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New Subspecies of the Steppe Racerunner, *Eremias arguta belyalovi* ssp. n. (Sauria, Lacertidae), from Southeastern Kazakhstan and Northwestern China[1]

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Abstract. The Steppe Racerunner, *Eremias arguta* (Pallas, 1773), is a widespread lizard species from North Eurasia within the genus *Eremias*. Currently, five subspecies have been distinguished within the entire range of the species: *E. a. arguta* (Pallas, 1773); *E. a. darevskii* Tsaruk, 1986; *E. a. deserti* (Gmelin, 1789); *E. a. transcaucasica* Darevsky, 1953; and *E. a. uzbekistanica* Chernov, 1934. Results obtained in the last decade have indicated the morphological and genetic distinctiveness of lizards from the Ili River basin. This study describes a new subspecies, *Eremias arguta belyalovi* ssp. n., as identified in the southeastern part of the species' range. It differs from other subspecies of *E. arguta* by the presence of brightly colored spots on the sides of the body in males (blue, greenish, or yellow depending on the season and age), its small size (max. SVL of males 65 mm), some distinguishing features of its pholidosis, and the fact that it is distinguished by the mitochondrial marker from the closest subspecies (*E. a. arguta* and *E. a. uzbekistanica*). The new subspecies inhabits the Kegen and Tekes basins of Southeastern Kazakhstan, the foothills of the Ili River Basin, which straddles Kazakhstan and China (Xinjiang Province), and the western Dzhungarian Depression in Xinjiang. *Eremias arguta belyalovi* ssp. n. inhabits gravelly-clayey and clayey piedmont plains with xerophytic plant communities at elevations ranging from 630 to 2000 m above sea level.

Keywords: Lacertidae, *Eremias arguta* new subspecies, intermountain depressions, southeastern Kazakhstan, northwestern China

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Author contributions. Article concept – OVF; data collection – DTN, CMA; analysis of literature data, morphological data, distribution and biotope data – OVF, DTN, CMA; writing – OVF, DTN, CMA; editing – OVF, DTN.

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DOI: 10.7868/S3034545626090086 Оригинальная статья

Новый подвид разноцветной ящурки *Eremias arguta belyalovi* ssp. n. (Sauria, Lacertidae) из Юго-Восточного Казахстана и Северо-Западного Китая[1]

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Аннотация. Разноцветная ящурка (*Eremias arguta* (Pallas, 1773)) – широко распространенный вид ящериц рода *Eremias* в Северной Евразии. В настоящее время в пределах обширного ареала вида различают 5 подвидов: *E. a. arguta* (Pallas, 1773), *E. a. darevskii* Tsaruk, 1986, *E. a. deserti* (Gmelin, 1789), *E. a. transcaucasica* Darevsky, 1953 и *E. a. uzbekistanica* Chernov, 1934. Полученные в прошлом десятилетии результаты указали на морфологическую и генетическую обособленность разноцветных ящурок из Илийской впадины. В настоящей статье приведено описание нового подвида *Eremias arguta belyalovi* ssp. n. из юго-восточной части ареала вида. Он отличается от других подвидов *E. arguta* наличием ярких цветных пятен по бокам туловища у самцов (голубых, зеленоватых или желтых в зависимости от сезона и возраста), мелкими размерами (макс. SVL самцов 65 мм), некоторыми особенностями фолидоза и дистанцирован по митохондриальному маркеру от ближайших подвидов (*E. a. arguta* и *E. a. uzbekistanica*). Новый подвид обитает в Кегенской и Текесской впадинах юго-востока Казахстана, в предгорной периферии Илийской впадины, расположенной на территории Казахстана и Китая (Синьцзян), а также на западе Джунгарской впадины в Синьцзяне. *Eremias arguta belyalovi* ssp. n. придерживается щебнисто-глинистых и глинистых подгорных равнин с ксерофитными растительными сообществами в диапазоне высот 630–2000 м над ур. м.

Ключевые слова: Lacertidae, новый подвид *Eremias arguta*, межгорные впадины, юго-восточный Казахстан, северо-западный Китай

Финансирование. Исследование проводилось по гостеме Московского государственного университета (18-1-21 ЦИТИС № 121032300105-0) для ОВФ. Исследование частично финансировалось Комитетом науки Министерства науки и высшего образования Республики Казахстан (№ BR24993060) для ЧМА и ДТН.

Соблюдение этических стандартов. При написании статьи были учтены все этические нормы. Материал был собран в соответствии с разрешениями № 34 от 10 апреля 2007 г. и № 109 от 11 апреля 2013 г. от Комитета лесного хозяйства и животного мира Министерства экологии и природных ресурсов Республики Казахстан.

Конфликт интересов. Авторы заявляют об отсутствии очевидных или потенциальных конфликтов интересов, связанных с публикацией данной статьи.

Вклад авторов. Концепция статьи – ОВФ; сбор материала – ДТН, ЧМА; анализ литературных данных, морфологических данных, данных о распространении и биотопах – ОВФ, ДТН, ЧМА; написание текста – ОВФ, ДТН, ЧМА; редактирование – ОВФ, ДТН.

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INTRODUCTION

Steppe Racerunner, *Eremias arguta* (Pallas, 1773), has a vast range in Eurasia – from the northwestern Black Sea region (Romania) through the steppe zone of Kazakhstan to the Dzhungarian Gobi (Mongolia). Its northern border runs along the steppe zone of European Russia and Kazakhstan, while its southern border extends to the Lesser Caucasus Mountains, Northern Ustyurt, Southwestern Pamir, and the Tien Shan, bypassing the southern desert zone. The extreme eastern populations are known from southwestern Mongolia (Khovd and Gobi-Altai aimags) and from northwestern China (Xinjiang Uyghur Autonomous Region) (Szczerbak, 1974; Szczerbak et al., 1993; Orlova, Terbish, 1997). The suggestion by Zhao and Adler (1993) that the species is present in Inner Mongolia is probably erroneous.

The variability of the racerunner's external morphology (the coloration and pattern, the metric and meristic characteristics) within the species range is very high and this has served as the basis for the description of six subspecies (Szczerbak, 1974; Szczerbak et al., 1993). The nominate form, *E. a. arguta* (Pallas, 1773), inhabits the eastern part of the range (from the Ural River to the Balkhash region, south to the mountains of Central Asia). The western variegated-legged racerunner, *E. a. deserti* (Gmelin, 1788), is distributed from Romania to the Ural River in the east and Azerbaijan in the south. In the Transcaucasus (Georgia, Azerbaijan, Armenia (Sevan Lake Basin)), the Armenian form, *E. a. transcaucasica* Darevsky, 1953 is found. The Uzbek form, *E. a. uzbekistanica* Chernov, 1934, is found in Uzbekistan and the border regions of Southern Kazakhstan, Kyrgyzstan and Tajikistan. Darevsky's Racerunner, *E. a. darevskii* Tsaruk, 1986, was described from the Issyk-Kul Basin. Szczerbak (1974) assigned the eastern populations to an area from the Balkhash region to Southern Mongolia, Dzhungaria and Kashgaria to *E. a. potanini* Bedriaga, 1912.

