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Zooarchaeology in Complex Societies: Political Economy, Status, and Ideology

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Abstract The zooarchaeology of complex societies provides insights into the interrelated social and economic relationships that people and animals created. I present a synthesis of zooarchaeological research published since the early 1990s that addresses political economy, status distinctions, and the ideological and ritual roles of animals in complex cultures. I address current approaches and applications as well as theoretical shifts in zooarchaeological practice. Research indicates there is great variability across space and time in how past peoples used animals to generate economic surplus, to establish status differentiation within societies, and to create symbolic meaning through sacrifices, offerings, and in feasts. The study of human/animal interactions in complex societies can contribute to fundamental questions of broad relevance regarding political and social life.

Keywords Zooarchaeology · Complex societies · Economy · Ritual

Introduction

Zooarchaeology contributes to our understanding of the interrelated social and environmental processes that shaped how people used animals in past civilizations. Animals, their meat, and the products they produced were essential for the development and survival of complex societies. The rise of inequality was accompanied by pervasive and fundamental restructuring of the relationship between humans and animals. Complex societies possessed hereditary inequality as well as multiple scales of hierarchy and rank (Marcus and Flannery 1996; Rosenswig 2000; Spencer 1993). Zooarchaeological remains can be used to understand how animals functioned in various realms and at different scales to

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provide food, to create commodities that denoted status, and to serve as ideological symbols of power. The local laboratory of animals and the presence or absence of domesticated animals also are significant factors in how animals were used in complex societies. Zooarchaeology also can demonstrate humankind's ability to biologically manipulate animals for the creation of new species with desired traits. Social manipulation consists of how animals are perceived and treated as well as their symbolic and supraculinary transformation for ritual sacrifices, offerings, and interments.

In this essay I focus on three broad themes. First, I examine the political economic uses of animals for the accumulation of capital and elite wealth, for social control, to increase or augment other forms of economic specialization, or for other political advantage. Second, I examine how animals or their consumption reflect community, household, or personal wealth and status. Third, I address the ideological and ritual uses of animals to understand how beliefs about animals are manifest in the archaeological record. Feasting serves both symbolic and political agendas but differs from animal management and therefore is considered along with ritual. I address political economy, status, and ritual animal use separately, followed by a discussion of crosscutting themes and methodological issues that can affect interpretation. I also present suggestions of how zooarchaeology can move closer to the anthropology of food and foodways.

I use the synthesis of zooarchaeology and complexity by Crabtree (1990a) and the study on foodways in complex societies by Gumerman (1997) as the foundation for this essay. Crabtree (1990a) examined issues related to trade, social status, and ethnicity in prehistoric and historical assemblages, including post-1492 assemblages of the Americas. Gumerman's (1997) analysis was focused broadly on foodways in general, as opposed to only animal remains, with a topical focus on the social and symbolic role of food. Building on these studies, I compiled zooarchaeological information from various chiefdom and state-level societies with an attempt at global representation. I include studies of animal use in early village-level societies where complexity later developed. I also include historical studies related to medieval Europe up to colonization of the Americas. And I review zooarchaeological studies in which the temporal framework postdates European colonization of the Americas but the faunal data are associated with indigenous populations as opposed to Europeans. Landon (2005) recently reviewed historical zooarchaeology; therefore, I do not include European settlements.

Because Crabtree's (1990a) review was devoted to zooarchaeological data almost exclusively, I review the literature published after that work. Given space limitations, however, it is not possible to include all relevant works, particularly technical reports that contain chapters with zooarchaeological findings. Also, I selected chapters from zooarchaeology edited volumes that I thought had broad appeal. I hope that the discussion of general zooarchaeological trends compensates for the omission of particular case studies.

In the last 20 years there have been significant theoretical shifts in archaeology. In zooarchaeological research this debate focuses on the primacy of environmental/ecological, demographic, and economic explanations versus social, historical, and symbolic causal explanations (Crabtree 2004; Emery 2004a; Hesse 1995;

MacDonald 1991; O'Day et al. 2004b; Rosenberg and Redding 1998; Zeder 1994). While many recent studies emphasize social factors, symbolism, and ritual, the nature of the zooarchaeological database has obligated researchers largely to remain grounded in empirical observation (Hesse 1995; Serjeantson 2000). Although zooarchaeologists seek to discern *patterns* in past animal use that reflect behavior in general, current practices often emphasize local/particularistic and historical/social conditions (see Hesse 1995; Twiss 2007). The social perceptions and meanings associated with animals are recognized as significant (O'Day et al. 2004a). At the same time, the documentation of local environmental conditions and societal economic strategies continues to be important.

My survey of zooarchaeology in complex societies demonstrates that there are diverse manifestations across space and time in regard to how animals are used for political motives, status, or as objects of ritual value. Although complex societies possess many similar organizational characteristics (i.e., rank, inequality, and different spheres of hierarchy), there are very few uniform correlates in terms of methods of production and distribution, status value of animals, or the ideological roles that animals play. Often, only very broad generalizations concerning animal use are possible within cultural regions (e.g., the Maya region) or for specific time periods within regions (e.g., medieval Europe). Because of the spatial variability present at most complex sites, interpretations commonly require that faunal remains originate from contexts with well-defined functions. And methodological issues related to recovery and analysis as well as how results are reported can distort the relationship among contexts or between assemblages; therefore, comparisons often need to be circumscribed. Although zooarchaeologists desire to make their results relevant to questions of broad interest to nonspecialists, many studies are focused narrowly. As this essay demonstrates, numerous studies present meticulously analyzed data along with creative and insightful interpretations of how animals were used in complex societies; however, few researchers address economic issues in tandem with ideological ones. In order to generate interpretations that many archaeologists working on complex societies would find relevant, more zooarchaeologists should consider how animal use was manifest in the distinct, but interrelated, political and ideological realms.

Zooarchaeology and political economy

One of the hallmarks of increasing social complexity is the emergence of political elites who managed the economic affairs of the society, including how animals were used. In order to increase their own personal wealth and that of the society, elites oversaw economic activities that were designed to generate capital or finance for the society (Brumfiel and Earle 1987; D'Altroy and Earle 1985; Earle 1987). In addition, the transformation of labor through elaborate food production was both a manifestation of political power and was used to amass greater control (Bray 2003b; Leach 2003; Nelson 1998; Pohl 1994). Occupational specialization in the form of either part-time or full-time laborers, craft workers, or administrators eventually

resulted in large segments of the population no longer involved in their own subsistence needs. These individuals needed to be fed.

There is great intrasocietal variability in how either elites or political administrative bodies functioned to establish their preferred economic practices, dictate the activities of part-time or full-time food-producing specialists, or feed the various clients under their charge. There is significant variability in the politics of animal use depending on the scale, geographic setting, and strategies/goals of the political unit; urbanism *per se* is not the defining feature that creates either a managerial or a political apparatus. Centralized control and elite involvement with animal production is greatest when animals provide secondary products (i.e., renewable products extracted over the animal's lifetime [Sherratt 1983]). Also, in instances where individuals were separated from either their own kin or from systems of local production in order to perform state-required labor or military tasks, the procurement and distribution of foodstuffs was done by administrative service or attached specialists; however, local production could be highly variable. The use of animals for political economic advantage also is prevalent in risk management strategies of the state—where animals and the food they provided served as real sources of food or *apparent* ones to prove the benevolence of the political apparatus. In many instances there is an absence of centralized food production and distribution, thus indicating that political bodies relied on local systems of production. And as some examples indicate, commoners manipulated food systems to their advantage, particularly in rural or more isolated settings where they were not under direct control nor fearful of sanctions.

I organize this discussion by cultures within geographic regions. Following a discussion of regional manifestations, I summarize recurring themes related to political economic production and distribution of animals and animal resources.

Political economy and animal use in North America, the Caribbean, and the Pacific Islands

In eastern North America the greatest political organization is found in the Mississippian chiefdoms that emerged late in the prehistoric period. In the absence of domesticated or managed fauna and the apparent absence of full-time specialists, Mississippian elites garnered the greatest political economic capital through feasting rituals as discussed below. Feasting involved assembling and redistributing meat along with the probable mobilization of labor and collection of nonfood tribute.

Although feasting and labor projects, presumably accompanied by eating and drinking, were characteristics of Mississippian society, centralized production and distribution of animals is not evident. According to Muller (1987, p. 21), true specialists and the production of staple finance appear to be absent from Mississippian society; however, in some cases the elites were able to use their political leverage to acquire and consume better-quality meat and a greater variety of foodstuffs (Jackson and Scott 1995, 2003; Kelly 2001; Pauketat et al. 2002; Welch and Scarry 1995). In other settings the animals and portions of animals that villagers consumed were similar, showing little distinction (Zeder and Arter 1996). Commandeering the best for oneself or your lineage is not simply a reflection of

wealth, status, or prestige but denotes political power. Local production supported chiefly status differentiation and feasting that in turn augmented political power.

Similar to eastern North America, chiefdom societies arose in the Pacific Islands and Caribbean. Islands are unique in geography and cultural systems. Despite high faunal diversity in both the Pacific and the Caribbean, the tropical island settings limited animal intensification (Kirch and O'Day 2003; Newsom and Wing 2004); however, elites manipulated the biological diversity to their advantage without centralized, direct control. The more elaborate and better-documented Pacific Island societies had larger domesticates, including introduced pigs and dogs as well as chickens (Kirch 1997). In the protohistoric period, Hawaiian Island chiefs demanded animal meat as tribute for consumption in feasts and elite meals thus creating social distinctions or status differences (Kirch and O'Day 2003; Kolb 1994); however, domesticated dogs and pigs also functioned as sources of capital or wealth (Leach 2003). Very little is known about the spatial management of dogs and pigs in later prehistory, particularly for the paramount chiefdoms of the Hawaiian Islands. As was seen in Mississippian societies, an Oceanic chief's possessive control over the productive economy is linked to ritual feasting. In the Hawaiian example chiefly manipulation of ritual foods involved a shift from fish to pigs with repercussions beyond ritual use to animal husbandry (Kolb 1994).

In the Caribbean at the time of Spanish contact, chroniclers identified the political organization on Hispaniola as a redistributive chiefdom in which rulers oversaw the collection and distribution of food and craft materials (Deagan 2004, p. 600). Only at the site of En Bas Saline in modern Haiti has archaeological evidence for a chiefly village been identified and excavated (Deagan 2004). Intrasite variability in faunal data reflects status differences as discussed below, but evidence for redistribution is equivocal. In contrast to the Pacific Islands, no large mammals were reared or imported as sources of food or wealth in the Caribbean. The possible intensified exploitation of small mammals (e.g., hutias and imported guinea pigs) may have created resources that could be either demanded by elites or serve as high-status foods. At present there is no contextual evidence that these animals served as sources of capital. Furthermore, they do not appear to have been subject to sumptuary laws or restricted to elite members of society (deFrance in press; Newsom and Wing 2004); therefore, political economic control of animal foods is not seen in the Caribbean despite ethnohistorical accounts of legitimated inequality. Fishing intensification may have served to create a surplus that could be used for political advantage. Future zooarchaeological analyses should address whether people in the Caribbean used animals to generate wealth and political control.

Political economy and animal use in Mesoamerica

The Maya region of southern Mexico and northern Central America shows considerable variability in faunal use between political centers with no indications of direct elite control in the regional distribution of animals or meat. The Maya possessed domesticated dog and turkey, both of which were raised on the household level of production. Hunting wild animals, particularly deer and peccary, provided a significant portion of meat, as did smaller wild mammals, freshwater turtles, fish,

and shellfish, wild birds, and marine fish (Emery 2004f; Pendergast 2004; Wing 2004). Turkey, dog, deer, and some fish were very important in ritual as well as diet. Zooarchaeological data suggest that local political control dictated animal use, land management, and trade; however, the empirical correlates of these practices are often difficult to identify (Teeter and Chase 2004, p. 169).

The decentralized control of Maya animal products for subsistence and probably other uses parallels that of other commodities during the Classic period, whereby noncentralized marketing and reciprocal exchange are thought to have prevailed in lieu of regional centers, marketplaces, or supply zones (Rice 1987, p. 85). Despite the scale and complexity of Maya exchange systems linking urban centers, subsistence goods and animal products for food, ceremonies, and other uses were not centralized; however, certain animals and animal products, especially those important for ritual and autosacrifice (e.g., marine resources including stingray spines and marine shellfish used for bloodletting), circulated within elite spheres only (Beaubien 2004; Maxwell 2000; Moholy-Nagy 2004). Territorial hunting rights and overall consumption of meat from large mammals appear to have been elite prerogatives (Pohl 1994, 1995; Teeter 2004), although commoners regularly consumed meat from various smaller animals (Emery 2004e; Healy et al. 1990; Masson 1999, 2004; Powis 2004; Teeter 2004; Wing and Scudder 1991). Pohl (1994, p. 121) argues that the elaboration of meat eating by the upper stratum paralleled other Maya elite consumption habits such as craft production. Thus meat circulated as a commodity or as a source of wealth. Researchers see continuity through time in faunal use with much local variability (Masson 2004; Teeter 2004), although characterization of an overall "Maya diet" remains problematic (Emery 2004f). Faunal remains consistently reflect local biogeographic conditions and social rank, but correlations with occupational specialization are not evident (Emery 2004e; Pendergast 2004; Wing 2004).

The question of animal management in the Maya region commonly focuses on deer and dogs. Deer management and possible rearing by women are discussed as either a means of increasing meat supply to large populations or rearing and fattening deer for ceremonial use Teeter and Chase 2004, pp. 164, 166; Tozzer 1941, p. 127; White et al. 2001b; Wing 2004). Unfortunately, zooarchaeological data indicating deer management are rare and complicated by taphonomic factors that may bias against the best evidence for deer management—unfused skeletal remains of prime-age subadult deer with maximum body weight (Carr 1996, p. 257). As Carr (1996) documents, the archaeological correlates of deer husbandry will require careful analysis of archaeological contexts and animal mortality profiles along with knowledge of taphonomic variables. Researchers also are now examining the isotopic signatures of deer and dog skeletal remains from contemporaneous Belizean sites (Colha, Cuello, Altun Ha) to determine if these animals were supplemented with food or fed directly by humans (Tykot et al. 1996; White et al. 2001b and references therein; White et al. 2004). At the site of Lagartero the isotopes of deer and dog indicate these animals had maize diets, which suggests that people fattened them prior to consumption (White et al. 2004).

