Int. j. adv. multidisc. res. stud. 2026; 6(6):704-709

Received: 27-09-2026
Accepted: 07-11-2026

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Preliminary Morphometric Characterization of the Georgian Mountain Dog (Kartuli Nagazi)

[1] Milivoje Urošević, [2] Darko Drobnjak, [3] Anton V Markov, [4] Tatiana A Chistilina, [5] Roman Inashvili, [6] Milosava Matejević, [7] Mikheil Giorgadze

[1] PhD, Full Research Professor, Member of the Veterinary Medicine Academy - Serbian Veterinary Society, Center for Preservation of Indigenous Breeds, Belgrade-Zemun, Serbia
[2] DVM, MVSc Center for Preservation of Indigenous Breeds, Belgrade-Zemun, Serbia
[3] CEO of ZOOGEN Center of Veterinary Genetics, Vice President of National Society of Veterinary Genetics NSVG, Serbia
[4] International FCI Judge, Georgian Kennel Club, Serbia
[5, 6] PhD, Associate Professor, Department of Geography, Tourism and Hotel Management Faculty of Sciences, University of Novi Sad, Serbia
[7] Georgian Kennel Club, Serbia

DOI: https://doi.org/10.62225/2583049X.2026.6.6.7178
Corresponding Author: **Milivoje Urošević**

Abstract

Morphometric characterization provides quantitative information on body size, proportions, and sexual dimorphism in indigenous dog populations. This study aimed to describe selected morphological characteristics of the Georgian Mountain Dog and compare them with published findings for other livestock guardian dogs. Sixteen dogs, comprising seven males and nine females, were examined using ten measurements. Descriptive statistics and six morphometric indices were calculated. Sex differences were assessed using two-sided Welch's independent-samples t-tests, with Holm adjustment across the ten comparisons.

Males exhibited higher mean values for nine traits, whereas mean muzzle length was slightly higher in females. Mean height at the withers was 73.4 ± 2.5 cm in males and 67.9 ± 4.1 cm in females, while mean body length was 82.4 ± 5.5 and 78.9 ± 4.3 cm, respectively. Coefficients of variation ranged from 2.24% to 10.39% in males and from 3.04% to 10.53% in females. Seven traits showed significant sex differences before adjustment; however, only height at the withers, back height, croup height, and forechest width retained significance after Holm correction (adjusted $p = 0.0496$ for each trait). Body format indices of 112 in males and 116 in females indicated rectangular proportions and relatively greater elongation in females. Head length indices were 42 and 43, robustness indices were 122 and 123, and the skeletal strength index was 22 in both sexes.

The examined Georgian Mountain Dogs combined relatively large body dimensions with an elongated format and broadly similar proportional characteristics between sexes. These findings provide a preliminary morphometric characterization, although the small sample warrants cautious generalization and confirmation in a larger population.

Keywords: Georgian Mountain Dog, Morphometry, Sexual Dimorphism, Body Proportions, Livestock Guardian Dogs

Introduction

Livestock guardian dogs have long been associated with pastoral production systems, contributing to the protection of domestic animals and the maintenance of traditional livestock husbandry. Their importance extends beyond their working role, as indigenous dog populations also form part of the biological and cultural heritage of the regions in which they developed. In Georgia, livestock guardian dogs are closely associated with pastoral communities and seasonal movements between mountain and lowland grazing areas. Rigg *et al*. (2017) [5] documented their role in the transhumant sheep-farming systems of eastern Georgia, emphasizing the relationship between livestock management, traditional knowledge, and the continued use of working dogs.

In the large family of mountain (livestock guardian) dogs, the Georgian mountain dog certainly has its place. In recent years,

activities have been intensified to definitively standardize and internationally recognize this breed as an autochthonous dog breed from Georgia. Indirect evidence of the existence of these dogs is provided by Turkin and Sabaneev (1895) [14] when they state that in the Caucasus, practically every nation has its own breed of shepherd dogs. The Georgian Mountain Dog, recognised by the Cynological Federation of Georgia (not yet by the Fédération Cynologique Internationale, FCI), has been described as an 'ancient' natural breed, the 'ancestor' of many other Molossian-type dogs (Beradze, 2003) [1].

