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**ZOOARCHAEOLOGICAL ANALYSIS  
OF MATERIAL FROM CISTERN  
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IN NEA PAPHOS**

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PCMA Associate

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In the 1996–1997 field campaign of the Polish archaeological mission in Nea Paphos testing in the southwestern corner of insula 9A, that is, the intersection of latitudinal street 9 and longitudinal street A, situated to the south of the Villa of Theseus, uncovered a cistern (STR1/96-97). The installation belonged to a Hellenistic–Early Roman house known only from small exploratory pits I and IV excavated in 1965 (Młynarczyk 1990: 171, Figs 20, 21; Lichočka 1992: Fig. 6 [Młynarczyk 1990: Fig. 20, direc-

tion corrected]), a narrow trench along the southern and eastern elevation of the Villa of Theseus (Młynarczyk 1990: 173–174, Papuci-Władyka 1995: 174–176, Fig. 8). The cistern was located under room 66 (Papuci-Władyka 1998; Papuci-Władyka 1995: 180–182) and appears to have been filled in two stages: the chamber in the second half of the 1st century BC (Daszewski 1997: 118–120; Papuci-Władyka 1998) and the upper part of the shaft later, having first been used in the times of the Roman Emperor

Augustus as a bin for a pot with an Eastern Sigillata A dish, Hayes form 29, acting as a lid. The fill produced large quantities of potsherds, stamped amphora handles and lamps, as well as a number of coins (latest of Cleopatra VII) and other small finds. Mendable vessels included a substantial number of cooking pots and one misfired example, which according to the excavators suggests that the lower layers of the fill in the chamber consisted of debris of domestic origin, relocated from another rubbish dump (Papuci-Władyska 1998: 135). Sieving with a 0.8 cm mesh recovered multiple faunal remains: mammals, birds, fish bones (to be analyzed separately), as well as remains of sea urchins, and marine and terrestrial mollusks.

Another cistern (HA/NEH S.16.3) was discovered in 2008 during the exploration of the Northeastern House, a building underlying in part later House of Aion, situated to the east of the Villa of Theseus. A masonry stylobate from an earlier building with incorporated wellhead was found at the eastern end of room 36. This narrow bottle-shaped installation was 6.45 m deep. The fill included diverse pottery as well as stamped amphora handles, lamps, glass vessels, all of which set a tentative date for the facility from the end of the 1st century AD through the early second half of the 2nd century AD (Meyza forthcoming). Animal remains from the fill included mammals, birds, fish (to be analyzed separately), marine and terrestrial mollusks, as well as corals.

## EARLIER ZOOARCHAEOLOGICAL RESEARCH IN CYPRUS

Few analyses of archaeological faunal remains from Cyprus have been made for the relevant periods, hence the set for comparative research is limited. Available publications have supplied data for domesticated and wild mammals, birds, fishes and also mollusks.

P. Columeau's examination of animal remains from the sanctuary of Aphrodite in Amathus on the southern coast of Cyprus revealed the presence of domestic animals such as ox, sheep and goat. There were no finds of pig remains. According to the measurements of bovine bones, their height increased in the course of the pre-Christian periods (Columeau 1996). Analyzing faunal remains from same site, Columeau (2006) reported the presence of cattle, pig, goat, sheep, dog, partridge, various mollusks and fish remains.

Despite the fact that these bones date to the archaic period, there are many similarities in the species types compared to the Paphos cisterns. The remains from Amathus consisted foremost of domesticated species: cattle, sheep/goat (ruminants in general) and pig, as well as some pigeon. Over 70% of the bones from the cave belonged to cattle. The next most commonly represented species was sheep/goat. The species structure was the same for the post-archaic period, there being a variation in numbers with 80% of the bones belonging to cattle and almost 20% to sheep/goat. There were also remains of horse, donkey and sheep, as well as of birds. Bones of wild animals like deer, roe deer, hare, rabbit were also found on the site, demonstrating the faunal variety on the island during these times.

Hellenistic material from Kition-Bamboula IV, analyzed by J. Deese, was not extensive (just 110 bones), but it showed that the most common species on the site were cattle and sheep/goat. There were also some pig bones, as well as remains of *Equidae* and *mustelidae*, rabbit, fish and birds (Deese 1993).

Only caprine and bird bones were found in the Hellenistic tomb of Pegeia and they seem to have been brought there as part of funerary rites. Caprine species were represented by sheep and goat, birds by chicken bones and eggshells exclusively. There were few, if any, marks of burning or butchering, which could indicate according to the excavator that the meat had been brought to the tomb cooked. The birds were small (according to the bone measurements) and all appeared to be female (hen). The sheep and goat were represented by young and very young individuals (average age up to two years and

plenty of lambs aged only a few months) (Croft 2002).

