FAUNAL REMAINS AND ZAPOTEC ELITE AT MONTE ALBÁN DURING THE PRECLASSIC AND CLASSIC PERIODS: SUBSISTENCE, FUNCTIONAL, RITUAL AND SYMBOLIC ASPECTS

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Patricia Martínez-Lira

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ABSTRACT

PML "Faunal Remains and Zapotec Elite at Monte Albán during the Preclassic and Classic Periods: Subsistence, Functional, Ritual and Symbolic aspects" PhD

The ancient Zapotec city of Monte Albán, occupied from approximately 500 BC to 850 AD, was prehispanic Oaxaca´s largest and most important urban centre. The zooarchaeological material considered in the study dates from the Late Preclassic (400 BC-200 AD) and Early Classic (200-500 AD) periods, when growth and consolidation of Monte Albán took place. The main topic is related to the subsistence, which allowed the survival of the elite. Other uses of the taxa apart from food were also taken into account such as ritual, symbolic and functional ones.

The faunal remains were found in association both with elite households, and with some public spaces near the Main Plaza. The study showed that animals were used in different activities within private and public spaces of the elite, including food processing, consumption and discarding. Some other taxa were also appreciated for their symbolic meaning and functioned as status symbols. According to the identification of the faunal bones not only domestic species such as dog and turkey were part of the diet, but wild animals were also represented by white-tailed deer, peccary and lagomorphs. Occasionally, species including fish and turtles were obtained from the rivers near Monte Albán. Faunal assemblages were probably the product of both daily activities and feasts. Subsistence patterns were detected during different periods of time and areas. The diet of Monte Albán inhabitants was discussed and compared to evidence from contemporary elite societies in the Valley of Oaxaca and Mesoamerica, such as the Mayas and Teotihuacanos.

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AUTHOR´S DECLARATION

Except where reference is made in the text, this dissertation contains no material published elsewhere or extracted in whole or in part from a thesis submitted for the award of any other degree diploma.

No other person´s work has been used without due acknowledgment in the main text of the dissertation.

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INTRODUCTION

Zooarchaeology has evolved in the last decades to include a wider variety of theoretical subjects. Faunal remains have demonstrated their important role in social interactions (feasts and ceremonies), which served in community cohesion and to reinforce hierarchical relationships. In complex societies with status distinctions (elite and commoners) and centralized political authority, access to certain resources may have been limited, especially to those animals whose symbolism was related to political ideology and power. Exotic or imported fauna from distant regions, used to reinforce status, may have also been restricted. In hierarchical societies, animals were useful for different purposes besides food. They were associated with religious or ritual contexts, used as raw material (for tool manufacture or clothing), for trade and tribute or simply as adornment or company. Faunal remains in archaeological contexts reflect different aspects: as offerings in human burials, temples or structures; at feasts to celebrate social events in public contexts and households; or ritual ceremonies to communicate with ancestors or supernatural forces in temples or residences.

Finally, faunal remains have also been relevant to infer diet and subsistence strategies in complex societies. Finds of domesticated species are an important source of dietary information and might have been a useful strategy to fulfil growing population needs. Diet also showed the different conformation of social strata. Sometimes variations in consumption patterns may be notable between the elite and commoners. Moreover, subtle differences may take place in access to animals and in food processing. For example, elite and commoner status may be evident not only in the taxa or the distribution of animal parts, but also by the amount of meat consumed (Sandefur 2001).

The faunal evidence used in this dissertation, includes samples collected during the excavations directed by Dr. Marcus Winter during the special project of Monte Albán in 1992-1994. The animal bones date mainly to the Late Preclassic (400 BC-200/250 AD) and Classic (200/250-800 AD) periods. The most represented phases were Pe (400-200 BC), Nisa (200 BC-200 AD) and Pitao (200-600 AD). The political situation and power of Monte Albán over the Valley of Oaxaca during these periods of time was considered.

The faunal remains included in this study came from four areas of Monte Albán: the W1, W2, A3 and PNLP Areas, the first three consisting of domestic units and the last one a public space. Within the domestic areas, garbage deposits with faunal remains were found. In some cases objects such as grinding stones or obsidian blades and fires related to domestic activities were observed in the residences (Martínez *et al*. 1977; Morales *et al.* 1999). The PNLP Area consisted of a patio surrounded by platforms. This area was allocated to the production of goods such as shell, pottery and chipped stone during the Pe phase (Martínez and Markens 2004). The samples were mainly chosen to find out the subsistence at residence level. However, a public area was considered in order to compare the patterns between both types of contexts. The zooarchaeological material was selected to obtain information about the early phases of Monte Albán.

The specific objectives of this dissertation are to: 1) identify the species that were part of the elite diet; 2) detect subsistence patterns during different periods of time and in different areas; 3) determine the kind of environments that inhabitants exploited to obtain their food resources; 4) investigate whether species represented in the sample were local or brought from more distant regions; 5) analyse the relative abundance of anatomical elements of the most abundant species in the four areas under study, to detect similarities and variations in element distribution; 6) identify the taphonomic agents on animal bone surfaces such as cut marks, burning, gnawing and weathering; 7) consider the possible uses of the identified taxa apart from subsistence (ritual, symbolic and functional); and 8) compare Monte Alban faunal assemblage with other zooarchaeological studies of contemporary sites in the Valley of Oaxaca and other cultures and regions of Mesoamerica

The results obtained from the analysis will be related to other studies of Monte Albán based on social organization and inequality at residence level, considering household architecture (location, size and shape), funerary practices (evidence of differential wealth and hierarchy) and pottery (decoration, shape and origin) (Winter 1974; González Licón 2011). Evidence of faunal remains recovered at lower terraces (related to the commoners) can be compared in the future to the species frequencies found in elite residences in order to detect consumption variations between members of different status.

Based on historic and archaeological information, by 500 BC Monte Albán was established in the middle of a political conflict crisis in the Valley of Oaxaca (Joyce 2009). Soon after its founding, Monte Albán became the largest community in the valley (Kowalesky *et al.* 1989). Moreover, this represented the first stage in a long-term process of subduing other dominant centers (Marcus and Flannery 1996). By the end of period I (Pe phase), Monte Alban defeated their rivals to the south and east, uniting the valley into a regional state (Balkansky 1998a). However, it was not until Period II (Nisa phase) that the population of Oaxaca coalesced into a state, with a four-tiered administrative hierarchy (Spencer 1982; Flannery and Marcus: 1983; Marcus and Flannery 1996; Marcus 2008). But by the Early Classic, the rulers of Monte Albán had lost control of certain areas, such as Cuicatlán Cañada, that had probably been conquered during the Terminal Formative period. Such a decrease in power and control may have been a result of political relations with Teotihuacán (Joyce 2010: 200-201). Therefore, the evolution of Monte Albán has been organized into three subdivisions: 1)

Growth and consolidation: Early periods I and II (500 BC -200AD); 2) Relations with Teotihuacan: Periods II and IIIA (200 -500 AD); and 3) Resurgence and reorganization: Xoo Phase 500-800 AD (Winter 2001; 2002b).

Monte Albán is located at an altitude of 400m above the basin Valley of Oaxaca. Its population is estimated to have reached a maximum of 25,000 to 30,000 people (Winter 2001; Marcus 2008). One of the main topics of this dissertation is to discover how the population of Monte Albán survived. This means that the study of faunal remains from Monte Albán was focused on the identification of species that were part of the subsistence of the elite. Evidence to support this was found in households and public areas near the Main Plaza. So, it appears that the animal bones found were probably the product of daily activities and feasts. Primary features, such as garbage deposits associated with domestic contexts were used as the basis from which the taxa related to consumption was determined. Animal food resources in Oaxaca and in other Mesoamerican regions were also taken into account for this purpose.

As we shall see dietary resources from Monte Albán, were found throughout in Mesoamerica. Most species used for subsistence were local and just a few could have come from further away. However, species found in environments that were not frequently exploited, or that were more distant from Monte Albán, might have been considered exotic or valued as prestigious items among the elite. Once the taxa used for consumption was distinguished, data collected were grouped into periods of time and phases, in order to detect the subsistence patterns through time. Some subtle fluctuations of the dietary species were observed during the Preclassic and Classic periods but subsistence species did not change dramatically.

Zapotec society was divided into two endogamous, socially restricted groups: nobles and commoners (Elson 2006). The unification in the valley contributed to this emerging process of social stratification (Elson 2006). The power of the nobility was also confirmed by their greater access to exotic imported goods like pottery, obsidian blades, and ornaments of shell (Winter 1984). Mortuary treatment also showed different status (Winter 1990; Winter 1995; Joyce 2010). Thus, faunal remains related to subsistence and other uses, would reflect the status of the stratified society and the powerful elite group that inhabited Monte Albán.

Isotopic studies from Monte Albán demonstrated that in the Classic period (200/250-800 AD) consumption variations were more evident between members of different status (Blitz 1995). Subsistence studies from other sites in Oaxaca and Mesoamerican cultures demonstrated that contemporary counterpart Zapotec rulers had also a greater access to meat than commoners. Food resources for the elite were more diverse than those of non-elite members. The species used for subsistence identified in Monte Albán were similar to those found in elite contexts at El Palmillo site in Oaxaca and in the Maya area (Pohl 1994; Carr 1996; Masson 1999; Emery 2003, 2007; Teeter 2004; Haller *et al.* 2006).

Another issue of this research was to find out the different uses of the species represented in the sample, their symbolic meaning and the activities in which these were included, apart from food. According to the findings, other taxa identified in the sample were related to uses other than human consumption. Pelts of animals related to power and religious symbolism and feathers from various birds were included in the attire of the elite and functioned as a symbolic language to reinforce their authority and as a distinguishing feature from the rest of the population.

The research also demonstrated that animals played an important role in religion and ideology in Monte Albán. Using symbolic resources helped to structure the power of the elite, who through their knowledge and rituals, controlled and manipulated ideology (Joyce 1994; Joyce and Marcus 1996; 2000). Zapotec nobles were considered to be related to the gods and were conceived as a group apart from the rest of the population (Joyce 2000; 2010). So, certain animals were appreciated for their symbolic value and used to indicate status among Zapotec rulers. Faunal remains from diverse contexts were taken into account, to find out which species were included in different kind of activities. Therefore, animal offerings associated with human burials and certain structures from Monte Albán and other sites in Oaxaca were considered. The species identified were compared to other cultures in Mesoamerica and showed that the same taxa were found in ritual contexts, or had a similar symbolic meaning, or were used as raw material in the attire of the elite.

The dissertation was organized in seven sections. Chapter 1 provides information about how zoo-archaeology emerged in Mexico and the main topics approached by this discipline within Mesoamerican cultures. Zooarchaeology has focused on subjects of biological and archaeological interest. However, this dissertation only considers the latter, especially those studies which are relevant for this research. Some of these topics include domestication and captivity, dietary practices, bone manufacture and ritual use of animals. Faunal researches from Oaxaca and from other Mesoamerican regions and cultures constituted a valuable framework from which to compare the data obtained from Monte Albán.

Chapter 2 presents information about the environment in the Valley of Oaxaca, and the geographic location of Monte Albán. A description of the site is included, showing the different structures and areas, supported by photographs and drawings. Different chronologies proposed for the site have been introduced. Previous studies that have been carried out at Monte Albán are mentioned. The research objectives and postulates are introduced in this section. Finally, the historical evolution of the site has been organized in phases, considering different aspects such as population growth, urban development and political power.

Chapter 3 mentions the working methods that have been applied to answer the initial research questions. The methodology followed different steps which included taxa and anatomical identification, age determination, the faunal remains quantification, and taphonomy. The latter refers to the chemical, biological or human alterations on bone remains. The taphonomic processes considered in the study were weathering, roots, trampling, carnivores, rodents, cut marks, fracture patterns and burning. A brief discussion of each agent is presented.

Chapter 4 describes the four areas under study at Monte Albán. Information of each area is provided with images of its location in relation to the Main Plaza. The description of the four areas is supported by floor plans drawn during the excavations of the PEMA 1992-93 archaeological project. Features (garbage deposits) associated with faunal remains are emphasised. Evidence of fires, food preparation utensils, such as grinding stones, pestles, and architectural facilities for cooking in household areas are also included.

Chapter 5 presents the results of the identification of faunal remains from the W1, W2, A3 and PNLP Areas. A floor plan of each area is displayed, indicating the distribution of the excavated pits or trenches and the location where the faunal samples and data showed in the tables were found. Faunal remains from different areas are grouped into phases and are introduced in chronological order.

Chapter 6 discusses the data obtained from results presented in Chapter 5. It explains the different uses of taxa, either for diet, ritual, symbolic or functional. Species related to diet are separated, observing subsistence patterns through graphs of different phases and in the four areas. The equitability of each area is considered. Identified taxa are related to the environment in which they could be found. An idea of the ecosystems exploited by the inhabitants is obtained. The anatomical pattern of the most represented subsistence species is analysed to see the differences and similarities between each taxa and the areas. Evidence of taphonomic agents observed on bone surfaces is presented and discussed. Possible uses of different taxa are described, comparing information of animals from other regions and cultures in Mesoamerica, other archaeological evidence, stelae and codices. The diet of the elite members in Monte Albán is compared to their counterparts in other sites in Oaxaca, the Maya Area and Teotihuacán. Evidence of food preparation and feasts is included in the final section.

Chapter 7 summarizes the original aims of the research and the results obtained by the identification of the faunal remains from Monte Albán.

CHAPTER I

ZOOARCHAEOLOGY BACKGROUND IN MESOAMERICA AND NORTH MEXICO

This chapter introduces some of the main topics that have been approached through zooarchaeology within the cultural area called Mesoamerica, which includes part of Mexico and Central America (Belize, Guatemala and El Salvador) and northern Mexico that is not considered as part of Mesoamerica (Fig. 1). The intention is to give an overall idea of the achievements in this discipline rather than mention all the studies done until now, as it is not the objective of this dissertation. The chapter explains how zooarchaeology emerged in Mexico and discusses topics related to the study of faunal remains such as domestication and captivity, subsistence, bone artifacts and ritual activities. In each section, examples illustrate the kind of information that has been obtained.

For studies related to subsistence, it is crucial to determine if humans were relying on domestic or wild fauna and why they were chosen, depending on the environmental conditions, fauna available for domestication, social organization, population growth and human impact on hunted species. Some subsistence case studies within several regions in Mesoamerica will be presented to show how diverse civilizations have adapted to different environments. As will be shown, fauna also had an important place in feasts and ceremonies to reinforce status among members of the elite. Animals were valued in prehispanic cultures not only for consumption but also some anatomical parts were used to manufacture bone tools. It is important to notice that hunted taxa were used for many purposes, apart from food and to consider which parts of the skeleton were brought to the site and for what reason. Another aspect is that some animals were part of ritual activities and had a symbolic meaning. When an archaeological site is studied, a more complete perspective is obtained when different uses of the animals found in the assemblages are determined. So these issues will be included in this section since they are closely related to the main subject of the present dissertation. The selection of the topics is focused mainly on research of archaeological interest rather than biological studies, which have also been considered in Mexican zooarchaeology.

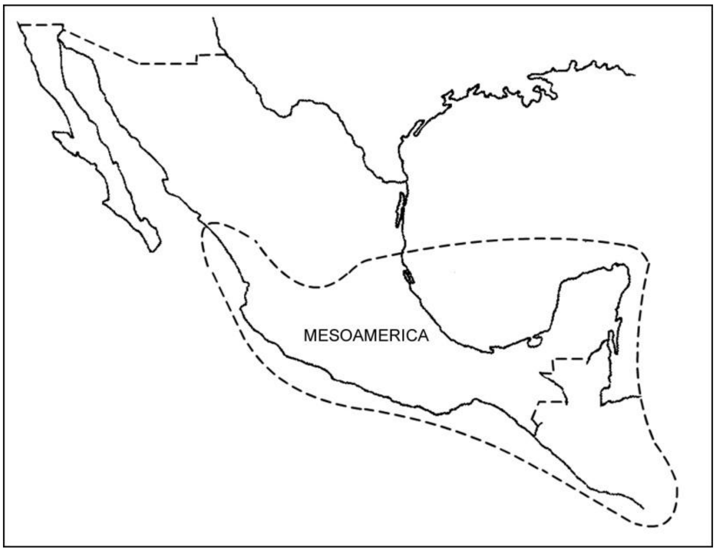


Fig.1. Map of Mesoamerican delimited area (after Valadez and Mestre 1999:69).

The emergence of zooarchaeology in Mexico

Zooarchaeology is an interdisciplinary field concerned with the study of the interaction between people and animals such as hunting, food, raw materials for tool manufacture, symbolic and ritual matters, just to mention a few. Most of this information is accomplished through the study of faunal remains from archaeological sites (Polaco 1991; Reitz and Wing 1999). In Mexico, zooarchaeology emerged during the 19th century as part of the research on topics related to Prehistory (Corona-M. 2002). Later, in the year 1970, modern archaeology in Mexico began after the discovery of the *Piedra del Sol* and the goddess *Coatlicue* in the ancient Mexica capital called Tenochtitlán, in Mexico City. These archaeological monoliths, products of the Mexica culture, were discovered associated with offerings containing ornamental objects made of clay and metal and faunal remains. Based on this evidence, León y Gama (1990) wrote the first report on animal bones in an archaeological context, clearly associated with religious attributes. Unfortunately, this was an isolated event that did not develop into a methodological study of the faunal remains from archaeological sites (Corona-M 2008).

From 1882, naturalists became interested in studying animal bones. So this period could be considered as the modern origin of zooarchaeology in Mexico (Corona-M 2008). The florescence of this kind of research came first with understanding past relations between human beings and extinct fauna, and later with the interaction between prehispanic cultures and nature. However, this kind of research was not established as zooarchaeology until the late 20th century (Corona-M 2008; Corona-M. *et al*. 2010). In 1952 the Department of Prehistory was created in the National Institute of Anthropology and History (Corona-M 2008). In 1963 the mammalogist Ticul Álvarez was invited to become the head of the Laboratory of Paleozoology (Álvarez 1967). In 2002 the INAH added the name of Ticul Álvarez to the Laboratory of Zooarchaeology to honour him (Corona-M. 2010). This space was created to attend the requirements of archaeologists for identification and analysis of animal bone and shells obtained from their excavations, as well as specimens of extinct fauna recovered from late Pleistocene sediments (Álvarez 1967). The laboratory was composed of three areas: preparation, collections, and research. The osteological collection was created for comparative purposes and initially included one specimen of each of the vertebrate species known living in Mexico (Arroyo-Cabrales and Polaco 1992).

In 1991 the first methodological synthesis of the zooarchaeological practices that took place in the INAH laboratories was produced, to emphasize the importance of anatomical and taxonomical identification as solid initial evidence for data interpretation (Polaco 1991). After 2000, the research and literature published in this field showed that zooarchaeology had become a common scientific practice in Mexico (Corona-M 2008).

Nowadays, zooarchaeology has evolved from the traditional descriptive reports to a more interpretative field. It has grown and diversified including other sciences to answer broader questions. However, there are still many aspects of animal remains that should be taken into account. One example is the symbolic meaning of animals and their multiple representations in codices, stelae, pottery, mural paintings and sculptures. Studies of this kind are very rare in Mexico.

Regarding subsistence, it is necessary to relate the zooarchaeological materials to other evidence, such as botanical remains and human bones, just to mention a few. In general, zooarchaeological research is presented without linking other evidence found in the site, in order to provide a wider perspective. For instance, culinary objects such as pottery and spaces assigned to food processing, consumption and discarding can offer valuable information. The type of deposits where faunal remains are found, cultural and natural processes affecting contexts and animal bone distribution need to be explored in more detail.

Ethnohistoric data could be a good source to support inferences about gender activities in food supply. The role of women in domestic contexts and collaboration in subsistence practices is almost unknown. Equally, a great number of studies do not consider the type of diet or survival strategies practised among lower classes; most research focuses on members of the elite. So, a wider type of context needs to be included. Finally, results should be integrated on a regional scale to relate one site to another and determine subsistence patterns between sites located in the same region, according the environment and social organization, as in the Maya area. In the next section, some of the main topics of zooarchaeology in Mexico will be presented, in order to demonstrate the progress made in this field.

Domestication and captivity

One of the topics that have been studied through zooarchaeology is the domestication and captivity of animals, mainly to find out how, where and when these activities took place. Animal domestication in America compared to the Old World, was a limited process, more related to fowl than to mammals, and was concerned with religious rituals. In the Old World, most of the domestic species had an alimentary purpose, which might be due to the environmental conditions, as well as the contemporary distribution of resources in the wild. Domestication is an important option in places such as the Middle East, where resources might be in short supply during certain seasons. In the tropical and subtropical areas of America, resources are much more evenly distributed throughout the year; therefore, domestication was probably not focused exclusively on alimentary purposes. Another factor is that each continent has its own fauna suitable for domestication (Valadez 1996).

At the Paquimé archaeological site (700-1475 AD) (Fig. 2), in Chihuahua (northern Mexico), the remains of 290 individuals identified as macaws (*Area militaris*) were found. Apparently, this was the main area where common turkey (*Meleagris gallopavo*) was raised, since 241 individuals of this species were discovered. Evidence of macaw nesting and breeding boxes, turkey pens and bones of a breeding population showed that these places were used by bird raising specialists, who reached sophisticated bird "domestication". The term "aviculture" could be used in the case of macaws, as it simply infers that people raised and cared for birds, whereas the term "domesticated" is used in the case of common turkey and could be applied to the Paquimé situation (Di Peso *et al*. 1974).

Birds were used as the raw material required by the feather merchants. Evidence of headless articulated burials were also found, which may be interpreted as animals sacrificed to gods. Locally, at Paquimé, the scarlet macaw (*Ara macao*) played an

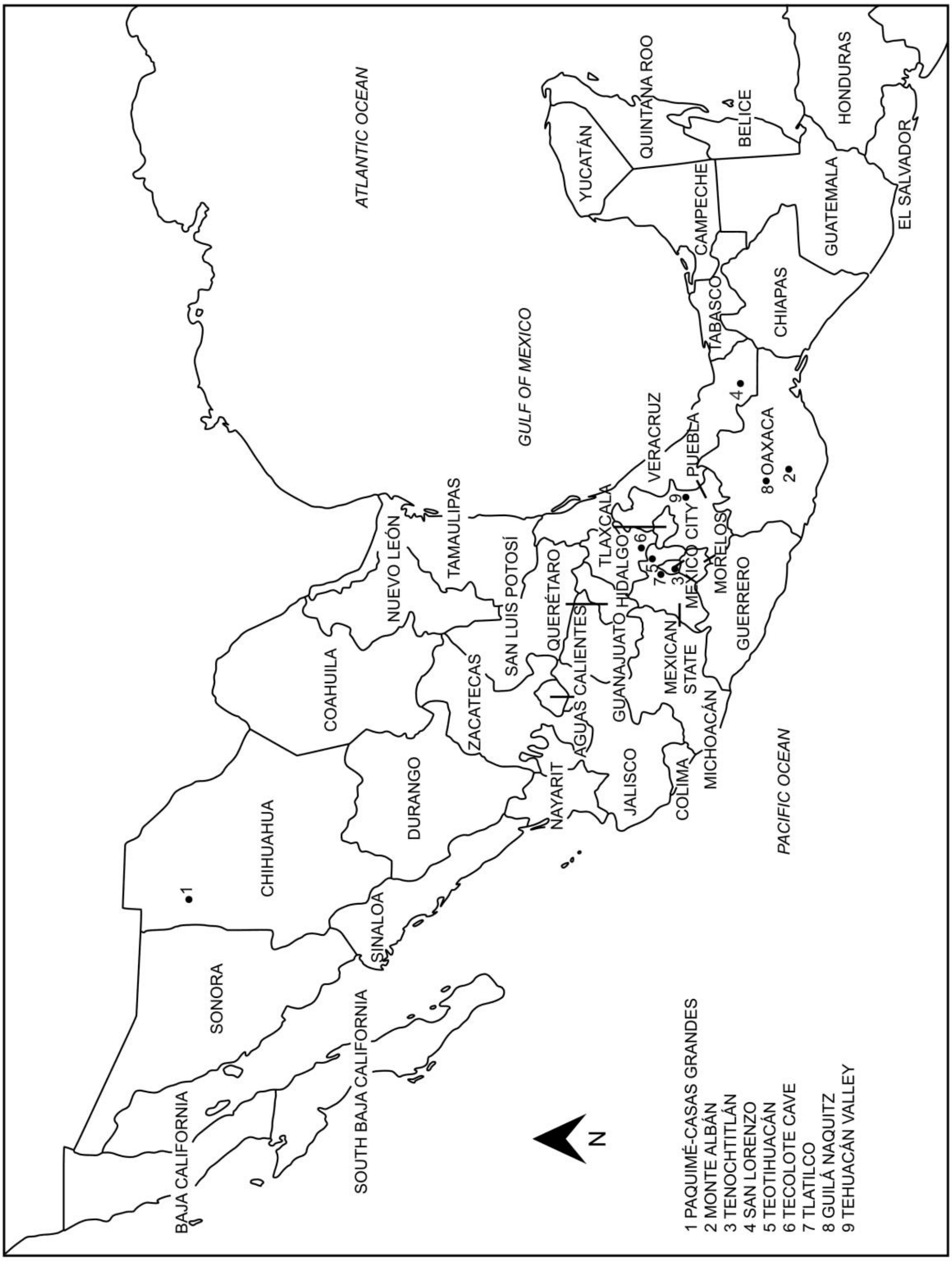


Fig.2. Map of Mexico and Central America with the geographic location of the archaeological sites mentioned in the text (after Solanes and Vela 2000:2).

important role since it was related to the *Quetzalcoatl* cult, as can be inferred from art depictions of this bird with the body of a plumed serpent (Di Peso 1974). At Monte Albán, in Oaxaca (Fig. 2), a ceramic model of a temple which had a roof opening and an image of a macaw sun god sitting in the place of importance was recovered (Paddock 1966). Zapotecs from this place believed that it could fly from the sky, enter the temple and perform an oracle, answering questions which the priest posed (Caso 1962).

At Casas Grandes, in Chihuaha (Fig. 2) (northern Mexico), turkeys were apparently used for feathers and for sacrifice, but not for food. Many headless turkeys were found not compactly arranged as when a bird dies of natural causes, but extended with wings and legs outstretched (a characteristic of beheaded birds). Some turkeys were buried with humans or under room floors, most of them recovered from concentrated areas under plaza floors, suggesting the continuation over a period of years of a ceremonial use. Considering the use of turkeys in the Valley of Mexico for food, a similar pattern could be expected here. There was a tendency to use turkeys for feathers where they were scarce and for food where they were more abundant. The turkey population might have provided feathers for fabrication because there was no evidence of food use for this animal (Di peso 1974).

In Mexico City, at the Templo Mayor, a total of 16 offerings were recovered, located between the foundations of the buildings, hidden in boxes of stone under the floors, or directly buried within filled constructions; at the time a great monolith of the Aztec goddess of the earth called *Tlaltecultli* (dated from 1486 to 1502 AD) was found in 2006. A great diversity of faunal remains (molluscs, echinoderms, crustaceans, amphibians, reptiles, birds and mammals) was discovered with other archaeological materials such as shell, obsidian, pottery, among others. These objects were offerings or requests that the Mexicas made to their deities, through complex ceremonies, to create a link between the terrestrial and the divine. Most of them came from distant provinces.

Even though these deposits have an important symbolic meaning, they also represent the political and economic power the Aztec empire held, showing its extensive exchange and tribute systems (Quezada *et al.* 2010).

Next to the monolith of *Tlaltecutli* goddess, offerings 120 and 125 were found. The first contained bone remains of 12 royal eagles (*Aquila chrysaetos*). Some of them were dressed with pectorals of shell or wood on the chest, and small copper bells were tied around their feet too. Another two eagles of the same species were discovered in offering 125. Only half of the 14 skeletons were complete. Seven of these individuals were placed without thorax, most of the vertebra and part of the wing and feet bones were missing. Some of the skulls were cut and perforated at the nape and base of the head, and the long bones showed skinning and filleting marks. This evidence suggests that the individuals received a special treatment to preserve the skin and feathers, since the same characteristics can be observed in modern birds that have been prepared through taxidermy. Pathologies were also noticed in some of the eagle bones, as a product of illness or accidents suffered when the animal was still alive. Based on the serious suffering and the degree of damage detected in bones, it is possible that the eagles were kept alive or even raised in captivity. The presence of such illness in vital zones of the body (wings and feet), indicated that birds could not perform their daily activities such as flying, hunting, defending or feeding themselves (Quezada *et al.* 2010).

At Tenochtitlán, in Mexico City (Fig. 2), evidence of birds associated with a burial of three children was also found. The sample consisted of 41 individuals, corresponding to three bird genera: the Montezuma quail (*Cyrtonyx montezumae*) (12 specimens), the band-tailed pigeon (*Columba fasciata*) (28 elements), and the common turkey (*Meleagris gallopavo*) (one fragment). Both quails and pigeons were represented in whole skeletons, so it is possible that they were placed complete and without any cooked or boiled treatment, since some of the scales from the feet were identified. The homogeneity in size and age of the birds could suggest that the Mexicas had breeding places for birds (Valentín 1999).

Referring to domestic species, dogs, together with the common turkey (*Meleagris gallopavo*), were the only domestic animals of the population in Mesoamerica and were also part of their diet (García 1987; Seler 2008). The types of dogs in Mesoamerica mentioned in this section will be related to the dog remains identified at Monte Albán. According to the studies performed on collections from more than 30 archaeological sites in Mexico, three types of dogs were found in Mesoamerica: the *Itzcuintli*, the *Xoloitzcuintli* or hairless dog, and the *Tlachichi* (Valadez 1995; Valadez 2000a). This is the most accurate information and the closest to archaeological evidence (Valadez and Mestre 1999). The Mesoamerican common dogs and *Xoloitzcuintles* are, without doubt, the best defined types, due to the fact that supporting zooarchaeological, iconographic, ethnohistorical, and biological evidences exist. There is less evidence for the *Tlachichi*; nevertheless sufficient bone remains exist for it to be considered a real type, rather than just one case (Valadez 2000b). It seems the *Tlachichi* dog became extinct between the seventeenth and eighteenth centuries; the *Itzcuintli* was less valued by Spaniards, because they considered it an ordinary dog, but it survived due to its skills; the *Xoloitzcuintle* lasted, and was protected by native groups (Fig. 3) (Valadez 1995; 2000b).

The *Xoloitzcuintle* or hairless dog was medium-sized, with a height of about 40cm, and approximately 70cm in head-trunk length (Valadez 1999a). This type of dog distinguishes itself since it usually has fewer incisor teeth, no canine teeth, and only the fourth premolar tooth and a single molar are present (Valadez 2000b; De la Garza 1997). Remains of this type of dog showed evidence of having been used as food, although less frequently than the common dog (Valadez 1998; Valadez *et al.* 1998;

Rodríguez 2001). Based on the fact that this dog was never abundant and that it has been found in ritual contexts, it seems it was exclusively used by the elite, or that its use was restricted to special events (Valadez 2000b).

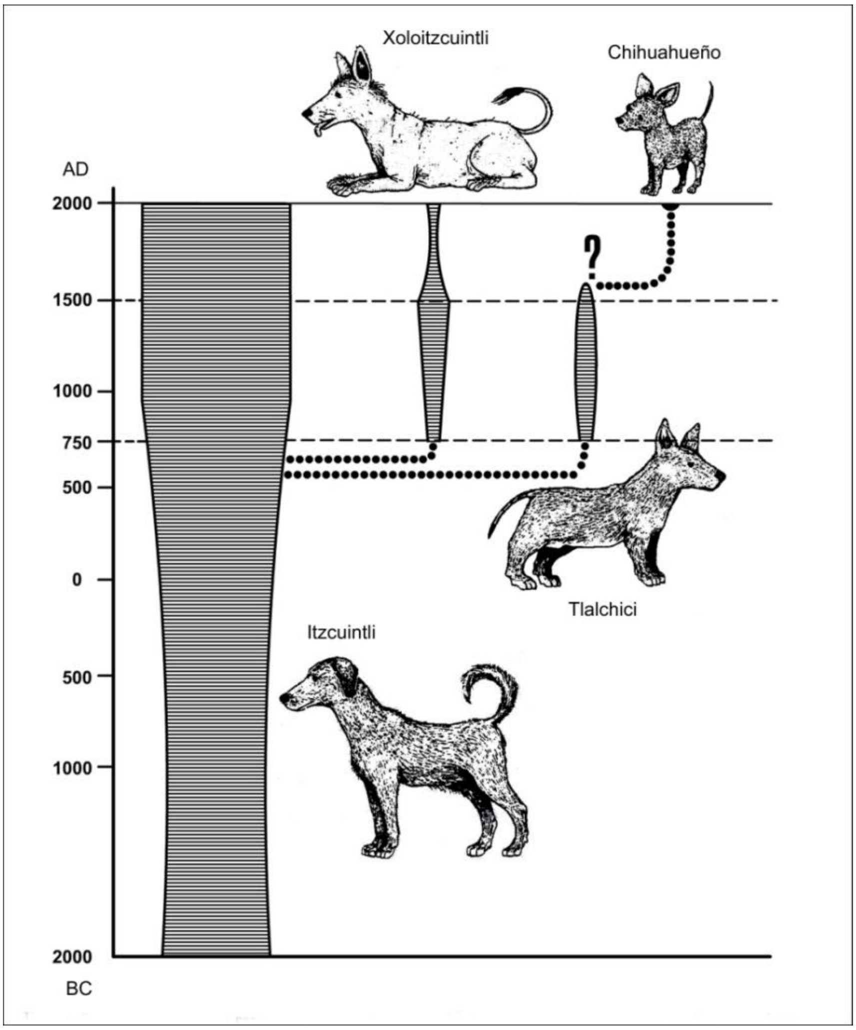


Fig. 3. Mesoamerican dog chronology (after Valadez 1995:35).

The Mesoamerican common dog or *Itzcuintli* (in Náhuatl) was the most abundant type of dog in the Mexican territory. It was medium-sized (40 cm in shoulder height and 70 cm in head-trunk length), although there were specimens leaning toward smaller sizes (35 or 36 cm in shoulder height and less than 65 cm in length), while others were substantially larger (over 45 cm in shoulder height and about 80 cm in length) (Valadez 2000b; 2003, Valadez *et al.* 2004; Blank 2006). This dog was used in all human activity, since it is found in burial sites as an offering, as well as food (Rodríguez *et al.* 2001; Blank 2006).

The *Tlachichi* or short-legged dog is a medium-sized adult specimen. Its short limbs are the only indication that this dog was different from the Mesoamerican common dog (55 cm in length, and not more than 30 cm in height). It has been found spread across the west and the centre of Mesoamerica (Valadez 1999a; 2000c; 2003; Valadez *et al*. 2003). Remains of *Tlachichi* associated to humans have been found, which suggest it had a ritual, possibly funeral use (Valadez 2000c).

Faunal remains and subsistence practices in Mesoamerica

In the prehispanic period, diet could vary depending on different factors such as the ecological resources available, the degree of social and economic organization, and the technological development. In order to reconstruct the diet in prehispanic times, faunal remains are very useful. As a result of the archaeological field work performed since the 70´s, nowadays there are excellent analyses of fish, molluscs and land vertebrates. This kind of research shows the exploitation in different areas of the country and periods of time for food purposes (Márquez 1991).

In this section, reference is made to studies of different cultures (Olmec, Maya, Teotihuacan and Zapotec) and diverse areas of study (samples from archaeological sites in Veracruz, Guerrero, Oaxaca, Yucatán states in Mexico, and some regions in Belize and Guatemala). The purpose is to illustrate how information obtained from animal bone studies provide valuable evidence, in order to infer subsistence practices related to socioeconomic status and politics, meat distribution, food trade, adaptation, depending on the location of the sites (inland or coastland for example), survival strategies and environmental impact due to population growth. All these studies will provide a valuable framework to compare the results obtained from the identification of faunal remains from Monte Albán.

Olmecs

One of the first villages or settlements in Mesaomerica corresponds to the Olmec culture. Archaeological sites in the Olmec heartland are located along the southwestern Gulf Coast, which correspond to the Formative period (1300 BC – 400 AD). In this area, subsistence was mainly typified by abundant remains of dog, musk turtles (*Kinosternon* spp. and *Claudius angustatus*), and snook (*Centropomus* spp.). However, of the nine archaeological sites that have been studied, dog remains were only abundant in two Formative period samples representing 23% of those faunal assemblages (Wing 1981).

In the San Lorenzo archaeological site (Fig.2) the fauna, according to environmental preferences, was composed of about one third (32%) of terrestrial species and two-thirds (60 %) of aquatic species. However, when this fauna is viewed in terms of the amount of meat that each species provided, a different picture emerges of the importance of land versus aquatic resources for Olmec subsistence, since more than half (58%) of the usable meat was made up of land vertebrates. Of the 43 % contributing species, the fresh water species were far less important (12 %) than the rest (31 %) (Wing 1980).

The three most frequent species in this assemblage were the dog, marine toad and musk turtle (*Claudius angustatus*). Of these animals, dogs were the third most abundant group (10 % of the vertebrate remains) represented at San Lorenzo site. Since evidence of dog was associated with food remains, it was probable that this animal was part of the diet. Calculations indicated that dogs provided the largest contribution of meat. There were also a few remains of game animals (Wing 1980).

One of the most abundant taxon was the snook fish. The musk turtle was similarly common but considering that it is a small animal whose weight is composed largely of bone, they could not have contributed to the diet to the extent that snook did.

So San Lorenzo showed a lack of interest in hunting terrestrial game and a strong emphasis upon fishing and turtle collecting. Animal protein was easily obtained in the rivers, ponds and *potreros*, and thus hunting was not a necessity but a hobby (Wing 1980). It is difficult to say if this is the result of geographical determinism or cultural preference.

The fourth most frequent animal was the marine toad whose value is not clear. This animal could provide food if prepared carefully to remove the poison glands in the skin. The other possibility is that toads had some cultural significance other than subsistence. According to pre-Columbian art representations, toads may be associated to the rain god. However, the occurrence of toad is an enigma that further study may explain (Wing 1980).

Mayas

The Mayas were settled in southeastern Mexico and Central America. Sites from these regions showed a clear cultural taste when compared with tropical lowland Olmec sites where dogs, musk turtles and snook were predominant (Pohl 1989). In the Maya culture, several archaeological sites have been studied. On the northern and southern coasts, many sites consisted of shell middens and subsistence communities dated mainly from the Formative period (ca. 400 BC- 100 AD). During this time, communities focused on gathering and fishing. At the end of this period a dynamic salt exploitation expansion took place and most of the archaeological sites were located near lakes where this resource was collected. In the Early period I (100 AD - 450 AD) the coast settlements increased, however for the next period (450 - 700 AD) they almost disappeared. This phenomenon is related to the emergence of more complex sites built some kilometres away from the coast. There was a strong contrast in the variety of resources between the coast places and the inland sites. The latter had as base diet of agricultural products and some food obtained by hunting or gathering, depending on the degree of technological development and the socioeconomic organization (Márquez 1991).

For instance, the Lowland Maya sites of the Caribbean, away from large rivers, estuaries and the sea shore showed more land fauna and fewer aquatic resources than coastal sites of the Gulf of Mexico and Honduras. The kind of fish recovered on both coasts differed too. Common snook fish remains (*Centropomus undecimalis*) were abundant but evidence of Jack fish (*Caranax lugubris*) were rare in the Gulf of Mexico assemblages, whereas an opposite trend was observed in the Gulf of Honduras samples. Such differences might be due to prehistoric use of different fishing technology perhaps as a result of dietary preferences. The sites located in the Lowland Maya area of the northwestern Caribbean Coast showed considerable change through time. There was a relative abundance of dog remains in sites occupied during Formative times (ca. 1200 BC – 200 AD) as compared to their relative decrease in sites of the Classic period (200 – 600 AD) (Wing 1981).

Faunal remains associated with elite dwellings from five prehispanic Maya sites (Champotón, Chichén Itzá, Dzibichaltún, Sihó, and Xcambó), located in the northern Maya lowlands (Fig. 4), corresponding to Classic and Postclassic periods (between approximately 200 and 1500 AD) indicated diverse subsistence adaptations and harvesting/hunting of vertebrate animals between inland and coastal settlements. While elite residences of inland sites appear to have used strategies well adapted to a modified environment of secondary forest and agricultural fields, the coastal site elite mainly relied on marine fauna, with only minor quantities of terrestrial vertebrates, some of which were possibly obtained through local and long distance exchanges. Fish remains found in small quantities at all inland sites could indicate a possible long distance trade (Götz 2008).

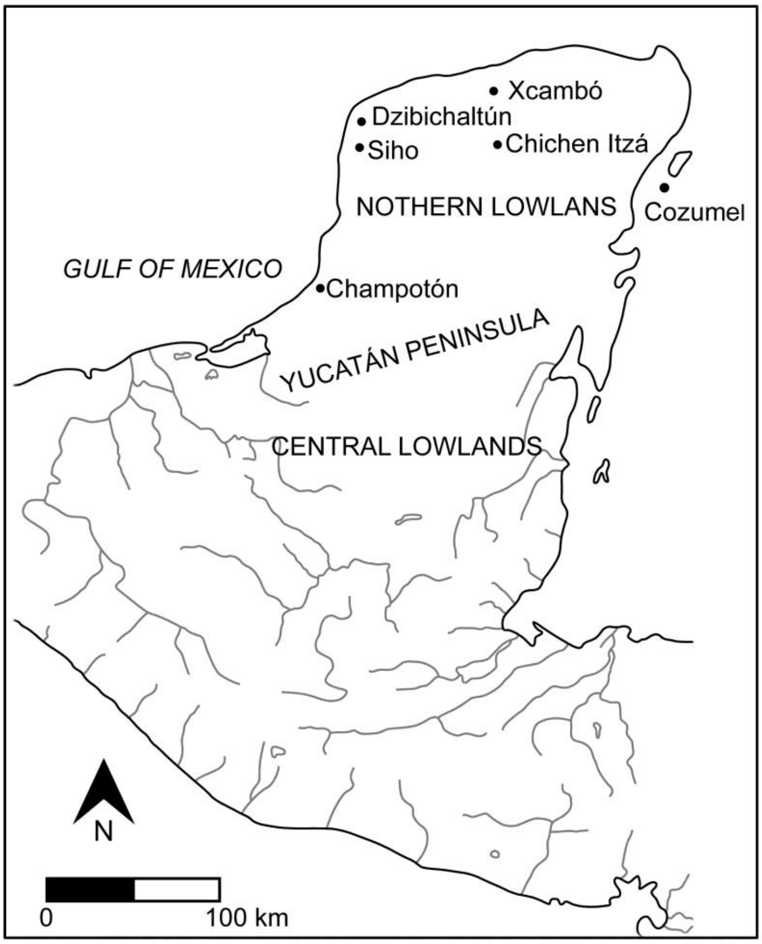


Fig.4. Map with Maya archaeological sites in northern lowlands (after Götz 2008:155).

The zooarchaeological comparison results showed that in Late Classic times (600 - 900 AD), the consumption of large animals, especially of white-tailed deer was high at the powerful cities of Chichén Itzá and Dzibichaltún (according to elements found in identified middens together with domestic waste material with cut marks, spiral fractures and traces of burning) (Götz 2008). Large animals demanded big groups of consumers, or the ability to keep the meat fresh, or that members of the elite threw any extra away to demonstrate their power. These are important questions to explore with more studies in zooarchaeology.

The data from Chichen Itzá and Dzibichaltún contradicted the hypothesis (Márquez 1991) suggesting a reduced consumption of large game between the Preclassic and Classic periods, which expanded to the northern lowlands in general. It has also been argued (Márquez 1991) that the Classic Maya used smaller taxa due to a supposed population pressure during the end of the Classic period. An intensification of agricultural production was required by this time, reducing the space to hunt big game. However, results showed that smaller taxa were much less represented at the inland sites, indicating an opposite trend to what was proposed (Götz 2008).

In the Postclassic (ca. 600-900 AD), apparently only at the sites located near the coast (Champotón and Xcambó), the northern turkey appeared, possibly brought by long distance trade from central Mexico. The taxonomic profiles and richness of species showed a widespread exploitation pattern at the coastal zone of the Yucatec peninsula, which did not necessarily indicate a widespread environmental exploitation, but perhaps a specific environmental adaptation and restriction. The taxonomical profiles from both the inland and coast define the prehispanic Maya of the northern lowlands as opportunistic hunters adapted to, and dependent on, their surrounding environments. The fact that no purely pelagic (not deep water or oceanic) species were found at the coastal Maya sites, seems to emphasise that fishing and marine hunting was undertaken only near the shore (Götz 2008).

A faunal sample of ten different sites on the Cozumel Island (Fig. 4), from the Late Formative (100 - 300 AD) through the Late Postclassic (1250-1500 AD) periods, made it possible to obtain information about how Mayas from this area used animals in their everyday lives. The data supported the idea of a heavy reliance on marine fauna in the Late Postclassic (1200 - 1521 AD). The Cozumel Archaeological Project has demonstrated maritime trade between this island and the coast of Yucatán in the Postclassic period. However, the great abundance of fish and crab remains may only reflect an exploitation of available sea resources for local consumption. The fact that there was no indication of fish-drying or preservation activities to transport the fish, (since skull elements appear in adequate percentages), does not support the idea of exchange. On the other hand, fish caught for export would not necessarily leave any archaeological evidence if the heads were removed on the beach and discarded into the sea. The remaining body parts would also be absent if the preserved fish had been exchanged elsewhere. Perhaps some of the fish recovered at Mayapán and other inland sites were originally caught in Cozumel (Hambling 1984).

Turtles were the most abundant group of reptiles found in Cozumel sites. The majority of remains from this group have been dated to the Postclassic and included box and fresh water turtles (Emydidae), the mud and musk turtles (Kinosternidae) and the sea turtles (Cheloniidae) in decreasing order of abundance. The predominance of turkeys (*Meleagris gallopavo* and *Meleagris ocellata*) was a common factor at all sites. Since these birds were imported from the mainland, they could have been raised in Cozumel as either domestic animals (*Meleagris gallopavo*) or as tame captives (*Meleagris ocellata*). The Cozumel sites appear to be the first in the Mayan lowlands to contain the common turkey in archaeological contexts. This information confirms the existence of a long-distance trade network with other parts of Mexico. After the Galliformes, the next most important group of birds in the Cozumel diet was Columbiformes (pigeons or doves) (Hambling 1984).

The group of mammals was represented mainly by dog and collared peccary (*Tayassu tajacu*). The latter must have been attracted to human settlements for food and might have been obtained by garden hunting. The large amount of meat obtained per animal probably explains its prominence in the Cozumel faunal collection. The relative high numbers of young peccaries found in the sample might indicate that they were reserved for human use (Hambling 1984). The possibility that these animals were kept and tamed by the Maya for eating or ritual purposes, particularly during the Postclassic period has been discussed in detail before (Pohl 1976). This animal could have been prepared directly over the fire or by boiling or stewing it. The scarcity of white tailed-deer at the Cozumel sites represents an exception to the usual occurrence of this animal in the Maya culture. The brown brocket deer, *Mazama gouazoubira*, was absent from the sample. Deer scarcity might be due to the fact that this animal may have been imported from the mainland. The overall pattern of faunal use focused greatly on marine resources while reptiles were very scarce (Hambling 1984).

Among the Maya, meat eating followed established strategies and policies. So the patterns of animal bone distribution at Maya sites reflect political ideology and control of meat procurement and distribution in this society. Evidence of the influence of policies on food resources comes from prehistoric iconography and ethnography. This information helps explain how bones of certain animals ended up in elite contexts. If the customs documented for the early historical period -specifically venison tribute payment, restriction of hunting favoured species to elites, perhaps in the contexts of ceremonial groups, women raising deer, dogs, and turkeys for ritual feasts sponsored by the elite- extended back into the prehistoric period, the results would be a preponderance of these species in the elite archaeological contexts (Pohl 1994). Food and social status are closely linked; feasts played an important role in order to structure and centralize political control, to create exclusive elite circles that excluded the lower classes, to display, consolidate or validate status and to enhance political cohesion (Hayden 1996; Rosenswig 2007).

Domesticated animals would have provided a convenient and reliable source of meat for political and ceremonial activities. Nevertheless, effort and resources were invested into animal raising where women might have been in charge of this duty. Women´s involvement with the production of high-status meats may have contributed to and/or reflected their retaining control over food preparation and presentation. Even feasting emerged as a focus on the elite activity of celebrating their victories in battle. In contrast, the small game mammals, birds and monkeys that characterized Postclassic non-elite sites, suggest that these hunters were using unsophisticated technology such as blowguns and bow and arrow (Pohl 1994).

In Mexico, the Mayapán archaeological site (Fig. 5), the largest political capital of the Late Postclassic period in the Maya area was founded in the 12th century AD and was abandoned by 1441-1461 AD. The range and quantity of wild, tamed and domesticated animals found in consumption contexts at the site, revealed diverse methods for animal acquisition and consumption, including exchange, fishing, hunting, and husbandry or game management. Based on the evidence recovered at this site, it has been considered possible that white-tailed deer was raised by local people (Masson and Peraza 2008).

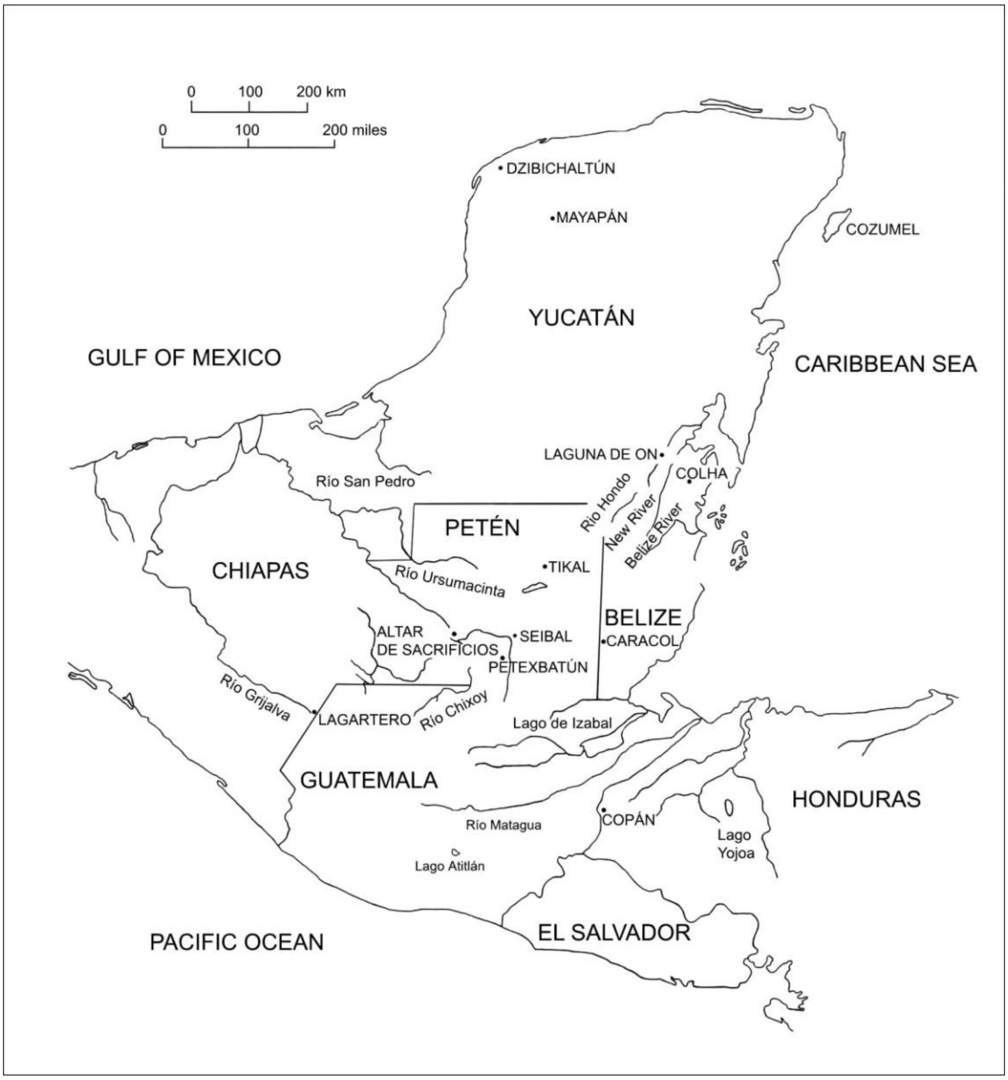


Fig. 5. Map with archaeological sites in the Maya area (after Masson 2004:100).

Techniques of husbandry often include the slaughter of a high portion of animals in late subadulthood. At this point in the life cycle, animals attain adult size and provide the maximum amount of meat. Butchering animals soon after they reach full size is an efficient strategy, as keeping animals longer would include more feeding but no increase in meat return (Davis 1987). A remarkably high proportion of older subadult white-tailed deer (rather than full adults), at Mayapán would suggests that deer were raised and probably bred in captivity. Another possibility is that sophisticated forest management was in place. Proportions of older subadult white-tailed deer were similar to those of subadult dog, a known domesticate, and differed from the brocket deer or peccary ones. The abundance of subadults at Mayapán could not have been the result of selective hunting practices, as there is no ethnographic evidence that fully grown adults were ever excluded in Mesoamerican hunts for food. Furthermore, there was no evidence either of depletion of deer at Mayapán, where it was present throughout the city´s occupation. However, if game reserves were carefully managed in Mayapán territory, older subadults could have been allowed to reproduce prior to being hunted. This strategy would have replenished the population but would have shown fewer numbers of older adults in the sample (Masson and Peraza 2008).

At Copán Valley, in Honduras (Fig. 5), analysis of faunal remains suggested that deer was raised by local people too. Animal consumption was an important means by which Maya elite achieved privileged social rank in Late Classic times. The most abundant species in the sample from this place was the white-tailed deer. These animals are browsers, and their population increased significantly with the introduction of agriculture, which provides a maximum forest edge habitat. Deer bones were present in most of the Maya agricultural sites, although the degree to which the inhabitants of Copán focused on this species is unusual (Pohl 1995: 465). Pollen data suggests that the Maya had virtually eliminated the forest in the region in the Late Classic period.

However, based on the evidence of demand for animals together with habitat destruction, it is possible that women raised deer for food, ritual offerings, dance headdresses, skins, and bone tools (Pohl 1995).

In the Maya area, zoarchaeological research has revealed a complexity in the distribution of animal remains among hierarchically ranked residences. The upper classes of the Maya society had greater access to specific animal resources, including luxury goods and commodities, for both dietary and non-dietary resources. Elite archaeological deposits contained non-local species, ritually important species and high quality food portions (Emery 2003). In this section, several examples from Guatemala and Belize illustrate this concept.

Fauna from the Late Classic period (1200-1521 AD) deposits at Seibal archaeological site, in Guatemala (Fig. 5), showed that elite and ceremonial contexts contained more game obtained on hunting trips to forested areas (65 % of MNI), perhaps located at a distance from Seibal, than peripheral areas (47 %) (Pohl 1985). So the highest social status consumed the largest quantities of meat and most favoured foods such as deer (Pohl 1976).

Relative percentages of turtles indicated the orientation of low status inhabitants toward animals that could be procured close to the site. All the species of turtles recovered would have been available from the Pasion River, which flows in front of Seibal or from land around the site. The turtles also provided evidence of a distinction in the species used between social classes. Only low status, peripheral plain residents ate the musk turtle (*Staurotypus*) and mud turtle (*Kinosternon*), while the upper class displayed a preference for *Dermatemys*. Regarding venison, elite refuse contained a minimum of 33% of white-tailed deer, while peripheral dwellings showed 19 % of this species (Pohl 1985).

Demand for game must have been high at the same time that Maya agricultural and architectural projects were destroying animal habitats. To ensure that enough game was available, elites might have maintained refuges, most likely in nearby savannas (Pohl 1985). Maya nobles might have arranged for the management of deer habitats or raised this animal in pens to ensure that they had venison for sacrifices and feasting (Pohl 1989).When deer is subjected to hunting pressure, the age structure of the population may show a tendency toward younger individuals because fewer animals survive into old age. At Seibal, the number of juvenile deer bones was low, suggesting that this animal was available or that hunting was selective, in order to favour longer-term conservation of this resource (Pohl 1985; Pohl 1989).

Hunting may have been most productive in the dry season when swampy land dries out and game tends to congregate near sources of water. However, many of the trees fruit in the wet season, particularly in August, drawing a variety of game such as agouti, paca, peccaries, white-tailed deer, curassow, guan, and turkey. The exploitation of freshwater resources may have been more restricted to the dry season. This is the time when turtles and crocodiles lay their eggs. Low water levels leave molluscs exposed and makes the hiding places of shrimp and crab more accessible (Pohl 1989).

Since white-tailed deer held a special place in Maya religion, this might be related to a discernible pattern in the right or left side of deer bones represented at Seibal refuse. Other animals showed no particular pattern, except for the turkey. All right elements occurred in plain structures and all left ones in elite contexts. The predominance of left elements, particularly front limb bones, in elite contexts at Seibal, might reflect codes of meat distribution. Also, the Maya associated the left side with the heart, the source of life. Left was the direction of the underworld, also the realm of the dead. Females were related with the left side and fertility (Pohl 1985; Pohl 1989).

Ethnographic studies have shown that in the Maya culture, the left side of any animate object (buildings were considered animate) was associated with women (Brown 2004).

In addition to deer, the Maya revered felines, and the jaguar was a powerful supernatural being. Late Classic period art demonstrated that these animals were ritually sacrificed. Pelts, teeth, and claws were essential for elite paraphernalia, like throne cushions, sacred bundles, clothing, and other items of personal adornment. At Seibal, cat bones were scarce in the faunal sample, but they did occur in elite contexts. Cat bones suggested that the elite exercised tight control over precious resources (Pohl 1985; Pohl 1989).

The ancient Maya elite of Petexbatún in Guatemala (Fig. 5) had preferential access to exotic or ritual species like marine shells (used as decorative adornments) and wild cats (jaguars, margays and ocelots). Non-exotic animals were also differentially distributed as food and secondary resources (artifacts, tools and non-food consumables) and, of these animals, the elite received more or higher quality portions. (Emery 2003).

At the Maya Lowland Postclassic site of Laguna On (Fig. 5), in Belize, evidence suggested that animal resources were used differentially in diverse social and functional contexts across the site. Large game animals (tapir, peccary, deer, and crocodile) and selected small taxon (agouti, iguana and birds) were more commonly associated with upper status residential or ritual contexts than with lower status residential zones. Not only were large animals more frequently represented in upper status and ritual contexts, but they appear to have been processed in a manner that suggests their manipulation for feasting, redistribution, or ritual activities. Comparisons of species frequencies according to contexts at other Postclassic Maya communities (Colha and sites in Cozumel Island) suggest that mammals and birds were universally preferred for ritual and upper status use. Other species, such as iguanas and crocodiles, varied in their significance for such purposes in each community. Aquatic resources, especially fish and turtles, provided important dietary goods at all sites considered. They were not preferentially distributed and less significant for ritual purposes. Feasting and ritual integration at Laguna de On and other Postclassic communities was seen as affirmations of power (Masson 1999).

The Caracol site in Belize (Fig. 5) was continuously occupied from the Preclassic (ca. 600 BC) throughout the Terminal Classic (ca. 1000 AD). The faunal remains gave information about population pressure, socio-political status, subsistence, and animal use, and how they were affected by increasing social complexity in Maya society. Based on the faunal data, it appears that Caracol was quite efficient in providing meat to households and importing luxury products such as marine fish. A slight decline during the Terminal Classic period coincides with a decrease in population as people began to leave the city through 1000 AD (Teeter 2004).

The sample comes from the epicentre and the causeway of the site, classified as an elite area, and the core containing households of all socioeconomic strata. The largest diversity in diet was found in the core, showing unequal access to food resources. The distribution of fish remains showed that they were eaten by an affluent segment of the Caracol population, both in the epicentre and the core. The presence of stingray and other sea fish proved a long history of trade between Caracol and the coast. Turtle were more frequently found in upper-class groups throughout the city. Bird remains were recovered in dated contexts from the Late Preclassic, with a drop in use during the Early Classic. This decline was followed by a sharp increase by Late Classic. The increase of bird use during the Terminal Classic period matches northern Belize Maya cities, where an increase of birds and smaller animals took place. Turkey and other birds represented only a small proportion of the Caracol resident’s diet. Quail (Galliformes) and songbirds (Passeriformes) were restricted to the epicentre. Similar to birds, the mammal data overall, suggested some level of restriction on their use for food. Rabbit represented the third most abundant mammal. Dog formed a small part of the elite diet. Peccaries were one of the most important meat resources for the Maya. However, at the Caracol site they were limited to the epicentre. Deer formed a large part of the elite diet (Teeter 2004).

Prehispanic civilizations had an important impact on the environment, so inhabitants had to organise themselves to provide resources for a growing population. For example, at the Dzibichaltún site, in Yucatán (Fig. 5), most of the identified vertebrate fauna was represented by local species (95% based on minimum number of individuals). Dog, white tailed deer, turkey, iguana and chachalaca remains (Galliform birds of the genus *Ortalis*), constituted 95%. The other 5% consist of sea species brought from the Gulf Coast. Marine resources were only a small part of the diet. During the Formative period, deer made up 55% and dog 23% of the faunal assemblage. In the following periods, a considerable decrease (from 78% to 18%) of these animals was observed. In contrast, a considerable increase of small animals such as: chachalaca, iguana and turkey took place. This change might have been due to a strong demographic pressure of almost 40,000 people, which made inhabitants look for other protein sources (Wing and Steadman1980). The southern lowland sites -Altar de Sacrificios, Seibal, Macanche, and Flores- differed from northern sites like Dzibichaltún and Mayapán- where more turkey bones occurred (Pohl 1989).

Analysis of four faunal samples from northern Belize Maya sites detected patterns of aquatic and terrestrial resource utilization during the Preclassic (Pulltrouser and Colha), Terminal Classic (Nothern River Lagoon), and Postclassic (Laguna de On) periods. The examination of these four settlements indicated that the significance of terrestrial game -deer, tapir, agouti, paca, armadillo, canids, mustelids and peccary-, and aquatic fauna -primary fish and turtles but also crocodiles- fluctuated significantly over time in northern Belize. This variation may be attributed to changing local habitats surrounding these ancient communities, which had an impact on the availability of particular species over time. Human population levels and the extent of agriculture cultivation at each site probably affected the quantity and type of game for exploitation. The differences observed in faunal assemblages for this period, compared to earlier or later occupations, suggested that the maximum human impact on local animal population took place during the Classic period. Such changes varied in each location, so it was not possible to define a regional pattern. The more significant impact on game animals may have occurred at Laguna de On and Colha during the Late and Terminal Classic periods (Masson 2004).

At the Pulltrouser Swamp, the frequency of large game was not significantly higher during the Middle Preclassic (1200-300 BC) compared to later periods. This pattern suggested that human predation after the Middle Preclassic did not alter the availability of large game, with the development of a state society in this region. Turtles occupied a secondary position compared to terrestrial mammals (at Colha site, this same pattern was found). However, turtles became more important at Pulltrouser in the Protoclassic and Early Classic, when a decrease of small/medium mammals took place. By Terminal Classic period, fish provided the primary resource at this site. The constant presence of aquatic varieties of turtles and birds in samples of all periods, suggested that the ecology of the Pulltrouser Swamp remained stable over the Preclassic and Classic periods and that the effects of human cultivation on turtling and fishing were sufficiently balanced in this productive wetland (Masson 2004).

The Early Maya faced a particular challenge in their growth to a state-level society because of the absence of large domesticated animals, like those of Old World civilizations. The early Middle Preclassic (1000-600 BC) faunal data from a Colha household in Belize, suggested the use of a wide variety of species from both terrestrial and aquatic habitats, with a dominance of wetland species (turtles and fish) in bone remains. However, if biomass is considered, terrestrial mammals would probably dominate the sample. This information indicated a much greater emphasis on the use of mammals for food, with a broadening of the number of habitat ranges of the species used. Most of the identified species could have been found in the immediate vicinity of Colha, but several others came from distant environments. Marine fish could reflect long-distance fishing trips to the coast or maybe the beginning of exchange between communities in different habitats. By the late Middle Preclassic (600-300 BC) and early Late Preclassic (300-100 BC) faunal assemblages exhibited a trend toward a decrease in the use of mammals and an increase in the use of small fish. This change may be related to a general degradation of the environment, due to the effects of a long-term exploitation of the area for meat resources and a growing population. Colha households may have been less involved in agricultural activity and, therefore, unable to procure meat easily from garden areas. So the solution adopted was a change in the organization of procurement rather than a greater intensification of strategies already in use (Shaw1999).

Zooarchaeological analyses of animal remains from residential deposits of Petexbatún sites (from six chronological periods at seven major sites), in the Guatemala lowlands (Fig. 5), provided evidence of a decrease in small-scale resources that might have resulted at some places during early periods of human population growth, site expansion, increasing political activity and with periods of political dissolution in the region. At the end of the Late Classic period, societal disruption culminated in warfare and the abandonment of the region by the political elite around 800 A D. The study evaluated animal acquisition at the community level, providing a generalized pattern that included all animal products used by the community during one period (Emery 2008).

In comparison with other Maya sites, animal use was relatively diverse in terms of total number of species recovered (high species richness), but assemblages were dominated by a small number of species (low species evenness), particularly the white-tailed deer. Deposits at large political centres contained more deer remains relative to other animals than deposits at intermediate subordinate sites, suggesting that residents at large and small centres may have had a very different impact on the wild resources around their cities. Taxonomic diversity of remains was higher at intermediate sized sites (Emery 2008).

The results of these studies did not support a hypothesis of resource decrease specifically associated with the "collapse" period in the region. Species heterogeneity was stable during the periods immediately before, during and after the collapse of the political elite in the Petexbatún region. Overall, hunting efficiency (representing nutritional availability) rose over these periods (Emery 2008).

Oaxaca

In Oaxaca, subsistence practices can be traced back to 8,000 and 6,500 BC at Guilá Naquitz Cave (Fig. 2). Faunal remains from this site revealed that animals hunted or trapped were species that can still be found today, or would have been common until they were reduced by overhunting with firearms. Faunal remains from this Preceramic Cave, in Oaxaca, revealed that the most important species for the residents were the white-tailed deer (*Odocoileus virginianus*), the Mexican cottontail rabbit (*Sylvilagus cunicularius*), the eastern cottontail rabbit (*Sylvilagus floridanus connectens*), and the mud turtle (*Kinosternun integrum*). Of the four most abundant species found, the white-tailed deer was perhaps the major source of meat. However, even if the cottontail did not provide the same quantity of meat as deer, they were a more frequent item in the diet, simply because of their higher numbers in the environment around the cave. The mud turtle was the fourth most common species eaten in this site. There is not much meat on this animal but it may have been popular due to the fact that it can be caught easily. The variety of birds eaten by preceramic inhabitants of the cave is quite varied. It seems that the occupants did not systematically search for any species in particular, but took whatever was available: quails, pigeons, and doves remains were some of the animals eaten (Flannery and Wheeler 1986).

As for the season of deer hunting, it is known that bucks from Oaxaca lose their antlers in February or March (occasionally in early April) and begin to grow new ones in April or May. During the rainy season (May to September) their antlers are “in velvet” and would appear spongy and immature in archaeological deposits. Not until the end of October they reach their definitive shape, fully grown and ossified right to the tips of the antler tines (Villa 1954). No fragments of antlers “in velvet” or of frontal bones with the pedicles of recently shed antlers were observed in the deposits. Thus, most bucks at Guilá Naquitz must have been killed between October and February (Flannery and Wheeler 1986).

Faunal remains from more recent sites in Oaxaca showed differential access to faunal resources (meat), related to socioeconomic inequality. Excavations in residential contexts at the Classic-period hilltop terrace site of El Palmillo, in the Valley of Oaxaca (Fig. 6), have produced a large faunal assemblage from different households. Comparisons between terraces revealed variability in the distribution of faunal remains.

This information provides a clear perspective of socioeconomic inequality, in conjunction with other patterns of status differentiation (architecture, distribution of exotic shells and obsidian) that have been observed at El Palmillo (Haller *et al.* 2006).

The first difference detected was that animal bone density and species with more available meat increased moving up the hill, indicating that inhabitants of the upper terraces had greater access to faunal resources. Since terrace elevation reflects positioning, the residents of higher terraces had greater access to meat, with other

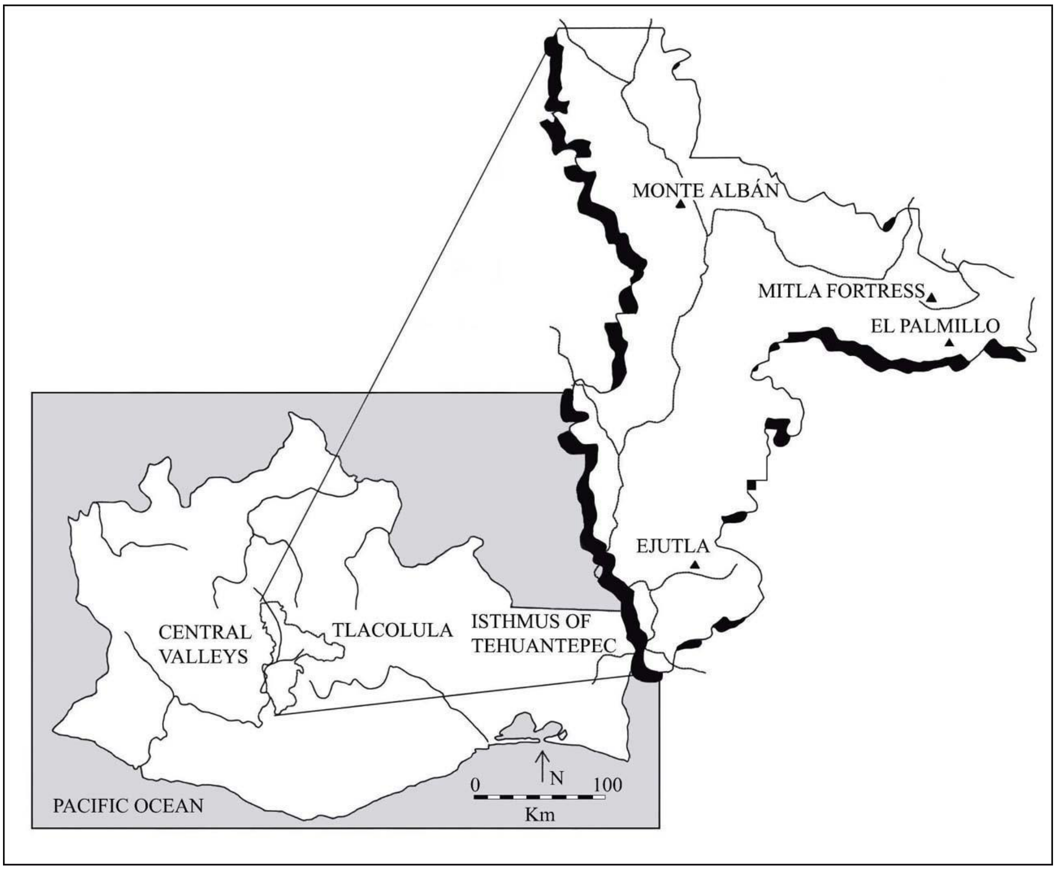


Fig. 6. Map with archaeological sites Ejutla and El Palmillo (after Haller *et al*. 2006:40).

indicators of increase consumption of exotic and non-local portable goods. Overall, three faunal patterns were detected. First, there was a correlation with high significance between terrace elevation and density of cottontail rabbit and jackrabbit; a strong correlation but low significance, between terrace elevation and density of dog; and a moderate correlation, with low significance for white-tailed deer. Second, there is a moderately strong negative correlation, with low significance, between increasing terrace elevation and increasing density of reptile and turtle remains. In other words, reptile and turtle remains behaved in an inverse manner to the larger mammals. Third, there was no specific pattern found for some animals such as turkey (Haller *et al*. 2006).

The analysis of faunal remains attributed to food waste revealed that the inhabitants of the uppermost terraces obtained resources, including species used for sumptuary purposes, through a combination of direct (animals hunted by the local population) and indirect procurement strategies (animals brought to the site by exchange), whereas the inhabitants of the lower terraces followed more opportunistic foraging strategies. The consumption of desirable meat was also higher on the upper terraces (Haller *et al*. 2006).

Ejutla and El Palmillo are large, contemporary, prehispanic settlements, located at the margins of the Valley of Oaxaca (Fig. 6). Both sites were first settled as small communities during the Later Formative period (ca. 300-200 BC). Subsequently, they expanded during the Classic period (ca.200-800 AD) and became major centres in their respective regions. The Ejutla site is situated at the southern end of the Valley of Oaxaca. Household members produced marine shell ornaments, a variety of ceramic shapes and lapidary objects. El Palmillo, on the other hand, is located at the eastern end of the Tlacolula arm of the Valley of Oaxaca. The range of economic specializations at this site differed from those at Ejutla, which manufactured stone tools from available chert sources. Based on the evidence of spindle whorls at the site, it appears that maguey was also used in the production of fibres and textiles, some probably for exchange. Another key difference between these two sites is the environment. Ejutla is next to the river and surrounded by agricultural land, whereas El Palmillo is located in the rocky foothills of the mountains, one of the driest parts of the region. There is little arable land and rainfall is uncertain (Middleton *et al*. 2002).

The ceremonial treatment of animals at these sites made it easier to distinguish between food and craft remains from ritual uses of the fauna. The evidence also indicated that they participated in the Mesoamerican cultural tradition in which animals served for ritual and subsistence purposes. Despite their environmental differences the faunal assemblage composition was very similar. Dog, deer, cottontail and jackrabbit constituted 94% of the samples at both places. The raising of dogs represented an important means of producing high quality meat in the diet. However, there were subtle differences in subsistence strategies. There was a greater reliance on small mammals at

Ejutla versus domesticated animals at El Palmillo. In the dry eastern arm of the valley, domesticated animals may have assumed a more important role than at Ejutla, where small mammals, especially lagomorphs, could have been caught in and around agricultural fields while people were doing other duties related to farming. The focus on bone artifact production also differed at Ejutla and El Palmillo. In the first, there was an emphasis on ornaments that complemented marine shell craftwork, while in the latter, bone artifacts were mainly used as tools; although the majority of manufactured bone at both sites were related to the textile industry (cotton at Ejutla and maguey cloth at El Palmillo) (Middleton *et al*. 2002).

Tehuacán and Teotihuacán

The Tehuacán Valley is located in the state of Puebla, bordering the states of Oaxaca and Veracruz (Fig. 2). Remains of domestic dogs have been found in this valley, dating back to 3200 BC. People started cultivating plants at this time, as the population grew. Dog remains increased in frequency during the early and middle formative periods (1500 BC), after which they were common in all levels and in all subareas, being used as animal protein and representing 24% of the total individual animals. By 600 BC, dogs were routinely used as food in farming villages on the valley floor. The population increased dramatically by 150 BC, hence people of the Tehuacán valley ate turkeys as well as dogs (Flannery 1967; MacNeish 1967).

Teotihuacán was a city of 20km in the Basin of Mexico (Fig. 2). This site and Monte Albán were two of ancient Mexico´s greatest cities (Marcus and Flannery 1996). Teotihuacán showed a different subsistence pattern from Tehuacán, since its population also relied on domestic species, like turkeys and dogs; they, however, represented only 10% of the meat consumed (Starbuck 1987). The availability of resources might explain the varying degrees of dog consumption. The use and size of dogs could also be related to consumption: smaller dogs were eaten more frequently than larger dogs, which were kept for hunting (Schwartz 1997).

Dogs consumed in Mesoamerica were not always bred in houses where remains were found. Dog markets existed in large Mesoamerican cities, due to the wide range of their use; dogs were bred to be sold later, for different purposes (Noguera 1967; Aguilera 1985; Valadez 1995; Blank 2006). In Teotihuacán, for example, it has been observed that part of the population bred dogs, while others acquired the ones they needed for different uses, such as religious activities, mainly by the elite, or for consumption in different social strata (Valadez 1995). So people in Mesoamerica could acquire dogs to use them as food, pets, for protection, or sacrifice in funereal rites, or religious ceremonies (Landa 1938; Gallardo 1964; De la Garza 1997; Schwartz 1997). After human beings, dogs were the animal sacrificed most frequently to pay tribute to the gods and the meat was used later in ritual celebrations (Baus 1998; Valadez *et al.* 2004).

Early researchers only considered improvements in agricultural technology to explain the development of Teotihuacán. The importance of hunting and meat for consumption has been ignored. However, faunal studies have demonstrated that other types of adaptations took place. The emergence of urbanism in the Teotihuacán Valley did not diminish the desirability or the availability of meat as part of subsistence. On the contrary, people became more dependent on a broader base of animal resources (Starbuck 1976).

The diet of the population of Tlalchinolpan, located in the northwestern corner of what later became the Classic City of Teotihuacán, was made up of local animals. Only a few species were preferred, in terms of pounds of usable meat, deer provided over 90%, dogs 2%, and rabbits 3%. Teotihuacán also relied upon these groups of animals, although proportions varied: deer provided about 80% of the meat, dogs about

9% and rabbits over 7%. The diet also included many birds, turtles and fish. Heavy predations within the Teotihuacán Valley required a reorientation in species preferences and an overall increase in the size of the support area. The presence of turtle and fish bones suggested that during the Classic period (200 – 600 AD), the Teotihuacán Valley was no longer the only supplier of meat; part of which could have been obtained from the shores of the lakes in the southern part of the Valley of Mexico (Starbuck 1975; 1976; 1987).

One of the effective ways to face a rapidly increasing population maintaining meat reliance is through domestication. However, few food animals were suitable for domestication in Mesoamerica, so only dogs and turkeys were available to Teotihuacanos. These two domesticated species constituted no more than 10% of the meat consumed at Teotihuacán. Clearly, animal domestication was not a desirable or necessary option for increasing meat supply. One reason could be attributed to additional labour required to feed and tend domesticated animals, taking into account also the limited availability of land within the city. It would have been much more economical to extend the hunting area instead. Therefore, domestication would not have become a desirable alternative until later, in the Postclassic period (900 – 1521 AD), when continuous overhunting had seriously reduced the available supply of game animals in the Valley of Mexico (Satrbuck 1975; 1976; 1987).

Prehispanic animal bone industry

Animal bones have also been used as raw material to elaborate utilitarian and ornamental artifacts. However, the study of bone industry has faced some difficulties, for example to create a typology to identify and classify the function of the artifacts. Through experimental work with replicas and studies of use wear marks, considerable progress has been achieved to understand the function of bone tools.

In Mexico, studies in this area are scarce and only a few of them propose a methodology. The first research that considered bone artifacts was around 1930-1935 in the archaeological sites of Zacatenco, Ticomán, Gualupita and El Arbolillo. Modified bone was identified, photographed and published (Vaillant 1930; 1931; 1934; 1935). Decades later at the Teotihuacán archaeological site, there were other studies related to bone artifacts found in this place (Séjourné 1959; 1966). At Casas Grandes, artifacts were classified for the first time as ornamental, ritual or utilitarian (Di Peso 1974). A similar classification was made at Teotihuacán too (Starbuck 1975). However, none of these studies established a methodology to approach this kind of archaeological material. Among the most recent systematic researches that propose a methodology are the ones of Padró (2000; 2002) and Pérez (2005) with samples from Teotihuacán. According to these authors, the modified bone typology categories divided the artifacts into three kinds based on their function: practical, ornamental and votive. Practical usage refers to objects such as tools or implements showing traces of wear. Votive is related to archaeological evidence found in offerings or burial associated elements (Padró 2000; 2002; Pérez 2005). Modified animal bone case studies from Teotihuacán in the Valley of Mexico and Monte Albán in Oaxaca will be presented in the following section.

In a palace called *Xalla* associated with the Sun pyramid, at Teotihuacán, a total of 386 bone artifacts were found in different contexts such as plazas, rooms and activity areas. Most of them (74.8 7%) were tools, others were ornamental (3.37%) and just a few (1.55%) were votive (found associated with burials and deposited as offerings). The presence of fragments with no specific shape and bone waste fragments, suggested that tools and ornamental objects were manufactured in this elite site (Pérez 2005).

