Social Taphonomy:

Agency, Biography and *Chaîne Opératoire* of Cattle Bones in a Mediaeval European City

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Abstract

This PhD sets out to tackle the subject of animal bone material from heterogeneous pits, especially on the edge of Mediaeval European cities. These are often the most common feature encountered by zooarchaeologists yet the analysis given them often does little to add to our understanding of the lives and actions of the people who lived and worked in the city, or of the city's relationship with its region or hinterland. Chapter 1 reviews the approaches taken to answering some of these questions by zooarchaeologists in the past as well as outlining the history of taphonomic research as it applies to the question. Chapter 2 aims to provide context to current approaches to the subject through a brief overview of relevant urban history. Chapter 3 focuses on how zooarchaeologists have studied butchery, other carcass related products and their waste. This current approach is typified by a standard, or traditional, analysis of an assemblage from Princesshay, Exeter, South West Britain (a previously unstudied assemblage), in Chapter 4.

The second half of the PhD takes a different tack. Having presented the status quo, chapter 5 looks at how similar questions from other allied branches of archaeology have been investigated. These conceptual models are used, in combination with the established approaches already identified, to propose a new model based on *chaîne opératoire* theory for analysing the flow of Mediaeval urban fauna material that make up the final assemblages of individual contexts. It is suggested that through an understanding of the Guilds, and therefore memes, of industry in the city (recognising the raw materials and wastes from the varied processes/trades), the animal bone data can provide further insights into society and the city from the same typical heterogeneous pits and ditches that ordinarily provide so little cheer for zooarchaeologists. In a short test-case, and again in chapter 6 with a large case study, the potential of this new model (using *chaîne opératoire* theory to inform interpretation of routinely recorded zooarchaeological information (including representation of particular body parts e.g. horns, ribs, vertebra, skulls, feet and modifications such as butchery evidence chop/cut/fracturing)), is explored by applying it to the same dataset from Mediaeval Exeter analysed in the first half of the PhD. The additional insights provided by the new model are then discussed. Employing this model in Princesshay suggests the development of a intricate system of trade specialisation and societal complexity between the earlier and later periods of Medieval Exeter in a more nuanced way than could be understood through the earlier analysis.

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Acknowledgements

All PhDs are a struggle in one way, shape or form. This particular PhD has struggled through two universities and several advisory teams. I was initially inspired to work with material from Mediaeval Exeter by Mark Maltby, to whom I will always be grateful for his patience and support. It was John Allen who first suggested that the material from the recent Princesshay excavations in the city centre might be suitable for the study; another kind, patient and gentle man, like Mark, his backing and tolerance were vital at certain stages in the project's development. Arriving to begin my research at Bournemouth University, Mark was unable to supervise the project and instead Ellie Hambleton supervised the early stages of research, as I outlined a recording strategy and began my data collection while considering bigger questions about city development and urban ecology, and Clare Randall advised me. Clare's friendship and advice were eventually to prove pivotal in the 'big move'. When Ellie took maternity leave, coincident with Clare's contract with the university finishing, Kate Welham was nominated to take over supervisory duties for the project and it was shortly after that that the project moved to York.

Terry O'Connor's enthusiasm for this project was tangible and I cannot thank him enough both for welcoming me to York and for his valuable advice, guidance, care and attention. Without Terry and his encouragement my PhD would not have taken the form that it finally did, re-examining pre-depositional taphonomies against an informed theoretical background. After around eighteen months I met my TAP team at York; Steve Roskams is to be commended in trying to keep the project moving against a background of my conflicting work and research pressures as a part-time student and in trying to ensure a clear relevance and focus for the project within the wider archaeological community; Allan Hall's advice was to the point and encouraging in valuing the direction that my research was then taking. By the time of my next TAP meeting, Allan had left York and Kevin Walsh replaced him on my TAP team. Kevin brought a thorough understanding of taphonomy in the wider archaeological sphere to bear on the project and his advice in hunting out extra references was welcome. The final reshuffle occurred with Terry's retirement, when Steve took over as my official supervisor, a change which proved vital in the dying days leading to submission. My examiners, Richard Thomas and David Orton, were the final academic leg upon which this work was built and they are to be thanked for helping to buttress the framework.

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Who encouraged a love of animals and the natural world, taught me to always ask ‘why?’, to work hard and to follow my dreams.

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Declaration

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as References.

1. **Introduction**

> *‘Although studied as an independent population, bones must eventually be integrated into the spatial context from which they were first drawn… They must contribute to our appreciation of variability and its causes in the archaeological record.’* (Gamble, 1978, 347)

Towns and cities are, for some, a defining feature of complex societies (e.g. Cohen, 1976; Basham, 1978) and are, in themselves, complex entities where a variety of different human activities are carried out and where the resultant archaeological signatures of those activities are usually entangled. That archaeological contexts are usually the result of several different activities, or the same activity being carried out many different times, is one reason that the archaeological record is imperfect. The imperfection of the record is usefully employed by zooarchaeologists, who regularly combine different contexts in order to form larger, more statistically viable, samples for site-wide but period-specific interpretations of economies and the environment.

It should not be lost sight of, though, that the combining of several different contexts, however much it may decrease the potential error of assumptions, is facilitated by the broad similarity of many contexts. Most archaeological contexts, including those producing faunal material, are essentially heterogeneous in nature and so it becomes easier to consider them *en masse*. This simple underlying principle is highlighted by the fact that the many zooarchaeological studies which consider a particular activity are often prompted by the discovery of a context or other assemblage which is unusual for its homogeneity in one way or another (i.e. the almost or total dominance of one animal, species or skeletal element or selection of elements) (e.g. Driver, 1984; Morris, 2008; Broderick, 2012). This focus on identifying activities through unusual deposits can only mask the true extent and frequency of such activities, perhaps even concealing some altogether, so significantly altering our understanding of life in the societies studied.

This project aims to identify a method for revealing the activities (pre-depositional taphonomies) alluded to above through the development of a new model, so furthering our understanding of the zooarchaeological record and, thus, the people that are the focus of archaeology. Zooarchaeologists have employed models, principally derived from ethnographic, experimental and biological research to identify several taphonomic processes in the past – indeed, taphonomic considerations are now integral to most zooarchaeological interpretations – and the first part of this thesis will outline the development of such study, drawing attention in particular to those discoveries most pertinent to the present subject. Immediately following this discussion, a piece of slightly shorter length considers the approaches taken to identifying taphonomic signatures by archaeologists studying urban environments.

By focusing research on the urban environment, it will be shown that patterns can be identified in even the most complex assemblages, deriving their material from a multitude of different processes and activities – often several acting sequentially on the same material. To provide the necessary background for such a study, a brief history of British Mediaeval towns and cities will be outlined in chapter 2, stressing those parts of life which zooarchaeological research can illuminate.

In chapter 3 the study of butchery and carcass disposal in Mediaeval towns and cities will be reviewed, emphasising the taphonomic models proposed and applied to the study of this material in trying to identify the crafts and trades carried out. The importance of identifying these industries to our understanding of British Mediaeval urban life will already have been made clear in the previous chapter.

A case study is introduced in chapter 4 by way of ensuring that readers are fully aware of the approaches typically taken in the study of fauna remains in Mediaeval cities. This is based on original data from recent major excavations in the city of Exeter, in South West Britain. Exeter was once the pioneer city for Mediaeval archaeology but has been poorly investigated ever since: this new study will aim to shed some new light on our understanding of the city whilst still essentially epitomising where such studies are now.

A new model for interpreting urban zooarchaeological material is presented in chapter 5, which begins by emphasising the need for such a new model. After the case is made, approaches to similar taphonomic problems are considered from other subjects and their suitability to the specific problems presented by urban environments is considered. These arguments will be refined and developed in the final part of the chapter, which presents the new model in full.

In order to demonstrate the usefulness of the new model a lengthy case-study is presented in chapter 6, which reconsiders the data from Exeter presented in chapter 4, emphasising the results of applying the model and the resultant new interpretations that can be formed.

Finally, the whole project is discussed, bringing together the different lines of evidence considered and presenting the most important points of the model and the insights which it can provide us with into complex societies and zooarchaeological assemblages. This demonstrates not only the importance of understanding the pre-depositional taphonomic signatures acting on an assemblage for understanding the society and environment from which they derive but also the viability of identifying such signatures for zooarchaeologists.

1.0.1 Research Questions, Aims and Objectives

This thesis presents a new model for interpreting fauna remains from archaeological sites, developed in the context of the Mediaeval Urban environment. It fits within a growing corpus of archaeological work examining Mediaeval urban life through environmental and artefactual analysis (Jervis et al., 2016a) and alongside current developments in zooarchaeology, which puts greater emphasis on theoretically informed models and the recognition of animals as more than food (Marciniak, 2016; Russell, 2012). The following research questions were identified as primary aims of this PhD:

1. Can we gain a greater insight into the workings of a society through its fauna remains and standard zooarchaeological methods than we currently do?
2. Can material culture theory be used effectively in developing a new model for aiding zooarchaeological interpretation?
3. What does the use of such a model tell us about a society that traditional analysis does not?

1.1 Social Taphonomy

'Archaeological evidence in general, and animal bone assemblages in particular, are not a passive reflection of normatively understood processes, functions, activities, etc.

> *Rather, they are to be seen as a medium of social life through which humans live in a world which they change and modify but which also transforms them.'*
>
> (Marciniak, 2016, p. 2)

Many readers will have instantly recognised the similarity between the phrase 'social taphonomy', used in the title here, and 'social zooarchaeology', a term championed by Arkadiusz Marciniak. As the above quote makes quite clear, we are both seeking some of the same goals, drawing on a rich new vein of archaeological theory in order to better use zooarchaeological evidence to develop our understanding of past human societies. 'Social Zooarchaeology' has also been used by Nerissa Russell (2012) as a term for an approach to zooarchaeology which is more closely aligned with anthrozoology (e.g. Argent, 2016). This paradigm sees non-human animals as sentient beings that are agents in their own destinies and as being equally important and worthy of study as humans (Hurn, 2010; Yates and Koler-Matznick, 2006). Essentially this is analogous to gender studies in archaeology (e.g. Dobres, 1995; Tringham, 1994) and may, like that turn, present important new understandings as we begin to view and interpret our evidence differently.

Leaving aside the somewhat broader approach to social zooarchaeology as advocated by Russell, then, it is worth noting that Marciniak never refers to 'social taphonomy' in his most thorough presentation of 'social zooarchaeology', *Placing Animals in the Neolithic: Social Zooarchaeology of Prehistoric Farming Communities*, from which the above quote was taken. In fact, although it is an indexed term, the word taphonomy appears only fifteen times in the book's nearly two hundred and fifty pages. By contrast, the terms 'refuse' and 'disposal' appear one hundred and forty three and seventy nine times, respectively. Noting this is not meant to be a criticism of the book but merely an illustration of the rather different emphasis of this treatise from that one. In fact, Marciniak appears to adopt a far more restricted definition of taphonomy than I do here, principally using the term to describe weathering and modification by carnivores (2016, pp. 103–105).

As I point out later in this volume (5.1.1 Systemic Context), the disposal of refuse is just one event in the taphonomic history of animal bones. It can be socially informative, as Marciniak expounds (2016), but no more or less so than any other event in the history of a bone if we adopt an appropriate theoretical framework with which to interpret it.

There are clear parallels in some of what Marciniak sought to establish in critiquing the way that zooarchaeological studies are normally carried out pertaining to the European Neolithic and what I lay out in critiquing traditional zooarchaeological studies of urban environments. Broadly, we agree in our belief that the theoretical underpinnings of zooarchaeology are old-fashioned (which is not to say out-of-date) and that a greater engagement with theoretical debate in the humanities could give renewed vigour and relevance to the discipline. Where we depart, however, is in how we think this can best be achieved and in the theories we apply to our material.

Marciniak draws principally upon Bourdieu's (1977) theory of *habitus* and upon anthropological theory more generally. Here, I examine the roots of taphonomic theory as well as anthropological and archaeological, looking at recent developments and diving back to review their influences and inspiration in philosophy. It is a broad and, I hope, thorough approach that I believe is necessary to establish the practicality as well as the usefulness of the new model that I propose here.

Social zooarchaeology sees the understanding of human-animal relationships and animal symbolism as research aims of equal value to identifying past biomes and subsistence strategies. It is difficult to fault this view. Indeed, I have written in support of it elsewhere (Broderick, 2016). Engaging with wider theoretical perspectives, however, should not be limited in application to helping answer these new questions. Taphonomy is an important area of research both within and outside of zooarchaeology, as the section following this (1.1 A History of Taphonomy) will set out. My aims here are actually more aligned with these traditional areas of zooarchaeological enquiry – specifically the economy – and I will go on throughout the thesis to demonstrate how adopting theories borrowed from anthropology and post-processual archaeology can provide the necessary theoretical framework that has been lacking in previous taphonomic studies of animal bones from complex societies. This is another point of departure from Marciniak, who sees the economy in far narrower terms and states that 'social zooarchaeology is explicitly aimed at overcoming the 'economic' bias in studies of faunal remains' (2016, p. 238).

Social taphonomy, as I propose the term here, relates not to any particular social milieu, or to the taphonomy of symbolism and ritual, but to using taphonomy to understand society. It proposes that taphonomic indicators can be socially informed and, therefore, that taphonomic research should be informative of society.

1.2 A Note on Chronology

From the Arthurian 'Dark Ages' to the Wars of the Roses, historians and archaeologists alike in Britain have had a curious habit of discussing poorly defined periods which sometimes mean little to colleagues in other disciplines or in other countries. Throughout this study I have endeavoured to stick rigidly to a chronological system that may occasionally fit the archaeological strata poorly but which should be understood clearly by most readers.

The 'Early Mediaeval' period is now widely understood to cover that time between the fall of the Roman Empire and the time around AD1000 when the modern states of Western Europe began to emerge. In England, this is often bracketed by neatly known dates taught to small school children – AD410, when Emperor Honorius told Britain to look to its own defence, and AD1066, when William the Bastard won the Battle of Hastings and became King William I of England. Neither moment brought quite as sharp a change for the majority of the population as narrativists might like to think and certainly in the case of the excavations discussed here (4. The Animal Bones from Mediaeval Princesshay, Exeter and 6. Case Study) contexts were often phased as 'Saxo-Norman' by the ceramicists and so a date closer to AD1100 should be assumed.

The High Mediaeval period, meanwhile, is generally held to last around three centuries, ending sometime around AD1250 (it can be seen that these figures are conveniently round and therefore owe little to specific events around Europe). In Britain a more precise date is sometimes given as the death of Alexander III, of Scotland, in AD1286. The Late Mediaeval period then continues on from that point and up to the Early Modern Era, *c.* AD1500, with another convenient school-room date thrown into the mix in England – AD1485 and the Battle of Bosworth, marking (almost) the end of the Wars of the Roses.

1.3 A History of Taphonomy

An understanding of taphonomic theory is crucial to the proper understanding and interpretation of any- and every- thing found underground which had a former life above it (whether in the literal sense, or that in which a pot or a tool may be said to have had a life). In making such a bold statement it might be necessary to define taphonomy in order to demonstrate that its theory informs the work of all archaeologists, whether they are conscious of it or not. The most frequently quoted definition of taphonomy is provided by Efremov (1940, p. 85), who wrote:

> *'The chief problem of this branch of science is the study of the transition (in all its details) of animal remains from the biosphere into the lithosphere, i.e., the study of a process in the upshot of which the organisms pass out of the different parts of the biosphere and, being fossilized, become part of the lithosphere.*
>
> *'The passage from the biosphere into the lithosphere occurs as a result of many interlaced geological and biological phenomena. That is why, when this process is analyzed, the geological phenomena must be studied in the same measure as the biological ones.*
>
> *'In the indissoluble unity of geological-biological analysis lies the key to the following most important problems of paleontology, which cannot be determined by the usual methods.'*

Part of the reason that Efremov is so widely quoted is that it was in this same article that the word 'taphonomy' was first used. Much as with the term 'archaeology' (Bahn, 1996, p. vii) though, the subject interested people long before a term to describe it was universally adopted. The famous Swedish archaeologist Oscar Montelius wrote in 1888:

> *'Only a small part of what once existed was buried in the ground; only a part of what was buried has escaped the destroying hand of time; of this part all has not yet come to light again; and we all know only too well how little of what has come to light has been of service for our science.'*
>
> (Quoted in Lyman, 1994, p. 1)

Efremov's problem may appear to be quite narrow when compared with the disciplinary angst exhibited by Montelius but they are essentially the same problem described by researchers in separate, but related, subjects at different times. As a palaeontologist, Efremov was logically frustrated by the biases of an imperfect geological record of biomes and sought to estimate the surviving fossil record through analogy with known Quaternary fauna (Efremov, 1940). This has led to a broad understanding of taphonomy as being the study of bias in the record.

Where Montelius's concerns differ from Efremov's, however, are in his implicit recognition that one of the biases acting on the archaeological record is humankind itself – the principal object of enquiry. In other words, our understanding of taphonomy in archaeology should be used not just as an exercise in getting from the site deposit to the living site (or whatever the archaeological equivalent of a biome is) but could itself shed light on some of the activities that occurred on that site beyond the bald artefactual record. Efremov's concern was with what happened to an organism between its death and the moment of its excavation. Archaeologists have, to some extent, expanded that definition to include everything up to the moment of publication (but see Clark et al., 1967, for the first such extension, by geologists). The important point to note is that many of the objects we study – especially vertebrate remains – have a life in the human world beyond the moment of its first death: e.g. the slaughter of an animal and its subsequent use as food or the repurposing of parts of a broken ceramic vessel as spindle whorls (e.g. Vaughn and Neff, 2000).

It has been argued that zooarchaeologists and archaeobotanists made taphonomy an archaeologically relevant discipline and, in doing so, showed it to be revelatory about the past rather than merely distortional – a subtle understanding of 'bias' (Rowley-Conwy et al., 2005). By throwing light on the taphonomic pathways of material excavated from archaeological sites we can begin to answer more complex questions about past societies than simply suggesting what people ate. Analysis of butchery patterns, for example, can suggest how people prepared their food and what other uses they made of primary animal products; studies of weathering patterns can inform us about site formation processes; fracture patterns can tell us about dietary stress and/or preferences as well as about activity areas and site formation. As might be imagined for such an intrinsic area of research then, a great deal has been written about it and it is impossible to write a thorough review of the subject within the confines of the space permitted here. What follows then, is a review of the major developments in taphonomy as they relate to zooarchaeology and the most significant trends in the wider academic community.

1.3.1 The Roots of Taphonomy

The first record of taphonomic studies comes from Leonardo da Vinci, whose observations of recently dead and living bivalves led him to conclude that fossil beds near his home were unrelated to the biblical flood (Martin, 1999, p. 1). Two centuries later, the provenience of fossils continued to exercise the minds of polymaths and Robert Hooke and Steno both demonstrated that they were of organic origin (Martin, 1999, p. 1) and so laid the groundwork for the discipline of palaeontology. It is fair, therefore, to conclude that taphonomy was intrinsic to the study of palaeontology from its inception and scientific papers based on experimental taphonomic research were a feature of the burgeoning discipline from the beginning of the nineteenth century (Lyman, 1994, p. 17). A direct consequence of this affiliation was a research focus on how the palaeontological record was an imperfect archive of biotic communities (Lyman, 1994, p. 18).

As a part of this paradigm, Lartet (1860, p. 471) observed that certain bones of extinct large mammals associated with stone tool artefacts showed no signs of having been ‘rolled’ and were, therefore, deposited *in situ*; a highly significant observation when it was published, just one year after Charles Darwin’s *On the Origin of Species*. No doubt aware of the debate which his observations could only fuel, however, he went further by conducting planned experiments to demonstrate ancient human or hominin interaction. First, he made some cut-marks on modern bones to show that these marks resembled some he had identified on the ancient bones (Lartet, 1860, p. 472) and then, observing that some of the ancient bones had been sawn, he proceeded to saw modern bones with both a modern saw and with a recovered stone hand axe. In doing so, he was able to suggest that the marks on the ancient bones more perfectly matched those made with the stone tool than the metal one, adding further evidence of the association of these bones with ancient man beyond the stratigraphic record (Lartet, 1860, p. 473)

Around the same time Lartet was writing, a series of taphonomic observations proved important to understanding the fauna remains and, hence, the archaeological record of Kjoekkenmoedding– Danish shell middens. Through analogy with feeding experiments, in conjunction with evidence of canid gnawing, it was suggested that the bird skeletal part abundances were modified by domestic dogs (Morlot, 1861, p. 19).

In the early twentieth century, several researchers examined bone modification patterns for what this information could reveal about vertebrate assemblages. Martin (1910) examined the effects of percussive fracture on bones by hammering three horse (*Equus caballus*) bones with 'Mousterian quartz blocks' – in recording the effects of which he was the first to document and illustrate what has become known to zooarchaeologists as 'helical fractures' (Figure 1). In the 1920s Weigelt (1989) carried out extensive survey work in Texas to observe and document modes of death, decomposition, disarticulation, transport (Figure 2) and burial among vertebrates in non-anthropogenic contexts. On the basis of this work, it was argued that much of the fossil record is conditional on unusual or catastrophic events (Behrensmeyer and Badgley, 1989). Pei (1938), meanwhile, published a wide-ranging consideration of the pre- and post- depositional modifications to bones, mainly from Palaeolithic China, illustrating examples of root-etching and fluvial action as well as gnawing by carnivores and rodents and chop marks made with tools wielded by humans. Of principal interest to Breuil (1938), also working on material from Palaeolithic China, though, were the modifications made to bones for their use as tools.

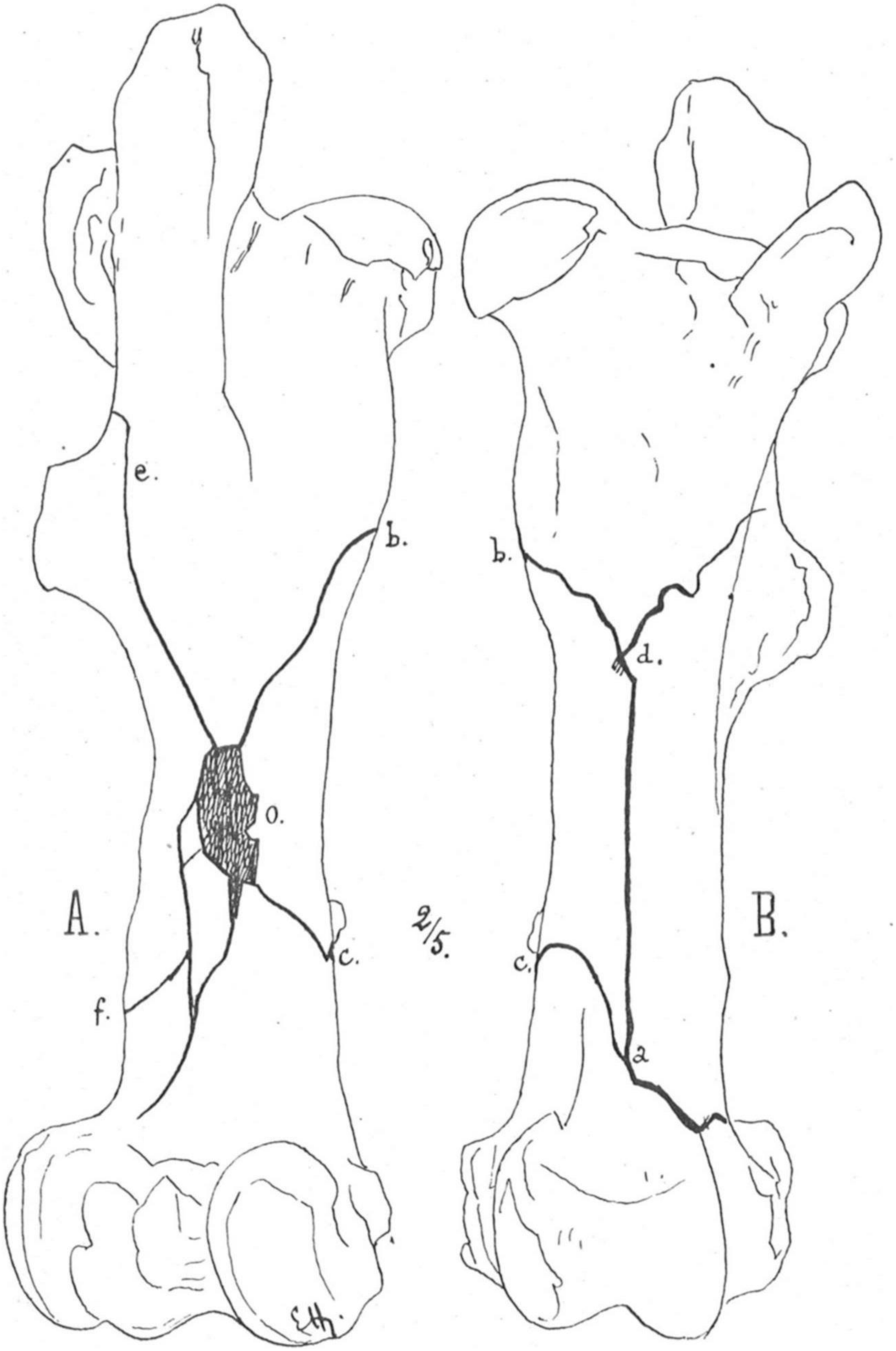

Figure 1: Martin's experimentally fractured horse femurs, showing helical fracture lines (Martin, 1910)**.**

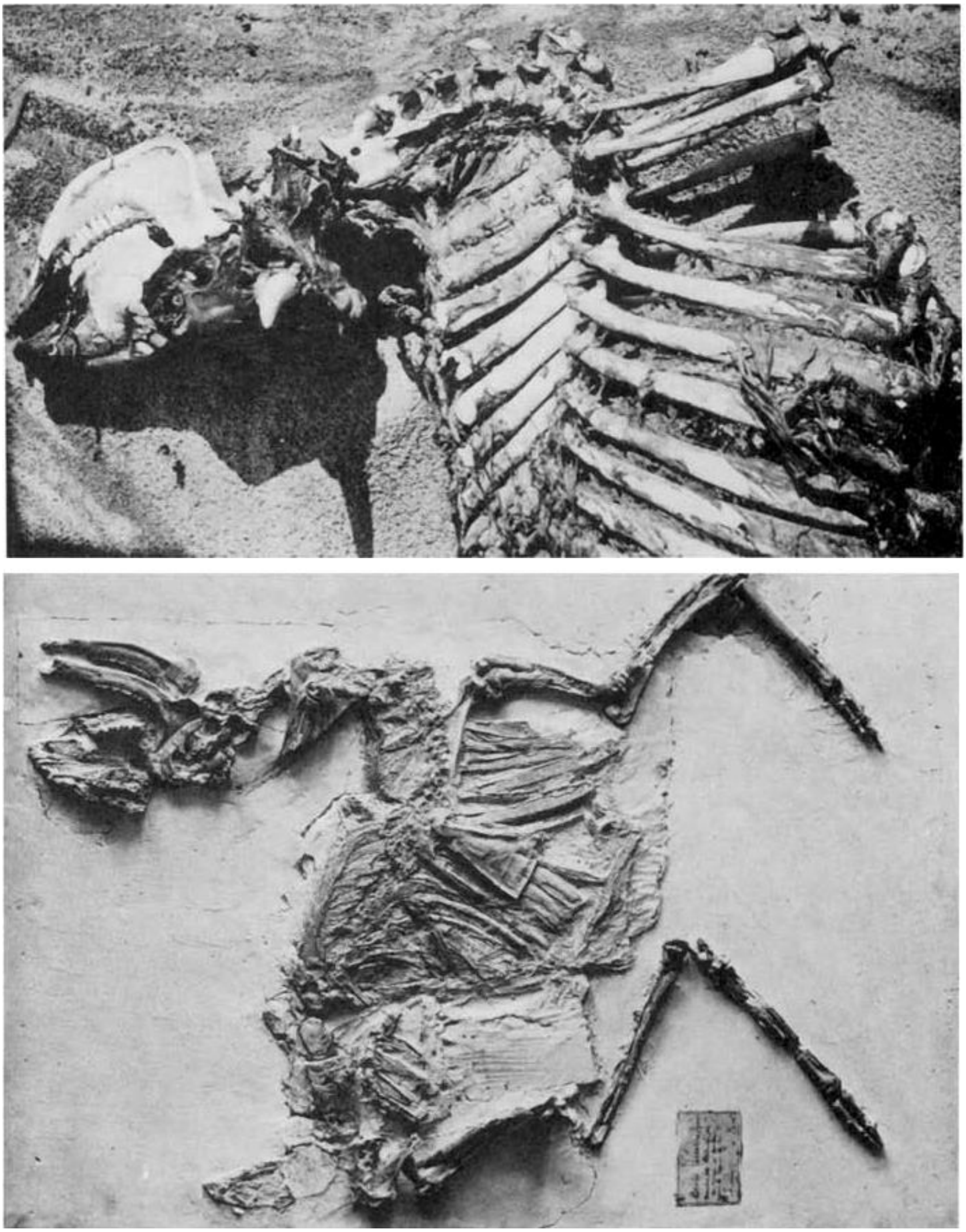

Figure 2: Cow carcass on the bank of the Brazos River (above) and *Dicrocerus furcatus* (below) in a similar posture from the Miocene of the Steinheim Basin (Natural History Museum, Stuttgart) (Weigelt, 1989)**. Weigelt suggested that the same fluvial transportation processes could account for the similar posture in both dead animals.**

Weigelt referred to this emergent field of study as it related to palaeontology as 'biostratinomy' (Behrensmeyer and Badgley, 1989, p. viii), meaning the way in which biological remains are transformed into the fossil record. It was a few years later that the word 'taphonomy' was used (see introduction to this chapter, above) but biostratinomy has also persisted as a word into the modern taphonomy lexicon with a more restricted meaning of pre-depositional taphonomy: the study of the processes which affect organisms from the moment of death to the moment of burial (i.e. excluding post-depositional taphonomies such as diagenesis, or even recovery bias and recording strategy in our expanded definition).

1.3.2 Taphonomy Comes of Age

It was shortly after Pei and Breuil published their major work that Efremov (1940) published his seminal paper on taphonomy. Mentioned again here in its proper chronological place, it can be seen that it is not the beginnings of taphonomic research. Efremov's paper was important though, acting as a focus for researchers who had previously been conducting different strands of research within the burgeoning discipline and giving them an umbrella term to work under (Weigelt's work had not yet been published in English and so 'biostratinomy' remained outside the lexical consciousness of many researchers). His paper acted as a rallying call not just because it provided a word to describe their research but because it joined up the dots between these different strands and placed them within a coherent framework. Due to his own background and the publication venue of the paper, however, its effects were to be more immediately felt in palaeontology than in archaeology.

Writing a decade later, Dart (1949) was keen, to some extent, to develop Breuil's (1938) theory of a prehistoric 'bone age' (or osteodontokeratic culture, as he termed it with specific reference to *Australopithecus africanus*) predating the Stone Age by examining bone modification (although Breuil is not referenced in this work – it seems possible that the papers published by both Breuil and Pei made little impact in the wider academic world due to their publication in French rather than English which was, by this time, becoming the primary language of scientific research, cf. Weigelt's 'biostratinomy', above). Dart adopted both pathological interpretations of traumatic injury to baboon (*Papio* sp.) skulls and functional interpretations of modifications to baboon femora to develop theories of australopithecines as predators rather than scavengers. He later followed up this work to include deliberate shaping of long bones into points and blades for use as tools, in which he did reference Breuil's work in China (Dart, 1959). Dart's taphonomic lines of enquiry were not confined to stone tool use, however: he expended some effort in developing ethnographic and ecological analogues. His motivation can be seen as preserving the integrity of his archaeological sites to some degree, in dismissing hyenas (*Hyaenidae*) as agents of bone accumulation through a thorough literature review and fieldwork carried out by his assistant A.R. Hughes (Dart, 1956). One animal that does accumulate bones, however, is the porcupine (*Hystricidae*), and he compared the bone modifications made by the gnawing action of these large rodents with Thomson's (1936) ethnographic observations of the bone chisels and gouges made by aboriginal peoples in Australia (Dart, 1958). It can be seen how this research pre-empted his later publication on sharpened bone tools, already mentioned.

Around the same time that Dart was considering Palaeolithic bone modifications in Africa, White was examining prehistoric butchery practices in North America. In doing so, he made a series of interesting and pertinent observations. First, he noticed that butchery technique was often adapted to the size of the animal rather than being uniformly applied as a set pattern (White, 1952). He also noted that missing ends of long bones need not necessarily be due to the actions of carnivores but could be due to human feeding habits (White, 1955) or else due to the vagaries of 'sampling and preservation' (White, 1953). Consideration was also given to the interpretation of spatial distribution patterns on both an intra-site (White, 1956) and inter-site (White, 1954) level. At the inter-site level he recognised what was to become known as the *Schlepp effect*, whereby the skeletal elements which carry more meat would be carried to habitation/consumption sites and bulky but less meat-dense parts of a carcass would be left at the kill site. Within sites he used his observations to develop formulae for calculating MNI (Minimum Number of Individuals) (White, 1956, p. 403), demonstrating a cohesive approach to zooarchaeology by linking taphonomic and quantitative research. Most of his interpretations of these spatial variations were essentially cultural though, where dietary preference and status were given at least as much weight as any functional reasoning such as that outlined above.

While a case was slowly being built for the importance of taphonomic enquiry in considering archaeological questions when studying vertebrate remains, taphonomic research in palaeontology gathered pace in the 1950s and 1960s. Schäfer's work in 1962 documented the death, decay and disintegration of organisms in the North Seas in unprecedented detail (English translation Schäfer, 1972). This added considerable detail to the longstanding taphonomic problems in palaeontology which recognised assemblages as consisting of three different components – the autochthonous (deposited *in situ*), the parautochthonous (autochthonous but moved) and the allocthonous (originating elsewhere) (Martin, 1999, p. 13) and established conclusively that information could be gained through an understanding of taphonomic agents and histories rather than it simply being a record and comprehension of loss (Martin, 1999, p. 14).

1.3.3 Taphonomy and Zooarchaeology

Dart's ideas were timely and, in the 1970s and 1980s a flurry of consciously taphonomic work was undertaken in zooarchaeology (e.g. Behrensmeyer and Hill, 1980; Behrensmeyer, 1975; Binford, 1978; Brain, 1983). This coincided with the growth of zooarchaeology as a recognisable and increasingly valued part of archaeology in the 'New Archaeology' or 'processual archaeology' paradigm (Trigger, 2006) and it is probably no coincidence that Binford was a leading proponent of this paradigm as well as of taphonomy in zooarchaeology. In light of the developments outlined above it may come as a surprise that in the early 1970s most inter-site differences between zooarchaeological assemblages were still interpreted as being almost entirely cultural (Lyman, 1994, p. 23):

> *'Zooarchaeology asked the same questions and answered them the same ways between 1950 and 1980. Change occurred when actualistic research revealed that the taphonomy of a collection of faunal remains could significantly skew interpretations.'*
>
> (Lyman, 2012, p. 55)

This new group of researchers though were quick to adopt each other's ideas as well as to build upon past research, leading to a rapid development of taphonomic understanding in zooarchaeology. It can be seen that Binford, in particular, built on the work of Brain in examining how bone density related to bone survival (Lyman, 2012, p. 58). In *Nunamiut Archaeology*, however, he owed an equal debt to White, in demonstrating through ethnographic research that anthropogenically created assemblages could differ from each other for entirely functional reasons rather than cultural ones (Binford, 1978). In large part, his utility models can be seen to be direct correlates of White's, with the cultural explanations removed and in doing so he made the *Schlepp effect* explicit after it had been first described in detail by Perkins and Daly (1968).

This flurry of activity may perhaps have been prompted by a call to arms for more taphonomic research to take place in zooarchaeology in one of the earliest textbooks on the subject (Chaplin, 1971, p. 121). It has been suggested that, prior to this time, taphonomic studies in zooarchaeology were relatively rare due to the inherent weakness that they recognised in the area of study (Lyman, 1994, p. 23). Binford's prominence in the valorisation of zooarchaeology in the 1970s and 1980s has been discussed above and it may be that his confrontational and provocative nature is a crucial part of this. What is not often credited is that he recognised what was elaborated at the beginning of this chapter – that the bias of the archaeological record is a strength and not a weakness. Acknowledging weakness may have been at odds with the promotion of zooarchaeology as a relevant and valuable source of evidence amongst colleagues but taphonomic research increasingly showed that this bias was in fact a strength rather than a weakness – capable of elucidating different past human behaviours such as butchery and industry.

Lee Lyman (1994, p. 22) noted that the first International Conference of ArchaeoZoology (ICAZ), held in 1974 and published in 1975, did not include 'taphonomy' in the list of indexed terms although several papers did cover the subject – addressing such topics as fracture patterns, fragment size and carnivore attrition. Carnivore attrition, or the removal of specific bones and parts of bones from the archaeological record through the gnawing and digestive action of carnivores, was also a specific focus of Brain's (1983, 1980) research, which linked survival to bone density. Other, non-animal, agents also affect the survival of bones in the archaeological record and one of these, the effects of long-term exposure and subsequent weathering, was evaluated through systematic survey of the remains of animals of known date of death in the Serengeti National Park in Tanzania (Behrensmeyer, 1978).

In fact, around this this time East Africa became something of a focus for taphonomic research underpinned by uniformitarian assumptions from modern analogues. Post-mortem damage of bones (Hill, 1980, 1979a) and the disarticulation of vertebrates (Hill, 1979b, 1979a; Hill and Behrensmeyer, 1984) were two such themes that, like Behrensmeyer's weathering research, were concerned at least as much with palaeontological questions as with zooarchaeological ones. Diane Gifford-Gonzalez, however, was explicitly interested in furthering knowledge of taphonomic processes in zooarchaeology in several ethnoarchaeological studies. Through several different papers ethnographically informed models were developed to identify differential disposal and trampling (Gifford-Gonzalez et al., 1985; Gifford, 1980; Gifford and Behrensmeyer, 1977) as well as butchery and cooking (Gifford-Gonzalez, 1989; Gifford-Gonzalez et al., 1999) as windows into anthropogenic behaviours. These observations were also brought to bear in developing debate on equifinality and the relative importance of biologically derived models in zooarchaeological middle range theory versus archaeologically or anthropologically informed ones (Gifford-Gonzalez, 1991; Gifford, 1981).

If ethnographic, as opposed to merely observational, research was becoming more of a theme at this time, then so too was experimental research, comparatively little of which had been conducted in zooarchaeology since Martin in the early twentieth century. In particular, it was realised that laboratory conditions could allow for the precise monitoring of things such as the effect of fire on bones (Shipman et al., 1984) and for differentiating otherwise similar surface morphologies such as trampling and cut marks (Olsen and Shipman, 1988). With similar concerns about equifinality and the causes of burning it was hoped that by introducing a standard recording protocol it might be possible to ascertain the intensity of burning and, therefore, suggest a cause – cooking or waste disposal, for example. In fact it was with the causes of taphonomic processes in mind that another theme began to emerge in the 1970s and 1980s, that of developing on overarching model with which to frame the varied taphonomic information in order to understand archaeological site formation processes (Schiffer, 1987, 1972) (cf. 1.4 The Taphonomy of Cities and 5 Building a New Model, below).

1.3.4 Taphonomy Today

Recognition that taphonomic history can be informative demands that the problems posed by taphonomic agents to the researcher are acknowledged and considered:

'Taphonomic processes may obscure distributional contexts, unrelated elements may become spatially associated, or related elements may lose their spatial association.'

(Lyman, 1994, p. 7)

As zooarchaeology has established itself as a respected part of the archaeological canon, so a new generation of researchers has built upon the work carried out in the 1970s and 1980s. To a certain extent, this has involved more detailed analysis into traditional problems, such as distinguishing carnivore-mediated assemblages from anthropogenically created ones (e.g. Faith et al., 2007), albeit occasionally with different carnivores (e.g. Lloveras et al., 2014a, 2014b, 2014c; Nicholson, 2000), as well as differentiating herbivore modified bones (Cáceres et al., 2011). Other new avenues of research have also begun to be explored, however, such as the effects of post-depositional diagenesis – which it would appear is not a uniform process but is instead dependent upon various factors including the part of the bone and the age of the animal from which it originated (Van Wijngaarden-Bakker, 2000), to some extent suggesting that bone density remains a crucial factor, as first suggested by Brain (1981b).

As new laboratory techniques for investigating the processes of bone diagenesis have been developed, however, it has become increasingly evident that there are a very complex suite of factors acting on bones after deposition which may result in their transformation and, ultimately, destruction (Hedges, 2002). Despite this intricacy, research is beginning to suggest that, except in highly acid environments, pre-depositional taphonomy may play a determining role in the ultimate taphonomic pathways of bones, particularly with regard to the amount of flesh still present at burial (and therefore the potential for damaging microbial activity) (Hedges et al., 1995; Jans, 2008; Jans et al., 2004; Nielsen-Marsh et al., 2007; Smith et al., 2007). Moreover, as new laboratory techniques have been developed, so archaeological questions can be answered from bones at levels other than the macroscopic (such as aDNA (e.g. Alves et al., 2003) and ZooMS (e.g. Buckley et al., 2010)) and a recognition of the differential survival of different components of bones under different conditions has become increasingly important (e.g. Smith et al., 2005). These questions have also been important to furthering understanding of taphonomic pathways in palaeontology where, however, the emphasis has been placed more on discerning processes of mineral crystallisation (Cuif et al., 1999; Weiner, 2008) and it is in this sphere that most overlapping archaeological/palaeontological work has taken place (e.g. Weiner et al., 2002).

If pre-depositional taphonomy is increasingly seen as important in bone diagenesis then it should be no surprise that some researchers have already begun to investigate aspects of this at the chemical level. The effects of boiling on bones are one such area to have been investigated and the implications for some of the laboratory techniques mentioned above are severe, even if our ability to recognise the activity in the archaeological record is still limited (Roberts et al., 2002). If these problems of equifinality in identifying cooking processes echo Shipman's earlier work on fire damage then it is to be commended that a new generation of researchers particularly interested in the possibility of bones being used as fuel in the Palaeolithic have carried on this strand of research (Costamagno et al., 2005; Théry-Parisot et al., 2005; Théry-Parisot and Costamagno, 2005). Similarly, Shipman's work on cut mark identification has also been developed by others in the twenty-first century (Alcántara García et al., 2007; Domínguez-Rodrigo et al., 2009; Domínguez-Rodrigo and Yravedra, 2009). Contrary to modern Western dietary preferences, there has also been an increasing awareness of the nutritional importance that animal fats can play in human diet – especially in communities with limited access to plant products – and the recognition of fracture patterns associated with marrow extraction, first studied in the early twentieth century (Figure 1), has been refined whilst methods for identifying grease processing in the archaeological record have also been investigated (Karr and Outram, 2012; Munro and Bar-Oz, 2005; Outram, 2004, 2003, 2002, 2001).

With so many different taphonomic factors now being investigated, some of which have unique signatures but some of which effect similar changes to bones, it is unsurprising that zooarchaeologists have begun to investigate their own modelling approaches with which to understand the formation processes at sites and the various taphonomic pathways which may have occurred. Originally designed to ascertain the primary taphonomic agents on a site, multivariate statistical analysis is one approach which has been used to suggest that many taphonomic agents are of limited use to cultural and economic questions (Bar-Oz and Dayan, 2003; Bar-Oz and Munro, 2004). In contrast, multivariate models have also been used to demonstrate that a thorough understanding of taphonomic pathways is crucial to our understanding of assemblage formation processes and, therefore, to estimate its effects on the archaeological (including cultural and economic) record (Madgwick and Mulville, 2012). Taphonomic modelling has also been used to good effect recently in identifying different waste disposal patterns in Mediaeval Spain (Grau Sologestoa, 2014) and underpinned some of the interpretations made by Marciniak (2016) when reviewing the European Neolithic (1.1 Social Taphonomy). Perhaps some archaeologists might see waste disposal as functional rather than cultural but there is a growing school of thought that would argue otherwise (Gifford-Gonzalez, 2014; Jervis, 2014), its members including zooarchaeologists expounding a 'social zooarchaeology' (Marciniak, 2016).

The blossoming maturity of the discipline within zooarchaeological studies can perhaps best be demonstrated by a new call to move research away from the purely functional (1.1 Social Taphonomy). It has been suggested that since humans are an emotional animal, taphonomic research should begin to consider psychological theory as well as biological and ecological (Wilson, 2000). It can also be measured in other ways, however; after taphonomy's near no-show at the first ICAZ conference, it formed by far the largest corpus of work submitted to the eleventh, held in Paris in 2010, and was the theme for the only session to run over more than one day (Marín Arroyo et al., 2012). Indeed, a specific Taphonomy Working Group was formed under the umbrella of the society function of ICAZ in 2009, when it was suggested that taphonomic research was most prevalent in palaeontology and in zooarchaeology (Marín Arroyo et al., 2012). Those palaeontological roots still show, however, and it is largely on this basis that it has been suggested that the quantity of taphonomic studies undertaken in zooarchaeology directly correlates with the age of the material studied (Marín Arroyo et al., 2012).

If taphonomic studies are more prominent in Palaeolithic archaeology, however, that is not to suggest that they are non-existent in Mediaeval contexts, as the Spanish waste disposal study referenced above should indicate. Where perhaps it differs is in terms of its emphasis; if studies of Palaeolithic sites have been more concerned with identifying non-anthropogenic agents as a way of supporting anthropogenic interpretations of assemblages (cf. Taphonomy Comes of Age, above) then taphonomic studies in Mediaeval zooarchaeology have been most concerned with identifying specific human activities. Butchery and industrial activities using primary animal products have received the most focus in this regard (3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists) even as waste disposal is an activity whose archaeological significance has only begun to be explored more recently (e.g. Croly, 2005; Evans, 2010).

1.4 The Taphonomy of Cities

At the beginning of the preceding section (1.3 A History of Taphonomy), I observed that an understanding of taphonomic trajectories was crucial to understanding everything excavated from the lithosphere which ultimately originated above ground, echoing Efremov's (1940) palaeontology inspired rallying call for the subject. I ended the same section in noting that taphonomic models applied to historical periods have been more concerned with identifying specific human activities when compared with studies in earlier periods: I suggested specific examples of this such as butchery and waste disposal. That section was primarily concerned, however, with taphonomic studies within zooarchaeology. The twin reasons for that are that this is itself a zooarchaeological study and that zooarchaeology has arguably been paramount in developing taphonomy within archaeology (cf. Introduction to 1.3 A History of Taphonomy above). Taphonomic studies, if we are to take a full and literal meaning of the biosphere to lithosphere definition (or perhaps tweak it a little to 'anthrosphere to lithosphere'), are not confined to zooarchaeology, however: the example of waste disposal alone should be enough to demonstrate this fact. What follows in this section then, is a review of taphonomic understanding within wider archaeology as it has been applied to the interpretation of material from urban deposits. This does include some zooarchaeological models, as will be seen, and there is a certain amount of overlap with both the preceding section and the following chapter (3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists) but this overlap is only by way of illustrating relevant examples within zooarchaeology of analogous practices from other areas of archaeology – the focus here is on how the study of urban taphonomies has developed, not on the taphonomy of faunal remains within cities.

1.4.1 A Potted History

Ceramic finds are among the most, if not the most, numerous of urban archaeological finds. It is perhaps surprising then, that their primary use in archaeological interpretation has not been directly related to their function but has instead made use of their abundance and typological seriation to date contexts and features in sites (Jervis, 2014, p. 120) and to ascertain the nature of contexts (occupation layer, rapid development, etc.) and whether they are primary or secondary deposits (Carver, 1987, pp. 133–136). Where taphonomic concerns have been a focus of archaeological ceramic research it has generally been with this concern in mind, focusing on the problems posed by residuality in the archaeological record (Brown, 1994; Vince, 1994). This is a problem that has also preoccupied zooarchaeologists from time to time, who have reasonably suggested that the taphonomic pathways of animal remains and ceramics might be different and that, therefore, an apparently secure context of one type of material (i.e. one relatively lacking in residual material) might not correlate with a secure context for the other (Billson, 2009; Dobney et al., 1996). In practice, the problems of accurately modelling for the residuality of non-typological material such as fauna has meant that ceramic finds have continued to be used as a proxy for predicting residuality for other material types (O'Connor, 1996, p. 7).

The paradigm for ceramic artefact interpretations in historical archaeology might be said to mirror that for environmental archaeology, including zooarchaeology, more generally: a comparative overabundance of material has cast it in a supporting role, suggesting that such large volumes of data can speak for themselves, whilst more robust theoretical frameworks are employed to interpret stratigraphic and architectural townscape features (cf. Finch, 2008 for an argument that the comparative richness of data in Mediaveal landscape studies has deterred use of the kind of phenomenological approaches commonly adopted in prehistoric landscape archaeology; Jervis, 2014). It is this standard that sees ceramic and environmental archaeology reports included as appendices to overarching reports, supporting them with dating and economic or ecological data, respectively, that perpetuates a myth of empirical data presenting atheoretical facts:

> *'Landscape studies, which are becoming increasingly popular in historical archaeology, examine issues related to the cultural modification of the environment and are, thus, closely linked to archaeological site formation. Consumption studies focus more on analysis of artifacts and refuse deposits and, therefore, represent a qualitatively distinct level of interpretation.'*
>
> (LeeDecker, 1994, p. 352)

Of course, archaeology is an interpretive discipline and therefore there can be no abstract truths: theory is implicit in all interpretations and so in all archaeology (Johnson, 1999). The Mediaeval period played a starring role in the development of landscape history (Hoskins, 2005) and its sister discipline landscape archaeology and it is perhaps against this background that an emphasis on townscape features might be read but if landscapes and townscapes can be palimpsests, then surely artefacts and other archaeological finds, too, must have their own unique trajectories and histories rather than being squarely the providers of single monolithic data classes (cf. 5 Building a New Model, below).

1.4.2 Pits, Ditches and Walls: Digging a Canvas

The interpretation of stratigraphic features necessitates the palimpsest approach: it is impossible to observe them without observing how they intersect, cut and override earlier features. That they can be described as earlier or later than other features is perhaps fundamental to the archaeological method but to be able to ascribe a date to them – to say how much earlier or later – requires finds and, as has just been indicated, this has become the *de facto* role of ceramics in urban archaeology. The emphasis that has been placed on features over finds for interpreting archaeology cannot be better demonstrated than when, owing perhaps to time constraints, stratigraphic sequences have been reconstructed *post-hoc* through artefactual remains (Birmingham, 1990, p. 15). A related problem, reported from early rescue archaeology in Australia but probably existent in most parts of the world at some time, sees a lack of systematic finds recovery from rushed urban excavations; the resultant selectivity of which undermines context integrity and taphonomic pathways (Birmingham, 1990, p. 16).

Perhaps some of the problems arise from project planning: archaeologists can typically expect to find some kind of stratigraphic sequence in urban sites which can be informed by artefact scatters and so emphasise spatial patterns (an approach first suggested for British urban archaeology by Biddle and Kjolbye-Biddle, 1969); rich deposits of artefacts though cannot be relied upon and so they can potentially be regarded as a serendipitous bonus when found (Birmingham, 1990, p. 18). If features can be categorised by type (surface, structural feature, foundation trench, negative feature, etc.) they can simultaneously be characterised by their soil type and/or artefact density, thus in effect assigning a taphonomic, or at least depositional, history to a feature. Indeed, the identification of these features is integral to urban archaeology where they, in combination with architecture, define the spatial framework for archaeological interpretations (LeeDecker, 1994) – activity areas, house plots, etc. – and so, in turn, define the townscape which has remained the principal focus of urban historical archaeology throughout its short history (Jervis et al., 2016b).

Within this assortment of features, it is pits (including wells and pit-toilets) that often receive the most attention as rich assemblages which most likely originate from a relatively short depositional time span. Before the introduction of municipal waste collection these features, together with burning (which we may speculate was hazardous in many urban environments), represented the most effective means of rubbish disposal. Some may have been made specifically for such a purpose whilst other pits may have started out with another purpose, such as a toilet, and been opportunistically backfilled with detritus when they reached the end of their usability. In such cases, although the backfilling episode may represent one comparatively brief event, the fill material does not and could in fact represent several different activities and even activities from several different places. In effect, these assemblages are themselves often palimpsests, to borrow landscape archaeologists' favourite term, within the townscape or landscape palimpsests in which their presence can be a key interpretational building block (cf. introduction to 3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists).

Where pits are stood open for some time, depositional history can be reconstructed through analysis of stratigraphy, artefacts and/or geomorphology (LeeDecker, 1994, pp. 356–360), with particular emphasis on the former. Sometimes pits can be linked through stratigraphy, spatial organisation, documentary records or a combination of these to specific sites and where this occurs interpretations can be made on the basis of pit contents which connects them to specific activities, so informing the townscape analysis by linking activities or industries with structures (e.g. O'Connor, 1989). These circumstances are fortuitous however and are not to be expected.

Many pits occur in brownfield, urban edge, sites (cf. 6 Case Study) and these, it is to be presumed, principally represent pits that have been dug for the express purpose of waste disposal. Often heterogeneous in nature and not linked to any specific structures or other guiding architectural features they are, if considered at all, used only by specialists to consider (principally economic) questions as they relate to the urban population as a whole, where they can be confidently dated on the basis of artefact finds (cf. Jervis, 2014). Although waste disposal may not be municipally organised when these pits are being dug, it does suggest that people are concerned enough with their home (working and living) environment as to transport rubbish some distance for ultimate disposal. If this is true, it suggests that we are missing a large and important swathe of potential data which could inform us about how people are living their daily lives; taken to its logical extreme this proposition would mean that those pits (perhaps principally toilets and wells) are even more fortuitous than we realise because if they consist primarily of closure events then it can be considered unlikely that the features were being disused (and therefore closed) continuously.

1.4.3 Environmental Approaches

In practice, the way in which features and contexts are first identified on archaeological sites is usually through a combination of soil colour and type, during excavation. Specialist post-excavation analysis of soils has begun to lead to a better understanding of the processes which help to inform them – micromorphological analysis, for example, has shown that urban contexts are subject to considerable natural and anthropogenic reworking (Macphail, 1994).

Palynological studies are now a common feature of landscape archaeology interpretations, these are often from off-site locations however and their direct use in urban environments, where the soil samples must, of necessity, be taken from cultural layers presents interpretational difficulties. Although the depositional pathways of peat and lake deposits are relatively well understood, the taphonomy of pollen in cultural layers is 'fuzzy' (Kozáková et al., 2009, p. 485). Anthropogenic soil creation must surely create problems of residuality of microscopic remains and the specialist examining them runs the risk of making circular arguments but a fairly predictable pattern of a higher herbage component in comparison with surrounding landscapes can emerge from such analysis (Kozáková et al., 2009).

It is, then, not entirely unfair to conclude that taphonomic theory remains an under-utilised resource in urban archaeology. Whether due to disciplinary history or else due to time and budgetary constraints the contribution the field of enquiry could make to understanding site formation process and joining the dots with how those processes reflect societal mores and function, or how the urban space grew and developed remain as little more than potential for the time being.

2. Urban History

Having illustrated the unusual degree of primacy bestowed upon pits by Mediaeval urban archaeologists it is now important to take several steps back and widen our focus once more. If a pit is just one feature which can contribute to our understanding of an archaeological site, the site itself is no more special. Due to the constraints under which urban archaeology is often carried out in the UK – namely developer funded and tied to both financial and temporal deadlines – sites are often given a specificity which they are unlikely to have possessed in the past. Comparisons are usually made with contemporary sites in the same city, when there are any that have been excavated, and may be contextualised through comparison with large or similar sites in other cities – particularly when the site being studied is, itself, large or otherwise unusual. Where a site has previously been the focus of historical enquiry, such as a chronicle of property ownership, this may guide the narrative of the site interpretation. Throughout all of this though, the site remains the focus of attention and in doing so may itself be accorded undue primacy in interpretations of wider regional developments.

Historians, by contrast, are often forced to study urban environments at a civic level. As with the site-level focus of archaeologists this is largely governed by the type of material they have available for study. In recent years, however, the shortcomings of this approach have been realised and a conscious effort has been employed to move away from the town hall. Cities exist within wider political and economic bodies; in order to understand the role of a city – how it functioned, how it grew and how its inhabitants experienced life on a day to day basis – it is not enough to study the city in itself, it must instead be studied in association with its region (Nicholas, 2003, p. 1). This is made more complicated by the fact that cities may have multiple regions, or spheres of influence, of varying size, depending upon the questions being asked. Asking purely economic questions for example, the region from which the city might consume (in a literal sense) fresh milk is likely to be much smaller than that from which it draws cheese. Wool or cloth are likely to have come from even further afield. The edges of the boundaries are likely to be governed by a combination of travel time (not the same as distance) and proximity to other similarly sized urban centres. It is for these reasons that cities were often surrounded my small farms and market gardens – it was the cities that made them profitable – and meat was the foodstuff most likely to have travelled a long distance (Nicholas, 2003, p. 33 after von Thünen, 1826).

In looking at the way that a larger city can exert a larger field of influence – a greater gravitational field, as it were and so have a larger influence, one need look no further than the bloated civic capital of England. In the Early Mediaeval period, London (Lundenwic) had large tracts of land left as open brownfield sites, including much of the old Londinium. In these environs the inhabitants were able to raise pigs and sheep were kept outside the city limits but in the city's immediate hinterland (Tames, 2003, p. 12). By the High Mediaeval period, London had grown to such a state that it attracted drovers bringing cattle and sheep on the hoof from as far afield as Wales and Scotland. Relative staple crops of the British diet, such as onions and leeks, were the focus of a regular import trade from the Low Countries (Tames, 2003, pp. 15–16). The hinterlands that had previously supported flocks of sheep were, thus, given over to fattening sheep raised elsewhere.

These relationships are not purely economic either. Civic leaders increasingly took on important political roles and the relationship between towns and cities and their regions were social as well as economic and political – most cities developed in areas of high rural population, an almost necessary requirement as throughout the Mediaeval period the birth rate in urban areas was lower than the death rate (Epstein, 2009, p. 65; Nicholas, 2003, p. 9; Swanson, 1999, p. 111). In other words, population growth was entirely dependent upon immigration. As with the example of the economic spheres described above, we may speculate that less skilled individuals may have been drawn to the city from its immediate hinterland and the more skilled from its wider region. Even a large city in a large region might not have had much specialised industry, with clerical and skilled workers (such as butchers and bakers) supplying the local economy and unskilled workers accounting for the bulk of employment, just as today. Also like today, the less skilled a worker was the less likely they were to move long distances for work (Nicholas, 2003, p. 7). Small, local transactions were then, the lifeblood of towns and provide a framework for their study (Swanson, 1999, p. 10).

By the High Mediaeval period cities in Italy and the Low Countries, in particular, had grown to a considerable size – far larger than any in Britain excluding London, which is and was exceptional. In the Early Mediaeval period, however, England had the highest urban density in Europe, something that was only reversed after the Norman Conquest in AD1066 (Nicholas, 2003, p. 5). Of course, there may be room for debate as to what constitutes an urban development – are all those *wics* and *burhs* truly urban? It is possible to argue that there are no recognisable cities, or an urban way of life that is distinct from a rural one, before the High Mediaeval (Nicholas, 2003, p. 2).

Nevertheless, drawing principally on archaeological evidence, Hodges (1982) was able to identify several different types of urban settlement in Northern Europe at this time. He mentions that contemporary observers felt justified even in calling Kildare 'a metropolis' (Hodges, 1982, p. 47) but pulls short of using this as a justification in and of itself. Instead he draws attention to the role that emporia such as *wics*, in particular, played in creating a market for surplus as well as in supporting specialist craft and industry and providing a permanent place for year-round trade:

> *'There were, then, urban communities in the period 500-800, but their scale was far more modest than anything we might term a 'city'.*
>
> (Hodges, 1982, p. 49)

Such is the somewhat erratic story of urbanism in Europe in the early Mediaeval period, then. If we permit that a sprawling metropolis need not be a defining feature of urbanism and instead allow ourselves to be guided by more relative definitions – relative, that is, to the time and place – then we can assert that Anglo-Saxon England (i.e. England from *c*.AD 800 up to the Norman Conquest) had a thriving urban component in its society. After that point, many of the urban places grew less quickly than on the continental mainland but still continued to fulfil many of the same roles.

The most conspicuous phenomenon of Western European cities coincident with this transition, regardless of their population, was the formation of guilds. It was in the 11th century AD that towns and cities began to be truly productive (Nicholas, 1997, p. 2) – although *wics* had played a manufacturing role they were essentially centres of international and local trade (Swanson, 1999, p. 7), really little more than permanent markets. The first guilds began to appear in Northern Europe at about this time (Epstein, 1991, pp. 52–56) and by the late 13th century AD cities there, and elsewhere in Europe, usually chose their councillors from prominent members of guilds (Nicholas, 1997, p. 9). In England and the

Low Countries, in particular, it is practically impossible to distinguish guilds from city government by the Late Mediaeval period (Nicholas, 1997, p. 4), although the nature of guilds was particularly variable in England. They were often far less numerous than in continental cities, with Southampton, for example, having no craft guilds at all (Swanson, 1999, p. 97). By contrast corporate representation of craft guilds on the city council was enshrined in York (Nicholas, 2003, p. 101).

It has been argued that the industrial revolution began in the Mediaeval period (Gimpel, 1992; Lucas, 2005; Reynolds, 1984). Such arguments usually hinge upon the technological developments for energy production – i.e. waterwheels – and the debate is far outside the scope and reach of this study. It is important to note the implications of such an assertion however – that there was industry in the Mediaeval period. As such, these technological developments should be seen as related to the development of craft guilds, around the same time. The words ‘craft’ and ‘industry’ appear frequently in this study but not entirely synonymously. The two terms represent distinct ends of a scale in which the middle ground is less easily defined. ‘Industry’ is usually associated with secondary considerations such as systemic economic activities and with the production of large numbers of similar or identical items(Caple, 1991). The contrasts it with the more irregular and artisanal production associated with ‘craft’. The formation and propagation of Mediaeval craft guilds can be seen as an important step between these two positions.

2.2 City and Guilds

Towns were essential to Mediaeval feudalism – not only in rents and taxes but also indirectly by providing a market in which manorially produced goods could be monetised (Swanson, 1999, pp. 11–12). To some extent, however, they also became a cultural counterbalance to the power of the hereditary aristocracy – at the core of guilds was a belief that labour, like material wealth or any other commodity, could be traded (Epstein, 1991, p. 64). As has just been discussed, guilds became a phenomenon coincidentally with what we might recognise today as genuinely urban places, at the beginning of the High Mediaeval period. The political power of cities was the political power of the guilds, in every sense. The bourgeoisie were certainly not immune to charges of nepotism (Epstein, 1991, pp. 103–124) but the guilds did encompass a broad cross-section of society and provided a ladder with which to climb it:

> *'Butchers not only cut meat for sale; they also bought and sold live animals and bought rural land on which to pasture them, both of which were activities that elevated their status.'*
>
> (Nicholas, 1997, p. 10)

People joined guilds as apprentices. Often this was as boys as young as eight years old but adults could apprentice themselves, usually for shorter periods than the boys, and girls also sometimes served apprenticeships in guilds (Epstein, 1991, pp. 103–124). Eventually, apprenticeships would come to an end and apprentices would have the opportunity to become journeymen and, most privileged of all, masters. Craft guilds often demanded production of an item at the moment of either of these graduations, known as a 'journeyman piece' or 'masterpiece'. The production of these pieces served two purposes – firstly, they made sure that the individual concerned knew that his work was of an acceptable standard, since the piece was judged by members of the guild other than his or her own master (Epstein, 1991). Secondly, it enabled the guilds to protect their industry in a very literal sense – not just demonstrating that individuals were capable of working to certain quality standards but giving them absolute control over who could and could not carry out that work in their city.

At the core of the master-apprentice relationship, and therefore, of guild society was an implicit understanding that the master (mistresses were very rare) should instruct his apprentice in his craft or trade. This instruction was often provided, especially in the early years of a long apprenticeship, mostly through observation (cf. 5.1.4 *Chaîne Opératoire*), with apprentices expected to carry out many of the less skilled tasks both in the workplace and around the house in return for their board and lodging. Apprentices often lived together in one room and the relationship between apprentice and master usually became pseudo-familial when actual blood-ties did not exist, a consequence of the young starting age and long terms served. This arrangement also goes some way to explaining many of the instances recorded of girl apprentices – female journeymen and masters (mistresses) were even rarer than female apprentices and often the reason for taking them on was that they effectively functioned as free domestic servants rather than having real expectations of a career in the guild (Epstein, 1991, p. 109). Having served their apprenticeship though, many of these girls remained wedded to their guilds, often quite literally, by marrying masters.

Other than the smaller size, the urban experience in Mediaeval Britain is likely to have been much the same as that on the European mainland (Swanson, 1999, p. 64). Guild-life and guild-structures permeated the townscape with people likely to be living alongside others carrying out the same profession and so enforcing a kind of occupational segregation – sometimes literally, as in the case of numerous butcher's lanes, but these legal proscriptions had often ended by the end of the High Mediaeval period (butchers remaining the notable exception) (Nicholas, 2003, pp. 76–78). Butchers and tanners were generally perceived as less wholesome industries but the guilds and their members often achieved positions of great power in their cities (Swanson, 1999, p. 115) and so came to shape public life in the cities. In many places, the butchers guild came near to monopolising supply to the leather industry (as high as 95% in late 14th-Century Exeter (Swanson, 1999, p. 35).

The guild-controlled city councils granted actual monopolies and restrictions in order to try and encourage growth and Exeter is exceptional in this again, having more legal monopolies than any other Mediaeval city in England (Kowaleski, 1995; Swanson, 1999, p. 26). In short, it can be seen that a history of urbanism in Medieval Britain and Europe is a history of guilds trying to direct the growth and character of a city from the inside and of its region dictating what those opportunities for growth might be. In order to understand a city in this period we have to understand its region and the guild structures that influenced people's everyday lives. Archaeologists have generally been poor at achieving this aim, as we shall see in the next chapter when we look at the ways that taphonomy has been employed in urban archaeology.

3. A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists

It might be expected that the subject of powerful Mediaeval guilds, such as butchers, may become itself the object of academic enquiry, and so it has. The study of bone modifications and carcass distribution takes on a unique flavour when applied to the Mediaeval period, particularly on urban sites, since we can be relatively certain before analysis begins that the assemblage recorded is the result of human activity. This contrasts with assemblages from earlier (and otherwise more dispersed) cultures where the focus of research has often been in designing methods and divining patterns from which to distinguish human mediated assemblages from those that could have been created by other animals (Lyman, 1994, pp. 294–297).

For the period under discussion, there has been some consensus that certain activities must produce particular identifiable and obvious signatures; often these focus on the extremities – i.e. 'heads and hooves' (O'Connor, 1993, p. 63). These portions, which typically have less meat associated with them, have frequently been associated with specific industrial activities and so, for example, horncores probably represent waste from the horn trade and metapodials and phalanges waste from the tanning industry (Albarella, 2003, pp. 74–75). Mediaeval industry was highly specialised, an effect perpetuated by the guild structure, and thus it is to be assumed that specific activities should result in specific deposits – large assemblages formed almost exclusively of the types of material mentioned above. In fact, such assemblages are rare, a phenomenon which might partly explain the reductionist glee with which zooarchaeologists typically take to recording them.

What can be deduced from this preamble then is that, much like articulated faunal remains (for an overview of possible interpretations of these deposits see Broderick, 2012; Morris, 2008), large assemblages of specific skeletal faunal elements are an unusual deposit. Over the years, zooarchaeologists have become very good at identifying unusual deposits – in part, of course, simply as a result of having studied more material and thus a larger sample with which to compare but also as a direct result of the models and analogues adopted which are implicitly designed to identify such anomalies. If such assemblages are rare then it follows that most assemblages, on Mediaeval and urban sites as elsewhere, are rather more heterogeneous in nature. Making meaningful interpretations based upon this somewhat catholic material, presumably the result of a diverse range of activities occurring in different sectors of the urban community, becomes a problem of some magnitude for zooarchaeologists who may have the inclination and resources to move beyond the report-by-template (or even the 'laundry-list' (cf. Reitz and Wing, 2008, p. 29)).

3.1 Aims and Objectives

The purpose of this chapter is to review ways in which human mediated pre-depositional taphonomies of animal bones have been studied by zooarchaeologists when applied to Mediaeval urban environments. Several models have been suggested and reviews carried out of specific taphonomies (e.g. butchery, horn working or leather working) in the past but these have usually done so in an isolationist capacity which fails to give due consideration to other processes which may be affecting the same material. These earlier models and reviews will be considered and described below, before a brief review of the major published sites and the activities identified there. Finally, an attempt is made to draw these models together and a critical assessment is made of the way in which the subject has been approached in the past, considering the strengths and weaknesses of each.

3.2 Models Suggested and Patterns Reviewed

In one of the earliest zooarchaeology textbooks, Chaplin suggested that an urban animal bone assemblage consisting of bones of one type and from one species might be the result of a specific (industrial) activity carried out at that place repeatedly (Chaplin, 1971, p. 142). Seeking to explain why an assemblage from Mediaeval Coventry might consist almost entirely of cattle horncores, Chaplin hypothesised a pattern of carcass dispersal which might result in such an accumulation. This pattern takes as its starting point a newly slaughtered animal at an abattoir and proceeds as follows:

> *'The dressed carcass excluding the skull and often the feet would go to the butcher, the hide to a tanner, the gut, offal, [...] etc., to a butcher. The waste bones – the skull after removal of the tongue and maybe brain, could, with the feet, be sent for boiling into glue or fat or they might be further divided up, the cannon bones, for example, being used for the manufacture of pins and other objects, and the horns sent to a horner, the remainder of the skull then going for glue.'*
>
> (Chaplin, 1971, p. 142)

Driver (1984) used this principle to try and develop a more nuanced tool for identifying bone tool workshops based on an assemblage he had analysed from Early Mediaeval Southampton. In an unusual set of circumstances, he was able to analyse an assemblage which contained not only unmodified and butchered animal bones but also partly and fully completed bone combs. Working on a principle that others had previously noted – that certain bones have inherent properties which make them more suitable as raw materials for certain tool types, primarily their shape, size and density – he set about investigating whether or not it would be possible to identify such an assemblage without the presence of the tools themselves. Systematically working through these criteria, Driver hypothesised that the latter two – size and density would tend to favour larger, mature animals (Driver, 1984, p. 401). He successfully demonstrated that his assemblage did, indeed, contain older, larger animals than others in Southampton – both according to species and within the species itself (possibly favouring males over females) – thus predicting that an assemblage containing relatively more of these bones could be the result of a bone tool-making industry.

Combs were also of significance in MacGregor's (1989) study of bone-, horn- and antler working in Britain. MacGregor hypothesised that particular properties of antler, such as its greater tensile strength when compared with bone, were understood by Mediaeval craftsmen and so favoured for this reason. Due to the scattered but standardised nature of the finds he suggested a system of peripatetic antler-working specialists in the Early Mediaeval period, starkly contrasting with bone-working at the time which he saw as a more *ad-hoc* domestic activity carried out by non-specialists, manufacturing basic tools as and when the need arose (MacGregor, 1989, pp. 107–110). From the eleventh century onwards, however, MacGregor saw a gradual rise in specialisation and sedentary craftsmen coinciding with the growth of towns and cities; this shift in culture saw a decrease in the quantity of material produced from antler but an increase in the variety and quantity of other animal derived primary products, including the more widespread adoption of horn working (MacGregor, 1989, pp. 112–120). This specialisation was as apparent in the animal skin and leather working industry as any other, as evidenced by the occurrence of descriptors such as tanners, tawyers, skinners, fellmongers and furriers; Serjeantson (1989) suggests that such activities might be most easily identified from assemblages containing large amounts of horncores, phalanges and metatarsals (the 'heads and hooves' mentioned above) but cautions that, due to the nature of urban waste disposal, such assemblages might not be associated with that activity taking place in the immediate vicinity.

More than twenty years after Chaplin published his pattern of Mediaeval carcass disposal, O'Connor revisited the subject to develop the model. This adopted the previously mentioned points into a consideration of the urban environment as an inter-related system, with each trade dependent upon another for their acquisition of raw materials which ultimately depended upon the regular production and slaughter of live animals (O'Connor, 1993). In adopting the idea of a chain of interrelated events, recognising that the waste product of one process could be the raw material for another (O'Connor, 1993, p. 63) and doing away with the notion of the abattoir as a central node of carcass part distribution, it was perhaps the first study to look at the issue from the perspective of economic systems and urban life rather than from the resultant assemblage – a case of trying to rise above the trees and see the woods, as it were. On the basis of these assumptions, O'Connor suggested a model of carcass utilisation (and, therefore, unintentional zooarchaeological assemblage creation) in Mediaeval towns and cities (Figure 3).

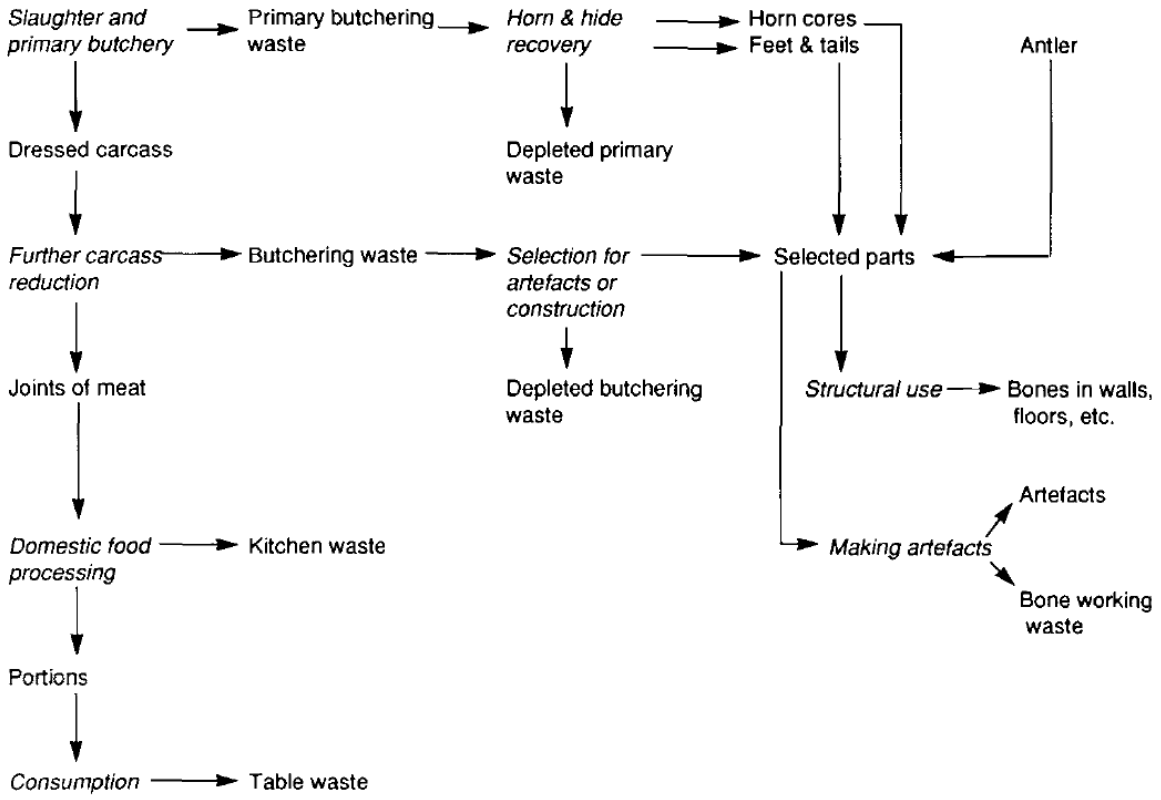

Figure 3: Hypothetical model of carcass utilisation and zooarchaeological assemblage creation in Mediaeval urban environments (after O'Connor, 1993).

Working on the other side of Europe, Bartosiewicz was attempting to reconstruct a Mediaeval urban economy, from primarily zooarchaeological remains, along a similar model. Threading the model into a specific case-study, however, he added practical observations related to the wider archaeological picture, such as domestic assemblages principally reflecting dietary habits – and adding that refuse pits generally contain such an assemblage (Bartosiewicz, 1995, p. 20). In considering butchery waste, he perceptively observed that cut marks could appear on an animal bone at any stage between slaughter and the table but that chop marks can most reasonably be associated with primary butchery (Bartosiewicz, 1995, p. 35) and that cuts of meat in Mediaeval Europe were often sold off the bone (Bartosiewicz, 1995, pp. 37–39 and quoting Vörös, 1992, p. 232). Recognising that desirability of different cuts of meat owes as much to individual (and, therefore, cultural) preference as to nutritional content, Bartosiewicz analysed meat prices across modern day (1980s) Europe as a proxy for Mediaeval European taste (Bartosiewicz, 1995, p. 38). Basing his study on average prices across sixteen different countries, Bartosiewicz identified some variation according to cultural preferences but nevertheless determined a general pattern which supports assumptions regarding the relative lower value of 'head and hoof' elements (Figure 4).

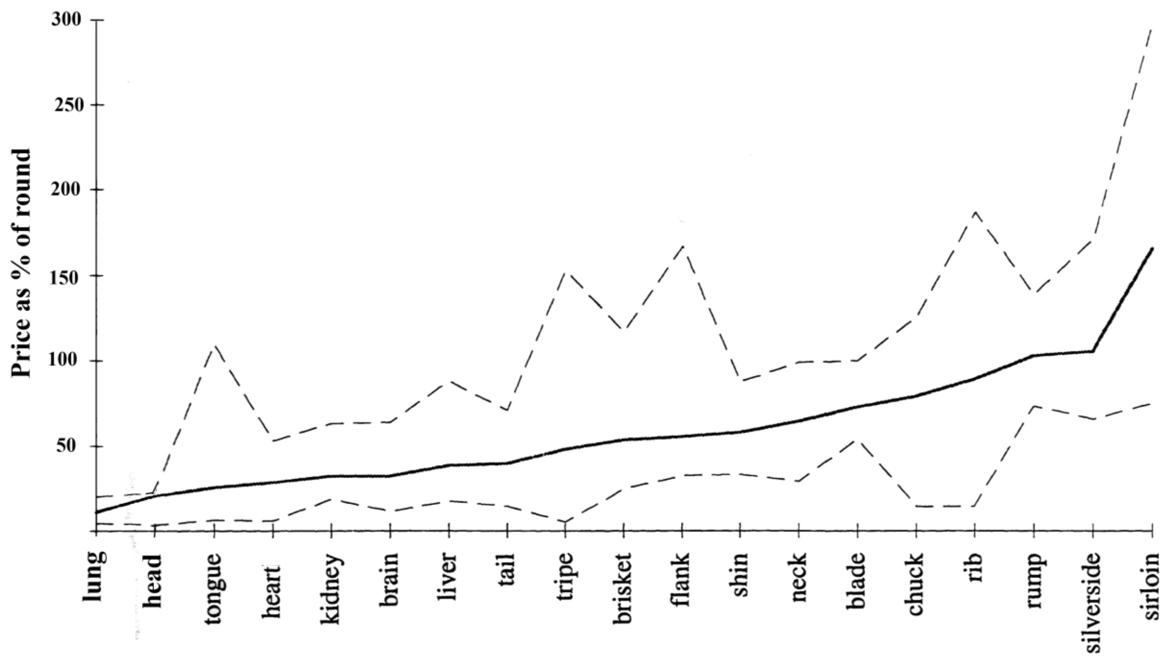

Figure 4: Relative mean prices (solid line) and ranges (dashed lines) of cuts of meat in late twentieth century Europe, expressed as a percentage of the price of the round (i.e. femoral) cut of meat (after Bartosiewicz, 1995).

Such a measure of value can have implications for the recognition of factors beyond processes, however, and Bartosiewicz was quick to recognise spatial patterns in the distribution of animal bones in Mediaeval Vác which could be explained by this scale (Bartosiewicz, 1995, p. 40), although he acknowledged that where possible the age of the animal should also be considered. Whilst examining this spatial distribution of elements he was also able to demonstrate that horncores were rare in these apparently domestic assemblages, both supporting the pattern and strongly suggesting that these elements rarely occurred in kitchen or table waste (Bartosiewicz, 1995, p. 44). It was also possible in Vác to identify tanning waste as discreet from domestic waste, due to the occurrence of the lower value 'head and hoof' skeletal elements absent from the other assemblages present in deposits strongly associated with the activity by other archaeological and historical evidence (Bartosiewicz, 1995, p. 74). A final cautionary note was sounded, however, by the potentially significant role played by dogs as scavengers in towns and cities of this date (Bartosiewicz, 1995, p. 59); dogs, like all scavengers, are not indiscriminate in their scavenging behaviour but prefer some skeletal elements to others (Brain, 1981b).

At around the same time that O'Connor was suggesting his model, based on trade patterns and economic and social habit, Wilson (1996) was approaching the subject of carcass distribution and assemblage formation from another angle, which explicitly recognised scavenging and other bone-moving activities as a part of the assemblage forming process. Where O'Connor's model implicitly worked from the top-downwards, seeking to find signatures of human activities in zooarchaeological assemblages, Wilson's was one which used as its starting point patterns in the general distribution of animal bones across an archaeological site observed across several sites in Oxfordshire. In fact, although applied to Mediaeval sites as case-studies, Wilson's model was designed as a universal one, equally as applicable to prehistoric sites as to Mediaeval ones, deriving from a study of what he termed 'ecoculture' (Wilson, 1996, p. 10).

The universal model of animal bone disposal proposed by Wilson was one of radial symmetry – appropriate either at the structure (house) or conurbation (town) level – which noted that bones increased in size away from the focus of domestic activity (Wilson, 1996, pp. 19–28). This model has two key underlying normative assumptions – that the larger a bone is the more likely it is to be moved after its initial disposal (unless that is in a pit) (Wilson, 1996, p. 14) and that the butchery of animals, despite cultural preferences, is largely dictated by size (Wilson, 1996, pp. 28 & 35). Thus, a large animal, such as a cow, is likely to have its meat sold off the bone and, consequently, its bones disposed of away from domestic properties (but they may be picked up and moved there by scavenging activities, etc. unless disposed of in a pit); a medium mammal, such as a sheep, is more likely to have its meat sold on the bone and so meat-bearing bones may end up as domestic waste; a small animal, such as a rabbit or a chicken, might be taken whole to the kitchen and even to the table so all of its bones may end up in domestic waste and, furthermore, the smallest bones may get lost and trampled underfoot in the home itself, or else burnt in the hearth.

Complementing Bartosiewicz's observation that chop marks were mainly the result of primary butchery processes whilst cut marks could result from kitchen or table activities, in a review of British Mediaeval butchery methods, Seetah noted that butchery marks present on forelimb elements, across several different sites, were more likely to be the result of disarticulation than from deboning practices (Seetah, 2006, p. 186). In comparison there appeared to be noticeably more fine blade marks on lumbar and pelvic elements at these sites but it was also noted that these same elements were more likely to be broken. The easiest way to butcher a skeleton into portions for cooking is to follow the natural articulations (Seetah, 2006) and so it has to be allowed that the greater frequency of chop marks on limb shafts may be related to some activity other than primary butchery – such as marrow extraction or tool manufacture. Whatever the underlying cause, it remains a noteworthy observation

For the most part, however, zooarchaeologists remained preoccupied by considerations of 'head and hoof' assemblages as the best window into Mediaeval trade and industry in cities. Albarella reviewed this line of evidence, from the (English) historical and zooarchaeological perspective, in 2003. On the basis of this review, it was argued that specific horn-working assemblages were almost entirely absent from the archaeological record and that they would, in any case, be difficult to identify (Albarella, 2003). Suggesting that tanners and tawyers, rather than butchers, may have been responsible for selling material to horners (Albarella, 2003, p. 75) he inferred that accumulations of horncores may be more closely associated with leather-working than horn-working industries. Albarella also recognised that peripheral elements of the carcass could be primary butchering waste (an intrinsic assumption in O'Connor's (1993) model which saw such waste becoming a useful material for other industries rather than simply being disposed of) but reasoned that the methodical process of butchery would lend itself to the creation of discreet assemblages of specific elements and so could be distinguished from the mixed waste assemblage created by leather workers (Albarella, 2003, p. 77). Albarella also recognised that parts of the skull were meat bearing, an issue implicitly ignored by the catchy 'heads and hooves' slogan but tacitly recognised by most practitioners, and thus constructed a model of what elements might be found as a result of each industry discussed here (Table 1). The overlap in such a model is plain and led Albarella to call for greater consideration of wider sources in interpreting such assemblages; fully integrating zooarchaeological signals into wider evidence to reach secure conclusions.

Table 1: Types of animal bone assemblages to be expected from principle carcass related industries (after Albarella, 2003).

	Butcher	Leather Worker	Horner
Small fragments (incl. teeth) and feet	x		
Horncores (frontals) and feet	(x)	x	
Feet	x	x	
Horncores	x	x	x

Specific zooarchaeological signatures were noted, however: horncores with saw marks, he argued, were evidence of horning in the Mediaeval period due to the fact that butchery with the use of saws has not been documented in this period; assemblages containing horse remains were more likely to be leather working waste as these animals were not eaten in Mediaeval Britain and so did not pass through the hands of the butcher and assemblages where the bovid remains were exclusively heads (presumably just frontal bones and horncores, in light of Albarella's other arguments) and feet were probably also the result of tanning or tawying industries (Albarella, 2003, p. 81).

Writing in 2010, Yeomans explicitly adopted and adapted O'Connor's model to examine 'animal product industries' in London and in doing so first noted that the assemblages resultant from such a model reflected a 'reduction sequence' (Yeomans, 2010, p. 33). This study focused on the Post-Mediaeval city but some Late Mediaeval sites were also examined in order to understand the origins and development of the industries. This review also followed Albarella in associating horse remains with tanning waste (Yeomans, 2010, p. 38) and acknowledging that leather working derived assemblages could be similar to those created by primary butchery (Yeomans, 2010, p. 34). Yeomans echoed Serjeantson (1989) in postulating that horns were left attached to the hide in order for the leather worker to estimate the age of the animal and so adapt the industrial process to suit the raw material; thus horncores would be associated with leather working waste, with the horner buying horn from the leather worker.

Bracketing the time period discussed here (together with Yeomans's review), in a recent review of Early Mediaeval butchery in England, Holmes reported a clear dominance of chop over cut marks on bones and noted that saw marks occurred almost exclusively on horncores (2011, p. 86). The review suggests that butchery at this time was not standardised and was principally concerned with achieving pot or portion sized chunks of meat which may have been carried out at the household level, additionally noting a high level of marrow extraction (including axial splitting of the metapodials) in this period, with indications that it was tailing off towards the end (Holmes, 2011, pp. 90–91). Holmes indicates that industrial activity is already an urban activity by this time, with the most commonly identified industry being antler working (but that the evidence for this industry decreases from the ninth century onwards). She adds that cut marks on phalanges and chop and saw marks on horncores are suggestive of leather and horn working but that these interpretations are speculative, being associated with finds within mixed assemblages rather than the kind of clear industrial waste examined in later periods (for example by Yeomans) and so may represent activities carried out at a household level, just as with the butchery evidence (Holmes, 2011, p. 92).

3.3 Sites Studied

Many Mediaeval archaeological sites in Britain, especially urban ones, have been excavated by commercial units as a result of government regulation and guidance – especially since 1990 (Pryor, 2006, pp. 12–16). The time and financial limits typically imposed on projects by contract work of this kind largely account for the lack of resources implied above for zooarchaeologists who may otherwise be more inclined to make more detailed studies of the material presented to them for analysis. The greater time and budgetary constraints emplaced on commercial archaeology has also had an impact on publication – many sites excavated, including some at which specialist work such as zooarchaeological analysis has taken place, remain unpublished; those that do overcome this hurdle and enter the public arena often do so as a part of synthesis volumes. A consequence of this publication history is a bias in our understanding towards particular cities in the South and East.

Probably the best example of this is York, arguably more thoroughly studied and widely published than any other Mediaeval city in Britain and the one with which most zooarchaeological comparisons begin. There was clear evidence for horn-working at several sites in High Mediaeval York (Bond and O'Connor, 1999; O'Connor, 1988, 1984, p. 28); their concentration in one area of the city might indicate a strong industry, or, alternatively the diffuse waste disposal activities of a single workshop (Bond and O'Connor, 1999, p. 380). There are also some indications of a tawying industry in the Late Mediaeval city (O'Connor, 1984, p. 52) and it has been suggested that a system of centralised and standardised butchery was adopted in York in the Early Mediaeval period (O'Connor, 1991), with assemblages of primary butchery waste being identified (O'Connor, 1984, p. 26). If York is the city with which comparisons often begin then it is perhaps not unfair to say that they often end with Lincoln, in which Mediaeval tanning and horn-working industries have been confidently interpreted (Dobney et al., 1996, p. 29) whilst butchery practices would appear to have been altered after the Norman conquest (O'Connor and Wilkinson, 1982, p. 50).

Elsewhere in eastern England, horn-, bone- and leather- working and organised butchery have all been interpreted on the basis of the faunal evidence in High Mediaeval Norwich (Albarella et al., 2009). The evidence from Leicester is less extensive but there are indications of bone working and furrier industries (Gidney, 2000). A furriery has also been suggested on the basis of the faunal remains from the Mediaeval layers in the southern city of Winchester (Serjeantson and Smith, 2009, pp. 146–149) alongside a shift in butchery practices similar in form and timing to that observed in York (Bourdillon, 2009, p. 81) and extensive evidence of bone-, horn- and skin- working (Serjeantson, 2009, pp. 176–180).

Finally, a possible furrier trade was also identified in High Mediaeval Exeter, together with bone- and horn- working industries (Maltby, 1979, p. 86). A system of organised butchery was also suggested which saw domesticated bovids driven to the city for slaughter and butchery by specialised tradesmen, whilst pigs and chickens were raised within the city and were despatched and butchered by the households that raised them (Maltby, 1979, p. 87).

3.4 Approaches Taken

Although methods are usually stated, fully referenced or explained, for identification and recording of faunal assemblages it remains the case that frameworks for interpretation are rarely explicated. Most reference previous interpretations by way of comparison and support to their own and the sites mentioned above all do so. As such, inferences based on 'head and hoof' assemblages remain the most common form of identifier for animal primary product industrial activities; whilst cut and chop mark analysis is the usual point of discussion for questions of both butchery standardisation and furrier activity.

3.5 Discussion

The framework suggested by Chaplin (1971, p. 42) for considering Mediaeval urban faunal assemblages was perhaps overly simplistic but it was, nevertheless, a positive step at the time which encouraged zooarchaeologists to consider these questions. That this should have occurred just as zooarchaeology and historical archaeology were beginning to become accepted branches of archaeology was a serendipitous circumstance which no doubt helped to aid its widespread adoption. If there is a criticism to be made then, it is not so much of the model itself but rather with what has come after: what should have been a solid base from which to build has been left as an unfinished structure.

Not all zooarchaeologists have been content simply to fit material to this model – a notable and common phenomenon since has been the gradual inclusion of horncores with metapodials and phalanges as a part of the 'heads and hooves' paradigm and scepticism of some previous interpretations of horn-working assemblages (see Albarella, 2003 discussing O'Connor, 1984). Such adaptations of the model amount to little more than tinkering, however: despite some researchers actively engaging with the zooarchaeological record in order to devise new methods for identifying industrial activities their more general adoption has remained negligible. Driver's (1984) model, in particular, was notable not just for its attempt to identify industrial (specifically bone-working) waste through less obvious but more prevalent material but also in that it has consequences for domestic assemblages. The model works on the same broad principle as the 'heads and hooves' model in that it operates at the level of the assemblage; if such industrial assemblages should inherently include more large mammals then this would suggest that these same large mammals are absent from the domestic assemblages. The interrelatedness of the Mediaeval urban economy could not be more clearly expressed than through such a model – each activity was dependent upon another and the disposal of animal bones is just one point in a chain of taphonomic events which culminate in the publication of the assemblage.

Serjeantson's (1989) observation of the impact of waste disposal practices on the resultant assemblage raised a similar point, although it missed the subtleties. Her review was concerned with leather and skin working waste and still focused on the assemblage as the appropriate analytical unit, in suggesting that waste could be dumped outside of the city and so not be directly related to the site which produced that waste she either missed or ignored an important consideration – if waste is dumped outside of the city there is a high chance that it may originate from several different sources and become mixed. Nevertheless, MacGregor (1989) highlights the importance of trying to understand these studies – the shift to an urban society had profound consequences not just for the economy but for how people lived. A large, fixed, market presented opportunities for people to work in new professions and live in different styles; opportunities which multiplied according to the demands of more people and more professions.

Tracing the web of these different professions, O'Connor (1993) was the first to suggest an alternative, cohesive model to Chaplin's. No doubt prompted by his extensive experience in analysing and interpreting the zooarchaeological record from Lincoln and, especially, York, it was perhaps meant more as food for thought than as a rigid template, which would explain why the applicability of such a model was not demonstrated through an extensive case-study. If that was the intention, its influence has not been as meteoric as might have been hoped but recent work (Holmes, 2011; Yeomans, 2010) has begun to develop this model more fully. At its heart, though, it remains a more nuanced version of Chaplin's model.

Bartosiewicz's (1995) study of Vác, meanwhile, contained some very interesting ideas in what was a fully rounded study. Just as O'Connor's proposed model may have been born out of a need to better understand what was happening in Mediaeval York and Lincoln, Bartosiewicz investigated several proxies and models in order to better understand the zooarchaeological record of the city in an examination which was already well integrated with wider archaeological and historical data. His proposal of modern day meat prices as a proxy for earlier preferences, in particular, may have obvious flaws (which he, himself, acknowledges) but is worthy of some consideration in an urban context where meat weights and other nutritionally-derived measures of 'value' have equally obvious problems. His spatial analysis of Vác was illustrative in this respect, suggesting both class and cultural differences across the city (Bartosiewicz, 1995, p. 40).

Wilson's (1996) model is interesting in this regard due to it approaching the subject explicitly from a spatial analysis perspective – this study clearly acknowledges the movement of bones hinted at earlier here, not just deposition of bones away from the activity area but also secondary deposition and scavenging activities. Any study of zooarchaeological material has to consider movement of bones but the potential number and variety of pre-depositional taphonomies in urban environments can be bewildering. By adopting the site-aggregated assemblage as the starting point for his model, Wilson's approach was significantly different to the other models here, which take a top-down approach in asking what assemblages produced by various activities may look like.

In this respect, Albarella's (2003) review of probable horn- and leather- working sites in Central England is instructive; just as with this discussion it warns of possible over-simplification but it ends on an optimistic note, arguing that although many taphonomic processes act upon Mediaeval urban assemblages the fact that likely industrial waste assemblages do occur makes them worth seeking and studying. Whilst there should be few arguments that they are worth studying, the notion that they should be sought is, to my mind, more contentious. As observed in the introduction to this chapter, these assemblages are unusual and it is their inherent unusualness that makes them worthy of discussion – the usual material may be just as informative if the right approach is taken, however, as Wilson and Bartosiewicz demonstrated. Seetah's (2006) review of Mediaeval butchery is another example of how this kind of approach may pay dividends – his observation of patterns of butchery marks on axial elements compared to limb elements suggests that more meat associated with thoracic and lumbar elements was sold on the bone than limb elements, which may have commonly been boned-out by butchers before sale. This is another consideration for both the value of different cuts of meat and what kind of waste might be accumulated from different processes – would limb elements be more regular occurrences in butcher's waste than in domestic?

Holmes's (2011) review is also worth mentioning here, as an example of a piece of work which seeks to test previous assumptions and build on earlier work, especially that of MacGregor (1989). Specifically, she questioned the timing of the move from a peripatetic to a settled craft in light of a larger dataset – it is worth noting, though, that she did not demur on the central idea of the model despite the insight offered by more research. Yeomans's (2010) study also fits this trend of assessing earlier models – here most notably O'Connor's (1993). Although this model was broadly adopted without alteration her observation that it basically consists of a 'reduction strategy' is an important one as it suggests that there may be valid comparisons to be made with other reduction strategy models outside of zooarchaeology.