A mule skeleton found in Kourion in 198 proved to have been a victim of the earthquake in AD 365. Marks of an iron chain were found on the animal's bones, indicating that it had been unable to escape. According to L.J. Pierce (1986), the mule was between 6 and 8 years old.

Marine and fresh-water shells from the village of Kalavassos Kopetra (Vasilikos Valley) were found to represent 23 different species of mollusks: *Mytilus*, *Murex trunculus*, *Dentalium dentalis*, *Turritella communis*, and many more, and 20 bivalve fresh-water shells mostly from the genus *Unio*, which comes from the large family of *Unionidae*. According to author some of these could have been eaten (e.g., genus *Mytilus*), while others could have been collected at the beach for the purpose of making ornaments as they had holes pierced in the shells (Reese 2003).

## MATERIAL AND METHODS

Animal remains from both cisterns were well preserved and the two batches were examined separately. Archaeozoological analyses were carried out on 1552 remains from cistern STR1/96-97 and 822 remains from cistern HA/NEH S.16.3. Comparative techniques were applied (Krysiak, Kobryń, Kobryńczuk 2004) and the remains identified with regard to anatomy and taxonomy. The bird bones from both batches were analyzed by Teresa Tomek from the Institute of Systematics and Evolution of Animals, Polish Academy of Sciences in Kraków (Poland).<sup>1</sup> Zoological

and anatomical analyses were made and wherever the exact species could not be ascertained, the remains were assigned to family for mammals and mollusks and to order for birds. Anatomical distribution was analyzed for three mammal species (986 pieces) from cistern STR 1/96-97; the rest of the animal species from this cistern and the bones from cistern HA/NEH S.16.3 were not numerous enough to study anatomical distribution. Animal age was determined based on fusion of bone epiphysis and diaphysis (Kolda 1936) and dentition (Lutnicki 1972). Sex was

<sup>1</sup> I would like to acknowledge my gratitude to Assoc. Prof. Teresa Tomek for her support.

specified for respectively four and one species of mammals from the cisterns STR 1/96-97 and HA/NEH S.16.3 by using features of sexual dimorphism as described by A. Lasota-Moskalewska (2008) and measurements of the skull's condylobasal length (Pucek 1984). For birds, sex was specified on the basis of features appearing on the bones and their fragments. Bones of sheep and goat were distinguished only in material from cistern STR 1/96-97 on the basis of horn core shape (Schramm 1967) and for the most part could not be identified more precisely for lack of specifically diagnostic features. Osteometric examination of the bones and measurement of their

fragments was made consistent with the method given by von den Driesch (1976). Withers height was counted only for pig using coefficients worked out by Teirecht (1966-1969, cited after von den Driesch and Boessneck 1974). Marks on the bones were interpreted using methods described by Lasota-Moskalewska (2008). Detailed morphology could not be established for all animals owing to the poor condition of the bones. Terrestrial mollusk species were determined by comparison with common currently occurring species on the island. A similar procedure was applied to marine mollusks (Orr 2000), sea-urchins and corals.

## CISTERN STR 1/96-97

Remains analyzed anatomically and zoologically counted 1331 of 1552 remains, that is, 85.76% [Table 1]. Mammals accounted for 1140 remains; of this 90.32% belonged to domesticated species and 8.68% to wild mammals. Bird remnants numbered 132 bones, that is, 9.92% of the examined material. Participation of all mollusks was 3.98%, while sea urchins under 1%.

Sheep/goat was predominant among domestic mammals (60.04%). The distinction between species was made by examining preserved horn core and sacrum bone fragments. Sheep remains were found to exceed twice the number of goat remains. The share of pig stood at 34.68%, while cattle was ten times less at 3.46% [Table 2]. Under 1% of determined remains belonged to dog, cat, donkey, and representative(s) of the equid family.

Wild mammals were represented by 99 bones. Most belonged to the least

weasel *Mustela nivalis vulgaris* (32.33%), followed by mouse *Mus musculus* and hare. Remains of other species were also distinguished: black rat *Rattus rattus frugivorus* (9.09%), Cypriot spiny mouse *Acomys nesiotus* (7.07%) and long-eared hedgehog *Hemiechinus auritus* (2.02%). Micro mammals included remains that the author was unable to identify to species (5.05%). Single cases of a mole *Talpa europaea* and shrew *Sorex* occurred as well [Table 3]. The lack of comparative material did not permit anything beyond a general attribution to the *soricidae* family.

