

ANIMAL PROVISIONING AT CHICHEN ITZA AND ISLA CERRITOS: A ZOOARCHAEOLOGICAL REVIEW OF FAUNAL UTILIZATION

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Abstract

Zooarchaeological data are presented to examine aspects of animal resources utilization at Chichen Itza and Isla Cerritos during the Terminal Classic. Through the review of zooarchaeological records, a differential pattern emerges based on contextual and environmental origins of the identified taxa, highlighting the ritual importance of coastal species at Chichen Itza. In addition, the transportation network of animals and animal parts from the peninsular interior to Isla Cerritos and coastal areas towards Chichen Itza is outlined. The reviewed zooarchaeological evidence of both settlements represents the first effort to rethink and heighten understanding of the relationship between the northern Maya capital and its coastal outpost during the Terminal Classic, profiling the diverse environments being exploited and differential utilization in the coast and the interior of the Northern Lowlands.

The Terminal Classic period in the Northern Maya Lowlands was characterized by social and economic development fueled by the crisis that led to the abandonment of Southern Lowland capitals. This new panorama enabled Chichen Itza (CI) to become the new political and religious capital of the northern region. During this period, commercial expansion triggered broad interregional contacts that became more frequent and solid, known as a phase of “Mexicanization” in which central-Mexican cultural aspects were incorporated into CI (Kowalski and Kristan-Graham 2007; Ringle et al. 1998). In this setting, CI emerged as a robust regional capital in the first half of the ninth century and held much of northern Yucatan under its control from A.D. 850 to 1100 (Andrews et al. 2003; Andrews V and Sabloff 1986; Cobos 1998, 2004; Cobos and Winemiller 2001).

The economic importance of the capital extended to the coastal territories, which granted control of the trade routes. Archaeological research from the last decades has suggested that Isla Cerritos (IC) was the main port of CI, serving as the coastal outpost of the northern capital (Andrews and Gallareta Negrón 1986; Cobos et al. 2007, 2010; Gallareta Negrón et al. 1989). IC is a small island located in a strategic position on the north coast of Yucatan. This situation enabled commercial exchange by sea and by land due to its proximity to the large salt works of Emal-Las Coloradas. Due to salt being the main export product from the Northern Maya Lowlands, its control fostered domination of the regional economy and long-distance commercial networks (Andrews 1980, 1983, 1997; McKillop 2002). The commercial relevance of the island is reflected by its administrative structures, piers, and the existence of a marine dam. Furthermore, the quality of exchanged goods found in burials, such as green stone, gold, turquoise, and *Spondylus* shells, indicates the economic importance of the site (Andrews et al. 1988). The

substantial and constant relationship with the capital is evidenced in contemporary Itza ceramic groups and lithic artifact typologies (Andrews et al. 1984, 1988; Braswell 1997; Cobos et al. 2007, 2010). At a long-distance level, archaeological evidence suggests that the island contributed to the expansion of CI towards central Mexico, the highlands of Guatemala, and Central America during the Terminal Classic (Andrews et al. 1984, 1988; Braswell 1997; Cobos et al. 2007, 2010). During the Early Postclassic, around A.D. 1100, when the decline of the capital occurred, IC lost its administrative and commercial importance until its abandonment in the thirteenth century (Andrews and Gallareta Negrón 1986; Andrews et al. 1984, 1988; Cobos et al. 2010; Gallareta Negrón 1998; Gallareta Negrón and Andrews 1988; Gallareta Negrón et al. 1989).

While trade relations between CI and IC have been extensively investigated based on different archaeological materials, the connections regarding faunal consumption and habitat exploitation have not yet been thoroughly explored. The lack of studies on the faunal relationship between the two sites is probably because the archaeofaunal remains have been analyzed separately by different specialists and archaeological projects (Carr 1987a, 1987b; Chávez Lizama 2014; Cobos et al. 2007, 2010; Götz 2007, 2008; Herrera Flores 2011; Herrera Flores and Götz 2014; Jiménez Cano 2019). Thus, in this article, zooarchaeological information from both sites is integrated for the first time to provide insights into meat provisioning patterns and the use of animal resources. In this sense, the main objective of this work is to explore the relationships of faunal provisioning and utilization at CI and IC during the Terminal Classic, through a review of the archaeofaunal evidence.

MATERIAL AND METHODS

The following is an examination of the zooarchaeological information from CI and IC to understand faunal utilization at both sites

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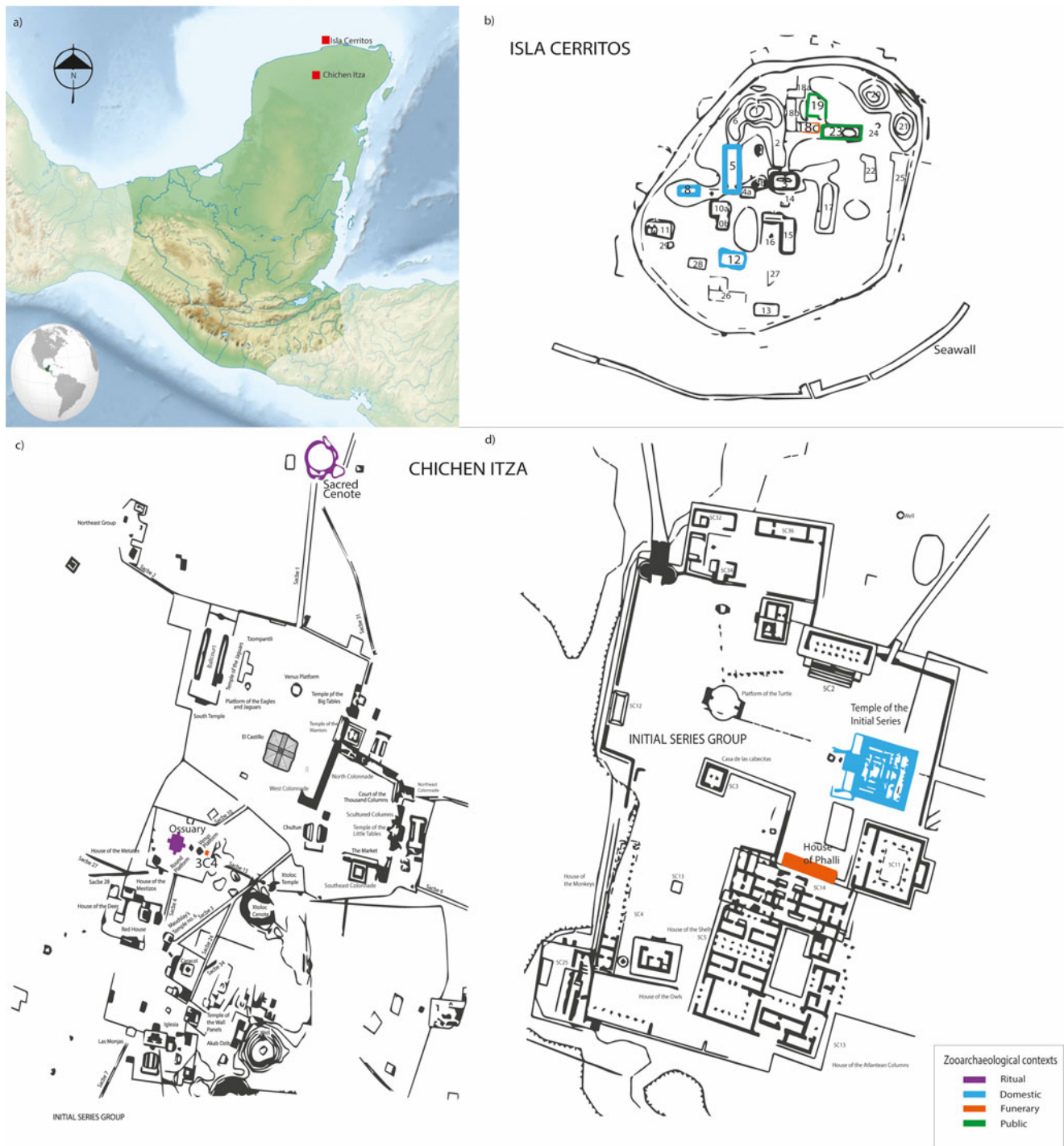


