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Taphonomic contribution of large mammal butchering experiments to understanding the fossil record

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A dissertation submitted to the Faculty of Science, University of the Witwatersrand, Johannesburg, in fulfillment of the requirements for the degree of Master of Science

Supervisors: Professor Francis Thackeray and Professor Bruce Rubidge

DECLARATION

I declare that this dissertation is my own, unaided work. It is being submitted for the degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.

Andrea Leenen



14th day of January 2011

ABSTRACT

The primary goal of this project is to create a modern comparative collection of complete large bovid skeletons that record butchery marks made by stone tools. Four different raw materials commonly found in the southern African archaeological record (chert, quartzite, dolerite and hornfels) were selected for flake production. Butchery was conducted on three cows by modern Bushmen subsistence hunters skilled in the processing of animal carcasses. They form part of a relatively isolated group of !Xo-speaking Bushmen resident in the village of Kacgae in the Ghanzi district of western Botswana.

The study focuses on characterising the type and conspicuousness of stone-generated butchering marks on bones under low magnification, and documenting patterning including anatomical location, number and orientation. Due to the fact that numerous natural events and human practices modify bones, unequivocal interpretation of bone modifications is sometimes difficult. Further to this, mimics, which are a result of non-human activity, produce the same or qualitatively similar patterns that complicate positive identification of butchery marks made by hominins. Reliable measures are required for interpretation of fossil bone modifications, and controlled actualistic observations provide a direct link between the process of modification (stone tool butchery aimed at complete flesh removal) and the traces produced. A number of taphonomic processes, including bone modification by various animals and geological processes are recorded in comparative collections housed at institutions in the province of Gauteng in the Republic of South Africa. These provide reference material for taphonomists attempting to identify agents responsible for the modification and accumulation of fossil bone assemblages, particularly from early hominin cave sites in the Sterkfontein Valley. However, no reference material exists for hominin modification of bone, and thus motivates for the collection of such traces.

The modern comparative collection produced by this study shows butchery marks inflicted exclusively by habitual hunters who are also skilled butchers, and provides a resource for researchers to help accurately identify hominin-produced butchery marks on fossil bones. The accompanying catalogue records the type and conspicuousness, anatomical location

and orientation of the butchery marks and provides a controlled sample against which a fossil assemblage can be compared.

Results indicate no consistent patterning in the intensity of butchery marking with regard to the type of stone tool material that is utilised. However, a high number of butchery marks per surface area were recorded for most stone tool materials for certain skeletal elements including the mandible, ribs, scapula and humerus. Overall, there are indications that raw material influences butchery marking, however, the small sample size hinders the potential of an identifiable pattern with regard to the type of raw material from which the stone tools responsible for the butchery marks were produced. Furthermore, the vast range of variables that can exist during the butchery process contribute to the equivocal nature of the results. Additional research is required, some of it ongoing, which expands the sample of stone tool butchering, utilises iron tools and investigates ethnographic differences in butchering techniques.

Dedicated to my parents A.J.H. Leenen and C. Leenen.

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CHAPTER 1 – INTRODUCTION

1.1 Introduction

What makes us human? This is a question posed by palaeo-anthropologists who recognise Africa as the cradle of humankind, the continent where the human line evolved. It is the ancestral homeland where the genus *Homo* emerged around 2 million years ago, and it is also the place of origin of modern humankind, within the last 200,000 years (Barham and Mitchell 2008). This dissertation contributes to an understanding of traces that hominins left on fossil bones in the shape of butchery marks inflicted by their hunting or scavenging strategies, with a view to understanding the genesis of butchery marks on bones preserved in the fossil record. The earliest uncontested evidence of butchery marks and percussion marks on bone comes from the Bouri Formation in the Middle Awash Valley, Ethiopia, which records meat and marrow acquisition by hominins at 2,5 million years ago (de Heinzelin *et al.* 1999).

There are numerous natural events and human practices that modify bones and therefore the interpretation of modifications on bone is not always clear-cut. Marks on fossil bones are often interpreted as evidence of human activity which is not necessarily accurate, as modifications may be created by non-human biological and geological agents and processes (Morlan 1984; Behrensmeyer *et al.* 1986; Bunn 1991). A number of natural processes occurring during the life of an animal or after its death can produce mimics of hominin-produced modifications to bone surfaces. Identification of modifications on bone material is complex and much research has been done on identifying the different characteristics of various modifications (e.g., Binford 1981; Potts and Shipman 1981; Shipman and Rose 1983; Behrensmeyer *et al.* 1989; Brain 1981; Bunn 1991; Njau and Blumenschine 2006). Vascular grooves have been shown to mimic butchery marks (Shipman and Rose 1984) and engravings (d'Errico and Villa 1997). Other mimics of hominin modification of bone include gnawing or digestion by carnivores, rodents or herbivores (Sutcliffe 1973; Binford 1981; Villa and Bartram 1996; d'Errico and Villa 1997), fracture for marrow extraction by carnivores (Bunn 1981; 1982; Gifford-Gonzalez 1989a), trampling (Haynes 1988), root

etching (Binford 1981), weathering (Brain 1967a), and the action of different sedimentary environments (Brain 1981; Lyman 1994).

At the macroscopic level modifications on bone produced by non-human agents and those produced by human actions can appear similar. However, at the microscopic level it is generally possible to distinguish butchery marks of various types from modifications produced by other agents (Bunn 1981; Potts and Shipman 1981; Blumenschine and Selvaggio 1988), but much ambiguity exists, especially for traces on isolated fossil elements. Although evidence for butchery in the form of butchery marks on bone was already recognised by researchers in the nineteenth century (Tournal 1833 in Thackeray 1982-1983), methodical cut mark studies were only initiated in the twentieth century, particularly in the 1980s.

Taphonomy became an important consideration through groundbreaking work by researchers such as Brain (1981), Shipman and Rose (1984); Behrensmeyer *et al*. (1986), and Olsen and Shipman (1988). This led to earlier interpretations of the fossil record being questioned, particularly those in which bone modifications had been seen as being cultural in origin or human-made (Bonnichsen 1979; Morlan 1984). For example, Dart's (1957) osteodontokeratic culture of *Australopithecus* was challenged by Brain (1976) when he discovered variability in the durability of different skeletal elements, and showed that different modifying and accumulating agents could determine how and what elements were preserved.

Brain (1981) found an overall similarity in composition between the Makapansgat faunal assemblage and a goat collection from the Namib plains adjacent the Kuiseb River (accumulated by modern Khoi pastoralists and modified by humans as well as dogs). Over 91.7% of faunal remains at Makapansgat came from antelope and of these elements mostly hard and compact distal elements were preserved, including parts of skulls. It was also the case that forelimbs were much more abundant than hindlimbs. In particular the distal ends of humeri were found much more frequently than proximal ends. Vertebrae were rarely preserved and if present they were represented most abundantly by the atlas and axis,

whereas tail vertebrae were absent.

In the Kuiseb goat collection it was clear that preservation of part of the goat skeletons in the sample studied by Brain was due to the durability of the elements; mandibles followed by distal humeri showing the highest percentage of survival. This contradicted Dart's (1957) postulation that artificial selection, by hominins, of certain skeletal elements to utilise as tools was the reason for the disproportionate survival of particular skeletal elements. In some cases spiral fractures on bones were considered by some researchers as characteristic of human activity. Following his study of trampling by bison in North America, Haynes (1983) concluded that spiral fracturing can also occur as a result of carnivore activity or trampling, and may not necessarily be associated with humans.

In order to distinguish between mimics and human modifications it is necessary to adopt an interdisciplinary approach, combining taphonomic analysis of the associated fossil assemblages, microscopic studies of possible modifications, and the experimental replication of hominin-produced bone modifications. Reliable measures are required for interpretation of bone modifications and actualistic experimentation is one of the methods that can provide such measures. Measures to utilise in interpretation of bone modification can be applied based on uniformitarian principles (Morlan 1984; Gifford-Gonzalez 1989b). This study used an experimental actualistic approach to characterise stone-generated butchering marks at a macroscopic scale, documenting their distribution, abundance, orientation, size, type and conspicuousness. The primary goal of this research is to create a modern comparative collection of complete large bovid skeletons showing butchering processes resulting from tools made from different raw materials, and to document and compare the effects of these fine- to coarse-grained lithics on butchered bone. Complete skeletons of modern ungulates (cows, in this study) were used to create a template that will enable comprehensive comparison with isolated elements of ungulates found in the fossil record. Four different raw materials commonly found in the southern African archaeological record were selected for flake production, namely finer-grained chert and quartzite, and coarser-grained dolerite and hornfels. Butchery was conducted on three cows by Bushmen subsistence hunters skilled in the processing of animals. They form part

of a relatively isolated group of !Xo-speaking Bushmen resident in the Kacgae village in the Ghanzi district of western Botswana.

1.2 Background

The term taphonomy (from the Greek *taphos* meaning burial and *nomos* meaning law) was coined in 1940 by Russian scientist Ivan Efremov (Shipman 1981: 5-6; Lyman 1994). The foundation of this field of study is to better understand biases present in the fossil record. Taphonomy is the study of what happens to bone from the time of an animal's death to its burial, fossilisation and later retrieval and curation (Shipman 1981; Lyman 1994). Taphonomists aim to understand the processes an organism undergoes after death, including disarticulation or break-up, any biological processes that may have modified the remains before burial (e.g. scavenging), response of the carcass to transport by animals, water or wind and the time elapsed before burial. Preservation of the fossil after burial is dependent on numerous environmental conditions and once buried the material may be subjected to diagenesis and processes responsible for fossilisation. Finally, the fossil is retrieved by researchers and curated. The curatorial process itself can be associated with taphonomic signatures.

Faunal taphonomists study the modifications recorded on fossil bones to identify what factors contributed to the modification and accumulation of faunal assemblages. Taphonomists also reconstruct site formation processes and attempt to infer behaviour. Their interpretations have important implications for our understanding of human evolution. For example, meat-eating is considered an important factor in the evolution of humankind, and establishing at what point in the evolutionary record scavenging was replaced by hunting is an ongoing debate (Bunn 1981; Blumenschine 1986; Bunn and Kroll 1986; Lyman 1994; Thackeray 2007).

The reconstruction of hominin dietary behaviour plays a significant role in answering questions regarding human behavioural evolution (Nilssen 2000). Issues such as carcass acquisition, butchery and transport are especially important, as the identification and

elucidation of these behaviours provide researchers with insight into the social and ecological contexts in which our earlier ancestors existed. A number of studies have been conducted in this regard. For example, Binford (1985) reported that hominins were marginal scavengers obtaining scraps from carcasses virtually defleshed by other nonhuman hunters. Blumenschine (1986) proposed scavenging by early hominins based on the observable standard sequence of carcass consumption by modern nonhuman carnivores which he then compared to the archaeological record. Brain (1981) documented the nature of bone collections in caves by leopards and other accumulators and discussed the modifications to these bone collections by various animals. Bunn and Ezzo (1993) conducted studies that they proposed supported hunting or 'power scavenging' by hominins stealing carcasses with a lot of meat from carnivores. Marean (1989) discussed how hominids may have obtained a large quantity of meat by scavenging sabre-tooth cat kills. Milo (1998) supported Klein's research at Klasies River (1982, 1988) which favoured Middle Stone Age hominins as hunters. Thackeray (1990) responded to Binford by noting that some ungulate assemblages at Klasies River were associated with leopard activity. Selvaggio, (1998), modelled the frequency of carnivore tooth marks defleshed by felids and scavenged by hominins to explain the percussion and tooth mark frequencies that Blumenschine (1995) reported on the long bone fragments from the FLK *Zinjanthropus* site at Olduvai Gorge.

Recent research on *Paranthropus robustus* dentition, including stable light isotopes (e.g. Lee-Thorp *et al*. 1994, 2000; Sponheimer *et al*. 2006) and dental microwear analysis (Grine and Kay 1988; Ungar and Grine 1991), together with the study of associated bone tools (Brain and Shipman 1993; Backwell and d'Errico 2001), reveals a more complex diet and behavioural repertoire than previously thought.

1.3 Theoretical framework

The investigation of early hominin behaviour is divided into two broad classes; socio-ecological models and palaeo-taphonomic models (Blumenschine *et al.* 1994).

Social-ecological (or behavioural) models use living systems to understand extinct ones. Modern analogues are utilised as models for past behaviours based on uniformitarian principles (Morlan 1984; Gifford-Gonzalez 1989b; Pobiner and Braun 2005a). Researchers can, for instance, combine morphological traits of fossil hominins (brain size, dentition, osteology) with modern ecological behaviour to extrapolate possible behaviour in pre-historic human populations. In this vein researchers such as Goodall (1976) and Jolly (1970) have respectively utilised chimpanzees and baboons to infer hominin behaviour. In some cases researchers have also observed contemporary peoples, including Bushmen (San) hunter-gatherers, to establish linkages between modifications in the archaeological record and the behaviours that produced them. Although enlightening, the challenges experienced with this model include the substantial gap in time and space between the taxa observed, and the differences in social and biological characters that exist between them (Gould 1980; Bunn and Kroll 1986; Shipman 1989).

The utilisation of palaeo-taphonomic models requires a sound understanding of taphonomy, particularly the complexities related to the burial process, the context of the site and knowledge of the diagnostic criteria relating to bone modification categories. Palaeo-taphonomic models are concerned with burial and preservation processes and involve two approaches, namely, paleaotaphonomy and actualism (e.g., Lyman 1994). Palaeotaphonomy is described as examining the content and context of faunal assemblages, the skeletal part representation and patterns of bone modification (e.g., Klein 1975, 1982, 1988; Behrensmeyer 1978, 1991; Brain 1981; Bonnischen and Sorg 1989; Thackeray 1984)

Actualism (Lyman 1994), also known as neotaphonomy (Gifford 1981) or Middle Range research (Binford 1981), is the extrapolation of modern observations back into the past. Causal relationships established in modern processes are used to establish diagnostic effects or signature criteria caused by past processes. The presence of diagnostic signature criteria on pre-historic material serves as evidence that certain events occurred in the past. Two types of actualistic research exist and include ‘naturalistic’ and ‘experimental’ approaches. The former encompasses the study of modern animal behaviour (ethology) and human (ethnographic) populations in an attempt to determine the outcome of their

activities or behaviours and to extrapolate these to past populations. Naturalistic studies are effective models to utilise for extinct populations and some of the numerous studies executed in this field include the effects of trampling (Brain 1967b; Behrensmeyer *et al.* 1986; Haynes 1986; Fiorillo 1989; Thackeray 1984), hyena scavenging (Shipman and Phillips-Conroy 1977), and modification by modern humans (Brain 1967b; Gifford 1977; Gifford-Gonzalez 1989b; Parsons and Badenhorst 2004). The latter, the 'experimental' approach, is still a topic of debate (Binford 1968, 1981; Collins 1975; Yellen 1977; Gould and Schiffer 1981; Wylie 1985), with challengers arguing that modern human bias and their ability to mimic can lead to the manufacture of predetermined results (Wylie 1985). It is a problem that needs to be addressed particularly in research where replication studies are the only method utilised.

Utilising modern analogues and executing actualistic research are both entrenched in uniformitarian theoretical principles, and palaeontological research relies on postulation that bone material responds to the effects of various agents in similar ways over time. Researchers are aware of the problems that are encountered in such an approach (Hill 1984; Binford 1987), but despite these difficulties, understand that methodological uniformitarianism and analogical research are the best methods for investigating past processes (Binford 1981, 1987; Gifford-Gonzalez 1989b). With reference to this particular study, modern humans, specifically those proficient in butchery, arguably remain the best models available and replicating tools for them to utilise in their butchery activities is perhaps the most appropriate and effective method to use.

1.4 Bone surface modifications

Backwell (2000) provides an overview of the various damage categories into which bone surface modifications are divided, upon which the following summary is partly based. Bone damage categories are grouped according to the nature of the modifying agent, namely biotic, abiotic or a mixture of both. Biotic agents are further classified into animal, insect and plant groups. In order to determine a timeline of events for bones exhibiting taphonomic palimpsests, damage categories are also classified in order of pre-and post

depositional stages. All bone surface modifications linked to tool use are categorised as pre-depositional.

Porcupine gnawing is characterised by incisor scrape marks which are broad, shallow and either flat-bottomed or slightly rounded in cross-section (Newman 1993). Potts and Shipman (1981) observe that they tend to overlap and lie parallel to each other. They may be orientated perpendicular to the axis of the bone shaft or longitudinally at the extremities (Maguire 1976; Brain 1981). Gnawing occurs pre-depositionally.

Tooth scores, also known as gouge marks and tooth scratches, are produced by mammal molars or carnassials impressing upon green bone (Binford 1981). Green bone is also termed as wet or fresh bone (Johnson 1989); it is bone from which flesh has recently been removed (Buikstra and Swegle 1989), without being exposed for more than two seasons (Irving *et al.* 1989). This is dependent on seasonal variability and context, but the major identifier of green bone is the fact that it retains grease. Tooth scores have relatively shallow furrows (Blumenschine 1995, Blumenschine *et al.* 1996) with smooth internal groves that can be V- or U-shaped in cross section depending on the morphology of the tooth cusp (Bunn 1981; Potts and Shipman 1981; Shipman 1989; Pickering and Wallace 1997). They may occur on bones as single sets of parallel and sub-parallel marks or as clusters of marks with different orientations (Newman 1993). Tooth scores usually follow the topography of a bone surface (Binford 1981) and commonly exhibit a crushed internal surface (Blumenschine and Marean 1993).

Tooth pits appear as distinct, roughly circular markings which scar the bone surface, producing an inward crushing of the cortical bone (Blumenschine *et al.* 1996). They tend to have a localised distribution (Maguire *et al.*1980) typically adjacent to chewing. Tooth crushes or punctuate depressions (Maguire *et al.* 1980), also referred to as tooth punctures in the more widely used terminology of Binford (1981), are produced by the pointed tips of mammal canines and carnassials and are characterised by circular to oval depressions in bone where the cortical surface has been pushed down into underlying cancellous bone or the medullar cavity.

Modifications produced by stone tools are usually categorised as butchery marks, scrape marks, chop marks or percussion marks. Butchery marks are typically described as elongated, narrow grooves that are often V-shaped in cross-section with flat sides (Marshall 1989). Some literature describes the most distinctive feature of butchery marks in terms of the presence of multiple, fine, linear striations lying longitudinally within the main groove (Potts and Shipman 1981; Shipman and Rose 1983, 1984). Cut marks could occur almost anywhere on a bone surface, however, on particular bone elements they occur in specific areas of ligament attachment (Fiorillo 1989; Marshall 1989).

Scrape marks are usually present as bands of multiple, fine, parallel striations that are linear and narrow, covering a relatively broad area (Potts and Shipman 1981). Chop marks are broad, short, linear depressions, V-shaped in cross-section with bone fragments crushed inwards at the bottom of the indentations. They may not present fine parallel striations within their borders (Binford 1981; Potts and Shipman 1981). Percussion notches are semi-circular indentations that may occur along the fracture edges of long bones (Bunn 1981; Blumenschine 1995; Blumenschine and Selvaggio 1998; Backwell and d'Errico 2004).

1.5 Review of butchering studies with a focus on butchery marks as bone surface modifications

Bone surface modifications such as butchery marks and carnivore tooth marks show direct evidence for hominin and carnivore activity and these characteristics are therefore utilised to reconstruct hominin dietary behaviour. Hominin-produced butchery marks form an aspect of butchery studies and are the focus of this research. A historical review of butchery studies follows to provide the reader with an understanding of the broader field within which cut mark studies reside.

Butchery has been defined by Lyman (1987: 252) as the human reduction and modification of an animal carcass into parts that can be consumed. Lyman emphasises that he

differentiates between human butchery and *faunal processing*, with butchery defined as "the reduction and modification of an animal carcass into consumable parts" (1987:251-252). In other words, many animals other than hominins process carcasses for consumption, but only humans *butcher* carcasses. Lyman is in agreement with Binford's (1978) description of butchery, which he describes as the task of dismemberment through which a carcass is divided into sets of bones that may be abandoned, transported or assigned to different uses, provided his 'sets of bones' are defined as the archaeologically observable results of a process involving not only bones, but also muscle fat and hide (Lyman 1994: 295). Binford (1978:48) goes on to say that butchery involves a number of acts starting from the death of the animal and continuing until the animal is completely consumed or discarded.

Researchers in this field attempt to unravel how prehistoric populations utilised animal products, and how they hunted, butchered, transported and allocated animal resources. Reconstructions of this aspect of ancient lifestyles are based on animal skeletal remains and aim to illuminate a more complete picture of early human behaviour. There are many potential variables involved in the processing of an animal carcass for consumable products, as an animal possesses many different resources and there are many factors which influence which of these resources are exploited and how this is executed. Lyman (1987:252) records that resources obtainable from a carcass can include, *inter alia*, hide, sinew, bone, horn, blood, fat and brains which will involve the activities of skinning, hide removal, defleshing, filleting, blood and brain extraction and so on. Factors which may influence the choices butchers make regarding animal species and butchery methods include both natural and cultural factors, such as the size and age of the animal, the size of the human population and the technology available to the butchers. Lyman (1987:252) termed the actions and activities involved in butchering as the *butchering process and butchering technique,* and the results of the butchering as the *butchering pattern.*

As early as 1833, Phillipe Tournal claimed the contemporaneity between humans and extinct animals based on his discovery of extinct animal bones in association with artefacts. In addition, the bones he had discovered were cut marked which he attributed to the

butchering practices of prehistoric humans (Tournal 1833 in Thackeray 1982). In 1860, Lartet (Lyman 1994) also recognised evidence for human butchery in the form of butchery marks. However, it was only a century later that researchers started systematic studies of butchery marks on animal bones. Several papers were published by White (1952, 1953, 1954, 1955 and 1956), outlining the potential information that could be gathered from animal remains, including butchery methods, hunting patterns, transportation and group size at a particular site. White's work is an early example of ethnoarchaeology as he compared skeletal element abundance data from archaeological sites with ethnographic butchery data of modern peoples. White's interpretation of faunal remains included skeletal part frequencies, bone damage and ethnographic accounts of butchering techniques observed by earlier researchers such as Wilson (1924) and Wissler (1910). Several researchers followed White's lead when interpreting faunal remains, for example, Wheat (1972), Frison (1971) and Guilday *et al.* (1962). They observed modern peoples and related their behaviours to what excavators uncovered in the archaeological record, thus utilising an analogous approach, but not taking into consideration the taphonomic complexities of the faunal record. The same omissions were made by earlier researchers working on the African fossil record where taphonomic processes were not duly considered (e.g Isaac 1971, 1977; Leakey 1971).

Prior to the late 1970s, researchers in this field of interest focused mainly on inferring early human behaviours that relate to the butchery process by observing the butchering patterns as reflected in a fossil assemblage (Binford 1981; Lyman 1994). It was presumed that prehistoric butchers were pragmatic and efficient in the butchering process (White 1956). Prior to taphonomic considerations becoming a research priority, many analysts ascribed several characteristics of bone modifications to human activity. Often this assumption of human involvement in bone modification was based on finding animal remains and artefacts in association (Lyman 1994: 296). It was only in the late 1970s that an increasing taphonomic awareness encouraged analysts to identify taphonomic agents prior to inferring hominin behaviour (Nilssen 2000), and to spend more time studying the characteristics of bone modifications in order to explicitly ascribe modifications to human activity (Lyman 1994).

Through several ground-breaking studies Brain (1967a, 1967b, 1969, 1981, 1989), known to many researchers as the 'father of cave taphonomy', established that there are several non-human processes that produce bone modifications and that these modifications may very well mimic the marks produced by human agents. Brain also noted that factors such as bone density can create preservational biases which can affect inferences based upon skeletal parts frequency. Nilsen (2000) noted that it is only recently that most zooarchaeologists agreed that butchery marks are the most convincing indicators of hominin involvement at sites (Binford 1981; Shipman and Rose 1983; Potts 1984; Behrensmeyer 1986 *et al*; Bunn & Kroll 1986; Shipman 1986; Lyman 1987, 1994; Blumenschine and Selvaggio 1988; Bunn and Ezzo 1993; Milo 1994, 1998; Fisher 1995; Blumenschine *et al.*1996). Researchers (e.g. Milo 1994; Bartram and Marean 1999; Klein *et al.* 1999) also started analysing the intricacies of utilising other methods, such as skeletal part frequencies and mortality profiles, for evaluating hominin dietary behaviour. Analytical biases, such as the exclusion of shaft fragments from skeletal part frequencies, have also been shown to be capable of seriously altering results (Bartram and Marean 1999).

In butchery studies a great number of papers have dealt with the hominin 'hunting versus scavenging' debate. Nilssen comments that modern hunter-gatherers combine hunting and scavenging in their acquisition of animal carcasses (2000), and that unambiguous evidence for hunting as opposed to scavenging is virtually absent from the archaeological record (see Milo 1998 and references therein). Nilssen states that it is the position of hominins within the greater chain of meat-eaters that is more practical to evaluate, rather than trying to address the question as to whether hominins predominantly hunted or scavenged. He observed that is it important to evaluate a hominin's ability to acquire resources in relation to the ability of other carnivores, and to establish whether early hominins were able to manipulate other carnivores and establish a dietary niche for themselves. Nilssen's work compared butchery marks from a large sample of animals butchered by modern butchers to butchery marks from a Plio-Pleistocene and Upper Pleistocene assemblage to place hominins within a sequence of meat acquisition by meat-eaters and to note how their status

would have changed over time.

Numerous researchers have also worked on the timing of hominid access to animal carcasses (e.g. Binford 1981, 1984; Bunn 1981, 1983; Potts and Shipman 1981; Bunn and Kroll 1986; Shipman 1986; Blumenschine 1988; Marean 1989; Blumenschine and Marean 1993; Lupo 1994; Milo 1994, 1998) and the manner in which hominins accessed large animal carcasses is widely debated (e.g. Isaac 1978; Binford 1981, 1984; Bunn 1981; Blumenschine 1986, 1987; Bunn and Kroll 1986; Shipman 1986; Speth 1989; Klein 1992, 1999; Bunn and Ezzo 1993; Selvaggio 1998).

Accurately identified butchery marks may be evidence of hominin activity, however, they do not elucidate the manner of involvement of these hominins by merely being noted as present or absent (Nilssen 2000). Lyman (1994) noted that it was largely the efforts of Pat Shipman (1981, 1983, 1986; Shipman and Rose 1983, 1984) that initiated the examinination of various scratches on bone both macroscopically and microscopically. Shipman reported that stone tool marks can be morphologically differentiated from marks produced by, for example, carnivore and rodent. More recently, Lyman (2005) remarked that there is a large body of research focusing on cut marks, but a lack of studies investigating the variation in frequency of cut marks recorded in archaeological assemblages.

Limited actualistic butchering studies have been conducted to investigate butchery marks created by tools produced from different raw materials (Bunn and Kroll 1986). Greenfield (1999, 2006) conducted experimental research and created diagnostic criteria for identifying stone tool type and raw material from butchery marks on bone. His research built on previous experimental studies (Potts and Shipman 1981; Shipman and Rose 1983; Blumenschine *et al*. 1996) concerned with determining the origin of bone modifications. These studies had to consider numerous taphonomic variables such as non-human biological modifications due to animal trampling and gnawing, and also included modifications made by geological processes (Lyman 1994) and by humans through excavation and preparation damage (White and Toth 1989). Greenfield's (1999, 2006)

research concluded that butchering implements leave identifiable cut marks on bones and it is possible from these marks to try differentiate between raw materials and types of stone tools utilised. However, he states that it is easier to identify the shape of a tool rather than the raw material from which it was made by looking at the cut mark. Greenfield replicated the cut marks himself reproducing cut marks on wood (pine boards) and bone (only the medial surface of a domestic cow rib). The current study adds to the data of Greenfield by utilising habitual, skilled butchers butchering complete animals.

A recent study by Greenfield (2006) attempted to differentiate stone from metal tool marks. Greenfield mentions that the earliest research in this area was executed by Walker and Long (1977). Although he applied his research to the fossil record, Greenfield's (2006) experimental studies did not include actualistic butchering experiments utilising stone tools wielded by modern marginal hunter-gatherers, and neither do the majority of studies investigated in the course of literature reviewed here. A lack in utilising the skills of hunter-gatherers is also noted as problematic by Haynes (1991) and Milo (1994). What is of interest is that Greenfield noted differences between butchery marks made by lithics and other materials. In addition, through studying the fossil bones at a site in Afridar, Israel, Greenfield (2006) concluded that most of the stone tools used in butchering at this site were probably haphazardly made unmodified flakes.

Dewbury and Russel (2006) investigated how stone tool materials affect the frequency of butchery marks by butchering deer utilising flint and obsidian stone tools. They did not utilise habitual hunters and remarked that their sample size was too small to statistically demonstrate a correlation between stone tool material and cut mark frequency. However, interesting observations were made regarding the relationship between sharpness and durability of stone tools on the one hand and butchery mark frequency on the other.

Nilssen (2000) focused on actualistic approaches to develop models for identifying butchery marks. His research provides detailed inventories of types of butchery marks, their frequencies, and their associated behavioural correlates. He mentions that previous actualistic butchering studies produced cut marks at anatomical locations and in

frequencies that vary from marks produced by habitual butchers. This study specifically utilises habitual butchers for this reason.

The above review of the literature indicates that further actualistic studies are required to compare the morphology, frequency and distribution of butchery marks on bones (Bunn 1991; Lyman 1994) and to provide detailed inventories of specific butchery marks and their associated behavioural correlates (Nilssen 2000). In a 2002 paper, Lupo and O'Connell comment that more actualistic studies are needed to look at the variables that may be significant in affecting cut mark frequency.

A number of taphonomic processes, including bone modification by various animals and geological agents, are recorded in comparative collections housed at the Bernard Price Institute for Palaeontological Research at the University of the Witwatersrand and the Ditsong National Museum of Natural History (formerly the Transvaal Museum) in Gauteng, South Africa. These provide reference materials for taphonomists attempting to identify which agents modified and accumulated a fossil assemblage. However, no reference material exists in these collections relating to human modification of bone, and thus motivates for the collection of such traces in this study.

1.6 Objectives

1.6.1 Primary Objectives

Primary objectives of this study are:

1. *To create a modern comparative collection of known origin of complete large bovid skeletons showing butchering processes resulting from tools made from different raw materials.*

To my knowledge no such collection is currently available. Institutions or individual researchers may possess isolated skeletal elements, with experimentally-made butchery

marks or impact marks, but no complete skeletons, recording true butchering modifications are known to exist. Such a collection can be used for teaching as well as for comparative research purposes.

2. *To document and compare the effects of lithics produced from different raw materials on bone, at a macroscopic level.*

Fine-grained lithics produced from chert, medium-grained lithics produced from quartzite, and coarse-grained lithics produced from hornfels and dolerite were utilised in the butchering process. Chert and quartzite lithics are commonly found in the 'Cradle of Humankind' World Heritage fossil sites in South Africa and represent predominantly Early Stone Age (ESA) sites, dated to between 2.6 million and 200 000 years ago (Clarke and Partridge 2010). Hornfels and dolerite are commonly found at archaeological sites in the South African interior and represent predominantly Middle Stone Age (MSA) sites dated to between 200 000 and 35 000 years ago (McCarthy and Rubidge 2005). The expectation is that different raw materials will produce different observable bone modifications at a macroscopic level including distribution, morphology and abundance based on the assumption that the finer-grained lithics (chert and quartzite) is sharper and cuts more efficiently, requiring less strokes to perform a particular task and therefore inflicting fewer marks on the underlying bone.

3. *To document different rates of butchery marking across elements and to see the extent that raw material type influences this.*

This allows a comparison of the rate of butchering intensity between skeletal elements of the same animal, and between the same skeletal elements across all three animals, to try to determine which elements required the most intensive butchering and to investigate how the differences in rates of butchering intensity are influenced by the material differences in the stone tools utilised. The expectation is that certain skeletal elements are more difficult to butcher than others, and will therefore always be more intensely cut marked regardless of material type of the butchery tool.

The ultimate objective is to contribute a model for interpreting butchery-marked bones from the fossil record. Human behaviour responsible for bone modification is difficult to identify, considering the variability in motivation and the context within which butchering occurs. Variables can include cultural practices, transport distance, competition with carnivores and individual skill, stature and size.

CHAPTER 2 – MATERIALS

2.1 Butchers

This study did not aim to utilise the butchers in the experiment as an analogue for the earliest hominins; instead they participated because of their skill in butchering large mammals. The decision was made not to use local commercial butchers, because they use modern equipment such as stainless steel knives and band saws, and often process animals that have already been skinned and partially disarticulated. It was also decided that the researcher would not butcher the animals herself as she is not skilled in this regard. Modern Bushmen (who prefer to be called as such, rather than San) are subsistence hunters skilled in processing animals. The butchers comprised six !Xõ-speaking Bushmen living in the Kacgae village in the Ghanzi District of central western Botswana. They are all currently residing in and around the Kacgae village in the Ghanzi district to which they were relocated by the Botswana government. These men practiced hunting and butchering as part of their subsistence strategy prior to their relocation to Kacgae. Today they are unable to regularly practice hunting as legislation controls the hunting of game in Botswana. Approximately once per year the community is provided with a permit to hunt game.

The same six men butchered the animal in each experiment to ensure that there was as little variability in processing as possible. Details concerning the names, age and linguistic affiliation of the butchers are:

1. Xomate 'Punch' Qomane, 46 years of age from the Qoong language group in the Kalahari desert.
2. Kayate Xwixakci, approximately 70 years of age, from the Qoong language group in the Kalahari desert.
3. Xwamkwa Xeekwe, 43 years of age from the Qoong language group in the Kalahari desert.
4. Joe Tshao, approximately 36 years of age from the Monarwa language group in D'Kar.

5. Xasa Qomane, 42 years of age from the Qoong language group in the Kalahari desert.
6. Xaxe Qoma, claimed to be 80 years of age although he appeared much younger, from the Monarwa language group from Chobokwane.

A translator from the local Setswana community was utilised to communicate with the butchers. The butchers are able to communicate effectively in Setwana and also had command of a few basic English words. The translator was a teacher from the local Kacgae pre-primary school which is attended by most of the local Kacgae San children as well as a small number of local Setswana children, mainly the children of local government workers. Contact was also made with the local Headman of the Kacgae village as well as the local police sergeant to facilitate the research. The University of Witwatersrand issued an animal ethics clearance certificate (no. 2010/54/01) providing approval for the butchering of the three cows.

2.2 Bovids

Three cows were utilised in the butchering experiment. These cows were killed by the Bushmen as part of an annual ritual feast. Cows are bovids, representative of large animals (ungulates) preserved in abundance in the fossil record bearing traces of human modification and often found in association with stone tools (Brain 1976; Bunn and Kroll 1986). The first cow weighed approximately 235 kilograms and was just over two years of age. It was butchered using lithics produced from quartzite, a finer-grained raw material. The second cow weighed approximately 260 kilograms and was just over two years of age. It was butchered utilising chert, a fine-grained raw material. The third cow weighed approximately 240 kilograms and was just over two years of age. It was butchered utilising two different raw materials: dolerite and hornfels, both coarse-grained raw materials. The dolerite was utilised only to remove the two hind limbs of the third cow and to deflesh these limbs, while the hornfels was utilised on the remainder of the carcass.

2.3 Tools

Raw materials were sourced from various localities in South Africa. The quartzite was collected from a small koppie situated in a suburban area north of Johannesburg which forms part of the Witwatersrand Supergroup. Chert was sourced from sites in the 'Cradle of Humankind' World Heritage Site in the Sterkfontein Valley north-west of Johannesburg, which forms part of the Transvaal Supergroup. Hornfels and dolerite were gathered from sources located in the Free State province forming part of the Karoo Supergroup. Tools were knapped by archaeology students and researchers from the University of the Witwatersrand. The majority of stone tools produced were unmodified flakes. However, all lithics produced by the knapping process were made available to the butchers, including cores. With each raw material type, the butchers were provided with access to all the flakes produced and the number of tools available to them were more or less the same with each butchery. All lithic material was collected after each butchery experiment. Tools selected for use in butchering were individually stored in sealed plastic bags for potential micro-residue analysis.

The stones used in this study were transported to South Africa and have been retained for future study. They were unpacked and laid out on a table in a well-ventilated facility to dry. They were then measured, counted (Table 2.1), packed and stored. The tools were accessioned into the collections held at the Bernard Price Institute for Palaeontological Research at the University of the Witwatersrand as part of the butchery experiments.

Table 2.1 Counts of stone tools used for butchery, by size class

Size class	COW 1 Quartzite	COW 2 Chert	COW 3 Hornfels	COW 3 Dolerite	COW 3 Hornfels Total
< 2 cm	9	2	36	3	39
2-5 cm	92	132	52	59	111
5-8 cm	78	119	14	49	63
> 8 cm	26	17	3	21	24
Total	**205**	**270**	**105**	**132**	**237**

CHAPTER 3 – METHOD

3.1 Butchery

The butchery experiments took place during an annual ritual feast at which cows belonging to the local community were butchered by the men and distributed as part of the ceremony. The researcher requested permission from the community to utilise the cows allocated for slaughter as part of the butchery study. In order to minimise behavioural variables the men were asked to butcher the animals as if they had hunted them and as if they were preparing them for consumption at camp. The butchers were requested not to break the bones for marrow extraction so as not to mask or modify marks produced during butchering. Each butchering experiment was time-controlled and an average duration of six hours was recorded for butchery of each cow including skinning, de-fleshing and filleting. The cows were laid flat on the ground on top of a plastic sheet for the entire butchery process. Butchery commenced immediately after the death of the animals and continued until all the flesh had been removed.

3.2 Collection and transportation of bones

During and after the butchering process care was taken to prevent local dogs, as possible external modifying agents, from damaging the bones. After butchering, all the bones were retrieved, and immediately immersed in a 6% formalin solution in plastic drums (each cow carcass being stored in separately marked containers) following the requirements stipulated in the permit issued by the Department of Agriculture in Pretoria. At the conclusion of the project they were transported to Gaborone, Botswana. The state veterinarian inspected the bones to ensure that they were appropriately prepared for transportation by road to South Africa. A release document was provided in order to permit the export of the bones.

3.3 Cleaning and preparation of bones

Upon arrival at the University of the Witwatersrand the bones, still in their plastic

containers and preserved in their formalin solution, were transported to the University's Medical School for cleaning and preparation which included boiling and de-fatting of the bones. Trichloroethylene and peroxide were utilised in the process. The bones were boiled in large pots over the course of several days. Once all the fat and adhering tissue was removed from the bones they were collected and transported to a laboratory at the Bernard Price Institute for Palaeontological Research where they were laid out on a table in a well-ventilated area to dry. The different elements from each skeleton were identified, labelled with an accession number and packed into individual wooden storage boxes until such time that the analysis took place. After analysis the bones were accessioned into the collections held at the Bernard Price Institute for Palaeontological Research at the University of the Witwatersrand.

3.4 Data collection

The method utilised in this study broadly follows that used by Nilssen (2000) for recording data on experimentally modified skeletal remains. Each skeletal element was studied with a 10x magnification hand lens in sunlight or under an incandescent lamp to record the presence, distribution pattern, abundance and morphology of modifications. Marks were documented schematically on bone element templates to allow for easy visual comparison, as written explanations are not always clear. The same data were also recorded in an Excel spreadsheet for quantitative analysis.

3.5 Compilation of data sets

A data base was compiled documenting the butchery process. Variable measures and coding conventions used appear in Appendix i. Independent variables included specimen and accession number, raw material, skeletal element and anatomical portion. Dependent variables were number of butchery marks, orientation of marks, type of mark, number of clusters and mark visibility.

The specimens are listed in the data base as deriving from cow one, two or three, whereas the accession number which appears as a written number on each skeletal element was assigned by the curator of collections at the institute where the collection is housed. Raw material is listed as either quartzite, chert, hornfels or dolerite.

Skeletal element identifies each bone element, for example, femur or humerus. In the case of individual cervical (three to five), thoracic (one to thirteen) and lumbar (one to six) vertebrae each specimen was analysed separately. The atlas and axis were also analysed separately. The caudal vertebrae were analysed individually but not numbered in series. The individual ribs (one to thirteen) were analysed separately. The carpals were treated as a unit as no butchery marks were present on any of them. The tarsals received the same treatment because there were only three butchery marks on the left calcaneum of cow three. The phalanges of the fore- and hindquarters are not distinguished but were analysed individually.

The anatomical portion is described using the standard terms. Proximal, distal and shaft describe portions of long bones and ribs. Ascending ramus and body describe portions of the mandible. Epiphyseal, near epiphyseal, illium and ischium are the portions used for the innominate, and the astragalus, calcaneum, naviculo-cuboid and calcaneum tuberocity are distinguished for the tarsals.

The orientation of the cut mark is modelled after Nilssen (2000) and appear as follows: longitudinal, transverse and diagonal are utilised where single butchery marks appear in a clear orientation. Longitudinal/diagonal, transverse/longitudinal, transverse/diagonal and transverse/longitudinal/diagonal are utilised where there are several overlapping butchery marks at different orientations in a small area.

Mark type is described using standard terms of which some are also reviewed in section 1.4 of the main body of the thesis. Additional descriptive terms used are as follows : Cut mark, flat cut mark, puncture and deep gouge are the basic butchery mark descriptors. Butchery marks are described in section 1.4 of the thesis. A flat cut mark is where the edge of the

stone tool entered the bone at a very shallow acute angle to the surface, unlike a cut mark where the blade entered the bone more perpendicular to the surface. A gouge and a deep gouge describe a qualitative difference, where the deep gouge appears more pronounced.

For number of clusters, a cluster is defined as more than four butchery marks appearing together and likely to have been made by the same butchery task, for example, removal of a individual scrap of flesh.

Mark visibility is described as superficial, distinct and superficial/distinct, according to the qualitative differences in visibility of butchery marks.

Body side is indicated as left, right or not determined and describes the side of the body from which the element originates.

View of bone utilises standard terms to describe the following aspects of each skeletal element: anterior, posterior, inferior, superior, ventral, dorsal, medial, lateral, caudal, cranial, left and right.

In general a category identified as not determined is indicated as a question mark (?), and a blank space indicates that a category is not applicable.

3.6 Quantifying the rate of butchery marking

To examine material differences in rates of marking, comparisons are made within elements (i.e., the same element from different cows) to control for different constraints to butchering among elements of different size and shape. To measure butchery marking rates and intensity of marking, the total number of butchery marks per bone, the number of clusters of marks per bone, the number of bone sections that bear marks and the visibility of the butchery marks are utilised.

To examine differences among elements (i.e., different elements in the same cow) and the

extent to which raw material tool type might influence this, it is necessary to standardise the rate of butchery marking per unit surface area given the different size and shape of elements within a skeleton.

An approximate measure of external surface area of skeletal elements was obtained by wrapping each element of an individual cow skeleton in plastic and then shaping the plastic to fit entirely over the element before cutting it. The cut-out plastic was then removed and laid out on a flat surface. The plastic was cut into pieces to form squares. The external surface area for each element was then calculated.

Bones from cow two were measured to determine surface areas, which were then subsequently applied to bones of cows one and three, which are similar in weight and age (section 2.2).

The number of butchery marks was divided by the surface area (SA) to calculate the number of butchery marks per unit surface area. The results were expressed in terms of number of butchery marks (NCM) per 10000 mm^2 .

Table 3.1 records the surface area for selected skeletal elements of cow two. The selected skeletal elements include all the major elements, for example, the cranium and the hemi-mandible. Representatives of elements that occur in a series were selected: cervical vertebrae are represented by the atlas, axis and cervical vertebra five; thoracic vertebrae by numbers two, six and thirteen; lumbar vertebrae by number three and ribs by numbers two, seven and thirteen of the left body side. Only the metapodial was measured for the foot as the other elements were not complete and most often did not contain any butchery marks.

3.7 Sample characteristics

Table 3.2 shows the total number of bones butchered for each cow and by each raw material. It is important to again note that the third cow was butchered by two types of raw

material, namely hornfels and dolerite, with the latter only utilised to butcher the two hind legs. The differences in numbers of bones recorded for each cow is a result of differences in the number of carpals, tarsals, phalanges and caudals recovered from the butchering. Carpals, tarsals and phalanges were treated as single element units such that each cow has two sets of carpals, two sets of tarsals and four sets of phalanges. A hemi-mandible was counted as one element. A total number of 267 bones were recorded for all three cows. The 20 bones butchered by an indeterminate raw material were derived from the phalanges and caudal bones of cow three.

Table 3.3 notes the number of butchery marks produced by each raw material. As in Table 3.2, the carpals, tarsals and phalanges were treated as single element units such that each cow has two sets of carpals, two sets of tarsals and four sets of phalanges, and a hemi-mandible was counted as one element.

Table 3.1 Surface Area Measurements of individual skeletal elements of cow two.

Skeletal Element	Surface Area (mm^2 x 10000)
cranium	33.2
hemi-mandible	8.1
atlas	6.6
axis	7.9
cervical vertebra 5	5.2
thoracic vertebra 2	3.6
thoracic vertebra 6	3.7
thoracic vertebra 13	2.9
lumbar vertebra 3	4.4
sacrum	10.8
rib 2	2.9
rib 7	4.3
rib 13	2.6
scapula	10.9
humerus	9.8
radio-ulna	10.1
innominate	21.4
femur	12.7
tibia	9.2
metapodial	3.9

Table 3.2 Number of bones butchered by each raw material.

Specimen	Total # of bones	Quartzite	Chert	Hornfels	Dolerite	Indet
COW1	88	88	0	0	0	0
COW2	83	0	83	0	0	0
COW3	96	0	0	68	8	20
TOTAL	**267**	**88**	**83**	**68**	**8**	**20**

Table 3.3 Number of butchery marks by each raw material.

Specimen	Quartzite	Chert	Hornfels	Dolerite	TOTAL
COW1	1790	0	0	0	**1790**
COW2	0	1381	0	0	**1381**
COW3	0	0	1959	213	**2172**
TOTAL	**1790**	**1381**	**1959**	**213**	**5343**

CHAPTER 4 – RESULTS

4.1 Comparative collection and catalogue of butchery-marked bones

A complete catalogue recording each butchery-marked bone for each of the complete bovid skeletons can be found in Appendix ii. The records in this catalogue correspond to the images of butchery-marked bones contained in Appendix iii, where each butchery mark is visually recorded.

The catalogue (Appendix ii) serves to fulfill one of the primary objectives of this dissertation, namely to create a modern comparative collection of known origin of complete large bovid skeletons showing butchering processes resulting from tools made from different raw materials. As such, each view of each skeletal element of each of the three cow skeletons has a separate entry describing the presence of butchery marks on the bone, focussing on the variables of butchery marks as shown under the coding conventions in Appendix i. For each bone the accession number under which the skeleton is stored in the university collections is noted as well as the raw material utilised for butchering the particular cow. Entries for each bone also describe the body side (left or right), the view and anatomical portion of each bone element as well as the number, type, orientation, clustering and visibility of the butchery marks. The catalogue also records notes, where necessary, describing difficulty in recording of butchery marks due to lack of visibility often ascribed to the quality of the cleaning and preparation of the bones.

4.2 Effects of lithics produced from different raw materials on butchery marking

One measure of the intensity of butchery marks on bone made by different raw materials is the average number of butchery marks produced. These data are reflected in tables 4.1, 4.2 and 4.3, and summarised in Figure 4.1. Table 4.3 indicates that overall, more butchery marks are produced per skeletal element by stone tools made from coarse-grained hornfels (28.8) and dolerite (26.6) compared to finer-grained quartzite (20.3) and chert (16.6). However, there is considerable variation among different skeletal elements.

When the variation in marks on different skeletal elements is taken into account the patterning is not consistent. When hornfels and dolerite are used as butchery tools a larger number of butchery marks are not always produced. On a 'per skeletal element basis' there is no consistent tendency for any one material to be associated with a higher number of butchery marks. There is a high intensity of butchery marking when butchers utilised dolerite on femora and tibiae which, along with the foot, were the only skeletal elements butchered by this material. The high overall rate of marking by butchering using hornfels is primarily on the scapula and radio-ulna and to a lesser extent the atlas. Otherwise the intensity of marking by hornfels tools is similar to or less than that of quartzite. Chert tools cause a relatively high intensity of marking on the hemi-mandible. It also has a higher intensity of marking on the atlas, cervical vertebrae, thoracic vertebrae and lumbar vertebrae. Quartzite tools only stand out as producing a relatively high intensity of marking on the innominate.

Clustering is another measure of the intensity of butchering. A cluster is defined as more than four butchery marks overlapping or immediately adjacent to one another. Table 4.4 reports clustering per skeletal unit and Table 4.5 reports clustering taking into account the number of bones by which each skeletal unit is represented. The latter data are graphed in Figure 4.2.

Overall the results for clustering are broadly similar to those seen for the individual number of marks per skeletal element. The rate of clustering produced by dolerite tools is relatively high for the femur, tibia and foot, which were the only skeletal elements butchered by this material. The number of clusters produced by hornfels tools is relatively high for the scapula and radio-ulna, but in this case also for the humerus. Chert also follows a pattern of producing more clusters on the hemi-mandible as well as a higher number of clusters on the cervical, lumbar and thoracic vertebrae. Quartzite does not stand out for producing comparatively high rates of clustering on any of the skeletal elements.

Another measure of butchery mark intensity is how distinctive these marks are. This was recorded for each anatomical portion and view of each skeletal element. Some elements had

only distinct marks, some only superficial marks and some a combination of the two. Table 4.6 describes the number of bone sections (view and anatomical portions) which bear at least one mark. Table 4.7 shows the number of those sections that only bear distinct marks, while Table 4.8 shows the percentage of bone sections that only bear distinct marks.

Overall the bone sections bearing the most distinct butchery marks are those butchered with quartzite tools. Once again much greater variability is revealed when skeletal elements are examined individually. Quartzite tools produce a greater proportion of distinct marking on the hemi-mandible, thoracic vertebrae, ribs, humerus, radio-ulna and tibia. On the other hand bones butchered by chert show the greater proportion of distinct marking for the cervical vertebrae, lumbar vertebrae, innominate bones, femur and foot. Bones processed by hornfels show a greater proportion of distinct marking for only the atlas and scapula while those butchered using dolerite do not show a relative high proportion of distinct marking for any of the few elements on which it was used.

4.3 Different rates of butchery marking across skeletal elements

The number of butchery marks per unit area for each element (see Table 4.9) supplements the data on the intensity of butchery marks recorded per skeletal element, per bone and per skeletal unit, but also provides a simple way to address the third objective of this thesis. Combining all skeletal elements, for each of the three cows, the results are consistent in that an average number of butchery marks per unit area, approximately 3.4 butchery marks per 10000 square millimetres, has been recorded. The mean ranges from a low of 2.8 for chert butchery marking, to a high of 3.5 for quartzite butchery marking. The standard deviation is in all cases essentially equal to or greater than the mean for each material, which combined with the similar means indicates lack of substantial difference in the density of butchery marking across material types. The high standard deviation also indicates a high variability in the butchery marking across skeletal elements within each individual cow.

Certain skeletal elements acquired a relatively high number of butchery marks per unit area for most stone tool materials, including the mandible, scapula and the seventh and

thirteenth ribs. This appears to indicate which skeletal elements within each cow required more intense butchering. It also confirms that for certain skeletal elements the number of butchery marks are high for particular raw materials. For example, the butchery mark density on the femur and tibia is high for dolerite, which could suggest that it is a less efficient raw material type. The butchery mark density for ribs is high when butchered with chert. Butchery mark intensity on ribs may be due to the difficulty of severing the intercostal muscles, even when utilising chert tools. The hemi-mandible, which also shows a high butchery mark density compared to the other skeletal elements, also indicate a higher cut mark density for the chert stone tools compared to the quartzite and hornfels tools.

Table 4.1 Number of bones for each skeletal unit processed by tools of each raw material.

Skeletal Unit	Quartzite	Chert	Hornfels	Dolerite	TOTAL
cranium	1	1	1		3
hemi-mandible	2	2	2		6
atlas	1	1	1		3
axis	1	1	1		3
cer 3-7	5	5	5		15
thoracic vertebrae	13	13	13		39
lumbar vertebrae	6	6	6		18
sac/caud	9	4	1		14
rib	26	26	26		78
scapula	2	2	2		6
humerus	2	2	2		6
radio-ulna	2	2	2		6
innominate	2	2	2		6
femur	2	2		2	6
tibia	2	2		2	6
foot	12	12	4	4	32
TOTAL	**88**	**83**	**68**	**8**	**247**

Table 4.2 Number of butchery marks per skeletal unit by tools of each raw material.

Skeletal Unit	Quartzite	Chert	Hornfels	Dolerite	TOTAL
cranium	72	78	74		224
hemi-mandible	88	220	146		454
atlas	0	11	25		36
axis	0	8	0		8
cer 3-7	0	12	0		12
thoracic vertebrae	59	112	89		260
lumbar vertebrae	35	73	34		142
sac/caud	2	0	0		2
rib	1073	534	1012		2619
scapula	131	91	258		480
humerus	106	48	85		239
radio-ulna	90	35	181		306
innominate	85	68	54		207
femur	25	60		87	172
tibia	14	18		122	154
foot	10	13	1	4	28
TOTAL	**1790**	**1381**	**1959**	**213**	**5343**

Table 4.3 Number of butchery marks per bone in each skeletal unit by tools of each raw material. Values are number of butchery marks (Table 4.2) divided by number of bones of each skeletal unit (Table 4.1).