Bird bones were represented by 145 remnants (9.92% of the assemblage) and of these 132 bones were submitted to zoological identification. Several egg-shell fragments were collected, but were not included in the analysis. Altogether three species of birds and seven bird families were discerned. Significant parts of bird bones were identified in the collected

material. Chicken was extremely common (59.85%), followed in frequency by Island chukar *Alectoris chukar cypriotes* (23.48%). The Galliformes family appeared to be quite numerous (9.09%), followed by Emberizidae (2.27%) and Anatidae (1.51%). The remaining bird orders/families: owls, Ciconiidae, Columbidae, Charadriidae, were represented by fewer bones (less than 1% each). The remains of common quail *Coturnix coturnix* also presented less than 1% [Table 4].

The number of all mollusk shells was 53, which constituted 3.98% of all the examined remains. The most common shells belonged to terrestrial mollusks (25) and of these 20 represented the snail *Helix ascenis*. The remaining shells were assigned to the Helicidae snail family. Two families and eight species of marine mollusks were identified [Table 5]. The most common was the Muricidae family (9 fragments). Two snails, *Bolinus brandaris* (*Murex b. L*) and *Patella ulyssiponensis*, were quite common among the marine mollusk species. The remaining marine snail species occurred individually. Sea urchins (*Echinoidea*) were represented only by six fragments belonging to the same specimen.

Unfortunately, a lack of comparative material and a large number of existing species prevented specific species identification.

Study of anatomical distribution was feasible only for pig and sheep/goat. The most frequently consumed parts of the carcass were connected with the trunk, followed by the distal part of the forelimb-scapula. Phalanges of both species were separated, which means that animal slaughter and meat jointing were done on site [Table 6]. In total, 47 bones and teeth were measured. Most of the measurements were taken from sheep/goat bones. Withers height was calculated only for two pig specimens: 68.18 cm and 64.44 cm, which classifies both as a small domesticated pig.

The sex of sheep/goat and cattle was identified on the basis of shape and cross section of the horn core, for pig on the basis of shape and cross section of teeth. All examined horn cores of cattle and sheep/goat belonged to males. Six of the examined pig fangs belonged to males and two to females. For one wild mammal, least weasel *Mustela nivalis vulgaris*, sex could be determined for three specimens on the basis of measurement of the condylobasal length of skulls: two turned out to be male

Table 1. Animal class composition in cisterns STR 1/96–97 and HA/NEH S.16.3

Animal group	Cistern STR 1/96–97		Cistern HA/NEH S.16.3	
	N	%	N	%
Mammals	1140	85.65	437	57.73
Birds	132	9.92	199	26.29
Mollusks	53	3.98	119	15.72
Sea-urchins	6	0.45	2	0.26
<b>Total</b>	<b>1331</b>	<b>100</b>	<b>757</b>	<b>100</b>

Table 2. Composition of domesticated mammal remains from cisterns STR 1/96–97 and HA/NEH S.16.3

Species/family name	Cistern STR 1/96–97		Cistern HA/NEH S.16.3	
	N	%	N	%
Cattle	36	3.46	1	0.81
Sheep-goat	625	60.04	36	29.27
Pig	361	34.38	82	66.67
Equid	9	0.86	—	—
Dog	6	0.58	3	2.44
Donkey	3	0.28	—	—
Cat	1	0.10	1	0.81
<b>TOTAL</b>	<b>1041</b>	<b>100</b>	<b>123</b>	<b>100</b>

Table 3. Composition of wild mammal remains from cisterns STR 1/96–97 and HA/NEH S.16.3

Species/family name	Cistern STR 1/96–97		Cistern HA/NEH S.16.3	
	N	%	N	%
Hare	20	20.20	5	1.59
Least weasel	32	32.33	126	40.13
House mouse	22	22.22	39	12.42
Cyprus spiny mouse	7	7.07	39	12.42
Black rat	9	9.09	96	30.57
Long-eared hedgehog	2	2.02	—	—
Mole	1	1.01	—	—
Shrews	1	1.01	—	—
Sorex	—	—	3	0.96
Micro mammals	5	5.05	6	1.91
<b>TOTAL</b>	<b>99</b>	<b>100</b>	<b>314</b>	<b>100</b>

and one female. In the case of chicken, 14 bones were sexed and found to belong nine to males and five to females. Among the wild birds, sex was set for one male of the Island chukar *Alectoris chukar cypriotes*.