Figure 1. (a) Location of Chichen Itza and Isla Cerritos in the Maya area, (b) plan of Isla Cerritos, (c) general plan of Chichen Itza and (d) plan of Chichen Itza's Initial Series. Contexts of provenance are differentiated with colors. Image of the Maya area from Wikipedia, plans after Cobos et al. (2007) and Schmidt (2004) and with modifications by the author.

(Figure 1). In this article, zooarchaeological identifications made by previous authors (Carr 1987a, 1987b; Chávez Lizama 2014; Cobos et al. 2007, 2010; Götz 2007, 2008; Herrera Flores 2011; Herrera Flores and Götz 2014), as well as my own (Jiménez Cano 2019), are considered, as this contribution intends to obtain an integral and regional perspective on faunal exploitation. This set of data represents the objectives of several archaeological projects; thus, the

level of information provided is diverse. The faunal assemblage of CI is composed of the materials studied by Carr (1987a) from the excavations of Edward Thompson in the nineteenth century at the Sacred Cenote, the Satellite Mound and a *chultun* near the House of Phalli; the samples analyzed by Álvarez (1976) were recovered at the excavations of Román Piña Chán in the Sacred Cenote during the 1960s; and the faunal samples studied by Götz

(2007) were recovered at the excavations by Schmidt (2004) in the Initial Series midden and the Ossuary. The revision of zooarchaeological identifications of IC included the test pit materials studied by Carr (1987b) from Anthony Andrews' excavations; the samples from Rafael Cobos's excavations were analyzed by several researchers including the analysis of Götz (2008), from Structures 5, 8, and 12; Herrera Flores (2011) and Herrera Flores and Götz (2014) from Structures 3, 5, 8, 12, and 23; Chávez Lizama (2014) from Structure 19; and Jiménez Cano (2019) from Patio, Structures 23 and 30, and burials 23 and 30.

In order to understand the utilization of animal resources, contexts were grouped according to their reported functionality, including domestic, ritual, public, or funerary (Table 1). Domestic contexts included middens related to residential activities, such as the Initial Series midden at CI and Structures 19, 23, and 30 at IC; ritual contexts included offerings from the Sacred Cenote and the Ossuary at CI; public contexts came from administrative structures used for public purposes from Structures 5, 8, 12, and Patio at IC; while funerary contexts represented burials from the House of Phalli and the Satellite Mound Structure 3C4 (Platform of the Tombs) at CI, and burials 19 and 23 (Structure 18c) at IC. Since animal remains came from different archaeological projects, the recovery procedures were also diverse. While earlier excavations of Thompson and Piña Chan in the Sacred Cenote at CI used manual recovery, later projects at both sites used 5 mm sieves for collecting remains (Andrews et al. 1988; Cobos et al. 2007, 2010; Schmidt 2004). The difference in recovery methodologies can bias the comparative results, especially regarding the presence of small remains. However, the largest and more taxonomically specific faunal remains proceed from screened contexts at both sites, allowing for more confident inter-taxonomic comparisons. In addition, integrations of taxonomical composition were made at detailed taxonomic categories below family. Family levels were used to obtain an equivalent level of observations and descriptions, while genus and species levels were used for identifying detailed contextual utilization. Zooarchaeological information was heterogeneous in terms of nomenclature, quantifications, and descriptions. Thus, to standardize the provided information, the taxonomical nomenclature of all identifications was validated and updated by reviewing their status at the Integrated Taxonomic Information System (2020). For assessing the composition of the assemblages, ecological measurements were applied at species-specific levels of taxonomical identifications and included the quantification of richness (S'), diversity (H'), and equitability (V') indexes. The inclusion

of these measurements corresponds to the focus of this article on faunal taxonomic assessment and its relative abundance regarding various context categories. It also represents the first effort to correlate the faunal composition as indicators to deepen understanding of animal utilization at both sites during the Terminal Classic.

Skeletal frequencies were also profiled to identify correlations on element preferences at the settlements, in order to understand possible transportation strategies. It is acknowledged that the application of this approach is limited, because not all authors presented detailed quantifications of the elements represented in each taxonomical group. For these reasons, skeletal frequencies focused on deer and fish remains, as these animals reported detailed information of skeletal elements (Carr 1987a; Jiménez Cano 2019) and their remains were abundant, providing a source of comparison in this matter.

RESULTS AND DISCUSSION

Taxonomical Composition

The archaeofaunal assemblage comprised a total of 19,426 remains, 69.42% from CI (13,486 NISP; see Supplementary Material) and 38.58% from IC (5940 NISP; see Annex 2). The difference in the number of remains found at both sites might correspond to excavation efforts, since CI has a long history of archaeological interventions, while IC excavations are limited to the last few decades.

At CI, most of the faunal remains were identified at taxonomic levels above family, comprising a 79.26% (10614 NISP); at IC, this level of identification represented 69.63% (4136 NISP) of the site assemblage. More detailed taxonomical identifications, such as genus and species, represented 20.74% (2872 NISP) of the CI assemblage and 30.37% (1804 NISP) of the IC faunal sample. In terms of species richness and diversity, IC presented a richer and more diverse faunal assemblage ($S = 76$, $H = 3.16$), with a normal distribution of species ($J = 0.73$), while the faunal assemblage from CI was taxonomically less diverse ($S = 26$, $H = 0.60$), with an unequal species distribution ($J = 0.18$). These differences might be due to diverse animal utilization at both sites and different degrees of taxonomical identification.

Faunal Utilization

The following is a zooarchaeological assessment to explore human-animal relationships in Late Classic CI-IC cultural associations, based on the taxonomical distribution of different animal classes and their distributed abundance within different activity spaces.

