

“Elaboration of in-situ and ex-situ conservation measures for
two red-listed species of Armenian Amphibians
(*Ommatotriton ophryticus* and *Pelobates syriacus*)”



Final Report

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INTRODUCTION

Amphibians in Armenia are represented by seven species (Eghiasarian, 2008; Arakelyan et al., 2011) from which two species – *Ommatotriton ophryticus* Berthold, 1846 (estimated as CR) and *Pelobates syriacus* Boetter, 1889 (VU) are listed in the Red Book of the Republic of Armenia (Aghasyan, Kalashyan, 2010). Despite of presence of numerous works where these two species were mentioned, or works specially dedicated to them (Gumilevsky, 1939; Papanian, 1956, 1959; Pipoyan 1998; Danielyan et al., 1998; Eghiasarian, 2007; Aghasyan et al., 2009; Arakelyan et al., 2011; Stepanyan et al., 2014), many questions of their distribution, peculiarities of biology, environmental conditions remained unsolved. Our data obtained during implementation of the previous Project (RSG ID: 13769-1) filled some existing gaps (Petrosyan et al., 2014). It was shown that newt is presented by few populations in Lori province, magnitude of populations is critically low and habitats are more or less degraded. Eastern Spadefoot has mosaic distribution in Central and Southern Armenia; its habitats are mainly surrounded by agricultural landscapes and situated under hard anthropogenic pressure, particularly pollution. No conservation measures (both *in-situ* and *ex-situ*) are applied for both species and no habitats are presented in the existing Protected Areas. Taking into account above mentioned, elaboration and implementation of conservation measures of these species is quit necessary.

Project goal and objectives

The **general goal** of the project is elaboration and implementation of the measures of conservation of *Ommatotriton ophryticus* and *Pelobates syriacus* including both *in-situ* and *ex-situ* approaches and involvement of local communities into implementation of conservation measures.

To achieve the overall goal the following objectives were stated:

- Control of the actual condition of known populations and habitats of 2 Armenian Red book amphibian species;
- Revealing of habitats suitable for the species survival, but not inhabited yet;
- Collecting as much as possible individuals of newt from populations living in inauspicious habitats and re-placing them into comfortable habitats newly revealed;
- Looking for the new populations, using in particular folk information with following checking of localities and census of populations revealed;
- Adaptation to our conditions methodology of breeding of northern banded newt and eastern spadefoot in *ex-situ* conditions including: creation of sustainable laboratory populations of both species, and implementation of pilot experiments of re-introduction and introduction of target species from laboratory' population to the habitats suitable for both species survival but not inhabited yet;
- Perform public awareness rising activity;
- Elaboration and submission to the stakeholders, including Ministry of Nature Protection of RA draft recommendations for conservation of *Ommatotriton ophryticus* and *Pelobates syriacus* in Armenia.

Project implementation

Included three general directions, as follows: 1) field work; 2) laboratory works, including creation and implementation of capacities of *ex-situ* breeding of target species; 3) introduction/ re-introduction into suitable habitats; 4) public awareness rising activity.

Field work

Field surveys were carried out in May - September, 2016, and March - June 2017. Eight expeditions were carried out according to the Working Plan, and one extra expedition note anticipated was carried out. Numerous localities were cover with our surveys in Lori, Tavush, Armavir, Ararat, Kotayk, Vayots Dzor and additionally Aragatsotn Provinces of Armenia (see maps in Fig. 1 A-D).

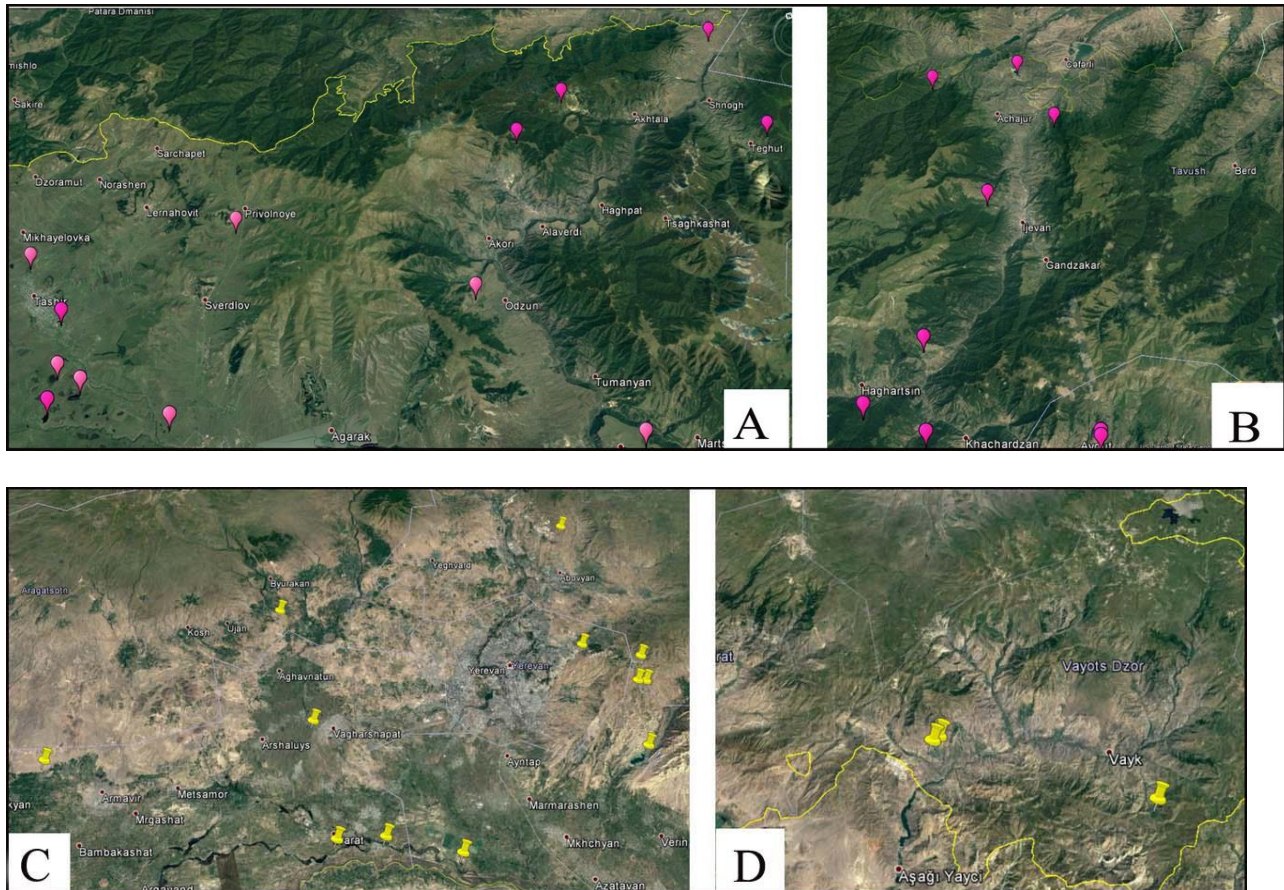


Figure 1. Surveys' localities. A – Lori Province (vicinities of Alaverdi, Stepanavan, Tashir towns, Dsegh, Shamlugh, Akhtala, Teghut, Mets Ayrum villages; **B- Tavush Province** (vicinities of Dilijan, Idjevan towns, Hovk, Aygut, Enokavan, Kayan, Sevkar, Kirants villages); **C: Armavir** (vicinities of: Vagharshapat, Armavir towns and Khanjan, Araks, Jrarat villages), **Ararat** (vicinities of Ranchpar, village), **Kotayk** (vicinities of: Yerevan, Garni, towns and Jervezh, Geghadir, Voghjaberd villages), **Aragatsotn** (vicinities of Agarak town), **D - Vayots Dzor** (vicinities of Chiva, Rind, Martiros villages) Provinces.

