# PRENJENSIS Conservation Project

## Mid Term Report

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## Field analyzes and data collection

Field analyzes are divided in two types:

(a) Distribution analyzes – imply conducting field investigations on mountains that are potentially suitable for *prenjensis* in order to try to confirm the presence of the subspecies in other localitites, thus expanding known knoledge of scarse subspecies distribution.

(b) Field analyzes for collecting biological data – imply visits to already confirmed locations in order to collect as much data as possible necessary for setting up an efficient regional conservation plan

### *(a) Distribution analyzes*

Distribution analyzes have been conducted extensivly in Bosnia and Hercegovina (B&H) on the mountains **Treskavica** and **Maglić** for the past several years (Fig 1). Besides these mountains, through the second Rufford we additionaly investigated **Mt. Cincar** (Fig 1) as potential locality for *prenjensis* occurence acting as a possible link between Croatian and B&H populations. Mt. Cincar is reported by Stanković (2014) as a *prenjensis* locality, but these data are doubtful. During our field investigations in this area we concluded that the habitat is in general not suitable for the (sub)species and we suspect that data reported by Stanković (2014) are confused with the presence of *Ichtyosaura alpestris*, a common species inhabiting Cincar area and resembling the morphology of *prenjensis* (no picture of the finding were given by Stanković). Information of potential presence on Cincar mountain were additonally collected by interviewing local community and active mountaineers of „Cincar" mountaineering society (mr. Anđelko Kelava). None of the interviewed people reported presence of *prenjensis*. Given the presented facts, we are confident that Mt. Cincar is not inhabited by *prenjensis*.
Although existing data (Šunje, 2011; Beukema, 2010 – personal communicaiton; Džukić, 2004; Werner, 1895) suggest that Mts. Trskavica and Maglić are suitable habitats for the subspecies, we didn t manage to confirm its presence there (Tab 1). Additionally, we interviewed local community and two hunters regularly hunting wild animals in early dawn on mt. Treskavica on high altitudes; neither the local community people, neither the hunters have ever seen *prenjensis* on Treskavica during their 15 years of hunting experience. Its existence on Mt. Treskavica is only reported once by Werner (6.9.1895) and published by Bolkay (1924). Since then, no data for its occurence for this mountain were given. Samples collected by Werner can be still found in the National History Museum of Sarajevo. A potential extinction from this mountain can be speculated, although we are determined to persistently continue to solve the *prenjensis* misterious case of Mt. Treskavica: Percentages of covered area by field work (total potential area of occurence substracted with mine field area) will be provided in the next report.
Although planed, the field activities on Mt. **Visočica** were not perfomed beacuse the priority was given to field work for collecting biological data (b) since activity of animals is very short. Additionally, extensive interviews and discussion with experienced mountaineers suggested lack of *prenjnesis* on Visočica. Mt. Maglić and Mt. Visočica (Fig 1) occupy small areas and have slightly different geological foundation and climate characteristics compared to Mts. Prenj and Čvrsnica were the subspecies occurs. The explanation of not finding populations on these mountians could be discussed by these facts, but additional information are still beeing collected.
In conclusion, the lack of detecting new populations on more mountains in B&H, proves the extreme fragmented distribution of *Salamandra atra prenjensis* Mikšić, 1969, and its vulnerability compared to alpine populations of the same species (ssp. *Salamandra atra atra* Laurenti, 1768).