Fish

At CI, fish presence is restricted to ritual contexts of the Sacred Cenote, and among those, there is an absolute dominance of cichlids, which might represent a natural deposition, as the Cenote is the natural habitat of these animals. On the other hand, it is important to note the presence of marine fish, such as requiem sharks (*Carcharhinidae*) and rays (*Myliobatidae/Dasyatidae*), suggesting an intentional deposition. The deposited elements of these fish included worked shark vertebrae (*Carcharhinus* sp.) and a ray spine, reinforcing their cosmogonical significance in a sacred space, as sharks have been identified as sea monsters and play an important role as mythical creatures related to the origin of the universe (Newman 2016). In addition, the presence of the ray

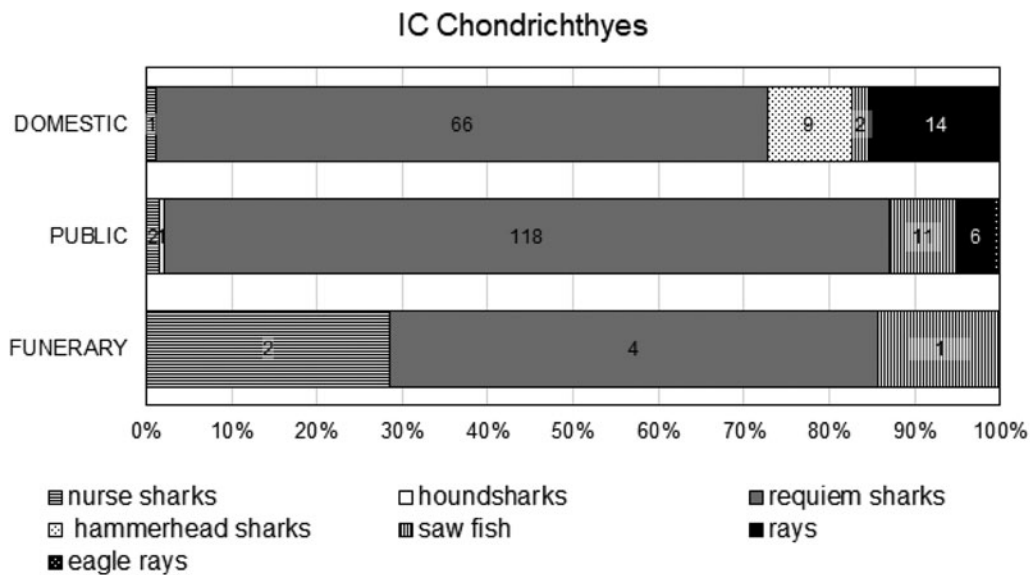
Table 1. Type of context at Chichen Itza and Isla Cerritos, with their corresponding zooarchaeological investigations.

Type of context	Chichen Itza	Isla Cerritos
Ritual	Sacred Cenote, ^{a,b} Ossuary ^c	
Domestic	Initial Series midden ^c	Structures 19, ^d 23, and 30 ^e
Funerary	House of Phalli, ^b Satellite Mound (Structure 3C4) ^b	Burials 19 and 23 (Structure 18c) ^e
Public		Structures 5, 8, and 12, ^{e,f} Patio ^g

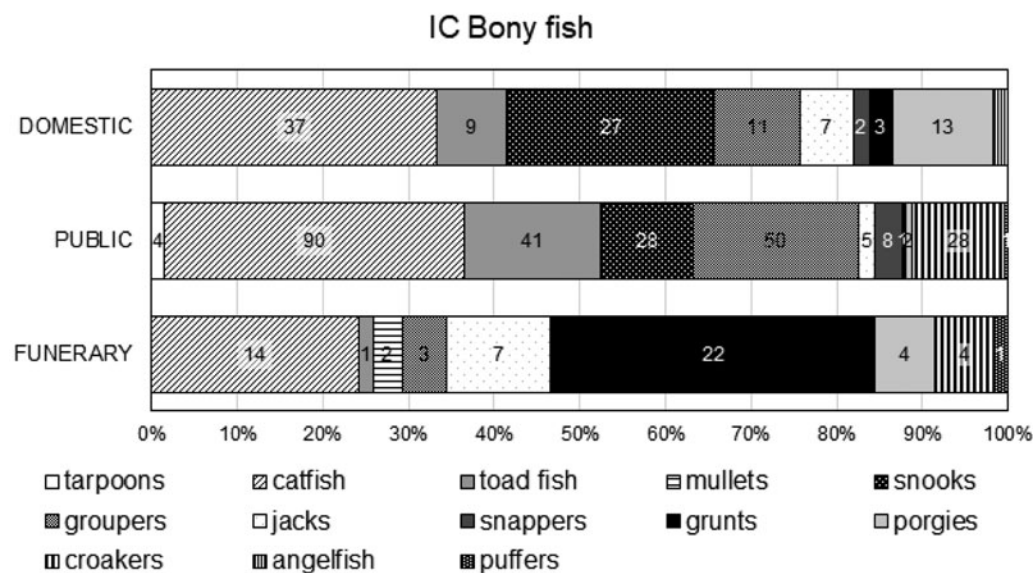
Notes: ^aÁlvarez (1976), ^bCarr (1987a), ^cGötz (2007), ^dChávez Lizama (2014), ^eGötz (2008), ^fHerrera Flores (2011), ^gJiménez Cano (2019).

spine emphasizes the importance of these elements as sharp objects associated with sacrifices (Haines et al. 2008). On the other hand, fish at IC, as would be expected for a coastal site, are abundant and taxonomically diverse, including both bony and cartilaginous fish (Figure 2). Regarding their distribution at the site, public contexts represented 17 fish families, followed by domestic structures with 14 families, and funerary contexts with 12 families. Despite the high diversity of fish, there is a preference for certain species in different contexts. In this sense, catfish (*Ariidae*, *Ariopsis felis*, and *Bagre marinus*) and sharks (*Carcharhinus* sp., *C. acronotus*, *C. altimus*, *C. brevipinna*, *C. isodon*, *C. leucas*, *C. limbatus*, *C. obscurus*, *Galeocerdo cuvier*, and *Rhizoprionodon terraenovae*) were resources used broadly at IC in all contexts. However, sawfish (*Pristis*) seemed to be restricted to public and funerary contexts at

IC, similar to other coastal settlements in the region, such as Xcambó (Jiménez Cano and Sierra Sosa 2018), where sawfish were preferred in funerary spaces. Snooks (*Centropomus* sp. and *C. undecimalis*) were also an important taxonomical group in the fish assemblage, especially in domestic and public contexts, although they were absent in funerary spaces, where other bony fish, such as grunts (*Haemulon plumieri*) and mullets (*Mugilidae*), were abundant. These two taxa were absent in domestic and public spaces, and their presence at IC might be restricted to burials. According to the most preferred fishing grounds, exploitation of estuarine species from nearby coastal areas was favored, which corresponds to a similar pattern of exploitation on the north coast of the Yucatan Peninsula (Götz 2008; Jiménez Cano 2017).



(a)



(b)

Figure 2. NISP frequencies of fish utilization at Isla Cerritos: (a) Chondrichthyes and (b) bony fish.

Reptiles

Differential patterns can be observed regarding reptile utilization (Figure 3). In general terms, there is less diversity at CI, with the reported presence of only four families (Iguanidae, Kinosternidae, Emydidae, and Cheloniidae). Iguanas (Iguanidae, *Ctenosaura similis*) dominated the domestic contexts of the Initial Series midden, where their remains showed taphonomic signatures of consumption (Götz 2007). To a lesser extent, these animals were part of the ritual context of the Sacred Cenote. Although iguanas were a resource widely consumed as food by the pre-Hispanic Maya (Batún Alpuche 1999), their presence in the Sacred Cenote likely represents natural intrusions (Carr 1987a), although it is possible that these animals might have been deposited as part of ritual

activity (Álvarez 1976:25). A different pattern emerges regarding the presence of iguanas in the three different contexts of IC, as they were less abundant and their remains did not register taphonomic signatures of consumption. Marine turtles represent an exclusive ritual utilization at CI, as the presence of these animals clearly indicates an intentional deposition in ritual spaces such as the Sacred Cenote (Álvarez 1976; Carr 1987a). Their marine nature could correspond to the Maya cosmology of the sea, therefore becoming common elements in rituals and offerings, especially at elite rituals (Pohl 1981). IC shows a greater diversity of reptiles, mainly due to the large presence of various families of marine turtles (Cheloniidae), as well as terrestrial and pond turtles (Kinosternidae, Emydidae, Geomydidae, and Dermatemydidae).

