Second *Discoglossus nigriventer* rediscovery expedition
in the Central Bekaa Valley, Lebanon
17-28 April 2005 expedition report

Summary :

From April 18th to 27th a second international expedition was led in the Central Bekaa, Lebanon, in order to research the expected *Discoglossus nigriventer*.
Field work involved 10 people, including 5 experienced herpetologists of 3 nationalities; 80 hours in the field produced more than 150 data on 76 sites.

5 species of amphibians have been identified during this expedition : *Salamandra infraimmaculata, Rana bedriagae, Hyla savignyi, Bufo viridis and Pelobates syriacus.*
P. syriacus reproduction was recorded at two distant localities, bringing first and second evidence of the species occurence in Lebanon. Possible occurrence of *Bufo bufo* and of another unidentified *Rana (Pelophylax) sp* species is also documented.

No evidence of any *Discoglossus* was found during the expedition, but improvements on the Lebanese amphibians biology understanding seems to indicate that breeding of this supposed terrestrial species may occur much earlier in the year.

For first time A Rocha Lebanon, the American University of Beirut and the Université du Liban have been closely working together; both for field research and to develop a shared strategy for further amphibian and *Discoglossus* research in Lebanon.

Content :

Introduction

The Bekaa valley, in the South East Lebanon used to be a major wetland in the Middle East but agricultural and urban development led to dramatic shrinkage of natural and semi-natural habitats. The main remaining fragment is the Aammiq marsh (300 ha), a wetland of international importance, recorded under the Ramsar convention. Since 1997, A Rocha Lebanon is undertaking scientific research and practical conservation on site with very valuable results.

In April 2000, Colin Beale, scientific officer for A Rocha Lebanon, found a distinctive frog that he referred as a *Discoglossus* (Appendix 1). However no *Discoglossus* had ever been reported from Lebanon, and the only one known from the Middle East, *D. nigriventer*, had been seen only twice in the Hula valley, Israel, and is considered to be extinct since 1955 (IUCN Red List).

In April 2004, A Rocha initiated a first amphibian survey, carried out by François Tron and Rémi Duguet. Four amphibian species were documented but no clear evidence of any *Discoglossus* was reported.

From April 17th to 28th, a second international amphibian expedition was led in the Central Bekaa, Lebanon, in order to further research the expected *Discoglossus nigriventer*. A partnership was developed between A Rocha, the American University of Beirut and the Université du Liban in order to coordinate field work and share experience on amphibian survey and identification.
Emphasize was put in tadpole identification ; areas farther afield were also surveyed, including the Hasbani valley, that directly flows into the Hula valley.

This project was supported by :
The Threatened Species Fund (Conservation International)
The MedWetCoast initiative, a GEF program.

1 - Expedition objectives

The objectives below are directly transcripted from the project proposal.

1 – Field research for *Discoglossus* rediscovery in the Bekaa valley

- Look for adults at night
- Look for tadpoles during the day
- Put forward a reward for a local person who brings in a live specimen
- Assess taxonomic status on external characteristics
- Record data on locations, habitats and population size.

2 - Training local staff on herpetology

- A Rocha Lebanon team members (both scientific & education) will be invited to take part in the field research and trained in amphibian identification (eggs, tadpoles, adults).
- Local estate guards will also take part in the field research.

3 - Building a strategy for an holistic approach to the species conservation

- Evaluate status and threats (population range and size ; habitats and their dynamics) to the *Discoglossus*.
- Make recommendations to include the conservation requirements of the species within the Aammiq nature reserve management plan.
- Evaluate needs and opportunities for further surveys, autecological research, specific habitat and population management, and partnerships.
- Establish links with potential partner organizations (funding agencies, universities, Ministry of Environment, other NGOs).

4 - Publication of results

- Propose a major article to the journal *Copeia* (in which *D. nigriventer* has first been described).
- Propose secondary articles (or press release) in Medwet News (from the main Mediterranean conservation body) and any other relevant publications in Lebanon, France and elsewhere in Europe.
- A Rocha website will be updated with new findings.

2 - Materials and methods

2.1 - Partnership and staff

This expedition is a joint initiative A Rocha Lebanon/A Rocha France led by Chris Naylor (ARL – overall coordination) & Francois Tron (ARF - project & scientific coordination).
A partnership was developed with the American University of Beirut and the Skaff family; staff included:

François Tron : Scientific officer – A Rocha France
Colin Conroy : Scientific officer – A Rocha Lebanon
Vincent Fradet : MSc student, EPHE – laboratoire de Biogéographie et Ecologie des Vertébrés, Montpellier II.
Alan Preece : A Rocha volunteer
Riyad Sadek : Lecturer –Researcher - American University of Beirut
Souad Hraoui-Bloquet : Lecturer – Researcher - Université du Liban
Faysal Halabi : Assistant - Skaff estate guard
Imad Issa : Assistant – American University of Beirut
Sophie Tron : A Rocha volunteer
Rich Prior : Scientific officer – A Rocha Lebanon

2.2 - Study area

In South East Lebanon, the Bekaa valley lies North-South, at an average altitude of 850 m. The Jebel Barouk and the Anti Lebanon ranges of mountains border on its West and East side respectively, forming an impressive corridor whose both sides reaches an altitude of up to 2200 m.
Lowlands are almost completely drained for agriculture (wheat, potatoes, vegetables, hay and pasture meadows). Water is pumped from ditches, excavated pools or even bores for irrigating the crops. Farming involves tractors for earth plowing and pulling materiel, but handworkers achieve important tasks. Fertilizers and pesticides use does not involve high tech equipment; therefore human and environmental damages are expected to be important.

Rivers are embanked and natural and semi-natural habitats are scarce; the Aammiq marsh (ca 300 ha) being the main fragment. Wetland shrinkage led to regular flooding problems.
Herds of 300-500 sheep and goats graze the lower slopes, and also the wet meadows by the marsh creating very open, short grass habitats.

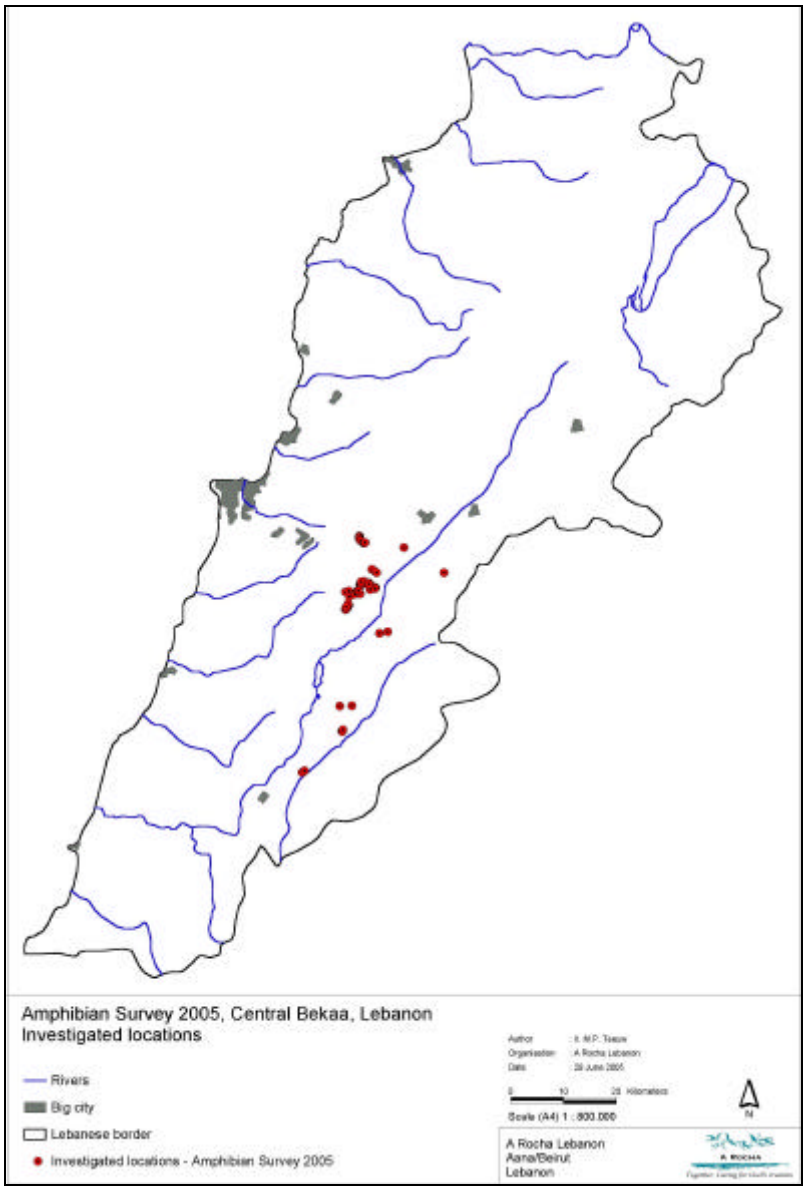
Higher elevated areas comprise extensive oak forests and “alpine” meadows, whilst the upper parts of the mountains (above 1700 m) are mostly barred. Many ponds have been excavated around villages to provide water for local herds; they are supplied by spring or rainfall water.

