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# Journal of Anthropological Archaeology

journal homepage: www.elsevier.com/locate/jaa



# Do faunal remains reflect socioeconomic status? An ethnoarchaeological study among Central African farmers in the northern Congo Basin

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#### ARTICLE INFO

Article history: Received 27 February 2008 Revision received 25 June 2008 Available online 15 August 2008

Keywords: Socioeconomics Animal prey Taxonomic diversity Ethnoarchaeology Zooarchaeology Farmers Central Africa

#### ABSTRACT

Zooarchaeological analyses often draw inferences on socioeconomic status from the composition of bone assemblages associated with houses and other structures in residential sites. In this paper, we test how well faunal assemblages reflect socioeconomic differences among contemporary farmer households in two rural villages in the Central African Republic. Independent measures of wealth are tallied and ranked for six households in each village, including complete inventories of the types and numbers of material goods and the sizes of residential structures and agricultural fields. These data are compared against the associated food bones collected from household trash middens and activity areas, including skeletal abundances, large mammal body part representation, and taxonomic diversity. In most instances larger and more taxonomically diverse faunal assemblages are associated with houses of means and the faunas do, in fact, reflect differences in socioeconomic status. However, faunal "wealth" may be linked to factors unrelated to social or economic inequalities, notably the presence of active hunters. Our analyses suggest that small animals provide useful and important data in assessing socioeconomic means, and comparative studies of wealth in archaeological contexts should not be based on bones alone.

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# Introduction

Qualitative and quantitative comparisons of food residues to assess economic means have had a long history in both archaeological and ethnographic contexts. From hunter-gatherers to statelevel societies, spatial differences in food types and abundances are often used to identify socioeconomic differences in prehistoric contexts (Dietler and Hayden, 2001; Welch and Scarry, 1995; see also LeHuray and Schutkowski, 2005) and include a number of studies that center on the composition of bone assemblages generated by the consumption of meat (Bayham and Grimstead, 2006; Crabtree, 1990; Emery, 2003; Hockett, 1998; Kirch and O'Day, 2003; Pohl, 1985; Schmitt, 1992). In addition, there are a number of inquiries in historic archaeology where spatial contexts, known ethnic contexts, or material goods are compared against the types and frequencies of associated cuts of meat (Crader, 1984, 1990; Lyman, 1987; McKee, 1987; Reitz, 1987; Schmitt and Zeier, 1993; Schulz and Gust, 1983), and there are ethnographic studies that use game types and abundances to identify and characterize feasts and socioeconomic inequalities (Adams, 2004; Demmer et al., 2002; Dietler and Hayden, 2001; see also Price and Feinman, 1995).

This paper builds on these previous investigations of the relationship between foodways and economic means by centering on a single question; do faunal remains reflect socioeconomic status

among contemporary Central African farmers? To investigate this question we begin by presenting detailed ethnographic information on Central African farmers and their foraging neighbors. We then provide data on the types and abundances of material wealth, number of structures, and the size of structures and horticultural fields for six households in two separate villages. Based on these economic findings, the houses are ranked and compared against the types and frequencies of faunal remains retrieved from associated household middens and activity areas. Our intent is to provide straightforward analyses of material wealth and associated bone and shell refuse in two contemporary rural contexts that will offer insights to identifying socioeconomic status differences in prehistoric farmer and forager residential sites. This study is not new in that we assume that socioeconomic differences should be reflected in the abundance and types of food resources-in this case differential access to animal prey—and that differences in household faunal aggregates ought to be correlated with the types and frequencies of material goods, structures, and other indicators of economic stature (Crabtree, 1990 and references therein). It is unique, however, in that for the first time it provides comprehensive ethnoarchaeological records of material wealth and land associated with a series of individual households to compare against animal bones from adjoining middens and food preparation loci. Moreover, our investigations of faunal "wealth" examine a variety of household types and data classes, including taxonomic richness and evenness, and the proportions of large game and the frequencies of associated high quality cuts of meat.

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## Project setting and ethnographic context

The study sites consist of the small rural villages of Ndele and Grima. Both villages are located on the periphery of the Ngotto Forest Reserve in the southern Central African Republic (Fig. 1). The N'Gotto Forest Reserve is a 3250 km<sup>2</sup> triangular shaped area that lies between the Lobaye and Mbéaré Rivers along the extreme northern edge of the Congo Basin. The area is co-managed by Ecosystèmes Forestiers d'Afrique Centrale (ECOFAC), an EC funded regional conservation entity, and logging companies with the goal of balancing preservation and sustainable harvests. The area is a complex mosaic of microenvironments including swamps with evergreen forests, ephemeral wetlands, and occasional pockets of open wet savanna (Bahuchet and Guillame, 1982). Most of the region is comprised of a dry Guinea-Congolian rainforest containing thick patches of understory vegetation and a dense forest canopy (White, 1983, 2001). The region is characterized by high temperatures (annual average is approximately 25 °C [77 °F]) and humidity (70-90%). Annual precipitation averages about 160 cm, most of which occurs during the wet season between June and October where monthly averages can exceed 20 cm (Hudson, 1990).

Several ethnically distinct farming populations inhabit the area. Grima is inhabited by approximately 150 village farmers who speak an Oubanguian language. Ndele is occupied by about 100 village farmers, most of whom speak Banda Yangere and a few speak Pande. The ancestors of some of these villager populations are believed to have entered this portion of the Congo Basin some 2000 year ago, but historic and very recent migrations also contrib-

uted to these populations (David and Vidal, 1977; Hewlett, 1991a; Iones. 1959; Vansina. 1990).

Farmers largely make a living by growing crops, but some earn wages working for local lumber companies or as rangers for ECO-FAC. A few farmers also supplement their income by producing specialized products for local sale such as basketry or mud bricks. Some men supplement their income by obtaining and selling prey through illegal hunting activities or making palm wine, while some women produce and sell corn whiskey. Both men and women may earn wages by working in the fields for their neighbors.

