THE ROLE OF THE FELINE IN THE MEDIEVAL SOCIETY IN THE NORTH ATLANTIC REGION

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CONTENTS

Appendices

THE ROLE OF THE FELINE IN THE MEDIEVAL SOCIETY IN THE NORTH ATLANTIC REGION

Abstract

This investigation is threefold. Firstly, a substantial literary review has been undertaken in order to establish the function of the feline during the defined geographical and spatial boundaries. The representation of the cat throughout antiquity has also been reviewed in this manner. Secondly, a cat bone assemblage recovered from an excavation at Earl's Bu, Orphir in Orkney has been systematically analysed and a number of issues addressed. These include, calculating the N.I.S.P. count, establishing the minimum number of individuals represented at the site, the age and size at death of the animals and the reason for death. This research has also involved a study of the remains for evidence of burning, pathology and butchery. Thirdly, eighteen archaeological sites have been reviewed. This analysis covered the recording and identification methods applicable to the recovery of any cat bones from these sites. The information attained from this review has been summarised and applied to the future recovery of feline remains.

A general conclusion realised from this research is that the data sets, to date, are not large enough to be wholly definitive and this is further hindered by the poor recovery and analytical methods that have been utilised in the past.

However, there are aspects of a number of reports that ascertain the economic usage of cats. Evidence of butchery has been established on a percentage of the Earl's Bu assemblage and this has been used as a comparative with other archaeological sites.

Illustrations

Figure XVI ‘Virgin and Child with Cat’ by Leonardo da Vinci (1452 - 1519) (Clutton-Brock 2000: 90)

Figure XVII Dried corpses of a cat and rat found in a house at Bloomsbury, London (Clutton-Brock 2000: 57)

Figure XVIII Cat skull from Odense, Denmark showing numerous cut marks on the bones of the snout (Hatting 1990: 187)

Figure XIX Medieval wood carving of a kitchen cat chasing rats (Matterer 2000)

Figure XX A snarling cat head from the Oseberg Ship; an all purpose vessel used for raiding (Magnusson 1980: 51)

Figure XXI Map of the Orkney Islands (Hunter n. d: 14)

Figure XXII The Brough of Birsay (Magnusson 1980: 260)

Figures XXIII – XXXIV are photographs of the twelve bones from Earl’s Bu, Orphir, Orkney, which displayed traces of butchery and / or skinning.
(The first numerical code represents the context, followed by the sample number, the year of recovery, then the phase).

Figure XXIII 362/T21/90/06.00 A left metatarsal III

Figure XXIV 421/T2/89/06.00 Atlas

Figure XXV 242/306/86/13.00 Phalanx I – The butchery marks can be seen on the ventral surface at the distal end

Figure XXVI 242/310/86/13.00 A right hand side pelvis fragment

Figure XXVII 242/317/86/13.00 A right tibia with a slicing cut at the distal end of the bone

Figure XXVIII 510/483/89/13.00 The proximal end of a left tibia

Figure XXIX 390/T7/89/15.00 A right hand side scapula

Figure XXX 404/363/88/15.00 Phalanx I

Figure XXXI 417/T4/89/15.00 A right hand side radius

Figure XXXII 559/536/90/15.00 The proximal end of a very robust left femur

Figure XXXIII 339/352/88/17.00 A right hand side femur

Figure XXXIV 339/352/88/17.00 A left hand side radius

Diagrams

1.0 Aim

The aim of this dissertation is to establish the role of the feline in the medieval society of the North Atlantic region. The work is being undertaken, primarily because of the apparent lack of information that currently exists in this field of potential study. While other mammal taxa, for instance; dog, (*Canis* sp. L.), horse, (*Equus* sp. L.) and sheep, (*Ovis* sp.), achieve relative status in an archaeological report, the importance of the cat, (*Felis* sp. L.) appears to be largely ignored. The recognition of feline remains being registered and / or recorded on a site report, vaguely or otherwise, indicates the significance of such a find. Yet, while the recovery of the bone or bone assemblage is deemed worthy of a mention, very little research has been done to substantiate further the reason for its presence.

The focus of a clearly defined spatial and temporal boundary, the medieval society within the North Atlantic region, is necessary in order to condense suitably the resource material available. The geographical area of study includes Iceland, Greenland, Norway, the Faeroe Islands, the Shetland Islands, the Orkney Islands and the North of Scotland. (**See Figure I**). In particular, analysis will focus upon the Orkney Islands and Caithness in the Northern uppermost area of Scotland. (**See Figure II**). Principle sites of archaeological interest are Crosskirk Broch and Freswick Links in Caithness, the Brough of Birsay, St. Boniface Church (Papa Westray), Howe by Stromness and Quaterness in Orkney. In addition, sites have been considered outside of the Orkney Islands and Caithness to act as a comparative. These include Scalloway in Shetland, Montrose, Perth and St. Andrews in Scotland, Odense and Tybrind Vig in Denmark, Cambridge in England and miscellaneous sites that date to the medieval period in the Netherlands.

2.0 Objectives

(Vernacular or common names of taxa are used throughout the text with Latin nomenclature given in brackets.)

In order to have the ability to make recommendations for the future recovery, sampling, processing and subsequent research of cat bone assemblages, there are four main issues that need to be addressed.

2.1 The Representation of Cat Bones in Medieval Sites

The primary objective is to establish how often feline remains have been recorded from such a site type? The older reports make very little mention of cats. There is always the possibility that there were no such remains to be found. However, if feline presence was ignored, there may be a need to re-examine and re-evaluate the archived remains using modern archaeological techniques and practice. Furthermore, the wild cat, (*Felis sylvestris* L.), was indigenous to Caithness but not Orkney and it may be possible to chart the differences between the wild and domestic of the species when reviewing these sites (Barrett 1997: Table 5a & 5b; Mainland, pers comm. 2000).

2.2 Recording Techniques

A secondary objective will encompass the actual method of recording applied to the faunal assemblages of the sites under review, be it a simplified presence or absence or a more detailed account. There may be a bias in data collection and / or processing. The use of different recovery strategies from archaeological deposits will have an obvious effect upon the quality of the data (Payne 1972: 52; O'Connor 1991: 258; 1996: 15; Morris & Rackham 1992: 49). For example, small mammal bones, such as

cats, are rarely recovered when hand collection is utilised. Bulk sampling, such as wet sieving, is more appropriate (Buglass & Rackham 1991: 31 *et seq*; Batey 1992: 38). Another aspect that must be considered is whether any differentiation is made between domestic, feral and wild cat. It is possible to make this distinction by observing cranial morphology and metric traits of the collection under study; looking at the size and age at death of the animal (Berman 1974: 929 – 931; Hatting 1990: 188 – 192; Luff & Moreno García 1995: 96 – 99). Age related pathology will also assist in age determination.

2.3 Function

A tertiary objective is that it is important to consider the prevailing attitudes associated with this era, particularly in the medieval North Atlantic region. Were cats recognised within any ritualistic beliefs? A number of papers have been written which cite demonstrable interpretation for such an occurrence where other taxa are concerned, however, these do not relate to the medieval period (Grant 1991: 110). There is a 'grey area', regardless of oral superstition, when trying to establish the position of the feline. There are sources that suggest persecution but little or no archaeological evidence to validate these.

A further factor to consider is the evidence in favour of the economic value of felines and to what degree. Evidential traces of skinning and / or butchery marks may be an indication of the fur trade and / or simple subsistence needs. For any relationship of skinning and butchery to be revealed, statistics will have to be accumulated from the bone assemblage under observation and information gathered from other published site reports, in particular those sites which appear within the spatial and temporal boundaries.

Were the cats utilised specifically for pest control or is there conclusive proof of a creature having been wholly cared for?

2.4 Colonisation

A fourth objective is to see if there is any evidence to substantiate cats as having been purposely introduced to the locale in question or that there was already a population *in situ* prior to integration within the settlements. Albeit a difficult task, determination of the answer may be constituted by, if possible, calculating ratios of the cat population before, during and after, if applicable, of the human populated areas. This information may assist with the identification of domestication of the animals and if there is a notable transitional period.

Is there a deconvergence of the cat population; those that settle within the community, those that remain wild and those that favour a feral existence? Age, size at death and pathological finds are indicators for such a theory (McCormick 1991: 223 – 225).

2.5 The Interpretation of a Cat Bone Assemblage

A final objective is to attempt to draw parallels with contemporary sites. For this purpose, laboratory research, the investigative analysis of a collection of cat bones that were recovered from Earl's Bu, Orphir, Orkney, has been undertaken. This site has Norse significance thus the data is beneficial to this study. Information gathered from this assemblage has in turn been compared to the other sites under review.

3.0 The Archaeological Significance

Cataloguing the bones recovered from an archaeological site is of itself a pointless exercise unless clear research aims are outlined at the onset (O'Connor 1988: 63).

Thus by establishing the aforementioned facts and qualifying the theories posed, it should be possible to recognise the religious, symbolic and economic implications associated with the cat in this locale and time period. While all these matters are all inextricably combined, determinations may be made in relation to a deliberate introduction of the animal for whatever reason, be it an economic purpose, to revere the species or merely for companionship. By collating the diverse data sets, it is hoped that new patterns of demographic and economic change in cat populations in the study area will be elucidated. Facts that were originally vague may be clarified and anomalies, previously not registered, can be recognised and hopefully a feasible explanation provided. Thus recommendations for further research can be reasonably suggested and the potential of this subject realised.

4.0 The Recovery of Small Mammal Bone (Focusing on Feline Remains)

The nature of the excavation techniques used on an archaeological site will have an overall effect on the finds that are recovered and cat bones are no exception. Prior to the excavation commencing, it is important that the site personnel are acquainted with the nature of potential finds. If staff are not familiar with, or indeed interested in, environmental material then there is the distinct possibility that suitable samples will go unrecognised and unrecovered due to ignorance or a lack of interest (Andrews 1991: 12).

'Hand collecting' or 'hand picking' is a method that is extensively used and it is considered to be a very suitable method for the recovery of large animal bone. However, where small mammal bone is concerned, it takes a very skilled eye and undoubtedly, finds will be missed in the process. One only needs to consider the size of the cats' third phalanx to realise this to be true. Aggressive methods, such as

mattocking, are potentially destructive to the material that is to be recovered, especially when the fragility of small animal bone, such as cat, is taken into consideration. Unfortunately, such methods are necessary on some sites due to time limitations and / or funding restrictions. This is particularly true in modern developer funded archaeology. However, it has to be realised that the data accumulated from these sites can only be archaeologically useful in a superficial way as the full range of the available material has not been recovered (Westman 1994). Wet sieving is a process that is now extensively used in environmental sample recovery. Sample volume and weight are measured prior to processing. The samples are then washed in a tank using a flotation sieve, usually with a 0.5mm mesh for the flot and an internal wet-sieve of 1mm mesh for the residue. The samples are then transferred to a bowl and rinsed in warm water and light material is washed over onto the 0.5mm mesh sieve (Williams 1973: 198 – 202; Jacques *et al* 2001: 44). It was observed at the Fishergate site in York that the cat bones were small enough for sieving to have made a big difference to their recovery (O'Connor 1991: 258).

Payne (1972: 52) stated that the value of any analysis is wholly dependant upon the quality of the sample upon which it is based. This is reiterated by O'Connor (1996: 5 – 19) who broaches the subject in, 'A critical overview of archaeological animal bone studies'. This work draws attention to the importance of data quality and highlights problematic areas concerning the need for detailed research and integration of taxonomic identification and bone diagenesis with other archaeological disciplines. Furthermore, the site archive comprises the excavation records and any materials recovered. It is vital that this is quantified, ordered, indexed and internally consistent for the archaeological interpretation to be correctly surmised (Andrews 1991: 13; Reitz & Wing 1999: 119 - 120).

The taphonomic processes that the site under investigation has gone through must also be brought into the equation. Although all bones have a reasonable chance of preservation in most soils, they will only be discovered providing they have survived the various destructive factors applicable to most, if not all, burial environments. These factors can be natural, such as weathering and associated erosion, soil pH, root intervention, animal gnawing and scavenging and bioturbatory processes including the effects caused by worm action. For example, gnawing animals attack the articular ends of the bone first which leaves bone cylinders and splinters (O'Connor 1989: 147; Renfrew & Bahn 1996: 269). Human intervention, such as ploughing, is also destructive to the underlying archaeology. Furthermore, the amount of gnawing and splintering of bones prior to burial is dependant upon the length of time that the material was exposed before becoming incorporated into the archaeological record. As such, the longer the exposure, the higher the potential for damage through these taphonomic processes (Davis 1995: 17, 22, 27 – 28; Rackham 1995: 227; Reitz & Wing 1999: 110 *et seq*). An acceleration in decay will also be apparent in those bones recovered from later levels lying closer to the surface of the site. It is, therefore, important to record any distinct changes of the bones from the different contexts of recovery.

All the aforementioned must be made aware to the excavation and post-excavation personnel if the site is to be correctly analysed. It is thought provoking that had this information been more suitably assimilated in previous studies, there may be a far greater collection of archaeological cat bone assemblages to investigate further.

5.0 Literary Review

The evidence for the status for any, or indeed all, of the issues, which are addressed, is attained from an extensive literary and pictorial research programme. The resources available include published site reports and reports in preparation, journal papers and discursive articles, past dissertations which encompass the subject, internet pages, parish records, reference collections and general texts.

5.1 Archaeological Importance

A number of relatively old site reports have been reviewed. While these do not necessarily relate to the area and / or temporal zone under scrutiny, they provide a basic indication as to how important or not, the recording of cat bone assemblages were deemed at the time of discussion. Many of these reports acknowledge feline presence but confine the information to simple classification and / or distribution tables or refer to the find briefly in the text only. (For example, Sheteilg & Falk 1937: 69; Stead 1980: 26 – 30 & 149 – 155; Armitage & West 1985: 11, Figures 13 & 14). (**See 8.0**)

5.2 Worshipped and Exploited

Throughout antiquity, the cat has been either a revered creature or a thoroughly despised animal. The Ancient Egyptians were worshipping the cat in the Sixteenth Century BC (Bokoyni 1974: 311) and the feline was venerated as a national deity for more than thirteen hundred years (Tabor 1991: 9). The Greek historian, Diodorus wrote, while visiting Egypt during the Roman occupation in the First Century BC, that rough justice could be meted out to anyone who ill-treated a cat. When a Roman

soldier ran over and killed a cat with his chariot in Alexandria, the soldier was lynched and stoned to death by the enraged mob (Conway 1998: 45; Angus 2001). Other foreign eyewitness accounts reported rituals associated with the death of a house cat; the animal's owners would go into mourning and shave off their eyebrows (Tabor 1991:10; Clutton-Brock 1999: 138). The feline divinity that inspired such devotion was the fertility goddess Bast also called Bastet (Aldington & Ames 1959: 36; Houlihan 1996: 88 - 89). (**See Figure III**).

Herodotus wrote accounts of the annual festival at the city of Bubastis, the centre of cat worship and the principal burial place of the cats that had been purposely reared at the temple (Sillar & Meyler 1966: 16). The deceased cats were embalmed and the mummies sold to the devotees of the religion. This was a lucrative trade where demand exceeded supply (Tabor 1991: 14). In 1981, a study was undertaken on fifty-five mummified cats from this location which showed that nearly all these cats were less than one year old and several had vertebral displacement having suffered from a broken neck (Armitage & Clutton –Brock 1981: 185 – 196; Clutton-Brock 1999: 138; 2000: 37). This would suggest that there was a ritual sacrifice of the deity, temple priests may have killed kittens to control the cat population and / or the potential earnings to be made from peddling the mummified remains outweighed the religious implications (**See Figure IV**).

Cats have long been known to other cultures. Excavations in 1983 unearthed feline jawbones and teeth in a Neolithic settlement in South Cyprus dating to 6000BC. There were no wild cats on Cyprus so cats must have brought to the island either directly or indirectly by humans (Gebhardt 1991: 43). Wall tiles have been recovered from Crete that depict wild cats and have been dated from 1600BC (Anon 2000). Evidence from art and literature indicate that the cat was being treated as a

domesticate in Greece by the Fifth Century BC (McMormick 1988: 218). In India, cats were mentioned in Sanskrit writings around 100BC (Ghosh 1990: 5, 84 – 86). The Romans were responsible for the cat's introduction into Britain and central and Western Europe (McMormick 1988: 218).

There is proven evidence of a cat from a Romano-British site at Dalton on Tees having been wholly looked after, the pathological evidence dictates that it could not have survived otherwise. The changes in the femur have resulted in the disappearance of the whole of the head of the bone and the shaft has undergone massive changes as far down as the lesser trochanter. There is a degree of eburnation on the inner face of the new bone growth. Eburnation is the polishing of the surface due to bone to bone contact after the destruction of the cartilage (Roberts & Manchester 1997: 37). This is indicative of the animal having survived the trauma although the limb would have had a limited movement range. The bones from the left elbow joint show a healed fracture. The changes to the bone are likely to be the result of an associated infection and a reduction in length. (After Buglass 1998: 55). (**See Figures V & VI**).

5.3 The Mythological Feline

Greek legend tells the classical tale of Galenthias who was turned into a cat and became a priestess of the Goddess Hecate (Room 1999). The Roman Goddess Diana is said to have assumed feline form to invite the fury of the giants (IBID).

In Pagan Celtic Britain, the cat was seen as both divine and menacing. (**See Figure VII**). A series of antefixa have been recovered from Caerleon. These divine head motifs have feline ears and short radiating strokes, which are reminiscent of cat fur. These heads have been attached to the vernacular Irish tradition of Cairbre Caitchenn, an Irish ruler who apparently had the ears of a cat (Ross, 1968: 301 – 302). Cairbre

ruled over the Milesians who were the last invaders of Ireland before the historical period. It is possible that Cairbre came from a tribe whose totem animal or guardian spirit was the cat (Davies 1998: 118). Irish legend also tells of an island inhabited by men with cats' heads (Ross 1968: 302). *Cat bec* is a 'little cat' in Celtic mythology. As a guardian of treasure, it is written that he transformed into a flaming object and leapt through a potential thief, turning him to ashes (*IBID*). Scottish Highlanders believed in the Cath Sith, or the 'Cat of the Sidhe' (otherworld abode of the fairies). This cat was believed to be a shape-shifted sorceress, full of esoteric knowledge (O'Neill & Davies 1999: 48). The Celts sought to ensure the continuity of life force by ritually burning manifestations of their deities. Cats were burnt as objects of veneration at the Celtic midsummer festival of sacrifice fires (Tabor 1991: 51). From the Dane Hills of Leicestershire comes a tradition of a feline goddess called Black Annis, Cat Annis or Cat Anna. This deity originated in Denmark and bears a similarity to the Roman goddess Diana whose Greek counterpart was Artemis. Both these goddesses were huntresses and both were linked with the cat (Ash 1977: 37; Davies 1998: 121).

The cat featured in Teutonic and Norse legend for which there are written down 'memories'. An unknown medieval writer recorded the tale of how giants, threatened by Thor, tricked the God by challenging him to lift a large and hefty grey cat which was in fact the great serpent that encompasses the Earth in disguise (Graham-Campbell 1980: 181 – 182; Gray 1990: 187). The Norse goddess of fertility was Freyja; her chariot was drawn by two cats (Aldington & Ames 1959: 280; Conway 1998: 68 – 69; Lorvic 2000: 4). (**See Figure VIII**). There is a Northern European Corn Cat deity, which is called upon to protect the crops and has been associated with Freyja. In some parts of Europe, in the present day, country people dress themselves

up as cats in order to celebrate the end of a successful harvest (Conway 1998: 38). A simple explanation for this would be the association of the cat and the ability of pest control. By preventing rodents feasting on the corn, the cat is revered as a necessary commodity. Another cat-orientated celebration takes place every May in the city of Leper (Ypres) in Belgium albeit for a different reason. The origin of which lies in the ritual that follows a magnificently staged procession. The year's 'Cat Queen', her attendants and the jester ascend the Cloth Tower from which cats are thrown out to the crowd below. Up until 1817, live cats were used, now only toy ones are thrown. This is a symbolic re-enactment of an event that took place a thousand years previous when in 962AD, the Count of Ypres and joint-Count of Flanders, Baldwin III, ordered three cats to be thrown from a tower built on a cult shrine of a brass cat with two kittens. There are two conflicting reasons for this festival. Either this was a public demonstration of the abandonment of cat worship or the proof of the cat's supernatural powers, it's ability to fall from a great height and land safely on it's feet (Tabor 1991: 43 – 44).

There is a frequently recurring presence of feline forms all through the decorations of the Christian teaching gospels, the Kells Manuscript (Edwards 1990: 59). The zoomorphic illuminations that have been interpreted as feline form, while eccentric in representation, capture the grace and flexibility of the animal and are typical of the ecclesiastical style of the Eighth Century (Sullivan 1986: 41). (**See Figure IX**). Cats have also featured in other illuminated ecclesiastical books of hours and of prayers, however, these depictions are truer to the natural form of the animal (Sillar & Meyler 1966: Plates 34 & 50). The Fifteenth Century Book of Hours even depicts the cat in comical fashion; holding a crossbow, the cat is attacking a rat's castle! (Sillar & Meyler 1966: Plate 51). (**See Figures X, XI & XII**).

5.4 Religious Persecution

There are sources which state that cats suffered horribly during witch hunts which in turn fostered and / or encouraged all kinds of superstition and brutality (Hartley 1979: 109; Maxwell-Stuart 2000: 50). In fact, the Middle Ages were a time of unspeakable cruelty to cats; as Christianity swept over Europe, so did the hatred of cats. Throughout Europe, cats were burnt in their thousands. The Christian Church officials, in their campaign against pagans and their apparent association with witchcraft, used the cat as a scapegoat. They said that the cat's nocturnal wanderings and it's screeching during the breeding season were signs of secret orgies and ceremonies with Lucifer. They were roasted in wicker cages above bonfires, prolonging their agony was to make the Devil suffer (Mery 1968: 117). It is easy to understand why this belief arose now that we have the understanding of the feline anatomy. As the male leaves the female after mating, she yowls and strikes the tomcat. This procedure is due to the penis being covered with short barbed spines which rake the vaginal wall on withdrawal; not demonic, merely a biological feature (Loxton 1975: 62; Taylor 1986: 203). Drunk on power, these same officials also condemned and punished anyone who helped a sick or wounded cat, sheltered or even loved one (*IBID*: 118; Cavendish 1982: 89). A popular dictionary of symbols produces a brief and bare list of the significance's of the cat – 'Satan; darkness; lust; laziness (Cooper 1978: 29).

The Knights Templar were a noble order of fighting monks formed in 1119AD to provide a safe passage for pilgrims to the Holy Land. Their honour encouraged wealthy nobles to entrust to them their valuables. When a third of the fifteen thousand Templar Knights became based in France, their accrued wealth and renown unnerved

King Philip the Fair of France who used the Knights' worship of a black cat idol to denounce them as heretics (Upton-Ward 1992: 10; Conway 1998: 84). In the Thirteenth Century, Pope Gregory IX issued a statement that the Cathars (break-away Christians) bred black cats, the colour of evil and sin, which were the devil in disguise (Gray 1990: 188 – 189; Conway 1998: 84; Hyland 2001). The inquisitor, Nicholas Remy, declared all cats demons and ordered their extermination (O'Neill & Davies 1999: 48). The cat had become synonymous with the Antichrist.

5.5 Artistic Portrayal

Bearing the aforementioned in mind, the other end of the spectrum views the cat as a humble and potentially comical creature. This can be seen by the visual representation of the animal in church misericords; a projecting ledge that afforded support to the clergy as at this time in history it was forbidden to sit in church (Hayman 2000: 3). (**See Figure XIII**). A possible survival of Isis worship from Ancient Egypt has been suggested for a misericord at Beverley Minster. This is a carving dating from 1530 and features a cat playing the fiddle to four kittens. The sistrum was the instrument connected with Isis and her daughter, Bast. This also had four strings and the repetition of the number '4' has been thought to signify the number of weeks in the month and therefore relates to the moon goddess. The moon means 'measurer' and the cat is playing a dance measure (Tanfield n. d: 23). (**See Figure XIV**). This may even provide a derivation for the nursery rhyme 'Hey diddle diddle, the cat and the fiddle'.

It is perhaps due to the nature of the interpretation of the feline throughout the Middle Ages that after the early Egyptian paintings, in which cats were commonplace, a long period elapsed prior to cats being once more artistically portrayed. Both Dürer in 1504

and da Vinci in the Sixteenth Century used the cat as a subject (**See Figures XV & XVI**). However, both of these portrayals are said to convey inner meanings (Sillar & Meyler 1966: 30). In Dürer's, 'The Fall of Man', the cat is representative of the tense relationship between Adam and Eve. The cat in Leonardo's sketch of a virgin and child appears to be straining to get away from the Holy infant's grasp (Gray 1990: 185).

5.6 Ritual Deposition

In archaeological excavation, ritual deposits of cats that have been placed in buildings are infrequently recovered (Howard 1951: 149 – 151). Although the significance of this is uncertain, deliberately placed, dried cats have been discovered. There are about fifty dried, or mummified, cats on record at present. However, there are probably many more anecdotal records. There are cases where it is difficult to tell if the animal was purposely concealed or if it merely crawled away to die. However, when a cat is found concealed in a wall or bricked into a cavity, human intent is usually the reason. Furthermore, when the creature is found to be in a life-like pose, the likelihood is that it was dried in this position prior to internment. The skin is still intact although the fur has long since decayed. In Tyseley, Birmingham, a cat had been set up to face a similarly dried bird within the hollow wall of a medieval house (Merrifield 1987: 129). In Southwark, a cat was found under the floorboards of a Sixteenth Century house. It had a mummified rat in its jaws and another beneath its forefeet. Similar finds have been made at Lothbury in the City of London, Pilton in Northamptonshire, behind the organ in Dublin Cathedral (*IBID*) and at a house in Bloomsbury in London (Clutton-Brock 2000: 57). (**See Figure XVII**). An archaeologist from the Museum of London was called to the demolition site of a medieval house in Beak Street, Soho in

1997 to retrieve a mummified cat that also appeared to have been ritually placed (Buglass, pers comm. 2001).

These incidents are not isolated to the British Isles; similar finds have been made in areas of Gibraltar and Sweden (Merrifield 1987: 129). While these occurrences have previously been interpreted as being an aspect of the ancient custom pertaining to building sacrificial superstition, they have since been rationalised as vermin deterrent (IBID: 131). Albeit on a more spiritual plane. Perhaps it was hoped that the family cat, who served so well in life, could exercise its hunting prowess and assumed psychic abilities in the afterlife also. Ritual incidents are not isolated to the medieval period. At the Iron Age site at Danebury, England, the complete skeleton of a young kitten was found in a burial pit and interpreted as a ritual sacrifice due to the nature of location and associated finds (Grant 1984: 525 & 533).

5.7 Function

There is evidence, both archaeological and in contemporary literature, to interpret the role of cats as being economically viable, be it for their fur, subsistence requirements and / or their capabilities for vermin control.

