <sup>th</sup>	Nogalski 1991a
<b>Szamotuly Castle (Górka family)</b>	Poland	19 <sup>th</sup> -20 <sup>th</sup>	Makowiecki and Gotfredsen 2002
<b>Gdańsk, Olejarna St. Old Town</b>	Poland	17 <sup>th</sup>	Makowiecki and Gotfredsen 2002
<b>Gdańsk, Hevelius Square, Young Town</b>	Poland	17 <sup>th</sup> -18 <sup>th</sup>	Makowiecki and Gotfredsen 2002
<b>Santa Clara, Coimbra</b>	Portugal	15 <sup>th</sup> /16 <sup>th</sup>	Davis, pers. comm.
<b>Wapnő herrgård</b>	Sweden	1500-1600	Benecke 1994
<b>Lödöse, Västergötland</b>	Sweden	12 <sup>th</sup> -15 <sup>th</sup>	Lepiksaar 1965a
<b>Vapnő manor, Halland</b>	Sweden	1500-1700	Ericson and Tyrberg 2004
<b>Ny Varberg Town, Halland,</b>	Sweden	1430-	Ericson and

Varberg Castle, Halland	Sweden	1612 No date	Tyrberg 2004 Ericson and Tyrberg 2004
Gothenburg Town, Kronobageriet	Sweden	1500- 1700	Ericson and Tyrberg 2004
Gothenburg Town, Marklandsplatsen	Sweden	1600- 1700	Ericson and Tyrberg 2004
Norrköping Town, Kvarteret Dalkarlen	Sweden	1620- 1655	Vretemark 2003
Norrköping (Fst. Kronan 8)	Sweden	16 <sup>th</sup> - 17 <sup>th</sup>	Sten 1987b

**Table 6.1: European sites with turkey present**

### **Archaeological presence of *Meleagris gallopavo* in the UK and Éire**

Table 6.2 below is adapted from Kristopher Poole's chapter on bird introductions in *Extinctions and Invasions: A Social History of British Fauna*. The focus of the book was British fauna, but only turkeys from English sites were listed. I retain his terminology for these sites in Figures 6.5 and 6.6, but do not apply it to sites derived from other sources as I feel that it is not sufficiently nuanced (Table 6.3). The use of the label "Wealthy" could be awkward in some cases as certain sites might have been considered centres of wealth and some high-status sites may not have been particularly affluent. In addition, the classification of "Wealthy" sites in "Urban" areas requires simultaneous use of two categories. In Table 6.3, the site category was chosen based upon description in the relevant reports or summaries; only St Alban's was in use as an ecclesiastic site. The presence of only a single rural site in Table 6.2 probably reflects excavation bias rather than a lack of turkeys or evidence thereof (see Chapter 3).

Site Name	Site Type	Date	Reference
Hull Magistrate's Court	Urban/Ecclesiastical	c. AD 1310- 1600	Dobney n.d.
Castle Mall, Norwich	Urban	Mid-late 14 <sup>th</sup> - Mid 16 <sup>th</sup>	Albarella et al. 1997
Whitefriar's, Coventry	Urban	AD 1545-1558	Rackham 2005
Barnstaple, Devon	Urban	16 <sup>th</sup> century	Bourdillon n.d.
Beeston Castle, Cheshire	Urban	c. AD 1500- 1600	Dobney n.d.
Manor of Beaurepaire, County Durham	Wealthy	c. AD 1500- 1600	Gidney 1995
Durham Cathedral	Urban/Ecclesiastical	c. AD 1500- 1600	Dobney n.d.
Royal Navy Victualling Yard, London	Urban	AD 1560-1635	West 1995



<b>Heigham Street, Norwich</b>	Urban	<i>c.</i> AD 1575-1625	Weinstock 2002
<b>Hull Magistrate's Court</b>	Urban	<i>c.</i> AD 1500-1750	Dobney n.d.
<b>Preceptory of the Knights Hospitallers, Beverley</b>	Urban	<i>c.</i> AD 1500-1750	Dobney n.d.
<b>South Castle Street, Liverpool</b>	Urban	<i>c.</i> AD 1500-1750	Dobney n.d.
<b>Exeter, Devon</b>	Urban	Mid 16 <sup>th</sup> century	Maltby 1979
<b>Camber Castle</b>	Castle	Mid 16 <sup>th</sup> century-AD 1637	Connell et al. 1997
<b>Hereford, Herefordshire</b>	Urban	16 <sup>th</sup> century and later	Noddle and Hamilton-Dyer 2002
<b>Reading Abbey</b>	Wealthy, Urban	16 <sup>th</sup> -17 <sup>th</sup> century	Coy 1986-90
<b>Castle Ditch, Newcastle</b>	Urban	Late 16 <sup>th</sup> -17 <sup>th</sup> century	Allison 1981
<b>Norton Priory</b>	Wealthy	Late 16 <sup>th</sup> -17 <sup>th</sup> century	Greene 1989
<b>Alms Lane, Norwich</b>	Urban	AD 1600-1675	Harman 1985
<b>Royal Navy Victualling Yard, London</b>	Urban	AD 1635-1726	West 1995
<b>Camber Castle</b>	Urban	AD 1637 and later	Connell et al. 1997
<b>Exeter, Devon</b>	Urban	AD 1660-1700	Maltby 1979
<b>Worcester Cathedral, Worcester</b>	Urban/Ecclesiastical	17 <sup>th</sup> century, 19 <sup>th</sup> century	Thomas 1999
<b>Castle Bastion, Newcastle-Upon-Tyne</b>	Urban	Mid 17 <sup>th</sup> century	Rackham 1983
<b>Aldgate, London</b>	Urban	Late 17 <sup>th</sup> century	Armitage 1984
<b>Cook's Green, Winchelsea, Sussex</b>	Rural	17 <sup>th</sup> century	Clements 1990
<b>St Ebbe's, Oxford</b>	Urban	17 <sup>th</sup> century	Wilson 1984
<b>Castle Mall, Norwich</b>	Urban	Late 16 <sup>th</sup> -18 <sup>th</sup> century	Albarella et al. 1997
<b>Skeldergate and Walmgate, York</b>	Urban	Late 17 <sup>th</sup> century	O'Connor 1984b
<b>Christchurch, Dorset</b>	Urban	17 <sup>th</sup> -18 <sup>th</sup> century	Coy 1983
<b>Alms Lane, Norwich</b>	Urban	AD 1720-1750	Harman 1985
<b>Exeter, Devon</b>	Urban	AD 1660-1800	Maltby 1979
<b>Castle Mall, Norwich</b>	Urban	Late 16 <sup>th</sup> -18 <sup>th</sup> century	Albarella et al. 1997
<b>St Mary's Guildhall, Lincoln</b>	Urban	Late 17 <sup>th</sup> -late 19 <sup>th</sup> century	O'Connor 1991c
<b>St Peter's Lane, Leicester</b>	Urban	18 <sup>th</sup> century	Gidney 1992
<b>Bewsey Old Hall, Warrington</b>	Wealthy	18 <sup>th</sup> century	Roberts 1986
<b>Westgate Road, Newcastle</b>	Urban	Mid-late 18 <sup>th</sup> century	Gidney 1994
<b>Launceston Castle, Cornwall</b>	Urban	18 <sup>th</sup> -19 <sup>th</sup> century	Abarella and Davis 1996
<b>The Bull Ring, Birmingham</b>	Urban	18 <sup>th</sup> -19 <sup>th</sup>	Baxter 2009

**Table 6.2: Sites with turkey present (from Poole 2010:164-165)**

Table 6.3 below lists additional archaeological sites (in Éire as well as the UK) at which turkey has been identified. The site names in bold are those from which I have examined turkey elements or fragments thereof.

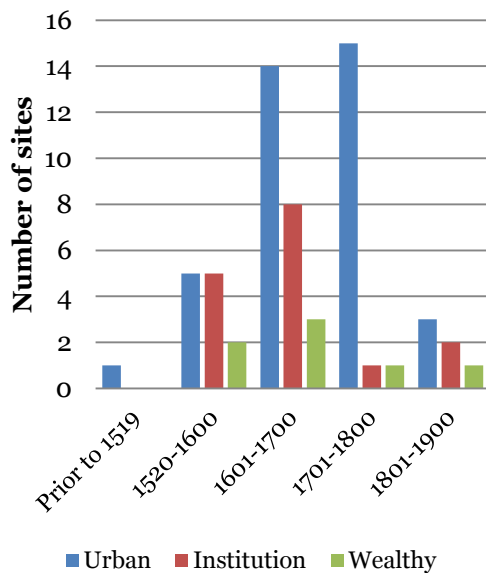
Site Name	Country	Site Type	Date	Reference
IR SMI103, Smithfield, Dublin	Éire	Urban	17 <sup>th</sup> -18 <sup>th</sup>	Reeners 2006
<b>Wood Quay, Dublin</b>	Éire	Urban (Docks)	13 <sup>th</sup>	MacDonald et al. 1993
Castle Rushen, Isle of Man	UK	Castle	c. 16 <sup>th</sup> -18 <sup>th</sup>	Davey et al. 1996
<b>BOS87 Bishopsgate, London</b>	UK	Urban	c.1700	MOLA database
<b>CH75 Chaucer House, London</b>	UK	Urban	No date	MOLA database
<b>FNB02 Finsbury Avenue, London</b>	UK	Urban	c.1800	MOLA database
FSU99 Finsbury Square, London	UK	Urban	No date	MOLA database
<b>GHT00 Blossoms Inn, London</b>	UK	Urban	c.1710-1800	MOLA database
<b>GWO05 St. Bartholomew's Medical College, London</b>	UK	Institution	c.1660	MOLA database
<b>KEW98 Newgate St., London</b>	UK	Urban	No date	MOLA database
KIG95 King St., London	UK	Urban	c.1760	MOLA database
<b>MCF06 Mariner's House</b>	UK	Urban	1650-1660	MOLA database
<b>NGT00 Laud House Forecourt (Newgate St.), London</b>	UK	Urban	c.1900	MOLA database
NHG98 Northern House, London	UK	Urban	No date	MOLA database
<b>RLP05 Royal London Hospital</b>	UK	Institution	c.1840	MOLA database, Morris 2010
<b>SQU94 Spital Square, London</b>	UK	Urban	c.1730-1800	MOLA database
<b>SRP98 Spitalfields, London</b>	UK	Urban	c. 1770-1820	MOLA database
Pontefract Castle	UK	Castle	1644-1648	Roberts 2002
Grand Arcade, Cambridge	UK	Urban	18 <sup>th</sup> -early 19 <sup>th</sup>	Higbee, pers. comm.
St Alban's Abbey, Herts	UK	Ecclesiastic	1534-1550	Serjeantson, pers. comm.
Stafford Castle	UK	Castle	c.19 <sup>th</sup>	Thomas 2011
Hill Hall, Essex	UK	Manor	c.16 <sup>th</sup> -	Hamilton-

Hungate, York	UK	Urban	17 <sup>th</sup> Late 19 <sup>th</sup> - 20 <sup>th</sup> century	Dyer 2001 Hunter- Mann 2008
Devon St, Glasgow, Scotland	UK	Urban	Late 19 <sup>th</sup> - 20 <sup>th</sup> century	Reilly 2009

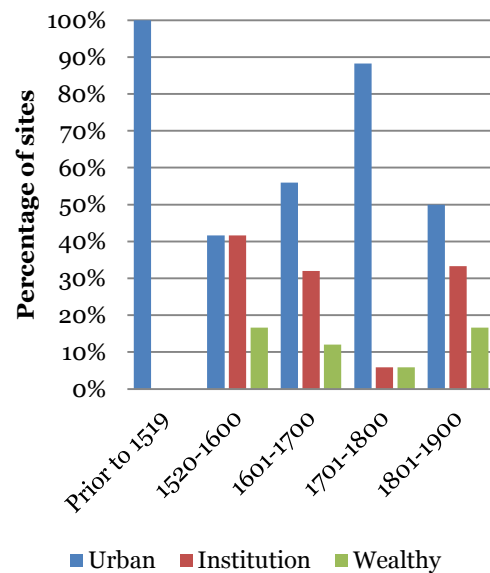
**Table 6.3: Additional sites with turkey present in the UK and Éire**

### **6.1.2. Change in turkey presence over time: democratisation?**

There is some diachronic change in the types of sites at which turkey is present in Éire, England, the Isle of Man and Scotland collectively, which may be interpreted as an indication of the possible "democratisation" of the turkey. As mentioned above, I retained the category "Wealthy" as applied by Poole (2010; Table 6.2) and "Urban" as used in excavation reports. I use "Institution" to represent town halls, schools, hospitals and similar organisations which may have been housed in former ecclesiastic structures. Sites with an unknown temporal association are not included, nor is the single rural site. Wood Quay is represented as the only site in the first column of both charts. Midpoints for all data ranges are used (Figures 6.5 and 6.6) to demonstrate the change in numbers of site types and percentage of site types by century.



**Figure 6.5: Number of sites with turkey by century**



**Figure 6.6: Percentage of site types with turkey by century**

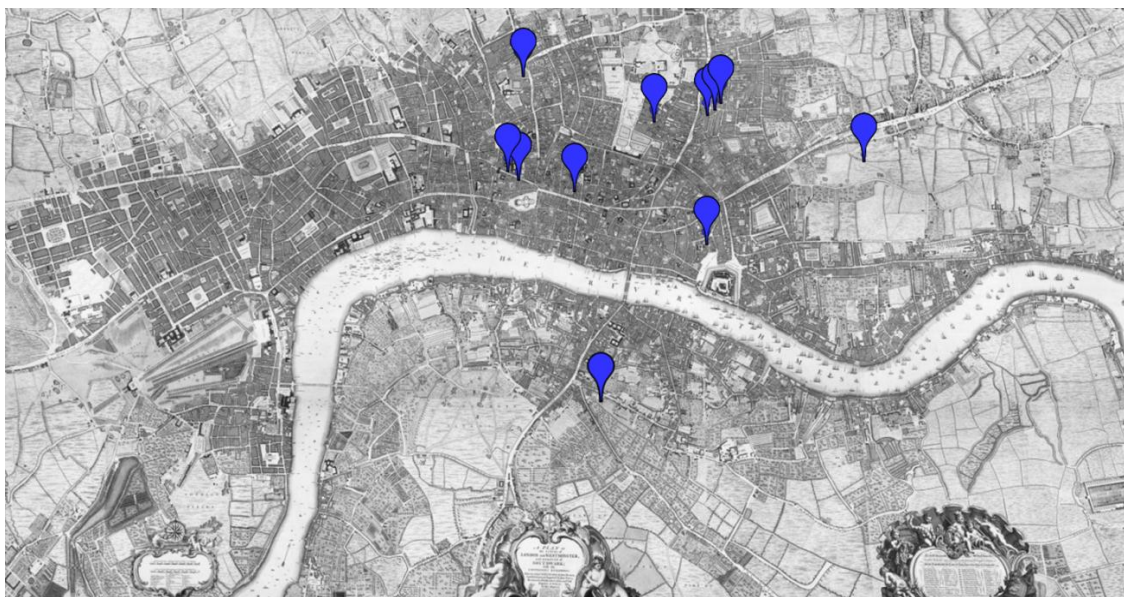
From these graphs, it appears that an increase in the accessibility of turkey took place; turkeys are absolutely and relatively more commonly excavated by the 17<sup>th</sup> century. Prior to this, they were more common on "Wealthy" sites. The Reformation also affected the interpretation of the sites themselves; in many other countries of this time period, ecclesiastic sites would have been labelled "Ecclesiastic" rather than being split by the function of their re-use. The highest number of sites with turkey occurs in the 18<sup>th</sup> century; by the following century, there were very few records indeed and a note of caution is warranted. Excavation requirements and biases have likely affected this outcome; certainly all other sources suggest that there ought to be far more turkeys turning up after 1800. The systematic neglect of the zooarchaeological record after 1750 is much more likely responsible for that change as represented above. Institutional and wealthy sites might also have been a higher priority for excavation, thus skewing the percentage data for post-1800 sites.

I did not find any reference to elements identified as turkey (or possibly turkey) in Northern Ireland or Wales (nor in Scotland until the 19<sup>th</sup> century). The absence of skeletal remains does not indicate an absence of the bird from these regions, but instead demonstrates the intersection of several factors including the bias against post-medieval material and the inaccessibility of faunal reports on post-medieval sites.

### **6.1.3. Site histories**

All turkey elements that were available for examination originated from sites in London apart from the coracoids from Wood Quay in Dublin. The purpose of these site histories, however brief they may be in some cases, is to illustrate the variety of contexts from which turkey elements originated. Details regarding the exact context of the turkey bones has been provided depending upon the information available for each site. The London turkeys are mapped onto Rocque's 1746 map of London in Figure 6.7. The maps below (Figures 6.7-6.9) were derived from (<http://locatinglondonspast.wordpress.com/>) and as the site was not yet

completely capable of full file exportation at the time of submission, the reader is encouraged to visit the Locating London's Past website.



**Figure 6.7: Locations of all turkey elements from LAARC on Rocque's 1746 map of London. (Locating London's Past)**

#### **6.1.3.1. Wood Quay, Dublin**

Information on the Wood Quay excavation has been gleaned in part from the ceramic report by Clare McCutcheon (2006) and also from the report on geese (MacDonald et al. 1993) as the turkey elements originated from the same contexts as the geese (Kevin MacDonald, pers. comm. 2011). Brief, essential descriptions are available for each of the London sites on the Museum of London website and I summarise the post-medieval portions of them here.

The 13<sup>th</sup>-century bird bones from Wood Quay in Dublin were mainly geese (35%) and chickens (35%). However, two coracoids encountered during analysis were not attributable to these or the usual wild species. Galliformes can be difficult to differentiate (MacDonald 1992), and both of these elements are incomplete at the distal articulation (one is missing the distal articular surface entirely) with some abrasion and rodent gnawing at the proximal end (Figures 6.8 and 6.9). In addition, one of the elements is juvenile and larger than the other; however, the turkey is sexually dimorphic and both specimens fit into the spectrum of coracoid measurements obtained at other sites (see Figure 6.11 below). Having

examined these elements, I generally agree with Kevin MacDonald's assessment and believe that the morphology evident does indeed largely justify their classification as *Meleagris gallopavo*. The numbers written on these coracoids correlate with squares from the Wood Quay excavation (McCutcheon 2006:16), but do not indicate their exact stratigraphic context. The Wood Quay materials date primarily from the 11<sup>th</sup>-13<sup>th</sup> centuries based upon the ceramics and coins recovered; dendrochronological analysis of timber revetments confirms this (McCutcheon 2006). There is post-medieval material in the pottery report and although it is described as originating from surface finds and stone drains in most cases, it seems feasible that the turkey elements could be intrusive. Alternatively, it is not entirely beyond the realms of possibility that turkeys arrived in Dublin in or before the 13<sup>th</sup> century. The ancient territories of the turkey sub-species are not well known but the Eastern subspecies (*Meleagris gallopavo silvestris*) did historically range north into Canada (White 1915a) where the Norse had established a settlement (L'Anse aux Meadows) in the 10<sup>th</sup> century (Nydal 1989). The presence of plant species (*Juglans cinerea*, or butternut) which are known to grow only further south of L'Anse aux Meadows indicates that Norse explorations of North America did not end at Newfoundland. Additionally, recent mtDNA research has revealed the presence of a haplogroup subclade in Icelandic people which most resembles those present in North American First Nations groups (Ebenesersdóttir et al. 2011).