Pathological changes caused by inflammation were observed on three donkey phalanges. Evidence of a healed bone fracture was noted on one sheep-goat rib. A post-fracture pathology was also observed on one Island chukar bone. The fracture had self-healed, which suggests that this wild bird lived for some time after that, perhaps in captivity.

Slaughter age analysis was done for cattle, pig and sheep-goat. The age profile for sheep/goat and pig started from one month of life. The cattle slaughter age was established on the basis of one horn core

belonging to a young specimen. Among birds age data were gathered for domestic chicken and all belonged to young birds.

Anthropogenic and animal marks were observed on 71 mammal bones. Marks revealing meat preparation for consumption appeared on both domesticated and wild mammal, as well as bird bones. The most frequent were lengthwise and crosswise chopping marks, burning, charring, filleting and crosswise diaphysis cuts, also noticed on the long bone epiphysis. Dog bites were noted on two sheep/goat bones and rodent gnawing on another. Burning through was observed on a fragment of hare skull. Anthropogenic marks were observed on bird bones, most commonly cut off edges of long bones, burning, charring and diaphysis lengthwise cutting marks.

Table 4. Composition of bird remains from cisterns STR 1/96–97 and HA/NEH S.16.3

Species/family/ order names	Cistern STR 1/96–97		Cistern HA/NEH S.16.3	
	N	%	N	%
Hen	79	59.85	177	88.94
Island chukar	31	23.48	18	9.04
Common quail	1	0.76	2	1.01
Owls	1	0.76	—	—
Emberizidae	3	2.27	—	—
Charadriidae	1	0.76	—	—
Ciconiidae	1	0.76	—	—
Columbidae	1	0.76	—	—
Galliformes	12	9.09	2	1.01
Anatidae	2	1.51	—	—
<b>TOTAL</b>	<b>132</b>	<b>100</b>	<b>199</b>	<b>100</b>



Table 5. Composition of molluscs in cisterns STR 1/96–97 and HA/NEH S.16.3

Species/genus/family	Cistern STR 1/96–97		Cistern HA/NEH S.16.3	
	N	%	N	%
<i>Acanthocardia tuberculata</i>	1	—	—	—
<i>Antalis dentalis</i>	—	—	1	0.84
<i>Antalis vulgaris</i>	—	—	1	0.84
<i>Arca noae</i>	—	—	2	1.68
<i>Argonauta argo</i>	—	—	1	0.84
<i>Astraea rugosa</i>	1	—	7	5.88
<i>Barbatia barbata</i>	—	—	1	0.84
<i>Bollinus brandaris</i>	4	—	—	—
Cardiidae	—	—	1	0.84
<i>Cerithium rupestre</i>	—	—	1	0.84
<i>Chamelea</i>	—	—	1	0.84
<i>Columbella rustica</i>	—	—	13	10.92
<i>Conus ventricosus</i>	—	—	7	5.88
<i>Cyclope neritea</i>	—	—	3	2.53
<i>Eobania vermiculata</i>	—	—	2	1.68
Fascioliariidae	—	—	1	0.84
<i>Fissurella picta</i>	—	—	1	0.84
<i>Fusinus pulchellus</i>	—	—	1	0.84
<i>Fusinus rostratus</i>	—	—	8	6.72
Glycymeridae	—	—	15	12.60
<i>Glycymeris bimaculata</i>	—	—	1	0.84
<i>Glycymeris insubrica</i>	1	—	—	—

Table 5. Composition of molluscs in cisterns STR 1/96–97 and HA/NEH S.16.3 (continued)

Species/genus/family	Cistern STR 1/96–97		Cistern HA/NEH S.16.3	
	N	%	N	%
<i>Haliotis tuberculata</i>	1	—	—	—
Helicidae	5	—	2	1.68
<i>Helix assemnis</i>	20	—	3	2.53
<i>Lima lima</i>	—	—	20	16.81
<i>Luria lurida</i>	—	—	1	0.84
<i>Mimachlamys varia</i>	—	—	4	3.36
Mitridae	—	—	1	0.84
Muricidae	9	—	5	4.20
<i>Muricopsis cristatus</i>	—	—	1	0.84
Mytilidae	—	—	3	2.53
<i>Nassarius cuvieri</i>	1	—	2	1.68
Olividae	—	—	1	0.84
Ostreidae	5	—	—	—
<i>Patella caerulea</i>	1	—	—	—
<i>Patella ulyssiponensis</i>	4	—	1	0.84
Pectinidae	—	—	1	0.84
Ranellidae	—	—	1	0.84
<i>Spondylus gaederopus</i>	—	—	2	1.68
<i>Tellina tenuis</i>	—	—	2	1.68
<i>Turritella communis</i>	—	—	1	0.84
<b>TOTAL</b>	<b>53</b>	<b>—</b>	<b>119</b>	<b>100</b>