It has been stated that it is in the nature of fur trading and production to leave few direct and unequivocal traces of its existence in the archaeological record (Anderson 1981: 37). However, some physical evidence may be found. The best evidence is in the form of cut marks, that are the result of skinning, on the bones of species that are not usually eaten (Serjeantson 1989: 131). In 1970, an excavation of medieval houses in the centre of Odense on Funen, Denmark took place. A pit was found which contained the remains of sixty-eight domesticated cats (*Felis catus* L.). Radiocarbon analysis gave the bones a date of 1070 ± 100AD meaning that the pit was in use

during the Viking Age. The size of the bones in comparison with the level of maturity identified the cats as domestic. The cut marks apparent on the snout of the animals gave indication to the fact that they were skinned (**See Figure XVIII**). Of those determined, the majority of the bones belonged to juveniles and it has been suggested that a number of elder cats were allowed to live as breeding stock, presumably for the sake of production (Hatting 1990: 179, 184 & 187). The absence of skinning cut marks does not discount the process, as it is possible to skin a cat and leave no trace on the bones. Hence the phrase, 'There is more than one way to skin a cat.' Furthermore, if no marks survive on any cat bones, there may be an absence of evidence rather than evidence of absence (O'Connor n.d: 3; Hall 2000: 75). People who frequently use stone tools for butchery and processing often leave few cut marks on bones as hitting the bone damages the edge of the tool (Russell *et al* 1996). In instances such as this, there may be other evidence to suggest fur removal. Unexpectedly large numbers of juvenile animals would indicate that the species was being exploited for its skin. This has been the interpretation from excavations at Kings Lynn where sixteen out of twenty five cats were juvenile (Noddle 1977: 378 – 408). The bones of immature cats recovered from medieval Exeter have also been interpreted as the result of fur exploitation (Maltby 1979: 86).

The butchering of the wild cat has been recorded from the Ertobølle culture settlement, the youngest phase of the Danish Mesolithic, at Tybrind Vig in Southwestern Denmark (Trolle-Lassen 1987: 89). Although of English origin, the partial skeletons of seventy-nine medieval cats were recovered from a well in Cambridge, England (Luff & Moreno García 1995: 93). The creatures' throats had been cut and they were subsequently skinned and dismembered for consumption by the town's inhabitants thus, fulfilling subsistence requirements. Eating the meat of

cats was probably only practised during periods of dearth or food shortage (Smith 1998: 878). It is reasonable to presume that the pelts would also have been utilised although the Cambridge cats are considerably smaller than that of the modern day domestic cat and as such, it is debateable as to what the fur could have been used for. In 1127AD Archbishop Corbyl decreed that abbesses and nuns could only wear fur of lamb or wild cat and later in the Fourteenth Century, Richard II granted a charter to the Abbot of Peterborough to allow him to hunt and kill foxes and wild cats (Freethy 1983: 165). It used to be supposed that only true wild cats were hunted however, the medieval chase term 'a clowder of cats' refers to a group and is more applicable to the hunting of ferals as opposed to the more solitary wild cat (Tabor 1991: 40). The Franciscan friar, Bartholomew de Glanville wrote of the cat in *circa* 1240AD, "…*is ofte for his fayre skynne ytake of the skynnere and yslayne*." (Reeves 1998). There is documentation that categorically states that feline pelts were imported from Scandinavia and the Baltic to the British Isles for the manufacture of furs particularly during the Thirteenth Century (Veale 1966: 27; Schofield & Vince 1994: 110). Cat skins were also traded in Scotland although it is unknown whether the skins were from domestic or wild cat (Stavert 1993: 216). Fur was one of the most important commodities to be exported from Ireland during the medieval period. A murage grant for Youghal, which was granted by King Edward III in 1358AD, allowed a taxation of a halfpenny for every hundred cat pelts exported from the port (McCormick 1991: 226). Cat culling has also been recorded at Fishamble St. Dublin and Waterford. It has been proposed that the animals would be allowed to grow to full size, then killed and skinned. There would have been a constant and easily available supply due to the short gestation period and relatively large litter size (*IBID*).

In contrast, there is contemporary literature in the medieval period that views cats in the more practical sense of performing a ratting and mousing service (Sillar & Meyler 1966: 22; Edwards 1990: 59; Tabor 1991: 39; Matterer 2000). (**See Figure XIX**).

There is a Welsh legal document from 948AD called 'King Hywell Dda's Law'. These were laws enacted by Hywell the Good, Prince of South Wales who saw the cat as a working but highly valuable animal. Its value was gauged on size and usefulness (Clutton-Brock 2000: 41). A kitten was worth a penny until it opened its eyes, then twopence until it caught its first mouse, when it was worth fourpence. If a cat guarding the corn in the royal barn was killed, compensation was calculated by holding the dead cat by its tail until its head touched the ground and then wheat was poured in a heap until the tip of the tail was covered (Sillar & Meyler 1966: 121; After Chadwick in Hatting 1990: 192; Harris 2000).

In the medieval burgh of Scotland, the cat's value lay in its ability to keep the rodent population under manageable control. However, on death, these creatures were skinned thus utilising the animal to its full potential (Smith 1998: 875 & 877). There was actually a salaried feline for the purpose of vermin control at Exeter Cathedral from 1305 to 1467. A cat-hole is still to be found in the door in the North transept wall through which the paid cat could enter and egress while hunting the vermin (Reeves 1998: 110).

5.8 The Transition to Domestication

When a wild animal makes the transition to being a domesticate, the skeleton undergoes changes that are relatively recognisable within the first few generations. Factors related to its captive state such as different diet and living conditions result in the body becoming smaller. A domesticated cat has a shorter facial region to the skull,

large round orbits, reduced body fat and a softer coat. Psychologically, it will lose the independence of a wild animal responsible for obtaining its food and it will acquire a more submissive temperament (Taylor 1986: 44 – 45; Clutton-Brock 2000: 26). However, it is extremely difficult to trace the process of domestication in the fragmentary remains from an archaeological excavation. It is far easier to state simply whether the cat is a wild or domesticated creature and broach the subject no further, although any affirmative information is obviously essential. (For example, Lowe 1998: 147). There is no one site that can prove definitively that the domestication of the cat occurred at any one particular time or place. It is necessary to disseminate information on the feline from a number of contemporary site types and then apply this knowledge to contemporary literature sources that will support, or disprove an interpretation. There are plausible interpretations that suggest a steady transition to a domesticated state but as with all processes of progression, this did not happen throughout the world in the same period.

Although the element of conjecture exists, it is feasible that the cat was increasingly becoming a common domesticated pet during the medieval period within the geographical boundary of study. Rafnsson states that the cat was shipped to Iceland and Greenland by the Norse farmers and it thrived as a species (1997: 120). However this evidence has not been supported by archaeological data and as such cannot be treated with conviction.

Despite the evidence that indicates extensive culling, a survey of the available Early Christian archaezoological evidence concludes that the domestic cat had a wide distribution in rural Ireland. These animals attained a large size and reached maturity or old age (McCormick 1991: 223). Irish ecclesiastics seem to have held them in particular affection (Edwards 1990: 59). Initially cats were accepted as strays around

monasteries but the inviting kitchens, producing plenty of waste food and buildings which offered protection from the weather, will have enticed the cats into the complex moreso.

In the Ninth Century AD, an Irish monk living in Richenau on Lake Constance dedicated a poem to his beloved pet cat, Pangur Bán to celebrate their relationship;

…I and Pangur Bán, my cat

'Tis a like task we are at;

Hunting mice is his delight

Hunting words I sit all night,

So in peace our tasks we ply,

Pangur Bán, my cat, and I.

However, on a more practical level, the cat, no doubt, contributed to keeping the scriptorium free of vermin in addition to loving his master unreservedly (Rowling 1979: 71; McCormick 1991: 224; Cooney 1996; Marchand 2000; O'Connor 2000). It is possible that cats may have domesticated themselves rather than humans doing the domesticating. When humans began to grow and store grain, the cats may have come into the villages because of the rodent population that fed off the grain. On observing that these felines killed the vermin, the farming community probably encouraged them by feeding them in the hope that the cats would stay in the near vicinity thus continuing to protect the food supply indirectly. Such a theory holds stead with the likes of the Northern European corn cat deity. However, were the now domesticated felines originally of the wild variety or were they really feral? One theory of origin is that the feral cats escaped a temple-like captivity only to opt for

domestication in a very different environment (Tabor 1991: 23). This is perhaps a question for which we shall never gain a satisfactory answer.

It is more than apparent from the literary research that the cat has long been a very important animal, albeit for very different reasons. Such a creature is deserving of a more detailed account of its existence and yet there are few archaeological reports that do any more than acknowledge the presence of this fine creature.

The few specialised studies have proffered an insight into the historical and ritualistic implications of the cat and have proved that it is indeed possible to determine the age of the remains, the reason for death and even the individual animal's living conditions. Ignorance of the subject can no longer be a substitute for an absence of data.

6.0 The Vikings In Orkney

The reason behind the outpouring of the people from Scandinavia that represented the Viking Age is unknown. However, suggested stimuli include population pressure, dynastic strife, political hierarchies, commercial expansion and both a natural and technical progression (Graham-Campbell 1980: 16 – 17; Sawyer 1982: 1) (**See Figure XX**).

The movement and migration of the Vikings overseas was determined to a great extent by the nature of the Scandinavian landscape. By sailing westwards from the main area of population, across the North Sea, the Norse Vikings reached the Shetland Islands, the Orkney Islands or the Scottish mainland. From the Northern Isles, the Norsemen could traverse northwesterly to the Hebrides, Ireland, the Isle of Man and Northwest England. Travelling in a westward direction, they could reach the Faeroe Islands and Iceland (Jones 1975: 90; Graham-Campbell & Kidd 1980: 18).

6.1 The Orkney Environment

The Orkneys, comprising some seventy islands, offered good land for agriculture (Rosendahl 1987: 214). (**See Figure XXI**). As these islands were, in many respects, similar to Norway and on the same latitudes, it is likely that the early experiments in farming were successful. The maritime location and position in the North Atlantic Drift are important factors that did, and still do, condition the Orkney environment (Senior & Swan 1972; Davidson 1979: 7). In addition, large fish processing sites have been found in excavations at Freswick and Caithness (Morris 1982: 89; Rosendahl 1987: 215).

6.2 The Archaeological Evidence

There is archaeological and linguistic evidence that indicates that it was predominantly the Norse Vikings who occupied land in the Northern Isles. Indeed, it seems that there may have been contact between Norway and the Orkney Islands as early as the Seventh Century (Sawyer 1997: 8). It would have been possible to conquer the Orkney Islands in one expedition thus opening the way for settlers. The main documentary source is the *Orkneyinga Saga* (Saga of the Orkneymen) that was written down in Iceland in the early Thirteenth Century (Jones 1975: 90 & 198; Rafnsson 1997: 118). The saga chronicles are difficult to reconcile due to the potential for bias and exaggeration so it is necessary to treat this source with caution but it reflects the Icelandic historical tradition, which deems King Harold Fine-Hair of Norway as the primary cause of the Norwegian emigration to Iceland via Shetland and the Orkney Islands (Magnusson 1980: 53 – 57).

…He subdued Shetland and the Orkneys and the Hebrides, and sailed all the way down to the Isle of Man and destroyed all the settlements there. He fought many

battles there, and extended his dominion further west than any King of Norway has done since then.

Extract from Chapter IV of the *Orkneyinga Saga* (Magnusson 1980: 251).

The archaeological evidence for the Viking period in the Orkney Islands is definitive albeit limited. Christianity did not embrace the Norse Vikings until *circa* the late Eleventh to the early Twelfth Century (Graham-Campbell 1980: 174) and although fewer than one hundred pagan graves have been found in Orkney, they are not significantly different from graves which date to the same period in Scandinavia (Morris *et al* 1995: 271; Sørensen 1997: 202). Such discoveries confirm that the islands were populated by 'heathens' of Scandinavian origin.

6.3Birsay on Mainland, Orkney

In the late Viking Age, Birsay on Orkney was of particular importance. The Brough of Birsay is a small island in the Bay of Birsay; it is connected with the northwestern coast of Mainland at low tide (Curle 1982: 11) (**See Figure XXII**). Excavations have revealed long-term habitation but due to coastal erosion, much has disappeared into the sea (Hunter n. d: 15; Graham-Campbell 1980: 69; Magnusson 1980: 260; Morris 1989: 257). This tidal island was the main residence of the Orkney Earldom, a political elite in Northern Britain during the Eleventh and Twelfth Centuries. The greatest Earl to hold the seat was Thorfinn the Mighty who died in 1065 (Jones 1975: 387; Crawford 1977: 99; McGovern 1990: 337; Rafnsson 1997: 125).

6.4 Earl's Bu, Orphir on Mainland, Orkney

There is a reference in the *Orkneyinga Saga* that relates to the Earls of Orkney as having had a residence and estate, referred to as a Bu, in the parish of Orphir on Mainland during the Twelfth Century (Pálsson & Edwards 1978; Mainland 1995: 1). It was whilst working in Birsay that the archaeologists' attention was drawn to a site known as Earl's Bu at Orphir on the north side of the Scapa Flow (Batey 1992: 33). The remains of a fragmentary medieval 'round church' and an adjacent Norse Hall have been identified as belonging to the Earl's residence. Later excavations on an area lying adjacent to this site have further substantiated Norse occupation. A stone-built underhouse, lade, or head-race and the tail-race of a horizontal mill, all constructed during the Viking period, were recovered and all the structures were either infilled or covered by Late Norse midden material (*IBID*: 34; Mainland 1995: 1).

These midden deposits comprised the debris discarded from the Earl's Hall and buildings in association. Later midden deposits were dated from the Thirteenth and Fourteenth Centuries (*IBID*). This bioarchaeological material is important as it was excavated in stratified contexts. A vast faunal assemblage, in excess of eighty thousand bone fragments, was recovered from the 1979 – 1993 excavations at the Earl's Bu. After complete analysis, these will serve in the understanding of the economic and social significance of animal in Late Norse Orkney (Mainland 1995: 3 –5).

Of particular importance, to this thesis, are the feline remains.

7.0 Research Methodology

The laboratory research consisted of the systematic and detailed analysis of the collection of cat bones that was recovered from the archaeological excavations at Earl's Bu, Orphir, Orkney, which took place between 1979 and 1993.

(**See Diagram I**).

7.1 Sampling

These bones were recovered as a result of an extensive environmental sampling programme, which was undertaken in conjunction with the excavations. All the soil samples were wet-sieved on-site using a Sirāf-type sieving machine (Batey 1992: 38; Mainland 1995: 1). This is a process that involves sieving the soil in water. The smaller particles are washed away and the fragments are retained on the sieve. Wet sieving is advantageous as the residue, which is retained on the sieve, is sufficiently clean so that it can be sorted very efficiently. Although dependent upon the sieve size, very few, if any, finds are missed (Payne 1972: 52). This machine had a 1mm mesh for residue and the flot was collected on a sieve of 500µm. The contexts which contained ecofactual material were completely sampled, otherwise approximately 15 litres / 28kg of soil was sampled. This processing method allowed for 'total' recovery of the contexts (Batey 1992: 38; Mainland 1995: 1).

7.2 Reason for Analysis

The bone material had survived well, attaining good preservation thus it was hoped that the following issues could be successfully assessed: - which bone types were present, the degree of fragmentation, the number of complete animals (if any), minimum number of individuals, age and size at death and the reason for death. It was also important to look for traces of pathology or pseudo pathology, skinning and / or butchery marks and evidence of burning. Furthermore, the same information has been recorded from contemporary published sites in Orkney and Caithness, in addition to a number of miscellaneous sites, to act as a comparative to the Earl's Bu assemblage examination.

7.3 Identification of the Cat Bone Assemblage

The remains were recovered from seven phases of the excavation. Phases 06.00, 09.00 and 11.00 were dated to Eleventh and Twelfth Century Viking. Phases 13.00, 14.00 and 15.00 were dated to Twelfth and Thirteenth Century Late Norse and phase 17.00 was dated to the medieval period (Mainland *in prep*). As phase 17.00 was disturbed, this has been treated as a separate entity on all data tables. Each bone was assigned a context, sample and phase number, in addition to a figure denoting the year of excavation.

The Earl's Bu cat bone assemblage had already been identified to species and anatomical element in a previous, post-excavation, exercise. However, these details were double checked as part of the analytical process. Vertebrae and ribs were not identified to species but were previously grouped into a small-mammal sized category

thus omitted from this study. Dubious fragments, which could not be positively identified to a single species, were similarly categorised.

The author initially identified the bone by comparison with published manuals for faunal identification (Schmid 1972; Hilson 1996). These were then confirmed, or in some cases refined, by comparison with the reference collection in the department of Archaeological Sciences, University of Bradford and in consultation with Dr. Mainland. Siding the bone elements was possible in most cases although none of the phalanges have been sided due to possible error. (**See Diagrams II & III**).

Excel data tables and histograms were created to reflect this information. These tables also represent data concerning the examination of each bone for pathology and butchery. (**See Appendices I – VI**).

For the purpose of the text, summary tables have been devised to show the number of fragments identified (N. I. S. P.). (**See Summary Tables I & II**).

Summary Table I

EARL'S BU, ORPHIR, ORKNEY: BONE TOTALS - PHASES 06.00 - 15.00

BONE TYPE	SIDE	N.I.S.P.
ASTRAGALUS	L	5
ASTRAGALUS	R	1
ASTRAGALUS	UNID	1
ATLAS	N/A	1
CALCANEUM	L	3
FEMUR (WHOLE)	L	1
FEMUR (WHOLE)	R	4
FEMUR (WHOLE)	UNID	1
FEMUR (DISTAL)	R	1
FEMUR (DISTAL)	UNID	1
FEMUR (PROXIMAL)	L	1
FEMUR (PROXIMAL)	UNID	1
FIBULA (WHOLE)	L	2
FIBULA (WHOLE)	R	1
HUMERUS (WHOLE)	L	5
HUMERUS (WHOLE)	R	4
JAW	L	2
JAW	UNID	2
LOOSE TOOTH	UNID	1
METACARPAL (WHOLE)	L	2
METACARPAL II (WHOLE)	L	1
METACARPAL III (WHOLE)	L	6
METACARPAL III (WHOLE)	R	1
METACARPAL III (WHOLE)	UNID	1
METACARPAL IV (WHOLE)	L	3
METACARPAL IV (WHOLE)	R	1
METACARPAL V (WHOLE)	L	1
METACARPAL V (WHOLE)	R	3
METAPODIAL	UNID	2
METATARSAL II (WHOLE)	L	1
METATARSAL II (WHOLE)	R	1
METATARSAL III (WHOLE)	L	5
METATARSAL IV (WHOLE)	L	5
METATARSAL IV (WHOLE)	R	2
METATARSAL V (WHOLE)	L	1
METATARSAL V (WHOLE)	R	1
PELVIS	L	4
PELVIS	R	5
PHALANX I	UNID	26
PHALANX II	UNID	11
PHALANX III	UNID	5
PREMAXILLA	L	1
RADIUS (WHOLE)	L	1
RADIUS (WHOLE)	R	4
SCAPULA	L	1

SCAPULA	R	1
Summary Table I cont….		
TIBIA (WHOLE)	L	3
TIBIA (WHOLE)	R	4
ULNA (WHOLE)	L	2
ULNA (WHOLE)	R	5
	TOTAL = 148	

Summary Table II

EARL'S BU, ORPHIR, ORKNEY: BONE TOTALS - PHASE 17.00

BONE TYPE	SIDE	N.I.S.P.
ASTRAGALUS	R	1
ATLAS	N/A	1
CALCANEUM	L	2
CALCANEUM	R	3
FEMUR (WHOLE)	L	1
FIBULA (WHOLE)	R	3
FIBULA (WHOLE)	UNID	1
HUMERUS (WHOLE)	L	3
HUMERUS (WHOLE)	R	1
JAW	L	1
METACARPAL II (WHOLE)	L	1
METACARPAL II (WHOLE)	R	2
METACARPAL III (WHOLE)	R	1
METACARPAL V (WHOLE)	L	1
METAPODIAL	R	1
METATARSAL IV (WHOLE)	R	1
PELVIS	L	1
PELVIS	R	1
PHALANX	UNID	1
PHALANX I	UNID	13
PHALANX II	UNID	5
PHALANX III	UNID	2
RADIUS (WHOLE)	L	3
RADIUS (DISTAL)	R	1
RADIUS (PROXIMAL)	R	1
SCAPULA	R	1
TIBIA (WHOLE)	L	2
TIBIA (WHOLE)	R	3
TIBIA (DISTAL)	R	1
TIBIA (PROXIMAL)	L	1
ULNA (WHOLE)	L	1
ULNA (WHOLE)	R	2
		TOTAL = 63

7.4 Observations

7.4/1 Bone Presence

Phases 06.00 – 15.00 contained a total of 148 cat bones. 78% of the bones were complete or substantially whole, 20% of the bones were fragmented or represented by the proximal or distal end only and 2% of the assemblage comprised epiphysial ends. The greatest number of bones were recovered from phase 15.00 which dated to the Late Norse. (**See Summary Table III**).

The disturbed phase, phase 17.00, contained a total of 63 cat bones, more than half of the other six phases added together. 73% of the bones were whole or substantially complete, 14% were fragmented and 13% were represented by epiphysial ends.

There is a similarity of bone elements that have been recovered from phases 06.00 – 15.00 and phase 17.00. Furthermore, there is not a great dissimilarity in the distribution numbers. (**See Appendices II – III & V – VI**). This could perhaps imply that there is little or no difference, with regard to what is happening to cats, over the time period represented by the phasing.

Summary Table III

EARL'S BU, ORPHIR. ORKNEY: RECOVERY PERCENTAGE FROM PHASES 06.00 - 15.00

PHASE	N.I.S.P.	PERCENTAGE OF TOTAL ASSEMBLAGE
06.00	5	3.4%
09.00	11	7.4%
11.00	1	0.7%
13.00	27	18.2%
14.00	2	1.4%
15.00	100	67.5%
?	2	1.4%

TOTAL 100%

7.4/2 Bone Absence

There is a distinct absence of skull bones, apart from five jaw fragments, (1 x 09.00, 3 x 15.00 and 1 x 17.00). There are a number of reasons that may account for this consistent absence of the skull.

Due to the fragility of cranial bones, post depositional fragmentation may have removed them from the archaeological record. However, if this were the scenario, one would expect to find some of the teeth remaining, as they are not fragile by comparison. Teeth are constructed of dense and hard material, resist decay in the ground and often outlast bone (Bass 1995: 273). Only nine teeth were recovered from the Earl's Bu site at Orphir, three of which were loose. (**See Appendix VII**). This minimal representation is unfortunate as the teeth are a very useful indicator of age due to the sequential process of tooth eruption, wear and loss (Rackham 1994: 10). (**See Diagram IV**).

If dogs were present on the site, there is the possibility that they may have been responsible for having removed the skulls. A reasonably sized domestic dog is quite capable of crushing a feline skull between its teeth.

A macabre possibility concerns the skinning of a cat. If, and when, the pelt was removed, the skull may have been retained as decoration on a garment.

(**See** *7.4/8)*

7.4/3 Minimum Number of Individuals

Epiphysial fusion was not considered for the calculation of minimum numbers, as there were fewer specimens to review. Although there was generally a good preservation of the cat bones, a considerable amount had suffered erosion at the

epiphysial end thus disallowing a reasonable interpretation of the fusion process. As such, the bone fusion tables do not represent the entire cat bone assemblage. (**See Appendices VIII & IX**).

The minimum number of cats present at Earl's Bu, Orphir was, instead, calculated by looking at the N.I.S.P. count of the long bones. The long bones provide support; the interconnected set of levers and linkages that allow the creation of movement. The number of proximal and distal fragments was first established to side. Any unidentified fragments were halved and added to both left and right.

For example: - In phases 06.00 – 15.00, there were two left proximal femur fragments, four right femur fragments and two fragments which were unidentified to side. By halving the unidentified proximal fragments, the potential left fragments was equal to 2 (+1) and the potential for the number of right hand side fragments was equal to 4 (+1). This gave a minimum number of five right femurs and as one cat has one right femur, there were five individual cats in this equation.

This method was applied to the whole site, using all the long bones.

(**See Summary Tables IV & V**).

Phases 06.00 – 15.00 gave a minimum of six individuals. (The distal humerus was the most abundant element). Phase 17.00 gave a minimum number of four individual cats. (There were numerous abundant elements).

Summary Table IV

EARL'S BU, ORPHIR, ORKNEY: MINIMUM NUMBER OF INDIVIDUALS - PHASES 06.00 - 15.00

BONE TYPE	(SIDE) L	(SIDE) R	UNID	N.I.S.P.	M.N.I.
-	-	-	-	-	-
FEMUR (PROXIMAL)	2 (+1)	4 (+1)	2	8	5
(DISTAL)	1 (+1)	5 (+1)	2	8	6
FIBULA (PROXIMAL)	2	1		3	2
(DISTAL)	2	1		3	2
HUMERUS (PROXIMAL)	5	4		9	5
(DISTAL)	5	4		9	5
RADIUS (PROXIMAL)	1	4		5	4
(DISTAL)	1	4		5	4
TIBIA (PROXIMAL)	3	4		7	4
(DISTAL)	3	4		7	4
ULNA (PROXIMAL)	2	5		7	5
(DISTAL)	2	5		7	5

⇒ **MINIMUM NUMBER OF INDIVIDUALS = 6**

Summary Table V

EARL'S BU, ORPHIR, ORKNEY: MINIMUM NUMBER OF INDIVIDUALS - PHASE 17.00

BONE TYPE	(SIDE) L	(SIDE) R	UNID	N.I.S.P.	M.N.I.
-					
FEMUR (PROXIMAL)	1			1	1
(DISTAL)	1			1	1
FIBULA (PROXIMAL)		3 (+1)	1	4	4
(DISTAL)		3 (+1)	1	4	4
HUMERUS (PROXIMAL)	3	1		4	3
(DISTAL)	3	1		4	3
RADIUS (PROXIMAL)	3	1		4	3
(DISTAL)	3	1		4	3
TIBIA (PROXIMAL)	3	3		6	3
(DISTAL)	2	4		6	4
ULNA (PROXIMAL)	1	2		3	2
(DISTAL)	1	2		3	2

⇒ **MINIMUM NUMBER OF INDIVIDUALS = 4**

7.4/4 Bone Survivorship

Having calculated the minimum number of individuals, it was possible to then calculate the survivorship percentages of the various bone elements. By knowing the minimum number of cat specimens present meant that the minimum number of bone types could be established.

For example: - One cat has two femurs. A minimum number of four cats would therefore generate eight femurs. In ideal world, we would expect to find eight femur bones in an assemblage of four cats. However, as in phase 17.00, only one proximal end of a femur was recovered thus, giving a survivorship percentage of 12.5%, (1 ÷ 8).

This method was applied to the whole site, using all the remains in this study. (**See Summary Tables VI & VII**).

Calculating the bone survivorship percentage serves two purposes. Firstly, it reduces the possible misinterpretation of data that has been recorded in a different manner. Appendices II and V, 'The number of bones recovered from Earl's Bu,' are both histograms that correctly convey information pertaining to the recovery numbers of all the feline remains. In both phase categories, the first phalanx was the most frequently occurring element. However, it must be realised that a cat has sixteen first phalanges and therefore, this bone is in fact under represented compared with what is expected from the anatomical frequencies. By cross-referencing the raw data with the survivorship percentage, a truer 'picture' can be established. In phases 06.00 – 15.00, 27% of the potential phalanx bones survived and in phase 17.00, only 20% of this element survived.