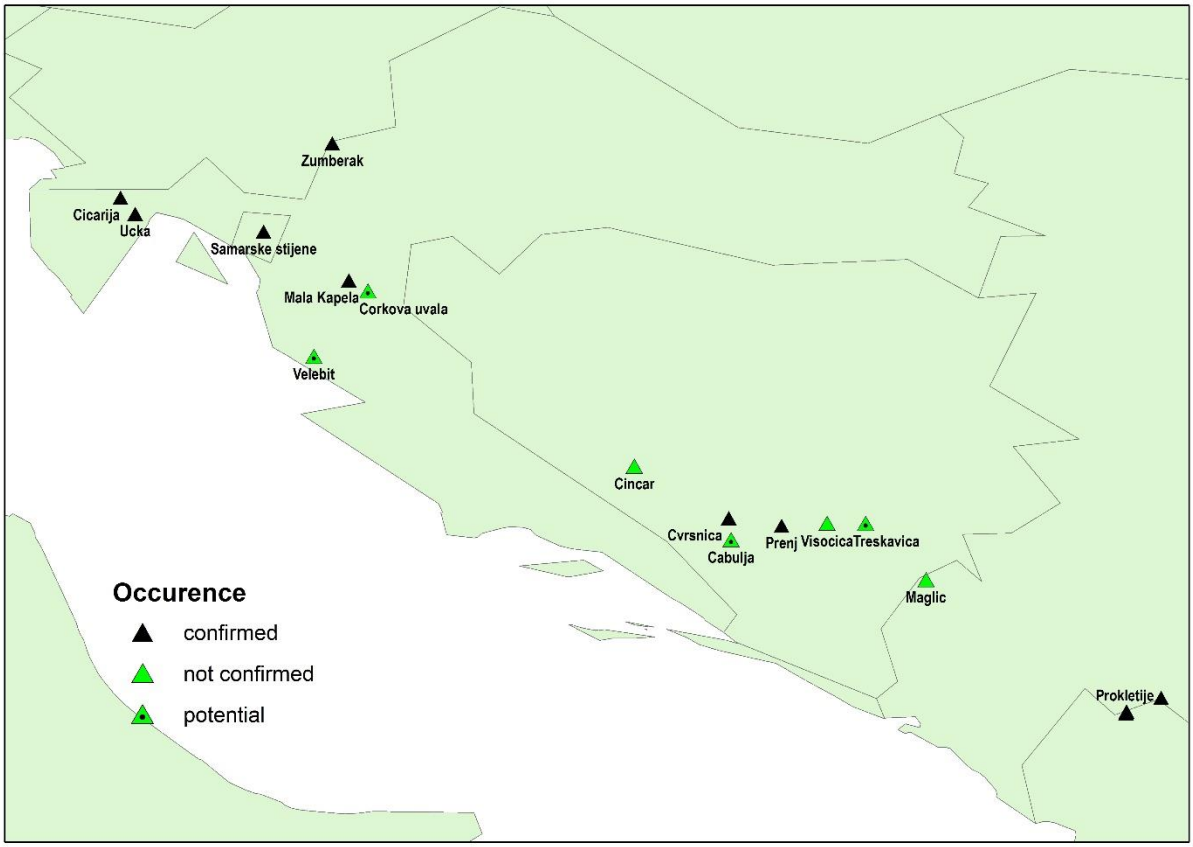


*Fig. 1 – Distribution of Salamandra atra prenjensis is extremely fragmented (Croatia, Bosnia and Herzegovina, and Prokletije mountains located in the borders between Montenegro, Kosovo/Serbia, Albania). Confirmed locations are the once that have been confirmed in the past 20 years trough field work. Potential locations are found in literature/or are geographically close to already confirmed locations. Not confirmed localities are the once that represent links between known patches of distribution and might have suitable habitat for prenjensis occurence*

## *(b) Field analyzes for collecting biological data*

Field analyzes for collecting biological data were constantly conduceted during the whole activity season of *prenjensis* (June – October 2015) in both: Bosnia & Herzegovina and Croatia (in collaboration with herpetological society: HYLA) – Tab 1 . This season we also started first monitoring actitvties of known populations on Mts. Prenj and Čvrsnica (B&H) and new populations of Samarske (and Bijele stijene) in Croatia in Gorski Kotar area – Fig. 1. Besides monitoring activities, we collected thermal ecology data and feeding preferences data (flushing stomachs of salamanders). We managed to collect three (3) pregnant females in B&H which are beeing currently observed in BHHU: ATRA facilities. So far it is believed that pregannt females give birth to two cubs by default (investigations were only made on Alpine populations). Dinaric individuals, inhabiting harsher conditions showed that pregnant females give birth to only one cub, (First Rufford project report). The generation estiamtes are very important for conservation planing, thus, is in our interest to understand the complex reproductive fitness of Dinaric populations.

*Tab 1 – Details of field work activities performed during active season of prenjensis in 2015*

