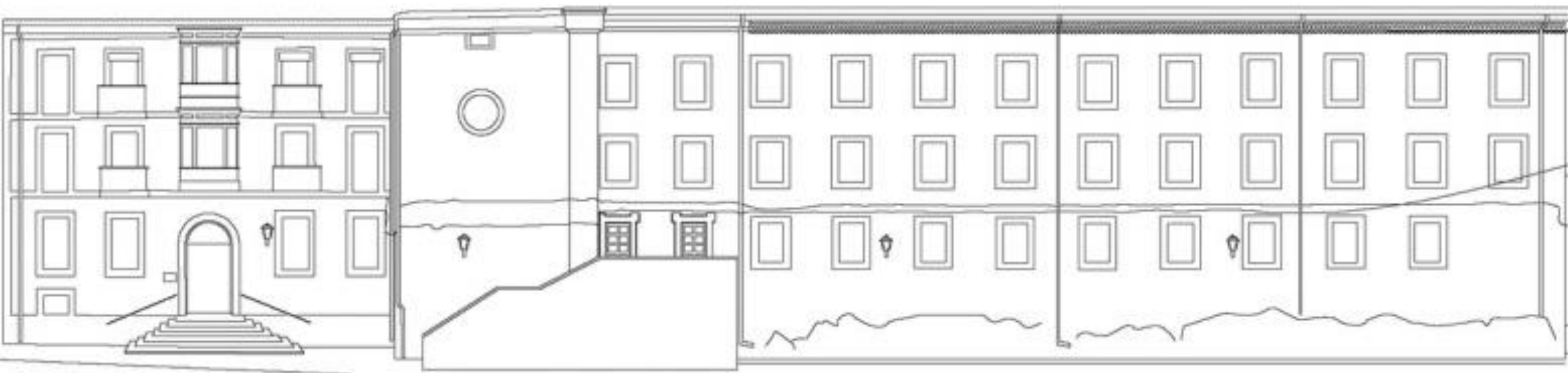
Continuity and Change at Tabacalera, Gijón (Spain)

A Diachronic Comparison of the Zooarchaeological Assemblage from the Late Roman Period and the Medieval Period

Rowanne J. Schouten



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Master thesis

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1. Introduction

Zooarchaeology is a discipline that has been around in Spain since the 1970s and started with a focus on prehistory. This was mainly caused by two things: archaeology in Spain was seen as a humanities study, which led to palaeontologists first practicing zooarchaeology, and zooarchaeology was first only used for bioindication, which is mostly useful for the study of prehistoric sites as they have no historic dating methods (Morales Muñiz 2002, 103-4). However, zooarchaeology has much more potential and can answer many more questions than those relevant in this period. It has often been assumed that from the Roman Era onwards most information could be gained from historical sources. Thus, the battle of archaeology to gain a foothold on this terrain has been ongoing. Archaeology, and with that zooarchaeology, can answer those questions that history often cannot. Questions about people that history does not write about. Questions that due to its different sources of evidence, archaeology can provide a different perspective for. One of those questions is about animal husbandry. Animal husbandry supplied – and still does- an important food source to people in every region in every era since its conception. As the study of animal bones, zooarchaeology is extremely suitable for studying this subject. In this thesis, the focus is on an era for which animal husbandry still requires further research in Spain but recently has found interest amongst zooarchaeologists (Grau-Sologestoa and García-García 2018, 342; Morales Muñiz 1996, 255-66; Morales Muñiz 2002, 108-12).

The site, that this thesis focusses on is Tabacalera, which is situated in the city of Gijón. Gijón is located in the north of Spain in the region of Asturias (see figure 1). It is one of the main cities of this region having 271.843 inhabitants in 2018 (mas.lne.es). It is the largest city in the region, even though the region's capital is Oviedo. The region is bordered by the Bay of Biscay to the north, the region of Cantabria to the east, Castile and Leon to the south, and Galicia to the west. The region's geology is marked by the Cantabrian mountains and its coastal location gives it a mild climate. Due to the geology and mountainous character of the region, it has been exploited for mining activities since Roman times.

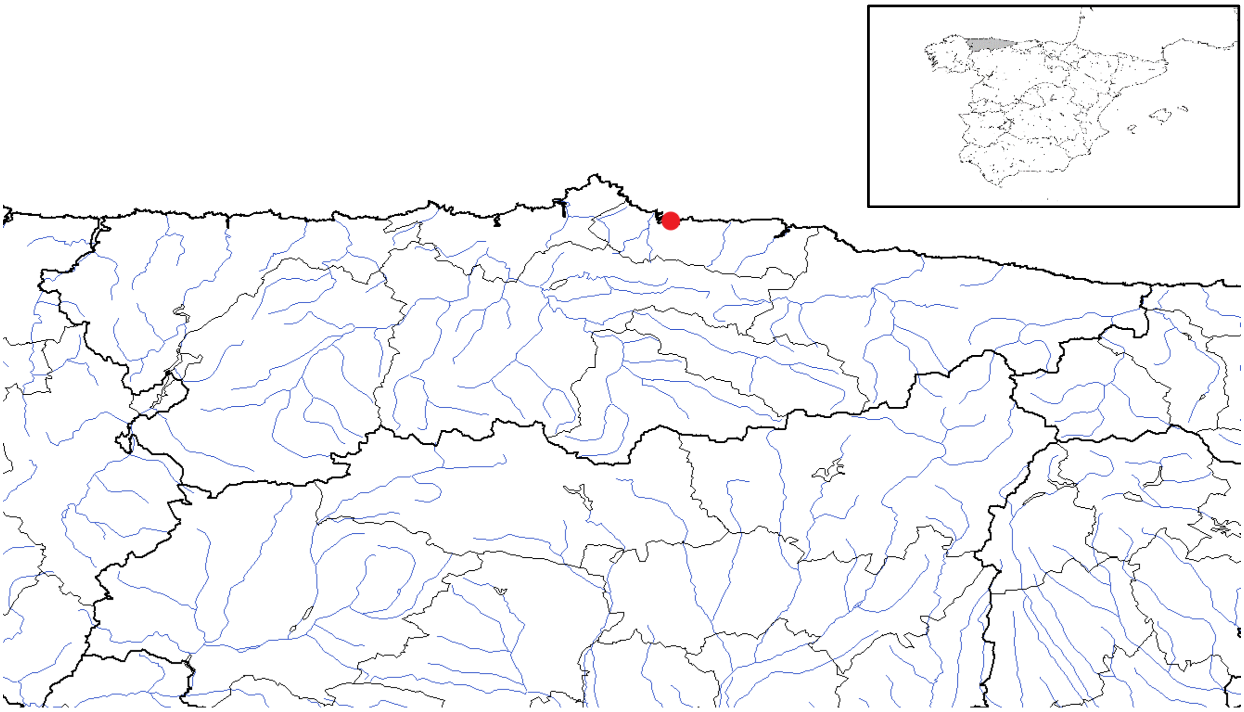

Figure 1: Map of site location (red point) in Asturias, Spain

The site of Tabacalera in Gijón is uniquely suited for this research, as it has a long continuing record of animal remains and is located in the centre of its Roman occupation (Fernández Ochoa 1987, 153-61; Fernández Ochoa *et al.* 2015, 282-95). This provides us with the opportunity to study the changes in animal husbandry formerly reported, in an urban centre of relative importance in the region of Asturias from Roman times onwards. The region of Asturias is of special interest in the study of the animal husbandry of Spain as the north of Spain is known for its cattle husbandry, as opposed to the other regions of Spain, who mainly focus on the rearing of sheep and goat.

The site of Tabacalera (which means tobacco factory in Spanish) is located on a peninsula in the city of Gijón called Cimadevilla. Today Cimadevilla is the historical centre of Gijón, which has been in use since the Roman Era (although there are traces that suggest an even earlier occupation in the area during the Iron Age (Fernández Ochoa 1987, 153-61)). Both the history of Gijón and the archaeological findings of the Tabacalera site are discussed in more detail in later chapters, but a short introduction is provided below.

As the name of the site suggests it has until fairly recently been in use as a tobacco factory. From historical documents, it was already known that before its use as a tobacco factory, the site was in use as an Augustinian monastery. During excavation, the remains of this building were also found (Fernández Ochoa *et al.* 2015, 114-25). In an article published before the excavation took place, it was already suggested that the site might also contain Roman traces because in the area surrounding it many remains of Roman occupation were found (Fernández Ochoa 1987, 153-61). This prediction proved to be true. During the excavation of the site, a Roman cistern was found, which had been in use until the Early Middle Ages and whose faunal remains were studied in previous studies (Llorente Rodríguez *et al.* 2015, 226-37). During the Middle Ages, the cistern fell out of use and the tower on top of the cistern collapsed. On top of this destruction layer, there were layers also containing many animal bone fragments. It has been suggested that the cistern was used as a waste dump after its destruction (Fernández Ochoa 2015, 114-25). These layers are amongst the layers that are discussed in this thesis, that alongside additional layers not belonging to the cistern area were determined by the author and are all from the Late Middle Ages (except some layers, which are only discussed in chapter 5 but are excluded from further analysis). These results are then compared to material from older late Roman layers already published. All contexts, layers, and dating are further discussed in chapter 4.

This analysis between material from the Middle Ages (8th to 16th centuries) and the Late Roman Era (4th to 6th centuries) can bring to light possible changes in animal husbandry strategies and trade or exchange during the millennium in the area. From other regions in the Roman Empire, it is known that the practices from the Iron Age changed after joining the Roman Empire. Most notable changes are the increase in the importance of pig husbandry, the creation of an open market, changing a largely autarkic husbandry strategy into one focused on surplus production, and the breeding of larger animals (Valenzuela-Lamas and Albarella 2017, 402-15; Colominas *et al.* 2017, 510-34). These changes have also been reported for sites on the Iberian Peninsula. After the collapse of the Roman Empire, it is thought that these observed changes are reversed, as the connectivity throughout Europe declines. This might not be an effect observed directly after the Empire's fall, but could be a gradual decline seen throughout the Early Middle Ages. However, at the end of the Middle Ages this connectivity should have increased again (according to historical sources) (Grau-Sologestoa 2015, 123-34). Is this change also visible in the archaeological record and does this change animal husbandry the same way as it did in the early Roman Era?

1.1 Research questions

Most of the studies that focus on developments, such as this, use several sites to counteract small assemblage sizes (Frémondeau *et al.* 2017, 494-509; Grau-Sologestoa

2015, 123-34; Grau-Sologestoa *et al.* 2016, 1-12; Sirignano *et al.* 2014, 1-11). This makes the focus of these studies often regional and sometimes even countrywide. This thesis focuses only on one site: that of Tabacalera, Gijón, Spain. This leads to the following research question:

How does the medieval animal assemblage of Tabacalera, Gijón reflect diet and animal husbandry practices of the period, and how does this compare to the Late Roman context of Tabacalera and the Medieval and Late Roman assemblage of the rest of the Iberian Peninsula?

This question envelops a broad array of changes, but this study is limited to those most easily analysed through zooarchaeological analysis. To be able to answer this question, this main research question is subdivided into multiple sub-research questions. They are the following:

1. What is the ratio between the three main domesticates for the late Roman and medieval assemblages, how did this change and is this change common for these periods and the region?
2. What are the production aims for the three main domesticates? How does this change and is this change representative of the period and region?
3. Is breed improvement practiced during the Middle Ages visible on the Tabacalera site, how does this affect the domesticates, and is this representative for the period and region?
4. Is the production of animal products for autarkic consumption or is there surplus production for trade/exchange and is this representative for the period and region?
5. What functions do other species than the domesticated mammals have in the assemblage, how does this change and is this representative of the period and region?
6. In what way do taphonomic processes influence the analysis and conclusions made for the other sub-research questions?

The first sub-research question studies the most basic but essential changes that occur when studying animal husbandry. These changes can have many factors attributing to it. A change in focus from autarkic production to production for a market or the introduction of foreign strategies may cause such changes, but also an increase in population or climate change can have this effect. The spread of the Roman Empire caused an increase in the importance of pig husbandry and therefore an increase in the amount of pig remains in some regions of the Roman Empire (Colominas *et al.* 2017, 510-34). Did such a shift also occur after its fall?

The second sub-research question goes into more detail. Both cattle and sheep/goat can have multiple functions and do not only contribute meat to the diet. In the case of these animals, those secondary products can be of greater importance than the meat they produce. In such populations, animals tend to have other age distributions, being slaughtered at an older age. This does not mean that these animals are not consumed after serving for this purpose. If secondary or primary products are the main focus of production or not is discussed in this research question.

The third sub-research question studies if not only the functions of these animals change but if other changes in the husbandry strategy are also visible in the archaeological record. These changes can include seasonality and (where possible) distribution of sex. Seasonality is of interest because it can be a marker of social changes. This might be legislative, such as seen in pig husbandry in south-west Spain, which limits the period in which pigs can be slaughtered (Hadjikoumis 2012, 353-64), or it can be religious, related to the introduction of lent in the Christian kingdoms or the prohibition of the consumption of pigs in Muslim territories (García-García 2017, 86-96). From the Roman Era onwards, the North of Spain was Christian, which has a fasting period in the spring. When comparing an assemblage -albeit Christian-, for which such restrictions did not yet exist, with a Christian assemblage, where they did, such changes might be discovered. A change in butchery methods might indicate the difference between systematic or occasional slaughter, which can point to autarkic or surplus production.

In the Iron Age, most breeds were unimproved, and thus not selected for their size. In some regions their size increases during the Roman Age because of a selection for larger animals during the breeding process (Colominas *et al.* 2017, 510-34). In some studies, it is shown that this size decreases again after the end of the Roman Era. This might be caused by a decrease in trade. During the Late Middle Ages, the size of animals has been proven to increase again, linked to the increase of international connectivity in the era, that in the Iberian Peninsula might have started earlier than other European areas within the Muslim territories (Davis 2008, 991-1010; Davis *et al.* 2012, 1445-54). The fourth sub-research question discusses if this change is also visible for the Tabacalera assemblage.

The fifth research question focuses on the role other species can have in society. First of all, this includes other animals that may be part of food production. Chicken is such a species. Birds were not part of the assemblage studied by the author, but as they are a species that is a large part of animal food production, some conclusions may be drawn from the assemblage studied by others. The same is also true for fish, which might be a large part of the diet due to the site's coastal location. However, the research question does not limit itself to those animal products suitable for consumption. Other examples are horses, which like cattle, can be used for traction and companion animals such as cats and dogs.

All of the layers studied were hand collected, which leads to a probable underrepresentation of small animal species in both periods. But even though the collection methods may be the same, the environmental conditions for these layers are different. The Roman material was found in a waterlogged environment creating anaerobic conditions. This does not apply to the medieval material. The sixth sub-research question studies to what extend those conditions might have led to the changes described in the other research questions.

To answer all of these questions, this thesis has been divided into the following chapters. The second chapter of this thesis discusses all information found during literary research. This chapter gives more information about the history and the archaeology of the city Gijón. It also discusses the past climate and ecology of the area. Lastly, it gives a brief discussion of animal husbandry on the Iberian Peninsula in the period under discussion (the Late Roman Period to the Late Medieval Period).

In the third chapter, the Tabacalera site is discussed in more detail. In this chapter, the focus is first on the history of excavation at the site and secondly on the stratigraphical sequence of the site.

The fourth chapter discusses the material that is used in this thesis in more detail. This mainly includes the contexts and layers the material is from and the dating of the material.

Next, the methodology is explained. In this chapter, all methods are listed and they are discussed in further detail than has been done in this introduction. This is done for both the methods used in the recording of the database for the animal bone assemblage and the analysis done on these records.

In chapter six the analysis needed to answer all of the research questions is carried out. This includes both standard analyses done, such as a species distribution table and mortality profile, as well as analysis more specific to the research questions, such as osteometric analysis. All of these methods are applied to the three main domesticates as they are the main focus of this research. For other species, only the methods are used that are most relevant to their research questions.

The seventh chapter is the discussion in which the research questions that were introduced here are answered and the results of the analysis done in the previous chapter are interpreted. Where in chapter five the paragraphs are divided into the species analysed, this chapter is divided into subjects relevant to the research questions.

The last chapter is, as always, the conclusion in which a summary is given of the results of the last few chapters, and the main research question is answered. Lastly, some critiques and possible improvements in the research are given and subjects for future research are recommended.

2. Historical overview

This chapter gives a summary of the historical and archaeological information known of the area in which the Tabacalera site is located. The first two parts of the chapter discuss the history of the city of Gijón both from a historical and an archaeological perspective. The third part focusses on the ecology of Asturias during the relevant periods as determined by bioarchaeological reconstruction. The last part discusses animal husbandry on the Iberian Peninsula during the Roman Era and Middle Ages and what changes have been detected in those periods zooarchaeologically.

2.1 A Brief History

Not much is known of Gijón from before the Roman Era. There are some Palaeolithic traces found in the vicinity of Gijón (for example Cabo de Peñas and in the valley of the Nalón River), but it is unsure if the city of Gijón was founded by the Romans or already existed in the Iron Age. The conquest of the Iberian Peninsula by the Romans began in the 3rd century BC, but Asturias was one of the regions to be conquered last (Ring *et al.* 1996, 284). Historical sources say that Augustus led legions into Asturias in 26 BC to conquer these last parts of Spain, which he did in less than a year. Shortly after this conquest, the site of Gijón was founded under the name *Gigia*. The settlement was situated around mount Santa Catalina, which lies in the current neighbourhood of Cimadevilla and is also where the Tabacalera site is situated. The Roman occupation ended with the invasion of the Iberian Peninsula by the Alans, Vandals, Suevi, and Visigoths in the 5th century AD (Ring *et al.* 1996, 284). The Suevi established a kingdom, which included the city of Gijón, but this kingdom was conquered by the Visigoth in 585 AD. From 711 onward the Islamic Moorish tried to conquer the whole of Spain, establishing a garrison in Gijón in 714, but could not conquer the region of Asturias. They gave up after the battle of Covadonga and Asturias remained in the hands of the Christian Visigoths. This kingdom became the centre from which the Christians later reconquered the whole of Spain. In the tenth century, this kingdom became a part of the Kingdom of Leon and under this kingdom, the port of Gijón was developed in the late twelfth century. In 1390 a succession battle for the Spanish throne arose. The city of Gijón supported the rival to the throne Alfonso Henriquez and became his base of operations. This led to a battle in 1395 after which the city of Gijón was razed (possibly leading to the demolition of the Tabacalera cistern). It took 15 years to fully rebuilt the city, but some sources say that the region around the Tabacalera site was not fully repopulated (Ring *et al.* 1996, 284-5).

After this, Gijón played a small role during Spain's attempt to conquer England in 1588, as it was one of the ports that received ships of the Armada after this attempt failed. Gijón slowly grew in importance as an economical centre. This is especially true from 1778 onward, as this was when trade opened to the ports in North America, now independent from Britain as the United States of America. During the age of Napoleon, the French state occupied parts of Spain, amongst which was Gijón. The city fell to the French after Britain and Spain cooperated to try and reclaim the regions and Gijón was sacked and plundered. During the 19th century, connections were made to the Asturian hinterland and the port became a point of export for Asturian coal (Ring *et al.* 1996, 285-6).

2.2 Archaeological perspective

The first archaeological evidence of Roman presence begins soon after the conquest of Asturias by Augustus. The settlement was logically of military nature (Fernández Ochoa 2015, 282). These first archaeological remains are the Alto de la Carisa military complex located at Campo de Torres in north-west Gijón. The camp had a powerful defensive system, but the main occupation of its residents seems to be agriculture, fishing, and metallurgy. The foreign pottery spanning many periods is indicative of ships visiting the camp, although maybe sporadically. The Romans probably named this place *Noega* and it was likely the starting place of Roman control over the area. Gijón was not the capital of the region, but a part of the *Hispania Citerior* province with its capital in Tarraco and the region of *Conventus Asturum* with its capital in modern-day Astorga (Fernández Ochoa 2015, 283).

Roman presence on the peninsula of Cimadevilla appears in the middle of the 1st century AD and begins to get a firm foothold during the late 1st century AD when the construction of the urban nucleus truly begins and it is connected via roads to other parts of Asturias (Fernández Ochoa 2015, 283). After this it grew into a regional centre, possibly acting as a *caput civitatis*. From a Roman inscription, it is known that during the 1st and 2nd centuries some inhabitants of Gijón gained Roman citizenship, which earlier indigenous inhabitants did not have. This shows the rise of the status of Gijón as an urban centre during this period. The most impressive archaeological remains of this time in the Cimadevilla neighbourhood are the baths of Campo Valdés. In other neighbourhoods of Gijón and its outer regions also a plethora of Roman remains is present (Fernández Ochoa 2015, 284).

The Cerro de Santa Catalina settlement kept growing until the end of the Roman empire. The Campo Valdés baths stayed active during this period and a salting factory was added near the modern marina (Fernández Ochoa 2015, 284). Another structure that was constructed in this late Roman period is the wall built during the late 3rd to early 4th century, which followed the model of other defensive walls built in northern Spain at that time (Fernández Ochoa 2015, 284). The city of Gijón played a more important role in the defence of the Roman empire than ever before. It was a key link in the communication of the interior of Spain with its northern coast and a port for the supply of and communication with the Roman *Limes.* The cistern of the Tabacalera site seems to be linked to this defensive system and shares its type of construction with the wall (Fernández Ochoa 2015, 285). This indicates that the Tabacalera cistern likely dates to this period. It is important to note that the role of Gijón at this time was not only defensive but also commercial in character.

After the collapse of the Roman Empire Gijón, during the 5th century, was still the most important urban centre of the region but, despite this, was also subject to abandonment and the closure of some of its Roman facilities, such as its baths and salting factories. This is also the period of the lower deposits in the Tabacalera well, which formed after it fell into disuse. This shows a paradox for Gijón at a time: its continuation as a commercial centre shown by the many finds of imported pottery against the abandonment of some of its most important commercial structures. This leads to the conclusion that (commercial) life continued albeit in smaller numbers. From this moment on the commercial networks of the Mediterranean and Atlantic shrink (as do they in Gijón), but never really disappear, mainly surviving as regional trade (Fernández Ochoa 2015, 285-6).

After this period Gijón enters the Early Middle Ages, of which few written sources survive. Archaeological records of this time include a Christian necropolis located at the former baths, which has been dated to the 6th to 7th century AD (Fernández Ochoa 2015, 287). In the area surrounding Gijón most other urban centres diminish in size and are now rural centres or are completely abandoned. Only Coaña maintains its role in long-distance commercial trade to some degree (Fernández Ochoa 2015, 287). Another urban centre in Asturias that has some surviving evidence from this period is *Lucus Asturum*, but this centre is later greatly diminished in size and importance after Oviedo was chosen as an ecclesiastic and political centre. The same happened to Flavionavia after its royal seat was displaced. Both these cases are examples of major territorial restructuring at the time. This was a territorial restructuring that Gijón luckily was not subject to, maintaining its importance. This restructuring required new rural facilities, which centred mainly around Gijón, but also around Oviedo and *Lucus Asturum* (all in central Asturias). These rural facilities do seem to be of a lower class, with less monumental architecture than their earlier Roman counterparts. In the urban space, a lessening of monumentalism is also visible with monuments being converted into productive structures of lower-class architecture. Elite spaces are converted into spaces like cemeteries and churches. A good example of this is the villa Veranes. During the 7th century, international trade seems to disappear, being replaced by local trade only, and the conversion of stately into public is completed (Fernández Ochoa 2015, 288-9).

During the 7th century, new elite structures also arose, forming the basis for high-status settlements for the Middle Ages (Fernández Ochoa 2015, 289-90). Some of the old Roman forts and towers are converted into high-rise castles. These castles become the new centres of aristocracy during the Middle Ages. During this time more and more rooms are being converted into churches, showing the presence of Christianity in the region at this time. However, the origin of this Christian tradition in this region is unknown. For material culture, a break with the Roman traditions is also visible. During this period there is a change in burial practices and the material culture changes to classical Visigoth typologies, with much of this material being found as grave goods in these new cave burials. It shows processes also known for other regions during this period: transformations in old Roman towns and cities, implantation of Christianity, and relative maintenance of trade and communication with Mediterranean and Atlantic regions (Fernández Ochoa *et al*. 2015, 290-2).

2.3 Climatic reconstruction

When discerning changes in animal husbandry practices, it is important to include or exclude climate change as a possible cause for these changes. Therefore, the climate of Gijón and Asturias in general needs to be discussed. The focus of this climatic reconstruction should be on the Roman and medieval periods as they are the focus of this thesis. This, however, proofs difficult as climate reconstruction often focuses on periods much older than these. The reconstruction available does show some interesting results.

The ecological record reconstructed from the remains of the Tabacalera site itself represents climate conditions of the assemblage's environment, but this reconstruction has a very limited temporal range not extending into the Middle Ages (Peña-Chocarro *et al.* 2019, 157). This reconstruction was made using the pollen, plant macrofossil and acari analyses, preserved in the Roman waterlogged layers and therefore only discusses the 5th to 8th century (Carrión Marco *et al.* 2015 210-25; González Ibáñez 2015, 266-75; González Ibáñez and Nores Quesada 2015, 276-9; Llorente Rodríguez *et al.* 2020 93-8; Peña-Chocarro *et al.* 2019, 155-69; Pérez Díaz and López Sáez 2015, 200-9). The environment of the Tabacalera site is characterised by a wet environment in the direct area of the well and by pastures, meadows, and cereal fields in its further surroundings. There is also evidence of a beech/deciduous forest and a riparian forest in the Tabacalera area. The wet environment in the direct area is mainly indicated by the presence of ivy and other water-loving plants. The pastures and meadows are indicated by the herbaceous species present in the samples. The cereals that were grown in the area consist mainly of rye, but also barley and foxtail millet. The beech and deciduous forest consist of species like oak, hazel, birch, walnut, and lime and pine for higher altitudes. The wood of these forests was used by the inhabitants of the site, as shown by the artefacts found in those layers. The riparian forests are marked by ash, alder, and willow. As riparian trees grow near waterways, this indicates the presence of flowing water in the nearby area (Peña-Chocarro *et al*. 2019, 155-69).

A second study used the Monte Areo site in the Gijón area to reconstruct the environment between the Neolithic and the Middle Ages (López-Merino *et al.* 2010, 1978-86). The study is divided into four periods, the last of which spans from 387 BC to the present. The pollen record for this period shows an increase in oakwood in the beginning. It also shows a change from the initial fen system of the area to a peatland. During Late Antiquity/Early Middle Ages, a decline in the woodlands is visible and an increase in cereals and ruderal taxa. This shows a more intense anthropic use of the area. From the Late Middle Ages onward this trend increases. During this period there is also a large vegetation modification visible due to fire and grazing. The relative abundance of shrub type vegetation also increases markedly, showing intense anthropic use of the area. When considering forest versus open land dynamics the amount of forests in the area stays the same until circa 1300 years ago, after which there is an increase in open shrublands. Even though there was an increase in shrublands there was no increase in soil erosion, which might indicate that agriculture in the area was of low intensity and had a minor impact on the soil. For most of the period of study in this thesis the balance between herbaceous species and cultivated land favours that of cultivated land. This is evidence for a prominent use of the land for agriculture as opposed to pasture for animal husbandry. The last relevant observation of this study is the progressive paludification in the area caused by an increase in wetness from the Roman Era onward (López-Merino *et al.* 2010, 1978-86).

A third interesting study was done on another peat bog, which had as a goal to identify dryer and wetter periods during the last 2000 years (López-Días *et al.* 2010, 3542-4). This peatland was located at Huelga de Bayas, which is located further to the west in Asturias. Using variations between the Alkanes n-C_{23} and n-C_{25}, they were able to identify the start of a wetter period around ca. 250 AD, 1080 AD, 1270 AD, 1460 AD, and 1920 AD. This means that these dates represent the dates around which the environment was the driest, with the times in between those being the wettest (see figure 2) (López-Días *et al.* 2010, 3542-4).