Almost every farmer maintains one or more fields of manioc (cassava; Manihot esculenta) and many grow smaller amounts of coffee (Coffea arabica), taro (Colocasia escuienta) peanuts (Arachis hypogea), maize (Zea maize), tobacco (Nicotiana sp.), yams (Dioscorea sp.), and squash (Curcubita sp.). Fruiting plants and trees such as pineapple (Ananas comosus), papaya (Carica papaya), mango (Mangifera indica), banana and plantain (Musa sp.), oil palm (Elaeis guineensis) and passion fruit (Passiflora edulis) are encouraged by farmers but generally not grown in large quantities. Horticultural fields are scattered around each village and include some that are less than a hundred meters from the village edge and others that are more than two kilometers distant. Most farmers also maintain small vegetable gardens near their houses, which might include sugar cane (Saccharum sp.), okra (Hibiscus esculentus), eggplant (Solanum sp.), peppers (Capsicum sp.), tomatoes (Solanum lycopersicum), and pineapple. Livestock is limited here, but most farmers keep a few chickens. In Grima, several families also owned goats and a few enterprising families are raising ducks. With the

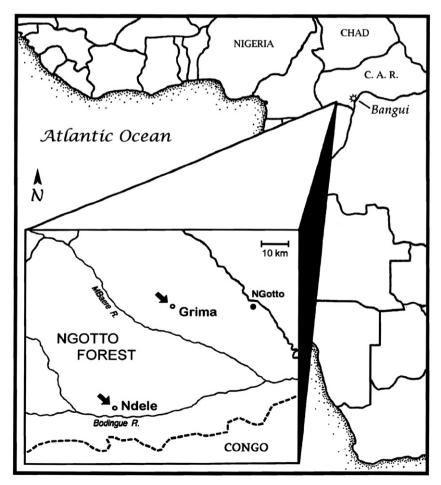


Fig. 1. Map of west Central Africa showing the locations of Ndele and Grima in the southern Central African Republic.

exception of an occasional chicken, domesticated animals are rarely consumed and only on special occasions.

The Ndele and Grima villagers have close social and economic ties with their forest forager neighbors, the Bofi and Aka, which often involves the sale or exchange of manioc and other village goods for forest products, especially meat (Bahuchet, 1992; Hewlett, 1991b, 1996; Hladik and Dounias, 1993; Kitanishi, 1998; Lupo and Schmitt, 2004, 2005). This relationship between farmers and foragers is believed to extend back to when Bantu horticulturalists arrived in the area (Vansina, 1990). Traditional relationships between farmers and foragers are ongoing and multidimensional and have economic, social, and religious aspects ( Hewlett, 1991a). In traditional relationships, the farmer provides the forager with village goods (especially manioc) in exchange for forest products and labor. Foragers may take the clan name of their farmer patron. Farmers may also attend and participate in forager funerals. marriages, and dances. These traditional relationships are slowly being replaced by more a flexible and autonomous system in which the foragers are independent and do not have an on-going relationship with a particular farmer. In these cases, the relationship between farmer and forager is purely economic and the forager can choose to trade forest products with any farmer.

#### Variability in social and economic status

The greatest difference in socioeconomic status in these rural villages is between the foragers and farmers. In general, farmers have more material possessions, larger fields, increased access to goods and services, and different overall societal beliefs than their Bofi and Aka neighbors. Most farmers have the resources to purchase better-made clothing, a variety of utilitarian and non-utilitarian material possessions, and send their children to school (see Lupo and Schmitt, 2005). Farmers occupy the village year-round and live in substantial mud and pole structures (Fig. 2). In both villages most of the houses occur along main thoroughfares where extended families live in separate clusters of 3–4 houses separated by footpaths, gardens, dense vegetation, and/or open communal spaces. Even though the foragers live in close proximity to the farmers, they occupy spatially separate camps.

There are also intra-group differences among farmer households in the access to material wealth, wage labor, and size and

composition of fields. But the range of variation in these attributes is fairly small, there are no "rich" farmer families in either Ndele or Grima. Most people grow their own food and acquire meat and wild foods from the local market. However, there are important recognized differences in social and economic status within the farmer population that may influence access to material goods and the composition of faunal assemblages. The village chief is a traditional position of leadership and in times past was hereditary. Today, chiefs are elected by popular vote, but elections in smaller villages are highly informal affairs. The chiefs' tenure may last for a set period of time or until the incumbent dies. The position carries minimal power, but the chief can dispense local justice, grant land concessions, and settle disputes, and in some cases the chief is compensated with gifts of money, food, or other goods. According to tradition certain types of prey, such as large serpents, must be surrendered to the chief if captured by a hunter. We observed this practice on three separate occasions while living in the village of Grima, but never observed this tradition in Ndele.

Other important social differences exist with respect to marriage patterns and family descent. Hypergyny between farmer men and forager women is uncommon and relationships between farmer women and forager men reportedly never happen. Few farmer men in our study villages had forager wives and those that did were often the product of a mixed union between a farmer father and forager mother. Farmers largely view the Bofi and Aka foragers as uncultured primitives, but they do admire their sharing ethics, hunting skills, and purported magical abilities. Despite the interdependent relationship between foragers and farmers, foragers are still viewed as socially and intellectually backward and are considered to be of lower social status than the farmers. Several farmers reported that to have a forager mother or grandmother was considered scandalous. Moreover, one of the worst insults one can make is to call a farmer a "Baminga," a slang word for pygmy and an implication of descent from a forager family. Farmer men that were married to forager women lived on the fringes of the village, often between the farmer village and forager camp. Although, the men in the relationships are accepted by their village neighbors, their forager wives and children are viewed the same as (and affiliated with) the local foragers.

Based on their sociopolitical status both locally and in neighboring villages, we anticipate that chief households will manifest



Fig. 2. A Ndele married couple and child sitting by their exterior hearth.

the most wealth, and that the other end of the economic spectrum will likely include newlywed couples and dwellings occupied by individuals or single parents. With respect to the former, newlywed husbands pay a bride price and serve bride service to their wife's family that often places the men in significant debt. As such, newlywed households may be economically disadvantaged for some time depending upon the amount and duration of the payment. In most instances houses occupied by individuals will also be of low economic means since they often consist of a young single male or an elderly widow or widower that lack the manpower to maintain large crops for selling or exchanging in local markets and larger familial affiliations that might provide economic support. Similarly, single parents may only have the resources to grow small horticultural fields, especially when their children are too young to help tend crops and hunt animal prev.