To this end, the Georgian Kennel Club made a standard for this breed. The first standard was published in 2000, and the adapted standard in 2025.

The published standard has no basis in zootechnical research, where certain morphometric parameters, necessary for evaluating the exterior of this breed, would be accurately determined and defined. As part of the international show, a specialized Georgian Mountain Dog Show was organized in the city of Telavi, in Georgia. A preliminary zootechnical measurement of several exterior parameters was performed. This is a guide and a confirmation that serious zootechnical tests must be carried out in order to make a definitive standard.



Fig 1: Measurement at the show

Morphometric investigations of related livestock guardian dogs provide a comparative framework for evaluating the Georgian Mountain Dog. Studies of the Kangal have described body dimensions and body format (Daskiran, 2007; Urošević *et al*., 2012) [3, 9], while research on the Akbash has examined a broader range of body and head measurements (Urošević *et al*., 2020) [12]. Investigations of the Šarplaninac and Tornjak have contributed information on cranial morphology and variation between sexes (Urošević *et al*., 2017; Drobnjak & Urošević, 2018) [6, 4]. More recently, studies of the Iranian Sarabi and Macedonian Shepherd Dog Karaman have extended the available comparative data on body dimensions and proportional indices (Urošević *et al*., 2023, 2025) [13, 10]. These studies demonstrate the value of examining both absolute measurements and relative proportions, while recognizing that comparisons must account for differences in sampling and methodology.

Material and Methods

In this study, a morphometric examination of 10 exterior parameters was conducted on 16 dogs. The study population consisted of 7 males and 9 females of the Georgian Mountain Dog (Kartuli Nagazi). The age of the examined dogs ranged from 1 to 9 years. All dogs were bred in Georgia and possessed pedigrees issued by the Georgian Kennel Club.

The following exterior parameters were measured: Height at withers (WH) - measured from the ground to the highest point of the withers. Back height (BH) – mesured from the ground to the highest point of the back. Croup height (CH) - measured from the ground to the highest point of the croup. Forechest width (FW) - measured as the distance between the left and right shoulder joints. Chest circumference (CC) - measured around the thorax immediately behind the scapulae and elbows. Pastern circumference (PC) - measured at the narrowest part of the pastern immediately below the carpal joint. Body length (BL) - measured from the anterior point of the shoulder joint to the posterior edge of the ischial tuberosity. Head length (HL) -measured from the tip of the nose to the occipital protuberance. Skull length (SL) measured from the stop to the occipital protuberance. Muzzle length (ML) measured from the stop to the tip of the nose. All measurements were performed on correctly positioned dogs standing naturally on a flat surface. Body measurements were obtained using a Lydtin measuring stick and measuring tape, while head measurements were taken using a caliper. To minimize measurement error, all measurements were performed by the same investigator according to standard zootechnical methodology. (Urošević & Drobnjak, 2019) [8].

The collected data were processed using the Statistical Package for Social Sciences (SPSS) for Windows Release 17.0.0 software. Descriptive statistics values were presented by gender, including the mean values of measured parameters, maximum and minimum values, standard deviation, standard error, and coefficient of variation. Mean index values for the following parameters were calculated using the respective formulas: Body format index = body length/height at the withers × 100; Head length index = head length/height at the withers × 100; Skull length index = skull length/head length × 100; Muzzle length index = muzzle length/head length × 100; The index of robustness= chest circumference/height at the withers x 100; Skeletal strength index= pastern circumference/height at the withers x 100. (Urošević & Drobnjak, 2019) [8]. Sex differences in mean values were assessed using two-sided Welch's independent-samples t-tests, with Holm adjustment across the ten comparisons. Statistical significance was accepted at $p < 0.05$.

