



### In this issue...

|   |    |
|---|----|
| Amphibian Conservation Needs Assessment in Bolivia .....  | 2  |
| Husbandry training course for <i>ex situ</i> amphibian conservation in Bolivia .....            | 3  |
| Association Spotlight - Michael Ready .....   | 5  |
| Amphibian Conservation Needs Assessment for the Philippines .....                               | 6  |
| Conservation Needs Assessments moving to an online process .....                                | 7  |
| Captive-bred Mountain Chicken Frogs released in Montserrat .....                                | 8  |
| Progress report of the Honduras Amphibian Rescue and Conservation Center .....                  | 9  |
| Featured Frog MatchMaker project .....  | 10 |
| Northern Corroboree Frog conservation program at the Tidbinbilla Nature Reserve .....           | 11 |
| Call for Photos for the 2014 Year of the Salamander Calendar Photo Contest .....                | 12 |
| National Amphibian Conservation Coordinators - Case study in the Philippines .....              | 13 |
| A review of recent insights on amphibian chytrid pathogens and conservation mitigation .....    | 14 |
| Captive management of the Critically Endangered Andean Buckley Glass Frog in Ecuador .....      | 16 |
| Mesoamerican amphibian <i>ex situ</i> conservation course and conservation strategy workshop .. | 18 |
| AZA is member of PARC's Joint National Steering Committee .....                                 | 18 |
| National Amphibian Expo .....   | 19 |
| Amphibian Ark donors, January-August 2014 .....   | 20 |



**Amphibian Ark**  
c/o Conservation Breeding Specialist Group  
12101 Johnny Cake Ridge Road  
Apple Valley MN 55124-8151  
USA

[www.amphibianark.org](http://www.amphibianark.org)

Phone: +1 952 997 9800  
Fax: +1 952 997 9803

[www.amphibianark.org](http://www.amphibianark.org)



## Amphibian Conservation Needs Assessment in Bolivia

The Conservation Needs Assessment for the amphibians of Bolivia brought together sixteen amphibian field biologists from around Bolivia, representing eight different museums, universities, zoos and non-governmental organizations. The three-day assessment workshop, held in July, was hosted by the Museo de Historia Natural Alcide d'Orbigny in Cochabamba, Bolivia, and was facilitated by Kevin Johnson from the Amphibian Ark.

By using a proven process for prioritizing national conservation actions, this assessment process guides conservationists to focus their limited resources towards those species that are most in need of intervention to ensure their ultimate survival in the wild. The Conservation Needs Assessment process was initially developed in 2006, during an Amphibian *Ex Situ* Conservation Planning workshop in Panama, where a taxon selection and prioritization working group developed a series of questions to select and prioritize which taxa are most in need of assistance in captivity. The decision tree has subsequently been further reviewed and refined, and has now been developed into the AArk Conservation Needs Assessment process, and a standardized electronic data entry tool, using Microsoft Excel ([www.amphibianark.org/planning-workshops/](http://www.amphibianark.org/planning-workshops/)). The assessment process has proven to be a logical, transparent, and repeatable procedure for guiding amphibian conservation activities within a country or region.

During the Conservation Needs Assessment workshop, all 265 amphibian species found in Bolivia were assessed and prioritized for the most urgent conservation actions required to ensure their ongoing survival in the wild. The workshop brought together the leading amphibian biologists and researchers from Bolivia, and their collective expertise has resulted in a thorough and up-to-date assessment. The results of the workshop include prioritized reports for seven different conservation actions. These recommended actions can be used to update the Plan de Acción para la Conservación de los Anfibios Amenazados de Bolivia (Action Plan for the Conservation of Threatened Amphibians of Bolivia), which was produced by the Bolivian Ministry of Environment and Water in 2012.

The 265 amphibian species found in Bolivia include 16 that are listed in the IUCN Red List as Critically Endangered, 16 Endangered, 25 Vulnerable, 5 Near Threatened, 185 Least Concern and 18 Data Deficient. Eighty-eight of the species (33%) are endemic to Bolivia, and of these, 45 species are considered to be threatened.

The recommendations from the conservation needs assessment for Bolivian amphibians include:

- **29 Rescue** - species that are in imminent danger of extinction (nationally) and require *ex situ* management, as part of an integrated program, to ensure their survival.
- **40 In situ conservation** - species for which mitigation of threats in the wild may still bring about their successful conservation.
- **113 In situ research** - species that for one or more reasons require further *in situ* research to be carried out as part of the conservation action for the species. One or more critical pieces of information is not known at this time.

The Titicaca Water Frog (*Telmatobius culeus*) is the world's largest aquatic frog and is only found in high altitudes in the Andes. It was assessed as the highest priority Bolivian amphibian species for a range of conservation actions. Photo: Arturo Muñoz.





- **18 Ex situ research** - species currently undergoing, or proposed for specific applied research that directly contributes to the conservation of the species, or a related species, in the wild (this includes clearly defined 'model' or 'surrogate' species).
- **2 Mass production in captivity** - species threatened through wild collection (e.g. as a food resource), which could be bred in captivity - normally in-country - to replace a demand for wild harvested specimens.
- **73 Conservation education** - species that are specifically selected for management – primarily in zoos and aquariums – to inspire and increase knowledge in visitors, in order to promote positive behavioral change.
- **29 Biobanking** - species for which the long-term storage of sperm or cells to perpetuate their genetic variation is urgently recommended, due the serious threat of extinction of the species.
- **86 No conservation action** - species that do not require any conservation action at this point in time.

