



ULST Timisoara  
**Multidisciplinary Conference on  
 Sustainable Development**  
 21-22 May 2026



## Morphometric assessment of the golden jackal (*Canis aureus* L.) in Western Romania

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**Abstract:** The golden jackal (*Canis aureus* L.) has rapidly expanded its range in Romania over the past two decades and is currently present in all counties. This study aims to assess morphometric variation in individuals from western Romania, mainly from Arad and Timiș counties. A total of 97 legally culled individuals were analyzed using a standardized morphometric evaluation based on 10 criteria. Preliminary results indicate variation in body size and body proportions among individuals, possibly influenced by sex, age, habitat conditions, food availability, and population density. These observations suggest that abundant trophic resources and habitat diversity may favor larger body size in expanding populations. Further statistical analyses and broader national-scale studies are needed to confirm these trends.

### Introduction

The golden jackal (*Canis aureus* L.) has undergone a rapid expansion across Europe in recent decades, favored by ecological changes such as habitat transformation, increased food availability, climate change, and reduced pressure from large carnivores. In Romania, the species has expanded markedly over the past two decades and is currently widespread, raising important ecological, epidemiological, and management concerns.

Therefore, the aim of this study was to evaluate the morphometric variability and body proportions of golden jackals harvested in western Romania during the 2025–2026 hunting season. Specifically, the study aimed to describe the main morphometric characteristics, quantify trait variability using descriptive statistics, and calculate indices of body proportionality and robustness across sex and age classes.



### Material and method

The study was conducted between June 2025 and January 2026 in western Romania, across 32 hunting grounds from five counties: Timiș, Caraș-Severin, Arad, Bihor, and Satu Mare. A total of 97 legally harvested golden jackals, including 59 males and 38 females, were analyzed, and for each individual sex, age class, geographical coordinates, body weight, and standardized morphometric measurements were recorded.

The measured variables included total length, trunk length, tail length, head length, ear length, trunk circumference, forelimb length, hindlimb length, and body weight. Several morphometric indices were calculated to evaluate body proportionality, relative robustness, cranial development, tail proportion,

Table 1. General characteristics of the dataset used for the morphometric assessment of golden jackals in western Romania

Parameter	Description
Species studied	Golden jackal
Study area	Western Romania
Sampling period	Legal hunting season 2025–2026
Sample size	97 specimens
Sex structure	59 males, 38 females
Age structure	81 adults, 16 subadults
Number of hunting grounds	32
Number of counties	5
Recorded morphometric variables	Total length (TL), trunk length (TRL), tail length (TAL), head length (HL), ear length (EL), trunk circumference (TC), forelimb length (FLL), hindlimb length (HLL), and body weight
Data collection method	Standardized morphometric measurements collected from legally harvested individuals

### Results and discussions

A total of 97 golden jackals from western Romania were analyzed, showing moderate morphometric variability, with body weight being the most variable parameter ( $10.51 \pm 2.72$  kg; CV = 25.91%) and forelimb and hindlimb lengths showing the lowest variability.

Table 2. Descriptive statistics of morphometric measurements recorded in golden jackal specimens harvested in western Romania

Variable	Unit	N	Mean $\pm$ SD	Median	Min	Max	CV (%)*
Total length (TL)	cm	97	97.58 $\pm$ 14.92	100	64	126	15.29
Trunk length (TRL)	cm	97	72.55 $\pm$ 11.22	74	47	94	15.47
Tail length (TAL)	cm	97	25.04 $\pm$ 4.94	26	13	35	19.73
Head length (HL)	cm	97	20.01 $\pm$ 3.22	20	9	26	16.09
Ear length (EL)	cm	97	7.94 $\pm$ 1.70	8	4	11	21.37
Trunk circumference (TC)	cm	97	50.02 $\pm$ 10.71	49	23	72	21.41
Forelimb length (FLL)	cm	97	38.61 $\pm$ 5.44	39	25	58	14.10
Hindlimb length (HLL)	cm	97	39.27 $\pm$ 5.28	40	25	48	13.45
Body weight (W)	kg	97	10.51 $\pm$ 2.72	10.91	2.91	16.21	25.91