# Meat acquisition and distribution

The most common prey animals in the region are less than 10 kg in live weight and include blue duiker (Cephalophus monticola), giant pouched rat (Cricetomys emini), marsh cane rat (Thryonomys swinderianus), brushy-tailed porcupine (Atherurus africanus), guenon monkeys, small carnivores such as the mongoose (Herpestes naso) and civet (Civettictis civetta), tree pangolin (Phataginus tricuspis), land tortoise (Kinixys erosa), and several varieties of reptiles and birds. Medium-sized prey (10 to 25 kg) include Bay and Peter's duikers (C. dorsalis and C. callipygus) and are uncommon in and around Grima, but are encountered more frequently near Ndele. Other medium-sized animals such as chimpanzee (Pan troglodytes) are currently very infrequently encountered in this area and are rarely taken. Larger-sized prey (>25 kg) include Yellow-Backed duiker (C. silvicutor), Bongo (Tragelaphus euryceros), Sitatunga (Tragelaphus spekei), Gorilla (Gorilla gorilla), River hog (Potamocherus porcus) and Giant Hog (Hylochoerus meinertzhageni) are uniformly uncommon. Elephant (Loxodonta africana) were formerly hunted and, while they are still found in the area, are now protected by law.

Most animal protein comes from the consumption of wild prey obtained through exchange with local Bofi and Aka forest foragers. Meat is available throughout the year and is especially abundant during the dry season when foragers use communal net-hunts to capture prey (Bailey, 1991; Hudson, 1990, 1993; Lupo and Schmitt, 2005). Hunting with traditional technologies commonly used by the forest foragers such as nets, spears, and woven traps (Lupo and Schmitt, 2002, 2005; Noss, 1995, 1998; Terashima, 1983) is allowed on the periphery of the Ngotto Forest Reserve. However, many farmers use illegal metal cable noose snares to obtain extra meat for their families. These farmers may monitor between 10 and 25 snares located in close proximity to the village. Most farmers set snares near their own fields similar to garden hunting strategies reported in other forest societies (Linares, 1976; Smith, 2005). A few village farmers hunt animals with rifles and especially shotguns, but guns are illegal and difficult to obtain and the cartridges are expensive. Fishing provides extra protein for consumption in Ndele which is located close (<2 km) to the Bodingué River and supports a wide array of large-sized fish. Men actively fish from the shore and with boats using nets, spears and hooks. Fish account for a very small proportion of the protein consumed by villagers in Grima. Although Grima is only one kilometer from the Yaya River, the river is shallow and supports only minnow-sized fish and other small aquatic invertebrates (i.e., frogs, crustaceans). Few men are willing to travel the considerable distance of about 9-10 km to nearest large river that supports large fish. In both villages, farmer women and children catch small-sized fish in shallow streams with rattan fish traps.

The local and commercial meat markets in Grima and Ndele influence the portions of meat available for local consumption. In both villages the demand for domestic consumption is met by farmers and especially foragers selling or trading meat. Forest foragers exchange whole fresh carcasses of most small-sized prey and portions of medium and large-sized animals. For prey such as giant pouched rat, the entire carcass except the tail and organs is usually exchanged. For blue duikers, one-half of a carcass is the most common unit of exchange. One quarter of the carcass (one forelimb plus thoracic vertebrae/ribs or a hindlimb with lumbar and innomnate/sacrum) is the common unit of exchange for a medium and large-sized duikers. Duiker heads are rarely exchanged but may be sold or given away as gifts. Internal organs are usually kept and consumed by the foragers. Most often farmer women exchange chunks of dried manioc for meat rather than completely processed manioc flour. Other types of village products such as salt, soap, oil, cigarettes. locally made alcohol, and clothing are also exchanged, but cash is rarely used by farmers to purchase meat for domestic consumption. The amount exchanged for the carcass is scaled to portion or carcass size (Table 1).

Farmers who have obtained meat from hunting or through an exchange with a forager also often sell meat to the local village inhabitants. Carcasses of duikers that are destined for local sale are usually further segmented into smaller packages of so-called fillets. These ~300 gm portions are usually comprised of duiker meat attached to a half vertebra, proximal rib, or a distal rib segment. Village farmers who hunt for commercial markets may also act as middlemen and purchase fresh carcasses from foragers that will then be resold to bush-meat vendors. Commercial vendors work throughout the region and visit villages several times a week or travel to forest hunting camps where they may live with the foragers for weeks. To preserve the meat for transport, farmers and vendors smoke whole carcasses and segments of prey over fires, sometimes for days. The smoked carcasses are then packed into backpacks and carried through the forest to the nearest port of transport or large town. Although evidence of the bush-meat market was observed in both villages, it was markedly active in Ndele because animal prey are more abundant around this more remote setting.

# Access to commercial markets

The two villages differ with respect to access to commercial goods from large outside markets such as clothing, cooking equipment, non-local foodstuffs, and exotic items. At the time of our study, Grima was located on the main road connecting all the larger towns and villages in the area (e.g., Ngotto and Bambio). At least once and sometimes several times a week, a vehicle passed through Grima and transported people to larger towns where they could purchase items. Some villager farmers owned bicycles and could ride to the next largest village (Ngotto; ~25 km) to purchase items, although this trip usually took the entire day. A different circumstance characterizes Ndele, which is considerably more remote. At the time of our study a narrow footpath connected Ndele (and several other small forest villages) to the large markets in Mambele, which is 53 km away. Farmers sometimes walked to Mambele and could usually make the trip in one day. Enterprising men in Grima and Ndele regularly traveled to the next largest town to purchase necessities such as matches, cooking and lamp oil, cigarettes, soap, and medicines that they then resold to their village neighbors. In addition, itinerant forest salesmen carrying a variety of wares (clothing, pots and pans) regularly visited both villages. These "petite marchés" were particularly common on Sundays when a salesman or two set-up improptu displays of their wares under a shade tree. Both traveling salesmen and commercial

**Table 1**Exchange values of common forest products for manioc and money

Product	Value in manioc (gm)	Value in CFA <sup>a</sup>
1/2 blue duiker carcass (without head and organs)	1700–2000	750–1000
1 leg or quarter medium duiker carcass	3000-3400	1000-1500
1 whole porcupine (without tail and organs)	1200-1500	1000-1500
1 whole giant pouched rat (without organs)	600-850	350-500
1 small meat fillet (250-400 gm)	_	50-100
1 small (250 gm) bundle koko leaves	450-500	0.25
1 large (~700 gm) bundle koko leaves	650-740	0.75
350-500 gm packet of mushrooms	750-850	100
4 to 5 h working in the fields	1200-1500	200-500

 $<sup>^{\</sup>rm a}$  Central African francs; one U.S. dollar equaled  ${\sim}600$  CFA at the time of our visits.

meat vendors also transport cigarettes and small pouches of liquor and marihuana to sale to local farmers and foragers.