The basic ideas regarding the species' intraspecific structure as described in the literature have been generally accepted, although questions regarding the taxonomic status and range of the species' easternmost populations remain unresolved. The highest level of morphological variability was noted for this area. Regarding the territory from the southern Balkhash region to the Tien Shan and the western spurs of the Dzhungarian Alatau, different authors indicated different populations as belonging to the subspecies *E. a. arguta* and *E. a. uzbekistanica*; or noted specimens with transitional characteristics (Chernov, 1934; Yakovleva, 1964; Chirikova, 2001; Chirikova, Kolbinzev, 2003). For the lizards of the Southern Balkhash region and the territory to the south, Yakovleva (1964) noted their similarity to the racerunners of the Issyk-Kul region (an "intrasubspecific" difference of the Uzbek subspecies: p. 144), which was later described as *E. a. darevskii* (Tsaruk, 1986). This situation indicated that various heterogeneous populations had been grouped under the subspecies *potanini* (Orlova et al., 2012) and mtDNA data provided no support for recognizing *E. a. potanini* as a distinct subspecies (Poyarkov et al., 2014).

In 20th-century studies, lizards from the basin of the River Ili (hereafter Ili Basin) were not specifically studied. In the first decade of the 21st century, a racerunner with colored ocelli on the sides of its body was found in the vicinity of the village of Konyrolen (in the Konyrolen Valley) (Dujsebayeva et al., 2007). The ocelli were green or blue in adult males, depending on sexual activity, and yellow or yellowish in young males and females respectively. This characteristic was atypical for any of the populations of the *E. arguta* subspecies studied. The specimens from the Konyrolen Valley were also visibly smaller than lizards from other populations in Kazakhstan.

Subsequent comparative studies of external morphological characteristics (Orlova et al., 2012) and molecular genetic analysis of mitochondrial DNA cytochrome *b* (Poyarkov et al., 2014) of lizards from eastern and southeastern Kazakhstan, the Mongolian part of the Dzhungarian Gobi, and northwestern China (Yining) have demonstrated that the lizards inhabiting the Ili Basin constitute an independent taxonomic unit. Chinese colleagues soon reached a similar conclusion (Gong et al., 2018) using additional material from the Chinese part of the Ili Basin and from the western periphery of the Dzhungarian Depression (Bole City). In addition to their morphological and genetic distinctiveness, these lizards have a clearly defined area of distribution in the eastern part of their range. In this article, we formalize the status of *E. arguta* populations from the intermountain depressions of southeastern Kazakhstan and northwestern China as a new subspecies for science – *Eremias arguta belyalovi* ssp. n. Orlova, Poyarkov, Chirikova et Dujsebayeva.

MATERIALS AND METHODS

Sample collection. Specimens were collected during fieldwork in 2006–2009 and 2016 in the intermountain depressions of Southeastern Kazakhstan, specifically the Ili Basin (including the Konyrolen, Sogety and Zhalanash valleys) and the Kegen and Tekess basins.

Geographic coordinates and elevation were obtained using a Garmin GPSMAP 60CSx GPS receiver and recorded in the WGS84 datum. Specimens were photographed in life, euthanized (permit no. 34 from April 10, 2007, and no. 109 from April 11, 2013, from the Forestry and Hunting Committee), and preserved in ethanol. Sex was determined by direct observation of sexually dimorphic characters or gonadal inspection by dissection. Voucher specimens ($N = 16$ specimens) were deposited in the herpetological collection of the Zoological Museum of Moscow University, Russia.

Information on known encounters of the new subspecies, including storage location and inventory number for collection material, author and year for literature references, and geographic references for locations, is provided in Table S1 (Supplement). The following abbreviations of organizations are used throughout the text: IZKAZ – Institute of Zoology (Almaty, Kazakhstan); ZMMU – Zoological Museum of Moscow University (Moscow, Russia); ZISP – Zoological Institute of Russian Academy of Sciences (Saint-Petersburg, Russia).

Morphological analysis. The type series of the new *Eremias* species examined comprises 16 specimens: a holotype and 15 paratypes (11 males, 4 females). Morphological characters studied included body size and body shape, meristic characteristics of scalation, and descriptions of coloration patterns in adult and juvenile specimens. All measurements were taken using a digital caliper under a dissecting microscope to the nearest 0.1 mm. Morphometrics and morphological description follow Szczerbak (1974), Orlova and Terbish (1997) and Orlova et al. (2012).

For morphometric analysis, the following standard characters were used: SVL – snout-vent length (from snout to vent); TL – tail length (from vent to the tip of the tail); Lpil – pileus length (from rostrum to the posterior border of parietals); HL – head length (from rostrum to occipital sinus); HW – head width (maximum wide); HH – head height (maximum height); Ga – gleno-acetobular distance (from axilla to groin measured from the posterior edge of forelimb to the anterior edge of hindlimb insertion); FLL – forelimb length (from forelimb insertion to the tip of the longest finger); HLL – hindlimb length (from hindlimb insertion to the tip of the longest toe). Morphometric indices included ratios SVL/TL, FLL/SVL, HLL/SVL, HL/SVL, HW/HL, HH/HL. The following scalation characters were examined: Sq – number of scales around midbody; G – number of gular scales along mid-line of throat; P.fm.r – number of femoral pores on the right limb; P.fm.l – number of femoral pores on the left limb; Dist.P.fm – distance between the proximal femoral pores; Ventr – number of transverse rows of ventral scales; Ventr.long – the maximal number of longitudinal rows of ventral scales (counted at midbody); Sq.c.cd – number of scales around the 9–10th tail ring; Lam.subdig – number of subdigital lamellae on the 4th toe of hindlimb; Sq.dors – number of dorsal scales between parietals and the level of cloaca; Coll. – number of collar scales; Lab.min – number of supralabial shields anterior to subocular (right/left); Lab.total – total number of supralabials (right/left); Infralab – number of infralabial shields (right/left); subocular shield in contact with mouth margin or is separated from it by supralabials (yes or no); the 5th pair of the chin shields in contact with infralabial shield or is separated from it (yes or no); Submax – number of submaxillary shields (= chin shields) (right/left); Sublab – total number of sublabial shields; Submax.cont – the number of pairs of mandibular scutes touching along the midline: 1 – three pairs, 2 – two pairs, 3 – two and a half pairs; additional shield between prefrontals (Prfront) present (1) or absent (2); supraoculars separated from frontal and frontoparietals by a complete row of small granular scales (yes or no); number of enlarged scales in precloacal area.

