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The Faunal Remains from Ramla

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Introduction

The faunal remains from the excavation in Azrieli Mall, Ramla, were retrieved from the three areas excavated at the site (A–C; see Toueg and Torgë, this volume). The majority of the remains were found in Area A, where three strata were identified: Strata III–II, from the late Abbasid–Fatimid periods and Stratum I from the Mamluk period. The material from Areas B and C was predominantly ascribed to the Abbasid–Fatimid periods. Remains of buildings and installations were found in Areas A and B, and the remains of a plastered installation of an unknown purpose was found in Area C.

Here we describe the faunal assemblage in terms of the species composition, bone surface modifications, skeletal part profiles and demography, and examine the variability in patterns of meat consumption throughout the periods represented at the site. The assemblage mostly comprises domestic livestock, including domestic fowl. It also includes a few remains of wild mammals, fish and songbirds. This assemblage adds important information regarding the animal economy of the Early Islamic period at Ramla.

Material and Methods

Animal bones were collected during excavation by hand picking, and all the retrieved material was examined and documented for this report.

Recording. The analysis included mostly material from contexts that were well-defined stratigraphically and chronologically, according to the excavators. Some remains from surface loci for which the date could be determined based on other finds, pottery or coins, were also included.

Sorting. Animal bones from each excavation unit were separated into identified and unidentified fragments; remains from the latter category comprised mostly long bone diaphysis that were not included in further analysis.

Taxonomic Identification. Bone remains were identified using the comparative collection of the Laboratory of Archaeozoology, University of Haifa. Separation of sheep (*Ovis aries*) from goat (*Capra hircus*) was based on morphological criteria of selected bones, following Boessneck (1969), Davis (1987) and Zeder and Lapham (2010). Sheep and goat skeletal elements that could not be identified to species were grouped in a general caprine category.

Measurements. Selected skeletal elements, such as complete and fragmented epiphyses, were measured following Driesch (1976). Measurements were recorded to a precision of 0.1 mm, using a digital caliper (FUJI 150 stainless hardened).

Quantification. The abundance of different taxa was quantified using the number of identified specimens (NISP), minimum number of individuals (MNI) and minimum number of elements (MNE), following the criteria in Grayson (1984), Klein and Cruz-Uribe (1984) and Lyman (1994).

Taphonomy. Bones were inspected for various macroscopic bone surface modifications, such as butchery marks (Binford 1981), weathering marks (Behrensmeyer 1978), root etching (Lyman 1994) and signs of animal activity (e.g., rodent gnawing, carnivore punctures; Lyman 1994). Butchery marks were classified into three categories, according to stages in the butchery process: removal of the skin, dismemberment of the carcass and filleting of meat from the bones (Binford 1981).

Burning. The state of burning was recorded for each of the identified specimens, according to four categories of the degree of burning, from light to heavy: (1) brown, (2) black, (3) gray and (4) calcined.

Mortality Profile. Age at death of the major culled species was analyzed on the basis of epiphyseal closure (Silver 1969; Davis 1983), distinguishing between young and old individuals based on selected epiphyses that fuse around the age of two years (Davis 1983).

RESULTS

The assemblage of animal remains from Azrieli Mall, Ramla, comprised 749 complete and fragmentary identified skeletal specimens (for bone measurements, see Appendix 1). The majority of faunal remains originated from Stratum III (ninth–tenth centuries CE; n = 509) and Stratum II (tenth–eleventh centuries CE; n = 185), while only a few remains were retrieved from Stratum I (thirteenth–fifteenth centuries CE; n = 56; Table 1). The number of remains from each excavation locus and the species identification are detailed in Appendix 2.

The remains from all three strata are dominated by caprines, sheep (*Ovis aries*) and goat (*Capra hircus*)), and also includes a small number of cattle remains (*Bos taurus*; Fig. 1). The

Table 1. Summary of NISPs and Taxa Representation in Strata III–I

Strataum	NISP	Species
III	508	Sheep, goat, caprine, cattle, pig, equid, dog, cat, small carnivore, chicken, songbird, fish
II	185	Sheep, goat, caprine, cattle, equid, camel, dog, small carnivore, rodent, chicken, songbird
I	56	Sheep, goat, caprine, cattle, mountain gazelle, chicken, songbird
Total	*749*	