**Figure 6.8: Coracoids from Wood Quay, ventral view**



**Figure 6.9: Coracoids from Wood Quay, dorsal view**

Whether intrusive or unexpectedly early, the coracoids from Wood Quay do not vary in size from their North American counterparts and potentially provide physical evidence for the extent of the turkey's presence in the UK and Éire prior to the modern period. Radiocarbon dating and stable isotope analysis are necessary to confirm this.

**6.1.3.2.      *Bishopsgate, London (BOS87)***

Developer-funded excavations from November of 1987 to February of 1988 found that post-medieval building activity had truncated earlier, Roman deposits at this site (282-294 Bishopsgate, EC2). Post-medieval building foundations, some with discernible rooms and floors, were located and excavated. The exact context from which a turkey tibiotarsus derived is not known.

**6.1.3.3.      *Chaucer House, London (CH75)***

Part of the excavations of Roman Southwark, work from 1975-1976 at Tabard Street, SE1 unearthed evidence of land reclamation in the 16<sup>th</sup> or 17<sup>th</sup> centuries as well as 17<sup>th</sup>-century pits which may have been associated with buildings on Tabard Street. The context of the turkey carpometacarpus from this site is not known.

**6.1.3.4.      *Finsbury Avenue, London (FNBo2)***

The entirety of the site at Finsbury Avenue Square was covered with debris from the Great Fire prior to rebuilding in the late 17<sup>th</sup> century. Brick building footings and a floor tiled with ceramic along with associated drainage systems survived, but the construction remains of either the Broad Street Railway Station or the Broadgate Centre (in the 19<sup>th</sup> and 20<sup>th</sup> centuries respectively) truncate these deposits; it is not known from which context the turkey carpometacarpus originated.

**6.1.3.5.      *Blossoms Inn, London (GHToo)***

Excavations at Blossoms Inn along Lawrence Street revealed a 17<sup>th</sup>-century brick culvert and brick barrel-vaulted icehouse along with a number of medieval wells filled with debris from the Great Fire and one well backfilled in the 18<sup>th</sup> century. The turkey elements (a humerus, radius, 3 ulnae, a carpometacarpus, a femur and two tarsometatarsi) were excavated from an 18<sup>th</sup>-century context.



**6.1.3.6.      *St Bartholomew's Medical College, London (GWO05)***

Post-medieval pit digging was identified in the central and south-eastern areas of this site, truncated in many areas by 19<sup>th</sup>-century basements. Substantial remnants of the walls of Charterhouse, the medieval Carthusian monastery, may have stood long after the Dissolution in this location and may have been robbed as late as the 17<sup>th</sup> century. Refuse from household or light industrial activity comprise the bulk of deposits, which date from the 16<sup>th</sup>-17<sup>th</sup> centuries; it is not known which context a turkey femur derived from.

**6.1.3.7.      *Newgate Street London (KEW98)***

This site was occupied by Christ's Hospital Boys' School from 1553-1902, with part of it cleared in 1787 for the construction of Giltspur Street Compter Prison (demolished 1854). Secondary fills from a medieval city ditch (built over in 1825) may also date to the early post-medieval period. A precise context for the turkey coracoid and humerus was not available for this site.

**6.1.3.8.      *Crutched Friars, London (MCF06)***

A turkey humerus from the House of the Crutched Friars originated from a very tightly dated (1650s-1660s) well-fill context and were accompanied by other faunal and botanical material that may indicate a high-status establishment or household, possibly the Three Colts pub or its precursor.

**6.1.3.9.      *Laud House Forecourt, London (NGT00)***

A number of cellars, cesspits, wells and pits were excavated at this site, the contents of which may have been associated with a bawdy house or tavern. Re-worked medieval stone was present, as well fine porcelain and delftware dating from the late 17<sup>th</sup> to late 19<sup>th</sup> century. The exact context of the turkey humerus is not provided.

**6.1.3.10.     *Royal London Hospital (RLP05)***

Although the majority of material from this excavation originated from human burials (265 inhumations) and dissected remains (89 'coffin-loads'),

reclamation dumping had taken place and waste from sugar refining and tanning was found outside the cemetery boundary. This is the only site at which pathological elements were identified (see Figures 6.24-6.29 below). Three tibiotarsi have bowing and other manifestations of disease present (see discussion below). The turkey elements from this site originated from a context which contained other faunal remains, both those which are interpreted as the results of kitchen waste disposal and anatomical teaching practices. All associated small finds date prior to the 1840s, by which time when the hospital's anatomy school was relocated, thus the turkey elements are thought to date prior to 1840.

**6.1.3.11. Spital Square, London (SQU94)**

Part of a late medieval or early post-medieval timber building was recorded, as well as a large brick building which was extended over the 16<sup>th</sup>-17<sup>th</sup> centuries. In the 17<sup>th</sup> century, boundary walls divided this former monastic garden into several properties; 17<sup>th</sup>-18<sup>th</sup> century wells and cesspits were dug into the yards of these properties and by the early 18<sup>th</sup> century, they were occupied by houses. Exact contextual information for the turkey tibiotarsus is not provided.

**6.1.3.12. Spitalfields, London (SRP98)**

The excavations on the site of the Priory and Hospital of St Mary Spital; the church was demolished *c.* 1539, apart from one wall which functioned as a garden wall. In the 16<sup>th</sup>-17<sup>th</sup> centuries, a road was constructed and brick houses with basements built along the road with redevelopment for housing in the late 17<sup>th</sup> to early 18<sup>th</sup> centuries. Deposits consisted mainly of dumps, probably pit fills and levelling deposits; it is not known from which context the turkey bones were excavated.

**6.1.4. Turkey elements**

The number of bones originating in the UK and Ireland which were accessible, measurable and clearly identifiable as turkey (Table 6.4 below) was extremely low (total NISP of 30) and limited to the sites described

above which were located in London and Dublin. I had access to 41 elements which had been identified as turkey, but 11 of these were eliminated from the study because they were too fragmentary, excessively affected by taphonomic processes or incorrectly identified.

Site	Elements
Wood Quay, Dublin	2 Coracoids
BOS87 Bishopsgate, London	Tibiotarsus
CH75 Chaucer House, London	Carpometacarpus
FNB02 Finsbury Avenue, London	Carpometacarpus
GHT00 Blossoms Inn, London	Humerus
	Radius
	3 Ulnae
	Carpometacarpus
	Femur
	2 Tarsometatarsi
GWO05 St. Bartholomew's Medical College, London	Femur
KEW98 Newgate St., London	Coracoid
	Humerus
MCF06 Crutched Friars, London	Humerus
NGT00 Laud House Forecourt (Newgate St.), London	Humerus
RLP05 Royal London Hospital	3 Tibiotarsi*
SQU94 Spital Square, London	Tibiotarsus
SRP98 Spitalfields, London	Scapula
	Humerus
	Ulna
	Carpometacarpus
	Tibiotarsus
	2 Tarsometatarsi
Total	30 Elements

**Table 6.4: Turkey elements from the UK and Éire (\* = pathological)**

In terms of metrics, 19 of the elements listed above had a measurable GL (greatest length) and 20 had a measurable SC (smallest breadth of corpus). Due to the small data set, means and standard deviation have not been calculated. An x, y scatter plot was also not used due to the extremely small sample size involved. Instead, Figures 6.10-6.17 below show the GL values for turkey elements from London as well as the same elements from "early" and "late" North American sites (see Chapter 4) in order to illustrate how the data sets compare; a brief discussion follows. No scapulae had a measurable GL and thus that element is missing from the following charts. The UK and Irish sites are arranged earlier to later from left to right.

The carpometacarpi in Figure 6.10 (66.4, 67.1, 69.6 and 55.7 mm) generally fall into the middle of the North American domestic turkey measurements

(average 72.7), with the exception of one from Spitalfields which falls at the low end of the range.

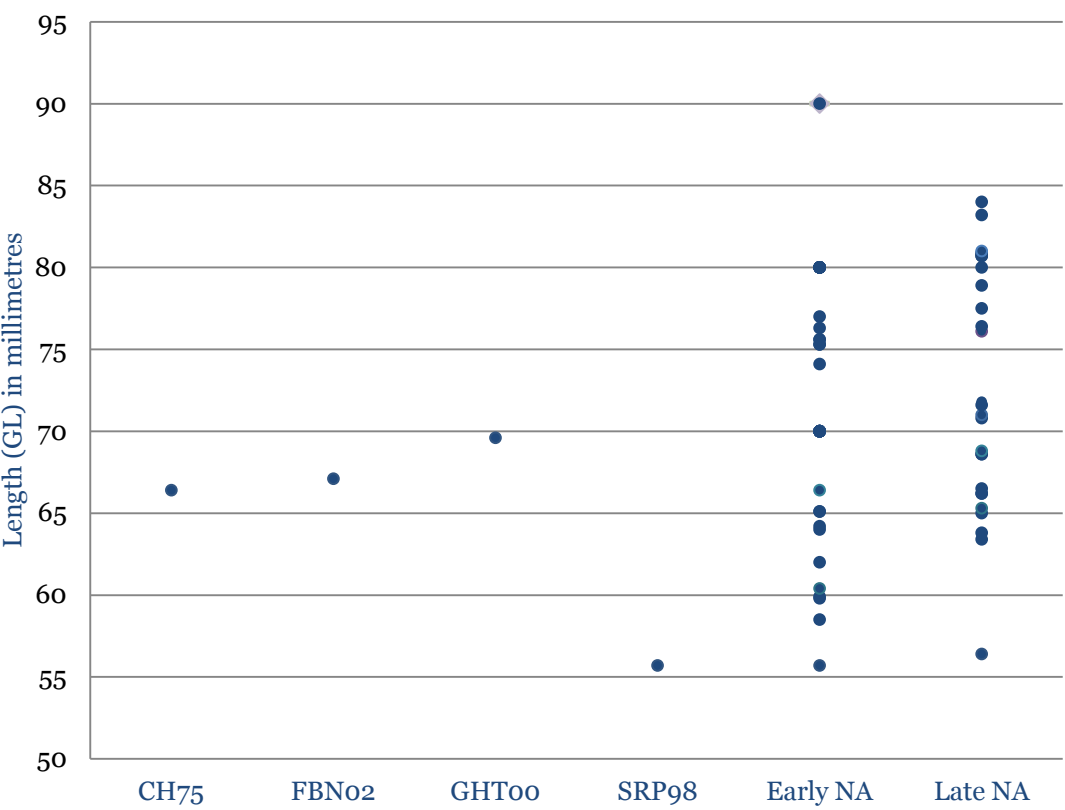


Figure 6.10: Carpometacarpus GL comparison

Coracoids are similar to carpometacarpi in terms of the pattern present in GL measurements; those in Figure 6.11 are from Dublin (at 85.2 and 75.4 mm) and are generally smaller than the North American coracoids (average 88.3), but not excessively so.

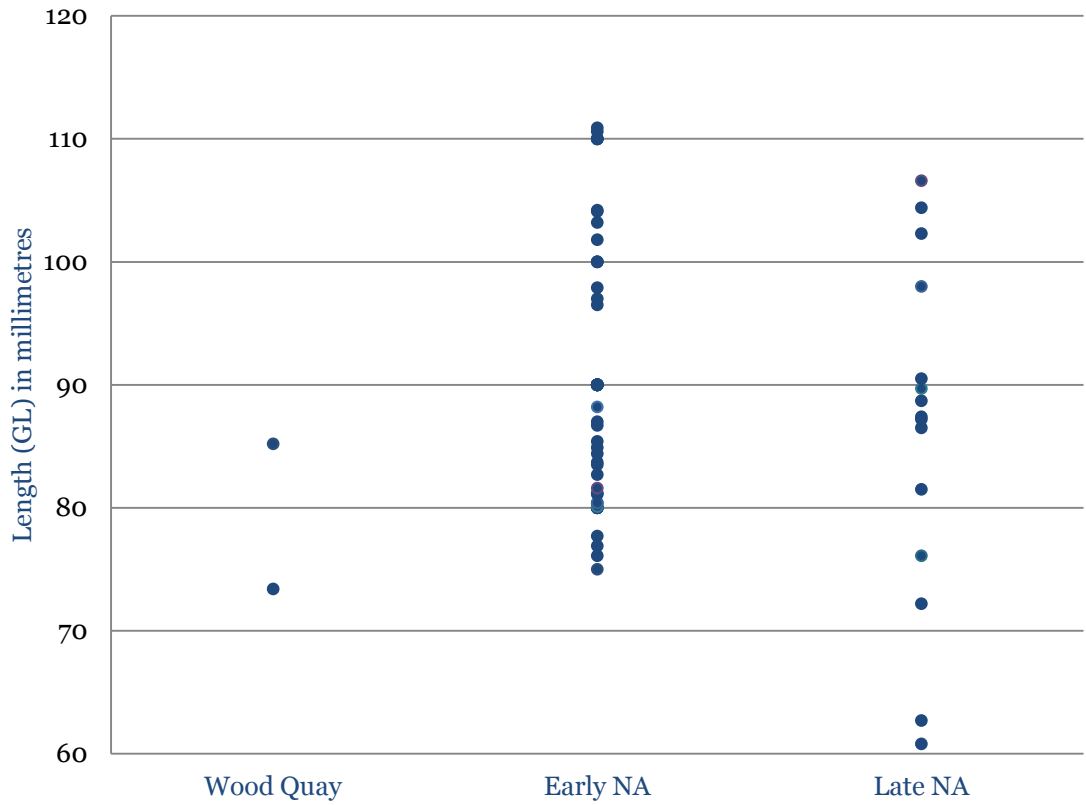
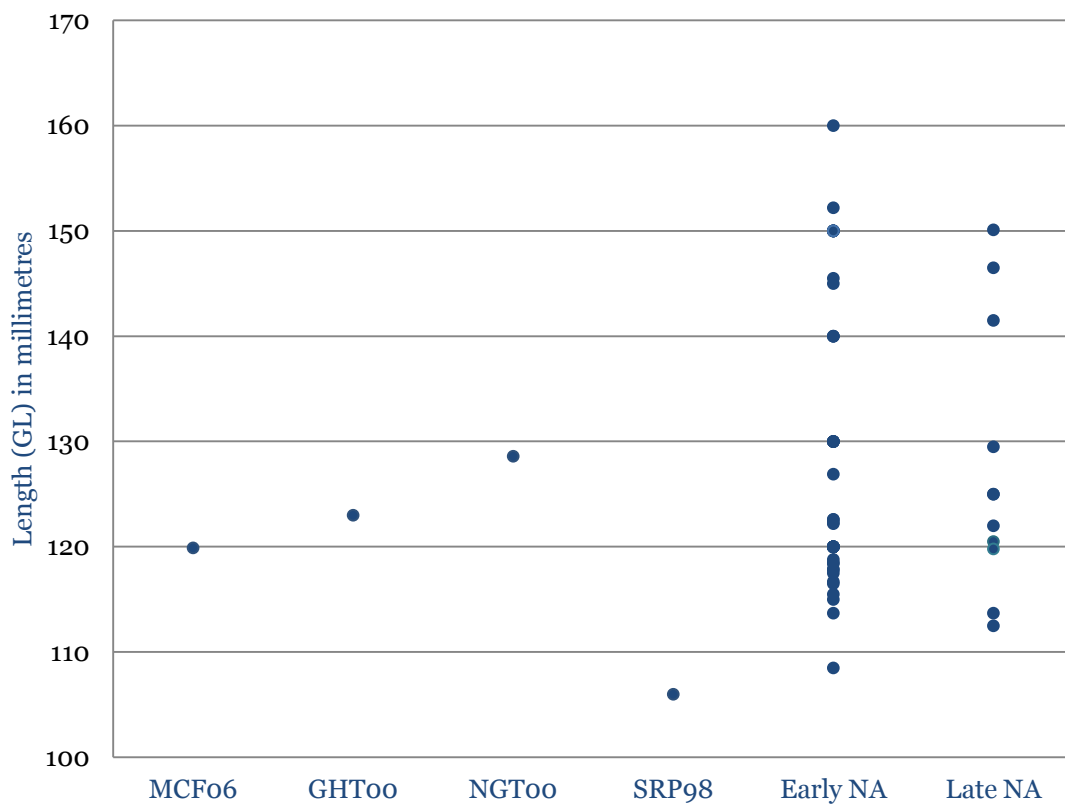


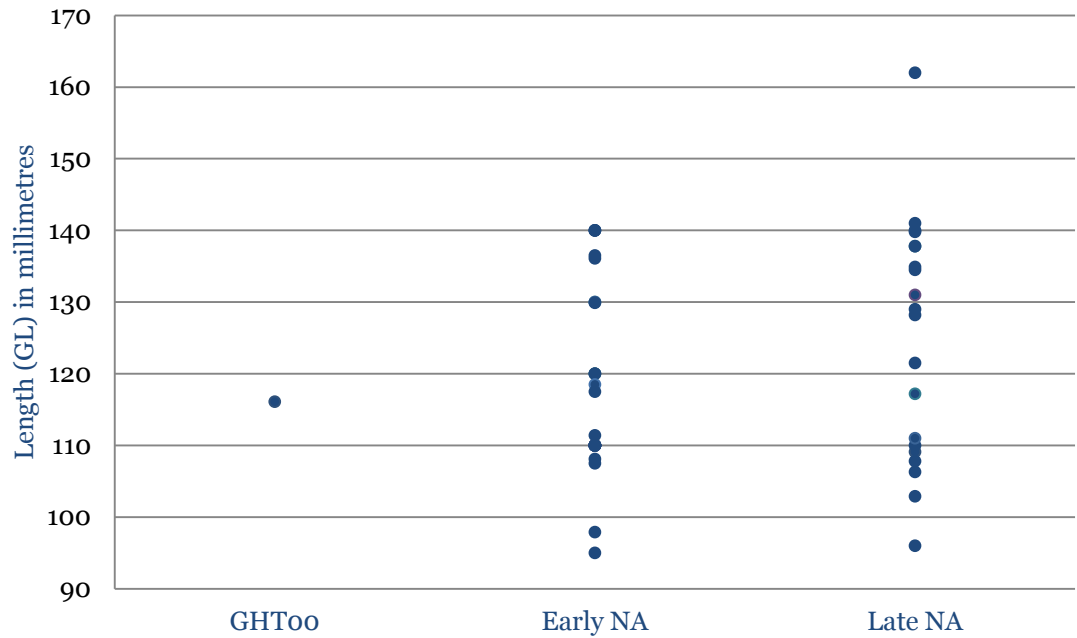
Figure 6.11: Coracoid GL comparison

The humeri shown in Figure 6.12 (again with the exception of the element from Spitalfields) follow the same pattern observed in the carpometacarpi and coracoids. The measurements from House of the Crutched Friars and Blossoms Inn (119.9, 123.0 mm) are smaller than the North American average (128.3), though the Laud House humerus was slightly larger (128.6 mm) and the Spitalfields GL was smaller than all North American measurements (106.0 mm).



