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TAXONOMIC POSITION AND GEOGRAPHIC RELATIONS OF A LACERTID LIZARD *EREMIAS VELOX* FROM THE ISSYK-KUL LAKE DEPRESSION, TIEN SHAN MOUNTAINS, KYRGYZSTAN.

A new subspecies, Eremias velox borkini *ssp. n., has been described from the Issyk–Kul Lake Depression, Tien Shan, Kyrgyzstan. Possible relations of this mountain isolated subspecies and geographically nearest populations of* E. velox velox *from Kyrgyzstan (Chu RiverValley) and eastern Kazakhstan are discussed.*

Key words: Eremias velox borkini *ssp.n., Lacertidae, Sauria, karyotype, nucleolar organizer region, Issyk–Kul Lake Depression, Tien Shan, Kyrgyzstan.*

The first record of *Eremias velox* from the Issyk-Kul Lake Depression has been published by D.P.Dementiev [1]. Later, these lizards were collected there by Yu.A.Dubrovsky [2] and I.D.Yakovleva [3]. All these samples were restricted to several localities on the western part of the Issyk-Kul Depression (Fig. 1). A locality in the vicinity of the village Toru-Aigyr on the northern shore of the lake is marked by us by a question mark, since specimens confirming correctness of the identification have not been kept in collections [2]. These were found in that locality neither by I.D. Yakovleva [3], nor by us in 1986-1990.

New data on distribution of *E. velox* in the Issyk-Kul Lake area have been obtained in a study of the southern shore in 1980-1998. Lizards were found by us on the shores of the lake in several sites between rivers Ak Terek and Ak Sai, later in the vicinity of the town of Przhevalsk (now Karakol) near the village Dzhety-Oguz (Fig. 1). Therefore, within the Issyk-Kul Lake Depression this species is spread only along the southern shore and has not been found east of

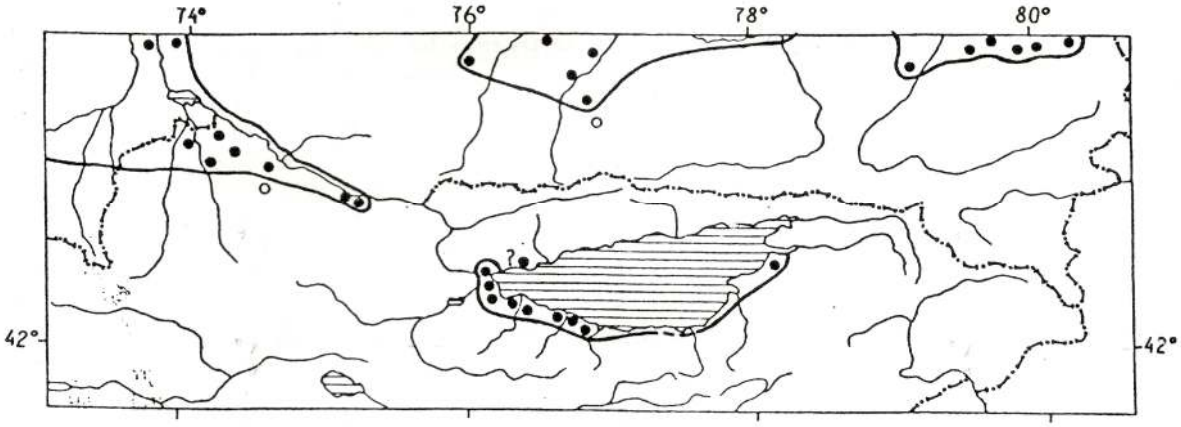

Fig. 1. Distribution of *Eremias velox borkini*, ssp.n. (Issyk-Kul Lake Depression, Kyrgyzstan) and of the nearest populations of *Eremias velox velox* in Kyrgyzstan (Chu River) and Kazakhstan.