In spite of the few sites published and the general lack of engagement with explicit models and theories, a general pattern of industry growth and trade specialisation seems to be emerging from York, Norwich, Lincoln and Winchester which sees a standardisation (and, therefore, probably organisation) of butchery practice some time before or soon after the Norman conquest and the subsequent development of intensive bone-, horn-, and skin-working industries. Such a development would appear to be logical but the nature and impact of these changes remain to be determined and these are not light questions at a time when animal derived products were of the utmost importance to the British and European economy (Epstein, 2009, p. 91; Seetah, 2007, p. 22). Maltby's (1979) observations about different treatment of animals from different sources deserve further attention in this light; zooarchaeologists are quick to separate wild and domestic taxa in interpreting urban assemblages but it would appear that an intra- and extra-urban origin of the animal may be at least as important for the way in which the carcass was treated from the moment it entered the city to its final deposition – that these considerations should concern sheep at the time of the famously important wool trade should not be seen as inconsequential, either.

In conclusion, several researchers have conducted reviews and proposed models for furthering our understanding of the pre-depositional taphonomic pathways of faunal bones in Mediaeval urban environments and, thus, the societies and activities that affected them. That analysis carried out by other researchers should be so wedded to the idea of seeking signature assemblage types is perhaps partly the result of the environment in which much of this work is undertaken but there is also an argument to be made which would see as an assemblage level unit of analysis as inherent in most of the models discussed. Focusing on unusual assemblages in this way ignores the majority of material excavated in urban environments, which typically contain many mixed assemblages as a result of waste disposal and bone-movement (including scavenging) activities; by contrast, focusing on site-wide spatial analysis would appear to reveal information about these disposal practices and about lifestyles but misses the important information suggested by the unusual deposit. An analysis of butchery marks, meanwhile although carried out at the site-wide level is in itself an analysis of an unusual assemblage – one containing elements selected by the zooarchaeologist. It would appear that though each approach may have some benefits, each also has flaws; an integrated approach may cover for these flaws but it may, alternatively, mask them or even introduce new ones.

4. The Animal Bones from Mediaeval Princesshay, Exeter

The title of this chapter is self-knowing, as much as self-deprecating. The dull, uninspired 'The Animal Bones' heading will be familiar to anyone who has ever read a site report. As commercial excavations, which are responsible for the majority of urban archaeology research in the UK, suffer under the burden of time and budgetary constraints a certain prescriptiveness creeps into reports. In part, this is a decision imposed to ensure a consistent product for clients as well as to maintain standards. It possibly also feeds a malaise, however, entrenching a 'report by numbers' approach that sees us ask the same questions of material and answer them in the same ways over and over again. Then we saddle the 'Animal Bones' title over our text and complain that our work is unlooked for and unloved, consigned to the appendices where no-one but another specialist will ever encounter it (although there are indications that this may be changing, with several recent published reports (as opposed to grey-lit) interweaving artefactual and environmental evidence throughout the text, e.g. Barber et al., 2015; Cowie et al., 2012; Hill and Rowsome, 2011). Could something as simple as a different, more creative, title inspire both more creative work and greater interest in the report? It seems to me, at least, that that is possible. The purpose of this chapter, however, is not to be creative but to report on the zooarchaeology of Mediaeval Princesshay in a traditional manner in order to set a baseline for the rest of this thesis. In order to demonstrate different approaches it is first necessary to show what traditional approaches achieve with the same material.

4.1 Materials & Methods

4.1.1 The Animal Bones

The material analysed was excavated by Exeter Archaeology during 2005 from a large site in the north-west of the Mediaeval City (Figure 5). Two parts of the Princesshay redevelopment were the focus of open-area excavations but almost all of the material came from the area inside the city walls (Figure 6, Figure 7). Most of the material was hand-collected although environmental samples were taken and these were fine-sieved using a 3mm gauge gauze. Although excavations took place in two distinct areas of the site, spatial information was not available at the time that this material was studied. The bones were selected for study on the basis of an assessment carried out by Lorraine Higbee, which targeted contexts with better dating potential (on the basis of ceramic associations) (Coles, pers. comm.).

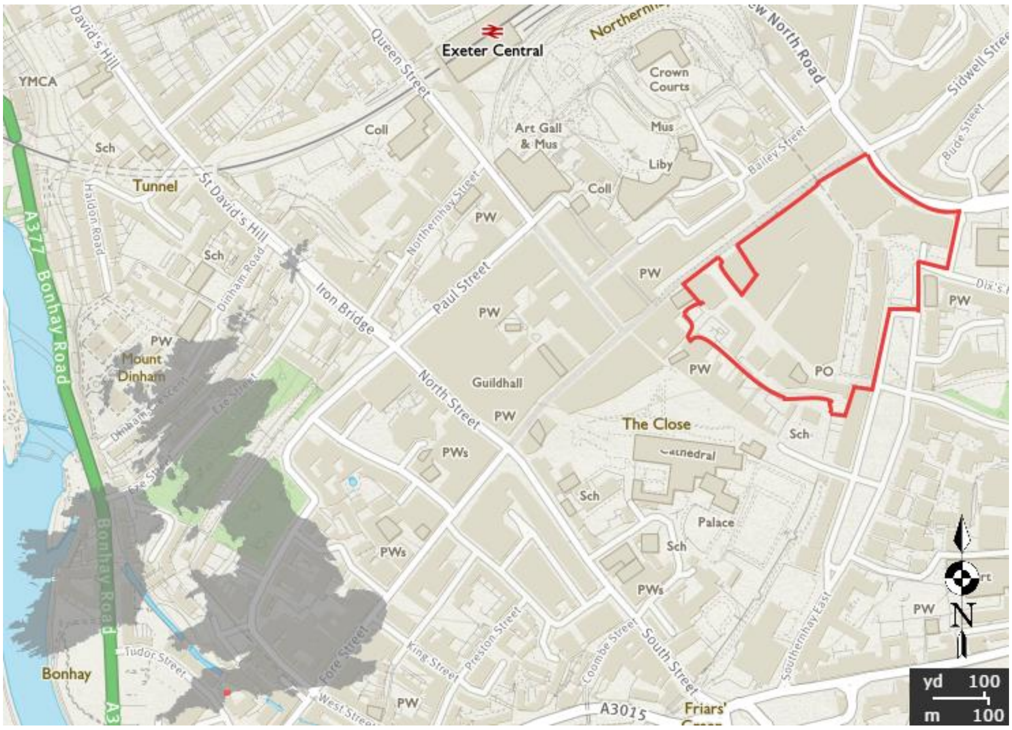

Figure 5: Location of Exeter (overlay) and Princesshay (red outline).

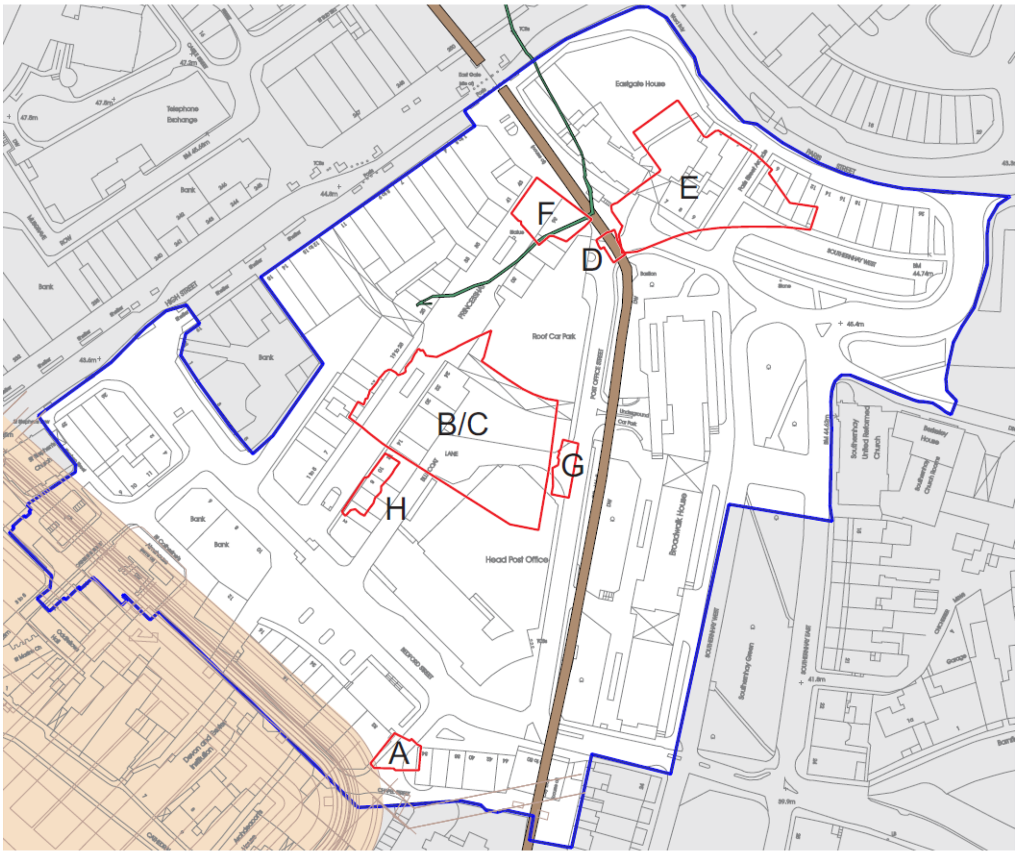

Figure 6: Location of city walls (brown line) and excavation areas (red boxes) in relation to Princesshay (after Pearce et al., 2007, Fig. 1)**.**

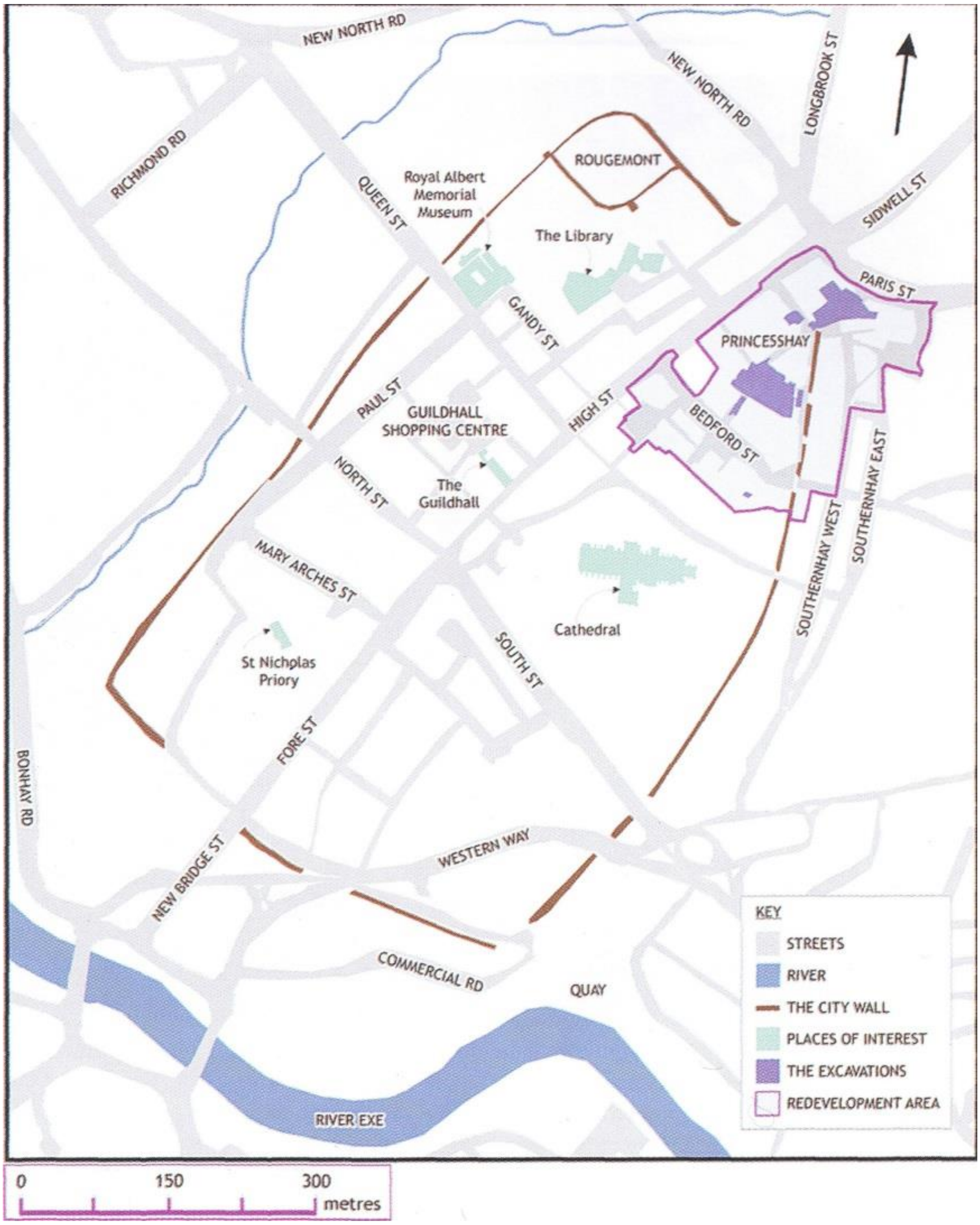

Figure 7: Map of Exeter showing the Mediaeval city walls and areas of excavation (from Green, 2009)**.**

4.1.2 Methods

The binomial name is used for all species throughout this chapter. Taxonomy follows Wilson and Reeder (2005) for mammals and Gill and Donsker (2015) for birds. For convenience, their common (English) name is used in brackets alongside the binomial name when the animal is first mentioned, and a dictionary of all the animals mentioned in the report is provided in Appendix 1. The word caprine is used when referring to an animal that may be a sheep or a goat.

All bones in the assemblage were identified by comparison with the specimens held in the reference collections at Bournemouth University, the University of Sheffield, the University of York, or the private collections belonging to the author or Sheila Hamilton-Dyer.

The recording protocol is based on a modified version of that outlined by Davis (1992). A number of revisions have been made which reflect the specific research aims of the current project and that will efficiently explore its characteristics. The elements and zones listed below have been chosen based on a number of criteria including:

1) potential for identification to skeletal element and species by specialists of varying experience

2) survivability

3) potential for providing information on the age and/or sex of an animal

4) potential to provide useful measurements.

The system is based on three main database structures using Microsoft Access 2010, one for teeth, one for bones recordable under the protocol (countable elements) and one for all other fragments (non-countable elements).

In brief, all teeth were counted (maxillary and mandibular) and a pre-determined selection of skeletal parts was recorded and used in counts. Specifically, these parts are as follows: zygomaticus; occipital; supraorbital; atlas; axis; scapula (glenoid articulation); distal humerus; proximal humerus; distal radius; proximal radius; proximal ulna; carpal 2-3; distal metacarpal; pelvis (ischial part of acetabulum); distal femur; proximal femur; distal tibia; proximal tibia; calcaneum (sustentaculum); astragalus (lateral side); scafocuboid; distal metatarsal and proximal parts of the 1st, 2nd and 3rd phalanges. At least 50% of any given part had to be present for it to be recorded. The number of large (cow or horse sized), medium (sheep or pig sized) and small vertebrae and ribs were recorded. Horncores with a complete transverse section were also recorded.

For birds, the following elements were always recorded, along the same lines outlined above for mammals: scapular (articular end), proximal coracoids, distal humerus, proximal humerus, proximal radius, distal radius, proximal ulna, proximal carpometacarpus, distal femur, proximal femur, distal tibiotarsus, proximal tibiotarsus and distal tarsometatarsus.

Amphibian bones were recorded when either end of the following bones is present: humerus, radioulna, femur and tibiofibula. The acetabulum is also recorded.

The following bones of fish were recorded with the assistance of Sheila Hamilton-Dyer and Harry Robson: post-temporal, dentary, articular, pre-maxilla, maxilla, vomer, parasphenoid, hyomandibular, pre-opercular, pre-caudal vertebrae, caudal vertebrae, vertebrae, dermal denticle, cleithrum, opercular, quadrate, urohyal, ceratohyal, supracleithrum, basioccipital, hyopohyal, frontal, spine anal pterygiophore. All unidentifiable spiny fragments were recorded as ribs.

Non-countable elements (fragments) are those specimens which are not used for any high-resolution quantitative analysis (i.e. Minimum Number of Elements [MNE], Minimum Animal Units [MAU] and Minimum Number of Individuals) and include identifiable but partial bones and all other elements or parts of elements which are not included in the list of regularly recorded teeth and bones (see below). As much information as possible is recorded for these specimens including, where possible, attribution to species, genus, class (for fish and bird) or Large Mammal (*Cervus*/Bos/*Equus* size), Medium Mammal (*Capreolus*/*Ovis*/*Sus* size), Small Mammal (*Oryctolagus*/*Felis* size) or Rodent. This information is recorded because it is used for low-resolution quantitative analysis (i.e. Number of SPecimens [NSP] and Number of Identified SPecimens [NISP])

The separation between *Ovis aries* (sheep) and *Capra hircus* (goat) was attempted on the following elements: mandible; dP_3; dP_4; M_1; M_2; M_3; distal humerus; distal metapodials (both fused and unfused); distal tibia; astragalus and calcaneum, using the criteria described in Boessneck (1969), Payne (1969, 1985); Kratochvil (1969) and Halstead, et al.(2002).

The separation between *Dama dama* (fallow deer) and *Cervus elaphus* (red deer) was attempted on the following elements: scapula; distal humerus; proximal radius; distal radius; proximal metacarpal; distal metacarpal; distal tibia; astragalus; calcaneum; proximal metatarsal; distal metatarsal and first phalanx, using the criteria described in Lister (1996).

The separation of the various galliform species followed the criteria laid out by Tomek and Bocheński (2009).

Hare and rabbit bones were distinguished using reference specimens. It is acknowledged that *Lepus europaeus* (European hare) and *Lepus timidus* (mountain hare) are osteologically very similar – indeed, identifying a standard means of distinguishing them is the focus of a current ongoing research project elsewhere. Bones identified as *Lepus europaeus* may include some specimens of *Lepus europaeus* but, considering the time and place studied, this is thought unlikely.

Wear stages were recorded for P_4, dP_4, M_1, M_2, and M_3 of *Bos* (cattle), caprines and *Sus* (pig), both isolated and within mandibles. Tooth wear stages follow Grant (1982) for *Bos*, Bull and Payne (1982) for *Sus* and Payne (1973; 1987) and Jones (2006) for caprines.

A mammal bone epiphysis is described as "fusing" once spicules of bone have formed across the epiphyseal plate, joining epiphysis to metaphysis, but while some 'gaps' are still visible between the epiphysis and diaphysis. An epiphysis is described as "fused" once these gaps along the line of fusion have disappeared. Fusion stages follow Moran and O'Connor (1994) and Zeder (2006). Bird bones with ends that are incompletely ossified were recorded as "juvenile". Where mammal bones were fused, or fusing, and bird bones were not juvenile specimens, metapodial measurements were taken according to Payne (1969), measurements for *Sus* teeth were taken following Payne and Bull (1988), whilst all other measurements taken followed the criteria laid out by von den Driesch (1976).

Equus sp. (horse) bones and teeth are aged according to Silver (1969) and Levine (1982).

Butchery is recorded adapting Maltby (2010, 126-142) and fracture patterns following Outram (2001; 2002). The principal adaptation of Outram's FFI (Fracture Freshness Index) recording system is to apply it to all specimens recorded – the original method only proposed its use for long bones. There is an assumption made here that the system can be applied to cancellous bone, as well as to cortical bone. The two types of bone might be supposed to fracture very differently but initial experimental work suggests that it reacts to percussive fracture similarly enough to warrant a standard recording system. These data are currently unpublished as further work is ongoing. Although this approach means recording a lot of bones with high (5 or 6) scores on the index and might be supposed to lead to little direct information, it provides an objective means of assessing the nature of breaks in the assemblage as a whole. In brief, FFI proscribes a score of 0-2 in each of three different categories: angle (the angle of break in the cortical bone, with a score of 2 being along the radius of the bone and 0 being an acute angle), texture (of the break in the cortical bone, with 0 being smooth and 2 being rough) and outline (the shape of the break, with 0 being a helical fracture and 2 being a perpendicular oblique break in the bone). The three individual scores are then totalled and scores of 0-2 are assumed to be bones broken when fresh and 5-6 being bones broken when old, with intermediate scores being more equivocal. Maltby's recording system of 2-4 character strings for registering the type (chop, cut or saw), angle and location of butchery marks is elegant and versatile – lending itself to easy use in statistical as well as graphical analysis. The only adaptation made here is to extend the number of codes used to cover those butchery marks not featured in Maltby's original lists (see Appendix 2 for a complete list of the codes used).

Bone condition was recorded as Excellent, Good, Moderate, Bad or Awful. The scale can be seen as analogous to that proposed by Lyman (1994) and similar to the weather scale proposed by Behrensmeyer (1978) but, importantly, also accounts for other diagenetic processes in addition to weathering. It attempts to ascribe a surface condition to the bone without attributing a cause to that condition.

Measurements were taken following Davis (1987, 1996), von den Driesch (1976) and Walker (1980). The following measurements are taken:

TEETH

Equids: L_1, W_a and W_d (only teeth which can be positioned, i.e. we know which tooth it is) (W_d is only taken on molars)

Cattle: dP_4 W, dP^4 W, M^1W, M^2W, M^3W, M_1W, M_2W, M_3L and M_3W

Caprine: dP_4W, M_1W, M_2W, M_3L and M_3W

Pig: dP^4 (L,WP), M^1, M^2 & M^{12} (L, WA,WP), M^3 (L,WA,WC), dP_4 (L,WP), M_1, M_2 & M_{12} (L,WA,WP), M_3 (L,WA,WC, WP), H.

Carnivores: P_4, M_1 (L & W), P^4 (L, WA, WP), P_1-M_3L (canids), P_3-M_1L (felids), P_2-M_3L (canids), P_1-P_4 L (canids), P_2-P_4L (canids), P_4-M_1L (canids), M_1-M_3L (canids), M^1-M^2L (canids), H.

Rodents: M_1-M_3L, M^1-M^3L (P_4-M_3L, P^4-M^3L in dormice and P_3/P_4-M_3L, P^3/P^4-M^3L in squirrels)

BONES

Horncores and antlers: min. (Dd) and max. (Bd) diameter of the base

Cranium: birds = GL, GB, GH, LP

Atlas: mammals = H, BFcr (only for pig)

Scapula: mammals = SLC

birds = GL, Dic

Coracoid: birds = GL, Lm, Bb, BF

Humerus:	mammals = GLC, Bp, BT (ungulates), Bd (all other mammals), HTC, SD
	birds = GL, Bd, Dd, SC (when GL is taken)
	reptiles = GL, Bd, Dd, SD (when GL is taken)
Radius:	mammals = GL, Bp, Bd, SD (when GL is taken)
Ulna:	mammals = DPA, SDO, BPC
	birds = GL, Bp, Did, SC (when GL is taken.
Metacarpal:	bovids and cervids = GL, SD, BatF, Bd, Bp, WCM, WCL, DEM, DVM, DEL, DVL
	other mammals = GL, SD, Bd, Dd, Bp
	birds = GL, SC, Bd, Bp
Pelvis:	mammals = LAR (LA)
Femur:	mammals = GL, Bd, Bp, DC, SD (when GL is taken)
	birds = GL, Lm, SC, Bd, Dd
Tibia:	mammals = GL, Bd, Dd, Bp, b, SD (ant-post, when GL is taken)
	birds = GL, La, SC, Bd, Dd
Astragalus:	bovids and cervids = GLl, GLm, Bd, Dl
	pig = GLl, GLm
	equids = GH, GB, BFd, LmT
	other mammals = GL
Calcaneum:	mammals = GL, GD

Metatarsal: bovids and cervids = GL, SD, BatF, Bd, Bp, WCM, WCL, DEM, DVM, DEL, DVL

Other mammals = GL, SD, Bd, Dd, Bp

birds = GL, SC, Bd

Phalanx 1: equids = GL, Bp, Dp, SD, Bd, Dd

other mammals = GL/GLpe, Bp, Bd

Phalanx 2: mammals = GL, Bp, Bd

A complete guide to all the database codes and the metadata is provided in Appendix 2.

Statistical analysis, including the creation of graphs, calculation of percentages, *t* Test and χ^2 tests was carried out using Microsoft Excel 2010, which was also used for the preparation of all tables presented in the text. Log ratio analysis follows the method devised by Simpson (1941).

4.2 Results

After discounting all specimens from undated contexts and from those only dated loosely to the Mediaeval period, 11,013 hand-collected specimens were identified from more closely dated Mediaeval phases on the site – 4,483 from the Early Mediaeval period (principally from the eleventh and early twelfth centuries AD), 3,130 from the High Mediaeval period and 3,400 from the Late Mediaeval. Remains from the earlier (Roman) phases have been written up elsewhere (Broderick, 2013) and those from the later (primarily Civil War) phases will be discussed in a future publication. In these assemblages it was possible to identify 929, 732 and 729 specimens, respectively, to species level and a further 2,115, 1,562 and 1,412, respectively, to taxonomic class or 'class + taxon size' for mammals (such as 'medium mammal' for a mammal that is sheep or pig sized). Fragments that were not identified to at least this level were, most likely, mammal specimens for which it was not possible to assign a size class. In each period then, it was possible to identify between a fifth and a quarter of specimens to species with some degree of taxonomic precision in addition to between two fifths and a half with considerably less precision.

A general characterisation of the preservation of each specimen was carried out during recording, covering post-depositional taphonomies such as weathering and erosion, and the assemblage was seen to be in generally good to moderate condition (Figure 8). This means that the identification of pre-depositional taphonomic indicators could be made with more confidence but the incidence of the marks was low in each phase of the assemblage (Table 2).

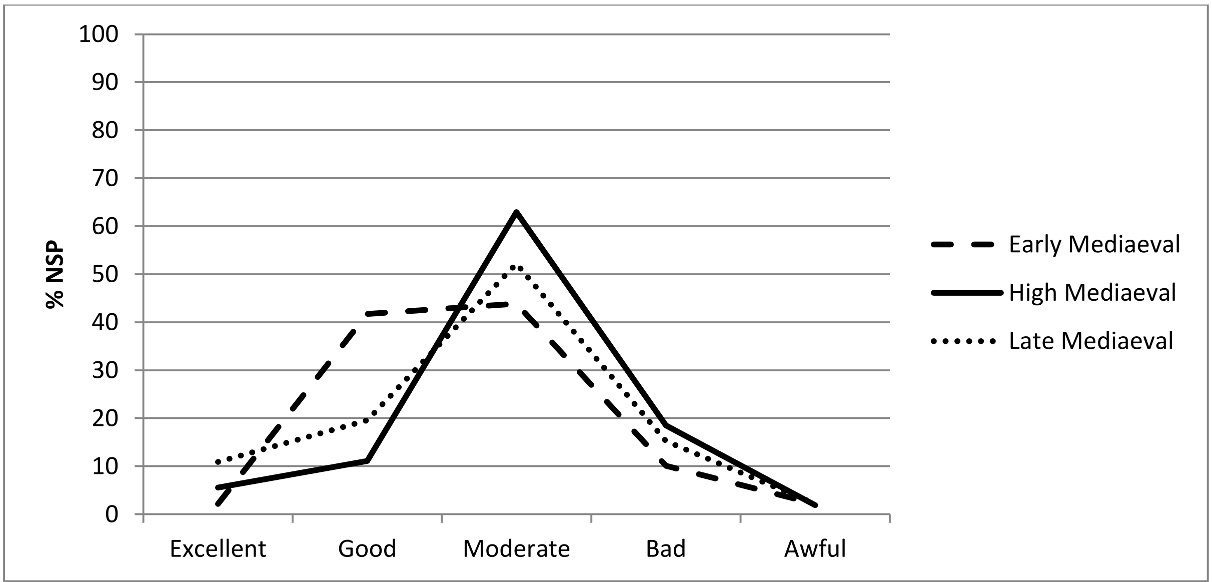

Figure 8: Condition of the identified specimens recovered, expressed as a percentage.

	Early Mediaeval				High Mediaeval				Late Mediaeval			
	NSP	Burnt	Gnawed	Butchered	NSP	Burnt	Gnawed	Butchered	NSP	Burnt	Gnawed	Butchered
Totals	4283	361	69	511	2979	144	76	233	3225	270	70	178
Proportion of NSP	1.00	0.08	0.02	0.12	1.00	0.05	0.03	0.08	1.00	0.08	0.02	0.06
	NISP	Burnt	Gnawed	Butchered	NISP	Burnt	Gnawed	Butchered	NISP	Burnt	Gnawed	Butchered
Totals	3044	361	69	511	2294	144	76	233	2141	270	70	178
Proportion of NISP	1.00	0.12	0.02	0.17	1.00	0.06	0.03	0.10	1.00	0.13	0.03	0.08

Table 2: Incidence of pre-depositional taphonomic indicators in each phase. NSP and NISP exclude teeth, NISP here includes those specimens only identified as far as class or class + size (for mammals).

When planning the Princesshay excavations, Exeter Archaeology consulted Vanessa Straker, the then regional science advisor for English Heritage (now Historic England), in order to design a thorough strategy for environmental sampling. It was acknowledged at the time that this was an area of particular interest in Exeter that had been poorly investigated previously.

Unfortunately, a crucial part of this process seems to have failed during post-excavation. While recording the material it was observed that some bags were labelled as having been sieved but did not have a sample number. Conversely, almost all of the bags that did have sample numbers were devoid of any labelling that they had been sieved. With that important caveat, a total of 4,742 specimens were recovered from environmental samples dated to the same periods as the hand-collected material described above – 2,098 from the Early Mediaeval period, 1,078 from the High Mediaeval and 1,579 from the Late Mediaeval. Of these, it was possible to identify just 16, 13 and 28 specimens to species level and a further 203, 129, 203 to class level (in the same manner described above) (Table 3).

Class (*Phylum)	Order	Family	Species (*other category)	Early Mediaeval	High Mediaeval	Late Mediaeval
Mammalia			*large mammal	8	**8**	**4**
			*medium mammal	46	**10**	**23**
			*small mammal	18	**9**	**27**
	Artiodactyla	Bovidae	*Ovis aries / Capra hircus*	1		1
			cf. *Ovis aries / Capra hircus*		4	
		Suidae	*Sus scrofa domesticus*	1	1	1
	Canivora	Felidae	*Felis catus*	28		
	Rodentia		*small rodent	7		
		Muridae	*Rattus rattus*			1
			Mus musculus		5	
			Apodemus sylvaticus	5		3
			cf. *Apodemus sylvaticus*			1
	Soricomorpha	Soricidae	*Sorex araneus*	1		
Aves			*bird	23	10	46
	Passeriformes				1	
		Corvidae	*Corvus corone / frugilegus*	2		
	Falconiformes	Falconidae	*Falco columbarius*			1
	Charadriiformes	Scolopacidae	cf. *Scolopax rusticola*		2	
Amphibia				6	2	1
Fish				92	92	103
Actinopterygii	Pleuronectiformes	Pleuronectidae	*Pleuronectes platessa*			1
	Gadiformes	Gadidae	cf. *Melanogrammus*			1
	Salmoniformes	Salmonidae				13
	Esociformes	Esocidae	*Esox lucius*			5
	Anguilliformes	Anguillidae	*Anguilla anguilla*	17		
Mollusca*				10		

Table 3: NISP from environmental samples.

4.2.1 The Early Mediaeval Period

The Early Mediaeval assemblage, though diverse, was characterised by the three principal domesticated mammals – *Bos taurus taurus* (domestic cattle), caprines (*Ovis aries* [sheep] and *Capra hircus* [goats]) and *Sus scrofa domesticus* (pigs) – together accounting for 770 of the 929 identified specimens (Table 4). The next most common species were also domesticates – *Gallus gallus* (domestic fowl), *Equus caballus* (horses) and *Canis lupus familiaris* (dogs) – but all of these were present in much smaller quantities. Wild birds and mammals were very rare on the site, and those that may have been food even rarer – a total of just five specimens of *Capreolus capreolus* (roe deer), *Cervus elaphus* (red deer) and *Scolopax rusticola* (woodcock) make a strong argument that the six *Anser* sp. specimens identified were of domestic goose and not the closely related greylag goose, which is difficult to distinguish osteologically.

The environmental samples did little to alter this, with the most common species in these samples being another domesticate – *Felis catus* (cat) – although there were enough specimens in these samples to make it the fifth most common species from this period in the assemblage (counting caprines as a single species). The order of commonality of species changed little, whether the measure used was NISP (Number of Individual SPecimens), MNE (Minimum Number of Elements), MAU (Minimum Animal Units) or MNI (Minimum Number of Individuals) – although this analysis did reveal that there were a peculiarly high number of right sided ulnae of *Sus scrofa domesticus* present (Table 5). In fact, for the most part, a relatively even distribution of skeletal parts appeared to be true for each species (Figure 9), although femurs were noticeably low. This suggests that, with the possible exception of the femur, all parts of the carcass were deposited on the site and that destructive taphonomies were not a determining agent in the assemblage's creation (Figure 10).

Also present in the assemblage were a variety of different species of fish, mainly gadids, as well as frogs and toads.

Butchery at this time appears to have been fairly non-standardised. Although ribs were often chopped through (30.6% [78 of 255] of all Large Mammal rib specimens and 26.9% [79 of 294] of all Medium Mammal rib specimens), other elements were treated far less consistently (Table 6). Butchery marks were more likely to be present on cattle bones (29.3% of all identified *Bos taurus taurus* specimens) than on specimens from smaller animals (15% of all identified caprine specimens and 10.4% of all identified *Sus scrofa domesticus* specimens) and some bones, at least, of all the domesticates were broken when fresh (Figure 11).

Class	Order	Family	Species	NISP
Mammalia	Artiodactyla	Bovidae	*Bos taurus taurus*	336
			cf. *Bos taurus taurus*	18
			Ovis aries/Capra hircus	152
			cf. *Ovis aries/Capra hircus*	61
			Capra hircus	6
			cf. *Capra hircus*	1
			Ovis aries	32
		Cervidae	*Capreolus capreolus*	1
			cf. *Capreolus capreolus*	2
			cf. *Cervus elaphus*	1
		Suidae	*Sus scrofa domesticus*	154
			cf. *Sus scrofa domesticus*	10
	Perissodactyla	Equidae	*Equus caballus*	26
	Carnivora	Canidae	*Canis lupus familiaris*	19
			cf. *Canis lupus familiaris*	1
			Canis sp./*Vulpes* sp.	1
			Vulpes vulpes	1
		Felidae	*Felis catus*	1
	Rodentia		*small rodent	1
Aves	Passeriformes	Corvidae	*Corvus corone corone*	4
			cf. *Pica pica*	1
	Charadriiformes	Scolopacidae	*Scolopax rusticola*	1
	Galliformes	Phasianidae	*Gallus gallus*	46
	Anseriformes	Anatidae	*Anser* sp.	8
			cf. *Anser* sp.	1
Amphibia	Anura	Ranidae	*Rana* sp.	1
		Bufonidae	*Bufo bufo*	1
Fish				1
Actinopterygii	Perciformes	Sparidae		3
	Gadiformes	Gadidae		6
			Pollachius virens	1
			Gadus morhua	5
			Merlangius merlangus	5
			Merluccius merluccius	16
	Salmoniformes	Salmonidae		1
	Anguilliformes	Congridae	*Conger conger*	3
Chondrichthyes	Rajiformes	Rajidae	*Raja clavata*	1

Table 4: NISP figures for hand-collected material from the Early Mediaeval period.

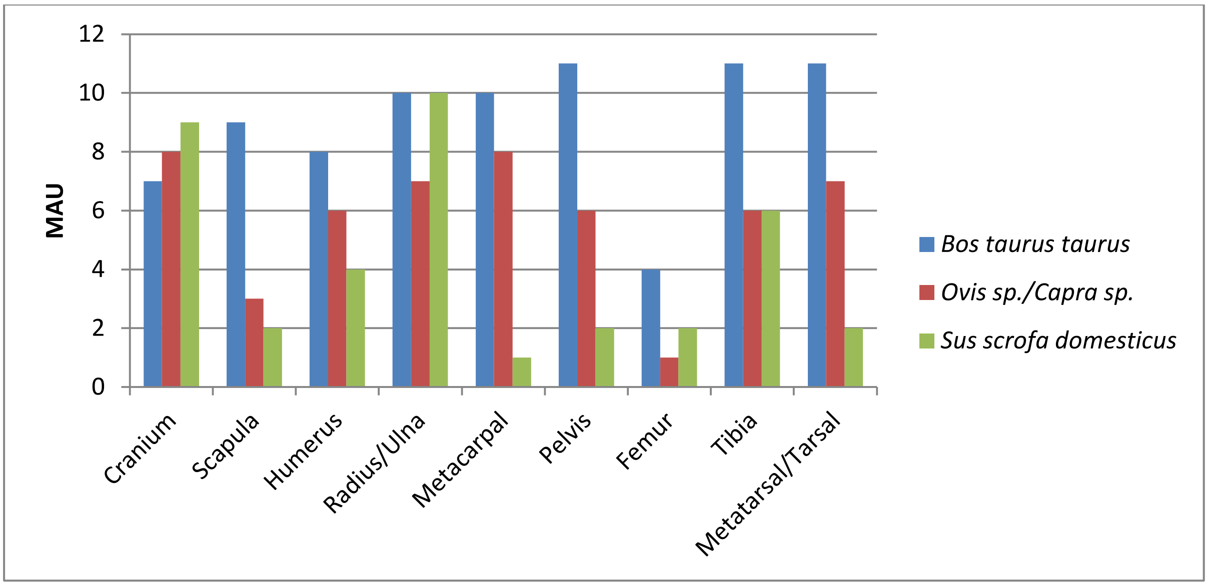

Figure 9: MAU figures for the principal domesticates in the Early Mediaeval phase.

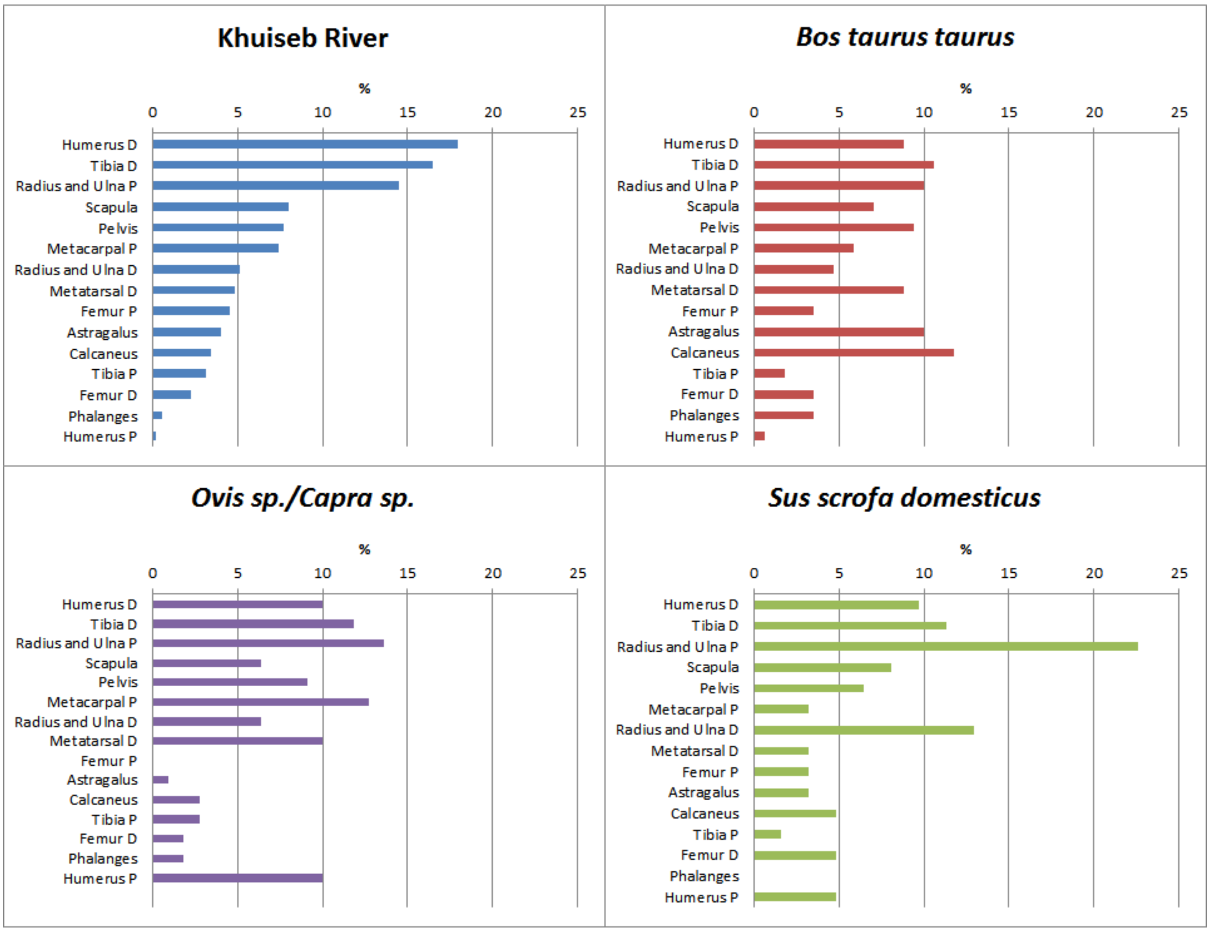

Figure 10: Skeletal element survival in the Early Mediaeval phase compared with ethnoarchaeological data from Khuiseb River (Brain, 1981b)**.**

	Element	Left	Right	MNE	MAU
Bos taurus taurus	Maxilla	4	7	11	7
	Mandible	5	7	12	7
	Supra-orbital	1	0	1	1
	Zygomaticus	2	2	4	2
	Horncore	7	7	14	7
	Occipital	1	1	2	1
	Atlas	n/a	n/a	7	7
	Axis	n/a	n/a	4	4
	Scapula	9	3	12	9
	Humerus	7	8	15	8
	Radius	8	8	16	8
	Ulna	10	7	17	10
	Cuboid	0	1	1	1
	Metacarpal	3	10	13	10
	Pelvis	11	5	16	11
	Femur	4	3	7	4
	Tibia	7	11	18	11
	Astragalus	1	11	12	11
	Calcaneum	10	10	20	10
	Metatarsal	10	8	18	10
	Phalanx 1	n/a	n/a	23	3
	Phalanx 2	n/a	n/a	8	1
	Phalanx 3	n/a	n/a	8	1
Capra hircus	Mandible	2	0	2	2
	Horncore	3	1	4	3
Ovis aries	Mandible	8	5	13	8
	Horncore	2	2	4	2

	Element	Left	Right	MNE	MAU
***Ovis* sp./*Capra* sp.**	Maxilla	5	8	13	8
	Mandible	6	3	9	6
	Supra-orbital	1	1	2	1
	Zygomaticus	0	1	1	1
	Occipital	4	3	7	4
	Axis	n/a	n/a	2	2
	Scapula	3	3	6	3
	Humerus	5	6	11	6
	Radius	7	7	14	7
	Ulna	4	3	7	4
	Metacarpal	6	8	14	8
	Pelvis	6	4	10	6
	Femur	1	1	2	1
	Tibia	6	6	12	6
	Astragalus	1	0	1	1
	Calcaneum	0	3	3	3
	Metatarsal	7	4	11	7
	Phalanx 1	n/a	n/a	8	1
	Phalanx 2	n/a	n/a	2	0
Sus scrofa domesticus	Maxilla	4	3	7	4
	Mandible	8	9	17	9
	Supraorbital	1	0	1	1
	Occipital	1	1	2	1
	Scapula	2	2	4	2
	Humerus	4	4	8	4
	Radius	4	4	8	4
	Ulna	4	10	14	10
	Metacarpal 1	0	1	1	1
	Metacarpal 2	0	1	1	1
	Metacarpal 3	1	1	2	1
	Metacarpal 4	0	1	1	1
	Pelvis	2	2	4	2
	Femur	2	2	4	2
	Tibia	2	6	8	6
	Astragalus	2	1	3	2
	Calcaneum	1	2	3	2
	Metatarsal 3	0	1	1	1
	Metatarsal 4	1	1	2	1
	Phalanx 2	n/a	n/a	1	0

Table 5: MNE, MAU and MNI (highlighted) figures for the principal domesticates in the Early Mediaeval period.

BUTCH	LARGE MAMMAL	*Bos* sp.	*cf. Bos* sp.	MEDIUM MAMMAL	*Ovis* sp./*Capra* sp.	cf. *Ovis* sp./*Capra* sp.	cf. *Capreolus capreolus*	*Sus* sp.	Bird	*Anser* sp.	*Gallus gallus*
A1		2									
A3		1									
A4		1									
A5		1		1		1					
A7		1									
A17					1						
A20		1									
A22		1									
C6		2									
C7		1									
C9		1									
F1	1										
F5	1	2									
F8		1		1			1	1			
F9						1					
F10	1										1
F12								1			
F13		1						1			1
F18		1									
F20	2	1									
F22								1			
H1	6	2									
H2		1									
H3	4							1			
H6	1	1						1			
H7		1									
H8				1							
H10		1		1							
H13		1									
H14	1										1
H15				1							
H16		1									
H17	1	2	2					1			
H18		1			1					1	
H19	2	2						2			
H20				1		1					
H21		1									
H23	3										
H24		1									
J13	1		1								
M1	8	9		1	2						
M3	3		2								
M7		1									
M10				1		1					
M12	3	2	2	1	3						
M13		1									
M17		1									
M18		2									
M20	1		1	1							
M21					1						
P5	3	3			1						
P7		1									
P8	1	2									
P9		4			1						
P10	1										
P12		1									
P13				1							
P16				1							
P18		1			2						

BUTCH	LARGE MAMMAL	*Bos* sp.	*Equus* sp.	MEDIUM MAMMAL	*Ovis* sp./*Capra* sp.	cf. *Ovis* sp./*Capra* sp.	*Capra hircus*	*Ovis aries*	*Sus* sp.	cf. *Sus* sp.	Bird	*Anser* sp.	*Gallus gallus*
PH2		1											
PH15		1											
R1	1	2											
R5	1												
R6	1												
R9		1											
R11										1			
R12		1											
R13		1							1				
R16	1				1								
R18		1											
R23	1					1							
R24					1								
R25										1			
RB1				1									
RB3	78			77									
RB5				1									
RB7	6			5									
RB8	17			15									
S1	3												
S2		1											
S3		1											
S6		2											
S12													1
S16									1				
S17		1											
S21												1	1
S22									1				
SK2		4		1	2		3	3					
SK3		1											
SK16		1											
SK17					2								
T1				1	1	1							
T7			1										
T8		2			1								
T10		2		1	2	1			1				
T11		2										1	3
T13		1		1		1							
T14		4											
T16			1										
T19		1							1				
U1		1											
U5									1				
U9									1				
U17		1											
V1	4			1									
V2	5	1											
V3	11	1		1	1								
V4	4			1									
V6	1												
V7	1												
V8		1											
V9	2	1			1						1		
V11	4	2											
V12	1												
V14	1				1								
V15	1												
V16	11			1	1								
V17				1									
V18													
XP	33			5									
XT	15			6									

Table 6: Butchery marks recorded for birds and mammals from the Early Mediaeval period (for definition of codes used, see appendix 2).

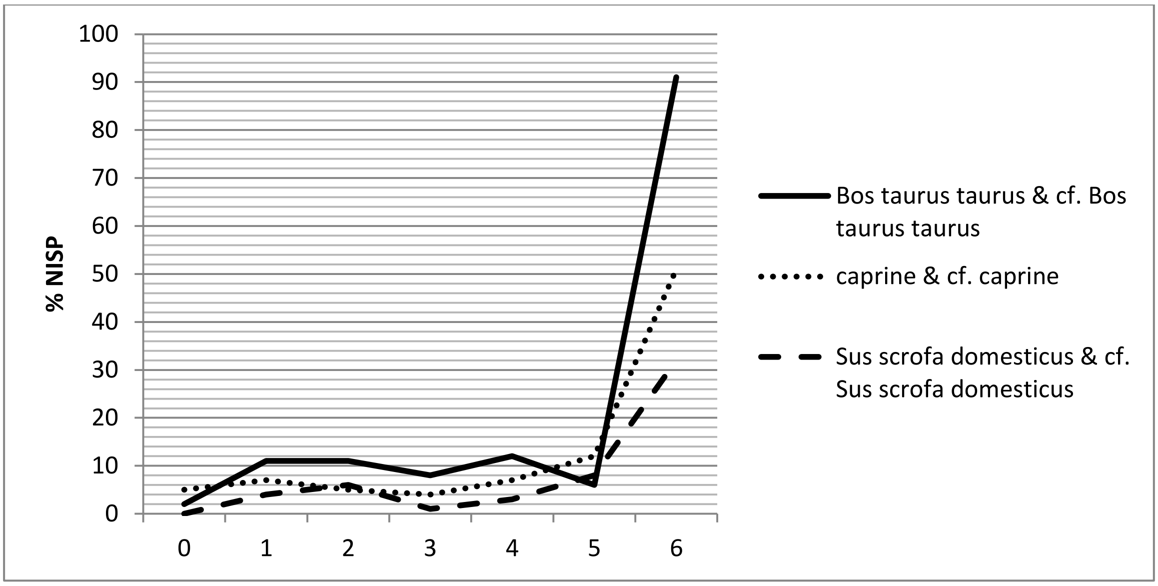

Figure 11: FFI values for specimens of the three principal domesticates from the Early Mediaeval phase on the site.

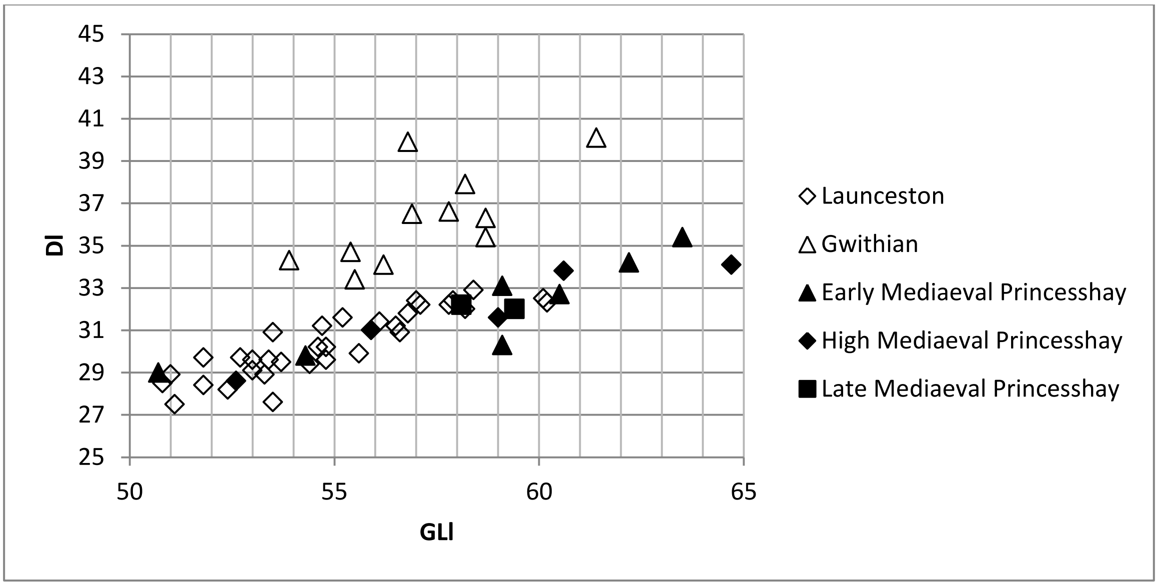

Figure 12: *Bos taurus taurus* astragalus measurements compared with those from Early Mediaeval Gwithian and High Mediaeval Launceston Castle.

Due to the acid soils present in much of the South West of Britain there are few assemblages in the region with which Princesshay can be compared. There are two which have produced large or medium sized assemblages though – Launceston Castle (Albarella and Davis, 1996), in Cornwall, produced a large number of specimens from the High Mediaeval period and

Gwithian (Broderick, 2014), in the far west of Cornwall produced a large number of *Bos taurus taurus* specimens. There were enough astragali identified from Princesshay, from which it was possible to obtain measurements, that it was possible to compare the size of the animals from these three assemblages. Plotting these measurements out it can be seen that the animals deposited in Princesshay were similar in shape to those from Launceston Castle, although some were a little larger (Figure 12). They were, however, narrower in depth than those from Gwithian. A *t* Test shows that this difference is highly significant, with the Princesshay population having a probability of .9520 of being statistically the same as the Launceston Castle population and 0.0183 of being the same as the Gwithian population.

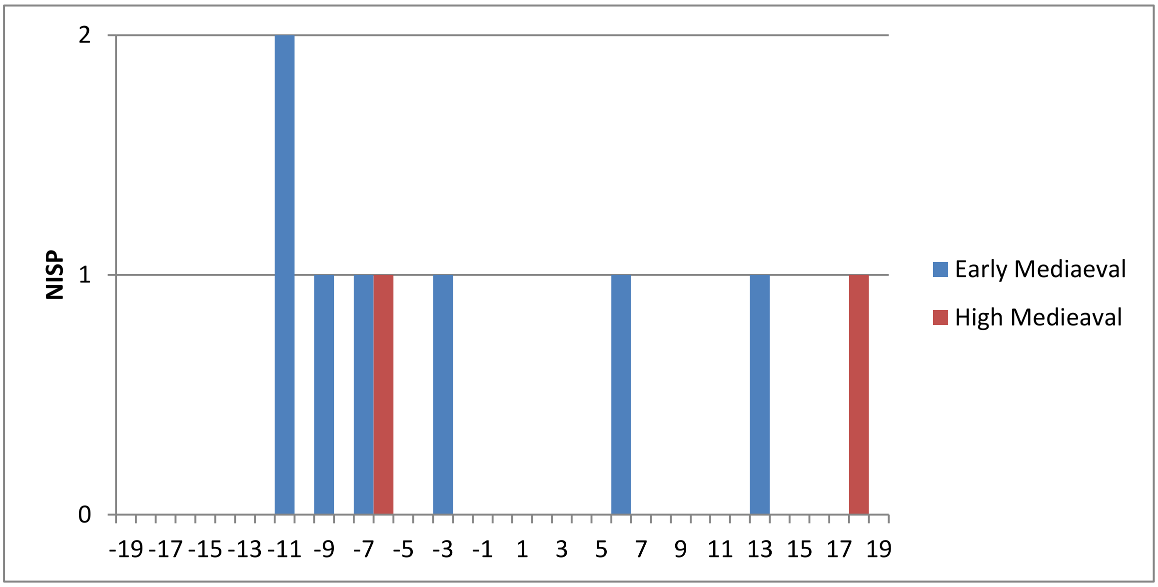

Figure 13: Log ratios of the Greatest Length (GL) of metapodials, using the mean of the same measurements from the Launceston Castle assemblage as a standard.

Using the log ratio method to compare metapodial lengths from Princesshay (and thereby increase the size of the sample that can be directly compared) with those from Launceston Castle, paints a similar picture as the data from the astragali – namely that the animals are of a similar size (Figure 13). We have to be very careful not to read too much into such a small sample but it is also possible that there are two groups represented – smaller females and larger males. Although other *Bos taurus taurus* length measurements were taken from the Princesshay assemblage, it was only metapodials and astragali (already compared in Figure 12) which provided this data in the Launceston Castle assemblage. It was possible to compare breadth measurements across more specimens and this showed a similar pattern, with a large spread of sizes, although more smaller than the Launceston Castle than larger (Figure 14).

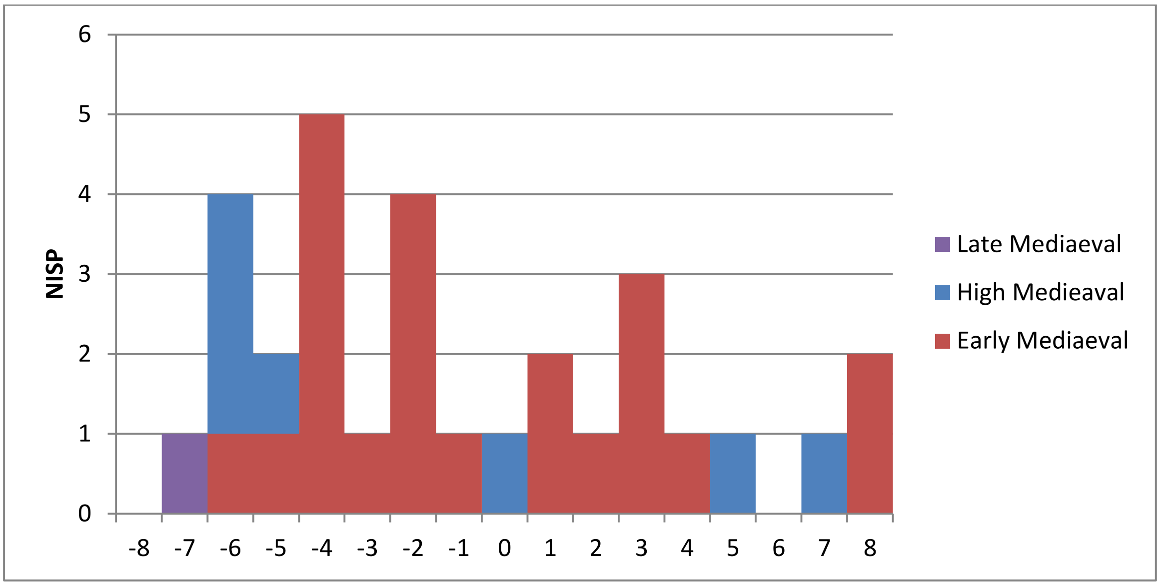

Figure 14: Log ratios of the distal Breadth (Bd) of metapodials and tibiae, using the mean of the same measurements from the Launceston Castle assemblage as a standard.

4.2.2 The High Mediaeval Period

The High Mediaeval assemblage was very similar to the Early Mediaeval one, with the three principal domesticated mammals – *Bos taurus taurus*, caprines and *Sus scrofa domesticus* – together accounting for 600 of the 732 specimens (Table 7). The most significant change is that caprines become the most common taxa present in the assemblage from this phase onwards, although the lead is slight (NISP=258, compared to 253 *Bos taurus taurus*, when including cf. specimens of the taxa).The next most common species were also domesticates – *Gallus gallus*, *Equus caballus*, *Felis catus* and *Canis lupus familiaris* – but all of these were present in much smaller quantities. Wild birds and mammals were again very rare on the site – those that may have been food providing a total of nine specimens (*Capreolus capreolus*, *Cervus elaphus*, *Lepus europaeus* (common hare) and *Scolopax rusticola*). So it is again assumed that the seven *Anser* sp. specimens identified were of domestic goose and not the closely related greylag goose. It may well be that the single *Anas* sp. specimen is from a domestic duck, for similar reasons; distinguishing it from mallard (like with domestic/greylag geese) is difficult to do based on skeletal morphology or biometrics.

The environmental samples did little to alter the general picture that emerged from the hand-collected samples but it was noted that *Apodemus sylvaticus* (wood mouse), represented by five specimens in the earlier phase, was absent and instead five specimens of *Mus musculus* (house mouse) were recorded (Table 3). The order of commonality of species also changed very little when MNI values were compared to the NISP (Table 8). In general a relatively even distribution of post-cranial skeletal parts again appeared to be true for caprines and *Sus scrofa domesticus* but there was some evidence for more selective disposal of *Bos taurus taurus* (Figure 15). In particular, it was noted that the head and foot elements were most common and that scapulae and femurs were low. It is important to consider that the sample size for analysing MNE and MAU figures is relatively low, however, it is unlikely that these patterns would be caused by destructive taphonomies (Figure 16).

Class	Order	Family	Species	NISP
Mammalia	Artiodactyla	Bovidae	*Bos taurus taurus*	213
			cf. *Bos taurus taurus*	40
			Ovis aries /Capra hircus	143
			cf. *Ovis aries /Capra hircus*	91
			Capra hircus	3
			cf. *Capra hircus*	1
			Ovis aries	19
			cf. *Ovis aries*	1
		Cervidae	*Capreolus capreolus*	2
			cf. *Capreolus capreolus*	1
			cf. *Cervus elaphus*	1
		Suidae	*Sus scrofa domesticus*	80
			cf. *Sus scrofa domesticus*	9
	Perissodactyla	Equidae	*Equus caballus*	16
			cf. *Equus caballus*	3
	Carnivora	Canidae	cf. *Canis lupus familiaris*	3
		Felidae	*Felis catus*	4
	Lagomorpha	Leporidae	cf. *Lepus* sp.	1
Aves	Passeriformes	Turdidae/Sturnidae	*Turdus* sp./*Sturnus* sp.	1
	Charadriiformes	Scolopacidae	*Scolopax rusticola*	4
	Galliformes	Phasianidae	*Gallus gallus*	44
	Anseriformes	Anatidae	*Anas* sp.	1
			Anser sp.	7
Fish				2
Actinopterygii	Perciformes	Carangidae	*Trachurus trachurus*	2
		Scombridae	*Scomber scombrus*	1
	Scorpaeniformes	Triglidae		1
	Gadiformes	Gadidae		16
			Pollachius virens	1
			Gadus morhua	8
			Merluccius merluccius	4
			cf. *Merluccius merluccius*	2
	Salmoniformes	Salmonidae	*Salmo salar*	1
	Esociformes	Esocidae	*Esox lucius*	2
	Anguilliformes	Anguillidae	*Anguilla anguilla*	1
		Congridae	*Conger conger*	1
Chondrichthyes	Rajiformes	Rajidae	*Raja clavata*	1
	Squaliformes	Squalidae	*Squalus acanthias*	1

Table 7: NISP figures for hand-collected material from the High Mediaeval period.

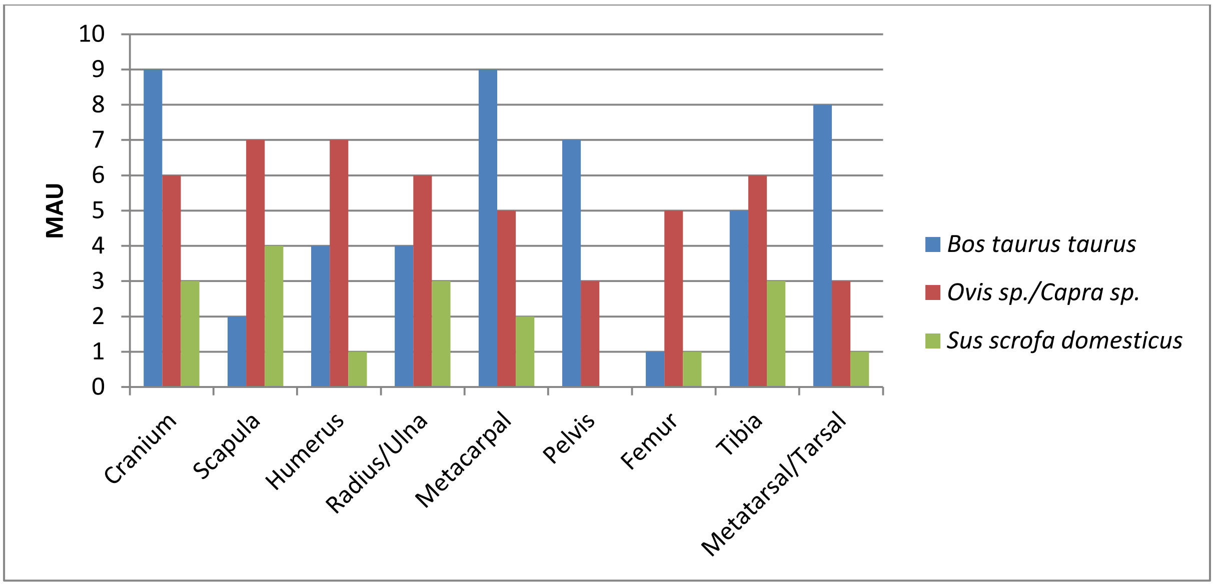

Figure 15: MAU for the principal domesticate s in the High Mediaeval phase.

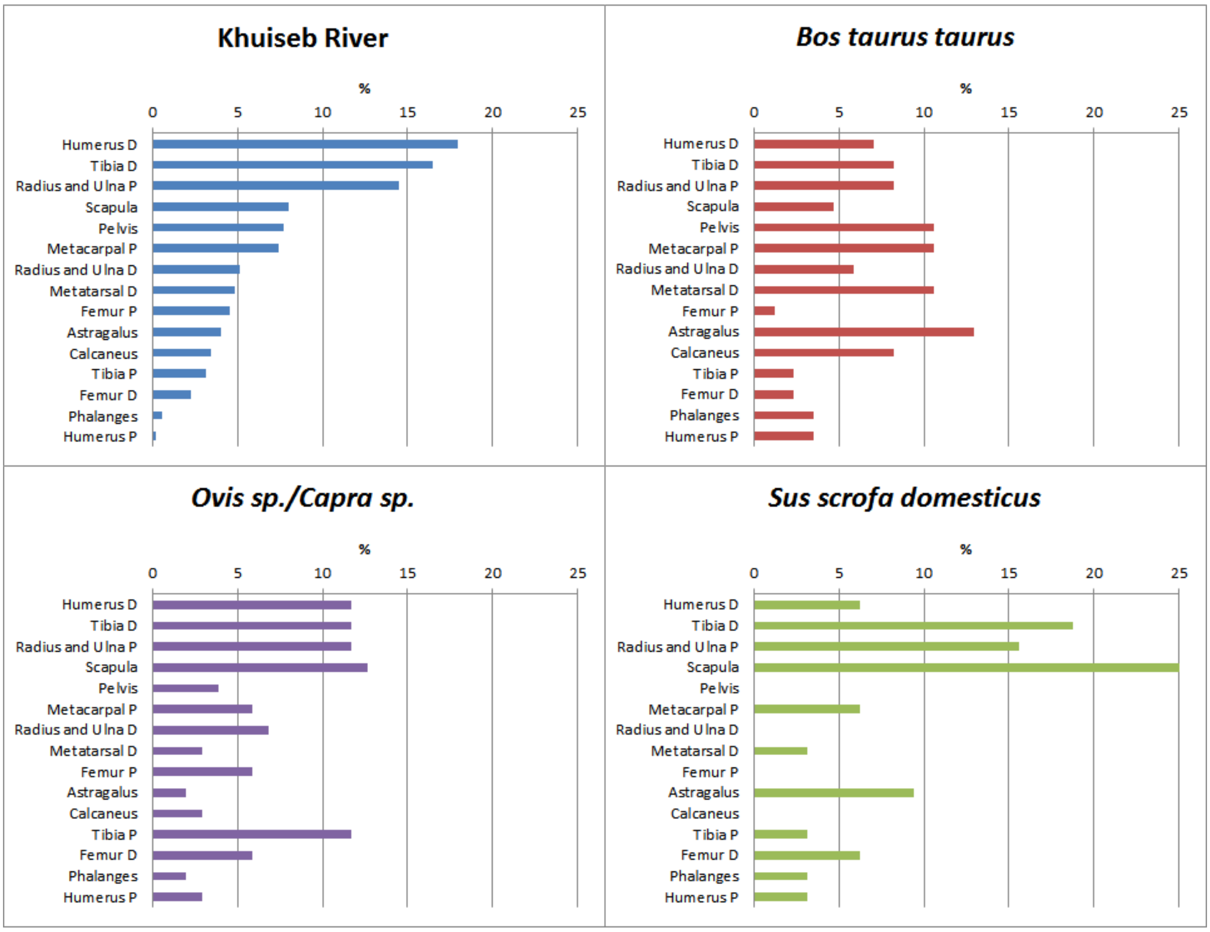

Figure 16: Skeletal element survival in the High Mediaeval phase compared with ethnoarchaeological data from Khuiseb River (Brain, 1981b)**.**

	Element	Left	Right	MNE	MAU
Bos taurus taurus	Maxilla	9	4	13	9
	Mandible	4	1	5	4
	Zygomaticus	1	2	3	2
	Horncore	1	2	3	2
	Occipital	2	2	4	2
	Atlas	n/a	n/a	1	1
	Axis	n/a	n/a		0
	Scapula	2	2	4	2
	Humerus	2	4	6	4
	Radius	3	4	7	4
	Ulna	3	1	4	3
	Cuboid	1	1	2	1
	Metacarpal	2	9	11	9
	Pelvis	2	7	9	7
	Femur	1	1	2	1
	Tibia	5	2	7	5
	Astragalus	4	7	11	7
	Calcaneum	1	6	7	6
	Metatarsal	8	3	11	8
	Phalanx 1	n/a	n/a	14	2
	Phalanx 2	n/a	n/a	8	1
	Phalanx 3	n/a	n/a	5	1
Capra hircus	Mandible	0	1	1	1
	Horncore	1	2	3	2
Ovis aries	Mandible	6	3	9	6
	Horncore	5	2	8	5

	Element	Left	Right	MNE	MAU
***Ovis* sp./*Capra* sp.**	Maxilla	3	2	5	3
	Mandible	5	5	10	5
	Zygomaticus		1	1	1
	Occipital	1	1	2	1
	Atlas	n/a	n/a	1	1
	Axis	n/a	n/a	1	1
	Scapula	7	6	13	7
	Humerus	5	7	12	7
	Radius	6	6	12	6
	Ulna	2	3	5	3
	Cuboid	0	1	1	1
	Metacarpal	5	5	10	5
	Pelvis	1	3	4	3
	Femur	2	5	7	5
	Tibia	6	6	12	6
	Astragalus	1	1	2	1
	Calcaneum	2	1	3	2
	Metatarsal	3	3	6	3
	Phalanx 1	n/a	n/a	8	1
	Phalanx 3	n/a	n/a	2	0
Sus scrofa domesticus	Maxilla	1	2	3	2
	Mandible	2	3	5	3
	Occipital		1	1	1
	Atlas	n/a	n/a	1	1
	Scapula	4	4	8	4
	Humerus	1	1	2	1
	Radius		1	1	1
	Ulna	2	3	5	3
	Metacarpal 2	1		1	1
	Metacarpal 4	1	2	3	2
	Femur	1	1	2	1
	Tibia	3	3	6	3
	Astragalus	1	2	3	2
	Metatarsal 3	1		1	1
	Metatarsal 4		1	1	1
	Phalanx 1	n/a	n/a	3	0
	Phalanx 2	n/a	n/a	1	0

Table 8: MNE, MAU and MNI (highlighted) figures for the principal domesticates in the High Mediaeval period.

Fewer than half as many butchery marks were observed on the High Mediaeval specimens than were observed on the Early Mediaeval specimens (Table 2). This change is statistically significant, with a *t* Test suggesting a probability of 0.0290 that the observed frequencies could be from the same statistical population. To a large extent, however, the patterns observed are very similar to that earlier phase, with a great variety of different marks being present, although ribs (14.2% [20 of 141] of all Large Mammal rib specimens and 20.4% [45 of 221] of all Medium Mammal rib specimens) and, to a lesser extent, vertebrae (23.2% [16 of 69] of all Large Mammal vertebrae specimens and 21% [9 of 43] of all Medium Mammal vertebrae specimens) continued to be chopped through obliquely – in this period we can see that that treatment even extends to small mammals (Table 9) (1 of 22 small mammal rib specimens). Butchery marks were still more likely to be present on cattle bones (15% of all identified *Bos taurus taurus* specimens) than on specimens from smaller animals (8.1% of all identified caprine specimens and 1.1% of all identified *Sus scrofa domesticus* specimens) and some bones, at least, of all the domesticates were still broken when fresh (Figure 17).

BUTCH	LARGE MAMMAL	*Bos* sp.	*cf.Bos* sp.	cf. *Cervus elaphus*	*Equus caballus*	MEDIUM MAMMAL	*Ovis* sp./*Capra* sp.	cf. *Ovis* sp./*Capra* sp.	cf. *Sus* sp.	*Gallus gallus*
A5		1								
A9				1						
A10		1								
A12		1								
A15		1								
A18		1								
A19		1								
C4		1								
C6		1								
C11	1									
F8			1				1	1		
F12								1		
F20								1		
H1		1								
H3			1							
H8							1			
H10		1				1				
H14	1									1
H15		1								
H17		2				1	1		1	
M1	2	2								
M3	1						2			
M12		1			1					
M13	1	2								
M18	1	1								
M20	1	1								
P2	1					1				
P3	1									
P4	1									
P5		2								
P9							1			
P10		1								
P12							1			
P13							1			
P15		1								

BUTCH	LARGE MAMMAL	*Bos* sp.	*Equus* sp.	MEDIUM MAMMAL	*Ovis* sp./*Capra* sp.	cf. *Ovis* sp./*Capra* sp.	*Capra hircus*	*Ovis aries*	Small Mammal
R13					1				
R18		1							
RB1	1			1					
RB2				1					
RB3	18			42					1
RB5	1			1					
RB7	6			6					
RB8	5			10					
RB9	1								
S10			1						
S13					1				
S16					1				
S20	3			1					
S24					1				
S25	1								
SK2		2					1	4	
T1					2				
T7	1								
T8		1							
T10	1	1							
T11	1	1							
T13	1	1			1				
T17				1					
T22						1			
V1	6			6					
V2	6	1	1						
V3	2			3					
V7	1								
V14				1					
XP	20	4		2					
XT	7			3	1				

Table 9: Butchery marks recorded for birds and mammals from the High Mediaeval period (for definition of codes used, see Appendix 2).

If any patterns were beginning to emerge it might be that humeri were most likely to be separated from the radius and ulna with an oblique chop through the distal end (25% of *Bos taurus taurus* humerus specimens, 9% of caprine humerus specimens and 33.3% of *Sus scrofa domesticus* humerus specimens), a mark almost absent from medium-sized mammals in the preceding phase. In spite of this, enough caprine humeri were intact enough to take measurements of the distal end to compare them to measurements taken of specimens from Gwithian and Launceston Castle, as with the *Bos taurus taurus* astragali mentioned previously (4.2.1 The Early Mediaeval Period). These were within the range encountered at both sites (Figure 18).

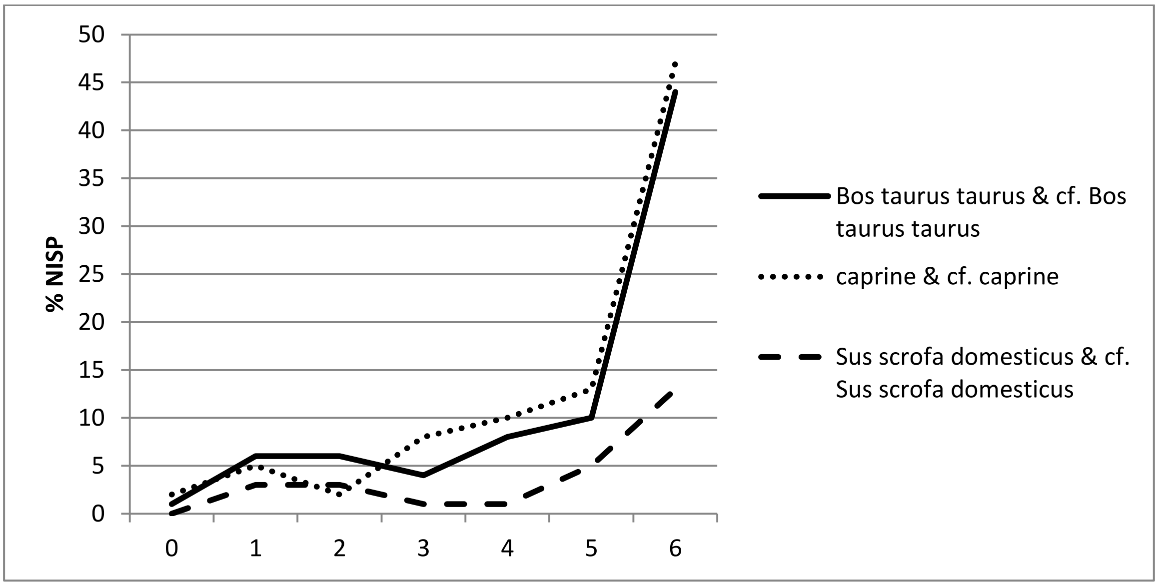

Figure 17: FFI values for specimens of the three principal domesticates from the High Mediaeval phase on the site.

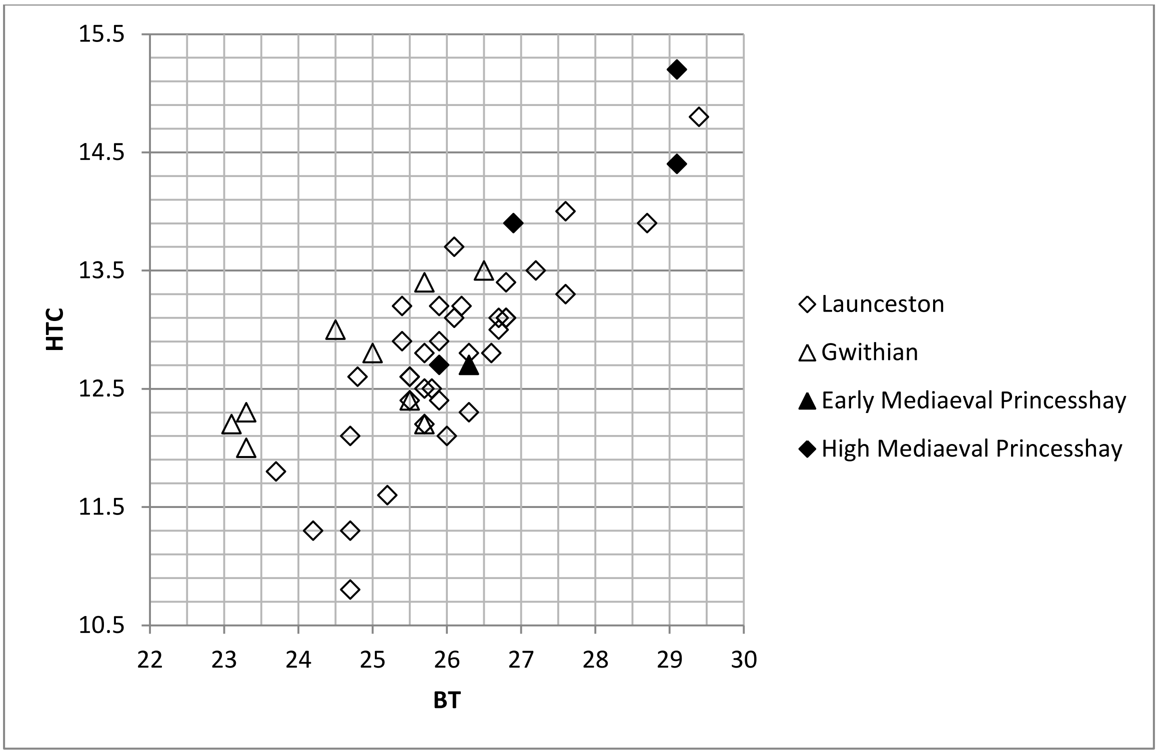

Figure 18: Caprine distal humerus measurements compared with those from Early Mediaeval Gwithian and High Mediaeval Launceston Castle.

Trying to find any other comparable datasets with which to carry out biometric comparisons was difficult but it was possible to compare the greatest lengths of the metapodials, radii and astragali (the only bones for which these measurements were taken in both assemblages) with those recovered from Launceston Castle, using the log ratio method (Figure 19). It is possible to compare the distal breadths (Bd) of more bones, however (Figure 20), and taken together with the data presented in the previous two graphs, this suggests that there may have been a decrease in size after the Early Medieval period. A *t* Test comparing the distal breadth log ratios presented in Figure 20 returns a probability of 0.0106 that the Early Medieval population is the same as that from the later periods, a difference which is highly significant. We can, thus, be confident that the caprines were at least more gracile, although height change is less certain, with a *t* Test on the log ratios used in Figure 19 returning a probability of 0.1230 that the Early Medieval population is the same as that from the later periods.

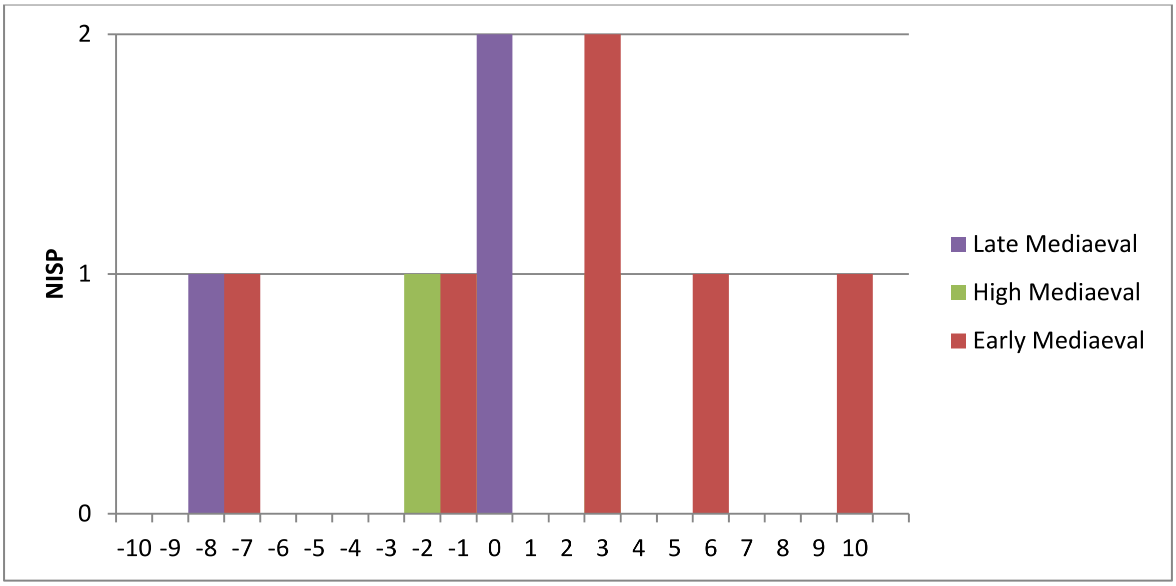

Figure 19: Log ratios of astragalus (GLl), metapodial (GL) and radius (GL) greatest lengths, using the mean of the same measurements from the Launceston Castle assemblage as a standard.

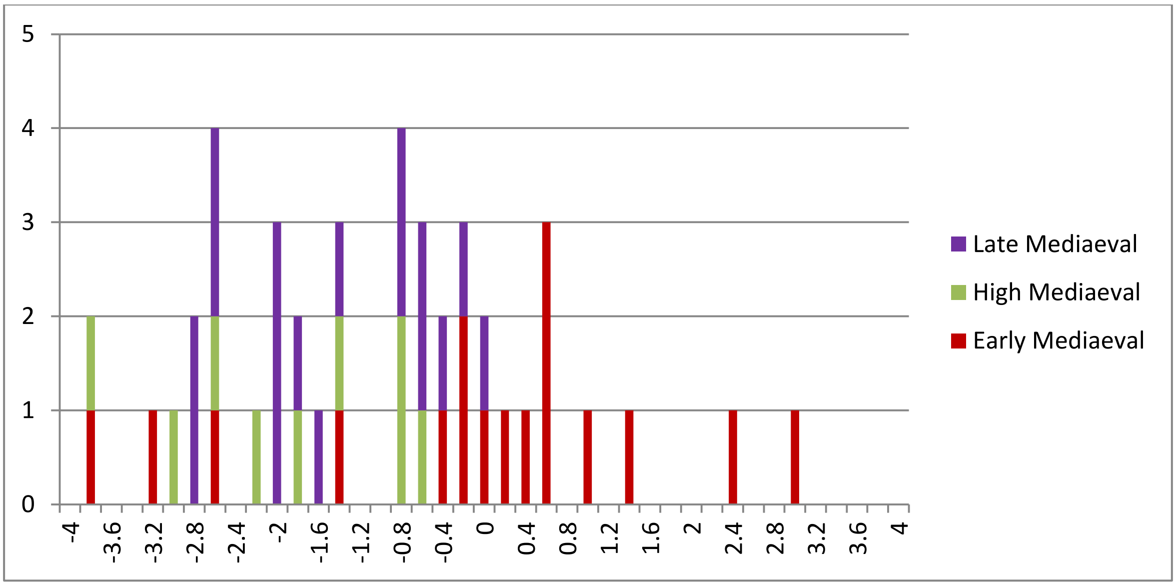

Figure 20: Log ratios of astragalus, metapodial and tibia distal breadths (Bd), using the mean of the same measurements from the Launceston Castle assemblage as a standard.

4.2.3 The Late Mediaeval Period

The Late Mediaeval assemblage is, at first glance, similar to the earlier Mediaeval phases, with the three principal domesticated mammals – *Bos taurus taurus*, caprines and *Sus scrofa domesticus* – together accounting for 491 of the 729 specimens (Table 10). Although other domesticates – *Gallus gallus*, *Equus caballus*, *Felis catus* and *Canis lupus familiaris* – continued to be represented by multiple specimens though, the biggest differentiating factor from this phase, when looking at species, is the number of gadid specimens present, particularly *Merluccius merluccius* (European hake). Wild birds and mammals were, once more, very rare on the site, with those that may have been food providing a total of four specimens (*Capreolus capreolus* and *Scolopax rusticola*). As with the earlier phases, then, it seems safe to assume that the seven *Anser* sp. specimens identified were of domestic goose and not greylag goose.

The environmental samples did little to alter the general picture that emerged from the hand-collected samples but among the micro mammals it can be observed that the switch that appeared to occur between the Early and High Mediaeval phases, when *Mus musculus* seemed to replace *Apodemus sylvaticus*, was reversed. This phase also saw the only appearance of *Rattus rattus* (black rat) in the assemblage. The order of commonality of species was changed in one very important way when MNI was compared to the NISP values – *Ovis aries* (note – not caprines) became the most common species in the assemblage, with at least ten individuals based on counts of mandibles and loose mandibular teeth (Table 11). In general though, a relatively even distribution of skeletal parts appeared to be true again for each species (Figure 21), suggesting that destructive taphonomies were probably not a determining agent in the assemblage's creation, although this data is less clear cut than in the preceding phases (Figure 22) (it also has the smallest sample size).

Class	Order	Family	Species	NISP
Mammalia	Artiodactyla	Bovidae	*Bos taurus taurus*	178
			cf. *Bos taurus taurus*	25
			Ovis aries / Capra hircus	141
			cf. *Ovis aries / Capra hircus*	62
			Capra hircus	2
			Ovis aries	21
		Cervidae	*Capreolus capreolus*	1
		Suidae	*Sus scrofa domesticus*	59
			cf. *Sus scrofa domesticus*	3
	Perissodactyla	Equidae	*Equus caballus*	15
	Carnivora	Canidae	*Canis lupus familiaris*	7
		Felidae	*Felis catus*	19
	Rodentia			1
Aves	Passeriformes			1
		Corvidae	*Corvus corone corone*	2
	Charadriiformes	Sternidae	*Sterna* sp.	1
		Scolopacidae	*Scolopax rusticola*	3
	Galliformes	Phasianidae	*Gallus gallus*	34
	Anseriformes	Anatidae	*Anser* sp.	7
Fish				10
Actinopterygii	Perciformes	Sparidae		1
		Carangidae	*Trachurus trachurus*	7
		Scombridae	*Scomber scombrus*	1
	Scorpaeniformes	Triglidae		2
	Pleuronectiformes	Pleuronectidae	*Pleuronectes platessa*	2
	Gadiformes	Gadidae		62
			Pollachius virens	1
			Gadus morhua	9
			cf. *Gadus morhua*	1
			Merlangius merlangus	1
			Merluccius merluccius	23
	Salmoniformes	Salmonidae		3
	Esociformes	Esocidae	*Esox lucius*	2
	Anguilliformes	Congridae	*Conger conger*	7
Chondrichthyes	Rajiformes	Rajidae	*Raja clavata*	2
	Squaliformes	Squalidae	*Squalus acanthias*	13

Table 10: NISP figures for hand-collected material from the Late Mediaeval period.

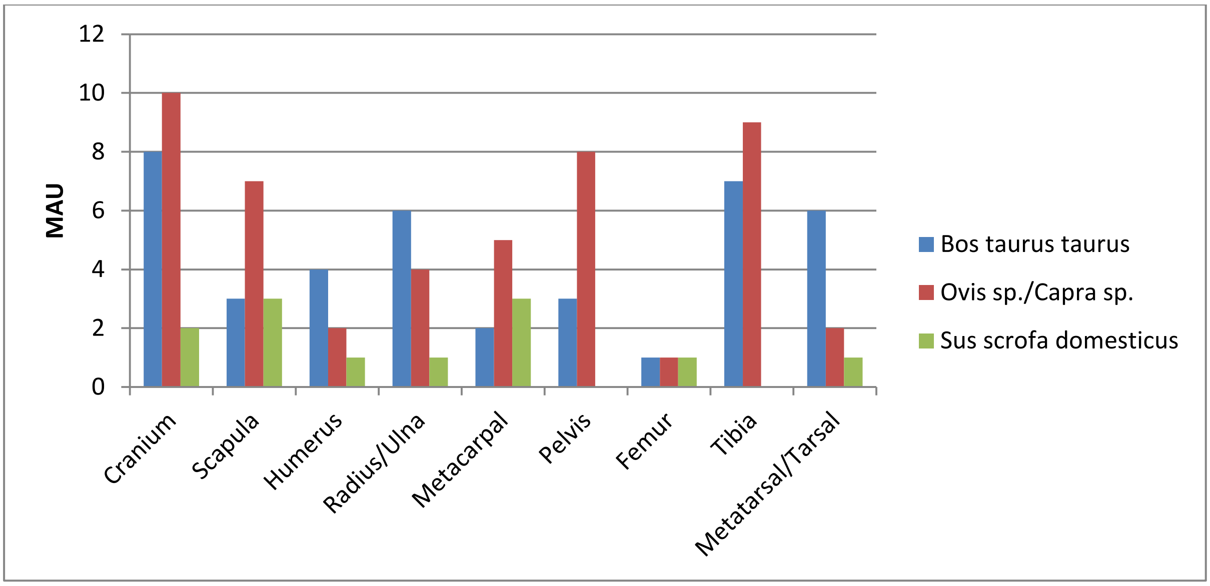

Figure 21: MAU for the principal domesticate s in the Late Mediaeval phase.

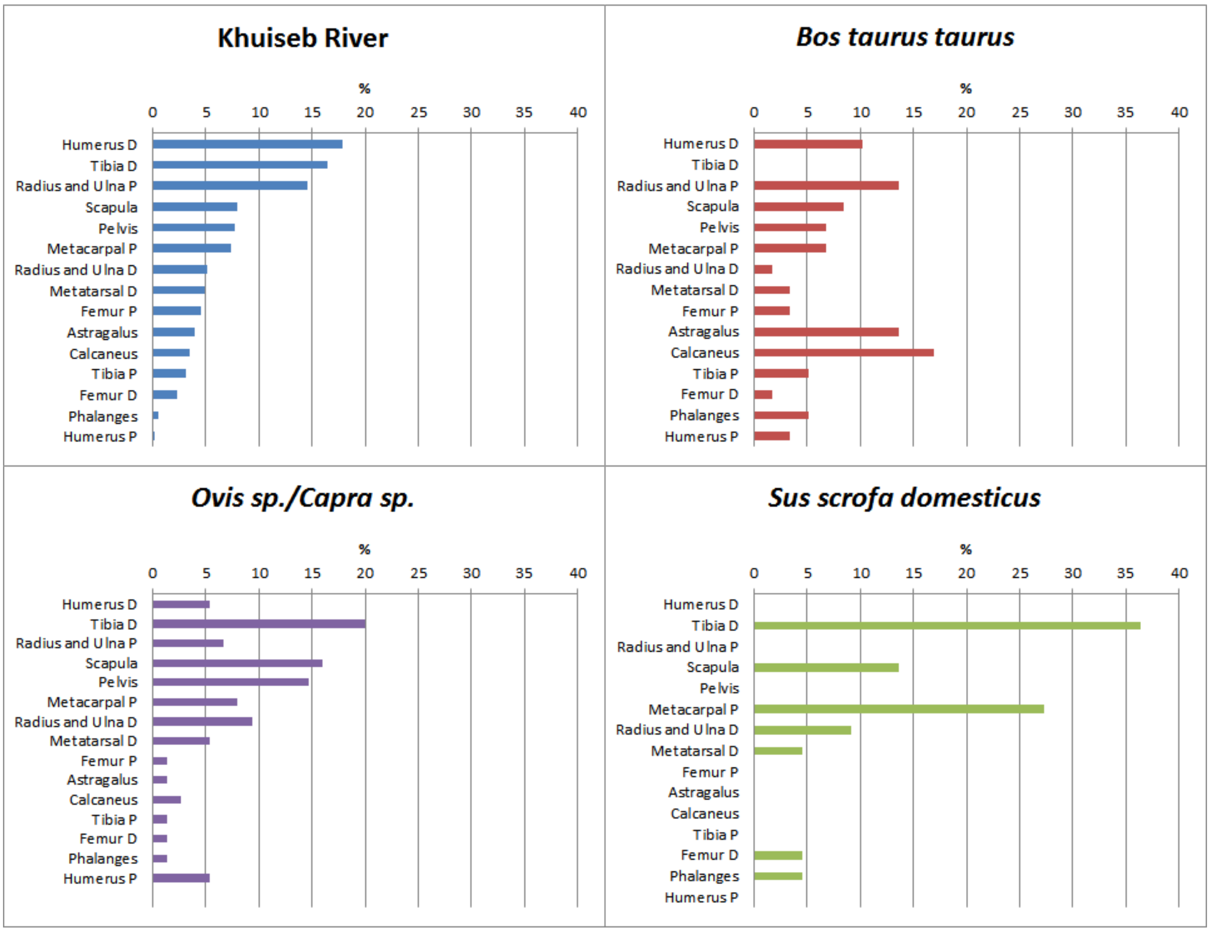

Figure 22: Skeletal element survival in the Late Mediaeval phase compared with ethnoarchaeological data from Khuiseb River (Brain, 1981b)**.**

	Element	Left	Right	MNE	MAU
Bos taurus taurus	Maxilla	4	8	12	8
	Mandible	3	4	7	4
	Supra-orbital	1		1	1
	Zygomaticus	2	3	5	3
	Horncore	2	3	5	3
	Occipital		1	1	1
	Atlas	n/a	n/a	1	1
	Axis	n/a	n/a	2	2
	Scapula	3	2	5	3
	Humerus	2	4	6	4
	Radius	6	2	8	6
	Ulna	2	4	6	4
	Cuboid		1	1	1
	Metacarpal	1	2	3	2
	Pelvis	3	1	4	3
	Femur	1	1	2	1
	Tibia	7	3	10	7
	Astragalus	2	6	8	6
	Calcaneum	4	6	10	6
	Metatarsal	2		2	2
	Phalanx 1	n/a	n/a	15	2
	Phalanx 3	n/a	n/a	2	0
Capra hircus	Mandible			0	0
	Horncore	1	1	2	1
Ovis aries	Mandible	10	6	16	10
	Horncore			0	0

	Element	Left	Right	MNE	MAU
***Ovis* sp./*Capra* sp.**	Maxilla	3	4	7	4
	Mandible	4	4	8	4
	Supra-orbital		1	1	1
	Zygomaticus	1	2	3	2
	Occipital	2		2	2
	Atlas	n/a	n/a	1	1
	Axis	n/a	n/a	1	1
	Scapula	7	5	12	7
	Humerus	2	1	3	2
	Radius	3	4	7	4
	Ulna	1	4	5	4
	Cuboid	1	0	1	1
	Metacarpal	2	5	7	5
	Pelvis	8	3	11	8
	Femur		1	1	1
	Tibia	6	9	15	9
	Astragalus	1		1	1
	Calcaneum	1	1	2	1
	Metatarsal	2	2	4	2
	Phalanx 1	n/a	n/a	4	1
Sus scrofa domesticus	Maxilla	2	2	4	2
	Mandible	2	2	4	2
	Occipital		1	1	1
	Atlas	n/a	n/a	2	2
	Scapula	3		3	3
	Humerus		1	1	1
	Radius	1	1	2	1
	Metacarpal 2	1		1	1
	Metacarpal 4	3	3	6	3
	Metacarpal 5	1	1	2	1
	Femur		1	1	1
	Tibia	3	5	8	5
	Metatarsal 4		1	1	1
	Phalanx 1	n/a	n/a	4	0
	Phalanx 2	n/a	n/a	1	0

Table 11: MNE, MAU and MNI (highlighted) figures for the principal domesticates in the Late Mediaeval period.

