

## On the herpetofauna of Turkmenistan\*

By

A. K. RUSTAMOV & S. SHAMMAKOV

**Abstract:** Fifty-three species of reptiles occur in Turkmenistan, of which 25 inhabit lowlands and 28 occur in plains and mountains. The species composition of reptiles in seven natural regions of Turkmenistan is discussed; the fauna of the sandy and clay desert is the richest. Seven species of reptiles occur in high density (from 10 to 71 per hectare), 30 species are frequent (1 to 10 per ha.) and 16 species are rare (0.2 to 1 per ha.). The fauna is subjected to a zoogeographical analysis.

The present paper deals with the reptilian fauna of the plains (lowland regions) of Turkmenistan. Composition, biotopic and vertical distribution, and abundance of reptiles are discussed. In the conclusion an analysis is given of the zoogeographical aspects and the genetic relationships of the entire herpetofauna of Turkmenistan (not only of the plains but also of the mountainous regions).

### 1. Composition of the herpetofauna

Arid and semiarid landscapes predominate in the Turkmen S.S.R. Reptiles, by virtue of their abundance and large number of species, occupy a significant position in the biogeocenoses introduced here.

The list of reptiles comprises 78 species (83 subspecies). Of these, 53 species (57 subspecies) inhabit the plains of Turkmenistan, altogether accounting for 67.9 per cent of the herpetofauna in the Republic.

The number of species within the systematic groups is given in Table 1. It can be seen from this table that the families Lacertidae, Gekkonidae, Agamidae, Scincidae and Colubridae comprise the majority of the herpetofauna of the plains, as well as that of the whole of Turkmenistan. It is also seen from Table 1 that the species of the families Anguidae and Typhlopidae are not represented in the plains at all.

The territory of Turkmenistan may be divided into eleven natural regions (RUSTAMOV 1966), with reptilian species indicated for each of them; 7 of these regions are situated in lowlands. For

---

\* Paper presented by S. SHAMMAKOV at the First Herpetological Conference of the Socialist Countries on the 27th August, 1981 in Budapest.

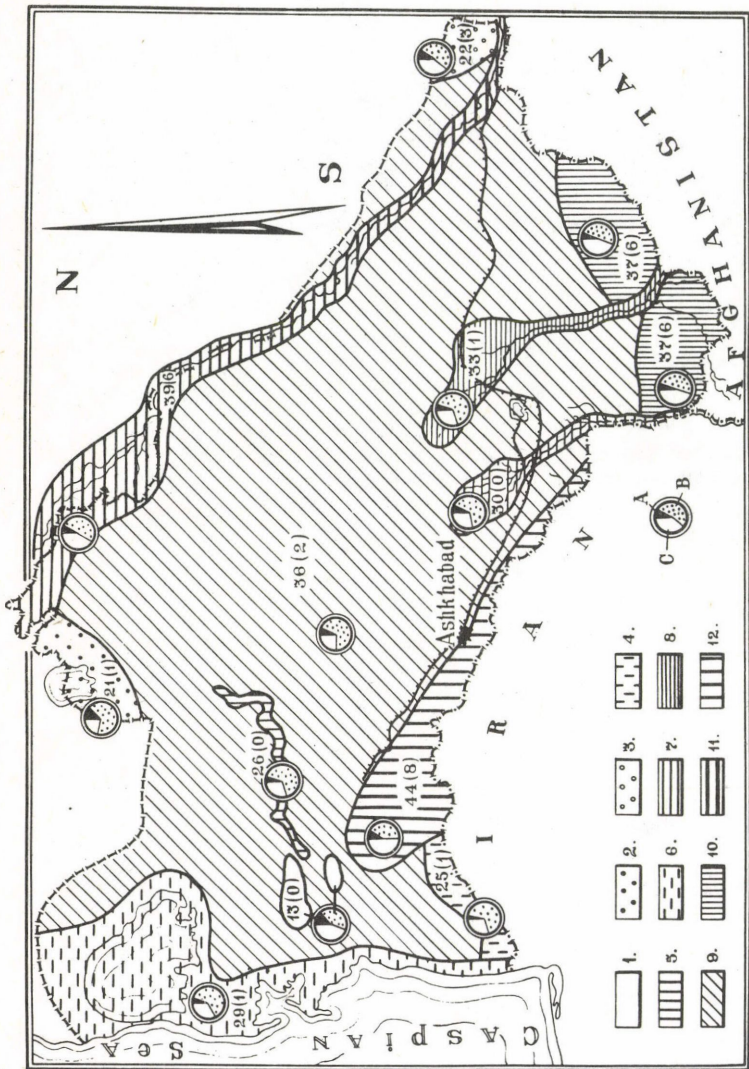


Fig. 1. The natural regions of Turkmenistan and the characteristics of their herpetofauna. The natural regions: 1. Greater and Minor Balkhan Mountains; 2. Sarykamysh Depression; 3. Kugitang Mountains; 4. Atrek River valley; 5. Western Uzboi channel; 6. Caspian Sea coast; 7. Tedzhen River valley; 8. Murgab River valley; 9. Karakum Desert; 10. Badkhyz and Karabil Uplands; 11. Amu Darya River valley; and 12. Kopetdag Mountains. Figures outside brackets denote the total number of species, and those in brackets - species occurring only in the given natural region. The species number proportions (in percentage) in the natural regions: A, abundant; B, common; and C, uncommon and rare.



the purposes of this paper it was deemed necessary to supplement this scheme of natural regionalization of the lowlands in Turkmenistan with one more region, namely, the Sarykamysch natural region (Fig. 1).