#### Field recordation

The data reported here were collected in June and July of 2002 (Ndele) and October and November of 2003 (Grima) as part of an ethnoarchaeological project conducted between 1999 and 2005. Information on the Ndele and Grima households is presented in Table 2. In both locations a sample of households were judgmentally selected to include the village chief and an assortment of houses throughout the community that possessed discrete trash middens and exterior work areas. At Ndele households ranged from a newlywed couple to an extended family with four children, and the ages of houses span from one year to approximately 10 years. The six selected Grima households range from an elderly village chief and family to a single male to a family with five children. The age of houses range from 5 months to approximately 15 years. Both village samples include mixed marriage households (farmer husband and pygmy wife; Nv4, Gv2 and Gv4), and the single male house in Grima consists of a widower with no children.

Information on household composition (number of occupants, relationship of occupants, number of children) was recorded along with information on the age of the main house and length of occupation. All structures and horticultural fields owned by each household were measured with hand-held metric tapes and/or GPS units. Structures consist of main domiciles with brick or

mud walls, and associated out-structures that include shaded ramadas for cooking and visiting, shaded kitchens, and/or guesthouses. With one or more family member present we conducted an itemized inventory of all possessions in all structures associated with each household and, although generally few in number, we described and quantified all material goods cached at horticultural fields and field processing loci. Material goods were grouped into 10 artifact categories: clothing, crockery, manioc processing equipment, furnishings, personal items (e.g., toiletries, mirrors, and jewelry), general tools (e.g., machetes, needles, and shovels), hunting tools (e.g., cable snares, spears, fishing equipment), leisure items, exotics, and other. Whether purchased locally or in the commercial markets of larger villages, some of the more expensive items include furniture, personal items (notably jewelry), and leisure items such as soccer balls, musical instruments, and radios, Exotics are defined as ornate and unique items that were purchased in larger. distant markets and include a glass statue, a chamber pot, and in the Ndele pastor's house, a cuckoo clock.

# Faunal remains

Most food processing activities are performed outside the main house in association with a fire hearth (Fig. 2) or shaded ramada. House interiors and exterior activity areas are routinely swept and the accumulated trash is tossed into middens that are usually behind or adjacent to one or more sides of the main house. While most of the bone and shell refuse are clustered in these discreet middens, refuse piles from closely neighboring households overlap in some areas and isolated bones occur along footpaths, betweenhouse open spaces, and in small garden plots associated with some of the main houses and ramadas. This thin scattering of food bone is largely a product of expedient human disposal activities, including the tossing of refuse after consumption, and post-depositional dispersal of bone by the domestic dog populations that inhabit each village (Lupo, in press; see also Hudson, 1993).

All faunal remains were collected from household living surfaces and trash middens during repeated, close-interval surface reconnaissance. Household middens ranged from dense ovate clusters measuring less than  $5\ m^2$  to larger and more diffuse scatters covering  $10{\text -}12\ m^2$ . In some instances loose vegetal and other material was moved aside in trash piles to detect and collect shallowly buried food bones and shell. Faunal assemblages were identified in the field to the most specific level possible and all

**Table 2**Duration of occupation and composition of the Ndele (top) and Grima (bottom) households

House	Occupants	Household composition	Length of occupation <sup>a</sup>	Current house age
Nv1	Village chief & family	4 adults, 3 children	≥10 yr	≥10 yr
Nv2	Pastor & family <sup>b</sup>	3 adults, 4 children	2 yr	2 yr
Nv3	Family <sup>c</sup>	2 adults, 2 children	≥5 yr	≥5 yr
Nv4	Family <sup>de</sup>	2 adults, 1 child	5 yr	1 yr
Nv5	Widow & grandchildren	2 adults, 4 children	10 yr	10 yr
Nv6	Married couple	2 adults	2 yr	2 yr
Gv1	Village chief & family	3 adults, 3 children	14 уг	3-5 yr <sup>f</sup>
Gv2	Family <sup>eg</sup>	2 adults, 1 child	2 yr	5 mo
Gv3	Single male	1 adult	15 yr	15 yr
Gv4	Family	3 adults, 4 children	1 yr	1 yr
Gv5	Family	2 adults, 5 children	<15 yr	2 yr
Gv6	Single female <sup>h</sup>	1 adult, 1 child	2 mo	3 yr

<sup>&</sup>lt;sup>a</sup> Refers to how long one or more of the occupants have lived in the space associated with the current house and vicinity.

b The Pastor is the chief's son.

<sup>&</sup>lt;sup>c</sup> The adult male is a full-time hunter.

<sup>&</sup>lt;sup>d</sup> Newlyweds.

<sup>&</sup>lt;sup>e</sup> Farmer husband and pygmy wife.

f The chief and his wife have separate (neighboring) houses; the chief's house is 3 years old and his wife's is 4–5 years old.

g Newlyweds; the adult male is a full-time hunter.

h Recently divorced with a teenager.

**Table 3**Numbers of identified faunal specimens from middens and activity areas associated with the Ndele and Grima houses