BUTCH	LARGE MAMMAL	*Bos* sp.	*cf.Bos* sp.	*Equus caballus*	MEDIUM MAMMAL	*Ovis* sp./*Capra* sp.	*cf. Ovis* sp./*Capra* sp.	*Capreolus capreolus*	*Gallus gallus*
A2		1							
A7		1							
C3		1							
F5					1				
F8								1	
F10		1							
F11		1							
F12							1		
F13		1							
H2			1						
H3		1	2						
H13		1							
H14									1
H17		1							
J8	1								
M1	2	2	1						
M10				1		1			
M12	2	3		1			1		
M19									1
M24	1	1							
P12		1							
P13	1					1			
P14		1							
P15	1								
P16									
P18									
PH4		1							
PH11		1							
R1		2							
R5		1			1				
R6					1				
R12					1				
R13					3	1			

BUTCH	LARGE MAMMAL	*Bos* sp.	*cf.Bos* sp.	*Equus* sp.	MEDIUM MAMMAL	*Ovis* sp./*Capra* sp.	*cf. Ovis* sp./*Capra* sp.	*Sus* sp.	Small Mammal
RB1					1				
RB3	22				8				1
RB4	2								
RB5					1				
RB6	1								
RB7	12								
RB8	11				6				
S1	1	1		1			1		
S12	1					1			
S19	1		1						
S20				1					
S23				1					
S25	2		1						
SK6		1							
SK17						1			
T1									
T2	1								
T10						1		1	
T11		1							
T12	1		1						
T13							1		
T14	1	2							
T22		1							
U1		3							
V1	2	1			4				
V2	2				1				
V3	3	1			2		1		
V7	1								
V9		2							
V12	1								
V14					1				
V15					1				
XP	10		1		1				
XT	7				3				

Table 12: Butchery marks recorded for birds and mammals from the Late Mediaeval period (for definition of codes used, see appendix 2).

The number of butchery marks observed in the assemblage decreased further when comparing the Late Mediaeval specimens to earlier phases (Table 2). This change is statistically highly significant, with a *t* Test suggesting a probability of 0.0016 that the observed frequencies could be from the same statistical population. The variety of different marks continues to be the defining feature, however, although there are some indications of routine practice – cut-marks on the mid-shaft of medium mammal radii (28.6% [4 of 14]) and an axial chop (in an anterior-posterior direction) through the proximal end of cattle metapodials (29.4% [5 of 17]) as well as oblique cut-marks mid-shaft (29.4% [5 of 17]) (Table 12). Butchery marks were still more likely to be present on cattle bones (21.2% of all identified *Bos taurus taurus* specimens) than on specimens from smaller animals (4.9% of all identified caprine specimens and 1.6% of all identified *Sus scrofa domesticus* specimens) and some bones, at least, of all the domesticates were still broken when fresh (Figure 23).

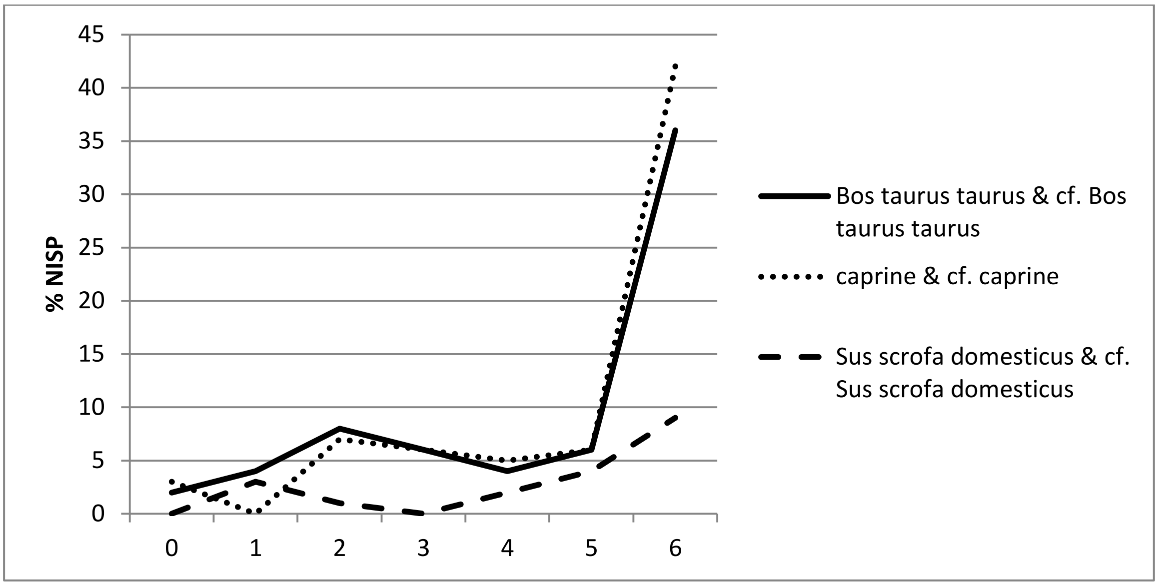

Figure 23: FFI values for specimens of the three principal domesticates from the Late Mediaeval phase on the site.

4.2.4 The Principal Domesticates in Mediaeval Princesshay

This has been touched on in each of the period-specific comments above but it is worth highlighting the changes in the assemblage over time. The assemblage from each phase at Princesshay had a low diversity of mammals and birds and was dominated in each phase by *Bos taurus taurus*, caprines and *Sus scrofa domesticus*. In each phase, it was possible to note that both *Capra hircus* and *Ovis aries* were among the caprines but unfortunately, due to preservation and other taphonomic processes (such as butchery) it was only possible to base this observation on cranial elements (horncores, mandibles and loose teeth). It was also noted that the biggest change in ratio between these three taxa (or groups of taxa, in the case of caprines) came between the Early Mediaeval and High Mediaeval phases. This can be clearly seen when the ratios are plotted on a graph (Figure 24). Comparing it to other British assemblages of those periods, including those from Gwithian and Launceston Castle, it is also clear that the shift between these periods is fairly typical (Figure 24) and that the assemblages for each period fit comfortably within the known range for British urban sites at this time (Figure 25).

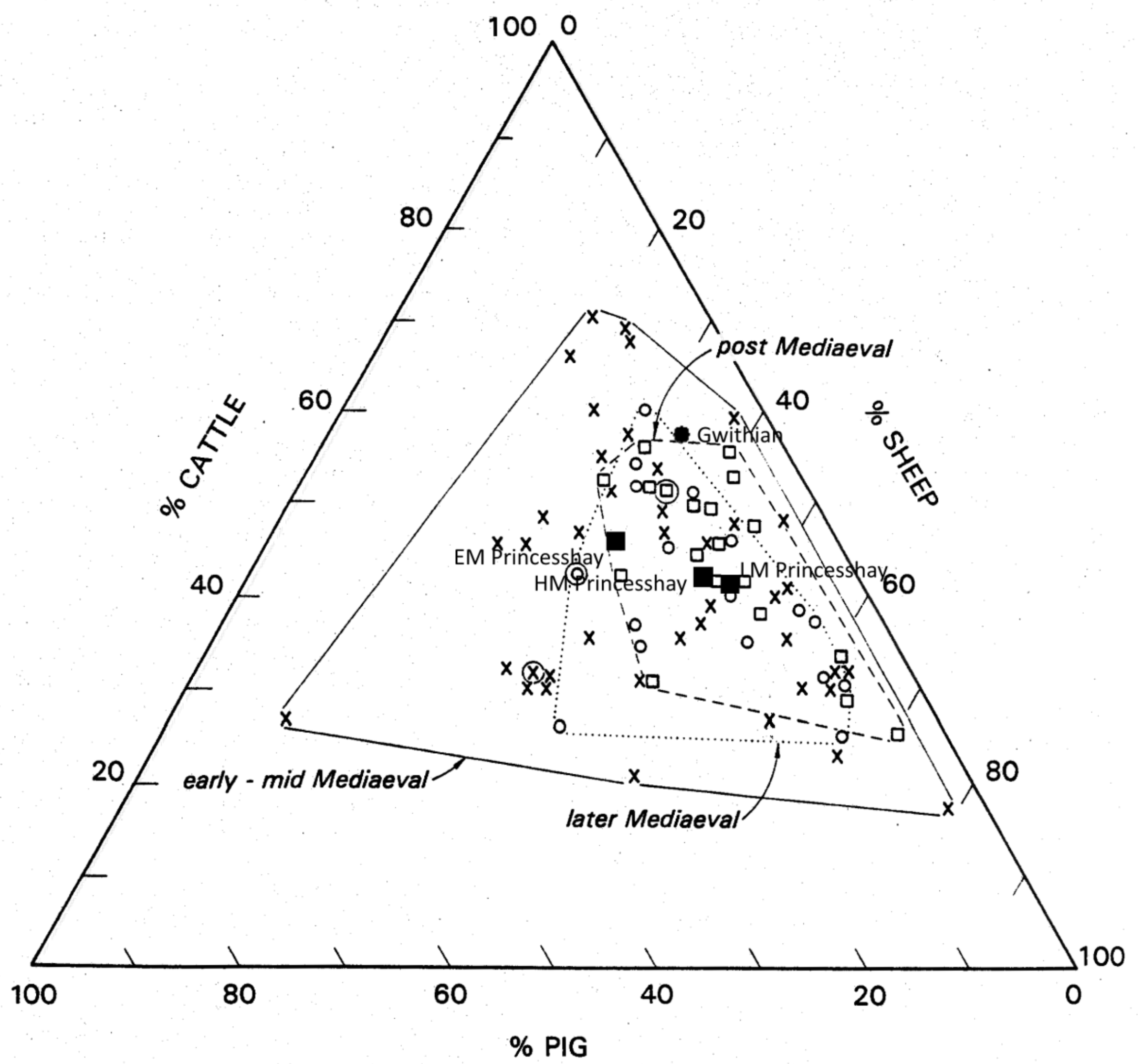

Figure 24: Princesshay assemblage (solid squares) principal domesticate proportions by NISP plotted against other British Mediaeval and Post-Mediaeval assemblages (including Gwithian [solid circle] and Launceston Castle [shapes inside hollow circles]), grouped by period (after Albarella and Davis, 1996)**.**

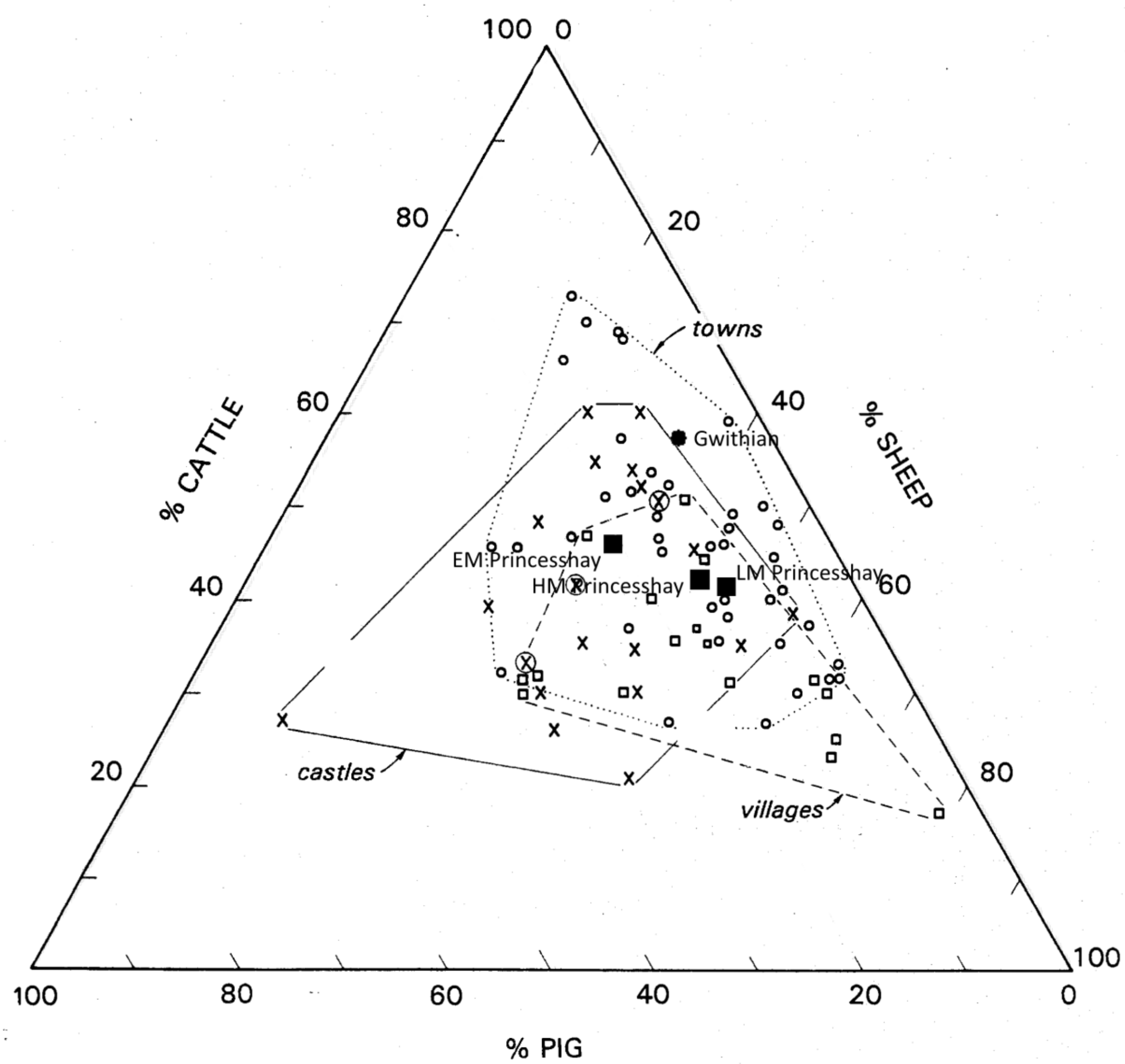

Figure 25: Princesshay assemblage (solid squares) principal domesticate proportions by NISP plotted against other British Mediaeval and Post-Mediaeval assemblages (including Gwithian [solid circle] and Launceston Castle [shapes inside hollow circles]), grouped by site type (after Albarella and Davis, 1996)**.**

4.3 Discussion

Before commencing detailed discussion of the environment and economy of Mediaeval Exeter, it is necessary to confront a glaring peculiarity of the results – the environmental samples. As mentioned in 4.2 Results, something seems to have gone awry in post-excavation processing of these samples. It was pointed out there that many of the bags labelled with a sample number did not state what fraction they had been sieved at (although, as stated in 5.1 Materials & Methods, this was held to have been 3mm for all samples), whilst some bags stated a sieving size without having a sample number written on them. To add to that list of confusion, we can now add the observation that the majority of fish specimens came from bags which had neither a sample number nor a sieving fraction written on them. It is, of course, possible that there were some very careful excavators working on the site when these remains were recovered. Given the other problems already mentioned though it would seem best to regard the divide between 'hand-collected' and 'environmental sample derived' material with scepticism. This is a great shame as the previous major study of the zooarchaeology of Exeter (Maltby, 1979) occurred before environmental sampling was carried out routinely and it would have been good to see how such processes may have altered our impressions of micro fauna and fish in the city.

4.3.1 Fish

With that said, the previous study of Exeter did contain an assemblage of 27 different species of fish (Wilkinson, 1979), compared with 22 identified in this study. Some the fish identified here though were not included in the 27 identified previously – *Esox Lucius* (northern pike) *Pollachius virens* (coley), *Squalus acanthias* (spiny dogfish), *Salmo trutta* (brown trout), *Salmo salar* (Atlantic salmon), *Alosa fallax* (twaite scad), *Galeorhinus galeus* (tope shark) and *Dasyatis pastinaca* (stingray) take the list of identified fish species from Mediaeval Exeter up to a total of 35. This is, in itself, of importance to our understanding of Mediaeval marine biogeography, which has some relevance today for fisheries management. With so few remains, however, it is impossible to ascribe relative importance to any of the species or, indeed, to the fishing industry as a whole to Exeter. A problem exacerbated by the environmental sample tribulations.

We do know that the fishing industry was important in Mediaeval England and particularly so in Devon and Cornwall (Fox, 2001, 1996; Kowaleski, 2001; Mattingly, 2008) and we know that the River Exe was navigable throughout this time, providing direct access to the coast. It seems likely, then, that the fish remains recovered are the product of a local industry and not of trading. The most common species identified in both this study and the previous one was *Merluccius merluccius* (hake), a deep-water fish that was the subject of a large fishery in the South West in the Modern period (Wilkinson, 1979, p. 76) which exported salted fish to the Mediterranean. It is tempting in this light to interpret the increase in *Merluccius merluccius* specimens in the Late Mediaeval period as marking the beginnings of this industry. The fact that the majority of specimens identified were cranial elements might even lend some support to this hypothesis, since if the fish were processed before being traded away then these are the parts that would be left behind. Wilkinson (1979) noted this pattern as well but the hypothesis needs to be treated with caution at this stage until such time as an excavation can recover a larger assemblage of fish bones from Mediaeval Exeter. In the meantime, the presence of so many deep-water shark specimens in the Late Mediaeval phase (8.8% NISP of fish, up from 2.3% in the preceding phase), coincident with the increase in number of *Merluccius merluccius* specimens (although the proportion remains the same as in the preceding phase), might offer some support for the idea of an increase in deep-sea fishing at this time. If true, the expansion would seem to be happening substantially later than in the North Sea and English Channel ports of England (Barrett et al., 2011, 2008, 2004a, 2004b).

Squalus acanthias is also a deep-water fish, while others in the assemblage, such as *Pleuronectes platessa* (plaice) are in-shore species (Froese and Pauly, 2010) and *Esox Lucius* is a freshwater fish, confirming what had previously been assumed on the basis of anadromous fish such as salmonids and *Anguilla anguilla* (eel) – that the full range of marine and freshwater biomes were exploited by Exeter's fishermen. Given the dominance of *Merluccius merluccius* and other gadid species, as well as *Squalus acanthias* in the later phase (gadids and *Squalus acanthias* combined account for 78.6%, 72.2% and 66.9% of NISP fish, in each period) it is appealing to suggest that the deep-water fisheries were the most important but like the Mediaeval origins of the *Merluccius merluccius* fishery the attribution of definitive conclusions is to be resisted - in this case, while there are questions around the integrity of the samples – from which the much smaller bones of *Anguilla anguilla* were far more common.

The fact that the earliest phase also seems to have experienced the better preservation would support any such misgivings. Maltby (1979), however, also noted in his report of the mammal and bird bones from Exeter that the preservation was very good – an observation which goes some way towards casting aside those doubts and which makes Exeter exceptional in the South West of Britain. He did, however, suggest that the preservation of bones in Exeter deteriorated with time – contrary to the case reported here.

4.3.2 Mammals and Birds

In general the acid soils prevalent in the region preclude good preservation, which is why just two other Mediaeval assemblages from the region have been found to be used for biometrical comparisons in the results. Unfortunately, although it may make the study of Exeter's zooarchaeology of even greater importance for the South West region it also makes it impossible to understand how typical this assemblage may be for the region as a whole – at best we can extrapolate the differences observed between urban, rural and high status sites elsewhere in Britain and assume that these differences hold true here as well. There is a counter argument to that otherwise bland assumption though, which pleads regional particularism – although the border between England and Cornwall may have been fixed by Æthelstan a century or more before the material examined here was deposited, it seems more reasonable to believe that there may have been some cultural differences in the South West than that Devon had been 'ethnically cleansed' (cf. Insley, 2005). Certainly, a case has been made recently for a continuing tradition of transhumant pastoralism in Cornwall into the Mediaeval period (Broderick, 2014), whilst a system of 'transhumance by proxy' has been strongly argued for Dartmoor (Fox, 2012), lying immediately to the west of Exeter.

It is perhaps with this idea of the micro-regional that we might best consider the evidence for the similarity of size between the *Bos taurus taurus* specimens from Princesshay and those from Launceston Castle. Although on the other side of the River Tamar, which separates Devon and Cornwall, Launceston lies immediately to the north-west of Dartmoor and was and remains the seat of the Dukes of Cornwall (although unoccupied by them after the Black Prince). The Duchy also held Dartmoor, which was a royal forest (the Duke of Cornwall filling the role of head of state in the Duchy) and so it might be supposed that any cattle being pastured on Dartmoor would be of similar stock and that they might variously make their way, *post-mortem*, to the tables of both the Duke's guests and servants and to Exeter's citizens. The larger cattle of Gwithian, as well as being a century or more older than the earliest specimens from Princesshay, may also be thought of as coming from a different circle of pastoral transhumance, in the far west of Cornwall, with another (Bodmin Moor) lying between that and Dartmoor. It is also worth noting, on this point, that the proportion of cattle specimens recovered, compared to the other principal domesticates, is much higher than in assemblages from other major urban centres in England at this time (Albarella et al., 2009; Dobney et al., 1996; O'Connor and Wilkinson, 1982; Serjeantson and Rees, 2009), with the only other two published large assemblages containing a proportion of *Bos taurus taurus* greater than half being two from York (Bond and O'Connor, 1999; O'Connor, 1991). The previous study in Exeter itself revealed a far lower proportion of *Bos taurus taurus* specimens (Maltby, 1979), which might possibly suggest another problem associated with recovery of the assemblage (cf. Payne, 1972) and certainly precludes any direct comparisons with continental cities in known pastoral regions (e.g. Bartosiewicz, 1995).

Pleading particularism on thin ground or not, the case is not undermined by the similarity in size of the caprine remains between all three of the sites – even today, in a country abounding with different native breeds of sheep, the South West is unusual in having just seven (including two from Dartmoor) (National Sheep Association, 2017). Despite this, we know that the wool industry was of huge importance to Exeter's renaissance in the Late Mediaeval period (Harvey, 1996, p. 20; Kowaleski, 1995; Swanson, 1999, p. 57) and it might not be unfair to speculate whether such interests would lead to (or from) a degree of homogeneity in the animals providing such an important product. Certainly, the burgeoning wool-industry might be considered as partly responsible for the increase in caprine remains in the city from the High Mediaeval period onwards, in Exeter as elsewhere in Britain.

Nevertheless, these two species – caprines and *Bos taurus taurus* – appear to have been the mainstay of the diet of the inhabitants, over and above animals which could be reared with some ease within the confines of the city walls itself, such as *Sus scrofa domesticus* and *Gallus gallus*. This is not at all unusual in British towns and cities of this time (Figure 25) and is perhaps even less surprising when we consider that as much as three quarters of all Exeter's trade was local (Kowaleski, 1995) – a stark contrast when compared with other, smaller, port cities such as Southampton (Swanson, 1999, p. 37).

We know that *Sus scrofa domesticus* and poultry were kept in the city right up into the Modern Era (Figure 26), a contrast with Trim, in Ireland, which saw such practices as socially 'unacceptable' by the Late Mediaeval period (Beglane, 2017). It has long been suspected that the proportion of *Sus scrofa domesticus* in archaeological assemblages is underestimated, possibly due to the greater porosity of the bones (e.g. Dobney et al., 1996). No definitive answer has ever been satisfactorily concluded for this state of affairs though and we experience other problems if we look to other probable urban domesticates for some

Figure 26: Lithograph of Rack Close Lane, Exeter, by John Gendall, nineteenth century.

kind of guide – *Gallus gallus* bones are much smaller than those of the domesticated mammals and, therefore, more likely to be effected by recovery bias (of which, as we have seen, there are particular issues in relation to the Princesshay assemblage). *Anser anser* bones are larger than those of *Gallus gallus* but are likely to have always been fewer (not least because they can be a greater nuisance). Previous studies in Exeter have suggested, however, like this one, that *Anser anser* was a relatively uncommon species in Exeter (Broderick, 2007; Maltby, 1979). By contrast, cities in the east of the country such as Norwich (Albarella et al., 2009) and Lincoln (O'Connor and Wilkinson, 1982) often see *Anser anser* specimens outnumber those of *Gallus gallus* in the High Mediaeval period.

The next most common group of birds in the assemblage, the corvids, can, for the most part, best be interpreted as scavengers that thrive on the detritus of urban life. *Turdus* sp./*Sturnus* sp. (thrushes and starlings) are commensal species and so their presence should also not be a surprise whilst *Sterna* sp. (terns) may be explained by the positioning of Exeter between an estuary and bogs and lakes, where many species of tern spend the winter. *Scolopax rusticola* (woodcock) is the only wild bird present in the assemblage that was more than likely a source of food. It was present in every phase but was recorded in far greater numbers in the Roman phase of the site (Broderick, 2013). Finally, the presence of *Falco columbarius* (merlin) in the Late Mediaeval period might require a little more explanation.

Fewer than a dozen sites have been excavated in Britain from which *Falco columbarius* specimens have been identified (Broderick, 2008; Yalden and Albarella, 2009, p. 137). Yalden and Albarella (2009, p. 213) give one of these identifications as Mediaeval Lincoln but it is difficult to ascertain the more precise origins of this, since a reference is not given and it is not mentioned in either of the two major zooarchaeology reports from the city

(Dobney et al., 1996; O'Connor and Wilkinson, 1982). In any case, the bird was listed in the dubious 'allocation list' of St. Alban's as being fit for a Lady falconer (Yapp, 1982). Falconry birds are not unknown in Mediaeval urban contexts (e.g. Coy, 2009) but given the lack of any other markers of status on the site that interpretation would seem to be a bit of a leap in this instance. Although it is, perhaps, worth noting in this light that *Scolopax rusticola* is common on high status sites in Mediaeval England (Albarella and Thomas, 2002) and is usually interpreted as an indicator of such.

Falco columbarius is not a scavenger but primarily a hunter of small song-birds and thrushes on the wing – it has been shown in more than one instance that *Sturnus vulgaris* (starlings) are one of the primary pray species (Wright, 2005). As such, the open space provided by an urban-edge brownfield site might provide just the ecological niche to support a *Falco columbarius* individual or pair. Certainly, the species has managed to adapt to the environment of modern cities (Sodhi et al., 1991), so the hustle and bustle of a Mediaeval urban space should not have been too difficult an obstacle to overcome.

The few micro-mammal specimens recovered would appear to further support the archaeological interpretation of the area as being a sort of undeveloped, edge-of city area during this period. The city walls were essentially Roman, even if they had been maintained or rebuilt in places, and the excavations at Princesshay revealed no standing buildings. The presence of *Mus musculus* (house mouse) in the assemblage from the High Mediaeval period should come as no surprise – a commensal species such as this would be expected in an urban environment. *Apodemus sylvaticus* (wood mouse) was present in the assemblage from both the Early and Late Mediaeval phases, however. Harris and Yalden (2008, p. 129) note that it is 'a pioneer. Probably limited in urban spaces by predation and habitat fragmentation, though offset by availability of suitable gardens.' Gardens may or may not have been common in Mediaeval Exeter but it would certainly have been at home in scrubland.

Also contained in the environmental samples from the Late Mediaeval phase, *Rattus rattus* (black rat), would perhaps have been a less welcome part of the local urban ecology. Given the broad period dating and what we now understand of the Black Death, it would be remiss not to mention in light of the find that Exeter was one of the worst hit areas in the country, losing half of its population in AD1349-51 and another quarter of the survivors in a subsequent outbreak thirteen years later (Harvey, 1996, p. 20).

Canis lupus familiaris and *Felis catus* might, of course, be expected to help keep the rodent population in in the city down to some extent (although modern research shows that this is not, in fact, the case (Feng and Himsworth, 2014)). Their presence in small numbers in a Mediaeval urban assemblage should usually pass without comment but the case of *Felis catus* is another that pleads for special attention in Exeter. Maltby (Maltby, 1979, p. 65) said when discussing this species that 'their comparatively frequent recovery and their relatively high mortality rate may suggest a more intensive exploitation. One possible explanation is that their skins were of some value.' Another previous study in Exeter (Broderick, 2007) also identified a higher than normal proportion of this species (cf. O'Connor and Wilkinson, 1982, where none were found). The only phase at Princesshay in which *Felis catus* matched the 2.6% of NISP reported in those earlier studies was the Late Mediaeval, in which nine of the thirteen recovered longbones were unfused at at least one end and seven of these came from one context. In some ways, this does match the evidence which Maltby used to build his interpretation and that for a similar assemblage from Southampton (Noddle, 1974) but he also cautions that 'surprisingly little appears to be known of the life expectancy of cats. The archaeological evidence may simply be representing the natural mortality rates of the species, perhaps enhanced by the deliberate putting down of young, unwanted and stray animals.' Perhaps more surprising then that is that much the same thing can be written today, nearly forty years on. Zooarchaeologists have recently begun to pay more attention to the issue of furs from cats, however, with one assemblage from Spain showing unequivocal evidence, featuring extensive butchery – significantly for the evidence presented here – on young individuals, suggesting deliberate exploitation (Lloveras et al., 2017). A regional study of Britain, however, reported a low incidence of butchery marks on cats (Fairnell, 2003). In Cambridge, meanwhile, a Mediaeval well containing the remains of 79 cats did have evidence for skinning but also other butchery and was interpreted evidence for the consumption of feral animals (Luff and Moreno-García, 1995). This site, also, had bones primarily from young individuals.

The question of *Felis catus* in Exeter thus remains equivocal – the numbers are large and the high rate of juvenile casualties is consistent with processing for fur. The complete absence of any butchery marks from any of the sites recorded in the city so far though perhaps mean that we should not think of cats playing a large role in Exeter's furrier industry, such as it was. Counter to that, however, are the documentary sources which suggest that the skin and fur industry was the third largest in Mediaeval Exeter, with skinners being the highest paid member of the profession (even journeymen able to afford to own horses and geese) but that the higher end of the fur market was catered for by merchants who imported their wares from London furriers (Kowaleski, 1995, pp. 157–159), which might suggest a local demand for lower quality or less exotic furs. One final thought to consider in light of the mention of plague in Exeter which linked into this discussion – the possibility that stray *Canis lupus familiaris* and *Felis catus* would have played a role in controlling the rodent population in a city is often considered but what is not often mentioned is that a rise in the rodent population – such as must have occurred in the Late Mediaeval period – would also see a corresponding rise in the animals that preyed on them. Since it is only this phase that saw Princesshay approach anything like the numbers documented elsewhere in the city it may be that we are conflating two lines of evidence – a rise in population reflecting a surplus of prey in the food chain at one moment in time and a normally high but very local population restricted to a particular industry in that place.

The other small mammal recovered, *Lepus europaeus*, is less ambiguous in its origins or purpose and can probably be grouped with the small mammal rib that was chopped through in the High Mediaeval period. When taken together with *Capreolus capreolus* (roe deer) (which was present in every phase) and *Cervus elaphus* (red deer) (which was present in the first two phases) it can be seen that, legally or not, wild game was making its way into the city consistently through the Mediaeval period. Indeed, in the 12^{th} century Queen Street assemblage, *Dama dama* (fallow deer) was present as well as the two deer species identified here (Broderick, 2007) and it was also from around this time that the first specimens of *Oryctolagus cunniculus* (rabbit) were found in the city (Maltby, 1979, p. 61). All these analyses agree with this one in one important aspect, however – that wild mammal remains were always extremely rare in Mediaeval Exeter, just as they were on other Mediaeval urban sites (Sykes, 2007, p. 65).

This brings us neatly back to the question of the three principal domesticates and what role they played in Mediaeval Exeter's economy. Horncores from *Bos taurus taurus*, *Ovis aries* and *Capra hircus*, chopped through at the base, were found in each phase of the site. The former were also identified by Maltby (Maltby, 1979, p. 38) but he made no mention of caprine horncores being removed from the crania when he discussed the butchery of those elements (Maltby, 1979, p. 53). If there were any doubts about horners in the city using the horns of all bovids then they, at least, can be laid to rest.

Moving down the body, although the sheer diversity of butchery marks was a prominent feature in every phase, one other aspect of butchery also deserves comment – the most common marks in each phase were oblique chops through ribs and axial chops through the body of vertebrae, in a cranial-caudal direction. The other aspect commented upon was the decrease in frequency of butchery marks through time. Digging into this further, it can be seen that the main driving force behind this seems to be a shift away from chop-marks, which dominate butchery, especially of *Bos taurus taurus*, in the Early Mediaeval period. In fact the evidence from this phase of Princesshay fits almost exactly with the general picture of butchery in Early Mediaeval Britain outlined by Holmes (Holmes, 2014, 2011) and discussed in 3.2 (Models Suggested and Patterns Reviewed) – a dominance of chop (as opposed to cut) marks suggesting non-standardised butchery, axial splitting of metapodials and a non-standardised approach aimed at creating pot-sized pieces of meat.

The splitting of vertebrae by chopping through them axially would suggest that the entire carcases were being split lengthways – a process that more or less requires the animals to be hung up. The frequency and consistency of observations of this mark further suggest that an organised butchery industry was already in place in Exeter from the Early Mediaeval period. Given the plethora of other chopmarks at this time, particularly on ribs and large mammal long bones, we might also be able to infer something with regards to the culinary practices of Exeter's inhabitants. Pieces of meat at this time appear to have been sold, or at least cooked, with less regard to the natural anatomy of the animal from which it came and more regard to the size of the piece of meat. A good explanation for this would be if most of the cooking was done by boiling in pots – thus making 'pot-sized' pieces of meat preferable, since there would be less processing in the kitchen or at the table and less wastage. The decrease in chop-marks, and corresponding rise in cut-marks (particularly, as said, on large mammals) would appear to suggest that meat was either being sold off the bone more commonly in the Late Mediaeval period, or else that whole joints of meat, on the bone, were being bought. Either suggests a major change in culture, as expressed by dietary preferences.

One other bone was particularly likely to be butchered in a consistent manner - *Bos taurus taurus* metapodials, in particular, were likely to be chopped through axially, presumably to expose the marrow. This was especially common in the Early Mediaeval period but continued thereafter and was also a feature of caprine metapodials in the first two phases on the site. Those that were not split in this way often had cut-marks around the mid-shaft of metapodials – a mark consistent across all phases and all bovid species. This suggests an alternative use for these bones – those that were not sold and cooked for their marrow fat were often left attached to hides for processing by the tanner.

Finally, with regards to *Sus scrofa domesticus*, the peculiarly high number of right-sided ulnas in relation to the other elements in the Early Mediaeval periods is probably no more than a statistical anomaly. Although three of them did come from a single context, the others were from several different contexts and serve as a useful reminder regards the many different routes and origins that skeletal elements can take in a complex urban environment before being deposited (Madgwick and Broderick, 2016).

4.4 Conclusions

In summary then, the diet and economy of Mediaeval Exeter, as suggested by the assemblage excavated on Princesshay, depended to a large extent on just three species – *Bos taurus taurus*, *Ovis aries* and *Sus scrofa domesticus*. The first of these, *Bos taurus taurus*, was likely to have provided the greatest source of meat in the city throughout the Mediaeval period, even though it was usurped by *Ovis aries* as the most common species, according to quantitative analysis of skeletal parts recovered, during this time, due to the greater size of the animal. The rise in relative abundance of *Ovis aries* during this time can best be seen in the light of Exeter's booming wool industry, which would demand that an almost ever-increasing number of *Ovis aries* be herded in the region.

Although emphasis is placed here on *Ovis aries* it should be remembered that *Capra hircus* was identified in every phase of Princesshay's Mediaeval archaeology. This suggests that the animal was always present in the city in some proportion and the role of the animal may be underappreciated (cf. Noddle, 1994; cf. Salvagno, 2015), like *Sus scrofa domesticus*, *Gallus gallus* and *Anser anser*, it can be kept in low numbers in an urban environment and would provide a welcome source of dairy produce for its owners. It is primarily considered of importance for its horns though, which can grow exceptionally long on mature billies, and it is this element that is most frequently found in Mediaeval cities, as it was here. It was likely, therefore, to have been a familiar and every day site for the people who lived in Exeter at this time.

Trying to place this city in its regional context is made difficult by the paucity of other assemblages with which to compare it. The proportions of the three principal domesticates recorded on the site in each phase suggests that its development was typical of British urban spaces but we must be wary of what we describe as 'urban' at this point in time, a description which may cover conglomerations of very variable size and regional importance. We have seen that there are hints of difference in these measures between Exeter and the better studied major cities in the East of England and we have also seen that there are differences in the size and proportions of domesticates – especially the locally important *Bos taurus taurus* – which might make us wonder just how much we may extrapolate from other cities to Exeter.

The story in the city at this time appears to be one of more continuity than change but that should not mask us to the fact that change did occur – in the increase of *Ovis aries*, for example, and in butchery practice, which seems to have become less concerned with making small pieces of meat over time, with fewer chop-marks appearing after the earliest phase on the site.

5. Building a New Model

'I would argue that however detailed our descriptions may be, they contribute little to our understanding of how societies were reproduced under particular material conditions so long as they are studied in isolation. By this I mean isolation both from their material and historical contexts, and from broader theoretical propositions concerning the relationship between human action, social practice and social structure.'

(Edmonds, 1990, p. 58)

Many zooarchaeologists might feel a little insulted at the suggestion that they study objects. That biological material is studied within an archaeological framework has meant that interpretations by practitioners have tended to focus on ecological and economic models. Nevertheless, there has also been a propensity to see bones and other animal remains as objects in their own right. This is most noticeable in discussions of pathology and trauma (e.g. Clark, 2009) but is also evident in discussions of craft and butchery practices whereby a bone can be described in terms of its modified morphology – a humerus chopped through the proximal end, or a metapodial sawn in half, perhaps even a metapodial made into a skate or simply described as a 'worked bone' (see, for example, a discussion of bone tools in the Howieson's Port culture of Southern Africa, which makes no reference to skeletal element or animal species in Backwell et al., 2008 – by no means an unusual paper for its subject).

Recent work in other areas of archaeology, and in material culture studies generally, has tended to move away from this fascination with objects and to begin to look at the processes behind them (e.g. Ingold, 2011). This sort of approach may be crucial in refocussing our attention not on the objects that we identify, classify and analyse but on the people who made and used them that are the ultimate subject of enquiry. In terms of zooarchaeological urban taphonomy, this means understanding the pathways that bones take through a city – from the moment an animal enters the urban environment, through its dismemberment and the different uses and destinations of its various parts through to eventual deposition. Importantly, it is necessary to recognise that each of these states is not a fixed point but merely one status in its journey. As archaeologists, we have to remember that the object we study has been a different object, with different functions and meanings to different people, at different times in its own past. By understanding the taphonomic history of objects as well as that of the site from which they were excavated (finally associated) then, we can begin to understand something of the way in which people lived and interacted with the objects as well as with each other.

A cutler might sell a knife with a bone handle. He or she may well have bought the bone from a butcher, who bought it from a slaughterman, who bought an animal from a drover, who bought it from a farmer. Throughout all these transactions the bone is present and yet it is a different object in each circumstance. Its taphonomic history, then, is a history not only of its own interactions with its environment but also of the interactions that have taken place between people who have dealt with it.

Much of the recent thought in archaeology on this question has centred on questions of agency (Dornan, 2002), inspired by the Kantian philosophy of Heidegger and his ruminations on 'thingness' (Heidegger, 2001, pp. 163–180) (even if Heidegger's ideas remain controversial within philosophy (see Harman, 2009)). The important point here, however, is not necessarily the distinction between the object and the thing so much as the inherent plasticity of the object's material. An animal bone can be many things whilst also always being essentially animal bone; it exists fundamentally in a state of flux.

The second part of this chapter argues for a new way in which to tackle zooarchaeological material which focuses upon this flow of material as a way in which to better understand the society that created an assemblage. In doing so, it is suggested that more knowledge may be gleaned from more material and that an engagement with theoretical debate in the wider discipline of archaeology might be productive.

5.1 Approaches in Other Subjects

If object focused interpretive models can be said to have characterised much of zooarchaeology then there are certainly parallels to be found in other disciplines of archaeology. Use-wear analysis (particularly microwear analysis) of lithics, for example, focusses on identifying the principal economic activities of people through the identification of primary and secondary object functions (Holley and Del Bene, 1981; Keeley, 1974). This model thus functions at a site or assemblage level and relies upon having large assemblages from which to draw general trends. The general trends identified may be put to use in very general means, such as to suggest the relative frequency or importance of various tasks carried out at a site or more specifically, to attempt to trace the origins of specific technologies for example (Keeley, 1974, pp. 332–333). Some of the specific attributes of such analysis, such as the identification of precise uses like skinning were debated at the time (Holley and Del Bene, 1981) but whatever the detail it may be seen that the model is broadly analogous to approaches in zooarchaeology such as herd interpretation models (cf. Payne, 1973). It reflects, essentially, an early processualist concern with identifying economic practices as something with which scientific approaches could grapple (cf. Higgs, 1975, 1972) rather than the more obscure concepts of social structures, belief systems and behavioural processes.

5.1.1 Systemic Context

As highlighted above, the majority of attention devoted to the subject of identifying behavioural process in the archaeological record, shifting emphasis back to people and away from objects, has been relatively recent. One of the earliest attempts focused on processes which might happen in a ‘systemic context’ as opposed to the ‘archaeological context’ (Schiffer, 1972). This model was necessarily general and divided objects into two broad categories – durable and consumable (which are roughly analogous to inorganic and organic objects) – in order to suggest two similar systemic context cycles (Figure 27). Schiffer acknowledged weaknesses in this model such as the complications presented by trade and the probability that many objects likely missed several stages in the model (e.g. recycling, manufacturing or even use if a manufactured object was defective) (Schiffer, 1972). Perhaps its greatest weaknesses may be its underlying assumption of the archaeological record, however - that all objects entering the archaeological record are necessarily refuse. One useful concept generated in his study though is that of use-life: that is that an object can have a use-life before it is recycled (Schiffer, 1972, p. 159) (although many lithic specialists, in particular, seem to use use-life and object life synonymously (e.g. Surovell, 2009)).

Taken to a logical extreme, this would suggest several possible use-lifes of an object within one over-arching object life. This would appeal to any analysis based on the inherent plasticity of the material suggested above. Ultimately, Schiffer's model was concerned principally with identifying activity areas and so was concerned with spatial analysis, building on the work of Binford, among others. As a part of this he also coined the term '*defacto* refuse' which applied principally to waste materials, which would facilitate identification of activity areas (Schiffer, 1972, p. 162). This is broadly the approach taken by many zooarchaeologists to the analysis of faunal remains from urban sites today, as outlined previously (3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists).

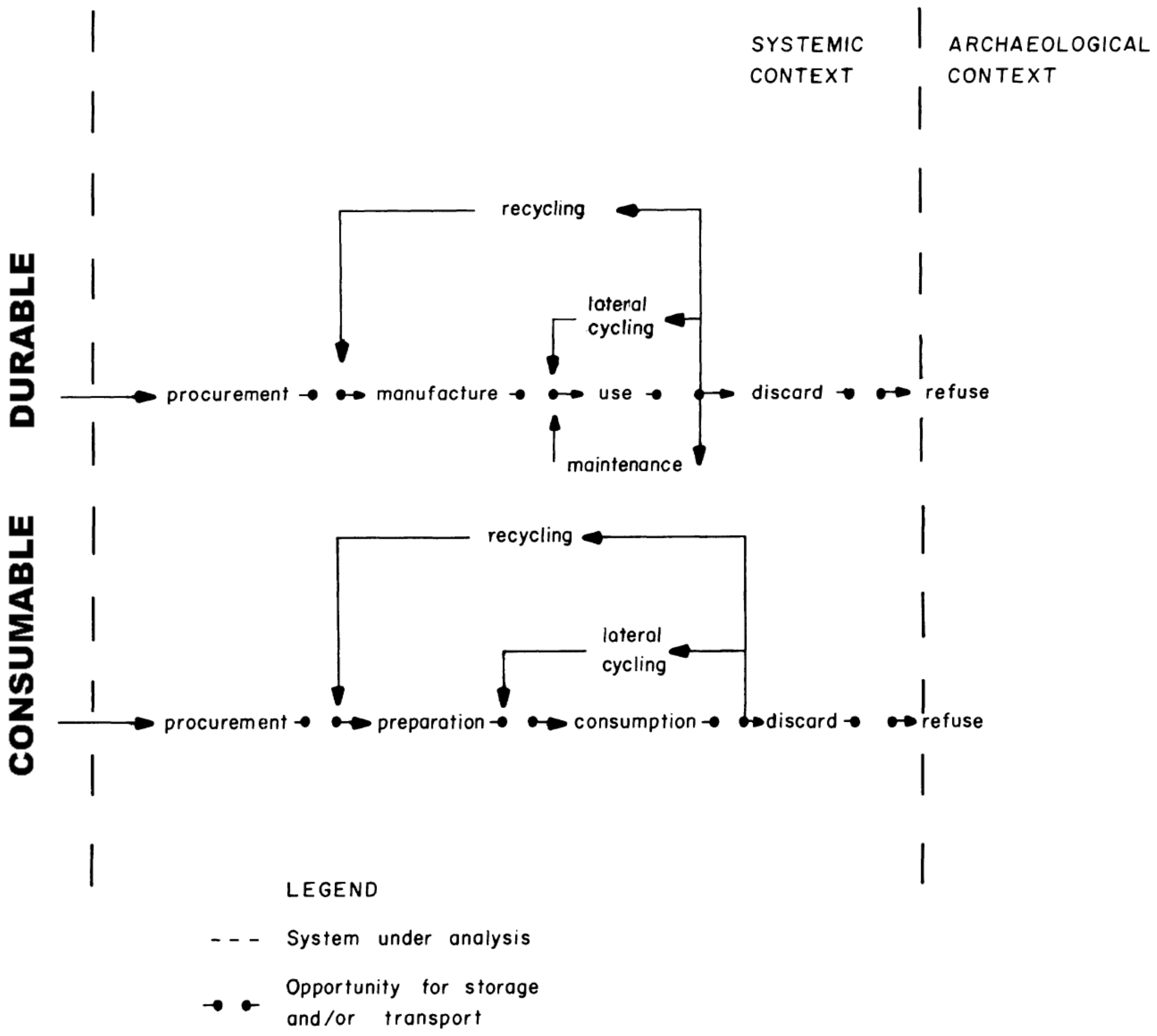

Figure 27: Flow models for consumable and durable elements in archaeological and systemic contexts (redrawn after Schiffer, 1972, pp. 158–159).

5.1.2 Agency

The 'use-life' concept aside, it can be seen that the systemic context model relies explicitly on object associations within a large site – individual objects in fact become subsumed within larger categories which denote activity areas. This in itself might help us to understand how people organised their lives on a site but it does little to suggest underlying social relations. As a post-processual paradigm gained traction in archaeology from the 1980s, however, an interest in what material culture could tell us about social relations became more prevalent and material culture studies became more targeted towards answering these questions. Using a multi-scalar approach, for example, Dobres (1995) was able to demonstrate that approaches to making various bone and antler tools in Magdalenian Europe varied between sites even as the general form was similar. Importantly, this information was used to suggest that the creation of the artefacts was public, thus not only maintaining styles and innovations within a community but also mediating social relations 'through the medium of material culture production and use' (Dobres, 1995, p. 43).

This approach to material culture studies placed an emphasis on human agency, i.e. a capacity to act in and influence the world, with the aim not simply of understanding activities but social processes:

> *'Technologies are not practiced in a cultural vacuum where physical laws take precedence. Objects are made, used, repaired, and deposited at a variety of sites, and the associated activities and social interactions that took place in those contexts form a meaningful and structuring set of background conditions.'*
>
> (Dobres and Hoffman, 1994, pp. 213–214)

In other words, to paraphrase Karl Marx, what people make and how they make it defines them no less than who they know and how they communicate with them. In fact the two may be fundamentally linked – technologies have a specific meaning or purpose within their society (for example a fence controls livestock) but the technology must fit the society (why not use a shepherd instead?). This suggests that there may be a symbolic meaning in objects; that technology represents the manipulation of materials may be the only thing that separates it from other human behaviours (Lemonnier, 1990, p. 28). The intricate network of social, political, environmental, symbolic, economic and technological factors behind production and development is a topic outside the scope of this thesis; it is necessary here only to acknowledge that they are linked and that, therefore, studies of objects should not be limited to technological questions such as identifying activity areas. Focusing on the social agency of technology, rather than the technology itself, realigns research with cultural and social concerns (Dobres and Hoffman, 1994, p. 216). An example of this can be seen in the metallurgical practices of Pre-Hispanic Andean societies, who preferred to use gold and silver alloys over the simpler plating technique due to the symbolic importance of the metals and a belief that if objects were plated with them rather than made of them then they did not possess those attributes (Lechtman, 1984).

It has been suggested that approaches to the interpretation of material culture which use an agency structure must, by necessity, be based on known historical conditions if they are to understand behaviours as thought processes and not merely as actions (Johnson, 1989). Often, however, ethnographic analogy is used as a proxy for historical conditions – unavoidably when studying prehistory – as a stand-in for Bourdieu's (1977) *habitus* when employing practice theory. Ultimately, the point of any interpretation relying on human agency is that the relationship between the material culture and that agency is purposed to sustain or improve a particular way of life (Barrett, 2012).

If agency can be defined as a capacity to act in and influence the world, as I have done above, then can objects themselves have agency? This has been argued for by some archaeologists (e.g. Gosden, 2005) on the basis that the form and design of objects can shape the way in which people interact with them. Adoption of such an approach can suggest, for example, that new styles of ceramic vessel can impose ‘new sensibilities and forms of relatedness’ on a human population (Gosden, 2005, p. 208). Object agency has been criticised from various angles: notably for the confusion of agency with intentionality (Knappett, 2005) and also through a confusion of objects with ‘things’ which underestimates the role of materials and sees pre-made objects as masters of their own history (Ingold, 2009). Perhaps the greatest criticism that can be made of it from an archaeological point of view though is that it is reductionist and, indeed, regressive in that it focuses debate once more on something that archaeologists are familiar with – material culture and objects rather than on people.

It has been suggested that if agency models are to contribute anything useful to archaeology in the future then they must both incorporate existing ways of thinking about the archaeological record and employ case-studies (Johnson, 2004; cf. Renfrew, 1994). The agency approach to understanding social processes thus quite possibly exists in a self-referential academic bubble which, though provoking continued debate, is not yet directly answering the questions that it is asking. Outside of this debate, however, are other approaches related to the agency model, or at least to the object-agency model; the biographical method emphasises the altering forces and events that befall an object without necessarily endowing it with its own world-altering capacities.

5.1.3 Biography

A biographical approach to material culture studies was first advocated by the social anthropologist Igor Kopytoff in a paper that set out implicitly to tackle the problems of incorporating Heidegger's thing/object distinction into anthropological discourse (Kopytoff, 1986) and so build on earlier genealogical methods (Rivers, 1910). The crux of this approach is to analogise 'between the way societies construct individuals and the way they construct things' (Kopytoff, 1986, p. 233) and the chief way in which this is done, according to Kopytoff, is by categorisation and 'singularisation', whereby something or someone does not fit with a standard classification and so becomes something unique – entering the realms of symbolism. Such a history of an object reflects Kopytoff's principal concern, which was with commodities, and this has inspired some archaeologists to look at such things afresh as heirlooms (e.g. Woodward, 2002). In general however, archaeologists who have embraced this model for analysis have expanded the concept to include transformations (physical, geographical and temporal) of the object itself – the focus of such an approach though, remains the relationship between people and things (Gosden and Marshall, 1999).

In a largely post-processual paradigm, such notions of biography have been mainly lifted directly from social anthropology. The applicability of such a model to the vast majority of archaeological material must be questioned – how often can we know when and where an object is exchanged? When and how, in fact, can we know that an object is a 'thing'? These criticisms share much in common with those of post-processual archaeology generally, i.e. a failure to interact directly with the archaeological record (cf. Renfrew, 1994, p. 3) but it has been pointed out elsewhere that archaeology has, in fact, already devised its own models for describing artefact biographies (Joy, 2009, p. 541) which, in the processes of doing so, suggests thingness. *Chaîne opératoire*, for example, describes a series of events which shaped an object and the decisions which were made in its formation (Martinón-Torres, 2002; Sellet, 1993).

Biographical approaches have also been devised within archaeology for interpreting items in the record other than artefacts. The 'use-life' model proposes that things have an inherent biographical rhythm and that this reflects social behaviour (Tringham, 1994, 177) (cf. Systemic Context, above). One explicit example of the 'use-life' framework is to the understanding of architectural and settlement development; the model borrows from ethnographic sources to suggest that buildings moved through a static set of life events - planning, construction, occupation, maintenance, decay, abandonment, destruction and eventual replacement – and that these could be identified and used to explore the social lives of the building's inhabitants. The related 'life cycle' model emphasises artefact deposition as merely the final act in a history of several modifications made to its status (York, 2002), this is important in that it emphasises that objects can change function and meaning over time (as suggested above, in the introduction to this chapter). Thus, a spear may be a weapon but it may also, finally, be a votive deposit (York, 2002) – its transition from the one state to the other is not inconsequential for the archaeologist interested in how people lived out their lives and interacted with each other, their environment and things.

Studies using such models, to a varying degree, rely on a narrative structure and can fail to adequately employ data gathered through scientific analysis (Joy, 2009, p. 545). This is one of the pitfalls of adopting essentially ethnographic models wholesale into archaeology (cf. Agency, above). The linearity of this narrative has also been criticised in recent years, notably by Ingold (2007), who instead proposed that the biography of objects consisted of a meshwork of different events, borrowing ideas from the philosopher Henri Lefebvre. Although each and every object and archaeological context may be unique in some way, one potential way in which to counter some of these difficulties is in considering objects as groups (Kopytoff, 1986, pp. 66–68). Such a method compares groups of objects to a standard or average and so seeks to identify deviations. This in turn makes it possible to ask questions of single objects, e.g. why did that event not happen to this thing? It also moves the interpretation away from a narrative 'birth-to-life' model and places the emphasis on events, i.e. biography as the 'sum of social relationships' (Joy, 2009, p. 545). Essentially then, this is (especially anthropogenic) pre-depositional taphonomy by another name but with an equal emphasis on the potential uses of an object as much as on its actual transformations.

Given this concern with pre-depositional taphonomy, it might be thought that biographic models would be widespread in zooarchaeology. Instead, they are rare in the extreme. They have been used effectively, in one case, in the interpretation of ABG (Associated Bone Group) deposits (Morris, 2011, pp. 167–180). Using the known historical conditions that are required as a *habitus*, for example, it was possible to suggest that cats excavated from Early Mediaeval Coppergate, York, underwent a change from commensal species to clothing and waste (neither object maintaining 'the animal's original agency' as the archaeologist drolly reported) (Morris, 2011, p. 178). The biographical approach adopted to study the material was, in this context, able to challenge accepted interpretations in several occurrences of ABG's in the British archaeological record.

5.1.4 *Chaîne Opératoire*

Developing a biographical model for the analysis of Iron Age mirrors which incorporated aspects of use-wear analysis and *chaîne opératoire*, Joy (2009) grouped different processes into related actions which could have been carried out by the same people (Figure 28):

1. The collection and processing of ores.
2. Metal smelting.
3. Recycling of old metal objects.
4. Exchange of ingots.
5. Handle construction.
6. Plate construction.
7. Decoration.

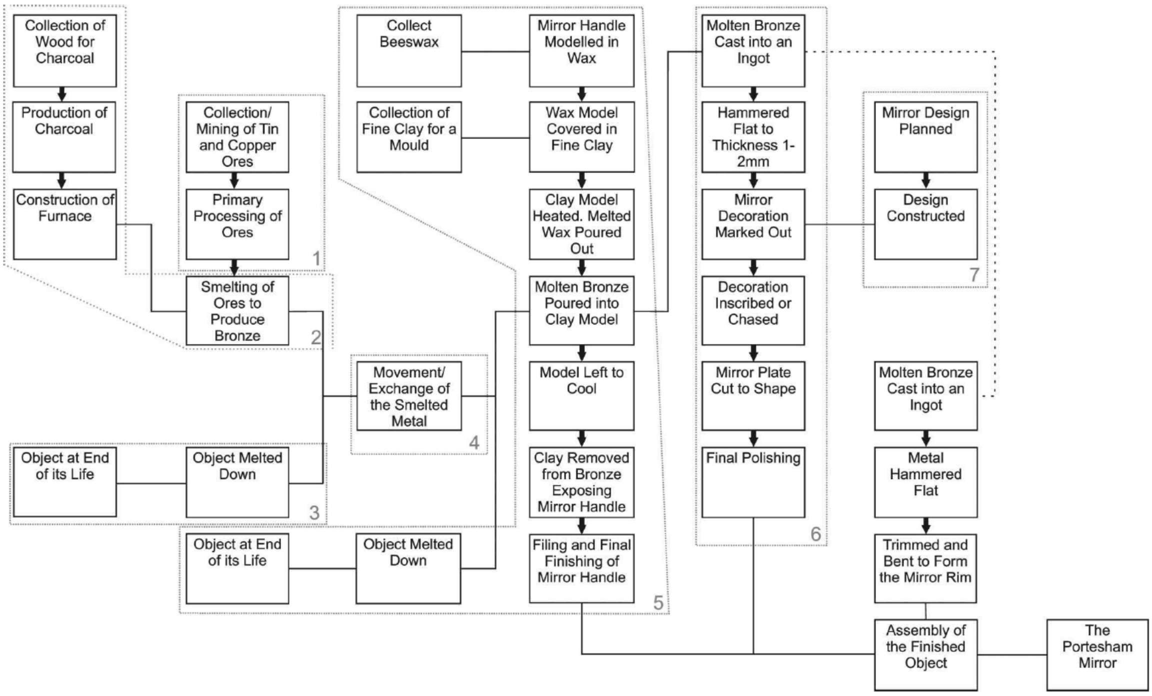

Figure 28: ***Chaîne opératoire*** **of an Iron Age mirror** (after Joy, 2009, p. 547).

Although this model does place an emphasis on the transformations from raw material to finished object and the number of different people that may have been involved in those transformations, it is to be observed that the final act – the creation of a mirror – is still essentially final. While it may be supposed that the mirror could be recycled, this would represent the birth of a new object in this model rather than the continuation of the same one. Furthermore, there is a complete lack of engagement with archaeological contexts – the mirror is still seen essentially as an object existing in its own world. As such, the model remains object focused and although the people who made it are now brought into the picture the people who used it remain outside of the frame (although to be fair to Joy, this aspect is discussed in his paper even if it is not explicit in his model).

The *chaîne opératoire* approach to understanding object biography was originally devised by André Leroi-Gourhan as a means of studying social, behavioural and cultural processes in lithic assemblages (Trigger, 2006, p. 464). This is the critical difference which separates *chaîne opératoire* studies from use-wear analysis, where the latter is concerned with identifying the uses of specific tools the former is based on the belief that technology is socially embedded (Edmonds, 1990, p. 56). This credo states that technology reproduces aspects of the social world at a vital level; *chaîne opératoire* is, in fact, highly descriptive of decisions and actions rather than of objects themselves (Edmonds, 1990, p. 57). Anthropologists have long advocated that technology is socially learned and socially reproduced (Lemonnier, 1990, p. 27) and we can see this clearly in the guild structure of the Mediaeval period (2.1 City and Guilds), where skills were learned through lengthy apprenticeships and initiates were bound together into a social and professional group which to a large extent defined their relationship to wider society.

The practical model of *chaîne opératoire* is based on a splitting up of the actions and ideas involved in making and maintaining a product within a timeframe beginning with raw material procurement and ending with an object's entry into the archaeological record (Karlin and Julien, 1994; Schlanger, 1994, p. 145; Sellet, 1993, p. 106) (Figure 29). In traditional archaeology jargon terms, this incorporates three foci of study: the artefact, its production and the technical knowhow required by a group for that production (Sellet, 1993, p. 107). The last of these is arguably the most important because without reference to it the entirety of the *chaîne opératoire* cannot be effectively interpreted. This kind of study reveals the dynamics of a specific technical system and its role in a social group; by analysing the *chaîne opératoire* of different objects or classes of objects it should be possible to begin to understand something of the social complexity which defines a group (Sellet, 1993, p. 107). Indeed, although perhaps originally intended as a way to try and get into the mind of a flint knapper, *chaîne opératoire* analysis of lithic assemblages has begun to hint at the collective nature of the enterprise (Karlin and Julien, 1994, p. 163), just as several different people must have been involved in the making of the Iron Age mirror described by Joy and outlined above.

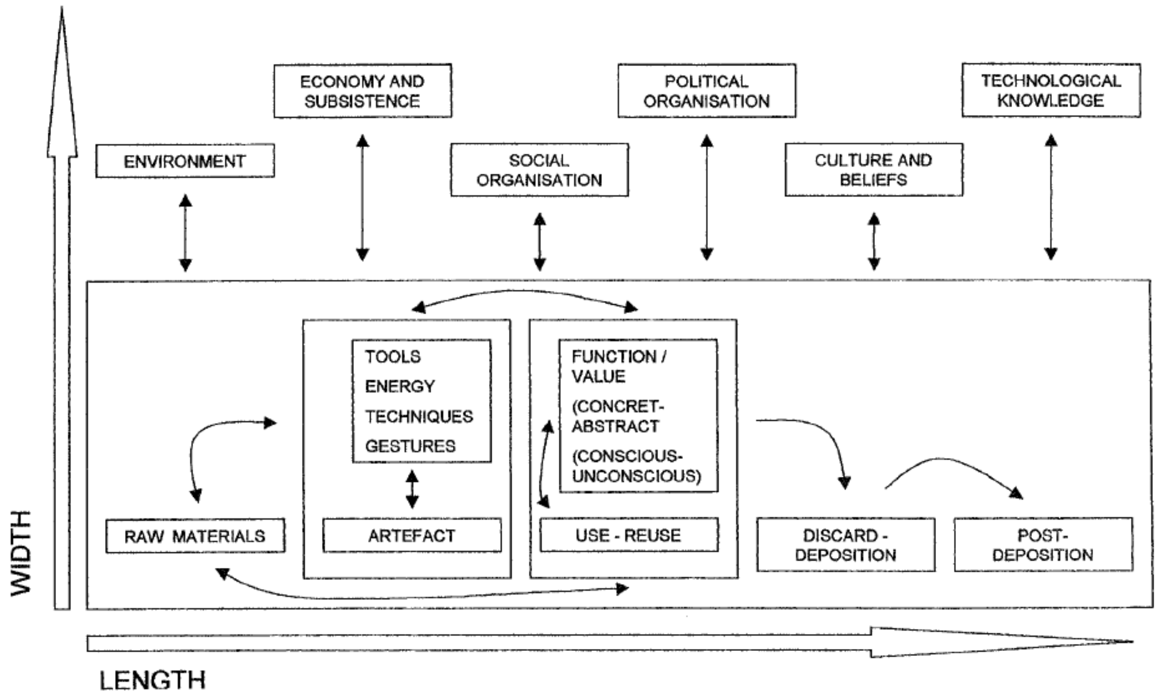

Figure 29: The length and width of the *chaîne opératoire* model (Martinón-Torres, 2002, p. 32)**.**

Defining the role of raw materials in this model can be done only by examining patterns of production, use and discard (Sellet, 1993, p. 108), thus *chaîne opératoire* models are explicitly based on the material rather than on pre-conceived notions of an artefact – overcoming one of the weaknesses of Schiffer's earlier model for understanding behavioural systems from the material record (Figure 27). Understanding the process governing material transformation and, thus, its socially embedded importance, relies in no small way on identifying reduction sequences (Sellet, 1993, p. 108) – revelatory of the model's lithic studies based origin (although reduction sequence analysis has also been used explicitly in bone tool manufacture (D'Errico et al., 2003) and implicitly in carcass reduction (O'Connor, 1993)) – and arises from a notion that 'defining the steps of use and discard are the ultimate steps of a technological analysis' (Sellet, 1993, p. 109). Fundamentally, this means that all material from a site needs to be considered in conjunction (i.e. waste material and fragments as well as recognisable objects) in order to understand the sequence and interaction of activities which underlie the way in which an object is embodied within a society (Sellet, 1993, p. 109) – the way in which, as Heidegger would have it, an object is a thing.

At first glance then, this model may suffer from one of the weaknesses already identified in previous models – that an object should be subsumed within a larger assemblage. To see things that way is, however, to misunderstand the model on a fundamental level – that the focus of study here is not on the object but on the sequence (Martinón-Torres, 2002, p. 31), what has been referred to in other circumstances as the flow of material (Ingold, 2009). *Chaîne opératoire* ‘appears as a succession of operations within which the materials, humans, gestures, tools and knowledge can be studied together’ (Martinón-Torres, 2002, p. 33). In other words this model is derived specifically to move the focus of study away from the object and towards people, as advocated at the beginning of this chapter. The width of the model (Figure 29) facilitates discussion of culture, society, politics and behaviour on a basic level (Karlin and Julien, 1994, p. 153; Martinón-Torres, 2002, p. 34). This enables interpretations to be made which can identify choices made by people and which were constrained through available technology or other natural restrictions (Karlin and Julien, 1994, p. 156), such as in the case of the Pre-Hispanic metalwork already mentioned (above).

5.1.5 Joining up the Thinking

One potential way in which to refocus social relationships within a *chaîne opératoire* model might be to incorporate meshwork ideas for, as Knappett (2011) discerned, Lefebvre’s meshwork is to a network what Heidegger’s thing is to an object but, as noted above, an object can be a thing and so it follows that a network can be a meshwork. This tension is informative in a literal sense since it highlights an otherwise poorly considered function of the *chaîne opératoire* model – that although the model itself may appear on one level to consist of a network of objects (albeit informed by human agency), each also represents a thing within a meshwork (Knappett, 2011, p. 47). This concept, then, outlines the inherent plasticity of the material, as suggested in the introduction to this chapter, above, whilst also recognising fixed objects within it. Even if we are to approach material from a perspective which emphasises this flexibility of resources we are always left with the problem that, as archaeologists, we are by default always beginning by studying objects. Perhaps then, we need to reconsider what questions we are asking of our objects and the applicability of them to the material.

Crucially, the applicability of a *chaîne opératoire* model to interpreting archaeological material may rest in the way in which it is used. If it is used prescriptively, to suggest a way in which materials were typically transformed from one state into another then this fails to capture the variations within and between relationships. It follows then, that identifying trends is only the first step in such a model and it is the deviations which are of equal interest (cf. Biography, above). This deviation emphasis can be applied to groups of objects, as well as to individual objects, however, as Knappett (2011, pp. 53–60) demonstrates using a *chaîne opératoire* model to suggest changes in social organisation and cognitive aesthetics in Bronze Age Crete through interpretation of architectural and ceramic remains:

> *'This is not to obviate or diminish the significance of lived experience. But it is to suggest that some experiences can become routinised, and that this routinisation can in turn facilitate the sharing of practices across communities, over both space and time.'*
> (Knappett, 2011, p. 60)

5.2 Presenting a New Model

It might be argued that although zooarchaeologists have adopted a wide variety of models and techniques from other subjects in their analysis and interpretation over the years, they have been unusually slow to embrace those from other archaeology subjects. The study of artefacts using the models described above is largely the study of transitions, the changing meanings and attributes of objects through their pre-depositional lives. Once that is understood, it becomes surprising that such approaches have not been more widely adopted in zooarchaeology, where the study of pre-depositional taphonomy has been largely exploring the same tropes for nearly a quarter of a century, particularly in the historic period (cf.1.4.1 A Potted History, above, and O'Connor, 1996, for a discussion of this generalisation and of exceptions to it). Taphonomy is, essentially, the study of transitions and a number of different methods and tools have been developed to record the transitions and the processes that cause them – butchery marks, for example, or weathering stages. What has been lacking is a coherent theoretical framework within which to interpret these transitions.

The length and width that Martinón-Torres (2002) identified as being fundamental to the *chaîne opératoire* model (Figure 29) could then be an informative first step in creating such a framework. The width in the model accounts for how an object fits into the world – as a part of environment, economy or social relations, for example – whilst the length describes the object's own transformations through its life – from raw material through to eventual discard. Although I have taken pains to emphasise that these transformations are merely the results of taphonomic processes, the same as any other, it has also been observed that much taphonomic research – both recent and less recent – has been principally concerned with processes that occur post-discard, even where they are pre-depositional (1.3 A History of Taphonomy but see 3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists). In order to integrate these length and width concepts fully into taphonomic studies it may be worthwhile to introduce a third dimension – that of depth. If width characterises the object's relations and length its various uses, then depth can be said to be its history. This third dimension recognises the transformations an object can undergo and places the emphasis firmly on the underlying material, thus helping to disentangle some of the processes and enable the analyst to focus on sections of the object's history (Figure 30).

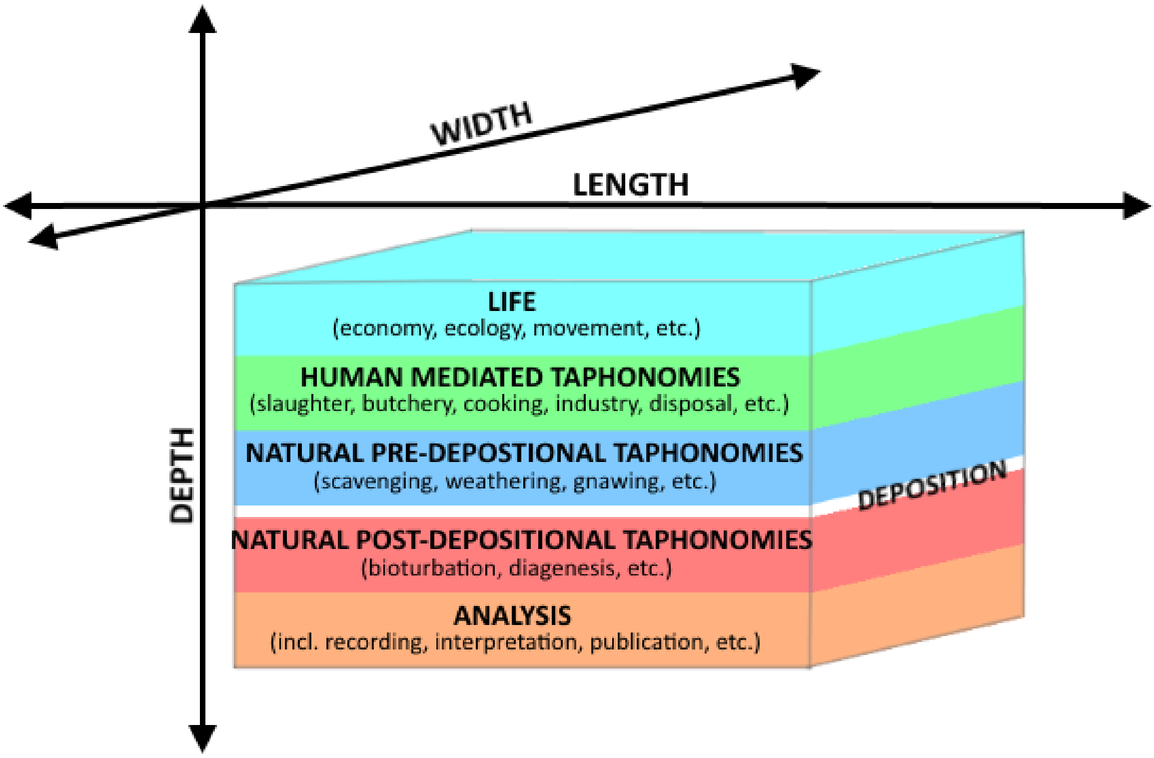

Figure 30: The length, width and depth of object transformation processes in the archaeological record.

Strictly speaking, the first section here – 'life' – is outside the scope of taphonomic studies but it is useful to bear in mind as both the beginning of the object's history and, arguably, the only phase where it may (in the case of animals, at least) be argued to have had any conscious agency. Other divisions are necessarily crude – human post-depositional taphonomies do exist, accidental or deliberate excavation and reburial for example, but are probably too specific to warrant a mention in such a general framework. Likewise some human mediated pre-depositional taphonomies, such as waste disposal, may occur after some non-human mediated taphonomies, such as gnawing, but it is not essential for every case to agree with a conceptual framework for it to be useful. In any case, such an apparent exception is only true if the depth of the model is taken to be synonymous with the linear passage of time, which it need not necessarily be. The illustration of such a framework does not simply emphasise which sections of objects' lives have been better served by zooarchaeological theoretical and methodological research but also points to a way in which future research, this included, can be incorporated.

If we are to understand people and society through material culture – and this study explicitly suggests that animal remains can be studied as such (cf. Jones O'Day et al., 2004) – then it is reasonable to focus attention on human mediated taphonomies. The framework illustrated above, however, emphasises that this is just one link in a chain and thus that these taphonomies should not be considered in isolation. Given that *chaîne opératoire* has not been widely adopted in zooarchaeology, it is perhaps ironic that Leroi-Gourhan was inspired in devising his model by vertebrate palaeontology (Leroi-Gourhan, 1993). Notably, this involved the recognition of the structural importance of techniques as purposeful and operating in a certain manner, analogous to biological parts such as limbs, and that these techniques left material remains similarly analogous to biological bodies and their skeletons (Schlanger, 1994, p. 145). Where he went further was in recognising that these techniques, or actions, were the result of a dialogue between materials and humans.

It has been suggested before that the study of butchery can be seen as the study of material culture (O'Connor, 2007, pp. 6–7) and this emphasis on the structural importance of techniques fits well with what we know of the educational and cultural roles of Mediaeval guild structures (2.1 City and Guilds). If butchery at this time can be seen as a learned set of repetitively performed techniques then we can confidently assert that we are studying memes, a term coined specifically to describe a cultural element or behavioural trait whose transmission is persistent in a population, analogous to the biological transmission and mutation of genes (Dawkins, 2006). This assertion can be pushed further, however since, as has already been emphasised, the guild structure prevalent in High Mediaeval Britain was highly proscribed and involved the allotting of different processes among different groups of people (see 3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists and 2 Urban History). This period is, then, a useful one for trialling a new technique along these lines, providing the historical context that Johnson (1989) suggested was necessary, even if it should prove to be more widely applicable.

Mapping the different named Mediaeval professions involved in the production of primary animal products (that is those that result from or in the death of an animal (cf. Greenfield, 2010; Sherratt, 1983)), highlights the social and economic organisation of society that is one of the stated aims of investigation in the *chaîne opératoire* model (Figure 31). In various places and at various times some of the people performing each of these different roles must have been the same person – it is entirely logical, for example, to suggest that a farmer may sometimes slaughter, butcher, cook and eat his or her own animals. Nevertheless, we know that such highly proscribed divisions of tasks did exist in some places, particularly the larger cities, in the Mediaeval period. Figure 31 thus highlights not only the path of an animal through human mediated taphonomies ('length', Figure 30) but also the dangers of any models presented for use in analysis.

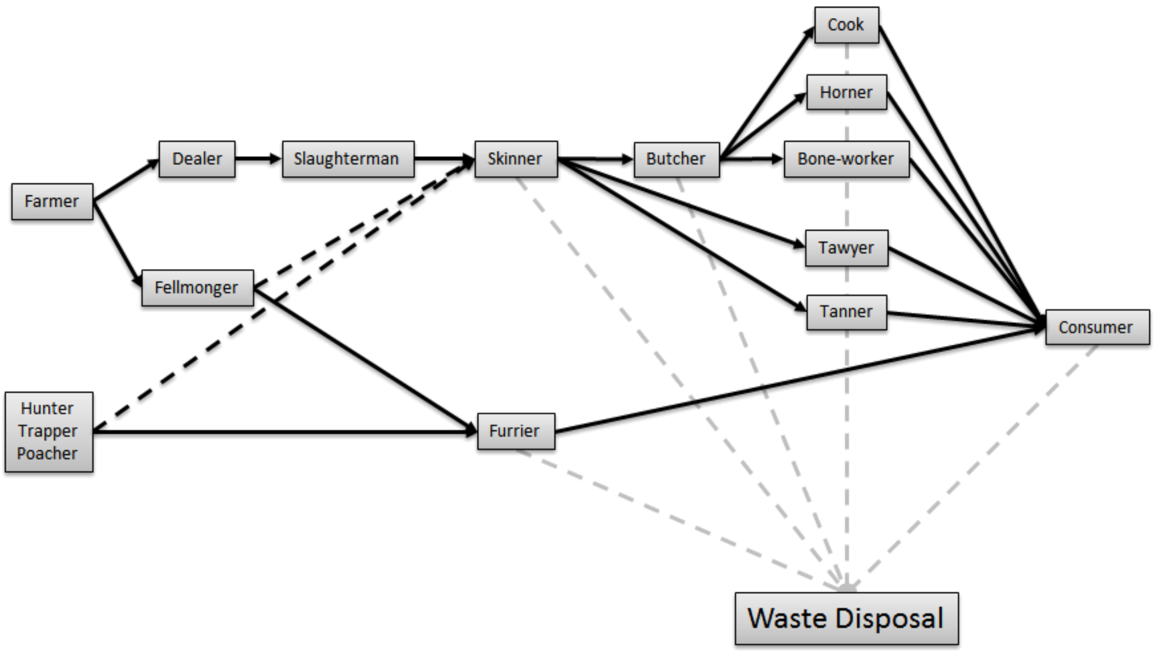

Figure 31: The division of professions and activities with regards to animals and their primary products in Mediaeval England.

There is an inherent problem in representing things graphically; that is that the emphasis might be placed on the model rather than on the processes that underlie it. It is important to recognise at this juncture that in this and all models presented here it is those processes which must remain the focus of the analyst and, as such, deviations from them are of equal if not greater interest than conformity. Despite this danger, graphical representation is a useful way in which to present relationships which may otherwise appear obscure or complex and so focus our attention in the subjects of our enquiries – lifting our attention from the objects on our desks and laboratory benches to those people we wish to glimpse and so transforming the objects into things.

At a basic level then, what we are dealing with here in the application of *chaîne opératoire* models is metaphor. Is it possible to extrapolate cultural and social meaning from technological processes? This is why it is important to analyse each stage of building the model and how these facets interrelate. A skinner is much more than just a producer of animal skins but this is a defining aspect of his profession, thus it is relevant to consider each of these activities in terms of their creative output of animal products. By overlaying the principal productive concerns of each process on the model it becomes possible to see the relationship between the underlying structure of social and economic organisation in terms of the flow of raw materials (Figure 32).

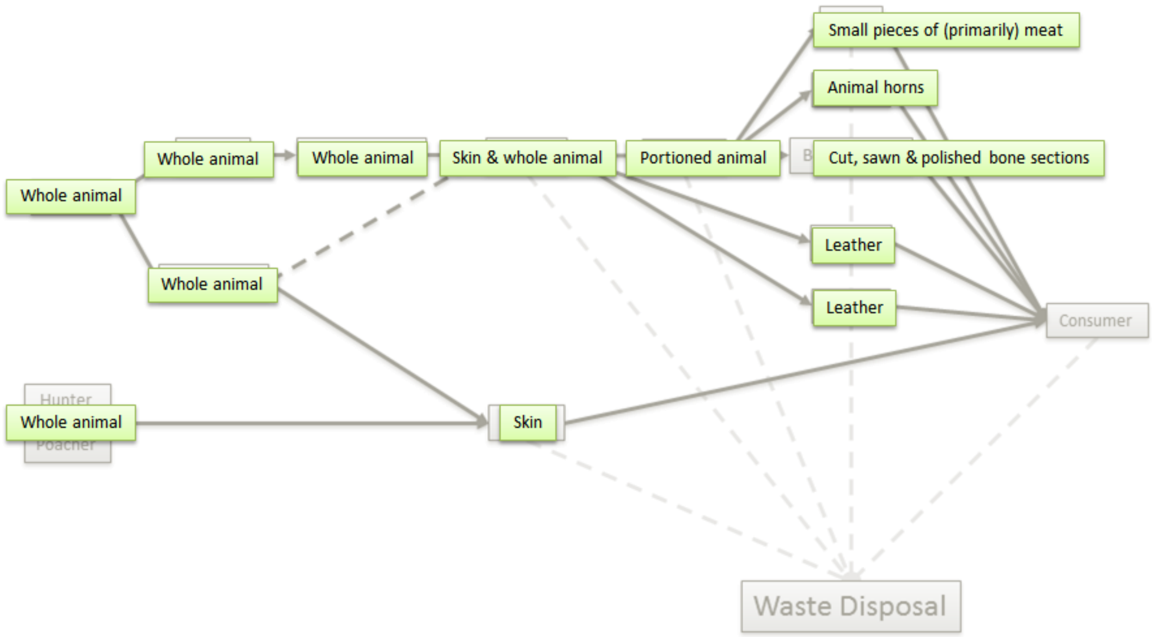

Figure 32: The principal animal product output of the various processes outlined in Figure 31.

The conversion of natural resources into cultural products is arguably what makes *chaîne opératoire* analysis archaeologically valid. Whether that natural material is stone, ore or an animal its transformation from one category of object to another is socially significant but it remains a product of the same material and this alteration of material is one that can be followed taphonomically. Figure 32 also highlights two stages which are obscure in this flow of material, however – the consumer and the process of waste disposal. The notion of a consumer might be debated when applied to a pre-capitalist society and it is important to state that the label as used here implies nothing more than its verbatim meaning – that is that it denotes the point at the end of the human social chain where the material ceases to be altered. This may involve literal consumption in the form of food, or it may be the use of a horn drinking vessel or bone handled knife (specifically when this object is disposed of as such and does not undergo further transformations).

The recognition of a distinct waste disposal category is more problematic and will be discussed more fully shortly. At this juncture it is necessary only to remark that it is outside of the chain, as denoted by the various, shaded, dotted links in Figure 31. This is the human activity that is perhaps least socially proscribed (although there may be legal precepts, several of which are known from Mediaeval towns) (cf. Evans, 2010) and which removes the material from the human mediated taphonomy sphere, before entering the other depths of natural taphonomies (Figure 30). More pertinent to the archaeological analysis of material in this framework is its obvious transformation from one stage to the next and, indeed, its likely eventual disposal after being damaged – a further transformation. This is not a new observation and it is one which archaeologists have usually confronted by focusing attention instead on the waste materials produced by activities rather than the end products.

It is thus necessary to apply a further layer of labels to the model, one which describes the dominant type of waste product resultant from the industries described above. These waste products may be fairly said to be the archaeological signatures of their associated activities (Figure 33). These categories might fairly said to be similar to those used previously by other researchers tackling this problem (3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists). The criticism made of that earlier work was not, however, in its recognition of certain classes of material but in its rigid association of such with particular activities and professions. This new model is not intended to imply that (to take just the most simple of the examples) the identification of horncores in an archaeological assemblage is a waste product of the horning industry and, therefore evidence of a horner operating in the vicinity. The focus here is very much on the flow of materials, the processes through which an animal (or its constituent parts) come to enter the archaeological record.

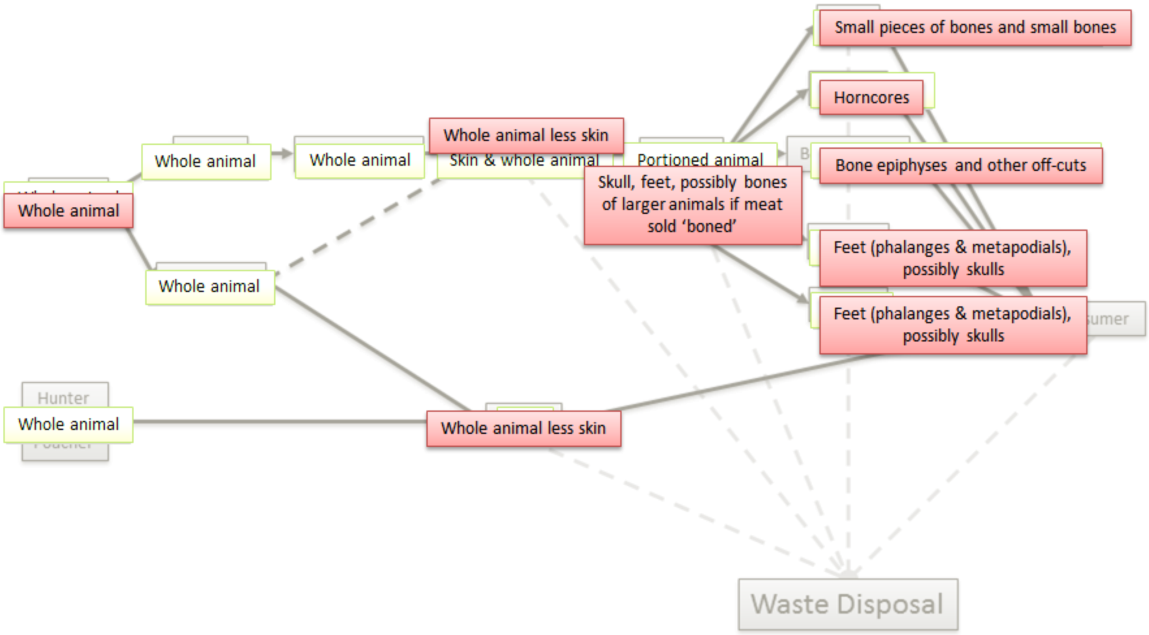

Figure 33: The waste products that might be produced from the processes identified in Figure 31 & Figure 32.

In this sense, the most significant nodes of the model are those which received no overlays in Figure 32 or Figure 33 – the consumer and waste disposal. The idea of the consumer has been briefly discussed already and it is necessary to repeat here only that various products can reside with them until such time as they are no longer of use (whether because they are damaged, spent (as in the example of food) or otherwise no longer desirable). It is important then to finally tackle the issue of waste disposal. Lurking in the background of Figure 31 was an implicit recognition that waste disposal is a heterogeneous activity. If previous models employed by zooarchaeologists have largely concerned themselves with identifying unusual deposits – signature assemblages – created by specific activities, then this model is aimed more at understanding the social system which produced any assemblage that the specialist is analysing.

There is room within this framework to recognise that special and unusual assemblages do exist and that they may represent one of the activities outlined here but the model itself has suggested that such assemblages should be rare. We have already seen that they are exactly that (3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists). Most pit deposits and urban deposits are allocthonous, that is they contain a variety of different materials from several different sources. It seems reasonable to suggest that the processes identified here will produce large amounts of waste material if carried out regularly; that being the case it is unlikely that individuals will have the room to dispose of their waste on their own property. It is equally unlikely that any waste-disposal site on public land would be utilised by only one individual or profession, even if it were a pit dug specifically for the purpose. Thus it is likely that many pit assemblages will derive their contents from several different activities and individuals.

The explicit recognition of these allocthonous assemblages should be argument enough for focusing analysis on the flow of material rather than on isolated events. It might be anticipated, then, that the question becomes less ‘why?’ and more ‘how?’. There are several categories of information that zooarchaeologists record more or less routinely when presented with a new assemblage including butchery marks, fracture patterns, size and other taphonomic markers as well as species, element and pathology. The mistake in focusing attention on the identification of specific activities has led to the elevation of some of these categories – particularly element – over others. Ultimately, this is both the root cause and result of the ‘head and hoof’ motif identified in 3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists. In order to refocus on the flow of material then, and shift our attention away from the identification of specific activities, we need for little more as zooarchaeologists than to re-evaluate our own data.

The diacritical stage is one which is central to *chaîne opératoire* studies in their original application as lithics analysis models (Sellet, 1993, p. 108) and it is one which is analogous to the study of butchery marks specifically in zooarchaeology; carcass dismemberment more generally. Analysis of butchery marks would thus seem to be pertinent to any zooarchaeological study which seeks to use a *chaîne opératoire* model to understand social and economic processes in the archaeological record. It is worth remembering at this juncture that these marks are not those left by butchers necessarily but by any of the various individuals involved in the transformation of the material who may utilise a blade in their work – ending ultimately with the consumer, who might drag a knife along a bone in order to retrieve meat (indeed, it may be the case that such unskilled interaction with the material is more likely to leave marks than skilled butchery – see 3 A Review of Butchery Practices and

Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists). Examination of such marks can then become a useful tool with which to engage the model.

If butchery marks are not confined in creation to butchers, butchery itself is not confined in its language of physical traces to ‘butchery marks’ as zooarchaeologists generally understand them: that is cutting, chopping and sawing damage. Bones might be deliberately broken by butchers, cooks or consumers in order to access the marrow within them that can be an important dietary source of various vitamins and fatty acids in some regions of the world, as well as a delicacy in others. Analysis of fracture patterns thus lends itself to a complementary role to that of butchery marks, extending our insight into the culinary effects and preferences of social organisation. As with the analysis of butchery marks (3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists), fracture patterns are a taphonomic signature that zooarchaeologists have designed increasingly objective and rigorous methods to record and identify (1.3 A History of Taphonomy).

The adoption of any new method probably rests equally upon two factors: its usefulness and the ease with which people can grasp it. It is thus advantageous to exploit current strategies where they are relevant and current techniques for recording butchery marks and fracture patterns should thus be used as building blocks for the application of the model suggested here. To emphasise further that this is evolution rather than revolution, the relative frequency of different skeletal elements must perforce remain a vital aspect of analysis. The models above have emphasised that different activities that mark specific alterations in the flow of material can be characterised by skeletal elements as waste products.

It has already been implied that the recognition of deviations from this flow and unusual assemblages might be more easily recognised through the identification of assemblages dominated by a small selection of skeletal elements. Following this argument through, however, suggests that it should be possible to track the flow of materials in any system through the analysis of the relative frequency of skeletal elements in any assemblage. This, then, is the heart of the new model proposed here: it does not rely upon new techniques or methods in identification or recording but rather a different way of thinking about that collected data in the analysis stage.

The flow of materials can be characterised thus:

1. The acquisition of an animal.
2. Its slaughter.
3. The processing of the carcass into meat and other raw materials.
4. The transformation of raw materials into finished products, including food.
5. The consumption of prepared animal products.
6. The disposal of waste products and damaged prepared products.

Listed in this way the flow highlights the width of the analysis: the animal itself reflects ecological conditions as well as economic decisions; its slaughter is likely proscribed by cultural and religious rulings; the processing by necessity and technological acumen; the consumption by societal mores and the disposal by environmental constraints as well as social responsibilities.

Ascertaining the source of an animal might be attempted through isotopic analysis but this remains an expensive technique beyond the resources of most zooarchaeologists at present. In certain situations in Mediaeval Europe it might also be possible to suggest the source of an animal through documentary records. It is not strictly necessary, though, however desirable. The identification of the species of an animal has long been used to aid interpretations of climate and ecology in zooarchaeology, particularly where those animals are supposed to be wild. Likewise, it is routine practice to interpret economic strategies on the basis of species frequency in zooarchaeological assemblages. This is the first step in tracing the flow of the materials and social, cultural and political conditions that they reflect.

The slaughter of an animal is, alas, zooarchaeologically almost invisible. Common techniques of despatching large domestic animals such as throat-slitting rarely leave any trace. Given the strict structures which often govern such dramatic activity this is to be regretted but no miraculous new insights can be offered here. Instead, attention must be paid to the first stage of processing, as the carcass is split into objects which might more easily be recognised as ‘raw materials’ than the living thing from which they came. The transformation of the animal into meat, horns, hide and bones is one which is as much conceptual as physical. The separate parts now begin to circulate in society in isolation from each other with inherent qualities that reflect very little upon the animal from which they originate. The flow of materials at this point diverges into multiple streams in complex societies, the number of which reflect the number of specialists supported in the economy and society and perhaps also the intensity with which the carcass is utilised, either through economic necessity or else cultural predilection.

The transformation of these raw materials into finished products is the stage which produces the greatest amount of waste material and so is probably the archaeologically most visible. That said, the consumption of the finished products and the disposal of these alongside waste materials will do much to obscure any archaeological signatures, as has already been stated. It becomes imperative, then, to ascertain not which skeletal elements might dominate an assemblage but the relative frequencies of each and every element (including those that are absent) in an assemblage and to combine these observations with analysis of anthrogenic bone modifications.

Subsequent phases in the depth of the *chaîne opératoire*, relating to post-depositional taphonomies (Figure 30) may do much to obscure some of these signatures. Many of the standard ways of identifying taphonomic destruction of elements, for example, rely on identifying proportions of more or less dense elements in an assemblage (e.g. Brain, 1981a; Marciniak, 2016). There is an inherent tension here in any model which relies on relative proportions of elements which may be more or less prone than each-other to destructive processes. Focusing on the 'human-mediated taphonomy' depth of the *chaîne opératoire*, such considerations might be thought to be separate and, thus, dismissed. Nevertheless, their exclusion from the model does not mean they should not be considered – estimations of taphonomic destruction are a routine component of zooarchaeological analysis (e.g. 4 The Animal Bones from Mediaeval Princesshay, Exeter) and should sit easily alongside the model proposed here. Most importantly, if measures of relative abundance are difficult, in that they would be used as indicators of two separate things (human activity and taphonomic destruction) other indicators, such as weathering and carnivore gnawing, can be used to flag potentially problematic contexts – high proportions of either should probably rule an assemblage out from analysis using this model, since it is less likely to be a human generated assemblage of material deposited *in situ* (gnawing) and have suffered selective destruction of elements (weathering and gnawing).

There is a danger in modelling anything new in environmental archaeology of falling foul of both the 'poverty of empiricism' and the 'tyranny of theory' (Roskams and Saunders, 2001). It is possibly for this reason above all others that zooarchaeologists have been unwilling to engage in wider debates in archaeology and have continued to plough the same furrow for decades, essentially always achieving the same harvest. It is hoped that the model here, although informed by archaeological theory, is not yoked to its tyranny and that the empirical soil should prove fertile. Notably, this model not only engages with the material in such a way as to provide fresh and meaningful insights into society but also uses the most substantial part of the zooarchaeological record, which is currently poorly utilised due to the very catholic nature of it which this model suggests should be a strength.

5.3 Integrating the Model

Having outlined how a *chaîne opératoire* model might be adapted to analyse animal remains from socially complex (specifically British Mediaeval urban) societies, it remains to demonstrate its application. It is, perhaps, important to emphasise again that this is a matter of developing our interpretive strategies rather than new methodologies. As suggested above (5.2 Presenting a New Model) zooarchaeological analysis is already equipped with many methods for identifying particular taphonomic signatures. Having sketched the flow of materials (Figure 31) and the products (Figure 32) and waste products (Figure 33) that are the signature of that flow, it remains to suggest how the waste products can be identified. Implementing the model will then allow for interpretations to be made for the social organisation of the environment.

5.3.1 Farmer to Furrier/Skinner

Observation of the model suggests that these professions are some of the most archaeologically invisible. The product traded is a whole animal and so archaeologically visible 'waste products' are restricted to accidental casualties – figuratively and literally – in the form of whole animals. Whole animal remains and their meaning in archaeological contexts have recently been the subject of renewed focus in zooarchaeology (see Morris, 2010 for an overview). A category of Associated Bone Group (ABG), their identification is largely the responsibility of the excavator rather than the post-excavation specialist.

Outside of the scope of taphonomic enquiry, isotopic and aDNA analysis could potentially shed light on the live animal and so, by association, the role and location of the farmer as they fit into the social structure (Fairnell, 2011).

