13. Dog-wolf Hybrid Biotype Reconstruction from the Archaeological City of Teotihuacan in Prehispanic Central Mexico

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*Between 1992 and 1996 the archaeological project "The Study of Tunnels and Caves at Teotihuacan", of the National University of Mexico, under the direction of Linda Manzanilla, was undertaken in the prehispanic city of Teotihuacan, located to the northeast of modern Mexico City. Initial analysis of the assemblage of identified canids (455 individuals), resulted in 20 being considered possible wolves. Although their cranial and dental characteristics were similar to the Mexican wolf (*Canis lupus baileyi*), their dimensions were smaller. In 1999 additional analysis indicates that these individuals were really hybrids of wolves (*Canis lupus*) and dogs (*Canis familiaris*).*

While the best example (of this proposed hybrid) was the complete skeleton of a young animal, there were many other individuals represented by just the inferior mandible and teeth. Their reconstructed shape is of a bigger dog with a wolf-like look, with a shoulder height of up to 20 inches, and length up to 30 inches. The data from the young individuals indicate a strong asincrony in their development. Quantification of bone strontium and zinc indicates that their diet was primarily herbivorous, with minimal access to meat. This condition could only be explained by owners who took care of them and gave them food.

Most of the samples recovered were dated between the VIII and XII centuries AD, and were discovered inside the tunnels, where they were left in locations oriented to the west. The association of caves, west and wolves in Prehispanic Indian symbolism indicates that these animals were used in rituals associated with the passage of the Sun and its entrance to the underworld, the night space associated with the god Xolotl, an Indian god with a dog shape, who was considered the sun´s night companion, but only in the night.

Teotihuacan tunnels

The archaeological project "The Study of Tunnels and Caves at Teotihuacan" was directed, between 1992 and 1996, by Dr. Linda Manzanilla of the National Autonomous University of Mexico, four Prehispanic volcanic scoria quarry tunnels were extensively excavated under the prehispanic city of Teotihuacan, located to the northeast of modern Mexico City (Manzanilla *et al*. 1996). The main goal was to determine the importance of these tunnels for the Epiclassic and Postclassic groups that occupied this site: the tunnels as extraction sites, dwelling sectors, storage areas, working sites, and ritual places.

Through an interdisiciplinary methodology involving the participation of archaeologists, osteologists, archaeobotanists, archaeozoologists, geophysicists, geochemists, and geneticists, a series of activity areas and occupational levels were established for Coyotlatelco, Mazapan, Aztec and modern people (*c.* AD 650–present times) (Fig. 1).

The faunal remains studied belong to different periods of the human occupation, from the VIIth century to the beginning of the XX century AD. During this time the tunnels were used as a place where the people lived, worked, where ritual and domestic activities were frequently held. From the VIIth until the XIIth centuries, occupants implemented diverse subsistence strategies
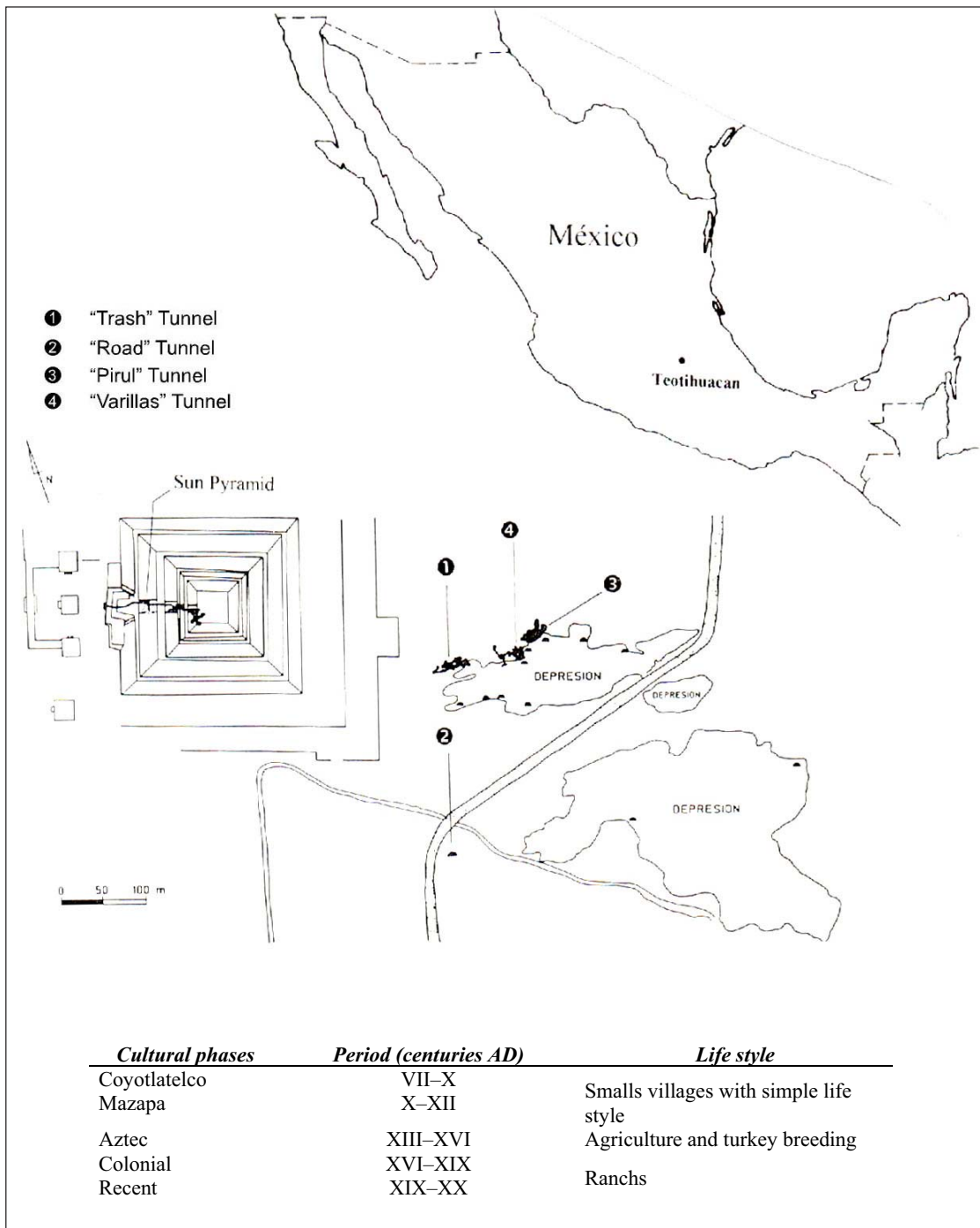
Cultural phases	Period (centuries AD)	Life style
Coyotlatelco	VII–X	Smalls villages with simple life style
Mazapa	X–XII	
Aztec	XIII–XVI	Agriculture and turkey breeding
Colonial	XVI–XIX	Ranchs
Recent	XIX–XX	

