

APPENDIX L: VERTEBRATE ANIMAL REMAINS

RECORDING PROTOCOL

SECTION I: RECORDING PROTOCOL FOR ANIMAL BONES AND TEETH

The system is based on two main database structures, one for teeth and one for bones.

Remains are recorded using a 'diagnostic zone' recording system. This involves the recording of a pre-defined set of skeletal parts, defined as 'countable', which are then used in the quantification of species and body parts. Zones followed those laid out in Bertini Vacca (2012). The following parts of the skeleton are recorded; 50% of each zone is needed for it to be recordable.

MAMMALS

Upper teeth (occlusal surface, with exception of pig canines, which are recorded whenever a complete transverse section is present), lower teeth (occlusal surface, with exception of pig canines, which are recorded whenever a complete transverse section is present), cranium (1 zone – complete or sub-complete zygomaticus), atlas (2 zones), axis (2 zones), scapula (1 zone), humerus (6 zones), radius (6 zones), ulna (3 zones), carpal3 (or C2+3), metacarpal (4 or 6 zones, species dependent), pelvis (3 zones), femur (6 zones), tibia (6 zones), astragalus (4 zones), calcaneum (2 zones), scafocuboid, metatarsal (4 or 6 zones, species dependent), metapodial (4 or 6 zones, species dependent), phalanges 1 and 2 (2 zones) phalanx 3 (1 zone).

BIRDS

Scapula glenoid cavity/articular end, coracoid (prox and distal), radius (prox and dist) humerus (prox and distal), ulna (prox and distal), carpometacarpus (prox and dist), femur (prox and distal), tibiotarsus (prox and distal), tarsometatarsus (prox and distal).

Side is recorded for the following elements: jaws; scapula; pelvis; humerus; radius; femur; tibia; astragalus; calcaneum (excluding the non-countable parts).

Vertebrae and ribs are recorded in a separate table into size groups (large, medium and small), only presence is recorded.

'Non-countable' elements are those which are not used for any quantitative analysis and include horncores and antlers (with a complete transverse section) and all other elements or parts of elements which are not included in the list of regularly recorded teeth and bones (see below), but are worth recording (e.g. rarer species, anomalous size, interesting butchery marks or abnormalities). All 'non-countable' elements are recorded as 'OTH' in the data table and the part of the body – if known – is specified in 'Comments'. The exception to this is horncores and antlers (at least a full circumference present), which are recorded as HC rather than OTH.

In this project when dealing with likely placed 'grave goods', all specimens were recorded and any that fell outside of the elements or zones specified by the recording protocol were recorded as 'other' and not included in quantifications.

CAPRINE DISTINCTION

Sheep/goat distinction is attempted on the following elements:

Horncore (non-countable); dP₃ & dP₄; distal humerus; prox radius; distal metacarpal; distal tibia; astragalus; calcaneum; distal metatarsal.

The criteria of Schmid (1972) and Clutton-Brock *et al.* (1990) were used for horncores, Payne (1985) and Halstead *et al.* (2002) for teeth, and Boessneck (1969), Kratochvil (1969) and Zeder and Lapham (2010) for postcranial remains.

PRESERVATION

Bone surface preservation is recorded using the categories 'excellent', 'good', 'medium', 'bad' or 'awful'. Definitions of these categories are provided in the 'Section iii: animal bone database codes'.

MEASUREMENTS

For a description of how measurements are taken see von den Driesch (1976), Payne and Bull (1988), Davis (1992), Albarella and Davis (1994) and Albarella and Payne (2005). Some additional measurements are also taken on caprine remains in order to attempt sheep/goat distinction according to Salvagno and Albarella (2017). The list of measurements taken on both bones and teeth are in the accompanying Excel spreadsheet. All measurements are in millimetres, to one decimal point (i.e. approximated to 10th of a millimetre), with the exception of those taken in a measuring box, which will have no decimal point (i.e. approximated to the millimetre).

AGEING

Age information is recorded using bone epiphyseal fusion and tooth eruption and wear. The fusion of postcranial bones is recorded as 'fused', 'fusing' or 'unfused' (Albarella and Davis 1994) and the codes used for recording these are in 'Section iii: animal bone database codes'. Methods for recording tooth eruption and wear are described in Grant (1982) for cattle and pigs, Wright *et al.* (2014) for pigs, and Payne (1973) for sheep/goat.

