Russian Journal of Herpetology Vol. 2, No. 2, 1995, pp. 87 – 94

REVIEWED DESCRIPTION OF THE TYPES OF *Phrynocephalus strauchi* NIKOLSKY, 1899 (SQUAMATA, AGAMIDAE) AND MATERIALS ON THE HISTORY OF ITS STUDY, DISTRIBUTION, AND VARIABILITY

E. A. Dunayev[1]

Submitted April 15, 1995.

The status of the Strauch toad agama was identified differently after reviewed description as *Phrynocephalus helioscopus strauchi*, *Ph. helioscopus*, *Ph. reticulatus strauchi*. The holotype was not identified by Nikolskii. The lectotype status established by Fedchenko's collection (No. R-2116 ZMMU[2]), because he worked before Middendorf in the Fergana Valley. Besides, Nikolskii preferred the first one in his study. Specimens of Middendorf's collection (Nos. 8703, 8704 ZISP) are paralectotypes.

Ph. strauchi is endemic of the Fergana Valley. The data collected on the Aral Sea coast and the south-west of Tadzhikistan were erroneous, because of bad marking of animals and wrong identification. We found that one of collection numbers of *Ph. guttatus* in the Fergana Valley was *Ph. strauchi* (No. 5029 ZISP).

Different ecological forms of this species occupy sandy and stony habitats. They differ in background colors of the back (gray – for the sandy form, deep-red – for the stony), the number of transverse stripes on the back in the adult forms (3 and 2, respectively). In this paper we describe the colors in detail. The sandy form has well developed edges on the caudal scales, while the stony form does not have them. All the outlined differences were ecologically dependant, and, according to Mayr, we can name the two forms as ecological races.

Key words: *Phrynocephalus strauchi*, types, systematics, ecological races, distribution.

Phrynocephalus strauchi Nikolsky was described by A. M. Nikolskii in 1899. We called it "oblong toad agama," and gave a rather detailed characteristics of the species, recording thoroughly the peculiarities of folidosis and color of several specimens from the collections of A. P. Fedchenko (Nos. R-2113, R-2116 ZMMU), A. F. Middendorf (Nos. 8703, 8704 ZISP) and A. A. Chekhov (No. 8705 ZISP) from some different regions of the Fergana Valley and the Aral Sea coast. Some of these specimens, as it was found out later, belong to other species. In later works Nikolskii (1905, 1907, 1915) and some other authors (Terent'ev and Chernov, 1936) considered this form to be independent species. L. A. Lantz referred it to *Phrynocephalus helioscopus* (as a subspecies *Ph. strauchi*), and G. S. Kochubei identified it as *Phr. helioscopus*, which was in accordane with the original labels of those specimens (Nos. 13156, 14930, 14943, 14954, 14991 ZISP; SR-847 IZASU). Later, Terent'ev and Chernov (1940) also considered "this species to be very close to and may be identical with the *Phr. helioscopus*." Chernov (1949) regarded *Ph. strauchi* as a subspecies of *Ph. reticulatus strauchi*, and under this name it was included into the faunistic summaries (Chernov, 1959; Bogdanov, 1960).

Galaeva (1976), having made a detailed morphometric analysis of *Ph. reticulatus* from the south-west of Kyzylkum and of *Ph. strauchi* from the sands of the Namangan Region, and taking into account the rather isolated area of the latter form, came to the conclusion that *Ph. strauchi* still diverse the specific status. Later, her conclusion was confirmed by Sattarov (1981), who studied *Ph. reticulatus* and *Ph. strauchi* from broken stone biotops.

Suggestions on the species status of *Phrynocephalus strauchi* were also made by Sokolovskii (1975) also. They were based on some karyological peculiarities.

At present, this form is unambiguously given as the rank of a species (Borkin, Darevsky, 1987; Anan-

[1] Zoological Museum, M. V. Lomonosov Moscow State University, Gertsena ul., 6, Moscow, 103009, Russia.

[2] The following abbreviations are used in the article: ZMMU) Zoological Museum, M. V. Lomonosov Moscow State University, Moscow, Russia; ZISP) Institute of Zoology, Russian Academy of Sciences, St. Petesburg, Russia; IZASU) Institute of Zoology, Ukrainian Academy of Sciences, Kiev, Ukraine.

jeva et al., 1988), although the type specimens and intraspecies variations in color still have not been analyzed. The main purpose of this work is in the main to fill this gap. In its realization I was supported by my colleagues to whom I wish to express my gratitude. N. B. Ananjeva, M. L. Golubev and I. V. Iksanova kindly provided the possibility and supported my work with the herpetological collection of the ZISP RAS, IZASU, Biology Department of St. Petersburg State University; V. F. Orlova and M. L. Golubev made a critical analysis of the manuscript.

