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Craniological parameters of Yugoslav shepherd dog sharplanina*

Yugoslav çoban köpeği sharplanina'nın kronolojik parametreleri

Milivoje M. UROŠEVIĆ[1], Darko DROBNJAK[1], Petar STOJIĆ[2], Milan B. UROŠEVIĆ[1]

[1]Center for Preservation of Indigenous Breeds, Belgrade, Serbia
[2]PKB Institute, Belgrade, Serbia

Corresponding author (*Sorumlu yazar*): D. Drobnjak, e-mail (*e-posta*): office@cepib.org.rs

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ABSTRACT

Yugoslav Shepherd Dog Sharplanina is among the oldest dog breeds on the Balkan Peninsula. Since ancient times, dogs of this breed have been bred in the mountainous regions in the southeast of the former Yugoslavia, primarily in the Shara Mountain, based on which the breed was named the Yugoslav Shepherd Dog Sharplanina. Today, according to the FCI classification the breed belongs to Group 2. Countries of origin of this breed are Macedonia and Serbia. The goal of this paper is to evaluate and analyze eight exterior trait parameters of the head for the investigated dog population. 109 dogs (44 males and 65 females) were measured. Following head parameters were measured: head length, muzzle length, skull length, ear length, muzzle width, skull width, muzzle depth, and muzzle circumference. Measuring was done using a mobile measuring device with nonius and a ribbon. The average head length of the male was 29.03 cm, and of the female 27.28 cm. The average skull length of the male was 17.32 cm, and of the female 16.69 cm. The average skull width of the male was 14.59 cm, and of the female 13.60 cm. Average muzzle length in the male was 11.78 cm, and in the female 10.59 cm. Average muzzle width in the male was 8.49 cm, and in the female 7.76 cm, and average muzzle depth in the male was 10.73 cm, and in the female 10.09 cm. Morphometric parameters for the investigated population of Yugoslav Shepherd Dog Sharplanina differ from results obtained in earlier investigations. In addition, measured values for exterior parameters in our study population also differ from the currently valid standard for this breed.

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***Anahtar Kelimeler*:**

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ÖZ

Yugoslav Çoban Köpeği Sharplanina, Balkan Yarımadası'ndaki en eski köpek ırklarından biridir. Antik çağlardan beri bu ırka ait köpekler başta Shara Dağı olmak üzere eski Yugoslavya'nın güneydoğusundaki dağlık bölgelerde yetiştirilmektedir ve Yugoslav Çoban Köpeği Sharplanina olarak adlandırılmaktadır. Günümüzde bu ırk Uluslararası Kinoloji Federasyonu sınıflandırmasına göre Grup 2 içinde yer almaktadır. Makedonya ve Sırbistan bu ırkın kökeni olan ülkelerdir. Bu makalenin amacı, söz konusu köpek populasyonunda kafayla ilgili sekiz dış özelliğin analizi ve değerlendirilmesidir. Araştırmada 44 erkek 65 dişi olmak üzere toplam 109 köpek kullanılmıştır. İncelenen özellikler, kafa uzunluğu, ağız uzunluğu, kafatası uzunluğu, kulak uzunluğu, ağız genişliği, kafatası genişliği, ağız derinliği ve ağız çevresidir. Ölçümler, taşınabilir kumpas ve şeritmetre kullanılarak yapılmıştır. Yapılan ölçümlerde ortalama kafa uzunluğu erkek ve dişiler için sırasıyla, 29.03 cm ve 27.28 cm, ortalama kafatası uzunluğu 17.32 cm ve 16.69 cm, ortalama kafatası genişliği 14.59 cm ve 13.60 cm, ortalama ağız uzunluğu 11.78 cm ve 10.59 cm, ortalama ağız genişliği 8.49 cm ve 7.76 cm, ortalama ağız derinliği ise 10.73 cm ve 10.09 cm olarak bulunmuştur. Sonuç olarak, bu çalışmada ölçülen Yugoslav Çoban Köpeği Sharplanina popülasyonunun morfometrik parametreleri önceki araştırmalarda elde edilen sonuçlardan ve bu ırk için geçerli olan standartlardan farklılık göstermiştir.