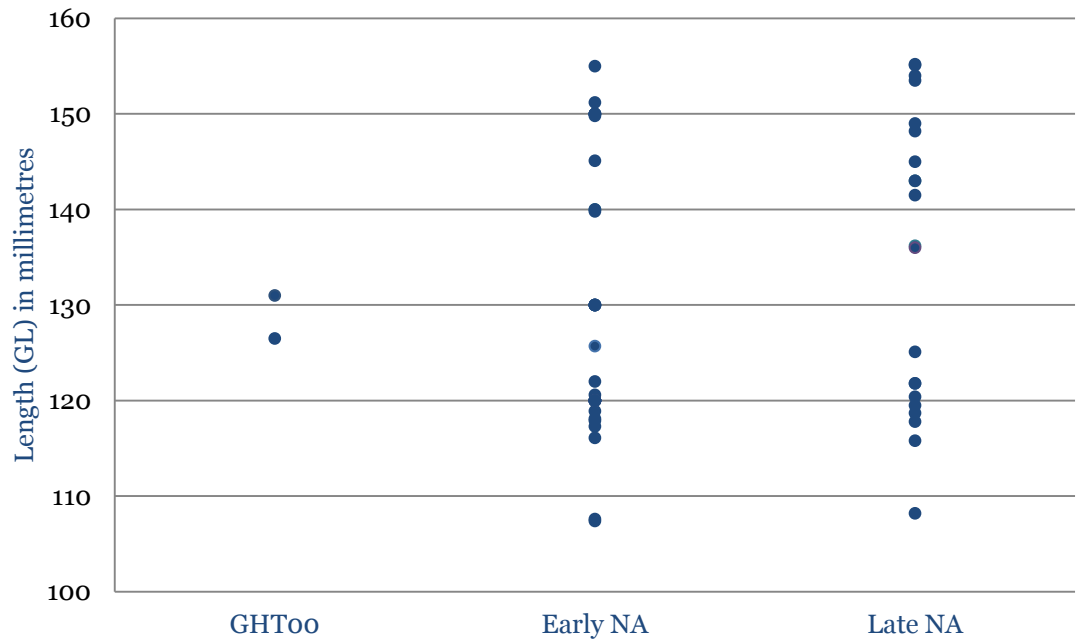
**Figure 6.12: Humerus GL comparison**

The single radius with a measurable GL (116.1 mm) shown in Figure 6.13 falls just below the North American average of measurements for that element (average 118.4 mm).



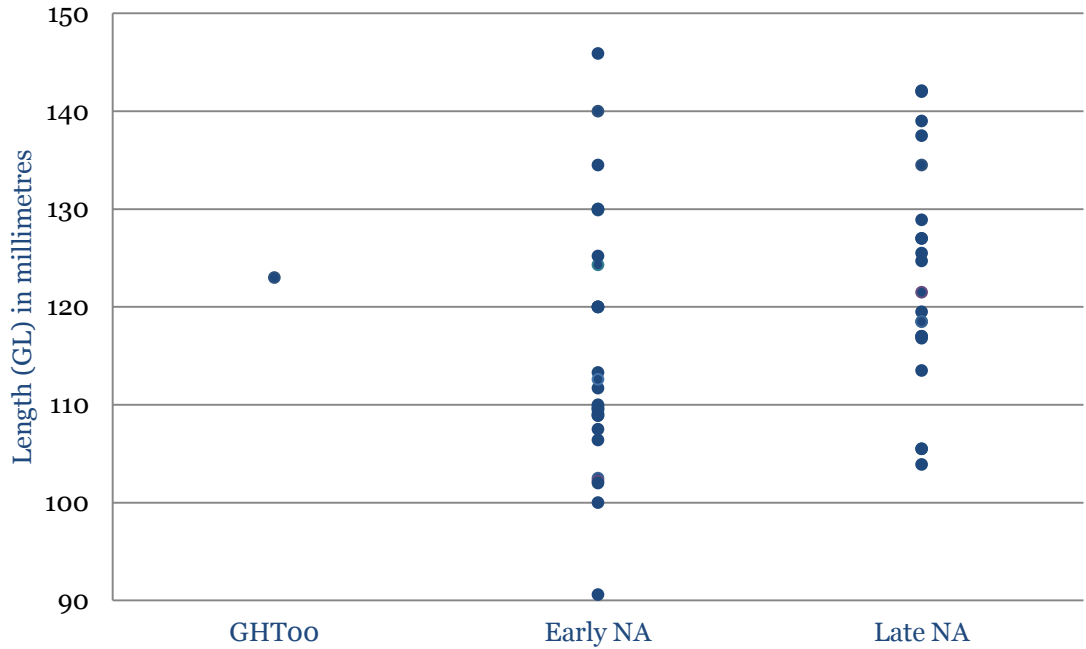
**Figure 6.13: Radius GL comparison**

The two measurable ulnae in Figure 6.14 were recovered from the Blossoms Inn site; they measured 131.0 and 126.5 mm respectively, slightly above and below the North American average of 130.5 mm.



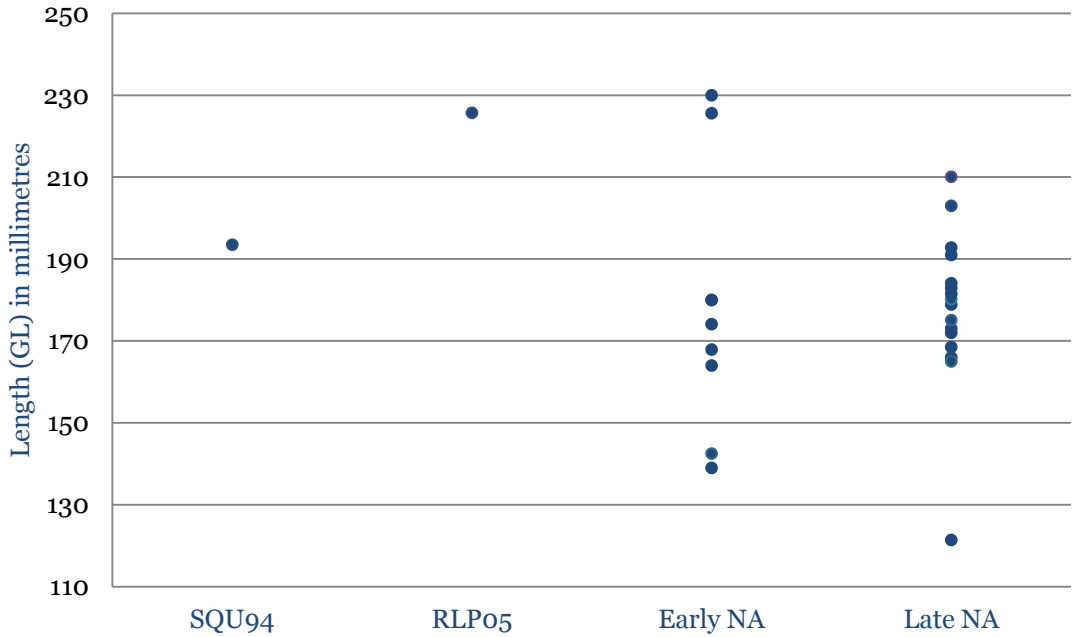
**Figure 6.14: Ulna GL comparison**

The pattern changes somewhat when the lower-limb length measurements are considered. The single femur GL measurement in Figure 6.15 is 123.0 mm and is larger than the 119.3 mm average from North American sites.



**Figure 6.15: Femur GL comparison**

In measuring the tibiotarsi (193.5, 225.7 mm), those from London (Figure 6.16) show a marked trend toward the upper end of the North American range of measurements (average 177.9 mm).



**Figure 6.16: Tibiotarsus GL comparison**



Tarsometatarsi (138.1, 133.4, 133.8 mm) continue this trend (Figure 6.17); all three exceed the North American GL average of 133.0 mm.

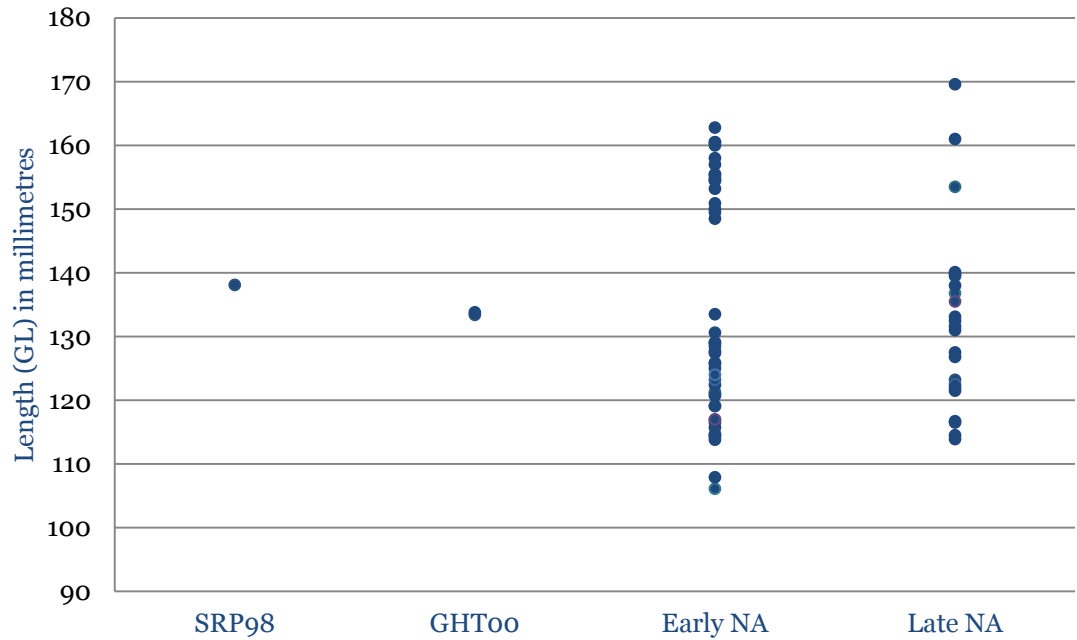


Figure 6.17: Tarsometatarsus GL comparison

The SC values from London turkey elements are compared to "early" and "late" specimens from the American Southwest in the figures (6.18-6.23) which follow. The humerus SC measurements from London are shown in Figure 6.18 and were 11.8, 13.7, 14.0, 13.5 and 12.5 mm; these are all near the North American average of 13.4, and a bit larger in three cases.

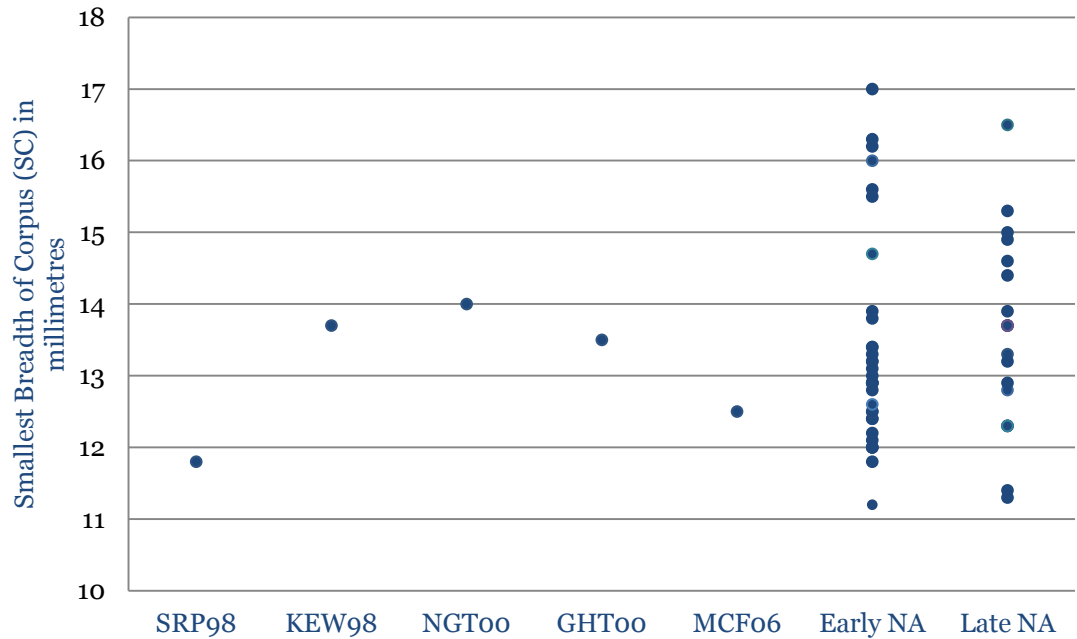
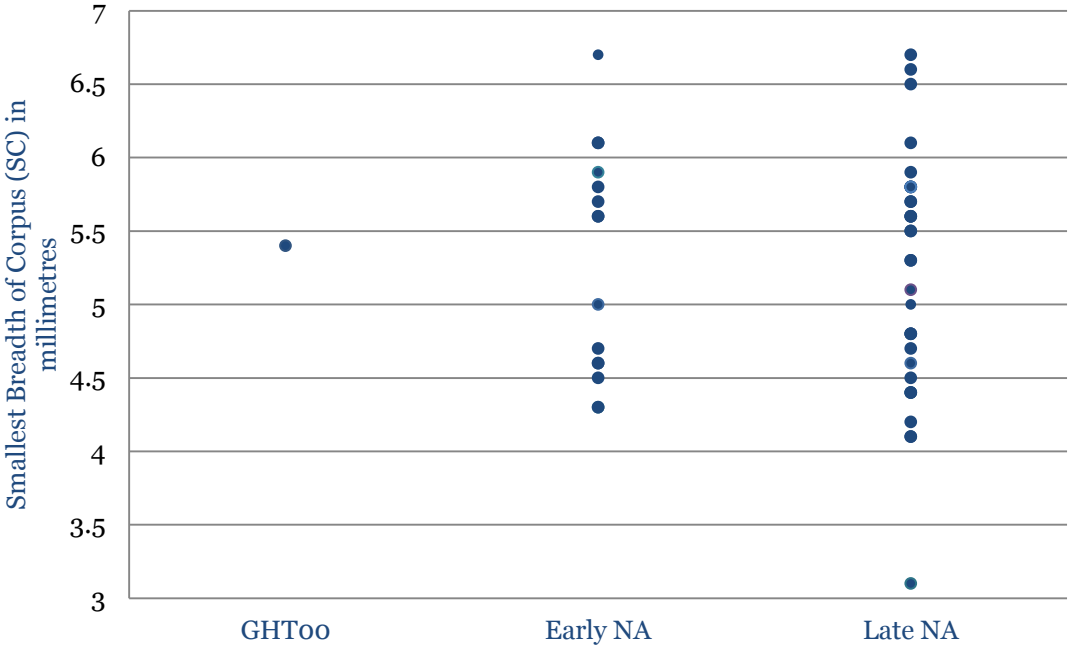


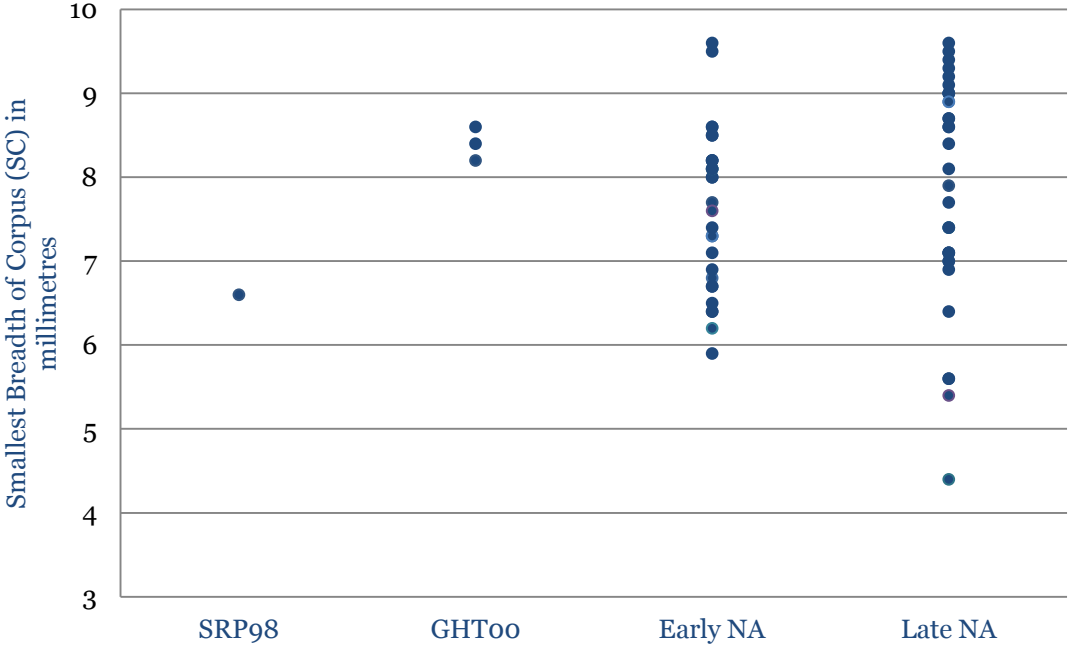
Figure 6.18: Humerus SC comparison

The single radius from Blossoms Inn had an SC measurement of 5.4 mm; this is quite close to the North American 5.3 mm average (Figure 6.19).



**Figure 6.19: Radius SC comparison**

The London ulnae measured 6.6, 8.2, 8.4 and 8.6 mm at their smallest corpus breadth (Figure 6.20); once again, these are not far off of the 7.8 mm average, and larger in three cases.



**Figure 6.20: Ulna SC comparison**

The femur from Blossoms Inn (Figure 6.21) had an SC of 12.0 mm, slightly higher than the 11.2 mm average for North American femora.

