SUDAN

FAUNAL REMAINS FROM THE FORTIFIED SETTLEMENT AROUND THE CHURCH AT BANGANARTI IN SUDAN

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Abstract: The assemblage of faunal remains from Banganarti subjected to archaeozoological examination counted 4178 bones and fragments of bones. They represented contexts recorded within the fortified settlement around the church in Banganarti, attributed to two different chronological phases: 7th–10th century AD (Early Makuria) and 11th–12th century AD (Classic Makuria). Species identified among the 1066 osteological remains from the first phase included mammals, fishes and mollusks. Domestic ruminants dominated this group: sheep/goat (42.77%) and cattle (41.08%); pig was also frequently recorded (12.38%). Bones from the second phase (1513 identified remains) were identified most frequently as cattle (43.75%), sheep/goat (32.78%) and pig (19.69%). Trace remains of donkey, dromedary, dog and bush pig were observed. The analysis gave rise to the first ever characteristic of breeding and meat consumption models for a settlement in the Kingdom of Makuria, outside the capital located at Old Dongola. Beef and pork proved to have a growing importance in consumption patterns in Banganarti over the ages. A study of animal morphology allowed breeds to be established.

Keywords: archaeozoology, Sudan, Makuria, African livestock, history of Nubia, economy, animals, meat consumption, animal breeding, African cattle, Christian kingdoms in Nubia

Archaeological fieldwork in Banganarti in the first seasons was concentrated on the ruins of a church (Raphaelion) in the central part of the enclosure (Żurawski 2012; 2014). The excavation yielded animal bones as well as iconographical sources for archaeozoological analysis, but for obvious reasons the remains coming from the religious complex were not numerous. Neither could they reflect typical meat consumption patterns characterizing the inhabitants in successive phases.

In 2007, digging started in other parts of the enclosure, the fortifications and areas by the walls, inside and outside. The architecture proved to be mainly dwellings, domestic installations and refuse dumps. Numerous well-preserved assemblages of faunal osteological material from this fieldwork constituted an excellent source for studies on the importance of the animal economy.

The faunal remains (altogether 4178) from excavations in 2007–2012

were studied in 2012. They came from archaeological contexts along the defense walls in the northern, western and southern parts of the fortifications, the eastern tower and the extensive quarter of houses in the southwestern part of the settlement. The osteological material was attributed to two general chronological phases: Early Makuria (6th–7th century AD) and Classic Makuria (11th–12th century AD).

MATERIAL

The state of preservation of the faunal remains collected by hand is good overall [*Fig. 1*] (61.49 % of the remains were identified to species) [*Table 1*]. Butchering and cooking had the greatest impact on the condition of the remains (heavy fragmentation of meat and bones), both representing biostratinomic processes in a taphonomic approach. Post-depositional factors affected the state of preservation of the bones to a lesser degree; extremely arid

Table 1. Identification of the studied animal remains from the Banganarti settlement

Bones	n	%
Identified	2579	61.5
Unidentified	1615	38.5
N	**4194**	**100**

Fig. 1. State of preservation of osteological material from Banganarti (Photo M. Osypińska)

conditions and high alkalinity ocassionally made the less compact bones brittle.

METHOD

Chronological and topographical divisions were applied to the material. Zoological and anatomical identification were the first stage of the analytical process. Macroscopic features on the bones were examined to establish age at death (Kolda 1936; Chaplin 1971; Lutnicki 1972; Müller 1973), sex (Calkin 1960; Sykes and Symmons 2007), osteometrics and taphonomy. Pathological changes on the bones were also observed. Species distribution was analyzed separately for two chronological phases; percentages were calculated for all identified remains within given groups. Frequency and percentage share of bones of animals exclusively with the highest economic potential were calculated as well. The anatomical distribution of the remains was analyzed for the most frequently represented species, also by chronological phases. Remains of species with the greatest economic value were examined also by technological carcass division corresponding to particular categories:

- head (H) (bones of cranium, corneal process, maxilla, teeth and mandible),
- torso (T) (vertebrae, sacrum, sternum and ribs),
- proximal part of anterior limb (PPAL) (scapula, humerus, radius, ulna),
- distal part of anterior limb (DPAL) (carpal bones, metacarpals I–V),
- proximal part of pelvic limb (PPPL) (pelvis, femur, patella, tibia, fibula),
- distal part of pelvic limb (DPPL) (calcaneus, talus, metatarsi),
- digits (D) (phalanges I, II, III).