Table 2 gives a list of the species and their distribution in the eight natural regions adopted here. It is not difficult to see that there are 25 typically lowland species within the area in question, whereas the remaining 28 occur both in the mountains and on the plains and can be named mountain-lowland species.

In order to give an idea of the species composition of the herpetofauna in Turkmenistan as a whole, it was considered expedient to list the species that are known to occur in highlands only. These 25 species are as follows: Eublepharis turkmenicus, Alsophylax spinicauda, A. tuberculatus, Gymnodactylus turkmenicus, G. longipes, Agama himalayana, A. caucasica, A. erythrogastra, A. lehmani, Ophiosaurus apodus, Ophiomorus chernovi, Chalcides ocellatus, Eremias strauchi, E. persica, Lacerta raddei, Typhlops vermicularis, Eryx tataricus, E. elegans, Lycodon striatus, Coluber najadum, Eirenis meda, E. persicus, Olygodon taeniolatus, Telescopus rhynopoma, and Psammophis schokari.

The natural regions differ with respect to the number of species. Besides, a number of species may be identified which were discovered to occur only in one region (Table 2, Fig. 1). Thus, for example, Phrynocephalus maculatus and Phr. rossikowi shammakowi are known from the Kara-Kum, Elaphe quatuorlineata - from the Caspian coast, Natrix natrix - from the Atrék River basin, Ptyas mucosus - from the Murgab River valley, Alsophylax loricatus - from the Amu Darya basin, as well as the nominative subspecies of Phrynocephalus rossikowi rossikowi and Phr. reticulatus reticulatus, Eremias regeli, E. arguta and E. nigrocellata - also from the Amu Darya, and Alsophylax pipiens - from the Sarykamish depression. Eleven species of reptiles, namely, Agriemys horsfieldi, Gymnodactylus caspius, Agama sanguinolenta, Varanus griseus, Eremias velox, E. intermedia, Eryx miliaris, Natrix tessellata, Coluber karelini, Spalerosophis diadema and Psammophis lineolatus are common to all the natural regions of the Lowland Turkmenistan.

The herpetofauna is represented abundantly in the Kara-Kum natural region. This is understandable, for aridity and warmth are fundamental conditions for reptiles. The favourable climatic conditions and the availability of proper food, together with historic factors, have formed a rich and original faunistic complex in the deserts of Central Asia, including the Kara Kum. The large number of species in the Kara-Kum natural region is also due to reptiles pervading here

Table 1. Abundance of reptilian species of Turkmenistan and of its plains

Order, suborder and family	Number of species	
	Turkmenistan	Lowland Turkmenistan in this number
Testudines	3	3
Emydidae	2	2
Testudinidae	1	1
Sauria	47	32
Gekkonidae	13	8
Agamidae	12	8
Varanidae	1	1
Anguidae	1	-
Scincidae	7	5
Lacertidae	13	10
Serpentes	28	18
Typhlopidae	1	-
Boidae	3	1
Colubridae	20	13
Elapidae	1	1
Viperidae	2	2
Crotalidae	1	1

Table 2. Reptiles of Lowland Turkmenistan and their distribution over the natural regions \*