5.3.2 Butcher

The waste products of the butcher, as proposed here (Figure 33) are arguably some of the most diagnostic. This is, perhaps, surprising in light of the emphasis that has been placed on recognising the waste of the more esoteric (by modern standards) trades in Mediaeval cities (1.4 The Taphonomy of Cities). Notably, butchery waste is most likely to contain skulls – and, therefore, teeth; which are often found loose. This is not to say that all skulls signify butchery waste or that skulls never find their way into domestic waste – Wilson (1996, pp. 60–61) points out that split sheep skulls were still occasionally found for sale in late twentieth century Oxford and that the heads of all domesticates can be found with apparently domestic waste in Medieval deposits from Oxford, although calves are more common than adult domestic cattle. Feet are also a likely waste product of the butchery process, in common with some of those esoteric trades just mentioned, although pig forefeet (in particular) can, again be found with domestic waste and, along with calves heads, were regarded as a delicacy in Medieval England (Lloyd, 2012). In fact, the metapodials of cattle, too, can be split for marrow and the heads and feet of animals continue to be delicacies around the world. Nevertheless, the heads and feet of animals do have considerably less prime meat and nutritional value than other parts. It is possible, as already observed (3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists), that this combination could also be the signature of one of the trades but it is considered less likely. In fact, recent ethnographic studies of butchery in a North African town has shown that skulls are particularly closely associated with the area of primary butchery (Arnold and Lyons, 2016).

Moving beyond the complex issue of skeletal part representation, it has also been suggested that chop marks are far more likely to be associated with the primary butchery of an animal than with any other stage in the flow of materials (Seetah, 2006). Where chop-marks are observed then, the role of a butcher may be supposed and, where bones exhibiting such marks are found in association with skull and foot bones, it may be confidently asserted. Furthermore, returning to the theme of skeletal part representation, it may be supposed that whole bones of larger animals, such as cattle, may be more likely to be associated with primary butchery waste. Large portions of meat are unsuitable for domestic cooking and so the meat must either be sold off the bone, or else the bone itself must be chopped into smaller pieces.

Various techniques have been advanced over the years for studying butchery marks on animal bones. At the most basic level this involves differentiating chop-, cut- and saw-marks from other types of superficially similar bone modifications (e.g. Domínguez-Rodrigo et al., 2009; Gifford-Gonzalez, 1989; Greenfield, 1999; Olsen and Shipman, 1988). More complex approaches have also been devised, however, often involving the use of pictorial representation (e.g. Abe et al., 2002; Dobney and Reilly, 1988). One of the more practical and comprehensive approaches to recording butchery marks involves using a series of unique codes which describe the type of mark (i.e. cut-, saw- or chop-mark), which bone it is present on and the position and direction of that mark on the bone (Maltby, 2010, pp. 126–142). Adopting this technique at the recording stage allows for both crude analysis (e.g. proportions of butchered v. unbutchered bones and chop- v. cut-marks) and for more detailed investigations into the cultural preferences exhibited by the butchery – preferred cuts of meat, for example.

Complementary to the analysis of butchery marks, in the conventional sense, is analysis of fracture patterns. As with butchery marks, these have already been discussed elsewhere in the context of the development of the field of taphonomy (1.3 A History of Taphonomy). Such analysis has, however, predominantly been used on prehistoric sites and rarely on those of more complex societies. Objective analysis of fracture patterns (Outram, 2002, 2001), however, can lead to further insight into dietary and cultural preferences. Bone marrow contains a lot of essential fatty acids and vitamins that are difficult to come by in diets with a low proportion of fresh vegetables (Outram, 2003). The modern obsession with lean meat is relatively recent and it is not so long ago that tins of marrow fat were sold in British supermarkets.

Elsewhere in the world, it has been observed that pastoral assemblages can resemble Binford's kill sites in that the bones present are the least meat-bearing parts, due to a cultural preference for processing bones for fats (Marshall and Pilgram, 1991). In Britain, it has been observed that one of the effects of the increasing affluence among harvest workers after the Black Death was a shift to a diet higher in fatty meats, as they aped the fashions of the higher social classes (Dyer, 1988). We can, thus, not be certain of past conceptions as to the value of particular body parts, which are bound up in personal and social expression and taste as much as any nutritional value. Complementary to my earlier observation that whole large bones might be indicative of meat being sold off the bone, large bones exhibiting signs of having been broken when fresh might suggest that these were deliberately cooked in order to access the marrow fat – either with or separately from the meat that once surrounded them.

5.3.3 Bone-Worker

The process of making tools and part-tools (e.g. handles) from animal bones necessitates specific knowledge and selection. Bones are selected for their shape and density. Processing of the various elements – particularly dense, straight bones such as metapodials and radii – often leaves the epiphyses as sawn off-cuts. Epiphyses that show signs of having been sawn from the diaphysis are, thus, more likely to be associated with this profession than with the butcher. As a type of butchery mark, the methods of identifying them are the same as for chop-marks, discussed above (5.1 Butcher), and use of the more nuanced code techniques will allow for easy comparison of the different elements selected for use.

In the past, there has been discussion over whether large numbers of radii and metapodials in assemblages represent primary butchery waste or the stock-pile of a bone-worker that has passed its use-by date (e.g. York – (O'Connor, 1991)). The debate is significant because it represents the activity of two socially distinct groups and is a good example of the type of problem that has ensued from traditional approaches to analysing urban assemblages – the search for signature deposits. As has been indicated above (5.1 Butcher) the presence of cranial elements is probably most indicative of primary butchery and a collection of these elements probably indicates the presence of a bone-worker. More importantly for the discussion here, the argument highlights once again the advantages that may be had from taking the flow of material as a starting point for analysis rather than the fixed and final objects contained in an assemblage – the problem is a product of the flow, whereby the waste-product of one process is the raw material for another.

5.3.4 Horner

Processing horns means that the horner produces very specific waste – horn-cores. Assigning meaning to the presence or absence of a specific element in any assemblage is fraught with issues of equifinality but the assignation of such parts to a process here is appropriate. The *chaîne opératoire* model is, after all, not concerned with identifying specific processes or events but with the flow of material. Identifying horncores in an assemblage – as distinct from horncores still attached to skulls – is suggestive that the flow of material passed through an individual processing horns. Indeed, many zooarchaeologists will be familiar with the curious incidence of the goat in the city; goat horncores are a relatively frequent find from British urban Mediaeval sites in comparison to their post-cranial bones, which are rare (Albarella, 2003; Noddle, 1994). This pattern is, of cause, highly suggestive of a specialist trade. Failing to record any horncores from an assemblage need not necessarily equate the opposite, however – other alternatives, such as off-site deposition and horncores still being attached to skulls must also be explored.

5.3.5 Tawyer & Tanner

These two professions are considered together here for their essential similarity – essentially the tanner deals with cattle hides and the tawyer with those from other animals. In either case, the process, products and waste products remain the same and the profession can be differentiated based on the species. Animal skins were often processed with the extremities still attached – i.e. the feet and possibly the skulls (Serjeantson, 1989). It is probable that most cut-marks present on phalanges are thus associated with removing the feet from the hides once processing the leather is complete and the finished product is sold. Identification of these specific butchery marks, in association with the presence of phalanges and metapodials is thus suggestive of the flow of material through this process in the *chaîne opératoire*.

5.3.6 Cook

It is in the kitchen that most secondary butchery will take place. Cut-marks could appear on bones at any point in the chain from slaughterman to consumer but, aside from those specific marks already outlined (such as those on phalanges (5.3.5)) they are perhaps most likely to occur here. A high number of cut-marks present in an assemblage is thus likely to represent kitchen or table waste – additionally, the opposite of the large element rule hypothesised for primary butchery is also likely to hold true. Of course, where large bones with heavy, reducing, chopmarks are found they are likely to have passed from the butcher, through the cook and to the consumer. Again, the emphasis of this model is on the flow of materials (and, at a higher level, the interactions of society) not the identification of specific signature assemblages relating to one aspect of that flow. These reduced pieces of bone are likely to have been cooked (often with meat attached) in stews and casseroles along with other unwieldy elements such as ribs and vertebrae.

Small animals, including poultry and rabbits, are likely to have been cooked and served whole and so it may be supposed that whole elements and ABGs from this category of animals may originate from this stage in the chain. Indeed, there is a relatively frequent co-occurrence in assemblages of this period of sheep axial elements (ribs and vertebrae) with bird bones (e.g. Wilson, 1996, pp. 42–43), although the full extent of this phenomenon is not known, since many zooarchaeologists prefer not to spend time identifying these elements to species.

5.3.7 Consumer

As with the initial processes in the flow of material, the final stages – use and disposal – are ephemeral in terms of the archaeological evidence. I have defined the consumer as either the final user of a product, in which case the waste and archaeological signature are likely to be a broken tool, or else the imbiber of food – the product from the kitchens. In this sense, signs of gnawing by human teeth would be particularly instructive but the means of identifying such remain under-explored in zooarchaeology. Cut-marks on bones, as already suggested, may be made at the table – by filleting long bones, including ribs. Crucially, this is where fracture pattern analysis can also be informative, once again. Long bones broken when fresh are likely to have been done so at the table (cf. 5.3.2 Butcher).

5.3.8 Waste-Disposal

Although the act which most directly results in us finding archaeological material, this remains the most archaeologically invisible process of all. Some indication may be found of the bone's pathway to its final resting place through analysis of scavenger gnawing marks and by consideration of whether it has been redeposited or reburied (Albarella, 2016; Rainsford and O'Connor, 2016). Both of these indices are evidence of taphonomic processes related to bone movement, rather than to waste-disposal itself, however.

Ultimately, waste-disposal is an issue which affects the entire archaeological record and not just zooarchaeology. Food waste is a particularly noxious form of waste and so may be deposited in specific places away from areas of high activity (though not inconveniently far away). On prehistoric sites, archaeologists often term these areas kitchen middens (often used as a synonym for shell middens (e.g. Elberling et al., 2011; Jerardino, 1998; Sørensen, 1993)) due to the obvious connections between these enormous mounds of refuse with food waste. In truth, all middens are principally comprised of food waste (Adkins and Adkins, 1998, p. 228) as this forms the overwhelming majority of all human produced waste products. The alternatives to midden piles are disposal by burning, burial or simply leaving the waste scattered around the landscape.

The higher the concentration of people – and, thus, the larger the amount of waste – the more impracticable the leaving of waste becomes. Such casual disposal practices, however, are considerably easier (less effortful) than planned disposal and so probably always make up some part of waste disposal practices. Disposal by burning has its own issues of safety and unpleasantness if carried out near people's homes. Burial requires some organisation and effort but it has the advantage over middening in that it provides fewer opportunities for scavengers as well as removing foul matter from the human sphere. It should come as no surprise, therefore, that disposal of waste becomes an increasing concern of governance as populations become more concentrated (Magnusson, 2013). The concern with pollution is exacerbated in urban contexts as waste derives not just from the domestic sphere but also from craft and industrial activities. Marciniak, whose work on the social zooarchaeology of the Neolithic placed a great emphasis on identifying refuse disposal, noted that 'the process of refuse removal is idiosyncratic and usually very complex' (2016, p. 239). Nevertheless, he listed six ways in which to potentially recognise refuse, including occurrence outside a building (Marciniak, 2016, p. 89).

We can, thus, be certain that most archaeological material recovered from Medieval urban pits is deliberately disposed refuse (Schiffer, 1987). Our problem is not in identifying waste, *per se*, since all or nearly all of the material from these pits is waste – but in understanding the social actions and societal restrictions which proscribed the activity of disposal itself. Some of this, at least, can be studied through the historical record (e.g. Croly, 2005) but there is no taphonomic indicator which will help us understand the processes from the animal bones themselves. Far from having an indicator of the route or pathway of waste, we know its destination and we can hope to shed some light on its origin with the aid of this new model.

5.4 Testing the Model

Although it has already been acknowledged that the purpose of a model is to test existing ideas and data it is, nevertheless, necessary to demonstrate its application and usefulness. This will be expanded upon in a subsequent chapter (6 Case Study) but a small proof of concept is helpful here.

5.4.1 Background

Excavations were carried out at the site of Princesshay, in Exeter (Figure 5 and Figure 6), between April 2005 and March 2006 (Pearce et al., 2007). These were the largest excavations to take place in the city since the 1970s, covering an area of 5,500 square metres and incorporating areas both inside and outside the Mediaeval city walls (Green, 2009). Although the excavations recovered a large number of animal bones (NSP (Number of SPecimens) = 21,636) their ultimate contribution to the interpretation of the site was little more than to suggest the proportions of various animal species present (4 The Animal Bones from Mediaeval Princesshay, Exeter). The reason for this is that the site consisted largely of pits, unnasociated with any other archaeological features which might help to identify their function (Figure 34). Unfortunately, section drawings of these pits were not available, so emphasis is placed on the textual stratigraphic record.

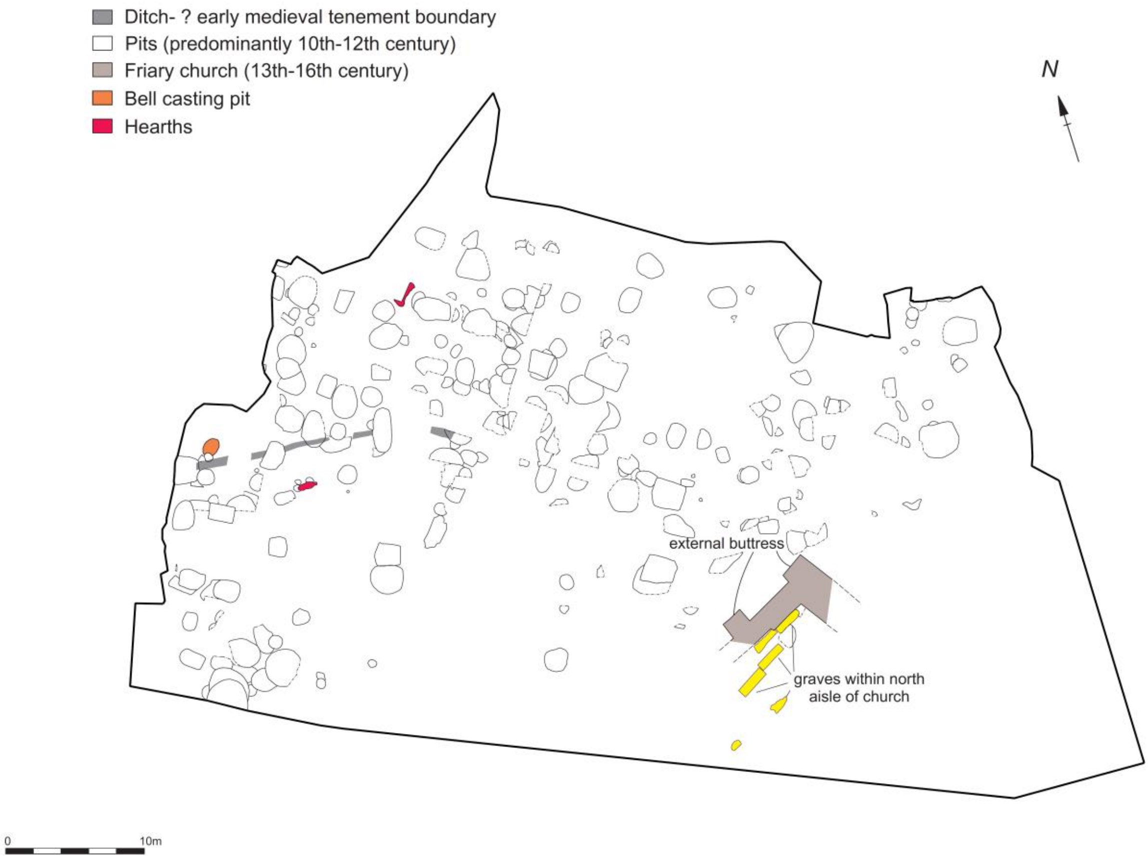

Figure 34: The Mediaeval features from excavation areas inside the city walls (area B/C) (after Pearce et al., 2007, Fig. 5).

This is, then, almost precisely the scenario outlined in 1.4 The Taphonomy of Cities and so is almost tailor-made for the purposes of this exercise. It must be remembered that such a situation is far from unusual in urban zooarchaeology and so the relevance of this study to proving the concept is of more than local significance. Although rich in material, the various pit deposits were poorly stratified and the zooarchaeological record was able to tell us little other than that a lot of domestic cattle (*Bos taurus taurus*) and sheep (*Ovis aries*) were deposited on the site. Taking into account the amount of meat provided by an individual domestic cow when compared to a sheep, it seems reasonable to suggest that, just as in Mediaeval Vác (Bartosiewicz, 1995), cattle formed the greatest component of the diet in the city (4 The Animal Bones from Mediaeval Princesshay, Exeter). For this reason, and for the fact that the material was largely hand-collected and cattle bones are less subject to recovery bias than sheep bones (Payne, 1972), the example will focus on domestic cattle bones.

Two pits were chosen at more or less at random for this exercise: pit number 721 and pit number 2547. No random number generator was used but the pits were selected from a list containing no information other than the pit number. Pit number 721 measured 2m x 1.3m in diameter and had straight sides filled with a single archaeological context. The excavators did not excavate it fully but on the basis of ceramic artefacts it was dated to AD 900-1100, placing it firmly in the Early Mediaeval period. Pit number 2547 measured 2m x 2m in diameter, had straight sides and a flat base and contained seven archaeological contexts (three of which contained animal bone). These contexts were dated on the basis of ceramic artefact typology and were all assigned to AD 1250-1400, making them Late Mediaeval in origin.

5.4.2 Results

Despite their differing chronological origins, the contents of the two pits were broadly similar: pit 721 contained 41 domestic cattle bones and pit 2547 contained 54, and 47 and 60 large mammal ribs and vertebrae, respectively (Table 13). The incidence of gnawing, in both pits, is higher than for the site as a whole (Table 14, cf. 4.2 Results) but is still low enough that it need not be considered a barrier to investigating human-mediated taphonomies using the model. Likewise, the level of preservation is also good (Table 14), with the earlier pit reflecting the exceptionally good preservation of the earlier phase that was typical of the site as a whole (4.2 Results). Two specimens of horse (*Equus ferus caballus*) were found in pit 721 and three in pit 2547 and the possibility must, therefore, exist that some of these large mammal ribs and vertebrae belong to that species and not to domestic cattle but it is considered unlikely that many, if any, of them are. In terms of carcass parts, as defined by the categories utilised here, it can be seen that 'feet' bones and 'skull & feet' bones also follow very similar patterns – 6 & 17 and 7 & 18, respectively. The number of epiphyses present – 8 in pit 721 and 10 in pit 2547 – is in keeping with the small variance in NISP.

Table 13: Descriptions of the two randomly chosen pits and the domestic cattle bones that they contained.

CTX #	AREA	DATE	DIMENSIONS	SHAPE	DEPTH	PROFILE	FUNCTION	COMMENTS
721	B	c. AD 900-1100	2m x 1.3m	oval		straight sides	robber	not bottomed; single context

NISP	Pr. Butch	Sec. Butch	FFI <2	Skull & Feet	Feet	Epihyses	Horncores	LM Ribs	LM Vert
41	46	9	1	17	6	8	0	37	10

CTX #	AREA	DATE	DIMENSIONS	SHAPE	DEPTH	PROFILE	FUNCTION	COMMENTS
2547	B	c. AD 1250-1400	2m-diameter	irregular	1.4m	straight sides, flat base	refuse	

NISP	Pr. Butch	Sec. Butch	FFI <2	Skull & Feet	Feet	Epihyses	Horncores	LM Ribs	LM Vert
54	24	21	7	18	7	10	12	45	15

Table 14: Indices of taphonomic destruction (gnawing and preservation) for the two test pits.

				Preservation				
CTX#	NSP	Gnawed	% Gnawed	% Excellent	% Good	% Moderate	% Bad	% Awful
721	358	12	3.35	6.25	75.00	10.42	6.25	2.08
2547	698	20	2.87	3.59	15.57	71.86	8.98	0.00

The two pits diverge in two of the aspects presented here: in the number of horncores present and in the butchery recorded. The difference in the ratio of specimens showing evidence of primary butchery (46 in pit 721 and 24 in pit 2547) and of secondary butchery (9 in pit 721 and 21 in pit 2547) is highly significant (χ^2 test: 1 degree of freedom, $p<.01$ - $p= 0.002$ and 0.0127, respectively). Note that these figures include specimens with butchery marks recorded among the large mammal ribs and vertebrae – hence why it is possible for there to be more specimens exhibiting signs of primary butchery than the NISP in pit 721. The difference in the presence of specimens with an FFI score less than or equal to 2 is also significant ($p=0.0203$, 1 in pit 721 and 7 in pit 2547). The difference in the presence of horncores is extremely significant – there are none in pit 721 and 12 in pit 2547 ($p=0.0001$).

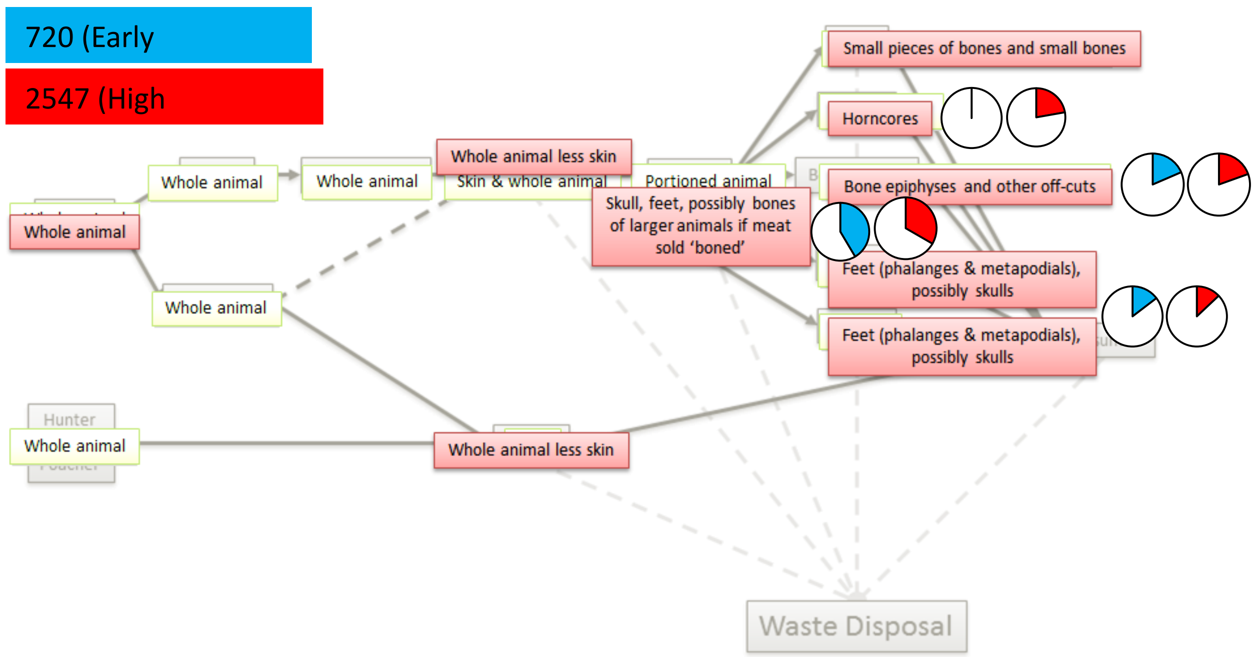

Figure 35: Carcass representation according to the categories shown in Table 13 for the two pits. Each pie chart shows the proportion of material for that category as a share of the total number of *Bos taurus taurus* specimens from the pit.

5.4.3 Discussion

It is fortuitous that the two randomly chosen pits contain a similar number of identified domestic cattle specimens and large mammal ribs and vertebrae – although small assemblages barely worth discussion ordinarily, the fact that they each contain over 80 specimens probably from a single species make them suitable for exploring the model presented here. The simplest way to illustrate the application of this dataset to the model is probably graphically. The broad similarity in the carcass representation patterns is immediately obvious (Figure 35). Just as obvious is the discrepancy in the representation of horncores between the two periods.

If, for arguments sake, we were to take these two pits as being representative of the entire city then we might suggest that the flow of material within it, as far as animal products are concerned, remains largely unchanged from the Early Mediaeval period to the Late Mediaeval. There is a large amount of material that could be categorised as butchery waste, and a smaller amount that could plausibly be associated with tawyers and tanners. Of course these pieces of material are constituent parts of a living animal and so it could be argued that they are not representative of any process and are merely biological waste. Such an argument, however, ignores the fact that the remains are demonstrably from anthropogenic contexts and, therefore, some processing and selection of material must have taken place.

Table 15: The various categories referred to in the model and how their indicators are calculated.

Category	Indicator	Quantification
NISP	Total number of *Bos taurus taurus* specimens identified from the pit.	Raw number.
Primary Butchery	Number of *Bos taurus taurus* specimens with a chop or saw mark.	Expressed as a percentage of the total number of *Bos taurus taurus specimens* identified from the pit (NISP).
Secondary Butchery	Number of *Bos taurus taurus* specimens with a cut mark.	Expressed as a percentage of the total number of *Bos taurus taurus specimens* identified from the pit (NISP).
FFI <2	Number of *Bos taurus taurus* specimens with an FFI value of less than 2 (Outram, 2002).	Expressed as a percentage of the total number of *Bos taurus taurus specimens* identified from the pit (NISP).
Skull & Feet	Number of *Bos taurus taurus* cranial, metapodial and phalanx specimens.	Expressed as a percentage of the total number of *Bos taurus taurus specimens* identified from the pit (NISP).
Feet	Number of *Bos taurus taurus* metapodial and phalanx specimens.	Expressed as a percentage of the total number of *Bos taurus taurus specimens* identified from the pit (NISP).
Epiphyses	Number of *Bos taurus taurus* epiphyses.	Expressed as a percentage of the total number of *Bos taurus taurus specimens* identified from the pit (NISP).
Horncores	Number of *Bos taurus taurus* horncore specimens.	Expressed as a percentage of the total number of *Bos taurus taurus specimens* identified from the pit (NISP).
LM Ribs	Total number of large mammal rib specimens identifies from the pit.	Expressed as a percentage of the total number of *Bos taurus taurus specimens* identified from the pit (NISP). NB - This indicator deals with large mammal and not *Bos taurus taurus* specimens and so may produce a result of greater than 100%.
LM Vert	Total number of large mammal vertebra specimens identified from the pit.	Expressed as a percentage of the total number of *Bos taurus taurus specimens* identified from the pit (NISP). NB - This indicator deals with large mammal and not *Bos taurus taurus* specimens and so may produce a result of greater than 100%.

While discussing the selection of material it is probably apposite to mention that the proportion of epiphyses identified from the two pits is also largely unchanged between the earlier and the later (Figure 36). Once again, however, our eyes are drawn to the discrepancy in the proportion of horncores present (or absent, in the case of the Early Mediaeval pit). Represented graphically (for details of how the indicators are calculated see Table 15), the difference is glaring and it has already been shown to be statistically highly significant. We are, of course, only dealing with one pit and it is possible that these items were disposed of elsewhere in the city. If we maintain the illusion, necessary for this example, however, that each of the pits is a sample of the homogenised debris of the town at the time the pit was open then the absence has to be explained.

It is possible that the domestic cattle extant in Early Mediaeval Exeter were of a polled (hornless) breed. Previous work in the city (Maltby, 1979) and elsewhere in South West Britain (Broderick, 2014) demonstrates the reverse though – that horned cattle were present in the city and the wider region at this time. Having dismissed a biological explanation we can move onto taphonomic and recording bias. It will have been noted in 4.1 (Materials & Methods) that horncores were recorded when a complete circumference was present, not a complete horn or tip. It is possible, therefore, that all 12 specimens were from the same horn originally. Although technically possible, it is highly unlikely that one horn could fracture in such a way as to preserve twelve separate pieces which each have a complete circumference. This bias, then, can be dismissed with recourse to Occam's Razor. All of which leads us back to the model – the material must have been present within the city during both phases and yet was only recovered from one phase.

Examining the absence against the *chaîne opératoire* model suggested here evidences a disruption in the flow of material – the waste product has not been disposed of. One of two possibilities exist which would explain this within the model – firstly, that domestic cattle are not entering the city on the hoof but that dressed carcasses are being traded into the city instead and the horncores do not in fact, contrary to what was just stated, ever enter the city. The presence of other skull parts, including loose teeth, is strongly suggestive of primary butchery taking place within the city though, as has already been indicated. We are left then,

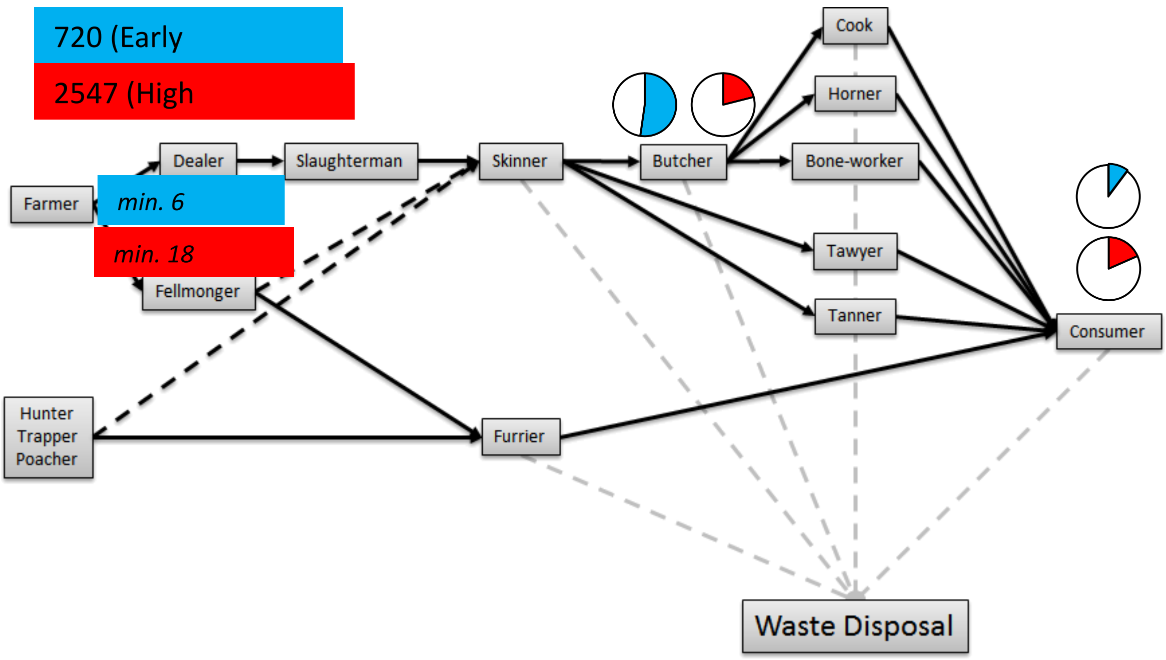

Figure 36: Butchery marks, according to the categories shown in Table 13, and age of the youngest domestic cow for the two pits. Each pie chart shows the proportion of material for that category as a share of the total number of *Bos taurus taurus* specimens from the pit.

with the reverse scenario being the only option left to us – that the horncores are being traded out of the city in the Early Mediaeval period and by the Late Mediaeval period a specialist horn-working trade has been established within the city.

Turning our attention to the evidence for the types of butchery taking place in the city and applying similar arguments and methods we can see further differences in the way in which society was organised to process domestic cattle in the mediaeval city. Just as with the differing numbers of horncores, the higher frequency of primary butchery marks and the lower frequency of secondary butchery marks in the Early Mediaeval Period relative to the Late Mediaeval has been shown to be highly significant.

The primary butchery marks in Figure 36 have, just as with the skull and feet waste product elements in Figure 35, been associated with the butcher. The secondary butchery marks have here been most closely associated with the otherwise invisible 'consumer' on the supposition that knife marks are mostly likely to occur at the table, even if they could in reality occur with varying degrees of likelihood at any stage in the flow of material (3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists). Unlike in the previous figure, the larger portions of the circles cannot be equated easily with more material – there are not more butchered than consumed products –

and we must take care to remember that the difference in proportions represents differences in the flow of material. To put it another way, the differences represent changes in the way in which society is treating the material.

A greater prevalence of chop marks (no saw marks were observed in the assemblage) might suggest less skilled butchery. The difference in the frequency of primary butchery marks between the two phases might also be representative of a change of cooking practice, however, brought about either by cultural preference or by technological advancement. Note that none of these interpretations – less skilled butchery, more advanced cooking technology or cultural expressions are mutually exclusive. That a change in cooking practice might be responsible can be further suggested by the corresponding rise in cut marks in the Late Mediaeval period.

More chop marks, as well as possibly being representative of unskilled butchery, would be a direct cause and effect of smaller chunks of meat, such as those suitable for boiling. These would require little further processing at the table whereas larger pieces, served on the bone, would attract filleting, scraping marks and other cut marks from diners eager to eat their fill. This shift, from small pieces to whole bones is also suggested by the significant rise in the number of specimens exhibiting a low FFI score, suggestive of deliberate marrow extraction, between the Early and Late Mediaeval periods. Marrow extraction is often associated with dietary stress (e.g. Outram, 2003) but it can also be an aspect of cultural preference – one need only look at the differences between Chinese and Western cuisine today. Marrow fat contains many essential vitamins and essential fatty acids and was a valued part of Western diets (including British) until relatively recently. The change from low to high incidences of this indicator need not imply greater dietary stress in Late Mediaeval Exeter compared to Early Mediaeval but could simply be a further expression of the same change in culinary culture. Only whole bones can be broken after cooking to extract the marrow, conversely, chopped pieces of bone cooked in a stew or casserole will naturally release their marrow fat into the meal.

One further change in the material was also noted between the two periods – the youngest domestic cow present in the Early Mediaeval period was a full year younger than the youngest in the Late Mediaeval period. This may represent a change in farming strategy in the wider region (cf. Broderick, 2014) but could equally represent a change in demand from the city – a preference for older meat or a need for specific material. Horns, for example, absent in the Early Mediaeval period, as has already been discussed, are underdeveloped in younger cattle and so horners, if they did begin to work later in the city, would have required material from older animals. Again, the question of supply and demand raises its ugly head in the form of the feted chicken and egg.

5.4.4 Conclusions

This small example has demonstrated that *chaîne opératoire* may provide a useful framework for discussing pre-depositional taphonomies and carcass representation, identifying trends and deviations in the flow of material which reflect the cultural conditions of society at the time the archaeological material was deposited. Importantly, adopting the model has succeeded in achieving one of its key aims – shifting our attention from individuals and groups of individuals (trade groups or social classes) to society as a whole. The change in focus from material to the flow of material enables us to begin to address questions of cultural mores and societal development (e.g. the growth of new trades).

The proof-of-concept exercise outlined here suggested the late development of a specialised horn-working industry in the city and a change in the food culture of the city between the Early and Late Mediaeval periods. Either or both of these changes may have affected the farming strategy in the wider region – and it would be foolhardy to consider a Mediaeval city without considering its region; the former was entirely dependent upon the latter (2 Urban History). Whether these trends were real is, of course, unknown. The arguments made were adopted on the basis of hypothesising that just two randomly chosen pit deposits could be representative of an entire city at two points in a 500 year period. With the concept proven up to this point, that hypothesis can now be dropped. The sample is, of course, far too small to identify any real trends in the city and the next chapter will provide a proper case-study, exploring the material from Princesshay more fully.

6. Case Study

Having demonstrated that it is possible to chart the flow of material through society – and its relevant industrial, craft and gastronomic parts – it is necessary to expand the sample. At the close of the previous chapter it was acknowledged that certain illusions had been maintained for the purposes of clarity in demonstrating the potential of the model. That demonstration focused on just two pits from the Mediaeval layers excavated at Princesshay in Exeter (Table 13) here the sample is expanded to include all of the pits from the same excavations, of which the zooarchaeology of the Mediaeval phases was discussed in 4 The Animal Bones from Mediaeval Princesshay, Exeter.

Once again, the analysis will focus on the *Bos taurus taurus* (domestic cattle) remains. These have been selected for analysis due to their greater size and density when compared to bones from many other species and owing to their great frequency in the assemblage. The greater size of the bones relative to those from other species makes recovery bias less of an issue (Payne, 1972) for the present study. It is quite common for *Bos taurus taurus* to be the most or second most commonly occurring species in zooarchaeological assemblages from Mediaeval British cities (Albarella and Davis, 1996, p. 55) and Princesshay is typical in this regard, with between 28% and 38% of the specimens associated with this species in each Mediaeval phase. The assemblage has been studied and reported elsewhere (Broderick, 2013; 4 The Animal Bones from Mediaeval Princesshay, Exeter) and so only the most relevant information will be repeated here, but a full transcript of the assembled database is included in appendix 3.

It should be noted that similar analytical techniques should be applicable for other species – particularly for other bovids, such as caprines – even if they are excluded from the analysis here. It might be observed though that the bones of smaller species, including caprines, are more likely to make their way to the cook, and thus into the archaeological record, whole (3 A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists), meaning that some adjustment to the emphasis placed on butchery marks may be necessary.

6.1 Methods

Throughout this chapter, unless specifically stated otherwise, NISP refers to *Bos taurus taurus* specimens only and NSP refers to large mammal specimens only. This restricted use is necessary for exploring the full potential of the model in Mediaeval Princesshay, building on the last chapter, and I hope that other zooarchaeologists will forgive me for using the terms in a, for us, unintuitive way. Further details of how this measure relates to the calculation of the other indicators presented is given in Table 15.

A full account of the methods used in identification and recording of the assemblage recovered can be found in Appendix 2 and in 4 The Animal Bones from Mediaeval Princesshay, Exeter. A brief outline of the most significant aspects, as they bear on this chapter will be provided here though.

All bones in the assemblage were identified by comparison with the specimens held in the reference collections at Bournemouth University, the University of Sheffield, the University of York or the private collection belonging to the author. A modified diagnostic zone system was used for recording elements, originally based on that proposed by (Davis, 1992) but expanded to include an increased number of elements and parts of elements, the full details of which can be found in the appendix 2 and in 4 The Animal Bones from Mediaeval Princesshay, Exeter.

Butchery was recorded adapting Maltby (2010, 126-142) and fracture patterns following Outram (2001; 2002). The principal adaptation of Outram's FFI (Fracture Freshness Index) recording system is to apply it to all bones recorded – the original method only proposed its use for long bones. Although this means recording a lot of bones with high (5 or 6) scores on the index and might be supposed to lead to little direct information, it provides an objective means of assessing the nature of breaks in the assemblage as a whole. Maltby's recording system of 2-4 character strings for registering the type (chop, cut or saw), angle and location of butchery mark is elegant and versatile – lending itself to easy use in statistical as well as graphical analysis. The only adaptation made here is to extend the number of codes used to cover those butchery marks not featured in Maltby's original lists (see appendix 2 for a complete list of the codes used).

Standard Deviations are calculated using Microsoft Excel, comparing an index divided by the total number of *Bos taurus taurus* specimens from its pit (giving a standardised ratio for comparison between pits) with the mean of all pits with 25 or more *Bos taurus taurus* specimens. Correspondence analysis was carried out in CANOCO 4.5 (ter Braak, 2006) using the unimodal response model, with symmetrical focus scaling (biplot scaling). Results were plotted using CANODRAW (Šmilauer, 2006).

6.2 Results

A total of 29 pits dated to the Mediaeval period were excavated on the site, of which eight were attributed to the Early Mediaeval period, thirteen to the High Mediaeval and one to the Late Mediaeval (seven more straddled two or more of these periods) through associated ceramics (Table 16). There were also three ditches excavated from this period, all of which were identified as robbing trenches. These features are considered alongside pits here since they ultimately served the same purpose – acting as a receptacle for waste disposal (cf. Broderick, 2012; Evans, 2010). Of these, context 2828 was attributed to the Early Mediaeval period, 5741 was most securely dated, to the mid-late thirteenth century (placing it firmly in the High Mediaeval period) and 2680 was another that straddled multiple periods (in this case being dated to mid-thirteen to late-fifteenth centuries) and so will only be counted as generically Mediaeval. In this way, the sample size is brought up to 32 in total, with usable sub-samples of 9 and 14 dating to the Early and High Mediaeval periods, respectively.

The data relevant to this model for each of these pits and ditches are explored below, presented in a similar manner as the pilot study presented in the last chapter. For ease of understanding, these will be grouped with the generally Mediaeval and Late Mediaeval features being presented first, grouped together, then the Early and High Mediaeval features. Due to the prior analysis of the material (4 The Animal Bones from Mediaeval Princesshay, Exeter) we can be relatively certain that destructive taphonomic processes have played little role in the creation of the assemblage and the material is, thus, suitable for investigation using the model.

CTX #	AREA	PERIOD	DATE	DIMENSIONS	SHAPE	DEPTH	PROFILE	FUNCTION	COMMENTS
721	B	Early Med	C10-11	2m x 1.3m	oval		straight sides	robber	not bottomed
889	B	Early Med	C10-11	1.8m x 1m	sub-rectangular	2m	straight sides	unknown	timber lined?
1614	B	Early Med	C10-11	1.3m x 0.9m	oval	1.1m	straight sides, flat base	cess pit	
2741	B	Early Med	C10-11	2m x 1.6m	irregular top	1.9m	straight sides, irregular base	cess pit	square base, burnt timbers, lined?
3803	B	Early Med	C10-11	1.86m x 1.47m	sub-rectangular	1.85m	straight sides	cess pit	tapered upper edges
4944	C	Early Med	C10-11	1.6m-diameter	sub-circular	1.75m	straight sides	storage pit	not bottomed, may be cess pit?
733	B	Early Med	C10-12	1m-diameter	circular		straight sides	cess pit	not bottomed
1937	B	Early Med	C10-12	1.8m x 1.3m	sub-rectangular	2.2m	straight sides, flat base	refuse	
4922	C	High Med	C10-13	2.9m x 2.5m	sub-square	2.22m	straight sides, flat base	storage pit	square in base of pit
2547	B	High Med	C10-15	2m-diameter	irregular	1.4m	straight sides, flat base	refuse	
831	B	High Med	C11-12	2.1m-diameter	circular	1.4m	straight sides, concave base	clay extraction	
1742	B	High Med	C11-12	3.8m x 2.8m	irregular	1m	straight sides, flat base	robber	
1835	B	High Med	C11-12	2.2m x 1.9m	irregular		irregular sides, flat base	cess pit	irregular top but rectangular base
1859	B	High Med	C11-13	1.6m-diameter	circular		straight sides	well	not bottomed
2693	B	High Med	C11-13	3.2m x 1.3m	oval	1.9m	sloping sides, concave base	cess pit	sloping sides?
821	B	High Med	C11-14	2.4m-diameter	sub-circular	1.6m	straight sides, flat base	refuse	
2658	B	High Med	C12-13	1.6m x 1.3m	sub-rectangular		straight sides	refuse	not bottomed
4893	C	High Med	C12-13	2.4m x 2.0m	sub-rectangular	0.6m	steep sides, flat base	cess pit	
1883	B	High Med	C13	1.4m x 0.8m	sub-rectangular	1m	straight sides, flat base	refuse	
6699	C	High Med	C13	2.4m x 2m	sub-circular	1.6m	concave sides and base	refuse	
3525	F	High Med	C13-14	2.5m-squared	sub-square	1.2m	concave sides and base	unknown	
961	B	Mediaeva	C13-15	1m-diameter	circular		vertical circular shaft	well	not bottomed
1873	B	Mediaeva	C13-15	1.3m-diameter	circular	1.3m	concave sides and base	cess pit	
2680	B	Mediaeva	C13-15		amorphous cut			robber?	no section recorded
3531	F	Mediaeva	C13-15	2.7m x 2.4m	sub-circular	0.8m	steep sides, flat base		not bottomed
682	B	Mediaeva	C14-15	1.9m-diameter	sub-circular	3m	v-shaped	cess pit	
781	B	Mediaeva	C14-15	1.7m-squared	square	1.5m	steep sides, concave base	storage pit	
1687	B	Mediaeva	Med	2.2m x 1.5m	sub-circular		straight sides	cess pit	not bottomed
4745	C	Late Med	C16	4m x 2m	sub-rectangular	0.4m	concave sides and base	refuse	

Table 16: The selected pits and their contextual information.

6.2.1 Site-wide Patterns

Before analysing the individual pits, it may be worthwhile investigating whether or not the broad trends suggested by the two pits, in the previous chapter, can be sustained at the site-wide level. Although the model is designed for aiding interpretation of pit assemblages it is, after all, predicated on the idea that pits are essentially heterogeneous and it is this same heterogeneity that has encouraged zooarchaeologists to frequently aggregate contexts when analysing assemblages (*cf.* 0.

For DORIS BRODERICK,

Who taught me that books were my best friends.

For JULIE JOHN,

Who always loved archaeology.

For NIGEL, PAULA and RON BRODERICK,

Who encouraged a love of animals and the natural world, taught me to always ask ‘why?’, to work hard and to follow my dreams.

Also for GEOFF WHALEY,

Who always believed in me and who passed away whilst this project was being pursued.

Declaration

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for an award at this, or any other, University. All sources are acknowledged as References.

Introduction). It should, therefore, be applicable to whole assemblages, although the value of it may be diminished. Exploring this idea here enables us to both lay down a marker for comparing individual pits from a phase and test whether there is any value in employing the model at this level of analysis.

The pits can be grouped into four ‘phases’ – the three phases discussed in 4. The Animal Bones from Mediaeval Princesshay, Exeter and also a ‘Medieval phase’ for all of those pits which could not be dated more precisely. This gives us three substantial assemblages and one smaller one (Table 17).

Table 17: The domestic cattle bone totals from the Mediaeval pits and ditches at Princesshay, following the layout provided in 5 Building a New Model, aggregated by phase.

CONTEXT	NISP	Pr. Butch	Sec. Butch	FFI ≤2	Skull & Feet	Feet	Epiphyses	Horncores	LM Ribs	LM Vert
EM	307	132	37	28	187	70	94	11	187	98
HM	424	130	54	41	240	125	173	21	189	60
LM	41	15	0	2	17	9	15	3	15	5
M	200	55	32	17	124	33	82	5	96	39

Building individual pie-charts for each category and overlaying them on the model is a very clear way of expressing the flow of material and visually ensuring that our attention remains focused on that aspect. It is not, however, practical to do so when considering many contexts together. Converting the figures to a percentage of the total number of *Bos taurus taurus* specimens and plotting them on a bar chart provides an easy tool with which we can see relative differences, in each of the categories, between the phases.

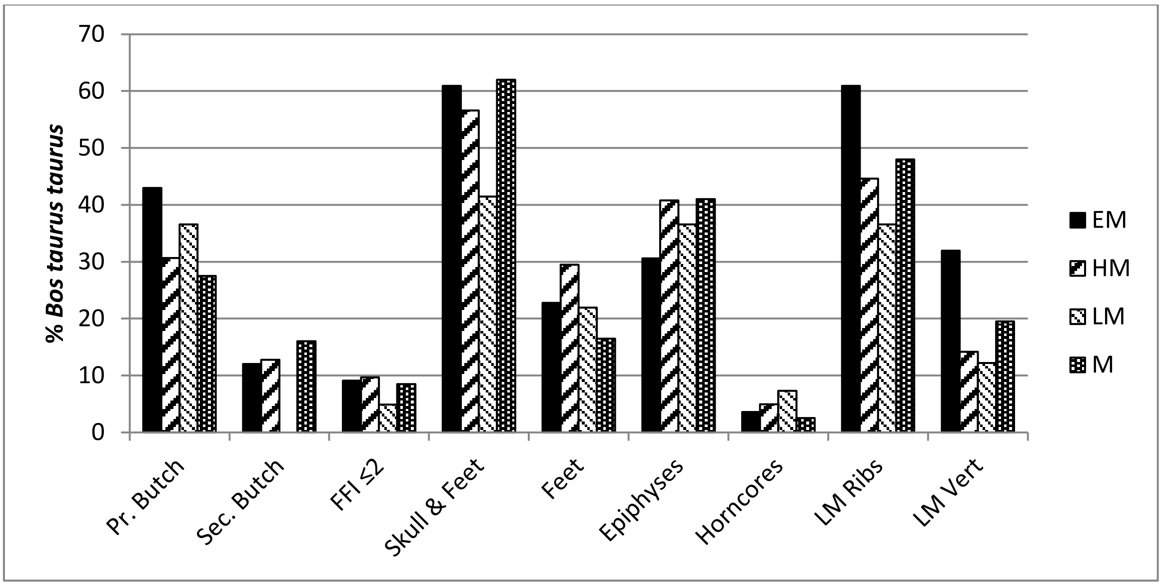

Figure 37: Incidence of the various categories prescribed by the model expressed as a percentage of *Bos taurus taurus* specimens for the Mediaeval pits and ditches, aggregated by phase.

The most striking observation of this data when visualised in this way is the similarity of the various phases – for the most part, each phase plots within *c*.10% of the other phases in each of the categories. This would suggest that there is little change in the way that society is interacting with animal material though the centuries that this material represents. It also, however, suggests a degree of site-averaging, which is to be expected – that is that when aggregated in this way, the material reflects all of the activities being carried out in its catchment area (the neighbouring city). As such, we should expect all activities (domestic refuse and industrial or craft waste) to be reflected in each phase. This may suggest that there is little value in employing the model at the site level, as suggested above.

There are, however, some differences greater than 10% which could represent broader trends in the city. The first of these is a lower proportion of skull & feet specimens in the Late Medieval phase. In fact, this phase is relatively low in several of the indices (excepting horncores, where it is highest and primary butchery, where it is second highest) and has no secondary butchery marks at all. The latter, in particular, may indicate a lack of domestic refuse. This seems unlikely for an entire city and we are forced to recognise that this 'phase' is, in reality, a single pit. This is explored more fully in the next section.

The other differences relate to the Early Mediaeval phase. This phase sees differences in proportion of greater than 10% in both Large Mammal vertebrae and Large Mammal ribs. This could indicate a greater proportion of domestic waste than in the successive phases. The phase also has the largest number of primary butchery marks, however, and taken together this probably reflects stews and pot-size chunks of meat being more common in the Early Mediaeval phase than in later periods (something which was also suggested in the more traditional analysis in 4 The Animal Bones from Mediaeval Princesshay, Exeter).

Recognising that bar charts are only one way to explore data and that the scope of the human eye is limited, the Princesshay pit data was also explored using Correspondence Analysis (CA). Using CA, it is possible to see variation in the frequency of the various indices used in the model *en masse*. CA is an ordination technique that arranges cases (here the individual contexts from the pits and ditches) along axes, on the basis of a number of variables (in this instance the raw counts from the indices) (for a more complete explanation see Lange, 1990, p. 43; Shennan, 1988). In this analysis (Figure 38), axis 1 is plotted horizontally against axis 2, vertical. These two axes account for the greatest variation in the data as calculated by the software package. Graphically correspondence analysis positions each of the 'contexts' relative to all other 'contexts' and to all other 'indices counts' and *vice versa* (Lange, 1990). The plot origin is considered its neutral 'centre of gravity'. Positive or negative associations between the pits and indices, represented by points, is shown by their divergence and the direction or angle at which they plot from the origin. Points that diverge in opposite directions indicate a negative association. The distance from the origin gives a measure of the 'degree' of divergence – that is how 'unusual' a sample is (Lange, 1990; ter Braak and Šmilauer, 2002). In Figure 38B, the individual points representing the pit contexts were coded by the assigned archaeological period.

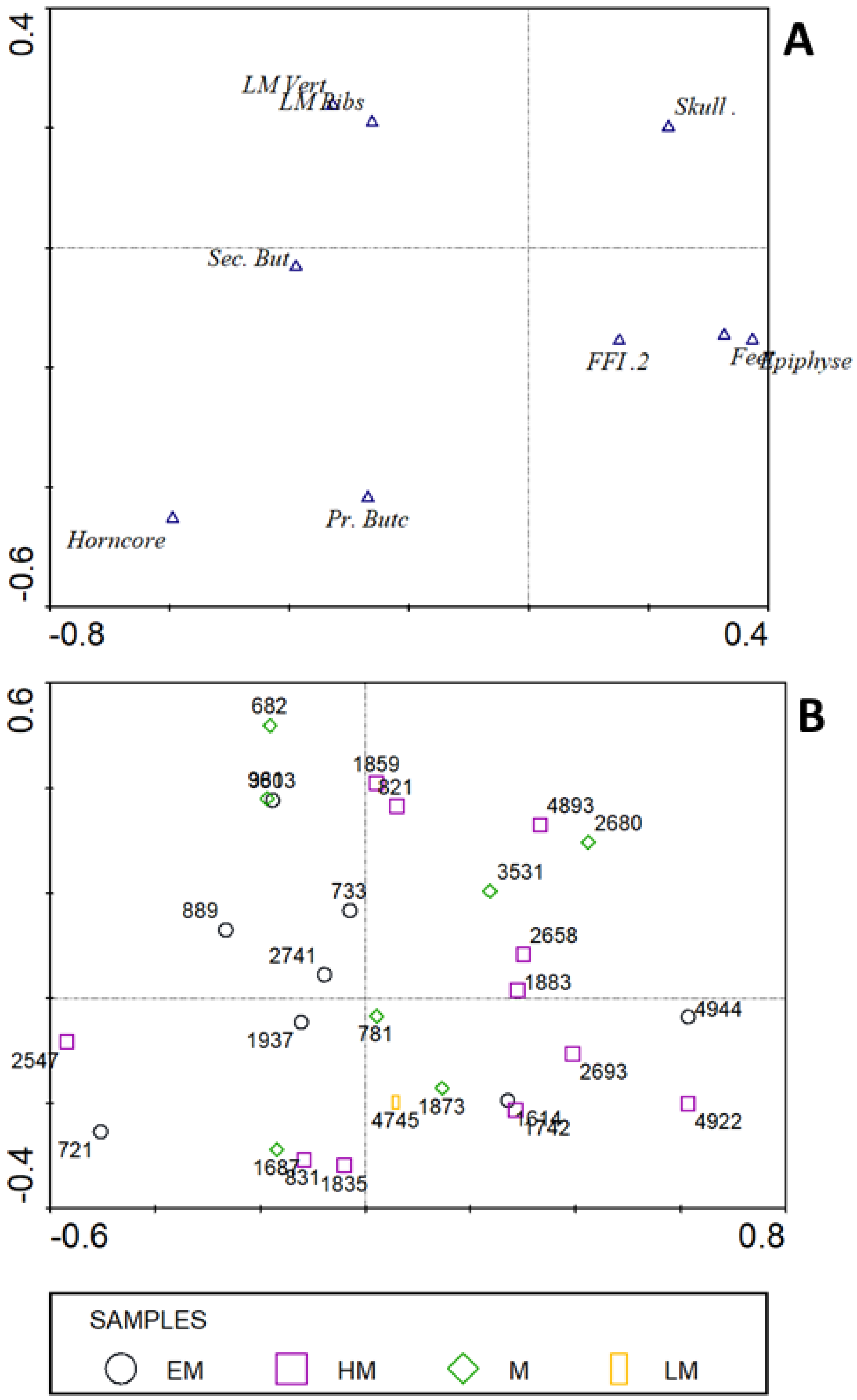

Figure 38: Correspondence analysis (axis 1 against axis 2) of Princesshay pits with ≥10 *Bos taurus taurus* specimens: A) plot of the indices scores, B) plot of pits coded by period grouping (Early Mediaeval, High Mediaeval, Medieval, Late Mediaeval)

In order to be effective, CA depends upon having sufficiently large datasets, therefore, in order to increase the number of contexts available, all pit contexts with a *Bos taurus taurus* NISP of 10 or greater were used in the analysis. Despite this lower threshold, there is no strong clustering in the contexts or indices categories towards the origin, suggesting that strong outliers (even those samples with low NSP) are not overly affecting the analysis. It was thus decided that it was reasonable to continue with the expanded larger data set in this instance.

It is noticeable that most of the Early Mediaeval pits plot to the left (negative) of the vertical axis, most strongly associated with the Large Mammal rib and vertebra nodes. The pattern thus fits with what we already observed above when discussing Figure 37, primary butchery also plots to the left of the vertical axis and so, as indicated previously, we can suggest that stews and pot-size chunks of meat were more common in the Early Mediaeval phase than in later periods. The grouping of these various nodes calls for greater discussion and it forces us to remember that the categories are not mutually exclusive. Foot elements, for example, will include epiphyses. These bones are less likely to be butchered and broken (5.3 Integrating the Model) so it may be supposed that most foot elements will also be counted in the epiphyses index as well as the skull and feet index. The close correspondence between them is, thus hardly surprising.

The association between Large Mammal ribs and vertebrae is also easily explained - firstly because they are not, strictly, *Bos taurus taurus* bones and so could be argued to form a separate data category and secondly because they are both indicators of the same thing – domestic waste. Horncores and primary butchery are the indicators most clearly separated from the others. We have already seen that horncores were rare in the assemblage, which would explain why they are (mathematically) pushed to the edge of the chart. The pits that plot into this area include several that include horncores but the common factor is that they all have a high *Bos taurus taurus* NISP. Thus it is sample size that is pulling them into this area (more specimens corresponding with more primary butchery).

To be truly useful, as already mentioned, correspondence analysis needs appropriately large data sets. We may wonder whether the pits assemblages are either numerous or large enough to qualify. The analysis is also hampered, not only by the non-exclusivity of some indices but by the requirement for specialist software and the difficulty in understanding – the presence of pit (721), which has no horncores, being most closely associated with the horncore node being a case in point (it is a larger sample and, as already noted, the larger samples tend to be in this area of the graph). These latter points mean that the approach would only be of limited use to zooarchaeologists – its uptake would be limited by the need to invest in specialist software and by difficulty of use. Furthermore, it has not added substantively to the discussion over the earlier way of exploring the data. Individual pits are difficult to interpret and the period trends mirror those that we have already identified – themselves identified previously, through standard analysis (4 The Animal Bones from Mediaeval Princesshay, Exeter).

If the value in employing the model at a site-wide level is questionable, then, we have at least identified broad trends with which we can compare the individual pits from those phases.

6.2.2 The Mediaeval Features

The broadly 'Mediaeval' pits, perhaps unsurprisingly, contained a broad range of NSP (large mammal fragments and *Bos taurus taurus* specimens only), from just 24 (the storage pit 781) to 77 (the cess pit (682)). Even this larger figure is smaller than either of the two pits used in the pilot study in the previous chapter. Since those were randomly chosen, it may be that those were both outliers in terms of the volume of material they contained. Alternatively, it may be that the less securely dated deposits are less securely dated due to having less material in general rather than fewer cattle bones specifically. A comparison with the ceramic record should shed some light on this but it is possible to suggest immediately that certain types of pits yield more material than others – it should come as no surprise that the five features featuring the largest NSP include the three cess pits in the sample and the only refuse pit. The fifth of these pits, context (3531), contains the highest NISP (Table 18) and the excavators recorded it as having an unknown function.

Much has been made in building this model of the fact that a hole in the ground will be treated much the same at the end of its life regardless of its original purpose – as a convenient receptacle for waste. These figures suggest that such differences should not be taken too lightly, however, and archaeologists will hardly be surprised to see more waste material being present in refuse and cess pits than in a storage pit. Since it is assumed here that all pits essentially end up as refuse pits, however, a more nuanced investigation may be helpful and that is one area in which this model may help shed some light. It is clear that pit (3531) has a higher cattle NISP than the other pits in this sample but are they originating primarily from domestic refuse or is the waste deposited in this pit of principally industrial origin?

CONTEXT	NISP	Pr. Butch	Sec. Butch	FFI ≤2	Skull & Feet	Feet	Epiphyses	Horncores	LM Ribs	LM Vert
961	12	1	4	2	8	3	6	0	16	6
1873	32	16	4	6	20	9	23	1	21	2
2680	23	2	1	1	18	2	7	0	7	0
3531	53	5	8	3	33	6	19	0	14	7
682	34	4	4	0	22	2	4	0	24	6
781	17	5	1	0	9	2	5	1	3	4
1687	29	22	10	5	14	9	18	3	11	14
CONTEXT	NISP	Pr. Butch	Sec. Butch	FFI ≤2	Skull & Feet	Feet	Epiphyses	Horncores	LM Ribs	LM Vert
4745	41	15	0	2	17	9	15	3	15	5

Table 18: The domestic cattle bones from the pan-Mediaeval pits and ditches at Princesshay (and the Late Mediaeval feature - context 4745), following the layout provided in 5 Building a New Model.

Converting the raw figures to a percentage of the *Bos taurus taurus* NISP (note that this means that a figure of greater than 100% is possible for large mammal fragments, where they are more common than *Bos taurus taurus* specimens, as is the case for pit (961) here) and plotting them out on a bar chart, a few contexts immediately leap out as being unusual. Pit (961) has very high indexes of secondary butchery marks relative to the other contexts, as well as high proportions of ribs, vertebrae, epiphyses and skull and feet elements (Figure 39). If the purpose of a model is to identify outliers, as I have argued, then this is clearly that. It could very well be that the pit contained a large amount of kitchen waste – particularly those pot-size chunks of flesh described in an earlier chapter (4 The Animal Bones from Mediaeval Princesshay, Exeter) as being possibly typical of the Early Mediaeval phase and it is therefore primarily a feature which tells us about the culinary and domestic arrangements of Exeter – a peek behind the twitching curtains of Mediaeval life. The high proportion of skull elements, in particular, might give us pause to wonder about this though. Although cattle skulls may have found their way to domestic kitchens in the Mediaeval period it is too early to make such a fundamental break with the model (and, in any case, evidence from Early Modern Oxford would suggest that this is unlikely for adult *Bos taurus taurus* (Wilson, 1996, p. 61)). A far simpler reason for the high indices in this feature may be the sample size. It is much easier to arrive at a value of greater than 50% when 'per cent' is in reality a euphemism for 'out of twelve'.

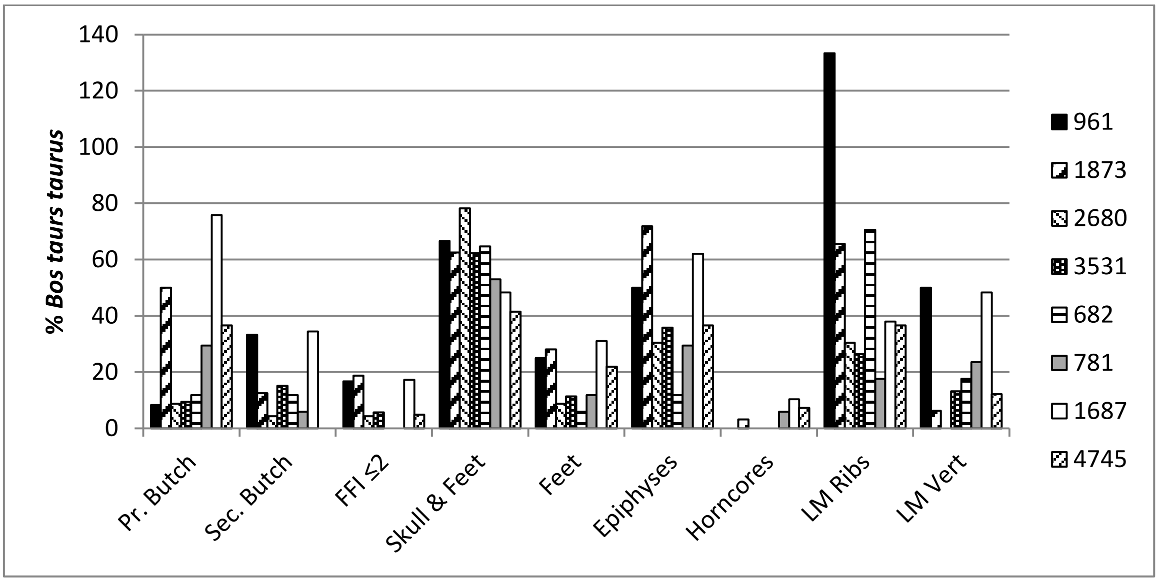

Figure 39: Incidence of the various categories prescribed by the model expressed as a percentage of *Bos taurus taurus* specimens for each pan Mediaeval pit and ditch (and Late Mediaeval pit 4745).

Such inflationary figures do not entirely invalidate the model – firstly because the domestic waste interpretation is the simplest one according to the model, and therefore the most likely, and secondly because by drawing our attention to the context the model has served its purpose. Nevertheless, it seems a prudent idea to disregard any features with fewer than twenty five specimens of *Bos taurus taurus*.

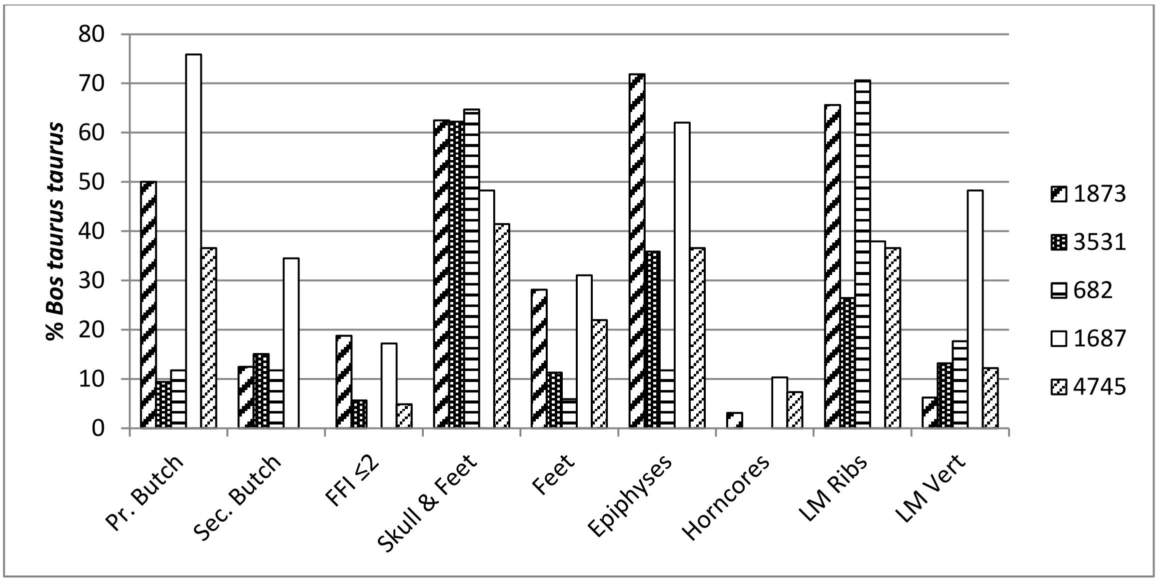

Figure 40: Incidence of the various categories prescribed by the model expressed as a percentage of *Bos taurus taurus* specimens for each pan Mediaeval pit and ditch with a NISP of twenty five or over (and Late Mediaeval pit 4745).

Restricting our view to these features, other anomalies come into sharper focus. The first point to note is that all of the features have proportions of head & feet elements between 41% and 65 %, with the two lower values – 48.3% (1687) and 41.5% (4745) being the most exceptional to the norm. Comparing this index to the mean of the pits with 25 or more *Bos taurus taurus* specimens in the assemblage, we can see that all of the values are within 1 SD (Standard Deviation) (0.16), confirming that they are all rather similar (Table 19). To a large extent, this may reflect the durability and movability of loose teeth. As small objects that are far less susceptible to destructive taphonomies, they may remain loose, and unnoticed, on a surface without attracting the same instinct to be tidied away as larger, more organic bones (and therefore noxious). This could mean that they get incorporated into pits at a later date. It could also mean that they are more likely to be redeposited (cf. Albarella, 2016; Rainsford and O'Connor, 2016) as well as outlast other elements of a similar age, something more commonly considered by zooarchaeologists (e.g. Phoca-Cosmetatou, 2005).

Table 19: Proportions of each category (index count divided by *Bos taurus taurus* specimens), mean of all pits > 25 *Bos taurus taurus* specimens and standard deviations therefrom. Individual indices for each pit that deviate by one or more standard deviations highlighted.

PERIOD	CONTEXT	*Bos taurus taurus* NISP	Pr. Butch (counts/ NISP)	Sec. Butch (counts/ NISP)	FFI ≤2 (counts/ NISP)	Skull & Feet (counts/ NISP)	Feet (counts/ NISP)	Epiphyses (counts/ NISP)	Horncores (counts/ NISP)	LM Ribs (counts/ NISP)	LM Vert (counts/ NISP)
EM	721	41	1.12	0.22	0.02	0.41	0.15	0.17	0.00	0.90	0.24
EM	889	42	0.36	0.14	0.05	0.55	0.12	0.21	0.05	0.31	0.55
EM	1937	45	0.67	0.13	0.11	0.87	0.38	0.29	0.09	0.58	0.44
EM	2741	49	0.24	0.06	0.08	0.49	0.18	0.22	0.08	0.43	0.20
EM	3803	57	0.28	0.11	0.07	0.82	0.21	0.19	0.00	0.96	0.42
EM	4944	25	0.12	0.08	0.04	0.72	0.36	0.68	0.00	0.16	0.08
HM	831	28	0.68	0.18	0.14	0.54	0.39	0.39	0.14	0.57	0.14
HM	1742	52	0.38	0.13	0.10	0.62	0.50	0.75	0.06	0.46	0.08
HM	1835	40	0.53	0.13	0.03	0.25	0.20	0.50	0.00	0.45	0.10
HM	1859	27	0.04	0.19	0.00	0.67	0.26	0.26	0.00	0.59	0.26
HM	1883	62	0.31	0.05	0.08	0.77	0.37	0.42	0.00	0.29	0.23
HM	2547	54	0.44	0.39	0.13	0.33	0.13	0.19	0.22	0.83	0.28
HM	2693	56	0.16	0.04	0.20	0.52	0.25	0.41	0.04	0.18	0.11
HM	4922	30	0.23	0.03	0.03	0.60	0.30	0.37	0.00	0.03	0.00
M	682	34	0.12	0.12	0.00	0.65	0.06	0.12	0.00	0.71	0.18
M	1687	29	0.76	0.34	0.17	0.48	0.31	0.62	0.10	0.38	0.48
M	1873	32	0.50	0.13	0.19	0.63	0.28	0.72	0.03	0.66	0.06
M	3531	53	0.09	0.15	0.06	0.62	0.11	0.36	0.00	0.26	0.13
LM	4745	41	0.37	0.00	0.05	0.41	0.22	0.37	0.07	0.37	0.12
Mean (all contexts >25 NISP)			0.39	0.15	0.08	0.59	0.25	0.38	0.05	0.49	0.22
Standard Deviation (σ)			0.28	0.10	0.06	0.16	0.12	0.20	0.06	0.26	0.16
>1σ			0.67	0.24	0.15	0.75	0.37	0.58	0.11	0.75	0.38
>2σ			0.95	0.34	0.21	0.91	0.49	0.78	0.17	1.01	0.54
<-1σ			0.11	0.05	0.02	0.42	0.13	0.18	<0	0.22	0.06

The presence of skull elements in the assemblage was of importance to the model for identifying butchery. Taken together with assumed primary butchery marks it might build a stronger case than it does on its own at present – likewise the difference between skull & feet and feet elements (i.e. just skull elements) might be more important than the model currently allows for. Turning our attention to these combinations of variables then, in a sense similar to the graphical overlays provided in (5.4 Testing the Model), certain patterns do begin to emerge. Pits (1873) and (1687) both have very high levels of primary butchery as well as large proportions of feet elements. In fact, both pits have high levels of each indicator, compared with the others, with notable exceptions that may help to distinguish them. Pit (1873) is especially low in large mammal vertebrae (an index for which it is lower than 1 SD (0.06) from the mean of all pits (Table 19)), as well as having ordinary levels of secondary butchery. This might suggest that more than the normal amount of material is coming from trade contexts, as opposed to domestic ones. Pit (1687), meanwhile, has a highly elevated level of vertebrae, as well as a high level of secondary butchery, but a more normal proportion of ribs. In fact, all of these indices in pit (1687) – primary butchery (0.76), secondary butchery (0.34) and large mammal vertebrae (0.48) are greater than 1 SD (0.67, 0.24, 0.38) from the mean of all pits, with secondary butchery being greater than 2 SD (0.34) from the mean of all pits (Table 19). This might indicate that more of the content of this pit is derived from domestic contexts.

Note that in each case the phrase ‘more of’ is used. These are not black and white cases. The heterogeneity of pit contexts is, after all, an explicitly acknowledged factor that this model is seeking to explore. It is also worth remembering, however, that these contexts are from less precisely dated features and so might be pre-supposed to contain material from a greater number of sources than more precisely dated deposits in any case.

Pit (4745), the only Late Mediaeval pit from the study, thus takes on greater significance. It does differ from the others in a couple of ways that are not immediately obvious but which might nevertheless be important. First of all, it contains a relatively high proportion of primary butchery marks (though within the normal range (Table 19)). It also contains relatively low proportions of ribs and vertebrae (both within the normal range (Table 19)), as well as a complete absence of secondary butchery marks (outside 1 SD (0.05) (Table 19)). Finally, despite being one of just three contexts to contain horncores, it contains the highest ratio of feet to skull and feet elements (although both indices are, again, in the normal range (Table 19)). According to a 'best fit' method of applying the model, this might be the most safely interpreted trade derived feature of all, fitting well with the waste we'd expect to be produced by a tanner, with some overlap with a horner as well. Interpreted at the time as a refuse pit, we can now suggest that this may have been a pit employed for a very specific kind of refuse, and therefore potentially planned by a specific part of Mediaeval Exeter's inhabitants.

The features from this largely poorly dated collection thus serve to further validate the model whilst also providing a base line with which to compare the more precisely dated features. This is an important part in employing a model if deviations are to be observed and one for which the Late Mediaeval refuse pit (4745) suggests might be worth the effort, even if more statistically robust samples would be helpful.

6.2.3 The Early Mediaeval Features

The pits from the Early Mediaeval phase have a higher NISP value than those from the pan-Mediaeval phases, suggesting one reason why they might be more precisely dated – the more material that ends up in them the more likely they are to provide a secure date through ceramic seriation. It helps to shed some light onto the question asked at the beginning of 6.2.2 (The Mediaeval Features) – whether the randomly chosen pits used in the proof of concept presented in 5.4 (Testing the Model) were unusually large pits or whether they just had less material. Whether or not that is related to them being less securely dated, the case can be seen that the more precisely dated features do generally contain more material (although ditch (2828) is an exception, with just 11 combined large mammal fragments and *Bos taurus taurus* specimens).

CONTEXT	NISP	Pr. Butch	Sec. Butch	FFI ≤2	Skull & Feet	Feet	Epiphyses	Horncores	LM Ribs	LM Vert
721	41	46	9	1	17	6	7	0	37	10
889	42	15	6	2	23	5	9	2	13	23
1614	18	5	2	4	8	5	7	0	6	0
2741	49	12	3	4	24	9	11	4	21	10
3803	57	16	6	4	47	12	11	0	55	24
4944	25	3	2	1	18	9	17	0	4	2
733	24	3	1	6	8	5	16	1	24	9
1937	45	30	6	5	39	17	13	4	26	20
2828	6	2	2	1	3	2	3	0	1	0

Table 20: The domestic cattle bones from the Early Mediaeval pits and ditches at Princesshay, following the layout provided in 5 Building a New Model.

In some respects, the features from the Early Mediaeval phase appear to be more diverse. Translating these into a bar graph showing proportion of NISP once more (whilst emphasising again that the NISP should be seen as a standard value, since plainly percentage values greater than 100 cannot normally exist and neither the large mammal ribs, nor the large mammal vertebrae are included in the NISP values but any butchery marks present on them are counted) throws up some interesting differences between the features in terms of their contents. One of those that stands out is pit (733), with a very high ratio of large mammal ribs to *Bos taurus taurus* specimens (Figure 41). With a NISP of just 24 though, it would miss the cut carried out in the previous section and it would seem wise to perform the same operation here, in order to minimise problems caused by small sample sizes, even if the other indices associated with the feature appear fairly normal.

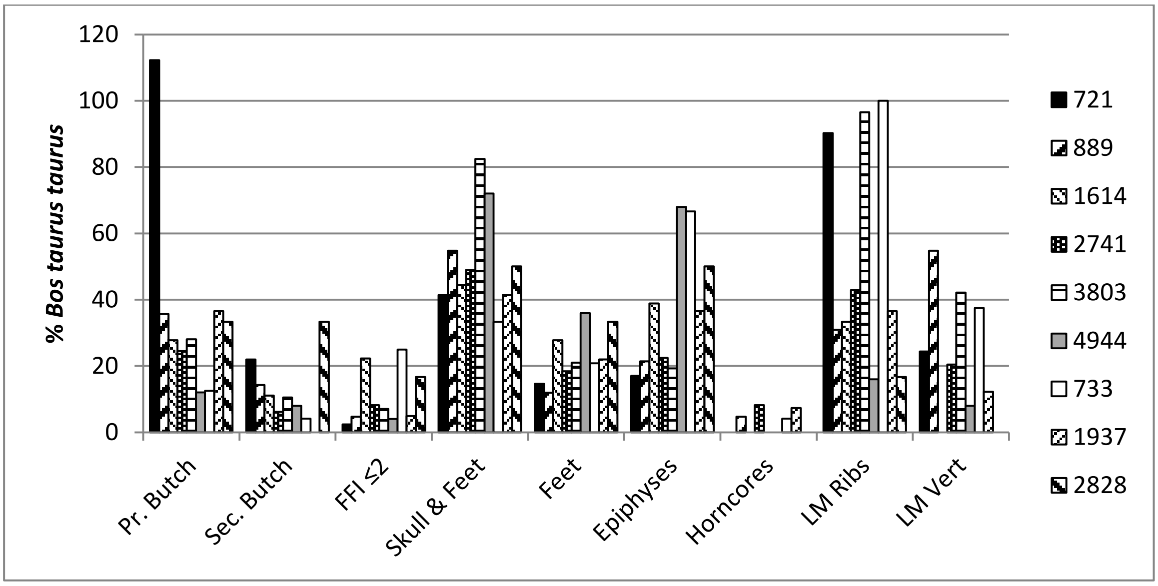

Figure 41: Incidence of the various categories prescribed by the model expressed as a percentage of *Bos taurus taurus* specimens for each Early Mediaeval pit and ditch.

Unlike the less precisely dated contexts, when only one feature came close to the cut-off point, the split here was more capricious. Although the low numbers attached to ditch

(2828) have already been mentioned, just as has the fact that pit (733), with a NISP of 24 is just under the cut-off point, it is also worth mentioning that pit (4944), with a NISP of 25, is just the other side of this somewhat arbitrary line. This seems especially uninformed when it is considered that the next lowest NISP for the phase is 41 (pits (721) and (1937)) but the decision was made in the previous section based on usable sample sizes and not on which contexts should be left in or out of the analysis.

With this in mind as a small caveat, it can be seen that (4944) does stand apart as a somewhat unusual feature assemblage (Figure 42). With the smaller assemblages removed, it can be seen that it contains far more epiphyses, proportionally, than other features (greater than 1 SD (0.58) from the mean (Table 19)), as well as a far greater ratio of skull and feet elements to NISP (although within the normal range (0.42 -0.75)). With a very small ratio of butchery marks to NISP, and of ribs (greater than 1 SD (0.26) from the mean (Table 19)) and vertebrae, the assemblage stands out as one that could be derived from bone-workers waste (bone ends) as well as from other trades such as butchery and tanning.

At the other end of the spectrum from (4944) is pit (721) which has a very high index of primary butchery marks (1.12) (greater than 2 SD (0.95) from the mean of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)) and ribs (greater than 1 SD (0.26) from the mean (Table 19)), as well as the highest ratio of secondary butchery marks. Since previous analysis of this phase of the assemblage indicated that 'pot-sized' pieces of meat may have been a feature of the gastronomic culture of the city at this time (4 The Animal Bones from Mediaeval Princesshay, Exeter and 6.2.1 Site-wide Patterns) and many of these 'primary butchery' marks recorded here are probably chop marks on ribs, we can probably assume that much of the material in this pit is coming by way of the kitchen. Considering the comparatively low ratios of skull and feet elements, as well as epiphyses and the absence of horncores, further supports this interpretation and represents a flow of the material from butcher to cook before deposition. Pit (3803) comes closest to matching this pattern but has much higher ratios of vertebrae (0.42) and, more importantly, of skull and feet elements (0.82) (both indices, along with ribs (0.96), are greater than 1 SD (0.38, 0.75, 0.75) from the mean of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)) – with a particular weighting to skull elements. This may represent some of the waste coming directly from the butcher but, alternatively, it may be another artefact of the 'loose tooth phenomenon' sketched in the last section (6.2.2 The Mediaeval Features).

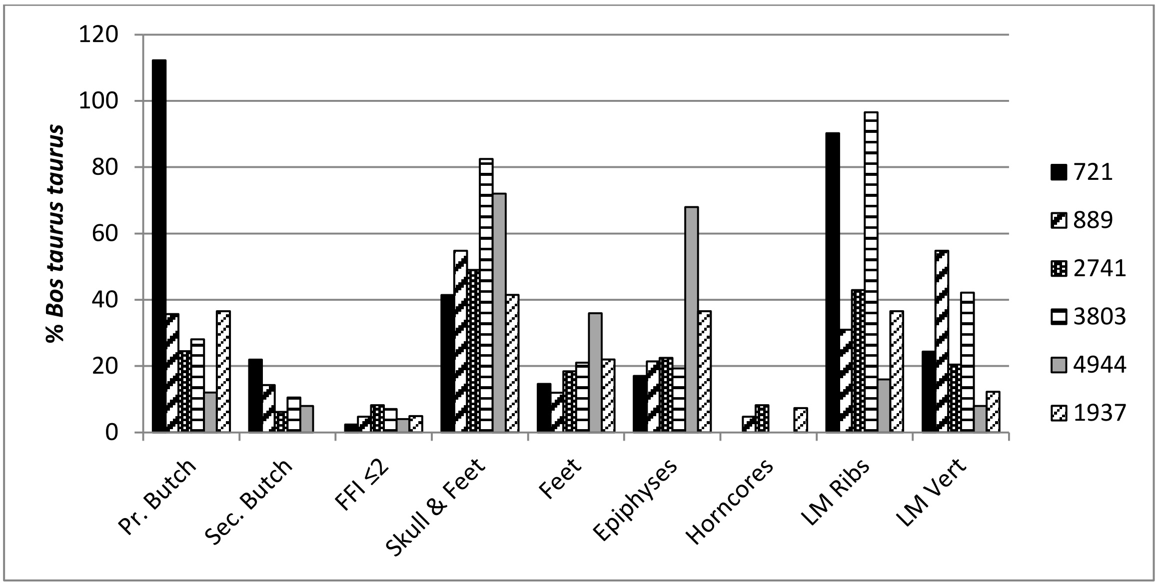

Figure 42: Incidence of the various categories prescribed by the model expressed as a percentage of *Bos taurus taurus* specimens for each Early Mediaeval pit and ditch with a NISP of twenty five or over.

Pits (889), (2741) and (1937) exhibit ratios consistently close to those typical for each category (although (889) is actually the highest in Large Mammal Vertebrae (0.55), a category in which it is greater than 2 SD (0.54) from the mean of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)) and so can best be seen as deriving equally from a number of different points around the city as the flow of material splits and then converges once again on a final point of rest – the place of deposition that ultimately forms the archaeologist's context. In point of fact, these 'typical' values for the Early Mediaeval phase are lower than the pan-Mediaeval values for epiphyses. Considering that preservation was indicated to be particularly good in this phase by the earlier study (4 The Animal Bones from Mediaeval Princesshay, Exeter) it may be that more shaft fragments, which might have fewer diagnostic features, were identified in this period, so lowering the ratio of epiphyses to other specimens. Alternatively, it could be that bone-working was a more itinerant trade at his point in time (Holmes, 2014) and so the epiphyses of bones suitable for working may have been traded and deposited elsewhere, just as was suggested in 4 The Animal Bones from Mediaeval Princesshay, Exeter for horncores at this time. Comparing those results with the more complete analysis for the phase now, it can in fact be seen that the occurrence of horncores through all these pits was very low (although not completely absent, as is the case with pit (721), randomly chosen for that study). As such the possibility that horncores may have been traded out of the city, suggested in 4 The Animal Bones from Mediaeval Princesshay, Exeter, cannot be rejected at this stage. Indeed, if we were to ignore the case of pit (4944), which we saw was a borderline inclusion on the basis of sample size, we might conclude that there was low evidence for industrialisation (or organised trade specialisation) in the city at this time. Much of the specialised work might very well, therefore, be taking place outside of the city and diverting the flow of material to wherever that might be.

Alternatively, of course, the material may be getting deposited elsewhere in the city. Unfortunately, Maltby (1979, p. 86), does not go into details when discussing the evidence for a horn-working industry in Exeter other than to say that he believed there was evidence for horncores being traded out of the city in the Roman period and that there was a possible horner workshop excavated elsewhere in the city but without giving any indication as to when this might date from.

6.2.4 The High Mediaeval Features

The pit and ditch features from the High Mediaeval phase cover a wider variety of assemblage sizes – four of the five largest assemblages, by NISP, are from this phase but so are two of the three smallest (Table 21). Some of the smallest assemblages in the phase, such as that from pit (3525) produce some of the most outlandish results when comparing ratios of NISP to the other features from this phase, as we have seen in other phases. Pit (6699), for example, with elevated levels of epiphyses and feet elements could nicely illustrate the flow of material through a tanner before deposition (Figure 43) but with a NISP of just five, the lowest number of all the Mediaeval features discussed here, it seems safest to remove all of these small groups in order to allow us to more easily focus on those with larger samples, as we have done in the two previous sections.

CONTEXT	NISP	Pr. Butch	Sec. Butch	FFI ≤2	Skull & Feet	Feet	Epiphyses	Horncores	LM Ribs	LM Vert
4922	30	7	1	1	18	9	11	0	1	0
2547	54	24	21	7	18	7	10	12	45	15
831	28	19	5	4	15	11	11	4	16	4
1742	52	20	7	5	32	26	39	3	24	4
1835	40	21	5	1	10	8	20	0	18	4
1859	27	1	5	0	18	7	7	0	16	7
2693	56	9	2	11	29	14	23	2	10	6
821	22	1	3	2	13	3	6	0	14	2
2658	22	5	1	2	16	6	6	0	8	1
4893	19	1	1	0	15	5	7	0	8	3
1883	62	19	3	5	48	23	26	0	18	14
6699	5	2	0	3	3	3	4	0	4	0
3525	7	1	0	0	5	3	3	0	7	0

Table 21: The domestic cattle bones from the High Mediaeval pits and ditches at Princesshay, following the layout provided in 5 Building a New Model.

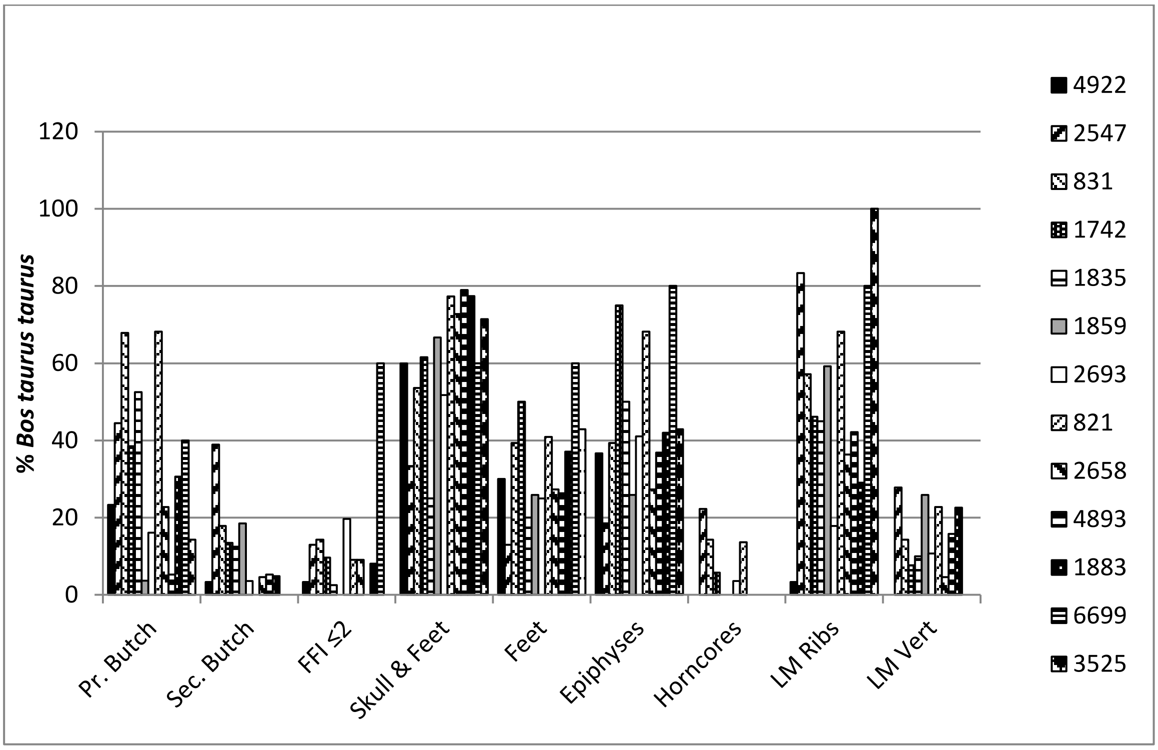

Figure 43: Incidence of the various categories prescribed by the model expressed as a percentage of *Bos taurus taurus* specimens for each High Mediaeval pit and ditch.

Filtering out the features with a NISP value of less than 25, it becomes apparent that this phase of activity really is more diverse than the previous phase. Trying to ascertain the typical level of any one ratio is difficult but comparing these ratios between pits is both necessary and possible. Given the general structure of this chapter, it would seem best to begin with the earliest feature in the phase and work forwards.

Pits (4922) and (2547) actually overlap slightly with the Early Mediaeval phase and both provide striking differences in some ratios when compared to other features from the High Mediaeval phase. (4922) has a relatively low ratio of butchery marks (secondary butchery marks (0.03) are outside 1 SD (0.05) when compared with the mean of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)) and an almost complete absence of ribs and vertebrae (0.03, 0.00) (Figure 44) (both greater than 1 SD (0.22, 0.06) from the mean (Table 19)). As such, it seems plain that this material never came very near a kitchen, but instead flowed through the Mediaeval city's industrial structure. The pit has a skull and feet, and feet index that is slightly above typical (0.60) (but within the normal range of all pits with 25 or more *Bos taurus taurus* specimens (0.42 - 0.75) (Table 19)) and as in the first section here it seems best to look at the difference in those values as a fair guide. The ratio of epiphyses to NISP is roughly in the middle of the various assemblages and it must be born in mind that a raised feet element index will often also raise the epiphyses index since no attempt is made to discount epiphyses of foot bone elements (after all, metapodials are one of the most appropriate bones for working for producing many tools and continued to be worked well into the Modern era (Benco et al., 2002; Unwin, 2014)). As such, it seems fair to suggest that the majority of the material in this pit was deposited after passing through the hands of a tanner.

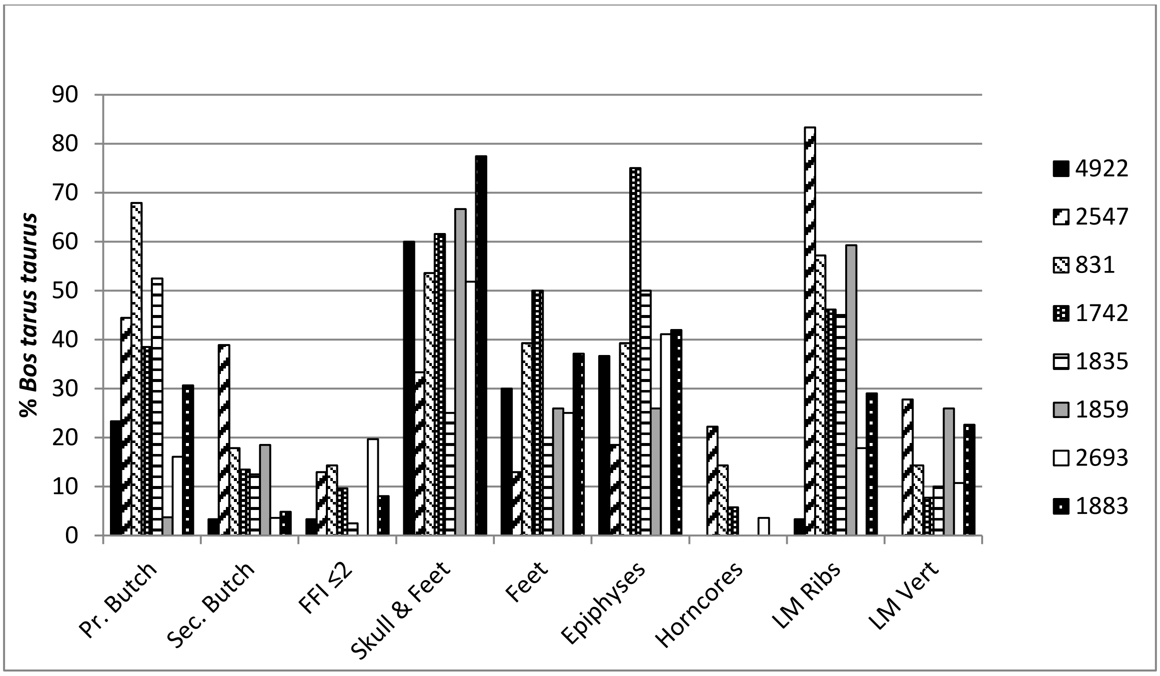

Figure 44: Incidence of the various categories prescribed by the model expressed as a percentage of *Bos taurus taurus* specimens for each High Mediaeval pit and ditch with a NISP of twenty five or over.

Pit (2547), is the one that we first encountered in 5.4 Testing the Model. Seen again here in relation to other features of a similar date, we can answer a bit more about whether it reflects an increased presence of horn-working in the city. The answer, though, has to be equivocal. We have seen that there is little evidence for horn-working in the Early Mediaeval phase of Princesshay (5.2.2 The Early Mediaeval Features) although it was pointed out that a horner's workshop had been suggested as present at some stage of the city's Mediaeval existence. It is unlikely the industry was ever a big part of Exeter's commerce, though, not even getting a mention in in one of the most thorough modern economic studies of a Mediaeval city, published on Exeter recently (Kowaleski, 1995). Pit (2547) clearly suggests itself though as representing the dual flow of material through a horner's workshop and through a kitchen (also having relatively high levels of secondary butchery marks and of ribs and vertebrae) (along with horncores (0.22), secondary butchery marks (0.39) are in proportions greater than 2 SD (0.17, 0.34) of mean and ribs (0.83) are greater than 1 SD (0.75) of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)) and although these aspects are greatest in this pit it is not alone – pit (831), the next in our chronological progress through the features shares a lot of the same indexes – high ratios of butchery marks and ribs and the only other feature to have a horncore proportion greater than 10% of NISP (horncores (0.14) and primary butchery (0.68), as well as foot elements (0.39) are in proportions greater than 1 SD (0.11, 0.67, 0.37) of the mean of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)).

Without knowing more about the Mediaeval horn-working industry in Exeter, these pits together suggest that sometime in the early High Mediaeval period cattle material passed from the butcher through both a horner's workshop and a kitchen (possibly, of course, in the same building) before being deposited in a pit in Princesshay after being transformed into other commodities. This further suggests that, at this time, a horner's workshop must have been relatively close to Princesshay – for all that this model depends on the heterogeneity of pits and that refuse comes from many different sources, it would be foolish to imagine that it was the only city-edge, brownfield site available for such uses and people, being inherently lazy, would probably only transport their refuse to the nearest convenient place.

If pit (2547) is the clearest indication we have of horn-working taking place in the vicinity, then pit (1742) is the least equivocal example we have of a pit containing waste from a tanner's workshop. Although the skull and feet index is the third highest for this period, the difference between that ratio and the feet ratio is the second lowest, having the highest feet index (0.50) of any of the pits (greater than 2 SD (0.49) of the mean of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)). This no doubt contributes to the extremely high epiphyses ratio (0.75) (greater than 1 SD (0.58) (Table 19)), as suggested earlier in this section when discussing pit (492) but, importantly, that ratio is even higher than the feet index alone. It is, therefore, possible that this represents the flow of some of the material through a bone-worker's business after the tanner had finished with the material. The moderate levels of butchery marks and of ribs and vertebrae suggest the ever present flow of material though the city's many kitchens alongside this enterprising craft flow.

