

Conference Paper

Deviations in Pholidosis of the Grass Snake *Natrix natrix* (L. 1758) from the Tatarstan Republic

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Abstract

This paper is devoted to the consideration of qualitative and quantitative characteristics of pholidosis deviations in grass snakes and the intraspecific variation of these features. 35 types of deviations were observed: segmentation, incomplete separation, fusion, reduction of scales and the presence of an additional small scale. The frequency and values of individual and population spectra of deviations were higher in adult snakes. Minimal values of all indices were characterized for a sample from the Laishevsky region. Deviations observed in grass snakes occur in other species of snakes, mostly deviations of the ventral and subcaudal scales.

Keywords: morphology, pholidosis, deviations, variability, grass snake.

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1. Introduction

The number, location, size and shape of certain scales are usually species-specific for reptiles. However, sometimes deviations in the pholidosis normally uncommon for this structure occur. Various terms are used to describe these structures: "scale anomalies" [3, 9], "changes in pholidosis" [10], "variations of pholidosis" [2, 7], "deviations of pholidosis" [2] and others.

Today there is no unified system of deviation classification in reptiles. There is a little information about some species [3, 5-7, 10]. Deviations are sometimes considered as a local variety of forms [2], so of special interest is the investigation of deviations in different species and populations and the examination of the frequency allocation of deviations in species area. This research presents data on pholidosis deviations in grass snakes from the Tatarstan Republic and comparative data on samples from different regions of the republic.

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2. Methods

The material for this research was gathered in 2009-2015 in the following regions of the republic: Zelenodolsky (Raifsky area of the Volzhsko-Kamsky National Nature Biosphere Reserve), Laishevsky (2 localities: Saralinsky area of the Volzhsko-Kamsky National Nature Biosphere Reserve and the neighborhood of the recreation centre "Kordon"), Vysokogorsky (the neighborhood of the village of Alan-Bekser) and Spassky (the National Nature Complex Reserve "Spassky"). In total, 641 individuals were investigated: 488 adults (311 males and 177 females) and 153 juveniles. Three samples were used for comparison between the regions because of the small sizes of the samples from "Kordon" and "Raifsky" (less than 50 individuals). To evaluate the quantitative characteristics of deviations, some indices and coefficients recommended for the evaluation of amphibian morphological anomalies were used [1].

3. Results

Pholidosis deviations occurred in 53% of grass snakes. 35 types of deviations were observed: segmentation (Fig.1 a, b, o, t-v, z-c₁, f₁), incomplete separation (Fig.1 e-g, n, x, y, e₁), fusion (Fig.1 h-m, p, q, s, g₁-i₁), reduction (Fig.1 r) of scales and the presence of an additional small scale (Fig.1 c, d). The most common were deviations of the ventral, subcaudal and loreal scales and scales in the posttemporal area.

There were no sex differences in the quantitative indices of deviations. Age differences were noted: adult snakes demonstrate a higher frequency of individuals with deviations (60% of individuals) than juveniles (30%) ($\chi^2=27.78$; $p<0.0001$). The values of individual and population spectra of deviations were also higher in adults (0.9 and 35 respectively) than in juveniles (0.5 and 16 respectively). It is difficult to determine the cause of age differences. On the one hand, the developmental conditions of these generations may differ. On the other, the juvenile sample is smaller than the adult sample, so perhaps not all types of deviations are present there.

The comparison of grass snake samples from different regions of the republic showed that minimal values of all indexes were observed in the Laishevsky region (Table 1). The frequency of deviant individuals in the Laishevsky region was significantly lower than those in the Vysokogorsky ($\chi^2=10.6$; $p=0.001$) and Spassky ($\chi^2=7.38$; $p=0.0066$) regions. The population spectra of all samples were similar ($I_{cs}>50\%$). Cluster analysis showed that the sample from the Vysokogorsky region was distanced from the others (Fig. 2).

Analyzing data from other researchers, we can say that the deviations in grass snakes observed during this research occur in other species of snakes, too. All six types of division of the ventral scales noted by James Peters were found in grass snakes [6]. Several researchers have observed the segmentation of ventral scales and call these structures “*half-ventrals*”, “*half-ventral scales*” [4, 6] or “*bifurcation of scales*” [10]. The deviations in the subcaudal scales were also noted by other authors [3, 9]. Deviations of the pileus are rarely mentioned [10]; most researchers note deviations in the ventral and subcaudal scales, which, according to our data, are the most frequent deviations.

Whether deviations affect the health, activity and other aspects of the reptiles’ lives is a difficult question. It is known that deviations of the ventral scales are often seen together with spine and rib anomalies in snakes [4, 6]. Some researchers note smaller body length, lower locomotor performance [4] and fewer reproductive opportunities [8] in snakes with “*half-ventral scales*”. Nevertheless, the question of the adaptive significance of pholidosis deviations remains open.

