

## OSTEOMETRIC SURVEY OF PIG (*SUS DOMESTICUS*) IN BRONZE AGE SETTLEMENTS ON ROMANIA'S TERRITORY

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**Abstract.** The purpose of this paper is to outline the osteometric variation of pig (*Sus domesticus*) from the Bronze Age in Romania. The bone remains came from Romanian assemblages which dating to: Early (3500-2200 BC), Middle (2200-1600/1500 BC) and Late Bronze Age (1600/1500-1100 BC). Our results reveal that the lower third molar is the most distinctive character that can characterize different populations of pigs (CV%=1.4-1.8). The increase of size of pig from Early to Late Bronze Age is obvious according to statistical analysis.

**Keywords:** pig, osteometric data, Bronze Age, Romania.

**Rezumat. Studiu osteometric al porcului domestic (*Sus domesticus*) din așezări de Epoca Bronzului de pe teritoriul României.** Scopul acestei lucrări este de a evidenția variațiile osteometrice pentru porcul domestic (*Sus domesticus*) pe baza resturilor din Epoca Bronzului din România. Resturile osoase provin din situri de Epoca Bronzului timpuriu (3500-2200 BC), Bronzului mijlociu (2200-1600/1500 BC) și Bronzului târziu (1600/1500-1100 BC). Rezultatele arată ca dințele molar trei mandibular are cele mai bune caracteristici care permit diferențierea populației de porc domestic (CV%=1.4-1.8). Conform analizei statistice, se observă o creștere a taliei porcului de-a lungul Epocii Bronzului.

**Cuvinte cheie:** Epoca Bronzului, porc domestic, date osteometrice.

### Introduction

A considerable problem for archaeologists is to clearly assign individual specimens as wild or domestic *Sus*, taking in account their coexistence in samples and crossbreeding process of these two forms. For this reason, new biometric data which could contribute in a better separation of wild and domestic forms are agreeable. Therefore, we propose to characterize and distinguish interpopulational differences in pig of Bronze Age focusing in analysis on those anatomical elements which criteria are certainly belong of pig. Bronze Age in Romania is divided into: Early (3500-2200 BC), Middle (2200-1600/1500 BC) and Late Bronze Age (1600/1500-1100 BC).

### Material and Methods

This osteometric study is based on pig (*Sus domesticus*) remains recovered in assemblages dating for Bronze Age from Romania. The regions of Romania that have yielded Bronze Age fauna for osteometrical analysis are: Moldavia - assemblages of: Bârlad (Haimovici, 1965), Piatra Neamț (Haimovici, 1965), Gârbovăț (Haimovici, 1965; 1991), Sărata Monteoru (Haimovici, 1965; 1994), Bogdănești (Haimovici, 1965; 1966), Mîndrișca (Haimovici, 1965; 1980), Poșta Elan (Haimovici, 2006), Erbiceni (Haimovici, 1970), Trușești (Haimovici, 1965), Valea Lupului (Haimovici, 1962; 1965), Foltești (Haimovici, 1965; 1972; 1974); Transylvania - assemblages of: Derșida, Mintiu Gherlei, Otomani, Pecica, Carei, Livezile, Iclod (Bindea, 2008); Banat - assemblages of: Moldova

Veche-Ostrov, Gornea-Păzăriște, Foeni) (El Susi, 1996); Wallachia - assemblages of: Glina (Haimovici, 1997), Verbita (Haimovici, 1965), Popești (Haimovici, 1965), Căscioarele (Perianu & Udrescu, 1990).

The following anatomical elements were analyzed: mandible, maxilla, humerus, scapula, radius, tibia, calcaneus and astragalus. All measurements discussed in this paper were taken according to von den Driesch (1976) (Table 1), and they come from the literature. The bones with non-fused epiphysis, porous surface and atypical measurements were excluded from the study.