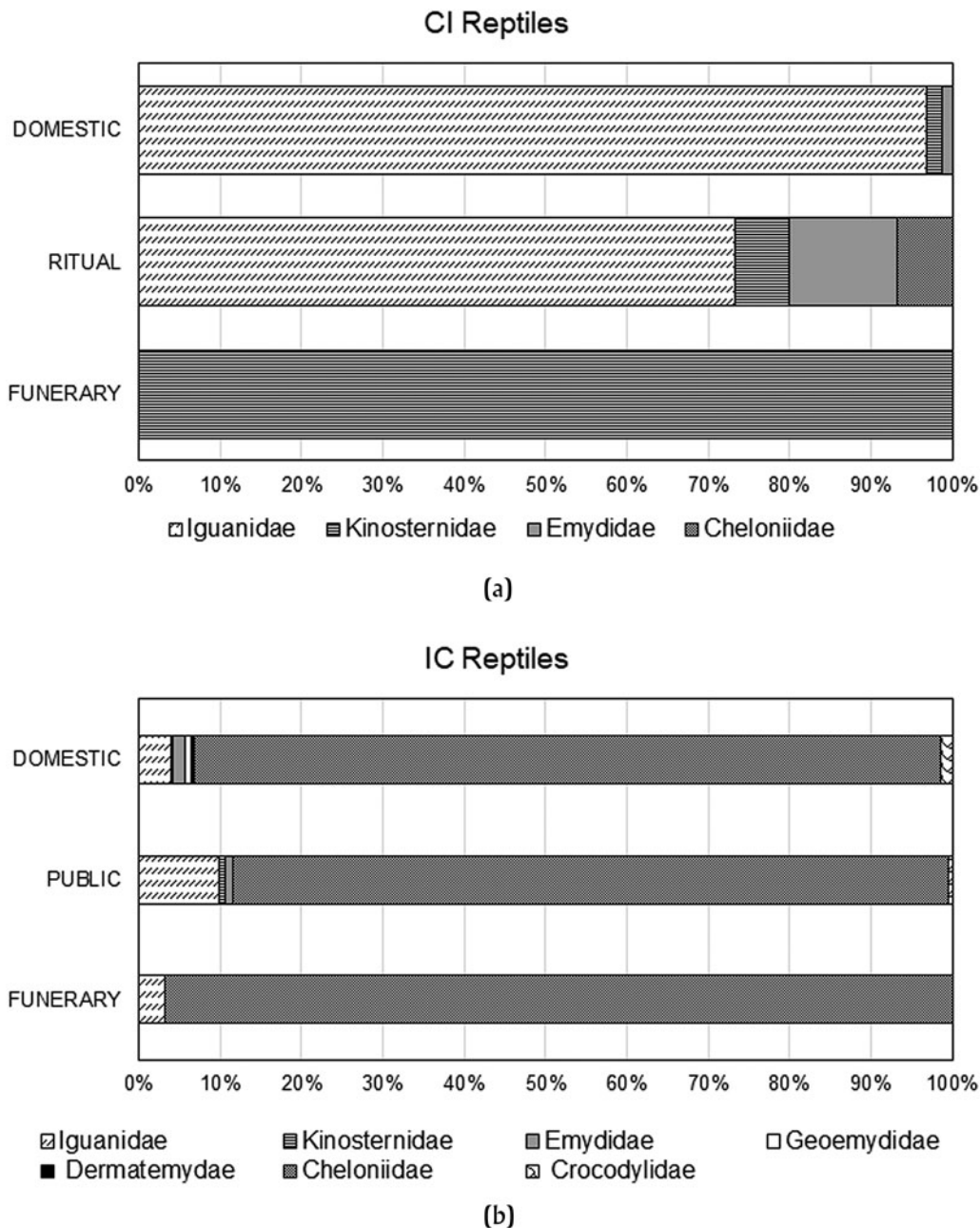


Figure 3. NISP frequencies of reptile utilization at (a) Chichen Itza and (b) Isla Cerritos.

However, as the NISP was the quantifier applied in this article, caution must be applied, as carapace turtles have a high fragmentation rate. At IC, sea turtles are widely distributed in domestic, public, and funerary contexts. Turtle consumption in domestic spaces was also reported, as some of the remains presented butchery and thermal marks (Herrera Flores 2011).

Birds

The utilization of birds in different contexts and their relative abundance at both sites can be seen in Figure 4. In domestic contexts, there is a dominance of turkey remains (Meleagrididae), which composed more than 90% of the bird sample at CI and almost 50% at IC.

However, in ritual spaces, turkey comprised almost 40% of the bird assemblage at CI, and was absent in public spaces at IC. Turkey records at both sites are relevant, as taxonomic identification of such birds through osteological characteristics is difficult due to the similarities between the domestic species (*Meleagris gallopavo*), native to the center of Mexico, and the wild species (*Meleagris ocellata*), endemic in the Mayan area. In this regard, it is important to mention that the CI turkey remains were identified as ocellated turkey (*Meleagris ocellata*; NISP = 15) and unidentified turkey (*Meleagris* sp.; NISP = 31) (Carr 1987a). At IC, turkeys were limited to domestic spaces and identifications included domestic (*M. gallopavo*; NISP = 16), wild (*M. ocellata*; NISP = 3), and unidentified turkeys (*Meleagris* sp.; NISP = 1) (Chávez Lizama

