

## **Development of measures for the conservation of the Desert Monitor in Kazakhstan and Uzbekistan**



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The project was implemented with support from the Rufford Foundation



2016

The desert monitor, *Varanus griseus*, is widely dispersed through North Africa, India, South-West Asia, and Pakistan, as well as throughout Central Asia.

The desert monitor is included into the Red Book of Kazakhstan (2010) as a threatened species (II category); into the Red Book of Uzbekistan (2009) as a vulnerable, decreasing, and mosaically distributed Central Asian subspecies (Status 2); into the Red Book of Kyrgyzstan (2006) as a decreasing subspecies distributed on its range frontier and represented by separated populations; into the Red Book of Turkmenistan (1999) and into Appendix I of the UN Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) as a decreasing species (II category). Now, this species still does not have its status assessment in accordance with the IUCN criteria.

Since desert monitors belong to endangered species of reptiles, it is extremely important to monitor the status of its populations. In Kazakhstan distribution and population studies of monitor lizards were conducted in the 1980s (Brushko, 1995). But the ecology of the species remains poorly studied in general (Bennett, 1995) and on the territory of Kazakhstan in particular (Red Book, 2010). In 2012, we carried out reconnaissance studies in some areas (Chirikova et al., 2012) which revealed a considerable reduction of the relative density of the population of desert monitor lizards compared to the 1980s. Also preliminary studies in Uzbekistan showed a significant decrease in the number of desert monitors (Nuridzhanov, 2008). A significant part of the Kyzylkum desert was not covered during the research. There is a necessity to carry out full-scale assessment of the population in Kyzylkum. It is important to study other population properties of these species in Kazakhstan and Uzbekistan in order to determine the up-to-date pattern of the population state.

In this regard, the aim of this project is: to continue exploring of the desert monitor lizard in Kazakhstan and Uzbekistan.

In the frame of this aim, we have the following objectives: expedition trip to study the distribution of desert monitor population density in different parts of the Kyzylkum desert; examination of previously studied lizard populations and new; active promotion of information about lizards with the participation of the media, through zoos and schools to reduce the negative attitude to this kind; definition desert monitor on the IUCN criteria status. According to the study, provide guidance to authorized organizations of Kazakhstan and Uzbekistan.

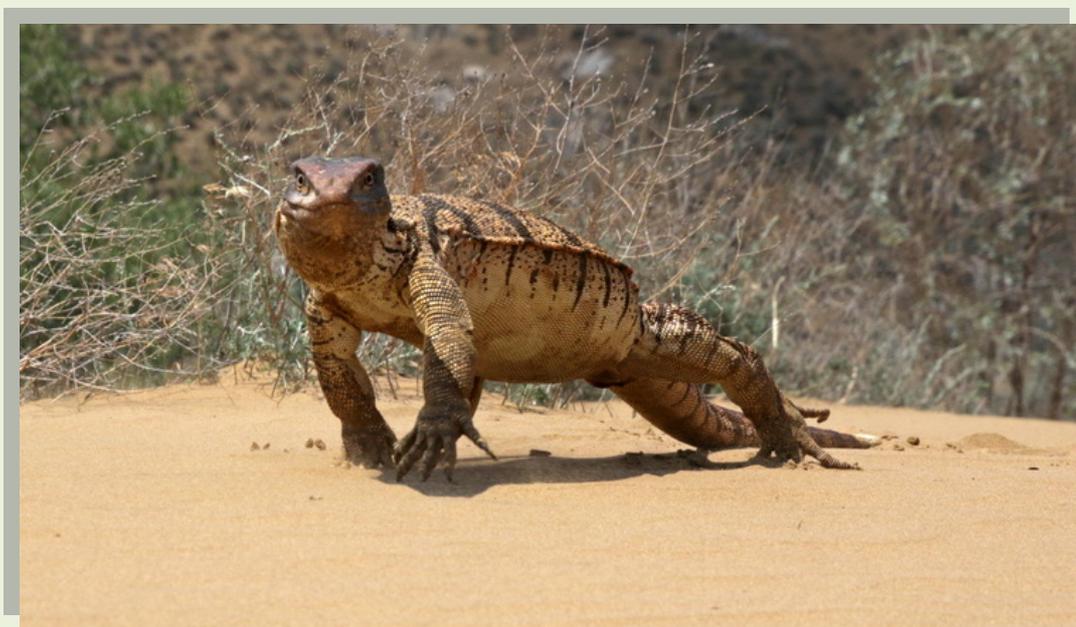


Figure 1. Desert monitor. Uzbekistan, May of 2016. (photo of M. Pestov)

## Area and Methods of Research

Trips along the Kyzylkum Desert in the territory of South Kazakhstan and Uzbekistan were undertaken to identify the desert monitor's distribution in April – July, and August – September 2016. In Kazakhstan, the North Kyzylkum route was around 600 km away, in the vicinity of Beltau mountain and Darbaza station - 140 km, in the eastern part of the Kyzylkum in May-July - more than 1000 km. In Uzbekistan, we studied the northern and central areas of the Kyzylkum. The total length of auto routes was 1500 km.