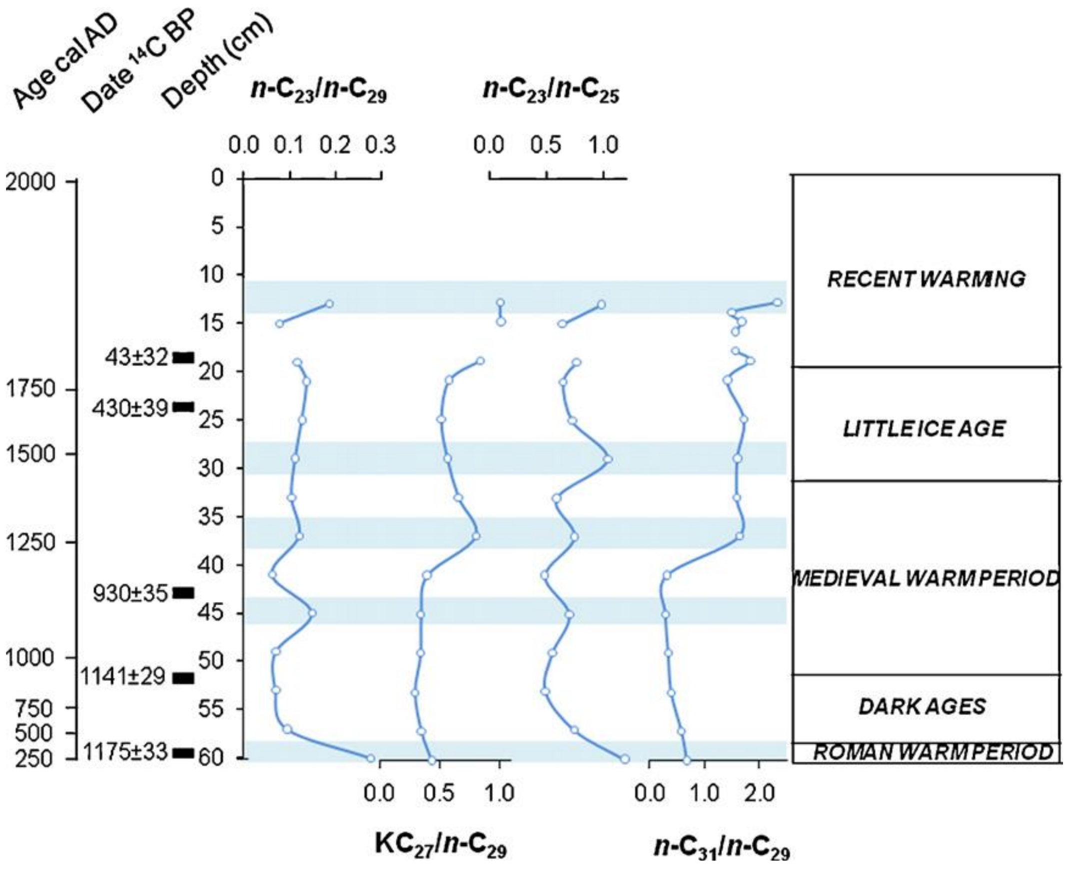

Figure 2: Graph of n-C23/n-C25 distribution indicating wetter and drier periods (Source: López-Días 2010, 3542).

2.4 Animal husbandry

This topic is central to the research questions of this thesis. The historical animal husbandry practices of the province of Asturias have not been studied deeply archaeozoologically and this is why some more general studies on the (Christian) medieval practices will be presented alongside some more specific studies from the surrounding Cantabrian regions.

First of all, many factors can influence the abundance in which animal species are exploited. Changes in these ratios can come from many different levels of society and be caused by both cultural and ecological factors. One of these factors is the urbanisation rate of a region, which is lower in the north of Spain than in other regions (Valenzuela-Lamas and Albarella 2017, 406). Another factor that can greatly influence animal husbandry strategies is the amount of production for trade and the extent of the trade networks in the region. When political structures change, such as at the time of the Roman conquest, requirements for production and dietary preferences may be the cause of such changes. This does not only happen due to Roman influences but also due to the region, now connected, influencing each other. After the Roman conquest of the Iberian Peninsula, the extend of the trade networks also grew and it allowed for specialisation, a better adaptation of their husbandry strategies to the environment, and development of better livestock and strategies (Valenzuela-Lamas and Albarella 2017, 407-8). This trade network was supported by the Empire's superstructure because, for instance, it allowed for the maintenance of infrastructure. This increase in connectivity is especially true for urban sites, villae, and military sites, whereas the rural sites continued in a way reminiscent of the Iron Age. During that time animal husbandry was unspecialized and small scale in most cases. The trend was on smaller size animals, i.e. not cattle but mostly sheep and goat. The end of this connectivity after the collapse of the Empire most regions returned to this type of animal husbandry (Valenzuela-Lamas and Albarella 2017, 409).

For the north of the Iberian Peninsula during the early Roman Period, there is a dual trend in the ratios of the three main domesticates (cattle, sheep, and pig) (Colominas *et al*. 2017, 524). There is a vast number of sites where cattle are the predominant species, with pig mostly in second place, at some sites they even reach between 30 and 40 percent of the total NISP (Colominas *et al*. 2017, 524). On some sites, however, caprines are the most abundant. This is a higher relative abundance for both pig and cattle than recorded for the previous period, which might be caused by an increase in population during the Early Roman Period and influences from other regions (Colominas *et al.* 2017, 524-6 and Valenzuela-Lamas and Albarella 2017, 402-9).

When comparing the size of these species during the early Roman period with their sizes during the late Iron Age, the size of cattle and sheep seem to increase, especially in those regions with an early Romanization (Colominas *et al*. 2017, 524-6; Colominas 2017 9-22). Such an increase in size, especially for cattle, has been reported for the entire Roman period (Valenzuela-Lamas and Albarella 2017, 402-9). There seems to be an increase in the variety in pig sizes on the sites created during this period (Colominas 2017, 9-22).

In terms of exploitation strategies interpreted through the analysis of mortality profiles, older specimens of both caprines and cattle at the time of slaughter are particularly abundant, indicating a focus on the secondary products of these animals. Even though the meat of these old animals was also consumed as well as that of other age groups more optimal for meat exploitation, the focus of meat production was likely on the pig, which has no secondary products and increases in abundance during this period (Colominas *et al*. 2017, 524-6).

The Roman conquest also impacted the representation of other species. There is an increase in the abundance of horses, but also donkeys and the hybrid forms between those two (Colominas *et al.* 2017, 527). The size of dogs increased and from then on appear in three size categories: hypometric (between 22 and 37cm), medium and hypermetric (taller than 60cm). New species are introduced like cats, camelids, and monkeys. The practice of hunting is marginal and it was likely an activity done for leisure, to obtain skins or to protect farms. The mammals that were mostly hunted are deer species and rabbit (Colominas *et al.* 2017, 527-8).

After the fall of the Roman empire, a lot of changes in animal husbandry have been reported for most regions of the old empire. One of these changes is that livestock seems to decrease in size during this period, reaching their minimum between the 8^{th} and the 9^{th} century (Grau-Sologestoa 2015, 123). This was probably caused by non-selective breeding and a free-range keeping husbandry style. Cattle were large during the Roman Era because all the livestock mobility that took place strongly improved the Iron Age cattle. Sheep and goats during the Roman Era were slightly larger than average and decreased in size after the Roman Era, reaching their smallest size during the 8^{th}/9^{th} century (Grau-Sologestoa 2015, 125-8). During the Late Middle Ages, they did increase in size again in all of the Iberian Peninsula, probably due to a focus on wool production (Davis 2008, 991-1010; Grau-Sologestoa 2015, 128). The size of pig also decreased during the Early Middle Ages but increased again between the 10th and 15th centuries. These changes were possibly accidental, but later documentary sources show that the improvement of livestock was likely intentional (Grau-Sologestoa 2015, 128). The decrease in size was possibly also intentional, but economically this would not be desirable. It is especially cattle for which the most size increase has been reported during Roman times. The cause of this may be an intensification of agriculture and thus a larger need for ploughing cattle. This may have been done by selection in already existing herds, the introduction of foreign larger cattle, or different feeding techniques (Grau-Sologestoa 2015, 123-32).

Animal husbandry also changes in other ways than animal size during the Middle Ages. These changes have been studied in detail in the Basque country. The sites of this study showed a predominance of sheep/goat, with only one exception. This exception was probably due to its location close to pastures of high elevation, which is similar to the situation in Asturias. Sheep and goats were kept until old age, indicating use for secondary products, but cattle were either killed relatively young or old, which shows a dual focus on milk/meat and traction. On most sites breeding can be seen as a secondary product for pig, as these pigs were kept mainly for the production of more pigs for sale and not for consumption or butchery on-site (Sirignano et al 2014, 6-7).

Two sites also showed evidence for the use of domestic animals to pay rent. This interpretation was given to the absence of pig posterior limbs at the site of Zornoztegi, which is a site that was classified as a rural community likely dependent on a high-status site. At the other site – the high-status castle of Treviño- young animals and pigs predominated, which was thus interpreted as a rent-seeking site (Sirignano et al 2014, 7-8). The seasonality derived from mortality profiles in some sites also shows evidence of short-distance transtermitance (i.e. vertical transhumance), which may be due to high pressure on cultivated lands during this period. During the Early Middle Ages, this was mainly carried out with cattle, which additionally requires larger pastures. This transtermitance may also have caused seasonal kill-off patterns. Overall, these (Christian) sites are marked by high product diversification throughout the Middle Ages, indicating a self-sufficient economy with a focus on agriculture instead of animal husbandry (Sirignano *et al.* 2014, 8-9).

An important factor when considering the diet of sites on the Iberian Peninsula during the Middle Ages is religion. For most of the Middle Ages, large territories of the Iberian

Peninsula were Muslim. The province of Asturias, however, remained Christian. The Muslim regulation of the diet includes a series of rules concerning animal consumption such as the consumption of Halāl (allowed) meat from herbivores slaughtered under the Islamic tradition and, which is widely known for the prohibition of pork consumption (Morales Muñiz *et al*. 2011, 304). The abundance of pig in the Islamic part of Spain is therefore usually low. Sheep/goats are most abundant on these sites, followed by cattle. This pattern is not stable throughout the Middle Ages. More pigs are consumed at earlier stages, reflecting a gradual change towards Islamisation (Morales Muñiz *et al.* 2011, 301-19; García-García 2017, 92-5).

A factor that also needs to be considered during the Middle Ages is the differences between urban and rural sites. Some animals were more suitable for urban animal husbandry than others. One of the species more suitable for urban environments is the pig and is therefore likely more abundant in such places (Grau-Sologestoa *et al.* 2016, 4-6). It is also important to keep in mind that breeding activities were more likely to have taken place in rural sites. The animal remains found on urban sites are therefore likely to show a different mortality profile than in rural areas. In urban sites at the end of the Middle Ages, there are also tendencies towards more economic specialisation and the improvement of breeds as a response to urban demand and an increase in connectivity. One of the developments associated with this is the substitution of cattle by equids as a traction animal. There is also a development of standard butchery practices, as indicated by vertebrae chopped along the sagittal plane (Grau-Sologestoa *et al.* 2016, 4-7).

Finally, in the case of the late medieval animal husbandry in most of the Basque country, an interesting observation was made. Most cattle were slaughtered at an adult to elderly age, which means a production focused on secondary products. Sheep/goat shows a very mixed mortality profile, indicating a variable use of the species for both meat, wool, and maybe even milk production. Pigs were slaughtered at younger ages at these urban sites, as is usual for exclusive meat production (Grau-Sologestoa *et al.* 2016, 1-11).

3. The Tabacalera Site

In this chapter the general stratigraphy and history of the Tabacalera site are discussed, as well as the characteristics of the material used in this thesis specifically. The chronology of the Tabacalera site is long, spanning from the Late Roman Era to the 20th century. The focus of this thesis is on the material from the medieval layers, which are compared to the earliest layers of the site. This leaves out the material from more recent layers, which therefore are only briefly discussed.

3.1 Excavation

The last purpose of the Tabacalera site was as the name suggests that of a tobacco factory, which closed in 2002 (Peña-Chocarro *et al* 2019, 155). After this, the factory site remained vacant for some years but was then cleared to be used as a cultural centre. Because of its known history as an Augustinian convent, archaeological research was needed at the site. The first series of excavations began in 2007 and were carried on until 2009 (Perez *et al*. 2015, 333). The excavation on the interior of the convent was started at the end of the 2007 campaign. This area was named area A and originally four test trenches were planned (A8, A9, A10, and A11; see Figure 3), but this plan was later modified after remains older than that of the convent were discovered. The northern part of these remains (later confirmed to be a Roman water cistern) was excavated during the 2008 difficult and slow due to the high groundwater level in the deeper layers. To excavate this area water pumps and pulleys were needed.

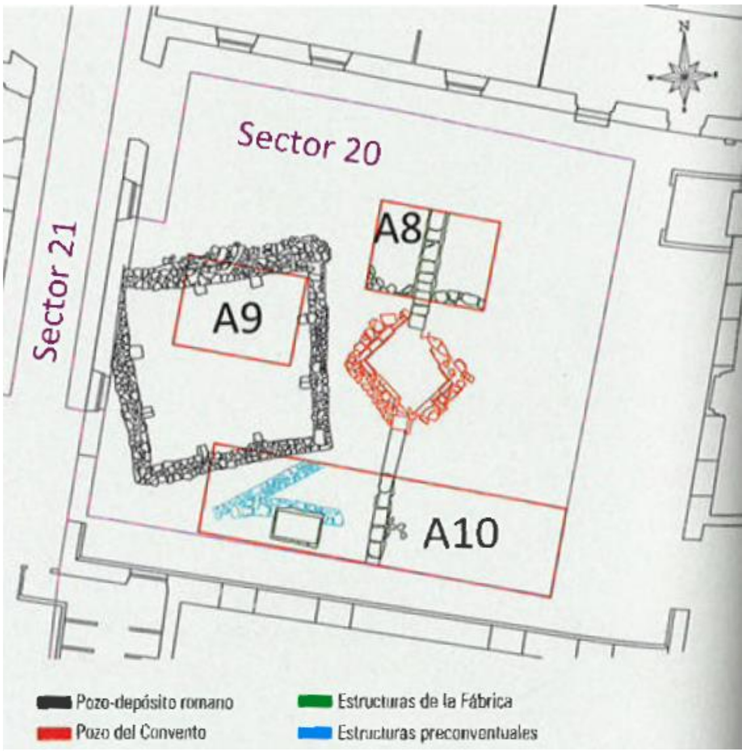

Figure 3: Map of the Tabacalera site (zone 20). Black: Roman well-deposit, Red: well of the convent, Green: remains of factory, Blue: remains dating before convent. Source: Fernández Ochoa 2015, 114.

Due to the slow progress, it was decided to excavate the southern half of the cistern during the 2009 campaign.

Besides the excavations inside the convent, areas next to this building were also excavated, where some medieval material was found and it is part of the material discussed in this thesis. The areas were located on the east (Area B) and west (Area C) side of the convent, but were still located on the same allotment as the convent (see Figure 3) (Ochoa *et al*. 2015, 114-6).

3.2 Stratigraphical sequence

The area of which the most detailed stratigraphical information is known is that of area A, inside of the convent, whereas of the Areas B and C limited information is available. The only information available of Area B is that the material from this area was dated to the Middle Ages according to the material culture (Dr. Almudena Orejas, personal communication). There is no information on any more specific dating. The material was said to date to before the construction of the convent, which was in the late 17th century. It must be assumed that the dating was done based on the stratigraphy relative to the construction layers of the convent. The material from this area can, therefore, be dated to earlier than the end 17th century AD, but probably later than 6th century AD. An unpublished radiocarbon date of hake in one of these contexts confirms the ascription to the Late Middle Ages (Llorente Rodríguez, personal communication).

In the case of Area A, much more information is available. The oldest remains are dated between the 5th to 6th centuries, which corresponds to late Roman times (Fernández Ochoa *et al.* 2015, 114-7). The remains consist of a cistern built as part of the water management for the Roman town situated in the Cimadevilla district of Gijón. The material found in these layers is very diverse, because of the exceptional preservation of bioarchaeological remains due to the high groundwater level, that preserved the archaeological material in an anaerobic environment. The walls of the cistern were built directly onto the geological substrate after the right area was cleared. The walls are supported by small buttresses on the inside of the wall. The cistern was built to capture water from a nearby aquifer and was likely cleaned regularly during its use. As no material of the construction was preserved, it is not clear when during the Roman period, the cistern was built, which only leaves the material deposited after it fell out of use. These are the layers dated to the end of the 5th century to the beginning of the 6th century. At this time, the abandonment of the cistern occurred probably as a consequence of the dumping of complete carcasses that spoiled the water (Morales Muñiz *et al.* 2020, 415-24). The cistern thus logically predates this period. After this period the structure on top of the well was intentionally demolished, to seal the well off.

The demolition of the tower on top of the cistern has been linked to a siege of Gijón that took place in 1390, after which a large part of the older structures in Gijón has said to have been demolished. After this event, the few literary sources that reference the upper part of Cimadevilla, mention that this part of the city was largely abandoned. The farmhouses located in Cimadevilla are placed on the lower part of the hill, the upper part of the hill (which is where the Tabacalera site is located) being dominated by orchards and a few scattered structures (Fernández Ochoa *et al.* 2015, 117-24). This explains the later construction of a convent in this area.

The layers after the demolition of the cistern are less well preserved than the lower layers, but still contain a large amount of material. The layers after the demolition contain a mix of ceramics from the 15th to the 16th century. These layers seem to have been used for the levelling of the ground on top of and next to the cistern and are therefore not stratigraphically organised. They cover the gap in the construction between 1390 (the demolition of the cistern) and the late 17th century (the construction of the convent), which is also the dating of these layers (Dr. Almudena Orejas, personal communication). The material from area A used for this thesis comes from these layers. This period is followed by the construction and use of the convent of Agustinas Recoletas. These layers contain little archaeological material. The convent of Agustinas Recoletas was in use until 1842 when the convent was converted into a tobacco factory, which was in use until 2002 (Fernández Ochoa *et al.* 2015, 124-5). The most recent layers exist of those dated to the time the tobacco factory was in use.

3.3 Material

The material that was studied for this thesis derives from different stratigraphical units and all three areas of the site (Table 1). All the material is considered to be from the Middle Ages in broad terms, but for some, a more specific date is known. During the analysis of the material, it was decided to use the broadest dating (which is the dating for Area B) to be able to use the most material possible. However, the dating of the stratigraphy is discussed in specifics, as some dates are more frequent than others and the conclusions drawn for the material later in this thesis are more likely to concern those periods. Stratigraphical units [2016 Sector29 AMPF BTE UE27], [TB SECTOR27 FOSA1 BOLSA 7], and [Sector 21 Sondeo SE UE4 OBS: Zona N] are related to the graves found in the convent. They are likely from the period of the use of the convent and thus date to the period between the end of the 17th century and 1842 (Rascón Pérez *et al.* 2015, 333-42). The fragments from these units are therefore excluded from further analysis. Three contexts have been dated to the late Roman Era. These contexts contain only five fragments, which has no significant effect on analysis, but they are added to the numbers available for the rest of the material from this period. As that material is only used for comparison in the discussion chapter, they are not included in the material discussed in the results chapter, as that material is strictly dated to the Middle Ages. All other material derives from layers dated to between the abandonment period and the construction of the convent, which is between the 8th and the 16th century AD. Most of these units are likely to come from stratigraphical layers dated to the 14th to 16th century, but as there are also layers which date to the 8th to 13th century and it is unclear if any of the units come from these layers, they are dated to the broader 8th to 16th century. This is likely also the dating of Area B, which is where most of the rest of the fragments come from. The 2,012 fragments from areas A and B are therefore from this point onwards analysed as one assemblage dating to the 8th to 16th century. Nine fragments come from area C. For this material, the same information was given as for area B and they are therefore also dated to the 8th to 16th century and added to the assemblage used for further analysis. All material was collected by hand except those associated with the graves, which came from soil samples.

For stratigraphy, all stratigraphical information present on the labels included with the material was noted. Some stratigraphical codes were present more than once, indicating stratigraphical units with more animal bone fragments. The codes usually followed one of two formats: TB for Tabacalera followed by six numbers or code with TB followed by 08 or 09 (year of excavation) and three letter-number combinations. The first of these combinations indicate the area of excavation, the second the stratigraphical unit, and the third the material (in this case animal bone). Some labels follow neither of these formats.

Area	Stratigraphical Units	Dating	Number of Fragments
A	[2016 Sector29 AMPF BTE UE27], [TB SECTOR27 FOSA1 BOLSA 7], [Sector 21 Sondeo SE UE4 OBS: Zona N]	17th-19th century	4
	TB.08.20.83B, TB.09.20.83, TB.09.20.83D	5th -6th century	5
	TB.08.20.11, TB.08.20.20, TB.08.20.21, TB.08.20.32, TB.08.20.36, TB.08.20.37, TB.08.20.44, TB.08.20.45, TB.08.20.46, TB.08.20.48, TB.08.20.49, TB.08.20.52, TB.08.20.53, TB.08.20.54, TB.08.20.55, TB.08.20.56, TB.08.20.58, TB.08.20.60, TB.08.20.61, TB.08.20.63, TB.08.20.65, TB.08.20.67, TB.08.20.69, TB.08.20.72, TB.08.20.77, TB08A10U2H1, TB.08.A10.U3.H1, TB.08.A5.U10.H1, TB.08.A5.U9.H1, TB.08.A6.U11.H1, TB.08.A7.U11.H1, TB.08.A7.U13.H1, TB.08.A7.U3.H1, TB.08.A9.U4.H1	8th-16th century	1,124
B	TB.08.B1.U6.H1, TB.08.B2.U7.H1, TB.08.B2.U8.H1, TB.08.B5.U7.H1, TB.08.B6.U5.H1	8th-16th century	888
C	TB.08.C7.U2.H1, TB.08.C7.U3.H1, TB.08.C7.U4.H1	8th-16th century	9

Table 1: Stratigraphical units of the material sorted by area with associated dating and number of fragments.

4. Methodology

The mammal bone fragments were determined anatomically and taxonomically to species level, whenever possible, using the reference collection at the Laboratory for Archaeozoological Studies of the faculty of Archaeology (Leiden University). If required, atlases and specialised literature were used to complement taxonomic identification, especially of close related species (eg. Boeschneck, 1969; France, 2010; Hillson, 2005; Hillson, 2016; Johnson, 2015; Pales and Lambert 1971a; Pales and Lambert 1971b; Schmid, 1972; Zeder and Lapham 2010; Zeder and Pilaar 2010).

During determination, all possible information was put into a database. The program that was first used was Microsoft Office Excel 2019, but after the initial determination, a switch was made to Microsoft Office Access 2019. The database made in Excel was still used for some forms of basic analysis, such as the analysis of weight distribution between species. The following characteristics were notated in the database during determination: stratigraphy, taxa, element, number, fragmentation, orientation, zones, epiphyseal fusion, sex, pathologies, biological agents, anthropic agents, natural agents, other traces, tooth wear stages (TWS) or general wear, osteometry, weight, and observations.

The codes that were used in the database were provided by Dr. Llorente Rodríguez and are largely based on the taxonomic names of the species. There are some exceptions to this, mainly when the fragments could not be identified to species level. One of these is when the distinction between sheep and goat could not be made. In these cases, the code o/c was used for *Ovis/Capra*, which are the genus names for both species. The other instance in which the taxonomic names are not used is when fragments could only be identified to class level. In these instances, medium or macro mammal is used. Medium mammals are mammals the size of pig, sheep/goat, and dog. Macro mammals are mammals the size of cattle and horses. If no size indication could be made only unidentifiable (code: unid) was noted. The full list of codes is included in appendix A.

In the case of the bone elements, the Latin names are used except for the case of the horncore. For the unidentified medium mammal, macro mammal, and mammal categories other categorizations and codes were used than those used for elements determined to species or Genus level. In most cases, it is not possible to determine the bone in these categories to a precise element, and thus broader elemental categories were used. These categories are cranial, girdle, rib, vertebrate, appendicular, and unidentifiable. For cranium sometimes the difference between neurocranium and viscerocranium was made, but only on fragments clearly only containing one of these parts. For the fragments in the broader categories only stratigraphy, taxonomical category, elemental category, number, and weight were noted.

4.1 Quantification, fragmentation and orientation

The relative amounts of species in an assemblage can be summarized using many different abundance estimators in Archaeozoology. In this thesis, the three most common methods were used. These are the NISP, which is an abbreviation for the Number of Identified Specimen, MNI, which is an abbreviation for Minimum Number of Individuals, and Weight (Lyman 2008, 298). The NISP is the absolute number of fragments belonging to an identifiable element that has been assigned to a species or category (Marshall and Pilgram 1993, 261-4). The NISP can overrepresent a species when complete or almost complete skeletons are involved, as one individual can contain many hundreds of bones. However, it is a method often used in zooarchaeological reports and therefore makes it easier to compare between different assemblages and sites. The second method is the MNI, which is also a method often used. It is mainly useful because it no longer overrepresents complete skeletons and therefore makes relative abundances more reliable. During this research, the MNI was calculated by taking the most abundant elements and the most abundant orientation. After this repetition was also analysed to make sure fragments likely belonging to the same individual were not counted double. The last method is the comparison of the weight of the fragments found. When comparing species for the use in the analysis of diet and husbandry, it is fairly unreliable. However, it is a useful method to analyse fragmentation and the determination rates achieved during determination.

The fragmentation was noted first by a simple yes or no followed by the description of diagnostic zones present in the element that provide a more detailed indication of the amount of bone present. The percentage of the element present is discussed in more detail under the characteristic zone.

Orientation is noted using D or S, which is an abbreviation of dextra (right) and sinister (left).

4.2 Zones

The codes for most of the zones follow the standard used at the Laboratory for archaeozoological studies, which are largely numerical and are simplified from those in

Dobney and Rielley (1988, 79-96) with additional notation for diaphysis fragment (DF) and diaphysis splinter (DS). The numeric code is different for each element and a full list is provided in Appendix A. For some elements a numeric code is not available. In most of these cases, a percentage was given. These percentages are a pure estimation and therefore can only be used as an indication and not as a true statistic. For the ribs, the zones were indicated by one and two for the proximal end, DF or DS for the diaphysis and five and six for the distal end. A zone is already noted when a part of that zone is present. The code does not indicate whether the zones are fully present or not.

4.3 Estimation of age and sex

Age was estimated using epiphyseal fusion, teeth wear stage, and teeth emergence calendars whose criteria are standardised in practical handouts at LAS-Leiden. These estimations and those to estimate sex follow the general reference manuals and publications (Boessneck 1969; Silver 1969; Grant 1982; Ruscillo 2006; Johansson and Hüster 1987; Payne, 1973). Sex determination was only possible for very few of the elements. Examples of when a fragment can be immediately sexed are canine teeth of pigs and the baculum of a dog. For other fragments sexing might be possible during later analysis using osteometric methods, but they are not noted in this database.

Epiphyseal fusion was indicated in the database by a system of +, -, +/- and ? codes noted for each fusion centre of the bone. The fusion of acetabulum is indicated only for the acetabulum. If an epiphysis is unfused this is indicated by -, if it is fusing by a +/- and if it is fused by a +. If the fusion is unknown it is marked with a ?. This results in codes like (+)/(?) for appendicular bones and vertebra, in codes like (+/-) for an acetabulum and in codes like /(-) for metapodia.

For lower premolar and molar teeth for cattle, sheep/goat, and pig the tooth wear stages used in Grant (1982) are used. For all other teeth, general wear is indicated. This is noted using the following code: +/ for little to no wear, ++ for medium wear, and +++ for heavily worn. When teeth that are normally assigned a TWS were too fragmented to be assigned one with any confidence, they were assigned a stage of general wear instead.

Mortality profiles were established using both data from the dental eruption and epiphyseal fusion. The advantage of using dental eruption and wear to establish a mortality profile is that also older individuals can be analysed. This is not possible when using an epiphyseal fusion method, as at a certain age all bones are fused and from that point onward no division can be made in the age of the animals. Because of this, differences can occur between the two methods whilst studying the same assemblage. By using both, the closest approximation of the true profile can be established. For both of these methods the larger the assemblage the more reliable the profile. Because of the research question posed in this thesis the mortality profiles are calculated for each period individually, which decreases the size of the assemblage. This means that the resulting mortality profiles can be rather crude. This is also true for most of the other methods used during the analysis of this study. To calculate the Mandible Wear Stage (MWS) of the dental elements suitable for a TWS, the method of Grant (1982) was used. Most of these elements were individual teeth and thus for those only a range of possible MWS could be calculated.

For the epiphyseal mortality profiles, the method of Habermehl (in Groot, 2010) was used for both cattle and pig. For sheep/goat, a mortality profile using this method could not be established, due to the limited amount of bones representing sheep/goat. For this taxon, the method of Silver (in Groot, 2010) was used. For taxa other than the three main domesticates a mortality profile could not be calculated as most elements found were fully grown and no TWS is available. Any interpretation made of the age of these animals is done on the basis of the general wear of the teeth.

4.4 Taphonomy

Taphonomy has been studied at different levels on the bone assemblages. The study of fragmentation relates to both the processes before and after the disposition of the bones. Most of all, fragmentation gives the first indication to the information that can be discerned from the assemblage and the preservation conditions of the stratigraphical units. In this thesis the fragmentation is indicated by the percentage of bones that are fragmented, the percentages present that are available, the tooth/bone index, and the determination rate. The tooth/bone index can mainly indicate to what extend the assemblage has been preserved as teeth often are preserved better than bones.

The taphonomic marks found on the animal bone fragments were recorded and divided into categories attending the possible agent causing the mark: pathologies, biological agents, anthropic agents, natural agents, and a miscellaneous category named “other traces”. All these categories are subdivided into the different types of marks within each category and then abbreviated into code for the database. What the marks look like and where on the fragment they are situated is discussed in further detail in the observations. The types for pathology are dental (PAD), traumatisms (PAT), congenital abnormalities (PAC), occupational (PAO), infectious (PAI), and various (PAV). The types of biological agents are chewed (ABC), digested (ABD), gnawed (ABG), fungi (ABF), and root (ABR). The anthropic agents are subdivided into the following types: sawing (AAS), scraping (AASC), cutmarks (AAC), chopmarks (AAP), fractures (AAF), drilling (AAD), industry (AAI; further subdivided into tools (AAT) and tool waste (AAW)), gnawing (AAG) and others (AAO). The types used to indicate natural agents are weathering (NAW), hydric erosion (NAH), eolic erosion (NAE), fractures (NAF; further divided into fresh (NAFF), and dry (NAFS)) and others (NAO). The other marks that are possible to occur on bone fragments are changes in colour (OTC), thermoalteration (OTT), and marks that fall under none of the categories mentioned above (OTD). When it is not clear what caused the fragmentation, it is noted under observations.