From a behavioral and management standpoint, dogs are a much better candidate for intensification with a long history of consumption as well as ritual sacrifice in the

Maya region (Clutton-Brock and Hammond 1994; Emery 2004e; Flannery and Marcus 2005; Pohl and Feldman 1982; Teeter 2004; Wing and Scudder 1991) and Mesoamerica in general (Flannery and Marcus 2005; Middleton et al. 2002; Wing 1978). The value of dogs for both their symbolic meaning and as a potential risk management or security food to ensure political stability appears to be underappreciated despite recognition that the Maya used a significant number of dogs (Pendergast 2004, p. 244). The dual role of dogs for ritual sacrifice and for consumption is a potential avenue of greater study.

In regard to periods of political instability and the "Classic Maya collapse," there is neither evidence of resource depletion that necessitated a political response nor the identification of starvation foods in deposits that postdate the Maya "collapse" (Emery 1997, 2004a, c; Emery et al. 2000). However, elite mandates or restrictions may have been relaxed, altered, or ignored in periods of political decentralization and hiatus whereby commoners might have hunted (or poached) animals such as large game typically reserved for elites (Pendergast 2004, p. 242). Identifying such activities and human response to political upheaval remains difficult. Various researchers address future goals and challenges of Maya zooarchaeology (Chase et al. 2004; Emery 2004a, b, c, e, f; Pendergast 2004; Teeter and Chase 2004).

The political economic uses of animals in other areas of Mesoamerica are less well known. In the Valley of Oaxaca analysis of faunal remains, bone tools, and bone ornaments from the Classic period sites of Palmillo and Ejutla demonstrates that production of crafts for the larger economy was unique at each site (Middleton et al. 2002, p. 246); there is no evidence for state directives in either the production or distribution of animal meat, utilitarian objects, or decorative bone products. The economic relationship between animals for subsistence and animals providing bone or teeth for crafts and bone tools is a topic of great relevance to complex society (see Choyke et al. 2004; Gidney 2000; Isaakidou 2005; Janusek 1999), but it is poorly understood. Often bone artifacts are separated from the faunal material (and the zooarchaeologist) for functional rather than taxonomic analysis. Understanding the economic transformation of bone requires careful quantification of bone specimens in order to distinguish either the removal or the addition of bone to an assemblage from possible taphonomic destruction of bone (see Middleton et al. 2002).

Political economy and animal use in the Andean region

The geographically diverse Andean region of South America gave rise to complex states whose economies often reflected the interplay between coastal exploitation of marine resources and agropastoralism, including domesticated camelids. Llamas and alpacas were the foundation of a diverse pastoral economy in which secondary uses included transport and products of fiber and dung along with their meat and hides (Bonavia 1997; Mengoni Goñalons and Yacobacci 2006; Wheeler et al. 1995). The central Andes also possessed domesticated guinea pigs, dogs, and the Muscovy duck. Of these the guinea pig had the most diverse role, serving for food, ritual, and medicine (Rofes 2000, 2004; Rofes and Wheeler 2003; Sandweiss and Wing 1997). The role of these animals in the political economy of Inca civilization, earlier states, and formative societies varied through time.

The Inca empire (A.D. 1440–1532) covered an extensive territory that encompassed over 10 million subjects representing at least 80 different ethnic groups (D'Altroy 2002). The Inca took control of all lands, herds, and resources but allowed household production to continue (Earle 1987). Ethnohistorical sources indicate that almost 40% of the subject population was engaged in labor service (e.g., as guards, retainers, porters, soldiers, litter bearers) (D'Altroy 1994, p. 182). All of these individuals needed to be fed. How did provincial managers and elites collect, store, and redistribute foodstuffs?

In some cases local specialization was established centuries or more prior to the Inca. Stahl (2003) demonstrates that domesticated camelids as well as guinea pigs were established in Ecuador by the second millennium B.C., long in advance of Inca expansion into the region. Remains of these animals are found only infrequently and in association with elites who participated in the trade of colorful thorny oyster shell (*Spondylus*), thus reflecting a complicated process of domesticate adoption rather than the diffusion of an animal for meat or other uses (Stahl 2003, p. 479).

In their analysis of faunal remains from the habitation areas surrounding the public ceremonial center at the Initial and Early period Peruvian highland site of Chavín de Huántar, Miller and Burger (1995) document the rise of interdependent specialized economies. Using camelid biometric data, local environmental conditions, diachronic changes in animal remains, and body part representation—an abundance of camelid limbs but few crania and feet—they argue that residents at Chavín traded agricultural products grown near the site for *ch'arki* (freeze-dried camelid meat) and fresh camelid meat that was produced by pastoralists in high-elevation habitats. This vertical interdependence with pastoralists reflects the spread of the Chavín religious sphere of influence on trade and contact (Miller and Burger 1995, p. 442). Meat entering the site fed nonfood producers, local elites, pilgrims, and the priestly functionaries. The managerial aspects of this system are not identified. Although this scenario is not without criticism (Stahl 1999; Valdez 2000), Miller and Burger (2000) argue the ch'arki effect (i.e., trade in dried camelid meat) constitutes a parsimonious explanation for the faunal assemblage. This debate highlights the need for detailed taphonomic data along with knowledge of local variability in animal processing and preservation.

By the 6th century A.D. late Moche state society on the central Andean coast included both camelid pastoralism along with a hake and sardine fishing economy that is identified as industrial (Roselló et al. 2001). The quantity of fish remains from excavations in the urban zone of the Moche capital is so plentiful, Roselló et al. (2001) argue, that fish must have been distributed in markets, but no evidence for markets is presented. Because of the modern emphasis on the excavation of rich Moche tombs, habitation areas with faunal remains are less systematically studied (but see Campbell 2000; Gumerman 2002).

In the southern Lake Titicaca Basin, pastoralism and intensive lake fishing supported prestate societies during the Formative period (ca. start of the common era) (Capriles et al. in press; Moore et al. 1999). Subsequently, camelid pastoralism served as the foundation upon which the pre-Inca Tiwanaku state supported itself (Webster 1993; Webster and Janusek 2003). The zooarchaeological materials from Tiwanaku sites outside the highland capital are poorly studied; however, there is no

indication that the state centralized the distribution of foodstuffs, altered local pastoral economies, or introduced new animals as part of state expansion.

Complementary to Tiwanaku, research at the Middle Horizon provincial Wari sites of Cerros Baúl and Mejía in southern Peru provides evidence that the state relied on local, probable household production as well as the importation of fauna. The inland administrative center of Cerro Baúl contains diverse exotic fauna, particularly fish (Moseley et al. 2005), as well as camelid remains with coastal isotopic signatures (Thornton 2003). Comparisons of the fauna from Cerro Baúl with that from Mejía demonstrate significant differences in consumption practices between administrative versus craft production centers (Moseley et al. 2005). The importation of exotic fauna augmented status difference rather than providing subsistence staples. Elsewhere in the Wari empire at the site of Conchapata, isotopic data from llama and alpaca remains indicating that these animals were reared in distinct habitats are interpreted as demonstrating a state-implemented policy of specialized agropastoral production (Finacune et al. 2006).

Zooarchaeological data from Inca-period sites are relatively rare considering the extent of the empire; therefore, researchers commonly cite ethnohistorical accounts suggesting that meat consumption, particularly of ch'arki, was a luxury reserved primarily for special occasions, feasts, and the military (Bray 2003b; Stahl 1999). These ethnohistorical accounts are treated uncritically and projected back in time to earlier periods such as the Middle Horizon (Cook and Glowacki 2003). In the few instances of empirical faunal data from late sites, animal remains suggest that meat was relatively common (Capriles et al. in press; deFrance 1993, 1996; Sandefur 2001); however, the rural nature of these assemblages makes generalizations to the entire society difficult. Also, since we do not know how many people were present or how long these sites were occupied, estimates of meat consumption are problematic. For example, at highland rural Xauxa in the Upper Mantaro Valley of Peru, diachronic faunal data from elite and commoner households of the Wanka ethnic group reveal that meat consumption of domesticated camelids as well as hunted animals was common prior to Inca colonization and that meat use, particularly of camelids, increased following Inca settlement (Sandefur 2001), possibly reflecting an equalizing effect of conquest at the household level. Inca expansion to the tropical Amazonian region also took advantage of established practices. At the site of Yoruma in eastern Bolivia, a relatively small sample of faunal remains associated with the chiefdom-level Yampara and Yampara-Inca reflect no clear indications of state provisioning or changes in faunal use with Inca settlement (Capriles et al. in press).

In the southernmost reaches of Inca expansion, sites in the Calchaquí Valley of northwestern Argentina show increased agropastoralism following Inca settlement (D'Altroy et al. 2000). A comparison of faunal data from the pre-Inca site of Valdez and the Inca site of Potrero de Payogasta shows that people used similar taxa, particularly llamas and vicuñas, but at the Inca settlement more camelids were butchered at their prime age for meat yield, whereas pre-Inca camelid use shows some animals were kept until old age after their utility as either wool producers or for transport had declined. D'Altroy et al. (2000, p. 19) interpret these findings as

demonstrating state ability to affect differential access to food under regional Inca control.

Coastal specialization in fishing has very ancient roots that are associated with the origins of complex society in central Peru (Moseley 1975, 1992; Shady Solís 2003, 2005). Millennia later coastal specialization provided an important component to Inca expansion. In the later half of the 15th century the coastal Kingdom of Huarco in the Cañete Valley was incorporated into the Inca empire. Excavations at the site of Cerro Azul explicitly tested whether coastal economic specialization existed prior to conquest by the Inca or whether the Inca imposed an extractive economy (Marcus et al. 1999). Specialized fishing, drying, and trade in anchovies and sardines were established at Cerro Azul prior to Inca colonization; therefore, the Inca were able to take economic advantage of the existing fishing infrastructure (Marcus et al. 1999, pp. 6569–6570).

A similar pattern of coastal specialization is documented by Sandweiss (1989) at the site of Lo Demás in the Chincha Valley. There segregated living space separated the laboring fisherfolk from elite fishing lords and their retainers. As Sandweiss (1989, p. 552) maintains, highland Inca would not have possessed traditional knowledge of fishing; therefore, subsuming existing fishing-focused polities under their control was the most logical strategy. Unknown aspects of Inca coastal specialization are the identities of the inland trade destinations and the people who consumed coastal fish products, how were they distributed, and how did caravan travel and trade change under Inca rule?

Many questions remain regarding how the Inca provided for the many subjects in the empire. Researchers have yet to identify or analyze faunal remains clearly associated with laborers, military, or the myriad service providers. Faunal data are needed both from large primary urban centers associated with Inca nobility and from other ethnic enclaves under Inca control. There is little empirical information on the diversity of fauna that circulated in the empire and whether elites imposed sumptuary laws and hunting restrictions as are noted in some ethnohistorical accounts such as Cobo (1979) or Garcilaso de la Vega (1994). Researchers also need to evaluate independently the validity of ethnohistorical texts with zooarchaeological data. In contrast to the Americas, research in many regions of the Old World rely on texts and documentation.

Political economy and animal use in Southwest Asia, the Near East, and Africa

A very thorough study of the role of centralized government in the distribution of meat to urban residents is Zeder's (1991) analysis of faunal remains from the Near Eastern site of Tal-e Malyan in the Kur River Basin in southeastern Mesopotamia. Although Crabtree (1990a) presents a summation of these data, Zeder's study warrants discussion here because it serves as a model for many subsequent analyses of economic provisioning. Using faunal remains from contexts spanning urban origins, urban florescence, and decline (c. 3400-900 B.C.), Zeder (1991) tests whether early urban residents acquired meat directly or whether residents were provisioned indirectly by state-established systems. According to the model, as urban society develops, centralized government, social stratification, and specialized

economy should give rise to efficient systems of animal management in which nonfood-producing specialists are provisioned with food. The analysis of faunal remains in light of explicit zooarchaeological correlates of direct versus indirect provisioning, including species composition, age and sex, and butchering practices, indicates that meat arrived to Malyan's residents through indirect channels. By establishing empirical criteria for direct versus indirect provisioning, Zeder (1991) is able to document variation in the faunal composition through time that reflects urban political shifts, elite preferences, and the external relationships of urban dwellers with rural producers. The result is a detailed historical analysis of Malyan and specifics regarding changes through time in the use of goats, cattle, and sheep. The study also raises many interesting questions regarding the systems of management that existed in outlying villages where the rural, lower-status producers resided. As Zeder (1991, p. 249) acknowledges, the zooarchaeological remains from urban contexts are best for understanding distribution and the end-product, while rural settlements are best for examining management.

This influential study prompted other researchers to examine questions related to household production, state demands, and animal provisioning. Allentuck and Greenfield's (in press) analysis of the early Bronze Age fauna from two low-status neighborhoods at Titriş Höyük, Turkey, at the western edge of the urban settlement, indicates that caprines were provisioned through indirect means while households exhibited variation, particularly in regard to the use of cattle. The distant location of Titriş Höyük and its relative early age in the rise of urbanism in this region are cited as having allowed its residents greater flexibility. In contrast, greater urbanism and increased specialization can be offset by tribute demands that negatively affect the producers. Wattenmaker (1994) shows that local consumption in nonelite households at Kurban Höyük, Turkey, suffered under state control. Prime-age market animals were moved on the hoof while older sheep and goats were consumed locally; there were no "trickle-down" benefits for Kurban households. Increased pastoralism for the tribute economy eventually resulted in environmental degradation. Wattenmaker (1994) suggests that the steady deterioration of nonelite households may have contributed to societal collapse by the third millennium B.C.

Focusing on the social processes involved in the transition from hunting to agropastoralism, Zeder's (1994) analysis of faunal and archaeobotanical remains from Umm Qseir located in northern Mesopotamia emphasizes local social history and environmental forces. Neolithic populations in this marginal habitat are characterized by dietary eclecticism, whereby residents created a mixed economy of hunted wild animals along with the rearing of caprids and pigs. People tailored the adoption of domesticates in a complex web of interaction and reciprocity with farmers, thus indicating the interrelated social forces in the transition to food production (Zeder 1994, p. 120).

Political economic topics addressed in studies in Israel and the Levant include the effects of hegemonic expansion on animal use, economics of local animal use, and trade (e.g., Bar-Yosef and Mayer 2005a, b; Fradkin 1997; Greenfield 2004; Horwitz 2002 and references therein; Horwitz and Milevski 2001). Faunal remains, pottery, and GIS data from Nahal Tillah, a site associated with the Egyptian colonization of the southern Levant during the Early Bronze I and IB (3600-3000 B.C.), reveal that

animal use by foreign colonists did not reflect economic might or the ability to demand quality meat portions (Kansa et al. 2006). The Egyptians were integrated into Levantine society, possibly as a hybrid or "creole" culture, thus indicating that integration over imposition was present at the margins of colonization and exchange networks (Kansa et al. 2006, p. 90).

