FINAL REPORT

Ranodon sibiricus Kessler, 1866: Monitoring study at the early XXI century with goal to establish and substantiate protected territory

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The main goal of the project was to provide a monitor study in the central part of the *Ranodon sibiricus* range and to substantiate the most suitable territories for its protection.

The Siberian Salamander *Ranodon sibiricus* Kessler, 1866 is rare tailed amphibian species with conservation status: IUCN (Red List) – EN; National Status – VU (Kazakhstan) and EN (China).



Ranodon sibiricus Kessler, 1866 (photo by Oleg Belyalov)

This species is biologically unique owing to its high level of endemism. It inhabits only Dzhungarsky Alatau Mountains in Southeastern Kazakhstan and neighboring area of Northwestern China (Xinjiang). It is possible to say that this species belongs to genetic rarities of the World fauna. The main part of its range is located in Kazakhstan.

R. sibiricus inhabits the mountain rivers and brooks with clear and well-aeraited water at optimal temperature +6-16°Cand altidudes(1400) 1800 – 2300 (2800)m above sea level. The salamanders prefer flatty river-bed plateu with mid-speed and not deep streams although they also don't escape the brooks flowing in the steep mountain raviges. *R. sibiricus i*s very strictly adapted to many environmental factors that is why it occupies not all the mountain streams of Dzungarsky Alatau.

Peculiar vulnerability of the species is determined by the following criteria:

- monotypic species;
- occupies a narrow range within mountain dissected area;
- inhabits the mountain streams with destabilizedhydro regime during last decades;
- presented by isolated populations;
- has a narrow range of tolerance to vital environmental factors temperature and humidity;
- range and abundance decreased;
- not protected in any Natural Reserve in Kazakhstan.

The following tasks were assigned for solution in the framework of the project:

- 1) To conduct a field investigation of *R. sibiricus* in the Koksu and Chizhe river basins the poor studied central part of species range in Kazakhstan;
- 2) To determine a general pattern of distribution and to establish the regions with most continuous spatial distribution of the species in every river basin;
- 3) To choose the populations with relative high abundance;
- 4) To evaluate a rate of anthropogenic influence on *R. sibiricus* habitats and to determine the main risk factors for its stability;
- 5) Basing on 2) 4) results to outline the most suitable territories for species protection from view of spatial and quantitative distribution;
- 6) To prepare a biological background as the "National Action Plan for *Ranodon sibiricus* Conservation" for submission to responsible authorities (Committee of Forestry and Hunting under Ministry of Agriculture of Republic of Kazakhstan)
- 7) To conduct the measures devoted to species protection for local population including the lectures in schools and other educational organizations in the regional centers and other villages located within or close to the territory of the research; to prepare the brochure and posters with general information on endangered species and main tasks of its protection.

In accordance with the tasks above enumerated and the time-table of the project for the period from July 2012 to August 2013 the ACBK team and our helpers has done the following actions.

SCIENTIFIC RESEARCH AND CONSERVATION ACTIVITY

MATERIAL AND METHODS

Spatial and quantitative study. The observations on *Ranodon sibiricus* were conducted in the central part of Dzungarsky Alatau Mountains in the zones of caniferous forests, forest-meadow-and-steppes and subalpic meadows within an altitude range from 1600 to 2600 m a. s. l. during July (13-22), September (13-24) 2012 and June (19-30) 2013.We examined 34 water streamswithin three main river basins – Chizhe,Tekeli and Koksu, and undertook a short trip to southern part of the area (Borokhudzir and Keskenterek Rivers) in order to get comparative data on species abundance.

A period from mid June to mid September is most suitable time for amphibian activity (Dujsebayeva, 2013). The weather was sunny, without strong winds and with rare rain. Daily temperatures reached +22-25°C for air (near the ground) and +23-25°C for water (5 cm deep near the bank); the minimal ones for nights were +4-8°C for air and water as well.

Monitoring works were based at the principes and recommendation of Caughley (1979) and Heyer et al. (1994).



