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Morphometric data for suines (*Sus scrofa domesticus* and *Sus scrofa ferus*) for Precucuteni-Cucuteni and Boian-Gumelnita cultures, in Romania

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Introduction

Suines represented an important economical resource for prehistoric communities according to their remains frequency in studied samples.

A synchronic and diachronic morphometrical study of the *Sus* remains were been realized on the basis of samples from 13 archaeological sites from Romania, belonging the following cultures: Precucuteni, Cucuteni, Boian and Gumelnita (Table 1, Figure 1).

The goal of the present study has been to determine the changes in time that occurred in the skeleton of pig and wild boar and also we proposed to add new dimensional differences between domestic and wild forms, this representing yet difficult item due to the fragmented bones and the absence of morphological differences.

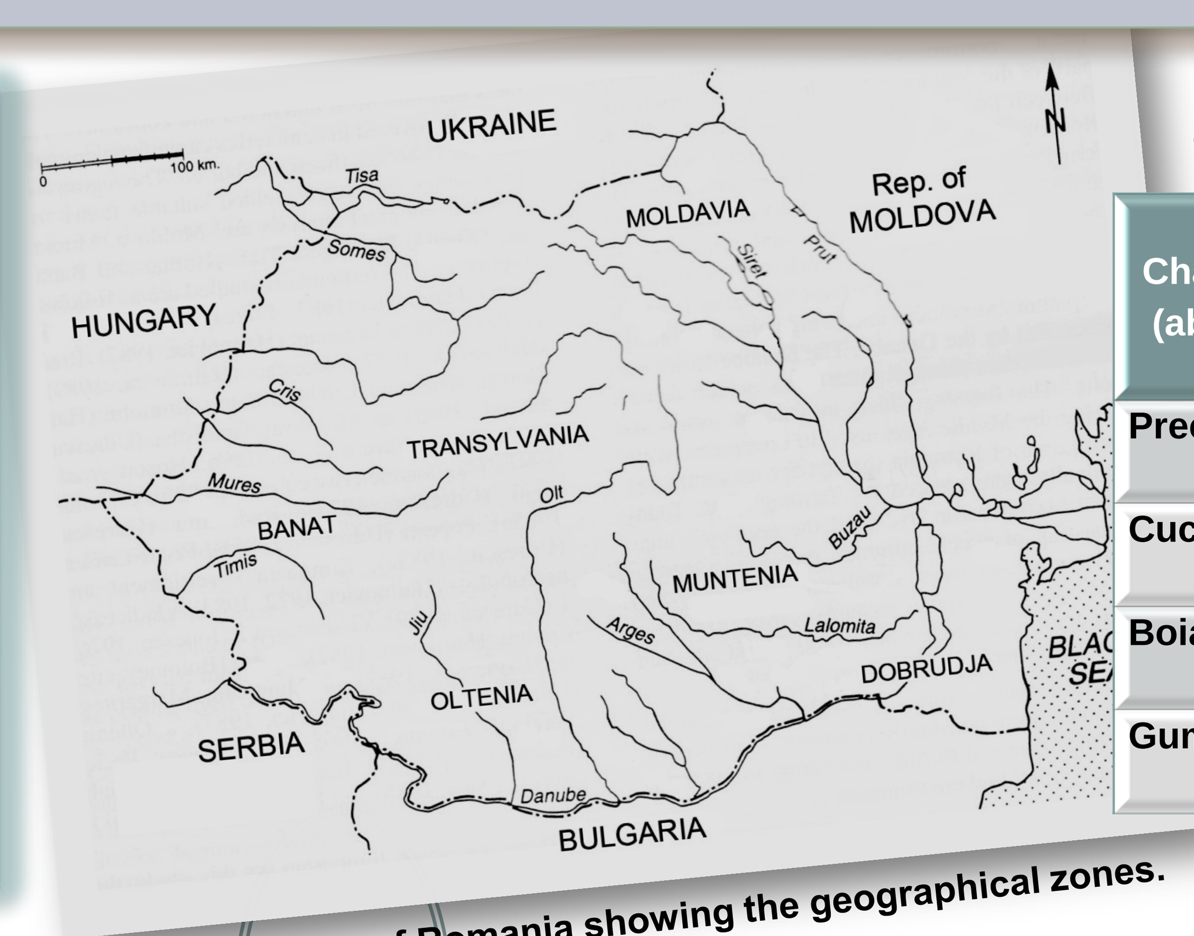

Figure 1. Map of Romania showing the geographical zones.