| Date of field work (2015) | Country / Location (Mt.) | Participants | Aim | Annotation |
|---|---|---|---|---|
| 25. – 27. 06. | B&H – Mt. Treskavica | Emina Šunje<br>Irhad Hadžiabdić<br>Nadir Abaza | Field investigations – type a: Distribution analyzes | 50km of trail passed – not succesfull in terms of confirming *prenjensis* presence |
| 28.06 – 02.07 | Samarske stijene – Gorski Kotar - Croatia | Emina Šunje<br>Nadir Abaza<br>Katarina Koller (CRO)<br>Ivan Pavliša (CRO) | Field investigations – type a and b: Distribution analyzes | We confirmed presence of two populations in area of Samarske stijene and path towards Bijele stijene; collection of thermal ecology data |
| 12.07-14.07 | Prenj | Šunje Emina<br>Saudin Merdan<br>Maja Hodžić<br>Berina Vrhovac | Field investigations – type b: Collecting biological data | First monitoring activities on Podotiš and Zakantar locations; thermal ecology; feeding ecology; reproductive analyzes |
| 19.07- 21.07 | Čvrsnica | Šunje Emina<br>Adnana Zimić<br>Irhad Hadžiabdić<br>Himzo Sinanagić | Field investigations – type b: Collecting biological data | First monitoring activities on Pločno and Ledeno jezero locations; thermal ecology; feeding ecology; |
| 23.07- 25.07 | Samarske stijene – Gorski Kotar - Croatia | Katarina Koller<br>Ivan Pavliša | Field investigations – type b: Collecting biological data | monitoring activities on Samarske and Bijele stijene locations; thermal ecology; morphometrics |
| 19. – 20.07 | Cincar | Šunje Amila<br>Šunje Alma<br>Nermina Spahija | Field investigations – type a: Distribution analyzes | 30km of trail passed – not succesfull in terms of confirming *prenjensis* presence |
| 26. – 28.07 | Maglić | Saudin Merdan<br>Berina Vrhovac<br>Tajna Klisura | Field investigations – type a: Distribution analyzes | 20km of trail passed – not succesfull in terms of confirming *prenjensis* presence |
| 02. – 04.08 | Čvrsnica | Saudin Merdan<br>Haris Šukman | Field investigations – type b: Collecting biological data | monitoring activities on Pločno and Ledeno jezero locations; thermal ecology; feeding ecology; reproductive analyzes |
| **Date of field work (2015)** | **Country / Location (Mt.)** | **Participants** | **Aim** | **Annotation** |

| | | | | |
|---|---|---|---|---|
| 08. – 10.08 | Prenj | Amila Šunje<br>Adnan Zimić<br>Haris Šukman | Field investigations – type b: Collecting biological data | monitoring activities on Podotiš and Zakantar locations; thermal ecology; feeding ecology; reproductive analyzes |
| 08 – 10.08 | Maglić | Saudin Merdan<br>Vanja Lazić | *S. atra prenjensis*<br>Field investigations – type a: Distribution analyzes | 25km of trail passed – not succesfull in terms of confirming *prenjensis* presence |
| 13.08.2015 | Samarske stijene – Gorski Kotar - Croatia | Katarina Koller<br>Ivan Pavliša | Field investigations – type b: Collecting biological data | monitoring activities on Samarske and Bijele stijene locations; thermal ecology; morphometrics |
| 25. – 26.08 | Treskavica - Treskač | Amila Šunje<br>Emina Šunje | *S. atra prenjensis*<br>Field investigations – type a: Distribution analyzes | 20km of trail passed – not succesfull in terms of confirming *prenjensis* presence |
| 05. - 07.09 | Prenj | Emina Šunje<br>Berina Vrhovac | Field investigations – type b: Collecting biological data | monitoring activities on Podotiš and Zakantar locations; thermal ecology; feeding ecology; |
| 12. - 13.09 | Čvrsnica | Amila Šunje<br>Irhad Hadžiabdić | Field investigations – type b: Collecting biological data | monitoring activities on Pločno; thermal ecology |
| 14. – 17.09 | Samarske stijene – Gorski Kotar - Croatia | Katarina Koller<br>Ivan Pavliša<br>Ana Stih | Field investigations – type b: Collecting biological data | monitoring activities on Samarske and Bijele stijene locations; thermal ecology; morphometrics |
| 25. – 26.09 | Bijele stijene – Gorski Kotar - Croatia | Katarina Koller<br>Ana Stih | Field investigations – type b: Collecting biological data | monitoring activities on Bijele stijene locations; thermal ecology; morphometrics |

**Promotion of the project within local communities**

Promotion of the project was done: (a) through design and distribution of promotional material; (b) through facebook page of BHHU: ATRA, and (c) through partecipation at the Research day event – „Noć istraživača".