Statistical analysis was performed with Statistica 6.0 (StatSoft, 2001). For univariate analyses, we used morphometric characters, corrected by body size. For specimen description, in addition to the characteristics mentioned above we recorded body coloration and pattern, including the presence or absence of blue, green or yellow light ocelli on the dorsum and body sides in adult and juvenile specimens.

RESULTS

Eremias arguta belyalovi Orlova, Poyarkov, Chirikova et Dujsebayeva ssp. n.

In addition to the authors of the article, N.A. Poyarkov participated in the description of the taxon. He conducted molecular genetic studies that confirmed the status of the taxon and took part in the discussion of the validity of the new subspecies.

Holotype. Male adult ZMMU R-12426 (fig. 1). Southeastern Kazakhstan, Almaty (now Zhetysu) Region, Panfilov District, Ili Basin, Konyrolen Valley, coordinates 44.3689° N, 79.4133° E, altitude (alt.) 1250 m a.s.l., 17.08.2006, coll. T.N. Dujsebayeva, O.V. Belyalov. Genbank KM 977961 (Poyarkov et al., 2014).

Description of holotype. SVL 57.5 mm (56.37), TL 44.51 (reg.), HL 16.4; HW 10.0; HH 7.0; Lpil 16.0; Ga 28.0; HLL 30.7; FLL 19.0.

Coll – 12; G. – 25; Ventr – 30; Ventr.long – 15–17; P.fm – 11/11; Dist.P.fm – 4 scales (left/right), Sq.c.cd – 24, Lam.subdig – 24, Sq. – 45, Sq.dors – 112.

An adult male (fig. 1) has a body length of 57.5 mm and a short (reg.) tail. The tail is wide and thick at the base, then sharply tapering. The hind limbs are relatively long – HLL/SVL = 0.53. FLL/SVL = 0.33. The head is quite massive, with prominent temporal parts, relatively wide and high: the ratio of head length to body length is 0.28, head width to head length is 0.60, and head height to its width is 0.70.

The frontal shield is rounded in the upper part, with a wide groove. Its width in the upper part is almost twice that of the lower part, and its length (height) is almost three times greater, leading to its protrusion at the bottom of the frontal shield. A wide, short suture connects the two prefrontal shields; an additional shield between them is absent; and one large frontonasal shield is diamond-shaped. Three nasal shields are inflated;



Fig. 1. Holotype of *Eremias arguta belyalovi* ssp. n.: *a* – top view, *b* – bottom view, *c* – head from side, *d* – head on bottom, *e* – head on top (pileus)

Рис. 1. Голотип *Eremias arguta belyalovi* ssp. n.: *a* – вид сверху, *b* – вид снизу, *c* – голова с боку, *d* – голова снизу, *e* – голова сверху

the nostril is cut above the subnasal shield and touches the 1st and 2nd subnasal shields. The area in front of the first supraocular shield is occupied by granules, a number of which are larger than the others. There are up to 14 granules in total, including a continuous row between the superciliaries and supraocular shields. The intermaxillary shield extends widely onto the upper side of the snout (head); and its lower margin is wider than the area in front of the first preocular shield. There are five supratemporal shields in the temporal region. The first is elongated, twice as long, and the fifth is rounded and bulging. The shields in the central part of the temporal region are larger. The small tympanic scale is located in the upper third of the ear opening. The vertical diameter of the ear opening is twice the horizontal diameter. There are no denticles along the edge of the ear opening.

There are 5/6 superciliaries, with 5 supratemporals on each side. There is one loreal and one loreal-nasal shield. The subocular shield does not touch the edge of the mouth and is in contact with four supralabial shields (5–8, with the fifth touching only partially). There are 10/12 supralabial shields and 10/8 infralabial shields. There are five pairs of submaxillary shields, with the gular scales reaching the middle (more likely a third) of the third pair. There are 25 shields along the midline of the throat; the gular fold is pronounced; and the collar of 12 large scales is arched, with a serrated edge. The pectoral plates are large; and the ventral plates, arranged in oblique rows, are rectangular or square in shape, with 30 shields in one longitudinal row.

There are 8 scales between the inner edges of the rows of femoral pores; and the distance between the rows of P.fm. is about 1.7 times the length of one row.



Fig. 2. A series of paratypes of *Eremias arguta belyalovi* ssp. n. Males
Рис. 2. Серия паратипов *Eremias arguta belyalovi* ssp. n. Самцы



Fig. 3. A series of paratypes of *Eremias arguta belyalovi* ssp. n. Females
Рис. 3. Серия паратипов *Eremias arguta belyalovi* ssp. n. Самки

The femoral pores do not reach the knee joint by the distance of 4 scales on each side. The number of femoral pores is 11/11; and underdeveloped pores are absent. There is one large pentagonal shield is in the precloacal area. The dorsal scales are relatively large and rather smooth; and there are 45 scales around the middle of the body. The tail scales are smooth on top, without ribs, and elongated in the posterior part; and there are 24 scales around the 9th-10th ring of the tail. There are 24 subdigital lamellae on the inner side of the fourth toe of the hindlimb.

Coloration. The holotype's dorsal pattern consists of elongated (oval) white ocelli with a dark border, in this case brown. These ocelli are arranged in rows, with a narrow, lightly-colored stripe between them along the spine. The ocelli pattern extends to the upper half of the tail, but the ocelli and dark border are often less distinct than on the back. The pattern is not clearly defined on the forelimbs and hindlimbs. On the sides of the body, the lower row of ocelli is bright blue, which is not preserved in the specimens fixed in ethanol. Dark spots remain visible in the centers of some of these ocelli. The head has a blurred beige-brown pattern (fig. 1).

Paratypes. ZMMU Re-16075–16089 (15 specimens) (Figs. 2, 3). Southeastern Kazakhstan, Almaty (now Zhetysu) Region, Panfilov District, Ili Basin, coordinates: 44.2553° N, 79.1469° E (ZMMU Re-16080); 44.3503° N, 79.3297° E (ZMMU Re-16075–16079); 44.3978° N, 79.2744° E (ZMMU Re-16081, Re-16083, Re-16086, Re-16089); 44.3792° N, 79.4497° E (ZMMU Re-16082, Re-16087, Re-16088, Re-16084, Re-16085), alt. 1242–1313 m a.s.l., 10–13.05.2007, coll. T.N. Dujsebayeva, O.V. Belyalov. Additional materials: ZMMU Re-12491 (1 specimen), IZRK 749/1–2 (2 specimens), Southeastern Kazakhstan, Almaty Region, Raiymbek District, Northern Tien Shan, southern slope of the Zhabyrtau Mountains between coordinates 42.9358° N, 80.0783° E and 42.9266° N, 80.0896° E, alt. 1948–2020 m a.s.l., 09–22.06.2008, coll. T.N. Dujsebayeva, O.V. Belyalov; IZRK 775/1–2 (2 specimens), Southeastern Kazakhstan, Almaty Region, Raiymbek District, Northern Tien Shan, northern foothill plain of the Ketmen Ridge, coordinates: 43.3138° N, 79.1853° E, alt. 1263 m a.s.l., 11.05.2007, coll. T.N. Dujsebayeva, O.V. Belyalov.