Within Israel, Lev-Tov (2000a, in press) examines how animals helped empires accumulate wealth. Faunal remains from Tel Miqne-Ekron document diachronic shifts in the dietary and economic uses of sheep and goats from the Bronze Age to Iron Age II. By the 7th century Ekron was incorporated into the larger Neo-Assyrian empire where seasonally complementary high-bulk but low-value commodities of locally produced cloth and olive oil were traded to Egypt in exchange for Nile perch. According to Lev-Tov (2000a, in press), animals moved from the kitchen and pasture to markets and market economies.

Egyptian faunal remains ranging in age, from the origins of village life to highly complex urban centers, are used to document diachronic shifts in animal management and distribution. Rossel's (2007) analysis of faunal material from village contexts at el-Mahâsna and South Abydos in Upper Egypt shows that a centralized bureaucracy with provisioning functions was in place during the Predynastic period. In a very processual analysis, Rossel proposes that paleoenvironmental changes, not political ones, facilitated the rise of a redistributive economy through time. The basic character of the subsistence system, including greater use of cattle than either sheep or goats, was established early. A symbiosis between animal production and crafts led to increased population. Changes in climate along with greater political structure necessitated reorganization of existing practices, not the implementation of a new system (Rossel 2007).

The conscription of workers for pyramid construction during the Old Kingdom parallels the Inca *mita* system of labor tax, where able-bodied males were required by the state to work on various construction and agropastoral projects. In contrast to the Inca state where we have no empirical zooarchaeological data of how these individuals in state service were fed, large-scale excavation and analysis of faunal remains from the workers' barracks and various other sectors at Giza document how the Egyptian state provisioned its workers during the Old Kingdom period of pyramid construction by Pharaoh Menkaure (Redding in press). Comparisons of animal remains from a deposit associated with a royal residence or administrative building with those from the workers' residential refuse site reveal that workers were provisioned with least desirable goat, sheep, and catfish, including some examples of rationlike portions. Elites consumed greater amounts of beef and Nile perch. Workers were able to raise some pigs for their own consumption, but other meat was distributed. There is no indication that workers had the freedom or luxury to hunt wild animals or to diversify their diet (Redding 1991, in press).

Animal remains associated with Egyptian butchers under state control reflect their self-interest in maximizing meat return. Butchering patterns on animal remains from the Workmen's Village outside of Tell el-Amarna, a New Kingdom city founded by King Akhenaten, indicate that individuals with anatomical knowledge used labor-intensive methods to carefully butcher pigs and goats primarily with knives, thus resulting in little waste or bone damage (Luff 1994). Some fresh meat

from these animals was used locally, but much of it was traded to the city as evidenced by the absence of hindlimbs. Butchering evidence and body-part representation can be used to identify distribution patterns in urban settings as well as how workers and laborers manipulated state demands to their advantage.

The ambiguous economic role of pigs as animals appropriate for household production, but not for state provisioning, has received attention in Southwest Asia and Egypt. According to Redding (1991), pigs were present in Neolithic, Predynastic, and Old Kingdom occupations, but by the Middle and New Kingdoms local families predominantly raised and consumed pigs while cattle, sheep, and goats became state resources. The inability of pigs to generate a surplus (i.e., secondary products) that could be manipulated by the state made them less desirable for intensification, but their rapid reproduction, high meat yield, and ability to thrive while spatially confined made them ideal for family use. Similar to trends in Egypt, evidence for pig rearing at Tell Halif in the Levant indicates that household production of pigs served as a hedge or buffer against state-provisioning shortfalls (Zeder 1998). Households could control their own meat supply and be subsistence independent regardless of state efforts to discourage domestic autonomy (Zeder 1998, p. 119). Faunal data from Middle Bronze age deposits at Tell el-Hayyat located in the southern Levant in modern-day Jordan also demonstrate a similar pattern of increased household pig husbandry during a time period of rising urbanism and integration into regional markets (Falconer 1995). These studies reveal that communities and individuals were able to implement personal subsistence and economic decisions that were sometimes counter to state economic goals.

The zooarchaeology of complex societies in sub-Saharan Africa has received attention recently; however, in comparison to other regions, the publication of data from complex African sites remains limited. At Axum in Ethiopia, Cain's (1999, 2000) analysis of faunal remains from various nonelite domestic structures dating to the first millennium A.D. indicates indirect provisioning in which meat from external producers was redistributed throughout the site. Although cattle were the most important animals serving as food, labor, and a source of wealth, people also used sheep, goat, chicken, and domestic equids in addition to lesser quantities of fish, wild bird, and some wild animals including ivory producers. Data on the exploitation of wild animals and their role in trade and exchange in Axumite society is a unique and important contribution. Ongoing zooarchaeological research by Chet Cain in other areas of Africa will augment information for various regions.

Political economic use of animals in the Indus Valley and China

In South Asia zooarchaeological research in the spatially enormous greater Indus Valley, an area encompassing roughly 500,000 km^2, documents issues related to political development and the use of animals over several millennia (c. 7000 to 1300 B.C.) (Shaffer 1992). Long-term research focuses on the rise of pastoralism, including issues related to the emergence of specialized small-sized breeds of domestic livestock (Meadow 1991, 1996, 1999; Meadow and Patel 2002, 2003; Patel 1997). Although much research documents the important role of cattle, water

buffalo, sheep, and goats, many questions remain concerning how, where, and by whom domestic animals were husbanded. As noted by Meadow and Patel (2003), there is a need for greater temporal representation, appropriate dating of contexts, and more systematic study of animal remains. Hunting and the role of wild animals in Indus Valley subsistence and as a possible indication of status are also of interest (Patel 1997; Thomas et al. 1997). The role of the local environment also is considered in regard to the animals documented in different assemblages (Meadow and Patel 2002, 2003).

The relationship of large bovids (zebu cattle and water buffalo) to agricultural expansion and the rise of urbanism are examined in conjunction with the secondary products of traction and transportation that these animals provide (L. Miller 2003, 2004). Using information from ethnoarchaeology, artifacts, and zooarchaeology, including patterns of animal pathology, L. Miller (2003, 2004) documents the use of cattle for traction at Harappa during the height of urbanism. Miller suggests that the utility of cattle for agricultural production and transport generated agricultural surplus giving rise to greater social hierarchy.

The specific role of craft production and meat in Indus Valley civilization also is a topic of recent study. Chase (2007) examines faunal remains from a provincial colonial site located in Gujarat, India. Colonists from the core region settled at Golo Dhoro (c. 2600–1900 B.C.), eventually establishing a characteristic walled compound to accommodate craft specialists who manufactured goods, particularly shell bangles. Faunal remains from within and exterior to the walled settlement indicate that the two segregated populations exhibited different preferences and consumption patterns of domestic meat (mutton, pork, beef), seafood (fish and crab), and wild mammals (wild equids, gazelle). Although residents of the walled compound are viewed as having a higher-status diet (i.e., greater variety, more wild animals, more mutton, more pork, more fish), colonization did not alter local systems of pastoral production. Residents within and outside the walled compound had direct access to animals, although some mutton was derived from indirect sources. The pastoral economy was resilient and conservative despite the economic and social changes brought about by colonization (Chase 2007, p. 269). The walled compounds of the Indus Valley are often interpreted as quintessential manifestations of the spatial segregation of elite members of a population who would impose economic control over their neighbors, including demands for local foodstuffs. In light of the faunal data, Chase's (2007) suggestion that spatial segregation served more for ritual purity related to social stratification rather than for economic purposes is thought-provoking.

The economic role of fish and fishing is an important topic in Indus Valley zooarchaeology. Using information on element representation, butchering methods, differences between riverine and marine exploitation, probable capture methods, and contextual information, Belcher (1991, 1997, 1998, 2003) examines temporal and spatial differences in fish use among urban settings, the economic uses of fish, and whether fish were distributed directly or indirectly to consumers. During the Harappan phase, the time of greatest political integration, fish remains from the inland site of Harappa indicate both indirect and direct systems of distribution; fisherfolk apparently traded salted and dried fish directly as well as fish transported

through other means. There apparently was little state control of fish and fish products even though the product may have been taxed. Although fisherfolk are seen as developing greater specialization through time, fish use does not conform to a single trajectory. Fisherfolk probably occupied a unique niche in Indus Valley civilization because of their knowledge (Belcher 2003).

Chinese zooarchaeology is an emerging field where studies examining political economy are rare. Instead, research emphasizes domestication, household production, animals as sources of status and feasting, and animal sacrifice (Jing and Flad 2002, 2003, 2005a, b; Kim 1994; Linduff 2003; Liu 1994; Mair 2003; Nelson 1998, 2003). At the state level, food presentation and the consumption of food was charged with great symbolism throughout Chinese civilization (Nelson 2003). The collection and analysis of zooarchaeological remains from Chinese sites has increased in recent years; however, many results are not disseminated widely (Jing 2002). Using ethnographic data on pigs in modern Korea, Nemeth (1998) provides an interesting model linking pigs to social development in China. According to Nemeth (1998), pigs were not essential for meat during the early dynastic period, but raising pigs in holding pens below household privies generated fertilizer that increased crop yield that led to population growth along with better health and less disease, thus giving rise to political stability that allowed greater complexity. A recent increase in fieldwork and zooarchaeology by Jing, Flad, and others may allow researchers to address more fully the role of animals and subsistence in the Chinese state apparatus.

Political economic use of animals in Europe

In Europe complex social and political histories, both ancient and modern, have resulted in great variability in the topical, temporal, and geographic range of zooarchaeological studies. Modern political segmentation also has created some challenges for generating synthetic studies that address questions related to ancient political systems that spanned large geographic ranges. Overviews tend to be temporally affiliated, such as for the Neolithic (Bailey et al. 2005; Serjeantson and Field 2006), Neolithic and Bronze Age (Parker-Pearson 2003), or for the medieval period (Woolgar et al. 2006), while others are country or regional compilations such as those for Greece and the Aegean (Halstead and Barrett 2004; Kotjabopoulou et al. 2003; Vaughan and Coulson 2000). Modern research foci also often address the economic uses of animals but not their relationship to political development. I outline a variety of studies and research questions of current interest.

The introduction of domesticated animals from Eurasia and the rise of agropastoral societies during the Neolithic created the opportunity for greater economic and political specialization. Halstead (1996) advocates a cautionary approach when using modern pastoral behavior to understand the rise of exchange-based, large-scale pastoralism during the Neolithic to the Bronze Ages. The ethnoarchaeology of pastoralism in Greece shows that modern mixed farming and animal husbandry practices, not specialized large-scale pastoralism, are better models for the understanding Neolithic wool production on heterogeneous, nonspecialized estates. The correlates of specialization versus mixed economies

including mortality profiles, age, and sex profiles are amenable to zooarchaeological analysis.

Political change and economic shifts accompanied colonization of Europe; however, the effects of politically motivated changes on systems of production are less well studied. One exception is the study of faunal remains from east England associated with the transition from the Roman Iron Age to the early urban Anglo-Saxon periods. The influx of Anglo-Saxon Germanic farming peoples to Britain and the rise of post-Roman urban centers resulted in production changes. Crabtree's (1989, 1991, 1993a, 1994) research on sites dating to the withdrawal of the Romans in the early 5th century and colonization from central Europe documents long-term continuities in rural animal husbandry and hunting for local consumption. After the Roman exodus, rural villages and farmsteads initially developed greater self-sufficiency while exploiting Roman livestock, but in traditional, pre-Roman fashion, thus creating a distinct Romano-British pattern of animal use. As Anglo-Saxon urbanism developed in the 7th-9th centuries, greater rural specialization emerged, including the rise of meat-provisioning locales to serve emerging cities, areas of specialized pig production, and wool centers for the production of commodities for trade (Crabtree 1989, 1996a, b). Faunal data from an urban emporium have the hallmarks of indirect provisioning, demonstrating the rising role of urban centers in commerce.

Other topics addressed include the timing and effects of the adoption of domesticated animals during the Neolithic as well as the social transformations that resulted during the subsequent Bronze and Iron Ages (Albarella 2006; Bartosiewicz 2005; Choyke and Bartosiewicz 1999, 1999–2000; Crabtree 1993b; Halstead 1996, 2003; Hamilakis 2003; Isaakidou 2006; Jones and Richards 2003; Marciniak 2005; Nicodemus 2003; Schibler and Steppan 1999; Snyder and Klippel 2000; Tarcan and Bejenaru 2001). Within Great Britain research spanning the Neolithic, Bronze and Iron Ages, Roman period, and the Anglo-Saxon transition documents animal economic use, animal processing, and variation in the goals of zooarchaeology (Cotton et al. 2006; Crabtree 1991, 1993a, 1996b; Davis 1997; Hamshaw-Thomas 2000; Maltby 2002, 2006b; McOmish 1996; Seetah 2006). Researchers address Roman animal use in Italy (MacKinnon 2004) as well as in geographic areas other than Britain (Lauwerier 1999; Oueslati et al. 2006), including North Africa (Larje 1995). And the zooarchaeology of later Europe, medieval, and more recent historical periods also is a topic of considerable study. Topics include specific case studies of religious orders and communities, exotic animal use, hunting, butchering, diet, and nutrition (Albarella and Thomas 2002; Ayres et al. 2003; Baxter and Hamilton-Dyer 2003; Crader 2003; Hoffmann 2001; Lentacker and Ervynck 1999; Polet and Katzenberg 2003; Serjeantson 2001; Soderberg 2004; Thomas 2005, 2007; Woolgar et al. 2006).

The role of fish in European cultures has been addressed for a number of time periods and geographic locations. Fish can be luxury food or a low-value bulk food to feed many people (Van Neer and Ervynck 2004). In Europe the general economic role of fish as well as the production of fish sauce during the Roman period is studied increasingly, particularly in recent years (Barrett 1997, 2003; Barrett et al.

1999, 2001, 2004a, b; Bødker Enghoff 1996; Locker 2001; Mylona 2003; Van Neer and Pieters 1997; Van Neer et al. 2005).

An innovative analysis of the rise of a commercial fishery in artic Norway by Perdikaris (1999) provides original insights into the use of fish for political advantage. Stratified Iron Age farm mounds provide evidence that large-scale commercial drying of cod dates significantly earlier than the medieval market economy. The local environment supported farming of barley, rearing of some domestic animals, and fishing. Using a variety of zooarchaeological correlates for commercial fishing (e.g., fish size, ratio of head to body parts, butchering patterns), Perdikaris (1999) argues that local chiefs who controlled seafaring and trade during the Iron and Viking periods traded large quantities of dried fish for other foodstuffs (grains and meat), thus allowing the chiefs to monopolize locally produced barley for beer making. Beer in turn was used for status-building feasts. Later in the medieval period an incipient capitalistic commercial fishery emerged whereby fish was traded to north and central Europe.