Accounting methods during pedestrian and auto routes and routing accounting of fresh traces were used to gather data on the occurrence frequency. The accounting area width was 20 m for auto trips (about 10 m per a recording person on each side of the automobile). The belt width in the pedestrian route ranged from 10 to 20 m depending on the plant density and rugged terrain. There were recorded coordinates, date and time of meeting with animals, their traces left when lizards made their shelters and performed their livelihood activities (such as holes, beds, feces, shedding of skin, and remnants of dead animals).

The map with the points of the desert monitor findings in the ArcMap environment was created to analyze its distribution. Data found in literature served as the basis for the map and this data was supplemented by information which we obtained during research expeditions in 2008, 2009, 2012, 2015, 2016, as well as by data collected during surveys conducted among the local population, employees of forest administrations of the South Kazakhstan Region, KazTransGaz JSC, and environmental protection inspectors. We determined the sex of captured lizards and measured the length of their bodies (SVL) and tails (TL). All captured monitors were photographed.



A

Б

Figure 2. A. Field camp. North Kyzylkum, Kazakhstan. May 2016. (photos of F. Sarayev)  
B. Expedition team. Southern seashore of Aidarkol, Uzbekistan. August, 2016.

## **The study of the distribution of desert monitor lizard in Kazakhstan and Uzbekistan**

During expedition was conducted a monitoring of Northern Kyzylkum in Kazakhstan from Besaryk to Kosshin villages and their traces of lizard were not found.

Poll workers Border Service (outpost Kyzylorda squad) and antiplague Kyzylorda squad also confirmed the absence of a monitor lizard in the area in the last 10-15 years. To the south of the Chiili village, the traces of desert monitor were not found.

In the central part of the Kyzylkum desert, where the lizard did not find until recently, we were able to contact with frontier employees and receive the data about meetings of the lizard and its traces in the vicinity of the well Dalakuduk frontier (Fig. 3, the red circle). We believe that the desert monitor fairly widespread in the area and the lack of points on the map is only associated with his poor knowledge and inaccessibility. By the literature data, the desert monitor was spread on the north-east territory from Izakuduk sands and Beltau mountain to the right bank of Syrdarya river. Our new finds showed, that lizard distributed on the eastern, until Saryagash town and Darbaza station (Zima, 2016). Last 2 habitats located some far approximately on 100 km to the east from another known points (fig. 3, yellow circle). Probably, that lizard on the north-east inhabits all territory of Shardarya Steppe, some eastern of Syrdarya River. Around 50 years ago desert monitor lizard was observed on the geographic area close with Tashkent (Bogdanov, 1960). Due to the intensive development of the human lizard disappeared from this region (Bannikov et al., 1977, The Red Book of Uzbekistan, 2006).

To determine the type of the northern border had to trace its spread to neighboring Uzbekistan. During expeditions lizard was registered in the Central Kyzylkum (Yamankum Sands, in the vicinity of the Aktakyr village); on the road Zarafshan-Uchkuduk (14 km southeast of Uchkuduk); Depression Mynbulak (hill Jara and Salt Lake); Uchkuduk on the road - the village. Kulkuduk (in the vicinity of a dry riverbed Aksai) to Bukantau Mountains (Nuridzhanov et al., 2016). The sand lizard north Bukantau not met, in the former village Akboget (1 house and 1 fold) the locals told us that live in this place for several years, and the monitor lizard here have never seen closest seen in the mountains Bukantau. The reason for the absence is secreted not completely clear. Desert sands are presented semi-fixed high (the height of the sand ridges up to 20 meters), which grow saxaul (*Haloxylon*), sand acacia (*Ammodendron*) and *Calligonum* (*Calligonum*). Initially, the western boundary of the range goes up Akchadarinskogo collector. Thus, according to survey data lizard found on the highway Uchkuduk vill. to the Chukurkak collector. Further to the northwest to the south-eastern part of the Beltau hill lizard does not occur. Based on questionnaires to local shepherds, monitor is not in the vicinity of an artesian well 10 km southwest of the Doly hill; Turumbet artesian well; artesian well Kishi-Volkol (3 km northwest of the hill Bozgul); artesian well in the vicinity of the tract Zhetymyngir (11.5 km southwest of the hill Koktepa). However, V.A. Popov (1981) observed it in 1977 in the desert north of the Beltau hill and on the coast of the Aral Sea (Cape Akkala, 1 km southwest from the Mount Aybys).

We assume the northern boundary of the range of desert monitor extends from the east coast of the Caspian Sea in Turkmenistan, the southern escarpment of Ustyurt (Bannikov et al., 1977, Sindaco, R., Jeremčenko, 2008), to the south-eastern coastal zone in the region of the collector Akchadarinskij (Nuridzhanov and et al., 2016). It then passes through the remnant Bukantau mountains, limited sand ridges does not exceed 10-15 meters further to the east through the neighborhood Gaplar well, passes the territory of Kazakhstan in the area around the well Dalakuduk. Hence the boundary of the range goes north to the Syrdarya river and further east across the Beltau mountains and Saryagash town (Zima, 2016). Such regions as the western Moyinkum, and Saryagash District are prospective to specify the frontier line of the desert monitor distribution in Kazakhstan and the South Aral Basin and the Northern Kyzylkums in Uzbekistan.