Some of the animals used for this activity were white-tailed deer (*Odocoileus virginianus*) and pronghorn (*Antilocapra americana*). The most frequent anatomic parts present of these animals were the femur, tibia and metatarsus. Birds, such as the common turkey (*Melagris gallopavo*) were also found but there is less evidence of this group than mammals. Reptiles, specifically turtle shells, were used as raw material for making ornamental objects including buttons. Wild species represented 80.32% of the identified artifacts (Pérez 2005). Animals that were available for hunting such as white-tailed deer, one of the most represented dietary species at Teotihuacán, were also used as raw material for artifacts (Starbuck 1975; 1976; 1987).

The study of this material allowed archaeologists to determine the function of these artifacts. Most of the utilitarian objects were needles and pins, followed by awls and chisels. The artifacts were related to different activities that might have taken place at Teotihucán such as: chisels or gouges for carpentry; chisels or awl for stoning; needles, pins, awl, buttons and inlays for tailoring; soft hammers (deer antler) for working flaked stone; needles, awls and scrapers for saddlery, tools to smooth stucco for bricklaying and tools to smooth clay for pottery. Experimental archaeology, based on the different wear marks that each material leaves on bone, made it possible to identify which kinds of needles were employed to sew cotton, agave or leather. The shape of needles varied depending on the material they were going to be used for (Pérez 2005).

In *Teopancazco*, a periphery neighbourhood of Teotihuacán, one of the handcraft compounds showed different modified bone fragments to sew cotton cloth, probably from the Gulf Coast, suitable for sticking plates and pendants made of shell, crafts, turtles and other sea and land objects. The presence of multiple tools and raw material (especially of a faunal kind such as needles, pins and inlaid objects), which were used for the attire and headgear of the nobility, indicated the degree of specialization that craftsmen reached (Manzanilla *et al*. 2010).

Based on this evidence, it is possible to suggest that in this area, ritual and military clothes for the elite that ruled the neighbourhood were made (cut and sewn). The wear marks (polish and grooves) observed on the needles and the diameter of the holes showed that they might have been used for cotton threads. Elements that were inlaid in textiles (through sewing) were canid teeth and armadillo plates, among others (Manzanilla *et al*. 2010).

At Monte Albán, in Oaxaca, a sample of 74 bone artifacts was studied. Results demonstrated that four zoological classes were represented: Chondrichthyes Class (shark) (5%), Actinopterygii (fish) (5%), Aves (27%), and Mammalian (63%). The most abundant mammal species was *Odocoileus virginianus* with 32 elements, followed by bird remains and *Meleagris gallopavo*, with 20 artifacts (Valentín and Pérez 2010).

Artifacts were divided by their function into three kinds: practical, ornamental and votive. Objects classified in the practical category were grouped in: 1) sharp (needles, pins, awls, punches and drills); 2) bevelled edge (chisels), 3) blunt (spatula, gouge, scrapers and dipstick); and 4) musical (whistle). Ornamental artifacts consisted of: 1) pendants, some of them made from dog, shark and peccary teeth; 2) beads, one of the two found was made from turkey bones and 3) earflares, generally made of femurs using the transversal section of some even-toed ungulates. In the votive category, a figurine was found representing a religious man made from a long deer bone (Valentín and Pérez 2010).

Technology was studied through experimental archaeology, so modifications (abrasion, cutting, drilling, piercing, incising, polishing and shining) performed in prehispanic times were replicated, using bones of modern species. This process required employing different materials and tools, which according to diverse sources (archaeological contexts, historical references and studies made by other researchers) were used in the past. The experimental traces were compared with those found in the archaeological sample (Valentín and Pérez 2010).

Traces of manufacture were observed in 65 bone remains. The most abundant were needles (12), drills (4), spatulas (4) and pendants (5). Technological analysis, carried out with a Scanning Electron Microscope (SEM), showed that artifacts were abraded with sand stone, and drilled, pierced and cut with obsidian, chert nodules were used for polishing the pieces (Valentín and Pérez 2010).

Faunal remains in ritual contexts

Animals have played an important role in ritual offerings and ceremonies in Mesoamerica; they have been used not only for food or raw material but have also been valued for their symbolic meaning. Some research on this topic will be presented in the next section, including case studies from the Templo Mayor Tenochtitlán, the Mayas and other sites in different cultural regions of Mexico.

The archaeological discoveries at Tenochtitlan, such as offerings of objects when a new construction started or when the old ones were enlarged, or during ceremonies or festivities are among the most important in Mexico. Data of different kinds were obtained in the excavations and have provided relevant information about the Mexicas. The offerings contained a great quantity of faunal remains of different species (corals, shells, fish, reptiles -turtles, snakes and crocodiles-, birds -eagles, quails, hummingbirds, turkey, hawks and pigeons-, and mammals -felines, armadillos, canids-, among others) (Álvarez and Ocaña 1991; López and Polaco 1991). For example, the famous offering 126, which was discovered in 2008 under the monolith of *Tlaltecutli*, contained eight thousand animal bones of all kinds of terrestrial and marine species. The identification of the faunal remains is still in process (Chávez *et al.* 2011). Some of these studies already published will be presented here.

Offerings 99 and 100 found in the south section of the Templo Mayor, in Mexico City, contained bone remains of 17 hummingbirds corresponding to four local species (*Eugens fulgens*, *Lampornis* cf. *amethystinus*, *Hylocharis* cf. *leucotis, Amazilia violicepis*). The temple was dedicated to the two most important Mexica gods, the south side to *Huitzilopochtli* (tutelary god of the Mexica community) and the north side to *Tlaloc* (god of rain). The north represented the underworld and the south symbolized water, fertility and food production. So offerings 99 and 100, placed in the south area of the temple, in front of the stairs of the sacred placed dedicated to the god *Huitzilopochtli,* had an important symbolic meaning. The name of this god comes from the word *huitzitzilin* (in Náhuatl), which means hummingbird. The bones were associated with diverse biological materials such as corals, turtles, sea molluscs and eagles, among others. The hummingbird skeletons were previously prepared, before being offered, using similar modern taxidermy techniques. They were placed with the wings open and the feet extended to both sides of the body, the tail was manipulated in a similar way. One of the individuals was found on top of a turtle, which allowed archaeologists to record the original position of the bird (Valentín and Gallardo 2006).

Offering 103 of the Templo Mayor was also discovered in front of the area dedicated to *Huitzilopochtli* and *Tlaloc.* It included different faunal species, especially molluscs of the *Oliva* genus, modified in shape of pendants. A skeleton of a young jaguar occupied a central part and was discovered complete: the skull was oriented to the west and the feet were extended to both sides. In this case, the jaguar could have been brought alive from the tropical forest of Mexico and sacrificed just before being offered, since *rigor mortis* was not yet present when it was buried (Valentín and Zuñiga-Arellano 2003).

In the area located in the central axis of the south half of the Templo Mayor, the one related to *Huitzilopochtli*, the skeleton of a young sacrificed human, was discovered. The infant was placed in the stairs of the platform associated with other materials such as wood, copper, shell, obsidian, green stone and pottery artifacts, a predator bird, and a feline skeleton. On the shoulders of a child were superimposed and in anatomic relation, the carpus and metacarpus (left and right), and phalanges (first and second) of the wings of a sharp-shinned hawk (*Accipiter striatus*). Due to the fact that no more evidence of this bird was found and that it is very difficult to extract the bones without damaging the skin and the feathers, it suggested that the infant was wearing both wings when he was buried. The bone recording of the bird wings showed that they were extended, with the ventral feathers facing up, showing their characteristic horizontal ochre lines to the audience (López *et al.* 2010).

There were three signs that the sacrificed victim was an *ixtipla* (in Náhuatl) or the representation of *Huitzilopochtli*. The first was a wooden ring placed over his chest. This artifact was known as *anáhuac* (in Náhuatl) and it was one of the attributes of *Huitziopochtli* that has appeared in many images of him. The second were the shells and small bells around the ankles. This attribute was also related to Huitzilopochtli and has appeared in many pictographs. The third were the wings of the Sharp-shinned hawk placed on the shoulders. So the child was dressed like a bird that had the colours of the solar god in his plumage. In fact, the dorsal feathers of the sharp-shinned hawk are bluish grey and the ventral ones are ochre. Then at the moment of his death, he was dressed like *Huitzilopochtli,* or like some of his slaves that were normally offered by tradesman to this divinity (López *et al.* 2010).

The offerings of consecration of the Templo Mayor (Complex A) were placed during the period of *Motecuhzoma Ilhuicamina* (1440-1469 AD) (Guzmán and Polaco 2000; Guzmán 2007). While this emperor was ruling, some towns on the Atlantic Gulf Coast of the state of Veracruz, and provinces of Oaxaca on the Pacific Coast (Fig. 2), were subdued. This situation enabled fish and other objects from both coasts to be transported to the Mexican Basin (Alvarado Tezozomoc 1980; Clavijero 1987; Guzmán 2007).

It is not certain if fish were brought alive or dead, complete, dried, salted, smoked or fresh. In prehispanic towns it was common to request tribute of complete animal skins with head and limbs, especially of mammals or birds. So it is possible that people also knew techniques to prepare and salt fish skins, which could have allowed them to be transported from the area where they were caught to Tenochtitlán. This would also explain why most of the fish remains were prepared through taxidermy (removing the vertebra but leaving the fins and skin) (Guzmán and Polaco 2000; Guzmán 2007).

Offering 23, containing 7775 elements of fish remains, was part of a constructive extension of the Templo Mayor. Animal sacrifices, especially fish, were mainly offered to *Xiuhtecuhtli*, who was honoured in several months of the year, like the month of *Izcalli* (Torquemada 1986). During this period, many buildings, public and common houses were inaugurated (Guzmán and Polaco 2000). The identification of fish remains from this offering revealed that 88 individuals of 32 taxa and 23 families were included. Only sea fish, especially from the Atlantic, were chosen for this ritual act. So the fishing area included reefs and maritime coast zones, rather than estuaries. It is not certain if fish were brought as tribute, commerce or were donated as presents. However, it is known that after one of the building periods that took place during the *Motecuhzoma Ilhuicamina* kingdom, Mexicas went to the Atlantic Coast for fish to offer them to *Huitzilopochtli*. The most abundant species in the sample were the French angelfish (*Pomacanthus paru*), the balloonfish (family Diodontidae) and the houndfish (*Tylosurcus crocodiles*). The criterion for choosing the fish species it is not known, but their appearance and coloration might have had an influence (Guzmán and Polaco 2000: 167; Guzmán 2007: 441). Most of the species commonly found in domestic contexts such as common snook (Centropomidae), drums (Sciaenidae), corakers or hardheads (Sciaenidae) and grey mullets (Mugilidae), among others, are absent (Guzmán 2007). The importance of fish resources in prehispanic times is proved since bone remains of this group have been recovered in 83 archaeological sites all over Mexico, located in coast and inland areas, from domestic and ceremonial contexts (Polaco and Guzmán 1997).

The Maya also used animals in their agricultural and lineage ceremonies. They buried fauna in caches underneath monuments and in tombs, and they made blood sacrifices at sacred caves and *cenotes* (natural water well). On ritual occasions they adorned themselves in status paraphernalia taken from different species. Because animals were tangible manifestations of Maya religious thought, bones provide a unique insight into prehistoric ceremonies and the people who conducted them. Dedicatory and intrusive caches were placed in structures built as mortuary monuments to dead rulers, and under the stelae that were erected to commemorate dynastic ceremonies. Most of the caches and burials may therefore be related to Maya rulership and lineage worship (Pohl 1983).

To the ancient Maya, animals symbolized the elements of nature, such as earth, rain, and sun, in addition to abstract concepts such as renewal and immortality. The deer for example, was an important figure in ancient Maya religion. Ethnohistoric data indicate that this animal was associated with the sun. Other animals linked to renewal rites were monkey, peccary, dog, jaguar, snake, fish, opossum, armadillo, crocodile and turtle, as well as turkey in the Postclassic period (900 – 1521 AD). The jaguar was a supernatural being in ancient Maya religion in a similar way to the deer. Thus, the Maya may have come to believe that the jaguar inhabited caves, traditionally regarded as entrances to the underworld, as well as sources of life-giving water. Cats were often depicted in contexts in which dynastic ceremonies were represented. The armadillo was a symbol of fertility in many areas of Mesoamerica. Turkey sacrifices became a requirement for New Year ceremonies in the Postclassic period. Birds had an immense ritual significance and the lowland Maya exploited a variety of species such as the owl, the macaw, the quail, and birds of prey. Bats and rodents often occurred in ceremonial deposits and the Maya believed that they were routes or guides to the underworld. The dead rulers may have entered the underworld through caves. So the presence of these animals in ritual deposits may be sacred symbols of their deities and ancestors. Frogs and toads were another class of small animal that the Maya traditionally revered and connected with rain, women and fertility. The difference in emphasis between ritual and subsistence fauna is most evident in the case of amphibians, snakes, birds, and fish. These animals occur much more frequently in ceremonial contexts, particularly during the Classic period (200 – 900 AD) (Pohl 1983).

The tradition of burying dogs with humans exists since early times in Mesoamerica. An internment of two individuals was discovered in the Tecolote Cave, in Hupalcalco, in Hidalgo (Fig. 2), dating back to 3500 BC; one of them was associated with five dog skeletons placed as an offering (Romano 1974; Baus1998; Monterroso 2004). Other early evidence of this type can be found at the Tlatilco archaeological site, in the State of Mexico (1700 - 1100 BC) (Fig. 2) (Valadez 1995). This tradition increased in the Postclassic period (900-1200 AD), mainly in the Central Plateau, and to a lesser degree in the rest of the territory (Merino and Garcia Cook 1997).

At the Tecualilla archaeological site (in Nayarit) skeletons of five dogs (almost complete) were intentionally buried with humans. In most cases, canines and some of the incisors of these dogs were intentionally broken during the animal´s life, prior to their burial with a human. Additional to the dogs, four raccoons (three complete skeletons) were also buried and associated with human remains. These animals also showed evidence of broken teeth; it seems that this practice was extended to raccoons, which apparently had a similar role to dogs. The reason why these people mutilated these animals is a matter of speculation. Clearly, dogs were very important in the life and death of prehistoric populations in Mexico. Even though these samples are small they do provide information about burial traditions of the Indians who lived in this Pacific estuarine area of Mexico (Wing 1968; 1984).

In Mesoamerica, the dog played an important role in religion since the beginning of civilization; this might have been due to the natural characteristics of the dog, which were later turned into a ritual symbolism (Valadez 1995). The study of ethnohistoric and iconographic documents from pre-Columbian Mexico indicates that Mesoamerican civilizations linked the dog to water and to the agricultural cycle. In central and southern Mexico, the rain, the maize and the farm dog’s reproductive cycles coincided, hence their association. The different phases of the dog’s reproduction are related to key moments in the rainy season and farming: the first phase (February-March) coincided with the time of preparing the soil, gestation (March-May) with the maize sowing season, and the breeding seasons (mid-July, early December) with the subsequent maize sowing and harvesting celebrations (Valadez and Blanco 2005; Blanco *et al.* 2006).

The dog was also linked to creation, because it participated in the New Year festivities (Aguilera 1985). For the civilization of Mesoamerica, the end of one life entailed the beginning of another; hence the dog-creation relation also linked it to death. The dog-death link, in addition to its relation as a protector, granted them the role of underworld guides (Valadez 1995). The figure of the *Xolotl* dog represented the evening star as a guide towards the underworld to transport the Sun and accompany it in its daily journey through the realm of death, in the same manner in which the common dog’s spirit transports that of his master to *Mictlán* (De la Garza 1997; Baus 1998; Seler 2008). The figure of the dog also appears as the tenth sign in the days of the sacred calendar of the Mexicas, called *Tonalpohualli*. Each sign of the day was associated with some god and the *Itzcuintli* dog had *Mictlantecutli*, god of the world of the dead, as his ruler (Baus 1998).

In Mesoamerica, the dog was highly valued in funeral ceremonies since the Late Formative period (400 BC - 200 AD); this practice was maintained for many centuries and was still in force when the Spaniards arrived in Mexico (1521 AD) (Valadez *et al*. 1999). The fact of dogs being associated with human burials is explained because the belief existed that this animal could free man from the dangers of the underworld. People that died from illnesses travelled to present themselves before *Mictlantecutli* (Lord of Death); to achieve this, they had to be buried with a ginger dog (with brown/red hair), putting a cotton thread around his neck, and placing him next to the deceased. This legend said the deceased walked up to the *Chiconahuapan*, the intermediate river in the first phase of the journey. Upon reaching the river, the traveller saw several dogs on the opposite bank and waited for one of them to recognize him, and help him to cross, but of all of them, the ginger dogs were the only ones that crossed the river and helped the deceased to arrive before *Mictlanteculti*, where he/she died later. This belief existed not only among the Nahuas, but also among the Mayas, and this has been confirmed by sources such as codices (*Laud Codex* where the arrival of the deceased’s spirit before *Mictlantecuhtli* is depicted, the image of his dog accompanying him can be seen above the image of the deceased), and also because groups in the present day still maintain this belief (Valadez 1995; Cuadra 1997; De la Garza 1997).

In Colima archaeological sites, on the west coast of Mexico (100 - 500 AD), dog statues have also been found in great numbers associated with human burials (Wing 1984). It is not certain if these figurines were representations of hairless dogs, or if the smooth surface was the result of the creation technique (Valadez and Mestre 1999). It is believed these dogs were created to be placed in large shaft tombs among the offerings for the deceased relatives (Wright 1960; Noguera 1967; 1997; Schwartz 1997; Baus 1998).

Other dog uses include transportation and hauling, but they were mostly used as pets and hunters (Schwartz 1997; Olsen 2000; Trantalidou 2006). Rituals and magic were important in hunting all over the Americas. Rituals included preparations that hunters undertook to put themselves, as well as their dogs, in the best condition to pursue the desired quarry (Schwartz 1997). Spanish writings of the sixteenth century mention that dogs were used for different household activities: to guard, as companions, to work in the fields, as beasts of burden, among others (Valadez and Mestre 1999).

Some of the main topics tackled by zooarchaeology in Mexico have been introduced in this chapter, but not all the studies have been included. The purpose was to underline the importance of including this kind of study and to show the information that can be obtained from faunal remains. In Mexico, as has been discussed above, zooarchaeology has been recently developed as a scientific discipline with an established methodology and modern collections of references to identify the archaeological material. Nonetheless, the discussions on each topic demonstrated the important advances that this discipline has achieved until now. As it has been observed, the studies of faunal remains in Oaxaca are scarce and one intention of this dissertation is to establish a methodology for future studies to be compared.

The development of zooarchaeology in Mexico can be summarized as follows: 1) during 19th century zooarchaeology emerged with topics related to prehistory; 2) from 1882 naturalists became interested in studying animal bones; 3) in 1970 the first report of animal bones in an archaeological context associated with religious attributes was written; 4) in the late 20th century zooarchaeology was established as a research field; 5) in 1991 the first methodological synthesis of the zooarchaeological practices was produced; 6) after 2000, zooarchaeology became a common scientific practice

(León y Gama 1990; Polaco 1991; Corona-M. 2002; Corona-M 2008). The present research will be an example of the scientific zooarchaeological studies, which have followed an established methodology and became more interpretative than descriptive.

The following chapter will give a theoretical point of view of Monte Albán to put the animal bones recovered from the site into a historical framework.

CHAPTER II

MONTE ALBÁN AND URBAN EVOLUTION IN OAXACA VALLEY

This chapter sets the archaeological context, introducing the geography of the Oaxaca Valley and the location of Monte Albán. The structure and phasing of Monte Albán are described in detail to show how zoning of the site responded to local and regional political and economic changes. Previous studies that have been carried out at Monte Albán are mentioned. The research objectives and postulates of this dissertation are introduced in this section. A theoretical discussion about the foundation and urban evolution of the site is also presented, in order to understand the development process of the site in each period of time. Subsistence strategies and food resources are mentioned to find out how inhabitants of Monte Albán survived considering the location of the site. Animals played an important role, both economically and symbolically, so a detailed understanding of the archaeology is essential to any interpretation of the faunal remains.

Geographic location and environment of Monte Albán

The Valley of Oaxaca is 1550 m above sea level and it is surrounded by mountains of 2000 m in height. This Valley is located in the centre of the Southern Highlands of Mexico, in the modern state of Oaxaca and divided into three branches or sub-valleys called: Etla, Tlacolula and Valle Grande or Zaachila (Fig.7) (Blanton 1978; Joyce 1994). Both the Etla and the Zaachila branches are drained by the Atoyac River, while the Tlacolula branch is drained by the Salado River which joins the Atoyac at the confluence of the valley´s three branches. Just north of the place where these two rivers meet is the modern capital of the state of Oaxaca de Juarez (Blanton 1978; Winter 1984; Smith 1985). The prehispanic city of Monte Albán is located 8 km south-west from the city of Oaxaca (Fig.8) (Marcus 2008).

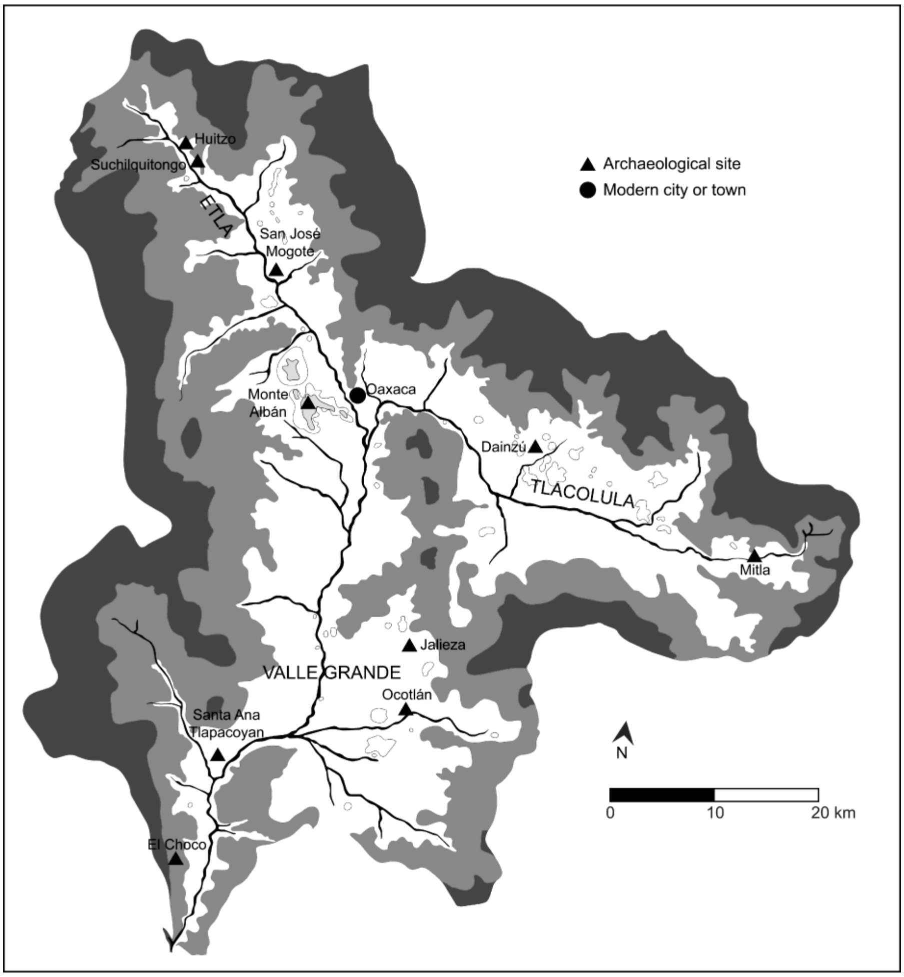


Fig.7. The Valley of Oaxaca with three sub-valleys: Etla, Tlacolula and Valle Grande (after Marcus and Flannery 1996:11).

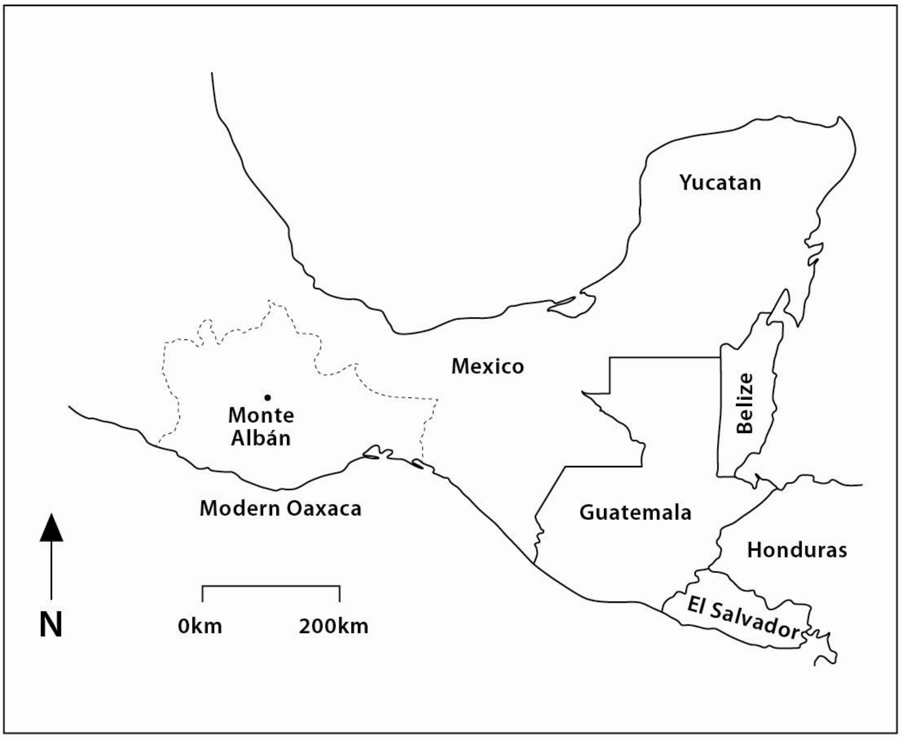


Fig.8. Map of Mexico with location of Monte Albán (after Hutson 2002:54).

Most archaeological sites from the Early Formative period (1500-500 BC) were located in areas with high alluvium, especially where the water table was near the surface. So, more sites are found in the Etla and the central part of the Valley of Oaxaca (around Zaachila), while in areas like the Tlacolula Valley, where the water table is low, they are scarce (Whitecotton 1997). Therefore, water is the limiting factor for valley agriculture because Oaxaca´s climate is semi-arid and during the rainy season (from May until October), the valley receives only 500-700 mm of rain per year (Winter 2001). Agriculture depends on some combination of irrigation channel, floodwater irrigation, or obtaining the water from wells (Blanton 1978). Most of the soils around Monte Albán are suitable for forest vegetation. Due to its slopes, only the mountainsides are appropriate for agriculture (Martínez 2004). Five thousand years ago gourds, squash, beans and maize started to be planted in Oaxaca (Marcus and Flannery 1996).

The valley was not the open extension of land with cornfields that can be appreciated today. Ten thousand years ago it was forested from the top of its mountains to the floodplain of its rivers. The forests have been cleared but the fossil pollen survives. The bones of wild animals that were hunted and the dried remains of the wild plants that were gathered are still preserved. Around 800 BC pine forests in Oaxaca changed to a mixed forest with oak, pine, manzanita and madroño. The piedmont below these mountains would have been thorn-scrub-cactus forest with leguminous trees, prickly pear, organ cactus, yucca and agaves. Along the Atoyac River there would have been forests of baldcypress, alder, willow and fig. As in Tehuacán Valley, this environment would be favourable for withe-tailed deer, peccaries, cottontails, quails and mud turtles (Marcus and Flannery 1996). These same species were identified in the zooarchaeological material from Monte Albán and will be presented in Chapter 5.

The original vegetation can also be reconstructed by comparison with areas in the valley where it survived and in other parts of Mexico, where the population pressure has not been so intense. Apart from the vegetation on river banks, a tropical forest would have covered the valley (Fig. 9). Some genera must have included *Ficus*, but also many types of the Lauracea, such as *Persea Americana*, *Ocotea* app., *Nectandra* spp. and *Litsea* spp., perhaps some Annonacea including *Anona purpurea*, which grows along watercourses higher on the valley sides and any other tropical trees which prefer mesic cool habitats (Smith 1983).

Fig.9. Tropical forest (Mexico) (http://www.defendersblog.org/2013/03 /tropical-trees-get-a-respite-at-cites/2014).

The primary forest must have consisted of individual trees as large 1.5 m in diameter at chest height and 30 m or taller. The canopy would have been closed but sunlight would have penetrated through the trees to the floor, which would have been covered with scattered herbaceous plants and ferns. In the forest canopy, the branches of the trees would have been almost covered with epiphytic orchids, peperomias, ferns and araceous vines. A number of creepers would have been hanging from the treetops but all have now disappeared due to opening up the forest habitat (Smith 1983).

Regarding vegetation nowadays, 26 types, grouped by physiognomic-floristic criteria, are found in Oaxaca. Some of the most frequent in the valley include the following in different areas: oak and pine groves (in Etla, Centre, Zaachila, Ejutla, Ocotlán, and Zimatlán), columnar cacti (Fig. 10) (in Tlacolula), chaparrals (Fig.11) (in Etla and Tlacolula), thickets (in Tlacolula), low deciduous jungle (Fig. 12) (in Tlacolula), tule vegetation and reed bed (in the Centre) (Colin 2004). Nowadays, 80% of the vegetation near Monte Albán shows some type of disturbance. Only on the lower slopes of the hill, where the site is located, there is a small area of low and medium dry deciduous forest that covers 200 hectares. On the east side of the lower slopes of Monte Albán hill, the vegetation is bush type, especially hopbush (*Dodonea viscosa*), *cazahuate* (*Ipomea murucoides*) (Fig. 13), *pirú sarnoso* (*Pseudosmodingium multifolum*) and *huizache* (*Acacia pennatula*) (Fig. 14) (Martínez 2004).

Fig.10. Columnar cacti (Mexico) (http://mexicoalnatural.com/tag/cactaceas/2014).

Fig.11. Landscape with chaparral (Pacific Coast Mexico) (http://www.skyscrapercity.com/showthread.php?t=736356&page=128/2014).

Fig.12. Low deciduous jungle (Mexico) (http://riveracuale.wordpress.com/2014).

Fig.13. ***Cazahuate*** **(*****Ipomea murucoides*****) (http://edialogo.ning.com/ photo/casahuates-1?context=popular/2014).**

Fig.14. ***Huizache*** **(*****Acacia pennatula*****) (http://www.imagejuicy.com /images/plants/a/acacia/9/2014).**

Some of the mammals commonly found in the central region of the state of Oaxaca are the North American opossum (*Didelphis virginiana*), the armadillo (*Dasyphus novemcinctus*), the coyote (*Canis latrans*), the grey fox (*Urocyon* *cinereoargenteus*), the common hog-nosed skunk (*Conepatus mesoleucus*), the hooded skunk (*Mephitis macroura*), the long tailed weasel (*Mustela frenata*), the Mexican grey squirrel (*Sciurus aureogaster*), the Mexican spiny pocket mouse (*Lyiomis irroratus*), the Mexican woodrat (*Neotoma mexicana*), the white ear cotton rat (*Sigmodon leucotis*), the white-sided jackrabbit (*Lepus callotis*), eastern cottontail (*Sylvilagus floridanus*), peccary (*Dycotyles tajacu*), the white tailed deer (*Odocoileus virginianus*), and red brocket deer (*Mazama americana*) (Hall 1981; Briones and Sánchez 2004).

Birds include the mountain hen (*Tinamus major*), American bittern (*Boutarus lentiginosus*), gadwall (*Anas strepera*), double-toothed kite (*Harpagus bidentatus*), Montezuma or harlequin quail (*Cyrtonix montezumae*), hen harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicencis*), bat falcon (*Falco rufigularis*), great horned owl (*Bubo virginianus*), bearded wood-partridge (*Dendrortyx barbatus*) white necked jacobin (*Floris ugamellivora*), and wild turkey (*Meleagris gallopavo*) among others (Navarro *et al.* 2004). Some of the local reptiles and amphibians include the pine toad (*Bufo occidentalis*), eastern barking frog (*Elutherodactylus augusti*), gadow´s alligator lizard (*Mesaspis gadovii*), and the Mexican small-headed rattlesnake (*Crotalus intermedius*) (Casas-Andreu *et al.* 2004).

Archaeological site description

The Monte Albán archaeological site covers more than 20 km^2 but the area most intensively inhabited measures 6.5 km^2 (Blanton 1978: 7; Winter 1990: 59; 2001: 281). The neighbouring hills of Monte Albán Chico, El Gallo and Atzompa were part of the site in various stages after Period II or the Nisa phase (200 BC- 200 AD) (Whitecotton 1937). Monte Albán was strategically settled for political and military control because it is in the centre of the Valley of Oaxaca where the three branches meet. Evidence of war during hundreds of years before and after the founding of Monte Albán, confirms how important defensive concerns were for establishing the site (Joyce 2010).

The main plaza is located on the high part of the hill and is surrounded by natural and artificial terraces with residential structures. In some cases, houses have platform mounds which support temples, with a civic purpose such as the performance of rites (Blanton 1978; Winter 1990; 2001). High status residences are near the community centre and the low status ones are further away, especially in the north and east areas, where the hill is less steep (Blanton 1978; Winter 1990).

The plaza measures 300 m long and 180 m wide in a monumental scale, and has enough space for approximately 15,000 visitors (Fig. 15) (Flannery 1983; Winter 2001) It is bounded by structures such as the North and South Platforms, east (Building M, *Danzantes* courtyard, Buildings L, IV and N) and west buildings (Temple Q, East Palace, Temple P, Temple II, a palace and a ball game), and has central structures as well (Building J and Temples I, H and G) (Fig. 16) (Lind 1994). Monte Albán´s sacred geography was similar to other Mesoamerican cities where the north represented the celestial realm and the south the earth or the underworld (Barber and Joyce 2006).

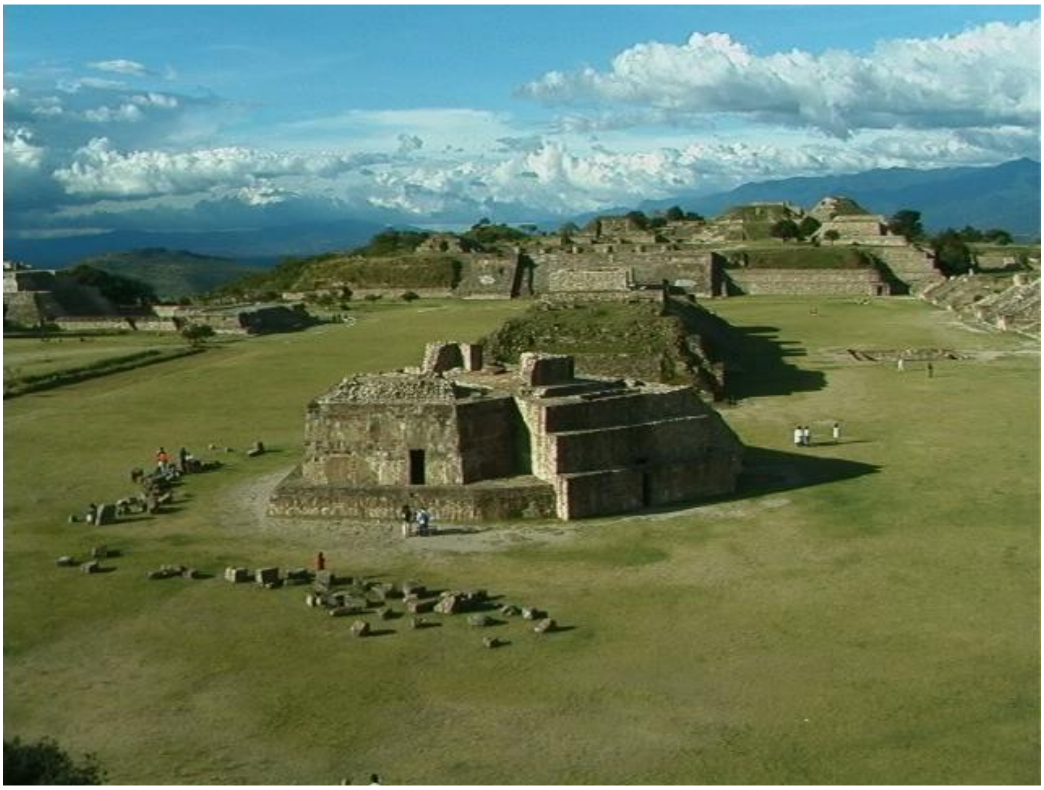


Fig.15. Main Plaza of Monte Albán (http://ciudadania-express.com/2014/ 03/20/inicia-en-monte-alban-operativo-por-equinoccio-de-primavera/2014).

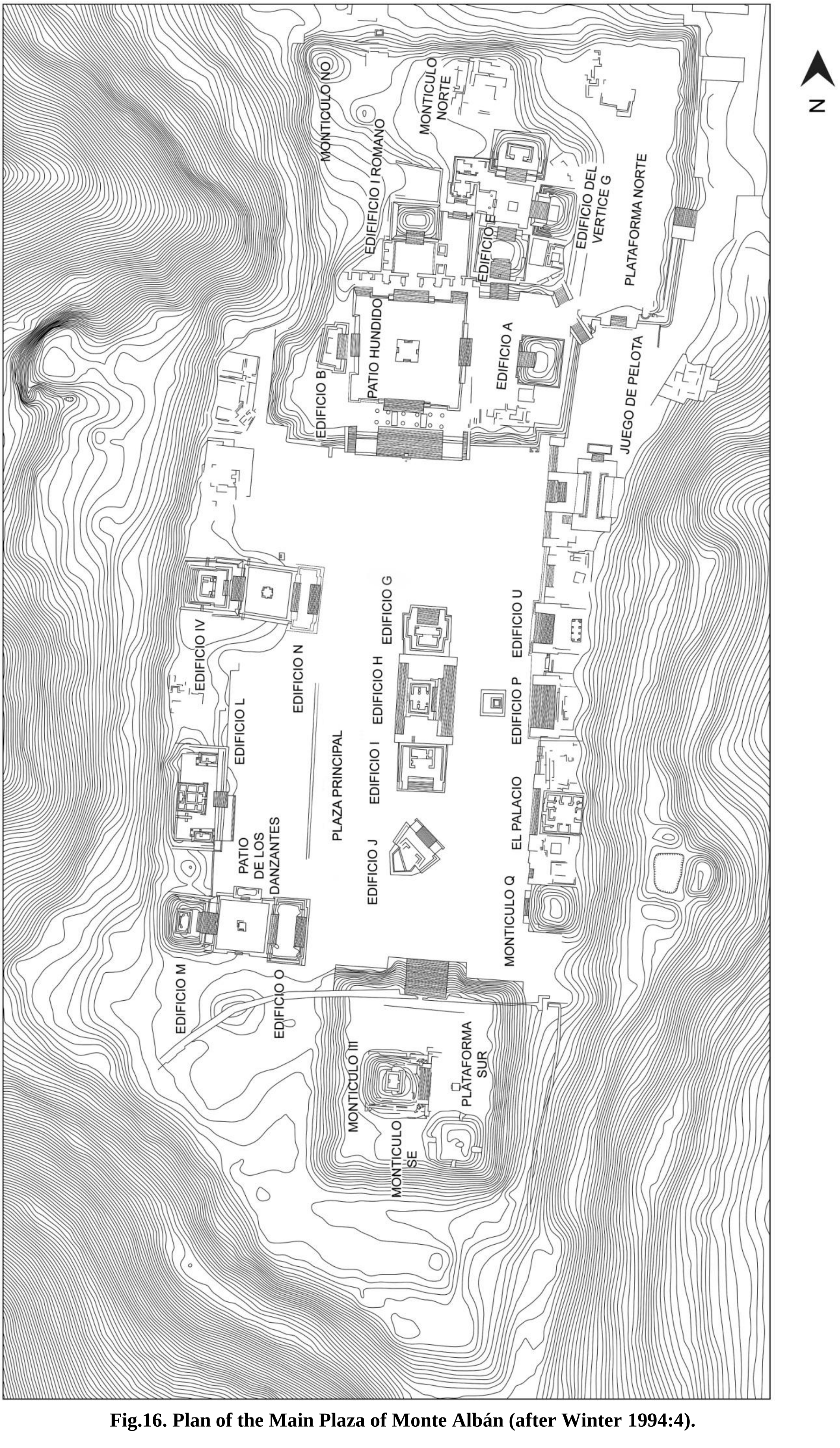


Fig.16. Plan of the Main Plaza of Monte Albán (after Winter 1994:4).

The North Platform is considered by some authors to be the residence of the Zapotec kings, an administrative and ceremonial area with restricted access. The South Platform has two temples on top and is conceived as a place with ceremonial functions (Winter 1990: 61; Lind 1994: 100). Building J with a pointed shape located in the centre of the plaza, possibly an observatory and also a calendric temple associated with zenith passage (Lind 1994: 100; Peeler and Winter 1995; Marcus 2008). Buildings M and IV have been determined as temples with patios (TPA) (Winter 1986a).

The North Platform is the largest structure at the site, its elevated area measures 220 m from north to south (Winter 1994: 6; 2001). A central stairway leads to the top of the platform which rises 10 m above the plaza (Fig. 17) (Joyce 2010). The Platform has three levels: 1) surface of Area A (3 m above the level of the Main Plaza); 2) the principal surface of North Platform where buildings A and B were constructed; 3) the floor of the patio VG (geodesic vertex) and the plain surface north and south to Building VG (Winter 1994: 7). The VG Temple complex is located on the highest part of the North Platform and was probably the principal temple group at Monte Alban (Winter 1997). This area includes three buildings VG, D and E and the Temple of Columns with its central patio (Patio VG1) (Winter 1994).

To the southeast of the North Platform is a ball court (Fig. 18) (Blanton 1978: 63). The ball game consisted of a court with I shape, the long axis was the court and the ball bounced on the lateral sloping walls. Two people or two teams played and hit the ball with elbows, feet, hip or other body part to move the ball into the opponent team area. Groups from the elite might have played it and it probably fulfilled an important role in its ritual and/or political association among the people (Winter 1990: 75).

The South Platform is a massive construction located in the south part of the main plaza. Its base measures approximately 110 m east-west by 110 m (Winter 1994).

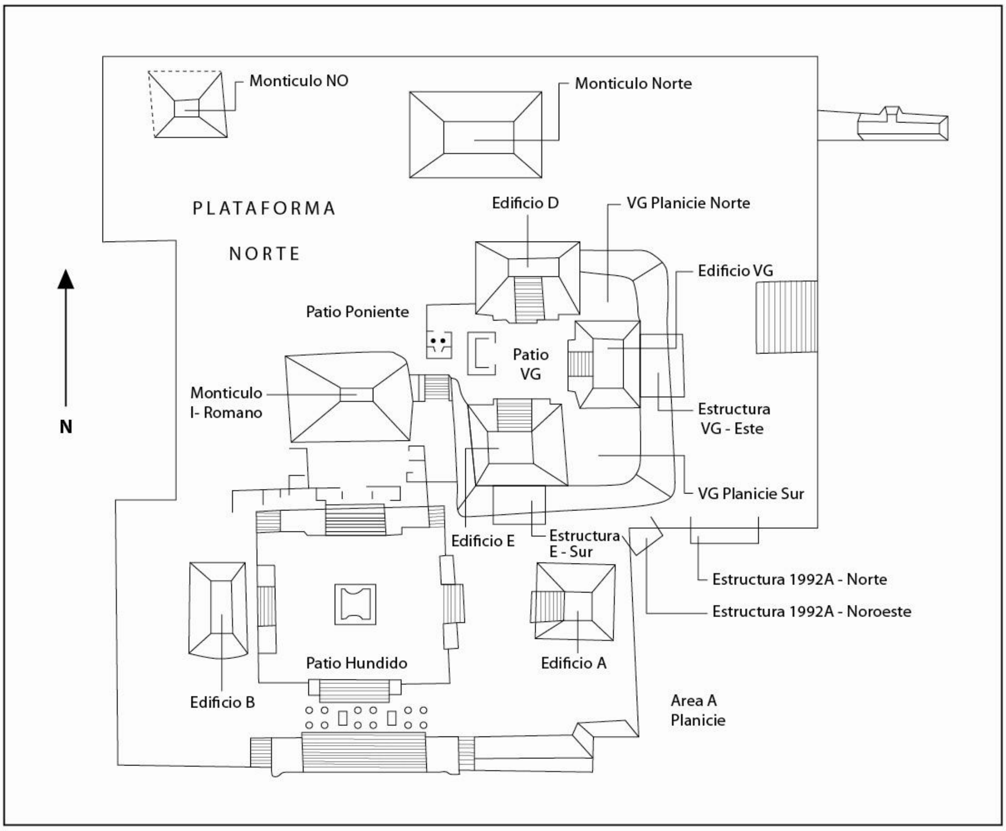


Fig.17. North Platform (after Winter 1994:7).

Fig.18. Ballgame court at Monte Albán (http://upload.wikimedia.org/ wikipedia/commons/f/f0/Ball_court_at_monte_alban.jpg).

On top of the platform are located Mound III, which is part of a TPA with its patio and an altar in the centre and the Southeast Mound (Fig. 19) (Joyce 2010). Mound III is the highest point of the southern portion of the site (Winter 1994). It is possible that Temples G, H, I, located in the centre of the main plaza, were built for or dedicated to venerate the most popular and important deities, since they were situated in a more open space than those of the North Platform (Structures VG, D and E and the Temple of Columns). Buildings in the North Platform may have only been used by the priests (Martínez 2002).

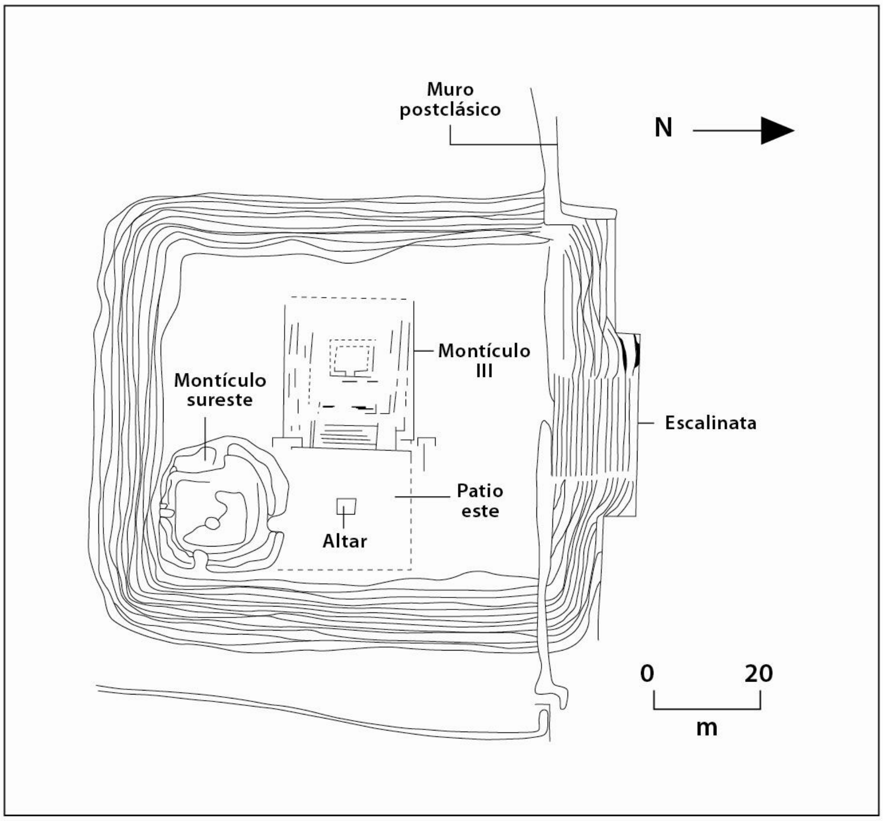
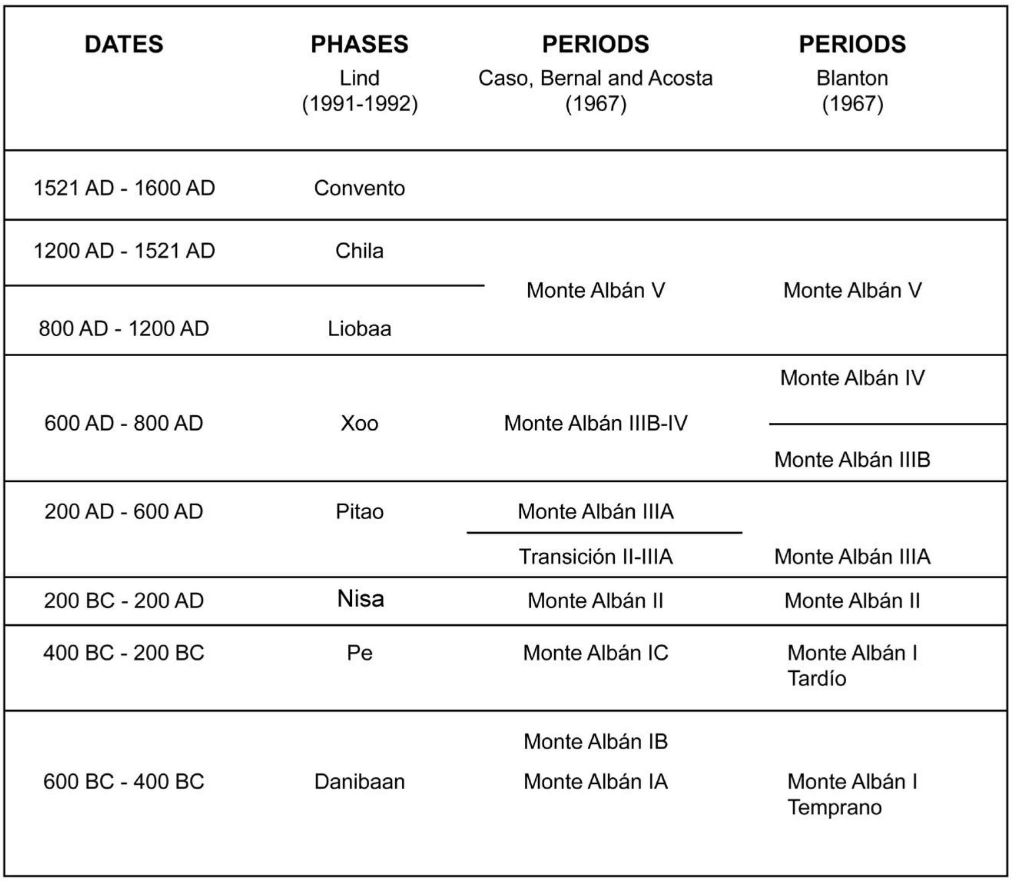


Fig.19. South Platform (after Herrera 2002:356).

Monte Albán and State of Oaxaca chronologies

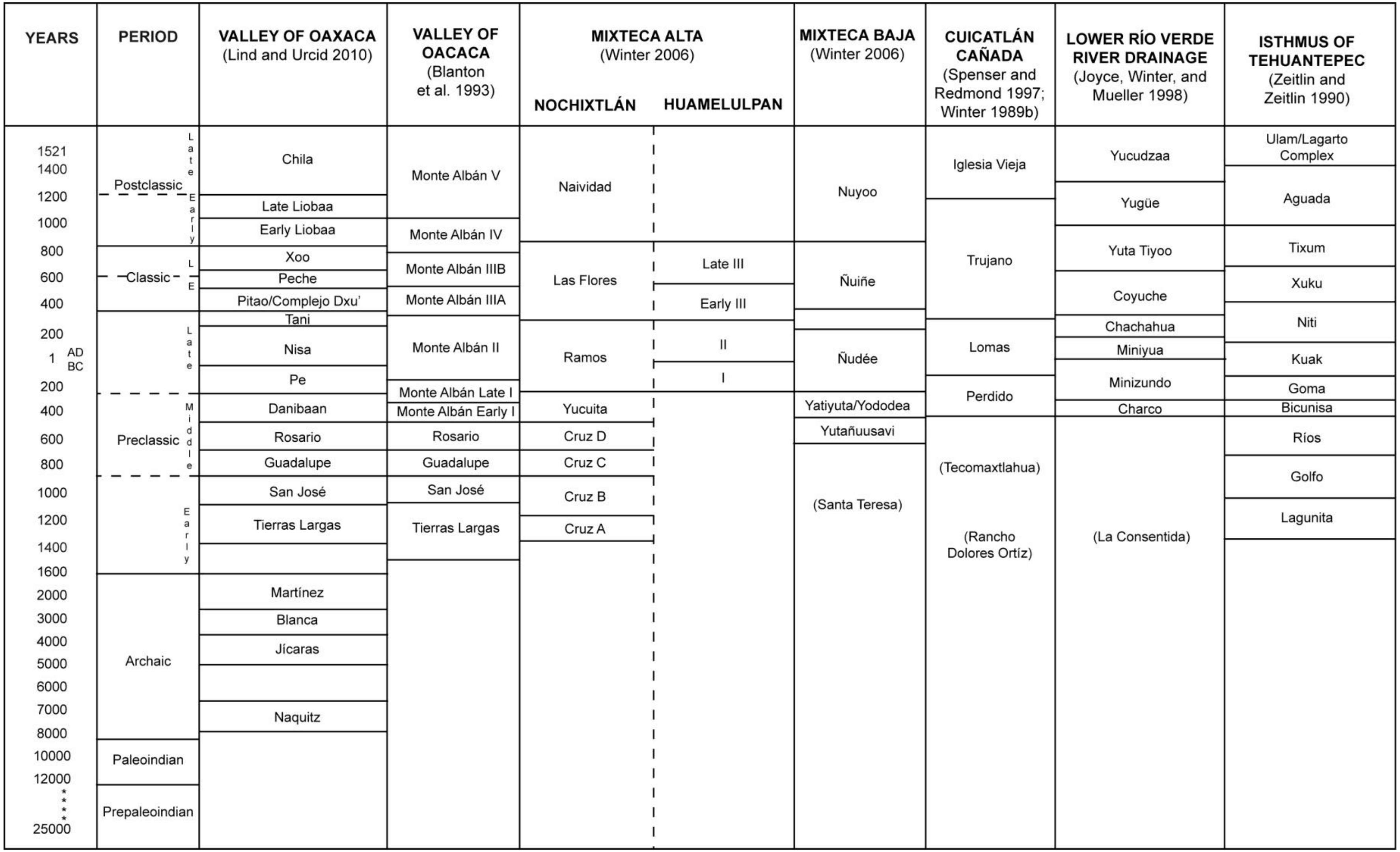
Monte Albán was inhabited for more than 1000 years, so in order to study its origin, development and collapse it is necessary to establish a time chronology (Winter 1994: 3). The periods or phases in the Valley of Oaxaca have been correlated with major developmental stages called Formative or Preclassic, Classic and Postlassic, throughout Mesoamerica, which are still used today (Whitecotton 1997: 26; Joyce and Weller 2007). The chronology of the site was first established by Caso *et al.*(1967) who divided it into periods designated with Roman numerals: Monte Alban I and II correspond to the Late and Terminal Preclassic periods (600 BC-200 AD), Monte Alban IIIA and IIIB-IV to the Classic (200-800 AD), and Monte Albán V to the Postclassic (800-1200 AD) (Table 1). These phases were subdivided with letters for example Ia, Ib, Ic and in transitions such as II-IIIA (Caso *et al.* 1967). Subsequently Lind (1994) modified this chronological sequence and named seven phases instead of using numbers (Table 1). Later, this chronology was also subdivided and related to the chronology of the state of Oaxaca (Table 2) (Lind and Urcid 2010; Winter and Sánchez 2014).



DATES	**PHASES**	**PERIODS**	**PERIODS**
	Lind (1991-1992)	Caso, Bernal and Acosta (1967)	Blanton (1967)
1521 AD - 1600 AD	Convento		
1200 AD - 1521 AD	Chila	Monte Albán V	Monte Albán V
800 AD - 1200 AD	Liobaa		
600 AD - 800 AD	Xoo	Monte Albán IIIB-IV	Monte Albán IV Monte Albán IIIB
200 AD - 600 AD	Pitao	Monte Albán IIIA Transición II-IIIA	Monte Albán IIIA
200 BC - 200 AD	Nisa	Monte Albán II	Monte Albán II
400 BC - 200 BC	Pe	Monte Albán IC	Monte Albán I Tardío
600 BC - 400 BC	Danibaan	Monte Albán IB Monte Albán IA	Monte Albán I Temprano

Table 1. Monte Albán chronology (after Lind 1994:99).

Earlier periods have been added to the Monte Alban sequence: Tierras Largas (ca. 1450-1150 BC), San José (ca. 1150-850 BC), Guadalupe (ca. 850-500 BC), and Rosario (ca. 500-400 BC) (Marcus and Flannery 1996). These four phases and Monte Albán I and II Periods are assigned to the Formative stage which is divided into Early,



YEARS	PERIOD		VALLEY OF OAXACA (Lind and Urcid 2010)	VALLEY OF OACACA (Blanton et al. 1993)	MIXTECA ALTA (Winter 2006)		MIXTECA BAJA (Winter 2006)	CUICATLÁN CAÑADA (Spenser and Redmond 1997; Winter 1989b)	LOWER RÍO VERDE RIVER DRAINAGE (Joyce, Winter, and Mueller 1998)	ISTHMUS OF TEHUANTEPEC (Zeitlin and Zeitlin 1990)
					NOCHIXTLÁN	HUAMELULPAN				
1521		Late	Chila						Yucudzaa	Ulam/Lagarto Complex
1400				Monte Albán V				Iglesia Vieja		
1200	Postclassic		Late Liobaa		Naividad		Nuyoo		Yugüe	Aguada
1000		Early	Early Liobaa	Monte Albán IV						
800		L	Xoo			Late III		Trujano	Yuta Tiyoo	Tixum
600	Classic	E	Peche	Monte Albán IIIB	Las Flores		Ñuiñe			Xuku
400			Pitao/Complejo Dxu'	Monte Albán IIIA		Early III			Coyuche	
200			Tani			II			Chachahua	Niti
1 AD BC		Late	Nisa	Monte Albán II	Ramos		Ñudée	Lomas	Miniyua	Kuak
200			Pe	Monte Albán Late I		I		Perdido	Minizundo	Goma
400			Danibaan	Monte Albán Early I	Yucuita		Yatiyuta/Yododea		Charco	Bicunisa
600	Preclassic	Middle	Rosario	Rosario	Cruz D		Yutañuusavi			Ríos
800			Guadalupe	Guadalupe	Cruz C			(Tecomaxtlahua)		Golfo
1000			San José	San José	Cruz B		(Santa Teresa)			
1200			Tierras Largas	Tierras Largas	Cruz A					Lagunita
1400		Early						(Rancho Dolores Ortíz)	(La Consentida)	
1600										
2000			Martínez							
3000			Blanca							
4000			Jícaras							
5000	Archaic									
6000										
7000			Naquitz							
8000										
10000	Paleoindian									
12000										
* * * *	Prepaleoindian									
25000										

Table 2. Chornological chart for the state of Oaxaca (after Lind and Urcid 2010: 354-355;Winter and Sánchez 2014:2).

Middle and Late. However, sometimes Monte Albán II could be classified as Classic (Whitecotton 1997: 26). Even though the development of Monte Albán has been conceived as a unique and uninterrupted process, Winter (2001) has identified internal and regional changes that may be organized into three subdivisions: 1) Growth and consolidation: Early Periods I and II (500 BC -200AD); 2) Relations with Teotihuacan: Periods II and IIIA (200 -500 AD); 3) Resurgence and reorganization: Periods IIIB-IV (500-800 AD) (Winter 2001: 277; 2002b: 66). The information on Monte Albán presented in this chapter will use these subdivisions, together with the process of founding Monte Albán. The collapse of the site will not be discussed because the faunal remains studied in this dissertation were from earlier periods (mainly from Pe, Nisa and Pitao phases).

Monte Albán background

Significant studies have been conducted in the Valley of Oaxaca, which can be traced back to the work of Alfonso Caso, who emphasized the importance of the Zapotec and Mixtec prehispanic inhabitants in the development of Measoamerican civilizations (Blanton *et al.* 1979). Alfonso Caso started the archaeological explorations in Monte Albán with his associates, especially Ignacio Bernal and Jorge R. Acosta, and between 1931-1932 he had spent 18 field seasons (Caso 1932; Blanton 1978). Among his substantial contributions he established the ceramic chronology of Monte Albán and the construction periods for Oaxaca´s urban evolution (Caso *et al.* 1967). Later, in 1971, under the direction of Richard Blanton, a survey of the prehispanic centre of Monte Albán began (Blanton 1978). Among his aims were to: 1) locate, describe and collect archaeological features visible on the surface, in order to infer the site´s ancient function and nature; 2) determine changes through time, such as the extent and density of the site´s occupation; 3) make an estimation of population based on these data and the residential occupation in the terraces; and 4) detect changes in the city´s internal organization (political control and social stratification), considering patterns of spatial distribution and variability in civic and residential buildings.

Other excavations in Monte Albán were directed by Dr. Marcus Winter as part of the special project of Monte Albán (PEMA by its initials in Spanish) in 1992-1994. This project provided new data on the end of the Classic and the Classic-Postclassic transition. One goal of the project was to better understand the collapse of the site (Winter 1997: 22). The faunal remains samples that form the main focus of this dissertation were collected during the PEMA1992-1993 project.

Research objectives and postulates

- The specific objectives of this dissertation are to: 1) identify the species that were part of the elite diet; 2) detect subsistence patterns during different periods of time and in different areas; 3) determine the kind of environments that inhabitants exploited to obtain their food resources; 4) investigate whether species represented in the sample were local or brought from more distant regions; 5) analyse the relative abundance of anatomical elements of the most abundant species in the four areas under study, to detect similarities and variations in element distribution; 6) identify the taphonomic agents on animal bone surfaces such as cut marks, burning, gnawing and weathering; 7) consider the possible uses of the identified taxa apart from subsistence (ritual, symbolic and functional); and 8) compare the Monte Alban faunal assemblage with other zooarchaeological studies of contemporary sites in the Valley of Oaxaca and other cultures and regions of Mesoamerica.

-The research´s postulates are that: 1) animal bone samples studied are the result not only of food remains but also of ritual and/or manufacture activities; 2) subsistence strategies changed in different periods of time, depending on the control that Monte Albán had over other communities located in the valley; and 3) consumption patterns vary between private (households) and public spaces.

Monte Albán foundation

Various conditions favoured Monte Albán foundation. First, the near location of scarce resources such as clay, flint, salt sources, lime deposits (to prepare corn), allowed the population of some villages to become specialized, in addition to practicing regular farming. Second, the uninhabited hills in the centre of the Valley of Oaxaca where Monte Albán was built later on, offered wood, space to build houses, land for farming and springs for domestic use. Third, the Monte Albán hills had an overall view of the sub-valleys from faraway and it was an ideal place for defence. Fourth, there were approximately 50 small villages in the Rosario phase (ca 500 BC–400 BC) in the Valley of Oaxaca, most of them concentrated in the Etla Valley with 2000 inhabitants (Winter 1990; Marcus 2008).

Seven models or interpretations have been proposed to explain the foundation of Monte Albán:

-The first is the “Rival Chiefdoms and Disembedded Capital”. This model suggests that during the Rosario phase, each branch of the Valley of Oaxaca was dominated by one large chiefdom: San Jose Mogote in Etla, el Mogote Tilcajete in Zaachila-Zimatlan and Yegüih in Tlacolula. According to this proposal the three large communities were in conflict. So, Monte Albán was founded on a marginal land as a disembedded political capital (Blanton 1976; Blanton *et al.* 1999). The problem is that these chiefdoms apparently split up (some people staying and other leaving), but has not been demonstrated (Winter 2011).

-A second model “Market and Centralization” proposes that Monte Albán was founded because it is in a central location in order to control and coordinate exchanges in the valley (Winter 1984). However, Monte Alban´s role in the Valley of Oaxaca economy was important but probably not the main cause of its foundation (Winter 2011).

-The third model called “Cultural Ecology” argues that Monte Alban´s location can be explained in terms of cultural ecological factors (Stanley 1980; Sanders and Nichols 1988).

-The forth model “Synoikism” states that existing villages were brought together to form Monte Albán. People from San José Mogote moved to Monte Albán and took other local people to extend their political control over the valley. “Synoikism” is equivalent to “urban relocation” (Marcus and Flannery 1996). This possibility is reasonable but it is not supported by archaeological evidence (Winter 2011).

-The fifth model “Ideology” finds an ideological explanation for the founding of Monte Albán (Joyce and Winter 1996; Joyce 2000). The location of Monte Albán was problematic because of the distance from sources of water and prime agricultural land. So, how could leaders keep followers and what did they offer in exchange? Rulers were viewed as having a close relation to gods, who performed human sacrifices and offered blood in return for corn provided by deities. Some evidence of bloodletting is presented by the *danzantes* representations. Related elements of this ideological perspective can be found in the Main Plaza (Winter 2011).

-The sixth model “External Stimulus” noted that a military threat could have influenced the formation of a federation in the valley (Blanton 1978). Since groups in regions next to the valley were small, distant pressure may have come from foreign regions such as Puebla, Morelos, Veracruz, or the Mixteca Alta of the Isthmus of Tehuantepec (Blanton *et al.* 1999). However, there is no substantial evidence of such pressure. Furthermore, trade relations in the Rosario phase of the Mixteca Alta with the valley flourished (Winter 2011).

-The seventh model is “Xoxocotlan Hinterland Defense”. It seems that this is the most likely model supported by archaeological evidence. The best agricultural land in the Valley of Oaxaca is located to the east of Monte Albán where the two main rivers merge. So, Monte Albán could have been founded by the Rosario phase central villagers to defend and control this land. The area of archaeological site may have been agriculturally marginal, as mentioned in the first model, but the hills supplied other basic resources (Winter 2011).

Different lines of evidence corroborate this model. First, the extensive agricultural land east of the Monte Albán hills could have produced enough corn to fulfil the needs of thousands of inhabitants at the city during the early centuries. Second, archaeological evidence suggests that many villages in the centre of the valley were abandoned during the Rosario phase and their inhabitants may have been some of the founders of Monte Albán (Winter 2011).

Growth and consolidation of Monte Albán (500 BC-200 AD) (Periods I and II)

Period I (Danibaan, Pe and Nisa phases)

Population growth, urban development and survival strategies

While in the Danibaan phase population was around 3,600-7,200, by the Pe phase it had increased to approximately 10, 200-20,400 people (Blanton 1983). The principal buildings of the Main Plaza (lacking general habitation) and the site´s major defensive wall which was 3 km long and 3-4 m in height began to be constructed in this period (Blanton 1978; 1983; Winter 1994; 2001). The 300 *danzantes* (dancers), carved stones at the site, located under the southeast portion of Mound L represent the largest single corpus of carved stones in the Late Formative period in Mesoamerica (Fig. 20). These carved stones, which have been interpreted as war prisoners or sacrificial victims, show the great effort of the elite to demonstrate their power over prisoners, captives and subjugated communities, since it represents 80% of monument carving at Monte Albán (Joyce 1994; 2000; Winter 1990; 1997). However, Urcid (2008a), using pan-Mesoamerican comparisons proposed that the figures on the vertical stones represent men performing self-mutilation by perforating their penises, with genital scrolls interpreted as blood. The horizontal figures show ancestors contacted through the act of auto sacrifice. Acts of human sacrifice are related to four depictions of decapitated heads (Urcid 2008a).

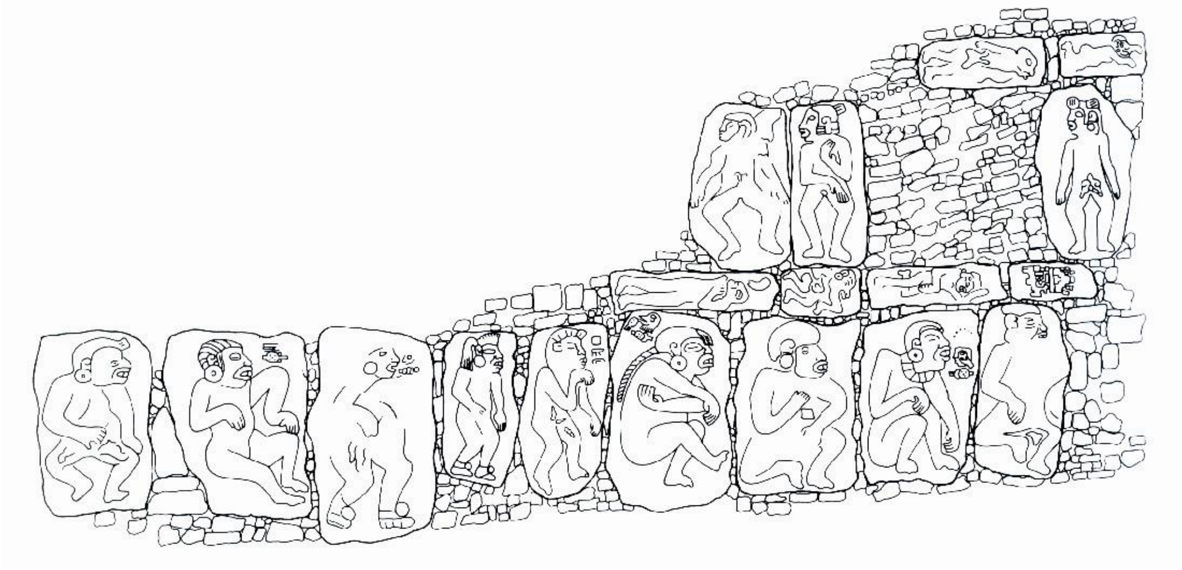


Fig.20. ***Danzantes*** **carved stones of Mound L**
(after Marcus and Flannery 1996:152).

Population rise in the area around Monte Albán, would have needed more labour available for farming land around the urban centre. Consequently, an increase of settlements in the middle and upper piedmont, especially in the Etla branch, constituted a “piedmont strategy”, which consisted of using small-scale irrigation techniques to generate surplus for Monte Albán (Kowalesky *et al.* 1989). By the Nisa phase many piedmont sites were abandoned, probably due to soil erosion (Joyce 2010).

Whereas in the earlier phases most people lived near the humid *bajios,* in the Pe phase for the first time a substantial proportion of the population lived at higher elevations. Growth in the piedmont near Monte Albán played a key part in provisioning the city. People farmed virgin land, beginning in this phase with the piedmont nearest Monte Albán. In general, people living in the piedmont tended to be low class and immigrants (Kowalesky *et al.* 1989). There had been quite an elaborate water-control system in the eastern piedmont of Monte Albán, which transported and then channeled water to various parts of the piedmont. The entire system consisted of two dams. An artificial water source and irrigation system was created, so that agriculture could take place close to the administrative-ceremonial centre (O´Brien *et al.* 1982).

The best agricultural land was next to the Atoyac River near the north-east base of the mountain. Possibly the majority of food consumed in Monte Albán was cultivated here and transported to the top of the mountain. There are two ways that this might have happened: people in Monte Albán might have had cornfields in the valley and there were dozens of villages that were a half day walk from Monte Albán, which might have produced food as tribute (Marcus 2008).

Social stratification, economy and elite control over resources

The unification of the valley contributed to the emerging social stratification process. Zapotec society was divided into two endogamous, socially restricted strata: nobles and commoners (Elson 2006). Each one had different ranks, roles and professions. The upper stratum consisted of a ruler, royal family, major and minor nobility. The lower stratum would have been formed by traders, farmers, landless serfs, and slaves. Within the upper stratum, principal members of the nobility could marry members of lower nobility. Neither group was supposed to marry commoners. Similar social interactions took place among members of the lower stratum. For Mesoamerican states, the elite were not those chosen by men, but the hereditary nobles whose ancestors were selected to rule because they were considered supernatural rather than mortal (Marcus 1992a;1992b). Therefore, genealogical relationships were important for status since proximity to the oldest ancestor, as well as the prestige of that ancestor, validated the inequality among social groups (Joyce 2010). The power of the nobility was also proved because they had greater access to exotic imported goods like pottery, obsidian blades, and ornaments of shell (Winter 1984). Also, isotopic studies from skeletons buried in household tombs at Monte Albán showed a diet variation among neighbourhoods, higher status people showed a greater access to meat (Márquez and González 2001).

The exchange of goods and marriage among the nobility were used to consolidate alliances with other elites (Joyce 2000). These products were not exclusive to the nobility, however, high status families controlled trade relations with elites of political centres in more distant regions such as Teotihuacán in the Basin of Mexico, through which imported goods entered the Valley of Oaxaca (Joyce 2010). Direct evidence of interregional exchange derives from obsidian, ceramic, shell and greenstone artifacts found at Monte Albán and other Valley of Oaxaca sites (Winter 1984). Classic Period economy consisted of household production; goods were more likely to have been circulated through markets than via tribute or redistribution alone (Feinman and Nicholas 2004). Monte Albán´s elite ensured that some prestigious goods were manufactured with some degree of central control (Elson 2006). At the same time the city obtained products from other communities located in the Valley of Oaxaca such as salt, pottery, flint, shell, and perishable materials (wood, leather, and food) (Joyce 1994; Winter 2001). However, ceramic styles, architecture and funerary traditions were different from region to region, probably as a result of diverse ethnic identities (Joyce 1994).

Elite household, funerary treatment and status

Minor changes occurred during Period I in Monte Albán houses. One was a switch from wattle-and-daub construction using stone foundations and mud-brick walls (Blanton *et al.* 1999). Domestic groups consisted of a nuclear or extended family, which produced stored and consumed their own food and buried their dead relatives near the house (Winter 1990; Blanton *et al*. 1999). However, the storage pits were smaller than in earlier phases indicating that residents stored less food. In later periods, storage pits were not found, probably indicating that households obtained their daily food supply from markets or through governmental institutions (Winter 1974). In Period I, migrants preferred nuclear-family dwellings surrounded by open yards (Blanton *et al.*1999).

Mortuary patterns also varied: 1) burials and tombs were associated with residences which existed in villages before Monte Albán; 2) distinction between burials and tombs; 3) residence with or without tombs; 4) differentiation in mortuary treatment between adults and children (Winter *et al.* 1995).

Mortuary treatment showed different status as well. Commoners were buried in simple graves with one or two vessels and people of high status were buried in formal stone-masonry tombs with offerings that included luxury objects of jade (Winter 1990; Winter 1995; Joyce 2010). People often performed ritual mortuary ceremonies with dog sacrifices associated with both commoners and nobles, while bird sacrifice was restricted to nobles. Zoomorphic figurines such as dogs and birds (both animals that were sacrificed to ancestors) were associated with burials as well. Internments of rulers might have also involved human sacrifice (Joyce 2010). In Mesoamerica, the dog was highly valued in funereal ceremonies since the early times of the Late Formative period (400 BC- AD 200). This practice was maintained for many centuries and was still in use when Spaniards arrived in Mexico (AD 1521) (Valadez *et al*. 1999). The fact of dogs being associated to human burials is explained because of the belief existed that this animal could free man from the dangers of the underworld (Valadez 1995). Among sedentary groups in Mesoamerica, the dog can be found in ceramic, stone or bone depictions, as well as in mural paintings (Merino and Garcia Cook 1997).

Stone-masonry tombs consisted of a main chamber, attached to smaller rooms and in some occasions, vestibules, corridors, and internal stairs were built (Joyce 2010). The use of masonry tombs showed that the elite were buried in special locations from non-tomb internments. Tombs were reopened to add the more recently deceased and to perform certain rituals which included painting the bones with red pigment, and removing parts of the skeleton of ancestors for use as ritual heirlooms (Urcid 2005a).

Imagery was depicted in carved-stone monuments placed inside the tombs as well as stone lintels and door jambs (Joyce 2010). These representations and the hieroglyphic inscriptions recorded the genealogies of couples, which frequently had calendric and personal names. Personages depicted in tombs were richly dressed wearing zoomorphic headdresses or helmets with images of crocodiles, or birds together with fine ornaments including beads, necklaces, feathers, bracelets, and headbands (Urcid 2005a). The imagery suggests that descent was passed through the male line, although there were cases where powerful women figure in the succession of rulers. There is a general correlation between the wealth of burial offerings and the elaboration of the grave (Joyce 2010).

Religion and symbolism

As mentioned in the “ideology model” of Monte Albán foundation, the role of nobles as ritual experts, especially sacrificing victims, reinforced their image as mediators between commoners and the sacred, and gave them power to force people to provide tribute in the form of agricultural surplus (Joyce and Winter 1996; Joyce 2000; 2010). Deceased royalty became “cloud people”, who through ritual sacrifice of humans and animals, could intercede with supernatural forces (Elson 2006). The interests of the elite were generalized by linking their ritual practices to the maintenance of fertility and the prosperity of all people (Joyce 2000). Elite individuals were represented on carved stones and depicted with attributes and symbols of deities, showing that ideology was controlled by them (Winter *et al.* 2007).

In order to make up for the energy and effort invested to produce enough resources to feed the population of Monte Albán, the elite developed ideological innovations in religion to attract and maintain food supplier loyalty (Winter 2001). Population growth produced territorial expansion and a tributary system was established which required dependent communities to contribute with goods, participation of warriors and labourers for the construction of monumental buildings and working the land for nobles. In exchange, communities could participate in ceremonies, but if they refused to cooperate they were subdued by force (Winter 1990; Joyce 2010).

Animals had a significant role not only in subsistence but also in religion and symbolism. Some animals represented during the village period, considered as intermediaries between human beings and spirits, constituted the same four categories – eagles, jaguars, crocodile and serpents- that continued to appear in the art and iconography during the urban period. These kinds of animals were modified or combined as in the case of the serpent covered with feathers. The sky was represented as an animal or as parts of different animals. The Zapotec symbol “sky jaws” (similar to the Sun God of the Mayas, the wide billed bird) was similar to the jaguar jaw but stylized. Each symmetric half of this symbol showed the profile of a crocodile or a serpent with a mask covering its face (Winter 1990). This symbol was associated with deceased royal ancestors and reflects their place in heaven and association with supernatural beings (Fig. 21) (Marcus 1992a).

Effigy vessels in the form of water-related animals probably reflected the development of the *Cocijo* (Zapotec god of the rain and thunder) cult that linked sacrifice, fertility and the rain god. Zoomorphic vessels usually representing animals associated with water included ducks, shells, frogs, and toads. These kinds of vessels were frequently found in tombs and burials with elaborate offerings, which meant that the rain god was related or its status ascribed by birth (Joyce 2010). Other animals such as squirrels, dogs, deer, wolves and jaguars were represented in ceramic sculptures (Whitecotton 1997).

Fig.21. Drawing of the *Lapida de Bazán* with "sky jaws" above the individual on the right hand side (after Winter 1998:173).

The expansion of Monte Albán

One of the models that discusses the expansion of Monte Albán is "predatory-warfare", which supports the idea of a powerful militarism in Monte Albán during the Pe and Nisa phases, forming an empire of 20,000 km^2 (Blakansky 1998a). Hegemonic control involved conquest, or at least the threat of military action, followed by the establishment of tributary relations (Joyce and Winter 1996; Joyce 2010). The predatory-warfare model argues that the Monte Albán Empire mainly exerted a form of territory control over most of its provinces (Marcus and Flannery 1996; Spencer 2003). This model coincides with a universal cause of pristine state origins where necessities of military expansion give rise to administrative institutions of the state (Spencer 2003). There is no doubt that Monte Albán battled with nearby regions and conquered some communities outside the Valley of Oaxaca; however, evidence at present does not support the hypothesis that Monte Albán controlled a substantial empire (Joyce 2010).

Another alternative to the military model of expansion of Monte Albán is based on the struggle over human, material and symbolic resources that structured power relations, in which the elite manipulated and controlled the ritual knowledge and the ideology (Joyce 1994; 2000; Joyce and Winter 1996). Nobles were related to gods and were regarded as a group apart from commoners (Joyce 2000; 2010). Although the Main Plaza was a public space, ritual practices contributed to the power of the nobility and marked the distinction between noble and commoners (Joyce 2000). The Zapotecs held public religious ceremonies that included feasting, sacrifices, ritual bloodletting, dancing, and the taking of drugs or intoxicating drinks like *pulque* (Flannery 1983). Symbols and artifacts used in ritual contexts, including hieroglyphic writing, calendars, braziers and anthropomorphic urns were found in elite places (Joyce 1994; 2010). People contacted the divine through ritual practices, including human sacrifice and the ballgame (Joyce and Winter 1996; Joyce 2000; 2010).