## CISTERN HA/NEH S.16.3

Analyzed remains counted a total of 822 with 757 (92.09%) assigned by anatomy and zoology. Eggshell fragments (20) were not examined. Most of the remains were small and belonged to mammals (57.73%), followed in frequency by birds and mollusks [see *Table 1*]. Pig remains were the most common among domesticated mammals (66.67%), followed by sheep/goat (29.27%). Much fewer were the remains of dog (2.44%), cattle and cat bones (both 0.81%) [see *Table 2*]. Wild mammals were represented mostly by least weasel *Mustela nivalis vulgaris* (40.13%) and by black rat *Rattus rattus frugivorus* (30.57%).

House mouse *Mus musculus* and Cypriot spiny mouse *Acomys nesiotus* had a similar share, which amounted to 12.42%. Hare and micro mammals appeared with a share slightly higher than 1% [see *Table 3*]. Birds were represented by chicken (88.95%) and among the wild birds Island chukar *Alectoris chukar cypriones* (9.05%). Bones of common quail *Coturnix coturnix* and birds belonging

to the order of galliformes had the same percentage share of approximately 1% [see *Table 4*].

Mollusks were relatively numerous and were represented by 119 remnants. Only seven belonged to terrestrial snails of two species, *Eobania vermiculata* and *Helix assemnis*. Two other shell fragments could not be assigned to exact species, but displayed characteristic features of the Helicidae snail family. Two recovered fragments of the Anthozoa class could be assigned only to the order of stony corals *Scleractinia*. Marine snail *Lima lima* was the most common snail among remnants of all mollusks with a percentage of 16.81%. Another common marine snail was *Collumbella rustica* with a 10.92% percentage share. Remains of other species and families appeared in lower numbers [see *Table 5*].

The only species represented with sufficient bones to enable anatomical distribution analyses was the least weasel *Mustela nivalis vulgaris*, but since it is of no consumption interest to humans,

Table 6. Anatomical composition of sheep/goat and pig remains from cistern STR 1/96–97

Species /group names	Number of anatomical parts of sheep/goat and pig skeletons													
	Head		Trunk		Forelimb proximal part		Forelimb distal part		Hind limb proximal part		Hind limb distal part		Phalanges	
	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Sheep/ goat	49	7.84	283	45.28	117	18.72	37	5.92	79	12.64	38	6.08	22	3.52
Pig	128	35.46	136	37.67	38	10.53	6	1.66	41	11.36	4	1.10	8	2.22

its distribution was not studied.

Only five bones from this cistern could be measured, the rest of the material being too fragmented. Pig and sheep/goat long bones were measured, as were three length measurements of a least weasel skull.

Determination of sex was possible only for three specimens of least weasel. Condylbasal skull length measurements indicated that these were males. Bird sex was determined for six specimens of domestic chicken: four females and two males.

Age was determined for 81 remains of wild and domesticated mammals. Among these were bones of young and very young animals: least weasel, hare, black rat, pig, sheep-goat, dog and cat. A similar range was established only for two chicken specimens.

Marks, both anthropogenic and animal-made, were observed on nine bones. On bones of domesticated pig and sheep/goat there were lengthwise chopping marks, traces of cutting lengthwise and crosswise of the diaphysis and burning marks. Marks made by animals, such as gnawing by rodents, were noticed on two pig bones. One sheep/goat bone had dog bite marks. One least weasel had a healed fracture with dislocation. Seven bones of domestic hen exhibited pathology and anthropogenic marks. Four bones had cutting marks noticed on the bone heads, three bones had pathology marks, such as deformation and self-healed fracture. Two Island chukar bones were charred.

## SUMMARY

Animal remains from cistern STR 1/96–97 represent post-consumption refuse. Domesticated mammals were a staple food at the time when the cistern was in use. The meat of sheep/goat and pig, and to lesser extent cattle was mostly consumed. Domesticated birds were of lesser importance in the diet with chicken being the most popular. An overview of chicken remains indicated both small and big birds being kept, as well as different breeds. Wild fowl included a very popular Island chukar, followed by common quail. Venison played a lesser role in the diet and was seldom consumed. Terrestrial snail could have supplemented meals, as in the modern-day diet. Mostly lamb and young pork was eaten. Domesticated predators, that is, dogs and cats were kept assuredly because of sentimental and utilitarian reasons. Apart from their role as guardians, dogs could be used for hunting wild birds.