Species	Natural regions							
	See Fig. 1							
	1	2	3	4	5	6	7	8
<i>Mauremys caspica</i> (xx)	-	-	-	++	-	-	-	-
<i>Emys orbicularis</i> (xx)	-	+	-	+	-	-	-	-
<i>Agrionemys horsfieldi</i> (xx)	+	+	+	+	+	+	+	+
<i>Teratoscincus scincus</i> (x)	+	+	+	+	-	+	+	+
<i>Crossobamon evermanni</i> (x)	+	+	+	+	-	+	+	++
<i>Alsophylax pipiens</i> (x)	-	-	-	-	-	-	-	++
<i>Alsophylax laevis</i> (x)	+	-	-	-	+	-	-	-
<i>Alsophylax loricatus</i> (x)	-	-	-	-	-	-	++	-
<i>Gymnodactylus russowi</i> (xx)	+	+	-	-	-	+	-	+
<i>Gymnodactylus caspius</i> (xx)	+	+	+	+	+	+	+	+
<i>Gymnodactylus fedtchenkoii</i> (xx)	-	-	-	-	-	-	++	-
<i>Agama sanguinolenta</i> (xx)	+	+	+	+	+	+	+	+
<i>Phrynocephalus helioscopus</i> (x)	+	+	+	+	+	-	+	+
<i>Phrynocephalus rossikowi rossikowi</i> (x)	-	-	-	-	-	-	++	-
<i>Phrynocephalus rossikowi shammakowi</i> (x)	++	-	-	-	-	-	-	-
<i>Phrynocephalus reticulatus reticulatus</i> (x)	-	-	-	-	-	-	++	-
<i>Phrynocephalus reticulatus bannikowi</i> (x)	+	-	+	-	-	-	-	-
<i>Phrynocephalus raddei raddei</i> (x)	+	+	-	+	+	+	-	-
<i>Phrynocephalus raddei boettgeri</i> (x)	+	-	-	-	-	-	+	-
<i>Phrynocephalus maculatus</i> (x)	++	-	-	-	-	-	-	-
<i>Phrynocephalus interscapularis</i> (x)	+	+	+	-	+	+	+	+
<i>Phrynocephalus mystaceus</i> (x)	+	+	+	-	+	+	+	+
<i>Varanus griseus</i> (xx)	+	+	+	+	+	+	+	+
<i>Mabuya aurata</i> (xx)	+	+	+	-	+	+	+	-
<i>Eumeces schneideri</i> (xx)	+	-	+	+	+	+	+	-
<i>Eumeces taeniolatus</i> (xx)	-	-	-	-	+	+	+	-
<i>Ablepharus pannonicus</i> (xx)	-	-	-	+	-	+	-	-
<i>Ablepharus deserti</i> (x)	-	-	-	-	-	+	+	-
<i>Mesalina guttulata</i> (xx)	+	-	-	-	+	+	-	-
<i>Eremias velox</i> (xx)	+	+	+	+	+	+	+	+
<i>Eremias regeli</i> (x)	-	-	-	-	-	-	++	-
<i>Eremias arguta</i> (x)	-	-	-	-	-	-	++	-
<i>Eremias intermedia</i> (x)	+	+	+	+	+	+	+	+
<i>Eremias nigrocellata</i> (x)	-	-	-	-	-	-	++	-
<i>Eremias lineolata</i> (x)	+	+	+	-	+	+	+	+
<i>Eremias scripta</i> (x)	+	+	+	-	-	-	+	-
<i>Eremias grammica</i> (x)	+	+	+	-	+	+	+	+
<i>Lacerta strigata</i> (xx)	-	-	-	++	-	-	-	-
<i>Eryx miliaris</i> (xx)	-	+	+	+	+	+	+	+
<i>Natrix natrix</i> (x)	-	-	-	++	-	-	-	-
<i>Natrix tessellata</i> (xx)	+	+	+	+	+	+	+	+
<i>Coluber jugularis</i> (xx)	-	-	-	++	-	-	-	-
<i>Coluber karelini</i> (xx)	+	+	+	+	+	+	+	+
<i>Coluber rhodorhachis rhodorhachis</i> (xx)	+	+	-	-	+	+	-	-
<i>Coluber rhodorhachis ladaensis</i> (xx)	-	-	+	-	+	+	-	-
<i>Coluber ravergieri</i> (xx)	+	-	+	-	+	-	+	-
<i>Spalerosophis diadema</i> (xx)	+	+	+	+	+	+	+	+
<i>Ptyas mucosus</i> (xx)	-	-	-	-	-	++	-	-
<i>Lithorhynchus ridgewayi</i> (xx)	+	-	-	-	+	+	+	-
<i>Elaphe quatuorlineata</i> (x)	-	-	++	-	-	-	-	-
<i>Elaphe dione</i> (x)	-	-	-	+	-	-	+	-
<i>Boiga trigonatum</i> (x)	+	-	+	+	+	+	+	-
<i>Psammophis lineolatus</i> (xx)	+	+	+	+	+	+	+	+



(Table 2 cont.)

	1	2	3	4	5	6	7	8
<i>Naja oxiana</i> (xx)	+	+	+	-	+	+	+	-
<i>Vipera lebetina</i> (xx)	+	-	-	-	+	+	+	-
<i>Echis carinatus</i> (xx)	+	+	+	+	+	+	+	-
<i>Agkistrodon halys</i> (x)	-	-	+	-	-	-	+	+

\* Typically lowland species are marked with (x), and mountain-lowland species with (xx). Species occurring in a natural region are marked with (+), and those occurring only in a given region with (++)

from the adjacent piedmonts of the Kopetdag and from the lower reaches of river valleys. These include *Mabuya aurata*, *Eumeces schneideri*, *Mesalina guttulata*, *Eremias velox*, *Natrix tessellata*, *Coluber rhodorhachis*, *C. ravergeri* and *Vipera lebetina*.

There are rather many species, namely 39, in the Amu Darya natural region. This is explained by the diversity of habitats, the juxtaposition with the Kara-Kum, and the geographical situation of the River. It is not a mere chance that many widely dispersed species may be found here, as well as 7 species whose southern boundary of distribution runs just over these places. The are the following species: *Alsophylax loricatus*, *Gymnodactylus fedtchenkoi*, *Phrynocephalus rossikowi*, *Phr. reticulatus*, *Eremias regeli*, *E. arguta* and *E. nigrocellata*.

The Sarykamys region, despite its immediate proximity to the Kara-Kum and Amu Darya natural regions, harbours considerably fewer species than the latter two, only 21. Some psammophilous and southern form do not reach these places in their migration. They are representatives of the Scincidae family, and also such species as *Mesalina guttulata*, *Eremias scripta*, *Coluber rhodorhachis*, *Boiga trigonatum*, *Naja oxiana*, *Echis carinatus* and *Vipera lebetina*.

The faunistical characteristics of other natural regions will not be dealt with; the biotopic relationships of reptiles are discussed below.

## 2. Biotopic and vertical distributions

Seven biotopes can be distinguished in lowland Turkmenistan, namely, 1) sandy desert areas, 2) clay desert areas, 3) scree desert areas, 4) solonchak desert areas, 5) man's constructions, 6) river floodplains and cultivated lands, and 7) water bodies. The distribution of reptiles over these biotopes is given in Table 3.

