February 1992 *Asiatic Herpetological Research* Vol. 4, pp. 113-122

Intrapopulational and Geographic Variation of *Eremias przewalskii* Strauch in Mongolia

VALENTINA F. ORLOVA[1]

[1]*Zoological Museum of the Moscow Lomonosov State University, Russia*

Abstract. -Body size and proportions, characters of pholidosis, coloration and pattern of *Eremias przewalskii* from western, southern and eastern Mongolia were studied. Sexual dimorphism is displayed in the relative sizes of the tail, head, legs, number of scales around 9-10th tail ring and ventralia. Some characters of pholidosis, as number of scales around the mid-body, number of femoral pores on the right side of the thigh and others displayed clear geographic variability. Live specimens from western Mongolia have blue ocelli on the body flanks. The lizards from southern Mongolia significantly differ from the specimens from other parts of the range by a larger number of scales around the mid-body, number of femoral pores on the right side of the thigh and other features. The intraspecific structure of *E. przewalskii* is discussed.

Key words: Reptilia, Squamata, Lacertidae, *Eremias przewalskii*, Mongolia, geographic variation, morphometrics, pholidosis, population variation.

Introduction

Eremias przewalskii Strauch is a common species of western and southern Mongolia (Bannikov, 1958; Dely, 1979, 1980; Munkhbayar, 1973, 1976; Obst, 1963; Orlova, 1984, 1989; Orlova and Semenov, 1986; Szczerbak, 1970, 1974; Terbish, 1989). Earlier it was thought that it only occured along the boundaries of southeastern Mongolia (Bannikov, 1958; Szczerbak, 1974). Now it is known to be the most widely distributed lizard in this region (Semenov and Shenbrot, 1986). Outside of Mongolia this lizard is distributed in northern China and Russia, in the southern portion of Tuva Autonomous Republic (Bedriaga, 1909; Flint, 1960; Pope, 1935; Schmidt, 1927; Strauch, 1876; Szczerbak, 1974).

All researchers who have observed *E. przewalskii* in the wild have noted its preference for soft soils. This species inhabits sands overgrown with *Nitraria* sp., sand dunes with *Haloxylon* sp. and *Tamarix* sp. In the Transaltai Gobi, *E. przewalskii* rarely occurs in gravel areas adjacent to sandy habitats (Borkin et al., 1983). In Uws-Nuur hollow and on the right bank of the river Khowd-gol it occurs on semi-anchored sands with *Caragana*. Rarely, *E. przewalskii* lives on saline soil, in the dry gullys with almond-bush. In Bayan-Drag it is found among the stones of Cretaceous red sandstone precipices (Borkin, 1986; our observations). As compared to *Eremias multiocellata*, this species does not extend into high mountains, inhabiting either hollows and foothills with elevations 760-1800 m above sea level (Szczerbak, 1974) or in a narrower range of elevation, 1030-1650 m above sea level (Borkin, 1986).

Within its range, *E. przewalskii* is syntopic with *E. multiocellata* (e.g., near the well Buiesengijn-khuduk, 35-40 km northeast of Ba-Tsagan, in Bayan-Dzag).

High variability of external morphological features of *E. przewalskii* has been noted repeatedly in the literature. Such investigations were started by Strauch in his description of three *Eremias* species from China in 1876. Later (Boulenger, 1921; Nikolsky, 1915; Szczerbak, 1969, 1974) these forms (*E. brachydactyla, E. przewalskii* and *E. kessleri*) were synonymized with *E. przewalskii.*

Treatment of collections made by the Herpetological Department of the Joint Soviet-Mongolian Complex Biological