The marks present on a bone can give clues to many different aspects of animal life and bone taphonomy. One interesting aspect of this is the butchery marks. The systematic presence of butchery marks on a standard set of bones can indicate standardized husbandry practices and production focused on trade or exchange (Lyman 1994, 294-353). The absence of or sporadic presence of these markings may indicate the opposite and consumption of largely intact animals. Other markings such as burned bones may also indicate these practices. Butchery marks can also indicate other practices, such as the skinning of animals for their fur.

The presence of certain pathologies can indicate husbandry practices as well. One of these is the inflammation of carpal and tarsal bones and the bones in the shoulder area, as they are caused by strain on these areas when used as draught animals (Bartosiewicz et al., 1997). Some forms of inflammation found in archaeology are osteomyelitis, osteoperiostitis, and exostosis (Baker and Brothwell 1980, 63-81). Other pathologies and whether they are healed or not may indicate veterinary practices and how animals were treated overall.

Biological marks may give clues to taphonomic processes. The gnawing or otherwise marking of bones by animals can indicate that bones have laid on the surface for a while and were not buried or that the assemblage was even natural in origin and not accumulated by human consumption (Groot 2010, 77-88). Additionally, recent marks can indicate excavation practices and if any fragmentation occurred during this process and the later shipping and study of the bones. The animal bones in this assemblage are analysed for any such markings.

The analysis of the frequency of skeletal parts provides useful insight on the origin of the accumulation and spatial distribution of carcasses as well as the effect of scavengers or natural biases on the assemblages (Lyman 1994). The two methods used to determine the element ratios are those of Spennemann (1985 in Groot 2010) and Uerpmann (1973). They have the goal to distinguish between elements that were deposited first as complete skeletons and those that are refuse from anthropic processes. Spennemann (1985 in Groot 2010) compares the normal distribution of elements expected when a complete skeleton is deposited with the distribution of these elements found at a site. If this distribution strongly deviates from the expected distribution, this is likely to be caused by anthropic processes. If the elements that are overrepresented and underrepresented are studied, it is also possible to determine if this refuse concerns consumption refuse or production refuse. Uerpmann (1973) also uses over- and underrepresentation to study consumption. For this method, the elements are divided into those expected to derive from meat poor, medium meat, and meat-rich parts. The ratios between these parts can distinguish between production, consumption, and mixed assemblages.

4.5 Osteometry

For all measurements, the guidelines of von den Driesch (1976) have been used. All measurements were taken -when possible- of fused bones and relatively well-preserved specimens. When only small fragments of the bones were missing where normally a measurement would be taken, an approximate measurement was taken. All measurements were taken with an accuracy of 0.05 mm, except for the greatest length (GL), which was often too large to be measured with a digital calliper. These measurements were taken analogously with an error of 0.1mm.

For osteometric analysis, this assemblage consists of very few bones, especially ones that are complete enough to be measured. In the medieval layers of this material, enough measurable bones were found of cattle, but of sheep, goat, and pig there were very few. For the Late Roman assemblage, barely enough measurable bones were found for sheep and goat, but not enough for cattle or pig as a lot of the bones were unfused and could therefore not be measured. To overcome these difficulties, it was decided that no osteometric analysis would be done on the pig material, as measurements are very few for both layers. For sheep and goats, they were carried out using the Late Roman material and the medieval material from Tabacalera. As there are enough measurements of cattle taken from the medieval layers of Tabacalera, but not enough for the Late Roman layers, material from other sites in the region is used to supplement the material from Tabacalera in order to still be able to draw some conclusion on breed improvement.

Two osteometric analyses have been used with a different goal. The first is the Log Size Index (LSI) method (Meadow 1999, 285-300). This method is used to study if there is any evidence for breed improvement for sheep and cattle. By using this method, the measurements of different elements can be pooled, which makes it possible to use more measurements than when only using the measurements of one element. This helps make the most of the small number of measurements available at Tabacalera. For sheep, the elements only defined as sheep/goat are also used, as goats are few in this assemblage. The goats of which measurements were taken are used also to study possible bias of the sheep/goat material. The second method is the plotting of the greatest length (GL) against the smallest diaphysis (SD) measurement of the metacarpus or metatarsus in order to possibly divide the assemblage into sexes. This was done only for cattle, as the data of sheep was too limited. During this analysis, the data proved inconclusive and therefore none of the species was sexed.

4.6 Weight and observations

All weights were taken on a digital kitchen scale with a precision of 1 milligram. The weights were only taken of all elements of a species together per stratigraphical unit, as this gives all the information needed for analysis in this thesis. Under observation, all information was added that could not be noted under any of the other characteristics. Observation also includes all more detailed information that is also noted under the other characteristics.

5. Results

The medieval assemblage of the Tabacalera site consists of 2,030 animal bone fragments (Table 3). Nine of these have been excluded due to their dating, leaving 2,021 fragments dated to the medieval period. The nine fragments that were dated to other periods consisted of four fragments probably dated to a later period and five fragments dated to the Roman period (see Table 2). The fragments dated to the Roman period consist of an unidentifiable mammal fragment, two cranial fragments determined to the medium mammal category, which belongs to one individual, a fifth dog metatarsal, and a dog rib. The four fragments dated to a later period consist of three medium mammal ribs and a pig fibula. These fragments are not included in the rest of the analysis but are included in the database of Appendix B.

Of the total of 2,021 bone fragments, 45% of specimens (NISP) have been determined to species or genus level, whereas 55% were undetermined (Table 3). Of those that have not been determined to species level, the macro mammals are the most frequent with 26%, followed by overall unidentified (21%) and medium mammal (9%) (Table 3). The bones that have categorised as macro mammal are likely to be from cattle (*Bos taurus*) and secondarily horse (*Equus caballus*) attending to the higher frequency of the former within the identified fraction (25% of the NISP) compared with the horse (barely 1%) (Table 3). The fragments categorized as a medium mammal can be from a wider number of species, like sheep (*Ovis aries*), goat *(Capra hircus*), pig (*Sus domesticus*), dog (*Canis familiaris*) or cat (*Felis catus*).

5.1 Fragmentation

Only 66 of 2,030 bone fragments were not fragmented. However, 43 of these complete remains are in fact teeth, which often stay preserved better in zooarchaeological assemblages because they are more mineralized. The bones can also be compared according to how many zones were recorded. As some zones are larger than others and the percentage of the present zones is not given this is only an indication. For some bones that did not have zones, a percentage present was given, which we can also compare (see table 2).

The approximately 60 percent for which no zone is indicated are mostly those that have not been determined to species level, as for size groups and the general mammal category no zones needed to be indicated. However, for 41 fragments not determined to species level, a zone was indicated. For two this was a specific zone and for 39 this consisted of the diaphysis fragment or splinter zone. 133 of the fragments without a zone are determined to species level. 81 of these are fragmented teeth, for which no zones are available, and 47 are cranial or mandibular fragments existing of parts of the skull for which no zones are available. Most of the cranial fragments have general zones noted in the observations section. This leaves a patella and a sternum, which are fragmented, but of which the percentage present was unclear and a lumbar vertebra that existed only of a processus transversus. Only 3.3% was found to be complete, of which most are teeth. 441 only have one indicated zone and with the number of zones increasing, the number of fragment decreases, which is to be expected. Of those indicated with a percentage, the 81-99 percent category is the most frequent. This can be explained by the fact that most bones for which no zones are available are compact and small bones, such as the carpals.

Number of zones	Percentages	Number of fragments	Percentage of assemblage
1		441	21.72%
2		179	8.82%
3		75	3.69%
4		28	1.38%
5		3	0.15%
	1-20%	2	0.10%
	21-40%	3	0.15%
	41-60%	1	0.05%
	61-80%	5	0.25%
	81-99%	9	0.44%
No zones		1,218	60%
Complete		66	3.25%
Total		**2,030**	**100%**

Table 2:Assemblage split up into the number of zones or percentage present expressed in NISP and percentage of assemblage.

Another way to see how well preserved the bones are is by the determination rate of the assemblage. According to the NISP, this is 44% and according to weight 78%. However, weight is biased, as larger pieces weigh more and can be determined to species level easier. The NISP is therefore the most reliable. Of the undetermined assemblage, 35% could be sorted into a size category, leaving 21% of the assemblage completely undetermined. The determination rate is not high but approximates normal for a medieval assemblage (Groot 2010, 102-3).

The last method that can indicate preservation is the tooth-bone index. The tooth-bone index for the Tabacalera medieval assemblage is 7.04. As most layers exist of clay, which is a good preservative, this is a slightly elevated index for the dating of the assemblage. This indicates that the preservation of the material is slightly worse than expected, but still within a normal range (Groot 2010, 102-3).

	NISP	NISP %	NISP det. %	Weight(g)	Weight %	Weight det. %	MNI	MNI %
Bos taurus	515	25.5%	57.2%	13014	63.3%	80.2%	33	44%
Equus caballus	23	1.1%	2.6%	738	3.6%	4.6%	1	1.3%
Ovis aries/Capra hircus	155	7.7%	17.2%	1012	4.9%	6.2%	17	22.7%
Ovis aries	38	1.9%	4.2%	210	1%	1.3%	5	6.7%
Capra hircus	17	0.8%	1.9%	93.1	0.5%	0.6%	4	5.3%
Sus domesticus	120	5.9%	13.3%	1039.1	5.1%	6.4%	9	12%
Canis familiaris	28	1.4%	3.1%	164.9	0.8%	1%	4	5.3%
Felis catus	4	0.2%	0.4%	16	0.1%	0.1%	2	2.7%
Subtotal	**900**	**44.5%**	**100%**	**16227.1**	**79%**	**100%**	**75**	**100%**
Macro mammalia	518	25.6%	-	3254.2	15.8%	-	-	-
Medium mammalia	184	9.1%	-	314	1.5%	-	-	-
Unidentified	419	20.7%	-	699	3.4%	-	-	-
Subtotal	**1121**	**55.5%**	**-**	**4327.2**	**21.1%**	**-**	**-**	**-**
Total	**2021**	**100%**	**100%**	**20554.3**	**100%**	**100%**	**75**	**100%**

Table 3: Species distribution of the Medieval assemblage according to NISP, NISP percentage of total assemblage, NISP percentage of the total determined to species, Weight (in grams), percentage of total Weight, percentage of the total weight of determined species, MNI and percentage of total MNI.

5.2 General Analysis

The most abundant determined species in the assemblage is cattle representing 25% of the overall assemblage, a significant 57% of the taxonomically determined NISP, and 44% of the MNI (table 3). Although its weight constitutes 63% of the overall assemblage and 80% of the determined fraction. This is more related to fragmentation as can be seen with the estimated mean weight of remains (i.e. taxa weight/NISP) for which cattle have a mean weight of 25 gr per fragment suggesting a high fragmentation rate of cattle bones. If we assume that much of the undetermined macro mammal remains are also cattle, their low mean weight per fragment (6 gr), suggest a heavy fragmentation of cattle bones, probably due to butchery practices.

The second most frequent taxon is sheep/goat with 7.7% NISP (Table 3), a figure that becomes 10.4% when the determined to sheep and goat fragments are added up totalising 210 specimens, of which 38 are sheep and 17 are goat. The total sheep/goat then represents 10.4% of the total NISP assemblage or 23.3% of the determined species. When the number of MNI is studied, the sheep/goats account for 34.7% of the assemblage. According to weight, this is 6.4% of the total assemblage and 8.1% of the determined species. The mean weight of the fragments of this taxon is 6 gr, which also suggests heavy fragmentation for sheep/goat. This explains the high amount of sheep/goat fragments as opposed to those determined specifically to sheep or goat. This is especially true when it is considered that some of the medium mammal fragments can also be attributed to this taxon, of which the mean weight is less than 2 gr. This is probably also due to butchery practices.

The third most frequently determined species is pig with 5.9% of the total NISP assemblage and 13.3% of the determined one, close to the MNI of pig, which is 12% of the assemblage. In terms of weight, pig bones represent 5% of the total assemblage and 6.4% of the determined assemblage. The mean weight is 9 gr, which is higher than that of sheep/goat. This may be due to the heavier weight of pig bones or a lesser fragmentation. These three most frequent taxa are exploited for consumption.

The other three species that have been determined in the assemblage are horse and companion animals, but all three represent a NISP abundance below 5% independently of if the whole assemblage is taken into account or only the taxonomically determined fraction (Table 4). Amongst these, the most frequent is dog with 28 NISP, which is 1.4% of the total assemblage or 3.1% of the determined species and a weight of 0.8% of the total assemblage and 1% of the determined assemblage. Despite the low NISP contribution, four dogs have been determined that represent 5.3% of the MNI. Dog is followed by horse in abundance by NISP, MNI and weight (1.1% NISP, 2.6% of the determined NISP, 1.3% MNI and ca. 4% weight) and the least frequent species in the assemblage is cat (0.2% NISP, 0.4% of determined NISP, 2.7% MNI and ca. 0.1% of the weight).

As aforementioned, there are three domesticates in this assemblage which are the species that are commonly consumed. They are also the most abundant. This is to say that it is not excluded that other species can and were not eaten, but these were kept specifically for food production (table 4). The three main domesticates constitute 93.8% of the NISP of determined fragments, 94.3% of the weight of the determined species, and 90.8% of the MNI.

	NISP	NISP %	NISP det. %	Weight	Weight %	Weight det. %	MNI	MNI %	MNI det. %
Bos taurus	515	61%	57.2%	13014	84.7%	80.2%	33	48.53%	44%
Ovis aries/ Capra hircus	155	18.3%	17.2%	1012	6.6%	6.2%	17	25%	22.7%
Ovis aries	38	4.5%	4.2%	210	1.4%	1.3%	5	7.35%	6.7%
Capra hircus	17	2%	1.9%	93.1	0.6%	0.6%	4	5.88%	5.3%
Sus domesticus	120	14.2%	13.3%	1039.1	6.8%	6.4%	9	13.24%	12%
Subtotal	**845**	**100%**	**93.9%**	**15368.2**	**100%**	**94.3%**	**68**	**100%**	**90.8%**
Other determined	55		6.1%	918.9		5.7%	7		9.3%
Total	**900**		**100%**	**16227.1**		**100%**	**75**		**100%**

Table 4: Distribution of three main domesticates according to NISP, NISP percentage of three main domesticates total, NISP percentage of determined assemblage, Weight (grams), the weight percentage of three main domesticates total, the weight percentage of determined assemblage, MNI, MNI percentage of three main domesticates total and MNI percentage of determined assemblage. a) Sheep/goat total: 210 NISP, 24.85 NISP%; 1315.1 weight, 8.56 weight%; 26 MNI, 38.24 MNI%

The studied assemblage entirely consists of domesticated animals. This suggests that the assemblage almost entirely derives of consumption/production refuse. The complete absence of wild species may indicate that hunting was not part of the diet or that the remains of these animals were not dumped here. More on this is discussed in the next chapter.

Fish and birds are also absent from the assemblage, but the reality is that they were sorted out to be determined by other researchers. Some birds have been determined and thus are discussed later in this chapter as well as a premaxilla of a hake.

5.3 Cattle

The most frequent species with 515 remains does not present a homogenous skeletal distribution as can be seen in Figure 4. It is expected that the bigger elements are the most frequent and the smaller ones are less frequent due to the excavation retrieval bias (hand collection of bones) to which we have to take into account some anthropic selection of elements deposited in the assemblage. The elements that are the most frequent are the metapodia and the teeth/mandibula but the femur and tibia are also well represented (Figure 5).

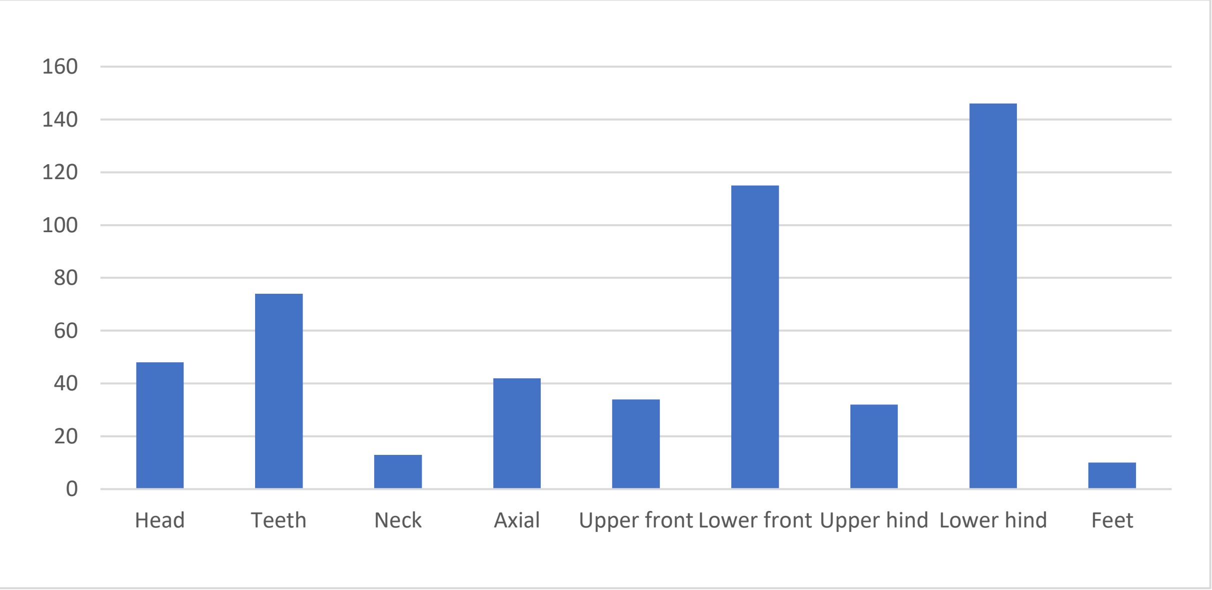

Figure 4: Distribution of cattle fragments by the anatomical regions of Stiner (2002).

The larger presence of the teeth may be purely taphonomical as they preserve better than bones. The overrepresentation of the metapodia is likely to be caused by an assemblage which largely consists of the deposition of production waste. Alongside metapodia, the upper hindlimb bones (femur and tibia) are frequent as well, especially in contrast with the front limb bones. Concerning femur and tibia, these are large and resistant bones, especially tibia might be related to taphonomic processes as well. Although a selection of meat-rich elements such as femur cannot be ruled out. The method of Uerpmann (1973 in Kootker *et al.* 2016) can be used to divide the body into high meat (vertebrae, scapula, pelvis, upper front limb, and upper hind limb), medium meat (lower limbs, the neurocranium, mandibula, ribs, and sternum) and low meat (viscerocranium, caudal vertebrae, and feet) zones. This results in a ratio of roughly 4:3:7. This division also points to a production waste assemblage.

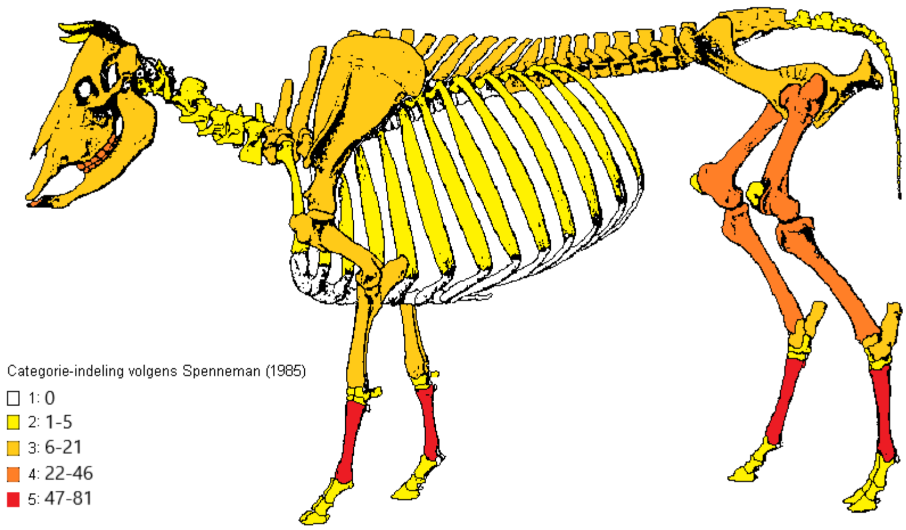

Figure 5: elemental distribution for cattle according to the Spennemann method (1985 in Groot 2010).

For cattle, two mortality profiles were made: one based on the epiphysial fusion of the bones and another based on tooth wear stages and emergence (Figure 6 and 7). The mortality profile according to the epiphyseal fusion shows that most cattle were killed after four years old, with an increase during the 3-4 years age (Figure 6). Hardly any cattle were killed before that age. The mortality profile based on tooth wear provides more detailed information although it shows a very similar peak of cattle killed between the 2.5-3 years. According to both profiles, it is likely that there was a diverse focus of production, with a part of cattle being slaughtered for meat as sub-adults and a part kept until older age for the production of secondary products, such as traction and milk. It is also important to consider the taphonomy bias underrepresenting neonatal and juvenile remains. The lack of mortality peak amongst calves may indicate a focus on meat and traction rather than milk, but this might be due to this taphonomy bias. The proximity of cereal fields found in the botanical remains might also support this hypothesis.

Finally, although it is not that standardized, general wear of upper molariforms was recorded. This indicates 7 teeth with minimal wear, 21 with medium wear, and 2 heavily worn. These values also support the profile of the other methods.

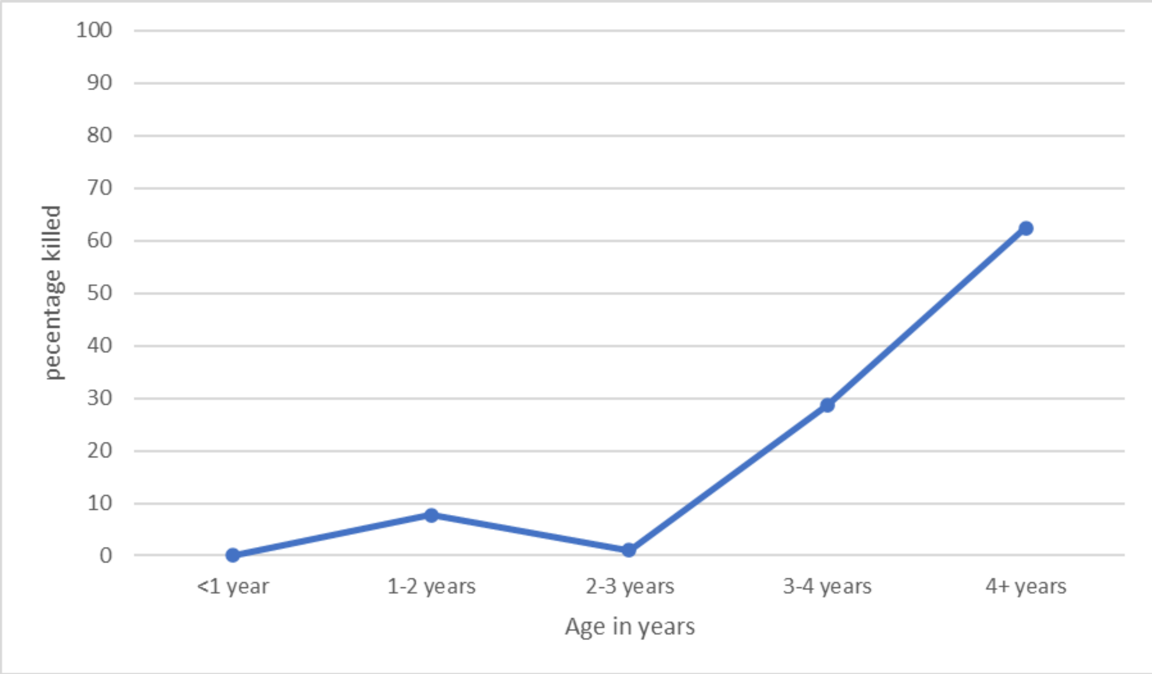

Figure 6: Mortality profile of cattle based on epiphyseal fusion according to the method of Habermehl (1975 in Groot 2010).

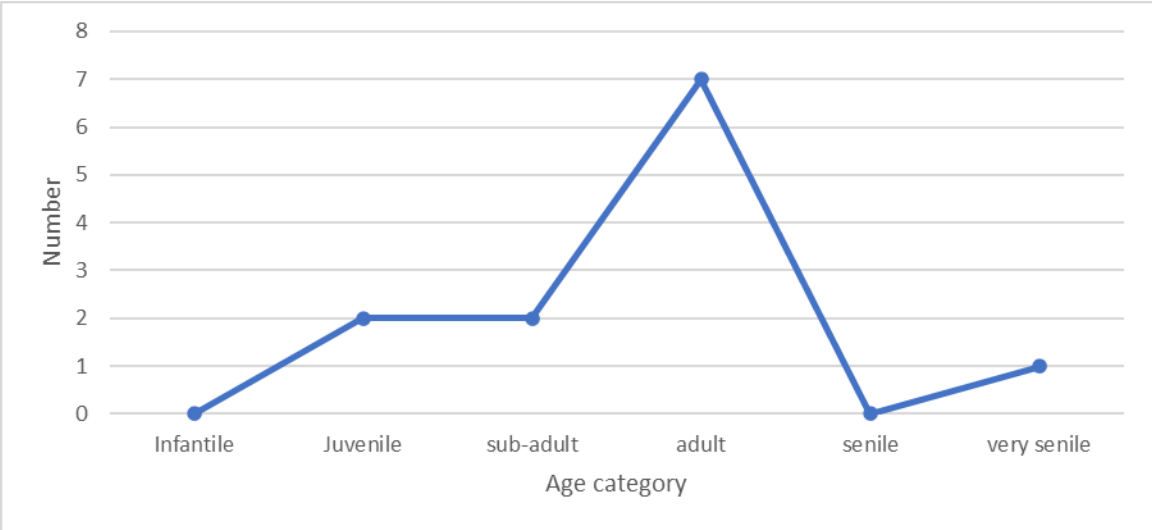

Figure 7: mortality profile of cattle based on tooth wear according to Grant (1982) and Halstead (1985 in Groot 2010).

It was attempted to sex the cattle in the assemblage, but it was impossible to get more than two greatest length measurements of metacarpus and only very few distal parts of metapodia were present.

The available measurements were used to study the size of animals and to analyse whether an increase in those measurements occurred between the Late Roman Era and the Middle Ages using a Log Size Ratio technique. For the Middle Ages, this assemblage was used. For the late Roman Era, data from the relatively nearby sites of Astorga (Léon) and Termas Campo Valdés (Gijón) were used. The Log Size Ratio needs a standard to compare the ancient data. For this standard, the measurements from a recent Avileña breed were used (L. Llorente Rodríguez, unpublished data). The distribution of the medieval cattle from the Tabacalera site is less detailed, as only fewer measurements were available for this period (Figure 9). When comparing the Roman and Medieval histograms (Figures 8 and 9) it becomes immediately clear that there is a reduction in the size of cattle between the Late Roman period and the Middle Ages. First, we can observe that the normal size distribution of the Roman cattle is more centred around the standard that corresponds to the 0.00 value (Figure 8), whereas the medieval size distribution is more skewed to the negative values (to the left, Figure 9) with just one single value in the positive values. That suggests that the medieval sample is smaller than the standard. This is also suggested by the mean, which is -0.03 for the Late Roman assemblage and -0.10 for the medieval period. The standard deviation for both assemblages is very low and almost the same (0.039 for Roman and 0.04 for medieval) suggesting again homogeneity within the samples.

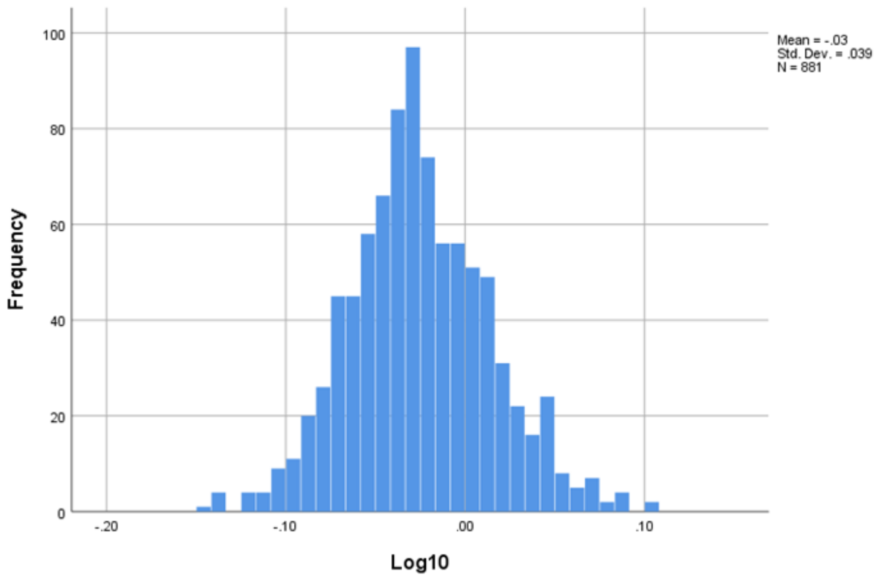

Figure 8: Log Size Ratio of Late Roman Cattle.