Fig. 1. The location of the tunnels studied in the project "The Study of Tunnels and Caves at Teotihuacan" and general characteristics of the discovered contexts.
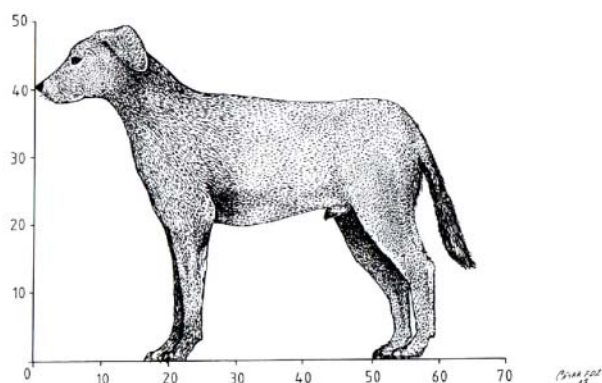
Fig. 2. Mesoamerican common dog, discovered in a burial (16998 registered number) in the Pirul Tunnel.

when compared to Classic Teotihuacan, where a more mobile element was present. It is possible that this more diverse strategy was derived from an origin in the Bajío area, in northcentral Mexico.

Archaeofauna registred

From this project, an archaeofaunal collection was obtained that included a MNI total of 2,845 vertebrates and 294 mollusks, and 16% (455 animals) of the vertebrates were canids (Fig. 2 and Table 1).

Recent research of prehispanic dogs of Mexico (Blanco *et al*. 1999; Valadez and Mestre 1999; Valadez *et al*. 1999) indicate the existence of four types of authoctonous dogs; the most abundant type was named the "Mesoamerican common dog". These were medium-sized animals, 14–18 in (36–46 cm) high, and 23–28 in (60–70 cm) large. This was the common type from which other types of dogs were derived, that was the most abundant type in prehispanic Mexico, and was uniform in characteristics.

In the collection there were 20 distinct individuals that were identified as Mexican wolves (Rodríguez 2000). Based on bone morphology and teeth size, these individuals were more similar with the *Canis lupus bailey* than with *Canis familiaris*. In 1999 the comparison with the archaeozoological remains of the wolves discovered in the Teotihuacan valley and the confirmation that the contexts in which they appear, indicated clear evidences of human activity, led us to the conclusion that these individuals were wolf-dog hybrids.
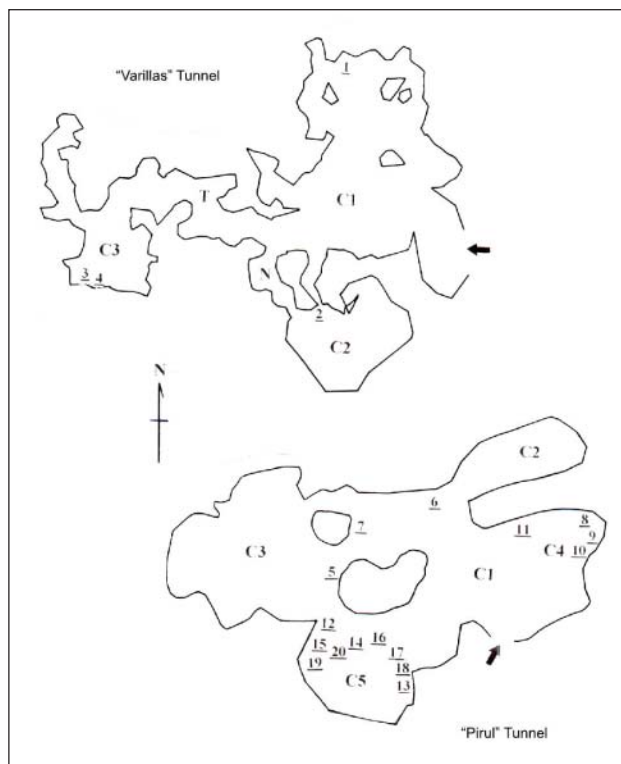

Fig. 3. "Las Varillas" and "Pirul" tunnels. The numbers indicate the hybrid number (see Table 2) and the place where each individual was found

Diagnostic elements of the hybrids skeleton

The hybrids appear in two tunnels: the Varillas tunnel and the Pirul tunnel (Fig. 3), but the majority were discovered in the area known as the "Chamber 5" (C5) in the Pirul tunnel. The chronology of these individuals goes from 500 to 1,350 years BP, although the majority are dated in the Coyotlatelco and Mazapa phases (*c*. AD 600–950). With the exception of one complete young individual (Fig. 4), individuals are only represented by a few bones. Many of them had cut marks, and several bones were cooked (Table 2).