Skeletal Unit	Quartzite	Chert	Hornfels	Dolerite	All Materials
cranium	72.0	78.0	74.0		74.7
hemi-mandible	44.0	110.0	73.0		75.7
atlas	0.0	11.0	25.0		12.0
axis	0.0	8.0	0.0		2.7
cer 3-7	0.0	2.4	0.0		0.8
thoracic vertebrae	4.5	8.6	6.8		6.7
lumbar vertebrae	5.8	12.2	5.7		7.9
sac/caud	0.2	0.0	0.0		0.1
rib	41.3	20.5	38.9		33.6
scapula	65.5	45.5	129.0		80.0
humerus	53.0	24.0	42.5		39.8
radio-ulna	45.0	17.5	90.5		51.0
innominate	42.5	34.0	27.0		34.5
femur	12.5	30.0		43.5	28.7
tibia	7.0	9.0		61.0	25.7
foot	0.8	1.1	0.3	1.0	0.9
TOTAL	**20.3**	**16.6**	**28.8**	**26.6**	**21.6**

Table 4.4 Number of butchery mark clusters per skeletal unit by tools of each raw material. (Note that dolerite was utilised only on the hind limbs of cow three and the rest of cow three was butchered utilising hornfels. See 2.2).

Skeletal Unit	Quartzite	Chert	Hornfels	Dolerite	TOTAL
cranium	1	4	4		9
hemi-mandible	3	14	10		27
atlas		1	1		2
axis		1			1
cer 3-7		1			1
thoracic vertebrae	2	7	6		15
lumbar vertebrae	0	4	0		4
sac/caud	0				0
rib	73	22	75		170
scapula	8	2	21		31
humerus	4	1	6		11
radio-ulna	2	2	12		16
innominate	5	3	3		11
femur	0	6		7	13
tibia	0	1		5	6
foot	0	1	0	0	1
TOTAL	**98**	**70**	**138**	**12**	**318**

Table 4.5 Number of butchery mark clusters per bone in each skeletal unit made by each raw material. Data calculated by dividing numbers in Table 4.4 by the number of bones in each skeletal unit.

Skeletal Unit	Quartzite	Chert	Hornfels	Dolerite	All Materials
cranium	1.0	4.0	4.0		3.0
hemi-mandible	1.5	7.0	5.0		4.5
atlas	0.0	1.0	1.0		0.7
axis	0.0	1.0	0.0		0.3
cer 3-7	0.0	0.2	0.0		0.1
thoracic vertebrae	0.2	0.5	0.5		0.4
lumbar vertebrae	0.0	0.7	0.0		0.2
sac/caud	0.0	0.0	0.0		0.0
rib	2.8	0.8	2.9		2.2
scapula	4.0	1.0	10.5		5.2
humerus	2.0	0.5	3.0		1.8
radio-ulna	1.0	1.0	6.0		2.7
innominate	2.5	1.5	1.5		1.8
femur	0.0	3.0		3.5	2.2
tibia	0.0	0.5		2.5	1.0
foot	0.0	0.1	0.0	0.0	0.0
TOTAL	**1.1**	**0.8**	**2.0**	**1.5**	**1.3**

Table 4.6 Number of bone sections (combining all views of each anatomical portion) bearing at least one mark for which visibility was recorded.

Skeletal Unit	Quartzite	Chert	Hornfels	Dolerite	TOTAL
cranium	5	4	5	0	14
hemi-mandible	8	8	8	0	24
atlas	0	2	2	0	4
axis	0	1	0	0	1
cer 3-7	0	2	0	0	2
thoracic vertebrae	14	17	14	0	45
lumbar vertebrae	7	5	11	0	23
sac/caud	2	0	0	0	2
Rib	59	39	52	0	150
scapula	8	5	6	0	19
humerus	12	10	9	0	31
radio-ulna	12	3	12	0	27
innominate	15	10	10	0	35
femur	5	6	0	8	19
tibia	4	4	0	7	15
foot	0	3	1	2	6
TOTAL	**151**	**119**	**130**	**17**	**417**

Table 4.7 Number of bone sections (combining all views of each anatomical portion) bearing only distinct butchery marks.

Skeletal Unit	Quartzite	Chert	Hornfels	Dolerite
Cranium	2	1	2	0
hemi-mandible	6	5	1	0
atlas	0	1	2	0
axis	0	0	0	0
cer 3-7	0	2	0	0
thoracic vertebrae	6	6	0	0
lumbar vertebrae	4	5	0	0
sac/caud	0	0	0	0
rib	47	1	11	0
scapula	3	1	4	0
humerus	5	2	3	0
radio-ulna	5	0	3	0
innominate	2	5	3	0
femur	1	6	0	3
tibia	2	0	0	1
foot	0	3	0	0
TOTAL	**83**	**38**	**29**	**4**

Table 4.8 Percentage of bone sections (combining all views of each anatomical portion) bearing only distinct butchery marks.

Skeletal Unit	Quartzite	Chert	Hornfels	Dolerite	All Materials
cranium	40.0	25.0	40.0		285.7
hemi-mandible	75.0	62.5	12.5		312.5
atlas		50.0	100.0		0.0
axis		0.0			0.0
cer 3-7		100.0			0.0
thoracic vertebrae	42.9	35.3	0.0		95.2
lumbar vertebrae	57.1	100.0	0.0		248.4
sac/caud	0.0				0.0
rib	79.7	2.6	21.2		53.1
scapula	37.5	20.0	66.7		197.4
humerus	41.7	20.0	33.3		134.4
radio-ulna	41.7	0.0	25.0		154.3
innominate	13.3	50.0	30.0		38.1
femur	20.0	100.0		37.5	105.3
tibia	50.0	0.0		14.3	333.3
foot		100.0	0.0	0.0	0.0
TOTAL	**55.0**	**31.9**	**22.3**	**23.5**	**13.2**

Table 4.9 Number of butchery marks per unit surface area (Table 3.1) for each skeletal element and material type.

Skeletal Element	NCM/Area Quartzite	NCM/Area Chert	NCM/Area Hornfels	NCM/Area Dolerite	Average NCM/Area All Materials
cranium	2.2	2.4	2.2		2.3
hemi-mandible	5.5	13.6	9.0		9.4
atlas	0.0	1.7	3.8		1.8
axis	0.0	1.0	0.0		0.3
cervical 5	0.0	0.0	0.0		0.0
thoracic vertebra 2	2.8	4.4	1.9		3.0
thoracic vertebra 6	1.6	7.5	0.0		3.1
thoracic vertebra 13	0.0	0.7	0.0		0.2
lumbar vertebra 3	0.9	0.9	2.5		1.5
sacrum	0.0	0.0	0.0		0.0
rib 2	2.6	0.0	0.4		1.0
rib 7	11.7	4.2	10.4		8.8
rib 13	22.7	4.8	16.5		14.7
scapula	6.0	4.2	11.9		7.4
humerus	5.4	2.5	4.4		4.1
radio-ulna	4.5	1.7	9.0		5.1
innominate	2.0	1.6	1.3		1.6
femur	1.0	2.4	0.0	3.4	1.7
tibia	0.8	1.0	0.0	6.6	2.1
metapodial	0.6	0.8	0.1	0.1	0.4
Mean	3.5	2.8	3.7	3.4	3.4
Std deviation	5.4	3.2	5.0	3.2	3.9

Figure 4.1 Number of butchery marks per bone in each skeletal unit by each raw material. See Table 4.3 for data.

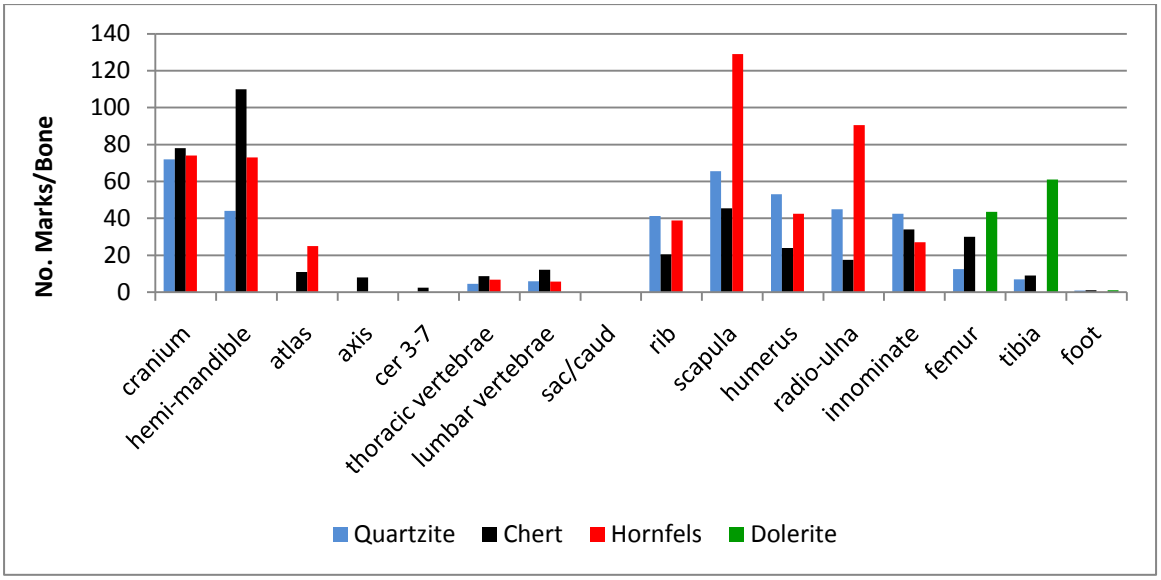


Figure 4.2 Number of butchery mark clusters (≥ 4 marks in close proximity) per bone in each skeletal unit by each raw material. See Table 4.5 for data.

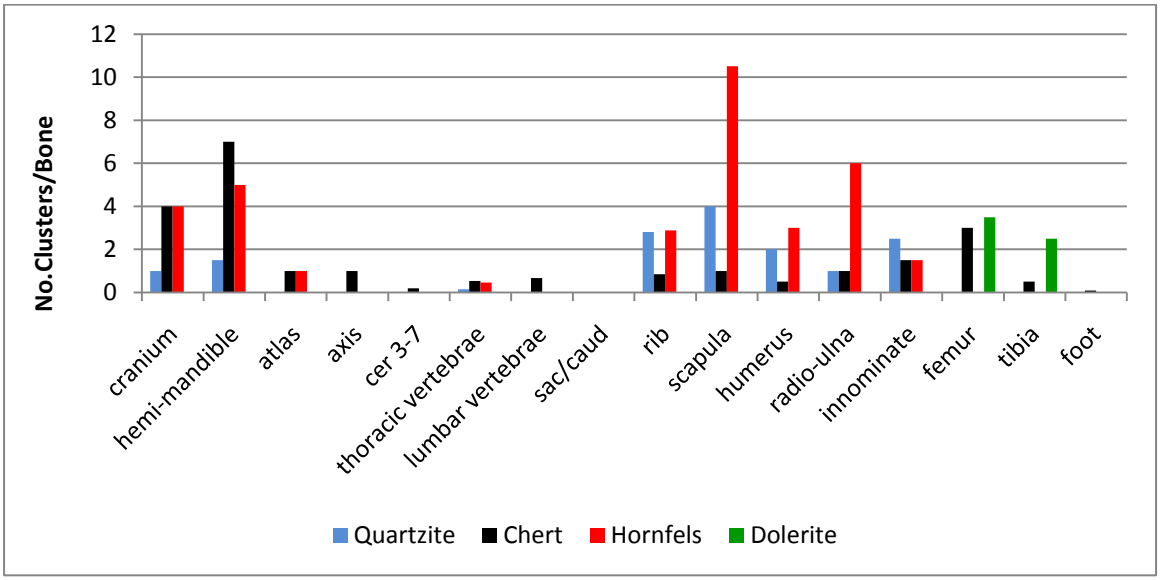


Figure 4.3 Percentage of bone sections bearing only distinct butchery marks. See Table 4.8 for data.

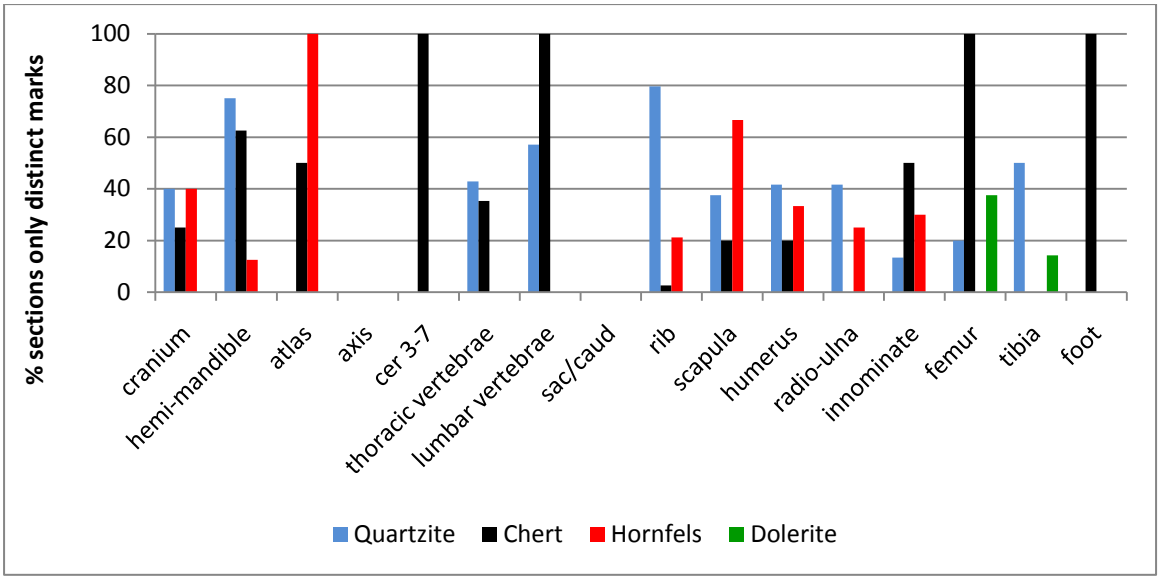


Figure 4.4 Number of butchery marks per unit surface area (100 cm²) of individual skeletal elements. See Table 4.9 for data.

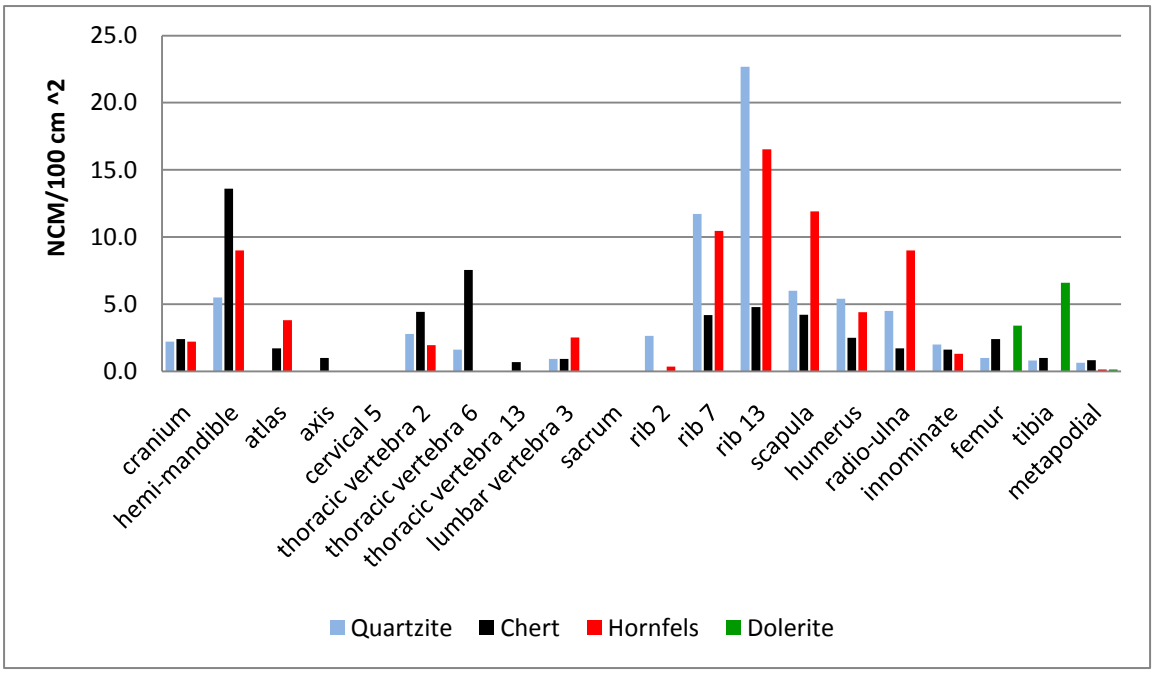
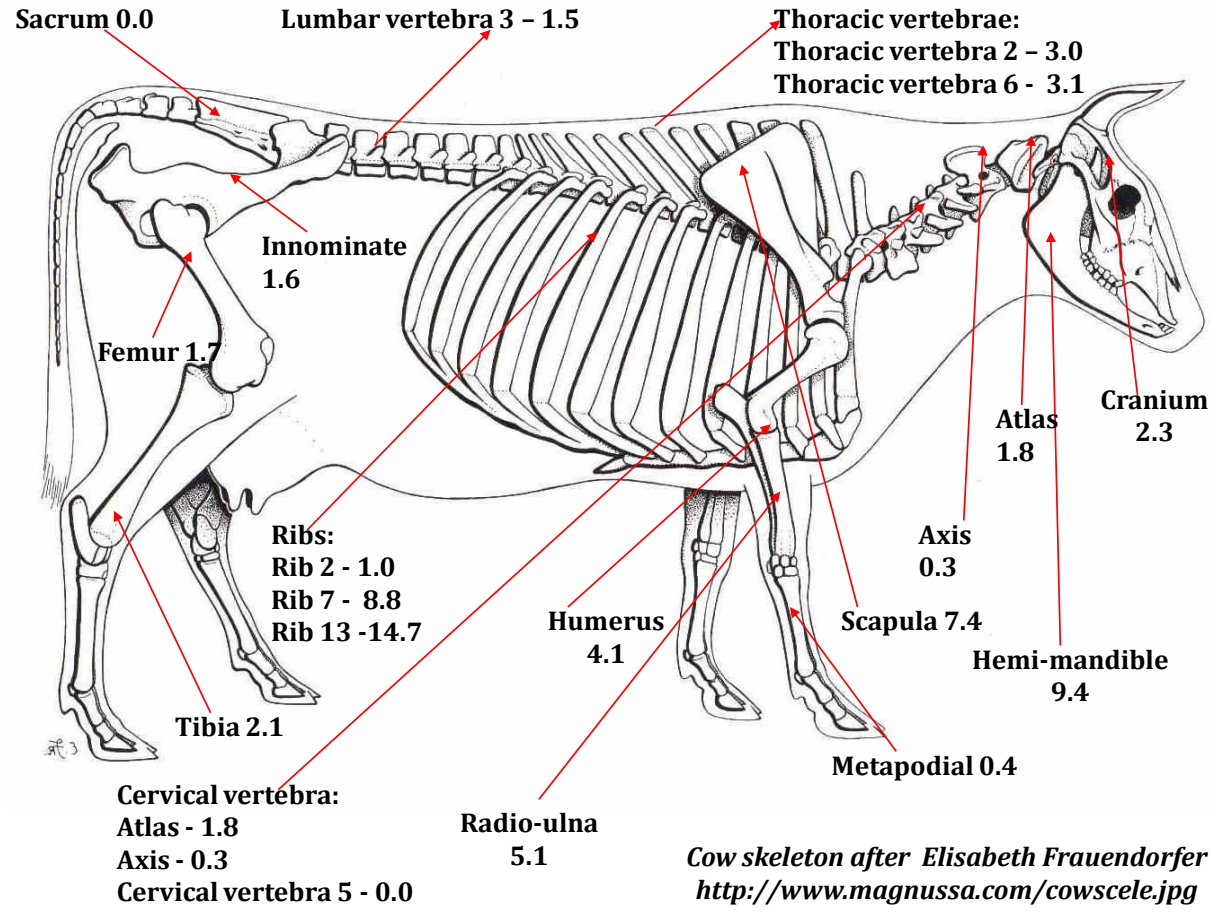


Figure 4.5. Average number of butchery marks (NCM) per unit surface area (100 cm^2) for each skeletal element and material type indicated on image of side view of domestic cow. See Table 4.9.



CHAPTER 5 – DISCUSSION AND CONCLUSION

The study reported here is novel in two ways. First, it has produced Africa's only accessioned and complete modern comparative collection of butchery traces produced by habitual hunters using stone tools to skin and completely deflesh whole carcasses. The comparative collection is accompanied by a Microsoft Excel data base as well as bone drawings that record the location, type, conspicuousness, density and orientation of each butchery mark on all skeletal elements of the three cows used. Production of the comparative collection and accompanying data base fulfills the first objective of the study.

This study is also novel in that it has begun to explore whether tools made of different stone materials produce distinctive butchery patterns, as seen in the location, type, conspicuousness, density and orientation of butchery marks on bone surfaces. This fulfills the second objective of this study.

Few studies prior to this one have documented the marks produced during butchery of complete carcasses, and none have investigated butchery by habitual hunters using stone tools made from different raw materials. Binford's pioneering work with the Nunamiut published in 1978 was the first systematic butchery study utilising full skeletons, but his study involved metal tools as opposed to stone tools. Abe (2005) also looked at metal tool-butchery, investigating hunting and carcass butchery of the Evenki people in Russia, and relating these to anatomical patterning of butchery marks on complete carcasses. Nilssen's (2000) experimentation involved stone-tool butchery of a larger sample of complete skeletons than used here, but his study's main aim was to correlate cut mark placement and frequency to specific butchery actions, such as skinning, disarticulation and defleshing of carcasses. Dewbury and Russell (2006) observed butchery mark frequencies produced by Dewbury, a ex-professional chef and experienced butcher, using stone tools made from obsidian and flint to butcher complete deer carcasses. The study reported here limited the potential bias inherent in the investigator serving as both the butcher and the observer, by using the Bushmen as butchers, and thereby making this a blind study.

Fulfillment of the study's two objectives contributes to addressing two major questions that arise from a fossil assemblage in terms of butchery marks. The first question is whether a bone modification can accurately be identified as a hominin-generated butchery mark. This most fundamentally requires the investigation of the morphology of the butchery mark being investigated, including the type and conspicuousness of the mark. This data base of skeletons recording butchery marks produced by habitual butchers in this study will assist researchers in identifying the agents responsible for modification of fossil bones by providing complete skeletons recording solely stone-tool generated butchery marks produced by humans. The collection and accompanying catalogue will provide a frame of reference for the study of prehistoric assemblages.

As mentioned in the introduction, the earliest widely-accepted evidence of butchery marks and percussion marks on bone come from the Bouri Formation in the Middle Awash Valley, Ethiopia, which records meat and marrow acquisition at 2,5 million years ago (de Heinzelin *et al*. 1999). Some of the claims for very early butchery marks are unequivocal based on their morphology and association with impact marks and stone tools, however, other evidence is less compelling such as the most recent report on hominin-produced butchery marks from Ethiopia dated at 3,2 million years and reported in the recent paper by McPherron *et al.* (2010). The purported cut marks are found on a rib and a femur shaft of surface finds, unassociated with stone tools, and as such are ambiguously identified as hominin-produced cut marks. The comparative collection created through this study acts as a control for the butchering of complete skeletons utilising stone tools and will assist researchers in the identification of butchery marks and distinguishing those produced by hominids utilising stone tools. Researchers will be able to use the comparative collection to produce moulds of butchery marks in order to study them microscopically.

The second major question that arises from fossil assemblages in terms of marks that have been positively identified as hominin-made pertains to behaviour. This basically requires investigation of the patterning of butchery marks, including the location, orientation and density of marks. As detailed in Chapter 1, the behavioural questions may relate to the resolution of whether hominins were scavengers or hunters, or a combination of both. They

may also relate to the amount of meat hominins consumed, how carcasses were obtained and shared, and the ranking of hominins in the carnivore guild. Importantly it also provides clues as to the type of tools utilised by hominins, their effectiveness and longevity, and their possible symbolic meaning beyond the merely practical.

This study investigated whether raw material type can influence butchery mark patterning as seen macroscopically. Other efforts to investigate raw material in butchery marking have been those by Greenfield (2006), who looked at the morphology of butchery marks in order to identify raw material type, and Dewbury and Russell (2006), who investigated the relationship between butchery tool material and resultant cut mark frequencies. As in the current study, both Greenfield (2006) and Dewbury and Russell (2006) conclude that larger samples would be required to make definitive statements regarding the effects of raw material type on mark morphology, frequency and anatomical patterning. Alternatively, other characteristics of stone tools may be more important than material type. For example, Greenfield (2006) notes that the shape of the stone tool rather than its raw material type influences the morphology of the butchery mark produced. Dewbury and Russell (2006), on the other hand, emphasise the importance not only of tool sharpness, which in this study was assumed to correlate with cutting efficiency, but also of edge durability.

Like Dewbury and Russell (2006), I have shown that differences in raw materials do emerge in terms of intensity of marking. Dewbury and Russell found that obsidian stone tools generally produce fewer butchery marks than flint tools, but results were not statistically significant. In this study I found that chert tools overall leave fewer butchery marks, and those made of hornfels leave the most, while tools made from quartzite and dolerite leave intermediate densities of butchery marks. This distinction, however, is not consistent for all skeletal parts. For example, the butchery mark density on the femur and tibia is high for dolerite, which could suggest that it is a less efficient raw material type. By contrast, the butchery mark density for ribs is higher when butchered with chert than with quartzite and hornfels. The hemi-mandible, which in general shows a high butchery mark density compared to the other skeletal elements, also indicates a higher cut mark density for the chert stone tools compared to the quartzite and hornfels tools.

A high number of butchery marks per unit surface area was recorded for most stone materials on certain skeletal elements, particularly the mandible, scapula and the seventh and thirteenth ribs. This seems to reveal which skeletal elements within each cow required more intense butchering in an effort to meet the requirement of complete flesh removal, even from skeletal portions bearing little flesh. For example, the ribs in general show a high density of butchery marks, and this may be due to the butchers' effort to completely remove the small amounts of flesh that occur intercostally. Likewise, on lumbar vertebrae in particular, butchery mark density is greater on the ventral face of the centra and lateral processes, which bear much smaller amounts of flesh than the meaty dorsal aspects of this vertebral section.

In summary, there are indications that raw material influences butchery marking, however, the data indicate no consistent patterning in the number of butchery marks with regards to the type of stone tool material that is utilised. This could be due to the small sample size used here, and it is recognised that a much larger sample is needed to identify any possible patterns in terms of the type of raw material used to make the stone tools with which butchery marks are inflicted. In this study the expectation was that there would be observable material differences between the different stone tools, where quartzite and chert were expected to produce fewer butchery marks due to sharper, finer-grained edges, but the data did not reflect this across all skeletal elements. Failure of this study to show the expected patterning may be related to the experimental observations Egeland (2003) made regarding the lack of a correlation between butchering intensity (as measured by number of tool strokes) and the frequency of butchery marks produced.

Numerous other variables exist during the butchery process that can make it difficult to model pre-historic butchery processes and the butchery marks subsequently produced. This probably explains why inferences regarding butchery mark intensity and raw material differences based on frequency and location of butchery marks have been equivocal. This study attempted to limit the equivocal nature of such investigations by utilising skilled butchers working on full skeletons which were butchered and examined utilising a multi-fold approach including number of butchery marks per skeletal element and per unit

surface area, as well as butchery mark distribution, location and visibility.

Additional factors influence the frequency and patterning of butchery marks produced during butchery of carcasses. As such it is difficult to model the different circumstances which may have prevailed in pre-history. It is now known that skilled butchers are likely to produce fewer butchery marks than those produced by unskilled butchers (Nilssen 2000; Dewbury and Russell 2006). Other variables that actually or potentially influence the butchery mark frequency include carcass size (Frison 1989; Lyman 1992), the stiffness or dryness of carcass parts butchered as it relates to the time of death and temperature of the carcass, the size of portions into which butchered portions are reduced, the ambient temparture (Dewbury and Russell 2006), and the amount of scavengeable meat available on the carcass for butchery (Pobiner and Braun 2005b).

The author's future research will expand the sample reported in this thesis. The current study will assist in the construction of future actualistic experimentation as certain aspects of the butchery experiments could be constructed more efficiently. For example, future work will need to test the underlying assumption of this study: that differences in grain size of stone tools affect sharpness, which in turn will affect slicing efficiency and consequently the number of butchery marks inflicted on bone. This will be essential given the potential importance of butchery tool material in explaining variability in intensity of butchery marking. A further variable to control for is the replacement rate of tool flakes, that is, the material-dependent rate at which cutting edges dull, and the resultant number of tools needed for butchering of like-sized carcasses.

Ethnographic differences in butchering processes is an interesting aspect to explore. Further to the habitual hunters and butchers from the Bushman community used here, the current researcher has more recently conducted similar experiments utilising the Masaai communities of East Africa. Compelling differences have already been noted in terms of the duration of the butchery process. The time it takes to butcher a carcass is an interesting variable to more fully investigate in the future. Dewbury and Russell (2006) observed that future research should include the amount of time needed to butcher carcasses of a similar

size. Abe (2005) and Madrigal and Blumenschine (2000), among others, recorded butchery time, but their studies involved metal, not stone, tools. This study does note the time required to butcher three carcasses and future research will report on the time needed for butchery of wildebeest carcasses using both stone and iron tools. Game animals have also been utilised in the experiments, and in addition to stone tools, iron tools have been used. Other variables to investigate here would be the number of stone tools utilised by different groups to butcher similarly sized animals. The work reported here, in conjunction with future studies investigating the diet and lifestyle of our early hominin ancestors, will help to address the enduring question: What makes us human?

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Appendix i. Coding Conventions.

VARIABLES	CODE	DEFINITIONS
Specimen and Accession Number (independent variable)		
COW1; C1Q BP/4/1285	-	Whole animal butchered with quartzite
COW2; C2C BP/4/1286	-	Whole animal butchered with chert
COW3; C3H BP/4/1287 &	-	Whole aniumal excluding hindlegs butchered with hornfels
C3D BP/4/1287	-	Hind legs butchered with dolerite
Raw Material (independent variable)		
quartzite	-	
chert	-	
hornfels	-	
dolerite	-	
Skeletal Element (independent variable)		
cranium	-	
mandible	-	
atlas	-	
axis	-	
cervical vertebra 3-7	-	individual cervicals treated seperately
thoracic vertebra 1-13	-	individual thoracics treated seperately
lumbar vertebra 1-6	-	individual lumbars treated seperately
sacrum	-	
caudal vertebra	-	treated individually but not numbered along series
rib 1-13	-	individual ribs treated seperately
scapula	-	
humerus	-	
radio-ulna	-	
carpals	-	treated as a unit because cut marks absent
metacarpal	-	
innominate	-	
femur	-	
tibia	-	
tarsals	-	treated as a unit because only 3 cut marks on left calcaneum of cow 3
metatarsal	-	
phalanges proximal	-	phalanges of fore and hind quarters not distinguished
phalanges medial	-	phalanges of fore and hind quarters not distinguished
phalanges distal	-	phalanges of fore and hind quarters not distinguished

VARIABLES	CODE	DEFINITIONS
Body Side		
left	l	
right	r	
not determined	?	for carpals and phalanges
View of Bone		
anterior	a	
posterior	p	
ventral	v	
dorsal	d	
medial	m	
lateral	la	
inferior	inf	
superior	su	
caudal	ca	
cranial	cra	
left	l	
right	r	
Anatomical Portion (independent variable)		
proximal	prox	for long bones and ribs
shaft	sh	for long bones and ribs
distal	dis	for long bones and ribs
ascending ramus	ar	for mandible only
body of mandible	bm	for mandible only
epiphyseal	ep	for innominate only
near epiphyseal	ne	for innominate only
illium	il	for innominate only
ischium	isc	for innominate only
astragalus	as	for tarsals only
calcaneum	ca	for tarsals only
naviculo-cuboid	nc	for tarsals only
calcaneum tuberocity	tc	for tarsals only
# of (butchery) Marks (dependent variable)		
Orientation of Marks (dependent variable)		
longitudinal	l	
transverse	t	
diagonal	d	

VARIABLES	CODE	DEFINITIONS
transverse & longitudinal	tl	
transverse & diagonal	td	
transverse, longitudinal & diagonal	tld	

Mark type (dependent variable)

Cut Mark	cm
Flat Cut Mark	cmf
Cut Mark and Flat Cut Mark	cmfc
Cut Mark and Puncture	cmpu
Cut Mark and Deep Gouge	cmdgo
Deep Gouge	dgo
Deep Gouge and Puncture	dgpu

Number of (butchery mark) Clusters (dependent variable)

>4 butchery marks appearing = cluster	cluster is defined as group of butchery marks appearing together and likely to have been made by same butchery task, e.g., removal of an individual scrap of flesh

Mark Visibility (dependent variable)

Superficial	sup
Disctinct	dst
Superficial and Disctinct	sad

General

not determined	?
space left blank	n/a

Appendix ii. Catalogue of butchery marked bones.

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	mandible	l	la	ar	11	td	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	mandible	l	la	bm	17	ld	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	mandible	l	m	ar	3	t	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	mandible	l	m	bm	17	tld	cmf	1	dst	
COW1	C1Q BP/4/1285	quartzite	mandible	r	la	ar	3	td	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	mandible	r	la	bm	15	tld	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	mandible	r	m	ar	4	td	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	mandible	r	m	bm	18	tld	cm	2	supdis	
COW1	C1Q BP/4/1285	quartzite	cranium		r		27	tld	cm	1	supdis	
COW1	C1Q BP/4/1285	quartzite	cranium		l		28	tld	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	cranium		v		7	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	cranium		d		7	ld	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	cranium		ca		3	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	atlas		d		0					
COW1	C1Q BP/4/1285	quartzite	atlas		v		0					
COW1	C1Q BP/4/1285	quartzite	atlas		cra		0					
COW1	C1Q BP/4/1285	quartzite	axis		r		0					
COW1	C1Q BP/4/1285	quartzite	axis		l		0					
COW1	C1Q BP/4/1285	quartzite	axis		d		0					
COW1	C1Q BP/4/1285	quartzite	axis		v		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 3		cra		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 3		ca		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 3		v		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 3		d		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 3		r		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 3		l		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 4		cra		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 4		ca		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 4		v		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 4		d		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 4		r		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 4		l		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 5		cra		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 5		ca		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 5		v		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 5		d		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 5		r		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 5		l		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 5		cra		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 6		ca		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 6		v		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 6		d		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 6		r		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 6		l		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 7		cra		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 7		ca		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 7		d		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 7		r		0					
COW1	C1Q BP/4/1285	quartzite	cervical vertebra 7		l		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 1		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 1		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 1		r		8	td	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 1		l		1	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 1		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 1		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 2		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 2		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 2		r		6	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 2		l		4	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 2		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 2		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 3		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 3		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 3		r		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 3		l		7	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 3		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 3		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 4		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 4		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 4		r		11	d	cm	2	dst	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 4		l		1	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 4		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 4		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 5		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 5		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 5		r		8	d	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 5		l		2	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 5		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 5		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 6		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 6		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 6		r		2	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 6		l		4	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 6		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 6		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 7		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 7		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 7		r		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 7		l		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 7		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 7		v		3	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 8		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 8		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 8		r		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 8		l		1	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 8		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 8		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 9		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 9		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 9		r		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 9		l		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 9		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 9		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 10		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 10		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 10		r		1	l	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 10		l		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 10		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 10		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 11		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 11		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 11		r		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 11		l		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 11		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 11		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 12		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 12		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 12		r		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 12		l		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 12		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 12		v		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 13		cra		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 13		ca		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 13		r		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 13		l		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 13		d		0					
COW1	C1Q BP/4/1285	quartzite	thoracic vertebra 13		v		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 1		r		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 1		l		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 1		d		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 1		v		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 1		cra		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 1		ca		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 2		r		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 2		l		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 2		d		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 2		v		9	l	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 2		cra		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 2		ca		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 3		r		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 3		l		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 3		d		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 3		v		4	l	cmf	0	supdis	
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 3		cra		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 3		ca		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 4		r		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 4		l		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 4		d		2	d	cm	0	dst	very distinct cm
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 4		v		11	ld	cmfc	0	dst	2 fc
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 4		cra		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 4		ca		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 5		r		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 5		l		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 5		d		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 5		v		2	l	cmf	0	supdis	
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 5		cra		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 5		ca		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 6		r		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 6		l		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 6		d		6	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 6		v		1	d	cmf	0	dst	
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 6		cra		0					
COW1	C1Q BP/4/1285	quartzite	lumbar vertebra 6		ca		0					
COW1	C1Q BP/4/1285	quartzite	scapula	l	p		7	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	scapula	l	a		13	l	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	scapula	l	la		1	t	cm	0	dst	rib nearly broken right through at mid shaft

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	scapula	l	m		32	tld	cm	3	dst	
COW1	C1Q BP/4/1285	quartzite	scapula	r	p		3	l	cmfc	0	supdis	
COW1	C1Q BP/4/1285	quartzite	scapula	r	a		15	l	cm	1	supdis	
COW1	C1Q BP/4/1285	quartzite	scapula	r	la		38	tld	cm	2	supdis	
COW1	C1Q BP/4/1285	quartzite	scapula	r	m		22	tld	cm	2	supdis	
COW1	C1Q BP/4/1285	quartzite	humerus	r	a	prox	0					
COW1	C1Q BP/4/1285	quartzite	humerus	r	a	sh	0					
COW1	C1Q BP/4/1285	quartzite	humerus	r	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	humerus	r	p	prox	0					
COW1	C1Q BP/4/1285	quartzite	humerus	r	p	sh	0					
COW1	C1Q BP/4/1285	quartzite	humerus	r	p	dis	8	tl	cm	1	supdis	
COW1	C1Q BP/4/1285	quartzite	humerus	r	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	humerus	r	m	sh	14	tld	cm	1	dst	
COW1	C1Q BP/4/1285	quartzite	humerus	r	m	dis	3	t	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	humerus	r	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	humerus	r	la	sh	22	tld	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	humerus	r	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	humerus	l	a	prox	0					
COW1	C1Q BP/4/1285	quartzite	humerus	l	a	sh	9	ld	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	humerus	l	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	humerus	l	p	prox	0					
COW1	C1Q BP/4/1285	quartzite	humerus	l	p	sh	16	l	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	humerus	l	p	dis	1	t	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	humerus	l	m	prox	3	l	cm	0	dst	3 very distinct cm's

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	humerus	l	m	sh	14	ld	cm	1	dst	
COW1	C1Q BP/4/1285	quartzite	humerus	l	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	humerus	l	la	prox	3	l	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	humerus	l	la	sh	11	tld	cm	1	supdis	
COW1	C1Q BP/4/1285	quartzite	humerus	l	la	dis	2	l	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	a	prox	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	a	sh	12	tld	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	p	prox	4	td	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	p	sh	15	td	cm	1	supdis	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	p	dis	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	m	sh	8	td	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	la	sh	4	d	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	su	prox	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	r	inf	dis	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	a	prox	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	a	sh	11	tld	cm	1	supdis	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	p	prox	3	t	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	p	sh	1	d	cm	0	dst	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	p	dis	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	m	prox	2	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	m	sh	5	td	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	la	prox	4	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	la	sh	21	tld	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	su	prox	0					
COW1	C1Q BP/4/1285	quartzite	radio-ulna	l	inf	dis	0					
COW1	C1Q BP/4/1285	quartzite	femur	r	a	prox	0					
COW1	C1Q BP/4/1285	quartzite	femur	r	a	sh	0					
COW1	C1Q BP/4/1285	quartzite	femur	r	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	femur	r	p	prox	0					
COW1	C1Q BP/4/1285	quartzite	femur	r	p	sh	2	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	femur	r	p	dis	0					
COW1	C1Q BP/4/1285	quartzite	femur	r	m	prox	0					femoral head missing
COW1	C1Q BP/4/1285	quartzite	femur	r	m	sh	4	ld	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	femur	r	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	femur	r	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	femur	r	la	sh	0					
COW1	C1Q BP/4/1285	quartzite	femur	r	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	femur	r	su	prox	0					femoral head missing
COW1	C1Q BP/4/1285	quartzite	femur	r	inf	dis	0					
COW1	C1Q BP/4/1285	quartzite	femur	l	a	prox	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	femur	l	a	sh	4	d	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	femur	l	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	femur	l	p	prox	0					
COW1	C1Q BP/4/1285	quartzite	femur	l	p	sh	8	d	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	femur	l	p	dis	0					
COW1	C1Q BP/4/1285	quartzite	femur	l	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	femur	l	m	sh	7	d	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	femur	l	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	femur	l	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	femur	l	la	sh	0					
COW1	C1Q BP/4/1285	quartzite	femur	l	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	femur	l	su	prox	0					
COW1	C1Q BP/4/1285	quartzite	femur	l	inf	dis	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	a	prox	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	a	sh	2	d	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	tibia	r	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	p	prox	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	p	sh	2	d	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	tibia	r	p	dis	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	m	sh	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	la	sh	6	ld	cm	0	dst	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	tibia	r	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	su	prox	0					
COW1	C1Q BP/4/1285	quartzite	tibia	r	inf	dis	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	a	prox	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	a	sh	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	p	prox	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	p	sh	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	p	dis	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	m	sh	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	la	prox	4	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	tibia	l	la	sh	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	su	prox	0					
COW1	C1Q BP/4/1285	quartzite	tibia	l	inf	dis	0					
COW1	C1Q BP/4/1285	quartzite	innominate	l	v	il	0					
COW1	C1Q BP/4/1285	quartzite	innominate	l	v	ep	0					
COW1	C1Q BP/4/1285	quartzite	innominate	l	v	ne	11	d	cm	2	dst	
COW1	C1Q BP/4/1285	quartzite	innominate	l	v	isc	7	d	cm	1	dst	
COW1	C1Q BP/4/1285	quartzite	innominate	l	la	il	11	tld	cm	1	supdis	
COW1	C1Q BP/4/1285	quartzite	innominate	l	la	ep	0					
COW1	C1Q BP/4/1285	quartzite	innominate	l	la	ne	5	t	cm	0	sup	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	innominate	l	la	isc	6	td	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	innominate	l	d	il	12	tld	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	innominate	l	d	ep	0					
COW1	C1Q BP/4/1285	quartzite	innominate	l	d	ne	2	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	innominate	l	d	isc	2	d	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	innominate	l	m	il	3	td	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	innominate	l	m	ep	0					
COW1	C1Q BP/4/1285	quartzite	innominate	l	m	ne	4	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	innominate	l	m	isc	0					
COW1	C1Q BP/4/1285	quartzite	innominate	r	v	ep	7	d	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	innominate	r	v	isc	5	td	cm	1	supdis	
COW1	C1Q BP/4/1285	quartzite	innominate	r	v	il	0					
COW1	C1Q BP/4/1285	quartzite	innominate	r	v	ne	0					
COW1	C1Q BP/4/1285	quartzite	innominate	r	la	il	7	td	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	innominate	r	la	ep	0					
COW1	C1Q BP/4/1285	quartzite	innominate	r	la	ne	2	t	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	innominate	r	la	isc	0					
COW1	C1Q BP/4/1285	quartzite	innominate	r	d	il	1	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	innominate	r	d	ep	0					
COW1	C1Q BP/4/1285	quartzite	innominate	r	d	ne	0					
COW1	C1Q BP/4/1285	quartzite	innominate	r	d	isc	0					
COW1	C1Q BP/4/1285	quartzite	innominate	r	m	il	0					
COW1	C1Q BP/4/1285	quartzite	innominate	r	m	ep	0					
COW1	C1Q BP/4/1285	quartzite	innominate	r	m	ne	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	innominate	r	m	isc	0					
COW1	C1Q BP/4/1285	quartzite	1st rib	l	m	sh	0					
COW1	C1Q BP/4/1285	quartzite	1st rib	l	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	1st rib	l	la	sh	0					
COW1	C1Q BP/4/1285	quartzite	1st rib	l	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	2nd rib	l	m	sh	2	l	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	2nd rib	l	m	prox	1	d	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	2nd rib	l	la	sh	0					adhering flesh prevents study of cm's
COW1	C1Q BP/4/1285	quartzite	2nd rib	l	la	prox	0					adhering flesh prevents study of cm's
COW1	C1Q BP/4/1285	quartzite	3rd rib	l	m	sh	0					
COW1	C1Q BP/4/1285	quartzite	3rd rib	l	m	prox	3	l	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	3rd rib	l	la	sh	2	d	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	3rd rib	l	la	prox	3	check	0	0	check	
COW1	C1Q BP/4/1285	quartzite	4th rib	l	m	sh	28	tld	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	4th rib	l	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	4th rib	l	la	sh	26	tld	cm	2	dst	
COW1	C1Q BP/4/1285	quartzite	4th rib	l	la	prox	2	t	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	5th rib	l	m	sh	11	ld	cm	0	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	5th rib	l	m	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	5th rib	l	la	sh	29	ld	cm	3	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	5th rib	l	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	6th rib	l	m	sh	31	tld	cm	3	dst	rib nearly broken right through at mid shaft
COW1	C1Q BP/4/1285	quartzite	6th rib	l	m	prox	6	check	0	0	check	rib nearly broken right through at mid shaft
COW1	C1Q BP/4/1285	quartzite	6th rib	l	la	sh	17	tld	cm	0	dst	rib nearly broken right through at mid shaft

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	6th rib	l	la	prox	1	t	cm	0	dst	rib nearly broken right through at mid shaft
COW1	C1Q BP/4/1285	quartzite	7th rib	l	m	sh	40	tld	cm	4	dst	
COW1	C1Q BP/4/1285	quartzite	7th rib	l	m	prox	5	d	cm	1	dst	
COW1	C1Q BP/4/1285	quartzite	7th rib	l	la	sh	6	ld	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	7th rib	l	la	prox	1	t	cm	0	sup	
COW1	C1Q BP/4/1285	quartzite	8th rib	l	m	sh	25	tld	cm	2	dst	
COW1	C1Q BP/4/1285	quartzite	8th rib	l	m	prox	6	t	cm	1	dst	head missing
COW1	C1Q BP/4/1285	quartzite	8th rib	l	la	sh	1	t	cm	0	dst	head missing; deep cm
COW1	C1Q BP/4/1285	quartzite	8th rib	l	la	prox	0					head missing
COW1	C1Q BP/4/1285	quartzite	9th rib	l	m	sh	41	tld	cm	6	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	9th rib	l	m	prox	3	t	cm	0	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	9th rib	l	la	sh	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	9th rib	l	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	10th rib	l	m	sh	25	tld	cm	3	dst	head missing
COW1	C1Q BP/4/1285	quartzite	10th rib	l	m	prox	3	t	cm	0	dst	head missing
COW1	C1Q BP/4/1285	quartzite	10th rib	l	la	sh	2	ld	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	10th rib	l	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	11th rib	l	m	sh	25	tld	cm	2	supdis	Fine l cm's crossed by t &d cm, prox missing
COW1	C1Q BP/4/1285	quartzite	11th rib	l	m	prox	0					Fine l cm's crossed by t &d cm, prox missing
COW1	C1Q BP/4/1285	quartzite	11th rib	l	la	sh	20	tld	cmdgo	1	dst	Fine l cm's crossed by t &d cm, prox missing
COW1	C1Q BP/4/1285	quartzite	11th rib	l	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	12th rib	l	m	sh	24	tld	cm	2	supdis	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	12th rib	l	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	12th rib	l	la	sh	31	tld	cmdgo	2	dst	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	12th rib	l	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	13th rib	l	m	sh	35	tld	cmdgo	4	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	13th rib	l	m	prox	4	t	cm	0	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	13th rib	l	la	sh	33	tld	cmdgo	2	dst	
COW1	C1Q BP/4/1285	quartzite	13th rib	l	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	1st rib	r	m	sh	0					
COW1	C1Q BP/4/1285	quartzite	1st rib	r	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	1st rib	r	la	sh	2	ld	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	1st rib	r	la	prox	1	t	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	2nd rib	r	m	sh	3	l	cm	0	supdis	
COW1	C1Q BP/4/1285	quartzite	2nd rib	r	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	2nd rib	r	la	sh	9	tld	cm	0	dst	
COW1	C1Q BP/4/1285	quartzite	2nd rib	r	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	3rd rib	r	m	sh	15	tld	cm	0	supdis	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	3rd rib	r	m	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	3rd rib	r	la	sh	19	tld	cm	0	supdis	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	3rd rib	r	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	4th rib	r	m	sh	19	ld	cm	1	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	4th rib	r	m	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	4th rib	r	la	sh	10	tl	cm	1	supdis	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	4th rib	r	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	5th rib	r	m	sh	18	tld	cm	1	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	5th rib	r	m	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	5th rib	r	la	sh	19	tld	cm	1	dst	head, neck, tubercle missing

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	5th rib	r	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	6th rib	r	m	sh	30	tld	dgpu	2	dst	head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	6th rib	r	m	prox	6	t	dgpu	0	dst	head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	6th rib	r	la	sh	43	tld	cmdgo	4	dst	head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	6th rib	r	la	prox	12	t	cmdgo	1	dst	head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	7th rib	r	m	sh	15	tld	cm	0	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	7th rib	r	m	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	7th rib	r	la	sh	34	tld	cm	4	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	7th rib	r	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	8th rib	r	m	sh	18	tld	dgpu	0	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	8th rib	r	m	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	8th rib	r	la	sh	39	tld	cm	2	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	8th rib	r	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	9th rib	r	m	sh	31	tld	dgpu	1	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	9th rib	r	m	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	9th rib	r	la	sh	45	tld	cm	3	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	9th rib	r	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	10th rib	r	m	sh	23	tld	cmpu	1	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	10th rib	r	m	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	10th rib	r	la	sh	45	tld	cm	3	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	10th rib	r	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	11th rib	r	m	sh	18	tld	cm	0	dst	head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	11th rib	r	m	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	11th rib	r	la	sh	29	tld	cm	3	dst	head, neck, tubercle missing