It can be seen from Table 3 that, according to the biotopic relationships, clay desert areas are the most repleted with species. This biotope is inhabited by 20 species which prefer compacted soils, while nine species, although occurring here, are less characteristic for it. The fauna of the sandy areas is comprised of 10 characteristic and 19 less characteristic species, scree areas - 1 and 9, solonchak areas 2 - and 15, man's constructions - 2 and 17, river floodplains and cultivated lands - 13 and 13 respectively, and, finally, 5 species inhabit water basins, their life being related to water to a large extent.

Some species are eurytopic and others are stenotopic. The following reptiles may be attributed as eurytopic species occurring in various habitats: *Agrionemys horsfieldi*, *Gymnodactylus caspicus*, *Agama sanguinolenta*, *Varanus griseus*, *Eremias velox*, *E. intermedia*, *Coluber karelini*, *C. rhodorhachis*, *Spalerosophis diadema*, *Boiga trigonatum*, *Psammophis lineolatum*, *Naja oxiana* and *Echis carinatus*; the following species are rather similar to this group: *Alsophylax pipiens*, *Gymnodactylus russowi*, *Phrynocephalus raddei*, *Mabuya aurata*, *Eumeces schneideri*, *Mesalina guttulata*, *Eremias lineolata*, *Lacerta strigata*, *Eryx miliaris*, *Coluber ravergeri*, *Lithorhynchus ridgewayi*, *Elaphe dione*, *Agkistrodon halys*, and *Vipera lebetina*. The following reptiles are stenotopic species: *Mauremys caspica*, *Emys orbicularis*, *Teratoscincus scincus*, *Crossobamon evermanni*, *Alsophylax laevis*, *A. loricatus*, *Gymnodactylus fedtchenkoi*, *Phrynocephalus helioscopus*, *Phr. rossikowi*, *Phr. reticulatus*, *Phr. maculatus*, *Phr. interscapularis*, *Phr. mystaceus*, *Eumeces taeniolatus*, *Ablepharus pannonicus*, *A. deserti*, *Eremias regeli*, *E. arguta*, *E. nigrocellata*, *E. scripta*, *E. grammica*, *Natrix natrix*, *N. tessellata*, *Coluber jugularis*, *Ptyas mucosus*, and *Elaphe quatuorlineata*.



Table 3. Biotopic distribution of reptiles of Lowland Turkmenistan \*

Species	Sandy desert areas	Clay desert areas	Scree desert areas	Solonchak desert areas	Man's constructions	River floodplains and cultivated lands	Water bodies
1	2	3	4	5	6	7	8
<i>Mauremys caspica</i>	-	-	-	-	-	-	++
<i>Emys orbicularis</i>	-	-	-	-	-	-	++
<i>Agrionemys horsfieldi</i>	+	++	+	+	-	+	-
<i>Teratoscincus scincus</i>	++	-	-	-	-	-	-
<i>Crossobamon eversmanni</i>	++	-	-	-	-	-	-
<i>Alsophylax pipiens</i>	-	++	-	+	+	-	-
<i>Alsophylax laevis</i>	-	++	-	-	-	-	-
<i>Alsophylax loricatus</i>	-	-	-	++	+	-	-
<i>Gymnodactylus russowi</i>	+	++	-	+	+	-	-
<i>Gymnodactylus caspius</i>	+	+	-	+	++	+	-
<i>Gymnodactylus fedtchenkoi</i>	-	-	-	-	++	-	-
<i>Agama sanguinolenta</i>	+	++	+	+	-	+	-
<i>Phrynocephalus helioscopus</i>	-	++	+	+	-	-	-
<i>Phrynocephalus rossikowi</i>	-	-	++	-	-	-	-
<i>Phrynocephalus reticulatus</i>	++	-	+	-	-	-	-
<i>Phrynocephalus raddei</i>	+	++	-	+	-	-	-
<i>Phrynocephalus maculatus</i>	-	-	-	++	-	-	-
<i>Phrynocephalus interscapularis</i>	++	-	-	-	-	-	-
<i>Phrynocephalus mystaceus</i>	++	-	-	-	-	-	-
<i>Varanus griseus</i>	+	++	-	-	+	+	-
<i>Mabuya aurata</i>	-	+	-	-	+	++	-
<i>Eumeces schneideri</i>	+	+	-	-	+	++	-
<i>Eumeces taeniolatus</i>	-	-	-	-	-	++	-
<i>Ablepharus pannonicus</i>	-	-	-	-	-	++	-
<i>Ablepharus deserti</i>	-	-	-	-	-	++	-
<i>Mesalina guttulata</i>	+	++	-	-	-	-	-
<i>Eremias velox</i>	+	+	-	+	+	++	-
<i>Eremias regeli</i>	-	++	-	-	-	-	-
<i>Eremias arguta</i>	-	++	-	-	-	-	-
<i>Eremias intermedia</i>	++	+	+	+	-	-	-
<i>Eremias nigrocellata</i>	-	++	-	-	-	-	-
<i>Eremias lineolata</i>	++	+	-	+	-	-	-
<i>Eremias scripta</i>	++	-	-	-	-	-	-
<i>Eremias grammica</i>	++	-	-	-	-	-	-
<i>Lacerta strigata</i>	-	-	-	+	-	++	-
<i>Eryx miliaris</i>	++	+	-	-	+	-	-
<i>Natrix natrix</i>	-	-	-	-	-	+	++
<i>Natrix tessellata</i>	-	-	-	-	-	+	++
<i>Coluber jugularis</i>	-	-	-	-	-	++	-
<i>Coluber karelini</i>	+	++	+	-	+	+	-
<i>Coluber rhodorhachis</i>	+	+	-	-	+	++	-
<i>Coluber revergieri</i>	+	-	-	-	+	++	-
<i>Spalerosophis diadema</i>	+	++	+	+	-	+	-
<i>Ptyas mucosus</i>	-	-	-	-	+	+	++
<i>Lithorhynchus ridgewayi</i>	-	++	+	-	-	-	-
<i>Elaphe quatuorlineata</i>	-	++	-	-	-	-	-
<i>Elaphe dione</i>	-	-	-	+	+	++	-



(Table 3. cont.)