Warfare may have been crucial to conquer and incorporate independent communities, gain agricultural land, and control trade in foreign goods like obsidian, shell, and greenstone (Joyce 2010). The iconographic and epigraphic evidence show that warfare was related to ritual beliefs and practices where captives were taken for human sacrifice (Joyce 2000). Consequently, the significance of warfare increased, it was not only a way to defeat competing elites and obtain tribute but also to capture sacrificial victims that would contribute to human fertility and the politico-religious role of the elite (Joyce 2000; 2010).

The location of the site should also be considered from the point of being a sacred place. The Main Plaza centre suggests that the area was probably known and visited as a sacred place well before the urbanization of Monte Albán. According to Orr (2001: 61), as the site gained importance the urban population expanded. The impact of warfare and internal conflict must have played a decisive role during this period; however, ideology also had a significant influence (Orr 2001).

The history of Oaxaca was originally thought to start with the Zapotecs in the Classic Period followed by Mixtecs in the Postclassic Period. However, archaeological evidence demonstrates that both groups co-existed at the same time in the Valley of Oaxaca and in the Mixteca region (Winter 1994). Urban centres contemporary to Monte Albán in the Mixteca region include: Monte Negro, Cerro de las Minas, Huamelupan and Yucuita, among others (Fig. 22) (Winter 1990; 1994). These sites were smaller than Monte Albán (50 to 100 hectares) and with populations of 3,000 habitants approximately. Nonetheless, there were administrative regional centres with monumental architecture similar to Monte Albán (Joyce 1994). In order to understand Oaxaca´s key cultural transitions, it is necessary to bring Mixtec and Zapotec study regions into a single interpretative framework. By the Pe phase Monte Albán expanded into nearby regions conquering Cuicatlán, colonized the Sola Valley, and other centres in the Mixteca Alta. Monte Albán control extended throughout the central valleys and even to more distant provinces by the end of this phase (Balkansky 1998a). Simultaneously, cities and states arose outside the bounds of Monte Albán control at the Mixtec centres of Humelupan, Monte Negro and Yucuita (Balkansky 1998b).

Other communities were politically related to Monte Albán. Dainzú in the Tlacolula Valley functioned as a community of second rank in economic, political and religious terms; its main occupation dated from 250-350 AD. Lambityeco in the Tlacolula Valley was occupied in Period IIIB-IV (Xoo phase), and was an important salt producer (Winter 1990: 61-62). Cerro de la Campana in the Etla Valley was inhabited during Period I and became an important centre in Period III (Winter 1990).

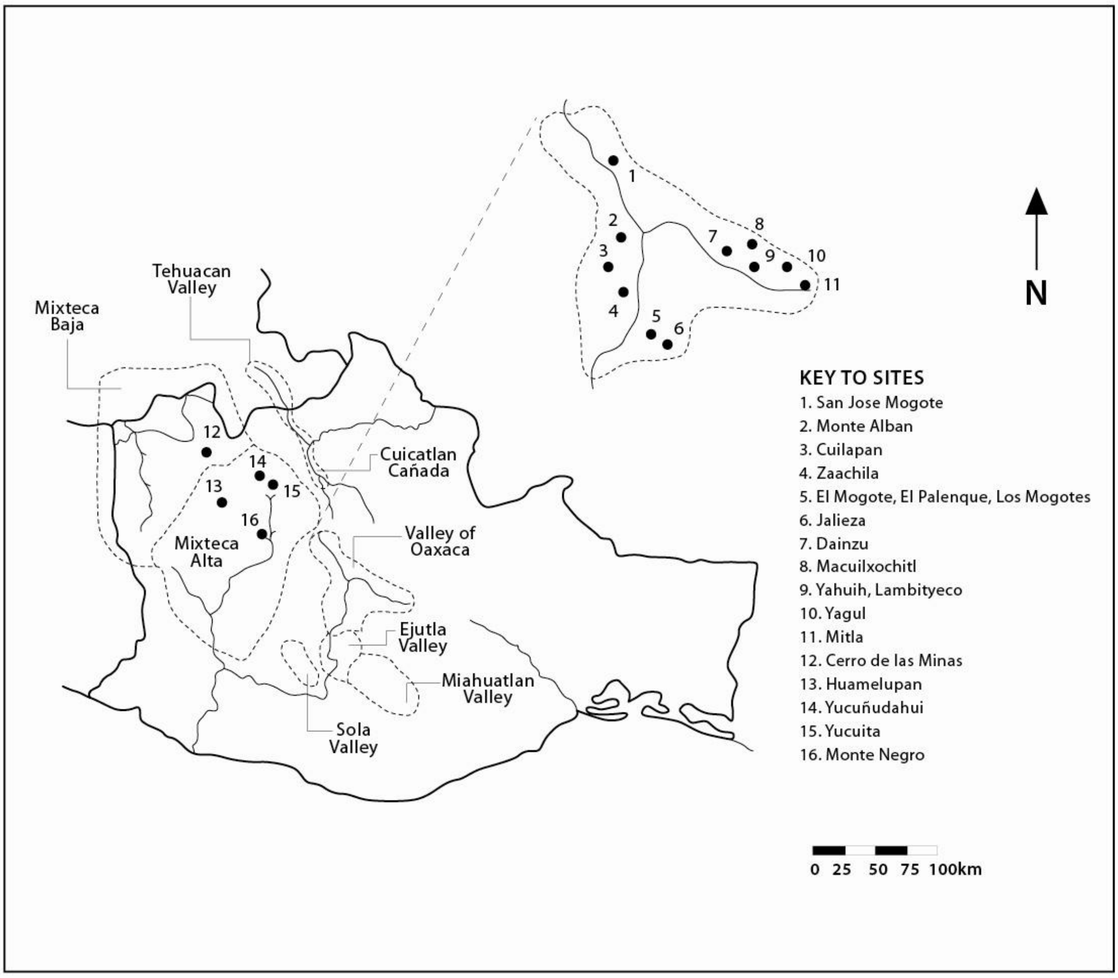


Fig.22. Map of Oaxaca showing sites and regions mentioned in the text (after Joyce 2004:193).

Early Period II (Nisa phase)

Population growth, urban development and subsistence strategies

At this time the population increased an average of 20%, reaching 12,000 people and there was also an important construction development in Monte Albán consisting of an urban complex of five or six square km (Whitecotton 1997; Winter 2001). All the surrounding hills (including El Gallo, Atzompa, and Monte Albán chico) were occupied (Whitecotton 1997). It is estimated that during this phase 24 structures were built, related to administrative diversification in the government of Monte Albán, which was established as a state. Elite residences were built on stone foundations and the walls were covered with stucco (González 2011). The population depended on a combination of dry farming, irrigation, and tribute. Diet consisted of maize, beans, squash, chile peppers, avocados, agaves, prickly pear, and other wild and domestic plants. There were so many people in the valley that venison probably had to be reserved for the elite, but there were other animals available such as rabbits, mud turtles, pocket gophers, birds, and lizards for commoners. Domestic dogs represented a major source of meat and turkey (*Meleagris gallopavo*) was also consumed (Marcus and Flannery 1996).

Elite households, funerary treatment and status

Nobles from this period lived in large palaces, built of adobe brick and lime plaster over a stone foundation. The tombs of Zapotec nobles became more elaborate during Period II, with a cruciform plan including several chambers and offerings in niches, and a doorway reached by descending stairs (Marcus and Flannery 1996).

Economy and elite control over resources

During this period the regional political economy of the Oaxaca Valley operated the same way as it had during Period I. Alliances were probably formed between the elites at the regional capital of Monte Albán and those at smaller centres in the valley. These ties were consolidated by the movement of surplus from the valley communities to the capital and vice versa. However, by Period II prestige goods were probably obtained by Monte Albán elite through interregional conquest and tribute extraction while in Period I these products were acquired by interregional exchange (Spencer 1982).

The expansion of Monte Albán

It was not until this period that the population of Oaxaca was organized as a state when a four-tiered administrative hierarchy is demonstrable (Spencer 1982; Flannery and Marcus: 1983; Marcus and Flannery 1996; Marcus 2008). Monte Albán was the first capital city of the first state-level-society in Mesoamerica (Balkansky 1998a). The city covered 416 ha and was the only occupant of Tier 1. Six cities with estimated populations of 970 to 1950 people might have made up Tier 2. All of them were between 14 and 28 km away from Monte Alban. The largest of these sites was San José

Mogote with 60-70 ha. Tier 3 consisted of 30 “large villages” covering 5-10 ha, with estimated populations of 200-700 persons. Tier 4 included more than 400 “small villages” with estimated populations below 200 people. Towns were settled around the capital city at regular distances, and large villages encircled towns at regular and shorter distances, similar to nested cells (Marcus and Flannery 1996).

A characteristic of many early states was that their foundation was followed by a period of rapid growth until they reached their maximum territorial limit (Marcus and Flannery 1996). Building J with 40 conquest memorial stones was constructed showing Monte Albán control over other communities (Figs. 23 and 24) (Joyce 1994; Winter 2001; Marcus 2008). Three elements appear frequently on most of them: in the centre there is a glyph representing a place, under this glyph there is an upside-down human head, and above this a glyph the name of a site is shown, which varies in each stone (Winter 1990; Joyce 2010). According to Caso´s (1947) interpretation, the upside-down human head means conquest or subjugation, the glyph of the site indicates that it is a mountain or natural landmark, and the symbol above this glyph the specific name of the place.

However, not all the stones show a human head upside-down under the glyph hill. In those cases, provinces that were not subjugated but colonized or politically absorbed could be represented (Marcus and Flannery 1996; Marcus 2008). The Zapotecs might have used three methods to subdue the surrounding regions: 1) the inhabited or almost inhabited were simply colonized; 2) the regions that had a peaceful relationship with Monte Albán were probably adhered to the valley through marriage alliances or mutual economic arrangements; 3) communities that refused to be integrated, were subdued by military force (Marcus 2008). By Period II administrative architecture, urban residences and the iconography and offerings associated with them suggest that lesser nobles acted as priests and advisors, some with specific military roles (Elson 2006: 50).

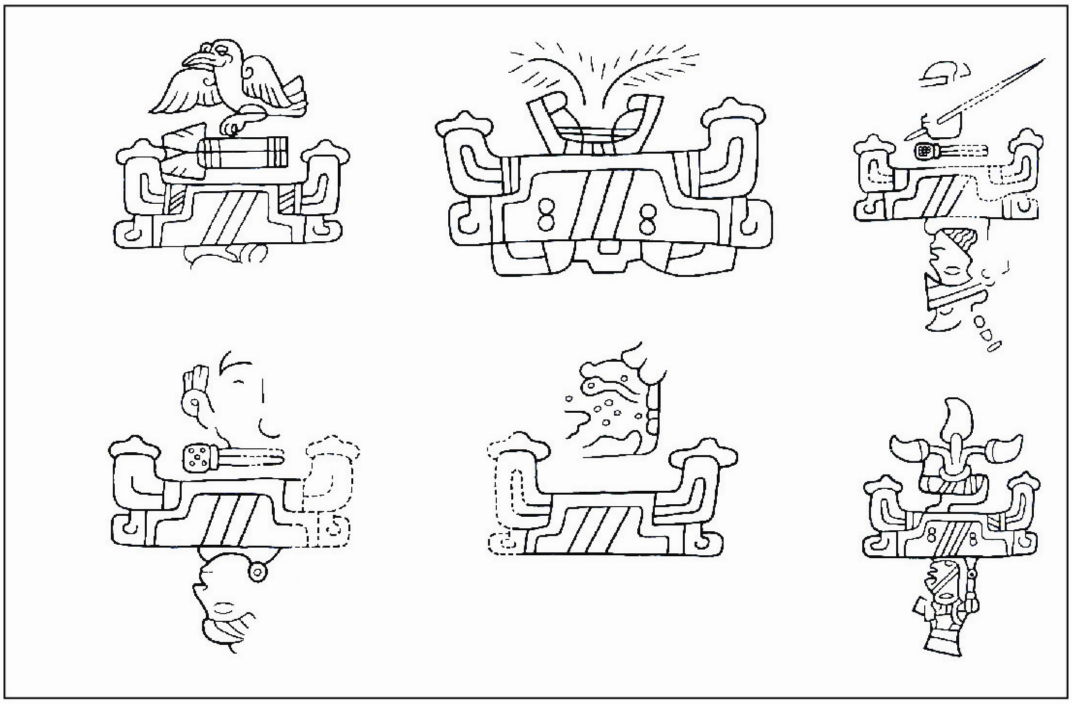


Fig.23. Conquest memorial slab stones of Building J (after Marcus and Flannery 1996:198).

Fig.24. Photograph of a conquest memorial slab stone of Building J (source: author).

Relationships with Teotihuacán (200-500 AD)

Late Period II and Period IIIA (Tani and Pitao phases)

The decrease of Monte Albán´s political control over the valley

Some researchers view the Classic period as the “Golden Age” of Monte Albán, where states reached their greatest power (Marcus and Flannery 1996; Kowaleski *et al.* 1989). However, more recent studies have questioned the degree of unity in the Valley of Oaxaca (Winter 2004). By the Early Classic, Monte Albán was no longer the dominant demographic centre in the valley. While the city was growing to its maximum size, the boundaries of its tribute territory had begun to reduce (Marcus and Flannery 1996). The communities of Jalieza as well as the nearest places to Dainzú, Macuilxóchitl, Tlacochahuaya and Guadalupe (Fig.22) approached Monte Albán in size with estimated populations of 12,835 and 12,300 approximately. By the Early Classic, the rulers of Monte Albán lost control of areas that might have been conquered during the Terminal Formative period, including the Cuicatlán Cañada. Such decrease of power and control may have been a result of political relations with Teotihuacán (Joyce 2010).

Teotihuacán was the largest and most powerful city of the Classic period in Mesoamerica. During the Early Classic period, the city covered 20 km^2 with an estimated population of 100,000-150,000 (Joyce 2010) (Figs. 25, 26 and 27) Teotihuacán expanded its hegemony through eliminating local centres and creating a centralized regional system, with most political and economical activities concentrated in one centre. In contrast, in the Valley of Oaxaca, local governors retained a considerable degree of autonomy (Blanton 1978). From 200 AD the Zapotecs established relations with the powerful city of Teotihuacan in the Basin of Mexico (Fig. 28), which influenced their culture and the formation of their state (Winter 2001; Joyce 2010).

Fig.25. Teotihuacán Pyramid of the Moon (http://blakeandrews. blogspot.mx/2011_07_01_archive.html/2014).

Fig.26. Teotihuacán way of the dead (http://en. wikipedia.org//wiki/Teotihuacán/2014)

Evidence of interaction between Monte Albán and Teotihuacán began during the Tani phase (AD 200-350) with the presence of a Zapotec barrio in the Tlailotlacan residential complex at Teotihuacán (Cowgill 1997). Zapotecs living in this Teotihuacán residence style maintained their identity and continued producing Oaxaca Valley style ceramics and urns, buried their people according to their funerary traditions, and used Zapotec writing (Winter 1998; Joyce 2010). There were also stylistic links in pottery, architecture and mural painting between the elites of Monte Albán and Teotihuacán (Whitecotton 1997; Martínez1994).

Fig.27. Pyramid of the Sun at Teotihuacán (http://www.grayline.com/2014).

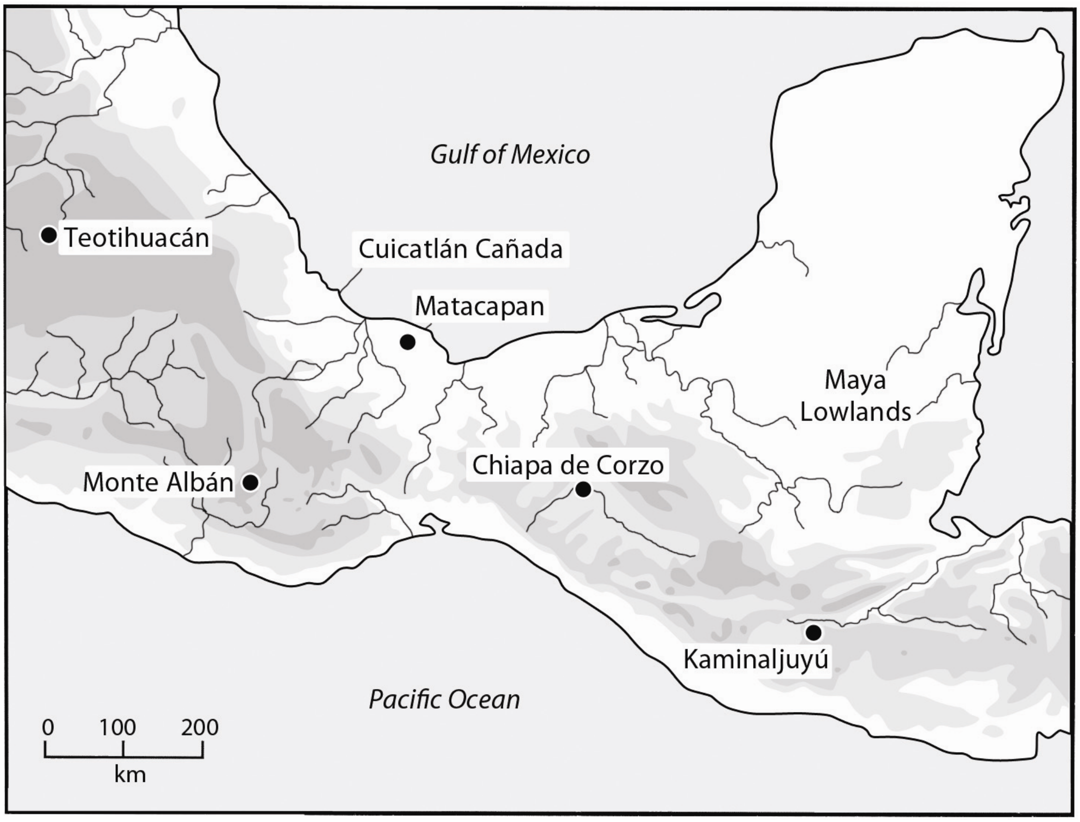


Fig.28. Map with Monte Albán and Teotihuacán location (after Marcus and Flannery 1996:231).

The impact of Teotihucán has been debated. According to Winter (1998) the beginning of the Classic period in Oaxaca highlands was marked by conquest and political domination by Teotihuacán. This author (Winter 1998) suggests that high-status residences located on the North Platform without tombs might indicate the presence of foreigners since the majority of the Zapotec houses included tombs, while those from Teotihuacán usually did not. Moreover, Winter (1998) found burials in the North Platform that showed mortuary practices and offerings in a Teotihuacán style. Winter (1998) also attributed the changes in burial customs during the Pitao phase and the decrease in monumental building construction as being the result of Teotihuacán influence. Teotihuacanos were located in a key spot of control in the city, while Zapotecs in Teotihuacán lived outside the central area (Winter 2002a).

In the North Platform artifacts and features were found indicating a Teotihuacán presence in Monte Albán. A deposit of mica was discovered in this area. Mica plates were obtained from deposits located near Monte Albán and transported to Teotihuacán. Green obsidian objects attributed to Teotihuacán were also found. Also, the analysis of residences, tombs and the associated artifacts of the Northeast hillock in the North Platform, indicated that this section of the site was occupied in Period II by Zapotecs involved in the exchange with Teotihuacán and other sites (Winter 2002a). Winter´s (1998; 2002a) model is based on the territorial imperialism of Teotihuacán over Monte Albán with its administrators who ruled during the Early Classic.

However, there is other evidence which shows a Zapotec continuity during this period. High status residences on the North Platform and other areas followed the Zapotec architectural canons and differed greatly from Teotihuacán compounds (Winter 1986b; Barber and Joyce 2006). According to the evidence, Zapotecs lived in the elite residences on the North Platform before and after the possible conquest, showing occupational continuity. The absence of tombs in some residences may simply be the consequence of sample bias (Joyce 2010). Several Late Classic high-status residences did not have tombs. Even public buildings that showed Teotihuacan architectural influence, such as the *talud-tablero* walls, also exhibited a similarity to earlier architecture as well and they did not show the precise style of Teotihuacán (Blanton 1978; Joyce 2010). Several Pitao-phase tombs with Zapotec-style painted murals showed depictions of local nobility (Urcid 2005a). It is probable that political involvement of Teotihuacán in Monte Albán lasted no more than a few generations (Joyce 2010). Actually, archaeological evidence suggested that neither of these cities controlled each other and that they just had a diplomatic relationship (Marcus 2008).

Apparently, evidence is more consistent with reciprocal economic and political relations between rulers of Monte Albán and Teotihuacán. This model proposes that nobles settled on North Platform during the Pitao phase imported elaborated ceramics, obsidian and ritual objects like figurines. In exchange, noble or subordinate specialists manufactured mica for exportation to Teotihuacán. So, the eastern part of the North Platform could have been an important ceremonial place for interaction with visiting nobles and/or merchants from Teotihuacán, where food preparation and consumption, ritual performances and gift exchange took place. Feasting implied broader relations between Zapotecs and Teotihucanos, which might have involved intermarriage of nobles, alliance and trade (Joyce 2010).

Teotihuacán collapsed around 600 AD and without the potential threat of this city, rulers of other communities may have become independent and distanced from Monte Albán (Joyce 2010). This situation promoted increasing competition among ruling dynasties throughout the valley, which was negotiated through alliances (Joyce 2004). Classic period elite may have been more concerned with competition from other counterparts than with rebellion by commoners (Joyce and Winter 1996).

Population decline, urban transformation and religion

During period IIIA there was a decrease in population to 10,000 people and also in the architectural expansion. There are no stones commemorating military battles, as in periods I and II. Zapotec leaders lost power in the community and other centres independent of Monte Albán emerged. There were fewer public religious ceremonies showing that residences were the focus of ritual life (Winter 2001: 291-293). The construction of high status residences in the plaza transformed it from a public space for large-scale ceremonies into a place of domestic activity. Commoners were increasingly excluded from the plaza (Winter 2001; Joyce 2010).

Zapotec nobility conducted rituals in restricted ceremonial spaces around the Main Plaza in the temple-patio-altar (TPA) (Fig. 29) (Winter 1990; 2001). This complex consists of a temple on a platform, a rectangular patio located in front of the temple and an altar in the centre of the patio. In Monte Albán some palaces and residences are associated to a TPA (Winter 2001). The TPA could be used for religious rites and festivities. Ethno historic data suggest that animals could be sacrificed on the altar or offerings could be placed (Winter 1990). Activities within the patio would have been hidden from the view of people outside and fewer members would have participated in the ceremonies, since patios were smaller than the Main Plaza (Joyce 2010). Religion and the state were only partially separated; priests were recruited from the families of the nobility (Flannery 1983).

Resurgence and reorganization (500-800 AD)

Period IIIB-IV (Xoo phase)

Population growth

Teotihuacán was destroyed about 650 AD, and its impact on Monte Albán culture ceased at that time (Whitecotton 1997). During the Xoo phase the Teotihuacán influence diminished and the Zapotec culture re-emerged. Monte Albán reached its maximum population of 25 000 to 30 000 inhabitants (Winter 2001; Marcus 2008).

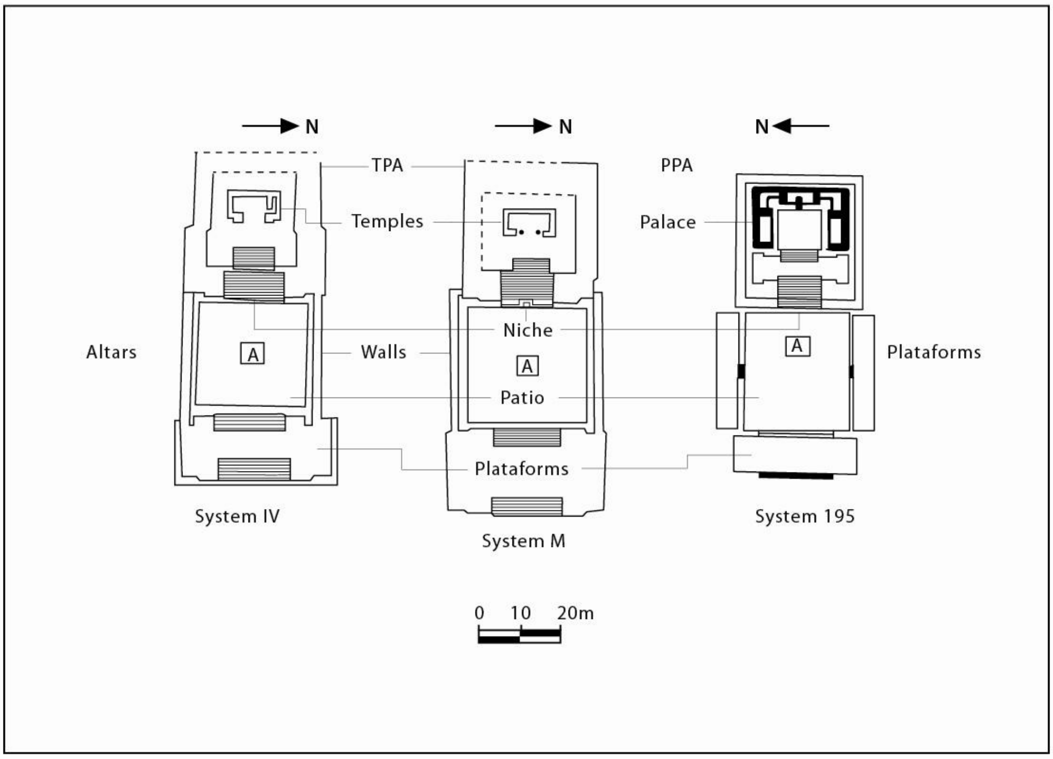


Fig.29. Drawing of Temple-Patio-Altar (after Lind 1994:108).

Households and funerary treatment

Residences by this time were closed and consisted of a central patio surrounded by rooms according to Winter (2001). Nonetheless, Blanton (1978) found buildings of simple rectangular rooms, lacking a patio in small terraces far down from the Main Plaza. It is probable that residences with patios found by Winter (2001) represented only higher ranking individuals who could afford to live closer to the civic-ceremonial centre (Blanton 1978). The enclosed and highly restricted domestic spaces served to limit access to the elite and maintained privacy (Barber and Joyce 2006).

Following Winter´s (2001; 2002b) proposal there were three sizes of residences that can be distinguished by the degree of constitution and by the mortuary treatment of their inhabitants: 1) small, generally with burials in graves; 2) medium, with tombs of medium size; 3) palaces with large elegant tombs (Figs. 30, 31 and 32) (Winter 2001; 2002b). However, Marcus and Flannery (1996) established a different set of categories. Common people lived in a simple house called *yoho*. A noble or *coqui* lived in a royal house (*quehui*), probably a minor palace. The *coquitáo* or supreme governor lived in a *quihuitáo* or beautiful palace. This palace was not only used as a residence but also as seat for governmental matters, such as reunions with local or foreign visitors (Marcus and Flannery 1996; Marcus 2008). The Zapotec ruler had a temple (or temples) for his ritual activities. Monte Albán also had palaces with several rooms (*quehui o casa real*) with a more residential function in the main plaza and on the nothern terraces part of the North Platform (Flannery 1983: 133-136; Marcus 2008). According to Zapotec beliefs, a dead ruler continued to influence the affairs of his royal descendants and his subjects. They were buried in elegant tombs with their servants or slaves under buildings where offerings continued to be made long after their death (Flannery 1983: 134-136). During the Xoo phase, tombs were reused and opened several times when it was necessary to place another skeleton in (Winter 2002b). Tombs were decorated with mural paintings depicting people associated to the families showing the respect and importance of their ancestors (Winter 2002b; Winter *et al*. 2007).

According to Berber and Joyce (2006), from Monte Albán´s earliest years, its sacred geography was similar to other Mesoamerican cities where the cosmos was rotated on to the surface of the site´s ceremonial centre, so that the north represented the celestial realm and the south the earth or the underworld. High status residences at Monte Albán located around the northern area of the Main Plaza were part of the sacred geography of the site, indicating an association between the celestial realm, nobles, and nobles´ ancestors (Barber and Joyce 2006: 224-226). The southern end of the Main Plaza contained iconographic references to sacrifice, warfare and the earth or the underworld (Joyce 2009).

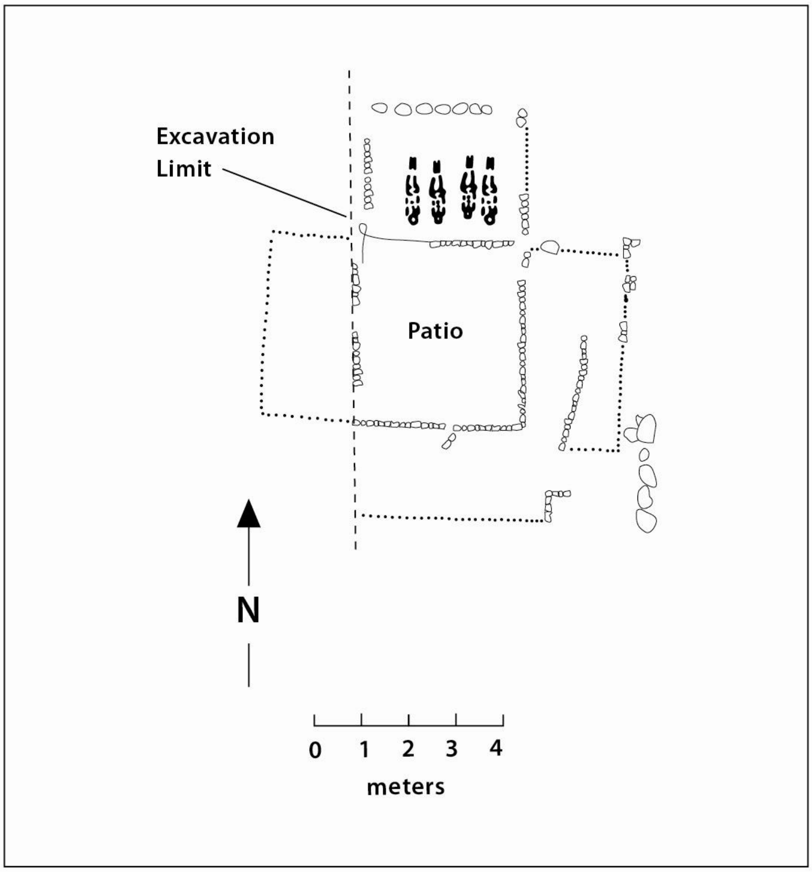


Fig.30. Type 1, Period IIIB household (after Winter 1974:984).

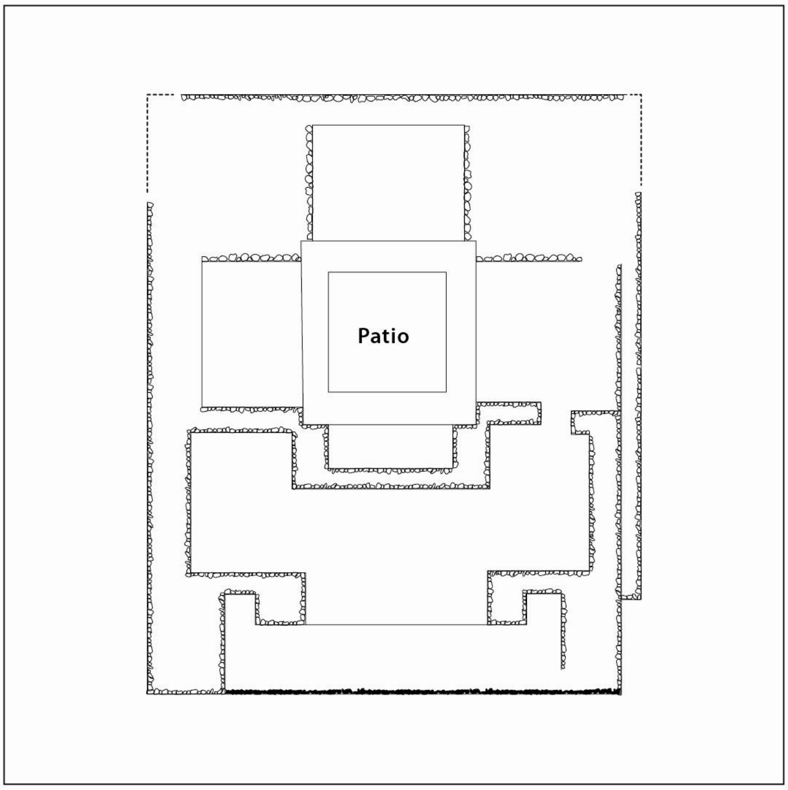


Fig.31. Type 2, Period IIIB household (after Winter 1974:984).

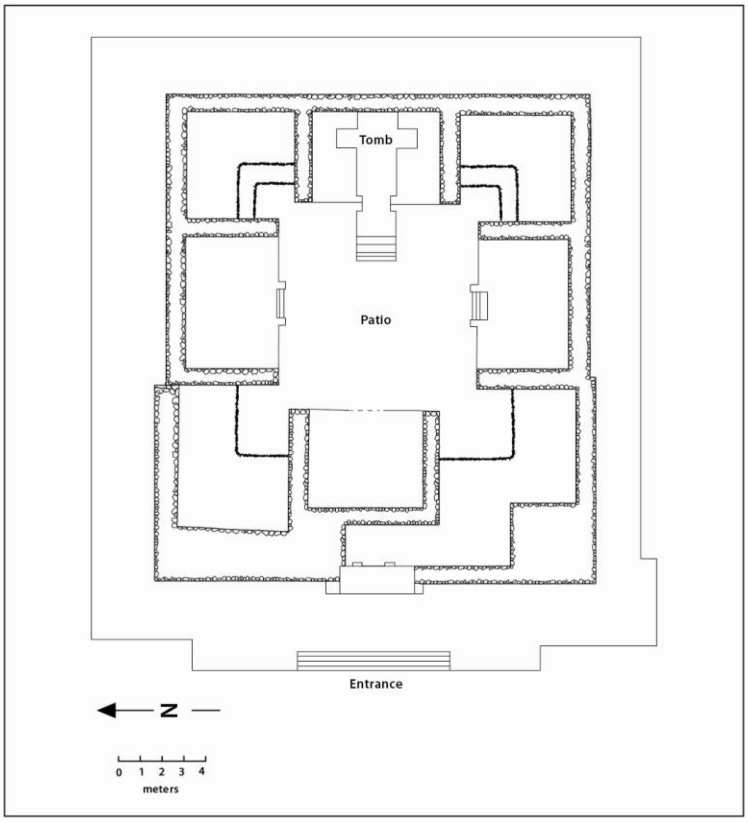


Fig.32. Type 3, Period IIIB household (after Winter 1974:985).

Nonetheless, during the Xoo phase new residences were built on or near the southern end of the Main Plaza, breaking the pattern of the sacred geography of earlier areas. Architectural ornamentation in residential patios began to depict the genealogical ties that would have provided an individual with their power. These depictions were on the walls of rooms facing domestic patios. This connection with the divine and noble ancestors did not change over 2,000 years. However, the way in which the elite represented their power shifted from the communal to the individual or family. Elite residences before the Xoo phase lacked public or semi-public audience rooms (Barber and Joyce 2006).

During the Xoo phase most of the elite residences also moved to the east-west line below and north of the North Platform. So location of elite residences changed again. Two patterns can be identified: 1) small or medium residences built in the patios of larger earlier houses; 2) residences built in key places of the site where earlier residences did not exist (Winter 1997: 31-32). Low status Xoo phase residences were common and abundant at Monte Albán, located on most terraces. They consisted of a square patio surrounded by rooms with burials in stone-lined slab-covered graves beneath the floors (Winter 1997). Winter (1974) suggests that some Monte Albán lower status residences were more focused on craft activities than in food production. Ritual activities also took place in the residences, so constructions appeared where ceremonies were celebrated to ensure individual and family benefits (Martínez 2002).

Religion and social stratification

The most common ceremonial and religious building during the Xoo phase was the TPA (temple-patio-altar). During this phase there was a standardization and formalization of religion among communities in the valley (Winter 2002b). The TPA had altars in the centre of the patio, probably used for performing sacrifices (Winter *et al.* 2007). The TPA of the Xoo phase was linked to heads of the family, governors and ancestors and was used to celebrate family religious practices (Martínez 2002). Association of temples (TPA) and residences during the Xoo phase suggested that religion and power were unified (Martínez 2002; Winter 2002b).

The strategy of the elite to impress the population with their power over rival leaders shifted to an interaction between members of the elite, as shown on the stones. The Late Xoo phase slabs commemorated significant events or rites of passage (marriage, death or transfer of power) where families of high status took part showing a shift in political organization. Slabs emphasized alliances between elite families rather than dominance and subjugation (Winter 1997).

It is possible that the power situation of Teotihuacán influenced the political instability of the Valley of Oaxaca (Lind 1994). When Monte Albán lost its central position due to its relationship with Teotihuacán (Period IIIA or Pitao phase), other communities became independent without the tributary obligations. Consequently, Monte Albán consolidated its power through activities such as the ball game, human sacrifices and direct control over the rest of the communities. The social stratification structure was maintained through intercommunity alliances between the families of the elite. This organization was more successful and flexible than the central power that Monte Albán had in periods I and II (Winter 2001).

This chapter offers a theoretical framework to put into geographical, environmental, historical and archaeological context the faunal remains studied in this dissertation. This information will be useful to relate species identified in the zooarchaeological sample and subsistence patterns detected during different periods of time, to the urban evolution of Monte Albán, its power and control over the Valley of Oaxaca. The next chapter will explain in detail the methodology and criteria used for the study of the animal bones that formed the focus of this research.

CHAPTER III

METHODOLOGY FOR THE STUDY OF FAUNAL REMAINS FROM MONTE ALBAN

This chapter presents the concepts and criteria considered for the identification of the zooarchaeological sample from Monte Albán. Some cultural alterations on bones usually take place at the time of animal death as a result of hunting or slaughtering. Other alterations occur after the death of the animal and before it has been buried such as: skinning, dismembering, defleshing, transporting a carcass, and cooking. Natural taphonomic agents can also affect bone assemblages such as scavenging by other species. Finally, animal bones can be subjected to a wide variety of disposal practices ranging from casual to ritual.

In some occasions, human action produces similar marks on bones to those caused by natural process. It is important for archaeologists to distinguish between both actors in order to infer human behaviour. Therefore, in this chapter biological and physicochemical agents that affect bones were also taken into account. A brief discussion of each topic will be presented describing all diagnostic characters and marks produced by different taphonomic processes.

Materials and Methods

As mentioned in the previous chapter, the faunal assemblage considered for this dissertation was collected during the excavations directed by Dr. Marcus Winter as part of the special project of Monte Albán (PEMA by its initials in Spanish) in 1992-1994. The animal bone sample corresponded mainly to Pe (440-200 BC), Nisa (200 BC- 200 AD) and Pitao (200-600 AD) phases. The archaeological contexts included households and public spaces. Garbage deposits and fires associated with domestic units were excavated and presented valuable information about subsistence practices. The sample offered an occasion to study different periods and occupation areas of the site. The households were located in W1, W2 and A3 Areas. The North Platform (PNLP by its initials in Spanish) Area was considered as a public space.

The zooarchaeological material offered the opportunity to obtain information about the elite diet and other animal uses apart from food (ritual, symbolic, adornment, company and raw material for elite attire or bone tools). This is the first time that a study of this kind is performed for Monte Albán, in order to find out how the inhabitants survived, what food resources were part of their diet and what kind of habitats were exploited. The present dissertation will contribute to a better understanding of the relation between Monte Albán inhabitants and their environment, the symbolic meaning of animals and their diverse uses.

In order to control the origin of archaeological materials, each excavated area received an arbitrary assignation (for example, A Area, B Area) or a descriptive (for example, North and South Platforms). The excavation units in an area were registered horizontally as excavation trenches, pits, features (fires, garbage deposits and tombs), structures, rooms, and vertically as natural and cultural layers and/or arbitrary levels registering archaeological materials (pottery, lithic, bone, among others) simultaneously (Winter 1994). Each area and its location will be described in more detail in Chapter 4.

The methodology for the study of the faunal remains included the following steps that will be explained in this chapter: 1) Taxa identification; 2) Anatomical identification; 3) Age determination; 4) Quantification of the faunal remains; 5) Taphonomy agent identification; and 6) Skeletal element transportation to archaeological sites, bone survival, and anatomical patterns present in archaeofaunal assemblages. The intention was to develop working methods that took into account current research on all these topics. Therefore, the following text discusses in some detail the present state of knowledge before explaining its practical application in developing working methods for Monte Albán.

Taxa identification

The first step was to separate the material into different groups of vertebrates: fish, amphibian, reptiles, birds and mammals. Three categories were established for the group of mammals when bones were very fragmented and identification to species level was not possible: big as deer; medium as dog or peccary; and small as hare, rabbit or rodents. Non-identifiable specimens were counted and taphonomic agents such as weathering, rodent and carnivore gnawing, burning, cut marks, percussion marks or type of fractures, were registered too. The identification of the faunal sample of Monte Albán was partially undertaken using the reference collection of the Archaeozoology Laboratory "M. in C. Ticul Alvarez Solorzano", of the National Institute of Anthropology and History in Mexico City (INAH by its Spanish initials), along with manuals and detailed literature (Lawrence 1951; 1966; 1967; 1968; Lawrence and Bossert 1967; Olsen 1968; 1979; 1996; Gilbert 1993; Gilbert *et al*. 2006).

The identification process was completed through measurements. Most mammals are characterized by their size and, sometimes, this is the main criterion to separate closely related species (Davis 1987). In order to establish differences in sizes biometric data are very helpful, due to the fact that they are more objective than human judgment, in determining if a fragment can be attributed to one taxon or to another (O'Connor 2000). Therefore, cranial and post-cranial measurements were required to accomplish the identification process and these were taken with a fauler ultra-cal digital II Vernier, following those proposed by von den Driesch (1999). When identifying closely related species such as wolf, dog, and coyote, or different kinds of deer, hare and rabbits, measurements of modern skeletons were taken from the reference collection of the Archaeozoology Laboratory "M. in C. Ticul Alvarez Solorzano", of the INAH in Mexico City, the National Collection of Mammals of the National

Autonomous University of Mexico (UNAM by its Spanish initials), and the reference collection of the Archaeozoology Laboratory of the Arizona State Museum, in Tucson.

Those measurements were compared to the archaeological sample using two methods: The first compared the highest and lowest ranges of each measurement from the reference collection to the same measurement that was taken from the archaeological sample. If the measurement from the archaeological sample fitted in these ranges the fragment was attributed to a determined species. The second method is the log-ratio technique which consists of taking a skeleton as the "standard" measurement against which the archaeological data is rescaled. However, using mean values from a number of skeletons as the standard is recommended, instead of using only one individual, which may be biased toward the extremes of natural variation (O' Connor 2007). The goal was to investigate the size and morphological variations of the reference collections, and to compare the results with the archaeological sample. Only adults were considered for this purpose. Log-ratio values were calculated using the algorithm: Log-ratio = $\log_{10}$ (observed/standard) (Meadow 1999).

Anatomical identification

This process was carried out by comparing the archaeological sample with modern skeletons from the reference collection of the Archaeozoology Laboratory "M. in C. Ticul Alvarez Solorzano", of the INAH. Recording of anatomical parts included: which element and what portion of the bone was present when it was fragmented (five categories were employed: proximal end, proximal shaft, middle shaft, distal shaft, distal end), element side and epiphysis fusion. This process aided in the quantification of the faunal remains.

Age determination

In this study, age was based on the varying degrees of bone fusion, dental eruption and ware. Age was divided into five categories: 1) undetermined, when an element showing an earlier stage of fusion was present but those of a later stage were absent; 2) adult included mandibles with teeth fully erupted and any limb-bone showing late fused epiphysis; 3) juvenile (animals in the rapid stage of growth) based on mandibles with only deciduous dentition and limb bone showing unfused early-fusing epiphysis; 4) subadult, when mandibles had some deciduous teeth and one or more permanent teeth; limb bones with unfused late-epiphyses but close to adult size; and when the line of fusion between the epiphysis and the diaphysis was very evident; 5) young (animals that might have been just born) with very small unfused bones of porous consistency.

Among the artiodactyls, lagomorphs, *Canis familiaris* and *Tayassu Tajacu* long bones, age was calculated based on the elements that fuse later, according to criteria proposed by Lewall and Cowan (1963) and Purdue (1983) for artiodactyls, Diehl and Waters (1997) for lagomorphs, and Silver (1963) for *Canis familiaris*. In the case of *Tayassu tajacu* age was based on wild boar epiphyseal fusion sequence proposed by Bridault *et al.* (2000). This study was taken as an approximation, since no information about *Tayassu tajacu* age determination was found for long bones.

Quantification of faunal remains

The quantification was done according to the number of identified specimens (NISP). This method is based on the quantification of the total number or bone fragments attributed to a specimen in a sample to estimate the relative taxa abundance (Klein and Cruz-Uribe 1984). When applying this method it was necessary to take into account if fragments were part of the same element or not, for example, if isolated teeth were associated to a mandible or, if a proximal end corresponded to a distal end, they were counted as one specimen.

The quantification also included the minimum number of individuals (MNI). In this method, the most abundant skeletal elements arranged on right and left sides (in the case that the most abundant part is a pair and not a single, such as an atlas bone) determine the minimum number of individuals corresponding to a specific taxon (Gilinsky and Bennington 1994; O’Connor 2000). The characteristics to pair a bone from the left side to that of the right side are: size, gender, and age. However, size is complex because complete bones are required (it is more common to find fragments), and the differences between adults can be very subtle (Klein and Cruz-Uribe 1984: 26-27). Due to sample fragmentation gender was not considered. The criterion used in the quantification of the material was age, based on the epiphysial fusion and size when there was a clear difference between elements.

The MNI method can only be used if an analytical unit has been established: it is possible to count the fauna remains of the site all together, or divide them into smaller units such as layers or vertical excavation units with arbitrarily defined levels (Grayson 1984). The problem with the MNI is the aggregation, since the number obtained is not arithmetical, so data cannot be aggregated. If it is necessary to add sedimentary units, it is required to physically aggregate the bone sample (O’Connor 2000). It is also important to acknowledge that grouping all the fills of a pit can still mix a lot of different formation processes. In this dissertation each residence or area was considered independently. MNI was calculated considering the excavation unit, level and phases of time. So bone fragments from the same excavation unit, level and phase were counted together. Faunal remains from features such as garbage deposits, dated from the same phase, were counted separately as a unit.

NISP calculations are influenced by differences in skeletal structure and numbers of bones between taxa, and by patterns of differential fragmentation of bone (which may in turn be modified by different taphonomic processes). In addition, the NISP method assumes that each bone belongs to a different carcass but usually this is not the case. Secondly, MNI are affected by sample size, being more accurate for large samples. Splitting of excavation units, as in the analysis of deeply stratified contexts, considerably increases MNI numbers (Grayson 1984). MNI calculations are more useful when whole animals or particular body parts have been brought to a site (Marshall 1990).

Assumptions for accurate MNI or NISP calculations, such as whole animals or derivation of each bone from separate carcasses, are unlikely to be fulfilled. So, MNI and NISP were used together to provide a range of minimum (MNI) and maximum estimate (NISP) of a relative taxa present in the sample.

A major objective in this dissertation is to compare the frequency of species, in order to detect tangible differences about taxa representation between phases and areas of occupation in Monte Albán. In the present study no specific statistical hypothesis has been tested. Furthermore, the aims of the research are merely descriptive: to find out about the kind of fauna resources used by the population; the habitats that were exploited to obtain food; if species were included in the diet were local or brought from further afield; to propose different uses besides subsistence such as ritual, symbolic or functional, of the identified taxa, through comparisons with other Mesoamerican cultures. This research, like any other academic work, can generate other questions and hypotheses during its development, which could justify the use of statistics in the future. However, the priority now is to fulfil the initial objectives established in the beginning of this dissertation.

Taphonomy agents

The taphonomic agents were recorded examining each bone fragment carefully with the stereoscopic microscope. Taphonomic studies are focused on two intervals: from the moment the animal dies until the incorporation of the bone to the ground, and the time it remains buried until it is exposed again (Johnson 1985; Shipman 2001; Denys 2002). Taphonomic groups (taphofacies) bring together all the animal remains that went through the same processes and establish how and why each bone or another animal fragment is present at the archaeological site. For example, faunal assemblages can be the result of consumption refuse, workshop or manufacture refuse, remains of complete carcasses or intrusive animals not intentionally brought to the site, just to mention a few (Gautier 1987). The taphonomic processes included physicochemical, biological, and anthropic agents.

Among the physicochemical agents we find:

Weathering. It produces the change in the physical and chemicals properties of the bone structure (Johnson 1985). Weathering can be caused by consecutive exposure to heating and cooling and wetting and drying. Bones in mobile sand or earth contexts such as those exposed to erosion, are often re-exposed and re-buried; this cycle contributes to weathering of the assemblage too (Conard *et al.* 2008). Due to weathering, organic and inorganic components are separated and destroyed by physical and chemical agents that work on the bone *in situ*, either on the surface or in the ground (Behrensmeyer 1978). The effects of weathering on bone remains become apparent as bleaching, cracks, splits, exfoliation, disintegration, and decaying marks (Fig. 33) (Fisher 1995; Bass 1997).

Fig.33. Weathered deer pelvis (Level 2, after Behrensmeyer (1978): bleached with exfoliation) (sample from La Playa archaeological site).

Progressive cracking, splitting and exfoliation could cause complete and more or less rapid bone destruction (Denys 2002). The weathering categories used to identify the zooarchaeological material from Monte Albán were those proposed by Behrensmeyer (1978: 152-153). Level 0: no cracks are detected; Level 1: the surface starts cracking; Level 2: areas of exfoliation begin to show; Level 3: flaking can be observed as a result of the layers that have become separated; Level 4: the surface has a fibrous texture and splinters can be observed; Level 5: the bone can fall apart, it shows parts with missing splinters and cracks are deeper. These categories apply for sub-aerial weathering not in-ground diagenesis.

Behrensmeyer (1978) suggests that the anatomical parts of the skeleton do not weather at the same rate. According to Gifford (1981), weathering rates vary significantly among taxa because they have different bone structure: equid bone remains show a slower weathering rhythm than bovids, probably as a consequence of a more dense and robust bone structure. Natural porosity varies not only between different animal species but also within juvenile and adult individuals (Robinson *et al.* 2003). Behrensmeyer (1978) also proposes that subaerial microenvironment of a bone can inhibit or exacerbate the weathering index. Rates of weathering progress vary also depending on local conditions (Stinner *et al*. 1995). Size and density of the vegetation are important variables to take into consideration (Behrensmeyer 1978). For example, weathering crack formation is slower in the rain forest than in open savannas. In the forest, shelter from sunlight is a crucial factor for better bone preservation conditions, creating little temperature or humidity variation during the day. The ultra violet rays of sunlight are reduced with shadow and bones do not become bleached white, dried out, or cracked (Tappen 1994). Moisture is also an important agent for bone deterioration (Bass 1997). Weathering index does not reflect time directly, so the condition of the bone is a very fallacious guide to its antiquity (Boyd-Dawkings 1874; Lyman and Fox

1989). The speed that bones pass from one state to another depends on three factors: the anatomic part, the taxa and the environment in which bones are found (Lyman and Fox 1989).

Roots. They cause changes in the surface of the bone through secreted acids (Behrensmeyer 1978; Johnson 1985). Roots may destroy bone by splitting and increasing the porosity, and by enlarging osteocyte lacunae (Denys 2002). It is not possible to know how long it takes a root to be in contact with bone and to make a groove. Also, it is not known if different species of plants take the same time to leave marks on the bone surface (Lyman 1994: 377). This agent can be distinguished from cut marks because of its irregular morphology, the incoherent pattern and the U shape observed in cross section (Fig. 34) (Johnson 1985; Fisher 1995). Root etching sometimes shows as linear arrangements of closely spaced pits or as pits isolated from each other. This latter pattern can be confused with pitting caused by other processes. However, isolated pits formed by root etching will appear with characteristic sinuous linear features in other areas of the specimen (Fisher 1995).

Fig.34. Deer pelvis with root marks (sample from Monte Albán archaeological site).

Among the biological agents we find:

Trampling. It can be defined as “the pressure exerted by the transit of biological agents on the sediments and the remains left there” (Blasco *et al.* 2008: 1605). Animal bones left on the surface for a long period of time risk being trampled by mammals. Bones can be broken or buried in the sediment, so gravel and sandy soils create friction leaving shallow, subparallel scratches or cortical striae on the bone shafts. Trampling can cause fragmentation and/or shift of remains both horizontally and vertically (Fiorillo 1989; Denys 2002).

Other non-biological agents can also produce dragging or sediment movements and leave similar marks on animal bone surface (Fisher 1995). However Blasco *et al.* (2008) found that small notches on oblique fracture angles of some bones are useful evidence to identify the action of trampling on bones. According to their experiments, notches usually are isolated or can appear consecutively in groups of two or three, surface striae may be present or absent. These authors have also found that dry and semi-dry bones and those situated at surface level or half-buried were the most susceptible to trampling processes (Blasco *et al.* 2008).

Short-time exposure to trampling can produce marks with internal striae similar to cut marks. At the same time, trampling marks without internal striae could be difficult to differentiate from cut marks that have lost this kind of evidence (Domínguez-Rodrigo *et al.* 2009). Research on this topic proposes a list of variables based on morphological properties and structural features of marks inside grooves and outside them but associated (Behrensmeyer *et al.* 1986; Domínguez-Rodrigo *et al.* 2009). Some of these variables include the following characteristics: 1) Trajectory of the groove. Marks can show a straight, curvy or sinuous trajectory; butchery marks are in general straights grooves. In contrast, straight trampling marks observed under magnification show a wavy trajectory; 2) Orientation of the mark relative to the axis of the bone. The orientation can be parallel, perpendicular or oblique to the axis of the bone (Domínguez-Rodrigo *et al*. 2009). Trampling marks would not show preference in orientation, whereas butchery marks would be oblique or perpendicular to the axis of the bone (Behrensmeyer *et al.* 1986); 3) Number of conspicuous grooves present in a bone specimen. According to Behrensmeyer *et al.* (1986), cut marks appear in lower numbers per specimen than trampling marks; 4) Micro-striations trajectory. It can be continuous (when it extends along the trajectory of the groove) and discontinuous (when micro-striations are interrupted inside the groove). A tool is more likely to create continuous micro-striations due to uniform friction with bone. A trampling mark is more likely to create discontinuous micro-striations if friction forces sediment particle to move inside the groove (Domínguez-Rodrigo *et al*. 2009). Domínguez-Rodrigo *et al.* (2009) found that cut marks made with simple flakes are deeper than trampling marks and narrower than tooth mark scores. One way to recognize non-intensive trampling in prehistoric bone assemblages could be the absence of polish (Domínguez-Rodrigo *et al.* 2009). According to Domínguez-Rodrigo *et al.* (2009), prolonged exposures to trampling reduce the similarities between trampling marks and butchery marks.

Carnivores. Their scavenging results in bone disarticulation, which exposes remains to other types of damage such as weathering, and reduces assemblages into smaller and more easily dispersed units (Haglund 1997a: 367). However, ethnoarchaeological experimentation has shown that bones are not scarred when gnawed, only when the meat has been removed (Kent 1993). Carnivores can also accumulate and fracture bone remains in a similar manner to humans (Gutierrez 1998; Elkin and Mondini 2001). In order to find the marrow and nutrients, canids and large felids gnaw at long bones on the joint areas, vertebrae, phalanges, carpals and tarsals (Fig.35) (Haynes 1983; Gifford 1989; Denys 2002; Pobiner 2008).

Fig.35. Proximal ulna chewed by a carnivore (sample from Monte Albán archaeological site).

Carnivores use incisors, canines, premolars and molars in chewing bones, teeth which differ in their size, shape and acuteness of cutting edges (Shipman and Rose 1983).The main changes produced by carnivores in bones considered in the sample from Monte Albán were: punctures (produced by canine and carnassial teeth, when the bone collapses and they appear as round incisions in thin portions of the bone) (Fig.36), pits (indentations caused by tips of the teeth when there is insufficient strength to penetrate the surface) (Fig.37), teeth edges or notches (fractures due to gliding of the tooth), scoring (Fig.38) (produced when the teeth slip and drag over compact bone; shafts of long bone are the most common areas of these linear and parallel scratches oriented transverse to the long axis of the bone) and furrows (channels in bone produced by cusps of cheek teeth which extend from the ends of long bones longitudinally into the marrow cavity) (Binford 1981: 44; Perez 1992; Haglund 1997a). Once articular surfaces of long bones are removed, there is a progressive reduction of shaft until the bone is totally destroyed. Punctures and pits are commonly located short distances from the edges of damage. Scoring is most frequently found on surfaces near the ends of larger compact bones (Haglund 1997a).

Fig.36. Distal femur of deer with a puncture (sample from Monte Albán archaeological site).

Fig.37. Distal radio of deer with a pit (sample from Monte Albán archaeological site).

Fig.38. Canid vertebra with carnivore scoring marks (sample from La Playa archaeological site).

Canids and other carnivores develop the upper fourth premolar and lower first molar or carnassial teeth which are blade-like and shear against each other to cut through meet or skin (Miller 1969; Haynes 1983). According to Haynes (1983: 165) "when carnivores bite down on bone, which deforms under pressure only up to a point, the teeth leave impressions as pits in the bone surface. When the animal moves its teeth on the bone, the impressions may be in the form of furrows, scratches or incisions. On epiphyses, cheek teeth may be used to grind or shear off trabecular or thin compact tissue, creating groves where the cusps pressed deep into, and moved through the tissue". Furrows of this kind may be similar to those produced by stone, metal or bone artifacts which have relatively low-angled edges (Haynes 1983). However, deep perforations caused by carnivores can be distinguished from those produced by human beings. In most cases the periphery of the second kind of perforation is smooth and in its interior lines oriented to the direction of the tool that caused them can be observed. Holes made by carnivore canines have a rough line with few fractures on the periphery (Miller 1975). On bones such as epiphyses, pelvis, vertebrae, carnivore tooth marks often show compact surface bone crushed down into the underlying cancellous bone (O´Connor, personal communication, 2014).

Developments of techniques have found a way to identify carnivore taxa that have modified bone surfaces according to tooth pit size (length and breadth), tooth morphology, cusp spacing, tooth pit distribution, location in bone section and element (Domínguez-Rodrigo and Piqueras 2003; Coard 2007). For example, small pits close together are a good indicator of a small mammal. Large carnivores may also produce small pits; however, space between pits will differ because of tooth morphology and dental configuration. Equally useful are the space between individual tooth scores within multiple series of scores. A wider tooth will also leave a wider score mark (Coard 2007: 1681-1682). This identification can only be achieved when comparing small-sized and large sized-carnivores (Domínguez-Rodrigo and Piqueras 2003). Tooth mark morphologies also vary depending on species, since they use different teeth when chewing bones (Pobiner 2008). In archaeological contexts, the identification of carnivore activity requires more consideration than tooth pit evidence alone. Taphonomic analysis should include skeletal part representation and patterns of damage, as well as information about depositional environment (Coard 2007).

*Rodents***.** Rodent marks are parallel, wide, shallow grooves with a flat bottom as a result of the action of incisive teeth (Shipman 1981; Johnson 1985; Klippel and Synstelien 2007). This agent can be distinguished from carnivores by its characteristic parallel series of furrows created by the incisors usually found on the margins of damage areas (Fig.39) (Haglund 1997b; Pobiner 2008). Rodent damage soft tissue in layered destruction and scratch marks are absent beyond affected areas. In contrast, canid marks in soft tissue often appear with claw-induced, linear, scratch-type abrasions or puncture marks from canine teeth beyond affected margins (Haglund 1997b).

Fig.39. Long bone fragment with rodent marks (sample from Monte Albán archaeological site).

It is sometimes difficult to distinguish, macroscopically, between the marks of rodents and those of the scraping of cutting tools using the shaft edge on the bone surface perpendicularly to its axis. Both are wide, shallow, and create a broad area of transversal streaks that usually overlap. Nevertheless, the edges of the marks in the first case are well defined, while those in the second are not as marked and more rounded (Blasco 1992).

Rodent parallel channels are not always found. In trabecular bone or anatomic parts such as metacarpals, metatarsals and phalanges where the shaft cortex is extremely thin striae may be absent. Patterns produced by rodent gnaw marks differ depending on chewing behaviour, the number of chewings, and if the bone is fresh, weathered and degreased, trabecular or compact. Multiple gnawing may be observed as a series of parallel marks, “fan-shape patterns”, or totally disorganized striae overlying each other (Haglund 1997b: 405).

Among the anthropogenic agents we find:

Cut marks. The way an animal skeleton is disarticulated is an important datum. When human beings butcher a prey they usually modify bones. An animal is hunted frequently to obtain certain resources, such as energy (meat, marrow, and fat for eating), raw material for tools (bones, horns and teeth) and clothing or shelters (skin, fur, and tendons) (Shipman and Rose 1983; Lyman 1994). In general, tools are used to obtain many of these resources, so cut marks may be present on animal bones for a variety of reasons, not only for meat eating (Shipman and Rose 1983).

The term “butchering” may have many connotations. In this dissertation it refers to Lyman´s (1987) and Seetah´s (2008) definition which is related to the range of processes employing implements of reduction and modification of an animal skeleton by human beings, into parts not only for food. Even though transport can occur between different actions of this activity, technically it is not part of this process. Cooking and eating are not included either. Actions involved in this activity have been called butchering processes or techniques and the result butchering patterns (Lyman 1994).

Binford (1978: 48) states that butchering not only implies one act but a series of actions that start once the prey is killed and continue until it is discarded or consumed. The term “series of acts” used by Binford (1978: 48), refers to individual actions, while the term use by Seetah (2008: 137-138) includes not only individual cuts but also incorporates several techniques and principles. This means that disarticulation of a carcass through a series of processes will depend on its ultimate use. It is necessary to see the butchery procedure as a continuum instead of individual actions (Seetah 2008). As in lithics the term *chaine operatoire* refers to a continuum in different chronological steps to produce an artifact (Soressi and Geneste 2011). Researchers should try to understand the order and sequence of cut marks based on experimental approach (Seetah 2008: 138-139).

So, cut marks are the result of: taking off the skin, separating the anatomical parts, cutting off the meat of animals and in some cases, removal of periosteum. They show a V-shaped channel with parallel striations oriented longitudinally, when produced by stone tools (which does not occur when rodents or carnivores produce them) (Binford 1981: 47; Fiorillo 1989; Blasco 1992; Abe *et al*. 2002). Cut marks are sometimes difficult to detect when sub-areal weathering and diagenetic processes take place (Koon 2010). A criterion of cut mark identification involves specific location within the anatomic parts and the reason or function of why a mark occurs where it does. Another criterion is to identify the patterns of the cut marks on the skeleton (Lyman 1987).

Skin removal marks are observed in bones with little meat such as: distal part of the radio-ulna and tibia or proximal part of metapodials and phalanges, and the cranium (at the antler or horn base, less common around ears and mandible). This kind of taphonomic agent appears generally surrounding the bone fragment involved (Binford 1981). Bone disarticulation produces more marks than skinning: it takes place in all the articulation areas of the skeleton (for example proximal and distal epiphysis) (Binford 1981; Blasco 1992) (Fig. 40). When butchers deal with a complete skeleton or limbs where meat is the final objective, it is easier to leave the anatomical parts articulated (Binford 1988). Some skinning and filleting marks are frequently grouped in diaphysis and epiphysis under the articulations or in areas of muscular insertion. These marks are short and deep, and can be a consequence of muscle removal in the areas with less meat (Binford 1981; Blasco 1992). The categories to classify cut marks found on bones from Monte Albán followed the categories and criteria mentioned above.

Fig.40. Calcaneus with disarticulation cut marks (after Binford 1981) (sample from Monte Albán archaeological site).

Marrow cracking is most easily done with disarticulated anatomical parts. After bones have been cleaned of skin and meat, disarticulation can be done with few cuts. Dismembering limb bones would be more related to marrow extraction than to meat recovery, which can be done more easily when limb bones are disjointed (Binford 1988). Cleaning bone surface to make percussion easier (in order to extract marrow) leaves marks of periosteum removal or scraping in the middle of the epiphysis. These marks differ from those of filleting because of their location and shape (fine, multiple and parallel striations) (Binford 1981; Shipman *et al.* 1984; Bunn and Kroll 1986; Blasco 1992).

Zooarchaeologists use two different approaches to record cut marks. The first consists of counting and describing cut marks in a database. This can be done on a general level (number on a specimen) or on a specific level (location in the specimen). The second uses a diagram to draw cut marks (Fig.41). These approaches can be combined. Once cut marks are recorded, it is necessary to choose a way to quantify and analyse the data. This process becomes quite problematic due to the wide variation in convention. One method of quantifying cut marks consists of diagrams, using drawings of skeletal elements (diagrammatic method). Many analysts prefer to count the number of fragments with cut marks, without considering the number of cut marks on each fragment (fragment-count data). Others count the frequency of cut marks on specimens within a skeletal element, or within a specific region (such as the proximal end or the

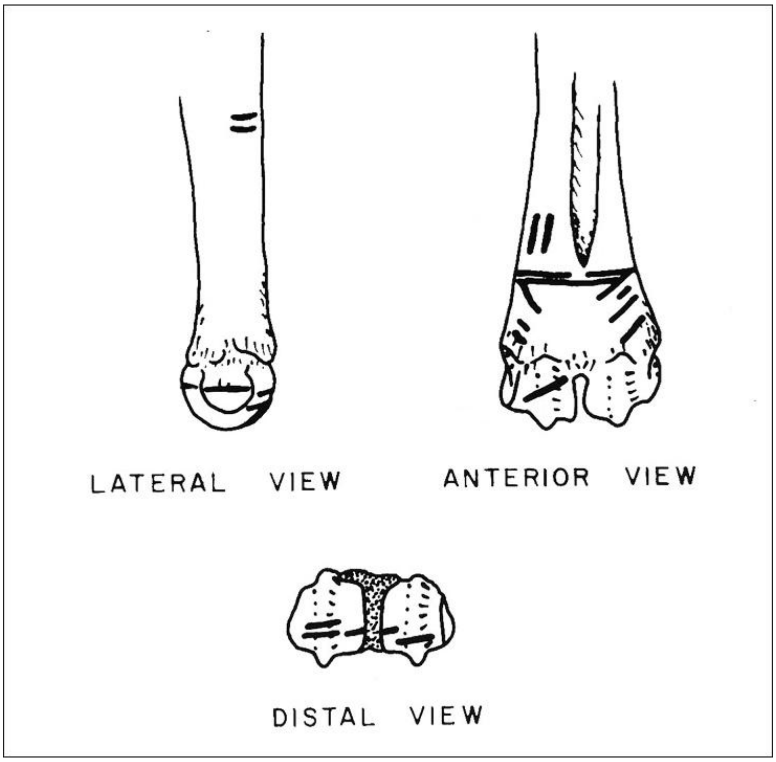


Fig.41. Locations of cut marks (after Lyman 1994:310).

middle shaft) (cut mark-count data). These approaches provide different types of data and are not comparable. When levels of fragmentation differ between assemblages, cut mark values cannot be compared (Abe *et al.* 2002). More fragmented assemblages show lower cut mark percentages. Likewise, assemblages with a better surface preservation would have higher percentages of cut marks. The degree of carnivore ravaging is also a relevant factor in the variability of cut mark frequencies in faunal assemblages (Domínguez-Rodrigo and Yavedra 2009). It is important to consider technology (for example, stone versus metal implements). Cut marks are more abundant when made with stone tools than with metal. Similarly, tools with less sharp edges require more force when used and tend to leave more marks on the bone (for example obsidian and flint). Also, the availability of storage facilities, cooking vessels, cooking techniques ("joints of meat to roast on a fire, segments of bones and flesh to boil in a pot, boneless cuts to be sliced and dried as jerky, or manageable and quickly frozen segments for winter storage") (Gifford-Gonzalez 1993: 185), the need and desirability of marrow (which varies with bone element, species, sex and season), distance of large prey from the camp or site, socio-cultural and economic factors influencing bone fragmentation levels, cut mark frequency and type of cut marks (such as hack marks resulting from a heavier tool) (Gifford-Gonzalez 1993: 185; Abe *et al.* 2002; Lyman 2005; Outram *et al.* 2005; Dewbury and Russell 2007; Seetah 2008; Domínguez-Rodrigo and Yravedra 2009). The method of recording cut marks used in this dissertation consisted of counting the number of elements or fragments with this evidence and its location on the bone.

Fracture patterns. It is common that during the zooarchaeological analysis fragments that cannot be assigned to a skeletal element or taxon are classified as indeterminate and are considered as less important to be studied. However, there is much information to be obtained from these fragments (carnivore and rodent knowing, burning, butchery and modern breakage). For bone marrow and grease exploitation studies it is useful but not crucial to identify element and taxon. What it is more important to know is the fragmentation pattern in terms of bone fat utility. Also, the cause of fragmentation needs to be assessed. Shaft fragments (determinate or not) maintain their fracture surfaces (Outram 2001).

Fat exploitation within subsistence economies can be critical, especially when they depend upon animal products (hunting or pastoral groups) due to the limited availability of carbohydrates (Outram 2002; 2003; 2004). Dietary fat can be found in different sources (plants, nuts and meat) but one of the purest forms is within bones (marrow fat and bone grease). Even when animals are lean, their bones will still have a little marrow or fat (Outram 2003). If the aim is the study of animal fats archaeologically, it is essential to focus on specific patterns of bone fragmentation and type of fractures. Bones are preserved in most archaeological assemblages and the pattern associated to fat exploitation is easy: the bone´s medullary cavity has to be broken while in a fresh condition. Evidence of this activity will be a pattern of undamaged articulations and axial elements with helical splinters of diaphysis bone (Outram 2003; 2004).

Bone grease refers to bone fat, similar to the fat located in medullary cavities, but is found within the structure of the bone. The articular ends of long bones or the axial skeleton consist of trabecular bone with fat within its structure. Fat can be extracted by breaking the bone into small pieces and boiling them. The fat will come to the surface when it cools and solidifies (Outram 2004). The resulting pattern will consist of large numbers of very small pieces of trabecular bone accompanied by larger, helical, shaft splinters (Outram 2003; 2004).

The choices people make about which types of bones are processed and how much of the bone is used reveal subsistence economy and the degree of dietary stress (Outram 2004). This can be detected by the fragmentation level of different kinds of bones (measuring bone fragments and identifying diaphysis, epiphysis, axial or unidentified), the fracture patterns in the assemblage (shape, angle, texture, in order to determine if a fracture is fresh or dry) and a wide variety of taphonomic agents which can also break bones (such as post-depositional factors) (Outram 2002; 2003; 2004).

Hammerstone percussion of skeletal elements is also considered butchery, but it has a different goal which is to obtain marrow or to make grease rendering by boiling easier (Abe *et al.* 2002). “Breakage due to pre-depositional human behaviour is often obscured by breakage due to post-depositional factors, such as trampling or profile compaction, carnivore gnawing and recovery bias” (Cruz-Uribe and Klein 1994: 38-39). So, an important issue is to identify if the fractures found in the bone remains were produced by humans, or if they are the result of the action of natural agents. Humans usually break bones in different manners, but almost all require the use of a dynamic load (Lyman 1994). According to Johnson (1985), there are two mechanics that can fracture bones: 1) dynamic load which focuses on the impact on the bone (an object creates a contact point by hitting the bone), and 2) static force produced by an overall pressure.

Research on this topic found marks on bones that are a consequence of human action: the point of impact or point of load is an area with a circular or oval-shaped hollow with a notch in the point of contact (Standford *et al.* 1981; Johnson 1985); notches are “semicircular to accurate identations on the fracture edge of a long bone”; the force of a dynamic load moves a single bone flake or series of flakes, leaving a negative scar through the thickness of the bone and onto the medullary surface (Capaldo and Blumenschine 1994: 730); hackle marks are curved discontinuous grooves or streaks; the ribs consist of continuous semicircular or concave streaks in relation to the origin of the fracture (Johnson 1985) (Fig.42); other evidences include flake and chopping scars (Lyman 1987) and associated percussion pits (Blumenshine and Slevaggio 1988).

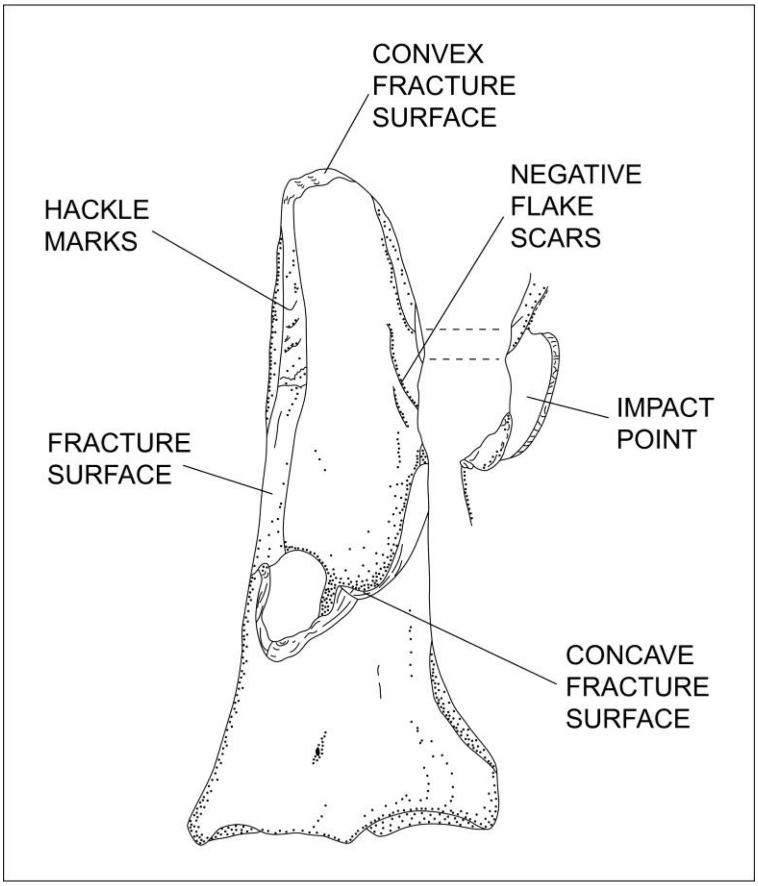


Fig.42. Surface characteristics in bone fractures (after Lyman 1994:323).

Pits and grooves are usually associated with shallow micro-striations oriented approximately transverse to the long axis (Blumenshine and Slevaggio 1988; Domínguez-Rodrigo 2009). Percussion micro-striations are shallower, narrower, and usually shorter than stone tool-cut marks and appear in dense unidirectional patches. They are also different from scraping marks, created while removing periosteum before breakage, which are longer and oriented 15° parallel to the long axis bone and from trample marks, which are longer and do not have a uniform or predictable direction. These distinctions are relevant in order to detect percussion marks, and are unambiguous when considering the anatomical location (Blumenshine and Slevaggio 1988).

Notches created by hammerstone have larger dimensions from cortical view than from medullary view. Notches generated by carnivores show the opposite trend (Galán *et al.* 2009). Percussion notches have more accurate plan forms, broader negative flake scars, more oblique platform angles and are shallower than carnivore notches. Flakes removed from percussion notches are broader and have a more obtuse release angle than those removed by tooth notches which are almost perpendicular (Capldo and Blumenschine 1994). So, it is possible to distinguish when breakage is caused by a dynamic impact of a hammerstone rather than static loading of carnivore teeth (Pickering *et al.* 2005). Notch data should be used with other taphonomic evidence (notch type distribution, tooth mark frequencies, among others) to determine if bones were broken by hominids or by carnivores (Galán *et al.* 2009). Notches are very useful to detect human intervention in faunal assemblages because they are preserved longer than surface marks. Notches penetrate the entire thickness of the bone and their morphology will resist advanced stages of bone weathering, corrosion and abrasion (Capaldo and Blumenschine 1994). The frequency of percussion marks on long bones is an excellent quantitative measure of the contribution of hominids to a bone assemblage (Marean *et al.* 2000).

Cultural fractures can be caused by many activities such as butchering, disarticulation, marrow and grease extraction, when cooking and during tool manufacture. Fractures may also be produced by post-depositional processes. Therefore, different types of fractures exist, depending on the condition of the bone fragment: spiral in helicoid form in fresh bone, and in parallel or diagonal form in dry bone (Johnson 1985). According to Shipman (1981), the most common types of fractures in long bones are: longitudinal, stepped, sawtoothed, V-shaped, flaking, irregular perpendicular, smooth perpendicular and spiral (Fig. 43). Outram (2002) also proposes different types of fractures on long bones such as: helical, transverse, longitudinal and transverse, diagonal with step and columnar (Fig.44).

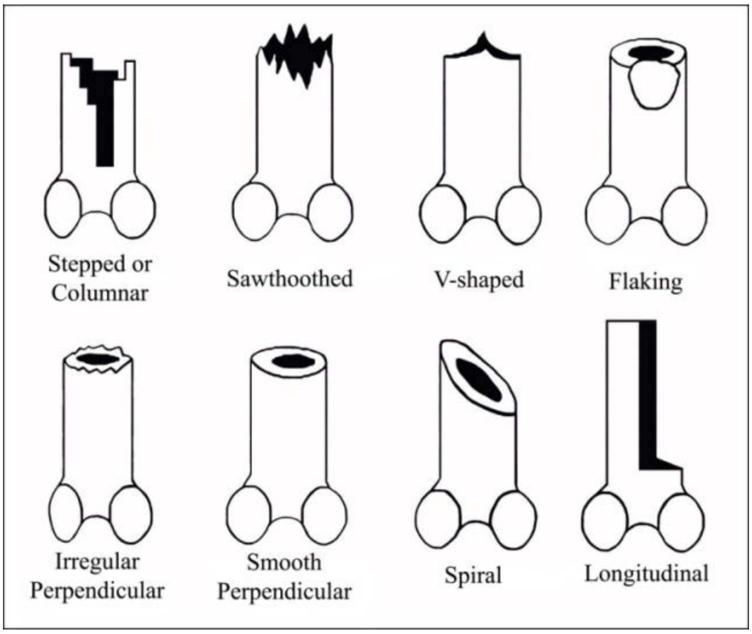


Fig.43. Types of fractures in long bones (after Lyman 1994:319).

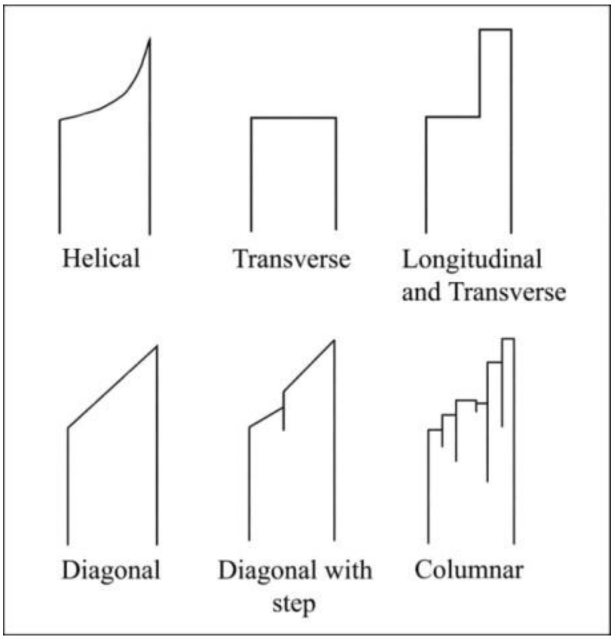


Fig.44. Types of fractures in long bones (after Outram 2002:54).

Gifford-Gonzalez (1989: 188) defines the most common type of fractures which include the following: transverse “at right angles to the long axis of the bone”, longitudinal “parallel to the long axis of the bone”; spiral “curved in a helical, partially helical, or compositely helical pattern around the circumference of the shaft". "In general, green bone will fracture, relative to its long axis, along oblique and longitudinal planes, and will preserve fracture angles that vary but are usually less than 85° or more than 95°". In contrast, "dry broken bone, will typically break along transverse and/or longitudinal planes at 90° angle" (Pickering *et al.* 2005: 251).

