CORRELATION OF THE TRAITS OF FUR FROM DIFFERENT PARTS OF THE BODY IN ARCTIC FOXES (*ALOPEX LAGOPUS* L.)

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Abstract. The aim of the study was to investigate into the possibility of evaluating arctic fox fur basing on the correlation of laboratory measurements of hairs collected from various parts of the coat. The material involved samples of prime fur hairs of 20 two-year-old females of the blue arctic fox, collected at the end of January. The samples were cut by the skin at six places of the body, namely: the head (between the ears), back (in the middle between the tail base and the neck base), the side (below the place of sampling located on the back), belly (mid between the base of the front limbs and the vulva), the tail (in the middle of the dorsal side), as well as the shank. The samples were subjected to macro- and microscopic measurements. The results indicate that fur coat of arctic foxes is more dense, longer, and usually more intensely colored on the back, as compared to the belly. The hairs on the head and the limbs are much shorter and contain more awn hairs. The results reveal a very weak correlation of the morphological fur characteristics between different parts of the body. It has been found that it is impossible to objectively evaluate the basic structural characteristics and the dark tops of hairs in the arctic fox on the basis of a sample of hair from a single part of the body.

Key words: arctic fox, hair coat, structural and morphological characteristics of hairs, variability

INTRODUCTION

Evaluation of a fur-bearer pelt is based on sensory rating of the characteristics, i.e. by sight and touch. Despite a high selectivity of human senses, it is merely

a subjective method. Measurements have so far involved only the size (length) of the pelt and the color of the fur.

A more objective assessment of the individual characteristics of the structure and color of the coat, through measurements, is also possible [Gedymin et al. 1973, Cholewa, Gedymin 1974], which however is combined with taking samples of hair and can lead to a damage of the fur. Not all areas of the pelt are of equal value in terms of furriery; for example, the fur of the arctic fox on the head, legs, and belly is far less valuable than that on the sides, back, neck, thighs, or even on the tail. A minor damage resulting from hair sample collections from the peripheral parts of the body should not exert a major impact on the overall value of the pelt. In the case of a strong association (correlation) between the characteristics of the fur located on the peripheral regions and of that located on the most valuable parts of the pelt, the sensory evaluation could be supplemented by measuring the samples, thus carried out in an objective way. Applying such a method of assessment would primarily have a cognitive importance, showing the harmony of fur structure as a basis of the coat of an animal; it should also provide information for selection-purposes assessment a live fox, when the evaluation is much more difficult than in the case of a raw pelt.

The aim of the study was to get an insight into the feasibility of arctic fox coat evaluation based on the correlation between laboratory measurements of hair samples collected from various parts of the body.

MATERIAL AND METHODS

The material was represented by samples of prime hair coat collected at the end of January from 20 two-year-old females of blue arctic foxes. The samples, cut by the skin with scissors, were collected from the following six places of the body:

1. Head (between ears),
2. Back (mid between tail base and neck base),
3. Side (below the place of the back sample collection),
4. Belly (mid between the base of frontal legs and the vulva),
5. Tail (middle of the dorsal side),
6. Shank (middle of the external side).

The samples were subjected to macro- and microscopic measurements, which led to specifying the following characteristics:

1. Length of the hair (after straightening),
2. Height of the hair (distance between the apex and the base, measured in hair's natural state),
3. Length of the apical dark band,

4. Thickness of the hair in its middle,
5. Thickness of the hair core in its middle,
6. Percentage composition of four hair types (guard, awn, transitional, and down hairs).

The length of the hairs and color bands were measured using a ruler with precision to 1 mm, whereas the thickness of the hair and its core was measured under a microscope (VEB Carl Zeiss) with precision to 1.8 µm. The above-listed measurements allowed calculating the following indices:

1. Height-to-length ratio of the hair (%), describing hair undulation and corrugation,
2. The ratio of dark band length to the length of the hair (%), a characteristic of the so called voile,
3. The ratio of the core thickness to the hair thickness (%),
4. The ratio of the thickness in microns of the hair to its length in mm (coefficient of hair softness).

All above-listed properties were measured and calculated for each of the four hair types, which had been distinguished in relation to structure and shape according to Toldt [1935]. These four types of hairs are: down, transitional, awn, and guard hairs.