1	2	3	4	5	6	7	8
<i>Boiga trigonatum</i>	+	++	-	-	+	+	-
<i>Psammophis lineolatum</i>	+	++	+	+	-	+	-
<i>Naja oxiana</i>	+	+	-	-	+	++	-
<i>Vipera lebetina</i>	+	-	-	-	+	++	-
<i>Echis carinatus</i>	+	++	-	+	+	+	-
<i>Agkistrodon halys</i>	+	++	-	-	-	+	-

\* Species characteristic of the given biotope are marked with (++) , and those non-characteristic with (+)

Data from Table 4 give an idea of the vertical distribution of the species of reptiles in question. It can be seen from this table that many species do not penetrate up in the mountains as high as in other parts of Central Asia, in Kazakhstan, in the Crimea, in the Caucasus, in Afghanistan, in Pakistan and in Iran. This is due to the ecological conditions favourable to reptiles being restricted to medium-altitude highlands in Turkmenistan. The fact that our ridges are "mountains in the desert" is also of significance. The desert conditions affect them rather seriously and that is why the reptiles of the plains penetrate into the mountains up to the aridity limits along certain ecological channels.

### 3. Abundance

The abundance of reptilian species in Lowland Turkmenistan is given in Table 5. According to the scale adopted here, species with 10 and more individuals per hectare are attributed to the category of "abundant". There are 7 such species in the herpetofauna of Lowland Turkmenistan. In cases with 1 to 10 individuals per ha the species fall in the category of "common". There are 29 such species. Finally, 17 species of the herpetofauna belong with the category of "uncommon" and "rare", their densities do not exceed 1 individual per 1 ha.

Here, however, certain reservations are needed. The abundant species of *Alsophylax laevis*, *A. loricatus* and *A. pipiens* have an extremely limited distribution. Due to the development of arid lands, their habitats are being heavily degraded and therefore the populations of these species are decreasing and being scattered. For this reason these species are included in the Red Data Book of the U.S.S.R. (second edition, under preparation for publication) and in the Red Data Book of the Turkmen S.S.R. For that matter, take *Phrynocephalus maculatus*: this lizard is shown in Table 5 as being a common species because its relic population in a small area has an average of 4.3 individuals per 1 ha. But in fact this population is in danger of extinction. Intensive hydro-economic work is being carried out in its habitats. In order to prevent the total extinction of the population, some of the individuals have been recently transferred to secure places. The species, though attributed to the category of "common", is indicated in the Red Data Book of the U.S.S.R. and is included in the Red Data Book of the Turkmen S.S.R. for the reason of its relic population being in imminent danger of extinction.

Discussing the abundance of reptiles, some facts should be dwelt on concerning their concentration over rather small areas. Thus, for example, in one of the fruit orchards situated within an encirclement of cotton plantations in the north of Turkmenistan, about 2,000 individuals of the species *Ablepharus deserti* were found on 1 hectare. Concentrations of *Gymnodactylus caspius* were recorded in abandoned mud houses. Up to 900 individuals of this species were counted up within 15 such constructions. About 3,500 individuals of *Natrix tessellata* were counted in a water basin of about 0.2 ha in area in the southwest of Turkmenistan (SHAMMAKOV & VELIKANOV 1980). About 120 individuals of *Echis carinatus* per 1 ha were found to inhabit the ruins of an old fortress and its neighbourhood in the south of Turkmenistan. These and other observations on the concentration of reptiles are connected with the availability of food and protection conditions favourable to them, found in small areas.



Table 4. Vertical boundary of reptile distribution in Turkmenistan and in some other regions of the area (altitude in m above sea level)

