THE FAUNAL REMAINS OF BROGLIO DI TREBISACCE (SOUTHERN ITALY)

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ABSTRACT: The article presents an interpretation of a faunal complex from a Middle Bronze Age context in southern Italy. The excavation area 'Sector 10' of Broglio di Trebisacce has yielded a substantial number of animal bone remains attributable to three distinct sub-phases. On the basis of the archaeozoological analysis the organisation of the household economy and the role of the various domesticated and wild animal species found at the site are reconstructed, and an analysis is made of how the subsistence economy at Broglio changed between the different phases. This evidence is compared with that of two nearby settlements, whose archaeozoological data was previously published.

KEYWORDS: southern Italy, Broglio di Trebisacce, Middle Bronze Age, archaeozoology.

1. INTRODUCTION

1.1. The settlement and excavation area

The protohistoric site of Broglio di Trebisacce (southern Italy) is situated on the northern Ionic coast on a foothill (180 m a.s.l.) with a dominating position over the Plain of Sybaris and controlling the coastal passage between this plain and the Basilicata territory (fig.1).[1] The settlement is dated between the Middle Bronze Age (MBA) (more precisely the second sub-phase of this period, c. 1700-1350 cal. BC) and the Early Iron Age (EIA), when the site was abandoned (c. 720 BC) after the arrival of Greek colonists in the coastal plain. In the period of maximum expansion the size of the settlement was about 11 ha. Excavations concentrated on the uppermost plateau, 1.5 ha wide, named the acropolis of the site.

Past archaeozoological research on the site was carried out by Cassoli (1984), Gliozzi (1984) and most notably by Tagliacozzo (1994). These studies dealt with modest amounts of faunal material from the excavations carried out between 1979 and 1984, coming from four excavation areas, some with internal partitions[2] and chronologically covering the entire occupation period of the site (about a millennium). With 345 items for the MBA phase it was not an extensive bone collection. By contrast, this study proposes an in-depth archaeozoological analysis based on a significant number of faunal remains from a stratigraphically and chronologically well-defined area of the excavation, with the aim of creating an accurate reconstruction of the subsistence economy at Broglio in its earliest period of occupation.

The faunal assemblage under examination comes from the excavation area known as 'Sector 10' (fig.1), where over the period 1998-2002 a substantial faunal sample, mostly in a good state of preservation[3] and chronologically well-defined (MBA2-3), was collected. The faunal remains under study originate from a total of 103 stratigraphic units (SU), that were grouped into three major stratigraphical phases (see table 1: phases 1-3) and processes. Sector 10 is situated on the north-western (inland) edge of the acropolis of Broglio, in an area of strategic importance, as it is a major natural access-point to the acropolis itself. The excavation has so far uncovered a c. 4,5 m deep ditch of limited extent, which might have been a means of defence. Three phases in the fill of this ditch have been identified.[4] They are:

- Phase 1: the construction and use of the ditch, dated in the MBA2.
- Phase 2: the degradation of the ditch, also dated in the MBA2.
- Phase 3: the abandonment and refilling of the ditch, dated in the MBA3.

The decision to adopt a chronologically more reliable division into three phases is the result of a close study of the nature of the archaeological context with its relatively complex stratigraphy; in this manner an overly detailed analysis was avoided, which would have entailed the risk of losing an overview of the changing relationships between the various species. Furthermore, taking into account the quantities of bone remains recovered from the various layers, a three-phase subdivision was deemed to be more appropriate and more effective for internal comparisons.

1.2 Methodological framework

The methodological framework for this analysis is based on the following reference studies. For the calculation of

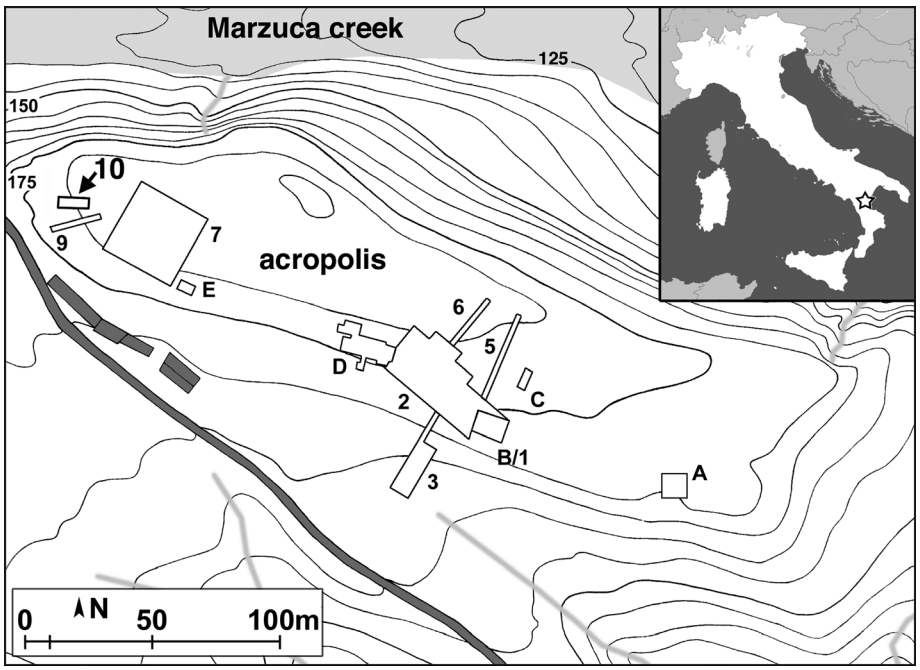

Fig. 1. Location of the site of Broglio di Trebisacce (CS) with the excavation area under examination ('Sector 10') indicated (Illustration provided by Dr A.Vanzetti of the '*Sapienza*' University of Rome).

the Minimum Number of Individuals (MNI) the guidelines proposed by Bökönyi (1970) and Chaplin (1971) were followed. The MNI calculations always took into account aspects such as age and sex; but in practice the gathered data on bone size was of little use in the MNI calculations, owing to the fragmentary nature of the faunal remains. The individuals were counted for each of the three archaeological phases; the particular stratigraphic units from which the bone material was recovered were not taken into account, as this would have resulted in an over-estimation of MNI values for the less common species, especially for those phases where the microstratigraphical results are complex. Also, the reliability of MNI calculations is influenced by the number of bone remains per species, with the rare species (with low numbers of remains) tending to be overrepresented.

The age estimations of the faunal remains are based on Habermehl (1975; 1985) and Silver (1969), and on Payne (1973) for the dental eruption and dental wear of ovicaprines. Grant (1982) was also consulted for the dental wear of pigs, cattle and ovicaprines.

In the reconstruction of a subsistence economy, the importance of distinguishing bone remains from sheep and goat is crucial for understanding the different roles that these species played and their exploitation. Whenever possible, ovicaprine bones were distinguished to the species level, with the use of studies in this field by Boessneck *et al*. (1964), Payne (1969; 1985) and Prummel & Frisch (1986). For distinguishing wild boar from domesticated pig the reference study by Mayer, Novak & Brisbin Jr. (1998) was used. Other consulted reference works include Prummel (1987a; 1987b) for the foetal remains of cattle, horse, sheep and pig, while the wither heights were calculated using Clark (1995) for dogs, Teichert (1969) for pigs, Teichert (1975) for sheep, Schramm (1967) for goat and Von den Driesch & Boessneck (1974) for cattle.

For the age-class distributions of the mammalian species a subdivision into five relative age groups was adopted: infantile, juvenile, sub-adult, adult and senile. In these age groups the absolute ages will differ from species to species, depending on the species' reproductive age and its physical growth process.[5]

2. THE FAUNAL ASSEMBLAGE

In the course of the archaeological excavations carried out at Broglio di Trebisacce between 1998 and 2002, a substantial quantity of bone remains was systematically recovered in the 'Sector 10' excavation area. Of the total collected faunal material, only those fragments that could reliably be attributed to one of the three occupational phases were included in the faunal analysis, making up a total of 4897 bone remains.

During the excavation, bone material was hand-collected, and also dry sieving was methodically carried out, using a mesh width of 10 mm. The first author performed flotation of soil samples, but this did not result in the identification of small animal species; the range of species identified in the faunal complex as analyzed is therefore considered to be representative. In the laboratory the material was washed and numbered and an initial attempt at refitting was carried out. Then followed the process of species determination, which was done at the Laboratory of Archaeozoology at the Museum of Prehistory and Ethnography 'L. Pigorini' in Rome, under the scientific direction of Dr A. Tagliacozzo, with the help of the museum's very useful reference collection. During

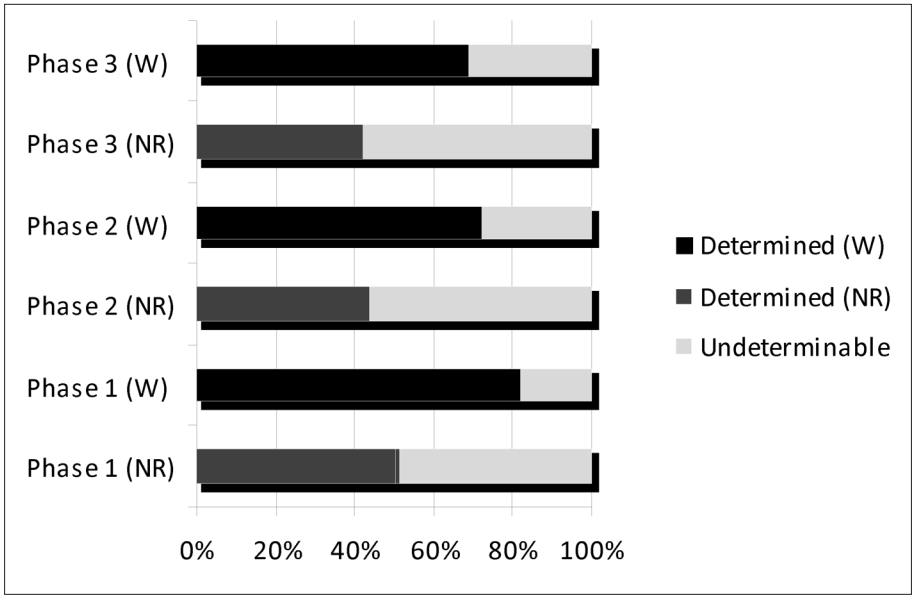

Fig. 2. Relationship between the determined and undetermined bone fragments (Graph S. Elevelt).

this process a range of data was recorded, including bone weight, and when possible bone measurements were taken, following Von den Driesch (1976).

In table 1 an overview is given of the numbers of analyzed bone remains and their respective weight, for the three archaeological phases and their total. Also, the average weight per bone fragment was calculated for each of the three phases separately. For the overall faunal assemblage the average weight per bone fragment was calculated at 5.3 g, making phase 1 the most distinctive with its relatively high 6.7 g average bone weight.[6] Furthermore, phase 1 is distinct from the later phases in the small number of remains (349) that could be attributed to it. As a higher state of fragmentation tends to hamper identification, it is interesting to examine briefly the ratio between determined and undeterminable bone remains (fig. 2). It is immediately clear that, for both number (NR) and weight (W), there is a continuous decrease in the percentage of determined bone remains. Yet a significant difference can be observed for phase 1, where on average about 10% more bone fragments could be determined (51% in terms of NR; 81.7% in terms of W).

This better state of preservation of the bone remains of phase 1 may be explained by the particular formation of these lowest layers in the ditch fill of Sector 10, where for example traces of burning were common (it may be assumed that the faunal remains were more quickly buried or covered up by burnt debris, so dogs and other scavengers would have been less likely to further fragment them). Also, the bone remains of phase 1 were located several metres down in a steep-sided ditch, which also may have protected the material from scavenging animals. The analysis of the faunal remains of Sector 10 will initially focus on the three separate phases, after which a general discussion of the overall faunal assemblage will follow.

Table 1. Sector 10: overview of the analyzed bone remains in the different phases (NR = number of remains; W = boneweight in grammes).

	NR	W	W/NR
Phase 1	349	2329,8	6,7
Phase 2	2081	10439,6	5,0
Phase 3	2467	13024,3	5,3
Total	**4897**	**25793,7**	

3. PHASE 1

The first phase (table 2) of the faunal complex under study is represented by 349 bone fragments, constituting a total weight of c. 2.3 kg, a much smaller sample than those from the two other phases (7.1% of the total faunal complex weight).

Looking at the general species representation, the predominance of the domesticated species in the faunal complex is notable: 90.4%. Nonetheless, eight different wild species were identified, of which roe deer, red deer and wild boar are the three most amply attested. Somewhat more surprising is the presence of a cuttlebone (*Sepia* sp.) fragment, a rare but not unique find in comparable southern Italian bone assemblages. This trace of cuttlefish is so far the sole evidence at the site of marine fauna; and it does not constitute proof of fishing, as the cuttlebone may have been collected on the seashore and brought to the site.