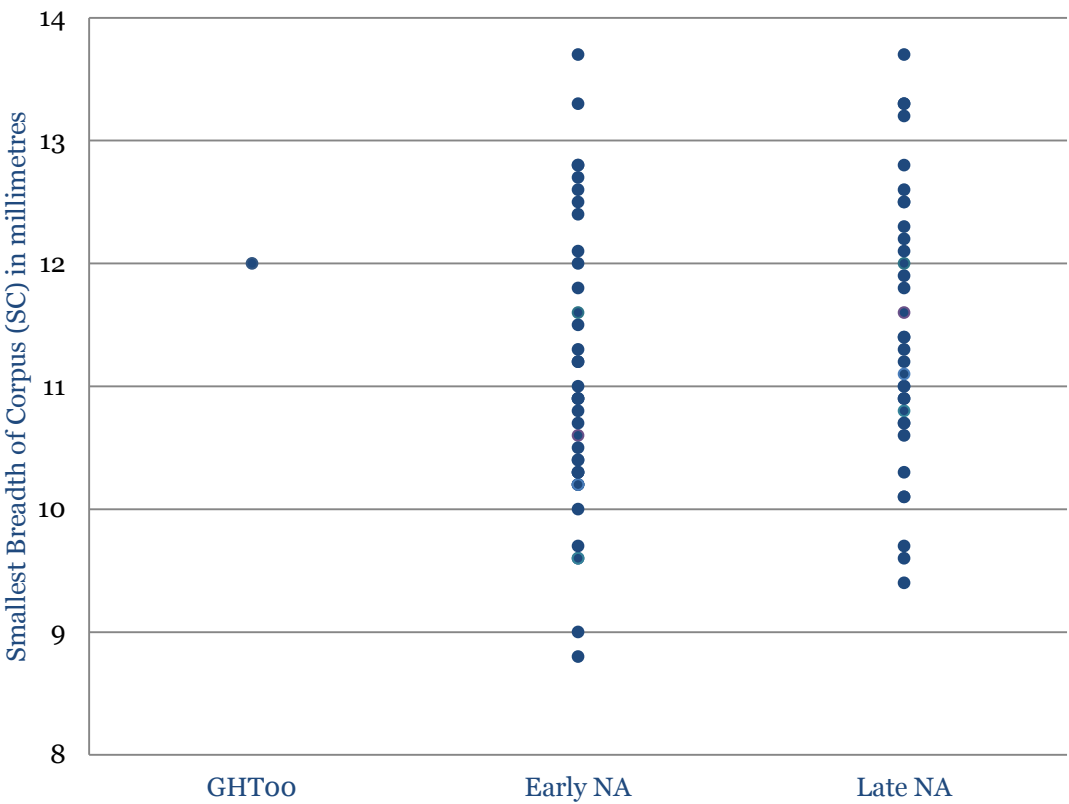
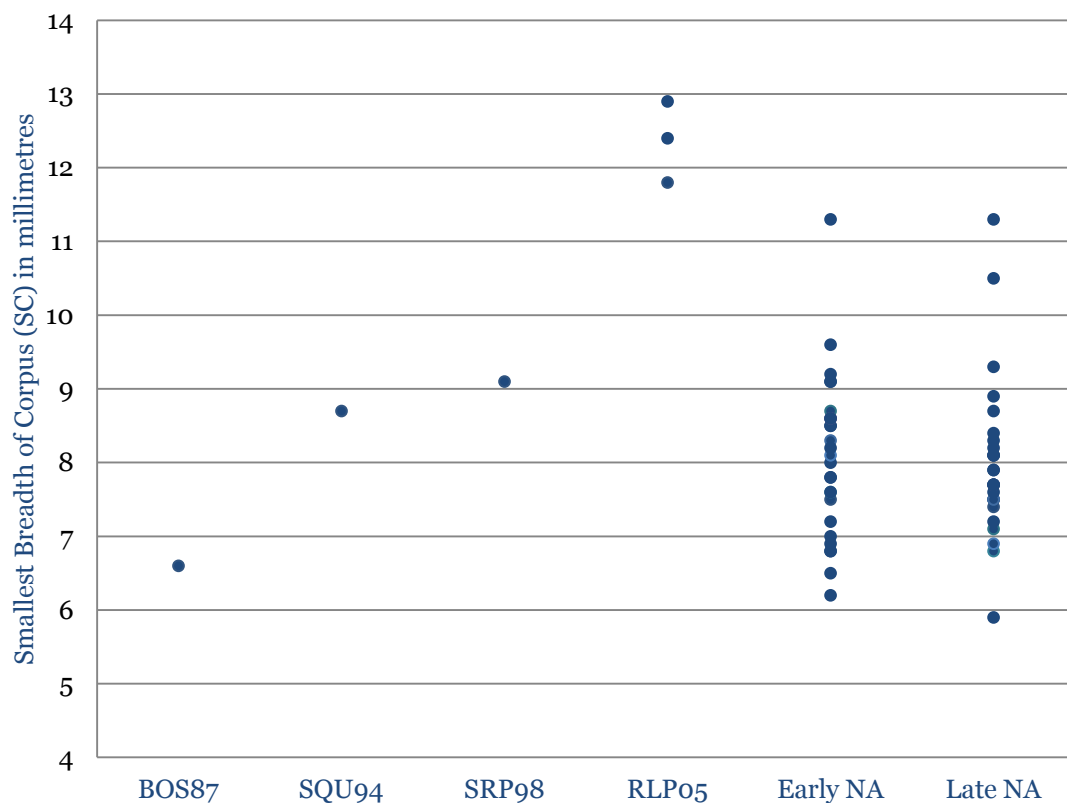


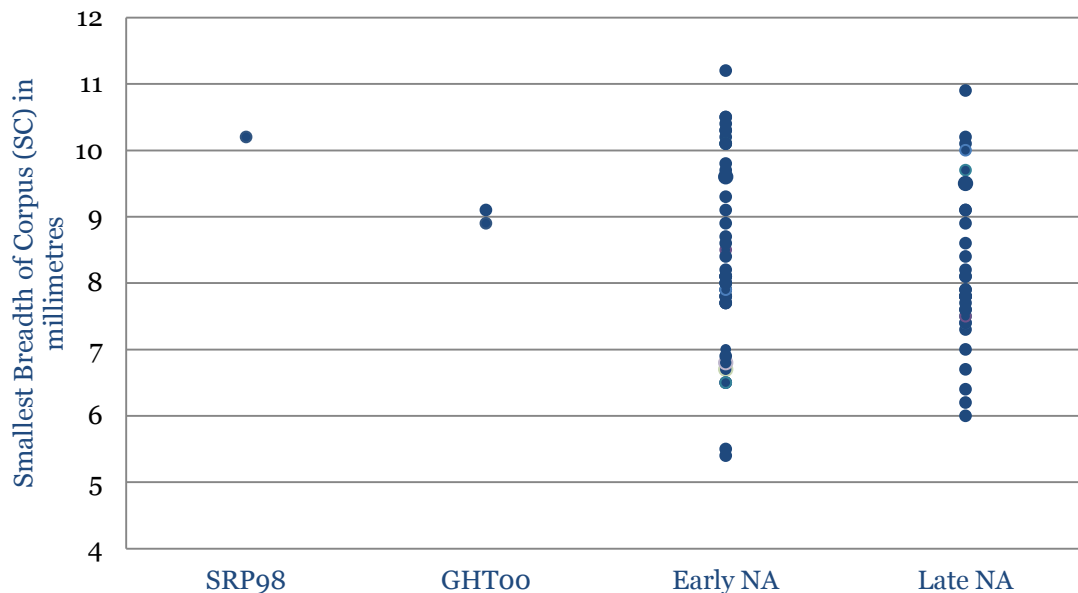
Figure 6.21: Femur SC comparison

With the exception of the tibiotarsus from the Bishopsgate site (6.6 mm), the other London tibiotarsi (8.7, 9.1, 11.8, 12.9 and 12.4 mm) had SC values in excess of the North American average (8.0 mm); these are shown in Figure 6.22. In fact, all of the tibiotarsi from the Royal London Hospital are larger than any North American tibiotarsus measured throughout the course of this study. This difference may partially reflect the pathological nature of these elements, though their length would not have been improved (see Figures 6.24-6.29 and discussion below).



**Figure 6.22: Tibiotarsus SC comparison**

Though slightly less dramatic than the tibiotarsal measurements, the tarsometatarsi from London (10.2, 8.9 and 9.1 mm; Figure 6.23 above) all easily exceed the 8.2 mm average SC measurement for North American tarsometatarsi.



**Figure 6.23: Tarsometatarsus SC comparison**

Although only very weak interpretations can be extrapolated from these measurements because of the small sample size, a hint of possible trends after translocation may be evident. The most noticeable pattern in the charts above is the general difference in upper and lower limb measurements. With both GL and SC measurements, the upper limb elements are all roughly the same size as their North American counterparts, if not slightly smaller. The femur and tarsometatarsi are above average in size with regard to both measurements. One tibiotarsus was below the North American average, but five were larger and three of these exceeded the largest North American SC measurement recorded in this study. Increase in lower limb size and an accompanying proportional decrease in upper limb size has been interpreted as evidence for domestication and pinioning, increased reliance upon the lower limbs for locomotion or a greater need for weight-bearing in bird species husbanded

for meat (Bramwell 1977, Reichstein and Pieper 1986, MacDonald et al. 1993). Although the data are few, it seems possible that similar factors could be responsible for the contrasting patterns in upper and lower limbs as compared to the North American parallels.

#### **6.1.4.1.      *Sex, age and bone modifications***

Although all element types included in this study were present in the material from the UK and Ireland, it was not possible to determine the sex of most elements. However, six juveniles were identified (20%). This exceeds the average percentage of juveniles from North American sites (7.15%, Table 4.6), but is well below that of Gran Quivira (31.82%) and close to that of Salmon Ruin (20.38%). Burning is present only in the form of singeing on three bones (10%). This is not much higher than the overall percentage of burned bones from the American Southwest, but that percentage (8.26%, Table 4.8) varies across sites and includes all forms of burning. Butchery was recorded on eight elements (26.67%), three of which were cut marks and five of which were chop marks. Butchery is comparatively rare in the North American turkey elements, with only 1.69% of bones showing signs of it (Table 4.9). As for the presence of gnawing, six elements (20%) had been chewed by carnivores and one by a rodent (3.33%); this is the reverse of the pattern in the North American elements, of which 3.5% were gnawed by carnivores and 7.59% were gnawed by rodents. Perhaps these elements were more available to dogs or dogs were more frequently kept by comparison. A single element from Spitalfields had evidence of root etching, compared to nearly a third of turkey elements from sites in the American Southwest. Any interpretations of the comparisons made above are exceedingly tenuous, owing to the sizes of the samples. Having stated this, I do not believe them to be completely meaningless. The differences in butchery mark frequency could indicate entirely different techniques for preparation prior to cooking and carving the bird for serving, which is consistent with the cookery literature (Beeton 1861, Smith 1753). Beeton, for instance, gives two sets of instructions for boning a turkey; both require a complex series of

cuts to be made near skeletal elements or joints (1861:222-224). Other differences, including the proportion of gnawing by different animals, probably reflect completely disparate disposal practices.

#### **6.1.5. Turkey pathologies at Royal London Hospital**

Three turkey tibiotarsi were excavated from the Royal London Hospital, and all exhibited some degree of bowing in a roughly posterior or caudal direction (Figures 6.24-6.29 below). The directionality evident is comparable to almost every case of bowing in the same element from the American Southwest (Figures 4.25, 4.42, 4.52, 4.78, 4.80, and 4.82), but the tibiotarsi from the American Southwest had no articular destruction or fused fibulae present as is the case with the Royal London Hospital tibiotarsi. Although it is possible that the deformities shown below were the result of different aetiologies, the consistent appearance and direction of the bowing suggest a similar skeletal response in at least two different individuals. Given their similar metrics and proportions, it is entirely possible that the first two tibiotarsi (Figures 6.24-6.27) are paired and originate from the same individual. Unfortunately, due to the effects of the pathology present (especially in the left element) as well as taphonomic modification, it is impossible to ascertain this with perfect certainty. This could indicate that although only the "drumsticks" from that bird were recovered, that an entire individual was consumed. If cooking techniques similar to those described by Beeton (1861:226) were followed, the turkey legs would have been prepared separately at a meal sometime later, after the initial presentation of the entire bird and carving of the breast meat (discussed later in this chapter).



**Figure 6.24: Royal London Hospital right tibiotarsus**



**Figure 6.25: Proximal end of right tibiotarsus (same element as Figure 6.24)**



**Figure 6.26: Royal London Hospital left tibiotarsus**





**Figure 6.27: Proximal end of a left tibia (same element as Figure 6.26)**



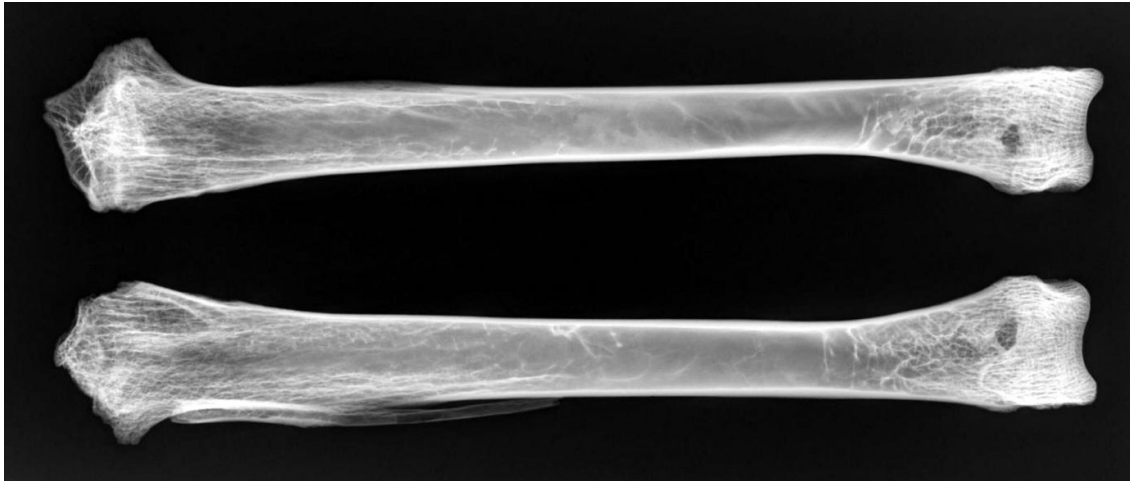
**Figure 6.28: Royal London Hospital left tibia**



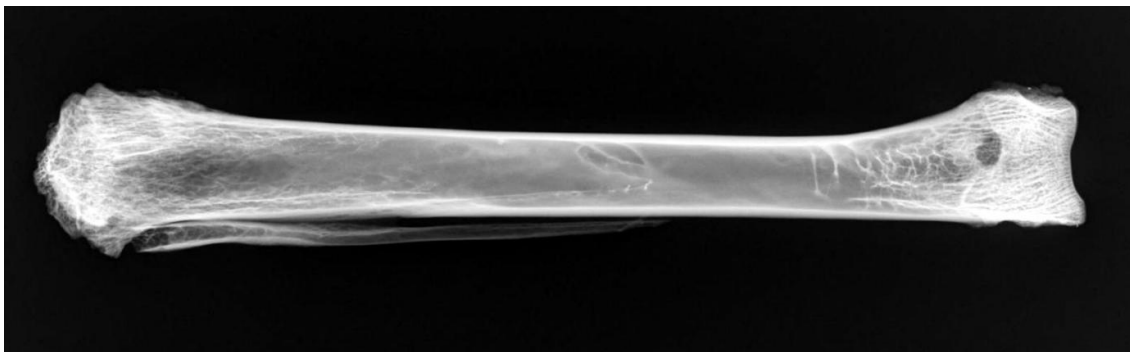
**Figure 6.29: Proximal end of a left tibia (same element as in Figure 6.28)**

Although the degree of bowing varies, all three tibiotarsi exhibit some warping and thickening of the proximal metaphysis (Figure 6.32), and both left tibiotarsi are ankylosed to the accompanying fibula. Additionally, both of the left tibiotarsi have large cavities present (measuring 16.5 mm by 7.2 mm and 15.2 mm by 13.4 mm respectively) just distal to the tibial plateau (Figures 6.27 and 6.29); no periosteal reaction is evident and the edges of these cavities appear smooth, although the unpaired tibiotarsus suffered more taphonomic destruction and therefore an accurate depth measurement could not be obtained. These cavities seem a probable locale for the agglomeration of unmineralised cartilage mass during the progression of tibial dyschondroplasia (Fothergill et al. in prep.).

Figures 6.30-6.32 show radiographs of these three elements taken from the anterior perspective. In terms of differential diagnosis, it is possible to discard the possibility that these deformities represent the effects of osteomalacia or healed rickets because the distal portions of the elements remain unchanged. It is also clear that the fibula of the paired left tibiotarsus exhibits endosteal thickening that may indicate a healed fracture; fibular fractures often accompany tibial dyschondroplasia (Lynch et al. 1992). Another factor in support of this diagnosis is the change in angle of the tibial plateau. Lynch et al. concluded that an angle greater than 25 degrees was abnormal (*ibid.*:282). By this criterion, all three tibiotarsi considered here qualify and although the cnemial crest is missing from two of the specimens, the estimated tibial plateau angles range from 27 to 30 degrees (Fothergill et al. in prep.).



**Figure 6.30: Radiograph of paired tibiotarsi from the Royal London Hospital, anterior view**



**Figure 6.31: Radiograph of single left tibiotarsus from the Royal London Hospital, anterior view**



**Figure 6.32: Radiograph of left tibiotarsus from paired set with modern juvenile left tibiotarsus and archaeological right tibiotarsus, anterior view**

These changes point to mineralisation failure characterised by improper bone formation, and support a diagnosis of avian tibial dyschondroplasia, a condition which (until this point) has not been identified in zooarchaeological study. The presence of this disease in at least two individuals from a 19<sup>th</sup>-century context indicates a probable trend toward selection for faster-maturing breeds of turkey by this point, a likely component of the improvement of the species.

Since the skeletal dataset from the UK and Éire is limited, the remainder of this chapter will consider information gleaned from court records, historical and art historical sources on the turkey in the post-medieval period.

## **6.2. Turkey husbandry and consumption**

Source material on poultry husbandry in the post-medieval period is extremely scarce. Despite the fact that the category "poultry" implicitly covers a variety of species and the most populous (and by the post-medieval period, ubiquitous) bird of all these is the chicken (*Gallus gallus*), little in the way of chicken husbandry is described or considered in the post-medieval literature (Thirsk 1997:189). Although Estienne and Liébault's textbook *Maison Rustique* (1569) gives some instructions for poultry-keeping and the first poultry manual was written in French by Prudent Le Choysselat in 1567, the topic does not appear to receive the same attention in contemporary England. Leonard Mascall (1581) wrote *The Husbandlye ordning and Governmente of Poultrie*, the first book in English on the subject, but his work (though enriched by his own experiences) drew heavily on the writings of Columella, Choysselat and Estienne.