As the ecology of *Discoglossus nigriventer* is not known, all the different habitats were surveyed:

- marsh sides
- ponds by the marsh
- ponds by villages
- ditches
- springs
- small streams
- rivers

The expedition focused on the surroundings of the Aammiq marsh but many sites across the Bekaa and the Hasbani valleys were also surveyed. The conservation situation in this last area seems better, probably because of insecurity for over 30 years and less arable grounds. The vicinity of Mount Hermon (2800 m) provides numerous small water bodies and streams that make the area very attractive for amphibians.

As François Tron already surveyed the Aammiq marshes in April 2004, reconnaissance time was limited and survey started as soon as arriving on site. The provision of a 4x4 car by A Rocha Lebanon also facilitated transportation and surveys farther in the region. The A Rocha team on site, Faysal Halabi (guard on the Skaff estate) and Riyad Sadek also knew of a number of sites that were also included in the survey.



Map 1 : Localization of surveyed amphibian sites (red dots) in the Central Bekaa – April 2005

2.3 - Survey techniques and reporting system

In order to maximize chances to detect all amphibian species, of all stages, the following techniques were used:

- Survey calling adults at night
- Survey adults and juveniles at day and night
- Pond net for tadpoles
- Drag net for tadpoles in appropriate sites
- DAT recording for unusual calls & songs
- Examine all potential refugia (rubbish, stones, planks etc)
- Put forward a reward for a local person who brings in a live specimen of *Discoglossus*

Many surveyed sites were visited at day and night. Most sites locations were also recorded using a GPS and transferred into the GIS database of A Rocha Lebanon.

The appendix 4 presents the datasheet used for this expedition.

2.4 - Weather conditions

According to the A Rocha Lebanon team, the winter 2004-2005 was rather cold and rainy/snowy, especially in February, resulting in wet conditions at the Aammiq marsh.
An important rain occurred on the 2nd April and a minor one also on the 23rd April.
Temperatures were quite high, regularly between 10°C and 15°C at night, slightly warmer than during the 2004 expedition.

Therefore, weather conditions were very suitable both for amphibian activity during the survey and for breeding activity the fortnight before we arrived.

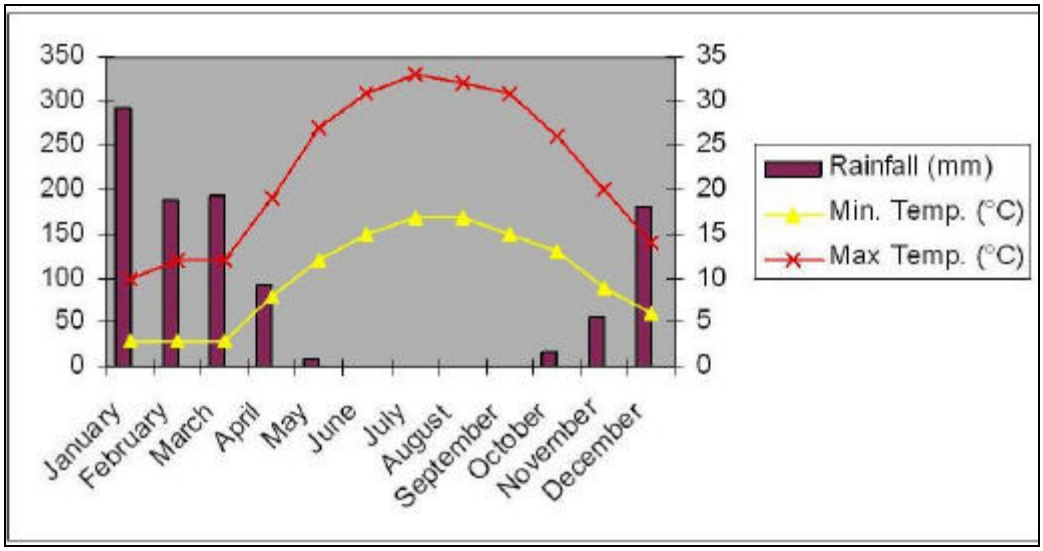


Fig 1 : Average temperature and rainfall in the Bekaa (provided by A Rocha Lebanon in March 2004).

3 - Results and Discussion

3.1 - Capacity building

Intensive field work and exchange of experience between all participants enabled a more comprehensive skill and knowledge base of each researcher.
A tadpole identification key was produced (Appendix 2), using pictures taken from specimens collected and released on sites during the expedition.

Colin Conroy and Rich Prior (Scientific officers - A Rocha Lebanon) and Faysal Halabi (Skaff estate guard) joined several times for the survey.
Colin Conroy was especially trained in order to be able to identify all amphibians, whether adults (when seen or heard) or tadpoles and clearly showed ability for proper identification. It is expected that he will also train Rich Prior so that the amphibian diversity of all sites surveyed across Lebanon by A Rocha can be assessed.

3.2 – About Discoglossus sp occurrence in the Central Bekaa

After two A Rocha expeditions in the Aammiq area without finding any *Discoglossus*, several alternatives present themselves:

1 – *Discoglossus* does not exit in Lebanon

Not finding the species after two years of intensive field work does not mean the species does not occur in Lebanon. Indeed absence (or disappearance) is very difficult to assess and needs intensive field work for several years.

As Colin Beale's observation seems reliable, this hypothesis sounds unlikely to be true.
One should also remind of the species' story in Israel : after its first record in 1940, *Discoglossus nigriventer* was looked for during 7 years without success. Only in 1955 was it found again when a farmer brought a specimen back to the university!
Thus, many herpetologists do consider its possible occurrence in Lebanon.

2 – *Discoglossus* has been overlooked at the surveyed sites in April 2004 & 2005

Intensive field work for two years would tend to think that *Discoglossus* did not occur on the surveyed sites during the expeditions field work. Considering that the species is very elusive with probably very low populations, this highlights the need of further research and active conservation measures, even in the Aammiq area.

3 – *Discoglossus* does not breed at the surveyed sites

Emphasis was put to survey all the different aquatic habitats in a wide area; however the suspected suitable habitats (lowland temporary ponds with little vegetation and good water quality) are very rare.

The discovery of *P. syriacus* in 2005 in the close neighborhood of Aammiq indicates that major findings can still happen, even in areas intensively surveyed. This highlights the need for an exhaustive census of all water bodies prior to field work.

4 – *Discoglossus* does not have tadpoles nor remain by water bodies in April

The 2005 expedition revealed the probable breeding season of *P. syriacus* being in February. It is possible that *Discoglossus* did the same (as *D. pictus* & *P. cultripes* do in France); therefore tadpoles would have emerged and gone in March.
Further research should therefore include intensive survey work in late February/March.

3.3 - Updated Amphibians annotated list

This list reproduces the comments provided from the 2004 expedition, but also takes into account new results, especially considering the species phenology, as the 2005 expedition was slightly later in the season.

Scientific amphibian names below are the most recent ones, in brackets English common names. Many synonyms exist for some species and taxonomy may still change, especially for the *Rana* (*Pelophylax*) group.

