[Supplementary material]

Pork for pilgrims: livestock breeding and meat consumption at medieval Banganarti, Nubia

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Archaeozoological data

The osteological material discussed in the paper (partially presented in fieldwork reports: Osypińska 2003, 2010, 2014a, 2014b, 2016a, 2016b; Gauza 2005) was subject to analysis aimed at the most comprehensive taxonomic and anatomical identification of remains possible. The analysis comprised of several stages. In the case of well-preserved diagnostic features the bones were identified according to taxa and anatomy based on the comparable collections and relevant publications (Walker 1985; Peters 1986; Peters 1989; Peters *et al.* 1997; Plug 2014). Skeletal remains of wild species were also subject to additional reassessment based on modern comparative collections in Belgium (L'Institut Royal des Sciences Naturelles de Belgique, Palaeontological Reseach Unit, Ghent University). Remains completely devoid of diagnostic features were counted and recorded in taxa and grouped according to the relevant context.

The remains coming from the main species (the most important for human consumption) were divided into seven groups, reflecting the technological division of the carcass: head (H), torso (T), proximal part of anterior limb (PPAL), distal part of anterior limb (DPAL), proximal part of posterior limb (PPPL), distal part of posterior limb (DPPL) and phalanges (Ph). The main criterion for this division was the location of the bone in the skeleton. Then, the percentage of remains from a particular part of the carcass was calculated. The data obtained were compared with the percentages achieved by the bones in the model skeleton, adequate for a given group of animals (Lasota-Moskalewska 2008). Studies of anatomical distributions of remains were also carried out taking into account the chronological and functional diversity of particular contexts from which the remains came (Table S1). Anatomical identification consisted of the determination of individual skeletal elements from which the particular bone elements derived. On this basis, anatomical distributions were analysed for the remains of these species, whose assemblages were statistically significant.

Observations were made regarding the age of animals at the time of death based on the stage of ontogenetic development of teeth and bones (Grant 1982). These considered the extent of epiphyseal fusion (Schmid 1972; Lasota-Moskalewska 2008; Reitz & Wing 2008). Another method to determine the age of animals was recording the development of tooth wear (for sheep and goat: Payne 1973; Vigne & Helmer 2007; for cattle and pig: Grant 1982; Greenfield & Arnold 2008; Desbiez & Keuroghlian 2009).

A part of the archaeozoological analysis, providing the most scientifically valuable data, were analyses of the morphology of breeding species (Table S2). Observations were mainly based on standardized osteometric protocol (Von den Driesch 1976). On the basis of the bones metrics, the height at the withers was calculated using adequate coefficients for pigs (Von den Driesch & Boessneck 1974).

Table S1. Faunal remains from Banganarti (eleventh to twelfth centuries AD) in light of the basic functional-topographic differentiation of the site.

Taxa	**Eastern district**	**Fortifications**	**Banganarti Total**
	%	%	%
Cattle *(Bos primigenius* f. *domestica/Bos taurus)*	49.52	46.13	47.15
Sheep *(Ovis aries)*/goat *(Capra hircus)*	35.61	30.18	32.00
Swine *(Sus scrofa* f. *domestica)*	12.28	20.12	17.47
Donkey *(Equus asinus)*	0.66	0.14	0.32
Equids *(Equinae)*	0.28	1.50	1.09
Dog *(Canis lupus* f. *domestica)*	-	0.24	0.16
Dromedary *(Camelus dromedarius)*	0.95	1.06	1.02
Dorcas gazelle *(Gazella dorcas)*	0.09	0.24	0.20
Bushpig *(Potamochoerus larvatus)*	0.09	-	0.03
Hare *(Lepus capensis)*	-	0.04	0.03
Rodents *(Rodent* sp.)	0.09	-	0.03
Fish *(Pisces* sp.)	0.19	0.19	0.20
Nile oyster *(Etheria nilothica)*	0.28	0.09	0.16
NISP	1050	2057	3107

Table S2. The anatomical distribution of the pig remains from Banganarti.

Part of the body	Eastern district		Fortifications		Total		Model skeleton (%)
	%	Surplus/ deficiency	%	Surplus/ deficiency	%	Surplus/ deficiency	
Head	41.3	21.3	37.7	17.7	39.0	18.9	*20*
Torso	18.5	-15.5	27.0	-7.1	24.1	-9.8	*34*
Proximal part of anterior limb	18.0	14.0	10.8	6.8	13.1	9.1	*4*
Distal part of anterior limb	3.2	-6.7	4.2	-5.8	3.8	-6.1	*10*
Proximal part of posterior limb	13.6	10.5	14.0	11.0	14.0	10.8	*3*
Distal part of posterior limb	3.8	-5.2	4.2	-4.7	4.0	-4.9	*9*
Phalanges	1.6	-18.3	2.1	-17.9	1.9	-18.0	*20*
NISP	129		414		543		

Table S3. Pigs from Makurian Banganarti: osteometric data.