Summary Table VI

EARL'S BU, ORPHIR, ORKNEY: SURVIVORSHIP PERCENTAGES OF BONE - PHASES 06.00 - 15.00

BONE TYPE	OBSERVED	EXPECTED (M.N.I. 6)	SURVIVORHIP %
ASTRAGALUS	7	12	58.00%
ATLAS	1	6	17.00%
CALCANEUM	3	12	25.00%
FEMUR (PROXIMAL)	8	12	67.00%
(DISTAL)	8	12	67.00%
FIBULA (PROXIMAL)	3	12	25.00%
(DISTAL)	3	12	25.00%
HUMERUS (PROXIMAL)	9	12	75.00%
(DISTAL)	9	12	75.00%
JAW	4	24	17.00%
METACARPAL II	2	24	8.00%
METACARPAL III	8	24	33.00%
METACARPAL IV	2	24	8.00%
METACARPAL V	3	24	12.50%
METATARSAL II	2	24	8.00%
METATARSAL III	5	24	21.00%
METATARSAL IV	7	24	29.00%
METATARSAL V	2	24	8.00%
PELVIS	9	12	75.00%
PHALANX I	26	96	27.00%
PHALANX II	11	96	11.50%
PHALANX III	5	96	5.00%
RADIUS (PROXIMAL)	5	12	42.00%
(DISTAL)	5	12	42.00%
SCAPULA	2	12	17.00%
TIBIA (PROXIMAL)	7	12	58.00%
(DISTAL)	7	12	58.00%
ULNA (PROXIMAL)	7	12	58.00%
(DISTAL)	7	12	58.00%

The second purpose begs the question as to why only a percentage of the remains survived? The answer to this leads back to the site under investigation, the method of recovery and the taphonomic processes to which the site has been susceptible. A more aggressive and / or dynamic environment is likely to see a poorer survivorship percentage in comparison to a more stable burial environment. Furthermore, as discussed previously, some bones decay quicker than others. Cranial bones will suffer

from post depositional fragmentation far quicker than teeth, the densest and hardest of the skeletal tissues.

Summary Table VII

EARL'S BU, ORPHIR, ORKNEY: SURVIVORSHIP PERCENTAGES OF BONE - PHASE 17.00

BONE TYPE	OBSERVED	EXPECTED (M.N.I. 4)	SURVIVORHIP %
ASTRAGALUS	1	8	12.50%
ATLAS	1	4	25.00%
CALCANEUM	5	8	62.50%
FEMUR (PROXIMAL)	1	8	12.50%
(DISTAL)	1	8	12.50%
FIBULA (PROXIMAL)	4	8	50.00%
(DISTAL)	4	8	50.00%
HUMERUS (PROXIMAL)	4	8	50.00%
(DISTAL)	4	8	50.00%
JAW	1	16	6.00%
METACARPAL II	3	16	19.00%
METACARPAL III	1	16	6.00%
METACARPAL V	1	16	6.00%
METATARSAL IV	1	16	6.00%
PELVIS	2	8	25.00%
PHALANX I	13	64	20.00%
PHALANX II	5	64	8.00%
PHALANX III	2	64	3.00%
RADIUS (PROXIMAL)	4	8	50.00%
(DISTAL)	4	8	50.00%
SCAPULA	1	8	12.50%
TIBIA (PROXIMAL)	6	8	75.00%
(DISTAL)	6	8	75.00%
ULNA (PROXIMAL)	3	8	37.50%
(DISTAL)	3	8	37.50%

Although the medieval phase, phase 17.00, was disturbed, it actually shows a relatively high percentage rate of survivorship in a number of bone types, notably, the humerus, radius and tibia. However, this is not an unreasonable result, as the more robust long bones will be expected to survive the burial environment better than the more fragile bones. In comparison, only 3% of the third phalanx survived. This is one of the smallest bones in the cat; it can be easily missed by an unskilled excavator or moved easily by soil, sediment and / or water pressure.

It is interesting to note that in all the phase categories, there is an equal representation of proximal and distal ends of the various long bone elements. The proximal end is the end that is closer to the body centre, the distal points away from the body centre. There appears to be no bias despite the fact that the distal end of a bone is more solid in comparison to the proximal end (Childe 1995). Furthermore, it is likely that some of the bones were articulated on burial. For example, there is a similar pattern of survivorship with the upper limb bones, the humerus, radius and ulna.

7.4/5 Animal Gnawing

The amount of gnawing present on a bone before burial is dependant upon the length of time that the material has been exposed prior to becoming incorporated into the burial environment. The longer the exposure, the greater the potential for damage through gnawing.

Only one bone, a tibia from phase 17.00, showed signs of rodent gnawing. Gnawing by canids was observed on two bones from phase 15.00; a pelvis and a radius. However, this is not necessarily a true reflection of the possible extent to which gnawing will have occurred. The evidence may be merely disguised by further abrasion of the bone surface as the material is eroded within the soil, either by plough damage or natural elements. Furthermore, if exposed for a lengthy period, scavengers may have removed the bones in their entirety, leaving no trace in the archaeological record. However, at the other extremity, this minor percentage of gnawing evidence present could be indicative of immediate burial and, perhaps more importantly, discounts the theory of dog scavenging being the result of cranial bone absence.

7.4/6 Exposure To Fire

If the bone has been in a fire, its colour, texture and weight change. These variables are affected to some degree by what has happened to the bone during its disposal and subsequent burial.

Although there was evidence of bone burning recorded elsewhere on the site (Mainland 1995: 4), there were no traces to be found on any of the feline remains. However, this does not necessarily imply that such an activity did not occur; remains may not have been recovered or they may not have survived in order to be recovered.

7.4/7 Pathology

During their life, animals may develop pathological changes to the bone for a number of reasons. (**See Figures V & VI**). The animal may catch a disease, undergo a period of malnutrition or be injured as a result of an accident, fighting or hunting (Rackham 1994: 14). Injuries, which are not cared for, will result in infection, which, in turn, will affect the bone. Infections are produced by pathogenic microorganisms, which inflame the bone causing bone destruction, new bone formation or a combination of the two (Mays 1998: 123).

None of the Earl's Bu cat bones exhibited traces of any pathological condition. The lack of pathological evidence could be as a result of these cats being extremely healthy. Achieving a constant and nutritious diet would protect them, to a greater extent, from illness but the lack of injuries from fighting and hunting would also suggest domestication. However, although not improbable, this is not a likely scenario. It is more probable that these cats were dying at a young age. (**See** *7.4/9)*. A short life span would prevent age related illnesses, such as arthritis, or, if the animal

had been unfortunate enough to contract a disease, it may have died before any reactive bone formation actually took place thus creating an osteological paradox. Some diseases only show an expression in the soft tissue, leaving no diagnostic signature on the bone.

7.4/8 Butchery

Cat skinning was not an uncommon practice in antiquity. (**See** *5.7*). Nor was it uncommon to the geographical area under scrutiny. Cats, dating to the Neolithic and Late Iron Age, were found to have been utilised for their pelts in Howe by Stromness in Orkney (Smith *et al* 1994: 151) and commercial cat skinning has been recognised in medieval Perth in Scotland (Smith 1997: 773).

Skinning of the feline does not necessarily imply that the animal was raised to be skinned. A dead pet may have been used opportunistically (O'Connor 1992: 112). In the medieval period, few natural resources were wasted. Thus, if an animal had a use after death then that use was fulfilled (Smith 1998: 876).

Of the feline remains recovered from Earl's Bu, Orphir, twelve bones exhibited traces of butchery and / or skinning cut marks. (**See Summary Tables VIII & IX**). All bones from the assemblage had been thoroughly inspected under a hand lens and those that appeared to show traces of butchery or skinning marks, were confirmed under a microscope and then by Dr. Mainland.

Summary Table VIII

EARL'S BU, ORPHIR, ORKNEY: EVIDENCE OF BUTCHERY
PHASES 06.00 - 12.00 = VIKING
PHASES 13.00 - 15.00 = LATE NORSE

PHASE	BONE TYPE	SIDE	BUTCHERY
06.00	ATLAS	N/A	Y
06.00	METATARSAL III	L	Y
13.00	PELVIS	R	Y
13.00	PHALANX I	UNID	Y
13.00	TIBIA	L	Y
13.00	TIBIA	R	Y
15.00	FEMUR (PROXIMAL)	L	Y
15.00	PHALANX I	UNID	Y
15.00	RADIUS	R	Y
15.00	SCAPULA	R	Y

Summary Table IX

EARL'S BU, ORPHIR, ORKNEY: EVIDENCE OF BUTCHERY
PHASE 17.00 = DISTURBED MEDIEVAL

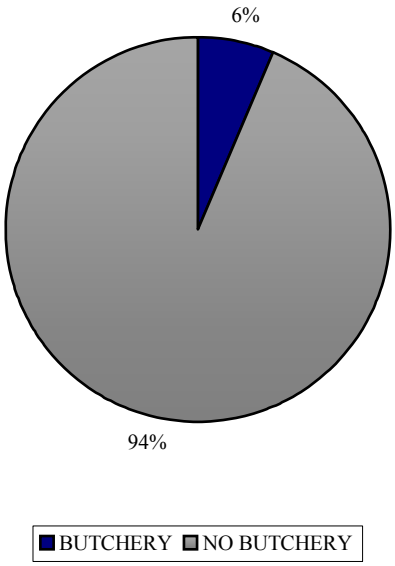
PHASE	BONE TYPE	SIDE	BUTCHERY
17.00	FEMUR	R	Y
17.00	RADIUS	L	Y

Although it is a very small percent of the collection which bear the notable marks of skinning, as previously mentioned (**See** 5.*7*), this may be absence of evidence as opposed to evidence of absence (O'Connor n.d: 3; Hall 2000: 75).

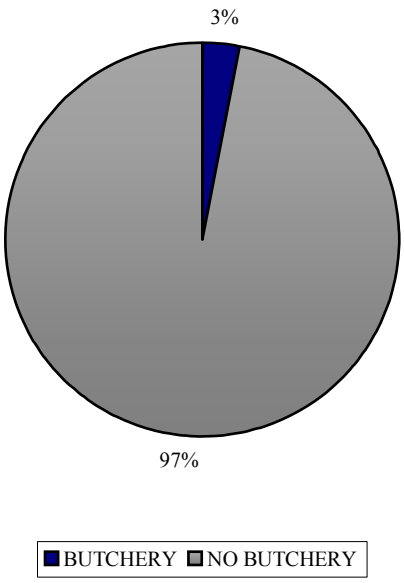
(**See Summary Table X**).

Summary Table X

EARL'S BU, ORPHIR, ORKNEY: PIECHART TO SHOW PERCENTAGE OF BONES DISPLAYING BUTCHERY: PHASES 06.00 - 15.00



EARL'S BU, ORPHIR, ORKNEY: PIECHART TO SHOW PERCENTAGE OF BONES DISPLAYING BUTCHERY: PHASE 17.00



Skinning could result in separate deposition of different elements of the limbs. If skulls were retained with the skins (**See** *7.4/2)*, or if the paws were retained for decoration on the end product, then there would be an absence of these anatomical elements within the contexts bearing the disposed carcasses.

There does not appear to be an indication of bias towards any particular bone in the case of Earl's Bu. However, the distribution of butchery evidence is interesting. (**See Summary Table XI**). There are more bones displaying butchery and / or skinning in the earlier phases, which can be expected, as phase 17.00 was disturbed and can therefore, only be treated in the superficial sense. Yet, one would expect the higher percentage of bones displaying the cut-marks to appear in the phase from which the most bones were recovered. This is not the case.

Summary Table XI

EARL'S BU, ORPHIR, ORKNEY: BUTCHERY PERCENTAGE FROM PHASES 06.00 - 15.00

PHASE	N.I.S.P.	NO. OF BONES DISPLAYING BUTCHERY	ASSEMBLAGE PERCENTAGE
6.00	5	2	40%
9.00	11	0	0%
11.00	1	0	0%
13.00	27	4	15%
14.00	2	0	0%
15.00	100	4	4%

Phase 06.00, from which only five bones were recovered, had two bones with evidence of butchery. There being more butchery and / or skinning in the earlier phases of the site may suggest that the society was developing and that resources were more marginal so the cat was used moreso for its fur and as a food source. By Phases

15.00 and 17.00, the society was more settled and at an equilibrium with the available resources thus the cat was utilised more for vermin control.

The twelve bones displaying the traces of butchery and / or skinning procedure were all photographed using a macro lens on a digital camera. (**See Figures XXIII – XXXIV**). All were placed with the proximal end of the bone facing to the left and a scale of three centimetres was used in order to establish the size of the cut marks. Arrow pointers were also utilised to indicate the area affected, as not all the marks were obvious to the human eye.

7.4/9 Age at Death

There are a number of ways applicable in determining the age of a cat at death.

7.4/9-1 Age Indication By Teeth

As aforementioned (**See** *7.4/2*), the maxilla and mandible (the upper and lower jaw), are valuable fragments for establishing how old an animal is, as they carry the teeth which undergo a sequence of eruption, wear and loss. Deciduous teeth are replaced by permanent dentition. (Payne 1973: 284). (**See Diagram IV**). Subsequent wear on permanent teeth can be used to gain an approximate, yet relatively accurate, age of an adult animal. (**See Summary Table XII**). Unfortunately, only nine teeth were recovered from Earl's Bu (**See Appendix VII**). This collection consisted of two, first molars, a second and third premolar from the mandible, a second and third premolar from the maxilla, a loose canine and a second and third premolar, which were loose also. All of these teeth were all permanent and relatively worn.

Summary Table XII

PERMANENT TOOTH ERUPTION IN *FELIS*

TOOTH	AGE
CANINE	5.5 - 6.5 MONTHS
PREMOLAR I	ABSENT
PREMOLAR II	4 - 5 MONTHS
PREMOLAR III	4 - 5 MONTHS
PREMOLAR IV	4 - 5 MONTHS
MOLAR I	5 - 6 MONTHS

(After Amorosi 1989: 116)

If the age determination of the entire assemblage were formed on the basis of this data only, then the age bracket would be deemed a minimum of four months old. While this may indeed be true, this data set is far too small in relation to the number of bones that were recovered, to be able to place any significance on this result. Similarly, the metrical data obtained from the jaw fragments is minimal due to the nature of the fragmentation of the two pieces that were large enough to be measured. (**See Appendix X**).

7.4/9-2 Epiphysial Fusion

The sequence of epiphysial fusion of a long bone can be used to establish relative age classes. The extremities of a long bone are formed from secondary ossification centres, called the epiphyses, united with the shaft, or diaphysis, of the growing bone by the growth cartilages. When bone ceases growing, the growth cartilage ossifies, fusing the epiphyses with the diaphysis. Epiphysial fusion occurs at a generally known rate, although extrinsic factors such as periods of malnutrition, can affect the chronological formation (Rackham 1994: 7 & 10). It is important to record that the specimen is from the proximal or distal end of the element because these fuse at different developmental stages (Reitz & Wing 1999: 161). Fusion is more informative

when dealing with unfused specimens of elements that fuse early and for fused elements that complete growth at the summit of the maturation process (*IBID*: 182). An obvious disadvantage is when a dimension that fuses early, is represented by a fused archaeological specimen. This bone could be from a cat that died soon after the fusion process was completed or it could have reached old age. (**See Summary table XIII**). However, as an overall indication of the age categories of an archaeological bone assemblage, epiphysial fusion is doubtless useful.

Summary Table XIII

EPIPHYSIAL CLOSURE IN *FELIS*

BONE	**AGE**
CALCANEUM	480 DAYS
FEMUR DISTAL	251 DAYS
PROXIMAL	251 DAYS
FIBULA DISTAL	435 DAYS
PROXIMAL	435 DAYS
HUMERUS DISTAL	251 DAYS
PROXIMAL	251 DAYS
METACARPAL DISTAL	200 - 341 DAYS
PROXIMAL	200 - 251 DAYS
PHALANGES	180 - 251 DAYS
RADIUS DISTAL	341 DAYS
PROXIMAL	251 DAYS
TIBIA DISTAL	341 DAYS
PROXIMAL	341 DAYS
ULNA	UNKNOWN

(After Amorosi 1989: 117 – 118)

All the cat bones from Earl's Bu were examined for epiphysial fusion. (**See Appendices VIII & IX**). Unfortunately, although there was generally, a good preservation of the remains, a considerable amount had suffered from erosion at the epiphysial end. This resulted in a restriction of the secondary data accumulation, as the whole assemblage could not be represented. However, the bones that were successfully examined, (either both or one of the proximal or distal epiphysial ends

were present), fell between the ages of less than 140 days, (phases 06.00 – 15.00), less than 200 days, (phase 17.00) and more than 480 days. (**See Summary Table XIV**).

Summary Table XIV

EARL'S BU, ORPHIR, ORKNEY: EPIPHYSIAL FUSION RESULTS

AGE RANGE (DAYS)	PHASES 06.00 - 15.00	PHASE 17.00
< 140	1	0
< 180	1	0
< 200	5	1
< 251	7	10
200 - 251	3	0
200 - 341	1	0
< 341	6	4
< 435	2	1
< 480	1	2
> 180	28	9
> 200	16	4
> 251	5	2
> 341	2	0
> 435	1	0
> 480	2	1

Ninety-five specimens were examined from phases 06.00 – 15.00; 64% of the Viking to Late Norse assemblage. Thirty-eight bones, from the disturbed phase from the medieval period, were examined, representing 59% of this collection. The stage of the epiphysial fusion was determined at the proximal and / or distal ends of the bone. This was noted as unfused, fused or that the fusion line was visible. There were no neonatal bones to record.

This data was then applied to the ageing model (Amorosi 1989: 117 – 118). There is not a known rate of the epiphysial fusion process for the feline ulna and astragalus. As consequence, six ulnas and four astragalus bones from phases 06.00 – 15.00 were omitted at this stage of the study, as were three ulnas from phase 17.00. As previously discussed, epiphysial fusion is more informative when unfused bones are studied. Twenty four specimens, (25%), from phases 06.00 –15.00 and fifteen specimens,

(39.5%), using Amorosi's guide, were aged to being 341 days old or less at the time of death. The cats pertaining to these bones were definitely under a year old at death. In comparison, only four bones, (3 x 06.00 – 15.00; 1 x 17.00), could be aged definitively, to be in excess of a year; a minimum of 435 days old. The remainder of the specimens fell into an indeterminate range of, less than 435 – less than 480 days old at death, and, more than 180 – more than 341days old at death. The cats, to which the latter bones belonged, could have been under or very much older than twelve months old on death.

It is interesting to note that three of the bones, which were aged to under a year, are radiuses from the right hand side. This indicates that three of the six cats from the Viking – Late Norse assemblage were juvenile. The sexual maturity of the modern domestic cat is 7 – 12 months for a queen and 10 – 14 months for a tom (Taylor 1989: 203). This high percentage, (50%), of the minimum number of individuals being representative of the cats not having reached maturity would suggest fatal illness or an intentional death. The lack of pathological evidence from Earl's Bu can possibly discount the severity of disease yet, the evidence of butchery and / or skinning can only serve to further substantiate culling on site. This suggestion is fuelled moreso as one radius from context 417, sample T4, displays evidence of cut marks. (**See Figure XXXII**). The small percentage of bones dated to over a year old at death, (3%), could suggest that one or two cats were allowed to reach sexual maturity in order to breed litters for culling.

7.4/9-3 Morphometric Dimensions

Circumstances permitting, metric dimensions were taken from the Earl's Bu cat bone assemblage. These measurements were taken using a set of digital callipers and followed the instruction of Driesch (1976). As with the epiphysial fusion data

accumulation, difficulties were encountered. Measurements could not be taken if elements had not fused. Similarly, if the bone was broken, the greatest length and the greatest breadth of the proximal or distal end could not be registered.

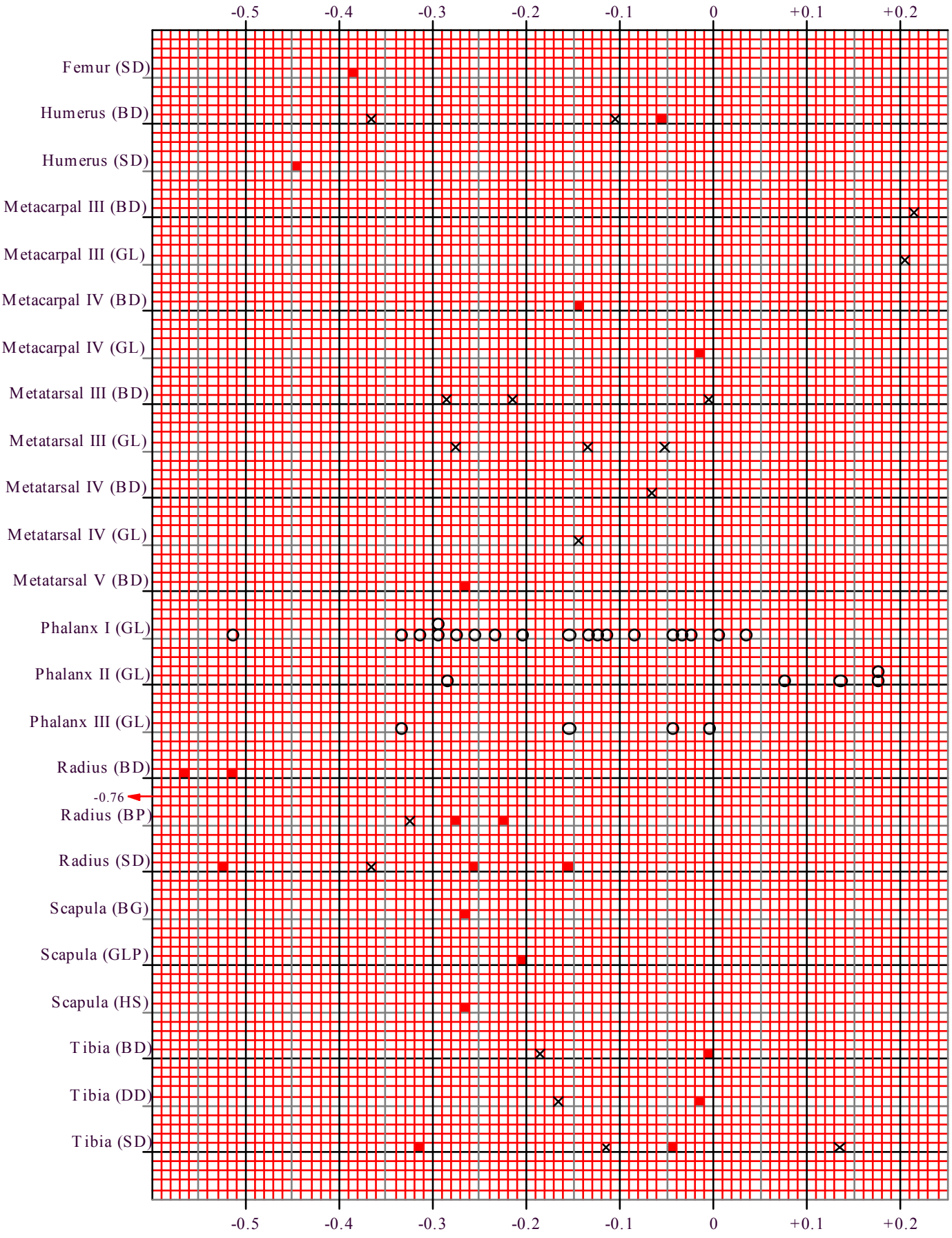
Sixty-one bones from phases 06.00 – 15.00, (41%), and twenty-three bones from phase 17.00, (36.5%), were measured. (**See Appendices XI & XII**). These are poor percentages, from an already small data set, when trying to establish a reasonable archaeological interpretation. Sample size is of great import as the data range is dependant upon the number of observations made (Reitz & Wing 1999: 172).

Although the exact relationship between an archaeological and a modern feline cannot be established, the interpretation of the morphometric data needed to be based upon modern data in order to gain a qualified image of the cats from Earl's Bu. For this purpose, specimen material, a cat bone assemblage of a single, adult individual, archived in the Environmental Laboratory at the University of Bradford, was utilised as a standard reference. All the available bones were measured and, to eliminate error, the same procedure was applied and the same equipment used. Thus, if any error did occur, the data sets would be consistent and comparable to a greater extent. Three first, second and third phalanges were measured and an average calculated. (**See Appendix XIII**). This standard did not necessarily represent an average cat, however, its usefulness was in being used as a known reference against which, trends could be observed. Logarithmic ratios were then calculated for both the modern and archaeological bone measurements. (**See Appendices XIV & XV**). This is achieved by dividing the value of the archaeological specimen's measurement by the same measurement in the standard specimen. This calculates the ratio, which is then converted to the logarithmic scale. In plotting the archaeological ratios, where the standard is zero, the dimensions can be visually compared to those of the reference

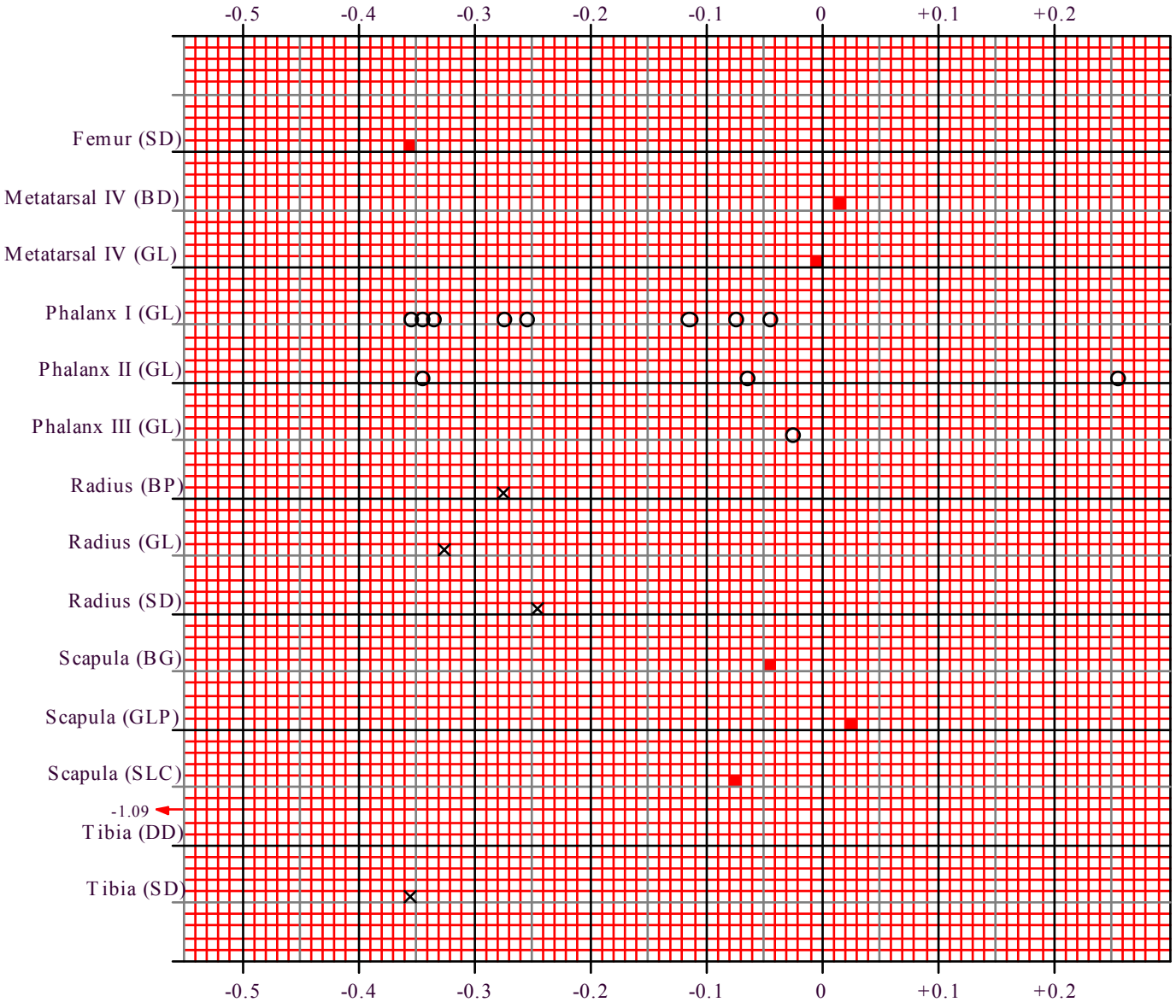
material as the log ratio technique expresses the differences between the two data sets by means of the logarithm of the ratio between the measurements (Erricker 1970: 98 – 99; Payne & Bull 1988: 41). Positive values are indicative of the dimensions being relatively larger than the standard. Negative values are indicative of the dimensions being relatively smaller than the standard. (**See Summary Graphs I & II**).