The arithmetic means were used to estimate correlations between individual places using the graphical methods with correlation grids. The dependences visible on the grid were ranked from 0 to 3 points, which has the following meaning:

$$
\begin{aligned}
0 \quad &- \quad \text{no correlation } (r) \\
1 \quad &- \quad\quad\quad\quad\ \ r \ \leq \ 0.20 \\
2 \quad &- \quad 0.20 \ < \ r \ < \ 0.45 \\
3 \quad &- \quad 0.45 \ \leq \ r
\end{aligned}
$$

A minus sign (−) was added to negative values. The correlation was estimated for 552 juxtapositions of paired parts of the body.

RESULTS

Arithmetic means of the characteristics listed in the previous section are presented in Table 1.

Length. The longest coat hairs, i.e. guard and awn hairs, were found on the side, whereas the hairs of the underfur, transitional and down hairs, were roughly equal on the side and tail, although longer than those found on the other parts of the body. The shortest hairs of all four types were found on the peripheral parts, i.e. on the head and the shank; only down hairs were of similar length on the belly.

Table 1.　Arctic fox coat characteristics ($\overline{x}$, SD)

Tabela 1. Cechy okrywy włosowej lisa polarnego ($\overline{x}$, SD)

Characteristic Cecha	Place of sample collection Miejsce pobrania próbek											
	Head Ciemię		Back Grzbiet		Side Bok		Belly Brzuch		Tail Ogon		Shank Podbudzie	
	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD
Guard hairs Włosy przewodnie												
1. Length, mm Długość, mm	42.5	3.7	67.8	7.8	76.1	6.4	61.6	6.5	64.8	10.9	51.2	7.2
2. Height, mm Wysokość, mm	40.0	3.2	63.1	7.2	64.8	9.4	55.2	6.4	63.8	10.5	48.8	7.1
3. Height-to-length ratio, % Wysokość w % długości	94.1		93.1		85.3		89.7		98.5		95.3	
4. Color band length, mm Długość pasa barwnego, mm	10.8	2.0	15.9	2.8	15.6	4.4	11.0	1.8	7.5	3.6	12.2	4.4
5. Color band length to hair length, % Długość pasa barwnego w % długości włosa	25.7		23.6		20.8		18.2		11.6		23.8	
6. Hair thickness, µm Grubość włosa, µm	60.5	17.5	64.3	8.4	70.0	8.9	67.6	7.3	99.3	17.6	65.8	8.2
7. Core thickness, µm Grubość rdzenia, µm	41.6	3.9	44.0	5.6	45.5	7.3	41.7	6.5	77.2	17.8	42.6	7.4
8. Core thickness to hair thickness, % Grubość rdzenia w % gruości włosa, µm	68.7		68.3		64.9		61.5		77.3		64.0	
9. Softness coefficient Współczynnik miękkości	1.4		0.9		0.9		1.1		1.6		1.4	
10. Percentage contribution to sample, % Udział w próbce, %	2.2		0.9		0.3		0.4		0.4		0.6	
Awn hairs Włosy ościste												
1. Length, mm Długość, mm	36.2	3.7	54.8	5.7	65.2	3.6	50.5	8.1	56.2	9.8	33.5	5.7
2. Height, mm Wysokość, mm	33.2	3.6	47.9	5.2	51.2	7.1	46.2	7.1	53.8	9.2	31.6	5.5
3. Height-to-length ratio, % Wysokość w % długości	92.1		88.4		78.4		91.7		95.8		94.3	
4. Color band length, mm Długość pasa barwnego, mm	5.7	1.8	6.7	1.2	6.3	2.2	7.0	2.4	5.1	1.6	7.9	2.7
5. Color band length to hair length, % Długość pasa barwnego w % długości włosa	15.8		12.1		10.0		13.8		9.3		23.6	
6. Hair thickness, µm Grubość włosa, µm	41.6	5.8	37.1	4.8	41.2	5.6	43.9	7.4	87.5	11.1	47.4	7.0
7. Core thickness, µm Grubość rdzenia, µm	26.8	4.4	25.9	3.7	26.6	4.2	25.7	5.5	63.2	11.6	30.7	5.1

Table 1.   Arctic fox coat characteristics ($\overline{x}$, SD) – continued

Tabela 1. Cechy okrywy włosowej lisa polarnego ($\overline{x}$, SD) – ciąg dalszy

