

## Reptile communities of desert landscapes and analysis of the herpetofauna of Southeastern Kazakhstan

D. A. Bondarenko, T. N. Dujsebayaeva ✉

*Institute of Zoology, Ministry of Science and High Education of the Republic of Kazakhstan  
93 al-Farabi Avenue, Almaty 050060, Kazakhstan*

### Article info

#### Original Article

<https://doi.org/10.18500/1814-6090-2024-24-3-4-127-144>  
EDN: EMWXVK

Received February 23, 2024,  
revised March 26, 2024,  
accepted March 26, 2024

**Abstract.** We used the route method to carry out quantitative counts of reptiles in nine regions of Southeastern Kazakhstan. The results yielded data on the population density of reptiles in fourteen habitats. We observed the greatest diversity of species and the largest number of reptiles in sandy deserts. Both measures were much smaller in loamy plains and low mountains. In desert habitats, the Central Asian tortoise *Agrionemys horsfieldii* and the rapid racerunner *Eremias velox* were more common than other species. In the desert habitat, agama *Trapelus sanguinolentus* was less common. Despite its wide distribution, the Central Asian tortoise was rare or common in most habitats: its population density values did not exceed four individuals/ha. High numbers ( $23.2 \pm 8.4$  ind./ha) were recorded for the species only in the north of the Moyinkum desert. The population density of the tortoise in commercial harvesting areas from 1950 up to the 1980s remained low ( $3.5 \pm 0.9$  ind./ha) and failed to recover. Using the population density data, we calculated similarity indices of reptile communities and then grouped communities into several complexes based on similarity indices and the ecological specialization of numerically dominant species. In loamy, sandy loam, and stony deserts, eurytopic species formed the basis of the population. These were *A. horsfieldii*, *E. velox*, and *T. sanguinolentus*. In the sands of Taukum and Saryesik Atyrau, racerunners (*Eremias*) dominated in the reptile communities. These were *E. intermedia*, *E. lineolata*, and *E. velox*, among these stenotopic species dominated. The community of the foothills of the Kyrgyz ridge turned out to be the most isolated from the others. The similarity was revealed between nine desert areas in terms of reptile fauna. The deserts that are similar in landscape features (especially the substrate and vegetation) had high indices of commonality regardless of their remoteness and isolation. This shows that the process of historical dispersal of species and their movement between territories faced no obstacles.

**Keywords:** deserts of Kazakhstan, reptiles, species diversity, population density, faunal analysis

**Funding.** The study was carried out with partial financial support of the Ministry of Education and Science of the Republic of Kazakhstan (project “Terrestrial Vertebrates of the Ile-Balkhash Region as an Object of Conservation and Rational use in Modern Environmental Conditions, 2010–2012”).

This is an open access article distributed under the terms of Creative Commons Attribution 4.0 International License (CC-BY 4.0)

**For citation:** Bondarenko D. A., Dujsebayaeva T. N. Reptile communities of desert landscapes and analysis of the herpetofauna of Southeastern Kazakhstan. *Current Studies in Herpetology*, 2024, vol. 24, iss. 3–4, pp. 127–144 (in Russian). <https://doi.org/10.18500/1814-6090-2024-24-3-4-127-144>, EDN: EMWXVK

### REFERENCES

Ananjeva N. B. Seasonal changes in adipose bodies and gonads of five sympatric species of desert lizards (Sauria, *Eremias*) of the Southern Balkhash region. *Zoologicheskii zhurnal*, 1971, vol. 50, iss. 11, pp. 1700–1708 (in Russian).

Bedareva O. M., Khlustov V. K. Ecosystem diversity of the Moynikum sand massif and its economic use. *Izvestiya of Timiryazev Agricultural Academy*, 2007, no. 2, pp. 132–135 (in Russian).

Beloselskaya G. A. Experience of physical-geographical zoning of the Muyunkum desert. *Voprosy geografii*, 1956, vol. 39, pp. 168–178 (in Russian).

Bogdanov O. P. *Fauna Uzbekskoj SSR. T. 1. Zemnovidnye i presmykayushchiesya* [The Fauna of the Uzbek SSR. Vol. 1. Amphibians and Reptiles]. Tashkent, Academy of Sciences of the UzSSR Publ., 1960. 260 p. (in Russian).

Bondarenko D. A. *Spatial Structure of the Reptile Population in the Karshi Steppe and its Changes under*

✉ *Corresponding author.* Department of Ornithology and Herpetology of Institute of Zoology, Ministry of Science and High Education of the Republic of Kazakhstan, Kazakhstan.