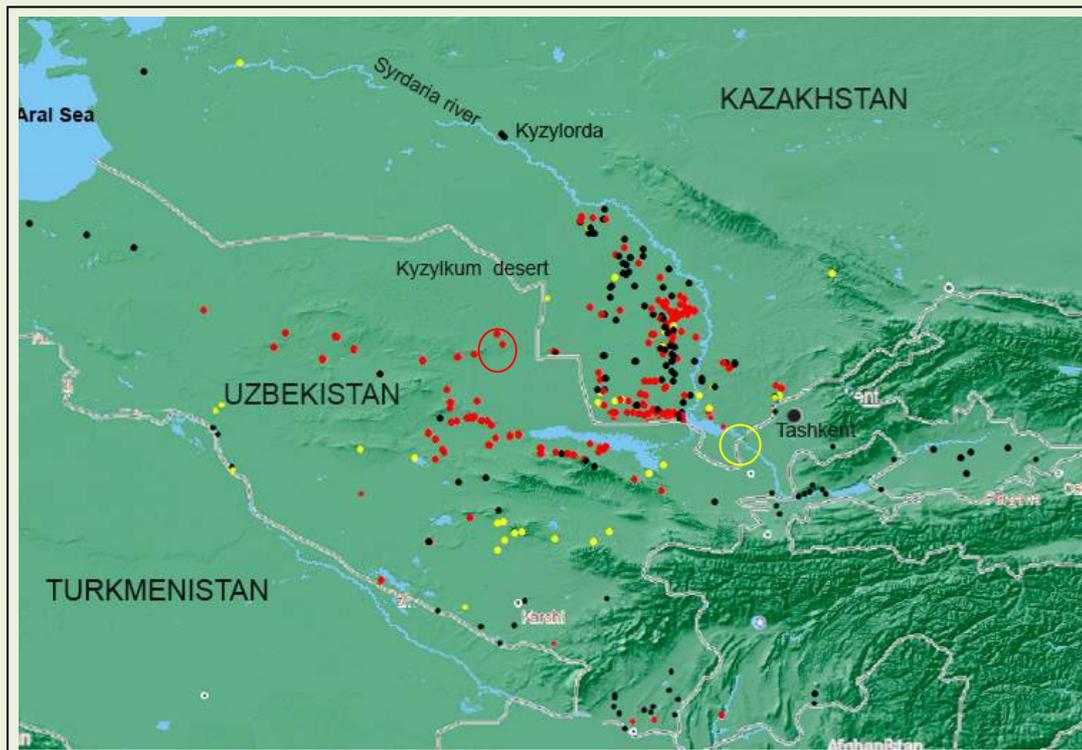


Figure 3. Occurrences desert monitor: black - published data, yellow - questionnaires information, red - Unpublished new data. The rest of the explanation in the text.

### Population density

The results of multiple surveys in Kazakhstan, in the vicinity of Karaktau Mountains (Eastern Kyzylkum) in 2016 are presented in Table 1.

Table 1. The results of surveys of desert monitor lizard near the Karaktau Mountains (Kazakhstan)

Lot№	Lot size	Meeting of individuals	Ind./ km <sup>2</sup>
1	3.0x1.7 км = 5,1 км2	6	1,17
2	2.0x0.6 км = 1,2 км2	3	2,5
3	1.5x0.6 км = 0,9 км2	4	4,44
4	1.1x1.7 км = 1,87км2	5	2,67
5	1.8x1.0 км = 1,8км2	5	2,77
Average			2,71

It was difficult to compare the results with the estimates made in the 1980s because they were conducted in different areas using different methods. Desert monitor population density in those years was about 0,1-0,36 ind./ha (Brushko, 1995) (when recalculated per km<sup>2</sup> - 10-36 ind./km<sup>2</sup>). In general, however, decrease of this indicator at least by twice today is evident (1,17-4,44 ind./km<sup>2</sup>).

In Uzbekistan, it was slightly higher than the density of the desert monitor population. According to our data on the piedmont plain Kazaktau mountains, representing the ephemeral-wormwood deserts, population density reaches the lizard to 7 ind./km<sup>2</sup>, while in the dunes and sands loosely held Yamankum (Central Kyzylkum, neighborhood Aktakyr village) - 2-4 ind./km<sup>2</sup> (Nuridzhanov et al., 2016). In general, we obtained in 2016 correspond to the information given for the end of the 80s the population density. In the southwestern Kyzylkum 0.4-1 ind./km<sup>2</sup> (Khodzhaev, 1989), on the piedmont plain Nuratau in the sand at the Aydarkul lake found 6 ind./km<sup>2</sup>; in the area of the farm №4 in Kyzylkum – 5 ind./km<sup>2</sup> (Nuridzhanov, 2008); in Kyzylkum Reserve (Kyzylkum desert) - up to 2-14 ind./km<sup>2</sup> (Khodzhaev, 1989). In the Central Kyzylkum population density of *Varanus griseus* was 0.04-0.08 ind./ha (Bondarenko, 1989).

## Movement

To study the movement of desert monitor we used the footsteps of tracking and camera traps (Fig. 4).

For the first time, Kazakhstan has been approved satellite tracking method. Satellite tagging results are shown in Figure 5. Monitor №1 was tagged evening at 20.27. He remained active until 21 hours. Morning activity secreted began at 07.53.