Summary of political economic uses of animals

Topics of relevance across the globe include the rise of state-implemented economic specialization, documentation of the timing and consequences of the introduction of domesticated animals to different regions, and the social consequences of imperial colonization and changes in methods of production. Overall, there are more examples of subsistence autonomy than of centralized state control in animal use and distribution, thus indicating that political entities could frequently take advantage of existing systems of production rather than needing to implement new ones, particularly in regions where domesticated animals provided the majority of meat. Although urban and rural settlements are complementary, various researchers suggest that more data are needed on the rural sector to provide information on the lives of producers.

Research also is needed on how political entities collected surplus and how households conformed to or circumvented demands. Household production would provide individuals with commodities that could be bartered or traded (see Kemp 1994). Two challenging avenues of investigation are (1) did the state or rulers discourage the ancient informal economy or (2) did the state allow leeway in production as long as the function of the state system was not threatened? Animals and their products may have been able to circulate more freely than material goods, particularly wealth objects. Also, people would consume the "evidence" rather than openly displaying it. Zooarchaeological evidence suggests that individuals or households of higher status could manipulate the ideal of state provisioning to their advantage (see Zeder 1991). Individuals with less status and less skill, such as conscripted workers laboring away from their home territory, were most dependent on the state and may have had less opportunity to circumvent state systems in order to increase the variety of meat in their diets.

In addition to meat and animals circulating covertly in an informal economy, subversive economic behavior might involve poaching, theft, or violating state-imposed hunting restrictions. Some of this activity may have been community or

household survival mechanisms, not just efforts to have more variety in the diet. The greatest challenge for zooarchaeologists in identifying and interpreting informal, subversive, or survival behavior is confounded by the smaller quantities of faunal remains that probably result from these types of activities. Zooarchaeological patterns need to be identified for the household, community, or region to understand deviations.

Researchers also need to move beyond the identification of direct and indirect provisioning and address the broader political implications of animal management and distribution. How did political entities control production, distribution, and consumption? More studies should consider the role of redistribution centers and the movement of animals, meat, and products. How did ruling bodies use animal and animal resources to reinforce political inequalities? A related aspect of political economy in hierarchical societies is the means by which those in positions of power, control, and wealth acquired the "best" for their personal consumption. As I examine in the following section, animals and animal products often served as markers of social inequality.

Zooarchaeology and status

Complex societies are characterized by significant differences in socioeconomic status. Individuals of greater status can distinguish themselves from lower-status persons through differential consumption habits as well as through distinct uses of animals for nonfood purposes. Socioeconomic status can be distinguished along the three lines defined by Weber (1968) (see also Kim 1994)—wealth is the economic realm, prestige is social, and power is political. Of interest is the degree to which faunal remains reflect socioeconomic status, therefore wealth, but also how status differences in animal use reflect the political ability to establish and maintain social distinctions or prestige. Zooarchaeological remains also are often used to characterize the consumption habits of specific social classes or strata within ranked societies. How and why did people use animals to distinguish themselves?

Determining status using faunal remains requires detailed analysis of taxonomic distinctions, identification of anatomical portions, body part frequencies (including MAU, MNE), age profiles, butchering patterns, styles and intensity of butchering, as well as evidence for cooking methods, such as roasting versus boiling (Crabtree 1990a; Jackson and Scott 1995, 2003; Luff 1994). Holistic interpretations of socioeconomic status should consist of faunal studies that are corroborated with other material evidence such as artifacts, architecture, documents, or texts as well as bioarchaeological data on skeletal and dental health, staple isotopes, and nutrition as advocated by Welch and Scarry (1995).

I examine the zooarchaeological correlates of dietary status, including the consumption of luxury foods. I consider the dynamic nature of status and how political change can affect the perceived value of different animals and meat. In addition, I address how animal management and the processing of animals can be used to generate status. Finally, I critique the heuristic difficulties associated with distinguishing the food habits of different status groups.

Zooarchaeological correlates of status

Defining or identifying the zooarchaeological correlates of status for the culture being studied is essential. We must be cautious and use variables that genuinely reflect differences in socioeconomic status (Crabtree 1990a, p. 176). As Grant (2002) and Lev-Tov and McGeough (2007) argue, we must also avoid indiscriminately projecting modern "costs" and perceptions of value onto the past. Several researchers show that ethnoarchaeological studies of modern peoples also can generate analogies to understand status and consumption habits in past complex social groups (see Belcher 1998; Chase 2005, 2007; deFrance 2006; Jones in press; O'Day 2004a; Powis 2004). Ethnohistorical and historical (texts) can be used as well to generate testable hypotheses that are amenable to zooarchaeological data.

Because the zooarchaeological manifestations of status are culturally and temporally specific, there are no universal correlates. I summarize the more commonly applied criteria (Table 1) and critique their application. I evaluate feasting along with ceremonial and ritual use of animals; therefore, the applications summarized here are exclusive of ceremonial and ritual uses of animals. As is evident in Table 1, the criteria of status are highly variable both culturally and geographically. Common measures relate to "quantity of meat"; therefore, animal size is often important. High status is equated frequently with "better quality of meat" (i.e., better cuts or portions of animals); however, this criterion is both subjective and culturally determined. Modern perceptions of poor utility and toughness cannot be projected onto the past. Cooking might render a poor-quality cut (tougher, greater fascia, greasier) into a more desirable portion (Hastorf 2003; Leach 2003). A greater desire or preference for meat from younger animals also can be culturally specific.

In regard to body portions, crania and distal limb elements have less meat than some other anatomical portions; however, fat content is very high in crania while metapodials and feet can be rich in marrow. The value of crania and feet also can vary. For example, Grantham's (2000) ethnoarchaeological research of modern Druze villagers, who inhabit the southern Levant, indicates that caprid crania are highly prized portions indicative of high status. This study also documents that limb bones may be used for tool manufacture even among higher-status households; therefore, the low representation of limb bones may not be an indication of low status. Grantham applies these findings to the interpretation of ancient fauna from households of the Byzantine period site of Qasrin located in the Golan Heights.

Domestic animals vary in size, meat and fat content, and the products that they provide as does their perceived value. In Old Kingdom Egypt, low-body-fat goats produced low-status meat that was used to feed workers, whereas higher-fat-content sheep and cattle were used by managerial classes (Redding in press). In the chiefdom societies of Hawaii, high-fat-content pigs and dogs were the preferred food of elites (Kirch and O'Day 2003; Kolb 1994). The Maya elite also consumed large quantities of dogs (Clutton-Brock and Hammond 1994; Teeter 2004), as did the Classic period inhabitants of Oaxaca (Haller et al.

Table 1 Some commonly used zooarchaeological correlates for the identification of status from dietary remains

Elite consumption	Study region	Source
More meat	Peru, Inca	Sandefur 2001
	Belize, general, Maya	Pohl 1994; Wing and Scudder 1991
Better cuts, meaty portions (forelimb or hindlimb)	Eastern U.S., Mississippian	Jackson and Scott 1995, 2003; Welch and Scarry 1995
	Ireland, medieval	McCormick 2002
	Mesopotamia	Zeder 1991
	Bolivia, Inca	Capriles et al. in press
	Peru, Formative Chavin	Miller and Burger 1995
Greater diversity/variety of animals (than nonelites)	Eastern U.S., Mississippian	Jackson and Scott 1995, 2003
	Peru, Middle Horizon	Moseley et al. 2005
	Maya	Emery 2003; Pohl 1994
	Mesopotamia	Zeder 1991
	Europe, medieval	Grant 2002
Younger animals, especially domesticates	Mesopotamia	Zeder 1991
	Peru, Formative Chavin	Miller and Burger 1995
	Maya	Clutton-Brock and Hammond 1994
Greater use of domestic animals (than nonelites)	Hawaii	Kirch and O'Day 2003; Kolb 1994
	Maya	Clutton-Brock and Hammond 1994; Teeter 2004
	Philippines	Mudar 1997
Greater use of larger domesticates	Egypt	Rossel 2004
	Peru, Formative Chavin	Miller and Burger 1995
Use of nonindigenous domesticates	Ecuador	Stahl 2003
	Caribbean	deFrance in press
Deer and pig as high-status animals	Britain, medieval	Grant 2002; Thomas 2007
Greater use of wild animals (than nonelites), hunted	Indus Valley, Egypt	Chase 2007; Redding in press
	Levant, Late Bronze Age	Lev-Tov and McGeough 2007
	Europe, medieval	Ervynck 2004; Grant 2002
	Valley of Oaxaca	Haller et al. 2006
	Southwestern U.S.	Muir and Driver 2002
Exclusive use of rare or exotic wild animals	Pacific Islands	Leach 2003
	Eastern U.S., Mississippian	Jackson and Scott 1995
Rare, imported animals	Europe, various	Ervynck et al. 2003
Management of wild animals	Maya	Carr 1996; Masson and Peraza in press

Table 1 continued

Elite consumption	Study region	Source
Animals (food) that involve much preparation, processing	Pacific Islands	Leach 2003
Little butchering waste (e.g., crania, feet)	Eastern U.S., Mississippian	Jackson and Scott 2003
Crania as high-value portion	Levant, modern Druze	Grantham 2000
	Levant, Bronze Age	Lev-Tov and McGeough 2007
Meat wastage	Eastern U.S., Mississippian	Jackson and Scott 2003
Efficient butchering methods	England, Late Roman	Crabtree 1991
Less bone tool debitage	Peru, Late Horizon, Inca	Marcus et al. 1999
Ornamental bone object manufacture	Eastern U.S., Mississippian	Jackson and Scott 1995, 2003
	Europe	Choyke et al. 2004
	Panama	Cooke 2004b
Use of fat, greasy flesh foods	Hawaii	Kirch and O'Day 2003
Larger fish	Caribbean, Hawaii	Deagan 2004; Kirch and O'Day 2003
	Florida	Luer 2007
	Peru, Late Horizon, Inca	Marcus et al. 1999; Sandweiss 1989
Imported fish, marine products	Peru, Middle Horizon	Moseley et al. 2005
	Peru, Formative Chavin	Miller and Burger 1995
	Maya	Teeter 2004
	Europe, various	Van Neer and Ervynck 2004
Preferred fish	Israel, Egypt	Lev-Tov in press; Redding in press
Larger shellfish	Hawaii	Kirch and O'Day 2003
More shellfish	Peru, Late Horizon, Inca	Sandweiss 1989
Greater use of birds, especially wild birds	Eastern U.S., Mississippian	Jackson and Scott 1995, 2003
	Maya	Masson 1999
	Mesopotamia	Zeder 1991
	Britain, medieval	Thomas 2007
Commoner consumption	**Study region**	**Source**
Less meat, poor-quality meat	Maya	Pohl 1994
	Ireland, medieval	McCormick 2002
	Turkey	Wattenmaker 1994
Ration-like portions of meat	Egypt	Redding in press
	Mesopotamia	Zeder 1991
Greater butchering intensity (bone fragmentation)	Hawaii	Kirch and O'Day 2003
	Eastern U.S., Mississippian	Jackson and Scott 1995, 2003
Domesticated animals with low fat content	Egypt	Redding in press

Table 1 continued

Commoner consumption	Study region	Source
Greater household animal management	Mesopotamia, Levant	Falconer 1995; Zeder 1998
	Turkey	Allentuck and Greenfield in press
	Egypt	Redding 1991
Meat decline coupled with environmental degradation	Turkey	Wattenmaker 1994
Older domesticates, fewer large domesticates	Levant, Turkey	Kansa et al. 2006; Wattenmaker 1994
Efficient meat use, little waste	Mesopotamia	Zeder 1991
	Egypt	Luff 1994
Use of bones for tools	Peru, Late Horizon, Inca	Marcus et al. 1999
Abundant butchering refuse (e.g., crania, feet)	Mesopotamia	Zeder 1991
Varied butchering techniques	England, Anglo-Saxon	Crabtree 1991
Opportunistic hunting, hunting small animals	Maya	Pohl 1994
Absence of diversity, absence of wild fauna	Egypt	Redding in press
	Peru, Middle Horizon	Moseley et al. 2005
Consumption of rats	Hawaii	Kirch and O'Day 2003
Little use or absence of birds	Egypt	Redding in press
	Mesopotamia	Zeder 1991
	Eastern U.S., Mississippian	Jackson and Scott 1995, 2003; Kelly in press
Poor-quality fish	Egypt	Redding in press; Rossel 2004
Smaller fish	Caribbean, Hawaii,	Deagan 2004; Kirch and O'Day 2003
	Peru, Late Horizon, Inca	Marcus et al. 1999
Greater variety of smaller shellfish	Hawaii	Kirch and O'Day 2003
More fish and turtles	Maya	Wing 2004
More turtles and reptiles	Valley of Oaxaca	Haller et al. 2006
Emulation of elite diet in times of political instability	Maya	Emery 2003
	Britain, medieval	Thomas 2007

2006). In medieval Britain pigs were considered high status because they produced no secondary products and competed with humans for food; the elites were the only ones who could *afford* to eat them (Grant 2002). However, the household production of pigs in Mesopotamia, the Levant, and Egypt reflects a strategy designed to augment protein by nonelite families living in unpredictable state systems (Falconer 1995; Redding 1991; Zeder 1998).

The relationship of diversity to status can vary significantly as well. In general, the "luxury of variety" is seen as the prerogative of the elite that was either demanded or enjoyed (Jackson and Scott 2003, p. 568; see also Grant 2002; Lev-Tov and McGeough 2007; Moseley et al. 2005; Pohl 1994; Zeder 1991). However, people inhabiting rural farmsteads in Mississippian times may have practiced greater opportunistic hunting and other capture methods that resulted in a greater variety of faunal remains. In addition, elite assemblages do not always conform to patterns of great variety (Jackson and Scott 1995). Tropical habitats of the Caribbean and the Pacific Islands and the resulting assemblages are characterized by high natural diversity, particularly if aquatic habitats are exploited where reef, inshore, and pelagic fishes are available (Deagan 2004; deFrance in press; Emery 2004e; Kirch and O'Day 2003; Newsom and Wing 2004; O'Day 2004c). In the marginal habitats of the Mesopotamian empire, hunting was practiced to buffer shortages from animal husbandry (Zeder 1994). In some cases, in the Classic period Valley of Oaxaca (Haller et al. 2006), for example, elites and commoners used roughly the same variety of taxa but in different quantities. Elsewhere, elites are characterized by a diet limited to a few large and meaty domesticates, as occurs in pre-Dynastic and later Egypt where middle-class residents consumed much cattle and caprines (Rossel 2004). Therefore, diversity as a measure of status is socially and geographically relative. It requires that zooarchaeologists be aware of the range of species that were available in the past. It also requires that negative evidence—the absence of a naturally abundant animal—is not merely relegated to the domain of the prohibited or taboo food.

