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Basic Morphometric Parameters of the Macedonian Shepherd Dog Karaman

¹ Milivoje Urošević, ² Darko Drobnjak, ³ Marija Karova, ⁴ Jordan Hristovski

¹ PhD, Full Research Professor, Center for Preservation of Indigenous Breeds, Belgrade-Zemun, Serbia

² DVM, MVSc, Center for Preservation of Indigenous Breeds, Belgrade-Zemun, Serbia

³ PhD Student, Faculty of Applied Ecology, Futura, Belgrade, Serbia

⁴ President, Kennel Association of the Republic of Macedonia, Skopje, Macedonia

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Corresponding Author: **Darko Drobnjak**

Abstract

The Macedonian Shepherd Dog Karaman is an indigenous breed, whose origin is linked to livestock settlements in Macedonia and the nomadic movements of shepherds. For centuries, it has been bred continuously as a protector of herds in Macedonia. The goal of this paper is to analyze values of five morphometric parameters of Macedonian Shepherd Dog Karaman, as well as to compare them to the values of morphometric parameters obtained in previous studies of other breeds of shepherd dogs.

In this study, a morphometric examination of 5 exterior parameters was conducted on 221 dogs. The study population included 126 males and 95 females of the

Macedonian Shepherd Dog breed, Karaman.

The average height of male Karamans is 66.96 cm, while females average 63.32 cm. The head length of male individuals ranged from 24.00 to 32.00 cm, with an average value of 28.60 cm. For females, the head length ranged from 23.00 to 30.00 cm, with an average value of 27.23 cm. The individuals have a rectangular body format, meaning their body length exceeds their height at the withers by 10.75% in males and 12.54% in females. The head length represents 42.71% of the height at the withers in males and 43.00% in females.

Keywords: Karaman, Morphometric Parameters, Body Index

Introduction

Shepherd dogs, along with hunting dogs, belong to the group of the oldest dogs. Authors have written about the existence and use of such dogs, which are essentially guard dogs, since ancient times. Xenophon (431-354 BC) left a written record that there are two groups of dogs: Guard dogs and hunting dogs (Tureen, 2024) ^[6]. Throughout all periods of civilization, as humans improved and advanced livestock farming, shepherd dogs were present and significantly helped in guarding flocks of sheep, goats, and other domestic animals.

The Macedonian Shepherd Dog Karaman is an indigenous breed, whose origin is linked to livestock settlements in Macedonia and the nomadic movements of shepherds. For centuries, it has been bred continuously as a protector of herds in Macedonia. Shepherds have also nurtured a special cult for these dogs, and they have always been a mythical dog to them. Records of these dogs can be found in the works of ancient poets, and depictions of Karaman can be found in medieval frescoes and iconostases. The most important artifact featuring Karaman is a fresco in the Church of St. George in the village of Kurbinovo, Prespa, painted in 1191, which is also part of the club's logo. In its original form, the breed has been preserved to this day by shepherds whose lives were spent in constant movement from summer to winter pastures.

Little is known about the origin of the breed. It is presumed that it originates from Asia, i.e. that the peoples that migrated from Asia to Europe also brought with them the shepherd dogs that guarded their flocks. Over the centuries, selection under specific geographical and climatic conditions formed the breed. The basic type of these dogs is preserved only in those areas where extensive type sheepherding still exists.

In the early 2000s, after nearly a decade of observing shepherd dogs in the mountains of Macedonia, the frequent presence of Karaman dogs among shepherds in pastures was established. Brothers Vlatko and Marjan Kostovski described this breed in detail in their book "Macedonian Shepherd Dog Karaman." For the organized preservation of the breed, a club was formed in

2004, which was accepted as a full member of the Macedonian Kennel Association. Since then, intensive work has been done to promote the breed, its selection, and preservation.

The goal of this paper is to analyze values of five morphometric parameters of Macedonian Shepherd Dog Karaman, as well as to compare them to the values of morphometric parameters obtained in previous studies of other breeds of shepherd dogs.

Material and method

In this study, a morphometric examination of 5 exterior parameters was conducted on 221 dogs. The study population consisted of 126 males and 95 females of the Macedonian Shepherd Dog breed, Karaman. The age of the examined dogs ranged from 1 to 9 years. All dogs were bred in Macedonia and possessed pedigrees issued by the Macedonian Kennel Club.