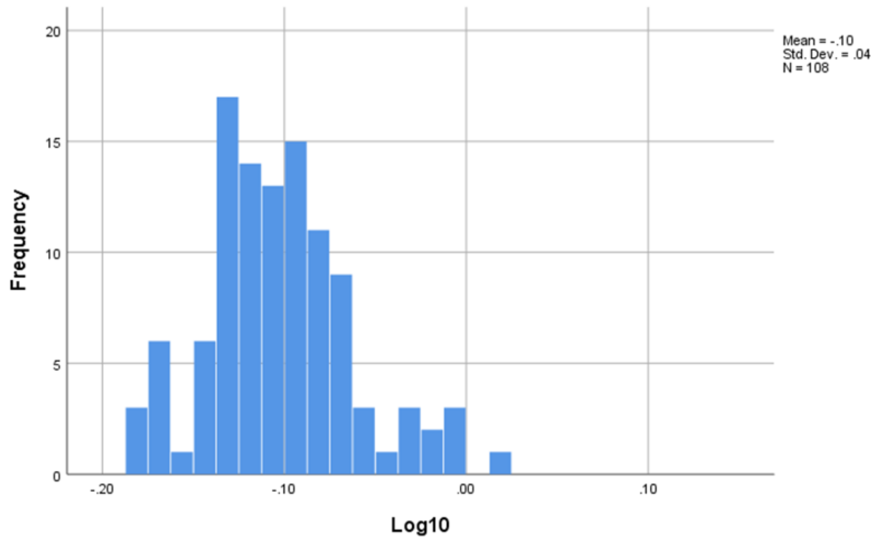

Figure 9: Log Size Ratio of medieval Tabacalera cattle.

The last cattle analysis was done on the marks on the bones and their locations. Most of the butchery marks are located on the appendicular bones. On the femur, most chopmarks were found on the proximal part of the bone and they were likely caused by the separation of the leg from the body. The chopmarks on the humerus were all detected distally, which might indicate the separation of the lower forelimb from the upper forelimb, which is richer in meat. All vertebrae chopmarks were made on the sagittal plane. The only chopmark on the metacarpal is recent, probably produced during excavation or transport. In total 26 butchery marks were found on cattle bones, which is five percent of the total cattle bones. Most of these butchery marks were related to the separation of the carcass into larger parts, which can be indicative of the assemblage as a production site.

Element	Number	Element	Number	Element	Number
Astragalus	3	Humerus	5	Metatarsal	1
Atlas	1	Lumbar vertebrae	2	Patella	1
Axis	1	Mandibula	1	Pelvis	1
Cervical vertebrae	1	Metacarpal	1	Rib	1
Femur	6	Metapodia	1	Tibia	1

Table 5: Distribution of butchery marks over the elements of cattle.

Pathologies are scarce on the cattle fragments, only four fragments presented evidence of some kind of pathologies: three teeth with an unusual wear pattern and one pelvis with signs of possible osteoperiostitis (caused by inflammation) (Baker and Brothwell

1980, 63-81). This could indicate use for traction that was too intensive but may also have other causes such as pastures that consist of soft soils (Bartosiewicz *et al.*, 1997).

Finally, three fragments had black staining on the inside of the medullary cavity of the bone. This was likely caused by the surrounding soil.

5.4 Sheep/goat

There are 210 fragments that have been determined to be either sheep or goat (Table 3). This makes sheep/goat the second most common taxon in the assemblage. Of these 210 fragments, 155 were not determined as either sheep or goat (73.8% of total taxon NISP), 38 have been determined as sheep (18.1% of total taxon NISP, but 69.1% of to sheep or goat species determined NISP) and 17 have been determined as goat (8.1% of total taxon NISP, but 30.9% of to sheep or goat species determined NISP). Assuming a similar ratio exists for the bones determined as sheep/goat, 109 of the 155 specimens are sheep. However, as most bones could not be determined as either sheep or goat, they are from now on analysed as one taxon.

To analyse the distribution of the elements for sheep/goat, the methods of Spennemann (1985 in Groot 2010) and Uerpmann (1973 in Groot 2010) were again used. In this case, a large number of tibiae draws attention (Figure 10 and 11). Other elements that are well represented are the femur, humerus, lower teeth, and radius.

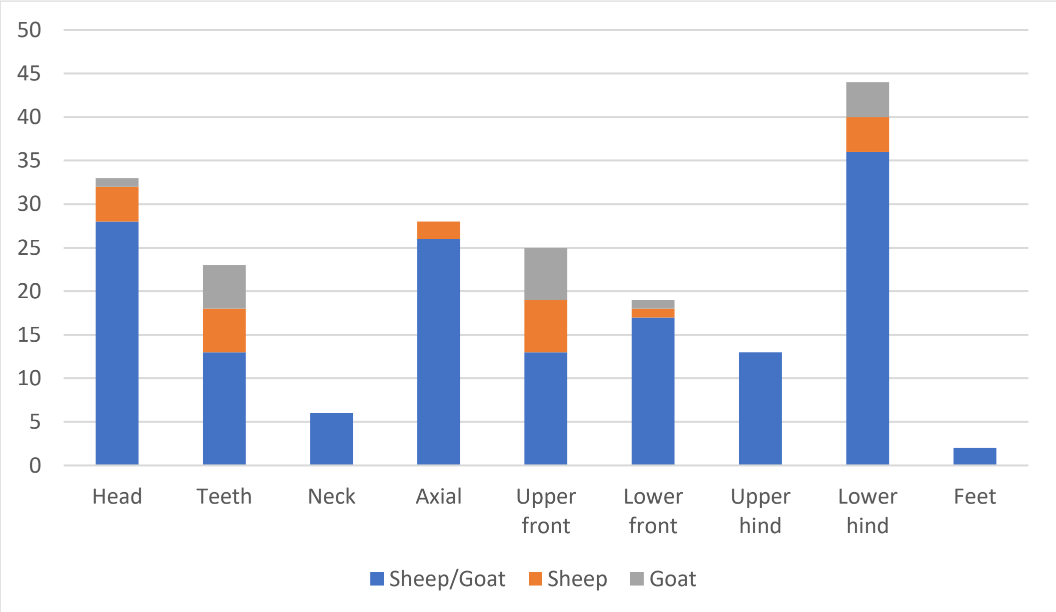

Figure 10: The distribution of sheep/goat with a distinction being made between sheep/goat, sheep, and goat by anatomical regions according to Stiner (2002).

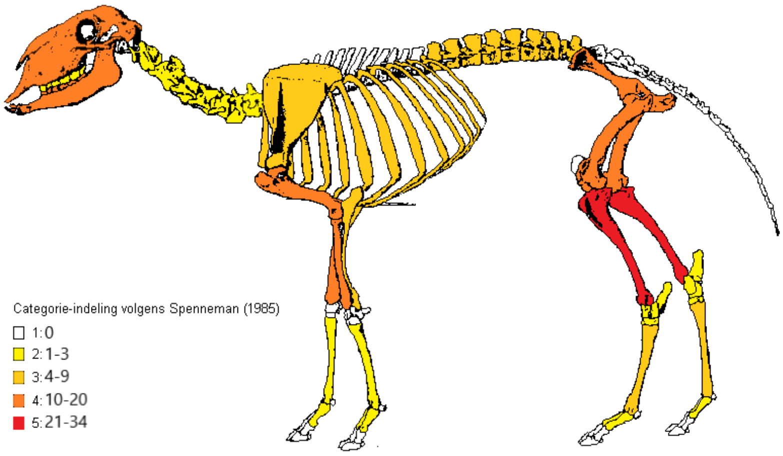

Figure 11: Spennemann (1985 in Groot 2010) distribution for sheep/goat.

These suggest that the body parts of the sheep/goat best represented are the upper limbs of both the forelimb and the hindlimb. This was possibly caused by selection or meat-rich body parts transported to this site for consumption. Although these appendicular elements have a better taphonomical resistance and excavation retrieval biases cannot be ruled out, the fact that teeth are very low represented tip the scales towards a selection in the carcasses. When using the method of high meat usefulness according to Uerpmann, the ratio between high, medium, and low in meat body part areas is 4:5:1 respectively, supporting such a hypothesis. This still may be caused by taphonomic processes, but points towards the Tabacalera site as a consumption site for sheep/goat. Still, the presence of elements from the entire skeleton indicates that animals were slaughtered there. Therefore, it is likely that these sheep/goats were kept on-site and produced for own consumption and if they transported from other locations to be consumed here, they were sold as complete animals and bought for consumption.

Mortality profiles based on epiphyseal fusion and tooth wear indicate hardly any mortality during the first months, which may point to Tabacalera being a consumption site again (Figures 12 and 13). In the case of epiphyseal fusion, the mortality profile shows that sheep/goats were mostly killed during the age of 10-28 months (juveniles/subadults), and after 36 months (adults). In the case of the tooth wear mortality profile, which was largely based on loose teeth, the same juvenile/subadult peak can be detected (between 1 and 3 years old) and another at an old age (6-8 years old). However, no sheep/goat reach the 8-10 years category. These profiles suggest a mixed production strategy, with juveniles/subadults killed for meat exploitation and some sheep/goat that are kept to older ages to exploit secondary products like wool or milk. A remark should be made that these mortality profiles are a mix of sheep and goat. It is therefore also possible that for example goats were kept for meat production and sheep for secondary products.

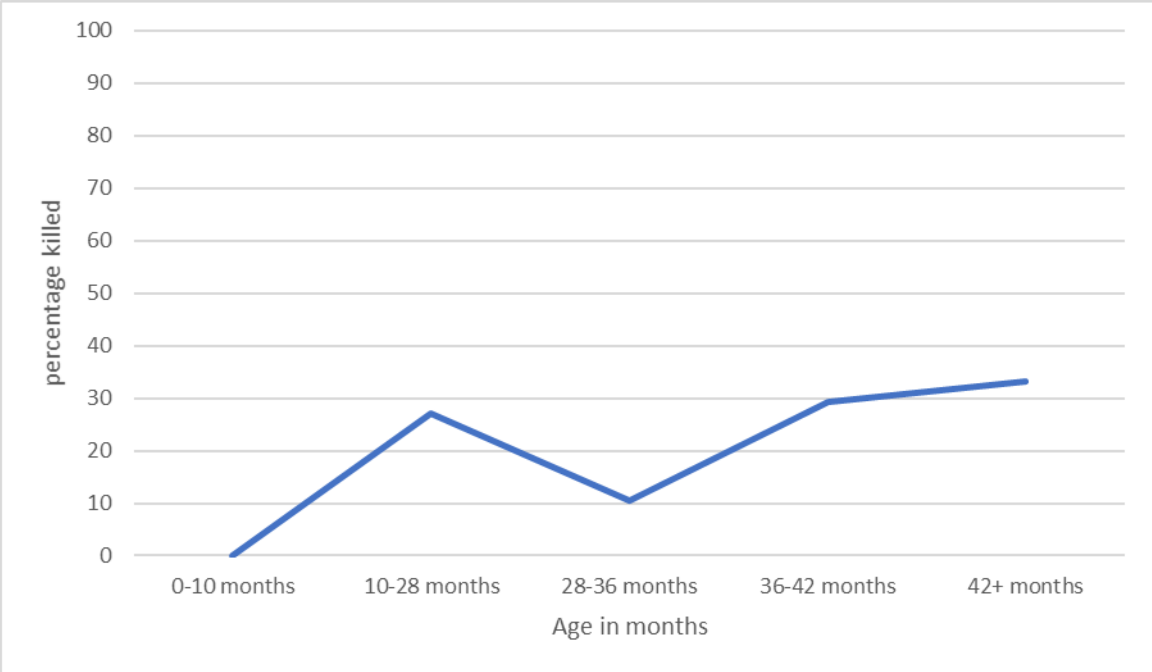

Figure 12: Mortality profile of sheep/goat based on epiphyseal fusion using the age of fusion by Silver (1969 in Groot 2010).

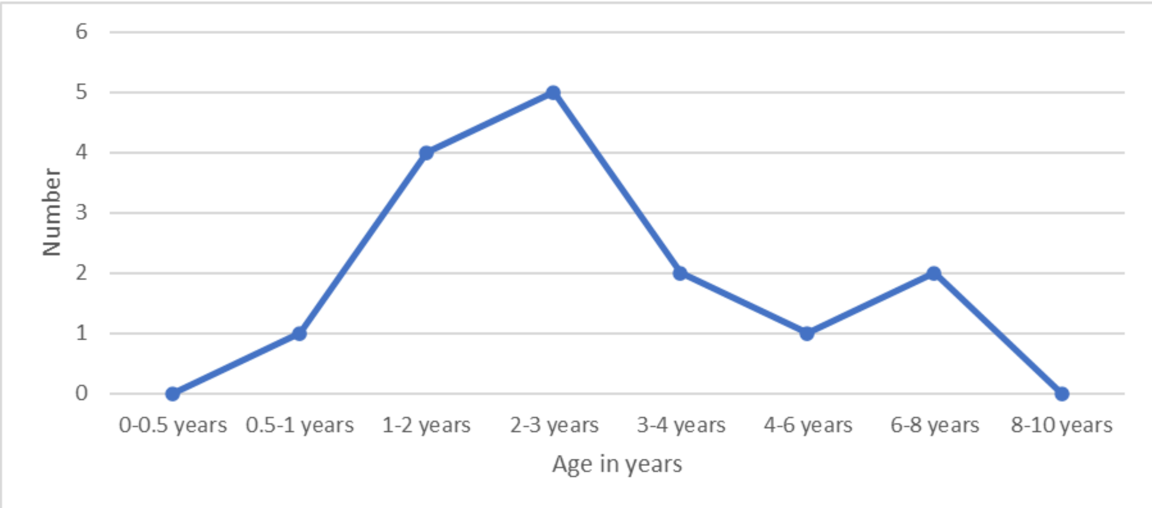

Figure 13: Mortality profile of sheep/goat based on tooth wear using Grant (1982) and age categories of Payne (in Groot 2010).

The analysis of size for sheep/goat by Log Size Index only incorporated measurements of metapodia from both the Late Roman assemblage and the medieval assemblage of Tabacalera (Figures 14 and 15). These measurements were few and thus no certain conclusions can be based on this. According to these results, no real difference is measured between the two periods, but the measurements for the Middle Ages already seem more diverse, even though the sample is smaller.

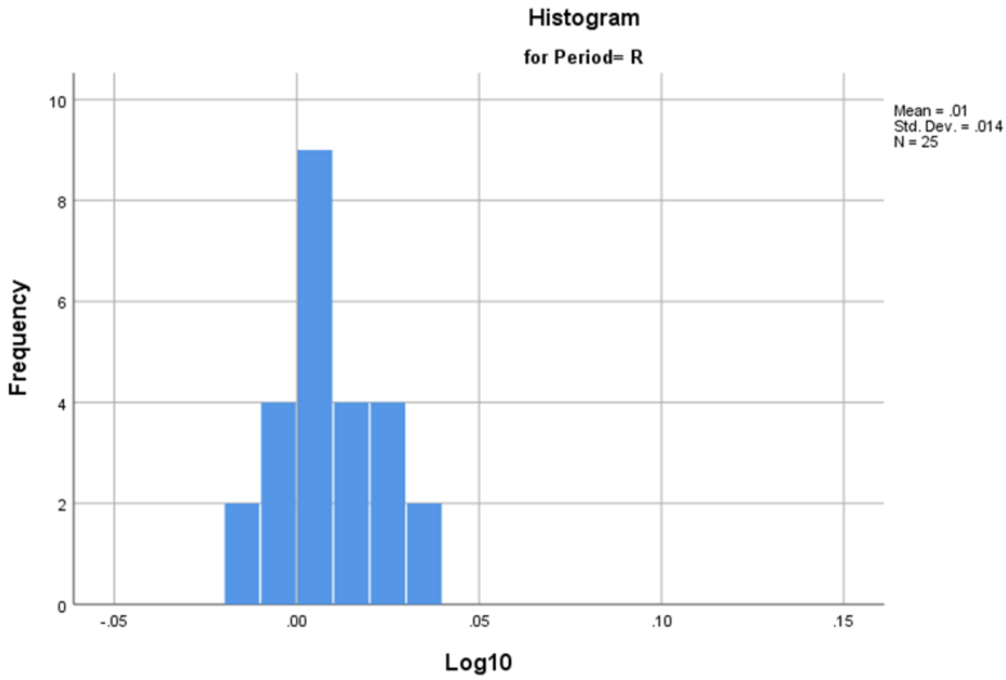

Figure 14: Log Size Index for late Roman sheep of the Tabacalera assemblage.

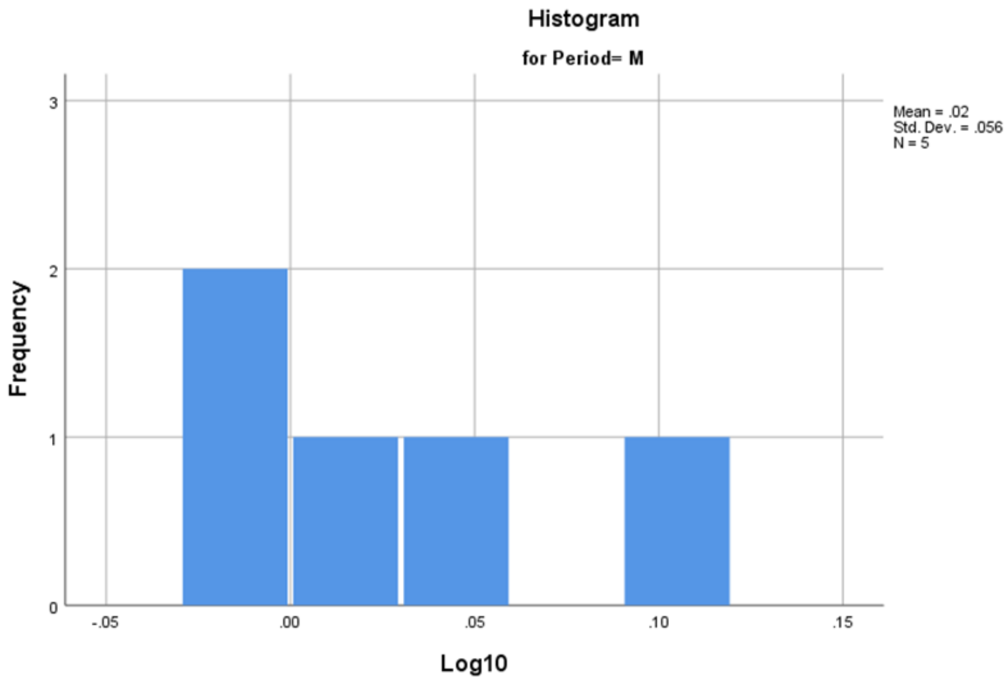

Figure 15: Log Size Index of medieval sheep/goat assemblage of Tabacalera.

The last data analysed for sheep/goat are the taphonomy marks on the bones. Seven butchery marks were found on the bones of sheep/goat. This means that on 3.3% of the sheep/goat bones butchery marks were found. They were found on the following elements: one on a cervical vertebra, two on pelvises, one on a humerus, two on radii, and one on a metatarsus. Four were cutmarks and 3 chopmarks. The chopmark on the cervical vertebra is on the sagittal plane. The other two were on the diaphyses of radii. The placement of the butchery marks does not seem systematic as there are marks that suggest body part division (vertebra, pelvis), consumption (humerus, radius), and skinning (metapodia). No other marks were found on the bones.

5.5 Pig

With 120 remains, pig is the third most common species in this assemblage and also the least present of the three main domesticates (Table 3). Its limited number of remains make all the methods used for cattle and sheep/goat less reliable. No osteometric analysis is done on the pig assemblage, but measurements can be consulted in the database (Appendix B).

In terms of skeletal distribution lower teeth, mandibula and cranium were found in high quantity (Figures 16 and 17). Within the post-cranial elements, humerus and tibia were the best-represented elements.

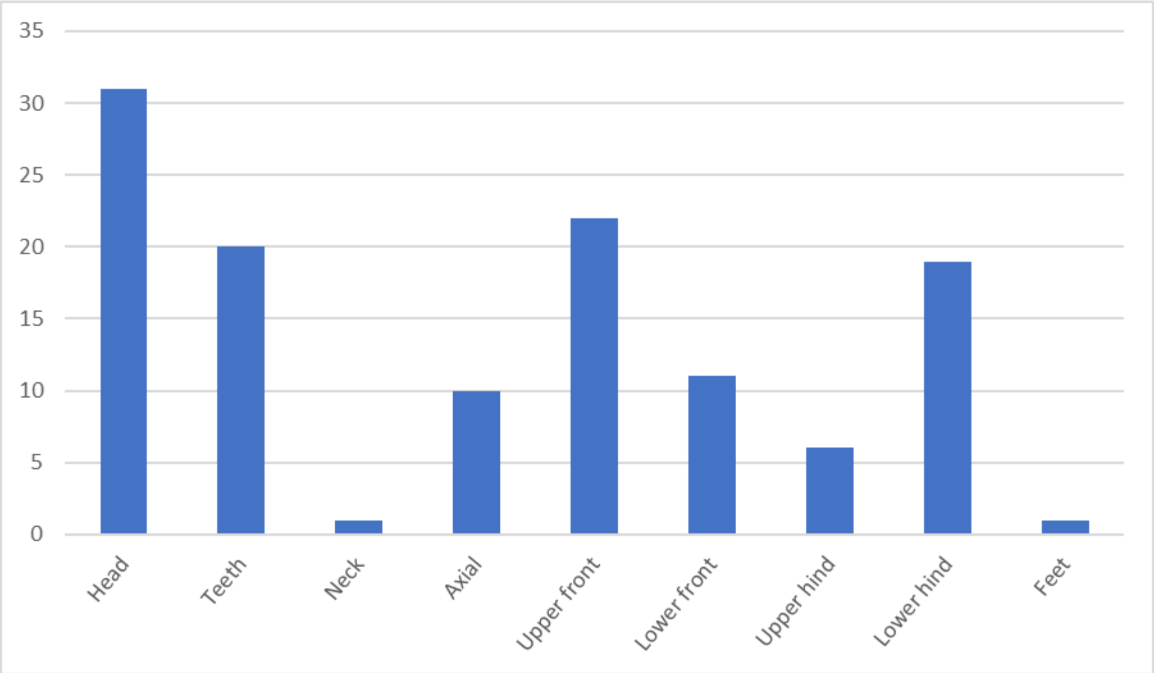

Figure 16: Distribution of pig fragments by anatomical regions according to Stiner (2002).

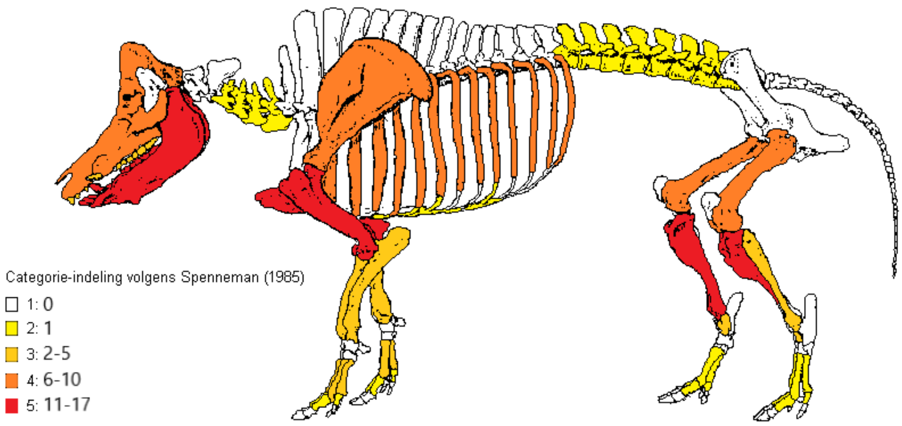

Figure 17: Elemental distribution for pig according to the Spennemann method (1985 in Groot 2010).

This skeletal distribution is likely caused by natural taphonomical biases, although when dividing the fragments into meat-rich, medium and meat-poor zones the ratio 10:13:1 suggests a higher frequency of meat-rich body parts, but a pig contains little meat-poor zones, which mainly exist of small bones (only caudal vertebrae, carpals, and tarsals are counted as such). The ratio leads to the interpretation of pig to have been accumulated in a consumption refuse site.

The pig epiphyseal fusion and a tooth wear mortality profile show that all pig died between 12 and 42 months, and the second mortality profile shows that all pigs were killed between 7 and 21 months (Figures 18 and 19). It is therefore likely that the pigs were kept for meat production and not for breeding or that they were bought for consumption, as no older pigs are found.

On the pig bones, four butchery marks -including three chopmarks and one cutmark- located on a femur, a neurocranium fragment, a scapula, and a humerus were found. There was also a recent chopmark. No clear pattern can be suggested. Finally, one mark possibly indicating periostitis or exostosis was found on a scapula. This indicates possible soft soils where the pigs were kept (Bartosiewicz *et al*., 1997). This is supported by the ecological reconstructions, which suggested wet environments in the area. No other marks were found.

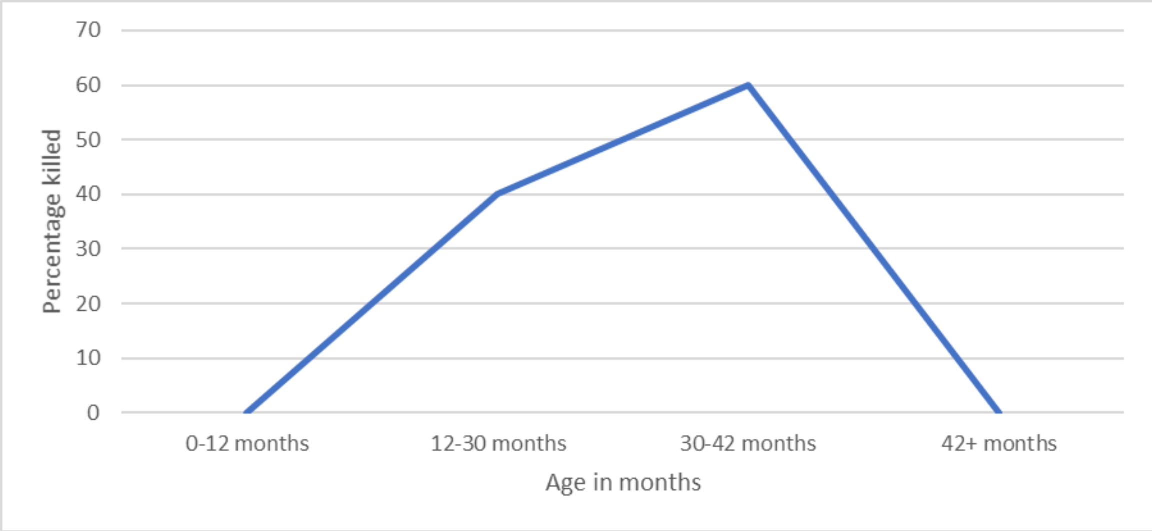

Figure 18: Mortality profile of pig based on epiphyseal fusion according to Habermehl (1975 in Groot 2010) fusion ages.

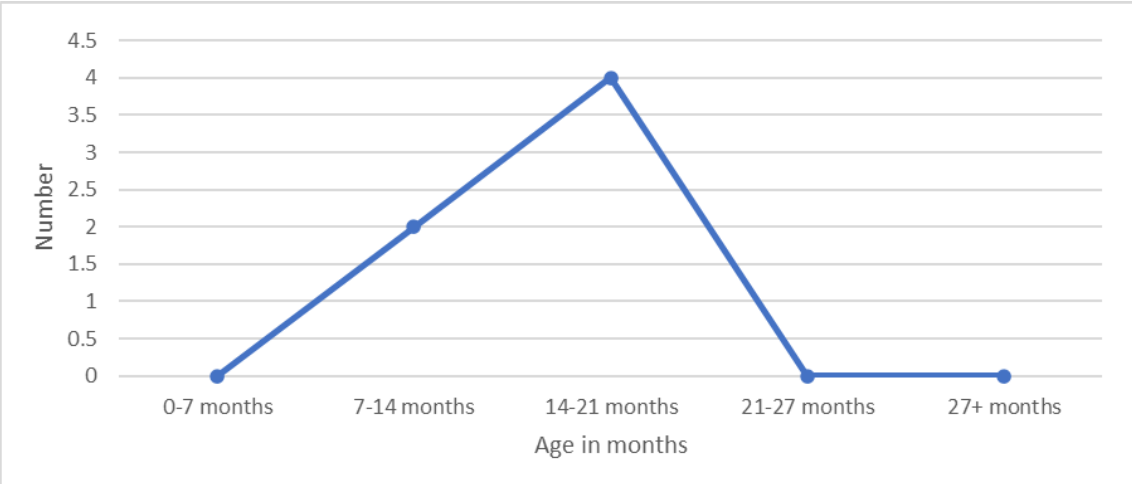

Figure 19: Mortality profile of pig based on tooth wear according to Grant (1982) and Halstead age categories (1985 in Groot 2010).

5.6 Other domesticates

Fragments of three other domesticates were found. The most frequent of these was dog with 28 fragments. The distribution according to the elements is shown in figure 20. Tibia, mandibula, and femur occur the most often. This figure shows that the fragments of dogs were distributed over the entire body and it is therefore likely that they were deposited as a complete carcass.