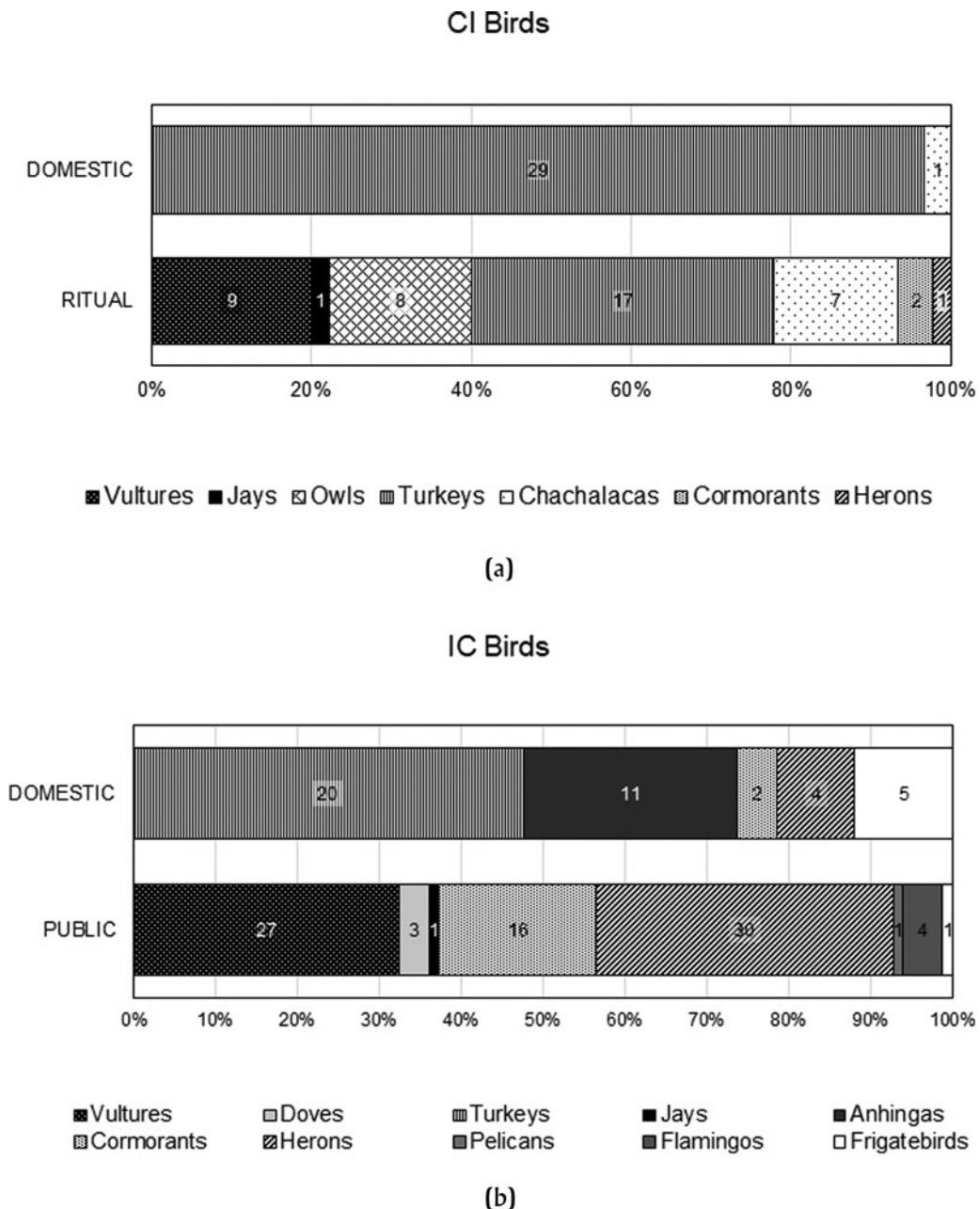


Figure 4. NISP frequencies of bird utilization at (a) Chichen Itza and (b) Isla Cerritos.

2014; Götz 2008; Herrera Flores 2011; Herrera Flores and Götz 2014). The identification of domestic turkeys at IC is undoubtedly relevant in economic and social terms, but its absence at CI is noteworthy. If taxonomical identifications are valid, domestic turkeys likely arrived at IC to be transported to the capital or to other destinations. However, one must be cautious regarding identifications between closely related species, and it is necessary to refine the identification methods to confirm possible interpretations. Consumption of large birds also included Chachalacas (*Ortalis vetula*), which were registered in domestic contexts at both sites. In addition, seabirds such as anhingas (*Anhinga anhinga*), double-crested cormorants (*Phalacrocorax auratus*), and great herons (*Ardea herodias*) are recorded in domestic contexts at IC, while marine birds such as cormorants (*Phalacrocorax* sp.), egrets, and herons (Ardeidae) are restricted to ritual contexts at CI, reinforcing the connection with the coast and the marine environment from a cosmological perspective. These birds were also accompanied by vultures (Cathartidae) and great horned owls (*Bubo virginianus*), which are birds associated with the night (Seler 2004; Sharpe 2014), reflecting their role as underworld emissaries in ritual activities. By comparing both sites, a differential pattern emerges, as seabirds found at CI pointed to an intentionality of deposition to satisfy ritual activities, whereas at IC, their presence could likely respond to intrusions over time, as these animals are common inhabitants of the island and no butchery signatures were reported (Carr 1987a, 1987b; Chávez Lizama 2014; Cobos et al. 2007, 2010; Götz 2008; Herrera Flores 2011; Herrera Flores and Götz 2014; Jiménez Cano 2019).

Mammals

Regarding mammals (Figure 5), the taxonomical distribution at both sites indicated a clear dominance of deer and white-tailed deer (Cervidae, *Odocoileus virginianus*), which is highly accentuated in domestic spaces at both sites. In the domestic contexts of CI, deer were also accompanied by non-identified peccaries (Tayassuidae and cf. *Tayassu* sp.), collared peccary (*Pecari tajacu*), white-lipped peccary (cf. *Tayassu pecari*) and tapir (*Tapirella bairdii*); while at IC, non-identified peccaries (Tayassuidae and *Tayassu* sp.), collared peccary (*P. tajacu*), tapir (*T. bairdii*), manatee (*Trichechus manatus*), and the extinct monk seal (*Neomanachus tropicalis*; Adam 2004; Andrews 1984) were also consumed (Chávez Lizama 2014; Götz 2008; Herrera Flores 2011). Such animals were probably appreciated for their meat at both sites, but at IC there is no mention of whether these animals were found in complete representation of the skeleton. At CI, a scapula with incised glyphs and a carved humerus of a tapir were found in the Sacred Cenote, as well as peccary teeth, which suggest the specific purpose of certain animal parts in ritual practices (Carr 1987a:21–22).

Interestingly, the terrestrial fauna at IC is more taxonomically diverse and included small mammals, such as the eastern cottontail (*Sylvilagus floridanus*), with cutmarks and thermal alterations (Chávez Lizama 2014:56), and the central American agouti (*Dasyprocta punctata*), with boiling signatures (Herrera Flores 2011:65). In addition, rodent remains with no taphonomic signature were also found (Jiménez Cano 2019), which might suggest an intrusive component in the IC faunal assemblages. However, it is important to keep in mind that small rodents in Yucatan are consumed complete in piñb, with the possibility that no butchery marks are preserved. Additionally, little attention has been paid to thermal alterations, such as those of piñb cooking, on Maya

zooarchaeological research, which causes a lack of methodological tools for taphonomical identification.

Remains of European domestic animals, such as cattle (*Bos taurus*), were also found at IC in the superficial layers (Herrera Flores 2011), which indicates a posterior inclusion in the assemblage by mixed materials. Dogs (*Canis lupus familiaris*) were found in domestic structures at IC (Chávez Lizama 2014; Götz 2008; Herrera Flores 2011), while at CI, modified teeth of dogs were recovered in the Sacred Cenote (Carr 1987a:7). On the other hand, dog remains found in the Initial Series midden depicted signatures of butchery, probably meant for consumption (Götz 2007:63). Big felines were also found in the Sacred Cenote at CI, including cougar (cf. *Puma concolor*), jaguar (*Panther onca*), and ocelot (*Leopardus pardalis*), while at IC felines were represented by jaguar (cf. *P. onca*) in public and domestic structures. Dogs and jaguars were also likely transported to IC, as in the case of jaguars there are no native populations of these species reported on the island; while dogs, the only domesticated mammal in Mesoamerica, are related to human mobility. Dogs were edible animals and had ritual importance as a food resource (Pohl 1981; Seler 2004), while jaguars and other felines were animals associated with elite offerings (Seler 2004). The ceremonial role of these animals is more precise at CI, as perforated teeth of felines were deposited in the Sacred Cenote, while at IC the presence of these animals registered a lack of taphonomic signatures.