The *Discours Oeconomique* of Choysselat (the English version of which was published in 1580) is instructional in nature, and is entirely dedicated to the description keeping of chickens for egg production. Despite the common perception of this industry as unworthy of attention and unprofitable in England (see below), Choysselat's volume was written as a letter to a friend, "the right honorable the Contie Rotchfort, knight of the order of the kyng",

who had suffered serious financial losses due to "the troubles of the Civill warres in Fraunce" and was in need of advice as to how he might make a recovery (Choyselat 1580:3, 5). Choyselat's suggestion was, in essence, that this knight purchase land and buildings in Paris and keep 1,200 hens for their eggs. In the context of this communiqué, a wealth of information on chicken husbandry is provided. Houses for the chickens were to be well-aired and set up "with the vewe or prospect toward the Winter Oriente, that the Sunne maie give the good morrowe to your Hennes, whiche greatly delite at the Mornyng Sunne" (Choyselat 1580:7). This interest in the happiness of the chickens is a theme of the book, and provides a stark contrast to other attitudes to animals in the same time period (Thomas 1983; Ritvo 1994; Serpell 1996). Choyselat also recommends that the chickens be provided with loose clay to have dust baths in (for their enjoyment) and states that they must also be kept warm (*ibid*:8, 14). The chickens were to be provided with fresh hay on a weekly basis, not straw, as it is "not so apt to engender Lice or Woormes" (*ibid*). He recommends getting hens without spurs in colours of "Black, Redde, and Taunie" (*ibid*:9-10) from Angeou, Touraine and Lodunoys because they "have been the countries with Britaigne, less troubled with the said Civill warres" (*ibid*). In his instruction on the selection of cockerels, of which there should be one per ten hens, Choyselat states that they should be of the same colours as the hens and have an important suite of characteristics:

"Thei that have their Combe or Creaste upright, and double, or divided. Their eyes redde and glisteryng: Their becke, shorte and hooked: well-spurred: their goyng, hautie and proude: Their voice strong and soundyng: and sutche as crowe mutch, representyng sutche a Majestie..." (Choyselat 1580:10)

In these descriptive and colourful terms, the correct cockerel is a regal, splendid chap who knows his business. The hens were to be moved into their houses at 3 o'clock in the winter and 5 o'clock in the summer and were to be looked after by no fewer than four servants or maids, who were to change

the water daily, tidy the waste, and change the hay on a weekly basis in addition to collecting the eggs. The chickens were to be fed oats, barley, and "sometimes also Fetches or Tares" which were to be scattered amongst horse dung in order to give the chickens more exercise and a reward for their labour (*ibid.*:13), though different wheat varieties could be substituted in the winter (Choyselat 1580:19). Scratching behaviour was clearly to be encouraged, for Choyselat instructs his friend to keep a quarter of a two-acre yard ploughed up so "that the Hennes mai easily raise it without hurtyng their claws" (*ibid.*:14), with the remainder dedicated to growing barley (*ibid.*:25). Since chickens tended to lay less frequently in the winter, Choyselat suggests that this could be remedied by feeding them "Fenegreke and barly half sodde" (*ibid.*:17).

Choyselat also describes various problems and diseases that affect poultry. Foxes are the chief predatory concern, and although he states that the musk or meat of a fox can be rubbed on the walls of the henhouse to deter them from entering, the best prevention method was to keep the henhouse secure, especially at night, and have the servants keep a close eye on the hens and their surroundings (*ibid.*: 24). Lice and other parasites were to be cured by bathing the afflicted chicken in wine with cumin or stavesacre added to it (*ibid.*:23). Another affliction of concern was "the pippe, whiche is a disease of the tongue, the end whereof is thereby hardened, in maner of a gristle" (*ibid.*); to cure it, one must removing the hardened pellicule from the chicken's tongue, wash the tongue and beak with garlic oil, "rubbe the tong well with Spettle or Vinegar, first tempered in the mouthe of the servaunt" and add some stavesacre to their feed (*ibid.*). For chickens suffering from "the Catare or Rheume", Choyselat recommended ensuring that their water was warm and never frozen and that one must take a feather and "traverse or overthwart theire nosethrells with a Feather put through them, to open the Fluxion or Rheume that is stopped and maketh them blinde" (*ibid.*). Following humoural theory, it was necessary to prevent chickens from "liying under the Moone, the mother of all moistnesse" (*ibid.*). No mention of

trauma or other injury is made. In autumn of every year, Choyselat recommended that one or two hundred of the oldest hens be slaughtered and replaced with new, young hens (*ibid.*:24).

About 800 eggs were to be expected from 1,200 hens on a daily basis (*ibid.*:17). The eggs, once gathered, were to be kept well-aired and cold (*ibid.*:12) prior to their daily delivery to or collection by 15-20 resellers who would take them to areas in Paris where they could be sold. For the delivery of eggs, Choyselat recommends using an ass, because they move slowly and will therefore break fewer eggs (*ibid.*:15). Additionally, supplying fresh eggs to physicians and their patients was a marketing priority (*ibid.*:14-15). Choyselat describes a healthy financial profit if his poultry-keeping instructions are followed and many of these seem as though they could have been easily applied to other poultry species, but the degree to which *Discours Oeconomique* may have impacted turkey husbandry practices, especially in countries outside of France, is unknown.

Excerpts from original price lists and rents which include poultry (or 'pullen', in many probate inventories) do exist and feature in sections of major texts such as *The Agrarian History of England and Wales* (Thirsk 1967, 1985), but only rarely is the keeping of such animals considered. Animal-human relationships or day-to-day interactions between these 'pullen' and their keepers are left to the imagination, though they are described as requiring intensive management (Thirsk 2006:254). Furthermore, it is unusual to see these birds divided into categories which may well have existed in the minds of people; geese and ducks are not often separated from turkeys and chickens although they were kept for a variety of products and probably fed and husbanded differently (Thirsk 2006). Even the agricultural commodities tables which have been split into "hens and capons" and "ducks and geese" for the years 1450-1649 do not feature turkeys (Bowden 1967:829-833, 859), although the prices for turkeys were fixed for the London market by 1555 (Thirsk 2006:254) or 1559 (Jones 1965:116). This does eventually change, as Thirsk notes (2006:252), and

may have been driven by an increasing perception of the commercial importance of the different poultry species. Nevertheless, there is some information available on the post-medieval turkey; dissemination of this knowledge is largely thanks to the work of Joan Thirsk.



**Figure 6.33: "Multae et diversae avium species multifariis formis & pernaturalibus figuris per Franciscum Barlovium Anglum artis pingendi celeberrimae Philomusum indigenam Londinensem ("Turkeyes")", held at the British Museum (artist unknown).**

The seasonality of turkey production appears to change over time. At first, they seem to have been available for slaughter mainly in the late autumn and winter; this follows their normal reproductive cycle and made them ideal for Christmas. John Tutchin, in describing a Christmas toast in an issue of his *Observer*, specifically mentions turkey as one of the hallmark foods of the season (1706). Most of the crimes in 17<sup>th</sup> and 18<sup>th</sup> century London which featured turkeys in some way (discussed below) occurred in December and January (Figure 6.38), with a few taking place in the autumn and early spring months. By 1861, Beeton lists the turkey as "in season" from January to March and September to December, and turkey poults from June to August. With regard to housing, the husbandry manuals are silent;



however, two court cases in 1786 and 1805 (London Lives LMOBPS450300661 and Old Bailey Court Records Online t18050109-21) mention "turkey-houses", which appear to be entirely distinct and presumably different from similar structures such as henhouses.

As to other aspects of their keeping, no mention of turkeys being pinioned is made in husbandry manuals; their ground-based locomotion might have made pinioning less necessary. However, in a court case heard at the Old Bailey on the 13<sup>th</sup> of January in 1790, Christopher Chapman, a farmer of Sudbury Green had several chickens and at least one turkey stolen and killed on the previous 23<sup>rd</sup> of December (Old Bailey Court Records Online t17900113-18). From his statement, it seems as though he habitually clipped the wings of his birds in a unique manner and was therefore able to identify them as his own, though it did not specify whether the turkey was exempt from this practice.

Turkey-cocks were being caponised (castrated) as early as 1587, as William Harrison notes in his *Description of England* (1587). According to William Ellis (1745), who highly favoured the flavour of caponised turkeys, by the mid-18<sup>th</sup> century it was already apparently quite difficult to find a woman skilled in the art of caponising. Turkeys are said to have been fed sodden barley and oats, along with bruised acorns (Markham 1623:139), and John Houghton (in a newsletter devoted to the parts of the ox) suggested that they be fed beef liver (Houghton 1695). The surge in growth of the poultry industry in the post-medieval period (especially in East Anglia) is interpreted as resulting in part from the success of buckwheat, which could be grown in very poor soil (Thirsk 1967:44). Poultry were considered to be a source of food and income for 'the modest husbandmen', and the use of buckwheat as fodder may have allowed some flexibility and potential for expansion. Norfolk continued to be (and remains) an important centre for poultry production. Figure 6.34 below shows the tombstones of Ann and George Basey, a pair Norfolk poulterers who died in 1868 and 1870 respectively. The stones are located in the churchyard of St Mary the Virgin

in the parish of Ashby St Mary. On her tombstone, Ann is depicted with a flock of geese whilst her husband leans on a fence behind her; George's tombstone shows him feeding turkeys.



**Figure 6.34: Tombstones of Ann and George Basey, poulterers of Norfolk**

Although I have not encountered supporting evidence of the practice, Isabella Beeton rails against what she perceives as the common, misguided tendency to fatten poultry in the dark (Beeton 1861:216). Thirsk (1997:189) notes the probable impact of French, Flemish and Dutch practices on poultry keeping, which were possibly the result of both population movement and publications. For instance, if the instructions for the ideal dung-hill as described in *Maison Rustique* were followed, poultry dung would have been mixed with beef blood in order to encourage worms to take residence, thereby increasing the amount and variety of food available to the

birds. Nearly identical advice is given by Mascall two decades later (1581). If post-medieval innovations in chicken feeding had an impact upon turkey-keeping, it is possible that they were variously fed toast soaked in ale (Shewring 1699), crammed in three to four days with a paste of flour, sugar and milk (Mayerne 1658:31), or kept drunk and awake by candle-light and encouraged to eat continuously (Digby 1669; see below under heading: Women in post-medieval turkey husbandry). It seems more likely, given the turkeys' reputation for troublesome behaviour, that they were harder to manage than chickens and required some specific skills or knowledge to husband successfully, especially when in large groups. Mascall (1581) and Markham (1623) both indirectly support this by suggesting that while turkeys can be kept more easily than peacocks, they are exceptionally destructive in their habits.

There were two to three stages of production in the business of turkey farming in the post-medieval period. Young turkeys were reared in many parts of Britain after the species was introduced and by the late 19<sup>th</sup> to early 20<sup>th</sup> century (if not before), they were being imported to England from Ireland along with young geese (Haggard 1902). Prior to the advent of transport by cart or rail, these turkeys were driven on foot to market by "turkey merchants", and sold. Turkeys, unlike geese, could be shod and were fitted with leather or sackcloth boots for the journey (Simon 1952:607). As noted by Defoe (1928:59), turkeys as well as geese were driven into London from Suffolk and Norfolk (as well as other locations) in massive numbers (he estimates 150,000 turkeys in one season) by 1724. He also mentions a newly-developed four-stage carriage for the purpose of transporting the valuable live turkey poults and sometimes even chickens 'in the dear seasons' (*ibid.*:60). Once rail became the primary transport mechanism for live poultry, the birds were transferred to a "crammer" for fattening and then on to "higglers" who would sell them at market (Thirsk 1997).

Turkey poults fetched a good price at market; the base price in England for a single poult from 1640-1750 was 2.56s, lower only than geese at 3.47s

(Bowden 1985:893). These prices varied, as fully grown turkeys in the Worcester Cathedral dinner audit accounts for 1661 cost 2s and 3d, 2s and 6d, and 2s and 10d (roughly the same cost as geese at 2s, 4d and 2s, 10d) (Thomas 1999, submitted). By 1759, turkeys from the same accounts cost 3s and 6d, well above the price of a goose which cost 2s. This is generally in keeping with an overall percentage increase in the cost of poultry from 1640-79 and 1710-49 (Bowden 1985:13, Chartres 1985:446). However, sometime between 1685 and 1691, the Worshipful Company of Poulterers of the City of London began a tradition of giving the serving Clerk a turkey for Christmas at the cost of 6 shillings, which would later (about 1760) increase to 7 shillings. These prices are not that much higher than those from the Old Bailey Court Records (discussed below) and it is likely that these poulterers had access to the very best and most expensive turkeys (Jones 1965).

Part of this cost includes transport of the turkeys to market. Chartres (1985:468) estimates that the cost of driving turkeys was approximately 6 1/2d per head for a 25-mile journey. The practice of driving turkeys and geese was eventually abandoned, possibly due in part to a loss of open commons after enclosure and the development of new, faster transport techniques (e.g. the railway). More control over the movements of the birds would have been a great boon; in 1560 the fine in Southwark for any kind of poultry that was to "rayse upp the myre and mucke to the common annoyaunce" was 4s for the first offence and 8s for the second (Jones 1965:82). Although I have been unable to determine when all major markets switched to selling poultry by weight, a long journey would have caused the birds to lose valuable weight and appear less appealing to the discerning buyer (though presumably they could have been fattened after purchase like cattle). In northern England before 1880, poultry were still sold at the same price per individual instead of by weight and specialised purchasers were sent to London for the fattest specimens (Worlidge 1675:41-42). Apart from the well-known Bronze and Norfolk Black breeds, other varieties of turkey were developed by at least the early 18<sup>th</sup> century, as an entry in the *Post*

*Man and the Historical Account* classified advertisements (1711) selling black-spotted turkeys may indicate.

Despite the fact that the entirety of Britain and Ireland have been included in this chapter, the historical sources are nearly silent on areas outside of England. Although Wales is explicitly featured in most sections of *The Agrarian History of England and Wales*, there is only one mention of turkeys in Wales. Apparently, the Saturday market at Haverfordwest was the best market at which to obtain the greatest variety of meat, game and poultry in Wales during the 17<sup>th</sup> century (Thirsk 1967:123). In discussing the efforts of a poultry farmer in Cumberland in 1639, Thirsk states that "Outside of East Anglia poultry-keeping as a specialty was the eccentric choice of individuals" (*ibid.*:194). No mention is made of turkeys or even poultry in Scotland in other historical sources.

#### **6.2.1. Women in post-medieval poultry husbandry**

Like the Turkey Girl of Zuñi lore, the women involved in post-medieval poultry production in the UK and Éire have often been overlooked and their importance understated. Due to the relative lack data from areas other than England in these Isles, I use English sources to clarify what is known about women as a major constituent of the egg and poultry industry. Thirsk (1997:194-195) includes portions of an 1896 exchange of letters between a Commissioner investigating the state of British agriculture and a poultry-farming expert called Edward Brown. Brown was of the opinion that French eggs and poultry were superior and that the primary reason for their excellence was the work of the women who produced them. He felt that British male social attitudes toward female labour were the problematic factor involved. After being asked to clarify his position, Brown responded that male farmers were of the opinion that poultry were unprofitable and women's business, whilst in France there was no doubt of female excellence in egg and poultry production and the skill was attributed proper value and attention. That these products were the results of "women's work" is clear much earlier than the 19<sup>th</sup> century. In 1570, a large feast at Oxford required

not only the flour, beer and wine from male suppliers, but also 282 eggs, supplied by two women. The chickens, capons and pigeons were also supplied by goodwives in Oxford and nearby villages; likewise, the seven turkeys provided for the same feast were produced by another local lady (Gutch 1781:4-11).

Even in original household accounts, these products are not well documented. Although some of them would have been produced on estates and therefore not recorded, Thirsk (2006:262) is of the opinion that male convention assigned a lesser worth to these foods and they were therefore not worth the time and attention of documenting their presence, let alone their price and origin. They may also have been perceived as less worthy of investment and improvement as a result. Thirsk interprets the frequent presence of dairy foods and conspicuous absence of poultry-keeping in the headlines of John Houghton's news sheet in the 1680s and 1690s (Shewring 1699; Thirsk 2006) as evidence of this tendency. Individual producers of such products are therefore difficult to trace, (only Thirsk has attempted to do so), and a few post-medieval sources do mention them by name.

In the mid-16<sup>th</sup> century, Mistress Katherine Woodward, wife of Queen Elizabeth's kitchen clerk, may have been selected to provide poultry for the royal household (Mascall 1581). The description of one Lady Fanshawe in 1669 who fattened her poultry by keeping them drunk with ale and burning a candle all night long to encourage them to eat, creates an image not soon forgotten (Digby 1669:229-30). The appropriately named Mrs Feather of Soham, Cambridgeshire, had the utmost concern for the health of her chickens and kept them in a clean, warm environment, feeding them every one and a half hours from 6am to 6pm every day (BPP 1895 XVII C7871, cited in Thirsk 1997:194). In the early 17<sup>th</sup> century, widow Anne Armingier of North Creak, Norfolk owned and managed no fewer than 141 birds, including 5 turkeys (Thirsk 1967:44). Women not only kept these birds and crammed or fattened them, but also made significant contributions to their marketing. In 1788, Mrs Kezia Collins of Cade Street, Heathfield, devised a

plan to send local poultry by carrier into London (Short 1982:19). As mentioned above, William Ellis had great difficulty locating someone skilled in the art of caponisation (poultry castration); he was searching specifically for a woman (1745). Women appear not only in the context of egg production and husbandry of various domestic poultry, but were also involved in rearing and keeping game species. A woman in Chelsea in the 17<sup>th</sup> century exclusively bred pheasants and was reputed to have hatched a thousand of them (Worlidge 1675:165, 167). There is record of a widow who was paid by the Earl of Rutland to feed and tend to the pheasants on his estate in 1607 (Thirsk 2006:261). A counterpoint to this is the apparent lack of women in the Old Bailey Court Records involving turkey theft and related crimes (discussed below). Be that as it may, it is possible that women tended the birds but did not technically own them, or that they were represented in court by a male counterpart. There may also have been a different proportion of women keeping poultry in urban areas as compared to the rural countryside. Furthermore, although there is documentary evidence for women being called "poulterers" in England from the 13<sup>th</sup> century (Farmer 1991), women were only officially able to obtain the status of Freeman in the Worshipful Company of Poulters in the City of London after 1884 (Jones 1965:42). Jones notes that two women obtained the Freedom in the 17<sup>th</sup> century, although none are documented as having advanced to the Livery; this may in part explain their absence from court records.