**Table 1.** Linear measurements (according to von den Driesch, 1976).

<b>Abbreviation</b>	<b>Variable description</b>
<b>maxilla</b>	
GL P2-P4	Greatest length of the second premolar and cheektooth row
GL M1-M3	Length of the upper cheektooth row, measured along the alveoli
GL M3	Greatest length of the upper third molar
<b>mandible</b>	
GL M1-M3	Length of the lower cheektooth row, measured along the alveoli
GL M3	Greatest length of the lower third molar
<b>scapula</b>	
GLP	Greatest length of the Processus articularis (glenoid process)
SLC	Smallest length of the Collum scapulae (neck of the scapula)
LG	
BG	Breadth of the glenoid cavity
<b>humerus</b>	
BT	(Greatest) breadth of the trochlea
Bd	(Greatest) breadth of the distal end
Dd	(Greatest) depth of the distal end
SD	Smallest breadth of diaphysis
<b>radius</b>	
Bp	(Greatest) breadth of the proximal end
BFp	(Greatest) breadth of the Facies articularis proximalis
<b>tibia</b>	
Bd	(Greatest) breadth of the distal end
BFd	Breadth of the Facies articularis distalis
Dd	(Greatest) depth of the distal end
<b>calcaneus</b>	
GL	Greatest length
GB	Greatest breadth
<b>astragalus</b>	
GL	Greatest length
GB	Greatest breadth

The withers heights have been estimated according to Teichert's coefficients using astragalus (listed by Udrescu *et al.*, 1999).

The descriptive analysis was realized out separately for each variable. We described the variability using coefficient of variation (CV%), which is dimensionless and allows a comparisons of variability of large and small anatomical elements. In order to test

the homogeneity of the populations, the Kolmogorov-Smirnov test was used on each variable assuming they had a continuous distribution. The measurements of variables are compared using one-way ANOVA test. Multivariate analysis has not been undertaken because, although potentially valuable in the analysis of complete skulls and skeletons, this was likely to be of limited use for the generally highly fragmented archaeological specimens.

In statistical analysis XLStat version 2012.4.01 was used.

### Results and Discussion

In Bronze Age, the pig (*Sus domesticus*) represented a principal alimentary resource for human population, having the largest implication in Early Bronze Age according to pig remains came from assemblages. This aspect is illustrated in Figure 1: skeletal remains belonging to Early Bronze represents more than 34% of total domestic mammals identified (in samples of Walachia region); the lower frequencies of pig remains were accepted in samples from Moldavia region in the period of transition Eneolithic - Bronze Age (6.51% of domestic mammal).

The complete metapodials providing data on withers height are absent in our samples, therefore the withers height is established by means astragalus (Fig. 2).

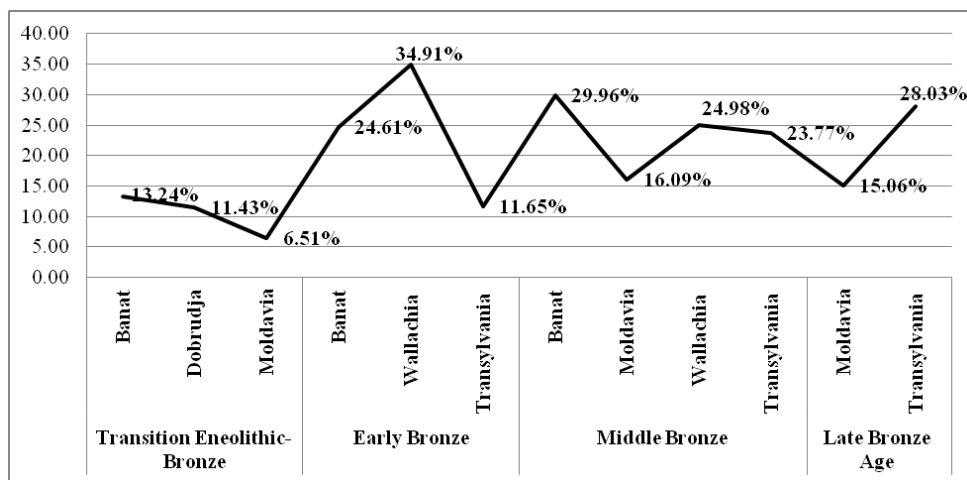


Figure 1. Pig proportions (%NISP) calculated from the domestic mammals remains.

The observed distributions of data were not significantly different from normality ( $p > 0.05$ ) for every variable. Analyses of variance were used to test each character for differences between variables from material of settlements. No significant differences were found for any character ( $p > 0.05$ ), excepting the size in the lower third molar in three assemblages ( $p < 0.05$ ).