Cats were kept to be rid of rodents. The latter had a large share in the collected material: house mouse *Mus musculus*, Cypriot spiny mouse *Acomys nesiotis* and black rat *Rattus rattus frugivorus*, as well as least weasel *Mustela nivalis vulgaris*, long-eared hedgehog *Hemiechinus auritus* and several rodents connected with the shrew (*Sorex*) family and micro mammal group. Both the mice species and rat, as well as the weasel which hunted these pests, may have lived inside the cistern or around houses. Their remains inside the cistern could have also been introduced with the fill. The long-eared hedgehog, mole, shrews and other micro mammals must have fallen in by accident or as in case of mollusks and sea urchins, could have been brought with soil dumped in the cistern.

The post-consumption character of much of the analyzed material supports the idea posed on archaeological grounds

that the cistern had been filled with kitchen refuse brought from elsewhere.

The remains from cistern HA/NEH S.16.3 are entirely different in character, representing more than likely accidental fill. The zooarchaeological analysis of the remains indicates that the identified species for the most part did not have consumption significance. Other wild animal remains, in particular least weasel, rodent, mollusk and coral, suggest that the cistern was filled with soil brought from outside of the nearest area. Domesticated animal bones could have been thrown

inside with discarded pottery and other objects. The cistern evidently served as a dump after it had lost its primary function of water storage.

The zooarchaeological analysis of remains from the two cisterns does not provide a basis for studying the consumption preferences of residents of the early Roman buildings in the Maloutena district of Paphos. Nonetheless, it has opened a window onto the fauna present in an urban context on Cyprus in the late Hellenistic and early Roman periods.

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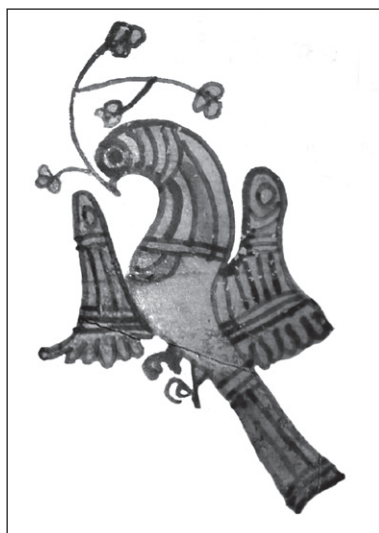
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XXI

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## CONTENTS

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## CONTENTS

ACKNOWLEDGMENTS ..... 11

### OBITUARIES

*Aleksandra Krzyżanowska* ..... 13

ABBREVIATIONS AND STANDARD REFERENCES ..... 15

## PAM REPORTS

PCMA FIELD MISSIONS AND PROJECTS IN 2009 (WITH MAP) ..... 19

### EGYPT

#### ALEXANDRIA

ALEXANDRIA KOM EL-DIKKA: EXCAVATIONS AND PRESERVATION WORK.  
PRELIMINARY REPORT 2008/2009

*Grzegorz Majcherek* ..... 27

APPENDIX: AUDITORIUM E: EXPLORATION IN SEASON 2009

*Karol Juchniewicz, Katarzyna Lach* ... 43

KOM EL-DIKKA 2005–2009: SELECTED ANTHROPOLOGICAL RESEARCH

*Robert Mahler* ..... 49

#### MAREA

MAREA. REPORT 2009

*Hanna Szymańska, Krzysztof Babraj* ..... 59

MAREA 2009: POTTERY FROM THE EXCAVATIONS

*Anna Drzymuchowska* ..... 72

#### MARINA EL-ALAMEIN

MARINA EL-ALAMEIN. CONSERVATION WORK IN THE 2009 SEASON

*Stanisław Medeksza, Rafał Czerner, Grażyna Bąkowska with contributions by I. Fuks-Rembisz, W. Grzegorek, G. Majcherek, M. Mrozek-Wysocka, P. Zambrzycki* ..... 79



## CONTENTS

---

### TELL EL-RETABA

- TELL EL-RETABA: SEASON 2009  
*Stawomir Rzepka, Jozef Hudec* ..... 107  
APPENDIX: TELL EL-RETABA: ARCHAEOBOTANICAL STUDIES  
*Claire Malleson* ..... 118  
TELL EL-RETABA 2009: THE POTTERY  
*Anna Wodzińska* ..... 124