BONE MODIFICATIONS

Evidence of bone modifications, including butchery, pathology, gnawing and burning, is also recorded. Butchery, burning and gnawing have designated columns in the database; information about pathology is included in the Comments column. Codes are described in 'Section iii: animal bone database codes'.

- A description of all database fields and definitions for database codes is provided in this Appendix, Section iii.

SECTION II: FORMULAE USED FOR QUANTIFICATION

Table i: Formulae used to calculate Minimum number of Animal Units (MAU) and Minimum Number of Individuals (MNI) values. n=Minimum Number of skeletal Elements (MNE). The count of the most common zone for each bone was used as the MNE.

Element	Calculation
Upper or lower incisors	Bos and Ovis/Capra = $n/8$ Pig = $n/6$
Unidentified incisors	Bos and Ovis/Capra = $n/8$ Pig = $n/12$
Premolars	$n/6$
P/M	$n/12$
M1/2	$n/4$
M3	$n/2$
Phalanges	Bos, Ovis/Capra and Sus = $n/8$ Horse = $n/4$
Atlas/axis	$n/1$
Metapodials	
Metacarpal	Bos and Ovis/Capra = $n/2$; $n=(MC1=MC2/2)$ Sus = $n/2$; $n = (MCIII+MCIV/2 + MP/4)$
Metatarsal	Bos and Ovis/Capra = $n/2$; $n=(MT1=MT2/2)$
Metapodial	Sus = $n/2$; $n = (MTIII+MTIV/2 + MP/4)$ Bos and Ovis/Capra = $n/4$; $n=(MP1+MP2/2)$
All other body parts	$n/2$

SECTION III: ANIMAL BONE DATABASE CODES

COL (=type of collection)

>4mm = from fine sieving (>4mm fraction)

<4mm = from fine sieving (<4mm fraction)

PRES (=preservation)

A = awful (>90% of cortical surface degraded and/or surface beginning to flake away)

B = bad (>60% of cortical surface degraded)

M = medium (40-50% of cortical surface degraded)

G = good (20-30% of cortical surface degraded)

E = excellent (preservation equivalent to a modern specimen)

ELEM (=anatomical element)

U = unknown

X = maxilla

N = mandible

CR = cranium (zygomaticus)

AT = atlas

AX = axis

SC = scapula

CO = coracoid (prox end)

HU = humerus

RA = radius

UL = ulna

C3 = carpal 3 or 2+3 (=carpal 2+3 – i.e. capit-trapez. in bovids and cervids; carpal 3, distal row – i.e. capit. in equids, pig and carnivores)

MC1 = metacarpal (=carpometacarpus, prox end, in birds)

MC2 = 1/2 metacarpal

MCIII = third metacarpal (pigs/carnivores)

MCIV – fourth metacarpal (pigs/carnivores)

PE = pelvis (acetabulum, ischiatic part)

FE = femur

TI = tibia (=tibiotarsus in birds)

AS = astragalus

CA = calcaneum

SCU = scafocuboid (bovids and cervids) or scafoid (equids) or cuboid (pigs and carnivores)

MT1 = metatarsal (=tarsometatarsus in birds)

MT2 = 1/2 metatarsal

MTIII = third metatarsal (pigs/carnivores)

MTIV – fourth metatarsal (pigs/carnivores)

MP1 = metapodial

MP2 = 1/2 metapodial

P1 = phalanx 1

P2 = phalanx 2

P3 = phalanx 3

HC = horncore or antler

OTH = all the others (element specified in comments)

L/J

L=loose tooth

J=jaw

A jaw is defined as a tooth having adjacent to it at least another half tooth/alveolus or an equivalent length of bone

Hypoplasia

P=present (one line)

PP=present (two or more lines)

TAX (=taxon)