The relationship of hunting to status is often, but not always, correlated positively. Formal restrictions may have prevented commoners from taking wild animals, particularly large game animals, such as deer, as historical records note for medieval Britain (Ervynck 2004; Grant 2002; Thomas 2007). Similar restrictions are reported by Inca chroniclers (Garcilaso de la Vega 1994) and may have been enacted by elites in the Maya region (Pohl 1994). Hunting birds or mammals added variety to the diet of elite households in the Indus Valley, Europe, the eastern United States, the Maya region, Egypt, and Mesopotamia (Chase 2007; Ervynck 2004; Grant 2002; Jackson and Scott 1995, 2003; Masson 1999; Redding in press; Thomas 2007; Zeder 1991). The capture and consumption of rare wild animals also may be limited to the elites, as Leach (2003) suggests for sea turtle and whale in Polynesian society. In lower-status settings among the Maya, hunting can be an opportunistic and survival strategy to provide needed animal protein (Pohl 1994; Wing 2004). The absence of hunted fauna in nonelite contexts may indicate strict provisioning with little opportunity (i.e., time) to exploit or capture animals, as is suggested for Middle Horizon Peru and Dynastic Egypt (Moseley et al. 2005; Redding in press).

The most extreme status-associated practice is the consumption of luxury food-extravagant and unnecessary items that serve to create social distance (Van der Veen 2003). The concept of luxury is relative and undergoes considerable change through time in relation to political shifts, commodity availability, and perceived or real "cost" (Ervynck et al. 2003; Pohl 1994; Thomas 2007). Luxury

is that which is desired by many but obtained by few (Van der Veen 2003, p. 407). For some, quality is emphasized over quantity—luxury in a diet surpasses the use of food to satisfy physiological needs, imagined needs, and perceptions of affluence (Ervynck et al. 2003). Using European faunal assemblages from Roman to postmedieval periods, Ervynck et al. (2003) propose that dietary luxury was achieved by acquiring rare animals or ones traded over long distances. As they note, luxury is contextually difficult to identify, requiring local comparative zooarchaeology from multiple sites. Taphonomically, it may be difficult to identify luxury foods because the flesh had no hard tissue remains (e.g., filets, cartilaginous fishes, organ meats, gonads, various invertebrates). Or the immature skeletal elements of animals consumed when very young (i.e., prior to prime meat age) may be fragile and not preserve well (Ervynck et al. 2003). In other cases a large *quantity* of food can be transformed into luxury fare through elaborate and time-consuming preparation, whereby serving large volumes of foodstuffs to many functions to create inclusiveness (Leach 2003). Researchers have sought to identify opulence in the Maya region, Pacific Islands, the northern Andes, and medieval Britain (e.g., Emery 2003; Kirch and O'Day 2003; Stahl 2003; Thomas 2007). Zooarchaeology has the potential to identify extravagant foods, particularly in diachronic assemblages where we might be able to document the transition of an animal from a rare entity to one accessible to many (Ervynck et al. 2003).

Methods of butchering, the intensity of butchering, the accumulation of bone waste, and the use of bones for either utilitarian or ornamental products can indicate status differences. Luff's (1994) research on the Workmen's Village outside Tell el-Amarna shows that commoner butchers employed very efficient and precise techniques to maximize their return of pork and goat meat as well as to process meat for city-dwelling elites. The herds may have been owned and processed locally, thus butchers were motivated to maximize meat yield. In Polynesian chiefdoms where ruling elite may have demanded pigs and dogs as tribute and then redistributed them to commoners, the great fragmentation of bone suggests that people extracted every morsel of sustenance from animals that they consumed infrequently (Kirch and O'Day 2003). Great quantities of fragmented mammal bone may reflect preparation methods; Snyder and Klippel (2000) found "pot-sized portions" at the Bronze/Iron Age Aegean village of Kastro. Greater quantities of butchering waste along with the manufacture of utilitarian bone tools is a characteristic of nonelites identified for Late Horizon and Inca period contexts from coastal Peru (Marcus et al. 1999). In contrast, elite contexts are characterized by less butchering waste and less fragmentation (Crabtree 1991; Jackson and Scott 1995, 2003) along with the production of crafts or ornamental objects rather than utilitarian ones (Choyke et al. 2004; Jackson and Scott 2003).

Fish remains also can be correlated to different social strata. Larger fish are associated with elites in Caribbean, Polynesian, and Mississippian chiefdoms (Deagan 2004; Jackson and Scott 2003; Kirch and O'Day 2003). Smaller fish are found in association with commoners at both Caribbean and Polynesian sites. And smaller shellfish are commoner fare, while elites consumed larger mollusks in

Hawaii (Kirch and O'Day 2003). At coastal Peruvian sites dating to the Late Horizon and the Inca periods, elites also ate larger fish while nonelites dined on smaller ones (Marcus et al. 1999; Sandweiss 1989). Greater quantities of shellfish are found with elites in some of these Peruvian examples (Sandweiss 1989).

Regardless of animal size, fish importation is often linked to greater status. Andean examples from the highland Formative site of Chavín de Huántar to the Middle Horizon Wari outpost at Cerro Baúl indicate that fish, when imported over long distances, are associated with high-status contexts (Miller and Burger 1995; Moseley et al. 2005). In the Maya region fish and fish products are associated with greater status (Teeter 2001, 2004) as well as with ritual (see below). Fish also circulated as commodities in the Late Iron Age southern Levant (Lev-Tov 2000a, in press). A cautionary analysis of how fish can be either a high-status import or a low-status bulk food depending on time period and political conditions is addressed by Van Neer and Ervynck (2004) for contexts dating to the Chalcolithic, Roman, and medieval periods in northern Europe. If fish remains are derived from Roman fish sauce, they may reflect bulk fish that arrived in processed form as compared to fresh fish, which would have been more difficult to acquire due to rapid spoilage and transportation costs and was therefore more valuable. And in some cases local fish are associated with lower-status individuals. In Egypt less desirable catfish are found in association with Old Kingdom workers' barracks (Redding in press). In addition to remains of domestic mammals thought to be elite fare, the faunal assemblage associated with the mayor's house from Middle Kingdom Abydos contains abundant fish remains that are identified as probable employee food because fish were inexpensive (Rossel 2004). Equivocal findings of fish and status are associated with Indus Valley civilizations where fish variability may reflect local habitat more than human selection (Belcher 2003).

Zooarchaeology and the dynamic nature of status

Political entities and the social rankings within them can be relatively stable or they can fluctuate through time, resulting in shifts in the value of animals and their meat. Mudar's (1997) analysis of fauna from four sites in the Philippines documents conservative trends in animal use long before lowland complex chiefdoms developed. The use of economically important water buffalo, pig, and deer remained relatively constant through time, but portions of these animals changed significantly in relation to greater political development and social differentiation. Masson (2004) also sees consistent patterns in the use of deer, peccary, and turtles but highly variable use of other animals at four Belizean Maya sites spanning the Preclassic to the Postclassic. In the Maya case these differences in faunal use are attributed to the waxing and waning of regional and community politics, including possible commercial extraction of some animals for trade.

Periods of political and social instability also can break down existing status boundaries as well as generate new ones. Emery (2003) suggests that lower-class Maya may have emulated the meat consumption habits of elites in times of political instability. For example, if hunting regulations were relaxed or unenforceable during periods of political upheaval, nonelites could have eaten animals that

previously were prohibited. Therefore, knowledge of the local historical and political trajectory is needed to interpret changes in animal use through time (Emery 2003, p. 512). In medieval Britain the population decline and shifts in wealth associated with the Black Death made it possible for nonelites to acquire and consume varieties and quantities of meat similar to the upper class; the aristocratic elites then increased their consumption of wild birds in order to differentiate themselves from lower-class individuals (Thomas 2007). Elites created a commodity to which commoners did not have access.

Periods of political colonization and succession also can alter how animals and meat reflect status. Grant (2002) argues that in Roman Britain venison was not a high-status meat but that by medieval times only elites could hunt and consume deer. The value of fish in Europe also increased from Roman to medieval periods as a result of commodity differences in processed versus fresh fish (Van Neer and Ervynck 2004). And colonists living in distant lands are not always able to impose their will upon the local population to extract the highest-quality meats as indicated by Bronze Age Egyptians in the Levant (Kansa et al. 2006) and medieval Frankish clergy who established a monastery in Corinth, Greece (Lev-Tov 2000b).

In addition to political fluctuations and demographic shifts affecting the value of meat and animals, people used animals to acquire other status goods or increase their social standing. Kim (1994) proposes that social complexity and status differences arose in Neolithic China when aspiring elites increased pig production and traded swine for other wealth products. The social value of pigs was greater than their subsistence value. An alternative view by Nelson (1994) argues that early Chinese pig production generated status through the control of *labor* rather than through the pigs themselves. Stahl (2003) suggests that Andean camelids and guinea pigs functioned as symbols of status that were acquired in the trade of highly valued marine thorny oyster shell; the subsistence value was secondary. In the transition to animal husbandry, the ability to delay consumption of your herd animals along with the *potential* to fail as a producer may have been indications of existing wealth and eventually higher status (Hesse 1995, p. 212). Those who already had wealth could risk adopting a new system of production. Keeping domestic livestock to generate secondary products, and thus more wealth, or maintaining animals until they reached prime meat age constituted a fundamental shift in how people did things. Rather than being forced to adopt animal husbandry, the role of learning, experimentation, and gaining knowledge contributed to the transition (Hesse 1995) and eventually increased status.

Those in control of trade in fresh or processed fish also could increase their status through economic gain as shown for the Levant (Lev-Tov 2000a, in press), Inca period coastal Peru (Marcus et al. 1999), and chiefdom society in Norway (Perdikaris 1999). Technology, particularly the manufacture and use of plank canoes among the coastal Chumash, to increase the production of fish, the exchange of information, or the movement of other trade goods also is viewed as a catalyst toward greater complexity and increased status for those in control of ocean-going watercraft (Arnold 1995, 2007).

The ability to acquire animals, transform them into meat, process the meat into edible cooked food, and then distribute the cooked food in the form of meals

constitutes an interconnected economic and social network with significant political and culinary ramifications (Bray 2003a, b; Hastorf and Weismantel 2007; Leach 2003; Montón Subías 2002). Issues related to the quality and style of consumption are more often explored in relation to feasting (see below) but also in conjunction with status differences in everyday meals (see Hastorf 2003; Jackson and Scott 1995, 2003; Kansa et al. 2006; Welch and Scarry 1995).

Heuristic obstacles in the archaeological identification of status

In hierarchical societies status is a continuum with multiple and subtle distinctions along lines of inheritance, occupation, achieved wealth, gender, age, and others variables. In archaeological practice, it is often very difficult or impossible to distinguish between these different categories. In most zooarchaeological studies status distinctions consist of only two categories: elites and commoners or nonelites (Cain 2000; Crabtree 1991; Allentuck and Greenfield in press; Jackson and Scott 1995, 2003; Kirch and O'Day 2003; Kolb 1994; Luff 1994; Marcus et al. 1999; Masson 2004; Muir and Driver 2002; Pohl 1994; Potter 2004; Sandefur 2001; Sandweiss 1989; Teeter 2004; Thomas 2007; Wattenmaker 1994; Welch and Scarry 1995; Wing and Scudder 1991; Zeder 1991). These studies range from cultures associated with early status differentiation in the southwestern United States to large-scale urban society in Mesopotamia.

Identifying specific classes of people is rare. In Egypt great social differentiation is reflected in the animal remains from the Old Kingdom conscripted pyramid builders and administrative elites (Redding in press) as well as from Middle Kingdom administrative personnel at Abydos (Rossel 2004). In the case of Abydos, Rossel (2004) proposes that some of the animal remains, particularly inexpensive fish remains, probably represent servant meals.

The analysis by Thomas (2007) of shifting patterns of consumption in medieval England identifies the elites as aristocrats (i.e., landed nobility and gentry classes). In other cases European historical period texts indicate that medieval social order was divided into three parts—orant (prayer = clergy), pugnant (fighter = nobility), and laborant (worker = peasant)—with corresponding food rules, restrictions, and laws related to animals and diet (Ervynck 2004). In this system diet reflects an individual's place in society, not their personal culinary preference. Diachronic zooarchaeological assemblages potentially could identify classes not present in the historical documents, such as neglected and marginal peoples as well as hierarchical differences between adults and children or men and women (Ervynck 2004, p. 222). Efforts to identify such subtle class distinctions are highly contextually dependent.

The invisibility of different classes also is present in the Americas. In the Maya area people of different status levels—the upper echelon, servants, serfs, slaves—often inhabited the same "household"; the lowest class is often the least visible (Collins 2002), while elites and middle-class craft persons can be identified (Emery 2003, p. 499, 502). In the Valley of Oaxaca, Classic period contexts provide insights into elites and commoners, although it is not always evident where to draw the line between these two classes (Haller et al. 2006). As noted by

Haller et al. (2006), ethnohistorical sources often indicate more significant status differences than are evident in the archaeological record. At a southern Peruvian colonial outpost of the Middle Horizon Wari state, elites and middle-management/craft persons are distinct while peasant agropastoralists are less evident (Moseley et al. 2005).

Furthermore, from a taphonomic perspective status distinctions are difficult to discern because people of different levels and classes may have deposited their trash in the same area. Food sharing by members of different social classes in the same household is difficult to identify (Pendergast 2004; see also Marshall 1993). And the identification of food sharing across households requires meticulous lab analysis and cross-mending of bones from different contexts, as shown by Zeder and Arter (1996) in their analysis of faunal remains from a Mississippian village. Most dietary bone refuse accumulates over a long period of time with no way of discerning how much time passed and how many persons contributed to the deposit (Pendergast 2004). Associating general midden refuse with distinct classes is very difficult.

In addition to meat choices, many status differences may be reflected in the more holistic sense of cuisine—how animals were prepared, when they were served, how they were eaten (serving wares), with whom, the accompanying dishes, and how much time was allowed for consumption (see Douglas 1997; Farb and Armelagos 1980; Goody 1982; Mintz 1996; Mintz and Du Bois 2002). Some of these variables are elusive when examining only archaeological data; however, some are amenable to zooarchaeology, while others require collaboration with those analyzing site material culture, particularly ceramics, as well as the full spectrum of food remains including archaeobotanical analyses and human isotopes (see Kansa et al. 2006; Maltby 2006b; Welch and Scarry 1995).