Results

Morphometric traits were evaluated in 16 animals, comprising seven males and nine females. Descriptive statistics revealed higher mean values in males for nine of the ten examined traits, with muzzle length being the only

measurement for which females exhibited a slightly higher mean. Relative variability, expressed as the coefficient of variation (CV), ranged from 2.24% to 10.39% in males and from 3.04% to 10.53% in females. Females exhibited higher CV values for seven traits, whereas males showed greater relative variability in chest circumference, body length, and skull length. Descriptive statistics and the statistical significance of differences between sexes are presented in detail in Tables 1 and 2.

Table 1: Descriptive statistical parameters of males and females

Parameter	Gender	N	Min	Max	Mean±SD	SE	CV %
WH	Male	7	68.70	76.50	73.42±2.51	0.94	3.42
	Female	9	61.80	75.10	67.91±4.06	1.35	5.98
BH	Male	7	68.20	75.50	71.30±2.68	1.01	3.76
	Female	9	56.00	72.00	65.26±4.57	1.52	7.01
CH	Male	7	73.20	77.90	75.40±1.68	0.63	2.24
	Female	9	61.00	76.00	69.87±4.31	1.43	6.17
FW	Male	7	20.00	26.00	22.71±2.36	0.89	10.39
	Female	9	15.50	22.00	19.05±2.00	0.66	10.53
CC	Male	7	83.00	97.00	89.71±5.76	2.10	6.42
	Female	9	80.00	87.00	83.66±2.54	0.84	3.04
PC	Male	7	15.50	17.00	16.21±0.48	0.18	3.00
	Female	9	13.50	17.00	15.05±1.10	0.36	7.32
BL	Male	7	74.00	89.00	82.35±5.50	2.08	6.71
	Female	9	72.00	85.00	78.88±4.31	1.43	5.46
HL	Male	7	30.00	33.00	30.85±1.06	0.40	3.46
	Female	9	28.00	33.00	29.55±1.58	0.52	5.37
SL	Male	7	17.00	20.00	18.14±1.06	0.40	5.89
	Female	9	16.00	18.00	16.66±0.70	0.23	4.24
ML	Male	7	12.00	13.00	12.71±0.48	0.18	3.83
	Female	9	12.00	15.00	12.88±1.05	0.35	8.17

(SD = standard deviation; SE = standard error; CV = coefficient of variation)

Table 2: Sex differences in morphometric traits assessed using Welch's independent-samples t-test, with Holm adjustment for multiple comparisons

Trait	t	df	Unadjusted p	Holm-adjusted p
Height at withers (WH)	3.336	13.462	0.0051	**0.0496**
Back height (BH)	3.293	13.200	0.0057	**0.0496**
Croup height (CH)	3.509	10.899	0.0050	**0.0496**
Forechest width (FW)	3.281	11.837	0.0067	**0.0496**
Chest circumference (CC)	2.586	7.828	0.0329	0.1317
Pastern circumference (PC)	2.818	11.560	0.0160	0.0801
Body length (BL)	1.367	11.153	0.1984	0.3969
Head length (HL)	1.953	13.791	0.0714	0.2142
Skull length (SL)	3.156	9.917	0.0103	0.0620
Muzzle length (ML)	−0.440	11.819	0.6679	0.6679

Mean height at the withers was 73.42 ± 2.51 in males, ranging from 68.70 to 76.50, and 67.91 ± 4.06 in females, ranging from 61.80 to 75.10. The CV was lower in males (3.42%) than in females (5.98%), indicating less relative variation among the examined males. Mean back height was also greater in males, at 71.30 ± 2.68, compared with 65.26 ± 4.57 in females. Recorded values ranged from 68.20 to 75.50 in males and from 56.00 to 72.00 in females. Back height exhibited greater relative variability in females (CV = 7.01%) than in males (CV = 3.76%). Similarly, mean croup height was 75.40 ± 1.68 in males and 69.87 ± 4.31 in females, with respective ranges of 73.20–77.90 and 61.00–76.00. Croup height was the least variable trait in males (CV = 2.24%), whereas its CV in females was 6.17%. Welch's independent-samples t-tests indicated significant sex differences in all three height measurements before adjustment for multiple comparisons. The respective test statistics were t = 3.336 for height at the withers, t = 3.293 for back height, and t = 3.509 for croup height, with unadjusted p-values of 0.0051, 0.0057, and 0.0050. Following Holm correction across the ten examined traits, all three differences remained statistically significant, with an adjusted p-value of 0.0496 for each measurement.

