Zooarchaeology, medieval economy and culinary practices: The case of Petra Castellana castrum (South of France)

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Declarations of interest: none

Abstract:

Through the work of historians and zooarchaeologists, French medieval butchery, its regulations, skills, prices and products offered for sale are well known, especially from the 13th and 14th centuries. Nevertheless, the consumer of the high Middle Ages as well as his culinary practices are relatively unknown. This zooarchaeological study of Petra Castellana castrum *(11th - 12th centuries AD), in particular bone density and animal utility indices, has shed light on the supply systems and culinary practices of an area of the site. The contribution of textual sources has also been decisive in contextualizing and interpreting the results. This paper puts forward the preparation of two different types of meat cuts: (1) a preliminary cut favouring equally sized pieces of meat, followed by (2) a cooking cut which, on the contrary, was adapted to the different kinds of meat.*

Keywords:
Archaeozoology - Middle Ages - taphonomy - animal economy – butchery

INTRODUCTION

Since the 1970s, medieval urban economy has generated a strong interest among European historians, particularly in issues related to animal products/by-products and culinary practices. Consequently, many studies have emerged (*e.g.*, Montanari, 1988; 1993; Flandrin *et al.*, 1999; Adamson, 2004; Woolgar, 2006; Lewicka, 2011; Gautier, 2013; Montanari, 2015). The south of France has benefitted from this trend with, for example, the work of Sclafert (1959), Stouff (1970), Ferrières (2002), Horard and Laurioux (2017) or Petrowiste and Lafuente Gómez (2018). Subsequently, advances in medieval zooarchaeology through international studies such as those of Baker (1993), Bartosiewicz (1995), Albarella (2005) or Grau-Sologestoa (2015) have nuanced or completed the information provided by textual sources. Substantial research in southern France such as that of Forest (1987), Leguilloux (1994), Catalo *et a*l. (1995), Durand *et al.* (1997), Rodet-Belarbi and Forest (2008) and Bertin *et al*. (2017) has largely been inspired by the work of Audoin-Rouzeau (1986) although hers was not about the south of France. In this context, urban supply issues, changes in food choices and regional culinary practices have been at the very core of discussions. These considerations have highlighted two main points. First, the incredible complexity and diversity of these phenomena, making it extremely difficult (if not impossible) to propose a recurrent pattern between periods, regions or settlement types. Secondly, issues and biases in archaeology and history are different. For example, zooarchaeology is able to fill in the gaps in textual sources for periods preceding the 13th-14th centuries AD and to verify and complete the available data. Nevertheless, it can hardly address some topics such as trade, regulations and cooking. It will necessarily have to rely on posterior texts (or iconography) to contextualize its results, thus exposing itself to anachronisms. These obstacles are inherent. Yet, bringing these two disciplines together is crucial to the study of medieval societies.

In this way, Provençal butchery, its rules and skills as well as its prices and the products offered for sale, are well known. Nevertheless, whether from textual or material sources, consumer-specific information is very often supplanted by that of the butcher: archives overwhelmingly collect legislative texts aimed at regulating and standardising meat selling or refer to complaints which bear witness to the tensions between butchers and local authorities (Stouff, 1970; Ferrières, 2002; Petrowiste, 2018). In addition, the methods applied by zooarchaeologists may be biased because it is difficult to determine whether the meat diet was marked by a production/consumption dynamic or only consumption. This issue is even more crucial when the context is not clearly identified as urban. Thus, several questions arise: was the site supplied by a butcher or through private production? If from a butcher, was it a travelling butcher who slaughtered and butchered the animals? A major underlying question lies behind these issues: were carcasses consumed entirely by a single household or were they shared among the inhabitants of the settlement? Without these data, how can we meaningfully discuss the various contributions of different social groups to meat consumption? Another question remains concerning meat: how to distinguish traces left by the butcher from those produced by the consumer during preparation and consumption? While zooarchaeology studies are interested in eating practices, they are most often based on slaughter ages and butcher marks (e.g., Audoin-Rouzeau, 1986). Nevertheless, this approach is incomplete, especially since the author of these traces remains, as previously mentioned, unidentifiable.

The zooarchaeological study of Petra Castellana (11th - 12th centuries AD) is based on these considerations and on the historical and archaeological studies mentioned above. There is another particularly interesting point: no written source defines the status of Petra Castellana. The agglomeration below (Castellane) is known as a city, but only later, during the 13th and 14th centuries AD. The mention of *castrum* and *castellum* only reveals that Petra was a fortified agglomeration. So, was it a city or merely a town? Given that its church was parochial until the middle of the 13th century AD and considering the size of the site, it is highly plausible it was a city. It seems that during the main settlement of the *castrum*, Petra was the political (vicinity of the castle), military (the fortifications) and religious (the parish) centre of both agglomerations. However, there is no way of telling which, the *castrum* or the lowland, held the economic core. The unclear status of the site, combined with the results of the zooarchaeological study, led to the questions presented above. This paper discusses, through different sources and methods, the status of Petra Castellana and its economic bonds with the lowland habitat. Taphonomy has also been a decisive tool in apprehending the consumer as well as the medieval cuisine.

1. MATERIALS AND METHODS

1.1. The site

Located in the Verdon Valley, Castellane (Alpes de Haute-Provence, Fig. 1) corresponds to the location of the capital of a Gallic population ("*Suetrii*") and to a chief town in Roman times: *Salinae*. These two agglomerations are poorly known. In the 11th century AD, a fortified settlement (Petra Castellana) and a castle (where the Castellane family lived) were built on the heights of the current town. Shortly afterwards, still during the 11th century AD, the town of Castellane emerged in the lowlands. In 1262, following a siege of the castle and *castrum*, the Counts of Provence drove out the Castellane family, and the latter's possessions entered the Counts' domains. The castrum started to be abandoned quite early, between the 13th and 14th centuries AD in favour of the city below. The beginning of this desertion is potentially linked to the siege and to the resulting destructions. In the Middle

Ages, Castellane was an important regional centre. The Lords of Castellane were, from the 10th to the 13th centuries AD, among the most important and powerful families in Provence. Castellane was also an important economic centre in the Alpine area. Located at the convergence of several axes leading into the Alps, it dominated one of the few convenient crossing points of the Verdon river. The presence of gypsum in local geological formations leads to the rising of salt springs. These were exploited in ancient times and explain the name of the city during Roman times. This salt, combined with the roads, made Castellane an important point for transhumance. The relatively opulent medieval Castellane was represented by three main sites (fig 2): (1) the Roc, on which the fortress was erected until its destruction at the end of the 15th century, (2) Castellane, where the current town is located, mentioned in the 11th century and fortified in the middle of the 14th century AD, and (3) Petra Castellana, the focus area of this study. The *castrum* dominated the Verdon valley by its position and the city was easily accessible to its inhabitants (at about 300 metres).

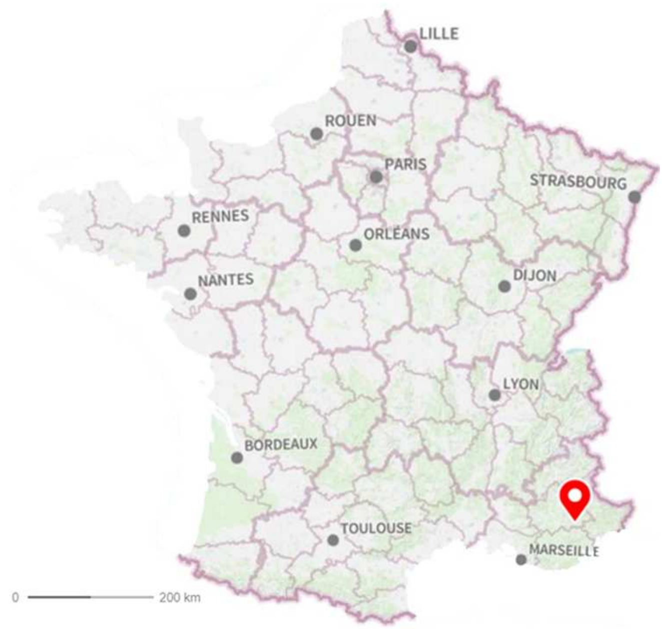

Figure 1 : geographical location of Castellane (map from geoportail.gouv.fr) **(B&W)**