© 1992 by *Asiatic Herpetological Research*

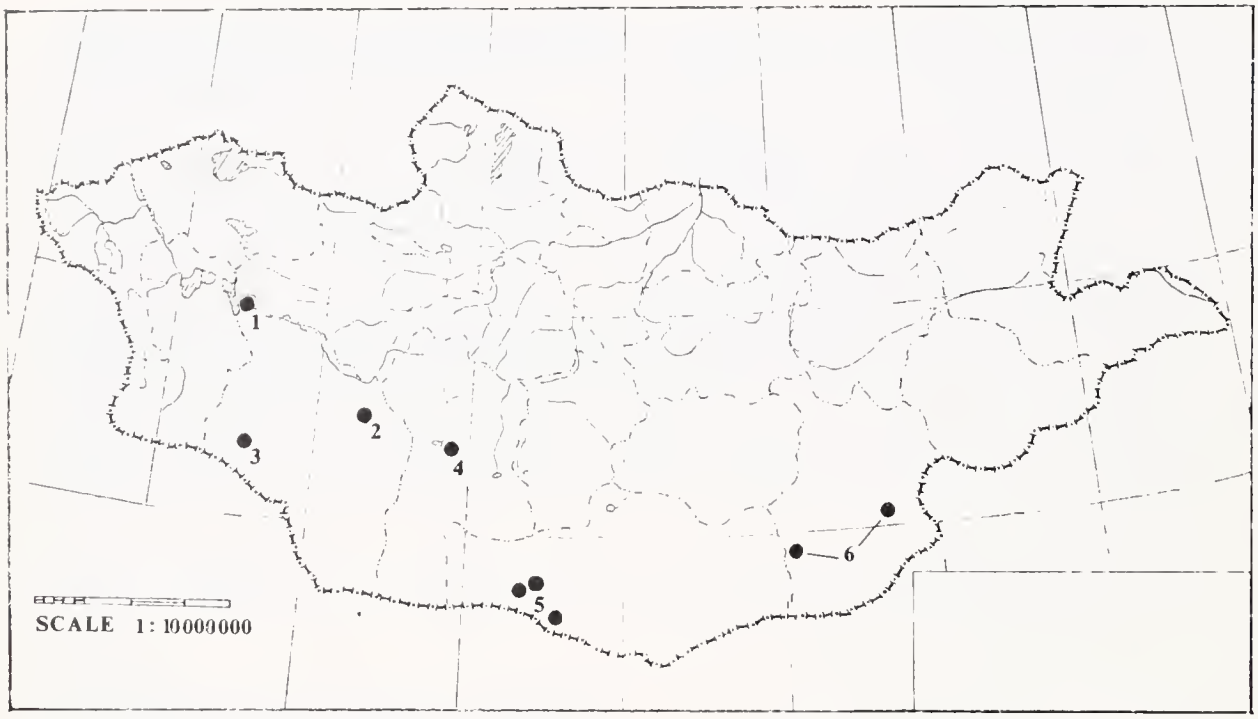

FIG. 1. Localities of the samples studied. See **Methods** below for a reference to the numbers.

Expedition of the Academies of Sciences of the USSR and MPR allow us to report more detailed information on intrapopulational and geographic variability of the species within the territory of Mongolia. The results are later to be used for comparative analysis of the variability of *E. przewalskii* and *E. multicellata*, in discussion of the relationships of these and other Mongolian species.

Methods

Our material originates from western, southern and southeastern Mongolia. Localities of *E. przewalskii* are noted on figure 1. Samples collected are combined in to groups as follows:

1. Northern coast of Char-Us-Nuur Lake, Somon Urdgol (=Chandman), 19.06.1986, coll. Kh. Terbish, n=30.

2 Gobi-Altai Aymag: Lake Beger-Nuur, 20.07.1982, coll. Herpetological Department, n=17 (N 5034).

3. Gobi-Altai Aymag: Lake Alag-Nuur, 15.07.1982, coll. Herpetological Department, n=25 (N 5030).

4. Bayan-Chongor Aymag: 35-40 km NE of Ba-Tsagaan, 30.07.1984, coll. Herpetological Department, n=20 (N 5402).

5. South-Gobi Aymag: Shavgijn-Us, southern Chovuun (=Noen), 19.08.1982.; Sain Khuduk Well, 02.09.1982.; 6 km East of Obot-Khural, 17.08.1982, coll. Herpetological Department, n=54 (NN 5023, 5029, 5031).

6. East-Gobi Aymag: 43° 53' N 108° 05' E, 28.-30.07.1987, coll. G. I. Schenbrot et al.; 60 km SSE of Dzuun-Bayan, 06.1986, coll. G. I. Schenbrot, n=21 (NN 5614, 5802).

In all specimens investigated (162 specimens in total) the snout-vent length (L); tail length (L. cd.); foreleg and hindleg length (P_a and P_p); head length, width and height (L_p, C_p, H_p) were measured. The indices: L/L. cd., P_a/L, P_p/L, L_p/L, C_p/L_p and H_p/L_p were calculated. The following

characters of pholidosis were taken into consideration: 1 - number of scales around the midbody (Sq.); 2 - number of scales along mid-line of throat (G.); 3 - number of femoral pores on the right side of the thigh (P. fm.); 4 - distance between the internal sides of the rows of femoral pores; 5 - number of transversal rows of pectoral and ventral scales (ventrale); 6 - number of scales around the 9-10th tail ring (Sq. c. cd.); 7 - number of subdigital lamellae on the 4th toe of right hindleg; 8 - number supralabial scales (labialia); 9 - number of infralabial scales (infralabialia); 10 - number of dorsal scales between parietals and level of anus; 11 - number of frontonasal scales.

In addition to characters mentioned above, pattern and body coloration were recorded, including the presence or absence of blue spots on the body sides.

For the treatment of material standard statistical methods were used (Lakin, 1980) with the calculation X, m_X and t-criterion for revealing sexual dimorphism and geographic differences.