Przhevalsk town and west of Rybachye town (now Balykchi). It is absent also in the Boom Canyon. Further in the Chu River Valley the species occurs sporadically in the vicinity of Tokmak town and west of it [3; 4]. The populations of *E. velox* of the Issyk-Kul Depression are therefore isolated geographically from the range of the nominotypical subspecies. This circumstance as well as the fact that Issyk-Kul lizards inhabit at the maximal altitude known for this species (1880 m above sea level) stimulated our interest in their origin and taxonomic position. In this connection it would be important also to verify the assumption made by N.N.Szczerbak [5] about an increased variation in *E. velox* in foothills of the mountain systems of Central Asia.

MATERIAL AND METHODS

To analyse variation of the main morphometric and meristic characters (Table 1 and 2), apart from of Issyk-Kul lizards, we used samples of *E. velox* from eastern Kazakhstan, Chu River and Ferghana valleys, and also southern Uzbekistan (south of the Zeravshan Mountain Range) and Turkmenia. A total of 183 specimens have been studied.

With application of the cytogenetical methods (method Giemsa [6] and Ag-NOR-staining [7; 8]) four copies of rapid fringetoed lizard are investigated (2 males and 2 females) that have being caught at 30.07.1993 on Southern coast of the Issyk-Kul Lake (type locality, below subspecies that is describing). Air-dried preparations of chromosomes are prepared by direct method from testises, bone marrow, blood cells [9] and method of reception of chromosomal preparations from cultures of lymphocytes of the peripheral blood [10] in updating of A. A. Sharshov (is not published). 10-20 of metaphase plates were analysed for every tissue (by 40-50 of metaphases to copy), and 400 of interphase nucle uses for each lizard.

RESULTS AND DISCUSSION

Comparison of our and the literature data [3; 5; 11 and others] testifies to geographic and genetic isolation of the Issyk-Kul *E. velox* and allow to us to regard them as a separate new subspecies.

TABLE 1.

Variation in Several Pholidosis Characters in *E. velox borkini* ssp. n. and Some Populations of *E. velox velox* (I is Issuk-Kul Lake Depression, Kyrgyzstan; II is Chu River Valley, Kyrgyzstan; III is eastern Kazakhstan, and IV is Ferghana Valley, Uzbekistan; range above, mean and standard error beneath).

sex	*E. v. borkini*		*E. velox velox*						Student's t-test		
	n	I	n	II	n	III	n	IV	I-II	I-III	I-IV
Dorsal scales across middle of body (Sq)											
males	19	52-63	26	46-55	16	51-62	20	57-69	6.4	0.1	5.6
		56.9±0.8		51.2±0.5		56.8±0.8		62.8±0.7			
females	20	52-61	15	47-55	3	52-58	16	57-73	6.8	0.8	5.3
		55.6±0.6		50.3±0.5		54.0±2.0		61.8±1.0			
Ventrals (Ventr)											
males	15	31-36	15	28-32	16	30-33	20	29-34	6.0	4.6	4.5
		33.0±0.2		30.7±0.3		31.6±0.2		31.3±0.3			
females	14	31-35	12	32-34	3	31-35	16	31-34	1.7	0.1	1.9
		33.4±0.3		32.8±0.2		33.3±1.2		32.7±0.2			
Gulars (G)											
males	19	25-30	26	20-25	16	23-29	20	28-36	8.4	2.1	8.0
		27.3±0.3		23.5±0.3		26.2±0.5		31.7±0.4			
females	22	24-31	15	22-25	3	23-27	16	27-33	5.9	1.2	4.7
		26.9±0.4		23.9±0.3		25.3±1.2		29.7±0.5			
Scales in 9th-10th caudal annulus (Sq.c.cd 9-10)											
males	19	25-32	26	21-27	16	22-30	20	24-30	6.7	3.3	1.9
		28.3±0.5		24.4±0.3		26.0±0.5		27.1±0.4			
females	22	23-29	15	20-27	3	24-30	14	23-29	6.4	0.03	1.8
		27.0±0.4		23.6±0.4		27.0±1.7		25.9±0.5			
Femoral pores (P.f.)											
males	37	18-24	52	16-23	31	18-24	40	19-25	5.2	0.5	1.3
		21.2±0.3		19.4±0.2		21.3±0.2		20.7±0.2			
females	33	18-24	32	18-23	6	19-22	30	16-22	8.6	1.8	5.3
		21.2±0.2		18.9±0.2		20.3±0.4		19.3±0.3			

TABLE 2.