Upon review of the logarithm ratio graphs, there is a definite pattern apparent. The difficulty with interpretation lies in the fact that the log ratio data is based upon the bone metrical data as opposed to the whole assemblage from both phase categories. (41% 06.00 – 15.00; 36.5% 17.00). However, there is always the assumption that this proportion of the assemblages is representative of the whole.

Summary Graph I



Summary Graph II



Key to summary graphs: - x = Left Hand Side

■ = Right Hand Side

○ = Unidentified to Side

In both assemblage categories, the vast majority of the bones have a negative relationship in comparison to the standard. In phases 06.00 – 15.00, two first phalanges, four second phalanges, one left metacarpal III and one tibia displayed positive ratios. These bones represent only 13% of the elements compared. Similarly, in phase 17.00, only three bones had a positive correlation; a right metatarsal IV, a second phalanx and a right scapula. Of the elements compared, these specimens were representative of 13% also. Furthermore, there are few elements plotted to suggest that these cats were bordering adulthood. Two of the bone ratios from phases 06.00 – 15.00 are plotted off the negative scale, such is the difference in size. These bone measurements are the smallest breadth of the diaphysis of a left humerus, (-1.05), and the greatest breadth of the proximal end of a right radius, (-0.76). The right radius is the same bone that has evidence of cut marks. (**See page 52**). There is a right tibia from phase 17.00 that is also plotted off the negative scale with the ratio calculated from the greatest depth of the distal end, (-1.09). However, the ratio calculated from the smallest breadth of the diaphysis, (-0.36), while still less than the standard, is considerably greater in comparison to the aforementioned ratio.

While the log ratio data, on the face of it, does appear to correlate with the bone fusion data, there being a juvenile feline population on the Earl's Bu site, there are other possibilities that require consideration.

7.5 Wild, Feral or Domesticated?

It is reasonable to discount these remains as belonging to wild cats as the wild cat is not indigenous to Orkney (Barrett 1997: Table 5a & 5b; Mainland, pers comm. 2000). Furthermore, the wild cat is a solitary creature and defends a territory, which, on average, covers approximately ¼ square mile (Morris 1984: 41). This being the likely scenario in antiquity, it is highly unlikely that even if the wild cat had reached the Orkney Islands, it would have become a sociable creature and the finds indicate the presence of a cat community. The element of human intervention suggests control over the animals and it is improbable that a wild cat would succumb to the nature of this as it avoids contact with humans.

Feral cats are domestic cats that have reverted to living wild. Some are lost or abandoned pets while others are the descendants of such pets and have lived wild all their lives. These cats usually live in colonies composed of related animals. The colony establishes an order of rank among its members and other cats are deterred from entering the colony. Scavenging is the process by which sustenance is usually acquired (*IBID*: 43). The possibility of the Earl's Bu remains being representative of feral cat remains is relatively feasible. However, this would further suggest that there was initially domestication of cats in the first place. If, as Smith suggests, the cat was skinned at the end of its life in order to limit the waste of a resource (1998: 876), then this is unlikely as the bones indicate an early slaughter. If these were undersized feral cats that had not reached their genetic potential, the bone fusion data would recognise this, as the bones, albeit small, would have been fused at the epiphysial ends. If feral cats had died at a young age due to malnutrition, there would have been indicators pointing to this in the make up of the bone.

A comparison of all the primary and secondary data accumulation from the Earl's Bu site at Orphir, all seems to lead to a single interpretation. The majority of the cats were juvenile at death. There was no trace of pathology on any of the bones and few elements had suffered from canid and / or rodent gnawing, suggesting immediate burial. The evidence of butchery can also be feasibly rebuked. If the human community was under extreme hardship, they could have slaughtered the cats for eating. However, this being the scenario, they would have had to have waited until these cats were of a reasonable size for consumption, which would have required additional food to help them attain a suitable body weight. The presence of other domesticated species on the site at the same time as the felines further contests this possibility (Mainland *in prep.*).

The most astute reason for these cats being present on this island testifies to the purpose of skinning; they were deliberately cropped for the source of pelts. The evidence of cut marks from skinning, albeit minor, supports this theory. These animals were probably domesticated but only in the manner by which they were exploited, be it for profit or resource material. The question of where the first cat came from is difficult to distinguish. It may have been a feral animal which was captured, it may have been introduced to the settlement for the purpose of breeding or it may have even been a cared for pet that was latterly exploited. They were domesticated in the sense that these creatures were being controlled. There was an administration involving the breeding, feeding, culling and skinning of the cat and the subsequent disposal of the waste material. There being a small percentage of remains of cats that had reached maturity would suggest that some cats were retained for breeding purposes. Unfortunately, none of the elements were sexed but there is a distinct possibility that there may have been more females on the site to maintain

breeding stock although any queens proving to be barren would doubtless have been slaughtered. It is difficult, when dealing with such a small data set, to establish if the pelt was being exported. A determination of this would require a much larger assemblage. The lack of cranial bones leads to the assumption that the skull was retained for decoration, particularly if the waste was immediately buried, thus removing the possibility of scavenging having occurred.

Observations from past reports, (for example, Noddle 1974; Maltby 1979; O'Connor 1986: 186), have stated that cat bones, recovered from medieval settlements, are commonly from immature animals. This being a result of a weak feral population or deliberate slaughter by human intervention (O'Connor 1992: 110 – 111).

8.0 Comparable Site Data

Eighteen other archaeological sites have been reviewed to act as a comparative with the data disseminated from Earl's Bu in Orkney. (**See Summary Table XV**). The reasoning for this is to establish just how important cat bones have been viewed in past excavations and also to see if there are any parallels observed between the Earl's Bu assemblage and the others under review. (It must be noted that when ratios were calculated between cats and domesticates, and cats and wild species, birds were not included nor were those bones that had not been identified to species).

8.1 The medieval Netherlands

From thirty-nine archaeological sites, which dated 800 – 1600AD, that were excavated in the Netherlands between 1966 and 1989, twenty-five sites reported finds of cat bones (Groenman-van Waateringe & van Wijngaarden-Bakker 1990). This abundance alone would suggest the requirement of further analysis of these remains and yet the reports fail to mention anything other than the presence of the species.

There is no N.I.S.P. count and any evidence in favour of butchery and / or skinning marks, burning, pathology and the reason for death is not discussed. This leads to the assumption that such diagnostic processes were never carried out. The reports do not disclose as to whether or not these remains were archived, however presuming they were suitably stored, it is hoped that at some point, they will be reassessed. It is more than apparent as to how informative just a small archaeological assemblage is and as such, these bones should never have been so easily dismissed.

Key to Summary Site Data Table

MED-NET: A number of miscellaneous, medieval sites excavated in the Netherlands

CRO-CAI: Crosskirk, Caithness

ODE-DEN: Odense, Denmark

BRO-ORK: Brough of Birsay, Orkney

BRB-ORK: Brough Road, Birsay, Orkney

BVS-ORK: Beachview, Birsay, Orkney

QUA-ORK: Quaterness, Orkney

HOW-ORK: Howe by Stromness, Orkney

FRE-CAI: Freswick Links, Caithness

TYB-DEN: Tybrind-Vig, Denmark

NIC-AND: St. Nicholas Farm, St. Andrews, Scotland

SCA-SHE: Scalloway, Shetland

BON-ORK: St. Boniface Church, Papa Westray, Orkney

PER-SCO: Perth, Scotland

STA-MON: Star Garage, Montrose, Scotland

CAMB: Cambridge, England

METHOD OF RECOVERY:	**H**	=	Hand recovery
	S	=	Sieve (Wet – flotation or riddle)
CONTEXT TYPE:	**M**	=	Midden (Primary context)
	P	=	Pit (Primary context)
	W	=	Well (Primary context)
	D	=	Ditch (Secondary context)
	L	=	Layer (Secondary context)
	O	=	Other
BONE TYPE PRESENT:	**N**	=	Not specified
	Y	=	Detailed
CONDITION:	**N**	=	Not specified
	Y	=	Detailed
N.I.S.P.		=	Number of fragments
AGE AT DEATH:	**N**	=	Not specified
	Y	=	Detailed
SIZE AT DEATH:	**N**	=	Not specified
	Y	=	Detailed
PATHOLOGY:	**N**	=	Not specified
	NO	=	Not present
	Y	=	Detailed
EVIDENCE OF BURNING: (No / Yes)	**N**	=	Not specified
	NO	=	Not present
	Y	=	Detailed
BUTCHERY:	**C**	=	Cut marks
	CH	=	Chop marks
	S	=	Saw marks
REASON FOR DEATH:	**S**	=	Slaughter

	T	=	Trauma
	D	=	Disease
	U	=	Unknown
DOMESTIC / FERAL / WILD:	**D**	=	Domestic
	F	=	Feral
	W	=	Wild
	U	=	Unknown

Summary Table XV

SITECODE	**MED-NET**	**CRO-CAI**	**ODE-DEN**	**BRO-ORK**
YEAR OF EXCAVATION	VARIOUS	1966-1972	1970	1973-1974
METHOD OF RECOVERY	Not specified	Not specified	Not specified	Not specified
CONTEXT TYPE	U	L	P	L
BONE TYPE PRESENT	Y (only to species)	Y	Y	NO
CONDITION	N	Y (damaged)	Y (well pres)	N/A
N.I.S.P.	N	7	1783	N/A
MINIMUM NO. OF INDIVIDUALS	N	1	68	N/A
AGE AT DEATH	N	N	Y (extensive)	N/A
SIZE AT DEATH	N	Y	Y (extensive)	N/A
PATHOLOGY PRESENT	N	N	NO	N/A
EVIDENCE OF BURNING	N	N	NO	N/A
BUTCHERY	N	N	C (High %)	N/A
REASON FOR DEATH	U	U	S	N/A

APPROXIMATE DATE	800-1600AD	Norse	1070± 100AD	Pictish - Norse
DOMESTIC/FERAL/WILD	U	(?) W	D	N/A
RATIO OF CATS : DOMESTICATES	Total numbers unknown	Total numbers unknown	1:0.20	N/A
RATIO OF CATS : WILD SPECIES	Total numbers unknown	Total numbers unknown	1:0.84	N/A

Summary Table XV continued…

SITECODE	**BRB-ORK**	**BVS-ORK/1**	**BVB-ORK/2**	**BVB-ORK/3**
YEAR OF EXCAVATION	1976-1978	1978	1979	1979
METHOD OF RECOVERY	H S - 1cm mesh	H S - 1mm mesh	H S - 1mm mesh	H S – 1mm mesh
CONTEXT TYPE	L M	L M	L M	L M
BONE TYPE PRESENT	Y (only to species)	Y (only to species)	Y (only to species)	Y (only to Species)
CONDITION	Y (well pres)	N	N	N
N.I.S.P.	2	22	19	1
MINIMUM NO. OF INDIVIDUALS	2	?	?	1
AGE AT DEATH	N	N	N	N
SIZE AT DEATH	N	N	N	N
PATHOLOGY PRESENT	N	N	N	N
EVIDENCE OF BURNING	N	N	N	N
BUTCHERY	N	N	N	N

REASON FOR DEATH	U	U	U	U
APPROXIMATE DATE	Pre Norse & Norse	Circa 1100AD	1020-1280AD	Late Norse
DOMESTIC/FERAL/WILD	U	U	U	U
RATIO OF CATS : DOMESTICATES	1:390	1:40	1:32	1:114
RATIO OF CATS : WILD SPECIES	1:648	1:8	1:94	1:122

Summary Table XV continued…

SITECODE	**QUA-ORK**	**HOW-ORK**	**FRE-CAI**	**TYB-DEN**
YEAR OF EXCAVATION	1979	1978-1982	1980-1982	1984-1986
METHOD OF RECOVERY	S - 2mm mesh	H S - not specified	H S - 0.5mm mesh	Not Specified
CONTEXT TYPE	O	L	L M	L
BONE TYPE PRESENT	Y	Y	Y (only to species)	Y
CONDITION	N	Y (well pres)	Y (extreme fragments)	Y (excellent)
N.I.S.P.	Not Specified	144	50	100 approx.
MINIMUM NO. OF INDIVIDUALS	1	(?) 5	N	(?) 5
AGE AT DEATH	Y	Y (extensive)	N	N
SIZE AT DEATH	Y	Y (extensive)	N	N
PATHOLOGY PRESENT	NO	NO	N	NO
EVIDENCE OF BURNING	NO	NO	N	NO
BUTCHERY	NO	C % not specif	N	C (High %)

REASON FOR DEATH	S (Predatory)	S	N	S
APPROXIMATE DATE	Modern	Neolithic - Late Iron Age	Norse	Late Mesolithic
DOMESTIC/FERAL/WILD	D	D	U	W
RATIO OF CATS : DOMESTICATES	N/A	1:164	1:19	No domestic Animals
RATIO OF CATS : WILD SPECIES	N/A	1:16	1:3	1:8.25

Summary Table XV continued…

SITECODE	**NIC-AND**	**SCA-SHE**	**BON-ORK**	**PER-SCO**
YEAR OF EXCAVATION	1986-1987	1989-1990	1990	1992
METHOD OF RECOVERY	Not specified	Not specified	S - not specified	H S -1mm mesh
CONTEXT TYPE	L	L M	L	D M P
BONE TYPE PRESENT	Y	Y	Y	Y (only to species)
CONDITION	Y (v. frag'ted)	Y	Y (well pres)	N
N.I.S.P.	3	6	7	131
MINIMUM NO. OF INDIVIDUALS	2	1	1	?
AGE AT DEATH	Y	Y	Y (mature)	N
SIZE AT DEATH	Y	Y	Y (robust)	N
PATHOLOGY PRESENT	NO	N	Y	N
EVIDENCE OF BURNING	NO	N	NO	N
BUTCHERY	NO	N	NO	C (% not spec)

REASON FOR DEATH	U	U	U	S U
APPROXIMATE DATE	1200-1300AD	Medieval	Pre Norse	1200-1500AD
DOMESTIC/FERAL/WILD	U	U	D	U
RATIO OF CATS : DOMESTICATES	1:118	Total numbers unknown	Total numbers unknown	1:27
RATIO OF CATS : WILD SPECIES	No wild species	Total numbers unknown	Total numbers unknown	1:0.07

Summary table XV continued…

SITECODE	**STA-MON**	**CAMB**
YEAR OF EXCAVATION	1992-1993	1993
METHOD OF RECOVERY	Not specified	S - 0.5mm Mesh
CONTEXT TYPE	L	W
BONE TYPE PRESENT	Y (only to species)	Y
CONDITION	N	Y (excellent)
N.I.S.P.	11	1943
MINIMUM NO. OF INDIVIDUALS	3	79
AGE AT DEATH	N	Y (extensive)
SIZE AT DEATH	N	Y (extensive)
PATHOLOGY PRESENT	N	NO
EVIDENCE OF BURNING	N	NO
BUTCHERY	N	C CH (89%)

REASON FOR DEATH	U	S
APPROXIMATE DATE	Medieval	1300AD
DOMESTIC/FERAL/WILD	U	(?) D
RATIO OF CATS : DOMESTICATES	1:14	N/A
RATIO OF CATS : WILD SPECIES	No wild species	N/A

8.2 Excavations at Crosskirk Broch, Caithness

Excavated between 1966 and 1972, this Norse site unearthed the finds of seven damaged, cat bones from a layer context (Macartney 1984: Illustration 83). There may have been a bias in recovery although the method of retrieval is not discussed. However the nature of the site, a broch, would deem the possibility of such a minor assemblage. Furthermore, a diagnostic study of the bones in comparison with a modern adult domestic cat and a wild cat suggest that these are the elements of a mature wild cat. These being the remains of an individual cat are feasible when the nature of a wild cat is considered. (**See page 56**). The bones were not examined for pathology, burning or butchery and the reason for death was not ascertained.

8.3 Viking Age Odense, Denmark

This is a comprehensive report on the excavation of a pit undertaken in 1970 that contained the remains of at least sixty-eight domesticated cats (Hatting 1990). The well-preserved bones were radiocarbon dated to the Viking Age. Although the method of recovery is not discussed, the area of excavation was extended to outside of the pit, suggesting that these finds were highly valued. In addition to all the bones being systematically and metrically analysed, comparative material was utilised in order to establish the size and sex of the Odense cats. The nature of death was determined as being the result of a powerful jerk to the head, prior to the creatures being skinned. As

with the Earl's Bu cats, the majority of these animals were under a year old at death and were probably kept in captivity. Cut marks on the skulls and the lower jaws show that the purpose of slaughter was for fur production. This is substantiated further by the number of felines in ratio to other animals, both domestic and wild, on the site. The presence of cats is far greater in comparison to other species. Taking the year of excavation into consideration, it is apparent that this assemblage was recognised for its archaeozoological and culturally historic importance from the onset and an extensive and informative study continued throughout.

8.4 An Absence of Cats in the Brough of Birsay

This excavation was undertaken in 1973-4 and although there were no felines recovered, other animal bone material was found (Seller 1982: 132 *et seq*). It was assumed that these elements were the remains of kitchen refuse which would account for the lack of cat. The method of recovery is not specified however, small rodent remains were found which, suggests that the material was thoroughly scrutinised. That this site was a domestic environment is apparent, due to the evidence in favour of animal husbandry, so while it is perhaps unusual that there were no cats present in this settlement during the Pictish and Norse periods, it needs to be considered that there may have been external factors that removed the evidence prior to the excavation.

8.5 Brough Road, Birsay, Orkney

The Brough Road site, dating to the Pre Norse and Norse periods, was excavated between 1976 and 1978 (Morris & Rackham 1992: 231). The report states that there was no strategy formulated for the environmentally related finds at the onset and all ecofactual recovery was derived from hand excavation for the first two seasons of investigation. Latterly, wet sieving on a 1cm mesh was utilised. This initial procedure

may account for the very small N.I.S.P. count. While only two cat bones were recovered, reported to represent two individuals, a high percentage of rodent bones were retrieved. This infers that if smaller bones were not missed, then it is highly unlikely that the larger cat bones would be missed. However, it is possible that other cat elements, if fragmented, were identified to an indeterminate small mammal class. It must also be considered that only two cats were present at this site although, wild cats are an unlikely probability as they were not indigenous to Orkney at this time (Barrett 1997: Table 5a & 5b; Mainland, pers comm. 2000).

There is no suggestion that the feline finds were of any importance, nor is there any mention of the bones having been assessed for evidence of pathology, butchery or burning. The ratios are high, in favour of domesticates and wild species. This is to be expected when the feline N.I.S.P. count is so small.

8.6 Beachview, Birsay

The Beachview 'Studio' site, Area 1 structure was dated to the Eleventh Century, a time when Birsay was home to the Earls of Orkney (Morris 1996: 6). Hand 'picking' and wet and dry sieving to a 1mm mesh was used in the 1978 excavation (Rackham 1996: 161). This resulted in the recovery of twenty-two cat bones. The ratios are relatively high, reflecting that for each individual cat on the site, there were forty other domesticates and eight wild species. Yet, despite representing a reasonable percentage of the entire mammal bone assemblage, there was no analysis of the feline remains other than to say that cat bones were found more frequently than dogs. The minimum number of individuals was not calculated.

8.7 Excavations at Beachview, Burnside, Birsay: Areas 2 and 3

Both of these sites were excavated in 1979. Using the same recovery methods as at Area 1, Areas 2 and 3 had evidence of the presence of cats. Only one bone was found in Area 3 and Area 2 had a N.I.S.P. count of nineteen (Morris 1996: 50 & 66). As with the Beachview 'Studio' excavation and subsequent post-excavation procedure, no further analysis was carried out on these bones.

8.8 Quanterness, Orkney

This is a Neolithic tomb site, which was excavated in 1979. The remains of cat were found and subsequently established to be the fragments of a skull from a six-week-old kitten. Rather than being associated with the Neolithic, there was positive evidence to deem these fragments as intrusive, probably the result of a fox, (*Vulpes vulpes*), or otter, (*Lutra lutra*), den. The bones were discounted as belonging to a wild cat as it is unlikely that wild cat would have been part of the Orkney fauna in the post-Pleistocene (Clutton-Brock 1979: 112 & 115). These fragments were recovered by wet sieving with a 2mm mesh.

8.9 Howe by Stromness in Orkney

The one hundred and forty four cat bones that were recovered from Howe were thoroughly examined and no traces of pathology or burning were found. However, there was evidence of butchery. Estimated to be representative of at least five individuals, the epiphysial fusion analysis indicated that kittens, as well as adult cats, were slaughtered, probably for their pelt. Tooth overcrowding in the mandibles was interpreted as a sign of domestication (Smith *et* al 1994: 146 & 149).

The extensive research on this assemblage is definitive proof that cats were being skinned in Orkney from as early as the Neolithic.

8.10 Freswick Links, Caithness

Work took place on the Norse settlement at Freswick Links, Caithness between 1980 and 1982. Hand 'picking' and wet sieving on a 0.5mm mesh were the methods used in recovery. The presence of cat was found in the midden layers, there being a N.I.S.P. count of fifty, although the bones were extremely fragmented. It is, perhaps, due to the level of fragmentation that no further analysis was carried out on the remains. However, the report states that, the quantities of the entire mammal bone assemblage was minimal, offering little data for interpretation (Rackham 1992: Table 13 & 85). Yet, one in three wild animals at this site was a cat.

8.11 Exploitation of the Wild Cat in Mesolithic Denmark

This report comprises the detailed study of the bones of wild cat from the settlement Tybrind Vigg (Trolle-Lassen 1987). Ontogenetic age determination, measurement, calculation of the minimum number of individuals, evaluation of the skeletal representation and the registration of cut marks and breaks are all issues that were addressed. Such methodology allowed for a reconstruction of the activities that occurred in connection with the prehistoric exploitation of the cat at this site. Representing a minimum number of five cats, one hundred bones of excellent condition were recovered. Cut-marks, the result of butchering the animal, were found on a high percentage of the bones and indicated disarticulation and dismemberment. The report also suggests that, due to the known period of slaughter of one of the individuals, autumn was the most favourable time for hunting and trapping of the wild cat. This was likely to be due to the cat's newly acquired winter coat (Tetley 1941: 23).

8.12 St. Nicholas Farm at St. Andrews

At the site of a medieval leper hospital at St. Nicholas Farm, St. Andrews in Scotland, only three, extremely fragmented, cat bones were recovered. The location of the bones rendered the possibility that they were representative of two cats. Furthermore, these were not young animals (Smith 1995a). It could be considered that these cats were either feral and scavenging from the hospital kitchen waste or, they were domesticated animals who befriended the leprosy patients.

8.13 A Medieval Broch in Scalloway

The threat of destruction to the site initiated investigation. Six cat bones were recovered from the entire site, although, this is not surprising considering the nature of the site. These were identified to the anatomical element and measured (O'Sullivan 1998). This was a single, mature individual but the reason for death was not established. No further analysis was spent on these remains. While not suggested, as with the Neolithic tomb site at Quanterness on Orkney, it is feasible that these remains were intrusive to the context. (**See 8.8**).

8.14 St Boniface Church, Papa Westray, Orkney

Dating to the pre-Norse period, the site of the church proffered the remains of an individual cat, seven bones in total. Recovered from a layer, the elements were very well preserved and subsequent analysis allowed an interpretation of these bones having belonged to a very robust, mature, domesticated male cat. The feline bones were an exception to the rest of the site's mammal bone assemblage in that they displayed no butchery marks. In contrast, the cat was quite old at the time of death and there was evidence of arthritis related pathology on its distal humerus

(McCormick 1998: 147). This cat may well have been tolerated due to its usefulness for keeping the rodent population under manageable control.

8.15 Excavations at 80 – 86 High Street, Perth

In advance of redevelopment, an excavation was carried out on this site in 1992. One hundred and thirty one bones, identified as cat, were recovered by hand 'picking' and sieving on a 1mm mesh. The skinning of cats was observed in the form of thin knife cuts on the mandibles, skulls and a single humerus (Smith 1997: Table 2 & 768). This practice may even be related to the naming of a nearby junction to the site called Skinnergate. Unfortunately where the animal bone is concerned, this report is merely a summary. However, work is currently in preparation regarding the butchery found on the feline remains (Hodgson & Jones: in prep). This study will no doubt itemise all the finds and hopefully the subsequent analysis will establish the age at death and the minimum number of individuals.

8.16 Star Garage, Montrose

This small scale excavation of stratified medieval deposits was initiated in 1992 (Mackenzie 1995: 36). Eleven bones, identified as cat, were recovered, although, the recovery method is not mentioned. These bones were interpreted as being representative of a minimum of three individuals but there was not a further systematic analysis of these bones (Smith 1995b). This is unfortunate as knife cuts were found on the distal end of a dog humerus, which were probably inflicted during skinning and it would have been interesting to see if there were similar marks on any of the cat bones.

8.17 Murder in Cambridge

The partial skeletons of seventy-nine cats were recovered from a well in Cambridge (Luff & García 1995: 93). The material was retrieved, being wet-sieved through a

0.5mm mesh. Eighty percent of the bones, which were in an excellent condition, displayed evidence of cut and / or chop marks. The location of these marks indicated that these animals had been slaughtered by having their throats cut then they were skinned and dismembered for consumption by the town's inhabitants. There was a very detailed and systematic analysis of this assemblage and comparable data provided. That these cats were eaten is definitive, however, the reason for the consumption is unknown, be it for famine or fare. Cat strongly resembles the meat of hare, so it may have been used to deceive unsuspecting customers (*IBID*: 108).

9.0 **Conclusion**

From having reviewed the eighteen site reports and systematically analysed the cat bone assemblage from Earl's Bu, Orphir in Orkney, there are a number of issues that have come to fruition. Notably, that there is an apparent difference, from site to site, with regards to the importance of cat bone remains.

There is no particular pattern, such as the type of excavation or year of excavation and yet, while some archaeological investigations conduct a thorough analytical procedure on the remains, others dismiss the assemblage once an identification to the species has been made. This could possibly be understood if the assemblage was minor and / or severely fragmented, however, this is not necessarily the case. For example, the seven bones recovered from St. Boniface Church in Orkney were thoroughly examined and a suitable interpretation concluded. Yet, the assemblages recovered from the excavations at Beachview, Birsay were only identified to species. It may well be that there is ongoing research concerning these elements but if this is the scenario, the report editor should advise the reader of such a situation, as is the case with the Perth cat bone assemblage. Similarly, if there are funding constraints, which limit the level

of examination, then this should be noted to allow for the potential of future research, rather than the simpler, but inadequate, dismissal of the finds.

Furthermore, when the assemblage is small, although more difficult if not impossible to establish size, sex and the age at death of the animal, it should be standard procedure to establish the minimum number of individuals and to check for evidence of pathological conditions, burning and / or butchery. Such data must be ascertained when the ratios between cats and domestic animals, and cats and wild species are high as this is indicative of cats having been introduced deliberately to the site, this being representative of the number of domesticates present for each individual feline. For example, at Freswick Links, Caithness, one in nineteen domesticated animals was a cat and at Montrose, one in fourteen animals was a cat. Neither of these sites made a thorough examination of the cat bone assemblages that were recovered. There is an obvious difficulty in recognising cut-marks on a bone due to the fineness in some cases of the incisions, as was realised when the Earl's Bu bones were studied. However, these evidential traces of the economic value of the cat are a vital element to an archaeological interpretation. As such, it is necessary to have trained personnel to deal with these remains otherwise important facts can easily be missed. An absence of cut-marks will serve to eliminate cat skinning on a site, which is a more desirable scenario as opposed to a hypothetical possibility if checks have not been made.