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1. Introduction

Yugoslav Shepherd Dog Sharplanina is among the oldest dog breeds on the Balkan Peninsula. Since ancient times, dogs of this breed have been bred in the mountainous regions in the southeast of the former Yugoslavia, primarily in the Shara Mountain, based on which the breed was named the Yugoslav Shepherd Dog Sharplanina (Dimitrijević 2008). The breed was

registered with Fédération Cynologique Internationale (FCI) in 1939 under No. 41 as the Illyrian Shepherd Dog. After the decision of the Yugoslav Cynological Society in 1955, the name of the breed was changed to Yugoslav Shepherd Dog Sharplanina. This change was adopted by Fédération Cynologique Internationale in 1957 (Špoljarić and Urošević 1987). Today, according to the FCI classification the breed belongs to Group 2. As countries of origin of the indigenous breed of Yugoslav Shepherd Dog Sharplanina, Fédération Cynologique Internationale states Macedonia and Serbia (Standard FCI No 41 1980)

Not much is known about the origin of the Sharplanina breed. Dogs of this breed were bred since ancient times in mountainous southeast regions of the former Yugoslavia, primarily on Sharplanina mountain, based on which the breed was named Yugoslav Shepherd Dog Sharplanina. 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. (Urošević et al. 1987) Over the centuries, selection under specific geographical and climatic conditions formed the Yugoslav Shepherd Dog Sharplanina breed. The basic type of these dogs is preserved only in those areas where extensive type sheepherding still exists (Dimitrijević 2008). Dogs similar to the Sharplanina inhabited our mountains as far back as Illyrian times. Illyrian tribes lived as nomads and were animal breeders. In their work Illyrians relied on the assistance of their valued dogs. After Romans conquered the Balkans a minority of Illyrian tribes remained in the rugged mountainous terrain of the Sharplanina Mountain (Stanković 1967).

The official standard for the breed was last changed in 1980. According to this standard, the Sharplanina should have the appearance of a strong, well-connected dog, of above average height and of overall harmonious build. The coat should be long, thick and rather rough, and as such suitable for living in mountainous conditions, while the color is monochromatic, where all shades of color from white to dark brown, almost black, are allowed. The most preferable colors are gray-green and dark gray. The average height for males should be 62 cm, and for females 58 cm, while the average weight of an adult dog in shape should be 35-45 kg for males and 30-40 kg for females. The head is proportional to body size and is about 40% of the height at the withers.

The goal of this paper is to analyze values of craniological exterior parameters of Yugoslav Shepherd Dog Sharplanina, as well as to compare them to the values for parameters of the exterior obtained in previous studies of this breed. In addition, obtained values for reference morphological traits will be compared to the currently valid standard for Yugoslav Shepherd Dog Sharplanina.

2. Materials and Methods

This research was a morphometric investigation of 8 exterior parameters of the head of 109 dogs. The study population encompassed 44 male and 65 female dogs of the Yugoslav Shepherd Dog Sharplanina breed. The age of dogs in the investigated population was between 9 months and 9 years. All dogs were bred in the region of the city of Belgrade and the municipalities of Velika Plana, Smederevska Palanka and Pančevo, and had genealogy certificates issued by the Cynological Association of the Republic of Serbia.

Following exterior parameters were measured: head length, skull length, muzzle length, skull width, muzzle width, muzzle depth, muzzle circumference and ear length. Width, length and depth were measured using a movable measuring device with a nonius, while muzzle circumference was measured using a zootechnical ribbon. Head length was measured from the occipital protuberance to the tip of the nose, where the distance from the occipital protuberance to the imaginary line connecting the inner corners of the eyes is regarded the skull length, and the distance from the line connecting the medial corners of the eyes to the tip of the nose is regarded as the length of the muzzle. Skull width was measured at the widest part of the skull, in front of the ears. The width, depth and circumference of the muzzle were measured in the middle of the muzzle in front of the eyes. Length of the ears is measured from the base to the top of the auricle. Descriptive statistics parameters established by this investigation are the arithmetic mean (M), standard deviation (SD), variation interval (IV), standard error (Sg), and coefficient of variation (CV). These parameters were processed separately for all males and all females from the investigated group of dogs. Both the bitches and the males were then divided in three age groups. The first group (AG I) was formed from