TYPE SPECIMENS

The holotype of *Ph. strauchi* was not identified by Nikolskii (1899a) and collections from which he made his first description are deposited today in the ZISP of Russian Academy of Sciences (Nos. 8703, 8704 with the note "type" in the catalogue and on the jar) and in the ZMMU (No. R-2116) with the note "type, species nova" on one of the labels.

In each of the jars, containing the seria deposited in ZISP, the are two specimens of lizards, collected by Middendorf between the Kokand and Namangan in 1878. Fedchenko collected a single specimen of this species, deposited in the ZMMU under its own inventory number. The date of collecting this specimen is not indicated on the original label. His other collections of Fedchenko from the Fergana Valley; however, No. R-2113 ZMMU are dated 1869, i.e., 11 years earlier than Middendorf's collections.

In addition, according to the full title of the first work and the preface to it, Nikolskii (1899a) was guided in the description of Fedchenko's collections first of all. Moreover, later, describing the species in the work *Fauna of Russia and Adjacent Countries* (Nikolskii, 1915), containing the same volume of the studied material, he gave a drawing of the *Ph. strauchi* with a hardly noticeable defect in the end of the tail. Such a defect was only found in the specimen from ZMMU.

All above-mentioned allow us to give the status of lectotype (according to the issue 74(a) and recommendations 72B, 74B and 74D of the International Code of Zoological Nomenclature) to the specimen No. R-2116, deposited in the ZMMU; Nos. 8703 and 8704 ZISP in this case should be regarded as paralectotypes. Morphological measurements, reported by Nikolskii (1899a) in the first description, were, apparently, taken from the two specimens: No. 8703 (ZISP) and either No. 8704 (ZISP) or No. R-2116 (ZMMU).

Description of the lectotype of *Phrynocephalus strauchi* Nikolsky, 1899 (ZMMU, No. R-2116): the adult male (ad, ♂) caught in the vicinity of Khodzhent (former Leninabad), collector A. P. Fedchenko, the collecting year unknown. Supposedly, it should be 1870 judging from his other collections from the Fergana Valley and according to the route of the journey (Fedchenko, 1875). Measurements are given in Table 1.

The general background on the back is gray with the small light spots and streaks. On the neck is a horseshoe-shaped pattern with only its lower part clearly seen. The belly and ventral surface of the head are white with smooth scales. The middle and end of the tail on the ventral side are gray-blue, the preanal area is white. On the back and highs are groups of elevated and slightly thickened (on the back) scales. The caudal scales are smoothed but with well noticeable keels. The are 12 supralabiales, 13 intralabiales, 2 internasales, 18 scales across the head, and 14 scales along the head.

Paralectotypes: a) No. 8703 (ZISP), 2 specimens, adult males (ad, ♂♂), were caught between Kokand and Namangan, 04.1878, collector A. F. Middendorf; b) No. 8704 (ZISP), 2 specimens,

TABLE 1. Some Body Dimensions (mm) of Specimens of the Type Series of *Phrynocephalus strauchi* Nik.

Index	Nikolskii, 1899a			Our data, 1988				
	1	2	3	1	2	3	4	5
L.	47	51	40	46.0	51.9	41.3	36.8	45.3
L. cd.	79	82	72	79.0	83.0	66.0	def	61.3
L. c.	11.5	13.5	11.5	11.6	13.2	10.4	10.0	12.2
Lt. c.	12	13.5	10.5	11.4	12.0	10.1	9.3	11.1
P. a.	26	27	24	24.5	27.0	20.0	20.2	23.5
P. p.	42	45	38	40.0	47.0	34.3	35.0	39.0
L. + L. cd.	125	134	113	125.0	134.0	107.0	72.0	108.0
F.	–	–	–	11.8	13.4	10.9	10.0	10.5
T.	–	–	–	14.2	16.5	11.9	11.5	13.9
L. p.	–	–	–	8.8	8.9	7.5	7.0	8.8

Note. 1, 2) No. 8703 ZISP; 3, 4) No. 8704 ZISP; 5) No. R-2116 ZMMU.

adult females (ad, ♀♀). Locality, date, and collector are the same. Transdet. – A. M. Nikolskii.

Type locality of the species should be the vicinity of Khodzhent, according to the issue 73 (b) (III) International Code of Zoological Nomenclature. All paralectotypes were caught in the "clay steppe" (Nikolskii, 1899a). Judging from some peculiarities of their color, both lectotype and paralectotypes were caught on loess-sandy soil. These sands in which these lizards could live, apparently have been destroyed by agriculture by now.