Von den Driesch (1976) unified the results for all domestic species. Metric data for cattle bones were plotted on point scales (Lasota-Moskalewska 2005) in order to characterize trends in the cattle population morphotype in Banganarti.

RESULTS

PHASE 1: EARLY MAKURIA

The identified osteological remains from the Early Makuria phase of the settlement in Banganarti [***Table 3***] were dominated by mammals (*Mammalia*), with a few fish (*Pisces*) and bivalve mollusk shells (*Bivalvia*). Bones of domestic animals, especially ruminants (*Ruminantia*), prevailed in this assemblage. The frequency and percentage share of cattle and combined sheep/goat remains was very similar: respectively 42.77% and 41.08%. Pig was the next relatively numerous species in the assemblage (12.38%). The remaining animals were represented by much smaller groups. Skeleton elements of a dromedary were identified (3.18%) and single bones of donkey, dog and the only wild species in the group, that is, Dorkas gazelle. Two fish remains belonged to African sharptooth catfish (*Calrias gariepinus*), while a mollusk shell was identified as *Etheria nilotica*.

Cattle (44.44%), sheep/goat (42.69%) and pig (12.86%) were species of the greatest economic importance [***Table 2***].

Cattle was represented in the assemblage by all elements of the skeleton. Patellas and phalanges II and III were missing in the small ruminants group. Even more elements and the phalanges in particular were missing from the pig bones group.

Anatomical distribution of the cattle skeleton [*Table 4*] considered in categories of division of the carcass demonstrated the predominance of elements of the head (H). The frequency and percentage share of bones from the proximal part of the pelvic limb (PPPL), torso (T), and the proximal part of the anterior limb (PPAL) were also high. Bones from the distal part of the limbs and the phalanges both represented very small groups. A comparative analysis of the percentages calculated for the cattle bones from Banganarti and the model skeleton (after Lasota-Moskalewska 2005: 237–238) demonstrated differences regarding chiefly three parts of the carcass: torso and proximal parts of limbs. Evidently less torso fragments were identified at Banganarti,

Table 2. Percentage of remains of the most important economic species

Species	Early Makuria (6th–7th century AD) %	Classic Makuria (10th–11th century AD) %
Cattle	44.44	45.46
Sheep/goat	42.69	34.06
Pig	12.86	20.46

Table 3. Species distribution in the two general phases: Early Makuria (6th–7th century AD) and Classic Makuria (11th–12th century AD)

SPECIES	Early Makuria (6th–7th century AD)		Classic Makuria (11th–12th century AD)	
	n	%	n	%
Cattle *Bos primigenius f. domestica/f. taurus*	456	42.77	662	43.75
Sheep/goat *Ovis orintalis f. domestica/Capra aegagrus f. domestica*	438	41.08	496	32.80
Pig *Sus scrofa f. domestica*	132	12.40	298	19.70
Dromedary *Camelus dromedarius f. domestica*	34	3.20	22	1.45
Donkey *Equus africanus f. domestica*	1	0.09	29	1.91
Dog *Canis lupus f. domestica*	1	0.09	1	0.06
Dorcas gazelle *Gazella dorcas*	1	0.09	0	–
Bush pig *Potamochoerus larvatus*	0	–	1	0.06
Rodent *Rodentia*	0	–	1	0.06
African sharptooth catfish *Calrias gariepinus*	2	0.18	3	0.19
Etheria nilotica	1	0.09	–	–
Total	**1066**	**99,99**	**1513**	**100**

whereas the PPAL and PPPL constituted a much larger percentage compared to the model skeleton.