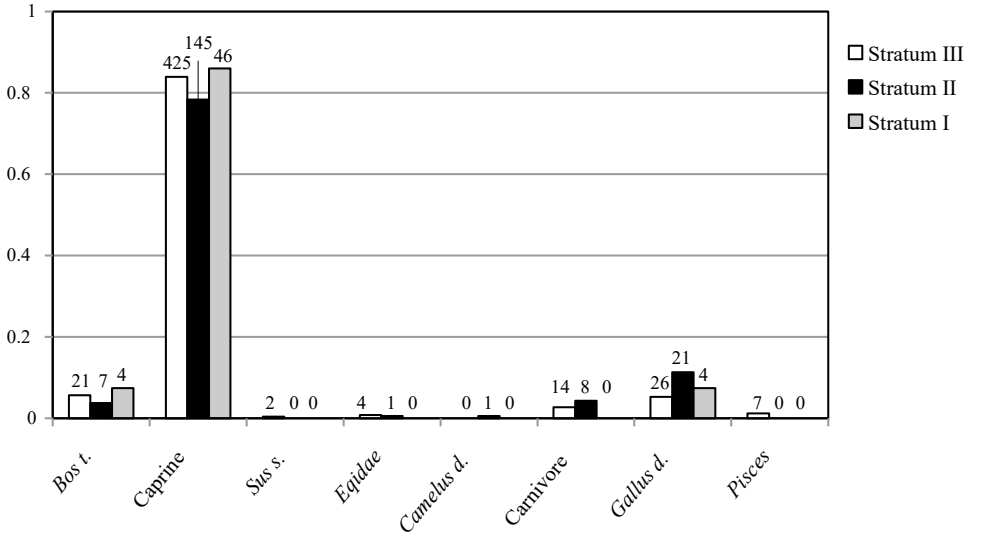

Fig. 1. Composition of the major animal taxa in Strata III–I.

caprine bones for which the species could be identified show that sheep is over-represented in comparison to goat in Strata III–II, while the ratio is reversed in Stratum I (Fig. 2).

The assemblage also includes a small number of equid remains from Stratum III (*Equus* sp.; n = 4, 1%), and a single worn tooth from Stratum II (n = 1, 1%). Only two pig bones from Stratum III were found at the site (n = 2, 0.04%). A single phalanx of camel (*Camelus dromedarius*; n = 1, 1%) was found in Stratum II.

Domestic carnivores are represented by several dog specimens from Stratum III (*Canis familaris*; n = 7, 1%) and Stratum II (n = 2, 1%), and remains of a domestic cat from Stratum III (*Felis domesticus*; n = 2, 0.4%).

Bird bones are represented in all strata, and include a substantial proportion of chicken (*Gallus domesticus*; Stratum III: n = 27, 5%; Stratum II: n = 21, 11%; Stratum I: n = 4, 7%). Also represented are a few unidentified remains of songbirds (Passeriformes; Stratum III:

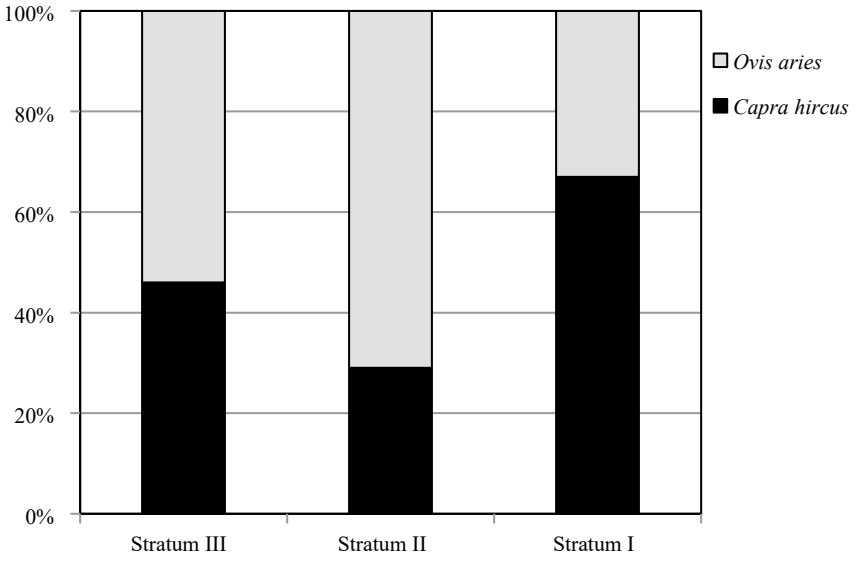

Fig. 2. Ratio of sheep to goat remains in Strata III–I.

n = 1, 0.2%; Stratum II: n = 2, 1%; Stratum I: n = 1, 2%). A small number of fish bones were found in Stratum III (n = 7, 1%), including a single vertebra of Nile perch (*Lates niloticus*).