During field survey traditional transect method was used both to count adult amphibians and spadefoot juveniles during their mass escape from the breeding sites. Besides, at breeding period for accounting of spadefoots visual registration at day/night time and audio registration during the night along the coasts of breeding sites was applied. Egg and larva search were used for both species survey. Searching a pond by torchlight between shortly after dusk and midnight was used for detecting of adult newts. Besides, for accounting of adult newts at the breeding period the trapping methods (bottle or funnel trapping, pitfall traps, netting) was applied. Methods of dip netting of larvae and searching for hiding juveniles were used as well. In all newly discovered habitats morphometric parameters of amphibians were taken.

Laboratory work

Data analysis

Morphometric parameters of amphibians from newly discovered habitats were analyzed which provides additional data on population variability of target species.

All the data obtained were included into database created during implementation of RSG Ref: 13769-1. Using the database the maps were renewed with assessment of environmental conditions of habitats of target species. During assessment the data on vegetation and geobotanical characteristics as well as their current condition were kindly provided by Dr. Ivan Gabrielyan (Institute of Botany, National Academy of Sciences of Armenia).

Capacity building for breeding of target species

The vivarium, consisting of aqua-terrariums, and aquariums with necessary tools, was created.

Ex-situ breeding of target species

The results are presented below for each species separately.

Works on introduction of target species into suitable habitats

The results are presented below for each species separately.



Figure 2. During field and laboratory work.

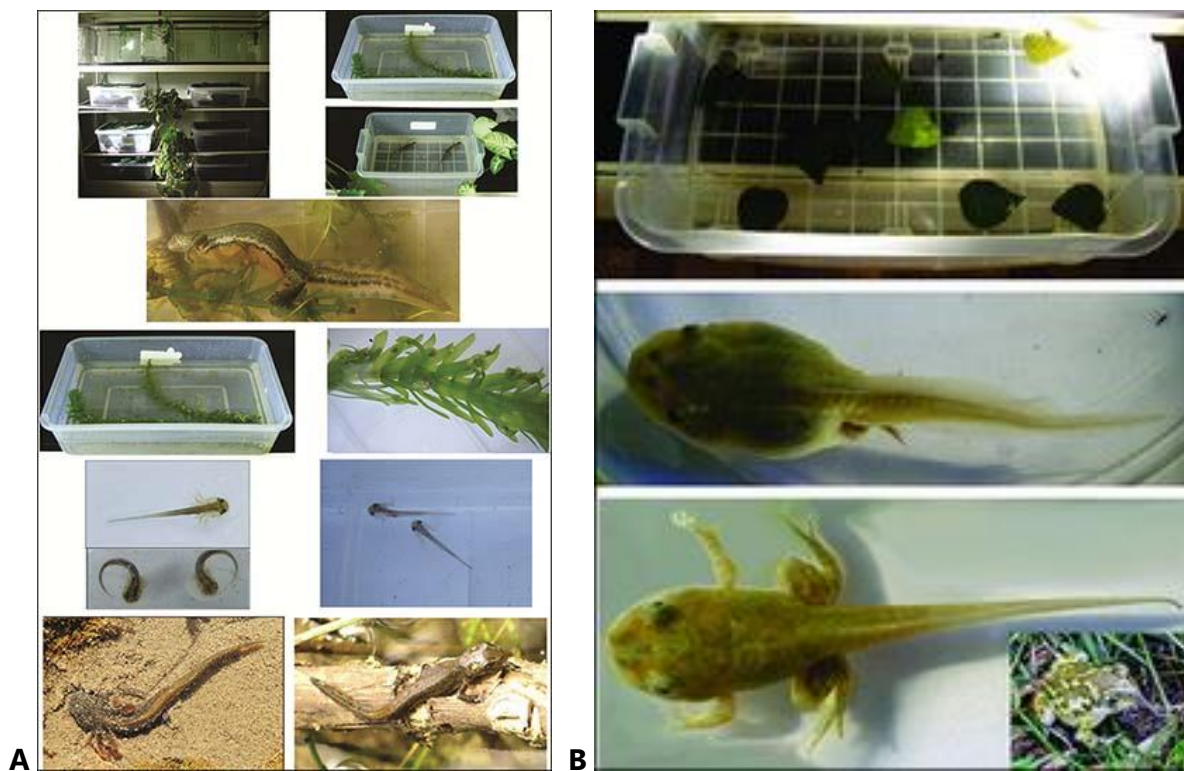


Figure 3. Breeding and housing of target species in vivarium A – newt; B - spadefoot



Figure 4. Introduction and re-introduction of target species.

***Northern Banded Newt - Ommatotriton ophryticus* Berthold, 1846**

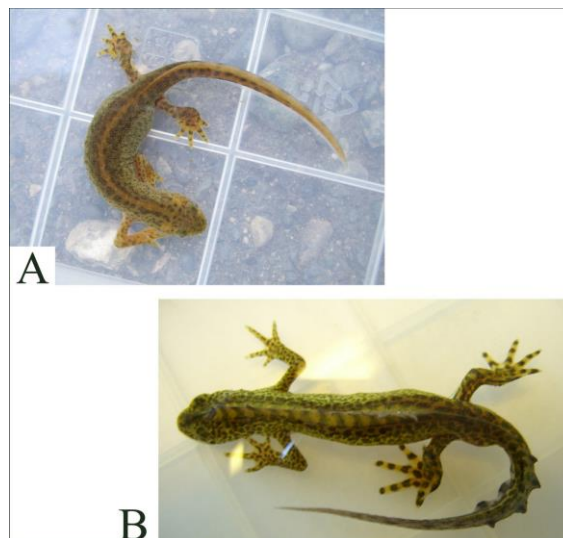
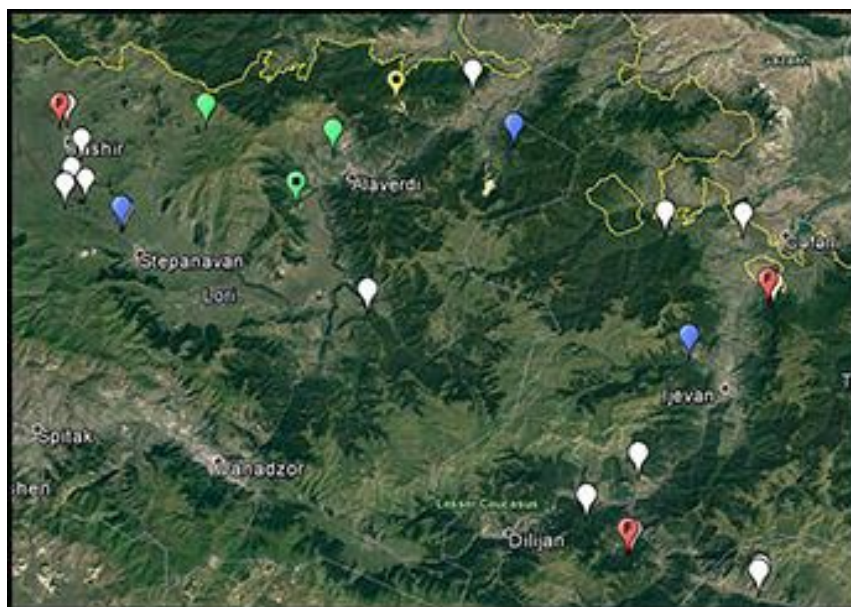