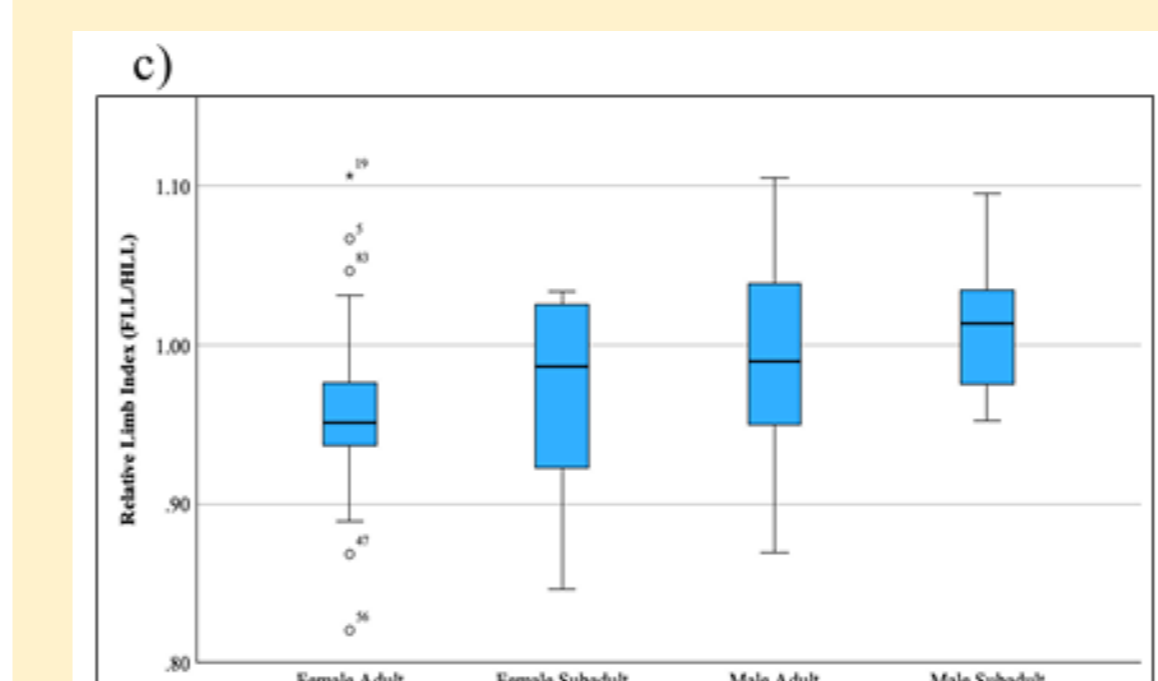
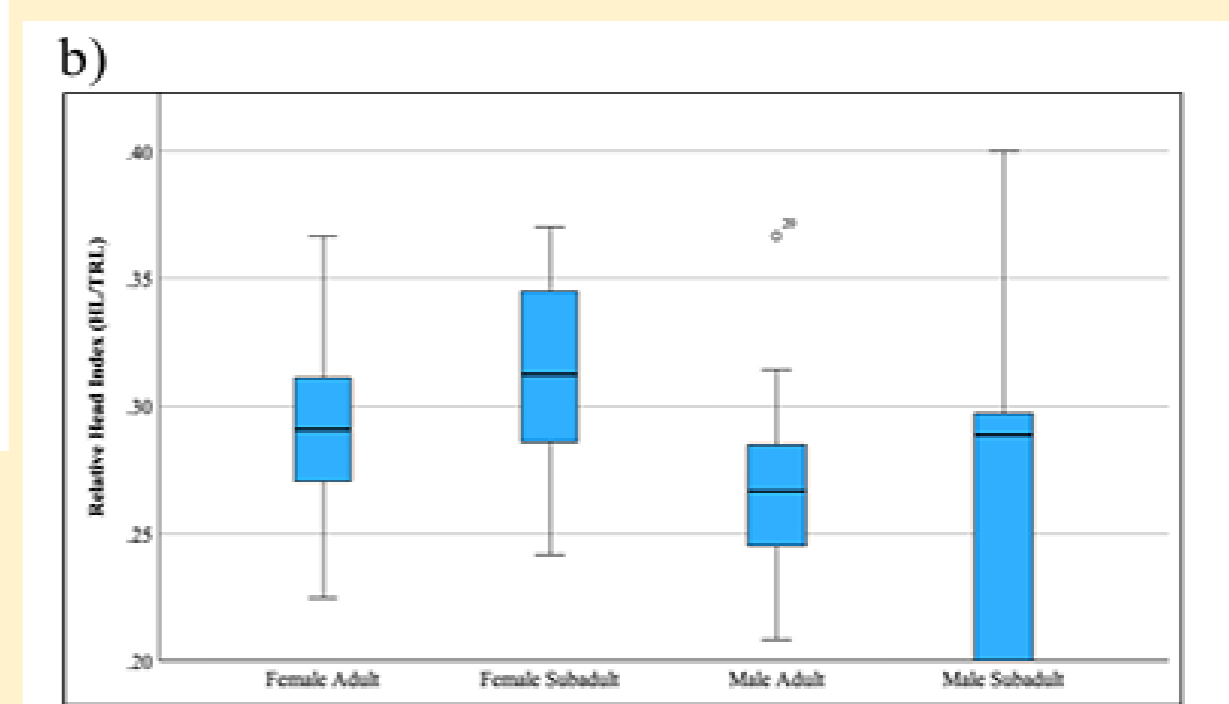
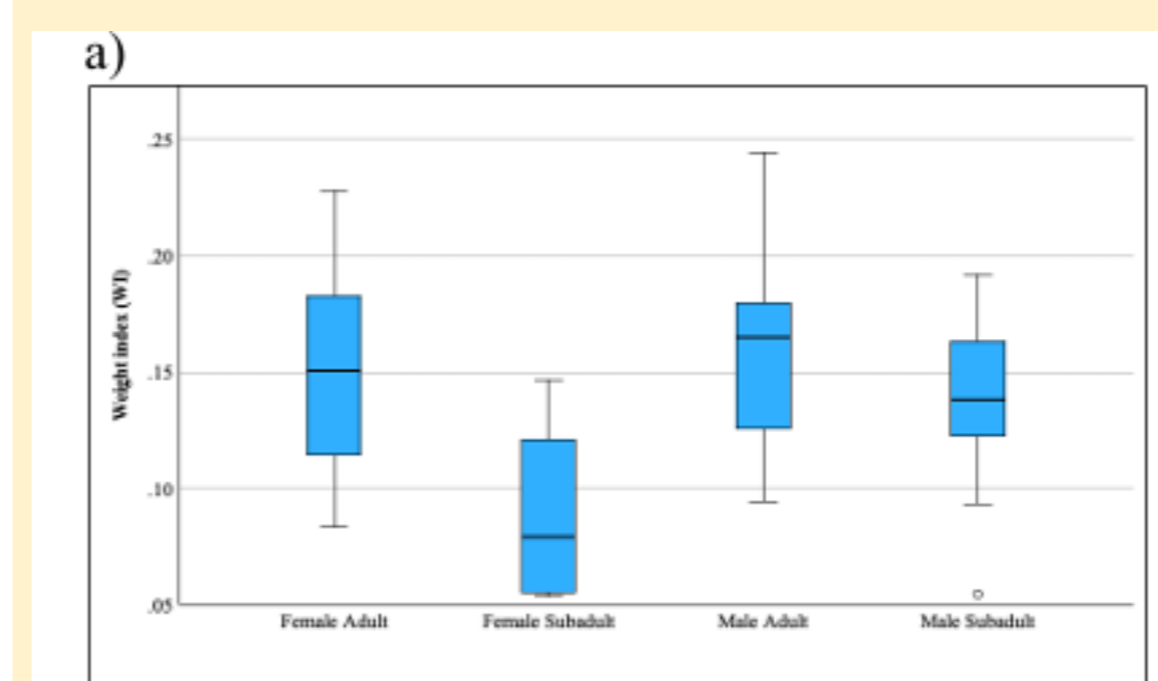
\* Coefficient of variation (CV%)