Wild species include a single tibia of mountain gazelle from Stratum I (*Gazella gazella*; n = 1, 2%). Also found were carnivore bones: three from Stratum II were identified as fox (*Vulpes vulpes*; 2%) and five from Stratum III belonged to unidentified small carnivores (1%; Fig. 1), including a rodent femur. A mollusc shell was retrieved from Stratum III.

The demography of the culled sheep and goat sheds light on the way in which livestock was exploited. The data for Stratum III indicates that 57% of the animals were slaughtered before they reached the age of 20 months (Table 2). A similar proportion was determined for Stratum I (50%), although the sample size from this layer was too small to provide a reliable assessment of the caprine age structure. A lower proportion of young caprines was determined for Stratum II (41%), possibly indicating an increased economic importance of secondary products, i.e., milk and wool, and maintaining a breeding population of mature caprines relative to the importance of meat production; however, this difference was not statistically significant (Chi-square = 1.88, P = 0.169). The small number of cattle bones did not allow an analysis of their age structure.

Data on bone surface modification generally reveals that the bones are well-preserved and show a moderate degree of weathering, with a low occurrence of cracks and exfoliation of bones. The degree of weathering among 196 long bone shafts from Stratum III and 76 such fragments from Stratum II was an average of 2.7 on Behrensmeyer's (1978) scale of 1–5. The small sample from Stratum I (n = 12) had an average of 2.9. The frequency of root etching was also fairly moderate, occurring on <60% of the bones examined in all three strata (Table 3).

Table 2. Data on Epiphyseal Fusion of Caprines (Sheep/Goat) in Strata III–I

Stratum	Fusion	Distal Radius	Distal Metapod	Distal Femur	Distal Tibia	Distal Calcaneus	Total	% Young
III	Unfused	3	16	5	18	7	49	57%
	Fused + unfused	7	25	6	31	17	86	
II	Unfused		1	1	9	2	13	41%
	Fused + unfused	2	5	1	17	7	32	
I	Unfused		1		1	2	4	50%
	Fused + unfused	1	2		2	3	8	

Table 3. Bone Surface Modifications in Strata III–I

Modification	Stratum III	Stratum II	Stratum I
Weathering[i]	2.7	2.7	2.9
Root etching[ii]	46%	51%	53%
Gnawing[i] marks[i]	2%	2%	
Cut marks[ii]	9%	7%	9%
Burnt bones[ii]	2%	3%	

[i] These figures are averages of the long bone shafts scored according to Behrensmeyer's weathering scale (1978).
[ii] Proportions of the assemblage as a whole for each stratum.

A few bones with signs of carnivore gnawing, chewing, digesting and tooth puncture were noted in Stratum III (n = 8, 2%) and Stratum II (n = 3, 2%; Table 3). This damage was most probably the result of dog scavenging.

Human-induced bone modifications related to meat consumption allow the reconstruction of carcass-processing practices. Cut marks were mostly found on specimens of sheep and goat (n = 56), to a lesser extent on cattle bones (n = 8) and on one specimen each of a mountain gazelle, chicken and fish. The proportion of bones bearing cut marks was between 7% and 9% in the three strata. Most butchery marks were made during the process of carcass dismemberment, filleting and removing meat from the bone (Binford 1981), while marks related to skinning and decapitation were relatively scarce.

The bone assemblages include a small number of burned bones from Strata III (n = 9, 2%) and II (n = 6, %; Table 3). This suggests that the method of preparing meat was by stewing rather than grilling over an open fire.