Variation in Body Length (L) and Relative Tail Length (L/L.cd) in Adult *E. velox borkin* ssp. n., and *E. velox velox* from Different Regions (range above, mean and standard error beneath).

Region	Males			Females		
	n	L	L/Lcd	n	L	L/Lcd
Eremias velox borkini						
Issyk-Kul Lake	13	60.3-75.0	0.51-0.63	12	56.1-69.5	0.60-0.66
		68.9±1.11	0.60±0.02		61.4±1,15	0.62±0.01
Eremias velox velox						
Chu River Valley	16	65.0-75.0	0.55-0.67	12	56.0-68.2	0.61-0.65
		65.7±0.88	0.59±0,00		61.1±1.42	0.63±0.02
Eastern Kazakhstan	10	62.1-78.3	0.49-0.55	3	63.5-67.0	0.60
		71.9±1.90	0.52±0.02		65.8±1.17	
Ferghana Valley	14	66.2-79.0	0.47-0.55	8	56.0-63.0	0.52-0.59
		70.7±1.11	0.51±0.07		59.5±0.90	0.55±0.01

We name this new subspecies in honor of our friend Dr. L.J.Borkin (St. Petersburg) in recognition of his contribution to knowledge of the herpetofauna of Central and Eastern Asia, and of his 25-year cooperation with us in the field studies in Kyrgyzstan.

The type collection has been deposited in the Zoological Museum, National Academy of Sciences, Kyrgyz Republic, Bishkek. Two paratypes (R002112 and R002113) have been donated to the Department of Herpetology, Zoological Institute, Russian Academy of Sciences, St. Petersburg.

***Eremias Velox Borkini* Eremchenko et Panfilov ssp. nov.**

Eremias velox velox - Yakovleva (1964: 99, part.); Szczerbak (1974: 98, part.).

Type locality: Tien Shan Mountains; Kyrgyzstan, the southern coast of Lake Issyk-Kul, area between the rivers Ak Terek and Ak Sai (Fig.1).

Holotype (Fig. 2): R002662, female, V.K. Eremchenko, 6 June 1986.

Paratypes (44 specimens): R003617; R004387, R004403, and R004421; R004388, R004409, and R004422 – Issuk-Kul Depression, Ak Olen, D.P. Dementiev, 21 June, 30 June - 2 July, and 21 July 1939, respectively; R003378 and R003379, unknown collector, May 1966; R004382, R004391, and R004395 - Akkyrcho, D.P. Dementiev, 11-12 July 1939; R004384 - southern shore of Issyk-Kul Lake, A. I. Yanushevich, 4 August 1953; R004376 - Ulakhol, R.P. Zimina, 13 July 1959; R002112 - R002131 - southern shore of Lake Issyk-Kul, in the area between rivers Ak Terek and Ak Sai, V.K. Eremchenko, 30 June 1980 (two specimens from this sample were given to the Zoological Institute, St. Petersburg); R004483 - R004485, southern shore of Lake Issuk-Kul, vicinity of Dzhety Oguz health resort, S.S. Klimenko, 19 May 1990; R010001 - R010007, Issuk-Kul Depression, Yu. A. Dubrovsky, 1956.