Table 2 provides summary statistics for measurements of anatomical elements.

The degree of variability of measurements differs when the CV% of variables are compared (Table 2; Fig. 3). The high variability was underlined by humerus, in specially: breadth of diaphysis (SD): CV% = 28.02 and depth of the distal end (Dd): CV% = 25.72.

Low variability was obvious in case of the upper and lower molars (CV% = 1.4-9.5), tibia (length of tibia CV% = 2.2) and astragalus (length of astragalus (GL) CV% = 1.7).

The most accurate results were obtained for the series of lower molars (length of cheek tooth row (CV% = 1.8) and the third molar (CV% = 1.4). In the case of this anatomical element considerable difference between measurements was obtained.

In Figure 4, the comparative representation for the lower third molar (GL M3) is shown. The molar measurements are not substantially affected by sexual dimorphism (Payne & Bull, 1988), that measurements of the lower third molar provide consistent results about size of pigs in Bronze Age. A significant differences between size of this molar was obvious in three assemblages: Mândrișca, Bogdănești and Cernavodă (One Way ANOVA:  $F=6.3$ ;  $p<0.05$ ). These data highlight that tooth measurements are better suited for identifying interpopulational differences (in case of our study), revealing the greater specimens in Cernavodă assemblage: GL M3 (Mean / Standard Deviation) = 39.2 / 2.89 and smaller specimens in Mandrișca assemblage: GL M3 (Mean / Standard Deviation) = 32.28 / 0.8).

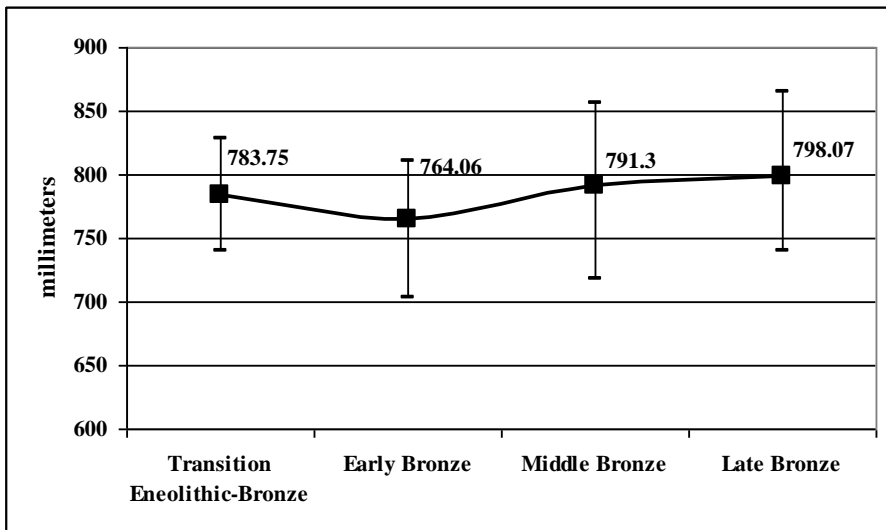


Figure 2. Variation in withers heights of pig in Bronze Age, in Romania.

Table 2. Summary statistics for measurements of pig remains. Abbreviations: n - number of remains examined; SD – standard deviation; Min, Max – Minimum, Maximum range measurement; CV - coefficient of variation in %; CL - confidence level a mean of population.

Anatomical element	Variable	n	Mean	SD	Min.	Max.	CL (95%)	CV%
maxilla	GL P2-P4	27	40.66	8.0	31	44	2.3	19.67
	GL M1-M3	77	69.35	4.21	55.5	80	0.95	6.07
	GL M3	12 3	33.43	3.19	27	43	0.56	9.5