Salamandra infraimmaculata (Fire Salamander)

Habitats :

Mainly terrestrial species. Spends most of its life in bushy areas.
Adults come to deposit larvae at mountainous springs and pools. Lowland ponds are more rarely colonized as the Salamander need bushy or rocky area for their terrestrial life.

Population :

Seems widespread but must be localized and probably not abundant.
In 2004 two small populations were found (and confirmed in 2005), at the pond near the Skaff farm and at the pond, west of the Aammiq springs, across the road.

Phenology :

Breeding occurs during winter and early spring.
Tadpoles at the Skaff farm pond were leaving the water on the 13th April 2004.
A gravid female, young and older tadpole and also first emerged juvenile were all found together on the 21st April 2005 in Aammiq wadi springs).

Threats :

Drying out of the ponds and fish introduction in the valley.

Bufo viridis (Green Toad)

Habitats :

Mainly terrestrial species. Spends most of its life in bushy areas.
Adults come to breed at temporary and usually shallow water bodies with very little vegetation (if any). *B. viridis* is a specialist of ephemeral ponds.
Mostly occurring on mountainous slopes, but a small population also breeds by the Aammiq marsh.

Population :

Widespread but not abundant.
A huge population (several tens of millions of tadpoles) was however discovered in 2004 in a temporary lake east of the Bekaa.

Phenology :

Breeding seems to occur after any rainy event. March/early April seems to be the main breeding period. Mountainous population are slightly later.

Threats :

Road traffic
Fish introduction : No breeding evidence was recorded in sites with fishes.

Bufo cf bufo (Common Toad)

Very dark tadpoles with a higher upper crest fin have been found in two ponds of the Qabb Elias uplands. Their identification based on teeth formula analysis on preserved specimens by V. Fradet (EPHE), P. Geniez (EPHE) did not produce a clear identification.

Rana bedriagae (Marsh frog)

Habitats :

Mainly aquatic species.
Adults usually breed in the marsh and the ditches of the valley. Can also be found in ponds near villages, upland streams and springs.
Juveniles can be found everywhere damp conditions occur, including near leaking water pipes.
This species is very dynamic and can withstand fish predation better than any other local amphibian.

Population :

Very abundant in the lowlands, only common at higher elevations.

Phenology :

Adult start calling in early April. Strong increase of vocal activity around 15-20 April.
First clutches laid in early April, most of them are found from late April onward (none during the 2004 expedition).
Some large tadpoles were found in April, suggesting that breeding may also occasionally occur in the autumn.

Threats :

No obvious threat; this species is sometimes collected for the restaurant trade.

Rana (Pelophylax) sp (Marsh frog sp)

In 2004, a *Rana (Pelophylax) sp* was found with distinctive characteristics: smaller, shorter legs, uniform white belly, yellowish coloration below the blacklegs, rufous dorsal and longer metatarsian tubercles.
In 2005, we also had the feeling that different taxa of *Rana (Pelophylax) sp* occur in Lebanon. V. Fradet preserved toes samples of the two distinct forms

The systematics of this group is very complex and more research may provide new taxonomic understanding.

Hyla savignyi (Tree Frog)

Habitats :

Terrestrial species. Spends most of its life in bushes, trees, rocky areas, farmland and villages.
Adults seem to breed in any water body, though being more abundant where fishes are absent.
In 2004 it was expected that two different populations occurred in Aammiq : one on the side of Jebel Barouk and a distinct one in the marsh surroundings.

Population :

Common to abundant.

Phenology :

On April 3rd 2004, an intense migration was observed, animals going towards the marsh. Song activity increased during the first week of April but decreased in the second week. Mating was observed in the second week, while many tadpoles of different ages were recorded during the expedition, showing that breeding probably started in March.
In 2005, thousands of tadpoles of 1-2 weeks may refer to the mountainous population that came for breeding during the rain of the 2nd April. Unlike in 2004, no population movement was recorded, but mating was observed several times during the expedition.

Threats :

Road traffic
Fish introduction : marsh sides present relatively few suitable breeding sites, with rather low populations. This may reflect fish predation and/or site avoidance by mating individuals. However important chorus were recorded within the reedbeds.

Pelobates syriacus (Eastern spadefoot Toad)

Peracca (1894) mention this species from a location that Hraoui-Bloquet *et al* (2001) attribute to an imprecisely located site from Palestine, probably disappeared now.
Leviton *et al* (1992) and Bosch In Den (1998) also mention the species from Lebanon, but without location details.
Only Werner (1939) mention it near Tripoli and Beirut, but Hraoui-Bloquet *et al* (op cit), though expecting it on the coastline, thought it to be extinct.
In April 2005, the two first Lebanese breeding records of *Pelobates syriacus* were gathered by the expedition.

Habitats :

Mainly terrestrial species. Spends most of its life underground in sandy areas.
Adults come to breed at temporary water bodies with depth of 1m+.
The first site, in the Hasbani Valley, is a pond of 300 m^2 with much submergent and emergent vegetation; it is surrounded by wet meadows extensively grazed and some arable fields.
The second site, in the Bekaa valley near the Aammiq marsh, used to be an army camp with many ponds of rounded profiles (probably managed to attract wildfowl game). The aquatic vegetation is not very developed ; the site is intensively grazed and surrounded by vegetables and cereal fields.

Population :

Very localized with low populations.

Phenology :

As tadpoles were probably 2 months old in Mid-April 2005, breeding may have occurred late February.
Some specimens were raised in captivity from the second site ; emergence started in early June.

Threats :

Drainage and agriculture development.
One of the two discovered sites in April 2005 was directly threatened with destruction 1 month after discovery. The site may be cultivated soon. A Rocha is negotiating for its conservation and already managed an agreement for preserving part of the site as a nature reserve in June 2005.

"Unidentified calling frog"

In 2004, a distinctive amphibian call was heard at 3 distinct sites at a distance of 3-15 m ; the animals were singing under the water, at a depth of *ca* 20-50 cm. Turbidity and vegetation prevent any view of the ponds ground surface, so that the animals have never been seen, neither caught in the nets during our visits to the different localities. At all localities, *Rana bedriagae* and *Hyla savignyi* were abundant, but *R. bedriagae* was not heard calling at these times.

In 2005, a similar call was heard at one of these localities and Vincent Fradet considered it could well be a *R. cf bedriagae.* Unfortunately, this call was not recorded.

4 - About Amphibians conservation in Lebanon

In the mediterranean/subdesertic climate of Lebanon, water is a resource of very high importance, both for wildlife and humans. If the high mountains of Lebanon provide a major source of water for the whole region, the water management shows clear unsustainability and wetland are suffering dramatic loss and degradation.
Though this could form an exciting project, threats and conservation opportunities will only briefly be considered here.

Threats:	Conservation opportunities:
Drainage and changes in land use.	Identification, situation analysis and conservation measures implementation.
Abundance of fish in most ponds by the Aamiq marsh.	Create new ponds in the higher parts of the marsh, including temporary ponds, in order to avoid fish colonization.
Excess of organic matter in most ponds by the Aammiq marsh.	Re-evaluate grazing patterns of landowners and sheepherders, based on a scientific appraisal and shared objectives.
Road traffic mortality.	Raise amphibian corridors (50 cm concrete walls on 20 m) along the road near the streams pipes that cross under the roads.
Pollution by agriculture runoffs.	Set up an "ecological farming" program (training, experiments, marketing, new orientations, fallow land strips etc).

Three other interesting opportunities exist that don't face threats :

- Faysal Halabi (Skaff estate guard) has created several little temporary ponds. Though they are already interesting, some improvements can be made (waterproofing to retain the water for a longer period of time).
- On the mountainous slopes and around villages, many ponds have been created by sheepherds; a cooperation scheme may help their management of ponds and livestock.
- The water pipes bringing the water down the mountain from the springs to the irrigated crops have leaks; this could be an opportunity. A similar project could target the margins of streams and ditches.

Other proposals were also made for amphibians conservation initiatives in Tron & Duguet (2004).

5 - Shared strategy for further amphibian and *Discoglossus* research

Below, the general aims and objectives of a shared strategy discussed during and after the 2005 expedition. The appendix 3 gives details for each objective.