Figure 5. *Ommatotriton ophryticus*. A – Male; B – Female

Habitats surveyed.

During period of 2016-2017 were surveyed numerous localities in Tavush and Lori provinces both revealed in the framework of previous project as well as several newly revealed habitats suitable for newt survival but not inhabited yet (see map in Figs. 1, A-B; 6, A-B). Surveys were carried out in Debed, Tashir, Aghstev, Getik rivers' basins. In total 22 localities were surveyed. Among these: 4 were inhabited by newt (including those, where conditions were unsuitable), 8 - were suitable for newt but not inhabited yet; 10 - were both uninhabited and not suitable for further introduction.



Figures 6. Surveyed habitats of *Ommatotriton ophryticus*.

White place mark indicates the absence of a newt in a present locality; green - newt lives there and conditions are less good; yellow - newt lives there but conditions are bad; blue - newt was released by us; red - newt will be released in the future.

Observations of the season 2016 were shown that abundance of newt was lower in comparison with data collected in 2013-2014. It was low in all populations surveyed: from 2 (Shamlugh

population) to 3 (NE of Tashir) and 4 (NW of Alaverdi population) individuals per day in May 2016. This can be explained by unusual weather conditions during surveyed period. But in spring 2017 abundance was rather high (from 4 (NE of Tashir) to 8 (NW of Alaverdi population) in May).

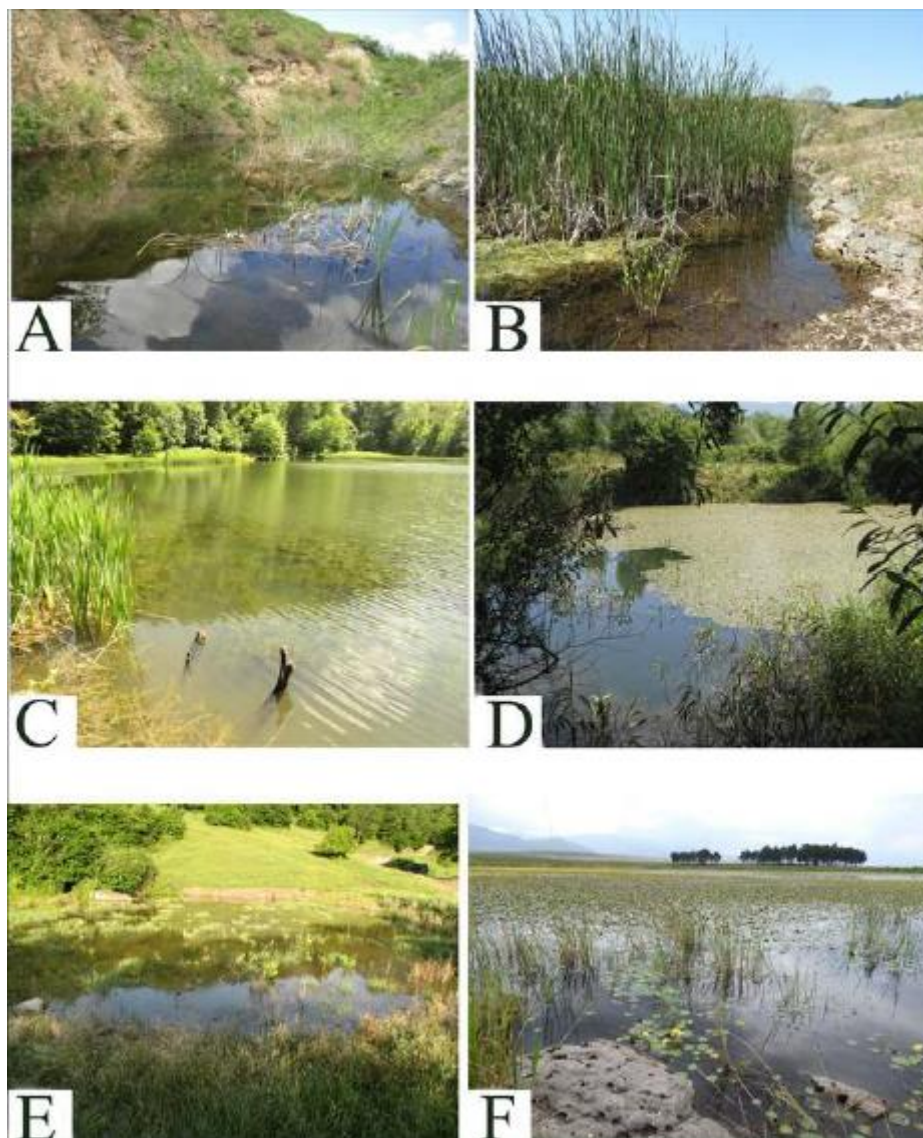


Figure 7. Surveyed habitats of *Ommatriton ophryticus* in Lori and Tavush Provinces

A – inhabited pond with suitable conditions in the vicinities of N from Alaverdi town (Lori Pr.); B– inhabited pond with not suitable conditions in the vicinities of Shamlugh village (Lori Pr.); C– pond in the vicinities of Dilijan town (Tavush Prov, not inhabited, good conditions); D - pond in the S vicinities of Enokavan vil. (Tavush Pr., not inhabited, good conditions, introduction was carried out); E- pond in the vicinities of South of Kayan vil. (Tavush Pr., not inhabited, good conditions, for future introduction); F- small lake in the vicinities of Stepanavan town (Lori Pr., not inhabited, good conditions, re-introduction was carried out).

Assessment of environmental conditions.

It must be stressed that among localities inhabited by newt no one could be considered as ideal. Even those which assessed as suitable were under danger due to several factors.