**(a)** The designed promotional material are in form of:

- planners (60 pieces),
- leaflets (300 pieces), and
- t-shirts (30 pieces)

The very attractive planners for the year 2016, with the first few pages describing the (hi)story of *prenjensis* (Fig 2), were distributed to professors participating on this project and regional collaborators in Serbia, Croatia, Montenegro and Antwerp (chapter 3 & 4 of this report).
Promotional lectures for advertising the work of BHHU: ATRA were made in Sarajevo at several faculties: Faculty of Natural Sciences; Faculty of Veterinary studies; Faculty of Forestry, and Faculty of agriculture. In total, we managed to attract 20 new members to join us to work on this and other projects. Leaflets were mostly distributed during these promotional lectures. T-shirts representing the *prenjensis* were distributed to all active participants of the project (Tab 1/ participants).

**(b)** So far, promotional material and activities have been presented within the **facebook page (fb) of BHHU: ATRA** - https://www.facebook.com/BHHUATRA/photos_stream ; This fb page has been updated with new information related to field activities for prenjensis project conducted in 2015: https://www.facebook.com/media/set/?set=a.641015142596807.1073741830.631823713515950&type=3 . We are proud to mention that BHHU: ATRA started first activities for designing its offcial web page (www.bhhuatra.com). The purchase of theme and hosting and contact with the web designer are made. We expect releasing the web page in the year 2016.

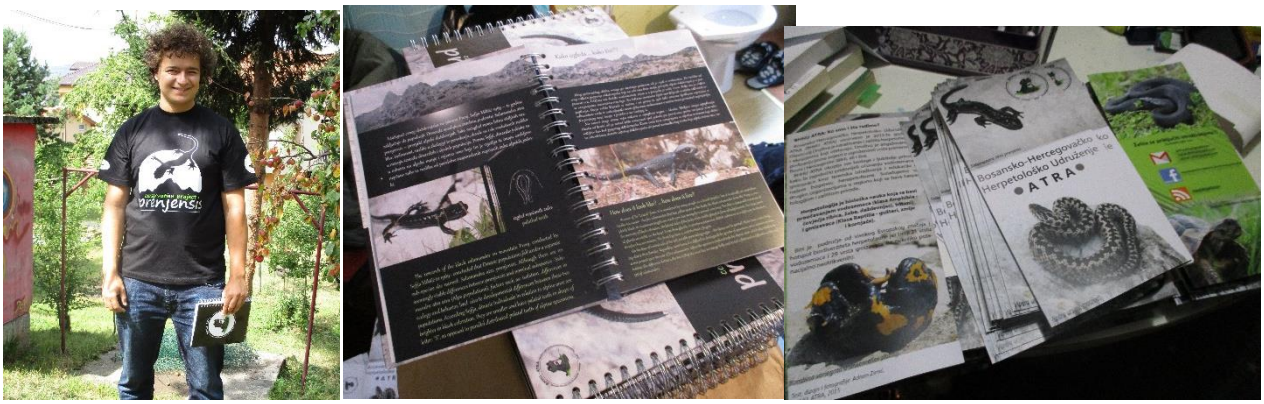


*Fig 2 : Promotional material: a) Adnan Zimić wearing prenjnesis t-shirt; b) the planner containing the story of prenjensis; c) leaflets promoting the work of the association (BHHU ATRA) highlighting the prenjensis project activities*

**(c) The research day – „Noć istraživača“** is a traditional event organized by several organizations of B&H, among which OXFAM association of Sarajevo contacted BHHU-ATRA to participate at this event by promoting activities realted to our work. The research day is a pubblic event for citizens of B&H which aims to „make closer“ the world of science to local communities.

The event was organized the 25.9.2015 and more then 300 citizens attended it. BHHU ATRA activly participated at the event with the exhibition named: „Upoznajte skriveni svijet vodozemaca i gmizavaca **– *Meet the secret worl of amphibians and reptiles***“- http://www.nocistrazivaca.ba/program/sarajevo .

During the exhibition we presented our work in several ways: (a) active interaction with childern - drawing and coloring pictures of amphibians and reptiles (b) a photographic and live exhibition of amphibians and reptiles that are beeing observed in the facilities of BHHU: ATRA (c) a presentation of the prenjnesis project to local communities

More then 300 citizens participated at this event and infromation and work of BHHU: ATRA reached at least 200 people. During this occasion we distributed more then 100 leaflets to interested citizens.


*Fig 3: Promotional activities within the Research day: a) stand of BHHU: ATRA with our volounteerers: Berina Vrhovac and Amela Džananović b) Berina Vrhovac presenting the „prenjensis project“ to interested audience c) working with childern d) Live exhibition of herpetofauna – sign guiding interested people to our stand. More picture of the event can be seen at: https://www.facebook.com/BHHUATRA/photos/pb.631823713515950.-2207520000.1450088834./1041646472533670/?type=3&theater*

## Educational actitivities

Educational activities were conducted through (a) lectures in B&H, Montenegro and Croatia, and (b) active participation on the first Balkan Herepetological Symposium.