Anatomical distribution analyses of sheep/goat remains [see ***Table 4***] indicated the highest frequency and percentage share in the torso group. Head remains formed a large share in the small ruminants group. There was also a high frequency of bones of the proximal parts of limbs, standing out significantly from model skeleton data. Another significant difference from the model concerned the share of small ruminant phalanges. Head remains

Table 4. Anatomical distribution of bones for the key species in two chronological phases: Early Makuria (6th–7th century AD) and Classic Makuria (11th–12th century AD)

BODY PART	Cattle		Sheep/goat		Pig	
	%	Model skeleton (%)	%	Model skeleton (%)	%	Model skeleton (%)
Early Makuria (6th–7th century AD)						
H	23.70	20	25.61	20	39.71	20
T	18.20	43	35.18	43	22.70	34
PPAL	14.25	5	17.37	5	20.56	4
DPAL	7.90	8	2.90	8	0.70	10
PPPL	20.61	3	13.14	3	12.05	3
DPPL	10.30	7	4.90	7	4.25	9
D	5.04	14	0.90	14	–	20
Classic Makuria (11th–12th century AD)						
H	26.22	20	28.00%	20	46,80	20
T	26.70	43	21.14%	43	23.00	34
PPAL	15.95	5	26.28%	5	13,63	4
DPAL	6.60	8	2.28%	8	1,87	10
PPPL	12.26	3	17.14	3	12,30	3
DPPL	6.90	7	4.00%	7	1,87	9
D	5.36	14	1.14%	14	0,53	20

Table 5. Age of animals at death in the two chronological phases: Early Makuria (6th–7th century AD) and Classic Makuria (11th–12th century AD) (fr = fragments)

SPECIES	Early Makuria (6th–7th century AD)			Classic Makuria (11th–12th century AD)		
	Juvenis	Subadult	Young/adult (%)	Juvenis	Subadult	Young/adult (%)
Cattle	0 fr	28 fr	6.1	3 fr	37 fr	6.0
Sheep/goat	2 fr	12 fr	3.2	1 fr	13 fr	2.8
Pig	0 fr	7 fr	5.3	6 fr	17 fr	7.7

Table 6. Sex of animals in the two chronological phases: Early Makuria (6th–7th century AD) and Classic Makuria (11th–12th century AD)

SPECIES	Early Makuria (6th–7th century AD)		Classic Makuria (11th–12th century AD)	
	Female	Male	Female	Male
Cattle	2	5	0	2
Sheep/goat	0	0	0	1 (goat)
Pig	0	0	0	3

Table 7. Osteometry of cattle bones in the Early Makuria phase (6th–7th century AD)

BONE	OSTEOMETRY (mm)	WH (cm)
Proc. cornuales	Basal circumference (BC)-200	
Scapula	SLC-58.36	
Humerus	Bd-76.28; 75.9; 71.9; 75.09	
Radius	Bd-71.56	
O. metacarpi III+IV	Bd-54.5; 58.15; 53.46; 57.99; 60.27; 56.58; 56.27 **SD-53.39; Bd-62.43; GL-222.38**	133.4
Tibia	Bd-64.36; 59.77	
O. metatarsi III+IV	Bd-50.64; SD-26.68 Bd-64.36; 53.27 **Bp-47.86; SD-25.85; GL-248.25** Bp-47.72; SD-27.14 Bp-43.79; 46.34 Bd-59.77; 54.18 Bp-46.4; SD-28.34	132.8
Talus	GLI-74.0; GLI-72.97; GLm-65.26; Bd-46.17 GLI-67.87; Gm-62.5; Bd-39.01 GLI-64.4 GLI-66.82; GLm-59.17; Bd-41.53	
Calcaneus	GL-121.52; 137.41; 130.13; 160.32; 137.57; 144.4;	
Ph. proximalis	Bp-28.7; Bd-27.28; GL-58.9 Bp-29.64; Bd-28.93; GL-62.25 Bp-27.85; Bd-27.16; GL-66.88 Bp-26.46; Bd-27.67; SD-25.84; GL-62.82	
Ph. media	GL-44.94	
Ph. distalis	DLS-66.23	

predominated in the pig group as well. Bones from the torso, PPAL and PPPL groups demonstrated a relatively high frequency. The distal parts of limbs were characterized by very low percentages; no phalanges were recorded.