The principal domesticated species are pig, cattle and ovicaprines; pigs are the best represented with 37.3%, cattle account for 31.1% and ovicaprines for 28.5% (based on NR; table 2). Not surprisingly, in terms of bone weight, the dominant species is cattle. This species has a

Table 2. Phase 1: Overview of analyzed bone remains (NR & W).

Species	NR	%	%	W	%	%
Dog	5	1,4	3,1	25,1	1,1	1,4
Pig	60	17,2	37,3	429,6	18,4	24,3
Cattle	50	14,3	31,1	1029,5	44,2	58,2
Sheep	11	3,2	6,8	127,0	5,5	7,2
Goat	6	1,7	3,7	86,1	3,7	4,9
Ovicaprines	29	8,3	18,0	70,7	3,0	4,0
Domesticated mammals	**161**	**46,1**	**100**	**1768,0**	**75,9**	**100**
Bear	1	0,3	6,7	2,0	0,1	1,5
Wolf	1	0,3	6,7	3,0	0,1	2,3
Badger	1	0,3	6,7	3,6	0,2	2,7
Wild boar	3	0,9	20,0	34,1	1,5	25,8
Red deer	4	1,1	26,7	26,2	1,1	19,8
Roe deer	5	1,4	33,3	63,3	2,7	47,9
Wild mammals	**15**	**4,3**	**100**	**132,2**	**5,7**	**100**
Cuttlefish	1	0,3		0,4	0,02	
Hermann's Tortoise	1	0,3		3,3	0,1	
Total wild	**17**	**4,9**		**135,9**	**5,8**	
Total determined	**178**	**51,0**		**1903,9**	**81,7**	
Large size	46	13,2	26,9	232,0	10,0	54,5
Medium size	121	34,7	70,8	192,4	8,3	45,2
Undeterminable	4	1,1	2,3	1,5	0,1	0,4
Total undetermined	**171**	**49,0**	**100**	**425,9**	**18,3**	**100**
Total complex	**349**	**100**		**2329,8**	**100**	

Table 3. Phase 1: NR and MNI for the mammalian species.

	NR	%	MNI	%
Dog	5	2,8	3	12
Pig	60	34,1	5	20
Cattle	50	28,4	5	20
Ovicaprines	46	26,1	5	20
Bear	1	0,6	1	4
Wolf	1	0,6	1	4
Badger	1	0,6	1	4
Wild boar	3	1,7	1	4
Red deer	4	2,3	2	8
Roe deer	5	2,8	1	4
Total	**176**	**100**	**25**	**100**

W/NR ratio of 20.6 g, more than three times that of pig (7.2 g) or ovicaprines (6.2 g).

An examination of the Minimum Number of Individuals (MNI) for the different species can be useful in helping to understand the relationship between those species and their relative importance for the (subsistence) economy of the site. Regarding the first phase (table 3), however, the general scantiness of the bone assemblage distorts the calculation of the MNI values, as the three principal domesticated species don't particularly stand out, whereas species represented by just one single bone fragment tend to be overrepresented. This is particularly true for the relationship between domesticated and wild mammals: in terms of NR, the relationship wild : domesticated is almost 1:11, but the MNI values suggest that for every wild individual there were only 2.5 domesticated individuals. Clearly, the fact that MNI calculations tend to give too high a score to the species represented by just a few bone remains is a problem that affects the first phase under discussion more than the other two; consequently, in phase 1 the domesticated species make up 72% of the total MNI, whereas in phases 2 and 3 this value is 87.5% and 83.3%, respectively.

An important indication for the possible uses of the domesticated species in a subsistence economy can be obtained by analyzing the age distribution of the various species. In table 4 the distribution in age classes is given for the domesticated and wild mammals (MNI and %), while figure 3 shows a graphic representation of the same data for the three main domesticated species. Apart from the three principal domesticated species, all other species are represented only by adult individuals. This in itself is hardly surprising, considering the nature of the faunal assemblage, a settlement dumpsite, and the generally poor state of conservation of the bone remains, which is particularly unfavourable for the preservation of bones of young individuals. In comparing the age-class distributions of the three archaeological phases, the relative-

Table 4. Phase 1: MNI age-class distribution for the domesticated and wild mammals.

	infantile		juvenile		subadult		adult		Total
	MNI	**%**	**MNI**	**%**	**MNI**	**%**	**MNI**	*%*	**MNI**
Dog							3	*100*	3
Pig	1	*20*	1	*20*	1	*20*	2	*40*	5
Cattle			1	*20*	2	*40*	2	*40*	5
Ovicaprines			1	*20*	1	*20*	3	*60*	5
Total domesticated	**1**		**3**		**4**		**10**		**18**
Bear							1	*100*	1
Wolf							1	*100*	1
Badger							1	*100*	1
Wild boar							1	*100*	1
Red deer							2	*100*	2
Roe deer							1	*100*	1
Total	**1**		**3**		**4**		**17**		**25**

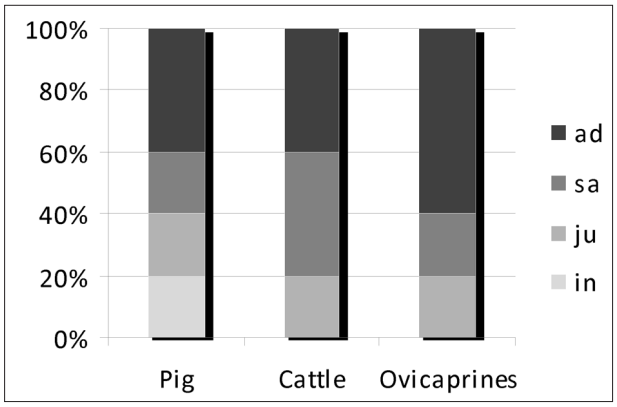

Fig. 3. Phase 1: Relative age-class distribution for the principal domesticated species (Graph S. Elevelt).

ly low MNI values for phase 1 should be considered for what they are: poor comparative data.

In the age-class distributions for the principal domesticated species, pigs are the only species for which in this phase infantile individuals (c. 0-3 months) are attested. For all three species one juvenile individual is attested, and the ovicaprines especially are marked by having a strong adult age-class representation. The overall picture that emerges from this brief analysis is that of a slaughter strategy aimed at meat procurement from young pigs and, to some extent, from young cattle, cattle being exploited also for its secondary products (milk and traction); ovicaprines seem to have been mostly exploited for milk and wool, rather than meat. This picture will be compared with those for phases 2 and 3, where the faunal assemblage is considerably more representative.

The overview of element distribution of the various species for this phase (table 5) shows that the various skeletal elements of the domesticated species are evenly represented, although vertebrae are notably rare, most probably due to the fact that the spinal column tends to be heavily damaged in the course of the dismemberment of a carcass. The wild species bear, wolf and badger are all represented by a single bone element, while wild boar is attested by three elements, red deer by four and roe deer by five. In none of the wild species is there any clear indication that the animals were slaughtered off-site, although theoretically wolf (attested by a first molar) and badger (frontal-parietal cranial fragment) may have been partially dismembered off-site. It should be noted, however, that for both these species other bone elements are attested in the later phases, which tend to undermine the likelihood of an off-site butchering strategy. It is interesting to note the total absence of red deer antler fragments for this period, whereas in the later phases antler makes up almost half (46% and 48% for phases 2 and 3, respectively) of the species representation.

Later on, a more detailed analysis will be presented of the various wild and domesticated species and their individual contributions to the subsistence economy of Broglio di Trebisacce in the various MBA phases attested in Sector 10.

4. PHASE 2

The second archaeological phase, like the first, is dated in MBA2, but it relates to an archaeological context very different from that of phase 1. The ditch was beginning to lose (or had already lost) its main function as a defensive barrier, so that no real effort was made to maintain it, although in this period it was not yet deliberately filled in.

An overview of the faunal remains relating to phase 2 is given in table 6. The total number of faunal remains in this phase is 2081, with an overall weight of c. 10.4 kg. This phase comes second in terms of number of analyzed bone remains, though the number is comparable to that of the third phase (where NR=2467). As mentioned before (*cf.* table 1), average bone weight varies somewhat between the three phases, and with just 5.0 g, phase 2

Table 5. Phase 1: Representation of skeletal elements.

Element	Dog	Pig	Cattle	Goat	Sheep	Ovicaprines	Bear	Wolf	Badger	Wild boar	Red deer	Roe deer	Cuttlefish	Hermann's Tortoise	Medium Size	Large Size	Indeterminable	**Total**
Cranium		7	1	1		4			1						8	1		23
Horncore				1	1													2
Maxilla		1																1
Upper teeth		1	2			2					2							7
Mandibula	2	6	5	1	2	2									2			20
Lower teeth	1	1	1			1		1										5
Teeth		1																1
Hyoid			1															1
Atlas						1												1
Cervical vertebrae	1														3			4
Thoracic vertebrae							1								1	1		3
Lumbar vertrebrae			1												3			4
Vertebrae															3	5		8
Ribs		15	7			6					1				23	7		59
Sternum						1												1
Scapula		4	3		2										2			11
Humerus		4	2	1						1					6	1		15
Radius		1	2			3									3	1		10
Ulna		2				1									2			5
Carpus			2							1								3
Metacarpus			4		2	1					1	2						10
Metacarpus 4		1																1
Pelvis		2	1									1			3			7
Femur		1	2		1	1						1			2	1		9
Tibia	1	2	2			2						1			4	2		14
Fibula		3																3
Calcaneus		2	1		1	1				1								6
Astragalus			1		1													2
Tarsus			2															2
Metatarsus			2	2	1	1												6
Metatarsus 2		1																1
Metatarsus 3		1																1
Long bone															56	26		82
Metapodium		1														1		2
Phalanx 1		1	5			2												8
Phalanx 2		1	1															2
Phalanx 3		1	2															3
Carapace														1				1
Cuttlebone													1					1
Indeterminable																	4	4
Total	**5**	**60**	**50**	**6**	**11**	**29**	**1**	**1**	**1**	**3**	**4**	**5**	**1**	**1**	**121**	**46**	**4**	**349**

registers the lowest average bone weight for the entire faunal assemblage.

As far as the domesticated species are concerned, dogs are slightly better represented than in the previous phase, their share rising from 3.1 to 4.4 percent.[7] The contrary

Table 6. Phase 2: Overview of analyzed bone remains (NR & W).

Species	NR	%	%	W	%	%
Dog	38	1,8	4,4	192,3	1,8	2,7
Pig	286	13,7	33,4	1847,6	17,7	25,7
Cattle	237	11,4	27,7	3587,6	34,4	49,9
Sheep	43	2,1	5,0	521,9	5,0	7,3
Goat	27	1,3	3,2	162,9	1,6	2,3
Ovicaprines	226	10,9	26,4	882,4	8,5	12,3
Domesticated mammals	**857**	**41,2**	**100**	**7194,7**	**68,9**	**100**
Fox	1	0,05	3,6	0,9	0,01	0,4
Badger	1	0,05	3,6	7,0	0,07	2,9
Hare	3	0,1	10,7	2,4	0,02	1,0
Wild boar	1	0,05	3,6	5,8	0,1	2,4
Red deer	13	0,6	46,4	183,2	1,8	76,0
Roe deer	7	0,3	25,0	37,4	0,4	15,5
Chamois	2	0,1	7,1	4,2	0,04	1,7
Wild mammals	**28**	**1,3**	**100**	**240,9**	**2,3**	**100**
Partridge	1	0,05		0,5	0,005	
Hermann's Tortoise	18	0,9		102,8	1,0	
Tortoise sp.	3	0,1		4,5	0,04	
Total wild	**50**	**2,4**		**348,7**	**3,3**	
Total determined	**907**	**43,6**		**7543,4**	**72,3**	
Large size	326	15,7	27,8	1587,6	15,2	54,8
Medium size	842	40,5	71,7	1306,8	12,5	45,1
Undeterminable	6	0,3	0,5	1,8	0,02	0,1
Total undetermined	**1174**	**56,4**	**100**	**2896,2**	**27,7**	**100**
Total complex	**2081**	**100**		**10439,6**	**100**	

can be noted for pigs as well as cattle: pigs accounted for 37.3% in the previous phase, but now for only 33.3%; a similar trend is seen in cattle, their share dropping from 31.1 to 27.7%. By contrast, the ovicaprines in this phase score a significantly higher value than they did previously: 34.7% as against 28.6% for phase 1.[8]

As far as the wild mammals are concerned, phase 2 sees the first appearance of fox (*Vulpes vulpes*) and hare (*Lepus* sp.) in the faunal complex.[9] On the other hand, bear and wolf are completely absent in this phase, an observation of little consequence considering that in the other phases these species are represented by just single fragments. In total, phase 2 yielded 28 bone fragments of wild mammals (a mere 3.1% of the total identified mammals), in which red deer accounts for about 50% (including antler fragments). A special mention should be made of the presence of chamois (*Rupicapra* sp.) remains in this phase, a single individual is represented by two upper right molars.[10] This finding is unique for the site; in fact, the species is unattested in other southern Italian protohistorical contexts. The singularity of the find will be discussed in more detail below (see Ch.6). Another new species attested in this phase is the partridge, represented by a single left femur.