#### **6.2.2. Turkey selection, preparation for the table and serving**

Women were expected to have a role in the selection, preparation and serving of turkeys at meals. The presentation and carving of the bird were the responsibility of the resident patriarch, however (Beeton 1861:225). Smith (1753:6) provides directions for selecting a turkey for the table and instructs one to seek out a specimen with short spurs (if male), smooth black legs, limber feet and lively eyes. If there was any sign of roughness or paleness of legs or the eyes had a sunken appearance, the turkey was surely not young or fresh enough to be suitable. In addition to drawing, plucking

and singing, Beeton recommended hanging poultry "till its fibres have lost some degree of their toughness" (Beeton 1861:55) in a well-ventilated, airy larder. If continental practices were similar, "bleeding" of the birds may have been employed to improve the whiteness of the turkeys' flesh. In his 1570 *Opera*, Bartolomeo Scappi (personal cook to Pope Pius V) advised that a turkey's throat should be cut and then the bird left to bleed out for two days before being wrapped in wet linen cloth and aged beneath a bed for a number of hours (Scappi 1570). Whilst continental chefs probably prepared the turkey in a manner similar to the peacock (Eiche 2004:31-32), English recipes for roasted turkey, "turkey pye", potted turkey and stewed turkey such as those provided by Smith (1753:81) generally resemble those for geese; indeed, the potted turkey recipe is intended for geese as well. Beeton gives a recipe for roast turkey only, but does describe the superiority of the breast meat and the contingent, vital importance of proper carving methods (1861:225-226). The legs of the turkey were apparently considered only fit for a bachelor's supper (and only when "devilled"), and were not to be removed during carving (*ibid*:226).

### **6.2.3. Court records: the turkey in daily life**

Figures 6.35 and 6.36 below show the locations of all crimes involving turkeys according to the Criminal Justice Records of 1676-1800, and the Old Bailey court records respectively. The archaeological evidence makes it appear that turkeys were mainly consumed or at least discarded on the East side of London (Figure 6.7), whilst they were being stolen (or otherwise involved in crimes) in Central London. This probably reflects the high number of large-scale excavations undertaken on the East side of London and the preservation of post-medieval material by the Museum of London Archaeology services and the London Archaeological Archive and Research Centre rather than a lack of turkey consumption in other parts of London.





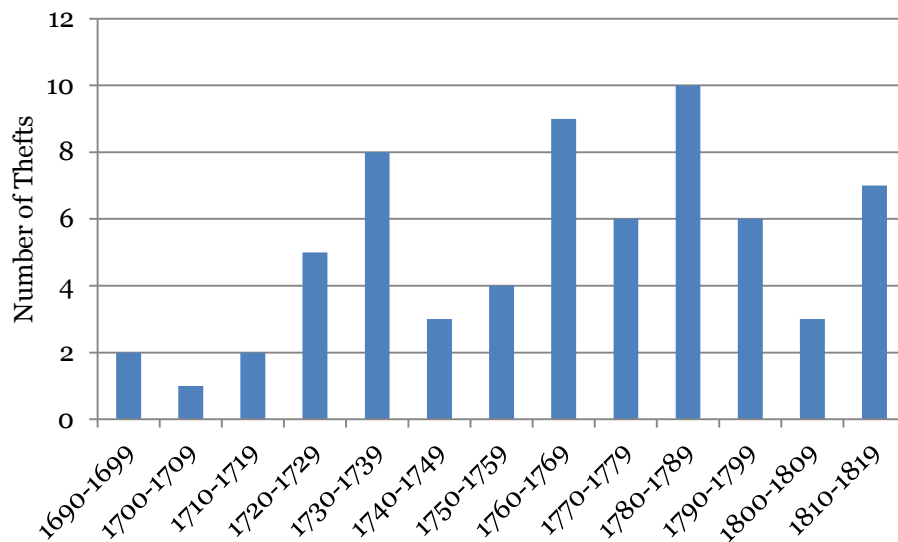
**Figure 6.35: Locations of all crimes in the Criminal Justice Records 1676-1800 with mention of 'turkeys' on Rocque's 1746 map of London (map from Locating London's Past)**



**Figure 6.36: Locations of all crimes from the Old Bailey proceedings 1674-1819 with mention of 'turkeys' on Rocque's 1746 map of London (map from Locating London's Past)**

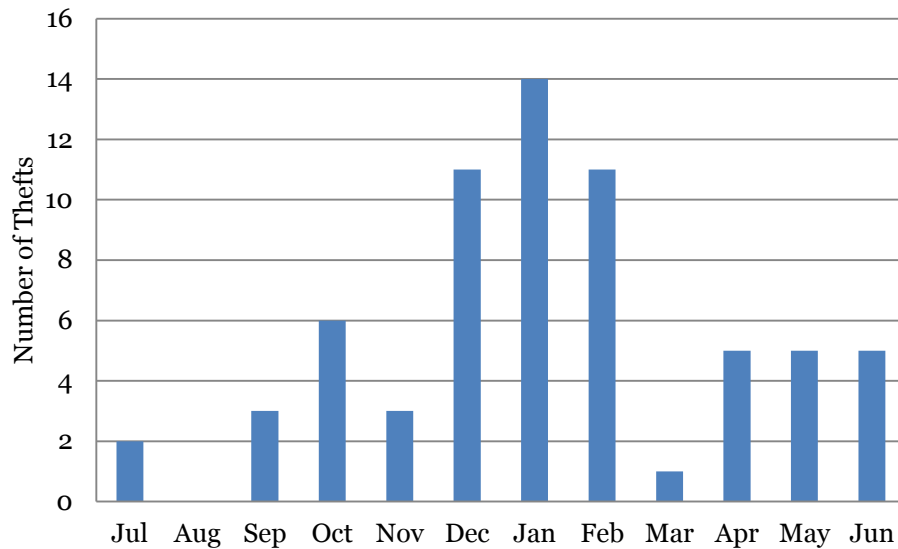
The Old Bailey Court Records provide a unique window into the lives of 17<sup>th</sup>-and 18<sup>th</sup>-century individuals and families. These people, both the victims and perpetrators of crimes, represent a partial cross-section of society in those centuries rather than only those groups more frequently considered due to their wealth or social position. In these records, it is clear

that the turkey is associated with status, but also celebration and goodwill. The gift of a turkey is used as part of an elaborate criminal ruse to gain access to a house for purposes of theft (turkeys are frequently presented as gifts) and turkeys belonging to the Duke of Northumberland were stolen along with his peacocks (London Lives LMOBPS450270156). In the case of a very young wealthy heiress abducted and forced to marry against the will of her guardian, the wedding feast features a turkey; the perpetrator was sentenced to death (Old Bailey Court Records Online t16901210-56). Despite its festive associations, live turkeys are routinely subjected to what would be considered abuse today. In these cases, they are swung round by the neck (Old Bailey Court Records Online t17950416-34), flung at guard dogs (Old Bailey Court Records Online t17650227-30) and probably suffocated in sacks into which they were stuffed during theft (Old Bailey Court Records Online t17900113-18, t18141130-55). Their treatment is not a reason for any of the court cases, but is included in the details of written proceedings. This surely reflects the prevailing attitudes to animals during the majority of the post-medieval period. These attitudes only began to change rather late in the 19<sup>th</sup> century (Thomas 1983; Ritvo 1994; Serpell 1996). Although a number of records mention turkeys and the eating thereof in passing (in one case, a discrepancy in whether a turkey had been roasted or boiled was used to discredit a witness in court; Old Bailey Court Records Online t18160214-76), 66 cases deal explicitly with the theft or unlawful killing of turkeys, often in the company of other birds. Figure 6.37 below shows the number of turkey thefts by decade from 1690 to 1819. The numbers of birds stolen varied in each case, as did the rate of theft.



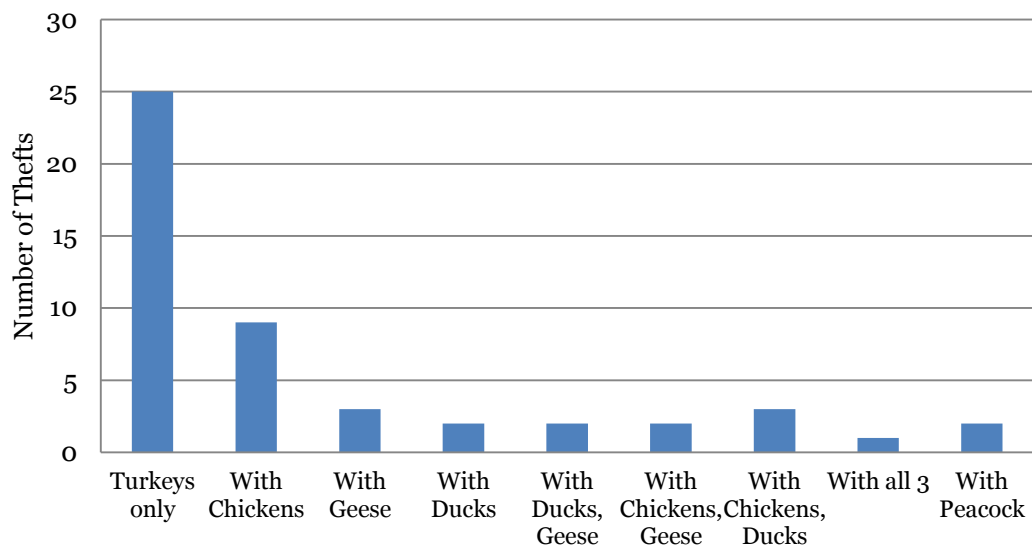
**Figure 6.37: Number of turkey thefts by decade, 1690-1819**

The monetary value of turkey hens versus that of cocks is generally the same in these records, though in one case a turkey-cock is valued at 4s and the hen at 2s. While the number of turkey thefts vaguely increases over time (Figure 6.37), the cost of the birds skyrockets in 1789 from 2-5s each depending upon age and condition to 7s and higher, perhaps a reflection of the conditions leading up to the French Revolution. Several years of poor weather conditions including severe droughts starting in 1785, at least one massive hailstorm in July of 1788 and a very harsh winter from 1788-1789 resulted in the failure of many crops and caused a 40-50% rise in the price of foodstuffs in France and similar increases in adjoining countries (Sée 1927). There is a distinct seasonality to turkey thefts, which correlates reasonably well with the documented glut of turkeys available in the autumn (Defoe 1928) and Beeton's list of months during which turkeys are available (Beeton 1861:50-55, Figure 6.38). March, April and May thefts could have involved mainly very young turkeys or turkey-cocks of more than a year in age, and the increased availability of turkeys intended in part for the Christmas table probably led to an increase in thefts during the winter.



**Figure 6.38: Turkey theft by month reported, 1680-1820**

Turkeys appear to have been a primary target for thieves, and were stolen alone or with other turkeys in 38% of cases (Figure 6.39). However, in the remaining cases, other bird species were also stolen, most frequently chickens but also ducks, geese, capons and peacocks. This probably reflects methods of keeping birds in the same general area, if not in the same structure.



**Figure 6.39: Birds stolen with turkeys**

Most of the turkey-only thefts involve one or a few birds, with a maximum of nineteen turkeys stolen at once. In terms of the numbers and general composition of the multi-species thefts, there are several instances where

turkeys are clearly targets of opportunity and a large number of other birds are stolen along with one or two turkeys. Examples include the theft of twenty chickens and one turkey cock, the theft of thirty-three geese and one turkey hen and the theft of sixteen ducks and one turkey. Even the three peacocks stolen from the Duke of Northumberland were accompanied by only a single turkey (London Lives LMOBPS450270156). Perhaps most turkey owners kept only one or a few of them for Christmas (or another celebratory meal).

### **6.3. Perception and role of the turkey**

#### **6.3.1. Access to and use of the turkey**

Sir William Strickland, one of Sebastian Cabot's commanders, claimed to have imported the first turkeys into England and although there is no textual or archaeological evidence for this, he did adopt a white turkey-cock as his family crest in 1550 (Brears 1985:9). Turkeys appear on the Strickland family mortuary monuments at the Boynton parish church, and a lectern carved in the shape of a turkey was created as a memorial to another member of the Strickland family (Figure 6.40).



**Figure 6.40: Lectern at Boynton Parish Church**

Whether they were brought across by Strickland or were conducted through continental channels, the first turkeys in these Isles were undoubtedly conductors of status and reflected the power, wealth or social standing of those who owned them. Some of these birds were probably kept for live display whilst others were exhibited at the dinner table, but once turkeys



could be reliably bred on a seasonal basis, they appear to have been adopted rapidly by those who raised other birds for the table.

The table was a realm in which those who possessed (or wished to be perceived as possessing) power could demonstrate their influence within society by displaying not merely their wealth, but their connections. The presence of luxury and exotic items upon one's table would have had an impact upon the attendant guests and may have reinforced favourable impressions of the household and family involved. Serving a resplendent "turkey pye" with glossy, fanned tail-feathers (see Figure 6.48 in discussion below) to the right people at the correct time could even have contributed to attempts at social mobility, as the prevailing cultural conditions of the period created an atmosphere in which this was feasible. Although there were problems of nomenclature and confusion with other fowl of high status or exotic origin which were also called "turkeys" (see Chapter 2), as the end of the seventeenth century approached, Francis Willughby was sure that "The Turkey being now so well known, and become so common everywhere in Europe, needs no very minute and operose description" (Willughby 1678:159).

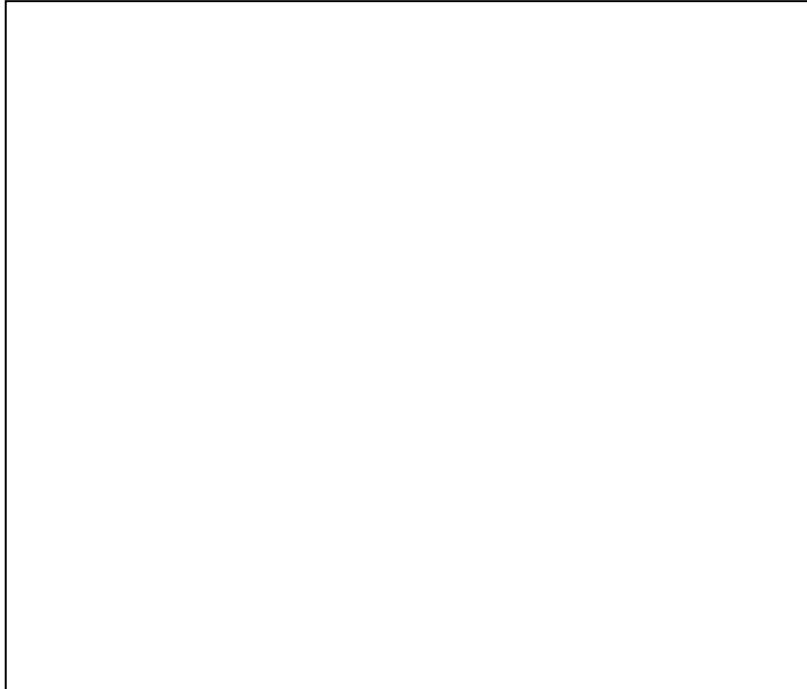
### **6.3.2. Fashionable, festive and foolish: the turkey in art and literature**

From the arrival of the turkey in Europe, it was portrayed in sketches and woodcuts whilst alive and as part of a meal and also featured in paintings, including those which were intended to evoke the mythical or ancient (Figure 6.41), in this case as part of the tribute paid to a triumphant Caesar. The early impression of the bird as numbering among things which are fine, rare and the exotic comes across clearly in such works.



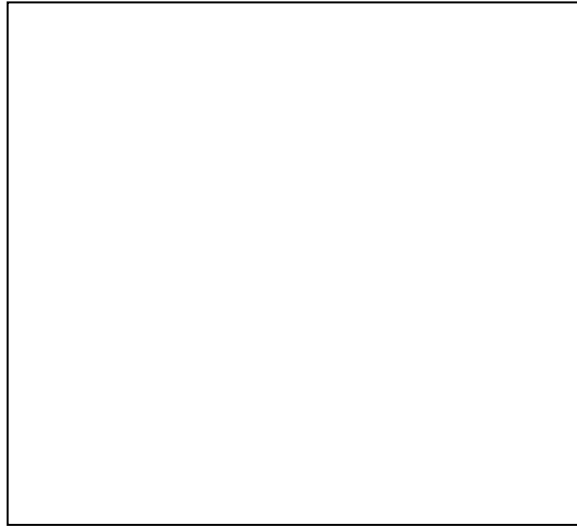
**Figure 6.41: Detail from *The Triumph of Caesar* (Andrea del Sarto and Allesandro Allori, 1582)**

The turkey also appears in paintings of imagined, idealised realities such as the Garden of Eden (Figure 6.42), and in a number of tapestries depicting more earthly but grand garden landscapes.



**Figure 6.42: Detail from *The Garden of Eden, with the Fall of Man, the Creation of Eve, and the Expulsion from the Garden* (Maerten de Vos, 1570s)**

Turkeys are sometimes juxtaposed against more conventionally attractive birds, both wild and domestic (Figure 6.43), though this is far rarer than a composition featuring other poultry or game.



**Figure 6.43: Detail from *Allegory of Air* (Jan van Kessel the Elder, 1661)**

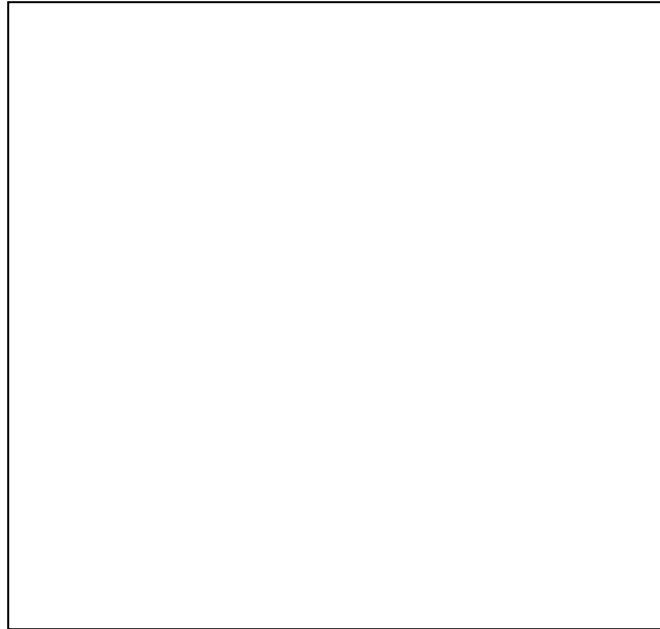
Figure 6.44 shows an ideal poultry-yard, complete with many poultry species and pigeons. A centrally-placed girl, virginal and arrayed in white feeds milk to a young lamb and is gazed upon with great happiness by two men, one of which is a dwarf. The turkeys are in the background, and no great emphasis is placed on their depiction.



**Figure 6.44: *De Hoenderhof* by Jan Steen, 1660**

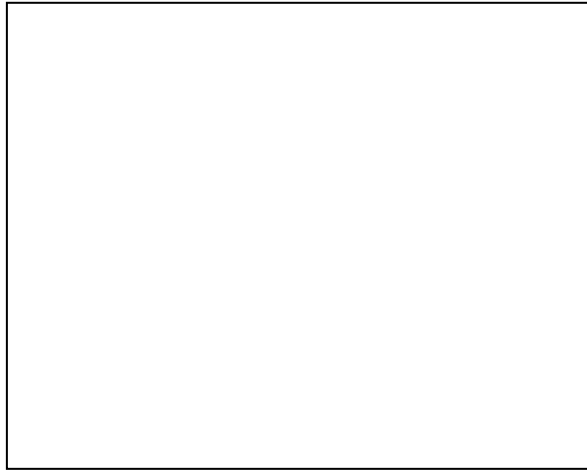


Few illustrations of the turkey capture the grace of the bird in life; even John Audobon's naturalistic portrait showed the turkey in stillness. Additionally, the turkey shown is nearly always a turkey-cock in full display (or fighting a cockerel). Figure 6.45 by Nicholas Robert gives the viewer some idea of the elegant gait and movement of the bird.