The bones (of the proposed hybrid specimens) are similar or larger than the dog bones, but none of them are as large as the Mexican wolves. The mandibles have dimensions similar or superior to the dogs (Table 3 and Fig. 4), but, more significantly, they have an close resemblance with the morphology of the Mexican wolf mandible (Fig. 5).

Table 1. Canid collection discovered in the tunnels

| | Types of canids | | | | | |
| | **Dogs** | | | | **Wolf-like** | **Coyotes (Canis** |
	Mesoamerican Common	*Mexican hairless*	*Europeans*	*Unidentified*	**canids**	**latrans)**
No ind	43	3	3	384	20	2
%	9.4	0.7	0.7	84.4	4.4	0.4
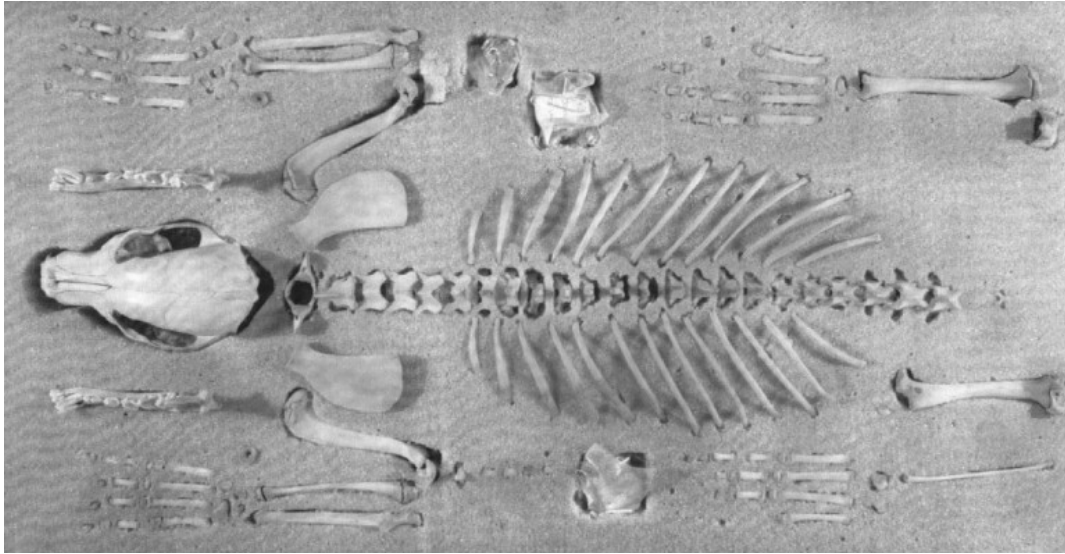
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Table 2. Wolf-dog hybrids discovered in the Teotihuacan tunnels

Hybrid number	Archaeological information			Bone remains registered		
	Bag number	Tunnel/ camera	Cultural phase	Cranium	Dental pieces	Poscraneal bones
1	6507	Varillas/C1	Coyotlatelco	Right mandible	Pm/3–4, M/1–2	
2	14973	Varillas/C2		Mandibles right and left	Cd,i, Pm/2–4d,i, M/1–2d,I	Calcáneo left
3	14824	Varillas/C3	Mazapa	Left mandible	Pm/3–4, M/1–2	Atlas, 5th dorsal vertebrae, first-2nd lumbar vertebrae; rib; right scapula; 3rd right metacarpus; proximal epiphysis to right femur
4	14152				I3 (pd)	Right Isquion
5	25223	Pirul/C1	Late Coyotlatelco		M/2d	5th left metatarsus
6	17352	Pirul/C1	Mazapa	Left mandible	Ml/2–3	
7	16058	Pirul/C1	Azteca			Right and left femur; ulna, rib
8	21154	Pirul/C4	Coyotlatelco	Neurocranium and left mandible (&)	M/1	Right ulna; right radium; left calcaneum; two caudal vertebrae
9	23402					Right humerus; pelvis acetabulum (&)
10	20923	Pirul/C4	Late Coyotlatelco			Left ulna
11		Pirul/C4	Mazapa	Skeleton		
12	24136	Pirul/C5	Late Coyotlatelco	Right maxilla	C, Pm3–4, M1–2	
13	24206			Right mandible	I/1, C, Pm/2–4, M/1–3	
14	24671	Pirul/C5	Late Coyotlatelco - Mazapa	Left mandible	Pm/4, M/1–2	Atlas–5th cervical vertebrae and caudal vertebrae. Right pelvis(&)
15	24020			Right mandible (&)	M/2i	
16	24032	Pirul/C5	Coyotlatelco-Mazapa transition	Left mandible, right premaxilla	I1–2, Pm2/2,4	
17	24192			Left mandible	I/1, C (pd) I/2, C, Pm/3–4, M/1–2	
18	24029					Fíbula diaphysys
19	23426	Pirul/C5	Mazapa	Left maxilla	Pm3–4, M1–2	
20	22795	Pirul/C5	Azteca	Left maxilla	Pm4	

Fig. 4. Individual 14824, discovered in the Varillas Tunnel. The teeth possess a morphology of the "wolf type", although the individual dimensions are only higher than a dog

Only one neurocranium was discovered (Fig. 6), and it was possible to take three measurements (Table 3), one of them is similar to the dogs, the other to the wolves and the last one have a intermediate value. The form of the mastoid region (Fig. 7) indicated a hybrid condition (Yates 2000). One hybrid burial was discovered, with a five months old animal that belongs to the Mazapa phase (AD 900). While the individual presents a large head, the diagnostic teeth elements also show permanent and deciduous incisors and canines together, an unusual condition in the dogs that shows an irregular dental development, a reasonable condition derive from his hybridism.