Mean forechest width was 22.71 ± 2.36 in males and 19.05 ± 2.00 in females. Values ranged from 20.00 to 26.00 in males and from 15.50 to 22.00 in females. Forechest width exhibited the highest CV in both sexes, reaching 10.39% in males and 10.53% in females. Thus, although males had a higher mean, relative variability was similar between the sexes. The sex difference was statistically significant in the unadjusted analysis (t = 3.281, p = 0.0067) and remained significant after Holm correction (adjusted p = 0.0496).

Mean chest circumference was 89.71 ± 5.76 in males, with a range of 83.00–97.00, compared with 83.66 ± 2.54 in females, with a range of 80.00–87.00. Unlike the height measurements, chest circumference showed greater relative variability in males (CV = 6.42%) than in females (CV = 3.04%). Chest circumference was the least variable trait in females. Mean pastern circumference was 16.21 ± 0.48 in males and 15.05 ± 1.10 in females, with respective ranges of 15.50–17.00 and 13.50–17.00. Relative variability in pastern circumference was greater in females (CV = 7.32%) than in males (CV = 3.00%). Both chest circumference and pastern circumference showed significant sex differences in the unadjusted analyses (p = 0.0329 and 0.0160, respectively). However, neither difference remained statistically significant following Holm correction, with adjusted p-values of 0.1317 and 0.0801, respectively.

Mean body length was 82.35 ± 5.50 in males and 78.88 ± 4.31 in females. The observed ranges were 74.00–89.00 and 72.00–85.00, respectively. Males exhibited greater relative variability in body length (CV = 6.71%) than females (CV = 5.46%). Despite the higher male mean, the difference was not statistically significant in either the unadjusted analysis (p = 0.1984) or the Holm-adjusted analysis (p = 0.3969).

For head measurements, mean head length was 30.85 ± 1.06 in males and 29.55 ± 1.58 in females, with respective ranges of 30.00–33.00 and 28.00–33.00. Relative variability was greater in females (CV = 5.37%) than in males (CV = 3.46%). The sex difference did not reach statistical significance before or after adjustment (unadjusted p = 0.0714; adjusted p = 0.2142). Mean skull length was 18.14 ± 1.06 in males and 16.66 ± 0.70 in females, ranging from 17.00 to 20.00 and from 16.00 to 18.00, respectively. Skull length showed greater relative variability in males (CV = 5.89%) than in females (CV = 4.24%). Although the unadjusted test indicated a significant sex difference (p = 0.0103), this difference did not remain significant after Holm correction (adjusted p = 0.0620). Mean muzzle length differed only slightly between males (12.71 ± 0.48) and females (12.88 ± 1.05). Male values ranged from 12.00 to 13.00, whereas female values ranged from 12.00 to 15.00. Females exhibited greater relative variability (CV = 8.17%) than males (CV = 3.83%). No statistically significant sex difference was detected, with both the unadjusted and Holm-adjusted p-values equal to 0.6679.

Morphometric indixes were calculated for seven males and nine females. The body format index was 112 in males and

116 in females, indicating that body length exceeded height at the withers in both sexes. The higher value in females reflected a relatively more elongated body format, whereas males exhibited comparatively more compact proportions.

The head length index was similar between sexes, with values of 42 in males and 43 in females. Differences were more apparent in the relative proportions of the skull and muzzle. The skull length index was higher in males (58) than in females (56), whereas the muzzle length index was higher in females (44) than in males (42). These values indicated a relatively greater contribution of the skull to total head length in males and a relatively greater contribution of the muzzle in females. Nevertheless, the skull was longer than the muzzle in both sexes.

The robustness index showed little difference between males and females, with respective values of 122 and 123. Similarly, the skeletal strength index was identical in both sexes, at 22, indicating comparable pastern circumference relative to height at the withers.