The comparison between the number of remains (NR) and the minimum number of individuals (MNI) for the mammalian species of phase 2 is given in table 7. A few observations should be noted. First, whereas the relative MNI values for pigs and ovicaprines are substantially similar to their relative NR values, cattle shows a notable discrepancy (from 26.8%MNI to 14.3%NR). This might be explained through the fact that the cattle bones, being larger, are more likely to be more fragmented in this type of context, resulting in a relatively low MNI. In fact, as has been mentioned, the fragmentation of the faunal assemblage is particularly high in the second phase, resulting in an average weight per bone fragment of 5.0 g (*cf.* table 1).

Secondly, considering the relationship between the domesticated and the wild species, the latter represent 3.1% based on NR, whereas the MNI values suggest that the wild species made up 12.5%, an apparently notable contribution to the subsistence economy.[11] This marked difference between the two values should be seen as a reminder that the less well represented species (in NR) tend to become overrepresented when their MNI is calculated.

A more in-depth study of the different mammalian species and their role in the subsistence economy should consider the age distribution of the individuals, as discussed above; an overview is presented in table 8, with a

Table 7. Phase 2: NR and MNI for the mammalian species.

	NR	%	MNI	%
Dog	38	4,3	5	8,8
Pig	286	32,3	18	31,6
Cattle	237	26,8	8	14,0
Ovicaprines	296	33,4	18	31,6
Fox	1	0,1	1	1,8
Badger	1	0,1	1	1,8
Hare	3	0,3	1	1,8
Wild boar	1	0,1	1	1,8
Red deer	13	1,5	2	3,5
Roe deer	7	0,8	1	1,8
Chamois	2	0,2	1	1,8
Total	**885**	**100**	**57**	**100**

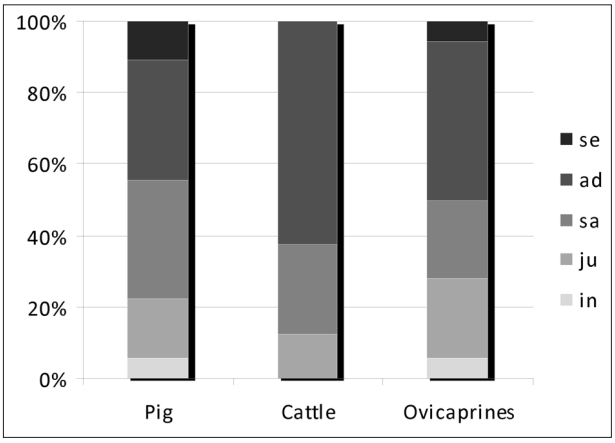

Fig. 4. Phase 2: Relative age-class distribution for the principal domesticated species (Graph S. Elevelt).

Table 8. Phase 2: MNI age-class distribution for the domesticated and wild mammals.

	infantile		juvenile		subadult		adult		senile		Total
	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%	MNI
Dog			1	*20*			4	*80*			**5**
Pig	1	*5,6*	3	*16,7*	6	*33,3*	6	*33,3*	2	*11,1*	**18**
Cattle			1	*12,5*	2	*25*	5	*62,5*			**8**
Ovicaprines	1	*5,6*	4	*22,2*	4	*22,2*	8	*44,4*	1	*5,6*	**18**
Total domesticated	**2**		**9**		**11**		**23**		**3**		**49**
Fox							1	*100*			**1**
Badger							1	*100*			**1**
Hare							1	*100*			**1**
Wild boar							1	*100*			**1**
Red deer							2	*100*			**2**
Roe deer							1	*100*			**1**
Chamois							1	*100*			**1**
Total	**2**		**9**		**11**		**31**		**3**		**57**

graphic elaboration for the three principal domesticated species in figure 4.

The different age classes are fairly well represented. Even two infantile individuals were recognized (a piglet 1 or 2 weeks old and a lamb of 1-2 months), as well as three senile individuals (two pigs and one goat). Adults prevail, however, and this is particularly evident for cattle (62.5% for the species) and for the wild mammals, which are all represented by adult individuals. Pigs are characterized by a relatively high share of pre-adult individuals (56%), while pre-adult ovicaprines represent 50% of the species.

The age-class distribution of pigs in this phase is not substantially different from that of phase 1 and can be interpreted as reflecting the role of this species as a source of meat, with most animals being slaughtered at a pre-adult age, with a number of (mainly female) adult animals kept for maintaining the group and for periodical renewal. On the basis of the pig canines it was possible to determine the sex of six adult individuals: five were of males and one of a sow. It should be noted here that the male canines are much more resilient than female ones and that their overrepresentation should not be taken as evidence of a slaughter practice favouring the killing of males at advanced ages.

Most cattle were slaughtered at an adult age in phase 2; this age class represents 62.5% of the total number of cattle bones. This is in contrast with the age-class distribution of cattle in the previous phase, where pre-adults made up 60%. It is premature at this point to identify a changing strategy in the exploitation of cattle over the two phases. In fact, the low NR and MNI values for phase 1 might well distort the age-class distribution in favour of the younger age classes in that phase. In the light of subsequent developments in phase 3, this supposition will

Table 9. Phase 2: Representation of skeletal elements.

Element	Dog	Pig	Cattle	Sheep	Goat	Ovicaprines	Fox	Badger	Hare	Wild boar	Red deer	Roe deer	Chamois	Partridge	Hermann's Tortoise	Tortoise	Medium Size	Large Size	Indeterminable	**Total**
Cranium	5	29	20	2	1	6											67	16		**146**
Horncore			3	5	4	3														**15**
Antler											6	1								**7**
Maxilla	5	9				2														**16**
Upper teeth		26	15			28					2		2							**73**
Mandibula	5	21	22	7	5	26											1			**87**
Lower teeth		42	17	5	6	15														**85**
Teeth			2			3														**5**
Hyoid						1														**1**
Atlas		1				2												2		**5**
Epistropheus						2														**2**
Cervical vertebrae	1		2			3											8	6		**20**
Thoracic vertebrae	2	5	3			1											8	4		**23**
Lumbar vertrebrae			1			3											11	8		**23**
Sacrum			1																	**1**
Caudal vertebrae		1				2														**3**
Vertebrae	1																6	3		**10**
Ribs		33	36			31											144	66		**310**
Scapula		21	15	8	1	8											14	8		**75**
Humerus	1	13	7	2		3						1			1		36	14		**78**
Radius	3	7	8		1	22											30	5		**76**
Ulna		7	6			4											2	4		**23**
Radio+Ulna				1		1														**2**
Carpus			4																	**4**
Metacarpus			10	2		12														**24**
Metacarpus 2	2	3																		**5**
Metacarpus 3	1	7					1													**9**
Metacarpus 4	1	2																		**3**
Metacarpus 5	2	4																		**6**
Pelvis	3	6	2			7											13	6		**37**
Femur		11	6			4		1						1			15	4		**42**
Patella		1				1														**2**
Tibia		11	6	3		14											20	8		**62**
Fibula		6																		**6**
Calcaneus		1	7	2		2					1	1								**14**
Astragalus	1		7	4	2	1														**15**
Tarsus		1	1			1														**3**
Metatarsus			9	1	2	12						2								**26**
Metatarsus 2	2	1							1											**4**
Metatarsus 3	1	1							1											**3**
Metatarsus 4	1	3																		**4**
Metatarsus 5		6							1											**7**
Long bone																	466	163		**629**
Metapodium	1				1	1					2	1					1	9		**16**
Phalanx 1		3	12	1	3	4														**23**
Phalanx 2		3	12		1	1				1	2	1								**21**
Phalanx 3		1	3																	**4**
Carapace															17	3				**20**
Indeterminable																			6	**6**
Total	**38**	**286**	**237**	**43**	**27**	**226**	**1**	**1**	**3**	**1**	**13**	**7**	**2**	**1**	**18**	**3**	**842**	**326**	**6**	**2081**

have to be re-evaluated. In any event, the age data for phase 2 suggests a subsistence strategy mainly aimed at the exploitation of cattle for their secondary food products, particularly milk (and cheese), and for traction.

Ovicaprines are well-represented by the youngest age classes, very infantile and juvenile (27.8%), the highest value among all species for these two classes combined. Evidently, sheep and goat were slaughtered at an early age, attesting their use as a meat source. On the other hand, the exploitation of ovicaprines for milk, and sheep for their wool, is reflected in the values for the adult and senile age classes, together making up half of the bones of these species. Sheep seems to predominate somewhat over goat in this phase, as was the case in phase 1, though there seems to be a trend towards a more equal proportioning between the two species. A more detailed discussion on the relationship between sheep and goat in the faunal assemblage, and on their presumably differentiated role in the subsistence economy will follow once all the data has been fully analyzed.

The representation of the skeletal elements for the various species is shown in table 9. What is striking is the generally homogeneous representation of all skeletal parts for the principal domesticated species, save for a few exceptions that are undoubtedly caused by the relatively small size or fragility of the animal bone (for example the hyoid bone, but also the carpal and tarsal bones and phalanges).[12] The logical conclusion is that, at least regarding pigs, cattle and ovicaprines, the faunal assemblage comprises all parts of the slaughtered animal carcass, and that dismemberment did not involve the dispersal of specific parts of the carcass over the site.

As mentioned before, this is the first time a fox is attested on the site, represented by a complete metacarpus 3 of an adult individual. This skeletal element might indicate that this species (or at least this individual) was not butchered on-site, but skinned off-site, and that the fur was brought to the settlement with the feet attached. This consideration will be elaborated in the light of the fox remains of phase 3, which will be presented shortly.

Wild boar is attested in the faunal complex by a single 2nd phalanx of an adult individual. Given the fragmented nature of the bones in this assemblage, it is probable that this species is somewhat underrepresented, part of its remains being erroneously identified as pig. This considered, the low presence of wild boar should be judged with caution. The importance of this species for the inhabitants of Broglio di Trebisacce may be underrated. In fact, in the previously published faunal studies of the site wild boar is attested only by two bone fragments (Tagliacozzo, 1994: 623).

5. PHASE 3

The third and last archaeological phase under examination is attributed to the MBA3. In this period the final abandonment and subsequent filling up of the ditch of Sector 10 is attested. This process probably occurred over a relative short period of time.[13] The faunal remains from this phase are the most numerous so far; indeed they amount to more than the two preceding phases combined: 2467 remains, totalling just over 13 kg (table 10).

All the usual domesticated species are present and make up 94.3% of the total determined bone remains. Dogs have slightly increased their share in the faunal assemblage, as have ovicaprines. Sheep and goat seem to have been more evenly represented than in the previous phase: sheep are only slightly predominant now, with 6.5% compared to 5.8% for goats. The steady increase of ovicaprines (their share is 43.9% of the domesticated species in this phase) has resulted in a decrease for both pig and cattle: their values drop by 4.4% and 5.3%, respectively. This development was already identified in phase 2 and can be said to signify a clear trend in the changing subsistence economy of Broglio. Cattle especially seem to be affected by this trend, presumably reflecting a decreasing role in the local subsistence economy.

The wild mammals (a mere 3.5% of the total determined bone remains) are dominated by red deer (63.9%), but also wild boar, fox and hare are relatively well-represented. With respect to the previous phase two differences can be noted. Firstly, bear and wolf (species already identified in phase 1) are once more attested, albeit by a single bone fragment each. Secondly, roe deer is completely absent in this phase, whereas in phase 2 it constituted 25% of the wild mammals. Chamois is also present, but is only represented by a single phalanx.

From the Minimum Number of Individuals for the wild and domesticated mammals (table 11), it is immediately clear that the share of cattle in the faunal assemblage is steadily decreasing from phase 1 to phase 3. With just nine individuals calculated, cattle make up 13.6% of the total MNI for phase 3 (16.4% of the domesticated species). Even if the low number of nine individuals of cattle may be considered methodologically debatable (as is well documented, e.g. Grayson 1981), it should in the authors' opinion be seen as indicative of the trend already recognized on the basis of the NR values, and as a development which can be followed over the course of all three phases. In fact, the MNI for cattle in phase 2, where an otherwise reliable and representative faunal assemblage of 2081 bone fragments is recorded, comprises just eight individuals, all in all comparable to the score for phase 3.