Species	Turkmenis- tan	Kazakhstan and other Central- Asian republics	The Caucasus and the Crimea	Afghanistan, Pakistan and Iran (according to ANDERSON & LEVITON, 1969, and LE- VITON & ANDERSON, 1970)
<i>Mauremys caspica</i>	800	-	1800	-
<i>Emys orbicularis</i>	800	-	600	-
<i>Agrionemys horsfieldi</i>	2200	1300	-	-
<i>Teratoscincus scincus</i>	-	-	-	1800
<i>Gymnodactylus russowi</i>	1000	2000	-	-
<i>Gymnodactylus caspius</i>	800	-	-	1653
<i>Gymnodactylus fedtchenkoi</i>	2000	2300	-	-
<i>Agama sanguinolenta</i>	1200	-	-	-
<i>Phrynocephalus helioscopus</i>	400	1200	-	-
<i>Phrynocephalus reticulatus</i>	400	-	-	-
<i>Varanus griseus</i>	800	-	-	-
<i>Mabuya aurata</i>	1000	-	1200	-
<i>Eumeces schneideri</i>	1600	-	1300	-
<i>Eumeces taeniolatus</i>	1600	-	-	-
<i>Ablepharus pannonicus</i>	1700	-	-	-
<i>Mesalina guttulata</i>	400	-	-	2600
<i>Eremias velox</i>	1200	1700	-	-
<i>Eremias regeli</i>	300	-	-	-
<i>Eremias nigrocellata</i>	-	-	-	2700
<i>Eremias strigata</i>	800	-	2500	-
<i>Eryx miliaris</i>	1200	-	-	-
<i>Natrix tessellata</i>	1000	300	-	2440
<i>Coluber jugularis</i>	1000	-	1600	-
<i>Coluber karelini</i>	1000	1800	-	-
<i>Coluber rhodorhachis</i>	2000	2300	-	-
<i>Coluber ravergieri</i>	2000	2600	2000	2600
<i>Spalerosophis diadema</i>	1800	1500	-	1440
<i>Ptyas mucosus</i>	800	-	-	1800
<i>Lithorhynchus ridgewayi</i>	1800	-	-	1830
<i>Boiga trigonatum</i>	300	-	-	900
<i>Psammophis lineolatum</i>	1000	1600	-	2400
<i>Naja oxiana</i>	2000	2000	-	-
<i>Vipera lebetina</i>	2000	1500	-	-
<i>Echis carinatus</i>	700	950	-	1425

The abundance and distribution of reptiles on the plains of Turkmenistan are changing appreciably due to the development of arid territories. Some facts were given above, but many other observations have also been recorded. For example, *Varanus griseus*, *Eremias lineolata*, *Phrynocephalus reticulatus*, *Phr. raddei*, *Teratoscincus scincus*, *Gymnodactylus russowi*, *Alsophylax laevis*, and other species are disappearing or are being forced out of their habitats because of arable farming and irrigation. *Vipera lebetina* nearly always disappears from developed areas; *Ophisaurus apodus* and *Eremias velox* however are tolerable of conditions that arise with the development of lands.



Table 5. Abundance of reptiles in Lowland Turkmenistan

Species	Mean number of individuals		Abundance category*
	per 1 ha	per 1 km	
<i>Ablepharus deserti</i>	71.5	21.5	+++
<i>Alsophylax laevis</i>	30.7	6.1	+++
<i>Alsophylax loricatus</i>	27.7	5.5	+++
<i>Alsophylax pipiens</i>	26.6	6.0	+++
<i>Phrynocephalus interscapularis</i>	16.6	6.7	+++
<i>Phrynocephalus reticulatus</i>	14.1	5.6	+++
<i>Teratoscincus scincus</i>	10.4	4.2	+++
<i>Phrynocephalus rossikowi</i>	9.5	5.7	++
<i>Phrynocephalus raddei</i>	8.9	2.7	++
<i>Natrix natrix</i>	7.6	4.6	++
<i>Gymnodactylus fedtchenkoi</i>	7.5	3.0	++
<i>Crossobamon eversmanni</i>	7.4	2.2	++
<i>Lacerta strigata</i>	7.0	2.8	++
<i>Eremias grammica</i>	6.8	2.2	++
<i>Eremias intermedia</i>	6.4	2.6	++
<i>Phrynocephalus helioscopus</i>	6.2	2.5	++
<i>Ablepharus pannonicus</i>	6.2	1.9	++
<i>Eremias scripta</i>	5.3	1.6	++
<i>Eremias lineolata</i>	4.9	1.9	++
<i>Eremias velox</i>	4.8	2.9	++
<i>Natrix tessellata</i>	4.8	2.8	++
<i>Gymnodactylus russowi</i>	4.4	1.3	++
<i>Phrynocephalus maculatus</i>	4.3	2.5	++
<i>Vipera lebetina</i>	4.2	1.4	++
<i>Emys orbicularis</i>	4.1	4.1	++
<i>Agama sanguinolenta</i>	3.9	2.1	++
<i>Agrionemys horsfieldi</i>	3.7	2.2	++
<i>Gymnodactylus caspius</i>	2.8	1.4	++
<i>Phrynocephalus mystaceus</i>	2.7	2.1	++
<i>Mesalina guttulata</i>	2.3	1.4	++
<i>Eryx miliaris</i>	2.2	0.9	++
<i>Eremias nigrocellata</i>	1.7	1.4	++
<i>Echis carinatus</i>	1.7	1.3	++
<i>Psammophis lineolatus</i>	1.6	0.8	++
<i>Eumeces schneideri</i>	1.3	0.8	++
<i>Mabuya aurata</i>	1.0	0.6	++
<i>Coluber karelini</i>	0.9	0.6	+
<i>Spalerosophis diadema</i>	0.8	0.5	+
<i>Coluber jugularis</i>	0.7	0.5	+
<i>Coluber rhodorhachis</i>	0.6	0.3	+
<i>Varanus griseus</i>	0.2	0.3	+
<i>Ptyas mucosus</i>	0.2	0.3	+
<i>Naja oxiana</i>	0.05	0.05	+
<i>Eremias regeli</i>	0.04	0.06	+
<i>Eremias arguta</i>	0.04	0.06	+
<i>Agkistrodon halys</i>	0.04	0.05	+
<i>Boiga trigonatum</i>	0.02	0.03	+
<i>Elaphe quatuorlineata</i>	0.02	0.02	+
<i>Coluber ravergieri</i>	0.02	0.02	+
<i>Elaphe dione</i>	0.02	0.03	+
<i>Lithorhynchus ridgewayi</i>	0.02	0.03	+
<i>Mauremys caspica</i>	0.02	0.02	+
<i>Eumeces taeniolatus</i>	0.01	0.02	+