The representation of different parts of the body was reconstructed for the caprines, but could not be determined for cattle, of which the sample size was insufficient (Fig. 3). These

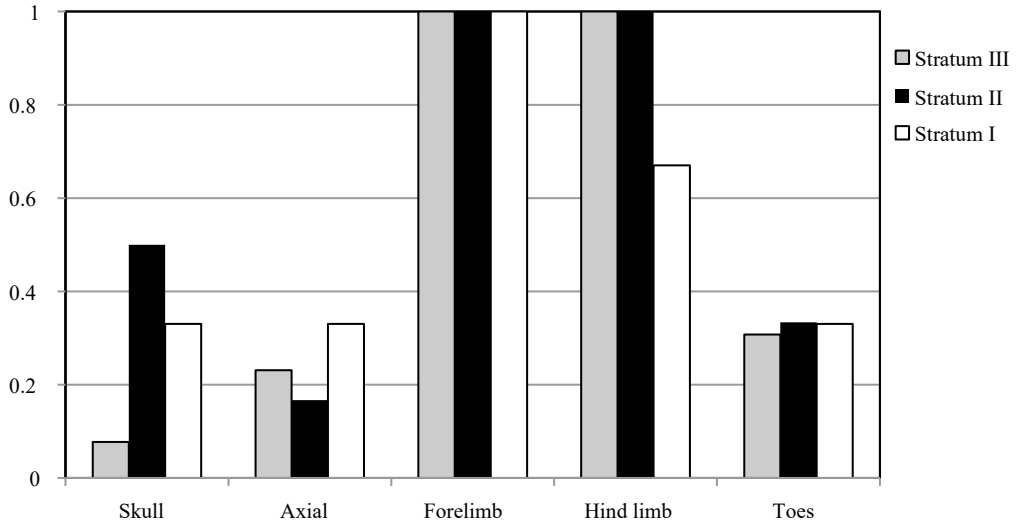

Fig. 3. Representation of caprine body parts in Strata III–I.

data show that while all of the major body parts are represented in the three strata, certain parts are present in higher proportions than others. Thus, the forelimbs (humerus, radius) and hind limbs (tibia) are over-represented, while the horn, vertebrae and toes are under-represented in all the assemblages. The high frequency of long bones, both the upper and the lower limbs, in these assemblages may indicate that they represent refuse from primary butchery.

CONCLUSIONS

The Ramla Azrieli Mall bone assemblage is dominated by livestock species, primarily sheep and goat, and to a lesser extent, cattle and chicken. Faunal assemblages dominated by caprines have been documented in many sites from the Early Islamic period in Israel (e.g., Hellwing and Feig 1989; Sade 2005; Bouchnick 2018; 2020; Bar-Oz and Raban-Gerstel 2019). The very low numbers of pig bones at the site are characteristic of assemblages associated with cultures that imposed a taboo on eating pork, as Jewish and Muslim communities of the region (e.g., Horwitz and Studer 2005; Bouchnick et al. 2007; Greenfield and Bouchnick 2011; Bouchnick 2020).

The good state of bone preservation, in particular the low incidence of bone weathering and carnivore damage, indicates that most of the bones were buried rapidly. The presence of cut marks from several of the stages in the meat consumption process, and the skeletal part representation appear to indicate that the livestock consumption and slaughtering was carried out in the vicinity of the site. The assemblage appears to represent refuse deposits, although their precise origin is unclear and may include refuse from households, the slaughterhouse or the local market.

APPENDIX 1. Bone Measurements of Cattle and Caprine Specimens according to Area (in mm); Each specimen is given a unique catalogue number (Index #)

Area	Index #	Locus	Basket	Square	Species	Bone	Part	F/UF	B/UB	Bp	Bd	GL	SD	
A	19	180	1408	9	*Bos taurus*	Toes	Phalanx 1			26.7	28.21	66.08	22.71	
A	501	140	1176	1	*Bos taurus*	Toes	Phalanx 2			33.98	26.63	47.89	27.72	
										Bp	Bd			
A	60	129	1314	14	*Capra/Ovis*	Hind limb	Tibia				30.8			
A	63	130	1255	17	*Capra/Ovis*	Hind limb	Tibia				29.04			
A	91	144	1254	8	*Capra/Ovis*	Hind limb	Tibia				26.25			
A	99	140	1176	1	*Capra/Ovis*	Hind limb	Tibia				38.23			
A	823	161	1319	5	*Capra/Ovis*	Hind limb	Tibia				28.53			
A	824	161	1319	5	*Capra/Ovis*	Hind limb	Tibia				30.02			
										Bp	Bd	GL	SD	
A	26	180	1408	9	*Capra hircus*	Hind limb	Metacarpus				26.94			
A	50	117	1086		*Ovis aries*	Hind limb	Metatarsus				26.18			
	62	130	1255	17	*Capra/Ovis*	Forelimb	Metacarpus			25.78				
	825	161	1319	5	*Ovis aries*	Forelimb	Metacarpus				29.54			
										GLP	LG	BG		
A	25	180	1408	9	*Capra/Ovis*	Forelimb	Scapula			32.43	28.04			
A	97	174	1388	13	*Capra/Ovis*	Forelimb	Scapula			37.58	31.01			
										Bp	Bd	BT	HDH	
A	32	121	1334	16	*Capra/Ovis*	Forelimb	Humerus				32.24	31.34	16.35	
A	73	159	1332	7	*Capra/Ovis*	Forelimb	Humerus				35.94	35.12	17.81	
A	854	116	1318	14	*Capra/Ovis*	Forelimb	Humerus				34.6	17.86	32.13	
										Bp	Bd	BFd	GL	
A	15	146	1242	3	*Capra/Ovis*	Forelimb	Radius			36.22		31.64		
A	59	129	1314	14	Capra/Ovis	Forelimb	Radius	0	0	33.13		29.5		
A	74	121	1252	16	Capra/Ovis	Forelimb	Radius	0	0		31.52			
A	884	116	1397	14	*Capra/Ovis*	Forelimb	Radius			31.82		30.8		