During surveys were revealed that all of the habitats were more or less threatened. First of all overgrowing and shoaling of ponds must be mentioned. Cutting was registered in the forests surroundings the ponds which can lead to worsening of hydrological conditions as well. High abundance of predators– native *Pelophylax ridibundus*, *Natrix*, *Natrix tessellata*, *Leuciscus* sp.,

somewhere *Alcedo atthis* etc. is another threatening factor for newt. The coastal part of several water bodies is polluted by household garbage, being popular places for picnics of local people (see Fig. 8). Somewhere newts are the object of pet trade.

These threats are generalized according IUCN Red List Guidelines:

Major threats

1. 1.3.3.2.: selective logging, 1.3.3.3.: clear-cutting;
2. 2.2.: predators (fishes, *Phelophylax ridibundus*);
3. 3.5.1.: subsistence use/local trade;
4. 9.5.: low density; 9.9.: restricted range.
5. 10.1.: recreation/tourism.

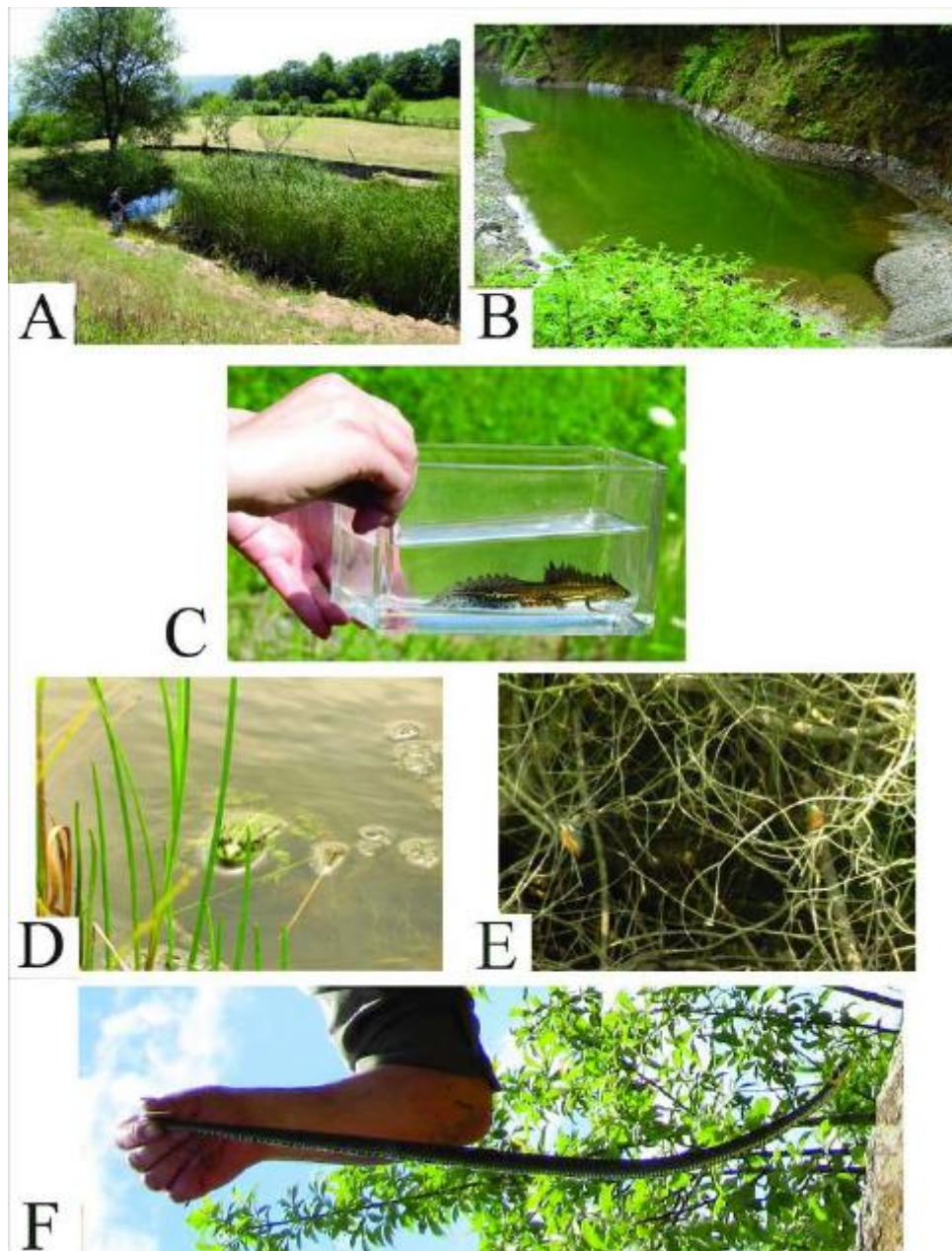


Figure 8. Major threats of *Ommatotriton ophryticus*

A- Overgrowing by reeds; B- shoaling of pond; C- pet trade; predators: D – *Pelophylax ridibundus*; E – *Alcedo atthis* ; F - *Natrix natrix*

Breeding activity

Using capacities above mentioned, the following activities of breeding of newt were carried out:

- 5 adult pairs of *Ommatotriton ophryticus* for formation of laboratory (*ex-situ*) populations were collected in 2016 at the beginning of summer (Fig. 2. A-D). Due to rather late beginning of work newts found in the field were already nearly finished reproduction activity; only few individuals with eggs were taken and delivered to the lab. The eggs were incubated in the lab (Fig. 3 A) and 15 larvae were hatched. Restricted time didn't allow to create good enough conditions for adults in vivarium, so, individuals collected and larvae incubated were released to suitable biotopes after short-time housing in the lab (until increasing of water temperature to 25 C° when newts begun leaving water).
- Now conditions in vivarium are quite satisfactory and continuation of our experiments was done in May 2017. The breeding season takes place in May. Females lay eggs, which are singly attached to aquatic vegetation or on stones in the aqua-terrarium. Embryogenesis was lasted over 12 days.
- Newly born larvae after 2 -3 days were fed by cultures of *Artemia sp.* and *Daphnia magna*; larvae grown up were fed on chopped tubifex worms and live bloodworms.
- Now we are keeping larvae for further realizing.

Introduction activity

Over 30 adult and 20 two years old individuals of newt from populations living in inauspicious habitats (continuous shoaling of water-bodies, pollution, high density of main juveniles predator – *Pelophylax ridibundus*, etc.) were collected and re-placed into comfortable habitats newly revealed in Lori (2 localities) and Tavush (1 locality) provinces (Fig. 6). Over 10 youngest of newt, obtained from our laboratory population were re-placed into comfortable habitats newly revealed.

Proposed conservation measures.

Conservation measures are as follows:

- In the vicinities of: N. from Alaverdi town: control and prevention of possible pond' shoaling and eutrophication.
- In the vicinities of: Shamlugh village prevention of illegal collection for pet trade and disturbance of population during mass going out of the under yearling (in August-September).
- Prolongation of collection of juveniles and larvae of newt from the ponds with inauspicious conditions for further releasing into other appropriate water-bodies.
- Creation of State or Public/ Community based Protected Areas in the localities with rather good conditions and/or high abundance of newt in the vicinities of: Shamlugh vil., NE from Alaverdi tw. E from Tashir tw. and Enokavan vil. populations).
- Re-introduction of youngest of newt in the vicinities of: N of Alaverdi tw. Teghut vill., N of the Tashir tw., S of Kayan vil.