Anatomical element	Variable	n	Mean	SD	Min.	Max.	CL (95%)	CV%
mandible	GL M1-M3	62	71.49	5.11	56	85	1.29	1.8
	GL M3	19 2	34.98	3.48	22.5	41	0.49	1.4
scapula	GLP	22	36.55	5.09	28	49	2.26	13.92
	SLC	31	24.98	4.53	20	39	1.66	18.12
	LG	19	31.82	5.37	24	42	2.59	16.88
	BG	22	23.94	3.4	17	30	1.51	14.21
humerus	BT	14	32.48	2.46	28.5	36.2	1.42	7.56
	Bd	77	40.20	3.97	26	46	0.9	9.87
	Dd	15	35.21	9.06	18	45	5.01	25.72
	SD	5	18.84	5.28	11.8	25	6.55	28.02
radius	Bp	42	30.44	1.86	27	36	0.58	6.12
	BFp	37	21.73	2.78	17.5	32	0.93	12.8
tibia	Bd	77	40.20	3.97	26	46	0.9	2.2
	BFd	1	-	-	26.4	-	-	-
	Dd	37	27.2	4.61	9	38	1.54	16.96
calcaneus	GL	5	63.9	3.1	80	83.5	3.9	4
	GB	5	28.6	4.22	24	32	5.24	14.75
astragalus	GL	53	42.98	2.8	38	48	0.77	1.7
	GB	42	25.98	2.46	21	32	0.76	2.92

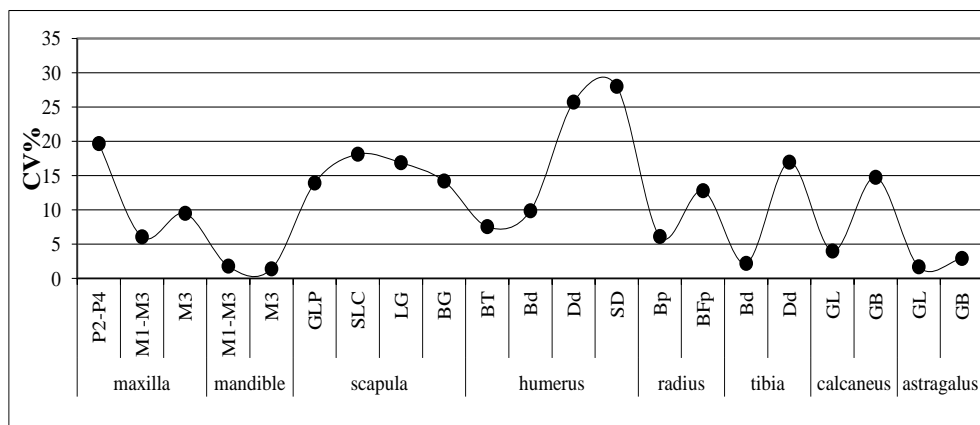
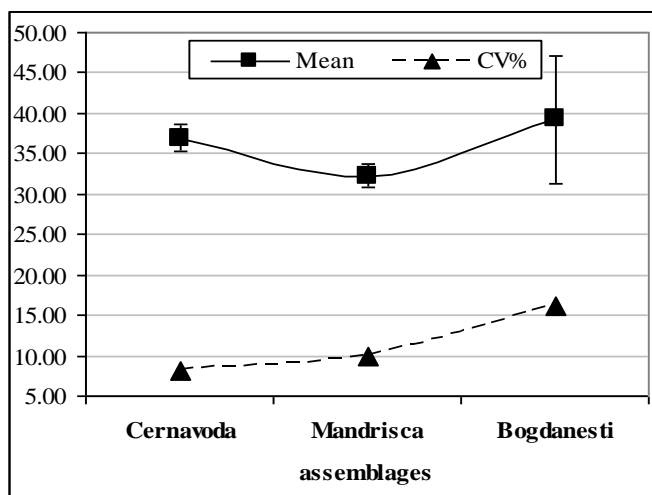


Figure 3. Variation in pig measurements (CV%) in Bronze Age settlements on Romania's territory.



**Figure 4.** Comparative analysis of the length (GL) of the lower third molar of pigs in Bronze Age (only assemblages with significant differences) (in millimetres).

### Conclusion

The lower third molar is clearly the most distinctive character that can characterize different populations of pigs. Taking in account the significant differences between the samples belonging the two different subperiod (Transition Eneolithic - Bronze Age: Cernavodă, and Middle Bronze Age: Mândrisca and Bogdănești), and the high variability for some of postcranial bones (humerus and scapula) we can conclude that in Bronze Age is typified by the presence of admixture of breed. This supposition could be underlined by the increase of withers heights of pig towards Late Bronze. Our study offer some range sizes of anatomical elements which can be used like a criteria to identify domestic swine specimens.

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