A

B

Figure 4. A. Photographing tracks of desert monitor. B. Installing camera around the hole of desert monitor (photos of Yu. Zima, F. Sarayev)

Total monitor lizard has been completed about 1 km. From the colonies it was not deleted and moved not more than 500 meters from the point of capture (Fig. 5). This lizard twice visited the same places. Of tracking the footsteps showed that it was the great gerbil burrows. In terms of our observation of the movement of secreted almost exclusively been associated with the location of colonies of large gerbils. Here he is, apparently, looking for their own food, find shelter during the hottest time of the day and night period. At day lizard was caught and the sensor removed.

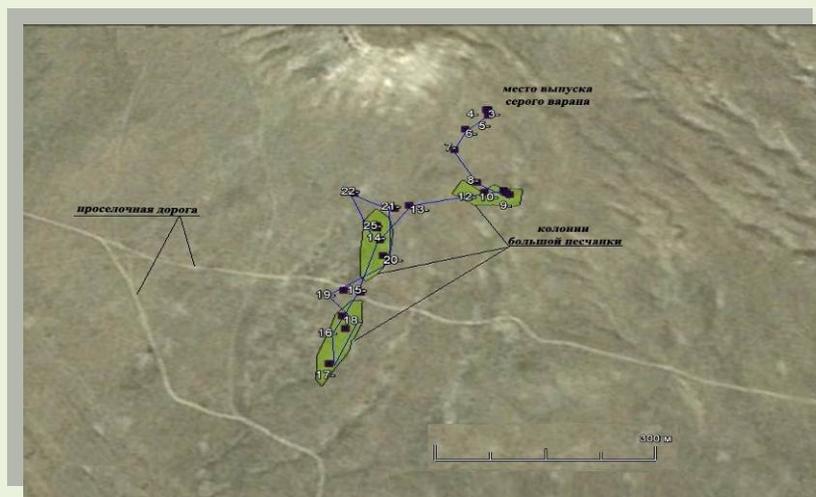


Figure 5. These satellite transmitters mounted on lizards. Frequency of signal 5 min.

Based on satellite transmitter data from desert monitor №2 demonstrated activity at 23:51 for some period of time. However, we believe this to be due to anxiety due to fixed transmitter. Literature

sources state night activity of desert monitor. Based on survey data shepherds occasionally encounter desert monitor at night. However, based on trap camera data and night reptile monitoring data as well as information obtained from the other parts of distribution area desert monitors were not seen at night. Therefore, we believe that all encounters with desert monitor at night time are associated with anxiety of this animal and desert monitor is strictly day type of lizards.

### **Human impact on the desert monitor**

During the research in 2016 data of 30 dead desert monitor on the territory of Eastern Kyzylkum (Kazakhstan) have been received. Of these, 29 were found crushed on the road and one killed by shepherd dog. 26 dead desert monitor were found on the road (at the site about 90 km) near the Tabakbulak village, near uranium deposit. Likely to increase the flow of vehicles in connection with the uranium deposit, led to a sharp increase in the death of desert monitor on the road.

This year, unfortunately, we have learned the facts about the illegal catching of desert monitor in order to use alternative medicine in Kazakhstan. If such data for Uzbekistan were known previously, in Kazakhstan, due to the negative attitude to the desert monitor, the belief that this animal brings disease had not previously been aware of such facts. One hunter catches and sells at least 15 specimens per year. In Uzbekistan, we have found dead desert monitor on the roads. Total noted 5 dead monitors on the road. There have been cases of illegal trapping for use in traditional medicine (Red Book of Uzbekistan, 2009).



Figure 6. The desert monitor that died under vehicle's wheels. Kyzylkum, 2016 (photo of Yu. Zima)

### **GIS modeling of the ecological niche of desert monitor**

The works on ecological niche modeling desert lizard on the basis of WorldClim (monthly temperatures and precipitation), BioClim (set of variables, derived from WorldClim and meteorological stations) (<http://www.worldclim.org/>), Global Potential Evapo-Transpiration (<http://www.cgiar-csi.org/data/global-aridity-and-pet-database>), Digital Elevation Model and its derivatives (exposition, slope, curvature etc.) (with the support of MES RK) (Fig. 7). Input data and model development were performed in ESRI ArcGIS 10.1 environment.

Modeling of the ecological niche of desert monitor GIS tools possible to establish the factors that influence the distribution of the species in the study area, to determine its potential habitats clarify promising for the study of the form area, and territory, promising for a possible reintroduction of species while reducing its size.