The percentage of immature cattle in the Early Makurite assemblage was 6.14% [*Table 5*], but none of the bones belonged to very young individuals (*juvenis*). All could be estimated as being of subadult age, that is, immature but almost the size of mature animals. In the sheep/goat group, two bones of very young animals and 12 fragments of subadult specimens were recorded (3.19%) [see *Table 5*]. The percentage of remains from immature pigs, all of subadult age, stood at 5.30%.

Only cattle bones from the Early Makurian phase at Banganarti retained enough distinctive characteristics to allow identification of the sex. Five of them were identified as male and two as female [*Table 6*].

Cattle height at the withers could be calculated in two cases, both approximately 133 cm. Osteometric data calculated on appropriate point scales resulted in a skewed graph with a predominance of mean values [*Table 7* and *Fig. 2*]. The graph shows a population that was homogeneous but morphologically unstable.

Skeletal material from early Makurite Banganarti yielded only 17 bones with evidence of damages, mainly charring and burning. Occasional cuts resulting from carcass sectioning were recorded as well. The only recorded pathological changes were noted on the jaw of a sheep and were caused by long-lasting inflammation [*Table 9A* and *Fig. 4*].

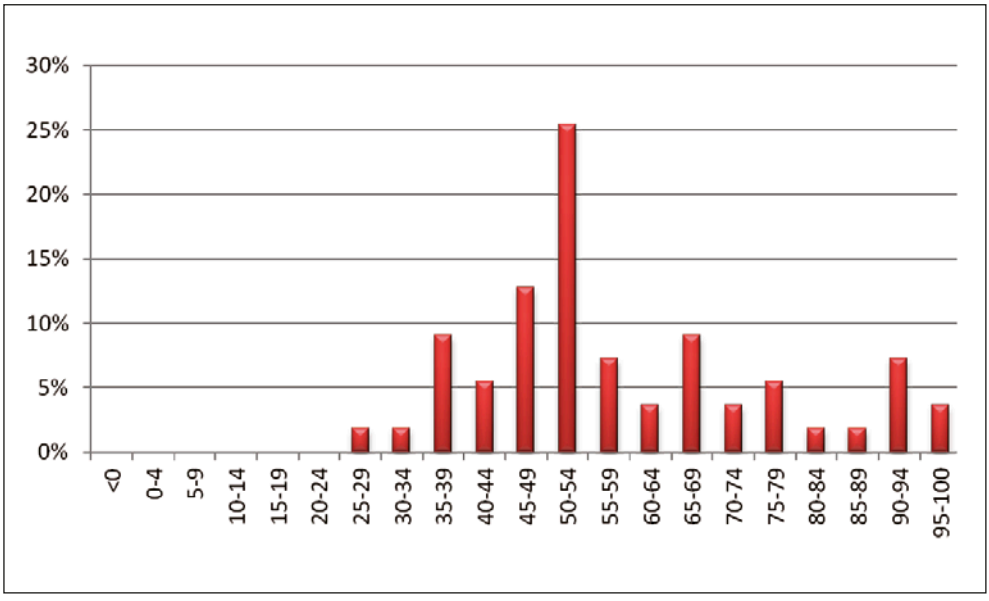

Fig. 2. Morphology of cattle in the Early Makuria phase (6th–7th century AD)

Table 8. Osteometry of cattle bones in the Classic Makuria phase (11th–12th century AD)