Prey	Ndele l	nouses						Grima	houses					
	Nv1	Nv2	Nv3	Nv4	Nv5	Nv6	Total	Gv1	Gv2	Gv3	Gv4	Gv5	Gv6	Total
Blue duiker	100	83	40	71	11	24	329	129	91	35	39	66	20	380
Med. duiker	73	38	57	6	24	5	203	88	64	17	50	44	14	277
Lg. duiker	6	6	1	1	2	_	16	4	_	_	_	_	_	4
Sm. monkey	2	3	_	_	_	_	5	_	3	_	_	_	_	3
Med. monkey	33	56	9	6	4	13	121	44	10	6	7	10	2	79
Lg. monkey	5	10	_	_	1	_	16	1	3	_	_	5	_	9
Porcupine	7	8	_	_	_	4	19	12	11	5	3	8	2	41
Pouched rat	45	15	6	_	2	1	69	41	14	_	4	9	6	74
Cane rat	1	1	_	_	1	1	4	_	_	_	_	_	_	0
Sm. rodent	12	2	_	_	_	_	14	_	_	1	_	_	_	1
Hog	4	8	1	1	_	1	15	7	_	_	_	1	_	8
Cow	_	_	_	_	_	_	0	_	_	_	_	_	1	1
Felid	8	_	_	_	_	_	8	_	_	_	_	_	_	0
Civet	7	2	_	_	_	_	9	9	_	_	1	2	_	12
Other carnivore	_	1	_	2	_	_	3	_	_	_	_	_	_	0
Tortoise	27	_	_	_	_	_	27	23	_	_	3	2	_	28
Lizard	_	_	_	_	_	_	0	1	_	_	_	_	_	1
Snake	4	_	2	3	_	1	10	_	_	_	_	_	_	0
Snail	3	5	1	_	1	_	10	4	10	_	2	_	_	16
Fish	39	11	1	8	_	3	62	5	_	_	_	2	_	7
Lg. fish	6	3	_	_	_	_	9	_	_	_	_	_	_	0
Bird	5	3	3	_	_	2	13	4	1	_	5	1	1	12
Unidentified	64	31	30	2	2	7	136	3	_	_	-	_	4	7
Totals	451	286	151	100	48	62	1098	375	207	64	114	150	50	960

specimens were quantified by the number of identified specimens (NISP; e.g., Grayson, 1984) per taxon or size category.

Table 3 lists the 22 animal species identified in the twelve house middens in the two villages. Given the large number of species in the region—more specifically, the numerous species within a given genera-and because all skeletal remains were identified in the field, some specimens were separated into groups on the basis of bone size. Twenty-one different species were identified at Ndele and 18 were present in the sample at Grima. In both villages most skeletal remains represent Cephalophus monticola and mediumsized duiker (likely C. dorsalis and/or C. callipygus), and are followed somewhat distantly by medium-sized guenon monkeys and giant pouched rats. Brush-tailed porcupine remains were present in both villages but were more common in the middens at Grima. Ndele contained more small fish and forest hog (cf. Potamochoerus porcus), and escargot shell (land snail; Achatina balteata) and small carnivores, including civet, are present but rare in both samples. Regardless of context, most of the recovered taxa represent small animals with blue duikers ( $\sim$ 7.0–8.5 kg) representing the dominant species in most of the sampled middens. In both villages differences in faunal abundances (Table 3) do not appear to be a consequence of differences in household composition as the rank order of the number of recovered bones are not correlated with the number of house occupants (Ndele,  $r_s = .638$ , p = .077; Grima,  $r_s$  = .464, p = .157). Similarly, the number of bones are not correlated with the length of household occupation ( $r_s$  = .232, p = .301;  $r_s$  = -.257, p = .283), but we again note that the specimens were collected from midden surfaces.1

# Ndele material wealth and faunal remains

A complete inventory of possessions in the six Ndele house-holds is presented in Table 4. Overall, crockery is the most abun-

dant artifact in the sample, followed by general tools, clothing, and manioc processing tools. The pastor, a family of four, and the village chief own the most material goods and a newlywed couple possess the least. The chief and pastor houses have the most furnishings, personal items and general tools. Regardless of household, leisure items and especially exotics are generally rare in Ndele

Table 5 presents economic ranking data based on the types and abundances of goods and land. Moving left-to-right, the first column lists the six Ndele houses in the order of their final economic ranking that is presented at the far right; here and throughout, a ranking of one marks the house with the highest economic means, and six the lowest. This final ranking is based on five selected data categories situated in between. The first category is a straightforward tally of all of the household possessions. The second column presents abundances of expensive and/or extravagant items (furnishings, exotics, and personal and leisure items) that were not produced locally and clearly purchased in outside commercial markets. The third and fourth columns quantify and rank the number of household structures and the area that these structures encompass. Finally, the total area of horticultural fields are tallied and ranked. Although most household occupants tend their own fields, larger fields are difficult to maintain and those of means often employ their neighbors to tend crops in exchange for money or carbohydrates (e.g., Hewlett, 1991b). Based on the types and abundances of material goods and land, the village chief (Nv1) and his son, the village pastor (Nv2), exhibit the highest economic means, a newlywed couple with an infant (Nv4) and a widow and her children (Nv5) are of the lowest economic means, and a married couple (Nv6) and small family (Nv3) fall in the middle.

In Table 6, the Ndele villagers are listed in order of economic rank in the far left column based on their possessions and land (Table 5), and at the far right are their rankings based on five faunal categories. The first category simply lists the number of food bones recovered. Meat is the highlight of any Central African meal and people of means can afford to purchase animal prey more often than those of less means (e.g., Walker and Hewlett, 1990). The second and third columns present values and rankings of taxonomic richness and evenness. Richness is a simple measure of the number

<sup>&</sup>lt;sup>1</sup> Although our test excavations of midden deposits in both villages found little or no bone, due largely to the rapid decay of organic materials in this rainforest setting, archaeofaunal assemblages collected from broad subsurface exposures in well-preserved contexts may offer insights on the duration of occupation and/or group

**Table 4**Types and numbers of material goods owned by each of the Ndele households

Items	Nv1	Nv2	Nv3	Nv4	Nv5	Nv6	Total	%
Clothinga	15	35	7	11	30	16	114	13.8
Crockery	51	56	39	26	39	47	258	31.2
Manioc process.	15	12	17	4	18	18	84	10.2
Furnishings	14	15	8	6	7	10	60	7.3
Personal	17	15	11	3	7	8	61	7.4
Tools	29	48	20	8	8	19	132	16.0
Hunting tools	14	10	47	_	1	1	73	8.8
Leisure	_	5	1	3	_	11	20	2.4
Exotics	_	3	1	_	_	1	5	0.6
Other/misc.	_	_	10	_	6	3	19	2.3
Total	155	199	161	61	116	134	826	100.0

<sup>&</sup>lt;sup>a</sup> Shoes, belts, hats, etcetera. Shirts, skirts, pants, and undergarments were not counted.

of taxa represented, and evenness (calculated using the reciprocal of the Simpson's index  $[1/\sum pi^2]$ ; Grayson, 1984,160–163; Schmitt and Lupo, 1995) measures how evenly specimens are distributed across species; the higher the value, the more even the distribution of individuals across species. These measures are incorporated here because we assume that those of economic means will consume a wider array of animals than those of less means, and the resulting food refuse will contain a more even distribution of species. More specifically, those of means have the purchasing power to acquire luxury items that may include rare or exotic meats, and when meat shortages occur, especially during the wet season, they will have the means to buy or trade for any meat that is available. Moreover, we observed that village chiefs and other socially affluent houses are more likely to receive gifts that at times include meat. This expectation is supported, at least in part, as taxonomic richness and evenness at Ndele are correlated (Table 5;  $\tau$  = .788, p = .013).