On the other hand, the MNI share for the ovicaprines shows a strong reduction relative to their NR value (31.8% as against 42.3%). The importance of ovicaprines should, however, be evaluated through comparison with the second species of the faunal assemblage, pig. By comparing the MNI values for this phase with that of the previous phase, the relationship between these two species might be clarified better. In phase 2, the MNI of pigs and ovicaprines resulted in equal numbers (eighteen individuals, or 36.7% of the total domesticated MNI each); in

Table 10. Phase 3: Overview of analyzed bone remains (NR & W).

Species	NR	%	%	W	%	%
Dog	48	1,9	4,9	200,2	1,5	2,3
Pig	282	11,4	28,9	1887,1	14,5	22,1
Cattle	218	8,8	22,4	3724,0	28,6	43,6
Sheep	63	2,6	6,5	775,6	6,0	9,1
Goat	56	2,3	5,7	686,1	5,3	8,0
Ovicaprines	308	12,5	31,6	1267,5	9,7	14,8
Domesticated mammals	**975**	**39,5**	**100**	**8540,5**	**65,6**	**100**
Bear	1	0,04	2,8	8,0	0,06	2,2
Wolf	1	0,04	2,8	2,0	0,02	0,6
Fox	3	0,1	8,3	2,0	0,02	0,6
Hare	3	0,1	8,3	6,9	0,1	1,9
Wild Boar	4	0,2	11,1	47,2	0,4	13,2
Red deer	23	0,9	63,9	290,2	2,2	80,9
Chamois	1	0,04	2,8	2,6	0,02	0,7
Wild mammals	**36**	**1,5**	**100**	**358,9**	**2,8**	**100**
Partridge	1	0,04		0,4	0,003	
Wood Pigeon	1	0,04		0,8	0,01	
Hermann's Tortoise	13	0,5		33,1	0,3	
European Pond Tortoise	2	0,1		12,7	0,1	
Tortoise	6	0,2		3,9	0,03	
Total wild	**59**	**2,4**		**409,8**	**3,1**	
Total determined	**1034**	**41,9**		**8950,3**	**68,7**	
Large size	385	15,6	26,9	2248,8	17,3	55,2
Medium size	1038	42,1	72,4	1822,0	14,0	44,7
Undeterminable	10	0,4	0,7	3,2	0,02	0,1
Total undetermined	**1433**	**58,1**	**100**	**4074,0**	**31,3**	**100**
Total complex	**2467**	**100**		**13024,3**	**100**	

phase 3, pigs make up 34.5%, whereas ovicaprines are 38.2% of the domesticated MNI, a modest but noteworthy difference of two individuals. From this comparison it follows that ovicaprines predominate in phase 3 and that their importance is steadily increasing, although the MNI values do not show this trend as clearly as the NR values do.

An accurate analysis of the distribution of the age-classes for the various domesticated and wild mammals, as shown in table 12 and figure 5, may help to answer some important questions concerning the developments that so far have been tentatively recognized in the various phases. For this phase a minimum number of six dogs have been calculated, making this species a modest but ever-increasing component of the domesticated mammals. The fact that dogs from phase 1 to phase 3 increase in share reflects their growing importance to the community, their most obvious use being as guard dogs and as sheepdogs helping to herd the flock. The presence of three pre-adult individuals (50% of the total MNI for this species) should be read as indicating a more intensified use of dogs at Broglio; later on, the role of dogs as a meat source will be discussed.

The age-class distribution of pigs shows a somewhat different picture with respect to the previous phases. For the first time, adult pigs account for over half of the individuals (52.6%, as against 40% in phase 1 and 44.4% in phase 2).[14] Over the three phases, a gradual increase in the share of adult individuals can be noted, which can best be explained as a changing preference in the choice of meat for consumption, now favouring young pigs less as a meat source.

Cattle show an age-class distribution where over half of the individuals (55.6%) are pre-adult individuals. This seems to reflect a slaughtering strategy directed mainly at young specimens as a meat source, the importance of cattle for secondary products being somewhat decreased. Whatever the interpretation of this age-class distribution, and in particular the weight given to this data in the light of the low MNI values, it should be stressed that the age-class distribution for cattle has changed dramatically between phase 2 and this phase. This might reflect a change in the exploitation of the species, a subject that will be discussed in more detail below.

The MNI age-class distribution for ovicaprines represents a balanced relationship between the various age classes, the three youngest (pre-adult) totalling ten indi-

Table 11. Phase 3: NR and MNI for the mammalian species.

	NR	%	MNI	%
Dog	48	4,7	6	9,0
Pig	282	27,9	19	28,4
Cattle	218	21,6	9	13,4
Ovicaprines	427	42,2	21	31,3
Bear	1	0,1	1	1,5
Wolf	1	0,1	1	1,5
Fox	3	0,3	1	1,5
Hare	3	0,3	1	1,5
Wild Boar	4	0,4	2	3,0
Red deer	23	2,3	5	7,5
Chamois	1	0,1	1	1,5
Total	**1011**	**100**	**67**	**100**

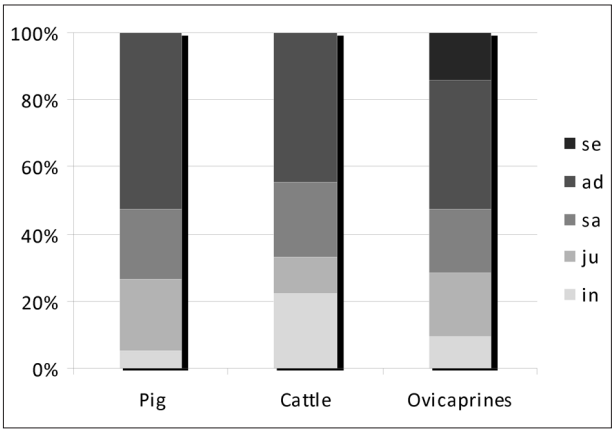

Fig. 5. Phase 3: Relative age-class distribution for the principal domesticated species (Graph S. Elevelt).

Table 12. Phase 3: MNI age-class distribution for the domesticated and wild mammals.

	infantile		juvenile		subadult		adult		senile		Total
	MNI	%	MNI	%	MNI	%	MNI	%	MNI	%	MNI
Dog	1	*16,7*	1	*16,7*	1	*16,7*	3	*50*			6
Pig	1	*5,3*	4	*21,1*	4	*21,1*	10	*52,6*			19
Cattle	2	*22,2*	1	*11,1*	2	*22,2*	4	*44,4*			9
Ovicaprines	2	*9,5*	4	*19*	4	*19*	8	*38,1*	3	*14,3*	21
Total domesticated	**6**		**10**		**11**		**25**		**3**		**55**
Bear							1	*100*			1
Wolf							1	*100*			1
Fox							1	*100*			1
Hare							1	*100*			1
Wild Boar					1	*50*	1	*50*			2
Red deer					1	*20*	3	*60*	1	*20*	5
Chamois					1	*100*					1
Total	**6**		**10**		**14**		**33**		**4**		**67**

viduals (47.6%), against eleven (52.4%) for adult and senile ovicaprines combined. Noteworthy is the great similarity of the age-class distribution in this phase and the situation in phase 2, signifying that between these two periods no significant change occurred in the subsistence strategy as far as ovicaprines are concerned. The only difference to be kept in mind is that the relationship between sheep and goat seems to become more balanced, the earlier predominance of the former species decreasing over time.

Lastly, in the MNI age-class distribution for the wild species, the adult individuals once more predominate, as was the case in the previous phases, but now also two sub-adult individuals (wild boar and red deer) and one senile individual (a red deer aged 10-14 years) are present. Overall, the wild species account for 16.7% of the total MNI, compared to 28% and 12.5% for phases 1 and 2, respectively. It should be remembered here that the MNI calculations for the first phase are statistically unreliable, based as they are on a low NR. When comparing phases 2 and 3, an increased share of wild species in the faunal assemblage may be noted, which is principally caused by the red deer, the MNI of which increased from 2 to 5 (3.6% to 7.6%) between phases 2 and 3. Hunting in general, and in particular that of red deer, can therefore be said to have gained in importance at Broglio in the last phase.

The distribution of the skeletal elements of the faunal remains of phase 3 is presented in an overview (table 13). As far as the domesticated species are concerned, all parts of the skeleton are more or less evenly represented (only dog shows some lacunae). The wild species show a less homogeneous element distribution: red deer is fairly evenly represented, but the other wild mammals (apart from the bear) are represented only by postcranial elements: in particular hare and wild boar, represented only by skeletal elements of the lower extremities, may indicate a butchering strategy by which the meaty parts of the carcass were taken to another part of the site and the waste

material was dumped at Sector 10. This interpretation, although tempting, is hard to base on two species alone, with quite low NRs (NR=3 for hare, NR=4 for wild boar), and fails to explain why the same butchering strategy was not applied to the other species. In all likelihood, the picture tentatively outlined here for these two wild species is distorted by the low numbers of remains of both species and the fact that, especially in the case of wild boar, some bone elements are hard to distinguish from those of pig (particularly when fragmented). It is a reasonable assumption that at least some of the bone fragments counted as pig (long-bone fragments, as well as teeth and other cranial elements) owing to their fragmentation were erroneously attributed to this species, when in fact they belonged to wild boar.

6. THE ANIMAL SPECIES

The survey of the faunal remains for each of the three separate archaeological phases will be followed by an interpretation of the observed trends and developments, focussing on the individual species, and drawing attention not only to their share in the faunal complex, but also to their characteristics, such as breed and size. Cut marks and other butchering traces found on each species' bone remains will be examined, as well as the use of some of these bones for the manufacture of tools and other bone objects. Also, the new evidence is confronted with that known from the previous archaeozoological research carried out at the site, and with that from two other sites in the Sibaritide that have yielded substantial archaeozoological data: Torre Mordillo and Francavilla Marittima.[15]

Dog (*Canis familiaris*)

In the faunal complex dogs account for 4.3% of the determined remains (NR=91). On average, the species constitutes 4.6%NR of the domesticated species representation, and for the three phases MNIs of 3, 5 and 6, respectively, have been calculated. The same trend of a growing importance of dogs at Broglio over time can also be observed in the NR. The representation of dogs at the site is much comparable to that of other protohistoric Italian settlements, and the low percentage values are explained by this species not being kept in the first place as a source of meat, but as help in hunting and herding. Nevertheless, on six dog bone fragments, attributed to the second and third phases, a total of twelve cut marks were identified (fig. 6). In two cases cut marks are found horizontally on either side of the ramus of the mandible, clearly the result of the process of detaching the mandible from the skull. Also, a cut mark was found on the ventral side of the fourth cervical vertebra, evidently created by the cutting of the dog's throat. The cut marks also appear on a humerus and a radius at locations that can be related to the practice of dismemberment of the carcass. Lastly, two cut marks were found on the pelvis (more precisely, the ischium). Judging from the positions of the cut marks on the bone it seems that the marks were created in the process of killing, butchering and skinning the dogs for recuperation of the meat and the skin and not for obtaining workable bones. However, in one case a dog lower canine was made into an ornament, the root was perforated and the canine was probably part of a necklace. The practice of dog consumption at Broglio is not unique; other examples in southern and central Italy are known from Punta le Terrare and Trasacco (Wilkens, 1990).

Owing to the scarcity of bone remains in phase 1, all the measured dog bones belong to phases 2 and 3, with the exception of one mandible. There appears to be no significant difference between the sizes of dogs in phases 2 and 3, although a few bones are anomalous: a maxilla fragment (phase 2: U.S. 10067) and a partial left mandible (phase 3: U.S. 10006). The maxilla appears somewhat shortened, while the mandible is less high and more slender than most Broglio dog mandibles.[16] These two bones, rather than being explained by sexual dimorphism, should be interpreted as evidence of different breeds of dog on the site.

In total, seven heights at the withers could be calculated from adult metacarpal bones, three belonging to phase 2 and four to phase 3. They range from 40.1 to 43.8 cm, with an average of 41.6 cm. A comparison between the osteometric data from the dog remains under study and those from the nearby site of Torre del Mordillo (Tagliacozzo & Curci, 2001) shows a substantial homogeneity in the measurements. The few measurements available for comparison from the published archaeozoological studies at Broglio (Tagliacozzo, 1994: 607) show a distinct, albeit not statistically reliable difference: the dogs of Sector 10 in general are smaller than those of the other areas, in particular those of Sector B. Unfortunately, only seven measurements could be compared, and the chronological range of the dog remains from Sector B is much too broad[17] to allow diachronic inferences.

Pig (*Sus scrofa domesticus*)

In all three phases at Sector 10, pigs are one of the principal domesticated species. However, their representation in the faunal complex changes over the phases, not only in their numerical presence, but also in the ratio of the different age classes of this species.