BONE	OSTEOMETRY (mm)
Proc. cornuales	Basal circumference (BC)-260
Scapula	SLC-74.42 SLC-78.96; GLp-63.46
Humerus	Bd-79.2; 76.0; 73.44; 71.72; 76.66; 76.99; 61.01
Radius	Bd-59.42; Bp-78.8; 78.62; 79.81; 83.38; 77.20
O. metacarpi	Bp-54.44; 56.36; 53.25 Bd-48.08; 50.11; 57.60; 57.39; Bp-51.68 SD-29.03 Bd-54.21
Femur	Bd-108.72; 82.67
Tibia	Bd-60; 61.48; 57.85; 57.96; 53.18
O. metatarsi	Bd-49.18; 53.17 Bp-47.7
Talus	GLI-69.67; GLm-63.24; Bd-43.30 GLI-68; GLm-63; Bd-45 GLI-65.80; GLm-60.82; Bd-38.88 GLI-66.91; GLm-60.67 GLm-67.42
Calcaneus	GL-138.51; 137.33; 131.06
Ph. proximalis	Bp-26.46; Bd-26.15; GL-62.93 Bp-28; Bd-27; SD-23; GL-66 Bp-27.84; Bd-26.9 Bp-26.42; Bd-27.6; GL-60.00 Bp-29.73; Bd-26.81; GL-66.29 Bp-29.95; Bd-27.32; GL-58.01 Bp-27.45; Bd-27.5; GL-55.87 Bp-27.66; 31.13 Bp-27.23; Bd-26.65; GL-58.74 Bp-28.64; Bd-28.36; GL-61.35 Bp-28.51; SD24.10; Bd-28.15; GL-60.50 Bp-30.33; SD-26.10; Bd-28.94; GL-58.42 Bp-27.02; SD-25.05; Bd-25.30; GL-57.34 Bp-27.77; Bd-27.09; GL-63.75
Ph. media	GL-40.0; 42.59; 39.36; 39.95 Bp-28.64; Bd-24.28; GL-42.6; 43.57; 43.25; 42.3; II Bp-24.08; SD-19.14; Bd-22.00; GL-35.79
Ph. distalis	DLS-60.63; Ld-48.17 DLS 60; 53.65

PHASE 2: CLASSIC MAKURIA

Archaeological contexts dated to the 11th–12th century AD yielded 1513 identifiable faunal remains [see *Table 3*]. They belonged to ten species, mainly mammals. The most numerous group was made up of cattle remains. Sheep/goat remains were also relatively frequent, as was pig. The other taxonomic groups were represented by decidedly smaller assemblages: donkey, dromedary, dog, bush pig and rodent. The only non-mammal remains were three bones of catfish. Cattle dominated the list of economically significant species [see *Table 2*].

The anatomical distribution analysis for species with key economic importance [see *Table 4*] demonstrated that almost all the elements of the cattle skeleton were found in 11th–12th century AD assemblages from Banganarti. As for small ruminants, some minor bones were missing (patella, metacarpalia and phalanges III). Analysis of the anatomical distribution of pig remains demonstrated the absence of only the smallest bones: metacarpalia, phalanges II and III. Anatomical distribution of remains considered in categories of division of the carcass demonstrated a dominance of the head and torso remains. A high frequency of PPAL and PPPL remains were noted as well. Osteological remains from the distal parts of limbs and phalanges formed much smaller groups. A comparison with the model cattle skeleton revealed the main differences in the T, PPAL, PPPL and D groups. Remains of parts of the carcass attractive from a consumption point of view constituted a much higher percentage of the material compared to the model skeleton, but the share of phalanges was evidently smaller. Other parts of the carcass (head, distal parts of limbs) were recorded in percentages approximating data for the model skeleton. Regarding sheep/goat remains, head parts as well as PPAL and torso fragments demonstrated the highest frequency. PPPL fragments were also high in number, while the distal parts of limbs and phalanges were minimal. This was reflected in the comparison of