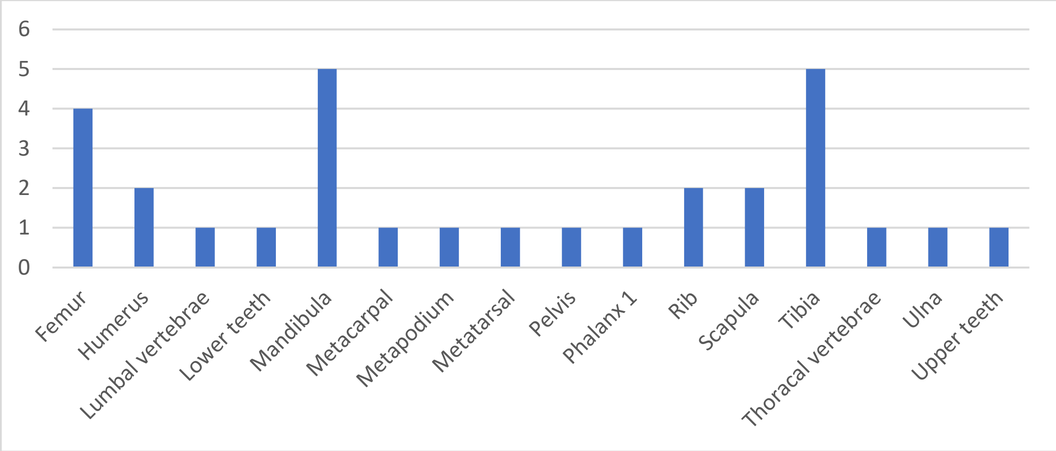

Figure 20: Elemental distribution for dogs.

Almost all dog elements were fused, except for a metatarsal. This latter individual was therefore likely younger than 10 months old. All other individuals are fully grown. No marks were found on the dog fragments.

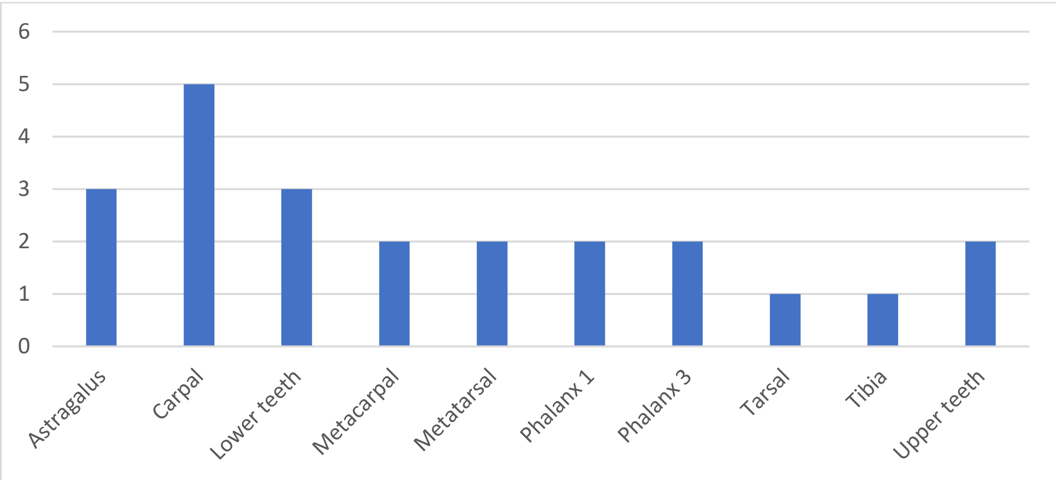

Figure 21: Elemental distribution of horses.

Of horse 23 fragments were found. The distribution of these fragments is shown in figure 21. All elements are lower limb bones or teeth. This makes it possible that these fragments are part of production waste, but it is also possible that whole carcasses were deposited as only a few fragments were found. There were no marks found on the horse fragments.

Lastly, four fragments were found of cat, two femurs, and two humeri. All bones are fused and no marks are present on any of them. They were likely deposited as a complete carcass.

5.7 Birds

Mammals are not the only taxa important when discussing diet and husbandry. The fish and molluscs are discussed in the next chapter, as there is no raw data available for those groups. Raw data was available for birds (determined by Sarah van der Laan) and they are therefore briefly discussed here. In this dataset, the material dated to three different periods was present. Here only the Roman and the medieval material is discussed.

The difference in the character of the two assemblages becomes immediately clear when studying the species distribution. The Roman assemblage entirely consists of wild taxa (Table 6). The taxon most common in the Roman material is thrushes (*Turdidae)*, followed by common jackdaws (*Corvus monedula)* and common ravens (*Corvus corax)*. Other taxa present in the material are owls (*Strigiformes*), true owls (*Strigidae*), red-billed coughs (*Pyrrhocorax pyrrhocorax)*, *Corvidae*, carrion crows or rooks *(Corvus corone/frugilegus*), falcons (*Falconidae)* and gulls (*Laridae)*.

	NISP	NISP %
Corvus corax	11	10.5%
Corvus corone/ frugilegus	1	1%
Corvus monedula	18	17.1%
cf. Corvidea	1	1%
Falconidae	2	1.9%
Lariidae	1	1%
Pyrrhocorax pyrrhocorax	3	2.9%
Strigidae	2	1.9%
Strigiformes	1	1%
Turdidae	48	45.7%
Undetermined Bird	17	16.2%
Total	**105**	**100%**

Table 6: Species distribution according to NISP and NISP % for Roman birds

The Medieval assemblage exists entirely of domestic taxa (Table 7). The most common of these is the chicken (*Gallus gallus*), followed by turkey (*Meleagris gallopavo*). Due to the dating of this material (until the beginning of the 16th century or at least before the 17th) the presence of turkey is interesting. Turkey is a species that is native to Northern America and only arrived in Spain for the first time in 1519 in Seville. From there the turkey spread through Spain and the rest of Europe (Reitz *et al.* 2016, 642). This makes its presence in the Tabacalera material very shortly after it arrives in Spain. Other taxa present are greylag geese (*Anser anser*), mallards (*Anas platyrhynchos*), and gamefowl (*Galliformes*).

	NISP	**NISP %**
Gallus gallus	19	44.2%
Galliformes	1	2.3%
Anser anser	2	4.7%
Anas platyrhynchos	1	2.3%
Meleagris gallopavo	11	25.6%
Undetermined Bird	9	20.9%
Total	**43**	**100%**

Table 7: Species distribution according to NISP and NISP% for Medieval birds

6. Discussion

6.1 The faunal assemblages at Tabacalera: a chronological and taphonomical assessment

In this chapter, the results of the former chapter are interpreted and discussed in relation to the research questions. The first of the topics is the relation of the results with taphonomy.

First of all, the species found in the Late Roman assemblage are different than those found in the medieval assemblage. Whereas most of the medieval assemblage consists of remains of the three main domesticates, the Late Roman assemblage is represented by a wider variety of taxa. Dog was, in fact, the most frequent species on account of both NISP and MNI estimators (Llorente Rodríguez *et al.* 2015, 227-8). In the medieval assemblage studied in this thesis, 93.9% of the determined species are part of the three main ungulate domesticates group, as opposed to the 31% who belong to this group in the Late Roman assemblage (Llorente Rodríguez *et al.* 2015, 228). This means that the assemblages are likely completely different when studying the nature of deposition.

The Late Roman layers were sealed by demolition rubble and preserved in an anaerobic environment (Fernández Ochoa *et al.* 2015, 114-25). These circumstances and its rather neutral pH, constant temperature and humidity, preserved the organic material of the bones, leaving them in a much better state of preservation, than is to be expected for an assemblage in this region (Llorente Rodríguez *et al.* 2015, 226). These beneficial conditions for preservation ended after the Late Roman layers were deposited, making the accumulation and preservation of the material from the medieval contexts as would be expected from such a deposit. This means that there is a difference in bone survival between the two periods that affected the representation of taxa and their skeletal distributions in the assemblages. The lesser preservation of the medieval assemblage also led to less complete bones, making the possibilities for osteometric analysis limited. However, these are circumstances not unusual in archaeology.

The differences in the accumulation of the deposits is another point to take into account during the comparison of the assemblages. The Late Roman deposit was likely to not have accumulated over time, but to have been dumped at one or several consecutive events, rapidly after the death of the animals (Llorente Rodríguez *et al.* 2015, 234; Morales Muñiz *et al.* 2020). The peculiar taxa distribution where companion animals were dominant, the presence of complete skeletons, and the absolute lack of any taphonomical marks, were the main evidence to suggest that animals were likely not deposited after consumption but might be the result of a (catastrophic) event (Llorente Rodríguez *et al*. 2015, 234; Morales Muñiz *et al*. 2020). Thus, the deposit does not provide many details on diet and husbandry practices, but only a general tentative interpretation of the more complex economic activity. This is entirely different from the medieval deposits that have the characteristics of having been accumulated over time and used as regular middens of consumption and production waste of the area. This makes them more suitable to interpret the diet and husbandry practices of this period. However, even though these assemblages are very different, they can be compared on general subjects and those that are not affected by this process, such as the breed improvement studied for cattle that will be discussed in section 6.4.

6.2 The production aims of the three main domesticates: Representative of the period and region?

When we focus on the abundances of cattle, sheep/goat, and pig, we find different contributions in the Late Roman and medieval assemblages. In the medieval context, cattle is the dominant species with 61% of the three main domesticates, followed by sheep/goat with 24.9% and then pig with 14.2% (See table 4). In the case of the Late Roman assemblage, this is completely different. Not cattle, but sheep/goat dominates this assemblage with 51% of the total main domesticates. The relative amount of pig is also higher with 27.3%. Cattle is the least abundant with 21.75% of the three main domesticates (Llorente Rodríguez *et al*. 2015, 227-31). Why does this change in such a drastic manner? The character of the assemblage may have some influence on these ratios as previously mentioned, but during the Roman Era, the area of Gijón around the Tabacalera site was urbanised and in the centre of the Roman settlement. This means that the taxa of this assemblage were more likely linked to consumption than production waste and little secondary activities (i.e. workshops, tanneries, etc.) seem to have taken place. Besides, the Late Roman assemblage has been interpreted to derive from a high socio-economic population on account of different factors of which we can highlight the abundance of dog and its diversity in morphotypes as one of the most important (López-Arrabé *et al.* 2012; Llorente Rodríguez *et al*. 2015, 235; Morales Muñiz *et al*. 2015, 244). Regarding the main ungulate domesticates the higher abundance of pig in the Roman assemblage is a pattern that is consistent as well with the increase in urbanisation where pigs are more suitable in such environments. This is different in the Medieval Era when the area around Tabacalera was now deurbanised and was mainly an area of agriculture and animal husbandry (Fernández Ochoa *et al.* 2015, 114-25; Peña-Chocarro *et al.* 2019, 155-71). In addition, some workshop activity seems to have taken place as evidenced by the skeletal overrepresentation of cattle metapodia, which often characterises production waste deriving from workshops or tanneries. In the case of sheep/goat and pig, these animals, likely, were more often traded as complete animals. Altogether it seems that the assemblages from the two periods in Tabacalera testify both the differences in urbanization and the socio-economic nature of the assemblages. However, it is also important to count in the religious factor for the medieval assemblage. Especially in later Christian sites, cattle are of increased popularity (Davis 2008, 995-1006). This might explain the substantially higher proportion of cattle remains in the medieval assemblage compared to the Late Roman assemblage.

Are these ratios similar to other sites in the region? Pigs are less common in more rural settings as seen in the medieval contexts from Tabacalera especially when compared with Roman settlements that regularly present a higher quantity of pig (Valenzuela-Lamas and Albarella 2017, 402-15). The high abundance of sheep/goat is slightly atypical, as the north of the Iberian Peninsula has always been known for cattle husbandry, even during the Roman period (Colominas *et al.* 2017, 510-34). This may be explained by the urban and high socio-economic Late Roman context, as cattle require larger extensions of land (pastures) but there is also less need for cattle traction for ploughing, which may be the reason behind the large abundance of cattle during the medieval period, as was also suggested by the mortality profile. Wool and milk production of sheep and goats may have been exploited more in the urban Roman setting, which might explain the higher abundance of sheep/goats.

In terms of exploitation activities, the mortality profiles of the animals usually provide good insight. The medieval assemblage mortality profiles indicated that the aim of cattle husbandry was that of secondary products (Figures 6 and 7). Sexing data could have defined if this secondary product was milk or traction, but the low amount of infantile mortality may indicate that traction was the secondary product of focus. The cattle data from the Late Roman assemblage is very limited and most probably derived from a catastrophic event, making it harder to draw any sound conclusions. Still, five individuals were determined, of which three were adults (of which one male), one juvenile/subadult, and one juvenile (Llorente Rodríguez *et al.* 2015, 231). The younger individuals may indicate that the aim of cattle husbandry during this period lay more on meat production than secondary products or that the aim was at least mixed.

For sheep/goat the mortality profile of the medieval assemblage indicated a mixed production aim, with some of the animals being killed at a younger age for meat exploitation and the older individuals kept for the secondary products, such as wool and maybe milk (Figures 12 and 13). The goats from the Late Roman deposit were interpreted to have been kept to exploit meat and possibly dairy products (Llorente Rodríguez *et al*. 2015,230). For the sheep, this assemblage contains at least ten individuals, of which one infantile, one juvenile, three juvenile/subadult, one subadult male, and four adult females (Llorente Rodríguez *et al.* 2015, 228). The substantial number of younger individuals suggests meat production, but there is a second peak with the four adult females. These females indicate a focus on secondary products such as milk and dairy products and wool production. Both sheep and goats are more suitable for the urban environment of the Roman assemblage than cattle.

The mortality profile of the medieval pig indicated that the aim of production lay on the production of meat. Within the Late Roman pig assemblage, five individuals were aged: one new-born, one infantile, one juvenile, and two subadults (Llorente Rodríguez *et al.* 2015, 231). The absence of any older individuals indicates that the aim of production is the same for both assemblages, namely meat production for direct consumption as opposed to breeding to be sold and consumed somewhere else.

Is this pattern also observed at other sites in the region? Other zooarchaeological studies agree that pig was probably the main source of meat during the Roman period, as this is the main focus of production with pigs. They also indicate that cattle and sheep/goat are being kept until an older age from the start of the Roman Era. This means that the focus on secondary products from sheep/goats is expected, but the focus of meat production with cattle is not. The profile of cattle may be caused by the lack of data, but this may also indicate regional preferences that are common during the Roman Era. The interpretation of the site as a high-status settlement can also be linked to this, as high-status sites are consumption sites with a demand for high-quality meat. This leads to higher proportions of cattle at prime slaughter ages and thus not reflect production strategies per se (Grau-Sologestoa 2016, 7-8).

In the north of the Iberian peninsula, the economic activity was focused on the exploitation of secondary products (i.e. dairy products, wool, traction, manure) of cattle, sheep, and goat during the Middle Ages, but pig lay on meat production at some sites except some in which they were bred to be traded elsewhere. This is especially true for rural sites where there is a lot of production of surplus goods. This is less true for high-status sites, which show a focus on meat production for pigs especially, but also for cattle (Sirignano *et al.* 2014, 1-11). This makes that the pattern visible for the function of the three main domesticates in the medieval assemblage of Tabacalera fully agrees with the patterns expected for this era.

6.3 Production strategy: autarkic consumption or surplus production?

To conclude if the production at the Tabacalera site was purely autarkic or if there was surplus production, two methods can be used. The first is the representation of the elements and the second mortality profiles. For the Late Roman assemblage, it is difficult to ascertain this, as no mortality profile is available and the sample of food-producing animals is limited. In addition to this, the assemblage likely accumulated during one or more catastrophic events as aforementioned (Llorente Rodríguez *et al.* 2015, 226-37; Morales Muñiz 2020, 415-24). This means that even if a reliable conclusion can be drawn based on these methods, they likely do not represent the normal production strategies and the mortality profiles can differ greatly from mortality profiles created from assemblage accumulated over larger periods. Keeping this in mind, a Spennemann distribution was made and there was no clear over or underrepresentation visible for both cattle and sheep/goat. For pig, the cranial, vertebrae, and ribs were much more represented than the other elements, but this is only logical as these elements are present in higher quantities in the body. It is therefore likely that the carcasses that were deposited in this assemblage were complete at the time of deposition, as expected for the character of accumulation of this assemblage. The only remaining method than is the mortality profile, but because of the limited number of individuals, patterns of this are unclear and it is therefore hard to see if any age categories are missing. This all is likely caused by the nature of this assemblage, which is neither production nor consumption. It is therefore impossible to make any conclusion for the husbandry strategy of this assemblage. The high-status interpretation given to this site, however, would suggest that this is a consumption site that imported at least parts of its animal products. Therefore, it likely also had no significant production to speak of and thus neither the autarkic nor surplus production strategy applies (Llorente Rodríguez *et al.* 2015, 226-37; Morales Muñiz 2020, 415-24).

The Spennemann element distribution of cattle (figure 5) showed an overrepresentation of metapodia and lower appendicular bones. The Uerpmann method showed a larger quantity of meat-poor elements. This all indicates that parts of cattle were sold or exchanged and that for this animal surplus production existed. For sheep/goat and pig this was not observed and if these species were traded this would have been done as complete animals. To be able to observe the trade of complete animals, the mortality profiles must be studied.

For pig, the mortality profile indicated that all pigs were killed at the age suitable for meat production. No animals were found of other age groups, which would occur if Tabacalera was a site where pigs were bred. This means that Tabacalera was likely a consumption site for pigs. These pigs were possibly bought alive and slaughtered when at the right age. If not, they were bought as complete carcasses.

In the mortality profile of sheep/goats, no age categories are missing, except the youngest categories below a year and senile category of the tooth wear mortality profile. Especially the absence of the youngest categories indicates the production strategy. When intensively breeding a species, it is expected that at least some of the sheep/goat die in the first year of disease or natural causes. As this group is absent this might mean that sheep/goat was merely consumed at Tabacalera and that they were bred elsewhere. The other possibility might be taphonomic, but in that case at least some traces of young animals would be expected. Even though the preservation of the medieval layers was poorer than the late Roman layers, some fairly small fragments were found. If the young animals were present in this assemblage at least some trace of this would have been found.

During the Late Roman period, there was a lot of connectivity between Asturias (Gijón specifically) and other parts of Spain and Europe (Valenzuela-Lamas and Albarella 2017, 402-15). This led to a lot of surplus production and specialisation in animal husbandry. During the Early Middle Ages, this changed. Connectivity and trade continued but on a smaller scale (Valenzuela-Lamas and Albarella 2017, 402-15). There was still trade, but mainly within the region and with regions surrounding it. This also led to a more autarkic subsistence strategy. As communities had to rely on the immediate vicinity more for all their foodstuffs, the once specialised husbandry strategy became more general. However, during the later period of the Middle Ages, this change largely reversed and during the High Middle Ages, long-distance trade resurfaced and specialisation increased again (Fernández Ochoa *et al.* 2015, 282-95). As the medieval assemblage of Tabacalera spans the entire Middle Ages it is hard to tell which of these phases is better represented. The only species, of which surplus production (or production in general) has been ascertained, is cattle. It can be said with a high degree of certainty that the site of Tabacalera was focused on cattle husbandry and that the meat of this animal was produced for a market. The strategy, therefore, fits better into the pattern that is known for the High Middle Ages, than the earlier period. This is consistent with the dating information given about the contexts that were studied. Even though a broad dating was upheld during analysis, most contexts were thought to have been from the 14th to 16th centuries.

6.4 On Roman and medieval breed improvement practices at Tabacalera

The Romans are known to have greatly increased the size of their cattle throughout the Empire in general and the Iberian Peninsula in particular (Colominas *et al.* 2017, 516-28). The Log Size index analysis carried out in this thesis support this hypothesis (section 6.3, Figures 8, 9, 14, and 15). The trend that was shown by our histograms is that the Late Roman cattle are only slightly smaller than the reference modern cattle on the mean, although a substantial number of measurements exceeded the size of the standard measurements. This is the opposite in the case of the histogram for the medieval cattle where the mean suggests a much smaller size relative to the modern cattle. This indicates that there is quite a strong reduction in size measured for cattle. As mentioned in an earlier chapter, this size reduction may be intentional as smaller animals are easier to keep, but as the main aim for production was traction, this would not seem logical as larger sizes would be translated into larger power force for this activity. It is also possible that the production aim was mixed. The size of cattle would be most consistent with dairy products, but if production was unspecialised, the absence of breed improvement is just as likely. Cattle greatly decreased in size after the 8th century (Grau-Sologestoa 2015, 123-34), but this has often been linked to the introduction of Islam on the Iberian Peninsula, as Moslem culture often favours mutton over beef. Cattle would therefore only be kept for milk products leading to a decrease in size. The region around Tabacalera, however, remained Christian throughout the Middle Ages. Christianity has been linked with an increase in the size of cattle, as they preferred beef, and the larger the cattle the more beef available per individual. It also provides more power for ploughing if this is the aim of production (Davis 2008, 995-1006). Therefore, there possibly was an influence on animal husbandry strategies from other (Moslem) regions of the peninsula and that the production aim previously suggested being traction, might indeed be dairy products instead, but with at least a secondary aim for meat production as shown by the mortality profiles.

Studies have also shown that the Romans barely improved the size of sheep/goat breeds. This is also visible for the Late Roman assemblage of Tabacalera, which are small and probably unimproved as suggested by the LSI analysis. Although there were only a few measurements, the results suggest that the mean size of sheep stayed almost the same, while size diversity increased in the medieval material but this is most likely caused by the measurements from this context deriving from a mix of sheep and goat (Figure 15). Some sheep and goats have shown to decrease in size during the Early Middle Ages but as the sheep of Tabacalera were already small for Roman standards, it is likely that they did not decrease in size (Grau-Sologestoa 2015, 123-34; Llorente Rodríguez 2015, 226-37). It is also possible that they did during the Early Middle Ages, but then increased again during the Late Middle Ages, which would lead to overall stability in size but an increase in diversity. This has been observed for the Tabacalera data, but as to the limited amount of data, there is no possibility to draw any real conclusions. As abovementioned, in both periods a mixed aim for production is likely. The stability in size confirms this continuity in function because a change in production aim would result in a change in size in most cases. Animals kept for meat production are often larger and thus a shift to this as a production aim would lead to an increase in size, whilst the exclusive focus on secondary products would likely decrease its size. The Christian character of the medieval assemblage is in agreement with this, as Islamic sites during this era often show an increase in size, due to the focus of Moslem sites on the production of mutton (Davis 2008, 995-1006).

6.5 Beyond food-producing mammals: functions of other species at Tabacalera

Most of the discussion has focused on the three main domesticates, as they are the species that produce the most food in an agrarian society. However, other species also play a significant role. Some of these are also used in the production of foodstuffs, but others fulfil a different role. The first category is the other domesticates. In the Late Roman assemblage, this category corresponds with horse, donkey, dog, and cat (Llorente Rodríguez *et al.* 2015, 226-37). This is one more than the medieval assemblage, which does not have any donkey remains. The abundance of these species however is very different in the Late Roman context than the medieval context. In the medieval context the other domesticates are only 6.1% of the determined species, whereas, in the Late Roman assemblage, these taxa represent 65.2%. As previously mentioned, the dog is the most abundant species in the Late Roman assemblage and they were deposited as complete carcasses (Llorente Rodríguez 2015, 226-37; Morales Muñiz *et al.* 2015, 238-45). However, the function of these dogs was likely not the same as for the medieval assemblage: that of guard dog and companion animal. The presence of medium to large dogs in the Roman material indicates that dogs were used for hunting. There are also larger and more robust dogs in the assemblage, which could also have been used for hunting, but also for guarding or companionship. Next to these, there are also dogs suited for just companionship, herding, and bulldog type dogs, that might even have been used during wars and for fighting. All in all, the Roman dog assemblage shows a wide variety of types, sizes, and functions. The extreme morphotypes found in the Tabacalera material is one of the lines of evidence that indicate a high-status site during the Roman Period (Morales Muñiz *et al.* 2015, 238-45).

Another taxon present are the equids. Horses and donkeys can fulfil the same function of traction as cattle. An increase of the animals relative to cattle can be an indication that they were increasingly used for this function. However, this is only relevant for the Late Medieval assemblage. During the Roman Era they could be used as pack animals, which became more popular from the Roman conquest onwards, but not for traction as the invention of bits had not reached Europe yet (Colominas *et al.* 2017, 527; Grau-Sologestoa *et al*. 2016, 2). It is, therefore, important to note that one of the main focusses of cattle husbandry for the medieval assemblage is thought to have been traction but even though a horse can be used for ploughing and traction, this only became common at the end of the Middle Ages and the beginning of the Modern Period (Grau-Sologestoa *et al*. 2016, 1-12).

Wild species are absent from the medieval assemblage. This suggests that hunting was practised at least not intensively, although it is also possible that some small mammals such as rabbits were hunted. The small mammals are not part of the assemblage studied and have been separated into a different assemblage. Therefore, the hunting of species like rabbits was possibly done on occasion. Some wild species have been found in the Late Roman assemblage, but they also do not include larger species that are typically hunted (such as deer) (Colominas *et al.* 2017, 527-8). These wild species are fox, polecat, vole, and shrew, which were interpreted as penecontemporaneus intrusives. The small carnivores probably approach the settlement to raid chicken coops and were then chased away or killed (Llorente Rodríguez *et al.* 2015, 226-37). The last identified mammal is the Egyptian Mongoose (*Herpes ichneumon*). However, this species has been interpreted as a companion animal during this period (Llorente Rodríguez *et al.* 2015, 247-9). Even though these remains are very few, they do fit in with the period, as hunting during the Roman period in Northern Spain only took place as a leisure activity and did not contribute to the diet regularly (Colominas *et al.* 2017, 527-8).

Birds are found in both the Tabacalera assemblages, but a clear break in the type of birds is visible. The Roman assemblage exists purely of non-domesticated birds, which is consistent with the taphonomic character of the site already discussed many times in this chapter. It is therefore impossible to conclude if the absence of domestic birds is in any way related to the absence of it in the Tabacalera diet. Domestic birds were likely present in the Roman settlement, as especially chicken was already introduced on the Iberian Peninsula during the Iron Age (Davis 2008, 997). During the Roman Era, the abundance of chicken increased and they grew in size (Colominas *et al.* 2017, 527). This means that the accumulation type is likely the cause of this absence of chicken and other domesticated bird species. The birds that have been found in this Roman assemblage are much like the bird assemblage that was already determined for the Late Roman period. The interpretation given to most of these bird species and the Corvids especially, is that of synanthropic birds, who scavenge from human waste and for who the waste in the Tabacalera cistern might have been a trap (Llorente Rodríguez *et al.* 2015, 233-34).

The medieval material contained exclusively domestic birds, which corresponds with the rest of the medieval assemblage. The absence of any wild species was already noted above and the absence of wild bird species gives additional evidence to the conclusions drawn there. This also allows for the drawing of conclusions on the consumption of birds as an addition to the diet. Their presence alone is enough to conclude that they were at least part of the diet. As no other analysis was done on the remains (for this see Sarah van der Laan, forthcoming), it is impossible to say this was for the consumption of the eggs or the meat, but it is safe to assume some part of the function was meat consumption. As only 19 fragments of chicken were found and they only produce a low quantity of meat, the ratio of chicken meat, as opposed to other meat sources, may be marginal. Another interesting find in the bird assemblage was turkey. The dating of the material to maximally the 17th century (but likely beginning of 16th century) makes this a very early find for this species, as the species was only brought over to Spain from America in 1519 (Reitz *et al.* 2016, 642). This early presence is evidence that reinforces the high-status interpretation made for the site during the Roman Period. It however is not consistent with the rural site interpretation thought for the Middle Ages. It is possible though that Tabacalera was a production site for a nearby high-status. This would explain the presence of these turkey and the production of beef for trade/exchange.

The fish assemblage of Tabacalera was only studied for the Late Roman layers, with the medieval assemblage still to be studied. During our analysis, one fishbone was put in the mammal assemblage determined as hake by L. Llorente Rodríguez. This shows that in the Middle Ages fish was at least a small part of the diet. Fish is known to be an important part of the diet, especially during the Christian Middle Ages, because of the tradition of Lent amongst Christian society. Fish was one of the meats that were still allowed during the period of lent and therefore became more widespread and popular (Mundee 2010, 72). It is therefore likely that during the Middle Ages fish was also an important contributor to the diet at Tabacalera. In the Late Roman layers, two species of fish were found: the red sea bream (*Pagellus bogaraveo*) and the Ballan wrasse (*Labrus bergylta*). These remains reflect at least a part of the fishing activity in Tabacalera and show a type of fishing that was traditional in this region from the Iron Age and likely returned to the site during the Late Roman Era. These remains likely do not reflect the whole of the fishing activity at Tabacalera, as it is a coastal settlement and probably fished on more fish than these two species. The fish remains found in the assemblage also reflect the high-status interpretation that was already made based on other evidence (Roselló Izquierdo and Morales Muñiz 2015, 252-9).

In the Tabacalera deposit, some remains of molluscs were also found. These were found both in the Late Roman layers as in some medieval layers and represent mostly marine molluscs. Almost all of these marine molluscs were deposited as consumption waste, as was shown by cuts present that were made to extract the meat (Llorente Rodríguez and Morales Muñiz 2015, 260-5). The exception is the terrestrial molluscs from stratigraphical unit 25 (Late Roman), that accumulated naturally (Llorente Rodríguez and Morales Muñiz 2015, 260-5). This accumulation of molluscs points to the catching of them as a marginal activity as an addition to the diet. The relative abundance of these as opposed to other species, however, points to a limited amount of consumption.

7. Conclusion

The main aim of this thesis was to determine how the animal assemblage of the medieval contexts of Tabacalera reflects the diet and animal husbandry practices at that period. Only with this information can than be assessed if any change could be detected when comparing this assemblage to the Late Roman assemblage of the site and the information already known about these periods on the Iberian Peninsula.

