2012

Herpetological Diversity of Mongolia and Its Conservation Issues

Khorloo Munkhbayar
Mongolian State University of Education, khmunkhbayar@yahoo.com

M, Munkhbaatar
Mongolian State University of Education

Erforsch. biol. Ress. Mongolei (Halle/Saale) 2012 (**12**): 203–212

Herpetological diversity of Mongolia and its conservation issues

Kh. Munkhbayar & M. Munkhbaatar

Abstract

From the viewpoint of evolution, the classes of amphibians and reptiles could be considered as relicts, and because they are poikilothermic animals, it's very difficult for these species to live under the dry and cold climatic conditions in Mongolia. Even species diversity is poor, Mongolian herpetological composition is unique, highly adopted to the country's harsh climate and originated a long time ago.

In Mongolia, 6 species of amphibians belong to four genera, four families and two orders and the recorded 21 species of reptiles belong to 13 genera in 6 families of 2 suborders.

Key words: amphibians, reptiles, herpetological diversity, Red Book, Gobi, Mongolia

Introduction

Central Asian herpetological studies started since the middle of 19th century, and books on the herpetological fauna of Mongolia have been published by A.A. STRAUCH (1876), Y.V. BEDRYAGA (1912) and A.M. NIKOLSKY (1916–1918). Mongolian herpetological studies and taxonomical data were reported in these publications. However, A.G. BANNIKOV (1958) has published the status of Mongolian recent herpetological studies in the middle of the 19th century.

Mongolian herpetological fauna and their species distributions are studied well and their ecological and conservation issue are growing. Recent Mongolian herpetological fauna divided into two classes, three orders, 10 families, 18 genera consisted of 6 species of amphibians and 21 species of reptiles. It seems that our herpetological fauna is poor compared to that of the wide country, however, it must be seen that it is adapted to the extreme climate.

According to A.M. NIKOLSKY (1916), mountainous Asian desert has the most ancient origin which started from Eocene epoch. Aral-Caspian desert has the latest origin beginning after the ice-age. Therefore, reptiles which were originated in the mountainous Asian desert started moving to Aral-Caspian desert which was just originating from East Turkistan. In this way, NIKOLSKY (1916) estimated that Middle Asian desert reptiles originated from Central Asian species, and this assumption can be possible. Also we can derive from his conclusion that all the Mongolian terrestrial vertebrates didn't come from the surrounding areas.

There are two main characteristics in herpetological species composition of Mongolia. First, marginal population of widely distributed Palaearctic species entered. Second, core zone of species originated in Central Asia is Mongolia. Based on these two characteristics, objective and future trends of herpetological studies might determine. Recently climate changes and human impacts on the environment influence the marginal species in Mongolia negatively.

The Biological Department of the Mongolian State University of Education studied the Mongolian herpetological fauna since 1963. Numerous people contributed such as Mongolian-Germany Biological Expeditions, which started in 1962, Mongolian-Russian Biological Expedition, which started in 1970 to this aspect of the biodiversity of Mongolia. Kh. Munkhbayar has joined on the expedition led by German herpetologist F.Y. OBST, while he was undergraduate student at the National University of Mongolia. Also G. PETERS (1971, 1981) has published several valuable articles on herpetology of the western part of the country as results of this expeditions.

Fig. 1: Dr. F.J. Obst, researcher of Zoological museum of Dresden and Prof Dr. A. Dashdorj in 1961. F.J. Obst was the first teacher in herpetology of Kh. Munkhbayar.

Also Kh. MUNKHBAYAR joined on Mongolian-Russian Biological Expedition since 1970, and led the private expeditions since 1983. He investigated areas in the Khangai, the Gobi, Bulgan, Shaamar and Ekhijn-gol. Results of these expeditions were published in various articles and two books, entitled “Amphibians and reptiles of MPR: Amphibians” (BORKIN et al. 1988) and “Reptiles of Mongolia” (ANANJEVA et al.1996) were published.

BORKIN et al. (1986) reported on polyploidy of Central Asian green toad from Dzungarian Gobi. It is described for an individual of the species *Bufo danatensis*, due to detection of polyploidy from recent study. Thus this is an important discovery which exposed 4n = 44 chromosomes from Mongolian amphibians. This is published in the journal of Academy of Science of USSR. Later researchers recorded polyploidy in the green toad (back to the first name it is *Bufo pewzowi*). In our opinion, the most appropriate aspect is that Pewzow’s toad should include in the Central Asian fauna, and that means the Mongolian fauna.