Characteristic Cecha	Place of sample collection Miejsce pobrania próbek											
	Head Ciemię		Back Grzbiet		Side Bok		Belly Brzuch		Tail Ogon		Shank Podbudzie	
	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD
8. Core thickness to hair thickness, % Grubość rdzenia w % grubości włosa, μm	64.4		66.0		64.3		58.2		77.1		65.0	
9. Softness coefficient Współczynnik miękkości	1.1		0.7		0.6		0.9		1.5		1.4	
10. Percentage contribution to sample, % Udział w próbce, %	11.1		6.5		4.3		6.2		2.9		4.2	
Transitional hairs Włosy przejściowe												
1. Length, mm Długość, mm	28.9	3.2	48.9	4.0	56.6	4.7	38.5	4.2	56.8	6.3	25.3	6.2
2. Height, mm Wysokość, mm	26.4	3.1	40.8	3.8	41.9	4.2	32.6	1.2	52.4	6.2	23.1	4.8
3. Height-to-length ratio, % Wysokość w % długości	90.9		84.5		74.4		84.8		92.2		91.3	
4. Color band length, mm Długość pasa barwnego, mm	0		0		2.8	1.1	3.6	0.6	3.2	0.9	7.9	2.2
5. Color band length to hair length, % Długość pasa barwnego w % długości włosa	0		0		4.9		9.1		5.6		13.8	
6. Hair thickness, μm Grubość włosa, μm	18.8	1.6	20.1	2.1	26.8	4.2	26.5	4.1	51.8	4.7	27.2	5.5
7. Core thickness, μm Grubość rdzenia, μm	11.7	1.5	16.6	1.7	16.7	2.3	14.6	2.5	37.6	4.8	16.4	3.9
8. Core thickness to hair thickness, % Grubość rdzenia w % grubości włosa, μm	60.6		72.5		62.7		55.2		72.5		59.8	
9. Softness coefficient Współczynnik miękkości	0.6		0.4		0.5		0.7		0.9		1.1	
10. Percentage contribution to sample, % Udział w próbce, %	27.7		17.0		14.1		9.5		5.8		6.9	
Down hairs Włosy puchowe												
1. Length, mm Długość, mm	21.3	2.0	38.3	3.7	44.6	4.3	20.1	2.9	45.1	4.7	19.2	4.2
2. Height, mm Wysokość, mm	17.9	2.3	30.4	2.7	25.7	3.5	14.1	2.2	35.7	4.2	16.7	3.5
3. Height-to-length ratio, % Wysokość w % długości	83.6		78.5		57.5		69.9		79.0		87.0	
4. Color band length, mm Długość pasa barwnego, mm	0		0		0		0		0		0	

Table 1.   Arctic fox coat characteristics ($\overline{x}$, SD) – continued

Tabela 1. Cechy okrywy włosowej lisa polarnego ($\overline{x}$, SD) – ciąg dalszy

Characteristic Cecha	Place of sample collection Miejsce pobrania próbek											
	Head Ciemię		Back Grzbiet		Side Bok		Belly Brzuch		Tail Ogon		Shank Podbudzie	
	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD	$\overline{x}$	SD
5. Color band length to hair length, % Długość pasa barwnego w % długości włosa	0		0		0		0		0		0	
6. Hair thickness, μm Grubość włosa, μm	13.2	0.7	12.9	0.8	17.0	0.6	16.3	1.0	26.6	3.2	15.4	1.5
7. Core thickness, μm Grubość rdzenia, μm	8.0	0.7	8.9	0.7	10.6	0.9	9.5	0.6	17.5	2.7	9.0	1.4
8. Core thickness to hair thickness, % Grubość rdzenia w % grubości włosa, μm	59.4		69.0		62.2		58.6		66.4		58.5	
9. Softness coefficient Współczynnik miękkości	0.6		0.3		0.4		0.8		0.6		0.8	
10. Percentage contribution to sample, % Udział w próbce, %	59.0		75.6		81.3		84.0		90.1		88.3	

Height. The highest coat hairs were found on the side, tail, and back, whereas highest underfur hais were found on the tail. The lowest and the shortest coat hairs were found on the head and the shank, while down hairs – on the belly.

Height-to-length ratio. The least wavy or corrugated hairs, i.e. showing the highest indices, were found on the tail and the peripheral regions of the body. The lowest value of this characteristic in all hair types was observed on the side.

Dark band length. Dark topical bands were present on guard and awn hairs, less frequent on transitional hairs, and completely absent from the hairs of the head and the back. The down hairs lacked this characteristic altogether. The longest dark bands on hairs were found on the back and the shank, the shortest – on the other hand – on the tail.