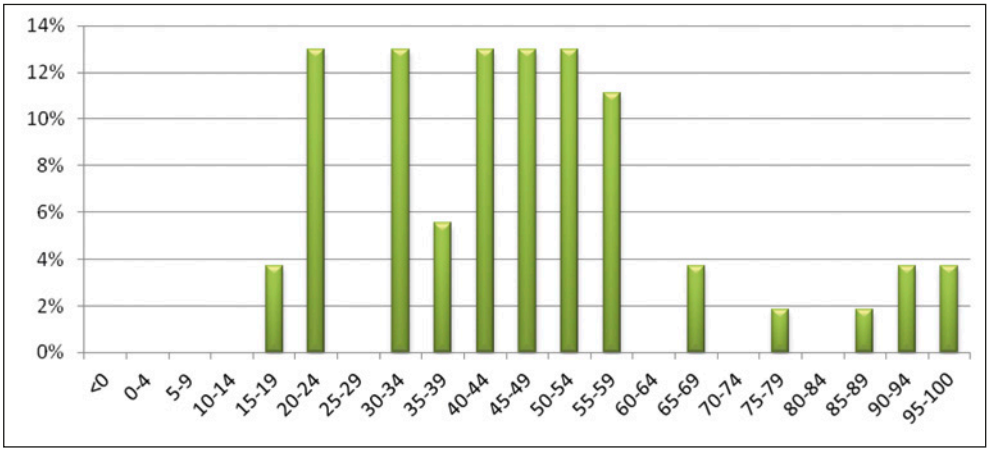

Fig. 3. Morphology of cattle in the Classic Makuria phase (11th–12th century AD)

percentage shares with model data, which evinced clear differences, especially with regard to remains from the torso, PPAL and PPPL categories. As for the pig group, head parts predominated, while the other groups were characterized by a definitely lower frequency: torso, PPAL and PPPL in diminishing order. The same number of bone remains from the distal parts of limbs was found and only two phalanges. An analysis of percentage shares indicated that almost half of the remains consisted of head bones and teeth. There was a high share of torso bone fragments and a comparable share of proximal parts of limbs. A comparative analysis of the anatomical distribution of pig remains as compared to the model skeleton revealed significant differences concerning all elements of the pig carcass.

Archaeozoological analysis identified 40 fragments of cattle bones from immature specimens: three came from very young individuals and 37 from specimens of almost mature size. The combined share of young animals in the group of cattle remains was 6.14% [see ***Table 5***]. The same was true of bones of sheep/goats with most of the immature individuals being slaughtered between 18 and 30 months of age. The share of immature animals among the small ruminants was 2.82%. The highest share of young animals was found among pig bones: 7.71% [see ***Table 5***]. None of the faunal remains from late contexts in Banganarti could be identified as belonging to female specimens [see ***Table 6***]. Two fragments of cattle bones, one bone of goat and three pig teeth were identified as belonging to male animals.

The state of preservation of animal remains from the younger archaeological contexts permitted osteometric measurements, cattle remains being the largest

Table 9A. Damage to bones from Banganarti from the Early Makuria phase (7th–10th century AD)

Species	Bone	Kind of damage
	Banganarti 7th–10th century AD	
Sheep/goat	Mandibula	Post-inflammation changes
Sheep/goat	Humerus	Burnt
Sheep/goat	Radius	Burnt
Sheep/goat	O. metacarpi	Burnt
Sheep/goat	Pelvis	Burnt
Sheep/goat	Femur	Burnt
Sheep/goat	Femur	Burnt
Pig	Costa	Burnt
Pig	Femur	Burnt
Pig	O. metatarsi	Burnt
Cattle	Vertebra	Burnt
Cattle	Scapula	Burnt
Cattle	Humerus	Cut marks at the distal epiphysis
Cattle	Humerus	Burnt
Cattle	O. metacarpi	Burnt
Cattle	Talus	Burnt
Cattle	Calcaneus	Burnt
Cattle	O. metatarsi	Burnt

group of measured bones [see ***Table 8*** and ***Fig. 3***]. Height at the withers could not be calculated for any specimen. Cattle morphology studies used the same method as for the earlier assemblage; the result was a graph with two clusters of values and a predominance of mean values. It suggested a heterogeneous population, the main herd being made up of middle-sized animals. Large cattle were imported.