4. Conclusion

Pholidosis deviations in grass snakes are diverse and affect almost all the scales of the pileus, the lateral side of the head and the abdominal side of the body. Deviations in the ventral, subcaudal and loreal scales and scales in the posttemporal area were more common for snakes from the studied area. The quantitative indices of deviations varied among samples from different regions of the republic. Other researchers have also observed deviations in different species of snakes, mostly deviations in the ventral and subcaudal scales.

TABLE 1: Quantitative characteristics of pholidosis deviations in samples from different regions of the Tatarstan Republic.

Indexes	Samples					
	Vysokogorsky (n=142)		Laishevsky (n=168)		Spassky (n=256)	
	n	%	n	%	n	%
P_{as}	89	62.7	73	43.5	147	57.4
S_{ap}	23		20		30	
S_{ai}	1.0		0.6		0.9	
$M / min-max$	0-4		0-4		0-5	

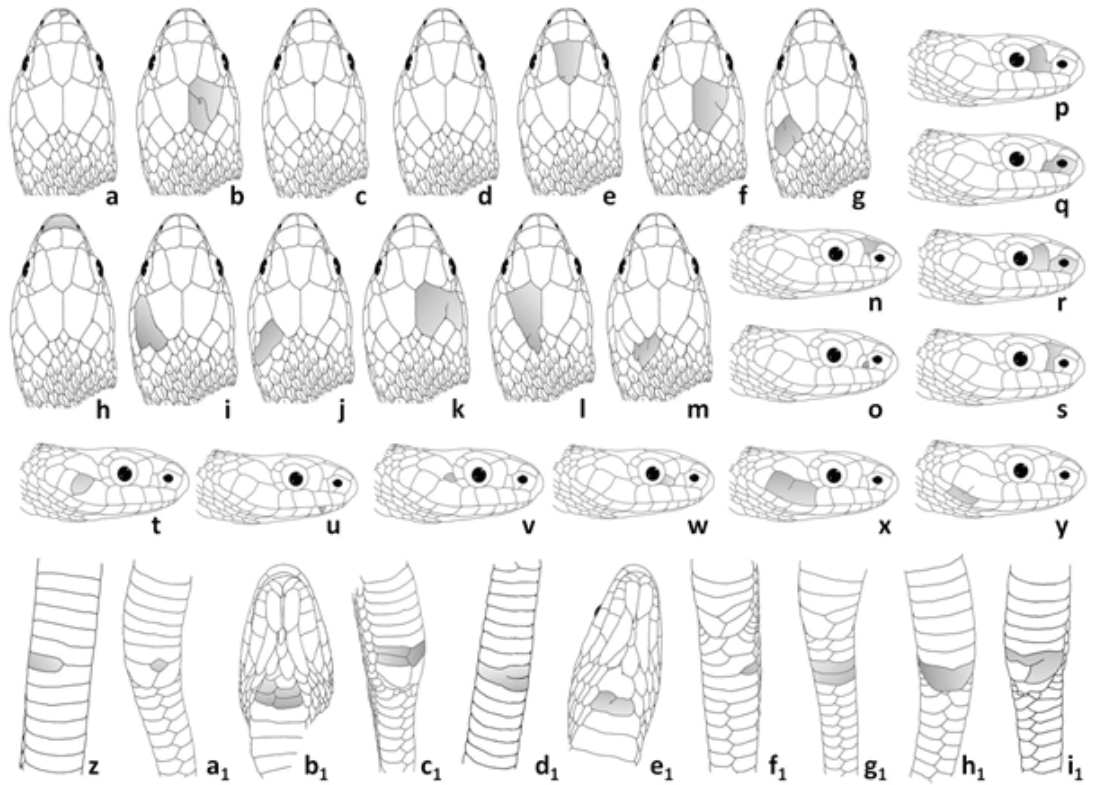


Figure 1: Pholidosis deviations in grass snakes.

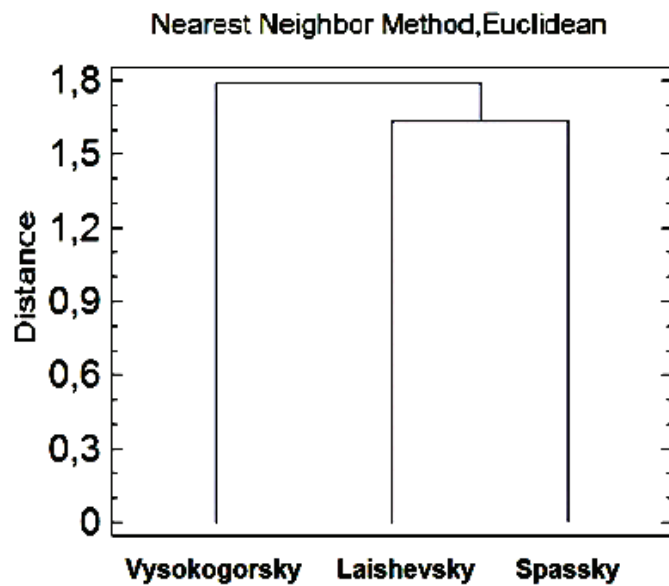


Figure 2: Cluster analysis of samples from different regions of the Tatarstan Republic.

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