The region inspected – the central part of *Ranodon sibiricus* range in Kazakhstan



Typical habitat of Ranodon sibiricus

The main method of the field research was the road routes with short-term (a few hours to one-two days) stay in some localities to look for salamanders, to work on its account and comprehensive collection of ecosystem parameters, including amphibian habitat characteristics. Few water arteries (tributaries of Shimbulak, Karabulak and Cherkassay rivers) were choosed as the model for careful inspection of altitudinal salamander distribution and comparative nocturnal and daily acounting. All data have been entered in the information and analytical base.

Accounting work was conducted in all streams, where we found the salamanders, in different parts of their flow with two nearby transects (100-200m), separated by a distance of 50-100 m for each locality. Certain streams from different parts of the area were selected as the model ones to update the altitudinal species preference and comparative nocturnal and daily counting. We counts the salamander with a method of "turning over rocks" at the water's edge on both sides (and their subsequent return to the original position) and at a distance of about 10-20 cm from it in both directions, and a detailed examination niches of the coast and the coastal strip width of about 1 m. Daily accounts conducted from 10 AM (in rare cases from 8 AM) to 4 PM, nocturnal accounts – from 9 PM to 12 PM, i.e. using the time of highest species activity (Dolmen et al., 1999). Both the river and the river banks have been inspected.

For comparative analysis we used the data with maximal occurrence (maximal abundant) of salamanders independently upon the time (day/night) of account and season. We have shown recently (Dujsebayeva, 2013) that effect of daily and night accounts visibly dependents upon the morphological characteristics of the brooks and not always has the maximal values during the night calculations as was noted previously (Dolmen et al., 1997). There were no observations on reliable differences in *R. sibiricus* abundance during period from the mid-June to the mid-September.

The meanings of occurrence (abundance) selected have been grouped into six classes according to number of specimens per 100 m of the river (brook) and presented as map: 1) 0.1 - 4.9; 2) 5.0 - 9.9; 3) 10.0 - 19.9; 4) 20.0 - 29.0; 5) 30.0 - 39.9; 6) 40.0 ивыше. We counted only adults, subadults and the larvae near/at metamorphosis (Dolmen et al., 1997). The young larvae (TL less 60 mm) we ignored because of their very uneven distribution in the brooks and very high mortality during hibernation (Bannikov, 1949).

Collecting of data on hydrochemistry will be done with Horiba W-20XD Series water analyzer.

Analysis of human impact (mainly distant-pasturecattle and deforestation) was based on field data as well as using conversation with local people.

GIS-modelling. GIS is a tremendously powerful analytical tool, which operates with a plenty of data sources, like ground observations, maps, satellite and aerial imagery, remotely sensed data, etc. Combination of several sources of information provides a possibility to get adequate and reliable information, being analyzed with GIS.

Ranodon sibiricus is rare, endemic amphibian species, which inhabits mountain areas in Eastern Kazakhstan and Western China. There are some indications of the possible presence of that species in the Zaiiliskiy Alatau Range of Northern Tien-Shan Mountains, both recent and fossil (Brushko et al., 1988; Averianov, Tjutkova, 1995). The amphibian inhabits small streams leaking away from glaciers and snow fields. Streams are forming the network of first to fourth order tributaries of main rivers, where the amphibian was found rather accidentally. The pattern of amphibian distribution within the area is mosaic, and it is quite difficult to access every potentially suitable stream by vehicle or even with horse.



Water analyzing in the brooks of the upper flow of Oisaz River

Both those factors: mosaic distribution and inaccessibility make the GIS approach to be very perspective.

Consuming that the number of factors, delimiting the amphibian distribution, is not very high, and the animal is not highly mobile, we attempted to develop the model of *R. sibiricus* distribution using Remote Sensing data and GIS modeling. Virtually, most of controlling parameters are related to climate, since the recent known area of the species is delimited with mid and highlands of Dzungarskiy Alatau, i.e the area that could be called "climate-specific". Behavioral factors are of less importance, as the amphibian is strictly connected to living water flows of different range (tributaries of first and second orders) and it, obviously, is unable to migrate far inland.

The following parameters, all accessible from remote sensing, were taken into consideration: height, slope, aspect (derived from Digital Elevation Model), vegetation (calculated as Normalized Difference Vegetation Index from Landsat imagery), precipitation and air temperature for selected months and quarters (BIOCLIM and WORLDCLIM datasets).