The following exterior parameters were measured: Height at the withers (WTH), body length (BL), head length (HDL), skull length (SLL), and muzzle length (MZL). Measurements of height at the withers and body length were taken using a Lydtin stick, while head, skull, and muzzle lengths were measured with a vernier caliper. Height at the withers was measured at the highest point of the withers, body length from the shoulder joint to the tip of the ischial tuberosities, head length from the tip of the nose to the occipital protuberance, skull length from the occipital protuberance to the stop, and muzzle length from the tip of the nose to the stop (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 \times 100; Head length index = head length/height at the withers \times 100; Skull length index = skull length/head length \times 100; Muzzle length index = muzzle length/head length \times 100 (Urošević & Drobnjak, 2019) [8].

Results

Table 1 presents the descriptive statistical parameters for males and females. The average height of males is 66.96 cm, while for females, it is 63.32 cm. The range of variation is quite wide for both sexes, ranging from 59.00 cm to 76.00 cm in males and from 56.00 cm to 70.00 cm in females. The average body length in males is 74.16 cm, with a standard deviation of 3.82, while females have an average body length of 71.26 cm with a standard deviation of 3.93. The coefficient of variation for this parameter is 5.13% in males and 5.48% in females. The head length in males ranged from 24.00 to 32.00 cm, with an average value of 28.60 cm. In females, head length ranged from 23.00 to 30.00 cm, with an average value of 27.23 cm. The average length of the cranial part of the head in males is 16.83 cm, while in females, it is 16.09 cm. The muzzle has an average length of 11.75 cm in males and 11.23 cm in females. The coefficient of variation for this parameter is relatively high in both sexes, at 9.35% for males and 9.97% for females.

Table 1: Descriptive statistical parameters of males and females

| Parameter | Gender | N | Min | Max | Mean \pm SD | SE | CV % |
|-----------|--------|-----|-------|-------|------------------|------|------|
| WTH | Male | 126 | 59.00 | 76.00 | 66.96 \pm 3.22 | 0.29 | 4.79 |
| | Female | 95 | 56.00 | 70.00 | 63.32 \pm 3.44 | 0.35 | 5.40 |
| BL | Male | 126 | 66.00 | 84.00 | 74.16 \pm 3.82 | 0.34 | 5.13 |
| | Female | 95 | 63.00 | 82.00 | 71.26 \pm 3.93 | 0.40 | 5.48 |
| HDL | Male | 126 | 24.00 | 32.00 | 28.60 \pm 1.48 | 0.13 | 5.15 |
| | Female | 95 | 23.00 | 30.00 | 27.23 \pm 1.61 | 0.17 | 5.89 |
| SLL | Male | 126 | 14.00 | 19.00 | 16.83 \pm 1.21 | 0.11 | 7.17 |
| | Female | 95 | 13.00 | 19.00 | 16.09 \pm 1.41 | 0.14 | 8.72 |
| MZL | Male | 126 | 9.00 | 14.00 | 11.75 \pm 1.10 | 0.09 | 9.35 |
| | Female | 95 | 9.00 | 13.00 | 11.23 \pm 1.12 | 0.12 | 9.97 |

When analyzing the average index values presented in Table 2, it is observed that the individuals exhibit a rectangular body format, meaning their body length exceeds their height at the withers by 10.75% in males and 12.54% in females. The head accounts for 42.71% of the height at the withers in males and 43.00% in females. The skull part of the head constitutes 58.84% of the total head length in males and 59.08% in females. The muzzle length represents 41.16% of the total head length in males and 40.92% in females.

Table 2: Index values of males and females

| Index | Gebder | N | Values |
|---------------------|--------|-----|--------|
| Body format index | Male | 126 | 110.75 |
| | Female | 95 | 112.54 |
| Head length index | Male | 126 | 42.71 |
| | Female | 95 | 43.00 |
| Skull length index | Male | 126 | 58.84 |
| | Female | 95 | 59.08 |
| Muzzle length index | Male | 126 | 41.16 |
| | Female | 95 | 40.92 |

Discussion

Studying the exterior of the Turkish Shepherd Dog Kangal, Daskiran (2007) [3] determined that the average height at the withers of males was 71.7 cm and 65.2 cm for females. In this population, the average body length of females was 66.2 cm, while males had an average body length of 71.1 cm. Based on these results, it can be concluded that males and females do not have the typical body format of shepherd dogs. The body length is almost identical to the height at the withers, which is undesirable. Shepherd dogs must have a rectangular body format, with body length greater than height at the withers.