New subspecies of reptiles were found such as *Laudakia stoliczkana altaica* (MUNKHBAYAR 1971). PETERS (1981) also recorded this agama under the above subspecies name. Further the following subspecies were discovered: *Eremias multiocellata bannikowi* Szcerbak, 1973; *Eremias przewalskii tuvensis* Szcerbak, 1970; and *Eremias multiocellata tsaganbogdensis* Munkhbayar et Borkin, 2010. There are new records of Asiatic grass frog – *Rana chensinensis*, Gobi naked-toed gecko – *Cyrtopodion elongatus* and Sand lizard – *Lacerta agilis*. Also two new parasitic worms were found in Mongolian agama, which are *Thelandros mongoliensis* Sharpilo, Biserkov et Munkhbayar, 1986, and *Th. gobiensis* Sharpilo, Biserkov et Munkhbayar, 1986.

Recent status of the Mongolian herpetofauna

In Mongolia, totally 6 amphibian species are recorded (see also fig. 3):

order Caudata

family Hynobiidae: Siberian salamander (*Salamandrella keyserlingii)*

order Anura

family Bufonidae: Mongolian toad (*Bufo raddei)* and Pewzov's toad (*Bufo pewzowi*)

family Hylidae: Japanese tree frog (*Hyla japonica*)

family Ranidae: Siberian wood frog (*Rana amurensis*) and Asiatic grass frog (*Rana chensinensis*).

There are 21 species of reptiles in two suborders (snakes, lizards) of one order (Squamata) distributed in Mongolia. From these 13 genera of 6 families are lizards: Caspian even-fingered gecko (*Alsophylax pipiens*), Przewalski's wonder gecko (*Teratoscincus przewalskii*), Gobi naked-toed gecko (*Cyrtopodion elongates*), Mongolian agama (*Laudakia stoliczkana altaica*), Toad-head agama (*Phrynocephalus versicolor*), Sunwatcher toad-head agama (*Ph. helioscopus*), Mongolian racerunner (*Eremias argus*), Variegated racerunner (*E. vermiculata*), Stepperunner (*E. arguta*), Multi-oscillated racerunner (*E. multiocellata*), Gobi racerunner (*E. przewalskii*), Sand lizard (*Lacerta agilis*), Viviparous lizard (*Zootoca vivipara*), and 8 species are snakes: Tatary sand boa (*Eryx tataricus*), Slender racer (*Coluber spinalis*), Steppes rat snake (*Elaphe dione*), Amur rat snake (*E. schrenckii*), European grass snake (*Natrix natrix*), Steppe ribbon racer (*Psammophis lineolatus*), Halys pit viper (*Gloydius halys*), and Common northern viper (*Vipera berus*).

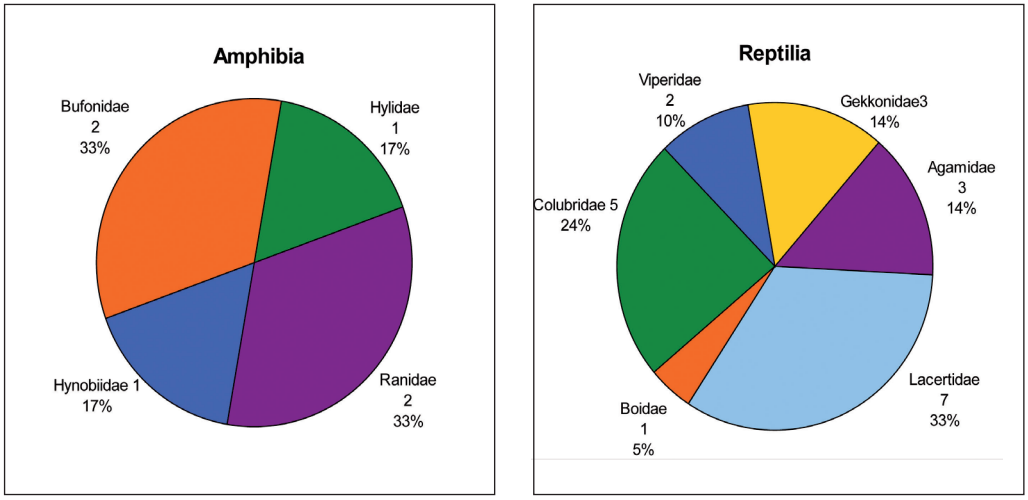

Fig. 2: Species and percentage of Amphibians and Reptiles distributed in Mongolia (MUNKHBAATAR 2009)