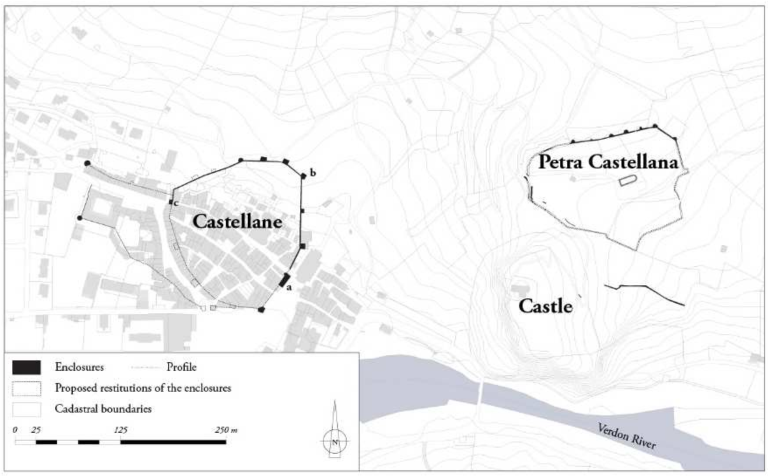

Figure 2: Petra Castellana, the castle and Castellane **(B&W)**

This settlement of about two ha (fig. 3) has been the target of planned excavation campaigns since 2016 (Buccio *et al., 2018*). It has a still partially standing enclosure and a parish church (adjacent to zone 12). Several surveys across the site have aimed at studying both buildings and open spaces. These surveys represent about 2% of the surface area of the settlement.

At the end of three excavation campaigns, the first documented medieval occupation was attributed to the 11th and 12th centuries AD. Most of the faunal material is associated with this settlement. Two later settlements left few remains and stratigraphic disruptions have led to their exclusion from analysis. The site was on agricultural land, including terracing, until the 1950s. The excavation revealed residential buildings that originally probably had a residential

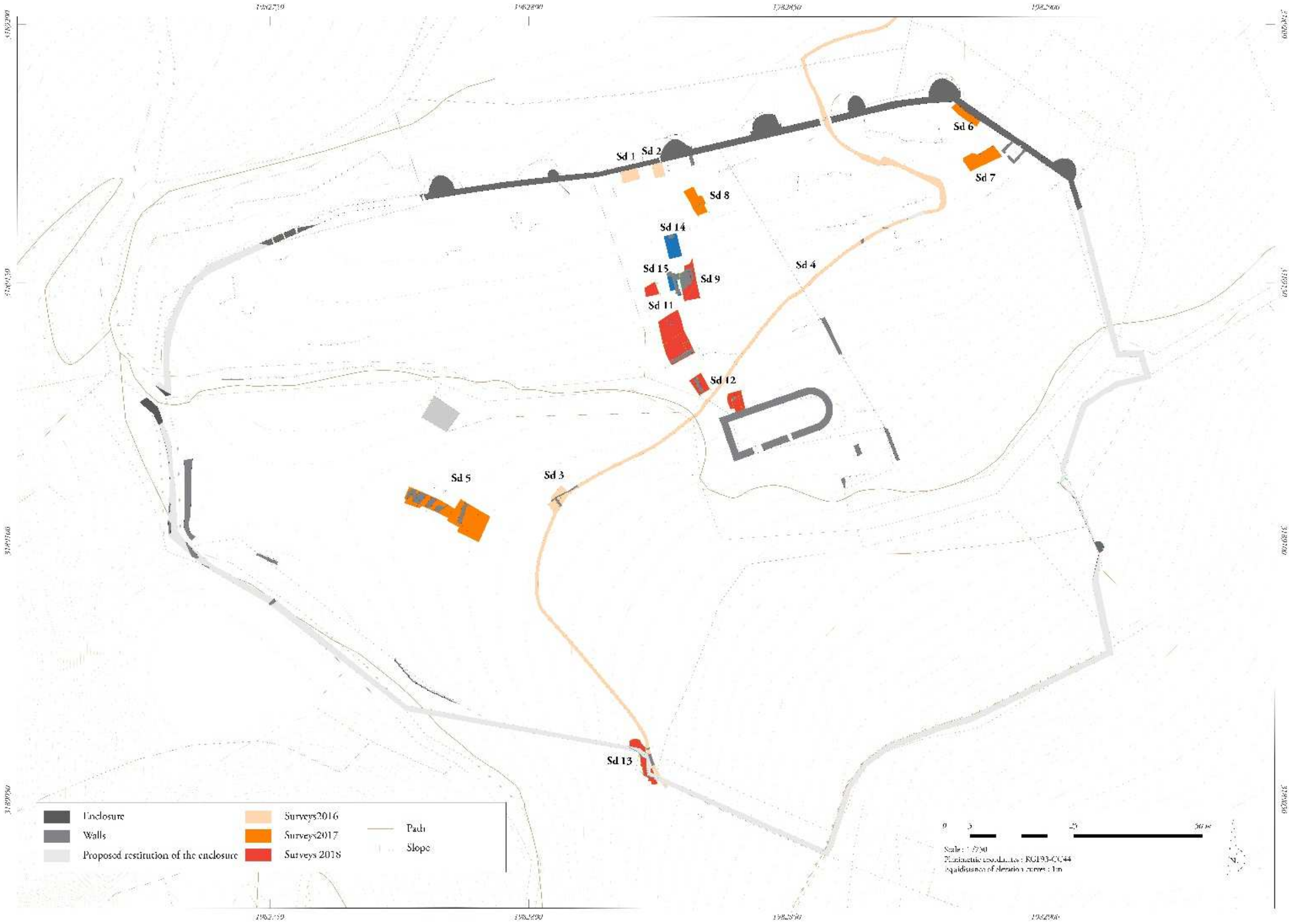

Figure 3 : Plan of Petra Castellana and location of the excavation areas (Buccio) ***(colour)***

level, but from which little material was recovered (zone 8). Built manufacturing and trade areas have also been identified. South of the site, but still within the urban zone, there is a silo area (zone 5).

During the archaeological intervention, 2,440 faunal remains (identified and non-identified = NR) were found. Nearly 63% of these finds dated from the 11th and 12th centuries AD (1,529 faunal remains). For this occupation, the NISP (Number of Identified Specimens) was 793 (53%). The remains, kitchen waste, were essentially concentrated in the occupation levels (NR = 828 or 54%) and the pit fills (NR = 106 or 7%). Most of the assemblage therefore comes from well-defined archaeological contexts. The fills (diverse) were also rich in remains, with NR = 435 (or 28%).

1.1. Method

1.1.1. General data

The faunal material was collected by hand, on sight. A multifactorial zooarchaeological study was conducted. It included the identification of the remains at the anatomical and taxonomic level, basic quantifications according to Lyman (1994), the study of animal resources management, butchering analysis and a taphonomic study. To distinguish between goat and sheep, (*e.g.,* Helmer, 2000; Fernandez, 2001; Zeder and Lapham, 2010) the lower cheek teeth and long bones were used. The age at death was estimated from the degree of bone fusion (e.g., Barone, 1976; Zeder, 2009; Zeder *et al*., 2015) as well as from dental eruption and tooth wear. For *Suidae* and sheep/goat these estimates were made from observations of the eruption sequence and the degree wear of the upper and lower cheek teeth. The rankings are based on the tables of Matschke (1967) and Bridault *et al.* (2000) for pigs, on those of Greenfield and Arnold (2008) for sheep/goat and on Jones and Sadler (2012) for cattle. The composition of the assemblages is described through the Number of Remains (NR), the NISP, the Minimum Number of Individuals by frequency and by comparison (MNIf, MNIc, for further discussion about MNI biases see, *e.g.,* Plug and Plug, 1990; O'Connor, 2001), the Minimum Number of Elements (MNE) and the standardised Minimum Animal Unit, expressed in %MAU (Binford, 1978; Brugal *et al*., 1994; Lyman, 1994). It should be noted that laterality and rank (ribs; vertebrae) are not included in graphic anatomical representations. The same goes for phalanges (anterior, posterior, medial, lateral). Finally, bone survivorship, expressed in %MAU, was applied on the whole bone for the skull, vertebrae and girdles. This explains the difference between the levels of survivorship of these anatomical elements and that of the long bones. Long bone survivorship was documented by dividing each bone into five sections: proximal and distal joints and then proximal, median and distal diaphyses. This type of representation enables the clear visualisation of anomalies. All identified specimens were examined for anthropogenic bone-surface modifications (bone fracturing, *e.g.,* Villa and Mahieu, 1994, and cutmarks, *e.g.,* Audoin-Rouzeau, 1986, Lyman 1994b). Number of marks, anatomical position and orientation were systematically recorded.