First of all, it must be noted that the meat from the species found in the assemblage is not the entirety of the available diet for the people of the Tabacalera site. In the botanical assemblage the presence of cereal was already indicated. The bread and other products made from these cereals likely contributed for a large amount to the diet of these people, with a plethora of other plant foods adding to this. One of the functions that was ascribed to the cattle population of Tabacalera (ploughing and traction) also confirms the importance of agriculture for the site. The production aim of cattle, however, was indicated to be mixed and -aside from the traction purposes- leather, milk, and meat were also important products gained from cattle husbandry. If these products were produced for autarkic use or larger markets is largely uncertain. Meat is the exception to this, as the element distribution suggests that at least a substantial proportion of the cattle (likely of prime slaughter age) were exchanged or traded to other sites.

Such a clear production of animals for trade was not attributed to the other species, for which no clear evidence of production was present. It is therefore likely that sheep/goats and pigs were kept for own consumption. For pig, this consumption would entirely consist of meat, but for sheep/goats, this is mixed with other secondary products. The most important of these secondary products is wool, which was for many sites on the Peninsula the main reason to keep sheep. At the Tabacalera site, however, a peak in mortality is also seen around prime slaughter ages, which indicates that meat was just as important.

These characteristics are consistent with the rural interpretation given to the site during this period. Most of the meat would have come from the pigs kept on site until they reached the prime slaughter age. The sheep/goats would be an addition to this meat source. They were likely normally kept until an older age, to fully profit from the secondary products of wool and milk, but may have been slaughtered at prime slaughter age when pig meat was scarcer. It is also possible that sheep/goats were bought as an additional source of meat when needed. Sometimes cheaper older animals would be bought and other times younger but likely more expensive animals. Cattle were kept for market production, both to help with the ploughing of the fields as well as the production of meat to be traded to other more urban areas or high-status sites. It is known from historical and some archaeological sources that Gijón was still an important settlement in the area during the entire Middle Ages, even though the urban centre might no longer have been in the direct vicinity of Tabacalera.

This production for an urban or high-status site is supported by the presence of turkey on the site. The keeping of chickens already existed in the area from the Iron Age onward and they were likely kept as an addition to the diet and to supply eggs. However, the turkey was a species very new to Spain at the period and even though this bird spread through Europe in a matter of decades, the fact that they were already found at the rural site of Tabacalera indicates the presence of a high-status site in the area at least.

Another social factor that must be considered is the Christian character of the site. Christian sites of the period were often characterised by the high consumption of beef, especially as opposed to mutton, which was a source of meat very popular amongst Muslim communities. Of course, because of the consumption restrictions of Islam, pork was not consumed in great quantities at such sites, but these restrictions did not exist for Christian communities. Although pig was the least abundant of the three consumption animals of the site, they still formed a substantial part of the diet. The production of beef at the site is also consistent with the characteristics of a Christian community.

The lack of breed improvement on cattle on the other hand is not entirely consistent with this. Breed improvement was known of later Christian sites, especially where the production aim lay on meat and traction. The lack of breed improvement at Tabacalera therefore might be explained threefold: the first is a lack of intensity in both agriculture and husbandry. This means that even though meat and traction were the main production aims, the production was not intense enough for a selection of larger cattle. The second might be a stronger focus on dairy products than formerly expected, as dairy cows are usually smaller. The third is environmental factors, such as insufficient land for pastures or the fact that smaller cattle are easier to keep.

The Christian tradition of Lent also indicates the possible importance of other taxa than mammals. This is mainly true for fishes, which were usually widely consumed during Lent. The exact role of fishes in the diet of medieval Tabacalera is an interesting topic for future study. The taphonomic and excavation bias of these layers might, however, make the study of this subject more difficult.

The second part of the research question was how these results are different from those already obtained from the Late Roman assemblage. It can be said that these results differ from the medieval period in almost every way. Where during the Middle Ages cattle were most important, they were the least important consumption mammal during the Late Roman period. Sheep/goat seems to be the most abundant of the consumption animals but no real conclusions on diet and husbandry strategies can be drawn, due to the assemblage's accumulation and taphonomic characteristics.

The change that can be concluded with relative certainty is the difference in socio-economic status. Several species in the Late Roman assemblage of Tabacalera (amongst which the fish and the wide variety of dog types) pointed to a high-status site. This is a significant difference from its rural status during the Middle Ages.

Another change was that of the breed improvement practices. During the Late Roman Era, there is evidence of breed improvement of cattle from the surrounding area, but this improvement seizes to exist in the Middle Ages, the cattle being much smaller than their Roman counterparts. The Roman samples were even almost the same size as the modern standard used, sometimes even exceeding it. However, when studying breed improvement of sheep at the site, the sizes of this species stayed almost the same. The only difference is the range of size that increases during the Middle Ages but this is likely due to the mix of sheep and goat measurements, whilst the Roman measurements were exclusively from sheep.

The last objective of the research question was how these results can be compared to the other data from the region. This was a challenge and it is almost impossible to draw any conclusions for two reasons. The first is that data from the direct vicinity is limited and that those studies focus on larger regions (such as the entire north of Spain) or a neighbouring region (the Basque country). These studies did not always agree with each other and sometimes focused on only part of the timeline of this thesis or an even broader one. The second reason why it is hard to compare these results with results from other studies is that to make the assemblage as large as possible, the entire Middle

Ages was analysed together, while the trends visible for animal husbandry and diet differ greatly between the early and later periods of the Middle Ages. The medieval animal assemblage of Tabacalera is characterised by cattle husbandry with a mixed focus on meat and secondary products. Some of this was produced as part of surplus production. This fits some of the characteristics known for the High Middle Ages in the North of Spain. As most of the assemblage likely dates to this period, it can be concluded that the findings of this thesis are consistent with other studies.

Lastly, some remarks need to be made on the research done for this thesis. The assemblage was limited to the fragments of mammal taxa. Other animal categories still need to be studied. These include fish and small mammals. They may be an interesting direction for further study. The birds were briefly discussed in this thesis but, as aforementioned, they were determined by another student of this faculty (Sarah van der Laan) and a more detailed and complete study of the bird species is, therefore, forthcoming. Although literary research was done to contextualise the changes and other developments discussed in this thesis, this research was complicated by the author's lack of knowledge of the Spanish language. Some Spanish literature was included, but the translation of more articles was deemed too time-consuming. For future research, another direction of interest may be a more detailed and complete comparison with other sites of the region during these periods.

All in all, it was possible to draw compelling conclusions on animal husbandry and diet in the Medieval period at Tabacalera but maybe the most important conclusion that can be made based on this research is that, even if a long continuous record is present on a site, the many other factors that influence this can make periods and assemblages hard to compare.

Summary (English)

In this thesis, the zooarchaeological assemblages from the Tabacalera site are compared with each other and changes in animal husbandry strategies and diet are studied. Afterward they are also compared to other data from the Iberian Peninsula known for the periods in question. These assemblage date to the Late Roman Period (5^{th}-6^{th} centuries) and the Middle Ages (8^{th} to 16^{th}, but mainly 14^{th} to 16^{th}). The Late Roman assemblage exists of carcasses dumped after a catastrophic event and the medieval assemblage was accumulated over de course of the centuries. These differences in accumulation made it hard to compare the two assemblages. To asses the possible changes a plethora of methods was used: species ratios, element distribution, mortality profiles, osteometric analysis and the distribution of taphonomic marks. In addition to the mammal fragments these methods were used on, species distribution is also discussed for the other animal groups, such as birds. All in all, this led to the following conclusions. Firstly, due to the different taphonomy and accumulation the two assemblages can barely be compared when animal husbandry and diet is considered. Some conclusions, however are possible. Secondly, cattle were the animals that were produced at the site. The focus of production lay on a mix of meat and secondary products. A part of the cattle was used for milk, ploughing and traction, and not consumed until old age and a part was slaughtered for meat and likely traded to a high-status or urban site in the area. Pig and sheep/goats were animals consumed at the site, but not produced or traded. The only product of pig was meat and sheep/goats were kept for mixed production of both wool and meat. Other species formed a supplement to this diet. Mainly these are chicken and turkey. The presence of turkey is special due to its only recent introduction to the country. Other animal groups still need to be studied. The medieval assemblage fits with the characteristics of a rural Christian site near a high-status or urban settlement during the High Middle Ages in Northern Spain. The changes that could be determined between the Roman and medieval assemblages were the change in socio economic status from high-status Roman to rural medieval. This was also attested by historical sources. There was also a change in primary consumption animal and the breed improvement of cattle known in the area from the Roman period ceased in the Middle Ages, resulting in a decrease in cattle size. The size of the sheep (that were already small during the Roman period) stayed the same during the Middle Ages. This resulted in the conclusion that no breed improvement took place

and that the mixed production known for the Roman period stayed the same in the Middle Ages. In conclusion, between the Late Roman period and the (High) Middle Ages the site underwent many changes with little continuity between the periods. These changes envelope both taphonomical and husbandry changes.

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Appendix A

ABBREVIATION	TAXA
EQC	Horse
EQA	Donkey
EQU	*Equus* sp.
BOS	Cattle
OVI	Sheep
CAP	Goat
O/C	Sheep/goat
CAN	Dog
SUD	Pig
SCR	Wild Boar
SUS	*Sus* sp.
FEL	Cat
ORY	Rabbit
LEP	Hare
GAL	Chicken
AVE	Undetermined Bird
CER	Red deer
CPR	Roe deer
DAM	Fallow deer
PYR	Spanish ibex

List of abbreviations used for Taxa in the database

Abbreviation	Element	Abbreviation	Element
ANT	Antler	HUM	Humerus
HOR	Horn	RAD	Radius
CRA	Cranial bone	ULN	Ulna
NEUK	Neurocraneum	RAU	Radius-Ulna
VISK	Viscerocraneum	CAR	Carpal
UPtooth	Upper tooth	MTC	Metacarpal
LWtooth	Lower tooth	PEL	Pelvis
MAN	Mandibula	FEM	Femur
HYO	Hyoid	TIB	Tibia
ATL	Atlas	FIB	Fibula (Os malleolar)
AXI	Axis	PAT	Patella
CV	Cervical Vertebra	CAL	Calcaneus
TV	Thoracic Vertebra	AST	Astragalus
LV	Lumbar Vertebra	CTT	Centrotarsal
V	Undetermined Vertebra	TAR	Tarsal
SAC	Sacrum	MTT	Metatarsal
KV	Caudal vertebra	MTP	Metapodial
RIB	Rib	PH1	First phalanx
STN	Sternum	PH2	Second phalanx
CLA	Clavicle	PH3	Third phalanx
SCP	Scapul		

List of abbreviations used for Elements in the database

Appendix B

STRATIGRAPH	CODE	TAXA	Element	N	FAR	D/S	ZONES	Epihyseal fusion	SEX	PA	BA	AA	NA	OT	Tooth wear/eruption stages, osteometry and observations		weight
TB08B6U5H1		OVI	HUM	1	Y	D	6,7,8,9	(?)/(+)							Ff,Bd:27.38, BT:27.09		
			ULN	1	Y	S	2,3								BPC:14.81		
			FEM	1	Y	S	5,6,7	(?)/(+)							Bd:33.99		
			FEM	1	Y	S	5,6,7	(?)/(-)							Loose epi., no frac., Bd:31.27		
			FEM	1	Y	S	DF	(-)/(?)									
			TIB	1	Y	D	5,6,7	(?)/(+)							F1, Bd:24.74, Dd:18.69		
			total	**6**													**49**
		CAP	HUM	1	Y	S	6,8,9	(?)/(+)							Ff + F1, Bd:27.66		
			TIB	1	Y	S	5,6,7	(?)/(+)							Ff, Bd:21.40, Dd:16.87, SD:12.17		
			total	**2**													**24**
		O/C	MAN	1	Y	S	5,6										
			MAN	1	Y	S	5										
			ATL	1	Y	A	4										
			CV	1	Y	A	4,5	(?)/(+)				P			chopped in half		
			CV	1	Y	A	2,4	(-)/(?)							Ff		
			LV	1	Y	A	2,4	(-)/(?)							Ff		
			SCP	1	Y	S	2,5	(?)/(+)							Ff (all sides)		
			PEL	1	Y	D	4,5	?									
			TIB	1	Y	S	DF								Ff		
		O/C	TIB	1	Y	S	1,2,3	(-)/(?)							LOOSE EPI		
			TIB	1	Y	D	DF	(-)/(?)									
			FEM	1	Y	D	DF	(?)/(-)									
			TIB	1	Y	D	DF	?							Ff		
			TIB	1	Y	?	DF	?							Ff		
			TIB	1	Y	?	DF	?							Ff		
			FEM	1	Y	?	DF	?									
			FEM	1	Y	D	DF	?									
			FEM	1	Y	?	DF	?									
			Total	**18**													**117**
		SUD	CV	1	Y	A	4,5	(-)/(-)							Bpacr:32.23, GLPa:22.80		
			AST	1	N	S									GLl:35.06, GLm:32.29, Dl:17.51, Dm:20.00, Bd:20.57		
			TIB	1	Y	S	1,2,3	(-)/(?)							LOOSE EPI, Bp:40.84		
			HUM	1	Y	D	DF	(-)/(?)									
			RAD	1	Y	S	DF	?									
			FEM	1	Y	D	DF	(?)/(-)									
			CRA	1	Y	A	5	-									
			HUM	1	Y	S	DF	(?)/(?)									
			LV	1	Y	A	1,4,5	(-)/(-)							Bpacr:35.65, Bpacd:27.65, GLPa:50.32		
			Total	**9**													**84**
		BOS	Lwtooth	1	N	S	M2								TWS:g		
			AST	1	Y	D	2	+							F1,Bd:38.60		

			FEM	1	Y	S	5	(?)/(-)									
			PEL	1	Y	S	5										
			FIB	1	N	D									Os Malleolaire, GD:31.90		
			SCP	1	Y	D	2										
			RIB	1	Y	S	DF	?				P			chopmark on anterior side		
			RAU	1	Y	S	DS	?							Ff		
			RAU	1	Y	D	DS	?									
			MAN	1	Y	S	7										
			Total	**10**													**150**
		MACRO	VER	3	Y	A		?									
			GIRDLE	5	Y	-		?									
			APEND	6	Y	-		?									
			RIB	5	Y	-		?									
			CRA	1	Y												
			Total	**20**													**177**
TB08B2U8H1		BOS	Uptooth	1	Y	S	P4								+/		
			Uptooth	1	N	S	P2								+/		
			Uptooth	1	Y	D	M1								++		
			Uptooth	1	Y	D	M3								++		
			Uptooth	1	Y	S	M1/2								+++		
			Lwtooth	1	Y	S	M1								TWS:d		
			Lwtooth	1	N	D	I1								++		
			AST	1	Y	S	1,2	+				P			prox/ant. & lat/post. sides chopped off Dm:35.28 mm		
			AST	1	N	S		+							GLl:70.50 GLm:63.22 Dl:37.43 Dm:39.36 Bd:44.02		
			RAD	1	Y	D	1,2	(+)/(?)									
			RAD	1	Y	D	1,2	(+)/(?)							F1 BP:64.39		
			MTC	1	Y	D	1,2	/(?)									
			MTT	1	Y	?	3,4,5	/(+)							Ff, Bd:44.90		
			MTT	1	Y	D	1,2	/(?)							F1, Bp:37.50		
			MTT	1	Y	?	DF	?							F1		
			MTP	1	Y	?	DF	/(-)							bone slightly porous, Ff		
			MTP	1	Y	?	3/4	/(+)									
			HUM	1	Y	S	DF	?							SD:26.55		
			CV	1	Y	A	4	(?)/(?)							Ff, GLPa:55.60		
			PEL	1	Y	D	5,7	?							F1		
			PEL	1	Y	D	5	?							F1		
			PEL	1	Y	D	4,5	?				P			medial side acetabulum chopped		
			SCP	1	Y	S	2	/(+)							F1, LG:44.92		
			LV	1	Y	A	2,4	(+)/(?)									
			ATL	1	Y	A	3	+									
			PEL	1	Y	D	1,2	?									
			ATL	1	Y	A	2	?									
			MTC	1	Y	S	2								Porous> young animal		
			VISK	1	Y	A	6?										
			MTC	1	Y	?	DF	/(?)									

			MTP	1	Y	?	DS	/(?)									
			NEUK	1	Y	A	2										
			CAL	1	Y	S	DF										
			Total	33													**739**
		MACRO	RIB	4	Y	?											
			Total	**4**													**29**
		EQC	CAR	1	N	S	MAGNUS	-							GB:35.73		
			Total	**1**													**9**
		SUD	Lwtooth	1	Y	?	C1		M								
			Uptooth	1	Y	?	I	-									
			HUM	1	Y	S	9	(?)/(?)									
			HUM	1	Y	D	9	(?)/(?)									
			HUM	1	Y	D	DF	(?)/(?)							F1, SD:10.39		
			HUM	1	Y	S	6	(?)/(?)							SD:11.38		
			RAD	1	Y	D	DF	(?)/(?)									
			RAD	1	Y	S	DF	(?)/(?)									
			RAD	1	Y	S	1,2								F1, Bp:18.60		
			ULN	1	Y	D	1,2,3,4	(?)/(-)							SDO:20.25, DPA:28.30, BPC:17.25		
			FEM	1	Y	S	DF	(?)/(?)									
			AST	1	Y	D	1										
			AST	1	Y	D	1,2								GLl: 40.73 GLm:38.38		
			MTC	1	Y	D	1,2								MCIII, Bp:12.90		
			Total	**14**													**84**
		CAN	Lwtooth	1	N	S	C								+/		
			MAN	1	Y	D	DF								[(M1),M2,(M3)], 10:+41.70, M2/L:8.14, M2/B:6.40		
			FEM	1	Y	S	5,6,7	(?)/(+)							Bd:29.00		
			FEM	1	Y	D	DF	(?)/(?)							F1		
			TIB	1	Y	S	3	(+)/(?)							F1		
			TIB	1	Y	S	DF	(?)/(?)							F1		
			MTP	1	Y	?	4,5	/(+)							F1, Bd:7.37		
			MTC	1	Y	D	1,2	/(?)							F1		
			Total	**8**													**46**
		OVI															
			FEM	1	Y	S	1	(+)/(?)							DC:17.10		
			RAD	1	Y	S	1,2	(+)/(?)							Bp:27.67 BFp:25.73		
			FEM	1	Y	S	5,6	(?)/(+)							Bd:34.22		
			ULN	1	Y	D	3	(?)/(?)									
			HUM	1	Y	D	6,7,8,9	(?)/(+)							BT:25.66, SD:12.80		
			Lwtooth	1	Y	S	M1								TWS:h		
			Total	**6**													**45**
		O/C	TIB	1	Y	S	DF	(?)/(?)									
			Lwtooth	1	Y	D	M2								TWS:c		
			PEL	1	Y	S	5,7	+									
			MTT	1	Y	?	DF	?									
			Total	**4**													**24**

		MEDIUM	RIB	6	Y	?	DF	?									
			Total	**6**													**7**
		MACRO	APEND	26	Y	?	DS	?									
			Total	**26**													**191**
		UNID	CRA	3	Y	-	-										
			APEND	11	Y	-	-										
			UNID	66	Y	-	-										
			Total	**80**													**162**
TB08B2U8H1		BOS	Uptooth	1	N	S	P2								not worn		
			SCP	1	Y	D	2,3,5	/(+)							Ff		
			MTC	1	Y	D	1,2	/(?)							F1, Bp:48.87		
			MTC	3	Y	?	DF	/(?)							F1		
			MTT	1	Y	D	1,2,5	/(?)							Bp:40.86, SD:22.96, DD:22.28		
			MTT	1	Y	D	1,2	/(?)							Bp:40.20, SD:22.25		
			MTT	2	Y	S	1,2	/(?)							F1, prox. art. Part. Gone		
			MTT	1	Y	D	1	/(?)									
			MTT	3	Y	?	DS	/(?)							F1		
			MTT	1	Y	?	DS	/(?)							F1		
			MTP	1	Y	?	DS	/(?)							F1		
			PH1	1	Y	S	1,2	(+)/(+)									
			Total	**17**													**464**
		CAN	TIB	1	Y	S	5,6,7	(?)/(+)									
			FEM	2	Y	S	DF	(?)/(?)									
			Total	**3**													**18**
		O/C	Lwtooth	1	Y	D	M2								TWS:h		
			Lwtooth	1	N	S	I2/3								+++		
			Total	**2**													**3**
		SUD	Lwtooth	1	Y	?	C1		F						wear unid.		
			HUM	1	Y	S	DF	(?)/(?)							F1		
			MTP	1	Y	?	DF	/(?)									
			Total	**3**													**9**
		MEDIUM	CRA	3	Y	?	-										
			RIB	3	Y	?	-	?									
			APEND	1	Y	?	-	?									
			UNID	6	Y	?	-										
			Total	**13**													**16**
		UNID	GIRDLE	1	Y	?	-	?									
			APEND	13	Y	?	-	?									
			UNID	21	Y	?	-										
			Total	**35**													**94**
TB08B5U7H1		BOS	MAN	1	Y	D	4	-									
			MTC	1	Y	S	1	/(?)							???		
			Total	**2**													**17**
		O/C	NEUK	1	Y	A	?										
			Lwtooth	1	N	S	M2								TWS:f		

			PEL	1	Y	D	5,7	+							F1		
			PEL	1	Y	D	5	+							Ff		
			Total	**4**													**13**
		OVI	RAD	2	Y	D	4,5	(?)/(+)							F1		
			Total	**2**													**3**
		SUD	SCP	1	Y	D	3,5	/(?)									
			Total	**1**													**6**
		MEDIUM	GIRDLE	1	Y	?	-										
			VER	1	Y	A	-										
			APEND	5	Y	?	-	(?)/(?)									
			UNID	11	Y	?	-										
			Total	**18**													**26**
		MACRO	RIB	1	Y	?	-										
			APEND	2	Y	?	-										
			UNID	1	Y	?	-										
			Total	**4**													**24**
	bag 2	BOS	MAN	1	Y	S	4										
			SCP	1	Y	D	2,5	/(+)							BG:47.84		
			AXI	1	Y	A	2	(+)/(?)									
			AXI	1	Y	A	2	(+)/(?)				P			prox end. Lat. Chopped		
			CV	1	Y	A	4	(?)/(?)									
			LV	1	Y	A	-	(?)/(?)							PROC. TRANS.		
			V	1	Y	A	4	(-)/(-)									
			RIB	1	Y	S	1	(+)/(?)									
			RAD	1	Y	D	6	(?)/(?)							ulna unfused		
			RAD	1	Y	S	4	(+)/(?)							F1		
			RAU	1	Y	D	DF	(?)/(?)							F1		
			RAU	1	Y	S	DF	(?)/(?)							F1		
			ULN	1	Y	D	1,2	(?)/(?)									
			CAR	1	Y	D	75%	-							SCAPH.		
			CAR	1	Y	S	90%	-							CUNEI., GB:35.36		
			CAR	1	Y	S	50%	-				P			CUNEI., F1		
			MTC	1	Y	S	1	/(?)							very large		
			MTC	1	Y	S	2	/(?)							very large		
			PEL	1	Y	D	2	?							porous>young animal		
			FEM	1	Y	S	1,2	(+)/(?)				P			Ff, Bp:97.65, DC:39.85		
			FEM	1	Y	S	1	(+)/(?)							DC:42.25		
			FEM	1	Y	?	1	(-)/(?)							loose epi., DC: aprox. 43.06		
			FEM	1	Y	D	1	(+)/(?)									
			FEM	1	Y	D	4	(?)/(?)									
			FEM	1	Y	S	4	(?)/(?)									
			FEM	1	Y	S	DS	(?)/(?)									
			TIB	1	Y	S	DF	(?)/(?)									
			TIB	1	Y	S	DF	(?)/(?)									
			MTT	1	Y	D	1	/(?)									

			Total	**29**													**635**
		MACRO	RIB	4	Y	?	DF	(?)/									
			Total	**4**													**20**
		CAN	Uptooth	1	N	D	P4								+/, L:16.67, GB:6.52		
			TV	1	Y	A	2,4	(+)/(?)									
			Total	**2**													**3**
		SUD	NEUK	1	Y	A	-										
			Lwtooth	1	N	S	I1								+/		
			MAN	1	Y	D	7										
			TIB	1	Y	S	1,2	(-)/(?)							Loose epi.		
			TIB	1	Y	D	1,3	(-)/(?)							Loose epi.		
			TIB	1	Y	D	1,2	(-)/(?)							Loose epi., Bp:35.04		
			MTP	1	Y	?	DF	/(?)									
			Total	**7**													**30**
		O/C	CRA	1	Y	D	2								F1		
			CRA	1	Y	S	2,3										
			CRA	1	Y	S	1,2								F1		
			CRA	1	Y	D	1,2								F1		
			CRA	1	Y	S	1,2										
			CRA	1	Y	A									vent. Ant. Occ.		
			CRA	1	Y	A									vent. Ant. Occ.		
			CRA	1	Y	?									Os Petrosum		
			NEUK	1	Y	A											
			MAN	1	Y	D	4,5,6								slightly porous>young		
			MAN	1	Y	S											
			ATL	1	Y	A	2,3,4,5										
			AXI	1	Y	A	1,2,4,5	(+)/(-)									
			RIB	2	Y	S	DF	?									
			RIB	1	Y	D	DF	?									
			HUM	1	Y	S	DF	(?)/(?)									
			RAD	1	Y	D	6	(?)/(?)							Ff		
			RAD	1	Y	?	DF	(?)/(?)									
			RAD	1	Y	D	1	(+)/(?)									
			FEM	1	Y	D	4	(?)/(-)									
			FEM	1	Y	?	DF	(?)/(?)									
			FEM	1	Y	?	DF	(?)/(?)									
			TIB	1	Y	D	DF	(?)/(?)									
			TIB	1	Y	S	DF	(?)/(?)									
			TIB	1	Y	?	DF	(?)/(?)									
			TIB	1	Y	D	DF	(?)/(?)									
			AST	1	Y	S	25%	-									
			Total	**28**													**140**
		OVI	NEUK	1	Y	A											
			Lwtooth	1	N	D	M2								TWS:b		
			Lwtooth	1	Y	D	M1/2								TWS:d		

			Uptooth	1	N	D	M1								++		
			PEL	1	Y	S	3	?							SB:7.86		
			PEL	1	Y	S	5,7	+									
			HUM	1	Y	S	2	(-)/(?)							Loose epi.		
			TIB	1	Y	D	DF	(?)/(?)									
			TIB	1	Y	S	7	(?)/(-)									
			TIB	1	Y	S	5,6,7	(?)/(+)							Bd:19.41		
			Total	**10**													**43**
		OVI	SCP	1	Y	D	2,3	/(+)							LG:19.18, BG:17.14		
		OVI	SCP	1	Y	D	1,2,3	/(+)							GLP:28,47, LG:20.68, BG:18.10		
		CAP	HUM	1	Y	D	2	(?)/(?)									
		CAP	HUM	1	Y	D	7,8	(?)/(+)									
		O/C	PEL	1	Y	S	3	(?)				C			2 AAC ON LAT. SIDE, SB: APP. 10.65		
		O/C	PEL	1	Y	D	5,7	(+)									
		O/C	PEL	1	Y	D	5,7	(+)									
		O/C	FEM	1	Y	D	4	(?)/(?)									
		O/C	TIB	1	Y	S	7	(?)/(-)									
		OVI	TIB	1	Y	D	5,6,7	(?)/(+)							Bd:21.85, Dd:18.24		
			Total	**10**													**43**
		MACRO	CRA	3	Y	-	-	-									
			VER	1	Y	-	-	-									
			GIRDLE	3	Y	-	-	-									
			APEND	16	Y	-	-	-									
			UNID	25	Y	-	-	-									
			Total	**48**													**232**
		UNID	CRA	5	Y	-	-	-									
			APEND	9	Y	-	-	-									
			UNID	31	Y	-	-	-									
			Total	**45**													**65**
TB08B2U7H1		SUD	Lwtooth	1	N	S	I2								+/		
			Lwtooth	1	Y	S	C		M								
			CRA	1	Y	D	2										
			MAN	1	Y	S	6										
			MAN	1	Y	D	6										
			STN	1	Y	A		(-)/(-)									
			RIB	1	Y	D	DF	(?)									
			SCP	1	Y	D	1,2,5	/(+)				P			AAP LAT. SIDE, GLP: 38.87, LG: APP. 32.30, BG: 27.08		
			SCP	1	Y	S	3,5	/(?)									
			FEM	1	Y	D	4	(?)/(?)									
			FEM	1	Y	D	DF	(?)/(?)									
			TIB	1	Y	S	DF	(?)/(?)							SD:16.18		
			FEM	1	Y	D	4	(?)/(?)				P?			distal frac. Looks chopped		
			FIB	1	Y	?	DF	?									
			PH1	1	Y	-	2	(?)							Bd: 16.18		
			SCP	1	Y	?	5	/(?)									

