Main body measurements of wolf *Canis lupus* in Bulgaria and their relation to geographic variability and gender

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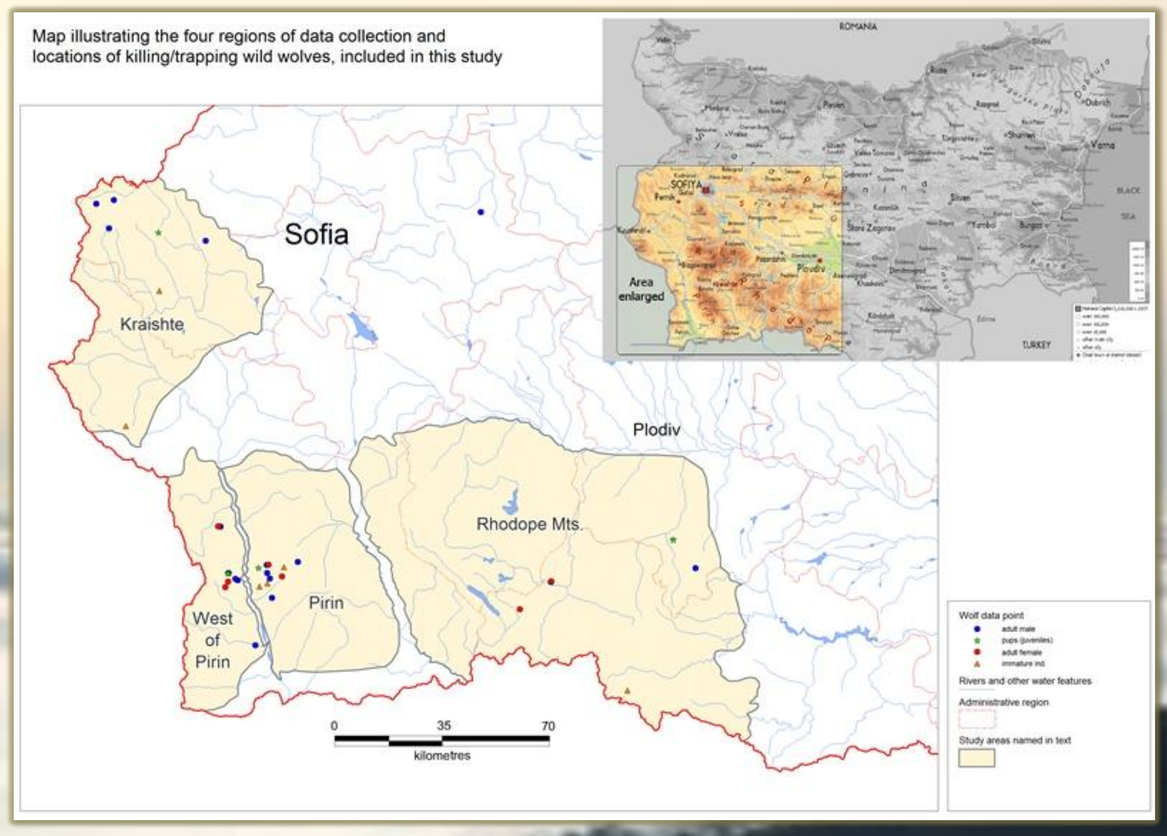
Abstract

Data on wolf *Canis lupus* body size in Bulgaria are usually based on subjective, approximate estimates and are limited to evaluation "by sight" of individuals' body weight. Compiled and analyzed data of bigger sample size from different regions of the country are not presented to date.

In the frames of the present study basic morphometric data have been collected and compared. All together 39 individuals from different sex and age have been subjected to those basic morphologic measurements. The locations where the studied individuals were killed or live-trapped are grouped in four different regions of the country.

Data are presented by mean values and confidence intervals (at p=0,05). There were no statistically significant differences between all data sets among the four localities, which indicate low geographic variation. The comparisons between males and females showed some sex specific values. Measurements taken from juveniles and immature individuals are presented as mean values.



Introduction and objectives

Size and weight of wolves is a topic which causes speculation. In Bulgaria, information about wolf size comes from media and usually individuals weighing more than 50 to 70-80 kg are reported. There is no science-based data about morphometric measurements of wolves, in the country to date. This fact allows the above speculation. Literature from other countries provides information on the size of wolf from similar latitudes. For example Bibikov (1985) reports for Bialowieza forest, Poland, the weight of 62 measured males which ranges from 23.3 to 44.8 kg. Platisa et al. report for Croatia mean body weight of males ranging in different seasons between 35 and 39 kg, and of females 27 – 29,7 kg.
The objective of the present study is to collect data of wolf body measurements and to compare those data by regions and by gender. Basic morphometric data have been collected (body weight, body length (without tail), tail length, head length, head width, neck circumference and height at withers) and compared.