Overall, the index values indicated broadly similar proportional characteristics between sexes. The largest numerical difference was observed in the body format index, followed by the skull and muzzle length indices. These comparisons are descriptive, as no inferential tests were reported for the indices. Detailed values are presented in Table 3.

Table 3: Index values of males and females

Index	Gebder	N	Values
Body format index	Male	7	112
	Female	9	116
Head lenght index	Male	7	42
	Female	9	43
Skull lenght index	Male	7	58
	Female	9	56
Muzzle lenght index	Male	7	42
	Female	9	44
The index of robustness	Male	7	122
	Female	9	123
Skeletal strength index	Male	7	22
	Female	9	22

Discussion

The present findings characterize the examined Georgian Mountain Dogs as relatively large animals with an elongated body format and broadly similar proportional characteristics between sexes. Males exhibited higher mean values for nine of the ten morphometric traits, although the statistical evidence for sex differences varied among measurements. Seven traits showed significant differences before adjustment, whereas only height at the withers, back height, croup height, and forechest width remained significant after Holm correction. In this sample, sexual differentiation was therefore expressed more consistently in vertical body dimensions and forechest width than in body length or head measurements.

Mean height at the withers was approximately 73.4 cm in male Georgian Mountain Dogs and 67.9 cm in females. These values place the examined dogs within the size range reported for several large livestock guardian dog populations. Daskiran (2007) [3] reported lower mean heights in Kangal dogs, at 71.7 cm in males and 65.2 cm in females, whereas Urošević *et al*. (2012) [9] recorded values of 72.80 and 69.20 cm, respectively. Thus, male Georgian Mountain Dogs were slightly taller than males in both Kangal studies, while the female mean fell between the reported Kangal values.

Comparisons with Balkan shepherd dogs provide further context. Urošević and Drobnjak (2011) [7] reported mean heights of 70.03 cm in males and 64.75 cm in females in an urban Šarplaninac population, both lower than the present Georgian Mountain Dog values. Bijelić *et al*. (2013) [2] reported adult Tornjak heights of 69.20 cm in males and 68.00 cm in females, indicating a lower male mean but a female mean close to that observed here. The Akbash population studied by Urošević *et al*. (2020) [12] was smaller, with mean heights of 66.79 cm in males and 63.15 cm in females.

The Iranian Sarabi shepherd dog provides another relevant comparison. Urošević *et al*. (2023) [13] examined 18 males and reported a mean height at the withers of 67.88 cm and a mean body length of 74.25 cm. Both measurements were numerically lower than the corresponding Georgian Mountain Dog means of approximately 73.4 and 82.4 cm. These findings indicate greater absolute stature and body length in the Georgian mountain dogs males examined here. The absence of females from the Sarabi study also prevents a corresponding comparison between female populations.

Comparison with the Macedonian Shepherd Dog Karaman highlights the distinction between absolute size and body proportions. In 126 males and 95 females, Urošević *et al*. (2025) [10] reported mean heights at the withers of 66.96 and 63.32 cm, respectively, and body lengths of 74.16 and 71.26 cm. Georgian Mountain Dogs had numerically higher values for both measurements. Nevertheless, the two samples shared a rectangular body format and relatively greater elongation in females. Karaman body format indices were 110.75 in males and 112.54 in females, compared with 112 and 116 in Georgian Mountain Dogs. Female elongation was therefore more pronounced in the present sample.

The body format indices indicate that body length exceeded height at the withers by approximately 12% in male Georgian Mountain Dogs and 16% in females. These proportions are comparable to the Kangal indices of 111 in males and 112 in females reported by Urošević *et al*. (2012) [9], whereas Sarabi males had a lower reported index of 109.38 (Urošević *et al*., 2023) [13]. The present male Georgian Mountain Dog sample consequently exhibited numerically greater relative elongation than the cited Kangal and Sarabi samples. Urošević *et al*. (2012) [9] also identified a significant sex difference in height at the withers but no significant difference in body length in Kangals, resembling the pattern observed here.