There does not appear to be a bias of recovery among the various context types. However, the method of recovery is not always specified. This is unfortunate as it limits comparisons between the sites. The earlier excavation reports, 1970's, do not mention this although, wet and dry sieving did not become commonplace until the early eighties. Sieving, albeit a more stringent method of recovery, should not necessarily limit the number of finds providing site personnel know what to look for.

Such a restriction was certainly not encountered at four sites in particular. Odense and Tybrind Vigg in Denmark, Cambridge in England and Howe by Stromness in Orkney are all sites that valued the feline remains and at each, a detailed research programme was administered. However, it must be considered that if the cat bone assemblages were much smaller by comparison, would there have been such a stringent process? Such a question is obviously unanswerable. The fact is, the bones were extensively researched in each case and have provided a wealth of information. All display definitive proof of the exploitation of cats for their pelt and, when compared, it seems that such practice had been occurring from the Late Mesolithic through to the Viking era. These sites also serve to quantify the data accumulated from Earl's Bu. This is by no means an exclusive site but the detailed analysis has further substantiated the previous research.

The five sites, Earl's Bu inclusive, bore a similarity of evidence in five main areas. The bone assemblages were well preserved which suggests an immediate burial of the remains. It was probably common practice to discard the carcass once the animal had been skinned. None of the bones displayed an evidence of burning, this is related moreso, to ritual disposal and these animals served an economic usage; they were not worshipped by any stretch of the imagination. Similarly, there was a distinct absence of any pathological condition. With the exception of the wild cat at Tybrind Vigg, these cats were kept in captivity for the purpose of culling, only a small number were allowed to reach sexual maturity so that they could be utilised for breeding. An existence of this type would obviously reduce the possibility of age related illnesses, such as arthritis, occurring. This short life span would also reduce the possibility of any disease impregnating the bone thus there would not be a visual observation of this sort to be recognised.

These cats were slaughtered, of that, there is no doubt. Three of the sites, Odense, Tybrind Vigg and Cambridge, showed a very high percentage of cut and / or chop marks on the bone assemblages. The percentage was not specified in the report from Howe by Stromness and the percentage of skinning was minor at Earl's Bu, nevertheless, the evidence, albeit minimal, was apparent. An opportunist may suggest that the Howe and Earl's Bu cats were pets that had died naturally and were then skinned but the ageing of the assemblage at death discounts such a theory.

In direct comparison, the remains of the individual male cat from St. Boniface church in Orkney provide definitive proof that while at some sites, cats were being bred for culling, some felines were cared for companions. The reason for why this mature cat, dating to the pre-Norse, was treated as a pet is indiscernible. Indeed, it may have even been the exception to the rule as no other finds indicating the same circumstance in this geographical area have been reported, then again, they simply may not have been discovered yet. O'Connor states that it is an open question, as to whether or not, cats in the Ninth to Twelfth Century towns in northern Europe existed as maintained companion animals (2000:19), similarly, this is probably applicable to rural settlements such as the Orkneys.

10.0 Recommendations

The cat is a diverse creature. It has been accepted into the homes of our ancestors and it has been sincerely revered in antiquity. In contrast, it has been seen as the servant of the devil and the evil familiar of witches. The creature has been worn as decoration and eaten in times of strife.

The feline has been present in society, for whatever reason, for an age and there is no doubt that valuable archaeological information can be gained if the remains of this animal are researched to an uppermost.

The following are recommendations of procedure for the treatment of feline remains: -

10.1

Prior to the undertaking of an excavation, all site personnel should be familiarised with the nature of the finds that they are likely to encounter and a suitable environmental sampling strategy put in place.

10.2

Regardless of the size of any cat bone assemblage recovered, the bones should be cleaned and stored as normal practice.

10.3

A detailed and systematic analysis should be carried out on the bones. A N.I.S.P. count calculated and the minimum number of individuals established.

10.4

Standard procedure should be introduced to all post excavation research, whereby the elements are checked for evidence of burning, pathological conditions and butchery and / or skinning.

10.5

Any artefacts found to be in association with cat bones remains should be recorded as being so thus allowing the analysis of possible ritual practice.

10.6

Where possible, the age at death of the cat should be established through epiphysial fusion and metrical data.

10.7

If time and / or funding constraints do not allow for intensive research, such an acknowledgement should be referred to in the site report. Similarly, if there is ongoing research after the site report publication, then this must also be referred to.

10.8

A methodical study of previous research will enable the clarification of an interpretation.

Above all, cat bones must not be so easily dismissed.

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13.0 Illustrations

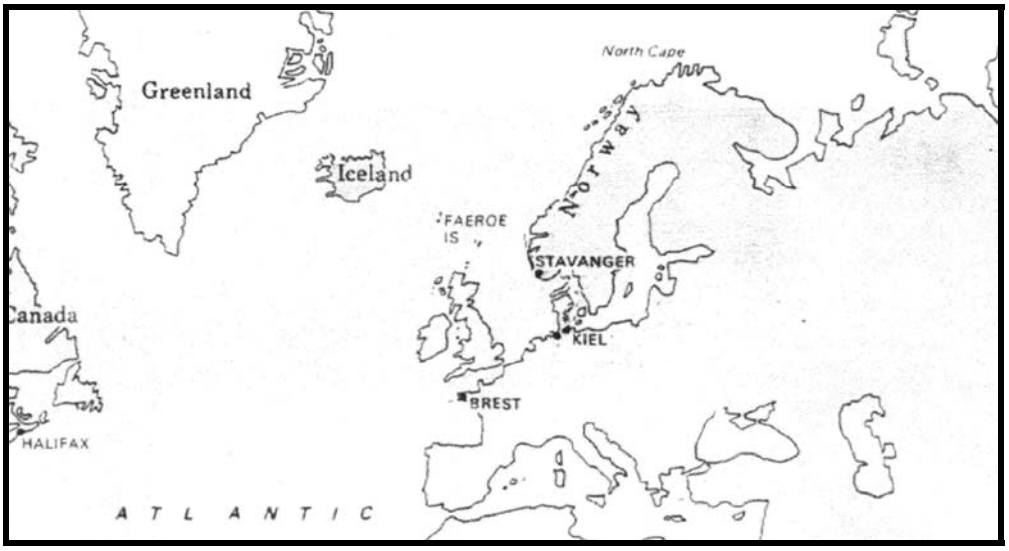


Figure I: The geographical area under study

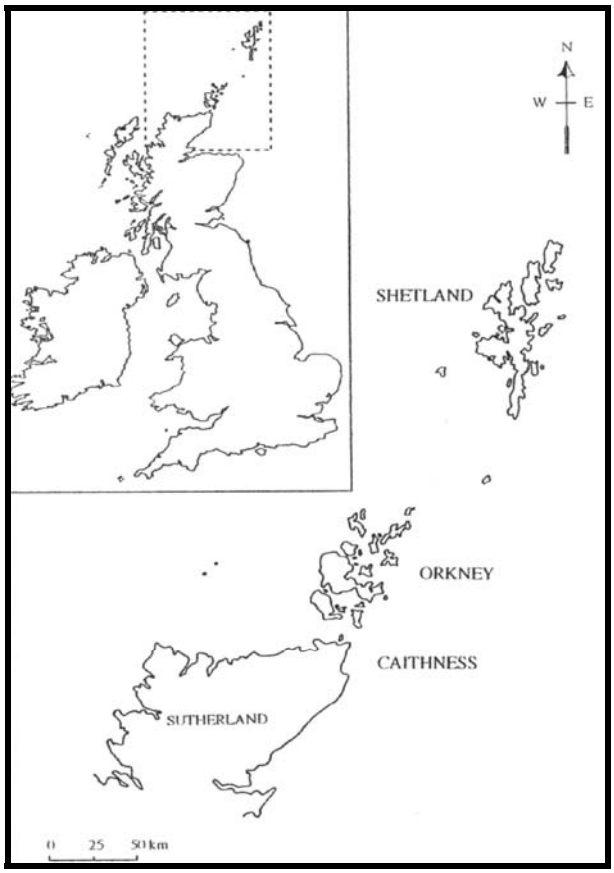


Figure II: Orkney, Caithness and Shetland (After Barrett 1997: Figure 1.1)

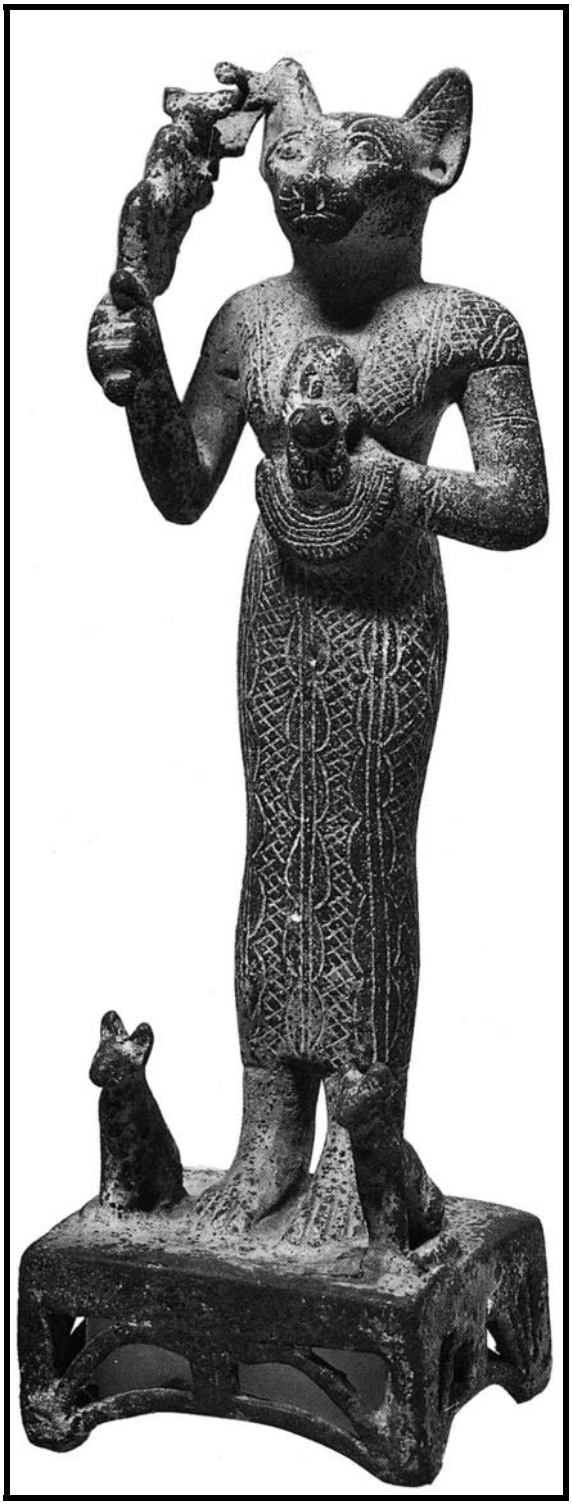


Figure III: Statue of the Cat-Headed Goddess, Bast / Bastet (Aldington & Ames 1959: 36)

Figure IV: An x-ray of a mummified cat showing vertebral displacement as a result of the neck being broken (Clutton-Brock 1999: 37)

Figure V: Pathological changes to cat femur from Dalton on Tees, scale in cms (Buglass 1998: 56)

Figure VI: Pathological changes to left elbow of cat specimen from Dalton on Tees, scale in cms (Buglass 1998: 56

Figure VII: Copy of a Celtic wood carving (Davies 1998: 118)

Figure VIII: Freyja and her cat drawn chariot (Conway 1998: 69)

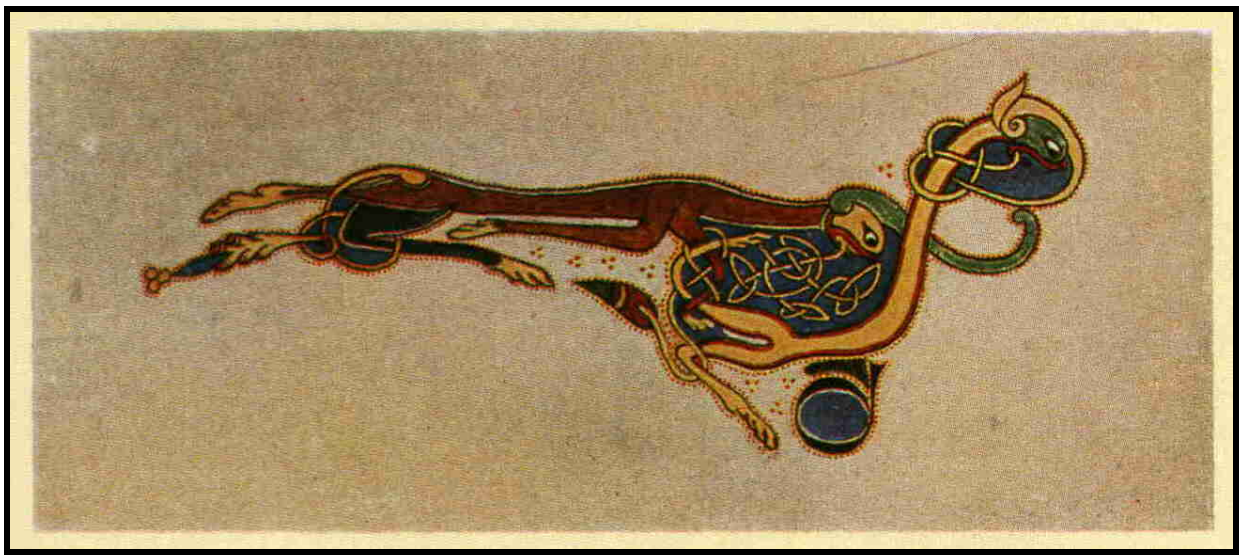


Figure IX: Illumination depicting a cat from the Book of Kells (Sullivan 1986: Plate XX)

Figure X: Illumination of cats and a mouse in a Thirteenth Century Bestiary (Sillar & Meyler 1966: Plate 34)

Figure XI: Illumination of a cat with mouse in the Luttrell Psalter
(Sillar & Meyler 1966: Plate 50)

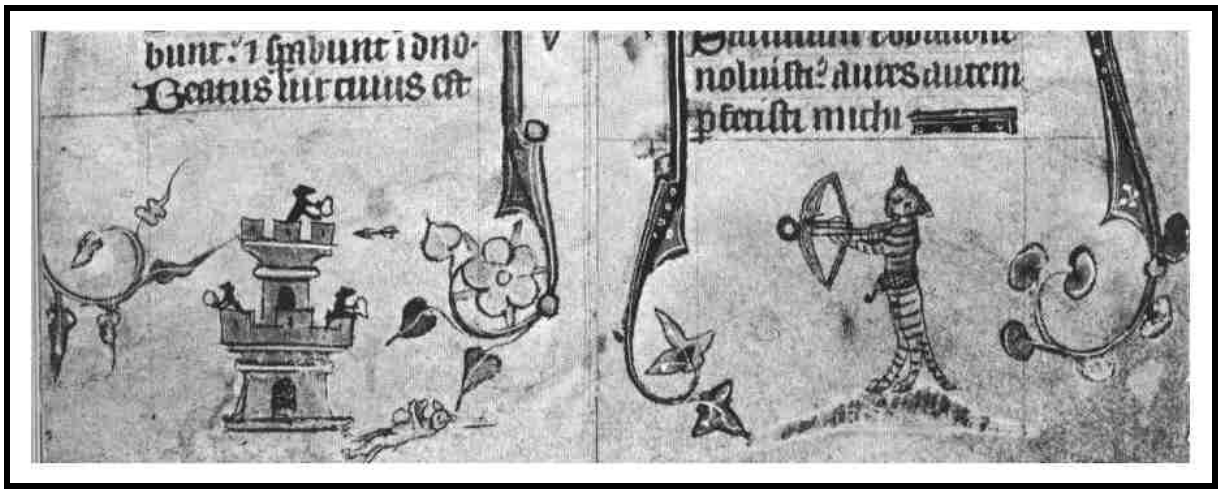


Figure XII: Illumination of a cat with crossbow attacking rats' castle
(Sillar & Meyler 1966: Plate 51)

Figure XIII: A knight and cat fighting, depicted on a misericord at Exeter Cathedral (Courtesy of staff at Exeter Cathedral)

Figure XIV: A cat playing a fiddle to four kittens, depicted on a misericord at Beverley Minster (Tanfield n.d: Plate 29)

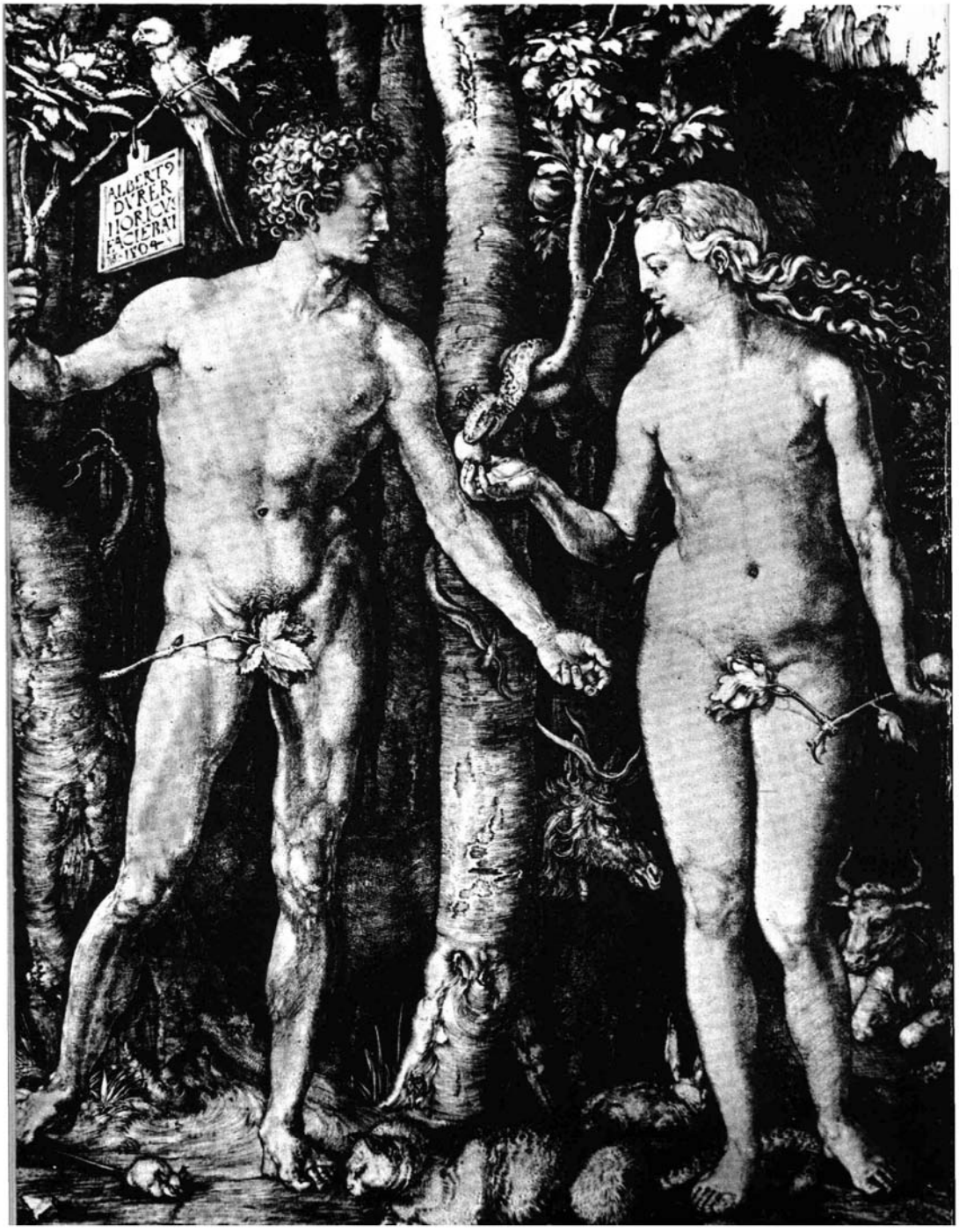


Figure XV: 'The Fall of Man' by Albrecht Dürer (1504)
(Sillar & Meyler 1966: Plate 19)

Figure XVI: 'Virgin and Child with Cat' by Leonardo da Vinci (1452 – 1519)
(Clutton-Brock 2000: 90)

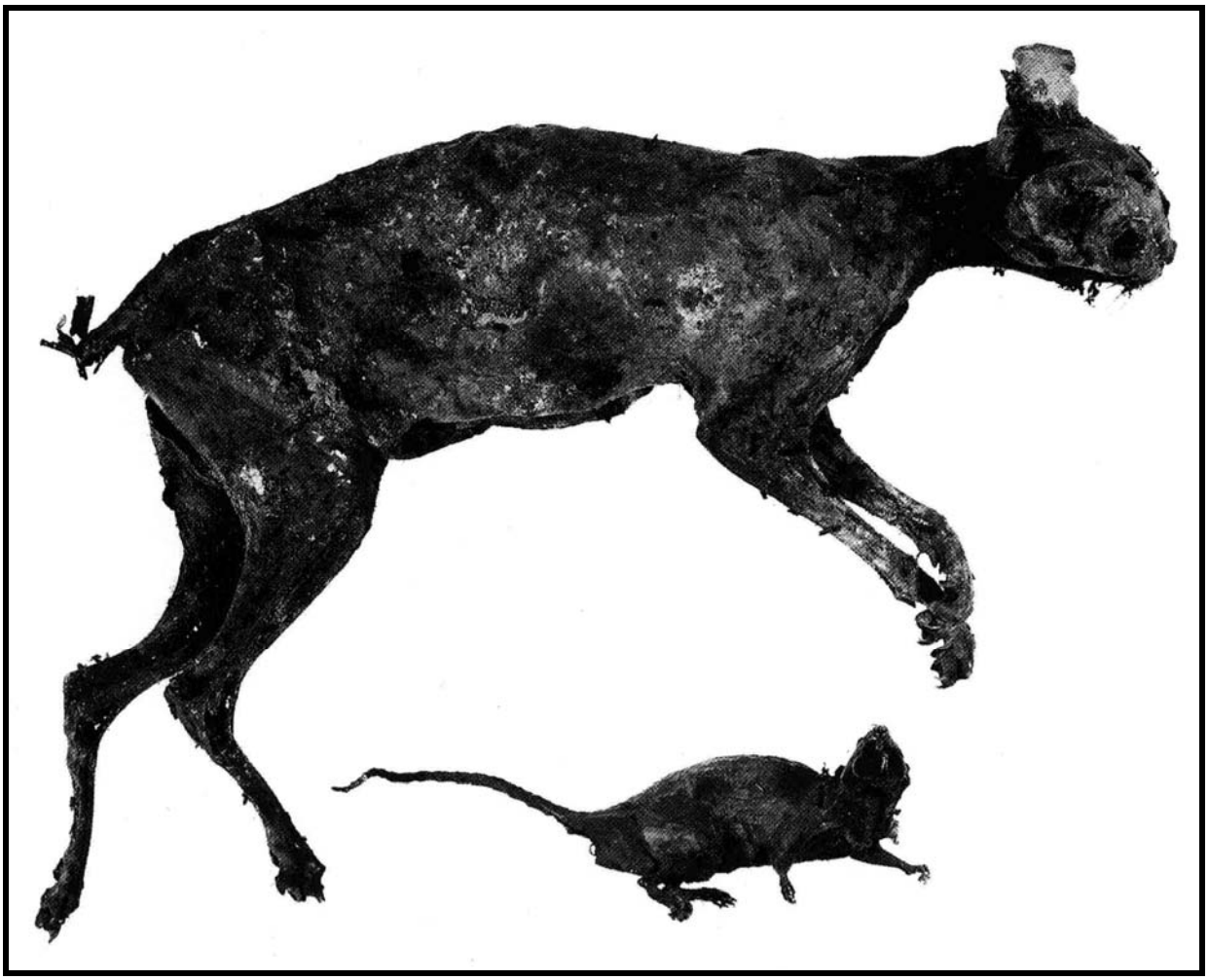


Figure XVII: Dried corpses of a cat and rat found in a house at Bloomsbury, London (Clutton-Brock 2000: 57)

Figure XVIII: Cat skull from Odense, Denmark showing numerous cut marks on the bones of the snout (Hatting 1990: 187)

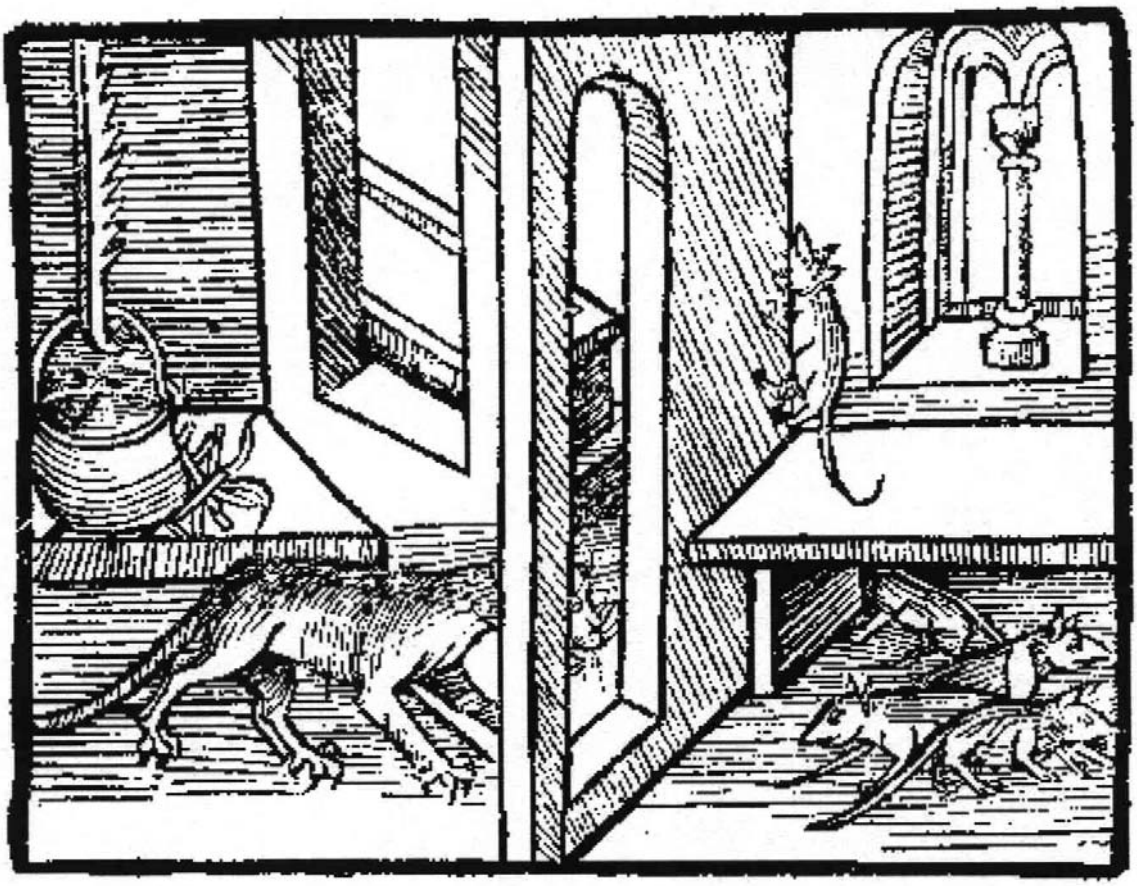


Figure XIX: Medieval wood carving of a kitchen cat chasing rats (Matterer 2000)