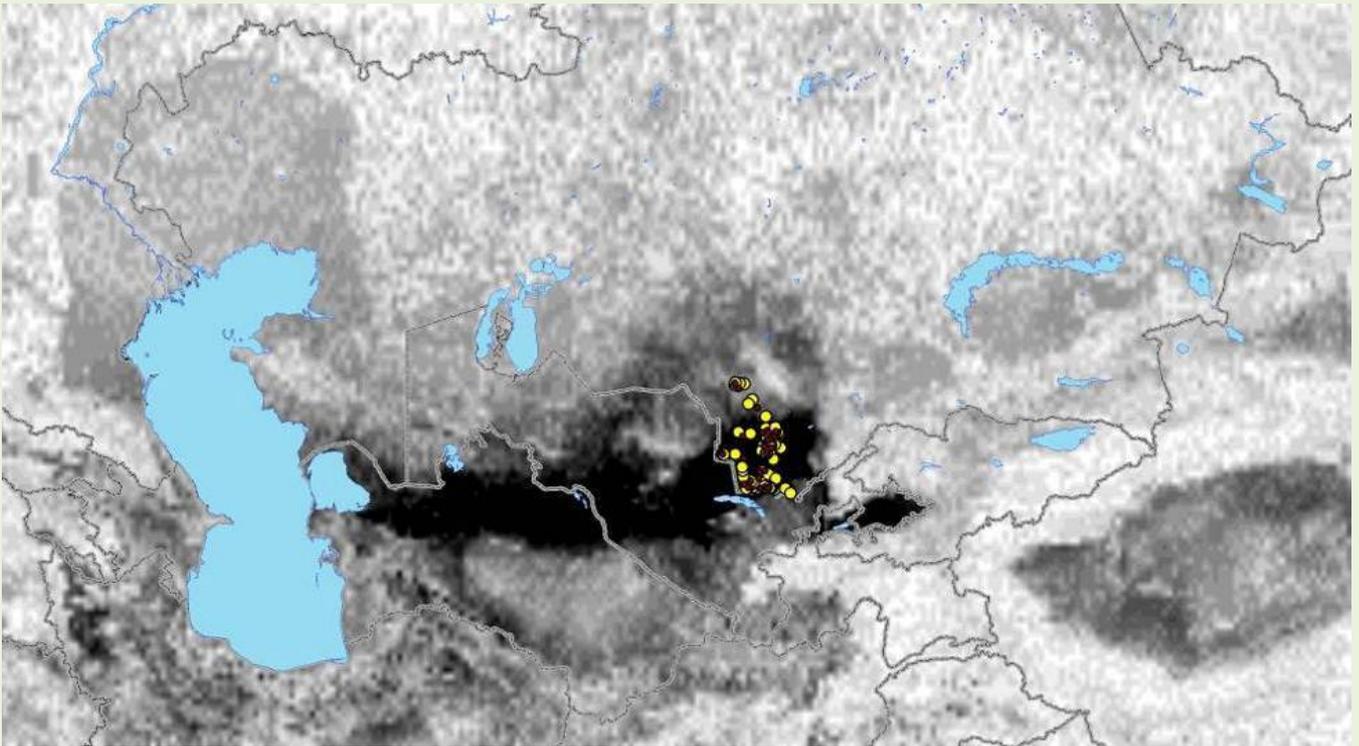


Figure 7. Preliminary GIS model most appropriate territories for the desert monitor. Gradation of color shows favorable combination of climatic factors. The richer the color, the more favorable conditions

In Northern Kyzylkum desert, where there were reports of findings desert monitor on a preliminary model of the ecological niche, habitat conditions are poorly suited, especially in the western part of the desert of the array. Indeed, at the beginning of May 2016 when examining the northern part of the Kyzylkum us neither lizards nor their traces were found. To the east, habitats are more suitable. Interestingly, more suitable habitats in the model and stood out on the territory of the north and south of the mountains of Karatau, including Moiyunkum sands. Although from the western part Moiyunkum known to one report on the observation of the desert monitor inspector on "Ohotzoprom", the fact remains uncertain and needs to be confirmed.

The most significant features that influence the spread of desert monitor, were those that match the percentage was more than 80%. They were part of the 48 indicators, including indicators of substrate curvature, monthly rainfall, temperature, solar radiation, relative humidity and their derivatives. Currently, data is being processed and the identification of the most important climatic factors affecting the spread of the desert monitor lizard on the northern periphery of the area.

### **Development of measures of conservation of desert monitor in Kazakhstan and Uzbekistan**

#### 1. Creation of protected areas

The main method in modern reptiles conservation strategy is the development of an effective network of protected areas (Ananieva et al., 2015). In Uzbekistan desert monitor protected in Kyzylkum State Reserve, State Reserve Nurata, Surkhan State Reserve and the Republican Scientific and Production Center for breeding rare species of animals Ecocenter "Jeyran" (Lim et al, 2007;. Nuridzhanov, 2009).

A significant part of the geographic range of *V. griseus* in Kazakhstan lies within the limits of specially protected natural areas of Southern Kazakhstan, Arys and Karaktau. However, in accordance with the status of these areas, for the most part of their territory there are practically no restrictions on

economic activities (except hunting). The land is used to grazing sheep; there is a network of roads, lots of transport and, according to our observations, the death rate of the monitor due to human factors is still high. In this regard, it is necessary either to expand the zones within the South Kazakhstan, Arys and Karatau Protected Areas where any human activity is prohibited, or to create new protected areas with limited human activities.

Currently, we are investigating the most suitable habitats of desert monitor in Kazakhstan. Creation of new specially protected natural areas in Kyzylkum Desert or expansion of specially protected natural area in the South Kazakhstan will enable protection of both monitor and desert ecosystem on the whole.