Results

Sexual dimorphism.—*Eremias przewalskii* males and females in Mongolia differ from each other by there snout-vent length in all samples, except those from South-Gobi Aymag (5) and East-Gobi Aymag (6). Males are slightly larger than females. The maximum difference in linear size between the sexes was in South-Gobi Aymag sample (5) from southern Mongolia, but statistically significant differences were not revealed, as in all other samples (Tables 1 and 2). The tail in the males is longer than in the females [except the samples from Gobi-Altai Aymag (2) and Gobi-Altai Aymag (3)]; as is length of the hind legs [except the sample from East-Gobi Aymag (6)]. As to the head proportions, there is a stable difference in relative head length ($P<0.01$, $P<0.001$). At the same time, other proportions, mainly H_p/L_p, slightly differed from each other in both sexes.

Some characters of pholidosis also displayed sex differences, although Szczerbak (1970, 1974) considered such sexual dimorphism to be absent in *E. przewalskii*. In all the samples we investigated the number of scales around the 9-10th tail ring is larger in males than in females (Fig. 2). In the samples from Gobi-Altai Aymag (3), South-Gobi Aymag (5) and East-Gobi Aymag (6) such tendency is displayed in the number of transversal rows of the pectoral and ventral scales. In specimens from western Mongolia (samples 1-4) the number of scales around the middle of the body differed between the sexes, but these differences are statistically insignificant.

Coloration and pattern.—We did not find clear differences in coloration and pattern between males and females. The ventral surface of the body, legs and tail is always entirely white in both sexes. In the western part of its range, *E. przewalskii* has blue spots on the flanks which is less bright in old females.

Thus, sexual dimorphism in *E. przewalskii* is displayed in relatively long tail, head, both pairs of legs, number of scales around the 9-10th tail ring and ventrals in males as compared to females.

Geographic Variability

Body size and proportions.—The largest (maximum length 84.5 mm) lizards inhabit the southern and southeastern parts of the country, and the smallest lizards in the northern and northwestern regions. Moreover, animals of minimum size have been found near lake Alag-Nuur, Gobi-Altai Aymag (3). Slender specimens with relatively long tail and hind legs are seen in the samples from Gobi-Altai Aymag (3) and South-Gobi Aymag (5). Lizards from the southeast of Mongolia [East-Gobi Aymag (6) sample] are similar to those from the south [South-Gobi Aymag (5)] in the relative tail length, but they have a more robust habitus and shorter hind legs. Thus, within the range of *E. przewalskii*, its body size, relative tail and hind leg length

TABLE 1. Geographic variation of size and proportions in *Eremias przewalskii* (males).

Loc.	n	L lim, $\bar{x}\pm m_{\bar{x}}$	n	L/L. cd. lim, $\bar{x}\pm m_{\bar{x}}$	n	P_a/L lim, $\bar{x}\pm m_{\bar{x}}$	n	P_p/L lim, $\bar{x}\pm m_{\bar{x}}$
1	22	52.6-78.4	15	0.68-0.79	21	0.32-0.38	21	0.49-0.55
		66.42±1.43		0.73±0.008		0.34±0.003		0.51±0.004
2	10	51.1-68.5	7	0.68-0.87	10	0.31-0.35	10	0.49-0.56
		63.55±1.64		0.75±0.02		0.33±0.003		0.52±0.006
3	13	50.1-78.6	7	0.58-0.68	13	0.32-0.38	13	0.48-0.57
		63.23±2.45		0.64±0.02		0.36±0.006		0.54±0.008
4	15	52.6-77.9	11	0.67-0.78	15	0.33-0.38	15	0.50-0.58
		71.63±2.08		0.71±0.01		0.35±0.004		0.52±0.005
5	18	52.1-83.3	12	0.62-0.75	18	0.32-0.38	19	0.48-0.58
		67.12±2.47		0.68±0.01		0.35±0.005		0.54±0.007
6	11	53.8-79.0	11	0.64-0.76	14	0.31-0.38	14	0.47-0.56
		71.45±2.27		0.69±0.009		0.35±0.005.		0.52±0.008

TABLE 2. Geographical variation of size and proportions in *Eremias przewalskii* (females).

Loc.	n	L lim, $\bar{x}\pm m_{\bar{x}}$	n	L/L. cd. lim, $\bar{x}\pm m_{\bar{x}}$	n	P_a/L lim, $\bar{x}\pm m_{\bar{x}}$	n	P_p/L lim, $\bar{x}\pm m_{\bar{x}}$
1	14	51.9-74.8	7	0.75-0.85	13	0.29-0.35	14	0.44-0.52
		64.52±2.03		0.81±0.01		0.32±0.006		0.47±.008
2	7	54.0-69.4	3	0.75-0.84	7	0.29-0.35	6	0.45-0.53
		63.04±1.86		0.81±0.03		0.31±0.008		0.49±0.01
3	8	50.0-67.2	6	0.61-0.86	10	0.33-0.36	10	0.51-0.54
		59.29±1.92		0.70±0.04		0.34±0.003		0.52±0.003
4	6	63.33-75.5	4	0.77-0.87	6	0.30-0.34	6	0.47-0.51
		71.28±1.91		0.82±0.03		0.32±0.004		0.49±0.004
5	25	55.0-84.5	10	0.70-0.83	25	0.30-0.39	25	0.43-0.55
		72.67±1.51		0.74±0.01		0.33±0.004		0.50±0.008
6	3	67.0-78.3	4	0.72-0.76	4	0.32-0.37	4	0.48-055
		73.23±3.32		0.75±0.01		0.34±0.01		0.51±0.02

increases from north to south. This tendency is more clear in males. As to the relative head size, index L_p/L is stable in all samples (X=0.22 in females and X=0.24 in males) except the sample from Bayan-Chongor Aymag (4), where males and females have lower values of the index mentioned. Relative head width and height do not allow us to differentiate between lizards from different parts of the range.