Figure XX: A snarling cat head from the Oseberg ship; an all purpose vessel used for raiding

(Magnusson 1980: 51)

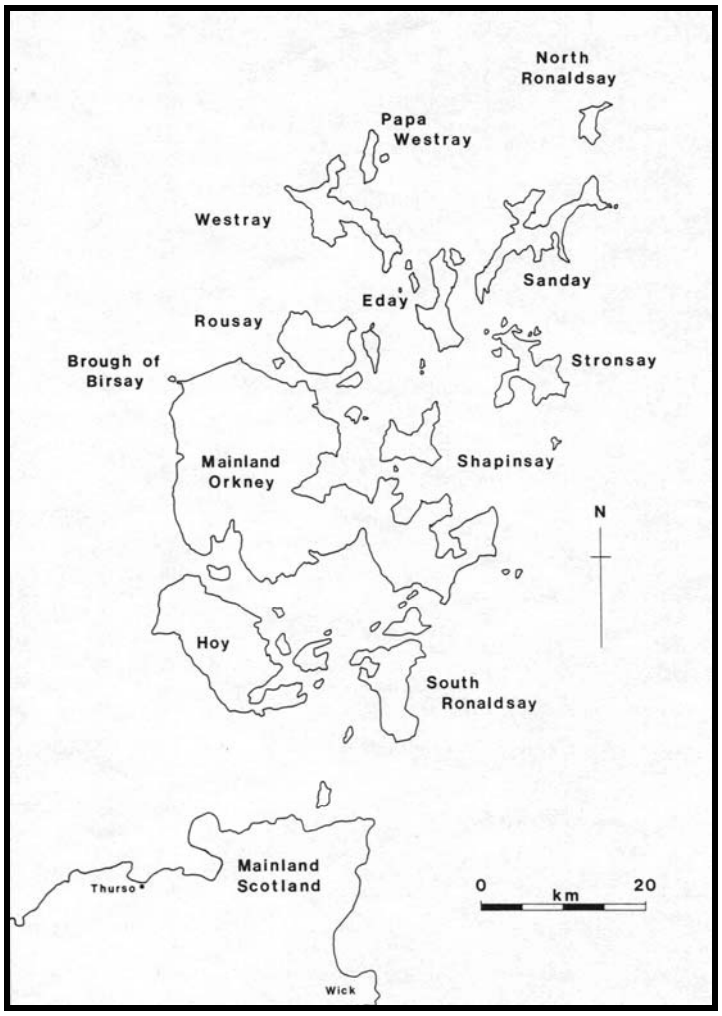


Figure XXI: Map of the Orkney Islands (Hunter n. d: 14)

Figure XXII: The Brough of Birsay (Magnusson 1980: 260)

Figure XXIII: 362/T21/90/05.00 A left metatarsal III

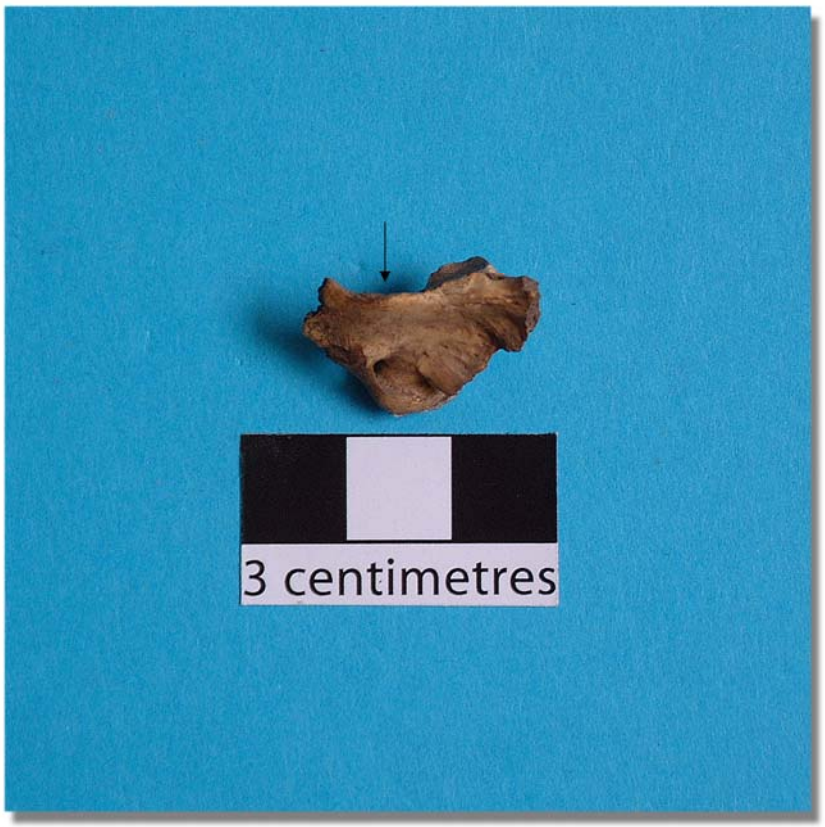


Figure XXIV: 421/T2/89/06.00 Atlas

Figure XXV: 242/306/86/13.00 Phalanx I – The butchery marks can be seen on the ventral surface at the distal end

Figure XXVI: 242/310/86/13.00 A right hand side pelvis fragment

Figure XXVII: 242/317/86/13.00 A right tibia with a slicing cut at the distal end of the bone

Figure XXVIII: 510/483/89/13.00 The proximal end of a left tibia

Figure XXIX: 390/T7/89/15.00 A right hand side scapula

Figure XXX: 404/363/88/15.00 Phalanx I

Figure XXXI: 417/T4/89/15.00 A right hand side radius

Figure XXXII: 559/536/90/15.00 The proximal end of a very robust left femur

Figure XXXIII: 339/352/88/17.00 A right hand side femur

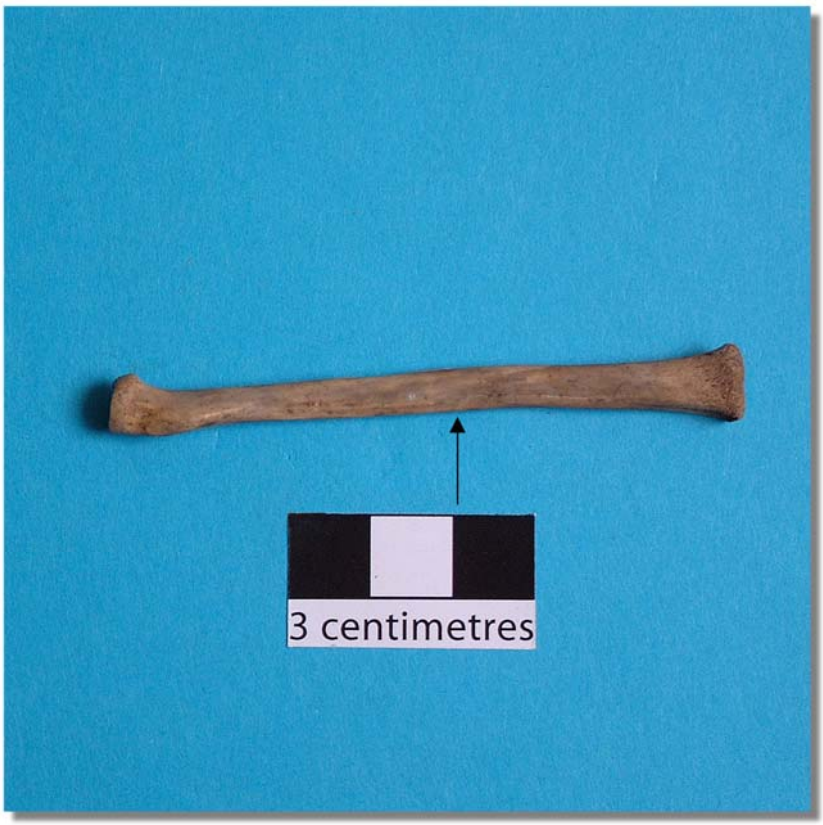
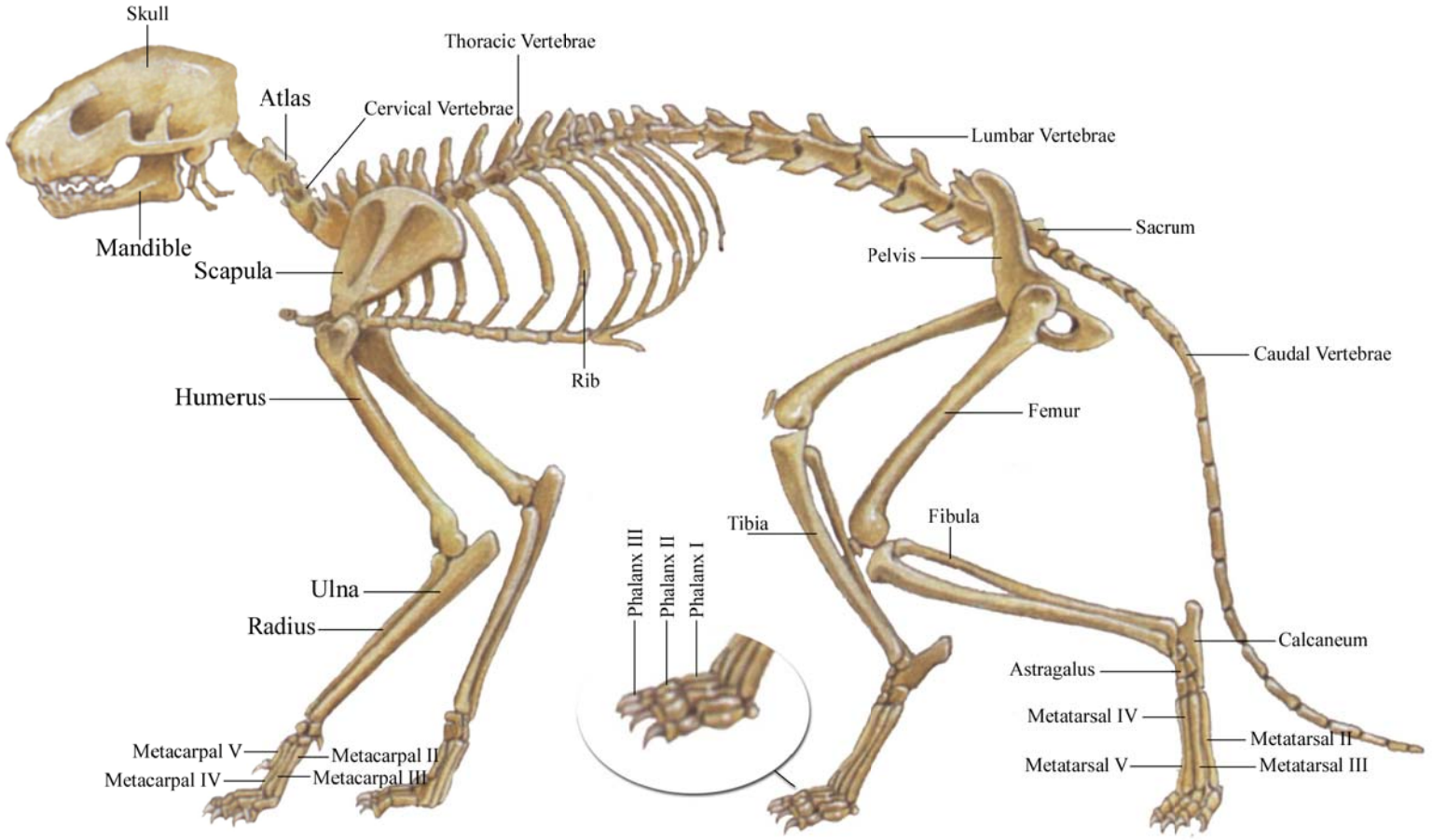


Figure XXXIV: 339/352/88/17.00 A left hand side radius

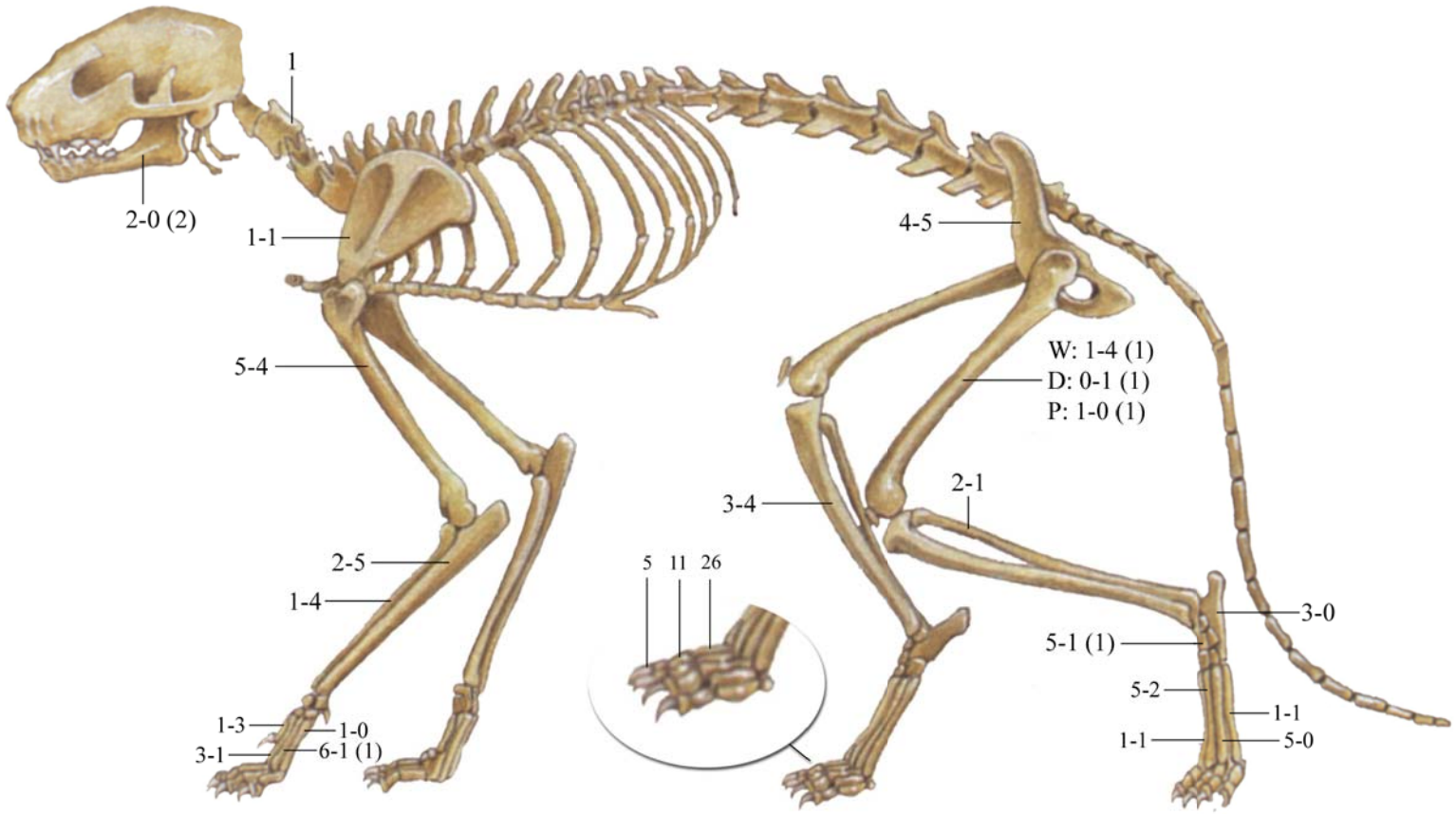
14.0 Diagrams

Diagram I: The bones of a cat skeleton.



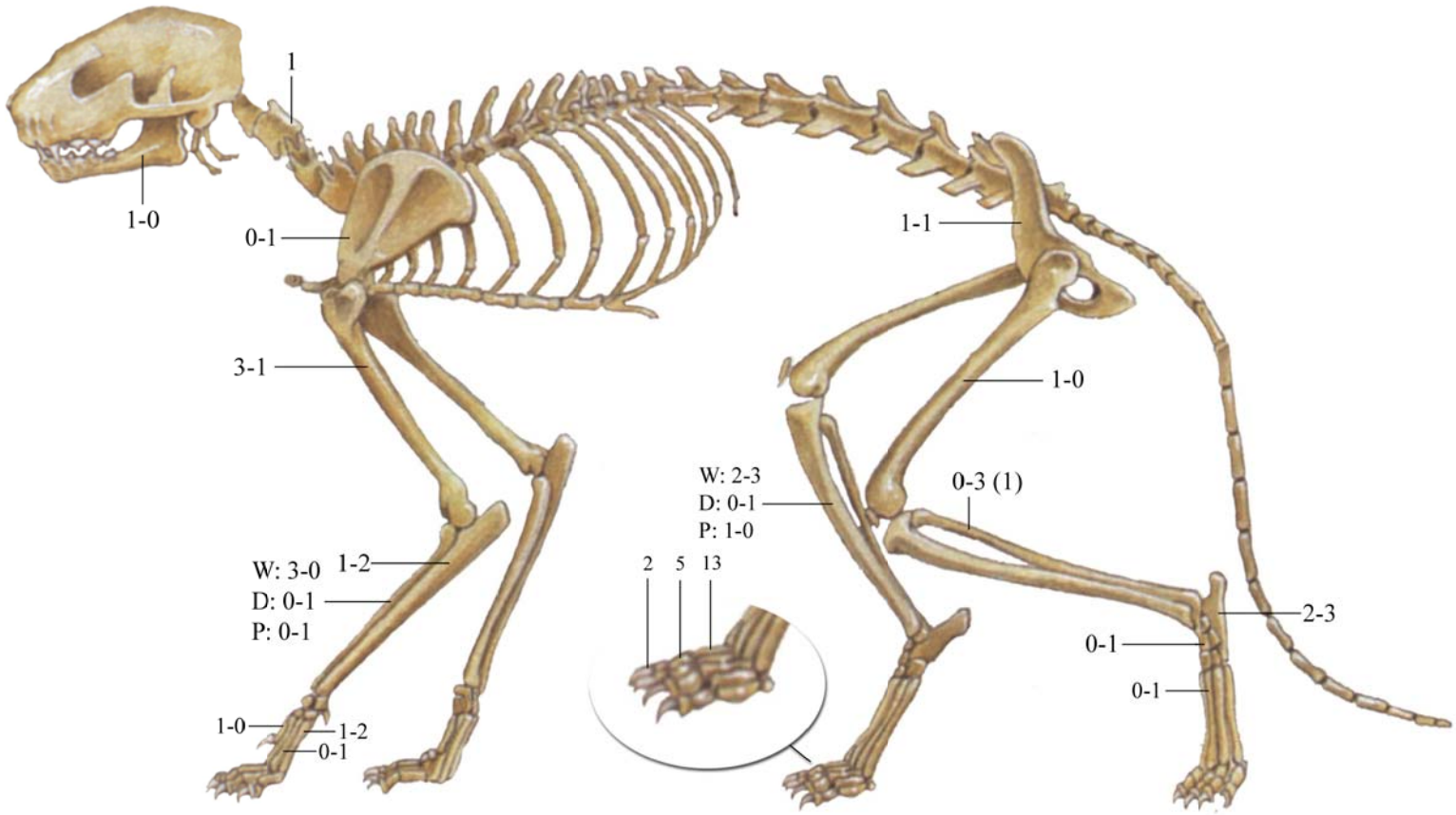
(After Taylor 1986: 19)

Diagram II: Earl's Bu, Orphir, Orkney: Phases 06.00 - 15.00 Diagram of cat skeleton showing the number of fragments found.



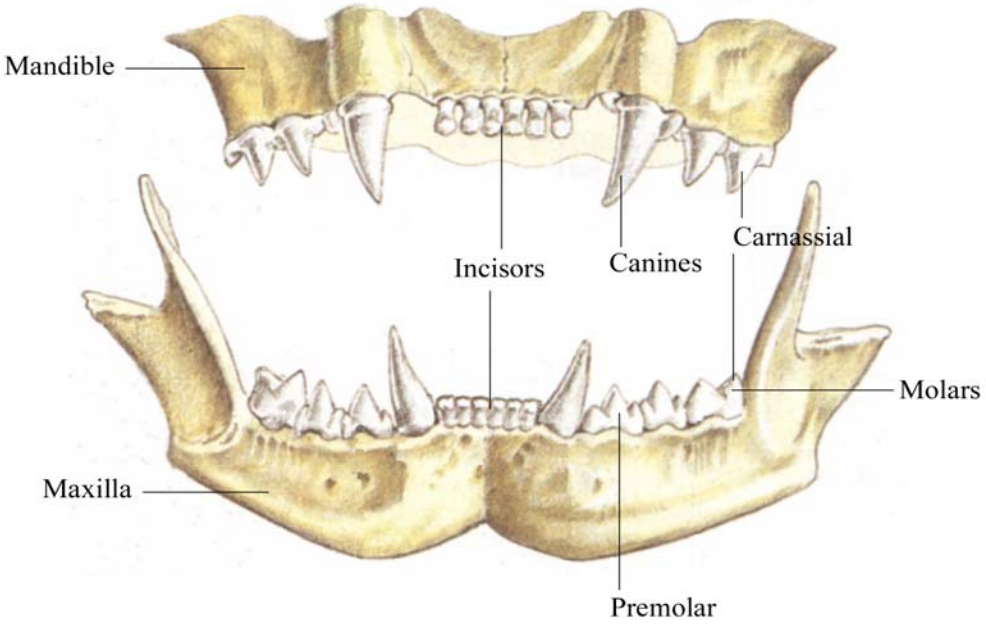
(After Taylor 1986: 19; Hatting 1990: 182)

Diagram III: Earl's Bu, Orphir, Orkney: Phase 17.00. Diagram of cat skeleton showing the number of fragments found.



(After Taylor 1986: 19; Hatting 1990: 182)

Diagram IV: The arrangement of cat teeth



(After Taylor 1986: 25)

APPENDICES

Appendix I

EARL'S BU, ORPHIR, ORKNEY: CAT BONE ASSEMBLAGE (A)

PHASES 06.00 - 12.00 = VIKING
PHASES 13.00 - 15.00 = LATE NORSE

CONTEXT	SAMPLE	YEAR	PHASE	BONE TYPE	WEIGHT (g)	SIDE	PATHOLOGY	BUTCHERY	ADDITIONAL NOTES
27	T?	85	?	FEMUR		UNID			
79	228	86	14.00	PELVIS	1.15	L	N	N	FRAGMENT
85	57+	80	13.00	ULNA	1.58	L	N	N	FRAGMENT
85	T20	88	13.00	METACARPAL III	0.44	L	N	N	
85	T20	88	13.00	METACARPAL IV	0.40	L	N	N	
85/86	136	86	13.00	HUMERUS	0.18	R	N	N	
85/86	136	86	13.00	ULNA	0.95	R	N	N	
85/86	142	86	13.00	PHALANX I	0.15	UNID	N	N	
96	134	86	14.00	ULNA		R	N	N	FRAGMENT
195	199	86	15.00	LOOSE TOOTH		UNID			
195	200	86	15.00	JAW	0.96	L	N	N	FRAGMENT
195	200	86	15.00	JAW		UNID	N	N	FRAGMENT
195	200	86	15.00	JAW		UNID	N	N	FRAGMENT
195	201	86	15.00	PELVIS	0.92	R	N	N	FRAGMENT
195	201	86	15.00	PELVIS		R	N	N	FRAGMENT
195	202	86	15.00	ASTRAGALUS	0.45	UNID	N	N	
195	242	86	15.00	HUMERUS	0.71	L	N	N	
195	242	86	15.00	METACARPAL III	0.55	L	N	N	
195	242	86	15.00	PHALANX I	0.11	UNID	N	N	
195	244	88	15.00	HUMERUS	3.77	L	N	N	
195	244	88	15.00	METACARPAL III	0.24	L	N	N	
195	244	88	15.00	METACARPAL IV	0.18	L	N	N	
195	244	88	15.00	METACARPAL V	0.26	L	N	N	
195	244	88	15.00	PHALANX I	0.33	UNID	N	N	

195	244	88	15.00	PHALANX II	0.23	UNID	N	N	
195	244	88	15.00	PHALANX III	0.03	UNID	N	N	
195	244	88	15.00	TIBIA	1.68	R	N	N	
195	244	88	15.00	ULNA	1.34	L	N	N	
195	246	86	15.00	HUMERUS	0.76	L	N	N	
195	246	86	15.00	METACARPAL II	0.20	L	N	N	
195	246	86	15.00	METATARSAL IV	0.27	R	N	N	
195	246	86	15.00	PHALANX I	0.07	UNID	N	N	
195	246	86	15.00	PHALANX II	0.05	UNID	N	N	
195	246	86	15.00	RADIUS	1.09	L	N	N	
195	246	86	15.00	SCAPULA	1.37	L	N	N	
196	185	86	15.00	METACARPAL IV	0.32	L	N	N	
196	185	86	15.00	PHALANX I		UNID	N	N	
215	T?	86	13.00	FEMUR (DISTAL)		UNID	N	N	EPIPHYSIAL END
215	T?	86	13.00	FEMUR (PROXIMAL)		UNID	N	N	EPIPHYSIAL END
234	183	86	09.00	METACARPAL V	0.08	R	N	N	
242	278	86	13.00	FEMUR	1.65	R	N	N	PROXIMAL END, HAS A SPIRAL FRACTURE
242	306	86	13.00	PHALANX I	0.27	UNID	N	N	
242	306	86	13.00	PHALANX I		UNID	N	Y	BUTCHERY ON VENTRAL SURFACE OF DISTAL END
242	308	86	13.00	PELVIS	0.94	L	N	N	
242	310	86	13.00	PELVIS	2.89	R	N	Y	FRAGMENT
242	313	86	13.00	PELVIS	1.77	L	N	N	
242	313	86	13.00	PHALANX I	0.12	UNID	N	N	
242	317	86	13.00	FEMUR (DISTAL)	0.73	R	N	N	EPIPHYSIAL END
242	317	86	13.00	METATARSAL II	0.33	L	N	N	
242	317	86	13.00	TIBIA	1.75	L	N	N	
242	317	86	13.00	TIBIA	3.36	R	N	Y	SLICING CUT AT DISTAL END
245	262	86	13.00	PHALANX II	0.04	UNID	N	N	