Dark band length to hair length ratio. The longest dark band in relation to hair length (%) was found in the samples collected on the shank, followed by the head. The shortest, on the other hand, was found on the side and the back.

Hair thickness. The thickest hairs within all the studied types were found on the tail, being much thicker as compared to the other parts of the fox's body, which in terms of this characteristic differed only slightly from one another. The thinnest hairs were found on the head and – in the case of transitional and awn hairs – also on the back.

Table 2. Analysis of correlation in the characteristics between the body parts

Tabela 2. Analiza zależności cech między okolicami ciała

No. Lp.	Characteristics Cechy	Hair type Typ włosa	G C	B C	V C	O C	P C	B G	V G	O G	P G	V B	O B	P B	O V	P V	P O
1.	Hair length, mm	α	–1	+1	0	+2	0	+1	0	0	0	0	–1	0	0	0	0
2.	Długość włosa, mm	β	0	0	0	+1	0	+1	0	–1	0	0	0	+1	0	0	+1
3.		γ	0	0	0	0	0	0	0	–1	0	0	0	+1	0	0	0
4.		δ	0	0	0	0	+1	+2	0	–1	0	+2	0	0	–1	0	0
		Σ	–1	+1	0	+3	+1	+4	0	–3	0	+2	–1	+1	–1	0	+1
5.	Hair height, mm	α	–1	0	–1	+2	+1	+1	+1	0	+1	+1	+1	+1	–2	0	+2
6.	Wysokość włosa, mm	β	0	0	–1	+1	+1	0	0	0	+1	0	+1	0	0	0	+2
7.		γ	0	0	0	+1	–1	0	0	0	0	+1	0	+1	0	+1	+1
8.		δ	+1	0	0	–1	+2	–1	0	–1	0	+1	+1	0	0	0	0
		Σ	0	0	–2	+3	+3	0	+1	–1	+2	+3	+3	+2	–2	+1	+5
9.	Hair height–to–length, %	α	0	0	0	+2	–1	+1	+1	–1	0	0	+1	0	0	+2	0
10.	Wysokość w % długości	β	+2	+1	0	+2	+1	+1	+1	+1	+1	+2	0	0	+2	0	0
11.		γ	0	0	0	+1	0	0	+1	+1	+1	+2	+2	+1	0	+2	0
12.		δ	0	+1	0	0	0	+1	0	0	0	+2	+1	0	+1	0	–1
		Σ	+2	+2	0	+5	0	+3	+3	+1	+2	+6	+4	+1	+3	+4	–1
13.	Length of color band, mm	α	+1	–2	+1	+1	0	–2	–2	–1	+1	+1	–1	0	+1	0	0
14.	Długość pasa barwnego, mm	β	0	0	+1	+2	0	0	+1	–1	+1	0	+1	+2	+2	+2	+1
15.		γ	–	–	–	–	–	–	–	–	–	+1	+2	+2	+1	0	+1
		Σ	+1	–2	+2	+3	0	–2	–1	–2	+2	+2	+2	+4	+4	+2	+2
16.	Length of color band to hair length, %	α	+1	–2	+1	0	0	0	–1	0	0	0	0	0	0	+1	–1
17.	Długość pasa barwnego w % długości włosa	β	0	0	0	0	0	0	0	0	0	0	–1	0	+2	0	0
18.		γ	–	–	–	–	–	–	–	–	–	0	+1	+1	+1	0	0
		Σ	+1	–2	+1	0	0	0	–1	0	0	0	0	+1	+3	+1	–1
19.	Hair thickness, µm	α	+1	–1	–1	–2	+1	–1	–2	–1	0	+1	–1	+2	0	–1	–1
20.	Grubość włosa, µm	β	0	–2	–1	–1	0	+1	0	–1	0	+2	–1	–1	0	–1	–1
21.		γ	+1	–1	–1	0	+1	0	+1	+1	–2	+2	0	–1	0	–1	+1
22.		δ	0	+1	0	0	–1	0	+1	–1	–1	0	0	0	0	0	0
		Σ	+2	–3	–3	–3	+1	0	0	–2	–3	+5	–2	0	0	–3	–1
23.	Core thickness, µm	α	+1	–2	+1	–1	0	–2	–2	–1	–1	+1	0	+2	+1	–1	–1
24.	Grubość rdzenia, µm	β	+1	–2	0	–1	0	+1	0	–1	–1	+1	–1	–1	0	0	0
25.		γ	0	–2	–1	+1	+2	0	–2	0	–1	+2	0	0	+1	–1	+1
26.		δ	0	–1	0	0	–1	0	0	–2	–2	+2	0	+1	0	0	+1
		Σ	+2	–7	0	–1	+1	–1	–1	–4	–5	+6	–1	+2	+1	–2	+1
27.	Core thickness to hair thickness, %	α	0	–1	0	0	–1	+1	+1	+1	–1	+2	+1	+1	+2	0	0
28.	Grubość rdzenia w % grubości włosa	β	+2	+1	+1	0	0	0	+1	–1	0	+1	–1	0	+2	+2	+1
29.		γ	+1	+1	0	+1	+1	+1	0	+1	+1	+1	+3	+3	0	0	+3
30.		δ	0	0	+1	+2	0	0	+1	0	–1	0	0	+1	+1	0	0
		Σ	+3	+1	+2	+3	0	+2	+3	+1	–1	+4	+3	+5	+5	+2	+4
31.	Softness index	α	0	–1	–1	0	+1	0	0	0	0	+1	0	0	0	0	0
32.	Współczynnik miękkości	β	0	–1	0	+1	+2	+1	0	0	0	+1	–1	+1	0	–1	0
33.		γ	0	0	–2	+1	0	0	0	0	0	+1	+1	0	–1	–1	+1
34.		δ	0	0	0	0	+1	0	0	0	0	+1	+1	+2	+2	0	0
		Σ	0	–2	–3	+2	+4	+1	0	0	0	+4	–1	+3	+1	–2	+1
35.	Morphological percentage composition	α	0	–1	0	+2	0	0	0	0	+1	–1	+1	–1	–1	–1	0
36.	Morfologiczny skład procentowy	β	0	0	0	+1	+2	0	0	0	0	+1	0	0	+1	0	0
37.		γ	+1	0	0	+1	0	+1	0	+1	–1	0	–1	0	0	0	0
38.		δ	0	+1	+1	+1	0	+1	+1	0	–1	+1	–1	–1	0	–1	0
		Σ	+1	0	+1	+5	+2	+2	+1	+1	–1	+1	–1	–2	0	–2	0