DISTRIBUTION

At present *Ph. strauchi* is an endemic of the Fergana Valley. Its discovery in 1880 near the Aral Sea coast by Chekhov (No. 8705 ZISP; Nikolskii, 1899a) was probably due to an erroneous label. His collections of *Ph. strauchi*, deposited in the Department of Zoology of Vertebrates of Biology Department of St. Petersburg State University (No. 97), which were made two years earlier (Tsarevskii, 1915), are precisely from the Fergana Valley. Probably the year of 1880 ascribed to Chekhov's collection in ZISP is not the year of the collection of the material but the year in which the inventory was taken, sometimes happens in museums. Elpat'evskii (1903), analyzing L. S. Berg's collections of reptiles from the Aral Sea coast, also did not find among them the toad agamas, identified with *Ph. strauchi*. Nevertheless, Sidorov (1925) related it to the Aral with referrence to Elpat'evskii (1903). Terent'ev and Chernov (1936) apriori continued to include under this name toad agamas not only from the Fergana Valley (between 67 and 71 E) but also from an area between Amudar'ya and Syrdar'ya.

Later, Nikolskii (1899b, 1915) referred the lizards, collected by A. N. Kaznakov in the vicinity of Kabad'yan (former Mikoyanobad, South-Western Tadzhikistan) in 1897 (No. 9043 ZISP) to *Ph. strauchi*, which is also not true, because these specimens have other peculiarities of folidosis and noticeable (but loss their color in fixation) suprascapular semilunar spots, typical of *Ph. raddei*. These peculiarities of the considered specimens were also noted by S. F. Tsarevskii (1926).

All other discoveries which were related to adult *Ph. strauchi*, are connected with the Fergana Valley. It is noteworthy only that young animals from Karasu (No. R-2113 ZMMU) and Yantak (No. 20059 ZISP), judging from the habitus and some peculiarities of scalation and color, probably belong to *Phr. helioscopus*.

Nikolskii (1905, 1915) related on the *P. caudivolvulus* (the same as *Ph. guttatus*), (No. 5029 ZISP) to Fergana, but this was not confirmed later (Yakovleva, 1964; Said-Aliev, 1979). Despite this the presence of *Ph. guttatus* in the vicinity of Khodzhent, Mogol-Tau hill was repeatedly pointed out in the faunistic reports and papers (Chernov, 1959; Yakovleva, 1964; Bannikov et al., 1977; Said-Aliev, 1979; Golubev, 1989) with reference to Nikolskii (1905, 1915) as a rule, although Tsarevskii (1926) and Chernov (1959) had noted earlier the indentity of these specimens with the *Ph. strauchi* (according to our data, No. 5029 ZISP contains two specimens of *Ph. strauchi* and one of *Phr. helioscopus*).

Among the specimens collected by A. A. Kushakevich in the vicinity of Khodzhent (Nos. 4902, 5024 ZISP; 1870) are actually *Ph. guttatus*, which is confirmed by the analysis of these specimens by Golubev (1989). But in the case a mistake, connected with the confusion in making the catalog and filling in the label also cannot be excluded, because it is known that it was precisely in 1870 that colonel Kuzhakevich brought K. F. Kessler ichthyological materials from his Turkestan trip not only from Khodzhent, but also from Yany-Kurgan (at present Yanykurgan on the south of Kzyl-Ordinskaya Region of Kazakhstan) (Kessler, 1872). It is, by the way, located almost within the area of *Ph. guttatus* (Bannikov et al., 1977).

Analysis of *Ph. guttatus* specimens collected at the end of the last and beginning of the current century from localities where the discovery of this species further has not been confirmed (in particular from the Fergana Valley) led Golubev (1989) to the conclusion "on its wider distribution in the recent time" and penetration to the Fergana area along the right shore of the Syrdar'ya River from the village of Chilik. This opinion is necessary, of course, to take into account in further investigations, the more so, since the discovery of *Ph. guttatus*, which at present is considered erroneous have been made vicinity of Tashkent (collections of Moshatov 1953 year from Inkomysh-Yangiul' and Kizyl-Tukmachi (Kyzyl-Tukumachi); Nos. R-62 Ø, R-81 Ø, R-7816 in the ZMMU).