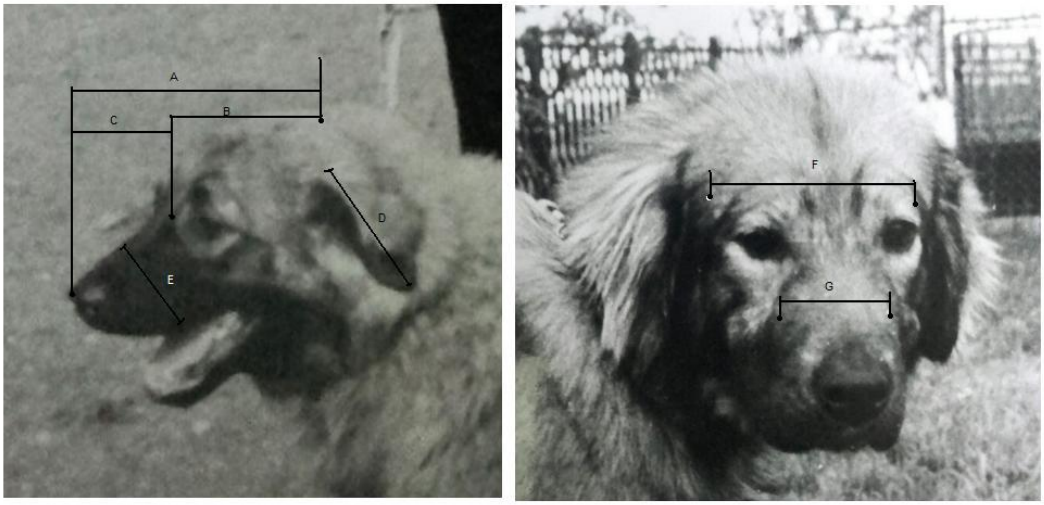

Figure 1. Measuring points – A- head length, B- skull length, C- muzzle length, D- ear length, E- muzzle depth, F- skull width, G- muzzle width.

dogs aged 9 to 18 months, the second (AG II) from dogs aged 1.5 to 3 years, while the third group (AG III) was formed from dogs over 3 years old. Then we run comparative statistics and testing for the statistically significant difference between age groups within the same sex. The existence of a statistically significant difference was checked using the t-test, based on the obtained t value. Statistically significant difference was found to exist between the sexes, as well as between age groups, both in bitches and in males. For both sexes, we compared AG I and AG III relative to AG II. All statistical calculations and comparisons were done using the program GraphPad Prism 5.

Following indexes of body development were also investigated: head index, skull index, muzzle index and head length index. Subsequently, a comparative statistic of these indexes between genders was also done. Indexes were calculated using following formulas:

head index= (skull length/head length) x 100

skull index= (skull width/skull length) x 100

muzzle index= (muzzle width/muzzle length) x 100

head length index= (head length/dog height) x 100

3. Results and Discussions

Table 1 presents values from analyses of absolute and relative craniometric parameters for measured dogs and their comparisons relevant to gender.

The average head length of the male was 29.03 cm, with a variation interval of 26.00 to 32.0 cm and standard deviation of 1.60. The average head length of the female was 27.28 cm. The variation interval of skull length was 15.00 to 20.00 cm, in the male, and 14.00 to 19.50 cm in the female. The arithmetic mean was 17.32 cm in the male with a standard deviation of 1.14. Average muzzle length was 11.78 cm in the male and 10.59 cm in the female. Average muzzle width in the male was 8.49 cm, a in the female 7.76 cm. Skull width was from 11.6 to 18.0 cm in the male and from 10.00 to 17.00 cm in the female. Average skull width in the male was 14.59, and in the female 13.60 cm. Average muzzle depth was 10.73 cm in the male, with a standard deviation of 1.27. In the female, average muzzle depth was 10.09 cm. Average muzzle circumference in the male was 31.73 cm, and in the female 29.98 cm. The variation interval for ear length in the male was from 12.00 to 19.50 cm, and in the female from 12.00 to 18.00 cm.