There also are various aspects of hierarchy and status that can be examined by shifting the focus of study from the end-product of discarded consumption refuse to the realm of preparation and consumption, particularly in regard to the role of women. A potentially fruitful avenue of study concerns not only preparation but also female labor in the acquisition and production of food animals (Hesse 1995; Kim 1994; Nelson 1998; O'Day 2004a; Pohl 1994; Zeder 1998). Ethnoarchaeological research in Fiji (O'Day 2004a, b) is providing insights into how women increase their status through fishing prowess in inshore waters as well as male and female differences in the use of architectural space (O'Day 2004c). As Hesse (1995) suggests, female labor in the adoption of domesticated animals may be an indication of social-sexual politics of the distribution of work and an attempt by men to further exploit the labor of their wives. I suggest that women also may have gained some independence and control over household production through their involvement with pastoralism (see also Zeder 1998). A related topic is the role of female labor in processing and cooking food (Bray 2003b; Kirch and O'Day 2003; Leach 2003; Montón Subías 2002). Corroborating data from multiple sources, particularly stable carbon isotopes, will increase our understanding of female consumption habits and status (e.g., Ambrose et al. 2003; Sandness 1992; White et al. 2001a).

Summary of zooarchaeology and status

In complex societies the differential consumption of animals and portions of animals often served to create status distinctions that reinforced political inequalities. Although status differences in animal use are highly variable through space and time, zooarchaeologists have been successful at documenting many empirical correlates of animal use that reflect status. At the same time, researchers have identified many shortcomings in understanding how and why differential consumption habits are established and how they changed through time. The ability to identify animal use at more refined scales beyond the broad categories of elites and commoners would contribute significantly to understanding status variation. Also needed are long-term syntheses of faunal data from specific regions in order to understand the waxing and waning of luxury foods. Studies also should consider how both premarket and market systems affected consumer access to different animals and meat. Smith et al. (2003, p. 260) suggest that, although there may have been some restrictions on unspecified "choice foods" in Aztec culture, people could have acquired goods and meat from independent, unrestricted Aztec markets, thus equalizing consumption habits among different classes.

Documentary accounts of how meat was distributed and who received different portions as well as recent ethnoarchaeological studies challenge our modern concepts of high-status food. The zooarchaeological record is biased against nonhard tissues; organ meats, which were often preferred portions, and invertebrates without hard exoskeletons are invisible in the archaeological record. Consequently, for those cultures without documentary sources, identifying how the full spectrum of animal consumption reflected status remains challenging.

In many cases zooarchaeology is used to confirm status assessments that are defined initially in relation to artifacts or to intrasite spatial variability. When possible, zooarchaeologists need to independently define status using faunal remains. At the same time, faunal remains need to be better integrated with the full range of archaeological evidence (e.g., material culture, archaeobotanical remains, human remains) to understand how status was manifest in all aspects of daily life.

Using animal remains to determine social status requires consideration of various taphonomic processes and contextual issues related to deposition and site formation. In some cases patterns of food acquisition, preparation, and discard can create intrasite variability that may be interpreted as status dependent rather than taphonomic. Researchers also must consider how sample aggregation and the presentation of data influence interpretations (see Driver 2004). Jackson and Scott (1995) note that many significant and meaningful status and social differences between contexts are lost when large site assemblages are combined analytically for quantification.

In some cases distinct intrasite architecture or living spaces suggest that dietary differences related to status should be present, but the faunal remains show few contrasts between contexts. Faunal remains from two unique sectors of the Mississippian age Snodgrass site in southeastern Missouri show no status differences in animal portions and faunal consumption (Zeder and Arter 1996, p. 335). The Tibes ceremonial center, associated with a middle-range, ranked

society on the south coast of Puerto Rico (Curet et al. 2006), shows no irrefutable status distinctions between contexts (deFrance in press). In these cases food differences also may develop after the emergence of other material manifestations of ranking, such as spatial segregation (see Chase 2007).

Status distinctions and political inequalities were reinforced through the performance of sanctified ritual behavior that provided legitimacy to those in power and created a communal sense of well-being. Animal sacrifices and offerings were particularly important forms of ritual behavior. The transformation of animals into food that was consumed at feasts linked the economic and ideological realms. In the following section, the ritual uses of animals provide significant insights into the ideological and symbolic life of past cultures.

Zooarchaeology and ideology

In all societies animals and the food they provide have ideological, symbolic, and social meaning beyond their economic uses. The reified ideological uses of animals, meat, and bones serve to justify and legitimate the political and social divisions in complex societies. Once viewed as epiphenomena, many researchers now advocate the study of the ideological and ritual (i.e., the noneconomic) uses of animals (e.g., Anderson and Boyle 1996; Crabtree 1995, 2004; Halperin et al. 2003; Hesse 1995; Hill 1996; Horwitz 2001a, b; Jackson and Scott 1995; Lauwerier 2002; Marciniak 1999; O'Day et al. 2004b; Ryan and Crabtree 1995; Serjeantson 2000; Wapnish 1995). Offerings of animals often served as critical linkages with the supernatural world. Ceremonies and rituals involving animals or food, particularly feasts, often serve to reinforce the power and position of those in control, to create group unity, or to create social distinctions between different groups of people. Many feasts served both economic and political ends; however, the *act of the feast* is a ceremonial performance. Therefore, I consider feasting along with other ideology rather than with political economy.

I follow the noneconomic uses of animals identified by Lauwerier (2002), whereby animals serve as festive foods, funeral foods, or sacrifices. Albarella and Serjeantson (2002, p. 46) distinguish between ceremonial events and ritual ones, with the latter characterized by either symbolic or religious value. According to their approach, feasting in Neolithic England is ceremonial and not ritual behavior. For many cultures, however, ceremony and ritual are inextricably united and cannot be disentangled into distinct components. For others, secular rituals or everyday patterned behavior is imbued with significant meaning, but it is not religious (O'Day 2004a). I use ritual to indicate participation in rites, customs, and behavior by individuals or the community that is performed to bring about anticipated social and ideological goals.

Following a review of zooarchaeological correlates of ritual, I examine animal sacrifices and food offerings in relation to funerary events, appeasing supernatural forces, house dedications, temple venues, and other activities. I review the use of specific types of animal bone as dedicatory caches. Finally, I consider the ritual role

of feasting, including feast composition, diachronic changes in feast activity, and intrasite variability in feasting.

Zooarchaeological correlates of ritual and ceremony

How does one recognize a ceremonial or symbolic animal or deposit of animal bones? And how does one interpret ritual behavior from faunal remains? Although the identification of ceremonial or symbolic animals is dependent on local conditions and context, there are some aspects of ritual use that transcend the local. Common variables identified by Kansa and Campbell (2004), based on criteria modified from Horwitz (1987), include degree of animal completeness, specific portions, sexes, age classes, presence of nonfood animals including exotics, animals that are normally food but were not consumed, and animal associations with human burials.

The presence of rare or exotic fauna has traditionally been viewed as evidence of ritual use. For example, carnivores and reptiles that are viewed as "dangerous" are often nonfood animals that are associated with symbolic meaning (Cooke 2004a, b; Jackson and Scott 1995, 2003; Miller and Burger 1995; Moseley et al. 2005). Identifying nonfood dangerous animals requires knowledge of the local repertoire of fauna as well as appropriate analogy in order to establish whether a symbolic link existed in the past. Comparisons with general midden refuse can aid in distinguishing the quotidian from the symbolic (see Emery 2004e; Moseley et al. 2005). Ethnohistorical accounts can provide information on past perceptions of animals in Mississippian culture, for example (see Jackson and Scott 1995, 2003; Kelly 2001, in press). Comparisons of animal imagery with zooarchaeological remains can be used to discern symbolic meaning, as in examples from pre-Columbian Panama and Formative Peru (Cooke 2004b; Miller and Burger 1995). However, as Cooke (2004a, p. 126) cautions for Panama, it is naïve and simplistic to assume that all neotropical native peoples were intimidated by jaguars, harpy eagles, and anacondas and thus imbued them with symbolic meaning. Negative evidence is also very difficult to interpret. If a locally common and dangerous animal is not present in a faunal assemblage, their absence can not be attributed simplistically to symbolic meaning or animal prohibitions. Without texts or iconography it can be difficult to interpret the absence of particular animals; interpretations of ritual or symbolic associations should be rigorous and empirical, not fanciful.

Exotic fauna imported from distant sources are often viewed as symbolic, for example, the occurrence of Ecuadorian spiny oyster (*Spondylus*) in highland Andean sites (Cordy-Collins 2001; Glowacki 2005; Hastorf 2003). Symbolism is associated with imported marine fish in Maya caches at Tikal (Maxwell 2000) and with marine fauna in funerary contexts at Copán (Beaubien 2004) and at the Templo Mayor of Tenochtitlán (Guzmán and Polaco 2003). Ritual use more often involves transformation of local animals rather than the exotic.

The treatment of animal remains also can indicate symbolic or ritual use. Ritual use can be reflected in the degree of bone burning, the type and kind of butchering, degree of bone completeness, presence or absence of worked or modified bone, and the patterns of bone disposal. The ideal documentation of a ritual deposit requires

that zooarchaeologists document the assemblage along with taphonomic and contextual information in comparison with nonritual deposits. Although Walker (1995) argues that ceremonial trash is not deposited in the same locale and manner as everyday trash, this is not a universal feature of all ritual activity, particularly if an animal is sacrificed in one cultural realm but consumed in another. Evidence for distinct contextual deposition of ceremonial garbage must be established on a site-by-site basis.

The varied social purposes served by ritual or ceremonial faunal remains include the creation of social unity and establishing social distance and hierarchical relationships. Rituals also are performed to bring about desired outcomes, to communicate with the supernatural, to appease supernatural forces to prevent malevolent consequences, and to communicate with ancestors to bring about desired outcomes. I highlight case studies that document unique ritual assemblages or posit distinct behavioral explanations.

Animals as offerings: sacrifices, meals, caches

Animals and meat are commonly used as offerings. Offerings are associated with human burials, ritual caches of bone, and dedicatory sacrifices for structures. Sacrifice and offerings involve removing animals from the economic system, acquiring rare or exotic animals, or mobilizing labor to produce food that symbolically feeds the deceased, ancestors, gods, or other supernatural powers. Sacrifices, defined as the ritual taking of life to secure some benefit (Jing and Flad 2005a), are one type of offering. Animals are sacrificed for building dedications, as part of cyclical rites to deities, or to accompany human burials. Sacrifices associated with burials commonly take one of two forms: (1) sacrificial offerings of unconsumed whole or partial animals or (2) remains of animals or parts of animals that were sacrificed, cooked, eaten, and then deposited as offerings. Burial offerings include meat or meals associated with mortuary feasting by the living or food left for the deceased. Mortuary feasting (i.e., consumption of meals by the living) (Hayden 2001) is conducted on a smaller scale than other types of community-wide feasting and is considered here rather than with other types of feasting.

In their analysis of Shang period animal sacrifice in China, Jing and Flad (2005a) use texts and zooarchaeological data to document the dynamic process of animal sacrifice as a prerogative of the royalty and a symbol of elite power. In Shang culture sacrifices served as prayers to spirit forces (i.e., natural forces of wind, the east, clouds, rivers) and ancestors and were a means to secure successful bronze production. Shang nobility sacrificed diverse animals for palaces, dedications of constructions, and as possible feast food. Although domesticated animals dominate, especially pigs, dogs, cattle, sheep, and horses, people also sacrificed captured wild animals such as monkeys, birds, elephants, turtles, and fish. Shang nobles interred some sacrificed animals whole, including trussed animals buried alive; others were dismembered and interred, and some were butchered and consumed as feast food. According to texts, the sacrificial victim underwent "induction," a process of victim procurement that distinguished the special nature of the sacrificial victim (Jing and Flad 2005a). Although unidentifiable through archaeology alone, observations of

camelid sacrifices in the Andes today (e.g., Dransart 2002; Flannery et al. 1989) document that induction also consists of display of the victim, decoration, giving the animal special food or alcoholic beverages, and singing prior to dispatching the animal.

In pre-Dynastic Egypt sacrificed exotic animals, including elephants and baboons, were treated with elaborate wrappings, resin, and matting in a process that was a precursor to formal animal mummification (Warman 2004). Sacrifice and mummification of an array of animals to accompany the dead is found at the Elkab necropolis in Upper Egypt where the great demand for animal mummies spurred the fabrication of artificial mummies (Gautier 2005; see Ikram [2005] for animal mummification in Egypt in general). At Egyptian Saqqara the cult of Seth, god of wild animals, generated the accumulation and interment of many trophy skulls of wild fauna, possibly in relation to typhonic ritual to bring about "maat" or order to the universe (Ikram 2004).

A communal burial pit known as the Death Pit, dating to over 5000 B.C. at Domuztepe in southeastern Turkey, provides insight into ritual, status, and the possible economic consequences of mortuary feasting. Kansa and Campbell's (2004) analysis shows that large quantities of high-value domestic cattle, prime-age female sheep/goats and pig, and dog were sacrificed and consumed. Comparisons between pit and nonpit fauna, skeletal portions, butchering, and burning are used to address the symbolic and ritual uses of food. At Domuztepe sacrificing prime animals was an indication of status. The study also demonstrates that the long-term economic consequences of sacrificial behavior warrant further consideration.

Religious practices described in ancient texts and depicted in iconography are linked with burned and unburned faunal remains from deposits at the Palace of Nestor at Mycenaean Pylos. The Mycenaean practice was a combination of religious sacrifice and feast in which the simultaneous slaughter of several adult cattle had both economic and religious repercussions (Issakidou et al. 2002). Spatial and contextual variation in prehistoric Aegean feasting and sacrifice through time demonstrates shifts from inclusive events to socially restricted ones that are thought to have functioned to establish divine legitimacy.

At the Mycenaean sanctuary of Ayios Konstantinos, young pigs were the preferred animals for sacrifices. Hamilakis and Konsolaki (2004) consider how the performance of sacrifices would have resulted in transcendental bodily experiences in which participants experienced sensory and emotive responses through their interaction with deities. Rather than simply documenting the zooarchaeological manifestations of sacrificial behavior, this analysis focuses on the acquisition of power and authority through participation and performance of the ritual act.