2.2.2 Specialised study: animal density and utility indices

Although the lack of data for some bones may bias the results, density and utility indices remain important because they can help explain the under- or over-representation of some elements. Therefore, skeletal bone density indices for sheep/goat, *Suidae* and cattle (Kreutzer, 1992; Ioannidou, 2003) were compared with %MAU through a correlation test (Spearman's *rho*). The aim was to determine whether there was a correlation between the mineral density of the anatomical parts and their level of representation in the assemblage. Table 1 (Appendix) presents the codes used, the density indices and %MAU for the three taxa. Through this method material preservation can be evaluated and differences between the bone sample studied and an expected theoretical assemblage can be compared.

In order to assess hunter-gatherer survival strategies during the Pleistocene, Binford (1978), followed by other specialists (Jones, Metcalfe, 1988; Lyman, 1994; Brink, 1997; Rowley-Conwy *et al*., 2002), developed animal utility indices based on meat (muscle and adipose tissues), bone-fat and marrow content in the different anatomical parts, according to the species. The objective of this method was to identify the preferred use of one and/or the other of these resources and to deduce, for instance, an intensive exploitation which could be attributed to a scarcity of food. This type of study has not been carried out on more recent contexts.

In the current study, the standardized Food Utility Index (sFUI) was used. It combines the different consumable portions mentioned above (Lyman, 1994). This analyse was conducted following the same protocol explained above for the density indices. The density and utility indices for cattle are those established for bison. The same goes for the utility indices of pigs (made for wild boar) and for sheep/goat (made for sheep). These data may, however, be used for taxonomically related species (e.g Rowley-Conwy *et al*., 2002). The aim was to evaluate whether adapting this method to recent contexts could be an effective means to address meat consumption strategies. Since the utility indices of the median diaphyses were not available, the lowest value from the proximal and distal diaphyses of the same bone was systematically assigned to it.

2. RESULTS

2.1. Taxonomic distribution and herd composition

TAXA	NISP
Avifauna	2
Bos taurus	188
Bovids	2
Canis lupus fam.	1
Capreolus capreolus	2
Sheep/goat	754
Cervus elaphus	1
Equus sp.	30

Lagomorps	2
Sus scrofa	249
Ursus arctos	1
TOTAL	**1232**

Table 1: taxonomic repartition, NISP

A total of 11 taxa were identified. The best represented are sheep/goat (*Ovis aries* and *Capra hircus*) with 497 determined remains or 62% of the NISP. *Suidae* and cattle are observed in similar proportions (156 and 128 elements) while the other taxa (*Equus*, *Canis lupus*, *Cervus elaphus*, *Capreolus capreolus*, *Ursus arctos*, avifauna and lagomorphs) are poorly represented (Table 1).

The MNIc for cattle is four. Age-at-death estimates indicate the presence of two juveniles and two adults. Pigs are slightly better represented (MNIc = six). Canine morphology suggests the presence of at least one male and one female. No wild boar was identified (based on the absence of reliable criteria of subspecies distinction in the assemblage), nor were individuals within the very young or the older adult categories identified. Five pigs were slaughtered at the optimum fat and meat yield age (one to two years old; Horard-Herbin, 1997) and another at a later stage (between four and eight years old).

For sheep/goat, the MNIc is 22. Twenty-five percent (25%) of these animals were between three and 15 months old (Fig. 4).

Adults (three to eight years old) were the most numerous, representing nearly 70% of individuals. There is a peak around four-year olds and a more pronounced one for five- to eight-year olds. A ratio of 14 sheep to one goat was estimated through the observation of morphological criteria.

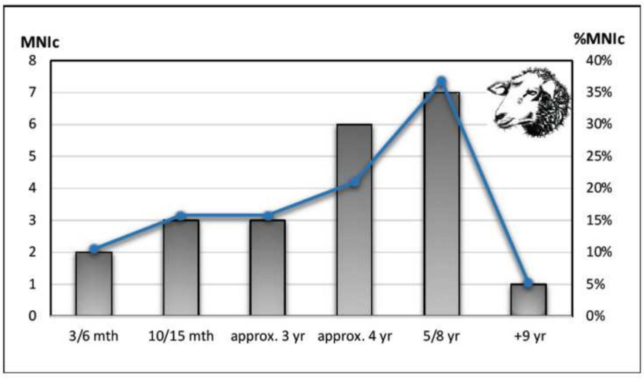

*Figure 4: Slaughtering ages for sheep/goat expressed in MNIc (the curve stands for the %MNIc) **(B&W)***

1.2. Skeletal representation

Figure 5 quantifies the frequency of anatomical elements for cattle, pigs and sheep/goat. These frequencies will not be discussed in detail, but several observations need to be highlighted. There is a discrepancy between the frequencies of forelimbs and hindlimbs of cattle. The NISP is close for both (33:25). Yet, the forelimb is observed in full whereas there is a selection of hindlimb elements: femoral and tibial diaphyses (median and distal parts).

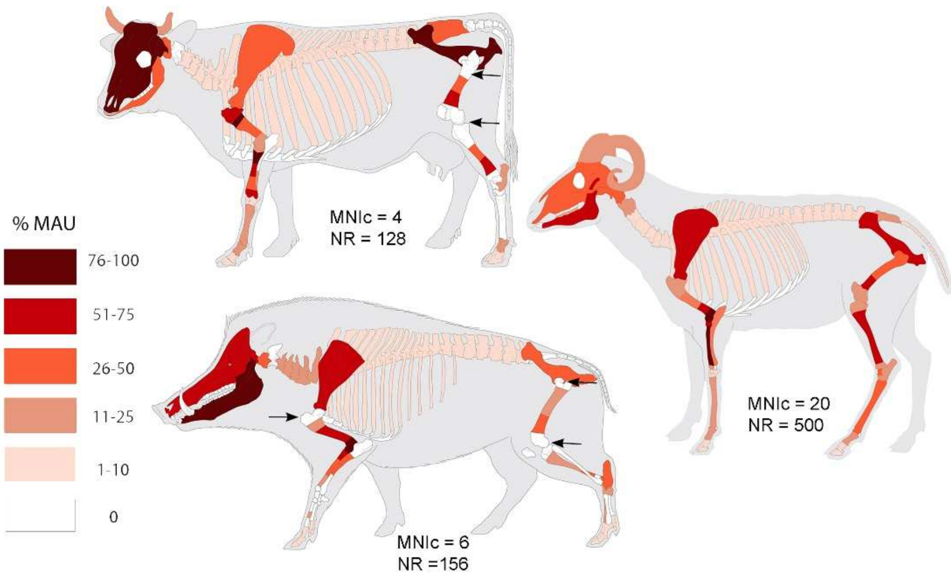

Fig. 5: Skeletal representation of cattle, pigs and sheep/goat *(%MAU). Arrows point to abnormal underrepresentations. Font from ArcheoZoo.org / Michel Coutureau (Inrap), Vianney Forest (Inrap) 1996* ***(Colour)***

Furthermore, coxal elements are overrepresented compared to the ends of the hindlimb long bones, which are completely absent, as is a considerable portion of the tarsals and metatarsals. These data are particularly surprising since the MNE for the coxal bone was obtained from the acetabulum. It is remarkable to observe such a contrast around anatomical connections: well represented *vs* completely absent portions. Even more striking is that this same pattern can also be observed for the forelimbs and hindlimbs of pigs (except for the humero-radial joint). For sheep/goat, however, there is no obvious under-representation of any particular element or portion of an element.

1.3. Density and utility indices

1.3.1. Density indices

For cattle (fig. 6), Spearman's *rho* shows no correlation between the %MAU and the mineral density (R_s=0.04; p=0.77). For suids (R_s=0.27; p=0.07) and for sheep/goat (R_s=0.30; p=0.05), the correlation is low. For cattle, the denser bones do not seem to be better preserved than the low-density elements. The distal part of the cattle femur (F6), with low density, is absent, while the proximal humerus (H1), with a similar density, is strongly represented. For sheep/goat and pigs, however, the results suggest that density plays a stronger role in sample composition. For sheep/goat, the cervical (CE1) and thoracic (TH1) vertebrae are poorly represented and have low density. However, this does not reflect natural preservation as some elements are abnormally represented. This is the case for the median diaphysis of the metacarpus (MC2) or the distal diaphysis of the radius (R4). The relatively dense distal metacarpus is under-represented while the less dense radius diaphysis is over-represented.