The taxonomical composition of the assemblages suggests a high diversity of animal utilization, especially in domestic contexts most likely consumed as food resources. However, a different pattern of the role of animal protein in the human diet is suggested by isotopic evidence, as individuals from Yaxuna (Mansell et al. 2006) and victims from the Sacred Cenote in CI (Price et al. 2019) indicated a diet mostly based on maize consumption and less animal protein consumption.

Skeletal Frequencies

Skeletal frequency was carried out to understand butchering and transportation patterns of deer and bony fish, as these were the only taxa with detailed reports of skeletal elements (Carr 1987a; Jiménez Cano 2019). Deer skeletal frequency indicates the utilization of practically the whole body at both sites, suggesting that there was no restriction on the use of certain body parts (Figure 6). However, comparing the relative abundance of body parts allows the observation of a pattern of skeletal frequency dominated by the presence of forelimbs and hindlimbs, comprising 30% NISP at CI and 45% NISP at IC. The high quantities of these elements are relevant in terms of diet, as this likely represents a preference for these body parts for consumption as they have a higher meat content. In addition, our recent analyses at IC indicated that deer remains belonged exclusively to adults (Jiménez Cano 2019), reinforcing the idea of deer legs for dietary purposes. These records also coincide with those of the CI Initial Series midden (Götz 2007)—although not completely quantified, the high presence of such remains for food consumption purposes is suggested.

On the other hand, the skeletal frequency suggests a similar abundance of metapodials at CI (20%) and IC (30%). The use of these elements for artifact manufacturing is widely reported within the assemblages, although the skeletal elements are not always quantified (Götz 2008; Herrera Flores 2011). At the time

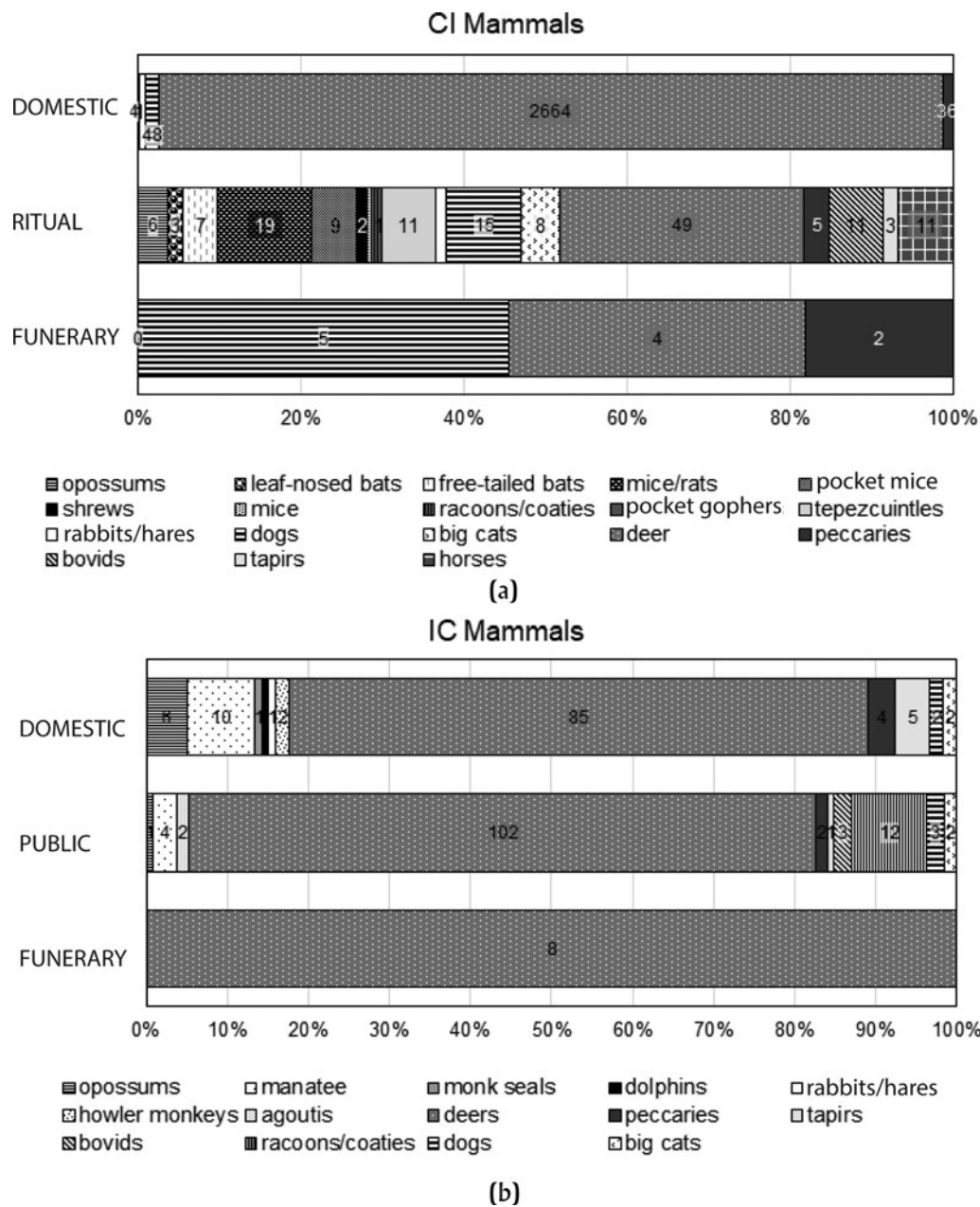


Figure 5. NISP frequencies of mammal utilization at (a) Chichen Itza and (b) Isla Cerritos.

of writing this article, a “tool with squared-off point” has been identified as possible evidence of shared artifact typology at both sites (Figure 7). This type of bone artifact was first found fragmented in the Sacred Cenote, described as an artifact “with a tip and flattened faced which is very even and appears purposeful” (Carr 1987a:36). Similar artifacts have been found at IC public structures (Jiménez Cano 2019) and identified at Xcambó (Canto Méndez 2009) as spatulas because their manufacture implied flat bone polishing with rounded or squared edges. However, it is also possible that vestigial remains on bone artifact manufacturing processes are underrepresented and categorized as non-identified materials. This situation hinders the identification of possible bone production workshops, as it has been identified in the Southern Lowlands (Emery 2008, 2009; Emery and Aoyama 2007). According to the evidence gathered so far, it is still difficult

to compare production patterns that could allow the identification of producer sites. Future studies of bone artifacts will potentially deepen our understanding of the social organization and bone technological development during the Terminal Classic period in northern Yucatan.

Relative frequencies on deer skeletal distribution indicated that cranial elements were less abundant at both sites. Antlers at CI comprised about 13% of the deer sample and represented less than 1% at IC. Such could be related to ritual and funerary purposes, as reported in the Sacred Cenote of CI, while at IC antlers presented burnt signatures in public structures (Herrera Flores 2011). The use of antlers for ritual purposes might also correspond to their use in offerings related to hunting activities, as has been reported in modern Guatemala communities (Brown and Emery 2008).