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	11th rib	r	la	prox	0					head, neck, tubercle missing
COW1	C1Q BP/4/1285	quartzite	12th rib	r	m	sh	11	tld	cm	0	dst	head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	12th rib	r	m	prox	0					head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	12th rib	r	la	sh	21	tld	cm	1	dst	head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	12th rib	r	la	prox	0					head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	13th rib	r	m	sh	7	tld	cm	1	dst	head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	13th rib	r	m	prox	0					head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	13th rib	r	la	sh	39	tld	cm	5	dst	head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	13th rib	r	la	prox	0					head, tubercle missing
COW1	C1Q BP/4/1285	quartzite	sacrum		v		0					
COW1	C1Q BP/4/1285	quartzite	sacrum		d		0					
COW1	C1Q BP/4/1285	quartzite	sacrum		r		0					
COW1	C1Q BP/4/1285	quartzite	sacrum		l		0					
COW1	C1Q BP/4/1285	quartzite	carpals	?			0					5 carpals in total; no siding possible; no cm's
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	a	prox	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	a	sh	2	l	cm	0	check	
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	p	prox	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	p	sh	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	p	dis	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	m	sh	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	la	prox	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	la	sh	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	l	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	r	a	prox	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	r	a	sh	3	l	cm	0	check	
COW1	C1Q BP/4/1285	quartzite	metatarsal	r	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	r	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	r	la	sh	3	d	cm	0	check	
COW1	C1Q BP/4/1285	quartzite	metatarsal	r	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	r	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	metatarsal	r	m	sh	2	d	cm	0	check	
COW1	C1Q BP/4/1285	quartzite	metatarsal	r	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	a	prox	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	a	sh	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	p	prox	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	p	sh	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	p	dis	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	m	sh	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	la	sh	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	l	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	a	prox	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	a	sh	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	a	dis	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	p	prox	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	p	sh	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	p	dis	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	m	prox	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	m	sh	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	m	dis	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	la	prox	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	la	sh	0					
COW1	C1Q BP/4/1285	quartzite	metacarpal	r	la	dis	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	m	tc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	m	ca	0					adhering flesh prevents study of marks
COW1	C1Q BP/4/1285	quartzite	tarsals	l	m	as	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	m	nc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	a	tc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	a	ca	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	a	as	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	a	nc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	la	tc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	la	ca	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	la	as	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	la	nc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	p	tc	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	tarsals	l	p	ca	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	p	as	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	l	p	nc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	m	tc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	m	ca	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	m	as	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	m	nc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	a	tc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	a	ca	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	a	as	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	a	nc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	la	tc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	la	ca	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	la	as	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	la	nc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	p	tc	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	p	ca	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	p	as	0					
COW1	C1Q BP/4/1285	quartzite	tarsals	r	p	nc	0					
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	p		0					6 distal phalanges; no siding possible
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	p		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges distal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	p		0					7 proximal phalanges
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges proximal	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges medial	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges medial	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges medial	?	p		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW1	C1Q BP/4/1285	quartzite	phalanges medial	?	a		0					
COW1	C1Q BP/4/1285	quartzite	phalanges medial	?	p		0					
COW1	C1Q BP/4/1285	quartzite	phalanges medial	?	a		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		v		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		d		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		v		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		d		1					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		v		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		d		1					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		v		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		d		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		v		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		d		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		v		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		d		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		v		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		d		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		v		0					
COW1	C1Q BP/4/1285	quartzite	caudal vertebra		d		0					
COW2	C2C BP/4/1286	chert	mandible	l	la	ar	46	tld	cm	3	dst	
COW2	C2C BP/4/1286	chert	mandible	l	la	bm	52	tld	cm	4	dst	
COW2	C2C BP/4/1286	chert	mandible	l	m	ar	7	td	cm	0	sad	
COW2	C2C BP/4/1286	chert	mandible	l	m	bm	17	tld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	mandible	r	la	ar	21	tld	cm	2	dst	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	mandible	r	la	bm	51	tld	cm	5	dst	
COW2	C2C BP/4/1286	chert	mandible	r	m	ar	25	tld	cm	0	dst	
COW2	C2C BP/4/1286	chert	mandible	r	m	bm	1	l	cm	0	supdis	
COW2	C2C BP/4/1286	chert	cranium		r		32	tld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	cranium		l		24	tld	cm	2	supdis	
COW2	C2C BP/4/1286	chert	cranium		v		9	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	cranium		d		13	l	cm	1	dst	
COW2	C2C BP/4/1286	chert	cranium		ca		0					a lot of adhering flesh which hides potential cm's
COW2	C2C BP/4/1286	chert	atlas		d		6	ld	cm	0	dst	
COW2	C2C BP/4/1286	chert	atlas		v		5	d	cm	1	sup	
COW2	C2C BP/4/1286	chert	atlas		cra		0					
COW2	C2C BP/4/1286	chert	axis		r		0					
COW2	C2C BP/4/1286	chert	axis		l		8	tl	cm	1	supdis	
COW2	C2C BP/4/1286	chert	axis		d		0					
COW2	C2C BP/4/1286	chert	axis		v		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 3		cra		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 3		ca		0					adhering flesh prevents study of cm's
COW2	C2C BP/4/1286	chert	cervical vertebra 3		v		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 3		d		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 3		r		9	td	cm	1	dst	
COW2	C2C BP/4/1286	chert	cervical vertebra 3		l		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 4		cra		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 4		ca		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 4		v		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	cervical vertebra 4		d		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 4		r		3	l	cm	0	dst	
COW2	C2C BP/4/1286	chert	cervical vertebra 4		l		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 5		cra		0					adhering flesh prevents study of cm's
COW2	C2C BP/4/1286	chert	cervical vertebra 5		ca		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 5		v		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 5		d		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 5		r		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 5		l		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 6		ca		0					adhering flesh prevents study of cm's
COW2	C2C BP/4/1286	chert	cervical vertebra 6		v		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 6		d		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 6		r		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 6		l		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 7		cra		0					adhering flesh prevents study of marks, bone discoloured
COW2	C2C BP/4/1286	chert	cervical vertebra 7		ca		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 7		v		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 7		d		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 7		r		0					
COW2	C2C BP/4/1286	chert	cervical vertebra 7		l		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 1		cra		0					a lot of adhering flesh which hides potential cm's
COW2	C2C BP/4/1286	chert	thoracic vertebra 1		ca		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 1		r		4	ld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	thoracic vertebra 1		l		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	thoracic vertebra 1		d		0					a lot of adhering flesh which hides potential cm's
COW2	C2C BP/4/1286	chert	thoracic vertebra 1		v		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 2		cra		0					a lot of adhering flesh which hides potential cm's
COW2	C2C BP/4/1286	chert	thoracic vertebra 2		ca		0					a lot of adhering flesh which hides potential cm's
COW2	C2C BP/4/1286	chert	thoracic vertebra 2		r		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 2		l		16	tld	cm	0	dst	
COW2	C2C BP/4/1286	chert	thoracic vertebra 2		d		0					a lot of adhering flesh which hides potential cm's
COW2	C2C BP/4/1286	chert	thoracic vertebra 2		v		0					a lot of adhering flesh which hides potential cm's
COW2	C2C BP/4/1286	chert	thoracic vertebra 3		cra		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 3		ca		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 3		r		2	d	cm	0	dst	
COW2	C2C BP/4/1286	chert	thoracic vertebra 3		l		9	tld	cm	0	dst	
COW2	C2C BP/4/1286	chert	thoracic vertebra 3		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 3		v		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 4		cra		2	l	cm	0	supdis	
COW2	C2C BP/4/1286	chert	thoracic vertebra 4		ca		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 4		r		2	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	thoracic vertebra 4		l		2	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	thoracic vertebra 4		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 4		v		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 5		cra		0					growth plates detached
COW2	C2C BP/4/1286	chert	thoracic vertebra 5		ca		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 5		r		5	d	cm	1	dst	
COW2	C2C BP/4/1286	chert	thoracic vertebra 5		l		15	d	cm	2	dst	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	thoracic vertebra 5		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 5		v		3	td	cm	0	supdis	
COW2	C2C BP/4/1286	chert	thoracic vertebra 6		cra		0					growth plates detached
COW2	C2C BP/4/1286	chert	thoracic vertebra 6		ca		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 6		r		24	d	cm	2	dst	
COW2	C2C BP/4/1286	chert	thoracic vertebra 6		l		4	d	cm	0	sup	
COW2	C2C BP/4/1286	chert	thoracic vertebra 6		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 6		v		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 7		cra		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 7		ca		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 7		r		14	ld	cm	2	supdis	
COW2	C2C BP/4/1286	chert	thoracic vertebra 7		l		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 7		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 7		v		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 8		cra		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 8		ca		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 8		r		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 8		l		3	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	thoracic vertebra 8		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 8		v		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 9		cra		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 9		ca		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 9		r		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 9		l		3	d	cm	0	supdis	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	thoracic vertebra 9		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 9		v		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 10		cra		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 10		ca		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 10		r		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 10		l		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 10		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 10		v		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 11		cra		0					growth plates detached
COW2	C2C BP/4/1286	chert	thoracic vertebra 11		ca		0					growth plates detached
COW2	C2C BP/4/1286	chert	thoracic vertebra 11		r		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 11		l		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 11		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 11		v		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 12		cra		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 12		ca		0					growth plates detached
COW2	C2C BP/4/1286	chert	thoracic vertebra 12		r		2	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	thoracic vertebra 12		l		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 12		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 12		v		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 13		cra		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 13		ca		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 13		r		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 13		l		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	thoracic vertebra 13		d		0					
COW2	C2C BP/4/1286	chert	thoracic vertebra 13		v		2	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	lumbar vertebra 1		r		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 1		l		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 1		d		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 1		v		3	ld	cm	0	dst	
COW2	C2C BP/4/1286	chert	lumbar vertebra 1		cra		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 1		ca		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 2		r		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 2		l		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 2		d		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 2		v		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 2		cra		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 2		ca		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 3		r		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 3		l		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 3		d		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 3		v		12	ld	cm	0	dst	
COW2	C2C BP/4/1286	chert	lumbar vertebra 3		cra		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 3		ca		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 4		r		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 4		l		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 4		d		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 4		v		17	ld	cm	0	dst	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	lumbar vertebra 4		cra		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 4		ca		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 5		r		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 5		l		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 5		d		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 5		v		32	ld	cm	4	dst	
COW2	C2C BP/4/1286	chert	lumbar vertebra 5		cra		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 5		ca		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 6		r		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 6		l		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 6		d		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 6		v		9	ld	cm	0	dst	
COW2	C2C BP/4/1286	chert	lumbar vertebra 6		cra		0					
COW2	C2C BP/4/1286	chert	lumbar vertebra 6		ca		0					
COW2	C2C BP/4/1286	chert	scapula	l	p		0					
COW2	C2C BP/4/1286	chert	scapula	l	a		0					
COW2	C2C BP/4/1286	chert	scapula	l	la		6	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	scapula	l	m		54	tld	cm	0	dst	
COW2	C2C BP/4/1286	chert	scapula	r	p		0					
COW2	C2C BP/4/1286	chert	scapula	r	a		3	ld	cm	0	sup	
COW2	C2C BP/4/1286	chert	scapula	r	la		8	ld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	scapula	r	m		20	ld	cm	2	supdis	
COW2	C2C BP/4/1286	chert	humerus	r	a	prox	0					
COW2	C2C BP/4/1286	chert	humerus	r	a	sh	2	ld	cm	0	supdis	adhering flesh hides potential cm's on epiphyses

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	humerus	r	a	dis	0					adhering flesh hides potential cm's on epiphyses
COW2	C2C BP/4/1286	chert	humerus	r	p	prox	0					
COW2	C2C BP/4/1286	chert	humerus	r	p	sh	2	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	humerus	r	p	dis	5	d	cm	0	supdis	adhering flesh hides potential cm's on epiphyses
COW2	C2C BP/4/1286	chert	humerus	r	m	prox	0					
COW2	C2C BP/4/1286	chert	humerus	r	m	sh	6	tl	cm	0	supdis	
COW2	C2C BP/4/1286	chert	humerus	r	m	dis	0					adhering flesh hides potential cm's on epiphyses
COW2	C2C BP/4/1286	chert	humerus	r	la	prox	1	l	cm	0	sup	
COW2	C2C BP/4/1286	chert	humerus	r	la	sh	1	l	cm	0	sup	
COW2	C2C BP/4/1286	chert	humerus	r	la	dis	0					adhering flesh hides potential cm's on epiphyses
COW2	C2C BP/4/1286	chert	humerus	l	a	prox	0					adhering flesh hides potential cm's on epiphyses
COW2	C2C BP/4/1286	chert	humerus	l	a	sh	2	tl	cm	0	dst	
COW2	C2C BP/4/1286	chert	humerus	l	a	dis	0					adhering flesh hides potential cm's on epiphyses
COW2	C2C BP/4/1286	chert	humerus	l	p	prox	0					
COW2	C2C BP/4/1286	chert	humerus	l	p	sh	9	ld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	humerus	l	p	dis	0					
COW2	C2C BP/4/1286	chert	humerus	l	m	prox	0					
COW2	C2C BP/4/1286	chert	humerus	l	m	sh	9	tl	cm	1	dst	
COW2	C2C BP/4/1286	chert	humerus	l	m	dis	0					
COW2	C2C BP/4/1286	chert	humerus	l	la	prox	0					
COW2	C2C BP/4/1286	chert	humerus	l	la	sh	11	tld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	humerus	l	la	dis	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	a	prox	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	a	sh	25	tld	cm	2	supdis	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	radio-ulna	r	a	dis	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	p	prox	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	p	sh	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	p	dis	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	m	prox	0					Growth plate detached on ulna
COW2	C2C BP/4/1286	chert	radio-ulna	r	m	sh	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	m	dis	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	la	prox	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	la	sh	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	la	dis	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	su	prox	0					
COW2	C2C BP/4/1286	chert	radio-ulna	r	inf	dis	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	a	prox	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	a	sh	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	a	dis	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	p	prox	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	p	sh	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	p	dis	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	m	prox	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	m	sh	4	d	cm	0	sup	
COW2	C2C BP/4/1286	chert	radio-ulna	l	m	dis	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	la	prox	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	la	sh	6	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	radio-ulna	l	la	dis	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	radio-ulna	l	su	prox	0					
COW2	C2C BP/4/1286	chert	radio-ulna	l	inf	dis	0					
COW2	C2C BP/4/1286	chert	femur	r	a	prox	0					Adhering flesh,bone discoloured brown.
COW2	C2C BP/4/1286	chert	femur	r	a	sh	0					
COW2	C2C BP/4/1286	chert	femur	r	a	dis	0					
COW2	C2C BP/4/1286	chert	femur	r	p	prox	0					
COW2	C2C BP/4/1286	chert	femur	r	p	sh	0					
COW2	C2C BP/4/1286	chert	femur	r	p	dis	0					
COW2	C2C BP/4/1286	chert	femur	r	m	prox	0					
COW2	C2C BP/4/1286	chert	femur	r	m	sh	12	ld	cm	1	dst	
COW2	C2C BP/4/1286	chert	femur	r	m	dis	0					
COW2	C2C BP/4/1286	chert	femur	r	la	prox	0					
COW2	C2C BP/4/1286	chert	femur	r	la	sh	3	td	cm	0	dst	
COW2	C2C BP/4/1286	chert	femur	r	la	dis	0					
COW2	C2C BP/4/1286	chert	femur	r	su	prox	0					
COW2	C2C BP/4/1286	chert	femur	r	inf	dis	0					
COW2	C2C BP/4/1286	chert	femur	l	a	prox	0					
COW2	C2C BP/4/1286	chert	femur	l	a	sh	3	ld	cm	0	dst	
COW2	C2C BP/4/1286	chert	femur	l	a	dis	0					
COW2	C2C BP/4/1286	chert	femur	l	p	prox	0					
COW2	C2C BP/4/1286	chert	femur	l	p	sh	1	d	cm	0	dst	
COW2	C2C BP/4/1286	chert	femur	l	p	dis	0					
COW2	C2C BP/4/1286	chert	femur	l	m	prox	0					
COW2	C2C BP/4/1286	chert	femur	l	m	sh	33	tld	cm	5	dst	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	femur	l	m	dis	0					
COW2	C2C BP/4/1286	chert	femur	l	la	prox	0					
COW2	C2C BP/4/1286	chert	femur	l	la	sh	8	td	cm	0	dst	
COW2	C2C BP/4/1286	chert	femur	l	la	dis	0					
COW2	C2C BP/4/1286	chert	femur	l	su	prox	0					
COW2	C2C BP/4/1286	chert	femur	l	inf	dis	0					
COW2	C2C BP/4/1286	chert	tibia	r	a	prox	0					
COW2	C2C BP/4/1286	chert	tibia	r	a	sh	0					
COW2	C2C BP/4/1286	chert	tibia	r	a	dis	0					
COW2	C2C BP/4/1286	chert	tibia	r	p	prox	0					
COW2	C2C BP/4/1286	chert	tibia	r	p	sh	1	t	cm	0	sup	
COW2	C2C BP/4/1286	chert	tibia	r	p	dis	0					
COW2	C2C BP/4/1286	chert	tibia	r	m	prox	0					
COW2	C2C BP/4/1286	chert	tibia	r	m	sh	0					
COW2	C2C BP/4/1286	chert	tibia	r	m	dis	0					
COW2	C2C BP/4/1286	chert	tibia	r	la	prox	0					
COW2	C2C BP/4/1286	chert	tibia	r	la	sh	0					
COW2	C2C BP/4/1286	chert	tibia	r	la	dis	0					
COW2	C2C BP/4/1286	chert	tibia	r	su	prox	0					
COW2	C2C BP/4/1286	chert	tibia	r	inf	dis	0					
COW2	C2C BP/4/1286	chert	tibia	l	a	prox	0					
COW2	C2C BP/4/1286	chert	tibia	l	a	sh	1	l	cm	0	sup	
COW2	C2C BP/4/1286	chert	tibia	l	a	dis	0					
COW2	C2C BP/4/1286	chert	tibia	l	p	prox	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	tibia	l	p	sh	9	tl	cm	1	supdis	
COW2	C2C BP/4/1286	chert	tibia	l	p	dis	0					
COW2	C2C BP/4/1286	chert	tibia	l	m	prox	0					
COW2	C2C BP/4/1286	chert	tibia	l	m	sh	0					
COW2	C2C BP/4/1286	chert	tibia	l	m	dis	0					
COW2	C2C BP/4/1286	chert	tibia	l	la	prox	0					
COW2	C2C BP/4/1286	chert	tibia	l	la	sh	7	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	tibia	l	la	dis	0					
COW2	C2C BP/4/1286	chert	tibia	l	su	prox	0					
COW2	C2C BP/4/1286	chert	tibia	l	inf	dis	0					
COW2	C2C BP/4/1286	chert	innominate	l	v	il	0					
COW2	C2C BP/4/1286	chert	innominate	l	v	ep	0					
COW2	C2C BP/4/1286	chert	innominate	l	v	ne	7	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	innominate	l	v	isc	12	d	cm	2	dst	
COW2	C2C BP/4/1286	chert	innominate	l	la	il	3	d	cm	0	dst	
COW2	C2C BP/4/1286	chert	innominate	l	la	ep	0					
COW2	C2C BP/4/1286	chert	innominate	l	la	ne	13	d	cm	0	dst	
COW2	C2C BP/4/1286	chert	innominate	l	la	isc	0					
COW2	C2C BP/4/1286	chert	innominate	l	d	il	0					
COW2	C2C BP/4/1286	chert	innominate	l	d	ep	0					
COW2	C2C BP/4/1286	chert	innominate	l	d	ne	0					
COW2	C2C BP/4/1286	chert	innominate	l	d	isc	0					
COW2	C2C BP/4/1286	chert	innominate	l	m	il	8	d	cm	0	sup	
COW2	C2C BP/4/1286	chert	innominate	l	m	ep	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	innominate	l	m	ne	0					
COW2	C2C BP/4/1286	chert	innominate	l	m	isc	0					
COW2	C2C BP/4/1286	chert	innominate	r	v	ep	0					
COW2	C2C BP/4/1286	chert	innominate	r	v	isc	7	d	cm	0	dst	
COW2	C2C BP/4/1286	chert	innominate	r	v	il	4	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	innominate	r	v	ne	2	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	innominate	r	la	il	6	d	cm	1	sup	
COW2	C2C BP/4/1286	chert	innominate	r	la	ep	0					
COW2	C2C BP/4/1286	chert	innominate	r	la	ne	0					
COW2	C2C BP/4/1286	chert	innominate	r	la	isc	6	d	cm	0	dst	
COW2	C2C BP/4/1286	chert	innominate	r	d	il	0					
COW2	C2C BP/4/1286	chert	innominate	r	d	ep	0					
COW2	C2C BP/4/1286	chert	innominate	r	d	ne	0					
COW2	C2C BP/4/1286	chert	innominate	r	d	isc	0					
COW2	C2C BP/4/1286	chert	innominate	r	m	il	0					
COW2	C2C BP/4/1286	chert	innominate	r	m	ep	0					
COW2	C2C BP/4/1286	chert	innominate	r	m	ne	0					
COW2	C2C BP/4/1286	chert	innominate	r	m	isc	0					
COW2	C2C BP/4/1286	chert	1st rib	l	m	sh	0					cm's hidden?-adjacent vertebra attached by dried flesh
COW2	C2C BP/4/1286	chert	1st rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	1st rib	l	la	sh	0					
COW2	C2C BP/4/1286	chert	1st rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	2nd rib	l	m	sh	0					
COW2	C2C BP/4/1286	chert	2nd rib	l	m	prox	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	2nd rib	l	la	sh	0					
COW2	C2C BP/4/1286	chert	2nd rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	3rd rib	l	m	sh	0					
COW2	C2C BP/4/1286	chert	3rd rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	3rd rib	l	la	sh	0					
COW2	C2C BP/4/1286	chert	3rd rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	4th rib	l	m	sh	6	tl	cm	0	supdis	a lot of adhering flesh which hides potential cm's
COW2	C2C BP/4/1286	chert	4th rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	4th rib	l	la	sh	7	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	4th rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	5th rib	l	m	sh	23	tld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	5th rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	5th rib	l	la	sh	25	tld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	5th rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	6th rib	l	m	sh	24	tld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	6th rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	6th rib	l	la	sh	20	tld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	6th rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	7th rib	l	m	sh	11	d	cm	1	supdis	
COW2	C2C BP/4/1286	chert	7th rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	7th rib	l	la	sh	5	d	cm	0	supdis	
COW2	C2C BP/4/1286	chert	7th rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	8th rib	l	m	sh	20	tld	cm	2	supdis	
COW2	C2C BP/4/1286	chert	8th rib	l	m	prox	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	8th rib	l	la	sh	20	tld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	8th rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	9th rib	l	m	sh	19	d	cm	0	supdis	head, neck, tubercle missing
COW2	C2C BP/4/1286	chert	9th rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	9th rib	l	la	sh	24	tld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	9th rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	10th rib	l	m	sh	13	ld	cm	0	supdis	head, neck, tubercle missing
COW2	C2C BP/4/1286	chert	10th rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	10th rib	l	la	sh	19	tld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	10th rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	11th rib	l	m	sh	31	ld	cm	3	supdis	head, neck, tubercle missing
COW2	C2C BP/4/1286	chert	11th rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	11th rib	l	la	sh	13	tld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	11th rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	12th rib	l	m	sh	9	ld	cm	0	supdis	head, neck, tubercle missing
COW2	C2C BP/4/1286	chert	12th rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	12th rib	l	la	sh	12	tld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	12th rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	13th rib	l	m	sh	4	ld	cm	0	supdis	head, neck, tubercle missing
COW2	C2C BP/4/1286	chert	13th rib	l	m	prox	0					
COW2	C2C BP/4/1286	chert	13th rib	l	la	sh	7	td	cm	0	dst	
COW2	C2C BP/4/1286	chert	13th rib	l	la	prox	0					
COW2	C2C BP/4/1286	chert	1st rib	r	m	sh	0					
COW2	C2C BP/4/1286	chert	1st rib	r	m	prox	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	1st rib	r	la	sh	0					
COW2	C2C BP/4/1286	chert	1st rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	2nd rib	r	m	sh	0					adhering flesh prevents study of marks
COW2	C2C BP/4/1286	chert	2nd rib	r	m	prox	0					
COW2	C2C BP/4/1286	chert	2nd rib	r	la	sh	0					
COW2	C2C BP/4/1286	chert	2nd rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	3rd rib	r	m	sh	0					adhering flesh prevents study of marks
COW2	C2C BP/4/1286	chert	3rd rib	r	m	prox	0					
COW2	C2C BP/4/1286	chert	3rd rib	r	la	sh	0					
COW2	C2C BP/4/1286	chert	3rd rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	4th rib	r	m	sh	14	ld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	4th rib	r	m	prox	0					
COW2	C2C BP/4/1286	chert	4th rib	r	la	sh	17	td	cm	1	supdis	
COW2	C2C BP/4/1286	chert	4th rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	5th rib	r	m	sh	8	tld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	5th rib	r	m	prox	0					
COW2	C2C BP/4/1286	chert	5th rib	r	la	sh	9	ld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	5th rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	6th rib	r	m	sh	16	tld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	6th rib	r	m	prox	0					
COW2	C2C BP/4/1286	chert	6th rib	r	la	sh	9	ld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	6th rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	7th rib	r	m	sh	14	ld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	7th rib	r	m	prox	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	7th rib	r	la	sh	6	ld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	7th rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	8th rib	r	m	sh	15	tld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	8th rib	r	m	prox	0					
COW2	C2C BP/4/1286	chert	8th rib	r	la	sh	9	ld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	8th rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	9th rib	r	m	sh	10	ld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	9th rib	r	m	prox	0					
COW2	C2C BP/4/1286	chert	9th rib	r	la	sh	6	ld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	9th rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	10th rib	r	m	sh	14	ld	cm	1	supdis	
COW2	C2C BP/4/1286	chert	10th rib	r	m	prox	0					
COW2	C2C BP/4/1286	chert	10th rib	r	la	sh	10	tld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	10th rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	11th rib	r	m	sh	13	ld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	11th rib	r	m	prox	0					
COW2	C2C BP/4/1286	chert	11th rib	r	la	sh	10	tld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	11th rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	12th rib	r	m	sh	17	ld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	12th rib	r	m	prox	0					
COW2	C2C BP/4/1286	chert	12th rib	r	la	sh	11	tld	cm	0	supdis	
COW2	C2C BP/4/1286	chert	12th rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	13th rib	r	m	sh	14	tld	cm	1	supdis	head, neck, tubercle missing
COW2	C2C BP/4/1286	chert	13th rib	r	m	prox	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	13th rib	r	la	sh	0					
COW2	C2C BP/4/1286	chert	13th rib	r	la	prox	0					
COW2	C2C BP/4/1286	chert	sacrum		v		0					
COW2	C2C BP/4/1286	chert	sacrum		d		0					
COW2	C2C BP/4/1286	chert	sacrum		r		0					
COW2	C2C BP/4/1286	chert	sacrum		l		0					
COW2	C2C BP/4/1286	chert	carpals	?			0					5 carpals in total; no siding possible; no cm's
COW2	C2C BP/4/1286	chert	metatarsal	l	a	prox	0					
COW2	C2C BP/4/1286	chert	metatarsal	l	a	sh	1	l	cm	0	dst	
COW2	C2C BP/4/1286	chert	metatarsal	l	a	dis	0					
COW2	C2C BP/4/1286	chert	metatarsal	l	p	prox	0					
COW2	C2C BP/4/1286	chert	metatarsal	l	p	sh	0					
COW2	C2C BP/4/1286	chert	metatarsal	l	p	dis	0					
COW2	C2C BP/4/1286	chert	metatarsal	l	m	prox	0					
COW2	C2C BP/4/1286	chert	metatarsal	l	m	sh	0					
COW2	C2C BP/4/1286	chert	metatarsal	l	m	dis	0					
COW2	C2C BP/4/1286	chert	metatarsal	l	la	prox	0					
COW2	C2C BP/4/1286	chert	metatarsal	l	la	sh	0					
COW2	C2C BP/4/1286	chert	metatarsal	l	la	dis	0					
COW2	C2C BP/4/1286	chert	metatarsal	r	a	prox	0					
COW2	C2C BP/4/1286	chert	metatarsal	r	a	sh	3	l	cm	0	dst	
COW2	C2C BP/4/1286	chert	metatarsal	r	a	dis	0					
COW2	C2C BP/4/1286	chert	metatarsal	r	p	prox	0					
COW2	C2C BP/4/1286	chert	metatarsal	r	p	sh	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	metatarsal	r	p	dis	0					
COW2	C2C BP/4/1286	chert	metatarsal	r	la	prox	0					
COW2	C2C BP/4/1286	chert	metatarsal	r	la	sh	0					
COW2	C2C BP/4/1286	chert	metatarsal	r	la	dis	0					
COW2	C2C BP/4/1286	chert	metatarsal	r	m	prox	0					
COW2	C2C BP/4/1286	chert	metatarsal	r	m	sh	9	td	cm	1	dst	
COW2	C2C BP/4/1286	chert	metatarsal	r	m	dis	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	a	prox	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	a	sh	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	a	dis	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	p	prox	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	p	sh	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	p	dis	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	m	prox	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	m	sh	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	m	dis	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	la	prox	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	la	sh	0					
COW2	C2C BP/4/1286	chert	metacarpal	l	la	dis	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	a	prox	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	a	sh	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	a	dis	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	p	prox	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	p	sh	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	metacarpal	r	p	dis	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	m	prox	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	m	sh	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	m	dis	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	la	prox	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	la	sh	0					
COW2	C2C BP/4/1286	chert	metacarpal	r	la	dis	0					
COW2	C2C BP/4/1286	chert	tarsals	l	m	tc	0					
COW2	C2C BP/4/1286	chert	tarsals	l	m	ca	0					
COW2	C2C BP/4/1286	chert	tarsals	l	m	as	0					
COW2	C2C BP/4/1286	chert	tarsals	l	m	nc	0					only nc and cuneiform for one side; no siding possible
COW2	C2C BP/4/1286	chert	tarsals	l	a	tc	0					
COW2	C2C BP/4/1286	chert	tarsals	l	a	ca	0					
COW2	C2C BP/4/1286	chert	tarsals	l	a	as	0					
COW2	C2C BP/4/1286	chert	tarsals	l	a	nc	0					
COW2	C2C BP/4/1286	chert	tarsals	l	la	tc	0					
COW2	C2C BP/4/1286	chert	tarsals	l	la	ca	0					
COW2	C2C BP/4/1286	chert	tarsals	l	la	as	0					
COW2	C2C BP/4/1286	chert	tarsals	l	la	nc	0					
COW2	C2C BP/4/1286	chert	tarsals	l	p	tc	0					
COW2	C2C BP/4/1286	chert	tarsals	l	p	ca	0					
COW2	C2C BP/4/1286	chert	tarsals	l	p	as	0					
COW2	C2C BP/4/1286	chert	tarsals	l	p	nc	0					
COW2	C2C BP/4/1286	chert	tarsals	r	m	tc	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	tarsals	r	m	ca	0					
COW2	C2C BP/4/1286	chert	tarsals	r	m	as	0					
COW2	C2C BP/4/1286	chert	tarsals	r	m	nc	0					
COW2	C2C BP/4/1286	chert	tarsals	r	a	tc	0					
COW2	C2C BP/4/1286	chert	tarsals	r	a	ca	0					
COW2	C2C BP/4/1286	chert	tarsals	r	a	as	0					
COW2	C2C BP/4/1286	chert	tarsals	r	a	nc	0					
COW2	C2C BP/4/1286	chert	tarsals	r	la	tc	0					
COW2	C2C BP/4/1286	chert	tarsals	r	la	ca	0					
COW2	C2C BP/4/1286	chert	tarsals	r	la	as	0					
COW2	C2C BP/4/1286	chert	tarsals	r	la	nc	0					
COW2	C2C BP/4/1286	chert	tarsals	r	p	tc	0					
COW2	C2C BP/4/1286	chert	tarsals	r	p	ca	0					
COW2	C2C BP/4/1286	chert	tarsals	r	p	as	0					
COW2	C2C BP/4/1286	chert	tarsals	r	p	nc	0					
COW2	C2C BP/4/1286	chert	phalanges distal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges distal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges distal	?	p		0					7 distal phalanges
COW2	C2C BP/4/1286	chert	phalanges distal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges distal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges distal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges distal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges distal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges distal	?	p		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	phalanges distal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges distal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges distal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	p		0					8 proximal phalanges
COW2	C2C BP/4/1286	chert	phalanges proximal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges proximal	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges medial	?	p		0					5 medial phalanges
COW2	C2C BP/4/1286	chert	phalanges medial	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges medial	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges medial	?	a		0					
COW2	C2C BP/4/1286	chert	phalanges medial	?	p		0					
COW2	C2C BP/4/1286	chert	phalanges medial	?	a		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		v		0					3 caudal bones, prob 1st caudal bone largest sc junction

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW2	C2C BP/4/1286	chert	caudal vertebra		d		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		v		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		d		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		v		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		d		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		v		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		d		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		v		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		d		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		v		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		d		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		v		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		d		0					
COW2	C2C BP/4/1286	chert	caudal vertebra		v		0					
COW3	C3H BP/4/1287	hornfels	mandible	l	la	ar	24	tld	cm	2	supdis	
COW3	C3H BP/4/1287	hornfels	mandible	l	la	bm	19	tld	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	mandible	l	m	ar	6	l	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	mandible	l	m	bm	9	tld	cm	1	dst	
COW3	C3H BP/4/1287	hornfels	mandible	r	la	ar	21	tld	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	mandible	r	la	bm	19	tld	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	mandible	r	m	ar	14	tld	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	mandible	r	m	bm	34	tld	cm	4	supdis	
COW3	C3H BP/4/1287	hornfels	cranium		r		19	tld	cm	0	supdis	occipital detached; dis part premax gone; nasal bones fragile

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	cranium		l		24	tld	cm	2	supdis	
COW3	C3H BP/4/1287	hornfels	cranium		v		10	tld	cmdgo	0	supdis	
COW3	C3H BP/4/1287	hornfels	cranium		d		2	d	cm	0	dst	
COW3	C3H BP/4/1287	hornfels	cranium		ca		19	td	dgo	2	dst	deep gouges within foramen magnum, anterior.
COW3	C3H BP/4/1287	hornfels	atlas		d		24	tld	cmdgo	1	dst	
COW3	C3H BP/4/1287	hornfels	atlas		v		0					
COW3	C3H BP/4/1287	hornfels	atlas		cra		1	l	cm	0	dst	
COW3	C3H BP/4/1287	hornfels	axis		r		0					
COW3	C3H BP/4/1287	hornfels	axis		l		0					
COW3	C3H BP/4/1287	hornfels	axis		d		0					
COW3	C3H BP/4/1287	hornfels	axis		v		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 3		cra		0					growth plates detached
COW3	C3H BP/4/1287	hornfels	cervical vertebra 3		ca		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 3		v		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 3		d		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 3		r		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 3		l		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 4		cra		0					growth plates detached
COW3	C3H BP/4/1287	hornfels	cervical vertebra 4		ca		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 4		v		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 4		d		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 4		r		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 4		l		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 5		cra		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	cervical vertebra 5		ca		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 5		v		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 5		d		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 5		r		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 5		l		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 6		ca		0					cm's hidden?-adjacent vertebra attached by dried flesh
COW3	C3H BP/4/1287	hornfels	cervical vertebra 6		v		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 6		d		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 6		r		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 6		l		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 7		cra		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 7		ca		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 7		v		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 7		d		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 7		r		0					
COW3	C3H BP/4/1287	hornfels	cervical vertebra 7		l		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 1		cra		0					adhering flesh prevents study of cm's
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 1		ca		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 1		r		1	d	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 1		l		4	d	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 1		d		4	l	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 1		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 2		cra		1	l	cm	0	sup	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 2		ca		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 2		r		6	l	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 2		l		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 2		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 2		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 3		cra		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 3		ca		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 3		r		23	tld	cm	2	supdis	odd cm shape
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 3		l		8	td	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 3		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 3		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 4		cra		2	l	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 4		ca		2	l	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 4		r		10	d	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 4		l		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 4		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 4		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 5		cra		0					growth plates detached
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 5		ca		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 5		r		12	d	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 5		l		2	ld	cm	0	supdis	odd loop shaped mark
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 5		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 5		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 6		cra		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 6		ca		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 6		r		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 6		l		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 6		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 6		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 7		cra		0					spinous process missing
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 7		ca		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 7		r		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 7		l		12	td	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 7		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 7		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 8		cra		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 8		ca		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 8		r		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 8		l		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 8		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 8		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 9		cra		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 9		ca		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 9		r		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 9		l		2	l	cm	0	sup	
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 9		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 9		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 10		cra		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 10		ca		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 10		r		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 10		l		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 10		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 10		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 11		cra		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 11		ca		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 11		r		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 11		l		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 11		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 11		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 12		cra		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 12		ca		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 12		r		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 12		l		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 12		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 12		v		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 13		cra		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 13		ca		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 13		r		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 13		l		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 13		d		0					
COW3	C3H BP/4/1287	hornfels	thoracic vertebra 13		v		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 1		r		1	l	cm	0	sup	adhering flesh which hides potential cm's on epiphyses
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 1		l		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 1		d		1	d	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 1		v		2	d	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 1		cra		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 1		ca		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 2		r		0					cm's hidden?-adjacent vertebra attached by dried flesh
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 2		l		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 2		d		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 2		v		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 2		cra		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 2		ca		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 3		r		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 3		l		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 3		d		4	d	cm	0	sup	
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 3		v		7	d	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 3		cra		0					poss marks hidden- adjacent vertebra attached by dried flesh
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 3		ca		0					poss marks hidden- adjacent vertebra attached by dried flesh
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 4		r		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 4		l		1	l	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 4		d		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 4		v		7	tld	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 4		cra		0					poss marks hidden- adjacent vertebra attached by dried flesh
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 4		ca		0					poss marks hidden- adjacent vertebra attached by dried flesh
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 5		r		1	d	cm	0	sup	
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 5		l		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 5		d		3	d	cm	0	sup	
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 5		v		6	td	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 5		cra		0					cm's hidden?- adjacent vertebra attached by dried flesh
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 5		ca		0					a lot of adhering flesh which hides potential cm's
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 6		r		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 6		l		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 6		d		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 6		v		1	l	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 6		cra		0					
COW3	C3H BP/4/1287	hornfels	lumbar vertebra 6		ca		0					
COW3	C3H BP/4/1287	hornfels	scapula	l	p		0					
COW3	C3H BP/4/1287	hornfels	scapula	l	a		6	l	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	scapula	l	la		12	ld	cm	0	dst	
COW3	C3H BP/4/1287	hornfels	scapula	l	m		86	tld	cm	6	dst	many clusters of fine v-shaped cm's
COW3	C3H BP/4/1287	hornfels	scapula	r	p		8	ld	cm	1	dst	
COW3	C3H BP/4/1287	hornfels	scapula	r	a		0					
COW3	C3H BP/4/1287	hornfels	scapula	r	la		62	tld	cm	5	dst	
COW3	C3H BP/4/1287	hornfels	scapula	r	m		84	tld	cmdgo	9	supdis	many odd cm's
COW3	C3H BP/4/1287	hornfels	humerus	r	a	prox	0					proximal epiphyses detached
COW3	C3H BP/4/1287	hornfels	humerus	r	a	sh	16	ld	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	humerus	r	a	dis	0					adhering flesh prevents study of marks
COW3	C3H BP/4/1287	hornfels	humerus	r	p	prox	2	d	cm	0	dst	
COW3	C3H BP/4/1287	hornfels	humerus	r	p	sh	0					
COW3	C3H BP/4/1287	hornfels	humerus	r	p	dis	0					a lot of adhering flesh which hides potential cm's

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	humerus	r	m	prox	0					
COW3	C3H BP/4/1287	hornfels	humerus	r	m	sh	19	tld	cm	2	supdis	
COW3	C3H BP/4/1287	hornfels	humerus	r	m	dis	0					a lot of adhering flesh which hides potential cm's
COW3	C3H BP/4/1287	hornfels	humerus	r	la	prox	4	d	cm	0	dst	
COW3	C3H BP/4/1287	hornfels	humerus	r	la	sh	7	d	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	humerus	r	la	dis	0					a lot of adhering flesh which hides potential cm's
COW3	C3H BP/4/1287	hornfels	humerus	l	a	prox	0					proximal epiphyses detached
COW3	C3H BP/4/1287	hornfels	humerus	l	a	sh	4	tld	cmdgo	0	dst	
COW3	C3H BP/4/1287	hornfels	humerus	l	a	dis	0					a lot of adhering flesh which hides potential cm's
COW3	C3H BP/4/1287	hornfels	humerus	l	p	prox	0					proximal epiphyses detached
COW3	C3H BP/4/1287	hornfels	humerus	l	p	sh	10	ld	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	humerus	l	p	dis	0					a lot of adhering flesh which hides potential cm's
COW3	C3H BP/4/1287	hornfels	humerus	l	m	prox	0					proximal epiphyses detached
COW3	C3H BP/4/1287	hornfels	humerus	l	m	sh	12	ld	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	humerus	l	m	dis	0					a lot of adhering flesh which hides potential cm's
COW3	C3H BP/4/1287	hornfels	humerus	l	la	prox	0					proximal epiphyses detached
COW3	C3H BP/4/1287	hornfels	humerus	l	la	sh	11	tld	cm	2	supdis	
COW3	C3H BP/4/1287	hornfels	humerus	l	la	dis	0					
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	a	prox	0					radio-ulna not yet fused
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	a	sh	37	tld	cmdgo	3	supdis	
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	a	dis	0					radio-ulna not yet fused
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	p	prox	0					growth plates detached
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	p	sh	0					
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	p	dis	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	m	prox	1	d	cm	0	dst	
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	m	sh	27	tld	cmdgo	2	supdis	
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	m	dis	0					
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	la	prox	6	td	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	la	sh	3	tld	cmdgo	0	dst	odd gouge
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	la	dis	3	ld	dgo	0	dst	dgo figure 8 shaped
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	su	prox	0					
COW3	C3H BP/4/1287	hornfels	radio-ulna	r	inf	dis	0					
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	a	prox	0					radio-ulna not yet fused; growth plate detached
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	a	sh	24	ld	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	a	dis	0					
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	p	prox	0					radio-ulna not yet fused; growth plate detached
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	p	sh	6	ld	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	p	dis	0					
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	m	prox	16	d	cm	1	supdis	radio-ulna not yet fused
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	m	sh	14	t	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	m	dis	0					
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	la	prox	16	d	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	la	sh	28	tld	cm	2	supdis	
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	la	dis	0					
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	su	prox	0					
COW3	C3H BP/4/1287	hornfels	radio-ulna	l	inf	dis	0					
COW3	C3D BP/4/1287	dolerite	femur	r	a	prox	0					proxl epiphyses detached
COW3	C3D BP/4/1287	dolerite	femur	r	a	sh	17	tld	cm	2	supdis	

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3D BP/4/1287	dolerite	femur	r	a	dis	0					dis epiphyses detached,adhering flesh hides poss marks
COW3	C3D BP/4/1287	dolerite	femur	r	p	prox	0					
COW3	C3D BP/4/1287	dolerite	femur	r	p	sh	5	ld	cm	0	sup	
COW3	C3D BP/4/1287	dolerite	femur	r	p	dis	0					
COW3	C3D BP/4/1287	dolerite	femur	r	m	prox	0					
COW3	C3D BP/4/1287	dolerite	femur	r	m	sh	32	tld	cm	3	supdis	
COW3	C3D BP/4/1287	dolerite	femur	r	m	dis	0					dis ephyses detached
COW3	C3D BP/4/1287	dolerite	femur	r	la	prox	0					
COW3	C3D BP/4/1287	dolerite	femur	r	la	sh	0					
COW3	C3D BP/4/1287	dolerite	femur	r	la	dis	0					
COW3	C3D BP/4/1287	dolerite	femur	r	su	prox	0					
COW3	C3D BP/4/1287	dolerite	femur	r	inf	dis	0					
COW3	C3D BP/4/1287	dolerite	femur	l	a	prox	0					
COW3	C3D BP/4/1287	dolerite	femur	l	a	sh	0					
COW3	C3D BP/4/1287	dolerite	femur	l	a	dis	0					
COW3	C3D BP/4/1287	dolerite	femur	l	p	prox	0					
COW3	C3D BP/4/1287	dolerite	femur	l	p	sh	10	td	cm	1	supdis	
COW3	C3D BP/4/1287	dolerite	femur	l	p	dis	0					
COW3	C3D BP/4/1287	dolerite	femur	l	m	prox	2	t	dgo	0	dst	
COW3	C3D BP/4/1287	dolerite	femur	l	m	sh	9	d	cm	0	supdis	
COW3	C3D BP/4/1287	dolerite	femur	l	m	dis	0					
COW3	C3D BP/4/1287	dolerite	femur	l	la	prox	4	ld	dgo	0	dst	
COW3	C3D BP/4/1287	dolerite	femur	l	la	sh	8	tld	cm	1	dst	
COW3	C3D BP/4/1287	dolerite	femur	l	la	dis	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3D BP/4/1287	dolerite	femur	l	su	prox	0					
COW3	C3D BP/4/1287	dolerite	femur	l	inf	dis	0					
COW3	C3D BP/4/1287	dolerite	tibia	r	a	prox	0					prox epiphyses detached
COW3	C3D BP/4/1287	dolerite	tibia	r	a	sh	7	tld	cm	0	supdis	
COW3	C3D BP/4/1287	dolerite	tibia	r	a	dis	0					
COW3	C3D BP/4/1287	dolerite	tibia	r	p	prox	0					proc epiphyses detached
COW3	C3D BP/4/1287	dolerite	tibia	r	p	sh	23	tld	cm	2	dst	
COW3	C3D BP/4/1287	dolerite	tibia	r	p	dis	0					
COW3	C3D BP/4/1287	dolerite	tibia	r	m	prox	0					
COW3	C3D BP/4/1287	dolerite	tibia	r	m	sh	4	d	cm	0	sup	
COW3	C3D BP/4/1287	dolerite	tibia	r	m	dis	0					
COW3	C3D BP/4/1287	dolerite	tibia	r	la	prox	0					
COW3	C3D BP/4/1287	dolerite	tibia	r	la	sh	17	tld	cm	0	supdis	
COW3	C3D BP/4/1287	dolerite	tibia	r	la	dis	0					
COW3	C3D BP/4/1287	dolerite	tibia	r	su	prox	0					
COW3	C3D BP/4/1287	dolerite	tibia	r	inf	dis	0					
COW3	C3D BP/4/1287	dolerite	tibia	l	a	prox	0					
COW3	C3D BP/4/1287	dolerite	tibia	l	a	sh	30	d	cm	2	sup	
COW3	C3D BP/4/1287	dolerite	tibia	l	a	dis	0					
COW3	C3D BP/4/1287	dolerite	tibia	l	p	prox	0					
COW3	C3D BP/4/1287	dolerite	tibia	l	p	sh	26	ld	cm	1	supdis	
COW3	C3D BP/4/1287	dolerite	tibia	l	p	dis	0					
COW3	C3D BP/4/1287	dolerite	tibia	l	m	prox	0					
COW3	C3D BP/4/1287	dolerite	tibia	l	m	sh	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3D BP/4/1287	dolerite	tibia	l	m	dis	0					
COW3	C3D BP/4/1287	dolerite	tibia	l	la	prox	0					
COW3	C3D BP/4/1287	dolerite	tibia	l	la	sh	15	d	cm	0	supdis	
COW3	C3D BP/4/1287	dolerite	tibia	l	la	dis	0					
COW3	C3D BP/4/1287	dolerite	tibia	l	su	prox	0					
COW3	C3D BP/4/1287	dolerite	tibia	l	inf	dis	0					
COW3	C3H BP/4/1287	hornfels	innominate	l	v	il	4	tld	cm	0	dst	
COW3	C3H BP/4/1287	hornfels	innominate	l	v	ep	1	t	cm	0	dst	
COW3	C3H BP/4/1287	hornfels	innominate	l	v	ne	6	td	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	innominate	l	v	isc	4	tld	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	innominate	l	la	il	4	d	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	innominate	l	la	ep	0					
COW3	C3H BP/4/1287	hornfels	innominate	l	la	ne	0					
COW3	C3H BP/4/1287	hornfels	innominate	l	la	isc	0					
COW3	C3H BP/4/1287	hornfels	innominate	l	d	il	18	tld	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	innominate	l	d	ep	0					
COW3	C3H BP/4/1287	hornfels	innominate	l	d	ne	0					
COW3	C3H BP/4/1287	hornfels	innominate	l	d	isc	0					
COW3	C3H BP/4/1287	hornfels	innominate	l	m	il	8	tl	cm	1	dst	
COW3	C3H BP/4/1287	hornfels	innominate	l	m	ep	2	d	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	innominate	l	m	ne	0					
COW3	C3H BP/4/1287	hornfels	innominate	l	m	isc	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	v	ep	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	v	isc	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	innominate	r	v	il	6	td	cm	1	supdis	
COW3	C3H BP/4/1287	hornfels	innominate	r	v	ne	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	la	il	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	la	ep	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	la	ne	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	la	isc	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	d	il	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	d	ep	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	d	ne	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	d	isc	1	l	cm	0	sup	
COW3	C3H BP/4/1287	hornfels	innominate	r	m	il	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	m	ep	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	m	ne	0					
COW3	C3H BP/4/1287	hornfels	innominate	r	m	isc	0					
COW3	C3H BP/4/1287	hornfels	1st rib	l	m	sh	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	1st rib	l	m	prox	2	d	cm	0	sup	
COW3	C3H BP/4/1287	hornfels	1st rib	l	la	sh	8	d	cm	0	dst	
COW3	C3H BP/4/1287	hornfels	1st rib	l	la	prox	4	d	cmdgo	0	dst	1 dgo
COW3	C3H BP/4/1287	hornfels	2nd rib	l	m	sh	0					
COW3	C3H BP/4/1287	hornfels	2nd rib	l	m	prox	0					
COW3	C3H BP/4/1287	hornfels	2nd rib	l	la	sh	2	d	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	2nd rib	l	la	prox	0					
COW3	C3H BP/4/1287	hornfels	3rd rib	l	m	sh	3	l	cm	0	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	3rd rib	l	m	prox	0					head, neck, tubercle missing

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	3rd rib	l	la	sh	6	ld	cm	1	dst	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	3rd rib	l	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	4th rib	l	m	sh	2	tld	cm	0	sup	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	4th rib	l	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	4th rib	l	la	sh	27	ld	cm	3	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	4th rib	l	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	5th rib	l	m	sh	17	ld	cm	2	supdis	head missing
COW3	C3H BP/4/1287	hornfels	5th rib	l	m	prox	13	d	cm	1	supdis	head missing
COW3	C3H BP/4/1287	hornfels	5th rib	l	la	sh	39	tld	cm	3	supdis	head missing
COW3	C3H BP/4/1287	hornfels	5th rib	l	la	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	6th rib	l	m	sh	15	tld	cm	0	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	6th rib	l	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	6th rib	l	la	sh	25	tld	cm	1	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	6th rib	l	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	7th rib	l	m	sh	38	ld	cm	4	supdis	head missing
COW3	C3H BP/4/1287	hornfels	7th rib	l	m	prox	10	ld	cmdgo	1	dst	head missing
COW3	C3H BP/4/1287	hornfels	7th rib	l	la	sh	17	tld	cm	0	supdis	head missing
COW3	C3H BP/4/1287	hornfels	7th rib	l	la	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	8th rib	l	m	sh	22	tld	cm	1	supdis	head missing
COW3	C3H BP/4/1287	hornfels	8th rib	l	m	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	8th rib	l	la	sh	40	tld	cm	3	supdis	head missing
COW3	C3H BP/4/1287	hornfels	8th rib	l	la	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	9th rib	l	m	sh	17	ld	cm	0	supdis	head missing
COW3	C3H BP/4/1287	hornfels	9th rib	l	m	prox	0					head missing

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	9th rib	l	la	sh	48	tld	cmdgo	5	supdis	head missing
COW3	C3H BP/4/1287	hornfels	9th rib	l	la	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	10th rib	l	m	sh	46	tld	cm	6	supdis	head missing
COW3	C3H BP/4/1287	hornfels	10th rib	l	m	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	10th rib	l	la	sh	6	t	cmdgo	1	dst	head missing
COW3	C3H BP/4/1287	hornfels	10th rib	l	la	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	11th rib	l	m	sh	16	tld	cm	0	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	11th rib	l	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	11th rib	l	la	sh	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	11th rib	l	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	12th rib	l	m	sh	45	tld	cm	8	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	12th rib	l	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	12th rib	l	la	sh	9	t	cmdgo	1	dst	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	12th rib	l	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	13th rib	l	m	sh	39	tld	cm	1	supdis	head missing
COW3	C3H BP/4/1287	hornfels	13th rib	l	m	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	13th rib	l	la	sh	19	tld	cm	0	supdis	head missing
COW3	C3H BP/4/1287	hornfels	13th rib	l	la	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	1st rib	r	m	sh	2	l	cm	0	sup	poss marks invisible-dried flesh attached
COW3	C3H BP/4/1287	hornfels	1st rib	r	m	prox	0					poss marks invisible-dried flesh attached
COW3	C3H BP/4/1287	hornfels	1st rib	r	la	sh	2	l	cm	0	sup	poss marks invisible-dried flesh attached
COW3	C3H BP/4/1287	hornfels	1st rib	r	la	prox	0					poss marks invisible-dried flesh attached
COW3	C3H BP/4/1287	hornfels	2nd rib	r	m	sh	0					adhering fleshhides potential cm's
COW3	C3H BP/4/1287	hornfels	2nd rib	r	m	prox	0					adhering fleshhides potential cm's

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	2nd rib	r	la	sh	0					adhering fleshhides potential cm's
COW3	C3H BP/4/1287	hornfels	2nd rib	r	la	prox	0					adhering fleshhides potential cm's
COW3	C3H BP/4/1287	hornfels	3rd rib	r	m	sh	38	tld	cmdgo	4	dst	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	3rd rib	r	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	3rd rib	r	la	sh	13	t	cm	1	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	3rd rib	r	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	4th rib	r	m	sh	26	tld	cm	2	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	4th rib	r	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	4th rib	r	la	sh	4	t	cm	0	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	4th rib	r	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	5th rib	r	m	sh	38	ld	cm	3	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	5th rib	r	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	5th rib	r	la	sh	8	tld	cm	0	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	5th rib	r	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	6th rib	r	m	sh	45	tld	cm	3	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	6th rib	r	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	6th rib	r	la	sh	3	ld	cm	0	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	6th rib	r	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	7th rib	r	m	sh	21	tld	cm	0	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	7th rib	r	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	7th rib	r	la	sh	4	tld	cm	0	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	7th rib	r	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	8th rib	r	m	sh	30	tld	cm	5	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	8th rib	r	m	prox	0					head, neck, tubercle missing