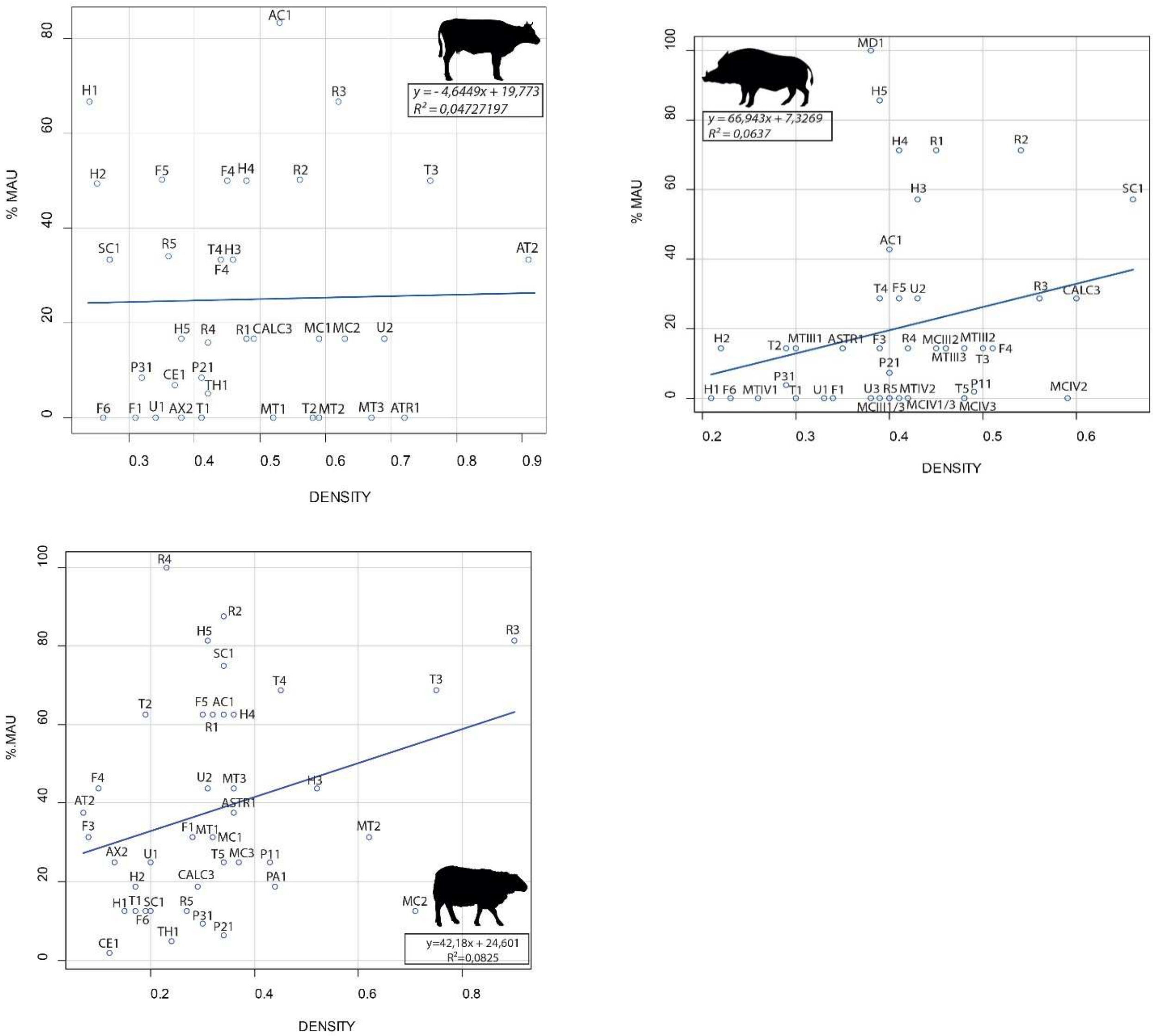

Figure 6: Comparison of cattle, pigs and sheep/goat skeletal parts (%MAU) and mineral density indices. See appendix for codes used ***(B&W)***

1.3.2. Utility indices

Spearman's *rho* does not show any correlation (Fig. 7) for cattle (R_s=-0.04; p=0.77) and sheep/goat (R_s=0.080; p=0.61). This suggests that the %MAU of anatomical portions is not correlated to their nutritional content. For example, the thorax, one of the most nutritious parts of the body of these three taxa, is almost absent. This does not mean, however, that the thorax was not consumed, a point which will be addressed later. It is important to note that some elements with very low meat or fat content are scarcely observed, such as the ends of legs. It should also be noted that several portions with very similar utility indices are observed in various proportions: for cattle, the thorax and the femur are the most nutritious elements (70 to 100% sFUI) but offer a %MAU going from zero to nearly 50. For sheep/goat, the utility index is identical for the coxal and for the different parts of the femur (about 80%) but the %MAU ranges from 15 to more than 60%. Among the best-preserved bone portions, density is generally average and therefore does not seem to be decisive. On the other hand, pigs show a significant correlation (Rs=0.26; p=0.05). However, the statistical result shows a relationship between bone representation and nutritional value and must clearly be considered in the archaeological interpretation, alongside the established utility indices (e.g., higher nutritional value of the thorax over the rest of the body). A closer look at the results shows that there is a wide variety of representations for the same nutritional values.

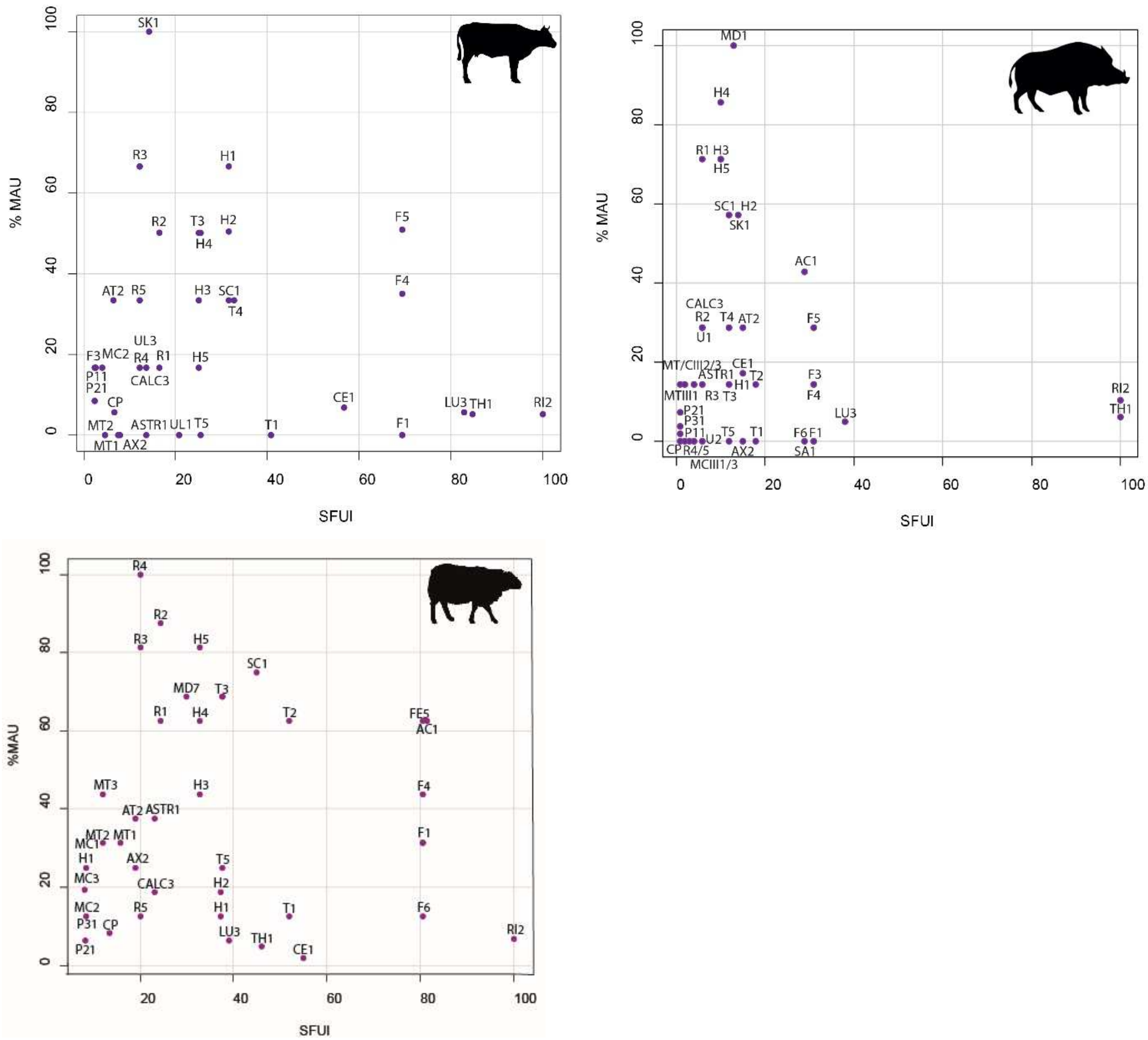

Figure 7: Comparison of cattle, pigs and sheep/goat *skeletal parts (%MAU) and standardised Food Utility Indices (sFUI). See appendix for codes used* ***(B&W)***