Variability of paratypes. The paratype series (figs. 2, 3) includes 4 females and 12 males (including the holotype), whose main characteristics are presented in Table 1. The head size and hindlimb length are larger in males. Visually, both sexes can be distinguished by habitus. Furthermore, males possess a large pentagonal shield in front of the cloacal opening, significantly larger than the other shields in this region; in females, all shields in this region are similar in size.

Both sexes have a light grey background coloration on the back, with a noticeable, unpatterned, lighter stripe along the spine. The coloration and pattern are more contrasting in males (figs. 2 and 3). A bright black border surrounds the white oval ocelli on the back of males, while in females, they are light brown. On either side of the light stripe, the white ocelli join (touch) within a brown field, and the third ocelli form a separate, longitudinal row.

Pattern and coloration of paratypes. Light brown or greyish above. On the back, the pattern is represented by transverse rows of elongated ocelli. The ocelli are arranged in six longitudinal rows, three on each side of the spine. Often, the edging of the central longitudinal rows of ocelli merges into a transverse stripe, forming double ocelli on the sides of the spine. The outer longitudinal row of ocelli, extending onto the lateral part of the body in males, is colored blue, greenish, light green, or greyish, depending on sexual activity. In May, adult males have bright green or yellow-green ocelli while subadults have yellow ocelli (fig. 4*b*, 4*d*); and at the beginning of the active season, as well as in August, adult males have blue ocelli of varying degrees of saturation (fig. 4*a*). The ocelli on the sides of the body in females are white (fig. 4*c*). In some juveniles and females, the white ocelli merge into a stripe around the neck and first third of the back (figs. 4*c*, 4*d*). The ventral side is white or slightly beige. In immature specimens, the undertail is yellow (fig. 4*d*). In males, the undertail and thighs are yellowish or cream-colored.

After fixation, lizards retain their characteristic pattern, but they lose the colored ocelli on the sides of the body in males and the yellowish undertail and thighs.

Diagnosis. A medium-sized lacertid lizard, maximum snout-vent length (SVL) = 64.5 mm, tail being ca. 1.5 times longer than body length (SVL), hindlimbs relatively long (HLL/SVL ratio 0.46); subocular scale not reaching mouth edge, in touch with 6–8 supralabials. The row of small granular scales between supraoculars and frontal with frontoparietals is absent; with the distance between the femoral pore rows being wide. The femoral pore rows do not reach the knee joint; and there is a coloration pattern with light colored ocelli with black edging (Szczerbak, 1974). Males with bright coloration consist of two to three dorsolateral rows of light-colored ocelli with thick black edging. The ventral row of ocelli in life is greenish to bluish; and the dorsal pattern consists of black irregular blotches along the middorsal line.

Etymology. The specific name "*belyalovi*" is a Latin toponymic adjective in the nominative singular (feminine gender). We named this subspecies in honor of Oleg Vyacheslavovich Belyalov (1960–2020), a Kazakhstan ornithologist, renowned photographer, and creator of photo albums and nature films, who died prematurely from COVID-19. With a broad knowledge of zoology, he was interested not only in birds but also in other animal groups, including reptiles. Most of the

Table 1. Morphological characteristics of the type series *Eremias arguta belyalovi* ssp. n.

Таблица 1. Морфологические признаки *Eremias arguta belyalovi* ssp. n.

Inv. №	Field №	Type	sex	SVL	TL	HLL	HL	HW	Sq	Ventr	G	P.fm.l/ P.fm.r	Dist.P.fm	Sq.c.cd	Lab.min. left/right	Sublab	Submax.cont	Prfront
Re-12426	698/9	H	m	57.5	44.51	30.7	16.4	10.0	45	30	25	11/11	4	24	5(5)/4(5)	8	3	2
Re-16075	T11/8	P	m	50.93	62.67	25.43	14.49	8.24	44	31	23	12/12	5	26	5(5)/6(5)	7	1	2
Re-16076	T11/7	P	m	60.58	76.92	29.46	17.31	10.58	42	31	23	11/12	3	29	5(5)/5(5)	6	1	2
Re-16077	T11/6	P	m	56.46	65.71	29.05	17.41	10.35	45	29	25	12/12	3	24	5(5)/6(5)	7	3	2
Re-16078	T11/5	P	m	50.43	66.51	28.52	14.42	8.89	42	31	26	10/11	4	26	5(5)/6(5)	7	3	2
Re-16079	T11/4	P	m	55.18	54.76	29.35	16.07	9.79	46	29	26	11/12	5	23	5(4)/5(2)	7	1	–
Re-16080	T8	P	f	57.27	63.17	26.76	13.37	8.67	47	30	27	12/11	5	23	6(5)/6(4)	6	2	2
Re-16081	T12/4	P	m	51.53	62.46	24.59	14.06	8.47	47	30	23	9/9	5	25	5(5)/5(5)	8	3	2
Re-16082	T15/6	P	f	52.94	59.25	25.96	13.96	7.97	45	29	25	11/11	4	23	5(5)/5(5)	8	1	2
Re-16083	T12/4	P	m	53.16	51.49	24.31	13.25	8.27	43	30	21	10/11	8	25	5(5)/6(5)	6	1	2
Re-16084	T15A/3	P	m	47.6	62.42	22.77	12.92	7.4	46	29	21	12/12	3	32	5(5)/5(6)	9	1	2
Re-16085	T15A/3	P	m	54.82	66.38	26.98	15.11	9.2	43	28	22	13/12	6	26	6(5)/6(6)	6	1	2
Re-16086	T12/4	P	f	58.03	Reg.	28.03	16.78	9.51	47	28	28	11/11	8	25	5(4)/6(5)	7	1	2
Re-16087	T15/6	P	f	58.57	54.5	25.78	13.61	7.81	46	32	22	11/11	5	23	5(4)/5(5)	8	1	2
Re-16088	T15/6	P	m	62.25	–	28.56	17.51	10.8	43	27	22	10/10	5	25	5(4)/5(3)	6	1	2
Re-16089	T12A/2	P	m	54.39	66.7	27.49	15.2	8.81	47	29	26	11/12	5	27	5(5)/5(5)	8	1	2

H – holotype, P – paratype.

H – голотип, P – паратип.