The typology suggested by Shipman (1981) does not indicate the condition of the bone at the time of fracture; however, Stanford *et al.* (1981), Johnson (1985) and Pickering *et al.* (2005) propose some characteristics to recognize fractures in fresh or dry bone. The surfaces of the green bone fracture have the same colour as the external cortical bone; they keep a smooth texture and form acute and obtuse angles (not only with the long axis of the bone but also with its outer surface) (Stanford *et al.* 1981; Johnson 1985; Pickering *et al.* 2005). The edges of the unfresh broken elements have a rough and uneven texture, with right angles in relation to the external cortical surface (triangular or rectangular shapes) (Stanford *et al*. 1981; Johnson 1985). On dry specimens, the fracture outline may be interrupted by micro-cracks already present in the bone, creating a step in the fracture outline. When this effect is advanced, the fracture outline may show small stepped columns. A fracture produced on purpose occurs usually when the bone remains are in a fresh condition, while broken in dry condition correspond to post-depositional events (Blasco 1992).

The spiral fracture may be curved in a partial or complete helicoid pattern, around the diaphysis circumference (Giffrod-González 1989: 188). Shipman (1981) and Johnson (1985) notice that this type of fracture may be divided in two subtypes: with rough surface and with smooth surface. The first type known as type I, is the result of dry bone. The second one is caused in fresh bone (Shipman 1981) and is produced by a dynamic load, but it does not indicate specifically that it was caused by human beings (Johnson 1985).

Myers *et al*. (1980) and Haynes (1983) found that type II fracture may be created by natural causes such as animal trampling. According to Binford (1981) carnivore gnawing can cause this type of evidence too. However, Johnson (1985) suggests that the absence of gnawing and the presence of a dynamic load point with a greater diameter than the one is produced by a carnivore tooth, may be the distinguishing feature between bones fractured by men or by natural agents.

Some taphonomic studies have discovered that bone assemblages generated by human beings produce a high proportion of fragments identified to a minimum level (Binford 1981; Bunn 1982). This pattern is the result of the interaction of two processes: 1) tools made by human beings are more efficient than carnivore teeth to break bones, and 2) the splinters produced by carnivores are digested or expelled further away from the main bone concentration, while cultural ones are discarded and become part of the archaeological context (Gifford-González 1989). Even if the unidentifiable fragment proportion could be considered to determine the cause of the fracture, other natural agents would have to be observed.

Zooarchaeologists generally expect processing intensity to be reflected by "(1) the utilization of lower-ranking carcass parts; and (2) the extraction of multiple carcass tissue (butchering a carcass not only for meat but also for marrow) and /or investment in the removal of one particular carcass tissue (filleting a carcass not only for large muscle masses but also for small flesh scraps)" (Pickering and Egeland 2006: 460-461). The number of impacts blows required to expose the medullary cavity can be used as a butcher investment to extraction marrow (Pickering and Egeland 2006). However, Pickering and Egeland (2006) found a negative correlation between the number of hammerstone blows and percussion mark frequency. The results showed that periosteum and residual musculature potentially cushioned the bones from direct blow percussion marks (Pickering and Egeland 2006).

If it were only marrow that had been exploited, it would be common to find deliberate long bone fractures. This activity would produce shaft fragments and splinters with evidence of dynamic impact when the bone was still fresh. The epiphysis would be deposited with the majority of axial elements. A different pattern would be observed if complete bones were processed for marrow and grease. Diaphysis with dynamic fracture evidence would be found, maybe some complete cylinders and shaft splinters would be present too (Outram 2001).

Taking all of that into account, for the present study, fractures types were identified using the criteria of Johnson (1985) and Outram (2002; 2004). These include fracture angles (right, acute or obtuse to the cortical surface) (Fig.45), outline shape of the fracture (longitudinal, transverse, oblique) (Fig.46), surface texture (smooth or rough and uneven) and colour. Individual fractures were classified as helical (fracture of bone in a fresh state), dry (fractured after partial loss of moisture and organic content), mineralized (broken after almost total loss of organic fraction) and new (breaks that occurred during or after excavation) (Outram *et al.* 2005). Types of fractures in long bones followed the typology of Shipman (1981) (Fig.43) and that proposed by Outram (2002) (Fig.44). The presence or absence of dynamic scars was also recorded as evidence of deliberate fracture of fresh bone (Johnson 1985; Capaldo and Blumenschine 1994; Outram 2002). All fragments were included whether identifiable or not (Outram 2003; 2004).

Burning. Burned bone is frequently found in archaeological deposits and can be related to cremations, culinary activities, waste disposal, fuel use or produced by natural fires. Bone can also be burned by the presence of a surface fire after it is deposited and buried. Bones which are burned in a subsurface context (indirect exposure) have a different appearance from bones burned in direct contact on the surface. Colour on bones affected by the radiation effect of a campfire shows continuous colours across all surfaces (Bennett 1999).

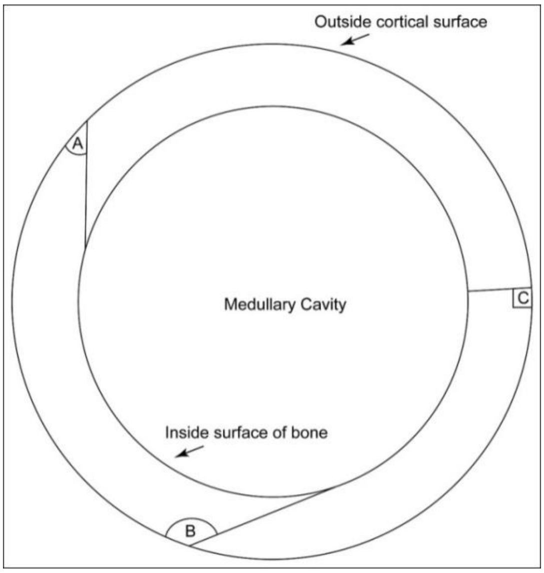


Fig.45. Three possible angles of fractures to the bone´s cortical surface: A) acute; B) obtuse; C) at right angles (after Outram 2002:55).

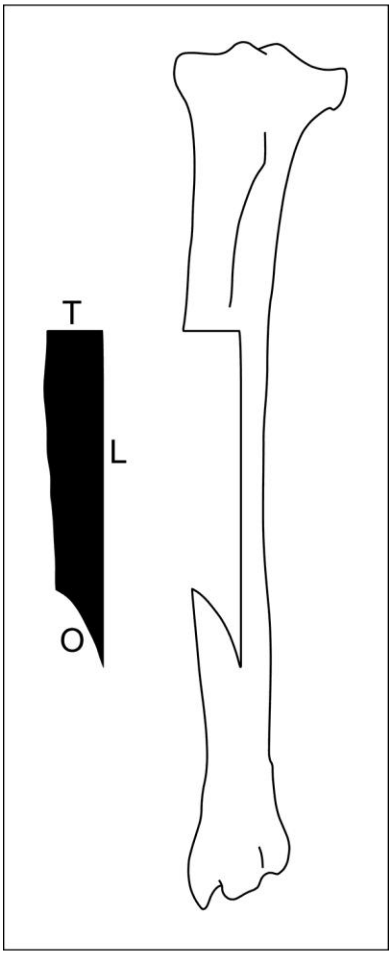


Fig.46. Longitudinal (L), transverse (T), and oblique (O) fractures planes (after Pickering *et al.* 2005:248).

Natural conditions usually carbonize bones, but rarely cacined (bluish-white or grey in colour) them: “When a large part of the surface is calcinated, it may be inferred that the cause (anthropogenic) was exposure for a long time to high temperature fire” (David 1990:75). Charring is reliable evidence to imply cooking, but it is difficult to find when the bones were boiled or covered by flesh. “This zooarchaeological evidence, along with patterns of butchery and spatial distribution of bones on a site, are commonly used to classify the faunal remains into one of the food processing stages” (Koon *et al.* 2010: 63).

The degree to which a bone fragment has been burnt is a clue for inferring the taphonomic agent (Lyman 1994:389). Bones heated to high temperatures could have been cremated or burnt as rubbish, either on purpose or by accident, while charred bone may have been the remnants of a meal (Nicholson 1993). According to Costamango *et al*. (2005) bones used for fuel always present high indices of combustion and are mostly integrated by grey or calcinated fragments. Preponderance of burned spongy parts is good evidence of bone used as fuel since they are better for combustion than shaft fragments with the marrow removed (Costamango *et al*. 2005).

Cooked bone includes three different processes: 1) burning/incineration, when bone is in contact directly with fire, or an intense heat source; 2) roasting/baking, when bone is covered by flesh, protecting bone from the heat source; 3) boiling when the bone and flesh are heated at a constant temperature maintained by liquid (Roberts *et al.* 2002: 485). Mechanical strength of bones varies depending on the extent to which the bones were burned (Stiner *et al.* 1995). Intensively boiled bone tends to disintegrate easily due to its high porosity and reduced mechanical strength, so it is less resistant to all forms of diagenetic alteration (Roberts *et al.* 2002). However, it is less exposed to scavenging damage because of its little organic content (Kent 1993; Roberts *et al.*

2002). Boiling in containers versus roasting in pits or fires increase unidentifiable bones at sites (animals had to be butchered into smaller packages to fit in the pot) (Kent 1993).

Interpretations about burned bone preservation diverge; some authors (David 1990; Stiner *et al*.1995; Costamango *et al*. 2005) agree that burned bones are more fragile when exposed to diagenetic processes and trampling than unburned bone, while other authors (Gilchrist and Mytum 1986) suggest that although the organic content of the bone can be destroyed by prolonged heating, incomplete calcinations can fortify the bone against other agents of destruction. According to Stiner *et al*. (1995) calcinated bones are more brittle and their survival would depend upon the subsequent processes that affect the assemblage.

If a bone is totally burned, it could have happened when the meat was removed, either because this was consumed before or due to an intensive incineration. If the burned area is on the epiphysis, it indicates that the event occurred when the anatomic part was covered by soft tissue (Gifford-Gonzalez 1989). However, this last inference requires that the butchering pattern is known, especially how the skeleton was disarticulated (Lyman 1994: 389). Buikistra and Swegle (1989) conclude that: 1) only the bone without meat is evenly smoked (blackened); 2) dry bone remains do not have enough organic material to be completely smoked; 3) meat isolates bone with covered areas, which maintain its colour, while exposed surfaces turn black. According to Johnson (1989), burning evidence on fractured surfaces, inside the bone (marrow cavity) or in two pieces that belong to the same anatomic part (only when it is burned), are good signs that the element was broken or disarticulated before burning.

The combustion categories depend on the degree of heat to which the bone remains have been exposed. According to Shipman and Schoeninger (1984), and Brain and Sillen (1988), bone colorations can indicate the temperature interval they were submitted to (Shipman and Schoeninger 1984; Brain and Sillen 1988). Johnson (1989) distinguishes four combustion stages: without burning, scorched (superficial burn) (Fig. 47), carbonized (black) (Fig. 48), and calcinated (blue-white) (Fig. 49). Buikstra and Swegle (1989), for their part, describe three patterns, depending on the degree of combustion: without burning, calcinated (grey, blue-grey, white) and smoked (black and some parts with its original colour). Cain (2005) also proposes some criteria to identify the colour of fragments (Table 3).

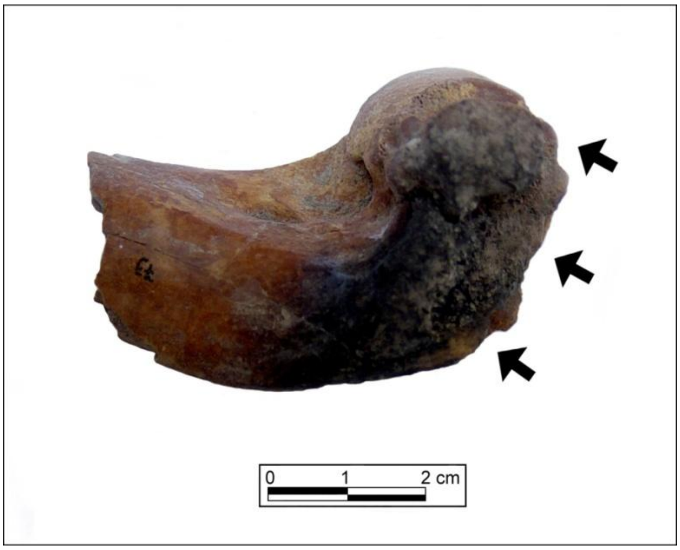


Fig.47. Scorched distal deer humerus with carnivore chewing (after Johnson 1989) (sample from Las Bocas archaeological site).

Fig.48. Carbonized deer astragalus (after Johnson 1989) (sample from Monte Albán archaeological site).

Fig.49. Calcinated distal deer metapodial (after Johnson 1989) (sample from La Playa archaeological site).

Colour	Description
Unburned	Off-White/ cream/tan
Brown	Brown/less than half carbonized
Dark brown	Dark brown/more than half carbonized
Black	Black/nearly fully carbonized
Grey	Grey/some white
Light grey	Light grey/bluish/more than half carbonized
White	Fully calcinated/white

Table. 3. Colour categories of burned bone (after Cain 2005:875).

Munro *et al.* (2007) established some range of temperatures according to bone coloration based on the Munsell Colours (Table 4). “Bone colour darkened to brown at 200 °C, and then to black at 300-400 °C, signaling combustion of organic matter and carbonization (charring) of the bone. Complete destruction of organic matter was indicated by the fading to taupe 500-600 °C. The subsequent change to light blue resulted from removal of structural carbonate between 650 and 750 °C. White calcinated bone appeared above 800 °C. Melting was observed at all temperatures, but increasingly so between 650 and 750 °C” (Muro *et al.* 2007: 94).

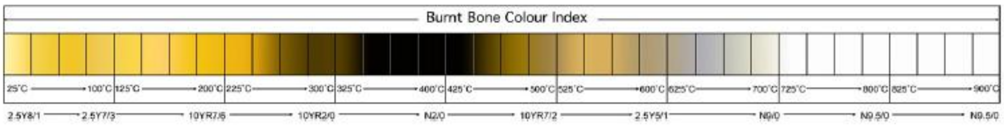


Table 4. Range of temperature according to bone coloration (after Munro *et al.* 2007:94).

Many variables are involved in bone combustion such as the position of the bone within the fire, rate at which the maximum temperature is attained, duration of the fire, amount of fat or meat on the bone, among others (Nicholson 1993). According to Costamango *et al.* (2005) the fat contained in a bone has a considerable impact on bone combustion. For example, proximal extremities which contain more fat than distal extremities present higher indices of heating. Fragmentation is another factor that affects burning. Whole extremities burn more easily than the extremities fragmented before combustion (Costamango *et al.* 2005).

Experiments have also shown that coloration of the bone is variable between vertebrates of different groups such as fish, bird and mammals. One possibility to explain colour variation at lower temperatures between these groups is the amount of organic matter within the bone: the greater the organic material in a bone, the longer the time needed to burn it (Nicholson 1993). Despite these uncertainties, colour typing is one of the most effective methods to distinguish burnt bone (Munro *et al.* 2007). So, according to Nicholson (1993) bone coloration is useful only as an indication of the temperature achieved by the specimen, and not of the temperature of the heat source. This principle also applies to bone morphology (Nicholson 1993).

The recognition of burned bones in some cases, such as burned fossil bones, can be difficult since black colour may be due not only to burning but also to staining by manganese and/or iron oxides (Brain and Sillen 1988; Shahack-Gross 1997). Burning damage on bone usually extends deep into the cortex and carbon is present (this can distinguish it from common types of mineral staining) (Stinner *et al.* 1995). Combustion of recent bones can also be identified by changes in their colour, crystallinity, and shape (Shipman and Schoeninger 1984).

The combustion stages established and ranges of temperature for the study of bone remains from Monte Albán, followed criteria established by Johnson (1989), Buikstra and Swegle (1989) and Munro *et al.* (2007). For indeterminate fragments only the numbers of burned fragments were recorded. For identified specimens, the anatomical area covered was taken into consideration. Some bones displayed different degrees of damage, so three levels were established: Level 1 indicated bones with localized burning or less than half of the surface, Level 2 showed half or more burned fragments and Level 3 when it was burned entirely.

Skeletal element transportation to archaeological sites, bone survival and anatomical patterns present in archaeofaunal assemblages

The processing and transport of large mammal carcasses provide important data. When hunters kill large animals some distance from their residence they have to take decisions on what to transport based on several costs. This situation is known as “Schlepp Effect”. These decisions would depend upon the size of the animal, the numbers of hunters and the distance to the camp. Considerations would also include the meat value of the element, taste preferences, the transportability of the anatomical part, its value for non-food raw material and if it should be transported with the soft tissues (or vice-versa). This selective behaviour would produce different patterns of refuse at kill sites or other sites (Outram 2004).

The initial costs of carcass processing are related to skinning. So, once the carcass is skinned, hunters would have to butcher and disarticulate it and transport only the selected parts. The final cost would be associated with extracting nutrients from skeletal elements (defleshing, marrow and grease extraction) (Marean and Cleghorn 2003; Faith and Gordon 2007). The utility is represented by meat, marrow or grease or the combination of all three (Marean and Frey 1997). Techniques to calculate the economic utility of animal body parts based on the weight of flesh associated with the anatomical elements have been established for large animals (Metcalfe and Jones 1988). Hunter-gatherers would generally transport high utility/high cost elements because they required considerable effort to be fully processed (Marean and Cleghorn 2003). This is possible when meat is abundant and there is no need for processing lower utility/high-cost body parts (Marean and Frey 1997). This theory can be applied only to large animals and not to small ones which could be transported complete to the site (Grayson 1989: 649).

Other studies have focused on ranking animal bones according to the amount of marrow associated with each bone and the cost in time and benefits in calories of extracting it (Jones and Metcalfe 1988). However, marrow extraction is a low cost activity and requires only a few minutes to process a bone, especially if the flesh has been removed. Costs of marrow extraction do not differ much between bones. For this reason, marrow processing costs do not have a strong influence on bone transport (Marean and Cleghorn 2003).

Economic utility is a useful tool when interpreting butchery and transport decisions based on the relative abundance of skeletal elements. However, destructive taphonomic processes (trampling, weathering, chemical leaching, carnivore modification, post-depositional alteration such as sediment compacting and burning) affect the bone frequency. So, faunal analysts should consider only those aspects which accurately reflect original abundances after humans discard bones (Marean and Cleghorn 2003; Faith and Gordon 2007).

The foraging theory needs to be linked to the realities of the skeletal element survival and taphonomic processes. Resampling techniques have been proposed to examine the impact of sample size in relation to high-survival skeletal element frequencies and economic utility (Faith and Gordon 2007). Dense elements with thick cortical walls and medullary cavities, such as long bones and mandibles, are classified as high-survival elements (Marean and Cleghorn 2003; Cleghorn and Marean 2004; Faith and Gordon 2007). The cranium, due to the presence of teeth is considered as a high-survival element when both elements are counted together. Otherwise the cranium would be a low-survival element (Cleghorn and Marean 2004; Faith and Gordon 2007). The low-survival bones include elements with thin cortical walls, low density and grease rich trabecular portions, such as vertebra, ribs, pelvises, scapulae and long-bone ends (Marean and Cleghorn 2003; Cleghorn and Marean 2004; Faith and Gordon 2007). Phalanges and small compact bones are considered part of the low density group since they are frequently consumed or swallowed by carnivores (Cleghorn and Marean 2004; Faith and Gordon 2007). So, results based on high-survival elements are the best candidates for analysing the economic decisions behind butchery and transport decisions. In contrast, the abundance of low survival elements are highly sensitive to taphonomic processes that have acted on an assemblage after human discard (Cleghorn and Marean 2004; Faith and Gordon 2007). Lyman (1984; 1985) noted that many of the high utility parts were low in density, and that many low utility parts are high in density.

Discovering that density-mediated destruction has affected a faunal assemblage is important however, it leaves human behaviour unaddressed. Studies of skeletal element abundance have provided the first method to measure utility. Unfortunately, evidence of only low utility bones has been frequently found in places such as residential sites where its presence should be unexpected (Grayson 1989; Marean and Frey 1997). When a methodology includes shafts to estimate element abundance, results are more consistent with the economic utility of skeletal elements (Marean and Frey 1997). The long bone ends are filled with trabecular bone, which the middle shaft portions lack. When bones are processed for meat and marrow and then discarded, it is the trabecular bone portions that carnivores remove to consume grease (Marean and Spencer 1991; Mondini 2002). Middle shaft portions are the densest zones of long bones (Lyman 1984). However, shaft fragments are difficult to be identified to species level, so only size category will be determined until techniques to assign shafts to species are proposed (Marean and Fey 1997).

The slaughter of a large animal in non-market societies produced much more meat than could be eaten by a family. Ceremony and feasting were efficient ways to deal with consuming the large amount of meat available when an animal is killed (McCormick 2002). Meat is widely shared in ceremonies, but through communal feasting at a single settlement. As a result bones are discarded at one rather than several sites (Marshall 1994). Therefore, it is important to consider spatial distribution of bones (Albarella and Serjeantson 2002). In some cases, it is impossible to know if an assemblage is the result of a large quantity of meat consumed in a short period or, if it is the consequence of small portions of meat consumed over a long period (McCormick 2002). Maybe in the latter case the degree of weathering would be greater. Animal bones are also useful to indicate aspects of society and status in certain sites. Since people from different ranks were present in feasts or in a site, it is important that carcass parts are distributed in a formalized fashion with specific cuts of meat for persons of different rank (Stokes 2000; McCormick 2002).

One of the objectives of this dissertation was to identify anatomical patterns of the most represented species in the sample. The intention was to see if the four areas had a similar distribution of different bones of the skeleton and to find out which elements of the hunted animals were brought to the site. The completeness of the skeleton was also considered to investigate if animals could have been transported to the site complete or if only the high meat content parts were taken. The possibility that faunal remains were the result of feasts or everyday activities was also explored. Thaphonomic processes found in the faunal assemblage from Monte Albán will be presented and discussed, in Chapter 6 (discussion). The results of the identification obtained in the Laboratory of Zooarchaeology will be shown in Chapter 5 (results). Meanwhile, in the next chapter the areas under study, where the animal bones come from, will be explained in detail in the next chapter.

CHAPTER IV

AREAS OF STUDY

This chapter describes the four areas of Monte Albán considered in the dissertation. The purpose is to show the type of contexts associated to the zooarchaeological samples, before the results are presented in the next chapter. The W1, W2 and A3 Areas consist of domestic units, so these three will be introduced first. The PNLP Area is a public space and this will be explained at the end of the chapter. Description of the areas is supported by floor plans made during the excavations of the PEMA 1992-93 archaeological project.

W1 Area

The W Area is located in the northeast part of the Main Plaza and on the east side of the North Platform (Fig.50). This area was divided into structures W1, W2 and W3. Only the first two that showed evidence of domestic units were considered in the study. The W1 Area consisted of three domestic structures built one on top of the other (Fig.51). The distribution showed a central patio surrounded by rooms with tombs and burials (found under the ground), garbage deposits and fires (Morales *et al*. 1999). The different structures were named W1-A, W1-B and W1-C and corresponded to type 2 residence or middle size according to Winter (1974). The structures were modified by enlarging some spaces, reducing or elevating rooms or steps (Morales *et al*. 1999).

Structure W1-A was the oldest residence identified in the area. This structure presented a closed pattern of rooms distributed around a patio (Fig.52). The chronology of this structure was related to the Pitao phase (200-600 AD) according to ceramic objects found in the residence. Structure W1-A was remodelled during the Xoo phase (600-800 AD) based on the objects associated with the room located in the north

Fig.50. Location of W Area in Monte Albán (after Morales *et al*. 1999:4).

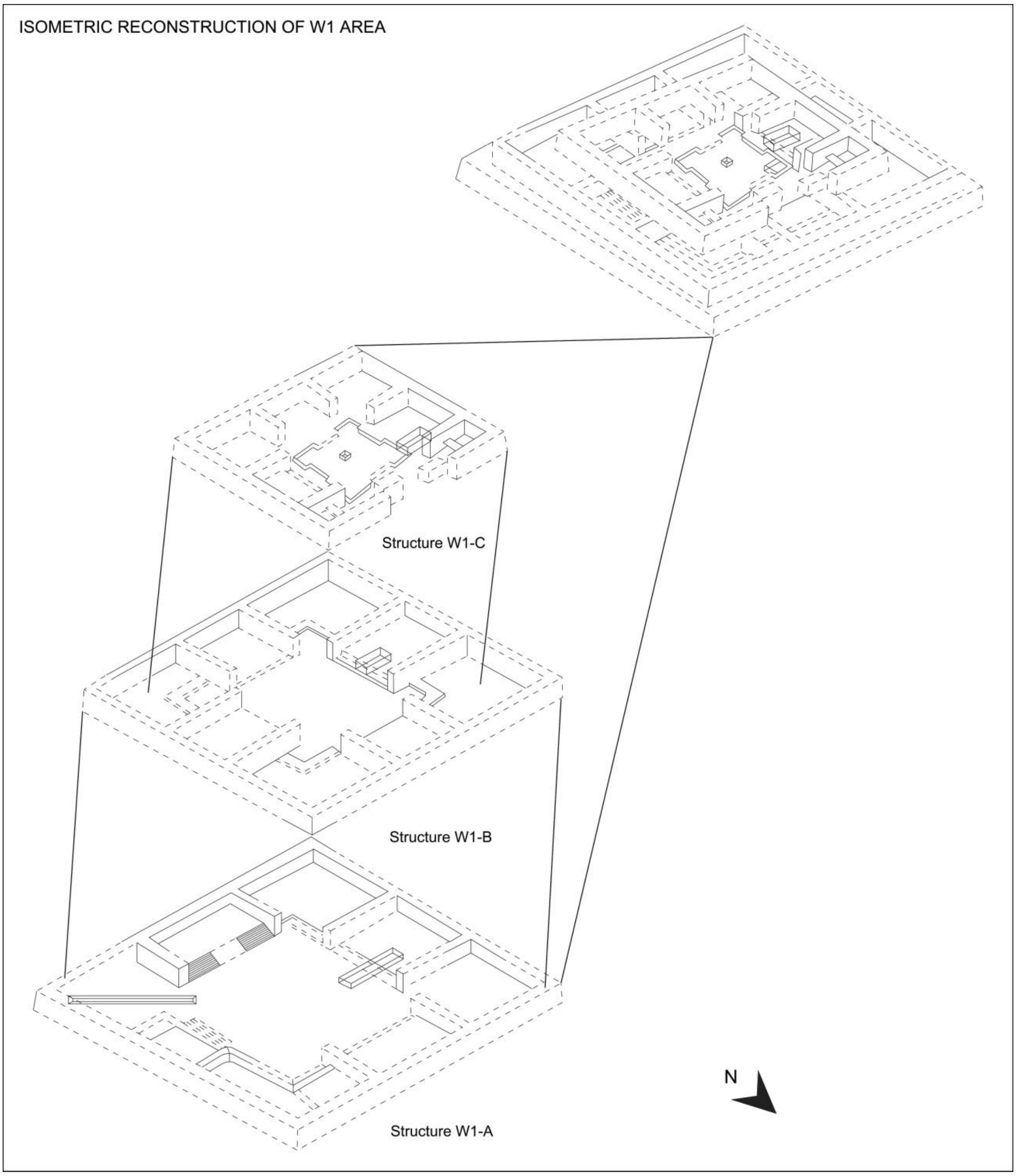


Fig.51. Isometric reconstruction of structures W1-A, W-B and W-C (after Morales *et al*. 1999:22).

part of the residence, features and floors (Morales *et al.* 1999). A garbage deposit (feature W1-14) from the Nisa phase (200 BC-200 AD), which contained faunal remains was found in the Structure W1-A.

The structure W1-B was built on top of the structure W1-A and had a central patio with stucco (Fig.53). There were rooms at the sides and corners of the patio. This residence corresponded to the Xoo phase according to the offering found in a burial

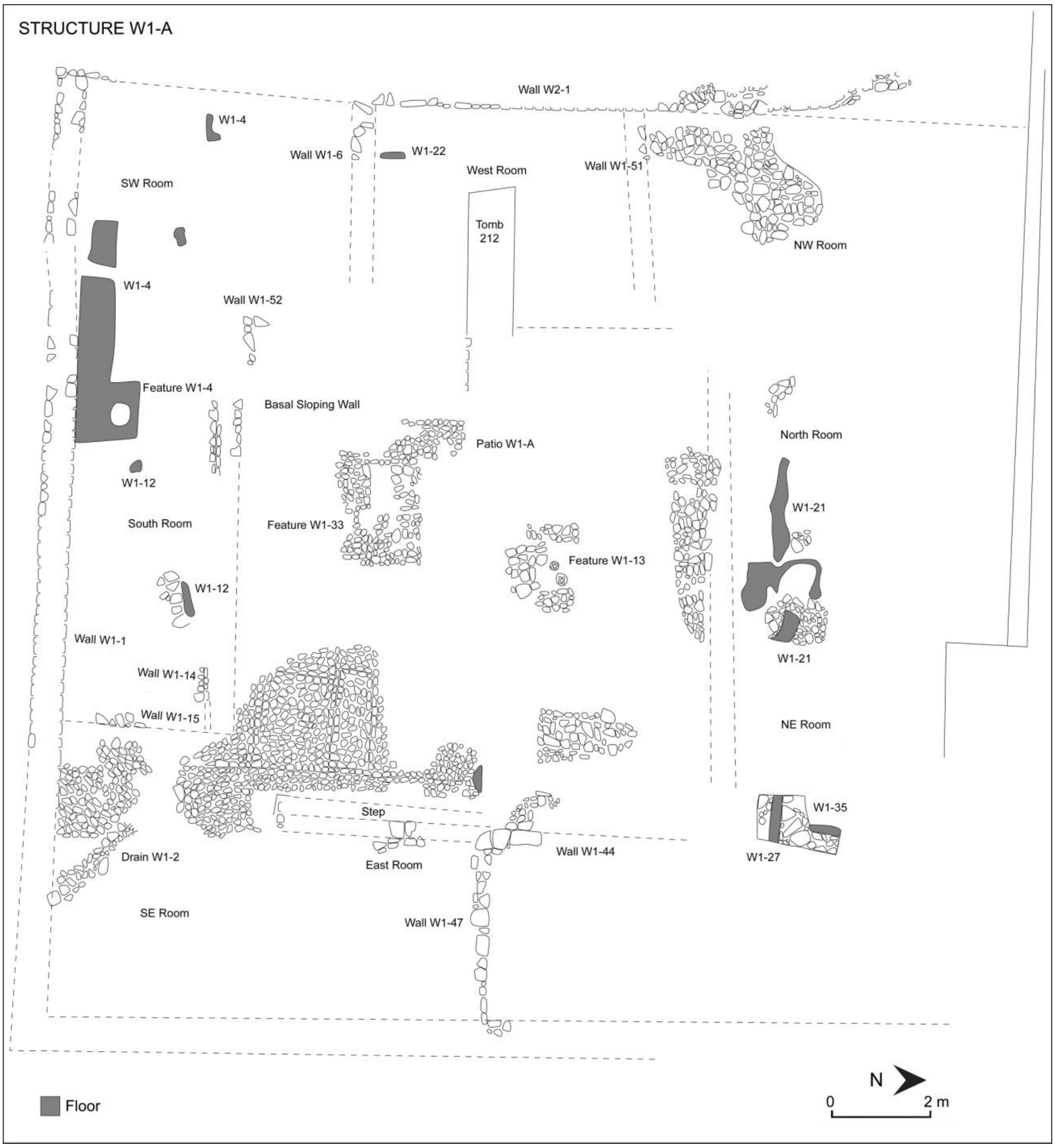


Fig.52. Floor plan of structure W1-A (after Morales *et al*. 1999:24).

(1993-17) in the patio. The structure W1-C was built on top of structures W1-B and W1-A (Fig.54). It showed the same distribution as the other two households. In the northeast corner of the patio (W1-C) there was a concentration of vessels which constituted feature W1-9 (a possible garbage deposit). Feature W1-1 consisted of another garbage deposit found in the exterior part of the wall W1-1 in the west part. Objects such as a grinding stone or obsidian blades related to domestic activities were found in the southwest room of this residence. The northwest room was as small (about 2 by 4 m) as the ones described by Lind (1998) in Lambityeco from the Xoo phase.

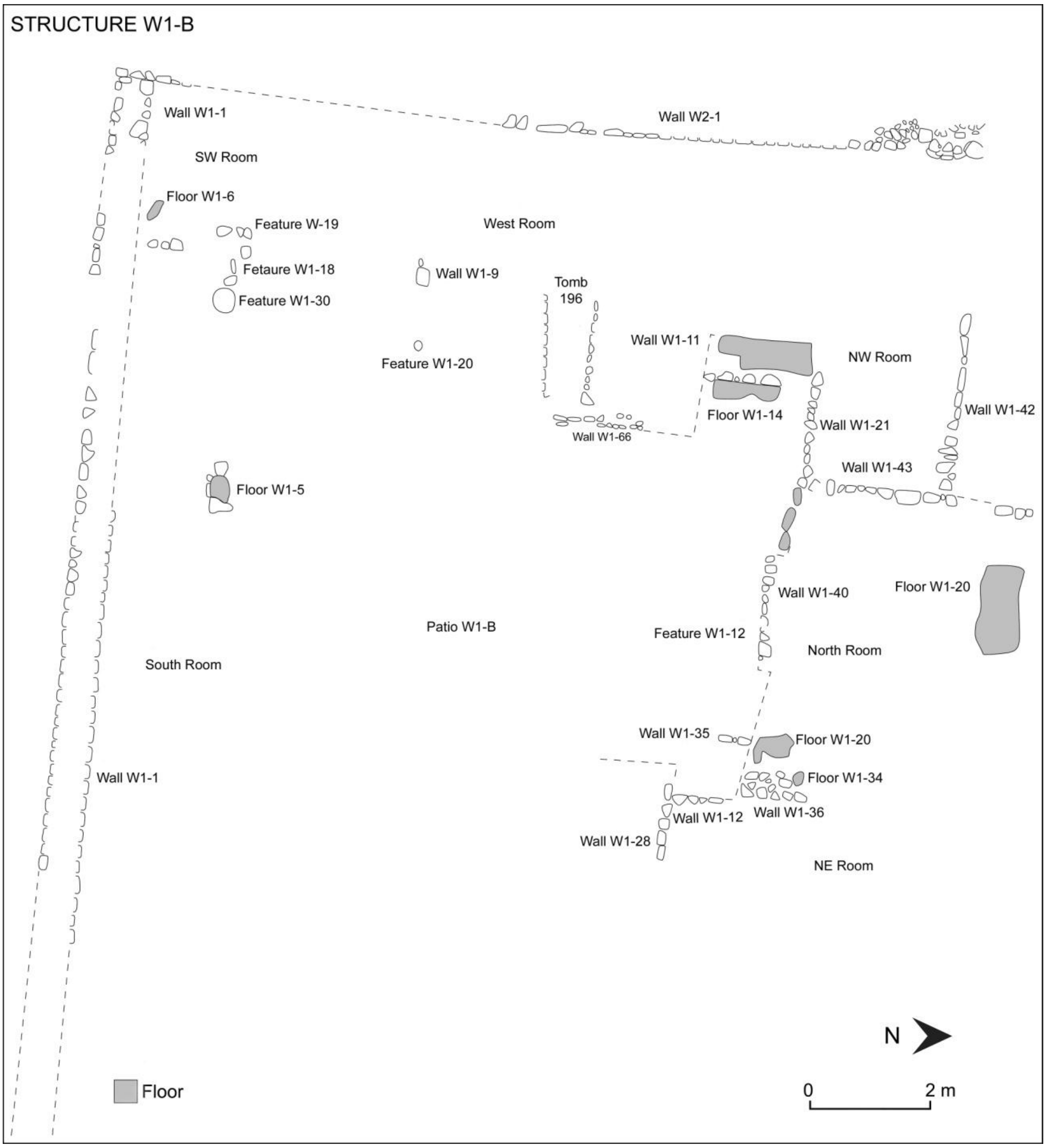


Fig.53. Floor plan of structure W1-B (after Morales *et al*. 1999:43).

According to his findings this kind of room functioned as a kitchen. The chronology based on the ceramic sample recovered from primary contexts -features and burials- corresponded to the Early Xoo phase (Morales *et al*. 1999).

W2 Area

This area was formed by two artificial terraces W2-A and W2-B, built with fills of the Pitao and Xoo phases (Fig.55). The W2 Area was located in the southwest part of

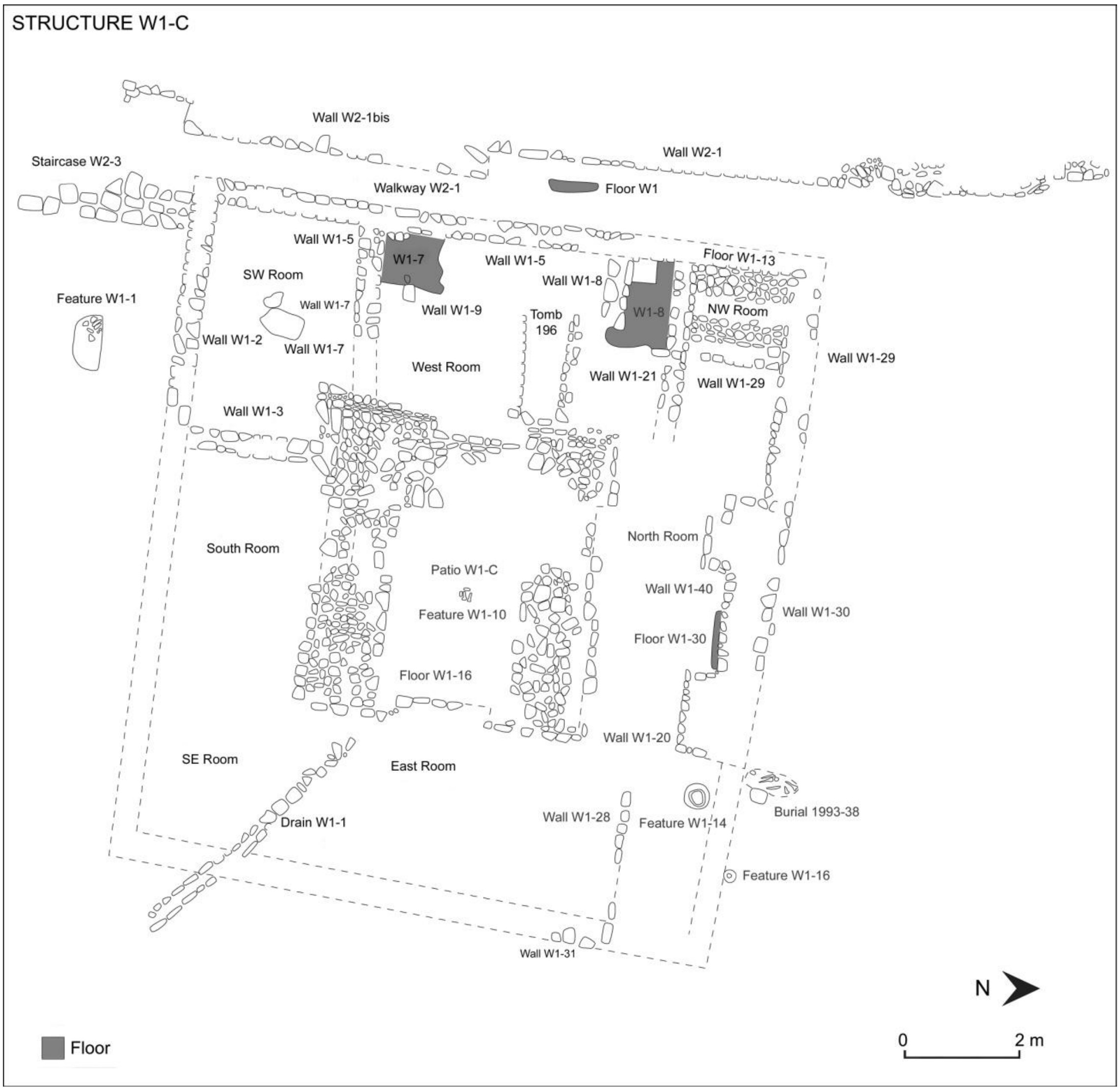


Fig.54. Floor plan of structure W1-C (after Morales *et al*. 1999:59).

building W and on the west side of the W1 Area separated by a corridor of 1.10m. These terraces could have been used as domestic units with places to produce pottery from the Nisa phase (200 BD - 200 AD). The W2 Area presented different architectural features such as stairs (W2-1, W2-2 and W2-3), a corridor (W2-1) and a room (W2-1). There were also burials (1993-16) and features with ceramic, shell, onyx and bone objects, among others. This area could have been built in the Xoo phase because fills of both artificial terraces, where the terrace W2 is located, corresponded mainly to the Early Xoo phase (Morales *et al*. 1999).

The terrace W2-A showed a different space distribution to the closed pattern of the residences. Two periods of construction have been identified: the oldest includes the

Fig.55. Floor plan of structure W2 (after Morales *et al*. 1999:79).

west and east side, stairs W2-2 and room W2-1 (Fig.55). In this period terrace W2-A could be accessed by the stair W2-2 through the corridor W2-1 that surrounded the structure W1-C on the west side. The presence of a fire found in room W2-1 indicated that domestic activities took place too. The most recent period of construction included the cancellation of the access through the stair W2-2 with the construction of a block projected and attached to the wall W2-1. The access of the southwest corner was cancelled with the construction of the wall W2-1. The stair W2-3 might have been built as another access. The north part might have had an agricultural use such as vegetable garden for the structure W1-C and the south part could have been used to prepare or store foods. There was no information about previous periods of construction or older terraces than W2-A and W2-B, they might have been covered by structures from the Xoo phase (Morales *et al.* 1999).

Terrace W2-B showed a more recent construction constituted by a rectangular structure defined to the west side by the wall W2-5 and east by the wall W2-2. In this place some features were found such as a patio crossed by a drain next to floor W2-2 and a stucco floor W2-4 located west to the drain and on a higher level. This terrace was built during the Xoo phase since the fill corresponded to this period of time. The architectural characteristics were similar to those found in the residences from the Xoo phase (Morales *et al.* 1999). Zooarchaeological material was recovered from both terraces.

A3 Area

This area was located on the slope of the southeast corner of the North Platform (Fig.56). It was mainly formed by big platforms and portions of residential structures from the Danibaan (600-400 BC), Pe (400-200 BC) and Nisa (200 BC-200 AD) phases, part of a residence from the Pitao phase (200-600 AD) and of a structure from the Xoo phase (600-800 AD). The earliest structures were located in the west limit of the area and correspond to the Danibaan phase. They showed vertical walls and fills of renovation in the Pe and Nisa phases. The structures included rectangular platforms made of thick walls with two facades which formed a buttress and at the same time they were used to delimit fill spaces, retaining walls, drains with flat or curved ceiling, corridors, and stairs of rectangular blocks and a big tomb. The platforms supported floors and wall foundations of residences which were made of adobe. It is possible that the panel constructive technique emerged after the Pe phase and was used to solve the instability of the walls. Another solution was the use of fills with stones and mud instead of just rocks (Martínez *et al*. 1977).

The A3 Area was divided into different sections in order to describe the structures and the constructive sequence that included the following:

1) structure A3A, which was an early platform defined by walls 8, 21 and 55, with a domestic unit and a tomb from the Danibaan phase (Fig.57);

2) structure A3B, which was a platform added to the south part of structure A3A from the Danibaan phase (Fig.58);

3) structure A3C, which was an extension (wall 8A) to the north part of platform A3A from the Danibaan phase (Fig.59);

4) structure A3D, which was a complex added to the east side of structure A3A (corridors 1 and 6, and buttress) that supported the residences and corresponded to the Danibaan and Nisa phases (Fig.61);

5) structure A3E, which was a northeast corner of a platform where there was also a corner of a room from the Danibaan phase (Fig.60);

6) structure A3F, which was a stair partially exposed to the northeast extension of the area from the Nisa phase (Fig. 62);

7) structure A3G, which was a corridor and a drainage located in the north part of the area from the Danibaan and Pe phases (Fig.63);

Fig.56. Location of A3 Area in Monte Albán (after Martínez *et al.* 1997:5).

8) structure A3H, which was a panel and slope of a platform located in the southeast part of the area from the Pitao phase (Fig.64); and

9) structure A3I, which was a possible residence from the Pitao phase constituted by wall 1, tomb 202 and burial 1993-22 (Fig.65) (Martínez *et al*.1997).

In the structure A3A features 11 and 18 were found, which were ovens or fires from the Nisa phase. In the structure A3D residences A3D-R1 and A3D-R2 from the Pe phase were identified. The first consisted of floors 3 and 9 and several walls. The distribution was not very clear and from north to south there were rooms A, B, and C. The residence A3D-R2 had floors, walls, rooms, a drainage system and buttress. In this residence a garbage deposit (feature 3) was observed with ceramic, charcoal, ash and animal bones associated to wall 62. Other garbage deposits near wall 46 and between wall 7A and 8A with faunal remains were discovered in this area. A fire (feature 25) was located here too. Other features included a multiple primary burial (1993-58) with three children and a primary child burial (1994-64) from the Nisa phase. The latter was found with an offering of three animal skulls and two ceramic ware (Martínez *et al*.1997).

The part exposed of structure A3E was similar to structure A3A, so it could have been another platform with a residence. Zooarchaeolgical samples were collected here from a garbage deposit (near wall 29). In the structure A3F a primary deposit with pottery vessels and figurines was recovered. Features 6 and 7 (garbage deposits) located in this area contained animal bones. In the structure A3G a concentration of pottery and a human skull was seen in the west side of the corridor. In structure A3H two big primary deposits of pottery (features 8, 9, 10 and features 28-29) were found; they probably belonged to material from a domestic unit built on top. Features 10 and 29 (both garbage deposits) contained faunal bone remains. Structure A3I consisted of domestic remains from the Pitao phase, which was probably the origin of the garbage deposit of structure A3H. In structure A3I the primary burial (1993-20) excavated contained the skeleton of an adult with two offering objects from the Pitao phase. This burial was found inside a garbage deposit with pottery, obsidian and animal bones. The structure A3I could have been a residence from the Pitao phase, before the construction of wall 1 (Martínez *et al*. 1997).

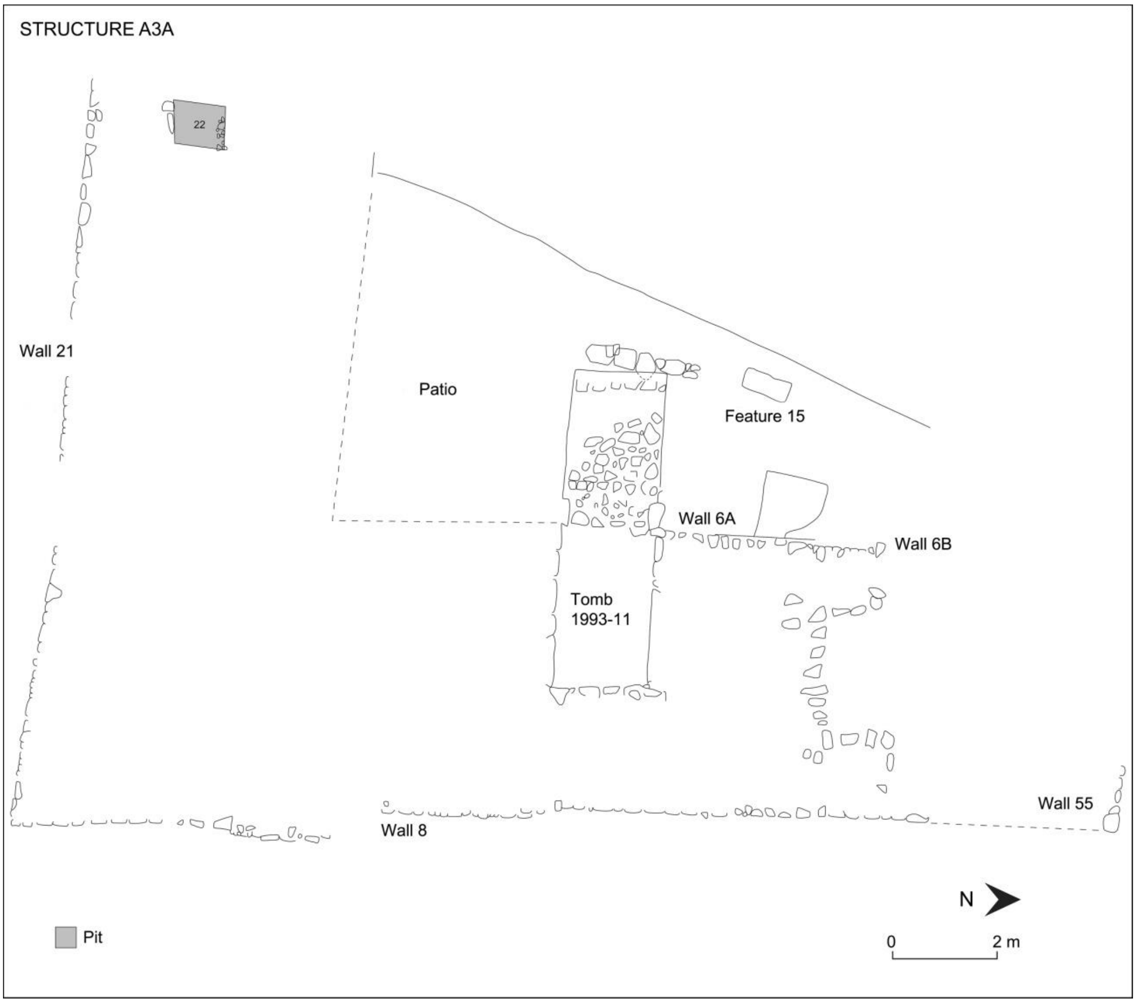


Fig.57. Floor plan of structure A3A (after Martínez *et al.* 1997:13).

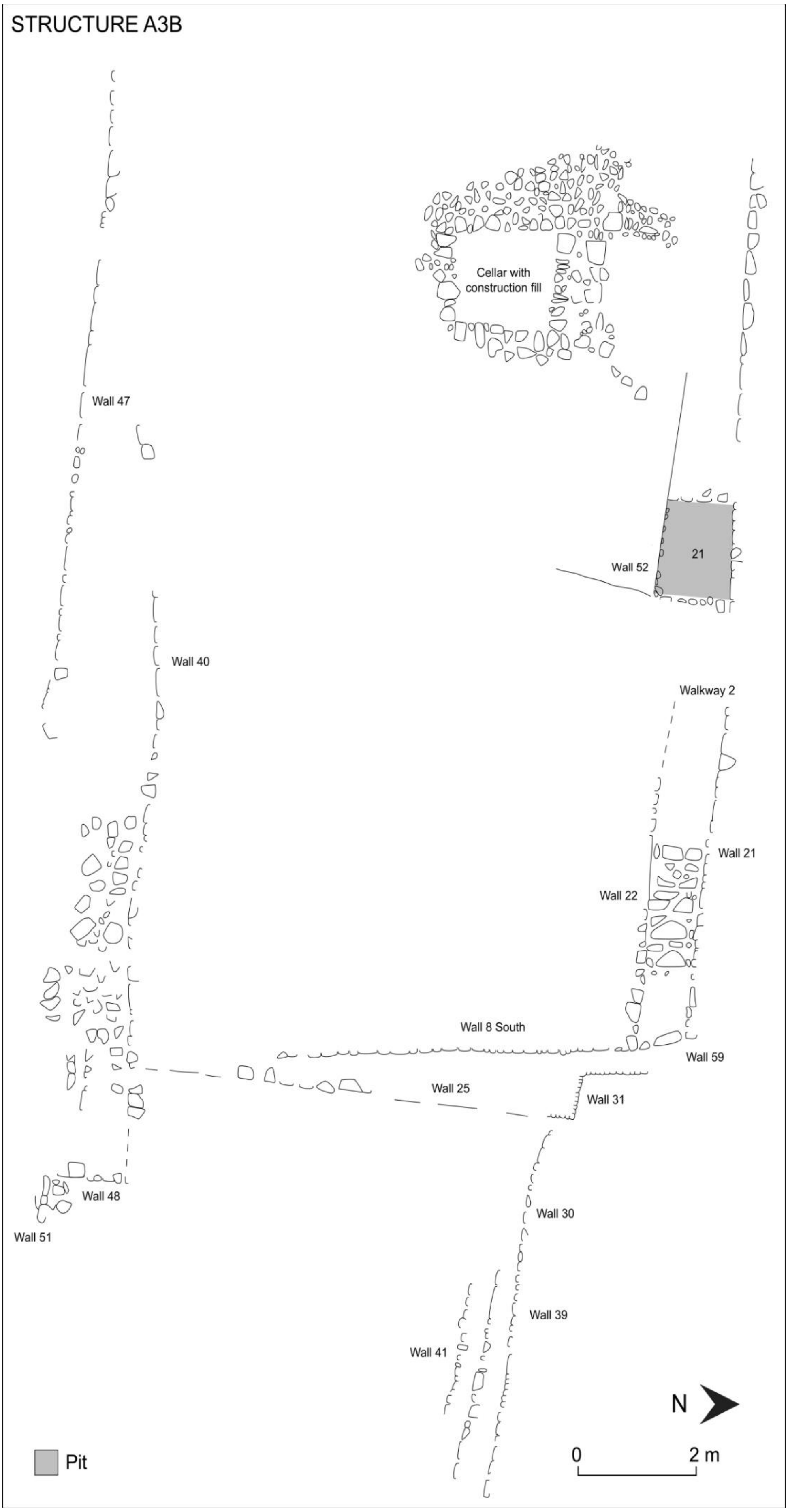


Fig.58. Floor plan of structure A3B (after Martínez *et al.* 1997:22).

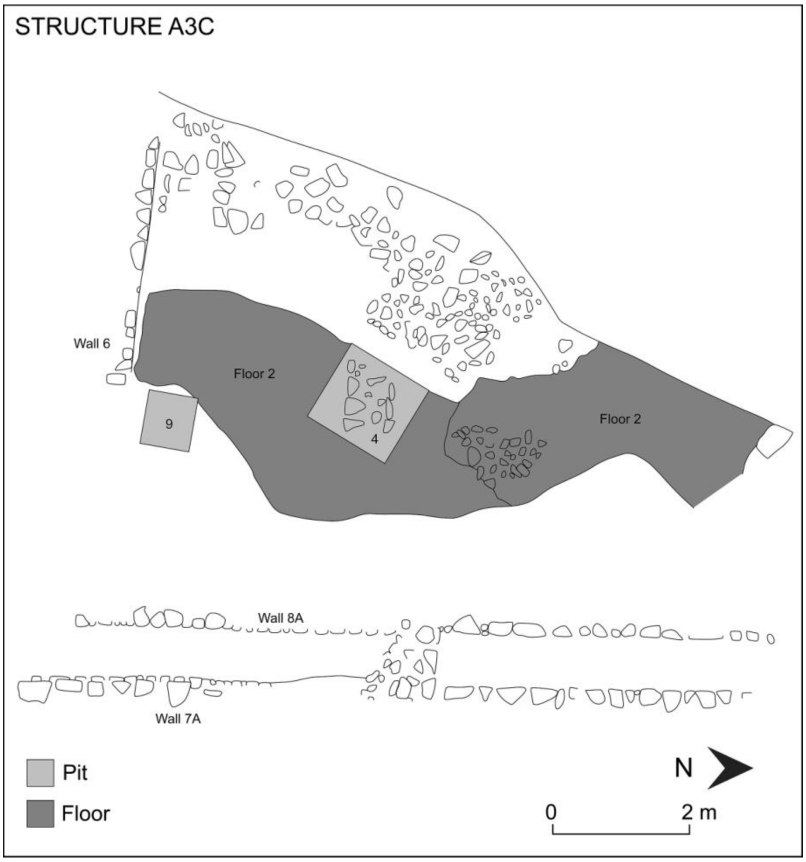


Fig.59. Floor plan of structure A3C (after Martínez *et al.* 1997:32).

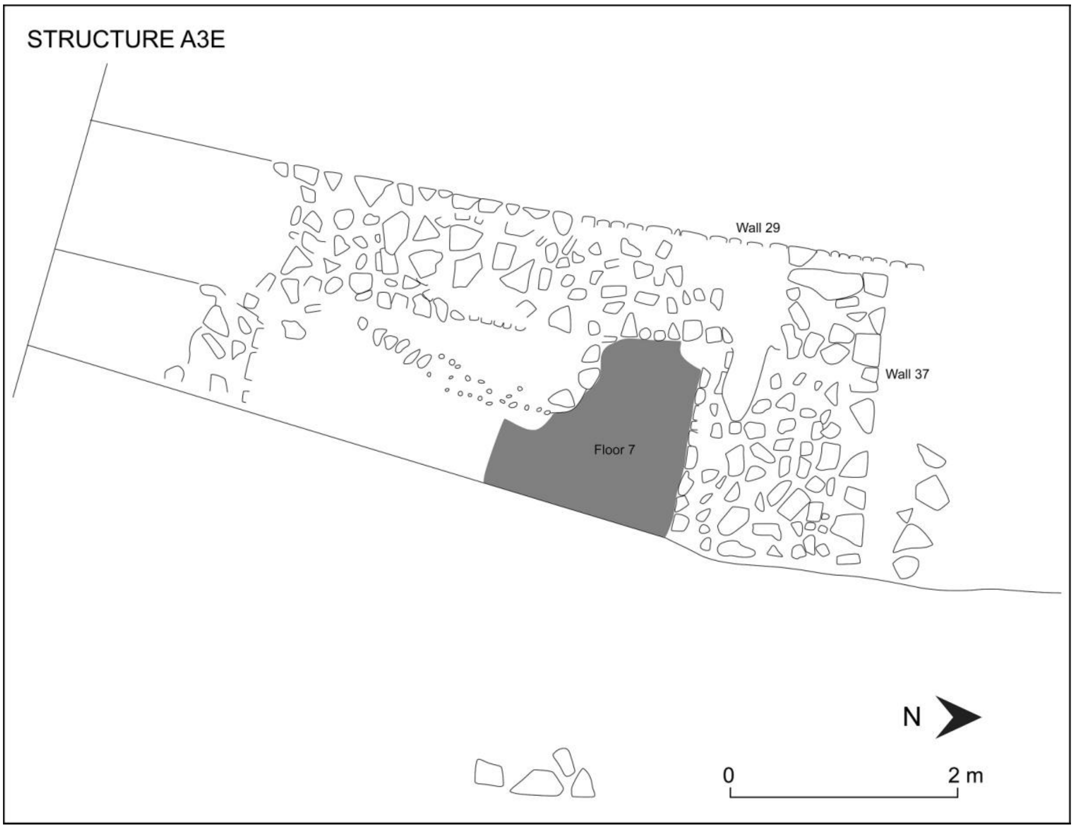


Fig.60. Floor plan of structure A3E (after Martínez *et al.* 1997:62).

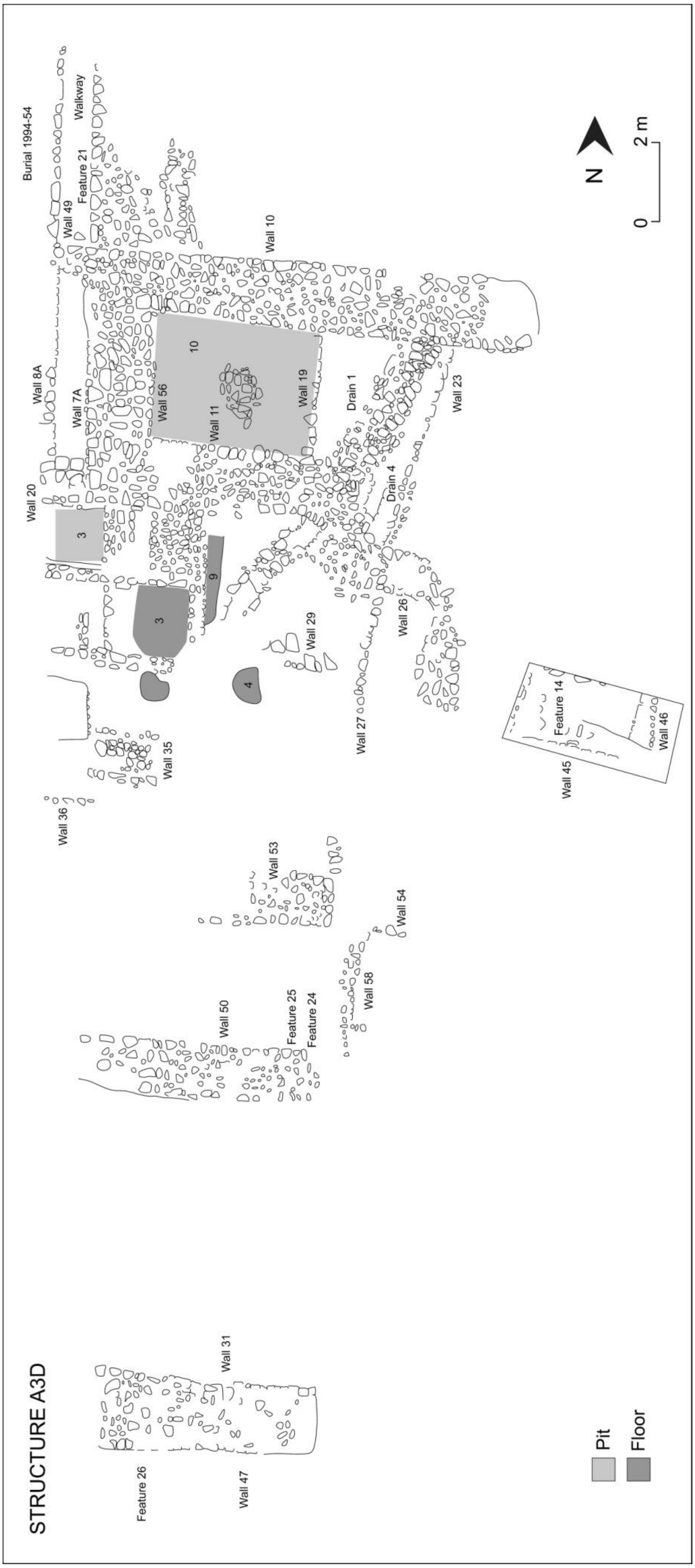


Fig.61. Floor plan of structure A3D (after Martínez *et al.* 1997:44).

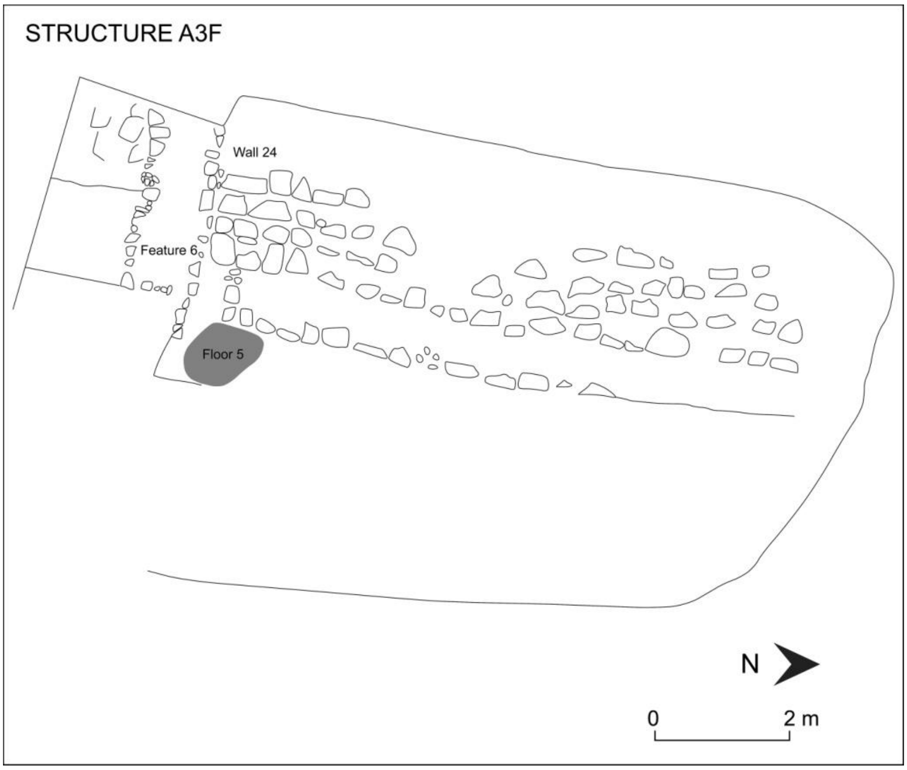


Fig.62. Floor plan of structure A3F (after Martínez *et al.* 1997:65).

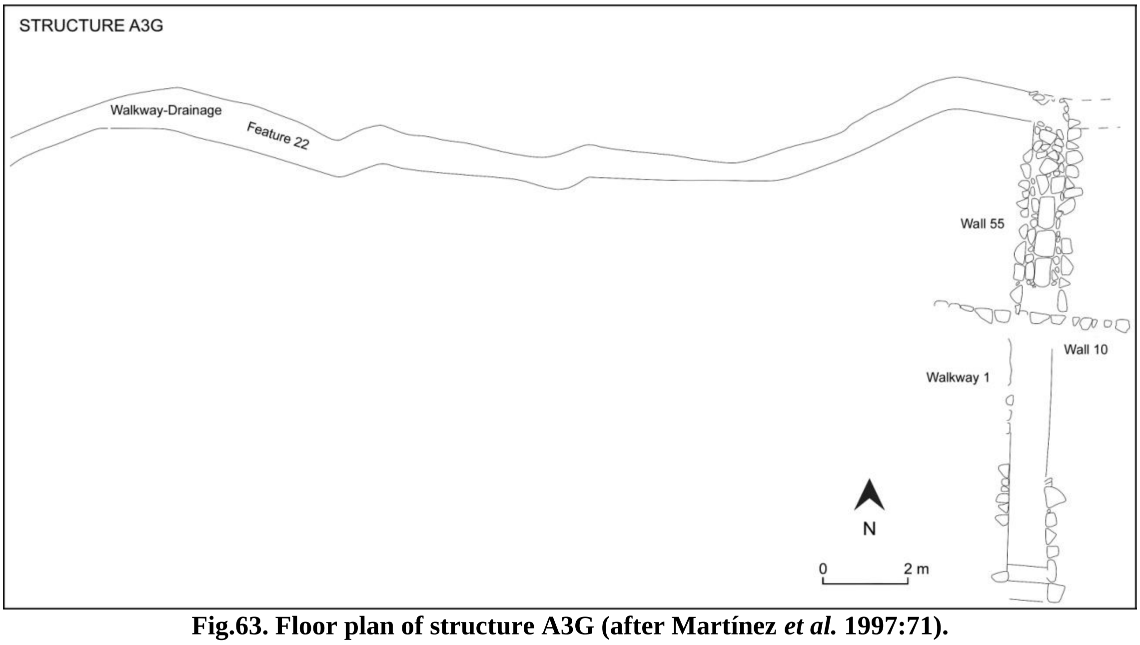


Fig.63. Floor plan of structure A3G (after Martínez *et al.* 1997:71).

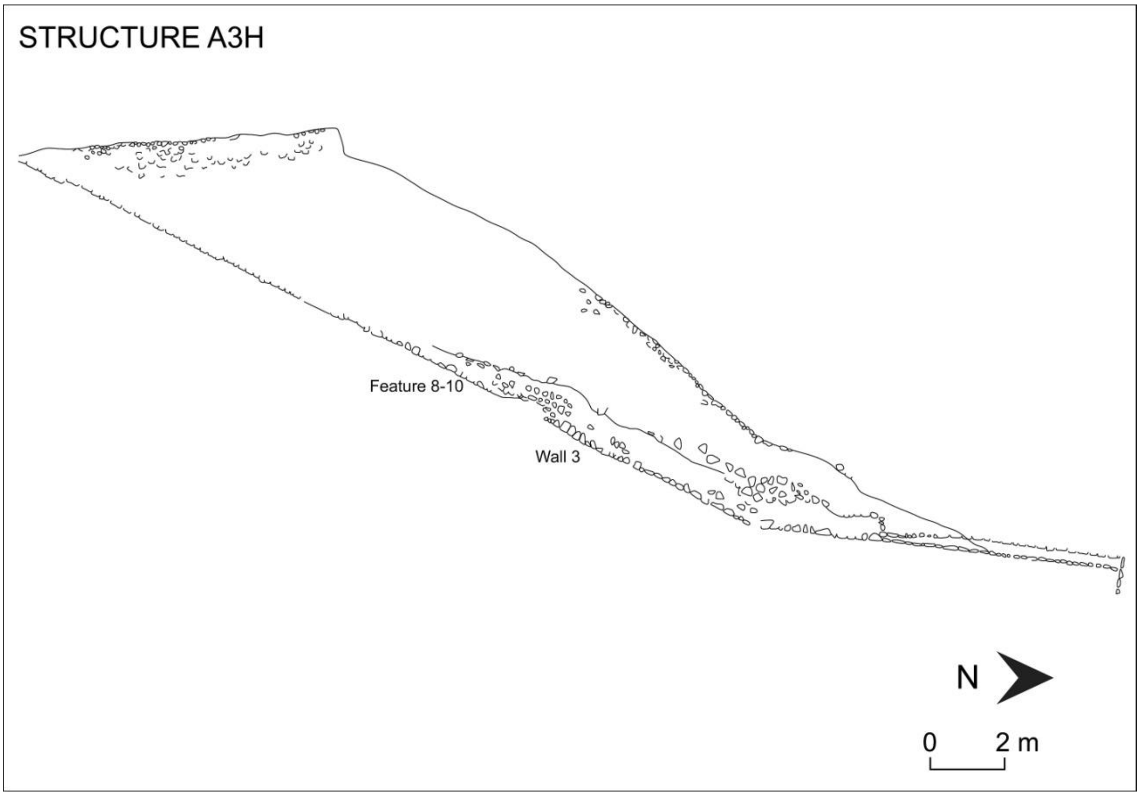


Fig.64. Floor plan of structure A3H (after Martínez *et al.* 1997:85).

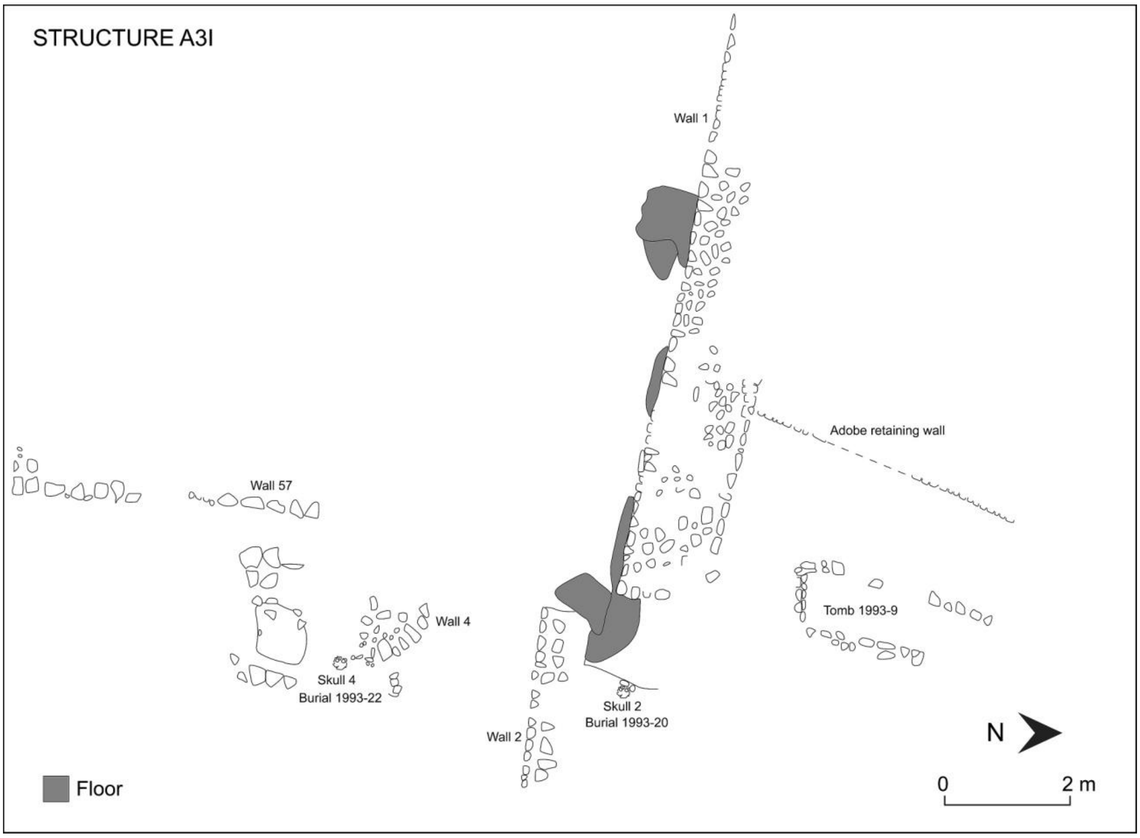


Fig.65. Floor plan of structure A3I (after Martínez *et al.* 1997:99).

PNLP Area

This complex was located in the west wall of the south part of the North Platform (Fig.66). It was a patio surrounded by platforms called structures PNLP-1 to PNLP-5 or structures 1 to 5 (Fig.67). The complex formed a unit separated from other structures. It showed the pattern of a residence but the patio was not square as in the classic domestic units and in the north part instead of a room, there was a platform (structure 1) which supported a temple (Winter *et al*. 2001).

When the PNLP complex was observed from the Main plaza it was hidden behind the west wall of the North Platform, so it could not be seen from this area. On the one hand, the PNLP area showed the limit of the plaza and on the other, it was not integrated in to it. Another uncommon characteristic of this complex was that the entrance was formed by a diagonal platform (structure 3) on its southeast side. These kinds of structures, which were not oriented to the cardinal points, were rare in Monte Albán. So at first view, it was not possible to determine whether these architectural characteristics were due to its location or if they reflected a specific function. The complex was occupied from the Danibaan (600-400 BC) to Liboa (800-1200 AD) phases and showed four periods of construction (Winter *et al.* 2001).

From the Pe phase the PNLP Complex was allocated to the production of goods such as shell, pottery and chipped stone. An oven for pottery was detected here and according to its size and compared to others that have been identified around the Main Plaza, it was used for production beyond domestic consumption. The biggest concentration of artifacts and shell, obsidian and silex waste has been registered in this area. This complex could have also been used for rituals since a temple was found here and to guard the site because it was located between two corridors of access to the Main Plaza, one at the west side and the other surrounding the North Platform. No domestic

Fig.66. Location of PNL Complex in Monte Albán (after Winter *et al*. 2001).

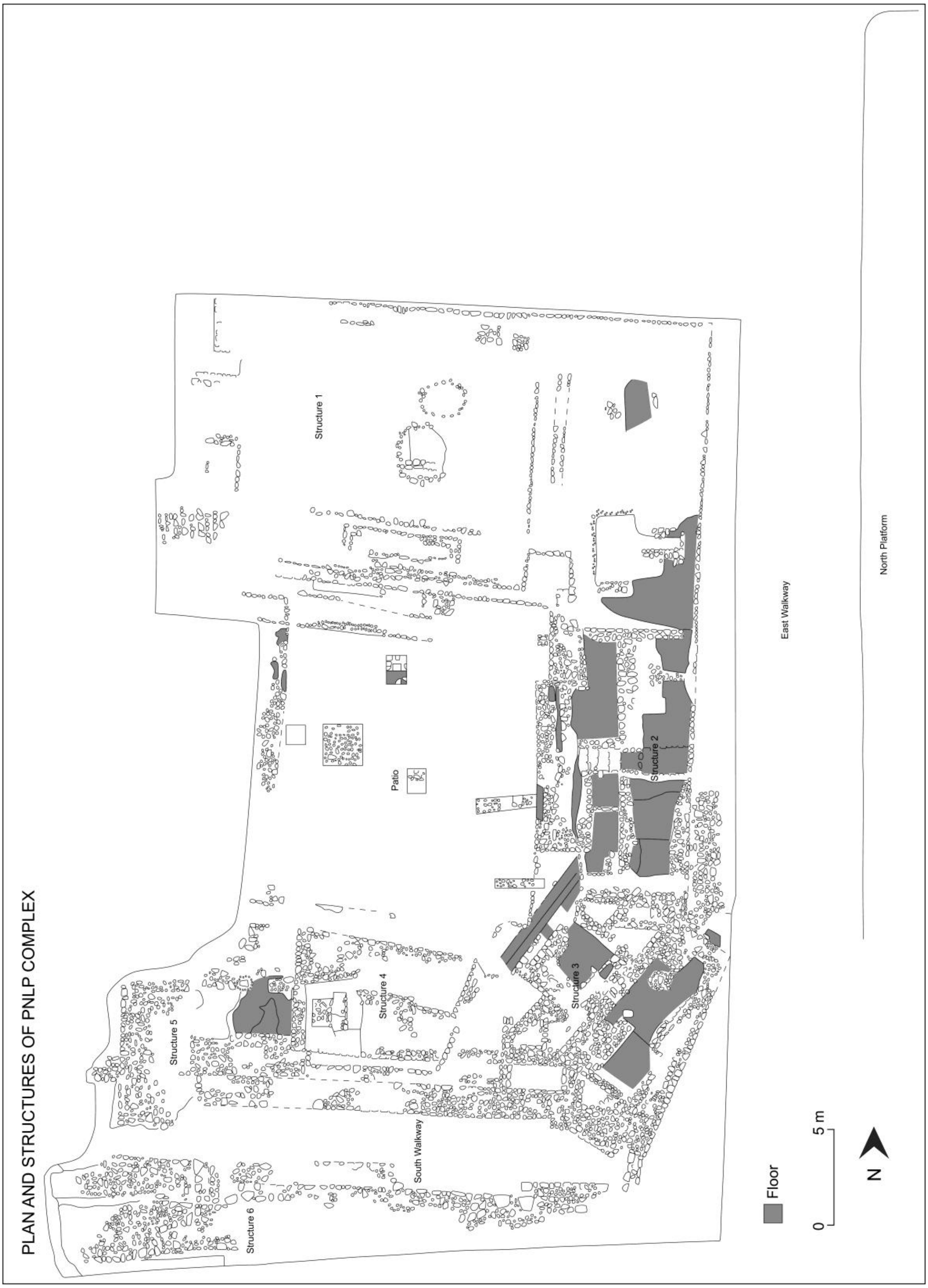


Fig.67. General floor plan of PNLP Complex indicating the structures (after Winter *et al*. 2001).

features such as burials or garbage deposits were observed (Martínez and Markens 2004).

The patio was defined to the north by structure 1, to the east by structure 2, to the southeast by structure 3, to the south by structure 4 and to the west by the wall-1, which probably was the edge of the other platform (structure 5). The patio was covered with stucco. Some of the architectural constructions that integrated this area were the Temple 1B, a few walls and a drain. In this patio a concentration of vessels was found from the Danibaan phase, probably as part of a garbage deposit (Winter *et al*. 2001).

Structure 1 was constituted by Temple 1B, several walls, floors of white and yellow stucco and drains 1 and 2. An oven was also found in the temple which was probably associated to a domestic unit. Structure 2 was on the east side of the complex and was a rectangular platform oriented to the west with three rooms and foundations of stone and stucco floors of different periods of construction. Under the floors of the rooms a tomb (208) was found which could have been accessed by stairs (Winter *et al*. 2001).

Structure 3 consisted of a rectangular platform oriented diagonally towards the patio and to the cardinal points (northeast-southeast). It was located in the southeast corner of the patio and it was part of the Complex PNLP entrance. The platform showed diagonal stairs covered with stucco to access the patio and the complex. Both the stairs and the platform showed several modifications. In its first constructive stage it was oriented to the southeast and afterwards it was extended and oriented to the northwest. Structure 3 was divided into structure 3a which was oriented to the Main Plaza or to the southwest and structure 3b oriented to the patio of the complex 1 or to the northeast. Structure 3 was integrated of architectural elements such as stairs and walls. Blades and projectile points made of obsidian, arrow heads of different materials such as silex, obsidian were found in structure 3b (Winter *et al*. 2001).

Structure 4 was the limit of the south part of the patio. It was an irregular platform with the principal facade to the north. This structure presented four periods of construction: 1) the base of the platform; 2) a panel with stucco, 3) rooms S1 and S2, and 4) the west extension of the platform. The structure 5 was located on the west slope of the south corridor. The limit was not clearly defined and it was integrated of scattered architectural elements. The corridor 6 was an open elongated and straight space, oriented to the east-west between the PNLP Complex and the IV-North Area, which could have been used as an access to the Main Plaza from the west. The south part of the corridor was part of the North-IV Area, which was built as a non-residential platform from Period I and the access was located in the south. On the east side there was a big panel with stucco and painted fragments. This platform was filled and a structure from the Nisa phase was built. The previous structure might have corresponded to the Danibaan and Pe phases. Finally the third structure was integrated of a house with a patio that has been dated to the Pitao phase. Structure 6 was made of walls and fragments of stairs on the way down to the west limit of the corridor and was part of the IV North Area and the PNLP-1 Complex. It was located in the south part of structure 5. The architectural elements in this area were defined in the north by wall F75 and in the south by wall F77, stair F1 and a balustrade (Winter *et al*. 2001). In this area zooarchaeologcial evidence was found mainly in structures 3 and 5 however, faunal remains were also collected in structures 2 and 6.