Finally, the forth and fifth columns quantify and rank the large mammal remains that largely consist of medium- and large-sized duikers. Column four presents the proportion of large game consumed in each house, and column five lists the number of high quality large mammal cuts from the short loin, sirloin, rump, and upper round. Overall, and except for the reversal of houses Nv5 and Nv6, these results mirror socioeconomic rankings based on the types and abundances of material possessions and land. The village chief's household (Nv1) contains the largest and most diverse assemblage, including most of the carnivore remains and all of the land tortoise bones and carapace fragments (Table 3), and the Nv4 newlywed's house ranks the lowest. In comparing the overall rank order of household goods and land against the recovered animal remains (Table 6), the relationship between these economic measures at Ndele is positive and significant ( $r_s = .928$ , p = .019).

When the rankings of goods, structures, and agricultural land are compared against the ranked proportions of large game and numbers of high quality large mammal cuts across the six Ndele households the correlation is not significant ( $r_s = .294$ , p = .255). Moreover, when the proportions of large mammal remains and the number of high quality cuts are removed, the relationship between the economic ranking of material goods and land and the combined rankings of the number of animal bones and taxonomic diversity becomes even stronger ( $r_s = .955$ , p = .015). Large game are intensively pursued and highly prized in some contexts, but not in the northern Congo Basin. Most farmers and foragers in the region make little or no distinction between prey types, nor do they prize certain cuts of meat; simply put, meat is meat. When distinctions do occur, they largely manifest gustatory preferences. Some individuals prefer stewed pouched rat with a side of manioc, others prefer roasted porcupine, and the Ndele pastor informed us that his favorite meal is civet cooked in oil. Higher frequencies of large game bones may be related to the number of household occupants (i.e., larger portions to feed more people), but this does not appear to be the case at Ndele as household composition (Table 2) is not correlated with the proportion of large mammal bone from the associated middens ( $r_s$  = .522, p = .122). In this case, and as we will see at Grima, the types and frequencies of large mammal remains alone do not provide useful indicators of economic means.

**Table 5**Numbers of goods and structures and sizes of structures and agricultural fields owned by the six Ndele households

House	Total go	Total goods		Expensive goods <sup>a</sup>		Structures		Structure sizes		Field sizes	
	N	Rank	N	Rank	N	Rank	$\overline{m^2}$	Rank	m <sup>2</sup>	Rank	Rank
Nv1	155	3	31	2	3	1	59	1	17,400	1	1.5
Nv2	199	1	38	1	2	2	50	2	10,400	2	1.5
Nv3	161	2	21	4	1	4.5	32	3	9100	4	3
Nv6	134	4	30	3	1	4.5	28.5	5	9600	3	4
Nv5	116	5	14	5	1	4.5	31	4	4400	5	5
Nv4	61	6	12	6	1	4.5	15	6	3500	6	6

<sup>&</sup>lt;sup>a</sup> Includes furnishings and exotic, personal, and leisure items.

**Table 6**Number of animal remains, taxonomic diversity, and proportions of large mammal remains associated with each of the Ndele houses

House	Total bone/shell		Richness (Ntaxa)		Evenness		Percent lg. mammal <sup>a</sup>		High quality lg. mammal cuts <sup>b</sup>		Total
	N	Rank	N	Rank	N	Rank	%	Rank	N	Rank	Rank
Nv1	451	1	19	1	5.92	1	21.4	3	5	4	1
Nv2	286	2	18	2	5.07	2	20.4	4	15	1	2
Nv3	151	3	10	3.5	2.48	5	48.8	2	11	2	3
Nv6	62	5	10	3.5	3.78	3	10.9	5	1	5	5
Nv5	48	6	8	5.5	2.92	4	54.3	1	6	3	4
Nv4	100	4	8	5.5	1.85	6	8.2	6	0	6	6

Houses are listed (top-to-bottom) in order of the total land and material wealth rankings presented in Table 5, and the overall household rankings based on the faunal data is presented at the far right.

<sup>&</sup>lt;sup>a</sup> Calculations do not include unidentified specimens.

<sup>&</sup>lt;sup>b</sup> Lumbar (short loin), innominate, sacrum (sirloin and rump), and proximal femur (upper round).

#### Grima material wealth and faunal femains

A detailed inventory of all possessions in the six selected Grima households is presented in Table 7. Similar to the Ndele samples, crockery is the most abundant artifact in the Grima inventories, followed by general tools, clothing, and manioc processing tools, while furnishings are less common, and exotics and leisure items are rare. Although, the chiefs' house contains the most crockery, furnishings, and exotics, the largest assemblages of material goods belong to two family households (Gv4 and Gv5) that are each occupied by seven people. Overall, there are more materials good in Grima than in Ndele (see Table 4), most likely due to the close proximity of Grima to the large commercial markets in Ngotto, and the presence of a road that allows outside goods to be transported in more frequently than in Ndele.

Economic ranking data based on the types and abundances of goods, structures, and land are presented in Table 8. As in the Ndele sample, the first column lists the six Grima houses in the order of their final economic ranking that is presented at the far right.

**Table 7**Types and numbers of material goods owned by each of the Grima households

Items	Gv1	Gv2	Gv3	Gv4	Gv5	Gv6	Total	%
Clothinga	15	4	7	34	48	9	117	11.5
Crockery	102	31	34	67	74	34	342	33.7
Manioc process.	13	7	6	20	16	32	94	9.2
Furnishings	24	5	9	12	16	5	71	7.0
Personal	19	3	14	20	19	8	83	8.2
Tools	15	25	15	36	23	8	122	12.0
Hunting tools	4	43	3	18	11	3	82	8.1
Leisure	4	1	1	3	4	1	14	1.4
Exotics	5	_	_	1	3	3	12	1.2
Other/misc.	11	37	2	10	7	10	77	7.6
Total	212	156	91	221	221	113	1014	99.9

<sup>&</sup>lt;sup>a</sup> Shoes, belts, hats, etcetera. Shirts, skirts, pants, and undergarments were not counted.

