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STEPPE VIPER (*Vipera renardi*) IN THE NORTHERN POINT OF ITS AREA

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INTRODUCTION

Some morphological and ecological data on *V. renardi bashkirovi* (the extreme north population of *Vipera renardi*) are presented.

MATERIAL AND METHODS

Investigations were conducted on an archipelago of Kuibyshev reservoir from 2000 to 2002. The studied area belongs to the forest-steppe Volga Region (Zapadnoe Zakam'e, Tatarstan, Russia) and situated at 54°55′ – 55°5′ N and 49°5′ – 49°20′ E. The island system (Spassk Archipelago) includes about 60 islands and belongs administratively to Spassk District of Tatarstan (Russia). Island plant formations (habitats of steppe viper) are described; ecology and morphology of the steppe viper population were studied.

The following morphological characters were used: L. (length of head-body), L.cd. (length of tail), Ventr. (number of ventrals), S.cd. (number of subcaudals), Sq. (number of midbody dorsal scale rows), S.orb. [number of scales in circumocular ring (right + left)], Lab. [number of supralabials (right + left)], Sublab. [number of sublabials (right + left)].

RESULTS AND DISCUSSION

The archipelago includes forest (the whole territory or 80% of it is covered by forest and bushes) and forest-meadow (most part of which are meadows) islands. The forest islands are well-preserved fragments of the former brand-leaved forests of oak, linden, maple forests, and elms. At present a half of the islands is covered mainly by meadow vegetation, which is used for haymaking and pasture. Phytocenoses of islands are presented by 32 plant formations, including xerophilous, mesophilous and hydrophilous ecological complexes.

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Habitats. The central part of the archipelago is occupied by the largest two islands. The first one is about 15 km^2. There are remains and ruins of buildings of "old town" Spassk covered with vegetation. Natural tree vegetation is absent on the island. The vegetation includes small sites of pine, birch and balsamic poplar; on the former "old town" territory there maple and solitary apple trees occur. The main area of the island is occupied by anthropogenic-caused "bush-steppe" broom being the basic species; grass vegetation consists of forest-steppe and weed forms: *Myosotis popovii*, *Poa anguistifolia*, *Astragalus cicer*, *A. danicus*, etc. The role of *Festuca valesiaca* increases with pasture intensity increase and with high load on grass vegetation soil denudation is marked. On the elevations along the border of the "old town" the *Festuca-Artemisia* cenoses are developed (Pavlov and Bakin, 2001).

Steppe viper are practically absent in the places of regular pasture. They prefer "mosaic coenoses," open places with prevalence of *Festuca* and *Artemisia*, alternating with numerous ruins and pits covered by ruderal vegetation (*Leonurus quinquelobatus*, *Urtica dioica*, *Artemisia vulgaris*, *Conium maculatum*, etc.). For the first time steppe viper was found in the central part of the island in 2000 and that was due to the pasture reduction and recovery succession development. Broom growth serves as a shelter from high day temperatures and constant winds. Orthoptera are abundant (30 – 50 ex./m^2) comprising a significant part (more than 30%) in adult snake feeding on the overgrown areas as well as on the territory of the "old town." Orthopteran larvae are the main food of vipers up to three years. Murid rodents numerous on all islands prevail in the nutrition of the adult snakes. Population of the steppe viper on the Spassk Island is estimated as approximately 700 – 800 individuals. The second unknown early habitat of vipers was found on the island, which is about 8 km^2 and situated west of the Spassk Island. It is a constant habitat of another group of 500 – 900 snakes. In the southern and eastern parts the island is covered for 2/3 by forest (oak, linden etc.) alternating with plots of wet meadows. The steppe viper is spread all over its territory including forest biome where *Vipera berus* was proposed to be met. The snakes were met here in wet and swamp habitats though it is not characteristic of the species. Moreover, the

species was found on two islets being the enclaves of the Spassk Island. Their areas comprise 20 and 2.8 ha. Here the snakes keep to the wet meadows and swamp plots (*Carex acuta*, *C. juncella*, *Rumex thyrsiflorus*, *Taraxacum* sp., etc.) from spring to autumn returning to Spassk Island for hibernation.

Morphological characters. The snakes of this population have got a number of ecological and morphological characters making this population a unique one. The discoverer of the population considered it to be a Tertiary relic (Bashkirov, 1935). On the basis of a number of morphological differences, the steppe viper of Spassk Archipelago was described as distinct subspecies *Vipera renardi bashkirovi* Garanin, Pavlov et Bakiev 2004.

Within the whole population of ursinii-complex the Spassk population vipers have the largest **total length** (up to 710 mm). This index can be compared only with the Orlov Island samples in the Black Sea (Kotenko, 1981). **Ventr.:** mean values of this indication of both sexes of the Spassk population are close to those of *V. r. renardi* taxon (Altai) and *V. r. renardi* taxon (east) and the limit of their variation is the widest among snakes of ursinii-complex. **S.orb. (right + left):** as well as number of ventrals by mean values this indication is close to those in *V. r. renardi* taxon (Altai) and *V. r. renardi* taxon (east). **Lab.:** indication meaning's variation of the males in the northern population is wider when compared with the entire *renardi* taxa (Nilson and Andrén, 2001), and mean indication values closer to east form of *V. r. renardi*. Mean values of female's sublabials is lower than that in *renardi* taxa on the whole. The number of Sublab. for both sexes is lower when with *renardi* taxa.