Pholidosis.—The characters of pholidosis demonstrate clear geographic variation in some cases. As shown in table 3, lizards from southern Mongolia, are sharply distinguished from others by a markedly higher scale number around the middle of the body (and wider variation limits), femoral pores, scales around the 9-10th tail ring, infradigital lamellae on the fourth finger of the hind leg and, to a lesser degree, by the number of transversal rows of pectoral and ventral scales. The distance between the rows of femoral pores is less in lizards from the south and southeast [South-Gobi Aymag (5) and East-Gobi Aymag (6) samples] as compared with the northern and northwestern ones. The tendency of reduced mean values of some characters of pholidosis is more pronounced in the western part of the range. These characters are: the number of scales around the midbody (Sq.), (Fig. 3), number of scales along mid-line of throat (G.), number of femoral pores on the right side of the thigh (P. fm.), (Fig. 4), ventrale and number of scales around the 9-10th tail ring (Sq. c. cd.)

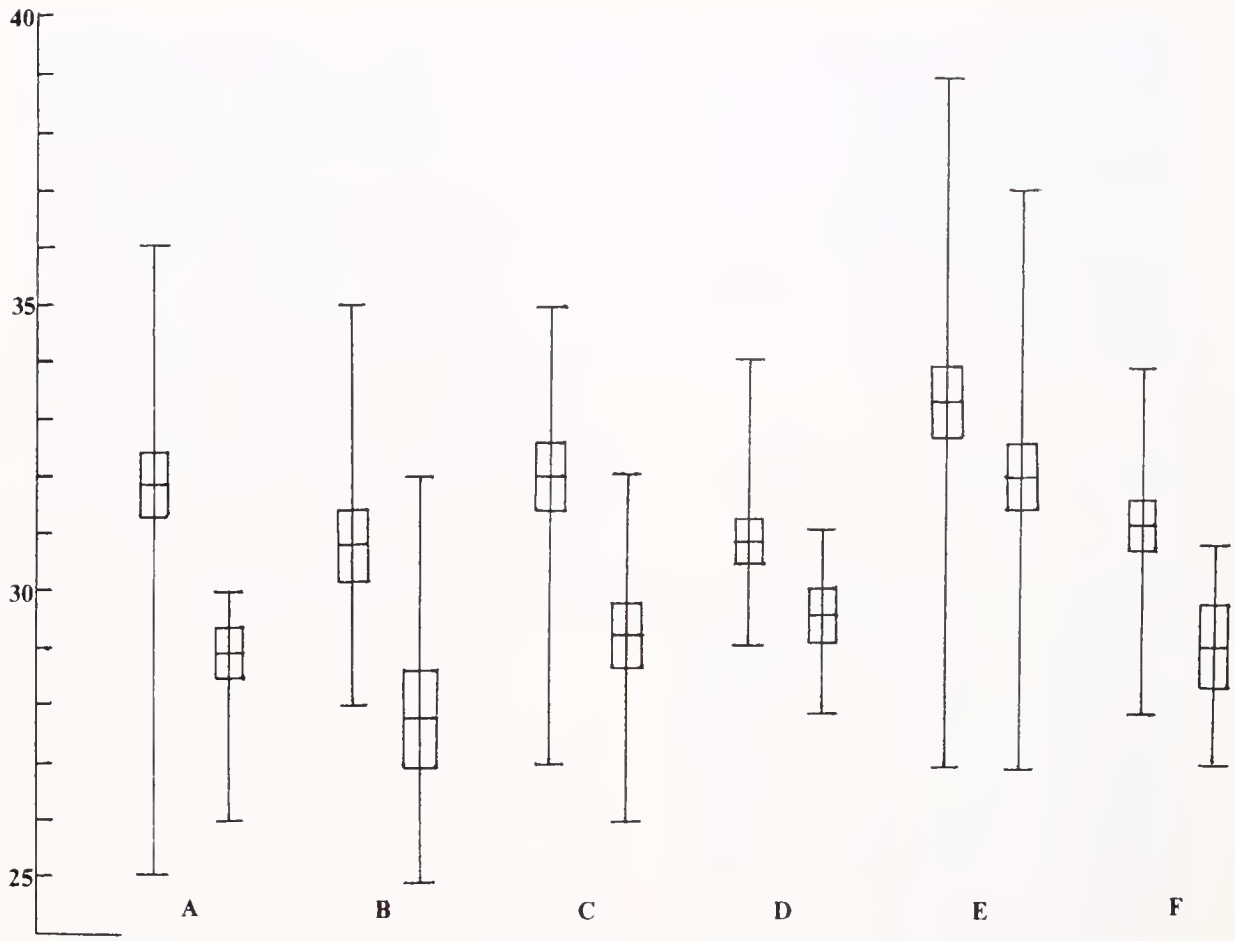

FIG. 2. Sexual dimorphism and geographic variation in the number of scales around 9-10th tail ring (Sq. c. cd.)