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	8th rib	r	la	sh	3	d	cmdgo	0	dst	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	8th rib	r	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	9th rib	r	m	sh	42	tld	cm	4	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	9th rib	r	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	9th rib	r	la	sh	3	td	cm	0	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	9th rib	r	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	10th rib	r	m	sh	56	tld	cm	4	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	10th rib	r	m	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	10th rib	r	la	sh	13	td	cm	1	supdis	head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	10th rib	r	la	prox	0					head, neck, tubercle missing
COW3	C3H BP/4/1287	hornfels	11th rib	r	m	sh	42	tld	cm	2	supdis	head missing
COW3	C3H BP/4/1287	hornfels	11th rib	r	m	prox	2	d	cm	0	dst	head missing
COW3	C3H BP/4/1287	hornfels	11th rib	r	la	sh	7	ld	cm	0	supdis	head missing
COW3	C3H BP/4/1287	hornfels	11th rib	r	la	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	12th rib	r	m	sh	26	tld	cmdgo	1	dst	head missing
COW3	C3H BP/4/1287	hornfels	12th rib	r	m	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	12th rib	r	la	sh	21	tld	cm	2	supdis	head missing
COW3	C3H BP/4/1287	hornfels	12th rib	r	la	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	13th rib	r	m	sh	24	tld	cmdgo	1	dst	head missing
COW3	C3H BP/4/1287	hornfels	13th rib	r	m	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	13th rib	r	la	sh	4	tl	cm	0	supdis	head missing
COW3	C3H BP/4/1287	hornfels	13th rib	r	la	prox	0					head missing
COW3	C3H BP/4/1287	hornfels	sacrum		v		0					
COW3	C3H BP/4/1287	hornfels	sacrum		d		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	sacrum		r		0					
COW3	C3H BP/4/1287	hornfels	sacrum		l		0					
COW3	C3H BP/4/1287	hornfels	carpals	?			0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	a	prox	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	a	sh	1	l	cm	0	sup	
COW3	C3D BP/4/1287	dolerite	metatarsal	l	a	dis	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	p	prox	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	p	sh	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	p	dis	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	m	prox	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	m	sh	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	m	dis	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	la	prox	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	la	sh	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	l	la	dis	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	r	a	prox	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	r	a	sh	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	r	a	dis	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	r	la	prox	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	r	la	sh	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	r	la	dis	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	r	m	prox	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	r	m	sh	0					
COW3	C3D BP/4/1287	dolerite	metatarsal	r	m	dis	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	hornfels	metacarpal	l	a	prox	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	a	sh	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	a	dis	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	p	prox	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	p	sh	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	p	dis	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	m	prox	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	m	sh	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	m	dis	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	la	prox	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	la	sh	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	l	la	dis	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	a	prox	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	a	sh	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	a	dis	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	p	prox	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	p	sh	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	p	dis	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	m	prox	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	m	sh	1	d	cm	0	supdis	
COW3	C3H BP/4/1287	hornfels	metacarpal	r	m	dis	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	la	prox	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	la	sh	0					
COW3	C3H BP/4/1287	hornfels	metacarpal	r	la	dis	0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3D BP/4/1287	dolerite	tarsals	l	m	tc	0					left side:ca,as,cuneiform,nc
COW3	C3D BP/4/1287	dolerite	tarsals	l	m	ca	3	l	cm	0	sup	
COW3	C3D BP/4/1287	dolerite	tarsals	l	m	as	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	m	nc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	a	tc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	a	ca	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	a	as	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	a	nc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	la	tc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	la	ca	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	la	as	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	la	nc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	p	tc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	p	ca	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	p	as	0					
COW3	C3D BP/4/1287	dolerite	tarsals	l	p	nc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	m	tc	0					right side:ca,as,cuneiform.
COW3	C3D BP/4/1287	dolerite	tarsals	r	m	ca	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	m	as	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	m	nc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	a	tc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	a	ca	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	a	as	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	a	nc	0					

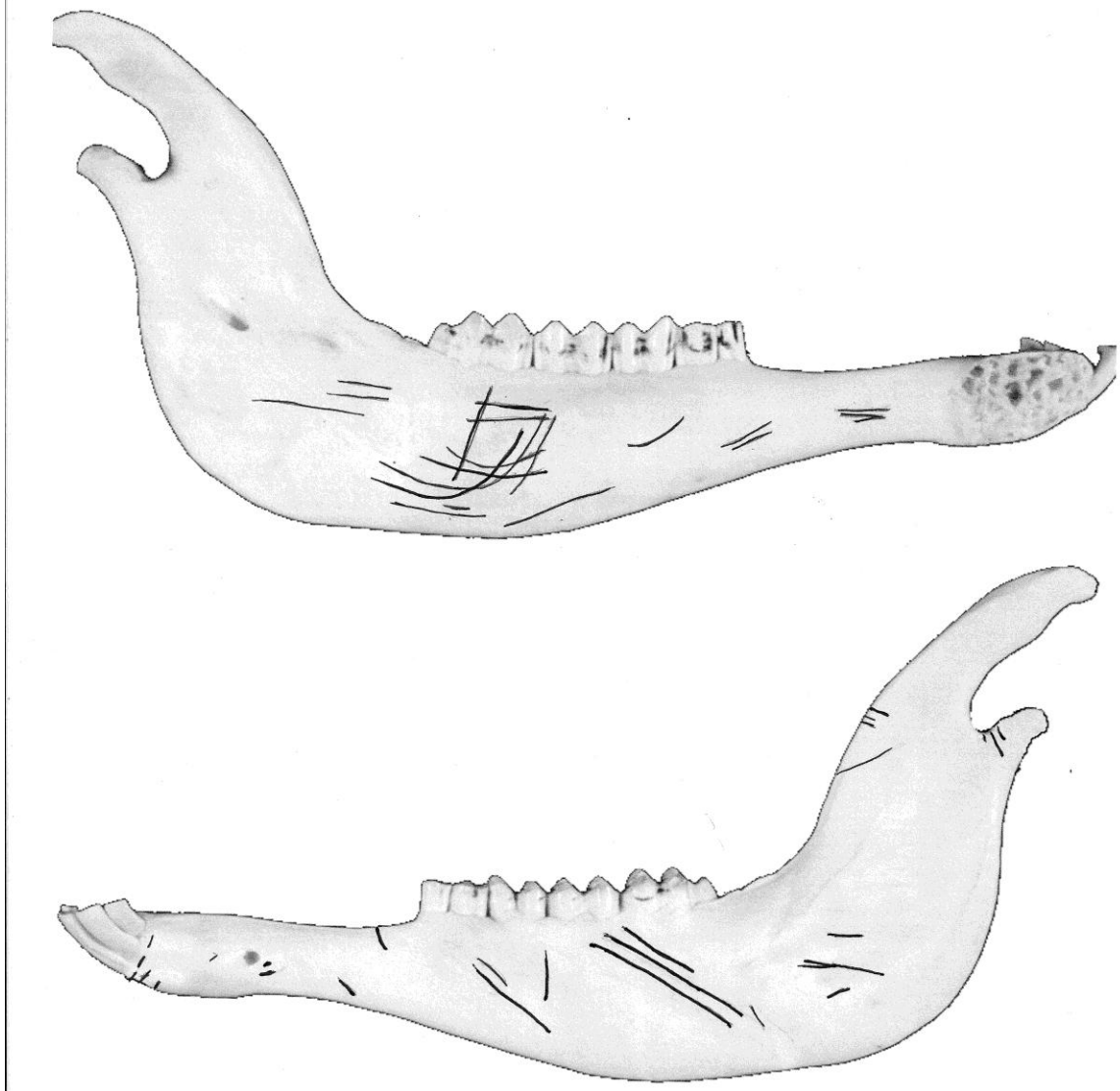
Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3D BP/4/1287	dolerite	tarsals	r	la	tc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	la	ca	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	la	as	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	la	nc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	p	tc	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	p	ca	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	p	as	0					
COW3	C3D BP/4/1287	dolerite	tarsals	r	p	nc	0					
COW3	C3H BP/4/1287	check	phalanges distal	?	p		0					7 distal phalanges
COW3	C3H BP/4/1287	check	phalanges distal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges distal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	p		0					8 proximal phalanges
COW3	C3H BP/4/1287	check	phalanges proximal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	a		0					

Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
COW3	C3H BP/4/1287	check	phalanges proximal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	p		0					
COW3	C3H BP/4/1287	check	phalanges proximal	?	a		0					
COW3	C3H BP/4/1287	check	phalanges medial	?	p		0					8 medial phalanges
COW3	C3H BP/4/1287	check	phalanges medial	?	a		0					
COW3	C3H BP/4/1287	check	phalanges medial	?	p		0					
COW3	C3H BP/4/1287	check	phalanges medial	?	a		0					
COW3	C3H BP/4/1287	check	phalanges medial	?	p		0					
COW3	C3H BP/4/1287	check	phalanges medial	?	a		0					
COW3	C3H BP/4/1287	check	caudal vertebra		v		0					16 caudal verts. No marks.
COW3	C3H BP/4/1287	check	caudal vertebra		d		0					
COW3	C3H BP/4/1287	check	caudal vertebra		v		0					
COW3	C3H BP/4/1287	check	caudal vertebra		d		0					
COW3	C3H BP/4/1287	check	caudal vertebra		v		0					
COW3	C3H BP/4/1287	check	caudal vertebra		d		0					
COW3	C3H BP/4/1287	check	caudal vertebra		v		0					
COW3	C3H BP/4/1287	check	caudal vertebra		d		0					

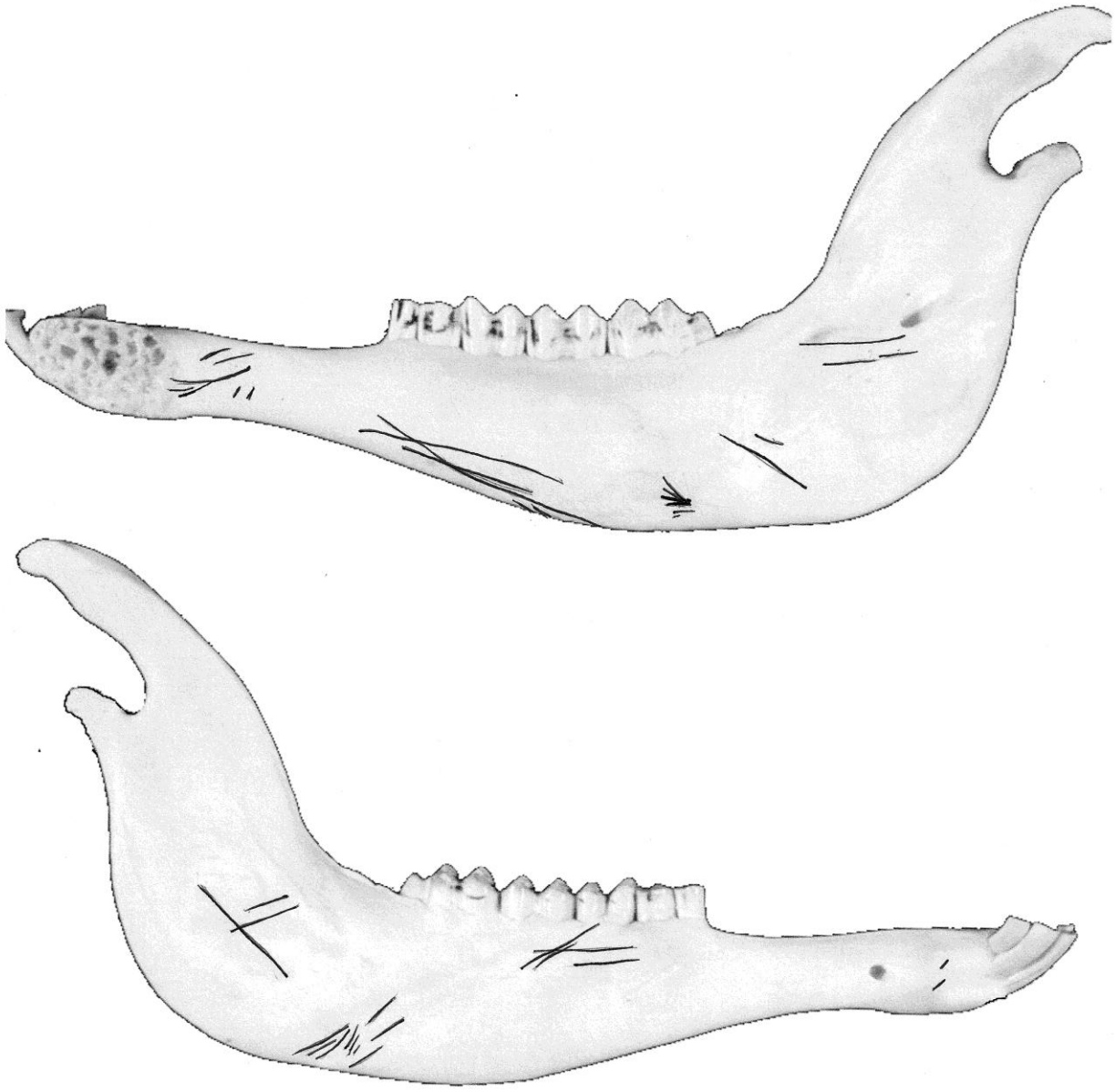
Specimen	Accession #	Material	Skeletal Element	Side	View	Portion	# marks	Orient	Type	# clusters	Visibility	Notes
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COW3	C3H BP/4/1287	check	caudal vertebra		d		0					
COW3	C3H BP/4/1287	check	caudal vertebra		v		0					
COW3	C3H BP/4/1287	check	caudal vertebra		d		0					
COW3	C3H BP/4/1287	check	caudal vertebra		v		0					
COW3	C3H BP/4/1287	check	caudal vertebra		d		0					
COW3	C3H BP/4/1287	check	caudal vertebra		v		0					
COW3	C3H BP/4/1287	check	caudal vertebra		d		0					

Appendix iii. Images of butchery marked bones.

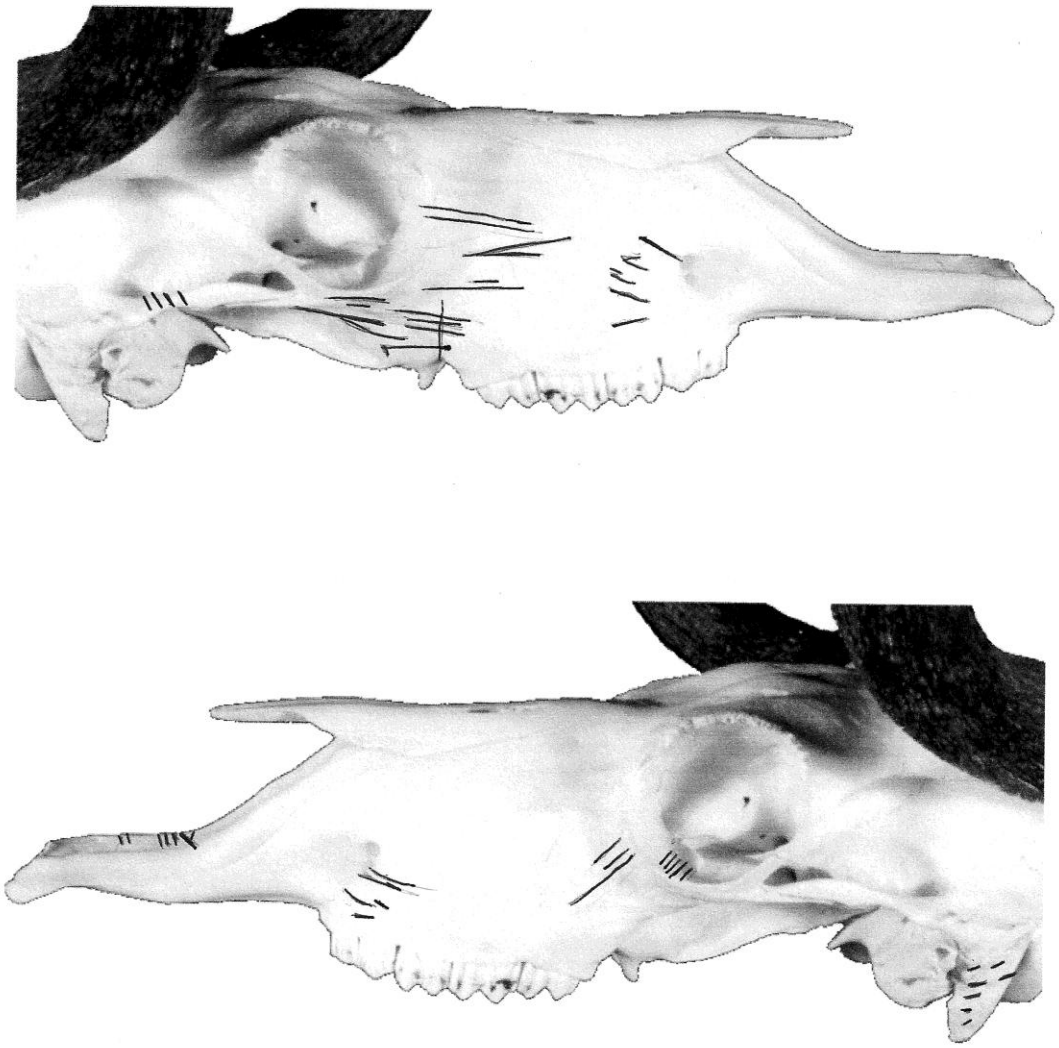
Cow 1. Left hemi-mandible medial & lateral views.



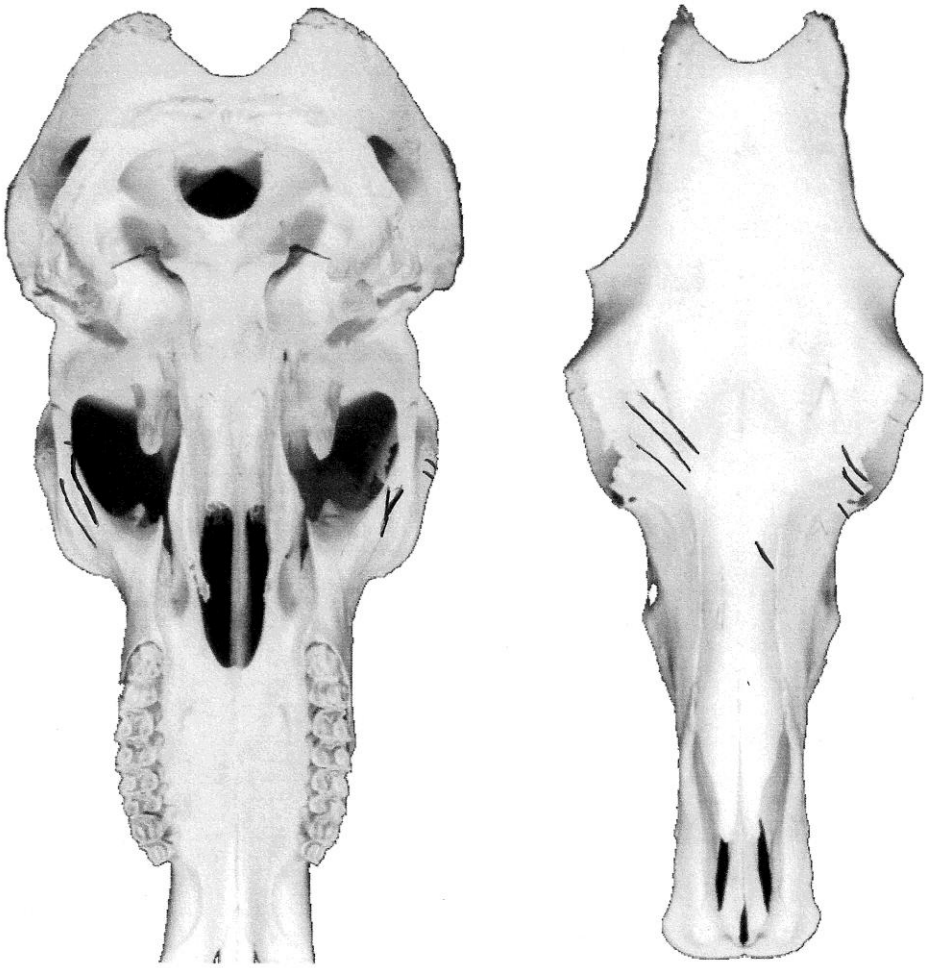
Cow1. Right hemi-mandible medial & lateral views



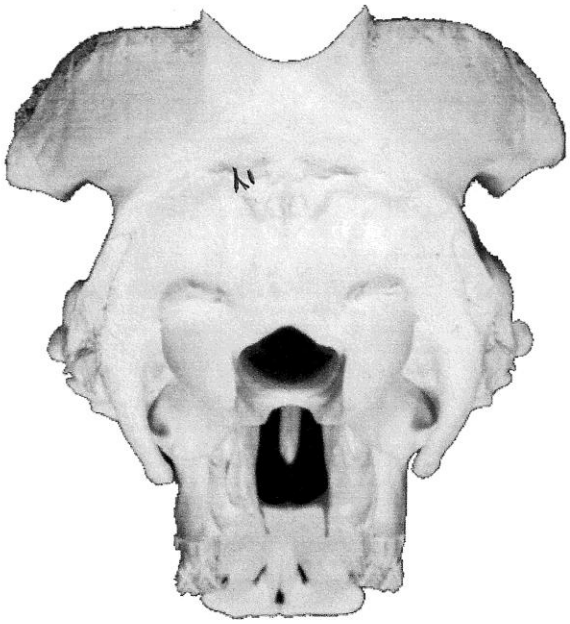
Cow1. Right and left views cranium.



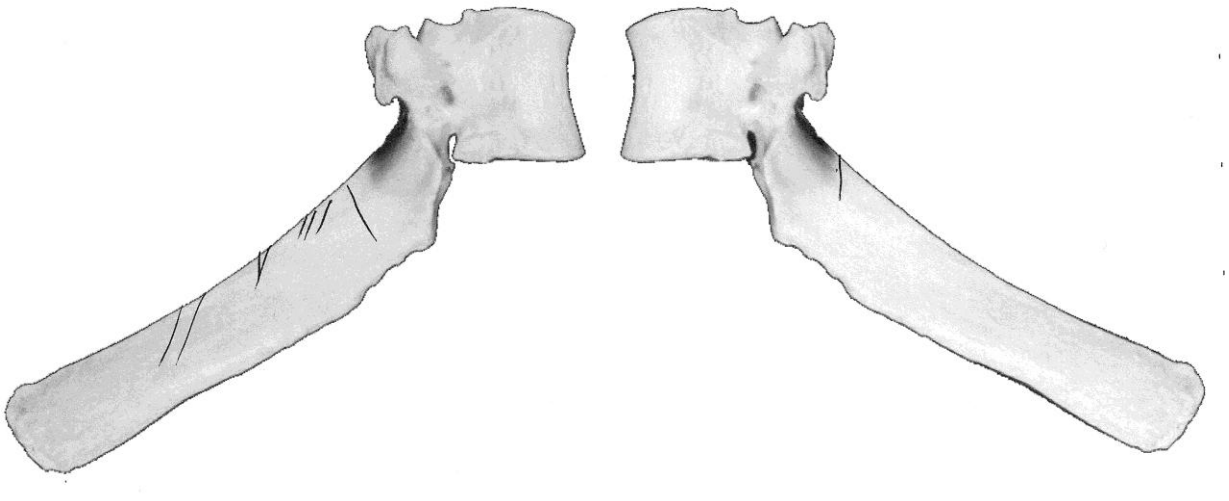
Cow1. Ventral and dorsal views cranium.



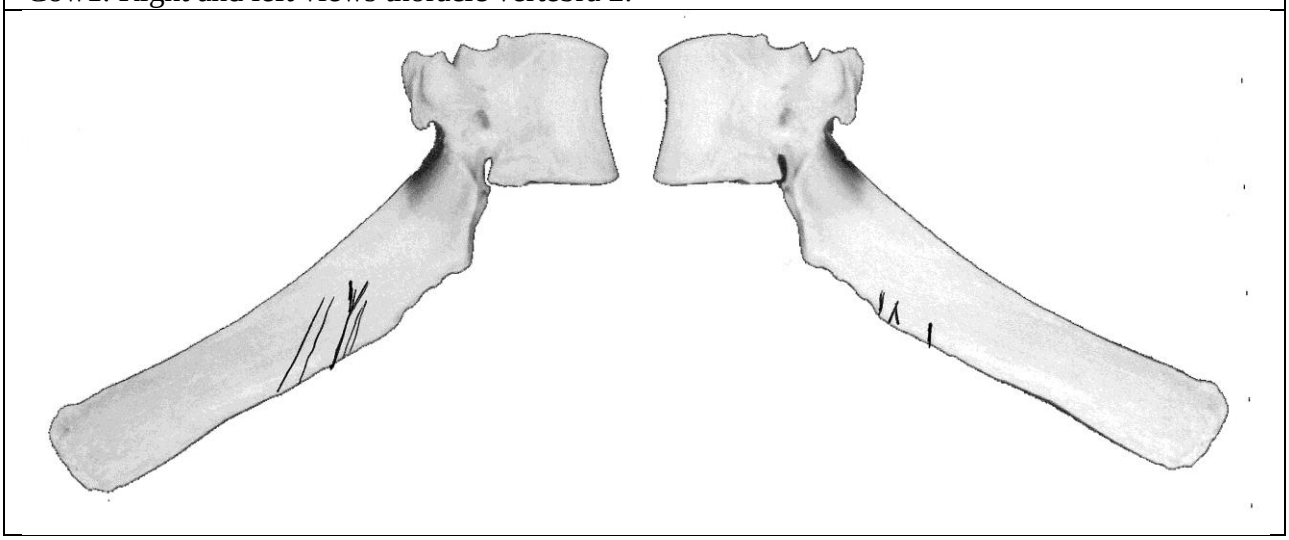
Cow1. Caudal view cranium.



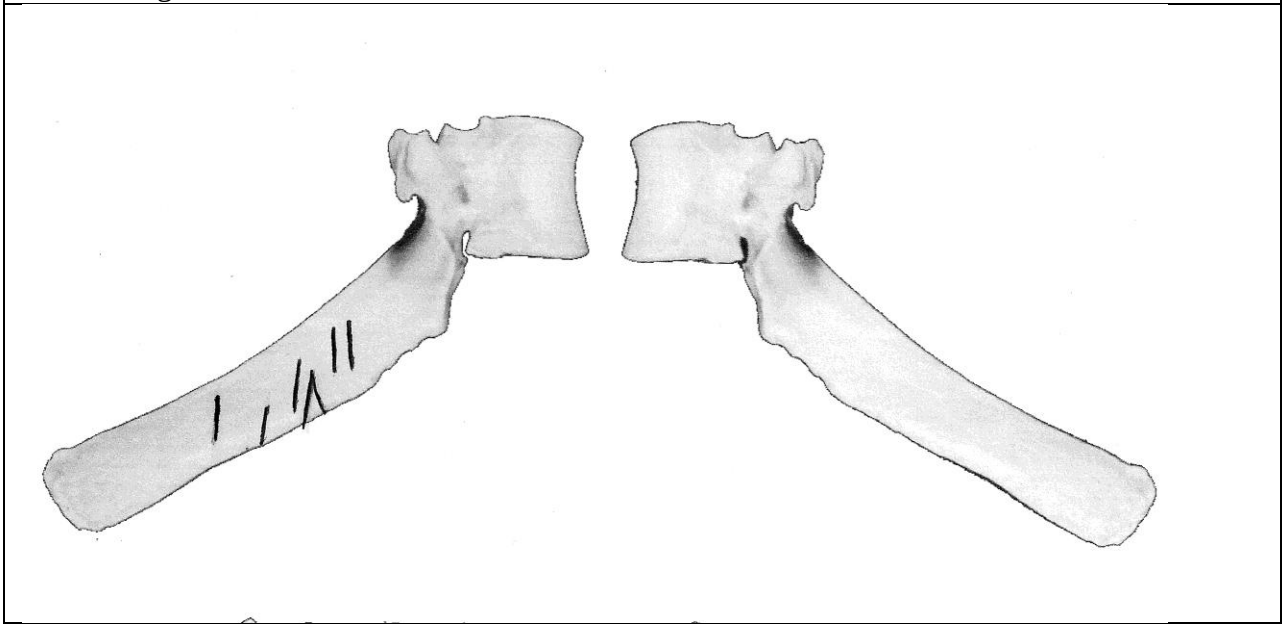
Cow1. Right and Left views thoracic vertebra 1



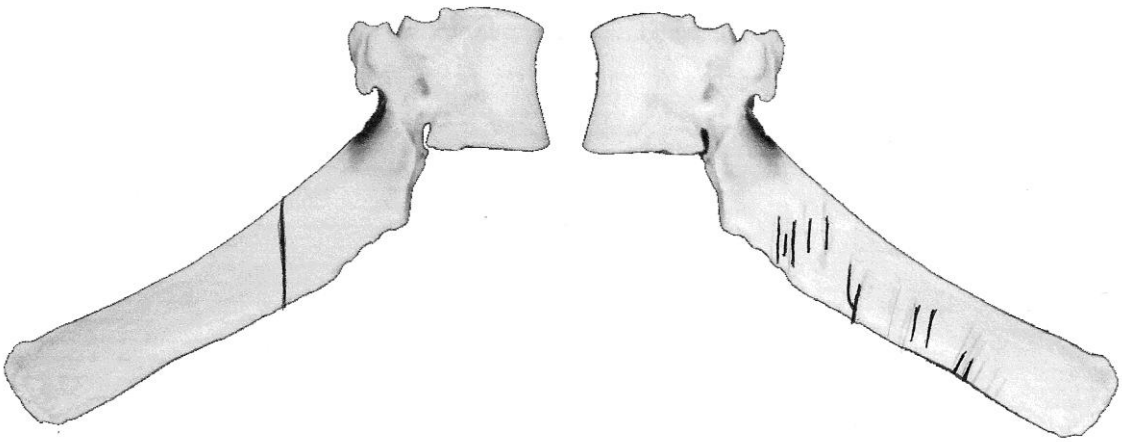
Cow1. Right and left views thoracic vertebra 2.



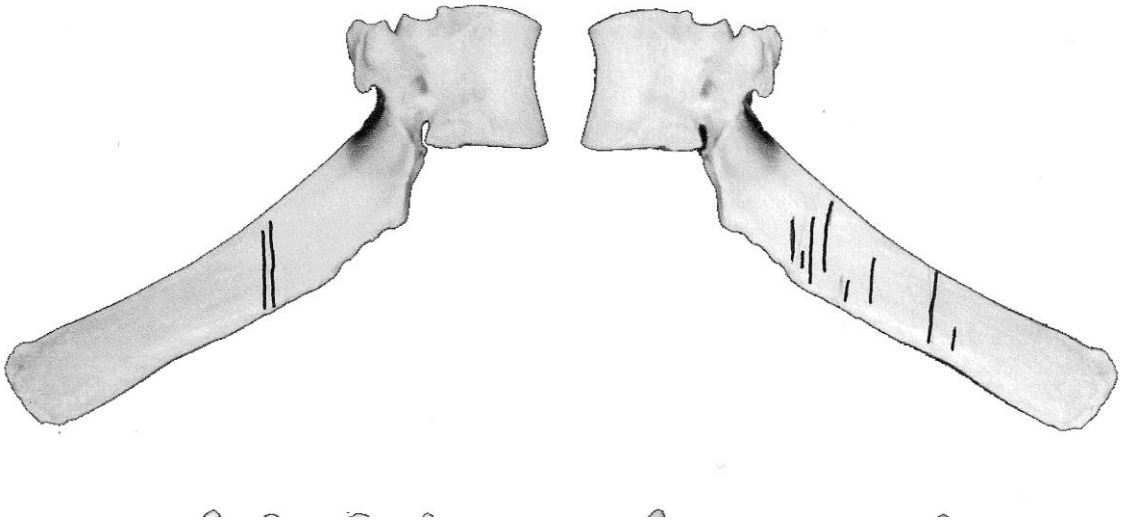
Cow1. Right and Left views thoracic vertebra 3.



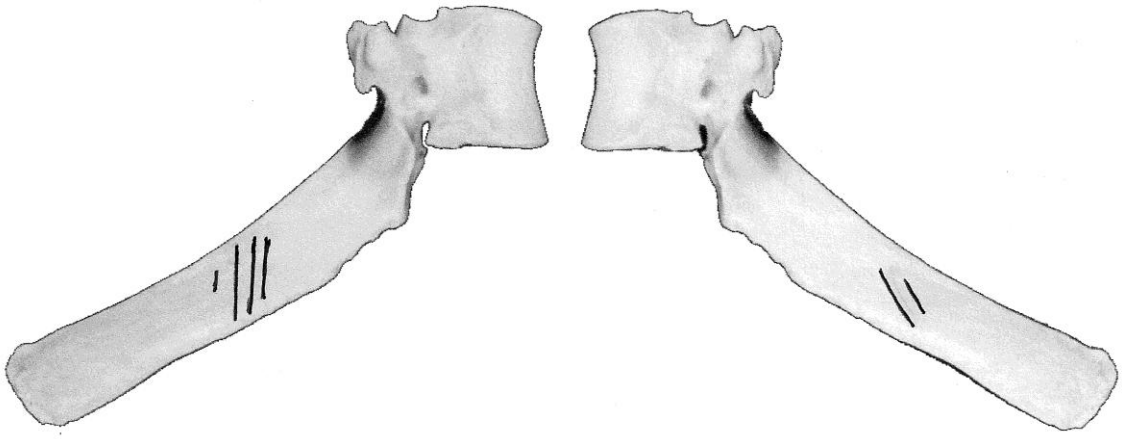
Cow1. Right and left views thoracic vertebra 4.



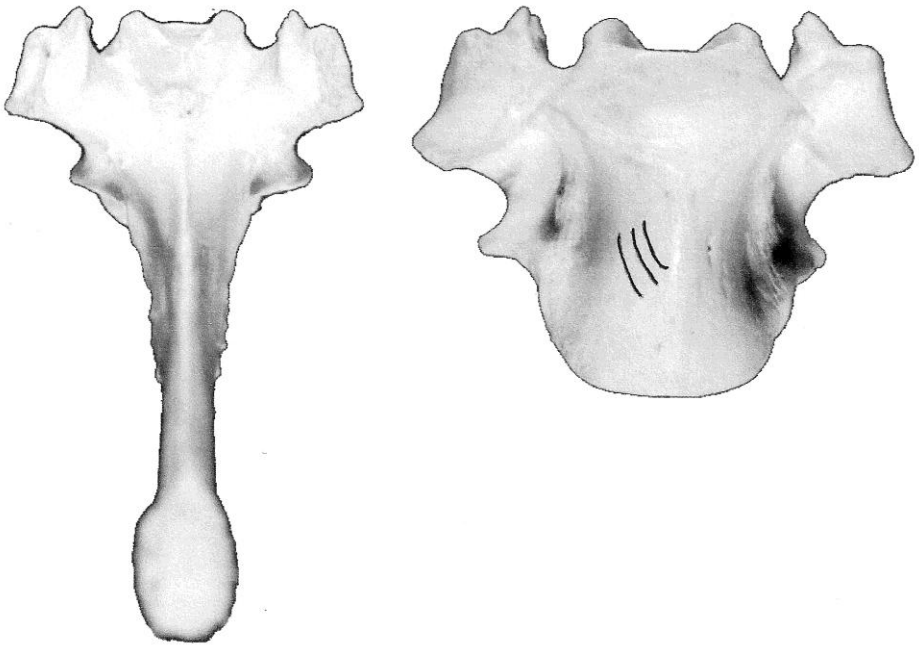
Cow1. Right and left views thoracic vertebra 5.



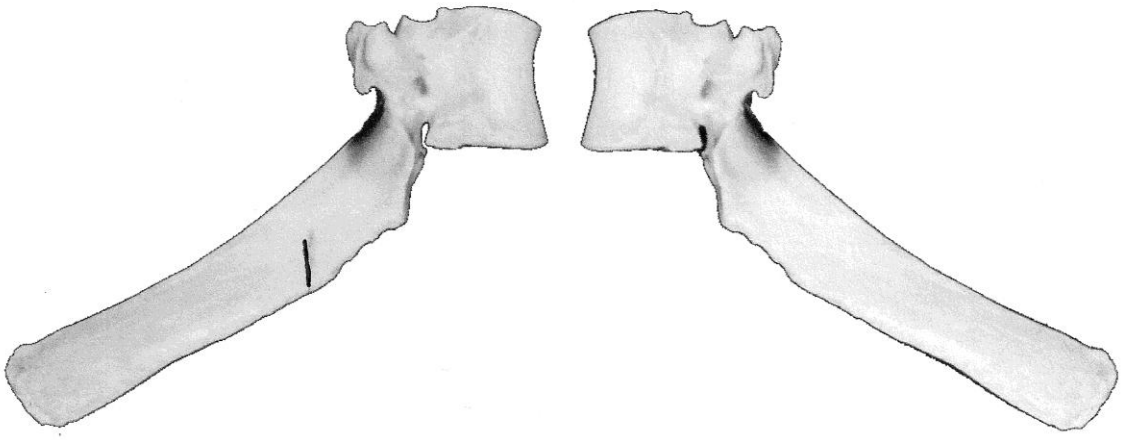
Cow1. Right and left views thoracic vertebra 6.



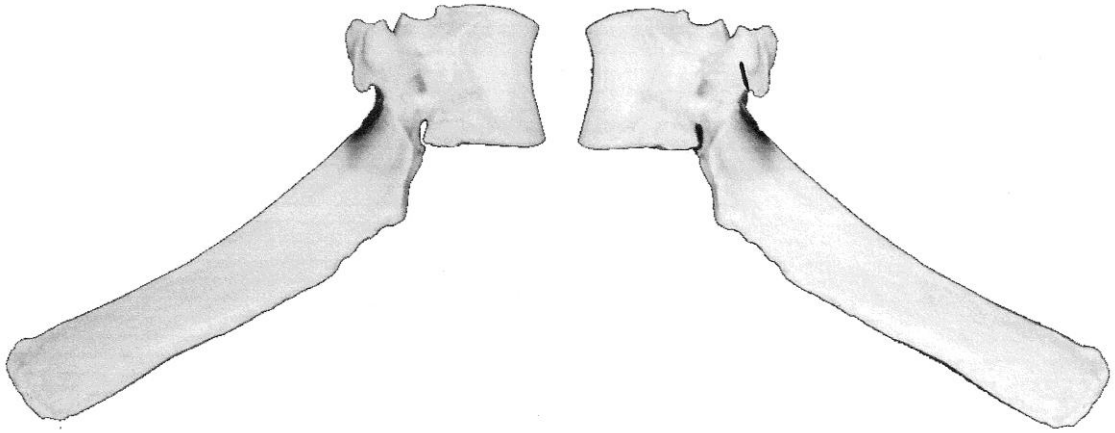
Cow1. Ventral and dorsal views thoracic vertebra 7.



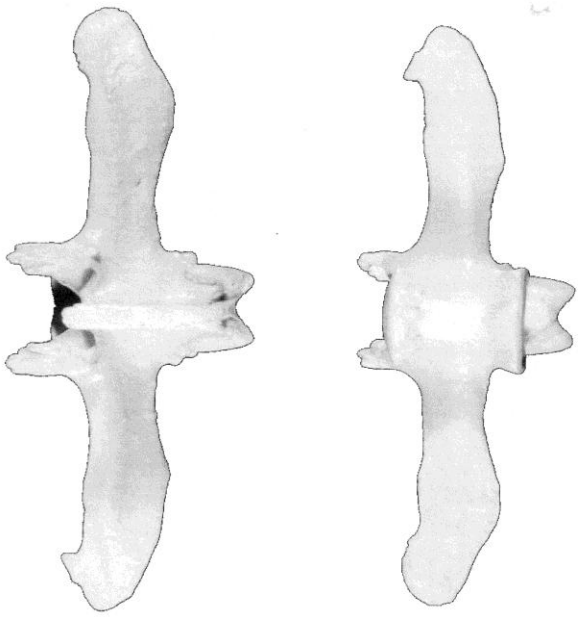
Cow1. Right and left views thoracic vertebra 8.



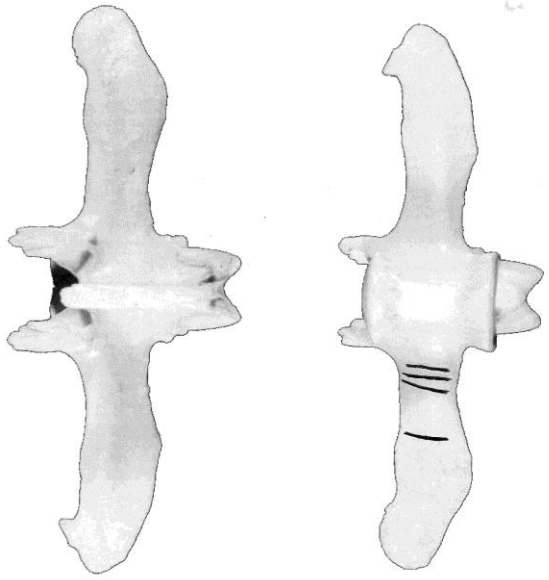
Cow1. Right and left views thoracic vertebra 10.



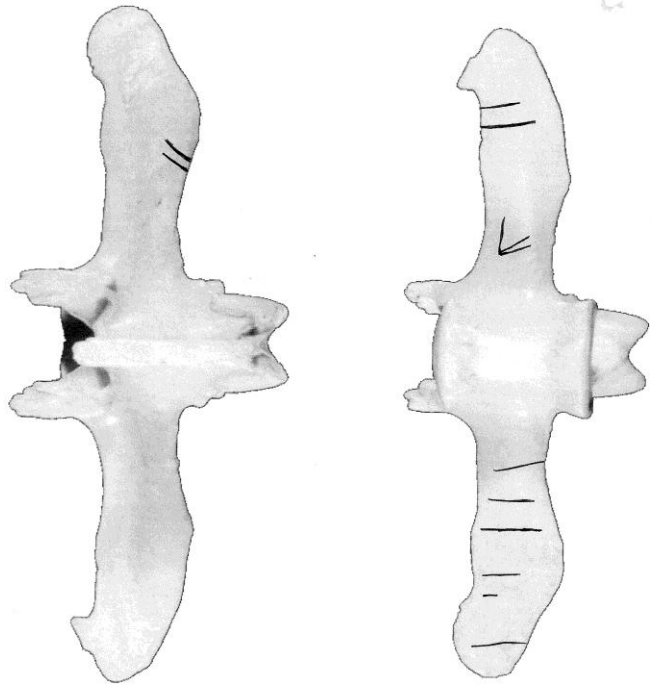
Cow1. Dorsal and ventral views lumbar vertebra 2.



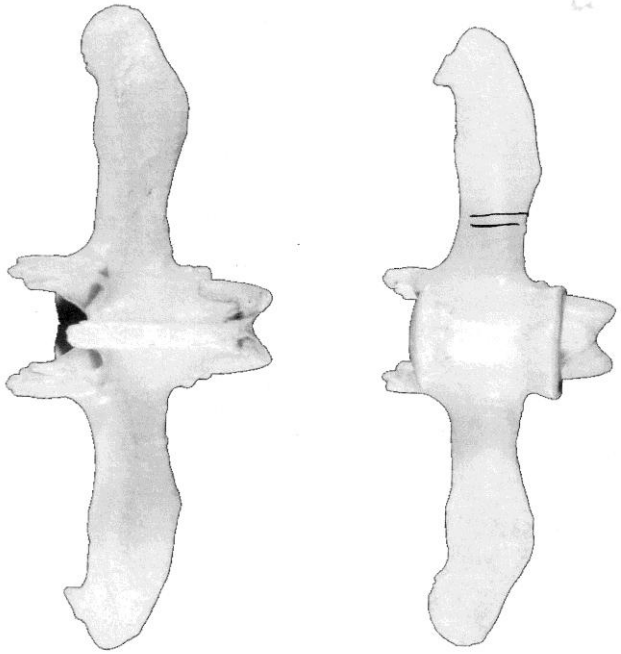
Cow1. Dorsal and ventral views lumbar vertebra 3.



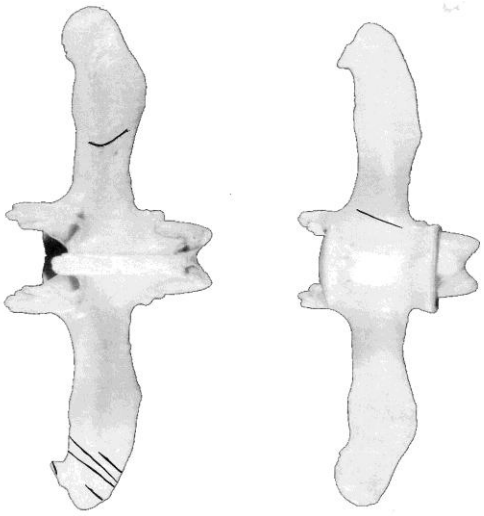
Cow1. Dorsal and ventral views lumbar vertebra 4.



Cow1. Dorsal and ventral views lumbar vertebra 5.



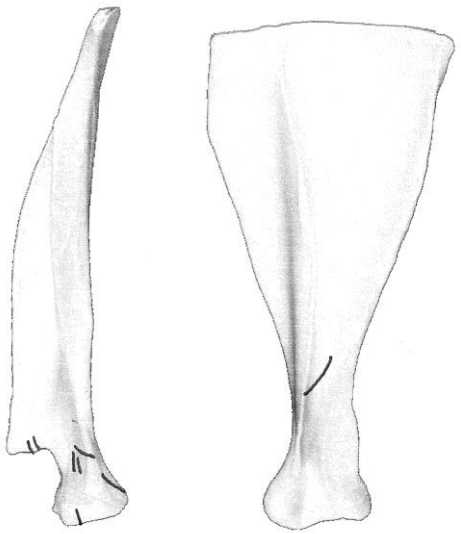
Cow1. Dorsal and ventral views lumbar vertebra 6.

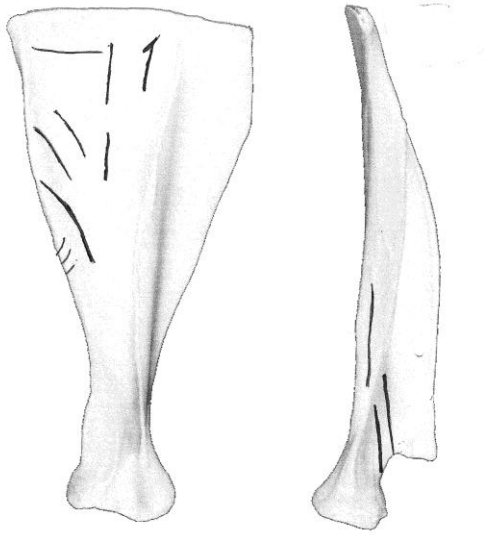


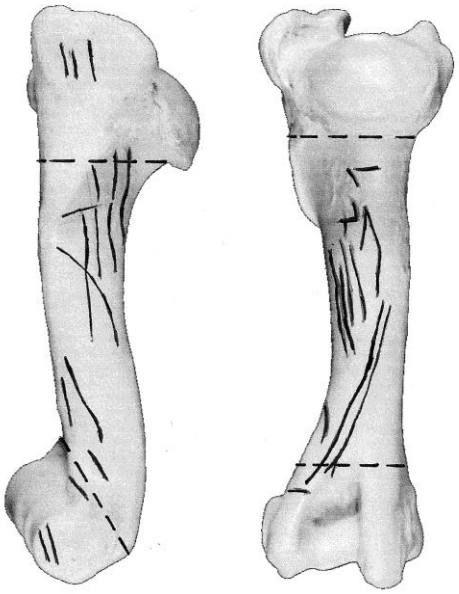
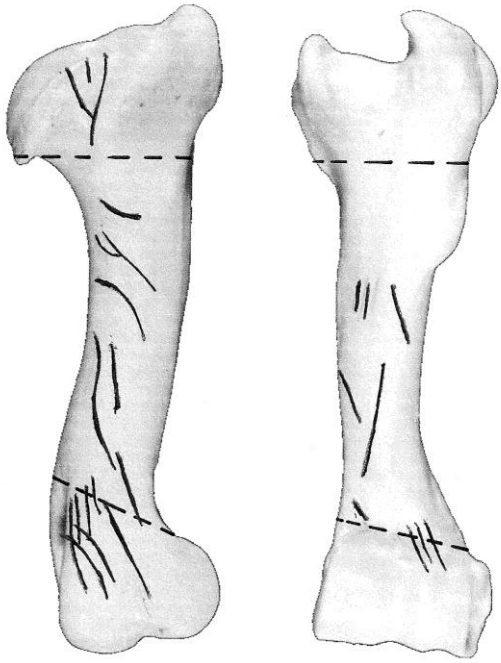
Cow1. Left Anterior and medial views scapula.

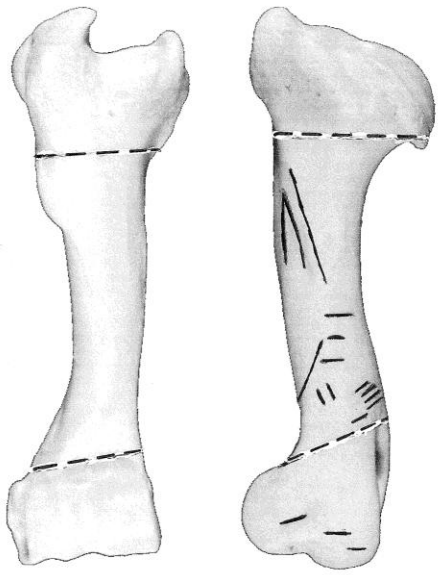
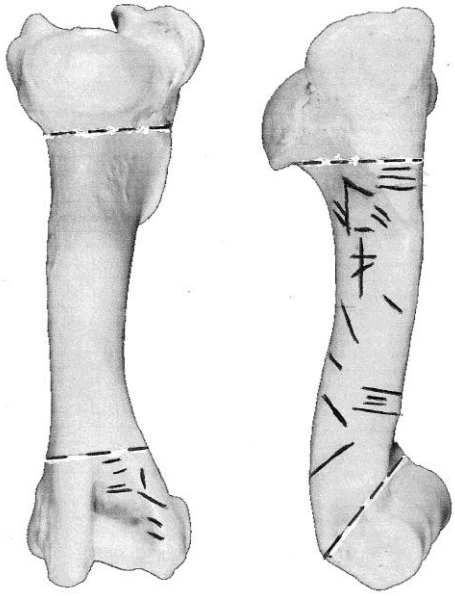


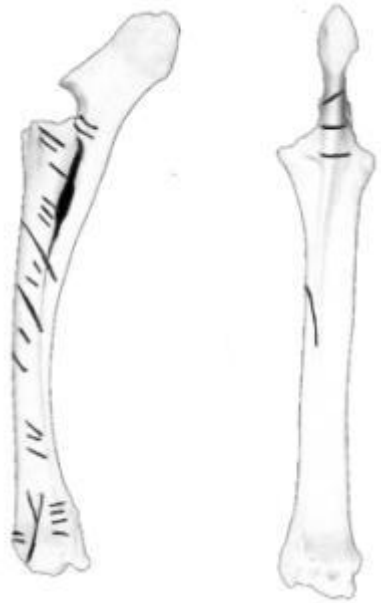
Cow1. Left Posterior and lateral views scapula.

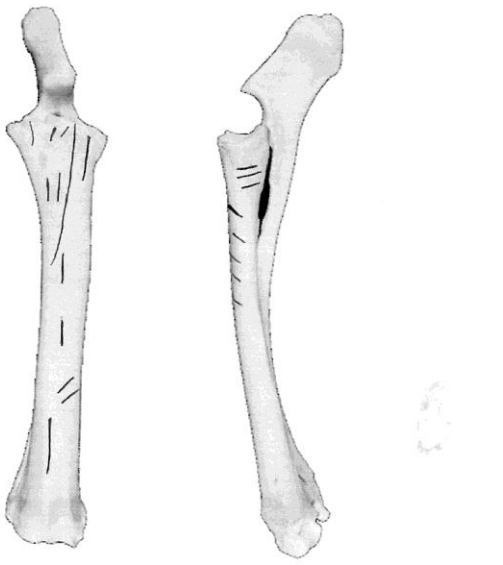
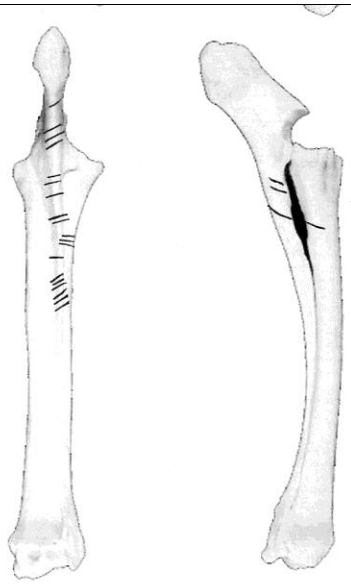


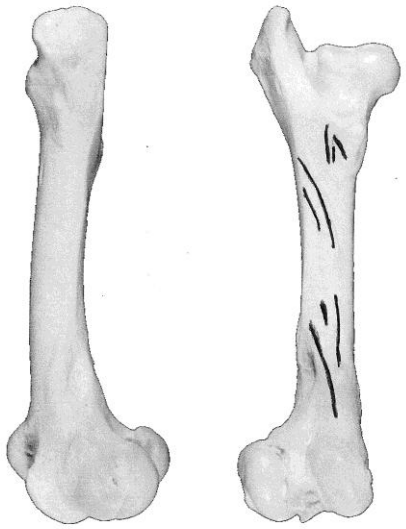
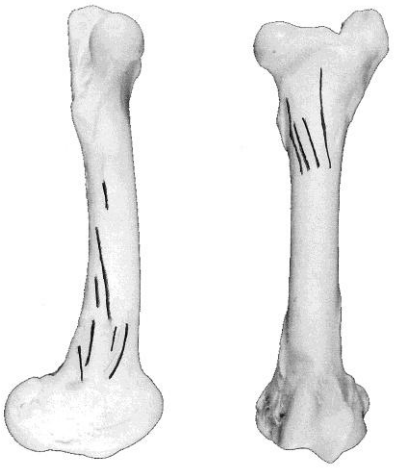
Cow1. Right Anterior and medial views scapula.	Cow1. Right lateral and posterior views scapula.
	