We have found some species rare for last 30-50 years in the Mongolian desert and some new species records for Mongolia such as the Caspian even-fingered gecko (*Alsophylax pipiens*), Przewalski's wonder gecko (*Teratoscincus przewalskii*), Gobi naked-toed gecko (*Cyrtopodion elongates*), and Variegated racerunner (*Eremias vermiculata*). These findings are related to the improvement and intensity of research, and also regarding with global warming and expansion of thermophile organisms' distribution and area to the North.

Fig. 3: Siberian salamander (*Salamandrella keyserlingii*) in the Darchad basin (above left), albino and normal Siberian frog* (*Rana amurensis*) (above right), Asiatic grass frog (*Rana chensinensis*) at Khargiltain-gol, Suchbaatar province (below left), and Japanese tree frog (*Hyla japonica*) (below right), which is registered in the Mongolian "Red Book" (1987).

* We found the first albinotic individual of Siberian wood frog in Mongolia at the Shatan stream which is a tributary of the Kharaa river in June 2008, it was the first record of an albino of this species worldwide.

Amphibians are more dominating in the northern regions of Mongolia which has more lakes, streams and ponds, whereas true terrestrial animals as reptiles mainly occurring in the Gobi desert region of the country.

Some species of amphibians and reptiles have been decreased from the original distribution area and also their distribution reduced due to climate change and human activities. Specially, rivers and streams, lakes and pools lowered their levels and dried out, and these influenced the distribution and diversity of the amphibian species negatively. After the estimations of the 'Nature and Environmental Conditional Report' (2006, 2007), the result of 2007 shows that there are in total 5128 rivers and streams – from these 652 are dried out, about 9306 springs and wells – from these 2277 are dried out, about 3747 lakes and wetlands – from these 1181 are dried out, total of 429 hot and cold springs – from these 60 are dried out. These results show that climate change,

agriculture and farm activities are negatively affecting for the system, resources and quality of water. The population of the Siberian salamander at the north facing slope of Bayanzurkh Mountain, and also the Mongolian Toad and the Siberian wood frog around Ulaanbaatar city and its streams, springs and ponds are disappeared. Also viviparous lizard disappeared from Ikh, Baga Bayan and Khandgait valleys.

MUNKHBAATAR (2009a) reported on an albinotic individual of Siberian wood frog (*Rana amurensis*), which was also the first record worldwide (see also fig. 3). Also was found an albino from Siberian wood frog population in 2008 at Shatan river (48° 30' 25'' N/106° 50' 29'' E) and east tributary of Kharaa river in Batsumber soum. It was a male, colour was pinkish, and eyes were bright red. Albinism is characterized by lack of melanin pigment and result from inheritance of heterogenic groups. This is caused by lack of tyrosinase enzyme, which is necessary for the production of melanin and colour of the body. This condition mostly affects invertebrates, but also vertebrates such as birds and mammals. But, occasionally occurs in fish, toads, and frogs.

Also it is nothing known about albinism in *Rana amurensis* from neighbouring areas. The measurements of this albino were: body length = 56.8 mm, length from tip of the mouth to the nostril = 4.5 mm, and from this till anterior of the eye = 7.6 mm, toe length = 32.9 mm, femur length = 27.9 mm, and tibia length = 29.1 mm, which are the normal values for this species.

Also there was found oligodactyly in the Mongolian toad, the animals have less then the normal number of fingers and toes. That happened among the tadpoles of Mongolian toad population at Kherlen and Balj rivers. We have found same situation at one of several ponds around the Kherlen river (48° 04' 13.6'' N/114° 04' 13.6'' E, elevation 729 m) near the centre of Dornod aimag – 56 of the 140 individuals and about 40 % of tadpoles' latest metamorphotype (metamorphose state) of the Mongolian toads had oligodactyly. Pond water's pH is 8.3. But, we have not found any individual with oligodactyly in the nearest ponds of neighbourhood. The same situation was at Mankhaadai spring (48° 40' 10.6'' N/110° 52' 09.3'' E, water-pH = 9.45, elevation 1055 m) close to Binder (Dadal soum), this spring almost dried out. We estimated the oligodactyly, and 14 of the 40 individuals (35 %) are malformed. This may resulted from the water pollution (?).