Fig. 4. *Eremias arguta belyalovi* ssp. n., Konyrolen Valley, Ili Basin, Southeastern Kazakhstan: *a* – adult male, 29 August 2007; *b* – adult male, 11 May 2007; *c* – adult female, 11 May 2007; *d* – immature male, 29 August 2007. Photo by O.V. Belyalov

Рис. 4. *Eremias arguta belyalovi* ssp. n., Коныроленская долина, Илийская впадина, Юго-Восточный Казахстан: *a* – взрослый самец, 29 августа 2007; *b* – взрослый самец, 11 мая 2007; *c* – взрослая самка, 11 мая 2007; *d* – неполовозрелый самец, 29 августа 2007. Фото Белялова О.В.

collection of the steppe racerunners described in this article was assembled by him (including the type specimen), or with his participation, between 2006 and 2008.

Differential analysis. To compare the new taxon with racerunners of other subspecies inhabiting the territory of Kazakhstan, the following samples were used: *E. a. arguta* from the Northern Aral Sea region and Eastern Kazakhstan; *E. a. deserti* from Western Kazakhstan and the Volgograd region; *E. a. uzbekistanica* from the Kyzylkum and Otar station; *E. a. darevskii* from Kungey-Alatau of Kyrgyzstan (Chirikova, 2007; Orlova et al., 2012); *E. a. transcaucasica* from the description of the subspecies according to Szczerbak et al. (1993).

It differs from *E. a. arguta* in its small size (47.6–62.25 versus 49.0–77.0), smaller relative head width (WT/HL: 0.57–0.65 versus 0.52–0.91), longer tail relative to the body (SVL/TL: 0.76–1.07 versus 0.89–1.36), the smaller number of Sq (42–47 versus 42–58), G (21–28 versus 20–34), and the larger number of femoral pores (10–13 versus 6–13). The third pair of submaxillary shields do not touch in 26.6%, while in the nominative subspecies they touch in 100%. The difference is also reflected in the number of scales between the femoral pores and the knee joint: the row of femoral pores is missing 1–5 scales (usually 2–3), whereas in the nominate form it is missing 3–6 scales (usually 4). It also differs from the nominate subspecies by the higher percentage of specimens with underdeveloped pores and the absence of an additional shield between the prefrontal shields. The pattern is distinguished by the presence of colored ocelli on the sides of the body and a thin border around the ocelli, as well as the absence of transverse dark stripes on the back.

It differs from *E. a. uzbekistanica* in its significantly smaller size (47.6–62.25 versus 53.0–86.5), slightly smaller relative head width (0.57–0.65 versus

0.54–0.7), and the larger number of scales around the 9th-10th ring of the tail (23–32 versus 17–26). Unlike in the Uzbek form, in which three pairs of submaxillary shields do not touch (92.86%), the third pair in the described form is separated in only 26.7% of cases. The row of femoral pores does not reach the knee joint by a distance of from 1–5 scales, whereas in the Uzbek subspecies, it does so by only one scale. It also differs in the presence of underdeveloped pores and the absence of an additional shield between the prefrontal scales. The pattern is distinguished by the presence of colored ocelli with a thin border on the sides of the body, which are often less elongated than in the *uzbekistanica*.

It differs from *E. a. darevskii* in having a longer tail relative to the body (SVL/TL: 0.76–1.07 versus 0.81–1.23), a smaller number of Sq (42–47 versus 45–55), G (21–28 versus 22–34), and a greater number of femoral pores (10–13 versus 8–12). The third pair of submaxillary shields in the subspecies described touch in 73.33% of cases, whereas in *E. a. darevskii* this occurs in only 5.56% of cases. 40% of lizards of new subspecies have underdeveloped femoral pores, while of *E. a. darevskii* only 7%. The pattern is distinguished by the presence of colored ocelli on the sides of the body.

It differs from *E. a. deserti* in having a smaller number of Sq (42–47 versus 40–55), G (21–28 versus 23–32), a larger number of femoral pores (10–13 versus 7–14), and the absence of an additional shield between the prefrontals. The third pair of submaxillary shields is contiguous in 73.3% of specimens, whereas in the western form, it is contiguous in 100%. The pattern differs in the presence of colored ocelli on the sides of the body and the absence of longitudinal light stripes on the back.

It differs from *E. a. transcaucasica* by its smaller size (the maximum body length is 62.25 mm, while in the Armenian steppe racerunners it is 85 mm), smaller number of Sq (42–47 versus 52–56), and larger number of scales around the 9th–10th ring of the tail (23–32 versus 21–29).

The new taxon is easily distinguished from all subspecies of *E. arguta* by its small size, the colored (blue, greenish, or light green) ocelli on the sides of the body in males, which are especially vibrant during the breeding season, and its clearly defined range, since no other subspecies of *E. arguta* has been recorded in this area.

None of the previously known subspecies of *E. arguta* has been described as having brightly colored ocelli with a dark border, arranged in a clear row along the sides of the body (Szczerbak, 1974; Szczerbak et al., 1993), or as having color variations in the background coloration of the body. It is interesting to note, however, that one of the male of racerunners from Ryn-Sands (Western Kazakhstan), caught by us in the second half of May 2010, had a faint blue-green tint on the sides of its body, and at the base of its fore and hind limbs were isolated small spots from a group of bluish scales, which had a dark border on one side of the body and no border on the other (own data). A slightly greenish color of the sides and some ocelli was observed in lizards in the foothills of Karatau (own data), and Vashetko (Szczerbak et al., 1993) reported greyish-violet spots in lizards from the Fergana Valley.

Genetics. According to molecular genetic analysis, the population from the Ili Basin forms a distinct clade, sister to the monophyletic group comprising all other *E. arguta* lineages. It is restricted to a small area of the valley of the Ili River between the Tien Shan and the Dzhungarian Alatau, extending from the Altyn-Emel Range in the west (Poyarkov et al., 2014) to the eastern edge of the Ili Basin and the south-west edge of the Dzhungarian Depression in the east (Gong et al., 2018). Two well-confirmed subclades have been identified: one on the right bank and one on the left bank of the Ili Basin (Poyarkov et al., 2014).

Terra typica. Vicinity of Konyrolen Village, Konyrolen Valley, Ili Basin, Southeastern Kazakhstan

Distribution. *E. a. belyalovi* ssp. n. was recorded in the intermountain depressions of Southeastern Kazakhstan and Northwestern China (Xinjiang): along the foothill periphery of the Ili Basin (including the Konyrolen, Sogety and Zhalanash valleys), the Kegen and Tekes basins and on the western periphery of the Dzhungarian Depression (fig. 5, Table S1).