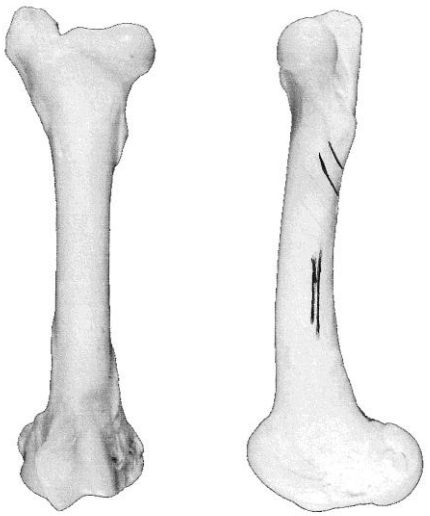
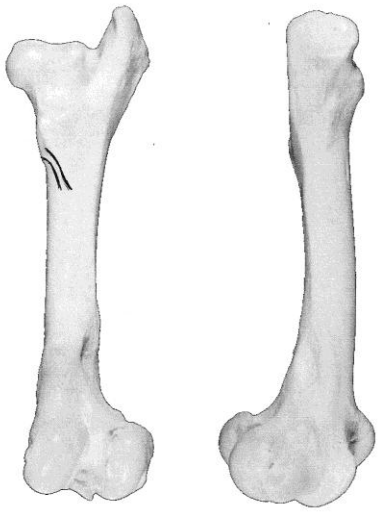
Cow1. Left lateral and posterior views humerus.	Cow1. Left medial and anterior views humerus.
	

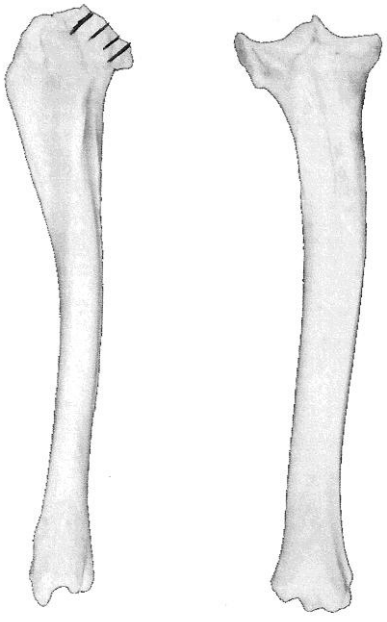
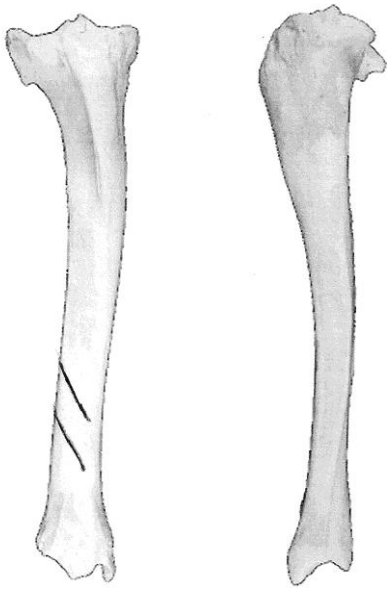
Cow1. Right anterior and medial views humerus.	Cow1. Left posterior and lateral views humerus.
	

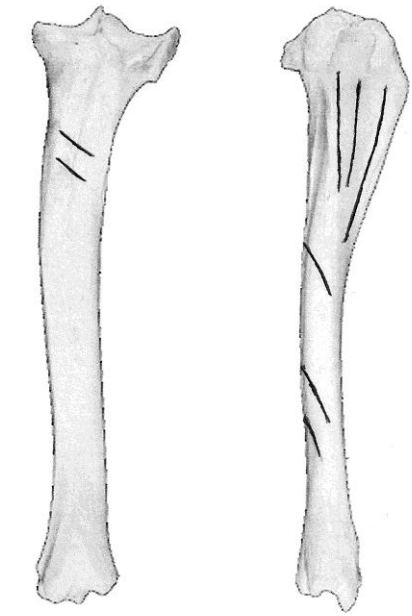
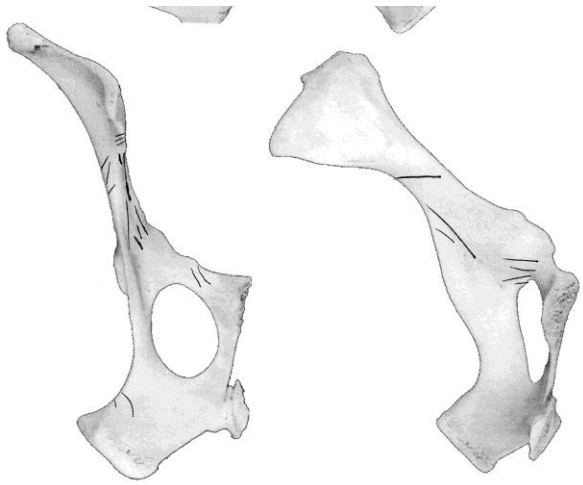
Cow1. Left lateral and posterior views radio-ulna	Cow1. Left medial and anterior views radio-ulna
	

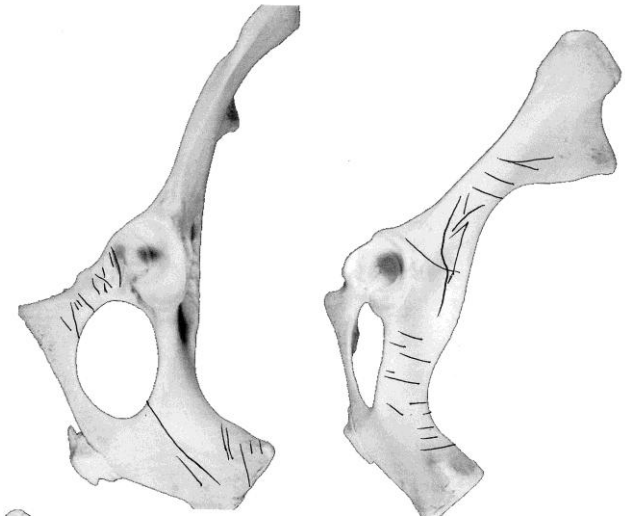
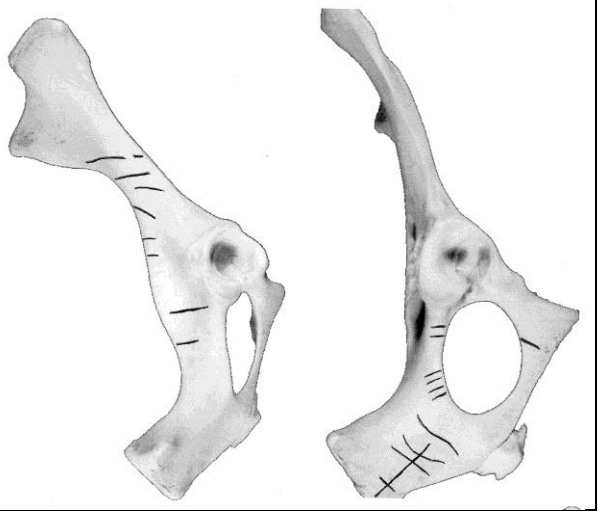
Cow1. Right anterior and medial views radio-ulna	Cow1.Right posterior and lateral views radio-ulna
	

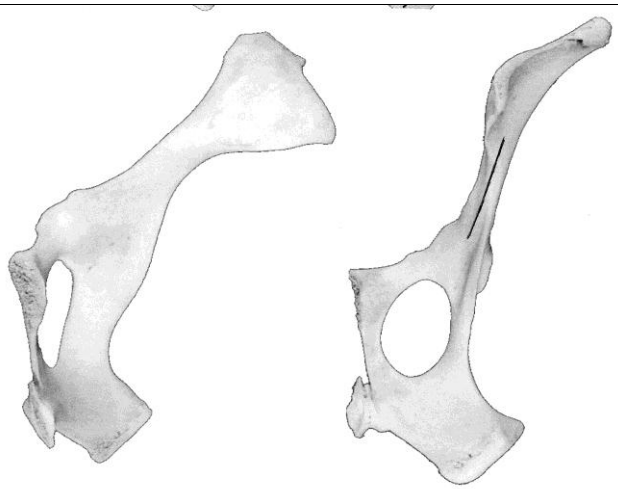
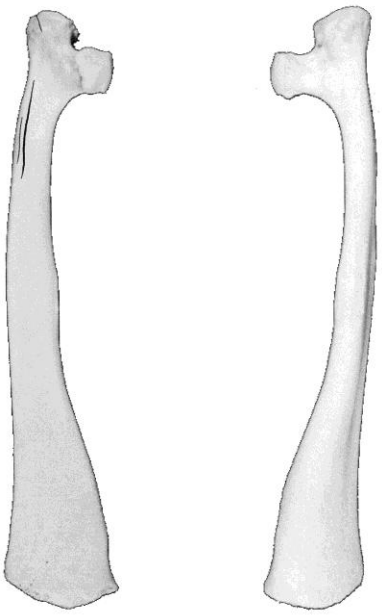
Cow1. Left lateral and posterior views femur.	Cow1. Left medial and anterior views femur.
	

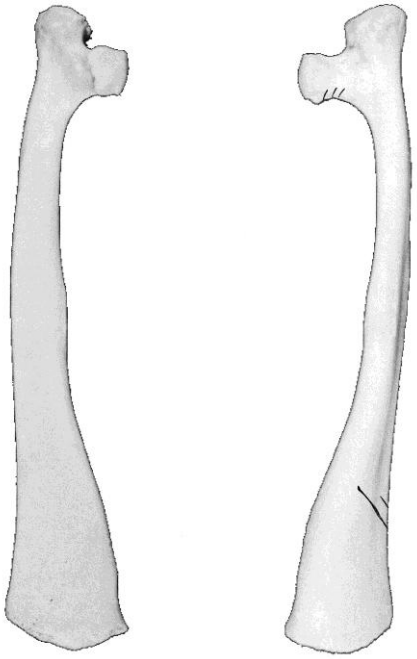
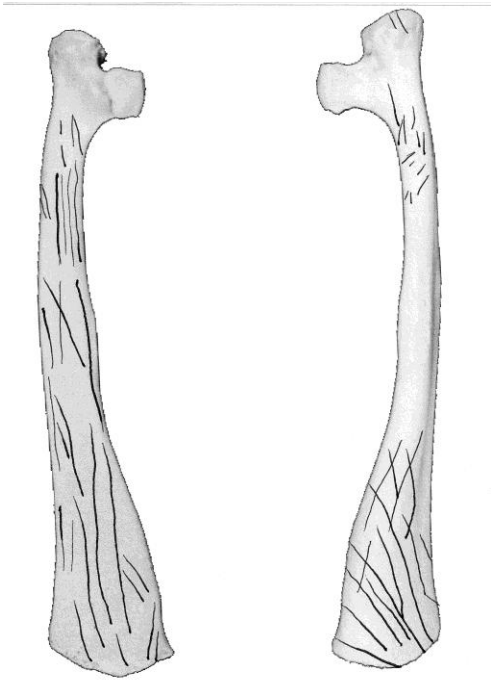
Cow1. Right anterior and medial views femur.	Cow1. Right posterior and lateral views femur.
	

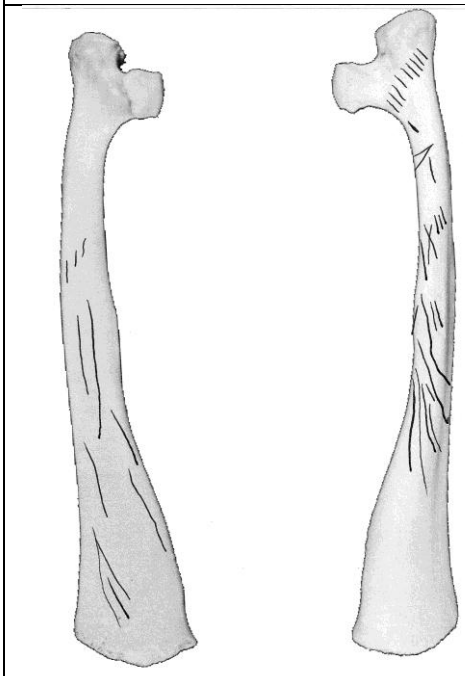
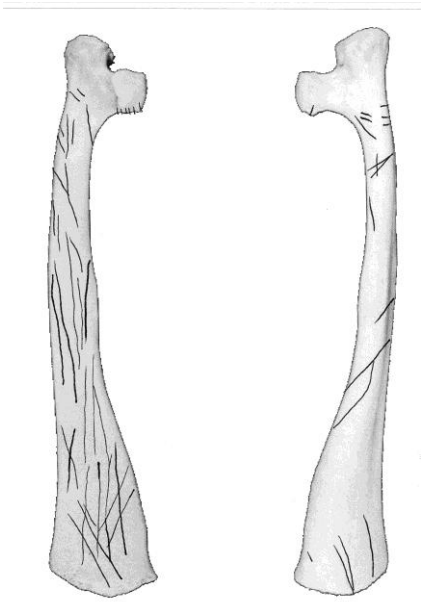
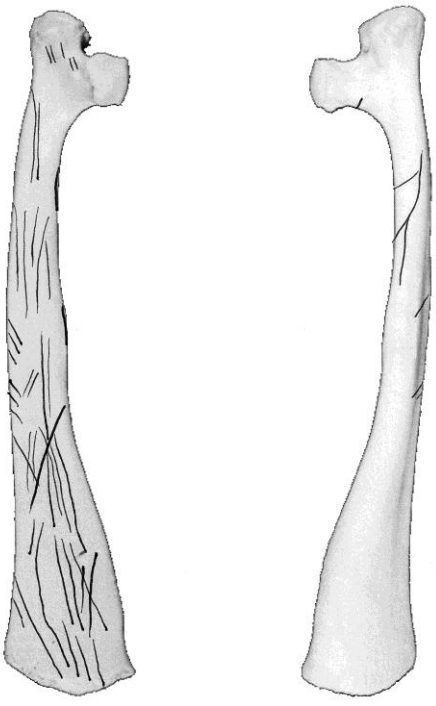
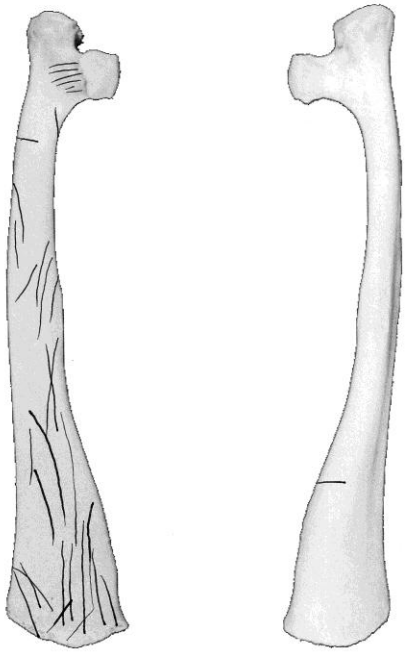
Cow1. Left lateral and posterior views tibia.	Cow1. Right anterior and medial views tibia.
	

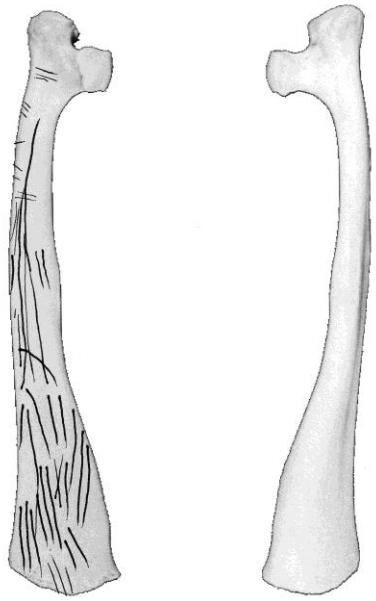
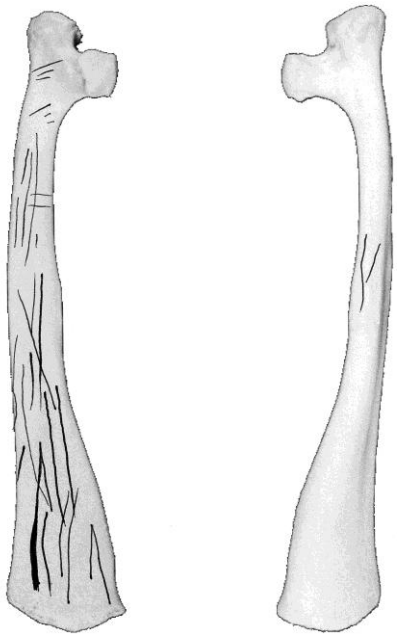
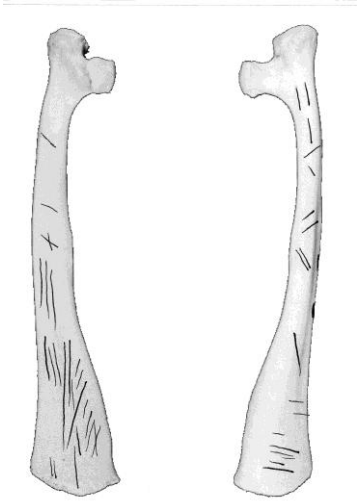
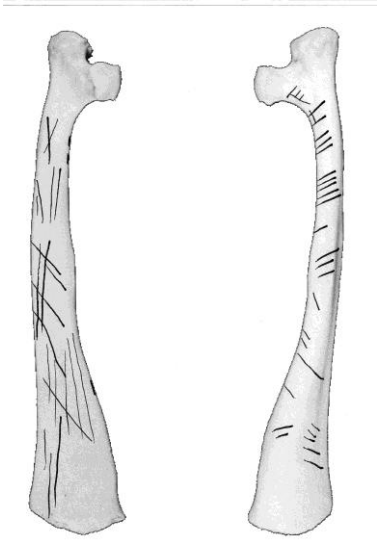
Cow1.Right lateral and posterior views tibia.	Cow1. Left dorsal and medial views innominate
	

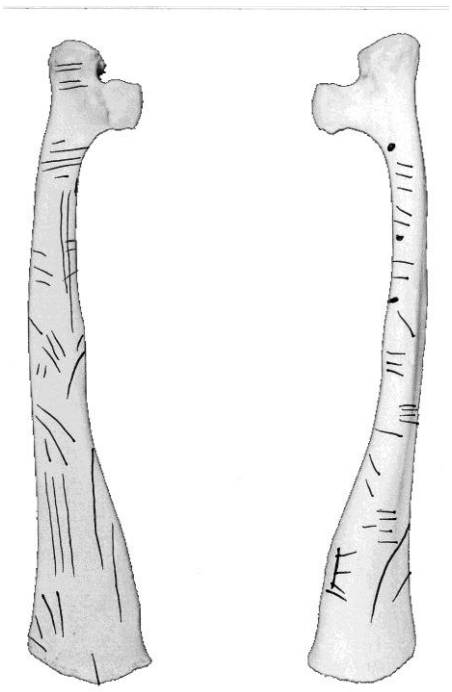
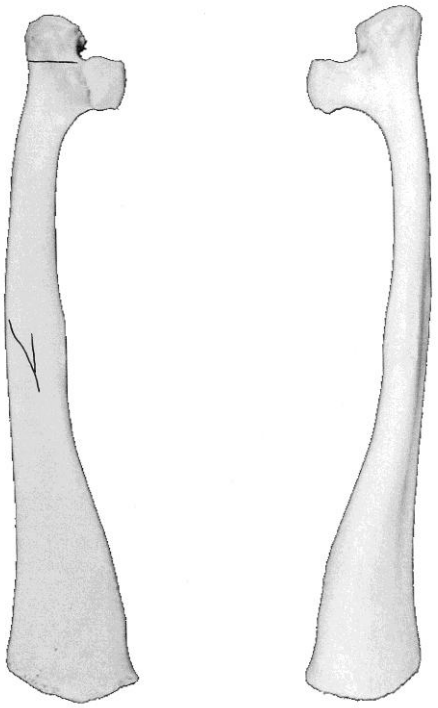
Cow1. Left ventral and lateral views innominate.	Cow1. Right lateral and ventral innominate.
	

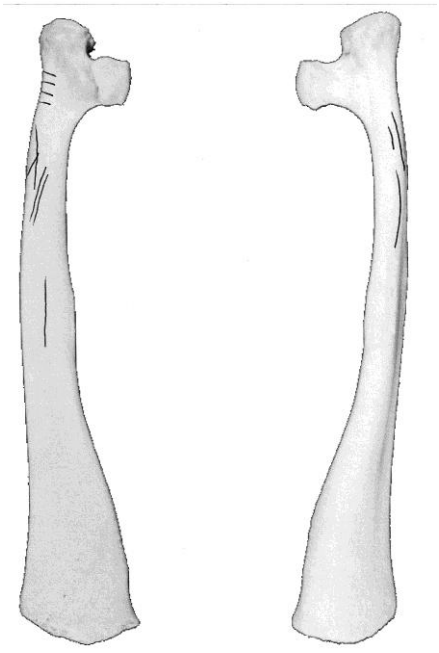
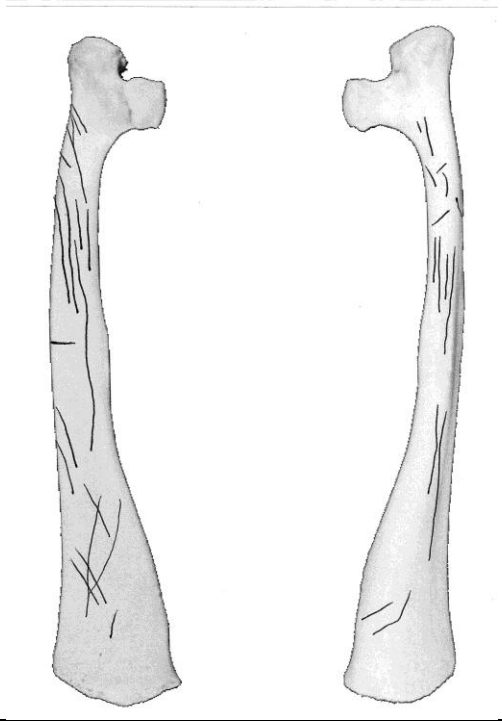
Cow1. Right medial and dorsal views innominate.	Cow 1. Left medial and lateral views rib 2.
	

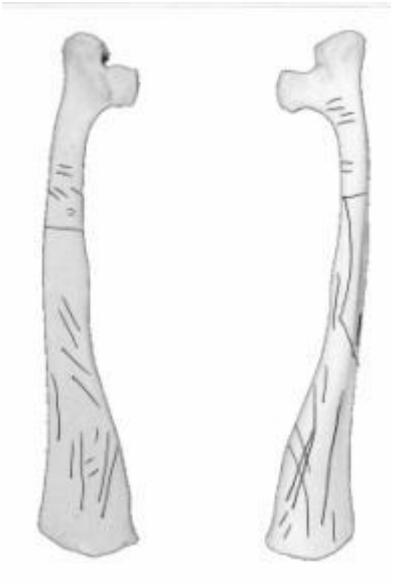
Cow1. Left medial and lateral views rib 3.	Cow1. Left medial and lateral views rib 4.
	

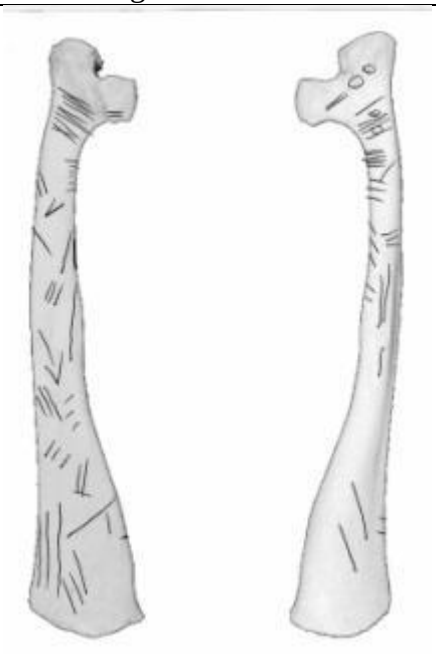
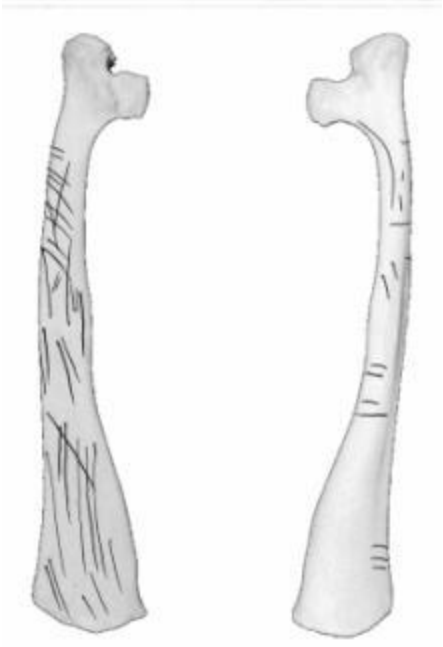
Cow1. Left medial and lateral views rib 5.	Cow1. Left medial and lateral views rib 6.
	
Cow1. Left medial and lateral views rib 7.	Left medial and lateral views rib 8.
	

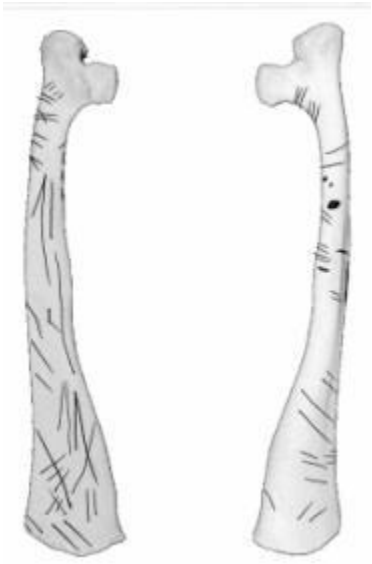
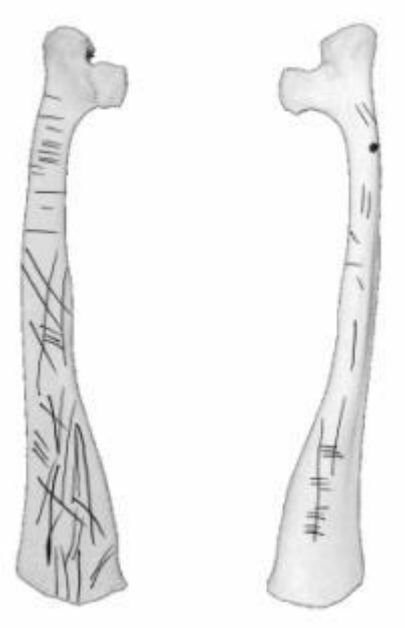
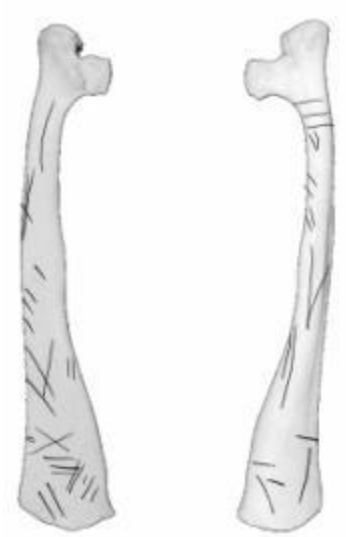
Cow1. Left medial and lateral views rib 9.	Cow1. Left medial and lateral views rib 10.
	
Cow1. Left medial and lateral views rib 11.	Cow1.Left medial and lateral views rib 12.
	

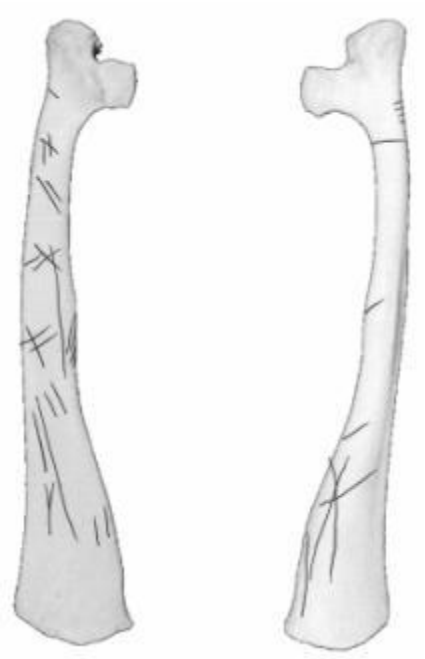
Cow1. Left medial and lateral views rib 13.	Cow1. Right medial and lateral views rib 1.
	

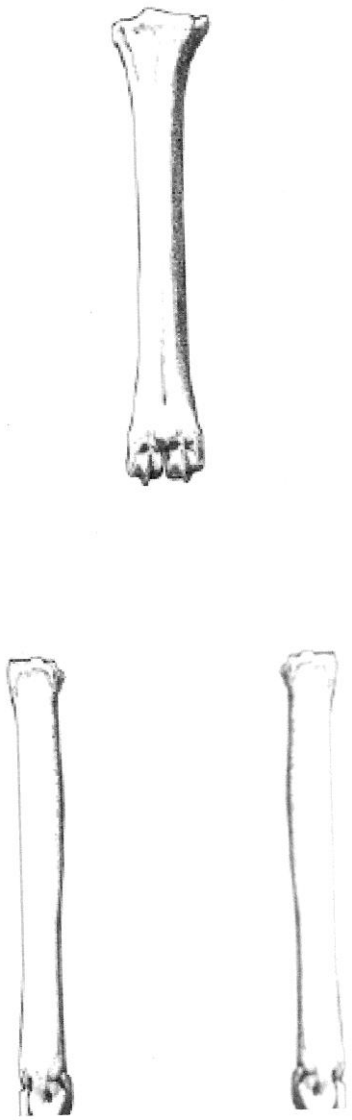
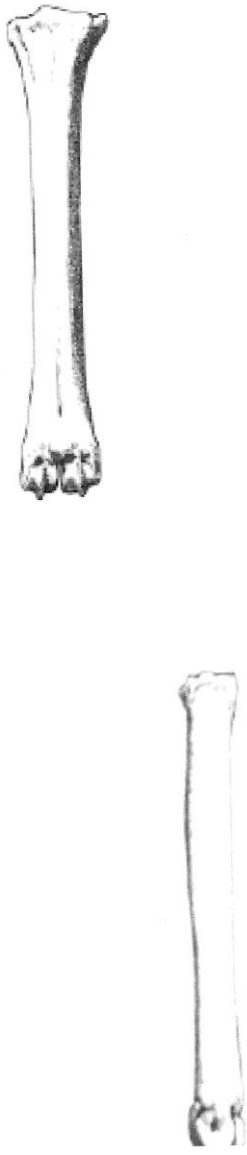
Cow1. Right medial and lateral views rib 2.	Cow1. Right medial and lateral views rib 3.
	

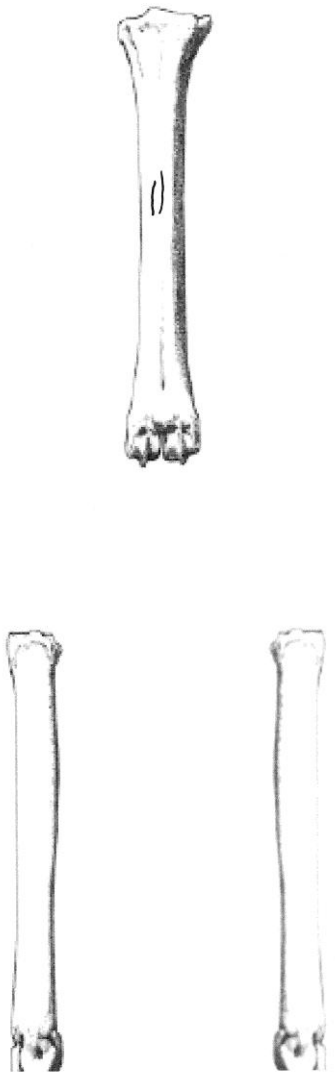
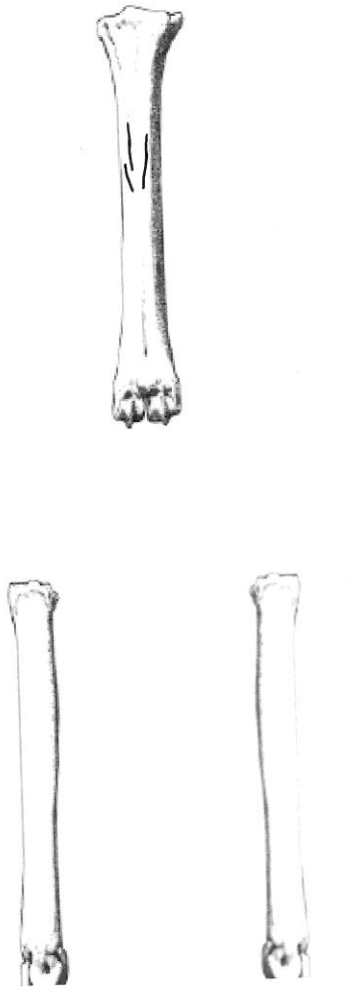
Cow1. Right medial and lateral views rib 4.	Cow1. Right medial and lateral views rib 5.
	

Cow1. Right medial and lateral views rib 6	Cow1. Right medial and lateral views rib 7.
	

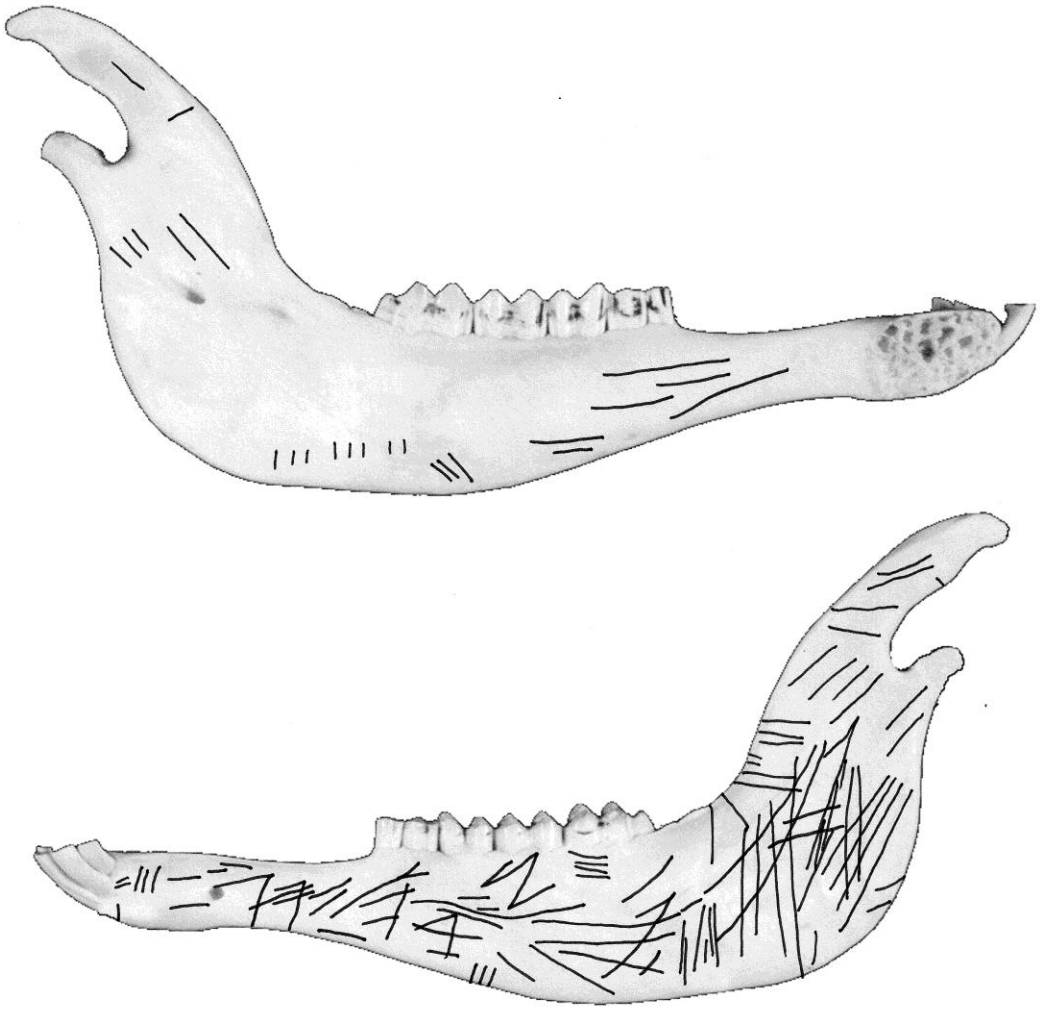
Cow1. Right medial and lateral views rib 8	Cow1. Right medial and lateral views rib 9.
	
Cow1. Right medial and lateral views rib 10	Cow1. Right medial and lateral views rib11.
	

Cow1. Right medial and lateral views rib 12	Cow1. Right medial and lateral views rib 13.
	

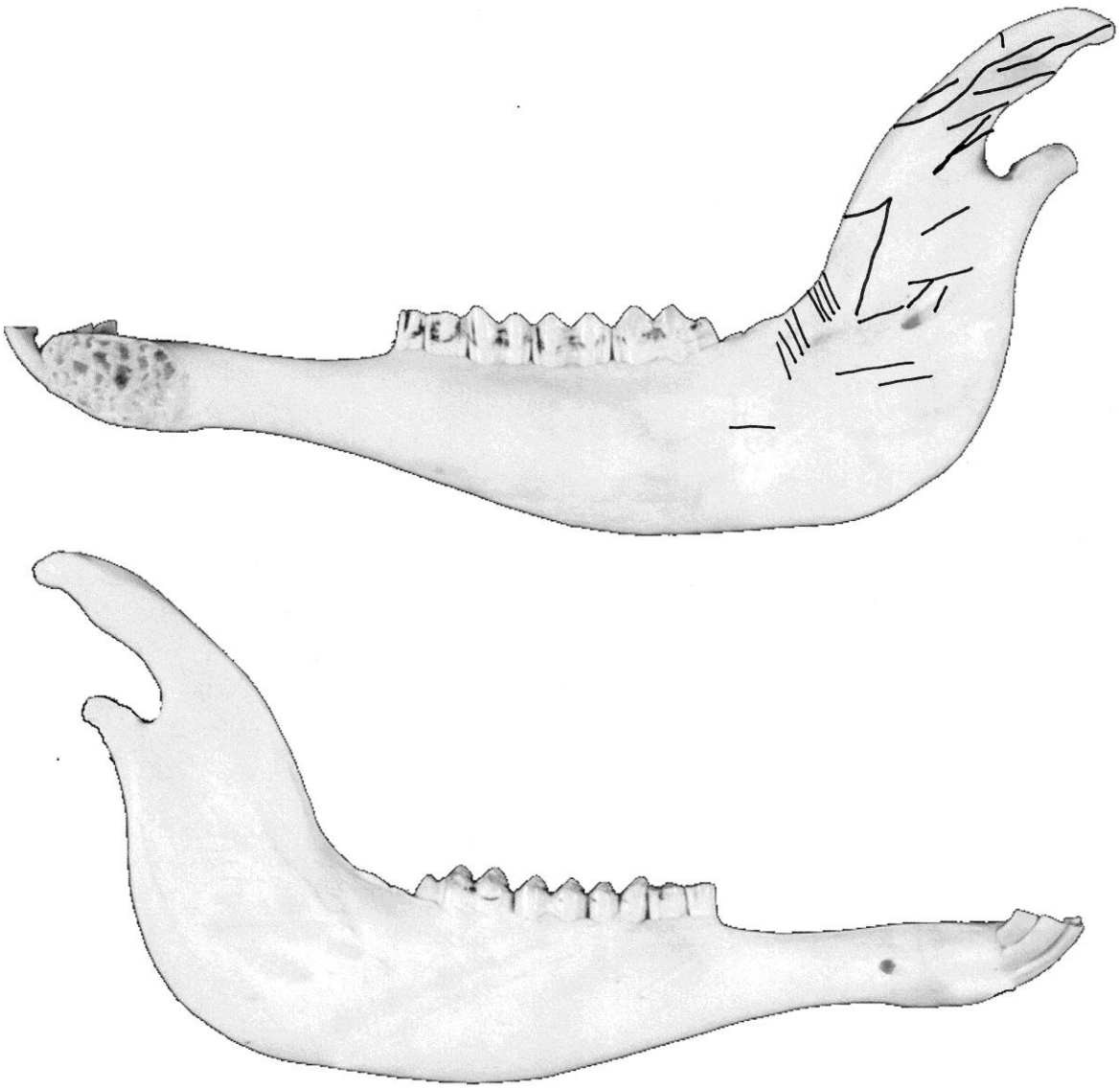
Cow1. Left anterior and medial views metacarpal.	Cow1. Right anterior and medial views metacarpal.
	

Cow1. Left anterior and medial views metatarsal.	Cow1. Right anterior and medial views metatarsal.
	

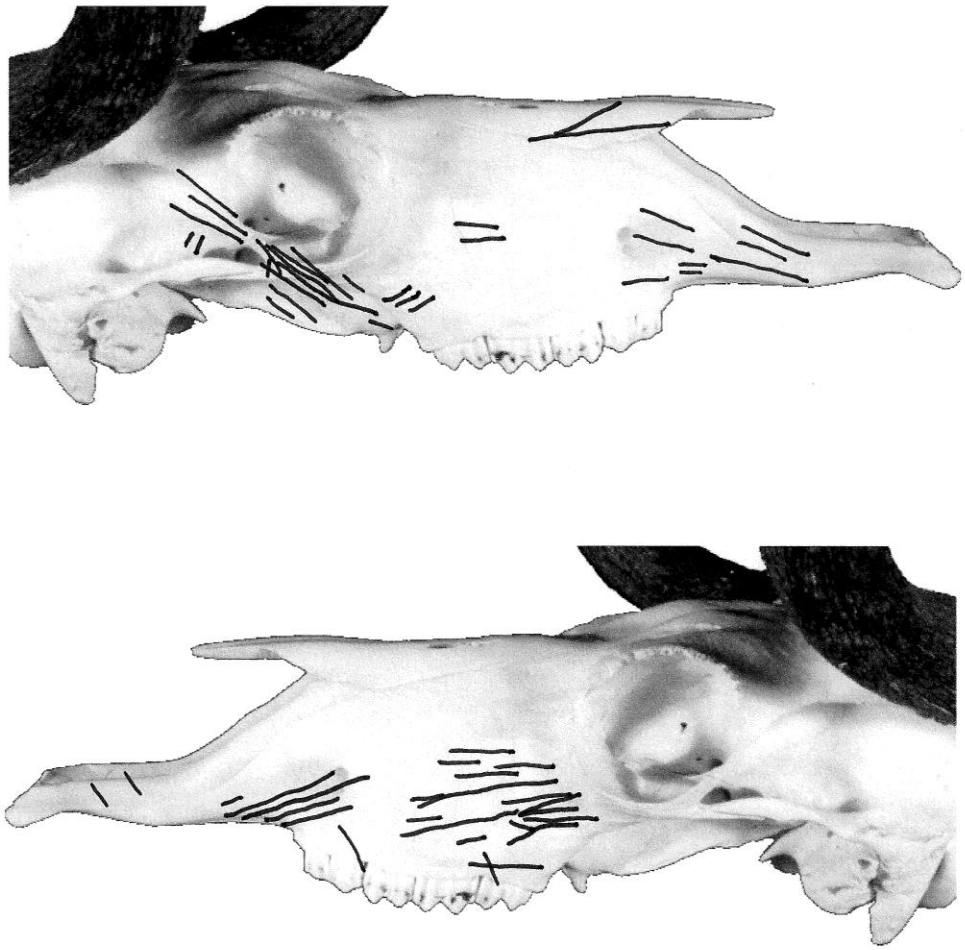
Cow2. Left medial and lateral views mandible.



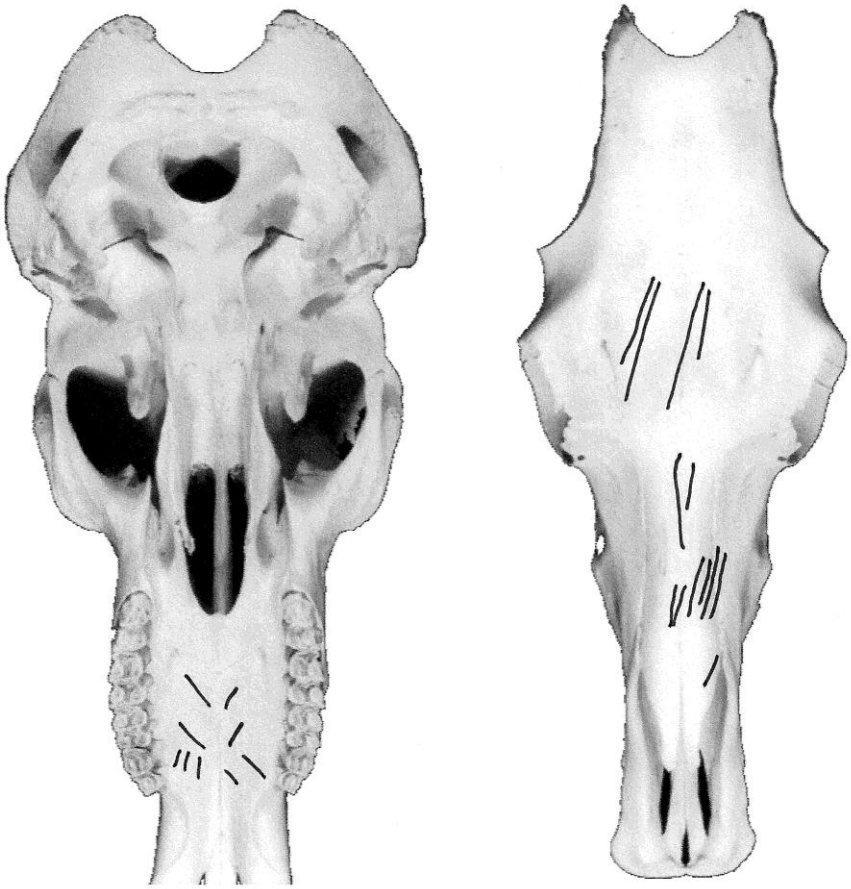
Cow2. Right medial and lateral views mandible.



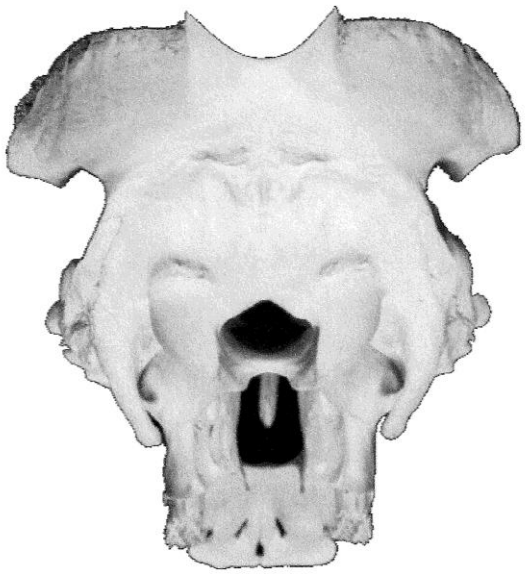
Cow2. Right and left views cranium.



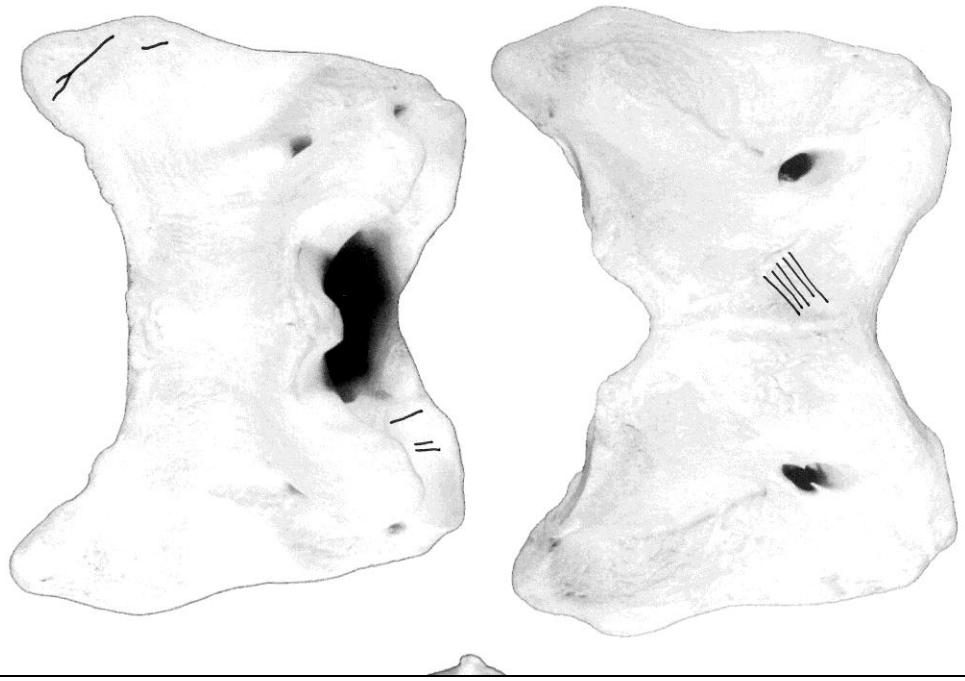
Cow2. Ventral and dorsal views cranium.



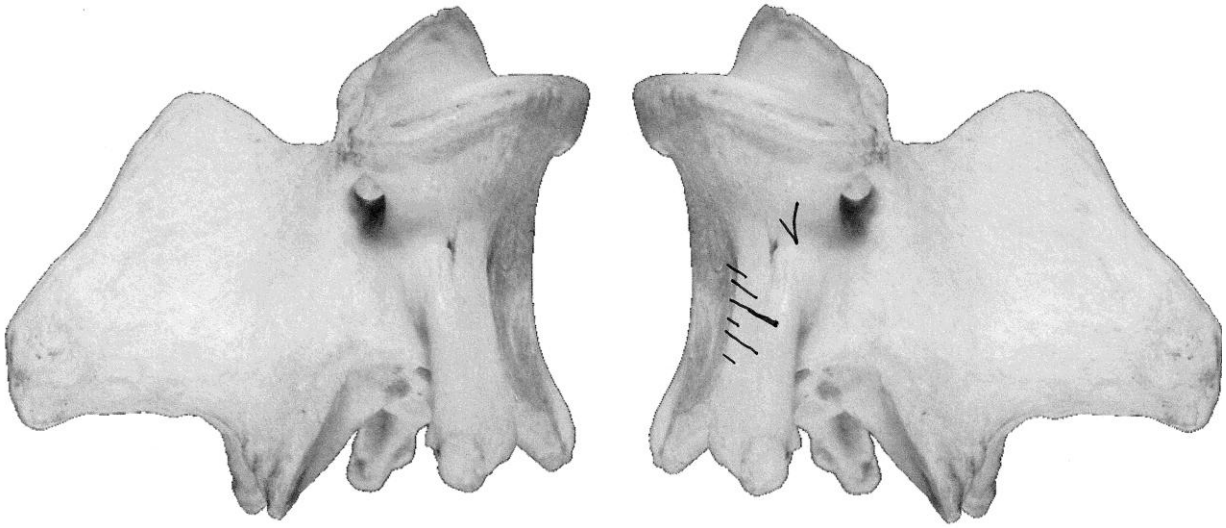
Cow2. Occipital view cranium.



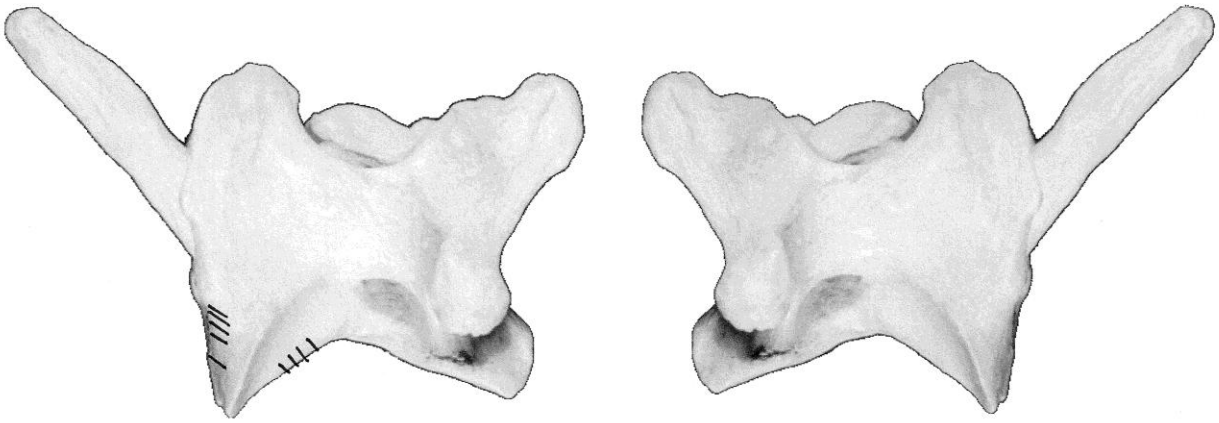
Cow2. Dorsal and ventral views atlas.