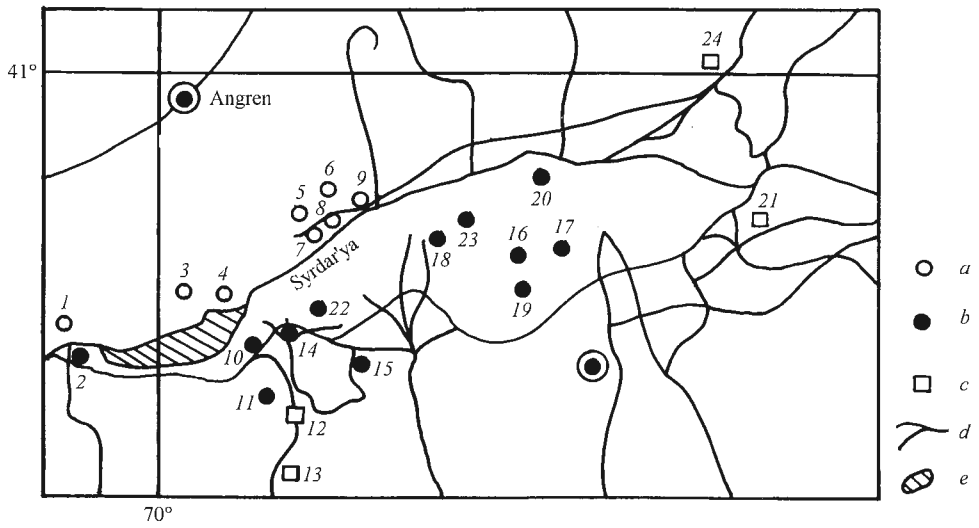

Fig. 1. Distribution of *Phrynocephalus strauchi* in the Fergana Valley: *a*) broken-stony form, *b*) sandy form, *c*) the ecological form has not been identified, *d*) rivers, *e*) Kajrakum reservoir. Tadzhikistan: *1*) The Mogol-tau mountain (No. 5029 ZISP; Tsarevskii, 1926; Chernov, 1959); *2*) Leninabad city (No. R-2116 ZMMU); *3*) the boundary of Asht and Leninabad districts along the Kajrakkum – Bulon route (No. R-6622 ZMMU); *4*) 70° N, Akbel' mountain (No. R-6430 ZMMU); *5*) Shaidan-Asht of the Asht District (Nos. R-2985, 6180 ZMMU; Said-Aliev, 1979); *6*) Yavan of the Asht District (Nos. 17314, 17327* ZISP; Said-Aliev, 1979); *7*) Kyrk-Kuduk, sovkhoz Pravda of the Asht District (No. R-6631 ZMMU; Said-Aliev, 1979; Pereshkol'nik, 1968); *8*) Dzharbulak (Said-Aliev, 1979); *9*) 10 km to the west of Pungan (No. R-6617 ZMMU); *10*) Mel'nikovo (No. R-2109 ZMMU); *11*) Kanibadadam – Isfara (Nos. 13156, 14943, 14991 ZISP); *12*) Isfara city (No. 14954 ZISP); *13*) Isfara – Chorku (Nos. 14930, 58/14966 ZISP). Uzbekistan: *14*) Akkiterak of the Kanibadam District (No. SR-1237 IZANU); *15*) Shorsu (No. R-4461 ZMMU); *16*) the Third Tokalyk of the Yaz'yavan District (Bogdanov, 1960); *17*) 50 km East-North-East of Kokand city (No. R-6429 ZMMU); *18*) Buvaida (No. 29060 ZISP; Bogdanov, 1960); *19*) between Kokand and Margelan (Nos. 5229, 8703, 8704 ZISP; Bogdanov, 1960); *20*) Ak-Kum, Dzhumashui (No. SR-3240 IZANU, Kamalova, 1970; Galaeva, 1976); *21*) Andizhan (No. 7397* ZISP; Bogdanov, 1960; Tsarevskii, 1926); *22*) Besharyk (No. SR-847 IZANU); *23*) between Dzhumashui and Kokand (No. SR-407 IZANU). Kirgizia: *24*) Uchkurgan, lower waters of the Naryn river (Yakovleva, 1964).

Note. In the cadastre are the nearest vicinities of the indicated populated localities. Asterisks designate the inventory numbers which were not found in the museum's collections in 1988. The author failed to identify geographic portions of the following localities: Kokkurak (Bogdanov, 1967; Said-Aliev, 1979); Besh-Bash on the left shore of the Syrdar'ya, Sarykamysh (Said-Aliev, 1979); Sol'prom (Said-Aliev, 1979; Bogdanov, 1965, 1967).

The current distribution of *Ph. strauchi* in the limits of the Fergana Valley is rather uneven. At present this territory is experiencing severe anthropogenic effects the sands have been ploughted for the cotton-plant and there are gardens and vinegards have been grown on the detritus plots. The boundary of distribution of the sandy form of *Ph. strauchi* is outlined by the north shore of the Syrdar'ya and the Great Fergana Channel. Local populations can be found on the persisting plots of former large sandy massifs (sands near Shorsu No. R-4461 ZMMU). The broken-stony now lives mainly on the territory of Tadzhikistan foothills along the right shore of the Syrdar'ya. Due to the poor preservation or loss of the collection material it is difficult to identify the ecological form in the south foothills area of the Fergana Valley (Fig. 1).

CHARACTERISTICS OF ECOLOGICAL GROUPS

The two ecological forms of *Ph. strauchi* indicated above differ distinctly one from another in some characteristics, first, in color (the colors are given according to Bondartsev's scale, 1954).