### TELL EL-FARKHA

- TELL EL-FARKHA (GHAZALA). SEASON 2009  
*Marek Chłodnicki, Krzysztof M. Ciałowicz* ..... 135

### SAQQARA

- SAQQARA 2008–2009  
*Karol Mysliwiec* ..... 157  
APPENDIX: CONSERVATION WORK IN SAQQARA (2008–2009)  
*Zbigniew Godziejewski* ..... 167  
SAQQARA 2008–2009: THE POTTERY  
*Teodozja I. Rzeuska* ..... 175

### NAQLUN

- NAQLUN (NEKLONI) EXCAVATIONS IN 2008–2009  
*Włodzimierz Godlewski* ..... 193  
APPENDIX: NAQLUN 2008: ARCHAEOBOTANICAL STUDIES  
*Jarosław Zieliński* ..... 210  
REFUSE DUMP IN SECTOR B IN NAQLUN: EXCAVATION REPORT 2008–2009  
*Tomasz Derda, Dorota Dzierzbicka* ..... 212  
POTTERY FROM THE REFUSE DUMP UNDER UNIT B.26 IN NAQLUN  
*Katarzyna Danys-Lasek* ..... 222  
TWO BURIALS FROM CEMETERY A IN NAQLUN: ARCHAEOLOGICAL  
AND ANTHROPOLOGICAL REMARKS  
*Dorota Dzierzbicka, Marzena Ożarek* ..... 233  
ON THE COLLECTION OF WOODEN FINDS FROM NAQLUN AGAIN  
*Jarosław Zieliński, Iwona Zych* ..... 244

### DEIR EL-BAHARI

- CONSERVATION WORK IN THE HATSHEPSUT TEMPLE IN DEIR EL-BAHARI (2009)  
*Rajmund Gazda* ..... 251  
SANDSTONE SPHINXES OF QUEEN HATSHEPSUT FROM DEIR EL-BAHARI:  
PRELIMINARY REMARKS  
*Agata Smilgin* ..... 255

## CONTENTS

---

TEMPLE OF TUTHMOSIS III IN DEIR EL-BAHARI IN 2008 AND 2009: WORK IN THE STORES AND FIELD <i>Monika Dolińska</i> .....	261
THE TEMPLE OF TUTHMOSIS I REDISCOVERED <i>Jadwiga Iwaszczuk</i> .....	269
DAKHLEH OASIS	
DAKHLEH OASIS PROJECT. PETROGLYPH UNIT: ROCK ART RESEARCH, 2009 <i>Ewa Kuciewicz, Michał Kobusiewicz</i> .....	279
SUDAN	
OLD DONGOLA	
DONGOLA 2008–2009 <i>Włodzimierz Godlewski</i> .....	289
APPENDIX: CONSERVATION OF WALL PAINTINGS INSIDE THE FORMER THRONE HALL OF THE MAKURIAN KINGS IN DONGOLA (2009 SEASON) <i>Cristobal Calaforna-Rzepka</i> .....	312
DONGOLA 2009: POTTERY FROM BUILDING I (KOM A) <i>Katarzyna Danys-Lasek</i> .....	315
WALL INSCRIPTIONS IN A BURIAL VAULT UNDER THE NORTHWEST ANNEX OF THE MONASTERY ON KOM H (DONGOLA 2009) <i>Adam Łajtar, Jacques van der Vliet</i> .....	330
CRYPTS 1 AND 2 IN THE NORTHWEST ANNEX OF THE MONASTERY ON KOM H IN DONGOLA: REPORT ON THE EXPLORATION IN 2009 <i>Włodzimierz Godlewski, Robert Mahler, Barbara Czaja-Szewczak</i> .....	338
EL-ZUMA	
THE POTTERY FROM FOUR TUMULI GRAVES IN EL-ZUMA (2009) <i>Edyta Klimaszewska-Drabot, Ewa Czyżewska</i> .....	361
FOURTH CATARACT	
RESEARCH IN THE PCMA UW CONCESSION ON THE FOURTH CATARACT (HAMDAB DAM RESCUE PROJECT). INTERIM REPORT 2009 <i>Marek Chłodnicki</i> .....	377
ROCK ART RESEARCH IN THE FOURTH CATARACT REGION, SEASON 2009 <i>Ewa Kuciewicz, Andrzej Rozwadowski</i> .....	387
EXCAVATIONS IN 2009 IN THE ENVIRONS OF EL-AR VILLAGE (FOURTH CATARACT REGION, SUDAN) <i>Anna Longa</i> .....	393
EL-AR 31: EXCAVATIONS OF LATE/POST-MEROITIC TUMULI. PRELIMINARY REPORT <i>Artur Buszek, Michał Kurzyk</i> .....	399