Table 1. Chalcolithic cultures – spreading sites in Romania.

Chalcolithic cultures (abbreviation in our study)	Period	Spreading
Precucuteni (PC)	~4800-4500 B.C.	Moldavia, southeast of Transylvania
Cucuteni (CC)	~4600-3500 CAL. B.C	Moldavia, southeast of Transylvania
Boian (BC)	~5300-4800 CAL BC	Oltenia, Muntenia, Dobrudja
Gumelnita (GC)	~4800-4000 CAL BC	Muntenia, Dobrudja

Material and Method

The linear measurements were taken with a calliper rule (in millimeters) for following anatomical elements: humerus, radius, tibia, scapula and the lower third molar. Measurements were defined according to von den Driesch (1976). The bones with non fused epiphysis and porous surface were excluded from the study. Samples sizes were too small to test males an females separately.
The descriptive analysis were carried out separately for each analyzed variables. We described the variability using coefficient of variation (CV%), which is dimensionless and allows a comparisons of variability of large and small bones. The measurements of variables are compared using one-way ANOVA test. Differences among pig populations were determined by Principal Components Analysis and Canonical Variate Analysis; significance differences between populations were determined by F-statistic of the Mahalanobis distances between them.
The statistical analysis was performed by the software PAST, version 2.08b and Excel (Haber *et al*. 2002; Hammer *et al*., 2001).

Table 2. Descriptive analysis in suine measurements. Abbreviations: n - number of bones examined; min – minimum value; max - maximum value; mean – mean value; SD – standard deviation; CV - coefficient of variation in %; GL / GB - greatest length / breadth; Bp / Bd - breadth of the proximal / distal part; LG - Length of the glenoid cavity (scapula) BG - Breadth of the glenoid cavity; SLC - Smallest length of the Collum scapulae; p - pig; wb – wild boar.