CHAPTER V

RESULTS

This chapter presents the results of the identification of faunal remains from four different areas of Monte Albán, described in more detail in the previous chapter. The first three areas (W1, W2 and A3) consist of domestic units and the last one (PNLP) is a public space. Each area is represented in a floor plan, showing the distribution of the excavated pits or trenches and the location where data of the tables and the animal bone samples came from. Faunal remains from different periods of time were present in each area, so they were grouped together in tables according to a phase. In some samples, pottery (associated with the animal bones) from different phases was mixed, therefore this zooarchaeological material was grouped in longer periods of time including two or more phases. Tables with the results of the identification will be introduced in chronological order from the oldest phase to the most recent one in the four areas under study.

A total of 1,184 non identified fragments conformed the sample (these were small splinters), 1,564 NISP and 784 MNI were identified to order, family, genus and species level and 1040 fragments were identified to class level (Tables 5 and 6). A zoology account of the identified species in the sample is included in the Appendix 1, which provides more knowledge about the taxa, their distribution, environment and behaviour. In the discussion, this information will be taken up again to find out what kind of environment the population was exploiting to obtain their faunal resources. The zoology account also shows the geographical location of each species, to discover if the animals found in the sample were local or came from other regions outside the Valley of Oaxaca.

Taxa	Common name	NISP	MNI
Actinopterygii			
Order Perciformes			
Family Centropomidae			
Centropomus sp.	Snook	3	3
Family Serranidae	Sea basses	1	1
Order Cypriniformes			
Family Catostomidae			
Ictiobus sp.	Buffalo fish	1	1
Order Mugiliformes			
Family Mugilidae			
Joturus pichardoi	Bobo mulet	1	1
Reptilia			
Order testudines	Turtle	1	1
Family Kinosternidae			
Kinosternon	Mud turtle	2	2
Family Emydidae			
Trachemys scripta	Pond slider	1	1
Family Chelonidae			
Chelonia mydas	Green turtle	1	1
Order Crocodyla			
Family cf. Crocodylidae	Crocodylus	1	1
Aves			
Order Passeriformes			
Family Icteridae			
Cassiculus melanicterus	Yellow-winged cacique	1	1
Order Corvidae			
Family Corvus			
Corvus corax	Common raven	1	1
Order Strigiformes			
Family Caprimulgidae			
Bubo virginianus	Great horned owl	1	1
Order Anseriformes			
Family cf. Anatidae		1	1
Family Anatidae	Ducks	3	1
Order Falconiformes			
Family Accipitridae			
cf. *Buteo* sp.		1	1
Buteo sp.	Hawk	1	1
Buteo jamaicencis	Red-tailed hawk	1	1
Order Charadiiformes			
Family Laridae			
Larus pipixcan	Franklin´s gull	1	1
Order Galliformes			
Family Odontophoridae			
Cyrtonix montezumae	Montezuma or harlequin quail	6	6
Family Meleagridae			
cf. *Meleagris*		1	1
Meleagris gallopavo	Common turkey	429	148
Family Cracidae			
cf. Crax	Curassow	1	1
Mammalia			
Order Carnivora			
Family Canidae			
cf. *Canis* sp		2	2
Canis sp.	Wolf, dog, coyotes	235	115

cf. *Canis familiaris*		4	3
Canis familiaris	Dog	25	22
Canis cf. *latrans*	Coyote	1	1
Canis cf. *lupus*	Wolf	4	2
Urocyon cinereoargenteus	Grey fox, tree fox	2	2
Family Procyonidae			
Procyon lotor	Northern raccoon	1	1
Family Procyonidae			
Nasua narica	Coatimundi, white-nosed coati	1	1
Family Felidae			
Puma concolor	Cougar, panther or mountain lion	4	3
Order Ariodactyla	Artiodactyls	183	96
Family Tayassidae			
Tayassu tajacu	Collared peccary	189	89
Tayassu cf. *peccari*	White-lipped peccary	3	3
Family Cervidae			
cf. *Odocoileus* sp.		4	3
Odocoileus sp.	Deer	22	19
Odocoileus virginianus	White-tailed deer	288	136
cf. *Mazama americana*		4	4
Mazama americana	Brocket deer	1	1
Order Lagomorpha	Lagomorphs	13	12
Family Leporidae			
Lepus sp.	Hare	33	25
Lepus callotis	White-sided jackrabbit	15	12
Sylvilagus sp.	Rabbit	28	18
Sylvilagus cf.*cunicularius*		1	1
Sylvilagus cunicularius	Mexican cottontail	9	8
Sylvilagus cf. *floridanus*		1	1
Sylvilagus floridanus	Eastern cottontail	22	18
Order Rodentia		1	1
Family Geomyidae			
Orthogeomys grandis	Giant pocket gopher	5	5
Family Cricetidae			
Peromyscus cf. *maniculatus*	White-footed mice or deer mice	1	1
Family Cricetidae			
Peromyscus melanophrys	Plateau deer mouse	1	1
Family Heteromydae			
Liomys irroratus	Mexican spiny pocket mouse	1	1
Total		1564	784

Table 5. Total of identified taxa from Monte Albán archaeological site.

Taxa	**NF**
Non identified fragments	1184
Fish	8
Aves	521
Mammals	40
Big mammals	364
Medium-big mammals	53
Medium mammals	49
Small-medium mammal	1
Small mammals	4
Total	2224

Table 6. Total of animal bone fragments from Monte Albán archaeological site.

In order to diferentiate close species represented in the sample, measurements were taken from the reference collection such as: *Odocoileus virginianus* (white-tailed deer) and *Mazama americana* (brocket deer); *Lepus callotis* (white-sided jackrabbit), *Sylvilagus floridanus* (eastern cottontail) and *Sylvilagus cunicularius* (Mexican cottontail); *Canis lupus* (wolf), *Canis familiaris* (dog) and *Canis latrans* (coyote), and the species *Tayassu tajacu* (peccary). The faunal remains from the archaeological sample that corresponded to deer, hare, rabbit, canids and peccary were measured. This information is included in Appendix 2 and 3.

Measurements of the reference collection and the archaeological sample were compared through two methods that were explained in Chapter 3. The data obtained applying the first method, based on the minimum and maximum ranges of each measurement of the reference collection, are shown in Appendix 4a, 4b, 4c and 4d. The measurements using the log-ratio technique are included in the graphs of Appendix 5a, 5b, 5c and 5d. Both methods showed similar results but in some cases such as the canid group, certain measurements of dog mandibles were close to those of dog and coyote from the reference collection (identified as *Canis* sp., according to the measurements). However, the morphology of some of these mandibles, following the criteria established by Lawrence (1951; 1966; 1967; 1968) to identify coyotes from dogs, showed it to be more similar to the latter. Therefore, these fragments were attributed to dog, even if the measurements were close to dog and coyote.

Postcranial skeleton measurements of the archaeological canids were also very close to those of coyote and dog from the reference collection, while the opposite trend was observed from those of wolf. This situation made it difficult to identify most of postcranial fragments to a species level. The size of *Canis* sp. fragments was between dog and coyote. However, all the mandibles measured showed diagnostic characters corresponding to *Canis familiaris*. None of the mandibles were attributed to coyotes and only one postcranial bone was identified as *Canis* cf. *latrans*. It seems that the presence of coyotes at the site was rare. Therefore, the group of *Canis* sp. was considered as *Canis* cf. *familiaris* since it was more likely that fragments identified at at this level corresponded to dog. The elements identified as artiodactyls showed the size of deer but some bones were broken into small pieces, making the identification to genus level difficult. However, no other artiodactyls of deer size were found in the sample, so it is more probable that the fragments of this group corresponded to this species. Therefore, bones identified as artiodactyls were considered to be *Odocoileus* sp. in the analysis.

W1 Area

In this area, most of the animal bone samples came from structures W1-A and W1-C. The results of domestic units were grouped in the same tables; when they were separated into structures the samples were very scarce. Most of the faunal remains from structure W1-C corresponded to the Xoo phase and Early Classic, only one sample was from the Nisa phase. Animal bones recovered from the surface were not considered in the quantification, although a fragment identified as probable ocellated turkey (*Meleagris* cf. *ocellata*) was found among these remains. Since this species was not present in the rest of the sample of this area or others, it is only mentioned now as part of this assemblage. Another fragment of fish identified as Serranide and a fragment of iguana (Family Iguanidae) were recovered in the debris of this area. As shown in Figure 68 the faunal remains were distributed mainly in the North, South and West part of W1 Area.

According to Table 7 only a few specimens of *Canis* sp. and eastern cottontail were identified from the Danibaan and Pe phases. Some bone fragments were attributed to aves and mammals of no specific size (Table 8). A small sample of animal bones was recovered with mixed pottery from the Pe and Nisa phases (Tables 9 and 10). Among the bird group, a fragment of hawk and a few specimens of common turkey were

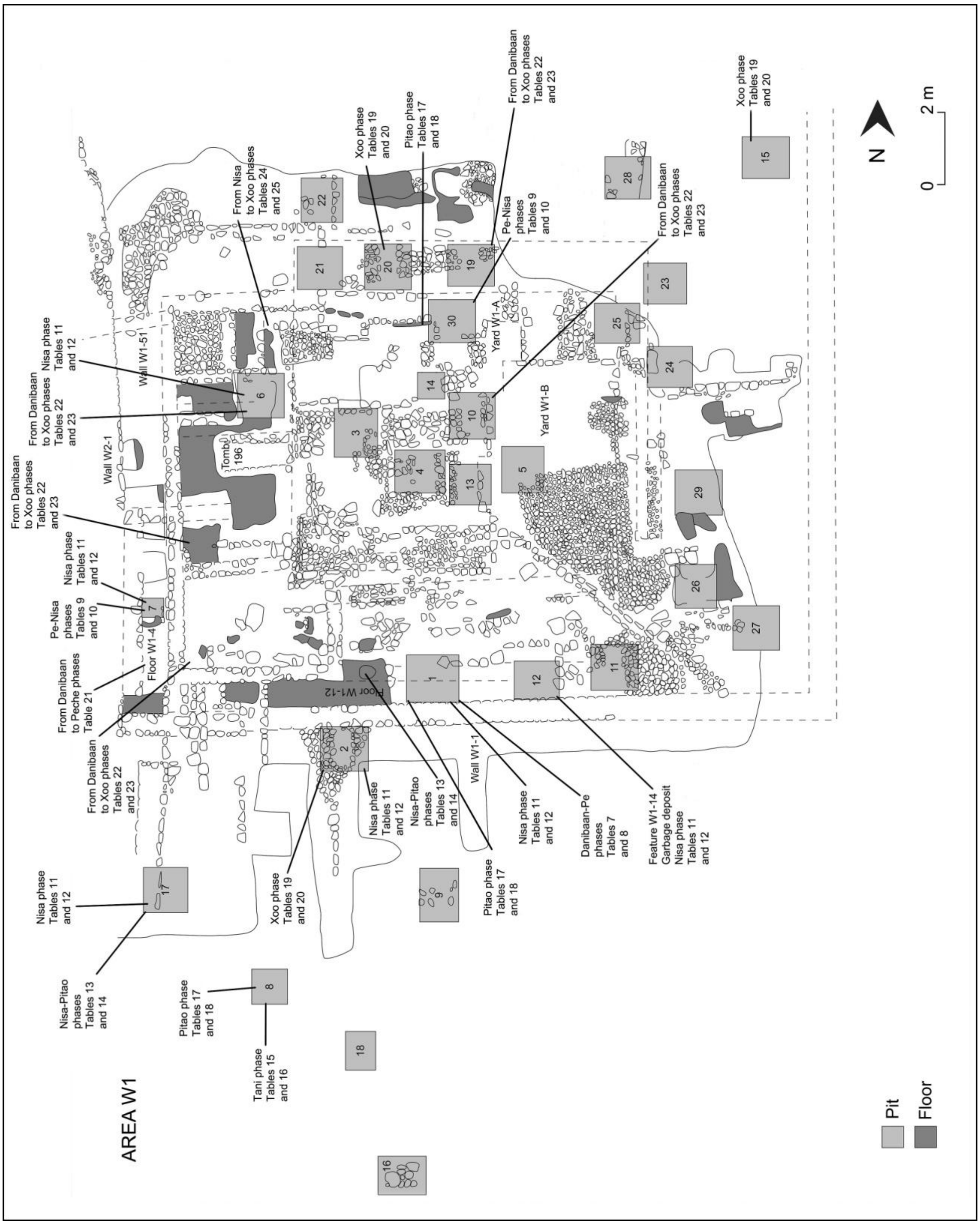


Fig.68. Floor plan of W1 Area with location of faunal remains (after Morales *et al*. 1999:8).

Taxa	**Common name**	**NISP**	**MNI**
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyote	2	1
Order Lagomorpha			
Family Leporidae			
Sylvilagus floridanus	Eastern cottontail	1	1
Total		3	2

Table7. Identified species from the Danibaan and Pe phases in W1 Area.

Taxa	NF
Non identified fragments	15
Ave	1
Mammals	3
Total	19

Table 8. Animal bone fragments from the Danibaan and Pe phases in W1 Area.

identified. Only four fragments of *Canis* sp. were recovered. Artiodactyls such as collared peccary and white-tailed deer were present. Evidence of lagomorphs, hare and eastern cottontail formed this sample too. No remains of big, medium or small mammals were observed, only a few fragments of aves (Table 10).

Taxa	Common name	NISP	MNI
Aves			
Order Falconiformes			
Family Accipitridae			
cf. *Buteo*	Hawk	1	1
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	5	1
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyote	4	2
Order Artiodactyla			
Family Cervidae			
Odocoileus virginianus	White-tailed deer	3	2
Family Tayassidae			
Tayassu tajacu	Collared peccary	1	1
Order Lagomorpha	Lagomorphs	4	2
Family Leporidae			
Lepus sp.	Hare	1	1
Sylvilagus floridanus	Eastern cottontail	1	1
Total		20	11

Table 9. Identified species from the Pe and Nisa phases in W1 Area.

Taxa	NF
Non identified fragments	9
Aves	2
Total	11

Table 10. Animal bone fragments from the Pe and Nisa phases in W1 Area.

According to the data shown in Table 11, during the Nisa phase (as in earlier phases) aquatic resources were very rare, since just one fragment of pond slider turtle was identified. The aves represented were mainly common turkey and one fragment of red-tailed hawk. As *Meleagris gallopavo*, canids were the most frequent group but only two fragments were identified as dog. Artiodactyls were also represented in this phase by collared peccary and while-tailed deer. Among small mammals, only one fragment of rodent was identified as Plateau deer mouse, the rest corresponded to hare and rabbits. The most abundant group of bones identified to class level was that of aves. Small mammals were absent and only big and medium mammals were observed (Table 12).

Taxa	**Common name**	**NISP**	**MNI**
Reptilia			
Order Testudines			
Family Emydidae			
Trachemys scripta	Pond slider	1	1
Aves			
Order Falconiformes			
Family Accipitridae			
Buteo jamaicencis	Red-tailed hawk	1	1
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	23	9
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyote	21	7
Canis familiaris	Dog	2	2
Order Artiodactyla	Artiodactyls	4	2
Family Cervidae			
Odocoileus virginianus	White-tailed deer	5	4
Family Tayassidae			
Tayassu tajacu	Collared peccary	7	5
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	1	1
Sylvilagus sp.	Rabbit	2	2
Order Rodentia			
Family Cricetidae			
Peromyscus melanophrys	Plateau deer mouse	1	1
Total		68	35

Table 11. Identified species from the Nisa phase in W1Area.

Taxa	NF
Non identified fragments	38
Aves	44
Big mammals	13
Medium mammal	1
Medium-big mammals	5
Total	101

Table 12. Animal bone fragments from the Nisa phase in W1 Area.

A few faunal remains mixed with pottery from the Nisa and Pitao phases were found in this area (Tables 13 and 14). The aves were consitituted by one specimen of yellow-winged cacique and domestic species such as common turkey, which were more abundant (Table 13). Medium sized mammals were represented by just a few fragments of *Canis* sp. and collared peccary. Presence of lagomorphs was scarce; only one specimen of white-sided jackrabbit was identified. Some fragments were classified as aves and big mammals (Table 14).

Taxa	Common name	NISP	NMI
Aves			
Order Passeriformes			
Family Icteridae			
Cassiculus melanicterus	Yellow-winged cacique	1	1
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	6	4
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyote	3	3
Order Artiodactyla			
Family Tayassidae			
Tayassu tajacu	Collared peccary	2	2
Order Lagomorpha	Hare and rabbit	1	1
Family Leporidae			
Lepus callotis	White-sided jackrabbit	1	1
Total		14	12

Table 13. Identified species from the Nisa and Pitao phases in W1 Area.

Taxa	NF
Non identified fragments	12
Aves	3
Big mammals	2
Total	17

Table 14. Animal bone fragments from the Nisa and Pitao phases in W1 Area.

Common turkey was the most common species in the Tani phase, followed by *Canis* sp. and artiodactyls such as white-tailed deer and collared peccary (Table 15). Fragments of aves, medium and big mammals were also present in the sample (Table 16).

Taxa	Common name	NISP	NMI
Aves			
Family Meleagridae			
Meleagris gallopavo	Common turkey	10	2
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyote	7	2
Order Artiodactyla	Artiodactyls	1	1
Odocoileus virginianus	White-tailed deer	2	2
Family Tayassidae			
Tayassu tajacu	Collared peccary	1	1
Total		21	8

Table 15. Identified species from the Tani phase in W1 Area.

Taxa	NF
Non identified fragments	11
Aves	12
Big mammals	3
Medium mammals	6
Total	32

Table 16. Animal bone fragments from the Tani phase in W1 Area.

The Pitao phase was after the Nisa, the most represented phase by animal bone remains in the W1 Area (Table 17). This sample was formed by fresh water resources such as the mud turtle. Common turkey was identified but also, a different kind of bird, the harlequin quail was present. A diversity of wild aves could be observed in this area according to the data shown in Tables 9, 11 and 13. A few individuals of *Canis* sp. and two fragments of probable dog were part of this sample too. Presence of felines such as cougar or mountain lion was noticed, in contrast with other phases. Among the ariotacyls, fragments of white tailed-deer and collared peccary were found. One piece of rodent was observed; apart from this, there was no other evidence of small mammals.

Among the specimens identified to class level, bird bones were absent, only fragments of big mammals were identified (Table 18).

Taxa	Common name	NISP	MNI
Reptilia			
Order Testudines			
Family Kinosternidae			
Kinosternon	Mud turtle	1	1
Aves			
Order Galliformes			
Family Phasianidae			
Cyrtonix montezumae	Montezuma or harlequin quail	1	1
Family Meleagridae			
Meleagris gallopavo	Common turkey	8	3
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyote	6	3
cf. *Canis familiaris*	Dog	2	1
Family Felidae			
Puma concolor	Cougar or mountain lion	1	1
Order Artiodactyla	Artiodactyls	3	2
Odocoileus virginianus	White-tailed deer	6	3
Family Tayassidae			
Tayassu tajacu	Collared peccary	1	1
Order Rodentia	Rodent	1	1
Total		30	17

Table 17. Identified species from the Pitao phase in W1 Area.

Taxa	NF
Non identified fragments	6
Big mammals	7
Total	13

Table 18. Animal bone fragments from the Pitao phase in W1 Area.

The Xoo phase was the latest time period represented in this area. Presence of common turkey, *Canis* sp., artiodactyls, collared peccary and hare was observed (Table 19). Fragments of aves and mammals of no specific size were also identified (Table 20).

Taxa	Common name	NISP	MNI
Aves			
Family Meleagridae			
Meleagris gallopavo	Common turkey	2	2
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyote	4	3
Order Artiodactyla	Artiodactyls	1	1
Family Tayassidae			
Tayassu tajacu	Collared peccary	2	2
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	1	1
Total		10	9

Table 19. Identified species from the Xoo phase in W1 Area.

Taxa	NF
Non identified fragments	16
Aves	2
Mammals	4
Total	22

Table 20. Animal bone fragments from the Xoo phase in W1 Area.

Some samples of animal bones were recovered with mixed pottery from various time periods which were grouped in Tables 21, 22, 23, 24 and 25. These data showed similar taxa to the other tables presented for this area. A small sample was dated from the Danibaan to Peche phases and taxa were present in almost even frequencies (Table 21). Only one fragment corresponding to a big mammal was classified for this period of time. Samples in Tables 22 and 24 were more abundant. In the first, the most frequent groups were *Canis* sp. and artiodactyls followed by common turkey. A specimen of a probable eastern cottontail rabbit was idientified. Fragments of big and medium-big mammals were also part of the sample (Table 23). In the Table 24 the animals represented in decreasing order were artiodactyls, common turkey, *Canis* sp. and eastern cottontail. Fragments identified as aves, mammals and big mammal were found too (Table 25).

Taxa	Common name	NISP	MNI
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	2	2
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyote	2	1
Order Artiodactyla	Artiodactyls	1	1
Family Cervidae			
Odoocileus sp.	Deer	1	1
Odocoileus virginianus	White-tailed deer	1	1
Family Tayassidae			
Tayassu tajacu	Collared peccary	1	1
Total		8	7

Table 21. Identified species from the Danibaan to Peche phases in W1 Area.

Taxa	Common name	NISP	MNI
Reptilia			
Order Testudines	Turtles	1	1
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	2	1
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyote	10	6
cf. *Canis familiaris*		1	1
Canis familiaris	Dog	1	1
Order Artiodactyla	Artiodactyls	7	3
Family Cervidae			
Odoocileus sp.	Deer	1	1
Odocoileus virginianus	White-tailed deer	4	3
Family Tayassidae			
Tayassu tajacu	Collared peccary	1	1
Order Lagomorpha			
Family Leporidae			
cf. *Sylvilagus floridanus*	Eastern cottontail	1	1
Total		29	19

Table 22. Identified species from the Danibaan to Xoo phases in W1 Area.

Taxa	NF
Non identified fragments	10
Mammal	1
Big mammals	7
Medium-big mammal	1
Total	19

Table 23. Animal bone fragments from the Danibaan toXoo phases in W1 Area.

Taxa	Common name	NISP	MNI
Aves			
Order Galliformes			
Famiy Meleagridae			
Melleagris gallopavo	Common turkey	4	1
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyote	2	1
Order Artiodactyla	Artiodactyls	1	1
Family Cervidae			
Odoocileus sp.	Deer	3	2
Odocoileus virginianus	White-tailed deer	5	2
Family Tayassidae			
Tayassu tajacu	Collared peccary	7	2
Order Lagomorpha			
Family Leporidae			
Sylvilagus floridanus	Eastern cottontail	1	1
Total		23	10

Table 24. Identified species from the Nisa to Xoo phases in W1 Area.

Taxa	NF
Non identified fragments	26
Aves	3
Mammals	20
Big mammal	1
Total	50

Table 25. Animal bone fragments from the Nisa to Xoo phases in W1 Area.

W2 Area

In this area the faunal remains came mainly from room W2-1 but also other zooarchaeological material was collected in room W2-2, corridor W2-1 and next to wall W2-3 (Fig.69). According to Table 26 remains of collared peccary, white-tailed deer and white-sided jackrabbit were present during Pe phase. Fragments of aves, big and medium mammals were also identified for this time period (Table 27).

Fig.69. Floor plan of W2 Area with location of faunal remains (after Morales *et al*. 1999:79).

Taxa	Common name	NISP	MNI
Mammalia			
Order Artiodactyla			
Family Cervidae			
Odocoileus virginianus	White-tailed deer	2	1
Family Tayassidae			
Tayassu tajacu	Collared peccary	3	2
Order Lagomorpha			
Family Leporidae			
Lepus callotis	White-sided jackrabbit	1	1
Total		6	4

Table 26. Identified species from the Danibaan and Pe phases in W2 Area.

Taxa	NF
Non identified fragments	18
Aves	4
Big mammal	1
Medium mammals	2
Total	25

Table 27. Animal bone fragments from the Danibaan and Pe phases in W2 Area.

A small sample from the Pe and Nisa phases was recovered in this area and consisted mainly of collared peccary, white tailed-deer and in less proportion of *Canis* sp. and common turkey. A few specimens of cougar were identified. Small mammals such as lagomorphs and rabbit were observed (Table 28). Fragments of big, medium and small mammals were also present (Table 29).

Taxa	Common name	NISP	MNI
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	1	1
Mammalia			
Order Carnivora			
Family Felidae			
Puma concolor	Cougar	2	1
Family Canidae			
Canis sp.	Wolf, dog, coyotes	2	1
Order Artiodactyla	Artiodactyls	4	1
Family Cervidae			

Odocoileus sp.	Deer	1	1
Odocoileus virginianus	White-tailed deer	8	1
Family Tayassidae			
Tayassu tajacu	Collared peccary	32	1
Order Lagomorpha	Lagomorphs	5	5
Family Leporidae			
Sylvilagus sp.	Rabbit	1	1
Total		56	13

Table 28. Identified species from the Pe and Nisa phases in W2 Area.

Taxa	NF
Big mammal	1
Medium mammals	6
Small mammals	2
Total	9

Table 29. Animal bone fragments from the Pe and Nisa phases in W2 Area.

The most represented group in the Nisa phase was the artiodactyls made up of white tailed-deer, brocket deer and probably white-lipped peccary (Table 30). The *Mazama americana* species was not present in W1 Area in the Nisa phase or any other period. It seems this kind of deer was not common to find near Monte Albán. The presence of white-lipped peccary was not frequent either. Among the aves, the common turkey was the most abundant species. This sample was formed not only by domestic aves but also by wild ones such as the common raven. A few fragments of *Canis* sp. were identified. The group of lagomorphs was scarce and just one specimen of white-sided jackrabbit was noticed. Fragments of aves, big and medium mammals were also part of the sample (Table 31).

Taxa	Common name	NISP	MNI
Aves			
Order Corvidae			
Family Corvus			
Corvus corax	Common raven	1	1
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	8	6
Mammalia			
Order Carnivora			

Family Canidae			
Canis sp.	Wolf, dog, coyotes	2	2
cf. *Canis* sp.		1	1
Order Artiodactyla	Artiodactyls	10	5
Family Cervidae			
Odocoileus virginianus	White-tailed deer	10	7
Mazama americana	Brocket deer	1	1
Family Tayassidae			
Tayassu cf. *peccary*	White-lipped peccary	1	1
Order Lagomorpha	Lagomorphs	1	2
Family Leporidae			
Lepus callotis	White-sided jackrabbit	1	1
Total		36	27

Table 30. Identified species from the Nisa phase in W2 Area.

Taxa	**NF**
Non identified fragments	14
Aves	18
Mammals	3
Big mammals	14
Medium mammal	1
Total	50

Table 31. Animal bone fragments from the Nisa phase in W2 Area.

Identified taxa for the Peche phase were few but included aquatic resources such as the mud turtle; the group of aves was constituted only by two fragments of common turkey. Among the big and medium mammalas, the white-tailed deer was the most frequent followed by *Canis* sp., and collared peccary (Table 32). The sample also contained fragments of aves and a big mammal (Table 33).

Taxa	**Common name**	**NISP**	**MNI**
Reptilia			
Order Testudines			
Family Kinosternidae			
Kinosternon	Mud turtle	1	1
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	2	2
Mammalia			
Order Carnivora			
Family Canidae			

Canis sp.	Wolf, dog, coyotes	4	1
Order Artiodactyla			
Family Cervidae			
Odocoileus virginianus	White-tailed deer	7	1
Family Tayassidae			
Tayassu tajacu	Collared peccary	1	1
Total		15	6

Table 32. Identified species from the Peche phase in W2 Area.

Taxa	**NF**
Non identified fragments	10
Aves	2
Big mammal	1
Total	13

Table 33. Animal bone fragments from the Peche phase in W2 Area.

The faunal remains recovered in this area mixed with pottery from various periods of time were grouped in Tables 34, 35, 36, 37 and 38. The sample from the Danbaan to Peche phases showed that artiodactyls were the most frequent taxa (Table 34). Mountain lion was present for the first time in W2 Area, another fragment of this species was found in W1 Area (Table 17). Five non identified fragments were quantified in this sample. According to Table 35 most of the animal bones came from Danibaan to Xoo phases. The most abundant group for this period of time was the artiodactyls, such as white-tailed deer, followed by collared peccary. Common turkey and *Canis* sp. were also present. Hare, white-sided jackrabbit and Mexican cottontail were some of the small mammals. The same trend could be observed in Table 37 showing artiodactyls as the most represented group, formed of white-tailed deer and collared peccary. Evidence of *Canis* sp. and common turkey was also found. Only one fragment of hare and another of rabbit were identified among the small mammals. Presence of aves and mammals of different sizes was observed and a fragment of fish was identified for the first time in W2 Area (Tables 36 and 38).

Taxa	Common name	NISP	MNI
Mammalia			
Order Carnivora			
Family Felidae			
Puma concolor	Cougar, mountain lion	1	1
Order Ariodactyla	Artiodactyls	4	2
Family Cervidae			
Odocoileus virginianus	White-tailed deer	7	4
Total		12	7

Table 34. Identified species from the Danibaan to Peche phases in W2 Area.

Taxa	Common name	NISP	MNI
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	12	6
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	13	6
Order Artiodactyla	Artiodactyls	10	5
Family Cervidae			
cf. *Odocoileus* sp.		1	1
Odocoileus virginianus	White-tailed deer	16	7
Family Tayassidae			
Tayassu tajacu	Collared peccary	4	4
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	2	2
Lepus callotis	White-sided jackrabbit	1	1
Sylvilagus cunicularius	Mexican cottontail	1	1
Total		60	33

Table 35. Identified species from the Danibaan to Xoo phases in W2 Area.

Taxa	NF
Non identified fragments	34
Fish	1
Aves	9
Big mammals	11
Medium-big mammals	4
Medium mammals	5
Total	64

Table 36. Animal bone fragments from the Danibaan to Xoo phases in W2 Area.

Taxa	Common name	NISP	MNI
Aves			
Order Galliformes			
Family Meleagriadae			
Meleagris gallopavo	Common turkey	5	4
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	4	4
Order Artiodactyla	Artiodactyls	5	2
Family Cervidae			
Odocoileus virginianus	White-tailed deer	6	3
Family Tayassidae			
cf. *Tayassu peccary*	White-lipped peccary	1	1
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	1	1
Sylvilagus sp.	Rabbit	1	1
Total		23	16

Table 37. Identified species from the Nisa to Xoo phases in W2 Area.

Taxa	NF
Non identified fragments	12
Aves	3
Big mammals	9
Medium mammals	2
Total	26

Table 38. Animal bone fragments from the Nisa to Xoo phases in W2 Area.

A3 Area

In this area, the archaeozoological material was found in different structures (A3A, A3B, A3C, A3D, A3F, A3G and A3H) (Figs.70, 71, 72, 73, 74, 75, 76, 77 and 78). However, a higher concentration of animal bones was perceived in structures A3B and A3D (Figs. 72 and 73). Faunal remains that were part of the clearance debris excavated in this area were not included in the quantification. One fragment of Mexican duck (*Anas diazi*) and another of common bobwhite (*Colinus virginianus*) were identified in the samples recovered from the debris. Since these species were absent in the rest of the sample they are only reported as part of the assemblage in this area. In the Danibaan phase, species such as common turkey, dog, white-tailed deer, collared peccary, rabbits and the Mexican cottontail were hardly represented (Table 39). Fragments of aves, big, medium and small-medium mammals were also observed in the sample (Table 40).

Taxa	Common name	NISP	MNI
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	2	2
Mammalia			
Order Carnivora			
Family Canidae			
Canis familiaris	Dog	1	1
Order Artiodactyla	Artiodactyls		
Family Cervidae			
Odocoileus virginianus	White-tailed deer	1	1
Family Tayassidae			
Tayassu tajacu	Collared peccary	8	3
Order Lagomorpha			
Family Leporidae			
Sylvilagus sp.	Rabbit	3	1
Sylvilagus cunicularius	Mexican cottontail	1	1
Total		16	9

Table 39. Identified species from the Danibaan phase in A3 Area.

Taxa	NF
Non identified fragments	11
Aves	6
Big mammals	7
Medium mammal	1
Samall-medium mammals	2
Samall mammal	1
Total	21

Table 40. Animal bone fragments from the Danibaan phase in A3 Area.

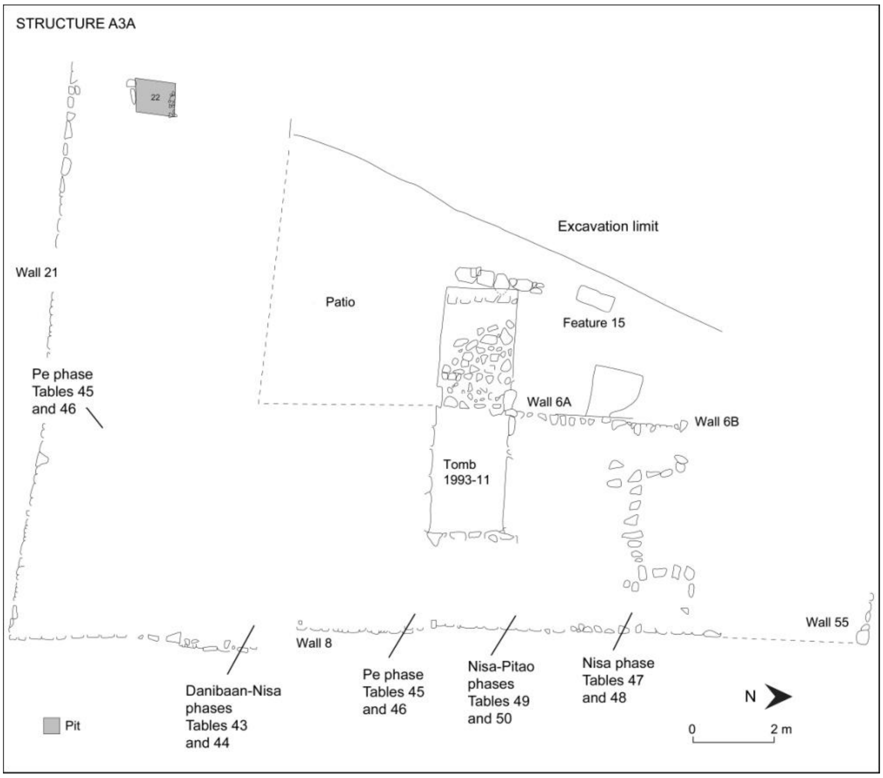


Fig.70. Floor plan of structure A3A in A3 Area with location of faunal remains (after Martínez *et al.* 1997:13).

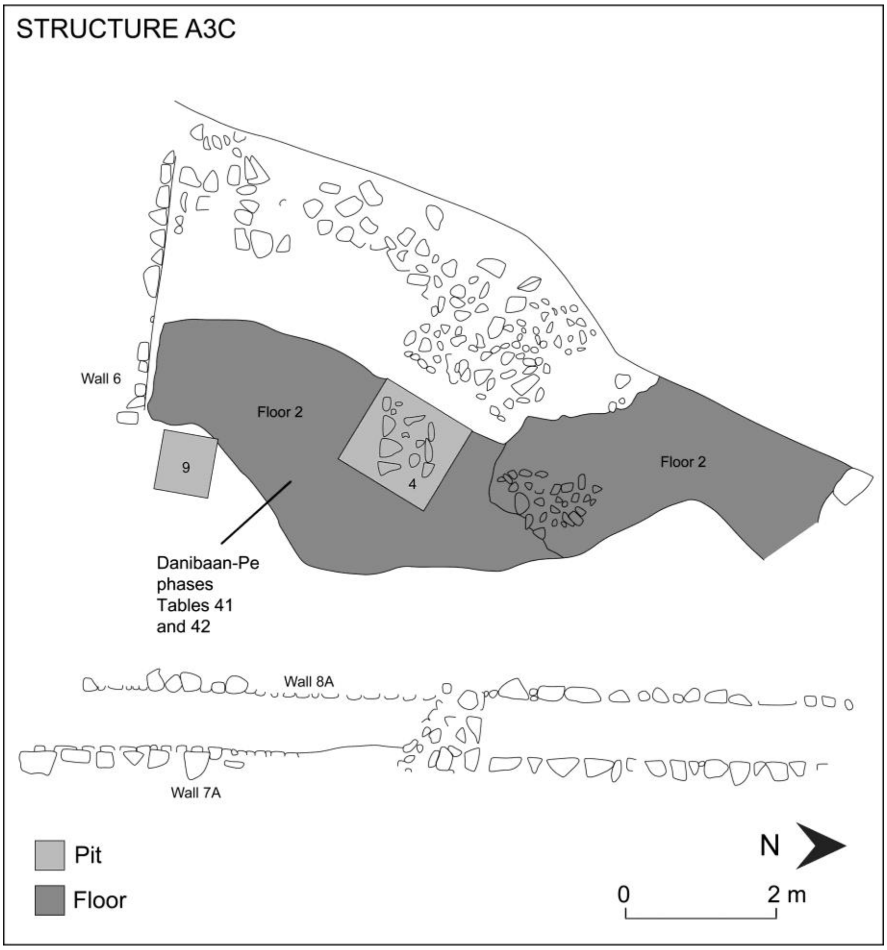


Fig.71. Floor plan of structure A3C in A3 Area with location of faunal remains (after Martínez *et al.* 1997:32).

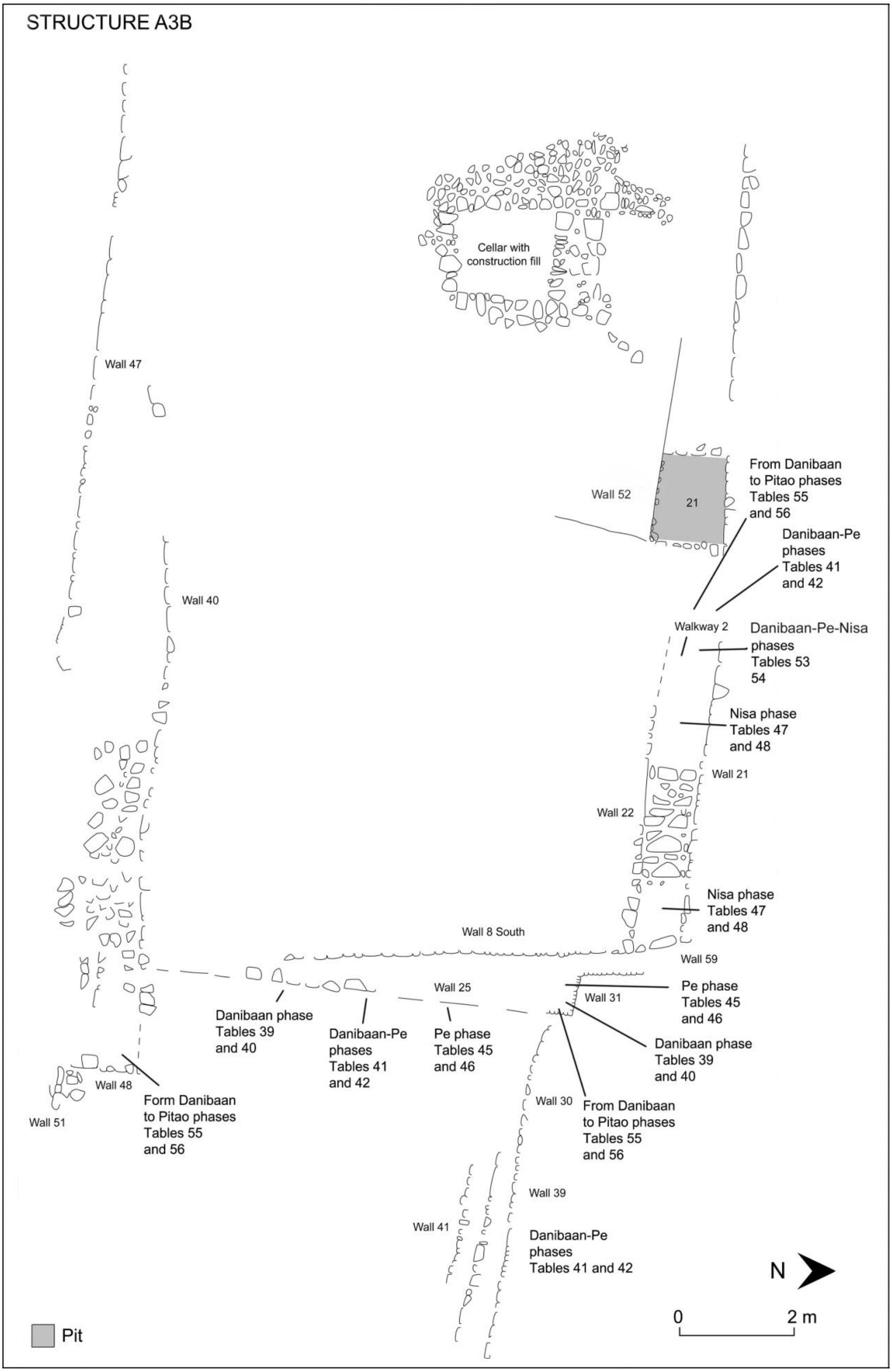


Fig.72. Floor plan of structure A3B in A3 Area with location of faunal remains (after Martínez *et al.* 1997:22).

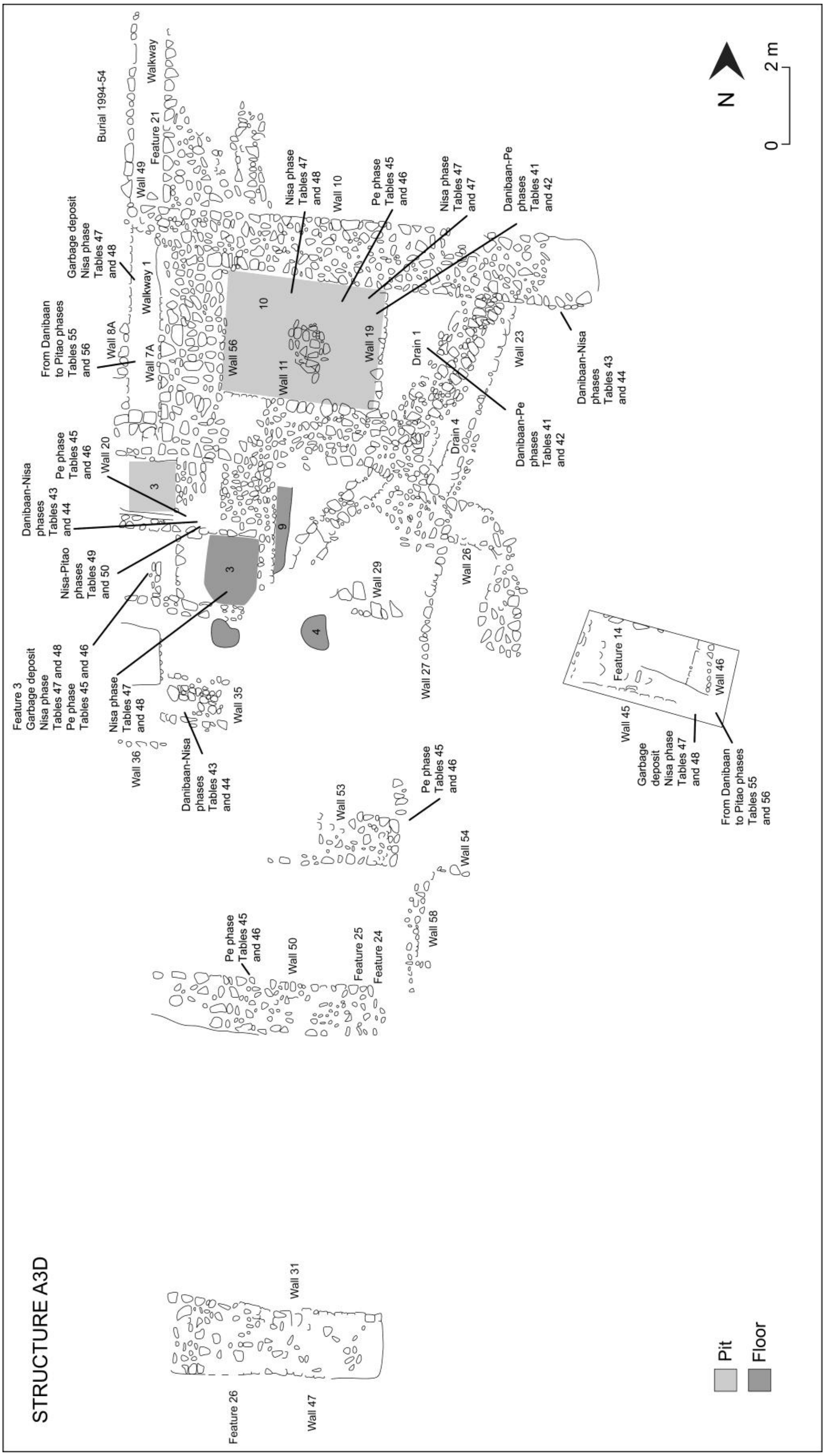


Fig.73. Floor plan of structure A3D in A3 Area with location of faunal remains (after Martínez *et al.* 1997:44).

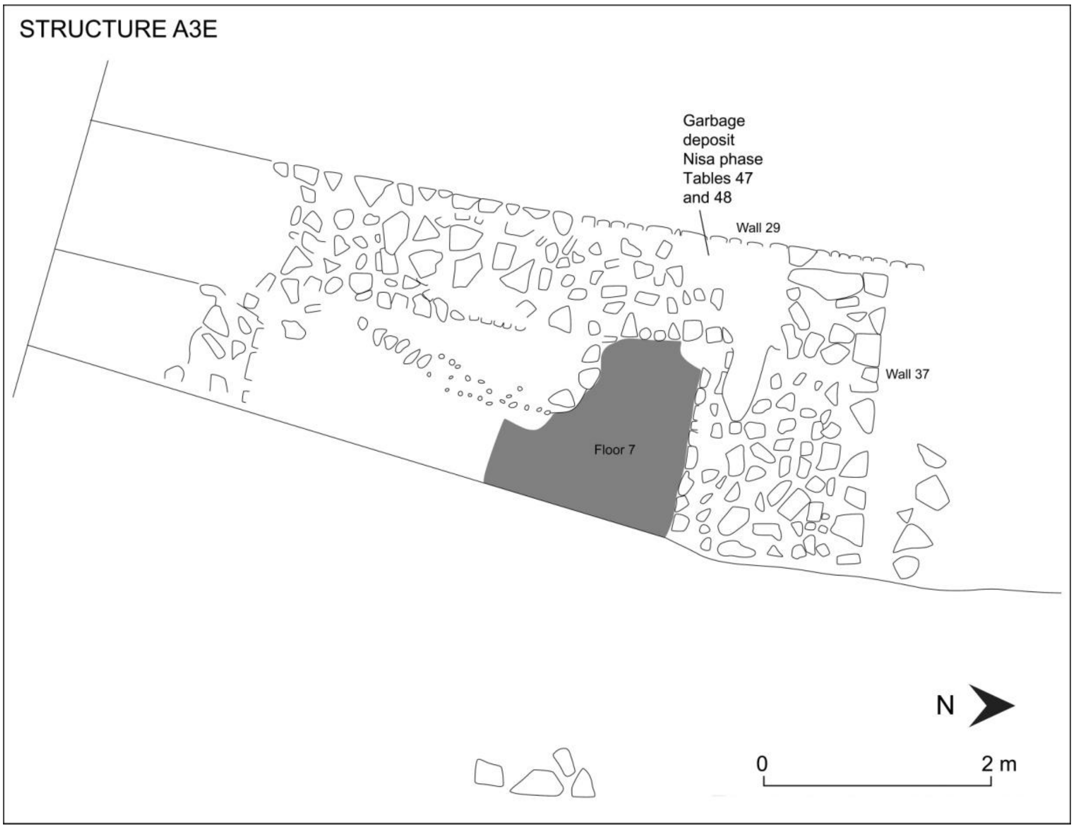


Fig.74. Floor plan of structure A3E in A3 Area with location of faunal remains (after Martínez *et al.* 1997:62).

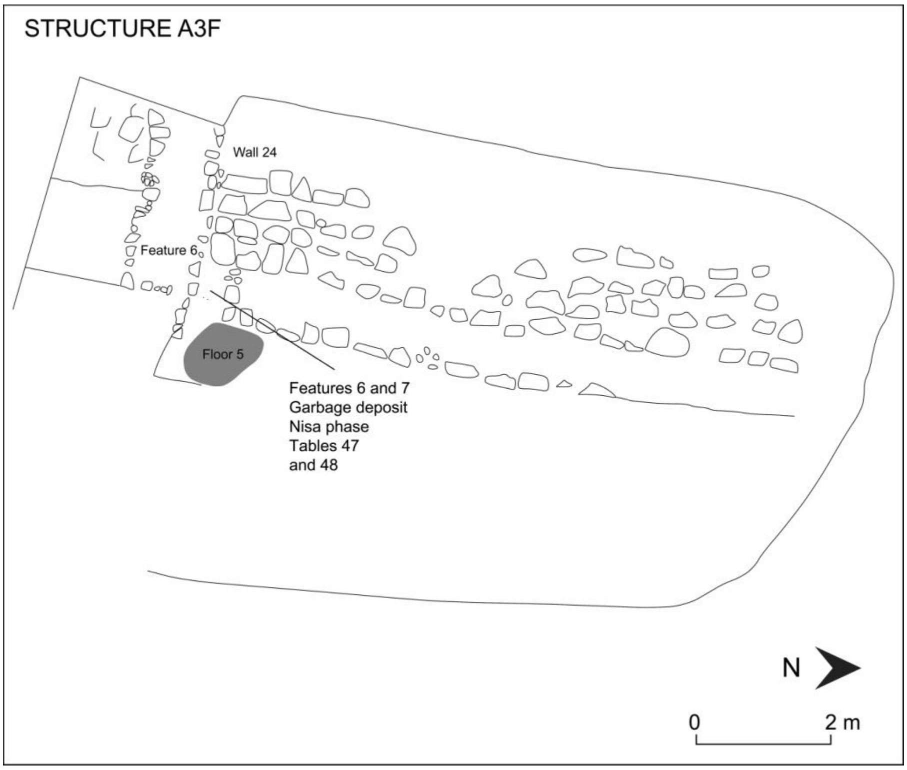


Fig.75. Floor plan of structure A3F in A3 Area with location of faunal remains (after Martínez *et al.* 1997:65).

Fig.76. Floor plan of structure A3G in A3 Area with location of faunal remains (after Martínez *et al.* 1997:71).

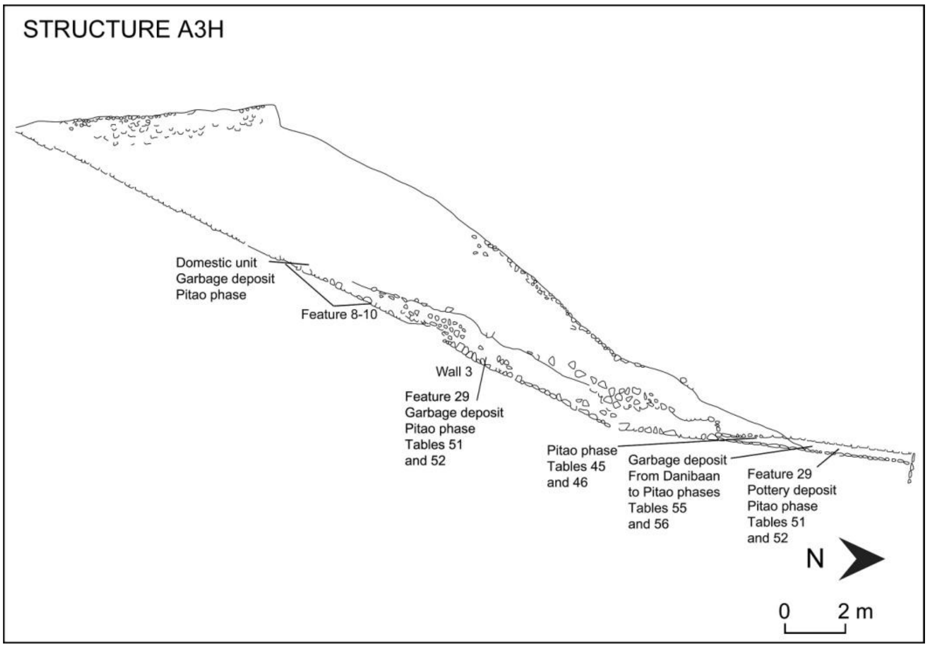


Fig.77. Floor plan of structure A3H in A3 Area with location of faunal remains (after Martínez *et al.* 1997:85).

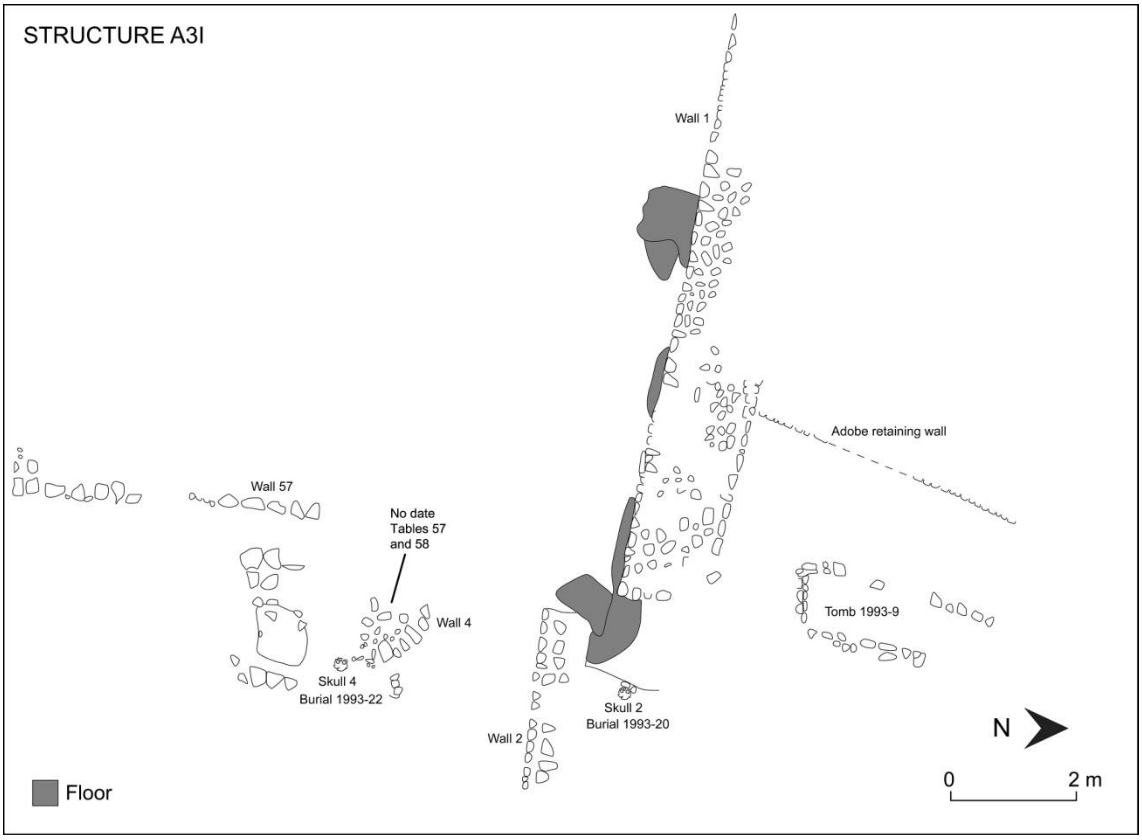


Fig.78. Floor plan of structure A3I in A3 Area with location of faunal remains (after Martínez *et al.* 1997:99).

A more abundant sample dated from the Danibaan and Pe phases was recovered (Table 41). The common turkey was the most frequent species among the birds but a fragment of probable curassow was observed too. *Canis* sp. also constituted the sample and one fragment was identified as dog. The group of artiodactyls was represented by the white-tailed deer and collared peccary. There was a little difference in the number of individuals perceived between these two taxa, although a slightly higher number of collared peccary was noticed. Small mammals such as hares, rabbits and the eastern cottontail were found. Some bone fragments also corresponded to aves and different size mammals (Table 42). A small sample from the Danibaan and Nisa phases was observed, consisting of common turkey, *Canis* sp., dog, artiodactyls and white-tailed deer (Table 43). The most abundant of these animals was the common turkey. A few bone fragments of mammals were counted too (Table 44).

Taxa	Common name	NISP	MNI
Aves			
Order Galliformes			
Family Cracidae			
cf. *Crax*	Curassows	1	1
Family Meleagridae			
Meleagris gallopavo	Common turkey	10	7
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	5	4
cf. *Canis familiaris*	Dog	1	1
Order Artiodactyla	Artiodactyls	7	4
Family Cervidae			
Odocoileus virginianus	White-tailed deer	9	7
Family Tayassidae			
Tayassu tajacu	Collared peccary	11	9
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	2	2
Sylvilagus sp.	Rabbit	2	1
Sylvilagus floridanus	Eastern cottontail	1	1
Total		49	37

Table 41. Identified species from the Danibaan and Pe phases in A3 Area.

Taxa	NF
Non identified fragments	38
Aves	4
Mammals	2
Big mammals	11
Medium-big mammal	1
Medium mammals	4
Samall mammal	1
Total	61

Table 42. Animal bone fragments from the Danibaan and Pe phases in A3 Area.

Taxa	Common name	NISP	MNI
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	15	5
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	5	2
Canis familiaris	Dog	1	1
Order Artiodactyla	Artiodactyls	2	1
Family Cervidae			
Odocoileus virginianus	White-tailed deer	1	1
Total		24	10

Table 43. Identified species from the Danibaan and Nisa phases in A3 Area.

Taxa	**NF**
Non identified fragments	12
Mammals	3
Total	15

Table 44. Animal bone fragments from the Danibaan and Nisa phases in A3 Area.

In the Pe phase, sea resources were represented by a marginal plate of a green turtle carapace. Different types of fish were found in the sample, one corresponding to the snook group, another fragment to sea bass family and the last one to a buffalo fish. A fragment of snook fish was identified for the first time in this area. Among the aves, common turkey was the most frequent species but presence of duck was also noted (Table 45). Evidence of *Canis* sp. was observed and some fragments were identified as dog. One of the most abundant groups was the artiodactyls consisting of collared peccary and white-tailed deer in similar proportions. It is possible that the brocket deer was present too. Hares, white-sided jackrabbit, rabbit, eastern cottontail and giant pocket gopher were part of small mammals. Bone fragments of aves, big, medium and medium-big mammals were also identified (Table 46).

Taxa	**Common name**	**NISP**	**MNI**
Actinopterygii			
Order Perciformes			
Family Centropomidae			
Centropomus sp.	Snook	1	1
Family Serranidae	Sea bass	1	1
Order Cypriniformes			
Family Catostomidae			
Ictiobus sp.	Buffalo fish	1	1
Reptilia			
Order testudines			
Family Chelonidae			
Chelonia mydas	Green Turtle	1	1
Aves			
Order Anseriformes			
Family Anatidae	Ducks	3	1
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	44	8

Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	14	7
Canis familiaris	Dog	5	3
Order Artiodactyla	Artiodactyls	7	4
Family Cervidae			
Odocoileus sp.	Deer	1	1
Odocoileus virginianus	White-tailed deer	19	8
cf. *Mazama americana*	Brocket deer	3	3
Family Tayassidae			
Tayassu tajacu	Collared peccary	21	13
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	5	3
Lepus callotis	White-sided jackrabbit	1	1
Sylvilagus sp.	Rabbit	1	1
Sylvilagus floridanus	Eastern cottontail	2	2
Order rodentia			
Family Geomyidae			
Orthogeomys grandis	Giant pocket gopher	2	2
Total		132	61

Table 45. Identified species from the Pe phase in A3 Area.

Taxa	**NF**
Non identified fragments	70
Aves	67
Big mammals	27
Medium mammal	1
Medium-big mammals	4
Total	169

Table 46. Animal bone fragments from the Pe phase in A3 Area.

The sample dated from the Nisa phase showed that turkey was the most common species represented in the ave group and only one fragment of harlequin quail was identified (Table 47). Among the *Canis* sp. not only evidence of dog was found but also a fragment of grey fox was identified. It is possible that this group consisted of wolf and coyote too. White-tailed deer was the most abundant species in the artiodactyls, followed by collared peccary. Small mammals, such as hare and rabbit were also present. Bone fragments of aves, big and medium mammals formed this sample too (Table 48).

Taxa	**Common name**	**NISP**	**MNI**
Aves			
Order Galliformes			
Family Odontophoridae			
Cyrtonix montezumae	Montezuma or harlequin quail	1	1
Family Meleagridae			
cf. *Meleagris*	Turkey	1	1
Meleagris gallopavo	Common turkey	76	24
Mammalia			
Order Carnivora			
Family Canidae			
Urocyon cinereoargenteus	Grey fox, tree fox	1	1
Canis sp.	Wolf, dog, coyotes	39	17
Canis cf. *lupus*	Wolf	4	2
Canis cf. *latrans*	Coyote	1	1
Canis familiaris	Dog	5	5
Order Artiodactyla	Artiodactyls	13	12
Family Cervidae			
Odoocileus sp.	Deer	3	3
Odocoileus virginianus	White-tailed deer	46	19
Family Tayassidae			
Tayassu tajacu	Collared peccary	22	14
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	3	2
Sylvilagus sp.	Rabbit	1	1
Total		216	103

Table 47. Identified species from the Nisa phase in A3 Area.

Taxa	**NF**
Non identified fragments	61
Aves	45
Big mammals	17
Medium mammals	4
Medium-big mammals	3
Total	130

Table 48. Animal bone fragments from the Nisa phase in A3 Area.

According to Table 49, the most abundant species in the Nisa and Pitao phases was the common turkey. Another frequent animal was the white-tailed deer and in smaller proportion collared peccary and dog. Evidence of white-sided jackrabbit was observed. Bone fragments of aves, big, medium-big and medium mammals were also identified (Table 50).

Taxa	Common name	NISP	MNI
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	30	5
Mammalia			
Order Carnivora			
Family Canidae			
cf. *Canis* sp.		1	1
Canis sp.	Wolf, dog, coyotes	9	1
cf. *Canis familiaris*	Dog	2	1
Order Artiodactyla	Artiodactyls	16	5
Family Cervidae			
Odocoileus virginianus	White-tailed deer	15	5
Family Tayassidae			
Tayassu tajacu	Collared peccary	2	1
Order Lagomorpha			
Family Leporidae			
Lepus callotis	White-sided jackrabbit	1	1
Total		76	20

Table 49. Identified species from the Nisa and Pitao phases in A3 Area.

Taxa	NF
Non identified fragments	2
Aves	4
Mammals	2
Big mammals	29
Medium-big mammal	1
Medium mammal	1
Total	39

Table 50. Animal bone fragments from the Nisa and Pitao phases in A3 Area.

The most represented species in the Pitao phase was the common turkey (Table 51). The same trend was observed for the Pe and Nisa phases (Tables 45 and 47). One fragment of harlequin quail was identified among the birds. The presence of *Canis* sp. was less common than that of common turkey and just one specimen corresponded to dog. In the group of artiodactyls, only white-tail deer was observed; no evidence of collared peccary was found. Small mammals consisted of hare, rabbit, the white-sided jackrabbit and Mexican cottontail (Table 51). Bone fragments identified as aves, big and medium-big mammals constituted the sample too (Table 52).

Taxa	Common name	NISP	MNI
Aves			
Order Galliformes			
Family Odontophoridae			
Cyrtonix montezumae	Montezuma or harlequin quail	1	1
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	77	20
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	11	6
Canis familiaris	Dog	1	1
Order Artiodactyla	Artiodactyls	13	7
Family Cervidae			
Odocoileus sp.	Deer	5	4
Odocoileus virginianus	White-tailed deer	11	7
Order Lagomorpha	Lagomorphs	1	1
Family Leporidae			
Lepus sp.	Hare	3	3
Lepus callotis	White-sided jackrabbit	3	2
Sylvilagus sp.	Rabbit	1	1
Sylvilagus cunicularius	Mexican cottontail	1	1
Total		128	54

Table 51. Identified species from the Pitao phase in A3 Area.

Taxa	NF
Non identified fragments	37
Aves	105
Big mammals	24
Medium-big mammals	9
Total	175

Table 52. Animal bone fragments from the Pitao phase in A3 Area.

Faunal remains with mixed pottery from different periods of time were recovered as in the W1 and W2 Areas. These data were organized in Tables 53 and 54 with fragments from the Danibaan, Pe and Nisa phases, and Tables 55 and 56 with fragments from the Danibaan and Pitao phases. Results showed almost the same species that have been identified in this area as from other phases.

According to the first table, evidence of snook fish and a fragment of probable crocodylus were identified (one of the limbs). Artiodactyls were the most abundant group, followed by common turkey and *Canis* sp. Small mammals consisted of white-sided jackrabbit, rabbits and Mexican cottontail (Table 53). The second table shows that artiodactyls were by far the most frequent taxa, especially white-tailed deer. After artiodactyls, *Canis* sp. was the most represented group and it doubled the number of individuals of common turkey. Small mammals such as lagomorphs, hare, white-sided jackrabbit, rabit, eastern cottontail, Mexican cottontail and giant pocket gopher were also found (Table 55). In these samples, fragments of aves and mammals of different sizes were counted too (Tables 54 and 56).

Taxa	Common name	NISP	MNI
Actinopterygii			
Order Perciformes			
Family Centropomidae			
Centropomus sp.	Snook	1	1
Reptilia			
Order Crocodyla			
Family cf. Crocodylidae	Crocodylus	1	1
Aves			
Order Anseriformes			
Family cf. Anatidae	Duck	1	1
Order Galliformes			
Family Odontophoridae			
Cyrtonix montezumae	Montezuma or harlequin quail	1	1
Family Meleagridae			
Meleagris gallopavo	Common turkey	23	9
Mammalia			
Order Carnivora			
Family Canidae			
Urocyon cinereoargenteus	Grey fox, tree fox	1	1
Canis sp.	Wolf, dog, coyotes	14	7
Canis familiaris	Dog	2	2
Order Artiodactyla	Artiodactyls	8	7
Family Cervidae			

cf. *Odocoileus* sp.		2	1
Odocoileus sp.	Deer	3	2
Odocoileus virginianus	White-tailed deer	14	5
Family Tayassidae			
Tayassu tajacu	Collared peccary	4	4
Order Lagomorpha			
Family Leporidae			
Lepus callotis	White-sided jackrabbit	1	1
Sylvilagus sp.	Rabbit	2	1
Sylvilagus cunicularius	Mexican cottontail	1	1
Total		79	45

Table 53. Identified species from the Danibaan, Pe and Nisa phases phase in A3 Area.

Taxa	**NF**
Non identified fragments	61
Aves	28
Big mammals	17
Total	106

Table 54. Animal bone fragments from the Danibaan, Pe and Nisa phases in A3 Area.

Taxa	**Common name**	**NISP**	**MNI**
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	14	4
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	16	8
Canis familiaris	Dog	1	1
Order Artiodactyla	Artiodactyls	11	7
Family Cervidae			
Odocoileus sp.	Deer	1	1
Odocoileus virginianus	White-tailed deer	20	7
Family Tayassidae			
Tayassu tajacu	Collared peccary	6	5
Order Lagomorpha	Lagomorphs	1	1
Family Leporidae			
Lepus sp.	Hare	1	1
Lepus callotis	White-sided jackrabbit	1	1
Sylvilagus sp.	Rabbit	1	1
Sylvilagus floridanus	Eastern cottontail	1	1
Sylvilagus cunicularius	Mexican cottontail	1	1
Order rodentia			

Family Geomyidae			
Orthogeomys grandis	Giant pocket gopher	1	1
Total		76	40

Table 55. Identified species from the Danibaan to Pitao phases in A3 Area.

Taxa	**NF**
Non identified fragments	114
Aves	27
Big mammals	29
Medium-big mammals	4
Total	174

Table 56. Animal bone fragments from the Danibaan to Pitao phase in A3 Area.

Some of the animal bones collected in this area did not have pottery associated, so it was not possible to assign them a date but it is probable that they correspond to the same phases as the platforms and residence units (Danibaan, Pe, Nisa, Pitao and Xoo) where they were found (Table 57). Among these fragments some species of aves such as great horn owl and Franklin´s gull were identified for the first time in this area and in the other areas. The harlequin quail was also found in this group but the most frequent was the common turkey. Of the artiodactyls the most abundant was the white-tailed deer and only one fragment of peccary was identified. *Canis* sp.was present by just a few individuals. Mexican cottontail and eastern cottontailed were part of the small mammals. Fragments identified to class level such as aves, mammals, big and medium-big mammals were also observed (Table 58).

Taxa	**Common name**	**NISP**	**MNI**
Aves			
Order Strigiformes			
Family Caprimulgidae			
Bubo virginianus	Great horned owl	1	1
Order Charadiiformes			
Family Laridae			
Larus pipixcan	Franklin´s gull	1	1
Order Galliformes			
Family Odontophoridae			
Cyrtonix montezumae	Montezuma or harlequin quail	1	1
Order Galliformes			

Family Meleagridae			
Meleagris gallopavo	Common turkey	7	3
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	4	4
Order Artiodactyla	Artiodactyls	3	2
Family Cervidae			
Odocoileus virginianus	White-tailed deer	8	5
Family Tayassidae			
Tayassu tajacu	Collared peccary	1	1
Order Lagomorpha			
Family Leporidae			
Sylvilagus cunicularius	Mexican cottontail	1	1
Sylvilagus floridanus	Eastern cottontail	1	1
Total		28	20

Table 57. Identified species with no date in A3 Area.

No date	**NF**
Non identified fragments	57
Aves	21
Mammals	2
Big mammals	15
Medium-big mammals	2
Total	97

Table 58. Animal bone fragments with no date in A3 Area.

PNLP Area

In this area, faunal bone remains were concentrated mainly in structures 3 and 5 but some samples were also recovered in structures 2 and 6 (Fig.79). According to Table 59 fish, like snook and bobo mulet were present for Pe and Nisa phases. It was the first time that the species bobo mulet was identified in these areas. The most abundant group was constituted by the artiodactyls, of which, the collared peccary was the most frequent, followed by the white-tailed deer. It is probable that other species were present in this group such as the white-lipped peccary and the brocket deer. Among the aves, common turkey was the most represented taxon but a specimen of hawk was identified too. The group of *Canis* sp. constituted also the sample and two fragments were attributed to dog. Evidence of small mammals was observed, such as hares and a

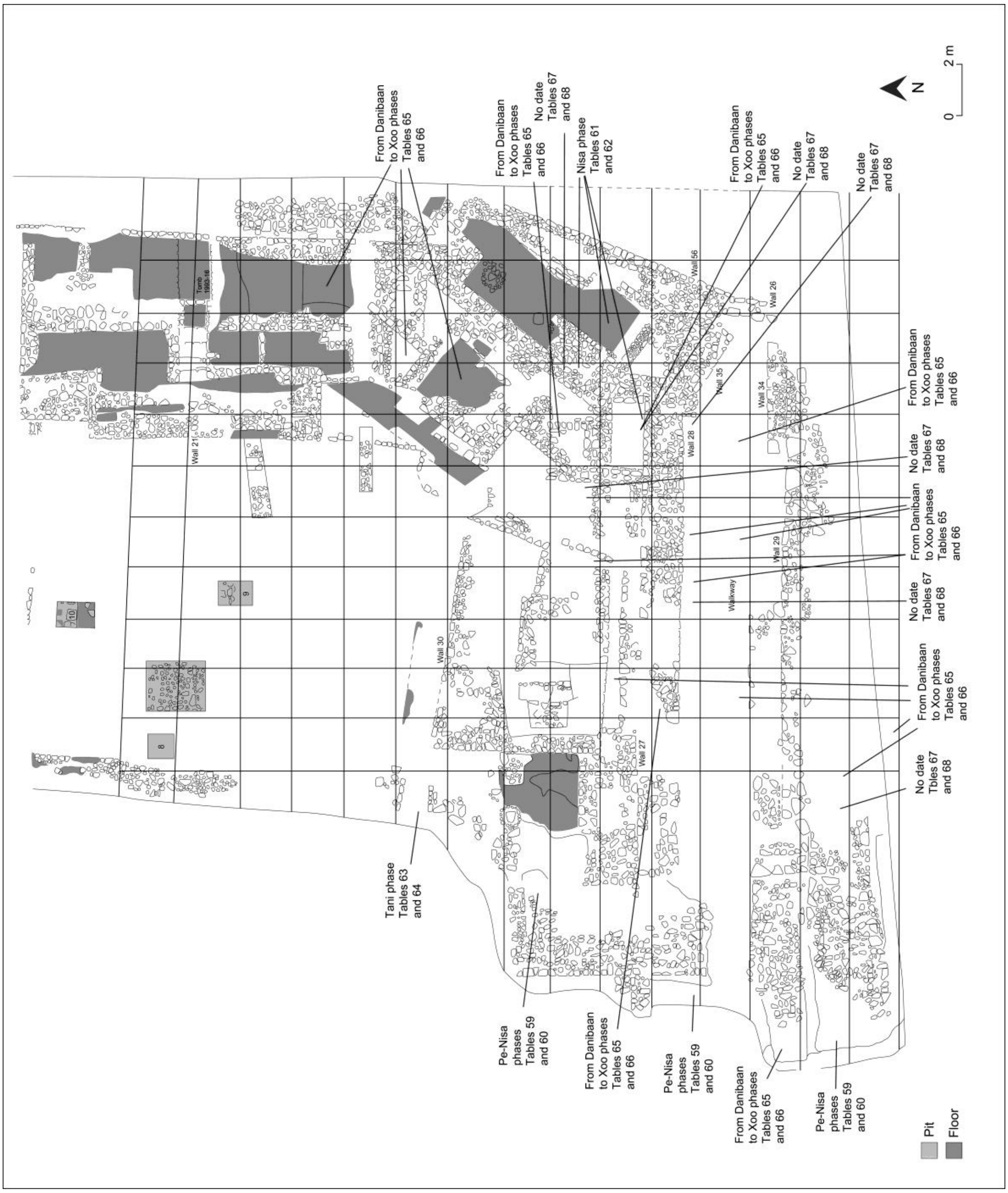


Fig.79. Floor plan of PNLP Area with the location of faunal remains (after Winter *et al*. 2001).

fragment of a giant pocket gopher. Bones of aves and mammals of different sizes were observed too (Table 60).

The sample dated to the Nisa phase (Table 61) showed similar results to that of the Pe and Nisa phases (Table 59). Once again, artiodacyls was the most represented group but in this case, white tailed-deer was more frequent than collared peccary. The only species seen in the group of aves was common turkey. Fragments of *Canis* sp.

were also identified. The group of small mammals was more abundant than in Table 59, consitituted by bone remains of hares, rabbits, white-sided jackrabbit and eastern cottontail species. Most of the bone fragments identified to class level were of aves and big mammals. Only one fragment of medium mammal was present and no evidence of small mammals was found. Fish were part of the sample too (Table 62).

Taxa	**Common name**	**NISP**	**MNI**
Actinopterygii			
Order Perciformes			
Family Centropomidae			
Centropomus sp.	Snook	1	1
Order Mugiliformes			
Family Mugilidae			
Joturus pichardoi	Bobo mulet	1	1
Aves			
Order Falconiformes			
Familia Accipitridae			
Buteo	Hawk	1	1
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	6	2
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	11	3
Canis familiaris	Dog	2	2
Order Artiodactyla	Artiodactyls	22	4
Family Cervidae			
Odocoileus sp.	Deer	1	1
Odocoileus virginianus	White-tailed deer	20	6
cf. Mazama americana	Brocket deer	1	1
Family Tayassidae			
Tayassu tajacu	Collared peccary	35	5
Tayassu cf. *pecari*	White-lipped peccary	1	1
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	4	2
Order Rodentia			
Family Geomyidae			
Orthogeomys grandis	Giant pocket gopher	1	1
Total		107	31

Table 59. Identified species from the Pe and Nisa phases in PNLP Area.

Taxa	**NF**
Non identified fragments	124
Aves	17
Big mammals	29
Medium mammal	5
Medium-big mammals	9
Total	184

Table 60. Animal bone fragments from the Pe and Nisa phases in PNLP Area.

Taxa	**Common name**	**NISP**	**MNI**
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	5	3
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	4	3
Order Artiodactyla	Artiodactyls	5	2
Family Cervidae			
Odocoileus virginianus	White-tailed deer	6	4
Family Tayassidae			
Tayassu tajacu	Collared peccary	2	2
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	2	1
Lepus callotis	White-sided jackrabbit	3	1
Sylvilagus sp.	Rabbit	2	2
Sylvilagus floridanus	Eastern cottontail	3	1
Total		32	19

Table 61. Identified species from the Nisa phase in PNLP Area.

Taxa	**NF**
Non identified fragments	19
Fish	5
Aves	33
Big mammals	27
Medium-big mammal	1
Total	85

Table 62. Animal bone fragments from the Nisa phase in PNLP Area.

A small sample from the Tani phase was recovered from PNLP area, which was constituted by common turkey, *Canis* sp., a dog specimen, artiodactyls, such as white-tailed deer and collared peccary (Table 63). A different species of medium sized mammal from the rest of the phases in this area was identified as coatimundi or white-nosed coati. The group of small mammals was poorly represented with just one fragment of eastern cottontail. Bone fragments of big and medium-big mammals formed the sample too (Table 64).

Taxa	**Common name**	**NISP**	**MNI**
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	5	1
Mammalia			
Order Carnivora			
Family Canidae	Wolf, dog, coyotes		
Canis sp.		2	1
Canis familiaris	Dog	1	1
Family Procyonidae			
Nasua narica	Coatimundi, white-nosed coati	1	1
Order Artiodactyla	Artiodactyls	3	1
Family Cervidae			
Odocoileus virginianus	White-tailed deer	4	1
Family Tayassidae			
Tayassu tajacu	Collared peccary	2	1
Order Lagomorpha			
Family Leporidae			
Sylvilagus floridanus	Eastern cottontail	1	1
Total		19	8

Table 63. Identified species from the Tani phase in PNLP Area.

Taxa	**NF**
Non identified fragments	13
Big mammals	4
Medium-big mammals	2
Total	19

Table 64. Animal bone fragments from the Tani phase in PNLP Area.

Some of the samples recovered from this area were mixed with pottery from the Danibaan to Xoo phases were grouped together in Table 65. According to the data, artiodactys were the most represented group with white-tailed deer in first place and collared peccary in second. After artiodactyls the group of *Canis* sp. was the most frequent and one fragment was identified as dog. Common turkey was also found to a lesser degree and small mammals consisted of hares, rabbits, white-sided jackrabbit and eastern cottontail. Fragments of aves, big, medium, medium-big mammals and fish were also observed (Table 66).

Taxa	**Common name**	**NISP**	**MNI**
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	11	6
Mammalia			
Order Carnivora			
Family Canidae			
Canis sp.	Wolf, dog, coyotes	11	6
Canis familiaris	Dog	1	1
Order Artiodactyla	Artiodactyls	22	12
Family Cervidae			
cf. *Odocoileus* sp.		1	1
Odocoileus sp.	Deer	2	2
Odocoileus virginianus	White-tailed deer	21	11
Family Tayassidae			
Tayassu tajacu	Collared peccary	6	4
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	4	3
Lepus callotis	White-sided jackrabbit	1	1
Sylvilagus sp.	Rabbit	6	4
Sylvilagus floridanus	Eastern cottontail	6	6
Sylvilagus cf. *cunicularius*		1	1
Sylvilagus cunicularius	Mexican cottontail	1	1
Order Rodentia			
Family Heteromydae			
Liomys irroratus	Mexican spiny pocket mouse	1	1
Total		95	60

Table 65. Identified species from the Danibaan to Xoo phases in PNLP Area.

Taxa	**NF**
Non identified fragments	192
Fish	1
Aves	29
Big mammals	41
Medium mammals	7
Medium-big mammals	3
Total	273

Table 66. Animal bone fragments from the Danibaan to Xoo phase in PNLP Area.