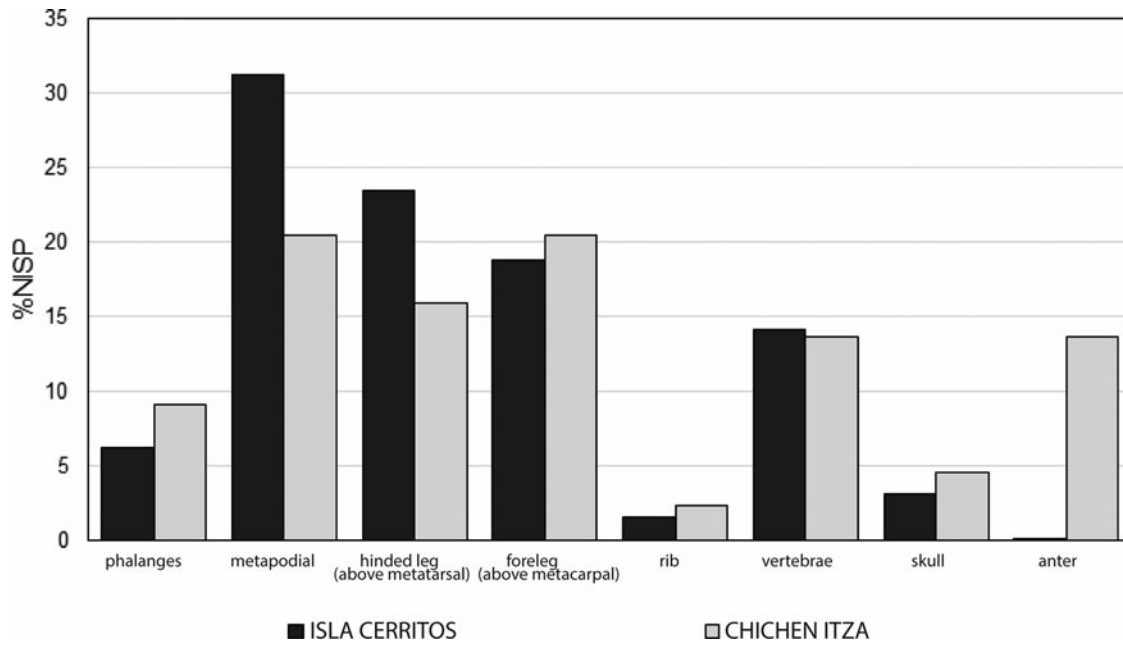


Figure 6. Deer skeletal frequencies at Chichen Itza and Isla Cerritos.

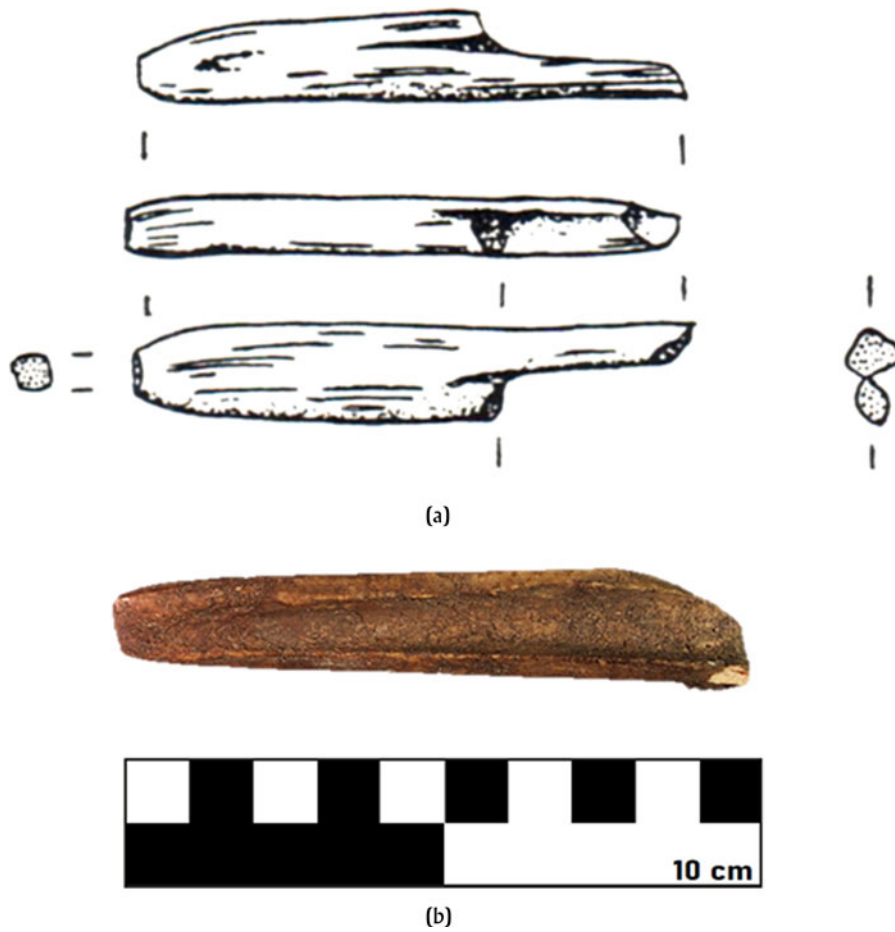


Figure 7. Deer bone artifacts with squared-off point from (a) Chichen Itza (Carr 1987a) and (b) Isla Cerritos. Photograph by Paula Cetz.

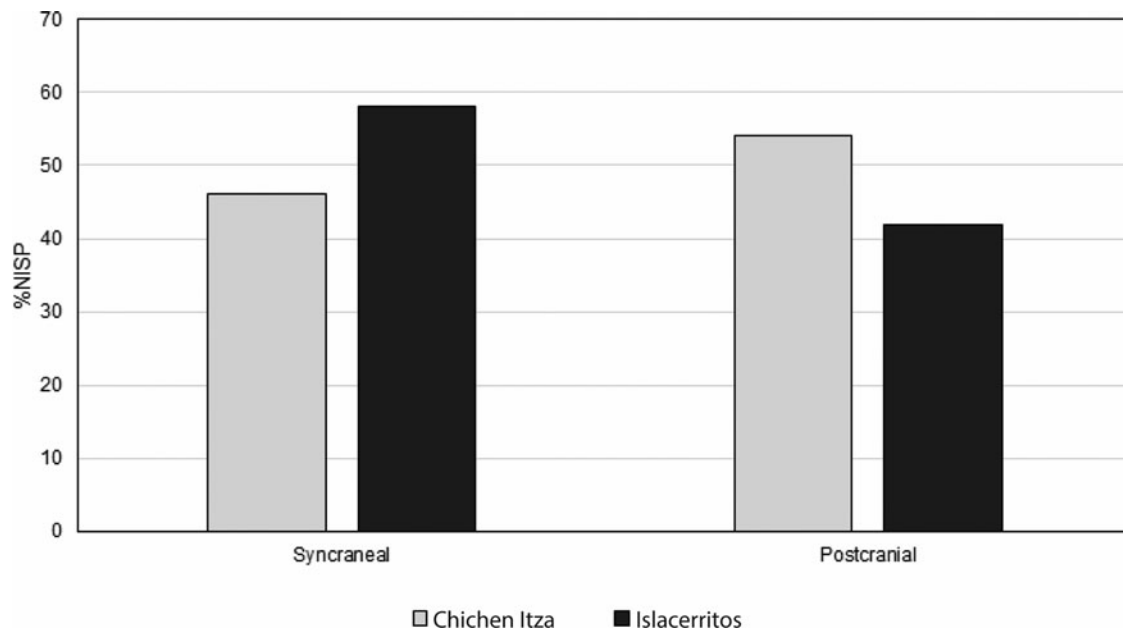


Figure 8. Bony fish skeletal frequencies at Chichen Itza and Isla Cerritos.