The key-method for the model development is reclassifying of the input data accordingly to ground-truth information on the actual species occurrence within the area. Each image analyzed was primarily converted into grid, where cells contained the unique value of the parameter, for example, the temperature meaning or vegetation index value. Next step was to gather the data from each raster to attributive table of the animal occurrence shape-file. As the distribution of each parameter values is a normal (or Gaussian) distribution, then the collected data were processed as standard interquartile analysis for each parameter and then input raster datasets were reclassified into new cell values, that corresponds to good (cell value-2), marginal (cell value-1) or poor (cell value-0) interval of parameter.

Final step was arithmetical summarizing of all reclassified grids and the development of preliminary map of suitability, where the highest cell value means

complete consilience of all good intervals, and lower values outlined the area with completely unfavorable conditions.

RESULTS

Spatial distribution

During two field seasons we haveprovided a careful investigation of the water streams of few big river basins – Tekely (Cherkassay tributary), Chizhe (Oisaz and Shimbulak Rivers) and Koksu(main flaw as well as Kazan, Karabulak, Terssakkan and Ermenssay tributaries) located in the central part of the species range in Kazakhstan territory of Dzhungarsky Alatau.



Difficult roads and wonderful landscapes of the trip

We have inspected totally 34 water streams (the main river beds as well as I-III order tributaries) and near 40 localities within them within the altitude 1750-3000 m a.s.l. Under "the water stream" we understood the certain whole rivers and creeks flowing in the region examined. "*The locality*" was accepted as a section of a certain water stream different from the neighboring sections with a set of morphological, physical and histochemical characteristics. So, within the certain stream usually we identified more than one locality.



Different sections of single water stream

We have collected rich data on spatial species distribution (see figures below) and elucidated the peculiarities of its habitats in the water stream examined.



Previous records of *Ranodon sibiricus* in the central part of Kazakhstan Dzungarsky Alatau



The records of Ranodon sibiricus collected during current Project

In the central part of the species range within Kazakhstan territory *R. sibiricus*usually inhabits the zone from 1900 to 2400 m a.s.l., although twice we have registered the salamanders at altitude near 2500 m (2519 m as maximal). In neighboring Borotala River Valley in China *R. sibiricus* goes visibly higher – up to 3200 m (IUCN, 2010) but it can be explained by different orographic position and climatic conditions of that river valley.

Quantitative distribution

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Estimation of amphibian abundance has been conducted by mean of careful calculation of its occurrence in the every locality visited (Fig. 8). We used the terms "abundance of animals" or "occurrence" because a determination of absolute number of animals needed special population study (Caughley, 1977; Measuring and Monitoring Biological Diversity.., 1994).



Everyday hard work on Ranodon sibiricus occurrence account

For the first time we have got the data on species abundance along the stream of Koksu River and its main tributaries – Ermenssay, Karabulak, Kazan and Terssakan and for many additional streams within Chizhe River Basin where only short-term exploratory examination has been done by Paraskiv (1953) in 40-es (Paraskiv, 1953) and Kubykin (1986) in 1978. We have also collected monitoring data for some streams of Tekely River which were studied at the end of 60-es (Kubykin, 1986) and partially in 90-es (Kuzmin et al., 1998).

We have confirmed a presupposition on very uneven species distribution within both single streams and river basins suggested by early investigators (Shnitnikov, 1913; Brushko, 1993; Dujsebayeva, 2013). In spite of quite similar morphological and physical characteristics even closely located brooks are often differed each other significantly in respect of salamander density (Table 1).

Table 1. Relative abundance of *R. sibiricus* (sp./100 m) in the water streams of the central part of species area (1900-2519 m above s.l.) according to data of 2012-2013: N, number of the localities explored; M_e (Q_3 - Q_1), median (interquartile interval)

Territory	N	Min-max	M _e (Q ₃ -Q ₁₎
Koksu River Basin (Koksu River and main tributaries: Kazan, Terssakan, Ermenssay)	25	1-200	24 (36-10)
Cherkassay River	7	4-160	45 (87,5-11)
Oisaz River and tributaries	2	1-2	1, 2*
Shimbulak River and tributaries	3	15-40	15, 30,40*

*, very rare records not enough for statistic analysis

The means of median which describe an average abundance of the salamanders at uneven statistical distribution was quite high for the rivers and brooks inspected in the central part of the species range – Koksu River with tributaries and Cherkassay River (Table 1).