Average index values were as follows: head length index was 41.80 in the male, and 42.22 in the female. The variation interval for this parameter in the male was from 38.00 to 44.90, and in the female from 37.80 to 46.60. The average head index in the male was 58.32, and in the female 60.95. The average muzzle index in the male was 72.97, and in the female 73.76. The average skull index in the male was 84.48, and in the female 82.04.

A very high statistical difference ($p<0.001$) was recorded for the values of the following parameters between genders: head length, ear length and muzzle circumference. A statistically significant difference ($p<0.01$), was recorded for muzzle width, skull width and muzzle depth. For other measured parameters no statistical difference was established.

The exterior of the Sharplanina was investigated by several authors. The first investigation of body development was done in dogs in the region of Sharplanina Mountain. When investigating the morphological traits of the Sharplanina, Stanković (1967) measured 47 males and 20 females from the Sharplanina Mountain and other sites in Serbia. The average height at withers of the male was 62.87 cm, and of the female 60.75 cm. The average head length in the male was 25.02 cm, and in the female 24.35 cm. Average skull length was 14.55 cm in the male, and 13.90 cm in the female. In this investigation, average head length in the male was 2 cm longer, and in the female this was almost 3 cm longer, that in the investigation performed by Stanković.

Urošević and Latinović (1987) investigated more important exterior measurements in 75 dogs and established that the average height at withers was 60.9 cm, and head length was 41% of the height at withers. The exterior of this breed in Macedonia was investigated by Božinovski (1984) by measuring 30 dogs. He stated that head length in measured dogs was in accordance with proportions defined by the standard for this breed and was approximately 40% of the height at withers. He established an average height in the male of 67.7 cm, and in the female 60.4 cm. The exterior of the Sharplanina in Macedonia was investigated by Drozdovski et al. (1987). They state that the average height of male dogs was 64.00 cm, and of females 59.00 cm. The average head length of the male was 27.17 cm, and of the female 25.92 cm. Simčić (1984) states that in dogs of this breed measured in Slovenia the average head length in the male was 27.00 cm, and in the female 25.6 cm. Skull length in the male was 13.70 cm, and muzzle length 13.20 cm. In the female, skull length was 13.50 cm, and muzzle length 12.10 cm. According to its craniological traits the Sharplanina belongs to mollosoids with a mesaticephalic head type. A comparison between previous research and the results obtained by measuring in this investigation shows an increase of total head length in today's dogs. In measured dogs, skull length was also larger than in previous measurements, but average muzzle length was less. This indicates also a change of the craniological parameter and the relationship between the skull and the facial region of the head in today's dogs compared to dogs of this breed 25 or more years ago. However, the obtained value for the head length index it is still 40% of the height at withers, indicating that the average height at withers of dogs today is greater than in previous investigations.

Table 2 shows descriptive parameters for males segregated into age groups, and the t value of statistical tests performed on age groups as described above.

None of the parameters showed statistically significant difference ($p>0.05$). The mean head length in males from AG I was 28.65 cm and 29.75 cm in males from AG III. Mean values of head length index between AG I and AG III showed minimal difference. In AG I males, it was 41.91% and in AG III males, 42.20%. Nozzle depth and nozzle width had almost the same values in all age categories of males. The highest t value (1.81) was found while comparing head length between AG II and AG III, however it was not statistically significant. Based on obtained values for the recorded parameters, it may be concluded that head in males develops completely by the age of 18 months.

Table 3 shows an overview of descriptive parameters for bitches, obtained in the same method as in males. Obtained t values show statistically significant differences between age groups in three parameters.

Mean head length in bitches aged 1.5 to 3 years (AG II) is 26.96 cm with range from 24.00 to 30.00 cm, while in bitches over 3 years old (AG III) it was 27.92 cm with range from 25.00

Table 1. Statistical analysis of absolute and relative craniometric parameters of measured dogs and their comparisons relevant to gender.