Dentition

The dental measurements of the molars and fourth superior premolar helps to recognize the hybrid condition of the individuals. These measurements frequently range between Mesoamerican dogs and Mexican wolves (Fig. 8). Although all of them show a "like-dog" morphology, in general it is clear that these animals posses a dentition larger than that of the dogs (Fig. 9).

Table 3. Mean measurements of the skull, teeth and some large bones in the Mexican wolf and Mesoamerican common dog and comparison with the measurements obtained in the discovered hybrids

Measurements	Promedium length (mm)		
	Canis lupus baileyi	*Mesoamerican common dog*	*Hybrids*
Total cranium length	235	164	163–182 (4 ind)
Greatest neurocranium breadth	62	52	49.1 (1 ind)
Greatest mastoid breadth	76	57	64.3 (1 ind)
Least skull breadth	40	33	37.4 (1 ind)
Greatest breadth across tooth rows at P or M	76	56	52.7–53.4 (2 ind)
Length from the angular process to the infradental	175.3	119	120.1–135 (5 ind)
Height of ascending ramus	71	48	48–55.9 (6 ind)
Breadth to the horizontal ramus	41	29	27.7–36.1 (8 ind)
Greatest height from M1 to base of jaw	29	20	20.8–26 (8 ind)
Ulna	249	140	183.5–185 (2 ind)
Radium	214	119	151.2 (1 ind)

Table 4. Dimensional comparation of diverse parts of the hybrid skeleton and of a common dog of the tunnels. The result indicates individuals of more than 500 mm of height and 714 mm of length

Measurements from a Mesoamerican common dog, buried in the Pirul tunnel (individual 16998)

Cranium length	160 mm	Radium length	115 mm	Height	390 mm
Scapula length	100 mm	Pelvis length	130 mm	Head-body length	628 mm
Ulna length	134 mm	Atlas-sacrum length	468 mm		

Dimensional reconstruction of four hybrids, derived from calculated measurements and its appearance in the 16998 dog

| Hybrid number (number bag)	Calculated cranium length	Height (mm)			Head-body length (mm)		
		Bone	Dimensional relationship with 16998	Calculated value	*Bone*	Dimensional relationship with 16998	Calculated value
14824		Scapula (100 mm)	1:1	390	Six vertebrae (98.1 mm)	0.96 smaller	607 mm
14973	182.3	Ulna (183.5 mm)	1.36 bigger	530 mm			
21154	161.5	Radium (151.2)	1.32 bigger	499 mm			
24671	170.6	Pelvis (130 mm)	1.1	430 mm	Atlas-fifth cervical vertebrae (151 mm)	1.16 bigger	543 (spine) + 170.6 (head) = 714 mm
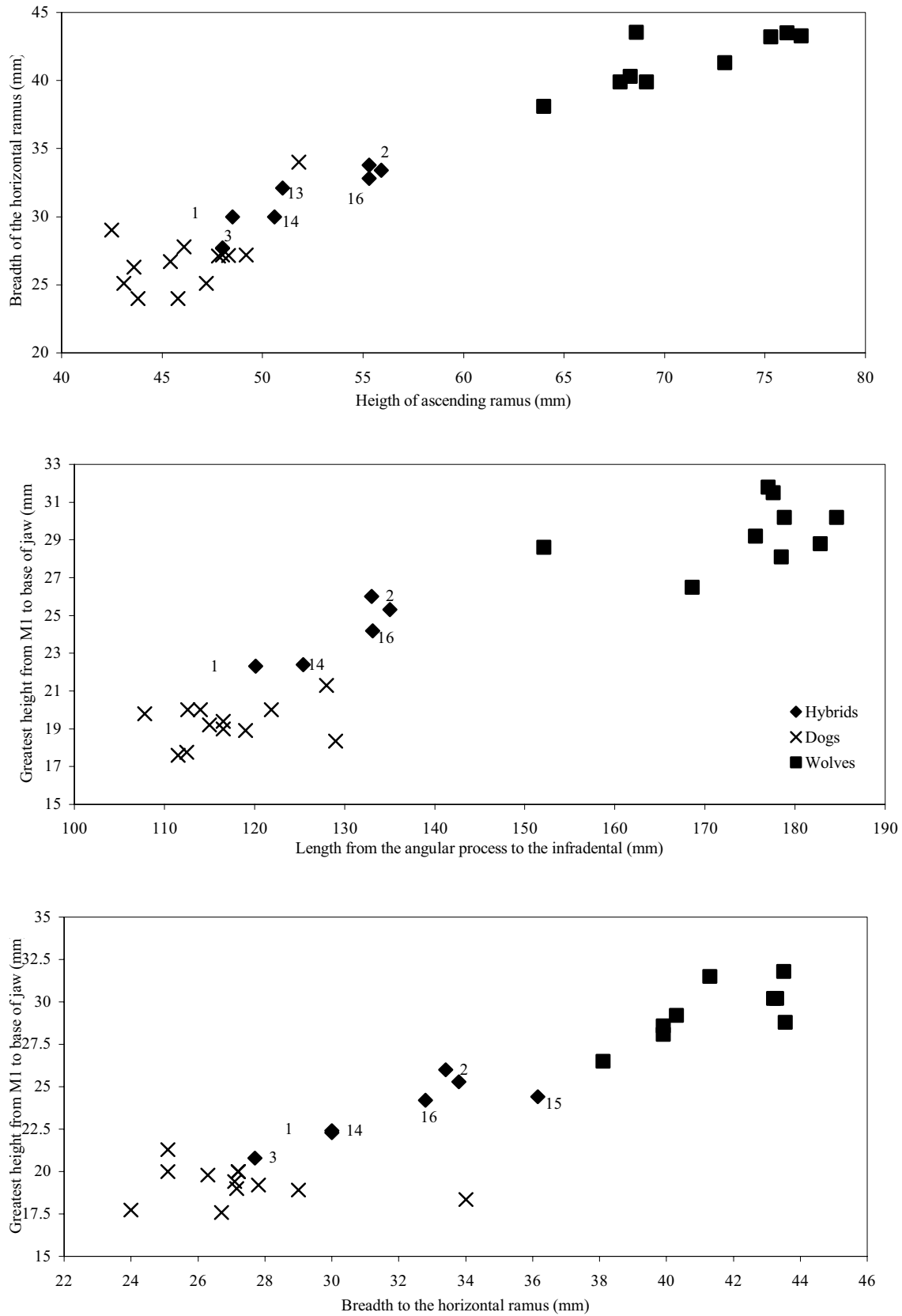
Fig. 5. Graphics in which the relationships between cranial measurements in dogs, wolves and hybrids location are show (the number shown in the graphics is the hybrid number of Table 2)