Of course, we didn't visit so many localities as it was done for the southern part (Table 2) but it is easy explained by shorter time for investigation as well as more difficult relief and dangerous roads. Nevertheless, we suspect that more careful inspection of the central range part will confirm its high habitat suitability for the species.

Table 2. Relative abundance of *R. sibiricus* (sp./100 m) in the water streams of the southern part of species area (1800-2400 m above s.l.) according to data of 2009-2011: N, number of the localities explored; M_e (Q_3 - Q_1), median (interquartile interval) (from Dujsebayeva, 2013)

Territory	Ν	Min-max	M _e (Q ₃ -Q ₁₎
Upper part of Borokhudzir River Valley and uppermost of Keskenterek River (the research area as a whole	81	0,3-51	6 (12-2,5)
The streams of Borokhudzir River Basin flowed from the southern slopes	24	0,3-34	3,2 (6-1,6)
The streams of Borokhudzir River Basin flowed from the northern slopes	42	0,5-51	8 (13,75-4)
Headsprings and uppermost of Borokhudzir and Keskenterek rivers (including Uigentass Pass	19	1-51	10 (13,5-5,25)
Confluence of three sources of Keskenterek River	15	2,5-24	8 (13-4,25)
Headsprings of Borokhudzir River from Uigentass Pass and surrounding mountain slopes	15	1-51	12 (14-8,5)

The figure below presents a model of *R. sibiricus* spatial and quantitative distribution obtained using the primary field data and GIS-interpolation with barriers. Like any model our preliminary map does not claim 100% accuracy and needs future developing. The current model works quite perfect in general, showing the common distribution of the species and marking possible suitable sites outside of study area.



Abundance of *Ranodon sibiricus* in the central and southern parts of the species range (based on Dujsebayeva, Malakhov, 2012 and present unpublished data)

Express-analysis of water quality

Analysis of water quality was not among the priorities of our Project. However, we tried to analyze at least pH because always there it is one of the usual requests of zoo and terrarium colleagues. Unfortunately, the known literature is not so rich with such data.

According to Dolmen et al. (1997) the water in the brooks of Borokhudzir River (southern part of the species range) was neutral (pH 6,7-7,3) or slightly alkaline with pH increasing to 7,6 or more to autumn.

Our data have shown that the brooks from the central part of the species range had water with pH varied from slightly acidic (pH 6,1-6,3) to slightly alkaline (pH 7,8-7,9) in July and had more visible alkaline nature in August (pH 8,3-8,5).

Limited factors

Recently, basing on the analysis of *R. sibiricus* population statement in the southern part of the species range we suspected that in close future climate warming rather than anthropogenic impact (as was suggested by Kuzmin et al. in 1998) will determine key changes in species stability (Dujsebayeva, Malakhov, 2012; Dujsebayeva, 2013). The data obtained from the satellite images showed a clear trend to decrease in size and mass of glaciers in Dzhungarsky Alatau (Kokarev, 2009). A steady state of the glaciers is most important condition for stable regime of the annual

flow of mountain streams (Lavrentyev, 1958), that is one of the primary conditions for *R. sibiricus* population stability. We suppose that the southern part of species area being closely placed to hot deserts of Ily River Depression, can fall into the risk zone before other. Obviously a decline of *R. sibiricus* populations will worsen because of future intensification and some qualitative changes in distant-pasture cattle.

Prognosis of future climate changes and glacier degradation (Vilesov et al., 2012) let us to think that the central part of the species area due to its orographic position and less anthropogenic press, rather than southern, will keep available habitats for *R. sibiricus* longer.

Our recent data have confirmed the suggestion that the influence of both factors – anthropogenic pressure and glacier degradation is apparently weaker in the central part of *R. sibiricus* range. This part is located between the biggest centers of recent glaciations of Dzhungarsky Alatau - Lepsi, Tokssanbay and Usek-Khorgoss mountain junctions and has visibly less rate of glacier degradation in comparison with the southern part (Vilesov and Morozova, 2008; Seversky et al., 2006). The distant-pasture cattle – very serious limited factor for *R. sibiricus* in the southern part of the range has not so great value for the central one because most inaccessible areas due to the complex orography, its cross-border nature and location of part of the territory of Verhnekoksuysky State Nature Sanctuary, limiting the economic activity of the man (Dujsebayeva, 2013).