The characteristics of external morphological features includes, along with others, the number of scales along the spine (from parietals to posterior border of hind leg). For the lizards from the South-Gobi Aymag (5) sample this feature shows a similar situation as in many others, i.e. their number is markedly higher than in lizards from the western part of the range. Other features, such as the number of supra- and infralabials, are less variable.

Coloration and pattern.—The coloration varies from sandy or grey to dark-brown and black. The pattern may be made up either of relatively thin lines, or of rather wide, interwoven, waved stripes and spots. The dorsal pattern of specimens from the Great Lakes Hollow (Fig. 5) is formed by sandy or light-coffee wavy lines or spots. Between these colored areas there are 4 longitudinal rows of white ocelli or larger eroded light spots. The legs (especially hindlegs) are covered by a pattern of light spots surrounded by brown. The upper tail surface (about one third of the tail length) has a similar pattern, caudally it is divided into single dark spots, and the tip of the tail is light. The upper surface of the head is olive-grey in immature specimens without spots, or with a few spots in the parietal and supraocular scales. There is a dark and light striped pattern on the side of the parital scales which sometimes reaches the supraorbitalia. In individual specimens the entire head surface is covered by dark spots, which are more or less apparent. Temporalia are covered by a pattern of dark spots or stripes alternating with light spots or ocelli. The ventral surface of the body

TABLE 3. Geographic variation in characters of pholidosis.

Character	Population 1	Population 2	Population 3	Population 4	Population 5	Population 6
Sq	48-57 51.67±0.49	47-56 51.58±0.64	50-60 53.72±0.37	49-62 53.24±0.62	50-71 58.20±0.48	53-62 56.32±0.50
G	25-34 29.80±0.41	24-34 28.65±0.71	24-35 27.44±0.52	25-34 30.28±0.47	25-41 31.54±0.46	29-25 31.84±0.40
P. fm.	10-15 12.33±0.21	10-14 12.24±0.28	9-14 11.52±0.27	10-14 11.90±0.29	12-17 14.05±0.16	10-14 12.63±0.19
Ventrals	31-36 33.80±0.21	30-34 32.88±0.25	31-34 32.92±0.18	33-37 34.67±0.23	32-38 34.39±0.22	32-35 33.74±0.20
Sqmc. cd.	25-36 31.07±0.47	25-35 29.64±0.62	26-35 30.80±0.49	29-34 30.57±0.31	27-39 32.88±0.41	27-34 30.79±0.45
Labials	9-12 10.93±0.18	10-12 10.94±0.14	10-15 11.72±0.23	9-12 11.14±0.19	10-14 11.94±0.13	10-13 11.68±0.20
Infralabials	6-9 7.37±0.14	7-9 7.65±0.15	7-9 7.54±0.13	7-11 7.86±0.20	7-10 7.81±0.11	7-9 7.47±0.16
Dorsal scales along spine	117-137 129.00±0.89	112-134 124.47±1.37	120-139 129.96±0.98	118-138 127.62±1.12	140-162 148.29±1.09	- -

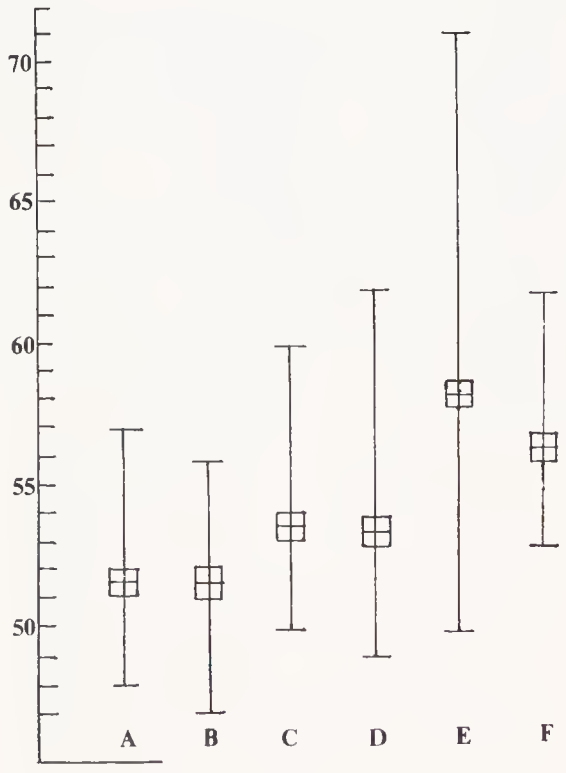

FIG. 3. Geographic variability of scale number around mid-body (Sq.) in *Eremias przewalskii*.