APPENDIX 1. (cont.)

Area	Index #	Locus	Basket	Square	Species	Bone	Part	F/UF	B/UB	Bp	Bd	GL	SD	
										Bp	Bd	GL	SD	
A	16	146	1242	3	*Capra hircus*	Toes	Phalanx 1			13.55	12.36	42.16	11.62	
A	51	117	1086		*Ovis aries*	Toes	Phalanx 1			13.57		41.22	11.31	
A	52	117	1086		*Ovis aries*	Toes	Phalanx 1			14.65	12.83	41.11	11.21	
A	53	129	1314	14	*Capra hircus*	Toes	Phalanx 1			12.77	11.96	39.52	10.94	
C	162	508	4023		*Capra hircus*	Toes	Phalanx 1			12.83	12.57	44.28	10.41	
C	163	508	4023		*Capra hircus*	Toes	Phalanx 1			13.58	12.88	44.12	11.74	
										GL	GB			
A	807	217	1107	10	*Capra hircus*	Hind limb	Calcaneus			58.26	20.33			
										BD	GLI	GLM	DI	DM
C	157	508	4023		*Ovis aries*	Hind limb	Astragalus			20.73	32.68	30.46	18.29	18.35
										Bp	Bd	Dd	GL	
A	42	117	1086		*Gallus domesticus*	Hind limb	Femur			15.23	15.01		78.91	
A	65	159	1332	7	*Gallus domesticus*	Forelimb	Humerus				18.32			

Appendix 2. Animal Remains by Excavation Areas and Loci

Area	Locus	Context	*Capra hircus*	*Ovis aries*	Caprine	*Bos taurus*	*Sus scrofa*	*Equus sp.*	C. *drome-darius*	G. *gaz-ella*	C. *fami-liaris*	Carnivors	Rodent	G. *domes-ticus*	*Columba* l.	Passer-iformes	Reptile	Pisces	Total
B	102	Surface			3														3
A	104	Surface			5														5
A	106	Surface			6														6
A	109	Surface			5														5
A	110	Surface			1														1
A	115	Surface			1														1
A	116	Surface			59									1				5	65
A	117	Surface		3	10									1					14
A	121	Surface			7									1					8
A	123	Surface			2														2
A	124	Fill under wall				1													1
A	125	Fill			1														1
A	126	Plaster floor			2									3					5
A	129	Surface	1	1	12	1													15
A	130	Surface			7														7
A	131	Plaster floor						1											1
A	132	Surface			1														1
A	134	Fill under floor			6														6
A	136	Surface			10														10
A	140	Cesspit			2	1													3
A	144	Plaster floor			6														6
A	145	Surface			1									1					2
A	146	Fill	2	1	19	2	2												26
A	149	Fill under floor			11	1								1					13

APPENDIX 2. (cont.)