Based on the types and abundances of artifacts and land, the village chief (Gv1) and the Gv5 family of seven exhibit the highest economic means. A single male (Gv3) and a married couple with one child (Gv2) are of the lowest economic means, and a family of seven (Gv4) and a recently divorced female with a teenage son (Gv6) fall in the middle.

Table 9 presents the economic ranking of the Grima houses based on the types and frequencies of animal remains retrieved from associated middens and activity areas. The far left-hand column lists the farmers in order of economic rank based on their possessions, structures, and land (Table 8) and at the far right are their rankings based on the five faunal categories. Overall, the village chief's house contains the largest, richest, and most even assemblage and ranks the highest, and the single male household and a household consisting of a divorced woman and her teenage son rank the lowest. Similar to the Ndele sample, the relationship between taxonomic richness and evenness is positive and significant  $(\tau = .828, p = .010)$  where the larger the number of species represented tends to equate with a more even distribution of individuals across species. However, and unlike the Ndele sample, the economic rankings of possessions, structures, and land at Grima are not correlated with the final rankings based on the five faunal categories ( $r_s$  = .406, p = .183). This lack of correlation is due largely to the Gv2 house where their material wealth ranks the lowest, including few personal items, furnishings, and no exotics (Table 7), but the recovered animal remains manifest an abundant and relatively diverse assemblage.

Large mammal bones, especially the remains of medium-sized duikers, are common in Grima and were collected from each house midden in the sample (Table 3). The rank order proportions of large mammal remains are not correlated with the number of house occupants ( $r_s = -.412$ , p = .178) and it appears that the frequency of large game cuts is not related to household composition. When the rankings of goods, structures, and land (Table 8) are compared against the proportions of large game and high quality meat cuts across the six Grima houses (Table 9) the correlation is negative and non-significant ( $r_s = -.044$ , p = .460). Moreover, when the large

**Table 8**Numbers of goods and structures and sizes of structures and agricultural fields owned by the six Grima households

House	Total go	Total goods		Expensive goods <sup>a</sup>		Structures		Structure sizes		Field sizes	
	N	Rank	N	Rank	N	Rank	m <sup>2</sup>	Rank	m <sup>2</sup>	Rank	Rank
Gv1	212	3	52	1	4	1	71	1	4740	3	1
Gv5	221	1.5	42	2	2	3	29	5	7650	1	2
Gv4	221	1.5	36	3	1	5.5	35	3	3540	4	3.5
Gv6	113	5	17	5	2	3	44	2	6820	2	3.5
Gv3	91	6	24	4	2	3	34	4	3020	5	5
Gv2	156	4	9	6	1	5.5	9	6	1320	6	6

<sup>&</sup>lt;sup>a</sup> Includes furnishings and exotic, personal, and leisure items.

**Table 9**Number of animal remains, taxonomic diversity, and proportions of large mammal remains associated with each of the Grima houses

House	Total bo	ne/shell	Richnes	Richness (Ntaxa) Evenness		Percent lg	Percent lg. mammal <sup>a</sup>		ty lg. mammal cuts <sup>b</sup>	Total	
House	N	Rank	N	Rank	N	Rank	%	Rank	N	Rank	Rank
Gv1	375	1	14	1	4.79	1	26.6	5.5	25	1	1
Gv5	150	3	11	2	3.42	2	30.0	4	9	3	3
Gv4	114	4	9	3.5	3.14	5	43.9	1	8	4	4
Gv6	50	6	7	5	3.30	4	32.6	2	1	6	5
Gv3	64	5	5	6	2.68	6	26.6	5.5	4	5	6
Gv2	207	2	9	3.5	3.32	3	30.9	3	13	2	2

Houses are listed (top-to-bottom) in order of the total land and material wealth rankings presented in Table 8, and the overall household rankings based on the faunal data is presented at the far right.

<sup>&</sup>lt;sup>a</sup> Calculations do not include unidentifiable specimens.

<sup>&</sup>lt;sup>b</sup> Lumbar (short loin), innominate, sacrum (sirloin and rump), and proximal femur (upper round).

mammal relative abundances and meat cuts are removed, the correlation between material wealth and the combined rankings of the number of animal bones and diversity measures remains insignificant, but the relationship between these economic measures does become stronger ( $r_s$  = .630, p = .077). Similar to the Ndele house assemblages, these data suggest that the types and frequencies of large mammal remains alone may not provide accurate measures for identifying differences in socioeconomic stature.

# Beware the hunter

The largest difference between material wealth and associated food bones and shell occurs in the Gv2 house occupied by a newlywed farmer and forager couple and their baby. In the Grima sample they have the smallest structure, the smallest field, and they possess the fewest number of furnishings and exotic and leisure items. Based on the scarcity of goods and especially land, it is reasonable to assume that an equally scarce assemblage of animal remains might be associated with this new family household. However, the adult male is a full-time hunter and the large faunal assemblage associated with this house is likely a product of his occupation. Our inventory identified a large and diverse hunting toolkit that included a woven fish trap, fishhooks, a spear, a shotgun, and 13 metal cable noose snares. In fact, over 27% of the Gv2 household possessions are hunting-related artifacts (Table 7) and this house contains 43 of the 82 hunting tools (52.4%) that were identified in our sample of six houses. As we have discussed previously (Lubo and Schmitt, 2002, 2005; see also Ashby, 2002), individual hunting techniques, especially snares, are wide-ranging in target prey and will often result in taxonomically diverse captures. Although taxonomic richness associated with the hunter's house is modest due to the selling of acquired carcasses locally and in distant commercial markets, the associated faunal "wealth" suggests that the hunter's family often enjoyed the fruits of his labor.

A similar situation appears to exist with the active hunter's household in Ndele. House Nv3 contains a relatively large and diverse assemblage of food bones (Table 6) and the associated artifact assemblage contains 64% of the hunting tools found in the six inventoried houses (Table 4), including 40 metal cable snares, two woven fish traps, and two crossbows. Based on the amounts of material goods and land, this house ranks second only to the village chief (Nv1) and his pastor son (Nv2). Similar to the Gv2 house it appears that meat was brought home on a number of occasions, but the active bush meat market in Ndele has afforded this hunter a more affluent lifestyle—at least greater material wealth—than the hunter in Grima.