5.1 - General aims

Well coordinated herpetological effort will stimulate amphibian research and conservation in Lebanon. Most recent findings should be published and further field work should improve the regional knowledge of amphibian diversity (and especially assess *Discoglossus* occurrence), ecology and status in order to contribute to amphibians and wetlands conservation across Lebanon.

As all partners of the 2004 expedition already have many current commitments, only some the below objectives can be achieved in 2005. A thorough survey of amphibians across Lebanon would need to develop a specific project and this document may assist this process.

5.2 - Objectives

1 Stimulate cooperation between herpetologists
2 Prepare communications
3 Monitor “Best quality sites” in the Aammiq area
4 Create and monitor new suitable ponds in the Aammiq area
5 Survey ponds as discovered
6 Organize systematic trips in less surveyed but potentially suitable areas
7 Assess *Rana (Pelophylax) bedriagae* and *Bufo cf bufo* phylogeny
8 Assess conservation status of known sites and species

Conclusion

The second international expedition of April 2005, did not bring any evidence of *Discoglossus* presence in the Central Bekaa, Lebanon. However it found 150 sightings of 5 species of amphibians on 76 sites: *Salamandra infraimmaculata, Rana bedriagae, Hyla savignyi, Bufo viridis and Pelobates syriacus.*

P. syriacus reproduction was recorded at two distant localities. These were the first and second positive scientific records of the species in Lebanon. Possible occurrence of *Bufo bufo* and another unidentified *Rana (Pelophylax) sp* species is also documented.

Improvements on the Lebanese amphibian ecology are presented and different options regarding the possible occurrence of *Discoglossus nigriventer* are discussed. Though it is impossible to assess the actual status of this species , further field investigation at different times of the year is recommended. Considering the probable elusivity of *D. nigriventer* and the severe wetland loss and degradation in the Middle East, it is likely that the species is now very rare and will require intensive field work for several years.

A successful partnership was developed between A Rocha Lebanon, the American University of Beirut, the Université du Liban and A Rocha France. It involved both field research and the development of a shared strategy for further amphibian and *Discoglossus* research in Lebanon.
It is hoped that this second international expedition will help to increase field research through successful partnership for effective Amphibians and wetlands conservation in Lebanon.

Acknowledgements

As the expedition leader, I want to thank all of the team members for their active work and good disposition that made this time very special, both enriching and fairly easy to manage.

Special thanks also to :
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- the A Rocha Lebanon team (especially Chris Naylor, Colin Conroy, Rich Prior, Martin and Lodi Bernahrd) for their hospitality and support in the provision of material help and field guidance.
- Faysal Halabi for great guidance and amazing friendship.
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- all the froggers within A Rocha (Simon Stuart, Will Simonson, Peter Harris, Paul Jeanson, Alain and Karin Boisclair-Joly…) for their input.
- the Skaff family for supporting this work on their property and for their will to preserve the marsh.
- Georges and Tony for their precious introduction to Lebanon.
- Mike Hoffman and Sylvie Goyet for their kind consideration and warm welcome.
- God for this unique and amazing Creation we are happy to take care of.

Literature:

http://www.globalamphibians.org/servlet/GAA?searchName=Discoglossus+nigriventer

http://elib.cs.berkeley.edu/cgi-bin/amphib_query?where-genus=Discoglossus&where-species=nigriventer#365

http://www.redlist.org/search/details.php?species=6715

http://en.arocha.org/lbaammiq/index7.html

ACEMAV coll., DUGUET R. & MELKI Fr. ed. (2003) Les Amphibiens de France, Belgique et Luxembourg. Collection Parthénope, éditions Biotope, Mèze (France), 480 p.
BOSCH IN DEN H.A.J.. 1998. Prodromus einer liste der Amphibien und Reptilien Lebanons. Fanu Abh. Staatl Mus. Tierk. dresden, 21 : 9-17.
KNOEPFFLER L.-Ph. (1962) Contribution à l'étude du genre *Discoglossus. Vie & Milieu* 13, 1-94.
AKL HABRE A., NAYLOR C.. 2001. The reforestation of the mountain slopes and the greening of the Aamiq Estate. 17 + Appendix.
ARNOLD E. N., BURTON J. A., OVENDEN D. W.. 1978. Reptiles and Amphibians of Britain and Europe' Collins Field Guide' London' 272 p'
A ROCHA LEBANON. No date. Recommendations for the sighting of Amphibian and Mammal crossing places on the Skaff Estate. 1 p + Appendix
A ROCHA LEBANON. December 1999. Scientific projects for A Rocha Lebanon. 4 p.
BOUSKILA A., PINCHAS A.. 2001. Handbook of Amphibians & Reptiles of Israel. Keter Publishing, Jerusalem, 345 p. HB, In Hebrew.
BUSACK S. D. 1986. Biochemical and morphological differentiation in Spainish and Moroccan populations of Discoglossus and the description of a new species from southern Spain (Amphibia, Anura, Discoglossidae). Annals of Carnegie Museum. 55 (3):41-61.
CAPULA M., CORTI M. 1993. Morphometric variation and divergence in the west mediterranean discoglossus (Amphibia, discoglossidae). J Zool. 231 (Part 1):141-156.
DISI A. M., MODRY D., NECAS P. AND RIFAI L.. 2001. Amphibians and Reptiles of the Hashemite Kingdom of Jordan. Edition Chimaira, Frankfurt, 408.
HRAOUI-BLOQUET S., SADEK R. & GEZE R.. 2001. Les Amphibiens du Liban : inventaire, répartition géographique et altitudinale. Bull. Soc. Herp. Fr. 99 : 19-28.
JARADI G, SADEK R., ABI SAID M.. 2000. Protected Areas project. Fauna monitoring manual Part II. Green line association. 45 p.
LEVITON A., ANDERSON S., ADLER K; & MINTON S.; 1992. Handbook to Middle East Amphibians and Reptiles. Society for the study of Amphibians and Reptiles. 252 p.
MENDELSSOHN H. AND STEINITZ H. 1943. A new frog from Palestine. Copeia 1943: 231.
NAYLOR, C. October 2001. Towards a management plan for the Aammiq wetland. 12 p.
NAYLOR C. Spring 2002. Management plan for the Aammiq marsh. Lebanon. A Rocha. 40 p + Appendix.
PERACCA M. G.. (1894). Viaggodel Dr E. Festa in Palestina, nel Libano e rigiono vicine. VI. Retilli ed Anfibi. Boll. Mus. Zool. anat; Comp. Univ. Torino, 9 (167) : 1-20.
STEINITZ H. 1955. Occurence of Discoglossus nigriventer in Israel. Bull. Res. Counc. Israel. (B)5: 192-193.
STOREY R. 2003. Hydrological studies at Aammiq Marsh 2002-2003. 4 p.
STOREY R. No date. Assessing groundwater and surface water flows through Aammiq wetland. 10 p.
TRON F; & DUGUET R. 2004. Amphibian research mission, Aammiq area, Central Bekaa valley, Lebanon, 3-16 April 2004. 25 p.
WERNER F. 1939. Die Amphibien und Reptilien vom Syrien. Abh. Ber. Mus; Nat. Vorg, Magdeburg, 7 (1) : 21-223.

Appendix 1
Colin Beale's observation report

Probable observation of a *Discoglossus sp* at Aammiq Lebanon, April/May 2000

Colin BEALE
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UK, November 10th 2003.

The story takes place some time in mid April, mid-morning on a sunny day at the Aammiq wetlands, South-east Lebanon. I was carrying out a butterfly survey along the avenue of trees with a visitor to the project, when a frog sitting in shallow water (half in/half out) in the ditch nearby caught our attention. (At this point the ditch had iris growing in it and overhanging *Rhamnus* sp.) We both had a very good view of the frog through binoculars and in good light at a distance of approximately 3m. Having some experience of frogs of the genus Discoglossus from Portugal (where we occasionally found them on the marshes near Cruzinha at night, or on the Monchique hills) I was confident that the individual we were watching was a member of this genera. Unfortunately neither of us were aware of the significance of such a record at the time and made no attempts to handle it, or take special notes of the circumstances. That said, however, I do remember it quite well, as it was the first (and subsequently seems to be only!) time I'd seen one at Aammiq and it stuck in my mind at the time.