An overview of the age-class distribution of pigs in the three phases is given in figure 7. The first observation that can be made regards the relationship between the adult and the pre-adult age classes.[18] Over the three phases, a clear and linear trend can be noticed of an increasing representation of the adult age classes, rising from 40% to 52.6%. As far as the pre-adult age classes are concerned, there appears to be a slight shift in favour of juvenile animals, related to a decrease in sub-adult individuals from phase 2 to 3. For the first phase a total MNI for pigs of only five individuals was calculated, which weakens this phase's comparative value, though it can be said that the

Table 13. Phase 3: Representation of skeletal elements.

Element	Dog	Pig	Cattle	Sheep	Goat	Ovicaprines	Bear	Wolf	Fox	Hare	Wild boar	Red deer	Chamois	Partridge	Wood Pigeon	Hermann's Tortoise	European Pond Tortoise	Tortoise	Medium Size	Large Size	Indeterminable	**Total**
Cranium		24	19	3	2	21	1												51	10		**131**
Horncore			1	3	3	3																**10**
Antler												11										**11**
Maxilla	5	17				7																**29**
Upper teeth	4	23	10			33						5										**75**
Mandibula	5	9	11	11	7	27						1							3	1		**75**
Lower teeth	5	51	6	4	8	22						2										**98**
Teeth		2	1			7														1		**11**
Hyoid			1			3																**4**
Atlas	1					1																**2**
Epistropheus			1			1																**2**
Cervical vertebrae			3			4													7	6		**20**
Thoracic vertebrae	2	6	4			1		1	1										9	2		**26**
Lumbar vertrebrae		1	2			6													8			**17**
Sacrum						1													1			**2**
Caudal vertebrae						2																**2**
Vertebrae																			1	2		**3**
Clavicula																		1				**1**
Ribs		35	34			35													151	77		**332**
Sternum						2																**2**
Scapula		16	12	8	5	9													22	7		**79**
Humerus	2	5	7	5	4	4										1			45	12		**85**
Radius	2	8	6	3		18				1	1								33	10		**82**
Ulna	3	8	6			6				1	1	1			1				2	3		**32**
Radio+Ulna		1		1	3																	**5**
Carpus		3	11									1										**15**
Metacarpus			13	4	4	10													1			**32**
Metacarpus 2									1													**1**
Metacarpus 3	2	3																				**5**
Metacarpus 4	2	1																				**3**
Metacarpus 5											1											**1**
Pelvis	3	3	3	1		9													7	9		**35**
Femur	1	7	3		1	8										2			21	7		**50**
Tibia	4	12	4	1	3	22				1									26	14		**87**
Tibiotarsus														1								**1**
Fibula	3	10							1													**14**
Calcaneus	1	5	4	3	3	5																**21**
Astragalus		2	3	5	3	3																**16**
Tarsus			7			3																**10**
Metatarsus			10	5	5	19													1			**40**
Metatarsus 2	1	4																				**5**
Metatarsus 3	1	2																				**3**
Metatarsus 4	1	2																				**3**
Long bone																			648	200		**848**
Metapodium		1	5		1	1													1	24		**33**
Phalanx 1		11	14	3	3	10							1									**42**
Phalanx 2		6	12	2	1	2					1	2										**26**
Phalanx 3		4	5	1		3																**13**
Carapace																10	2	5				**17**
Indeterminable																					10	**10**
Total	**48**	**282**	**218**	**63**	**56**	**308**	**1**	**1**	**3**	**3**	**4**	**23**	**1**	**1**	**1**	**13**	**2**	**6**	**1038**	**385**	**10**	**2467**

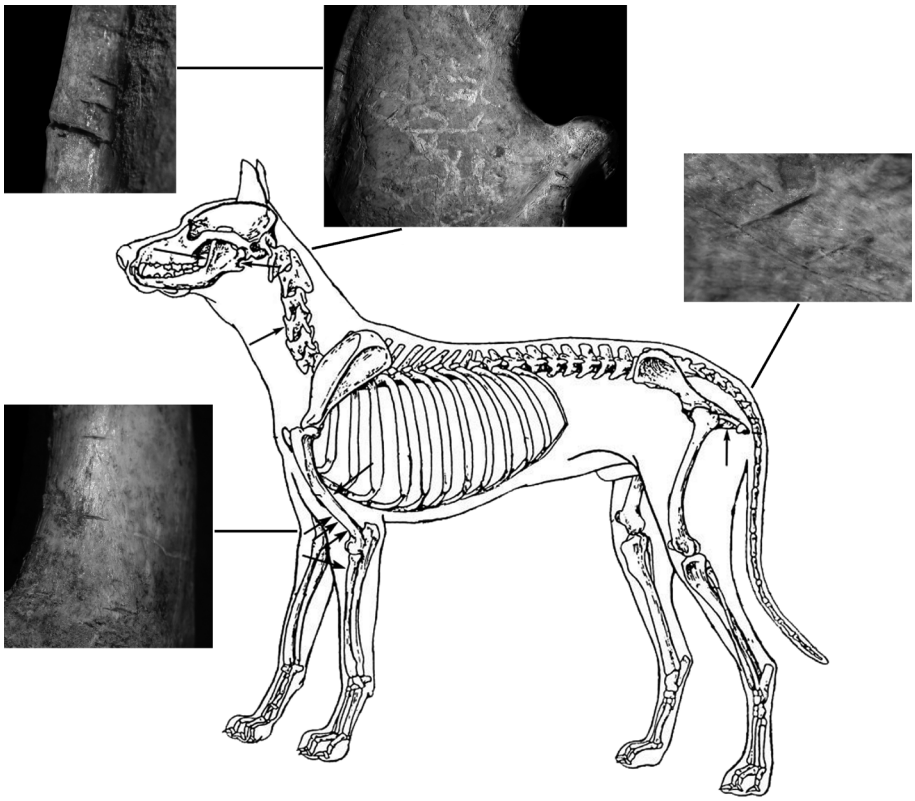

Fig. 6. Cut marks on dog for all three phases (Photos provided by the photographic laboratory of the National Museum of Prehistory and Ethnography '*L. Pigorini*' in Rome).

overall result presented for phase 1 generally fits in well with the later phases.

In figure 8 the percentage values (of the number of remains NR, the minimum number of individuals MNI, and the bone weight W) of pigs (calculated against cattle and ovicaprines) are graphically represented for the three phases. The three different types of data are combined here to show diachronic developments more accurately.[19] The changing representation of pigs over the phases is clear, especially between phases 2 and 3. There is a gradual decrease, with an average of 4% per phase, most evident in the %NR trend-line, but reflected to a lesser degree also for the other two. The inconsistency regarding the %MNI values for phase 1 can be explained by the unreliable MNI for this phase, due to the small sample and a consequent overestimation of the MNI. As for the somewhat low %W value for phase 1, this must be caused by the particular depositional conditions of the strata attributed to phase 1, with their larger than average overall boneweight, thus favouring the percentage representation of the larger-sized species and impairing particularly that of pigs.[20]

Viewing together the analysis of the pigs' age-class distribution and their general representation over the various phases, it can arguably be concluded that over time, pigs, while always constituting a stable element in Broglio's subsistence economy, decreased in importance and hence that their role as a source of meat was in part taken over by other species.

The representation of pigs in the faunal complex of Broglio as documented by the earlier excavations (Tagliacozzo, 1994: pigs account for 30.4% in the MBA[21]) is more or less comparable to the results for Sector 10, ending up just a little higher with an average of 33.0% for all the three phases combined. It should be noted that the statistical reliability of the faunal data from Broglio's past excavations is relatively poor, with only 345 bone remains attributed to the entire MBA (Tagliacozzo, 1994: 631).

The measurements on the bone remains of pig have allowed a calculation of the height at the withers in five cases. They range from 67.0 cm to 75.0 cm, with an average height of 70.6 cm; closely comparable to the average of the pigs at Torre Mordillo (70.2 cm).[22] The pigs at Francavilla were slightly smaller with a 63.6 cm average, although it should be noted that for this site the height at the withers of only two pigs could be calculated (Elevelt, 2006: 262).

Cattle (*Bos taurus*)

The third principal domesticated species, as for the NR, in the faunal assemblage of Sector 10 is cattle, its share being on average 28.2%.[23] Between the three archaeological phases notable differences can be observed. Regarding the MNI age-class distribution (fig. 9), there is no clear uniformity between the three phases. It should be noted that for the first phase only five individuals were calculated, rendering this phase particularly weak

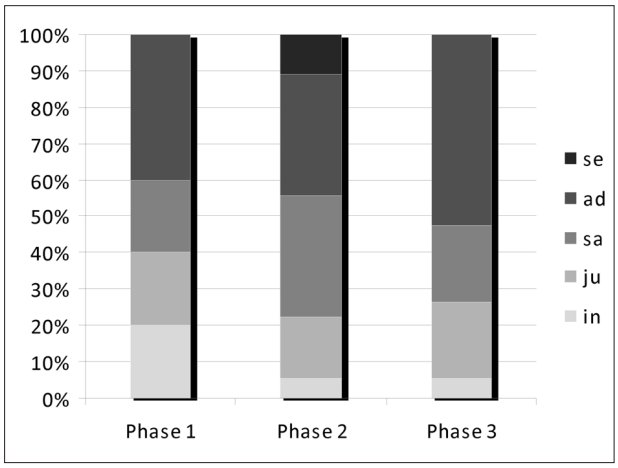

Fig. 7. Age-class distribution for pigs for all three phases (Graph S. Elevelt).

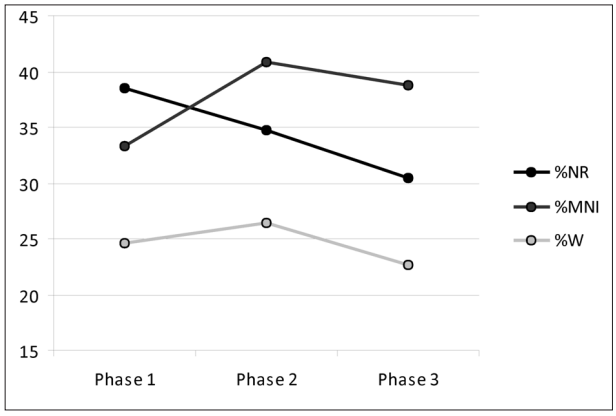

Fig. 8. Presence of pigs for all three phases (%NR, %MNI and %W) (Graph S. Elevelt).

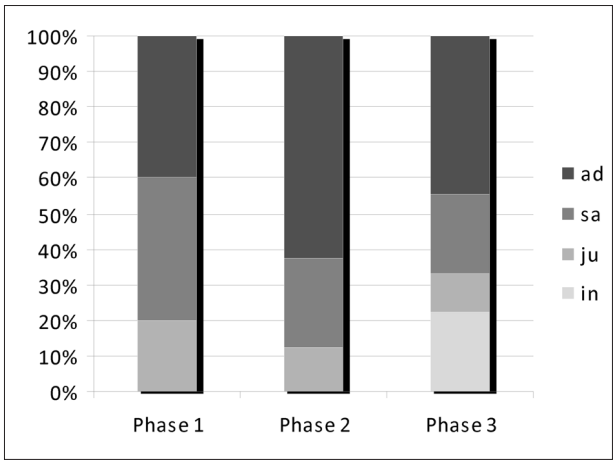

Fig. 9. Age-class distribution for cattle for all three phases (Graph S. Elevelt).

for comparative purposes. An interesting development is apparent in phase 3, when for the first time infantile individuals are present. In this phase the pre-adult individuals constitute 55.6% of the species, a picture unparalleled in the other phases. This increasing representation of young individuals can be explained through a changing exploitation of this species, with more calves being slaughtered for their meat.

Regarding the changing presence of cattle over time (fig. 10), a surprising homogeneity can be noticed between the three trend-lines, those of the percentage values of NR, MNI and W. The general trend of a continuously decreasing representation of cattle is evident; the %NR decreases gradually from 32.1% to 23.5%, which is echoed in the %W trend-line. The picture differs only slightly for the %MNI, where between phases 1 and 3 there is the same general development, but the second phase is somewhat lower than expected. It can be concluded that the importance of cattle in the subsistence economy decreased over the three periods under examination. It is difficult to relate this development to any specific change in the role that cattle played at the site, in other words, whether the data reflect changes in the consumption of cattle's secondary food products. A taste for veal is identified for the third phase, but the overall decrease in the representation of cattle should be interpreted in the light of developments relating to all three principal domesticated species.