Description of color of the sandy form (31 ♂♂, 28 ♀♀, 7 juveniles). The general background of the back and upper surface of the head is dark gray, sometimes with an isabell or reddish, rarely marble-pink stains. Along the sides of the body are red-

brown, brown, or reddish spots. Over all the surface of the back are scattered light (usually white) spots surrounded by a black color. A dark-gray horseshoe-shaped pattern is sometimes visible on the neck. The ventral surface of the head often has typical marble stains, which are brighter in males. A white (light) stripe passes on the dorsal surface of the tail, as a rule (91.8% of cases). The base of the ventral surface of the tail (preanal area) is white; in young males it is rarely light-blue; in young and subadult females its color ranges from sulphur yellow to light lemon yellow. The middle and tip of the tail along the ventral surface are almost always blue (from light-blue to leaden-gray) without dark transverse bands in males; gray (leaden-gray, blue-grayish), rarely light-blue with 3 – 6 transverse black stripes of different form (near the ventral surface of the tail they are often interrupted) and dark (gray, black) on the tip of the tail in females. The black (dark) end of the tail occupies 14 – 25 mm in length (28 – 39% of the length of the tail). On the back, three pairs of groups of enlarged black scales give the impression of three stipes stretching from the front to the hind limbs.

The description of color of the broken-stony form (14 ♂♂, 22 ♀♀, 8 juveniles). Against a gray-brown (from dirty-brown-violet and snuff-color-brown to blackish) background the back bears red (brown-red, brown-chestnut, crimson) broad patterns, often occupying a significant part of it. White spots with black edges are "scattered" on gray scale. On the back (between the limbs) in juveniles there are three transverse dark stripes, with the middle one disappearing in abult specimens (in 20% of cases is weakly noticeable). A marble pattern on the ventral surface of the head is rare. The light stripe along the middle of the tail is distinctly expressed as a rule. The ventral surface of the tail in the young specimens has yellow tinges (from sulphur yellow to light lemon yellow), in adults it is white. The middle of the tail from the ventral surface is light-blue to blue. On the ventral surface of the tail there are 4 – 7 black transverse stripes of different form. The color between them is leaden-gray, in young and adult females it is usually white. The end of the tail on the ventral surface is coal-black to snuff-brown and blackish color. It is 10.5 – 21 mm long in hatchlings (26 – 42% of the tail's length) and 18 – 28 mm in adult females (28 – 37%).

Thus, the main distinguishing features in the pattern of sandy and broken-stony forms are the differences in the general background of the back (gray in the sandy form and brown-reddish in broken-stony form) and in the number of transverse stripes in the adult specimens (three and two, respectively). The same differences were noticed by D. V. Semenov and V. F. Orlova (personal communication) for *Phr. versicolor* from Mongolia, which inhabits different soils; we found such differences for *Phr. helioscopus* inhabiting the red clays of Kyzyltuz site (Dzhambul Region, Kazakhstan) and possessing reddish-brown tinges in the pattern of the dorsal surface of the body.

Morphometric analysis (Table 2) did not reveal any taxonomically significant diagnostic differences between the forms described above, although on the fourth digit of the hind limb of the sandy form Galaeva (1976) encountered 26.4 ± 0.31 and 26.0 ± 0.42 subdigital lamellas (in males and females, respectively). Sattarov (1981) noted 22.4 ± 0.26 lamellas in the broken-stony form, which is closer to our data. Such disparities are most probably connected with the different methods of counting.

According to the absolute tail length, sexual dimorphism was discovered. Hatchings of both ecological groups differed in this characteristic as well as absolute body length significant substantially differed, but they cannot be taken into account as diagnostic signs due to the absence of data on the precise timings of trapping and the number of generations per season.

Significant differences were also detected between the sndy and broken-stony forms in some features of folidosis. Toad agamas caught on the sand ($n = 43$) had well developed keels on the tail scales (95.3%, this characteristic was poorly expressed only in hatchlings and some immature specimens), whereas 70.3% of lizards of the broken-stony form ($n = 32$) had "smoothed" scales (Fig. 2). Moreover, most sandy *Ph. strauchi* had almost equal in length and width claw and supradigittal plates on the front limbs, whereas in the broken-stony *Ph. strauchi* the supradigittal plates were 1.5 – 2 times narrower. This character, however, is variable.

The described differences in the coloration and folidosis in two ecological forms of *Ph. strauchi* are well noticeable, but earlier were not indicated. In combination with the strict biotopic confinement, these characteristics undoubtedly differentiate these

TABLE 2. Body Dimensions (mm), Body Indices, and Meristic Scale Characteristics of the Broken-Stony and Sandy Forms of *Phrynocephalus strauchi* Nikolsky