I remember the individual as being slightly larger than the average Marsh Frog and quite well marked; the feature that first drew my attention to it - a nice blotchy pattern on the back. Relative to the Portuguese species, my opinion at the time was that this individual was basically very similar, but probably rather better marked (the contrast between the dark spots and olive/grey ground colour stronger, and clearly delineated with a fine pale yellow/green boarder perhaps more distinct than Portuguese ones). The key feature, of course, being the pupil shape (somewhat like a rounded triangle in shape) which is obvious given a clear look in good sunshine, and it was this that led me to make the identification.

Although I looked twice at this individual because it was clearly better marked than most amphibians I'd seen in the area (excluding green toads, of course!), I considered it could just be a well marked individual of a variable species that caught my eye. The difference between this individual and what I was familiar with from Portugal was not beyond the individual variation I considered possible knowing that species. It looked rather like the illustration 1a of plate 6 of the Collin's Field Guide to Reptiles and Amphibians of Britain and Europe by Arnold *et al*., though I did know that the taxonomy was very complex so just assumed someone would identify it to species level from its range. Little did I know that the range would be of considerable interest!

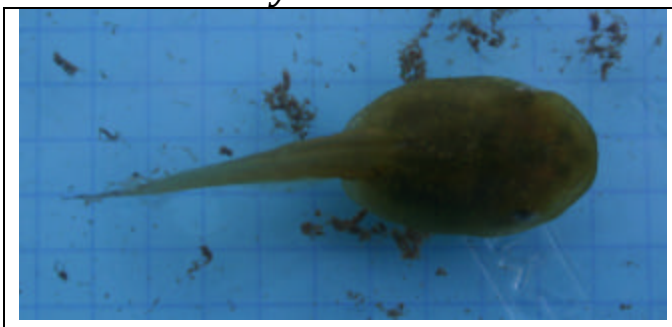
Being only a casual observation and not part of a systematic survey of the amphibians, it is hard to guess at the status of Discoglossus in the Aammiq wetlands. However, as I looked at an awful lot of frogs in the marsh whilst I was there and only once saw this species I can only conclude that either it is very secretive (quite possibly true), or very rare

Appendix 2

Identification key of anuran tadpoles in Lebanon

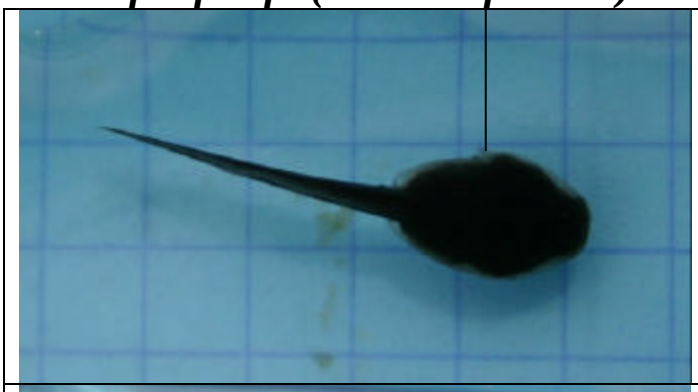
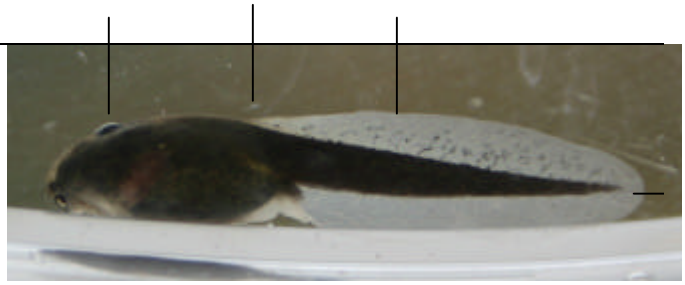
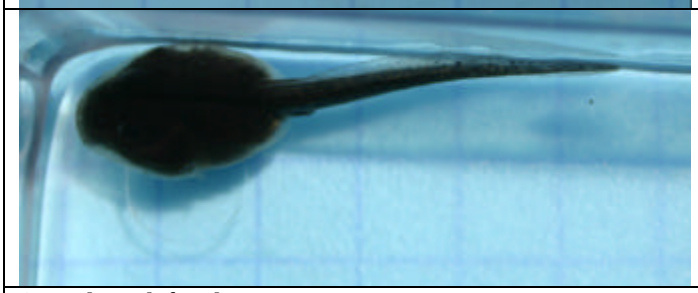
François Tron, June 22nd 2005

Pelobates syriacus :

<table>
<tr>
<td>  </td>
<td>  </td>
</tr>
<tr>
<td>Very big tadpoles (up to 10 cm long),
Roundish, “soft” body
Grey-brown coloration with white dots on the belly
Spiracle on left side
Pointed nose (in profile)
Eyes close on the top head

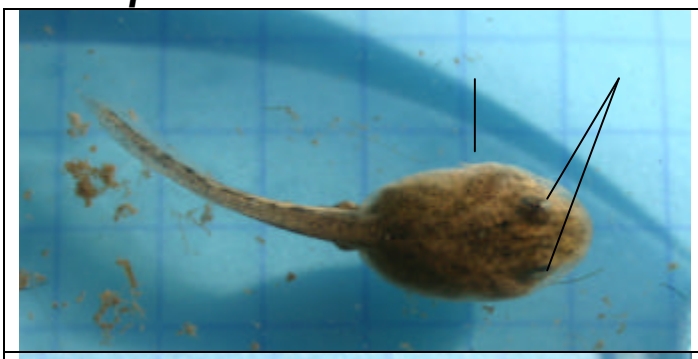
NB : Very young P. syriacus tadpoles may look like those of H. savignyi, but are greyish with pointed nose.</td>
<td>  </td>
</tr>
</table>

Bufo cf bufo (to be confirmed!) :

Spiracle on left side
Eyes close together on the head top
Crest starts on body back
Flat upper crest
Roundish tail tip
Brown-black coloration
Teeth formula is compulsery to formally distinguish between this species and *B. viridis*

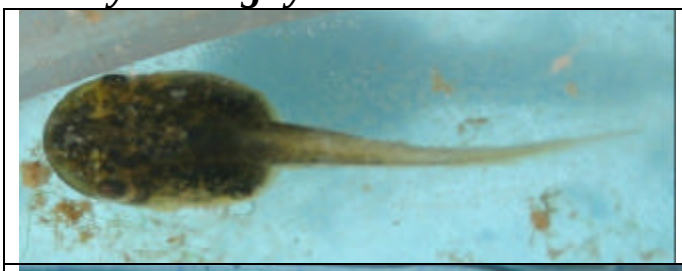
Bufo viridis :

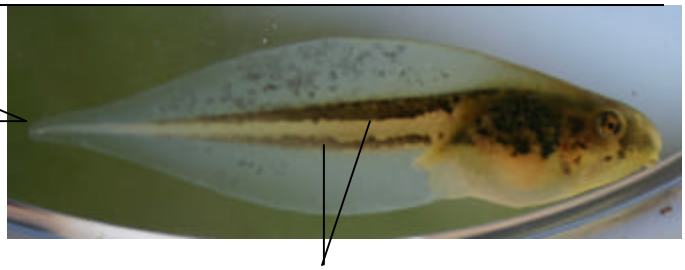


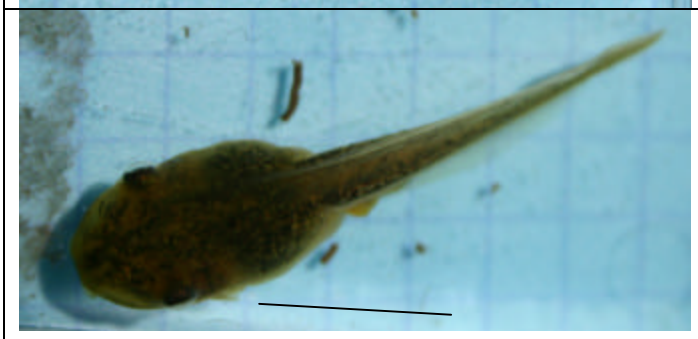

Spiracle on left side
Eyes close together on the head top
Crest starts on body back
Roundish upper crest

roundish tail tip
brown-sandy coloration (when larger, very dark when young)