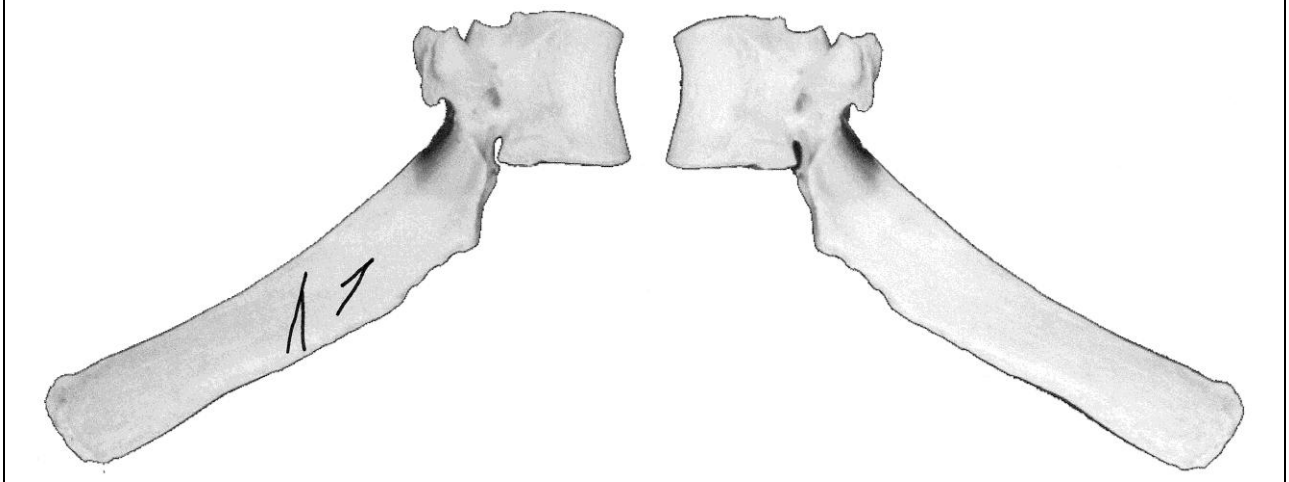
Cow2. Right and left views axis.



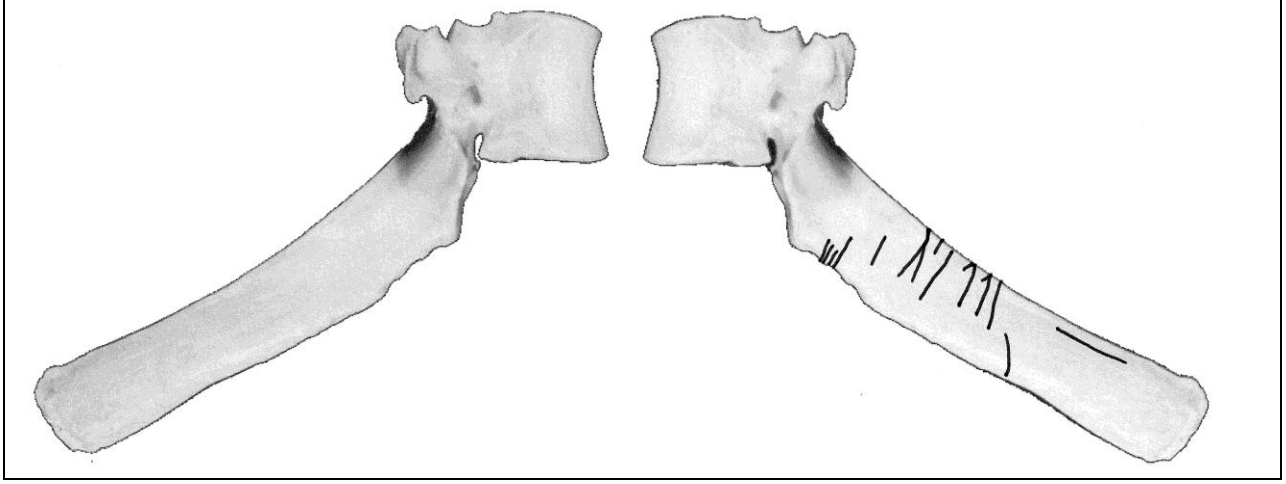
Cow2. Right and left views cervical vertebra 3.



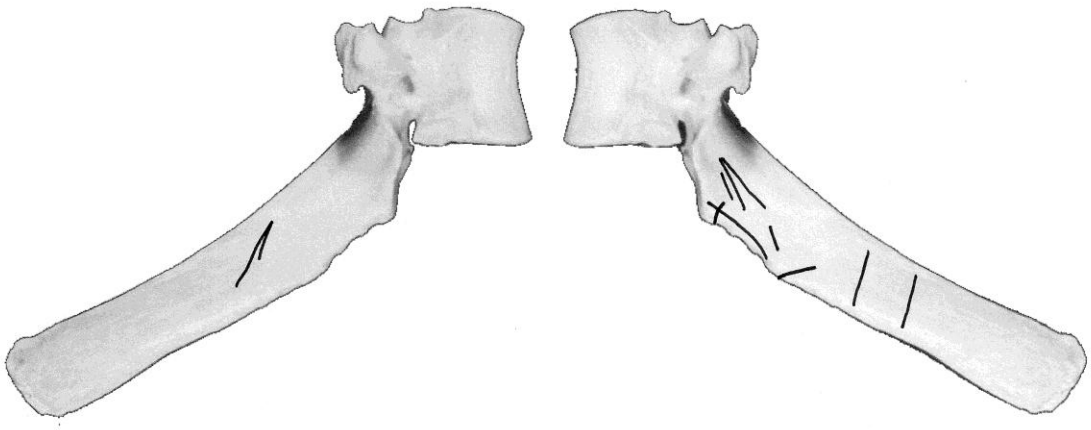
Cow2. Right and left views thoracic vertebra 1.



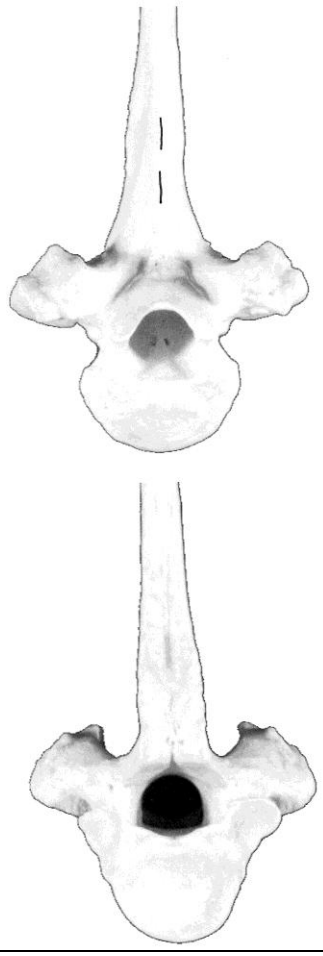
Cow2. Right and left views thoracic vertebra 2.



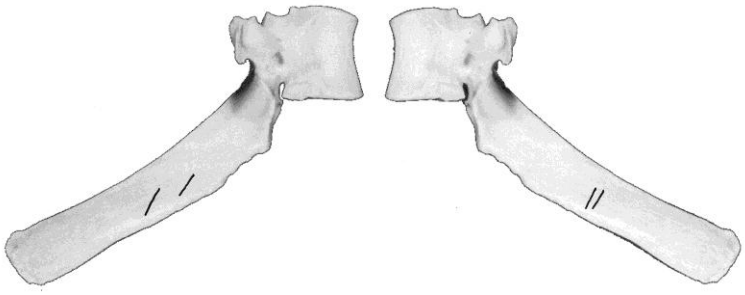
Cow2. Right and left views thoracic vertebra 3.

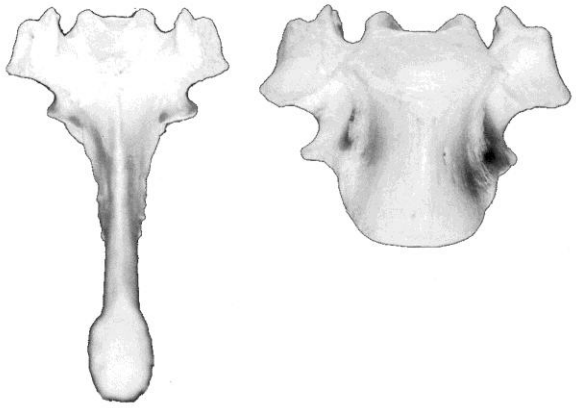
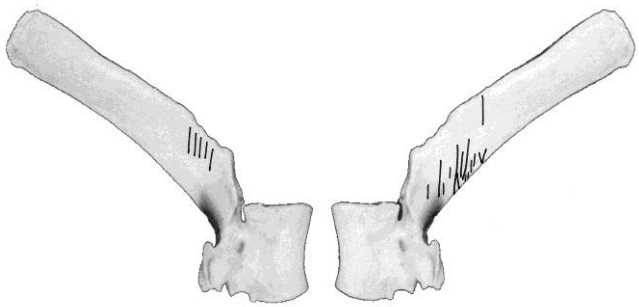


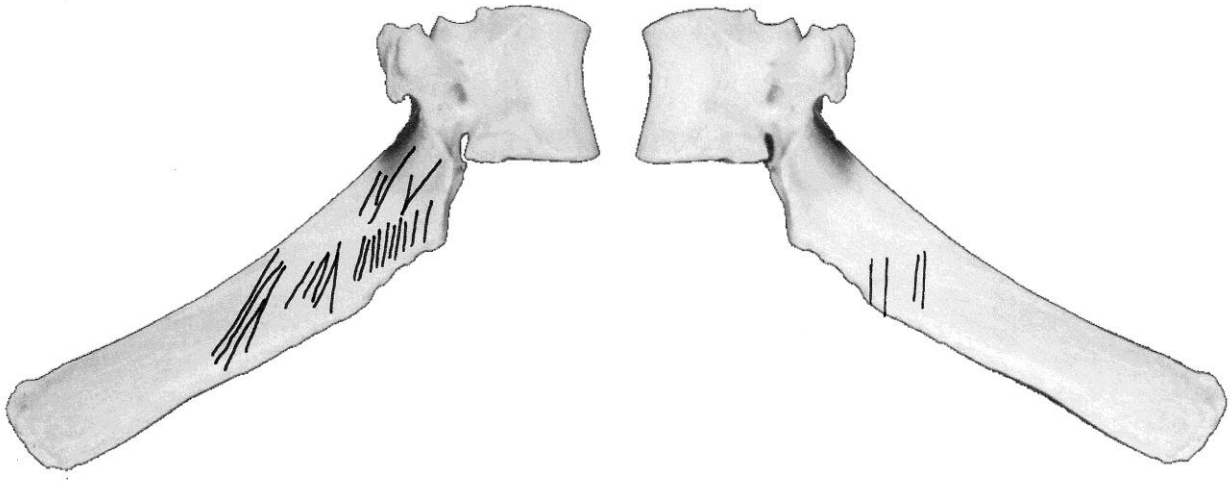
Cow2. Cranial and caudal views thoracic vertebra 4.



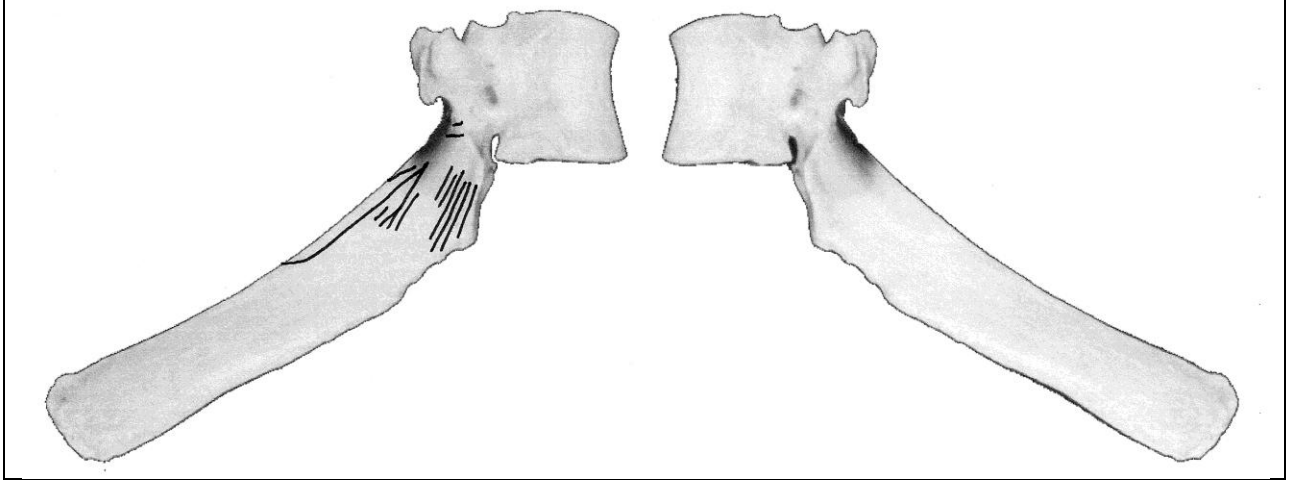
Cow2. Right and left views thoracic vertebra 4.



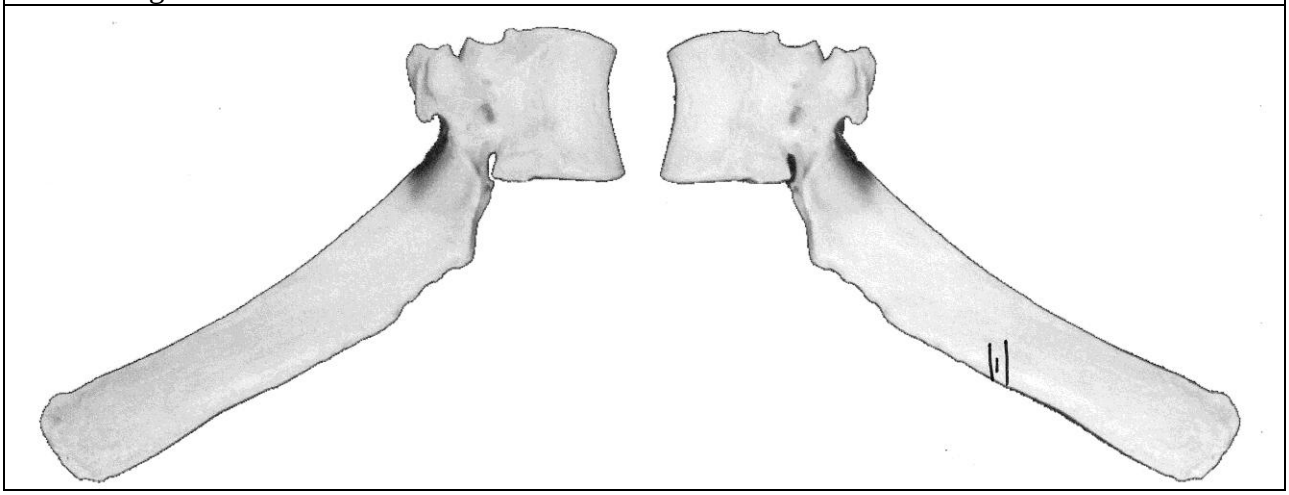
Cow2. Doral and ventral views thoracic vertebra 5.	Cow2. Right and left views thoracic vertebra 5.
	

Cow2. Right and left views thoracic vertebra 6.


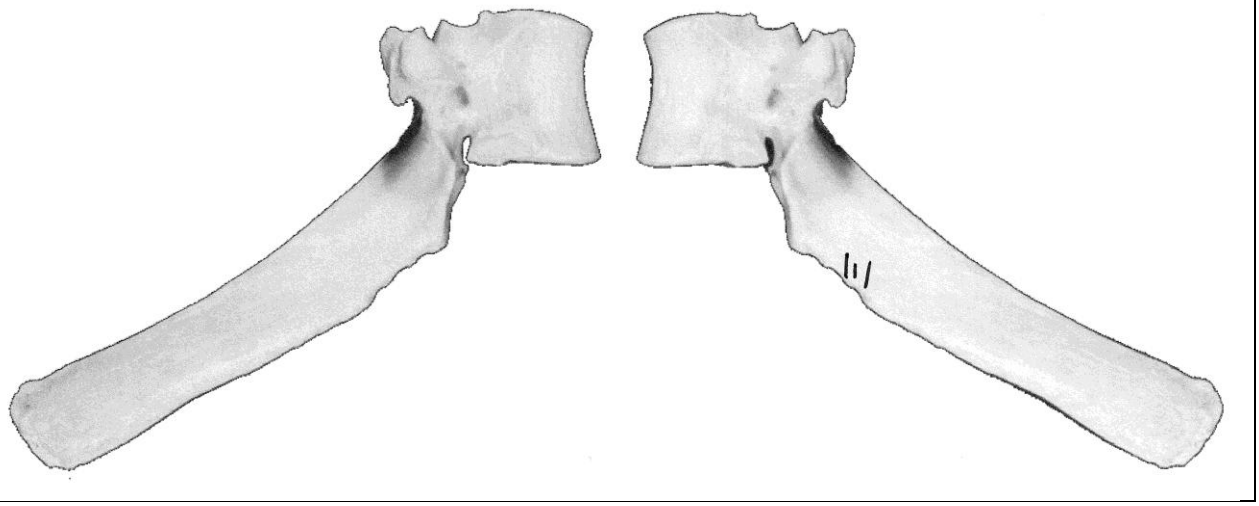
Cow2. Right and left views thoracic vertebra 7.



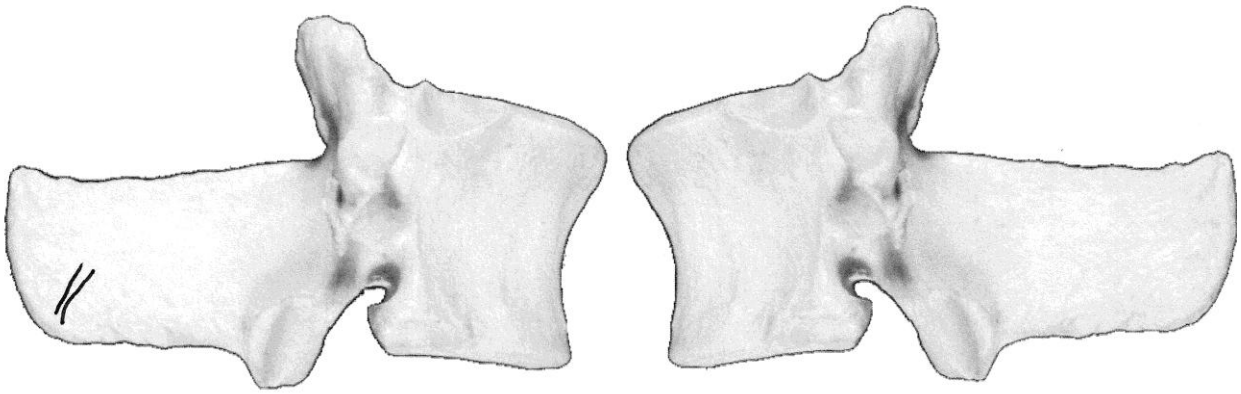
Cow2. Right and left views thoracic vertebra 8.



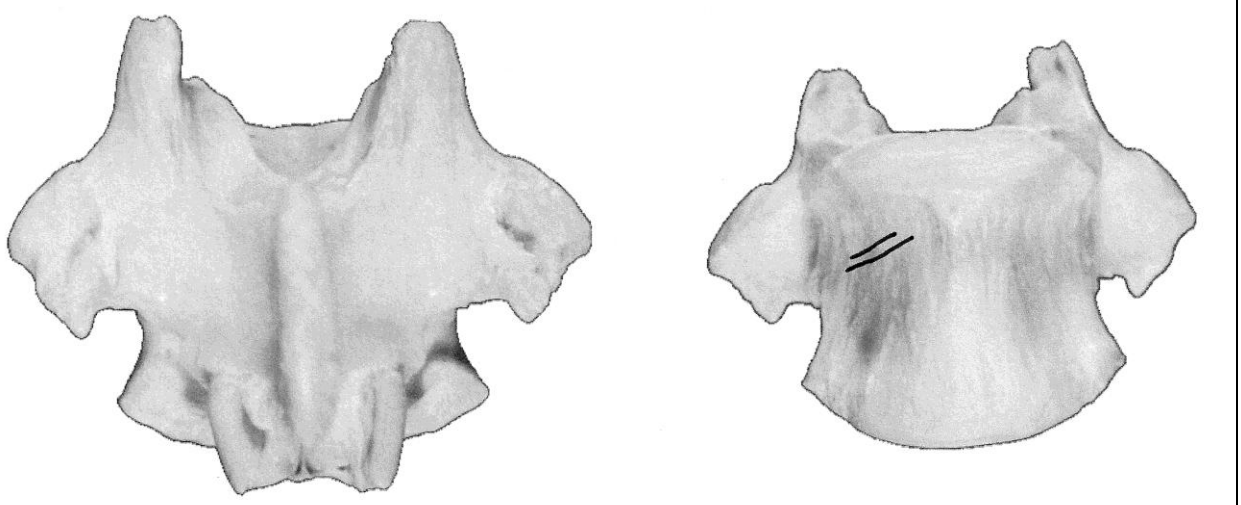
Cow2. Right and left views thoracic vertebra 9.



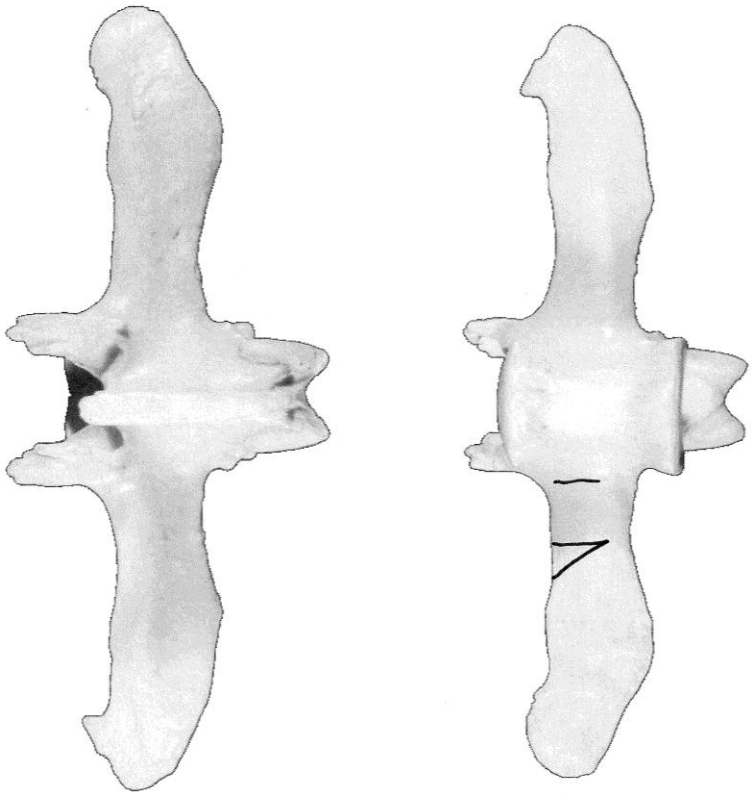
Cow2. Right and left views thoracic vertebra 12.



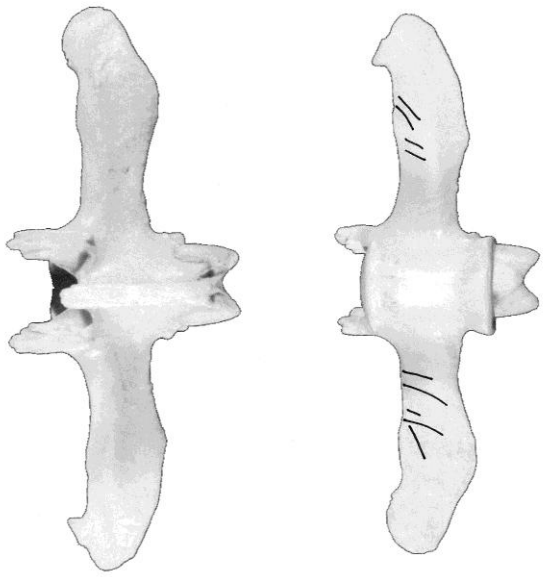
Cow2. Ventral and dorsal thoracic vertebra 13.



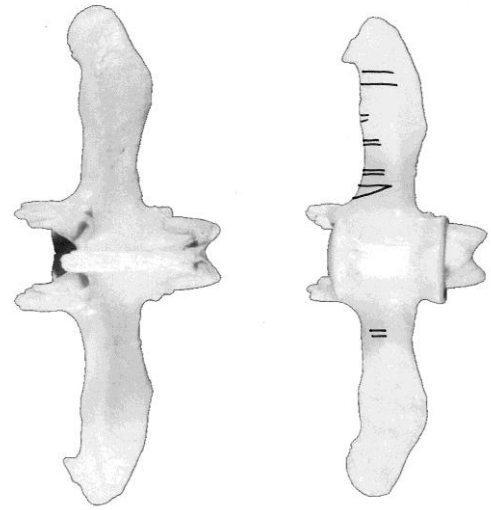
Cow2. Dorsal and ventral lumbar vertebra 1.



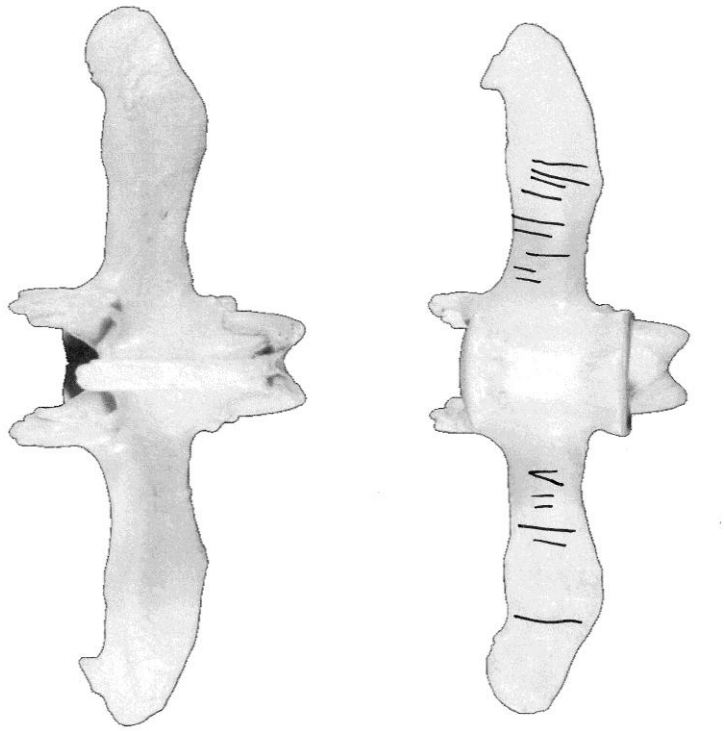
Cow2. Dorsal and ventral lumbar vertebra 3.



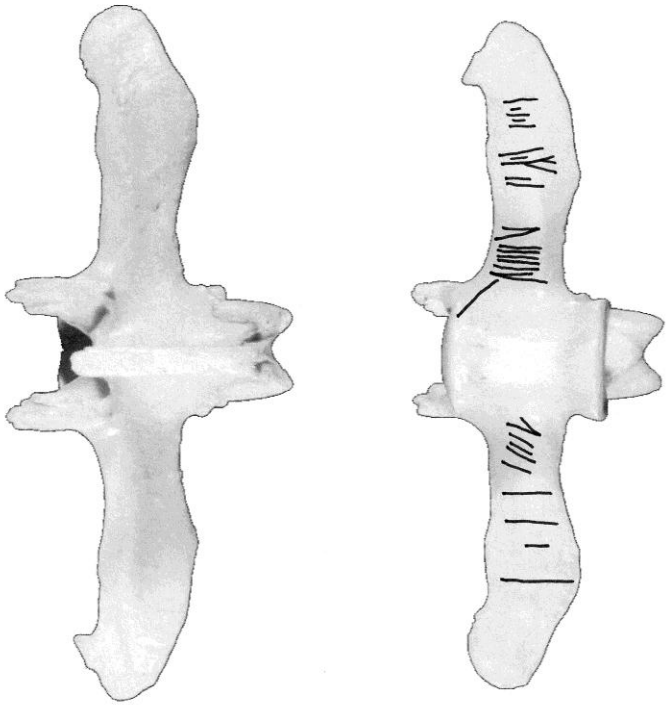
Cow2. Dorsal and ventral lumbar vertebra 4 .

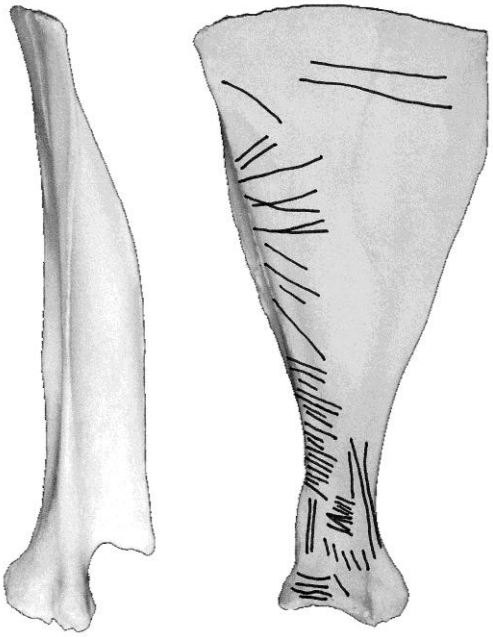
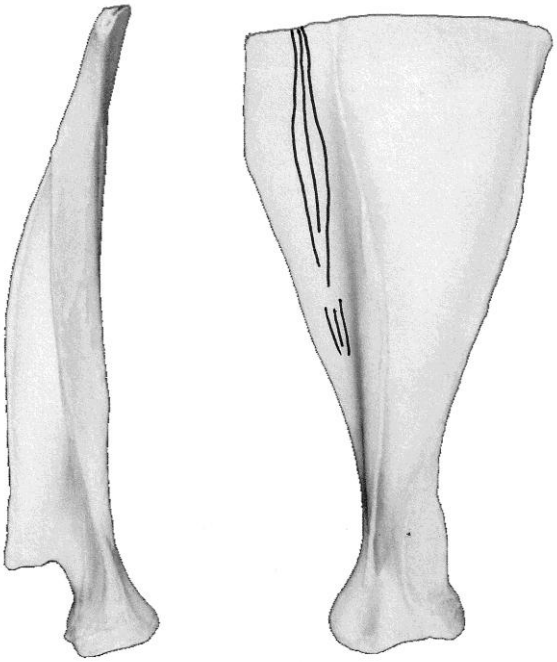


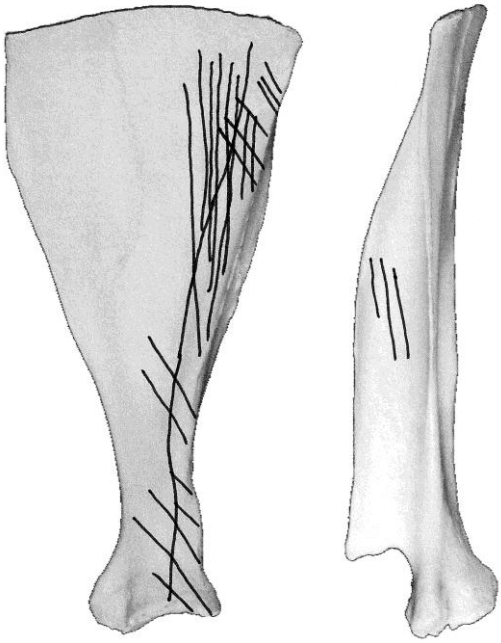
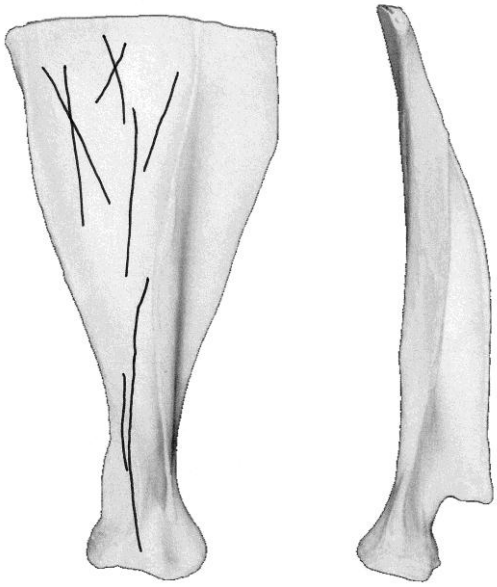
Cow2. Dorsal and ventral lumbar vertebra 5.

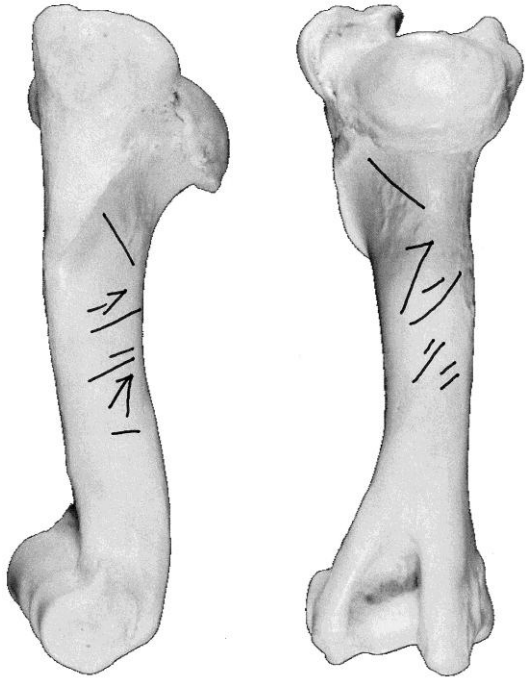
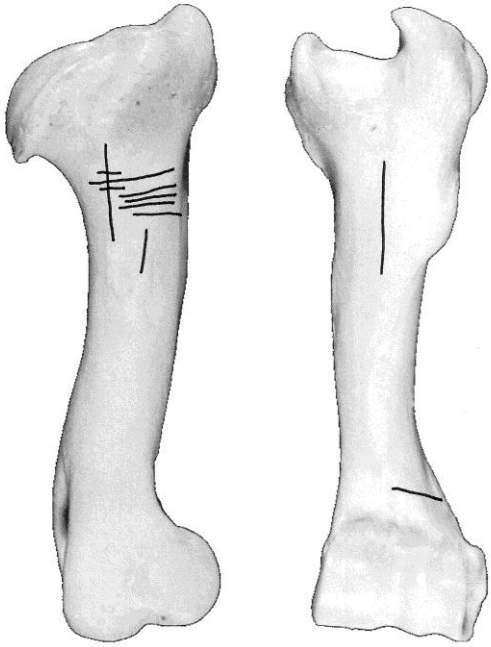


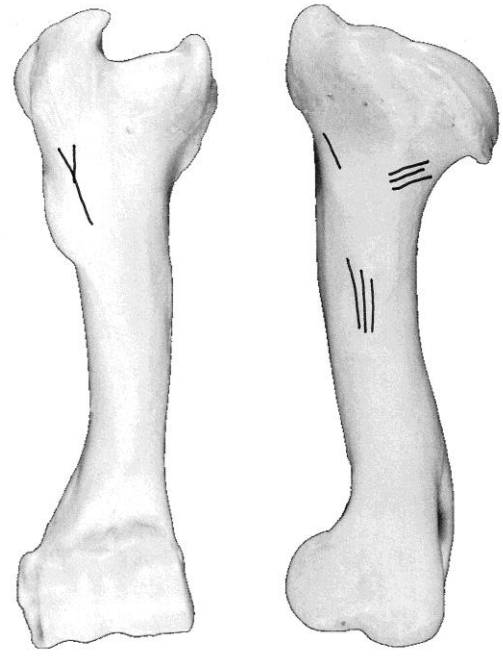
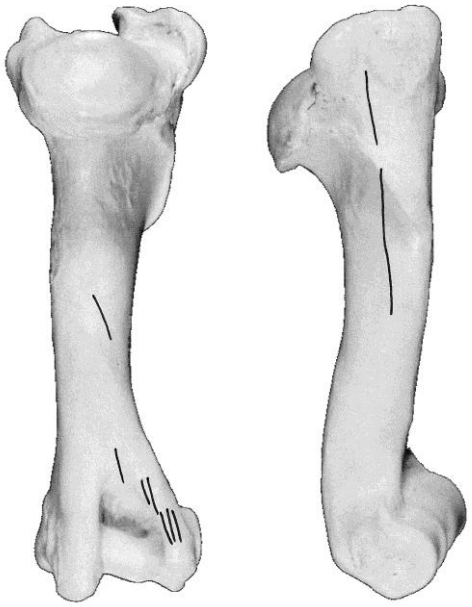
Cow2. Dorsal and ventral lumbar vertebra 6.

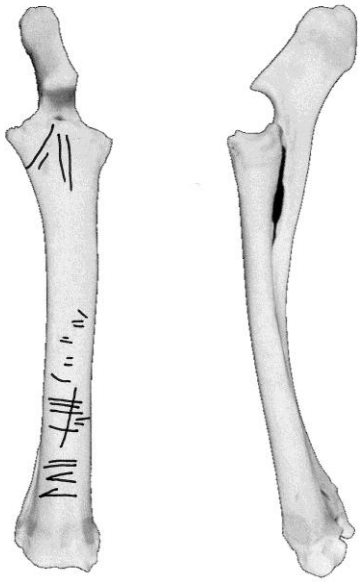
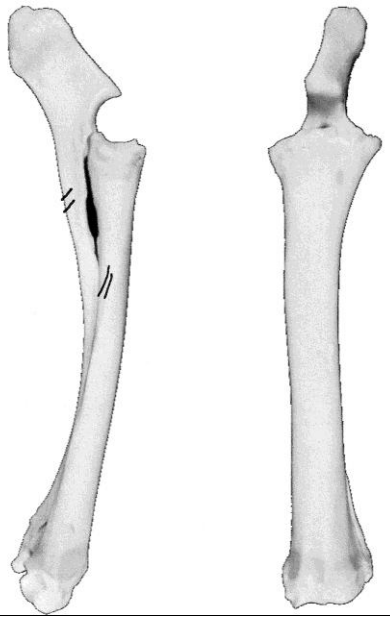


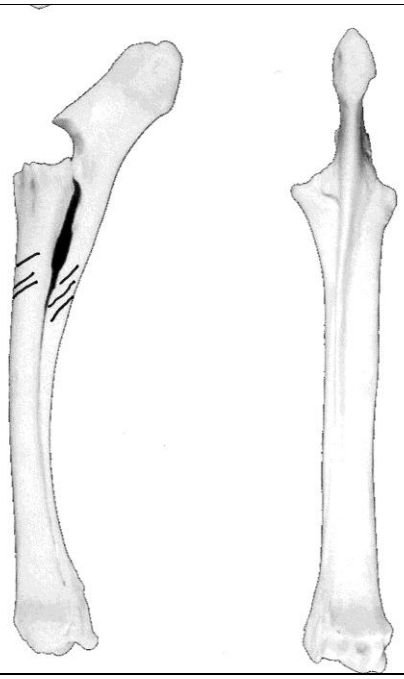
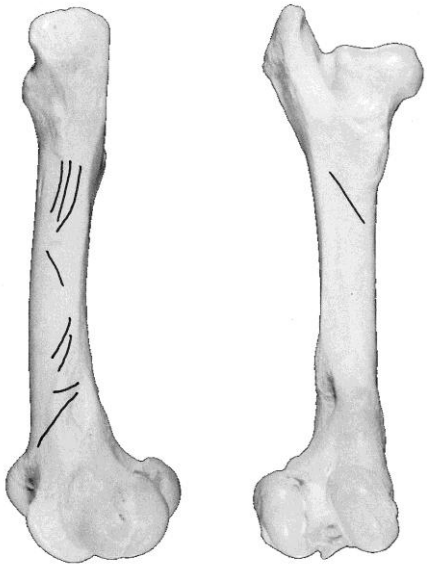
Cow2. Left anterior and medial views scapula.	Cow2. Left posterior and lateral views scapula.
	

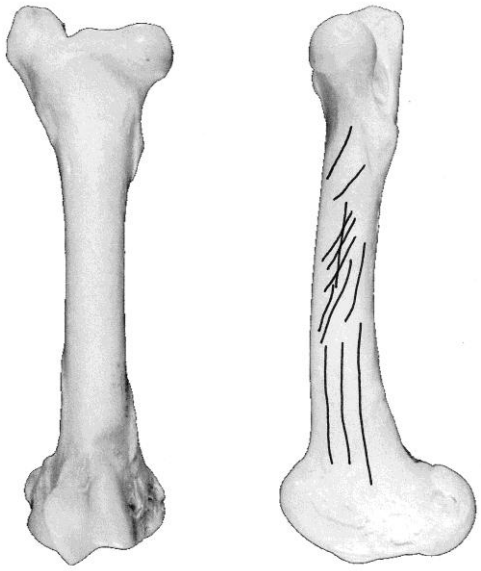
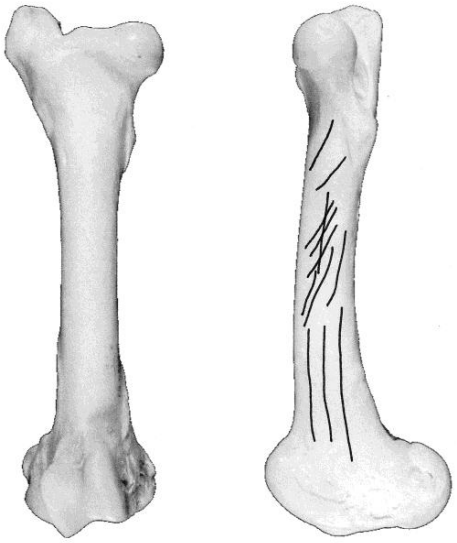
Cow2. Right medial and anterior views scapula.	Cow2. Right lateral and posterior views scapula.
	

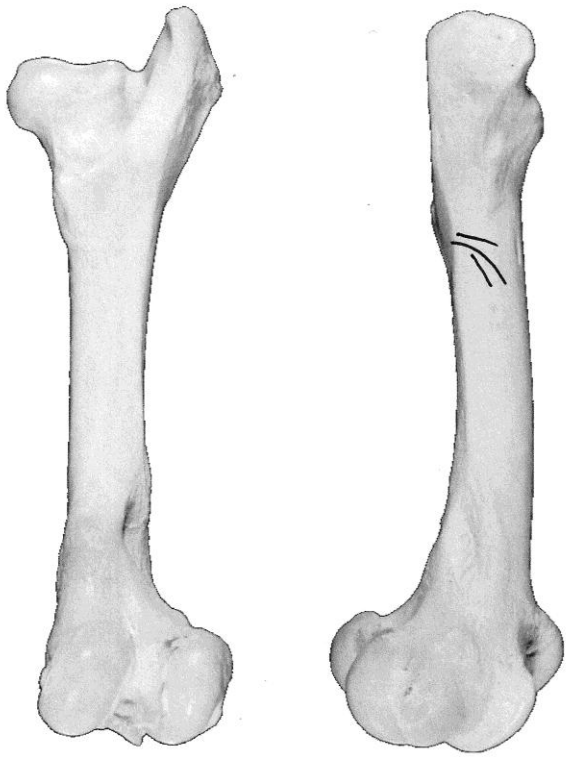
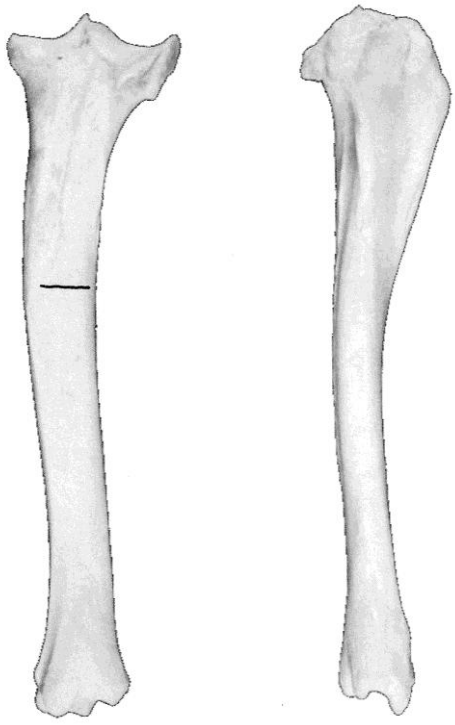
Cow2. Left lateral and posterior views humerus.	Cow2. Left medial and anterior views humerus.
	

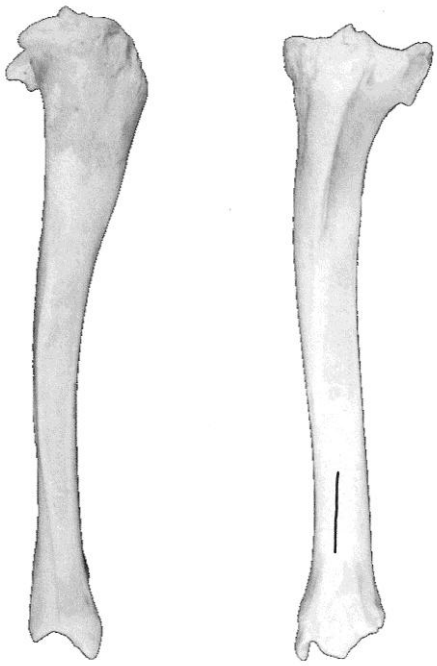
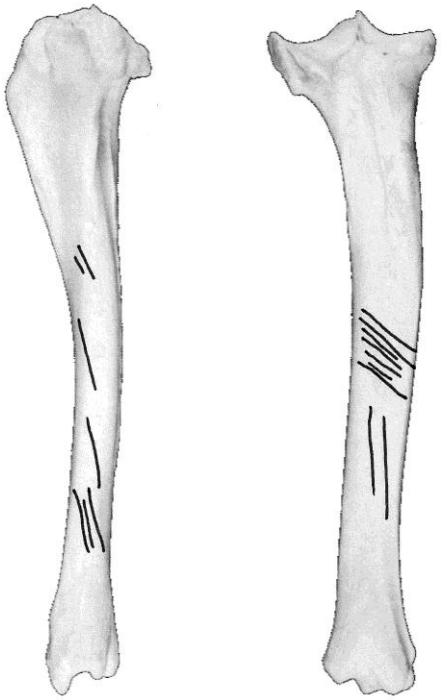
Cow2. Right anterior and media views humerus.	Cow2. Right posterior and lateral views humerus.
	

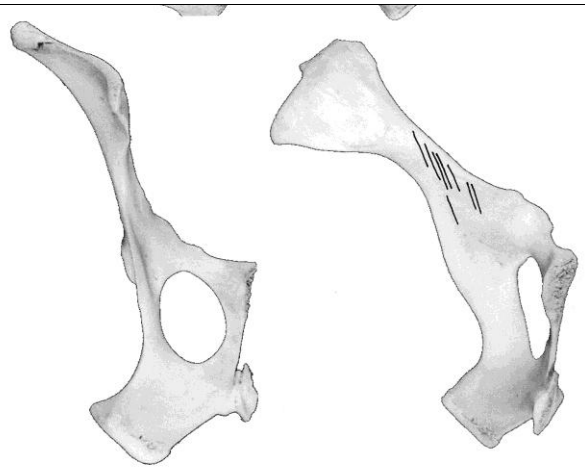
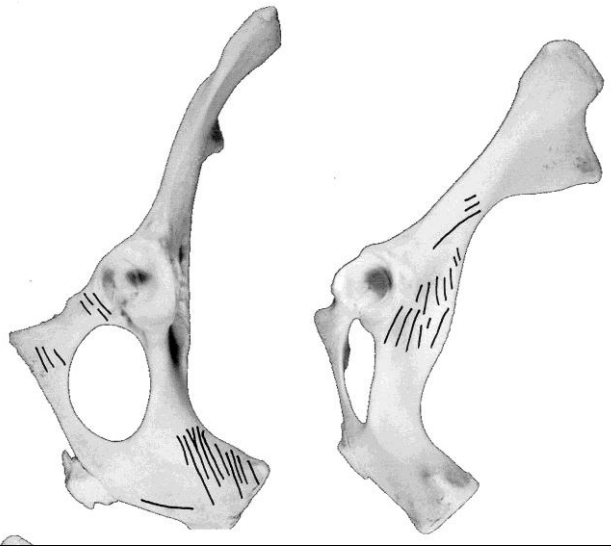
Cow2. Right anterior and medial views radio-ulna.	Cow2. Left medial and anterior views radio-ulna.
	

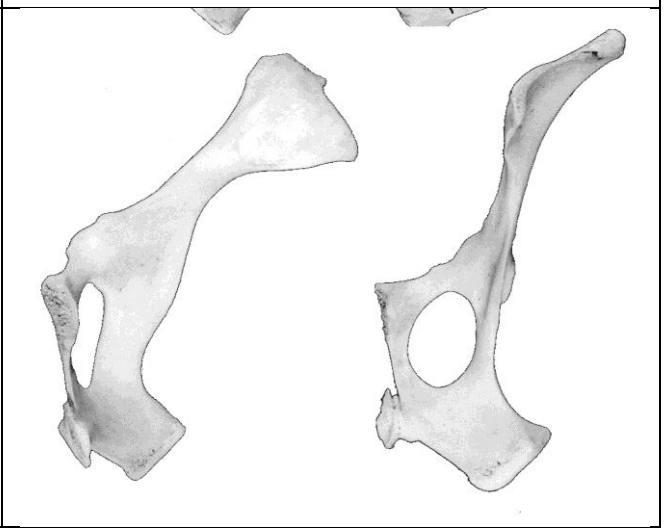
Cow2. Right lateral and posterior views radio-ulna.	Cow2. Left lateral and posterior views femur .
	

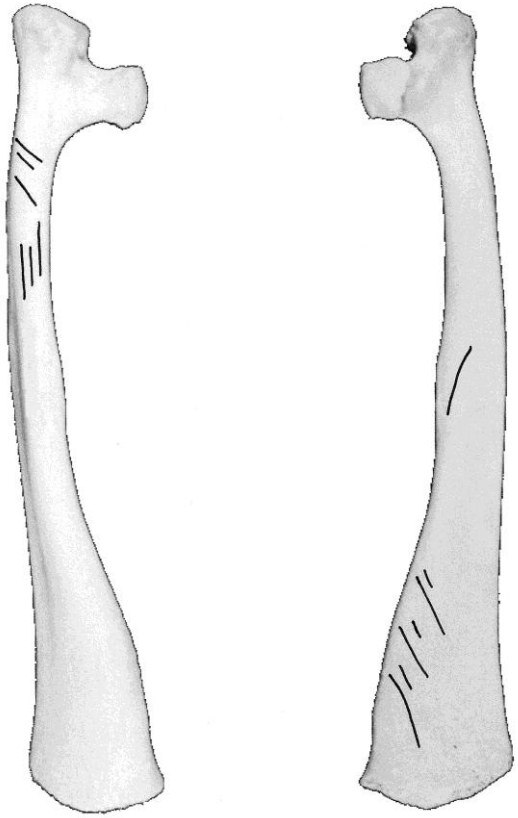
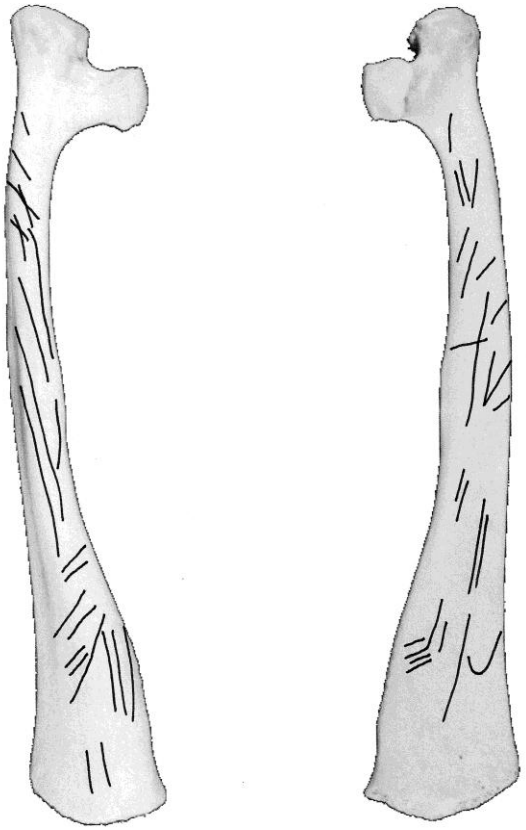
Cow2. Left Medial and anterior views femur.	Cow2.Right anterior and medial views femur .
	