The representation of cattle at Sector 10 is concordant with the evidence from previous excavations at the site (Tagliacozzo, 1994). Tagliacozzo records an average cattle share of 26.6% for the MBA, while this figure for Sector 10, as mentioned, is 28.2%. The two nearby sites used here for comparative analysis, Francavilla Marittima and Torre Mordillo, show a differing picture. The latter site registers 19.2% cattle, while at Francavilla the figure is relatively high, 36.8%. However, for both sites it should once more be noted that the MBA phase is marked by low NR values, which limits their reliability in a comparative analysis. Also, the fact that at these sites the MBA is treated as a single phase without sub-phases, makes it hard to recognize any trends like those observed within the various sub-phases at Sector 10.

An interesting example of worked bone from this species is a right mandible (phase 2; U.S. 10065). Its oral extremity was not worked and the incisors are missing, but the basal part of the mandible body (total length c. 15 cm) was made into an awl with evident traces of use. The object eventually broke at the base of the pointed shaft, close to the mental foramen, and was subsequently discarded.

For cattle no height at the withers could be calculated, which in view of the fragmented condition of the bones is not surprising. A comparison of the measurements of the cattle bones with those from the site of Torre Mordillo, the only nearby site for which bone measurements have been

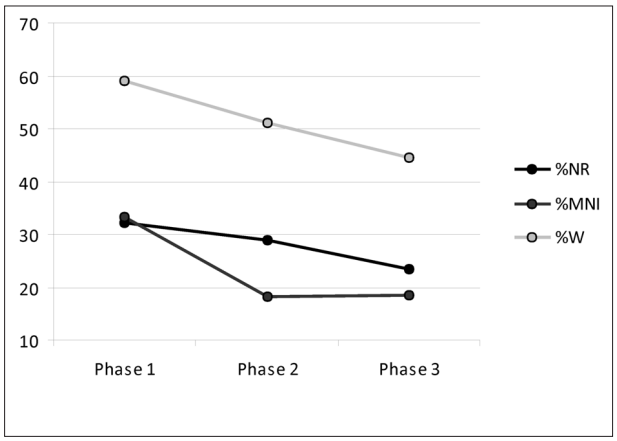

Fig. 10. Presence of cattle for all three phases (%NR, %MNI and %W) (Graph S. Elevelt).

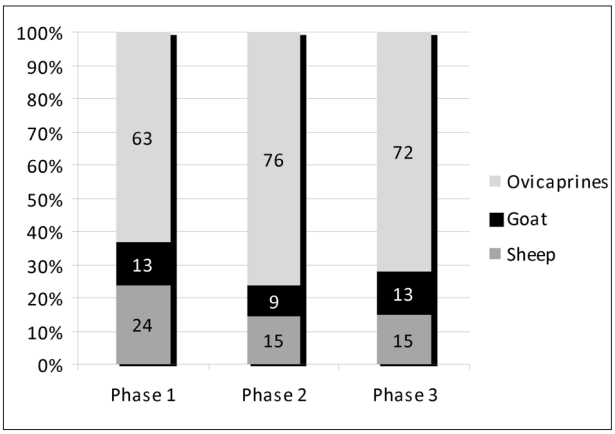

Fig. 11. Presence of sheep, goat and ovicaprines for all three phases (%NR) (Graph S. Elevelt).

published, shows a substantial homogeneity between the two sets.[24]

Ovicaprines (*Ovis aries* & *Capra hircus*)

The last of the principal domesticated species, the group of the ovicaprines, comprises goat and sheep; the two species should be considered separately as well as together in terms of their contribution to the subsistence economy at Broglio di Trebisacce. Whenever possible an identification to the species level is made, although the practical difficulty of distinguishing the bones of the two species is likely to work against separate interpretations for sheep and goat.

Figure 11 gives an overview of the proportions of goat, sheep and ovicaprines for the three archaeological phases. Two conclusions can be drawn. First, phase 1 allowed an identification to the species level of well over one third (37%) of the total ovicaprine sample, the highest level in the entire faunal complex. This high level of species identification can be explained by the generally good state of preservation of the archaeological deposits of this phase. Secondly, the relationship between sheep and goat follows a clear and steady trend: from a predominance of sheep over goat in the first phase (where there are almost twice as many sheep as there are goats) to a fairly equal representation of the two species in phase 3.[25]

In the treatment of ovicaprines in the faunal complex at Sector 10 and their age-class distribution, first of all a general discussion on the combined species will follow, after which an attempt will be made to distinguish and explain any observed patterns concerning the individual species.

Figure 12 is an overview of the age-class distribution of ovicaprines for the three archaeological phases. What is immediately noticeable is the overall uniformity of phases 2 and 3, where adult and senile individuals make up half of the remains of these species and the pre-adult age classes are all well-attested, the juveniles and sub-adults being equally represented and completed by one or two infantile individuals. The situation for the first phase is not substantially different, though perhaps less detailed, without doubt owing to the low MNI value for phase 1 (as explained above).

The situation thus presented for the ovicaprines points to a well-balanced herd composition where sufficient adults are present to allow a proper reproduction cycle, but where a large percentage of young animals (almost a third under the age of 10 months, the infantile and juveniles, and almost half of all pre-adults) are killed, evidently constituting an important meat source.

Figure 13 shows the representation of ovicaprines in the three phases, clearly showing the ever-growing importance of ovicaprines at Sector 10. An increase in the percentual number of remains (%NR) can be noted between the three phases from 29.5% (phase 1) to 43.9% (phase 3), which equals a 49% increase. Confirmation of this development is found in the two other trend-lines, relating to the percentages of MNI and W, where the trend already noted for the NR is on the whole repeated, with the exception that the %MNI shows a more modest increase between the second and third phases than is the case with the two other trend-lines.

An age-class distribution is proposed for sheep and goat individually (fig. 14) for the second and third phases. The first phase is the most difficult to deal with, owing to the underrepresentation of this phase and the generally low MNI values. In fact, only a few adult individuals could be identified as either sheep or goat. For this reason, phase 1 is excluded from the graphic representation and from the discussion.

Phase 2 shows very similar percentage values of adult[26] individuals for both species, 42.9% for sheep and 37.5% for goat. The great distinction between the two appears in the pre-adult age groups, where goats have a high (37.5%) juvenile representation, whereas with the sheep the emphasis is on the sub-adult age class (42.9%). The third phase shows a substantial similarity to the previous phase as far as sheep are concerned, with a slight

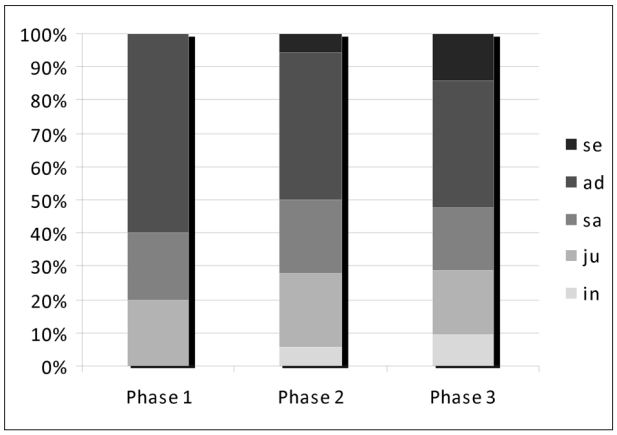

Fig. 12. Age-class distribution for ovicaprines for all three phases (Graph S. Elevelt).

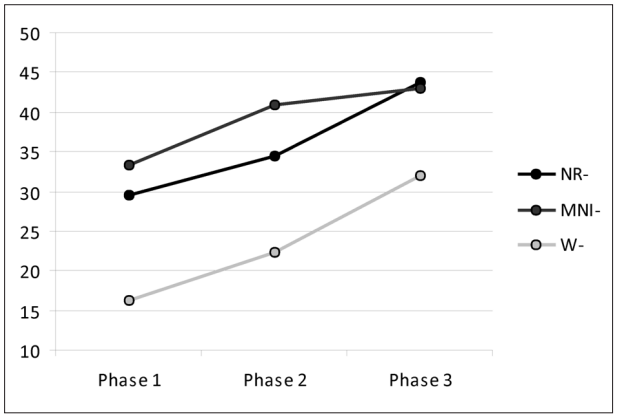

Fig. 13. Presence of ovicaprines for all three phases (%NR, %MNI and %W) (Graph S. Elevelt).

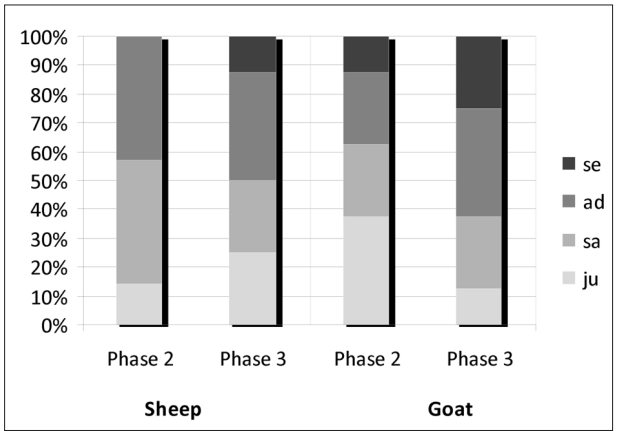

Fig. 14. Age-class distribution for sheep and goat for phases 2 and 3 (Graph S. Elevelt).

shift towards adult individuals in this period with respect to the previous. A similar trend can be noted for the goats, where the change is more profound: 62.5% of all individuals are now adult or senile animals, as against 37.5% for phase 2.

For sheep a total of ten wither heights could be calculated, giving an average of 58.8 cm with a range from 54.9 to 61.9 cm.[27] No wither heights for goat could be determined. A comparison can be made with the heights of sheep already published for Broglio: 55.0 and 56.7 cm (Tagliacozzo, 1994: 618) and with several from archaeologically later contexts at the nearby site of Torre Mordillo (Tagliacozzo & Curci, 2001: 410–1), which show an overall homogeneity between the sites and the archaeological periods; unfortunately the number of wither heights available for comparison is small, this clearly is the result of the nature of the archaeological deposit.

One height of an ovicaprine is anomalous: a large left calcaneus (U.S.10053, phase 2), indicating a height at the withers of 78.6 cm, is much larger than any of the others. A possible explanation for this may be that the bone is of a castrated goat (goats are typically larger than sheep, as attested in various Bronze Age contexts, the difference generally being 4-6 cm). Castration would probably have been performed to resolve problems of strong territorial behaviour and/or to increase the meat revenue, as castration leads to increased growth and weight of the animal in question. If this interpretation is correct, it constitutes the first evidence of the practice of castration at Broglio di Trebisacce.

Bear (*Ursus arctos*)

This species is represented in the faunal complex by two bone fragments: a thoracic vertebra (phase 1, U.S. 10110) and an occipital portion of the cranium (phase 3, U.S. 10027). Both fragments appear to represent adult individuals of normal proportions. On the vertebra one cut mark was identified.

These finds are not the first attestation of the species at Broglio di Trebisacce: a tibia fragment and a (perforated) canine were identified in the previous faunal analyses (Tagliacozzo, 1994: 621), both dated to the Recent Bronze Age (RBA). At the nearby site of Francavilla Marittima, bear is attested by a single fragment in the Recent-Final Bronze Age (Elevelt, 2006), while at Torre Mordillo the species is absent. In fact, bear is rarely found in protohistoric contexts in southern Italy,[28] and when present, is usually represented by very few fragments. Evidently the species was never systematically hunted, but presumably was killed only when it presented a threat (to the herd or to the settlement). Whereas nowadays bears are no longer found in southern Italy, the finds at Broglio (and other south Italian sites) attest its presence in the Bronze Age.

Wolf (*Canis lupus*)

The wolf shows great similarity to the bear in its representation in the faunal assemblage: like the bear, the wolf

is attested by two bone fragments, from phase 1 (a lower first molar from U.S. 10113) and phase 3 (a thoracic vertebra from U.S. 10034). The only other Bronze Age site in the Sibaritide with wolf is Torre Mordillo, where a single ulna fragment dated to the RBA was identified (Tagliacozzo & Curci, 2001). Wolves are also attested in various Bronze Age settlements in Apulia.[29]

Fox (*Vulpes vulpes*)
This species is attested by four fragments in the faunal complex of Sector 10: a complete metacarpus 3 dates to the second phase (U.S. 10049), and to the third phase belong a metacarpus 2 (U.S. 10037), a partial thoracic vertebra (U.S. 10031) and a fragment of fibula (U.S. 10027), all of adult individuals. Thus a slight increase in the number of fox remains can be observed between phases 2 and 3, although statistically this data is not reliable. Still, it can be interpreted in the light of changes in the representation of the other wild species.[30]

This is the first time that fox is identified for the site of Broglio di Trebisacce. Fox is rare in the sites in the Sibaritide, although the species is identified at the Early Neolithic site of Favella (Tagliacozzo, 2005/06). Also at the chronologically more comparable sites of Francavilla Marittima and Torre Mordillo, fox occurs amongst the faunal remains, but in later contexts, of the EIA and FBA, respectively. In any event, the species always is represented by very few fragments and was probably hunted only occasionally.