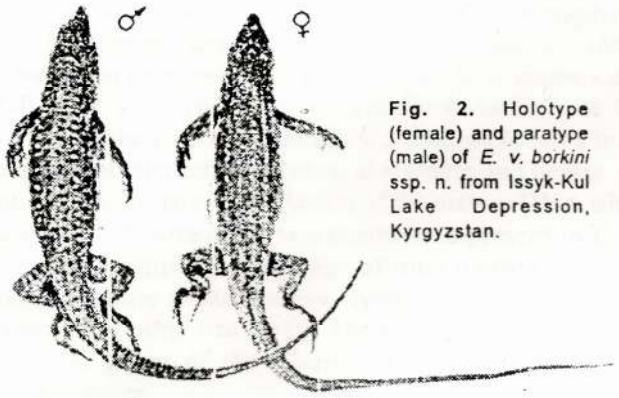

Fig. 2. Holotype (female) and paratype (male) of *E. v. borkini* ssp. n. from Issyk-Kul Lake Depression, Kyrgyzstan.

Variation in paratypes of *E. velox borkini* ssp. n. and comparison with samples of *E. velov velox* from some geographic regions are given in Tables 1 and 2.

Diagnosis: Mountain geographically isolated populations which are morphologically similar to lizards from eastern Kazakhstan and differ from the closest populations from the Chu River Valley by the lack of sex dimorphism in ventrals and higher values of ventrals (Table 1). They differ also in the number of dorsal scales (Sq), gulars (G), scales in 9th-10th caudal annulus (Sq.c.cd. 9-10), femoral pores (P.f.), and reduced coloration of the upper part of the body (Fig. 2).

Karyotype. Eremias velox borkini has 38 acrocentric chromosomes: 2n=36M(A)+2m(a); NF=38.

Two NOR-bearing chromosomes belong to the pair XIX (19q(t)-locus), the interphase nucleus contains two nucleoluses.

Description of Holotype. Large mature female with body length of 65.5 mm; length of regenerated tail 103.5 mm. Twenty-nine gulars; 58 scales across middle of body (not counting ventrals); 34 ventral plates along the middle line of the venter; 26 scales in 9th-10th caudal annulus; 9 (right) and 8 (left) supralabials; 8 infralabials on each side of the head. Fifth chien shields do not touch infralabials. Suborculars bordering mouth. Supraoculars are not separated by a row of granules from frontal and frontoparietal scales. Accessory shields are absent between prefrontals. Upper caudal scales are weakly killed. The series of femoral pores does not reach by three scales the bend of knee. The two series separated by a space of 3.53 times shorter than the length of each. Preanal region with two enlarged scales.

Coloration is beige grey (in life), grey (in ethyl alcohol). The pattern of the dorsal side of the body is reduced (Fig. 2). The lateral row of colour spots is absent, black binding is retained in their place. Temporals include seven white spots interspersed with not sharp black markings. The venture is white.

Suggested common name: Yashchurka Borkina (in Russian), Borkin's lizard (in English).

Karyologycal Characteristic of Issik-Kul Population

The chromosome set of investigated lizards consist of 38 acrocentric chromosomes. With opportionment of karyotype the last form the row of gradually decreasing in the sizes chromosomal pair. Homologues of XIX pair approximately less in twice than chromosomes of XVIII pair, and classified by us as microchromosomes. Their absolute sizes reachs 1 micron at the metaphases stage.

The research of meiosis of males has shown that 19 bivalents are there at the diak inesis stage and at the plates that are appropriate to metaphase II - 19 chromosomes: 18M(A)+1m(a).

The chromosome sets of male and female are identical. Sexual geterochromosomes of *E. v. borkini* are not revealed as well as at *E. v. caucasica* (first description of karyotype *E. velox* [12]). Last, ZW-type, were marked for *E. velox* from Central Asia [13; 14].

Secondary constrictions (S.C.) that are located in the telomeric area distinctly expose in a long arm of microchromosomes at staining on Giemsa. Results of Ag-NOR-staining have shown concurrence of two large clasters of the active rDNA with by areas S.C. of the XIX chromosomal pair. One or more often two nucleoluses present in the nucleus of somatic cells.

The multiple associations of microchromosomes of the q(t)-q(t)-type have observed in somatic tissues (bone marrow, lymphocytes) of the lizard *E. v. borkini*. Last was observed by us earlier at other lizards [8]. The given fact, is the one more proof of presence of large clusters of active genes of the ribosomal RNA in the areas of secondary constrictions of these chromosomes.