Protected areas

Basing on new data on spatial and quantitative species distribution and taking into consideration prognosis with possible future climate transformation and anthropogenic pressure we substantiate the certain sections of Cherkassay River (left orange circle), Ermenssay River (central orange circle) and Kazan River (right orange circle) as the main available territorial clusters for future organization of protected zones for *R. sibiricus*. The boundary position of Kazan River with strict mode visit of the region and presence Verkhnekoksuysky State Nature Sanctuary with formal species protection can serve as the additional arguments for successful species conservation there.

In June 2013 in the framework of 2030 strategic plan of Republic of Kazakhstan the Institute of Zoology (Almaty) and ACBK have officially included a proposal to expand the territory of Dzhungarsky State Nature Park by incorporating of Verkhnekoksuisky State Nature Sanctuary. Except of *R. sibiricus* there are a number of other endangered and vulnerable species of vertebrates: the birds – *Falco pelegrinoides, F. cherrug, Gyps hymalaensis, Neophron percnopterus, Gypaetus barbatus, Aquila chrysaetus; the mammals – Uncia uncia, Lynx lynx isabellinus, Ursus arctos isabellinus.* The proposed territories (see the map) obviously can be considered as a "biodiversity hotspot for conservation priorities" although a future work on the justification of these areas as the protected is necessary because of their high economic value and complex system of Land Management of Almaty District.



The clusters in central part of *Ranodon sibiricus* range (orange circles) proposed for future protection. Yellow circle marks the southern range part (Dujsebayeva, 2013)

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An official map of protected territories of Kazakhstan with indication of the territories proposed to expand the Dzungarsky State Nature Park

Target Program on study and conservation of Ranodon sibiricus

The materials obtained during current work became the basis to develop the "Target Program on *R. sibiricus* Kessler, 1866 study and conservation in Kazakhstan" and signing of the agreement on scientific co-operation between the Kazakhstan Association of Biodiversity Conservation (Almaty) and the Institute of Zoology, Ministry of Education and Sciences (Almaty) (Appendix 1: see attached files1). This Program has been prepared in a full accordance with the purposes and objectives of main international documents for World biodiversity conservation at the conditions of global climate change: UNESCO program "Man and Biosphere", UN Convention on Biological Diversity, UICN Red List of Threatened Species, Commission of the IUCN Species Survival (SSC IUCN: Department ASG - Amphibian Specialists Group) and others. The Program uses the principles of "Strategic Planning for Species Conservation..." (2008) and takes into consideration:

- Logical relation of species study and protection
- Co-operation between Non-governmental and governmental organizations
- Co-operation between Kazakhstan and foreign partners
- Multidisciplinary and ecosystem approaches.

Among the main objectives of the Program are:

- to estimate genetic diversity of species
- to get basic data on population structure, to determine a number of the model populations and to extrapolate a general species abundance within Kazakhstan part of Dzungarsky Alatau
- to develop the method of amphibian breeding in captivity
- to build and equip a nursery for keeping and breeding of the species *ex-situ*
- to prepare scientific background for protected area (-as) creation
- to undertake the attempts of species (re-) or introduction to nature sites
- to put the work in promoting of species conservation ideas among the local people including youth and border guards
- to put the work against illegal trade including CITES possibilities
- to organize a system of long-term species monitoring

The key partners are ACBK and the Institute of Zoology. Other partners are:

- Kioto University (Japan) responsible for genetic work and population structure study
- Institute of Cell Biophysics of Russian Academy of Sciences (Russia), specialized in captive breeding of rare amphibians
- IUCN French Urodela Group (FUG), specialized in captive breeding of rare amphibians
- Institute of Geography (Almaty, Kazakhstan), active partner of ACBK and Institute of Zoology in field research
- private company "Ulken-Balyk" (Baiseit Village, Kazakhstan) specialized in aquaculture developing
- private company "STeK" (Tekely Town, Kazakhstan) specialized in ecotourism

The Program is preliminary designed for 5 years with possible prolongation. According to its structure and content it can be considered as the National Action Plan of *R. sibiricus* conservation.