Hyla savignyi :

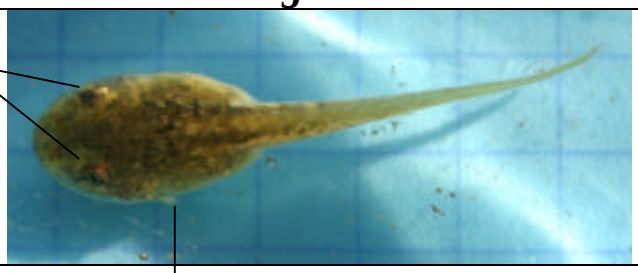


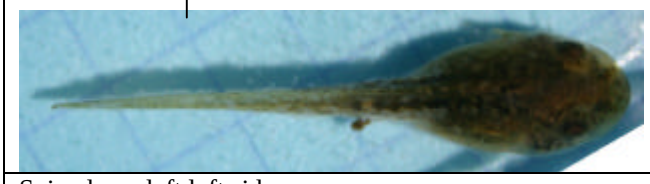




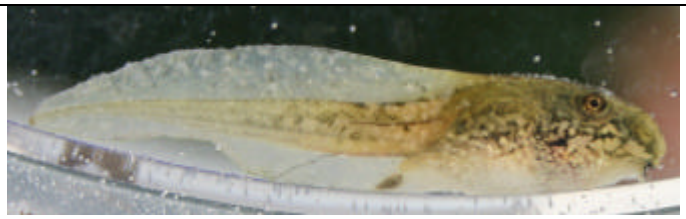
Spiracle on left side
Eyes on side of head
Crest starts on top of body
Very high rounded upper crest
Pointed fin tip
Greenish-golden coloration
Rounded body
Two black markings on the tail

Rana bedriagae :





Spiracle on left left side
Eyes on head top, but not close together
Crest starts on top of the back
Low crest
Pointed tail tip
Greenish coloration
Elongated body
No specific marking on the tail



Appendix 3

Shared strategy for further Amphibians and *Discoglossus* research in Lebanon in 2005-2006.

This document is the output of discussions:
- on April 25th 2005 between Chris Naylor (ARL Director), Colin Conroy (ARL Scientific Officer), François Tron (ARF), Vincent Fradet (EPHE) & Alan Preece (A Rocha Volunteer).
- on April 26th & 28th between Francois Tron & Riyad Sadek (AUB).
- by email with Souad Hraoui-Bloquet (UL) and all partners

MedWet Coast Lebanon expressed their unavailability for field work and strategy planning due to other commitments.

General aims :

Well coordinated herpetological effort will stimulate amphibian research and conservation in Lebanon. Most recent findings should be published and further field work should improve the regional knowledge of amphibian diversity (and especially assess *Discoglossus* occurrence), ecology and status in order to contribute to amphibians & wetlands conservation across Lebanon.

As all partners of the April 2005 expedition already have lots of current activities, only some of the below objectives can be achieved in 2005. A thorough survey of amphibians across Lebanon would need to develop a specific project and this document may help in this way.

Objectives:

1. Stimulate cooperation between herpetologists.
2. Prepare communication.
3. Monitor "Best quality sites" in the Aammiq area.
4. Create and monitor new suitable ponds in the Aammiq area.
5. Survey ponds as discovered.
6. Organize systematic trips in less surveyed but potentially suitable areas.
7. Assess *Rana (Pelophylax) bedriagae* and *Bufo cf bufo* phylogeny.
8. Assess conservation status of known sites & species.

Acronyms:

ARL : A Rocha Lebanon
ARF : A Rocha France
ARP : A Rocha Portugal
ARUK : A Rocha United Kingdom
AUB : American University of Beirut
UL : Université du Liban
EPHE : Ecole Pratiques des Hautes Etudes

Objective 1
Stimulate cooperation between herpetologists

The 2005 amphibian expedition has been successfully coordinated between A Rocha Lebanon, A Rocha France & the American University of Beirut. The Université du Liban has also been involved in some field work. The Skaff family, major landowner in the Aammiq marshes has also been very supportive since the early stage of this project.

The outputs of this cooperation are going far beyond the only herpetological findings and we all hope we can keep working together for efficient field work. Therefore details on partnership working are given for each of the following objectives.

For future work, we foresee the following opportunities:

1. Riyad Sadek (AUB) hopes to do more field work, especially in the Hasbani region; a preliminary GIS census of all water bodies would greatly help. Student projects could be helpful.
2. ARL hope to keep track of some major sites in the Aammiq area and survey any newly discovered sites found during other projects (IBA etc). However, human resources are limited and capacity increase is needed for a more ambitious work.
3. A yearly expedition for foreign herpetologists can be organized within A Rocha Lebanon activities. Facilities can be provided at the field study center (accommodation, field guidance…) for external resourced researchers.
4. A joint project between ARL, ARF & ARP may include an amphibian component and get funding support through international cooperation schemes.

Objective 2
Prepare communications

Between 2004 & 2005 expeditions, over 70 sites have been surveyed and c.400 amphibian data gathered. New findings include some of major importance (e.g. 1st & 2nd *Pelobates syriacus* breeding records for Lebanon, possible confirmation of *Bufo cf bufo* reproduction in Lebanon).
These results should be published in a scientific journal. Zoology in Middle East could be a first target. F. Tron (A Rocha France) will be the main author and will coordinate this work with all participants of the two expeditions.

Two tadpoles of *P. syriacus* for each locality have been preserved in order to process DNA analysis for assessing their phylogeny. There have been discussions on the possibility of there being subspecies, but so far we don't know any DNA analysis to support this. V. Fradet (EPHE) has offered to do further work on this aspect. Results should be published along with A Rocha & AUB.

A press release will enable our sponsors and other press papers to publicize the current co-operation in amphibian research. This would be of great help for the support of further projects support. S. Tron (A Rocha France) has offered to undertake this.

The A Rocha Lebanon website will also be updated with these new findings.

Objective 3
Monitor "Best quality sites" in the Aammiq area

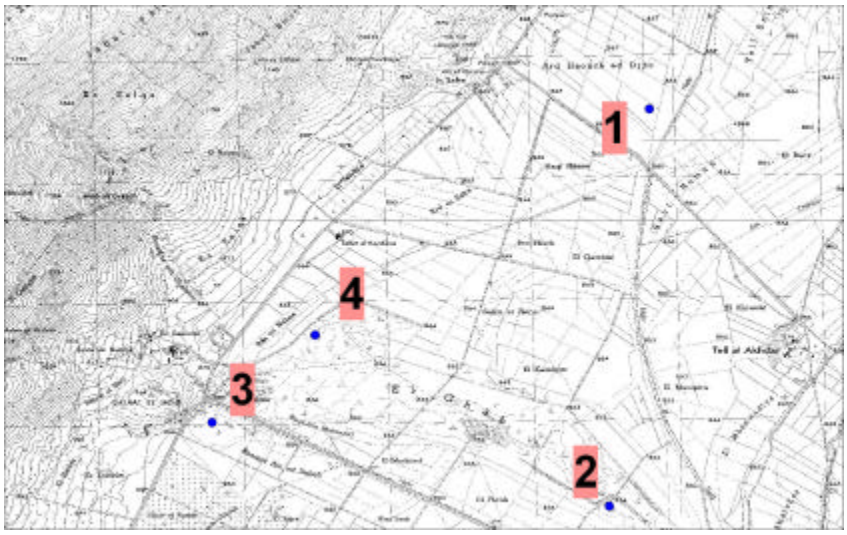
In the Aammiq area, 4 sites (see map 2) have been identified as "Best quality" for *Discoglossus* (as well as *Pelobates*); therefore they have become targets for monitoring.
A Rocha Lebanon will undertake this monitoring and will invite AUB & UL for field work.