The material from the 11th and 12th centuries demonstrated much more damages connected with successive stages of carcass division and meat processing for consumption [***Fig. 4***]. The largest group in this category was made up of cattle bones [see ***Table 9B***]. Similarly as in the case of the material from the earlier contexts, a considerable number of bones bore evidence of direct contact with fire.

Table 9B. Damage to bones from Banganarti from the Classic Makuria phase (11th–12th century AD)

Species	Bone	Kind of damage
	Banganarti 11th–12th century AD	
Cattle	Cranium	Burnt
Cattle	Mandibula	Burnt
Cattle	Vertebrae	Burnt
Cattle	Vertebrae	Burnt
Cattle	Scapula	Burnt
Cattle	Humerus	Cut marks
Cattle	Humerus	Burnt
Cattle	Humerus	Cut marks
Cattle	Humerus	Cut marks at the epiphysis Bd
Cattle	Humerus	Burnt
Cattle	Humerus	Cut marks
Cattle	Femur	Burnt
Cattle	Ph. proximalis	Burnt
Cattle	Ph. proximalis	Burnt
Cattle	Ph. proximalis	Burnt
Cattle	Ph. media	Burnt
Pig	Cranium	Burnt
Pig	Os frontalis	Cuted hole in the frontal bone
Pig	Os frontalis	Cuted hole in the frontal bone
Pig	Os frontalis	Cuted hole in the frontal bone
Pig	Os frontalis	Cuted hole in the frontal bone
Pig	Mandibula	Burnt
Pig	Costa	Cut marks
Pig	Costa	Illness changes
Pig	Tibia	Burnt
Pig	Calcaneus	Burnt
Sheep/goat	Cranium	Burnt
Sheep/goat	Scapula	Burnt
Sheep/goat	Humerus	Burnt
Sheep/goat	Radius	Burnt
Sheep/goat	Radius	Burnt
Sheep/goat	Femur	Burnt
Sheep/goat	Pelvis	Burnt
Sheep/goat	Vertebra	Burnt

RECAPITULATION

An archaeozoological examination of osteological material from the settlement surrounding the pilgrimage center in Banganarti has yielded key data on the animal economy model in operation at the religious complex. The results have given an opportunity to analyze for the first time breeding patterns, as well as meat

Fig. 4. Evidence of anthropic damages on bones: top, traces of chopping on the humeral bones of cattle (11th–12th century AD); bottom left, frontal bone of pig with evidence of consumption-related damages (11th–12th century AD); bottom right, astragalus/talus bone with traces of cutting (11th–12th century AD) (Photos M. Osypińska)

consumption and economic significance of animals in communities other than the social elites (as can be assumed for the Dongola Palace and citadel assemblages, see Osypińska 2004; 2013; 2014). The present report on the faunal remains from Banganarti has demonstrated many shared characteristics with the data from Dongola. First, a progressing economic significance of cattle over the ages and secondly, the common breeding and consumption of pigs, which was not restricted solely to the capital. Current research leaves no doubt that the Christian period was the only episode in the history of the Middle Nile when pigs played such a significant role.

The faunal assemblage from Banganarti, especially from the settlement, points however to the specific nature of this site in terms of the animal economy. Beef and pork were consumed in a much higher volume and proportions to the small ruminants from the Dongola citadel. The diversified morphology of the cattle from Banganarti (Classic Makuria period in particular) is an interesting issue as well. The main herd seems to have been fairly uniform throughout the studied periods. However, the population from the later phase reveals evidence of much larger animals.

Ataphonomic analysis of faunal remains from Banganarti has also shed new light on ways of meat preparation other than those already known from Dongola (Osypińska 2004; 2013; 2014). Roasting meat on an open fire seems to have been quite common at Banganarti. An unparalleled way of eating pork head has also been recorded; in both chronological phases, evidence of piercing the frontal bone was observed.

The archaeozoological analysis of material from the settlement in Banganarti has contributed significantly to studies of broadly understood Makurite economy. The presented data undoubtedly influenced the understanding of meat consumption (diet), ways of food processing, breeding models and animal behavior, as well as long-distance cattle trading in African civilizations in the past.

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