			RIB	1	Y	?	DF	(?)/								
			Total	**17**												**115**
		CAP	RAD	1	Y	D	4,5,6	(?)/(+)						Bd:23.93 BFd: 20.02		
		O/C	RAD	1	Y	D	6	(?)/(-)								
		OVI	RAD	1	Y	S	1,2	(+)/(?)				P		DIST. FRAC. AAP, Bp: 25.80, BFp: 24.17		
		O/C	PEL	1	Y	D	2,3	?				C		2 AAC VENT. SIDE, SB: 7.90		
		O/C	PEL	1	Y	D	2,3	?								
		OVI	FEM	1	N	?	1	(-)/(?)						DC: 17.43		
		O/C	FEM	1	Y	D	4,5	(?)/(+)								
		O/C	TIB	1	Y	S	DF	(?)/(?)								
		CAP	CAL	1	Y	S	2,3	+						GB: 19.12		
		CAP	TAR	1	N	D								SCAPHOCUBOID, GB: 19.85		
		O/C	MTT	1	Y	?	5	/(?)						SD: 11.58, DD: 9.40		
			Total	**11**												**57**
		BOS	NEUK	1	Y	A										
			Uptooth	1	Y	D	M1/2							++		
			MAN	1	Y	D	4									
			MAN	1	Y	S	6									
			CV	1	Y	A	4	(?)/(?)								
			LV	1	Y	A	5	(?)/(?)				P		chopped right of the proc.spin. In ant./post. Direction		
			LV	1	Y	A	4	(?)/(?)								
			RIB	1	Y	D	2	(+)/								
			RIB	1	Y	D	DF	(?)/						Ff		
			RIB	1	Y	S	DF	(?)/						Ff		
			PEL	1	Y	S	2	(?)		V				INFLAMATION?		
			SCP	1	Y	S	DF	/(?)								
			HUM	1	Y	S	DS	(?)/(?)								
			HUM	1	Y	S	6,9	(?)/(+)				P		DIST. CHOPPED		
			RAU	1	Y	S	DS	(?)/(?)								
			HUM	1	Y	D	4	(+)/(?)								
			FEM	1	Y	D	1	(+)/(?)								
			FEM	1	Y	S	5	(?)/(+)								
			FEM	1	Y	D	5	(?)/(-)								
			FEM	1	Y	D	DS	(?)/(?)								
			FEM	1	Y	?	DS	(?)/(?)						Ff		
			TIB	1	Y	S	7	(?)/(?)								
			TIB	1	Y	S	DS	(?)/(?)						Ff		
			TIB	1	Y	?	DS	(?)/(?)						Ff		
			TIB	2	Y	S	7	(?)/(?)						Ff		
			PH2	1	Y	?	1,2	(+)/(+)						Ff		
			PH2	1	Y	?	2	(-)/								
			PAT	1	Y	D										
			SES	1	Y	?	90%									
			Total	**30**												**345**
		MEDIUM	APEND	7	Y	-	DS	(?)/(?)								

			RIB	6	Y	-	DS	(?)/(?)									
			VER	2	Y	A	-	(?)/(?)									
			Total	**15**													**33**
		MACRO	APEND	2	Y	-	DS										
			Total	**2**													**12**
		CAP	Lwtooth	1	N	S	M2								TWS:g		
			Total	**1**													**0.1**
		OVI	SCP	1	Y	S	2,3,5	/(+)							BG: APP. 16.76, SLC: 17.73		
			Total	**1**													**4**
		O/C	Lwtooth	1	Y	D	M2								TWS:f/g		
			SCP	1	Y	D	4	/(?)									
			RIB	1	Y	D	1	(+)/									
			RIB	12	Y	?	DF	(?)/									
			LV	1	Y	A	1,4,5	(-)/(-)									
			LV	1	Y	A	4	(-)/(-)									
			HUM	1	Y	S	8	(?)/(+)				C					
			RAD	1	Y	D	6	(?)/(?)									
			MTC	1	Y	?	5	/(?)									
			FEM	1	Y	D	DF	(?)/(?)									
			TIB	1	Y	S	DF	(?)/(?)									
			TIB	1	Y	S	7	(?)/(?)									
			TIB	1	Y	S	7	(?)/(?)									
			Total	**24**													**68**
		MEDIUM	RIB	7	Y	-	DS										
			Total	**7**													**6**
		MACRO	CRA	2	Y	-	-										
			GIRDLE	4	Y	-	-										
			RIB	2	Y	-	DS										
			APEND	22	Y	-	DS										
			UNID	44	Y	-	-										
			Total	**74**													**349**
		MACRO	TV	1	Y	A	4	(?)/(?)									
			Total	**1**													**0.1**
TB08B2U8H1		O/C	CRA	1	Y	S									Temporalis		
		O/C	HUM	1	Y	S	6	(?)/(?)									
		O/C	ULN	1	Y	S	2	(?)/(?)							Ff		
		O/C	PEL	1	Y	S	2,3	(?)									
		O/C	PEL	1	Y	D	3	(?)									
		O/C	MTT	1	Y	?	DF	/(?)							Ff, SD:13.52 (APP.)		
			Total	**6**													**30**
		OVI	HUM	1	Y	D	6,7,8,9	(?)/(+)									
		OVI	RAD	1	Y	S	1,2	(+)/(?)									
			Total	**2**													**10**
		BOS	Lwtooth	4	Y	S	M3	-							Ff, B:11.34, TWS: f (frac. surface, unsure)		
			MAN	1	Y	D	4	-									

			HUM	1	Y	D	7,8	(?)/(+)				P			plant. Side dist. Art. Chopped off		
			RAD	1	Y	D	1	(+)/(?)									
			ULN	1	Y	S	1,2	(+)/(?)							LO:82.75, SDO:44.80, DPA: 55.15		
			AST	1	Y	D	30%	(+)							Ff		
			PH1	1	Y	?	2	(-)/							SLIGHTLY POROUS >YOUNG, Bd:14.38		
			Total	**10**													**134**
		SUD	TIB	1	Y	S	DF	(?)/(?)							Ff		
			Total	**1**													**21**
		MEDIUM	APEND	11	Y	-	DF	-									
			RIB	2	Y	-	DF	-									
			Total	**13**													**32**
		MACRO	CRA	4	Y	-	-	-									
			GIRDLE	3	Y	-	-	-									
			RIB	1	Y	-	-	-									
			APEND	8	Y	-	-	-									
			UNID	29	Y	-	-	-									
			Total	**45**													**252**
TB08B5U7H1		BOS	FEM	1	Y	D	1	(+)/(?)				P			prox. Chopped on head, med. Chopped in half, DC: 41.25		
			Total	**1**													**28**
TB08B5U7H1		SUD	HUM	1	Y	D	6,7,8,9	(?)/(+)									
			Total	**1**													**20**
		CAP	HUM	1	Y	D	6,7,8,9	(?)/(+)							SD:12.57, Bd:26.81, BT:24.99		
			Total	**1**													**20**
		O/C	TIB	1	Y	S	7	(?)/(?)									
			Total	**1**													**7**
TB08B5U7H1		O/C	Lwtooth	1	N	D	I2								+/		
		CAP	Lwtooth	1	Y	S	M1								TWS:g		
		CAP	Lwtooth	1	Y	D	M2								TWS:c		
		CAP	MAN	1	Y	S									[(P2),(P3),P4,M1,M2], TWS:l,h,f, 9:24.39, 15c:13.29, 15b:20.28		
		O/C	SCP	1	Y	S	1,2,5	/(+)							LG:19.34, GLP:23.97, BG:15.95, SLC:13,37		
		O/C	RAD	1	Y	S	6	(?)/(?)									
		CAP	TIB	1	Y	D	5,6,7	(?)/(+)							Bd:21.91, Dd:16.98		
			Total	**7**													**34**
		SUD	HUM	1	Y	D	9	(?)/(?)									
			TIB	1	Y	D	7	(?)/(?)									
			Total	**2**													**17**
		O/C	MAN	1	Y	D	4	-									
			CV	1	Y	A	3	(?)/(-)									
			LV	1	Y	A	3	(?)/(-)									
			LV	1	Y	A	3	(-)/(-)									
			Total	**4**													**11**
		BOS	MAN	1	Y	D	3	-									
			MAN	1	Y	D	6	-									
			ATL	1	Y	A	2,4	+									
			LV	1	Y	A	3	(?)/(+)							Ff		

			RAU	1	Y	S	6	(?)/(?)									
			FEM	1	Y	S	1	(?)/(?)				P			CHOPPED MED.		
			FEM	1	Y	S	DS	(?)/(?)									
			TIB	1	Y	S	2	(+)/(?)									
			CAL	1	Y	?	1	(-)/									
			MTT	1	Y	S	1,2	/(?)				P			Ff, DIST. END CHOPPED OFF, Bp:35.13		
			Total	**10**													**196**
		MEDIUM	RIB	4	Y	-	-	(?)/-									
			APEND	4	Y	-	-	(?)/(?)									
			Total	**8**													**19**
		MACRO	CRA	2	Y	-	-	-									
			GIRDLE	1	Y	-	-	-									
			VER	3	Y	-	-	-									
			RIB	1	Y	-	-	-									
			APEND	4	Y	-	-	-									
			UNID	9	Y	-	-	-									
			Total	**20**													**83**
		UNID	CRA	3	Y	-	-	-									
			GIRDLE	1	Y	-	-	-									
			VER	2	Y	-	-	-									
			RIB	4	Y	-	-	-									
			APEND	6	Y	-	-	-									
			UNID	23	Y	-	-	-									
			Total	**39**													**35**
TB08A6U11H1		BOS	Uptooth	1	N	S	P4	-							++		
			Uptooth	1	Y	D	M1	-							++, Ff		
			Lwtooth	1	Y	D	M3	-							TWS:g, B:12.53		
			Lwtooth	1	Y	D	P2	-							++		
			AXI	1	Y	A	2,4	(+)/(?)									
			TV	1	Y	A	1,5	(?)/(?)									
			SCP	1	Y	D	1,2,5	/(+)							Ff, GLP:60.10, LG:54.48		
			PAT	1	Y	S	75%	-				P			AAP DIST., GB:41.17		
			HUM	1	Y	S	7,8	(?)/(+)							Ff		
			HUM	1	Y	S	6,7,8	(?)/(+)				P			AAP DIST & CAU ON JOINT, Bd:70.85		
			HUM	1	Y	D	6,7,8	(?)/(+)				P			AAP CAU ON JOINT		
			MTC	1	N	S		/(+)							GL: ,Bp:50.02, Dp:29.24, SD:27.37, DD:19.55, Bd:50.41, Dd:28.00		
			MTC	1	Y	D	1,2	/(?)							Ff, Bp:53.23, Dp:33.89		
			MTC	2	Y	?	3,4,5	/(+)							Bd:45.07, Dd:24.47		
			AST	1	N	S		+							GLl:52.96, GLm:49.42, Dl:29.67, Dm:25.28, Bd:32.32		
			AST	1	Y	D	2	+				P			PROX. CHOPPED, Bd:38.31		
			MTT	2	Y	D	1,2	/(?)							Ff MED., SD:22.78		
			MTT	1	Y	S	1	/(?)							Ff		
			Total	**20**													**660**
		SUD	VISK	1	Y	A	FRONT	-									
			VISK	2	Y	S	MAX	-							[C1,(P2),(P3),(P4),M1,M2,(M3).+/. 29:38.42		

			Lwtooth	1	Y	S	C1	-	M							
			Lwtooth	1	Y	D	C1	-	M							
			Uptooth	1	Y	S	M3	-						+/, 30:22.12, 31:12.10		
			RIB	1	Y	D	DF	(?)/								
			HUM	1	Y	D	6,9	(?)/(?)								
			MTC	1	N	S	1,2,5	/(-)						MTCIII, B:11.78, Bp:15.49		
			Total	**9**												**74**
		O/C	Uptooth	1	Y	S	M3							+/		
		OVI	Lwtooth	1	N	D	M3							TWS:c, B:7.84, L:21.17		
		OVI	RAD	1	Y	D	4,5	(?)/(+)				P		AAP LAT. DIAP., Bd:24.19, BFd:20.24		
			Total	**3**												**21**
		O/C	MAN	2	Y	D	4,5,6	-								
			LV	1	Y	A	1,4,5	(-)/(-)								
			HUM	1	Y	S	6,9	(?)/(?)								
			Total	**4**												**29**
		OVI	CRA	3	Y	A	1,2,3							27:41.58, 29:15.40, 30:15.25		
			Total	**3**												**22**
		MEDIUM	CRA	3	Y	A	-	-								
			RIB	3	Y	-	-	-								
			APEND	6	Y	-	-	-								
			Total	**12**												**44**
		MACRO	VER	1	Y	-	-	-								
			GIRDLE	2	Y	-	-	-								
			RIB	5	Y	-	-	-								
			APEND	12	Y	-	-	-								
			UNID	4	Y	-	-	-								
			Total	**24**												**279**
		FEL	HUM	1	Y	S	1,2,3,4	(+)/(?)						Bp:15.39, Dp:16.79		
			HUM	1	Y	D	1,2,3,4	(+)/(?)						Bp:14.71, Dp:15.23		
			Total	**2**												**8**
TB08A9U4H1		EQC	Lwtooth	1	N	S	P3-M2							L:25.45, B:18.49		
			TIB	1	Y	S	5,6,7	(?)/(+)						Bd:75.69, Dd:46.79		
			AST	1	N	D		+						GH:52.17, GB:56.60, BFd:46.21, LmT:56.02		
			Total	**3**												**229**
		BOS	NEUK	2	Y	D	5,6	-						FRONT.		
			SCP	1	Y	D	5	/(?)								
			ULN	1	Y	S	2,3	(?)/(?)								
			MTC	1	Y	D	1,5	/(?)						SD:25.92, DD:18.07		
			MTC	1	Y	D	1,2,5	/(?)						Bp:51.09, Dp:30.10, SD:26.95, DD:18.08		
			MTC	1	Y	S	1,2	/(?)						Bp:43.13, Dp:25.09, SD:24.97		
			MTC	2	Y	S	1,2	/(?)						Bp:48.85, Dp:28.37		
			MTC	1	Y	-	5	/(?)						DD:18.96		
			MTT	3	Y	-	DF	/(?)								
			MTT	2	Y	S	1	/(?)								
			PH1	1	Y	S	1,2	(+)/(+)						SD:20.16, Bd:21.78		

			Total	**16**													**508**
		SUD	NEUK	1	Y	D	-	-							bulla tympanica		
			NEUK	1	Y	D	-	-				P			occipitale, AAP MED.		
			Total	**1**													**15**
		OVI	TIB	1	Y	D	5,6,7	(?)/(+)							SD:12.44, Bd:22.64		
			Total	**1**													**13**
		O/C	SCP	1	Y	S	4,5	/(?)									
			RAD	1	Y	S	1,2	(+)/(?)									
			HUM	1	Y	S	DF	(?)/(?)							Ff		
			FEM	1	Y	S	DF	(?)/(?)									
			MTT	1	Y	?	DF	/(?)									
			Total	**5**													**44**
		MACRO	CRA	2	Y	-	-	-									
			GIRDLE	2	Y	-	-	-									
			RIB	9	Y	-	-	-									
			APEND	8	Y	-	-	-									
			Total	**21**													**209**
		MEDIUM	APEND	3		-	-	-									
			Total	**3**													**5**
TB08A7U13H1		CAP	Uptooth	1	N	S	M1	-							++		
			Lwtooth	1	Y	D	M1	-							TWS:d		
			HUM	1	Y	D	7,8,9	(?)/(+)							Bd:28.24, BT:27.52		
			Total	**3**													**28**
		BOS	Lwtooth	2	Y	S	M1								TWS:m		
			Total	**2**													**7**
		SUD	RAD	1	N	S	4,5	(?)/(-)							Bd:24.11		
			Total	**1**													**3**
		MACRO	CRA	9	Y	A	-	-									
			VER	1	Y	-	-	-									
			RIB	1	Y	-	-	-									
			APEND	7	Y	-	-	-									
			Total	**18**													**110**
		MEDIUM	CRA	2	Y	A	-	-									
			Total	**2**													**5**
		O/C	HUM	1	Y	S	DF	(?)/(?)									
			LV	1	Y	A	4	(?)/(?)									
			Total	**2**													**7**
		UNID	VER	1	Y												
			RIB	3	Y												
			APEND	6	Y												
			UNID	16	Y												
			Total	**26**													**37**
TB08A5U10H1		BOS	Uptooth	1	N	D	M1	-							++		
			MAN	1	Y	D	5	-									
			LV	1	Y	A	3,4	(?)/(+)							Ff		

			SCP	1	Y	S	2,3,5	/(+)							Ff, GLP:61.23, BG:42.27, SLC:46.27		
			HUM	1	Y	D	6,8	(?)/(+)				P			Ff, AAP DIST.		
			ULN	1	Y	S	2,3	(?)/(?)							Ff, BPC:38.43		
			PEL	1	Y	D	5	(+)							Ff		
			FEM	1	Y	?	1	(-)/(?)				P					
			Total	**8**													**237**
		CAN	MAN	1	Y	S	6,7	-							[(M1),M2,(M3), L:8.48, B:6.71		
			MAN	1	Y	D	7	-							Ff, [(M1),M2,(M3), L:8.35, B:6.65		
			HUM	1	Y	S	6,7,8,9	(?)/(+)							Ff, Bd:29.47, SD:10.69		
			Total	**3**													**37**
		O/C	RAU	1	Y	D	6	(?)/(?)									
			TIB	1	Y	S	DF	(?)/(?)									
			Total	**2**													**20**
		SUD	Lwtooth	1	N	S	I1	-							+/		
			Total	**1**													**3**
		MACRO	RIB	5	Y	-	-	-									
			APEND	1	Y	-	-	-									
			Total	**6**													**34**
		MEDIUM	RIB	1	Y	-	-	-									
			Total	**1**													**1**
		UNID	UNID	5	Y	-	-	-									
			Total	**5**													**1**
TB08A10U3H1		MACRO	GIRDLE	3	Y	-	-	-									
			APEND	10	Y	-	-	-									
			Total	**13**													**105**
		O/C	ULN	1	Y	S	2	(?)/(?)							Ff		
			MTT	1	Y	D	1	/(?)									
			Total	**2**													**9**
		BOS	Lwtooth	1	Y	D	M1	-							TWS:j		
			Lwtooth	1	Y	D	M	-							TWS:g		
			Lwtooth	1	Y	S	M	-							TWS:?		
			KV	1	Y	A	2,4	(+)/(?)									
			KV	1	Y	A	2,4	(+)/(?)									
			SCP	2	Y	S	3,5	/(?)							Ff		
			MTT	1	Y	?	DF	/(?)							Ff		
			Total	**8**													**166**
TB08A10U3H1		BOS	ULN	1	Y	D	2,3	(?)/(?)							Ff		
			MTT	1	Y	?	5	/(?)									
			Total	**2**													**48**
		MACRO	RIB	1	Y	-	-	-									
			APEND	1	Y	-	-	-									
			Total	**2**													**16**
TB08A7U3H1		SUD	SCP	1	Y	S	1,2,3	/(+)							Ff, GLP:31.36, LG:26.94, BG:23.36		
			Total	**1**													**11**
		BOS	PEL	1	Y	S	3,5	(+)							Ff		

			MTT	3	Y	D	1	/(?)						T?	blackened inside of bone		
			Total	**4**													**56**
TB08A7U11H1		MACRO	APEND	3	Y	-	-	-									
			UNID	3	Y	-	-	-									
			Total	**6**													**29**
		MEDIUM	RIB	2	Y	-	-	-									
			APEND	2	Y	-	-	-									
			Total	**4**													**11**
		O/C	Lwtooth	1	Y	?	M								BADLY WEATHERED		
			Total	**1**													**1**
TB08C7U3H1		SUD	SCP	1	Y	S	1,2,3,5	/(+)		V					GLP:31.65, LG:25.28, BG:19.87, INFLAM?		
			Total	**1**													**22**
TB08A10U2H1		SUD	TIB	1	Y	D	6,7	(?)/(+)							Ff		
			Total	**1**													**12**
		O/C	RAD	1	Y	?	DF	(?)/(?)									
			Total	**1**													**5**
TB08A5U9H1		MACRO	RIB	1	Y	-	-	-									
			Total	**1**													**8**
		MEDIUM	RIB	1	Y	-	-	-									
			Total	**1**													**1**
TB08L7U4H1		MACRO	RIB	1	Y	-	-	-							Ff		
			Total	**1**													**6**
TB SECTOR27 FOSA1 BOLSA7																	
		MEDIUM	RIB	2	Y	-	-	-									
			Total	**2**													**1**
TB08A6U11H1		CAN	TIB	1	Y	D	DF	(?)/(?)									
			Total	**1**													**6**
TB08.20.63		BOS	Lwtooth	1	N	D	P3	-							ASS1		
			Lwtooth	1	N	D	P4	-							ASS1, TWS:h		
			Uptooth	1	N	D	P4	-									
			Uptooth	1	N	S	M1	-									
			Uptooth	1	N	D	M2	-									
			Uptooth	1	N	D	M3	-									
			Uptooth	1	N	D	M2	-		D					UNUSUAL WEAR		
			Uptooth	1	N	D	M3	-		D					UNUSUAL WEAR		
			Uptooth	1	N	D	M3	-		D					UNUSUAL WEAR		
			MAN	3	Y	D	2,3	-							[(P2),(P3),(P4)]		
			MAN	1	Y	D	6	-									
			TV	1	Y	A	3	(?)/(-)									
			TV	1	Y	A	1	(?)/(?)									
			LV	1	Y	A	4	(?)/(?)									
			LV	1	Y	A	4	(?)/(?)									
			LV	1	Y	A	4	(?)/(?)									
			SCP	1	Y	D	2,5	/(+)							SLC:45.33		
			TIB	1	Y	D	7	(?)/(?)							Fr, SD:32.04		

			TIB	1	Y	D	DS	(?)/(?)									
			TIB	1	Y	D	5,6	(?)/(-)									
			MTC	1	Y	S	1,2,5	/(?)							Bp:48.66, SD:23.27		
			MTT	1	Y	D	1,2	/(?)							Bp:38.78, SD:21.34		
			MTT	1	Y	D	1,2,5	/(?)							Bp:38.36, SD:20.77		
			MTT	1	Y	D	1,5	/(?)							SD:20.77		
			MTT	1	Y	?	5	/(?)							SD:21.68		
			MTT	3	Y	S	2,5	/(?)							SD:21.39		
			MTT	1	Y	?	DF	/(?)							SD:21.28		
			MTP	1	Y	?	3/4	/(+)									
			Total	**32**													**900**
		O/C	HOR	1	N	D	-	-							CORE, 45:38.15, 46:32.68		
			Lwtooth	1	N	S	M2	-							TWS:h		
			SCP	1	Y	D	7	/(?)									
			Total	**1**													**72**
		MACRO	CRA	2	Y	-	-	-									
			RIB	7	Y	-	DF	(?)/									
			APEND	1	Y	-	DS	(?)/(?)									
			Total	**10**													**80**
		EQC	MTT	1	Y	S	1,2	/(?)							MTTIV		
			MTC	1	Y	S	1,2	/(?)							MTCIV		
			MTC	1	Y	D	1,2	/(?)							MTCII		
			CAR	2	Y	D	95%	-							MAGNUM, GB:35.75		
			CAR	1	N	D	-	-							SCAPHOIDEUM, GB:37.16		
			CAR	1	N	D	-	-							UNCIFORME		
			PH3	2	Y	-	1,2	(+)/							GL:56.08, GB:68.51, LF:19.16, BF:44.00, Ld:44.26, HP:29.28		
			Total	**9**													**78**
		SUD	HUM	1	Y	D	6,9	(?)/(?)									
			HUM	1	Y	-	DF	(?)/(?)									
			TIB	1	Y	D	5,6,7	(?)/(+)							Bd:26.50		
			Total	**3**													**31**
		MEDIUM	RIB	1	Y	-	DF	(?)/									
			Total	**1**													**1**
TB08.20.55		UNID	CRA	10	Y	-	-	-									
			GIRDLE	5	Y	-	-	-									
			UNID	26	Y	-	-	-									
			Total	**41**													**75**
		MACRO	RIB	8	Y	-	-	-									
			APEND	17	Y	-	-	-									
			Total	**25**													**197**
		MEDIUM	RIB	3	Y	-	-	-									
			APEND	5	Y	-	-	-									
			Total	**8**													**9**
		BOS	VISK	1	Y	?	-	-							NASALE		
			VISK	1	Y	S	-	-							MAX, [(P2),(P3),P4]		

			Uptooth	1	Y	S	M2	-						+/		
			Uptooth	1	Y	S	M2	-						++		
			Lwtooth	1	N	D	I3	-						++		
			Lwtooth	1	Y	S	M2	-						TWS:b		
			MAN	1	Y	S	4	-				C		AAC LAT		
			TV	1	Y	A	1,5	(?)/(?)						Fr		
			AXI	1	Y	A	2	(+)/(?)								
			LV	1	Y	A	3,4	(?)/(+)								
			HUM	2	Y	D	6,9	(?)/(?)								
			FEM	1	Y	S	7	(?)/(?)								
			FEM	2	Y	S	4	(?)/(?)								
			AST	1	Y	D	25%	-								
			TAR	1	Y	D	98%	-						SCPAHO-CUBOIDE, GB:50.32		
			MTC	1	Y	?	DF	/(?)								
			PH1	1	Y	D	1	(+)/(?)								
			PH2	1	Y	D	1,2	(+)/(+)						GL:37.82, Bp:28.24, SD:22.66, Bd:21.99		
			Total	**20**												**356**
		O/C	Lwtooth	1	Y	D	I	-						+++		
			HUM	1	Y	S	9	(?)/(?)								
			RAU	1	Y	D	6	(?)/(?)								
			RAD	1	Y	?	DF	(?)/(?)								
			PEL	1	Y	D	5,7	+								
			TIB	1	Y	S	7	(?)/(?)								
			TIB	1	Y	D	DF	(?)/(?)								
			MTT	1	Y	S	1,2	/(?)						SD:9.93, Bp:18.30		
			Total	**8**												**53**
		SUD	HUM	1	Y	D	6,9	(?)/(?)								
			Total	**1**												**10**
		CAN	MAN	2	Y	S	-	-						[M1,M2,(M3); M1:L:19.54, B:7.25; M2:L:7.46, B:5.23		
			Total	**2**												**11**
		EQC	Uptooth	1	Y	S	P3-M2	-						++		
			Total	**1**												**45**
TB.08.20.21		BOS	Lwtooth	1	Y	D	M1	-						TWS:k		
			Lwtooth	2	Y	D	M3	-						to little of ocl. For TWS		
			TV	1	Y	A	1,5	(?)/(?)								
			MTT	2	Y	S	2	/(?)								
			MTT	2	Y	?	DF	/(?)								
			MTT	1	Y	?	DS	/(?)								
			Total	**9**												**155**
		EQC	MTT	1	Y	D	1,2,4,5	/(+)						Bp:47.64, Dp:42.01, SD:30.13, DD:22.91		
			Total	**1**												**192**
		O/C	PEL	1	Y	D	5,7	(+)								
			MTT	1	Y	D	1,2	/(?)								
			Total	**2**												**15**
		MACRO	RIB	6	Y	-	-	-								

			APEND	2	Y	-	-	-									
			Total	**8**													**61**
		MEDIUM	RIB	1	Y	-	-	-									
			Total	**1**													**3**
		UNID	UNID	5	Y	-	-	-									
			Total	**5**													**9**
TB.08.20.58		BOS	RAD	1	Y	S	1	(+)/(?)									
			RAD	1	Y	?	DF	(?)/(?)									
			MTC	1	Y	?	3,4,5	/(+)							Fr		
			MTC	1	Y	?	3,4,5	/(+)							Bd:46.00, DD:16.64		
			MTC	2	Y	S	1	/(?)									
			MTT	1	Y	S	1,2,5	/(?)							Fr, SD:18.92, Bp:38.78		
			MTT	1	Y	D	1,2	/(?)							Ff, SD:22.10, Bp:41.75		
			CAL	1	Y	S	1,2	(+)/(?)									
			Total	**9**													**311**
		SUD	SCP	1	Y	S	5	/(?)									
		*	TIB	1	Y	D	5,6,7	(?)/(+)							Bd:23.94, STILL FUSING		
			Total	**1**													**26**
		MEDIUM	GIRDLE	2	Y	-	-	-									
			APEND	1	Y	-	-	-									
			Total	**3**													**9**
		MACRO	APEND	2	Y	-	-	-									
			Total	**2**													**8**
TB.08.20.72		BOS	CRA	1	Y	A	5	-									
			NEUK	2	Y	A	-	-									
			Lwtooth	1	Y	D	M2	-							TWS:g		
		*	TAR	1	N	S	-	-							SCAPH.CUB., GB:55.77		
			CAL	1	Y	D	1	(?)/(?)									
		*	MTC	1	Y	D	1,2,5	/(?)							SD:26.95, DD:18.01, Bp:46.35		
		*	MTC	1	Y	D	1,2	/(?)							SD:23.65, Bp:48.38		
		*	MTC	1	Y	D	1,5	/(?)							SD:26.61, DD:18.78		
		*	MTC	2	Y	D	1,2	/(?)							Bp:47.21		
			MTC	1	Y	?	3,4,5	/(?)							Bd:45.56, DD:17.18		
			MTC	1	Y	?	5	/(?)							SD:23.95		
			MTC	1	Y	?	DS	/(?)									
			MTT	1	Y	S	1,2,5	/(?)							Bp:42.89, SD:23.85, DD:22.05		
			MTT	1	Y	S	2	/(?)									
			MTT	1	Y	?	DS	/(?)									
			MTP	1	Y	?	3/4	/(+)									
			Total	**18**													**686**
		O/C	RAD	1	Y	D	6	(?)/(?)									
			Total	**1**													**10**
		MACRO	CRA	1	Y	-	-	-									
			RIB	1	Y	-	-	-									
			Total	**2**													**13**