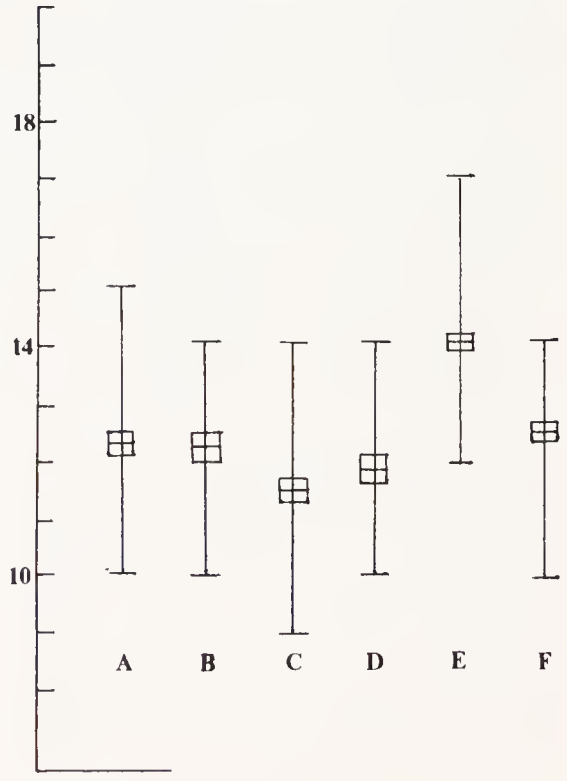

FIG. 4. Geographic variability of the porae femorales (P. fm.) in *Eremias przewalskii*.

and tail are white. Each body flank has one row of blue ocelli, not clearly visible in all fixed specimens. The general pattern is preserved in lizards from the lakes Alag-Nuur (sample 3) and Bon-Tsagan-Nuur (sample 4). However, those from Alag-Nuur have black color, while those from Bon-Tsagan-Nuur range from light to dark brown. The blue spots are bright. In the south [South-Gobi Aymag (5) sample]

lizards have the most bright and contrasting dorsal pattern (Figs. 5, 6 and 7). It is black and white, with the pileus pattern as bright. The ventral surface is white, but a slightly yellowish tint may be present. Regarding the blue spots on the body flanks, one could not make a definite conclusion. Fixed specimens may have blue spots, but these, as a rule, are positioned on the parts not characteristic for their usual occurrence. This could be a consequence of preservation in alcohol. Intrapopulation pattern polymorphism is characteristic of sample 2 from the Beger-Nuur Lake environs (Fig. 6), where the following specimens occur: 1- with black wavy spots (combined with white ones) on the body flanks, with a brown tint in the mid-dorsum; 2- with an unclear dorsal pattern and three rows of white spots (surrounded by black) on the body flanks; under these rows is a row of blue ocelli on each side; 3- with a pattern of thinner transversally elongated, black, wavy stripes, connected with each other or isolated, and with single white ocelli. The same pattern covers also the anterior one third of the tail, and is then divided into single small spots of dark color. The head in most cases is light-gray or beige, with a pattern on the parietal and temporal parts (mainly in specimens with a fine pattern - type 3). These blue spots are more or less visible in almost all the specimens.

FIG. 5. The dorsal surface pattern in *Eremias przewalskii* from the northern coast of Char-Us-Nuur Lake, Somon Urdgol (=Chandman) sample 1.

FIG. 6. The dorsal surface pattern in *Eremias przewalskii*: from Gobi-Altai Aymag, Lake Beger-Nuur, sample 2.

FIG. 7. The dorsal surface pattern in *Eremias przewalskii*: from South-Gobi Aymag, sample 5.

Discussion

Analysis of *Eremias przewalskii* intrapopulation size and proportions variability in Mongolia reveal clear sexual differences. They are expressed to different degrees in populations studied from the western, southern and southeastern parts of Mongolia. These differences do not concern, as a rule, the absolute sizes of the body (L) but relatively, length of the head, limbs and tail are larger in males than in females. We have also shown dimorphism of some characters of pholidosis in our material, including samples of adult specimens from each locality. Such sexual dimorphism had not been shown by Szczerbak (1974) during his researches of Tuva (Russia),

northwestern Mongolia, China and single specimens of *Eremias* from southern Mongolia. The number of scales around the 9-10th rings of the tail differs in all the samples and the number of ventrals differs in the samples from Gobi-Altai Aymag (3) and East-Gobi Aymag (6). The coloration and the pattern of adult specimens have no significant sexual differences.