No inferences can be drawn regarding the size of the animals, as only two metacarpal bones offer osteometric data.[31]

Badger (*Meles meles*)
Two skeletal fragments of badger were identified at Sector 10: a frontal-parietal cranium fragment from phase 1 (U.S. 10110) and a distal femur from phase 2 (U.S. 10099). Both individuals were adult and appear to be within the normal size range of the species, although no measurements were possible owing to the fragmentary state of the remains.

The previous archaeozoological research in Broglio had already documented this species by two bone fragments from different excavation areas, one datable to the MBA and one to the FBA. So far, Broglio di Trebisacce is the only site in the Sibaritide where the badger has been identified in the faunal assemblage. Similar finds are attested in protohistoric Basilicata and Apulia,[32] but always in modest quantities.

Hare (*Lepus* sp.)
In total, six fragments belonging to this species were found at Sector 10, three from phase 2 (metatarsi 2, 3 and 5) and an equal number belonging to phase 3 (fragments of ulna, radius and tibia), representing (at least) two individuals. Overall, hare makes up 7.9% of the wild species, based on the number of remains. On the other hand, in terms of bone weight hare constitutes just 1.3% of the wild species, which reflects the species' low importance on the economic level. An interesting example of the use of hare bone for tool manufacturing is the find of a worked metatarsal 5 (phase 2; U.S. 10098). The proximal end was made into a point to be used as an awl.

In other southern Italian protohistoric contexts, hare is well-attested, while for the Sibaritide the only comparison can be made with Francavilla Marittima, where fragments dated to the EIA were found: one on Plateau I (Elevelt, 2006: 264) and two more from the acropolis (Elevelt, unpublished).

Wild boar (*Sus scrofa*)
Wild boars are present in all three archaeological phases, constituting the third hunted species in the faunal complex, after red deer and roe deer. Overall, eight bone fragments are attributed to this species, almost exclusively representing adult individuals.

The finds of wild boar in the faunal assemblage of Sector 10 constitute the earliest evidence of this animal's presence at Broglio.[33] The only other site in the Sibaritide where it is attested is in the RBA levels at Torre Mordillo (Tagliacozzo & Curci, 2001), where three wild-boar bones were found. This low number confirms the marginal role of this species. Unfortunately it proved impossible to compare the bone measurements of wild boar from the two settlements.

It may be supposed that, because of the difficulty in distinguishing the wild animal from the domesticated pig, and of the fragmentary nature of the faunal assemblage, some of the wild boar bones were erroneously attributed to pigs, especially in the case of pre-adult individuals. Even when we consider this species as possibly underrepresented in the bone assemblage, it is evident that wild boars were not particularly important as a food source, and that their contribution to the overall subsistence economy was minimal.

Red deer (*Cervus elaphus*)
The presence of red deer in the faunal complex is attested by a total of 40 bone fragments, from all three phases (with NRs of 4, 13 and 23, respectively). Although the number of red deer remains is small, sufficiently diverse skeletal elements are present to suggest that the hunted animals were brought back to the site as entire carcasses, and that no butchering took place at the kill site.

It should be noted that 17 of the remains are antler fragments, the presence of which might distort the representation of this species in the faunal complex. In fact, an overall MNI of six is calculated for red deer. The possible distortion by the antler fragments aside, it is evident that red deer constituted only a marginal contribution to the local subsistence economy, an interpretation that is confirmed by the earlier faunal analyses carried out for Broglio (Tagliacozzo, 1994). It is possible that the presence of red deer at the site (partly) reflects the practice of

Table 14. Overview of the number of bone remains per phase and total.

Species	Phase 1	%	%	Phase 2	%	%	Phase 3	%	%	Total	%	%
Dog	5	1,4	3,1	38	1,8	4,4	48	1,9	4,9	91	1,9	4,6
Pig	60	17,2	37,3	286	13,7	33,4	282	11,4	28,9	628	12,8	31,5
Cattle	50	14,3	31,1	237	11,4	27,7	218	8,8	22,4	505	10,3	25,3
Sheep	11	3,2	6,8	43	2,1	5,0	63	2,6	6,5	117	2,4	5,9
Goat	6	1,7	3,7	27	1,3	3,2	56	2,3	5,7	89	1,8	4,5
Ovicaprines	29	8,3	18,0	226	10,9	26,4	308	12,5	31,6	563	11,5	28,2
Domesticated mammals	**161**	**46,1**	**100**	**857**	**41,2**	**100**	**975**	**39,5**	**100**	**1993**	**40,7**	**100**
Bear	1	0,3	6,7				1	0,04	2,8	2	0,04	2,5
Wolf	1	0,3	6,7				1	0,04	2,8	2	0,04	2,5
Fox				1	0,05	3,6	3	0,1	8,3	4	0,1	5,1
Badger	1	0,3	6,7	1	0,05	3,6				2	0,04	2,5
Hare				3	0,1	10,7	3	0,1	8,3	6	0,1	7,6
Wild Boar	3	0,9	20,0	1	0,05	3,6	4	0,2	11,1	8	0,2	10,1
Red deer	4	1,1	26,7	13	0,6	46,4	23	0,9	63,9	40	0,8	50,6
Roe deer	5	1,4	33,3	7	0,3	25,0				12	0,2	15,2
Chamois				2	0,1	7,1	1	0,04	2,8	3	0,1	3,8
Wild mammals	**15**	**4,3**	**100**	**28**	**1,3**	**100**	**36**	**1,5**	**100**	**79**	**1,6**	**100**
Partridge				1	0,05		1	0,04		2	0,04	
Wild dove							1	0,04		1	0,02	
Cuttlefish	1	0,3								1	0,02	
Hermann's Tortoise	1	0,3		18	0,9		13	0,5		32	0,7	
European Pond Tortoise							2	0,1		2	0,04	
Tortoise				3	0,1		6	0,2		9	0,2	
Total wild	**17**	**4,9**		**50**	**2,4**		**59**	**2,4**		126	**2,6**	
Total determined	**178**	**51,0**		**907**	**43,6**		**1034**	**41,9**		**2119**	**43,3**	
Large size	46	13,2	26,9	326	15,7	27,8	385	15,6	26,9	757	15,5	27,2
Medium size	121	34,7	70,8	842	40,5	71,7	1038	42,1	72,4	2001	40,9	72,0
Undeterminable	4	1,1	2,3	6	0,3	0,5	10	0,4	0,7	20	0,4	0,7
Total undetermined	**171**	**49,0**	**100**	**1174**	**56,4**	**100**	**1433**	**58,1**	**100**	**2778**	**56,7**	**100**
Total complex	**349**	**100**		**2081**	**100**		**2467**	**100**		**4897**	**100**	

élite hunting, which is however normally more associated with LBA periods.

Unfortunately the bone material of red deer was too fragmented to allow any wither heights to be calculated from the few bone measurements taken. A comparison between the phalanx 2 measurements from Broglio and those published for nearby Torre Mordillo (Tagliacozzo & Curci, 2001: 414–6) shows considerable overlap between the two samples. For Broglio one phalanx stands out for its dimensions (GL = 45.0 mm, against an average of 40.5 mm for the three other phalanges measured), but this can be explained by sexual dimorphism, this individual probably being a (fairly robust) male.

This species clearly was the primary hunted animal, its NR making up more than half of all the wild mammal remains at the site. This can be explained not only by the species' relatively high meat yield, but also because the antler of red deer was often used for making tools and other artefacts. At Sector 10, five antler fragments show traces of having been worked, one in particular can be identified as a handle for a small hand tool of some sort, the other four probably are waste material of worked antler, the presence of which is logical in a ditch with settlement waste. Lastly, two pedicle fragments of shed antler demonstrate that antler was also collected specifically for the purpose of making it into artefacts.

Roe deer (*Capreolus capreolus*)

Roe deer is represented in the faunal complex by a total of twelve bone fragments, five from phase 1[34] and seven from phase 2, all belonging to adult individuals. No particular parts of the skeleton seem to be absent. The non-identification of rib and vertebra fragments of this species can be explained by the difficulty of recognizing these in samples of highly fragmented bone such as this.

Cut marks found on some of the bone fragments, particularly on the metapodial bones and on a calcaneus, point to the practice of skinning. An antler fragment showed eight chop marks, which can be taken as evidence for the manufacture of tools or other artefacts.

For the MBA and RBA, the species is also attested at the neighbouring site of Torre Mordillo, albeit by only

one bone fragment per phase. Roe deer is commonly found in Bronze Age contexts of southern Italy, but always in low numbers. Its relatively frequent occurrence at Sector 10 seems to have been of a passing nature, as roe deer are totally absent in phase 3. However, in a different excavation area of Broglio (Sector D, dated to the RBA), two bone fragments of roe deer were found, documenting the species' presence at the site during this archaeological period.

Chamois (*Rupicapra* sp.)
The chamois is attested by three bone remains: two upper right molars (M1 and M2; figure 16) belonging to an adult individual and attributed to phase 2, and an unfused left first phalanx of a sub-adult individual, attributed to the third phase. The presence of this species on the site is surprising, as there are no comparable finds of chamois in protohistoric southern Italy. The scarcity of the remains, as well as the nature and habitat of the chamois, suggest an opportunistic hunting of this species, perhaps by herders or hunters as they encountered the animals in the mountainous hinterland of the site.

Birds: Partridge (*Perdix perdix*) and Wood Pigeon (*Columba palumbus*)
The partridge is attested in the assemblage by two bone fragments, a nearly complete left femur belonging to phase 2 (U.S. 10050) and the diaphysis of a right tibiotarsus from phase 3 (U.S. 10031). Both elements belong to adult individuals. Also, one left ulna of an adult wood pigeon was found, dated to phase 3 (U.S. 10041).

Considering the rarity of bone remains of birds, bird catching seems not to have played a significant role in the subsistence economy at Broglio, even when one takes into account that bird remains may be underrepresented in the faunal complex because of their small dimensions. This result is very much in accord with the two comparable sites for Broglio in the Sibaritide, as well as the previously published faunal analyses of the same site: bird remains are present throughout the different archaeological periods (MBA to EIA), but always represented by just a handful of bone fragments.

Cuttlefish (*Sepia* sp.)
The somewhat unusual find amongst the faunal remains of Sector 10 of a fragment of cuttlebone was already briefly mentioned above (see chapter 3). This species is also attested at the Apulian protohistoric settlements of Roca (Wilkens, 1995a; one fragment dated to the MBA, from a coastal site) and Madonna del Petto (Curci, 1995; two remains dated to the FBA, from a site located slightly inland). The rarity of the find can be partially explained by the extremely fragile nature of cuttlebone; it cannot be excluded that the species was fairly commonly consumed. Unfortunately, no clear information can be given about the level of marine exploitation (if any) by the inhabitants of Broglio. This is in part due to the generally poor conditions of bone conservation at the site and the methods of find collecting, which render the recovery of small animal (including fish) remains extremely difficult. On the other hand it is worth noting that the great majority of Italian protohistoric sites lack fish in their faunal complexes.[35]

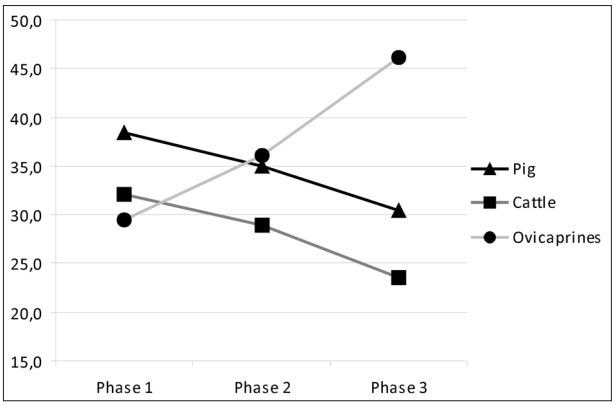

Fig. 15. Relationship between the three principal domesticated species for all three phases (Graph S. Elevelt).

Fig. 16. Chamois upper right molars: M1 (right) and M2 (left) (Photos provided by the photographic laboratory of the National Museum of Prehistory and Ethnography '*L. Pigorini*' in Rome).

Tortoises: Hermann's Tortoise (*Testudo hermanni*) and European Pond Tortoise (*Emys orbicularis*)

Tortoises of two different species have been identified amongst the faunal remains of Sector 10. In total, 28 carapace elements, two femora and two humeri of Hermann's Tortoise were identified, mostly dated to the second and third phases. Of the European Pond Tortoise, only two carapace fragments were found. Nine bone elements (eight carapace fragments and a clavicle) could not be attributed with certainty to either of the two species. Interestingly, one of the femora shows a small cut mark on the diaphysis.