During our surveys 4 localities were mapped and proposed for creation of PAs (see maps in Fig. 9).

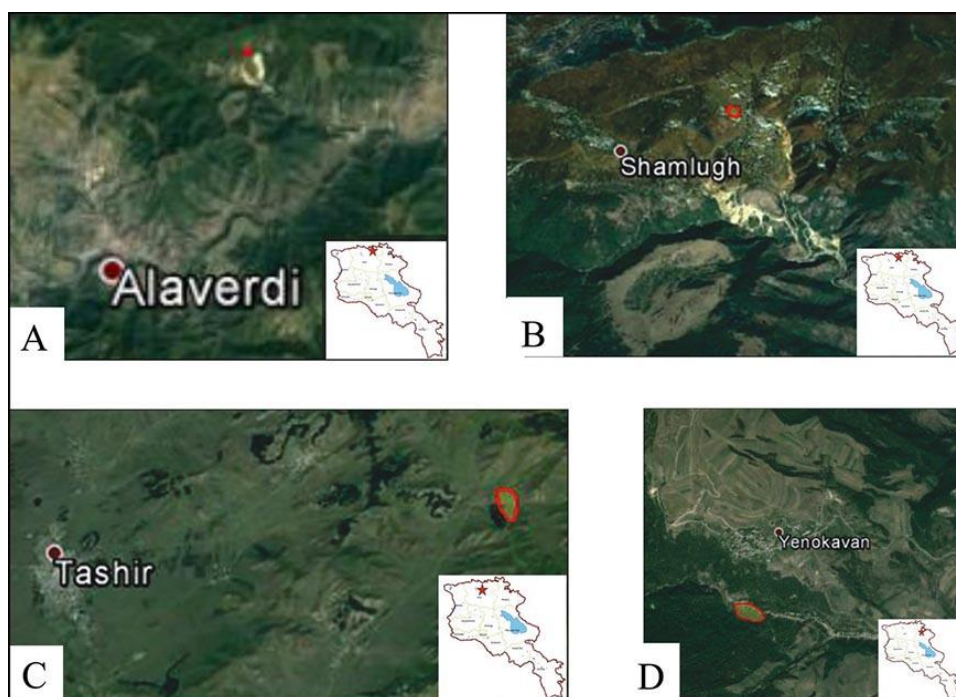


Figure 9. Proposed to creation of State or Public/ Community based Protected Areas in the vicinities of:
A- N from Alaverdi town, **B-** Shamlugh vil., **C** - E from Tashir town and **D** – Enokavan vil.

Eastern Spadefoot – *Pelobates syriacus*, Boetter, 1889

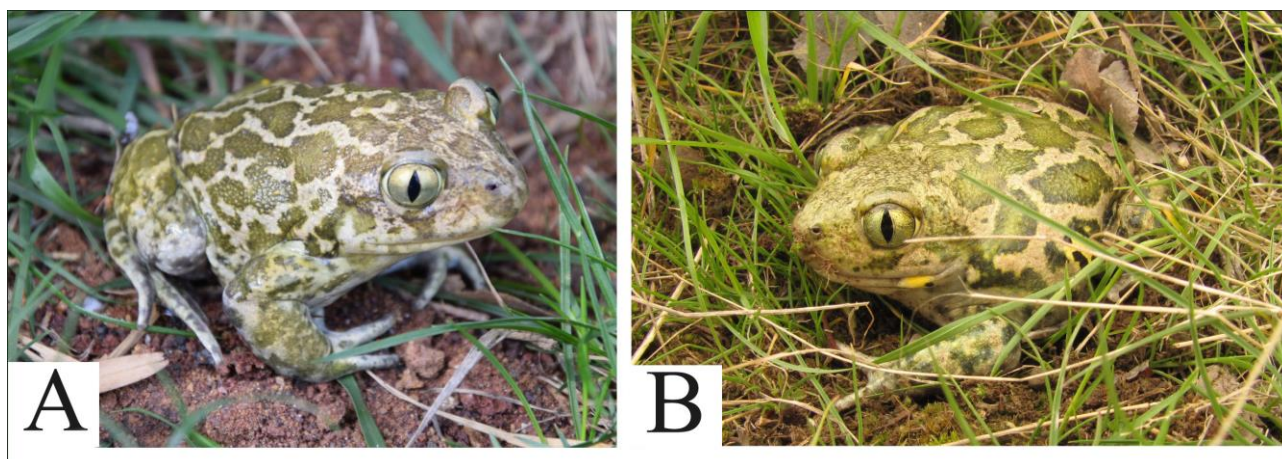


Figure 10. *Pelobates syriacus*, A- male; **B** - female

Habitats surveyed

During reporting period were surveyed numerous localities in Kotayk, Armavir, Ararat and Vayots Dzor Provinces both revealed in the framework of previous project as well as several newly revealed habitats, suitable for spadefoot survival both inhabited (localities) and not inhabited (see map in Figs.: 1.C-D; 11.A-B). This activity covered major part of known range of spadefoot in Armenia. Surveys were carried out in Hrazdan, Azat, Kasah, Arpa, Araks rivers' basins. In total 15 localities were surveyed. Among these: 8 - were inhabited by spadefoot (including those, where conditions were unsuitable), 6 - were more or less suitable for spadefoot both inhabit and not inhabited yet; 4 - not suitable for further introduction.

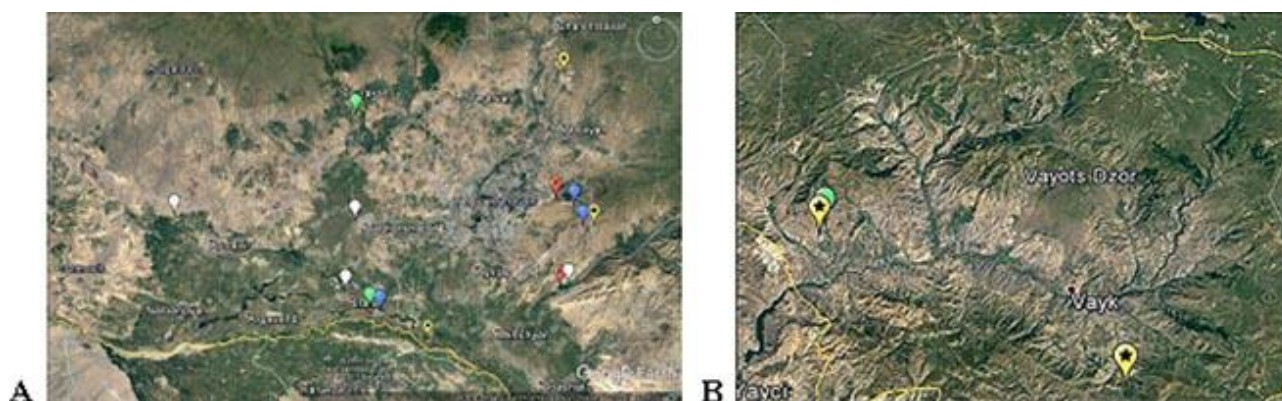


Figure 11 Surveyed habitats of *Pelobates syriacus*. **A**- Armavir, Ararat, Kotayk, Aragatsotn; **B** – Vayots Dzor Provinces.