Parameter	Age, sex											
	Ad, ♀♀				Ad, ♂♂				Juveniles			
	$(x \pm m)_a$ (n)	$(x \pm m)_b$ (n)	t	CD	$(x \pm m)_a$ (n)	$(x \pm m)_b$ (n)	t	CD	$(x \pm m)_a$ ($n = 8$)	$(x \pm m)_b$ ($n = 7$; for L. c. $n = 3$)	t	CD
L.	45.71 ± 0.83 (22)	43.29 ± 0.55 (27)	2.43	0.36	47.23 ± 1.05 (14)	46.45 ± 0.59 (25)	0.65	0.11	29.39 ± 1.61	35.39 ± 2.61	1.95	0.56
L. cd.	67.41 ± 1.20 (22)	64.08 ± 1.44 (26)	1.78	0.08	77.72 ± 1.75 (13)	74.28 ± 1.14 (29)	1.65	0.28	45.86 ± 2.97	52.26 ± 3.14	1.48	0.41
F.	11.97 ± 0.16 (22)	11.59 ± 0.26 (28)	2.02	0.18	11.76 ± 0.30 (14)	12.14 ± 0.19 (31)	1.07	0.17	7.45 ± 0.56	8.94 ± 0.52	1.96	0.54
T.	13.21 ± 0.18 (22)	12.77 ± 0.16 (28)	1.83	0.61	14.46 ± 0.25 (14)	14.37 ± 0.16 (31)	0.28	0.05	8.78 ± 0.61	9.36 ± 1.56	0.34	0.11
Supralabiales	13.29 ± 0.29 (21)	13.44 ± 0.30 (19)	0.37	0.06	12.85 ± 0.24 (13)	12.96 ± 0.21 (20)	3.46	0.06	13.17 ± 0.45	13.67 ± 0.36	0.88	0.24
Infralabiales	13.52 ± 0.34 (21)	13.44 ± 0.32 (20)	0.19	0.03	13.38 ± 0.34 (13)	13.64 ± 0.27 (20)	0.42	0.11	13.62 ± 0.66	14.29 ± 0.39	0.87	0.25
L. c.	11.69 ± 0.23 (21)	11.14 ± 0.19 (21)	1.89	0.29	12.17 ± 0.26 (13)	12.14 ± 0.16 (21)	0.10	0.02	8.29 ± 0.45	9.54 ± 0.59	1.69	0.47
Lt. c.	10.62 ± 0.16 (21)	10.25 ± 0.13 (21)	1.80	0.28	10.83 ± 0.18 (13)	11.22 ± 0.14 (21)	1.69	0.30	7.39 ± 0.44	8.26 ± 0.52	1.28	0.36
At. c.	6.75 ± 0.11 (21)	6.43 ± 0.13 (21)	1.92	0.29	7.01 ± 0.18 (13)	6.70 ± 0.13 (21)	1.42	0.25	4.41 ± 0.34	5.03 ± 0.32	1.32	0.37
Internasales	1.69 ± 0.11 (21)	1.69 ± 0.11 (20)	0.26	0.00	1.92 ± 0.14 (13)	1.87 ± 0.07 (21)	1.70	0.06	2.06 ± 0.37	2.00 ± 0.00	0.16	0.06
L. p.	7.95 ± 0.14 (22)	7.75 ± 0.10 (28)	1.19	0.17	8.78 ± 0.15 (14)	8.54 ± 0.09 (31)	1.40	0.23	6.29 ± 0.29	6.53 ± 0.16	0.75	0.21
L./L. cd.	0.68 ± 0.01 (22)	0.67 ± 0.01 (26)	0.67	0.10	0.60 ± 0.01 (13)	0.62 ± 0.01 (23)	1.07	0.22	0.65 ± 0.03	0.68 ± 0.02	0.83	0.21
L. c./L.	0.26 ± 0.002 (21)	0.26 ± 0.003 (21)	0.50	0.00	0.27 ± 0.003 (13)	0.26 ± 0.003 (21)	0.90	0.00	0.28 ± 0.01	0.27 ± 0.004	0.93	0.25
T. L.	0.29 ± 0.003 (22)	0.29 ± 0.01 (27)	1.00	0.00	0.31 ± 0.001 (14)	0.31 ± 0.003 (25)	1.29	0.00	0.30 ± 0.01	0.31 ± 0.01	0.71	0.17
L. p./L.	0.18 ± 0.01 (22)	0.18 ± 0.004 (27)	1.05	0.00	0.18 ± 0.01 (14)	0.18 ± 0.004 (25)	0.17	0.00	0.21 ± 0.01	0.19 ± 0.01	1.43	0.33
Lt. c./At. c	1.59 ± 0.02 (21)	1.59 ± 0.02 (21)	0.07	0.00	1.56 ± 0.02 (13)	1.68 ± 0.02 (21)	3.66	0.75	1.80 ± 0.17	1.65 ± 0.03	0.86	0.28
Lt. c./L. c.	0.91 ± 0.01 (21)	0.92 ± 0.01 (21)	0.54	1.10	0.89 ± 0.01 (13)	0.92 ± 0.01 (21)	2.77	0.33	0.89 ± 0.02	0.87 ± 0.01	0.91	0.22
The chell around crown	7.19 ± 0.26 (21)	7.89 ± 0.26 (18)	1.88	0.31	7.96 ± 0.34 (13)	7.92 ± 0.22 (21)	0.11	0.02	8.25 ± 0.27	8.00 ± 0.41	0.51	0.15
Lamelle subdigitales (L. s.)	22.45 ± 0.34 (22)	23.18 ± 0.43 (13)	1.32	0.24	23.50 ± 0.42 (12)	23.61 ± 0.27 (19)	0.21	0.04	22.63 ± 0.61	23.00 ± 2.13	0.17	0.08
The lenght of black ending of the tail	22.45 ± 0.58 (19)	19.61 ± 0.95 (12)	2.58	0.50	–	–			14.15 ± 1.11	17.03 ± 0.69	2.20	0.62