*ORCID and e-mail addresses:* Dmitry A. Bondarenko: <https://orcid.org/0000-0001-6377-6816>, [dmbonda@list.ru](mailto:dmbonda@list.ru); Tatjana N. Dujsebayaeva: [tatjana.dujsebayaeva@zool.kz](mailto:tatjana.dujsebayaeva@zool.kz).

*the Development Impact*. Thesis Diss. Cand. Sci. (Biol.). Moscow, 1994. 20 p. (in Russian).

Bondarenko D. A. Characteristics of the reptiles' populations cosmodrome "Baikonur" (Kazakhstan) and adjoining deserts area. *Bulletin of Moscow Society of Naturalists, Biological Series*, 2007, vol. 112, no. 2, pp. 67–71 (in Russian).

Bondarebko D. A. Community of reptiles in the sandy habitats of the Ferghana valley (Uzbekistan) and the endemic species conservation problem. *Current Studies in Herpetology*, 2020, vol. 20, iss. 1–2, pp. 3–15 (in Russian). <https://doi.org/10.18500/1814-6090-2020-20-1-2-3-15>

Bondarenko D. A., Antonova G. S. Landscape distribution of reptiles on the Ustyurt plateau. *The Problems of Herpetology: Abstracts of Fourth Herpetological Conference*. Leningrad, Nauka, 1977, pp. 41–42 (in Russian).

Bondarenko D. A., Duysebayeva T. N. Central Asian tortoise, *Agrionemys horsfieldii* (Gray, 1844), in Kazakhstan (distribution, habitat division, population density). *Current Studies in Herpetology*, 2012, vol. 12, iss. 1–2, pp. 3–26 (in Russian).

Bondarenko D. A., Peregontsev E. A. Reptile communities of the Karakalpakian Ustyurt (Uzbekistan). *Current Studies in Herpetology*, 2018, vol. 18, iss. 1–2, pp. 13–26 (in Russian). <https://doi.org/10.18500/1814-6090-2018-18-1-2-13-26>

Bondarenko D. A., Chelintsev N. G. A Comparative estimation of different methods of the line transect census of desert reptiles. *Bulletin of Moscow Society of Naturalists, Biological Series*, 1996, vol. 101, no. 3, pp. 26–35 (in Russian).

Brushko Z. K. *Lizards of Kazakhstan Deserts*. Almaty, Konzhyk, 1995. 232 p. (in Russian).

Vashetko E. V. Ecology of Rapid racerunner (*Eremias velox velox*) in Ferghana valley. *Zoologicheskii zhurnal*, 1972, vol. 51, iss. 1, pp. 153–155 (in Russian).

Vilesov E. N., Naumenko A. A., Veselova L. K., Aubekerov B. Zh. *Physical Geography of Kazakhstan: Textbook*. Almaty, Kazakh University Publ., 2009. 362 p. (in Russian).

Vtorov P. P., Pereshkolnik S. M. Counts of reptiles in several points of Central Asia. *Zoologicheskii zhurnal*, 1970, vol. 49, iss. 3, pp. 467–470 (in Russian).

Vyatkin M. K. On Geomorphology and some moments of the recent geological history of Southern Pribalkhash. *Proceedings of the Academy of Sciences of the KazSSR*, 1948, no. 8 (41), pp. 3–16 (in Russian).

Golubev M. L. *Phrynocephalus guttatus* (Gmel.) or *Ph. versicolor* Str. (Reptilia, Agamidae): Which species of Toadhead agama occurs in Kazakhstan? *Vestnik zoologii*, 1989, no. 5, pp. 38–46 (in Russian).

Dzhurkashev T. N. *Anthropogenic History of Balkhash-Alakol Depression*. Almaty, Nauka, 1972. 126 p. (in Russian).

Dunaev E. A. Systematics and paleogeography: A conceptual synthesis using the example of *Phrynocephalus* (superspecies *guttatus*) (Reptilia: Agamidae). *Pro-*

*ceedings of the Zoological Museum of Moscow State University*, 2009, vol. 50, pp. 275–298 (in Russian).

Duysebaeva T. N. Brief characteristics of natural conditions of the Shu-Ilei mountains. In: *Hantau Transit Corridor in the Paleometallic Era. History and Archaeology of Semirechye Series*. Almaty, Margulan Institute of Archaeology of the Committee of Science of the Ministry of Science and Higher Education of the Republic of Kazakhstan Publ., 2020, iss. 7, pp. 7–20 (in Russian).

Zima Yu. A., Fedorenko V. A. Distribution of snakes of the *Vipera* Family Viperidae in Kazakhstan and modeling of their potential ranges. *Principles of Ecology*, 2022, vol. 12, no. 1, pp. 3–2 (in Russian). <https://doi.org/10.15393/j1.art.2022.12424>

Kireev V. A. Amphibians and reptiles of Zhiltau ridge. *The Problems of Herpetology: Abstracts of Fifth Herpetological Conference*. Leningrad, Nauka, 1981, pp. 64–65 (in Russian).