Publisizing, ecological education and international activity for *Ranodon sibiricus* conservation

Publicizing and international activity of ACBK conducted with Stiftung Artenschutz Project had very positive response among the scientific and conservation community. In 2013 ACBK has signed few agreements with governmental and NGO-organizations for future work with *R. sibiricus* that permitted to start a realization of the Target Program on species conservation.

1) By February 13th - March 4th 2013 ACBK and the Graduated School of Human and Environmental Studies of Kioto University have signed the Memorandum on scientific cooperation and exchange (Appendix 2). 18th-23rd June 2013 the Japanese herpetologists Drs. Kanto Nishikawa and Atsushi Tominago having a great experience in the study and conservation of urodelen amphibians took part in the fieldwork and ecological training of ACBK conducted in the framework of Stiftung Artenschutz Project. Together with Tatjana Dujsebayeva and Sergey Gaydin (young member of ACBK) they collected the data on population structure of *R. sibiricus* from few localities that can be considered as a start of <u>Target Program Task 2</u> realization.

A group of children from primary schools of Almaty helped with observation on salamander breeding behavior and amphibian calculation. Without any comparing the activity of nimble and sharp-sighted children had a lot more effect than that of serious scientists and we were very grateful to them!

2) At 30th May-10th June 2013 Tatjana Dujsebayeva during a fieldwork in Xinjiang conducting in collaboration with Chinese colleagues from Chengdu Institute of Biology (China Academy of Sciences) on the herps of Central Asia has visited the Research Center of Xinjiang Salamander (*R. sibiricus*) in the Xinjiang Normal University of Urumqu. This Center is known in its successful study and captive maintenance of *R. sibiricus*. Tatjana Dujsebayeva had a special report on the results of Stiftung Artenschutz Project of ACBK, exchanged in ideas of future works and possible cooperation with Chinese colleagues in the field of *R. sibiricus* breeding and in captivity and distributed printed materials.

3) In June 2013 the IUCN French Urodela Group (France) interested in the results of Stiftung Artenschutz Project of ACBK have proposed to prepare the General Memorandum and Agreement for scientific collaboration in future study and conservation of rare amphibians, with focus on *R. sibiricus* as a key species and its breeding in captivity as a main task. The Memorandum and Agreement are at the stage of signing now. The works with *R. sibiricus* captive breeding (Task 4 of the Target Program) are planning to start in 2014.



The member of ACBK Sergey Gaydin acquaints the schoolchildren and Japanese researchers with main habits of *R. sibiricus* during egg-laying





Visit of Tatjana Dujsebayeva to the Research Center of Xinjiang Salamander (Urumqu, China) with report on Stiftung Artenschutz Project

ECOLOGICAL EDUCATION

1. Publicizing

The following information was publishes and placed in web-sites during the Project realization:

- http://www.acbk.kz/ru/news/2211/
- http://www.amphibians.org/conservation/dzhungarsky-alatau/
- Regular journal of ACBK "Вести АСБК" ("ACBK News"), № 9 (Appendix 3)
- Regular journal of ACBK "ЖасылЭлемі" ("Green Piece") (in press: will send to the Stiftung Artenschutz as soon as will be published)
- Poster in two languages (Kazakh and Russian) (Appendix 4)
- Booklets in four languages (Kazakh, Russian, German, English (Appendixes 5A,B-8A,B)

The printed material with short outreach information was distributed among the local people and wild nature inspectors during the Project fieldworks, in the frameworks of ecological training and lectures with schoolchildren and teachers as well as among the colleagues and students from scientific and research institutes and other organizations with specialization in environmental study and protection, conservation biology, zoology and ecology:

- Kazakhstan: Museum of Nature History ("Gilim Ordasy" Department, Ministry of Education and Sciences, Kazakh National University named after al-Farabi, North-Kazakhstan State University, Kostany Agricultural University, Institute of Geography, Ecological Department of Zharkent and Tekeli Administrations, etc.
- Russia: Zoological Institute of RAS (Saint-Petersburg), Zoological Museum of Moscow State University
- Ukraina: Museum of Natural History of Ukrainian Academy of Sciences (Kiev)
- China: Xinjiang Normal University (Urumqu), Institute of Geography and Ecology (Urumqu), Chengdu Institute of Biology of CAS (Chengdu)
- Japan: Kioto University
- Germany (zoos and terrariums in perspective)