Parameter	Gender	N	M±SD	Sg	CV %	VI	t
Head length	M	44	29.03 ± 1.60	0.24	5.51	26.0 – 32.0	5.95***
	F	65	27.28 ± 1.45	0.18	5.32	24.0 – 30.0	
Muzzle length	M	44	11.78 ± 1.37	0.21	11.59	9.0 – 15.0	1.78ns
	F	65	10.59 ± 1.18	0.15	11.10	7.0 – 13. 0	
Skull length	M	44	17.32 ± 1.14	0.17	6.56	15.0 – 20.0	1.48ns
	F	65	16.69 ± 1.34	0.17	8.04	14.0 – 19.5	
Ear length	M	44	14.94 ± 1.56	0.24	10.46	12.0 – 19.5	3.75***
	F	65	13.95 ± 1.19	0.15	8.54	12.0 – 18.0	
Muzzle width	M	44	8.49 ± 1.28	0.19	15.02	6.5 – 12.0	3.24**
	F	65	7.76 ± 1.07	0.13	13.77	5.5 – 10.5	
Skull width	M	44	14.59 ± 1.53	0.23	10.45	11.6 – 18.0	3.52**
	F	65	13.60 ± 1.39	0.17	10.20	10.0 – 17.0	
Muzzle depth	M	44	10.73 ± 1.27	0.19	11.83	8.5 – 14.0	2.98**
	F	65	10.09 ± 0.95	0.12	9.43	7.5 – 12.0	
Muzzle circumference	M	44	31.73 ± 2.37	0.36	7.46	26.0 – 36.0	4.05***
	F	65	29.98 ± 2.08	0.26	6.96	24.0 – 36.0	
Head index	M	44	58.32 ± 5.01	0.75	9.95	57.5 – 62.3	0.37ns
	F	65	60.95 ± 5.28	0.65	10.56	58.0 – 65.0	
Skull index	M	44	84.48 ± 9.58	1.44	11.34	63.2 – 100.0	1.22ns
	F	65	82.04 ± 10.67	1.32	13.01	55.6 – 100.0	
Muzzle index	M	44	72.97 ± 10.51	1.59	14.41	51.5 – 104.6	0.39ns
	F	65	73.76 ± 10.56	1.31	14.32	50.0 – 114.3	
Head length index	M	44	41.80 ± 1.57	0.24	3.76	38.0 – 44.9	1.13ns
	F	65	42.22 ± 2.12	0.26	5.02	37.8 – 46.6	

ns – no statistical difference (p>0.05); * - statistical difference (p<0.05); ** - significant statistical difference (p<0.01), *** - highly significant statistical difference (p<0.001), M±SD- Mean value with Std. Deviation; Sg - Std. Error; CV- Coefficient of variation; VI - Variation interval; t - T-test value.

Table 2. Statistical analysis of absolute and relative craniometrical parameters of males in AG I and AG III relative to AG II.