White place mark indicates the absence of a spadefoot in a present locality; green - spadefoot lives there and conditions are less good; yellow - spadefoot lives there but conditions are bad; blue - spadefoot was released by us; red - spadefoot will be released in the future.

Observations of the season 2016 were shown that abundance of spadefoot was lower in comparison with data collected in 2013-2014. Abundance of adults was assessed in breeding season (in May) by accounting from twilight and through the night. Near Ranchpar village were observed 2 individuals per night. Nearly the same data was registered in the vicinities of Geghadir to Hatsavan villages (1-2 individuals). As to tadpole's abundance, we observe over 100 individuals in small pond near Jervezh village (Kotayk Province), which is shoaled and overgrowing by reeds in May. This can be explained by unusual weather conditions during that period. A lot of tadpoles were observed in the vicinities of N from Chiva village (Vayots Dzor Province) only. In spring 2017 abundance of spadefoot was rather high (over 6 individuals per night in one of localities of Armavir Province). Spadefoots were registered in several sites (in Armavir, Ararat, Kotayk, Vayots Dzor Provinces) surveyed.

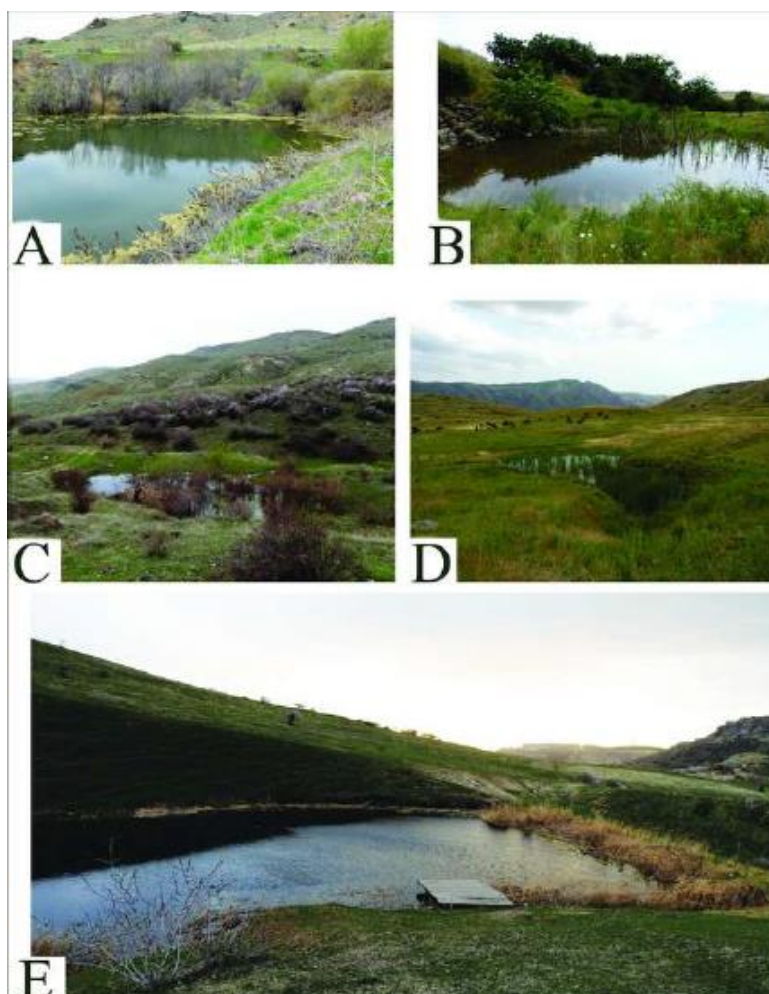


Figure 12. Surveyed habitats of *Pelobates syriacus* in Kotayk and Vayots Dzor Provinces.

A – inhabited pond with suitable conditions in the vicinities of N from Chiva vil. (Vayots Dzor pr.); B –pond with suitable conditions in the vicinities of Geghadir vil. (Kotayk Pr., introduction was carried out); C- pond in the vicinities of Voghjaberd vil. (Kotayk Pr., inhabited, good conditions, introduction was done); D - pond in the S from Geghadir vil (Kotayk Pr., inhabited, not suitable conditions); E - pond in the vicinities of NE from Yerevan tow. (Kotayk Pr., good conditions, for future introduction).

Assessment of environmental conditions

Distribution of Eastern spadefoot is scatter and local in Armenia.

During surveys were revealed that all of the habitats were more or less threatened and all the localities of species occurrence are under strong anthropogenic pressure. Majority of them are situated near or even inside of settlements, most of water bodies are stocked by fish sometimes including spadefoot tadpoles' predator species. Permanent pollution of water by agricultural and domestic sewage is threatening the tadpoles. Besides in all water bodies comfortable for breeding and larval development was registered high abundance of *Pelophylax ridibundus* which is hunting tadpoles of early stages, *Natrix natrix*, *Natrix tessellata*, *Mauremys caspica* and somewhere *Leuciscus* sp. etc. Being situated in arid and semi-arid landscapes majority of breeding water bodies are under the threat of drying. The coastal part of several water bodies is polluted by household and agricultural garbage (see Fig. 13). Somewhere spadefoots are the object of pet trade.