Pit (1835) is possibly the most mixed of all of the assemblages, reflecting an eddying, braided flow of material through the city's households and businesses but pit (1859) suggests a less complicated dual flow to deposition. Here, a very low incidence of primary butchery (0.04) (greater than 1 SD (0.11) from the mean of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)) and high ratios of ribs (0.59) and vertebrae (0.26) (although within the normal distribution (0.22 – 0.75, 0.06 – 0.38) of all pits of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)) strongly suggest food waste, whilst a large difference between the skull & feet and feet ratios suggests that some, at least of the material is coming directly from the butcher's shop. Indeed, earlier analysis of the material suggested that animals may have been butchered slightly differently in this phase, with less division of large bones by chopping and more anatomically precise division of the carcass (4 The Animal Bones from Mediaeval Princesshay, Exeter). As such, a high incidence of skull parts may be more indicative of the butcher's shop at this stage than primary butchery marks are.

Pit (2693) has the highest ratio of all pits where bones have been broken when fresh (0.20), presumably to get at the marrow (greater than 1 SD (0.15) from the mean of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)). This in itself suggests table waste, where low indexes of butchery marks, ribs and vertebrae did not (ribs (0.18) and secondary butchery (0.04) are both greater than 1 SD (0.22, 0.05) from the mean (Table 19)), but it also helps to explain the high ratio of epiphyses which we might otherwise have taken to suggest evidence for the flow of material through a bone-worker's workshop. Finally, pit (1883) is another that is even more heterogeneous in origin than others but a high ratio of skull and feet specimens (0.77) (greater than 1 SD (0..75) from the mean of all pits with 25 or more *Bos taurus taurus* specimens (Table 19)) might suggest that a fair amount of the material deposited here flowed from the butcher's shop directly to the Princesshay refuse pits.

6.3 Discussion

Overall, the model has functioned well, offering a more nuanced interpretation of some of the changes identified and interpretations made during the more traditional analysis of the material in 4 The Animal Bones from Mediaeval Princesshay, Exeter. The shift in the flow of material between the Early and High Mediaeval phases is marked, actually being far greater than expected using this more nuanced approach when compared to the more broad-brush comparisons (e.g. species proportions) used traditionally. In particular, the change to a more complex system of trade specialisation and societal complexity suggested by the different flow of materials into Princesshay in the High Mediaeval period does to some extent agree with the documentary sources:

> *'The slow development of apprenticeship and the craft guilds in Exeter was probably a product of the tremendous civic power vested in the town's freedom and its member's desire to restrict rivals. Throughout the fourteenth and early fifteenth centuries there were only hints of loose craft affiliations.'* (Kowaleski, 1995, p. 99)

Of course, such broad statements will inevitably ignore some of the subtleties. It seems, for example, as if one of the earliest guilds formed in Exeter was the Butcher's guild 'elected to supervise the town's meat market in 1384' (Kowaleski, 1995, p. 100). Such an early founding (by Exeter's terms) would also help to explain another artefact of both this analysis and the earlier site analysis (4 The Animal Bones from Mediaeval Princesshay, Exeter). The formation of a guild, implying as it does the protection of a trade through standards and peer assessment (2 Urban History), suggests not just the maintenance of those standards but also the increased professionalism that should be evident in the finished product shortly after the trade is protected – and so it is. The reduction in the number of crude chop-marks directed at breaking up unwieldy pieces of meat into something that will fit into a pot does not have to equate with a change of cooking technology – from pots to ovens and from boiling to roasting – but can also evident a more skilled approach to the craft. Seetah (2008, 2007) has pointed out that a skilled butcher can disarticulate an animal and remove the meat from the bone without ever leaving a mark that we, as zooarchaeologists, could identify. We have, perforce, then to rely on other indicators for material passing through the hands of the butcher's guild after its formation during the High Mediaeval period, as we have done here by placing emphasis on the presence of head specimens, even where there are genuine issues of equifinality surrounding the route to final deposition for some of these specimens.

By the Late Mediaeval period, butchery was one of the most legislated professions (Swanson, 1999, pp. 84–85), a circumstance that no doubt both reflects the rising power of butcher's guilds and, in part, explains the guilds' formations. A cycle of public-health consciousness on the part of the other burghers and an act of circling-the waggons by the butchers and then a series of increasingly high-stakes stand-offs. Many cities in England saw their guilds form much later than on the continent though (Epstein, 1991), even their butchers' guilds formed earlier than others, with some cities, such as Southampton never witnessing the birth of formal craft guilds at all (Swanson, 1999, p. 97). As such, although Exeter is far from unusual in its changes it would be useful to test the model further in a city such as York or London, which both have far better histories of zooarchaeological research than Exeter and, by British standards, powerful and early guilds as well as the benefit of thorough economic history studies that Exeter is also favoured with. If the model can demonstrate its usefulness in one of those cities by affecting our understanding of Mediaeval life there and changing our impressions of the archaeology by giving assemblages from edge-of city pits, unnasociated with any particular role or function, a function in providing a real window into the way in which people organised their lives and their city then it will have proven its use beyond doubt.

It can go further though. This model has, at times, struggled with the very nature of the material that it has sought to exploit and explain in its development – its plasticity. Bones undoubtedly have permanent changes made to them as they flow through the *chaîne* of Mediaeval urban life and its determinist guild structures. Trying to say with certainty which *opératoire* was responsible for each change – which event in the flow of material from one pair of hands to another – caused a particular signature on a specimen remains difficult, if not impossible.

This chapter has been clouded in language and terminology that will be familiar to the zooarchaeologist – not just the altered acronyms mentioned in 6.1 Methods but more subtle insinuations such as 'specimen' and 'assemblage' – yet it is hoped that the reader will have been able to see through the language used and appreciate that the focus of enquiry was different. It is necessary to view the categories of evidence – presence/absence of certain elements, butchery marks, etc. – as happening to the material from a feature, not to individual specimens or even to the collection of specimens which we usually take the word ‘assemblage’ to mean. This helps to remind us that the material has likely flowed through several different points in its journey through the *chaîne opératoire* and it is not the result of one final activity – all those activities are recorded in its history and can help inform our interpretations of a site and of a feature.

7. Conclusions

This thesis has developed a new model for interpreting pre-depositional taphonomies, within a paradigm I have called 'social taphonomy'. As stated in the introduction, this is related to wider developments in zooarchaeology, specifically to the idea of 'social zooarchaeology', although it remains distinct from that idea. By focusing on taphonomic indices and incorporating a long history of research into a robust theoretical framework we can gain valuable insights which are otherwise lost in the minutiae of study.

In 2 Urban History, I outlined the problems of considering archaeological sites in isolation. In essence, in order to understand what was happening at the site it is necessary to consider it in relation to both the rest of the city and to the city's wider region. That involves a consideration of geography and culture as well as economics. In 2.2 City and Guilds, it was emphasised that the life of a Mediaeval European city – its culture, politics and economy – was dictated by guilds. These guilds wielded great power and were maintained by a strict regimen of legal monopolies and performative instruction.

Performative instruction is a key component in the theory behind *chaîne opératoire* and so this concept seems ripe for adapting to the study of animal bones from archaeological sites. I have done so here and demonstrated its applicability through a case-study which specifically applied the model to a British Mediaeval city. There is a sample size problem here – one case study does not make for a compelling argument. That said, the potential has clearly been demonstrated as the use of the model provided insights into how animal bones were being handled around the city, and who was handling them, from material which had otherwise limited potential – i.e. an assemblage derived from pit deposits unnasociated with other archaeology. The 'who' here is critical, as we can approximate it with the guilds that existed at the time, allowing an insight into social organisation of the city through the taphonomic record – hence 'social taphonomy'.

This kind of insight is clearly contrasted with the more traditional approach taken to the same material that I presented in 4 The Animal Bones from Mediaeval Princesshay, Exeter. That method gave little insight other than what animals were in the city at the time, together with a broad supposition on their potential use. It is clear that the origins of many urban pits are not single event or single source and social taphonomy allows us to see the flow of material around the city that an exclusive focus on context level data does not.

Although the model has been developed and demonstrated with the specific case of Mediaeval cities and guild structures in mind, there is no reason to think that it should be constrained by this limited application. As already mentioned, the application of the model to other Mediaeval cities is an entirely necessary next step in demonstrating its usefulness but the underlying principle of *chaîne opératoire* theory is not one that is specific to such a setting. In fact, of course, the theory was originally developed as an approach for interpreting lithic remains from prehistoric societies and it has already been successfully adapted to other classes of material and other societies – such as British Iron Age craft specialists (Joy, 2009). In fact, the model should be applicable to any society in which technology is socially learned and socially reproduced and it may be fairly contended that this is all societies without easy access to the written word or audio-visual media. In other words it should be applicable to most societies in human history and anywhere in the world.

That statement is not meant to imply that the specific intricacies of Mediaeval guild structures can be transplanted to other times and places. It is important to remember that that milieu is the context of the case-study and not the output of the model. In other words the model has been used here to demonstrate insights which can be compared with and interpreted through the historical context that we already know. Such an approach was necessary to demonstrate its usefulness. Applying the model in other contexts will necessitate other, or no, direct historical correlates. Even without those correlates, however, it can still provide valuable insights. Accepting that technology is socially learned we can gain insights into societal organisation and technological knowhow in much the same way that *chaîne opératoire* theory was originally used to provide the same insights into prehistoric society from lithic assemblages. In later prehistory, of course, animal bones are often a much more abundant artefact than lithics, and so will be more often useable for these purposes.

Animal bone is a plastic medium that can be transformed in particular ways. Understanding the transformations that it has undergone, and which feature in an assemblage, can tell us much about the society that produced that assemblage. This can be anything from the material culture of butchery practices to the technology of specific crafts such as horn-working. The fact that these insights can be gained owes as much to using robust theory for interpretations as it does using appropriate methods to identify and record taphonomic markers.

The study of taphonomy has come a long way since its earliest practitioners carried out fracturing experiments to prove human agency in fluvial strata and wrung their hearts decrying the imperfection of the archaeological and palaeontological records. Zooarchaeologists have, unusually, played a leading role in developing the discipline as well as in promoting its relevance to other archaeologists. The spread and adoption of ideas has remained rather mono-directional and closeted, however, in that discussions of taphonomy still rely on models rooted in biology and geology. There is, of course, nothing wrong with adopting principles and models from these disciplines – indeed, our subject has advanced markedly through doing so (for example though foraging theory - Lyman, 2003; Pyke, 1984) – but that is no reason to be blind to other approaches and theories that may help us as well by making the most of the data and material that we have to work with.

The days of zooarchaeology needing to prove its worth are, hopefully, long gone. To remain relevant, however, the discipline must continue to progress and find new ways to answer new questions. To do otherwise risks being left behind and a slow slide back into irrelevance. One way in which the study of animal remains in archaeology has progressed markedly in recent years is in the adoption of new, principally chemical, methods of analysis.

When creating the model in 5 Building a New Model and using it in 6 Case Study there was a certain obligatory willingness to look at the flow of material within the city only. This was necessary due to the restrictions of time and budget and it was desirable, in part, in order to keep the model simple. This is usually to be preferred when presenting new concepts. As was pointed out in 5 (Building a New Model) though, the material we are studying does not suddenly pop into existence after passing through an abattoir. As zooarchaeologists we study material that potentially undergoes a far more radical and dramatic transformation than perhaps any studied by any other archaeologists – from sentient being to tool, if not to food, a point emphasised by ‘social zooarchaeology’. Not so long ago, we could only track changes to the material after this chthonic point in its life. Now, we are not so restricted.

New, chemical approaches to studying animal remains in archaeology open up whole new vistas to which this model can be applied. In particular, isotopic analysis of select material from the pits could be employed to suggest the geographic origins of the living animal. It has been pointed out several times during this study that understanding Exeter’s zooarchaeology in relation to its region (surely a pre-requisite for understanding the city in relation to its region and, therefore, for understanding the city at all) is severely hobbled by the acid soils present in much of the region. The geology of Britain’s South West peninsular is surprisingly varied, however, as is its rainfall. Combining analysis of strontium isotopes, which reflect the geology of an animal’s life (Alexander Bentley, 2006; Beard and Johnson, 2000) with oxygen isotopes, which reflect the rainfall of its life (Gat, 1996; Sponheimer and Lee-Thorp, 1999) could potentially help to pinpoint the origin of Exeter’s animal remains with some precision. So literally plotting the flow of material through the landscape and into the city as well as plotting it through its life – note, the material’s life, not the animal’s. After all, the material is plastic, capable of being shaped into several different classes of thing during its lifetime but essentially always remaining the same thing (5 Building a New Model).

Of course, zooarchaeologists have long had the means of estimating the life of an animal, whether through epiphyseal fusion (Silver, 1969) or through tooth wear (Grant, 1982). Combining age profiling with isotopic analysis could thus give valuable insights not only into Exeter’s relationship with its region but into that region itself, so helping to overcome some of the geological obstacles presented to zooarchaeologists wishing to study the region. Other cities, of course, do not share all of the specific problems that Exeter does but that does not make employing the model there less meritorious.

It was demonstrated in 6 Case Study that adopting the model as it stands helped us to a greater insight into the workings of a Mediaeval city. The shift from domestic activities – non-standardised butchery and peripatetic craft industries – to the professionalism of guild enterprises was suggested in a way that the traditional analysis carried out in 4 The Animal Bones from Mediaeval Princesshay, Exeter could not achieve. This is not to suggest that it had all of the answers, of course – the discussions and perceptions provided by the various fish in Exeter, by *Rattus rattus*, *Falco columbarius* and even *Felis catus*, all remain outside the confines of this model – but it was never intended for the new model to replace all existing analyses. Strong interpretations are founded on strong datasets and asking the right questions of that data. The model developed here is another tool with which to ask questions of data from urban contexts and should be used in conjunction with other approaches.

The model should, in fact, be further tested with application to datasets from other British cities – including those about which we already think we know much, such as London and York – as well as other Mediaeval European cities. Much has been made of the Mediaeval European guild structures when highlighting the relevance of this model but it should be remembered that *chaîne opératoire* theory was originally devised as a way of understanding Palaeolithic lithic assemblages. It is difficult to envisage a starker contrast with the society we have successfully applied the model to. As such, assuming the model continues to prove successful in providing insight into these contexts it would also be interesting to test the limits of the model in the future, by applying it to other urban assemblages – older and newer than the Mediaeval period, and to non-urban assemblages as well. The limits of its applicability cannot yet be known but there is no reason to think that it should not be useful in any large assemblage of heterogeneous material.

It was suggested in 3 (A Review of Butchery Practices and Carcass Disposal in Mediaeval Towns and Cities, as Studied by Zooarchaeologists) that zooarchaeologists tend to spend a lot of time identifying uncommon deposits and then making more general observations about society – economic or ritual behaviours based on inherently unusual remains. The suggestion was not meant to suggest that such practices or interpretations are inherently invalid but more to highlight how much we do with so little and how little we do with so much. Through extensive research into approaches taken into investigating material in other areas of our subject, combined with exploration of the philosophical theories that underpin some of those models, it was concluded that applying our existing methods within the framework of one of those borrowed models – *chaîne opératoire* – might help us to see the woods for the trees.

Much remains to be done. The model can be honed and developed further. It can be combined with other existing methods to see still more of the picture and it should be tested on other assemblages but it has been demonstrated here (6 Case Study) that adopting the *chaîne opératoire* approach to zooarchaeology can help us understand our material and how it reflects its urban society in a way that we have not managed to previously. Complex societies are complex and produce complex archaeological sites with complex material assemblages. Previously, our attention has been on the assemblages. Perhaps diverting some of that gaze to the material might result in new insights to Mediaeval societies and new questions being asked in future.

Appendices

Appendix 1: Dictionary of Animals referred to in the text.

Taxa List		
Binomial Classification (Latin)	**Common Name (English)**	**French Name**
Anser sp.	goose	oie
Apodemus sylvaticus	wood mouse	mulot sylvestre
Bos taurus taurus	domestic cattle	vache
Bufo bufo	common toad	crapaud commun
Capreolus capreolus	roe deer	chevreuil
Canis lupus familiaris	domestic dog	chien domestique
Capra hircus	domestic goat	chèvre domestique
Corvus corone corone	carrion crow	corneile noire
Cervus elaphus	red deer	cerf élaphe
Corvus corone/frugilegus	crow/rook	corneile/corbeau freux
Equus caballus	horse	cheval
Anguilla anguilla	European eel	anguille d'Europe
Falco columbarius	merlin	faucon émerillon
Conger conger	European conger	congre commun
Felis catus	domestic cat	chat domestique
Esox lucius	northern pike	grand brochet
Gadidae	gadid	gadidé
Gadus morhua	Atlantic cod	morue de l'Atlantique
Merluccius merluccius	European hake	merlu commun
Merlangius merlangus	Whiting	merlan
Pleuronectes platessa	plaice	plie commune
Pollachius pollachius	pollock	lieu jaune
Pollachius virens	coley	lieu noir
Raja clavata	thornback ray	raie bouclée

Taxa List		
Binomial Classification (Latin)	**Common Name (English)**	**French Name**
Salmonidae	char/grayling/huchon/lenok/trout/salmon/etc.	corégones/ombles/ombres/corégones/saumons/truites/etc.
Squalus acanthias	spiny dogfish	aiguillat commun
Sparidae	sea bream	sparidé
Scomber scombrus	Atlantic mackerel	maquereau commun
Triglidae	gurnad	grondin
Trachurus trachurus	Atlantic horse mackerel	chinchard
Gallus gallus	chicken/red jungle fowl	poules domestiques/coq bankiva
Lepus europaeus	European hare	lièvre d'Europe
Mus musculus	house mouse	souris commune
Ovis aries	domestic sheep	mouton domestique
Pica pica	magpie	pie bavarde
Rana sp.	frog	anoures
Rattus rattus	black rat	rat noir
Sus sp.	pig	porc/sanglier
Scolopax rusticola	Eurasian woodcock	bécasse des bois
Sorex araneus	common shrew	musaraigne carrelet
Sterna sp.	tern	sterne
Turdus sp./*Sturnus* sp.	thrush/starling	grives/merles/étourneau
Vulpes vulpes	red fox	renard roux

Appendix 2: Recording Protocol

This system is based on a modified version of that outlined by Davis (1992). A number of revisions have been made which reflect the specific research aims of the current project and that will efficiently explore its characteristics. The elements and zones listed below have been chosen based on a number of criteria including:

1) potential for identification to skeletal element and species by specialists of varying experience
2) survivability
3) potential for providing information on the age and/or sex of an animal
4) potential to provide useful measurements.

The system is based on three main database structures, one for teeth, one for bones recordable under the protocol (countable elements) and one for all other fragments (non-countable elements).

Non-countable elements (fragments) are those specimens which are not used for any high-resolution quantitative analysis and include identifiable but partial bones and all other elements or parts of elements which are not included in the list of regularly recorded teeth and bones (see below). As much information as possible is recorded for these specimens including, where possible, attribution to species, genus, class (for fish and bird) or Large Mammal (*Cervus/Bos/Equus* size), Medium Mammal (*Capreolus/Ovis/Sus* size), Small Mammal (*Oryctolagus/Felis* size) or Rodent.

Countable elements (bones and teeth) are recorded when at least 50% of the articulation or of the occlusal surface is present. Other elements, such as carpals, tarsals and cranial elements are recorded when at least 50% of the element is present. Horn cores and antlers are recorded when a complete circumference is present.

Amphibian bones are recorded when either end of the following bones is present: humerus, radioulna, femur and tibiofibula. The acetabulum is also recorded.

A Fracture Freshness Index is recorded for all countable and non-countable elements, which follows the criteria laid out in Outram (2001; 2002). Butchery and size class recording methods follow Maltby (2010) and Outram (2001), respectively, modified as per the fields below.

For a description of how measurements are taken see Davis (1987, 1996), von den Driesch (1976) and Walker (1980). The following measurements are taken:

TEETH

Equids:	L_1, W_a and W_d (only teeth which can be positioned, i.e. we know which tooth it is) (W_d is only taken on molars)
Cattle:	dP_4 W, dP^4 W, M^1W, M^2W, M^3W, M_1W, M_2W, M_3L and M_3W
Caprine:	dP_4W, M_1W, M_2W, M_3L and M_3W
Pig:	dP^4 (L,WP), M^1, M^2 & M^{12} (L, WA,WP), M^3 (L,WA,WC), dP_4 (L,WP), M_1, M_2 & M_{12} (L,WA,WP), M_3 (L,WA,WC, WP), H.

Carnivores: P_4, M_1 (L & W), P^4 (L, WA, WP), P_1-M_3L (canids), P_3-M_1L (felids), P_2-M_3L (canids), P_1-P_4 L (canids), P_2-P_4L (canids), P_4-M_1L (canids), M_1-M_3L (canids), M^1-M^2L (canids), H.

Rodents: M_1-M_3L, M^1-M^3L (P_4-M_3L, P^4-M^3L in dormice and P_3/P_4-M_3L, P^3/P^4-M^3L in squirrels)

BONES

Horncores and antlers: min. (Dd) and max. (Bd) diameter of the base

Cranium: birds = GL, GB, GH, LP

Atlas: mammals = H, BFcr (only for pig)

Scapula: mammals = SLC
birds = GL, Dic

Coracoid: birds = GL, Lm, Bb, BF

Humerus: mammals = GLC, Bp, BT (ungulates), Bd (all other mammals), HTC, SD
birds = GL, Bd, Dd, SC (when GL is taken)
reptiles = GL, Bd, Dd, SD (when GL is taken)

Radius: mammals = GL, Bp, Bd, SD (when GL is taken)

Ulna: mammals = DPA, SDO, BPC
birds = GL, Bp, Did, SC (when GL is taken.

Metacarpal: bovids and cervids = GL, SD, BatF, Bd, Bp, WCM, WCL, DEM, DVM, DEL, DVL
other mammals = GL, SD, Bd, Dd, Bp
birds = GL, SC, Bd, Bp

Pelvis: mammals = LAR (LA)

Femur: mammals = GL, Bd, Bp, DC, SD (when GL is taken)
birds = GL, Lm, SC, Bd, Dd

Tibia: mammals = GL, Bd, Dd, Bp, b, SD (ant-post, when GL is taken)
birds = GL, La, SC, Bd, Dd

Astragalus: bovids and cervids = GLl, GLm, Bd, Dl
pig = GLl, GLm
equids = GH, GB, BFd, LmT
other mammals = GL

Calcaneum: mammals = GL, GD

Metatarsal: bovids and cervids = GL, SD, BatF, Bd, Bp, WCM, WCL, DEM, DVM, DEL, DVL
Other mammals = GL, SD, Bd, Dd, Bp
birds = GL, SC, Bd

Phalanx 1: equids = GL, Bp, Dp, SD, Bd, Dd
other mammals = GL/GLpe, Bp, Bd

Phalanx 2: mammals = GL, Bp, Bd

Additional measurements may be taken, and are included in the “comments” field when recorded.

The sheep/goat distinction is attempted on the following elements:

horn core
dP_3, dP_4, M_1, M_2 & M_3
Humerus
Metacarpal

Tibia
Astragalus
Calcaneum
Metatarsal
The frog/toad distinction is attempted on the pelvis and tibia.

LIST OF FIELDS FOR THE THREE DATABASE STRUCTURES:
Teeth
ID = automatically generated specimen record number
SITE = site code
YEAR = year of excavation
BOX = box number
CTX = context
ERA = period
CAT # = catalogue number
COL = type of collection
EL = maxilla or mandible
LJ=loose tooth or jaw
SIDE
TAX = taxon
I1
I2
I3
I (=I/C in ruminants)
dI1
dI2
dI3
dI (=dI/dC in ruminants)
C
dC
PM (premolar or molar)
P
P1
P2
P3
P4
P4L (L_1 in equids)
P4W (W in carnivores)
dP2
dP3
dP4
dP4L
dP4W
M
M12 (first or second molar)
M12L (P4/M1 L in canid mandibles)
M12WA
M12WP

M1
M1L (L_1 in equids) (C in cattle upper tooth)
M1WA (W in caprines and carnivores) (Wa in equids)
M1WP (Wd in equids)
M2
M2L (L_1 in equids) (C in cattle upper tooth)
M2WA (W in caprines) (Wa in equids)
M2WP (Wd in equids)
M3
M3L (L_1 in equids) (C in cattle upper tooth)
M3WA (W in bovids) (Wa in equids)
M3WC (Wd in equids)
M3WP
PATH
P1/M3 L (P3/M1 L in felids)
P2/M3 L
P1/P4 L
P2/P4 L
M1/M3 L
H
Comments = recording of all additional discernible information and photo' log records

Bones
ID = automatically generated specimen record number
SITE = site code
YEAR = year of excavation
BOX = box number
CTX = context
ERA = period
CAT # = catalogue number
COL = type of collection
SIZE = size class
EL = anatomical element
SIDE
TAX = taxon
FUSP = proximal fusion
FUSD = distal fusion
WTHR = weathering
ROOT = root etching
FFI = Fracture Freshness Index
BUTCH = butchery
BURN = burning
GNAW = gnawing
GL (=GLl in astragalus) (=GH in equid astragalus) (=GLC in humerus) (=H in atlas)
Bd (=GB in equid astragalus) (= BT in humerus) (=BFcr in atlas)
Dd (=Dl in astragalus) (=BFd in equid astragalus) (=3 in metapodials) (=DC in femur) (=GD in calcaneum)
HTC (=LmT in equid astragalus) (=GLm in astragalus) (=6 in metapodials)

LAR
SD (=SC in birds) (=SLC in scapula)
Lm (=La in tibiotarsus)
BatF
a
b
1
4
Comments = recording of all additional discernible information and photo' log records

Fragments
ID = automatically generated specimen record number
SITE = site code
YEAR = year of excavation
BOX = box number
CTX = context
ERA = period
CAT # = catalogue number
COL = type of collection
SIZE
TAX GRP = taxonomic group
TAX = taxon
EL = element
WTHR = weathering
ROOT = root etching
FFI = Fracture Freshness Index
BUTCH = butchery
BURN = burning
GNAW = gnawing
Comments = recording of all additional discernible information and photo' log records

CODES
ERA (=period)

Era List	
Code	**Period**
BA	Bronze Age
CH	Chinese
EBA	Early Bronze Age
EIA	Early Iron Age
EM	Early Mediaeval
EMOD	Early Modern
HM	High Mediaeval
IA	Iron Age
LBA	Late Bronze Age
LIA	Late Iron Age

Era List	
Code	**Period**
LM	Late Mediaeval
LR	Late Roman
M	Mediaeval
MBA	Middle Bronze Age
MIA	Middle Iron Age
MOD	Modern
MR	Middle Roman
R	Roman
T	Turkic

COL (=type of collection):
HC = hand collected
CS = from coarse sieving
FS>10 = from fine sieving (>10mm fraction)
FS>5 = from fine sieving (>5mm, <10mm fraction)
FS<5 = from fine sieving (<5mm fraction)

EL (=anatomical element):

Element List				
Code	**Element**	**Section**	**Body Portion**	**Recorded For Taxa**
*CT	carpal/tarsal		limb	
*FE	femur	shaft	hindlimb	
*FI	fibula	shaft	hindlimb	
*HU	humerus	shaft	forelimb	
*MC	metacarpal	shaft	forelimb	
*MP	metapodial	shaft		
*MT	metatarsal	shaft	hindlimb	
*PE	pelvis	shaft	hindlimb	
*PH	phalanx	shaft	limb	
*RA	radius	shaft	forelimb	
*SC	scapula	shaft	forelimb	
*T	tooth		head	
*TI	tibia	shaft	hindlimb	
*UL	ulna	shaft	forelimb	
AR	articular		head	fish
AS	astragalus		hindlimb	mammals
AT	atlas		head	mammals
AX	axis		head	mammals

Element List				
Code	**Element**	**Section**	**Body Portion**	**Recorded For Taxa**
C3	carpal 3 or 2+3		forelimb	mammals
CA	calcaneum		hindlimb	mammals
CER	ceratohyal		head	fish
CL	cleithrum		head	fish
CO	coracoid		forelimb	birds, reptiles
CR	cranium		head	birds, reptiles, amphibians
DD	dermal denticle		torso	fish
DN	dentary		head	fish
FE	femur	distal	hindlimb	mammals, birds, reptiles, amphibians
FI	fibula	proximal	hindlimb	mammals
HC	horn core or antler		head	mammals
HU	humerus	distal	forelimb	mammals, birds, reptiles, amphibians
HYO	hyomandibular		head	fish
MC1	metacarpal/carpometacarpus	distal (proximal for birds)	forelimb	mammals, birds
MC2	half metacarpal in artiodactyls, 2nd metacarpal all others	distal	forelimb	mammals
MCIII	third metacarpal	distal	forelimb	mammals
MCIV	fourth metacarpal	distal	forelimb	mammals
MCV	fifth metacarpal	distal	forelimb	mammals
MP1	metapodial	distal	limb	mammals
MP2	half metapodial	distal	limb	artiodactyls
MT1	metatarsal/tarsometatarsus	distal	hindlimb	mammals, birds
MT2	half metatarsal in artiodactyls, 2nd metatarsal all others	distal	hindlimb	mammals
MTIII	third metatarsal	distal	hindlimb	mammals
MTIV	fourth metatarsal	distal	hindlimb	mammals
MTV	fifth metatarsal	distal	hindlimb	mammals
N	mandible		head	mammals when teeth are present in jaw, or else fragment
OC	occipital		head	mammals

Element List				
Code	**Element**	**Section**	**Body Portion**	**Recorded For Taxa**
OP	opercular		head	fish
OTHFE	femur	proximal	hindlimb	mammals, birds, reptiles
OTHMC	metacarpal	proximal		
OTHMT	metatarsal	proximal		
OTHRA	radius	proximal	forelimb	mammals, birds, reptiles
OTHTI	tibia/tibiotarsus	proximal	hindlimb	mammals, birds, reptiles
OTHU	humerus	proximal	forelimb	mammals, birds, reptiles
P1	first phalanx	proximal	limb	mammals
P2	second phalanx	proximal	limb	mammals
P3	third phalanx	proximal	limb	mammals
PA	patella		hindlimb	mammals
PARA	parasphenoid		head	fish
PE	pelvis	acetabulum	hindlimb	mammals, birds, reptiles, amphibians
PMX	pre-maxilla		head	fish
POP	preoperculum		head	fish
POT	post temporal		head	fish
QU	quadrate		head	fish
R	rib (or other spine in fish)		torso	mammals, birds, reptiles, amphibians, fish
RA	radius	distal	forelimb	mammals, birds, reptiles, amphibians
SC	scapula	proximal	forelimb	mammals, birds, reptiles
SCU	scafocuboid/scafoid/cuboid		hindlimb	mammals
SH	shell		-	molluscs
SP	spine		torso	fish
SU	supraorbital arch		head	mammals
TI	tibia/tibiotarsus	distal	hindlimb	mammals, birds, reptiles, amphibians
U	urohyal		head	fish
UL	ulna	processus anconaeus	forelimb	mammals, birds, reptiles
V	vertebra		torso	fish
VC	causal vertebra		torso	fish
VOM	vomer		head	fish
VPC	pre-caudal vertebra		torso	fish
X	maxilla		head	fish (and mammals when teeth are present in jaw,

Element List				
Code	**Element**	**Section**	**Body Portion**	**Recorded For Taxa**
				or else fragment)
ZY	zygomaticus		head	mammals

Note: Mandible and maxilla only recorded in teeth database, not bones database. Shaft sections (marked star), proximal metapodials, ribs and vertebrae (unless from fish) are not recorded as countable elements under the protocol. The fragments database is used to calculate NISP figures, in conjunction with the other database structures (teeth and bones) but is not used for any other quantification exercises, in order to avoid duplication of material.

L/J (=loose or in jaw)
L = loose tooth
J = in jaw
A jaw is defined as a tooth having adjacent to it at least another half tooth/alveolus or an equivalent length of bone

SIDE
L = left
R = right

PATH (=pathology)
C=calculus
H=hypoplasia present (one line)
HH=hypoplasia present (two or more lines)
CH=calculus and hypoplasia present (one line)
CHH=calculus and hypoplasia present (two or more lines)

TAX GRP (=taxonomic group)

Taxonomic Group	
Code	**Description**
A	Amphibian
B	Bird
F	Fish
LM	Large Mammal
MM	Medium Mammal
MS	Mollusc (Shell)
R	Reptile
SM	Small Mammal

TAX (=taxon):
ACN = *Accipiter nisus*
ALA =

AMP = *Amphibia*
ANA = *Anas* sp.
ANS = *Anser* sp.
APO = *Apodemus* sp.
APS = *Apodemus sylvaticus*
ART = *Arvicola terrestris*
B = *Bos* sp.
BUB = *Buteo buteo*
BUF = *Bufo bufo*
BUU = *Buccinum undatum*
CAC = *Capreolus capreolus*
CAF = *Canis lupus familiaris*
CAH = *Capra hircus*
CAS = *Castor* sp.
CB = *Cervus/Bos* sp.
CCC = *Corvus corone corone*
CD = *Cervus/Dama* sp.
CEE = *Cervus elaphus*
CIR = *Circus* sp.
CLG = *Clethrionomys glareolus*
CO = *Corvus* sp.
COC = *Corvus corax*
COF = *Corvus frugilegus/corone*
COL = *Columba* sp.
COM = *Corvus monedula*
CTC = *Coturnix coturnix*
CV = *Canis/Vulpes* sp.
DAD = *Dama dama*
DC = *Dama/Capreolus*
EQ = *Equus* sp.
EQA = *Equus asinus*
EQC = *Equus caballus*
ERE = *Erinacaeus europaeus*
FAC = *Falco columbarius*
FAL = *Falco* sp.
F-AA = *Anguilla anguilla*
F-S = *Salmonidae*
FEC = *Felis catus*
FISH = Fish
GAG = *Gallus gallus*
GAL = *Galliformes*
GAN = *Gallinago gallinago*
GAR = *Garrulus glandarius*
GN = *Gallus/Numida* sp.
GNP = *Gallus/Numida/Phasianus* sp.
GP = *Gallus/Phasianus* sp.
LA = *Lagopus* sp.
LAG = Lagomorph

LE = *Lepus* sp.
LEE = *Lepus europaeus*
LRO = Large rodent
LU = *Lutra* sp.
MAR = *Marmota* sp.
MEM = *Meles meles*
MES = *Mergus serrator*
MIM = *Milvus milvus*
MUE = *Mustela erminea*
MUM = *Mus musculus*
MUN = *Mustela nivalis*
MUP= *Mustela putorius*
MUX = *Mustela erminea/nivalis*
NUA = *Numenius arquata*
O = *Ovis/Capra* sp.
OCC = *Ovis/Capra/Capreolus* sp.
OCH = *Ochotona* sp.
ORC = *Oryctolagus cuniculus*
OVA = *Ovis aries*
PEP = *Perdix perdix*
PHC = *Phalacrocorax carbo*
PIP = *Pica pica*
PL = *Pluvialis* sp.
PLA = *Pluvialis apricaria*
PLS = *Pluvialis squatarola*
PSF = *Passeriformes*
PUP = *Puffinus puffinus*
RA = *Rattus* sp.
RAN = *Rana* sp.
RAR = *Rattus rattus*
RAV = *Rattus/Arvicola* sp.
S = *Sus* sp.
SCR = *Scolopax rusticola*
SMI = Small *Microtinae*
SMU = Small *Murinae*
SOA = *Sorex araneus*
SRO = Small rodent
STE = *Sterna* sp.
STS = *Sterna sandvicensis*
STV = *Sturnus vulgaris*
TAL = *Talpa* sp.
TES=*Testudinidae*
TU = *Turdus/Sturnus* sp.
TUI = *Turdus iliacis*
URS= *Ursus* sp.
VAV = *Vanellus vanellus*
VUV = *Vulpes vulpes*

When the identification is uncertain a question mark is put at the end (e.g. CEE? B?)

FUS (=fusion):
F = fused
G = fusing
H = fused/fusing
UD = unfused diaphysis
UE = unfused epiphysis
UX = unfused diaphysis + epiphysis
J = juvenile (for birds)

FFI (=Fracture Freshness Index)
0
1
2
3
4
5
6
C = complete
B = butchered
N = new break
X (if specimen is fish, mollusc or tooth)

BUTCH (=butchery):
"blank" = absent or not recordable

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
A1	Astragalus	Chop	Oblique/horizontal chop through proximal end (usually in anterio-posterior direction).
A10	Astragalus	Cut	horizontal knife cuts on anterior aspect at distal end.
A11	Astragalus	Chop	superficial axial chop marks.
A12	Astragalus	Chop	superficial horizontal chop marks on posterior aspect running medio-laterally.
A13	Astragalus	Chop	superficial horizontal chop marks on medial aspect.
A14	Astragalus	Chop	superficial horizontal chop marks on lateral aspect.
A15	Astragalus	Cut	knife cuts on medial surface.
A16	Astragalus	Cut	knife cuts on lateral surface.
A17	Astragalus	Cut	knife cuts on posterior surface.
A18	Astragalus	Chop	axial chop through bone in medio-lateral direction.
A19	Astragalus	Cut	Knife cut on distal end

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
A2	Astragalus	Chop	superficial oblique/horizontal chop marks at proximal end.
A20	Astragalus	Chop	axial chop through medial side of distal end
A22	Astragalus	Chop	oblique chop through proximal end (lateral-medial direction)
A3	Astragalus	Chop	oblique/horizontal chop through centre of bone (usually in anterio-posterior direction).
A4	Astragalus	Chop	superficial medio-lateral chop marks on anterior of centre of bone.
A5	Astragalus	Chop	Oblique/horizontal chop through distal end (usually in anterio-posterior direction).
A6	Astragalus	Chop	superficial oblique/horizontal chop marks at distal end of bone.
A7	Astragalus	Chop	axial/oblique chop through bone in anterio-posterior direction.
A8	Astragalus	Chop	repeated axial/oblique chops through bone.
A9	Astragalus	Cut	horizontal knife cuts on anterior of centre of bone.
C1	Calcaneus	Chop	oblique/medio lateral chop through calcaneal tuber.
C10	Calcaneus	Cut	knife cuts on calcaneal tuber.
C11	Calcaneus	Chop	superficial axial chop/blade mark
C2	Calcaneus	Chop/Saw	superficial chop/saw marks on calcaneal tuber.
C3	Calcaneus	Chop	oblique/horizontal chops through distal end.
C4	Calcaneus	Chop	superficial chop marks on distal end.
C5	Calcaneus	Chop	oblique/horizontal chops through centre of bone.
C6	Calcaneus	Chop	superficial chop marks on centre of bone.
C7	Calcaneus	Cut	knife cuts on lateral and/or posterior aspect of centre/distal part of bone.
C8	Calcaneus	Cut	knife cut at distal end.
C9	Calcaneus	Chop	axial chop through bone.
F1	Femur	Chop	proximal articulation chopped through (ball joint).
F10	Femur	Cut	knife cuts on medial aspect of proximal end.
F11	Femur	Cut	other knife cuts proximal end.
F12	Femur	Cut	horizontal knife cuts on shaft.
F13	Femur	Cut	horizontal knife cuts around distal end.
F14	Femur	Chop	axial chop through distal lateral and/or medial

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
			condyles running in medio-lateral direction.
F15	Femur	Chop	superficial horizontal/oblique chop marks on shaft.
F16	Femur	Chop	proximal lateral aspect chopped through.
F17	Femur	Cut	oblique knife cuts on shaft.
F18	Femur	Chop	superficial axial chop distal end.
F19	Femur	Chop	axial chop through distal condyles running obliquely/ anterio-posteriorly.
F2	Femur	Chop	superficial chop marks on and around proximal articulation.
F20	Femur	Chop	horizontal/oblique chop through shaft.
F21	Femur	Chop	superficial axial chop marks proximal end.
F22	Femur	Chop	horizontal/oblique chop through proximal end.
F23	Femur	Chop	other superficial chop marks – proximal end.
F24	Femur	Cut	axial knife cuts – distal end.
F3	Femur	Chop	axial chop through proximal running in anterio-posterior direction.
F4	Femur	Chop	axial/oblique chop through shaft running in anterio-posterior direction.
F5	Femur	Chop	axial chop through distal running in anterio-posterior direction.
F6	Femur	Chop	repeated axial/oblique chops through distal running in anterio-posterior direction.
F7	Femur	Chop	superficial horizontal chop/saw marks around distal end.
F8	Femur	Chop	horizontal (or oblique) chop through distal end.
F9	Femur	Cut	superficial axial blade marks on shaft.
FB1	Fibula	Chop	Chop through proximal end
FB2	Fibula	Chop	Chop through shaft.
FB3	Fibula	Chop	Chop through distal end.
FB4	Fibula	Chop	Superficial chops at proximal end.
FB5	Fibula	Chop	Superficial chops on shaft.
FB6	Fibula	Chop	Superficial chops at distal end.
FB7	Fibula	Cut	Knife cuts at proximal end.
FB8	Fibula	Cut	Knife cuts on shaft
FB9	Fibula	Cut	Knife cuts at distal end.
H1	Humerus	Chop	axial chop through distal articulation

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
			(trochlea) running in anterio-posterior direction.
H10	Humerus	Cut	knife cuts medial aspect of distal end.
H11	Humerus	Chop	superficial axial chop/blade marks on shaft.
H12	Humerus	Chop	other superficial chop marks on shaft.
H13	Humerus	Cut	other knife cuts on shaft.
H14	Humerus	Cut	knife cuts near proximal end.
H15	Humerus	Chop	horizontal chops through proximal end.
H16	Humerus	Chop	axial chop on medial or lateral part of distal articulation running anterio-posteriorly.
H17	Humerus	Chop	horizontal/oblique chops through distal articulation.
H18	Humerus	Cut	horizontal knife cuts near distal end (not on medial).
H19	Humerus	Chop	other superficial horizontal chop marks distal end.
H2	Humerus	Chop	horizontal/oblique chop through distal surface of medial epicondyle.
H20	Humerus	Chop	horizontal/oblique chop through shaft.
H21	Humerus	Chop	Other superficial chop marks on distal articulation.
H22	Humerus	Chop	superficial axial chop mark
H23	Humerus	Chop	horizontal/oblique chop through or near distal end
H3	Humerus	Chop	axial/oblique chop through proximal articulation.
H4	Humerus	Chop	repeated axial chops through distal articulation running in anterio-posterior direction.
H5	Humerus	Chop	axial/oblique chop through shaft running in anterio-posterior direction.
H6	Humerus	Chop	repeated axial/oblique chops through shaft.
H7	Humerus	Chop	oblique/ anterio-posterior superficial chop marks on medial of distal articulation.
H8	Humerus	Chop/Saw	superficial chop/saw marks near proximal end.
H9	Humerus	Chop	axial/oblique chop through medial or lateral aspects of distal end.
J1	Mandible	Cut	dorso-ventral (or oblique) knife cuts – lateral diastema.

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
J10	Mandible	Cut	knife cuts on other parts of ramus.
J11	Mandible	Chop	cranio-caudal chop marks – lateral ramus near condyle.
J12	Mandible	Chop	chop/saw marks – caudal ramus on or below condyle.
J13	Mandible	Chop	chop/saw marks on other parts of ramus.
J14	Mandible	Cut	knife cuts below cheek tooth row (buccal).
J15	Mandible	Chop	superficial chop marks below cheek tooth row (buccal).
J16	Mandible	Chop/Saw	chop/saw marks on medial aspect of ramus near condyle.
J17	Mandible	Cut	knife cuts below cheek tooth row (lingual).
J18	Mandible	Chop	superficial chop marks below cheek tooth row (lingual).
J19	Mandible	Chop	dorso-ventral/cranio caudal chop through symphysis.
J2	Mandible	Cut	dorso-ventral (or oblique) knife cuts – medial diastema.
J20	Mandible	Cut	superficial blade marks on ventral or lateral of ramus/body
J21	Mandible	Chop	superficial chop marks on ventral or dorsal of diastema.
J22	Mandible	Chop	body chopped through
J3	Mandible	Cut	cranio-caudal knife cuts – lateral diastema.
J4	Mandible	Cut	cranio-caudal knife cuts – medial diastema.
J5	Mandible	Chop/Saw	dorso-ventral (or oblique) chop/saw marks – lateral diastema.
J6	Mandible	Chop/Saw	dorso-ventral (or oblique) chop/saw marks – medial diastema.
J7	Mandible	Chop	dorso-ventral/cranial-caudal chop though medial diastema.
J8	Mandible	Cut	cranio-caudal knife cuts – lateral ramus near condyle
J9	Mandible	Cut	other knife cuts on caudal part of ramus
M1	Metapodials	Chop	axial chop through proximal end in anterio-posterior direction.
M10	Metapodials	Cut	medio-lateral knife cuts on or near anterior aspect of proximal end.
M11	Metapodials	Cut	medio-lateral knife cuts on or near posterior aspect of proximal end.

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
M12	Metapodials	Cut	horizontal or oblique knife cuts around centre of shaft.
M13	Metapodials	Cut	horizontal knife cuts on or near distal end.
M14	Metapodials	Cut	superficial axial blade marks on shaft.
M15	Metapodials	Chop	superficial horizontal chop marks on medial/lateral aspects of proximal end.
M16	Metapodials	Chop	oblique chop through medial or lateral distal condyle running in posterio-anterior direction.
M17	Metapodials	Cut	Axial knife cuts.
M18	Metapodials	Chop	Superficial horizontal chop marks on or near distal end
M19	Metapodials	Cut	knife cuts on medial or lateral aspects of proximal
M2	Metapodials	Chop	axial chop through shaft in anterio-posterior direction.
M20	Metapodials	Chop	Axial chop through shaft in medio-lateral direction
M21	Metapodials	Chop	oblique/horizontal chops through proximal end.
M3	Metapodials	Chop	axial chop through distal end.
M4	Metapodials	Chop	repeated axial chops through proximal end.
M5	Metapodials	Chop	superficial medio-lateral chop marks on posterior aspect of proximal end.
M6	Metapodials	Chop	superficial medio-lateral chop marks on anterior aspect of proximal end.
M7	Metapodials	Chop	superficial horizontal chop marks on shaft.
M8	Metapodials	Chop	horizontal chop through shaft.
M9	Metapodials	Chop	horizontal chop through distal end.
P1	Pelvis	Chop/Saw	chop/saw marks on iliac tuberosity (articulation surface with sacrum).
P10	Pelvis	Chop/Saw	superficial chop/saw marks on shaft of ischium.
P11	Pelvis	Cut	superficial blade marks on ilium shaft.
P12	Pelvis	Cut	knife cuts on lateral aspect of shaft of ilium.
P13	Pelvis	Cut	other knife cuts on ilium.
P14	Pelvis	Cut	knife cuts in and around acetabulum.
P15	Pelvis	Cut	knife cuts on shaft of pubis.
P16	Pelvis	Cut	knife cuts on shaft of ischium.
P17	Pelvis	Cut	superficial blade marks on ischium.

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
P18	Pelvis	Chop	chop through ischial tuberosity.
P19	Pelvis	Cut	knife cuts under acetabulum
P2	Pelvis	Chop	dorsal-ventral/latero-medial chop through shaft of ilium.
P3	Pelvis	Chop/Saw	superficial dorso/ventral chop/saw marks on shaft of ilium.
P4	Pelvis	Chop/Saw	other superficial chop/saw marks on shaft of ilium.
P5	Pelvis	Chop	chop through acetabulum.
P6	Pelvis	Chop/Saw	superficial chop/saw marks in and around acetabulum.
P7	Pelvis	Chop	cranio-caudal/oblique chop through shaft of pubis.
P8	Pelvis	Chop/Saw	superficial chop/saw marks on shaft of pubis.
P9	Pelvis	Chop	chop through shaft of ischium.
PH1	Phalanges 1 & 2	Cut	medio-lateral knife cuts on anterior aspect of proximal end.
PH10	Phalanges 1 & 2	Chop	superficial chop marks on posterior aspect of shaft.
PH11	Phalanges 1 & 2	Chop	Axial chop through bone in anterio-posterior direction.
PH12	Phalanges 1 & 2	Chop	superficial chop marks on lateral/medial aspects of shaft running in posterio-anterior direction.
PH13	Phalanges 1 & 2	Chop	superficial chop marks on lateral/medial aspects of proximal running in posterio-anterior direction.
PH14	Phalanges 1 & 2	Chop	superficial axial chop marks.
PH15	Phalanges 1 & 2	Chop	proximal chopped through obliquely or horizontally
PH2	Phalanges 1 & 2	Cut	medio-lateral knife cuts on posterior aspect of proximal end.
PH3	Phalanges 1 & 2	Cut	anterio-posterior knife cuts on peripheral aspect of proximal end.
PH4	Phalanges 1 & 2	Cut	medio-lateral knife cuts on anterior aspect of shaft.
PH5	Phalanges 1 & 2	Cut	medio-lateral knife cuts on posterior aspect of shaft.
PH6	Phalanges 1 & 2	Cut	anterio-posterior knife cuts on peripheral or medial aspect of shaft.

Butchery Codes			
Classification	Element	Type	Definition
PH7	Phalanges 1 & 2	Cut	knife cuts at distal end.
PH8	Phalanges 1 & 2	Chop	superficial medio-lateral chop marks on posterior aspect of proximal end.
PH9	Phalanges 1 & 2	Chop	superficial medio-lateral chop marks on anterior aspect of proximal end.
Q1	Centroquartal	Chop	axial chop through bone running in anterio-posterior direction.
Q2	Centroquartal	Chop/Saw	superficial chop/saw marks posterior/lateral surfaces.
Q3	Centroquartal	Chop/Saw	superficial chop/saw marks anterior/medial surfaces.
Q4	Centroquartal	Cut	knife cuts on anterior aspect (+ medial and lateral).
Q5	Centroquartal	Cut	knife cuts on posterior aspect.
Q6	Centroquartal	Chop	axial chops in medio-lateral direction.
R1	Radius	Chop	axial chop through proximal articulation running in anterio-posterior direction.
R10	Radius	Chop	horizontal superficial chop marks at distal end.
R11	Radius	Cut	horizontal knife cuts on medial aspect of proximal end.
R12	Radius	Cut	horizontal knife cuts at distal end.
R13	Radius	Cut	knife cuts on shaft.
R14	Radius	Chop	superficial axial chop/blade marks on shaft.
R15	Radius	Chop	superficial axial chop/blade marks at proximal end.
R16	Radius	Chop	horizontal/oblique chop through shaft.
R17	Radius	Chop	horizontal chop through proximal end.
R18	Radius	Chop	horizontal chop through distal end.
R19	Radius	Chop	axial chop on lateral part of proximal articulation running anterio-posteriorly.
R2	Radius	Chop	axial chop through proximal articulation running in medio-lateral direction.
R20	Radius	Chop	axial chop on anterior part of distal end running medio-laterally.
R21	Radius	Chop	superficial axial chop marks on distal posterior running medio-laterally.
R22	Radius	Chop	superficial chop mark on proximal articular surface

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
R23	Radius	Cut	knife cut on proximal end (not medial aspect)
R24	Radius	Chop	other axial chops through distal end.
R25	Radius	Chop	oblique chop through proximal end.
R26	Radius	Saw	horizontal/oblique saw through shaft
R3	Radius	Chop	repeated axial chops through proximal articulation running in anterio-posterior direction.
R4	Radius	Chop	repeated axial chops through proximal articulation running in anterio-posterior and medio-lateral directions.
R5	Radius	Chop	axial chop through distal articulation running in anterio-posterior direction.
R6	Radius	Chop/Saw	superficial chop/saw marks on shaft.
R7	Radius	Chop	axial chop through shaft running in anterio-posterior direction.
R8	Radius	Chop	repeated axial chops through shaft running in anterio-posterior direction.
R9	Radius	Chop	superficial horizontal chop marks on medial aspect of proximal end.
RB1	Ribs	Chop	dorsal end chopped through
RB2	Ribs	Chop	superficial chop marks on and around dorsal end.
RB3	Ribs	Chop	shaft chopped through horizontally.
RB4	Ribs	Chop	superficial chop marks on lateral of shaft.
RB5	Ribs	Chop	superficial chop marks on medial of shaft.
RB6	Ribs	Cut	knife cuts on or around dorsal articulation.
RB7	Ribs	Cut	knife cuts on lateral aspect of shaft.
RB8	Ribs	Cut	knife cuts on medial aspect of shaft.
S1	Scapula	Chop	axial/oblique chops through glenoid cavity running in latero-medial direction.
S10	Scapula	Cut	axial knife cuts on medial and posterior aspects of blade.
S11	Scapula	Cut	other knife cuts on lateral and anterior aspects of blade.
S12	Scapula	Cut	other knife cuts on medial and posterior aspects of blade.
S13	Scapula	Cut	knife cuts near proximal end.
S14	Scapula	Chop	other superficial chop marks on medial aspect of blade.
S15	Scapula	Chop	superficial chop marks running posterio-

Butchery Codes			
Classification	Element	Type	Definition
			anteriorally on glenoid cavity.
S16	Scapula	Chop	axial chop through lateral or medial edges of glenoid cavity running posterio-anteriorally.
S17	Scapula	Chop	superficial chop marks on posterior of shaft running medio-laterally or obliquely.
S18	Scapula	Chop	axial chop on anterior or posterior edge of glenoid cavity running medio-laterally.
S19	Scapula	Punch	perforation in blade.
S2	Scapula	Chop	repeated axial/oblique chops through glenoid cavity running in medio-laterally.
S20	Scapula	Chop	horizontal chop through neck or glenoid.
S21	Scapula	Cut	knife cuts on neck.
S22	Scapula	Chop	oblique/horizontal chop through blade.
S23	Scapula	Chop	superficial chop marks on neck
S24	Scapula	Chop	superficial chop marks on glenoid cavity running medio-laterally
S3	Scapula	Chop	horizontal superficial chop marks around rim of glenoid cavity.
S4	Scapula	Chop/Saw	axial chop/blade/saw marks lateral spine.
S5	Scapula	Chop/Saw	other axial chop/blade/saw marks on lateral aspect of blade.
S6	Scapula	Cut	superficial axial chop/blade marks medial/posterior and anterior aspects of blade.
S7	Scapula	Chop/Saw	other chop/blade/saw marks on lateral aspect of blade.
S8	Scapula	Cut	horizontal knife cuts around rim of glenoid cavity.
S9	Scapula	Cut	axial knife cuts on lateral and anterior aspects of blade including spine.
SK1	Skull	Chop	frontal/parietal/occipital chopped through centre in cranio-caudal direction.
SK10	Skull	Cut	knife cuts on nasal.
SK11	Skull	Chop	zygomaticus chopped through.
SK12	Skull	Chop	maxilla chopped through horizontally.
SK13	Skull	Chop	oblique chop through back of skull.
SK14	Skull	Chop	superficial horizontal chop mark on occipital condyles or sphenoid.
SK15	Skull	Cut	vertical or horizontal knife cuts on premaxilla or front of maxilla.

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
SK16	Skull	Cut	Blade marks on maxilla, zygomatic or frontal.
SK17	Skull	Cut	Knife cuts on or around occipital condyles.
SK18	Skull	Cut	Other knife cuts on frontal or parietal.
SK19	Skull	Chop	Other superficial chop marks on zygomatic or temporal.
SK2	Skull	Chop	horn core base chopped through.
SK20	Skull	Chop	Chop marks on nasal or lacrimal.
SK21	Skull	Chop	maxilla/premaxilla chopped through vertically
SK3	Skull	Chop	superficial chop marks at base of horn core.
SK4	Skull	Chop	occipital condyle and/or sphenoid chopped through.
SK5	Skull	Chop	chop mark through frontal in medio-lateral direction.
SK6	Skull	Cut	cranio-caudal/oblique knife cuts on zygomatic or temporal.
SK7	Skull	Chop	superficial chopmarks on top of skull (frontal/parietal).
SK8	Skull	Cut	cranio-caudal/oblique knife cuts on maxilla.
SK9	Skull	Cut	knife cuts on frontal near horn core.
T1	Tibia	Chop	superficial horizontal/oblique chop marks at proximal end.
T10	Tibia	Cut	horizontal knife cuts on shaft.
T11	Tibia	Cut	horizontal knife cuts at distal end.
T12	Tibia	Cut	superficial blade marks on shaft.
T13	Tibia	Chop	other superficial horizontal/oblique chop marks on shaft
T14	Tibia	Chop	horizontal/oblique chop through distal end.
T15	Tibia	Chop	horizontal/oblique chop through proximal end.
T16	Tibia	Chop	horizontal/oblique chop through shaft.
T17	Tibia	Cut	oblique knife cuts on shaft.
T18	Tibia	Cut	oblique knife cuts near distal end.
T19	Tibia	Chop	axial chop through distal in medio-lateral direction.
T2	Tibia	Chop	axial chop through proximal usually running in posterio-anterior direction.
T20	Tibia	Chop	axial chop on edges of proximal articulation.
T21	Tibia	Chop	axial chop on edges of distal articulation.

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
T22	Tibia	Chop	superficial oblique chop mark on distal end
T3	Tibia	Chop	repeated axial chops through proximal.
T4	Tibia	Chop	axial chop through shaft running in posterio-anterior direction.
T5	Tibia	Chop	repeated axial chop through shaft.
T6	Tibia	Chop	Axial chop through distal running in posterio-anterior direction.
T7	Tibia	Chop	repeated axial chops through distal end.
T8	Tibia	Chop/Saw	superficial horizontal chop/saw marks on distal end.
T9	Tibia	Cut	knife cuts around proximal end.
U1	Ulna	Chop	Oblique/horizontal chop through olecranon.
U10	Ulna	Cut	Horizontal knife cuts at distal end.
U11	Ulna	Chop	superficial horizontal/oblique chop on shaft.
U12	Ulna	Chop	superficial horizontal/oblique chop marks on olecranon.
U13	Ulna	Chop	superficial horizontal/oblique chop marks on proximal articulation.
U14	Ulna	Cut	knife cuts on proximal joint surface.
U15	Ulna	Chop	axial chop through proximal running medio-laterally
U16	Ulna	Cut	knife cuts on posterio/anterior of olecranon
U17	Ulna	Chop	Superficial horizontal chop to top of tuber
U18	Ulna	Cut	knife cuts on proximal end (above articulation)
U2	Ulna	Chop	Axial chop through proximal joint surface.
U3	Ulna	Chop	Horizontal chop through proximal joint surface.
U4	Ulna	Chop	Axial blade/chop marks on posterior of shaft.
U5	Ulna	Chop	Oblique/horizontal chop through shaft.
U6	Ulna	Chop	Horizontal chop through distal end.
U7	Ulna	Cut	Oblique/horizontal knife cuts on medial of olecranon.
U8	Ulna	Cut	Oblique/horizontal knife cuts on lateral of olecranon.
U9	Ulna	Cut	Knife cuts on shaft.
V1	Vertebrae	Chop	axial chop through centre of bone in a cranio-caudal direction.
V10	Vertebrae	Cut	axial knife cuts on lateral aspect of body.

Butchery Codes			
Classification	**Element**	**Type**	**Definition**
V11	Vertebrae	Chop	horizontal chop through body.
V12	Vertebrae	Chop	other superficial chop marks.
V13	Vertebrae	Cut	cranio-caudal knife cuts on body.
V14	Vertebrae	Cut	knife cuts on dorsal.
V15	Vertebrae	Cut	other knife cuts.
V16	Vertebrae	Chop	oblique chop through body.
V17	Vertebrae	Chop	chop through dorsal.
V2	Vertebrae	Chop	axial chop through body of bone towards lateral in a cranio-caudal direction.
V3	Vertebrae	Chop	axial chop through lateral of bone in a cranio-caudal direction.
V4	Vertebrae	Chop	axial chop through bone in a medio-lateral/oblique direction.
V5	Vertebrae	Chop	superficial axial/cranio-caudal chop on centre of body.
V6	Vertebrae	Chop	superficial axial/cranio-caudal chop towards lateral of body.
V7	Vertebrae	Chop	superficial medio-lateral/oblique chop across body.
V8	Vertebrae	Cut	knife cuts on lateral surface.
V9	Vertebrae	Cut	medio-lateral knife cuts across body.
XP	*Extra	Chop	other chop mark
XS	*Extra	Saw	other saw mark
XT	*Extra	Cut	other cut mark

BURN (=burning):
S = singed
B = burnt
C = calcined
"blank" = absent or not recordable

GNAW (=gnawing):
C = gnawed by carnivores
D = partially digested
R = gnawed by rodents
U = gnawed by ungulates
H = gnawed by humans/primates
F = gnawed by felids
CR = gnawed by carnivores and rodents
"blank" = absent or not recordable

I1, I2, I3, I (all other than horse), dI1, dI2, dI3, dI, C (other than pig), dC , P1, P2, P3, P, dP2, dP3, P/M, M:
P = present
"blank" = absent

I1, I2, I3, I (horse):
U = unworn
W = worn
RI = round infundibulum
WI = worn with infundibulum
VW = very worn
EW = extremely worn

C (pig):
M = male
F = female
AM = male alveolus
AF = female alveolus
P = present
"blank" = absent

P4, dP4, M1, M2, M3, M12(=M1 or M2):
wear stage
P = present, but wear stage not recordable (or not recorded)
"blank" = absent

PATH:
C = calculus
H = hypoplasia (one band)
HH = hypoplasia (two or more bands)
CH = calculus and hypoplasia (one band)
CHH = calculus and hypoplasia (two or more bands)

Measurements:
All in tenths of millimetres.

Appendix 3: The database recorded from Princesshay.

Note that only two of the three tables included in the database described in Appendix 2: Recording Protocol are included here. The third table 'fragments' contains 18,216 individual records and it is considered far too large to reproduce in print. A copy is available from the author on request.

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
5858	EPH	2005	1	6777				HC	E	RA		B		F	0															
5859	EPH	2005	1	6777				HC	G	HU		B?		UD	3															
5860	EPH	2005	1	6719				HC	G	TI		B		F	B	T14					44									
5861	EPH	2005	1	6818				HC	G	UL		B	UD		C															
5862	EPH	2005	1	6776				HC	E	OTHRA		B	F		B	R16														
5863	EPH	2005	1	6714				HC	E	MT1	R	B		F	5	M8		C		49.5					47.1	20.6				
5864	EPH	2005	1	6713				HC	G	OTHRA		O	F		4															
5865	EPH	2005	1	6713				HC	E	PE		O			6								22.5							
5866	EPH	1998	2	509, T12				HC	E	UL		B			B	U3		C												
5867	EPH	1998	2	509, T12				HC	E	HU		S		G	2			C		31		20.6								
5868	EPH	1998	2	511, T16				HC	G	TI		O		F	6					23.2	19.1									
5869	EPH	1998	2	511, T13				HC	E	SH		BUU			6															
5870	EPH	1998	2	522, T16				HC	G	HU		O		F	3	H18		C		24.7		11.1								
5871	EPH	1998	2	531, T24				HC	G	HU		GNP			6					13.3										
5872	EPH	1998	2	531, T24				HC	G	MT1		O?	F	UD	C															
5873	EP	1998	2	524,				HC	E	MT1		B	F	F	C	M13			192.4	43.1	21.1	19.1		21	40.2	18.5	25.8			

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H			T13																										
5874	EPH	1998	2	511, T24				HC	A	AS		S			C															
5875	EPH	1998	2	519, T13				HC	E	UL		O?	UD		C															
5876	EPH	1998	2	519, T13				HC	E	MT1		B		F	2	M18				52.6	25.1	24.2			48.9	22.5	29.8			
5877	EPH	2005	3	2913				HC	A	CA		B	F		C				135.8		51									
5878	EPH	2005	3	2913				HC	E	HU		GNP			4					13.3										
5879	EPH	2005	3	2913				HC	B	TI		GNP			3					9	9.1									
5880	EPH	2005	3	2845				HC	M	SC		S	F		6	S16														
5881	EPH	2005	3	2845				HC	M	MC2		S	F	UD	C															
5882	EPH	2005	3	2845				HC	M	CA		O	UD		C						26									
5883	EPH	2005	3	2952		M		HC	G	P2		B	F		B	PH4														
5884	EPH	2005	3	2952		M		HC	M	RA		B		F	2	R10														
5885	EPH	2005	3	2592		M		HC	B	OTHU		B	F		5															THREE PIECES
5886	EPH	2005	3	2831				HC	G	P3		B	F		B	PH11														
5887	EPH	2005	3	2831				HC	E	P2		S	F		C															
5888	EPH	2005	3	2831				HC	G	SC		B	F		6	S1														
5889	EPH	2005	3	2831				HC	G	UL		S			6															
5890	EPH	2005	3	2831				HC	G	OTHRA		B	F		6	R14														
5891	EPH	2005	3	2831				HC	G	CA		B	UD		C						45.3									
5892	EPH	2005	3	2831				HC	G	CA		B	UD		B	C3														
5893	EPH	2005	3	2831				HC	G	CA		B	F		B	C3			127.3		49.1									
5894	EPH	2005	3	2831				HC	E	OTHTI		S	UD		6															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
5895	EPH	2005	3	2831				HC	G	RA		S		F	6															
5896	EPH	2005	3	2831				HC	G	OTHRA		O	F		6															
5897	EPH	2005	3	2831				HC	G	SC		S	F		6															
5898	EPH	2005	4	5740		HM		HC	E	AS		B			C	A19			67.6	42	35.6	61.1								
5899	EPH	2005	4	5740		HM		HC	E	HC		B			6															
5900	EPH	2005	4	5736				HC	G	OTHRA		B	F		6	R2														
5901	EPH	2005	4	5736				HC	G	TI		O		F	6					22.9	19									
5902	EPH	2005	4	5736				HC	G	MT1		O	F	UD	C															SLIGHT BULGE MID-SHAFT
5903	EPH	2005	4	5736				HC	G	P2		B	F		C															IRON ADHESION
5904	EPH	2005	4	5736				HC	G	MT1		B		F	4					52.4	25.6	23.8			50.9	20.8	29.4			
5905	EPH	2005	4	5736				HC	G	MT1		B		F	6							19.8			38.3	18.2				
5906	EPH	2005	4	5736				HC	G	SC		O?	UD		6		B							9.7						
5907	EPH	2005	4	5736				HC	G	CA		O?	UD		C						25									
5909	EPH	2005	4	5757				HC	E	OC		EQ			C															
5910	EPH	2005	4	5757				HC	M	SC	L	B	F		6	S16														
5911	EPH	2005	4	5757				HC	M	SC	L	B	F		6	S24														
5912	EPH	2005	4	5757				HC	G	MC2		S	F	UD	C															
5913	EPH	2005	4	5757				HC	B	PE		S?			6								26.4							
5915	EPH	2005	4	5767		HM		HC	G	HC		B			B	XP														AXIAL CHOP
5916	EPH	2005	4	5767		HM		HC	E	ZY		B			C															
5917	EPH	2005	4	5767		HM		HC	E	OC		B			B	XP														
5918	EPH	2005	4	5767		HM		HC	G	AT		O			C	XT														OBLIQUE CUT; VENTRAL; CRANIAL
59	E	20	4	57		HM		H	G	CA		B	UD		B	C4		C												

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
19	PH	05		67				C																						
5920	EPH	2005	4	5765		HM		HC	G	UL		S			6															
5921	EPH	2005	4	5767		HM		HC	M	OTHRA		B	F		5															
5922	EPH	2005	4	5767		HM		HC	G	SC	L	B	F		6															
5923	EPH	2005	4	5767		HM		HC	M	SC	L	B	F		6			R												
5924	EPH	2005	4	5767		HM		HC	G	OTHRA		O?	F		3															
5925	EPH	2005	4	5767		HM		HC	G	RA		O	F	F	C				141.7					14.3						TWO PIECES
5926	EPH	2005	4	5767		HM		HC	G	MT1		B?		UD	4															
5927	EPH	2005	4	5767		HM		HC	G	OTHU		B?			6															
5928	EPH	2005	4	5767		HM		HC	E	UL		O?	UD		C															
5929	EPH	2005	4	5767		HM		HC	G	HU		O	F	F	C				123.5	25.9		12.7		12.9						
5930	EPH	2005	4	5767		HM		HC	G	PE		O			6								18.4							
5931	EPH	2005	4	5767		HM		HC	G	P1		O?	UD		6															NEW BREAK
5932	EPH	2005	4	5767		HM		HC	G	CO		GNP			6															
5933	EPH	2005	4	5767		HM		HC	G	HU		GNP			6															
5934	EPH	2005	4	5767		HM		HC	G	TI		GNP			6															
5935	EPH	2005	4	5767		HM		HC	G	MT1		GNP			6															
5936	EPH	2005	4	5767		HM		HC	G	FE		GNP	J		C															
5937	EPH	2005	4	5767		HM		HC	B	RA		GNP	J		C															
5938	EPH	2005	4	5767		HM		HC	G	UL		GNP	J		C															
5939	EPH	2005	5	2699	2547	LM		HC	E	AX		B			B	V1; V9														
5940	EPH	2005	5	2699	2547	LM		HC	E	AX		B			B	V3; V9														
5941	EPH	2005	5	2699	2547	LM		HC	E	HU		B		UD	0															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
5942	EPH	2005	5	2699	2547	LM		HC	E	OTHFE		B	UD		1															
5943	EPH	2005	5	2699	2547	LM		HC	G	HC		B			6															
5944	EPH	2005	5	2699	2547	LM		HC	G	AS		B			B	A7				33.5		51.9								
5945	EPH	2005	5	2699	2547	LM		HC	G	AS		B			6					43.1		56.2								
5946	EPH	2005	5	2699	2547	LM		HC	G	AS		B			6					33.4		52.8								
5947	EPH	2005	5	2699	2547	LM		HC	G	HC		B			6															
5948	EPH	2005	5	2699	2547	LM		HC	G	CA		B	UD		C						43.5									
5949	EPH	2005	5	2699	2547	LM		HC	G	CA		B	UD		C															
5950	EPH	2005	5	2699	2547	LM		HC	G	CA		B	F		B	C3														
5951	EPH	2005	5	2699		LM		HC	G	HU		ANS			N					22.2										
5952	EPH	2005	5	2699		LM		HC	G	HU		O	UD	F	N							14.5								
5953	EPH	2005	5	2699	2547	LM		HC	G	OTHTI		B	F		6															
5954	EPH	2005	5	2699	2547	LM		HC	M	TI		B		F	6															
5955	EPH	2005	5	2699	2547	LM		HC	M	TI		B		F	3	T22														
5956	EPH	2005	5	2699		LM		HC	B	MP1		EQ		F	6					47.3										
5957	EPH	2005	5	2699		LM		HC	G	MC1	L	O	F	G	C				114.1			10.2			22.6	9.3	14.2	9.6	14.5	
5958	EPH	2005	5	2699		LM		HC	B	MC1	R	O		G	6					22.6	9.9	11		12.3	22.3	8	13.6	8.8	14.5	
5959	EPH	2005	5	2699	2547	LM		HC	G	MT1	L	B		F	4										48.5	21.2	28.3	22.4	28.9	
5960	EPH	2005	5	2699		LM		HC	G	OTHRA		O	G		3															
5961	EPH	2005	5	2699		LM		HC	B	RA		O		F	5	R13														
5962	EPH	2005	5	2699		LM		HC	E	RA		O		F	6	R12; R13		C												
5963	EPH	2005	5	2699	2547	LM		HC	G	P1		B	F		C															
5964	EP	2005	5	2699	2547	LM		HC	G	P1		B	F		C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
5965	EPH	2005	5	2699	2547	LM		HC	G	P1		B	F		C															
5966	EPH	2005	5	2699		LM		HC	M	FE		CAC	F	F	C	F8			178.2		18.5			12.4						
5967	EPH	2005	5	2699		LM		HC	M	TI		S		UD	6															
5968	EPH	2005	5	2699		LM		HC	M	TI		O	UD	UD	C															
5969	EPH	2005	5	2699		LM		HC	B	SC	R	CAF	F		6									23.8						
5970	EPH	2005	5	2699		LM		HC	M	SC	L	O	F		6									21.9						
5971	EPH	2005	5	2699		LM		HC	M	SC	R	O	F		6	S12		C						21.5						
5972	EPH	2005	5	2699		LM		HC	M	SC	L	S	F		N									24.3						
5973	EPH	2005	5	2699	2547	LM		HC	M	SC		B	G		B	S1														
5974	EPH	2005	5	2699	2547	LM		HC	M	PE		B			C								41.1							COPPER STAINING UNDER ACETABULUM
5975	EPH	2005	5	2699	2547	LM		HC	M	PE		B			B	P12														COPPER STAINING UNDER ACETABULUM
5976	EPH	2005	5	2699		LM		HC	M	PE		O			C															
5977	EPH	2005	5	2699		LM		HC	M	PE		O?			C															
5978	EPH	2005	5	2699		LM		HC	M	PE		O?			C															
5979	EPH	2005	5	2699		LM		HC	M	SC		O?	F		6	S1								17.5						
5980	EPH	2005	5	2699		LM		HC	M	MCIV		S	UD		6															
5981	EPH	2005	5	2699		LM		HC	M	P1		O	F		C															
5982	EPH	2005	5	2699		LM		HC	G	SC		STE			C															
5983	EPH	2005	5	2699		LM		FS <5	G	PE		O?			6															
5984	EPH	2005	5	2699	2547	LM		FS <5	M	OTHU		B?	UE		6			C												
5985	EPH	2005	5	2699		LM		FS <5	B	OTHFE		RAR	F		6															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
5986	EPH	2005	6	720		EM		HC	E	P3		B	F		C															
5987	EPH	2005	6	720		EM		HC	E	AS		B			C				63.5	39.8	35.4	57.8								
5988	EPH	2005	6	720		EM		HC	B	CA		O	UD		C						28.7									
5989	EPH	2005	6	720		EM		HC	B	CA		B	UD		C						49.9									
5990	EPH	2005	6	720		EM		HC	M	CA		B			C			C			44.7									
5992	EPH	2005	6	720		EM		HC	G	AX		B			B	V3		C												
5993	EPH	2005	6	720		EM		HC	G	UL		B			6															
5994	EPH	2005	6	720		EM		HC	G	SC	L	B			6									49.9						
5995	EPH	2005	6	720		EM		HC	G	SC		B			B	S2; S6														
5996	EPH	2005	6	720		EM		HC	G	PE	L	B			B	P5														
5997	EPH	2005	6	720		EM		HC	G	PE	R	B			B	P5														
5998	EPH	2005	6	720		EM		HC	G	MC 1		O		G	4	M12														
5999	EPH	2005	6	720		EM		HC	M	OT HU	L	S		F	4			C												
6000	EPH	2005	6	720		EM		HC	G	RA		B		G	1															
6001	EPH	2005	6	720		EM		HC	M	OT HRA		B	F		B	R1														
6002	EPH	2005	6	720		EM		HC	G	FE		B		UE	6			C												
6003	EPH	2005	6	720		EM		HC	G	FE		B		F	B	F5		C												
6004	EPH	2005	6	720		EM		HC	G	TI		O		F	2					25.2	20.3									
6005	EPH	2005	6	720		EM		HC	G	TI		S	UD	UD	C	T10														
6006	EPH	2005	6	720		EM		HC	E	OT HTI		B	F		3	T13														
6007	EPH	2005	6	720		EM		HC	G	OT HFE		S	UD		1	F12														
6008	EPH	2005	6	720		EM		HC	G	RA		S	UD	UD	C															NEONATAL
6009	EP	2005	7	3793		EM		HC	M	OC	L	O			C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6010	EPH	2005	7	3793		EM		HC	M	OC	R	O			C															
6011	EPH	2005	7	3793		EM		HC	M	P3		B			C															
6012	EPH	2005	7	3793		EM		HC	B	MC1		B		G	6						22.4				43.2	19.1		18.4		
6013	EPH	2005	7	3793		EM		HC	B	OTHRA		B	F		4															
6014	EPH	2005	7	3793		EM		HC	M	OTHRA		O	F		2															
6015	EPH	2005	7	3793		EM		HC	E	HU		GNP			C				61.6	13.1				6.1						
6016	EPH	2005	7	3793		EM		HC	G	UL		B			6															
6017	EPH	2005	7	3793		EM		HC	A	PE		O			C								20.6							
6018	EPH	2005	7	3793		EM		HC	M	OTHU		B	UE		6															
6019	EPH	2005	7	3793		EM		HC	M	OTHU		S	G		5	H3														
6020	EPH	2005	7	3973		EM		HC	M	TI		B		F	B	T8														
6021	EPH	2005	7	3793		EM		HC	G	TI		RAN			C															
6022	EPH	2005	7	3793		EM		HC	M	MC1		GNP			6															
6023	EPH	2005	7	3795		EM		HC	G	OC	L	EQ			C															
6024	EPH	2005	7	3795		EM		HC	G	OC	R	EQ			C															
6025	EPH	2005	7	3795		EM		HC	G	HU		B		F	2	H2														
6026	EPH	2005	7	3795		EM		HC	G	FE		O?		UD	2	F9														
6027	EPH	2005	7	3796		EM		HC	G	MC1		O	F	F	C			C	113.8	24.5	11.2	11.7		14	23.7	10.8	15.4	10.4	15.3	
6028	EPH	2005	7	3796		EM		HC	G	HC		B			B	SK2														
6029	EPH	2005	7	3794		EM		HC	G	UL		GNP			C															
6030	EPH	2005	7	3794		EM		HC	G	P1		O	G		C															
6031	EPH	2005	7	3794		EM		HC	M	P1		B	F		C															
60	E	20	7	37		EM		H	G	P2		B	F		C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
32	PH	05		94				C																						
6033	EPH	2005	7	3794		EM		HC	M	AS		B			6					36.4		51.9								
6035	EPH	2005	7	3794		EM		HC	G	TI		O		F	5	T8				24.8	19									
6036	EPH	2005	7	3797		EM		HC	M	HC		B			B	SK2														
6037	EPH	2005	7	3797		EM		HC	A	HU		O?		F	3															
6038	EPH	2005	7	3798		EM		HC	G	RA		O	F	UD	C															
6039	EPH	2005	7	3798		EM		HC	B	RA		O		UD	3															
6040	EPH	2005	9	5613		EM		HC	B	TI		PIP?			6															
6041	EPH	2005	11	1838		EM		HC	G	TI		B		F	5					58.5										
6042	EPH	2005	11	1838		EM		HC	A	OTHTI		B	F		1															
6043	EPH	2005	11	1838		EM		HC	B	UL		B			6															
6044	EPH	2005	11	1838		EM		HC	B	CA		B	F		C			C												
6045	EPH	2005	11	1838		EM		HC	M	PE		EQ			6								54							
6046	EPH	2005	11	1838		EM		HC	M	SC	R	B			6									41.8						
6047	EPH	2005	11	1838		EM		HC	B	SC	L	O?			6									18.2						
6048	EPH	2005	11	1838		EM		HC	B	MP1		B?		F	B	M3														
6049	EPH	2005	11	1840	1835	EM		HC	B	TI		B		F	6															
6050	EPH	2005	11	1840	1835	EM		HC	A	CA		B			C															
6051	EPH	2005	11	1842		EM		HC	M	CA		EQ	G		C				105.3		48.2									
6052	EPH	2005	11	1842	1835	EM		HC	M	FE		B		F	B	F5		C												
6053	EPH	2005	11	1845	1835	EM		HC	M	P2		B	F		C															
6054	EPH	2005	11	1845	1835	EM		HC	A	UL		B			6															
6055	EPH	2005	11	1845		EM		HC	G	UL		S	UD		B	U9														

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6056	EPH	2005	11	1845	1835	EM		HC	G	SC	R	B	F		N									43.4						
6057	EPH	2005	11	1845	1835	EM		HC	G	SC	L	B	F		6															
6058	EPH	2005	11	1845		EM		HC	G	OTHRA		O	F		6															
6059	EPH	2005	11	1845	1835	EM		HC	G	TI		B		F	3	T10; T14														
6060	EPH	2005	11	1845		EM		HC	G	TI		O		F	0															
6061	EPH	2005	11	1845		EM		HC	B	TI		O		F	5					23.8	17									
6062	EPH	2005	11	1845	1835	EM		HC	M	CA		B	UD		B	C9														
6063	EPH	2005	11	1845	1835	EM		HC	G	HU		B			B	H17				59.7		28.1								
6064	EPH	2005	11	1845		EM		HC	B	MC1		O			6			C												
6065	EPH	2005	11	1845		EM		HC	A	MC1		O	F	UD	C															IRON ADHESION
6066	EPH	2005	13	2637	2658	HM		HC	A	CA		B?			C			C												
6067	EPH	2005	14	3804		HM		HC	M	TI		GNP			6					10.1	9.9									
6068	EPH	2005	14	3809		HM		HC	G	OC	L	B			C	SK2														
6069	EPH	2005	14	3809		HM		HC	G	OC	R	B			C	SK2														
6070	EPH	2005	14	3843		HM		HC	M	RA		O		G	3															
6071	EPH	2005	14	3843		HM		HC	G	FE		GNP			C				70.2	18.3	12.1	5.2		5.8						
6072	EPH	2005	14	3843		HM		HC	G	CO		GNP			C															
6073	EPH	2005	14	3843		HM		HC	G	CO		GNP	J		C															
6074	EPH	2005	14	3843		HM		HC	G	HU		O?	UD	UD	C															FOETAL
6075	EPH	2005	14	3843		HM		HC	G	RA		O?	UD	UD	C															FOETAL
6076	EPH	2005	14	3974		HM		HC	A	CA		O?	UD		C			C												
6077	EPH	2005	14	3975		HM		HC	B	RA		B	UE		B	R18														
6078	EP	2005	14	3975		HM		HC	B	HU		S		F	1															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6079	EPH	2005	14	3976		HM		HC	B	RA		O?		UD	4															
6080	EPH	2005	16	2540		HM		HC	B	UL		O			6															
6081	EPH	2005	16	2540		HM		HC	G	ZY	R	O			6															
6082	EPH	2005	16	2540		HM		HC	M	AS	R	CEE?			C	A9			56.7	36	31.4	50.5								
6083	EPH	2005	16	2540		HM		HC	M	SC	R	O	F		6	S24								18.1						
6084	EPH	2005	16	2540		HM		HC	M	AS	R	O			C				23.6	14.8	12.8	22.8								
6085	EPH	2005	16	2540		HM		HC	A	AS		S?			C			D												
6086	EPH	2005	16	2540		HM		HC	M	HU		O		F	3					28.3										
6087	EPH	2005	16	1884	1883	HM		HC	G	P2		B	F		C															
6088	EPH	2005	16	1884	1883	HM		HC	G	P2		B	F		C															
6089	EPH	2005	16	1884	1883	HM		HC	M	P2		B	F		C															
6090	EPH	2005	16	1884	1883	HM		HC	M	P1		B	G		C															
6091	EPH	2005	16	1884	1883	HM		HC	M	UL		B			6															
6092	EPH	2005	16	1884		HM		HC	G	SC		O?	UD		C									9.8						NEONATAL
6093	EPH	2005	16	1884	1883	HM		HC	A	OTHRA		B			2															
6094	EPH	2005	16	1884	1883	HM		HC	A	AS		B			C			D												
6095	EPH	2005	16	1884	1883	HM		HC	A	AS		B			C			D												
6096	EPH	2005	16	1884	1883	HM		HC	G	MP1		B		UE	6															
6097	EPH	2005	16	1884		HM		HC	M	MC1		O		F	4										21.2	8.5	13.1			
6098	EPH	2005	16	1884	1883	HM		HC	B	MC1		B	F	F	C	M12; M13		C	196.7					35.1	57.3					
6099	EPH	2005	16	1884	1883	HM		HC	M	SCU		B			C															
6100	EPH	2005	16	1884	1883	HM		HC	B	SCU		B			C															
61	E	20	16	18	188	HM		H	B	P1		B	F		C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
01	PH	05		84	3			C																						
6102	EPH	2005	16	1884	1883	HM		HC	B	P1		B	F		C															
6103	EPH	2005	16	1884	1883	HM		HC	B	P1		B	F		C															
6104	EPH	2005	16	1884	1883	HM		HC	B	P1		B	F		C		B													
6105	EPH	2005	16	1884	1883	HM		HC	M	P2		B	F		C															
6106	EPH	2005	16	1884	1883	HM		HC	A	P2		B	F		C															
6107	EPH	2005	16	1884		HM		HC	B	P1		O	F		C															
6108	EPH	2005	16	1884		HM		HC	A	P1		O	F		C															
6109	EPH	2005	16	1884		HM		HC	M	P1		S	UD		C															
6110	EPH	2005	16	1884	1883	HM		HC	G	AS	L	B			C				55.9	38.6	31	51.1								
6111	EPH	2005	16	1884	1883	HM		HC	B	AS	L	B			B	A18		C												
6112	EPH	2005	16	1884		HM		HC	M	P1		O	F		C															
6113	EPH	2005	16	1884		HM		HC	M	P1		O	F		C															
6114	EPH	2005	16	1884		HM		HC	B	P2		S	UD		C															
6115	EPH	2005	16	1884		HM		HC	A	AS		S			C			D												
6116	EPH	2005	16	1884		HM		HC	M	AS	L	O			C				25.2	16.8	14.3	24.2								
6117	EPH	2005	16	1884	1883	HM		HC	M	ZY	R	B			C															
6118	EPH	2005	16	1884		HM		HC	M	SC		O	F		6	S16														
6119	EPH	2005	16	1884	1883	HM		HC	G	OTHTI	L	B	UX		1					28	25.9									
6120	EPH	2005	16	1884		HM		HC	M	PE	R	O			6								21.5							
6121	EPH	2005	16	1884		HM		HC	M	PE	R	O			6								23.4							
6122	EPH	2005	16	1884		HM		HC	M	TI		O		UE	6															
6123	EPH	2005	16	1884		HM		HC	B	MP1		O		F	6															

bones

ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6124	EPH	2005	16	1884		HM		HC	B	MP1		O		F	6															
6125	EPH	2005	16	1884		HM		HC	B	MP1		O		F	6			C												
6126	EPH	2005	16	1884	1883	HM		HC	M	MP1		B		F	6															
6127	EPH	2005	16	1884	1883	HM		HC	M	MP1		B		F	6		C													
6128	EPH	2005	16	1884		HM		HC	B	OTHFE		O?	UE		6															
6129	EPH	2005	16	1884		HM		HC	B	OTHRA		O?	UD		N															
6130	EPH	2005	16	1884	1883	HM		HC	B	MT1		B		F	6		C													
6131	EPH	2005	16	1884		HM		HC	M	MC1		O		F	3					21.6	9.2				21.6	8.5		8.2	12.6	
6132	EPH	2005	16	1884		HM		HC	M	MC1		O		F	3					23.7	10	10.8			23.1			9.4		
6133	EPH	2005	16	1884		HM		HC	B	MC1		O		F	6					22.7	10.6	10.6			22.6	9.4	13.7	9.2	13.4	
6134	EPH	2005	16	1884		HM		HC	B	MC1		O		F	1															
6135	EPH	2005	16	1884		HM		HC	M	OTHTI	R	O	G		1	T13														
6136	EPH	2005	16	1884		HM		HC	M	TI	L	O?	UD	UD	C															
6137	EPH	2005	16	1884		HM		HC	M	TI	L	O		F	5						16.9									
6138	EPH	2005	16	1884		HM		HC	B	SC	R	S?	F		6															
6139	EPH	2005	16	1884	1883	HM		HC	A	AS	R	B?			C			C												
6140	EPH	2005	16	1884	1883	HM		HC	A	MC1		B		UD	4															
6141	EPH	2005	16	1884		HM		HC	M	HU	L	O?		UD	6															NEONATAL
6142	EPH	2005	16	1884		HM		HC	M	HU	R	O?		UD	6															NEONATAL
6143	EPH	2005	16	1884		HM		HC	M	RA		O?	UD	UD	6															NEONATAL
6144	EPH	2005	16	1884		HM		HC	M	OTHFE	L	O?		UD	B	F20														NEONATAL
6145	EPH	2005	16	1884		HM		HC	M	FE	R	O?		UD	6															NEONATAL
6146	EP	2005	16	1884		HM		HC	M	TI		O?		UD	6															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6147	EPH	2005	16	1884		HM		HC	M	MCIV		S	UD		6															
6148	EPH	2005	16	1884		HM		HC	M	FE		O		UE	B	F8														
6149	EPH	2005	16	1884		HM		HC	M	CO		GNP			C															
6150	EPH	2005	16	1884		HM		HC	M	CO		GNP	J	J	C															
6151	EPH	2005	16	1884		HM		HC	M	CR		ANS			6															
6152	EPH	2005	16	1884		HM		HC	B	P1		GNP			6															
6153	EPH	2005	16	1884		HM		HC	M	UL		SCR			2															
6154	EPH	2005	16	1884		HM		HC	G	HU		TU			C				30.2	7.4				3						
6155	EPH	2005	7	3795		EM		HC	G	SU		EQ			C															
6156	EPH	2005	16	1884		HM		HC	G	UL		ANS			3															
6157	EPH	2005	16	1884		HM		HC	A	FE		GNP			5															
6158	EPH	2005	16	1884		HM		HC	B	TI		GNP			5															
6159	EPH	2005	16	1884		HM		HC	M	HU		GNP	J		6															
6160	EPH	2005	16	1884		HM		HC	M	SC		GNP			6															
6161	EPH	2005	16	1884	1883	HM		HC	B	HU		B		F	6	H1														
6162	EPH	2005	16	1884		HM		HC	G	HC		O			6					22.1	16.5									
6163	EPH	2005	16	1884		HM		HC	M	CR		ANA			C															
6164	EPH	2005	16	1884		HM		HC	B	SC		O	F		6															
6165	EPH	2005	16	1884		HM		HC	B	SCU		O			C															
6166	EPH	2005	17	1886		EM		HC	M	SC		GNP			6	S21														
6167	EPH	2005	17	1886		EM		HC	M	HC	R	B			B	SK2				51.9										
6168	EPH	2005	17	1886		EM		HC	M	HC	L	B			B	SK2					41.5									
61	E	20	17	18		EM		H	M	HC	R	B			C					48										

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
69	PH	05		86				C												.8										
6170	EPH	2005	17	1886		EM		HC	M	UL		S			6															
6171	EPH	2005	17	1886		EM		HC	M	RA		S	F	UD	C															
6172	EPH	2005	17	1886		EM		HC	G	MT1		O	F	F	C				135.5	23.7	11.6	10.3			23.5	10.2	16.4	9.6	15	
6173	EPH	2005	17	1886		EM		HC	B	TI		S			2															
6174	EPH	2005	17	1886		EM		HC	B	SC		S			6									21.3						
6175	EPH	2005	17	1886		EM		HC	M	PE		B			6								57.4							
6176	EPH	2005	17	1886		EM		HC	G	HU		B		F	2	H1		C												
6177	EPH	2005	17	1886		EM		HC	G	MC1		S	F	UD	C															
6178	EPH	2005	17	1886		EM		HC	M	MP1		B		F	2			C												
6179	EPH	2005	17	1886		EM		HC	G	TI		GNP	F		1		B													
6180	EPH	2005	17	1886		EM		HC	G	MC1		O	F	F	C				131.2	21.3	11.9	12.3			26.2	10.8	16.6	11.4	17.1	
6181	EPH	2005	17	1886		EM		HC	G	TI		GNP	F		C															
6182	EPH	2005	17	1886		EM		HC	G	TI		GNP	J	J	C															
6183	EPH	2005	17	1886		EM		HC	G	MT1		GNP	J	J	C															
6184	EPH	2005	17	1886		EM		HC	M	HU		B		F	1	H17														
6185	EPH	2005	17	1886		EM		HC	M	PE	R	B			6	P9														
6186	EPH	2005	17	1887		EM	370	FS<5	M	MC1		GNP			C															
6187	EPH	2005	17	1887		EM	370	FS<5	M	P2		S	F		C															
6188	EPH	2005	17	1954		EM		HC	B	OTHRA		O?	F		6															
6189	EPH	2005	17	1954		EM		HC	M	UL		S	UD		C															
6190	EPH	2005	17	1955		EM		HC	B	P1		B	F		6															
6191	EPH	2005	17	1955		EM		HC	E	AS	L	B			C				57.4	37.2	3.9	52.3								

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6192	EPH	2005	17	1955		EM		HC	B	OTHRA		O?	F		4															
6193	EPH	2005	17	1955		EM		HC	G	MT2		CAF	F	UD	C															
6194	EPH	2005	17	1955		EM		HC	G	MTIII		CAF	F	UD	C															
6195	EPH	2005	17	1955		EM		HC	G	MTIV		CAF	F	UD	C															
6196	EPH	2005	17	1955		EM		HC	M	UL		B			6	U17														FUSED TO RADIUS
6197	EPH	2005	17	1955		EM		HC	M	OTHRA		B	F		1	R13														FUSED TO ULNA
6198	EPH	2005	17	1955		EM		HC	B	P1		B	F		C															
6199	EPH	2005	17	1955		EM		HC	B	P1		O	F		C															
6200	EPH	2005	17	1955		EM		HC	M	SC		O?	F		6		B													
6201	EPH	2005	17	1956		EM		HC	M	MT1		GNP			C				63	10.9				5						
6202	EPH	2005	17	1956		EM		HC	B	FE		GNP			C				801	15.7	10.7		6.8	6.9						
6203	EPH	2005	17	1956		EM		HC	M	SC	R	O	F		6									17.9						
6204	EPH	2005	17	1956		EM		HC	B	UL		B	UD		6															
6205	EPH	2005	17	1956		EM		HC	B	PE		B			B	P9; P12							46.4							
6206	EPH	2005	17	1956		EM		HC	B	MT1		B		F	4					52.7	25.1	24			47.5	27.6	22.1	27.1	20.2	
6207	EPH	2005	17	1957		EM		HC	M	OTHFE		S	G		4	F22														
6208	EPH	2005	18	960	831	EM		HC	M	TI		B		G	2	T8; T19														
6209	EPH	2005	18	960		EM		HC	B	OTHRA		S	F		6															
6210	EPH	2005	18	960		EM		HC	B	SC	L	O	G		C									10.9						
6211	EPH	2005	18	960		EM		HC	G	AS	L	O			C	A17			28.8	19.6	15.4	28								
6212	EPH	2005	18	960		EM		HC	G	PE	L	O			0	P9							21.9							
6213	EPH	2005	18	960	831	EM		HC	M	OTHRA		B	F		1															
6214	EP	2005	18	960	831	EM		HC	E	PE		B			6	P5														