Overall, the tortoise remains found at Sector 10 of Broglio make up less than one percent of the number of bone remains. Their role as a food source, apparently attested by the presence of a cut mark (see above), must therefore have been marginal at best.[36] Tortoises were also attested for the site in the earlier excavation, for each of the various archaeological phases, and are quite common in protohistoric contexts in southern Italy.

7. CONCLUSIONS

In the course of the presentation of the faunal remains of the three chronological phases at Sector 10 and the subsequent discussion of the individual animal species found in the assemblage, some interpretations have already been proposed. Here a brief synthesis will be given of the role that the various domesticated animal species played in the MBA subsistence economy of Broglio, and of what the contribution of the various wild species may have been.

In table 14 the faunal remains of Sector 10 are presented per phase and for the faunal assemblage as a whole (NR and %). For an understanding of the organisation of the subsistence economy, the changing relationship between the principal domesticated species – pigs, cattle and ovicaprines – is of crucial importance. As figure 15 shows, there is a steady increase in the presence of ovicaprines, which from phase 2 onward were the principal animal group, and whose share in phase 3 nearly equalled that of pigs and cattle combined. The age-class distribution for ovicaprines does not change significantly over the three periods, despite a slight increase in the infantile/juvenile age groups, and shows a notable (and from phase 2 to 3 increasing) representation of adult and old (senile) animals. Apparently, the exploitation of domesticated animals at Broglio was increasingly oriented towards pastoralism, in which ovicaprines claimed a dominant role, their uses being principally as a source of milk and wool, with young animals providing meat.

The relationship between pigs and cattle, on the other hand, is very stable and always in favour of the former by c. 6-7%NR. In all of the periods, both species play an important role as a meat source, while the use of oxen for traction cannot be excluded. Also, there is a noticeable increase in the representation of pre-adult cattle in the last phase (56% for phase 3 as against 38% for phase 2), which suggests a more diversified use of cattle in phase 3, calves providing an important source of meat in this period.

The dogs at Broglio were mostly herding (and hunting) dogs, and would also have guarded the settlement against wild animals. Numerous cut marks found on dog remains from phases 2 and 3 prove that dogs also were a source of meat at Broglio; but dogs were consumed only occasionally, as their overall representation in the faunal complex is low. In phase 3 an increase is noted in the pre-adult dog remains, but it is uncertain whether this can be linked to a more intensified use of dogs for consumption. A cross-check between the cut marks on dogs and the different age classes is inconclusive. Finally, variation in some of the cranial bone measurements points to the presence of different breeds of dog at the site, although the fragmentary nature of the material does not allow clear-cut breeds to be distinguished among the dogs of Broglio.

Nine different species of wild mammal were identified, totalling a mere 3.7% of the total number of determined bone remains (79 out of 2119). Wild mammals are differently distributed over the various phases; in phase 1 the presence of wild mammals is relatively high, 8.4%. This discrepancy with regard to the two other phases (2.9% of wild mammals for phase 2 and 3.4% for phase 3) might be explained as resulting from the low number of bone remains from phase 1, although a decreasing importance of hunting during the three phases cannot be excluded, especially if the first phase could be dated close to the foundation of the site, thereby reflecting the start of a more intensive clearance of the surrounding landscape. The principal hunted species is red deer, followed by roe deer and wild boar. Red deer not only has the greatest meat revenue of these three species; it also provides antler, which was used for the making of artefacts.

Further evidence of tool manufacture includes an awl made from a hare's metatarsal bone, as well as a cattle mandible made into an awl. The aim of this article is not to propose a detailed analysis of the worked bone remains, but as a general observation it can be stated that very different types of skeletal elements (typically antler, ribs and long bones, but also nasal bones, teeth and in one case even a caudal vertebra of a sheep/goat[37]) from a wide range of animal species were used for making tools, implements or ornaments. The most surprising wild mammal identified in the faunal remains of Sector 10 is chamois, a species that is unattested in comparable southern Italian contexts.

In the course of the present faunal analysis, several references have already been made to comparable archaeozoological research published for two important sites in the Sibaritide area, Francavilla Marittima and Torre Mordillo, as well as past archaeozoological research carried out on material from other excavation areas at Broglio di Trebisacce. Unfortunately, these sources for comparative data take the MBA as a whole, whereas for Sector

10 a three-period subdivision was adopted. Nevertheless it is interesting to note some general similarities and differences between the available data sets. First of all, it should be noted that the analysed faunal assemblage from Sector 10 at Broglio is by far the most numerous, for the MBA in particular (c. 4900 remains), whereas the comparative datasets for this period present only a few hundred remains.[38] This first of all underlines the value of this study as a contribution to the archaeozoological evidence of the region for this period, but at the same time it is a call for caution in comparing these different data sets. At all three sites, ovicaprines are the dominant species, their share being in the range of 36-39% in all cases. At Torre Mordillo the ovicaprines are less dominant than at the other sites, and are followed closely by pigs in terms of share in the faunal complex (36.2% for ovicaprines and 32.8% for pigs). Also, at this site the NR of pig bones almost doubles that of cattle, whereas at Broglio (in Sector 10 as well as the other excavation areas) the two species are much more equally represented, pigs outnumbering cattle by just 3-6%. A different situation is seen at Francavilla, where cattle are the second domesticated species with 35.6%, and pigs follow with 19.8%.

The role of ovicaprines in the subsistence economy of Broglio in the MBA shows an important development from the first phase, which coincides with the settlement's first occupation, to the third, where a strong increase in the species' representation is noted. The principal use of sheep and goat seems to have been that of providing wool and milk, meat being a secondary consideration. The practice of castration probably was adopted mainly as a means of better controlling the herd, for which also dogs were kept. The evidence of the consumption of dog meat is not without precedence in similar Italian archaeological contexts (for two other known cases, see above), and shows that all sources of food available to the inhabitants were exploited. The principal animals consumed were pre-adult cattle and pre-adult pigs, the former especially in phase 3.

Hunting was practiced principally for the procurement of skins and of antler for the manufacturing of tools and other artefacts, some evidence of which was found in the assemblage.[39] The consumption of wild meat was no more than occasional and concerned mainly red deer and roe deer.

The MBA fauna from Sector 10 of Broglio di Trebisacce shows a changing subsistence economy, increasingly focusing on the exploitation of ovicaprines for their wool and milk, and secondarily for their meat (especially lambs), with young cattle becoming more important for providing veal in phase 3. Possibly dogs, apart from their traditional uses, were exploited as a source of meat; wild mammals played a minor role as a food source, being hunted primarily for their skins and antler.

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9. NOTES

1. The site was discovered in 1978. Excavation was begun in 1979 and is still ongoing, under the scientific direction of Prof. R. Peroni and dr A. Vanzetti of the 'Sapienza' University of Rome. The site has been widely published, see for example Bergonzi *et al*., 1982a; 1982b; 1984; Peroni, 1984, Peroni & Trucco, 1994; and Peroni & Vanzetti, 1998. These publications have constituted a valuable contribution to current knowledge of the protohistory of southern Italy.
2. The excavation areas are named Sector B (sub-divided in B and B-ovest); Sector D (sub-divided in D-ovest, D-centrale, D-est); Sector D-Nord (contiguous to the former ones, but pertaining to a different sedimentary basin) and Sector E. In these areas, habitations with multiple occupation phases, facilities for the storage of food products and other archaeological features relating to the long and complex history of the settlement were uncovered. Excavation areas, from 1990, have been named employing numbers (1 ... 12), and no longer letters (A ... E).
3. The state of preservation of bone material at the site is generally poor, probably due to the sedimentary formation processes, like poor sedimentation, consistent erosion and post-depositional processes (e.g. intense biological activity).
4. Sector 10 has not been published so far. All information concerning the excavation and the interpretations regarding the nature of the deposit were kindly provided by the excavators.
5. For example, ovicaprines and pigs are considered adult at 24 months, while cattle reach this stage at 36 months.
6. The reason for this relatively high number can be explained by the particular depositional conditions of certain archaeological layers belonging to phase 1: in-situ burning of the surface, which allowed reduced fragmentation of the archaeological remains (bone and otherwise) contained within these layers.
7. These values refer to the percentages within the category of domesticated species.
8. Here the values for sheep, goat and ovicaprines are summed.
9. In Italy a revision of the presence of various species of lagomorphs and their distribution is currently carried out (Trocchi & Riga, 2005). It is preferred for this article to refer to the hare remains only on the genus level, without distinguishing a particular species.
10. Chamois is currently represented in Italy by two distinct species: *Rupicapra rupicapra* and *Rupicapra pyrenaica*. A debate on their

respective geographic distributions in Italy is ongoing (*cf*. Masini, 1985; Masini & Lovari, 1988). Considering this, as well as the fact that an osteological distinction between the two species is only possible with large cranial elements, it is decided here to refer to the species on the genus level (*Rupicapra* sp.).

11. The calculations are based on the data presented in table 8.
12. The poor state of conservation of these bones is caused by the butchering method as well as by subsequent gnawing by rodents and dogs, which is attested on a considerable number of bone fragments.
13. As is attested by the nature of the microstratigraphy, presenting thicker layers and a wider horizontal spread.
14. The percentage for phase 2 comprises six adult and two senile individuals, summed here since the distinction is made between the three pre-adult age classes and the adult (and over) age classes.
15. An appendix to this article with the bone measurements taken from the faunal remains could not be published integrally with the article, but is available from the author by request.
16. As is evident from the measurements of the mandible; the greatest thickness of the body of the jawbone and the height of the mandible behind M1 (measurements 17 and 19 following Von den Driesch, 1976) are 0.9 cm and 1.6 cm, respectively.
17. 'Sector B' ranges from the MBA to the EIA.
18. Meaning the age classes 'adult' and 'senile'; 'pre-adult' refers to the age classes 'infantile', 'juvenile' and 'sub-adult'.
19. For example, MNI calculations may be distorted for a particular phase as a result of sample size, different levels of fragmentation may interfere with the species' representation based on boneweight. By combining different data types these distorting factors can be better corrected.
20. This phenomenon is in fact not attested for the ovicaprines (as discussed subsequently).
21. The percentage for pigs here is recalculated to render the value comparable with the values for Sector 10. The share of pig is calculated from the total of the three principal domesticated species.
22. The wither heights of pigs at Torre Mordillo relate to later phases (RBA and FBA), as osteometric evidence for the MBA is scant at this site.
23. Based on the number of remains of the principal domesticated species.
24. The osteometric data of cattle bones from Torre Mordillo refers mostly to the later phases; for the MBA only three bones could be measured. In the comparative analysis of animal size no distinction is made between the different phases, unless mentioned.
25. The predominance of sheep drops from 65% to 60% to 53% from phase 1 to 3.
26. Namely, the adult and senile age classes combined.
27. The wither heights are: 55.0 cm; 56.5 cm; 57.2 cm (twice); 58.5 cm (twice); 60.3 cm; 61.0 cm; 61.7 cm; and 62.0 cm. One height was left out of the calculation: a large left calcaneus (U.S.10053, phase 2), suggesting a withers of 78.6 cm, was thought unrepresentative of the species, but possibly being of a particular large buck.
28. Other sites where bears are attested include Grotta Cardini (Tagliacozzo *et al*., 1989), Grotta Pertosa (Regalia, 1907) and Grotta Zachito (Regalia, 1903).
29. E.g., Coppa Nevigata (Siracusano, 1995), Roca (Wilkens, 1995a,b), Monopoli and Egnazia (Wilkens, 1995b).
30. This aspect will be dealt with in the concluding chapter.
31. See the bone measurements appendix (not published, but obtainable from the author).
32. For example, at Rendina in Basilicata (Wilkens, 1995a), and at several sites in Apulia: at Roca, Monopoli, Punta le Terrare and Torre Santa Sabina (Wilkens, 1995b), at Coppa Nevigata (Siracusano, 1995) and at Cavallino (Sorrentino, 1979).
33. Two bone fragments of wild boar were found in FBA-EIA contexts in different excavation areas at the site (Tagliacozzo, 1994: 623).
34. In phase 1, roe deer actually outnumbers red deer (NR=4).
35. Nonetheless, in a different excavation area (Sector B) a big fish vertebra (unpublished) was found (Vanzetti, pers.comm.).
36. Except as a food source, the shell of tortoise could have been used for musical instruments.
37. The tail bone in question was perforated, probably to be strung on a necklace.
38. For Torre Mordillo, NR is 442; for Francavilla Marittima it is 461; in the other excavation areas at Broglio, the MBA levels produced 331 bone remains.
39. For a description of some of the worked bone remains, see the discussion of the individual animal species, in particular red deer, in section 6.

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