G – Back; B – Side; V – Belly; O – Tail; C – Head; P – Shank; α – Guard hairs; β – Awn hairs; γ – Transitional hairs; δ – Down hairs.

G – grzbiet; B – bok; V – brzuch; O – ogon; C – ciemię; P – podudzie; α – włosy przewodnie; β – włosy ościste; γ – włosy przejściowe; δ – włosy puchowe.

Core thickness. The pattern of this characteristic was found similar to that of hair thickness, i.e. the hairs on the tail were characterized by the thickest core, deviating even more than hair thickness on the other parts of the body. The thinnest core was measured in the hairs on the head.

Core thickness to hair thickness ratio. This trait was a characteristic of the core volume within the hair. Within the guard hairs, this ratio was the highest in the samples collected from the tail, in the transitional hairs it was equal for the tail and the back, whereas for the down hairs, the core was most bulky on the back followed by the tail.

Hair thickness to hair length ratio. The index of softness was highest for the guard hairs on the tail, head, and shank, whereas for the transitional and down hairs – on the shank, tail and belly. The softest hairs, i.e. those of the lowest ratio, were the hairs on the back and the side.

Morphological composition of the coat. This characteristic was expressed as a percentage composition of the four hair types. The most guard hairs were present on the head, back, and belly, whereas the underfur hairs were most abundant in the samples taken from the tail and the shank.

Correlations. The correlation of the individual hair characteristics between the studied parts of the body turned out to be negligible. The degree of dependence resulting from correlational grid diagrams was estimated in points: 0, 1, 2, 3, and – in the case of negative correlation – with a "minus" sign. The diagrams rated 2 pts demonstrated correlation coefficients, r, ranging 0.2–0.45. Since for the sample size of 20 specimens the correlation significance threshold is 0.44, further calculations of r for dependences rated 2 pts or less was abandoned. There were only three diagrams rated 3 points. Hence, a correlation of a coefficient r being significant or close to significance was detected in no more than 2% of the diagrams. Estimated correlations are shown in Table 2; this shows that the estimate of 0 prevails, i.e. there is a complete lack of correlation. For a number of 552 diagrams, the following dependences were demonstrated:

–2	17	3.1%
–1	85	15.4%
0	267	48.4%
+1	138	25.0%
+2	42	7.6%
+3	3	0.5%
	552	100.0%

DISCUSSION

Hair coat characteristics presented in this study have been studied by many authors. The research was intended to examine the environmental [Dahlman et al. 2002, 2003] and genetic determinants of these characteristics, or to reveal the sources of their variation [Cholewa 1978, 1983, Piórkowska 2001, Przysiecki et al. 2009]. The sources of variation also generally included the topographic variability, involving the differentiation of fur quality depending on its location on the body [Cholewa 1983, Piórkowska, Natanek 2007].