The higher female body format index should be interpreted through the relationship between its component measurements. Female Georgian Mountain Dogs had a shorter mean body length than males, but their lower stature produced a higher length-to-height ratio. A higher body format index therefore does not imply greater absolute body length. The rectangular proportions observed here contrast with Daskiran's (2007) [3] Kangal sample, in which mean body length was close to mean height at the withers. Such variation reinforces the importance of consistent anatomical landmarks and measurement procedures. Elongated body proportions have been documented in several livestock guardian dog populations.

The relationship among the three height measurements further characterizes Georgian Mountain Dog conformation.

Mean croup height exceeded mean height at the withers by approximately 2 cm in both sexes, while mean back height was lower than both measurements. These relationships suggest a similar arrangement of the dorsal body profile in males and females despite differences in overall size. A higher mean croup than withers was also reported in Sarabi males, with values of 68.40 and 67.88 cm, respectively, although the difference between these means was smaller than in the present Georgian sample (Urošević *et al*., 2023) [13].

Relative variability differed among the examined measurements. Croup height showed the lowest CV in male Georgian Mountain Dogs (2.24%), whereas chest circumference was the least variable trait in females (3.04%). Forechest width exhibited the highest CV in both sexes, at 10.39% in males and 10.53% in females. Thus, transverse forechest development varied more relative to its mean than the other recorded traits. This variation could reflect differences in conformation, maturity, or body condition, although their contributions were not evaluated. Females exhibited higher CV values for seven traits, whereas males showed greater relative variability in chest circumference, body length, and skull length. Given the small sample, these patterns cannot establish differences in genetic diversity or overall population homogeneity.

The distinction between unadjusted and Holm-adjusted results is particularly important when interpreting sexual dimorphism. Chest circumference, pastern circumference, and skull length showed significant differences in the individual tests, but their adjusted p-values exceeded 0.05. The evidence was therefore insufficient to retain significance when the ten comparisons were considered together. These findings do not demonstrate that males and females are identical for these traits. Similarly, the nonsignificant results for body length, head length, and muzzle length indicate an absence of clear evidence of a difference in this sample rather than proof of equivalence. The adjusted p-values for the four retained traits were close to the significance threshold, supporting cautious interpretation and confirmation in a larger sample.

Head measurements indicated relatively large absolute dimensions but limited statistical differentiation between sexes. Mean head length was approximately 30.9 cm in male Georgian Mountain Dogs and 29.6 cm in females. These values exceeded the means of 28.50 and 25.71 cm reported for male and female Akbash dogs by Urošević *et al*. (2020) [12], and the corresponding Tornjak means of 26.41 and 25.38 cm reported by Drobnjak and Urošević (2018) [4]. Larger absolute head dimensions may partly reflect greater overall body size. The Georgian Mountain Dog head length indices of 42 in males and 43 in females indicate similar head length relative to stature despite differences in absolute measurements.

The craniological study of Šarplaninac by Urošević *et al*. (2017) [6] provides an additional comparison. In 109 dogs, mean head lengths were 29.03 cm in males and 27.28 cm in females, below the present Georgian Mountain Dog means. Reported skull lengths were 17.32 and 16.69 cm, respectively, compared with approximately 18.14 and 16.67 cm here. Male Georgian Mountain Dogs therefore had a numerically longer skull, while female means were nearly identical. Muzzle lengths of 11.78 cm in male and 10.59 cm in female Šarplaninacs were lower than the present values of approximately 12.71 and 12.89 cm.

Despite differences in absolute head size, the Šarplaninac head length indices of 41.80 in males and 42.22 in females were close to the Georgian Mountain Dog values of 42 and 43. Urošević *et al*. (2017) [6] reported no significant sex difference in this index. Their findings reinforce the distinction between absolute dimensions and proportional similarity, although statistical equivalence between the present sexes or breeds has not been demonstrated.