In a study of the Sarplaninac in urban environments, the average height at the withers was found to be 70.03 cm for males and 64.75 cm for females (Urošević & Drobnjak, 2011) [7]. Examining the morphological parameters of certain dog breeds in Turkey, Yilmaz and Ertugrul (2012) [12] reported that the average height at the withers of the Kangal was 74.8 cm, and the average body length was 84.5 cm. For another Turkish shepherd dog breed, Akbash, the average height at the withers was 72.4 cm, with an average body length of 87.3 cm. These studies showed that Kangals and Akbash dogs in the observed populations have a rectangular body format.

The average height at the withers of the Iranian shepherd dog Sarabi, as reported by Urošević *et al.* (2023) [10], was 67.88 cm, and the body length was 74.25 cm. The authors did not have the opportunity to study the exterior parameters of females of this breed. To standardize the Turkish

shepherd dog, Kangal, research on its morphological parameters began in 2008. The basic results were published by Urošević *et al.* (2012)^[9], showing that the average height at the withers of males was 72.80 cm, with a body length of 81.20 cm. For females, the average height at the withers was 69.20 cm, and the body length was 77.60 cm.

Regarding the Bosnian-Herzegovinian-Croatian Shepherd Dog Tornjak, Bijelić *et al.* (2013)^[11] reported that the average height at the withers of adult males was 69.20 cm, while females measured 68.00 cm. Comparing these studies, the Karaman population, with an average height of 66.96 cm in males and 63.32 cm in females, is shorter than the shepherd dog breeds mentioned above. However, the Karaman has a rectangular body format, with body length greater than height at the withers, as is typical for shepherd dogs.

Cranial parameters of shepherd dog breeds have been published in several studies. Daskiran (2007)^[3] found that the average head length of female Kangals in the observed population was 23.8 cm, while for males, it was 24.7 cm. The average muzzle length of females was 10.8 cm, and for males, it was 11.2 cm. In studies of the cranial parameters of Kangals, Urošević *et al.* (2014)^[11] reported that the average head length of males was 29.53 cm, while females had an average head length of 27.65 cm. The variation interval was 26.00–33.00 cm for males and 25.00–32.00 cm for females. The minimum skull length for both sexes was 13.50 cm, while the maximum skull length was 20.00 cm for males and 19.00 cm for females.

The Akbash, another Turkish shepherd dog breed, had an average head length of 28.50 cm for males and 25.71 cm for females, with a head length index of 37–43. On average, the head is 40% of the height at the withers. The skull length of male Akbash dogs averaged 17.00 cm (range: 14.00–20.00 cm), while for females, it was 16.00 cm (range: 14.00–18.00 cm). The muzzle length of male Akbash dogs averaged 10.75 cm, while for females, it was 10.00 cm. The ratio of skull to muzzle length was 64:36, indicating a mesocephalic head type, typical of shepherd dogs (Urošević *et al.*, 2020)^[5].

Among shepherd breeds from the Balkan Peninsula, Tornjak and Sarplaninac cranial parameters have been studied. The average head length of male Tornjaks was 26.41 cm, and for females, it was 25.38 cm, with a variation interval of 20.00–28.00 cm. The skull length of males averaged 15.76 cm, while females had an average skull length of 15.15 cm. Muzzle length in males ranged from 8.00 to 15.00 cm, with an average of 10.73 cm, while females had an average muzzle length of 10.28 cm (Drobnjak & Urošević, 2018)^[2].

For the Sarplaninac, the average head length of males was 29.03 cm, with a variation interval of 26.00–32.00 cm. Females had an average head length of 27.28 cm. The average skull length for males was 17.32 cm, while the average muzzle length was 11.78 cm for males and 10.59 cm for females (Urošević *et al.*, 2017)^[4].

Comparing the data from this study with the previously described breeds, it is evident that the Karaman's head dimensions are approximately similar to those of other shepherd dog breeds. With a head-to-height ratio of around 43.00%, the Karaman adheres to the biostatic model principles for shepherd dogs. Furthermore, the ratio of cranial to facial parts of the head clearly indicates that the Karaman has a mesocephalic head type, with the facial part

slightly shorter than the cranial part, maintaining an approximate proportion of 60:40.

Conclusion

Length of male individuals ranges from 24.00 to 32.00 cm, with an average value of 28.60 cm. For females, the head length varies between 23.00 and 30.00 cm, with an average value of 27.23 cm.

These dogs have a rectangular body format, meaning their body length exceeds their height at the withers by 10.75% in males and 12.54% in females. The head accounts for 42.71% of the height at the withers in males and 43.00% in females. Karaman dogs have a mesocephalic head type, where the facial part is slightly shorter than the cranial part, with an approximate proportion of 60:40.

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