Monitoring methods:
Record trip and site conditions (use data sheet provided in Appendix 4).
Pond dipping during daylight for c.30 minutes at each site. Tadpoles can be sorted by species, then by size class in order to assess growth for each cohort. The 4 sites could all be surveyed within a (long) half-day.
Look for adults at night during and after major rains (>50 mm) or/and during temperature increase in early spring. 2 sites can be surveyed in a 3 hours outing.
Check hides in order to detect metamorphs when they leave the water.
Record amphibian data (use data sheet provided p 5).

Monitoring periods & frequency:
The table below gives general recommendations for a high intensity (and best quality) survey; a lower intensity survey is possible with less reliability and less data concerning biology.

Monitoring periods	**Monitoring frequency**	**Anuran stage to look for**	**Comments**
April/May	1 day visit/week	Tadpoles, metamorphs, adults	
Summer/autumn/winter	1 day visit/month	Tadpoles , metamorphs	
February-March	1 day visit/week	Adults, tapoles & metamorphs	
During & after major rains (>50 mm) or/and increase in temperature in spring.	Visits at night	Adults, metamorphs	At any time of the year
For 2 months after major rains	1 day visit/week	Tadpoles, metamorphs	First tadpoles can be expected 1 week after the rain.

Requirements:
During night survey; start looking for adults and metamorphs on the edge of the pond (both inside and outside the water).
During day survey; start looking for adults and metamorphs under hides in the vicinity of the pond. Artificial hides (i.e. : empty, washed, fertilizer plastic bags) can be set up around pools. Then look for tadpoles in the water with the pond net.



Objective 4

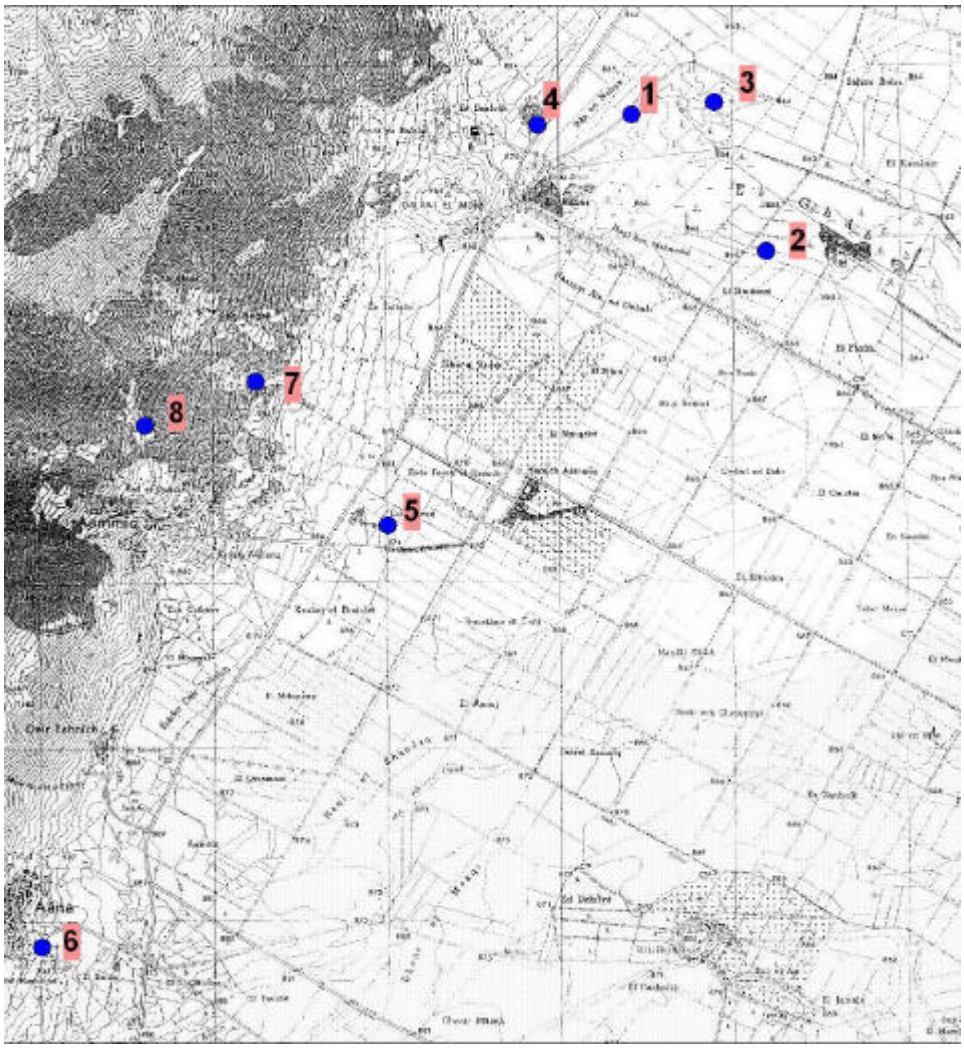
Create and monitor new suitable ponds in the Aammiq area

It is possible that *Discoglossus* could be attracted by creating ponds with specific characteristics that best suits their ecology. It is noteworthy to mention that Faysal Halabi has already created a number of small temporary ponds on the hills and his initiatives should be encouraged.
A Rocha Lebanon is in charge of this conservation initiative and will invite AUB and UL for work assessment.

Pond creation can be achieved during summer (June-September) with the following characteristics:
- Size: 20-50m^2
- Max depth: 1m
- Shape: lots of shallow water
- Vegetation: just a few inside the pond, surrounding habitats in and around.

Ponds should be dug in area that are less likely to be regularly flooded, in order to avoid fish presence. Also high intensity grazing may be a positive feature.
More details can be given by V. Fradet and Alan Preece and through the Herpetofauna Workers' Manual (ed. Gent, T. and Gibson, S., 1998) (available at ARL library).
The map 3 is proposing some possible sites locations.

These sites could become of "Best Quality" and may be included in the Objective 3.



Objective 5
Survey ponds as discovered

During trips further away in Lebanon, more wetlands may be found of some amphibian value.
Record GPS coordinates, describe site and record amphibian data.
An example datasheet is provided in appendix 4.

Efficient data exchange and analysis can be achieved by all ARL, AUB & UL teams using a standard form.

Objective 6
Organize systematic trips in less surveyed but potentially suitable areas

Less surveyed but favorable areas, especially South Lebanon, may well be of great amphibians importance.

According to available material, a preliminary reconnaissance of all springs, pools and swamps can be made through GIS. AUB is mainly interested in this preliminary work that would be highly useful in future years and projects.

Field work can be organized jointly for next autumn/spring.
Riyad Sadek has already planned some trips for this spring and will let partners know the dates for this.
A third international expedition could be organized for February/March 2006; please contact C. Naylor for coordination.

Objective 7

Assess *Rana (Pelophylax) bedriagae* and *Bufo cf bufo* diversity and phylogeny

Rana (Pelophylax) bedriagae may describe more than one species; R. Sadek (AUB) showed interest in investigating this field.
V. Fradet has sampled a few individuals (toes samples) ; those samples will be given to the appropriate researchers in France.

Bufo cf bufo may be a distinct species or subspecies from the regular *Bufo bufo*. Dr Verneau (EPHE Perpignan) has already processed some DNA analysis from preserved specimens collected by S. Hraoui-Bloquet but results are not yet published.

Objective 8

Assess conservation status of known sites and species

As amphibian research is increasing in Lebanon and wetlands are still suffering degradation, if not complete destruction, gathered data may help for amphibians and wetland conservation.
Hraoui-Bloquet *et al* (2001) already carried out a major field inventory in this respect a few years ago, but some areas remain poorly known (South Lebanon, Bekaa, eastern side of Mt Lebanon).