**(a)** Lectures of half hour length highlighted the importance and special features of the *prenjensis* as an unique animal resource of the Dinaric Alps. We additionally addressed the importance for its conservation and needed steps for designing a regional conservation plan. Since desigining an efficient regional conservation plan requires gathering and analyzing data of all sort of infromation on the life of the prenjensis in each country of its areal separately, several bachelor thesis for students of Faculties of Natural Sciences in B&H and Montenegro are offered (Tab 2). During lectures in Podgorica and Sarajevo educational leaflets (Fig 2), were distributed to participants. Students from Faculty of Sarajevo had a second chance (First is reported in my first Rufford report, 2013) to listen to project activities planed within the second Rufford grant. We gathered new members and interested students to volonteer in BHHU-ATRA association. In Croatia, lectures were held to childern of age 11 and 12 years since we want to raise consciousness of the importance for biodiversity protection within the youngest once, as it is crucial for developing this important feeling within the upcoming generations.
By the end of the project realisation, we will organize lecturer also in Serbia were we also plan to promote the prenjensis project and hopefully have more students working on its case in area of Prokletije mountain at the border with Kosovo/Serbia (Fig 1).

*Tab 2. Datails on educational lectures held within the prenjensis conservation project. Nb. of part. – number of participants*

| Date of lecture (2015) | Institution were lecture was held | Lecturer | Addres of institution and contact person | Nb. of part. | Offered bachelor thesis |
|---|---|---|---|---|---|
| 18.11. | Faculty of Natural Sciences, Podgorica, Montenegro | Vernes Zagora, Bsc of Biology (herpetologist) | Cetinjski put bb 81 000 Podgorica, Montenegro. Contact: Mihailo Jovicevic - mihajov@gmail.com | 14 | Population ecology of *S. atra prenjnesis* in area of Prokletije mt. |
| 26.11. | Faculty of Natural Sciences, Sarajevo, Bosnia and Herzegovina – B&H | Adnan Zimić, Bsc of Biology (herpetologist) | Zmaja od Bosne 33-35, 71000 Sarajevo, B&H. Contact: suvadlelo@yahoo.com | 13 | Determination of age structure in populations of *S. atra prenjensis* in B&H<br><br>Reproductive fitness of *S. atra prenjensis* in B&H |
| 11.12. | Elementary school: Sesvetska Sopnica | Katarina Koller, Msc of Biology (herpetologist) | Sesvete, Šopnička 69, 10360 Zagreb , Croatia. Contact: Marina Petrić Horvatić, biology prof. | 30 | / |

*Fig. 3: Educational lectures in a) Podgorica - Montenegro; b) B&H - Sarajevo; c) Croatia - Zagreb*

**(b)** In the section of educational activities it is important to mention that the work done so far (supported also through first Rufford grant) was proudly presented at the FIRST BALKAN HERPETOLOGICAL SYMPOSIUM held within the 12. Croatian Biological Congress (18 – 23. 09. 2015) at Martin na Muri (Croatia). The topics presented are:

Oral presentation:
E. Šunje, D. Jelić, M. Müller, R. Škrijelj, V. Helfer (O-68) COMPARATIVE MORPHOLOGY OF Salamandra atra prenjensis (BOSNIA AND HERZEGOVINA) WITH ITS NOMINOTYPIC SUBSPECIES Salamandra atra atra (AUSTRIA)

P-56 – poster presentation:
E. Šunje, F. Pasmans, Z.Maksimović, A. Martel, M. Rifatbefović DETECTION OF CONTINUED ANNUAL MORTALITY IN THE VULNERABLE ALPINE SALAMANDER, Salamandra atra prenjensis (MIKŠIĆ, 1969) NOT ASSOCIATED WITH THE PRESENCE OF KNOWN AMPHIBIAN PATHOGENS

More information regarding the (program of the) symposium can be found at:
http://www.hbd-sbc.hr/wordpress/wp-content/uploads/2013/07/Program-12.-HBK.pdf
The presentation of the work through listed topics, attracted many interested herpetologist in Balkan area and help establishing strong network, especially with the team of Serbia. The above listed topics are expected to be published in form of scientific articles in the year 2016.