TABLE 1. Some Pholidosis Characteristics of the Spassk Population of Steppe Viper

Characters	Sex	*N*	Range	Mean ± S.E.
L.	♀♀	73	320 – 665	533.36 ± 7.41
	♂♂	43	339 – 615	478.35 ± 9.79
L.cd.	♀♀	72	30 – 80	52.85 ± 1.15
	♂♂	42	43 – 95	65.17 ± 1.71
L. + L.cd.	♀♀	72	351 – 710	586.78 ± 8.19
	♂♂	42	388 – 670	543.00 ± 10.92
Ventr.	♀♀	45	140 – 152	147.91 ± 0.38
	♂♂	25	120 – 154	144.44 ± 1.41
S.cd.	♀♀	44	22 – 35	25.84 ± 0.44
	♂♂	24	24 – 35	32.33 ± 0.47
Sq.	♀♀	44	19 – 21	20.82 ± 0.07
	♂♂	23	20 – 21	20.96 ± 0.04
S.orb. (right + left)	♀♀	46	16 – 22	19.06 ± 0.19
	♂♂	25	17 – 22	19.64 ± 0.23
Lab. (right + left)	♀♀	47	14 – 18	17.47 ± 0.14
	♂♂	25	16 – 19	17.76 ± 0.16
Sublab. (right + left)	♀♀	45	15 – 21	18.09 ± 0.18
	♂♂	25	16 – 21	18.28 ± 0.23

Color patterns. Vipers of Spassk Archipelago population have two color forms: cryptic color and melanists. The first color form is represented by several transitional variations, typical for the species. The part of melanists is prevailing.

In the Spassk population we distinguish the following basic forms of melanistic pattern of coloration: **1) perfect melanists** — fully black without any other color elements; some individuals have yellowish tail end from the bottom side; **2)** the second form of melanism includes snakes with matt (dull) **black ground and dorsal band of anthracite-black color**; **3) deep brown** vipers have a black-brown basic color of the body varying in tints. Some snakes of the group have got rare small elements varying in color scattered over the body, e.g., gray and deep (dark)-cream specks and spots. In some cases color elements of the kind shade dull dorsal band; **4)** vipers with **deep gray** form of melanism have gray-black ground and dark dorsal band.

Some individuals with white and dim-white elements on supralabial and sublabial scales are met among vipers with melanistic form of coloration. The part of melanists in the investigation area reaches 66%. It should be marked that the same correlation (≥50%) between white and dark snakes is kept here from the first quarter of the 20th century. Bashkirov (1929) writes about Spassk snakes: "...what concerns steppe vipers... a half of them are gray, others are black or entirely black." The case when the balance between color groups in population has not been changing during 100 years is expanded by the Hardy – Weinberg Equilibrium. A conclusion of the absence of vipers' adaptive advantages with any of two color forms

TABLE 2. Basic Forms of Coloring of Spassk Population of Steppe Viper, %

Color forms	Perfect melanists	Black ground with dorsal band of anthracite-black color	Deep brown	Deep gray	Gray with dorsal band of dark color	Light ground with dorsal band of dark color	Olive ground with dorsal band of dark color
♀♀ (*n* = 73)	27.5	13.8	6.9	5.6	19.2	17.8	8.2
♂♂ (*n* = 44)	40.9	18.1	2.3	9.1	13.6	11.4	4.5

suggests itself as a consequence of the Hardy – Weinberg rule. And the nature of coloring is caused, to the great extent, by genetic mechanism. Fact of black color uniqueness for entire *ursinii*-complex is an indirect approval of it. There is only one report of *V. renardi* melanism: populations with a significant part of black individuals are known in the Krasnodar Krai of Russia (Ostrovskikh, 1997).

Meanwhile, the black color on the northern limit of spreading could helps vipers to be more active in comparison with cryptic colored individuals and have great reproductive success. Such a type of life strategy is known for *V. berus* (Andrén and Nilson, 1981).

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REFERENCES

Andrén C. and Nilson G. (1981), "Reproductive success and risk of predation in normal and melanistic colour morphs of the adder, *Vipera berus*," *Biol. J. Linn. Soc.*, **15**, 235 – 246.

Bashkirov I. S. (1929), "On the steppe viper (*Coluber renardi* Christoph) in Tatarstan Republic," in: *Coll. Papers of Student's Study Group. Vol. 3*, Kazan, pp. 143 – 144 [in Russian].

Bashkirov I. S. (1935), "Relic elements in the fauna of Zgyguli," *Byull. Mosk. Obshch. Isp. Prirody. Otd. Biol.*, **44**(5), 240 – 245 [in Russian].

Garanin V. I., Pavlov A. V., and Bakiev A. G. (2004) "*Vipera renardi* (Christoph, 1861)," in: *Snakes of Volga-Kama Region*, Samara Sci. Center, Samara, pp. 61 – 91 [in Russian].

Kotenko T. I. (1981), "On *Vipera* ursinii *renardi* in the south of Ukraine," in: Darevsky I. S., Ananjeva N. B., Barkagan Z. S., Borkin L. Ya., Sokolova T. M., and Shcherbak N. N. (eds.), *The Problems of Herpetology. Abstrs. of 5th Herpetol. Meeting*, Nauka, Leningrad, p. 73 [in Russian].

Nilson G. and Andrén C. (2001), "The meadow and stepper vipers of Europe and Asia — the *Vipera* (*Acridophaga*) *ursinii* complex," *Acta Zool. Academ. Hung.*, **7**(2 – 3), 87 – 267.

Ostrovskikh S. V. (1997), "Different form of melanism and its development with age in the populations of stepper viper *Vipera renardi* (Christoph, 1861)," *Russ. J. Herpetol.*, **4**(2), 186 – 191.

Pavlov A. V. and Bakin O. V. (2001), "Records of *Vipera ursinii* on islands of Kuibyshev reservoir," *The Problems of Herpetology. Proc. of the 1th meet. of the Nikolsky Herpetol. Soc.*, Pushchino – Moscow, pp. 220 – 222 [in Russian].