1.3.3. Butchering analysis

Blade marks found on both cattle and pigs are scarce and could reflect a certain professional level of skill: The more skilled the butcher is, the less marks he leaves on the bones when he picks up the meat (Lignereux, Peters, 1996). For sheep/goat (Fig. 8), marks are more frequent, but this can be explained by the NISP which is five times higher. Fractures on fresh bones are numerous. Nevertheless, few are the same for cattle and pigs. It is therefore difficult to establish a carving model for these species.

For each taxa, the skull was also consumed. For goats and pigs, the skull was separated from the rest of the body at the atlas or occipital condyle, where several sharp or blunt blows were made, probably keeping the head down. The horn-cores of goats were recovered and sliced or torn off, maybe for raw material. Finally, the mandibles were separated by tearing at the synchondrosis and cutting them into irregular portions.

The thoracic elements are generally scarce. It seems that three sections were usually extracted from the ribs. The numerous incisions on the ventral surface of the ribs indicate that they were cut at the abdomen. The breaking line was marked with a blade and pressure was applied to break the rib. Sharp blows were rare. Cattle thoracic and lumbar vertebrae were cut longitudinally at each of the transverse apophyses. In small bovids, the cervical vertebrae were cut longitudinally at their centre. Thoracic and lumbar vertebrae were either cut at the centre or at each apophysis, a double incision (*double fente,* Audoin-Rouzeau, 1986, p. 115). For pig, limited data are available. It seems that the simple incision was preferred.

The legs were mainly sectioned by percussion, whatever the species. The cut is also very similar between taxa. As a result, impact marks were found on the entire skeleton, except for the ends of the legs, which were almost absent. For sheep/goat, as they are better represented, fractures have been observed on the metapods. For each species, all long bones were heavily fractured, releasing small portions, with an average of three to four parts per bone.

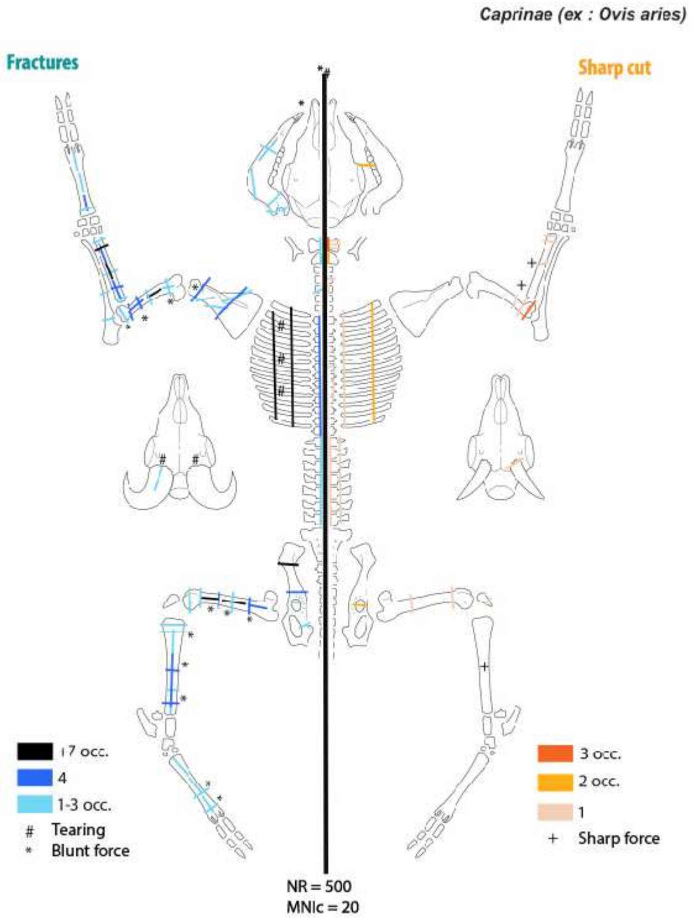

Fig. 8: Location of anthropic traces on sheep/goat. *Font from Archeozoo.org/ Michel Coutureau (INRAP 2013))* ***(Colour)***

2. Discussion

2.1. Meat quality and demography

Cattle age-at-death is diverse and there is a lack of mature adults, but the low MNI makes interpreting the management of the cattle herd difficult.

Pigs were generally raised for meat and fat but also for skin (as well as cattle and sheep/goat). Castellane is known for its hides, whose techniques are inherited from Grasse, with which it has close economic links since the 11th century AD (Sclafert, 1959). The locality had its own tawery. Petra Castellana's animal products were therefore not limited to food but were a major economic factor. Most of the meat was of average quality (adult sheep) but a few good products were also consumed (three lambs).

The prevalence of sheep/goat over other domestic species is common in Provence (Leguilloux, 1994; Rodet-Belarbi, 2011a; b; c) and more broadly in the Mediterranean region (e. g. García-García, 2017). Caprine mortality profiles correspond mainly to fleece production (40% from six to ten-year olds) more than to meat consumption (Payne, 1973; Horard-Herbin, 1997). The latter is focused on individuals younger than three years olds, whereas 75% of Petra's sheep/goat remains exceed that age-at-death. The age-at-death profile suggests, rather, wool production on the site or in the vicinity: owners selling non-productive animals downtown to the butcher (Forest, 1998). Furthermore, the Provençal butcher could travel long distances to obtain supplies of animals at fairs or from animal farming areas (Stouff, 1970[1]). This practice, however, was hazardous according to Stouff (1970) because once on site, the quantity and/or quality required may not have been available. For him, "*l'élevage est inséparable de la boucherie pour tous les macelliers*" (Stouff, 1970, p. 153–154). In other words, breeding and butchery are inseparable for all butchers. Therefore, butchers actively participate in the pastoral economy: they use various breeding contracts known for the Toulouse region and Provence (Wolff, 1953 ; Sclafert, 1959). This multiplicity of butcher activities must be linked to their status. In the city, the wealthiest ones combined activities and delegated their work. They were breeders and could sell skins, tallows, live animals, meat, fish and wool (Stouff, 1970).

2.2. Meat processing and culinary practices

2.2.1. Cooking

The systemic absence of some cattle and pig long-bone ends could be explained by a spatial distribution of meat but this hypothesis is hardly conceivable because it is too systematic, and the portions are too precise. The absence of these long-bone ends is more likely linked to a differential treatment of these parts. Consumers were able to put these pieces aside (in a fairly systematic way) for later consumption, in a bone soup for example (Binford, 1978). Prolonged cooking, which allows fat to diffuse into the preparation, weakens the bone and can lead to its destruction (Costamagno, Rigaud, 2013).

[1] His work is relevant because, even if it focuses mainly on the 14th century AD, the meat preferences described are very close to zooarchaeological data from earlier periods.

This feature has been observed at the charitable institution of the Pas hospital in Rodez in the 14th century AD (Catalo *et al.*, 1995). Here, however, the cuts were larger than in Petra, with four or five pieces per limb compared to usually six or seven in Petra. The chronological shift between the two collections could explain this difference. Indeed, important morphological changes affected culinary ceramics from the 13th century AD onwards. Small globular pots (the opening diameter of those of Castellane is between nine and 15 cm, or between 3.5 and 5.9 inches) were largely substituted by cooking pots and large open shapes (Lécuyer, 1997). This shift may have favoured larger pieces of meat in later settlements. Notwithstanding, the different distribution of food seems to be the main factor. In Petra Castellana, the waste comes from family units, while in Rodez, it is from a collective kitchen. The culinary equipment had to be adapted, with larger shapes. Bone broth is not surprising for a hospital setting as it is a highly nutritious and low-cost food for patients, in this case, women in childbirth, pilgrims and the poor. For Petra, results suggest a variety of culinary practices depending on the anatomical area and the species.