		UNID	APEND	4	Y	-	-	-									
			UNID	5	Y	-	-	-									
			Total	**9**													**9**
TB.08.20.54		BOS	VISK	1	Y	D	-	-							FRONT. MAX.		
			VISK	1	Y	S	-	-							[(M1),M2], +++		
			MAN	1	Y	S	2,3	-							Ff		
			Uptooth	1	Y	S	M3	-							++		
			Lwtooth	1	Y	D	M3	-							++		
			ATL	1	Y	A	3,5	(?)/(+)				P			AAP MED.		
			LV	1	Y	A	2,3,4	(+)/(+)				P			AAP MED.		
			LV	1	Y	A	4	(?)/(?)									
			ULN	1	Y	S	1,2,3	(-)/(?)							DPA:60.77, SDO:48.14, BPC:35.89		
			PEL	1	Y	S	2	(?)									
			FEM	1	Y	S	1,2,3	(+)/(?)				P			AAP ANT.1,		
			Total	**11**													**379**
		MACRO	CRA	2	Y	-	-	-									
			RIB	7	Y	-	-	-									
			APEND	5	Y	-	-	-									
			Total	**14**													**86**
		MEDIUM	RIB	9	Y	-	-	-									
			APEND	1	Y	-	-	-									
			Total	**10**													**13**
		UNID	UNID	7	Y	-	-	-									
			Total	**7**													**1**
TB.08.20.77		BOS	RAD	1	Y	S	6	(?)/(?)									
			MTC	1	Y	S	1,2,5	/(?)							Bp:47.30, SD:26.86, DD:17.75		
			MTC	1	Y	S	1	/(?)									
			MTT	1	Y	D	1,2,5	/(?)							Bp:37.46, SD:22.01		
			MTT	1	Y	D	1,2	/(?)							SD:20.62		
			MTT	1	Y	?	DS	/(?)									
			PH2	1	Y	S	1,2	(+)/(+)							GL:30.78, Bp:22.02, SD:17.56, Bd:17.96		
			Total	**7**													**341**
		SUD	Uptooth	1	N	S	M3	-							+/, 30:27.67, 31:13.12		
			Total	**1**													0.1
		MACRO	APEND	1	Y	-	-	-									
			Total	**1**													0.1
TB.08.20.20		BOS	Lwtooth	1	Y	?	M	-							+/		
			ULN	1	Y	S	2,3	(?)/(?)							Ff, BPC:42.03		
			FEM	1	Y	D	3	(-)/(?)									
			FEM	1	Y	S	4	(?)/(?)									
			MTC	1	Y	S	1,2,5	/(?)				P			AAP RECENT, Bp:60.19, SD:33.46, DD:22.81		
			Total	**5**													**285**
		SUD	MAN	1	Y	D	7	-							[(P3),P4,M1,M2,M3; TWS:c,g,e,U; 8:55.08		
			Lwtooth	1	N	S	M2	-							TWS:e		
			Total	**2**													**56**

		MACRO	GIRDLE	1	Y	-	-	-									
			APEND	3	Y	-	-	-									
			Total	**4**													**21**
		MEDIUM	APEND	1	Y	-	-	-									
			Total	**1**													**0.1**
		UNID	CRA	1	Y	-	-	-									
			UNID	4	Y	-	-	-									
			Total	**5**													**5**
TB.08.20.77		BOS	CRA	3	Y	D	-	-							NASALE		
			MAN	1	Y	S	-	-									
			Uptooth	1	Y	S	M3	-							+/		
			HUM	2	Y	D	6,9	(?)/(?)							Fr		
			FEM	1	Y	D	5	(?)/(+)									
			TIB	1	Y	D	1,2	(-)/(?)				P			AAP MEDIAL		
			MTC	1	Y	?	DF	/(?)							Fr		
			MTC	1	Y	D	2	/(?)							Fr		
			MTT	1	Y	?	3,5	/(+)							Fr		
			MTT	1	Y	?	DS	/(?)							Fr		
			MTT	2	Y	?	DS	/(?)							Fr		
			MTP	1	Y	?	3/4	/(+)							Fr		
			Total	**16**													**258**
		EQC	Lwtooth	1	Y	S	P3-M2	-							++		
			Total	**1**													**38**
		SUD	Lwtooth	1	Y	S	C1	-	F								
			Lwtooth	1	Y	D	C1	-	F								
			MAN	1	Y	D	-	-							dental form. Unclear		
			FEM	1	Y	D	4	(?)/(?)				P			AAP RECENT		
			Total	**4**													**33**
		MACRO	NEUK	5	Y	A	-	-							BOS V EQC UNCLEAR		
			Total	**5**													**19**
		UNID	UNID	12	Y	-	-	-									
			Total	**12**													**9**
TB.08.20.67		BOS	VISK	1	Y	D	-	-							NASALE		
			FEM	1	Y	D	DF	(?)/(?)							Fr		
			TIB	1	Y	S	DF	(?)/(?)							Fr		
			Total	**3**													**110**
		CAN	ULN	1	Y	S	1,2,3	(+)/(?)							DPA:22.00, SDO:18.31, BPC:15.69		
			Total	**1**													**8**
		MACRO	APEND	2	Y	-	-	-									
			Total	**2**													**34**
TB08A5U10H1		MACRO	CRA	1	Y	?	?	-							MYSTERY BONE, UNUSUAL SMOOTH AREA.		
			Total	**1**													**7**
TB.08.20.52		BOS	Uptooth	1	Y	D	M3	-							++		
			Uptooth	2	Y	S	M2	-							++		
			Lwtooth	1	Y	D	P2	-							++		

			Lwtooth	1	Y	?	M								TOO SMAL FRAG.; +/		
			Lwtooth	1	Y	D	M1								TWS:h		
			HUM	1	Y	S	8	(?)/(+)									
			AST	1	Y	D	65%	-				P			Fr; AAP PROX.; GLm:56.10, Dm:33.33		
			TAR	1	Y	D	10%	-							NAV.CUB.		
			Total	**9**													**112**
		O/C	MAN	1	Y	S	-	-							TOOTH FORM UNCLEAR		
			MAN	1	Y	D	6	-									
			TIB	1	Y	D	DF	(?)/(?)									
			TIB	1	Y	?	DF	(?)/(?)									
			MTP	1	Y	?	DS	/(?)									
			Total	**5**													**12**
		MACRO	APEND	2	Y	-	-	-									
			Total	**2**													**22**
		MEDIUM	CRA	3	Y	-	-	-									
			APEND	3	Y	-	-	-									
			Total	**6**													**9**
		SUD	HUM	1	Y	D	6,9	(?)/(?)							Fr, SD:12.37		
			Total	**1**													**16**
TB.08.20.60		BOS	Uptooth	1	Y	D	M2	-									
			Uptooth	1	Y	S	M3	-									
			Uptooth	1	Y	S	M3	-									
			Lwtooth	1	Y	S	M1	-									
			FEM	1	Y	D	DS	(?)/(?)									
			TAR	1	N	S	-	-							SCAPH. CUB.; GB:42.43		
			Total	**6**													**79**
		O/C	LV	1	Y	A	1,2,3,4,5	(+)/(+)							PL:20.85, BFcd:16.13, HFcd:12.54		
			MTT	1	Y	?	5	/(?)									
			Total	**2**													**16**
		MACRO	RIB	1	Y	-	-	-									
			APEND	15	Y	-	-	-							Fr		
			Total	**16**													**62**
TB.08.20.11		BOS	MTC	1	Y	?	5	/(?)							SD:23.69, DD:17.39		
			Total	**1**													**55**
		O/C	Lwtooth	1	Y	S	M2	-							TWS:c		
			RAD	1	Y	?	DS	(?)/(?)									
			Total	**2**													**6**
		MACRO	APEND	2	Y	-	-	-									
			Total	**2**													**12**
TB.08.20.45		BOS	SCP	1	Y	S	4	/(?)							Ff		
			TIB	1	Y	D	DS	(?)/(?)									
			Total	**2**													**35**
		SUD	TIB	1	Y	S	DS	(?)/(?)									
			Total	**1**													**1**
		UNID	CRA	1	Y	-	-	-									

		GIRDLE	7	Y	-	-	-							Fr		
		APEND	1	Y	-	-	-									
		Total	**9**													**13**
TB.08.20.77	O/C	RAD	1	Y	D	6	(?)/(?)									
		TIB	1	Y	S	7	(?)/(?)							Fr		
		Total	**2**													**14**
	MACRO	RIB	9	Y	-	-	-									
		Total	**9**													**20**
TB.08.20.69	BOS	CRA	1	Y	S	-	-							NASALE		
		Total	**1**													**6**
	SUD	MAN	3	Y	S	-	-							[(dp2),(dp3),dp4,M1,M2,(M3)];TWS: dp4:j, M1:c, M2:H		
		MAN	1	Y	A	2	-							Fr		
		MAN	1	Y	S	6	-							Fr		
		Lwtooth	2	Y	S	C1	-									
		ULN	2	Y	D	2,3	(?)/(?)							BPC:13.97		
		Total	**9**													**39**
	MACRO	RIB	1	Y	-	-	-									
		APEND	3	Y	-	-	-									
		Total	**4**													**21**
	UNID	UNID	6	Y	-	-	-									
		Total	**6**													**1**
TB.08.20.49	O/C	TIB	1	Y	S	DF	(?)/(?)									
		Total	**1**													**7**
TB08.C7.U4.H1	FEL	FEM	1	Y	S	2,3,4,5,6	(+)/(+)							GL:87.25, SD:7.02, Bd:15.93		
		Total	**1**													**4**
TB.08.B1.U6.H1	O/C	RIB	1	Y	S	1,3	(+)/									
		Total	**1**													**1**
SECTOR 21 SONDE	MEDIUM	RIB	1	Y	-	DF	(?)/									
		Total	**1**													**1**
TB.08.C7.U3.H1	FEL	FEM	1	Y	S	3,4	(+)/(+)							SD:7.50		
		Total	**1**													**4**
2016 SECTOR 29 A	SUD	FIB	1	Y	S	DF	(?)/(?)									
		Total	**1**													**1**
TB08.C7.U3.H1	O/C	VISK	1	Y	D	6	-									
		Total	**1**													**1**
	MEDIUM	RIB	2	Y	-	-	-									
		Total	**2**													**1**
TB08.C7.U2.H1	CAN	RIB	1	Y	?	DF	(?)/									
		PH1	1	N	-	-	(+)/(+)							GL:16.87, Bp:7.16, SD:3.99, Bd:4.93		
		Total	**2**													**1**
TB.08.20.54	BOS	Uptooth	1	Y	S	M3								++		
		MAN	2	Y	S	4,5	-									
		CV	1	Y	A	2,4,5	(+)/(-)				C			AAC 2x Med. Neuralarch		
		ULN	1	Y	S	2	(?)/(?)									
		TV	1	Y	A	5	(?)/(?)									

			MTC	1	Y	S	1,2,5		/(?)						Ff, Bp:44.53, SD:24.05		
			MTT	1	Y	?	3,4,5		/(+)						Bd:41.08, DD:17.81		
			MTC	2	Y	?	DF		/(?)						Ff		
			Total	**10**													**223**
		EQC	Uptooth	1	Y	S	P3-M3		-						++		
			PH1	1	Y	?		1	(+)/(?)								
			PH1	1	Y	?		2	(?)/(+)								
			Total	**3**													**38**
		SUD	MAN	1	Y	S	-		-						[(P4),M1,(M2)], TWS:f		
			Lwtooth	1	Y	D	M2		-						Too fragmented for TWS		
			Total	**2**													**29**
		O/C	TIB	1	Y	S	DF		(?)/(?)								
			TIB	1	Y	D	DF		(?)/(?)								
			PH1	1	N	D	-		(+)/(+)						DIST. Porous		
			Total	**3**													**18**
		MACRO	RIB	4	Y	-	-		-								
			VERT	1	Y	A		3	(?)/(-)								
			APEND	8	Y	-	-		-								
			Total	**13**													**67**
		MEDIUM	CRA	1	Y	-	-		-						Dental root		
			RIB	2	Y	-	-		-								
			APEND	2	Y	-	-		-								
			Total	**5**													**6**
		UNID	UNID	11	Y	-	-		-								
			Total	**11**													**35**
TB.08.20.58		BOS	VISK	1	Y	S	-		-						NASALE		
			Uptooth	1	Y	D	P2		-						++		
			TV	1	Y	A		5	(?)/(?)								
			PEL	1	Y	S	5,7		(?)								
			PEL	1	Y	S	4,5		(+)								
			FEM	1	Y	D		4	(?)/(?)								
			TIB	1	Y	S	DS		(?)/(?)								
			TIB	1	Y	S	DS		(?)/(?)								
			MTC	1	N	S	-		/(+)						GL:169; Bp:46.00; SD:23.83; DD:17.30; Bd:46.02		
			MTC	1	Y	?	4,5		/(+)						SD:20.71		
			MTC	2	Y	D	1,2		/(?)								
			MTC	1	Y	?	4,5		/(+)								
			MTC	1	Y	?	3,5		/(+)								
			MTC	2	Y	?		5	/(?)								
			MTC	1	Y	S		1	/(?)								
			MTC	2	Y	?		5	/(?)						SD:23.72, DD:17.64		
			MTC	1	Y	?		5	/(?)								
			MTT	1	Y	D		1	/(?)						SD:21.66, DD:20.15		
			MTT	2	Y	S	1,2		/(?)						SD:25.93		
			MTT	1	Y	D	1,2		/(?)						Bp:40.98		

			MTT	1	Y	?	5	/(?)						SD:22.17		
			MTT	1	Y	S	1	/(?)								
			MTT	1	Y	?	5	/(?)								
			MTP	19	Y	?	DS	/(?)								
			Total	**46**												**945**
		EQC	AST	2	Y	S	90%	(+)						GL:54.23		
			Total	**2**												**52**
		SUD	MAN	1	Y	D	-	-						[(P2),P3,(P4)], +/		
			Lwtooth	1	Y	D	C	-	F							
			Total	**2**												**7**
		MACRO	RIB	4	Y	-	-	-								
			GIRDLE	2	Y	-	-	-								
			APEND	1	Y	-	DS	-								
			Total	**7**												**63**
		UNID	CRA	2	Y	-	-	-								
			UNID	14	Y	-	-	-								
			Total	**16**												**39**
TB.08.20.58		BOS	VISK	2	Y	S	-	-						NASALE		
			Uptooth	1	N	D	P3	-								
			Uptooth	1	N	D	P4	-								
			Uptooth	1	N	D	M3	-								
			Uptooth	1	Y	D	M2	-								
			Uptooth	1	N	D	M3	-								
			Uptooth	1	Y	D	M3	-								
			Uptooth	1	Y	S	M3	-								
			Uptooth	1	Y	D	M3	-								
			Lwtooth	1	N	D	M2	-						TWS:g		
			Lwtooth	1	Y	D	M1	-						TWS:e		
			HUM	2	Y	S	6,8,9	(?)/(+)						Fr		
			RAD	1	Y	S	2	(+)/(?)								
			FEM	1	Y	D	DF	(?)/(?)								
			MTC	1	Y	D	1,2,5	/(?)						Bp:49.04, SD:25.26, DD:17.96		
			MTT	1	Y	D	1,2	/(?)						SD:20.81, DD:19.65		
			MTT	2	Y	D	2	/(+)						Bd:50.60, SD:22.23		
			MTT	1	Y	?	1,5	/(?)								
			MTT	1	Y	?	5	/(?)						SD:21.55		
			MTP	1	Y	?	DS	/(?)								
			MTP	1	Y	?	DS	/(?)								
			MTP	1	Y	?	DS	/(?)								
			CAL	2	Y	S	2,3	(?)/(+)								
			CAL	1	Y	D	3	(?)/(+)								
			Total	**28**												**694**
		CAP	HUM	1	Y	S	6,7,8,9	(?)/(+)						Bd:31.73, BT:30.38		
			Total	**1**												**21**
		MACRO	NEUK	12	Y	A	-	-								

			GIRDLE	1	Y	-	-	-									
			RIB	2	Y	-	-	-									
			APEND	10	Y	-	-	-									
			Total	**25**													**128**
		UNID	UNID	13	Y	-	-	-									
			Total	**13**													**28**
TB.08.20.48		BOS	HOC	1	Y	S	95%	-							47:00:00		
			MAN	1	Y	S	2,3	-							[(P2),P3,(P4)], TWS:H, 15C:27.61		
			SCP	1	Y	S	1,2,3,5	/(+)							SLC:42.41, GLP:55.97, LG:48.34, BG:41.20		
			SCP	1	Y	D	2,5	/(+)									
			RAD	1	Y	D	1,2	(+)/(?)									
			FEM	1	Y	D	5,7	(?)/(-)				P			MED. COND. DIST. & POST. AAP		
			MTC	1	Y	D	1,2,5	/(?)							Bp:63.05, DD:21.99		
			MTC	1	Y	D	1,2,5	/(?)							Bp:44.57, SD:23.60, DD:17.48		
			MTC	1	Y	?	5	/(?)							Fr, SD:26.51, DD:19.09		
			MTC	1	Y	?	5	/(?)									
			MTC	2	Y	D	1,2	/(?)							Bp:46.61		
			MTT	1	Y	S	1,2	/(?)							Bp:45.83, SD:23.76		
			MTT	1	Y	D	2	/(?)							MED. SPLIT		
			MTT	1	Y	?	DF	/(?)									
			PH1	1	Y	S	1,2	(+)/(+)							Glpe:49.16, Bp:27.07, SD:21.84, Bd:25.66		
			PH3	1	Y	S	95%	(+)/(+)							DLS:56.10, Ld:41.46, MBS:19.48		
			Total	**17**													**912**
		SUD	MAN	1	Y	D	7,8	-							[M2,M3; TWS: M2: f, M3: a; 10B:11.39, 10L:22.16, 16A:35.93		
			MAN	1	Y	D	6	-									
			Total	**2**													**84**
		O/C	HOC	1	Y	S	70%	-									
			HOC	1	Y	S	10%	-									
			TIB	1	Y	S	DF	(?)/(?)									
			Total	**3**													**73**
		MACRO	RIB	1	Y	-	-	-									
			APEND	4	Y	-	-	-									
			Total	**5**													**36**
		MEDIUM	CRA	1	Y	-	-	-									
			RIB	1	Y	-	-	-									
			Total	**2**													**6**
		UNID	UNID	7	Y	-	-	-									
			Total	**7**													**14**
TB.08.20.53		BOS	Uptooth	1	N	S	M3	-							++		
			Uptooth	1	N	D	M2	-							++		
			HUM	1	Y	S	6,7,8,9	(?)/(+)							Bd:57.04, BT:55.44		
			TIB	1	Y	D	DS	(?)/(?)									
			MTC	1	Y	D	2,5	/(?)							SD:26.85, DD:18.22		
			MTC	2	Y	S	1,2	/(?)							SD:24.99		
			MTT	1	Y	S	1,2,5	/(?)							SD:22.96, DD:19.82		

			MTT	3	Y	?	DF	/(?)								
			MTP	1	Y	?	3/4	/(?)				P		PROX. CHOPPED EPI.		
			Total	**12**												**525**
		EQC	Lwtooth	1	Y	S	P3-M2	-						+/, B:17.62, L:29.92		
			Total	**1**												**47**
		CAN	HUM	1	Y	S	6,7,8,9	(?)/(+)						SD:9.57, Bd:26.50		
			TIB	1	Y	S	DF	(?)/(?)								
			Total	**2**												**13**
		MEDIUM	RIB	1	Y	-	-	-								
			Total	**1**												**1**
		UNID	UNID	1	Y	-	-	-								
			Total	**1**												**7**
TB.08.20.36		BOS	PEL	3	Y	S	2	(?)						GLUED		
			MTT	1	Y	D	1,2,3,5	/(+)						Bp:37.30(APP), SD:21.37, DD:19.79		
			MTT	1	Y	D	1,2,5	/(?)						Bp:42.56, SD:23.92, DD:23.00		
			MTT	3	Y	S	1,2,5	/(?)						Bp:42.72, SD:23.04		
			CAL	2	Y	S	1,2	(+)/(?)								
			Total	**10**												**427**
		O/C	MAN	1	Y	S	2	-								
			PH1	1	N	S	-	(+)/(+)						Bp:11.56, SD:9.67, Bd:12.19		
			Total	**2**												**6**
		MACRO	APEND	5	Y	-	-	-								
			RIB	1	Y	-	-	-								
			Total	**6**												**37**
TB.08.20.65		BOS	Lwtooth	1	Y	S	M1	-						TWS:j		
			RAD	1	Y	D	DF	(?)/(?)								
			TIB	4	Y	D	2	(+)/(?)						Fr(ego)		
			MTC	1	Y	D	1,2,5	/(?)						SD:25.44, DD:18.11		
			MTT	2	Y	?	3,4,5	/(+)						SD:19.12, DD:18.83, Bd:43.52		
			MTT	1	Y	D	1	/(?)								
			Total	**10**												**288**
		O/C	MAN	1	Y	S	4	-								
			Lwtooth	1	Y	D	M2	-						TWS:f		
			FEM	1	Y	D	DS	(?)/(?)								
			Total	**3**												**10**
		MACRO	APEND	1	Y	-	-	-								
			Total	**1**												**31**
TB.08.20.44		SUD	CRA	9	Y	A	3,5,6,7	-						[P4,M1,M2], '+/		
			Total	**9**												**125**
		BOS	TIB	5	Y	D	5,6	(?)/(+)								
			Total	**5**												**31**
		O/C	HUM	1	Y	D	DS	(?)/(?)								
			Total	**1**												**4**
		MEDIUM	CRA	17	Y	-	-	-						likely belong to sud cranium, but too small to fit		
			RIB	1	Y	-	-	-								

			APEND	4	Y	-	-	-									
			Total	**22**													**33**
		UNID	UNID	16	Y	-	-	-									
			Total	**16**													**10**
TB.08.20.61		BOS	Uptooth	2	Y	S	M1	-							++		
			VISK	1	Y	?	-	-							MAXILLA		
			HUM	1	Y	S	8,9	(?)/(+)									
			CV	1	Y	A	4	(?)/(?)									
			FEM	1	Y	D	DS	(?)/(?)									
			TIB	1	Y	S	DS	(?)/(?)									
			MTC	2	Y	?	5	/(?)							Fr		
			Total	**9**													**175**
		SUD	TIB	1	Y	S	DF	(?)/(?)									
			MTIV	1	Y	S	1,2,5	/(-)							Bp:11.65, B:10.07		
			RIB	5	Y	?	DF	(?)/							Fr		
			Total	**7**													**34**
		EQC	TAR	1	Y	D	75%	-							NAVICULARE		
			Total	**1**													**10**
		UNID	UNID	8	Y	-	-	-									
			Total	**8**													**21**
TB.08.20.37		BOS	Uptooth	2	Y	S	M2	-							++		
			MTC	1	N	D	-	/(+)							GL:168, Bp:45.57, SD:24.30, DD:17.64, Bd:47.53		
			Total	**3**													**117**
		SUD	Lwtooth	1	Y	S	C	-							wear not visible		
			Total	**1**													**3**
		CAN	LV	1	Y	A	1,2,3,4,5	(+)/(+)							PL:18.59, BFcr:17.38, HFcr:11.46, BFcd:19.05, HFcd:10.49		
			PEL	1	Y	D	5	(+)									
			Total	**2**													**7**
		O/C	MTT	1	Y	?	5	/(-)				C			AAC POST MID DIAPH., DD:9.12, SD:9.88		
			Total	**1**													**9**
		MACRO	APEND	2	Y	-	-	-									
			Total	**2**													**13**
		MEDIUM	CRA	2	Y	-	-	-									
			RIB	2	Y	-	-	-									
			Total	**4**													**11**
TB.08.20.32		BOS	RAU	2	Y	S	4,5	(?)/(+)									
			RAU	1	Y	S	3	(?)/(?)									
			Total	**3**													**67**
		O/C	MAN	2	Y	D	-	-									
			Lwtooth	1	Y	S	M3	-							TWS:f/g, occl. Surface partially broken		
			FEM	1	Y	D	DF	(?)/(?)									
			Total	**4**													**23**
		MACRO	APEND	5	Y	-	-	-									
			Total	**5**													**21**
		UNID	UNID	4	Y	-	-	-									

			Total	**4**													**3**
TB.08.20.44		HAKE	MAN	1	Y	?	-	-									
			Total	**1**													
		BOS	VISK	2	Y	D	-	-							(Prae)maxillare		
			VISK	1	Y	S	-	-							Praemaxillare		
			NEUK	1	Y	A	-	-							Frontale		
			NEUK	1	Y	A	-	-							Frontale		
			Total	**5**													**71**
		CAN	SCP	2	Y	?	4	/(?)									
			Total	**2**													**15**
		MACRO	CRA	2	Y	-	-	-									
			Total	**2**													**4**
		UNID	UNID	1	Y	-	-	-									
			Total	**1**													**2**
TB.08.20.46		BOS	MAN	1	Y	S	-	-									
			MAN	1	Y	D	5	-									
			SCP	1	Y	S	-	/(?)									
			HUM	1	Y	S	6	(?)/(?)									
			TIB	1	Y	S	DS	(?)/(?)									
			MTT	1	Y	S	1	/(?)									
			Total	**6**													**81**
		MEDIUM	RIB	2	Y	-	-	-									
			Total	**2**													**1**
		UNID	UNID	16	Y	-	-	-									
			Total	**16**													**22**
TB.08.20.56		SUD	Lwtooth	1	Y	S	M2	-							TWS:a		
			HUM	1	Y	S	6,7,8,9	(?)/(+)				C			AAC ANT. DIAPH.; SD:11.43, Bd:28.18		
			Total	**2**													**19**
		MEDIUM	APEND	1	Y	-	-	-									
			Total	**1**													**4**
		MACRO	APEND	5	Y	-	-	-									
			Total	**5**													**26**
		UNID	UNID	1	Y	-	-	-									
			Total	**1**													**2**
TB.0120.83B		MEDIUM	CRA	2	Y	-	-	-							likely dog or cat		
			Total	**2**													**2**
TB.09.20.83D		UNID	UNID	1	Y	-	-	-									
			Total	**1**													**0.1**
		CAN	RIB	1	Y	S	1,2,3	(+)/									
			Total	**1**													**0.1**
TB.09.20.83		CAN	MTV	1	N	S	1,2,5	/(-)							Bp:6.25, SD:3.21		
			Total	**1**													**0.1**

Appendix C

category	element	unfused	fused	total	%unfused	%killed
<1 year	SCP	0	8	8		
	PEL	0	3	3		
	totaal	**0**	**11**	**11**	**0**	**0**
1-2 years	HUM Dis.	0	10	10		
	RAD Prox.	0	7	7		
	PH1	1	4	5		
	PH2	1	3	4		
	Total	**2**	**24**	**26**	**7.7**	**7.7**
2-3 years	MTC d	0	10	10		
	MTT d	0	6	6		
	MTP d	1	4	5		
	TIB d	1	1	2		
	Total	**2**	**21**	**23**	**8.7**	**1**
3-4 years	HUM p	0	1	1		
	RAD d	0	1	1		
	ULN p	1	1	2		
	FEM p	3	6	9		
	FEM d	3	2	5		
	TIB p	1	2	3		
	CAL	1	2	3		
	total	**9**	**15**	**24**	**37.5**	**28.8**
>4 years						62.5

Calculations for epiphyseal mortality profile cattle

category	element	unfused	fused	total	%unfused	%killed
	SCP	0	3	3		
	HUM d.	0	2	2		
	RAD p.	0	0	0		
	PH2	0	0	0		
	PEL	0	0	0		
0-12m	**Total**	**0**	**5**	**5**	**0**	**0**
	MTC	1	0	1		
	MTT	1	0	1		
	MTP	0	0	0		
	TIB d	0	3	3		
	CAL	0	0	0		
12-30m	**Total**	**2**	**3**	**5**	**40**	**40**
	HUM p	1	0	1		
	RAD d	1	0	1		
	ULN p	0	0	0		
	ULN d.	1	0	1		
	FEM p	0	0	0		
	FEM d	1	0	1		
	TIB p	4	0	4		
30-42m	**Total**	**8**	**0**	**8**	**100**	**60**
>42 months						0

Calculations epiphyseal mortality profile pig

Category	Element	Unfused	Fused	Total	%unfused	%killed
	SCP	0	5	5		
	PEL	0	8	8		
	HUM D.	0	9	9		
	RAD P.	0	5	5		
0-10m	**Total**	**0**	**27**	**27**	**0**	**0**
	PH1	0	2	2		
	TIB D.	2	6	8		
	MTT	1	0	1		
10-28m	**TOTAL**	**3**	**8**	**11**	**27**	**27**
	FEM P.	2	1	3		
	CAL	0	1	1		
	RAD D.	1	3	4		
28-36m	**Total**	**3**	**5**	**8**	**37.5**	**10.5**
	HUM P.	1	0	1		
	FEM D.	3	3	6		
	TIB P.	2	0	2		
36-42m	**Total**	**6**	**3**	**9**	**66.7**	**29.2**
>42 m						33.3

Calculations epiphyseal mortality profile sheep/goat