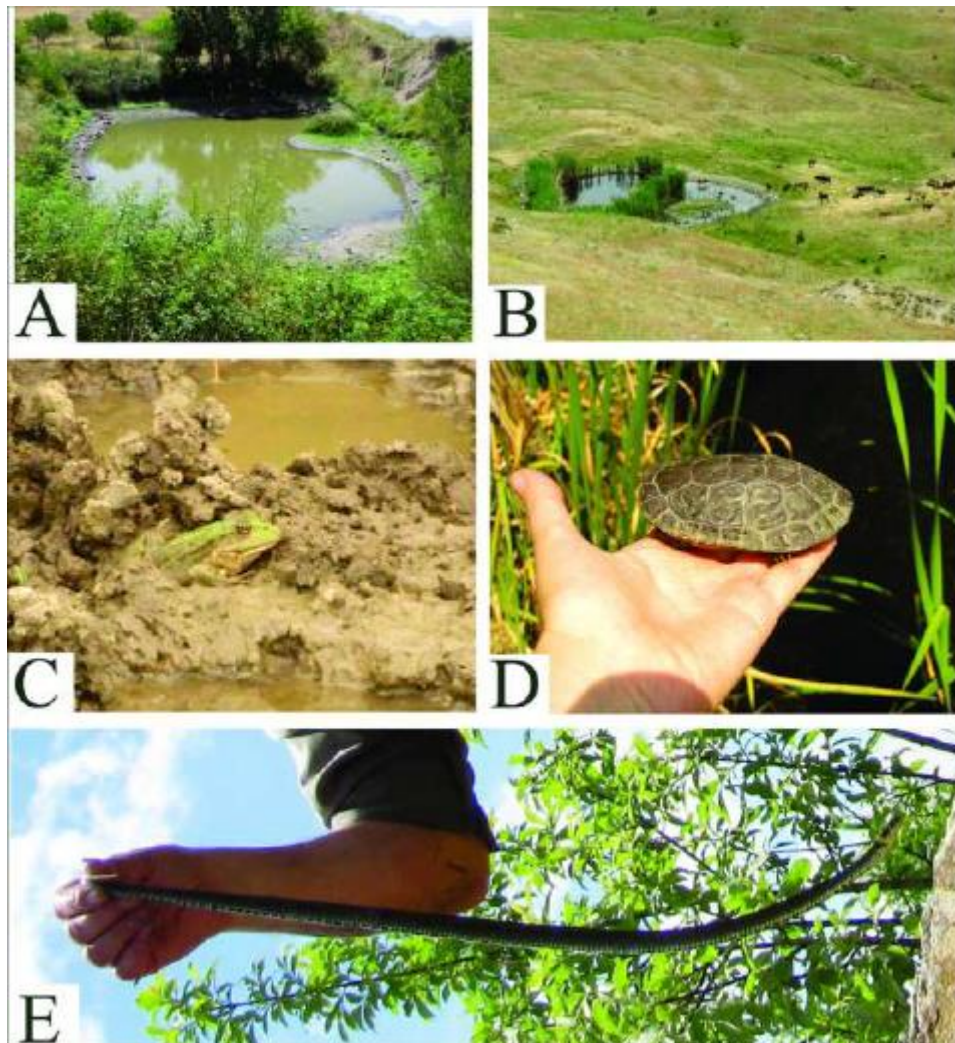


Figure 13. Major threats of *Pelobates syriacus*

A- Shoaling of pond; B - cattle grazing and overgrowing by reeds; predators: C- *Pelophylax ridibundus*; D – *Mauremys caspica*; E – *Natrix natrix*

Major threats

1. 1.1.1.2.: small – holder farming, 1.1.7.: freshwater aquaculture; 1.3.6.: groundwater extraction; 1.4.2.: human settlement; 1.4.4.: transport – land;
2. 2.2.: predators (fishes, amphibians (adults of *Phelophylax ridibundus*), snakes, water tortoises);
3. 6.2.1.: agricultural; 6.2.2.: domestic; 6.3.1.: agricultural; 6.3.2.: domestic; 6.3.8.: sewage; 6.3.9.: solid waste;
4. 9.3.: high juvenile mortality (especially tadpoles); 9.9.: restricted range.

Breeding activity

Using capacities above mentioned, the following activities of breeding of spadefoot were carried out:

- Tadpoles of spadefoot of late stages of development were taken and delivered to the lab during project implementation period. They were incubated in the lab (Fig. 3 B) before finishing development and metamorphosis and then they were re-placed into comfortable habitats (Fig. 12 see in appendix 1).
- Larval development lasted over 76 days.

- Tadpoles were feed by dry food for herbivorous fish, dry and crushed egg` yolk, scalded, crushed nettle (*Utrica* L.); larvae grown up were feed by crushed Heart of cattle and dry food for herbivorous fish, crushed egg` yolk.

Introduction activity

Eight of adults and 25 juveniles of spadefoot from populations living in inauspicious habitats were collected and re-placed into comfortable habitats in Kotayk (2 localities) and Armavir (1 locality) Provinces. Over 18 youngest of spadefoot, growth in our laboratory were re-placed into comfortable habitats in Kotayk Province (Fig. 11, A-B).

Proposed conservation measures.

Conservation measures are as follows:

- In the vicinities of: Jerveszh, Geghadir, Ranchpar villages: control and prevention of possible pond` draying and overgrowth with reeds.
- Creation of State or Public/ Community based Protected Areas in the localities with rather good conditions and/or high abundance of spadefoot in the vicinities of: Jerveszh, Geghadir (Kotayk Province), Agarak (Aragatsotn Province) and Chiva (Vayots Dzor Province) villages.
- Prolongation of collection of tadpoles and juveniles of spadefoot from the ponds with in inauspicious conditions for further releasing into other appropriate water-bodies.

During our surveys 4 localities were mapped and proposed for creation of PAs (see maps in Fig. 14)

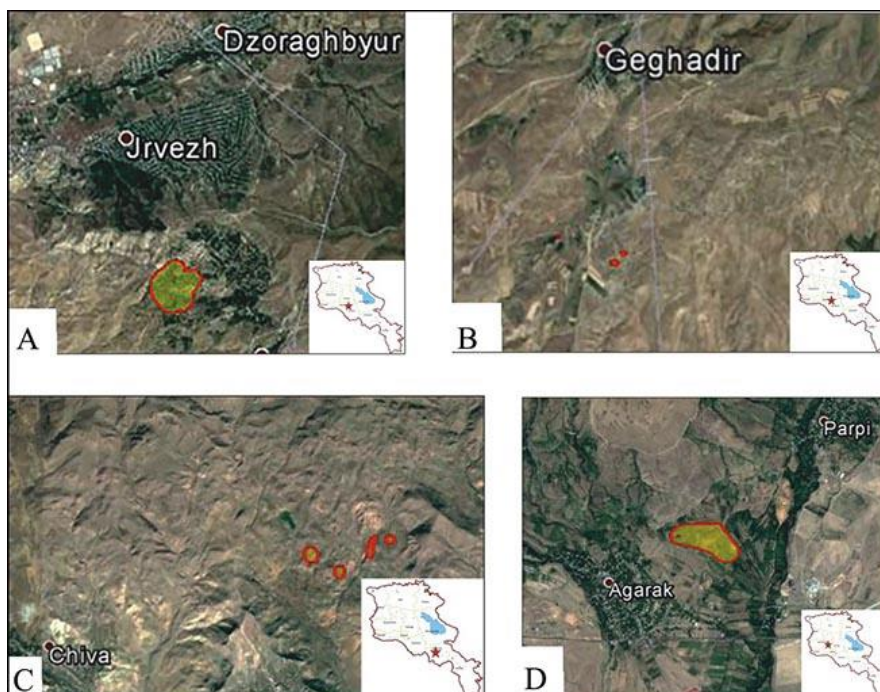


Figure 14. Proposed to creation of State or Public/ Community based Protected Areas in the vicinities of: **A-** Jerveszh, **B-** Geghadir, **C** - Agarak and **D** - Chiva villages.