245	265	86	13.00	PHALANX I		UNID	N	N	
245	265	86	13.00	PHALANX II		UNID	N	N	
245	265	86	13.00	PHALANX II		UNID	N	N	
254	243	86	09.00	ASTRAGALUS	0.38	L	N	N	
303	T5	89	13.00	METACARPAL V	0.36	R	N	N	
312	T1	88	09.00	JAW	1.45	L	N	N	
362	551-1	90	06.00	PHALANX II	0.14	UNID	N	N	
362	T21	90	06.00	METATARSAL III	0.73	L	N	Y	
362	T21	90	06.00	TIBIA	4.64	L	N	N	
365	T3	88	09.00	FEMUR	4.73	L	N	N	
369	381	88	06.00	PHALANX I	0.12	UNID	N	N	
378	553	90	?	PHALANX I	0.09	UNID	N	N	
390	469	89	15.00	ASTRAGALUS	1.08	L	N	N	
390	469	89	15.00	ASTRAGALUS		L	N	N	
390	469	89	15.00	CALCANEUM	0.58	L	N	N	
390	469	89	15.00	METATARSAL II	0.13	R	N	N	
390	469	89	15.00	METATARSAL III	0.31	L	N	N	
390	469	89	15.00	PELVIS	1.85	L	N	N	FRAGMENT
390	469	89	15.00	PHALANX I	0.11	UNID	N	N	
390	469	89	15.00	PHALANX I	0.09	UNID	N	N	
390	530	90	15.00	FEMUR	4.84	R	N	N	FRAGMENT
390	530	90	15.00	METATARSAL IV	0.25	R	N	N	PROXIMAL END
390	532	89	15.00	PELVIS	2.65	R	N	N	FRAGMENT
390	T7	89	15.00	SCAPULA	2.04	R	N	Y	
390B	472	89	15.00	ASTRAGALUS	0.39	L	N	N	
390B	472	89	15.00	METATARSAL III	0.27	L	N	N	PROXIMAL END
390B	472	89	15.00	METATARSAL IV	0.28	L	N	N	PROXIMAL END
390B	472	89	15.00	METATARSAL V	0.10	L	N	N	PROXIMAL END
390B	472	89	15.00	PHALANX I	0.10	UNID	N	N	
390B	472	89	15.00	PHALANX II	0.08	UNID	N	N	

390B	474	89	15.00	FIBULA	0.56	R	N	N	
390B	474	89	15.00	TIBIA	0.73	R	N	N	FRESH BREAK TO DISTAL END
390B	474	89	15.00	TIBIA	4.01	R	N	N	PROXIMAL END
394	504	89	15.00	METACARPAL III	0.26	R	N	N	
394	504	89	15.00	PHALANX I		UNID	N	N	
404	363	88	15.00	ASTRAGALUS	2.73	R	N	N	
404	363	88	15.00	CALCANEUM	0.79	L	N	N	
404	363	88	15.00	FEMUR	4.14	R	N	N	
404	363	88	15.00	METAPODIAL	0.36	UNID	N	N	
404	363	88	15.00	METATARSAL III	1.00	L	N	N	
404	363	88	15.00	METATARSAL III	0.62	L	N	N	
404	363	88	15.00	METATARSAL IV	0.54	L	N	N	
404	363	88	15.00	METATARSAL IV	0.97	L	N	N	
404	363	88	15.00	METATARSAL IV	0.37	L	N	N	
404	363	88	15.00	PHALANX I	0.25	UNID	N	N	RODENT GNAWING AT PROXIMAL END
404	363	88	15.00	PHALANX I	0.55	UNID	N	N	
404	363	88	15.00	PHALANX I		UNID	N	Y	
404	363	88	15.00	PHALANX I		UNID	N	N	
404	363	88	15.00	PHALANX III	0.17	UNID	N	N	
404	363	88	15.00	PHALANX III		UNID	N	N	
404	364	88	15.00	HUMERUS	3.33	L	N	N	
404	364	88	15.00	METACARPAL V	0.24	R	N	N	
404	364	88	15.00	ULNA	1.77	R	N	N	
413	T1	88	15.00	FEMUR	1.73	R	N	N	
415	T9	90	15.00	PELVIS	2.46	R	N	N	DOG GNAWED FRAGMENT
417	T4	89	15.00	RADIUS	1.17	R	N	Y	
417	T5	89	15.00	HUMERUS	1.58	L	N	N	DISTAL END
417	T5	89	15.00	METACARPAL III	0.22	L	N	N	
417	T5	89	15.00	METACARPAL III	0.26	L	N	N	

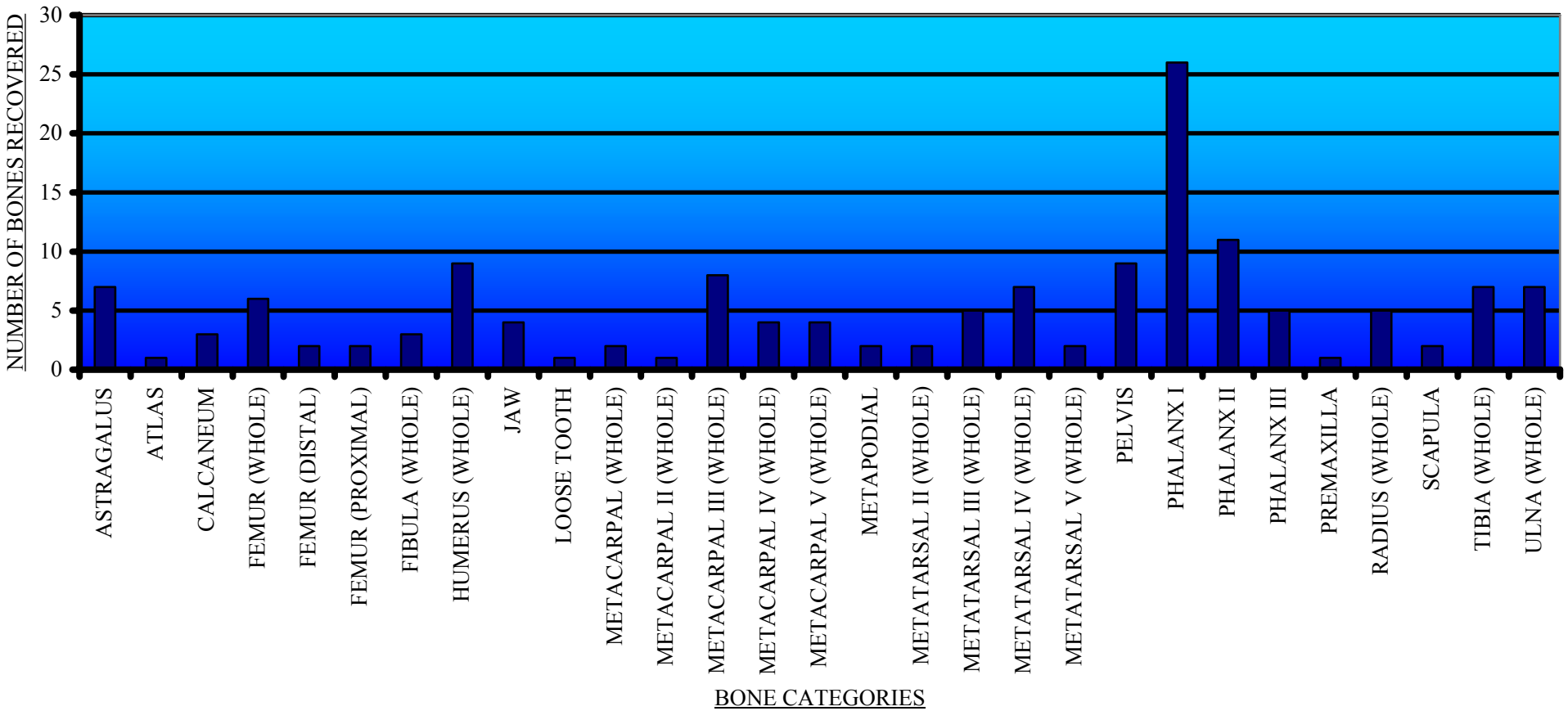
417	T5	89	15.00	RADIUS	0.85	R	N	N	PROXIMAL END
417	T5	89	15.00	ULNA	1.10	R	N	N	PROXIMAL END
421	T2	89	06.00	ATLAS	0.74	N/A	N	Y	
425	402	89	15.00	RADIUS	1.15	R	N	N	RODENT GNAWING ON SHAFT
510	483	89	13.00	PREMAXILLA	0.15	L	N	N	FRAGMENT
510	483	89	13.00	TIBIA	3.02	L	N	Y	PROXIMAL END
518	497	89	11.00	PHALANX I	0.48	UNID	N	N	
558	502	89	15.00	METACARPAL III	0.38	UNID	N	N	
558	502	89	15.00	METAPODIAL	0.09	UNID	N	N	
558	502	89	15.00	PHALANX II	0.10	UNID	N	N	
558	T2	89	15.00	HUMERUS	2.43	R	N	N	FRAGMENT
559	536	90	15.00	ASTRAGALUS	0.40	L	N	N	
559	536	90	15.00	CALCANEUM	0.72	L	N	N	
559	536	90	15.00	FEMUR (PROXIMAL)	2.67	L	N	Y	VERY ROBUST
559	536	90	15.00	FIBULA	0.19	L	N	N	
559	536	90	15.00	FIBULA		L	N	N	
559	536	90	15.00	METACARPAL	0.13	L	N	N	
559	536	90	15.00	METACARPAL	0.29	L	N	N	
559	536	90	15.00	2 (METATARSAL III)		L	N	N	SAME BONE BROKEN
559	536	90	15.00	METATARSAL IV	0.24	L	N	N	
559	536	90	15.00	METATARSAL V	0.10	R	N	N	PROXIMAL END
559	536	90	15.00	PHALANX I	0.09	UNID	N	N	
559	536	90	15.00	PHALANX I	0.20	UNID	N	N	
559	536	90	15.00	PHALANX I	0.07	UNID	N	N	
559	536	90	15.00	PHALANX II		UNID	N	N	
559	536	90	15.00	PHALANX II	0.16	UNID	N	N	
559	536	90	15.00	PHALANX III	0.04	UNID	N	N	
559	563	90	15.00	PHALANX I		UNID	N	N	
560	544	90	15.00	PHALANX II	0.12	UNID	N	N	
655	626	90	13.00	PHALANX III	0.05	UNID	N	N	

660	682ii	90	09.00	ULNA	2.71	R	N	N	
660	682iii	90	09.00	PHALANX I		UNID	N	N	
662	659	93	09.00	HUMERUS	0.78	R	N	N	DISTAL END
662	659	93	09.00	HUMERUS	21.60	R	N	N	FRAGMENT
662	659	93	09.00	PHALANX I	0.18	UNID	N	N	
662	T4	93	09.00	RADIUS	1.94	R	N	N	PROXIMAL END
663	T4	93	09.00	METACARPAL IV	0.35	R	N	N	

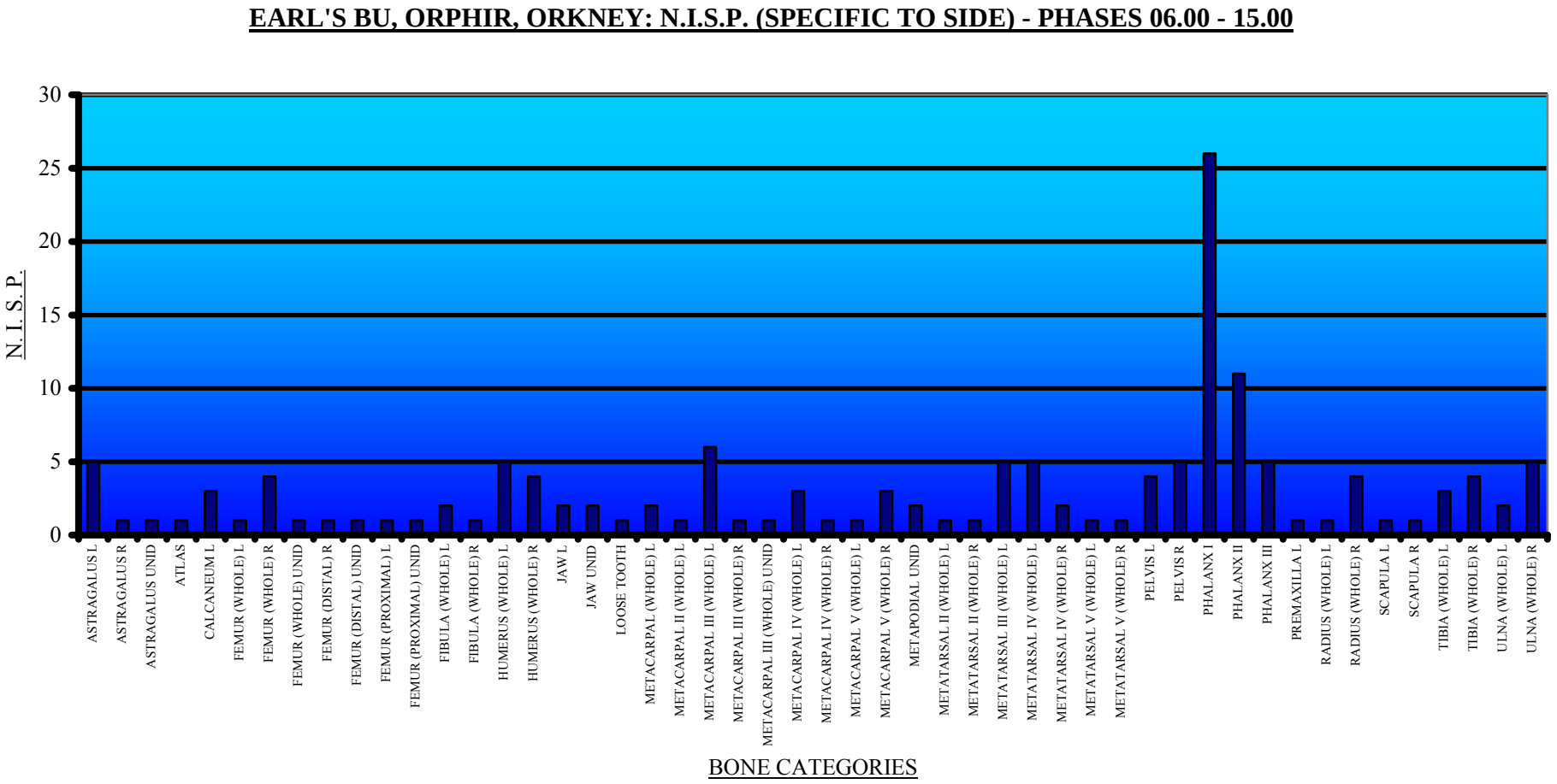
NO. OF BONES = 148

Appendix II

EARL'S BU, ORPHIR, ORKNEY: BONES RECOVERED FROM PHASES 06.00 - 15.00



Appendix III



Appendix IV

EARL'S BU, ORPHIR, ORKNEY: CAT BONE ASSEMBLAGE (B)

PHASE 17.00 = DISTURBED MEDIEVAL

CONTEXT	SAMPLE	YEAR	PHASE	BONE TYPE	WEIGHT (g)	SIDE	PATHOLOGY	BUTCHERY	ADDITIONAL NOTES
33	T22	90	17.00	METACARPAL II	0.33	R	N	N	
35	T5	88	17.00	METATARSAL IV	0.81	R	N	N	
35	T5	88	17.00	SCAPULA	1.23	R	N	N	
40	75	85	17.00	ATLAS		N/A	N	N	
76/77	133	86	17.00	PHALANX I	0.16	UNID	N	N	
76/77	133	86	17.00	PHALANX I	0.06	UNID	N	N	
76/77	133	86	17.00	PHALANX II	0.13	UNID	N	N	
76/77	133	86	17.00	PHALANX III	0.16	UNID	N	N	
127	T2	85	17.00	TIBIA		L	N	N	RODENT GNAWING ON SHAFT
141	?	86	17.00	METACARPAL II	0.36	L	N	N	
166	T3	88	17.00	JAW	0.81	L	N	N	
193	172	86	17.00	PHALANX I	0.05	UNID	N	N	
193	179	86	17.00	ASTRAGALUS	0.41	R	N	N	
193	179	86	17.00	CALCANEUM	0.77	R	N	N	
193	179	86	17.00	HUMERUS	0.75	L	N	N	
193	179	86	17.00	TIBIA (DISTAL)	0.20	R	N	N	EPIPHYSIAL END
323	T7	89	17.00	ULNA	11.25	R	N	N	PROXIMAL END
326	T1	88	17.00	RADIUS	3.58	L	N	N	
331	T2	88	17.00	CALCANEUM	0.87	L	N	N	
334	344	88	17.00	PHALANX I		UNID	N	N	
334	344	88	17.00	PHALANX I		UNID	N	N	FRAGMENT

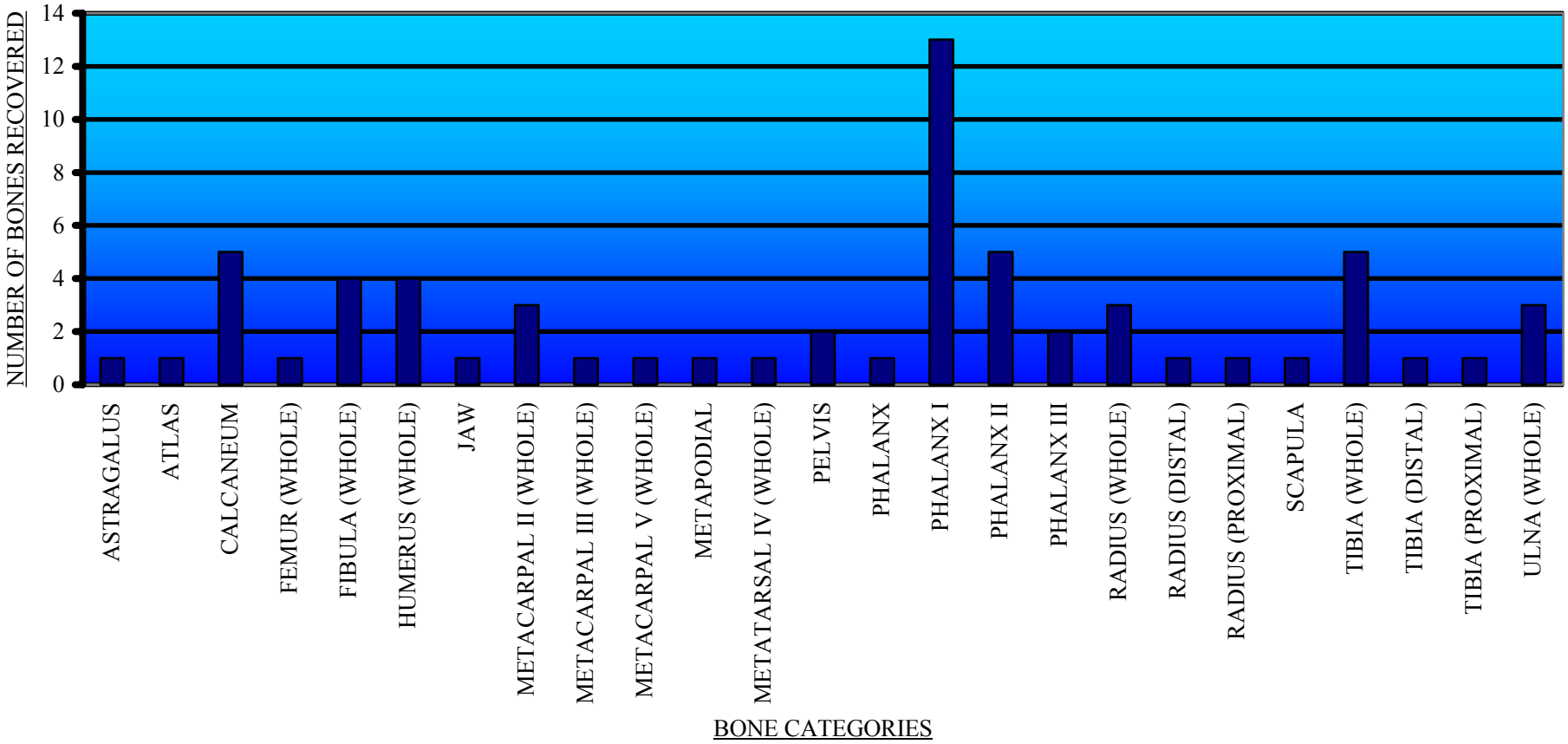
334	344	88	17.00	PHALANX I		UNID	N	N	FRAGMENT
334	344	88	17.00	PHALANX I		UNID	N	N	
334	344	88	17.00	PHALANX I		UNID	N	N	
334	344	88	17.00	PHALANX I		UNID	N	N	
334	344	88	17.00	PHALANX II		UNID	N	N	
334	344	88	17.00	RADIUS (DISTAL)	0.15	R	N	N	EPIPHYSIAL END
334	344	88	17.00	RADIUS (PROXIMAL)	0.07	R	N	N	EPIPHYSIAL END
335	357	88	17.00	CALCANEUM	0.17	R	N	N	FRAGMENT
335	357	88	17.00	METACARPAL II	0.30	R	N	N	
336	347	88	17.00	ULNA	1.41	R	N	N	PROXIMAL END
339	352	88	17.00	FEMUR	0.16	L	N	N	
339	352	88	17.00	FEMUR	3.06	R	N	Y	
339	352	88	17.00	FIBULA	1.24	R	N	N	
339	352	88	17.00	FIBULA	0.11	UNID	N	N	
339	352	88	17.00	HUMERUS	0.60	L	N	N	EPIPHYSIAL END
339	352	88	17.00	HUMERUS	0.75	R	N	N	EPIPHYSIAL END
339	352	88	17.00	METACARPAL V	0.18	L	N	N	
339	352	88	17.00	PHALANX		UNID	N	N	MID SHAFT
339	352	88	17.00	PHALANX I		UNID	N	N	
339	352	88	17.00	PHALANX I		UNID	N	N	
339	352	88	17.00	PHALANX I		UNID	N	N	
339	352	88	17.00	PHALANX II		UNID	N	N	
339	352	88	17.00	PHALANX II		UNID	N	N	
339	352	88	17.00	RADIUS	1.56	L	N	Y	
339	352	88	17.00	TIBIA	3.63	R	N	N	PROXIMAL END
339	352	88	17.00	TIBIA	0.40	L	N	N	EPIPHYSIAL END
339	352	88	17.00	TIBIA (PROXIMAL)	0.52	L	N	N	EPIPHYSIAL END
339	352	88	17.00	TIBIA	1.03	R	N	N	EPIPHYSIAL END
339	352	88	17.00	ULNA	1.65	L	N	N	
383	T2	89	17.00	CALCANEUM	1.27	L	N	N	

383	T2	89	17.00	CALCANEUM	1.05	R	N	N	
383	T2	89	17.00	FEMUR	1.11	R	N	N	
383	T2	89	17.00	HUMERUS	0.85	L	N	N	
383	T2	89	17.00	PELVIS	1.45	L	N	N	
383	T2	89	17.00	PELVIS	1.47	R	N	N	
400	351	88	17.00	METAPODIAL	0.15	R	N	N	
400	351	88	17.00	PHALANX II	0.06	UNID	N	N	
402	358	88	17.00	PHALANX I	0.24	UNID	N	N	
402	358	88	17.00	RADIUS	0.52	L	N	N	DISTAL END
402	358	88	17.00	TIBIA	2.73	R	N	N	DISTAL END
659	628	90	17.00	METACARPAL III	0.29	R	N	N	
659	681	90	17.00	PHALANX III		UNID	N	N	

NO. OF BONES = 63

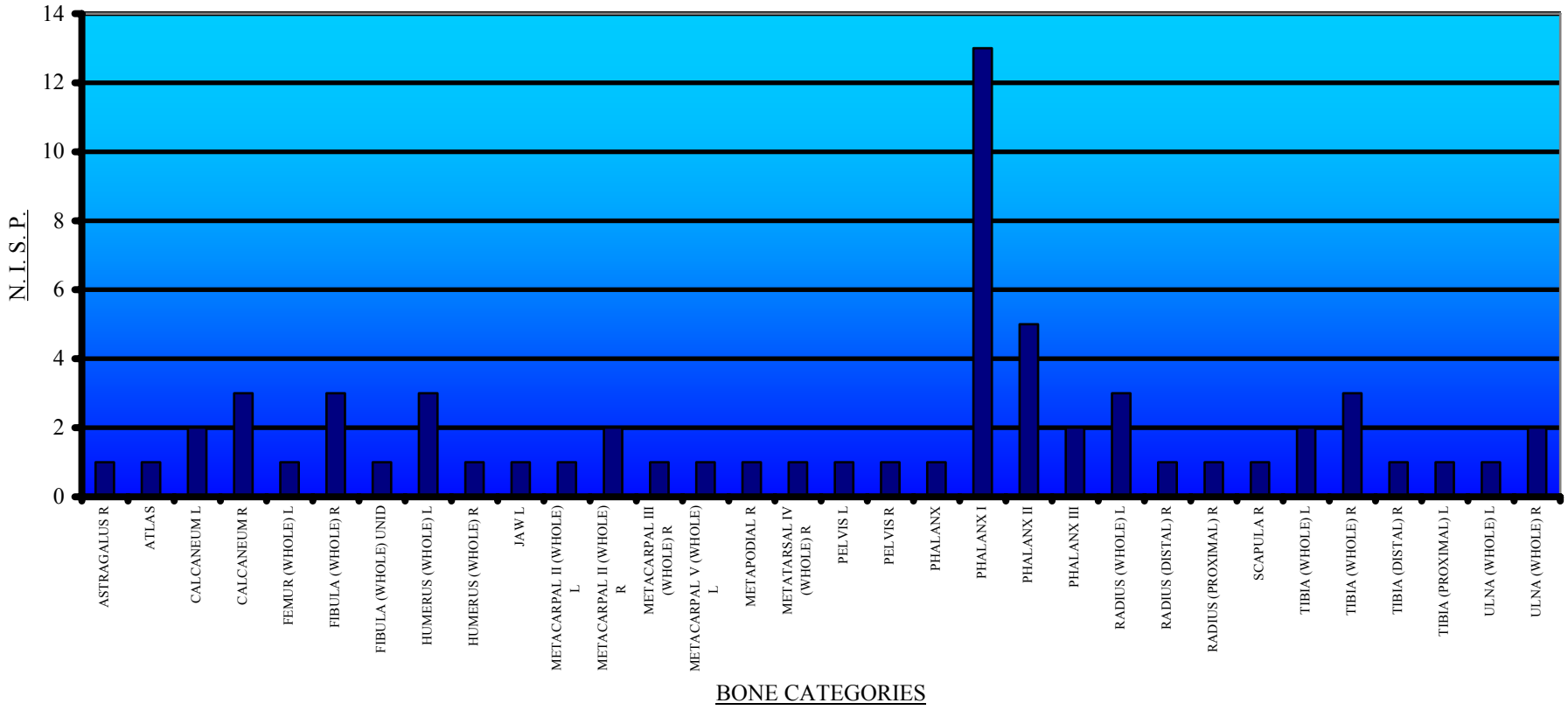
Appendix V

EARL'S BU, ORPHIR, ORKNEY: BONES RECOVERED FROM PHASE 17.00



Appendix VI

EARL'S BU, ORPHIR, ORKNEY: N.I.S.P. (SPECIFIC TO SIDE) - PHASE 17.00



Appendix VII

Key to Dental Ageing Table

P2	=	Premolar 2
P3	=	Premolar 3
P4	=	Premolar 4
M1	=	Molar
Ø	=	Unerupted
C	=	Crypt open
V	=	Tooth visible
E	=	Tooth erupting
½	=	Tooth half erupted
W	=	Worn
7	=	Absent - Pre-mortem
9	=	Absent - Post-mortem

EARL'S BU, ORPHIR, ORKNEY: CAT BONE: DENTAL AGEING DATA TABLE

				MAND. DECID.				MAX. DECID.				LOOSE DECID.				MAND. PERM.				MAX. PERM.				LOOSE PERM.				
CONTEXT	SAMPLE	YEAR	PHASE	P2	P3	P4	M1	P2	P3	P4	M1	P2	P3	P4	M1	P2	P3	P4	M1	P2	P3	P4	M1	P2	P3	P4	M1	NOTES
195	200	86	15.00													9	9	9	W									
195	200	86	15.00														W	W	W									
195	200	86	15.00																		W	W						
195	200	86	15.00																						W	W		CANINE (W)