Samples that were not possible to date due to the absence of pottery are showed in Table 67**.** It is probable that this material corresponds to the same phases as the rest of the faunal remains found in this area (from the Pe to Xoo phases). Among these fragments, some species were identified for the first time in PNLP Area, such as the northern raccoon and white-footed mice. According to these data the most abundant species was the common turkey. In the aves group one fragment of harlequin quail was also found. The most frequent species of the artiodactyls was the white-tailed deer followed by the collared peccary. Evidence of *Canis* sp. and small mammals such as hares, rabbits, eastern cottontail, Mexican cottontail and giant pocket gopher were present too. Fragments of fish, aves, big, medium and big-medium mammals were also part of the sample (Table 68).

Taxa	**Common name**	**NISP**	**MNI**
Aves			
Order Galliformes			
Family Meleagridae			
Meleagris gallopavo	Common turkey	14	5
Family Odontophoridae			
Cyrtonix montezumae	Montezuma or harlequin quail	1	1
Mammalia			
Order Carnivora			
Family Procyonidae			
Procyon lotor	Northern raccoon	1	1
Family Canidae			
Canis sp.	Wolf, dog, coyotes	4	3
Order Artiodactyla			
Family Cervidae			
Odocoileus virginianus	White-tailed deer	11	8
Family Tayassidae			
Tayassu tajacu	Collared peccary	6	2
Order Lagomorpha			
Family Leporidae			
Lepus sp.	Hare	3	2
Sylvilagus sp.	Rabbit	5	1
Sylvilagus floridanus	Eastern cottontail	4	2
Sylvilagus cunicularius	Mexican cottontail	2	1
Order Rodentia			
Family Geomyidae			

Orthogeomys grandis	Giant pocket gopher	1	1
Family Cricetidae			
Peromyscus cf. *maniculatus*	White-footed mice or deer mice	1	1
Total		53	28

Table 67. Identified species with no date in PNLP Area.

Taxa	**NF**
Non identified fragments	137
Fish	1
Aves	32
Big mammals	16
Medium mammals	3
Medium-big mammals	4
Total	193

Table 68. Animal bone fragments with no date in PNLP Area.

CHAPTER VI

DISCUSSION

In this chapter data obtained from the previous results are analysed. The first section presents the number of taxa identified for each area under study. Subsistence species were considered separately from those that might have had other uses (ritual, symbolic and functional) or were simply intrusive. Taxa were also grouped into phases and periods of time, bringing together data from all areas. The intention was to detect changes in subsistence patterns during such phases and periods of time.

Each area´s equitability was also considered and compared to ascertain the species' diversity and abundance of each taxon represented in the sample. The habitat of the species identified in the sample was also taken into account, in order to determine the kinds of environments exploited by the population and whether the animals represented were native to Oaxaca or not. The following section discusses the anatomical pattern of the most common taxa such as deer, peccary, canids and turkey. The aim was to establish which were the most frequently found skeleton parts of these species and if there were differences between areas and taxa. Evidence of taphonomic agents (cut marks, burning, fractures, among others) observed on bone fragments is also considered as well as the age of small, medium and large mammals. Different uses of the sample taxa are proposed. Subsistence patterns found in Monte Alban are compared to other sites in Oaxaca and Mesoamerica, among populations such as the Mayas and Teotihuacanos. Food preparation, status, and feasts are discussed in the last section.

Taxa and subsistence in W1, W2, A3 and PNLP Areas

The sample of taxa demonstrated, in the identification process, that they may have been related to other purposes as well as subsistence. Evidence of this kind was observed in the faunal remains from all four areas. In order to distinguish subsistence preferences, those taxa that were used for human consumption were separated from those that might have been used for other purposes. Each species was considered in terms of four categories - diet, functionality, symbolism and ritual. For example, functionality might refer to those animals used for raw material in the attire or adornment of the elite, such as feathers or furs. However, in some cases it was not possible to ascertain a specific use for a taxon, so various ones were suggested (ritual, symbolic or functional). Other species could have simply been intrusive, so they were not included in the discussion. Undated taxa were also excluded from the analysis. In the last section of this chapter, the different categories attributed to each taxon are discussed in greater detail.

The group of *Canis* sp. was considered as *Canis* cf. *familiaris* since it was more probable that fragments identified at this level corresponded to dog. Even though it was not possible to differentiate between dogs and coyotes through most of the postcranial measurements, all the mandibles that were measured and showed diagnostic characters, corresponded to *Canis familiaris*. None of the mandibles were attributed to coyotes and only one postcranial bone was identified as *Canis* cf. *latrans*. So, the presence of coyotes at the site was highly unlikely. The following section will show that *Canis* sp. was one of the most prevalent groups in the four areas. Equally, as was mentioned in the previous chapter, the fragments classified as artiodactyls were considered as *Odocoileus* sp., since no other artiodactyl of deer size was identified among all the elements (457 NISP) found in this category.

The following section contains tables showing the total number of identified animal bones from each area and phase. In the first case, tables consider the data from each area grouping results from diverse phases. The intention is to compare similarities and/or differences between areas. In the second case, data from the four areas under study are organized into phases. The aim is to detect changes of taxa through the most represented phases. Only subsistence species are compared in the graphs supplied. A baseline of the species used in Oaxaca or Mesoamerica for consumption was established to classify the taxa. Faunal remains associated with contexts relating to food preparation or discarding, within the areas under study and cultural taphonomic evidence on bones such as cut marks, were also taken into account as baselines in determining subsistence species.

In the W1 Area the most abundant groups were canids with fragments identified as *Canis familiaris* and *Canis* cf. *familiaris* (29.91%), followed by the common turkey (27.68%), cervids (deer and white tailed deer with 21.86%), collared peccary (9.8%), lagomorphs (6.25%), and turtles (1.35%). There were very few bones of Montezuma quail (0.45%) (Table 69).

Taxa	Common name	Percentage	NISP	Use
Testudines	Turtle	0.45	1	D, F, S, R
Trachemys scripta	Pond slider	0.45	1	D, F, S, R
Kinostenon	Mud turtle	0.45	1	D, F, S, R
Cassiculus melanicterus	Yellow-winged cacique	0.45	1	F, S , R
cf. *Buteo* sp.	Hawk	0.45	1	F, S , R
Buteo jamaicencis	Red-tailed hawk	0.45	1	F, S , R
Cyrtonix montezumae	Montezuma quail	0.45	1	D, F, S, R
Meleagris gallopavo	Common turkey	27.68	62	D
Canis cf. *familiaris*	Dog	27.23	61	D, F, S , R
Canis familiaris	Dog	2.68	6	D, F, S, R
Puma concolor	Cougar, panther	0.45	1	F, S, R
Odocoileus sp.	Deer	10.26	23	D
Odocoileus virginianus	White-tailed deer	11.6	26	D
Tayassu tajacu	Collared peccary	9.8	22	D
Lagomorpha	Lagomorphs	1.78	4	D, R
Lepus sp.	Hare	1.34	3	D, R
Lepus callotis	White-sided jackrabbit	0.45	1	D, R
Sylvilagus sp.	Rabbit	0.89	2	D, R
Sylvilagus floridanus	Eastern cottontail	1.79	4	D, R
Rodentia	Rodent	0.45	1	I
Peromyscus melanophrys	Plateau deer mouse	0.45	1	I

Table 69. Total of animal bone fragments identified from W1 Area (D=diet, F=functional, S=symbolic, R=ritual).

In the W2 Area the presence of Cervids (deer, white tailed deer and brocket deer), was notable and represented almost half of the identified taxa (43.95%). The second most abundant species was the collared peccary (19.81%), followed by the common turkey (13.53%), canids (*Canis familiaris* and *Canis* cf. *familiaris* with 12.56%) and lagomorphs (6.77%). There was very little evidence of turtles (0.48%) and probable white-lipped peccary (0.97%) in this area (Table 70).

Taxa	Common name	Percentage	NISP	Use
Kinostenon	Mud turtle	0.48	1	D, F, S, R
Corvus corax	Common raven	0.48	1	F, S, R
Meleagris gallopavo	Common turkey	13.53	28	D
Odocoileus sp.	Deer	16.42	26	D
Odocoileus virginianus	White-tailed deer	27.05	56	D
Mazama americana	Brocket deer	0.48	1	D
Tayassu cf. *pecari*	White-lipped peccary	0.97	2	D
Tayassu tajacu	Collared peccary	19.81	41	D
Canis cf. *familiaris*	Dog	12.56	26	D, F, S , R
Puma concolor	Cougar, panther	1.45	3	F, S , R
Lagomorpha	Lagomorphs	2.9	6	D, R
Lepus sp.	Hare	1.45	3	D, R
Lepus callotis	White-sided jackrabbit	0.97	2	D, R
Sylvilagus sp.	Rabbit	0.97	2	D, R
Sylvilagus cunicularius	Mexican cottontail	0.48	1	D, R

Table 70. Total of animal bone fragments identified from W2 Area (D=diet, F=functional, S=symbolic, R=ritual).

In the A3 Area the most abundant species was the common turkey (36.69%), followed by cervids (deer, white-tailed deer, and brocket deer with 29.12%), canids (*Canis familiaris* and *Canis* cf. *familiaris* with 16.77%), collared peccary (9.33%), lagomprphs (5.03%) and fish (0.51%). The rest contained a few other species such as green turtle (0.13%), duck (0.51%), Montezuma quails (0.38%), probable wolf (0.5%) and probable coyote (0.13%) (Table 71).

Taxa	Common name	Percenatge	NISP	Use
Family Serranidae	Sea basses	0.13	1	D
Ictiobus sp.	Buffalo fish	0.13	1	D
Centropomus sp.	Snook	0.25	2	D
Family cf. Crocodylidae	Crocodylus	0.13	1	D, F, S, R
Chelonia mydas	Green turtle	0.13	1	D, F, R
Family Anatidae	Ducks	0.51	4	D, F, S, R
cf. *Crax*	Curassow	0.13	1	F, S, R

Cyrtonix montezumae	Montezuma quail	0.38	3	D, F, S, R
cf. *Meleagris*	Turkey	0.13	1	D
Meleagris gallopavo	Common turkey	36.69	292	D
Odocoileus sp.	Deer	10.58	84	D
Odocoileus virginianus	White-tailed deer	18.16	144	D
cf. *Mazama americana*	Brocket deer	0.38	3	D
Tayassu tajacu	Collared peccary	9.33	74	D
Urocyon cinereoargenteus	Grey fox, tree fox	0.13	1	F, S, R
Canis cf. *lupus*	Wolf	0.5	4	F, S, R
Canis cf. *latrans*	Coyote	0.13	1	F, S, R
Canis cf. *familiaris*	Dog	14.37	114	D, F, S, R
Canis familiaris	Dog	2.4	19	D, F, S, R
Lepus sp.	Hare	1.76	14	D, R
Lepus callotis	White-sided jackrabbit	0.88	7	D, R
Sylvilagus sp.	Rabbit	1.39	11	D, R
Sylvilagus floridanus	Eastern cottontail	0.5	4	D, R
Sylvilagus cunicularius	Mexican cottontail	0.5	4	D, R
Orthogeomys grandis	Giant pocket gopher	0.38	3	I

Table 71. Total of animal bone fragments identified from A3 Area (D=diet, F=functional, S=symbolic, R=ritual).

In the PNLP Area cervids represented almost half of the sample (deer, white-tailed deer, and brocket deer with 49.32%), a similar pattern was observed in W2 Area. Canids (*Canis familiaris* and *Canis* cf. *familiaris* with 14.41%) and common turkey (11.79%) showed similar proportions. These groups were followed by lagomorphs (14.85%) and collared peccary (6.55%). Fish (0.88%), rodents (0.88%) and probable white-lipped (0.44%) peccary were the least frequent species in this area (Table 72).

Taxa	**Common name**	**Percentage**	**NISP**	**Use**
Centropomus sp.	Snook	0.44	1	D
Joturus pichardoi	Bobo mulet	0.44	1	D
Buteo sp.	Hawk	0.44	1	F, S , R
Meleagris gallopavo	Common turkey	11.79	27	D
Odocoileus sp.	Deer	24.44	4	D
Odocoileus virginianus	White-tailed deer	24.44	56	D
cf. *Mazama americana*	Brocket deer	0.44	1	D
Tayassu tajacu	Collared peccary	6.55	15	D
Tayassu cf. *pecari*	White-lipped peccary	0.44	1	D
Canis cf. *familiaris*	Dog	12.66	29	D, F, S, R
Canis familiaris	Dog	1.75	4	D, F, S, R
Nasua narica	White-nosed coati	0.44	1	D, F
Lepus sp.	Hare	4.37	10	D, R

Lepus callotis	White-sided jackrabbit	1.75	4	D, R
Sylvilagus sp.	Rabbit	3.49	8	D, R
Sylvilagus cunicularius	Mexican cottontail	0.87	2	D, R
Sylvilagus floridanus	Eastern cottontail	4.37	10	D, R
Orthogeomys grandis	Giant pocket gopher	0.44	1	I
Lyomis irroratus	Mexican pocket mouse	0.44	1	I

Table 72. Total of animal bone fragments identified from PNLP Area (D=diet, F=functional, S=symbolic, R=ritual).

The most representative of the subsistence taxa in the sample from the different areas were *Meleagris gallopavo*, Cervidae (*Odocoileus* sp., *Odocoileus virginianus* and *Mazama amaericana), Tayassu tajacu*, Canidae (*Canis* sp. and *Canis familiaris*) and lagomorpha (Lepus sp., *Lepus callotis, Sylvilagus* sp., *Sylvilagus cunicularius and Sylvilagus floridanus*). Therefore, these groups were selected to ascertain similarities and differences between the four areas.

According to the graph (Fig.80), the A3 Area presented a higher percentage of *Meleagris gallopavo* (36.69%) than in the rest of the areas (W1 27.68%, W2 13.53% and PNLP 11.79%). Cervidae were more abundant in PNLP (49.32%) and W2 Areas (43.95%) than in the A3 (28.74%) and W1 Areas (21.86%). *Tayassu tajacu* was more represented in W2 Area (19.81%) than in W1 (9.8%), A3 (9.33%), and PNLP Areas (6.55%). In this case percentages in the last three areas were closer than that of W2 Area. The canidae group had a greater presence in W1 Area (29.91%) than in the A3 (16.77%), PNLP (14.41%) and W2 (12.56%) Areas. These last three showed similar proportions. There were more lagomorpha in PNLP Area (14.85%) than in W2 (6.77%), W1 (6.25%) and A3 Areas (5.03%). Due to the fact that these are percentage data, it is important to be aware of interdependence of values (a higher abundance of one taxon in a given area might lower the percentage values for other taxa in that area).

It can be observed from the graph (Fig. 80) that taxa frequencies and patterns vary between areas. The PNLP area, described in Chapter 4, was a public space. According to Martínez and Markens (2004) this complex could also have been used for rituals since a temple was found there. The highest percentage of the resources used in this context corresponded to deer. It is probable that public events took place in this area, where higher numbers of people congregated, thus taxa with more meat content were required. In PNLP Area, wild species were more abundant than domestic animals. In the W2 Area, the number of cervidae was also high. In most cases, percentages of domestic species in W2 Area were lower than in the other areas. The highest percentage of *Tayassu tajacu* was found in W2 Area, so it seems that wild species were more frequent than domestic ones, as in PNLP Area.

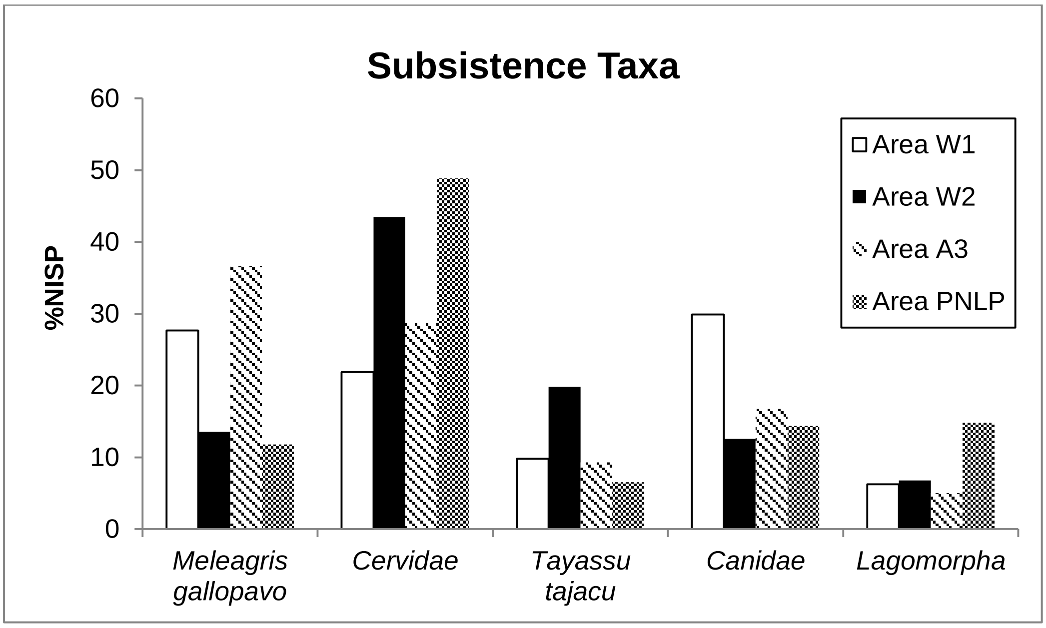


Fig.80. Taxa used for subsistence in W1, W2, A3, PNLP Areas.

However, the sample from W1 Area showed an opposite trend to that observed in W2 Area, since a higher percentage of *Canis* cf. *familiars* and *Meleagris gallopavo* was noticed. So, it is clear that domestic species in this area constituted a significant resource. There was a low percentage of lagomorphs in most areas, except in the PNLP area which displayed a higher proportion than the rest. In this context the group of lagomorphs was similar to that of domestic species such as *Canis* cf. *familiaris* and *Meleagris gallopavo*. In this sense, the pattern observed in this complex differed from those of the other areas. *Tayassu tajacu* was also scarce there. Apparently, a high percentage of taxa found in the PNLP Area concentrated in one kind of resource: cervidae. The highest numbers of *Meleagris gallopavo* were observed in A3 Area. This was the most abundant species in this context, more than cervidae and *Canis* cf. *familiaris*. *Tayassu tajacu* and lagomorpha were not very common.

It can also be noticed that certain taxa were present in some areas but absent in others (Table 73). This cannot be the result of preservation because as will be shown in the section of taphonomy, bones were equally affected by natural process and showed a similar preservation condition between the four areas. The same recovery procedures were also used in all the areas. For example, fish remains were just found in W2, A3 and in PNLP Areas. The species *Centropomus* sp. was only observed in A3 and PNLP Areas. The Familiy Serranidae and the genus Ictiobus sp. were identified in A3 Area, while the species *Joturus pichardoi* was just present in the PNLP Area. In the latter context, no remains of turtles or any other reptile were noticed. In A3 Area an element of probable crocodile was seen and a fragment identified as turtle was detected in the sample from W1 Area. The genus *Kinosternon* was discovered in W1 and W2 Areas but the species *Trachemys scripta* was only identified in W1 Area.

Regarding the group of aves; *Cassiculus melanicterus* was present in W1 Area, *Corvus corax* in W2 Area, the Family Anatidae in A3 Area, *Buteo jamaicencis* and *Buteo* sp. in W1 and PNLP Areas, *Cyrtonix montezumae* in W1 and A3 Areas and, cf. *Crax* in A3 Area. Among the mammals, remains of *Canis* cf. *latrans* and *Canis* cf. *lupus* and *Urocyon cinereoargenteus* were observed in A3 Area. Evidence of *Nasua narica* was detected in PNLP Area and remains of *Puma concolor* were discovered in W1 and W2 Areas. Species that formed the group of lagomorphs were found in the four areas, except the species *Sylvilagus floridanus* which was absent in the W2 Area.

The majority of the archaeozoological sample was composed of mammals with a few birds but hardly any reptiles and fish (Fig. 81). Therefore, it can be assumed that subsistence was based on wild and domestic mammals and to a lesser degree, on fowl, also mainly domestic. Each group must have required different techniques to hunt and raise.

TAXA	W1 Area		W2 Area		A3 Area		PNLP Area	
	NISP	NMI	NISP	NMI	NISP	NMI	NISP	NMI
Actinopterygii								
Centropomus sp.					2	2	1	1
Family Serranidae					1	1		
Ictiobus sp.					1	1		
Joturus pichardoi							1	1
Reptilia								
Order testudines	1	1						
Kinosternon	1	1	1	1				
Trachemys scripta	1	1						
Chelonia mydas					1	1		
Family cf. Crocodylidae					1	1		
Aves								
Cassiculus melanicterus	1	1						
Corvus corax			1	1				
Family cf. Anatidae					1	1		
Family Anatidae					3	1		
cf. *Buteo* sp.	1	1						
Buteo sp.							1	1
Buteo jamaicencis	1	1						
Cyrtonix montezumae	1	1			3	3		
Family Meleagride								
cf. *Meleagris*					1	1		
Meleagris gallopavo	62	21	28	19	291	84	27	12
cf. *Crax*					1	1		
Mammalia								
cf. *Canis* sp.			1	1	1	1		
Canis sp.	61	29	25	14	113	52	29	13
cf. *Canis familiaris*	3	2			1	1		
Canis familiaris	3	3			18	15	4	4
Canis cf. *latrans*					1	1		
Canis cf. *lupus*					4	2		
Urocyon cinereoargenteus					1	1		
Nasua narica							1	1
Puma concolor	1	1	3	2				
Order Ariodactyla	18	11	33	15	77	49	52	19
Tayassu tajacu	22	16	41	9	74	49	15	15
Tayassu cf. *peccari*			2	2			1	1
cf. *Odocoileus* sp.			1	1	2	1	1	1
Odocoileus sp.	5	4			5	6	3	3

Odocoileus virginianus	26	17	56	24	144	65	56	28
cf. *Mazama americana*					3	3	1	1
Mazama americana			1	1				
Order Lagomorpha	4	2	6	7				
Lepus sp.	3	3	3	3	14	11	10	6
Lepus callotis	1	1	2	2	7	6	4	2
Sylvilagus sp.	2	2	2	2	11	7	8	6
Sylvilagus cf.*cunicularius*	1	1					1	1
Sylvilagus cunicularius			1	1	4	4	1	1
Sylvilagus cf. *floridanus*							10	8
Sylvilagus floridanus	3	3			4	4		
Order Rodentia	1	1						
Orthogeomys grandis					3	3	1	1
Family Heteromydae	1	1						
Liomys irroratus							1	1
Total	224	125	207	105	793	378	229	127

Table 73. Total number of animal bone fragments present in W1, W2, A3, and PNLP Areas.

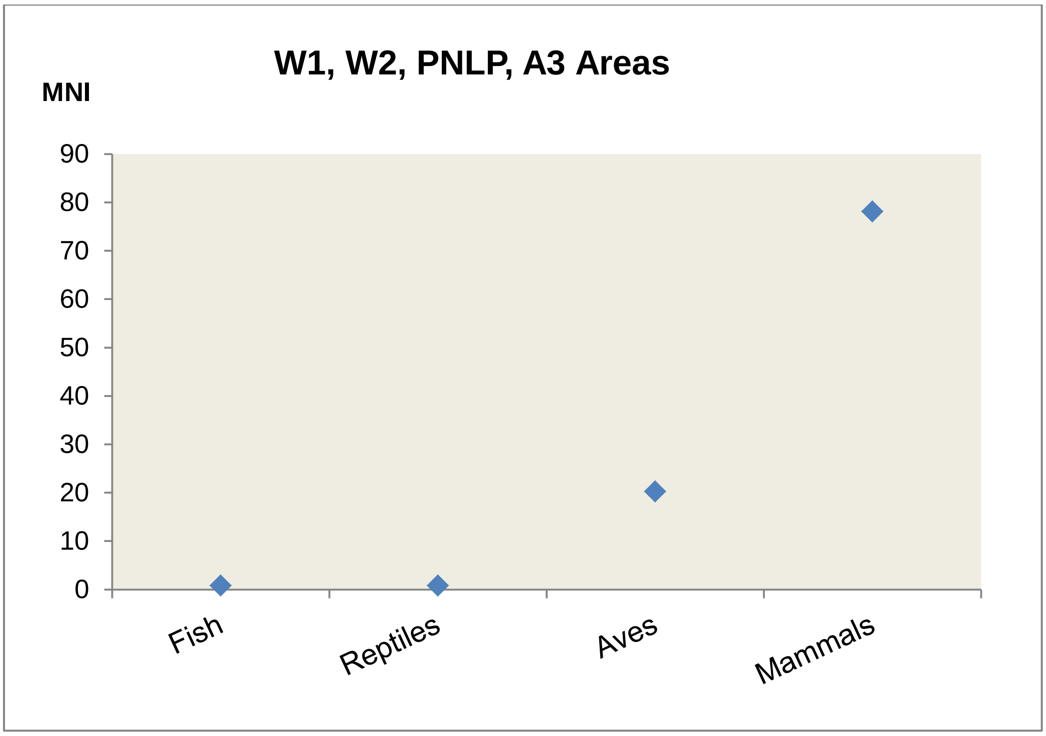


Fig.81. Taxa identified in W1, W2, A3, PNLP Areas.

Equitability

The four areas showed low equitability and focused on just a few taxa. The species classified as intrusive were not included in this part of the analysis. In all four areas *Meleagris gallopavo*, *Canis familiaris* and *Canis* cf. *familiaris* (the group of *Canis* sp. was considered as *Canis* cf. *familiaris* in the four areas), *Odocoileus virginianus*, *Odoocileus* sp. and *Tayassu tajacu* (Figs.82, 83, 84 and 85) were the most frequent. In the W1 Area the sample produced a total of 224 NISP and 89.29% of the sample concentrated in four groups (dogs, turkeys, deer and peccaries) (Fig.82). The W2 Area showed the same trend, since mainly *Odocoileus virginianus*, *Tayassu tajacu*, *Odocoileus* sp., *Meleagris gallopavo*, *Canis* cf. *familiaris* conformed the assemblage with few other taxa (Fig.83). The total of NISP in this area was 207, so 89.37% of the sample showed afore-mentioned taxa.

The sample of A3 Area included *Meleagris gallopavo*, *Odocoileus virginianus*, *Canis* cf. *familiaris*, *Odocoileus* sp., *Tayassu tajacu* and *Canis familairis*. Other taxa were represented by fewer number of fragments (Fig.84). The assemblage in this area was formed by a total of 790 NISP and 92% consisted of afore-mentioned animals. In this area a greater diversity of taxa was identified but this was probably related to the size of the sample. As Grayson (1984) proposes, smaller smples (as W1, W2 and PNLP Areas) show less diversity of species. In the PNLP Area *Odocoileus virginianus*, *Odocoileus* sp., *Canis* cf. *familiaris*, *Meleagris gallopavo* and *Tayassu tajacu* were the main groups present in the assemblage (Fig.85). The sample of PNLP area was formed by 227 NISP and 80.6% of this amount was represented by the taxa mentioned above.

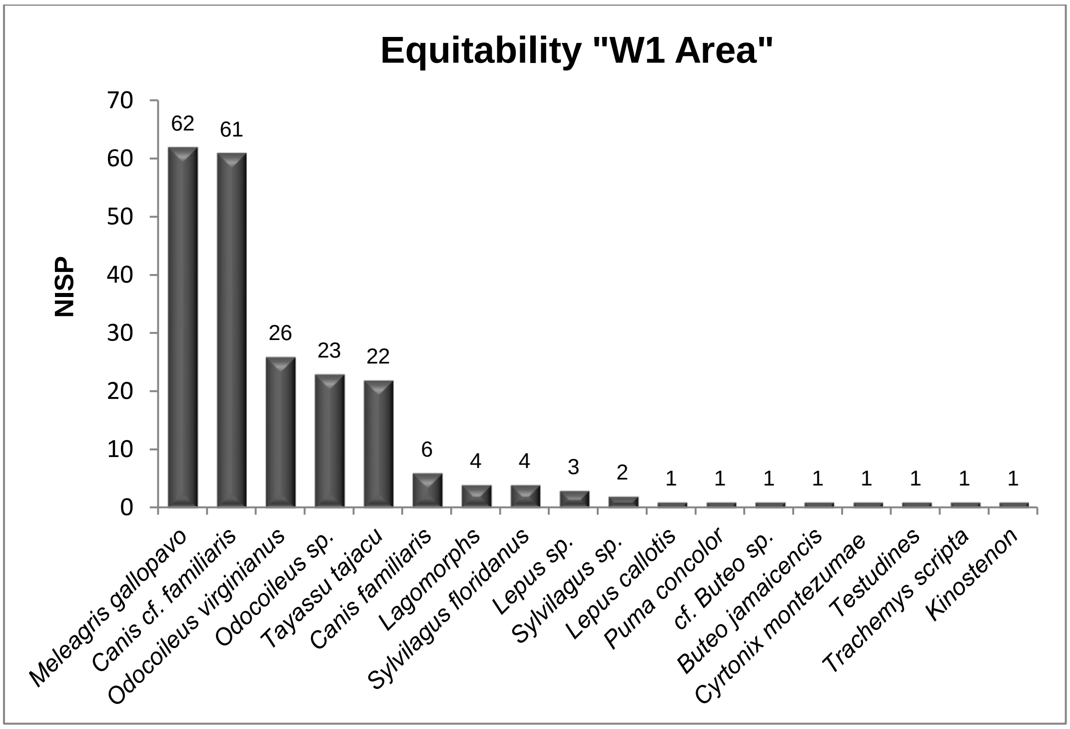


Fig.82. Equitability in "W1 Area".

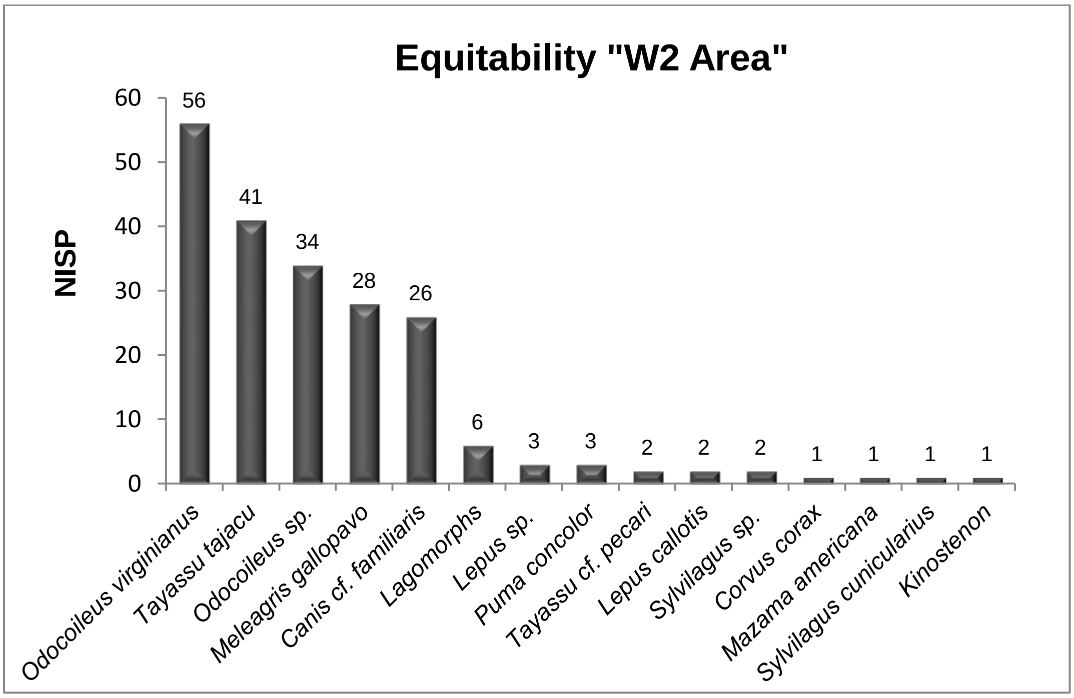


Fig.83. Equitability in "W2 Area".

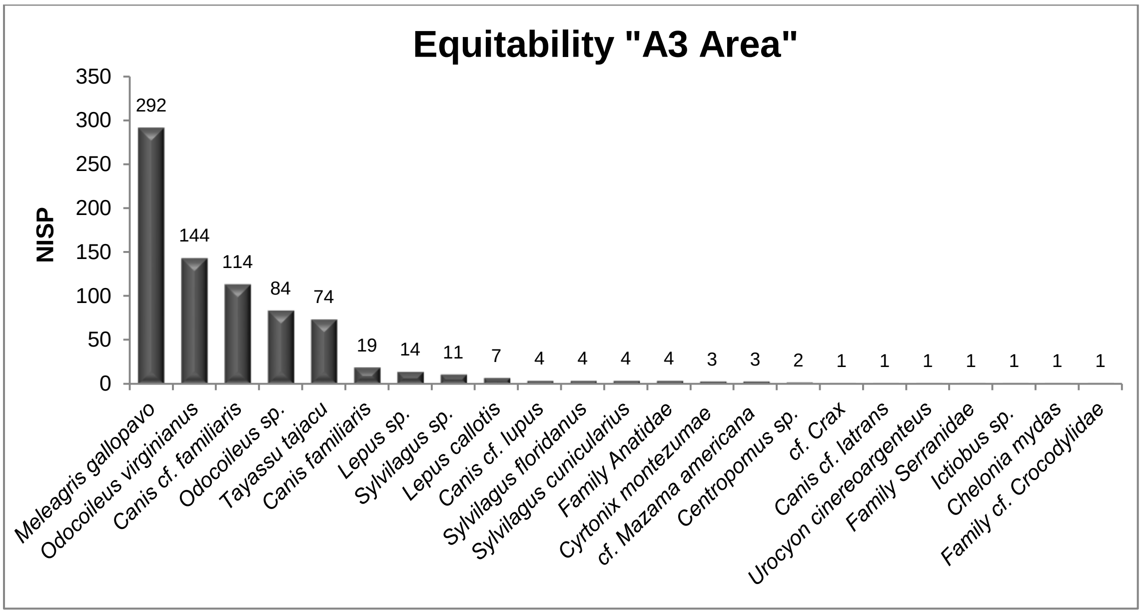


Fig.84. Equitability in "A3 Area".

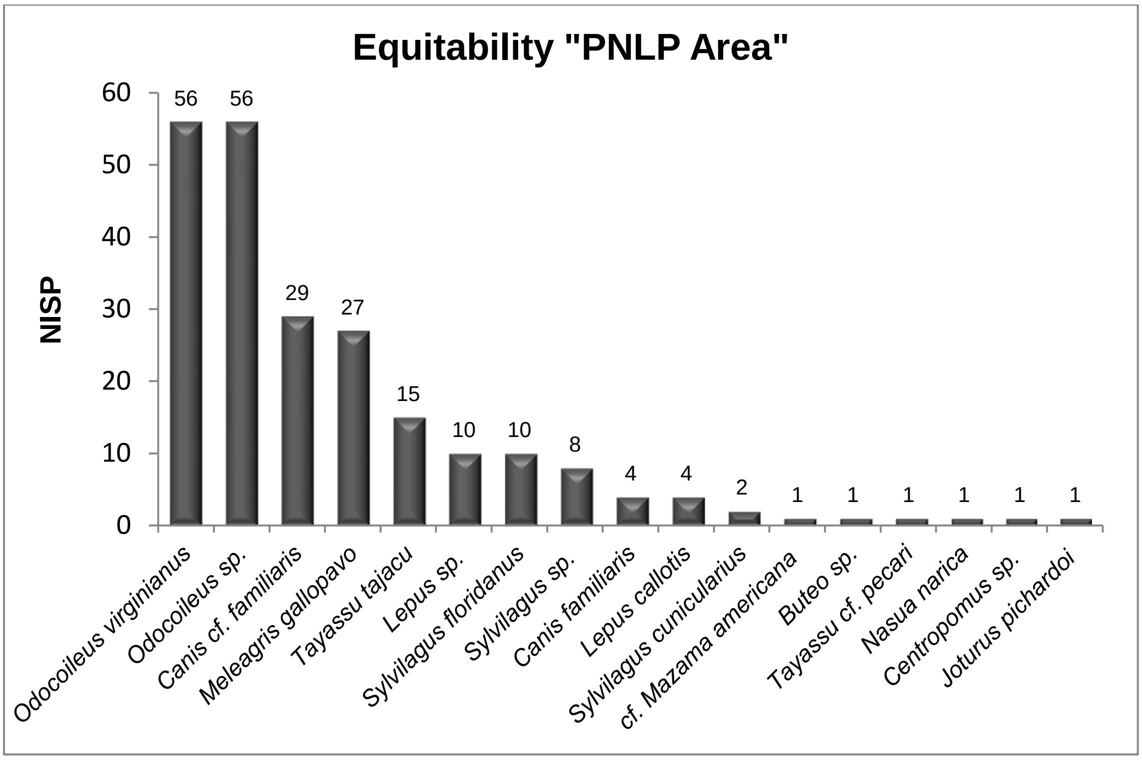


Fig.85. Equitability in "PNLP Area".

Subsistence in different periods of time at Monte Albán

In this section, the results are arranged in phases and periods of time to detect changes in subsistence. First, all the taxa are presented in tables and only those related to consumption are compared through graphs. The phases considered are Nisa, Pitao and Pe, since the other samples from Tani, Xoo and Peche phases were very small. However, when Preclassic and Classic periods are compared all the phases are included.

According to Table 74, the common turkey was the most abundant (31.91%) in the Nisa phase, followed by cervids (deer and white tailed deer with 29.35%), canids (*Canis familiaris* and *Canis* cf. *familiaris* with 21.09%), collared peccary (8.84%), lagomorphs (5.43%) and turtles (0.28%). Other bird species such as the red-tailed hawk (0.28%) and the Montezuma quail (0.28%) were present to a lesser degree.

Taxa	**Common name**	**Percentage**	**NISP**
Trachemys scripta	Pond slider	0.28	1
Buteo jamaicencis	Red-tailed hawk	0.28	1
Corvus corax	Common raven	0.28	1
Cyrtonix montezumae	Montezuma quail	0.28	1
Meleagris gallopavo	Common turkey	31.91	112
Canis cf. *familiaris*	Wolf, dog, coyotes	19.1	67
Canis familiaris	Dog	1.99	7
Canis cf. *lupus*	Wolf	1.14	4
Canis cf. *latrans*	Coyote	0.28	1
Urocyon cinereoargenteus	Grey fox, tree fox	0.28	1
Odoocileus sp.	Deer	9.97	35
Odocoileus virginianus	White-tailed deer	19.1	67
Mazama americana	Brocket deer	0.28	1
Tayassu tajacu	Collared peccary	8.84	31
Tayassu cf. *pecari*	White-lipped peccary	0.28	1
Lagomorpha	Lagomorphs	0.28	1
Lepus sp.	Hare	1.71	6
Lepus callotis	White-sided jackrabbit	1.14	4
Silvilagus sp.	Rabbit	1.43	5
Sylvilagus floridanus	Eastern cottontail	0.87	3
Peromyscus melanophrys	Plateau deer mouse	0.28	1

Table 74. Total number of animal bone fragments identified from the Nisa phase.

In the Pitao phase, the common turkey was the most abundant species (53.8%) (Table 75). Other kinds of fauna present in decreasing order included cervids (deer and white tailed deer 24.05%), canids (*Canis familiaris* and *Canis* cf. *familiaris* with 12.67%), lagomorphs (5.69%) and collared peccary (0.63%). The remaining species, such as Montezuma quail (1.27%), cougar (0.63%) and mud turtle (0.63%) were more infrequent. During this phase there were fewer species represented compared to the Nisa phase but this might be due to the sample size.

Taxa	Common name	Percentage	NISP
Kinostenon	Mud turtle	0.63	1
Cyrtonix montezumae	Montezuma quail	1.27	2
Meleagris gallopavo	Common turkey	53.8	85
Canis cf. *familiaris*	Wolf, dog, coyotes	10.77	17
Canis familiaris	Dog	1.9	3
Puma concolor	Cougar, panther	0.63	1
Odoocileus sp.	Deer	13.29	21
Odocoileus virginianus	White-tailed deer	10.76	17
Tayassu tajacu	Collared peccary	0.63	1
Lagomorpha	Lagomorphs	0.63	1
Lepus sp.	Hare	1.9	3
Lepus callotis	White-sided jackrabbit	1.9	3
Silvilagus sp.	Rabbit	0.63	1
Sylvilagus cunicularius	Mexican cottontail	0.63	1
Rodentia	Rodent	0.63	1

Table 75. Total number of animal bone fragments identified from the Pitao phase.

As can be seen from Table 76, the common turkey showed a similar pattern to that from Nisa and Pitao phases, since it was also the most frequent species at this period of time (33.33%). After the common turkey, cervids (deer, white tailed deer and brocket deer with 22.72%), collared peccary (15.9%) canids (*Canis familiaris* and *Canis* cf. *familiaris* with 14.48%) and lagomorphs (6.79%) were present in decreasing order. Snook (0.75%), sea bass (0.75%), buffalo fish (0.75%), green turtle (0.75%), and ducks (2.27%) were also observed but in fewer numbers.

Taxa	Common name	Percentage	NISP
Centropomus sp.	Snook	0.75	1
Family Serranidae	Sea basses	0.75	1
Ictiobus sp.	Buffalo fish	0.75	1
Chelonia mydas	Green turtle	0.75	1
Anatidae	Ducks	2.27	3
Meleagris gallopavo	Common turkey	33.33	44
Canis cf. *familiaris*	Wolf, dog, coyotes	10.7	14

Canis familiaris	Dog	3.78	5
Odoocileus sp.	Deer	6.06	8
Odocoileus virginianus	White-tailed deer	14.39	19
cf. *Mazama americana*	Brocket deer	2.27	3
Tayassu tajacu	Collared peccary	15.9	21
Lepus sp.	Hare	3.78	5
Lepus callotis	White-sided jackrabbit	0.75	1
Silvilagus sp.	Rabbit	0.75	1
Sylvilagus floridanus	Eastern cottontail	1.51	2
Orthogeomys grandis	Giant pocket gopher	1.51	2

Table 76. Total number of animal bone fragments identified from the Pe phase.

According to Figure 86, it can be noticed that while some subsistence taxa percentages did not fluctuate between different periods of time, others varied. For example, a noticeable increase of *Meleagris gallopavo* can be observed from the Pe and Nisa phases to the Pitao phase, while *Tayassu tajacu* showed an opposite trend. Apparently, this species decreased as time passed. The lagomorpha group remained stable throughout the three phases. In the Pe phase the most prevalent species was the *Meleagris gallopavo*, followed by Cervidae, *Tayassu tajacu*, Canidae and then lagomorpha. The most representative taxa in the Nisa phase were *Melagris gallopavo*, cervidae (*Odocoileus* sp., *Odocoileus virginianus* and *Mazama americana*) and canidae (*Canis* cf. *familiaris* and *Canis familiaris*). The first two showed similar numbers but there were relatively few lagomorpha and *Tayassu tajacu*. In the Pitao phase the *Meleagris gallopavo* was the principal taxon. During this time the percentage of cervidae, canidae and *Tayassu tajacu* decreased, particularly the latter.

The political situation of Monte Albán changed during these three phases. As was seen in Chapter II, in the Pe phase (Late Period I), Monte Albán was already founded but it was not until the Nisa phase (Period II) that it became a consolidated Zapotec state. During the Nisa phase there were so many people in the valley that venison had to be reserved for the elite (Marcus and Flannery 1996). However, during this period the regional political economy of the Oaxaca Valley operated the same way as it had during the Pe phase. Alliances were probably formed between the elite in the regional capital of Monte Albán and those of smaller centres in the valley. These ties were consolidated by the movement of surplus valley communities to the capital and vice-versa. Nevertheless, by the Nisa phase, prestige goods were probably obtained by the Monte Albán elite through interregional conquest and tribute extraction, rather through interregional exchange as in the Pe phase (Spencer 1982).

By the Pitao phase Monte Albán was no longer the dominant demographic centre in the valley. The communities of Jalieza as well as places near Dainzú, Macuilxóchitl, Tlacochahuaya and Guadalupe grew to a similar size as Monte Albán with estimated populations of 12,835 and 12,300 approximately. By the Early Classic period, the rulers of Monte Albán had lost control of areas that might have been conquered during the Terminal Formative period, for example, the Cuicatlán Cañada. Such a decrease in power and control may have been the result of political relations with Teotihuacán (Joyce 2010).

It seems that the percentage of deer abundance increased and decreased coinciding with the political status and power of Monte Albán, in the Valley of Oaxaca. From the Pe to the Nisa phases there was a rise in percentage of deer represented in the sample, but by the Pitao phase it diminished (Fig.87). Other species such as *Tayassu tajacu* may have been brought to the site less frequently or substituted by domestic species as *Meleagris gallopavo.*

Variations in subsistence taxa can also be observed from the Preclassic to the Classic periods. It is noticeable that the percentage of *Meleagris gallopavo* increased considerably from the first period to the latter. Eveidence of cervidae went down slightly with time but *Tayassu tajacu* declined substantially. The lagomorpha group remained stable throughout both periods. The most evident changes were the rise of *Meleagris gallopavo* and the fall of *Tayassu tajacu*. However, deer, one the most

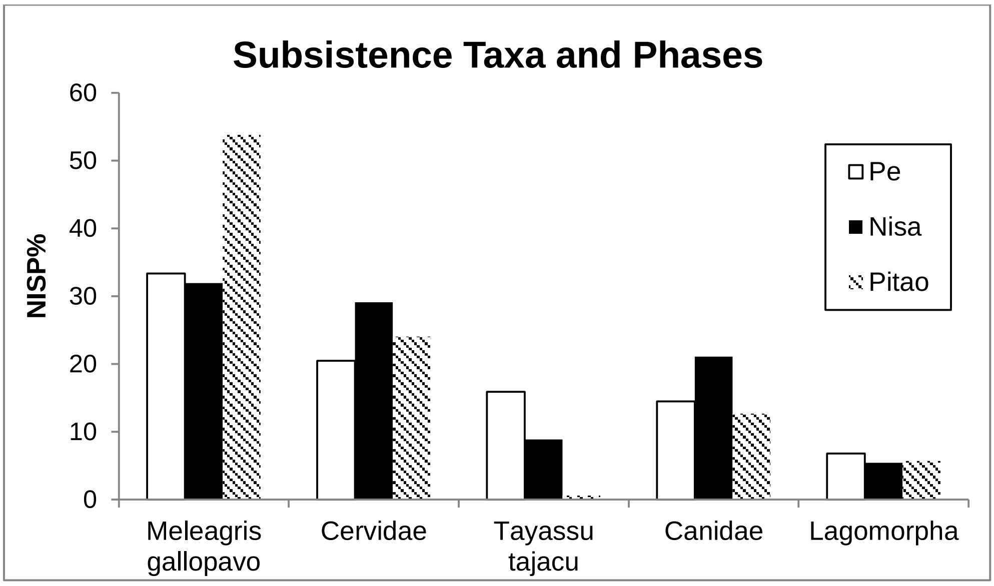


Fig.86. Taxa used for subsistence in the Nisa, Pitao and Pe Phases.

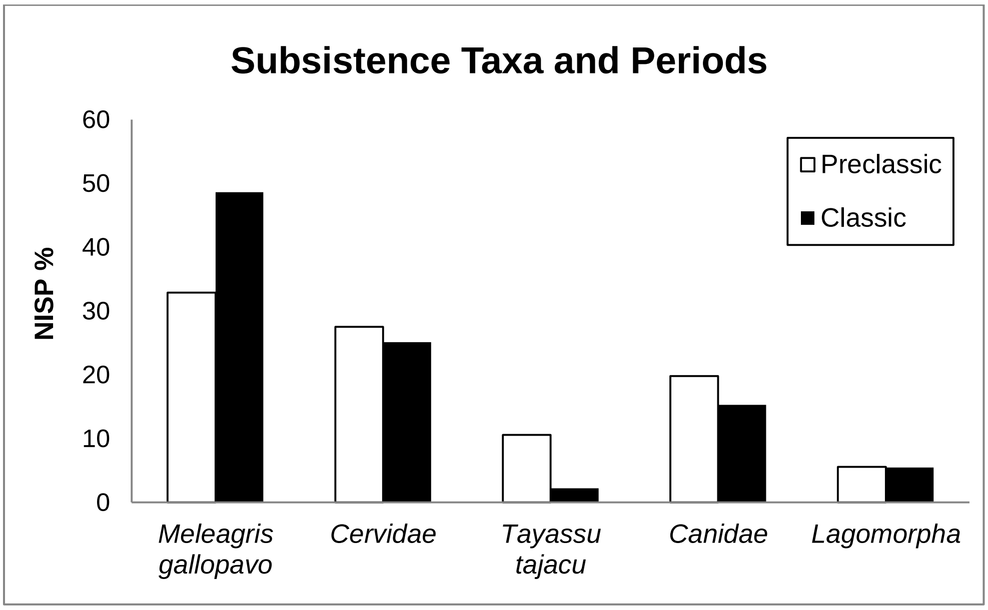


Fig.87. Taxa used for subsistence in the Preclassic and Classic periods.

favoured taxa, did not diminish drastically (indicating that there was not an over-exploitation of this resource), nor was it totally replaced by less-favoured ones (smaller mammals or species with less meat content). Neither was there an increase in overall species diversity or a sharp drop of previously highly favored species. It seems that there was no need to incorporate new animals because common taxa did not reduce or become extinct through hunting (Broughton and Grayson 1993). The same taxa remained present, except for the significant drop of *Tayasu tajacu*, which might have been due to a variation in food preferences, elite activities or uses. The presence of peccary at other sites and phases of time needs to be observed to confirm that this trend persists probably as a consequence of human impact.

Taxa and environment at Monte Albán

Faunal remains in archaeological assemblages may provide information about the kinds of environments explored by the inhabitants, in order to obtain food or other types of resources. Therefore, it was important to consider the environments in which the identified taxa could have been found. A more detailed descripton of the geographical distribution, habitat and behaviour of these taxa was included in Appendix 1.

The Central Valley of Oaxaca is drained by two main river systems: the Atoyac, the largest, which flows from north to south, through the Etla and ZaachilaValleys; and the Salado River, a smaller one that flows from east to west through the Tlacolula Valley (Blanton 1978: 1; Winter 1984: 181) (Fig.88). Monte Albán, as was mentioned in Chapter 2, is located in the centre of the Valley, at the confluence of these rivers. So riverine species identified in the assemblages from the four areas, may have been obtained from these river sources (Tables 77, 78, 79 and 80).

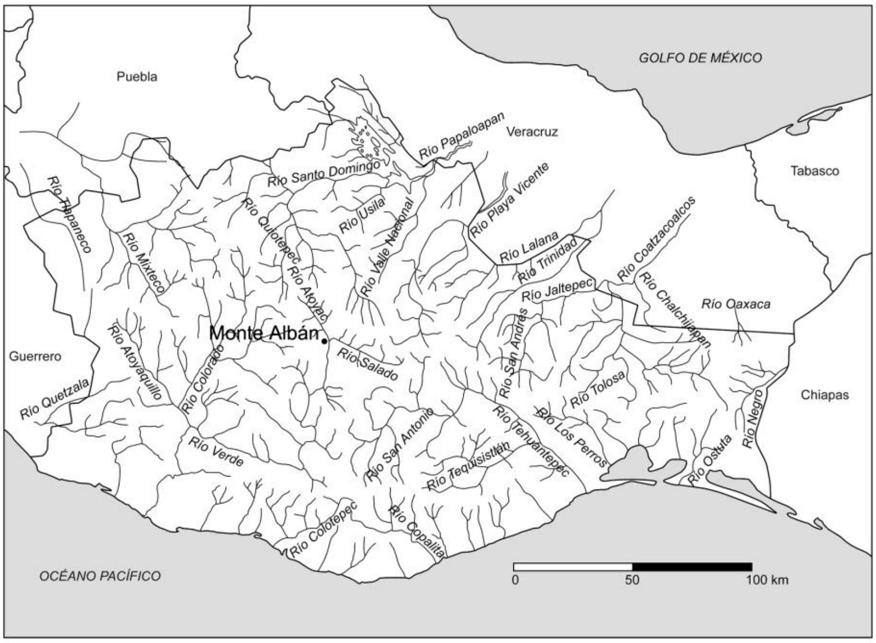


Fig.88. Geographic location of main rivers in Oaxaca (after Martínez *et al.* 2004:360).

Most of the identified fish could have been found in fresh water. Nowadays, species of the *Ictiobus* sp. genus in Oaxaca are located in the Papaloapan, Playa Vicente, Coatzacoalcos, Valle Nacional and Presa Miguel Aleman Rivers (Fig.88). The *Jotorus pichardi* species is common in the Lalana and Coatzacoalcos Rivers. Fish related to *Centropomus* sp. are frequent in the Atoyac, Coatzacoalcos, Playa Vicente, Copalita and Cozoaltepec and Tonto Rivers (Martínez *et al*. 2004). The *Centropomus* sp. genus and the Serranidae family are sea species that can tolerate fresh water and are distributed throughout the Pacific (http: // pescamax. foroactivo. com/ t682- la- esca-del-robalo-centropomus-sp-por-jose- manuel-lopez- pinto- actualizado -a- 03- de-noviembre- del/ 2013; http://.fishbase.org/summary /Family Summary. Php? ID = 289 /2003). *Jotorus pichardi* is a vicarious species that originally comes from the sea but spends most of its life in fresh water (Guzman, personal communication, 2014). All of these kind of fish are native of Oaxaca; however, the presence of these in all the areas was very scarce (in A3 Area 4 NISP and in PNLP Area 3 NISP) (Tables 79 and 80).

Endemic species of crocodiles found in Oaxaca are the *Caiman crocodilus*, *Crocodylus acutus* and C. *moreletii*. The *C. acutus* is located on the Pacific coast and the Istmo Tehuantepec (south Oaxaca) and *C. moreletti* in the coastal plains of the Gulf (northeast Oaxaca) (Fig.88). Most crocodiles prefer freshwater (Casas-Andreu *et al*. 2004). Only one fragment of a probable crocodile was found in A3 Area (Table 79).

Two species of freshwater turtles were identified in the sample, the *Kinosternon* and *Trachemys scripta*. The former looks for rivers, puddles or any water deposit to reproduce; the latter lives in aquatic habitats with slow currents (Ernest and Barbour 1989; Álvarez and Ocaña 1999). *Trachemys scripta* is located nowadays in the plains of the Gulf and Pacific Coasts. The *Kinosternon* genus is distributed in almost all regions of Oaxaca (Casas-Andreu *et al*. 2004). Evidence of *Kinosternon* in W1 Area (1 NISP) and W2 Area (1 NISP) was hardly present (Tables 77 and 78). *Trachemys scripta* was also very scarce and just observed in W1 Area (1 NISP) (Table 77). The only sea species found in the sample was a piece of *Chelonia mydas* shell in A3 Area (Table 79). There are two subpopulations of this species: one in the Atlantic and other in the Pacific Ocean (http:// es. wikipedia. org/ wiki/ Chelonia_mydas 2013). This kind of turtle could have been transported with the shell objects that arrived to Monte Albán from two different sea regions, the Pacific Ocean (*panámica-Pacifico)* and the Caribbean (*caribeña)* (Melgar *et al*. 2010).

In considering the bird species, several of the identified taxa from the sample could have been found in cultivated areas such as: *Cassiculus melanicterus* (1 NISP in W1 Area), *Buteo jamaicencis* (1 NISP in W1 Area) and *Buteo* sp. (1 NISP in W1 Area and, 1 NISP in PNLP Area), cf. *Crax* (1 NISP in A3 Area), Family Anatidae (4 NISP in A3 Area) and *Meleagris gallopavo* (62 NISP in W1 Area, 28 NISP in W2 Area, 292 NISP in A3 Area and 27 NISP in PNLP Area) (Leopold 1959; American Ornithologist´s Union 1983; Emery 2007; Peterson and Chalif 2008) (Tables 77, 78, 79 and 80). It is likely that these species lived near human settlements, especially *Melagris gallopavo*, which was considered a domestic species in Mesoamerica (García 1987). Anatidae birds may also live in ponds, rivers and lakes (Leopold 1959; Peterson and Chalif 2008).

According to Navarro *et al.* (2004), nowadays all these kinds of birds are common and are still found in Oaxaca today, except for some of the Anatidae Family species, which may arrive occasionally in winter (Navarro *et al*. 2004). The species *Cassiculus melanicterus* dwells on the Pacific side, Miahuatlán, Isthmus and Atlantic regions; *Buteo jamaicencis* in the Pacific, Sierra Madre del Sur, the Isthmus, Atlantic and Sierra Madre de Chiapas; cf. *Crax* in the Pacific, Atlantic and Sierra Madre de Chiapas; the Anatidae family in the Pacific, Atlantic, Isthmus, Miahuatlán, Sierra Madre del Sur, Balsas, Eje Neovolcánico, Oaxaca and Sierra Madre de Chiapas (Fig.89).

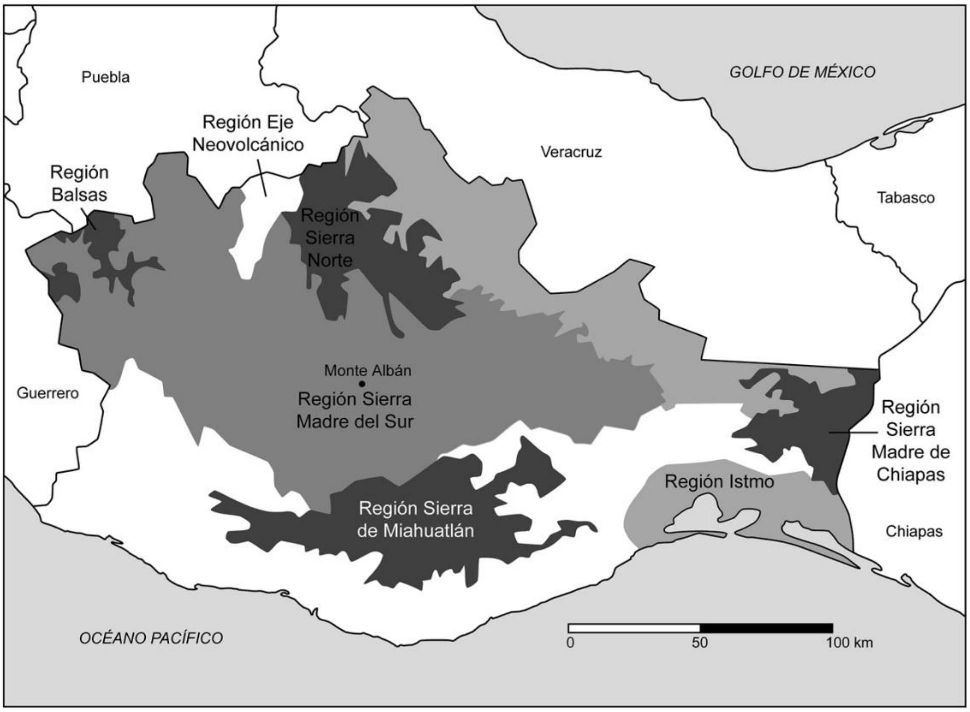


Fig.89. Regions of identified aves in Oaxaca (after Navarro *et al.* 2004:394).

There was a little evidence of *Cyrtonix montezumae* in the W1 Area (1 NISP) and A3 Area (3 NISP) (Tables 77 and 79). This bird is found in pine-oak areas, scrub oak in the highlands, especially in open woodland with grass (subtropical and lower temperate zones) and mountain sides with trees (American Ornithologists´ Union 1983; Peterson and Chalif 2008). In Oaxaca, this species is distributed in the central region called Sierra Madre del Sur and in Miahuatlán, towards the south (Navarro *et al*. 2004) (Fig.89). Only one fragment of *Corvus corax* was observed in the W2 Area (Table 78). The common raven lives in open fields or dense vegetation, in humid or desert zones but is more frequent in hills and mountains (American Ornitholgists´ Union 1983). This bird is located in the Sierra Madre del Sur in Oaxaca (Navarro *et al*. 2004) (Fig.89).

One of the most frequent mammal was the domestic species *Canis familiaris* (*Canis* sp., the latter considered as *Canis* cf. *familiaris*) (67 NISP in W1 Area, 26 NISP in W2 Area, 133 NISP in A3 Area, 33 NISP in PNLP Area) (Tables 77, 78, 79 and 80). The deer *Odocoileus virginianus* was also prevalent in the four areas (26 NISP in W1 Area, 56 NISP in W2 Area, 144 NISP in A3 Area, 56 NISP in PNLP Area) (Tables 77, 78, 79 and 80). The habitat of the white-tailed deer is diverse including humid environments, varying from forests to thickets along streams, and even dry and hot deserts (Hall 1981; Hesselton and Monson 1982). *Odocoileus virginianus* has been located in Oaxaca in Cuicatlán, Ixtlán, Juchitán, Putla and Yautepec (Fig. 90) (Briones-Salas and Sánchez-Cordero 2004). The other species of less frequent deer was *Mazama americana* (1 NISP in W2 Area, 3 NISP in A3 Area and 1 NISP in PNLP Area) (Tables 77, 78, 79 and 80). The brocket deer lives in woodlands and forests from sea level to elevations of 5,000 meters (Hall 1981). The *Mazama americana* has been located in Juchitlán, and Teotitlán and Tuxtepec districts, nowadays in Oaxaca (Briones-Salas and Sánchez-Cordero 2004) (Fig.90**).** It is possible that the habitat of this species was located further away from Monte Albán, which is why it was less abundant in the sample.

Other species included among the artiodactyls were the *Tayassu tajacu* and *Tayassu* cf. *pecari*. The first was more prevalent (22 NISP in W1 Area, 41 NISP in W2 Area, 74 NISP A3 Area and 15 NISP in PNLP Area) than the second (2 NISP in W2 Area, 1 NISP in PNLP Area) **(**Tables 77, 78, 79 and 80). *Tayassu tajacu* can be found in a variety of habitats: desert scrub, arid woodland and rain forest (Leopold 1959; Nowak and Paradiso 1983). It has recently been located in the Juchitán district but there are other subspecies distributed in Etla, Jamiltepec, Tehuantepec and Teotitlán (Briones-Salas and Sánchez-Cordero 2004) (Fig.90**)**. Generally, *Tayassu pecari* is more common in forests with dense vegetation and is not seen in cleared and thorny forests like the collared peccary (Leopold 1959). It has only been detected in the Juchitán and Teotitlán districts of Oaxaca, as well as the *Tayassu tajacu* (Briones-Salas and Sánchez-Cordero 2004) (Fig.90). There were many species in the carnivore group: of the Canidae family, *Canis familiaris*, *Canis* cf. *latrans* (1 NSIP in A3 Area), *Canis* cf. *lupus* (1 NISP in A3 Area), *Urocyon cinereoargenteus* (1 NISP in A3 Area) were identified, Procyonidae

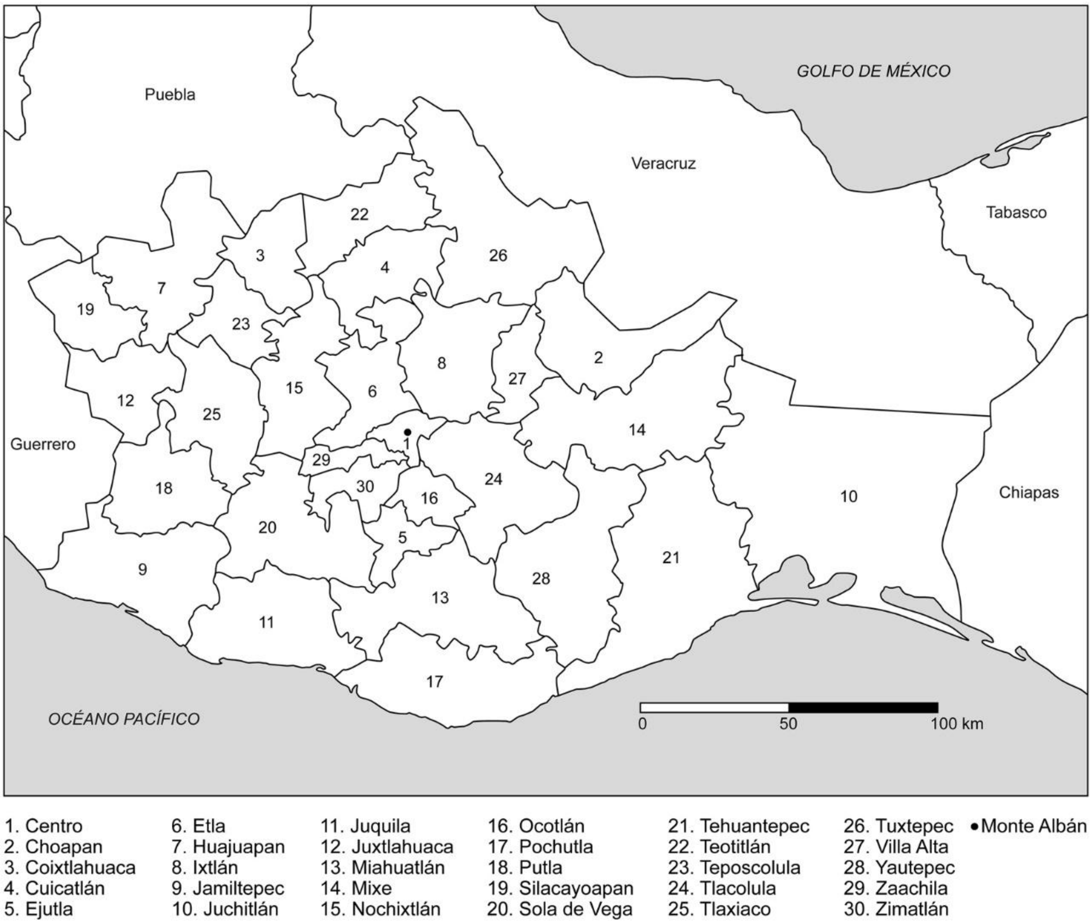


Fig.90. Geographic location of land mammals in Oaxaca
(after Briones-Salas and Sánchez-Cordero 2004:432).

family was represented by *Nasua narica* (1 NISP in PNLP Area) and from the felidae family, only the *Puma concolor* species was observed (1 NISP in W1 Area and 3 NISP in W2 Area), all of these were less frequent than the dog (Tables 77, 78, 79 and 80). The *Canis latrans* species live in a great variety of habitats including forests, grasslands, deserts and swamps. This animal is more prevalent in places where wolves have been exterminated and is able to survive in agricultural and urban settlements (http:// animaldiversity. ummz.umich.edu/ accounts/ Canis_latrans /2013; http://www. iucnredlist. org/ details/ 3745/0). In Oaxaca populations of coyote have been detected in the Centro, Etla and Tehuantepec districts (Briones-Salas and Sánchez-Cordero 2004) (Fig.90). *Canis lupus* is common in mountain forests and grasslands (http:// www. defenders. org/mexican-gray-wolf/ basic-facts 2013; http:// www. livingdesert .org/

animal _page. html? Animals =Mexican +Wolf/2013). The wolf has only been found in the Tehuantepec district in Oaxaca (Briones-Salas and Sánchez-Cordero 2004) (Fig.90). The *Urocyon cinereoargenteus* lives in deciduous forests with brush and woodland areas. Some groups may be seen where there are woodlands and farmlands (http:// animaldiversity. ummz.umich.edu/ accounts/ Urocyon_ cinereoargenteus/ 2013). This species may be located in different areas in Oaxaca such as Ixtlán, Juchitán, Pochutla, Tehuantepec and Teotitlán (Briones-Salas and Sánchez-Cordero 2004) (Fig.90).

The *Nasua narica* lives in various habitats, from tropical lowlands to dry, high-altitude forests (Macdonald 1985). The white-nosed coati can be tamed and has been proved experimentally to be very clever (http:// www.acguanacaste .ac.cr/ bosque_seco_ virtual/bs _ web_ page/paginas_ de_ especies/ nasua_narica.html. 2013). *Nasua narica* is hunted for its meat and may also be tamed (Parker 1989). Nowadays it is found in Ixtlán and Tehuantepec with subspecies located in diverse areas of Oaxaca (Jamiltepec, Cuicatlán, Juchitán, Tehuantepec, Teotitlán and Yautepec) (Briones-Salas and Sánchez-Cordero 2004) (Fig.90). The *Puma concolor* may be found in different environments such as coniferous and lowland tropical forests, swamps, grassland, dry bush country, deserts, or any other area with the necessary cover and prey (Nowak and Paradiso 1983). Apparently, cougar is only distributed in the Tehuantepec district of Oaxaca (Fig.90).

The lagomorph group was less diverse than that of carnivores and was represented by a few *Lepus callotis* (1 NISP in W1 Area, 2 NISP in W2 Area, 7 NISP in A3 Area and 4 NISP in PNLP Area), *Sylvilagus floridanus* (4 NISP in W1 Area, 4 NISP in A3 Area, 10 NISP in PNLP Area) and *Sylvilagus cunicularius* (1 NISP in W2 Area, 4 NISP in A3 Area and 2 NISP in PNLP Area) **(**Tables 77, 78, 79 and 80). *Lepus callotis* lives in large extensions of desert pastures and thickets (Best and Henry 1993). This species has been located in the Centro and Silacayoapan regions of Oaxaca (Briones-

Salas and Sánchez-Cordero 2004) (Fig.90). *Sylvilagus floridanus* may be found in a great variety of habitats: forests, deserts, marshes and prairies; preferences change from one season to another, and in different latitudes and regions (Chapman *et al*. 1980; Nowak and Paradiso 1983). In Oaxaca it has been detected in the Centro, Huajuapan, Tehuantepec and Tlacolula districts (Briones-Salas and Sánchez-Cordero 2004) (Fig.90). Finally, *Sylvilagus cunicularius* can tolerate both arid lowlands and temperate highlands (Ceballos and Galindo 1984; Ceballos and Miranda 1986). Nowadays, subspecies of *Sylvilagus cunicularius* may be seen in Mixe and Jamiltepec areas (Briones-Salas and Sánchez-Cordero 2004) (Fig.90).

As can be observed from Tables (77, 78, 79 and 80) and the previous information, species from diverse environments were present in the sample. Marine taxa were almost absent and riverine species were also rare. Most of the aves were land birds such as *Meleagris gallopavo* or *Cyrtonix montezumae*. Apparently, terrestrial taxa were the most abundant group including the mammals. It can also be noticed that domesticated species and animals living near human settlements, cultivated areas or cornfields constituted a considerable part of the assemblage. Some of these animals could have been attracted by the altered environment immediately around the settlements too. Only a few species such as *Puma concolor*, *Mazama Americana*, *Tayassu* cf. *pecari*, *Canis* cf. *lupus*, family cf. crocodylidae and *Chelonia mydas* might have been brought to the site from further distances. All the identified species can still be found in the State of Oaxaca.

Taxa	**Percentage**	**NISP**	**Habitat**
Testudines	0.45	1	Riverine
Trachemys scripta	0.45	1	Riverine/Lacustrine/Pond
Kinostenon	0.45	1	Riverine
Cassiculus melanicterus	0.45	1	Wooded/Cultivated area
cf. *Buteo* sp.	0.45	1	Forest/Cultivated area
Buteo jamaicencis	0.45	1	Forest/Cultivated area
Cyrtonix montezumae	0.45	1	Pine-oak/Open woodland

Meleagris gallopavo	27.68	62	Cornfield/Open woodland/Domestic
Canis familiaris	2.68	6	Domestic
Puma concolor	0.45	1	Forest/Grassland/Desert
Odocoileus virginianus	11.6	26	Forest/Cornfield/Thicket/Desert
Tayassu tajacu	9.8	22	Cornfield/Arid woodland
Lepus callotis	0.45	1	Thicket/Desert/Cornfields
Sylvilagus floridanus	1.79	4	Forest/Marsh/Prairie
Peromyscus melanophrys	0.45	1	Rocky desert

Table 77. Habitats of animal bone fragments identified from W1 Area.

Taxa	**Percentage**	**NISP**	**Habitat**
Kinostenon	0.48	1	Riverine
Corvus corax	0.48	1	Open field/Dense vegetation
Meleagris gallopavo	13.53	28	Cornfield/Open woodland/Domestic
Odocoileus virginianus	27.05	56	Forest/Cornfield/Thicket/Desert
Mazama americana	0.48	1	Forest/Woodland
Tayassu cf. *pecari*	0.97	2	Forest
Tayassu tajacu	19.81	41	Cornfield/Arid woodland
Puma concolor	1.45	3	Forest/Grassland/Desert
Lepus callotis	0.97	2	Thicket/Desert/Cornfields
Sylvilagus cunicularius	0.48	1	Arid lowland/Temperate higlands

Table 78. Habitats of animal bone fragment identified from W2 Area.

Taxa	**Percenatge**	**NISP**	**Habitat**
Family Serranidae	0.13	1	Riverine
Ictiobus sp.	0.13	1	Riverine
Centropomus sp.	0.25	2	Riverine
Family cf. Crocodylidae	0.13	1	Fresh water
Chelonia mydas	0.13	1	Sea
Family Anatidae	0.51	4	Cornfield/Rivers/Lakes/Puddles
cf. *Crax*	0.13	1	Cornfield/Forest
Cyrtonix montezumae	0.38	3	Pine-oak/Open woodland
Meleagris gallopavo	36.69	292	Cornfield/Open woodland/Domestic
Odocoileus virginianus	18.16	144	Forest/Cornfield/Thicket/Desert
cf. *Mazama Americana*	0.38	3	Forest/Woodland
Tayassu tajacu	9.33	74	Cornfield/Arid woodland
Urocyon cinereoargenteus	0.13	1	Cornfield/High brush/Woodland
Canis cf. *lupus*	0.5	4	Mountain forest/Woodland
Canis cf. *latrans*	0.13	1	Forest/Grassland/Dessert/Cultivated area
Canis familiaris	2.4	19	Domestic
Lepus callotis	0.88	7	Thicket/Desert/Cornfields
Sylvilagus floridanus	0.5	4	Forest/Marsh/Prairie
Sylvilagus cunicularius	0.5	4	Arid lowland/Temperate highlands
Orthogeomys grandis	0.38	3	Forest/Cornfield

Table 79. Habitats of animal bone fragments identified from A3 Area.

Taxa	Percentage	NISP	Habitat
Centropomus sp.	0.44	1	Riverine
Joturus pichardoi	0.44	1	Riverine
Buteo sp.	0.44	1	Forest/Cultivated area
Meleagris gallopavo	11.79	27	Cornfield/Open woodland/Domestic
Odocoileus virginianus	24.44	56	Forest/Cornfield/Thicket/Desert
cf. *Mazama Americana*	0.44	1	Forest/Woodland
Tayassu tajacu	6.55	15	Cornfield/Arid woodland/Rainforest
Tayassu cf. *pecari*	0.44	1	Forest
Canis familiaris	1.75	4	Domestic
Nasua narica	0.44	1	Forest/Domestic
Lepus callotis	1.75	4	Thicket/Desert
Sylvilagus cunicularius	0.87	2	Arid lowland/Temperate highlands
Sylvilagus floridanus	4.37	10	Forest/Marsh/Prairie
Orthogeomys grandis	0.44	1	Forest/Cornfield
Lyomis irroratus	0.44	1	Rocky areas-bushes

Table 80. Habitats of animal bone fragments identified from PNLP Area.

Taxa and anatomical patterns present in the sample

The analysis of anatomical parts represented in the assemblage can provide information about how animals might have been processed and transported to the site. It may also show the proportions of meat content elements, whether high, medium or low were distributed evenly between different households, areas or sites. Thus, the anatomical pattern of the most frequent subsistence taxa (cervids, canids, *Tayassu tajacu* and *Meleagris gallopavo*) was analyzed to detect the differences and similarities in the four areas under study. The PNLP Area is a public space so high meat content parts should be more abundant in this place, since more people were brought together and more food was needed. Status differences have not been observed between households located in W1, W2 and A3 Areas, so high, medium and low meat content parts should be represented similarly.

Odocoileus virginianus and *Odocoileus* sp.

According to Jackson and Scott (2003) low meat content parts of deer are the skull, atlas, axis, cervical vertebrae, carpals, tarsals, metacarpals, metatarsals and phalanges. Medium meat content elements are the thoracic vertebrae, ribs and sternum. High meat content bones are scapula, forelimbs (humerus, radius and ulna), pelvis and hindlimbs (femur and tibia) (Jackson and Scott 2003). In W1 Area parts of cervids most represented were the tibia, femur, lumbar vertebrae, humerus and ribs (Fig.91). In similar proportions, scapula, radius, ulna and pelvis were found. Only one fragment of cervical and thoracic vertebrae was observed. The absence of antlers, skull, teeth and hooves (metapodials and fingers) was evident. Based on this information, it seems that low meat content parts were almost absent and a significant part of the sample (95.92%) showed parts of medium and high meat content.

In the W2 Area the most abundant parts of the carcass were the tibia and humerus (both classified as high meat content) (Fig.92). Other high, medium and low meat content parts were present to a lesser degree (in decreasing frequencies by femur, ribs, astragalus, pelvis, radius, calncaneus and atlas). The rest of the anatomic parts were represented by only one fragment of each (antler, mandible, axis, caudal vertebra and metapodial). So, in W2 Area most of the sample (80.62%) contained high and medium meat content parts. The bone remains from the axial skeleton, such as pelvis found in W1,W2, A3 and PNLP Areas, might have been left attached when hindlimbs were disarticulated, according to the method of butchering proposed by Binford (1981). Equally, calcaneus and astragalus might have remained attached to hindlimbs.

In A3 Area the femur, humerus, tibia and scapula were the most frequent parts (all of them considered high meat content) (Fig.93). Other elements (in fewer numbers ribs, pelvis, radius, calcaneus, lumbar vertebrae, ulna, astragalus, thoracic vertebrae and sternum) were also observed. The rest of the skeleton (antler, mandible, axis, cervical and caudal vertebrae, patella, metacarpal, metatarsal and phalanx) was hardly present. This area showed a similar pattern to the W1 and W2 areas, since most of the bones (85.86%) were considered to be medium and high utility parts. Fragments of skull and hooves were aso very rare. Moreover, the anatomical bone pattern found in PNLP Area

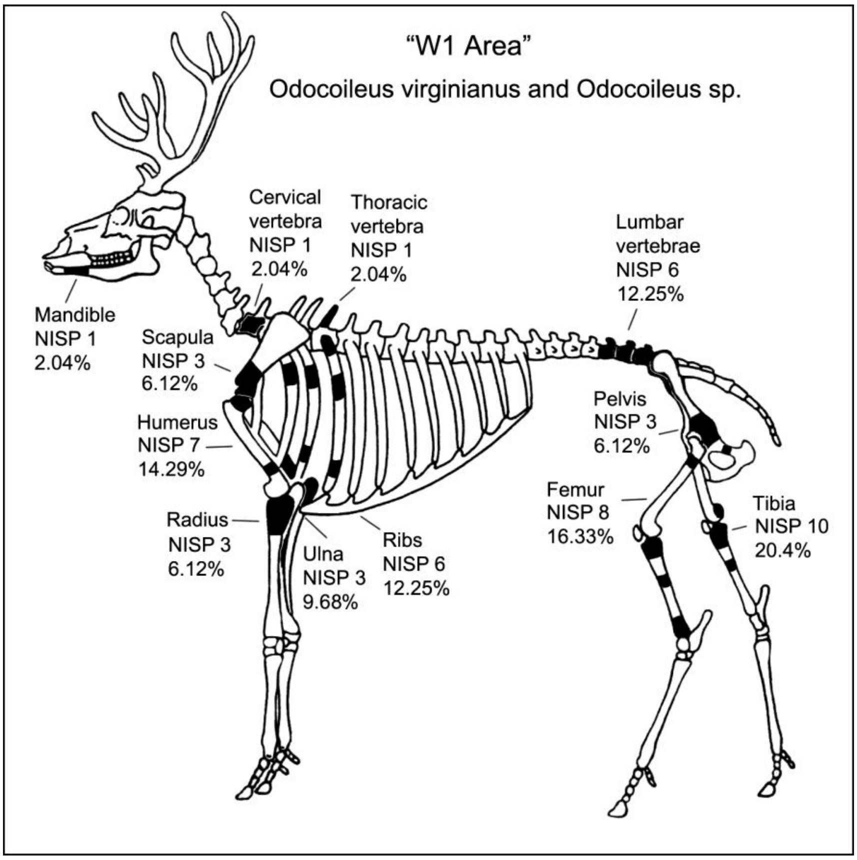


Fig.91. Anatomical parts of *Odocoileus virginianus* and *Odocoileus* sp. present in W1 Area (after Thiel 1998:202).