Fig. 6. Hybrid 8 (21154 bag number) The skull presents intermediate characters between dog and wolf, and the large bones are from a larger canid than a Mesoamerican dog.

Fig. 7. Comparation between the mastoidea region to wolf, dog and hybrid with number 8 (21154 number bag). See that in this last the region possess a more complex morphology that of the dog but simpler than the wolf

Reconstruction

The cranium and mandible remains of the individuals indicate that these animals have heads that are a little larger compared to the dog's head, but are more robust. The face is larger than the dogs', but thinner, and the skeleton bones indicate 30% larger dimensions. The comparison and the extrapolation of the hybrid measures with a dog found in the Pirul tunnel (CP16998) (Fig. 2) indicates that their withers´s height goes from 390–530 mm (15 to 20.9 in), and their length, between 600 and 714 mm (23.6 to 28 in) (Fig. 14). Accordingly, these canids were larger and more robust that common dogs with a wolf-like rostrum (Fig. 15).

Subsistence

One of the goals of the research that was carried out in the tunnels was the study of paleodietary indicators (Sr, Zn) in human remains, with the purpose of recognizing human subsistence trends (Burton and Price 1990; Farnum 1995; Fornaciari and Mallegni 1987; Gilbert *et al*. 1994; Manzanilla *et al*. 2000; Wing and Brown 1979). As reference points we took 36 mammals and birds bone samples, with one coyote (*Canis latrans*), eight dogs, and three hybrids among them.

The distribution of the results (Fig. 16) show that the Sr-Zn proportions in the hybrid individuals are more similar to the dogs than to the coyote. The coyote (*Canis latrans*), with a high Zn and a medium Sr concentration, points to a diverse diet with a strong protein support. The felines, in the left inferior extreme, indicate a good
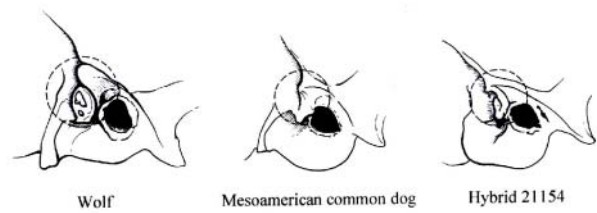
and a healthy meat diet. The dogs show a diverse subsistence pattern, from the ones which have a "coyote diet type", the ones that have a subsistence similar to the opossums (*Didelphis virginiana*), or the little carnivores like the skunks. This schedule is just like the typical dogs life and its master's relationships, because domestic dogs would have been more able to look for their food in wider variety of contexts: in the countryside, in the dumps or with its masters.

In an illogical situation, the hybrids depart from this pattern, because they feed like rabbits, skunks and opossums, revealing an herbivorous or omnivorous diet. One explication for this condition is that these animals were taken care of by people, and feed from their food (maize, beans, insects, and occasionally bones and a little meat) with the purpose of reducing the development of their wolf instinct. Chronicles of the XVI century state that dogs ate the same food that the people, and at present, dogs do not eat raw meat because people think that this would trigger their aggressive instincts.