Bone/tooth	Dimensions (mm)	Height at the withers (WH, cm)
Third molar	36.7; 34.0; 33.3; 32.7; 32.5	
Scapula	GLP-34.6; SLC-23.4	
	GLP-34.3; SLC-21.7	
	GLP-33.2; SLC-22.5	
	GLP-32.7; SLC-21.9	
	GLP-32.2; SLC-20.1	
	GLP-31.7; SLC-20.3	
	GLP-30.8; SLC-19.5	
	GLP-30.6; SLC-16.4	
	GLP-30.3; SLC-19.2	
	GLP-29.9; SLC-19.7	
	GLP-29.7; SLC-19,5	
	GLP-28.4; SLC-17.7	

Humerus	Bd-35.7; BT-26.5	
	Bd-34.5; BT-26.0	
	Bd-34.7; BT-28.8	
	Bd-34.1; BT-26.4	
	Bd-34.6; BT-25.6	
	Bd-33.9; BT-25.7	
	Bd-33.6; BT-26.3	
	Bd-33.6; BT-25.2	
	Bd-33.4; BT-26.1	
	Bd-32.7; BT-25,8	
	Bd-31.5; BT-23.6	
	Bd-31.3; BT-23.0	
	Bd-30.9; BT-26,7	
	Bd-30.8; BT-24,9	
	Bd-30.2; BT-25.7	
Radius	GL-137.6; Bp-23.8; Bd-27.7	72.5
	Bp-23.6; 25.7; 25.4	
Femur	GL-167.2; Bd-67.4	61.0
Calcaneus	GL-71.2	66,5
Talus	GL-41.4; 40.8	74.1; 73.0
Medial	GL-45.2; Bp-31.2; SD-27.0;	
phalanx	Bd-29.5	
	GL-40.5; Bp-26.3; SD-21.3;	
	Bd-22.7	

The literary sources

A classic example of the usefulness of literary sources for analysis of is Miracle 18 from the collection of Arabic texts relating to Saint Menas, published by Felicitas Jaritz (1993). It states that a villain named Bastamun used to steal the pigs belonging to the church of Abu Menas. The Saint was patient with his wrongdoing, but not forever. One day the man came, as usual, took a pig, returned to his house, slaughtered the pig and cut it into pieces. “Immediately after that, God gave an order, and that flesh became stone” (Jaritz 1993: 176).

Another story narrates the adventure of a soldier in the service of the king. When he rode past the Saint Menas church one of the pigs disturbed the horse's gait, whereupon the soldier fell down. He grabbed the pig, slaughtered it and tried to take it home, but servants and pilgrims who were standing in front of the church, said: “Hey man, why did you do that? Know that this pig belongs to the church of the Holy Abu Menas. Now we believe that he will soon take revenge on you” (Jaritz 1993: 173). The above narrative suggests that the pigs were foraging in the vicinity of the Saint Menas church, because it is hardly imaginable that the mounted soldier entered a pig-sty. Nevertheless, the custom of bringing pigs to the church as offerings to the Saint and keeping them in enclosures is attested in another version of Miracle 18 and in Miracle 20 (Jaritz 1993: 203, 205, 231). As a rule, however, the texts speak of Saint Menas’ pigs or simply of the pigs belonging to the church of St Menas without specifying the place or mode of their breeding (Jaritz 1993: 173, 176).

Further literary evidence for the presence of pig flocks in the pilgrimage centres is provided by the writings of Sophronius of Jerusalem, a sixth/seventh century monk and theologian. He authored a collection of miracles worked by Saint Cyrus and Saint John in Menuthis in Lower Egypt (Delattre 2008). In two miracles (nos. 11 and 49) there are clear hints at the ubiquitous presence of pigs in the vicinity of the Church of Four Evangelists in Menouthis, which was the focal point of the pilgrimage site there (Delattre 2008). The story narrated in Miracle 11 starts when a little girl fell out through a window in a house standing close to the sanctuary of Saint Cyrus and Saint John. It ends when the girl was found unharmed, sitting on the floor, near the (Saint’s) grave “happy with the pigs present there”. In another miracle wrought by Saint Cyrus and Saint John (Miracle 49), also narrated by Sophronius, two men Piamoth and Georgios, appropriated a pig destined for the sanctuary of the Saints. Needless to say they were severely punished by the holy healers.

References

DELATTRE, A. (2008). J. Gascou, Sophrone de Jérusalem: Miracles des saints Cyr et Jean, Paris, 2006. *Chronique d'Egypte* 83: 394–95.

DESBIEZ, A.L.J. & A. KEUROGHLIAN. 2009. Ageing feral pigs (*Sus scrofa*) through tooth eruption and wear. *Suiform Soundings* 9: 48–55.