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6215	EPH	2005	18	903	831	EM		HC	G	P1		B			C															
6216	EPH	2005	18	903	831	EM		HC	G	P3		B			C															
6217	EPH	2005	18	903		EM		HC	G	HU		ANS			5	H18				23.5										
6218	EPH	2005	18	903		EM		HC	G	CO		GNP			C															
6219	EPH	2005	18	903	831	EM		HC	M	MP1		B		G	B	M17				54.9	25.6	26.4			50.7	26.5	19.6		21.2	
6220	EPH	2005	18	903		EM		HC	G	TI		EQ		F	B	T7; T16														
6221	EPH	2005	18	903		EM		HC	G	TI	R	S	UD	UD	C															
6222	EPH	2005	18	903		EM		HC	G	FE	L	S	UD	UD	C															
6223	EPH	2005	18	903		EM		HC	G	TI		S	UD		6															
6224	EPH	2005	18	903		EM		HC	G	RA		S	UD	UD	C															
6225	EPH	2005	18	903		EM		HC	G	UL		S			6															
6226	EPH	2005	18	903		EM		HC	G	MTIV		S	UD	UD	C															
6227	EPH	2005	18	903		EM		HC	G	AS	L	S			C				21	12.9	11.2	20.5								
6228	EPH	2005	18	903		EM		HC	B	FE		S		UE	6															
6229	EPH	2005	18	903	831	EM		HC	G	HC		B			6															
6230	EPH	2005	18	903	831	EM		HC	G	HC		B			6					50.6	41.8									
6231	EPH	2005	18	903		EM		HC	G	HC		CAH			B	SK2				29	21.8									
6232	EPH	2005	18	903	831	EM		HC	M	CA		B			6															
6233	EPH	2005	18	903	831	EM		HC	M	AS	L	B			B	A20			50.7		29									
6234	EPH	2005	18	903		EM		HC	G	RA		ANS			C															
6235	EPH	2005	18	903		EM		HC	M	HU		O		F	5					27.1	13.8									
6236	EPH	2005	18	903		EM		HC	G	HU		S?	UD	UD	6															
62	E	20	18	90	831	EM		H	G	FE		B		UD	6															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
37	PH	05		3				C																						
6238	EPH	2005	18	940		EM		HC	G	RA		O		F	3															
6239	EPH	2005	18	940		EM		HC	G	UL		S	UD		5															
6240	EPH	2005	18	940	831	EM		HC	G	P1		B	F		C															
6241	EPH	2005	18	940	831	EM		HC	G	P1		B	F		B	PH2														
6242	EPH	2005	18	940		EM		HC	M	OTHRA		O?	F		6															
6243	EPH	2005	18	940		EM		HC	M	RA		S	UD	UD	6															
6244	EPH	2005	18	940		EM		HC	M	MCIV		S	F	UD	C															
6245	EPH	2005	18	940	831	EM		HC	M	MC1		B		F	6					49.2	24	23			44.3		19.4		20	
6246	EPH	2005	19	2838		EM		HC	B	SC		B	F		6									45.1						
6247	EPH	2005	19	2839		EM		HC	B	MC1		B	F	F	6	M18									55.8		23.7		24.3	
6248	EPH	2005	19	2839		EM		HC	B	SC	R	O	F		6									21.5						THREE PIECES
6249	EPH	2005	19	2839		EM		HC	A	P1		B	F		6															
6250	EPH	2005	19	2839		EM		HC	A	HC		B			6															
6251	EPH	2005	19	2839		EM		HC	B	OTHRA		B	F		1															
6252	EPH	2005	19	2851		EM		HC	M	AS	L	B			B	A3														
6253	EPH	2005	19	2851		EM		HC	B	P2		B	F		C															
6254	EPH	2005	17	1887		EM	370	FS<5	G	PE		APS			6								1.5							
6255	EPH	2005	17	1887		EM	370	FS<5	G	FE		APS	F	UD	C						1.4									
6256	EPH	2005	17	1887		EM	370	FS<5	G	MP1		SRO			C															
6257	EPH	2005	18	940		EM		HC	M	MT1		CCC			C				57.3	6.9				3.6						
6258	EPH	2005	18	940		EM		HC	M	TI		CCC			6															
6259	EPH	2005	18	940		EM		HC	M	TI		CCC			6															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6260	EPH	2005	18	940		EM		HC	M	FE		CCC			C				51.1	10.3	7.7			4						
6261	EPH	2005	19	1966		EM		HC	B	P1		B	F		6															
6262	EPH	2005	19	1966		EM		HC	B	CA		B			6						50.3									
6263	EPH	2005	19	1966		EM		HC	B	AT		B			6															
6264	EPH	2005	19	1966		EM		HC	B	HU		B		F	3	H19				65.9										
6265	EPH	2005	19	1966		EM		HC	B	OTHRA		B	F		6			C												
6266	EPH	2005	19	1966		EM		HC	B	OTHRA		O	F		6															
6267	EPH	2005	19	1966		EM		HC	B	OTHRA		O	F		1															
6268	EPH	2005	19	1966		EM		HC	M	UL		O	F		6															
6269	EPH	2005	19	1966		EM		HC	M	UL		O			6															
6270	EPH	2005	19	1966		EM		HC	M	OTHRA		S	F		3															
6271	EPH	2005	19	1966		EM		HC	B	TI	R	O		F	6															
6272	EPH	2005	19	1966		EM		HC	A	HU		O?		F	1			C												
6273	EPH	2005	20	1775		EM		HC	G	MT1	R	B		F	2						22.6				42.9			26.7	20	
6274	EPH	2005	20	1775		EM		HC	E	SC	L	B	F		N									62.7						
6275	EPH	2005	20	1775		EM		HC	G	AT		B			6	V9														
6276	EPH	2005	20	1775		EM		HC	G	MT1		GNP			C				59.5	10.5	7.8									
6277	EPH	2005	20	1775		EM		HC	G	TI		GNP			6	T11				10	9.5									
6278	EPH	2005	20	1777		EM		HC	M	TI		B		F	1															
6279	EPH	2005	20	1779		EM		HC	G	RA		B		F	0															
6280	EPH	2005	20	1779		EM		HC	G	HU		B		F	B	H6; H10; H16						32.8								
6281	EPH	2005	20	1781		EM		HC	B	MP2		B			6			C												
62	E	20	21	28		EM		H	M	TI		GN			6				97.	9.	10			5.						TWO

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
82	PH	05		37				C				P							2	9	.4			3						PIECES
6283	EPH	2005	21	2837		EM		HC	M	P3		B	F		C															
6284	EPH	2005	21	2837		EM		HC	M	SCU		B			C															
6285	EPH	2005	21	2837		EM		HC	B	AS		S			C			C												
6286	EPH	2005	21	2837		EM		HC	M	UL		B			B	U1														
6287	EPH	2005	21	2837		EM		HC	B	AX		B			B	V11		C												
6288	EPH	2005	21	2837		EM		HC	G	PE		B			6								47.2							
6289	EPH	2005	21	2837		EM		HC	M	PE		S			6															
6290	EPH	2005	21	2837		EM		HC	B	HU		B			B	H1; H13; H18		C												
6291	EPH	2005	21	2837		EM		HC	B	MC1		B	F	F	C			C	171.1	49.5	23.9	23.6		27.5	46.1	20.4		19.2		
6292	EPH	2005	21	2837		EM		HC	M	P1		B	F		C				82.4	44.1	25.3	53.7	34.3	35.1						
6293	EPH	2005	22	891		EM		HC	M	P1		O?	UD		N															
6294	EPH	2005	22	891		EM		HC	M	P2		B	F		C															
6295	EPH	2005	22	891		EM		HC	M	P2		B	F		C															
6296	EPH	2005	22	891		EM		HC	M	P2		EQ			C		B													
6297	EPH	2005	22	891		EM		HC	M	P1		B	F		C															
6298	EPH	2005	22	891		EM		HC	M	P1		B	F		5															
6299	EPH	2005	22	891		EM		HC	M	P1		B	F		C			C												
6300	EPH	2005	22	891		EM		HC	M	P1		B	F		C															HOL DRILLED THROUGH PROXIMAL END
6301	EPH	2005	22	891		EM		HC	M	AS	R	B			C				60.5	37.6	32.7	54.3								
6302	EPH	2005	22	891		EM		HC	M	AS	R	B			C			C	54.3		29.8									
6303	EPH	2005	22	891		EM		HC	M	AS	R	B			B	A1				40.2		33.8								

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6304	EPH	2005	22	891		EM		HC	A	AS	R	B			C															
6305	EPH	2005	22	891		EM		HC	E	OC	L	S			C															
6306	EPH	2005	22	891		EM		HC	E	OC	R	S			C															
6307	EPH	2005	22	891		EM		HC	M	OC	L	B			C															
6308	EPH	2005	22	891		EM		HC	M	OC	R	B			C															
6309	EPH	2005	22	891		EM		HC	M	OC	L	O			C	SK17														HORIZONTAL CUTS BASE OF SKULL
6310	EPH	2005	22	891		EM		HC	M	OC	R	O			C	SK17														HORIZONTAL CUTS BASE OF SKULL
6311	EPH	2005	22	891		EM		HC	G	HC		B			C					33.1	26.1									
6312	EPH	2005	22	891		EM		HC	G	HC		B			C					31.4	25.3									
6313	EPH	2005	22	891		EM		HC	B	CA	L	S	UD		6															
6314	EPH	2005	22	891		EM		HC	B	CA	R	B	UD		N															
6315	EPH	2005	22	891		EM		HC	B	CA		B			N															
6316	EPH	2005	22	891		EM		HC	B	CA	L	B	UD		C						48.2									
6317	EPH	2005	22	891		EM		HC	M	UL	L	B			6															
6318	EPH	2005	22	891		EM		HC	M	UL	L	B			4			C												
6319	EPH	2005	22	891		EM		HC	M	UL	L	B	UD		6															
6320	EPH	2005	22	891		EM		HC	M	AX		O			B	V14; V16														
6321	EPH	2005	22	891		EM		HC	M	PE	L	S	F		6	S16														
6322	EPH	2005	22	891		EM		HC	B	SC	L	S	F		6									18.7						
6323	EPH	2005	22	891		EM		HC	M	SC	R	O	UD		6									12.6						
6324	EPH	2005	22	891		EM		HC	M	MT1		GNP			6					11.5	8.6									
6325	EPH	2005	22	891		EM		HC	M	MT1		O	F	UD	C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6326	EPH	2005	22	891		EM		HC	M	MC1	L	O		F	N					22	10				21.9	14.9	10.3		9.7	
6327	EPH	2005	22	891		EM		HC	M	MC2		O		F	N	M2														
6328	EPH	2005	22	891		EM		HC	M	MT1	L	B		UX	6					46.1	22.1	21.9			43.4	26	19.2			
6329	EPH	2005	22	891		EM		HC	M	MP2		B		F	6															
6330	EPH	2005	22	891		EM		HC	M	MT2		B		F	6	M13														
6331	EPH	2005	22	891		EM		HC	G	FE		GNP			4						5.3									
6332	EPH	2005	22	891		EM		HC	M	TI		GNP			6	T11				11.9	12.5									
6333	EPH	2005	22	891		EM		HC	M	TI		GNP			3	T11				10.8	11.5									
6334	EPH	2005	22	891		EM		HC	B	OTHTI		O?	UD		1															
6335	EPH	2005	22	891		EM		HC	M	TI		S		F	6	T19		C												
6336	EPH	2005	22	891		EM		HC	M	FE		S?	UD	UD	C															
6337	EPH	2005	22	891		EM		HC	A	HU		O?		F	4															
6338	EPH	2005	22	891		EM		HC	G	HU		S		F	B	H17				32.1		19.8								
6339	EPH	2005	22	891		EM		HC	G	HU		GNP			5					13.2										
6340	EPH	2005	22	891		EM		HC	M	OTHRA		B	F		B	R1; R9														
6341	EPH	2005	22	891		EM		HC	G	RA		B		G	4	R12														
6342	EPH	2005	22	891		EM		HC	G	RA		B		UE	6															
6343	EPH	2005	22	891		EM		HC	A	P3		B?	F		6															
6344	EPH	2005	22	891		EM		HC	E	OTHU	R	O	UE		6															
6345	EPH	2005	22	891		EM		HC	M	SC	L	B	F		6	S17														
6346	EPH	2005	22	891		EM		HC	M	TI	R	S?		UD	5															
6347	EPH	2005	23	3800		EM		HC	E	P1		O	F		C															
6348	EP	2005	23	3800		EM		HC	M	HC	L	B			6															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6349	EPH	2005	23	3800		EM		HC	G	CA		B	F		C				117.3		47.9									
6350	EPH	2005	23	3800		EM		HC	E	TI		O		F	0					24.7	20									
6351	EPH	2005	23	3800		EM		HC	M	MP1		B		F	6					49.4	24	22.7			45	26.9	20.2	25.3	18.3	
6352	EPH	2005	23	3800		EM		HC	E	AS	R	B			B	A22				34.2	31									
6353	EPH	2005	23	3800		EM		HC	M	UL	L	S	UD		6															
6354	EPH	2005	23	3800		EM		HC	M	UL	R	B	UD		6															
6355	EPH	2005	23	3800		EM		HC	M	SC	L	O	F		6									18						
6356	EPH	2005	23	3800		EM		HC	M	RA		GNP			C															
6357	EPH	2005	23	3800		EM		HC	M	HU		S?		G	6			C												
6358	EPH	2005	23	3800		EM		HC	G	CO		GNP			C															
6359	EPH	2005	23	3800		EM		HC	B	MCIII		S	F	F	6															
6360	EPH	2005	23	3800		EM		HC	G	FE		B		F	B	F8; F13; F18														
6361	EPH	2005	23	3800		EM		HC	G	MT1	R	O	F	F	C				128.6	23	10.8	9.8		11.6	22.5		9.9	14.8	9.8	
6362	EPH	2005	23	3800		EM		HC	B	HC	L	CAC			B	SK2				18.4	16.4									
6363	EPH	2005	23	3800		EM		HC	M	UL	L	O	UD		6															
6364	EPH	2005	23	3800		EM		HC	M	HU		O		F	5	H18														
6365	EPH	2005	23	3800		EM		HC	G	PE	L	CAC?			C								27.1							MALE
6366	EPH	2005	23	3800		HM		HC	M	P3		B	F		C															
6367	EPH	2005	23	3800		HM		HC	M	P1		B	F		6															
6368	EPH	2005	23	3800		HM		HC	M	P1		B	F		6															
6369	EPH	2005	23	3800		HM		HC	M	AX		O			6															
6370	EPH	2005	23	3804		HM		HC	B	TI	L	B		F	4															
63	E	20	23	38		HM		H	B	TI	L	B		F	5															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
71	PH	05		04				C																						
6372	EPH	2005	23	3804		HM		HC	M	OTHRA		O	F		2															
6373	EPH	2005	23	3804		HM		HC	M	OTHRA		O	F		N															
6374	EPH	2005	23	3804		HM		HC	M	MP2		O		F	N	M3														NEW BREAK
6375	EPH	2005	23	3804		HM		HC	B	FE		GNP			C															
6376	EPH	2005	23	3804		HM		HC	M	MT1		GNP			C				89.3	13.7				6.4						
6377	EPH	2005	23	3804		HM		HC	M	MP1		S	UD	UD	C															
6378	EPH	2005	24	1816		EM		HC	G	HC	L	CAH			B	SK2				49.7	31.5									
6379	EPH	2005	24	1816		EM		HC	M	OTHU		ANS			5		B													
6380	EPH	2005	25	720		EM		HC	G	P1		EQ	F		C				83.7	42.9	25.3	57.5	34.8	35.6						
6381	EPH	2005	25	720		EM		HC	G	UL		S	UD		6															
6382	EPH	2005	25	720		EM		HC	G	P1		B	F		C															
6383	EPH	2005	25	720		EM		HC	G	P1		B	F		C			C												
6384	EPH	2005	25	720		EM		HC	G	P1		B	F		B	PH15														
6385	EPH	2005	25	720		EM		HC	G	SC		B	F		6	S6														
6386	EPH	2005	25	720		EM		HC	G	CA		B			6	C6														
6387	EPH	2005	25	720		EM		HC	G	CA		B			B	C6														
6388	EPH	2005	25	720		EM		HC	G	UL		O	UD		6															
6389	EPH	2005	25	720		EM		HC	G	AT		B			6															
6390	EPH	2005	25	720		EM		HC	M	TI		O		F	5	T10														SHAFT END WHITTLED
6391	EPH	2005	25	720		EM		HC	G	RA		B		F	B	R18														
6392	EPH	2005	25	720		EM		HC	G	RA		O		F	B	R16		C												
6393	EPH	2005	25	720		EM		HC	G	OTHRA		O	F		6															NEW BREAK

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6394	EPH	2005	25	720		EM		HC	G	AX		O			B	V3; V9														
6395	EPH	2005	25	720		EM		HC	G	HU		O		UD	6															NEONATAL
6396	EPH	2005	25	720		EM		HC	G	MT2		CAF	F	F	C															
6397	EPH	2005	25	720		EM		HC	G	HU		S		F	1					30.4		28								
6398	EPH	2005	25	720		EM		HC	G	AS	L	B			C			C	62.2	39.8	34.2	56.2								
6399	EPH	2005	25	720		EM		HC	G	AS	R	B			B	A5			61.6	34.4										
6400	EPH	2005	25	720		EM		HC	G	AS	R	B			C			C			35									
6401	EPH	2005	25	720		EM		HC	G	AS	R	B			B	A1					32.4	54.1								
6403	EPH	2005	25	720		EM		HC	M	P1		B			6															
6404	EPH	2005	25	720		EM		HC	A	UL		O?			6															
6405	EPH	2005	25	720		EM		HC	B	OT HFE		GNP			6	F10														
6406	EPH	2005	25	720		EM		HC	G	FE		S			1	F8; F13														
6407	EPH	2005	26	2890		EM		HC	B	P3		B			C															
6408	EPH	2005	26	2890		EM		HC	M	CA		B	UD		B	C7					47.1									
6409	EPH	2005	26	2890		EM		HC	M	OT HTI		S	UD		1															
6410	EPH	2005	26	2890		EM		HC	B	RA		S		UD	2															
6411	EPH	2005	26	2890		EM		HC	M	FE		O?	UD		2															
6412	EPH	2005	26	2890		EM		HC	B	MT1		GNP			C															
6413	EPH	2005	26	2914		EM		HC	M	TI		S		UD	2															
6414	EPH	2005	26	2914		EM		HC	M	AX		B			6	V8														
6415	EPH	2005	26	2914		EM		HC	G	HC		OVA			B	SK2														PATHOLOGY; PHOTO
6416	EPH	2005	26	2914		EM		HC	A	SC		EQ	F		6															
6417	EP	2005	26	2914		EM		HC	G	PE		O			6	P5														

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6418	EPH	2005	26	3612		EM		HC	M	P1		O?	F		6			D												
6419	EPH	2005	26	3612		EM		HC	E	P2		O	F		C															
6420	EPH	2005	26	3612		EM		HC	E	TI		B		F	2					56	44.9									
6421	EPH	2005	26	3612		EM		HC	E	CA		B	G		6						48.5									
6422	EPH	2005	26	3612		EM		HC	G	HC		OVA			6															
6423	EPH	2005	26	3612		EM		HC	G	P1		O	F		C															
6424	EPH	2005	26	3612		EM		HC	G	HU		O		UD	6															
6425	EPH	2005	26	3612		EM		HC	E	AS		B			C				59.1	39.6	30.3	53.2								
6426	EPH	2005	27	1616		EM		HC	G	ZY		B			6															
6427	EPH	2005	27	1616		EM		HC	A	AS		S?			B	A7														
6428	EPH	2005	27	1616		EM		HC	B	PE		B			6	P8							56							
6429	EPH	2005	27	1616		EM		HC	M	HU		S		UE	6															
6430	EPH	2005	27	1616		EM		HC	M	HU		S		UD	6	H6														
6431	EPH	2005	27	1616		EM		HC	M	HU		S		F	2	H19				30.3		17.8								
6432	EPH	2005	27	1616		EM		HC	G	HU		O		F	1					26.3		12.7								
6433	EPH	2005	27	1616		EM		HC	M	HU		S		UE	B	H19		C												
6434	EPH	2005	27	1616		EM		HC	M	OTHU		S		UD	2															
6435	EPH	2005	27	1616		EM		HC	G	HU		GNP			C	H14			65.3	13.9				6.2						
6436	EPH	2005	27	1616		EM		HC	G	RA		S	F	UD	C															
6437	EPH	2005	27	1616		EM		HC	M	MC1		O	F	UD	C															
6438	EPH	2005	27	1616		EM		HC	M	SC		GNP			6	S12														
6439	EPH	2005	27	1616		EM		HC	M	OTHTI		GNP			2															
64	E	20	27	16		EM	34	FS	A	TI		B		F	6					48										

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
40	PH	05		96			4	<5												.5										
6441	EPH	2005	27	1696		EM		HC	G	RA		O		G	5															
6442	EPH	2005	27	1696		EM		HC	B	SC		EQ	F		6									62.9						
6443	EPH	2005	27	1696		EM		HC	M	UL	R	O			6															
6444	EPH	2005	27	1696		EM		HC	M	PE	R	S			6								29.2							
6445	EPH	2005	27	1696		EM		HC	G	HU		B?			B	H17														
6446	EPH	2005	28	5613		EM		HC	M	MC1	R	B	F	F	C			C	169.4	49.5	23.3			26.7					18.6	
6447	EPH	2005	28	5613		EM		HC	M	HC	L	CAH			6															
6448	EPH	2005	28	5613		EM		HC	M	HU		B		F	3															
6449	EPH	2005	29	5613		EM		HC	G	RA		B		G	6															
6450	EPH	2005	29	1762		EM	365	FS<5	M	RA		O		UE	6															
6451	EPH	2005	29	1762		EM	365	FS<5	M	FE		FEC		F	6															
6452	EPH	2005	29	1590	1742	EM		HC	M	HU		B		F	3	H21														
6453	EPH	2005	29	1590		EM		HC	M	OTHRA		S	F		5															
6454	EPH	2005	29	1590		EM		HC	B	TI		O		F	5															
6455	EPH	2005	29	1590		EM		HC	M	TI		O		G	5															
6456	EPH	2005	29	1590	1742	EM		HC	M	CA		B	F		N															
6457	EPH	2005	29	1590		EM		HC	G	HC		OVA			6	SK2														
6458	EPH	2005	29	1590	1742	EM		HC	G	HC		B			6	SK3														
6459	EPH	2005	29	1590		EM		HC	M	MTIII		S	F	UD	C															
6460	EPH	2005	29	1590		EM		HC	M	OTHTI		FEC	G		6															
6461	EPH	2005	29	1590	1742	EM		HC	M	SC		B	F		B	S3														
6462	EPH	2005	29	1590	1742	EM		HC	M	MT1	R	B		F	6						22.5					26.5	19.8			

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6463	EPH	2005	29	1590		EM		HC	M	OTHRA		O	F		6															
6464	EPH	2005	29	1590		EM		HC	G	TI		EQ		F	6					61.3	37.2									
6465	EPH	2005	29	1590		EM		HC	M	TI		O		F	4					22.8	18.5									
6466	EPH	2005	29	1590		EM		HC	M	MTIV		S	F	UD	C															
6467	EPH	2005	29	1590		EM		HC	M	SC	R	S	F		6									19.6						
6468	EPH	2005	29	1590		EM		HC	M	HC	L	OVA			6	SK2														
6469	EPH	2005	29	1590	1742	EM		HC	M	MC1	R	B	F	F	C				167.2	54.7	27.7	25.3				29.4	22.5	29.1	21.2	
6470	EPH	2005	29	1590		EM		HC	M	OTHTI	R	O	UD		0															
6471	EPH	2005	29	1760	1742	EM		HC	M	ZY	R	B			6															
6472	EPH	2005	29	1760		EM		HC	M	HC	R	OVA			6															
6473	EPH	2005	29	1743	1742	EM		HC	G	P1		B	F		C															
6474	EPH	2005	29	1743		EM		HC	G	UL	R	S	UD		B	U5														
6475	EPH	2005	29	1743		EM		HC	B	UL	R	S	UD		6															
6476	EPH	2005	29	1743		EM		HC	B	FE	L	GNP			C				70.1	13			4.8	5.7						
6477	EPH	2005	29	1743		EM		HC	M	OTHRA		O	F		6															
6478	EPH	2005	29	1743		EM		HC	M	RA		S	F	UD	C															
6479	EPH	2005	29	1743	1742	EM		HC	M	TI		B		F	2	T10; T14														
6480	EPH	2005	29	1743		EM		HC	G	PE	L	O			C								26							
6481	EPH	2005	29	1743	1742	EM		HC	G	MT1		B	F	UD	C															
6482	EPH	2005	29	1743		EM		HC	G	MT1		O	F	UD	C	M12														NEONATAL
6483	EPH	2005	29	1743		EM		HC	M	MC2		S			6															
6484	EPH	2005	29	1743	1742	EM		HC	M	MT1	L	B		F	6					47.2	43.2				43.6	28	20.5	26.2	19.3	
6485	EP	2005	29	1743		EM		HC	M	MC1	R	O		G	6														10	

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6486	EPH	2005	30	1743		EM		HC	A	TI	L	O	UD	UD	C															
6487	EPH	2005	30	1743		EM		HC	M	OTHRA		O	F		6															
6488	EPH	2005	30	1743	1742	EM		HC	G	HU		B		F	6	H24														
6489	EPH	2005	30	1743	1742	EM		HC	M	MT1	R	B	F	F	C				216.9					24.7	50.5	31.3	23.2	30.6	21.1	
6490	EPH	2005	30	1743	1742	EM		HC	B	MC1	L	B	F	F	C	M1				55.9	27.3	26.9			51.9					
6491	EPH	2005	30	1743		EM		HC	B	MT1		GNP			C				79.2	13				7.2						SPUR PRESENT
6492	EPH	2005	30	1743		EM		HC	B	MT1		GNP			C				79.5	13.4				7						SPUR SCAR
6493	EPH	2005	30	1743		EM		HC	M	HU		CV		F	6					14.6		14.8								
6494	EPH	2005	30	1743	1742	EM		HC	M	P1		B	F		C															
6495	EPH	2005	30	1743	1742	EM		HC	M	P1		B	F		C															
6496	EPH	2005	30	1743	1742	EM		HC	M	P2		B	F		C															
6497	EPH	2005	30	1743	1742	EM		HC	B	UL	L	B			6															
6498	EPH	2005	30	1743	1742	EM		HC	B	PE		B			6															
6499	EPH	2005	30	1743		EM		HC	B	UL	R	S			6															
6500	EPH	2005	30	1743		EM		HC	B	OTHRA		S	F		2															
6501	EPH	2005	30	1743		EM		HC	B	PE	R	O			6															
6502	EPH	2005	30	1743		EM		HC	B	PE	L	O			6															
6503	EPH	2005	30	1743		EM		HC	M	TI	R	O?		F	1															
6504	EPH	2005	30	1743		EM		HC	B	OTHRA		O?	F		6															
6505	EPH	2005	30	1743	1742	EM		HC	B	HU		B		F	6			C												
6506	EPH	2005	30	1743		EM		HC	B	HU		O		UD	4															
6507	EPH	2005	30	1743	1742	EM		HC	G	MT1	L	B	F	G	C	M7			193	53.1	25.7			27.2	49	30.4	22.4	29.2	21.2	
65	E	20	30	17	174	EM		H	G	MC	R	B	F	F	C	M12			18	23				26	46	27	21	26	29	

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
08	PH	05		43	2			C		1									4.7	.7				.8	.6	.8	.5	.9	.6	
6509	EPH	2005	30	1743		EM		HC	B	PE	L	BUF			6															
6510	EPH	2005	31	1615		EM		HC	A	FE		GNP			6					13										
6511	EPH	2005	31	1615		EM		HC	M	AT		B			6															
6512	EPH	2005	32	1615		EM		HC	M	UL	R	S			6															
6513	EPH	2005	32	1615		EM		HC	G	P3		B	F		C															
6514	EPH	2005	34	4693		HM		HC	M	HU		O		UD	2															
6515	EPH	2005	34	4693		HM		HC	M	MC1		ANS			C				84.3			19.6								
6516	EPH	2005	34	4530		EM		HC	G	FE		B		F	6															
6517	EPH	2005	34	4530		EM		HC	G	UL	L	S	UD		4															
6518	EPH	2005	35	4515		EM		HC	B	CA	R	S	UD		6															
6519	EPH	2005	35	4515		EM		HC	B	HU		B		F	2															
6520	EPH	2005	35	4514		EM		HC	B	HC		CAH			6															
6521	EPH	2005	35	4514		EM		HC	B	AX		B			6															
6522	EPH	2005	35	4514		EM		HC	B	CA	R	B	UD		C						53.9									
6523	EPH	2005	35	4514		EM		HC	M	MT1		O	F	UD	C										22.1					
6524	EPH	2005	35	798		EM		HC	M	SU		B			6															
6525	EPH	2005	35	779		EM		HC	A	HU	R	O	G		1															
6526	EPH	2005	35	779		EM		HC	B	TI	R	B		F	1	T14														
6527	EPH	2005	35	779		EM		HC	B	TI	R	B		F	1	T14														
6528	EPH	2005	35	779		EM		HC	B	OTHTI	L	B	F		3															
6529	EPH	2005	35	779		EM		HC	M	SU		O			6															HORNS MISSING
6530	EPH	2005	35	779		EM		HC	M	SU		O			6															HORNS MISSING

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6531	EPH	2005	35	779		EM		HC	M	OC	L	O			C															
6532	EPH	2005	35	779		EM		HC	M	OC	R	O			C															
6533	EPH	2005	35	779		EM		HC	B	CA	L	B	UD		6	C														
6534	EPH	2005	35	779		EM		HC	B	CA	R	S	UD		6															
6535	EPH	2005	35	779		EM		HC	B	CA	R	O	UD		C						26.9									
6536	EPH	2005	35	798		EM		HC	M	TI	R	B		F	2	T11				61.8	43.5									
6537	EPH	2005	35	798		EM		HC	M	MC1		B	F	UD	C										48.2					
6538	EPH	2005	35	798		EM		HC	G	PE	R	O			6	P18														
6539	EPH	2005	35	798		EM		HC	B	SC		GNP			C															
6540	EPH	2005	23	3804		HM		HC	B	TI		SCR			6															
6541	EPH	2005	36	2964		EM	3300	FS<5	G	ZY	R	O			6															
6542	EPH	2005	36	2964		EM	3300	FS<5	G	FE	R	COF			C				47	9.4	7.8		44.5	4						
6543	EPH	2005	36	2964		EM	3300	FS<5	G	TI	L	COF		J	6					7.5	7.1									
6544	EPH	2005	36	2964		EM	3300	FS<5	G	RA		O	F	G	C	R24														
6545	EPH	2005	36	2964		EM	3300	FS<5	G	PE	R	S			5															
6546	EPH	2005	37	5606		EM		HC	M	ZY	R	CAF			6															
6547	EPH	2005	37	5606		EM		HC	M	ZY	L	B			6	SK16														
6548	EPH	2005	37	5606		EM		HC	M	ZY	R	B			6															
6549	EPH	2005	37	5606		EM		HC	G	P1		B	F		C															
6550	EPH	2005	37	5606		EM		HC	G	AS	L	B			C				59.1	36.9	33.1	53.8								
6551	EPH	2005	37	5606		EM		HC	G	TI	L	B	UD	UD	C															
6552	EPH	2005	37	5606		EM		HC	G	TI	R	CAF		F	6					25.9	17.6									
6553	EP	2005	37	5606		EM		HC	G	TI	R	B		F	3	T11				52	38.1									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6554	EPH	2005	37	5606		EM		HC	G	OTHU	L	CAF	F		3															
6555	EPH	2005	37	5606		EM		HC	G	HU		CAF		F	6					34.6		12.9								
6556	EPH	2005	37	5606		EM		HC	G	HU		CAF		F	4					35.6		12.9								
6557	EPH	2005	37	5606		EM		HC	G	OTHFE	L	CAF	F		3							20.2								
6558	EPH	2005	37	5606		EM		HC	G	FE	R	GNP			C	F13			70	12.7	11.4		66.5	5.9						
6559	EPH	2005	37	5606		EM		HC	G	UL	R	B			6															
6560	EPH	2005	37	5606		EM		HC	G	UL	R	CAF	F		6															
6561	EPH	2005	37	5606		EM		HC	G	OTHRA		CAF	F		6															
6562	EPH	2005	37	5606		EM		HC	G	OTHRA		S?	F		6	R11; R25														
6563	EPH	2005	37	5606		EM		HC	G	OTHRA		O?	F		5															
6564	EPH	2005	37	5606		EM		HC	G	OTHRA		O?	F		5															
6565	EPH	2005	37	5606		EM		HC	G	MCIII		CAF	F	F	C															
6566	EPH	2005	37	5606		EM		HC	G	MCIV		CAF	F	F	C															
6567	EPH	2005	37	5606		EM		HC	B	MP1		EQ		F	6															
6568	EPH	2005	37	5606		EM		HC	M	MT1		B		UD	4															
6569	EPH	2005	37	5606		EM		HC	G	MP2		O?		F	2															
6570	EPH	2005	37	5606		EM		HC	G	MT1	L	O	F	F	5					19.4	8.8	8.3			19.5	13.8	8.7	13	8.7	
6571	EPH	2005	37	5606		EM		HC	M	MT1	L	B		F	4					50.9	24.7	22.4			47.6	28.9	21.9	27.8	20.8	
6572	EPH	2005	37	5606		EM		HC	M	MT1	L	B	F	F	C	M1				57.7	29.9	25.6			52.1	29.8	23.1	29.5	21.4	
6573	EPH	2005	37	5606		EM		HC	M	P1		CAF	F		C															
6574	EPH	2005	37	5606		EM		HC	M	SC		ANS			6	S21														
6575	EPH	2005	39	1745		EM		HC	A	OTHRA		O?	F		5	R23														
65	E	20	39	17		EM		H	A	OT		B	F		4															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
76	PH	05		45				C		HRA																				
6577	EPH	2005	39	1775		EM	366	FS<5	B	V		F-AA			X		B													
6578	EPH	2005	40	780		EM		HC	M	HC		B			6															
6579	EPH	2005	40	780		EM		HC	M	SU	L	S			C															
6580	EPH	2005	40	780.		EM		HC	M	UL	R	S			6															
6581	EPH	2005	40	780		EM		HC	M	AT		B			6	V11		C												
6582	EPH	2005	40	780		EM		HC	M	PE	L	B			6			C					52.9							
6583	EPH	2005	40	780		EM		HC	M	PE	L	B			6	P8							42.6							
6584	EPH	2005	40	780		EM		HC	M	PE	L	B			6	P9							48.2							
6585	EPH	2005	40	780		EM		HC	M	RA		S	F	UD	C															
6586	EPH	2005	40	780		EM		HC	M	SC	L	S	F		6	S22								20.7						
6587	EPH	2005	40	780		EM		HC	M	HU		B		F	2			C												
6588	EPH	2005	40	780		EM		HC	M	MT1		O	F	UD	C										22.2					
6589	EPH	2005	40	780		EM		HC	M	MC2		O	F	UD	C	M1														
6590	EPH	2005	40	780		EM		HC	M	MC1	R	O		G	B	M21				24.7	11.7	11.3			24.7	15.6	10.5	15.1	9.9	
6591	EPH	2005	40	780		EM		HC	M	MT1	R	B		F	6					46.6	22.7	21.3			44.4	26.7	19.2	26.1	17.2	
6592	EPH	2005	40	780		EM		HC	M	CO		GNP			6															
6593	EPH	2005	40	780		EM		HC	M	CO		GNP			6															
6594	EPH	2005	40	780		EM		HC	M	HU		GNP			C				73.1	15.3				7						
6595	EPH	2005	40	780		EM		HC	M	RA		GNP			C															
6596	EPH	2005	40	780		EM		HC	M	FE		GNP			C				78.4	15	12.3		73.1	7						
6597	EPH	2005	40	780		EM		HC	M	OTHTI		GNP			4															
6598	EPH	2005	40	780		EM		HC	M	TI		GNP			6					11.3	11.6									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6599	EPH	2005	40	780		EM		HC	M	TI		GNP			C				110.5	11.6	11.4		107.6	5.9						
6600	EPH	2005	40	780		EM		HC	M	TI		GNP			C				109.7	10.6	11.8		106.3	5.9						
6601	EPH	2005	40	807		EM		HC	A	OTHRA		B	F		6															
6602	EPH	2005	40	795		EM		HC	B	UL	R	B			6															
6603	EPH	2005	40	795		EM		HC	A	HU		O		UD	6															
6604	EPH	2005	40	795		EM		HC	M	MT1	R	B		F	6					47.6	23.5				44.5	27.2	19.7	25.8	19.1	
6605	EPH	2005	40	795		EM		HC	A	HC		OVA			6															PATHOLOGY - THUMBPRINT
6606	EPH	2005	40	795		EM		HC	M	UL		GNP			C															
6607	EPH	2005	38	1886		EM		HC	G	P1		O	G		C															
6608	EPH	2005	38	1886		EM		HC	G	MT1	R	O	F	F	C				132.2	23.5	11.5	10.4		13.3	23.6	16	9.8	14.8	9.2	
6609	EPH	2005	38	1886		EM		HC	G	MC1		ANS			C				94.1			10.1								
6610	EPH	2005	38	1886		EM		HC	G	P1		ANS			X															
6611	EPH	2005	177	9810		EM		HC	G	DD		F-RC			X															
6612	EPH	2005	177	2540		EM		HC	M	CL		F-CC			X	XT														
6613	EPH	2005	177	2540		EM		HC	M	PMX		F-MM			X															
6614	EPH	2005	177	2540		EM		HC	G	UL		F-CC			X															
6615	EPH	2005	177	683		LM		HC	G	DN		F-CC			X															FUSED WITH ARTICULAR/ ANGULAR
6616	EPH	2005	177	683		LM		HC	M	PMX		F-MM			X															
6617	EPH	2005	177	683		LM		HC	M	CL		F-CC			X															
6618	EPH	2005	177	683		LM		HC	M	SP		F-T			X															
6619	EPH	2005	177	683		LM		HC	M	CER		F-MM			X															
6620	EPH	2005	177	683		LM		HC	M	AR		F-MM			X															
66	E	20	17	18		EM		H	G	DN		F-			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
21	PH	05	7	77				C				MME																		
6622	EPH	2005	177	1877		EM		HC	G	CER		F-MM			X															
6623	EPH	2005	177	1877		EM		HC	M	PMX		F-CC			X															
6624	EPH	2005	177	1877		EM		HC	M	PARA		F-SP			X															CF. RED
6625	EPH	2005	177	1877		EM		HC	M	VC		F-MM			X															
6626	EPH	2005	177	1877		EM		HC	M	VC		F-MM			X															
6627	EPH	2005	177	783		EM		HC	M	VC		F-MM			X															
6628	EPH	2005	177	1877		EM		HC	M	PMX		F-MM			X															
6629	EPH	2005	177	1877		EM		HC	M	PMX		F-MM			X															
6630	EPH	2005	177	1877		EM		HC	M	MX		F-MM			X															
6631	EPH	2005	177	1877		EM		HC	M	MX		F-MM			X															
6632	EPH	2005	177	1877		EM		HC	M	AR		F-MM			X															
6633	EPH	2005	177	1877		EM		HC	M	CER		F-MM			X															
6634	EPH	2005	177	1877		EM		HC	M	PARA		F-MME			X															
6635	EPH	2005	177	1877		EM		HC	M	PARA		F-MME			X															
6636	EPH	2005	177	1877		EM		HC	M	DN		F-MME			X															
6637	EPH	2005	177	1877		EM		HC	M	DN		F-MME			X															
6638	EPH	2005	177	2699		LM		HC	M	CER		F-MM			X															
6639	EPH	2005	177	855		LM		HC	M	VPC		F-MM			X															
6640	EPH	2005	177	855		LM		HC	M	VPC		F-MM			X															
6641	EPH	2005	177	3793		EM		HC	M	HYO		F-SP			X															CF. RED
6642	EPH	2005	177	3546	3531	LM		HC	M	PMX		F-MM			X															
6643	EPH	2005	177	1884		EM		HC	M	DN		F-PV			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6644	EPH	2005	177	1884		EM		HC	M	VC		F-MM			X															
6645	EPH	2005	177	3527	3531	LM		HC	M	CL		F-SP			X															
6646	EPH	2005	177	3527	3531	LM		HC	M	CL		F-T			X	XT														
6647	EPH	2005	177	3527	3531	LM		HC	M	VPC		F-MM			X															
6648	EPH	2005	177	3527	3531	LM		HC	M	VPC		F-MM			X															
6649	EPH	2005	177	3527	3531	LM		HC	M	PMX		F-MM			X															
6650	EPH	2005	177	3527	3531	LM		HC	M	DN		F-MM			X															
6651	EPH	2005	177	3527	3531	LM		HC	M	DN		F-MM			X															
6652	EPH	2005	177	3527	3531	LM		HC	M	DN		F-MM			X															
6653	EPH	2005	177	856		LM		HC	M	DN		F-MME			X		B													
6654	EPH	2005	177	856		LM		HC	M	CER		F-MM			X															
6655	EPH	2005	177	3807		EM		HC	M	VPC		F-G			X															
6656	EPH	2005	177	903		EM		HC	M	HYO		F-G			X															
6657	EPH	2005	177	903		EM		HC	M	VC		F-SP			X															
6658	EPH	2005	38	1878		LM		HC	A	CA	L	B	F		C				134.9		49.5									
6659	EPH	2005	38	1878		LM		HC	A	MC2		B	F	F	C	M1														
6660	EPH	2005	38	1878		LM		HC	M	P2		ANS			C															
6661	EPH	2005	38	1878		LM		HC	M	MCIV		S	F	UD	C															
6662	EPH	2005	38	1878		LM		HC	G	AT		B			6				78											
6663	EPH	2005	38	1878		LM		HC	B	OTHRA		B	F		1															
6664	EPH	2005	38	1878		LM		HC	B	OTHRA		B	F		3	R1														
6665	EPH	2005	38	1878		LM		HC	B	OTHFE	R	B	G		6	F10		C												
6666	EP	2005	38	1878		LM		HC	G	OTHFE	R	O	F		0						17.9									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6667	EPH	2005	38	1898		LM		HC	G	PE	L	O			6								18.9							
6668	EPH	2005	38	1898		LM		HC	G	P1		B	F		6			C												
6669	EPH	2005	38	1898		LM		HC	G	SC	L	B	F		6															
6670	EPH	2005	38	1898		LM		HC	G	SC	R	O	UD		6									17						
6671	EPH	2005	38	1898		LM		HC	G	SC	R	B?	F		B	S1; S20														
6672	EPH	2005	41	1898		LM		HC	E	TI	L	B		G	0					54.3	43.4									TWO PIECES
6673	EPH	2005	42	1898		LM		HC	E	UL	R	B			B	U1														FUSING TO RADIUS
6674	EPH	2005	42	1898		LM		HC	E	OTHRA		B	F		B	R1														
6675	EPH	2005	42	1898		LM		HC	G	P1		B			C															
6676	EPH	2005	42	1898		LM		HC	M	SC	R	O	F		6									16.6						
6677	EPH	2005	42	1898		LM		HC	E	FE	R	S		UX	1															
6678	EPH	2005	42	1898		LM		HC	M	AT		S			C				45.8											
6679	EPH	2005	42	1898		LM		HC	M	SC	L	S	F		6	`								23.9						
6680	EPH	2005	42	1898		LM		HC	M	SC	L	O	F		6									20.7						
6681	EPH	2005	42	6700		EMOD		HC	B	MC1	R	B		F	1					53	25.6	18.6			47.3	25.6	20.7	25	25.9	
6682	EPH	2005	44	6700		EMOD		HC	B	HU	R	B		F	0	H17														
6683	EPH	2005	44	6700		EMOD		HC	G	OTHRA	R	S	F		4															
6684	EPH	2005	44	6700		EMOD		HC	G	TI		S		UD	0															
6685	EPH	2005	44	6702		EMOD		HC	M	TI	L	O		F	1					21.7	18.1									
6686	EPH	2005	44	6702		EMOD		HC	M	TI	L	O		F	1					21.6	18.7									
6687	EPH	2005	44	6702		EMOD		HC	M	HU	L	O		F	0					25.1		11.2								
6688	EPH	2005	45	2745		EM		HC	G	SC	L	B	F		4															
66	E	20	45	27		EM		H	G	TI	L	O		F	N	T10				25	21									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
89	PH	05		45				C												.6	.2									
6690	EPH	2005	45	2745		EM		HC	B	UL	R	B			6															
6691	EPH	2005	45	2745		EM		HC	B	TI	R	S		F	5					24.3	21.3									TWO PIECES
6692	EPH	2005	45	2745		EM		HC	M	P1		B	F		C		S													
6693	EPH	2005	45	2745		EM		HC	M	HC	L	OVA			6		S													
6694	EPH	2005	45	2745		EM		HC	M	FE	L	GNP			C		S		77.2	15.7	13.1		74.7	6.8						
6696	EPH	2005	45	2745		EM		HC	M	TI	L	B		F	5					52.3	44.9									
6697	EPH	2005	45	2745		EM		HC	M	ZY	L	B			C															
6698	EPH	2005	45	2745		EM		HC	M	MC1	L	O		UD	4										23.2					
6699	EPH	2005	45	2745		EM		HC	M	TI		B		UD	1															
6700	EPH	2005	45	2745		EM		HC	G	OTHFE	R	VUV	F		6						10									
6701	EPH	2005	45	2745		EM		HC	M	HC		B			6															
6702	EPH	2005	45	2745		EM		HC	M	P3		B			6															
6703	EPH	2005	45	2745		EM		HC	M	MC1	R	B	F	UX	C				175.3	49.2	27.8	21.3		26.6	47	27.3	20.1	22.6	23.8	
6704	EPH	2005	45	2745		EM		HC	M	MT1	L	O		G	1					22.9	15.1	9.4			22.2	14.1	8.7	9.9	11	
6705	EPH	2005	45	2745		EM		HC	M	MC1	R	O		F	0					21.6	13.9	9.5			21.3	13.3	9	9.7	10.5	
6706	EPH	2005	45	2745		EM		HC	M	AT		B			6															
6707	EPH	2005	45	2745		EM		HC	M	RA		B		G	2															
6708	EPH	2005	45	2745		EM		HC	M	PE	R	B			B	P7; P9; P18							55.9							
6709	EPH	2005	45	2745		EM		HC	M	HC		B			6															
6710	EPH	2005	45	2745		EM		HC	M	TI	L	B		UD	0					49	40.4									
6711	EPH	2005	45	2745		EM		HC	M	OTHRA		B	F		6															
6712	EPH	2005	45	2745		EM		HC	M	TI	R	B		F	1					52.7	38.7									

bones																														
ID	**SITE**	**YEAR**	**BOX**	**CTX**	**Feature**	**ERA**	**CAT #**	**COL**	**PRES**	**EL**	**SIDE**	**TAX**	**FUSP**	**FUSD**	**FFI**	**BUTCH**	**BURN**	**GNAW**	**GL**	**Bd**	**Dd**	**HTC**	**LAR**	**SD**	**BatF**	**a**	**b**	**1**	**4**	**Comments**
6713	EPH	2005	45	2745		EM		HC	M	OTHRA		S	F		5	R13														
6714	EPH	2005	45	2745		EM		HC	M	MT1	L	B	F	UD	C	M18									45.7					
6715	EPH	2005	45	2745		EM		HC	M	MTIV		S	F	G	C				75.3	15.3	17									
6716	EPH	2005	49	6653		EMOD		HC	E	ZY	L	CAF			C															
6717	EPH	2005	49	6653		EMOD		HC	E	SU	L	CAF			C															
6718	EPH	2005	49	6653		EMOD		HC	E	OC	L	CAF			C															
6719	EPH	2005	49	6653		EMOD		HC	E	ZY	R	CAF			C															
6720	EPH	2005	49	6653		EMOD		HC	E	SU	R	CAF			C															
6721	EPH	2005	49	6653		EMOD		HC	E	OC	R	CAF			C															
6722	EPH	2005	49	6653		EMOD		HC	E	ZY	L	CAF			C															
6723	EPH	2005	49	6653		EMOD		HC	E	SU	L	CAF			C															
6724	EPH	2005	49	6653		EMOD		HC	E	OC	L	CAF			C															
6725	EPH	2005	49	6653		EMOD		HC	E	ZY	R	CAF			C															
6726	EPH	2005	49	6653		EMOD		HC	E	SU	R	CAF			C															
6727	EPH	2005	49	6653		EMOD		HC	E	ZY	L	CAF			C															
6728	EPH	2005	49	6653		EMOD		HC	E	SU	L	CAF			C															
6729	EPH	2005	49	6653		EMOD		HC	E	OC	L	CAF			C															
6730	EPH	2005	49	6653		EMOD		HC	E	ZY	R	CAF			C															
6731	EPH	2005	49	6653		EMOD		HC	E	SU	R	CAF			C															
6732	EPH	2005	49	6653		EMOD		HC	E	OC	R	CAF			C															
6733	EPH	2005	49	6653		EMOD		HC	E	ZY	L	CAF			C															
6734	EPH	2005	49	6653		EMOD		HC	E	SU	L	CAF			C															
6735	EP	2005	49	6653		EMOD		HC	E	OC	R	CAF			C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6736	EPH	2005	49	6653		EMOD		HC	E	ZY	L	S			C															
6737	EPH	2005	49	6653		EMOD		HC	E	SU	L	S			C															
6738	EPH	2005	49	6653		EMOD		HC	E	OC	R	S			C															
6739	EPH	2005	49	6653		EMOD		HC	E	SU	R	S			C															
6741	EPH	2005	50	6653		EMOD		HC	E	AT		CAF			C				29.2											
6742	EPH	2005	50	6653		EMOD		HC	E	AX		CAF			C															
6744	EPH	2005	49	6653		EMOD		HC	E	OC	R	EQ			C															
6745	EPH	2005	49	6653		EMOD		HC	E	OC	L	EQ			C															
6747	EPH	2005	50	6653		EMOD		HC	E	AT		EQ			C				76.2											
6748	EPH	2005	50	6653		EMOD		HC	E	AX		EQ			C															
6749	EPH	2005	50	6653		EMOD		HC	E	AT		EQ			B	V2; V15														
6750	EPH	2005	50	6653		EMOD		HC	E	AX		EQ			C															
6751	EPH	2005	50	6653		EMOD		HC	E	PE		FEC			C								10.6							
6752	EPH	2005	51	5563		EMOD		HC	E	OTHFE		S	UD		0															
6753	EPH	2005	51	5563		EMOD		HC	E	FE		O		G	0															
6754	EPH	2005	51	5563		EMOD		HC	E	SC		O	F		6	S17								22.5						
6755	EPH	2005	51	6653		EMOD		HC	M	TI	R	O	UD	UD	6	T14														
6756	EPH	2005	51	6653		EMOD		HC	M	OTHTI	R	B	G		6	T23														
6757	EPH	2005	51	6652		EMOD		HC	G	SC	L	O	F		6									20.3						
6758	EPH	2005	51	6652		EMOD		HC	M	OTHRA		B	F		3	R1														
6759	EPH	2005	51	6652		EMOD		HC	M	OTHTI	L	O	G		1															
6760	EPH	2005	51	6652		EMOD		HC	E	HC	L	B			C					59.6	44.8									
67	E	20	51	66		EM		H	M	HU	R	B		F	B	H20				91	38									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
61	PH	05		52		OD		C													.3									
6762	EPH	2005	51	6652		EMOD		HC	E	FE	R	B		UE	6															
6764	EPH	2005	51	6652		EMOD		HC	M	OTHTI	L	B?	F		6															
6765	EPH	2005	51	6652		EMOD		HC	G	OTHTI	L	B	G		3	T14														
6766	EPH	2005	51	6652		EMOD		HC	M	OTHRA	L	O	F		2															
6767	EPH	2005	51	6652		EMOD		HC	M	SC	L	O	F		6									22.1						
6768	EPH	2005	51	6652		EMOD		HC	M	FE		B?	F		6	F8														
6769	EPH	2005	51	6652		EMOD		HC	E	HU	L	B		F	6			C		76.8	33.4									
6770	EPH	2005	52	8692		MR		HC	M	P3		B			C															
6771	EPH	2005	52	8692		MR		HC	M	UL	L	S	UD		5															
6772	EPH	2005	52	8692		MR		HC	M	UL		GNP	J	J	C															
6773	EPH	2005	52	8692		MR		HC	M	TI		GNP	J	J	C															
6774	EPH	2005	52	8692		MR		HC	M	TI		GNP			3	T24				11.4	11.9									
6775	EPH	2005	52	8692		MR		HC	M	MC1	L	B		F	2					48.4					44.7	25.8	20	22.8	22	
6776	EPH	2005	52	8691		MR		HC	M	TI		GNP			C				119.7	11.7	13.5		113.9	6.8						
6777	EPH	2005	53	5535	4922	HM		HC	A	AS	L	B			C			C				53.8								
6778	EPH	2005	53	5535		HM		HC	B	TI		GNP			C				102.9	9.8	10		97.3							TWO PIECES
6779	EPH	2005	53	5535	4922	HM		HC	B	AT		B			6	V2														
6780	EPH	2005	53	5535		HM		HC	B	HC	R	OVA			6	SK2														
6781	EPH	2005	53	5535	4922	HM		HC	B	OC	R	B			C															
6782	EPH	2005	53	5535	4922	HM		HC	M	OTHU	R	B?			0	H3														
6783	EPH	2005	53	5535		HM		HC	B	SC	R	S	UD		6									25.6						
6784	EPH	2005	54	731		HM		HC	B	P3		EQ			C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6785	EPH	2005	54	731	2693	HM		HC	B	P3		B			C															
6786	EPH	2005	54	731		HM		HC	A	AT		EQ			6															
6787	EPH	2005	54	731		HM		HC	A	AS		EQ			6	V2														
6788	EPH	2005	54	731		HM		HC	M	MTIII		FEC	F	UD	C															
6789	EPH	2005	54	731		HM		HC	M	MTIV		FEC	F	UD	C															
6790	EPH	2005	54	731		HM		HC	M	MTV		FEC	F	UD	C															
6791	EPH	2005	54	731		HM		HC	M	OC		EQ			6															
6792	EPH	2005	54	2703		HM		HC	B	TI		O		F	4					20.5	18.5									
6793	EPH	2005	54	2703	2693	HM		HC	M	HU		B		F	B	H10; H17				61.2										
6794	EPH	2005	54	2703	2693	HM		HC	M	CA		B	UD		6			C												
6795	EPH	2005	54	2703		HM		HC	M	HC		CAH			6	SK2				32	22.7									PATHOLOGY; PHOTO
6796	EPH	2005	54	2703	2693	HM		HC	M	CA		B	F		C				11.8		44.7									
6797	EPH	2005	54	2703		HM		HC	B	SC		O	F		6									16.5						
6798	EPH	2005	54	2703	2693	HM		HC	M	MT1	L	B		F	2					43.4		15.9			39		18.2	19.4	21	
6799	EPH	2005	54	2703	2693	HM		HC	M	MT1	L	B		F	6					43.6		18.8			40.8		18.1	20.3	20.5	
6800	EPH	2005	54	2703		HM		HC	M	FE	R	O		G	1															
6801	EPH	2005	54	2703		HM		HC	G	UL		GNP			C															
6802	EPH	2005	54	2703		HM		HC	B	OTHRA	L	O	F		6															
6803	EPH	2005	54	2703		HM		HC	B	TI		O		UD	N															
6804	EPH	2005	54	2703		HM		HC	M	FE	R	O	UD	UD	C															NEONATAL
6805	EPH	2005	54	2703		HM		HC	A	OTHU	L	O	UD		0															NEONATAL
6806	EPH	2005	54	2703	2693	HM		HC	A	SC	R	B?	F		6									42.7						TWO PIECES
6807	EP	2005	54	2703	2693	HM		HC	E	OTHFE		B?	UE		C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6808	EPH	2005	54	2703	2693	HM		HC	B	HU	R	B?		UD	2															
6809	EPH	2005	54	2703	2693	HM		HC	B	FE		B?		UD	B	F8														
6810	EPH	2005	55	2745		EM	2317	FS<5	B	CA	R	O	UD		C						26.1									
6811	EPH	2005	55	2745		EM	2317	FS<5	B	CA	L	B			5															
6812	EPH	2005	55	2745		EM	2317	FS<5	B	UL	L	B			6															
6813	EPH	2005	55	2745		EM	2317	FS<5	M	P2		B	F		4															
6814	EPH	2005	55	2745		EM	2317	FS<5	B	P2		O	F		C															
6815	EPH	2005	55	2745		EM	2317	FS<5	G	DD		F-RC			X															
6816	EPH	2005	55	2745		EM	2317	FS<5	G	DD		F-RC			X															
6817	EPH	2005	55	2745		EM	2317	FS<5	G	MC2		O?		UD	6															
6818	EPH	2005	55	2745		EM	2317	FS<5	G	MTIII		SRO	F		C															
6819	EPH	2005	57	3976		HM		HC	B	TI	L	S	UD	UD	C															NEONATAL
6820	EPH	2005	57	3976		HM		HC	M	SC		GNP			6															
6821	EPH	2005	57	3976		HM		HC	M	MT1		GNP	J	J	C															
6822	EPH	2005	57	3976		HM		HC	M	MT1		GNP			6				65.9	12.2				5.8						
6823	EPH	2005	57	3976		HM		HC	M	FE	L	GNP			C				71.2	12.1	11.9		66.5	5.7						
6824	EPH	2005	57	3976		HM		HC	M	FE	L	GNP			C				69.8	13.1	11.9		65.6	5.9						
6825	EPH	2005	57	3976		HM		HC	M	TI		GNP	J		6															
6826	EPH	2005	57	3976		HM		HC	B	UL		GNP	J		5															
6827	EPH	2005	57	3976		HM		HC	B	RA		GNP	J	J	C															
6828	EPH	2005	57	3976		HM		HC	B	MTIII		S?	UD	UD	C															NEONATAL
6829	EPH	2005	58	2548		LM		HC	M	ZY	L	O			6															
68	E	20	58	25		LM		H	B	CA	L	O	UD		C						20									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
30	PH	05		48				C													.2									
6831	EPH	2005	58	2548		LM		HC	B	RA	R	S	F		1															
6832	EPH	2005	58	2548		LM		HC	B	AS	R	B			6	A2				36.2										
6833	EPH	2005	58	2548		LM		HC	M	PE	L	O			C								20.6							
6834	EPH	2005	58	2548		LM		HC	M	PE	R	O?			6								22.3							
6835	EPH	2005	58	2548		LM		HC	M	HU	L	B		F	1	H13				59.9	25.7									
6836	EPH	2005	58	2548		LM		HC	M	OTHU	R	S	UD		1															
6837	EPH	2005	58	2548		LM		HC	M	HU	L	O?	UD	UD	3															NEONATAL
6838	EPH	2005	58	2548		LM		HC	M	OC	L	O			6															
6839	EPH	2005	58	2548		LM	2309	FS<5	M	MTIV		SRO			C															
6840	EPH	2005	59	2657		HM		HC	M	TI	R	O		F	4					22	18.9									
6841	EPH	2005	59	2657	2658	HM		HC	M	CA	R	B	UD		6			C			44.5									
6842	EPH	2005	59	2639	2658	HM		HC	B	MC1	R	B		F	5	M20				58.3					52.8					
6843	EPH	2005	59	2639		HM		HC	B	HU	L	O		F	4					26	12.7									
6844	EPH	2005	59	2639		HM		HC	M	HU	R	O		F	B	H17				27.6	14									
6845	EPH	2005	59	2639	2658	HM		HC	M	P2		B	F		C															
6846	EPH	2005	59	2639		HM		HC	M	P1		S	G		C															
6847	EPH	2005	59	2639	2658	HM		HC	M	P3		B			C	XP														
6848	EPH	2005	59	2639		HM		HC	M	RA		GNP			C															
6849	EPH	2005	59	2639		HM		HC	M	OTHRA	L	O	F		0															
6850	EPH	2005	59	2639	2658	HM		HC	M	AS	R	B			B	A5				36.9		53.4								
6851	EPH	2005	59	2639		HM		HC	B	TI	L	S		UD	2															
6852	EPH	2005	59	2639		HM		HC	M	OTHFE	L	O	UD		5															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6853	EPH	2005	61	2638	2658	HM		HC	M	RA	L	B		UD	1															
6854	EPH	2005	61	2638	2658	HM		HC	B	MC1	R	B	F	F	C				171.9	46.9	24.9	16.1		26.9	44.3	24	17.9	21.5	22.6	
6855	EPH	2005	62	5795		MR		HC	M	OTHRA	R	O	F		6	R11														
6856	EPH	2005	62	5795		MR		HC	B	SC	L	S?	F		6															
6857	EPH	2005	62	5795		MR		HC	M	MTIV		CAF	F	F	C				46.8	6.2	6.1									
6859	EPH	2005	68	6635		EMOD		HC	G	MT1		EQ	F	F	C				266	48.3	37.3			30.9						
6860	EPH	2005	68	6635		EMOD		HC	G	OTHRA	L	EQ	F		4															
6861	EPH	2005	68	6635		EMOD		HC	E	OTHRA	R	EQ	F		6															MUCH SMALLER THAN ABOVE`
6862	EPH	2005	68	6635		EMOD		HC	E	OTHU	L	EQ	G		2															
6863	EPH	2005	68	6635		EMOD		HC	E	TI	L	EQ	F	F	C				344	70.7	45.1			37.7						
6864	EPH	2005	68	6635		EMOD		HC	E	SC	L	EQ	F		C									56.1						
6865	EPH	2005	68	6635		EMOD		HC	B	SC	R	O?	UD		6									24.6						
6866	EPH	2005	68	6635		EMOD		HC	B	OTHFE	R	S	UD		1															
6867	EPH	2005	66	6977		ER		HC	A	UL	R	B			6															
6868	EPH	2005	66	6977		ER		HC	A	UL	R	B			6															
6869	EPH	2005	66	6977		ER		HC	A	UL	L	B			6															
6870	EPH	2005	66	6977		ER		HC	B	CA	L	B	F		6															
6871	EPH	2005	66	6977		ER		HC	B	CA	R	B			6															
6872	EPH	2005	69	2946		MR		HC	M	P3		B			C															
6873	EPH	2005	69	2946		MR		HC	G	HC	L	O			6					40.3	28.3									
6874	EPH	2005	69	2946		MR		HC	M	AS	L	S			6					22.2	20.8	27.1								
6875	EPH	2005	69	2946		MR		HC	M	RA	R	O			C	R13			137.5					13.5						
68	E	20	69	29		MR		H	A	MC	R	B			5					48					44	27	19	22	22	

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
76	PH	05		46				C		1										.8					.7	.6		.5	.6	
6877	EPH	2005	69	2946		MR		HC	B	TI	R	O		F	5					20	22.5									
6878	EPH	2005	69	4555		MR		HC	M	OC	L	B			6															
6879	EPH	2005	74	4932		MR		HC	B	MTV		S	F	UD	C															
6880	EPH	2005	74	4932		MR		HC	B	MT2		S		F	6															
6881	EPH	2005	74	4932		MR		HC	B	SC	R	O	UD		6									11.2						NEONATAL
6882	EPH	2005	74	4932		MR		HC	G	UL	R	LE	F		6															
6883	EPH	2005	74	4932		MR		HC	G	UL	R	LE			6															
6884	EPH	2005	74	4932		MR		HC	G	RA	R	LE	F	F	6				96.9					4.6						
6885	EPH	2005	74	4932		MR		HC	G	MT1	L	B	F	F	4	M12			191	44.3	27.1	20		19	40.9	27.1	19.2	20.5	21.2	
6886	EPH	2005	74	4932		MR		HC	G	MT2		S	F	UD	C															
6887	EPH	2005	74	4932		MR		HC	B	MTIV		S	F	UD	C															
6888	EPH	2005	74	4932		MR		HC	G	MCIII		S	F	G	C				72.5	15.8	16.2									
6889	EPH	2005	74	4932		MR		HC	B	MCIV		S	F	UD	C															
6890	EPH	2005	74	4932		MR		HC	B	MCIV		S	F	UD	C															
6891	EPH	2005	74	4932		MR		HC	B	MCIV		S	F	G	C				76	16.4	17.9									
6892	EPH	2005	74	4879		MR		HC	B	UL	L	S	UD		6															
6893	EPH	2005	74	4879		MR		HC	G	UL		GNP			C															
6894	EPH	2005	74	4879		MR		HC	G	UL		GNP			C															
6895	EPH	2005	74	4879		MR		HC	G	UL		GNP			6															
6896	EPH	2005	74	4879		MR		HC	G	UL		GNP			6															
6897	EPH	2005	74	4879		MR		HC	G	SC	R	S	UD		6									21.2						
6898	EPH	2005	74	4879		MR		HC	G	HU	L	S			1	H17														

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6899	EPH	2005	74	4879		MR		HC	G	HU		GNP			5															
6900	EPH	2005	74	4879		MR		HC	G	CO		GNP			C															
6901	EPH	2005	74	4879		MR		HC	G	MC1		GNP			C				41			6								
6902	EPH	2005	74	4879		MR		HC	G	CO		ANS			6															
6903	EPH	2005	74	4879		MR		HC	G	PE	L	LE			6								10.9							
6904	EPH	2005	74	4879		MR		HC	G	TI		COM			6					6.7	7.3									
6905	EPH	2005	74	4879		MR		HC	G	RA		GNP			C															
6906	EPH	2005	74	4879		MR		HC	G	RA		GNP			6															
6907	EPH	2005	74	4879		MR		HC	G	RA		ANS		J	5															
6908	EPH	2005	74	4879		MR		HC	B	P1		B	F		6			C												
6909	EPH	2005	74	4879		MR		HC	M	MC1	L	B		F	1						26.5	20.5			44.1		23		19	
6910	EPH	2005	74	4879		MR		HC	M	OTHU		GNP			6															
6911	EPH	2005	74	4879		MR		HC	M	MC2		S	F	F	C				47.6	8.6	11.6									
6912	EPH	2005	74	4879		MR		HC	M	MCIV		S	F	UD	C															
6913	EPH	2005	77	6635		EMOD		HC	E	HC	R	OVA			C					47.6	28									THUMBPRINT
6914	EPH	2005	77	6635		EMOD		HC	E	HC	L	B			6	SK5				61.9	53									
6915	EPH	2005	77	6635		EMOD		HC	E	HC	L	B			6	SK1; XS				55	45.5									SAW THROUGH TIP
6916	EPH	2005	77	6635		EMOD		HC	E	HC	R	B			6					68.6	50.8									
6917	EPH	2005	77	6635		EMOD		HC	E	HC	R	B			6	SK5				65	53.2									
6918	EPH	2005	77	6635		EMOD		HC	E	HC	R	B			6	SK5				57.1	46.6									
6919	EPH	2005	77	6635		EMOD		HC	E	HC	L	B			6					45.1	36									
6920	EPH	2005	78	1883	1883	HM		HC	M	MT1	L	B	F	UD	C										54					
6921	EP	2005	78	1883	1883	HM		HC	M	MC1	R	B		F	N					48.4	27.6	20.9			46.3	22.5	23.5	26.6	19.7	

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6922	EPH	2005	78	1883	1883	HM		HC	M	TI	L	B		F	1					48.1	36.2									
6923	EPH	2005	78	1883	1883	HM		HC	M	TI	R	B		F	1					55.9	43.1									
6924	EPH	2005	78	1883	1883	HM		HC	M	HU	R	B			6	H17														
6925	EPH	2005	79	7662		ER		HC	G	SC	R	B	F		6									45.8						
6926	EPH	2005	79	7662		ER		HC	G	SC	R	O	F		6									21.6						
6927	EPH	2005	79	7662		ER		HC	G	HU	R	O	F		3					26.8	13.2									
6928	EPH	2005	79	7662		ER		HC	G	OTHU	L	O	UD		6															
6929	EPH	2005	81	6653		EMOD		HC	E	SU	L	EQ			C															
6930	EPH	2005	81	6653		EMOD		HC	E	SU	R	EQ			C															
6931	EPH	2005	81	6653		EMOD		HC	E	ZY	R	EQ			C															
6932	EPH	2005	81	6653		EMOD		HC	E	ZY	L	EQ			C															
6933	EPH	2005	84	3612		EM		HC	E	MC1		SCR			6															
6934	EPH	2005	84	3612		EM		HC	E	FE	L	GNP			C				70.4	13.2	11.2		65.7	5.8						
6935	EPH	2005	85	2783		HM		HC	G	HC	R	CAH			6					29.7	19.3									
6936	EPH	2005	85	2783		HM		HC	B	HC	L	CAH			6															
6937	EPH	2005	85	2783	2693	HM		HC	B	UL	L	B			6															
6938	EPH	2005	85	2783	2693	HM		HC	B	UL	L	B			6															
6939	EPH	2005	85	2783		HM		HC	B	OTHRA	L	EQ?	F		5			C												
6940	EPH	2005	85	2783	2693	HM		HC	B	OTHRA	L	B?	F		1															
6941	EPH	2005	85	2783	2693	HM		HC	B	OTHRA	R	B	F		6															
6942	EPH	2005	85	2783		HM		HC	B	OTHRA	R	O	F		6	R13														
6943	EPH	2005	85	2783		HM		HC	B	OTHTI	R	EQ?	G		6															
69	E	20	85	27		HM		H	A	TI	R	O		F	4					23	17									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
44	PH	05		83				C												.4	.7									
6945	EPH	2005	85	2783		HM		HC	G	CO		GNP			C															
6946	EPH	2005	85	2783		HM		HC	B	HU	R	O		F	2					26.9		13.9								
6947	EPH	2005	85	2783		HM		HC	B	MC1		EQ		F	2	M12				34.4	25.5									
6948	EPH	2005	85	2783	2693	HM		HC	A	MT1	R	B		F	4					49.4		21.8			5.7			22.3		
6949	EPH	2005	85	2783		HM		HC	B	UL	L	O			6															
6950	EPH	2005	87	4924		HM		HC	M	SC	L	O	F		6									18.7						
6951	EPH	2005	87	4924		HM		HC	M	TI	R	S		UD	1															
6952	EPH	2005	85	2783		HM	2334	FS<5	G	MC1		SCR			C				38.9			4.2								
6953	EPH	2005	85	2783		HM	2334	FS<5	G	P3		LE?			C															
6954	EPH	2005	85	2783		HM	2334	FS<5	G	P3		LE?			C															
6955	EPH	2005	85	2783		HM	2334	FS<5	G	P3		LE?			C															
6956	EPH	2005	85	2783		HM	2334	FS<5	G	P3		LE?			C															
6957	EPH	2005	85	2783		HM	2334	FS<5	G	FE	R	SRO			6															
6958	EPH	2005	85	2783		HM	2334	HC	G	P1		LE?			C															
6959	EPH	2005	85	2783		HM	2334	FS<5	G	P1		LE?			C															PATHOLOGY - EXOSTOSIS
6960	EPH	2005	85	2783		HM	2334	FS<5	G	P1		LE?			C															
6961	EPH	2005	85	2783		HM	2334	FS<5	G	P2		LE?			C															
6962	EPH	2005	85	2783		HM	2334	FS<5	G	P3		O			C															
6963	EPH	2005	85	2783		HM	2334	FS<5	G	AS		S			C				35.6	19.8	18.8	32.7								
6964	EPH	2005	85	2784	2693	HM		HC	B	HU	L	B		F	6															TWO PIECES
6965	EPH	2005	85	2784	2693	HM		HC	B	OTHRA	L	B	F		2															
6966	EPH	2005	85	2784	2693	HM		HC	B	OTHRA	R	B	F		6															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
6967	EPH	2005	85	2784	2693	HM		HC	B	OTHRA	R	B	F		3															
6968	EPH	2005	85	2784	2693	HM		HC	A	MT1	L	B	F	UD	6															
6969	EPH	2005	85	2784		HM		HC	B	P1		O	G		C			D												
6970	EPH	2005	85	2784	2693	HM		HC	B	FE	L	B		F	6															
6971	EPH	2005	85	2784	2693	HM		HC	M	OTHU	R	B	F		6	H15														
6972	EPH	2005	85	2784		HM		HC	M	SC	R	O	F		6	S13								18.3						
6973	EPH	2005	86	683		LM	353	FS<5	G	HU	L	O		F	0					27.2	12.6									
6974	EPH	2005	86	683		LM	353	FS<5	B	P2		S	F		C															
6975	EPH	2005	86	683		LM	353	FS<5	B	HU		GNP	J	J	6															TWO PIECES
6977	EPH	2005	86	683		LM	353	FS<5	B	UL		SCR			6		B													TWO PIECES
6978	EPH	2005	94	967		LM		HC	G	HC	L	CAH			4															
6979	EPH	2005	94	967		LM		HC	G	HC	R	CAH			6					26.7	19.4									
6980	EPH	2005	94	967		LM		HC	B	MC1		ANS			4							9.2								
6981	EPH	2005	94	967	821	LM		HC	M	SC	L	B	F		6															
6982	EPH	2005	94	967	821	LM		HC	G	TI	L	B		UD	3															
6983	EPH	2005	94	967		LM		HC	G	HU	L	GNP			C				65.9	14				6.4						
6984	EPH	2005	94	967		LM		HC	M	TI		GNP	J		6					10.1	10.2									
6985	EPH	2005	94	967		LM		HC	B	FE	L	GNP	J		0															
6986	EPH	2005	94	967		LM		HC	M	TI	R	O		F	2					22.7	18.9									
6987	EPH	2005	94	967		LM		HC	B	SCU	L	O			6															
6988	EPH	2005	95	967	821	LM		HC	G	ZY	R	B			C															
6989	EPH	2005	95	967	821	LM		HC	G	ZY	R	B			C															
6990	EP	2005	95	967	821	LM		HC	G	ZY	L	B			C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
6991	EPH	2005	95	967	821	LM		HC	M	P1		B	F		6															
6992	EPH	2005	95	967	821	LM		HC	G	HU	L	B		F	4			C												
6993	EPH	2005	95	3526	3531	LM		HC	M	P1		EQ	F		6															
6994	EPH	2005	95	3526	3531	LM		HC	M	CA	L	B	UD		C						41.1									
6995	EPH	2005	95	3526	3531	LM		HC	M	MC1	R	O		UD	5										18.8					
6996	EPH	2005	95	3526	3531	LM		HC	M	TI	R	B		F	2	T11				47.4	35.1									
6997	EPH	2005	95	3526	3531	LM		HC	M	SC	L	O	F		6									17.6						
6998	EPH	2005	95	3527	3531	LM		HC	G	RA	R	O		F	6	R6														
6999	EPH	2005	95	3527	3531	LM		HC	G	P1		EQ	F		N			C	71.4			51.5	35.2	29.5						
7000	EPH	2005	95	3527	3531	LM		HC	M	CA	L	B	UD		N															
7001	EPH	2005	95	3527	3531	LM		HC	M	OTHRA	L	B	F		5			C												
7002	EPH	2005	95	3527	3531	LM		HC	M	MT1	L	B	F	UD	N										41.1					
7003	EPH	2005	95	3527	3531	LM		HC	M	MT1		EQ	F	F	C	M10; M12		C	241					26.6						
7004	EPH	2005	95	3530	3531	LM		HC	M	P1		B	F		C															
7005	EPH	2005	95	3530	3531	LM		HC	M	P1		B	F		N															
7006	EPH	2005	95	3530	3531	LM		HC	M	ZY	L	B			6	SK6														
7007	EPH	2005	95	3527	3531	LM		HC	M	SC	L	O	F		6															
7008	EPH	2005	95	3527	3531	LM		HC	M	P1		B	F		C															
7009	EPH	2005	95	3527	3531	LM		HC	M	TI	R	O		F	4					21.5	18.2									
7010	EPH	2005	95	3527	3531	LM		HC	M	AS	L	O			C				25.5	16.8	14.3	24.6								EXOSTOSIS PROXIMAL MEDIAN
7011	EPH	2005	95	3527	3531	LM		HC	B	OTHRA	R	B	F		5															
7012	EPH	2005	95	3527	3531	LM		HC	G	OTHRA	R	O	F		6															
70	E	20	95	35	353	LM		H	G	RA		GN			C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
13	PH	05		27	1			C				P																		
7014	EPH	2005	95	3527	3531	LM		HC	G	MC2		CAF	F	F	C				59.6	9	8.8			6.9						
7015	EPH	2005	95	3527	3531	LM		HC	G	HU	R	FEC	UD	F	C					15.6		5.5								
7016	EPH	2005	95	3527	3531	LM		HC	M	TI	L	O?	UD	UD	C															NEONATAL
7017	EPH	2005	95	3527	3531	LM		HC	G	P1		B	F		C															
7018	EPH	2005	95	3527	3531	LM		HC	G	AS	R	B			C				58.1	36.8	32.2	53								
7019	EPH	2005	95	3527	3531	LM		HC	M	TI	L	B		F	4					52										
7020	EPH	2005	95	3527	3531	LM		HC	M	PE	L	B			6	P14							44.4							
7021	EPH	2005	95	3527	3531	LM		HC	M	OTHRA	L	B	F		3															
7022	EPH	2005	95	3527	3531	LM		HC	M	CA	R	B	G		6				113.2		46.8									
7023	EPH	2005	95	3527	3531	LM		HC	M	CA	R	B			6						43.1									
7024	EPH	2005	95	3527	3531	LM		HC	G	ZY	R	B			C															
7025	EPH	2005	95	3527	3531	LM		HC	G	CA	R	EQ			6			C												
7026	EPH	2005	112	7616		MR		HC	B	CA	L	B			6	C7					47.5									
7027	EPH	2005	112	7616		MR		HC	A	UL	L	B			6	U14														
7028	EPH	2005	112	6925		MR		HC	B	TI	L	B		F	6															
7029	EPH	2005	113	6635		EMOD		HC	E	UL	L	B			3	U12														
7031	EPH	2005	113	6635		EMOD		HC	E	UL	L	B			4	U18														
7032	EPH	2005	113	6635		EMOD		HC	M	UL	R	B			3															
7033	EPH	2005	113	6635		EMOD		HC	E	UL	R	B			3	U18														
7034	EPH	2005	113	6635		EMOD		HC	G	UL	R	B			3															
7035	EPH	2005	113	6635		EMOD		HC	E	OTHRA	R	B	F		4	R14														
7036	EPH	2005	113	6635		EMOD		HC	M	PE	R	B			4	P6							55.5							

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7037	EPH	2005	113	6635		EMOD		HC	E	OTHFE	L	EQ	F		3						52.7									
7038	EPH	2005	113	6635		EMOD		HC	E	AS	R	B			B	A3														
7039	EPH	2005	113	6635		EMOD		HC	G	TI	R	O		F	1					23.9	20.2									
7040	EPH	2005	113	6635		EMOD		HC	E	FE	L	O		F	1			C												
7041	EPH	2005	113	6635		EMOD		HC	M	MT1	R	O	F	F	C				120.9	24.1	15.7	10.4		12.6	24.5	14.8	9.9	10.4	11.3	
7042	EPH	2005	113	6635		EMOD		HC	E	MT1	R	B		F	B	M24				52.8	31.5	23.2			49.9	31.4	22.9	24.4	25.5	
7043	EPH	2005	113	6635		EMOD		HC	E	MP1	L	B		UE	C					57.6		26			60.9	32.8	24.3	26.3	27.6	
7044	EPH	2005	113	6635		EMOD		HC	E	OTHRA	R	B	F		3															
7045	EPH	2005	113	6635		EMOD		HC	G	HU	R	CAF	F	F	C				113.2	20.5		8.6		7						
7046	EPH	2005	113	6635		EMOD		HC	E	UL	L	CAF	F		C															
7047	EPH	2005	113	6635		EMOD		HC	E	TI	L	B		F	1					59.3	48.4									
7048	EPH	2005	113	6635		EMOD		HC	B	HU	R	B		F	3															
7049	EPH	2005	113	6635		EMOD		HC	B	HU	R	O?	UD	UD	C															NEONATAL
7050	EPH	2005	114	1878		LM		HC	B	RA	L	S	F	UD	5															
7051	EPH	2005	114	1878		LM		HC	B	SC	L	S	F		5									22.8						
7052	EPH	2005	114	1878		LM		HC	B	TI	L	S		G	6															
7053	EPH	2005	114	1878		LM		HC	B	TI	R	S		G	6															
7054	EPH	2005	114	1878		LM		HC	M	TI	L	O		F	3					22.2	18.6									
7055	EPH	2005	114	1878		LM		HC	M	OTHTI	R	O	F		2	T10														
7056	EPH	2005	114	1878		LM		HC	G	HC	R	B			6															
7057	EPH	2005	114	1878		LM		HC	M	HU	R	B		F	2					67.4	30.8									
7058	EPH	2005	114	1878		LM		HC	A	MP1		B		UE	C															
7059	EP	2005	114	1878		LM		HC	M	AX		O			6															

bones

ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7060	EPH	2005	114	1878		LM		HC	M	AT		S			6															
7061	EPH	2005	115	7583		ER		HC	G	TI	R	EQ		F	4			C		70	47.7									TWO PIECES
7062	EPH	2005	115	7593		ER		HC	G	MT1	R	B		F	3											28.6	21	24		
7063	EPH	2005	116	785		LM	1327	FS <5	G	P3		LE?			C															
7064	EPH	2005	116	785		LM	1327	FS <5	G	FE		APS?	F	F	C				14.5		1.4			1.5						
7065	EPH	2005	116	785		LM	1327	FS <5	M	OTHFE	R	FAC			5						3.6									
7066	EPH	2005	116	785		LM	1328	FS <5	M	P2		FEC	F		C															
7067	EPH	2005	116	785		LM	1328	FS <5	M	P2		LE?	F		C															
7068	EPH	2005	116	785		LM	1328	FS <5	M	P1		SRO	F		C															
7069	EPH	2005	117	4956		HM		HC	M	MT1		EQ	F	F	C				257	44.7				27.6						
7070	EPH	2005	117	4956		HM		HC	M	MC1		EQ	F	F	C				233	48.2	37			35.1						
7071	EPH	2005	117	4956	4893	HM		HC	M	AS		B			6				64.7	39.7	34.1	57.7								TWO PIECES
7072	EPH	2005	117	4956	4893	HM		HC	M	P1		B	F		6															
7073	EPH	2005	117	4956	4893	HM		HC	M	CA	R	B	F		6	C6														
7074	EPH	2005	117	4956		HM		HC	G	UL		GNP			C															
7075	EPH	2005	117	4956		HM		HC	M	SC	L	O?	UD		5									20.8						
7076	EPH	2005	117	4956		HM		HC	B	OTHRA	R	O	F		4															
7077	EPH	2005	117	4956		HM		HC	B	FE		S?		UD	1															
7078	EPH	2005	117	4956		HM		HC	B	AT		S			6				45.9											
7079	EPH	2005	117	4956		HM		HC	B	MC1		ANS			6				82			9								
7080	EPH	2005	117	4956		HM		HC	M	MT1		GNP			C				79.7	15.2				7						SPUR PRESENT
7081	EPH	2005	117	4956	4893	HM		HC	M	P1		B	F		C															
70	E	20	11	49	489	HM		H	M	UL	L	B	UD		5															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
82	PH	05	7	56	3			C																						
7083	EPH	2005	117	4956		HM		HC	B	SC	L	EQ	F		N															
7084	EPH	2005	117	4956		HM		HC	M	HU	L	EQ		F	N					72.5		36.4								
7085	EPH	2005	117	4956		HM		HC	M	P1		EQ	F		C				82.8	46.9	23.8	54.8	36.3	34						
7086	EPH	2005	117	4956		HM		HC	M	MP1		CAF?		F	6															
7087	EPH	2005	117	4956	4893	HM		HC	M	RA	L	B		G	5															
7088	EPH	2005	118	688		LM		HC	M	MC2		S		UD	6															
7089	EPH	2005	118	690		LM		HC	A	P1		O	F		6															
7090	EPH	2005	118	690		LM		HC	E	OC	R	S			C															
7091	EPH	2005	118	690		LM		HC	B	P1		B	F		6															
7092	EPH	2005	118	690		LM		HC	B	CO		GNP			6															
7093	EPH	2005	118	691		LM		HC	M	TI	L	B		UD	4															
7094	EPH	2005	118	691		LM		HC	M	OTHU		B?	UE		6															
7095	EPH	2005	118	691		LM		HC	M	MCV		S	F	UD	C															ROMAN RESIDUAL?
7096	EPH	2005	118	691		LM		HC	M	MTIV		S	F	UD	C			C												ROMAN RESIDUAL?
7097	EPH	2005	118	691		LM		HC	M	TI		GNP		J	6		B													ROMAN RESIDUAL?
7098	EPH	2005	118	691		LM		HC	M	RA		GNP	J		6															ROMAN RESIDUAL?
7099	EPH	2005	118	691		LM		HC	B	CA	L	B			6			C			41.7									
7100	EPH	2005	118	683		LM		HC	G	SC	R	O	F		5									17.7						
7101	EPH	2005	118	683		LM		HC	M	AS	L	B			6			C	58.4	39.6		52.1								
7102	EPH	2005	118	683		LM		HC	M	RA	L	O	F	F	C				138.6					11						
7103	EPH	2005	118	683		LM		HC	E	UL	R	B			6															
7104	EPH	2005	118	683		LM		HC	M	TI	L	O		F	6					22.2	18.5									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7105	EPH	2005	118	683		LM		HC	M	TI	L	O		F	5			C		22.5	17.7									
7106	EPH	2005	118	683		LM		HC	G	TI	R	O		F	0					22.8	18.4									
7107	EPH	2005	118	683		LM		HC	M	P1		O	F		C															
7108	EPH	2005	118	683		LM		HC	B	P1		S	F		6															
7109	EPH	2005	118	683		LM		HC	B	TI		S		UD	2															
7110	EPH	2005	118	683		LM		HC	B	TI	R	S	UD	UD	C															
7111	EPH	2005	118	683		LM		HC	M	HU		GNP			C				65.9	14	6.4									
7112	EPH	2005	118	683		LM		HC	B	MP2		O		F	3															
7113	EPH	2005	118	683		LM		HC	B	MT1		O	UD	UD	C															NEONATAL
7114	EPH	2005	118	683		LM		HC	B	MCV		S		F	6															
7115	EPH	2005	118	683		LM		HC	B	OTHTI	R	B?	UD		6															
7116	EPH	2005	118	683		LM		HC	M	UL	L	FEC	F	UD	C															
7117	EPH	2005	118	683		LM		HC	M	UL	R	FEC	F	UD	C															
7118	EPH	2005	118	683		LM		HC	M	MCIII		FEC	F	F	C				41.5	5.5	5.1			4.2						
7119	EPH	2005	118	683		LM		HC	M	RA	L	FEC	F	UD	C															
7120	EPH	2005	118	683		LM		HC	M	RA	L	FEC	F	UD	C															
7121	EPH	2005	118	683		LM		HC	M	TI	L	FEC	UD	F	C					13.8	8.1									
7122	EPH	2005	118	683		LM		HC	M	UL		PSF			6															
7123	EPH	2005	118	683		LM		HC	M	CO		CCC			6															
7124	EPH	2005	118	683		LM		HC	M	FE	L	CCC	J	J	C				47.5	9.1	6.5		46.2	4.2						
7125	EPH	2005	118	683		LM		HC	G	FE	R	GNP			C				73.6	13.5	11.3		69	5.7						
7126	EPH	2005	118	683		LM		HC	B	TI		GNP	J	J	C															
7127	EP	2005	118	683		LM		HC	B	TI		GNP	J	J	C															

bones																															
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7128	EPH	2005	118	683		LM		HC	B	TI		GNP	J	J	C															
7129	EPH	2005	118	683		LM		HC	B	UL		GNP			C															
7130	EPH	2005	118	683		LM		HC	B	CO		GNP			C															
7131	EPH	2005	118	683		LM		HC	B	MT1		GNP			C				77.4	13.5	9.9			7.3						SPUR PRESENT
7132	EPH	2005	118	683		LM		HC	B	MT1		GNP			C	M19			75.5	14.4	10.1			7.5						SPUR PRESENT
7133	EPH	2005	118	683		LM		HC	B	MT1		GNP			C				70.3	12.1	9.2			5.1						
7134	EPH	2005	118	683		LM		HC	B	MT1		GNP	J	J	C															
7135	EPH	2005	118	683		LM		HC	B	MT1		GNP	J	J	C															
7136	EPH	2005	118	683		LM		HC	B	MT1		GNP	J	J	C															
7137	EPH	2005	119	970		LM		HC	M	TI	R	EQ		F	1						42.2									
7138	EPH	2005	119	970	821	LM		HC	G	AS	R	B			6				54.8	36		48.9								
7139	EPH	2005	119	970	821	LM		HC	B	MC1	L	B		F	2											26	18.9	22.6		
7140	EPH	2005	119	970		LM		HC	B	MT1	R	O	F	F	C				120.7	22.8	14.5	8.8		10.4	22.2	13.5	8.3	9.7	10.7	
7141	EPH	2005	119	970		LM		HC	M	TI		GNP			6					10.8	10.7									
7142	EPH	2005	119	970		LM		HC	B	HU	R	O	UD	UD	C															NEONATAL
7143	EPH	2005	119	970		LM		HC	B	TI	R	O	UD	UD	C															NEONATAL
7144	EPH	2005	119	970		LM		HC	B	HU	R	FEC		F	4					13.4		5								
7145	EPH	2005	119	970		LM		HC	B	PE	R	O			6															
7146	EPH	2005	119	970		LM		HC	B	PE	L	O			6								22.4							TWO PIECES
7147	EPH	2005	119	970		LM		HC	B	SU	R	O			6															
7148	EPH	2005	119	972	821	LM		HC	M	MC1	R	B		F	N					47	25.2	19			41.7	25	18.1	22	23	
7149	EPH	2005	119	972		LM		HC	M	TI	R	O		F	2					24	18.4									
71	E	20	11	97		LM		H	M	FE		FE		F	5															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
50	PH	05	9	2				C				C																		
7151	EPH	2005	119	972		LM		HC	M	FE	R	FEC	UD	UD	C															
7152	EPH	2005	119	972		LM		HC	M	PE	R	FEC			C								9.3							
7153	EPH	2005	120	856		LM		HC	G	CO		SCR			C															
7154	EPH	2005	120	856		LM		HC	G	RA		SCR			C															
7155	EPH	2005	120	855		LM		HC	M	OTHRA	L	B	F		2															
7156	EPH	2005	120	855		LM		HC	M	P1		B	F		6															
7157	EPH	2005	120	855		LM		HC	B	HU	R	B		F	3					67.3		28								
7158	EPH	2005	120	855		LM		HC	B	TI	L	B		F	6						36.6									
7159	EPH	2005	120	855		LM		HC	M	MT1		GNP			C				67.5	11.5	9.2			5.3						
7160	EPH	2005	120	855		LM		HC	B	MP1		O		F	5															
7161	EPH	2005	120	855		LM		HC	B	MC1	R	O		UD	6															NEONATAL
7162	EPH	2005	120	855		LM		HC	M	MCIV		S		F	5															
7163	EPH	2005	120	855		LM		HC	B	CA	R	O?	UD		6															
7164	EPH	2005	120	855		LM		HC	M	UL	R	O	UD		6															
7166	EPH	2005	121	1877		HM	376	FS<5	B	P1		S	F		C															
7167	EPH	2005	121	1877		HM	376	FS<5	B	MC1		O		UD	5															NEONATAL
7168	EPH	2005	121	1877		HM	376	FS<5	M	TI		GNP			5					13.7	10									
7169	EPH	2005	121	1877		HM	376	FS<5	M	OTHU	L	S?	UD		B	H17														
7170	EPH	2005	121	1877		HM		HC	B	OC	L	O			C															
7171	EPH	2005	121	1877		HM		HC	B	OC	R	O			C															
7172	EPH	2005	121	1877		HM		HC	M	P1		O	F		C															
7173	EPH	2005	121	1877	1859	HM		HC	M	P1		B	F		C															

bones																														
ID	**SITE**	**YEAR**	**BOX**	**CTX**	**Feature**	**ERA**	**CAT#**	**COL**	**PRES**	**EL**	**SIDE**	**TAX**	**FUSP**	**FUSD**	**FFI**	**BUTCH**	**BURN**	**GNAW**	**GL**	**Bd**	**Dd**	**HTC**	**LAR**	**SD**	**BatF**	**a**	**b**	**1**	**4**	**Comments**
7174	EPH	2005	121	1877		HM		HC	M	SC	R	O	F		5															
7175	EPH	2005	121	1877		HM		HC	M	SC	R	S	F		5									18.2						
7176	EPH	2005	121	1877		HM		HC	M	SC	L	S	F		5									19.3						
7177	EPH	2005	121	1877		HM		HC	M	OTHRA	R	O	F		6															
7178	EPH	2005	121	1877		HM		HC	B	HC	L	OVA			6															
7179	EPH	2005	121	1877		HM		HC	B	HC	L	OVA			6															
7180	EPH	2005	121	1877		HM		HC	G	HC	L	OVA			C					23.8	15.8									
7181	EPH	2005	121	1877		HM		HC	B	MT1	L	O	UD	UD	C															NEONATAL
7182	EPH	2005	121	1877		HM		HC	M	MT2		O	F	F	B	M3														
7183	EPH	2005	121	1877		HM		HC	M	RA		ANS			6															
7184	EPH	2005	121	1877	1859	HM		HC	M	MT1	L	B		F	4					51.4	28.6	21.6			48.4	28.4	20.6	23.5	24.7	
7185	EPH	2005	121	1877	1859	HM		HC	M	AS	R	B			C	A15			52.6	34	28.6	48.1								
7186	EPH	2005	121	1877	1859	HM		HC	M	PE	R	B			6								52							
7188	EPH	2005	121	1877	1859	HM		HC	M	PE	R	B			6	P10							52.1							
7189	EPH	2005	121	1877		HM		HC	M	FE		O		UD	2															
7190	EPH	2005	121	1874		HM		HC	M	RA	L	O	F	UD	C															
7191	EPH	2005	121	1874	1859	HM		HC	A	TI	R	B		F	4					49.4	41.9									
7192	EPH	2005	121	1874		HM		HC	M	OTHRA	L	O	F	UD	5															
7193	EPH	2005	121	1874		HM		HC	M	SC	L	O?	F		5									17						
7194	EPH	2005	121	1874	1859	HM		HC	B	AS	L	B			C				59	36	31.6	53.7								
7195	EPH	2005	121	1874	1859	HM		HC	M	ZY	R	B			6															
7196	EPH	2005	121	1874		HM		HC	M	SC	L	O	F		5															
7197	EP	2005	121	1874	1859	HM		HC	M	P1		B			C															

bones																														
ID	**SITE**	**YEAR**	**BOX**	**CTX**	**Feature**	**ERA**	**CAT #**	**COL**	**PRES**	**EL**	**SIDE**	**TAX**	**FUSP**	**FUSD**	**FFI**	**BUTCH**	**BURN**	**GNAW**	**GL**	**Bd**	**Dd**	**HTC**	**LAR**	**SD**	**BatF**	**a**	**b**	**1**	**4**	**Comments**
	H																													
7198	EPH	2005	121	1874	1859	HM		HC	M	P1		B			6	P15														
7199	EPH	2005	121	1874		HM		HC	G	UL	R	O	G		6															
7200	EPH	2005	121	1874		HM		HC	G	SC	R	O	UD		6									10.4						
7201	EPH	2005	121	1874		HM		HC	G	HU	L	O		F	3					29.1		15.2								
7202	EPH	2005	121	1874		HM		HC	M	HU	R	O		F	2							12.3								
7203	EPH	2005	121	1874		HM		HC	B	MP1		O		UD	6															NEONATAL
7204	EPH	2005	121	1874		HM		HC	B	MP2		O		G	2															
7205	EPH	2005	121	1874		HM		HC	B	MCIV		S	F	UD	C															
7206	EPH	2005	121	1874		HM		HC	B	TI		S		UD	2															
7207	EPH	2005	121	1874		HM		HC	B	P3		O			C															
7208	EPH	2005	121	1874		HM		HC	B	MP2		O			2															
7209	EPH	2005	121	1874		HM		HC	B	MC2		S	F	UD	C															
7210	EPH	2005	121	1874		HM		HC	B	UL	R	S			6															
7211	EPH	2005	121	1874		HM		HC	B	P1		FEC	F		C															
7212	EPH	2005	125	4537		MR		HC	B	AT		CAF			C				25.9											
7213	EPH	2005	125	4537		MR		HC	B	OC	L	CAF			C															
7214	EPH	2005	125	4537		MR		HC	B	OC	R	CAF			C															
7215	EPH	2005	125	4537		MR		HC	B	ZY	R	CAF			C															
7216	EPH	2005	125	4537		MR		HC	B	SU	R	CAF			C															
7217	EPH	2005	125	4537		MR		HC	B	SU	L	CAF			C															
7218	EPH	2005	125	4537		MR		HC	B	ZY	L	CAF			C															
7219	EPH	2005	125	4537		MR		HC	B	RA	R	CAF	F	F	C				167.2					11.9						
72	E	20	12	45		MR		H	B	RA	L	CA	F	F	C				16					12						

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
20	PH	05	5	37				C				F							5.6					.8						
7221	EPH	2005	125	4537		MR		HC	B	HU	L	CAF	F	F	C				160.2	34.3		13		12.2						
7222	EPH	2005	125	4537		MR		HC	B	TI	R	CAF	F	F	C				187.9	22.3	15.1			12.3						
7223	EPH	2005	125	4537		MR		HC	B	OTHU	R	CAF	F		5															
7224	EPH	2005	125	4537		MR		HC	B	PE	L	CAF			6								21.4							
7225	EPH	2005	125	4537		MR		HC	B	FE	L	CAF		F	6															
7226	EPH	2005	125	4537		MR		HC	B	MT2		CAF		F	6					8.3	7.8									
7227	EPH	2005	125	4537		MR		HC	B	MTIII		CAF	F	F	C				69.9	9.5	9			6.8						
7228	EPH	2005	125	4537		MR		HC	B	MTIV		CAF	F	F	C				68.2	9.2	8.9			6.4						
7229	EPH	2005	125	4537		MR		HC	B	MTV		CAF	F	F	C				58.4	9.1	8.4			5.9						
7230	EPH	2005	125	4537		MR		HC	B	MCIII		CAF	F	F	C				76.8	9.3	9			7.3						
7231	EPH	2005	125	4537		MR		HC	B	MCIV		CAF	F	F	C				76.7	8.7	8.7			6.4						
7232	EPH	2005	125	4537		MR		HC	M	SC	L	O	F		5									16.8						
7233	EPH	2005	125	4537		MR		HC	B	HU	R	O		F	1					26.7		12.4								
7234	EPH	2005	125	4537		MR		HC	M	MC2		O		G	6															
7235	EPH	2005	151	3802		MR		HC	B	TI	R	O		F	0					21.8	18.3									
7236	EPH	2005	151	3802		MR		HC	A	HC	R	CAH			3															
7237	EPH	2005	125	4537		MR		HC	A	HC	R	B			B	SK2			52.6											
7238	EPH	2005	125	4537		MR		HC	B	FE	R	B		F	0	F8														
7239	EPH	2005	125	4537		MR		HC	B	ZY	L	B			C															
7240	EPH	2005	125	4537		MR		HC	B	PE	L	B			B	P9; P14							44.7							
7241	EPH	2005	125	4537		MR		HC	B	PE	L	CAF			6								21.3							
7242	EPH	2005	125	4537		MR		HC	B	TI	L	CAF		F	6					22.8	16									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7243	EPH	2005	125	4537		MR		HC	B	OTHFE	L	CAF	F		6						17									
7244	EPH	2005	156	2540		HM	1377	FS<5	M	OTHRA	R	O	F		4															
7245	EPH	2005	156	2540		HM	1377	FS<5	M	HU	R	GNP	J	J	6															
7246	EPH	2005	157	3523		M		HC	G	MTIII	R	S	F	UD	6															
7247	EPH	2005	157	3523		M		HC	A	P1		EQ	F		6															
7248	EPH	2005	157	3523		M		HC	M	OTHU	L	O	F		6															
7249	EPH	2005	157	3523	3525	M		HC	A	AS	R	B			6															
7250	EPH	2005	157	3523	3525	M		HC	M	P2		B	F		6															
7251	EPH	2005	157	3523		M		HC	A	CA	R	EQ	F		6															
7252	EPH	2005	158	2950		EM		HC	M	HU	R	B		F	3	H7				62.5	27									
7253	EPH	2005	158	2950		EM		HC	G	P2		B	F		C															
7254	EPH	2005	158	2950		EM		HC	G	MCIII		S	F	UD	C															
7255	EPH	2005	158	2950		EM		HC	G	MT1	L	O		UD	3										21.8					
7256	EPH	2005	158	2950		EM		HC	G	OTHTI	L	O	UD		4	T1														
7257	EPH	2005	159	782		LM		HC	G	HC	L	B			C				94.4	47.9	33.8									
7258	EPH	2005	159	782		LM		HC	M	P3		B			C															
7259	EPH	2005	159	782		LM		HC	G	P1		B	F		B	PH11														
7260	EPH	2005	159	782		LM		HC	M	TI	R	B		F	3	T14		C												
7261	EPH	2005	159	782		LM		HC	M	SCU		B			6															
7262	EPH	2005	159	782		LM		HC	G	UL	R	B			B	U1														
7263	EPH	2005	159	782		LM		HC	M	OC	R	B			6															
7264	EPH	2005	159	782		LM		HC	M	MCIV		S	F	UD	C															
7265	EP	2005	159	782		LM		HC	M	MCV		S	F	UD	C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7266	EPH	2005	159	782		LM		HC	G	MT1	R	GNP			6															
7267	EPH	2005	159	782		LM		HC	G	TI		GNP	J	J	C															
7268	EPH	2005	159	782		LM		HC	G	AX		O?			B	V3														
7269	EPH	2005	159	782		LM		HC	M	CR		GNP			6															
7270	EPH	2005	159	782		LM		HC	M	FE	R	GNP	J		6															
7271	EPH	2005	159	782		LM		HC	M	TI	R	S		F	5															
7272	EPH	2005	159	783		LM		HC	G	UL	R	B			B	U1														
7273	EPH	2005	159	783		LM		HC	A	FE	L	B?		UE	6															
7274	EPH	2005	159	783		LM		HC	B	MC1	R	O		G	6					21.9		9.6			21.3	13.5		9	10.4	
7275	EPH	2005	159	783		LM		HC	M	UL		ANS			6															
7276	EPH	2005	159	783		LM		HC	M	MC1		ANS			6							9.8								
7277	EPH	2005	160	4933		MR		HC	M	CA	L	B			6	C11					48									
7278	EPH	2005	160	4933		MR		HC	B	P1		B	F		C															
7279	EPH	2005	160	4933		MR		HC	B	P1		B	F		C															
7280	EPH	2005	160	4933		MR		HC	B	TI	L	S		F	6	T14														
7281	EPH	2005	160	4933		MR		HC	B	TI	L	S		F	4															
7282	EPH	2005	160	4933		MR		HC	B	OTHRA	L	S	F		6	R17														
7283	EPH	2005	160	4933		MR		HC	B	OTHRA	R	S	F		4															
7284	EPH	2005	160	4933		MR		HC	B	SC	L	S	UD		6									21.4						
7285	EPH	2005	160	4933		MR		HC	M	SC	L	O	UD		C									10.1						NEONATAL
7286	EPH	2005	160	4933		MR		HC	B	SC	L	S	UD		6									16.3						
7287	EPH	2005	160	4933		MR		HC	G	TI		GNP			6					12.4	12.3									
72	E	20	16	49		MR		H	M	HU	R	GN			C				75.	15	8.			6.						