# **Conclusions**

The Ndele and Grima material wealth and faunal data were approached with a single question in mind; do faunal remains reflect socioeconomic status differences among contemporary Central African farmers? Based on ethnographic observations and comparisons of comprehensive household material possessions and land with the associated food bones, the answer is yes they do, and rather strikingly so. Whether one compares goods and land against only richness ( $r_s = .955$ , p = .016), evenness or the total number of skeletal remains (both,  $r_s$  = .812, p = .035), the types and frequencies of food bones and shell at Ndele are correlated with economic means and reflect the differential access to animal prey. These economic measures tend to compare well with known sociopolitical differences in the village as the socially prestigious chief and pastor households rank the highest, and a newlywed couple and an elderly widow and her five grandchildren rank the lowest (Tables 2 and 6).

A similar relationship between wealth, meat consumption, and social hierarchy occurs at Grima where the village chief's household possesses the most wealth and the largest and most diverse assemblage of food bone and shell, a single male and divorced female and her teenage son possess the least material wealth and animal remains, and two families fall in between (Tables 2 and 9). The only exception occurs in the Gv2 house occupied by a newlywed farmer hunter and his forager wife of low economic means where we recovered an abundant and moderately diverse faunal assemblage which approaches that of more affluent and sociopolitically powerful households. The good news is that this house (and the Nv3 house in Ndele) contained a rather conspicuous assemblage of hunting tools and through comparative analyses of the types and frequencies of artifact classes the presence of an active hunter might be apparent in the archaeological record. If the hunter's house is removed from the Grima sample, the relationship between goods and land and food bone and shell (Tables 8 and 9) becomes positive and significant, especially when one compares material wealth against richness ( $r_s = .900$ , p = .036), evenness  $(r_s = 1.00, p = .023)$ , or a combination of the two  $(r_s = .975, p = .026)$ .

Small animals often make up a significant portion of the human diet in a variety of geographic and temporal settings (e.g., Hockett, 2007; Kirch and O'Day, 2003; Redford, 1993; Schmitt et al., 2004; Stiner and Munro, 2002; Szuter, 1991) and the food bone and shell refuse collected from the Ndele and Grima middens prove no exception. In fact, the majority of the animals consumed by rural Central African farmers and foragers consist of small-sized prey that include duikers, rats, monkeys, porcupines, birds, fish, reptiles, and mice. Although large game animals are high ranked and preferentially pursued in some contexts, they are rare in Central Africa and not often encountered. The majority of the prey are small in size, and save for individual gustatory preferences, hunter's make little or no distinction between prey types and dispatch whatever they encounter. Because meat is meat, the types and abundances of small animals provide important information on overall subsistence strategies and they must be considered when investigating intra-site disparities in economic means, especially when examining differences in taxonomic diversity.

The best archaeological examples illustrating the value of diversity measures and small animals in identifying economic differences are found in medieval Europe. Here, zooarchaeological analyses of a number of site assemblages mirror the results of our ethnoarchaeological investigations, as high status dwellings tend to contain greater taxonomic diversity than those associated with low status households in both urban and rural contexts (e.g., Gidney, 2000; Grant, 1988; Groenman-van Waateringe, 1994; O'Connor, 1982). Socioeconomic differences in the types of acquired meat were often directly related to whether or not one had the rights to hunt wild game that often included large animals (Albarella and Davis, 1996; Gardiner, 1997). However, greater taxonomic diversity in medieval castles, monasteries, and other high status dwellings is commonly influenced by the presence of small and/or exotic taxa that include, among others, hares, partridges, woodcocks, and peacocks (e.g., Albarella and Davis, 1996; Groenman-van Waateringe, 1994; Lev-Tov, 1999).

Our ethnoarchaeological investigations in two rural villages discovered positive relationships between material wealth and meat consumption and found species diversity measures to be important and useful tools in detecting intra-site socioeconomic differences. However, because most archaeological contexts lack information on foodways, societal structure, and consumer behavior that can be documented in ethnoarchaeological settings, archaeological inferences on socioeconomic inequalities should not be based on bones alone. We stress, as have others (Ashby, 2002; Crabtree, 1990; Huelsbeck, 1991; Lyman, 1987; Reitz, 1987), that multiple lines of evidence be examined in assessing dif-

ferences in social status and wealth in archaeological contexts, and that potential variables affecting food acquisition and consumption need to be considered. Variables that may have affected prehistoric farmer and forager foodways include group size and composition, local ecology, hunting technology, resource depression, and/or sex differences in resource access and eating habits (Adams, 2004; Broughton, 1994; Butler, 2000; Grayson and Cannon, 1999; Grayson and Delpech, 1998; Lupo and Schmitt, 2002; Schutkowski, 1995; Stiner and Munro, 2002; Walker and Hewlett, 1990) which, in turn, may have had long- and short-term affects on where and how prey was acquired, who hunted it, as well as its subsequent distribution. Whenever possible socioeconomic studies should incorporate the types and abundances of artifact classes, the types and sizes of households, environmental data, and detailed inventories and taphonomic analyses of the animal remains, both big and small. These data can only be of use when large-scale and finegrained field methods are employed, including the excavation of large exposures (e.g., O'Connell, 1993; Simms and Heath, 1990) and the recovery of artifacts and ecofacts in direct association with individual structures (e.g., Ashby, 2002 and references therein).

# Acknowledgments

This research was funded by grants from the L.S.B. Leakey Foundation and National Science Foundation (BCS-0003988). A number of individuals provided valuable support and advice; we thank Jay Fancher, Hillary Fouts, Alain Kolet Guy, Barry Hewlett, Matt Landt, Eduard Mboula, Alain Peneloin, Timothee Tikouzou, Bernard Voyemakoa, and two anonymous reviewers. Special thanks to the folks at the Ngotto Ecosystèmes Forestiers d'Afrique Centrale for getting us out of the rainforest when other means of transportation failed. Last, and certainly not least, we gratefully acknowledge the people of Ndele and Grima for their friendship and good-humor while we went through their drawers and rooted through their trash.

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