Culture	Variable	Suine form	n	Min	Max	Mean	SD	CV
CC	GB the lower third molar	p	8	14.4	19.2	16.24	1.55	9.57
		wb	15	18	22.5	19.50	1.08	5.56
BC		wb	2	21.5	24	-	-	-
GC		p	7	14.5	17.5	15.81	1.07	6.77
		wb	23	18	22.5	19.97	1.24	6.21
PC	GL the lower third molar	p	28	15.3	36	25.54	6.61	25.87
		wb	21	18	41.2	28.41	7.12	25.07
CC		p	25	25.5	39.5	32.11	3.09	9.61
		wb	16	40.2	52	44.56	2.88	6.46
BC		p	2	39	44	-	-	-
GC		p	24	29	43	33.60	3.88	11.55
		wb	24	40.2	52	44.93	3.06	6.81
PC	Bd humerus	p	34	37	44	39.89	2.42	6.07
		wb	9	37	58	46.15	5.85	12.68
CC		p	16	30	46	39.73	5.56	13.99
		wb	13	50	58	53.96	2.70	5.01
BC		p	4	36.7	54.5	42.18	8.29	19.66
		wb	4	50	55.8	52.93	3.15	5.96
GC		p	55	34.2	58.5	39.26	5.04	12.85
		wb	67	41.2	64.2	52.00	4.30	8.28
PC	Bp radius	p	23	27	37	33.65	3.56	10.59
		wb	32	38	49	41.34	3.15	7.61
CC		p	12	28	33	30.68	1.82	5.93
		wb	12	37.5	45	40.13	2.49	6.22
BC		p	4	26.2	35.1	30.70	-	-
		wb	4	26.2	36.5	33.07	-	-
GC		p	71	23.8	42	30.39	4.36	14.33
		wb	48	34.8	47	38.23	2.69	7.04
PC	BG scapula	p	16	21	32	26.61	3.54	13.29
		wb	11	38	55	44.24	4.58	10.35
CC		p	19	20	33	25.26	3.50	13.84
		wb	20	30	37	34.83	2.52	7.22
BC		p	6	22	31	25.08	3.44	13.72
		wb	4	34.5	35	-	-	-
GC		p	63	17.1	37	25.36	4.22	16.63
		wb	58	23	38.3	33.52	2.85	8.49
PC	GL scapula	p	16	23	39	30.78	4.74	15.40
		wb	11	26	37	29.36	2.84	9.67
CC		p	19	25	34.2	29.38	2.78	9.48
		wb	20	30	42	38.10	3.71	9.74
BC		p	6	28	33.5	30.58	1.83	5.98
		wb	4	36	41	-	-	-
GC		p	50	23.3	37.5	30.98	3.85	12.42
		wb	52	31.8	45.5	39.18	2.58	6.59
PC	SLC scapula	p	17	18	35	26.14	5.06	19.36
CC		p	19	19	29.5	23.59	2.69	11.41
		wb	20	27	36	33.17	3.10	9.34
BC		p	6	21.5	24	22.83	1.13	4.93
		wb	4	30.5	35	-	-	-
GC		p	105	15.3	30.1	22.31	3.06	13.73
		wb	59	23.5	39.2	31.27	3.55	11.35
PC	Bd tibia	wb		40	46	41.50	1.74	4.20
CC		p	7	25	31	28.50	2.07	7.28
		wb	10	38	42	40.43	1.72	4.25
BC		p	6	27	34	29.68	2.86	9.62
		wb	6	34	41	38.53	2.68	6.95
GC		p	58	26	42	31.04	3.21	10.33
		wb	67	32.8	44.4	38.98	2.76	7.09

Results and Discussions

The descriptive analysis is presented for every anatomical element in Table 2 and represents an overview of the size in populations investigated. The mean and coefficient of variation for the anatomical elements from the four contexts are comparatively illustrated in Figure 2.

Multivariate analysis was applied only for pig scapula. The first two components of PCA represent 94.96% of total variance (PC1 85.18 % and PC2 % 9.78%).
The biggest contribution in separation of samples between north-east region (CC, PC) and south-east region of Romania (BC, GC) is realized by PC 2, while a great contribution in division between pigs from within samples has the PC1. Along this axes the top loadings are GL and SLC (Figure 3).

Results of CVA and pairwise comparisons reveal a irrelevant differences between domestic populations from the regions while significant differences were obtained between samples from Precucuteni and those form south-east region (BC, GC) (Table 3).

Table 3. Multivariate analysis of variance (pairwise comparisons: Hotelling's *p values*).