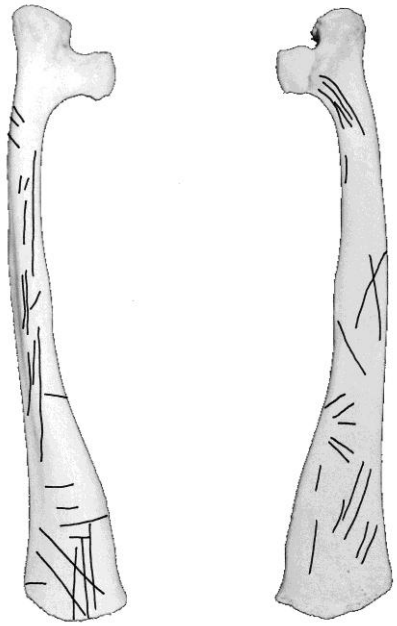
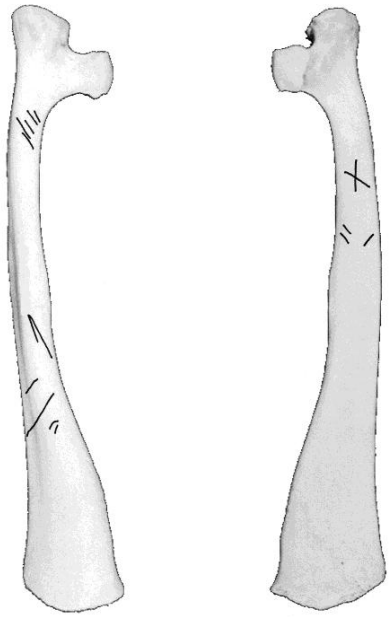
Cow2. Right posterior and lateral views .	Cow2. Right posterior and lateral views tibia.
	

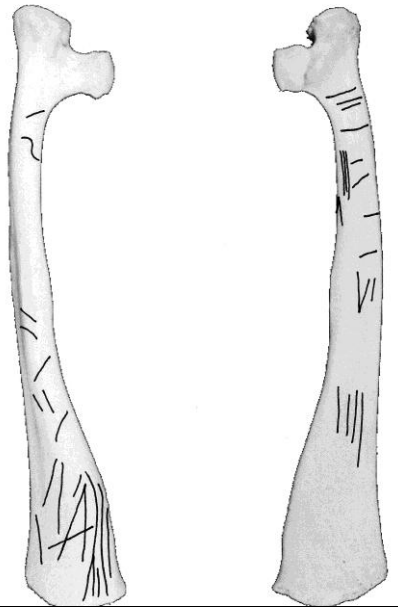
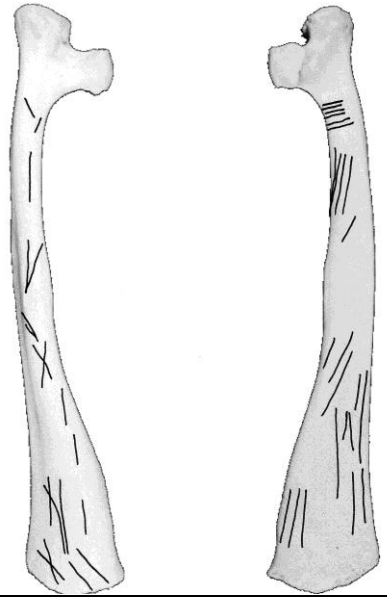
Cow2. Left medial and anterior views tibia.	Cow2. Left lateral and posterior views tibia.
	

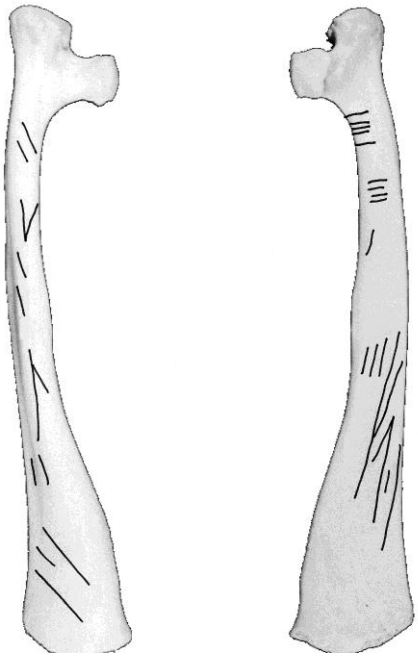
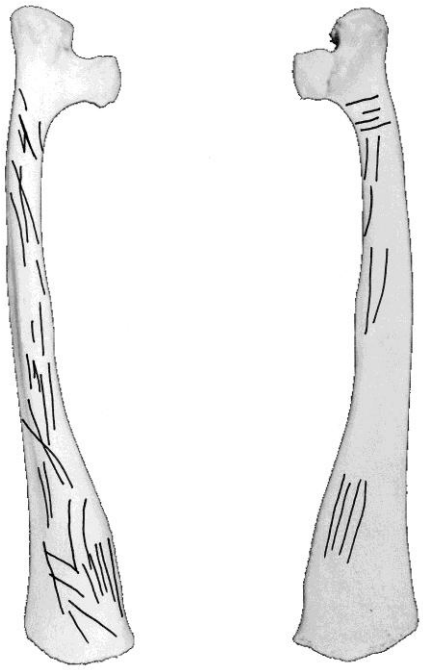
Cow2. Left dorsal and medial views innominate.	Cow2. Left ventral and lateral views Innominate.
	

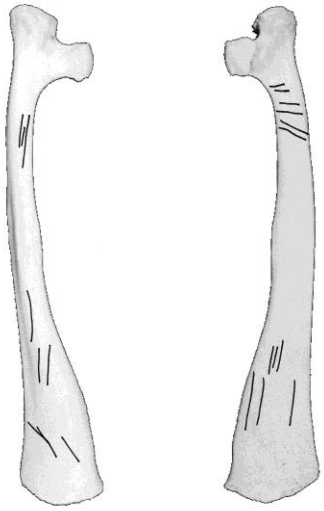
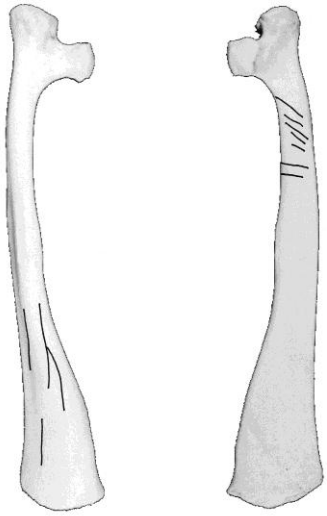
Cow2. Right lateral and ventral views innominate.	Cow2.Right views medial and dorsal innominate.
	

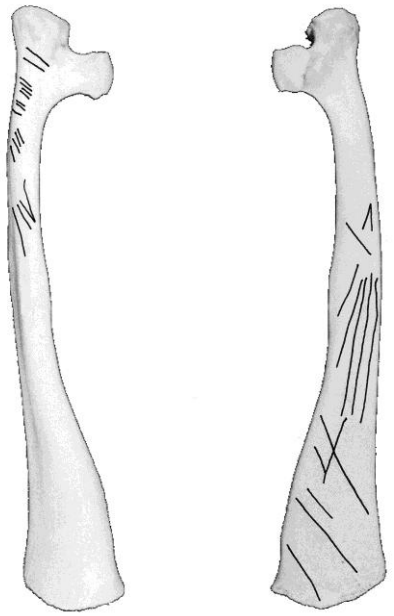
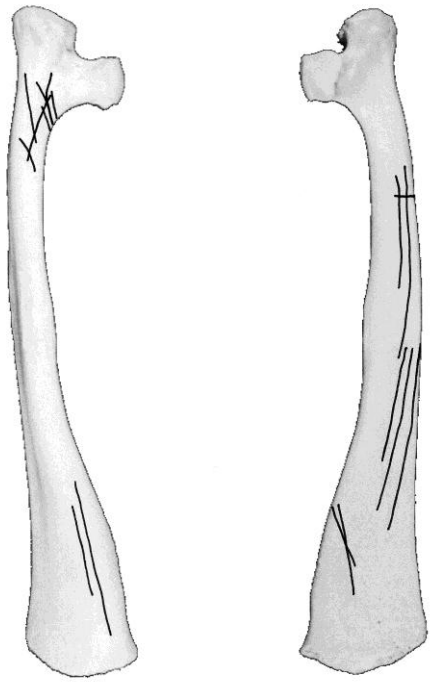
Cow2. Left medial and lateral views rib 4.	Cow2.Left medial and lateral views rib 5.
	

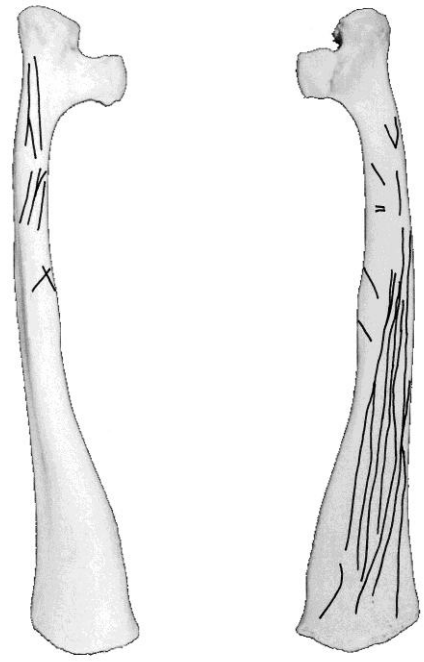
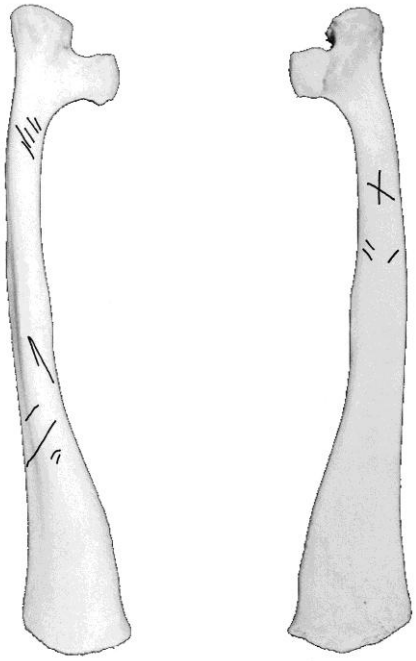
Cow2. Left medial and lateral views rib 6.	Cow2.Left medial and lateral views rib 7.
	

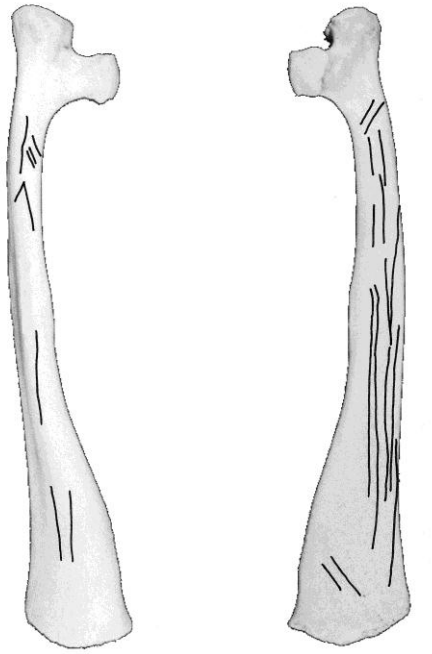
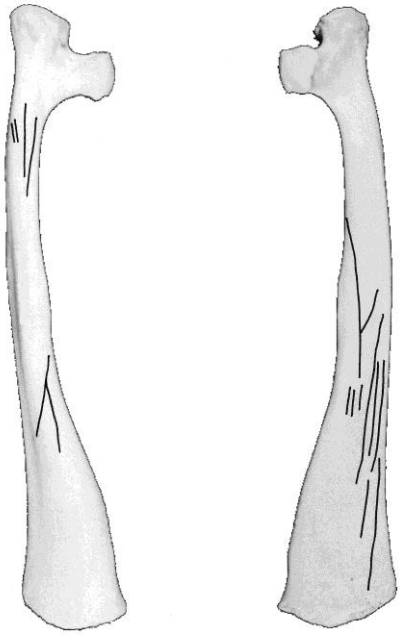
Cow2. Left medial and lateral views rib 8.	Cow2.Left medial and lateral views rib 9.
	

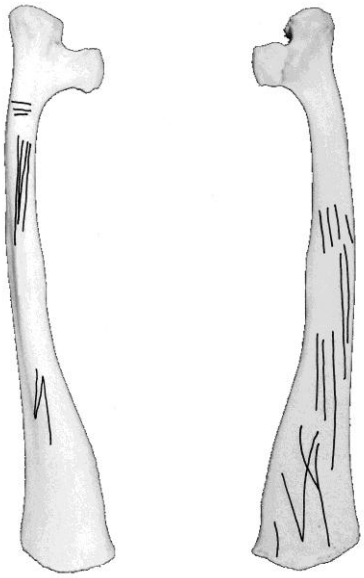
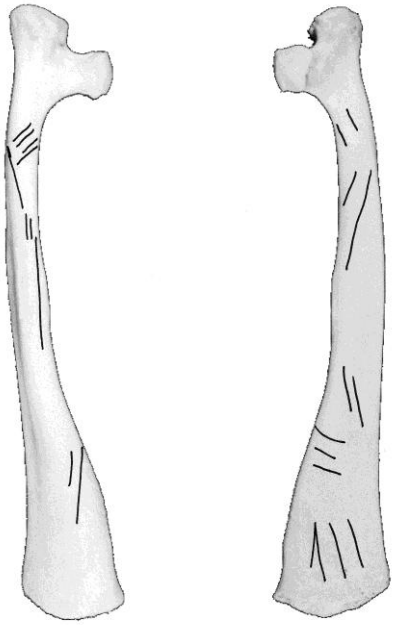
Cow2. Left medial and lateral views rib 10.	Cow2.Left medial and lateral views rib 11.
	

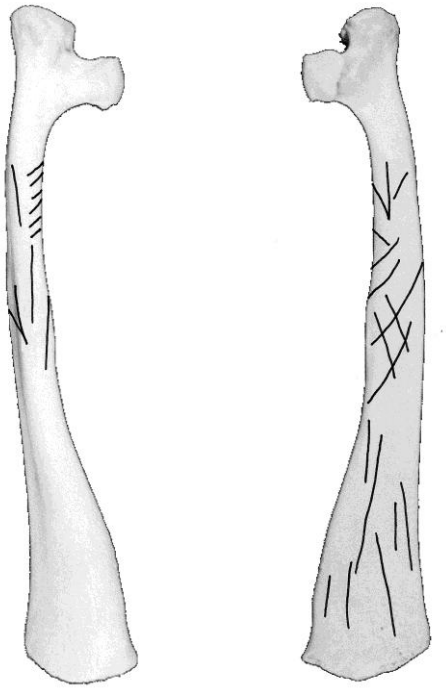
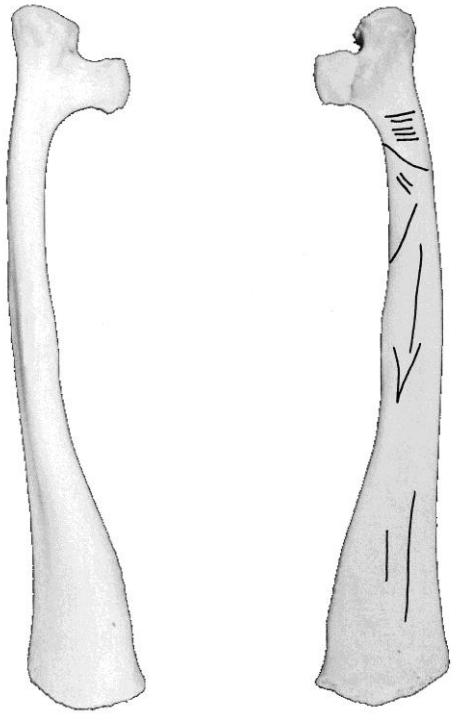
Cow2. Left medial and lateral views rib 12.	Cow2.Left medial and lateral views rib 13.
	

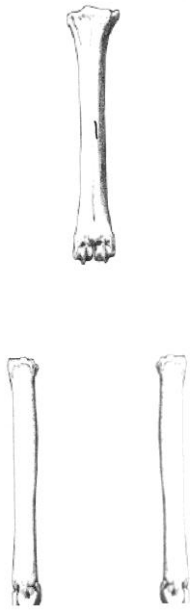
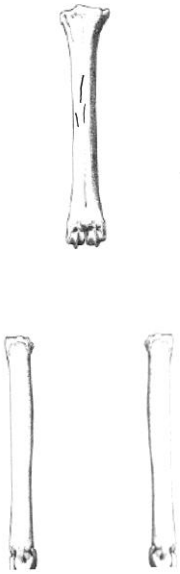
Cow2. Right lateral and medial views rib 4 .	Cow2.Right lateral and medial views rib 5 .
	

Cow2. Right lateral and medial views rib 6 .	Cow2.Right lateral and medial views rib 7 .
	

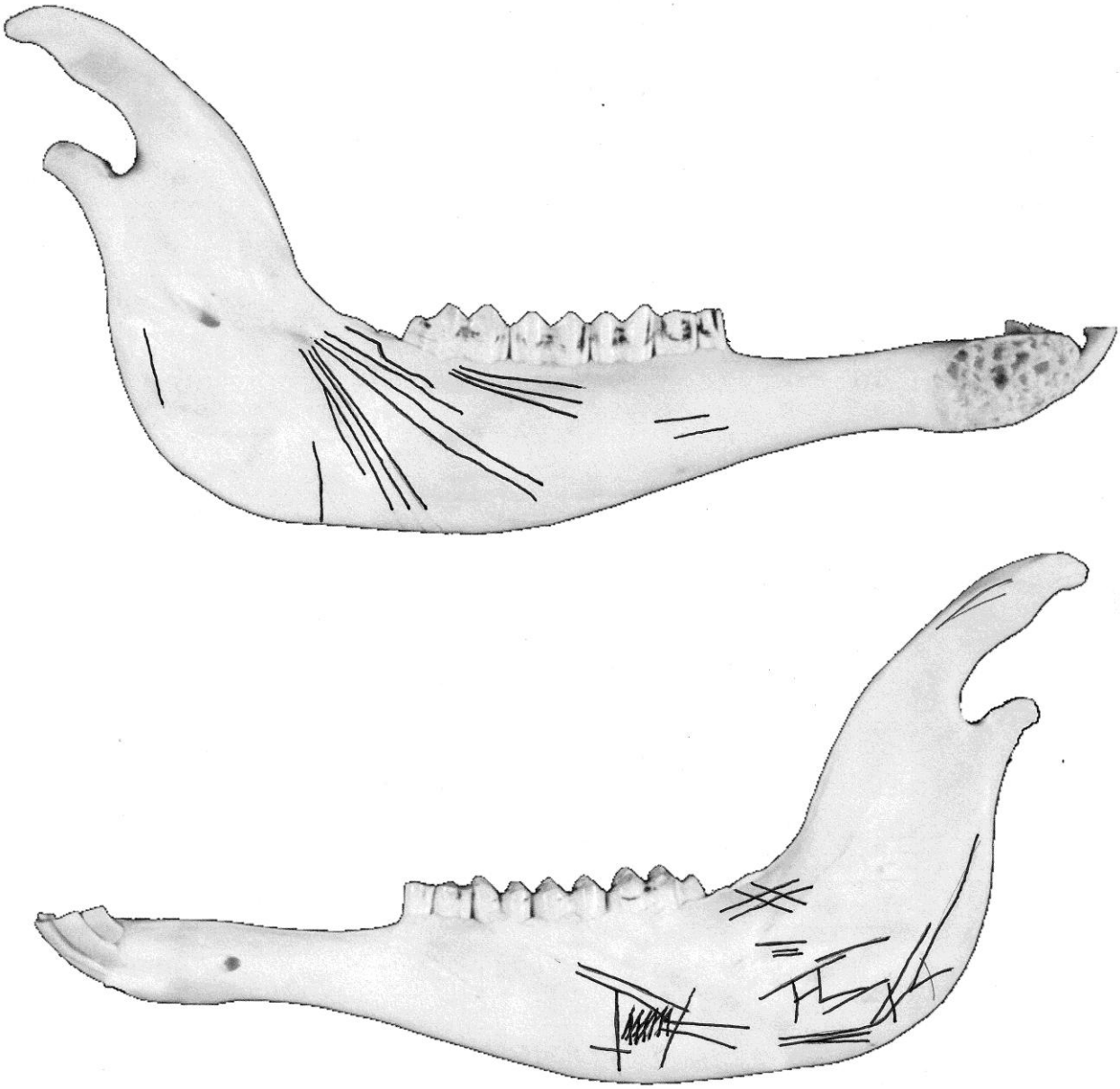
Cow2. Right lateral and medial views rib 8 .	Cow2.Right lateral and medial views rib 9 .
	

Cow2. Right lateral and medial views rib 10 .	Cow2.Right lateral and medial views rib 11 .
	

Cow2. Right lateral and medial views rib 12 .	Cow2.Right lateral and medial views rib 13 .
	

Cow2. Left anterior, medial and lateral view metapodial.	Cow2.Right anterior, medial and lateral view metapodial.
	

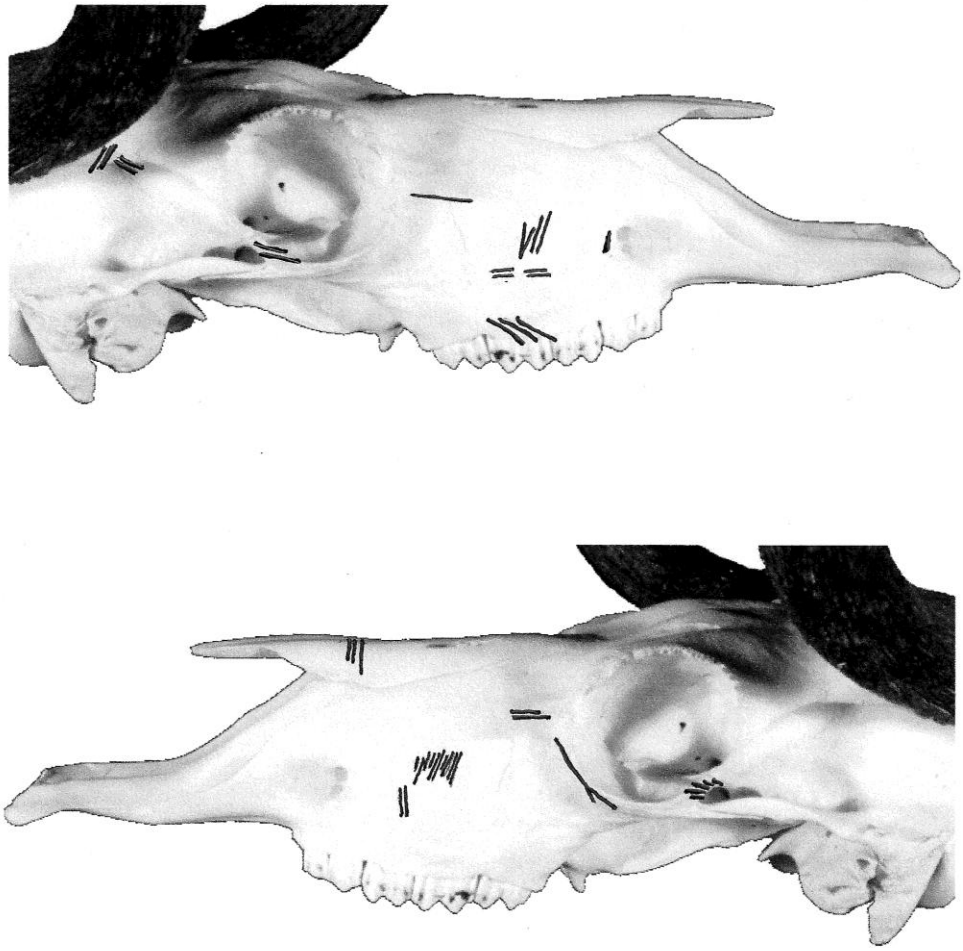
Cow 3. Left hemi-mandible medial & lateral views.



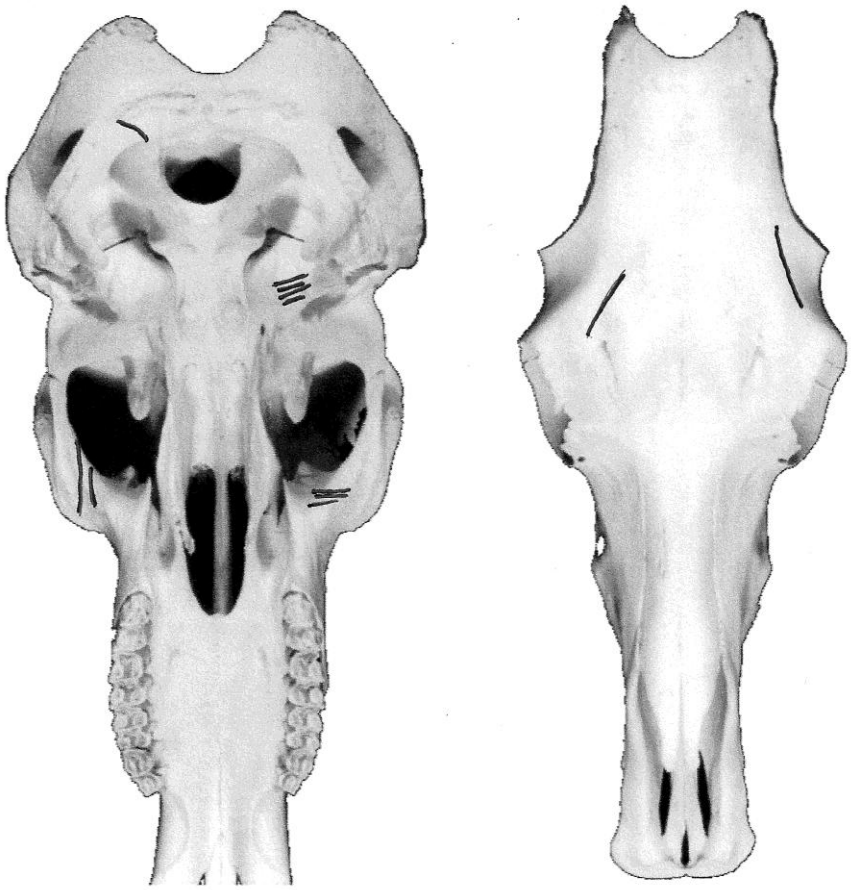
Cow 3. Right hemi-mandible medial & lateral views.



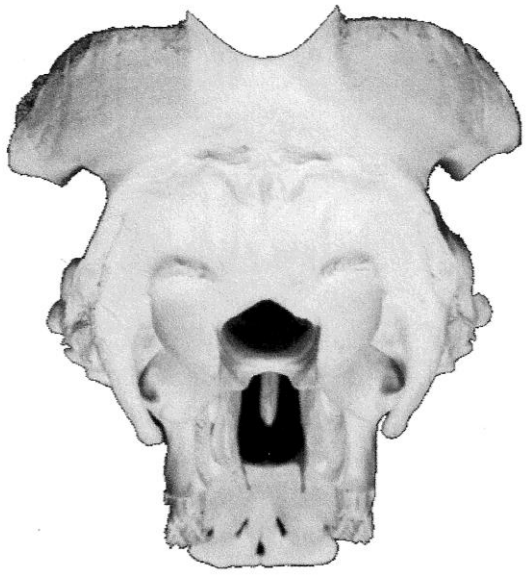
Cow3. Right and left views cranium.



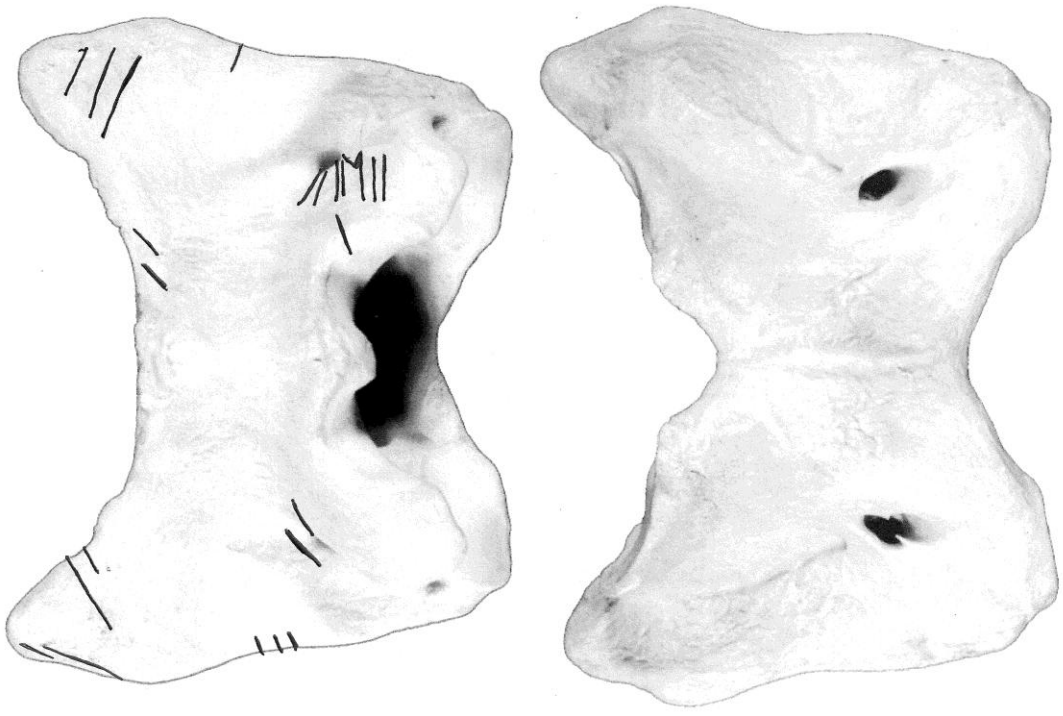
Cow3 Ventral and dorsal views cranium.



Cow3. Caudal view cranium.



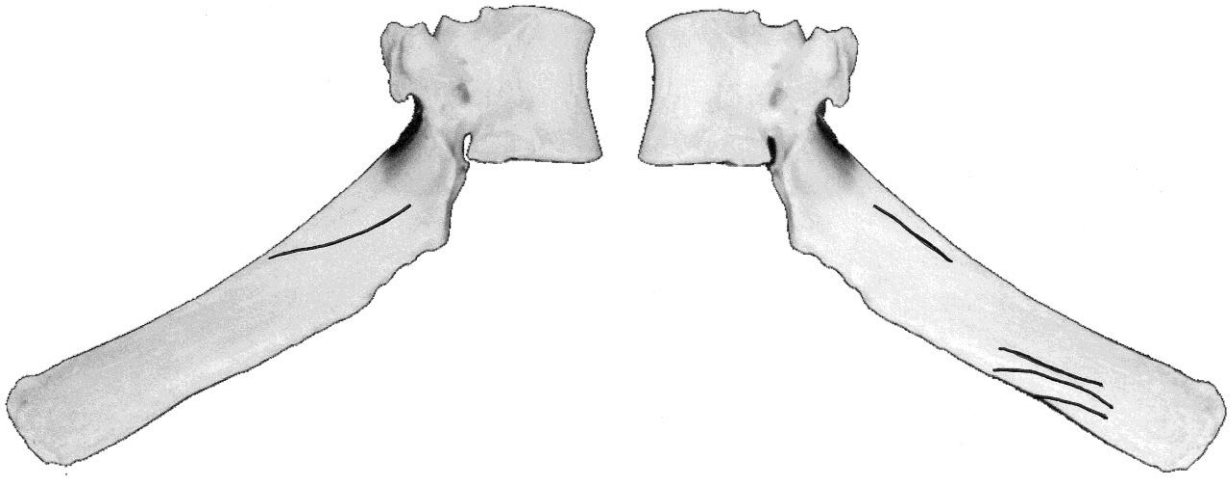
Cow3. Dorsal and ventral views atlas.

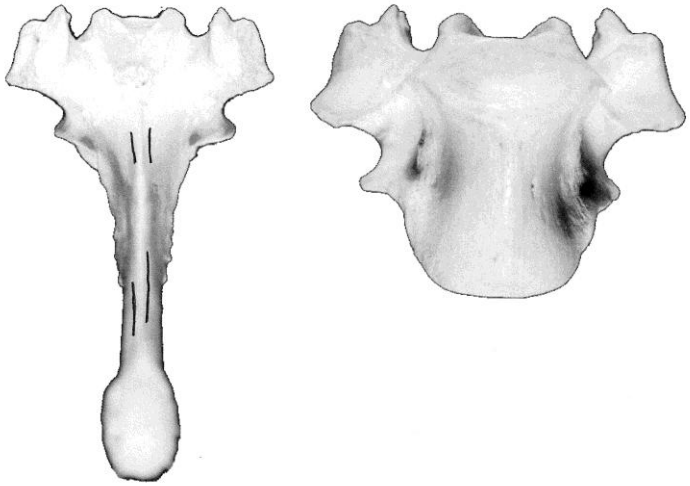


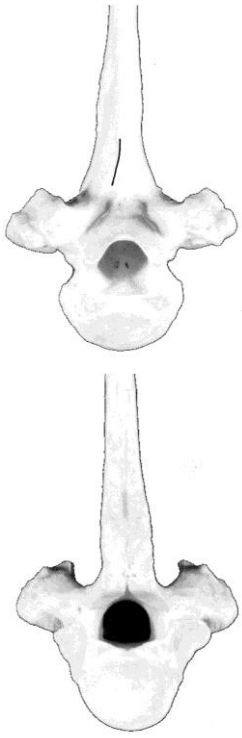
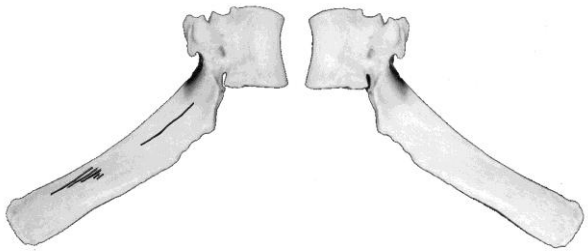
Cow3. Cranial view atlas.



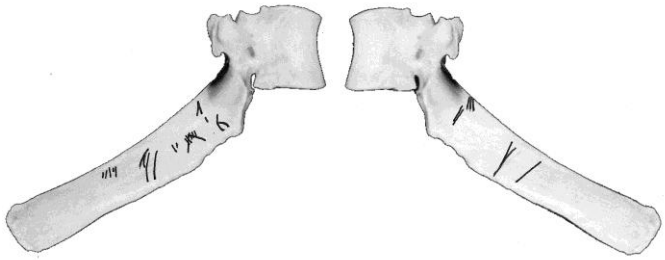
Cow3. Right and left views thoracic vertebra 1..



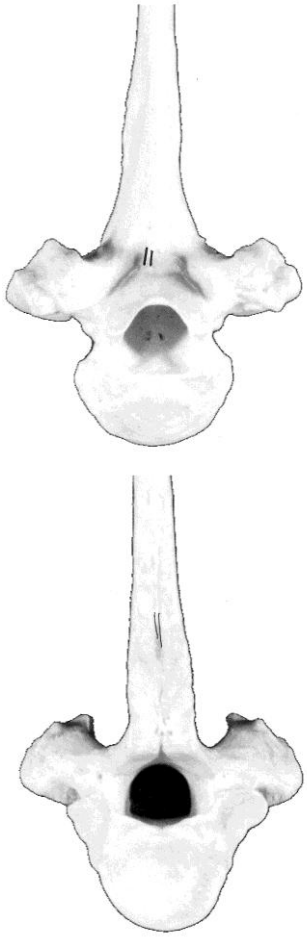
Cow3. Dorsal and ventral views thoracic vertebra 1.


Cow3. Cranial and caudal views thoracic vertebra 2.	Cow3. Right and left views thoracic vertebra 2.
	

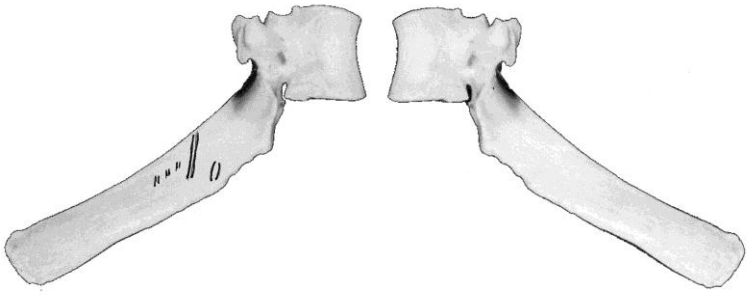
Cow3. Right and left views thoracic vertebra 3.



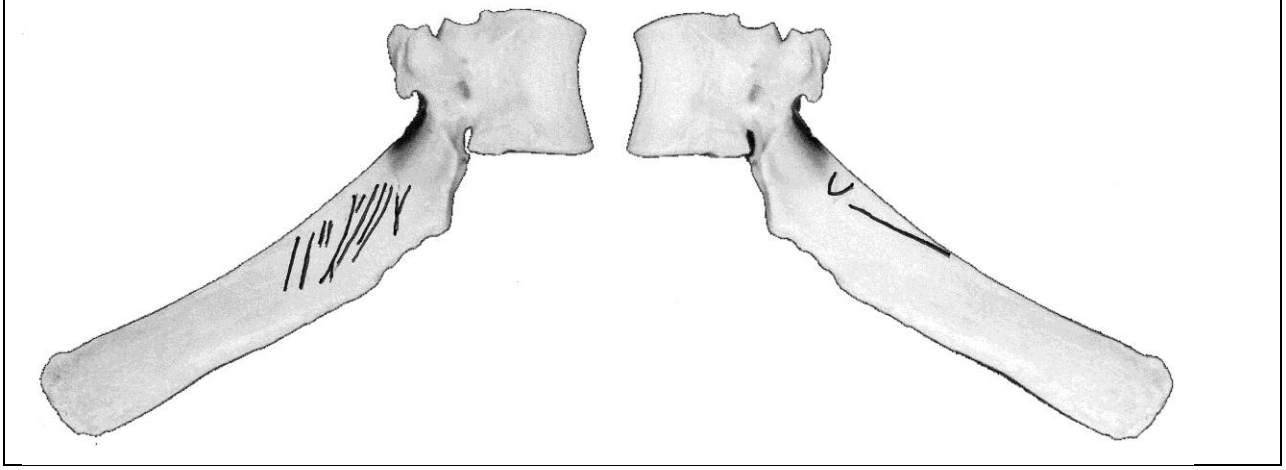
Cow3. Cranial and caudal views thoracic vertebra 4.



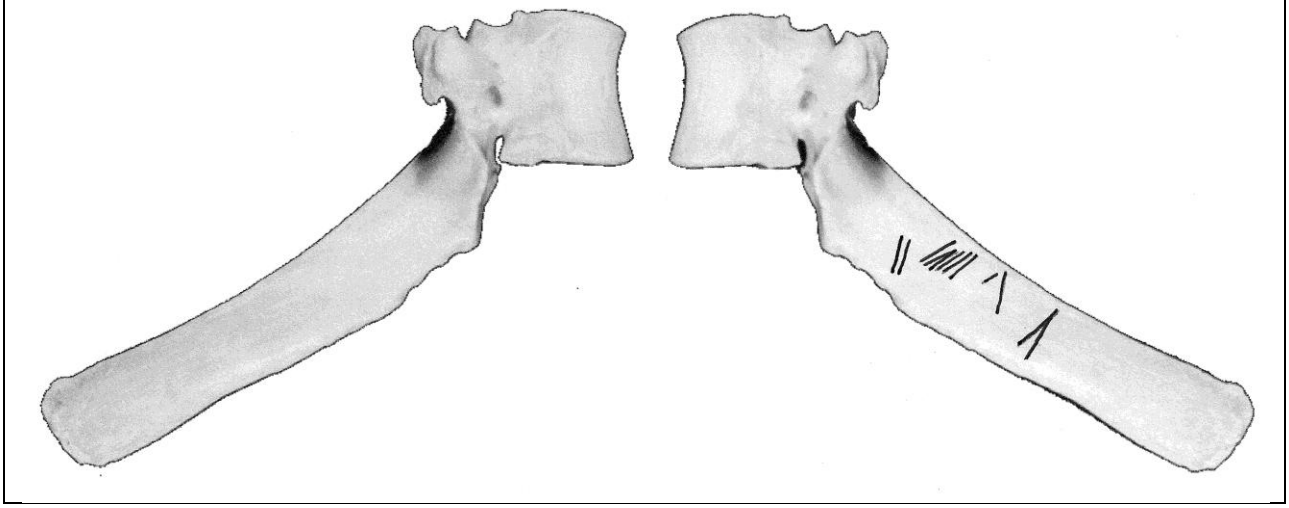
Cow3. Right and left views thoracic vertebra 4.



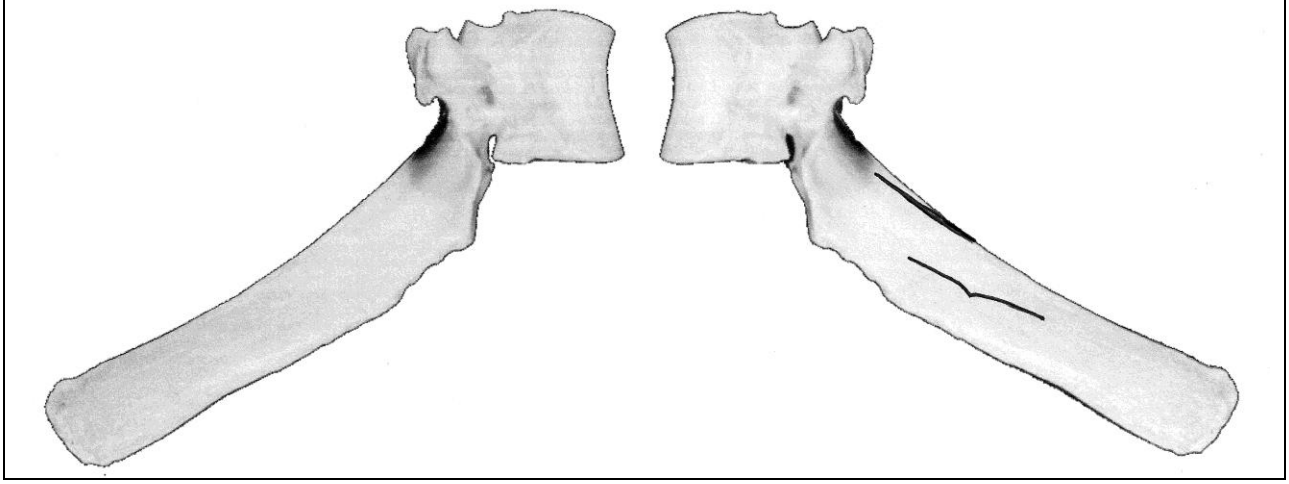
Cow3. Right and left views thoracic vertebra 5 .



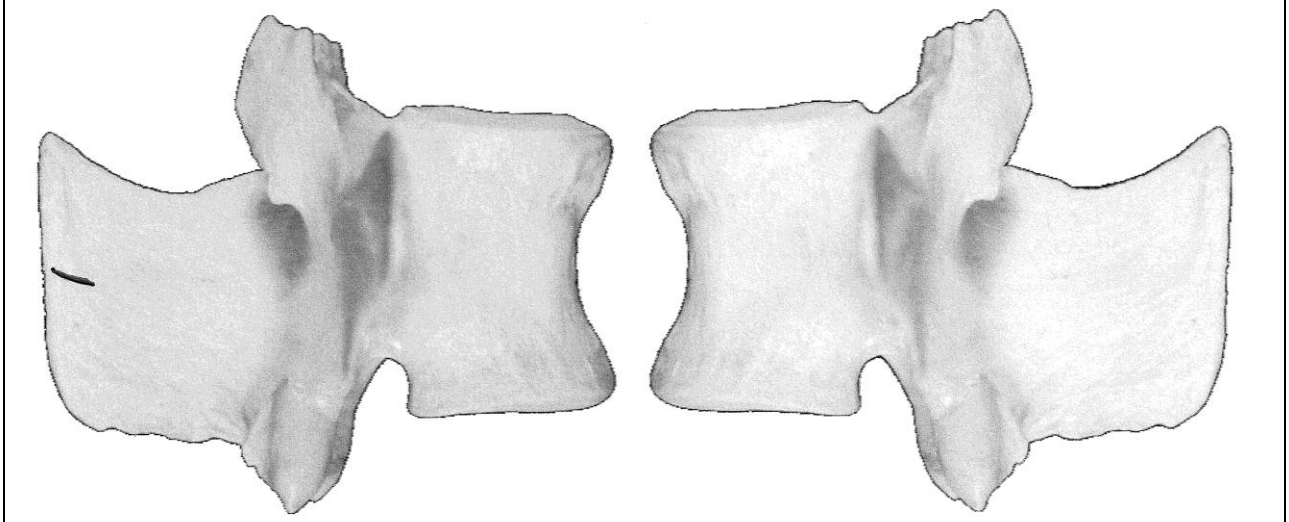
Cow3. Right and left views thoracic vertebra 7 .



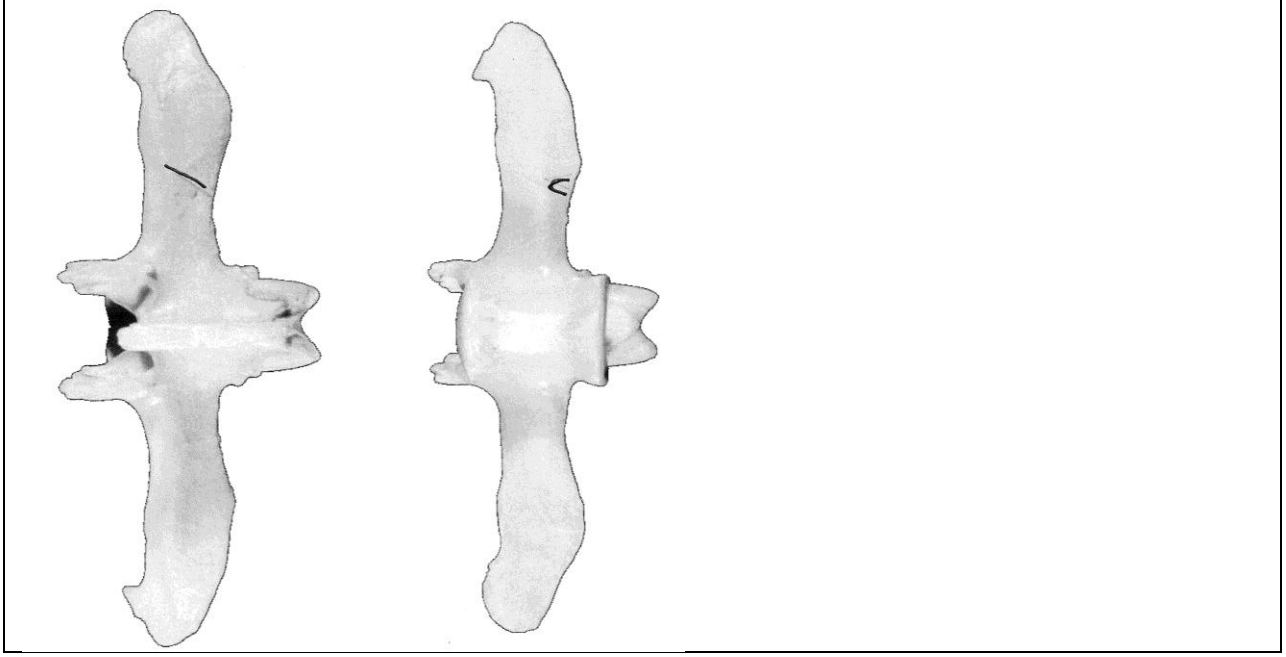
Cow3. Right and left views thoracic vertebra 9.



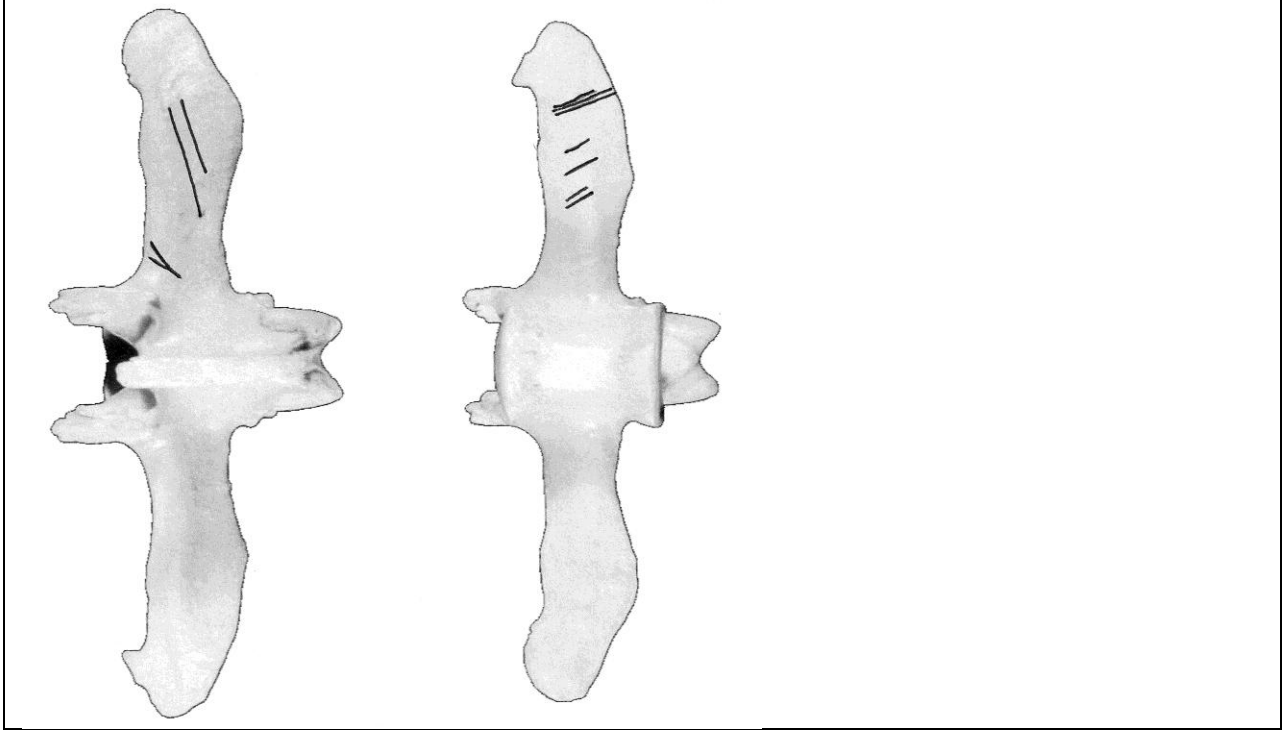
Cow3. Right and left views lumbar vertebra 1.



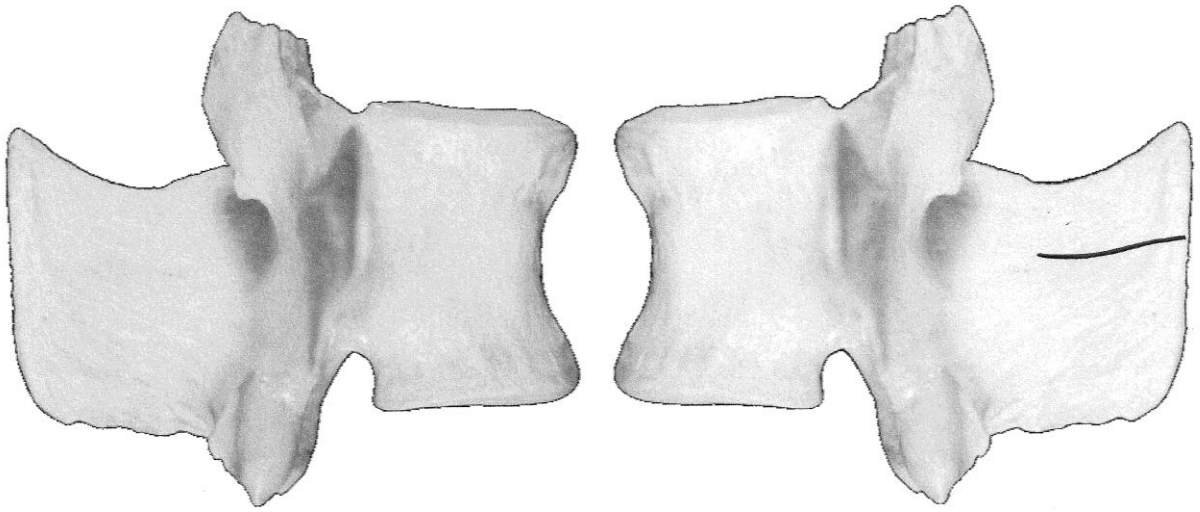
Cow3. Dorsal and ventral views lumbar vertebra 1.