On Geographic Relations of Lizards of the Issyk Kul Lake Region

As has been noted *E. velox borkini*, ssp. n., of the Issyk-Kul Depression is similar in the pholidosis and coloration to eastern Kazakhstan populations, but differs from the geographically closest population *E. v. velox* of the Chu River Valley, Kyrgyzstan. Geographic relations between lizards of these three regions could be explained at least by two hypotheses.

1. The first hypothesis is that the lizards might penetrate the Issyk-Kul Depression from the west through the Boom Canyon (Boom «corridor»). Later, geographic isolation and accumulation of morphological changes in lizards of this population took place.

Using of the Boom «corridor» in dispersal of and exchange of faunas of the Chu Valley and Issuk-Kul Depression at first sight appears to be the simplest explanation of infiltration of *E. velox* into the Issyk-Kul Depression. For the first time this idea was proposed by V.N. Shnitnikov [15, p. 56] in connection with the origin of *E. arguta* of the Issuk-Kul: «From the shore of this lake it penetrated undoubtedly through the Buam [now Boom] Canyon and encountered there it relative - *E. multiocellata* substituting it at great altitudes». I. D. Yakovleva [3] has convincingly shown this supposition to be groundless.

According to the recent paleogeographic data, formation of the Boom Canyon and the entry of the Chu River into the Chu Valley seemed to occur on the boundary of the Late Pleistocene and the Holocene. Before that a canyon with river flow towards the Issuk-Kul Lake existed in the place of the recent Boom Canyon [16]. As a result of tectonic tectonic breakage in the eastern extremity of the Kyrgyz Mountain Ridge, only *E. arguta* could have penetrated the Chu Valley through the newly formed passage from the Issyk-Kul Depression. This is evidenced by the zone of intergradation between populations of *E. arguta arguta* and *E. a. uzbekistanica* (now *E. a. darevskii*) in the regions of the eastern extremity of the Chu Valley [3]. Our studies have shown that these populations of *E. arguta* are almost continuously connected through the Boom Canyon, which cannot be said about *E. velox*. The latter was probably unable to use the Boom «corridor» in the past and at present owing to the lack of suitable habitats in this long (approximately 50 km) and quite narrow canyon. In any case, here *E. velox* is now absent; *E. arguta darevskii* Tsaruk, 1986 and *E. multiocellata stummeri* (Wettstein, 1940) only occur. The latter does not spread from the Boom Canyon into the Chu Valley: the

confirmed westernmost site of *E. multiocellata stummeri* is situated on the northern slope of the Kyrgyz Mountain Ridge facing the Boom Canyon.

E. velox in the Issyk-Kul Depression inhabits hilly sands fixed by *Ephedra tianschanica* and *Nitraria sibirica* (ripe berries of these plants represent the main food of local lizards). It inhabits also «islets» of strongly salted sand claycy soils with separate spiny bushes of *Caragana leucophloena* and *Nitraria sibirica* [2; 3; our data]. Therefore, in the Issuk-Kul Lake these lizards occupy particular desert habitats displaying stenotopic features.

2. According to the second hypothesis, lizards might penetrated the Issyk-Kul Depression from the eastern side and would be an isolated portion of eastern Kazakhstan populations.

Discussing the origin of desert fauna of the Issyk-Kul area, some authors [17; 18] emphasised its relation with the Desert Kazakhstan Province and Central Asia. D.P.Dementiev [19] was the first to express the idea about relic type of desert fauna of the western part of the Issyk-Kul Depression.

According to the paleogeographic data [16], the Lake Issuk-Kul was connected in the past with the Ili River system and the lake basin of the Eastern and Western Yuldus up to the Upper Pleistocene. The flow was directed towards the Lake Issyk-Kul. At that time *E. velox* could have penetrated the Issyk-Kul Depression. The rearrangement of Tien Shan Mountains relief beginning from the last Interglacial could have led to separation of the Issyk-Kul Depression and local populations of *E. velox*.

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