Morphometric indices indicated that adult males had the highest relative body mass, while subadult females had the lowest weight index. Relative head proportions were higher in females, especially adult females, whereas the relative limb index remained close to 1 in all groups, indicating balanced forelimb and hindlimb development.

Table 3. Mean values ( $\pm$  SD) of morphometric indices in golden jackal specimens harvested in western Romania, according to sex and age category

Sex	Age category	N	Weight index (WI)	Thoracic robustness index (TC/TRL)	Standardized thoracic robustness index (TC/TRL)	Relative tail index (TAL/TRL)	Relative head index (HL/TRL)	Relative limb index (FLL/HLL)
F(♀)	Adult	31	0.1497 $\pm$ 0.0407	0.7280 $\pm$ 0.2296	1.0278 $\pm$ 0.3241	0.3414 $\pm$ 0.0688	0.3207 $\pm$ 0.1489	0.9592 $\pm$ 0.0545
F(♀)	Subadult	6	0.0891 $\pm$ 0.0385	0.7363 $\pm$ 0.1712	1.0394 $\pm$ 0.2417	0.3261 $\pm$ 0.0547	0.3113 $\pm$ 0.0449	0.9667 $\pm$ 0.0714
M(♂)	Adult	58	0.1546 $\pm$ 0.0363	0.6718 $\pm$ 0.1708	0.9483 $\pm$ 0.2410	0.3499 $\pm$ 0.0458	0.2664 $\pm$ 0.0290	0.9985 $\pm$ 0.0745
M(♂)	Subadult	10	0.1346 $\pm$ 0.0391	0.8063 $\pm$ 0.1647	1.1382 $\pm$ 0.2325	0.3281 $\pm$ 0.1034	0.2678 $\pm$ 0.0685	1.0122 $\pm$ 0.0425

Kruskal-Wallis tests revealed significant differences among sex and age-class groups for the weight index ( $p = 0.013$ ), relative head index ( $p = 0.003$ ), and relative limb index ( $p = 0.026$ ), while thoracic robustness and relative tail length did not differ significantly among groups.



### Conclusions

✓The morphometric results obtained in this study highlight substantial body-size variability in the golden jackal population (*Canis aureus*) from western Romania and support the existence of moderate sexual size dimorphism, reflected particularly in the observed differences in relative body mass and in several morphometric indices.

✓Overall, the observed morphometric variability reflects the ecological plasticity of the species and its capacity to adapt to different local conditions, providing a useful basis for future research on the ecology, monitoring, and management of *Canis aureus* populations in Romania.