Comparison with Karaman dogs further illustrates this proportional similarity. Urošević *et al*. (2025) [10] reported head lengths of 28.60 cm in males and 27.23 cm in females, below the present Georgian Mountain Dog means. Nevertheless, their head length indices of 42.71 and 43.00 were close to the present values. Karaman skull-to-muzzle proportions were approximately 59:41 in both sexes, compared with 58:42 in male Georgian Mountain Dogs and 56:44 in females. Relative head length was therefore similar, while female Georgian Mountain Dogs showed a numerically greater muzzle contribution to total head length. The skull and muzzle indices indicate that the cranial segment was longer than the muzzle in both sexes. The relatively greater muzzle contribution in females was consistent with their slightly higher mean muzzle length despite smaller mean body dimensions. This pattern suggests that differences in head proportions were not simply a uniform increase in all measurements in males. However, skull length did not retain statistical significance after adjustment, and muzzle length showed no significant difference. The index comparisons must therefore remain descriptive.

The robustness indices of 122 in males and 123 in females indicate similar chest circumference relative to height at the withers in Georgian Mountain Dogs. Urošević *et al*. (2024) [11] reported corresponding indices of 124.86 and 125.22 in Tornjaks, 119.69 and 122.75 in Akbash dogs, 113.91 and 114.28 in Kangals, and 117.48 and 122.60 in Šarplaninacs. The present male value was intermediate between the Akbash and Tornjak means, while the female value was close to those reported for Akbash and Šarplaninac females. The slightly higher female index also followed the direction observed in all four populations examined by those authors.

Sarabi males provide a useful contrast between absolute dimensions and relative thoracic development. Urošević *et al*. (2023) [13] reported a mean chest circumference of 85.75 cm and a robustness index of 126.32. Male Georgian Mountain Dogs had a greater absolute chest circumference, approximately 89.7 cm, but a lower robustness index of 122 because their mean height was also greater. A larger chest circumference therefore did not correspond to greater circumference relative to stature. This distinction supports the use of both absolute measurements and proportional indices when describing conformation.

The skeletal strength index was 22 in both male and female Georgian Mountain Dogs. This value was close to those reported by Urošević *et al*. (2024) [11] for Kangals, at 22.50 in males and 21.94 in females, and Šarplaninacs, at 21.67 and 21.85, respectively. It was numerically higher than the Akbash means of 20.10 and 20.25. The identical rounded values in the present sample suggest comparable pastern circumference relative to stature, although males had a greater absolute circumference.

In comparison, Sarabi males had a mean pastern circumference of 16.00 cm and a reported skeletal strength index of 23.57 (Urošević *et al*., 2023) [13]. Their absolute

circumference was close to the Georgian male mean of approximately 16.2 cm, but their lower stature resulted in a higher proportional index. These findings again demonstrate that similar absolute measurements can represent different body proportions. Nevertheless, the skeletal strength index describes an external dimensional relationship rather than directly measuring bone density, structural strength, or resistance to loading. Likewise, the robustness index should not be interpreted as a direct measure of muscular strength or endurance.

Several limitations should be considered. Only seven male and nine female Georgian Mountain Dogs were examined, restricting the precision of estimates and the ability to detect smaller differences. Comparisons with published populations are additionally influenced by differences in age composition and number of measured dogs. Within these limitations, the examined Georgian Mountain Dogs exhibited a relatively large, rectangular body format, with males generally having greater absolute dimensions and both sexes retaining broadly similar relative head length, thoracic robustness, and pastern development. Comparisons with Karaman, Kangal, Akbash, Tornjak, Šarplaninac, and Sarabi populations place these findings within the broader morphological variation documented in livestock guardian dogs and provide a basis for further study of the Georgian Mountain Dog.

Conclusion

The examined Georgian Mountain Dogs exhibited a relatively large body size and a rectangular body format, with greater relative body elongation in females. Males generally had higher absolute measurements; however, only height at the withers, back height, croup height, and forechest width remained significantly different between sexes after Holm correction. Head length relative to stature was similar between sexes, and the cranial segment was longer than the muzzle in both. The closely corresponding robustness indices and identical rounded skeletal strength indices suggested similar thoracic and pastern proportions despite differences in absolute size. Comparisons with other livestock guardian dog populations revealed shared proportional characteristics alongside differences in individual measurements. These findings provide a preliminary morphometric characterization of the Georgian Mountain Dog, although the small sample warrants cautious generalization and confirmation through further research.