2. Ecological education and training

In April-June 2013 (including 5th June – International Day of Environment Protection) we have undertaken the course of ecological lectures and training for pupils, teachers and local people in the towns and villages of Almaty District. The lectures accompanying with presentation (Appendix 9) were devoted to nature of mountains of Southeastern Kazakhstan. We attracted a special attention to Dzungarsky Alatau, its flora and fauna and partially to its unique representative – *R. sibiricus*. A part of lectures and training was especially devoted to rare, endangered and vulnerable species of animals, their value in mountain ecosystems. Development of attention to wild nature, kind relation to surrounding environment, to every small flower or animal, understanding of strong relationships inside the ecosystems and between the man and biosphere as

well were the key questions discussed during the lectures. The Semirechensk Salamander as an absolutely non-dangerous and even defenseless creature became a wonderful key example for such discussions.

Another questions and problems covered in the classrooms:

- The rules of children behavior which can promote a nature protection
- A role of teacher and family in ecological education of young generations and development of care for nature
- The role of young generations in actions on nature protection
- The role of non-governmental organizations, nature reserves and national parks in nature protection activity.

The participants:

NGO "Wild Nature Fairy Tale" (Essyk Town) NGO "Nature Mistery" (Essyk Town) Middle School named after Valentina Tereshkova (Essyk Town) Middle School named after Aliya Moldagulova (Shelek Town) Middle School named after Maxim Gorky (Bolek Village) Middle School named after Maylin (Orikty Village) Middle School № 10 (Belbulak Village) Middle School № 3 (Chapayevo Village) Camp "Young tourist" of NGO "Stek" (Tekeli Town) Ile-Alatau State National Nature Park Forestry and Hunting State Inspection of Kerbulak Region







Marina Chirikova provides the lecture on significant value of *R. sibiricus* in mountain ecosystems of Dzungarsky Alatau with teachers from village schools and national park inspectors of Almaty District



Exchange in ideas on ecological education in the schools



Tatjana Dujsebayeva and Ardak Khamitov (the teacher of the Department of Energetic Ecology of Kazakh National University) during a short visit of Dzhungarsky Alatau foothills in August 2013



Marina Chirikova during the lecture with schoolchildren from the villages of Almaty District

The main results of the Project

- 1) We have conducted a field investigation of *R. sibiricus* populations in the central part of its range in Kazakhstan and inspected totally 34 water streams.
- 2) We have determined a general pattern of spatial distribution of the species and its abundance in every river basin.
- 3) We have defined the Cherkassay, Ermenssay River and Kazan Rivers as the main available territorial clusters for future organization of protected zones for *R. sibiricus* and officially included to 2030 Strategic Plan of responsible governmental organs of Kazakhstan a proposal to expand the territory of Dzhungarsky State Nature Park by incorporating of Verkhnekoksuisky State Nature Sanctuary for *R. sibiricus* conservation;
- 4) In co-operation with the Institute of Zoology (Almaty) we have prepared the "Target Program on *Ranodon sibiricus* Kessler, 1866 study and conservation in Kazakhstan" as a biological background for species conservation and submitted it to responsible authorities (Committee of Forestry and Hunting under Ministry of Agriculture of Republic of Kazakhstan).
- 5) Already in current year we began the work under this program starting a population study with Japanese colleagues from Kioto University and planning the breeding of *R. sibiricus* in captivity basing on scientific agreement with French Urodela Group of UICN.
- 6) We have provided a series of lectures and training for schoolchildren, teachers and staff of nature inspection from local schools, ecological non-governmental and nature protective organizations of the Almaty District.
- 7) We have published two-language poster and four-language booklets with information on nature protective status and natural history of *R. sibiricus* and distributed them among the local people as well as among our scientific colleagues from Kazakhstan and abroad.



Instead of Conclusion

We are looking forward for any individuals or organizations which could help us in very important activity of Ranodon sibiricus conservation.

Together with the STIFTUNG ARTENSCHUTZ's "Amphibian Funds", Verband Deutscher Zoodirektorene. V. (VDZ) and German zoological gardens we hope that future generations of people will see this pretty amphibian not only in the museums but still in the wild nature...

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APPENDIXES 1 – 9

(see attached files)