Malformed individuals of Toad-head agama were found around the centre of Dundgobi aimag, the body's spine and tail bones were curved. This shows that evidences of reactions of amphibians and reptiles can be indicators of pollution.

Conservation of the Mongolian herpetofauna

In 1987 the first National "Mongolian Red Book" formed a major milestone of the conservation of biodiversity within Mongolia, highlighting two species of amphibians (Siberian salamander and Asiatic grass frog) and four reptiles species (Gobi naked-toed gecko, Stepperunner, Tatary sand boa and Slender racer). The second version of the "Mongolian Red Book" was published in 1997 in association with the Ministry of Nature and Environment. Herein two species (Pewzow's toad and Japanese tree frog) of amphibians and one reptile (Sunwatcher toadhead agama) were added. A herpetological study was undertaken in Mongolia's protected areas, including the Great Gobi Strictly Protected Areas, thereby strengthening knowledge of Mongolia's reptiles and amphibians.

Second was organized the International Mongolian Biodiversity Databank Workshop (11–15 September, 2006). Participants assessed the status of 27 Mongolian reptile and amphibian species using the IUCN Red List Categories and Criteria. The assessments revealed a number of trends affecting amphibians and reptiles of Mongolia. Four Mongolian amphibian species and two reptile species were identified as regionally threatened. One species, the Steppe-runner (*Eremias arguta*), is categorized as 'data deficient'. This does not necessarily imply that it is facing a lower risk of extinction than those identified as threatened, but highlights a requirement for more extensive research.

Until now wasn't any urge to do something for the conservation of Mongolian amphibians and reptiles. Now it begins to change. The numbers of amphibian and reptile populations are decreased, and distribution areas are reduced due to habitat pollution, mining and climate change.

Four species of amphibians and five species of reptiles are included into the Mongolian Red Book (1988, 1997). Also, the Mongolian Red List for amphibians and reptiles and the Summary Conservation Action Plans for Mongolian reptiles and amphibians (2006) are published by the Zoological Society of London. 66 % of Mongolian amphibians are evaluated as vulnerable by regional evaluation according to IUCN categories.

Fig. 4: Govi naked-toad gecko (*Cyrtopodion elongates*) (above right), Tatary sand boa (*Eryx tataricus*) in the valley Nogoon-tsav (above right), Slender racer (*Coluber spinalis*) in Uuliin Hudag, Middle Govi province, Multiocellated racerunner (*Eremias multiocellata tsaganbogdensis*); photos: Kh. MUNKHBAYAR.

These Summary Conservation Action Plans are intended to highlight species of particular concern, and to alert politicians, conservationists, government and planning authorities to actions that ensure that reptiles and amphibians of Mongolia maintain viable populations in future. Amphibians and reptiles are functioning as consumers within the circulation of energy and matter of the Mongolian ecosystems.

We are offering some suggestions to create several restricted Natural Resource areas for the conservation of amphibians and reptiles' marginal populations. For example, Nogoon-tsav valley (fig. 6) in Shine Jinst soum of Bayankhongor province is a resource area for reptiles. The area of 50 ha contains seven species of reptiles (*Teratoscincus przewalskii*, *Alsophylax pipiens*, *Cyrtopodion elongatus**, *Phrynocephalus versicolor*, *Eremias vermiculata*, *Eryx tataricus**, and *Psammophis lineolatus*); that means one third of Mongolian reptiles species. Two of them (*) are included into the Mongolian Red Book.

Table 1: Amphibians and reptiles of Mongolia evaluated in the Red List of the World Conservation Union