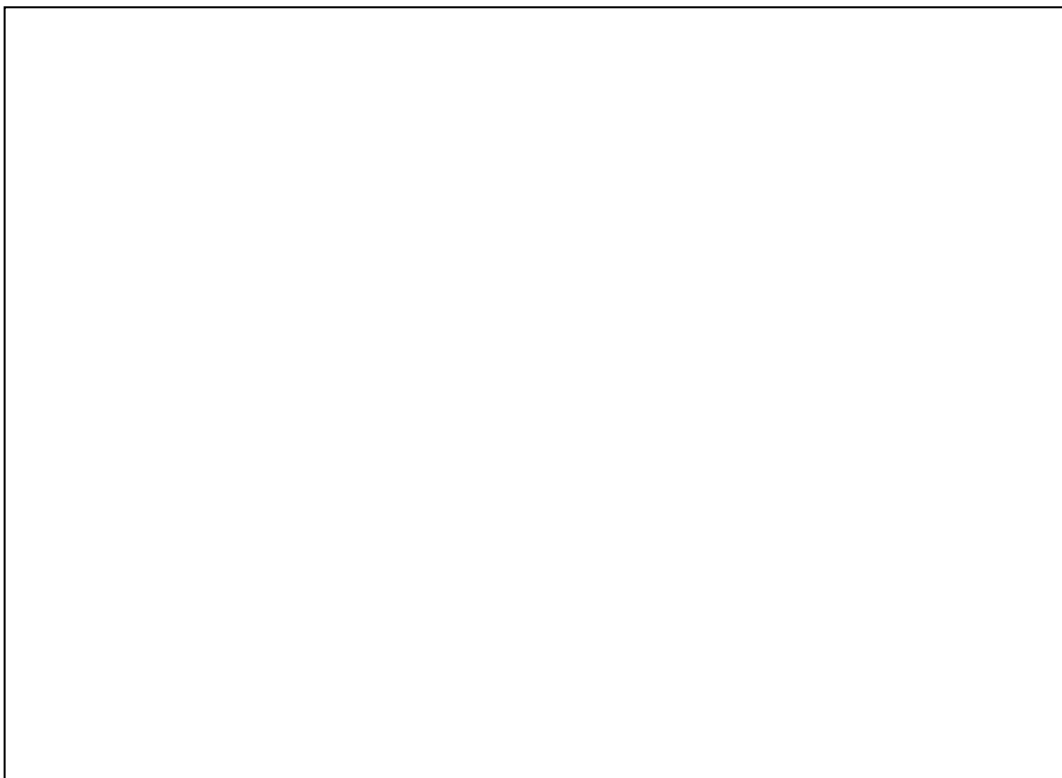
**Figure 6.45: *Turkey* (Nicholas Robert, 17<sup>th</sup> century)**

Despite its reputation for fleetness of foot, the perceived pride, territoriality and irascibility of the turkey (see literary discussion below) were characteristics far more frequently depicted and described (Figure 6.46). The behaviour of turkey-cocks may have initiated their separation from other birds and could have led to the use of the "turkey-houses" mentioned in the Old Bailey Court Records.



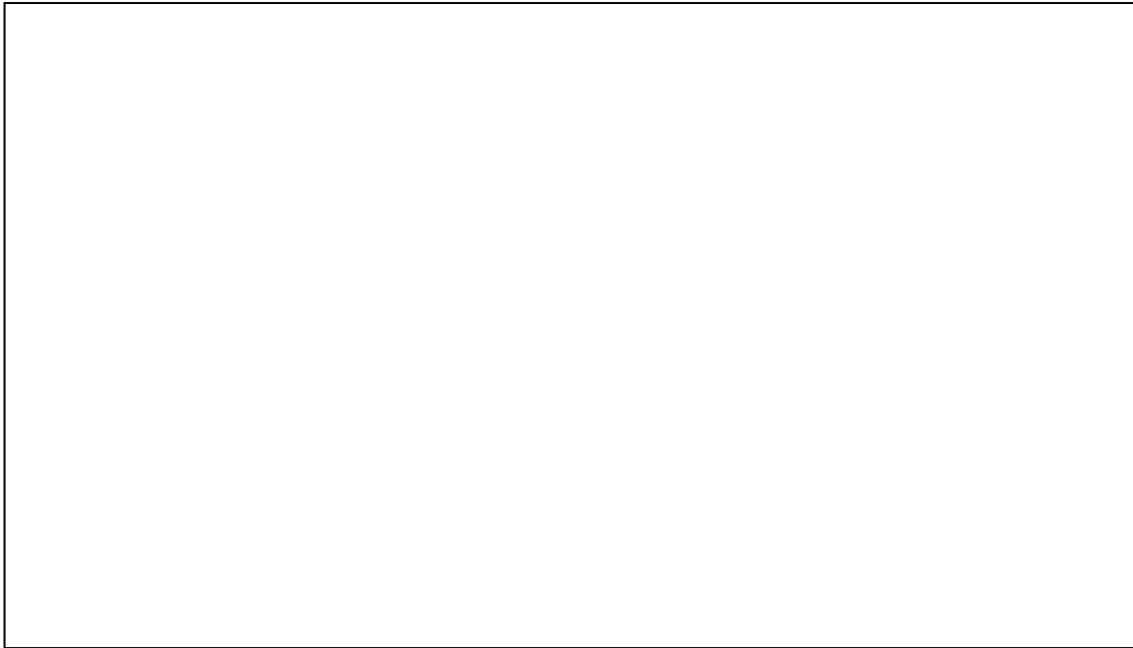
**Figure 6.46: Detail of *Fight between turkey cock and rooster* (Melchior de Hondecoeter, 1668)**

It is less common to see a portrayal of the turkey in a transitional state, as in Figure 6.47 below. It has been hung near a butcher's counter, partially plucked, and presumably prior to being cooked, presented, carved and eaten. This type of representation is part of a tradition of still-life painting which began after the Black Death; in these types of paintings, animals are often depicted as dead or dying and tend to be morbid in tone (Kalof 2007:79)



**Figure 6.47: *Still Life of a Butcher's Counter* (Jacopo Chimenti, 1621)**

Even in death, Pieter Clasz has lent turkey a certain splendour as the centrepiece of a laid table (Figure 6.48), an infrequent choice by both artists and writers who generally find the bird to be exotic but lacking in virtue. The oysters accompanying the turkey echo the line in John Gay's *The Turkey and the Ant*, written in 1727: "But man, cursed man on Turkey preys, and Christmas shortens all our days: Sometimes with oysters we combine, Sometimes assist the sav'ry chine" (Gay 1893:114).



**Figure 6.48: *Still Life with Turkey Pie* (Pieter Clasz, 1630)**

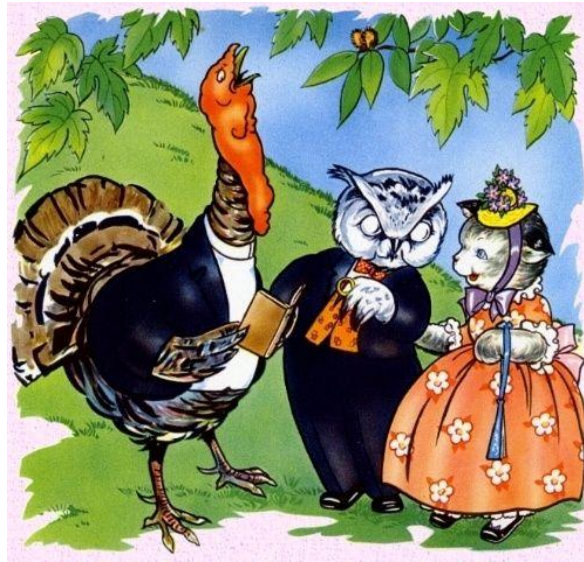
The turkey clearly filled a variety of roles after arriving in the Old World, and although some of these may have changed over time, some associations continue to this day. Chief among these (apart from celebrations and holidays such as Christmas and American Thanksgiving) are the aforementioned negative impressions of the birds' temperament and disposition.

In the continental literature, many descriptions of the turkey are derogatory. In Agostino Gallo's dialogues on agrarian life, a speaker called Vincenzo describes turkeys as dirty, dishonest and generally revolting in appearance (Gallo 1584). Charles Estienne expresses his disdain for them in *Maison Rustique*, saying that turkeys are filthy and hideous to look at, with deformed heads (1569). Olivier de Serres (1805:584) is equally unimpressed

with the bird, and writes that it is: "always greedy, and so stupid and brutish... ...Even the mothers kill their own offspring by walking on them." These opinions had evidently not improved much by the 20<sup>th</sup> century. After describing how easily turkey poults die when young (especially when subjected to the damp) Adrian Bell states that "When they become adult they make up for strengthened constitutions by becoming more troublesome. They take to roosting in trees... ...the fox has only to look at them for them to fall into his jaws" (Bell 1932:173-174).

These writers take an exception not only to the appearance of the bird and the difficulties implicit in keeping it, but also its perceived personality and character. These traits are easily transferred to human beings, and the turkey has been employed as a vehicle for conceptualisations of pompousness, vanity, irascibility and stupidity in caricatures and cartoons. It is also part of linguistic devices such as the French verb *dindonner* (the word for turkey-cock in French is *dindon*) to dupe or fool someone, or the German phrases *Wütend wie ein Truthahn* (as angry as a turkey-cock) and *aufgeplustert wie ein Truthahn* (puffed up like a turkey) (Eiche 2004:61-63). The main exceptions to this torrent of disparagement are early descriptions of their tasty flesh. Among others, Giovanni Battista claimed that turkey meat was highly desirable and that every nobleman should keep turkeys for this purpose (Gallo 1584).

There are some imaginative and even positive literary uses of the turkey. Of the four anthropomorphic characters in Edward Lear's 1871 nonsense poem "The Owl and the Pussycat", the turkey performs the important task of marrying the couple after they travel to a faraway land and acquire a ring from a local pig (Lear 1871; Ellsworth 1941). In this case, the turkey has been imbued with a clerical status or has been presented in a way which lampoons the clergy (Figure 6.49), which is slightly ironic considering that members of the clergy were the first documented group in Europe to have access to the bird.



**Figure 6.49: The Turkey marrying the Owl and the Pussycat, from *The Colorful Story Book*, illustrated by Mary Ellsworth (1941)**

D.H. Lawrence wrote a picturesque and impassioned free-verse poem called "The Turkey-Cock". He clothes the bird in flattering and graceful imagery, fully evoking its connection to North America. In the following excerpt, he asks:

Turkey-cock, turkey-cock  
Are you the bird of the next dawn?

Has the peacock had his day, does he call in vain, screecher,  
for the sun to rise?  
The eagle, the dove, and the barnyard rooster, do they call  
in vain, trying to wake the morrow?  
And do you await us, wattled father, Westward?  
Will your yell do it?

Take up the trail of the vanished American  
Where it disappeared at the foot of the crucifix.  
Take up the primordial Indian obstinacy,  
The more than human, dense insistence of will,  
And disdain, and blankness, and onrush, and prise open the  
new day with them? (Lawrence 1922:67)

The turkey taking over for the duties of the peacock and the failure of such intensely symbolic (and politically-charged) birds as the eagle, the dove and the cockerel speaks to the proverbial power of the impression that the bird has made. The reference to the attempted extinction of American First Nations peoples and the further link with Christianity appropriately weaves the symbolic turkey into the fabric of its past North American origins.

#### **6.4. Discussion**

Whilst keeping in mind that the sample size is extremely small and turkeys are sexually dimorphic animals, aspects of zooarchaeological and palaeopathological analysis of turkey elements from the UK and Éire lend support to the idea that the bird was increasingly bred for size and fast maturation. With regard to both SC and GL, the elements from the upper limbs are similar in size to those from North American turkeys, but the lower limbs show a general increase in size over time, perhaps indicating increased weight bearing requirements. This trend is particularly evident with regard to tibiotarsi. There are only two tibiotarsi from which GL (greatest length) measurements could be obtained, and six from which SC (smallest breadth of corpus) could be taken. The difference in size between the GL measurement of the tibiotarsus from the Spital Square residential area (SQU94), which dates from *c.* 1730-1800 and the Royal London Hospital (RLP05) tibiotarsus (dating roughly to the 1840s), is 32.2 mm (Figure 6.18 in Chapter 6). An increase in size over time is also present when the SC values for the tibiotarsi from the Bishopsgate area (BOS87; *c.* 1700), Spital Square (SQU94; 1730-1800) and Spitalfields (SRP98; 1770-1820) are compared with the three tibiotarsi from the Royal London Hospital (1840s) (Figure 6.24). The smaller size of the earliest-dated tibiotarsus from BOS87 could indicate that ideal turkey management strategies had not yet been devised or applied on a large scale. Although the documentary sources are not terribly forthcoming on the improvement of poultry in the post-medieval and early modern periods, it seems possible that these observed metrical differences are material evidence for the

changes brought on by intentional breeding for larger size. The palaeopathological evidence (e.g. the development of tibial dyschondroplasia) is certainly supportive of such an interpretation. This directed breeding, large-scale production and commodification of birds occurred within the wider economic trends of the post-medieval period: increasing consumerism, the institution of global trade networks and the establishment of European colonies in North America and elsewhere.

Due to their novelty, rarity and general tastiness, turkeys spread rapidly across Europe to the UK and Éire, despite their reputation for dying young and causing much inconvenience. Although turkeys have been framed as poultry in the majority of this chapter, it is worth mentioning that they were not consistently viewed in this way in Europe, especially immediately after translocation. The Queen of Navarre, Marguerite d'Angoulême, kept turkeys at her château in Normandy and gave six turkey-cocks and six hens to her daughter Jeanne d'Albret, who kept them as pets until she was sent to Plessis-lès-Tours in 1539 (Odolant-Desnos 1787:567-568). Turkeys were also imported from North America for hunting throughout the 18<sup>th</sup> century; the Earl of Leicester kept a flock of two thousand wild turkeys at Holkham Hall in Norfolk (Simon 1952). Although turkeys were kept for a variety of reasons, portrayed as an exotic object in paintings and described in vibrant terms by D.H. Lawrence, they were primarily viewed as an exotic meat product upon their arrival in Europe and classed as a valuable type of poultry which was hideous in appearance, bad-tempered and difficult to look after. The instances of maltreatment brought to light by the Old Bailey Court Records certainly correlate with a generally dispassionate or negative view of the bird, which may parallel perceptions of other animals that inhabit a neutral or slightly negative space in the post-medieval human consciousness. Although turkeys were not thought of as "noble" domestic creatures like hounds or horses, they were not treated as vermin and may therefore have been eventually categorised similarly to other poultry and

perhaps also pigs, apart from their association with holiday feasting and in the minds of a few individuals.



## Chapter Seven. Conclusion

### Pangur Bán

*Messe agus Pangur Bán,  
cechtar nathar fria shaindán:  
bíth a menmasam fri seilgg,  
mu menma céin im shaincheird.*

*I and Pangur Bán, my cat  
'Tis a like task we are at;  
Hunting mice is his delight  
Hunting words I sit all night.*

*Hé fesin as choimsid dáu;  
in muid du-ngní cach óenláu;  
du thabairt doraíd du glé  
for mu muid céin am messe.*

*Practice every day has made  
Pangur perfect in his trade;  
I get wisdom day and night  
Turning darkness into light.*

(Poem found in the margin of a 9<sup>th</sup> century manuscript; English translation by Robin Flowers)

In the poem "Pangur Bán", the first and last verses of which are shown above, the activities of a cat whose name means "white fuller" are likened to the scholarly pursuits of an unnamed monk (possibly Sedulius Scottus) living at or near Reichenau Abbey in what is now southern Germany. Although attitudes to animals in this period are often considered to be harsh in comparison to those prevalent today, the poem provides a rare example of what may be an everyday human-animal relationship in the past. Even more remarkably, the monk and his cat are presented almost as equals and one can picture them abiding in the same space: a monk at work, seated with a book and pen whilst a handsome white cat awaits any sign of his prey. Few narratives that allow such imagined, reconstructed personal moments between humans and animals are available; this makes the pursuit of archaeological knowledge extremely valuable and useful to any interpretation of past human-animal interactions.

This thesis has not only accomplished the illustration and interpretation of turkey husbandry and turkey-human relationships through the use of a holistic, multi-disciplinary approach, but has also achieved something unintended and relevant to archaeology as a whole as well as other disciplines: it has undermined strata of the economic paradigm and

demonstrated the richness and complexity inherent in the social history of just one species.

This research used a number of different data sources and types of information in the pursuit of several research objectives relevant to clarifying these human-animal relationships. From the creation of this project and its research aims, I also wished to address what I perceived as major gaps in the scholarly knowledge of the turkey. The use of translocation as the backdrop for this research, coupled with the concept of transformation as driving changes in animal husbandry allowed the creation of both long-term interpretations and day-to-day snapshots of human-animal relationships. Human actions and perceptions are vital to both of these overarching themes, and although skeletal data form the core of this research, the use of ethnographic and historical sources was vital to the conclusions presented here. Analyses of faunal bone assemblages and interpretations of the resulting data are coloured by the perceptions of the person conducting the research, and while this study will be affected by my own background and biases, some unexpected patterns and themes have emerged and it is my hope that the diverse sources employed have helped to balance my interpretations.

### **7.1. Research endeavours**

Four primary research aims have driven the production of this thesis; all of these were constructed out of a desire to use zooarchaeological and palaeopathological data to help clarify changing human-turkey relationships and enhance our understandings of the role of the turkey in the American Southwest and the post-medieval Isles of Ireland and Great Britain. It is clear that in both places, the bird inhabited multiple roles and that in addition to simply producing useful materials, the turkey was used as a symbol. The turkey of the American Southwest was said to have been representative of the earth and had the power to inspire the formation of rain clouds (Chapter 5), whilst the post-medieval turkey of the Irish and British Isles was initially a symbol of power and prestige; its display

represented far-reaching access to exotic goods. In the American Southwest, the turkey undoubtedly provided mundane goods including meat and eggs as well as material for the creation of bone tools. Its feathers were used for practical purposes such as manufacture of clothing; yet feathers from the same bird were essential in the creation of highly symbolic regalia and prayer sticks.