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
88	PH	05	0	33				C				P							1	.9	3			9						
7289	EPH	2005	160	4933		MR		HC	B	UL	R	S			6	U13														
7291	EPH	2005	160	4933		MR		HC	B	UL	R	S			5	U12														
7292	EPH	2005	160	4933		MR		HC	M	UL	L	O	UD		6															
7293	EPH	2005	160	4933		MR		HC	M	FE		O?		UD	5															NEONATAL
7294	EPH	2005	160	4933		MR		HC	M	PE	R	LEE			4								10.9							
7295	EPH	2005	160	4933		MR		HC	M	OTHFE	R	LEE	F		4						10.3									
7296	EPH	2005	160	4933		MR		HC	M	MC1	R	O?		G	6			C							24.2				11.2	
7297	EPH	2005	160	4933		MR		HC	M	MCIV		S	F	G	C				79.6	16	17.6			12.3						
7298	EPH	2005	160	4933		MR		HC	M	MCIV		S	F	G	C				75.3	15.2	17.1			12.3						
7299	EPH	2005	160	4933		MR		HC	M	MCIV		S	F	UD	C															
7300	EPH	2005	160	4933		MR		HC	M	MCIII		S	F	G	C				73.5	15.5	16.4			12.6						
7301	EPH	2005	160	4933		MR		HC	M	MTIV		S	F	F	C				78.8	13.3	16			10.8						
7302	EPH	2005	160	4933		MR		HC	M	HU	R	GNP			C				74.1	16.8	8.9			7.4						
7303	EPH	2005	160	4933		MR		HC	M	SC	L	B	F		N	S13														
7304	EPH	2005	160	4933		MR		HC	M	SC	L	B	F		N	S4								45.1						
7305	EPH	2005	160	4933		MR		HC	M	SC	L	B	UD		6									45.1						
7306	EPH	2005	160	4933		MR		HC	M	UL	L	S	UD		6															
7307	EPH	2005	160	4933		MR		HC	M	MCIV		S	F	F	C				76.2	15.7	17			12.3						
7308	EPH	2005	160	4933		MR		HC	M	MC1	L	B		F	N					47.6	26.4	20.5			43.8	25.7	18.9	22.9	22.6	
7309	EPH	2005	160	4933		MR		HC	M	SC	L	B	F		N	S4								41.9						
7310	EPH	2005	160	4933		MR		HC	G	P2		B	F		C															
7311	EPH	2005	160	4933		MR		HC	M	P3		B			C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7312	EPH	2005	160	4933		MR		HC	M	ZY	L	B			6															
7313	EPH	2005	160	4933		MR		HC	M	MCIV		S	F	UD	6															
7314	EPH	2005	160	4933		MR		HC	M	SC	L	O	UD		6															
7315	EPH	2005	160	4933		MR		HC	M	OTHFE	L	GNP			4															
7316	EPH	2005	160	4933		MR		HC	G	HU	R	GNP			6															
7317	EPH	2005	160	4933		MR		HC	M	MT1	R	GNP			6				74.7					5.3						SPUR SCAR
7318	EPH	2005	160	4933		MR		HC	G	CO	L	GNP	J	J	C															
7319	EPH	2005	160	4933		MR		HC	G	TI		PIP			6					7	6.6									
7320	EPH	2005	160	4933		MR		HC	M	P3		B			6															
7321	EPH	2005	160	4933		MR		HC	M	P1		S	F		C															
7322	EPH	2005	160	4933		MR		HC	B	P1		PIP?			C															
7323	EPH	2005	160	4933		MR		HC	M	PE	L	LEE			6								11							
7324	EPH	2005	160	4933		MR		HC	G	OTHRA	R	LEE	F		3															
7325	EPH	2005	160	4933		MR		HC	M	OTHRA	R	LEE	F		N															
7326	EPH	2005	160	4933		MR		HC	M	UL	R	LEE	F		5															
7327	EPH	2005	160	4933		MR		HC	M	UL	L	S	UD		6															
7328	EPH	2005	160	4933		MR		HC	M	UL	R	O?	UD		6															NEONATAL
7329	EPH	2005	160	4933		MR		HC	M	UL	L	O?			6															
7330	EPH	2005	160	4933		MR		HC	M	OTHFE	R	LEE	UD		3	F12														
7331	EPH	2005	160	4933		MR		HC	M	HU	L	LEE		F	4					12.7		6.9								
7332	EPH	2005	160	4933		MR		HC	M	HU	L	LEE		F	2					13		7								
7333	EPH	2005	160	4933		MR		HC	M	HC	R	CAH			6															
7334	EP	2005	160	4933		MR		HC	M	SC	L	LE?	UD		6									8.1						

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7335	EPH	2005	160	4933		MR		HC	M	SC	L	O?	UD		6									10.3						
7336	EPH	2005	160	4933		MR		HC	M	SC	R	O?	UD		6									10.2						
7337	EPH	2005	160	4933		MR		HC	M	SC	R	S?	UD		6									12.6						
7338	EPH	2005	160	4933		MR		HC	B	MT1		GNP		J	6															
7339	EPH	2005	160	4933		MR		HC	E	MCIII		LEE	F	F	C				50.1	6.4	5.4			4.4						
7340	EPH	2005	160	4933		MR		HC	B	MTIV		S	F	UD	C															
7341	EPH	2005	160	4933		MR		HC	B	MTIV		S	F	UD	C															
7342	EPH	2005	160	4933		MR		HC	B	MTIII		S	F	UD	C															
7343	EPH	2005	160	4933		MR		HC	B	MTIII		S	F	UD	C															
7344	EPH	2005	160	4933		MR		HC	B	MCIV		S	F	UD	C															
7345	EPH	2005	160	4933		MR		HC	B	MCIV		S	F	UD	C															
7346	EPH	2005	160	4933		MR		HC	B	MCIII		S	F	UD	C															
7347	EPH	2005	160	4933		MR		HC	B	MCIII		S	F	F	C				69	14.3	15.7			10.6						
7348	EPH	2005	160	4933		MR		HC	B	MCIII		S		UD	6															
7349	EPH	2005	160	4933		MR		HC	M	MTV		S	F	UD	C															
7350	EPH	2005	160	4933		MR		HC	B	MTV		S	F	F	C				51.7	9.5	12.8			4.7						
7351	EPH	2005	160	4933		MR		HC	M	MT2		S		F	C															
7352	EPH	2005	160	4933		MR		HC	B	MCV		S	F	UD	C															
7353	EPH	2005	160	4933		MR		HC	M	MCV		S	F	UD	C															
7354	EPH	2005	160	4933		MR		HC	M	MT2		S	F	UD	C															
7355	EPH	2005	160	4933		MR		HC	M	MT2		S	F	F	C				58.6	9.3	12.4			4.1						
7356	EPH	2005	160	4933		MR		HC	M	MT2		S	F	F	C				61.6	8.5	12			3.5						
73	E	20	16	29		EM		H	A	PE	L	S?			6															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
57	PH	05	1	17				C																						
7358	EPH	2005	161	1845	1835	EM		HC	G	AT		B			B	V2														
7359	EPH	2005	161	1845		EM		HC	M	PE	L	O?			6			C												
7360	EPH	2005	161	1845	1835	EM		HC	M	OTHFE	L	B	UD		4															
7361	EPH	2005	160	4933		MR		HC	M	OTHRA	L	LEE	F		6															
7362	EPH	2005	160	4933		MR		HC	M	UL	L	S			6															
7363	EPH	2005	160	4933		MR		HC	M	RA	R	S	UD	UD	6															NEONATAL
7364	EPH	2005	160	4933		MR		HC	B	OTHFE	L	S	UD		6															NEONATAL
7365	EPH	2005	160	4933		MR		HC	M	MTV		S	UD	F	C															
7366	EPH	2005	160	4933		MR		HC	M	MT1		SCR			5															
7367	EPH	2005	162	962		LM		HC	G	P3		B			C															
7368	EPH	2005	162	962		LM		HC	G	P1		B	F		C	PH4														
7369	EPH	2005	162	962		LM		HC	G	AS	R	B			6				59.4	38	32	54.2								
7370	EPH	2005	162	962		LM		HC	G	UL	L	B			5															
7371	EPH	2005	162	962		LM		HC	G	UL	R	O	UD		4															
7372	EPH	2005	162	962		LM		HC	M	MT1		O?	UD	UD	6															NEONATAL
7373	EPH	2005	162	962		LM		HC	M	SC	R	O?	UD		6									11.9						
7374	EPH	2005	162	962		LM		HC	M	SC		GNP			C															
7375	EPH	2005	162	962		LM		HC	G	UL	L	GNP			C															
7376	EPH	2005	162	962		LM		HC	G	UL	L	FEC	UD		4															
7377	EPH	2005	162	962		LM		HC	M	OTHTI	L	FEC	UD		5															
7378	EPH	2005	162	962		LM		HC	M	TI	L	S		UD	4	T10		C												
7379	EPH	2005	162	962		LM		HC	M	FE	R	O?		UE	C			C												

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7380	EPH	2005	162	962		LM		HC	B	RA	R	O		F	4			C												
7381	EPH	2005	162	962		LM		HC	M	RA	L	O?		UD	5															
7382	EPH	2005	162	962		LM		HC	B	TI		B?		UD	2															
7383	EPH	2005	162	884		LM		HC	M	CA	R	B	UD		C						42.7									
7384	EPH	2005	162	884		LM		HC	M	TI	L	O?		UD	6			C												
7385	EPH	2005	162	884		LM		HC	M	TI	R	O		F	6					23.7	18									TRAMPLING
7386	EPH	2005	162	884		LM		HC	M	OTHTI	R	B	UE		6															
7387	EPH	2005	162	884		LM		HC	M	MC1	L	O		F	4					21.8		9.6			21.7	12.7	9.4	9.7	10.3	
7388	EPH	2005	162	884		LM		HC	M	TI	L	GNP			5															
7389	EPH	2005	163	969	821	HM		HC	G	HC	R	B			6					58.4	46.1									
7390	EPH	2005	163	966		HM	311	FS<5	G	FE	L	MUM	F	F	C				14.7	2.8	1.4			1.3						
7391	EPH	2005	163	966		HM	311	FS<5	G	FE	R	MUM	F	F	C				14.3	2.7	1.7			1.2						
7392	EPH	2005	163	966		HM	311	FS<5	G	TI	L	MUM	F	F	C				17.4											
7393	EPH	2005	163	966		HM	311	FS<5	G	TI	R	MUM	F	F	C				17.7											
7394	EPH	2005	163	966		HM	311	FS<5	G	OTHU	L	MUM	F		6															
7395	EPH	2005	163	966		HM	311	FS<5	G	P1		FEC	F		C															
7396	EPH	2005	163	966		HM	311	FS<5	G	MTIV		FEC	F	UD	C															
7397	EPH	2005	163	966		HM	311	FS<5	G	MT1		PSF			4															
7398	EPH	2005	164	6653		EMOD		HC	E	RA	L	EQ	F	F	C				343.4					33.9						FUSED TO ULNA 7399
7399	EPH	2005	164	6653		EMOD		HC	E	UL	L	EQ	F		C															FUSED TO RADIUS 7398
7400	EPH	2005	164	6653		EMOD		HC	E	MT1	R	B	F	G	C				228.2	62.1	34.6	25.6		29	57.6	33.3	23.9	28.3	29.9	
7401	EPH	2005	164	6653		EMOD		HC	G	MT1	L	B	F	UD	C										58.5					
7402	EP	2005	164	6653		EMOD		HC	G	OTHR	L	B	F		2	R15														

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H									A																				
7403	EPH	2005	164	6653		EMOD		HC	E	OTHRA	R	B	F		3	R6; R16														WORKED
7404	EPH	2005	164	6653		EMOD		HC	E	MC1		EQ	F	F	C	M13			222.4	46.2	35.6			30.3						
7405	EPH	2005	164	6653		EMOD		HC	E	MT1		EQ	F	F	C	M12			270	47.6	38			28						
7406	EPH	2005	164	6653		EMOD		HC	E	TI	L	B		F	3	T11; T14				63.6	48.3									
7407	EPH	2005	164	6653		EMOD		HC	E	OTHTI	R	EQ	UD		5															
7408	EPH	2005	164	6653		EMOD		HC	E	TI	L	EQ	F	F	C				358.3	68.1	42.5			36.7						
7409	EPH	2005	164	6653		EMOD		HC	E	SC	L	EQ	F		2															
7410	EPH	2005	164	6653		EMOD		HC	E	OTHFE	L	B	UD		3															
7411	EPH	2005	164	6653		EMOD		HC	E	FE	L	B		F	N															
7412	EPH	2005	164	6653		EMOD		HC	E	HU	L	EQ	F	F	C				287.5	71.5		37.4		32.8						
7413	EPH	2005	160	4933		MR		HC	M	SC	L	GNP			5															
7414	EPH	2005	160	4933		MR		HC	M	SC	R	GNP			5															
7415	EPH	2005	160	4933		MR		HC	M	SC	R	SCR			5															
7416	EPH	2005	160	4933		MR		HC	M	SC	R	SCR			5															
7417	EPH	2005	160	4933		MR		HC	M	SC	L	ANA			5															
7418	EPH	2005	160	4933		MR		HC	G	RA	L	GNP	J	J	C															
7419	EPH	2005	160	4933		MR		HC	G	RA	L	GNP	J	J	C															
7420	EPH	2005	160	4933		MR		HC	G	RA	L	GNP	J	J	C															
7421	EPH	2005	160	4933		MR		HC	B	OTHRA	L	GNP	J		C															
7422	EPH	2005	160	4933		MR		HC	G	RA	L	GNP			C															
7423	EPH	2005	160	4933		MR		HC	G	RA	L	GNP			C															
7424	EPH	2005	160	4933		MR		HC	G	RA	L	GNP			C															
74	E	20	16	49		MR		H	E	RA	L	GN			C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
25	PH	05	0	33				C				P																		
7426	EPH	2005	160	4933		MR		HC	E	RA	L	GNP			C															
7427	EPH	2005	160	4933		MR		HC	E	RA	L	GNP			C															
7428	EPH	2005	160	4933		MR		HC	B	OTHRA	L	GNP			C															
7429	EPH	2005	160	4933		MR		HC	G	OTHRA	L	GNP			C															
7430	EPH	2005	160	4933		MR		HC	G	RA	L	SCR			C															
7431	EPH	2005	160	4933		MR		HC	B	RA	R	GNP			C															
7432	EPH	2005	160	4933		MR		HC	M	RA	R	GNP			C															
7433	EPH	2005	160	4933		MR		HC	M	RA	R	GNP			C															
7434	EPH	2005	160	4933		MR		HC	G	RA	R	GNP			C															
7435	EPH	2005	160	4933		MR		HC	E	RA	R	GNP			C															
7436	EPH	2005	160	4933		MR		HC	E	RA	R	GNP			C															
7437	EPH	2005	160	4933		MR		HC	G	CO	L	SCR			C															
7438	EPH	2005	160	4933		MR		HC	E	CO	L	SCR			6															
7439	EPH	2005	160	4933		MR		HC	G	CO	L	GNP			C															
7440	EPH	2005	160	4933		MR		HC	M	CO	L	GNP			C															
7441	EPH	2005	160	4933		MR		HC	M	CO	L	GNP			C															
7442	EPH	2005	160	4933		MR		HC	M	CO	L	GNP			C															
7443	EPH	2005	160	4933		MR		HC	M	CO	L	GNP			6															
7444	EPH	2005	160	4933		MR		HC	M	CO	L	GNP			6															
7445	EPH	2005	160	4933		MR		HC	B	CO	L	GNP			C															
7446	EPH	2005	160	4933		MR		HC	M	CO	R	GNP	J	J	C															
7447	EPH	2005	160	4933		MR		HC	M	CO	R	GNP		J	C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7448	EPH	2005	160	4933		MR		HC	M	CO	R	GNP		J	C															
7449	EPH	2005	160	4933		MR		HC	M	CO	R	GNP			C															
7450	EPH	2005	160	4933		MR		HC	M	CO	R	GNP			C															
7451	EPH	2005	160	4933		MR		HC	M	CO	R	GNP			C															
7452	EPH	2005	160	4933		MR		HC	M	CO	R	GNP			C															
7453	EPH	2005	160	4933		MR		HC	E	CO	R	ANA			6	CO1														
7454	EPH	2005	160	4933		MR		HC	M	HU	L	GNP			6															
7455	EPH	2005	160	4933		MR		HC	M	OTHU	L	GNP			6	H14														
7456	EPH	2005	160	4933		MR		HC	M	OTHU	L	GNP			6															
7457	EPH	2005	160	4933		MR		HC	M	OTHU	L	GNP			6															
7458	EPH	2005	160	4933		MR		HC	M	HU	L	GNP			C				66	14.9				6.8						
7459	EPH	2005	160	4933		MR		HC	M	HU	L	GNP			C				75.4	16.3				7.2						
7460	EPH	2005	160	4933		MR		HC	M	HU	L	ANA			6					15.3										
7461	EPH	2005	160	4933		MR		HC	G	HU	L	ANA			6	H14			80					5.5						
7462	EPH	2005	160	4933		MR		HC	M	OTHU	L	SCR			6															
7463	EPH	2005	160	4933		MR		HC	M	HU	L	SCR			C				59.4	10.6				4.2						
7464	EPH	2005	160	4933		MR		HC	E	HU	L	SCR			4					10.2										
7465	EPH	2005	160	4933		MR		HC	G	HU	R	SCR			6															
7466	EPH	2005	160	4933		MR		HC	E	HU	R	SCR			3					10.4										
7467	EPH	2005	160	4933		MR		HC	M	HU	R	GNP			C				71.9	16				7.2						
7468	EPH	2005	160	4933		MR		HC	M	HU	R	GNP			C				71.9	15.7				6.8						
7469	EPH	2005	160	4933		MR		HC	M	HU	R	GNP			2					16.3										
7470	EP	2005	160	4933		MR		HC	M	HU	R	GNP			6					15.7										

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7471	EPH	2005	160	4933		MR		HC	M	HU	R	GNP			5					15										
7472	EPH	2005	160	4933		MR		HC	G	OTHU	R	GNP			3															
7473	EPH	2005	160	4933		MR		HC	M	OTHU	R	GNP			3															
7474	EPH	2005	160	4933		MR		HC	M	UL	R	GNP			C															
7475	EPH	2005	160	4933		MR		HC	M	UL	R	GNP			C															
7476	EPH	2005	160	4933		MR		HC	M	UL	R	GNP			C															
7477	EPH	2005	160	4933		MR		HC	M	UL	R	GNP			C															
7478	EPH	2005	160	4933		MR		HC	M	UL	R	GNP			5															
7479	EPH	2005	160	4933		MR		HC	M	UL	R	GNP			6															
7480	EPH	2005	160	4933		MR		HC	M	UL	R	SCR			C															
7481	EPH	2005	160	4933		MR		HC	M	UL	R	SCR			6															
7482	EPH	2005	160	4933		MR		HC	M	UL	R	SCR			6															
7483	EPH	2005	160	4933		MR		HC	M	UL	R	SCR			6															
7484	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			C															
7485	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			C															
7486	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			6															
7487	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			5															
7488	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			6															
7489	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			C															
7490	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			C															
7491	EPH	2005	160	4933		MR		HC	M	UL	L	GNP	J		6															
7492	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			5															
74	E	20	16	49		MR		H	M	UL	L	GN			C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
93	PH	05	0	33				C				P																		
7494	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			5															
7495	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			5															
7496	EPH	2005	160	4933		MR		HC	M	UL	L	GNP			6															
7497	EPH	2005	160	4933		MR		HC	E	UL	L	GNP			6															
7498	EPH	2005	160	4933		MR		HC	G	UL	L	GNP			6															
7499	EPH	2005	160	4933		MR		HC	G	UL	L	GNP			C															
7500	EPH	2005	160	4933		MR		HC	G	UL	L	GNP			C															
7501	EPH	2005	160	4933		MR		HC	E	UL	L	GNP			C															
7502	EPH	2005	160	4933		MR		HC	M	UL	L	GNP	J	J	C															
7503	EPH	2005	160	4933		MR		HC	M	UL	L	SCR			6															
7504	EPH	2005	160	4933		MR		HC	M	UL	L	TU			C															
7505	EPH	2005	160	4933		MR		HC	M	UL	L	PIP?			C															
7506	EPH	2005	160	4933		MR		HC	M	OTHFE	L	GNP			6															
7507	EPH	2005	160	4933		MR		HC	M	OTHFE	L	GNP	J		5															
7508	EPH	2005	160	4933		MR		HC	M	OTHFE	L	GNP	J		5															
7509	EPH	2005	160	4933		MR		HC	M	OTHFE	L	GNP			5															
7510	EPH	2005	160	4933		MR		HC	M	FE	L	GNP			6					15.4	12.1									
7511	EPH	2005	160	4933		MR		HC	M	OTHFE	R	GNP			6															
7512	EPH	2005	160	4933		MR		HC	M	OTHFE	R	GNP			6															
7513	EPH	2005	160	4933		MR		HC	M	FE	R	GNP			6					15.9	12.2									
7514	EPH	2005	160	4933		MR		HC	M	FE	R	PIP?			6				42.8					3.7						
7516	EPH	2005	160	4933		MR		HC	M	MC1	L	GNP			C							5.3								

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7517	EPH	2005	160	4933		MR		HC	M	MC1	L	GNP			C				34.3			5.2								
7518	EPH	2005	160	4933		MR		HC	G	MC1	L	GNP			C				35.5			5.6								
7519	EPH	2005	160	4933		MR		HC	E	MC1	L	GNP			C				34			5.1								
7520	EPH	2005	160	4933		MR		HC	E	MC1	L	GNP			6				35.6			5.6								
7521	EPH	2005	160	4933		MR		HC	M	MC1	L	ANA			6							6.5								
7522	EPH	2005	160	4933		MR		HC	M	OTHTI	R	GNP			5															
7523	EPH	2005	160	4933		MR		HC	M	OTHTI	R	GNP			4															
7524	EPH	2005	160	4933		MR		HC	M	OTHTI	R	GNP	J		5															
7525	EPH	2005	160	4933		MR		HC	M	TI	R	GNP		J	4															
7526	EPH	2005	160	4933		MR		HC	M	TI	R	GNP			6															
7527	EPH	2005	160	4933		MR		HC	E	TI	R	GNP			C				101.9	10	10.3		97.9	5.3						
7528	EPH	2005	160	4933		MR		HC	B	TI	R	GNP			6					11.2	11.5									
7529	EPH	2005	160	4933		MR		HC	M	TI	R	GNP			6	T18				11	12.5									
7530	EPH	2005	160	4933		MR		HC	G	TI	R	GNP			5				104.1	10.9	12		100.3	5.6						
7531	EPH	2005	160	4933		MR		HC	M	TI	R	GNP			4					10.9	11.9									
7532	EPH	2005	160	4933		MR		HC	M	TI	R	SCR?			6															
7533	EPH	2005	160	4933		MR		HC	M	OTHTI	L	GNP	J		N															
7534	EPH	2005	160	4933		MR		HC	M	OTHTI	L	GNP	J		4															
7535	EPH	2005	160	4933		MR		HC	M	TI	L	GNP			6					11	12									
7536	EPH	2005	160	4933		MR		HC	G	TI	L	GNP			C				101.5	10.9	10.1		98.5	5.2						
7537	EPH	2005	160	4933		MR		HC	G	TI	L	GNP			C				98.4	10	10.8		95.5	5.1						
7538	EPH	2005	160	4933		MR		HC	B	TI	L	GNP	J	J	C				107.6	10.8				5.9						
7539	EP	2005	160	4933		MR		HC	E	TI	L	SCR			5					6.5	6.2									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7540	EPH	2005	160	4933		MR		HC	M	TI	L	SCR			5					6.3	6.2									
7541	EPH	2005	160	4933		MR		HC	M	TI	R	SCR			5															
7542	EPH	2005	160	4933		MR		HC	M	OTHTI	R	GNP			N															
7544	EPH	2005	160	4933		MR		HC	M	MT1	R	GNP	J	J	6															
7545	EPH	2005	160	4933		MR		HC	M	MT1	R	GNP	J		C					12.2										
7546	EPH	2005	160	4933		MR		HC	M	MT1	R	GNP	J		C				81.9	13.5				5.8						
7547	EPH	2005	160	4933		MR		HC	M	MT1	R	GNP			C				81.7	13.7				6.9						SPUR SCAR
7548	EPH	2005	160	4933		MR		HC	G	MT1	L	GNP			C				78.1	13.4				6.3						SPUR SCAR
7549	EPH	2005	160	4933		MR		HC	M	MT1	L	GNP			C				80	13.2				6.4						
7550	EPH	2005	160	4933		MR		HC	M	MT1	R	SCR			C				37.9	7.2				2.8						
7551	EPH	2005	160	4933		MR		HC	M	MT1	R	SCR			C				36.9	7.4				3.2						
7552	EPH	2005	160	4933		MR		HC	M	MT1	R	SCR			6				38.7					2.9						
7553	EPH	2005	160	4933		MR		HC	M	MT1	L	SCR			6					6.7										
7554	EPH	2005	160	4933		MR		HC	M	MT1	L	SCR			6				38.5					3						
7555	EPH	2005	160	4933		MR		HC	M	MT1	R	TU			C				32.6	3.6				1.4						
7556	EPH	2005	160	4933		MR		HC	M	MT1	L	TU			6				34.5					1.7						
7557	EPH	2005	160	4933		MR		HC	M	MT1	R	ANA			6				44.3	9.7				4.2						
7558	EPH	2005	160	4933		MR	4342	FS<5	E	FE	L	APS	F	F	C				17.2	3	1.6			1.7						
7559	EPH	2005	160	4933		MR	4342	FS<5	B	OTHFE	L	SCR			5															
7560	EPH	2005	160	4933		MR	4342	FS<5	G	SC	R	GNP			4															
7561	EPH	2005	160	4933		MR	4342	FS<5	M	TI	R	SCR?			6															
7562	EPH	2005	160	4933		MR	4342	FS<5	M	UL	R	SCR			5															
75	E	20	16	49		MR	43	FS	M	MC	L	SC			C				37.			4.								

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
63	PH	05	0	33			42	<5		1		R							8			3								
7564	EPH	2005	160	4933		MR	4342	FS <5	M	MC1	L	TUM			C				20.8			2.4								
7565	EPH	2005	160	4933		MR	4342	FS <5	M	MT1	R	SCR			C				38.2	6.8				2.7						
7566	EPH	2005	160	4933		MR	4342	FS <5	M	MT1	L	TU			5															
7567	EPH	2005	160	4933		MR	4342	FS <5	M	MT1	L	TU			5															
7568	EPH	2005	160	4933		MR	4342	FS <5	G	CO	R	TU			4															
7569	EPH	2005	160	4933		MR	4342	FS <5	M	CO	L	GNP			5															
7570	EPH	2005	160	4933		MR	4342	FS <5	G	OTHRA		SCR			6															
7571	EPH	2005	160	4933		MR	4342	FS <5	G	OTHRA		SCR			6															
7572	EPH	2005	160	4933		MR	4342	FS <5	M	OTHRA		GNP			6															
7573	EPH	2005	160	4933		MR	4342	FS <5	M	RA		GNP			6															
7574	EPH	2005	160	4933		MR	4342	FS <5	G	P1		S	G		C															
7575	EPH	2005	160	4933		MR	4342	FS <5	G	OTHRA		PSF			6															
7576	EPH	2005	160	4933		MR	4342	FS <5	E	HU	L	SCR			1					10										
7577	EPH	2005	160	4933		MR	4342	FS <5	E	HU	L	SCR			4					10										
7578	EPH	2005	160	4933		MR	4342	FS <5	G	HU	R	GNP			6					13.7										
7579	EPH	2005	160	4933		MR	4342	FS <5	M	HU	L	GNP			5					12.9										
7580	EPH	2005	160	4933		MR	4342	FS <5	G	HU	R	TU			5															
7581	EPH	2005	160	4933		MR	4342	FS <5	G	OTH		PSF			C															SPARROW/FINCH BEAK
7582	EPH	2005	160	4933		MR		HC	M	P1		B	F		C															
7583	EPH	2005	160	4933		MR		HC	M	MCIII		S	F	F	C				73.8	15.7	17			11.4						
7584	EPH	2005	160	4933		MR		HC	M	MCIV		S	F	F	C				76.5	16.3	17.8			14.9						
7585	EPH	2005	160	4933		MR		HC	M	MTIV		S	F	G	C				79.3	13.3	15.6			10.8						

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7586	EPH	2005	160	4933		MR		HC	M	PE	L	S			6	P14; P15														
7587	EPH	2005	160	4933		MR		HC	B	PE	L	LE?			6								10.9							
7588	EPH	2005	165	4983		HM		HC	B	OTHU	R	O?	UD		5															
7589	EPH	2005	165	4983	4922	HM		HC	B	HU	R	B			6					55.7		25.9								
7590	EPH	2005	165	4984		HM		HC	B	FE	L	GNP			C				72.4	13.5	11.1		67.8	6.3						
7591	EPH	2005	165	4984		HM		HC	M	OTHTI	R	O	F		5															
7592	EPH	2005	165	4984		HM		HC	M	HC	L	OVA			6	SK2														
7593	EPH	2005	165	4984		HM		HC	M	FE	R	O		G	3															
7594	EPH	2005	165	4984		HM		HC	M	MTIV		S	F	UD	C															
7595	EPH	2005	165	4984		HM		HC	M	SC	R	EQ	F		5	S10								62.1						
7596	EPH	2005	165	4984	4922	HM		HC	M	TI	L	B		F	3	T8				50.2	35.4									
7597	EPH	2005	165	4984		HM		HC	B	TI	R	S		UD	6															
7598	EPH	2005	165	4984		HM		HC	B	FE	L	S		UD	5															
7599	EPH	2005	165	4984	4922	HM		HC	B	MP1		B		F	5															
7600	EPH	2005	165	4984		HM		HC	M	FE	R	EQ		F	6			C												
7601	EPH	2005	165	4984		HM		HC	G	OTHTI		EQ?	UD		6															
7602	EPH	2005	165	4984	4922	HM		HC	M	PE	L	B			6	P5														
7603	EPH	2005	165	4984	4922	HM		HC	B	MC2		B		UD	5															
7604	EPH	2005	165	4986	4922	HM		HC	G	MC1	R	B	F	UD	6										45.4					
7605	EPH	2005	165	4985	4922	HM		HC	G	MC1	R	B	F		4			C			25.4	19.6			43.8				22.9	
7606	EPH	2005	165	4985		HM		HC	M	HC	L	OVA			6	SK2														
7607	EPH	2005	165	4985		HM		HC	M	HC	R	OVA			6	SK2														
7608	EP	2005	166	3551		LM		HC	B	OTHTI	L	FEC	F		6															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7609	EPH	2005	166	3551	3525	LM		HC	M	RA	R	B		F	5	R5														
7611	EPH	2005	166	3542	3525	LM		HC	G	MP2		B		UE	C															
7613	EPH	2005	167	6635		EMOD		HC	E	OC	L	EQ			C															
7614	EPH	2005	167	6635		EMOD		HC	E	PE	L	CAF			C								21.5							
7615	EPH	2005	167	6635		EMOD		HC	E	PE	R	CAF			C								23							
7616	EPH	2005	167	6635		EMOD		HC	E	PE	R	EQ			6															TWO PIECES
7617	EPH	2005	167	6635		EMOD		HC	E	OTHU	L	B	UE		B															
7618	EPH	2005	167	6635		EMOD		HC	E	OTHU	R	B	UE		6	H3														
7619	EPH	2005	168	8692		MR	5357	FS<5	M	P1		S?	UE		C															
7620	EPH	2005	168	8692		MR	5357	FS<5	M	RA		S?	UD		3															
7621	EPH	2005	168	8691		MR	5356	FS<5	G	P2		S	G		C															
7622	EPH	2005	168	8691		MR	5356	FS<5	G	CO	L	GNP			4															
7623	EPH	2005	168	8691		MR	5356	FS<5	G	FE	L	ANS			6					16.4	13.7									
7624	EPH	2005	168	8691		MR	5356	FS<5	G	TI	R	APS	UD	UD	C															
7625	EPH	2005	168	8691		MR	5356	FS<5	G	OTHTI	L	APS	UD		6															
7626	EPH	2005	169	855		LM		HC	B	P1		B	F		5			C												
7627	EPH	2005	169	855		LM		HC	E	CO	R	SCR			6															
7628	EPH	2005	170	6653		EMOD		HC	E	AS	L	B			B	A5				42.2										
7629	EPH	2005	170	6653		EMOD		HC	G	MT1	R	B		UD	6	M8									58.3					
7630	EPH	2005	170	6653		EMOD		HC	E	MT1	R	B		F	B	M24				64.9	32.8	25.7			59.7	31.6	23.3	30.2	31	
7631	EPH	2005	170	6653		EMOD		HC	B	MT1		B			6			C												
7632	EPH	2005	170	6653		EMOD		HC	G	OTHTI	L	B	UD		2															
76	E	20	17	66		EM		H	E	OT	R	EQ	F		4	T10														

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
33	PH	05	0	53		OD		C		HTI																				
7634	EPH	2005	170	6653		EMOD		HC	E	OTHTI	L	EQ	F		2	T16														
7635	EPH	2005	170	6653		EMOD		HC	E	OTHTI	L	EQ	F		1	T15														
7636	EPH	2005	170	6653		EMOD		HC	E	TI	R	EQ		F	2	T14														
7637	EPH	2005	170	6653		EMOD		HC	E	OTHTI		EQ	UD		2	T15														
7638	EPH	2005	170	6653		EMOD		HC	E	OTHFE	L	EQ?	UD		N	F11														
7639	EPH	2005	170	6653		EMOD		HC	G	OTHFE	L	B?	UD		4															
7640	EPH	2005	170	6653		EMOD		HC	E	OTHFE	L	B	F		6	F22														
7641	EPH	2005	170	6653		EMOD		HC	E	OTHU	L	B	G		1															
7642	EPH	2005	170	6653		EMOD		HC	E	HU	L	B	F		4					82.8		37.7								
7643	EPH	2005	170	6653		EMOD		HC	E	HU	L	B	F		2	H20; H21				84.9		37.8								
7644	EPH	2005	170	6653		EMOD		HC	E	HU	L	B	F		4	H1; H12						37.1								
7645	EPH	2005	170	6653		EMOD		HC	E	RA	R	B	F	F	C				330.7					35.7						
7646	EPH	2005	170	6653		EMOD		HC	E	OTHRA	R	B?	F		B	R1; R16														
7647	EPH	2005	170	6653		EMOD		HC	E	OTHRA	L	B	F		1	R17; R23; R26; R28														
7648	EPH	2005	171	2698		LM		HC	G	HU	R	ANS			3					20.6										
7649	EPH	2005	171	2698		LM		HC	E	P1		O	F		C															
7650	EPH	2005	171	2698		LM		HC	M	OC	L	O			6	SK17														
7651	EPH	2005	171	2698		LM		HC	M	TI	L	O	F		3					24.2	19.3									
7652	EPH	2005	171	2698		LM		HC	M	TI	R	O	F		3					23.5	17.6									
7653	EPH	2005	171	2698	2547	LM		HC	M	HU	R	B		F	2	H17														
7654	EPH	2005	171	2698		LM		HC	B	OTHFE	L	CAF	UD		5			C												

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7655	EPH	2005	171	2698	2547	LM		HC	B	SC	L	B?	F		6	S23														
7656	EPH	2005	171	2698		LM		HC	M	PE	L	O			6	P13							21.9							
7657	EPH	2005	171	2698		LM		HC	M	PE	L	O			6								21.7							
7658	EPH	2005	171	2698	2547	LM		HC	M	PE	L	B			5								49.5							
7659	EPH	2005	171	2698	2547	LM		HC	M	MC1	R	B		F	1	M12														
7660	EPH	2005	171	2698		LM		HC	M	MT1	L	O	F	F	C					22.4	12.9	8.2			21.3	14.5	8.6	10.5	9.3	
7661	EPH	2005	171	2698		LM		HC	M	MCIV		S	F	UD	C															
7662	EPH	2005	171	2698		LM		HC	M	MCIV		CAF	F	F	C				84.6	10	121	7.9								
7663	EPH	2005	171	2698	2547	LM		HC	B	OTHRA	L	B	F		2			C												FUSED TO 7664
7664	EPH	2005	171	2698	2547	LM		HC	B	UL	L	B	F		2			C												FUSED TO 7663
7665	EPH	2005	171	2698		LM		HC	G	OTHRA	R	O	F		2															FUSED TO 7666
7666	EPH	2005	171	2698		LM		HC	G	UL	R	O	F		2															FUSED TO 7665
7667	EPH	2005	171	2698		LM		HC	G	OTHRA	R	O	F		N			C												FUSED TO 7666
7668	EPH	2005	171	2698		LM		HC	M	OTHRA	R	O	F		2	R13		C												FUSED TO 7666
7669	EPH	2005	171	2698		LM		HC	M	RA	R	O		G	2															
7670	EPH	2005	171	2698		LM		HC	G	SC	L	O	F		6									18.4						
7671	EPH	2005	171	2698		LM		HC	M	SC	L	O	UD		6									19.5						
7672	EPH	2005	171	2698		LM		HC	G	ZY	R	O			6															
7673	EPH	2005	171	2698		LM		HC	G	ZY	R	O			6															
7674	EPH	2005	171	2698		LM		HC	M	TI	R	O		F	N					21.7	19									
7675	EPH	2005	171	2698		LM		HC	M	TI	R	S		UD	4			C												
7676	EPH	2005	171	2698		LM		HC	M	UL	L	O			6															
7677	EP	2005	171	2698		LM		HC	M	UL	R	O			6															NEONATAL

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7678	EPH	2005	171	2698	2547	LM		HC	M	SU	L	B			6															
7679	EPH	2005	171	2698	2547	LM		HC	M	HC	R	B			6					63.7	45.4									
7680	EPH	2005	171	2698		LM		HC	M	P3		EQ			6															
7681	EPH	2005	171	2698		LM		HC	M	AX		O			C				31.4											
7682	EPH	2005	172	902		LR		HC	M	TI	R	S?	UD	UD	C															NEONATAL
7683	EPH	2005	172	902		LR		HC	M	TI	R	GNP			6	T24				13.2	13.2									
7684	EPH	2005	172	902		LR		HC	B	FE	L	SCR?			C															
7685	EPH	2005	172	902		LR		HC	B	MTV		LEE	F	F	C				47.6	5.4	4.1			3.6						
7686	EPH	2005	172	902		LR		HC	M	SU	L	S			N															
7687	EPH	2005	172	902		LR		HC	M	RA		S	UD	UD	C															NEONATAL
7688	EPH	2005	172	902		LR		HC	M	RA		O?	UD	UD	C															NEONATAL
7689	EPH	2005	172	902		LR		HC	M	SC	R	GNP			6															
7690	EPH	2005	172	902		LR		HC	M	SC	L	S	F		5									21.9						
7691	EPH	2005	172	902		LR		HC	M	SC	L	S			6															
7692	EPH	2005	172	902		LR		HC	M	AS	R	O			6			C		17.7										
7693	EPH	2005	172	902		LR		HC	M	P1		O	G		C															
7694	EPH	2005	172	902		LR		HC	M	TI	L	S	UD	UD	C															
7695	EPH	2005	172	902		LR		HC	M	HU	R	S		F	5			C												
7696	EPH	2005	172	902		LR		HC	M	HU	L	O?		UD	2															
7697	EPH	2005	172	902		LR		HC	M	TI	L	GNP			6					13.2	10.9									
7698	EPH	2005	172	902		LR		HC	M	OTHTI	R	GNP			5															
7699	EPH	2005	172	902		LR		HC	M	MCIII		S	F	UD	6			C												
77	E	20	17	90		LR		H	G	MT1	R	GN			6					14										SPUR

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
00	PH	05	2	2				C				P								.5										
7701	EPH	2005	172	902		LR		HC	M	MC2	R	B		F	2			C			16.2	19.8								
7702	EPH	2005	172	902		LR		HC	M	UL	L	LEE	F		6															
7703	EPH	2005	172	902		LR		HC	M	TI	R	LEE		F	5					14.6	9.7									
7704	EPH	2005	173	1583		LR		HC	M	OC	L	EQ			6															
7705	EPH	2005	173	1583		LR		HC	M	OC	R	EQ			6															
7706	EPH	2005	173	1583		LR		HC	M	MT1	R	B	F	UD	6			C							48.2					
7707	EPH	2005	173	1583		LR		HC	M	SC	L	EQ	F		6			C						38.9						
7708	EPH	2005	173	1583		LR		HC	M	P3		B			C															
7709	EPH	2005	173	1583		LR		HC	M	CA	L	B			6			C												
7710	EPH	2005	173	1583		LR		HC	M	RA	R	O			C				136.5					14.3						TRAMPLING
7711	EPH	2005	173	791		LR		HC	M	P1		B	F		C															
7712	EPH	2005	173	791		LR		HC	M	HC	R	B			6					64.4	47.7									
7713	EPH	2005	173	791		LR		HC	M	OTHRA	L	B	F		2															
7714	EPH	2005	173	791		LR		HC	M	OTHRA	R	B	F		6	R15														
7715	EPH	2005	173	791		LR		HC	M	MC1	R	B	F	UD	6										42.9					
7716	EPH	2005	173	791		LR		HC	M	MC1	R	B	F	F	6			C		51.3					45.9			23.9	24.6	
7717	EPH	2005	173	1583		LR		HC	M	OTHRA	R	CAF	F		6															Bp=17.7; Dp=11.7
7718	EPH	2005	173	1583		LR		HC	M	OTHTI	R	O?	UD		6															NEONATAL
7719	EPH	2005	173	1583		LR		HC	M	MT1	L	PEP?		J	5															
7720	EPH	2005	174	4749		EMOD		HC	E	HC	R	B			6					76.5	62.8									
7721	EPH	2005	174	4749		EMOD		HC	E	HC	R	B			6					67.7	59.5									
7722	EPH	2005	174	4749		EMOD		HC	E	HC	R	B			6					74.7	64.7									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7723	EPH	2005	175	6653		EMOD		HC	E	SU	L	EQ			C															ARTICULATED
7724	EPH	2005	175	6653		EMOD		HC	E	SU	R	EQ			C															ARTICULATED
7725	EPH	2005	175	6653		EMOD		HC	E	ZY	L	EQ			C															ARTICULATED
7726	EPH	2005	175	6653		EMOD		HC	E	ZY	R	EQ			C															ARTICULATED
7727	EPH	2005	173	791		LR		HC	M	SC	R	B	F		5									42.5						
7728	EPH	2005	173	791		LR		HC	M	SC	R	B	F		5	S21								44.1						
7729	EPH	2005	173	791		LR		HC	M	HU	L	B	F		4	H18		C												
7730	EPH	2005	173	791		LR		HC	B	PE	L	B			5								54.2							TWO PIECES
7731	EPH	2005	173	791		LR		HC	G	UL	L	B			6	R11														
7732	EPH	2005	173	791		LR		HC	G	UL	L	B			6															FUSED TO 7733
7733	EPH	2005	173	791		LR		HC	G	UL	L	B	F		4															FUSED TO 7732
7734	EPH	2005	173	791		LR		HC	G	TI	R	B		UD	3															
7735	EPH	2005	23	3804		HM		HC	G	MT1		SCR			6															
7736	EPH	2005	177	3810		HM		HC	M	OTH		F-RC			C															BUCKLER
7737	EPH	2005	177	962		LM		HC	G	V		F-G			X															
7738	EPH	2005	177	2657		HM		HC	G	V		F-G			X															
7739	EPH	2005	177	5767		HM		HC	M	DN	L	F-MM?			X															
7740	EPH	2005	177	5767		HM		HC	M	DN	R	F-MM?			X															
7741	EPH	2005	177	5767		HM		HC	M	PARA		F-G			X															
7742	EPH	2005	177	5767		HM		HC	M	PARA		F-G			X															
7743	EPH	2005	177	683		LM		HC	M	DN	R	F-CC			X															
7744	EPH	2005	177	683		LM		HC	B	CL	L	F-CC			X															
7745	EP	2005	177	683		LM		HC	B	VOM		FISH			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7746	EPH	2005	177	683		LM		HC	B	CER		F-G			X															
7747	EPH	2005	177	683		LM		HC	B	DN	L	FISH			X															
7748	EPH	2005	177	683		LM		HC	B	PMX	R	F-GM			X															
7749	EPH	2005	177	2783		HM		HC	M	VPC		F-SS			X		B													
7750	EPH	2005	177	2698		LM		HC	M	CER		F-GM			X															
7751	EPH	2005	177	2698		LM		HC	M	DN	R	F-MM			X															
7752	EPH	2005	177	2698		LM		HC	B	SUC		F-G			X															
7753	EPH	2005	177	4933		HM		HC	B	CER		F-AA			X															
7754	EPH	2005	177	4933		LM		HC	B	DN	R	F-MM			X															
7755	EPH	2005	177	4933		LM		HC	B	MX		F-G			X															
7756	EPH	2005	177	4933		LM		HC	G	MX		F-G			C															
7757	EPH	2005	177	855		LM		HC	B	AR		F-G			X															
7758	EPH	2005	177	855		LM		HC	M	SUC		FISH			X															
7759	EPH	2005	177	785		LM	1328	FS<5	B	DN		FISH			X															
7760	EPH	2005	177	785		LM	1328	FS<5	B	DN	R	F-G			X															
7761	EPH	2005	177	785		LM	1328	FS<5	B	MX		F-MA?			X															
7762	EPH	2005	177	966		LM	311	FS<5	B	DN		FISH			X															
7763	EPH	2005	177	966		LM	311	FS<5	B	DN		F-EL			X															
7765	EPH	2005	177	966		LM	311	FS<5	B	DN		F-S			X															BROWN TROUT
7766	EPH	2005	177	966		LM	311	FS<5	B	CL		F-CC			X															
7767	EPH	2005	177	966		LM	311	FS<5	B	HYO		FISH			X	XT														
7768	EPH	2005	177	966		LM	311	FS<5	B	MX		F-G			X															
77	E	20	17	96		LM	31	FS	B	AR		FI			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
69	PH	05	7	6			1	<5				SH																		
7770	EPH	2005	177	966		LM	311	FS <5	B	AR		FISH			X															
7771	EPH	2005	177	1877		HM	376	FS <5	B	VOM		F-GM			X															
7772	EPH	2005	177	1877		HM	376	FS <5	B	PMX		F-G			X															
7773	EPH	2005	177	1877		HM	376	FS <5	B	POT		F-GM			X															
7774	EPH	2005	177	1877		HM	376	FS <5	B	POT		F-GM			X															
7775	EPH	2005	177	966		LM	311	FS <5	B	SUC		F-G			X															
7776	EPH	2005	177	966		LM	311	FS <5	B	SUC		F-GM			X															
7777	EPH	2005	177	966		LM	311	FS <5	M	MTIV		CAF	UD	UD	C															FOETAL
7778	EPH	2005	177	966		LM	311	FS <5	B	AR		FISH			X															
7779	EPH	2005	177	791		MR	2316	FS <5	B	OP		F-GM			X															
7780	EPH	2005	177	1789		MR		HC	M	OTH		F-SA			X															SPINE; TWO PIECES
7781	EPH	2005	177	4933		MR	4342	FS <5	M	VPC		F-SS			X															
7782	EPH	2005	177	4933		MR	4342	FS <5	M	VPC		F-SS			X															
7783	EPH	2005	177	4933		MR	4342	FS <5	M	VPC		F-SS			X															
7784	EPH	2005	177	4933		MR	4342	FS <5	M	VPC		F-SS			X															
7785	EPH	2005	177	4933		MR	4342	FS <5	M	VC		F-SS			X															
7786	EPH	2005	177	4933		MR	4342	FS <5	M	VC		F-SS			X															
7787	EPH	2005	177	4933		MR	4342	FS <5	M	V		F-SS			X															
7788	EPH	2005	177	4933		MR	4342	FS <5	M	V		F-SS			X															
7789	EPH	2005	177	4933		MR	4342	FS <5	B	VC		F-PLP?			X															
7790	EPH	2005	177	4933		MR	4342	FS <5	B	VC		F-PLP?			X															
7791	EPH	2005	177	4933		MR	4342	FS <5	B	VC		F-PLP?			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7792	EPH	2005	177	4933		MR	4342	FS<5	B	VC		F-PLP?			X			D												CRUSHED
7793	EPH	2005	177	4933		MR	4342	FS<5	B	V		F-G			X			D												CRUSHED
7794	EPH	2005	177	4933		MR	4342	FS<5	B	V		F-G			X															CRUSHED
7795	EPH	2005	177	4933		MR	4342	FS<5	B	VC		F-G			X															CRUSHED
7796	EPH	2005	177	4933		MR	4342	FS<5	B	V		F-G			X															CRUSHED
7797	EPH	2005	177	4933		MR	4342	FS<5	B	VC		F-G			X															CRUSHED
7798	EPH	2005	177	4933		MR	4342	FS<5	B	VC		F-MME			X															CRUSHED
7799	EPH	2005	177	4933		MR	4342	FS<5	B	VC		F-PLP?			X			D												CRUSHED
7800	EPH	2005	177	4933		MR	4342	FS<5	B	VC		F-S			X															CRUSHED
7801	EPH	2005	177	4933		MR	4342	FS<5	M	V		F-PLP?			X	XP														
7802	EPH	2005	177	4933		MR	4342	FS<5	M	V		F-G			X															
7803	EPH	2005	177	4933		MR	4342	FS<5	M	V		F-G			X															
7804	EPH	2005	177	4933		MR	4342	FS<5	M	V		FISH			X	XP														
7805	EPH	2005	177	4933		MR	4342	FS<5	M	V		FISH			X															
7806	EPH	2005	177	4933		MR	4342	FS<5	M	OP		FISH			X															
7807	EPH	2005	177	4933		MR	4342	FS<5	M	BAS		F-AA			X															
7808	EPH	2005	177	4933		MR	4342	FS<5	M	POP		FISH			X															
7809	EPH	2005	177	4933		MR	4342	FS<5	M	AR		FISH			X															
7810	EPH	2005	177	4933		MR	4342	FS<5	M	SUC		FISH			X															
7811	EPH	2005	177	4933		MR	4342	FS<5	M	OTH		F-SA			X															SPINE
7812	EPH	2005	177	4932		MR		HC	M	OTH		F-SA			X															SPINE
7813	EPH	2005	177	4932		MR		HC	M	OTH		F-SA			X															SPINE
7814	EP	2005	177	4933		MR		HC	M	RA		SCR			C															

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7815	EPH	2005	177	4933		MR		HC	M	RA		SCR			C															
7816	EPH	2005	177	4933		MR		HC	M	SC	L	SCR			6															
7817	EPH	2005	177	4933		MR		HC	M	SC	L	SCR			6															
7818	EPH	2005	177	4933		MR		HC	M	RA		TU			C															
7819	EPH	2005	177	1615		EM	343	FS<5	B	OTH		F-RC			C															BUCKLER
7820	EPH	2005	177	1816		EM	367	FS<5	M	SUC		FISH			X															
7821	EPH	2005	177	1816		EM	367	FS<5	M	V		F-S			X															
7822	EPH	2005	177	2699		LM	2304	FS<5	M	AR		F-GM			X															
7823	EPH	2005	177	2699		LM	2304	FS<5	M	V		F-GM			X															
7824	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-SS			X															
7825	EPH	2005	177	8692		MR	5357	FS<5	M	HYO		F-G			X															
7826	EPH	2005	177	8692		MR	5357	FS<5	M	AR		FISH			X															
7827	EPH	2005	177	8692		MR	5357	FS<5	M	AR		FISH			X															
7828	EPH	2005	177	8692		MR	5357	FS<5	M	SUC		FISH			X															
7830	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-G			X															
7831	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-SP			X															
7832	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-G			X															!!!CHANGE ID TO BASS!!!
7833	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-G			X															!!!CHANGE ID TO BASS!!!
7835	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-G			X															
7836	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-G			X															
7837	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-G			X															
7838	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-SS			X															
78	E	20	17	86		MR	53	FS	M	V		F-			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
39	PH	05	7	92			57	<5				CH																		
7840	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-CH			X															
7841	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-G			X	XP														
7842	EPH	2005	177	8692		MR	5357	FS<5	M	V		F-S			X															TROUT?
7843	EPH	2005	177	8692		MR	5357	FS<5	M	VPC		F-G			X															PLEURONECTIDAE
7844	EPH	2005	177	4985		HM		HC	M	OTH		F-SA			X															SPINE
7845	EPH	2005	177	4923		HM		HC	M	V		F-G			X															
7846	EPH	2005	177	966		LM		HC	M	CER		FISH			X															
7847	EPH	2005	177	2698		LM		HC	M	DN	L	F-MM			X															
7848	EPH	2005	177	2698		LM		HC	M	DN	R	F-EL			X															
7849	EPH	2005	177	2698		LM		HC	M	V		F-G			X															
7850	EPH	2005	177	2698		LM		HC	M	AR		F-EL			X															
7851	EPH	2005	177	2698		LM		HC	M	PARA		FISH			X															
7852	EPH	2005	177	2698		LM		HC	M	V		F-G			X															!!!CHANGE ID TO TOPE SHARK!!!
7853	EPH	2005	177	2698		LM		HC	B	OTH		F-RC			C															BUCKLER
7854	EPH	2005	177	2698		LM		HC	B	OTH		F-RC			C															BUCKLER
7855	EPH	2005	177	2698		LM		HC	M	V		F-SS			X															!!!CHANGE ID TO TOPE SHARK!!!
7856	EPH	2005	177	2698		LM		HC	M	V		F-G			X															!!!CHANGE ID TO TOPE SHARK!!!
7857	EPH	2005	177	2698		LM		HC	M	V		F-G			X															!!!CHANGE ID TO TOPE SHARK!!!
7858	EPH	2005	177	2698		LM		HC	M	V		F-G			X															!!!CHANGE ID TO TOPE SHARK!!!
7859	EPH	2005	177	2698		LM		HC	M	V		F-G			X															!!!CHANGE ID TO TOPE SHARK!!!
7860	EPH	2005	177	2698		LM		HC	M	V		FISH			X															!!!CHANGE ID TO TOPE SHARK!!!
7861	EPH	2005	177	2698		LM		HC	M	CER		F-GM			X															!!!CHANGE ID TO TOPE SHARK!!!

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7862	EPH	2005	177	2698		LM		HC	M	DN		F-MM			X															!!!CHANGE ID TO TOPE SHARK!!!
7863	EPH	2005	177	2698		LM		HC	M	MX		F-MM			X															!!!CHANGE ID TO TOPE SHARK!!!
7864	EPH	2005	177	2698		LM		HC	M	PMX		F-GM?			X															!!!CHANGE ID TO TOPE SHARK!!!
7865	EPH	2005	177	2698		LM		HC	M	OTH		F-SA			X															SPINE
7866	EPH	2005	177	2698		LM		HC	M	HYO		F-G			X															!!!CHANGE ID TO TOPE SHARK!!!
7867	EPH	2005	177	2698		LM		HC	M	HYO		F-G			X															!!!CHANGE ID TO TOPE SHARK!!!
7868	EPH	2005	177	2698		LM		HC	M	AR		F-G			X															!!!CHANGE ID TO TOPE SHARK!!!
7869	EPH	2005	177	2548		LM		HC	M	VPC		F-TT			C															
7870	EPH	2005	177	2548		LM		HC	M	V		F-TT			C															
7871	EPH	2005	177	2548		LM		HC	M	V		F-TT			C															
7872	EPH	2005	177	2548		LM		HC	M	V		F-TT			C															
7873	EPH	2005	177	2548		LM		HC	M	V		F-TT			C															
7874	EPH	2005	177	2548		LM		HC	M	V		F-TT			C															
7875	EPH	2005	177	2548		LM		HC	M	V		F-G			C	XP														
7876	EPH	2005	177	2548		LM		HC	M	V		F-G			C															CRUSHED
7877	EPH	2005	177	2548		LM		HC	M	VPC		F-G			C															
7878	EPH	2005	177	2548		LM		HC	M	VPC		F-G			C															
7879	EPH	2005	177	2548		LM		HC	M	VPC		F-G			C															
7880	EPH	2005	177	2548		LM		HC	M	V		F-G			C															
7881	EPH	2005	177	2548		LM		HC	M	VC		F-GM			C															
7882	EPH	2005	177	2548		LM		HC	M	VC		F-G			C															
7883	EPH	2005	177	2548		LM		HC	M	VC		F-G			C															
7884	EP	2005	177	2548		LM		HC	M	VC		F-G			C															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7885	EPH	2005	177	2548		LM		HC	M	V		F-G			C															
7886	EPH	2005	177	2548		LM		HC	M	V		F-TT			C															
7887	EPH	2005	177	2548		LM		HC	M	MX		F-GM			C															
7888	EPH	2005	177	2548		LM		HC	M	BAS		F-G			C	XP														
7889	EPH	2005	177	2548		LM		HC	M	PARA		F-G			C															
7890	EPH	2005	177	2548		LM		HC	M	PARA		F-G			C															
7891	EPH	2005	177	2548		LM		HC	M	PARA		F-G			C															
7892	EPH	2005	177	2548		LM		HC	M	CER		F-G			C															
7893	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7894	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7895	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7896	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7897	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7898	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7899	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7900	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7901	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7902	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7903	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7904	EPH	2005	177	2548		LM		HC	M	OTH		F-SA			X															SPINE
7905	EPH	2005	177	2548		LM		HC	M	AR		FISH			X															!!!CHANGE ID TO THWAITE SHAD!!!
7906	EPH	2005	177	2548		LM		HC	M	OP		F-G			X															

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7907	EPH	2005	177	2548		LM		HC	M	CL		F-G			X															
7908	EPH	2005	177	2548		LM		HC	M	CL		F-G			X															
7909	EPH	2005	177	2548		LM		HC	M	CL		F-G			X															
7910	EPH	2005	177	2548		LM		HC	M	AR		F-G			X															
7911	EPH	2005	177	2548		LM		HC	M	HYO		F-G			X															
7912	EPH	2005	177	2548		LM		HC	M	SUC		F-G			X															
7913	EPH	2005	177	2548		LM		HC	M	SUC		F-G			X															
7914	EPH	2005	177	2548		LM		HC	M	SUC		F-G			X															
7915	EPH	2005	177	2548		LM		HC	M	AR		F-G			X															
7916	EPH	2005	177	962		LM		HC	M	CER		F-GM			X															
7917	EPH	2005	177	1838		EM	368	FS<5	M	V		F-SS			X		C													
7918	EPH	2005	177	1838		EM	368	FS<5	M	OP		F-SP			X															
7919	EPH	2005	177	1838		EM	368	FS<5	M	VC		F-PLP?			X															
7920	EPH	2005	177	1838		EM	368	FS<5	M	POT		F-G			X															
7921	EPH	2005	177	1838		EM	368	FS<5	M	VC		F-SP			X															
7922	EPH	2005	177	3612		EM	3303	FS<5	M	AR	L	F-G			X															
7923	EPH	2005	177	3612		EM	3303	FS<5	M	AR	R	F-G			X															
7924	EPH	2005	177	3612		EM	3303	FS<5	M	QU		F-G			X															
7925	EPH	2005	177	3612		EM	3303	FS<5	M	CL		FISH			X															
7926	EPH	2005	177	4955		HM		HC	G	CL		F-MM			X															
7927	EPH	2005	177	3527	3531	LM		HC	G	PMX		F-G			X															
7928	EPH	2005	177	1966		EM		HC	M	PARA		F-GM			X															
7929	EP	2005	177	1956		EM		HC	M	V		F-G			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H											M																		
7930	EPH	2005	177	1887		EM	370	FS<5	M	V		F-AA			X															
7931	EPH	2005	177	1887		EM	370	FS<5	M	V		F-AA			X															
7932	EPH	2005	177	1887		EM	370	FS<5	M	V		F-AA			X															
7933	EPH	2005	177	1887		EM	370	FS<5	M	VC		F-AA			X															
7934	EPH	2005	177	1887		EM	370	FS<5	M	CL		F-AA			X															
7935	EPH	2005	177	1887		EM	370	FS<5	M	CL		F-AA			X															
7936	EPH	2005	177	1887		EM	370	FS<5	M	V		F-PLP?			X															
7937	EPH	2005	177	1887		EM	370	FS<5	M	V		F-CH			X															
7938	EPH	2005	177	1887		EM	370	FS<5	M	V		F-G			X															
7939	EPH	2005	177	2703		HM		HC	M	PMX	L	F-CC			X															
7940	EPH	2005	177	731		HM		HC	B	VC		F-EL			X															
7941	EPH	2005	177	731		HM		HC	M	V		F-TT			X															
7942	EPH	2005	177	731		HM		HC	M	V		F-TT			X															
7943	EPH	2005	177	2783		HM	2334	FS<5	M	VC		F-G			X															
7944	EPH	2005	177	2783		HM	2334	FS<5	M	VC		F-G			X															
7945	EPH	2005	177	2783		HM	2334	FS<5	M	VC		F-PV			X															
7946	EPH	2005	177	2783		HM	2334	FS<5	M	VC		F-PV			X															
7947	EPH	2005	177	2783		HM	2334	FS<5	M	VC		F-PV			X															
7948	EPH	2005	177	2783		HM	2334	FS<5	M	VC		F-G			X															
7949	EPH	2005	177	2783		HM	2334	FS<5	M	VC		F-G			X															
7950	EPH	2005	177	2783		HM	2334	FS<5	M	V		FISH			X															
7951	EPH	2005	177	2783		HM	2334	FS<5	M	V		F-G			X															
79	E	20	17	27		HM	23	FS	M	V		F-			X															

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
52	PH	05	7	83			34	<5				G																		
7953	EPH	2005	177	2783		HM	2334	FS<5	M	V		F-PLP?			X															
7954	EPH	2005	177	2783		HM	2334	FS<5	M	V		F-PLP?			X															
7955	EPH	2005	177	2783		HM	2334	FS<5	M	V		F-GM			X															
7956	EPH	2005	177	2783		HM	2334	FS<5	M	V		F-GM			X															
7957	EPH	2005	177	2783		HM	2334	FS<5	M	V		F-GM			X															
7958	EPH	2005	177	2783		HM	2334	FS<5	M	V		FISH			X															FLATFISH
7959	EPH	2005	177	2783		HM	2334	FS<5	M	VC		F-G			X															
7960	EPH	2005	177	2783		HM	2334	FS<5	M	V		F-G			X															
7961	EPH	2005	177	2783		HM	2334	FS<5	M	V		F-G			X															
7962	EPH	2005	177	1588		EM		HC	M	PARA		F-GM			X															
7963	EPH	2005	177	1588		EM		HC	M	DN		F-S			X															
7964	EPH	2005	177	1762		EM	365	FS<5	M	VPC		F-G			X															
7965	EPH	2005	177	1762		EM	365	FS<5	M	VC		F-SS			X		C													
7966	EPH	2005	177	1762		EM	365	FS<5	M	V		F-G			X															
7967	EPH	2005	177	1762		EM	365	FS<5	M	V		F-G			X															
7968	EPH	2005	177	1762		EM	365	FS<5	M	V		F-G			X															
7969	EPH	2005	177	1762		EM	365	FS<5	M	VC		F-PV			X															
7970	EPH	2005	177	1762		EM	365	FS<5	M	V		F-G			X	XP	B													
7971	EPH	2005	177	1762		EM	365	FS<5	M	VC		F-PV			X															
7972	EPH	2005	177	1762		EM	365	FS<5	M	V		F-G			X															
7973	EPH	2005	177	1762		EM	365	FS<5	M	V		F-G			X															
7974	EPH	2005	177	1762		EM	365	FS<5	M	VC		F-PLP?			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
7975	EPH	2005	177	1762		EM	365	FS <5	M	V		F-G			X															
7976	EPH	2005	177	1762		EM	365	FS <5	M	V		F-G			X															
7977	EPH	2005	177	1762		EM	365	FS <5	M	V		F-G			X															
7978	EPH	2005	177	1762		EM	365	FS <5	M	AR		F-G			X															
7979	EPH	2005	177	1762		EM	365	FS <5	M	PMX		F-G			X															
7980	EPH	2005	177	1762		EM	365	FS <5	M	QU		FISH			X															
7981	EPH	2005	177	903		EM		HC	M	DN	L	F-MM			X															
7982	EPH	2005	177	903		EM		HC	M	PMX		FISH			X															
7983	EPH	2005	177	903		EM		HC	M	DN	R	F-MM			X															
7984	EPH	2005	177	903		EM		HC	M	PMX	L	F-GM			X															
7985	EPH	2005	177	903		EM		HC	M	MX	L	F-GM			X															
7986	EPH	2005	177	903		EM		HC	M	MX	L	F-G			X															
7987	EPH	2005	177	903		EM		HC	M	DN	L	F-MM			X															
7988	EPH	2005	177	903		EM		HC	M	DN	L	F-MM			X															
7989	EPH	2005	177	903		EM		HC	M	CL		F-G			X															
7990	EPH	2005	177	2744		EM	2351	FS <5	M	MX		F-G			X															
7991	EPH	2005	177	2744		EM	2351	FS <5	M	V		F-G			X															
7992	EPH	2005	177	2744		EM	2351	FS <5	M	VC		F-CH			X															
7993	EPH	2005	177	2745		EM		HC	M	CL		F-G			X															
7994	EPH	2005	177	2745		EM		HC	M	CL		F-G			X															
7995	EPH	2005	177	2818		EM	2337	FS <5	M	VPC		F-PV			X															
7996	EPH	2005	177	2818		EM	2337	FS <5	M	VC		F-PV			X															
7997	EP	2005	177	2818		EM	2337	FS <5	M	VC		F-PV			X															

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
7998	EPH	2005	177	2818		EM	2337	FS<5	M	V		F-G			X															
7999	EPH	2005	177	2818		EM	2337	FS<5	M	VC		F-S			X															
8000	EPH	2005	177	2818		EM	2337	FS<5	M	AR		F-PLP?			X															
8001	EPH	2005	177	2818		EM	2337	FS<5	M	POT		F-G			X															
8002	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-G			X															
8003	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-G			X															
8004	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-G			X															
8005	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-G			X															
8006	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-G			X															
8007	EPH	2005	177	2745		EM	2317	FS<5	M	VC		F-PV			X															
8008	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-G			X															
8009	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-G			X															
8010	EPH	2005	177	2745		EM	2317	FS<5	M	VC		F-CH			X															
8011	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-G			X															
8012	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-G			X															
8013	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-G			X															
8014	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-CH			X															
8015	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-CH			X															
8016	EPH	2005	177	2745		EM	2317	FS<5	M	VC		F-SS			X															
8017	EPH	2005	177	2745		EM	2317	FS<5	M	VC		F-SS			X															CRUSHED
8018	EPH	2005	177	2745		EM	2317	FS<5	M	VC		F-PV			X															
8019	EPH	2005	177	2745		EM	2317	FS<5	M	VC		F-PV			X															
80	E	20	17	27		EM	23	FS	M	V		F-			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
20	PH	05	7	45			17	<5				CH																		
8021	EPH	2005	177	2745		EM	2317	FS<5	M	V		F-CH			X															
8022	EPH	2005	177	2745		EM	2317	FS<5	M	OP		F-G			X															
8023	EPH	2005	177	2745		EM	2317	FS<5	M	OTHU		F-PLP?			X															ANAL PTERY
8024	EPH	2005	177	2745		EM	2317	FS<5	M	AR		FISH			X															
8025	EPH	2005	177	2745		EM	2317	FS<5	M	AR		FISH			X															
8026	EPH	2005	177	1884		HM	377	FS<5	M	V		F-S			X															
8027	EPH	2005	177	2540		HM	1377	FS<5	M	V		F-S			X															
8028	EPH	2005	177	2540		HM	1377	FS<5	M	V		FISH			X															
8029	EPH	2005	177	2540		HM		HC	M	DN	L	F-MM			X															
8030	EPH	2005	177	2540		HM		HC	M	V		F-G			X															
8031	EPH	2005	177	2540		HM		HC	M	V		F-G			X															
8032	EPH	2005	177	2540		HM		HC	M	AR	L	F-PV			X															
8033	EPH	2005	177	1884		HM		HC	M	VPC		F-GM			X															
8034	EPH	2005	177	1884		HM		HC	M	VPC		F-GM			X															
8035	EPH	2005	177	1884		HM		HC	M	V		F-GM			X															
8036	EPH	2005	177	1884		HM		HC	M	V		F-EL			X															
8037	EPH	2005	177	1884		HM		HC	M	V		F-S			X															SALMON
8038	EPH	2005	177	1884		HM		HC	M	VC		F-GM			X															
8039	EPH	2005	177	1884		HM		HC	M	V		F-GM			X															
8040	EPH	2005	177	1884		HM		HC	M	V		F-GM			X															
8041	EPH	2005	177	1884		HM		HC	M	V		F-GM			X															
8042	EPH	2005	177	1884		HM		HC	M	V		F-GM			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
8043	EPH	2005	177	1884		HM		HC	M	V		F-G			X															
8044	EPH	2005	177	1884		HM		HC	M	VC		F-G			X															
8045	EPH	2005	177	1884		HM		HC	M	VC		F-G			X															
8046	EPH	2005	177	1884		HM		HC	M	V		F-G			X															
8047	EPH	2005	177	1884		HM		HC	M	V		F-G			X															
8048	EPH	2005	177	1884		HM		HC	M	V		FISH			X															SCOPTHALMIDAE
8049	EPH	2005	177	1884		HM		HC	M	DN	L	F-G			X															
8050	EPH	2005	177	1884		HM		HC	M	POT		F-G			X															
8051	EPH	2005	177	1884		HM		HC	M	AR		F-G			X															
8052	EPH	2005	177	1884		HM		HC	M	AR		F-G			X															
8053	EPH	2005	177	1884		HM		HC	M	CR	L	F-T			X															
8054	EPH	2005	177	785		LM	1327	FS<5	M	V		F-PV			X															
8055	EPH	2005	177	782		LM		HC	M	V		F-G			X															
8056	EPH	2005	177	782		LM		HC	M	AR		F-G			X															
8057	EPH	2005	177	1960		LM	1329	FS<5	M	CER	L	F-AA			X															
8058	EPH	2005	177	1960		LM	1329	FS<5	M	QU	L	F-G			X															
8059	EPH	2005	177	785		LM		HC	M	V		F-G			X															
8060	EPH	2005	177	785		LM		HC	M	DN	L	F-MM			X															
8061	EPH	2005	177	785		LM		HC	M	MX	R	F-G			X															
8062	EPH	2005	177	785		LM		HC	M	MX	R	F-G			X															
8063	EPH	2005	177	785		LM		HC	M	PMX	R	F-GM			X															
8064	EPH	2005	177	785		LM		HC	M	CL	R	FISH			X															SCOPTHALMIDAE
8065	EP	2005	177	785		LM		HC	M	HYO		F-G			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
8066	EPH	2005	177	785		LM		HC	M	MX		F-G			X															
8067	EPH	2005	177	785		LM		HC	M	CER		F-G			X															
8068	EPH	2005	177	785		LM	1328	FS<5	M	V		F-G			X															
8069	EPH	2005	177	785		LM	1328	FS<5	M	VC		F-PV			X															
8070	EPH	2005	177	785		LM	1328	FS<5	M	V		F-SS			X		C													
8071	EPH	2005	177	785		LM	1328	HC	M	VC		F-PV			X															
8072	EPH	2005	177	785		LM	1328	FS<5	M	V		FISH			X															
8073	EPH	2005	177	785		LM	1328	FS<5	M	V		F-SS			X															
8074	EPH	2005	177	785		LM	1328	FS<5	M	V		F-G			X															
8075	EPH	2005	177	785		LM	1328	FS<5	M	V		F-G			X															
8076	EPH	2005	177	785		LM	1328	FS<5	M	V		FISH			X															
8077	EPH	2005	177	785		LM	1328	FS<5	M	V		F-CH			X															
8078	EPH	2005	177	785		LM	1328	FS<5	M	V		F-CH			X															
8079	EPH	2005	177	785		LM	1328	FS<5	M	VC		F-AA			X															
8080	EPH	2005	177	785		LM	1328	FS<5	M	V		F-G			X															
8081	EPH	2005	177	785		LM	1328	FS<5	M	V		F-G			X															
8082	EPH	2005	177	785		LM	1328	FS<5	M	CER		F-AA			X															
8084	EPH	2005	177	785		LM	1328	FS<5	M	QU		F-AA			X															
8085	EPH	2005	177	785		LM	1328	FS<5	M	OTHU		F-G			X															INFRAPHARYNGEAL
8086	EPH	2005	177	967		LM		HC	G	DN	R	F-MM			X															
8087	EPH	2005	177	966		LM		HC	M	V		F-G			X															
8088	EPH	2005	177	966		LM		HC	M	V		F-G			X															
80	E	20	17	96		LM		H	M	V		F-			X															

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
89	PH	05	7	6				C				PLP?																		
8090	EPH	2005	177	966		LM		HC	M	V		F-PLP?			X															
8091	EPH	2005	177	966		LM		HC	M	V		F-G			X															
8092	EPH	2005	177	966		LM		HC	M	V		F-S			X															
8093	EPH	2005	177	966		LM		HC	M	V		F-G			X															
8094	EPH	2005	177	966		LM		HC	M	V		F-G			X															
8095	EPH	2005	177	966		LM		HC	M	QU		F-S			X															
8096	EPH	2005	177	966		LM		HC	M	AR		F-G			X															
8097	EPH	2005	177	972		LM		HC	M	DN	R	F-MM			X															
8098	EPH	2005	177	972		LM		HC	M	DN	L	F-MM			X															
8099	EPH	2005	177	968		LM		HC	M	CER		F-GM			X															
8100	EPH	2005	177	968		LM		HC	M	VC		F-GM			X															
8101	EPH	2005	177	966		LM	311	FS<5	M	VC		F-G			X															
8102	EPH	2005	177	966		LM	311	FS<5	M	VC		F-G			X															
8103	EPH	2005	177	966		LM	311	FS<5	M	VC		F-G			X															
8104	EPH	2005	177	966		LM	311	FS<5	M	VC		F-G			X															
8105	EPH	2005	177	966		LM	311	FS<5	M	VC		F-G			X															
8106	EPH	2005	177	966		LM	311	FS<5	M	VC		F-PLP?			X															
8107	EPH	2005	177	966		LM	311	FS<5	M	VPC		F-G			X															
8108	EPH	2005	177	966		LM	311	FS<5	M	VPC		F-G			X															
8109	EPH	2005	177	966		LM	311	FS<5	M	VC		F-G			X															
8110	EPH	2005	177	966		LM	311	FS<5	M	VC		F-G			X	XT														
8111	EPH	2005	177	966		LM	311	FS<5	M	VC		F-G			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
8112	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8113	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8114	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8115	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8116	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8117	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8118	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8119	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8120	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8121	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8122	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8123	EPH	2005	177	966		LM	311	FS <5	M	VC		F-AA			X															
8124	EPH	2005	177	966		LM	311	FS <5	M	VC		F-AA			X															
8125	EPH	2005	177	966		LM	311	FS <5	M	VC		F-CH			X															
8126	EPH	2005	177	966		LM	311	FS <5	M	V		F-G			X															
8127	EPH	2005	177	966		LM	311	FS <5	M	V		F-G			X															
8128	EPH	2005	177	966		LM	311	FS <5	M	VC		F-PLP?			X															
8129	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8130	EPH	2005	177	966		LM	311	FS <5	M	VC		F-G			X															
8131	EPH	2005	177	966		LM	311	FS <5	M	VC		F-PLP?			X															
8132	EPH	2005	177	966		LM	311	FS <5	M	V		F-SA			X															
8133	EPH	2005	177	966		LM	311	FS <5	M	V		FISH			X															
8134	EP	2005	177	966		LM	311	FS <5	M	V		F-G			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
8135	EPH	2005	177	966		LM	311	FS<5	M	V		F-G			X															
8136	EPH	2005	177	966		LM	311	FS<5	M	V		F-G			X															
8137	EPH	2005	177	966		LM	311	FS<5	M	VPC		F-G			X															
8138	EPH	2005	177	966		LM	311	HC	M	V		F-G			X															
8139	EPH	2005	177	966		LM	311	FS<5	M	V		F-PLP?			X															
8140	EPH	2005	177	966		LM	311	FS<5	M	V		FISH			X															
8141	EPH	2005	177	966		LM	311	FS<5	M	V		FISH			X															
8142	EPH	2005	177	966		LM	311	FS<5	M	V		F-G			X															
8143	EPH	2005	177	966		LM	311	FS<5	M	V		FISH			X															
8144	EPH	2005	177	966		LM	311	FS<5	M	V		F-PLP?			X															
8145	EPH	2005	177	966		LM	311	FS<5	M	V		FISH			X															
8146	EPH	2005	177	966		LM	311	FS<5	M	V		F-CH			X															
8147	EPH	2005	177	966		LM	311	FS<5	M	V		F-PLP?			X		C													
8148	EPH	2005	177	966		LM	311	FS<5	M	V		FISH			X															
8149	EPH	2005	177	966		LM	311	FS<5	M	CER		F-G			X															
8150	EPH	2005	177	966		LM	311	FS<5	M	CR		F-G			X															
8151	EPH	2005	177	966		LM	311	FS<5	M	CR		F-G			X															
8152	EPH	2005	177	966		LM	311	FS<5	M	PARA		FISH			X															
8153	EPH	2005	177	966		LM	311	FS<5	M	AR		F-G			X															
8154	EPH	2005	177	966		LM	311	FS<5	M	AR		F-G			X															
8155	EPH	2005	177	966		LM	311	FS<5	M	AR		F-G			X															
8156	EPH	2005	177	966		LM	311	FS<5	M	QU		F-G			X															
81	E	20	17	96		LM	31	FS	M	PA		FI			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
58	PH	05	7	6			1	<5		RA		SH																		
8159	EPH	2005	177	966		LM	311	FS<5	M	HYO		FISH			X															
8160	EPH	2005	177	966		LM	311	FS<5	M	CER		F-AA			X															
8161	EPH	2005	177	966		LM	311	FS<5	M	CER		F-G			X															
8162	EPH	2005	177	966		LM	311	FS<5	M	MX		F-G			X															
8163	EPH	2005	177	966		LM	311	FS<5	M	CER		FISH			X															FLATFISH
8164	EPH	2005	177	966		LM	311	FS<5	M	CER		FISH			X															FLATFISH
8165	EPH	2005	177	966		LM	311	FS<5	B	OTH		F-RC			C															BUCKLER
8166	EPH	2005	177	1874		HM		HC	M	DN	L	F-MM			X															
8167	EPH	2005	177	1874		HM		HC	M	PMX		F-MM			X															
8168	EPH	2005	177	1874		HM		HC	M	CL		FISH			X															
8169	EPH	2005	177	1874		HM	376	FS<5	M	OTH		F-RC			C															BUCKLER
8170	EPH	2005	177	1874		HM	376	FS<5	M	OTH		FISH			X															STINGRAY; TAILSPINE
8171	EPH	2005	177	1874		HM	376	FS<5	M	PMX		F-MM			X															
8172	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-SS			X															
8173	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-SS			X															
8174	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X															
8175	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-SS			X															
8176	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-SS			X															
8177	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-SS			X															
8178	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-SS			X															
8179	EPH	2005	177	1874		HM	376	FS<5	M	V		F-SS			X															
8180	EPH	2005	177	1874		HM	376	FS<5	M	V		F-SS			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
8181	EPH	2005	177	1874		HM	376	FS<5	B	PMX		F-G			X															
8182	EPH	2005	177	1874		HM	376	FS<5	M	V		F-PV			X															
8183	EPH	2005	177	1874		HM	376	FS<5	M	V		F-PV			X															
8184	EPH	2005	177	1874		HM	376	FS<5	M	V		F-PV			X															
8185	EPH	2005	177	1874		HM	376	FS<5	M	V		F-PV			X															
8186	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															
8187	EPH	2005	177	1874		HM	376	FS<5	M	VPC		F-G			X															
8188	EPH	2005	177	1874		HM	376	FS<5	M	VOM		F-G			X															
8189	EPH	2005	177	1874		HM	376	FS<5	M	MX		F-MM			X															
8190	EPH	2005	177	1874		HM	376	FS<5	M	V		F-SS			X															
8191	EPH	2005	177	1874		HM	376	FS<5	M	V		FISH			X															
8192	EPH	2005	177	1874		HM	376	FS<5	M	V		FISH			X															
8193	EPH	2005	177	1874		HM	376	FS<5	M	V		FISH			X															
8194	EPH	2005	177	1874		HM	376	FS<5	M	VPC		F-G			X															
8195	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-PV			X															
8196	EPH	2005	177	1874		HM	376	FS<5	M	V		F-S			X															
8197	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-PLP?			X															
8198	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-PLP?			X															
8199	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X															
8200	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X															
8201	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X															
8202	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															
8203	EP	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
8204	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															
8205	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															
8206	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															
8207	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															
8208	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															
8209	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															
8210	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															
8211	EPH	2005	177	1874		HM	376	FS<5	M	VPC		F-G			X															
8212	EPH	2005	177	1874		HM	376	FS<5	M	V		FISH			X															
8213	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X	XT														
8214	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X															
8215	EPH	2005	177	1874		HM	376	FS<5	M	VC		F-G			X															
8216	EPH	2005	177	1874		HM	376	FS<5	M	V		FISH			X															
8217	EPH	2005	177	1874		HM	376	FS<5	M	V		F-PLP?			X															
8218	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X															
8219	EPH	2005	177	1874		HM	376	FS<5	M	V		F-SS			X															CRUSHED
8220	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X															
8221	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X															
8222	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X															
8223	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X															
8224	EPH	2005	177	1874		HM	376	FS<5	M	V		F-CH			X															
8225	EPH	2005	177	1874		HM	376	FS<5	M	V		F-CH			X															
82	E	20	17	18		HM	37	FS	M	V		F-			X															

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
26	PH	05	7	74			6	<5				G																		
8227	EPH	2005	177	1874		HM	376	FS<5	M	V		F-SP			X															
8228	EPH	2005	177	1874		HM	376	FS<5	M	V		F-SP			X															
8229	EPH	2005	177	1874		HM	376	FS<5	M	V		FISH			X															
8230	EPH	2005	177	1874		HM	376	FS<5	M	SUC		F-G			X															
8231	EPH	2005	177	1874		HM	376	FS<5	M	VOM		FISH			X															
8232	EPH	2005	177	1874		HM	376	FS<5	M	OTH		FISH			X															FLATFISH; ANAL PTERRY
8233	EPH	2005	177	1874		HM	376	FS<5	M	OTH		F-RC			C															BUCKLER
8234	EPH	2005	177	1874		HM	376	FS<5	M	AR		F-G			X															
8235	EPH	2005	177	1874		HM	376	FS<5	M	PMX		F-G			X															
8236	EPH	2005	177	1874		HM	376	FS<5	M	PMX		F-G			X															
8237	EPH	2005	177	1874		HM	376	FS<5	M	HYO		F-G			X															
8238	EPH	2005	177	1874		HM	376	FS<5	M	HYO		F-G			X															
8239	EPH	2005	177	1874		HM	376	FS<5	M	CL		FISH			X															FLATFISH
8240	EPH	2005	177	1874		HM	376	FS<5	M	PARA		FISH			X															
8242	EPH	2005	177	1874		HM	376	FS<5	M	PARA		FISH			X															
8243	EPH	2005	177	1874		HM	376	FS<5	M	SUC		F-G			X															
8244	EPH	2005	177	1874		HM	376	FS<5	M	PARA		F-G			X															
8245	EPH	2005	177	1874		HM	376	FS<5	M	PARA		F-G			X															
8247	EPH	2005	177	1874		HM	376	FS<5	M	OTH		F-G			X															PALATINE
8248	EPH	2005	177	1874		HM	376	FS<5	M	AR		F-G			X															
8249	EPH	2005	177	1874		HM	376	FS<5	M	V		F-G			X		C													
8250	EPH	2005	177	1874		HM	376	FS<5	M	QU		F-G			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
8251	EPH	2005	177	1874		HM	376	FS<5	M	QU		F-G			X															
8252	EPH	2005	177	1874		HM	376	FS<5	M	QU		F-G			X															
8253	EPH	2005	177	1874		HM	376	FS<5	M	CER		FISH			X															FLATFISH
8254	EPH	2005	177	960		M		HC	G	OTHU		F-SA			X															SPURDOG
8255	EPH	2005	177	683		LM		HC	M	V		F-G			X															
8256	EPH	2005	177	683		LM		HC	M	V		F-G			X															
8257	EPH	2005	177	688		LM	325	FS<5	M	AR		FISH			X															
8258	EPH	2005	177	688		LM		HC	E	DN	L	F-CC			X															
8259	EPH	2005	177	688		LM		HC	B	DN	L	F-CC			X															
8260	EPH	2005	177	688		LM		HC	M	V		F-S			X															
8261	EPH	2005	177	688		LM		HC	M	PARA		FISH			X															
8262	EPH	2005	177	688		LM		HC	M	V		F-G			X															
8263	EPH	2005	177	688		LM		HC	M	V		F-G			X															
8264	EPH	2005	177	688		LM		HC	M	AR		F-G			X															
8265	EPH	2005	177	688		LM		HC	M	AR		F-G			X															
8266	EPH	2005	177	688		LM		HC	M	AR		FISH			X															
8267	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
8268	EPH	2005	177	683		LM	353	FS<5	M	VC		F-G			X															ARTICULATED TO 8629
8269	EPH	2005	177	683		LM	353	FS<5	M	VC		F-G			X															ARTICULATED TO 8628
8270	EPH	2005	177	683		LM	353	FS<5	M	VC		F-G			X															
8271	EPH	2005	177	683		LM	353	FS<5	M	VC		F-G			X															
8272	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
8273	EP	2005	177	683		LM	353	FS<5	M	V		F-G			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
8274	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
8275	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
8276	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
8277	EPH	2005	177	683		LM	353	FS<5	M	VC		F-PV			X															
8278	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
8279	EPH	2005	177	683		LM	353	FS<5	M	VC		F-G			X															
8280	EPH	2005	177	683		LM	353	FS<5	M	VPC		F-G			X															
8281	EPH	2005	177	683		LM	353	FS<5	M	VC		F-PV			X															
8282	EPH	2005	177	683		LM	353	FS<5	M	V		FISH			X															
8283	EPH	2005	177	683		LM	353	FS<5	M	V		FISH			X		C													
8284	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X		C													
8285	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X		C													
8286	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X		C													TWO PIECES
8287	EPH	2005	177	683		LM	353	FS<5	M	V		FISH			X															
8288	EPH	2005	177	683		LM	353	FS<5	M	V		FISH			X															
8289	EPH	2005	177	683		LM	353	FS<5	M	V		FISH			X															
8290	EPH	2005	177	683		LM	353	FS<5	M	V		F-SP			X															
8291	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
8292	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
8293	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
8294	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
8295	EPH	2005	177	683		LM	353	FS<5	M	V		F-G			X															
82	E	20	17	68		LM	35	FS	M	VC		F-			X															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
96	PH	05	7	3			3	<5				G																		
8297	EPH	2005	177	683		LM	353	FS<5	M	VC		F-G			X															
8299	EPH	2005	177	683		LM	353	FS<5	M	OTH		F-RC			C															BUCKLER
8300	EPH	2005	177	683		LM	353	FS<5	M	OTH		F-RC			C															BUCKLER
8301	EPH	2005	177	683		LM	353	FS<5	M	VC		F-PLP			X															
8303	EPH	2005	177	683		LM	353	FS<5	M	OTH		FISH			X															STINGRAY; TAILSPINE
8304	EPH	2005	177	683		LM	353	FS<5	M	PARA		F-G			X															
8305	EPH	2005	177	683		LM	353	FS<5	M	PARA		FISH			X															
8307	EPH	2005	177	683		LM	353	FS<5	M	CL		F-AA			X															
8308	EPH	2005	177	683		LM	353	FS<5	M	AR		FISH			X															
8309	EPH	2005	177	683		LM	353	FS<5	M	HYO		F-G			X															
8310	EPH	2005	177	683		LM	353	FS<5	M	CER		F-G			X															
8311	EPH	2005	178	6653		EMOD		HC	M	MT1	R	B		F	3					50.3		21.1			50		20	23.6	24.1	
8312	EPH	2005	178	6653		EMOD		HC	M	P1		B	F		6															
8313	EPH	2005	178	6653		EMOD		HC	M	P1		EQ	F		C				84.8	41.9	23.6	50.8	34.1	31.6						
8314	EPH	2005	178	6653		EMOD		HC	M	P1		EQ	F		C				82.7	40.1	22.9	47.9	32.7	31.6						
8315	EPH	2005	178	6653		EMOD		HC	E	RA	R	CAF	F	F	C				180.2					13.4						
8316	EPH	2005	178	6653		EMOD		HC	E	HU	R	O		F	6					28.9		14.6								
8317	EPH	2005	178	6653		EMOD		HC	E	HU	L	O		F	6					32.1		15.6								
8318	EPH	2005	178	6653		EMOD		HC	E	OTHU	R	CAF	F		N															
8319	EPH	2005	178	6653		EMOD		HC	E	FE	L	O		G	2															
8320	EPH	2005	178	6653		EMOD		HC	E	FE	R	CAF	F	F	N						16.8									TWO PIECES
8321	EPH	2005	178	6653		EMOD		HC	E	TI	L	FEC	UD	G	C					13.5	9.2									