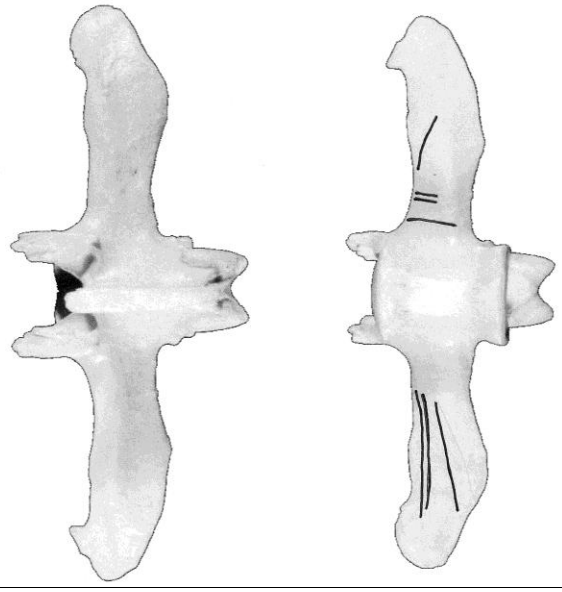
Cow3. Dorsal and ventral views lumbar vertebra 3.



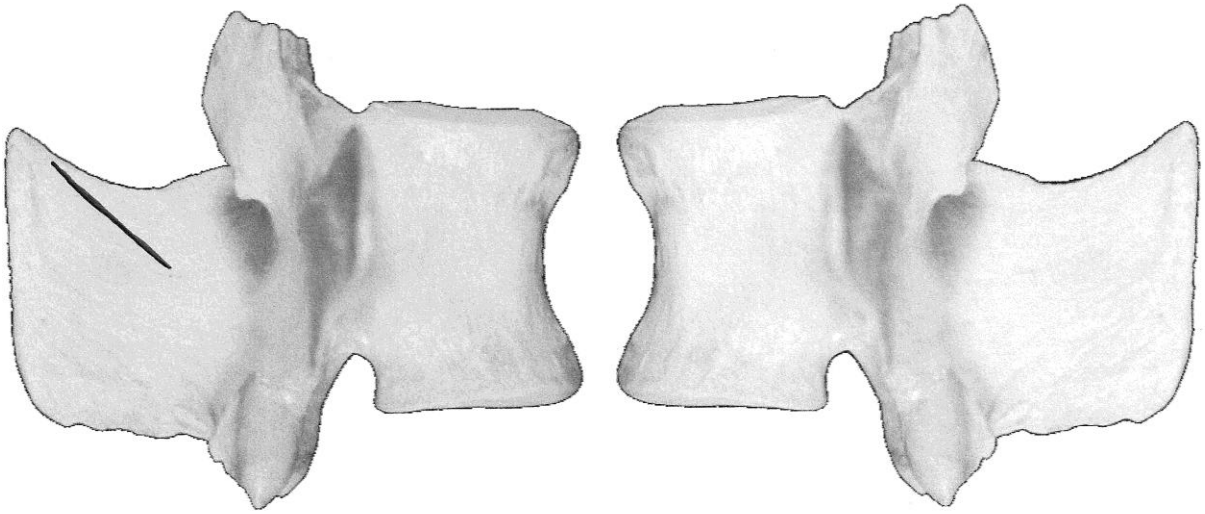
Cow3. Right and left views lumbar vertebra 4.



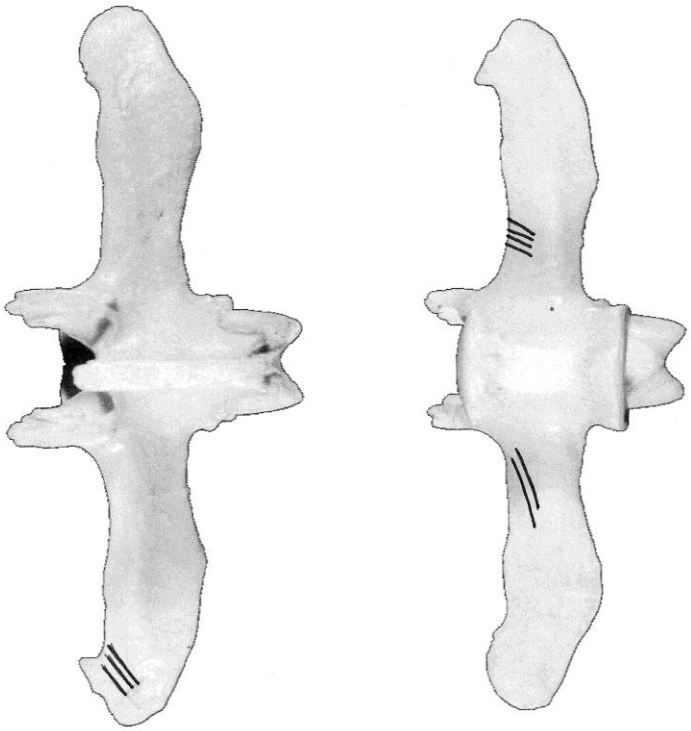
Cow3. Dorsal and ventral views lumbar vertebra 4.



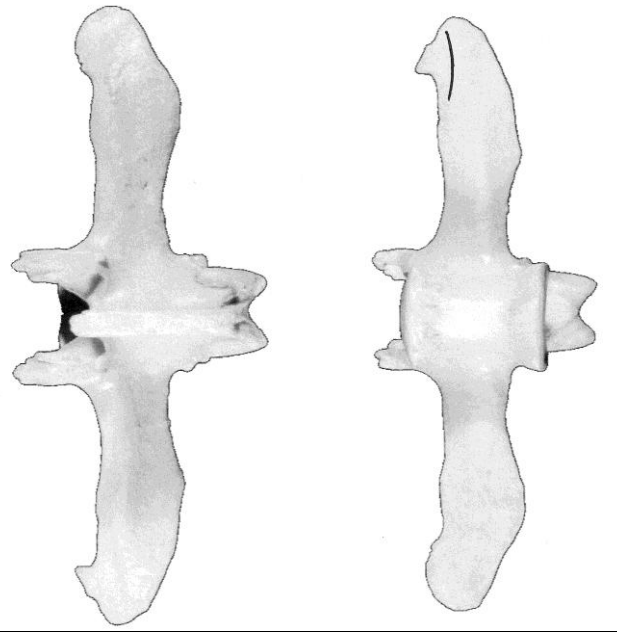
Cow3.Right and left views lumbar vertebra 5 .



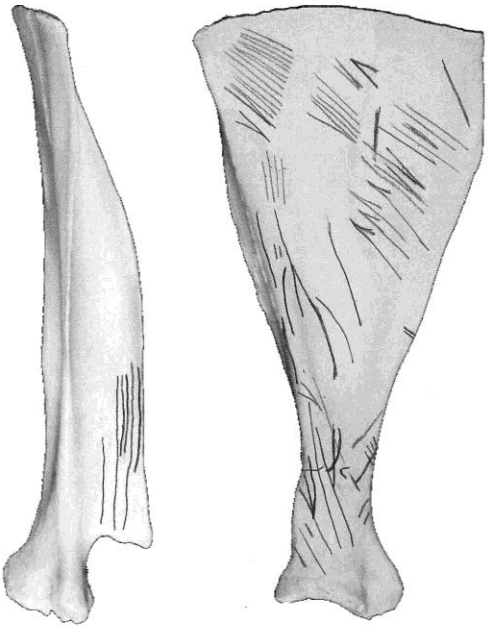
Cow3.Dorsal and ventral views lumbar vertebra 5 .



Cow3. Dorsal and ventral views lumbar vertebra 6 .

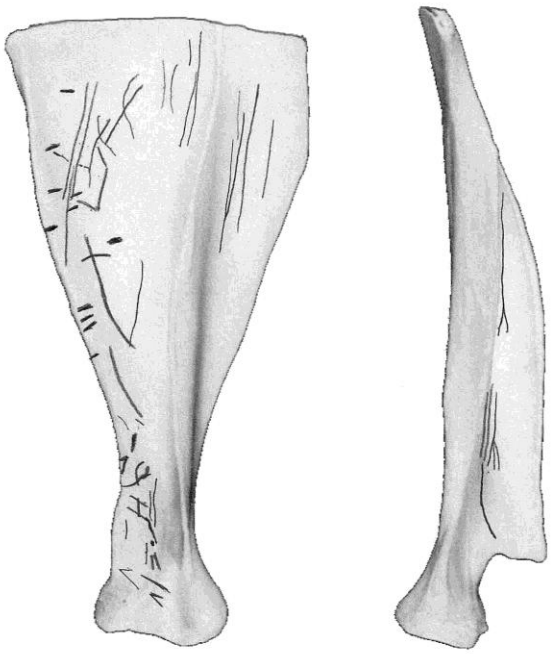
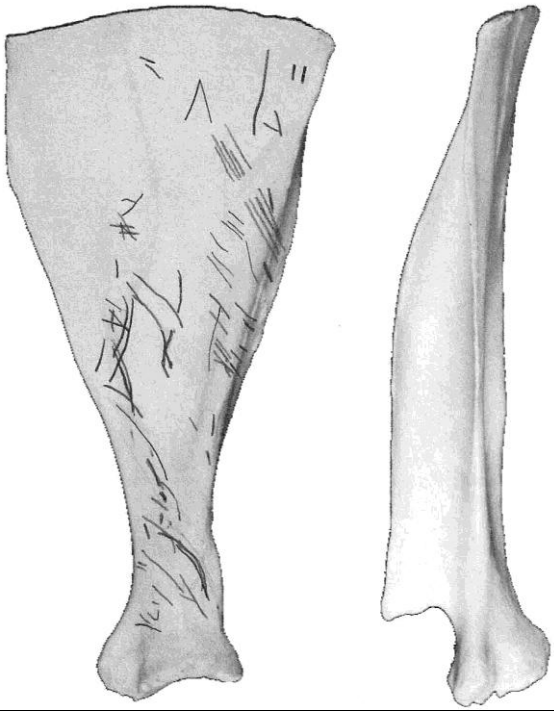


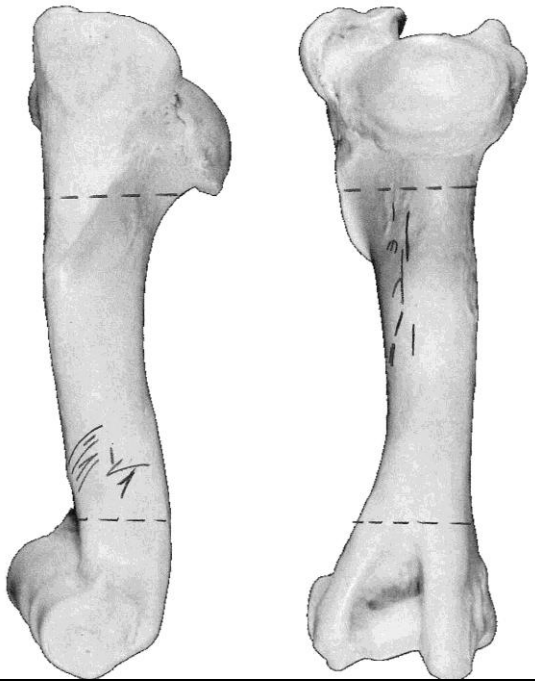
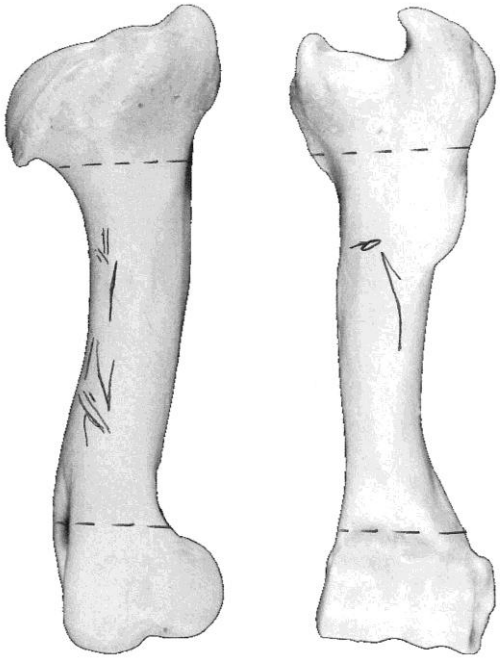
Cow3. Left anterior and medial views scapula.

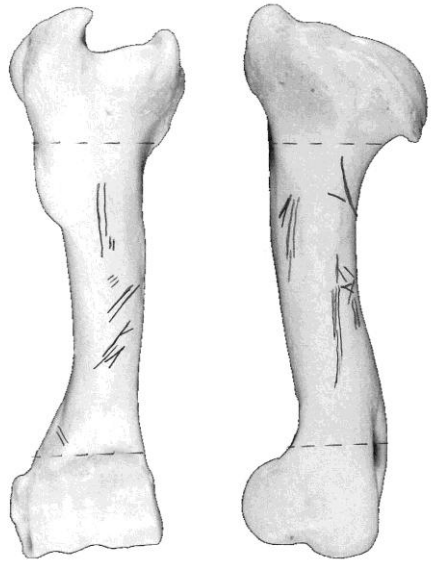
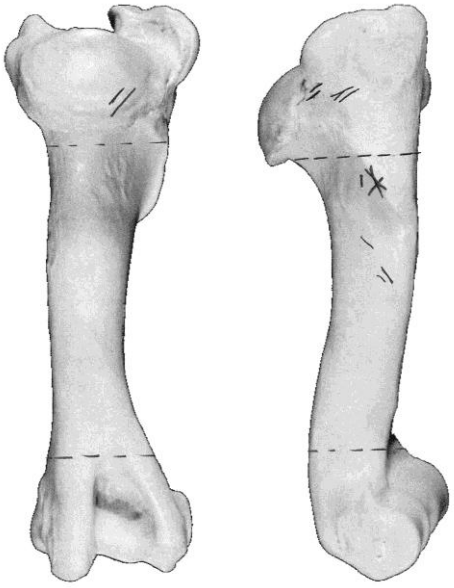


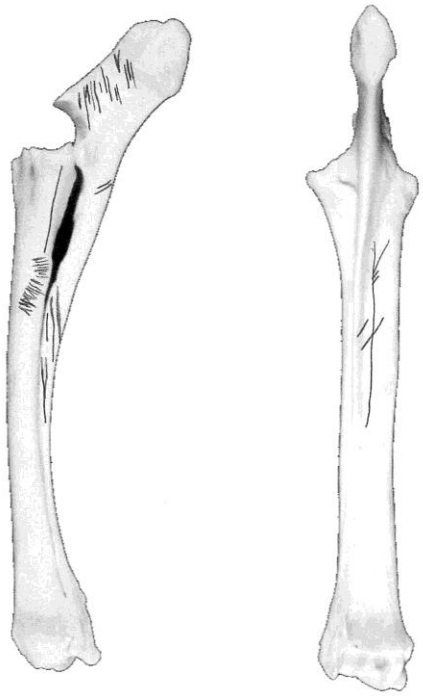
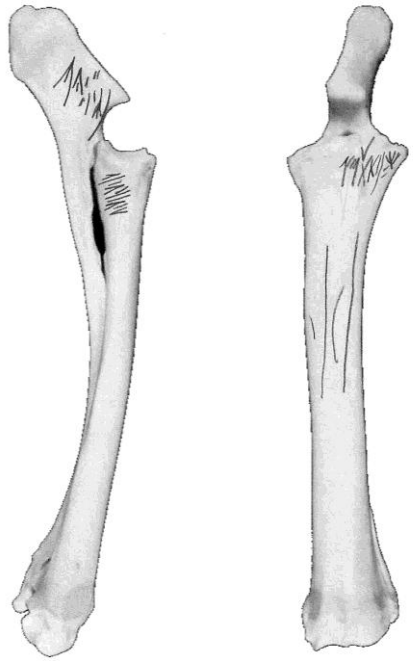
Cow3. Left posterior and lateral views scapula.

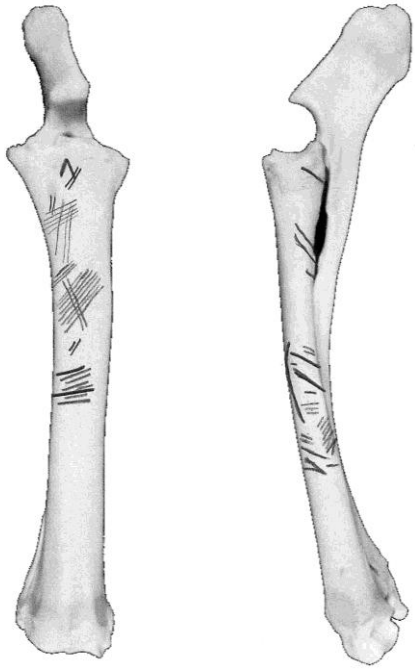
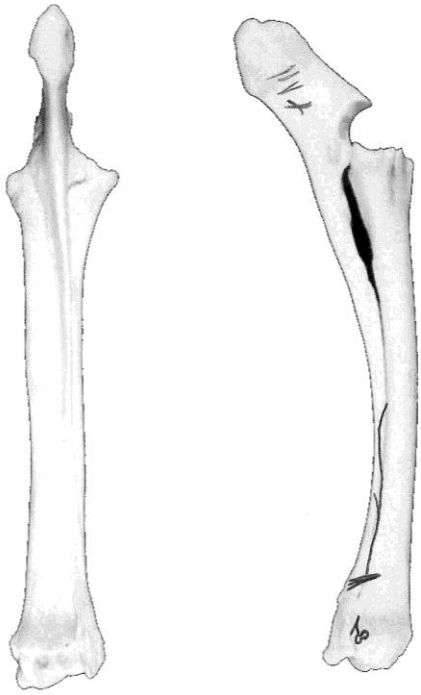


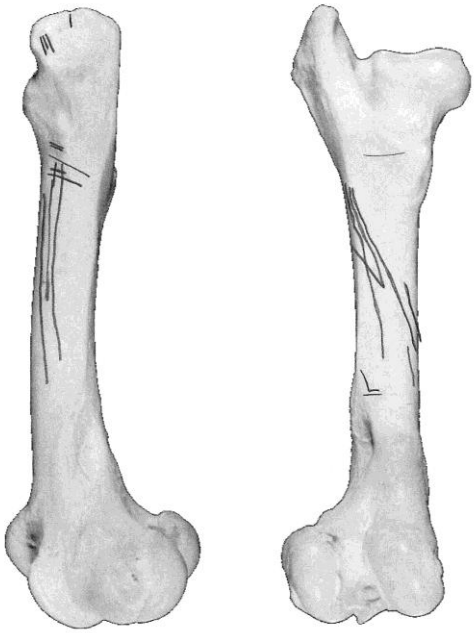
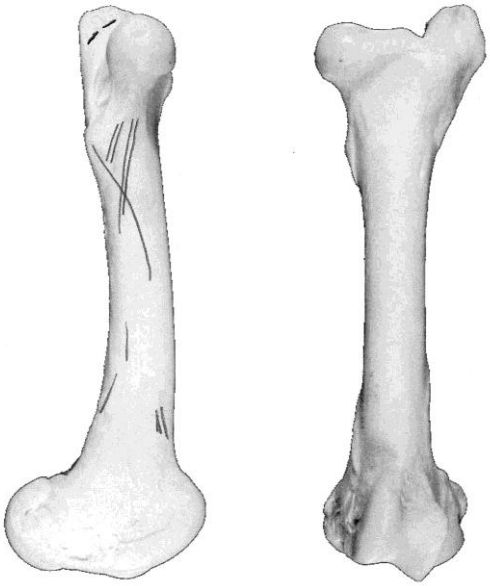
Cow3. Right lateral and posterior views scapula.	Cow3. Right medial and anterior views scapula.
	

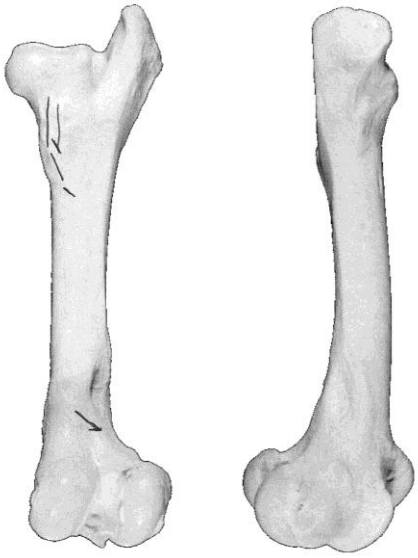
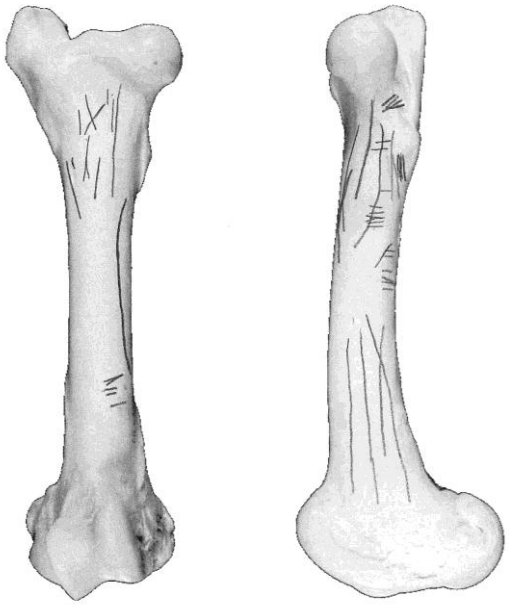
Cow3. Left lateral and posterior views humerus.	Cow3. Left medial and anterior views humerus.
	

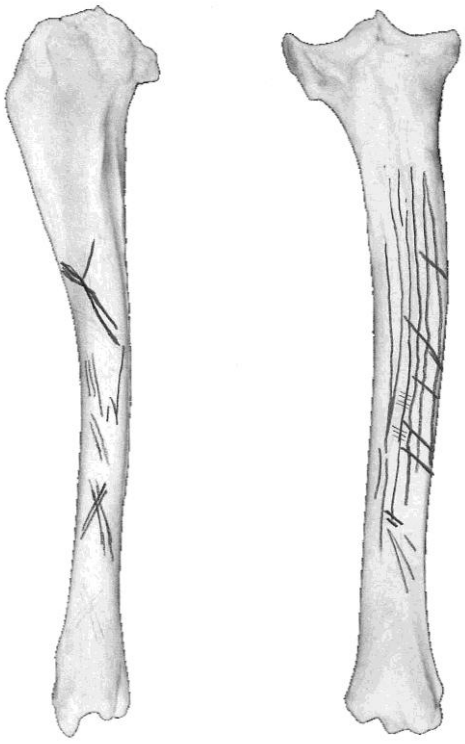
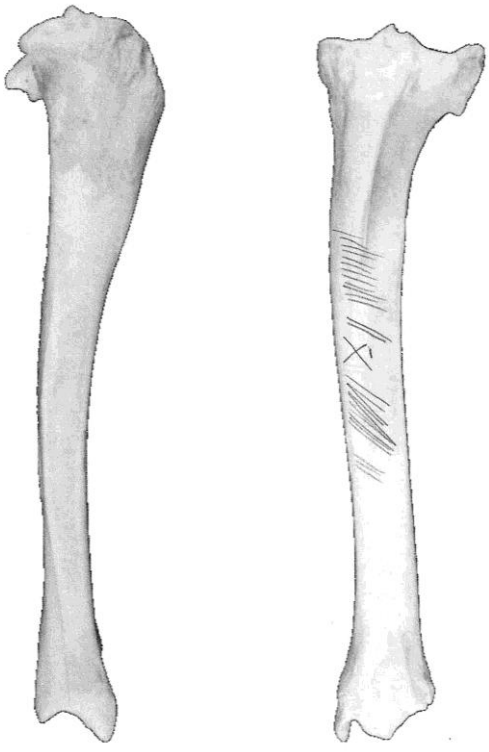
Cow3. Right anterior and medial views humerus.	Cow3. Right posterior and lateral views humerus.
	

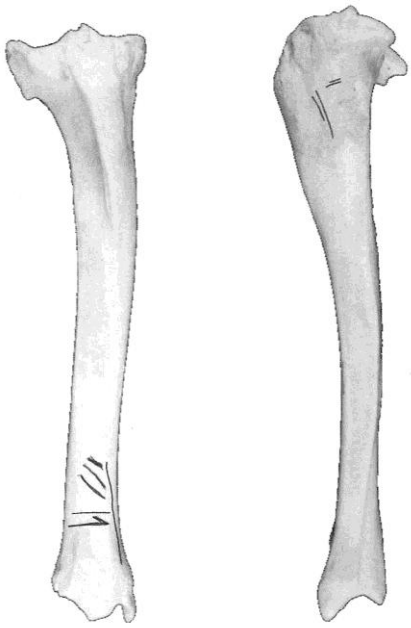
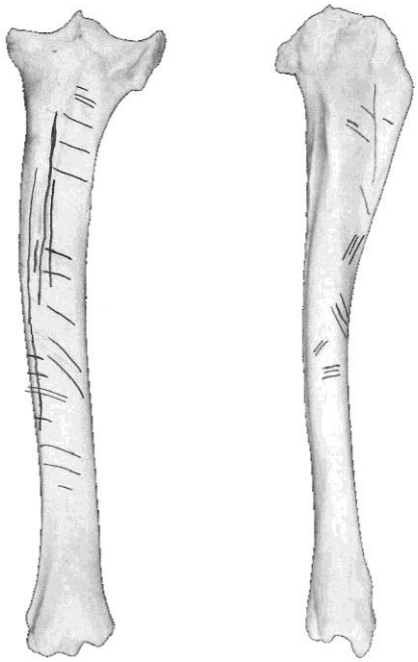
Cow3. Left lateral and posterior views radio-ulna.	Cow3. Left medial and anterior views radio-ulna.
	

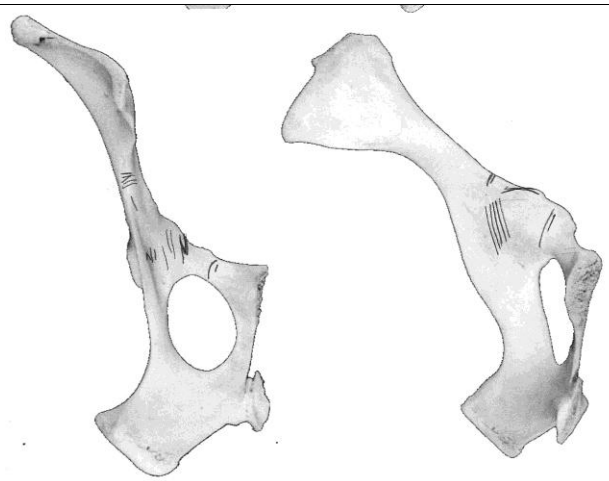
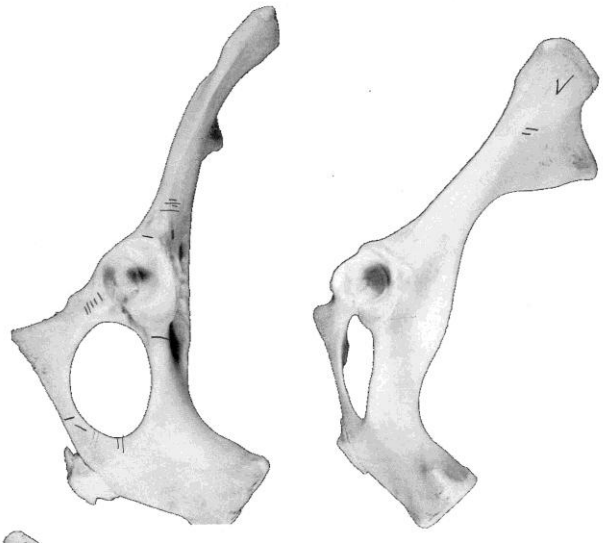
Cow3Right anterior and medial views radio-ulna.	Cow3. Right posterior and lateral views radio-ulna.
	

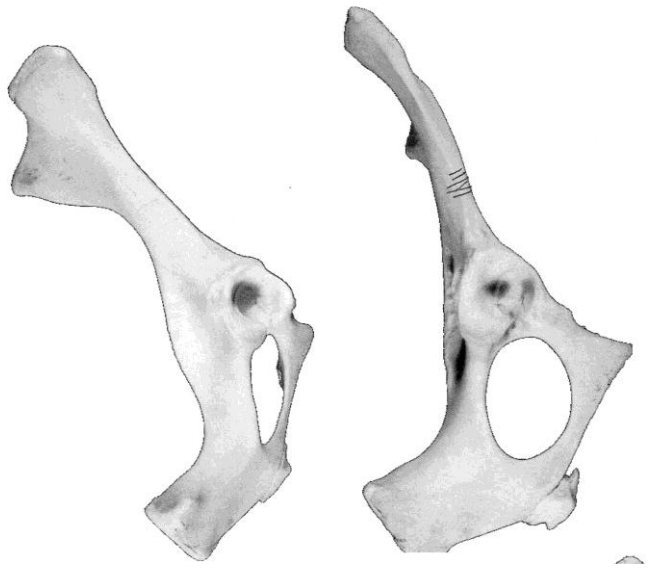
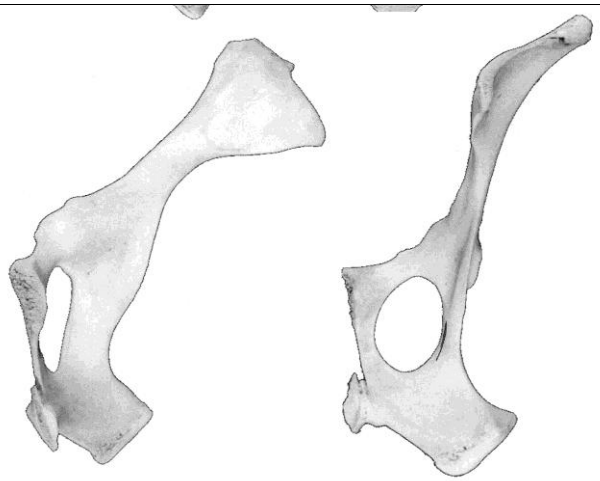
Cow3. Left lateral and posterior views femur.	Cow3. Left medial and anterior views femur.
	

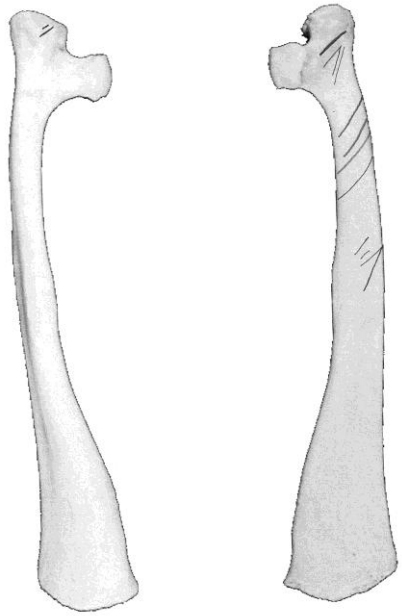
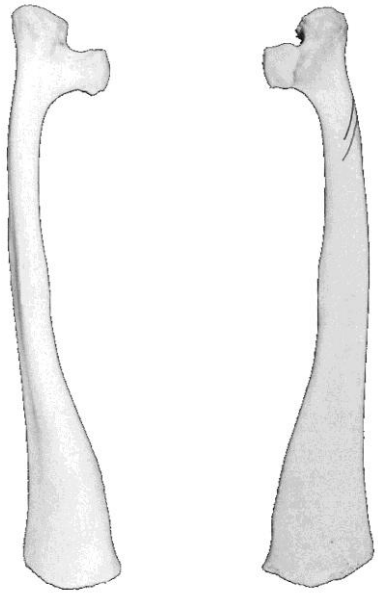
Cow3. Right posterior and lateral views femur.	Cow3. Right anterior and medial views femur.
	

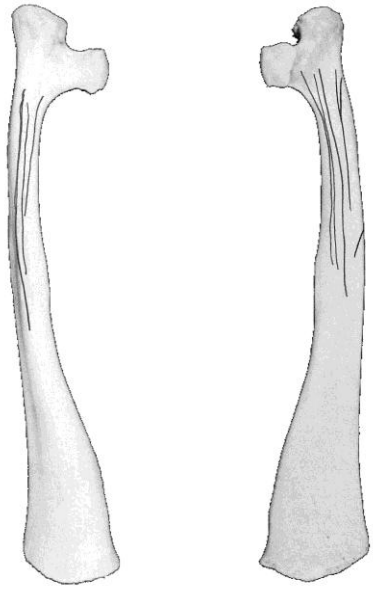
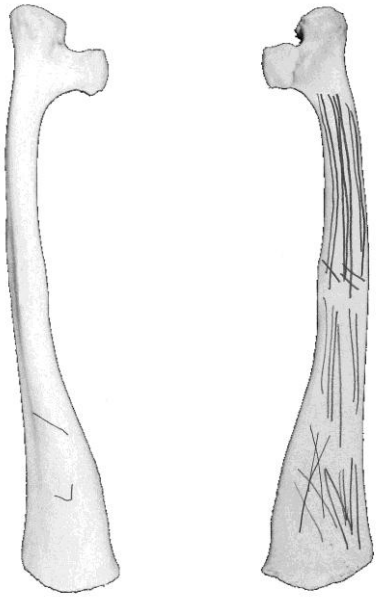
Cow3. Left lateral and posterior views tibia.	Cow3. Left medial and anterior views tibia.
	

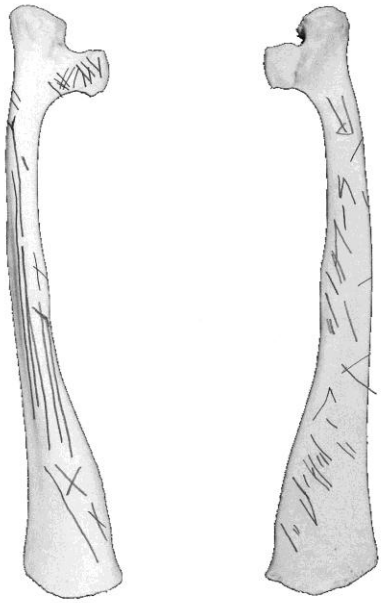
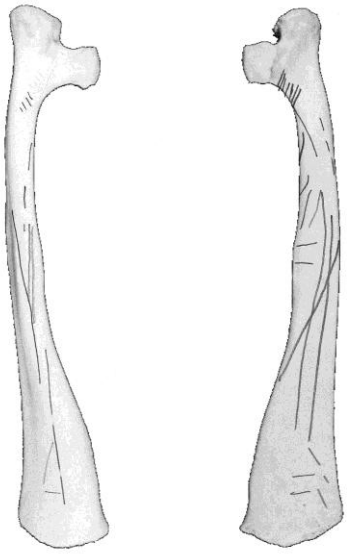
Cow3. Right anterior and medial views tibia.	Cow3. Right posterior and lateral views tibia.
	

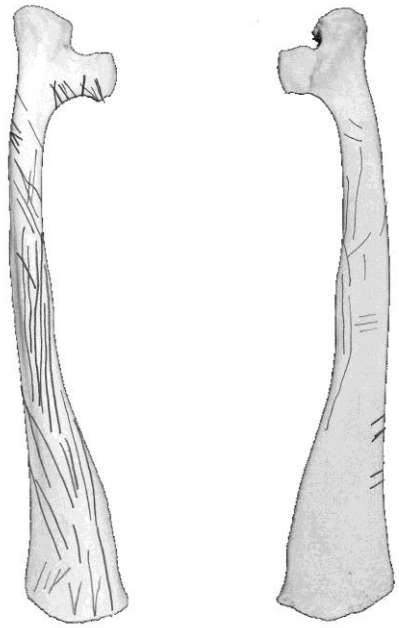
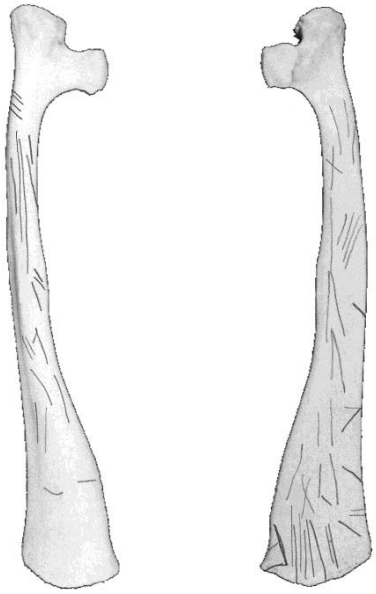
Cow3. Left dorsal and medial views innominate.	Cow3. Left ventral and lateral views innominate.
	

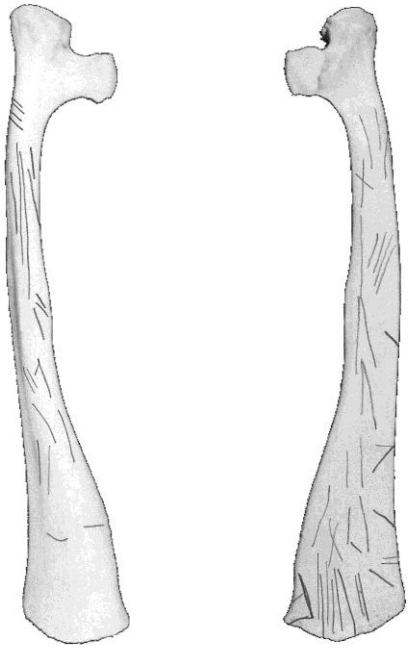
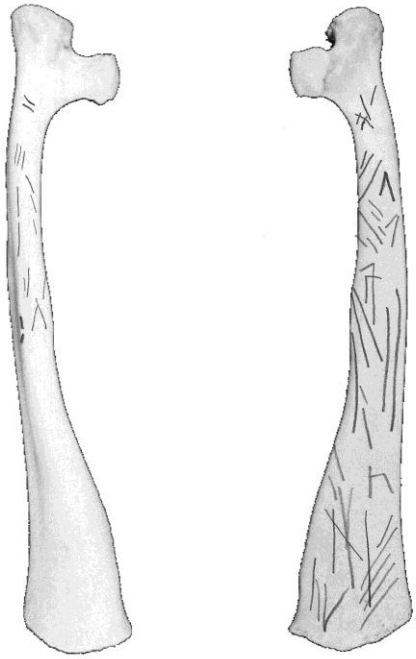
Cow3. Right lateral and ventral views innominate.	Cow3. Right medial and dorsal views innominate.
	

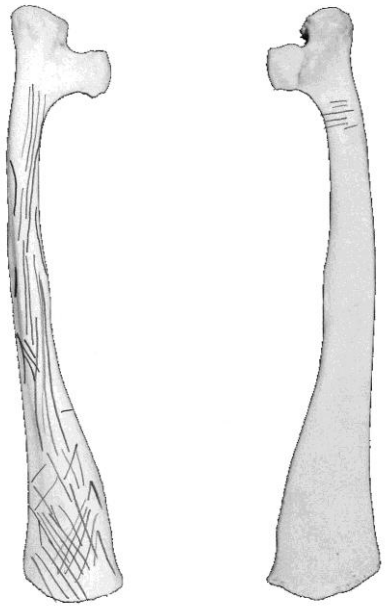
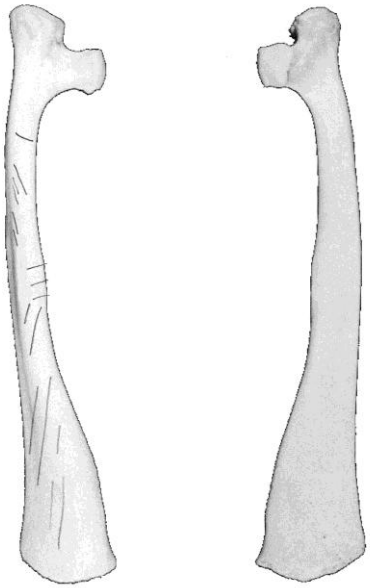
Cow3. Left medial and lateral views rib 1.	Cow3. Left medial and lateral views rib 2.
	

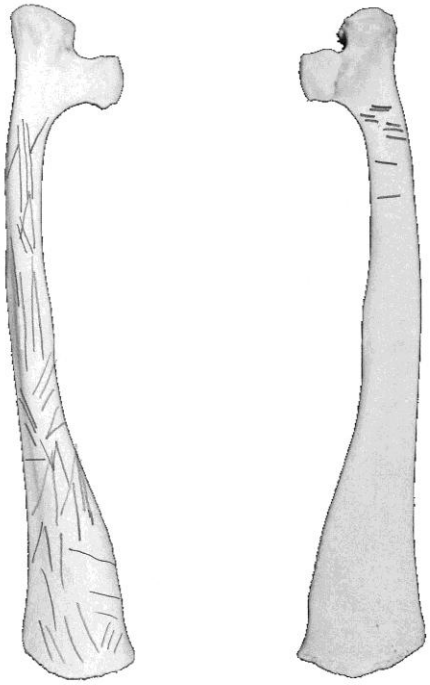
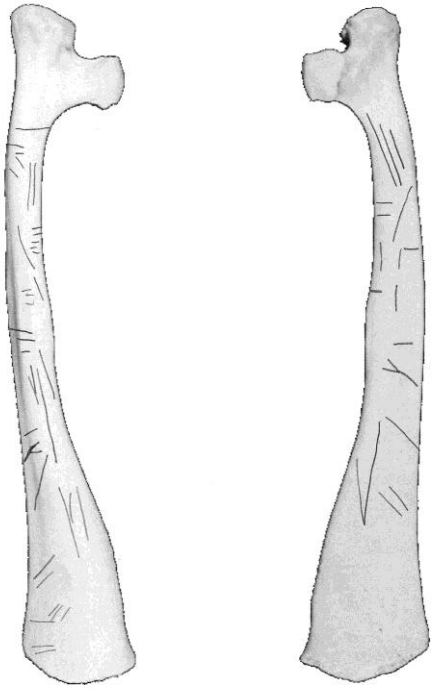
Cow3. Left medial and lateral views rib 3.	Cow3. Left medial and lateral views rib 4.
	

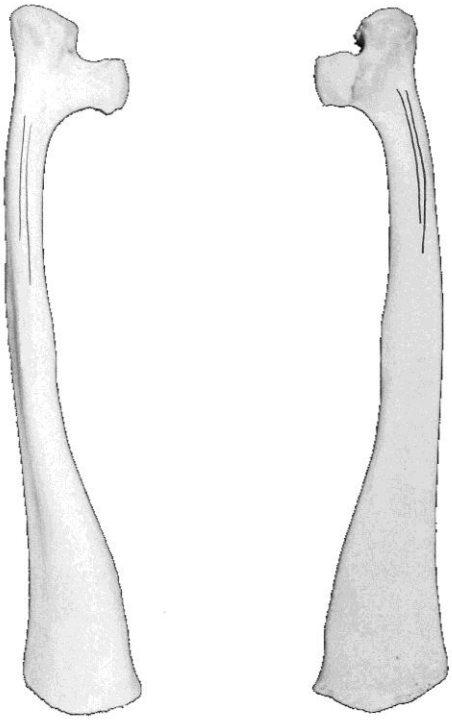
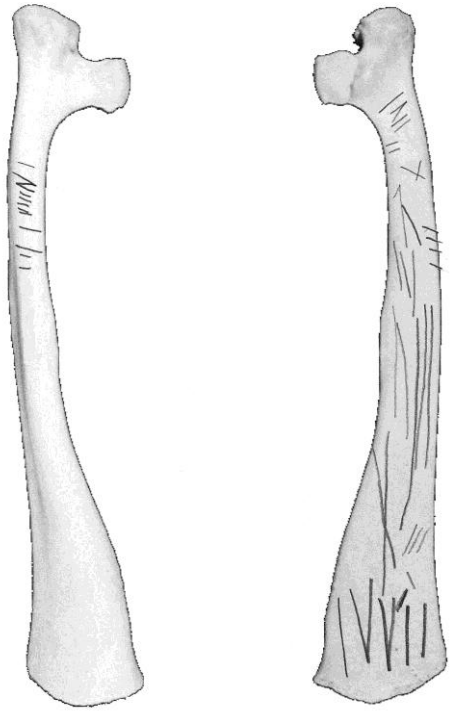
Cow3. Left medial and lateral views rib 5.	Cow3. Left medial and lateral views rib 6.
	

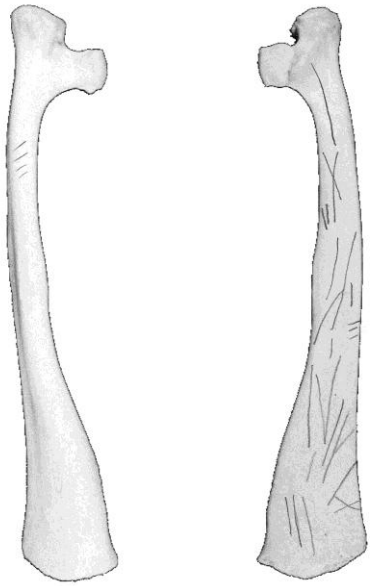
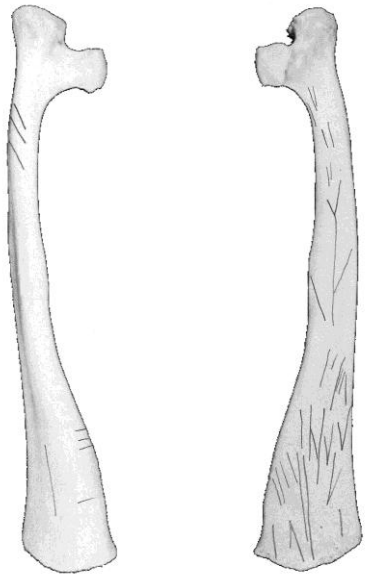
Cow3. Left medial and lateral views rib 7.	Cow3. Left medial and lateral views rib 8.
	

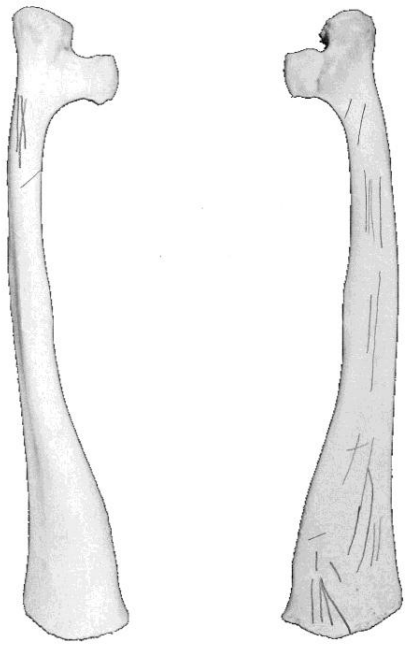
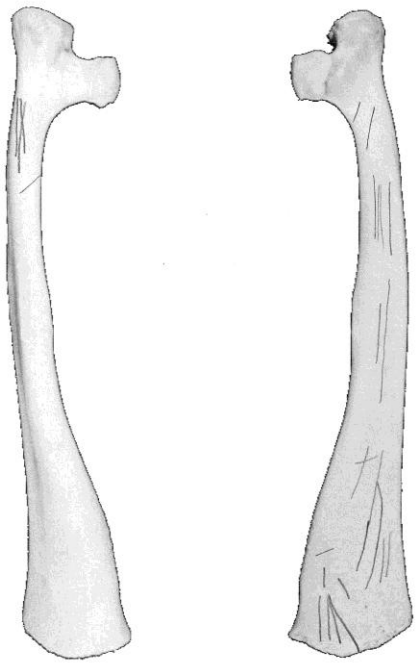
Cow3. Left medial and lateral views rib 8.	Cow3. Left medial and lateral views rib 9.
	

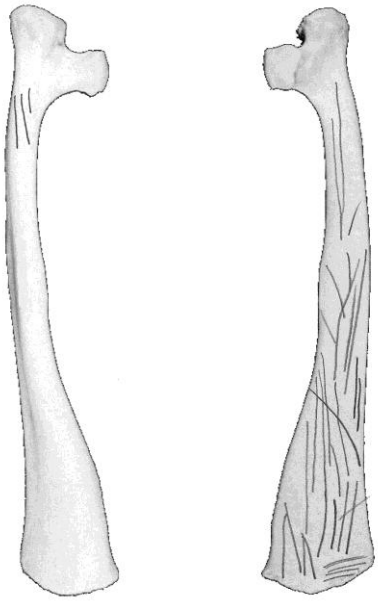
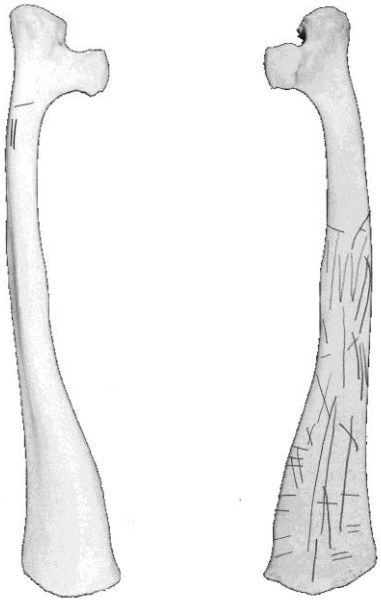
Cow3. Left medial and lateral views rib 10.	Cow3. Left medial and lateral views rib 11.
	

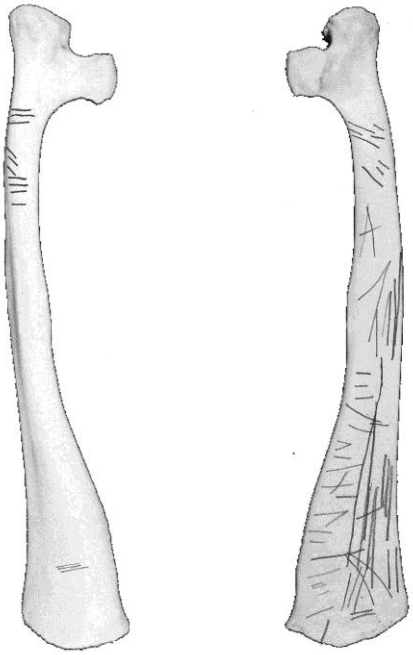
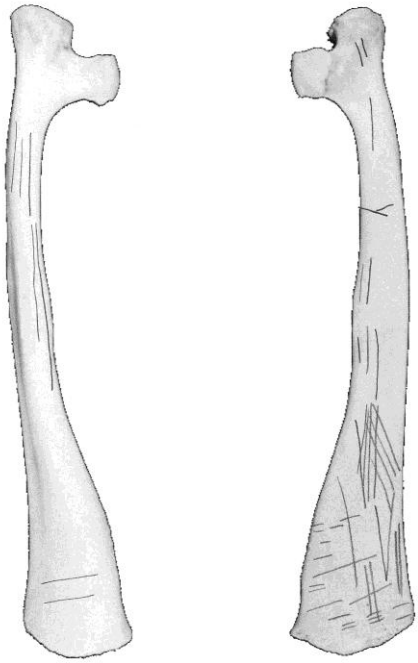
Cow3. Left medial and lateral views rib 12.	Cow3. Left medial and lateral views rib 13.
	

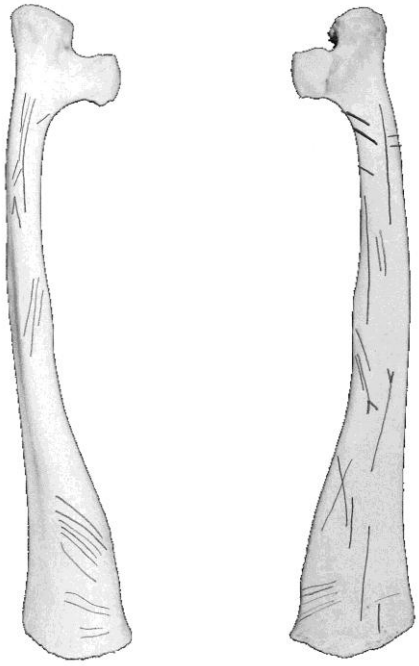
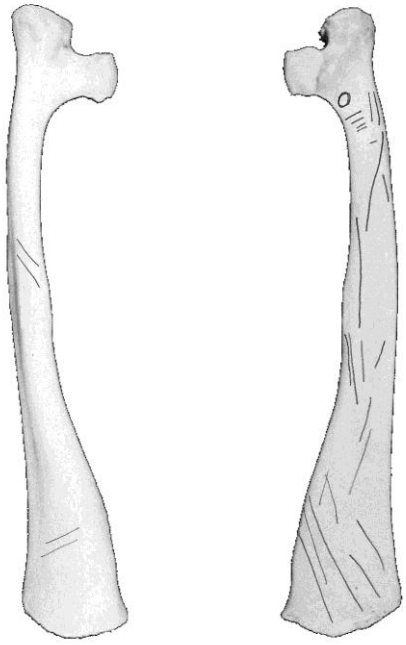
Cow3. Right lateral and medial views rib 1.	Cow3. Right lateral and medial views rib 3.
	

Cow3. Right lateral and medial views rib 4.	Cow3. Right lateral and medial views rib 5.
	

Cow3. Right lateral and medial views rib 6.	Cow3. Right lateral and medial views rib 7.
	

Cow3. Right lateral and medial views rib 8.	Cow3. Right lateral and medial views rib 9.
	

Cow3. Right lateral and medial views rib 10.	Cow3. Right lateral and medial views rib 11.
	

Cow3. Right lateral and medial views rib 12.	Cow3. Right lateral and medial views rib 13.
	

Cow3. Right anterior, medial and lateral views metapodial.	Cow3. Left medial, anterior and lateral views tarsals.