The wide range of pholidosis variability is clearly expressed to various degrees in all the samples from Mongolia. Dely (1979, 1980) speculated that an explanation of the high variability may be ecological isolation and interbreeding, connected with relatively low population density and low fecundity of the females. It was interesting to find 2 frontonasals in 25% of investigated lizards from southern Mongolia (Orlova, 1989) together with other characters (larger size, contrasting coloration, larger number of scales around the midbody, number of dorsal scales between parietals and level of anus, etc.). It is curious not only as a trait reflecting the isolation of these populations that the presence of 2 frontonasals is normal for *E. argus* and occurs in *E. multiocellata* as an exception. It may suggest a close relationship of these species, noted by previous authors (Bedriaga, 1912; Szczerbak, 1974). Szczerbak has not mentioned specimens of *E. przewalskii* with 2 frontonasals in Mongolia and did not report this in the description of the species and nominative subspecies, while Strauch (1876) indicated it in the description of his new species.

Strauch's descriptions of 3 species from China were based on the variability of coloration and pattern of *E. przewalskii*. Specimens with a "rough-spotted" pattern consisting of black or dark-brown stripes or spots drawn in transverse direction were described as *E. przewalskii*.. Specimens with a "netted" pattern consisting of fine, fused, wavy, interwoven lines were described as *E. brachydactyla*. The third type of pattern was designated by Szczerbak (1970) as "transitional", intermediate between the first and the second characteristics of *E. kessleri*. Within Mongolia, these lizards' coloration and pattern are also variable, but among specimens studied we have not found "rough-spotted" ones. In China, where the dorsal pattern of the lizards is known to be variable, nobody has mentioned the blue spots on the body flanks, which are characteristic of *E. przewalskii* in the western part of Mongolia. Strauch (1876) gave detailed descriptions of single specimens of the new species, but not in one case did he note blue spots. Possibly, southern Mongolian specimens also do not have these spots. In this connection the specimen of *E. kesslieri* (ZIN 5145: collection of Zoological Institute, Russian Academy of Sciences, St. Petersburg) from the lower Tarim, collected by N. M. Przewalskii, is interesting. Bedriaga (1912:577) wrote about this specimen: "Das Originalstuck der *E. kessleri* stammt aus Gansu; ein anderes soll von Przewalski am unteren Tarim erbeutet worden sein (N 5145). Diese weit westlich vorgeruckte Fundstelle und die Thatsache, dass nur ein einziges, an den Seiten sonderbarerweise blau geaugtes Individuum von dort mitgebracht worden ist, hat in mir Anfangs einige Zweifel hinsichtlich der Herkunft desselben erweckt; dock uberzeugte ich mich nachtraglich, das es im Jahre 1878 dem akademischen Museum ubergeben worden ist, und dass der General vorher, namlich in den Jahren 1876 und 1877, aus seiner Reise nach dem Lob-nor in Wirklichkeit am Unterlauf des Tarim-Flusses gewesen ist."

In no samples from the enormous Mongolian territory were such drastic pattern differences recorded, as in specimens from China, where lizards with 2 pattern types coexist (collections of the Zoological Institute, Academy of Science, St. Petersburg; T. J. Papenfuss and J. R. Macey, pers. comm.).

At present, *E. przewalskii* is considered a species with two subspecies: nominative *E. p. przewalskii* (Strauch) (southern Mongolia and northern China) and *E. p. tuvensis* Szczerbak (Tuva, Russia, and western Mongolia) (Szczerbak, 1970, 1974). Dely (1979, 1980), analyzing the variation of external morphological

characters of lizards from Mongolia, noted the population from the southern Gobi as most clearly distinct. While the author did not have the possibility of studying the materials from Tuva, Russia he suggested the existance of two subspecies of *E. przewalskii*. At the same time, each of the populations investigated by him was referred to the nominative subspecies.

Determination of the structure of the species as a whole will depend upon future research on *E. przewalskii* from China (with detailed analysis of intrapopulational and geographic variability, including biochemical analysis).

Acknowledgments

I would like to express my gratitude to Drs. Kh. Terbish, S. L. Kuzmin, E. A. Dunaev and M. Prutkina for their help in collecting material and in the preparation of this paper.

Literature Cited

BANNIKOV, A. G. 1958. [Data on the fauna and biology of Amphibia and Reptilia in Mongolia]. Bulletin of the Moscow Association of nature searchers, section biologie 68 (2):71-91. (In Russian).

BANNIKOV, A. G., I. S. DAREVESKY, V. G. ISCHENKO, A. K. RUSTAMOV, AND N. N. SCHERBAK. 1977. [Field guide of the USSR amphibians and reptiles]. Prosveschenye Publishing, Moscow. 414 pp. (In Russian).

BEDRIAGA, J. V. 1912. Wissenschaftliche Resultate der von N. M. Przewalski nach Central-Asien unternommenen Reisen. Band 111. (Zoologischer Theil). Abth. I. Amphibien und Reptilien. St. Petersburg. 769 pp.

BORKIN, L. J. 1986. [On the relationships of lizards of the genus *Eremias* (Lacertidae) from Gobi desert, Mongolia]. Proceedings of the Zoological Institute, Leningrad 157:185-192. (In Russian).