Finally, the MNE of the three taxa varies for each anatomical part, suggesting that a whole animal did not necessarily go to the same person. In rural environments, a "self-sufficient" supply is to be expected, with complete treatment of the animal, whether through fresh meat, cured meats or charcuteries. This practice allows consumers to have meat over a long period. For Petra Castellana, it corroborates the purchase of meat and therefore the proximity of an urban community (in situ or in the lowland).

2.2.2. Density indices

The different results for sheep/goat can be explained by a much higher number of remains or by a distinct anthropic contribution and/or treatment to that of cattle and/or pigs. Nevertheless, in all cases the results indicate that density itself does not fully explain the composition of the assemblage and that other factors were involved: human action, carnivores and/or physicochemical agents.

2.2.3. Utility indices

Results suggest three types of meat processing:

(1) Some very valuable cuts but among which only a few of the observed parts were intensively exploited, completely destroying them or at least, preventing any taxonomic identification of these elements. The large number of thoracic remains that are taxonomically undetermined support this argument even if taphonomical processes cannot been discarded. Among the 150 rib remains studied, 95 could not be taxonomically identified (nearly 63%).

For vertebrae, 43 of the 97 remains could not identified to taxon (44%). Because of the fragility of these elements, their nutritional value is certainly underestimated.

(2) Stylopodia, meaty and better represented than ribs but also than zeugopodia, were probably highly consumed but in such a way that they were not destroyed, suggesting a variety of culinary practices.

(3) The weak survivorship of pieces of low nutritional value (mainly autopodia) can be explained by a) a rejection, which appears unlikely since feet are consumed for all three species (Stouff, 1970), b) their consumption and subsequent disposal in an unexplored area of the site, a more probable hypothesis, and/or c) the sale, to the tanners, of autopodia attached to the skin.

2.3. Meat consumption

"A beginner uses a knife every month. An average butcher uses a knife every year. I've been using the same knife for nineteen years. It butchered several thousand cattle, without any wear of any kind. Because I only let it pass through where it can pass". Tchouang-Tzeu (370-287 BC; *in* Lignereux, Peters, (1996).

This quote perfectly summarises the butcher's skill and explains the paucity of cutmarks. For thoracic elements, the double incision (or spine lift) technique seems to have been used in cattle. It consists in extracting the vertebral nucleus by fracturing on either side of the vertebrae (Audoin, Marinval-Vigne, 1987). This is the case in La Charité-sur-Loire until the 14th century AD (Audoin-Rouzeau, 1986). Among small cattle (Fig. 3), several methods seem to coexist: the thoracic and lumbar vertebrae are divided either by a single incision, as at the Hôtel-Dieu de Marseille (Rodet-Belarbi, 2011a), facilitating the extraction of ribs with part of the vertebrae and associated fat, or through a double incision to isolate the core, rich in marrow. There may have been several "butchers" (professional or not) with different techniques. However, it was during the 14th century AD that butchery began to be standardised (Audoin and Marinval-Vigne, 1987). The single incision becomes an absolute rule for sheep/goat. Before this time, the technique for cutting, including this taxon, is variable and results in a greater variety of pieces and therefore in a wider range of culinary preparations.

The sectioning of long bones into parts of equivalent size is comparable to the findings at the Hôtel du Pas in Rodez and Hôtel-Dieu in Marseille (Catalo *et al.*, 1995; Rodet-Belarbi, 2011a). During the medieval period, butchers could set their prices without considering the quality of the meat, but only the animal's species, its age and sex. Thus, the butcher often favoured pieces of equal size, faster and easier to extract and well suited for retail (Petrowiste, 2018). These results raise questions about the place of standardised or "generic" meat cuts (Petrowiste, 2018) in the medieval diet. It also suggests two distinct phases in cutting, similar to those described by Lyman (1994): the butcher's cut resulting in standardised meat cuts, which corresponds to Lyman's "secondary butchery stage", and the consumption cut, linked to different culinary practices (the "final butchery-consumption stage"). To delve further into these questions, it is necessary to apply the method outlined here (or to develop new ones and apply them) to other assemblages in an attempt to distinguish the marks made by the butcher from those left by the consumer.

2.4. Contributions from textual sources

In Antiquity, according to K. Seetah (2002), the price of a cleaver, its size and the skills required to handle it make it the butcher's tool of choice. These statements probably also apply to the Middle Ages. Indeed, these tools, found in medieval iconography, were adapted to effectively fracture even the densest bone. The use of other objects is therefore difficult to contemplate because they need to be robust, heavy and have a suitable blade to optimise the force. However, hatchets and the carpenter axe (a small axe; handle and blade often about 12 inches or 30 cm) are worth mentioning, as they could have been used and were sometimes mentioned (Stouff, 1970). These tools, mainly reserved for loggers, charcoal makers and carpenters (Burri *et al.*, 2013) are close to those found in iconography used to stun and carve cattle and pigs (Monteix, 2007). But if these tools look suitable for cutting ribs, they seem inappropriate for chopping thicker bones such as long ones. Thus, the many severed elements identified (97, including 25 long bones) could indicate a professional's work. Slaughtering would have been carried out by people with appropriate anatomical and technical knowledge, as slaughtering and cutting up an animal is difficult. In this sense, the strategic use of a cleaver (or leaf), mainly at the joints, could also be evidence of a professional's work. The many blunt blow and the low presence of cutmark does not invalidate this hypothesis because the cleaver (like the axe) could be used to strike with either the blade or the back of the tool (Seetah, 2002; Monteix, 2007). In addition, the mallet was part of the butcher's tools (as indicated, for example, in the iconography of *Tacuinum Sanitatis*[2]).

Although the presence of a butcher is not exceptional, it is essential in order to address the supply systems and economy of the site. On this subject, L. Stouff indicates for Provence

[2] Ibn Butlan, ca 1440. *Tacuinum Sanitatis, illuminated manuscript, Germany, BNF, Manuscrit latin 9333, fol. 71 v*

that the *macelliers*[3] were present in all cities and in the "vast majority" of Provençal villages (Stouff, 1970, p.114). He adds they were scarcer in hostile regions, especially when crossing the Verdon valley. Indeed, the harsh climatic conditions meant that thousands of animals went down to the Lower Alps at the beginning of winter. To do so, herdsmen crossed Castellane, which had its own salt springs, considered a great asset for agropastoral activities (Moriceau, 2005). Besides, the locality was key in the regional economy, directly linked to animal products. Textual sources mention the installation of a large fair in Castellane. In the 13th century AD, it is already considered very old, so during the apogee of the site (11th - 12th centuries AD) it must have already been in existence. A large proportion of the skins produced on site (see 2.1.) were sold at this fair (Sclafert, 1959). The locality was therefore a strategic trading place probably visited by neighbouring populations (especially the highland inhabitants of the Haut Verdon). During the winter, the latter could have obtained supplies from Castellane to cope with the lack of meat until the return of the herds and the travelling butchers.

2.5. The diet of the common and the mighty folk: the case of medieval Provence

The results from Petra Castellana can be compared with similar contexts as well as elite ones. Firstly, similar contexts consist of Provençal small agglomerations and cities, from the 11th to the 14th centuries AD: (1) Galberto castrum, located at Digne-les-Bains, about 35 km from Castellane (Unsain unpublished); (2) Notre-Dame castrum[4] (rural part, Allemagne-en-Provence, about 40 km, Unsain 2019); (3) Marseille (city, Rodet-Belarbi, 2011a); (4-5) Marignane (town) and Fos-sur-Mer (castrum near Marseille, Rodet-Belarbi, 2011b ; 2011c). Secondly, this set has been compared with data from neighbouring elite contexts (40-55 km, from the 11th to the 12th centuries AD) such as the castles of the Rocca (6) at Niozelles and the Moutte (7) and Notre-Dame (8) at Allemagne-en-Provence (Leguilloux, 2008 ; 2015 ; Unsain, 2019).