Site investigation should therefore include a conservation perspective, including:
- Contacts with landowners and landusers for site access agreement and sharing results
- Overall biodiversity importance assessment
- Landuse and stakeholders analysis
- Threats assessment
- Preliminary management recommendations

A Rocha Lebanon has already carried out negociations woth the landowner of

Appendix 4

Datasheet used for trips, sites and amphibians recording during the 2005 expedition

ID Trip	Area name	Date	Time start	Time end	Cloud/8	Wind speed/10	Wind dir	Temp	km	Observers	Remarks

ID Site	Site name	Way point	Latitude	Longitude	Type	Surface /width	Depth max	Average Depth	Veg cover	Vegetation	Turbidity	Surrounding habitats	Remarks

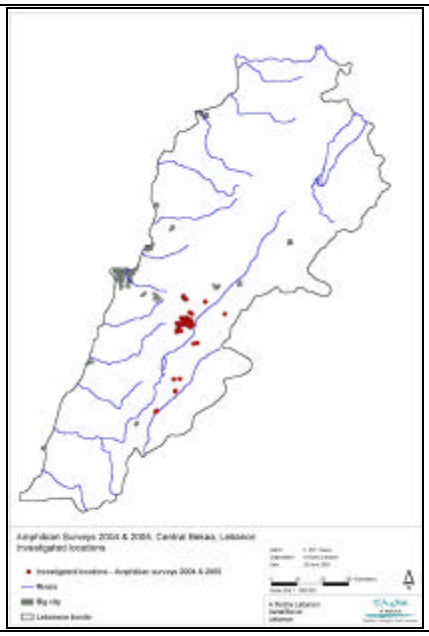
ID Obs	Species	Nb calling	Nb Adults	Nb juveniles	Nb tadpoles	Nb clutches	Remarks

Appendix 5
Photo gallery of the expedition

1 – The frog team, and their favorite animal and sites

Surveyed sites in April 2005

Locations of *Pelobates syriacus*



Surveyed sites in 2004 & 2005

The 2005 “frog team” : Colin Conroy, Alan Preece, Vincent Fradet, François Tron & Sophie Tron

The 2005 “frog team” : Souad Hraoui-Bloquet & Riyad Sadek

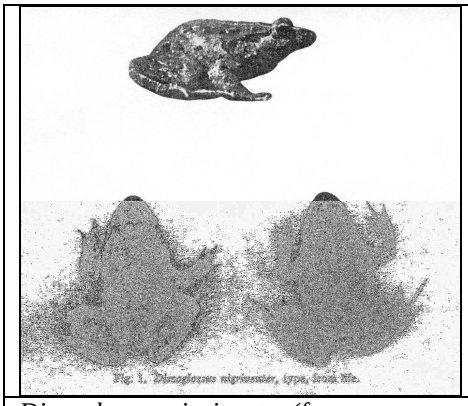
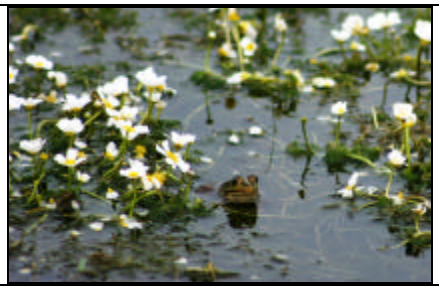
The 2005 “frog team” : Alan preece, Colin Conroy & Riyad Sadek

Riyad Sadek examining tadpoles at Aammiq marshes

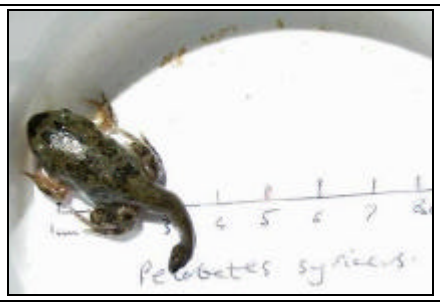
Rémi Duguet & Martin Bernhard photographing a Marsh Frog

Vincent Fradet & Riyad Sadek pond dipping at Aammiq marshes

Second *Discoglossus nigriventer* rediscovery expedition in the Central Bekaa valley, Lebanon. April 2005.
François Tron, A Rocha

		
Discoglossus nigriventer (from MENDELSSOHN & STEINITZ. 1943.)	*Discolgossus pictus* (picture from L. Courmont)	*Discolgossus pictus* (picture from V. Fradet)
		
Discolgossus sardus (picture from V. Fradet)	*Discolgossus montalentii* (picture from V. Fradet)	*Rana bedriagae*
		
Rana bedriagae	*Rana bedriagae*	*Rana bedriagae*
		
Freshly emerged *Salamandra infraimmaculata*	Gravid female *Salamandra infraimmaculata*	Male *Hyla savignyi*

Second *Discoglossus nigriventer* rediscovery expedition in the Central Bekaa valley, Lebanon. April 2005.
François Tron, A Rocha

		
Pelobates syriacus tadpole	Freshly emerged *Pelobates syriacus*	*Bufo virdis*
		
Aammiq marsh	Aammiq marsh	Aammiq marsh and surrounding farmland
		
Pond near Aammiq marsh springs	Pond near Aammiq marsh springs	Aammiq marsh springs
		
Houch, first location of *Pelobates syriacus*	Houch, first location of *Pelobates syriacus*	Tell el Akhdar, second location of *Pelobates syriacus*
		
Tell el Akhdar, second location of *Pelobates syriacus*	A temporary lake in the mount Hermon area	A temporary pond in Qabb Elias highlands

2 – Landuse in Lebanon with special reference to Agriculture and Water management

		
Olive grove	Sheep & sheepherder	The Bekaa valley, devoted to farming. Jabb Jenine and hills.
		
A farmer with his water buffalos at Aammiq marshes	Shepherd in Aammiq marshes	Sheepherder bringing sheep to the pastures of Aammiq marshes
		
Spraying pesticides on Leaks crop	Fertilizers in Peas crop	Pumping water in Kfar Zabbad marshes for irrigating crops
		
A leak in the irrigation pipe	A ditch blocked for raising the aquifer level	Signs of eutrophication in a farmland ditch

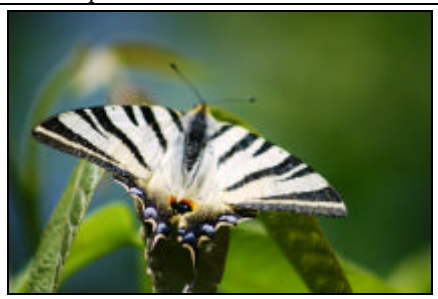
Second *Discoglossus nigriventer* rediscovery expedition in the Central Bekaa valley, Lebanon. April 2005.
François Tron, A Rocha

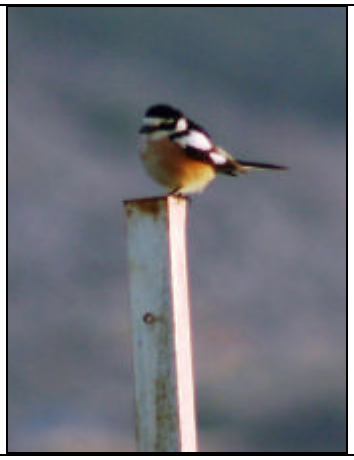
		
A traditional bridge over the Hasbani	A Druze & his donkey by the Hasbani	Cows drinking in the Hasbani
		
A bridge over the litany, showing litter brought very high by previous floods	The litany, showing litter brought very high by previous floods	

3 – Landscape & biodiversity

		
The village of Aanna, base of the A Rocha Lebanon field study center	The Bekaa valley from Jebel Barouk	The Bekaa valley from the A Rocha Lebanon field study center
		
The Jebel Barouk	The Jebel Barouk	The Mount Hermon
		
The Jebel Barouk	A wet meadow near Houch	An Apiacaea
		
Papaver sp	Poppies & irises	Poppy

Second *Discoglossus nigriventer* rediscovery expedition in the Central Bekaa valley, Lebanon. April 2005.
François Tron, A Rocha

		
Gladiolus sp	Aquatic plant	*Fritilaria sp*
		
Anemone sp	*Adonis sp*	A Zygoptera
		
Male nice little fish…	*Iphiclides podalirius*	A Crab
		
Mauremys caspica	*Natrix tesselata*	A skink

		
Acrocephalus melanopogon & *Acrocephalus schoenobaenus*	*Crex crex*	*Erinaceus sp*
		
Lanius minor	*Lanius nubicus*	*Tringa glareola*
		
	Aquila clanga on migration	