Parameter	AG	N	M±SD	SEM	CV %	VI	t
Head length	I	17	28.65 ± 1.77	0.43	6.16	26.0 – 32.0	0.21ns
	II	13	28.77 ± 1.36	0.38	4.74	27.0 – 31.0	-
	III	14	29.75 ± 1.45	0.39	4.88	28.0 – 32.0	1.81ns
Muzzle length	I	17	11.76 ± 1.49	0.36	12.67	9.0 – 14.5	1.10ns
	II	13	11.46 ± 1.35	0.37	11.74	9.0 – 13.0	-
	III	14	11.86 ± 0.93	0.25	7.83	10.0 – 13.0	0.99ns
Skull length	I	17	16.88 ± 0.98	0.24	5.79	15.5 – 19.0	1.21ns
	II	13	17.31 ± 1.30	0.36	7.51	15.0 – 20.0	-
	III	14	17.89 ± 0.88	0.24	4.92	16.0 – 19.0	1.00ns
Ear length	I	17	14.85 ± 1.82	0.44	12.24	12.0 – 19.5	0.01ns
	II	13	14.85 ± 0.98	0.27	6.65	13.0 – 17.0	-
	III	14	15.14 ± 1.75	0.47	11.54	12.0 – 18.0	0.54ns
Muzzle width	I	17	8.88 ± 1.63	0.39	18.30	6.5 – 12.0	1.42ns
	II	13	8.17 ± 0.89	0.25	10.93	6.7 – 9.5	-
	III	14	8.32 ± 1.03	0.28	12.38	7.0 – 10.0	0.41ns
Skull width	I	17	14.47 ± 1.43	0.35	9.88	12.0 – 17.0	0.38ns
	II	13	14.28 ± 1.32	0.36	9.21	11.6 – 16.0	-
	III	14	15.04 ± 1.80	0.48	11.99	12.0 – 18.0	1.24ns
Muzzle depth	I	17	10.85 ± 1.61	0.39	14.82	8.5 – 14.0	0.73ns
	II	13	10.50 ± 0.76	0.21	7.27	9.0 – 12.0	-
	III	14	10.79 ± 1.24	0.33	11.46	9.0 – 12.5	0.72ns
Muzzle circumference	I	17	30.88 ± 2.74	0.66	8.86	26.0 – 36.0	0.97ns
	II	13	31.69 ± 1.38	0.38	4.35	30.0 – 35.0	-
	III	14	32.79 ± 2.33	0.62	7.10	28.0 – 36.0	1.47ns
Head index	I	17	50.53 ± 4.04	0.98	8.00	41.4 – 55.6	0.44ns
	II	13	49.76 ± 5.44	1.51	10.93	38.7 – 59.3	-
	III	14	50.60 ± 5.92	1.58	11.70	37.5 – 59.0	0.38ns
Skull index	I	17	85.95 ± 9.26	2.25	10.77	66.7 – 100.0	1.70ns
	II	13	82.82 ± 8.86	2.46	10.69	68.2 – 96.8	-
	III	14	84.26 ± 10.95	2.92	13.00	63.2 – 100.0	1.26ns
Muzzle index	I	17	75.77 ± 11.89	2.88	15.69	53.9 – 104.6	1.45ns
	II	13	72.31 ± 12.02	3.33	16.62	51.5 – 90.0	-
	III	14	70.16 ± 6.25	1.67	8.91	53.85 – 76.92	0.55ns
Head length index	I	17	41.91 ± 1.34	0.32	3.18	39.1 – 44.1	1.23ns
	II	13	41.22 ± 1.71	0.47	4.15	38.0 – 44.8	-
	III	14	42.20 ± 1.66	0.44	3.93	39.4 – 44.9	1.51ns

ns – no statistical difference (p>0.05); * - statistical difference (p<0.05); ** - significant statistical difference (p<0.01), *** - highly significant statistical difference (p<0.001), M±SD- Mean value with Std. Deviation; Sg - Std. Error; CV- Coefficient of variation; VI - Variation interval; t - T-test value.

Table 3. Statistical analysis of absolute and relative craniometrical parameters of bitches in AG I and AG III relative to AG II.