Kubykin R. A. An Ecological and faunistic survey of reptiles of the islands of Lake Alakol (East Kazakhstan). *Izvestiya AN KazSSR. Biological Series*, 1975, no. 3, pp. 10–16 (in Russian).

Kubykin R. A. The abundance of the Central Asian tortoise in Southeast Kazakhstan and some problems of its harvesting. In: *The Animal World of Kazakhstan and the Problems of Its Conservation*. Alma-Ata, Nauka, 1982, pp. 101–102 (in Russian).

Kubykin R. A. The population density of the Central Asian tortoise in some areas of the Alma-Ata and Taldi-Kurgan Regions. *Russian Journal of Ecology*, 1988, no. 1, pp. 80–83 (in Russian).

Kubykin R. A., Brushko Z. K. Amphibian and reptile trade in Kazakhstan. *Selevinia*, 1994, vol. 3, no. 2, pp. 78–81 (in Russian).

Kuzyakin A. P. Zoogeography of the USSR. *Proceedings Moscow Regional Pedagogical Institute named after N. K. Krupskaya*, 1962, vol. 109, iss. 1, pp. 3–182 (in Russian).

Kurdyukov K. V. On the geological development of the Balkhash region in the Late Cenozoic. *Bulletin of Moscow Society of Naturalists, Geology Series*, 1958, vol. 33, iss. 3, pp. 23–46 (in Russian).

Lobachev V. S., Chugunov Yu. D., Chukanina I. N. Features of Herpetofauna of the Northern Aral Region. *The Problems of Herpetology: Abstracts of Third Herpetological Conference*. Leningrad, Nauka, 1973, pp. 116–118 (in Russian).

Mishagina J. V. Food Connections of lizards in haloxylon groves of the Repetek Reserve. *Problems of Desert Development*, 1992, no. 6, pp. 46–62 (in Russian).

Paraskiv K. P. *Presmykayushchiesya Kazakhstana* [The Reptiles of Kazakhstan]. Alma-Ata, Academy of Science of the Kazakh SSR Publ., 1956. 228 p. (in Russian).

Pesenko U. A. *Printsipy i metody kolichestvenno-go analiza v faunisticheskikh issledovaniyakh* [Principles and Methods of Quantitative Analysis in Faunal Studies]. Moscow, Nauka, 1982. 287 p. (in Russian).

Chikin Yu. A., Dujsebayaeva T. N., Joger U., Kadyrbekov P. Reptilian colonization of Aral sea drying bottom. In: *Fauna of Kazakhstan and Surrounding Countries at the Centuries Boundary: Proceedings of the International Scientific Conference*. Almaty, Infopress, 2004, pp. 232–235 (in Russian).

Shcherbak N. N. *Yashchurki Palearktiki* [Race-runners of the Palearctic]. Kiev, Naukova dumka, 1974. 296 p. (in Russian).

Yakovleva I. D. *The Reptiles of Kirghizia*. Frunze, Ilym, 1964. 272 p. (in Russian).

Chirikova M. A., Zima Yu. A., Pestov M. V., Terentjev V. A. About the problem of mass death of reptiles in barrage trenches in South Kazakhstan. *Selevinia*, 2019, vol. 27, pp. 111–114.

Chirikova M. A., Zima Yu. A., Pestov M. V., Terentjev V. A. Biodiversity of the herpetofauna of the Muyunkum desert, Kazakhstan. *Herpetological Review*, 2020, vol. 51, no. 3, pp. 438–446.

Pestov M. V., Chirikova M. A., Terentyev V. A. The problem of mass mortality of reptiles in trenches illegally used to fence agricultural land in South Kazakhstan: Three Years Later. *Selevinia*, 2022, vol. 30, pp. 190–194.

Sørensen T. A. A method of establishing groups of equal amplitude in plant sociology based on similarity of a species content and its application to analysis of the vegetation on danish commons. *Kongelige Danske Videnskabernes Selskab. Biologiske Skrifter*, 1948, vol. 5, no. 4, pp. 1–34.

Uetz P., Freed P., Aguilar R., Reyes F., Kudera J., Hošek J., eds. *The Reptile Database*. 2023. Available at: <http://www.reptile-database.org> (accessed February 13, 2024).

Wu N., Wang S., Dujsebayaeva T. N., Chen D., Ali A., Guo X. Geography and past climate changes have shaped the evolution of a widespread lizard in arid Central Asia. *Molecular Phylogenetics and Evolution*, 2023, vol. 184, article no. 107781. <https://doi.org/10.1016/j.ympev.2023.107781>