



Assessing the impact of ancient Maya animal use

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Summary

Tropical forest animals are at high risk worldwide as a result of over-exploitation and forest clearing. Zooarchaeological studies of animal use by the ancient Maya of the southern lowland regions of Guatemala, Honduras, Belize, and Mexico provide long-term historical information on animal populations under conditions of human population growth and climatic change that is valuable to both archaeology and conservation biology. In this paper, zooarchaeological data from 35 chronologically defined faunal sub-samples recovered from 25 ancient Maya archaeological sites are used to assess the effects of ancient hunting on animal populations of the Maya region between the Preclassic and Colonial periods (2000 BC–AD 1697). The variations in species abundance are used as a proxy for describing changes in ancient Maya hunting practices and hunted animal populations, interpreted on the basis of hunting efficiency models for foraging ecology. A significant reduction in the proportion of large mammals, particularly *Odocoileus virginianus*, in zooarchaeological assemblages between the Late Classic (AD 600–850) and Terminal Classic/Postclassic periods (AD 850–1519) suggest that over-hunting during the Late Classic may have led to a reduction in availability of these animals to the ancient Maya hunters in the later periods. This finding is discussed in relation to important social and environmental variations to evaluate the impact of hunting and other factors such as forest clearance and climate on ancient animal populations in the Maya region.

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Introduction

The question of human impact on fauna in the ancient Maya world is of current interest in both the biological and anthropological sciences.

Paleoenvironmental research has been combined with archaeological settlement and population studies to propose that human population growth and intensified use of forest and animal resources beginning with the first large settlements around 1000 BC and increasing rapidly throughout the Classic period (AD 250–850), coincided with a period of extended drought beginning around AD

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800. Taken together, these effects are thought to have limited the ability of the complex society to support itself using the depleted forest resources, particularly game animals (e.g., Abrams, Freter, Rue, & Wingard, 1996; Brenner, Rosenmeier, Hodell, & Curtis, 2002; Culbert, 1988; Curtis et al., 1998; Folan, Faust, Lutz, & Gunn, 2000; Haug et al., 2003; Hodell, Curtis, & Brenner, 1995; Islebe, Hooghiemstra, Brenner, Curtis, & Hodell, 1996; Leyden, 2002; Pohl, 1994; Rice, Rice, & Deevey, 1985; Santley, Killion, & Lycett, 1986; Webster, 2002). The mismanagement of environmental systems has been highlighted as one cause of the political and economic upheaval in ancient Maya society, beginning at the end of the 9th century AD that is termed the “Maya collapse”. This period, lasting for some 200 years, was characterized by a cessation of elite political activity and population dispersion away from urban centres in the southern lowlands of Guatemala and Honduras, but continuity of traditions at many northern Belize sites, and a florescence in the northern lowlands (Demarest, Rice, & Rice, 2005).

Zooarchaeological research has not revealed clear evidence of human caused extinctions on a regional or local scale in any pre-modern time period (for a direct investigation of possible extinctions, see Steadman, Tellkamp, & Wake, 2003), such as documented for some island faunal communities in the Pacific and Caribbean (Steadman, 2006; Steadman & Stokes, 2002). However, throughout much of the Classic period of Maya occupation, settlement was characterized by urban settlements and dense human populations. Impact on the fauna during this period included both hunting and forest clearance for settlement and agriculture, activities that undoubtedly affected faunal population sizes, distributions, and ecological community structure, while not causing the more obvious extinctions recorded in other world areas (for an example of the possible effects of habitat alteration on herpetological fauna in the Maya region, see Lee, 1996).

Foraging ecology presents one avenue through which human impact on animal populations can be explored where extinctions and extirpations are not evident. Foraging ecology research on predator/prey interactions has shown that predators selectively exploit large-bodied prey which provide the greatest or most efficient return of nutrients for expenditure of energy during hunting. When these prey become less available as a result of exploitation or other factors, predators turn to smaller, more diverse species (Griffiths, 1975; Stephens & Krebs, 1986, pp. 17–24). Ethnographic analogies of human responses to resource restriction indicate that human exploitation patterns mimic those of other predators (Colson, 1979,

p. 21; Dirks, 1980; Oliver-Smith, 1996). Hence, zooarchaeological data can be used to record shifts from low-diversity, large-bodied prey to high-diversity, small-bodied prey by ancient human hunters. Zooarchaeological abundance data can therefore be used as proxy evidence of a reduction in hunting efficiency as a result of resource depression (for excellent recent discussions, see Broughton, Mullins, & Ekker, 2007; Grayson, 2001).

In this study the proportions of large mammals, as well as just *O. virginianus*, relative to all vertebrates are used as proxy evidence for hunting efficiency and associated resource depression. Hunting efficiency and preferred prey abundances are assumed to have been high when large-bodied prey were predominant in the faunal assemblage. Reduction in hunting efficiency as indicated by an increase in small-bodied, diverse prey is hypothesized to reflect resource depression caused by hunting pressure, possibly in addition to other pressures. Foraging ecology models, such as hunting efficiency, are most appropriately used as evaluative tests, and the results must be viewed in the context of other variables likely to have had a role in the patterns seen in the data. Therefore, these results are presented in conjunction with a discussion of important cultural and environmental changes in ancient Maya history to assess the probable role of human activity in changing the relative abundance of animal species over time.

Analysis of these zooarchaeological data from Maya sites suggests the importance of archaeological research in providing a historical perspective on the animal–human relationships in the neotropics and the effects of that relationship on modern faunal populations and community structures. Details of animal population changes associated with the long history of Maya animal exploitation and habitat changes can assist with understanding the current status of biodiversity and ecology in the Mesoamerican neotropics. Conservation efforts can be facilitated by an understanding of the relationship between ancient human population growth, climate change, and impacts on animal populations as a result of direct exploitation and modification of forest habitats in this region. These data are found in the archaeological record and with sufficient study, may provide predictors for modeling the effects of modern activities.

Study samples

This study includes published and unpublished zooarchaeological data from 35 chronologically

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