On the other hand, bony fish, in general terms, had similar skeletal frequencies at both sites, with the presence of complete skeletons (Figure 8). The presence of cranial elements at IC is higher, while postcranial elements, such as fins and vertebrae, are slightly more abundant at CI. As most of the bony fish identified at CI are natural inhabitants of the Cenote, the skeletal frequency from both sites indicates a pattern of local signature.

A similar pattern of element representation is present at both sites regarding cartilaginous fish. Shark teeth, vertebrae, and stingray caudal spines have been reported at IC, and the same elements are also present at CI (Carr 1987a), although they are more frequent in their number of remains (371 NISP), as expected in a coastal site. At first glance, this might indicate the transportation of complete animals to CI. However, in the case of cartilaginous fish, the number of remains is very limited, denoting the fact that specific elements were transported and selected, in accordance with the rituals taking place at the Sacred Cenote. This does not exclude the possible transportation of complete marine fish to CI or other sites, which were probably using salt for conservation purposes. At other inland Postclassic sites, such as Mayapan, estuarine fish were identified, and skeletal representation suggested the transportation of complete fish (Jiménez Cano 2017); a similar pattern might be expected for CI, but the evidence gathered so far is not conclusive and more detailed fish recognitions are needed to obtain a complete understanding of the matter.

As stated above, there is a lack of detailed skeletal element quantifications among other taxa. However, zooarchaeological descriptions are reporting the presence of marine birds wings and carapaces of marine turtles at the Sacred Cenote (Carr 1987a), and deer limb elements at the Ossuary, which points to the presence of incomplete skeletons for ritual purposes.

Overall, the zooarchaeological data suggest the transportation of animal parts sustained by the presence of incomplete skeletons in ritual contexts and relative frequencies in domestic spaces for consumption and reutilization.

CONCLUSION

Faunal assemblages from CI and IC are abundant and taxonomically diverse. The taxonomical composition was compared for the first time, allowing the understanding of animal exploitation of the Northern Maya capital and its coastal outpost during the Late Classic. According to the zooarchaeological evidence, several species were present at both settlements, suggesting a relevance in abundance and cultural significance. The shared species might outline a possible exchange of animals (or animal parts) between the two sites, but it is also likely that other inland and coastal sites were taking part in this process. For example, the use of coastal species (sea turtles, marine birds, sharks, and rays) has been acknowledged in ritual and funerary activities at CI, also bearing marks of the effects of fire and of artifact production. The presence of such animals in ritual contexts might be related to the belief of reminiscing life after death due to their aquatic nature, as this environment was conceived as the origin of the universe in ancient Maya cosmogony.

These species are present in all contexts at IC, as should be expected for a coastal site. Due to skeletal elements of coastal animals also being found in the Sacred Cenote, a possible exchange of marine animal parts to inland sites may have been taking place, as proposed by different authors (Jiménez Cano 2017; Newman 2016). IC's taxonomic profile recorded "exotic" fauna, represented by land animals that do not usually inhabit coastal environments. The introduction of wild terrestrial animals to the island environment usually has a potential impact on resident animal populations and vegetation (Grayson 2001). However, it might be possible that the carriers at IC just moved animal parts and not live animals, as is shown by zooarchaeological records, with a high presence of meaty parts such as legs.

It is also interesting to note the existence of similar artifacts manufactured from deer bones at both sites. Shared artifact typologies have been registered for ceramic and lithic (Andrews et al. 1984,

1988; Braswell 1997; Cobos et al. 2007, 2010)—the first time that this relationship is also recorded in animal bone artifacts. Although the worked bone remains indicate similarities in bone manufacturing, the evidence is still scarce. More typological studies are needed to assess the presence of these artifacts in the goods transportation network between Chichen Itza and its coastal outpost.

On the other hand, despite the similar pattern of taxonomical and skeletal profiles at both sites, the degree of participation of different settlements in the transportation of animal parts is still to be determined. In this sense, ancient inhabitants were likely capturing animals exclusively for their transportation from IC to CI and vice versa, but it is also possible that other localities provided the two settlements with those elements. This is particularly important, as CI controlled the northern Yucatan coast and small inland sites (Andrews et al. 2003; Andrews V and Sabloff 1986; Cobos 1998, 2004, in this Special Section; Cobos and Winemiller 2001), which, at the same time, might have contributed to the commercial network with meat from coastal and terrestrial animals.

From an ecological perspective, animal exploitation at both sites was characterized by an opportunistic capture of fauna within accessible and rich environments. The exploited environ-

ments included estuarine and neritic waters, which are home to a high diversity of animals. Such areas are used as nursery and reproductive locations and are thus highly productive for animal exploitation. Terrestrial animals indicate the exploitation of low deciduous forest and milpa areas that attracted animals such as deer and small mammals. Hunting and fishing were likely conducted all year round, although more detailed seasonality studies are needed to recognize if specific taxa were captured during specific seasons of the year.

This article represents the first approach to understand animal consumption at Chichen Itza and Isla Cerritos. The zooarchaeological data point to an established relationship between the two sites, including exploitation, utilization, and transportation of animals. At the same time, results allow us to expand our perspective concerning human–animal relationships in the archaeology of Chichen Itza and its regional influence, as these processes have remained understudied from a zooarchaeological perspective. Furthermore, this contribution sets the basis for future zooarchaeological studies, exposing the need for methodological standardization that can allow further research on the regional implication of faunal exchange activities during the Terminal Classic in the Northern Maya Lowlands.

RESUMEN

En este trabajo se presentan datos zooarqueológicos sobre el estudio de la utilización de animales en Chichén Itzá e Isla Cerritos. A través de la revisión de los registros zooarqueológicos, se perfila un patrón de uso diferencial entre ambos sitios, basado en el origen ambiental y los contextos de procedencia de las especies identificadas, dentro del cual destaca la importancia de las especies marinas en los rituales en Chichén Itzá. Además, se identifica una red de transporte tanto de animales, y partes de ellos, desde

el interior de Yucatán hacia Isla Cerritos, así como desde la costa del litoral marino hacia Chichén Itzá.

La evidencia zooarqueológica de Chichén Itzá e Isla Cerritos representa una fuente fundamental de información para repensar y profundizar el entendimiento de la explotación de ambientes y la utilización diferencial, tanto en la costa como hacia el interior de las tierras bajas del norte durante el período clásico terminal.

SUPPLEMENTARY MATERIAL

The supplementary material for this article can be found at <https://doi.org/10.1017/S0956536121000407>.

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