Symbolism

In Mexico there has been a tradition of breeding female dogs and male coyotes, because the hybrids were considered as resistant, loyal but temperamental, and good guardians. The practice was to take the mating female dog and leave her chained in the mountain a few days, with enough food, until she was impregnated. In prehispanic Mexico, the wolf was one of the more important species in the religious life (Seler 2004). It was associated with the forces that guided the world, like a symbol of war (Fig. 17) and the Sun. Wolves were sacrificed and used in high-status ceremonies. We propose that the hybrids were created by men, with the purpose of having individuals that could display the sacred attributes of the father (wolf), inside a body that could be manipulated by men. These animals could be taken care until the sacrificial ceremony (Valadez *et al*. 2001), in which they were cut apart and separated in pieces
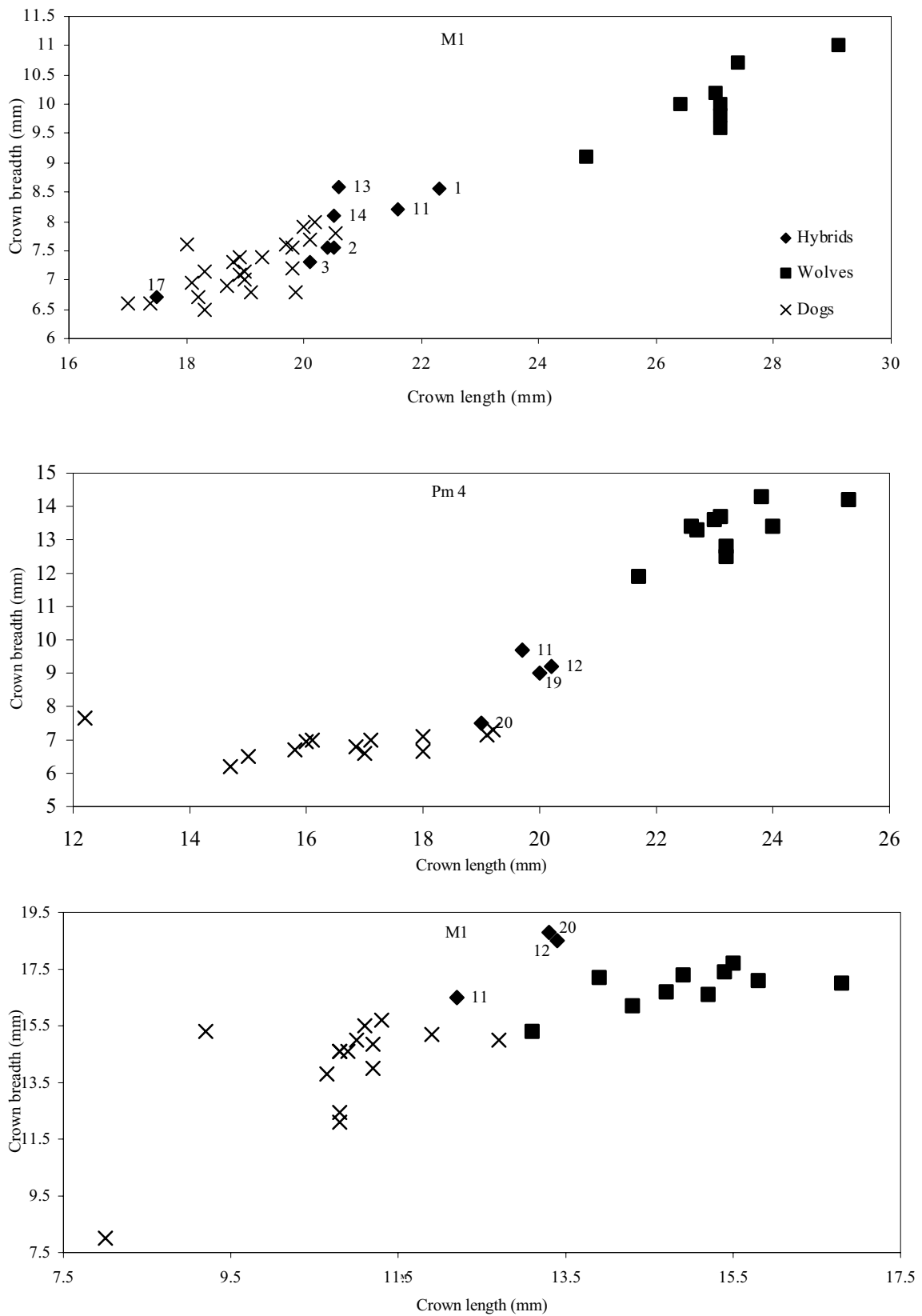
Fig. 8. Graphics that shows the relationship between many teeth measurements in dogs, wolves and hybrids. The medium condition is visible in all the hybrids (the number comes from the hybrid of Fig 6)
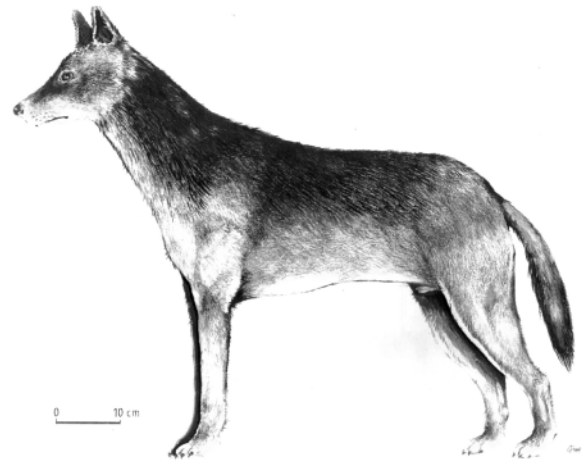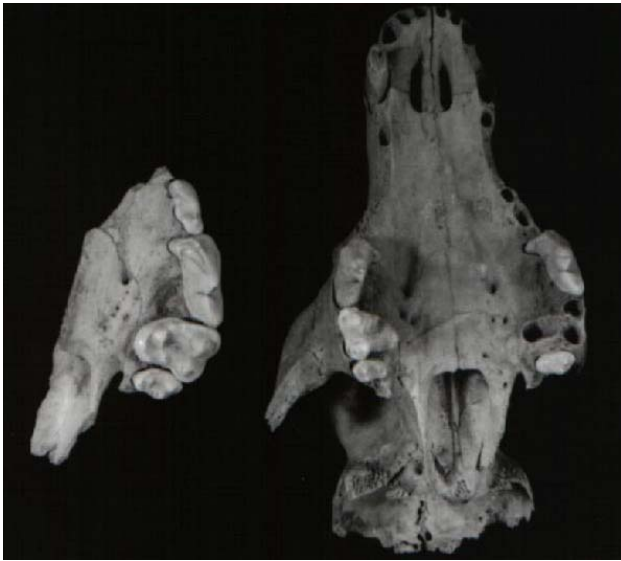
Fig. 10. Reconstructed image of a tunnel's hybrid