GAUZA (OSYPIŃSKA), M. 2005. Faunal remains from the church at Banganarti (2002 season). *Gdańsk Archaeological Museum: African Reports* 3: 79–86.

GRANT, A. 1982. The use of tooth wear as a guide to the age of domestic animals, in B. Wilson, C. Grigson & S. Payne (ed.) *Ageing and sexing animal bones from archaeological sites* (BAR British Series 109): 91–108. Oxford: British Archaeological Reports.
GREENFIELD H.J. & A.R. ARNOLD. 2008. Absolute age and tooth eruption and wear sequences in sheep and goat: determining age-at-death in zooarchaeology using a modern control sample. *Journal of Archaeological Science* 35: 836–49. https://doi.org/10.1016/j.jas.2007.06.003
JARITZ, F. 1993. *Die arabischen Quellen zum Heiligen Menas*. Heidelberg: Orientverlag.
LASOTA-MOSKALEWSKA, A. 2008. *Archeozoologia. Ssaki*. Warsaw: Wydawnictwo Uniwersytetu Warszawskiego.
OSYPIŃSKA, M. 2003. Faunal remains from the Banganarti Church**.** *Polish Archaeology in the Mediterranean XV* Reports 2003: 261–67.
– 2010. Faunal remains from Banganarti, season 2007. *Polish Archaeology in the Mediterranean XIX* Reports 2007: 359–68.
– 2014a. Animals in the economy of Christian Makuria, in J.R. Anderson & D.A. Welsdy (ed.) *The Fourth Cataract and beyond: Proceedings of the 12th International Conference for Nubian Studies, London, 1st–6th August 2010*: 209–16. Stratford-upon-Avon: Walpole.
– 2014b. Historic fauna: animal representations and faunal remains from the Upper Church, in B.T. Żurawski (ed.) *Kings and pilgrims: St. Raphael Church II at Banganarti, mid-eleventh to mid-eighteenth century*: 297–317. Warsaw: Neriton.
– 2016a. Faunal remains from the fortified settlement around the Raphaelion church in Banganarti. *Polish Archaeology in the Mediterranean* 24: 411–24.
– 2016b. The pig: a mystery of medieval Makuria, in A. Łajtar, A. Obłuski & I. Zych (ed.) *Aegyptus et Nubia Christiana. The Włodzimierz Godlewski jubilee volume on the occasion of his 70th birthday*: 525–38. Warsaw: Polish Centre of Mediterranean Archaeology.
PAYNE, S. 1973. Kill-off patterns in sheep and goat: the mandibles from Asvan Kalć. *Anatolian Studies* 23: 281–303. https://doi.org/10.2307/3642547
PETERS, J. 1986. *Osteomorphology and osteometry of the appendicular skeleton of African buffalo,* Syncerus caffer *(Sparrman 1779) and cattle,* Bos primigenius f. taurus *(Bojanus 1827)* (Occasional papers 1). Gent: Laboratorium voor Paleontologie, Rijksuniversiteit Gent.
– 1989. Faunal remains and environmental change in central and eastern Sudan from Terminal Pleistocene to Middle Holocene times. *Mededelingen van de koninklijke Academie voor Wetenschappen Letteren en Schone Kunsten van Belgie* 4: 123–47.

PETERS, J., W. VAN NEER & I. PLUG. 1997. *Comparative postcranial osteology of Hartebeest (*Alcelaphus buselaphus*), Scimitar oryx (*Oryx dammah*) and Addax (*Addax nasomaculatus*), with notes on the osteometry of gemsbok (*Oryx gazelle*) and Arabian oryx (*Oryx leucoryx*)* (Annales Sciences Zoologiques, vol. 280). Vertebrate Section Royal Museum of Central Africa: Tervuren

PLUG, I. 2014. *What bone is that? A guide to the identification of southern African mammal bones*. Pretoria: STN Printers.

REITZ, E. & A. WING. 2008. *Zooarchaeology*. Cambridge: Cambridge University Press. https://doi.org/10.1017/CBO9780511841354

SCHMID, E. 1972. *Atlas of animal bones: for prehistorians, archaeologists and Quaternary geologists*. New York: Elsevier.

VIGNE J.-D. & D. HELMER. 2007. Was mils a "secondary product" in the Old World Neolithisation process? First role in the domestication of cattle, sheep and goats. *Anthropozoologica* 42(2): 9–40.

VON DEN DRIESCH, A. 1976. *A guide to the measurement of animal bones from Archaeological sites* (Peabody Museum Bulletins 1). Cambridge (MA): Peabody Museum.

VON DEN DRIESCH, A. & J. BOESSNECK. 1974. Kritische Anmerkungen zur Widerristhöhenberechnung aus Längenmasen vor-und frühgeschichtlicher Tierknochenm. *Säugetierkundliche Mitteilungen* 22: 325–47.

WALKER, R.A. 1985. *Guide to post-cranial bones of East African animals*. Norwich: Hylochoerus.