In 2013, our recommendations for the creation of protected areas included in the plan on protected areas by 2020. This year we have once again confirmed the need for the creation of protected areas and submitted recommendations to the UNDP Kazakhstan. Further recommendations for the expansion of South-Kazakhstan protected area protected area we will provide leadership to this protected area.

## 2. Promotion

We consider it is important to change the locals' negative attitudes towards desert monitors in order to preserve this species. This can be achieved only through regular awareness-raising activities with locals, distribution of special printed materials among them, and publication of information about these unique animals in the media. According to the experience in other countries, this method has produced positive results for representatives of the *Varanus* family (Arijit, Silanjan, 2015). For this, we worked to popularize knowledge about the desert monitor, to promote the loyal attitude, the development of interest in these traditionally unloved mind reptiles in Kazakhstan and Uzbekistan.

In March, April, June, September and October, held 7 lectures, seminars on the problems of desert monitor and save it to the local population, pupils and students in the city of Shymkent, Almaty and the Panfilov (Kazakhstan) (Fig. 8).

Also held 3 drawing competition in conjunction with the Shymkent, Almaty Zoo, Museum of Nature in Almaty, Limited Partnership «Wild Nature Kazakhstan». The competition was attended by about 200 people.

Children from the schools were able to get acquainted with the unique view of the reptiles, were awarded prizes and certificates, teachers have an additional handout for further studies.

Results obtained propaganda among the local population - residents of several localities themselves talked about observations of the desert monitor lizard, and that was not killed in 2016 not a single lizard.

Due to the fact that the organization of lectures in Uzbekistan must obtain a special permit to organize thematic lectures and gathering of people in a certain place, implement contests and lectures we could not due to lack of support from government agencies.

Developed and published a brochure (Fig. 9), which includes information about the desert monitor, original photos, their role in nature and the modern problems of its preservation in the Kazakh, Russian and Uzbek languages.



Figure 8. Lectures about desert monitor

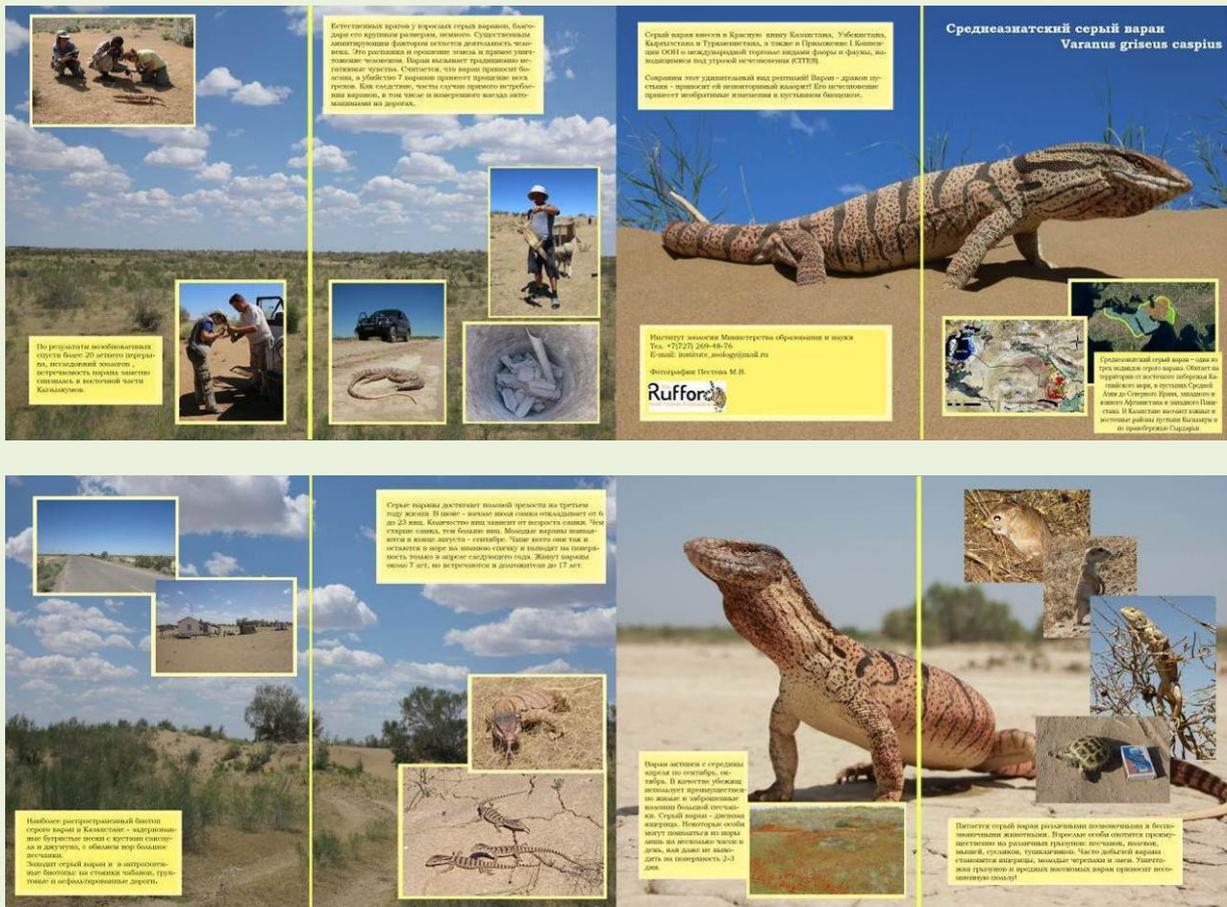


Figure 9. Brochure about desert monitor

Were held negotiations with environmental organization “Ohotzoprom” support for education and the possibility of installations billboard on the highway in the vicinity of uranium mining (Fig. 10).