Cyclical sacrifices of young animals at specific events or through the year are common in many areas. In Roman-period cultures of southern Italy, people sacrificed sheep, cattle, and swine in a single act followed by consumption and interment in shrine pits. As Wilkens (2004) notes, the Roman suovitaurilia practice is contextually dependent, requiring the identification of age, sex, and season of slaughter to determine if the animals were killed at the same time. In Belgium, pits at a Roman mithraeum at Tienen contain remains of abundant fowl, young piglets and lambs, along with fish, mollusks, birds, and amphibians that were slaughtered

during the early summer, possibly as banquet foods for the Mithras cult celebrated at the summer solstice (Lentacker et al. 2004). Elsewhere in the Old World animal sacrifices are found in 4th century Romania, where ethnically diverse Germanic cultures sacrificed sheep less than one year old (Stanc and Bejenaru 2004). Overall, the specific economic effects of sacrificing large numbers of prime-age domestic animals are poorly studied (see also Legge et al. 2000).

Examples of offerings from the Americas include the Middle Horizon and Late Intermediate period components at Beringa in southern Peru, where animals associated with human burials, mortuary feasting, and dedicatory offerings are interpreted as evidence for a variety of "cultural performance" behaviors that may have been designed to bring about "order to the cosmos" (Gladwell 2004). Interments include adult and fetal camelids, guinea pigs, dog and other canid, a songbird bound with cotton string, two naturally mummified large parrots wrapped in textiles, and *Spondylus* shell fashioned into beads and a pendant (Gladwell 2004). The animals used in the burial contexts signify trade networks and the acquisition of both exotic shellfish and vertebrates.

Taphonomy and bone recovery also are critical for understanding offerings. Demonstrating that sacrifices are not always of large-sized animals, Weissbrod and Bar-Oz (2004) document the decapitation, skinning, and interment of small toads as burial food offerings in a late Bronze Age sealed burial cave in Israel. The use of toads along with larger domesticates of caprines as burial food is corroborated with period texts. Researchers would not have recovered these small-sized anuran remains without fine-screening the contents of ceramic vessels along with the taphonomic analysis of nonoffering intrusive micromammals. Taphonomic factors and the failure to recognize animal bones as part of cremations in Anglo-Saxon England show that important information regarding human-animal relationships is often lost (Bond 1996).

Davis and Payne (1993) address the significant symbolic role of cattle in British Neolithic and Bronze Age society using ethnographic analogy of funeral rites, wealth, and status derived from cattle. In central England a Beaker-period circular barrow contains the burial of a high-status adult male who was interred with an anomalous cache of at least 185 defleshed cattle skulls along lesser quantities of other mammal bone (Davis and Payne 1993). These mortuary feasting remains demonstrate the difficulties in determining how many ritual events are represented and whether "curated" bones from earlier feasts were included in the deposit.

Death rituals and mortuary feasting provide unique examples of the symbolism associated with caves. In Austria an Iron Age cave site served as a location of sacrificial worship where people participated in death rituals (Galik 2004). Domestic and wild animals were eaten, disarticulated, and buried in the cave along with human remains. A study of faunal remains from a late prehistoric mortuary cave and habitation site in northwestern Puerto Rico by Oliver and Narganes Storde (2005) found people consumed river crabs (buruquena, *Epilobocera sinuatifrons*) at mortuary ceremonial feasts within the cave, but that everyday meals at the habitation site did not include the river crab. Symbolic associations of crabs with the afterlife could be explored.

Analysis of the mortuary feast refuse present at the Inca site of Machu Picchu addresses Andean ancestor worship and feeding the dead (G. Miller 2003). Chroniclers indicate that local retainers were required to make periodic animal sacrifices and food presentations to the dead in accordance with Inca calendrics. Although some interments of whole animals are present (e.g., long-nosed unbutchered dogs), the quantity of bone, particularly camelid bone, is less than suggested by the narratives. Miller infers that local retainers consumed much of the offered food as funerary meals. In contrast to camelid sacrifices in earlier periods, the Machu Picchu camelids are primarily older llamas, possibly retired breeding males. Other animals present include two species of deer, vizcachas, and guinea pigs. Miller considers what these animals and bones meant to the people who raised and slaughtered them. The analysis also indicates that the ethnohistorical record can be useful for providing an estimate of the *quantity* of faunal remains that might be expected if people conformed to specified ceremonial mandates.

Caches, or intentional burials of animal remains, not associated with human burials also are significant ritual contexts. Caches may represent the best examples of "ceremonial trash" as defined by Walker (1995). The bone refuse is distinguishable from ordinary midden material by either context (e.g., filled pit features) or content (e.g., remains of only one species of animal or one class of vertebrate). Although the function of caches is often difficult to determine, they appear to be distinct from dedicatory offerings. Caches may be associated with a variety of structure types or landscape features such as caves. They also may contain very specific bone elements; for example, worked astragali from various large-sized domesticated mammals occur at several Mediterranean sites (Gilmour 1997).

The interpretation of a dedicatory cache of various animal remains, including the wing elements of a common crane, from Çatalhöyük draws on various ethnographic accounts as well as site iconography to argue that crane wing costumes used in ceremonial dancing was symbolic of marriage and pair bonding in the ancient Mediterranean (Russell and McGowan 2003). As the authors note, the recovery and analysis of fragile wing elements used as ceremonial objects shifts our focus away from large-sized remains such as the cattle crania for which Çatalhöyük is so well known. This study also moves the remains from the static to the dynamic realm with a dramatic reconstruction of how human crane dances might have been performed.

For the Maya, ritual was a part of everyday private life as well as structured public ceremonial events. At the island setting of Laguna de On, Belize, Masson (1999) found that during the Postclassic occupation, large game and selected small game (e.g., deer, peccary, tapir, crocodile, bird, iguana, and agouti) were more common in elite upper-status residential and ritual contexts than in general site refuse. The ritual contexts include rubble-filled shrines and other deposits associated with domestic space. Drawing on zooarchaeological comparisons of faunal remains from Colha and Cozumel along with ethnohistorical accounts of hunting and visual depictions of game sacrifices in codices, Masson (1999) links elite ritual animal use to political demonstrations of power. Henderson and Joyce (2004) use the occurrence of dogs' teeth in ceremonial contexts from the lower Ulua Valley in Honduras to suggest that dogs may have been a Classic-period introduction for

ceremonial purposes; however, they acknowledge that greater time depth is needed to establish patterns of use.

The relationship of rituals to power and ideology is strongly debated for the Maya (see Lucero 2003 and comments); however, the role of animals and food in the process of ritual is underexamined. A more detailed taxonomic and anatomical analysis of the faunal remains from ritual contexts inventoried by Lucero (2003) would provide an excellent diachronic and comparative perspective of how people used animals. How and why did ritual uses of animals change through time? For example, the analysis by Maxwell (2000) of marine resources present in caches at Tikal posits that increased use in toxic marine fishes is associated with the Tikal hiatus that followed its capture by political rival Caracol and the ensuing period of political instability. The increased occurrence of marine fauna is used to suggest that people sought increased altered states of consciousness through bloodletting during a period of political transition. Moholy-Nagy (2004) also suggests that the content and quantity of vertebrate remains in Tikal structure caches changed over time in relation to political changes in the Early Classic to early Late Classic.

Caches of bone by the Maya also served other purposes. For the Maya, caves are portals to the underworld, a region inhabited by malevolent supernatural forces. In the Guatemalan cave of the Quetzales, Maya peoples deposited the remains of animals with metaphorical and symbolic connections to the underworld (Emery 2004d). Offerings consisted primarily of left-sided nonprime meat elements of young deer and dog along with bony fish remains, musical instruments, and other ceremonial goods. These offerings may have functioned as competitive elite rituals of renewal (Emery 2004d, p. 111). In Brown's (2005) analysis of 19th-century-to-contemporary cave sites in the Lake Atitlan area, caches of bones are interpreted as hunting shrines where people asked the supernatural guardians of wild animals permission to hunt them by leaving offerings of animal bone before and after the hunt. Brown (2005) uses ethnohistory, indigenous text, oral histories, and myths to argue that hunting shrines extended beyond the Maya region to central Mexico.

Dedicatory offerings commonly involve whole animals that were not consumed. In the Roman Netherlands the offerings placed at temples, buildings, and various sites led Lauwerier (2004) to hypothesize that economic consequences must have accompanied the significant use of animals for noneconomic purposes. In Shang China pigs are the most common animals used as dedicatory offerings for construction (Jing and Flad 2005a). At the Aztec capital dedicatory offerings of over 20,000 fish remains representing 57 marine species are associated with a 15th century phase of construction at the Templo Mayor (Guzmán and Polaco 2003). In the Aztec case, the trade implications as well as the symbolic meaning of marine fish as opposed to local freshwater fishes could be explored.

Dedicatory animal sacrifices may be found in association with domestic space. At the southern Peruvian site of El Yaral, a Late Intermediate-period site of the Chiribaya culture, the hyperarid climate resulted in the natural mummification and preservation of 26 llamas and alpacas and 112 guinea pigs (Rofes 2000, 2004; Rofes and Wheeler 2003; Wheeler 1992; Wheeler et al. 1995). After people sacrificed the guinea pigs by beheading, throat slitting, or breaking their necks, they were interred in the subfloors of four residences, some of them with additional burial goods. Some

guinea pigs were color coordinated with the sacrificed camelids. The symbolic meaning of this practice is attributed to various causes including calming the god's rage, ensuring owners' and community welfare, and ritual house reinforcement (Rofes 2004, p. 99). The great number of dispatched animals also may relate to a period of political instability brought about by drought conditions between A.D. 1000 and 1375. From the Inca period site of Lo Demás in the Chincha Valley of Peru, Sandweiss and Wing (1997) report on five naturally mummified guinea pigs, four of which were probably used in divination. Preservation and taphonomic destruction undoubtedly contribute to the loss of many sacrificed and ritual animals in domestic contexts, resulting in a great loss of ritual information.

Feasting in complex societies

All complex societies are characterized by commensal politics. Because most feasts in complex cultures involve the consumption of animal foods, often in large quantities, zooarchaeology figures prominently in the analysis of feasting behavior. Feasts transform economic and symbolic capital into political gain through ritual and ceremonial practice (Dietler and Hayden 2001). The social and political goals of feasts include the building of alliances, increasing or reducing competition, creating indebtedness, mobilizing labor, creating social distance or exclusion, fostering social inclusiveness, as well as other objectives (Adams 2004; Bray 2003a; Dietler 2001; Dietler and Hayden 2001; Hayden 1996, 2001; Spielmann 2002; Wiessner 1996, 2001; Wiessner and Schiefenhovel 1996).

In addition to the zooarchaeological refuse that accumulates from feasting, the topic has received greater focus in some geographic regions and cultures. In the late prehistoric eastern United States, researchers of Mississippian and Woodland feasts address tribute, trade, accumulation of feast food, preparation, discard, political agendas, status variation, and the material culture of feast events (Blitz 1993; Jackson and Scott 1995, 2003; Kelly 1991, 1997, 2000, 2001, in press; Kelly and Kelly 2007; Knight 2001; Pauketat et al. 2002; Ree 1997; VanDerwarker 1999; Welch and Scarry 1995; Yerkes 2005). Knight (2001) examines how feasts, particularly renewal ceremonies where people ate large quantities of deer meat, functioned in the earlier Woodland culture to create intervillage alliances that focused on mound construction rather than social differentiation. The analysis by Kelly (2000, 2001) of faunal remains from a rapidly filled submound barrow pit at Cahokia examines how and where tribute food accumulated for meal preparation. The assemblage characteristics, including low faunal diversity, high-value cuts of deer, little butchering debris, whole bones, processed fish and birds, along with a variety of nonfood luxury goods, are evidence of meal preparation for large inclusive public events. Evidence that the pit fill contains bone refuse from which the meat had been stripped for cooking and consumption elsewhere is provided by entomological evidence of blowfly larvae and dermestid beetles that were able to develop before the pit refuse was buried. VanDerwarker's (1999) analysis of fauna from Toqua, a mound site in North Carolina, provides evidence that elites/chiefs redistributed deer and other meat to create indebtedness on the part of commoners.

In Mississippian cases the ceremonial nature of feasting is augmented with ethnohistorical accounts (Jackson and Scott 1995; Kelly in press).

In Mesoamerica Rosenswig (2007) links ten categories of data to examine elite feasting by the Formative societies in the Soconusco region of southern Mexico. At Cuauhtémoc deer meat was a common feast food, but elites also consumed many dogs. The abundance of canines led Rosenswig to suggest that dogs may have been an Olmec parallel to the pigs of some Pacific Island cultures (see Kirch and O'Day 2003); dogs were not an everyday food but one that was controllable, subject to intensification, and bred specifically for feasts. In the Valley of Oaxaca at Tierra Largas, Marcus and Flannery (1996) report that a large pit feature contained the remains of five dogs that had been butchered systematically, possibly by the same individual, to produce a large feast for the purpose of building alliances and impressing their neighbors. However, dogs are also a common household food (Flannery and Marcus 2005).

In the Maya region evidence of feasting among commoners comes from well-preserved remains at Cerén where a structure for meat processing and food preparation has been identified (Brown 2001, 2002; Brown and Gerstle 2002). Feasting at Cerén is interpreted as probable lineage-sponsored events that took place in sacred space and created a network of crisis support, alliance formations, and other symbolic roles (Brown 2001). In contrast to commoner events, Pohl (1994) analyzes elite feasting, particularly consumption of deer and dog meat, among the Lowland Maya as a means through which social distance was created. Using iconography and patterns of fauna at three Maya sites, Pohl argues that elite feasting was metaphorically charged—the elites symbolically became top predators such as jaguars or vultures consuming their enemies in the form of venison and other meat. The ideology of the deer served as a surrogate for a human captive (Pohl 1994). The question of rearing and fattening deer and dogs for feasts is also a topic of ongoing interest (Masson and Peraza in press; White et al. 2004)

For Polynesian cultures Kirch (2001) examines spatial variation across the islands in regard to feast function, the foods used, and the spatial aspects of where food is prepared and consumed. A common feature of feasts in Oceania was the quantity and quality of food served in permanent structures that could accommodate large numbers of participants. Pigs, dogs, and large fish were popular feast food in the Marquesas and the Hawaiian Islands (Kirch 2001; Kirch and O'Day 2003); however, in lieu of pigs or dogs, the inhabitants of Tikopia transformed large quantities of starches into a pudding with coconut oil that could feed many. Leach (2003) also discusses the creation of Polynesian feast food through intensive labor investment in everyday starches. The transformation of the ordinary into feast food through labor is a theme in the Andean region as well (see Bray 2003b; Hastorf 2003).