Parameter	AG	N	M±SD	SEM	CV %	VI	t
Head length	I	16	26.69 ± 1.58	0.40	5.92	24.0 – 29.0	0.53^{ns}
	II	23	26.96 ± 1.55	0.32	5.76	24.0 – 30.0	-
	III	26	27.92 ± 1.02	0.20	3.64	25.0 – 29.0	2.61*
Muzzle length	I	16	10.38 ± 0.90	0.23	8.71	8.5 – 12.0	0.19^{ns}
	II	23	10.43 ± 1.04	0.22	9.94	9.0 – 12.0	-
	III	26	10.87 ± 1.40	0.28	12.92	7.0 – 13.0	1.21^{ns}
Skull length	I	16	16.31 ± 1.50	0.38	9.22	14.0 – 18.0	0.49^{ns}
	II	23	16.54 ± 1.39	0.29	8.40	14.0 – 19.0	-
	III	26	17.06 ± 1.14	0.22	6.70	15.0 – 19.5	1.42^{ns}
Ear length	I	16	13.88 ± 1.09	0.27	7.84	12.0 – 16.0	0.39^{ns}
	II	23	13.74 ± 1.05	0.22	7.67	12.0 – 16.0	-
	III	26	14.19 ± 1.36	0.27	9.56	12.0 -18.0	1.29^{ns}
Muzzle width	I	16	7.19 ± 0.81	0.20	11.32	5.5 – 8.0	2.21*
	II	23	7.89 ± 1.08	0.22	13.64	6.5 – 10.5	-
	III	26	8.00 ± 1.11	0.22	13.81	6.0 – 10.0	0.35^{ns}
Skull width	I	16	13.34 ± 1.31	0.33	9.84	10.0 – 15.0	0.92^{ns}
	II	23	13.76 ± 1.45	0.30	10.56	11.0 – 17.0	-
	III	26	13.62 ± 1.40	0.28	10.30	11.0 – 16.0	0.36^{ns}
Muzzle depth	I	16	9.78 ± 1.02	0.25	10.39	7.5 – 11.0	0.94^{ns}
	II	23	10.07 ± 0.87	0.18	8.64	9.0 – 12.0	-
	III	26	10.31 ± 0.96	0.19	9.31	9.0 – 12.0	0.92^{ns}
Muzzle circumference	I	16	29.31 ± 2.72	0.57	7.75	24.0 – 32.0	1.33^{ns}
	II	23	30.22 ± 1.95	0.41	6.46	28.0 – 34.0	-
	III	26	30.19 ± 2.08	0.41	6.89	27.0 – 36.0	0.04^{ns}
Head index	I	16	50.11 ± 5.15	1.29	10.27	37.0 – 54.2	0.60^{ns}
	II	23	51.12 ± 5.15	1.07	10.07	40.7 – 58.6	-
	III	26	48.82 ± 5.43	1.07	11.12	39.7 – 64.0	1.51^{ns}
Skull index	I	16	82.47 ± 10.90	2.73	13.22	55.6 – 100.0	0.37^{ns}
	II	23	83.84 ± 11.57	2.41	13.80	60.5 – 100.0	-
	III	26	80.19 ± 9.78	1.92	12.20	60.5 – 94.12	1.20^{ns}
Muzzle index	I	16	69.30 ± 5.64	1.41	8.13	61.1 – 80.0	2.73**
	II	23	75.74 ± 8.16	1.70	10.77	63.6 – 100.0	-
	III	26	74.75 ± 13.80	2.71	18.46	50.0 – 114.3	0.30^{ns}
Head length index	I	16	41.93 ± 2.25	0.56	5.38	38.1 – 45.3	0.22^{ns}
	II	23	41.76 ± 2.43	0.51	5.81	37.8 – 46.6	-
	III	26	42.82 ± 1.63	0.32	3.80	39.7 – 45.3	1.82^{ns}

ns – no statistical difference (p>0.05); * - statistical difference (p<0.05); ** - significant statistical difference (p<0.01), *** - highly significant statistical difference (p<0.001), M±SD- Mean value with Std. Deviation; Sg - Std. Error; CV- Coefficient of variation; VI - Variation interval; t - T-test value.

to 29.00 cm. Obtained t value (2.61) indicates statistical significance. Comparison of other parameters showed no statistical significance. Mean nozzle width in bitches from AG II was 7.89 cm with CV of 11.32. In AG I, the mean nozzle width was 7.19 cm with range from 5.5 to 8.0 cm. T-test value of 2.21 indicates statistical difference between these two age groups. Also, nozzle width index shows t value of 2.73, which indicates statistical difference between youngest bitches (AG I) and bitches aged 1.5 to 3 years (AG II). No statistically significant difference was found in other results.

4. Conclusion

The investigation of dogs in the population of the Yugoslav Shepherd Dog Sharplanina breed has shown an increase of overall head length compared to the previous period. Also, the relationship between the length of the skull and the facial section of the head has changed, and the length of the skull section has increased, while the length of the facial section has decreased. In view of the increased height of dogs, proportions and the relationship between head length and height has not changed, and complies with the standard. In males, none of the parameters compared between various age groups showed any statistically significant difference. In bitches, statistically significant difference between age groups exists in head length, and that between bitches aged 1.5 to 3 years relative to bitches older than 3 years. Statistical difference was also observed in nozzle width and nozzle index in bitches up to 18 month of age, compared to bitches aged 1.5 to 3 years.

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