Fig. 9. Left: hybrid 19 maxilla (23426 bag number) with Pm3–4, M1–2 and a common dog (right side) from the tunnels.

Key:

- ◆ Rabbit
- ■ Rock squirrel
- ▲ Opossum
- ✕ Skunks
- ✳ Weasel
- ● Ringtail
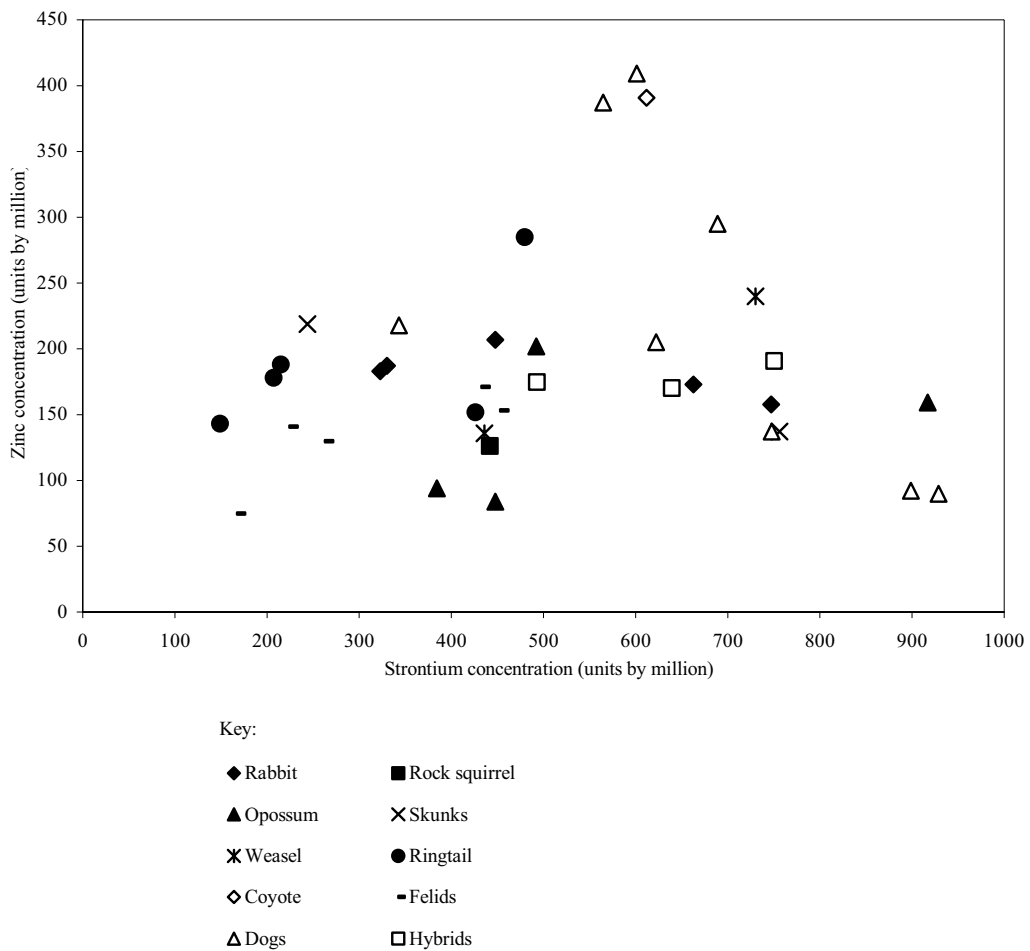- ◇ Coyote
- ▬ Felids
- △ Dogs
- □ Hybrids

Fig 11. Relationship between strontium (Sr) content and zinc (Zn) in mammal bones discovered in the tunnels. The dogs are placed in positions that manifest diverse diets from the omnivore or herbivore "hare type" to the carnivore "coyote type". The hybrids are placed between animals like the opossums, the rabbits and the skunks, showing a type of diet in which the meat presence was very low

Fig 12. Mural representation of a wolf at Teotihuacan (Atetelco compound)

according to the symbolic value. The most important body parts were the heads and faces, which were used for priest and warriors attires (Valadez *et al.* 2002).

The remaining pieces, the ones that were discovered during excavation, mandibles and large bones, would be the ones with less value for this people. These individuals were deposited in places with a west orientation. The same areas that were used as funerary chambers (Manzanilla and Arrellín 1999).