Materials and methods

Data have been collected in the period 2002 – 2014. The studied individuals were hunter-killed/live-trapped in an area ranging between 41° 20' and 42° 48' (latitude). All together 39 individuals have been subjected to those basic morphologic measurements. 18 of those were identified as adult males and 8 as adult females. Data from measurements of the other 13 individuals (6 juveniles, age 4 – 6 months and 7 immature individuals (age 1,1 – 2 years) are presented as average values.

7 of the adult individuals were hunter-killed in Kraishte, 9 were hunter-killed in mountains West of Pirin Mts., 7 were hunter-killed/live trapped in Pirin Mts. and 5 were hunter-killed in the Rhodope Mts. (West and Middle part) (see the map). Some measurements were omitted in some of the animals due to logistic difficulties.

Results

Data are presented by mean values and confidence intervals (at p=0,05). The mean values divided by regions are presented in Table 1. The medians of the samples were compared by Mann-Whitney U-test. There were no statistically significant differences between all data sets among the four localities, which indicate low geographic variation.

The comparisons between males and females showed some sex specific values. The mean values for males and females are presented in Table 2. There were statistically significant differences between the medians of weight, of body length, of head length, head width and neck circumference.

Table 1

Region	Body measurement						
	Weight (kg)	Body length (cm)	Tail length (cm)	Head length (cm)	Head width (cm)	Neck circumference (cm)	Height at withers (cm)
Kraishte							
Mean	39,40	115,50	41,00	27,33	14,27		
confidence interval at p=0,05	3,69	6,24	2,36	0,50	0,99		
West of Pirin Mts.							
Mean	35,31	111,13	38,72	27,07	13,67	40,77	62,86
confidence interval at p=0,05	2,95	5,28	2,22	0,41	0,46	2,45	1,62
Pirin Mts.							
Mean	32,17	105,20	36,80	26,10	14,05	39,00	61,00
confidence interval at p=0,05	6,19	4,97	2,35	1,58	0,91	4,53	4,08
Rhodope Mts.							
Mean	30,46	103,00	41,50	26,25	14,00	35,57	
confidence interval at p=0,05	6,94					5,28	

Table 2

Morphologic measure-ment	Males				Females				Comparison of medians, Mann-Withney U-test
	n	Mean	Confidence interval at p=0,05(+/-)	Range	n	Mean	Confidence interval at p=0,05(+/-)	Range	
Weight (kg)	16	37,94	2,09	30 - 45	8	27,23	2,59	22,8-32,5	U=2; P<0,02
Body length (cm)	11	112,73	3,97	103-120	6	102	6,01	90,0-111,0	U=7,5; P<0,02
Tail length (cm)	14	39,82	1,67	33-44	6	37	2,26	33-40	--
Head length (cm)	14	27,22	0,27	26,5-28	5	25,74	1,24	23,7-27	U=10; P<0,05
Head width (cm)	11	14,25	0,46	13,2-15,5	5	13,2	0,52	12,7-14,1	U=8; P<0,05
Neck circumference	8	41,24	2,16	36,4-46	6	37,28	3,64	30,7-44	U=10; P<0,1
withers height	7	63,14	1,84	60-66	5	60	3,67	54-65	--

Mean values of morphologic measurements taken from pups and immature individuals are presented in Table 3:

Table 3

Morphologic measurement	Pups (4 – 6 months)			Immature ind. (1 – 2 years)		
	n	Mean	Range	n	Mean	Range
Weight (kg)	6	13,8	10,3 - 16	7	26,3	22,8 - 31
Body length (cm)	6	84,5	81 – 87	5	101,2	90 - 120
Tail length (cm)	4	28	20 - 32	6	38,3	31,5 - 41
Head length (cm)	4	20,85	20,4 - 21	4	23,3	19 – 24,6
Head width (cm)	4	10,45	9 - 12	4	13,1	12 – 14,5

Conclusions

There is low geographic variation of morphologic measurements of wolves from the indicated areas of the country.

There are sex specific values of most of the morphologic measurements, included in this study.

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