Appendix VIII

Key to Bone Fusion Data Tables

PFUS	=	Proximal fusion
DFUS	=	Distal fusion
1	=	Fused
2	=	Unfused
3	=	Neonatal
4	=	Fusion line visible / fusing
A	=	Epiphysial absent

EARL'S BU, ORPHIR, ORKNEY: CAT BONE FUSION DATA TABLE (A)

PHASE 06.00 - 12.00 = VIKING
PHASE 13.00 - 15.00 = LATE NORSE

CONTEXT	SAMPLE	YEAR	PHASE	BONE TYPE	PFUS	DFUS	SIDE	APPROXIMATE AGE
85	57+	88	13.00	ULNA	1	DA	L	
85	T20	88	13.00	METACARPAL III	4	1	L	200 - 251 DAYS
85	T20	88	13.00	METACARPAL IV	4	1	L	200 - 251 DAYS
85/86	136	86	13.00	ULNA	2	2	R	
96	134	86	14.00	ULNA	PA	2	R	
195	242	86	15.00	METACARPAL III	4	2	L	< 200 DAYS
195	242	86	15.00	PHALANX I	1	1	UNID	> 180 DAYS
195	246	86	15.00	RADIUS	1	B	L	> 251 DAYS
196	185	86	15.00	METACARPAL IV	1	1	L	> 200 DAYS
196	185	86	15.00	PHALANX I	1	1	UNID	> 180 DAYS

234	183	86	09.00	METACARPAL V	2	1	R	< 200 DAYS
242	278	86	13.00	FEMUR	2	DA	R	
242	306	86	13.00	PHALANX I	4	1	UNID	< 251 DAYS
242	306	86	13.00	PHALANX I	1	1	UNID	> 180 DAYS
242	310	86	13.00	PELVIS	2	N/A	R	
242	317	86	13.00	METATARSAL II	2	1	L	< 200 DAYS
242	317	86	13.00	TIBIA	PA	2	L	< 341 DAYS
242	317	86	13.00	TIBIA	2	2	R	< 341 DAYS
245	262	86	13.00	PHALANX II	1	1	UNID	> 180 DAYS
245	265	86	13.00	PHALANX I	4	1	UNID	< 251 DAYS
245	265	86	13.00	PHALANX II	4	1	UNID	< 251 DAYS
254	243	86	09.00	ASTRAGALUS	1	1	L	
303	T5	89	13.00	METACARPAL V	2	1	R	< 200 DAYS
362	551-1	90	06.00	PHALANX II	1	1	UNID	> 180 DAYS
362	T21	90	06.00	METATARSAL III	1	1	L	>200 DAYS
362	T21	90	06.00	TIBIA	PA	1	L	> 341 DAYS
369	381	88	06.00	PHALANX I	1	1	UNID	> 180 DAYS
378	553	90	?	PHALANX I	1	1	UNID	> 180 DAYS
390	469	89	15.00	ASTRAGALUS	1	1	L	
390	469	89	15.00	ASTRAGALUS	1	1	L	
390	469	89	15.00	CALCANEUM	1	4	L	< 480 DAYS
390	469	89	15.00	METATARSAL II	1	DA	R	> 200 DAYS
390	469	89	15.00	METATARSAL III	1	DA	L	> 200 DAYS
390	469	89	15.00	PHALANX I	2	DA	UNID	< 180 DAYS
390	469	89	15.00	PHALANX I	1	1	UNID	> 180 DAYS
390	T7	89	15.00	SCAPULA	1	N/A	R	> 251 DAYS
390B	472	89	15.00	METATARSAL III	1	DA	L	> 200 DAYS
390B	472	89	15.00	METATARSAL IV	1	DA	L	> 200 DAYS
390B	472	89	15.00	METATARSAL V	1	DA	L	> 200 DAYS
390B	472	89	15.00	PHALANX I	1	1	UNID	> 180 DAYS

390B	472	89	15.00	PHALANX II	1	1	UNID	> 180 DAYS
390B	474	89	15.00	FIBULA	PA	4	R	< 435 DAYS
390B	474	89	15.00	TIBIA	4	DA	R	< 341 DAYS
390B	474	89	15.00	TIBIA	1	DA	R	> 341 DAYS
394	504	89	15.00	METACARPAL III	2	2	R	< 200 DAYS
394	504	89	15.00	PHALANX I	1	1	UNID	> 180 DAYS
404	363	88	15.00	ASTRAGALUS	1	1	R	
404	363	88	15.00	CALCANEUM	1	1	L	> 480 DAYS
404	363	88	15.00	METATARSAL III	1	1	L	> 200 DAYS
404	363	88	15.00	METATARSAL III	1	1	L	> 200 DAYS
404	363	88	15.00	METATARSAL IV	1	1	L	> 200 DAYS
404	363	88	15.00	METATARSAL IV	1	1	L	> 200 DAYS
404	363	88	15.00	METATARSAL IV	1	1	L	> 200 DAYS
404	363	88	15.00	PHALANX I	1	1	UNID	> 180 DAYS
404	363	88	15.00	PHALANX I	1	1	UNID	> 180 DAYS
404	363	88	15.00	PHALANX I	1	1	UNID	> 180 DAYS
404	363	88	15.00	PHALANX I	1	1	UNID	> 180 DAYS
404	363	88	15.00	PHALANX III	1	4	UNID	200 - 341 DAYS
404	363	88	15.00	PHALANX III	1	1	UNID	> 180 DAYS
404	364	88	15.00	HUMERUS	2	1	L	> 251 DAYS
404	364	88	15.00	METACARPAL V	4	1	R	200 - 251 DAYS
404	364	88	15.00	ULNA	2	2	R	
417	T4	89	15.00	RADIUS	2	1	R	< 251 DAYS
417	T5	89	15.00	HUMERUS	PA	1	L	> 251 DAYS
417	T5	89	15.00	METACARPAL III	PA	4	L	< 341 DAYS
417	T5	89	15.00	METACARPAL III	PA	4	L	< 341 DAYS
417	T5	89	15.00	RADIUS	4	DA	R	< 251 DAYS
417	T5	89	15.00	ULNA	2	DA	R	
510	483	89	13.00	TIBIA	4	DA	L	< 341 DAYS
558	502	89	15.00	METACARPAL III	1	1	UNID	> 200 DAYS

558	502	89	15.00	PHALANX II	1	1	UNID	> 180 DAYS
559	536	90	15.00	ASTRAGALUS	1	1	L	
559	536	90	15.00	CALCANEUM	1	1	L	> 480 DAYS
559	536	90	15.00	FEMUR	4	DA	L	
559	536	90	15.00	FIBULA	PA	1	L	> 435 DAYS
559	536	90	15.00	FIBULA	2	DA	L	< 435 DAYS
559	536	90	15.00	(2) METATARSAL III	1	1	L	> 200 DAYS
559	536	90	15.00	METATARSAL IV	4	DA	L	< 251 DAYS
559	536	90	15.00	METATARSAL V	1	DA	R	> 200 DAYS
559	536	90	15.00	PHALANX I	1	1	UNID	> 180 DAYS
559	536	90	15.00	PHALANX I	1	1	UNID	> 180 DAYS
559	536	90	15.00	PHALANX I	1	1	UNID	> 180 DAYS
559	536	90	15.00	PHALANX II	1	1	UNID	> 180 DAYS
559	536	90	15.00	PHALANX II	1	1	UNID	> 180 DAYS
559	536	90	15.00	PHALANX III	1	1	UNID	> 180 DAYS
559	563	90	15.00	PHALANX I	1	1	UNID	> 180 DAYS
560	544	90	15.00	PHALANX II	1	1	UNID	> 180 DAYS
655	626	90	13.00	PHALANX III	1	1	UNID	> 180 DAYS
660	682ii	90	09.00	ULNA	4	1	R	
660	682iii	90	09.00	PHALANX I	1	1	UNID	> 180 DAYS
662	659	93	09.00	HUMERUS	PA	1	R	> 251 DAYS
662	659	93	09.00	HUMERUS	2	DA	R	< 140 DAYS
662	659	93	09.00	PHALANX I	1	1	UNID	> 180 DAYS
662	T4	93	09.00	RADIUS	4	DA	R	< 251 DAYS
663	T4	93	09.00	METACARPAL IV	1	1	R	> 200 DAYS

Appendix IX

EARL'S BU, ORPHIR, ORKNEY: CAT BONE FUSION DATA TABLE (B)

PHASE 17.00 = DISTURBED MEDIEVAL

CONTEXT	SAMPLE	YEAR	PHASE	BONE TYPE	PFUS	DFUS	SIDE	APPROXIMATE AGE
33	T22	90	17.00	METACARPAL II	4	DA	R	< 200 DAYS
35	T5	88	17.00	METATARSAL IV	1	1	R	> 200 DAYS
35	T5	88	17.00	SCAPULA	1		R	> 251 DAYS
76/77	133	86	17.00	PHALANX I	1	1	UNID	> 180 DAYS
127	T2	85	17.00	TIBIA	PA	2	L	< 341 DAYS
141	?	86	17.00	METACARPAL II	1	1	L	> 200 DAYS
193	179	86	17.00	CALCANEUM	1	1	R	> 480 DAYS
323	T7	89	17.00	ULNA	1	DA	R	
326	T1	88	17.00	RADIUS	1	1	L	> 251 DAYS
331	T2	88	17.00	CALCANEUM	1	4	L	< 480 DAYS
334	344	90	17.00	PHALANX I	1	4	UNID	< 251 DAYS
334	344	90	17.00	PHALANX I	1	DA	UNID	> 180 DAYS
334	344	90	17.00	PHALANX I	PA	1	UNID	> 180 DAYS
334	344	90	17.00	PHALANX I	1	1	UNID	> 180 DAYS
334	344	90	17.00	PHALANX I	1	4	UNID	< 251 DAYS
334	344	90	17.00	PHALANX I	2	1	UNID	< 251 DAYS
334	344	90	17.00	PHALANX II	1	1	UNID	> 180 DAYS
335	357	88	17.00	CALCANEUM	4	DA	R	< 480 DAYS
335	357	88	17.00	METACARPAL II	1	DA	R	> 200 DAYS
336	347	88	17.00	ULNA	1	DA	R	
339	352	88	17.00	FEMUR	2	2	R	< 251 DAYS
339	352	88	17.00	FIBULA	2	2	R	< 435 DAYS
339	352	88	17.00	METACARPAL V	4	1	L	< 251 DAYS

339	352	88	17.00	PHALANX I	1	1	UNID	> 180 DAYS
339	352	88	17.00	PHALANX I	1	1	UNID	> 180 DAYS
339	352	88	17.00	PHALANX I	1	4	UNID	< 251 DAYS
339	352	88	17.00	PHALANX II	1	4	UNID	< 251 DAYS
339	352	88	17.00	PHALANX II	1	4	UNID	< 251 DAYS
339	352	88	17.00	RADIUS	4	2	L	< 251 DAYS
339	352	88	17.00	TIBIA	2	DA	R	< 341 DAYS
339	352	88	17.00	ULNA	2	2	L	
400	351	88	17.00	METAPODIAL	4	4	R	
400	351	88	17.00	PHALANX II	PA	1	UNID	> 180 DAYS
402	358	88	17.00	PHALANX I	4	1	UNID	< 251 DAYS
402	358	88	17.00	RADIUS	PA	2	L	< 341 DAYS
402	358	88	17.00	TIBIA	PA	2	R	< 341 DAYS
659	628	90	17.00	METACARPAL III	1	1	R	> 200 DAYS
659	681	88	17.00	PHALANX III	1	1	UNID	> 180 DAYS

Appendix X

EARL'S BU, ORPHIR, ORKNEY: CAT BONE: METRICAL DATA - THE JAW (mm)

CONTEXT	SAMPLE	YEAR	PHASE	JAW TYPE	TOOTH LENGTH	LENGTH OF THE CHEEK TOOTH ROW	LENGTH OF THE CARNASSIAL ALVEOLUS	HEIGHT OF THE VERTICAL RAMUS
195	200	86	15.00	MANDIBLE	N/A (FRAGMENT)	19.41	N/A (FRAGMENT)	N/A (FRAGMENT)
195	200	86	15.00	MAXILLA	N/A (FRAGMENT)	16.81	N/A (FRAGMENT)	N/A (FRAGMENT)

Appendix XI

Key to Bone Metrical Data Tables

GL	=	Greatest length
Bd	=	Greatest breadth of the distal end
Bp	=	Greatest breadth of the proximal end
Sd	=	Smallest breadth of the diaphysis
Dd	=	Greatest depth of the distal end
GLP	=	Greatest length of the Processus articularis (glenoid process)
SLC	=	Smallest length of the Collum scapulae (neck of the scapula)
HS	=	Height of the scapula
BG	=	Breadth of the glenoid cavity
PA	=	Proximal epiphyseal absent
DA	=	Distal epiphyseal absent
B	=	Broken

EARL'S BU, ORPHIR, ORKNEY: CAT BONE: METRICAL DATA
(A) (mm)

PHASE 06.00 - 12.00 = VIKING
PHASE 13.00 - 15.00 = LATE NORSE

CONTEXT	SAMPLE	YEAR	PHASE	GL	BD	BP	SD	DD	GLP	SLC	HS	BG	BONETYPE	SIDE
85	T20	88	13.00	39.11	5.41								METACARPAL III	L
85	T20	88	13.00	39.90	4.91								METACARPAL IV	L
195	242	86	15.00	9.79									PHALANX I	UNID
195	246	86	15.00	DA	DA	7.16	4.04						RADIUS	L
196	185	86	15.00	30.21	4.29								METACARPAL IV	L

196	185	86	15.00	14.62									PHALANX I	UNID
242	278	86	13.00	B	B	PA	6.47						FEMUR	R
242	306	86	13.00	15.91									PHALANX I	UNID
242	306	86	13.00	14.99									PHALANX I	UNID
242	313	86	13.00	13.40									PHALANX I	UNID
242	317	86	13.00	B	DA	PA	4.98	DA					TIBIA	L
242	317	86	13.00	PA/DA	DA	PA	5.70	DA					TIBIA	R
245	262	86	13.00	6.54									PHALANX II	UNID
245	265	86	13.00	14.40									PHALANX I	UNID
245	265	86	13.00	10.05									PHALANX II	UNID
254	243	86	9.00	13.53									ASTRAGALUS	L
362	551-1	90	06.00	9.42									PHALANX II	UNID
362	T21	90	06.00	46.20	5.11								METATARSAL III	L
362	T21	90	06.00	PA	13.12	PA	6.52	8.14					TIBIA	L
369	381	88	06.00	12.97									PHALANX I	UNID
378	553	90	?	12.21									PHALANX I	UNID
390	469	89	15.00	16.94									ASTRAGALUS	L
390	469	89	15.00	14.34									ASTRAGALUS	L
390	469	89	15.00	12.68									PHALANX I	UNID
390	T7	89	15.00						11.70	B	62.19	7.89	SCAPULA	R
390B	474	89	15.00	PA	15.82	PA	7.11	9.52					TIBIA	R
394	504	89	15.00	15.62									PHALANX I	UNID
404	363	88	15.00	13.49									CALCANEUM	L
404	363	88	15.00	21.80									ASTRAGALUS	R
404	363	88	15.00	42.44	4.13								METATARSAL III	L
404	363	88	15.00	36.98	3.84								METATARSAL III	L
404	363	88	15.00	43.18	4.90								METATARSAL IV	L
404	363	88	15.00	16.66									PHALANX I	UNID
404	363	88	15.00	17.21									PHALANX I	UNID
404	363	88	15.00	14.05									PHALANX I	UNID

404	363	88	15.00	11.92									PHALANX I	L
404	363	88	15.00	9.25									PHALANX III	UNID
404	363	88	15.00	7.89									PHALANX III	UNID
404	364	88	15.00	PA	13.27	PA	3.00						HUMERUS	L
404	364	88	15.00	22.32	5.10								METACARPAL V	R
417	T5	89	15.00	B	17.21	PA	B						HUMERUS	L
417	T5	89	15.00	B	DA	7.64	3.04						RADIUS	R
417	T4	89	15.00	PA	7.10	4.50							RADIUS	R
425	402	89	?	PA	7.50	PA	4.40						RADIUS	R
558	502	89	15.00	10.39									PHALANX II	UNID
558	T2	89	15.00	PA	DA	PA	5.32						HUMERUS	R
559	536	90	15.00	17.67									ASTRAGALUS	L
559	536	90	15.00	25.68									CALCANEUM	L
559	536	90	15.00	B	3.44								METATARSAL V	R
559	536	90	15.00	11.69									PHALANX I	UNID
559	536	90	15.00	12.20									PHALANX I	UNID
559	536	90	15.00	12.45									PHALANX I	UNID
559	536	90	15.00	10.43									PHALANX II	UNID
559	536	90	15.00	10.47									PHALANX II	UNID
559	563	90	15.00	14.39									PHALANX I	UNID
560	544	90	15.00	10.70									PHALANX II	UNID
660	682iii	90	09.00	12.32									PHALANX I	UNID
662	659	93	09.00	15.92									PHALANX I	UNID
662	T4	93	09.00	DA	DA	7.99	3.96						RADIUS	R
663	T4	93	09.00	30.02	3.84								METACARPAL IV	R

Appendix XII

EARL'S BU, ORPHIR, ORKNEY: CAT BONE: METRICAL DATA (B)
(mm)

PHASE 17.00 = DISTURBED MEDIEVAL

CONTEXT	SAMPLE	YEAR	PHASE	GL	BD	BP	SD	DD	GLP	SLC	HS	BG	BONETYPE	SIDE
35	T5	88	17.00	49.20	5.20								METATARSAL IV	R
35	T5	88	17.00						14.90	13.70	B	9.85	SCAPULA	R
76/77	133	86	17.00	12.76									PHALANX I	UNID
127	T2	85	17.00	PA	DA	PA	5.10	4.20					TIBIA	L
141	?	86	17.00	34.93	3.91								METACARPAL II	L
193	179	86	17.00	25.31									CALCANEUM	R
331	T2	88	17.00	25.86									CALCANEUM	L
334	344	88	17.00	15.19									PHALANX I	UNID
334	344	88	17.00	12.45									PHALANX I	UNID
334	344	88	17.00	11.63									PHALANX I	UNID
334	344	88	17.00	6.12									PHALANX II	UNID
339	352	88	17.00	PA/DA	DA	PA	6.63						FEMUR	R
339	352	88	17.00	20.03	5.00								METACARPAL V	L
339	352	88	17.00	11.73									PHALANX I	UNID
339	352	88	17.00	11.54									PHALANX I	UNID
339	352	88	17.00	14.60									PHALANX I	UNID
339	352	88	17.00	11.30									PHALANX II	UNID
339	352	88	17.00	8.10									PHALANX II	UNID
339	352	88	17.00	74.68	DA	7.52	4.57						RADIUS	L
400	351	88	17.00	16.00	4.20								METAPODIAL	R
402	358	88	17.00	15.75									PHALANX I	UNID
659	628	90	17.00	37.71	4.39								METACARPAL III	R
659	681	90	17.00	9.03									PHALANX III	UNID

Appendix XIII

ENVIRONMENTAL LABORATORY, UNIVERSITY OF BRADFORD, REFERNCE: *FELIS*

BONE TYPE	MEASUREMENT	VALUE (mm) LHS	Value (mm) RHS
FEMUR	BD	19.70	19.13
	BP	21.42	19.65
	GL	118.94	118.29
	SD	8.03	9.51
FIBULA	GL	112.61	112.58
HUMERUS	BD	19.21	18.57
	BP	19.23	21.81
	DD	12.89	12.50
	GL	105.72	103.95
	SD	8.59	8.36
METACARPAL III	BD	4.33	NOT PRESENT
	GL	31.75	NOT PRESENT
METACARPAL IV	BD	NOT PRESENT	4.41
	GL	NOT PRESENT	30.53
METATARSAL II	BD	4.84	4.73
	GL	44.36	43.82
METATARSAL III	BD	5.13	5.42
	GL	48.82	47.86
METATARSAL IV	BD	5.24	5.09
	GL	50.05	49.57
METATARSAL V	BD	4.50	4.50
	GL	48.53	47.81
PHALANX I	GL	16.49	16.49
PHALANX II	GL	8.72	8.72

PHALANX III	GL	9.29	9.29
RADIUS	BD	12.47	12.59
	BP	9.91	9.61
	GL	104.33	104.74
	SD	5.84	5.16
SCAPULA	BG	10.07	10.31
	GLP	14.92	14.40
	HS	81.56	81.38
	SLC	14.43	14.82
TIBIA	BD	15.88	15.93
	BP	20.59	21.20
	DD	9.69	9.94
	GL	120.57	120.50
	SD	7.33	7.50
ULNA	GL	123.01	123.00

Appendix XIV

EARL'S BU, ORPHIR, ORKNEY: LOG RATIOS I						
PHASE 06.00 - 12.00 = VIKING						
PHASE 13.00 - 15.00 = LATE NORSE						
BONE TYPE	**SIDE**	**MEASURE**	**VALUE (mm)**	**STANDARD**	**RATIO**	**LOG RATIO**
FEMUR	R	SD	6.47	9.51	0.68	-0.39
HUMERUS	L	BD	13.27	19.21	0.69	-0.37
	L	SD	3.00	8.59	0.35	-1.05
HUMERUS	L	BD	17.21	19.21	0.90	-0.11
HUMERUS	R	BD	17.54	18.57	0.94	-0.06
HUMERUS	R	SD	5.32	8.36	0.64	-0.45
METACARPAL III	L	BD	5.41	4.33	1.25	0.22
	L	GL	39.11	31.75	1.23	0.21
METACARPAL IV	R	BD	3.84	4.41	0.87	-0.14
	R	GL	30.02	30.53	0.98	-0.02
METATARSAL III	L	BD	4.13	5.14	0.80	-0.22
		GL	42.44	48.82	0.87	-0.14
METATARSAL III	L	BD	3.84	5.14	0.75	-0.29
		GL	36.98	48.82	0.76	-0.28
METATARSAL III	L	BD	5.11	5.14	0.99	-0.01
		GL	46.20	48.82	0.95	-0.06
METATARSAL IV	L	BD	4.90	5.24	0.94	-0.07
		GL	43.18	50.05	0.86	-0.15
METATARSAL V	R	BD	3.44	4.50	0.76	-0.27
PHALANX I	UNID	GL	9.79	16.48	0.59	-0.52

PHALANX I	UNID	GL	14.62	16.48	0.89	-0.12
PHALANX I	UNID	GL	15.91	16.48	0.97	-0.04
PHALANX I	UNID	GL	14.99	16.48	0.91	-0.09
PHALANX I	UNID	GL	13.40	16.48	0.81	-0.21
PHALANX I	UNID	GL	14.40	16.48	0.87	-0.13
PHALANX I	UNID	GL	12.97	16.48	0.79	-0.24
PHALANX I	UNID	GL	12.21	16.48	0.74	-0.30
PHALANX I	UNID	GL	12.68	16.48	0.77	-0.26
PHALANX I	UNID	GL	15.62	16.48	0.95	-0.05
PHALANX I	UNID	GL	16.66	16.48	1.01	0.01
PHALANX I	UNID	GL	17.21	16.48	1.04	0.04
PHALANX I	UNID	GL	14.05	16.48	0.85	-0.16
PHALANX I	UNID	GL	11.92	16.48	0.72	-0.32
PHALANX I	UNID	GL	11.69	16.48	0.71	-0.34
PHALANX I	UNID	GL	12.20	16.48	0.74	-0.30
PHALANX I	UNID	GL	12.45	16.48	0.76	-0.28
PHALANX I	UNID	GL	14.39	16.48	0.87	-0.14
PHALANX I	UNID	GL	15.92	16.48	0.97	-0.03
PHALANX II	UNID	GL	10.39	8.72	1.19	0.18
PHALANX II	UNID	GL	10.43	8.72	1.20	0.18
PHALANX II	UNID	GL	6.54	8.72	0.75	-0.29
PHALANX II	UNID	GL	10.05	8.72	1.15	0.14
PHALANX II	UNID	GL	9.42	8.72	1.08	0.08
PHALANX III	UNID	GL	9.25	9.30	0.99	-0.01
PHALANX III	UNID	GL	7.89	9.30	0.85	-0.16
PHALANX III	UNID	GL	6.62	9.30	0.71	-0.34
PHALANX III	UNID	GL	8.86	9.30	0.95	-0.05
RADIUS	L	BP	7.16	9.91	0.72	-0.33
	L	SD	4.04	5.84	0.69	-0.37
RADIUS	R	BP	7.64	9.61	0.80	-0.23

	R	SD	3.04	5.16	0.59	-0.53
RADIUS	R	BD	7.10	12.59	0.56	-0.57
	R	BP	4.50	9.61	0.47	-0.76
RADIUS	R	BD	7.50	12.59	0.60	-0.52
	R	SD	4.40	5.16	0.85	-0.16
RADIUS	R	BP	7.99	9.61	0.83	-0.18
	R	SD	3.96	5.16	0.77	-0.26
SCAPULA	R	BG	7.89	10.31	0.77	-0.27
	R	GLP	11.70	14.40	0.81	-0.21
	R	HS	62.19	81.38	0.76	-0.27
TIBIA	L	BD	13.12	15.88	0.83	-0.19
	L	DD	8.14	9.69	0.84	-0.17
	L	SD	6.52	7.33	0.89	-0.12
TIBIA	L	SD	4.98	4.33	1.15	0.14
TIBIA	R	BD	15.82	15.93	0.99	-0.01
	R	DD	9.52	9.69	0.98	-0.02
	R	SD	7.11	7.50	0.95	-0.05
TIBIA	R	SD	5.70	7.50	0.76	-0.27

Appendix XV

EARL'S BU, ORPHIR, ORKNEY: LOG RATIOS II

PHASE 17.00 = DISTURBED MEDIEVAL

BONE TYPE	SIDE	MEASURE	VALUE (mm)	STANDARD	RATIO	LOG RATIO
FEMUR	R	SD	6.63	9.51	0.70	-0.36
METATARSAL IV	R	BD	5.20	5.09	1.02	0.02
	R	GL	49.20	49.57	0.99	-0.01
PHALANX I	UNID	GL	12.76	16.48	0.77	-0.26
PHALANX I	UNID	GL	15.19	16.48	0.92	-0.08
PHALANX I	UNID	GL	12.45	16.48	0.76	-0.28
PHALANX I	UNID	GL	11.63	16.48	0.71	-0.35
PHALANX I	UNID	GL	11.73	16.48	0.71	-0.34
PHALANX I	UNID	GL	11.54	16.48	0.70	-0.36
PHALANX I	UNID	GL	14.60	16.48	0.89	-0.12
PHALANX I	UNID	GL	15.75	16.48	0.96	-0.05
PHALANX II	UNID	GL	6.12	8.72	0.70	-0.35
PHALANX II	UNID	GL	11.30	8.72	1.30	0.26
PHALANX II	UNID	GL	8.10	8.72	0.93	-0.07
PHALANX III	UNID	GL	9.03	9.30	0.97	-0.03
RADIUS	L	BP	7.52	9.91	0.76	-0.28
	L	GL	74.68	104.33	0.72	-0.33
	L	SD	4.57	5.84	0.78	-0.25
SCAPULA	R	BG	9.85	10.31	0.96	-0.05
	R	GLP	14.90	14.40	1.03	0.03
	R	SLC	13.70	14.82	0.92	-0.08
TIBIA	L	DD	4.20	12.50	0.34	-1.09
	L	SD	5.10	7.33	0.70	-0.36