\* (+++) abundant, (++) common, and (+) uncommon and rare species

#### 4. Zoogeographical analysis

There are few data on the Tertiary and Quaternary reptilian faunas of Central Asia, and none at all for Turkmenistan. Therefore, one can judge the origin and formation of the herpetofauna of Turkmenistan only by the structure of the areals, the species composition, and by identifying the form-origination centres of the various species. The considerations given below concerning the zoogeographical aspects and the genetic relationships of the herpetofauna of Turkmenistan are based on published data (NIKOLSKY 1916, CHERNOV 1959, RUSTAMOV 1966, SHCHERBAK 1974 etc.).

Ten species-group areals differing in structure can be distinguished within the herpetofauna of Turkmenistan (Table 6).

Table 6. The role of different faunistical complexes in the composition of the herpetofauna of Turkmenistan

Faunistical complex	Species number	Percentage of the herpetofauna of Turkmenistan
Turanian complex	29	37.2
Iranian-Afghan	28	35.9
Indian	5	6.4
Mediterranean ( <i>Mauremys caspica</i> , <i>Ophisaurus apodus</i> , <i>Natrix tessellata</i> , <i>Coluber jugularis</i> , <i>Elaphe qua-</i> <i>tuorlineata</i> )	5	6.4
Saharan-Sind ( <i>Mesalina guttulata</i> , <i>Spalerosophis diadema</i> , <i>Vipera lebetina</i> )	3	3.9
European ( <i>Emys orbicularis</i> , <i>Natrix natrix</i> )	2	2.6
Caucasian-Asian-Minor ( <i>Lacerta strigata</i> , <i>L. raddei</i> )	2	2.6
Eastern-Palaearctic ( <i>Elaphe dione</i> , <i>Agkistrodon halys</i> )	2	2.6
Himalayan ( <i>Agama himalayna</i> )	1	1.3
Upland-Asian complex ( <i>Agama lehmani</i> )	1	1.3

Turanian species. They are *Agrionemys horsfieldi*, *Teratoscincus scincus*, *Crossobamon eversmanni*, *Alsophylax pipiens*, *A. laevis*, *A. loricatus*, *Gymnodactylus russowi*, *G. fedtchenko*, *G. caspius*, *Agama sanguinolenta*, *Phrynocephalus helioscopus*, *Phr. rossikowi*, *Phr. raddei*, *Phr. reticulatus*, *Phr. interscapularis*, *Phr. mystaceus*, *Ablepharus deserti*, *Eremias velox*, *E. regeli*, *E. arguta*, *E. lineolata*, *E. scripta*, *E. intermedia*, *E. nigrocellata*, *E. grammica*, *Eryx miliaris*, *E. tataricus*, *Coluber karelini* and *Psammophis lineolatum*.

In Turkmenistan, the majority of the species of this group are confined to the Kara-Kum and other desert regions. With respect to biotopes, they inhabit sandy, clay and scree deserts.

The origin of these species is related to the centres of formation of sandy and non-sandy (clay-scrree) desert herpetofauna, existing in the deserts of Central Asia (CHERNOV 1959). Reptiles of these two types are those of sandy form-origination (psammophiles) and non-sandy origination (species of compacted-soil). The former type comprises *Teratoscincus scincus*, *Crossobamon eversmanni*, *Phrynocephalus reticulatus*, *Phr. interscapularis*, *Phr. mystaceus*, *Eremias intermedia*, *E. lineolata*, *E. scripta*, *E. grammica* and *Eryx miliaris*; and the latter - *Agrionemys horsfieldi*, *Alsophylax pipiens*, *A. laevis*, *A. loricatus*, *Gymnodactylus russowi*, *G. caspius*, *G. fedtchenko*, *Agama sanguinolenta*, *Phrynocephalus rossikowi*, *Phr. helioscopus*, *Phr. raddei*, *Ablepharus deserti*, *Eremias velox*, *E. regeli*, *E. arguta*, *E. nigrocellata*, *Eryx tataricus*, *Coluber karelini* and *Psammophis lineolatum*.

Iranian-Afghan species. The number of the Iranian-Afghan species in the herpetofauna of Turkmenistan is 28, they are *Eublepharis turcmenicus*, *Alsophylax spinicauda*, *A. tuberculatus*, *Gymnodactylus longipes*, *G. turcmenicus*, *Agama caucasica*, *A. erythrogastra*, *Phrynocephalus maculatus*, *Varanus griseus*, *Mabuya aurata*, *Eumeces schneideri*, *E. taeniolatus*, *Chalcides ocellatus*, *Ablepharus pannonicus*, *Ophiomorus chernovi*, *Eremias strauchi*, *E. persica*, *Typhlops*



vermicularis, Eryx elegans, Lithorhynchus ridgewayi, Coluber najadum, C. rhodorhachis, C. ravergieri, Eirenis meda, E. persica, Telescopus rhynopoma, Naja oxiana and Echis carinatus.