This comparison revealed two trends. The first one is specific to modest settlements, whether urban, small town or rural. Here, consumption is mainly focused on sheep/goat (sites 1-3-4-5). However, there are exceptions, such as Notre-Dame, where pigs predominate. This could be an adaptation to a forest area favourable to acorns. The zooarchaeological study of Galberto castrum (density, sFUI and classical analyses) is comparable to Petra Castellana's and provides similar results. It suggests a butcher' s cut and sale, as well as a consumer dynamic, rather than production/consumption. This feature is also suggested by the analysis of sites 3-4-5, although this relies on the slaughter patterns

[3] The term "butcher" appeared at the end of the 14th century AD and is associated with inferior quality meat cuts (Wolff, 1953)

[4] This settlement is divided into two parts: the castle and the "peasant settlement", located below.

only. For Galberto, the proximity of the city of Digne-les-Bains, located 6 km away, indicates a probable supply from the city. Indeed, the latter had a strong commercial position (Sclafert 1959) and a fair, like the one held in Castellane.

The second trend concerns elite occupations in rural areas (very limited data are available for the other elite contexts). Here, a significant proportion of very young pigs and/or goats are observed (three to six months old and ten to 15 months old). The latter would reflect a search for quality meat, in line with the social status of the consumers. The kind of supply is still uncertain. It could have been commercial. In this case, was the network the same as for the rest of the population or was it different? In the city, both possibilities exist. At the Archbishop of Arles and at the *Studium* of Trets (second half of the 14th century AD), texts reveal that an agreement had been made with the communal butcher. These contracts ensured them stable prices all year round (Stouff 1970). At the same time, H. Noizet has shown that the monks of the abbey of Saint-Martin de Tours, in the 13th century AD benefited from a structured network where food was transported by land and river (Noizet 2001, 2002, 2007). The rest of the city had to rely on public (the butcher) and private supplies (Cotté, 2008). For the Provençal castra mentioned above, the lands held by the lords living in the countryside were relatively extensive. In addition, connection to trade routes must have been difficult in these remote areas. A selection from the production of tenant farmers is therefore a more likely hypothesis. It could have consisted of taxes (Carrier, Mouthon 2010), purchases from stockbreeders, or the lords' own produce since farmers are in charge of the herds (Heers, 1981).

The results from Petra Castellana not only contribute to characterise the supply systems of Provençal cities, but also enable a discussion of the supply systems specific to the countryside. It is thus possible to perceive nuances and contrasts between the different components of medieval Provençal society.

3. Conclusions

The results on meat consumption in Petra Castellana are abundant and promising. Although they correspond to the main model identified for Provence (preferential consumption of sheep/goat), they also provide information on the supply system at the site, its surroundings and, more broadly, Provence. Culinary practices have also been discussed. Though it seems that the carving of all three species did not consider the quality of the different meat cuts (by favouring a standardised cut), the cook adapted his or her preparations to the types of meat available (absence of joints, intense consumption of the thorax and differential processing for the different limb sections). In addition, the cutting techniques (material and skills) and textual sources relating to the site suggest that it was a professional job.

It is currently not possible to determine the economic status of the two settlements from the 11^{th} and the 12^{th} centuries AD. There could have been an economic space in both Petra Castellana and Castellane, or one of the two supplied both itself and the other. However, given the close distance between the two, it is possible to consider them as two districts of the same city.

As the data focus mainly on small areas of the site, it is necessary to extend the excavation to other areas. Further work could help determine if these are isolated results, reflecting either a bias in the composition of the assemblage, a specific private consumption or a recurrent model. For now, these data suggest the presence of a butcher in the vicinity of Petra Castellana rather than a travelling butcher. This zooarchaeological study, carried out using an updated protocol (*e.g.*, density and utility indices) as opposed to previous French medievalist approaches, has altered the models of livestock rearing and consumption proposed by historians and zooarchaeologists to date. Furthermore, the method for discussing the butcher/consumer distinction needs to be further developed. Indeed, since the consumer's perspective is not easily palpable to historians, this would encourage new debates.

SHEEP/GOAT				CATTLE				PIG			
ANATOMICAL PART	NISP	MNE	MNIc	ANATOMICAL PART	NISP	MNE	MNIc	ANATOMICAL PART	NISP	MNE	MNIc
Horn-cores	6	4	3	Horn-cores	2	1	1	Skull	8	2	2
Skull	17	3	3	Skull	12	3	3	Mandible	24	7	5
Mandible	29	11	6	Mandible	5	2	1	Atlas	1	1	1
Hyoid	1	1	1	Hyoid	0	0	0	Axis	0	0	0
Atlas	5	3	3	Atlas	1	1	1	Cervical vertebrae	4	3	1
Axis	5	2	2	Axis	0	0	0	Thoracic vertebrae	3	3	1
Cervical vertebrae	6	1	1	Cervical vertebrae	1	1	1	Rib	14	10	1
Thoracic vertebrae	8	5	1	Thoracic vertebrae	5	2	1	Scapula	4	4	2
Lumbar vertebrae	7	3	1	Lumbar vertebrae	2	1	1	Humerus PJ	0	0	0
Sacral vertebrae	1	1	1	Sacral vertebrae	0	0	0	Humerus PD	1	1	1
Rib	17	15	1	Rib	24	4	1	Humerus MP	4	4	3
Scapula	20	12	8	Scapula	4	2	2	Humerus DD	7	5	3
Humerus PJ	3	2	2	Humerus PJ	4	4	1	Humerus DJ	7	6	3
Humerus PD	3	3	1	Humerus PD	4	3	2	Radius PJ	5	5	4
Humerus MP	10	7	3	Humerus MP	2	2	1	Radius PD	5	5	4
Humerus DD	11	10	5	Humerus DD	3	3	2	Radius MD	2	2	2
Humerus DJ	13	13	7	Humerus DJ	1	1	1	Radius DD	1	1	1
Radius PJ	10	10	5	Radius PJ	1	1	1	Radius DJ	0	0	0
Radius PD	18	14	10	Radius PD	3	3	2	Ulna PJ	0	0	0
Radius MD	18	13	4	Radius MD	2	2	1	Ulna PD	2	2	2
Radius DD	17	16	6	Radius DD	1	1	1	Ulna DD	0	0	0
Radius DJ	3	2	3	Radius DJ	2	2	1	Carpal	0	0	0
Ulna PJ	5	5	5	Ulna PJ	0	0	0	Metacarpal III PJ	0	0	0
Ulna PD	7	7	2	Ulna PD	0	0	0	Metacarpal III MD	0	0	0
Ulna DD	5	5	1	Ulna DD	1	1	1	Metacarpal III DJ	0	0	0
Carpal	4	4	1	Carpal	3	1	1	Metacarpal IV PJ	0	0	0
Metacarpal PJ	6	6	4	Metacarpal PJ	1	1	1	Metacarpal IV MD	0	0	0
Metacarpal MD	3	2	1	Metacarpal MD	1	1	1	Metacarpal IV DJ	0	0	0
Metacarpal DJ	4	4	3	Metacarpal DJ	1	1	1	Sacrum	0	0	0
Sacrum	2	1	1	Sacrum	2	1	1	Coxal	5	3	3
Coxal	10	10	6	Coxal	11	5	3	Femur PJ	0	0	0
Femur PJ	5	5	2	Femur PJ	0	0	0	Femur PD	2	1	1
Femur PD	7	5	4	Femur PD	0	0	0	Femur MD	2	1	1
Femur MD	9	7	3	Femur MD	3	2	2	Femur DD	2	2	2
Femur DD	11	11	8	Femur DD	3	3	3	Femur DJ	0	0	0
Femur DJ	2	2	1	Femur DJ	0	0	0	Patella	0	0	0
Patella	3	3	2	Patella	0	0	0	Tibia PJ	0	0	0
Tibia PJ	2	2	1	Tibia PJ	0	0	0	Tibia PD	6	5	3
Tibia PD	29	10	5	Tibia PD	2	2	2	Tibia MD	5	5	3
Tibia MD	13	11	6	Tibia MD	3	2	2	Tibia DD	2	2	2
Tibia DD	13	11	5	Tibia DD	3	2	2	Tibia DJ	0	0	0
Tibia DJ	3	2	4	Tibia DJ	0	0	0	Calcaneum	2	2	1
Malleolus	1	1	1	Malleolus	0	0	0	Talus	1	1	1
Calcaneum	5	3	2	Calcaneum	1	1	1	Metatarsal III PJ	1	1	1
Talus	8	6	5	Talus	0	0	0	Metatarsal III MD	1	1	1
Tarse	4	3	3	Tarse	0	0	0	Metatarsal III DJ	1	1	1
Metatarsal PJ	11	5	4	Metatarsal PJ	0	0	0	Metatarsal IV PJ	0	0	0
Metatarsal MD	7	5	3	Metatarsal MD	0	0	0	Metatarsal IV MD	0	0	0
Metatarsal DJ	7	7	3	Metatarsal DJ	0	0	0	Metatarsal IV DJ	0	0	0
Phalanx 1	12	8	1	Phalanx 1	2	2	1	Phalanx 1	2	1	1
Phalanx 2	2	2	1	Phalanx 2	1	1	1	Phalanx 2	5	4	1
Phalanx 3	3	3	1	Phalanx 3	1	1	1	Phalanx 3	2	2	1