Figure 10. Proposed billboard and road sign

In addition, we recommend to sections of roads in Uzbekistan, where most often die of desert monitor to install warning road sign (Fig. 6). The most dangerous areas in our opinion are the road Farish-Nurata-Baymurat; Zafarabad-Zarafshan-Uchkuduk; Koshkuduk-Baymurat vill. (Nuridzhanov, 2008); Ayakkuduk vill. - Yangikazgan-Zarafshan vill. (Nuridzhanov et al., 2016).

Published scientific and popular articles about the project and desert monitor in Kazakhstan (the magazine "Wind of Wanderings") and Uzbekistan (O'zbekiston havoy'llar).

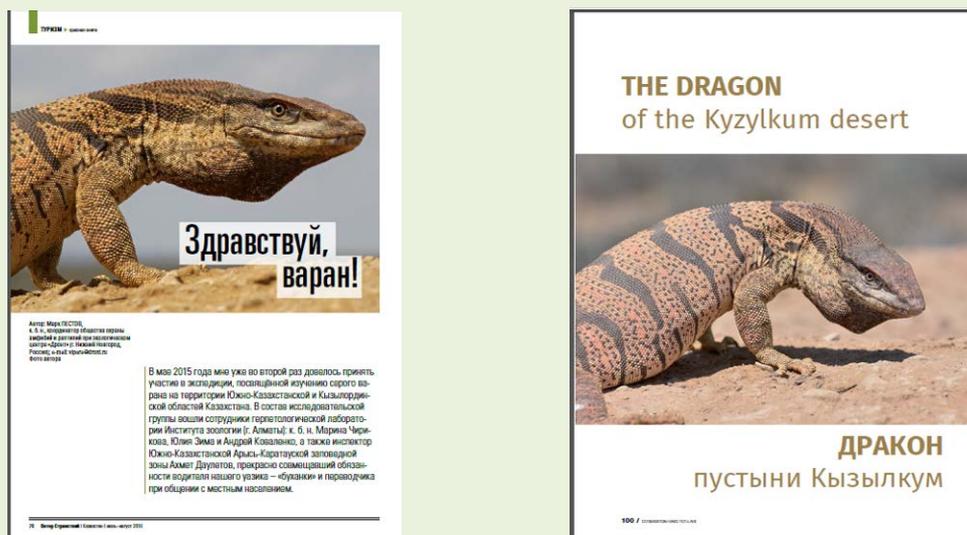


Figure 11. Popular scientific articles about the monitor lizard



Figure 12. Report on the scientific and practical conference (Uzbekistan)

September 9, 2016 at the Republican scientific-practical conference held at the Institute of the gene pool of flora and fauna of Uzbekistan (Tashkent, Uzbekistan), we presented the results of field research on the desert monitor lizard in Uzbekistan and Kazakhstan (Nuridzhanov Denis), and were also presented recommendations for the conservation of the species, as well as necessary measures to reduce the threats that affect the reduction of the species. The conference was attended by representatives of the State Biological Control of the State Committee of the Republic of Uzbekistan for

Nature Protection (Fig. 12).

October 14, 2016 on the basis of the Kazakh National University named after Al-Farabi (Almaty, Kazakhstan) held a round table with participation of representatives of environmental organizations, LLPs, the zoos, zoologists scientists. Among the participants were representatives of the LLP "Ohotzooprom" (Committee of forestry and wildlife), Almaty Zoo, LLP «Wildlife Kazakhstan», Kyzylorda anti-plague station, the Kazakh National University, Ile-Alatau SSPE, Institute of Zoology, Kazakhstan and other organizations (Fig. 13). At the round table, we reported the results of its work on the study are secreted in Kazakhstan and Uzbekistan (Chirikova Marina). Colleagues from the Shymkent zoo could not come, so the first results of semi-detention desert monitor in a zoo of Shymkent said participant of our project Julia Winter. Employees of LLP «Wildlife Kazakhstan» reported on its work to promote knowledge of the desert monitor and drawing contest (Svetlana Baskakova). Head of Almaty Zoo Exotarium Alexander Gurnev shared the results of breeding rare species of reptiles in a zoo, and the problems associated with this area.