Habitats. In the Konyrolen Valley, *E. a. belyalovi* ssp. n. occupies rubble-clayey or clayey (sometimes takyr-like) flat areas and the beds of dry watercourses on ancient alluvial and deluvial piedmont plains at an altitude range of 1000–1500 m a.s.l. with wormwood, tasbiyurgun-, boyalychevo and cereal-forb plant associations in various combinations (*Artemisia terrae-albae*, *Artemisia heptapotamica*, *Nanophyton erinaceum*, *Kochia prostrata*, *Krascheninnikovia ceratoides*, etc.) and sparse shrubs (*Caragana balchaschensis*, *Atraphaxis virgata*, *Artemisia replicata*) (fig. 6*a*) (Rachkovskaya et al., 2003). In spring, the projective cover of the plains reaches 70–75% and is represented primarily by ephemerals and ephemeroids, with *Carex stenophylla stenophylloides* and *Poa bulbosa vivipara* predominating (Rubtsov, 1950); in summer, this decreases to 40–50%. Areas of intensive grazing are identified by the dominance of hadraspan (*Peganum harmala*) and grasses. The racerunners also inhabit a similarly narrow elevation range to the east, on the watershed of the middle reaches of the Usek and Burkhan rivers, where the biotope is represented by clayey wormwood semi-desert (fig. 6*b*).

In the Zhalanash Valley, Kegen and Tekes basins, they occur in the clay plains dominated by wormwood (*Artemisia* sp.) and sparse feather grass (*Stipa* sp.) across a wide range of elevations from 630 to 2000 m above sea level (fig. 6*c*). In the extreme southeast of the range, in the Zhabyrtau Mountains, the lizards occur in a non-typical hilly-ridged landscape with wormwood

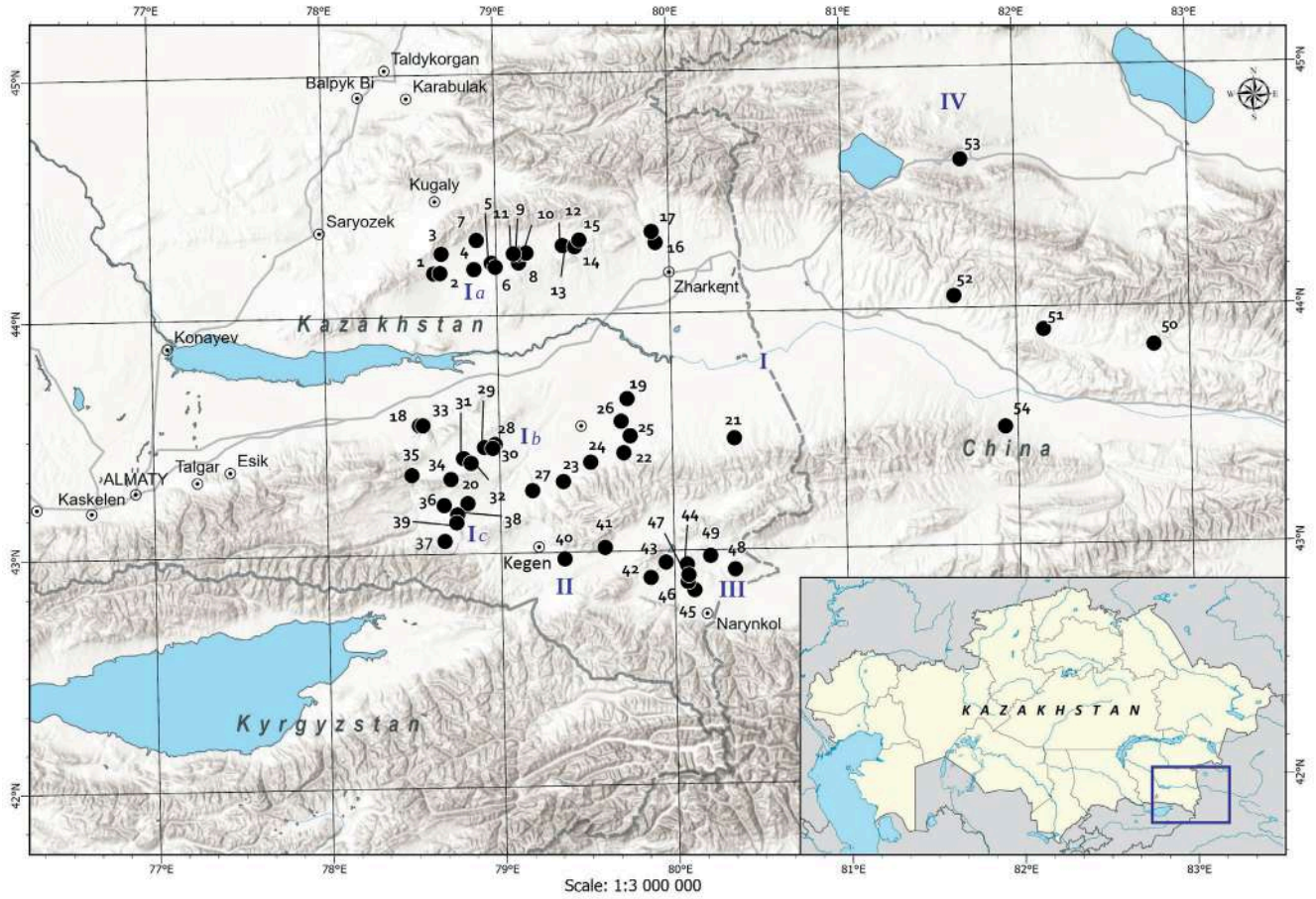


Fig. 5. Distribution of *Eremias arguta belyalovi* ssp. n. in Southeastern Kazakhstan and Northwestern China (Xinjiang) according to known data: I–Ili Basin, including: Ia – Konyrolen Valley, Ib – Sogety Valley, Ic – Zhalanash Valley; II – Kegen Basin; III – Tekes Basin; IV – Dzhungarian Depression. The names of the localities are provided in Table S1

Рис. 5. Распространение *Eremias arguta belyalovi* ssp. n. в Юго-Восточном Казахстане и Северо-Западном Китае (Синьцзян) согласно известным данным: I – Илийская впадина, включая: Ia – Коныроленская долина, Ib – Согетинская (Сюгатинская) долина, Ic – Жаланашская долина; II – II – Кегенская впадина; III – Текесская впадина; IV – Джунгарская впадина. Название пунктов приведены в таблице S1

slopes on the southern and western exposures, feather grass-wormwood slopes on the northern and eastern exposures, and mesophilic inter-ridge valleys (fig. 6*d*). The projective vegetation cover is 30–50%. In the southern foothills of the Karatau Ridge (Northern Tien Shan), lizards inhabit outcrops of Neogene clays, with xerophytic vegetation dominated by *Caragana microphylla*. The racerunners were not found to be avoiding areas of cattle grazing with secondary weed plant associations of *P. harmala* and cereals. They were nevertheless absent from the central part of the Ili Basin and from small sands near the villages of Kegen and Karasaz (Kegen Basin), which are covered with aeolian sands.