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
8322	EPH	2005	178	6653		EMOD		HC	E	TI	R	FEC	UD	G	C					13.9	9.7									
8323	EPH	2005	178	6653		EMOD		HC	E	RA	R	FEC	F	F	C				95.7					5.1						
8325	EPH	2005	178	6653		EMOD		HC	E	RA	R	CAF	F	F	C				101					7.8						
8326	EPH	2005	178	6653		EMOD		HC	E	MTIV		CAF	F	F	C				66.1	8	9.7			6.6						
8327	EPH	2005	178	6653		EMOD		HC	E	HU	R	O?	UD	UD	C															FEOTAL
8328	EPH	2005	178	6653		EMOD		HC	E	FE	L	CAF	F	F	C				198.1		17.4			13.4						TWO PIECES
8329	EPH	2005	178	6653		EMOD		HC	E	FE	L	FEC	G	UD	C						9.3									TWO PIECES
8330	EPH	2005	178	6653		EMOD		HC	E	FE	R	CAF	F	F	C				103.4	21.9		8.5		7.6						
8331	EPH	2005	178	6653		EMOD		HC	E	FE	R	CAF	UD	UD	C															NEONATAL
8332	EPH	2005	178	6653		EMOD		HC	E	FE	R	CAF	F	F	C				159.2	32.3		13.2		12.9						
8333	EPH	2005	178	6653		EMOD		HC	E	FE	L	CAF	F	F	C				179	35		12.9		12.5						
8334	EPH	2005	178	6653		EMOD		HC	E	FE	R	O	G	F	C				143.9	29		14.4		15.3						
8335	EPH	2005	178	6653		EMOD		HC	E	FE	L	O		F	4					28.8		15.1								
8336	EPH	2005	178	6653		EMOD		HC	E	TI	R	CAF	F	F	C				201.9	23.7	16.6			13.5						
8337	EPH	2005	178	6653		EMOD		HC	E	TI	L	O	G	F	C				170.3	22.9	17.5			12.3						
8338	EPH	2005	178	6653		EMOD		HC	E	RA	R	S		F	4															
8339	EPH	2005	178	6653		EMOD		HC	E	MT1	L	O	F	F	C				127.9	22	15	9.8		10.5	22.3	14.1	9.6	9.8	10.4	
8340	EPH	2005	178	6653		EMOD		HC	E	MT1	L	O	F	F	C				133.3	25.1	16.4	10.6		12.4	24.8	15.5	10.2	10.2	11.3	
8341	EPH	2005	178	6653		EMOD		HC	E	MT1	L	O	F	F	C				135.6	25.2	17.5	11.3		12.7	24.4	16.6	10.5	11	12.2	
8342	EPH	2005	178	6653		EMOD		HC	E	MT1	L	O	F	F	C				129.4	21.2	15.2	9.3		10.5	21.8	14.5	9	9.4	10.2	
8343	EPH	2005	178	6653		EMOD		HC	E	MT1	L	O	F	F	C				121.9	22.4	14.6	8.9		10.5	22.3	13.6	8.7	9.5	10.7	
8344	EPH	2005	178	6653		EMOD		HC	E	MT1	R	O	F	F	C				117.1	22.2	14.2	9.1		11.1	21.4	13.3	8.3	9.4	10.7	
8345	EP	2005	178	6653		EMOD		HC	E	MT1	R	O	F	F	C				128.9	22.7	15.2	9.7		11.4	22.1	14.2	8.7	9.9	10.8	

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
8346	EPH	2005	178	6653		EMOD		HC	E	MT1	R	O	F	F	C				137.9	26	15.3	10		12.7	24.9	16.3	11	12.2	10.7	
8347	EPH	2005	178	6653		EMOD		HC	E	MT1	R	O	F	F	C				118.6	21.7	13.2	8.9		11.8	21.4	14.5	9.9	10.3	9	
8348	EPH	2005	178	6653		EMOD		HC	E	MC1	R	O	F	F	C				117.1	23.1	14.9	9.9		11.8	23.8	14.6	9.5	10.3	10.9	
8349	EPH	2005	178	6653		EMOD		HC	E	MC1	R	O	F	F	C				103.7	23.4	13.9	9.5		13.6	24.2	13.3	8.8	10.6	10.9	
8350	EPH	2005	178	6653		EMOD		HC	E	MC1	R	O	F	F	C				123.5	27.2	15.7	10.9		15.3	27.7	15.4	10.3	12.5	12.7	
8351	EPH	2005	178	6653		EMOD		HC	E	MC1	R	O	F	F	C				113.7	22.2	14.4	9.6		15.3	21.3	13.5	8.9	10.2	10.5	
8352	EPH	2005	178	6653		EMOD		HC	E	MC1	L	O	F	G	C				123.5	25.2	15.3	10.3		14.5	26	14	9.7	11.2	12.2	
8353	EPH	2005	178	6653		EMOD		HC	E	MC1	L	O	F	G	C				121.9	24.3	15.6	10.1		13.9	26.2	14.9	9.3	10.1	11.6	
8354	EPH	2005	178	6653		EMOD		HC	E	MC1	L	O	F	F	C				117	24.7	15.9	11		13.1	23.5	15.8	10.8	11.6	11.6	
8355	EPH	2005	178	6653		EMOD		HC	E	MC1	L	O	F	F	C				116	22.1	14.5	9.3		11.6	22.4	14	8.8	10.3	10.4	
8356	EPH	2005	178	6653		EMOD		HC	G	MC1	L	O		UD	N										23.6					
8357	EPH	2005	176	3807		HM		HC	M	P3		B			6															TWO PIECES
8358	EPH	2005	176	3807		HM		HC	B	P1		O	F		C															
8359	EPH	2005	176	3807		HM		HC	M	OTHTI	L	CAC?	F		5															
8360	EPH	2005	176	3807		HM		HC	G	OC	R	S			6															
8361	EPH	2005	176	3807		HM		HC	B	CO	R	GNP			C															
8362	EPH	2005	176	3807		HM		HC	A	UL	L	S	F		C															
8363	EPH	2005	176	3807		HM		HC	A	TI	R	O?		F	5															
8364	EPH	2005	176	3807		HM		HC	M	HU	R	O		F	3					29.1		14.4								
8365	EPH	2005	176	3807		HM		HC	M	MCIV		S	F	F	C				71.5	14.1	16.6			11.9						
8366	EPH	2005	176	3807		HM		HC	B	CA	R	B	UD		6			C												
8367	EPH	2005	176	3807		HM		HC	B	SC	L	S	UD		5									19.5						
83	E	20	17	38		HM		H	M	SC	L	O	F		4									20						

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
68	PH	05	6	07				C																.1						
8369	EPH	2005	176	3807		HM		HC	M	OTHTI	R	O	UD		6	T1														
8370	EPH	2005	176	3807		HM		HC	A	OTHTI	R	B	UE		6															
8371	EPH	2005	176	3807		HM		HC	B	MC1	R	B		F	2					60.8	30.6	23.4			55.5	30.7	23.5		28.5	
8372	EPH	2005	176	3807		HM		HC	B	PE	R	B			4								55.3							
8373	EPH	2005	176	3807		HM		HC	M	PE	L	O			5	P9; P12; P13							23							
8374	EPH	2005	176	3809		HM		HC	E	HU	R	GNP			C	H14			65.3	14				6.5						
8375	EPH	2005	176	3809		HM		HC	B	OTHTI	L	S?	UD		2															
8376	EPH	2005	176	3809		HM		HC	M	TI	L	O?		UD	2	T22														
8377	EPH	2005	176	3809		HM		HC	B	RA	R	B		G	5															
8378	EPH	2005	176	3809		HM		HC	M	PE	R	B			3	P5														
8379	EPH	2005	176	3809		HM		HC	E	SUC		F-G			C															
8380	EPH	2005	176	3809		HM		HC	A	HU	L	S		F	3															
8381	EPH	2005	176	3809		HM		HC	A	P1		B	F		C															
8382	EPH	2005	176	3809		HM		HC	G	TI	R	O	G		1															
8383	EPH	2005	176	3809		HM		HC	B	SC	R	B	F		5															
8384	EPH	2005	176	3809		HM		HC	M	PE	R	B			5								54							
8385	EPH	2005	176	3809		HM		HC	G	RA	R	B		F	2															TRAMPLING
8386	EPH	2005	176	3809		HM		HC	B	TI	L	B		F	3															
8387	EPH	2005	176	3809		HM		HC	B	MT1	L	CAC	F	F	6															
8388	EPH	2005	179	4749		EMOD		HC	E	P1		B	F		C															
8389	EPH	2005	179	4749		EMOD		HC	E	P3		B			C															
8390	EP	2005	179	4749		EMOD		HC	B	SC	R	S	UD		5									22						

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
8391	EPH	2005	179	4749		EMOD		HC	M	OTHRA	L	S	G		1															
8392	EPH	2005	179	4749		EMOD		HC	E	HU	R	O		F	0					28		14.3								
8393	EPH	2005	179	4749		EMOD		HC	E	FE	R	O		G	N															
8394	EPH	2005	179	4749		EMOD		HC	G	P1		B	F		C															
8395	EPH	2005	179	4749		EMOD		HC	G	AT		B			6															
8396	EPH	2005	179	4749		EMOD		HC	G	FE		B		F	6	F14														
8397	EPH	2005	179	4749		EMOD		HC	G	SC		B	F		B	S20														
8398	EPH	2005	179	4749		EMOD		HC	G	HU		S			B	H17														
8399	EPH	2005	179	4749		EMOD		HC	G	UL	L	B	UD		6	U5														
8400	EPH	2005	179	4749		EMOD		HC	M	HU	R	O		F	2					25.8										
8401	EPH	2005	179	4749		EMOD		HC	G	UL	R	O?			6															
8403	EPH	2005	179	4749		EMOD		HC	G	MP2		B		F	5															
8404	EPH	2005	179	4749		EMOD		HC	G	RA	L	O		F	5			C												
8405	EPH	2005	179	4749		EMOD		HC	G	TI	L	O		F	3					27.7	22									
8406	EPH	2005	179	4749		EMOD		HC	M	TI	L	B?		UD	5															
8407	EPH	2005	179	4749		EMOD		HC	G	OTHRA	L	B	F		4															FUSED TO 8408
8408	EPH	2005	179	4749		EMOD		HC	G	UL	L	B			4															FUSED TO 8407
8409	EPH	2005	179	4749		EMOD		HC	G	OTHU		O?	G		6															
8410	EPH	2005	179	4749		EMOD		HC	G	OTHTI	L	O?	UD		6															COPPER STAINING
8411	EPH	2005	179	4749		EMOD		HC	G	P2		B	F		C															
8412	EPH	2005	179	4749		EMOD		HC	G	PE	R	O			6								21.8							
8413	EPH	2005	179	4749		EMOD		HC	G	MP1		CAF		F	N															
84	E	20	17	47		EM		H	G	RA	L	O	F	F	C				13					15						

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
14	PH	05	9	49		OD		C											9.9					.7						
8415	EPH	2005	179	4749		EMOD		HC	G	HU	R	O		F	3	H18				28.4		14.6								
8416	EPH	2005	179	4749		EMOD		HC	G	SC	R	O	F		5								18.5							
8417	EPH	2005	179	4749		EMOD		HC	M	FE	L	B?		UD	6															
8418	EPH	2005	179	4749		EMOD		HC	G	OT HFE		B?	G		6						47.9									
8419	EPH	2005	179	4749		EMOD		HC	G	OT HFE		B?	UE		6	F2														
8420	EPH	2005	179	4749		EMOD		HC	M	MT1	L	GNP			6				93.8					8.2						SPUR SCAR
8421	EPH	2005	179	4749		EMOD		HC	B	P2		EQ	F		6			C												
8422	EPH	2005	179	4749		EMOD		HC	M	UL	R	B			5	U5		C												
8423	EPH	2005	179	4749		EMOD		HC	G	OT HU	L	O	G		5															
8424	EPH	2005	180	3810		HM		HC	B	TI	R	S		UD	6															NEONATAL
8425	EPH	2005	180	3810		HM		HC	B	UL	L	S	UD		6															
8426	EPH	2005	180	3810		HM		HC	B	SC	R	S	F		6									24.7						
8427	EPH	2005	180	3810		HM		HC	M	SC	L	S?	UD		6															
8428	EPH	2005	180	3810		HM		HC	B	P3		B			6															
8429	EPH	2005	180	3810		HM		HC	B	P1		B	F		C															
8430	EPH	2005	180	3810		HM		HC	G	AS	L	B			C	A10; A12			60.6	40	33.8	54.3								
8431	EPH	2005	180	3810		HM		HC	M	RA	L	O		G	5															
8432	EPH	2005	180	3810		HM		HC	M	CA	L	O	UD		C						25.7									
8433	EPH	2005	180	3810		HM		HC	M	MT1	R	O	F	F	6					21.8	14.8	9.1			21.1	14.1	9.1	9.5	10.6	
8434	EPH	2005	180	3810		HM		HC	B	PE	R	B			6								44.6							
8435	EPH	2005	180	3810		HM		HC	M	OT HTI	R	O	G		4	T1														
8436	EPH	2005	180	3810		HM		HC	B	OT HRA	R	S	F		4			C												

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
8437	EPH	2005	180	3841		HM		HC	B	P2		B	F		C															
8438	EPH	2005	180	3841		HM		HC	B	P2		B	F		C															
8439	EPH	2005	180	3841		HM		HC	B	CA	L	O	UD		6						28.4									
8440	EPH	2005	180	3841		HM		HC	A	UL	R	S			6															
8441	EPH	2005	180	3842		HM		HC	G	SC	L	S	F		5									22.4						
8442	EPH	2005	180	3842		HM		HC	M	PE	L	B			6															
8443	EPH	2005	180	3842		HM		HC	M	PE	R	B			6															
8444	EPH	2005	180	3842		HM		HC	M	MT1	L	B		F	1					46.2	26.6	20			44.6	26	19	21.1	21.9	
8445	EPH	2005	180	3842		HM		HC	M	OTHU	L	O	F		6			C												
8446	EPH	2005	180	3842		HM		HC	M	OTHRA	L	O		UD	1															
8447	EPH	2005	180	3842		HM		HC	G	UL	R	O			6															
8448	EPH	2005	180	3842		HM		HC	G	RA		GNP			C															
8449	EPH	2005	180	3842		HM		HC	G	RA		ANS		J	6															
8450	EPH	2005	180	3842		HM		HC	G	UL	L	SCR			5															
8451	EPH	2005	180	3842		HM		HC	M	FE	R	GNP			C				71.5	13	12.1		66.8	5.9						
8452	EPH	2005	180	3842		HM		HC	B	TI	L	O		F	6															
8453	EPH	2005	180	3842		HM		HC	M	TI	R	GNP			C				98.1	9.5	11.2		94.4	5.7						
8454	EPH	2005	180	3842		HM		HC	M	TI		GNP	J	J	C															
8455	EPH	2005	180	3842		HM		HC	M	TI		GNP		J	4															
8456	EPH	2005	180	3842		HM		HC	M	OTHTI		GNP	J		6															
8457	EPH	2005	180	3842		HM		HC	M	OTHTI		GNP	J		6															
8458	EPH	2005	180	3842		HM		HC	M	HU		ANS			3					25.6										
8459	EP	2005	181	2918		EM		HC	B	CA	R	B			6															

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
8460	EPH	2005	181	2918		EM		HC	B	PE	R	O			6	P18							26.5							
8461	EPH	2005	181	2818		EM		HC	M	SC	L	B	F		5		B							53.1						TWO PIECES
8462	EPH	2005	181	2818		EM		HC	M	RA	R	B		F	5															TRAMPLING
8463	EPH	2005	181	2818		EM		HC	M	SC	R	S	F		5									22.3						
8464	EPH	2005	181	2818		EM		HC	M	OC	L	O			6	SK2														
8465	EPH	2005	181	2818		EM		HC	M	P1		O	F		C															
8466	EPH	2005	181	2743		EM		HC	M	TI	L	ANS			C	T11			110.8	12.2	12.7		106.9	6.6						
8467	EPH	2005	181	2743		EM		HC	M	PE	L	O			6								24.6							
8468	EPH	2005	181	2744		EM		HC	B	UL	R	S			6															
8469	EPH	2005	181	2744		EM		HC	M	PE	L	B			6															
8470	EPH	2005	181	2744		EM		HC	M	PE	L	B			6															
8471	EPH	2005	181	2744		EM		HC	M	PE	L	B			6															
8472	EPH	2005	181	2744		EM		HC	M	OTHRA	L	B			4															FUSED TO 8473
8473	EPH	2005	181	2744		EM		HC	M	UL	L	B			4															FUSED TO 8472
8474	EPH	2005	181	2744		EM		HC	G	P1		B	F		C															
8475	EPH	2005	181	2744		EM		HC	M	MT1	L	O	F	UD	C										19.3					
8476	EPH	2005	181	2744		EM		HC	A	AS	R	B			C	A4														
8477	EPH	2005	181	2999		EM	2371	FS<5	B	UL	L	O			6															
8478	EPH	2005	182	4556		MR		HC	E	MCIV		S	F	G	C				68	15.1	15.7			13.5						
8479	EPH	2005	182	2789		MR		HC	M	HC	R	B			6	SK2														
8480	EPH	2005	182	2789		MR		HC	G	UL	R	O	F		6	U7														
8481	EPH	2005	182	2789		MR		HC	M	UL	R	O			6															
84	E	20	18	27		MR		H	G	SC	L	S	F		5									24						

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
82	PH	05	2	89				C																.8						
8483	EPH	2005	182	2789		MR		HC	M	SC	L	S	F		6	S12								25						TRAMPLING
8484	EPH	2005	182	2789		MR		HC	G	HU	L	O		F	6					22.7	12									
8485	EPH	2005	182	2789		MR		HC	M	HU	L	O		F	4			C												
8486	EPH	2005	182	2945		MR		HC	B	CA	R	S	UD		C						28.7									
8487	EPH	2005	182	2945		MR		HC	B	ZY	L	O			6															
8488	EPH	2005	182	2945		MR		HC	B	CA	R	B			6						28.7									
8489	EPH	2005	182	2945		MR		HC	M	HU	R	CAF		F	N					28.6	10.9									
8490	EPH	2005	182	2945		MR		HC	B	OT HFE	L	CAF	F		5						17.7									
8491	EPH	2005	182	2945		MR		HC	G	MCIII		S	F	F	6					14.8	16.4									
8492	EPH	2005	182	2945		MR		HC	M	MC 1		EQ	F	F	N				215	49.5	35.8			32.9						
8493	EPH	2005	182	2945		MR		HC	M	TI	R	B		F	N					51	41.7									
8494	EPH	2005	182	2945		MR		HC	M	SC	R	B	F		N									44.4						
8495	EPH	2005	182	2945		MR		HC	M	OT HTI	R	EQ	F		N															
8496	EPH	2005	182	2945		MR		HC	G	RA	R	EQ	F	F	C				294.6					30.3						
8497	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			C	SK3				61.6	50.1									
8498	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			C					68	60									
8499	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			6					67.5	57.6									
8500	EPH	2005	183	6653		EMOD		HC	E	HC	L	B			6					70	56.2									
8501	EPH	2005	183	6653		EMOD		HC	E	HC	L	B			3	SK3				66.1	53.7									
8502	EPH	2005	183	6653		EMOD		HC	E	HC	L	O			B	SK2														
8503	EPH	2005	183	6653		EMOD		HC	E	HC	L	B			6	SK3				65.7	57.3									
8504	EPH	2005	183	6653		EMOD		HC	E	HC	L	B			C					63.7	51.5									

bones

ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
8505	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			6					78.7	65.5									
8506	EPH	2005	183	6653		EMOD		HC	E	HC	L	B			C					77.4	62.4									
8507	EPH	2005	183	6653		EMOD		HC	E	HC	L	B			C					52.2	38.2									
8508	EPH	2005	183	6653		EMOD		HC	E	HC	L	B			6					65.8										
8509	EPH	2005	183	6653		EMOD		HC	E	HC	L	B			C					60.9	51									SKULL JOINED TO 8510
8510	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			6					60.8	53.2									SKULL JOINED TO 8509
8511	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			6	SK3				61.9	48.8									
8512	EPH	2005	183	6653		EMOD		HC	E	HC	L	B			6					71.7	56.3									
8513	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			6															
8514	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			6					62.9	57.6									
8515	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			6					57.3										
8516	EPH	2005	183	6653		EMOD		HC	E	HC	L	O			B	SK2				44.8										
8517	EPH	2005	183	6653		EMOD		HC	E	HC	L	O			B	SK2				44.9										
8518	EPH	2005	183	6653		EMOD		HC	E	HC	R	O			B	SK2				37.5										
8519	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			6															
8520	EPH	2005	183	6653		EMOD		HC	E	HC	R	B			6															
8521	EPH	2005	184	6653		EMOD		HC	E	PE	R	B			B	P9							58.6							
8522	EPH	2005	184	6653		EMOD		HC	E	PE	R	EQ			C			R					60.6							
8523	EPH	2005	184	6653		EMOD		HC	E	PE	R	EQ			C								62.5							
8524	EPH	2005	184	6653		EMOD		HC	E	PE	L	EQ			C								64.5							
8525	EPH	2005	184	6653		EMOD		HC	E	PE	R	CAF			C								22							
8526	EPH	2005	184	6653		EMOD		HC	E	SC	R	CAF	F		5								18.9							AIR POCKET IN GLENOID - PHOTO
8527	EP	2005	184	6653		EMOD		HC	E	SC	L	CAF	F		5								27.6							

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	AREA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
8528	EPH	2005	184	6653		EMOD		HC	E	SC	L	O	F		5								20							
8529	EPH	2005	184	6653		EMOD		HC	E	SC	L	O	F		5								21							
8530	EPH	2005	184	6653		EMOD		HC	E	SC	L	O	F		5								20.1							
8531	EPH	2005	184	6653		EMOD		HC	E	SC	L	O	F		5								18.6							
8532	EPH	2005	184	6653		EMOD		HC	E	SC	L	O	F		5								20.9							
8533	EPH	2005	184	6653		EMOD		HC	E	SC	L	O	F		5								19.3							
8534	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5								17.5							
8535	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5								21.3							
8536	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5								20.7							
8537	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5								18.5							
8538	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5	S19							23.7							
8539	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5	S12							19.5							
8540	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5	S11							19.6							
8541	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5	S10							22.6							
8542	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5								18.9							
8543	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5								19							
8544	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5								17.6							
8545	EPH	2005	184	6653		EMOD		HC	E	SC	R	O	F		5	S21							21.2							
8546	EPH	2005	74	4932		MR		HC	E	HU	L	GNP			C				64.2	13.7				7.2						
8547	EPH	2005	74	4932		MR		HC	G	HU	L	GNP			C				66.5	15				6.5						
8548	EPH	2005	74	4932		MR		HC	B	HU	L	GNP		J	4				64.2	13.7				7.2						
8549	EPH	2005	74	4932		MR		HC	M	OTHU	R	SCR			3															
85	E	20	74	49		MR		H	M	HU	R	CO			C				45.	10				5.						

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
50	PH	05		32				C				L							7	.4				3						
8551	EPH	2005	74	4932		MR		HC	M	UL	L	GNP			C															
8552	EPH	2005	74	4932		MR		HC	M	UL	L	GNP			C															
8553	EPH	2005	74	4932		MR		HC	M	UL	L	GNP			C															
8554	EPH	2005	74	4932		MR		HC	M	UL	R	GNP			C															
8555	EPH	2005	74	4932		MR		HC	M	SC	L	GNP			6															
8556	EPH	2005	74	4932		MR		HC	M	CO	L	GNP			C															
8557	EPH	2005	74	4932		MR		HC	M	CO	L	GNP	J	J	6															
8558	EPH	2005	74	4932		MR		HC	E	CO	R	GNP			C															
8559	EPH	2005	74	4932		MR		HC	E	CO	R	GNP			C															
8560	EPH	2005	74	4932		MR		HC	M	CO	R	GNP			C															
8561	EPH	2005	74	4932		MR		HC	E	CO	R	ANA			C															WIDGEON SIZE; Lm = 43.5
8562	EPH	2005	74	4932		MR		HC	M	RA	R	GNP	J	J	C															
8563	EPH	2005	74	4932		MR		HC	M	OTHRA	R	ANS			6															
8564	EPH	2005	74	4932		MR		HC	M	MC1	L	GNP			C															
8565	EPH	2005	74	4932		MR		HC	M	OTHFE	L	GNP			4															
8566	EPH	2005	74	4932		MR		HC	M	FE	L	ANS		J	6															
8567	EPH	2005	74	4932		MR		HC	E	TI	L	SCR			4					6.1	6.2									
8568	EPH	2005	74	4932		MR		HC	G	TI	L	GNP			6	T11				10.1	12.1									
8569	EPH	2005	74	4932		MR		HC	G	OTHTI	L	GNP			5															
8570	EPH	2005	74	4932		MR		HC	M	TI	L	GNP	J	J	6															
8571	EPH	2005	74	4932		MR		HC	E	TI	R	GNP			5	T18				10.1	10.8									
8572	EPH	2005	74	4932		MR		HC	E	TI	R	GNP			6	T18				9.9	10.5									

bones																														
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT #	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
8573	EPH	2005	74	4932		MR		HC	E	TI	R	GNP			C				116.2	11.7	12.3		111.9	6.2						
8574	EPH	2005	74	4932		MR		HC	M	TI	R	GNP			6					11.8	11.5									
8575	EPH	2005	74	4932		MR		HC	E	TI	R	GNP		J	4															
8576	EPH	2005	74	4932		MR		HC	E	OTHTI	R	GNP	J		1															
8577	EPH	2005	74	4932		MR		HC	G	MT1	L	GNP			C				75.3	13.7				6.2						
8578	EPH	2005	74	4932		MR		HC	G	MT1	L	GNP			6				79.9					5.6						
8579	EPH	2005	74	4932		MR		HC	G	MT1	R	GNP	J		5					12.7										
8580	EPH	2005	74	4932		MR		HC	G	MT1	R	GNP	J		6															
8581	EPH	2005	74	4932		MR		HC	G	MT1	R	GNP			C				81.9	13.3				5.8						
8582	EPH	2005	74	4932		MR		HC	G	MT1	R	GNP	J		6															
8583	EPH	2005	74	4932		MR		HC	G	MT1	R	GNP			5					13.5										
8584	EPH	2005	74	4932		MR		HC	E	MT1	R	GNP			5				65.5					5.5						
8585	EPH	2005	74	4932		MR		HC	G	MT1	R	GNP		J	4															
8586	EPH	2005	74	4932		MR		HC	G	MC1	R	SCR			C				40.2			4.7								
8587	EPH	2005	74	4932		MR		HC	G	HU	L	SCR			5					10.5										
8588	EPH	2005	74	4932		MR		HC	G	HU	L	SCR			3					10.4										
8589	EPH	2005	74	4932		MR		HC	M	SC	L	GNP			6			C												
8590	EPH	2005	74	4932		MR		HC	E	SC	R	GNP			4															
8591	EPH	2005	74	4932		MR		HC	G	MT1	L	SCR			6															
8592	EPH	2005	74	4932		MR		HC	E	MT1	L	SCR			C				40.1	7.3				3.1						
8593	EPH	2005	74	4932		MR		HC	G	MT1	L	COL			6															
8594	EPH	2005	74	4932		MR		HC	E	MT1	L	TU			6				34.7	3.9				1.6						
8595	EP	2005	74	4932		MR		HC	G	TI	R	SCR			5															

bones																															
ID	SITE	YEAR	BOX	CTX	Feature	ERA	CAT#	COL	PRES	EL	SIDE	TAX	FUSP	FUSD	FFI	BUTCH	BURN	GNAW	GL	Bd	Dd	HTC	LAR	SD	BatF	a	b	1	4	Comments
	H																													
8596	EPH	2005	74	4932		MR		HC	G	TI	R	SCR			4					7.6	7.1									
8597	EPH	2005	74	4932		MR		HC	G	TI	L	COL			3					8.4	9.3									TRAMPLING
8598	EPH	2005	74	4932		MR		HC	E	UL	L	SCR			4															
8599	EPH	2005	74	4932		MR		HC	M	UL	L	GNP		J	3															
8600	EPH	2005	74	4932		MR		HC	G	RA	L	TU			C															
8601	EPH	2005	74	4932		MR		HC	M	RA	L	GNP			4															
8602	EPH	2005	74	4932		MR		HC	E	RA	L	GNP			C															
8603	EPH	2005	74	4932		MR		HC	G	RA	R	GNP			C															
8604	EPH	2005	74	4932		MR		HC	E	RA	R	GNP			4															
8605	EPH	2005	74	4932		MR		HC	E	RA	R	SCR			C															

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3LH BUTCH Comments
5554	EPH	2005	1	6777			HC	N	J	R	B																P				f										g																					No socket for P2; mandible deliberately broken behind M1
55	EP	20	1	67			HC		L		S				F																																															

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
55	H	05		78																																																										
5556	EPH	2005	1	6715		5302	FS<5	X	J	R	S																																			P	22.9	17	16.5													
5557	EPH	2005	1	6715		5302	FS<5	X	L	R	S																																								P	30.2	18.5	16.1	10.2							
5558	EPH	1998	2	512,T24			HC	N	L	L	B																																								l	37.1	15										CALCULUS
5559	EPH	1998	2	529,T24			HC	X	L	R	S																																														P		16.7			
5560	EPH	1998	2	529,T24			HC	N	J	R	B												P																		g					f																
5561	EPH	1998	2	519,T13			HC	N	L	R	B																																								g	34.2	14.5									
5	E	2	3	2			H	N	J	L	B																																														P					

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
562	PH	005		913			C																																																							CHOPPED BELOW OCCLUSAL SURFACE
5563	EPH	2005	3	2913			HC	X	L	L	O																																														P					
5564	EPH	2005	3	2997			HC	X	L	R	O																																														P					
5565	EPH	2005	3	2997			HC	N	L	R	S									F																																										
5566	EPH	2005	3	2831			HC	N	L	L	O																																														9A					
5567	EPH	2005	3	2831			HC	N	L	R	O																																														9A					
5568	EPH	2005	3	2831			HC	N	L	L	O																																														3C					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5569	EPH	2005	3	2831			HC	N	J	L	S												P				P				a		8.5								g		9.9	10.6		E		12.2	13.2	P												
5570	EPH	2005	3	2831			HC	N	J	R	O																																								P											
5571	EPH	2005	4	5767	HM		HC	N	J	R	CAH?																P																																			
5572	EPH	2005	4	5767	HM		HC	X	L	R	B																				P																															
5573	EPH	2005	4	5767	HM		HC	X	L	R	B																														P																					
5574	EPH	2005	4	5767	HM		HC	X	J	R	B																																			P																
557	EPH	20	4	576	HM		HC	X	L	L	B																				P																															

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5		5		7																																																										
5576	EPH	2005	5	2699	LM		HC	X	L	L	EQ																																																			P
5577	EPH	2005	5	2699	LM		HC	X	L	L	B																																														P					
5578	EPH	2005	5	2699	LM		HC	X	L	R	B																																														P					
5579	EPH	2005	5	2699	LM		HC	M	L	R	B																P																																			
5580	EPH	2005	5	2699	LM		HC	M	L	L	B																																								h	28.2	13.4	12.7								MISSING 3RD CUSP (PATHOLOGOCIGAL)
5581	EPH	2005	5	2699	LM		HC	M	J	L	B																														j	22				g																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
5582	EPH	2005	5	2699	LM		HC	N	J	L	S																																			E		12.4			a											
5583	EPH	2005	5	2699	LM		HC	N	J	L	OVA																														9A	12.2	7.8			7A		7.6														
5584	EPH	2005	5	2699	LM		HC	N	J	L	OVA																P				14S										10B					9A					11G											
5585	EPH	2005	5	2699	LM		HC	N	J	L	OVA												P				P				14S										11C					9A					11G											
5586	EPH	2005	5	2699	LM		HC	N	J	L	O																				E																															
5587	EPH	2005	5	2699	LM		HC	N	L	R	OVA																																														9A	11.8	7.8			
5588	EPH	2005	5	2699	LM		HC	N	L		O								P																																											

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5589	EPH	2005	5	2699	LM		HC	N	L		OVA																																														8A	14	7			
5590	EPH	2005	5	2699	LM		HC	N	L	L	OVA																											21L	14.1	4.6																						
5591	EPH	2005	5	2699	LM		HC	N	L		O				P																																															
5592	EPH	2005	5	2699	LM		HC	N	L	R	O																																								P											
5593	EPH	2005	5	2699	LM		HC	N	L		B												P																																							
5594	EPH	2005	5	2699	LM		HC	X	L		S									P																																										
5595	EPH	2005	6	720	EM		HC	N	J	L	OVA																														9A		6.5			9A		7.3														

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5596	EPH	2005	6	720	EM		HC	X	L	L	B																																														k	20.6	20.7			
5597	EPH	2005	6	720	EM		HC	X	J	R	B																														k		19	19.1		j	20.9	19.3															
5598	EPH	2005	6	720	EM		HC	N	J	L	B																									P	P	j	25.6	12.5						V																
5600	EPH	2005	6	720	EM		HC	N	J	L	S									N			P				P	9	6.4		a		8.5								h		10.5	11.2		C	18	13.8	13.8													
5601	EPH	2005	6	720	EM		HC	N	L	R	S																P	10.7	5.7																																	
5602	EPH	2005	6	720	EM		HC	N	J	R	S																				b	12.2	7.3								l	13.2	8.7	9																		
5603	EPH	2005	6	720	EM		HC	X	L		S																																														P					

teeth																																																												
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5604	EPH	2005	7	3794	EM		HC	N	L	L	B																																								g	33.3	15									
5605	EPH	2005	7	3794	EM		HC	N	J	L	CAH																				7A										9A					9A					6A											
5606	EPH	2005	7	3794	EM		HC	N	L	R	EQ												P																																							VERY WORN
5607	EPH	2005	7	3794	EM		HC	X	L		O																																														P					
5608	EPH	2005	7	3794	EM		HC	N	J	R	OVA																														10A	9	6.6			9A	12	7.9			11G											
5609	EPH	2005	11	1838	EM		HC	N	L	R	EQ																																														P					52.4
561	EPH	20	11	183	EM		HC	N	L	R	EQ																																														P					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
0		5		8																																																								50.3
5611	EPH	2005	11	1838	EM		HC	N	L	R	EQ																																								P											54.2
5612	EPH	2005	11	1842	EM		HC	N	J	L	OVA																														9A					7A					E											
5613	EPH	2005	11	1842	EM		HC	N	J	R	OVA																														P					P					E											
5614	EPH	2005	11	1842	EM		HC	N	L	R	OVA																																								14L											
5615	EPH	2005	11	1845	EM		HC	X	L	R	B																																														P					
5616	EPH	2005	11	1845	EM		HC	N	L	L	OVA																																								3C											
5617	EPH	2005	11	1845	EM		HC	N	L	L	B																																								b	30.8	13.4									

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5618	EPH	2005	13	2637	HM		HC	X	L	L	B																																													P					
5619	EPH	2005	13	2637	HM		HC	X	L	R	B																P																																			
5620	EPH	2005	14	3804	HM		HC	X	L		B																																													P					
5621	EPH	2005	16	2540	HM		HC	N	J	L	OVA																																							11G											
5622	EPH	2005	16	1884	HM		HC	N	L		B				I																																															
5623	EPH	2005	16	1884	HM		HC	N	L		B				I																																															
562	EPH	200	16	188	HM		HC	N	L		B				I																																															

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
4		5		4																																																										
5625	EPH	2005	16	1884	HM		HC	X	L	L	B																																														P					
5626	EPH	2005	16	1884	HM		HC	X	L	R	B																																														P					BURNT
5627	EPH	2005	16	1884	HM		HC	X	L	R	B																																														P					
5628	EPH	2005	16	1884	HM		HC	X	J	L	B																																														P					
5629	EPH	2005	16	1884	HM		HC	N	L	L	B																																														g	24.4	15.7			
5630	EPH	2005	16	1884	HM		HC	X	L	L	B																			P																																		
56	EP	20	16	18	HM		HC	X	L		B																			P																																		

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
31	H	05		84																																																										
5632	EPH	2005	16	1884	HM		HC	N	L	R	B																				f																															
5633	EPH	2005	16	1884	HM		HC	X	L	L	O																																								P											
5634	EPH	2005	16	1884	HM		HC	X	L	L	O																																								P											
5635	EPH	2005	16	1884	HM		HC	X	L	R	O																																								P											
5636	EPH	2005	16	1884	HM		HC	X	L	L	O																																														P					
5637	EPH	2005	16	1884	HM		HC	X	L	R	O																																														P					
5	E	2	1	1	H		H	X	L	R	O																																														P					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
638	PH	005	6	884	M		C																																																							
5639	EPH	2005	16	1884	HM		HC	X	L	R	O																														P																					
5640	EPH	2005	16	1884	HM		HC	X	L	R	O																			P																																	
5641	EPH	2005	16	1884	HM		HC	N	J	L	O																																								11G	20.4	7									
5642	EPH	2005	16	1884	HM		HC	N	L	R	O																																								P											
5643	EPH	2005	16	1884	HM		HC	N	L	R	O																																														P					
5644	EPH	2005	16	1884	HM		HC	N	L	R	O																																														P					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
5645	EPH	2005	16	1884	HM		HC	N	L	R	O																																														9A	11.5	6.7			
5646	EPH	2005	16	1884	HM		HC	N	L	R	O																																														9A	12.2	7.7			
5647	EPH	2005	16	1884	HM		HC	N	L	R	O																																														11A	10.2	6.8			
5648	EPH	2005	16	1884	HM		HC	N	L		O								P																																											
5649	EPH	2005	16	1884	HM		HC	N	L	L	O																										P																									
5650	EPH	2005	16	1884	HM		HC	N	J	L	O																										P																									
5651	EPH	2005	16	1884	HM		HC	N	L		S				P																																															

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5652	EPH	2005	16	1884	HM		HC	X	J	R	S																P																																			
5653	EPH	2005	16	1884	HM		HC	X	J	L	S																																								a	25.9	16.8	13.1	8.4							
5654	EPH	2005	16	1884	HM		HC	N	J	L	S																											j	16.9	8.3	b		9.2	9.9																		
5655	EPH	2005	16	1884	HM		HC	N	J	R	S																											j		8.6	d		9.6	10																		
5656	EPH	2005	16	1884	HM		HC	X	L		S																																														P					
5657	EPH	2005	16	1884	HM		HC	X	L		S																																														P					
5658	EPH	2005	16	1884	HM		HC	N	L		S																																														U					

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5659	EPH	2005	17	1886	EM		HC	X	L	L	B																				P																															
5660	EPH	2005	17	1886	EM		HC	M	L		B																																														k	25.6	14.5			
5661	EPH	2005	17	1886	EM		HC	X	L		O																																														P					
5662	EPH	2005	17	1886	EM		HC	X	L	L	B																P																																			
5663	EPH	2005	17	1886	EM		HC	X	J	R	S																																			P	16.2	15	14.9													
5664	EPH	2005	17	1887	LM	370	FS<5	M	L		O								P																																											
5665	EPH	2005	17	1954	EM		HC	M	L		O																																														9A					

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd		dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5666	EPH	2005	17	1954	EM		HC	X	L	L	B																P																																			
5667	EPH	2005	17	1954	EM		HC	X	L		B																																														P					
5668	EPH	2005	17	1955	EM		HC	M	L	R	O																																								11G	21.9	8									
5669	EPH	2005	17	1955	EM		HC	M	J	R	S																																			E	18.9	12.6	13.5													
5670	EPH	2005	17	1956	EM		HC	M	L		S				P																																															
5671	EPH	2005	17	1956	EM		HC	M	L		S				P																																															
5672	EPH	2005	17	1956	EM		HC	M	L		S				P																																															

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
5673	EPH	2005	17	1956	EM		HC	N	L		S				P																																															
5674	EPH	2005	17	1956	EM		HC	N	J	L	S									M		P	P																																							
5675	EPH	2005	17	1956	EM		HC	X	L	L	O																				P																															
5676	EPH	2005	17	1956	EM		HC	N	J	L	O																P				9A										9A					9A					8A											
5677	EPH	2005	17	1957	EM		HC	N	J	L	B																P				f										l					g					g											MISSING SPACE FOR P2
5678	EPH	2005	18	903	EM		HC	X	L		O																																														P					
5679	EPH	2005	18	903	EM		HC	X	L		O																																														P					

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5680	EPH	2005	18	903	EM		HC	N	L	L	O																																								P	19.8	7.3									
5681	EPH	2005	18	903	EM		HC	N	J	R	S																										P	d		7.5																							
5682	EPH	2005	18	903	EM		HC	X	J	L	S												P				P				P	12.4	7.5	8.8																												
5683	EPH	2005	18	903	EM		HC	X	J	R	S																				P										P		13.4	13.2		P		16	14.9													
5684	EPH	2005	18	903	EM		HC	N	L	R	O																																														9A	14.1	6.9			
5685	EPH	2005	18	903	EM		HC	N	J	L	OVA																																								11G	19.4	7.3									
5686	EPH	2005	18	903	EM		HC	N	L	R	OVA																											16L	15.4	6.2																						

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ID	SITE	YEAR	BOX	CTX	ERA	CAT #	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5687	EPH	2005	18	940	EM		HC	N	J	L	OVA																									P	P	23L			9A					7A																
5688	EPH	2005	18	940	EM		HC	X	J	R	S																				P		12.2								P					P		16.1	15.2													
5689	EPH	2005	19	2839	EM		HC	X	J	R	B																				P										P					P																
5690	EPH	2005	19	2851	EM		HC	N	J	R	S									F		P	P				P				f																															
5691	EPH	2005	17	1887	LM	370	FS<5	N	J	L	APS				P																										P					P					P											2.9
5692	EPH	2005	17	1887	LM	370	FS<5	N	J	R	APS				P																										P					P																2.9
5693	EPH	2005	19	1966	EM		HC	N	J	R	O															P																																				

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5694	EPH	2005	19	1966	EM		HC	N	J	L	O																P				12S	10.7	6.9								9A					9A	14.8	8.6			9G	22.2	8.2									
5695	EPH	2005	19	1966	EM		HC	N	L		S																P																																			
5696	EPH	2005	20	1746	EM		HC	X	L		O																P																																			
5697	EPH	2005	21	2837	EM		HC	N	L		O																																														P					
5698	EPH	2005	21	2837	EM		HC	X	L		S																														P	13.4	11.8	11.8																		
5699	EPH	2005	21	2837	EM		HC	X	L		B																											P																								
5700	EPH	2005	21	2837	EM		HC	X	L		B																																														P					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH H Comments
																																																														STEEP "V" SHAPED WEAR
5701	EPH	2005	22	891	EM		HC	X	L	L	B																																														P					
5702	EPH	2005	22	891	EM		HC	X	L	R	B																																														P					
5703	EPH	2005	22	891	EM		HC	X	L	L	O																																														P					
5704	EPH	2005	22	891	EM		HC	X	L	R	O																																														P					
5705	EPH	2005	22	891	EM		HC	M	L	L	O																																														9A	11	6.6			
5706	EPH	2005	22	891	EM		HC	M	L	L	O																																													9A	13	7.8			
5	E	2	2	8	E		H	M	J	R	O												P				P				9																															

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
707	PH	005	2	91	M		C				VA																				A																															
5708	EPH	2005	22	891	EM		HC	N	L		OVA																																														6A					
5709	EPH	2005	22	891	EM		HC	N	L	L	OVA																																								11G	21	8									
5710	EPH	2005	22	891	EM		HC	N	L	R	OVA																																								8G	21.3	8									
5711	EPH	2005	22	891	EM		HC	X	L		S				P																																															
5712	EPH	2005	22	891	EM		HC	X	L		S				P																																															
5713	EPH	2005	22	891	EM		HC	X	L		S				P																																															

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5714	EPH	2005	22	891	EM		HC	X	L		S									M																																										
5715	EPH	2005	22	891	EM		HC	X	J	R	S												P				P				P																															
5716	EPH	2005	22	891	EM		HC	X	J	L	S																P																																			
5717	EPH	2005	22	891	EM		HC	X	J	L	S																				P		12.4								P		12.3	11.9		P		14.5	14													
5718	EPH	2005	22	891	EM		HC	M	J	R	S																																														a					
5719	EPH	2005	22	891	EM		HC	M	J	R	S									M							P				b		7.7	8.7							g		11	11.2																		
5720	EPH	2005	23	3804	HM		HC	M	L		B																																														g	22.6	13.9			

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
5721	EPH	2005	23	3804	HM		HC	N	L		O																																														P	15	7.4			
5722	EPH	2005	23	3804	HM		HC	X	L	L	O																																														P					
5723	EPH	2005	23	3804	HM		HC	X	L	L	O																																														P					
5724	EPH	2005	23	3804	HM		HC	N	L	L	S									N																																										
5725	EPH	2005	23	3804	HM		HC	X	J	R	S												P				P				P		12.1								P		13.2	12.9		P		15.9	15.5	P	P	28.7	17.1	15	8.7							
5726	EPH	2005	25	720	EM		HC	X	L	L	O																																														P					
5727	EPH	2005	25	720	EM		HC	X	L	R	O																																														P					

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5728	EPH	2005	25	720	EM		HC	X	L	R	O																																														P					
5729	EPH	2005	25	720	EM		HC	X	L	R	B																																														P					
5730	EPH	2005	25	720	EM		HC	X	L	R	B																																														P					
5731	EPH	2005	25	720	EM		HC	X	L	L	B																P																																			
5732	EPH	2005	25	720	EM		HC	X	L	L	B																P																																			
5733	EPH	2005	25	720	EM		HC	N	L		EQ				P																																															
5734	EPH	2005	25	720	EM		HC	N	L	R	B																																														g	24.8				

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5735	EPH	2005	25	720	EM		HC	N	L		B																																														d	21.7	14.4			
5736	EPH	2005	25	720	EM		HC	N	L	R	B																																														I	20.5	14.3			CALCULUS
5737	EPH	2005	25	720	EM		HC	N	L		B																				E																															
5738	EPH	2005	25	720	EM		HC	N	L	R	S									M																																										
5739	EPH	2005	25	720	EM		HC	N	L	R	S									M																																										
5740	EPH	2005	25	720	EM		HC	N	L	L	S									F																																										
5741	EPH	2005	25	720	EM		HC	N	J	R	S									F																										j		12.5	13.1		C		14	13.4	11.5							

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5742	EPH	2005	25	720	EM		HC	N	L		S				F																																															
5743	EPH	2005	25	720	EM		HC	X	L		S				F																																															
5744	EPH	2005	25	720	EM		HC	X	L		S				F																																															
5745	EPH	2005	25	720	EM		HC	X	L	L	S									M																																										
5746	EPH	2005	25	720	EM		HC	N	L		S																P																																			
5747	EPH	2005	25	720	EM		HC	N	L		S												P																																							
5748	EPH	2005	25	720	EM		HC	N	J		S																				P																															

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5749	EPH	2005	25	720	EM		HC	N	L		S																										P																									
5750	EPH	2005	25	720	EM		HC	X	J		S												P				P														P	11.8	11	10.3																		
5751	EPH	2005	26	2890	EM		HC	N	L	L	S									F																																										
5752	EPH	2005	26	2914	EM		HC	N	J	L	S									F																																										
5753	EPH	2005	26	2914	EM		HC	N	J	R	S	F	F							F																																										
5754	EPH	2005	26	2914	EM		HC	N	J	R	OVA																									P	P	14L			9A					3C					E											
5755	EPH	2005	26	3612	EM		HC	X	J	R	O																														P					P					P											

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5756	EPH	2005	26	3612	EM		HC	N	J	R	OVA																									P	P	14L			E																					
5757	EPH	2005	27	1616	EM		HC	X	L		S				P																																															
5758	EPH	2005	27	1616	EM		HC	N	L		O																																														P					
5759	EPH	2005	27	1616	EM		HC	N	L		S				P																																															
5760	EPH	2005	27	1616	EM		HC	N	L		S				P																																															
5761	EPH	2005	27	1616	EM		HC	N	L		B																																														k	24.1	14.9			CALCULUS
5762	EPH	2005	27	1696	EM		HC	N	L		S				P																																															

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH H Comments
5763	EPH	2005	27	1696	EM		HC	X	L	R	B																																														P					
5764	EPH	2005	27	1696	EM		HC	N	L		O																																														7A	16.2	8.5			
5765	EPH	2005	28	5613	EM		HC	N	L		B																																														E	28.5	14			
5766	EPH	2005	29	1588	EM		HC	X	L		B																																														P					
5767	EPH	2005	29	1762	EM	365	FS<5	X	J	L	S																									P	P	11.7	7.6																						
5768	EPH	2005	29	1762	EM	365	FS<5	X	L	R	S																											10.9	7.7																						
5769	EPH	2005	29	1762	EM	365	FS<5	N	L	R	CAF											P																																								

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5770	EPH	2005	29	1590	EM		HC	X	J	R	OVA																P														P																					
5771	EPH	2005	29	1590	EM		HC	N	J	L	OVA																																			9A	13.5	6.8			6A											
5772	EPH	2005	29	1743	EM		HC	X	L	R	EQ				P																																															
5773	EPH	2005	30	2852	EM		HC	N	L	R	B																																								P											CALCULUS
5774	EPH	2005	30	2852	EM		HC	N	J	L	B											P																																								
5775	EPH	2005	30	2852	EM		HC	N	L	R	S									F																																										
5776	EPH	2005	32	1615	EM		HC	N	J	R	OVA																														9A					9A					5G											

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
5777	EPH	2005	35	4514	EM		HC	N	J	L	S																																								E											
5778	EPH	2005	35	779	EM		HC	X	L		O																																														P					
5779	EPH	2005	36	2964	EM	3300	FS<5	N	J	L	OVA												P				P				12S										12A					9A					11G											
5780	EPH	2005	37	5606	EM		HC	N	J	L	OVA																									P	P	14L	18.1	6.2	1B																					
5781	EPH	2005	37	5606	EM		HC	N	J	L	O																																								10G											CALCULUS
5782	EPH	2005	37	5606	EM		HC	N	L		S				F																																															
578	EPH	200	37	560	EM		HC	N	J	L	S									F							P																																			

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
3		5		6																																																										
5784	EPH	2005	37	5606	EM		HC	M	J	R	S												P				P																																			
5785	EPH	2005	37	5606	EM		HC	M	L		S																																														E	16.8	11	11.4		
5786	EPH	2005	37	5606	EM		HC	X	L	L	B																																														P					CALCULUS
5787	EPH	2005	37	5606	EM		HC	X	L	L	B																																														P					CALCULUS
5788	EPH	2005	37	5606	EM		HC	X	L	R	B																																														P					CALCULUS
5789	EPH	2005	37	5606	EM		HC	X	L	R	B																																														P					CALCULUS
57	EP	20	37	56	EM		HC	M	L		B																																														k	23	15.5			

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
90	H	05		06																																																						.5				CALCULUS
5791	EPH	2005	37	5606	EM		HC	N	L		B																																															k	23.5	12.9			CALCULUS
5792	EPH	2005	37	5606	EM		HC	X	J	R	CAF																				P	17	8.1	5.5							P					P																19
5793	EPH	2005	37	5606	EM		HC	N	J	L	CAF																P				P	11.2	5								P	21.4	7															31.5				18.7
5794	EPH	2005	37	5606	EM		HC	N	J	R	CAF																														P	21	7.2			P					P											35.5
5795	EPH	2005	37	5606	EM		HC	N	L		S												P																																							
5796	EPH	2005	37	5606	EM		HC	N	L		S																				P																															
5797	EPH	2005	37	5606	EM		HC	N	L		CAF																																			P																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5798	EPH	2005	40	780	EM		HC	N	J	L	OVA																									P	P	16L	15.9	6.5	8A					6A																
5799	EPH	2005	40	780	EM		HC	N	J	L	OVA																									P	P	19L	14.6	6.1	9A					6A																
5800	EPH	2005	40	780	EM		HC	X	J	L	S																				P										P					P					P											
5801	EPH	2005	40	780	EM		HC	N	J	L	S																																								E											
5802	EPH	2005	40	780	EM		HC	N	J	L	S															P				d		8.6								l		10.1			f																
5803	EPH	2005	40	780	EM		HC	N	J	R	S																														g					E		12.6	12.9		a											
580	EPH	200	40	795	EM		HC	N	J	L	B																														k	19.	13.1			P																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT #	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
4		5																																								8																				
5805	EPH	2005	38	1878	LM		HC	N	J	L	B																										P	f			a																					
5806	EPH	2005	38	1878	LM		HC	X	J	L	S																				P										P			13.7		P		17.5	16.4													
5807	EPH	2005	41	1898	LM		HC	X	J	R	B																																			P																
5808	EPH	2005	41	1898	LM		FS<5	N	L		O				P																																															
5809	EPH	2005	41	1898	LM		FS<5	N	L		O				P																																															
5810	EPH	2005	41	1898	LM		FS<5	N	L		O								P																																											
58	EP	20	41	18	LM		FS	X	L		S				P																																															

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
11	H	05		98			<5																																																							
5812	EPH	2005	41	1898	LM		FS<5	X	L		S									F																																										
5813	EPH	2005	42	1898	LM		HC	X	J	L	S																P				P																															SK22
5814	EPH	2005	42	1898	LM		HC	X	J	L	O												P				P				P										P					P																
5815	EPH	2005	42	1898	LM		HC	N	L		B				P																																															
5816	EPH	2005	42	1898	LM		HC	N	J	L	B																									P	P	k	27	12.2																						
5817	EPH	2005	42	1898	LM		HC	N	J	R	OVA																P				P										9A					8A					5B	21.2	7.7									P4 SECOND CUSP

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
																																																														MISSING DUE TO WEAR AGAINST M1; NO SUB-PREMOLAR FORAMEN
5818	EPH	2005	45	2745	EM		HC	X	J	L	S																				P										P		13.5			P		15.3	14.9		P		16.3									
5819	EPH	2005	45	2745	EM		HC	X	J	R	B																				P										P					P					P											CALCULUS
5820	EPH	2005	45	2745	EM		HC	X	J	L	B																																								P											CALCULUS
5821	EPH	2005	45	2745	EM		HC	X	J	L	B																																														P					CALCULUS
5822	EPH	2005	45	2745	EM		HC	X	J	L	B																																														P					CALCULUS
5823	EPH	2005	45	2745	EM		HC	X	L	L	S																P																																			

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
5824	EPH	2005	45	2745	EM		HC	X	J	R	B																														P					P					P											
5825	EPH	2005	45	2745	EM		HC	X	L	R	B																P																																			
5826	EPH	2005	45	2745	EM		HC	N	L	L	S									F																																										
5827	EPH	2005	45	2745	EM		HC	X	L	R	EQ																																																			P 58.6
5828	EPH	2005	45	2745	EM		HC	N	J	L	CAH																P				9A										12A	10.4	6.6																			
5829	EPH	2005	45	2745	EM		HC	N	L	L	S																																								a	25.3	13	12.2	9.2							
5830	EPH	2005	45	2745	EM		HC	X	J	R	B																				P																				P											

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5831	EPH	2005	45	2745	EM		HC	N	J	L	B																														g	22.5	16																			CALCULUS
5832	EPH	2005	49	6653	EMOD		HC	X	J	L	CAF									F											P	17.1	8.3	7.5							P					P												18.8				
5833	EPH	2005	49	6653	EMOD		HC	X	J	R	CAF			F						F											P	16.9	8	6.5							P					P												18.9				
5834	EPH	2005	49	6653	EMOD		HC	X	J	R	CAF	F											P																																							
5835	EPH	2005	49	6653	EMOD		HC	X	J	L	CAF	F											P								P	17.7	7.1	6.8																								19				NO P3 SOCKET
5836	EPH	2005	49	6653	EMOD		HC	X	J	L	CAF									F											P	13.9	6.1	5.6																												
5837	EPH	2005	49	6653	EMOD		HC	X	J	R	CAF																				P	13.5	5.9	5.6																												

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
5838	EPH	2005	49	6653	EMOD		HC	M	L	L	CAF									P																																										
5839	EPH	2005	49	6653	EMOD		HC	M	L	R	CAF									P																																										
5840	EPH	2005	49	6653	EMOD		HC	M	L		CAF																P																																			
5841	EPH	2005	49	6653	EMOD		HC	M	J	L	CAF																										P																									13.6
5842	EPH	2005	49	6653	EMOD		HC	M	J	L	CAF										P																																									14
5843	EPH	2005	49	6653	EMOD		HC	M	J	R	CAF										P																									P															13.9
5844	EPH	2005	49	6653	EMOD		HC	M	J	L	CAF			P						P		P	P				P				P	10.4	4.9								P	21.3	8.5			P																40.6 19.8

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
																																																														P4-M1=32.6
5845	EPH	2005	49	6653	EMOD		HC	N	J	L	CAF												P				P				P	10.5	5								P	20.7	8.6			P																40.6 19.7 P4-M1=32.5
5846	EPH	2005	49	6653	EMOD		HC	N	J	R	S																									P	P	c	8.6		E																					
5847	EPH	2005	51	6653	EMOD		HC	N	J	L	EQ		CI	CI																																																
5848	EPH	2005	52	8692	MR		HC	N	J	R	S																										P	c	17.6	7.8																						
5849	EPH	2005	52	8691	MR		HC	N	J	L	O																										P	10L																								
5850	EPH	2005	52	8691	MR		HC	N	J	L	OVA																											22M			9A					8A					C											
5851	EPH	2005	54	2703	HM		HC	N	L	L	B																																														g	19.5	13.2			

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5852	EPH	2005	54	2703	HM		HC	N	J	R	S																																			c	19.6	13.4	13.7		E											
5853	EPH	2005	54	2703	HM		HC	N	J	L	OVA																P				8B										9A					9A																
5854	EPH	2005	55	2745	EM		HC	N	L	R	O																																														9A	12.4	6.4			
5855	EPH	2005	55	2745	EM	2317	FS<5	N	L	L	S									N																																										TWO PIECES
5856	EPH	2005	55	2745	EM	2317	FS<5	N	L		O				P																																															
5857	EPH	2005	55	2745	EM	2317	FS<5	N	L		O												P																																							
5858	EPH	2005	55	2745	EM	2317	FS<5	N	L		S																																			E																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5859	EPH	2005	55	2745	EM	2317	FS<5	N	L		S																																								E											
5860	EPH	2005	58	2548	LM		HC	N	L	R	B																																														k	23.7	14.5			CALCULUS
5861	EPH	2005	58	2548	LM		HC	X	J	L	O												P				P				P										P					P					P											
5862	EPH	2005	58	2548	LM		HC	X	J	R	O																										P	P			P					P																
5863	EPH	2005	58	2548	LM		HC	N	J	L	OVA																									P	P	23L			9A					7A					C											
5864	EPH	2005	58	2548	LM		HC	N	J	R	OVA																									P	P	23L			9A					8A																
5865	EPH	2005	58	2548	LM		HC	N	L	R	O																																								C											

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5866	EPH	2005	58	2548	LM		HC	X	L		FEC										F																																										
5867	EPH	2005	59	2639	HM		HC	N	L	L	B																				d																															CALCULUS
5868	EPH	2005	59	2639	HM		HC	X	L	L	B																																														P					
5869	EPH	2005	59	2639	HM		HC	X	L	R	B																																														P					
5870	EPH	2005	59	2639	HM		HC	X	L		B																																														P					
5871	EPH	2005	59	2639	HM		HC	N	J	R	O																P				9A										10A	10.4	6.6																			
587	EPH	200	62	579	MR		HC	X	J	R	CAF		F	F						F			P																																							

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ID	**SITE**	**YEAR**	**BOX**	**CTX**	**ERA**	**CAT#**	**COL**	**EL**	**LJ**	**SIDE**	**TAX**	**I1**	**I2**	**I3**	**I**	**dI1**	**dI2**	**dI3**	**dI/dC**	**C**	**dC**	**P1**	**P2**	**P2L1**	**P2Wa**	**P2Wd**	**P3**	**P3L1**	**P3Wa**	**P3Wd**	**P4**	**P4L**	**P4Wa**	**P4Wd**	**P**	**dP2**	**dP3**	**dP4**	**dP4L**	**dP4WP**	**M1**	**M1L**	**M1WA**	**M1WP**	**M1hyp**	**M2**	**M2L**	**M2WA**	**M2WP**	**M2hyp**	**M3**	**M3L**	**M3WA**	**M3WC**	**M3WP**	**M3hyp**	**M12**	**M12L**	**M12WA**	**M12WP**	**M12hyp**	**M**P/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
2		5		5																																																									
5873	EPH	2005	62	5795	MR		HC	N	L	L	O																									P																										
5874	EPH	2005	68	6635	EMOD		HC	N	J	L	EQ	CI	CI	CI									P				P				P										P					P					P											
5875	EPH	2005	68	6635	EMOD		HC	N	J	R	EQ	CI	CI	CI																																																J10
5876	EPH	2005	68	6635	EMOD		HC	N	L	L	S																																								E	34.9	17.4	16.2	12.5							
5877	EPH	2005	68	6635	EMOD		HC	N	J	R	S																P	10.1	6.9		a	12	7.9	9.2												a	20.1	14.5	14.6	P	E											
5878	EPH	2005	68	6635	EMOD		HC	N	J	L	OVA																P				9A										11A					9A																
587	EPH	200	66	669	ER		HC	N	L	R	CAF			F																																																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT #	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
9		5		7																																																										
5880	EPH	2005	66	6697	ER		HC	N	J	R	OVA																P				9A										9A					9A					9G											
5881	EPH	2005	69	2946	MR		HC	N	L	L	B																														I	23.3	15.4																			CALCULUS
5882	EPH	2005	69	2946	MR		HC	N	L	L	B																																			I	24.7	17.4														CALCULUS
5883	EPH	2005	69	2946	MR		HC	N	L	L	B																																								g	37.3	17.3									CALCULUS
5884	EPH	2005	69	2964	MR		HC	N	L	R	EQ																																								P	32.8	14.4									52.8
5885	EPH	2005	69	2964	MR		HC	N	J	L	OVA																P				15A	7.3	5								15A	9.3	5.9			9A					11A											
588	EPH	200	74	493	MR		HC	N	L	L	S									N																																										

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6		5		2																																																									
5887	EPH	2005	74	4932	MR		HC	N	J	L	S																										P	e		8.8	a																					
5888	EPH	2005	74	4879	MR		HC	N	L	L	O																																								U	21.1	6.9									
5889	EPH	2005	74	4879	MR		HC	N	L	L	O																																														P					
5890	EPH	2005	78	1960	LM	1329	FS<5	X	L	L	B																P																																			
5891	EPH	2005	79	7662	ER		HC	X	L	R	B																																								P											
5892	EPH	2005	79	7662	ER		HC	N	L	L	EQ												P																																							42.7
589	EPH	200	79	766	ER		HC	N	L	L	EQ																P																																			

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
3		5		2																																																									54.8
5894	EPH	2005	79	7662	ER		HC	N	L	L	EQ																				P																															
5895	EPH	2005	79	7662	ER		HC	N	L	L	EQ																														P																				60.4
5896	EPH	2005	79	7662	ER		HC	N	L	L	EQ																																			P															63.6
5897	EPH	2005	79	7662	ER		HC	N	L	L	EQ																																								P											64
5898	EPH	2005	80	6653	EMOD		HC	N	J	L	EQ												P				P				P										P					P					P											
5899	EPH	2005	80	6653	EMOD		HC	N	J	R	EQ												P				P				P										P					P					P											
5900	EPH	2005	81	6653	EMOD		HC	X	J	L	EQ												P				P				P										P					P					P											

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
5901	EPH	2005	81	6653	EMOD		HC	X	J	R	EQ												P				P				P										P					P					P											
5902	EPH	2005	85	2783	HM		HC	N	J	L	OVA												P				P				8B										9A					9A					3C											
5903	EPH	2005	85	2783	HM		HC	N	J	R	OVA																P				9A										9A					9A					7A											
5904	EPH	2005	85	2783	HM		HC	N	J	L	B																				g										l					l					g											CALCULUS
5905	EPH	2005	85	2783	HM		HC	X	J	L	O												P				P				P										P					P					P											
5906	EPH	2005	85	2783	HM	2334	FS<5	X	L	R	O																																														P					
5907	EPH	2005	85	2783	HM	2334	FS<5	N	L		B																																														P					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
																																																														CALCULUS
5908	EPH	2005	85	2783	HM	2334	FS<5	M	L	R	O																				9A	8.8	5.5																													
5910	EPH	2005	85	2784	HM		HC	M	L	R	B																																								U	33.3										
5911	EPH	2005	85	2784	HM		HC	M	L		B												P																																							
5912	EPH	2005	86	683	LM	353	FS<5	X	L	R	B																																														P					CALCULUS
5913	EPH	2005	86	683	LM	353	FS<5	M	L	R	O																																														1A	17.2	8.1			
5914	EPH	2005	86	683	LM	353	FS<5	X	L		O																																														P					
5915	EPH	2005	86	683	LM	353	FS<5	X	L	R	S			F																																																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5916	EPH	2005	93	3806	HM		HC	X	L		O																																														P					
5917	EPH	2005	93	3806	HM		HC	N	J	L	O																P				10A										10A					9A					9G											
5918	EPH	2005	94	967	LM		HC	X	J	L	O																P				P										P					P					P											
5919	EPH	2005	94	968	LM		HC	N	L	L	B																																														g	24.2	13.3			CALCULUS
5920	EPH	2005	94	968	LM		HC	N	J	R	OVA																									P	P	16L			8A																					
5921	EPH	2005	94	968	LM		HC	N	J	L	OVA																P				8B										9A					9A																
592	EPH	200	94	968	LM		HC	N	J	L	OVA																P				12S	7.5	5.7								12A	10.	6.6			9A																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
2		5																																								4																				CALCULUS
5923	EPH	2005	94	968	LM		HC	N	L		B				P																																															BURNT
5924	EPH	2005	94	968	LM		HC	X	J	R	S																				P										P					P																
5925	EPH	2005	94	968	LM		HC	N	J	R	OVA																P				12S										14A					9A																
5926	EPH	2005	95	3530	LM		HC	X	J	L	B																																			P					P											
5927	EPH	2005	95	3530	LM		HC	X	J	R	B																																			P					P											
5928	EPH	2005	95	3530	LM		HC	X	J	R	CAF																P				P	15.4	8.1	6.2																												
59	EP	20	95	35	LM		HC	X	L	R	B																																								P											

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
29	H	05		26																																																										
5930	EPH	2005	95	3530	LM		HC	X	L		O																																														P					
5931	EPH	2005	95	3530	LM		HC	X	L	R	S									N																																										
5932	EPH	2005	95	3530	LM		HC	N	L		S																																														e	14.6	9.9			
5933	EPH	2005	95	3530	LM		HC	X	L	R	CAF																														P																					
5934	EPH	2005	95	3530	LM		HC	N	L	L	O																																														9A	11.8	6.9			
5935	EPH	2005	95	3530	LM		HC	N	L	L	O																																														9A	14	7.5			
5	E	2	9	3	L		H	N	L	L	O																																								5	1	7.									

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
936	PH	005	5	530	M		C																																												A	9.2	9									
5937	EPH	2005	95	3527	LM		HC	M	L		B												P																																							
5938	EPH	2005	95	3527	LM		HC	M	L	R	B																P																																			
5939	EPH	2005	95	3527	LM		HC	M	L	R	B																P																																			
5940	EPH	2005	95	3527	LM		HC	X	L	R	B																														P																					CALCULUS
5941	EPH	2005	95	3527	LM		HC	X	L	R	B																																			P																CALCULUS
5942	EPH	2005	95	3527	LM		HC	X	L	R	B																																									P											CALCULUS

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5943	EPH	2005	95	3527	LM		HC	X	L	R	B																																			P																CALCULUS
5944	EPH	2005	95	3527	LM		HC	N	L	L	B																																														o					CALCULUS
5945	EPH	2005	95	3527	LM		HC	X	J	R	O																																			P					P											CALCULUS
5946	EPH	2005	95	3527	LM		HC	N	J	R	O																P				9A	8.8	5.7																														CALCULUS
5947	EPH	2005	95	3527	LM		HC	N	L	R	O																																								6A	19.2	7.7										CALCULUS
5948	EPH	2005	95	3527	LM		HC	X	J	L	S																																														P					CALCULUS
5949	EPH	2005	95	3527	LM		HC	X	L	R	S			P																																															CALC

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
																																																														ULUS
5950	EPH	2005	95	3527	LM		HC	X	J	L	B																																														P					
5951	EPH	2005	112	5870	MR		HC	M	L	L	EQ												P																																							38.6
5952	EPH	2005	112	5870	MR		HC	M	L	L	EQ																P																																			52.9
5953	EPH	2005	112	5870	MR		HC	M	L	L	EQ																				P																															65.4
5954	EPH	2005	112	5870	MR		HC	M	L	L	EQ																														P																					51.1
5955	EPH	2005	112	5870	MR		HC	M	L	L	EQ																																			P																58.7
5956	EPH	2005	112	5870	MR		HC	M	L	L	EQ																																								P											59
5957	EPH	2005	114	1878	LM		HC	X	J	R	B																														P					P					P											

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5958	EPH	2005	114	1878	LM		HC	X	L		O																																														P					
5959	EPH	2005	114	1878	LM		HC	N	L	L	S									N																																										
5960	EPH	2005	117	4956	HM		HC	N	J	L	O																									P	P	6A																								
5961	EPH	2005	117	4956	HM		HC	N	J	R	S																				c		7.8	8.6							h		10.1	10.8		e		13.1	13.4		a											
5962	EPH	2005	117	4956	HM		HC	N	L	L	O																																								6A											
5963	EPH	2005	117	4956	HM		HC	N	L	R	O																																								2A	20.3	8.3									
596	EPH	200	117	495	HM		HC	N	L	L	B																																								g	28.	13.8									

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
4		5		6																																																6											CALCULUS
5965	EPH	2005	117	4956	HM		HC	X	L	R	B																																														P					
5966	EPH	2005	117	4956	HM		HC	N	J	L	B											P				P																																			
5967	EPH	2005	117	4956	HM		HC	X	J	L	B																																														P					
5968	EPH	2005	117	4956	HM		HC	X	L	L	B																																														P					CALCULUS
5969	EPH	2005	117	4956	HM		HC	N	J	R	O															P																																			
5970	EPH	2005	118	688	LM		HC	N	L		O				P																																															
59	EP	20	11	69	LM		HC	X	J	L	FE																			P	5.	2	2.7							P	8.	4.5	3.9																		

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
71	H	05	8	0							C																					4										9																				
5973	EPH	2005	118	688	LM		HC	M	L		S				P																																															
5974	EPH	2005	118	688	LM		HC	M	L		S				P					M																																										
5975	EPH	2005	118	688	LM		HC	M	J	R	S																P				b	12	7.3	7.6																												
5976	EPH	2005	118	688	LM		HC	M	L	L	B																				P																															CALCULUS
5977	EPH	2005	118	688	LM		HC	M	L	L	B																				P																															CALCULUS
5978	EPH	2005	118	688	LM		HC	M	L	R	B																P																																	CALCULUS
5	E	2	1	6	L		H	M	L		B				P																																															

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3LH BUTCH Comments
979	PH	005	18	88	M		C																																																							
5980	EPH	2005	118	688	LM		HC	M	L		B																E																																			
5981	EPH	2005	118	688	LM		HC	M	L		B																E																																			
5982	EPH	2005	118	688	LM		HC	X	L	R	B																																														P					
5983	EPH	2005	118	688	LM		HC	X	L	R	O																																														P					
5984	EPH	2005	118	691	LM		HC	M	L		B				P																																															
5985	EPH	2005	118	691	LM		HC	X	L	R	B																																														P					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5986	EPH	2005	118	691	LM		HC	N	L	R	O																																								P											
5987	EPH	2005	118	685	LM		HC	N	L		S				P																																															ROMAN RESIDUAL?
5988	EPH	2005	118	685	LM		HC	N	L		S				P																																															ROMAN RESIDUAL?
5989	EPH	2005	118	685	LM		HC	X	L		B																																														P					
5990	EPH	2005	118	685	LM		HC	X	L	R	O																																														P					
5991	EPH	2005	118	685	LM		HC	X	L	L	O																																														P					
5992	EPH	2005	118	683	LM		HC	N	L		O				P																																															

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5993	EPH	2005	119	970	LM		HC	N	J	R	OVA																				9A										9A					9A					8G											
5994	EPH	2005	119	970	LM		HC	N	L		S				P																																															
5995	EPH	2005	119	970	LM		HC	N	J	L	B																P																																			
5996	EPH	2005	119	970	LM		HC	N	J	L	O																				14S										13B																					
5997	EPH	2005	119	970	LM		HC	N	L	L	O																																			12A	10.8	7.6														
5998	EPH	2005	119	970	LM		HC	N	L	L	O																																								11G	20.2	6.9									
5999	EPH	2005	119	970	LM		HC	N	L	L	O																																								11G	919	6.9			P						

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3LH BUTCH Comments
6000	EPH	2005	120	856	LM		HC	X	L	L	B																P																																			
6001	EPH	2005	120	856	LM		HC	N	L		EQ				P																																															
6002	EPH	2005	120	856	LM		HC	N	L		O				P																																															
6003	EPH	2005	120	855	LM		HC	N	J	L	S	P	P							M			P				P				P																															
6004	EPH	2005	120	855	LM		HC	N	L		S				P																																															
6005	EPH	2005	120	855	LM		HC	N	L		S				P																																															
600	EPH	200	120	855	LM		HC	N	L		S									M																																										

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6		5																																																												
6007	EPH	2005	120	855	LM		HC	N	L		B				P																																															
6008	EPH	2005	120	855	LM		HC	N	L	R	B																																								P		15									
6009	EPH	2005	120	855	LM		HC	N	L	R	B																																								f	33.5	14.3									CALCULUS
6010	EPH	2005	120	855	LM		HC	X	L		B																P																																			
6011	EPH	2005	120	855	LM		HC	X	L		B																																														P					CALCULUS
6012	EPH	2005	120	855	LM		HC	X	L	L	O																																														P					
60	EP	20	12	85	LM		HC	X	L	L	O																																														P					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
13	H	05	0	5																																																										
6014	EPH	2005	120	855	LM		HC	X	L	R	O																																														P					
6015	EPH	2005	120	855	LM		HC	X	L	R	O																																								P											
6016	EPH	2005	120	855	LM		HC	N	L	L	O																																														15A	9.3	6.7			CALCULUS
6017	EPH	2005	120	855	LM		HC	N	J	R	O																P				2A										9A	12.9	7																			
6018	EPH	2005	120	855	LM		HC	N	L	R	O																																														P					
6019	EPH	2005	120	855	LM		HC	X	L		B																																														P					
6	E	2	1	1	H	3	F	N	L		S				P																																															

teeth																																																													
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
020	PH	005	21	877	M	76	S<5																																																							
6021	EPH	2005	121	1877	HM	376	FS<5	M	L	R	O																																														9A	13.7	6.9			CALCULUS
6022	EPH	2005	121	1877	HM	376	FS<5	X	L		B																																														P					
6023	EPH	2005	121	1877	HM		HC	X	L		B																																														P					CALCULUS
6024	EPH	2005	121	1877	HM		HC	M	L		S				P																																															
6025	EPH	2005	121	1877	HM		HC	M	L		S				P																																															
6026	EPH	2005	121	1877	HM		HC	M	L		O																																							11G	20.3	7									

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6027	EPH	2005	121	1877	HM		HC	N	J	R	OVA																														15A					11A	11.6	7															
6028	EPH	2005	121	1877	HM		HC	N	J	R	OVA																				12S										15A					9A					8G												
6029	EPH	2005	121	1877	HM		HC	N	J	L	OVA																																			9A					11G												
6030	EPH	2005	121	1877	HM		HC	N	J	L	OVA												P				P				12S										15A					9A					11G												
6031	EPH	2005	121	1877	HM		HC	X	L		S				P																																															
6032	EPH	2005	121	1877	HM		HC	X	L		S				P																																															
6033	EPH	2005	121	1874	HM		HC	X	L		B																																														P					CALC

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
																																																														ULUS
6034	EPH	2005	121	1874	HM		HC	N	L		B																																														k	23.5	15			CALCULUS
6035	EPH	2005	121	1874	HM		HC	N	L	R	O																																														P					BURNT
6036	EPH	2005	121	1877	HM	376	FS<5	N	L		O				P																																															
6037	EPH	2005	121	1877	HM	376	FS<5	N	L		O				P																																															
6038	EPH	2005	121	1877	HM	376	FS<5	N	L		O				P																																															
6039	EPH	2005	121	1877	HM	376	FS<5	N	L	R	O												P																																							
6040	EPH	2005	124	7681	ER		HC	X	L	R	O																																														P					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6041	EPH	2005	124	7681	ER		HC	X	L	R	O																																														P					
6042	EPH	2005	124	5723	ER		HC	N	L	R	B																				d	19.8	10.8																													CALCULUS
6043	EPH	2005	124	5723	ER		HC	N	L	R	B																																														k		13.1			CALCULUS
6044	EPH	2005	124	5723	ER		HC	N	J	R	B																																			k	23.3	13.5			g											CALCULUS
6045	EPH	2005	125	4537	MR		HC	X	L		CAF																P																																			
6046	EPH	2005	125	4537	MR		HC	X	L		CAF									F																																										
6047	EPH	2005	125	4537	MR		HC	X	J		CAF																				P	16.9	10.1	7							P																					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6048	EPH	2005	125	4537	MR		HC	X	L		O																				P																															
6049	EPH	2005	125	4537	MR		HC	M	L	R	B																																								f	28.1	14.2									CONGENITALLY ABSENT THIRD CUSP
6050	EPH	2005	125	4537	MR		HC	M	J	R	S																P				f	11.9	7																													
6051	EPH	2005	125	4537	MR		HC	M	J	L	S																																			a																
6052	EPH	2005	125	4537	MR		HC	M	J	R	B																																			g	24.5	14														CALCULUS
6053	EPH	2005	125	4537	MR		HC	X	L	R	S									F																																										
6	E	2	1	4	M		HC	M	J	R	O																				6										9					9					7											

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
054	PH	005	25	537	R		C																								A										A					A					G											
6055	EPH	2005	125	4537	MR		HC	N	J	R	B																P				f										k					k					g											
6056	EPH	2005	125	4537	MR		HC	N	J	R	CAF												P				P														P	20.3	8.8			P																18.9
6057	EPH	2005	125	4537	MR		HC	X	J	L	CAF																				P	16.6	10	7.8																												
6058	EPH	2005	125	4537	MR		HC	X	L	L	O																																														P					
6059	EPH	2005	125	4537	MR		HC	X	L	L	O																																								P											
6060	EPH	2005	125	4537	MR		HC	X	L	L	O																																														P					
6	E	2	1	4	M		H	X	L	L	C									F																																										

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
061	PH	005	25	537	R		C				AF																																																			
6062	EPH	2005	125	4537	MR		HC	N	J	R	B																				f										n					l					j											CALCULUS
6063	EPH	2005	125	4537	MR		HC	N	L	L	S												P																																							
6064	EPH	2005	157	3523	M		HC	N	J	L	EQ												P				P				P										P					P																P4 H = 25.7; P2 H = 3.6
6065	EPH	2005	157	3523	M		HC	N	J	L	EQ												P				P				P										P					P																P2 H = 24
6066	EPH	2005	157	3523	M		HC	N	J	L	EQ									F																																										
6067	EPH	2005	157	3523	M		HC	N	J	R	EQ									F																																										

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6068	EPH	2005	158	2950	EM		HC	N	L	R	S									F																																										
6069	EPH	2005	158	2950	EM		HC	N	J	R	S																P				a		7.3	7.8							g		9.9	8.1		a	15.5	11.7	12													
6070	EPH	2005	158	2950	EM		HC	N	L	R	B																											j	27.6																							
6071	EPH	2005	158	2950	EM		HC	X	J	L	O												P				P				P										P					P					P											CALCULUS
6072	EPH	2005	159	782	LM		HC	X	L	L	LRO	F																																																		
6073	EPH	2005	159	782	LM		HC	N	L		B								P																																											
6074	EPH	2005	159	782	LM		HC	N	L		S								P																																											

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6075	EPH	2005	159	782	LM		HC	N	L		S				P																																															
6076	EPH	2005	159	782	LM		HC	N	L	L	O																																													P					
6077	EPH	2005	159	782	LM		HC	N	L	L	O																																													P					CALCULUS
6078	EPH	2005	159	782	LM		HC	N	L	L	O																																							P											CALCULUS
6079	EPH	2005	159	782	LM		HC	N	L		S												P																																							
6080	EPH	2005	159	783	LM		HC	X	L	R	B																P																																			CALCULUS
6081	EPH	2005	159	785	LM		HC	X	L		O																																													P					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT #	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6082	EPH	2005	159	785	LM		HC	X	L		S				F																																															
6083	EPH	2005	160	4933	MR		HC	N	J	L	S									F																																										
6084	EPH	2005	160	4933	MR		HC	N	J	R	S		F							F																																										
6085	EPH	2005	160	4933	MR		HC	X	J	R	S												P				P														P					P																
6086	EPH	2005	160	4933	MR		HC	N	J	L	B																																		k					g											CALCULUS
6087	EPH	2005	160	4933	MR		HC	N	J	R	O																									P	P	14L			E																					
6088	EPH	2005	160	4933	MR		HC	N	J	R	B																				g																															

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
																																																														CALCULUS
6089	EPH	2005	160	4933	MR		HC	N	J	L	S												P				P				a		7.6	8.4							d		10.8	11.7		d		14.3	14.5													
6090	EPH	2005	160	4933	MR		HC	N	J	L	S																									P	P	d		7																						
6091	EPH	2005	160	4933	MR		HC	X	L		O																																														P					
6092	EPH	2005	160	4933	MR		HC	X	L		O																																														P					
6093	EPH	2005	160	4933	MR		HC	N	L		O												P																																							
6094	EPH	2005	160	4933	MR		HC	N	L		O				P																																															
609	EPH	200	160	493	MR		HC	N	L		O																P																																			

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT #	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
5		5		3																																																										
6096	EPH	2005	160	4933	MR		HC	N	L		O																											1A																								
6097	EPH	2005	160	4933	MR		HC	N	L		S				F																																															
6098	EPH	2005	160	4933	MR		HC	N	L		S								P																																											
6099	EPH	2005	160	4933	MR		HC	X	L	R	S									F																																										
6100	EPH	2005	160	4933	MR		HC	N	J	L	S																										P	b	18.5	8.3																						
6101	EPH	2005	160	4933	MR		HC	X	J	R	S																				P										P	12.2	10.6	10.2																		
61	EP	20	16	18	EM		HC	N	J	L	O																P				9A										9A					9A																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
03	H	05	1	45																																																										
6104	EPH	2005	160	4933	MR		HC	X	J	L	LEE				P																																															
6105	EPH	2005	162	962	LM		HC	X	L	R	O																																													P					
6106	EPH	2005	162	962	LM		HC	X	L	R	O																																													P					
6107	EPH	2005	162	962	LM		HC	X	L	R	B																P																																			CALCULUS
6108	EPH	2005	162	962	LM		HC	N	J	L	B																																								j											CALCULUS
6109	EPH	2005	162	884	LM		HC	X	L	L	B																																													P					CALCULUS
6	E	2	1	8	L		H	N	L		O																																													7					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
110	PH	005	62	84	M		C																																																		A					
6111	EPH	2005	163	966	LM	311	FS<5	N	L	L	O																P																																			
6112	EPH	2005	163	966	LM	311	FS<5	N	L		S								P																																											
6113	EPH	2005	160	4933	MR	4342	FS<5	X	L	R	S																																								P	28.3	15.7	12.8	9.3							
6114	EPH	2005	160	4933	MR	4342	FS<5	N	L	L	O								P																																												
6115	EPH	2005	160	4933	MR	4342	FS<5	X	L		O												P																																									
6116	EPH	2005	160	4933	MR	4342	FS<5	N	L		O?																																															U					

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6117	EPH	2005	160	4933	MR	4342	FS<5	N	J	L	APS?				P																															P																TOOTH ROW = 3.2
6118	EPH	2005	160	4933	MR		HC	X	L	R	S			P																																																
6119	EPH	2005	160	4933	MR		HC	X	L	R	S									N																																										
6120	EPH	2005	160	4933	MR		HC	X	J	R	S												P				P																																			
6121	EPH	2005	160	4933	MR		HC	N	L		S				P																																															
6122	EPH	2005	160	4933	MR		HC	N	L	L	B																																														k	21.7	14.8			CALCULUS
6123	EPH	2005	165	4923	HM		HC	X	L	R	B																																														P					

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6124	EPH	2005	165	4923	HM		HC	N	J	R	S	P	P							M			P				P																																			
6125	EPH	2005	165	4923	HM		HC	N	J	L	OVA																																			15A	10.2	6.6														
6126	EPH	2005	165	4923	HM		HC	N	L	L	B																																														P					CALCULUS
6127	EPH	2005	165	4923	HM		HC	N	L	L	B																																														k					CALCULUS
6128	EPH	2005	165	4985	HM		HC	X	J	L	B																																			P															CALCULUS
6129	EPH	2005	166	3523	LM		HC	N	J	L	EQ																																								P	31.8	13.6										26.6
6130	EPH	2005	167	6635	EMOD		HC	N	J	R	S		E																																	e	19.1	14.4	14.7													

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
																																																															TEETH BURNT
6131	EPH	2005	167	6685	EMOD		HC	N	J	L	S		E																																																		
6132	EPH	2005	169	855	LM		HC	N	L		B																																														P					CALCULUS
6133	EPH	2005	171	2698	LM		HC	X	J	L	B																				P																				P											CALCULUS
6134	EPH	2005	171	2698	LM		HC	X	L	L	B																																														P					CALCULUS
6135	EPH	2005	171	2698	LM		HC	X	L	L	EQ																																																			P
6136	EPH	2005	171	2698	LM		HC	N	L	R	B																																								g	34.8	15.4									CALCULUS
6137	EPH	2005	171	2698	LM		HC	X	J	R	O												P				P				P										P					P																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
																																																														CALCULUS
6138	EPH	2005	171	2698	LM		HC	X	J	R	O												P				P				P										P					P																CALCULUS
6139	EPH	2005	171	2698	LM		HC	X	L	R	O																																								P											CALCULUS
6140	EPH	2005	171	2698	LM		HC	N	L		O			P																																																
6141	EPH	2005	171	2698	LM		HC	N	L	R	O																P																																			CALCULUS
6142	EPH	2005	171	2698	LM		HC	N	L	R	O																				15A	7.6	5.9																													CALCULUS
6143	EPH	2005	171	2698	LM		HC	N	L	R	O																														15A	8.7	6.5																			CALCULUS
6144	EPH	2005	171	2698	LM		HC	N	J	R	O												P																																							

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6145	EPH	2005	171	2698	LM		HC	N	J	R	OVA																																								8G	22.1	8.2									CALCULUS
6146	EPH	2005	171	2698	LM		HC	N	J	R	OVA																																			15A					12G											
6147	EPH	2005	171	2698	LM		HC	N	J	R	OVA																P				9A										9A					9A					2A	20.5	7.9									CALCULUS
6148	EPH	2005	171	2698	LM		HC	N	J	L	OVA																														15A					9A					11G											CALCULUS
6149	EPH	2005	171	2698	LM		HC	N	J	L	OVA																P				9A										9A					8A					3A											CALCULUS
6150	EPH	2005	171	2698	LM		HC	N	J	L	OVA																P				9A										9A					9A					7G											CALCULUS
6151	EPH	2005	171	2698	LM		HC	N	J	L	OVA																P				15A										15A					12A	12	7.3			11A											

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
																																																														CALCULUS
6152	EPH	2005	172	902	LR		HC	N	L	L	B																P																																			CALCULUS
6153	EPH	2005	172	902	LR		HC	N	L	L	B																																								g	28.3	14									CALCULUS; CONGENITALLY ABSENT THIRD CUSP
6154	EPH	2005	172	902	LR		HC	X	L	L	O																P																																			CALCULUS
6155	EPH	2005	172	902	LR		HC	X	L	L	O																				P																															CALCULUS
6156	EPH	2005	172	902	LR		HC	X	L	L	O																																														P					CALCULUS
6157	EPH	2005	172	902	LR		HC	N	J	L	O																																																			

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6158	EPH	2005	173	1583	LR		HC	X	L		EQ				F																																															THREE PIECES
6159	EPH	2005	173	1583	LR		HC	X	L	R	S			F																																																
6160	EPH	2005	173	1583	LR		HC	X	L	R	O																																								P											
6161	EPH	2005	173	1583	LR		HC	X	L	R	O																																								P											
6162	EPH	2005	173	1583	LR		HC	N	L	L	B				F																																															
6163	EPH	2005	173	1583	LR		HC	X	L	L	B																																													P					CALCULUS
616	EPH	20	173	158	LR		HC	N	L	L	B																																													g	22.	13.4			

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L HBUTCH Comments
4		5		3																																																					8				CALCULUS
6165	EPH	2005	173	1583	LR		HC	N	L	L	B																																														g	23.9	13.3			CALCULUS
6166	EPH	2005	173	1583	LR		HC	N	L		B																E																																			
6167	EPH	2005	173	791	LR		HC	X	L	L	B																																														P					
6168	EPH	2005	173	791	LR		HC	X	L	L	B																																														P					
6169	EPH	2005	173	791	LR		HC	N	L	R	B																																							f	34.5	14.5									CALCULUS
6170	EPH	2005	173	791	LR		HC	N	L	R	B																																							g	33	14									CALCULUS
61	EP	20	17	79	LR		HC	N	J	R	B																			f										k					g																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
71	H	05	3	1																																																										
6172	EPH	2005	173	1583	LR	1332	FS<5	X	L	R	O																																														P					
6173	EPH	2005	173	1583	LR	1332	FS<5	M	L	L	B																P																																			
6174	EPH	2005	173	1583	LR	1332	FS<5	X	L		S																																								P											
6175	EPH	2005	173	791	LR		HC	M	L		B				P																																															
6176	EPH	2005	173	791	LR		HC	X	L	R	O																																								P											
6177	EPH	2005	173	791	LR		HC	M	L	R	O																				8A	11	7.2																													
6	E	2	1	6	E		H	X	J	L	E		P	P						F			P				P				P										P					P					P											

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
178	PH	005	75	653	MOD		C				Q																																																			
6179	EPH	2005	175	6653	EMOD		HC	X	J	L	EQ		P	P						P		P	P				P				P										P					P					P											
6180	EPH	2005	173	791	LR		HC	X	L	L	B																																														P					
6181	EPH	2005	173	791	LR		HC	X	J	L	B																P				P										P					P					P											CALCULUS
6182	EPH	2005	173	791	LR		HC	X	L	R	B																																														P					
6183	EPH	2005	173	791	LR		HC	N	J	R	S	P	P							M																																										
6184	EPH	2005	173	791	LR		HC	X	L	L	B																										P																									

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6185	EPH	2005	173	791	LR		HC	X	L	L	B																											P																								
6186	EPH	2005	173	791	LR		HC	N	J	R	CAF			P						P							P				P	13.1	6.6								P	22.2	9.6																			22.1 P4/M1=34.7
6187	EPH	2005	177	966	LM	311	FS<5	N	L	L	O																P																																			
6188	EPH	2005	177	966	LM	311	FS<5	N	L	L	O																				15A																															
6189	EPH	2005	177	4933	MR	4342	FS<5	N	L		F-S				P																																															
6190	EPH	2005	177	4933	MR	4342	FS<5	N	L		F-EL				P																																															
6191	EPH	2005	177	1816	EM	367	FS<5	N	J	R	SOA	P								P											P										P					P					P											

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ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6192	EPH	2005	1777	966	LM	311	FS<5	N	J	L	APS	P																			P										P					P																
6193	EPH	2005	1776	3807	HM		HC	N	L		S				P																																															
6194	EPH	2005	1776	3807	HM		HC	N	L		S				P																																															
6195	EPH	2005	1776	3807	HM		HC	X	L		S				P																																															
6196	EPH	2005	1776	3807	HM		HC	X	L		S				P																																															
6197	EPH	2005	1776	3807	HM		HC	X	L		S												P																																							
6198	EPH	2005	1776	3807	HM		HC	X	L		B																																														P					

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
																																																														TWO PIECES
6199	EPH	2005	176	3807	HM		HC	N	L		B																																													k	23.9	13.5			CALCULUS
6200	EPH	2005	176	3807	HM		HC	N	L		B																			f																														
6201	EPH	2005	176	3807	HM		HC	X	L		O																																													P				
6202	EPH	2005	176	3807	HM		HC	N	J	L	CAC															P				P									P					P					P										
6203	EPH	2005	176	3807	HM		HC	N	J	L	OVA																			P									P					P	13.2	7.6			P	22	7.7								CALCULUS
6204	EPH	2005	176	3807	HM		HC	X	L	R	B																																													P				CALCULUS
6205	EPH	2005	176	3807	HM		HC	N	J	L	O																																							P										

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6206	EPH	2005	176	3807	HM		HC	N	J	R	S																																							f	27.9	13.4	13.6	8.9							
6208	EPH	2005	176	3809	HM		HC	X	L	R	B																			P																															CALCULUS
6209	EPH	2005	176	3809	HM		HC	X	L	R	B																													P																					CALCULUS
6210	EPH	2005	176	3809	HM		HC	X	L	R	B																																		P																CALCULUS
6211	EPH	2005	176	3809	HM		HC	X	L	R	B																																							P											CALCULUS
6212	EPH	2005	176	3809	HM		HC	X	L	L	B																																		P																CALCULUS
6213	EPH	2005	176	3809	HM		HC	X	L	L	B																																		P																

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6214	EPH	2005	176	3809	HM		HC	X	L	L	B																														P																					
6215	EPH	2005	176	3809	HM		HC	N	L		B																																														g	26	15			CALCULUS
6216	EPH	2005	176	3809	HM		HC	N	J	L	O																														P					P					P											
6217	EPH	2005	179	4749	EMOD		HC	N	J	L	OVA																P				14S																															
6218	EPH	2005	179	4749	EMOD		HC	N	J	L	B																											c	33.9	13.8																							
6219	EPH	2005	179	4749	EMOD		HC	N	J	R	OVA																																			9A					11G											
6220	EPH	2005	179	4749	EMOD		HC	N	J	R	B																																								P											

teeth																																																														
ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
6221	EPH	2005	180	3810	HM		HC	X	L	L	B																																															P					
6222	EPH	2005	180	3810	HM		HC	N	J	L	S																P																																			
6223	EPH	2005	180	3810	HM		HC	N	L		S																																															d	19.1	13.2	13.8		
6224	EPH	2005	180	3810	HM		HC	N	L		O																																															10A	11.2	7.1			
6225	EPH	2005	180	3810	HM		HC	N	L		O																																															2A	14.9	7.3			
6226	EPH	2005	180	3810	HM		HC	N	J	R	OVA																																								11G											
622 2	EPH	200	180	381	HM		HC	N	L	R	O																																															9A	13.	7.7			

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
7		5		0																																																						5				
6228	EPH	2005	180	3810	HM		HC	N	J	L	O			E																																																
6229	EPH	2005	180	3810	HM		HC	N	J	L	OVA																									P	P	13L	16.5																							
6230	EPH	2005	180	3810	HM		HC	N	L		S				F																																															
6231	EPH	2005	180	3810	HM		HC	N	L		S				F																																															
6232	EPH	2005	180	3810	HM		HC	N	L		S				F																																															
6233	EPH	2005	180	3810	HM		HC	N	L		S				F																																															
62	EP	20	18	38	HM		HC	N	L		S				F																																															

teeth

ID	SITE	YEAR	BOX	CTX	ERA	CAT#	COL	EL	LJ	SIDE	TAX	I1	I2	I3	I	dI1	dI2	dI3	dI/dC	C	dC	P1	P2	P2L1	P2Wa	P2Wd	P3	P3L1	P3Wa	P3Wd	P4	P4L	P4Wa	P4Wd	P	dP2	dP3	dP4	dP4L	dP4WP	M1	M1L	M1WA	M1WP	M1hyp	M2	M2L	M2WA	M2WP	M2hyp	M3	M3L	M3WA	M3WC	M3WP	M3hyp	M12	M12L	M12WA	M12WP	M12hyp	MP/M P1/M3L P2/M3L P1/P4L P2/P4L M1/M3L H BUTCH Comments
34	H	05	0	10																																																										
6235	EPH	2005	180	3810	HM		HC	N	L		B				F																																															
6236	EPH	2005	180	3810	HM		HC	N	L	L	S									N																																										
6237	EPH	2005	180	3810	HM		HC	N	L	R	S									N																																										
6238	EPH	2005	180	3810	HM		HC	X	L	L	S									N																																										
6239	EPH	2005	180	3810	HM		HC	X	L	R	S									N																																										
6240	EPH	2005	180	3810	HM		HC	N	J	L	S																P				d																															
6	E	2	1	3	H		H	N	J	L	S																																			d		1	1		a											

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