Note. $(x \pm m)_a$) Mean and its standard error for the broken-stony form; $(x \pm m)_b$) the same for the sandy form; t) Student's t-test; CD) Maler's coefficient of differences.

forms in nature and in collections, where in change in the color as the result of fixation but the character of their pattern remains (stains, dots, spot, etc.). Semenov and Shenbrot (1982) consider the analogous dif-

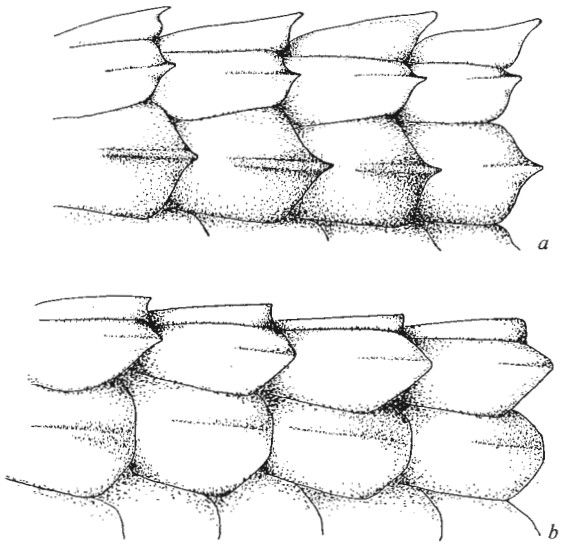

Fig. 2. The tail scales of sandy (*a*) and broken-stony (*b*) forms *Phrynocephalus strauchi*.

ferences in the shape of the supradigital and claw plates and the character of tail scale ridge to be one of the diagnostic signs in the distinguishing the *Ph. moltchanovi* from the *Ph. guttatus*. However, since all the distinguished characteristics are ecologically dependent and Mayr's (1971) coefficient of difference of does not exceed the subspecies level (Table 2), it is inexpedient to give any taxonomical status to the indicated forms. It could be added in the support of all stated above that comparison of the cranial skeleton and the external morphological peculiarities of hemipenial structures show no essential differences. Electrophoretic analysis, carried out by O. P. Likhnova (personal communication) also did not revealed any significant differences. We believe it most reasonable to the regard these forms as ecological races (according to Mayr), which, apparently, is not a rarity in nature for lizards of the genus *Phrynocephalus*.

This research was supported by the Russian Fund of Fundamental Research (grant No. 95-04-13105a).

REFERENCES

Ananjieva N. B., Borkin L. J., Darevsky I. S., and Orlov N. L. (1988), *Five-Language Dictionary of Animal Names in Amphibians and Reptiles* [in Russian]. Russkii Yazyk, Moscow.

Bannikov A. G., Darevsky I. S., Ishchenko V. G., Rustamov A. K., and Shcherbak N. N. (1977), *The Field Guide of Amphibians and Reptiles of the Fauna of the USSR* [in Russian], Prosveshchenie, Moscow.

Bogdanov O. P. (1960), *Fauna of UzSSR. Vol. 1. Amphibians and Reptiles* [in Russian], Nauka, Tashkent.

Bogdanov O. P. (1965), *Ecology of Reptiles of Middle Asia* [in Russian], Nauka, Tashkent.

Bogdanov O. P. (1967), "On the distribution and ecology of *Phrynocephalus reticulatus strauchi* Nikolsky," *Izv. Akad. Nauk TadzhSSR. Otd. Biol. Nauk* [in Russian], **1**(26), 88 – 90.

Bondartsev A. S. (1954), *The Color Scale. Manual for Biologists in Scientific and Scientific-Applied Reseacrh* [in Russian], Izd. AN SSSR, Moscow – Leningrad.

Borkin L. J. and Darevsky I. S. (1987), "The list of amphibia and reptilia of the fauna of the USSR," in: *Amphibians and Reptilia of Reserve Territories* [in Russian], Izd. AN SSSR, Moscow, pp. 128 – 141.

Chernov S. A. (1949), "Reptiles," in: *The Animal World of the USSR* [in Russian], Vol. 3, Moscow – Leningrad, p. 128 – 161.

Chernov S. A. (1959), *Fauna of TadzhSSR. Vol. XVIII. Reptiles. Proc. Acad. Sci. TadzhSSR* [in Russian], Stalinabad.

Elpat'evskii V. S. (1903), "Reptiles of the Aral," in: *Scientific Results of the Aral Expedition* [in Russian], No. 4, Tashkent, pp. 1 – 31.