Figure 13. Roundtable participants and their performances

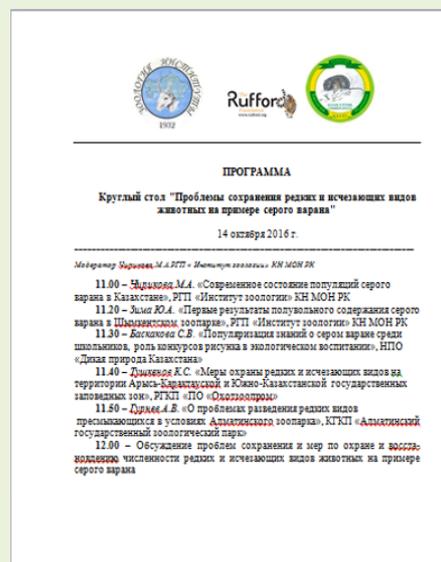


Figure 14. Round table program

Scientific Software "Ohotzooprom" employee Tyshkanov Kaisar presented information about the work of the inspectors in the Arys-Karaktau conservation area, told about measures of protection.

Speakers noted that the promotion and organization of protected areas is the most effective methods for preservation of vulnerable species like desert monitor. Representative anti-plague station Kyzylorda expressed interest in further cooperation.

### 3. Maintenance and breeding in captivity

Special attention also deserves the development of methods lizard breeding in captivity in zoos and breeding. To date, information on breeding desert monitor lizard in captivity there, although it contains many zoos and private collections terrarium.

In Kazakhstan, we carried out a joint operation with the Shymkent zoo for the content of semi-desert monitor. In 2016 the Shymkent zoo on our recommendation (device enclosure, feeding, forming a group of animals, the handling of monitor lizards) built enclosure (Fig. 15) and released there at their collection of 5 desert monitor.



Figure 15. Aviary for semi-free maintenance and further breeding desert monitor

Zoo staffs were daily observation. In addition, we have installed two camera traps, and later (in August), the zoo management has set the camcorder to continuously monitor the behavior and activities of daily desert monitor. Interesting results on a daily and seasonal activity. In particular, it noted the most recent autumn leaves on the surface of the desert monitor - 01 and 12 October.

Uzbekistan considers it appropriate to create a specialized nursery in their natural habitat of desert monitor, for example on the basis of Eco-Center "Jeyran" (Central Kyzylkum), which keep them semi-in enclosures with an appropriate animal control their fertilizing, if necessary, the number of the regulation, a deep study of the characteristics of reproduction.

#### 4. Contacting the IUCN with a view to formalizing the desert monitor in accordance with IUCN criteria

4-8 April 2016, two members of the group (Chirikova M.A., Nuridzhanov D.A.) participated in the workshop of IUCN on reptiles of Central Asia in Sankt-Petersburg (Russia). Besides Kazakhstan participants in the seminar was attended by specialists herpetologists from Turkmenistan, Tajikistan, Uzbekistan, Russia, Mongolia, as well as experts from the UK and the US. The main objective of this seminar was to combine regional and international scientific experts to assess the state of conservation and the threat of extinction for all species of lizards and snakes present in Central Asia, through the application of criteria of the IUCN Red List. Heard a presentation from the IUCN US (Department of Biodiversity Assessment Center Betty and Gordon Moore ecosystem science and economics, Virginia) and London (Zoological Society of London). In the course of discussion and debate materials were introduced updates to the specific outline of the desert monitor, introduced new information on its distribution. However, because of its vast area, although data on virtually universal reduction in the number of Central Asian desert monitor lizard, this species is likely to be given the status of Least Concern.



Figure 16. The participants of the IUCN workshop

On the results of the project was published three scientific papers:

1. Yu. Zima. New data on the distribution of the desert monitor lizard (*Varanus griseus*) in the north-eastern border area in Kazakhstan // Materials of the republican scientific-practical conference "Modern problems of preservation of rare, endangered and lesser-known animals of Uzbekistan" - 2016. - S.97-98.
2. D. Nuridzhanov, M. Chirikova, M. Pestov, Yu. Zima. New information on the state of the population of Central Asian desert monitor *Varanus griseus caspius* (Eichwald, 1831) in Uzbekistan // Materials of the Republican scientific-practical conference "Modern problems of preservation of rare, endangered and little-known animals of Uzbekistan". - 2016. - P. 154-158.
3. Yu. Zima, M. Chirikova, D. Nuridzhanov, M. Pestov Recommended measures to save the desert monitor in Kazakhstan and Uzbekistan // Proceedings of the International Conference "Problems of conservation of biodiversity of Kazakhstan and adjacent territories in nature and collections." - 2016. - P. 154-158.

## Acknowledgements

We thank Rufford Foundation for supporting of our researches.

Also, we would like to thank the Ministry of Education and Science of RK. For assistance in forwarding research thank A. Grachev, A. Sarayev, M. Gricina, V. Fedorenko, T. Abduraupov. We thank the employees of the Shymkent zoo - director – N. Bukharbayeva, Deputy Director – L. Aliyev, head of the terrarium - R. Dolgova enclosure for the organization and support the study of semi-detention desert monitor lizard. Thank NGO Conservation of Biodiversity Association and LLP «Wildlife of Kazakhstan" for their help in promoting the knowledge of the desert monitor, tenders drawings. Thank Kazakh National University for their help in organizing the Round Table, in particular K. Musabekov. We express our sincere appreciation for the consultations on the study of the desert monitor naturally A. Tsellarius, A. Khojayev. We thank IUCN for the opportunity to submit data on the desert monitor at the workshop and N. Ananyeva for support and advice. Also, we would like to thank Malakhov D.V. for building an GIS model of ecological niche.