In the Xinjiang Uyghur Autonomous Region of China, the new subspecies inhabits the eastern part of the Ili Basin (near Bole) and, judging by the photograph in the article (Gong et al., 2018), are found in similar lowland habitats with sparse xerophytic vegetation.

In the piedmont and foothill plains of the Kazakhstan part of the Central Tien Shan, the *Eremias arguta belyalovi* ssp. n. coexists with the Tien-Shan Racerunner (*Eremias stummeri* Wettstein, 1940) (Dujsebayeva et al., 2019), but not with other subspecies of *E. a. arguta* and *E. a. uzbekistanica*.

In addition, in some areas, it is found sympatrically and often symbiotically with the toad-headed agamas *Phrynocephalus helioscopus* (Pallas, 1771) and *Phrynocephalus alpherakii* (Bedriaga in Nikolsky, 1905).

E c o l o g y of the steppe racerunners from the intermountain depressions of Southeastern Kazakhstan was recently described by Dujsebayeva and Chirikova (2026).

T h r e a t s. The population status is favorable; no special conservation measures are required.



Fig. 6. Habitats of *Eremias arguta belyalovi* ssp. n. in Southeastern Kazakhstan: *a* – type locality in the Konyrolen Valley; *b* – the valley of Usek River; *c* – Zhalanash Valley (*a*–*c* – Ili Basin); *d* – Zhabyrtau Mountains (Tekes Basin)

Рис. 6. Местообитания *Eremias arguta belyalovi* ssp. n. в Юго-Восточном Казахстане: *a* – типовая территория в Коныроленской долине; *b* – бассейн р. Усек; *c* – Жаланашская долина (*a*–*c* – бассейн р. Или); *d* – горы Жабыртау (бассейн р. Текес)

DISCUSSION

The taxonomic assignment of the steppe racerunners from the Tien Shan region has a long history. Chernov (1934) identified most specimens, primarily from Semirechye, Kashgaria, and Dzhungaria (stored in the Zoological Institute of the Russian Academy of Sciences, further ZISP), as intermediate forms between the nominate subspecies and *E. a. uzbekistanica*. However, he included Dzhungaria within the range of *E. a. uzbekistanica*. He also discovered intermediate forms in northern Kyrgyzstan, and later, Yakovleva (1964) identified them in the Chu Valley and Issyk-Kul region. According to the last author, who compared Kyrgyz populations from the Issyk-Kul Basin with samples from southeastern Kazakhstan (the valleys of the Chu and Ili rivers, the northern slopes of the Trans-Ili Alatau, and the environs of Almaty City and Kaskelen Town), the lizards from these areas showed many similarities in several traits. Such data confirm the conclusions of Tarasov (1958) regarding the similarity of the desert fauna of the Issyk-Kul region and Southern Kazakhstan, and their common past. They are supported by paleogeographic evidence for the development of the territory in the Miocene – first half of the Pliocene, when the connection between the Chu, Issyk-Kul, Ili, Kegen and Tekess basins occurred (Aleshinskaya et al., 1976; Krestnikov et al., 1979; Grigina, Fortuna, 1981). The assumption of Yakovleva's (1964) observation of a special intra-subspecific variety of *E. a. uzbekistanica* in the Issyk-Kul region was supported by the assignment of these populations to independent subspecific status – *E. a. darevskii* (Tsaruk, 1986).

The lizards from the Ili Basin and adjacent intermountain depressions of the Northern Tien Shan differ sharply from all others in the small size of sexually mature specimens and the presence of blue or green ocelli on the sides of the body in males, depending on the season of activity; yellow undertail coverts; and yellow ocelli in immature specimens (Dujsebayeva et al., 2007). According to the results of Cyt b analysis,

specimens from the vicinity of the villages of Konyrolen, Kainar (southern slope of the Ketmen Ridge), and Baschi form a separate clade and are clearly differentiated from neighboring forms (Orlova et al., 2007; Poyarkov et al., 2014). Specimens of *E. arguta* collected in the late 19th century (ZISP) from Yining (the eastern Chinese part of the Ili Basin, Xinjiang) are phenotypically identical to the steppe racerunners from the Kazakhstan part, except for the absence of the colored ocelli, which were lost due to long-term storage in an alcohol fixative.

Gong et al. (2018) published the results of a morphological and phylogenetic analysis of 28 steppe racerunners from four *E. arguta* populations in the vicinity of Bole, Xinjiang Uyghur Autonomous Region (southwestern periphery of the Dzhungarian Depression). The morphological analysis showed that the lizards from Bole in pattern of coloration, habitus, and phylogenetic traits are most similar to the sister taxa *E. a. uzbekistanica* and *E. a. darevskii*, cannot be considered within *E. a. arguta* or *E. a. uzbekistanica*, and belong to a cryptic, undescribed clade. In their habitus and life coloration, these lizards are similar to specimens from the Ili Basin populations. Thus, a comparison of *E. arguta* from Bole and the eastern part of the Ili Basin leaves no doubt about their morphological identity with the steppe racerunners from the intermountain depressions of Southeastern Kazakhstan. The position of the Bole lizards on the phylogenetic tree of *E. arguta*, constructed based on the results of Cyt *b* analysis, confirms their belonging to a new taxon *E. arguta belyalovi* ssp. n. as described here.

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Supplement. Table S1. Known records of *Eremias arguta belyalovi* ssp. n. Orlova, Poyarkov, Chirikova et Dujsebayeva with indication of the storage location of collection material, literary sources and oral information: IZKAZ – Institute of Zoology (Almaty, Kazakhstan); ZMMU – Zoological Museum of Moscow University (Moscow, Russia); ZISP – Zoological Institute of Russian Academy of Sciences (Saint-Petersburg, Russia)

Приложение. Таблица S1. Известные находки *Eremias arguta belyalovi* ssp. n. Orlova, Poyarkov, Chirikova et Dujsebayeva с указанием мест хранения коллекционного материала, литературных источников и устных сообщений: IZKAZ — Институт зоологии (Алматы, Казахстан); ZMMU — Зоологический музей Московского университета (Москва, Россия); ZISP — Зоологический институт Российской Академии Наук (Санкт-Петербург, Россия).