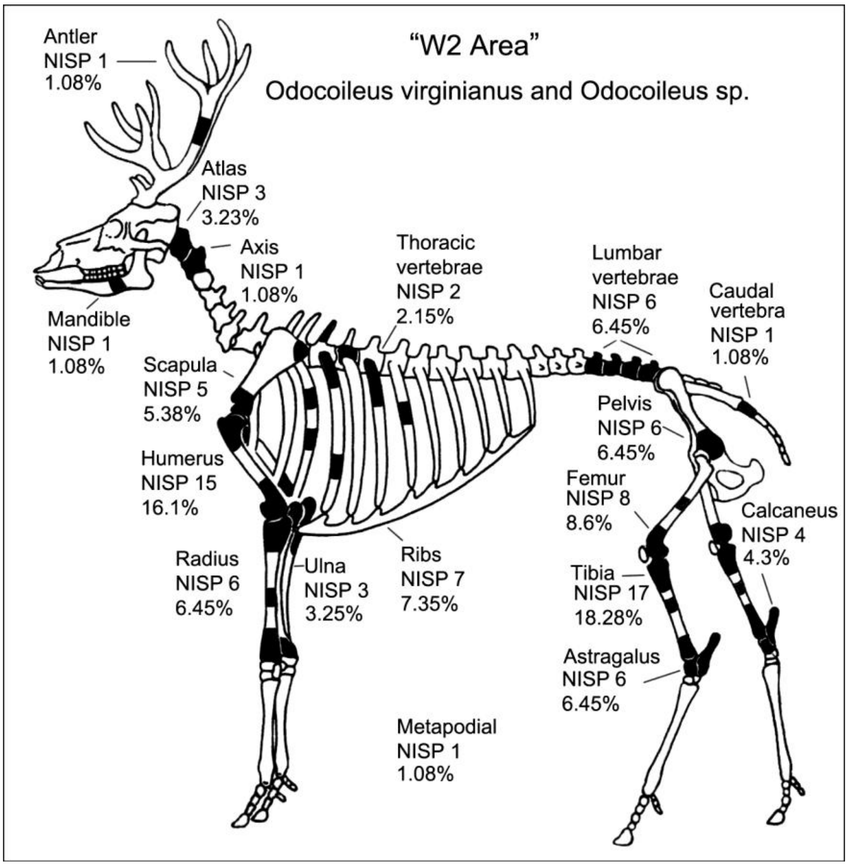


Fig.92. Anatomical parts of *Odocoileus virginianus* and *Odocoileus* sp. present in W2 Area (After Thiel 1998:202).

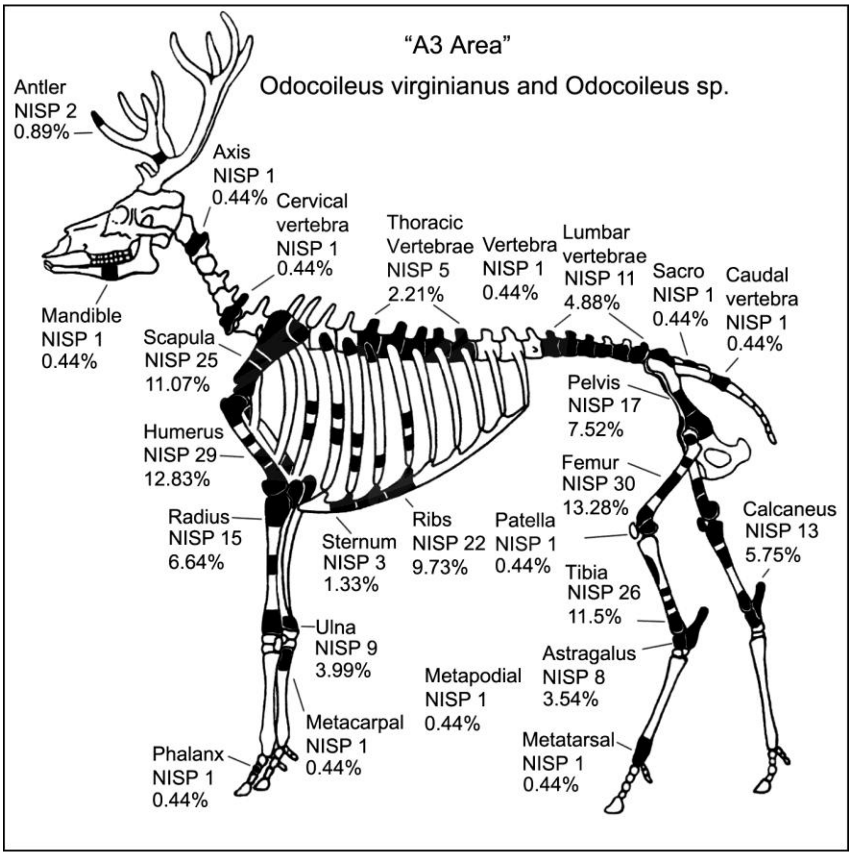


Fig.93. Anatomical parts of *Odocoileus virginianus* and *Odocoileus* sp. present in A3Area (after Thiel 1998:202).

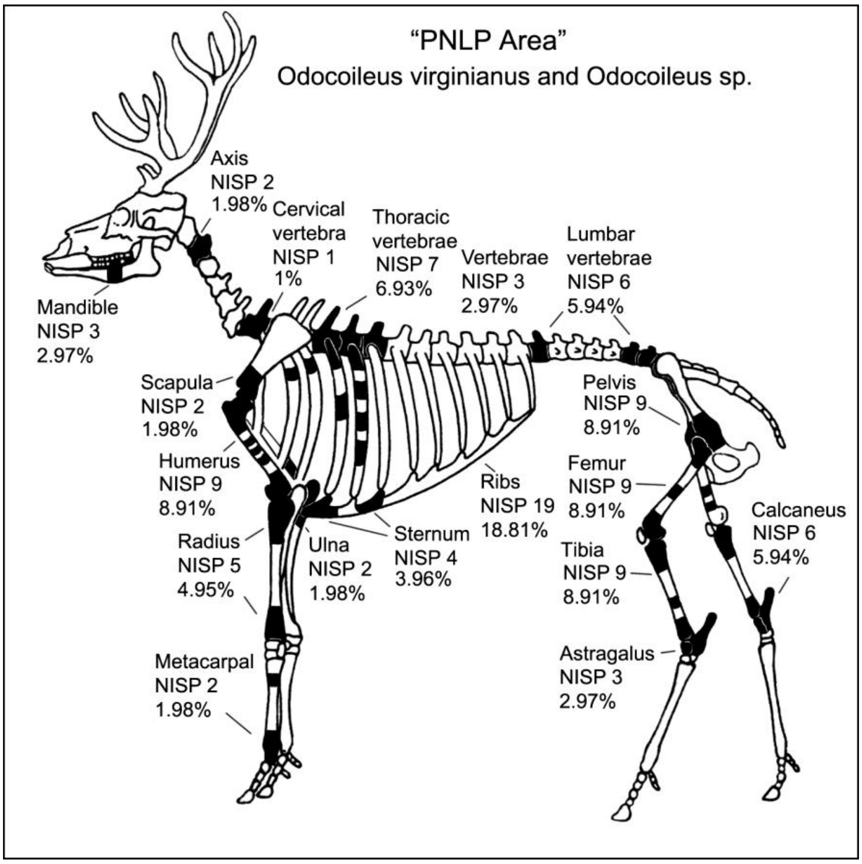


Fig.94. Anatomical parts of *Odocoileus virginianus* and *Odocoileus* sp. present in PNLP Area (after Thiel 1998:202).

revealed that ribs were one of the most represented element, followed by high meat content parts, observed in the same proportion (pelvis, femur, tibia and humerus) (Fig.94). High, medium and low meat content bones were also found in lesser quantities (thoracic and lumbar vertebrae, calcaneus, radius, sternum, mandible, astragalus, axis, scapula and cervical vertebrae). As in the other areas, the PNLP Area showed little evidence of skull and hooves.

Apparently, most of the anatomical parts of cervids represented in W1, W2, A3 and PNLP Areas corresponded to high and medium meat content (Fig.95). As seen in Chapter 3, bone transportation needs to be linked to the realities of skeletal element survival and taphonomic processes (Faith and Gordon 2007). Dense elements with thick cortical walls and medullary cavities, such as long bones and mandibles, are classified as high-survival elements (Marean and Cleghorn 2003; Cleghorn and Marean 2004; Faith and Gordon 2007). The cranium, due to the presence of teeth is considered as a high-survival element too (Cleghorn and Marean 2004; Faith and Gordon 2007).The low-survival bones include elements with thin cortical walls, low density and grease rich cancellous portions, such as vertebra, ribs, pelvises, scapulae and long-bone ends (Marean and Cleghorn 2003; Cleghorn and Marean 2004; Faith and Gordon 2007). Phalanges and small compact bones are considered part of low density group since they are frequently consumed or swallowed by carnivores (Cleghorn and Marean 2004; Faith and Gordon 2007).

As can be observed high-survival elements (mandibles, teeth or metapodials) were very scarce in the sample, whereas low-survival bones (vertebra, ribs, scapulae, pelvises and long-bone ends) were more abundant. So the anatomical pattern of deer seems to be related to bone transportation decisions rather than to the preservation of bones. Since Monte Albán is located 400 m above the valley, it is possible that only high-medium utility portions were brought to the site or that deer were butchered in

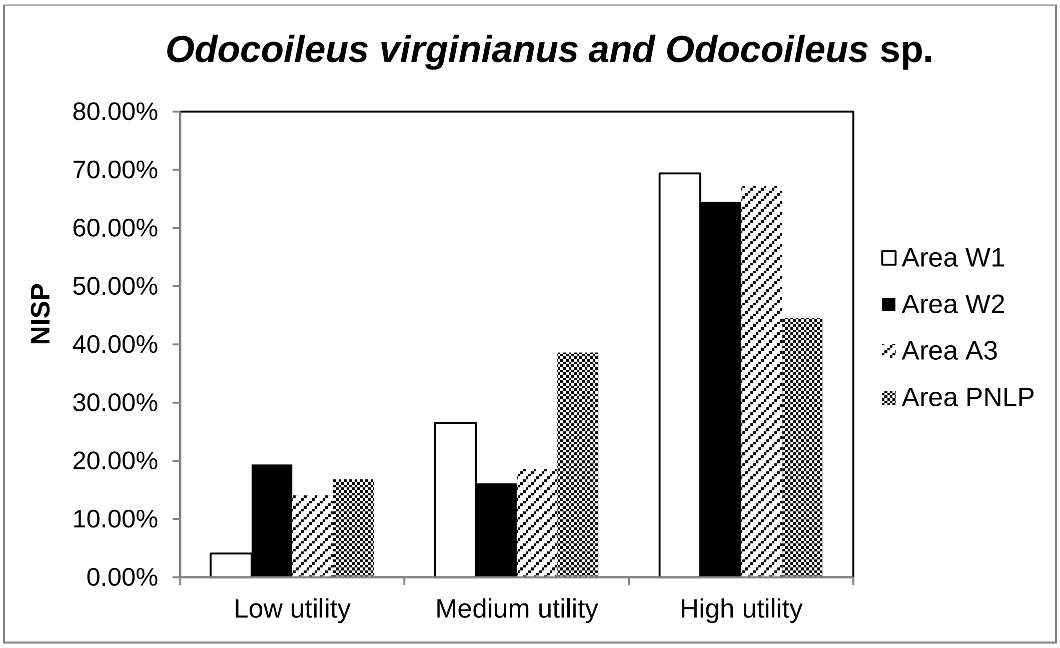


Fig.95. Percentages of low, medium and high utility anatomical parts of *Odocoileus virginianus* and *Odocoileus* sp. in W1, W2, A3 and PNLP Areas.

other areas. If this was the case, large portions of the heavier or non-meat sections would have been found in the areas where they were butchered. As might be expected, the anatomical pattern found within a context where the elite dwells, would contain the most desirable portions (Jackson and Scott 2003). Another possibility is that low meat content parts such as antlers and metapodials might have also been used to manufacture tools. A case in point was found in Tomb 1973-4, in Monte Albán, where a deer metapodial had been used as a punch and was found as part of the offering (Winter *et al.* 1995). It was also noticeable that there were more thoracic and lumbar vertebra than cervicals, which might indicate that the head was removed close to the shoulder during the initial butchering (Kelly 2000). In the Maya area, deer elements most used in ritual contexts such as caves were crania, antlers and teeth (Pohl 1983). So it is quite possible that the missing anatomical parts of deer might have been used in other contexts or transported to other sites.

Canis familairis and Canis cf. *familairis*

The skeleton of dogs was also divided into low, medium and high meat content parts, following the Jackson and Scott (2003) proposal for deer. The anatomical pattern for

Canis familiaris in W1 Area showed that the most represented parts were mandible and humerus (Fig.96). Other (high, medium and low) utility parts were also present (in decreasing order ribs, femur, metapodials, phalanges, tibia, tarsals, pelvis, cranium, vertebrae and metacarpal). There was only one fragment of some other elements of the skeleton (atlas, thoracic vertebrae, lumbar vertebrae, calcaneus and radius). Compared to deer, low utility parts constituted almost half of the sample (46.87%) and were more numerous in W1 Area.

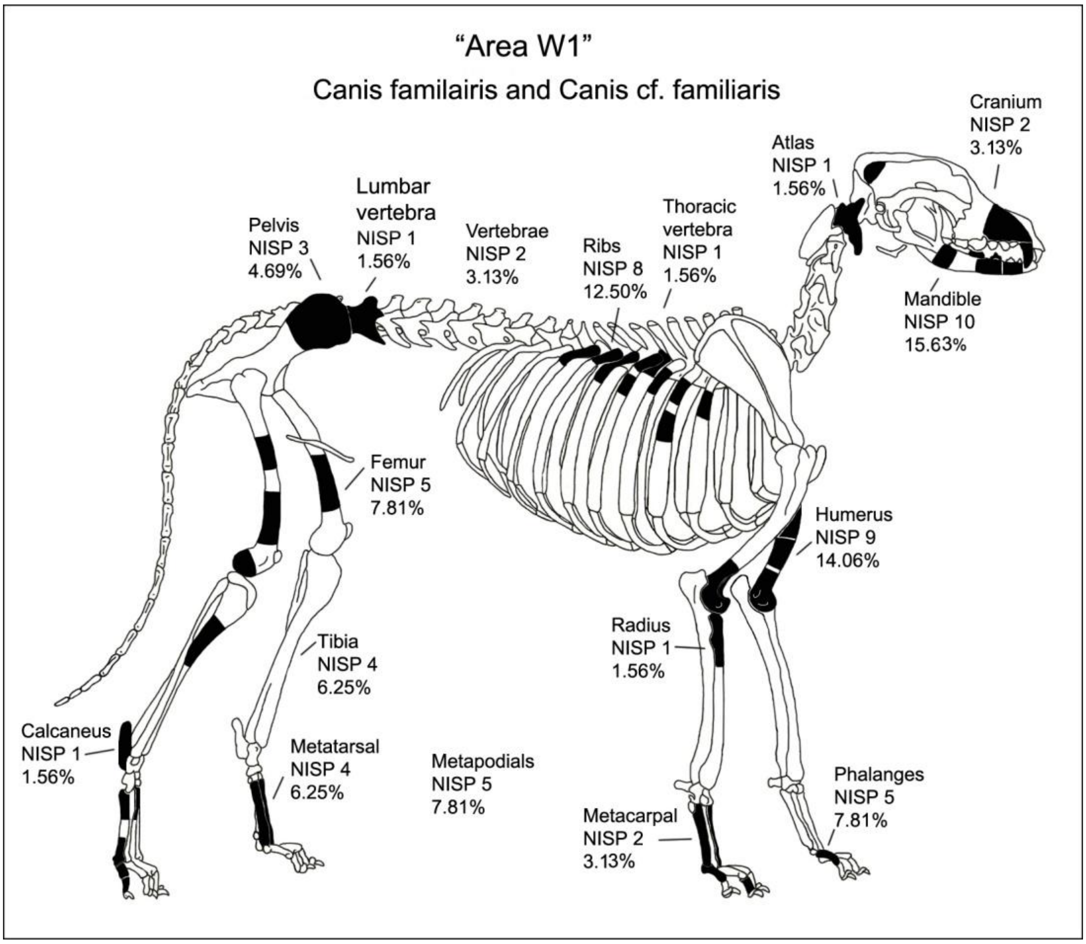


Fig.96. Anatomical parts of *Canis familiaris* present in W1 Area (after Olsen 1996:71).

In the W2 Area, low, medium and high meat content parts were found in similar proportions, and only varied a little in numbers between each other (Fig.97). The percentage of low utility elements constituted almost half of the sample (44%), as was observed in W1 Area. The most prevalent anatomic bones of *Canis familiaris* in A3

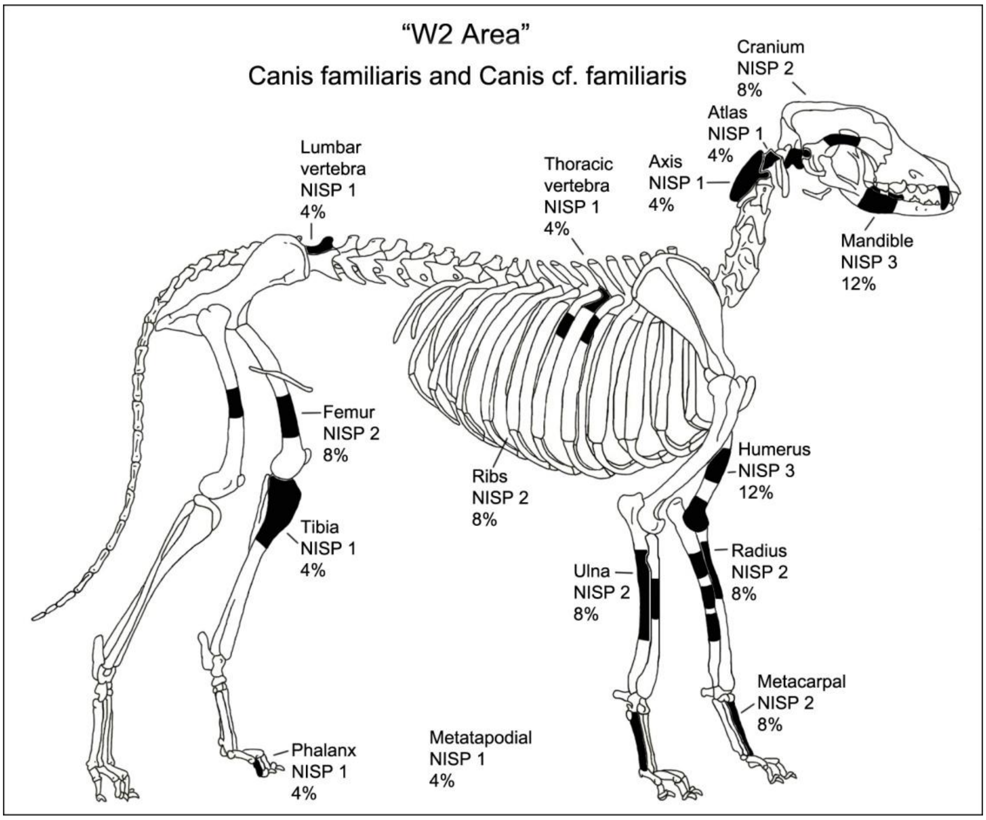


Fig.97. Anatomical parts of *Canis familiaris* present in W2 Area (after Olsen 1996:71).

Area were fragments of mandibles and cranium (Fig. 98). High and medium utility parts were also frequent (in decreasing percentages humerus, femur, tibia, radius, ribs and ulna), the rest of the identified fragments were observed in less proportion. In this area the percentange of low utility parts (43.90%) compared to those of medium and high utility (56.10%) were not very different. In this sense, A3 Area showed the same pattern observed in W1 and W2 Areas. Regarding PNLP Area, elements were represented by similar percentages between each other (Fig.99). This area also corroborated that low utility parts conformed almost half of the sample (43.90%) while medium and high utility together constituted 56.10%.

In sum, the four areas showed higher percentages of low utility parts than in the other two categories (Fig.100). Compared to the anatomical pattern of deer, it was not so obvious that all dog skeleton remains were used for human consumption, since there was a similar proportion of bones from all three categories. As is known, dogs were valued for both consumption and their symbolic meaning (Pendergast 2004). According

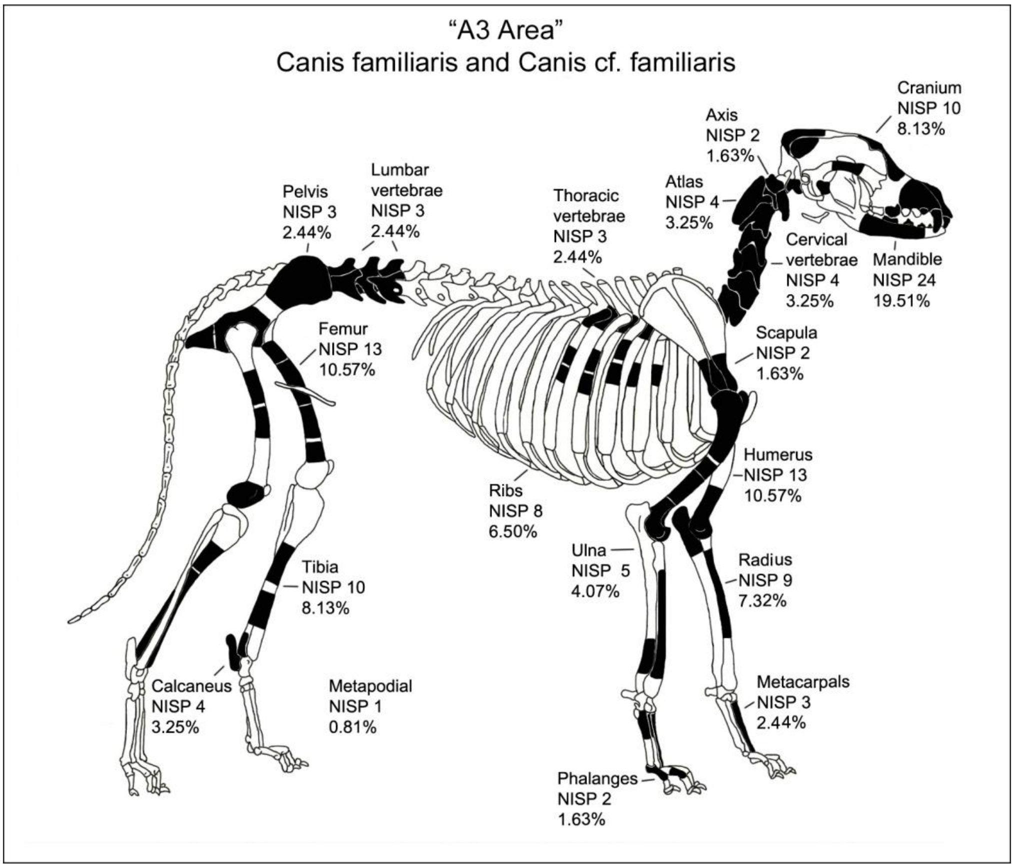


Fig.98. Anatomical parts of *Canis familiaris* present in A3 Area (after Olsen 1996:71).

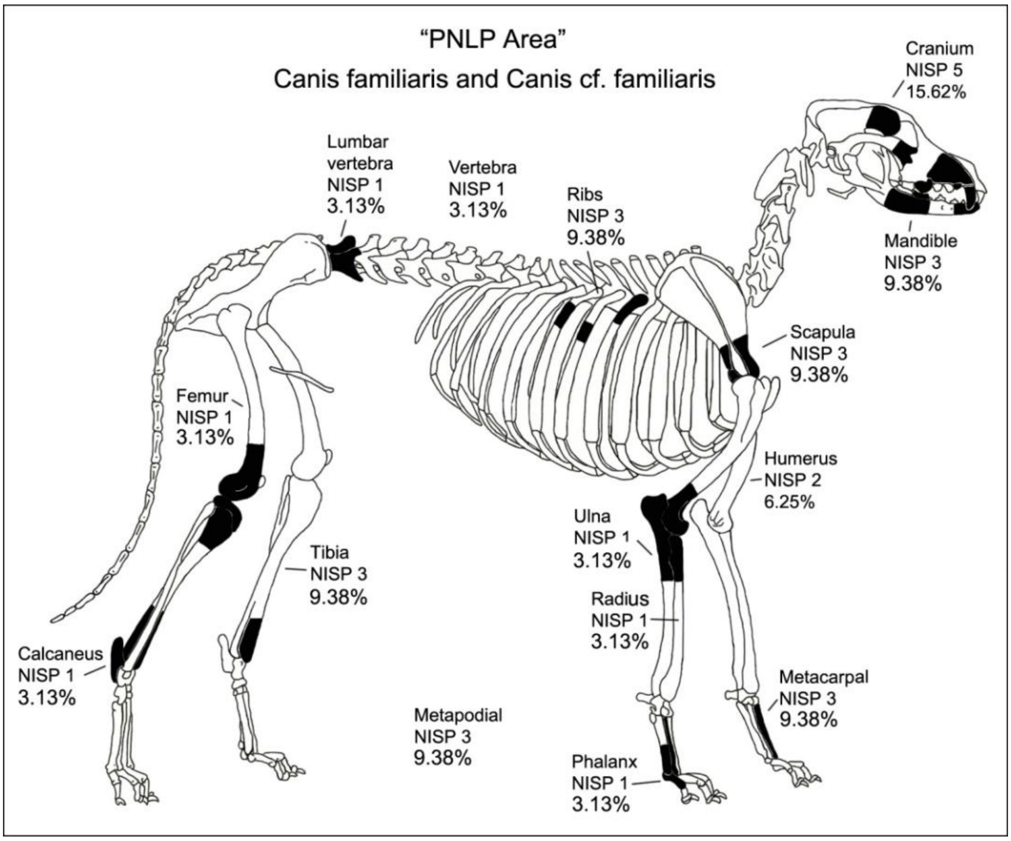


Fig.99. Anatomical parts of *Canis familiaris* present in PNLP Area (after Olsen 1996:71).

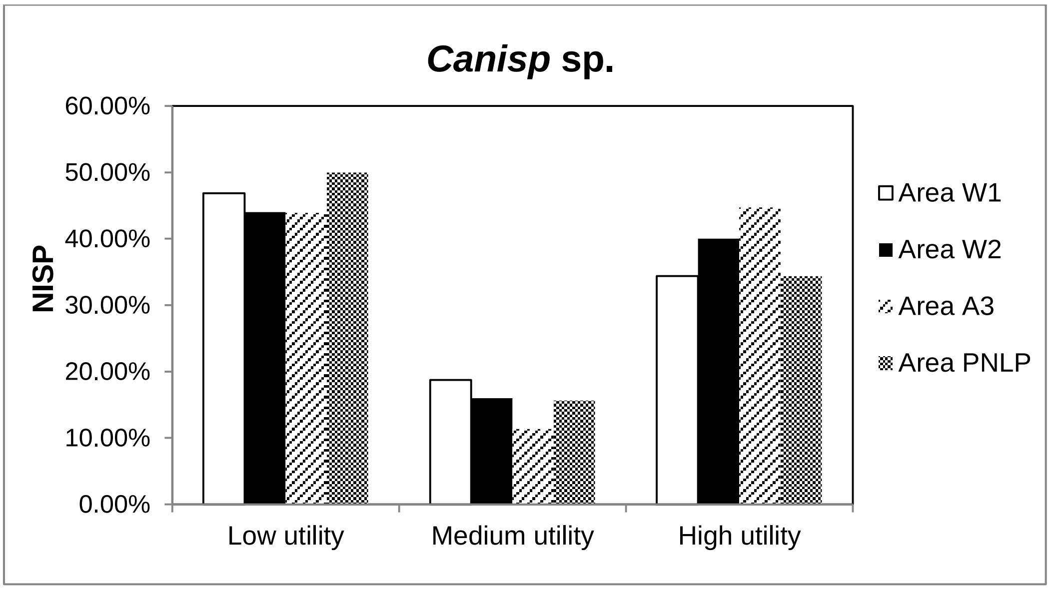


Fig.100. Percentages of low, medium and high utility anatomical parts of *Canis familiaris* and *Canis* sp. in W1, W2, A3 and PNLP Areas.

to Kansa and Campbell (2004) ritual or symbolic animals, can sometimes be identified by the degree of completeness of the skeleton. Therefore, it is possible that some of these remains were also the result of symbolic or ritual acts, such as offerings or sacrifices. Skull and mandibles were frequent in the W1 and A3 Areas, and were probably also used for specific non-consumption practices. In the Maya area, at the Aguateca site, dog remains were mainly represented by teeth, some of which were perforated and strung or made into belts. Therefore, it can be noted that some of these parts might have been used as ornamental items or for other purposes (Emery 1997). In Lambityeco, in Oaxaca, earrings made of canine teeth were discovered in Tomb 6 (Lind and Urcid 2010). Another aspect that should be considered is that dogs were animals that might well have been living with humans in the role of companions or pets, so the whole carcass could have been discarded or buried after they died.

Tayassu tajacu

Bone fragments identified as *Tayassu tajacu* were divided into the same three categories as dog and deer, based on the Jackson and Scott (2003) proposal, except that peccary cranium was considered as medium meat content. If utility is equated with meat/bone ratio, then peccary skull is higher than deer cranium. No research related to peccary meat/bone ratios quantification for peccary skull has been published, so this was estimated on cranium size compared to deer. In the W1 Area there were many more mandibles than other parts of the skeleton (Fig.101). Although high and medium meat content bones made up more than half of the sample (95.46%), the most frequent anatomical bones of *Tayassu tajacu* in the W2 Area were ribs and thoracic vertebrae (medium meat content) (Fig.102). The rest were high and medium utility parts observed in similar percentages. The majority of the collared peccary fragments (83.78%) found in this area fell into these two last categories.

In the A3 Area, fragments of cranium (including mandibles) were the most numerous anatomical bones (Fig.103). Following the cranium, there were frequent elements of high meat content (in decreasing order tibia, radius-ulna, humerus, scapula and femur). Other low meat content parts were also represented in lower percentage (phalanges, metapodials, astragalus and metatarsal). Medium utility parts were more scarce (ribs, thoracic and lumbar vertebrae). In this area medium and high utility parts represented more than half the sample (87.67%), followed by low utility elements (12.33%). The PNLP Area showed a similar pattern as in the W1 and A3 Areas of a greater number of cranium with mandible fragments (Fig.104). After skull bones, the most frequent parts were high and medium utility elements (in decreasing order ribs, radius-ulna, scapula, humerus, and thoracic vertebrae). Other parts from the three categories were also present in lower percentages (pelvis, lumbar vertebrae, femur, tibia, metacarpal and phalanx). In this area high and medium meat content elements formed more than half of the assemblage (93.33%).

According to Figure 105, high, medium and low utility parts varied between the four areas, showing that there were more frequent high utility elements in the W1 Area, followed by A3 and PNLP Areas. The lowest percentage of high meat content

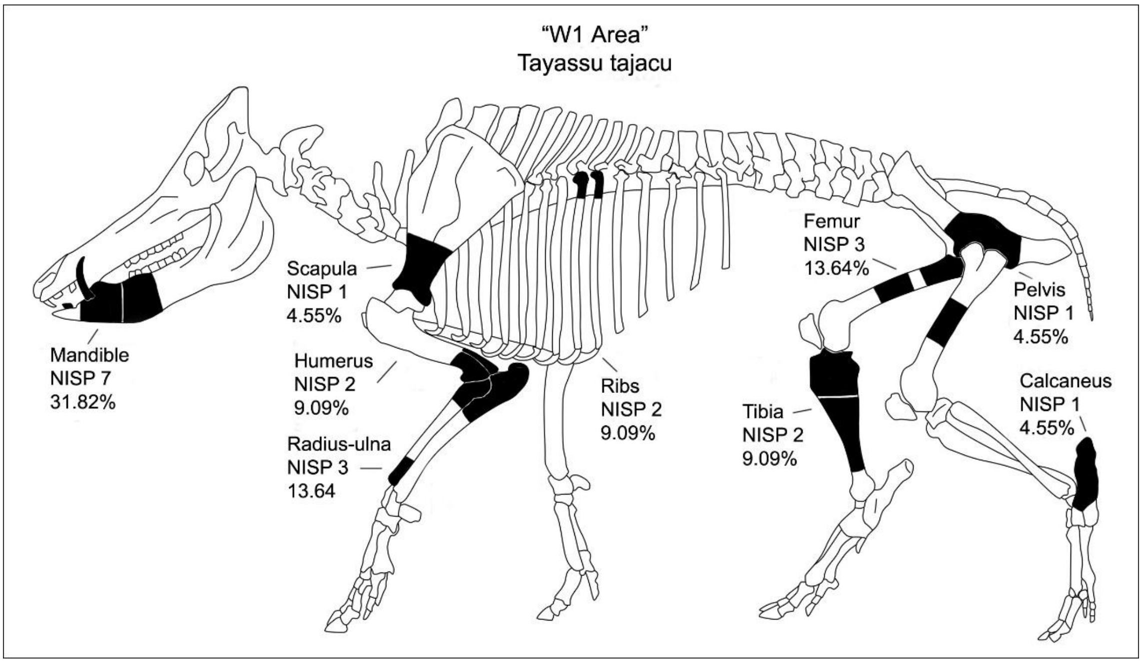


Fig.101. Anatomical parts of *Tayassu tajacu* present in W1 Area (drawing by Domínguez).

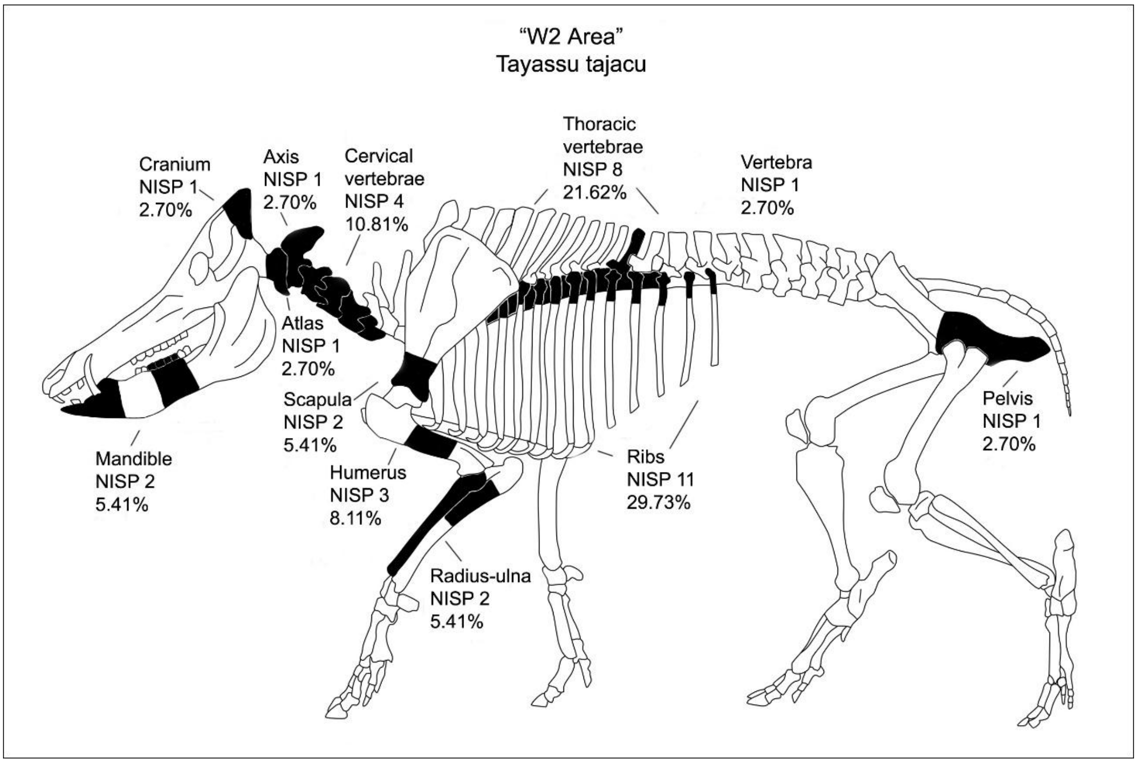


Fig.102. Anatomical parts of *Tayassu tajacu* present in W2 Area (drawing by Domínguez).

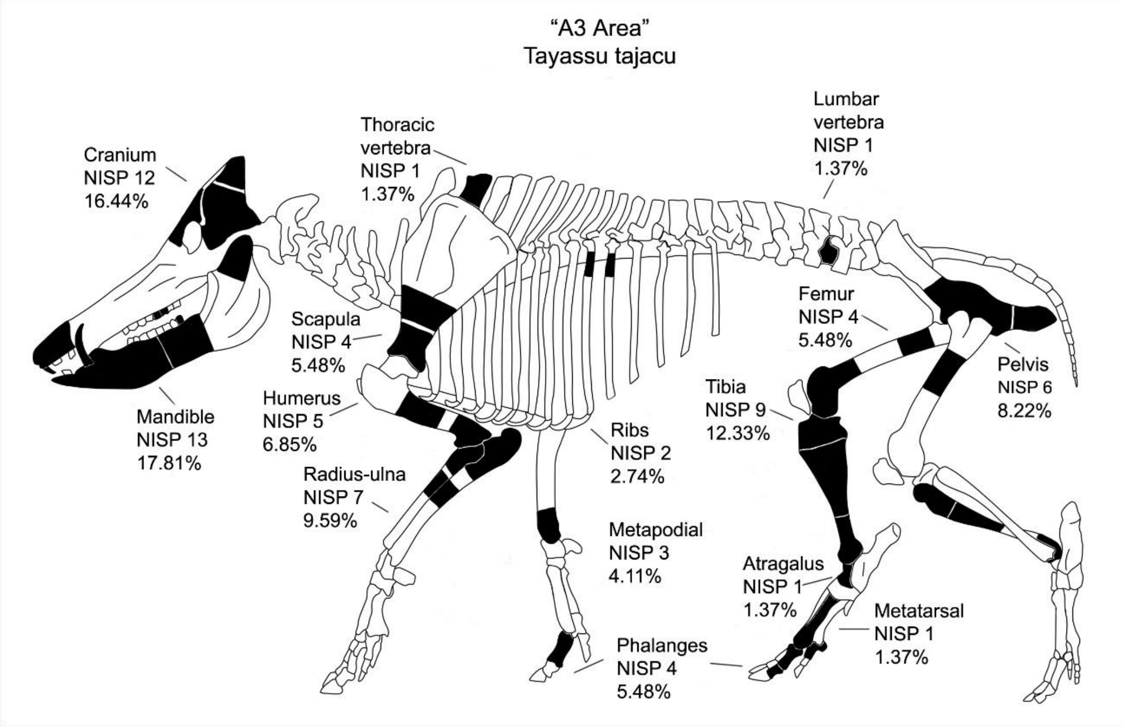


Fig.103. Anatomical parts of *Tayassu tajacu* present in A3 Area (drawing by Domínguez).

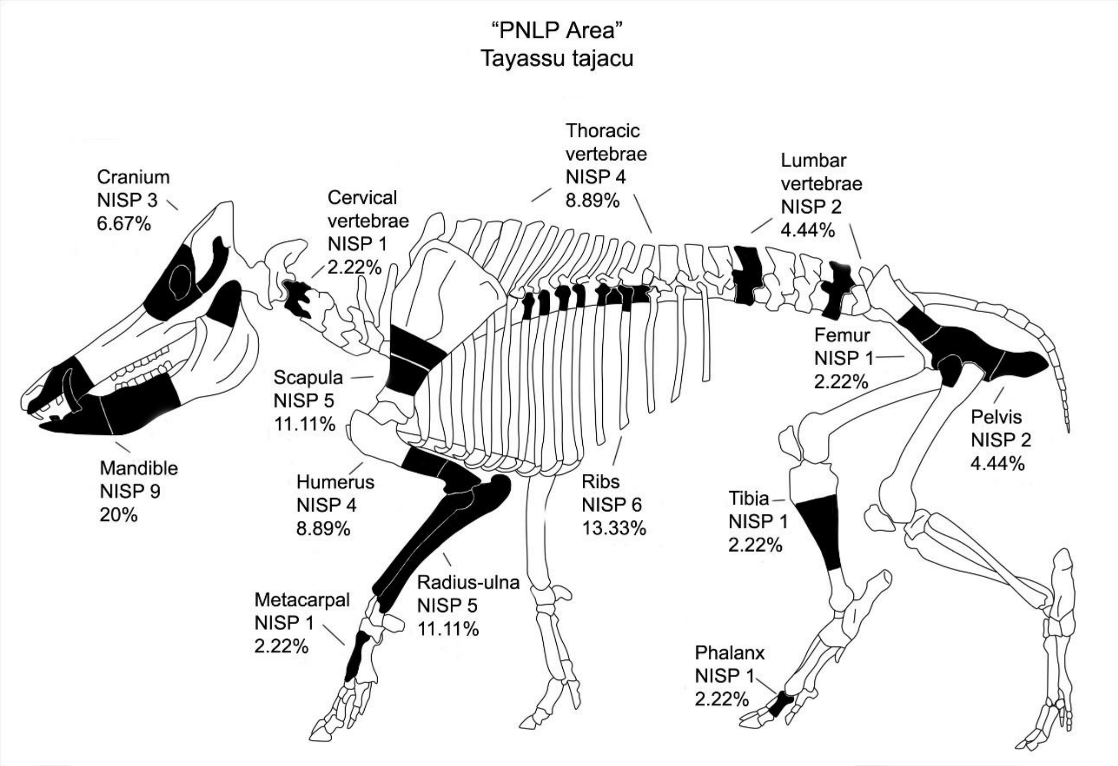


Fig.104. Anatomical parts of *Tayassu tajacu* present in PNLP Area (drawing by Domínguez).

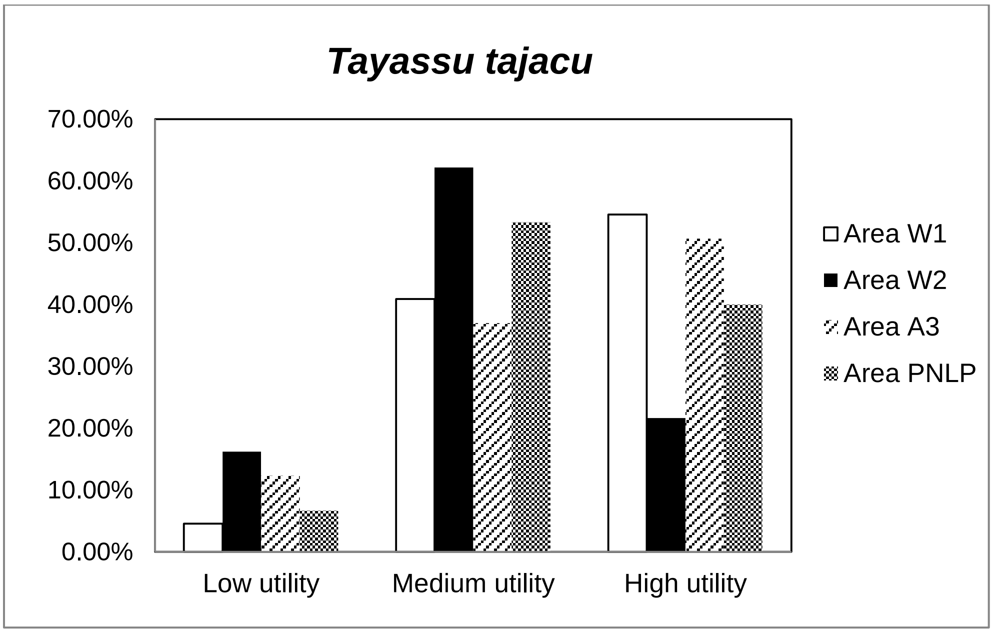


Fig.105. Percetages of low, medium and high utility anatomical parts of *Tayassu tajacu* inW1, W2, A3 and PNLP Areas.

fragments was observed in W2 Area. However, the latter showed the highest percentage of medium utility parts followed by PNLP Area. Elements of this category were more scarce in W1 and A3 Areas. Most anatomic parts of *Tayassu tajacu* corresponded to medium and high meat content and low utility elements were very rare. So this pattern is clearly related to consumption. Unlike dogs, skeletons of peccaries were not found associated to human burials or offerings in the tombs in Monte Albán (Martínez *et al.* 2014). However, pendants made of peccary teeth have been identified (Valentín and Pérez 2010). Since different parts of the skeleton were present, it is possible that the whole animal was brought to the site to be slaughtered and butchered, consumed and then discarded in these areas, possibly keeping some parts (such as teeth) for uses other than food.

Meleagris gallopavo

Bird anatomy varies from mammals so different elements were considered as high utility, which included the scapula, coracoid, sternum, humerus and femur, particularly in the case of turkey. The radius, ulna, pelvis and tibiotarsus were related to the medium meat content range and the low meat utility category was formed by cranium, mandible, vertebrae, ribs carpometacarpus, tarsometatarsus and phalanges. In the W1 Area the most frequent element to be found was the tarsometatarsus, and other parts of low meat content were also observed (carpometacarpus, and phalanges) (Fig.106). Nevertheless, elements of high and medium meat content (humerus, tibiotarsus, femur, radius and ulna) were also common. Some of the high, medium and low meat content parts are very fragile and rather more difficult to preserve such as sternum, ribs, vertebrae and cranium, which might explain why there were fewer of these bones present.

In the W2 Area the most represented part was the ulna, followed by trasometatarsus, and phalanges. There were hardly any other elements of the skeleton in the sample (Fig.107). Fragile bones of high, medium and low and meat content were more common in A3 Area than in the W1 and W2 Areas but the sample of *Meleagris gallopavo* in A3 Area was also bigger (Fig.108). Elements of high utility were abundant in A3 Area (in drecreasing order humerus, femur, coracoid, scapula pelvis and keel). Medium utility (tibiotarsus, ulna, radius, vertebrae and ribs) and low utility bones (cranium, mandible, scapholunar, carpometacarpus, tarsometatarsus and phalanges) were also present. In PNLP Area the most frequent parts were the ulna and tibiotarsus present in similar proportions (Fig.109). Other bones of the carcass in the sample were observed in low percentages (tarsometatarsus, phalanges, humerus, pelvis, cuneiform, carpometacarpus, cranium, mandible, vertebra and coracoid).

Acording to the graph (Fig.110), the A3 Area showed the highest percentage of high utility elements, followed by W1, W2 and PNLP Areas. In W1 Area parts of low utility bones were more abundant than the other two categories. The same trend was seen in W2 Area, however low and medium utility parts in this Area were higher than in W1 Area, while the opposite occurred with high utility percentages in W2 Area. It was noticed that in A3 Area high and medium utility bones were more abundant than those

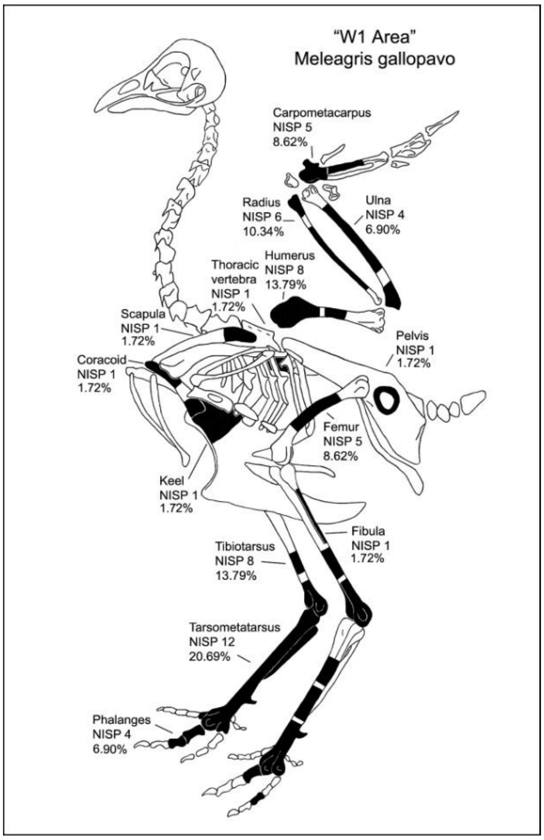


Fig.106. Anatomical parts of of *Meleagris galopavo* present in W1 Area (after Gilbert *et al.* 2006:13).

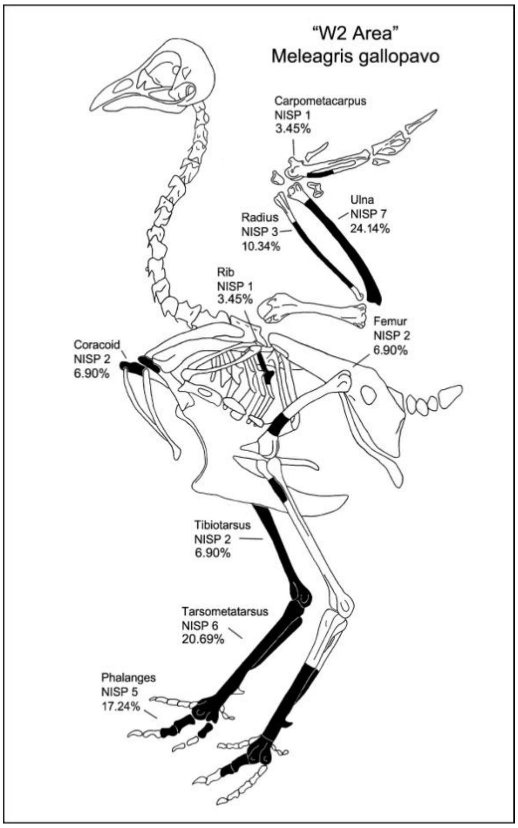


Fig.107. Anatomical parts of *Meleagris gallopav*o present in W2 Area (after Gilbert *et al.* 2006:13).

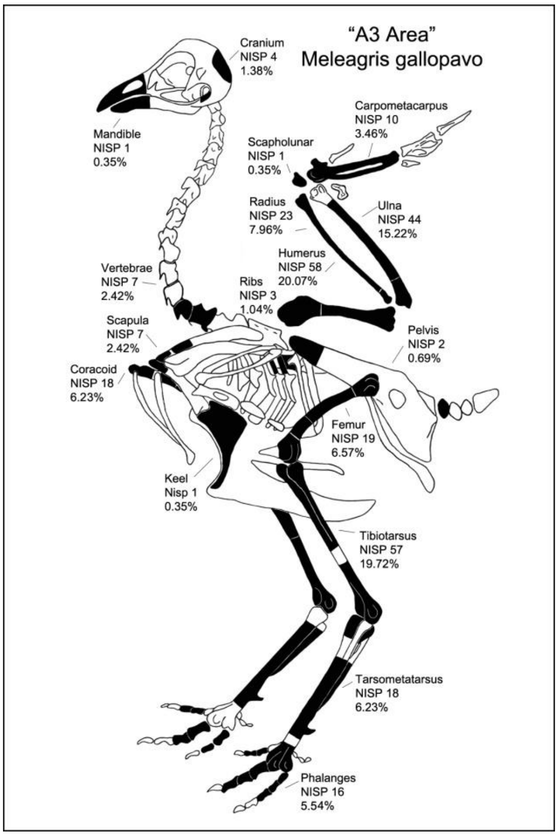


Fig.108. Anatomical parts of *Meleagris gallopav*o present in A3 Area (after Gilbert *et al.* 2006:13).

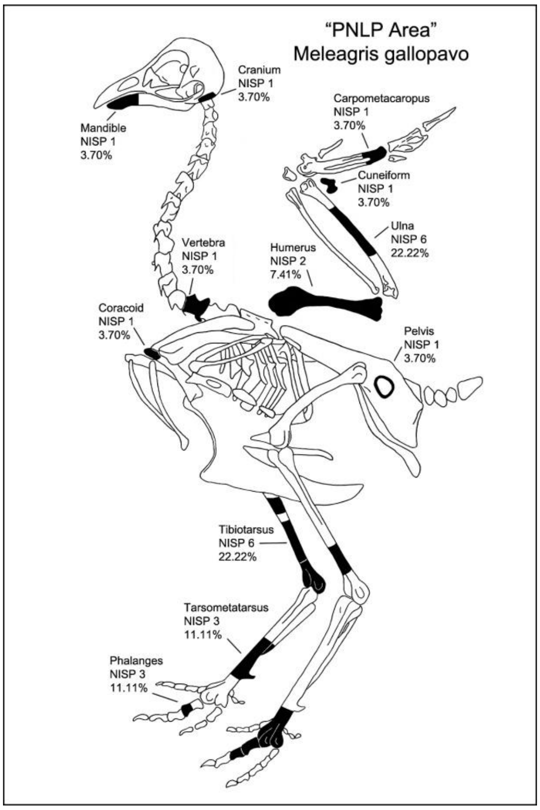


Fig.109. Anatomical parts of *Meleagris gallopav*o present in PNLP Area (after Gilbert *et al.* 2006:13).

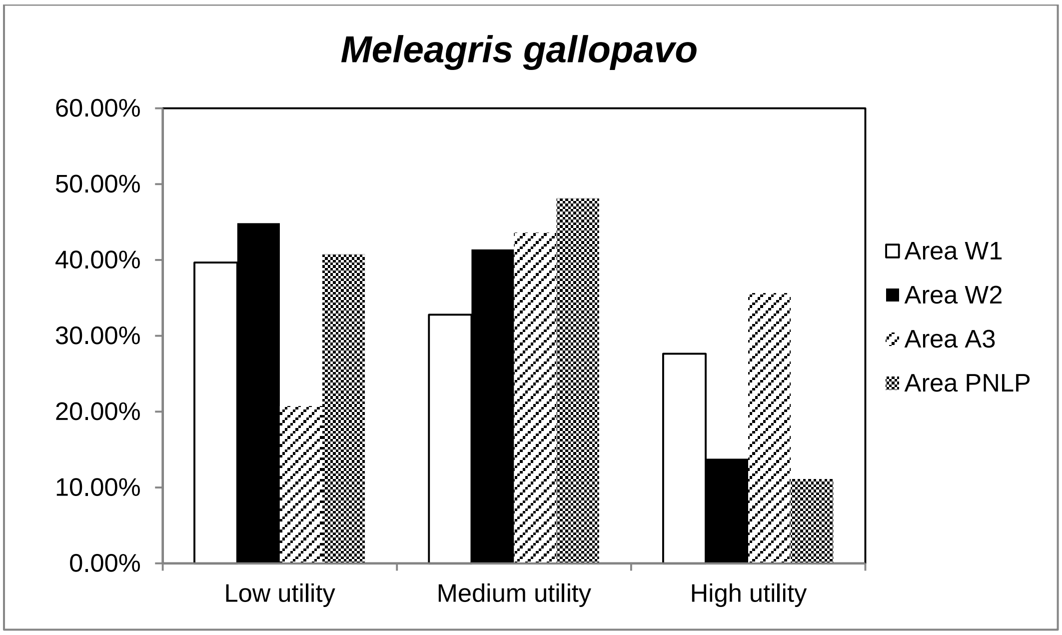


Fig. 110. Percentages of low, medium and high utility anatomical parts of *Meleagris gallopavo* in the W1, W2, A3 and PNLP Areas.

of low utility. In PNLP Area the percentage of medium meat content parts was higher than the other two groups, with the low utility parts being more frequent than high utility ones.

In general, most of the different parts of the skeleton were present. However, it is difficult to compare the anatomical pattern of *Meleagris gallopavo* with the other mammals found at the site, since birds skeletons have a different conformation. As mentioned before, one of the highest meat content section in birds is the pectoral girdle, however these bones are very fragile and difficult to find in an archaeological context, especially the keel as a whole (the rostrum of the sternum, where the coracoids articulate is more robust). Most of the identified elements corresponded to the fore and hind limbs, including low utility parts such as metapodials and phalanges that were probably attached to the high utility ones. In all four areas there was evidence of different parts of the skeleton, suggesting that this animal was butchered, eaten and discarded in these contexts. Although offerings of *Meleagris gallopavo* have been found in Oaxaca (Marcus and Flannery 1994; Pérez and Winter 2014), this animal was mainly an important food resource in the valley (Middleton *et al.* 2002). It is also relevant to consider the use of some anatomical parts of this species for the manufacture of bone tools. It is interesting to note that in Monte Albán, in the A3 Area, a needle made of tibiotarsus of *Meleagris gallopavo* was found in an offering associated with Tomb 204 (1993-11) (built in the Danibaan phase and reused in Pe phase) (Martínez *et al*. 2014).

According to results, high and medium meat content parts of diverse species were evenly represented between areas, so no marked difference of status was observed among households. The PNLP Area did not show more meat content bones of deer than household contexts.

Taphonomic agents

In this section taphonomic evidence found on some faunal remains is presented. One of the aims was to consider if in the areas under study bone preservation was similar, in order to be certain that the differences of anatomical patterns of taxa and species diversity found among these contexts were the result of human choice and not a variation of natural processes acting on faunal remains.Weathering, carnivore chewing, roots and trampling are among the factors that may affect the bones. In order to detect anthropic evidence, natural agents have to be distinguished, such as trampling from cut marks. The criteria used to identify taphonomic evidence was explained in detail in Chapter 3. In the number of fragments used to quantify taphonomic evidence, some could not be attributed to an anatomical part, therefore NISP was not considered as a unit of analysis.

Cut marks

Cut marks are the result of either taking off the skin, separating the anatomical parts, cutting of the meat of animals and in some cases removal of periosteum (Binford 1981). Cut marks were classified following Binford's (1981) proposal, which considers the anatomic part and location where this evidence is found. In W1 Area, disarticulation and skin removal marks were discovered on *Odocoileus virginianus* and *Canis* sp. This taphonomic feature was observed in a small portion of the sample (0.56%) (Table 81). It is interesting to find skin removal marks on dog, as this part was not just discarded but might have been used for other non-consumption purposes. As with deer, there is relatively little evidence of butchery or skinning practices of dogs for consumption purposes identified in the Maya record or anywhere else in Mesoamerica (Foreman 2004). In W2 Area cut marks were also observed in just a few fragments (0.63%), mainly of *Odocoileus virginainus* (Table 82). The kinds of cut marks detected in this

Taxa	Element	Type of cut mark	Fragments
Canis sp.	Calcaneus	Disarticulation	1
Canis sp.	Mandibles	Skin removal	2
Odocoileus virginianus	Astragalus	Disarticulation	1
Total 0.56%			**4**

Table 81. Cut marks identified on bone surfaces in W1 Area.

Taxa	Element	Type of cut mark	Fragments
Odoocileus virginianus	Metapodial diaphysis	Skin removal	1
Odoocileus virginianus	Distal radio diaphysis	Skinning or filleting	1
Odoocileus virginianus	Astragalus	Disarticulation	1
Odoocileus virginianus	Proximal diaphysis of radio	Skinning or filleting	1
Total 0.63%			**4**

Table 82. Cut marks identified on bone surfaces in W2 Area.

Taxa	Element	Type of cut mark	Fragments
Artiodactyl	Mesial diaphysis of tibia	Filleting	1
Artiodactyl	Proximal diaphysis of tibia	Filleting	1
Ocoileus virginianus	Proximal fragment of axis	Disarticulation	1
Ocoileus virginianus	Calcaneus	Disarticulation	1
Total 0.21%			**4**

Table 83. Cut marks identified on bone surfaces in A3 Area.

	Element	Type of cut mark	Fragments
Big mammal	Long bone	Filleting	1
Buteo sp.	Diaphysis of tibiotarsus	Skinning	1
Odocoileus virginianus	Lumbar vertebra	Disarticulation	1
Odocoileus virginianus	Right astragalus	Disarticulation	1
Total 0.38%			**4**

Table 84. Cut marks identified on bone surfaces in PNLP Area.

context included skin removal, filleting and disarticulation. Similarly, cut marks were also scarce (0.21%) in A3 Area (Table 83). These were seen on fragments identified as artiodactyls and *Odocoileus virginianus*. The type of cut marks found in the sample included filleting and disarticulation. There were few cut marks (0.83%) detected in PNLP Area on various taxa such as big mammals, *Buteo* sp. and *Odoocileus virginianus* (Table 84). Filleting, skinning and disarticulation cut marks were observed on these fragments. In general, cut marks on bones were found on rare occasions in all four areas. Presence or absence of cut marks may be due to different factors such as techniques and implements used to butcher the animals (for example, the use of fine obsidian tools), the skill of the person who does this kind of job, cooking techniques, among others (Gifford-Gonzalez 1993; Cruz-Uribe and Klein1994: 42; Abe *et al.* 2002; Lyman 2005; Outram*et al*. 2005; Dewbury and Russell 2007; Seetah 2008; Domínguez-Rodrigo and Yravedra 2009). All these causes were explained in more detail in Chapter 3. In Monte Albán flint flakes and obsidian blades were found in all the areas. These may well have been used in the butchering process and/or in food preparation, but a detailed microscopic analysis would be required to determine the exact use of these artifacts and no study of this kind has being undertaken for the moment (Winter, personal communication, 2014).

Fractures

The classification of types of fractures on long bones was based on the Shipman (1981) and Outram (2002) proposals. Research has established some criteria related to the condition of the bone when fractured (Stanford *et al.* 1981; Johnson 1985; Pickering *et al.* 2005). The surface of a fresh bone fracture mantains a smooth texture and forms acute and obtuse angles (not only with the long axis of the bone but also with the outer surface); green bone fracture surfaces have the same colour as the external cortical bone. The edges of the unfresh broken elements have a rough and uneven texture, with right angles in relation to the external cortical surface (triangular or rectangular shapes) (Stanford *et al*. 1981; Johnson 1985). Individual fractures were classified as helical (fracture of bone in a fresh state), dry (fractured after partial loss of moisture and organic content), mineralized (broken after almost total loss of organic fraction) and new (breaks that occurred during or after excavation) (Outram *et al.* 2005). A fracture produced on purpose usually occurs when the bone is in a fresh condition, while those broken in a dry condition correspond to post-depositional events (Blasco 1992). Deliberate breaking of bones is associated with marrow extraction (Outram 2002).

According to Johnson (1985) there are two mechanisms that can fracture bone: 1) dynamic load which focuses on the bone impact (an object hits the bone and creates a contact point), and 2) a static force producing pressure that is distributed thoughout. Human beings break bones in different ways, but almost all use a dynamic load (Lyman 1994). All these criteria were explained in more detail in Chapter 3.

In W1 Area most of the evidence was related to unfresh broken bones, only three fragments showed a helical shape with a soft surface, which might indicate fresh fracture (Table 85). Others had acute and obtuse angles but these were small fragments that in most cases the shape could not be determined or it was not precisely helical, so they must be considered with caution and not directly taken as fresh fractures in all the areas (Table 86). One notch (1 NISP) and two marks of flakes (2 NISP) were observed on bone fragments of this sample.

Types of fractures	**Frequencies**
Longitudinal	35
Transverse or perpendicular	31
Transverse or perpendicular irregular	7
Diagonal	4
Helical (irregular surface)	6
Helical (soft surface)	3
Stepped or columnar	13
Total	**99**

Table 85. Types of bone fractures in W1 Area.

Angles of fracture	Frequencies
Obtuse	16
Acute	8
At right angles	2
Total	**26**

Table 86. Angles of fractures in W1 Area.

In W2 Area three fragments had perpendicular shapes with smooth surfaces and four fragments had a helical shape with a soft surface (Table 87). Obtuse and acute angles were detected in just a few bones (Table 88). Marks of flakes (5 NISP) and notches (5 NISP) were found on bone fragments. In A3 Area some bones showed a helical shape but did not have a soft surface, so these were not considered as evidence of freshly broken bones (Table 89). Fragments with obtuse and acute angles were more prevalent than in the other two areas (Table 90). Evidence of flakes (5 NISP) and notches (2 NISP) was detected on bone surfaces.

Type of Fracture	Frequencies
Longitudinal	46
Transverse or perpendicular (soft surface)	3
Transverse or perpendicular	11
Transverse or perpendicular (irregular surface)	3
Diagonal	12
Diagonal with step	4
Diagonal with step and smooth surface	1
Helical (irregular surface)	17
Helical (smooth surface)	4
Stepped or columnar	9
Sawtoothed	6
V-shaped	2
Total	**118**

Table 87. Types of bone fractures in W2 Area.

Angles of fracture	Frequencies
Obtuse	18
Acute	3
At right angles	19
Total	**40**

Table 88. Angles of fractures in W2 Area.

Type of Fracture	Frequencies
Longitudinal	42
Transverse or perpendicular	25
Transverse or perpendicular (irregular surface)	16
Diagonal	26
Helical	16
Stepped or columnar	11
Sawtoothed	4
V-shaped	3
Total	**143**

Table 89. Types of bone fractures in A3 Area.

Angles of fracture	Frequencies
Obtuse	55
Acute	12
At right angles	8
Total	**75**

Table 90. Angles of fractures in A3 Area.

In the PNLP Area, helical fragments were also found but with irregular surfaces, so these were not considered to be fresh breaks (Table 91). Some bones had obtuse and acute angles (Table 92). Evidence of flakes (1 NISP) and notches (NISP 2) was found in just a few cases in the sample. In sum, most of the fractures detected corresponded to bones that were broken in a dry condition due to post-depositional events (Blasco 1992). Flakes, notches or other evidence of dynamic impact on bones is also scarce.

The majority of the bones was broken in half or quarters. Assemblages of anatomic parts broken in pieces less than a quarter of their size and with a low portion of identifiable material are the result of an intense bone processing to obtain marrow and grease (Diehl and Waters 1997). This was not the case in the samples analyzed from Monte Albán, so it can be deduced that there was no evidence of marrow or grease consumption found as a recurrent resource in these areas. It seems that intense bone processing needed to obtain grease (extensive bone breakage plus boiling) was less common in high-status households (resulting in the degree of bone fragmentation) (Jackson and Scott 2003).

Type of Fracture	Frequencies
Longitudinal	11
Transverse or perpendicular	6
Transverse or perpendicular (irregular surface)	1
Diagonal	6
Helical (irregular)	5
Stepped or columnar	3
Sawtoothed	2
V-shaped	2
Total	**36**

Table 91. Types of bone fractures in PNLP Area.

Angles of fracture	Frequencies
Obtuse	19
Acute	9
At right angles	4
Total	**32**

Table 92. Angles of fractures in PNLP Area.

Burning

Bone study categories in Monte Albán followed aspects established by Johnson (1989), who distinguished four stages in burning: without burning, scorched (superficial burn), carbonized (black), and calcinated (blue-white). On the other hand, Buikstra and Swegle (1989), established slightly different categories, depending on the degree of combustion: without burning, calcinated (grey, blue-grey, white) and smoked (black and some parts with its original color), which were also taken into consideration. According to Buikistra and Swegle (1989): 1) only a meatless bone can be evenly smoked (blackened); 2) dry bones do not have enough organic material to smoke completely; and 3) meat covers the bone, so it retains its color, while the exposed surfaces turn black.

According to bone coloration based on the Munsell colours, Munro *et al.* (2007) established a range of possible temperatures used. Colour darkened to brown (10YR7/6-10YR2/0) indicates that the bone reached a temperature of 200° C, and then to black at 300-400 °C, suggesting roasting of organic matter and charring of the bone. Complete destruction of organic matter was indicated by the fading to taupe 500-600 °C. The subsequent change to light blue resulted in removing structural carbonate with temperatures between 650 and 750 °C. White, calcinated bone, appears with temperatures greater than 800 °C. Melting was observed at all temperatures, but increasingly so between 650 and 750 °C" (Munro *et al.* 2007). Some bones display different degrees of damage; Level 1 indicates bones with localized burning or less than half of the surface, Level 2 shows half or more burned fragments, level 3 when it was burned entirely.

In W1 Area a small portion of the sample (12.25%) was scorched, carbonized and calcinated, burning degree varied between 1, 2 and 3 Levels (Table 93). Following Munro *et al.* (2007) colorations revealed that bones could have reached temperatures between 200°C, 300-400 °C, 500-600 °C and 650 and 750 °C. Fragments of all types of taxa showed signs of scorching, carbonizing or calcinating and included birds, big mammals, *Odocoileus virginianus, Tayassu tajacu*, *Canis* sp. and *Meleagris gallopavo.*

In W2 Area only one fragment of an artiodactyl was scorched and according to its coloration it might have reached a temperature about 200 °C (Table 94). This fragment was partially burned and was classified as Level 1. In A3 Area fragments identified as bird, medium and big mammal, artiodactyl, *Odoocileus virginianus*, *Tayassu tajacu*, *Canis familiaris* and *Canis* sp. were scorched, carbonized and calcinated (Levels 1, 2 and 3); these fragments constituted 1.80% of the sample (Table 95). Colorations showed that these fragments could have reached temperatures of 200 °C, 300-400°C, 650 and 750 °C. So, all three levels of burning degrees were observed in the assemblage.

In PNLP Area a low percentage (1.62%) of the sample was scorched, carbonized and calcinated (Table 96). Taxa showing this kind of evidence included big and medium mammals, artiodactyls, *Odocoileus virginianus* and *Tayassu tajacu*. Bone surfaces were partially and totally burned (Levels 1, 2 and 3) and according to their coloration fragments could have reached 200 °C, 300-400 °C, 500-600 °C and 650 and 750 °C.

Burning color and level	Burning degree	Taxa	Anatomical part	Fragments
Brown 1	Scorched	Non identified	------------------------	1
Brown 1	Scorched	Bird	Long bones	4
Brown 1	Scorched	*Meleagris gallopavo*	Carpometacarpus	1
Brown 1	Scorched	*Tayassu tajacu*	Tooth	1
Brown 1	Scorched	*Canis* sp.	Rib	1
Brown 3	Scorched	Bird	Long bone	1
Dark Brown 1	Scorched	*Canis* sp.	Carpometacarpus	1
Dark Brown 2	Scorched	Non identified	------------------------	1
Dark Brown 2	Scorched	*Meleagris gallopavo*	Phalanx	1
Dark Brown 2	Scorched	*Tayassu tajacu*	Phalanx	1
Black 1	Carbonized	*Odocoileus virginianus*	Astragalus	1
Black 2	Carbonized	Big mammal	Long bones	2
Black 2	Carbonized	*Odocoileus virginianus*	Lumbar vertebra	1
Back 3	Carbonized	Non identified	------------------------	5
Back 3	Carbonized	Big mammal	Long bone	1
Back 3	Carbonized	*Canis* sp.	Pelvis	1
Grey 1	Calcinated	Bird	Long bones	4
Grey 2	Calcinated	Bird	Long bones	3
Grey 2	Calcinated	Non identified	-----------------------	47
Grey 2	Calcinated	Bird	Long bones	2
Grey 2	Calcinated	*Meleagris gallopavo*	Phalanges	4
Grey 2	Calcinated	*Meleagris gallopavo*	Tibiotarsus	1
Grey 2	Calcinated	*Meleagris gallopavo*	Tarsometatarsus	1
Total 12.25%				**86**

Table 93. Type of burning identified on bone surfaces in W1 Area (after Buikstra and Swegle 1989; Johnson 1989 and Munro *et al.* 2007).

Burning color and evel	Burning degree	Taxa	Anatomical part	Fragments
Brown 1	Scorched	Artiodactyl	Humerus	1
Total 0.15%				**1**

Table 94. Type of burning identified on bone surfaces in W2 Area (after Buikstra and Swegle 1989; Johnson 1989 and Munro *et al.* 2007).

Burning color and level	Burning degree	Taxa	Anatomical part	Fragments
Brown 2	Scorched	*Tayassu tajacu*	Pelvis	1
Dark Brown 2	Scorched	Big mammal	Long bone	1
Dark Brown 2	Scorched	*Odocoileus virginianus*	Humerus	2
Black 1	Carbonized	Big mammal	Non identified	1
Black 1	Carbonized	Big mammal	Long bone	1
Black 1	Carbonized	Big mammal	Rib	1

Black 1	Carbonized	*Odocoileus virginianus*	Astragalus	1
Black 2	Carbonized	Artiodactyl	Tibia	1
Black 3	Carbonized	Non identified	--------------------	13
Black 3	Carbonized	Big mammals	Long bone	2
Black 3	Carbonized	Medium mammal	Long bone	1
Black 3	Carbonized	*Odocoileus virginianus*	Calcaneus	1
Black 3	Carbonized	*Canis familiaris*	Tibia	1
Black 3	Carbonized	Bird	Long bone	1
Black 3	Carbonized	*Meleagris gallopavo*	Tibiotarsus	1
Black 3	Carbonized	*Meleagris gallopavo*	Ulna	1
Grey 1	Calcinated	*Canis* sp.	Calcaneus	1
Grey 1	Calcinated	Bird	Radio	1
Grey-white 1	Calcinated	Bird	Phalange	1
Grey-white 1	Calcinated	*Tayassu tajacu*	Scapula	1
Total 1.80%				**34**

Table 95. Type of burning identified on bone surfaces in A3 Area (after Buikstra and Swegle 1989; Johnson1989 and Munro *et al.* 2007).

Burning color and level	**Burning degree**	**Taxa**	**Anatomical part**	**Fragments**
Brown 1	Scorched	Non identified	----------------------	1
Brown 1	Scorched	Big mammal	Long bone	1
Brown 1	Scorched	*Odocoileus virginianus*	Calcaneus	1
Dark brown 2	Scorched	Artiodactyl	Left pelvis	1
Dark brown 2	Scorched	*Tayassu tajacu*	Humerus	1
Black 1	Carbonized	Big mammal	Long bone	1
Black 3	Carbonized	Non identified	----------------------	3
Black 3	Carbonized	Big mammal	Long bone	1
Black 3	Carbonized	Big-medium mammal	Vertebra	1
Black 3	Carbonized	*Odocoileus virginianus*	Pelvis	1
Black 3	Carbonized	*Tayassu tajacu*	Phalanx	1
Grey-bluish	Calcinated	Big mammals	Long bone	3
Grey-bluish	Calcinated	Big-medium mammal	Long bone	1
Total 1.62%				17

Table 96. Type of burning identified on bone surfaces in PNLP Area (after Buikstra and Swegle 1989; Johnson 1989 and Munro *et al.* 2007).

The degree of burning can give valuable information about whether the bones were the result of cooking activities or other causes. For example, natural conditions usually carbonize bones, but rarely calcined them. If part of the surface is calcinated, it may be inferred that the cause (anthropogenic) was exposure for a long time to high temperature fire (David 1990). Charring is reliable evidence to imply cooking but it is difficult to find when bones were boiled or covered by flesh (Koon *et al.* 2010: 63).

Following Buikstra and Swegle's (1989) proposal, fragments that were partially burned in the sample (Levels 1 and 2), could have been burned while there was meat still attached to part of the bone. Bones heated to high temperatures could have been cremated or burnt as rubbish, either on purpose or by accident, while charred bones may have been the leftovers of a meal (Nicholson 1993). Fragments with grey colorations in the sample could have been the result of any of the activities mentioned above. Most of the bones showed brown and black coloration, which indicates that they were not exposed to high temperatures or prolonged contact with heat. The presence of burned bones could suggests that meat was directly exposed to fire, as in roasting, which leads to more direct meat refuse directly discarded into hearths (Sandefur 2001).

However, it must be noted that the majority of the fragments found in the four areas were not burned. This might indicate several possibilities: 1) some bones might have been totally covered by flesh when cooked, 2) the meat could have been separated from the bone and then cooked or boiled (this preparation is not the most efficient way to maximize the amount of meat (Kelly 2000)), 3) the distance of the bone from the fire, the temperature and the time of the bone exposure to heat would be all related to the burning colorations of the bone or, 4) other techniques might have been used that did not burn bones, such as boiling (among others). However, the latter would have to be corroborated by more detailed studies on animal bone constitution. Coe and Flannery (1967) noted a complete absence of burned bones in their samples from the Maya area, thus they supposed that pieces of meat might have been cut off from the bone and cooked separately by roasting or boiling, or animals might have been quartered elsewhere and then portions of the carcass were placed in the boiling pot (Binford

1978). Studies in the function of ceramics showed that in terms of fuel consumption, boiling food is more cost efficient than roasting or any other method (Sandefur 2001).

Researches in the central highlands of Mexico (the coastal region of Chiapas, in Soconusco) showed that large quantities of fire-cracked rocks may indicate non-ceramic-vessel cooking techniques, such as stone roasting or stone boiling (Clark and Blake 1994; Clark and Gosser 1995). When cooking ware was introduced, the frequency of fire-cracked rocks declined (Clark and Blake 1994). Coe and Flannery (1967) noted that bases of some vessels were charred inside and out indicating that some boiling was done with very little water or these vessels were used to steam food (Coe and Flannery 1967). North American natives practiced stone boiling, which was a common technique for people lacking ceramics. Generally, a cooking pit was dug and rocks were put on the fire and then removed and introduced into the water-filled hole. This stone boiling technique was also used in Mesoamerica (Chinantecs, Maya and Zoque) (Voorhies 2004).

In Monte Albán, evidence of fires was observed within the household units but there were not many remains of fire-cracked rocks; neither were roasting pits found (Morales *et al.* 1999). Some pots with traces of burning have been discovered, showing that they had been in contact with fire (Winter, personal communication, 2014). However, cooking pottery in Monte Albán related to boiling or other culinary methods has not yet been determined. This is significant because differences in status-related diet may be determined by the quantity of food consumption, its diversity and the type of cooking vessels used in preparing food (Smith 1987). For example, during the Classic Period at Teotihuacán, two types of cooking methods have been identified: simple floor-level hearths and ceramic braziers. Statistics showed that the latter were associated with intermediate and high status residences but the distribution of the former has not been reported (Smith 1975; 1987).

Carnivores

It is normal for canids to gnaw on long bones in the joint areas, vertebra, phalanges, carpals and tarsals, to find the marrow and nutrients, so bone remains may be fractured (Haynes 1983; Gifford 1989; Gutierrez 1998; Elkin and Mondini 2001; Denys 2002). Different kinds of carnivore marks were classified and explained in the methodology of Chapter 3. This agent was observed on bone surfaces and sometimes a fragment showed one or more types (Tables 97, 98, 99 and 100). There is relatively little evidence of carnivore marks, suggesting that the bones did not remain exposed for long enough to be accessible to these animals.

Carnivore marks	**Frequencies**
Chewed	7
Tooth notches	7
Punctures	4
Pits	4
Total	**22**

Table 97. Carnivore marks in W1 Area.

Carnivore marks	**Frequencies**
Furrows	6
Tooth notches	7
Punctures	3
Pits	5
Total	**21**

Table 98. Carnivore marks in W2 Area.

Carnivore marks	**Frequencies**
Chewed	17
Tooth notches	9
Scoring	4
Punctures	12
Pits	17
Total	**59**

Table 99. Carnivore marks in A3 Area.

Carnivore marks	**Frequencies**
Chewed	4
Tooth notches	4
Scoring	1
Punctures	6
Pits	7
Total	**22**

Table 100. Carnivore marks in PNLP Area.

Weathering, trampling, roots and rodents

Among the natural factors that affect the preservation of faunal remains is the degree of weathering on the bones. Effects of this kind result in a loss of the physical and chemical properties of the bones, causing them to crack and in extreme cases disintegrate (Fisher 1995). In the W1 Area there was a small quantity of weathered fragments, all of which were classified in Level 1 (where surface starts cracking and bone color changes) (Behrensmeyer 1978) (Table 101). This percentage was a little higher in W2 Area, where most of fragments showed Level 1, with just a few classified in Level 2 (where areas of exfoliation begin to show) and Level 3 (where flaking can be observed as a result of layers that have separated) (Behrensmeyer 1978) (Table 102). In the A3 Area, the number of weathered fragments was higher than in the W1 Area but little lower than in W2 Area. Most of the sample showed Level 1 of weathering, with just one fragment in Level 2 (Table 103). In the PNLP Area, the few weathered bones corresponded to Level 1 (Table 104). In sum, the level of weathering on bones was almost the same in all the areas, demonstrating that in this sense there was not a significant difference of bone preservation. One must also take into account that faunal remains did not stay on the surface for very long.

Taphonomic agents	Fragments	Percentages
Weathering	11 (Level 1)	1.56%
Trampling	0	0%
Roots	197	28%
Rodents	2	0.28%

Table 101. Taphonomic agents identified in W1 Area.