cultures	PC	CC	BC
CC	0.23		
BC	**0.04**	0.48	
GC	**0.00**	0.07	0.99

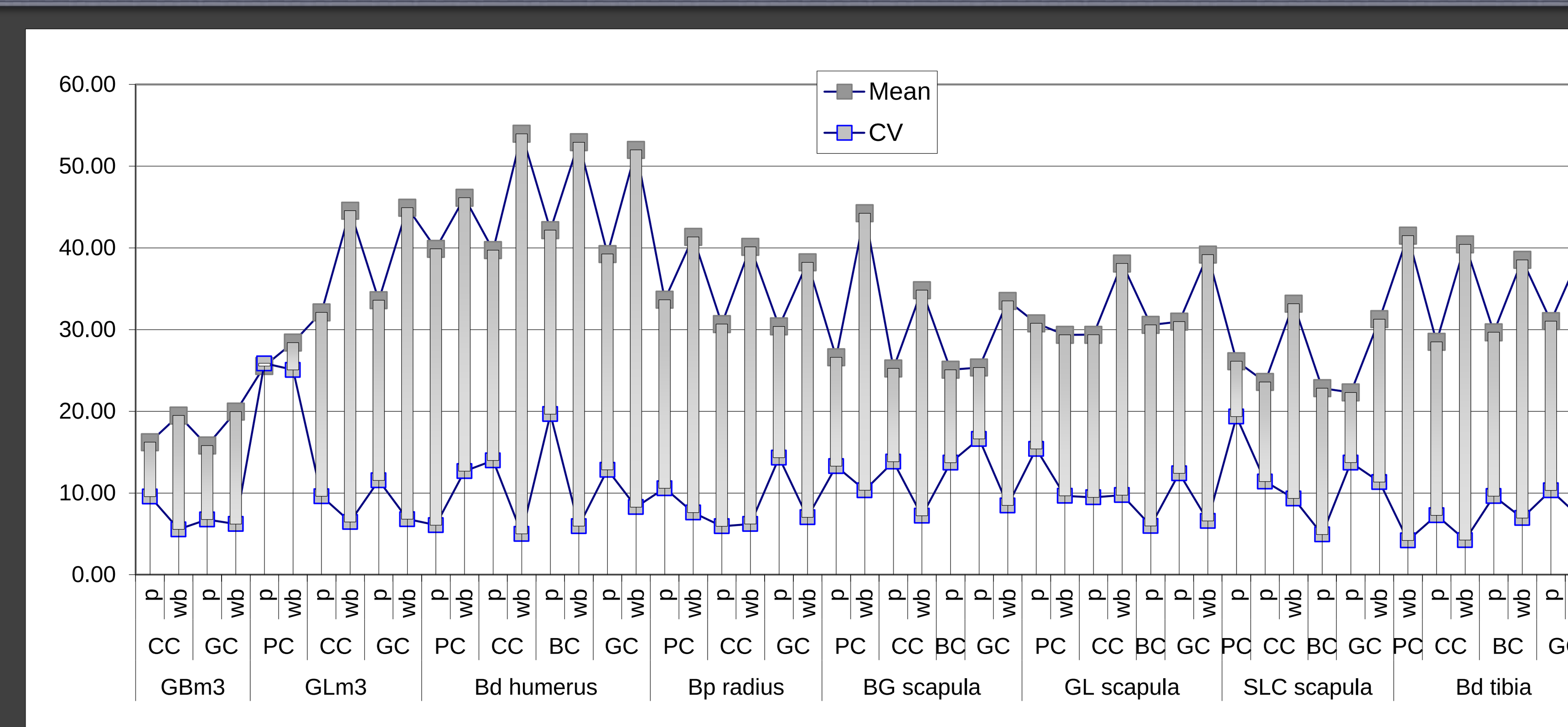

Figure 2: Mean box and coefficient of variation (C%) in suines

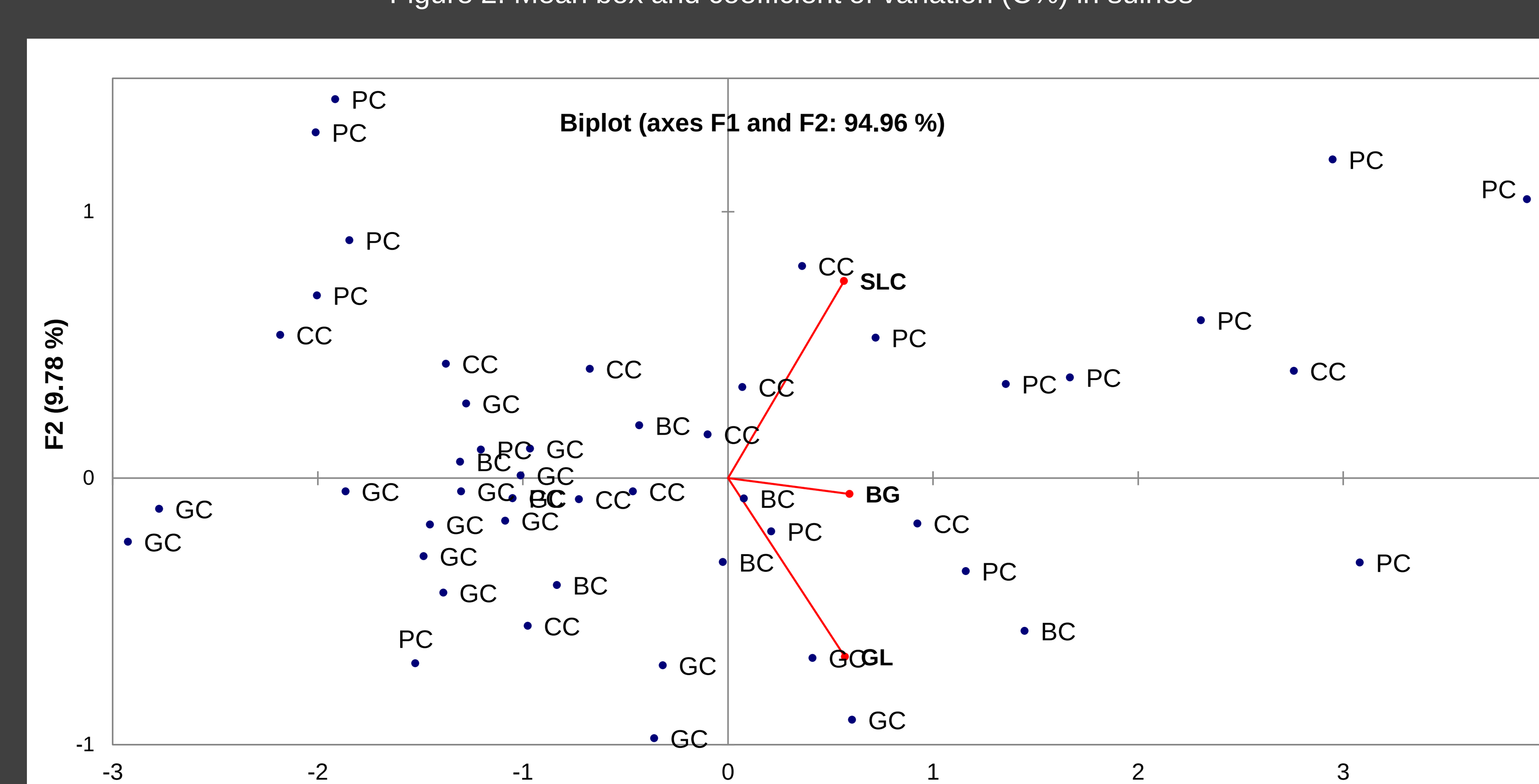

Figure 3. Biplot of PCA of scapula measurements in pigs

Conclusions

Our results reveal in case of some variables clear overlap between the size-ranges of the two forms of *Sus*, suggesting an interbreeding between wild and domestic populations. This aspect was more evident in osteological material from south-east region where a division between domestic and wild forms was not realized. This aspects is also obvious in coefficient of variation values (i.e. GL of the lower third molar, SLC and BG scapula, Bp humerus) and highlight the presence of pig regional structures whose size varies but that fits the "palustris" type which characterized the Chalcolithic period.

Separation between size ranges were obtained within samples from north-east region of Romania for the following anatomical elements:
- radius (Bp) PC: p = 27 - 37 and wb = 38 - 49; in CC: p = 28 - 33; wb = 37. 5- 45;
- tibia (Bd) CC: p = 25 - 31 and wb = 38 - 42;
- humerus (Bd) CC: p = 30 – 46 and wb = 50 - 58;
- the lower third molar (GB) CC: p = 25.5 - 39.5 and wb = 40.2 - 52;
- scapula (BG) PC: p=21 - 31 and wb = 38 - 55).

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