The palaeopathological evidence (and ethnographic descriptions) for turkeys being plucked repeatedly whilst live suggest that the bird was viewed in a way similar to the sheep in the post-medieval period rather than as an object composed only of meat, a simple source of protein which was necessary for survival in a marginal environment. Certainly the turkey was a familiar creature to the peoples of the American Southwest prior to the arrival of the Spanish and its skeletal remains are commonly recovered from archaeological sites; however, the understanding of its role in the daily lives of peoples in the past and the day-to-day life of the turkey has been limited. In the sections below, I describe the contributions that this research has made to our knowledge.

## **7.2. Application of new methodology, data collection and comparisons**

An essential requirement for the research aims was the collection of data and explicit application of the new palaeopathological recording protocol designed by Vann and Thomas (2006; Vann 2008) for this purpose. In Chapter 4, I used it in combination with Cohen and Serjeantson's zoning method (1997) to examine frequencies of disease and injury present in turkey populations from multiple sites in the American Southwest as well as in Chapter 6, though in a more limited fashion. Although I employed slightly more specific descriptive terms, the methodology was ideal for examining past patterns of disease and served well in the comparison of multiple assemblages with varying characteristics. It is my impression that while this protocol would be well-suited to routine zooarchaeological

analyses, it would also be extremely useful when applied to other species within a similar, long-term framework or for any analysis of pathological elements in a faunal assemblage.

As a result of using this approach, it became obvious that traumatic injury, including fractures, were not equally represented across sites, and thus unlikely to result from purely random factors. Other authors had previously suggested that traumatic injuries in turkeys occurred when humans would tread on the birds (McKusick 1981:52) or, in keeping with their perceived ill-temper, when turkeys would fight amongst themselves. The behavioural literature implies that bodily injuries do occur during male-male competition, but they are rarely serious and affect areas of the body such as the head and neck (Dickson 1992; Schorger 1966). Elements from these parts of the body are less likely to survive in the archaeological record due to their size and structural fragility.

I had previously considered the possibility of a husbandry-related cause for fractures in ulnae noted at the Bluff Great House (Fothergill 2008:146), but have shifted my interpretation away from methods of controlling movement. Upon further research, reflection and comparison with pathologies from other assemblages, I believe that it is much more likely that these injuries and similar trauma to ulnae from the Eleventh Hour site, the Bluff Great House, Salmon Ruin, Eleanor Ruin, Arroyo Hondo and Tse ta'a could have been inflicted during the harvesting of feathers. Lesions affecting the skeletal tissue at the papillae of the ulnae at Eleanor Ruin and Arroyo Hondo are further support for this (see Figures 4.46 and 4.50). Adjacent wing elements (e.g. humeri and scapulae) could also have been affected, but smaller elements toward the distal end of the limb were probably subject to loss depending on the excavation and processing methods used at each site (see Chapter 5). Male turkeys moult their flight feathers sequentially approximately every 180 days (Dickson 1992) but if plucked, these feathers will begin to re-grow immediately. Furthermore, a plucked feather will be of far superior quality than a moulted feather, which will have lost its sheen

and reached the end of its functional life. Depending upon the number of turkeys kept near each site and the need for the types of feathers that required plucking, this harvesting may have been routine and/or seasonal and could have been practiced on a large scale and involved many members of the community.

With regard to the lower limb fractures, the amount of deviation from the anatomic axis and general condition varied, but in comparison to similar lesions from other sites, the tibiotarsal fracture from the Bluff Great House was the least displaced and was well-healed. Even after adjustments to compensate for differing analytical approaches, the Bluff assemblage also had the lowest overall pathological prevalence and consistently large elements (see Chapters 4 and 5). This leads me to suggest that the turkeys from the Bluff site were husbanded with a great degree of care.

### **7.3. Differences prior to and following Spanish arrival**

In Chapter 5, I examined diachronic and regional incidences of disease and injury and have discussed methods of turkey husbandry in the American Southwest prior to and throughout the period of Spanish colonial activity. This comparison, unfortunately, can only be carried out between the Salinas Pueblos of Quarai and Gran Quivira and the other assemblages from the American Southwest. Whilst there are commonalities between the other assemblages and the Salinas Pueblos (for instance, in some element sizes and the sex composition of the turkey population) they differ in several ways. The major discernible differences are in the proportion of turkey in the assemblage (both Quarai and Gran Quivira are very low) and the types of pathologies present in turkey elements. Although both sites have high pathological prevalences (see Chapter 4), trauma is not a dominant category and a greater diversity of pathologies is present (particularly at Quarai) with joint disease, infection/inflammation, exostoses (both osteophytes and enthesophytes) and bowing present. Although the Salinas Pueblos are only about 30 miles (48 km) apart and are collectively different from the other assemblages in this study, their faunal assemblages are distinct from one

another in a few ways. At Quarai, the turkeys are larger, the population has more males present, and the pathological prevalence is higher. I theorise that although these differences could result from excavation strategy or differential effects from the severe, mid-17<sup>th</sup> century famine affecting these pueblos, it is possible that external influences (in the form of the three priests who resided at Quarai) affected husbandry practices at the site and caused some of the disparities between the two assemblages (Chapter 5). The requirements of these priests may have included a supply of certain numbers, sizes or types of turkeys, and their expectations were doubtless different from the local First Nations people of these Pueblos. Similar effects upon animal husbandry practices have been documented in mission contexts elsewhere in the American Southwest (Pavao-Zuckerman and LaMotta 2007).

#### **7.4. Palaeopathological differences post-translocation**

There were three pathologies present in the post-medieval material from the Royal London Hospital which were described in Chapter 6. Although I intended to interpret the impact of the translocation of the turkey to Great Britain and Éire on the nature and frequency of disease and injury in the species, three bones is an extremely small sample size from which to extrapolate major trends. However, considering the small number of turkey bones which I was able to access, their presence is important and it is possible to use this data to clarify the later post-medieval approach to turkey husbandry methods and perhaps some facets of how the species was managed. As a starting point, radiographic analysis was used to complete a differential diagnosis of these pathologies and has revealed that these elements belonged to individuals suffering from avian tibial dyschondroplasia, a condition which was not recorded in the pathological turkey bones from North America (Chapter 6). Although some tibiotarsi from the American Southwest are similarly warped, none of them exhibited the articular destruction characteristic of avian tibial dyschondroplasia and these changes were more likely the physical manifestation of osteomalacia

or rickets. Both conditions can be linked to diet; however, tibial dyschondroplasia has been specifically associated with fast-growing breeds of poultry and the occurrence of this disease indicates that this trait was important in the production of the later post-medieval turkey. The proportionately large size of turkey leg elements as compared to wing elements also supports this notion (Chapter 6). Although the poultry industry was not perceived as a major target for improvement in the post-medieval agrarian literature, these elements clearly illustrate that at least some producers had intentionally selected and bred for a larger, meatier bird that reached ideal weight rapidly.

### **7.5. Translocation and transformation**

In Chapters 5 and 6, archaeological data as well as historical sources were used to clarify the translocation driven transformation in the perception and role of the turkey as well as diachronic changes in access to the bird. Turkeys were symbolically linked with change and transformation; their visual displays and colour-changing wattles may well have inspired this association. In one telling of the Turkey Girl story from Zuñi (Chapter 5), the turkey-cocks of her herd had the transformative ability to change the physical nature of garments and other objects which they danced and strutted across. The human conceptualisation of the turkey as a feather provider could have led to breeding for feathers of certain colours or textures, traits which may have been of importance to those who kept the birds. Although feather qualities may not be obvious from skeletal material, the narrowing in skeletal element measurement ranges over time suggests intentional breeding. Whatever these desired characteristics were, the practises used by post-medieval turkey keepers were to push breeding in an entirely different direction. Upon translocation, the initial European perception of the bird represents an immediate change. This difference, particularly once the turkey becomes widespread and accessible, leads to an eventual alteration in the size and shape of the bird over time, driven by the conceptualisation of the turkey solely as meat.

Although the turkey occupies multiple roles within the minds of peoples on both sides of the Atlantic, it occupied these concomitantly in the American Southwest and was perceived in different ways across space and time (Chapter 5). The social position of the turkey seems to have been similar across the documented portions of the Isles, but was not a static construct and changed over time. Initially, people with wealth or social connections had access to the turkey, and it featured with other delicacies on the dinner tables of those who could afford to be decadent and fashionable or to whom appearances were socially vital (Chapter 6). Within a century, however, the mere presence of turkey was not sufficiently remarkable to warrant attention and with the industrialisation of production more people were able to access the bird. In turn, larger, heavier and more attractive turkeys may have been sought for social display and consumption as Christmas dinner centrepieces.

Although the sample discussed is small, the size increase in tibiotarsi over time discussed in Chapter 6 (Figure 6.24), in combination with the presence of tibial dyschondroplasia in the later elements suggest that the overall morphology of the bird was changing throughout the post-medieval period. The turkey in the Old World was not only perceived differently and transformed within the realm of human conceptualisations, but it was also physically transformed over time as a result of these perceptions. More skeletal data from a greater variety of contexts, particularly in the Isles, would be of inestimable value with regard to interpretations of translocation and transformation of the turkey and other imported species. Research on the post-medieval poultry industry could also make a large contribution to our understanding of the social histories of birds imported to the UK and Éire from abroad. In the paragraphs that follow, I highlight certain aspects of this research area and related ones which I feel have been passed over or have the potential to be most illuminating.



## **7.6. Recommendations for future research**

A common thread throughout this thesis has been a lack of scholarly attention to historical or post-medieval material on both sides of the Atlantic Ocean. In addition to a lack of excavated and curated assemblages, other problems do exist. In the American Southwest, that period of study (AD 1500-1950) is not only perceived as less physically impressive and engaging than examinations of monumental Chacoan Great Houses, but can be considered a cultural minefield. Arguments over which groups, both native and colonial, own the past and the biases innate to the written records of the period pose challenges to archaeological interpretation. At what point will the wider, international importance of the possible contributions which zooarchaeological insights provide outweigh the difficulties? The situation is slightly different (but no less problematic) in Europe, where the British and Irish Isles are part of a small number of countries who engage with post-medieval material from an archaeological perspective and openly share this data (see Figure 6.4). Histories are, as it were, still written by the victors and those individuals with the ability to write them were often in positions of power and will not have adequately or accurately represented the reality of the time. I recommend a unified approach in which archaeological data of multiple types from the post-medieval period are used in tandem with a diverse variety of other sources (historical, ethnographic, literary, iconographic, etc.) to complement each other and ultimately evaluate and attempt to interpret the past, rather than utilising one approach and criticising the other as flawed in certain ways.

The perceived value of animal palaeopathology is growing, but still being cast off as less useful than other types of analyses in zooarchaeology (Lyublyanovics 2010:184) or tacitly ignored. While a lack of a standardised recording practice had hampered attempts to analyse and compare collected data, Vann and Thomas (2006) and Vann (2008) have developed such a framework. If nothing else, this thesis proves some of the broad applicability and usefulness of their recording protocol. Not only does palaeopathological

data inform upon aspects of animal and potentially human health, but it can also serve to illustrate husbandry methods, human attitudes to animals and even reveal facets of human-animal relationships. These subjects are of interest to specialists but also have a wider applicability and can advance our knowledge of the past in ways that are not possible with other approaches. No animal bone analysis should overlook or discard palaeopathological data, and future large-scale projects involving multiple disciplines or sub-disciplines should make an effort to incorporate animal palaeopathology as a zooarchaeological research priority and not simply categorise pathological bones as "interesting" but unworthy of further study when they are encountered. Additionally, if no pathologies are encountered during a study of faunal material, a brief statement to that effect would be most welcome to scholars in search of data for comparative purposes. Pathological research also generally favours large, mammalian species rather than avians (e.g. Davies et al. 2005; Thomas and Miklíková 2008); part of this bias is surely due to the survivability of elements from these species, their large size as compared to most avians and their frequency in assemblages. Studies of avifauna do exist, but with a heavy bias toward wild or exotic birds rather than domestic species (see Chapter 4). More investigations in a vein similar to Erika Gál's study of pathological lesions in the domestic chicken (2008) would be of great value in applying palaeopathological knowledge to questions of animal-human relationships and husbandry methods whilst also providing useful threads of research which could be incorporated into larger-scale projects or used in comparative studies.

In some cases, deeper interpretations of pathologies involving the sex of affected individuals were not possible for this project because pathologies often obscure the true length of an element and only length measurements have been analysed and correlated with sex. A thorough analysis of the complete series of measurements described by Cohen and Serjeantson

(1996) of both male and female turkeys would be useful for future metrical investigations of the species.

Archaeological research lends itself to multi-disciplinary and cross-disciplinary analyses, and specific research questions would achieve deeper, more meaningful results if they were approached from several scholarly angles at once. Studies of turkey husbandry in the American Southwest have used eggshell analysis (Beacham and Durand 2007), ancient DNA (Speller et al. 2009) and isotopic analysis of turkey diet (Rawlings and Driver 2010). A study which applies these analytical techniques (in addition to palaeopathological and palaeobotanical analyses) to multiple assemblages from sites with known architectural features or areas clearly associated with turkey husbandry could be particularly valuable and revealing of husbandry methods and diachronic change in related practices. Although even the most multi-disciplinary approach to such material will not fully illustrate the past, the use of complementary techniques has the potential to provide a fleeting glimpse of daily human-turkey interactions.

Women were actively involved in the keeping of various avian species, particularly domestic poultry, in England and probably the rest of the United Kingdom and Éire. Although it seems to be common knowledge that women were involved in keeping and rearing poultry, few historical authors (with the sole exception of Joan Thirsk) have bothered to comment upon that link and the seemingly latent connection between women and poultry species. This relationship crossed social and political boundaries and is still present in some locales. To one former resident of a landlord village in Iran, the possession of chickens was firmly equated to the presence of a woman: "I don't have chickens" he said, "I have no wife" (Young, pers. comm. 2012). To the best of my knowledge, there are also no zooarchaeological studies which clearly associate the two realms and although archaeologies of gender are complex, it seems prudent to consider the implications of the fact that whilst post-medieval men were writing the animal husbandry manuals, women of the same period were keeping these birds and (in some cases) driving

innovation in fattening techniques and marketing (see Chapter 6). The investigation of female involvement in poultry husbandry (including egg and feather production), particularly with the use of both documentary and material evidence, could reveal a great deal about two neglected areas of study and their intersection. Investigation of the involvement of other overlooked parties (e.g. slaves, the elderly, children, the disabled) in animal husbandry more generally would also be of great value.

Although the general lack of attention to zooarchaeological materials from the post-medieval period is certainly cause for concern and frustration (Thomas 2009), another trend noted during the course of this study also bears mentioning. For what appear to be purely historical reasons, the agrarian literature on the time period has a very clear bias toward England and within England, toward the city of London. In addition, the most accessible faunal assemblages used for the purposes of this thesis originated from and were held in London. Little research on animal husbandry and animal health has been published using data from the other countries of these Isles (Northern Ireland, Wales, Scotland and Éire), though Eileen Murphy does provide a brief overview for all of Ireland (2007). Research projects have surely resulted in the excavation of large quantities of faunal material from these countries, but without unlimited temporal and budgetary constraints, it is difficult for a researcher to determine their disposition, the repository at which they are held or if they have been previously analysed. In contrast, a great deal of information on English sites is freely available from the Archaeological Data Service and the Museum of London websites. The development of trans-regional, searchable online databases and accessible zooarchaeological syntheses would contribute greatly to the adjustment of this imbalance.

## **7.7. Dead turkeys do tell tales**

This thesis has been productive in achieving the primary research aims that were set out in Chapter 1, though with some notable limitations which have been discussed above and in Chapter 3. The methodology was successfully

applied and the palaeopathological data which was gathered has informed upon husbandry methods used with domestic turkeys in the American Southwest from AD 900 to 1678. If the turkey was, as it appears to have been, a multi-purpose domesticate supplying a number of products for a variety of purposes (as opposed to primarily meat) then the assumption which follows is that (unlike the later post-medieval turkey producers) the peoples of the American Southwest were selecting for more than just maximum size (and the rapidity with which the bird reached that size) when carrying out their breeding practices. Additionally, there are also distinct traits that distinguish assemblages from the sites which were occupied during European contact and the period of Spanish colonial activity that followed. All sources, including the pathologies, suggest that the husbandry methods used in England (and quite possibly other countries in these Isles) were unsurprisingly very different from those used in North America; this was probably driven by differences in the human perception of the species. Furthermore, we may also then postulate that the Spanish colonial contact and translocation of the turkey is what caused the transformation in the perception of the bird and the accompanying shift in its size and appearance as a result of the ways in which it was bred. Unfortunately, some aspects of post-medieval history and archaeology have been understudied (see Chapters 3 and 6) and the poultry industry is certainly one of the neglected areas. Possible reasons for this lack of investigation are the perceived lack of value of poultry (and their products) in comparison to other animals, the association of women with the industry from an early period (Farmer 1991) and the negative attitudes of men to agricultural efforts which were viewed as "women's work" (Thirsk 1997:194-195). It is important to acknowledge these views as they inform upon the social context of research, but they need not continue to dictate the pursuit of historical or archaeological study on topics once perceived as unimportant.

While some domesticates continue to be perceived as noble companions (for instance, the horse and the hound), modern attitudes toward poultry are in part the products of our past manipulation and husbandry efforts. The changes which have led to the creation of the modern turkey include selection for large-sized birds and the development of faster-maturing breeds; these alterations were accompanied by the occurrence of diseases such as tibial dyschondroplasia. When combined with production techniques that require removal of poults from the hen at a very young age, these changes may well have driven the evolution of our perception of the turkey to the point at which we often consider it to be a bloated, idiotic object of derision. An animal that survives to an age of 12-14 years (Dickson 1992) is now routinely slaughtered at the age of 9-24 weeks. It is no small wonder that the avatar of an Aztec god (Chapter 2) has undergone transmogrification into a greedy, prideful buffoon that Americans would drop out of aeroplanes for the purpose of entertainment (Davis 2001). According to a journalistic exposé of the "turkey drop festival" in Yellville, Arkansas, during which live turkeys would be dropped out of aeroplanes, a turkey that survived the 1,000 ft drop (after some of its comrades encountered trees, office buildings and telephone poles) "hit the ground, shocked and dazed, and tried to walk... pitifully trying to run on two obviously broken legs before it was crushed to death by a pileup [sic] of kids" (Blosser and McCandlish 1989).

In essence, the modern treatment and perception of animals results indirectly from human actions in the past and the transformative power involved is remarkable, perhaps even surprising. The social journey taken by the turkey, a visually distinctive animal and larger-than-life figure, is only one of hundreds experienced by different species, both domestic and wild, that have been translocated to destinations both environmentally and culturally diverse from their land of origin during the course of human history. We should consider the archaeologies and histories of these travelling companions, Umberto Albarella's "animals in exile" (2002), to be

worthy of continued research and relevant to emergent discourses that focus on daily interactions and relationships between humans and animals. In the words of Steve Lekson, "Sing the benediction: More research is necessary" (Lekson 1999:187).

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