The biotopes to which these species are related in Turkmenistan are mountains, mountain-desert and desert areas, as in the Kopetdag, for example. More than half of this group of species occur only in the southern part of Turkmenistan. These include Eublepharis turcomenicus, Alsophylax spinicauda, A. tuberculatus, Gymnodactylus longipes, G. turcomenicus, Agama caucasica, A. erythrogastra, Phrynocephalus maculatus, Ophiomorus chernovi, Eremias persica, E. strauchi, Typlops vermicularis, Eryx elegans, Coluber najadum, Eirenis meda, E. persica and Telescopus rhynopoma. The areal of the other group of the Iranian-Afghan species is wider. This group influences the mountain and desert fauna. They are Varanus griseus, Mabuya aurata, Eumeces schneideri, E. taeniolatus, Ablepharus pannonicus, Coluber rhodorhachis, C. ravergieri, Lithorhynchus ridgewayi, Naja oxiana and Vipera lebetina. Echis carinatus stands by itself. It is an exclusively desert species in Turkmenistan, though occasionally it penetrates into the mountains (the individuals were collected near the settlement of Karakala and in the Malyi Balkhan).

Indian species. The group of the Indian species occupies the third place in the herpetofauna of Turkmenistan. According to our calculations, there are 5 species in this group, namely, Lycodon striatus, Ptyas mucosus, Oligodon taeniolatus, Boiga trigonatum and Psammophis schokari. All of them are confined to the area of the Kopetdag, in the main; Ptyas mucosus - to the Murgab River valley, and only Boiga trigonatum is relatively widely dispersed.

Thus, the zoogeographical aspect of the herpetofauna of Turkmenistan is determined by two faunistic complexes, namely, by the Turanian and Iranian-Afghan complexes which, taken together, comprise 57 species out of 78. The role of the remaining groups in the composition of the herpetofauna is insignificant (Table 6).

Various species that are related to deserts by their origin pervade the lower zone of the mountains (Phrynocephalus helioscopus, Phr. reticulatus, Eryx miliaris, Echis carinatus, and others) and higher (Agama sanguinolenta, Agrionemys horsfieldi, Psammophis lineolatum and others), which is explained by the situation of the "mountains in the desert".

Autochthonous forms predominate in the desert regions, the herpetofauna of these regions is unique. The fauna of the mountainous regions is most heterogeneous. 35 species (36 subspecies) inhabit the Kara-Kum, and 44 - the Kopetdag. The herpetofauna of the Kopetdag is related to eight faunistic complexes (9 Turanian species, 20 Iranian-Afghan, 4 Indian, 4 Mediterranean, 3 Saharan-Sind, 2 Caucasian, 1 European, and 1 Eastern-Palearctic species). The fauna of the Kara-Kum consists of Turanian species mainly (21 in number). There are 14 Iranian-Afghan, Saharan-Sind, Mediterranean and Indian species here, and all of them are stranger elements. There are rather many Turanian species in the Kopetdag and in other mountains of Turkmenistan, but their pervasion of the mountains is of a secondary character and is explained by the influence of the fauna of the adjacent deserts.

In the U.S.S.R., a number of species are found to occur only in Turkmenistan; these are Eublepharis turcomenicus, Alsophylax spinicauda, A. tuberculatus, Gymnodactylus turcomenicus, G. longipes, Agama erythrogastra, Phrynocephalus maculatus, Ophiomorus chernovi, Mesalina guttulata, Eremias persica, Eryx elegans, Ptyas mucosus, Oligodon taeniolatus, Eirenis meda, E. persica, Lithorhynchus ridgewayi, Telescopus rhynopoma and Psammophis schokari. The species of Mauremys caspica, Emys orbicularis, Eumeces taeniolatus, Lacerta raddei, L. strigata, Eremias strauchi, Natrix natrix and Coluber najadum have been found nowhere else in Central Asia, except in Turkmenistan.

#### REFERENCES

- ANDERSON, S.C. & LEVITON, A.E. (1969): Amphibians and reptiles collected by the Street expedition to Afghanistan, 1965. - Proc. Calif. Acad. Sci., Ser. 4, 37: 25-56.
- CHERNOV, S.S. (1959): The fauna of the Tajik S.S.R., Vol. 18. The Reptiles. - Dushanbe (in Russian).
- LEVITON, A.E. & ANDERSON, S.C. (1970): The amphibians and reptiles of Afghanistan, a checklist and key to the herpetofauna. - Calif. Acad. Sci., Ser. 4, 38: 163-206.
- NIKOLSKY, A.M. (1916): The fauna of Russia and the contiguous countries. The reptiles (Reptilia). Vol. 1-2 (in Russian).



- RUSTAMOV, A.K. (1966): A brief review of the herpetofauna of Turkmenia and its zoogeographical characteristics. - In: The vertebrates of Central Asia: 158-186. - Izdatel'stvo Akad.Nauk Uzbek S.S.R., Tashkent.
- SHAMMAKOV, S. & VELIKANOV, V.P. (1980): The concentration of *Natrix tessellata* on the eastern coast of the Caspian Sea and in the lower reaches of the Atrek River. - Dokl. Akad.Nauk Tadzhik.S.S.R., Ser.biol.nauk, 2: 1-92 (in Russian).
- SHCHERBAK, N.N. (1974): *Eremias arguta* of the Palearctic. - Izdatel'stvo Naukova Dumka, Kiev (in Russian).

Authors' address: Akad. Dr. A.K. RUSTAMOV  
and  
S. SHAMMAKOV  
Institut Zoologii AN TSSR  
744000 Ashkhabad  
ul. Engelsa, 6.  
SSSR