№	Source of information	Location	Coordinates
1	Reported by T.N. Dujsebayeva and O.V. Belyalov	Kazakhstan, between the Altyn-Emel Pass and the Baschi Village	44.1600° N, 78.6333° E
2	Reported by T.N. Dujsebayeva and O.V. Belyalov	Kazakhstan, Koyandytau Mountains near the Kaindy cordon	44.2500° N, 78.6666° E
3	IZKAZ 771/1	Kazakhstan, border of the Kerbulak and Panfilov Districts	44.1833° N, 78.8666° E
4	Reported by T.N. Dujsebayeva and O.V. Belyalov	Kazakhstan, 1 km north of the Kok-Beyit mazars, Ili Valley, 2 km south of the Uzunbulak cordon of the Altyn-Emel National Park	44.3000° N, 78.8666° E
5	IZKAZ 765/2	Kazakhstan, 25 km west and southwest of the Konyrolen Village, the dry bed of the Yntaly River	44.2166° N, 78.9666° E
6	ZMMU R-16095	Kazakhstan, 20 km east of the Baschi Village	44.2034° N, 78.9944° E
7	IZKAZ 765/1, 771/2-5	Kazakhstan, 5 km east of the Aynabulak Village	44.1536° N, 79.0776° E
8	ZMMU Re-16080	Kazakhstan, 3–15 km west of the Konyrolen Village, northern trail of the Katutau Mountains	44.2553° N, 79.1469° E
9	ZMMU Re-13075	Kazakhstan, 110 km of the Saryozek-Konyrolen highway	44.4177° N, 79.1709° E
10	IZRK 698/9, 771/6–8, ZMMU Re-12553, Re-12426	Kazakhstan, near the Konyrolen Village	44.2869° N, 79.3568° E
11	ZMMU Re-16081, Re-16083, Re-16086, Re-16089	Kazakhstan, northern trail of the Katutau Mountains	44.3978° N, 79.2744° E
12	ZMMU Re-16082, Re-16084, Re-16085, Re-16087, Re-16088	Kazakhstan, northern trail of the Katutau Mountains	44.3792° N, 79.4497° E
13	ZMMU Re-16075–16079	Kazakhstan, northern trail of the Katutau Mountains	44.3503° N, 79.3297° E
14	IZKAZ 348/3863	Kazakhstan, 10 km north of the Lesnovka Village	44.2891° N, 79.9186° E
15	Reported by M.A. Chirikova	Kazakhstan, the valley of Usek River, 3 km above the dam	44.3402° N, 79.8991° E
16	ZISP 21581	Kazakhstan, canyon of the Charyn River, the "Valley of Castles"	43.7830° N, 79.4160° E
17	ZISP 12592	Kazakhstan, north foothills of the Ketmen Ridge, environs of the Big Ketmen Village	43.4709° N, 80.3574° E
18	Shnitnikov (1915)	Kazakhstan, north foothills of the Ketmen Ridge, dry riverbed Tegermen (Tigermen)	43.4279° N, 79.7131° E
19	Shnitnikov (1915)	Kazakhstan, Podgornoye Village (now Kyrgyzsai Village), north foothills of the Ketmen Ridge	43.3395° N, 79.4770° E
20	IZKAZ 775/1-2, ZMMU Re-16101, Re-16102, Re-12496	Kazakhstan, road from the Temirlik River to Kegen Pass	43.3138° N, 79.1853° E

№	Source of information	Location	Coordinates
21	ZMMU Re-12746	Kazakhstan, Sogety Valley, 25 km east of the Kokpek Village	43.4616° N, 78.9740° E
22	ZMMU Re-12560	Kazakhstan, Sogety Valley, 20 km east of the Kokpek Viullage	43.4486° N, 78.9131° E
23	IZKAZ 385/4579, 4580	Kazakhstan, Sogety Valley	43.4395° N, 78.9561° E
24	ZMMU Re-12410	Kazakhstan, Sogety Valley	43.4044° N, 78.7915° E
25	IZKAZ 311/3484	Kazakhstan, Sogety Valley, 164 km of the Almaty-Narynkol highway	43.3833° N, 78.8333° E
26	Shnitnikov (1915)	Kazakhstan, north slope of the Toraigyr Mountains	43.3167° N, 78.7167° E
27	IZKAZ 217/2243–2259	Kazakhstan, Bartogay Village, Chilik River, ascent to the plateu of Assy	43.3333° N, 78.5000° E
28	Shnitnikov (1915)	Kazakhstan, between the south slope of the Toraigyr Mountains and the Zhalanash Valley	43.2070° N, 78.6733° E
29	ZISP 15221	Kazakhstan, watershed of the Charyn and Chilik rivers, the Zhalanash Village	43.0545° N, 78.6738° E
30	ZMMU Re-12411	Kazakhstan, Zhalanash Basin	43.1660° N, 78.7500° E
31	Reported by T.N. Dujsebayeva and O.V. Belyalov	Kazakhstan, Zhalanash Basin	43.1258° N, 78.6454° E
32	reported by T.N. Dujsebayeva and U.K. Dosbolov	Kazakhstan, south foothills of the Ketmen Ridge, before the entrance to the Emirsay Gorge	43.0177° N, 79.6012° E,
33	ZMMU Re-12425	Kazakhstan, 2–3 km north of the Kainar Village, Aigyrzhal Mountains	42.8862° N, 79.8624° E
34	ZISP 12587	Kazakhstan, at the exit from the Aybyrzhal Mountains to the Burado-Bosun Lake (= Tuzkol Lake)	42.9500° N, 79.9500° E
35	IZKAZ 749/1-2, ZMMU Re-16099, Re-16100, Re-12491	Kazakhstan, south slope of the Zhubartau Mountains	42.9333° N, 80.0833° E
36	ZMMU Re-12574	Kazakhstan, environs of the Tekes Reservoir	42.8333° N, 80.1166° E
37	Reported by T.N. Dujsebayeva and O.V. Belyalov	Kazakhstan, southern shore of the Tekes Reservoir	42.8166° N, 80.2500° E
38	IZKAZ 46/713	Kazakhstan, Yesertkan Village, 35 km northeast of the Narynkol Village	42.9166° N, 80.3500° E
39	Reported by T.N. Dujsebayeva, U.K. Dosbolov, and O.V. Okshin	Kazakhstan, southern foothills of the Karatau Range, between Sarybastau Village and Aigyrzhal Mount	42.9746° N, 80,2089° E and 42.9875° N, 80.2208° E
40	Reported by T.N. Dujsebayeva, U.K. Dosbolov, and O.V. Okshin	Kazakhstan, southern foothills of the Karatau Range, between Sarybastau Village and Aigyrzhal Mount	42.9875° N, 80.2208° E
41	Gong et al. (2018)	China, Gongliu County	43.4995° N, 81.9274° E
42	Gong et al. (2018)	China, between Yining and Nileke	43.8351° N, 82.7943° E
43	Gong et al. (2018)	China, between Yining and Nileke	43.9049° N, 82.1569° E
44	ZISP 5802, 9134, 5531	China, outskirts of Gulja City (no precise reference)	44.0497° N, 81.6432° E
45	Gong et al. (2018)	China, Bole City	44.6156° N, 81.6923° E

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