The Polynesian studies provide an interesting contrast to the Caribbean region. The faunal remains from the ceremonial site of Tibes (deFrance in press) suggest that feasts in Puerto Rico may have started as inclusive potlucks at the village level. By late in prehistory and at Spanish contact, the Taino participated in exclusionary feasts (Deagan 2004). In the absence of larger domesticates, smaller domesticated

rodents and large-sized marine fish and shellfish came to represent quality in the Caribbean.

In addition to an emphasis on meat quantity and quality, the distribution of meat also is a critical component of feasting events. Junker (2001) uses Spanish ethnohistorical accounts from the Philippines to argue that alliance building was dependent on the maintenance of an atmosphere of order during the distribution of feast meat (see also Junker et al. 1994). Drawing on historical texts, McCormick (2002) identifies medieval Irish cognitive food categories used in the distribution of meat portions and organs in 12th and 14th century banquets. The medieval concepts of value, especially of rich organ meats, are distinct from today and provide a caveat to our modern interpretations. McCormick also presents a functional argument for feasts in which the ritual slaughter of numerous animals and the sudden availability of large quantities of meat necessitated the banquet as a means to dispose of animal flesh.

In their analysis of Neolithic faunal remains recovered from the ditch and henge at Durrington Walls, Albarella and Serjeantson (2002) present evidence for the rapid ceremonial consumption of a large quantity of fresh pork. They use methods of butchering, burning, body parts, and age profiles to identify the roasting and consumption of whole young pigs followed by the disposal of much of the bone refuse in the ditch with lesser quantities deposited in the henge. The disposal pattern conforms to a "ceremonial trash" pattern (Walker 1995) that is distinct from that of domestic, residential events at the site. Pork is interpreted as a conspicuous and luxurious Neolithic feast food due to the low economic utility of pigs.

In their study of zooarchaeological remains and ancient texts, Lev-Tov and McGeough (2007) present an original and well-integrated study of how feasts in the Late Bronze Age Near East linked religion, identity, and economy. Faunal remains from the palace courtyard at Hazor, a Late Bronze Age Syrian city-state in Israel, and cuneiform texts from an archive uncovered in the ancient city of Emar are used to identify how religious exclusionary or diacritical feasts served to reinforce hierarchical relationships and existing social identities. The zooarchaeological analysis of a large deposit of bones within the courtyard altar complements the texts and identifies the social and economic strategies in provisioning feasts that exist beneath the ritual ones. This study integrates zooarchaeology, texts, and site context to identify emic function, economic reality, and past conspicuous events that both reinforced and reified social hierarchy and identity.

Demonstrating that theoretical shifts in archaeology can lead to new interpretations of faunal remains, Crabtree (2004) presents a self-critical reevaluation of faunal remains previously analyzed from the Dun Ailinne site, a pre-Christian Iron Age ceremonial site in Ireland (Crabtree 1990b). The original paleoeconomic interpretation argued that the remains of young male calves and old females, presumably no longer used in dairying, reflected surplus animals from a dairying economy. The persuasive reinterpretation using the lens of ritual and ceremonial feasting argues that the young veal calves are evidence for Iron Age conspicuous consumption that enhanced the power and prestige of local lords.

Summary of zooarchaeology and ideology

People integrated animals into their social and ideological worlds through ritual and ceremonial use. At a community level the performance of rituals created a sense of social well-being. Higher-order, more exclusive rituals created and reinforced existing political and social distinctions, particularly for elite dignitaries. Animals used in rituals occupied both ideological and economic realms. In addition to the power or forces that animals possessed, many animals were linked to the economic and productive realms of society. Offerings of whole or live animals or their ritual destruction removed animals from the economic sphere. The social and economic repercussions of ritual animal use that resulted in the slaughter of large numbers of individuals, even if these animals were consumed, warrant more investigation.

The identification of ritual deposits of bone or animal remains is dependent on context and preservation. In some cases distinguishing a ritual deposit of bone from a quotidian one requires detailed zooarchaeological comparison. The most ostentatious examples of ritual, such as some of the dedicatory burials discussed above, are often the best preserved. In contrast, the identification of everyday rituals is more difficult. Geographic location is also a factor resulting in differential preservation of ritual deposits. In addition to identifying the faunal details of a ritual offering, cache, or deposit of bone, zooarchaeologists contribute to understanding the ritual function of various contexts.

In regard to the ongoing popularity of the archaeology of feasting, zooarchaeologists should identify feasting behavior using appropriate analogies such as the ethnoarchaeological data generated by Adams (2004) and O'Day (2004a) or ethnohistorical and ethnographic accounts such as those used by Jackson and Scott (1995) or Kirch (2001). We also should critically evaluate ethnohistorical accounts of feasts and feast foods using archaeological data rather than give more weight to historical accounts, particularly when zooarchaeological data are lacking, such as the low estimates of meat use suggested by Bray (2003b) and by Cook and Glowacki (2003), respectively, for the Inca and Wari of the Andes. Rare, exotic, or recently introduced animals should not be interpreted as feast foods without corroborating contextual evidence regarding their consumption (deFrance in press).

Obviously, all accumulations of faunal remains are not necessarily indications of feasts. Distinguishing everyday meals from feasts requires careful analysis of taphonomic variables, body parts, and taxonomic variability between contexts (see Albarella and Serjeantson 2002; Jackson and Scott 1995; VanDerwarker 1999). As Adams (2004) demonstrates for modern Indonesia, documenting an elaborate pan-village or large-scale feast where numerous animals were killed and consumed is much easier than identifying a household feast in which one chicken was shared. Variables of scale, political motives, and participants need to be carefully considered.

One of the greatest divides between the anthropology of food and the archaeological study of feasting is the loss of ethnographic richness. Studies in various regions and times (e.g., eastern U.S. Mississippian, late prehistoric and historic Polynesian, Bronze-Age Syria, medieval Ireland; see Jackson and Scott 1995; Kirch 2001, Kirch and O'Day 2003; Lev-Tov and McGeough 2007;

McCormick 2002) have incorporated ethnographic or historical data to create rich studies; however, details on participants, posturing, and motives found in ethnographies (e.g., Adams 2004; Clarke 2001; Dransart 2002; Jones in press; O'Day 2004a, b; Rosman and Rubel 1986; Weismantel 1988; Wiessner 2001) are often lost in the archaeological record and difficult to reconstruct (see Spielmann 2002). A significant challenge for zooarchaeologists is to move beyond documenting the components of feast food to providing more information on how feasts functioned and why they occurred.

To understand the ritual and political motives of feasts, zooarchaeological data must be integrated with archaeobotanical remains, ceramics, ground and chipped stone, and site context. Researchers need to identify not only feasting locales, preparation methods, and areas of discard but also the participants and political objectives of feasting (see Rosenswig 2007). Integrated studies of multiple lines of evidence, including biological characteristics of the population (e.g., Ambrose et al. 2003), will allow much more holistic interpretations.

Discussion and conclusions

Complex societies used animals and meat to provide food, to establish social distinctions, to create legitimacy to elite rule, and to foster social unity through the symbolic manipulation of animals in ritual. Yet the role of live animals, meat, and other animal products varied considerably across geographic regions and through time. The best studies examine local histories in conjunction with past environmental conditions to identify the unique ways that various peoples used animals. Although well-excavated samples involving zooarchaeologists in the field are ideal, some studies indicate that fruitful results can be generated from the analysis of previously excavated assemblages whose recovery was less than ideal (see Albarella and Serjeantson 2002; Kelly 2001; G. Miller 2003; Zeder 1991).

All "animal choices" in past societies—economic utility, food, or symbolic uses—were embedded in wider social, environmental, and technological contexts. To understand the fundamental connections that people and animals had at different scales within societies, zooarchaeological analyses need to be placed in broad cultural context (see Sillar [2000] for similar discussion regarding technology). Zooarchaeologists must consider the various roles that animals served and the choices that people made in different circumstances. Not only are rigorous zooarchaeological analyses necessary, but researchers should produce regional synthetic studies that link disparate economic, social, and ritual data.

There are few crosscutting hallmarks of animal use that paralleled political development. Many studies explicitly examine whether ruling bodies mandated and enforced political economic restructuring of meat distribution to feed people. Direct versus indirect provisioning of meat was commonly dependent on local conditions. The strongest evidence for indirect provisioning is found at urban sites where the inhabitants performed labor service for the state, such as the conscripted workers' quarters associated with the Giza pyramids (Redding in press). Beyond proximity to animals, life in rural centers apparently allowed people greater flexibility and more

independence than their urban counterparts. Additional data are needed from households in many different geographic areas to understand how people circumvented state mandates for either personal profit or nutrition.

Complex cultures that did not possess domesticated animals pose a challenge to understanding systems of meat procurement and distribution. Specialized hunters may have provided much of the meat from wild animals, but little is known of these individuals and the structure within which they functioned. How did the ruling class impose restrictions on access to wild animals? Did restrictions extend to marine or riverine resources? Did sumptuary laws in various locations parallel medieval restrictions enacted by the European upper classes? How did the political realm develop and enforce regulations that also served to create status differences in consumption and use of animals?

Social goals in addition to economic ones should be considered for those populations who adopted domesticated animals. The temporal discrepancies between the origins of animal domestication and the adoption of pastoralism in different regions warrant more investigation. This process might successfully be investigated with a greater focus on social mechanisms, such as those outlined by Hesse (1995) in the Near East. Rather than emphasizing explanations such as overexploitation of hunted animals or greater population pressure necessitating a shift, zooarchaeologists should consider the social utility pastoralism would provide.

With greater political development people used different animals and portions of animals as symbols of status and wealth. People and political bodies also generated wealth from the products that animals produced. The relationship between animal use and status was fluid, dependent on the local setting and recent political alignments. Perceptions of meat quality, desirability of fat, and edibility of organs also was variable. Beyond identifying the correlates of status, zooarchaeologists need to consider how the differential consumption of animals enhanced the political power and social standing of those in control. Researchers should devise methods to identify classes of people other than elites and commoners.

The transformation of bone into cultural objects that circulated in restricted spheres reflects political might. Differential possession and use of animal bone or objects manufactured from animals is associated with greater status (see Cooke 2004b). People gained status or prestige through their skill in creating bone objects (see Choyke et al. 2004; Janusek 1999). In addition to objects made from bone, the possession of exotic live animals was a powerful symbol of status and prestige. More research should consider the spirituality associated with animals that were consumed either as food as or raw materials.

The performance of ceremonial and religious rituals provided dynamism to the political and social structure. Many zooarchaeological studies indicate that periodic rituals often involved the sacrifice and/or consumption of animals. Various explanations for recurring ritual performance relate to the maintenance of social unity and cosmic order. In contrast to cyclical or seasonal ritual, others have suggested that animal-related rituals increased during times of political upheaval in an effort to reestablish social order (see Maxwell 2000). As with other aspects of nonelite behavior, the ritual life of lower-class individuals is less well known.

Ritual behavior often involved the consumption of food. Ancient feasts were a common form of ritual behavior that linked economic surplus with political ends. The archaeology of feasting indicates that communal meals began as magnanimous inclusive affairs that underwent a transformation through time into spatially exclusive events that were attended primarily by the upper echelon. From a political developmental perspective, the increased exclusivity of feasts accompanying greater complexity is widespread. With greater exclusivity feast function changed from communal benefit, including the accomplishment of pancommunity projects, to events that apparently benefited only a few directly. The benefit of feasts to those not participating directly became more esoteric (see Hastorf and Weismantel 2007). Elite-privileged feasts may have been accompanied by events carried out by nonelite members of societies on a much smaller magnitude, but these events are less understood. Zooarchaeological studies provide some of the strongest evidence for feast composition, including spatial segregation of feasts that served elite social and political purposes but also provided religious communal benefit (see Lev-Tov and McGeough 2007). Although the discarded evidence for feasting in complex cultures can often be identified, feast function remains difficult to identify.

In contrast to the dramatic zooarchaeological evidence that ritual feasting can provide, daily behavior remains difficult to discern. Frequently, we have neither sufficient demographic information nor data on length of site or structure occupation to correlate accumulated refuse with daily behavior. If households were occupied by persons of distinct rank or classes, identifying daily behavior is complicated by the inability to link communal or household refuse with specific individuals or classes of people. Also, everyday offerings and the ritual life of nonelites is often less visible than elite ceremonial space. Deposits associated with elites and ceremonial contexts tend to be better preserved than more mundane contexts (but see Flannery and Marcus 2005).

Animals were transformed into edible food; however, the meat or other edible portions were only one component of the menu. The consumption of food, whether in feasts or everyday meals, was tied to the symbolic formation of identity (see Twiss 2007). Zooarchaeology has a long history of interest in identity, originally along the lines of ethnicity (see Crabtree 1990a), but also in regard to the manifestations of religious identity and food animals (see Daróczi-Szabó 2004; Hesse 1990; Hesse and Wapnish 1997, 1998; Lev-Tov 2003). To understand identity more holistically, future zooarchaeological studies should incorporate greater aspects of cuisine (*sensu* Farb and Armelagos 1980). Meals and the individuals who shared them were linked in multiple relationships depending on age, gender, status, or other variables. In addition to identifying what was consumed and where, integrated information is needed on methods of processing and cooking, probable seasonings, and associated serving and consumption vessels, as has been done with food and plant remains (see Atalay and Hastorf 2006). Towards that end, there are an increasing number of studies in which zooarchaeological data are correlated not only with paleoethnobotanical data and human isotopes but with various classes of material culture such as ceramics, stone tools, and architecture (e.g., Maltby 2006a; and several zooarchaeological studies in Twiss 2007).

There are both overlapping and distinct research foci among scholars of Old World cultures and those in the New World. A greater awareness by researchers of the studies in other regions would enhance zooarchaeological analyses and interpretations. Old World cultures possessed a greater variety of domesticates and longer histories of secondary animal use than the New World. In addition, a greater use of documents, text, and iconography is also found in Old World faunal studies. In contrast, New World studies frequently include greater environmental information and data on intrasite variability. Methods of quantification and presentation of data also differ whereby Old World studies typically present greater detail on animal age, sex, and butchering methods. The explosion in genetic research will provide an added dimension to understanding animal management and husbandry throughout the world.

Ultimately, zooarchaeology has much to contribute to studies of complex societies. The empirical nature of the database and the ability to address diverse questions ranging from economics to ideology indicate that studies of animal remains will continue to be integral to the archaeology of complex cultures. The challenge for zooarchaeologists is to make their results relevant to broad audiences within both archaeology and anthropology in general.

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