PUBLIC AWARENESS RISING ISSUES

This program was carried out during **September - November 2016, and January-May 2017**. The following activities were carried out:

1. The lectures on following themes: "Red Book amphibian species of Armenia" "The features of behavior and breeding of the newt" and "The monitoring and conservation of Armenian Red Book amphibian species and their habitats" with preparation of slide-show and distribution of the informational materials (posters, calendars, inf. flyers) in Secondary and Higher schools of Ararat, Armavir, Yeghegnadzor, Alaverdi, Tashir, towns and Voghjaberd, Khanjyan, Noravan, Musaler, Gehanist, Voskeat, Armash, Sevak, Surenavan, Goravan, Haitag, Rind, Dsegh, Odzun, Teghut etc. villages of Kotayk, Ararat, Armavir, Vayots Dzor and Lori Provinces.
2. Meetings with authorities on following themes: "Red Book amphibian species of Armenia" and "The monitoring and conservation of Armenian Red Book amphibian species and their habitats" were conducted in Sevak, Rind, Surenavan, Goravan, Ararat, Haitag, Dsegh, Teghut villages, Yeghegnadzor, Vedi, Alaverd, Tashir and Yerevan towns (Ararat, Vayots Dzor, Armavir, Lori Provinces). Poster "The Red book amphibian species of Armenia", information flyers, and calendars presenting Red Book Armenian amphibians were distributed.
3. Meetings with some Headquarters of Armenian Protected Areas were conducted "Dilijan" National Park, Reserve-parks complex of the Ministry of Nature Protection of RA, "Djrzezh" recreational forest, "Idjevan" dendropark, etc.); the same information material was distributed.
4. Data obtained were presented to several Armenian NGOs, in particular to Armenian branch of WWF and to "Ecolur" NGO which is orientated to the dissemination of ecological information as a media structure.
5. The students were trained in both field and laboratory methods of Red Book Armenian amphibians' trapping, housing, breeding, etc. They got experience in presentation of conservation issues in the schools and local communities also.

Besides, students involved into implementation of the project were participated in data analysis, manuscript preparation and will participate in presentation of data in Conferences (e.g., International Conference "Biological diversity and conservation problems of the fauna of the Caucasus-3" to be held in Yerevan, Armenia on 26-29 September, 2017), getting capacities of preparation and presentation of scientific data.



Figure 15. Poster (the title in Armenian is “The Red book amphibian species of Armenia”) and **Calendars 2017: *Ommatotriton ophryticus* and *Pelobates syriacus***



Figure 16. Lecturing and distribution of illustrative material among school and authorities of different villages of 6 Provinces of Armenia.

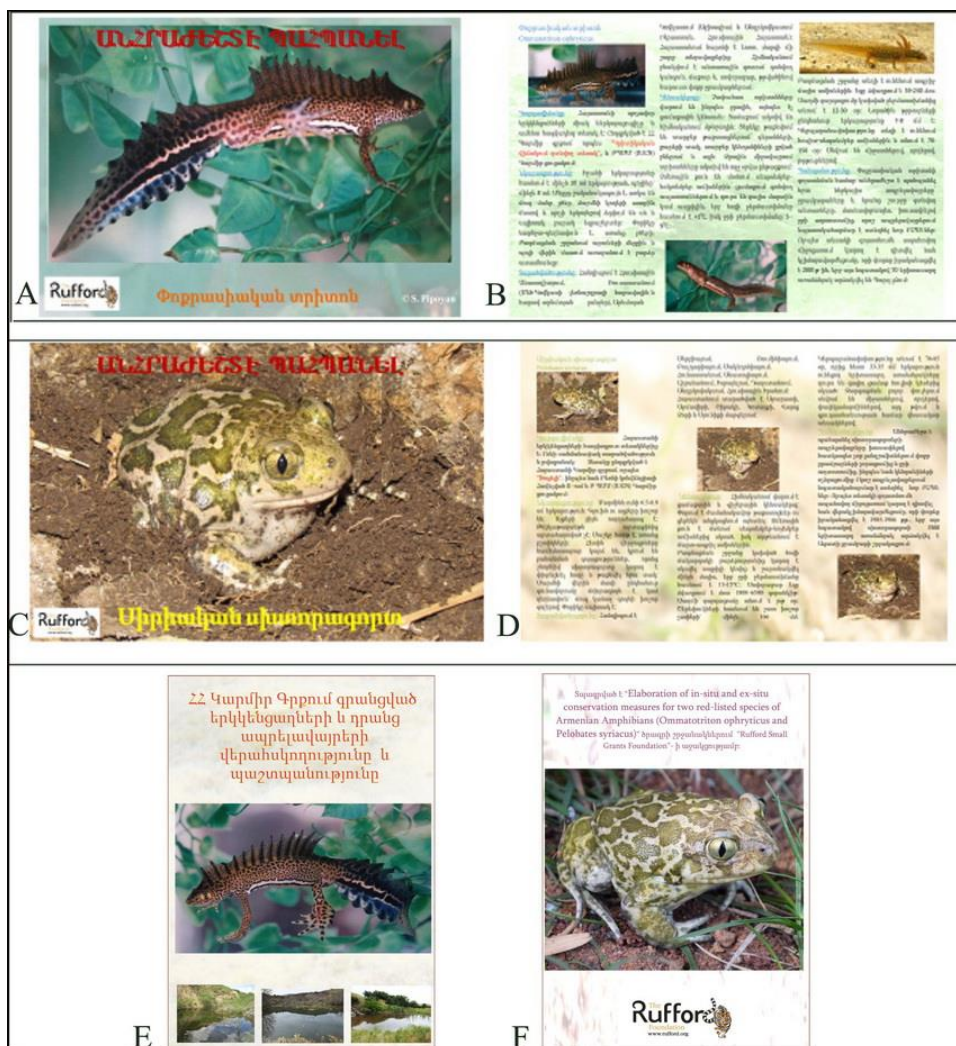


Figure 17. Flyers (A-D) and didactic brochure cover (*Ommatotriton ophryticus*) and back (*Pelobates syriacus*) pages (E - F): A- B *Ommatotriton ophryticus*; C - D - *Pelobates syriacus*; the tattle of the didactic brochure in Armenian is: "The monitoring and conservation of Armenian Red Book amphibian species and their habitats".

Achieved outcomes

1. Current control of the condition of known populations and habitats of the mentioned species were carried out, rather undisturbed habitats were selected;
2. Habitats suitable for 2 species survival but not inhabited yet were revealed;
3. Pilot experiments of re-introduction and introduction of newt from laboratory' population to the habitats above mentioned were carried out;
4. Mostly degraded and polluted habitats of target species which are under immediate threat of destruction were revealed and re-placement of animals to rather undisturbed localities was carried out;
5. Adaption to our conditions methodology of breeding of newt in *ex-situ* conditions, and starting to creation sustainable laboratory populations of newt were done;
6. Experiments on growing of spadefoot' tadpoles *ex-situ* were carried out;
7. New previously unknown populations of both target species were revealed, conditions of their populations and habitats were estimated and database is supplemented;
8. Draft recommendations for conservation measures of *Ommatotriton ophryticus* and *Pelobates syriacus* in Armenia, including planning of new EPNA-s were elaborated and submitted to the stakeholders, including Ministry of Nature Protection of RA

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