XIème Séminaire International de Médecine Vétérinaire : Advances in Animal Production, Food and Health : From Tradition to Innovation" 26 &27 October 2024, Constantine, Algérie

Mandibular and body measurements correlations in Ouled Djellal sheep: A reference dataset for Archeozoology

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ABSTRACT

Over the past decade, archaeozoological excavations in Algeria have increased significantly, leading to the discovery of various animal bone fragments, particularly sheep mandibles. Archaeozoologists aim to use these remains to determine the dimensions of the animals that ancient populations relied on. This study, the first of its kind on an Algerian sheep breed, seeks to establish significant correlations between mandibular and body measurements, focusing on how these relationships vary with age. A sample of 30 female Ouled Djellal sheep, consisting of 15 young adults and 15 adults, was analyzed. Before slaughter, eight body measurements and live weight were recorded, followed by eight mandibular measurements and mandible weight. Pearson's correlation coefficient and two-factor ANCOVA were employed to assess the strength and homogeneity of these correlations between the two age groups. Significant correlations were found between certain mandibular and body measurements, such as head length with the aboral height of the ascending branch, and thoracic perimeter with the length to the mental foramen. Additionally, some correlations varied with age, while others remained stable. This study provides a foundation for more accurate, age-related estimates of ancient animal dimensions, offering valuable insights for archaeozoology and enhancing our understanding of livestock characteristics in historical populations.

Keywords: *Craniometry; Ouled Djellal; Correlations; Archaeozoology*

INTRODUCTION

In Algeria, archaeozoological research has expanded in recent decades, uncovering sites like El Eulma in Sétif (2.4 to 1.7 million years old) [1], Ternifine in Mascara (700.000 years old) [2], and Akbou in Béjaïa (5052-4919 years old) [3]. These sites revealed animal remains, including sheep mandibles. Archaeozoologists attempt to determine animal sizes from body measurements, though such values remain largely unknown in this field [4]. This study **aims** to create a dataset for estimating ancient animal sizes, considering the influence of age through correlations within the population studied.

Table 1. Mandibular and Body measurements.

Mandibular Measurements (mm)	Body Measurements (cm)
ML6 Length to the mental foramen	WH Wither Height
ML8 Length of molars	SIL Scapulo-Ischial Length
ML9 Length of premolars	TP Thoracic Perimeter
MB1 Width at mandibular angle	CP Cannon Perimeter
MH1 Height of ascending branch	hL Head Length
MH7 Mandibular height posterior ot M3	hW Head Width
MH8 Mandibular height anterior to M1	eL Ear Length
MH9 Mandibular height anterior to P1	eW Ear Width
MW Mandible Weight (g)	LW Live Weight (kg)

MATERIALS AND METHODS

A sample of 30 Ouled Djellal ewes, including 15 young adults (2 to 4 years old) and 15 adults (over 4 years old) was analyzed. Eight body measurements and live weight were recorded before slaughter, and eight mandibular measurements and the mandible weight were taken post-slaughter using Ridouh's method [5]. All the measurements are presented in Table 1 and Figures 1 and 2. Pearson correlation coefficients (r) were calculated for each variable pair and a two-factor ANCOVA was performed to assess correlation homogeneity between age groups. Statistical analyses were conducted using R via R Studio 4.3.1®.

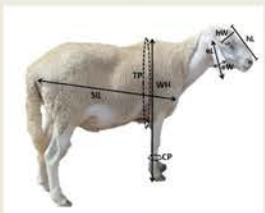

Figure 1. Body measurements.

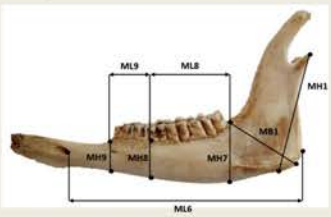

Figure 2. Mandibular measurements.

RESULTS AND DISCUSSION

Correlations in the total population : Moderate to strong significant correlations (i.e., r ≥ 0.48, p < 0.01) were observed between some mandibular and body measurements (Table 2, Figure 3).

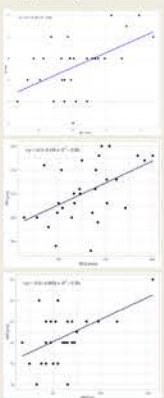

Table 2. Significant and moderate correlations between mandibular and body measurements.

Body measurements	Mandibular measurements	Coefficient (r)	P-value
hL	MH1	0.54	0.0022
TP	ML6	0.51	0.0042
hW	MW	0.50	0.0044
CP	MH1	0.48	0.0068
hL	ML6	0.48	0.0073
hW	MH1	0.48	0.0066

Figure 3. Example of scatterplots for the total population: (A) hL =f(MH1), (B) TP=f(ML6), (C) hW=f(MW).

Correlations by age : Strong relationships between variables (r ≥ 0.50) were more frequent in **adults** than in **young adults**. The results of the two-way ANCOVA, presented in Table 3, reveal significant differences in correlation strength between adults and young adults for some pairs of variables (Figure 4).

Table 3. Correlation analysis and age-related variability.

VAR 1	VAR 2	Total population	Adults	Young adults	p-Value
WH	MH8	0.13	0.73	0.16	0.137
SIL	**MW**	**-0.07**	**0.20**	**-0.55**	**0.026**
TP	ML6	0.51	0.46	0.60	0.973
CP	MH1	0.48	0.64	0.35	0.292
CP	**MW**	**0.41**	**0.63**	**-0.26**	**0.042**
hL	ML6	0.48	0.45	0.58	0.575
hL	**ML9**	**0.34**	**0.61**	**0.09**	**0.02**
hL	MH1	0.54	0.65	0.46	0.226
hW	**MH9**	**0.20**	**0.57**	**-0.33**	**0.016**
hW	MH1	0.48	0.50	0.52	0.912
hW	MW	0.50	0.63	0.52	0.679
eW	**MW**	**0.16**	**0.47**	**-0.40**	**0.033**

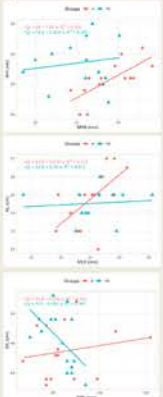

Figure 4. Example of scatterplots by age group: (A) WH =f(MH8), (B) hL=f(ML9), (C) SIL=f(MW).

CONCLUSION

These results offer promising prospects for future research. They pave the way for estimating the dimensions of ancient animals from their archaeological mandibles remains, while considering their age, and thus provide important dataset for archaeozoology.

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