**CYPRUS**

**NEA PAPHOS**

NEA PAPHOS. SEASON 2009

*Henryk Meyza in cooperation with Wiktor Andrzej Daszewski, Aleksandra Brzozowska, Joanna Michalska, Joanna K. Rądkowska, and Monika Więch*..... 407

**LEBANON**

**JIYEH**

PRELIMINARY REPORT ON THE 2008 AND 2009 EXCAVATION SEASONS AT JIYEH (PORPHYREON)

*Tomasz Waliszewski, Karol Juchniewicz, Mariusz Gwiazda* ..... 423

APPENDIX 1. SUNKEN VESSELS IN LATE ROMAN AND BYZANTINE HOUSES IN AREA D

*Mariusz Gwiazda* ..... 439

APPENDIX 2. PRELIMINARY REMARKS ON THRESHOLDS FROM PRIVATE HOUSES IN JIYEH (PORPHYREON)

*Mariusz Gwiazda* ..... 441

LOCAL HELLENISTIC 'PHOENICIAN'-TYPE AMPHORA AND OTHER POTTERY VESSELS FROM EXCAVATIONS IN JIYEH (PORPHYREON) (SEASONS 2008–2009)

*Urszula Wicenciak* ..... 446

GROUND AND AERIAL PHOTOGRAMMETRIC DOCUMENTATION IN JIYEH (PORPHYREON)

*Miron Bogacki* ..... 454

**SYRIA**

**PALMYRA**

POLISH ARCHAEOLOGICAL MISSION TO PALMYRA. SEASONS 2008 AND 2009

*Grzegorz Majcherek* ..... 459

**HAWARTE**

EXCAVATIONS IN HAWARTE 2008–2009

*Michał Gawlikowski* ..... 481

GLASS FINDS FROM THE MITHRAEUM IN HAWARTE

*Krzyszyna Gawlikowska* ..... 496

**TELL ARBID**

TELL ARBID 2008–2009. PRELIMINARY REPORT ON THE RESULTS OF THE THIRTEENTH AND FOURTEENTH SEASONS OF POLISH-SYRIAN EXCAVATIONS

*Piotr Bieliński* ..... 511

## CONTENTS

---

ADAM MICKIEWICZ UNIVERSITY EXCAVATIONS IN SECTOR P AT TELL ARBID (SPRING 2009) <i>Rafał Koliński</i> .....	537
TELL QARAMEL	
TELL QARAMEL: EXCAVATIONS 2009 <i>Ryszard F. Mazurowski</i> .....	559
<b>PAM STUDIES</b>	
ADULT BURIALS OF NINEVITE 5 DATE ON TELL ARBID (2007–2008) <i>Dariusz Szelaĝ</i> .....	585
CHARIOT TERRACOTTA MODELS FROM TELL ARBID <i>Mattia Raccidi</i> .....	605
NEW PROTODYNAMIC <i>SEREKHS</i> FROM THE NILE DELTA: THE CASE OF FINDS FROM TELL EL-FARKHA <i>Mariusz A. Jucha</i> .....	625
<i>PITHOS</i> -TYPE VESSELS FROM CHHÎM: PRELIMINARY ASSESSMENT OF FINDS FROM 1996–2009 <i>Zofia Kowarska, Szymon Lenarczyk</i> .....	643
BUILDINGS ON SITE B AT NAQLUN (NEKLONI) <i>Szymon Maślak</i> .....	653
ZOOARCHAEOLOGICAL ANALYSIS OF MATERIAL FROM CISTERNS STR 1/96–97 AND HA/NEH 2.16.3 IN NEA PAPHOS <i>Ewelina Tepe</i> .....	677
ANIMAL BONE REMAINS FROM SHEIKH ABD EL-GURNA: ISSUES AND OPPORTUNITIES <i>Urszula Iwaszczuk</i> .....	691
ANIMALS IN ROCK ART. RESULTS OF ARCHAEOZOOLOGICAL RESEARCH AT THE SITE OF EL-GAMAMIYA 67 (FOURTH CATARACT, SUDAN) <i>Marta Osypińska</i> .....	703
INDEX OF SITES .....	715
GUIDELINES FOR AUTHORS .....	716