B = Bos

O = Ovis/Capra

OVA = Ovis aries

CAH = Capra hircus

S = Sus

CEE = Cervus elaphus

DAD = Dama dama

CAC = Capreolus capreolus

C = Cervus

EQ = Equus

EQC = Equus caballus

EQA = Equus asinus

CAF = Canis familiaris

VUV = Vulpes vulpes

FEC = Felis catus

MUN = Mustela nivalis

MUP= Mustela putorius

MUE = Mustela erminea

MUX = Mustela erminea/nivalis

LE = Lepus

LEE = Lepus europaeus

ORC = Oryctolagus cuniculus

LO = Lepus/Oryctolagus

LAG = Lagomorphs

LUL = Lutra lutra

MEM = Meles meles

CAS = Castor

RA = Rattus

RAR = Rattus rattus

RAV = Rattus/Arvicola

APO = Apodemus

MUM = Mus musculus

SMU = Small Murinae

ART = Arvicola terrestris

CLG = Clethrionomys glareolus

SRO = Small rodent

LRO = Large rodent

ERE = Erinaceus europaeus

TAL = Talpa

SOA = Sorex araneus

SMI = Small Microtinae

CD = Cervus/Dama

DC = Dama/Capreolus

CB = Cervus/Bos

CV = Canis/Vulpes
OCC = Ovis/Capra/Capreolus
GNP = Gallus/Numida/Phasianus
GP = Gallus/Phasianus
GN = Gallus/Numida
GAG = Gallus gallus
PHC = Phasianus colchicus
GAL = Galliform
ANA = Anas
ANPS = Anas platyrhynchos sized duck
ANAC = Anas acuta sized duck
ANPE = Anas Penelope sized duck
ANS = Anser
AB = Anser/Branta
CYG = Cygnus
SCR = Scolopax rusticola
PEP = Perdix perdix
PUP = Puffinus puffinus
PHC = Phalacrocorax carbo
ACF = Accipitriformes
BUB = Buteo buteo
MIM = Milvus milvus
FAL = Falco
ACN = Accipiter nisus
PL = Pluvialis
PLA = Pluvialis apricaria
PLS = Pluvialis squatarola
ST = Sternula sp.
VAV = Vanellus vanellus
GAN = Gallinago gallinago
LIL = Limosa Limosa
COL = Columba
COLL = Columbia livia sized
TU = Turdus/Sturnus
CO = Corvus
COM = Corvus monedula
COF = Corvus frugilegus/corone
COC = Corvus corax
PIP = Pica pica
GAR = Garrulus glandarius
AL = Alauda sp.
PA = Pandion sp.
PSF = Passeriformes
CH = Charadriiformes
AV = Aves
AMP = Amphibia
RAN = Rana
BUF = Bufo bufo
MPF = Mustela putorius/furo
HS = Homo sapiens

Uncertain identifications are shown by a question mark at the end (e.g. CEE? B?)

FUS (=fusion)

F = fused

G = fusing

UD = unfused diaphysis (this code is also used for porous ends of very early fusing bones such as metapodials, and for juvenile bird remains)

UE = unfused epiphysis

UX = unfused diaphysis + epiphysis

Blank = no fusion information

BU (=butchery)

P = chopped

T = cut(s) (also TT used if many multiple cuts)

S = sawn

PT = chopped + cut(s)

SP = sawn + chopped

TS = cut(s) + sawn

'blank' = absent or not recordable

Specific Roman codes

CS = scapula with typical chops around the neck and/or removed spine

HS = scapula with hook damage

HCS = scapula with typical chopping and hook damage

BR (=burning)

S = singed

B = burnt

C = calcined

GN (=gnawing)

C = gnawed by carnivores

D = partially digested

R = gnawed by rodents

CR = gnawed by carnivores and rodents

'blank' = absent or not recordable

I1, I2, I3, I, dI1, dI2, dI3, dI, C (other than pig), dC, P1, P2, P3, P, dP2, dP3, P/M, M:

P = present

'blank' = absent

C (pig)

M = male

F = female

AM = male alveolus

AF = female alveolus

P = present

'blank' = absent

P4, dP4, M1, M2, M3, M12(=M1 or M2)

wear stage according to Grant 1982

P = present, but wear stage not recordable (or not recorded)

'blank' = absent

P4we, dP4we, M1we, M2we, M3we, M12we (=M1we or M2we) (only used for pigs)
wear stage according to Wright *et al.* (2014)
'blank' = absent or not recordable

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