For prehispanic people, the tunnels were considered as an entrance to the "underworld", as a fertility symbol, as death, and as a place where humankind had his origin (Weitlaner and Leonard 1959). The west was a place of rebirth, the region of the dead Sun (Anon 1942; Sahagún 1985), and an entrance to the "underworld", an association that we found repeatedly in the burials of the Varillas and Pirul tunnels. The association of the "cave" and western orientation leads us to consider this as a context of the nocturnal Sun (the night) inside the "underworld", a moment in which this star should cross through this region in company of Xolotl, a canid god, related frequently with the dog (Seler 1963).

This research describes these hybrids as organisms that were buried with the mission of accompanying the Sun during the night, as an earthly equivalent of the Xolotl god. Since each dog was buried in the tunnels with a western orientation, we conclude that the main canid element in the rituals were the wolves. It may be

that Xolotl was represented by *Canis lupus* (a wolf, not a dog), with the hybrids having the role of animals who carry on the sacred character of the wolf in the dog body that could be manipulated by men.

References

Anonymous. (1942) *Mitos indígenas*. México: Imprenta universitaria de la UNAM.

Blanco, A., Valadez, R and Rodríguez, B. (1999) Colección arqueozoológica de perros del sitio de Chac-Mool, Punta Pájaros, Quintana Roo. *Arqueología*. **22**, p. 89–106.

Burton, J., and Price, T. D. (1990) The ratio of barium to strontium as a paleodietary. Indicator of consumption of marine resources. *Journal of Archaeological Science*. 17, p. 547–557.

Farnum, J. F., Glascock, M. D., Sanford, M. K. and Gerritsen, S. (1995) Trace elements in ancient human bone and associated soil using NAA. *Journal of Radioanalytical and Nuclear Chemistr*y. **196(2),** p. 267–274.

Fornaciari, G. and Mallegni, F. (1987) Paleonutritional studies on skeletal remains of ancient population from the Mediterranean area. *Antropologische Anzeige, Jg.* **45**(4), p. 361–370.

Gilbert, Ch., Sealy, J. and Sillen, A. (1994) An investigation of barium, calcium and strontium as paleodietary indicators in the

southwestern cape, South Africa. *Journal of Archaeological Science*. **21**, p. 173–184.

Manzanilla, L., López, C. and Freter, A. (1996) Dating results from excavations in quarry tunnels behind the pyramid of the sun at Teotihuacan. *Ancient Mesoamérica*. **7(2)**, p. 245–266.

Manzanilla, L. and Arrellín, R. (1999) Los entierros de los túneles al este de la Pirámide del Sol: proyecto UNAM 1987–1996. *In*: L. Manzanilla and C. Serrano, (eds). *Prácticas funerarias en la ciudad de los dioses. Los enterramientos humanos de la antigua Teotihuacan*. México: Instituto de Investigaciones Antropológicas-Dirección General de asuntos del Personal Académico, UNAM. pp. 427–458.

Manzanilla, L., Tejeda, S. and Martínez, J. C. (2000) Implicaciones el análisis de calcio, estroncio y zinc en el conocimiento de la dieta y la migración en Teotihuacan, México. *Anales de Antropología*. **33**, p. 13–28.

Rodríguez, B. (2000) *Estudio morfológico y morfométrico, craneal y dental de perros y lobos hallados en Teotihuacan y su aplicación en la arqueozoología*. Biol. Thesis, Universidad Nacional Autónoma de México.

Sahagún, B. (1985) *Historia General de las Cosas de la Nueva España*. Libros séptimo (cap. II), undécimo (cap. I) y adiciones al libro noveno. México: colección "sepan cuántos......" No 300, Porrúa.

Seler, E. (1963) *Comentarios al Códice Borgia*. México: Fondo de Cultura Económica.

Seler, E. (2004) *Las Imágenes de los Animales en los Manuscritos Mexicanos y Mayas*. México: Casa Juan Pablos. 40–76.

Valadez, R, and Mestre, G. (1999) *Historia del Xoloitzcuintle en México*. México: Instituto de Investigaciones Antropológicas de la UNAM, Museo Dolores Olmedo Patiño, Cámara de Diputados.

Valadez, R., Paredes, B. and Rodríguez, B. (1999) Entierros de perros descubiertos en la antigua ciudad de Tula, Hidalgo. *Latin American Antiquity*. 10(2), p. 180–200.

Valadez, R., Blanco, A., Rodríguez, B., Viniegra, F. and Olmos, K. (2001) Una quinta raza de perro prehispánica o, ¿una segunda especie de lobo mexicano? *AMMVEPE*. **12(5)**, p. 149–159.

Valadez, R., Rodríguez, B., Cabrera, B., Cowgill, G. and Sugiyama, S. (2002) Híbridos de lobos y perros (tercer acto): hallazgos en la pirámide de Quetzalcoatl de la antigua ciudad de Teotihuacan. *AMMVEPE*. **13(5–6)**, p. 165–176, 219–231.

Weitlaner, R. and Leonard, J. (1959) De la cueva al palacio. *In*: C. Leonard, (coord). *El esplendor del México antiguo*. México: Centro de Investigaciones Antropológicas de México. pp. 933–956.

Yates, B. (2000) Use of the mastoid region of the crania of canids to distinguish wolves, dogs, and wolf/dog hybrids. *In*: S. Crockford, (ed). *Dogs through time: an archaeological perspective. Proceedings of the first ICAZ symposium on the domestic dog. Eighth Congress of the International Council for Archaeozoology (ICAZ 98)*. London: BAR International Series 889. pp. 269–270.

Wing, E. and Brown, E. (1979) Reconstruction of prehistoric diet, nutrients and food. *Paleonutrition*, **5**, p. 6–44.

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