Taphonomic agents	Fragments	Percentages
Weathering	50 (Level 1) 1 (Level 2) 1 (Level 3)	8.28%
Trampling	4	0.63%
Roots	206	32.80%
Rodents	2	0.31%

Table 102. Taphonomic agents identified in W2 Area.

Taphonomic agents	Fragments	Percentages
Weathering	117 (Level 1) 1 (Level 2)	6.19%
Trampling	0	0%
Roots	436	23.09%
Rodents	2	0.10%

Table 103. Taphonomic agents identified in A3 Area.

Taphonomic agents	Fragments	Percentages
Weathering	34 (Level 1)	3.25%
Trampling	1	0.09%
Roots	147	14.08%
Rodents	1	0.09%

Table 104. Taphonomic agents identified in PNLP Area.

When animal bones are exposed on the surface for a long period of time they may be trampled by other mammals. Bones may also be buried in sediment, where gravel and sandy soils create friction leaving shallow, subparallel scratches or cortical striae. This agent may also cause fragmentation (Fiorillo 1989; Denys 2002). As can be observed from the Tables 101, 102, 103 and 104, this condition was not significant in any of the four areas.

Roots may also cause changes on bone surfaces due to secreted acids (Behrensmeyer 1978; Johnson 1985). They can destroy bones by splitting them, increasing the porosity (Denys 2002). The percentage of the samples affected by this kind of agent was similar in W1, W2 and PNLP Areas (101, 102 and 104). However, it was noticed that in the A3 Area, the number of fragments was higher than in the other areas (Table 103). Although root damage was seen on a considerable part of specimens, it was always quite superficial. Therefore it was not a significant agent to be the cause of bone destruction. Equally, rodent damage can soften tissue in layered destruction (Haglund 1997b). Moreover, percentages showing this kind of evidence on the fragments were very low in all four areas (Tables 101, 102, 103 and 104).

Age of the taxa present in the sample

In this study, age was based on the varying degrees of bone fusion, dental eruption and weare. Age was divided into five categories: 1) undetermined, when an element showing an earlier stage of fusion was present but those of a later stage were absent; 2) adult included mandibles with teeth fully erupted and any limb-bone showing late fused epiphysis; 3) juvenile (animals in the rapid stage of growth) based on mandibles with only deciduous dentition and limb bone showing unfused early-fusing epiphysis; 4) subadult, when mandibles had some deciduous teeth and one or more permanent teeth; limb bones with unfused late-epiphyses but close to adult size; and when the line of fusion between the epiphysis and the diaphysis was very evident; 5) young (animals that might have been just born) with very small unfused bones of porous consistency.

In W1 Area only one mandible of *Tayassu tajacu* had deciduous teeth and was considered as juvenile. Other taxa such as *Odocoileus virginianus* and *Canis* sp. showed unfused bones and were also included in the juvenile category (Table 105). Of the 56 individuals analised for epiphysis and diaphysis to determine age, only 8 (cf. *Sylvylagus floridanus, Sylvylagus floridanus, Canis* sp., Artiodactyl, *Odocoileus virginianus* and *Tayassu tajacu*) could be assigned to adult and 44 were classified as undetermined.

Taxa	NISP	NMI	Anatomic part	Age
Artiodactyl	2	2	Proximal humerus	Adult
Odocoileus virginianus	1	1	Lumbar vertebra	Juvenile
Odocoileus virginianus	1	1	Proximal tibia	Juvenile
Tayassu tajacu	1	1	Mandible	Juvenile
Tayassu tajacu	1	1	Calcaneus	Adult
Canis sp.	1	1	Mandible	Adult
Canis sp.	1	1	Thoracic vertebra	Juvenile
Canis sp.	1	1	Proximal humerus	Juvenile
Canis sp.	1	1	Proximal metapodial	Adult
Canis familiaris	1	1	Mandible	Adult
cf. *Sylvylagus floridanus*	1	1	Proximal tibia	Adult
Sylvylagus floridanus	1	1	Right femur	Adult

Table 105. Age of individuals in W1 Area.

In W2 Area, two young individuals were observed, one identified as *Puma concolor* and the other as *Tayassu tajacu* (Table 106). Fragments classified as juvenile, included diferent taxa such as *Odoocoileus virginianus*, *Canis* sp., Lagomorph and Lepus sp. Only one individual of *Tayassu tajacu* corresponded to the subadult category. The sample was formed by 48 individuals and only three of which could be determined as adults (*Odocoileusvirginianus,* Lagomorph and *Tayassu tajacu*). The remainder were undetermined.

Taxa	NISP	NMI	Anatomic part	Age
Odocoileus virginianus	1	1	Lumbar vertebra	Juvenile
Odocoileus virginianus	1	1	Lumbar vertebra	Juvenile
Odocoileus virginianus	1	1	Distal femur	Adult
Odocoileus virginianus	1	1	Distal femur	Juvenile
Odocoileus virginianus	1	1	Proximal tibia	Juvenile
Odocoileus virginianus	1		Calcaneus	Juvenile
Tayassu tajacu	2	1	Axis	Adult
Tayassu tajacu	1		Cervical vertebra	Adult
Tayassu tajacu	2		Thoracic vetebrae	Adult
Tayassu tajacu	1		Distal radio	Adult
Tayassu tajacu	1		Astragalus	Adult
Tayassu tajacu	1	1	Astragalus	Adult
Tayassu tajacu	1	1	Maxilla	Young
Tayassu tajacu	1	1	Scapula	Subadult
Tayassu tajacu	7		Thoracic vertebra	Subadult
Canis sp.	1	1	Skull	Juvenile
Puma concolor	1	1	Proximal humerus	Young
Puma concolor	1		Long bone	Young
Lagomorph	1	1	Proximal femur	Adult
Lagomorph	1	1	Diaphysis of proximal humerus	Juvenile
Lepus sp.	1	1	Distal tibia	Juvenile

Table 106. Age of individuals in W2 Area.

In A3 Area some young animals were found in the sample such as *Tayassu tajacu*, *Canis* sp. and a small mammal (Table 107). An individual of *Odocoileus virginianus* was determined as subadult and the juvenile category included artiodactyls, *Odocoileus virginianus*, *Tayassu tajacu, Canis* sp., lagomorph, *Sylvilagus* sp. and *Sylvilagus cunicularius*. In the sample 12 individuals were classified as adults

(*Odocoileus virginianus*, *Sylvilagus* sp., *Sylvilagus floridanus*, *Canis* sp., *Canis familiaris* and *Tayassu tajacu*) and the rest (61 MNI) were left undetermined.

Taxa	**NISP**	**NMI**	**Anatomic part**	**Age**
Big mammal	1	1	Distal diaphisys	Juvenile
Artiodactyl	1	1	Distal femur	Adult
Artiodactyl	1	1	Distal tibia	Juvenile
Artiodactyl	1	1	Proximal diaphysis of tibia	Juvenile
Artiodactyl	1	1	Proximal tibia	Juvenile
Artiodactyl	1	1	Proximal tibia	Juvenile
Artiodactyl	1	1	Distal femur	Juvenile
Artiodactyl	1		Distal diaphysis of tibia	Juvenile
Odocoileus virginianus	1	1	Thoracic vertebra	Juvenile
Odocoileus virginianus	1	1	Lumbar vertebra	Juvenile
Odocoileus virginianus	1	2	Thoracic vertebrae	Juvenile
Odocoileus virginianus	1	1	Proximal humerus	Adult
Odocoileus virginianus	1		Distal femur	Adult
Odocoileus virginianus	1		Distal femur	Juvenile
Odocoileus virginianus	1	1	Distal radio epiphysis	Subadult
Odocoileus virginianus	1		Distal tibia	Subadult
Odocoileus virginianus	1	1	Proximal epiphysis of femur	Juvenile
Odocoileus virginianus	1	1	Proximal tibia	Juvenile
Odocoileus virginianus	1	1	Proximal humerus	Juvenile
Odocoileus virginianus	1	1	Lumbar vertebra	Juvenile
Odocoileus virginianus	1	1	Proximal ulna	Juvenile
Odocoileus virginianus	1	1	Distal femur	Juvenile
Odocoileus virginianus	1	1	Distal epiphysis of femur	Juvenile
Odocoileus virginianus	1	1	Distal epiphysis of femur	Juvenile
Odocoileus virginianus	1	1	Distal epiphysis of femur	Juvenile
Tayassu tajacu	1	1	Lumbar vertebrae	Adult
Tayassu tajacu	1	1	Proximal radio-ulna	Adult
Tayassu tajacu	3	3	Proximal ulna	Adult
Tayassu tajacu	1	1	Proximal diaphysis of tibia	Juvenile
Tayassu tajacu	1	1	Distal diaphysis of tibia	Juvenile
Tayassu tajacu	1	1	Proximal metatarsal	Young
Tayassu tajacu	1		Metapodial	Adult
Tayassu tajacu	1		Metapodial	Juvenile
Canis sp.	1	1	Maxilar	Young
Canis sp.	1	1	Mandible	Young
Canis sp.	1	1	Mandible	Adult
Canis sp.	2		Humerus	Young
Canis sp.	2		Humerus	Young
Canis sp.	1		Priximal diaphysis of femur	Juvenile
Canis sp.	1	1	Distal epiphysis of femur	Juvenile
Canis sp.	1	1	Cervical vertebra	Juvenile
Canis sp.	1	1	Thoracic vertebra	Juvenile
Canis sp.	2	2	Calcaneus	Adult
Canis familiaris	1	1	Maxila	Adult
Canis familiaris	1		Mandible	Adult
Canis familiaris	8	8	Mandibles	Adult
Small mammal	1	1	Distal humerus	Young
Lagomorph	1	1	Proximal tibia	Juvenile

Lepus callotis	2	2	Proximal femur	Adult
Lepus callotis	1	1	Proximal tibia	Adult
Sylvilagus sp.	1	1	Femur diaphysis	Juvenile
Sylvilagus floridanus	1	1	Distal femur	Adult
Sylvilagus cunicularius	1	1	Distal ephiphysis of radio	Juvenile

Table 107. Age of individuals in A3Area.

Taxa	NISP	NMI	Anatomic part	Age
Artiodactyl	1	1	Proximal radio	Juvenile
Artiodactyl	1	1	Diaphysis of femur	Juvenile
Artiodactyl	1	1	Proximal femur	Juvenile
Odocoileus virginianus	1	1	Mandible	Juvenile
Odocoileus virginianus	1	1	Thoracic vertebra	Juvenile
Odocoileus virginianus	1	1	Lumbar vertebra	Juvenile
Odocoileus virginianus	2	2	Proximal humerus	Adult
Odocoileus virginianus	1	1	Distal humerus	Juvenile
Odocoileus virginianus	1	1	Distal epiphysis of humerus	Juvenile
Odocoileus virginianus	1	1	Proximal femur	Juvenile
Odocoileus virginianus	1	1	Distal femur	Adult
Tayassu tajacu	1	1	Mandible	Juvenile
Tayassu tajacu	1	1	Cervical vertebra	Juvenile
Tayassu tajacu	1	1	Cervical vertebra	Juvenile
Tayassu tajacu	2	1	Thoracic vertebra	Juvenile
Tayassu tajacu	1		Lumbar vertebra	Juvenile
Tayassu tajacu	1	1	Distal humerus	Adult
Tayassu tajacu	1	1	Proximal unla	Adult
Tayassu tajacu	1	1	Proximal epiphysis of femur	Juvenile
Tayassu tajacu	1	1	Radio-ulna	Adult
Tayassu tajacu	1		Metacarpal	Adult
Canis sp.	1	1	Vertebra	Juvenile
Canis sp.	1		Proximal tibia	Juvenile
Canis sp.	1	1	Lumbar vertebra	Juvenile
Canis sp.	1	1	Distal tibia	Adult
Canis sp.	1	1	Metapodial	Juvenile
Canis familiaris	1	1	Distal tibia	Adult
Lepus sp.	1	1	Distal tibia	Juvenile
Sylvilagus sp.	1	1	Proximal femur	Adult
Sylvilagus sp.	1	1	Proximal tibia	Juvenile
Sylvilagus sp.	1	1	Proximal femur	Juvenile
Sylvilagus floridanus	1	1	Proximal femur	Juvenile
Sylvilagus floridanus	1	1	Proximal femur	Adult
Sylvilagus floridanus	2	2	Distal tibia	Adult

Table 108. Age of individuals in PNLP Area.

In PNLP Area juvenile individuals included artiodactyls, *Odocoileus virginainus*, *Tayassu tajacu*, *Canis* sp., *Sylvilagus* sp. and *Sylvilagus floridanus* (Table 108). None of the animal remains were identified as young or subadult and only 8 individuals (cf. *Sylvilagus floridanus*, *Sylvilagus floridanus*, *Canis* sp., *Canis familiaris*, artiodacyl and *Tayassu tajacu*) out of 56 were classified as adults. The rest of the individuals were considered as undetermined.

Different taxa in the sample were identified as juveniles, indicating that an adult age was not necessarly the criteria taken into account when hunting. Juvenile deer and collared peccary might have been easier prey to hunt, even though these animals may have represented less meat. Broughton (2002) suggests that a measure of human depredation is the age of the prey. An exhaustive exploitation of the animals would be reflected in a reduction of the adult population. However, this is difficult to corroborate as most of the individuals in the sample remained undetermined.

Young animals such as *Canis* sp., *Tayassu tajacu* and *Puma concolor* may be related to funerary or ritual offerings. In Lambityeco, Oaxaca, bone remains of young and adult dogs were found associated with a child burial (Burial 2003-1). Evidence of another young dog was associated with human remains in a tomb (Tumba 2003-19) in this site (Pérez and Winter 2013). In the history of Zapotec funerary customs, most of the sacrificed dogs were young and these practices were not reserved to the members of the elite (Urcid 2008b). Young individuals were common in Maya ritual deposits and were more frequent in elite contexts (Pohl 1983; Carr 1996). Mayas also captured young animals to raise them (Pohl and Fieldman 1982). This may also be the case for *Tayassu tajacu*, which have not been found associated with burials in the Zapotec culture.

Different uses of the identified taxa in Monte Albán

This section discusses in more detail the different uses to which the taxa represented in the sample were assigned.

Fish

Centropomus sp. (snook), Family Serranidae (sea bass), Ictiobus sp. (buffalo fish) and *Joturus pichardoi* (bobo mulet)

Species identified in this group from Monte Albán could have been used for consumption. Ritual activities (such as funerary offerings, among others) where fish might have been included have not been found in Oaxaca. However, in other regions of Mesoamerica, fish were commonly discovered in ritual contexts. As mentioned in Chapter 1, in Templo Mayor of Tenochtitlan (Mexica culture), offering 23 contained 7775 elements of fish remains (Guzmán and Polaco 2000). Animal sacrifices, especially fish, were mainly offered to *Xiuhtecuhtli* (the old god related to fire), who was honoured in several months of the year, like the month *Izcalli* (Torquemada 1986).

Another point to consider was how these animals were obtained. For example, in the Maya area fish are still caught in nets or with hooks or spears (Carr 1985). According to Carr (1985), fishing could have been carried out with traps and nets made of perishable materials, and with the use of some spears or hooks. It is possible that some of these techniques were used to obtain the fish observed in Monte Albán. However, more research is needed to find indicators related to fish procurement in Oaxaca.

Reptiles

Family cf. Crocodylidae (crocodylus)

There was not much evidence of the presence of crocodile in the site, since only one fragment was identified in the sample. This species might have been valued for its meat, skin, or for ritual or symbolic purposes. However, no evidence of this animal in ritual or domestic contexts in Oaxaca has been discovered. Among the Maya, faunal remains recovered from a cache in Tikal, Guatemala from the Classic period (ca. 250-800AD) contained the skeleton of a large crocodile, turtle and snake (Moholy-Nagy 1997). In the Cueva de los Quetzales in Guatemala evidence of this animal has also been found in ritual contexts (Emery 2004a). Regarding its symbolic meaning in Mesoamerica, the crocodile represented the earth itself (Pohl 1983).

Chelonia mydas (green sea turtle), *Kinosternon* (mud turtle) and *Trachemys scripta* (pond slider, common slider and red-eared slider turtle)

These taxa might have been used for consumption, ritual, symbolic or functional purposes. At El Palmillo archaeological site in Oaxaca, turtle remains were related to subsistence (Haller *et al*. 2006). Equally, in the Maya area, green sea turtles on the Island of Cozumel were very abundant along the coast and appreciated for their flavor. Based on the high frequency of burned turtle elements found in this site, it was suggested that turtles might have been roasted in their shells directly over the fire (Hamblin 1984).

Turtle remains have also been discovered in funerary contexts in Oaxaca. At the Lambityeco site, evidence of this animal was associated with a child´s burial (2003-25). Since the skeleton was almost complete, it was considered to be part of the offerings placed in this context (Pérez and Winter 2013). In the Maya area, turtles of *Kinosternon* genus have been found in burials at the Cerros site in Belize (Carr 1985). The symbolic, ritual or ceremonial significance of turtle in the Maya culture does not seem to depend on a particular species or family. Evidence of this ceremonial and ritual use of the turtle still continues through time and space in the Maya lowlands (Foreman 2004).

Turtles were related to water and rain. Carapaces were used as natural drums, which produced the sound of storm and thunder (Seler 2008). Thus, in the archaeological record, turtle carapaces were used as musical rattles and drums in ritual and ceremonial contexts (Carr 1985; Emery 2007). At the Petexbatun site in the Maya area during the Early and Postclassic periods, the majority of turtle elements were caparace fragments, possibly used as drums or rattles (Emery 1997). In the Codex *Magliabecchi*, an image of a musician appears playing a drum made of a turtle carapace (Fig.111) (Seler 2008).

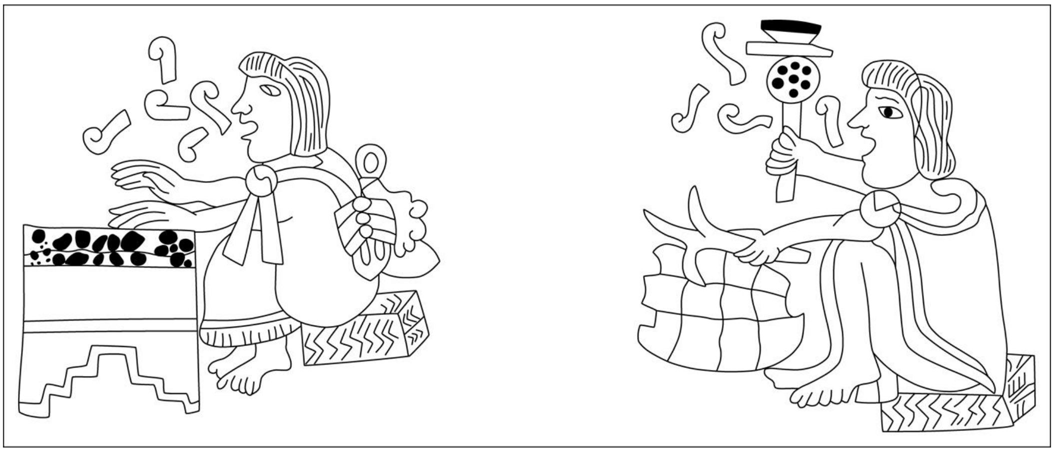


Fig.111. Codex *Magliabachi* showing a priest playing a turtle carapace with a deer antler (on the right hand side) (after Boone 1983).

There are a few records in ethnohistoric accounts about the methods used to obtain different turtle species in Oaxaca or in other areas. It has been speculated that turtles and their eggs were gathered by hand and that dragnets could also have been employed (Hamblin 1984). Another possibility might have been that the turtles were penned in artificial canals, but this idea has yet to be explored (Clutton-Brock and Hammond 1994). Fresh-water species identified in the sample from Monte Albán could have been captured by some of these methods.

<u>Aves</u>

Meleagris gallopavo (common turkey)

In general, the common turkey is related to consumption, ritual and functional activities. However, no evidence of the common turkey has been found in funerary contexts in the W1, W2, A3 and PNLP Areas of Monte Albán. According to Zapotec funerary customs, birds placed in tombs were small and were related to individuals of high status (Urcid 2008b). Thus, common turkey remains were considered to be a food resource. Feathers might also have been used for other purposes, including decoration or ornament.

The relationship between the common turkey and humans can be traced back to the first agricultural settlements in the Middle Preclassic (1200-400 BC) (Corona-M. 2013a). Bone remains of the common turkey were associated with domestic households or mortuary offerings in both the Mexican Basin and the Maya area. In the Maya Codex *Dresden* and *Madrid*, the turkey was represented as sacrificial offering, sometimes with the whole skeleton but mostly only the head was depicted (Seler 2008). Evidence showed that *Meleagris gallopavo* was frequently used as food and on some occasions for its symbolic and ritual aspect. Another characteristic that has not been well documented, is the use of the feathers of this animal. However, in the southwest of United States, for example, it is believed that the common turkey was domesticated for its feathers and this information has been documented (Corona-M. 2013a). In the Mexica culture the common turkey was used for consumption and decoration (birds were kept in captivity and displayed in domestic contexts for individual enjoyment) (Corona-Martínez 2013b).

Cyrtonix montezumae (Montezuma quail)

This bird may have been used for various purposes including food, symbolic, ritual and functional. The quail *Colinus virginianus* is also common in Oaxaca, and lives in weeds at the edges of maize fields. This species was identified in the sample but a date could not be assigned to the bone remains. For Zapotecs the quail was appropriate for sacrifice because it was considered “clean” or “pure”, since this kind of bird drank water from dew drops (Marcus and Flannery 1994).

Quail remains were discovered in Mound I at San José Mogote, Oaxaca, in three superimposed buildings (Structures, 36, 35 and 13). Bird bones were found in the oldest Structure 36, dating from the beginnings of Monte Albán II (200BC-150BC?) and in the rubble layer between it and Structure 35 (dated to middle Monte Albán II-*c.*50 BC?), some of which corresponded to the Montezuma quail. These birds may have been sacrificed in the earlier temple as five offering boxes were discovered below Structure 35. One of these (Feature 93) contained two bones of quail, including *Cyrtonyx montezumae*. Another offering box was discovered in a chamber from Structure 35

(Feature 96), and contained the skeleton of a bobwhite quail (*Colinus virgininus*). In this offering a pair of deer antlers was also observed, similar to those used by Zapotecs to play the indigenous turtle shell drum (Marcus and Flannery 1994).

Quail offerings have also been found in other parts of Mesoamerica, such as the Templo Mayor, in Tenochtitlan. Bone remains of Montezuma quail (*Cyrtonyx montezuame*), band-tailed pigeon (*Columba fasciata*) and the common turkey (*Meleagris gallopavo*) were associated with a burial of three children. The complete skeletons of quails and pigeons were discovered (Valentín 1999). In another offering (125) from the Templo Mayor, bone remains of the Montezuma quail were also discovered (López *et al.* 2012). The Codex *Borgia* shows a scene of a quail sacrifice, where the head was cut off and thrown in front of the Temple of the Sun. In the same way, the Codex *Nutall*, of the Mixtec culture in Oaxaca, shows a sacrifice of a quail (Fig.112) (Seler 2008). Apparently, the tradition of using quails as offerings and sacrifices could have been common through Mesoamerica in different regions and periods of time.

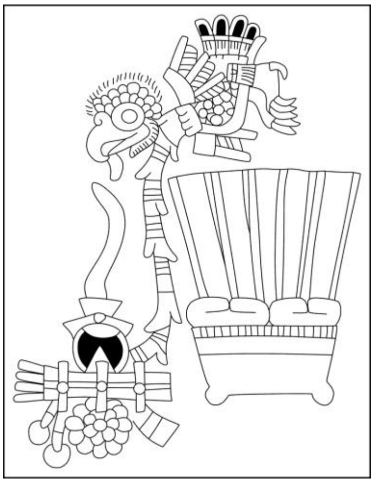


Fig.112. Codex *Nutall* showing a sacrifice of a quail (after Anders *et al.* 1992).

Quails were also used for consumption. Evidence of this taxon was found in a garbage deposit dated from XVI and XVII centuries, as a result of food discarding, in the Templo Mayor, Tenochtitlan (Montufar and Maldonado 2003). In the Mexica culture, quails were part of the diet (Corona-Martínez 2013b). Possibly, the feathers of this bird were also used. In the Codex *Borgia* the image of *Xipe totec*, an Aztec deity, appeared carrying quail feathers and even a complete quail as an ornament (Fig.113) (Seler 2008).

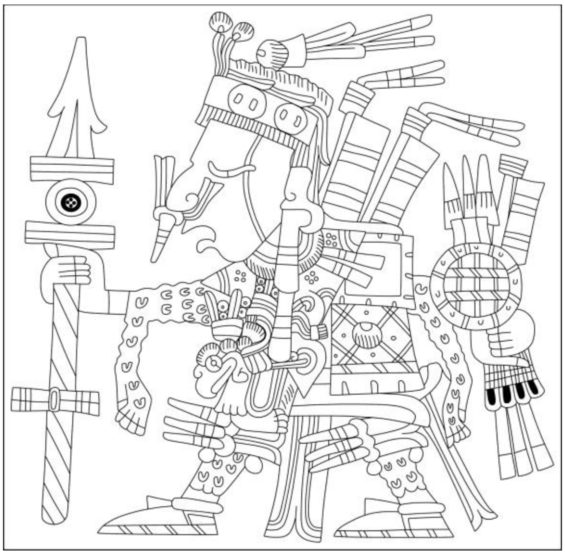


Fig.113. Codex *Borgia* with an image of *Xipe totec*, carrying quail feathers and a quial ornament (after Anders *et al.* 1993).

Family Anatidae (ducks)

Remains of this taxon may be related to food, ritual, symbolic and functional use. Representations of ducks were common in Mesoamerica from Early Preclassic (1800-1200 BC) to Postclassic (900-1521 AD). Evidence of this kind came from different regions and cultures of Mesoamerica including the Gulf Coast, Central High Plateau, the west part of Mexico, Oaxaca and the Maya area. Objects with duck images included: musical instruments, ornamental items such as earrings and necklaces, vessels, fugurines, and architectural and portable sculptures (Cisneros 2011). Some vessels and figurines were found as funerary offerings from Monte Albán from Middle Preclassic period (1200-400 BC) (Caso 2002; Joyce 2010). The symbolic meaning of ducks represented the beginning of life and their function was to accompany deaths, representing the cycle of life-death (De La Fuente 1974; Matos 1987). Ducks were related to water, a vital resource for a farming society (Cisneros 2011). It seems that ducks were first captured by hunting and then incorporated into the domestic domain. In the Mexican regions these kinds of birds were kept in captivity (Corona-Martínez 2013b).

Buteo jamaicencis (Red-tailed hawk)

This bird might have had either a symbolic, ritual or functional use. Hawks were mentioned in the Aztec myths and stories about eagles and jaguars and were associated with the winter season. The red-tailed hawk appears as the third bird representing one of the thirteen sky levels in the Codex *Borgia* (Seler 2008). Raptorial birds such as hawks, owls, falcons and eagles, were very important in the Indian cosmology and in the Mississippian iconography, constituting a special taxa category linked with political and religious connotations (Jackson and Scott 2003). Native Indians of south-western United States used hawk or other bird feathers for ornamental headdresses and clothing worn in important ceremonies. These birds were used for their symbolic meaning (Swanton 1946). Remains of red-tailed hawks were discovered in the La Playa archaeological site, in Sonora (northwest Mexico). Based on the anatomical pattern of the skeleton and its context, it was suggested that these birds were deposited in bundles. Such ritual activities were widespread among the native cultures of the south-western United States (Martínez-Lira *et al*. 2005).

In Templo Mayor, two eagles were part of an offering (125). These birds were placed with their wings folded and their feet tied at the tarsometatarsus. One skeleton was a female and the other a male. Both birds were decorated with shells and the male showed small gold bells on the feet. Based on the pathology found in one of the wings of the male, it was suggested that the eagle was kept in captivity with a broken wing for a long time (López *et al.* 2012). The eagle had a very important role in the Codex

Mexica. This animal was related to warriors as the jaguar. It is represented in images of sacrificial rites, the calendar and mythological texts (Seler 2008).

Cassiculus melanicterus (yellow-winged cacique), *Corvus corax* (common raven) and cf. *Crax* (Curassow)

Other bird species observed in the sample might have had different uses (symbolic, ritual and functional). Feathers for example could have been used in the ornamental attire of the elite. Zapotec elite used cotton clothing, sandals, feathered shirts and headdresses, gold and precious stone necklaces, among other jewelry (Zárate 1905). Genealogic slabs represented Zapotec members of the elite, distinguished by their elaborate feathered headdresses. Members of the Maya elite also wore clothing with feather features and according to depictions of them in the stelae, feathered headdresses were also an integral part of their attire. In one of the Zapotec stelae bird images appeared as well, as one of the figures was represented holding a staff with a bird´s head (Fig.114). Like the Maya elite, the Zapotec nobility were linked to the sky through symbols of it, celestial birds and supernatural beings depicted in stelae (Marcus 1992b).

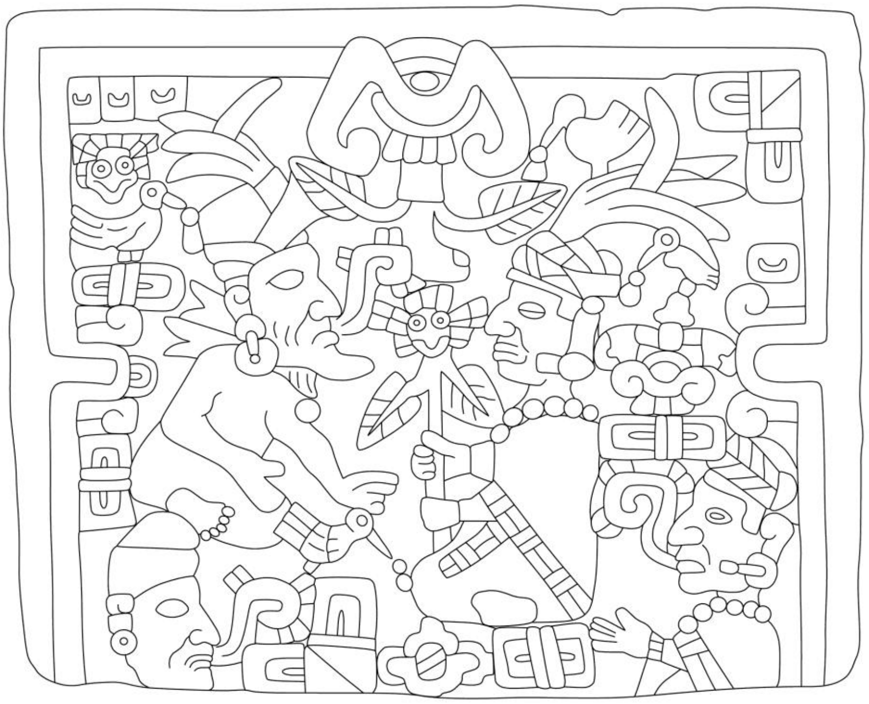


Fig.114. Ciénega memorial stone showing a Zapotec member of the elite wearing a headdress with feathers and holding a staff with a bird head (courtesy of Urcid, drawing by Domínguez).

Some birds might also have been kept as ornamental features in households or as company, but more evidence is needed to support this idea. Among the Aztecs, aves were kept in captivity to obtain their feathers, without the need for killing them, to fashion ornaments and ceremonial attire, used as status markers or religious symbols (Sahagún 2000). At the site of Aguateca, in the Maya Region, remains of *Crax rubra* appeared in residential deposits dated from Late Classic period (Emery 1997). The Maya women also raised birds for their feathers to adorn their clothes. This information comes from the narratives of Spanish priests in the XVI century (Landa 1941 by Tozzer). Noble Maya deaths were accompanied by various offerings; their burial attire consisted of elaborate jade jewelry and feathered headdresses. The quetzal feathers were highly valued and bartered among the Maya (Demarest 2004). Remains of bird feathers were found in an offering (102) from the Templo Mayor, Tenochtitlan. Feathered textiles were also discovered and a trace of a quetzal feather was observed under the lid of the offering, which judging by its position might have been part of a headdress (Valentín and Zúñiga-Arellano 2006). Birds have also been found in burials in Oaxaca, which means that some of the identified birds might have been used for ritual purposes (Urcid 2008b).

<u>Mammals</u>

Puma concolor (cougar, panther)

The remains of *Puma concolor* might have been used for ritual, symbolic or functional purposes. In Mesoamerica felines were associated with political ideology and religion. These kinds of animals were crucial in the establishing of hereditary rulers, in war and in human sacrifice. The image of a jaguar in southwest Mesoamerica was common and felines were represented in anthropomorphous or zoomorph postures or in human figures with jaguar attributes. Evidence shows that on certain occasions rulers were dressed in pelts of big felines or with the complete pelt including the head, feet, claws and tail (Fig.115) (Spencer and Redmond 1983; Urcid 2005b). Representations from different regions of Oaxaca demonstrate that craniums and pelts of felines were used as symbols in elite headdresses. Long bones show incisions of narrative scenes and were used as scepters. Canines and claws were carved into personal ornaments (Urcid 2005b). Zapotec rulers, like their Maya counterparts, were represented seated on a jaguar-skin throne or wearing jaguar pelts (Marcus 1992b; Urcid 2005b). Jaguars or pumas and other felines were associated with elite and ritual contexts also in the Maya area (Emery 2004a, 2007).

Fig.115. Drawing of the *Bazan* memorial stone showing a ruler dressed in a pelt of a big feline including the head feet, claws and tail (after Winter 1998:173).

In Teotihuacán, Mexico or in Copán, Honduras elites used to sacrifice jaguars and placed their carcasses in offerings that were sealed under architectural structures (Urcid 2005b). The ancient Maya elite had preferential access to exotic or ritual species like wild cats (jaguars, cougars, margays and ocelots) (Emery 2003; Emery 2007). Feline pelts, teeth and claws were symbols of high status (Emery 2003). In the Copán Valley, jaguar and cougar were frequently found in ritual contexts (Reed 1994). At Dos Pilas site, in Guatemala, during the Terminal Classic period, the second most common taxa were large felids (13.37%) (possibly either or both jaguar and cougar). A large proportion of these remains (67.74% of the total sample for this period) were burnt, showing evidence of very high temperatures (Emery 1997).

In Monte Albán, in the temple located in the centre of the sunken patio of the North Platform –the political centre in the city-, an offering with the articulated skeletons of a jaguar and an eagle were found. Although the ruling elite may been provided with living felines through barter or exchange between different regions, it is possible that members of the elite may have organized hunts to increase and maintain their social prestige (Urcid 2005b). In offering 102 in the Templo Mayor, for example, bone remains of *Felis concolor* were discovered. The anatomical parts present were feet, caudal vertebrae, the cranium and mandible, both showing cuts in the posterior part. This evidence suggests that the pelt of the animal was prepared before it was placed in the offering (Valentín and Zuñiga-Arellano 2006). In another offering in the Templo Mayor (103) a complete skeleton of a juvenile jaguar was found. It is possible that the animal was brought live from the tropical forest of Mexico. The skeleton was extended, with the anatomical parts carefully oriented and located in the centre of the offering. So when the animal was placed in this position, it did not present *rigor mortis* (Valentín and Zuñiga 2003).

The Cuicatlán Cañada, in Oaxaca, apparently subjugated by Monte Albán between the Middle/Late Formative (600-200 BC) and the Late/Terminal Formative (200 BC-200 AD), probably remained as a tributary site in the last period. During this time ritual practices in the Cañada changed. In the archaeological site of Loma de La

Coyotera representations of jaguar paw in ceramic were found. It appears that when the Zapotec conquered the Cañada a new imperial ideology was established, which came directly from Monte Albán. Caso and Bernal (1952) noted that jaguar statues, urns and figurines became more plentiful in Monte Albán during the Late/Terminal Formative period.

In the Aztec culture**,** jaguar symbolism and metaphor were also related to the supreme diety, Tezcatlipoca, who was associated with darkness, and the night, since the jaguar was a nocturnal predator. In the same way that jaguars could see their prey through their naturally mirrored eyes, shamans perceived the spirit-essence with mirrors and Tezcatlipoca saw into the hearts of men with his enchanted mirror. Aztec royalty used jaguar symbolism through their metaphorical associations with Tezcatlipoca to reinforce their social status. The Aztec emperor on his jaguar throne was regarded as Tezcatlipoca (Saunders 1998). Felines, turtles and crocodiles were related to the terrestrial plane and eagles, herons, among other birds, to the upper skies in the Aztec culture (López *et al.* 2012). It seems that jaguar ideology was widespread throughout Measoamerica, spatially and temporally.

Odocoileus virginianus (white-tailed deer) and *Mazama americana* (brocket deer)

The anatomical pattern of deer observed in Monte Albán was clearly related to subsistence, since most of the anatomical parts present were those of a high meat content (Fig.95). Other low meat content elements such as skull or antlers that could have been associated more with ritual activities or bone industry were almost absent. In Monte Albán, one of the offerings discovered in Tomb 202 (1993-9) (associated to a residence from the Pitao phase) located in the A3 Area, had a fragment of proximal radius (epiphysis) and a calcaneus of deer. However this was the only offering from the four areas of study that contained this taxon (Martínez *et al*. 2014).

In Monte Albán, the presence of white-tailed deer was significant and more abundant than brocket deer (Tables 69, 70, 71 and 72). It is possible that the *Mazama americana* species was found in habitats further away from Monte Albán than white-tailed deer. It will be necessary to verify this at other sites in Oaxaca, where brocket deer might have been closer, to show if this is a question of taste preferences for example, or distance of the habitats where these species were found. Ethnohistoric sources show that the Maya preferred to exploit the white-tailed, but brocket deer was also hunted occasionally (Tozzer 1941). This was corroborated by the lower frequency of brocket deer from all coastal and almost all the inland sites (Foreman 2004).

Among the Maya, the white-tailed deer stag was an important pre-Columbian deity that played a crucial role in ritual contexts. It was included in the cuch ceremonies that linked community rulers or leaders to agricultural fertility, the sun, rain, economic prosperity, the cyclical nature of time, death, renewal, and birth (Pohl 1981; Emery 2004a). This animal was considered to be a high status feasting food, offered to the gods and consumed by the elite (Foreman 2004a). Deer was probably one of the most important animals sacrificed and offered to gods (Tozzer and Allen 1910). In the Codex *Cortés* a skeleton of deer appeared as sacrificial offering. The Codex *Dresden* also showed offerings of deer limbs and feet (Seler 2008).

Researches reveal that Zapotec nobles from the XVI century organized deer hunts in which commoners participated by driving the prey (Marcus and Flannery 1996). Prehistoric Maya hunted deer with the use of nets, blowguns, spears and atlatls, and deadfall pits (Pohl and Fieldman 1982; Pohl 1985; Carr 1996; White *et al.* 2001). Some deer hunting scenes were represented on pottery showing different ways to trap this animal (Pohl 1994). Dogs were often included in the hunting expeditions, organized by an individual, a small group or at a community level (Pohl 1985;1994; White *et al.* 2001).

Tayassu tajacu (collared peccary) and *Tayassu* cf. *peccary* (white-lipped peccary)

These animals were more probably part of the subsistence, since they have not been found in ritual contexts of Monte Albán or in other sites in Oaxaca. Deer and peccaries were related to agriculture in the Maya culture. This fact is associated to the habits of these animals. Deer browse near farm lands and peccaries eat crops. Both animals were common in most Classic and Postclasic period ceremonial centres (Pohl and Fieldman 1982). Peccary in the Maya culture represented the feminine power and the coati the masculine force (Seler 2008). This animal also formed part of the diet among the Maya (Carr 1985).

Canis familiaris (dog)

Interpreting dog remains is rather more complicated because, as was explained before, this animal played different roles in society (ritual, symbolic, diet and functional -as a household companion) and the anatomical pattern observed was not so obviously related to subsistence (Figs. 96, 97, 98 and 99). Therefore, it was difficult to determine if all of the anatomic elements present were the result of consumption. However, the remains identified as *Canis familiaris* and *Canis* sp. (*Canis* cf. *familiaris*) from Monte Albán might well have been part of the diet, since some fragments were found in domestic garbage deposits, where a few bones were burned and others showed cut marks (Tables 101, 102, 103 and 104).

Evidence of dog consumption in Oaxaca has been proved (Middleton *et al*. 2002; Flannery and Marcus 2005), such as at Tierras largas site, in the Valley of Oaxaca, where Marcus and Flannery (1996) found a large pit from Guadalupe phase (850-700 BC) with five dogs that had been butchered systematically, possibly by the same individual, to prepare a large feast for the purpose of building alliances. Dogs were also commonly used for food in household contexts (Flannery and Marcus 2005). The raising of dogs represented high-quality food resource production that could have contributed significantly to the diet (Middleton *et al*. 2002). In the Tehuacán Valley, in Puebla (adjoining Oaxaca) remains of domestic dogs have been found dating back to 3200 BC. At this time humans started to exploit cultivated plants as the population grew. Dog remains increase in frequency during the Early and Middle Formative periods (1500 BC). By 600 BC, dogs were routinely used as food in farming villages in the valley. The population increased dramatically by 150 BC, so people of the Tehuacán Valley ate turkeys as well as dogs (Flannery 1967; MacNeish 1967).

Dogs, together with the common turkey, were the only domesticated species in Mesoamerica and both were part of the diet (García 1987; Seler 2008). *Canis familiaris* was an extremely important source of food throughout Mesoamerica during the Formative period (Rosenswing 2007). In the Olmec ceremonial centres, such as San Lorenzo (1200-900 BC), evidence of dog remains was found and constituted 70% of the identified mammals in the site. This information demonstrated the importance of *Canis familiaris* in domestic consumption, apart from marine resources, since early times (Schwarts 1997). The reliance of humans on dogs in Mesoamerica was equivalent to the Old World dependence on domestic animals, in terms of production and storage (Wing 1978). At the Cuello site, in the Maya area, evidence from a Preclassic deposit showed that dogs were raised for food and killed at the end of their first year of life. Dogs at this site provided an important source of protein during the Preclassic period (Clutton-Brock and Hammond 1994). Stable carbon and nitrogen isotopic analysis of dog remains from the Cuello site, indicated a similar diet to that of humans (with highly herbivorous C4 diets). This evidence was interpreted as feeding these animals for food and ceremonial purposes (White *et al.* 2001).

Dogs consumed in Mesoamerica were not always bred in the houses where remains were found; it appears that dog markets existed in large Mesoamerican cities. Since this animal had a wide range of uses, it was bred specifically to be sold later

(Aguilera 1985; Valadez 1995; Noguera 1997; Blank 2006). In Teotihuacán, for example, it has been noted that some of the population bred dogs, while others acquired them for various purposes, such as the religious activities of the elite, or for their consumption in different social strata (Valadez 1995). Thus, people in Mesoamerica would acquire dogs to use them as food, as pets, for protection, or for sacrifice in funeral rites, or religious ceremonies (Landa 1938; Gallardo 1964; De la Garza 1997; Schwartz 1997).

Dogs, after human beings, were the most frequently sacrificed animal to pay tribute to the gods and the meat was used later in ritual celebrations (Baus 1998; Valadez *et al.* 2004). Zoomorphic figurines of dogs and birds (both animals that were sacrificed to ancestors) were also associated with burials (Joyce 2010: 209-213). Skeletons of *Canis familiaris* were also placed in the graves of their masters to prepare the path to the underworld of the Mayas (Hamblin 1984). Ritual and ceremonial use of dogs has been documented throughout the Maya lowlands, and seems to increase in importance during the Classic and Postclassic periods (Pohl 1983).

It is possible that dog remains in the sample could have also been used in ritual contexts. However, according to Urcid (2008b) in the history of Zapotec funerary customs, most sacrified dogs were young, whereas most of the dog remains found in the sample from Monte Albán were juveniles and adults. Only one young individual was observed (Table 107). A juvenile individual, identified as *Canis familiaris*, was detected as part of the offering in burial 1973-28, in Monte Albán (Winter *el al.* 1996). In other archaeological sites in Oaxaca, dog remains have been found in domestic and funerary contexts from the Xoo phase (650-850 AD). In tombs from Lambityeco, evidence of sacrificed dogs was discovered. Lind and Urcid (2010) observed bone remains of dogs and birds in the Tomb 6 in Lambityeco. Evidence of *Canis familiaris* was also present in this site, in domestic contexts such as garbage deposits and fills. In Xaagá, dog remains corresponded to the Early and Late Postclassic (850-1250 AD/1250-1521AD). Young dog individuals were associated with households and ovens, probably indicating consumption. In Tomb 2003-5 two young dog skeletons were found with human bones, apparently used for ritual purposes (Pérez and Winter 2013).

The type of dog identified in Monte Albán was the common dog (Winter, personal communication, 2014). The usual Mesoamerican dog or *Itzcuintli* (in Nahuatl) was the most common type of dog in the Mexican territory. It was medium-sized (40 cm in shoulder height and 70 cm in head-trunk length), although there were specimens leaning toward smaller sizes (35 or 36 cm in shoulder height and less than 65 cm in length), while others were substantially larger (over 45 cm in shoulder height and about 80 cm in length). Dental formulae were complete, showing that dog bodies had been covered with hair (Valadez 2000b; 2003, Valadez *et al.* 2004; Blank 2006). This species has been found disseminated in almost all the Mexican territory. According to archaeological data, these were the first type of "Mexican" dogs, and they appear since the Formative period (2500 BC) in the Basin of Mexico (Valadez *et al.* 1999).

Urocyon cinereoargenteus (grey fox), *Canis* cf. *latrans* (coyote) and *Canis* cf. *lupus* (wolf)

Other carnivores identified in the sample could have been related to symbolic, ritual or functional use. A cranium of a grey fox was found in a burial at the Cerros site, in Belize. A hole was drilled in one orbit, apparently for suspension. A similar finding at Seibal supports the idea of magic-religious practice or a lineage-related significance for the drilled fox skull at Cerros (Carr 1985). For the Aztecs, the coyote was a wild animal related to the jaguar and to the god of dancing and singing. This species and the wolf were also associated with warriors. Individuals appeared dressed as coyotes in ritual dances or battles, according to the *Mendoza* Codex (Seler 2008).

Nasua narica (white-nosed coati)

This taxon might have been a food source or kept as a household companion. As mentioned before, the white-nosed coati can be tamed, but might also be hunted for its meat besides being kept as a pet (Parker 1989; http:// www.acguanacaste .ac.cr/ bosque_seco_ virtual/bs _ web_ page/paginas_ de_ especies/ nasua_narica.html. 2013). Pottery figurines showing women with dogs and other animals such as coati were common (Willey 1972). There has been a suggestion that in the Maya region women fed these animals (Pohl 1994).

Lepus callotis (white-sided jackrabbit), *Sylvilagus cunicularius* (Mexican cottontail), and *Sylvilagus floridanus* (eastern cottontail)

Lagomorphs could have both ritual and dietary uses. According to ethnohistoric descriptions, rabbit was a high status food in the Valley of Oaxaca (Horcasitas and George 1955). In the archaeological site of El Palmillo in the valley, these kinds of animals were part of the subsistence among high status members. However, many of the animal offerings discovered in the terraces included rabbits too (Haller *et al.* 2006). In Monte Albán, in tomb 195 (1993-2 from the Xoo phase), in Y2 Area, rabbit bones were found in a vessel. In W1 Area in the Tomb 196 (1993-3 from the Peche phase) a maxilla of *Lepus callotis* and bones of two complete rabbit skeletons were placed in a ceramic vessel as part of the offering (Martínez *et al.* 2014).

It is possible that the Zapotec elite organized, or sponsored jackrabbit drives in the same way they hunted deer (Marcus and Flannery 1996). Rabbits are found in more dense vegetation, where they escape and hide in dens. It is difficult to guide these animals towards corrals or nets, as is frequently done with hares, making it possible to catch them (Scott 1998; Dean 2003). Hares are easier to hunt with several people than individually (the best method to hunt rabbits) (Diehl and Waters 1997). Thus, a focus on communal hunt would favor the supply of hares (Dean 2003).

Monte Albán subsistence compared to other archaeological sites in the Valley of Oaxaca, the Maya area and Teotihuacán

In the Valley of Oaxaca there is no evidence of state control in either production or distribution of animal meat, utilitarian objects or ornamental bone products (deFrance 2009). In contrast, the Maya had complex exchange systems of subsistence goods, including animal products for food, ceremonies and other uses (Maxwell 2000). The elite also used tribute systems to obtain sufficient meat and food resources (Pohl 1994). However, none of these were centralized, except for those related to ritual and autosacrifice (marine shellfish used for blood-letting) which were only present in the elite contexts (Maxwell 2000). Apparently, territorial hunting and overall meat consumption of big mammals functioned under the prerogatives of the elite. Thus meat represented a source of wealth (Pohl 1994). Zooarchaeological evidence showed that the local governors controlled animal use, land management, and trade (McKillop 2004; Teeter and Chase 2004).

In the Maya area, it seems that there was a continuum in the use of fauna with local variations (Masson 2004). However a general idea of the “Maya Diet” is problematic, since there was a difference in the distribution of animal species between the inland and coastal regions during the Preclassic, Classic and Postclassic periods (Demarest 2004; Emery 2004b; Foreman 2004; Götz 2008). The most representative subsistence resources among the Maya were the domesticated dog and turkey, both of them raised in households (Emery 2004b; Pendergast 2004; Wing 2004). Wild animals such as deer and perccary constituted a significant part of meat consumption, except for sites along the coast, where seafood represented an important part of the diet (McKillop 2004). Smaller wild mammals (lagomorphs), freshwater turtles, fish, shellfish, wild birds and marine fish were included in the diet too (Emery 2004b; Pendergast 2004; Wing 2004). Turkey, dog, deer, and some fish were also used in rituals. Sea products such as stingray spines and conch shells were imported for rituals. Prestige and subsistence goods were exchanged from both near and more distant locations (McKillop 2004). As can be seen, the Maya used similar faunal resources (dog, turkey, deer and peccary) to those used by the elite at Monte Albán. It would be interesting to find some zooarchaeological results from the coastal sites of Oaxaca, in order to see if more marine resources were included in the diet but there is no information about this at the moment.

Concerning deer management in the Maya culture and the probable rearing by women as a measure to augment meat supply to fulfill the needs of a large population or the possible feeding of deer with corn for ceremonial purposes, this has been investigated (Pohl and Feldman 1982; White *et al*. 2001; Wing 2004). This is a complex subject because deer management studies are based on unfused anatomical parts of prime-age subadult deer. However, due to taphonomic reasons this evidence is difficult to find in the Maya area (Carr 1996). Research focuses on isotopic studies of dog, deer and peccary to find out if these animals were fed directly by humans (White and Schwarcz 1989; White *et al*. 2001). Analysis of (Sr,Mg, Zn) demonstrated that deer and peccary from the Lamani site were fed with maize (White and Schwarcz 1989). The isotopic studies of dogs from the Cuello site, indicated a 70% maize consumption (similar to that of humans) suggesting that women were feeding some dogs (Pohl 1994). In Oaxaca there are no studies related to this subject but some deer samples have been sent to the University of York to perform isotopic studies and to glean information about the diet of this species.

Another topic of research in Mesoamerica is food related to status. Sometimes differences in consumption patterns may be conspicuous between the elite and commoners. However, subtle differences may take place in the access to animals, in food processing, and in activities using bone tools. For example, elite and commoner status may be evident not only by the taxa or the distribution of animal parts, but also by the amount of meat consumed (Sandefur 2001).

The Maya were organized in city-states ruled by nobles linked by diverse and complex bonds of kinship, exchange, and political alliances (McKillop 2004). According to research, the Maya elite ate more meat and the best cuts, had a greater diversity and variety of animal resources, a larger amount of domesticated animals and deer, showed management of wild animals, imported fish and marine resources and had a greater use of wild birds than commoners. Non elite members ate more fish and turtles (Pohl 1994; Carr 1996; Masson 1999; Emery 2003, 2007; Teeter and Chase 2004). Commoners could have hunted any animal they found using bows and arrows or a blowgun, catching a variety of mostly small and terrestial animals (Pohl 1994). In the Oaxaca Valley, the elite hunted more wild animals than commoners who ate more turtles and reptiles (Haller *et al.* 2006). Results from Monte Albán showed that diet of the elite might well have consisted, in great measure, of domestic species during the Preclassic and Classic periods (Fig. 74), similar to the taxa found in Maya high status contexts.

High-status meat consumption is supported by ethnohistoric sources and archaeological evidence before and after the Classic period occupation of Monte Albán (Blitz 1995). Ethnohistorically, dietary variation between the social classes was present at the time of the Spanish contact in many Zapotec and Mixtec sites (Spores 1965). Based on Spanish sources from the XVI century, only Zapotec nobles were permitted to consume deer, rabbit and turkey (Zárate 1905; Marcus 1992b). The diet of commoners was based on lizards, snakes, and other small game (Marcus 1992b; Marcus and Flannery 1996). This information was corroborated in the archaeological site of El Palmillo from the Classic period, in the Valley of Oaxaca. White-tailed deer, domestic dog, cotton rabbit, and jackrabbit remains were more abundant in the upper terraces (related to the elite) and reptile and turtle were more common in the lower terraces (related to the commoners). The species found in the upper terraces were not absent in the lower ones but were simply less frequent (Haller *et al.* 2006). In the Maya culture, some cases of dietary consumption in lower status communities included similar species to those found in elite contexts. Emery (2003) suggests that during periods of political and social instability, the lower-class Maya may have imitated the diet of the elite.

As seen before, in Monte Albán the white-tailed deer, domestic dog, turkey, collared peccary, cotton rabbit and jackrabbit were present during the Preclassic and Classic periods, particularly the first three taxa. Turtles were very scarce in all four areas and there were no other reptiles (Tables 69, 70, 71 and 72). This pattern coincides with that observed in the uppermost terraces of El Palmillo.Another similarity was that during the Classic period in Monte Albán, the percentage of collared peccary was very low, compared to Preclassic period (Fig. 74). In El Palmillo the presence of *Tayassu tajacu* was also very rare in the Classic period (Haller *et al.* 2006).

The site of Ejutla is located in the alluvial floor of the Ejutla Valley at the southern end of the Valley of Oaxaca, while El Palmillo is conformed of terraces and situated on the top and slopes of a rocky hill. In Ejutla the subsistence diet was based more on small mammals than El Palmillo, which showed a predominance of domesticated animals. This trend corresponds to the environment of each site. El Palmillo is located in a dry area of the valley; therefore, domestic species were crucial to survival. In contrast, Ejutla was situated in a fertile area, where small mammals, specially lagomorphs, might be found in, or next to agricultural fields (Haller *et al.* 2006).

Monte Albán, presented a similar pattern to that found in El Palmillo, since domesticated animals were more abundant than lagomorphs (Tables 69, 70, 71 and 72). Both sites are located on top of a hill. It would be important to corroborate if this trend is consistent between hill and valley sites, considered apart from the environment, the importance of the site in relation to Monte Albán. More studies need to be carried out in Oaxaca to obtain more information on this subject.

Stable isotope and trace element analyses of the skeletal remains from Monte Albán indicated dietary differences according to the period of time, the burial contexts and the spatial distribution. During the Classic period individuals buried in tombs consumed fewer plant resources and more animal protein and/or maize than those in non-tomb internments. Since the elite displayed their power and prestige by gaining access to exotic goods and food resources, animal protein was a sign of high status, thus it was consumed in higher quantities by this segment of the population. This was not very evident during the Late Preclassic of Monte Albán, probably because the social classes were less defined at this time (Blitz 1995). During the Late Classic (600-900 AD) the elite may have had preferential access to imported foods from the sea and local food. This has been corroborated by differences detected in the bone chemistry in the elite and the commoners (Whittington and Reed 1997).

According to González (2011), social inequality existed in Monte Albán since phase I (500 BC) but increased in later phases, so individuals with more offerings were found. Differences were not related to gender and age. Variations between households in the same areas were not noticeable because the individuals with a greater number of offerings were not necessarily related to the bigger houses. However in phase II (100 BC-200 AD) this situation changed; jade, shell and obsidian were only found in male burials and not all men received the same funerary treatment. During this time, individuals that lived near the Main Plaza had more access to resources and participated more in ceremonial and ritual activities. In phase III A (200-500 AD) decorated vessels were associated with men, while domestic pottery was frequently related to women. This may be interpreted as the fact that men performed more ceremonies and feastings, whereas women were focused on domestic activities and every day life. Males buried in tombs in phase III A consumed more meat than those found in this kind of context in phase II, and individuals from graves in phase III had less access to meat than those found in similar contexts from phase II. Therefore, it seemed that differences in households increased. Wealthier people of the middle social stratum ate more meat than in phase II, and the same could have occurred in the elite strata but more data are needed to corroborate this. During phase IIIb (500-700/750 AD), apparently meat consumption was restricted to the ruling elite and individuals from middle social strata (González 2011).

The most significant variations were observed between the Preclassic and the Classic periods, and according to the affiliation of each neighbourhood. During the Preclassic period, results (Ba and Sr plant levels) suggested that plant resources constituted a major part of the diet. By the Classic period, the strontium-rich, non maize plants may have been replaced in the diet by other food items (lower in Sr and Ba), such as maize and meat (Biltz 1995). It was also during this time, that major political changes, organizations and settlements took place in the valley, with the focal point in Monte Albán (Blanton 1978; Blanton *et al*. 1981). By the beginning of the Terminal Preclassic period (MAII or Nisa phase 200 BC to 200 AD), Monte Albán had emerged as the centre of a state (Blanton 1978; Blanton *et al*. 1981; Spencer 1982). As the rural population concentrated around Monte Albán, susbsistence practices intensified to support increasing needs (Blitz 1995).

When the population grew, social differences increased, agricultural practices intensified and the region became unified under the influence of Monte Albán, during the Classic period (Blitz 1995). According to the graph (Fig. 74), where frequencies of subsistence taxa identified by Preclassic and Classic periods were shown, an increased number of domestic species was perceived, from the former to the latter period. Perhaps one subsistence strategy to fulfill the needs of the growing population, apart from intensification of agriculture was the rise in domestic species. The same strategy was seen in the Tehuacán Valley, as mentioned before, when the population increased dramatically in 150 BC and subsistence relied basically on domestic species such as turkeys and dogs (Flannery 1967; MacNeish 1967).

In the Valley of Mexico, Tehotihuacán became a city-state and a pan-Mesoamerican commercial and military power during the Classic period (200-600 AD). This city and its allies had contact with consolidated state-level societies in the Valley of Oaxaca, the Gulf Coast region of Mexico, west Mexico and the Maya highlands and coast (Demarest 2004). In Teotihuacán, for example, domesticated animals were not an option to increase meat supply. Only dogs and turkeys were available to Teotihuacanos, which constituted no more than 10% of the meat consumed. One reason might be attributed to the fact that additional labour would be required to feed and take care of domesticated animals, also considering the limited land space within the city to breed them. It would have been much more feasible to extend the hunting area instead. Therefore, domestication did not become a desirable alternative until later, in the Postclassic period (900 – 1521 AD). By this time continuous overhunting had seriously reduced the available supply of game animals in the Valley of Mexico (Starbuck 1975; 1976; 1987).

Food preparation and status

Since cooking in prehispanic Mesoamerica would have been very time consuming, elite members of the society would have relied on alternative ways to obtain prepared food (Hendon 1996). Domestic activities might have been delegated in different ways: hiring servants or commoners to prepare food in the elite residences, or cooked food could have been brought into the households (Turkon 2004). The more powerful the elite, the fewer members of this social class would have carried out such tasks, and the more non-elite households would be preparing food served to the elite (Rosenswing 2007). If the elite were less involved in domestic activities than commoners, elite trash should include residue of their specific activities (remains of feasts, control of production, resources and storage, or religious artefacts) and traces of everyday life would be absent or less evident (Gumerman 1997; Turkon 2004).

To support the idea that food was cooked outside elite households, the evidence of food consumption would be associated with the residence and food preparation debris would be absent. Household remains would show a higher ratio of serving vessels than food preparation vessels, showing that elite members were consumers rather than carrying out cooking activities. High frequencies of ground stones and pestles would be present in households where food was prepared, and would be absent or occur less frequently in households where food was brought. There would also be fewer utilitarian vessels used for cooking and storage (Turkon 2004). The physical preparation of food would require special architectural facilities or features in elite residences, if it was prepared there, or would be absent if food was cooked and transported from somewhere else (Hirth 1993; Abrams 1994).

In the Nochixtlan Valley in Oaxaca, the frequency of ceramic ware to prepare food increased in noble residences. This evidence, together with ethnohistoric sources demonstrates that the Spanish prevented food from being prepared outside noble residences and supplied to them, as a way to diminish local elite power (Lind 1987). In Teotihuacán for example, the study of artifacts and status suggested that different food preparation techniques were used in low and middle/high status residences. Distribution analyses of artifacts also showed that grinding stones and pestles were less frequent in high-status households than in low middle-status residences (Smith 1975).

Ethnohistoric documents from Morelos, Mexico, mention that commoner women were in charge of grinding maize (and weaving textiles) for noble households, therefore they lived nearby and went to work in the elite residences (Smith 1993). In this case, grinding stones in elite houses would be associated with wealth, since elite members consumed more maize (Smith 1987: 312; 1993: 198). Mesoamerican ethnohistoric sources, for example, document how Aztec commoner women lived in separate houses, but went to elite residences to grind maize and cook for nobles (Smith 1987). In the case of the Maya, commoners were in charge of supplying the food to the rulers. In exchange, rulers organized public rituals and ceremonies commemorating the agriculture cycle, the origins of human beings and their place in the world (Mckillop 2004).

In the Río Viejo site, in Oaxaca, hearths dating back to the Early Postclassic period (975-1220 AD) seemed not to have been used for everyday life, but for special purposes. In this site, chemical soil analysis revealed that small scale food processing activities were carried out in indoor spaces. The absence of cooking facilities in the excavated areas suggested that food preparation was carried out in other places. Thus, it is possible that food was cooked in communal spaces located near residences, where multiple households participated in sharing food (King 2008).

In Monte Albán evidence of food preparation within the households was found in W1, W2 and A3 Areas. For example, fires and ovens were observed in W1 Area, on the terrace W2-A, in room W2-1 and in A3 Area (features 11-fire- and 18 -fire/oven from the Nisa phase- in household A3A, feature 25-fire in household A3D-R2 from the Nisa phase-) (Martinez *et al*.1997; Morales *et al*. 1999). In the W1 Area the structure W1C contained objects for food preparation including a grinding stone and obsidian blades in the southwest room of this residence. In W2 Area fragments of grinding stones and pestles were also present (Morales *et al*. 1999).

Other important evidence of food preparation is the *comal* (flat clay tray for baking *tortillas*), which appeared in villages and during the urban period in all domestic units in the Valley of Oaxaca (Winter 1990; Marcus 2008; Joyce 2010). This culinary accessory was commonly used in Mesoamerica by the Maya, in Oaxaca, and by the Aztecs, among others (Winter 1984; Brumfield 1995; LeCount 2001). The archaeological reports of W1, W2 and A3 Areas do not mention any *comales* found in these contexts but it is known that these were present in Monte Albán from period I (Winter 1990; 2001).

Other cooking facilities consisted of special rooms designated for this purpose. A small room (about 2 by 4 m) of this nature was observed in structure W1C, in the northwest, similar to those described by Lind (2001) in Lambityeco from the Xoo phase. According to his findings this kind of room functioned as a kitchen. The chronology, based on the ceramic sample recovered from primary contexts -features and burials-, corresponded to the Early Xoo phase (Morales *et al*. 1999). Apparently storage pits were not found in the areas under study but evidence of this kind has been detected in Period I, of Monte Albán residences. During this period, the storage pits were smaller than in earlier phases, indicating that less food was stored in households (Winter 1974: 982). In later periods, storage pits were not found, probably showing that people obtained their daily food supply from markets or through governmental institutions (Winter 1974; Blanton *et al.* 1999).

Based on the evidence found in W1, W2 and A3 Areas, it is possible to suggest that cooking activities took place within the residences. However, a more detailed analysis of cooking pottery, serving vessels, grinding stones (among others) distribution in elite and commoner households is needed to get a better idea of the differences in food processing in both social groups. It is impossible to know if prepared meals were brought to elite houses by the commoners, but it is certain that some food was cooked in elite residences.

Feasts

Communal consumption of food and drink in a context that differs from that of daily life is defined as feasting (Brown 2001). Food and social status are closely linked; feasts played an important role to structure and centralize political control, to create exclusive elite circles that excluded the lower classes, to display, consolidate or validate status and to enhance political cohesion (Hayden 1996; Rosenswig 2007). Diplomatic ties based on marriage and military alliances were celebrated through feasting (McKillop 2004).

Archaeological evidence of feasts includes: special foods (surplus resources, usually difficult to procure and cuts of high meat content), food preparation facilities (hearths, roasting pits, kitchens, large preparation vessels, boiling pots, pestles, grinding stones, chert and obsidian) and presentation (large serving vessels elaborately decorated), the social and spatial contexts (architectural structures) in which particular meals take place. All this evidence differs substantially from every day assemblages of animal production and consumption (Brumfield 1987; Hayden 1996; 2001; Brown 2001; Crabtree 2002; Hendon 2003; Emery *et al.* 2009). None of these indicators should be used alone, but a number of these together, provide more solid evidence to argue that feasts took place (Hayden 1996).

High frequencies of burned and cut bone, with evidence of a large amount of meat consumption might have been related to feasting (Sandefur 2001; Crabtree 2002). Animal bones are not completely broken up for marrow, and feast refuse tends to show in considerable quantities, in single deposits (Hayden 1996). If large concentrations of bones are found, it is important to determine if the assemblage was formed by “filling” or levelling a previous floor to create a new surface, or if the animal remains were disposed inside a structure or domestic unit, representing short-term consumption as a result of feasting rituals (Scott 1998). It is actually possible to identify individual feasts archaeologically, but researchers have to deal with midden deposits which are the result of different kinds of feasts, ritual or everyday activities. However, if food preparation and presentation vessels and implements (together with special facilities and evidence of food) remain, the long-term accumulation of broken and discarded tools found with evidence of food remnants will create different patterns that it should be possible to identify (Rosenwig 2007).

Elite food consumption had great political importance in prehispanic Mexico and it changed depending on the political structure. This was a way to consolidate status and power. Commoners and the elite celebrated the births, marriages, and deaths of household members through feasts (Sahagún 1950-69 (1577). Feasting in central Mexico took place on all social levels and in all social contexts (Brumfield 1987). Among the Maya deer, peccary, turkey and dog were used for feasts (Pohl and Fielman 1982). The shape and distinguishing syles of different vessels were used to serve ritual or feast foods (LeCount 2001). There were specific vessels to drink cacao and platters were used to serve *tamales* for special social/political events (Houston *et al*. 1989).

At the Xunantunich site, in Belize, feasts were more inclusive during the Late and Terminal Classic periods. Elite rulers and commoner lineage leaders may have participated, supplying maize in small bowls, serving *tamales* on plates, and distributing chocolate in cups. Serving platters for *tamales* were found frequently in many different assemblages including: public, private, elite or common. However, drinking chocolate and the eating of *tamale*s were more commonly associated to elite events. Chocolate was considered a sacred drink and was only consumed during religious or political events (LeCount 2001). Maya feasts were relatively simple compared to those of the Aztecs. In the Postclassic, feasts were organized hierarchically, and the daily meals for the Aztec emperor Moctezuma consisted of 30 different dishes (Díaz del Castillo 1956).

Evidence of feasts has been found in the archaeological site of El Palmillo, in Oaxaca. Terrace 335 showed higher proportions of pottery possibly associated with feasting: large serving basins, lids for chocolate pots, cups and vessels with pitted interiors (probably related to alcohol consumption). The quantity of all these objects, together with the obvious high quantity of meat makes it evident that feasts in this place were highly important (Haller 2006).

Most of the faunal remains studied in this dissertation came from middens and other contexts, such as garbage deposits. Different origins for the bones have been spatially and temporally averaged by the process of deposition. Therefore, it was impossible to determine if the samples were the product of a big single event or multiple daily activities. Therefore, it is difficult to prove that the faunal remains were directly related to feasts. However, comparing the political status of Zapotec nobles to contemporary elites of the time, such as the Mayas, where feasting activities have been corroborated (LeCount 2001; Montero 2011), it can be assumed that these kind of activities took place in Monte Albán too. So the zooarchaeological sample studied was probably the product of both: daily activities and feasts.

In Monte Albán, nobles were related to gods and were conceived as a group apart from the commoners (Joyce 2000; 2010). Although the Main Plaza was a public space, ritual practices contributed to the power of the nobility and emphasized the distinction between nobles and commoners (Joyce 2000). Zapotecs held public religious ceremonies that included feasts, sacrifices, ritual bloodletting, dancing, and the taking of drugs or intoxicating drinks like *pulque* (Flannery 1983). One of the ovens (placed behind an altar) discovered on the west side of the Main Plaza of Monte Albán, contained approximately 125 serving vessels, a cooking pot, cooking stones and a large vessel, probably related to feasting or a ceremony. Spout-handled jars associated with burials, were probably used for funerary ceremonies (Winter, personal communication, 2014).

Nobles who had settled in the North Platform during the Pitao phase, apparently imported elaborate ceramics, obsidian and ritual objects like figurines. In exchange, noble or subordinated specialists manufactured mica for exportation to Teotihuacán. Therefore the eastern part of the North Platform would have been an important ceremonial space for interaction with visiting nobles and/or merchants from Teotihuacán, where food was prepared and consumed and where ritual performances and gift exchanges took place. Feasting promoted greater relations between Zapotecs and Teotihuacans, and might have involved intermarriage of nobles, further alliances and trade (Joyce 2010).

CHAPTER VII

CONCLUSIONS

The identification of faunal remains from Monte Albán revealed that subsistence of the elite rested on species frequently found in Mesoamerica such as deer, peccary, dog, common turkey and lagomorphs. This meant that their diet was based mainly on land mammals and domestic birds. Occasionally, species including fish and turtles were obtained, probably from rivers near Monte Albán such as the Atoyac. In the areas under study, it was noticed that most of faunal remains were represented by a few taxa and the rest was present in low percentages. A great number of mammals could have been found in local habitats near Monte Albán or in areas under cultivation. However, other species were from further afield for ornamental or ritual purposes.

A few variations were detected between species related to subsistence in the different areas. For example, the PNLP Area showed the highest percentage of cervids among the identified samples and domestic animals were less prevalent than wild species, with most of them being deer. According to Martínez and Markens (2004), the PNLP Area was used as a public space, where ceremonies or feasts took place, so animals with high meat content were more required than in a household context. Zooarchaeology results are therefore consistent with spatial criteria based on architecture, structures, temples and abundance of other archaeological materials such as pottery (Martínez and Markens 2004). In the W2 Area the collared peccary was more frequent than other domestic species and the A3 Area showed the highest percentage of common turkey. The anatomical pattern observed of species used for subsistence did not vary significantly between the four areas under study, in which the high and medium meat content bones were distributed similarly. Evidence of this nature did not indicate any differences between the areas regarding access to the most desirable elements. However, the W1 Area showed a higher percentage of deer than the W2 and A3 Areas. A more detailed study is required and should include other objects related to high status (shell, green stone, obsidian, among others), to see if theW1 Area presents a higher concentration of prestige items including deer.

It was also observed that taxa used for subsistence varied between the Pe, Nisa and Pitao phases. The most notable trend was the increase of common turkey in the Pitao phase and a considerable reduction in collared peccary. It was also detected that the percentages of deer changed in relation to the fluctuation of Monte Albán´s political power over the Valley. Deer percentages reached their highest point at the time when the Zapotec state was consolidated in the Nisa phase. Then, when political power of Monte Albán decreased, relative abundance of deer dropped in the Pitao phase (Marcus and Flannery 1996; Joyce 2010). According to finds, the presence of domesticated species such as turkey in Monte Albán, rose from the Preclassic to the Classic period, probably as result of a subsistence strategy to deal with population growth. A similar pattern was seen in the Tehuacán site, in Puebla (Flannery 1967; MacNeish 1967). Relative abundance of deer also declined slightly from the Preclassic to the Classic period. It is not certain if the drop of collared peccary percentage in the Classic period was due to over hunting this species, or to preferences of the elite, or as a subsistence strategy or to other reasons. Presence of this taxon during the Classic period at El Palmillo Oaxaca was also very scarce (Haller *et al.* 2006). In general, it was noticed that almost all the same species persisted throughout all this time. Even though the political situation of Monte Albán changed, there was no evidence of a greater diversity of taxa being used or a considerable exploitation of different ecosystems. Therefore the carrying capacity of the region was sufficient to meet the increased demand for resources.

The anatomical pattern of deer showed that most of the elements corresponded to those of high and medium meat content; antlers and crania were practically nonexistent. There are different probabilities that can be considered, for example, deer could have been butchered elsewhere in the site or only selected parts for consumption were transported to households or public gathering places. However, animal bone implements, such as punches made of deer metapodials have been found in tombs, demonstrating that these low meat content parts had other uses. More areas of the site need to be explored to find out if there are low meat content elements of deer. Dog, collared peccary and turkey showed a different pattern, since diverse parts of the skeleton were observed. These animals could have been butchered, processed and discarded *in situ* within households and the public areas.

In the case of dogs, they were used for consumption and for ritual purposes too. This animal had an important symbolic significance, since it was considered to be a guide in the underworld. Dogs were sacrificed and buried with humans, placing the skeleton as part of the funerary offerings. Evidence of *Canis familiaris* has been found in tombs and burials in Monte Alban and at other sites in the Valley of Oaxaca (Winter *et al.* 1996; Pérez and Winter 2014). However, according to Urcid (2008b) in the Zapotec funerary customs, most of the dogs sacrified were young (4-6 weeks), unlike the individuals found in the sample from Monte Albán, which were mainly juveniles and adults.

This species can be used in hunts or kept in households as pets too. In the latter case, the whole skeleton might have been buried near the household. Skull and mandibles were frequent in the W1 and A3 Areas, probably teeth were used as ornamental objects or for other purposes. In Lambityeco, in Oaxaca, earrings made of canine teeth were part of the ornament in Tomb 6 (Lind and Urcid 2010). So it seems that dogs were used for many reasons including subsistence, since bones of this animal were found in domestic refuse and some of them showed burning and disarticulation cut marks. In Oaxaca evidence of dog consumption has been registered since early phases (850-700 BC) and it constituted an important food resource in different regions of Mesoamerica, especially in periods of a growing population (Flannery 1967; MacNeish 1967; Marcus and Flannery 1996).

There was little evidence of other carnivores identified in the sample apart from a probable dog and coyote. These were very scarce and might been included in ritual activities or valued for their symbolic meaning. Only one fragment of white-nose coati was observed, which can be used for food or kept in households, since it can be tamed (Parker 1989). However, only one fragment of this taxon was found and it is not possible to determine with clarity its use. The group of lagomorphs, represented by hares and rabbits, was part of both subsistence and ritual activities. Evidence of these animals was discovered in refuse deposits together with other taxa related to consumption. Rabbits have also been found in funerary offerings in Monte Albán and in El Palmillo, Oaxaca (Haller *et al.* 2006; Cira *et al.* 2014).

Some animals were appreciated for their symbolic meaning and functioned as status symbols. Such is the case of large felines, commonly associated with elite and ritual contexts. Representations of Zapotec rulers showed them dressed in feline pelts and sometimes even with the craniums, claws and tails (Spencer and Redmond 2000; Urcid 2005b). Therefore feline attires were used as part of a symbolic language to reinforce political power. The jaguar, for example, was related to political ideology and religion not only in Monte Albán but in various Mesoamerican cultures (Urcid 2005b).

As for birds, the Montezuma quail was frequently included in ritual activities for its symbolic meaning. Evidence of this species has been discovered in offerings at other archaeological sites in Oaxaca and in Templo Mayor of Tenochtitlan (Marcus and Flannery 1994; López Lujan *et al.* 2012). This taxon is also related to consumption;

however only a few fragments were identified in the sample from Monte Albán. Ducks had a symbolic role and figurines of these birds have been found in funerary contexts in Monte Albán (Caso 2002). The red-tailed hawk can be used for ritual purposes, but also captured for its feathers. Other birds observed in the sample such as the yellow-winged cacique, the common raven and the curassow may have been obtained for ritual purposes, or particularly for their feathers, used for elite headdress or attire, or they might have been kept within households. More evidence is needed to support some of these proposals.

There were a few reptiles observed in the sample and some turtle carapaces were identified. This group of animals was provided for a variety of reasons in Mesoamerica, including symbolic, ritual or for food. For example, turtle carapaces were used as drums among different prehispanic cultures and there are representations of musicians playing these instruments in different codices (Seler 2008). The only sea species was the green turtle that was probably brought to the site from the Pacific Ocean, since shells from the *panámica-Pacifico* region have been discovered in Monte Albán (Melgar *et al*. 2010).

The subsistence of the Zapotec elite was similar to that of their Maya and Teotihuacan counterparts (Starbuck 1975; 1976; 1987; Emery 2004b; McKillop 2004). In Monte Albán, as in the Maya area, it has been corroborated that differences in meat and species consumption existed between the elite and non-elite members of the community (Pohl 1994; Carr 1996; Masson 1999; Emery 2003, 2007; Teeter 2004). The El Palmillo archaeological site in Oaxaca showed variations in the frequencies of resources found in uppermost (elite) and lower (commoners) terraces (Haller *et al.* 2006). The identified taxa in Monte Albán corresponded to those found in the higher terraces at El Palmillo. According to isotope studies, diet difference between social classes in Monte Albán was more evident in the Classic period than earlier (Blitz 1995).

The zooarchaeological samples studied from Monte Albán were collected from households and public spaces and they were probably the product of both daily activities and feasts. In Monte Albán, the nobles were considered to be related to the gods and were conceived as a group apart from the commoners (Joyce 2000; 2010). Since the Main Plaza was a public space, the ritual practices that took place there contributed to the power of the nobility, distinguishing them even more from the commoners (Joyce 2000: 83). The Zapotecs held public religious ceremonies that included feasts, sacrifices, ritual bloodletting, dancing, and the consumption of drugs or intoxicating drinks like *pulque* (Flannery 1983). So, faunal remains studied in this dissertation derived from animals that might have been used in different kinds of events.

In general, the objectives that were established in the introduction and Chapter 2 were achieved. As mentioned above, the identification of faunal remains provided information related to subsistence of the population, frequency variation of some species during different periods of time, the kind of environments that were exploited, the anatomical pattern represented for the most abundant species and the possible uses of animals apart from subsistence. The results obtained from the zooarchaeological analysis will complement other researches of domestic economy and social organization and will offer a new perspective of everyday life that has not been considered before.

The present research has shown that through zooarchaeological analysis it is possible to obtain valuable information about how prehispanc populations survived, the relation people had with their environment, the different activities in which animals were included and the important meaning that animals had for ancient populations. It has also offered the possibility to compare the subsistence of the Zapotec members of the elite in Monte Albán with their counterparts in other Mesoamerican cultures and sites in Oaxaca. Likewise, it has proposed that faunal remains can be related to other archaeological materials to answer some questions, such as isotopic studies carried out on human bones in order to find out about subsistence and differential access of meat consumption between members of high and low status (Blitz 1995). Furthermore, the thesis has shown that zooarchaeological analysis can be integrated with other archaeological research, especially in Mexico, where studies of this kind are scarce. Finally, it has also contributed to the establishment of a new methodological framework for future studies of human and animal relationships in Mesoamerica and Oaxaca.

The study of the zooarchaeological remains has also generated some questions concerning subsistence. Did the Zapotec state have control over meat distribution and species such as deer? Were wild animals (deer and peccary) fed and kept for ceremonies or feasts as was the case with the Mayas? What was the role of Zapotec women in daily food preparation activities? Were exotic animals or taxa from distant regions obtained as tribute or exchanged? Was the surplus produced by commoners or smaller dependent communities sent as tribute to Monte Albán? How did the diet of inhabitants from Monte Albán differ from that of other populations in the Valley, according to the location (lowland-highland sites or inland and coastal sites), environment and political hierarchy? What kinds of species were hunted and found in the lower terraces (commoners) of Monte Albán? These would be future lines of research in the zooarchaeological studies in Oaxaca. The present dissertation has answered some of the questions that were set at the outset of the research, but has raised even more questions for future studies; however, that is in the nature of archaeology. It also reflects how much work needs to be undertaken in this region and how important animal bone studies are and will continue to be in archaeological research.