Fedchenko A. P. (1875), *Voyage to Turkestan. Vol. I. Part II. In Kokand Khanstvo* [in Russian], St. Petersburg – Moscow.

Galaeva N. M. (1976), "On the systematics and morphology of some species of the genus *Phrynocephalus*," *Nauch. Trudy Kubansk. Gosuniv. Ser. Gerpetol.* [in Russian], No. 218, 53 – 62.

Golubev M. L. (1989), "*Phrynocephalus guttatus* Gmel. or *Phr. versicolor* Str. (Reptilia, Agamidae): which species of toad agamas inhabits Kazakhstan?," *Vestn. Zool.* [in Russian], No. 5, 38 – 46.

International Code of Zoological Nomenclature (1988) [in Russian], Nauka, Leningrad.

Kamalova Z. Ya. (1970) "On the nutrition of *Phrynocephalus reticulitus strauchi* Nikolsky," *Ékologiya* [in Russian], No. 5, 102 – 103.

Kessler K. F. (1872), "Ichthyological fauna of Turkestan," *Izv. Ob-va Lyubit. Estestvozn., Antropol. Étnogr.* [in Russian], **X**(1).

Mayr E. (ed.) (1971), *Principles of Systematic Zoology*, McGraw-Hill, New York.

Nikolskii A. M. (1899a). "The voyage to Turkestan of the member-founder of the A. P. Fedchenko society, acomplished on behalf of the Imperial society of amateurs of natural history, anthropology, and ethnography. Zoogeographic investigations. Reptiles and amphibians of Turkestan general-governorship (Herpetologia Turanica)," *Izv. Ob-va Lyubit. Estestvozn., Antropol. Étnogr.* [in Russian], **XCIV**, p. 21 – 84.

Nikolskii A. M. (1899b), "Reptiles and amphibians, collected by A. N. Kasnakov during the voyage to Shungan and Roshan," in: *Annuaire du Musee Zoologique de l'Academie Imperiale des Sciences de St. Petersburg* [in Russian], Vol. IV, St. Petersburg, pp. 172 – 178.

Nikolskii A. M. (1905), "Reptiles and amphibians of the Russian Empire (Herpetologia Rossica)," in: *Memoires de i'Academie Imperiale des Sciences de St. Petersburg. Class des Sciences Physiques et Mathematiques* [in Russian], Vol. XVII, No. 1. St. Petersburg, p. 64 – 518.

Nikolskii A. M. (1907), *Key of Reptiles and Amphibians of the Russian Empire* [in Russian], Khar'kov.

Nikolskii A. M. (1915), *Fauna of Russia and Adjacent Countries. Reptiles (Reptilia)* [in Russian], Vol. I, Petrograd.

Pereshkol'nik S. L. (1968), "Comments on the herpetofauna of North Tadzhikistan," in: *Herpetology of Middle Asia* [in Russian], Izd. FAN, Tashkent, pp. 15 – 21.

Said-Aliev S. A. (1979), *Amphibians and Reptiles of Tadzhikistan* [in Russian], Dushanbe.

Sattarov T. (1981), "On the species independence of *Phrynocephalus strauchi* Nikolsky (Reptilia, Sauria) from the Fergana Valley," *Vestn. Zool.* [in Russian], No. 6, 82 – 85.

Semenov D. V. and Shenbrot G. I. (1982), "On the species independence of *Phrynocephalus moltchanovi* (Reptilia, Agamidae)," *Zool. Zh.* [in Russian], **61**(8), 1194 – 1204.

Sidorov S. A. (1925), "Amphibians and reptiles of Aral," *Bydl. MOIP. Otd. Biol.* [in Russian], **33**(1 – 2), 188 – 200.

Sokolovskii V. V. (1975), "Kariotypes and systematics of lizards of *Agamia famelia*," in: *Biological Studies on the Far East* [in Russian], p. 109.

Terent'ev P. V. and Chernov S. A. (1936), *Brief Field Guide of Amphibians and Reptiles of the USSR* [in Russian], Uchpedgiz, Moscow – Leningrad.

Terent'ev P. V. and Chernov S. A. (1940), *Field Guide of Reptiles and Amphibians of the USSR* [in Russian], Uchpedgiz, Leningrad.

Tsarevskii S. F. (1915), "Catalogue of collections of the Museum at the Zoological Department of the Imperial Petrograd University. II. Reptiles (Reptilia)," Trudy Imper. Petrograd. Obshch. Estestvoisp. Otd. Zool. Fiziol., **XLIII**(4); in: *Proc. Zool. Zootom. Cab. Imp. Petrograd. Univ. and Murmansk Biol. Station Imp. Petrograd. Soc. Naturalists* [in Russian], p. 3 – 100.

Tsarevskii S. F. (1926), "On the systematics and distribution of lizards of the genus *Phrynocephalus*," *Dokl. Akad. Nauk SSSR* [in Russian], 119 – 122.

Yakovleva I. D. (1964), *Reptiles of Kirgizia* [in Russian], Frunze.