№	scientific name	common name	regional assessment	global assessment	protection
		Amphibians			
1	*Salamandrella keyserlingii*	Siberian salamander	V, A3c	LC	MRB, 16 %
2	*Bufo raddei*	Mongolian toad	LC	LC	8 %
3	*Bufo pewzovi*	Pewzow's toad	V, B1ab	LC	MRB, 1 %
4	*Hyla japonica*	Japanese tree frog	V, D2	LC	MRB
5	*Rana amurensis*	Siberian wood frog	LC	LC	11 %
6	*Rana chensinensis*	Asiatic grass frog	V, B1ab	LC	MRB, 15 %
		Reptiles			
1	*Alsophylax pipiens*	Caspian even-fingered gecko	LC	NE	24 %
2	*Teratoscincus przewalskii*	Przewalski's wonder gecko	NT	NE	37 %
3	*Cyrtopodion elongates*	Gobi naked-toed gecko	V, D2	NE	MRB, 55 %
4	*Laudakia stoliczkana altaica*	Mongolian agama	NT	NE	51 %
5	*Phrynocephalus versicolor*	Toad-head agama	LC	NE	18 %
6	*Phrynocephalus helioscopus*	Sunwatcher toad-head agama	NA	NE	MRB, 1 %
7	*Lacerta agilis*	Sand lizards	NA	NE	-
8	*Zootoca vivipara*	Viviparous lizard	LC	LC	25 %
9	*Eremias argus*	Mongolian racerunner	LC	NE	8 %
10	*E.vermiculata*	Variegated racerunner	LC	NE	38 %
11	*E.arguta*	Stepperunner	DD	NE	MRB, 18 %
12	*E.multiocellata*	Multio-oscillated racerunner	LC	NE	18 %
13	*E.przewalskii*	Gobi racerunner	LC	NE	18 %
14	*Eryx tataricus*	Tatary sand boa	NT	NE	MRB, 33 % CITES II
15	*Coluber spinalis*	Slender racer	NT	NE	MRB, 24 %
16	*Elaphe dione*	Steppes rat snake	LC	NE	10 %
17	*Elaphe schrenckii*	Amur rat snake	NA	NE	81 %
18	*Natrix natrix*	European grass snake	NT	LC	11 %
19	*Psammophis lineolatus*	Steppe ribbon racer	LC	NE	29 %
20	*Vipera berus*	Common northern viper	V, D2	NE	9 %
21	*Gloydius halys*	Halys pit viper	LC	NE	12 %

V = vulnerable; NT = near threatened; NA = not applicable; DD = data deficient; NE = not evaluated; LC = least concern, MRB = registered in the Mongolian Red Book, % = percentage of particular species distribution for Protected Areas of Mongolia (TERBISH et al. 2008).

We are also trying to establish amphibian reserve areas in Ikh and Baga Buureg (fig. 5), Shaamar soum of Selenge province. This area contains 66 % of Mongolian amphibian species (*Salamandrella keyserlingii**, *Bufo raddei*, *Hyla japonica**, and *Rana amurensis*). Two species (*) are included in the Mongolian Red Book.

Further there is the possibility to create a resource area for the conservation of amphibians and reptiles in the site of the river Nomrog.

Fig. 5: Buureg Tolgoi, downstream of the river Orkhon, near Shaamar soum (photo: M. MUNKHBAATAR).

Fig. 6: General view of the valley of Nogoon-tsav, Trans-Altai Gobi (photo: Kh. MUNKHBAYAR)

Conclusion and recommendations

Nine species of the Mongolian herpetofauna are registered in the Mongolian Red Book. Amphibians and reptiles and their distribution area are included in the Special Protected Area network. In 2008, 61 areas of Mongolian landscape, which accords about 14 % of the Mongolian territory or 21.9 million ha, were allocated as protected areas.

We should arrange following steps to protect amphibians and reptiles in future:

1. Do not destroy habitats of amphibians and reptiles; do not pollute rivers, streams, lakes and ponds which will help for number of organisms stay in normal condition. Make species list of amphibians and reptiles of Special Protected Areas, and then make database of life history, breeding and development, and number of individuals, and make evaluation of the distribution patterns of the different species.
2. Make advertisements and provide education about conservation of amphibians and reptiles for children and adults.
3. To protect rare species of amphibians and reptiles, we must create restricted recourse area for their micro-population.
4. Pay attention for restoration of mining, and make arrangement for reintroduction of destroyed amphibian and reptilian habitats in these areas.

Suggestions:

1. Organize long term monitoring and determine relationship of ecology, role for ecosystem and biocoenosis.
2. Determine effect of increased license of mining for habitats of amphibians and reptiles.
3. Make checklist of some taxonomic matter. If necessary, conserve certain areas for some species of amphibians and reptiles with split distribution. Fencing of roads in the neighbourhood of water bodies in migration time is an important possibility for conservation of amphibians and reptiles.

References

ANANJEVA, N.B.; MUNKHBAYAR, Kh.; ORLOV, N.L.; ORLOVA, V.F.; SEMENOV, D.V.; TERBISH, Kh. (1997): Amphibians and reptiles of Mongolia. Reptiles of Mongolia. – Moscow, 415 pp. (in Russian).