Area	Locus	Context	*Capra hircus*	*Ovis aries*	Caprine	*Bos taurus*	*Sus scrofa*	*Equus sp.*	C. *drome-darius*	G. *gaz-ella*	C. *fami-liaris*	Carnivors	Rodent	G. *domes-ticus*	*Columba* l.	Passer-iformes	Reptile	Pisces	Total
A	150	Surface		1	5									4					10
A	151	Surface			3	1													4
A	154	Fill of *ḥamra* soil			2														2
A	158	Surface				1													1
A	159	Plaster floor			6					1				1		1			9
A	161	Fill around wall			9									1					10
A	168	Plaster floor		1	8							1		1					11
A	169	Fill under floor		1	6	1								2					10
A	170	Debris on floor			2														2
A	173	Plaster floor			6														6
A	174	Surface			3	2													5
A	175	Fill of *ḥamra* soil			7									3		1			11
A	176	Surface													1				1
A	177	Surface			2														2
A	179	Surface			2														2
A	180	Plaster floor			7	1					1								9
A	181	Plaster floor			3														3
A	185	Surface			77	4		2			3	2		6					94
A	187	Surface				1													1
A	188	Surface			18														18
A	189	Fill			3														3
A	194	Surface			9							1							10

Appendix 2. (cont.)

Area	Locus	Context	*Capra hircus*	*Ovis aries*	Caprine	*Bos taurus*	*Sus scrofa*	*Equus sp.*	C. *drome-darius*	G. *gaz-ella*	C. *fami-liaris*	Carnivors	Rodent	G. *domes-ticus*	*Columba* l.	Passer-iformes	Reptile	Pisces	Total
A	195	Surface			2	1								1					4
A	197	Fill under floor			2														2
A	199	Surface			10	1					2								13
A	200	Plaster floor			4				1					1					6
A	202	Surface			7	2								2					11
A	203	Surface			5							1							6
A	204	Plaster floor			2														2
A	205	Surface			7							1							8
A	206	Surface			6														6
A	211	Fill installation			1														1
A	215	Surface			2														2
A	217	Plaster floor	1		2														3
A	220	Fill under floor			5														5
A	221	Plaster floor			4														4
A	222	Fill			1														1
A	224	Plaster floor		1	2									3					6
A	225	Surface			3	2													5
A	227	Fill on floor			2														2
A	228	Plaster floor			1														1
A	231	Surface			10						2	1		3					16
A	232	Fill around cesspit			5						1								6
A	233	Fill under floor			3														3

APPENDIX 2. (cont.)

Area	Locus	Context	*Capra hircus*	*Ovis aries*	Caprine	*Bos taurus*	*Sus scrofa*	*Equus sp.*	C. *drome-darius*	G. *gaz-ella*	C. *fami-liaris*	Carnivors	Rodent	G. *domes-ticus*	*Columba* l.	Passer-iformes	Reptile	Pisces	Total
A	234	On top of a robber trench			14	1													15
A	235	Plaster floor			4														4
A	238	Floor infrastructure			6	1								2				1	10
A	239	Robber trench			14	1						1		2					18
A	241	Fill on floor			21														21
A	244		1		5									1					7
A	245	Stove	1	1	7	2													11
A	247	Robber trench			2														2
A	248	Plaster floor			2	1								1					4
A	249	Fill on floor			2														2
A	250	Surface			5									1					6
A	253	Send			8														8
A	304	Surface			1									2					3
B	308	Fill on floor			1														1
B	311	Surface	2		2									3					7
B	317	Plaster floor			6	1						3							10
B	324	Surface				1													1
B	325	Surface			7									1					8
B	327	Surface			2									1					3
B	329	Fill on floor			2	1													3
B	330	Plaster floor			2														2
B	340	Fill on floor			2														2

APPENDIX 2. (cont.)

Area	Locus	Context	*Capra hircus*	*Ovis aries*	Caprine	*Bos taurus*	*Sus scrofa*	*Equus sp.*	C. *drome-darius*	G. *gaz-ella*	C. *fami-liaris*	Carnivors	Rodent	G. *domes-ticus*	*Columba* l.	Passer-iformes	Reptile	Pisces	Total
C	501	Fill between floors	1		2														3
C	503	Fill between floors	1		2														3
C	504	Plaster floor			3							2		1					6
C	507	Fill between floors			1														1
C	508	Under plaster floor			15								1			1			17
C	510	Surface			2	1													3
C	512	Fill on floor			1														1
C	516	Fill between floors			1	3								1					5
C	517	Under plaster floor			1														1
C	518	Fill on floor			1														1
C	522	Surface			1			1											2
C	523	Surface	1		1														2
C	528	Fill under plaster floor			1	2												1	4
C	529	Fill			1														1
C	531	Fill			1														1
C	545	Fill on floor			3	1													4
C	546							1											1
Total			*11*	*10*	*594*	*39*	*2*	*5*	*1*	*1*	*9*	*13*	*1*	*52*	*1*	*3*	*0*	*7*	*749*

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