References

1. Beradze I. Georgian Mountain Dog - Georgian Shepherd Dog - Kartuli Nagazi. Fédération Cynologique de Géorgie, Tbilisi, 2003, p. 8.
2. Bijelić D, Vudrag B, Ekert Kabalin A, Štoković I. Tjelesne izmjere tornjaka prema izložbenim razredima [Body measurements of Tornjak dogs according to show classes]. Veterinar. 2013; 51(1):15-25.
3. Daskiran I. Body weight and some morphological characteristics of Kangal dogs. Journal of Animal and Veterinary Advances. 2007; 6(3):368-370. Doi: https://doi.org/10.36478/javaa.2007.368.370
4. Drobnjak D, Urošević M. Osnovni morfometrijski parametri glave tornjaka [Basic morphometric parameters of the Tornjak head]. In Proceedings and abstracts of the 29th Conference of Veterinarians of Serbia. Zlatibor, Serbia, 2018, p. 296.
5. Rigg R, Goldthorpe G, Popiashvili T, Sillero-Zubiri C. Livestock guarding dogs in Georgia: A tradition in need of saving? Carnivore Damage Prevention News. 2017; 15:19-27.
6. Urošević MM, Drobnjak D, Stojić P, Urošević MB. Craniological parameters of Yugoslav shepherd dog sharplanina. Mediterranean Agricultural Sciences. 2017; 30(3):269-274. Doi: https://doi.org/10.29136/mediterranean.360006
7. Urošević M, Drobnjak D. Promena pojedinih eksterijernih parametara kod jugoslovenskog ovčarskog psa - šarplaninca kao posledica gajenja u urbanoj sredini [Changes in selected conformation parameters of the Yugoslav Shepherd Dog Šarplaninac associated with rearing in an urban environment]. In Proceedings and abstracts of the 22nd Conference of Veterinarians of Serbia with international participation. Zlatibor, Serbia, 2011, 323-329.
8. Urošević M, Drobnjak D. Metodologija morfometrije pasa - standard utvrđivanja eksterijernih parametara [Methodology of canine morphometry: A standard for determining conformation parameters]. Kinološka akademija, 2019.
9. Urošević M, Drobnjak D, Ograk Y. Format tela turskog pastirskog psa kangala [Body format of the Kangal, Turkish shepherd dog]. Agroznanje. 2012; 13(2):209-216. Doi: https://doi.org/10.7251/AGRSR1202209U
10. Urošević M, Drobnjak D, Karova M, Hristovski J. Basic morphometric parameters of the Macedonian Shepherd Dog Karaman. International Journal of Advanced Multidisciplinary Research and Studies. 2025; 5(1):668-671. Doi: https://doi.org/10.62225/2583049X.2025.5.1.3705
11. Urošević M, Drobnjak D, Ograk YZ, Karova M, Mandić R. Robustness and skeletal strength indexes in shepherd dogs. International Independent Scientific Journal. 2024; 62:25-27. Doi: https://doi.org/10.5281/zenodo.11519900
12. Urosevic M, Drobnjak D, Stojic P, Oğrak YZ. Morphometric characterization of the Akbaş (Akbash) Turkish shepherd dog. Turkish Journal of Agriculture - Food Science and Technology. 2020; 8(7):1571-1576. Doi: https://doi.org/10.24925/turjaf.v8i7.1571-1576.3452
13. Urošević M, Matejević M, Šťastná D, Drobnjak D. Формат корпуса иранской пастушьей собаки сараби (на примере кобелей) [Body format of the Iranian Sarabi shepherd dog: A study of males]. In Dog breeding in Russia: Development trends and prospects. Proceedings of the All-Russian scientific and practical conference with international participation dedicated to the 120th anniversary of the birth of Professor N. A. Ilyin. Moscow, Russia: Russian State Agrarian University - Moscow Timiryazev Agricultural Academy, 2023, 117-120.
14. Туркин НВ, Сабанеев ЛП. Русская овчарка. Охотничья Газета. 1895; 8:3.