The most valuable fur is that of the trunk, whereas the fur in the area of the head and the limbs is of much lower quality [Cholewa 2000]. The coat of the arctic fox on the back is thicker, longer, and usually more intensely colored than that on the belly. On the head and the limbs, the fur is much shorter and awn hairs prevail in it. The hair on the tail is longer than on the trunk.

The presented results of measurements of the coat characteristics on the back of arctic foxes are similar to those available in the specialist Polish [Cholewa 1978, 1983, 1988], Russian [Syrnikov, Vladimirov 1977], and German literature items [Cholewa 1982].

It is difficult, however, to compare the data coming from other regions of the body, because the worse quality of hairs on them previously discouraged any measurements. The presented analysis of the arctic fox coat characteristics has brought closer the variability of the characteristics on body regions that complement their topographical diversity. The relationships between the same fur characteristics in different parts of the body in the arctic fox were rarely discussed. Only Mejza [1975], using canonical correlation, showed that the relationships between the core thickness of awn, transitional, and down hairs in various regions of the body proved to be statistically non-significant at $\alpha = 0.05$. However, this author's finding of a statistically significant correlation between the core thickness of guard hairs located on different body parts proved that it is desireable to search for a method of arctic fox fur evaluation based on physical properties.

The data reported in this study revealed of a very weak correlation of a number of morphological hair characteristics between the parts of the body. While it may have partly resulted from the small size of the study group of foxes, it is also very doubtful that examination of a much more numerous population could demonstrate a radical change in the results. In any case, it does not seem possible to base an objective assessment on the measurements of hair from only one part of the body of a polar fox.

CONCLUSIONS

1. The mean values of the structural coat characteristics indicates a particular abundance of hair on the tail, and the smallest amount on the head.

2. The most intense coat color was found on the head and the shank, and the poorest on the tail, which also corresponds to the visual evaluation.

3. The correlation in the characteristics between different parts of the body turned out to be negligible – statistically non-significant.

4. It is impossible to assess the basic structural characteristics and the dark tops of hairs in the arctic fox fur cover on the basis of a single sample of hair.

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WSPÓŁZALEŻNOŚĆ CECH OKRYWY WŁOSOWEJ Z RÓŻNYCH PARTII CIAŁA U LISÓW POLARNYCH (*ALOPEX LAGOPUS* L.)

Streszczenie. Celem pracy było zbadanie możliwości oceny okrywy włosowej lisów polarnych na podstawie zgodności pomiarów laboratoryjnych wykonanych na próbkach włosów z różnych okolic ich futra. Materiał badawczy stanowiły próbki dojrzałej okrywy włosowej 20 dwuletnich samic lisa polarnego niebieskiego, które pobrano w końcu stycznia. Wycięto je przy skórze z 6 miejsc na powierzchni ciała zwierzęcia, które stanowiły: ciemię (między uszami), grzbiet (środek między nasadą ogona a nasadą szyi), bok (poniżej miejsca pobrania próbki grzbietu), brzuch (w połowie odległości między nasadą przednich łap a sromem), ogon (środek strony grzbietowej) oraz podudzie. Próbki poddano pomiarom makro- i mikro-skopowym. Uzyskane wyniki wskazują, że okrywa włosowa lisów polarnych na grzbiecie jest gęściejsza, dłuższa oraz z reguły intensywniej umaszczona niż na brzuchu. Na głowie oraz na kończynach owłosienie jest znacznie krótsze i większy w nim udział mają włosy ościste. Wyniki niniejszej pracy świadczą o bardzo słabej zależności szeregu cech morfologicznych owłosienia między poszczególnymi okolicami ciała. Stwierdzono, że niemożliwa jest ocena obiektywna podstawowych cech strukturalnych i ciemnych wierzchołków włosów w okrywie lisa polarnego na podstawie pomiarów włosów tylko z jednej partii ciała zwierząt.

Słowa kluczowe: cechy strukturalne i morfologiczne włosów, lis polarny, okrywa włosowa, zróżnicowanie