Table 1: Quantifiaction of NISP, MNE and MNIc for sheep/goat, cattle and pig

		% MAU			DENSITY INDICES			FOOD UTILITY INDEX		
SKELETAL PART	**CODE**	**CAPRINE**	***BOS TAURUS***	***SUS SCROFA***	**CAPRINE**	***BOS TAURUS***	***SUS SCROFA***	**CAPRINE**	***BOS TAURUS***	***SUS SCROFA***
Skull	SK	37,5	100,0	57,1	no data	no data	no data	no data	no data	14
Mandible	MD7	68,8	33,3	100,0	no data	no data	0,38	30	14,2	13
Atlas	AT2	37,5	33,3	28,6	0,1	0,91	no data	19	no data	15
Axis	AX2	25,0	0	0,0	0,1	0,38	no data	19	6,4	15
Cervical vertebrae	CE1	2,5	6,7	17,7	0,1	0,37	no data	55	7,8	15
Thoracic vertebrae	TH1	4,8	5,1	6,1	0,2	0,42	no data	46	56,6	100
Rib	RI2	7,2	5,1	10,2	no data	no data	no data	100	82,9	100
Scapula	SC1	75,0	33,3	57,1	0,3	0,27	0,66	45	100	12
Humerus PJ	H1	12,5	66,7	0,0	0,2	0,24	0,21	37,28	31,6	12
Humerus PD	H2	12,5	50,0	14,3	0,2	0,25	0,22	37,28	31,6	12
Humerus MP	H3	43,8	33,3	57,1	0,5	0,45	0,43	32,79	31,6	10
Humerus DD	H4	62,5	50,0	71,4	0,4	0,48	0,41	32,79	25,1	10
Humerus DJ	H5	81,3	16,7	85,7	0,3	0,38	0,39	32,79	25,1	10
Radius PJ	R1	62,5	16,7	71,4	0,3	0,48	0,45	24,3	25,1	6
Radius PD	R2	87,5	50,0	71,4	0,3	0,56	0,54	24,3	16,5	6
Radius MD	R3	81,3	66,7	28,6	0,9	0,62	0,56	20,06	16,5	4
Radius DD	R4	100,0	16,7	14,3	0,2	0,42	0,42	20,06	12,1	4
Radius DJ	R5	12,5	33,3	0,0	0,3	0,35	0,4	20,06	12,1	4
Ulna PJ	U1	31,3	0	0,0	0,2	0,34	3	no data	12,1	6
Ulna PD	U2	43,8	0,0	28,6	0,3	0,69	3	no data	20,8	6
Ulna DD	U3	31,2	16,7	0,0	no data	no data	3	no data	20,8	no data
Carpal	CP	8,3	5,6	0,0	no data	no data	no data	no data	12,1	3
Metacarpal PJ	MC1	31,3	16,7	-	0,3	0,59	-	10,11	6,6	-
Metacarpal MD	MC2	12,5	16,7	-	0,7	0,63	-	8,45	3,9	-
Metacarpal DJ	MC3	18,8	16,7	-	0,4	0,69	-	8,45	2,6	-
Metacarpal III PJ	MCIII1	-	-	0,0	-	-	0,4	-	-	2
Metacarpal III MD	MCIII2	-	-	14,3	-	-	0,45	-	-	1
Metacarpal III DJ	MCIII3	-	-	0,0	-	-	0,39	-	-	1
Metacarpal IV PJ	MCIV1	-	-	0,0	-	-	0,42	-	-	2
Metacarpal IV MD	MCIV2	-		0,0	-	-	0,59	-	-	1
Metacarpal IV DJ	MCIV3	-		0,0	-	-	0,48	-	-	1
Sacrum	SA1	12,5	33,3	0,0	0,2	0,27	no data	-	2,6	29
Coxal	AC1	62,5	83,3	42,9	0,3	0,53	0,4	81,5	no data	29
Femur PJ	F1	31,3	0	0,0	0,3	0,31	0,34	80,58	no data	31
Femur PD	F3	31,3	0	14,3	0,1	0,34	0,39	80,58	69,4	31
Femur MD	F4	43,8	33,3	14,3	0,1	0,45	0,51	80,58	69,4	31
Femur DD	F5	68,8	50,0	28,6	0,3	0,36	0,41	80,58	69,4	31
Femur DJ	F6	12,5	0	0,0	0,2	0,26	0,23	80,58	69,4	31
Patella	PA1	18,8	0	0,0	0,4	no data	no data	no data	no data	no data
Tbia PJ	T1	12,5	0	0,0	0,2	0,41	0,3	51,99	69,4	18
Tibia PD	T2	62,5	0	14,3	0,2	0,58	0,29	51,99	40,8	18
Tibia MD	T3	68,8	50	14,3	0,8	0,76	0,5	37,7	40,8	12
Tibia DD	T4	68,8	33,3	28,6	0,5	0,44	0,39	37,7	25,5	12
Tibia DJ	T5	25,0	0	0,0	0,3	0,41	0,48	37,7	25,5	12

Calcaneum	CALC3	18,8	16,7	28,6	0,3	0,49	0,6	23,08	25,5	6
Talus	ASTR1	37,5	0	14,3	0,4	0,72	0,35	23,08	13,6	6
Metatarsal PJ	MT1	31,3	0	-	0,3	0,52	-	15,77	13,6	-
Metatarsal MD	MT2	31,3	0	-	0,6	0,59	-	12,11	7,5	-
Metatarsal DJ	MT3	43,8	0	-	0,4	0,67	-	12,11	4,5	-
Metatarsal III PJ	MTIII1	-	-	14,3	-	-	0,3	-	-	4
Metatarsal III MD	MTIII2	-	-	14,3	-	-	0,48	-	-	2
Metatarsal III DJ	MTIII3	-	-	14,3	-	-	0,46	-	-	2
Metatarsal IV PJ	MTIV1	-	-	0,0			0,26	-	-	4
Metatarsal IV MD	MTIV2	-	-	0,0	-	-	0,41	-	-	2
Metatarsal IV DJ	MTIV3	-	-	0,0	-	-	0,48	-	-	2
Phalanx 1	P11	25,0	16,7	1,8	0,4	0,48	0,49	8,22	4,5	1
Phalanx 2	P21	6,3	8,3	7,1	0,3	0,41	0,4	8,22	2,4	1
Phalanx 3	P31	9,4	8,3	3,6	0,3	0,32	0,29	8,22	2,4	1

Table 2: %MAU, density indices, sFUI (standardized Food Utility Index) and codes for skeletal parts of Sheep/goat (Ovis aries & Capra hircus*),* Bos taurus *and* Sus scrofa*. Bones that are both missing in the assemblage and without any indices are not presented. PJ: proximal joint; PD: proximal diaphysis; MD: medial diaphysis; DD: distal diaphysis; DJ: distal joint. Indices from Binford, 1978; Lyman, 1994; Ioannidou, 2003.*

Acknowledgments:

First of all, we would like to warmly thank the anonymous reviewers for their involvement, advice and kindness.

The project PATHWAy leading to this publication has received funding from Excellence Initiative of Aix-Marseille University – A*MIDEX, a French « Investissements d'Avenir » programme.
The first author would like to thank in particular Aix Marseille University, which funds this research through a doctoral contract. She also wants to thank the Departmental Archaeology Service of Alpes-de-Haute-Provence (04), first directed by Mathias Dupuis and then by Vincent Buccio, for their trust in letting her conduct the zooarchaeological study.

We would like to express our gratitude to Jean-Philip Brugal (LAMPEA, UMR 7269) for the collection of comparative anatomy he has made available.
We also thank Dr Karina Gerdau for reviewing the manuscript, as well as Isabelle Rodet-Belarbi and Lionel Gourichon (CEPAM, UMR 7264) for their valuable advice.

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