BANNIKOV, A.G. (1958): Data on the fauna and biology of Amphibia and Reptilia in Mongolia. – Bull. Mos. Soc. Nat., Biol. Ser. **68** (2): 71–91 (in Russian).

BEDRYAGA, Ya.V. (1912): Amphibians and Reptiles. – Results of an expedition of N.B. Przewalskii in Centrel Asia. – Section Zool. B 3, Part 1, Issue 4: 503-769 (in Russian).

BORKIN, L.J.; TERBISH, Kh.; TSAUNE, I.A. (1986): Tetraploid and diploid populations of toad of the *Bufo viridis* group from Mongolia. – Doklady Academy of Sciences of SSSR **287** (3): 760–764 (in Russian).

BORKIN, L.J.; VOROBYEVA, E.I.; DAEVSKY, I.S.; MUNKHBAYAR, Kh., KUZMIN; S.L. (1988): Amphibians and reptiles of Mongolian People's Republic. Amphibians. – Nauka, Moscow, 248 pp. (in Russian).

Mongolian Red Book (1997). – Ulaanbaatar, 388pp. (in Mongolian and English).

MUNKHBAATAR, M. (2004): Amphibians and reptiles of Eastern Mongolia. – Ulaanbaatar, 130 pp. (in Mongolian).

MUNKHBAATAR, M. (2009): Amphibians and Reptiles of Mongolia. – Fourth National report on conservation of biodiversity of Mongolia, pp. 23–30.

MUNKHBAATAR, M. (2009a): Albinism of Siberian wood frog (*Rana amurensis* Boulenger, 1886, Ranidae) in Mongolia. – Iz. Mong. Akad. Nauk **2**: 39–43 (in Mongolian).

MUNKHBAYAR, Kh. (1976): Amphibians and Reptiles of Mongolia. – Ulaanbaatar, 168 pp. (in Mongolian).

MUNKHBAYAR, Kh. (1987): Amphibians and Reptiles. – Red Book of Mongolian People's Republic. – Ulaanbaatar, 181 pp. (in Mongolian).

NIKOLSKY, A.M. (1915-1918): The fauna of Russia and adjacent countries. – Petrograd.

PETERS, G. (1971): Die Wirtelschwänze Zentralasiens (Agamidae, Agama). – Mitt. Zool. Mus. Berlin **47** (2): 357–381.

PETERS, G. (1981): Die Erforschung der Herpetofauna der Mongolischen Volksrepublik: Situation und Perspektiven. – Erforschung biol. Ress. MVR (Halle/Saale) **1**: 75–80.

SHARPILO, B.P.; BISERKOV, V.I.; MUNKHBAYAR, Kh. (1987): The new species of the genus *Thelandros* (Nematoda, Phasynogonidae) parasite of Mongolian rock agama *Agama stoliczkana* (Reptilia, Agamidae). – Vest. zool. **6**: 3–8.

SHERBAKH, N.N. (1974): Gekkos of Palearctic. – Kiev, 296 pp.

STRAUCH, A.A. (1876): Reptiles and Amphibians. – In: PRZEWALSKII, N.M.: Mongolija i strana Tangutov. – Imper. Russ. Geogr. Soc. Vol. 2, Section 2, pp. 1–55. – St. Petersburg (1875), London (1876, Engl. ed.).

TERBISH, Kh.; MUNKHBAYAR, Kh.; CLARK, E.L.; MUNKHBAT, J.; MONKS, E.M. (2006): Mongolian Red List of reptiles and amphibians. – Regional Red List Series Vol. **5**. Zool. Soc. London (in English and Mongolian).

TERBISH, Kh.; MUNKHBAYAR Kh.; CLARK E.L.; MUNKHBAT, J.; MONKS, E.M. (2006): Summary Conservation Action plans for Mongolian reptiles and amphibians. – IUCN, Ulaanbaatar, 7 pp. (in English).

TERBISH, Kh.; MUNKHBAYAR, Kh.; MUNKHBAATAR, M. (2006): A guide to the amphibians and reptiles of Mongolia. – Ulaanbaatar, 72 pp. (in English).

Addresses:

Prof. Dr. Khorloo Munkhbayar
M. Munkhbaatar
Mongolian State University of Education
Dept. Zoology and Ecology
Baga Toruu- 14
Ulaanbaatar, 210648
Mongolia

e-mail: khmunkhbayar@yahoo.com