BORKIN, L. J., KH. MUNKHBAYAR, AND D. V. SEMENOV. 1983a. [Amphibians and reptiles of Transaltai Gobi]. Complex characteristic of desert ecosystems of the Transaltai Gobi (on the base of the desert research station and Great Gobian Reserve). Puszczino:52-56. (In Russian).

BORKIN, L. J., KH. MUNKHBAYAR, AND D. V. SEMENOV. 1983b. [Amphibians and reptiles of Transaltai Gobi]. Nature (10):68-75. (In Russian).

BOULENGER, G. A. 1887. Catalogue of the lizards in the British Museum, Vol. 3. London. 576 pp.

BOULENGER, G. A. 1921. Monograph of the Lacertidae, Vol. 2. London. 451 pp.

DELY, O. GY. 1979. Analyse der morphologischen Eigentumlichtleiten drei mongolischer *Eremias*-Arten. Vertebrata Hungarica 19:3-84.

DELY, O. GY. 1980. Die variabilitat von drei *Eremias*-Arten aus der Mongolei. Acta Zoologia Scientiarum Hungaria 26:89-122.

FLINT, V. E. 1960. [*Eremias kessleri* - a lizard species, new for USSR fauna]. Journal of Zoology 39(8):1264. (In Russian).

KUZMIN, S. L., L. J. BORKIN, KH. MUNKHBAYAR, E. I. VOROBJEVA, AND D. V. SEMENOV. 1988. [Amphibians and reptiles of Mongolia. General aspects. Amphibia]. Science, Moscow. 248 pp. (In Russian).

MUNKHBAYAR, KH. 1970. [Species composition of heteroterm animals of Mongolia]. Mongolian State Pedagogical Institute. Scientific-Methodic Notes 1(8):109-113. (In Mongolian).

MUNKHBAYAR, KH. 1973. [Amphibians and reptiles of Mongolia]. Ph.D. Thesis. Tashkent. 38 pp. (In Russian).

MUNKHBAYAR, KH. 1976. [Amphibians and reptiles of Mongolia]. Ulan Bator. 167pp. (In Mongolian).

NIKOLSKY, A. M. 1915. [Fauna of Russia and adjacent countries. Reptiles (Reptilia)]. Vol. 1. Petrograd. 532 pp. (In Russian).

OBST, F. J. 1963. Amphibien und Reptilien aus der Mongolien. Mitteilungen aus dem Zoologischen Museum in Berlin 39(2):361-370.

ORLOVA, V. F. 1984. [Amphibians and reptiles of Mongolia]. Pp.117-119. *In* Natural

conditions and resources of some regions of the People's Republic of Mongolia. Bratislava. (In Russian).

ORLOVA, V. F. 1989. [Distribution and variability of the *Eremias* lizards of Mongolia]. Pp. 181-183. *In* Problems of Herpetology. Kiev. (In Russian).

ORLOVA, V. F., AND D. V. SEMENOV. 1986. [Distribution of amphibians and reptiles in Mongolia]. Pp. 91-108. *In* Zoogeographical regionalization of Mongolian People's Republic. USSR Academy of Sciences, Moscow. (In Russian).

ORLOVA, V. F., AND KH. TERBISH. 1986. [Data on the herpetofauna of Dzungarian Gobi]. Pp.95-110. *In* Herpetological researches in Mongolian People's Republic. USSR Academy of Sciences, Moscow. (In Russian).

POPE, C. M. 1935. The reptiles of China. Natural History of Central Asia. Vol. 10. American Museum of Natural History, New York. 604 pp.

SCHMIDT, K. P. 1927. Notes on Chinese reptiles. Bulletin of American Museum of Natural History 6:467-551.

SEMENOV, D. V., AND G. I. SCHENBROT. 1986. [Data on the herpetofauna of southeastern Mongolia]. Pp. 110-119. *In* Herpetological researches in Mongolian People's Republic. USSR Academy of Sciences, Moscow. (In Russian).

SZCZERBAK, N. N. 1969. [*Eremias kesslieri* or *E. przewalskii*?]. Proceedings of the Zoological Museum, Kiev 33:103. (In Ukranian).

SZCZERBAK, N. N. 1970. [New subspecies *Eremias przewalskii tuvensis* ssp.n. (Sauria, Reptilia) from the Tuva Autonomous Soviet Republic and data on the species systematics as a whole]. Zoological Herald 1970(5):31-36. (In Russian).

SZCZERBAK, N. N. 1971. [Ecology of *Eremias przewalskii* Str.]. Zoological Herald 1971(4):58-66. (In Russian).

SZCZERBAK, N. N. 1974. {Palearctic *Eremias* lizards}. Kiev. 293pp. (In Russian).

STRAUCH, A. A. 1876. {Reptilians and amphibians}. Pp. 3-55. *In* N. Przewalsky Mongolia and Tangit's State. Vol. 11. St. Petersburg. (In Russian).

TERBISH, KH. 1989. [Amphibians and reptiles of West Mongolia]. Ph.D. Thesis. Ulaan Baator. (In Russian).