## Establishment of regional/international collaboration

Establishing regional collaboration is a crucial step for setting up a functional REGIONAL conservation plan for the protection of *prenjensis*. Through presented activities in the previous chapters of this report, we managed to establish sucessfull collaboration with:

1. **Faculty of Natural sciences in Podgorica** – Montenegro; Through the organization of educational lectures we managed to set up official agreement for conducting future necessary work on prenjensis population in area of Montenegro. Work will start in summer 2016.
2. **HYLA (Herpetological Association of Croatia)**; Collaboration was already established during first Rufford project and has been reinforced through field work activities that started in Croatia this year (Tab 1). Monitoring populations of Croatia and understanding their ecology , which very much differs from southern populations (Fig. 1 - B&H and Prokletije area), is mandatory for assesing the biological needs for maintaining stable and long term survivirship of *prenjensis* population along their entire areal of distribution (in the Dinaric Alps). Further work and monitoring activities will continue in summer 2016.
3. **Faculty of Natural Sciences in Belgrade – Serbia**; Collaboration was established on the Balkan Herpetological Symposium (see chapter 3 of report) during which the Serbian team (Dr. Ljiljana Tomović, Dr. Ana Ivanović, Dr. Aleksandar Urošević) showed big interest in working on *prenjensis* populations in area of Kosovo/Serbia. We are positive that concretisation of collaboration and set up of new research ideas will start from summer 2016.

International collaboration has been established with the University of Antwerp within the Department of Functional Morphology (FUNMORPH - Faculty of Biology). Thanks to Erasumus Mundus Join EU-SEE program, I obtained a scholarship of 9 months (October 2015 – June 2016) for analyzing collected biological data during prenjensis study for needs of my PhD dissertation. The overall PhD dissertation is a holistic study including five (5) different researches, out of which two (2) are currently being conducted in collaboration with the University of Antwerp:
**1) Quantification of thermal ecology of the species:** It has been predicted that species inhabiting so-called 'sky-islands' (such as *S. atra*) are most vulnerable to the consequences of global climate change (GCC). This part of research entails the measurement of: body temperatures, operative temperatures and physiological optima - all data that will be used to evaluate the impact of GCC on the survivorship of the species. Already collected data for this part of study are being analyzed in Antwerp under the supervision of prof. dr. Van Damme Raoul.
**2) Ecological niche modeling (ENM)** is a powerful tool that is widely used to predict potential areas of occurrence of species according collected ecological data. Abiotic and biotic factors collected during field work will be used for ENM analyzes, and aim to: (1) Define distribution patterns and potential area(s) of occurence; (2) Define environmental variables determining these patterns; (3) Define if, and how, biotic factors could act as limitations of distribution. The ENM analyzes are planed to be conducted during the second semester of my stay at the University of Antwerp.

Other researches part of my PhD dissertation will be conducted at the University of Sarajevo. These researches include: a) Comparative morphometrics of prenjensis with *S. atra atra* (data collected and analyzed through frist Rufford project – article in prep; see chapter 3 of report); b) Analyzes of feeding preferences (ongoing); c) Genetic structure and variability (part of study has been done during my Master thesis but will be furthermore analyzed from year 2016).

During my stay so far at the University of Antwerpen, the collaboration with my supervisor : Prof. Dr. Van Damme Raoul (FUNMORPH Department) has been reinforced and we agreed to collaborate on the research of prenjensis even after my scholarship has ended.

Two master thesis have been suggested to students of the University of Antwerepen:

a) Genetic divergence and diversity of Alpine salamander populations (more information): https://www.uantwerpen.be/en/rg/funmorph/education/student-projects/master-project-subje/alpine-salamander-ge/ )
b) Venom variation in Alpine salamander populations (more information at): https://www.uantwerpen.be/en/rg/funmorph/education/student-projects/master-project-subje/alpine-salamander-to/ )

Collection of data for the above presented master projects is going to be conducted during summer 2016 along the entire distribution areal of the prenjensis.
This international collaboration will certainly symplifying the impact of our studies in setting up the best conservation strategy for protecting salamander populations.

## Final word

The main goal of this extensive research is to get accepted the subspecies status of *Salamandra atra prenjensis* within scientific communities, since so far, its status is doubtful. By accepting the subspecies status, we are positive that the species could get transfered from Annex IV to Annex II of Habitat Directive which will reinforce its legal protection status.

Thank you Rufford Foundation for supporting this project. Without your help everything realized so far and everything planed to be realized, would never have been possible! I truly appreciate your interest and hope you are sattisfied in your investment concerning this research.