Almost all of the fourteen species in the genus *Telmatobius* were amongst the highest priority species for a range of conservation actions, as well as a number of *Hyloscirtus*, *Gastrotheca*, *Rhinella* and *Psychrophrynella* species.

The importance of building capacity to enable additional *ex situ* rescue, research and breeding facilities was discussed considerably, and in support of this, a husbandry training course for *ex situ* conservation of Bolivian amphibians was held immediately after the assessment workshop, and hopefully, this will lead to additional *ex situ* rescue programs being implemented for some of the most threatened species (see separate report below).

The Conservation Needs Assessment for Bolivian amphibians has recommended a total of 231 different conservation actions for 179 species. These actions are based on current, expert advice, gathered from Bolivia's leading amphibian field biologists and researchers, and provide guidance for future conservation actions to help save Bolivia's amphibian species. As sufficient funding becomes available, these actions will be implemented, with the cooperation of national wildlife and environment departments, local communities, and other relevant stakeholders.

The workshop was generously supported by a grant from the Chicago Board of Trade (CBOT) Endangered Species Fund, which is administered by the Chicago Zoological Society.

## Husbandry training course for *ex situ* amphibian conservation in Bolivia

The Bolivian amphibian husbandry training course was delivered immediately after the Amphibian Conservation Needs Assessment workshop, at the Museo De Historia Natural Alcides D'orbigny, in Cochabamba, Bolivia, June 6th - 8th. Instructors for the course were Arturo Muñoz (Museo De Historia Natural Alcides D'orbigny), Diego Almeida (Ecuador) and Luis Carrillo (Amphibian Ark).

The objectives of the training course were to:

- build capacity among Bolivian biologists and other professionals for the care and husbandry of endangered amphibians of Bolivia
- promote the establishment of assurance colonies for imperilled prioritized Bolivian amphibian species
- create partnerships between participants and their institutions to collaborate for the conservation of Bolivian amphibian species.

### Course content and learning design

The course consisted of a mix of lectures, group activities and practical sessions designed to deliver the most relevant information about amphibian husbandry and to put into practice what the students had learned during the lectures/group work sessions.



Arturo Muñoz from the Museo De Historia Natural Alcides D'orbigny demonstrating the use of UV light meters. Photo: Kevin Johnson.

The course content was designed to:

- inform students about the critical situation of amphibian species, especially those in Bolivia
- deliver updated amphibian husbandry methods and techniques
- ensure that students are aware of infectious diseases and biosecurity in captive amphibian assurance colonies
- provide the students with information and skills to successfully breed and maintain different groups of amphibians.

The course was designed to encourage participation and sharing of knowledge and expertise through different activities in small groups, where different challenges were presented to students, allowing them to present and discuss ideas and determine the best practices and recommendations to tackle the issues. Each group then



AArk's Training Officer, Luis Carrillo explaining the importance of conservation needs assessment and planning when developing new *ex situ* conservation programs for amphibians. Photo: Kevin Johnson.

### Participants

Fifteen participants representing eight different zoos, museums and non-government organizations from Bolivia and Argentina participated in the course. Most of them had been working with amphibians for many years, although mainly in taxonomy.

### Course evaluation

To evaluate the effectiveness of the course a pre- and post-workshop evaluation survey was delivered, consisting of basic questions relating to amphibian biology, husbandry and management. According to the results, the students' knowledge in these areas increased by 19% when comparing the pre- and post-workshop evaluations.

Also a post-workshop survey was sent to all the students as a way to also evaluate the effectiveness of the course in an indirect way. The results of that survey were:

- 80% of the participants expressed that the course content was better than what they were expecting, or it met their expectations
- 90% of the participants said that the information and knowledge acquired was very good to excellent
- 100% of the participants said that the quality of information relating to basic amphibian husbandry was adequate to excellent
- 90% of the participants said that the quality of information relating to *ex situ* management was adequate to excellent
- 90% of the information relating to biosecurity and veterinary issues was new to the participants
- 60% of the participants said they would like to have more practical sessions
- 100% said that they took advantage of the experiences of the other members of their working groups
- 100% agreed that with the information provided during the course they could initiate a new amphibian conservation program.

The funding to hold this workshop was generously provided by a grant from Chicago Zoological Society's Chicago Board of Trade, and with support from the Denver Zoo. The support of these two organizations is very much appreciated by everyone involved in the workshop.



One of the working groups presenting the terrarium they designed and built during the practical sessions during the amphibian husbandry course in Bolivia. Photo: Kevin Johnson.

present their ideas in plenary to receive feedback from the other teams. This methodology also encourages the development of abilities to work in a group environment which is critical for any conservation initiative.

The course also took advantage of the previous Conservation Needs Assessment workshop, and four species that had been assessed as requiring urgent rescue were selected so the students could develop a complete species conservation plan ranging from exhibit design and breeding plans to education and awareness-raising campaigns and possible reintroduction plans. Students applied the knowledge and skills gained during the training course to develop their plans.

Prior to the workshop, a dedicated web page for the course was developed to share bibliography and references so the students could attend the course with background information.



## Thanks to our Amphibian Ark associates

In this newsletter we are pleased to feature another of our professional associates, who regularly offer their services to support our amphibian conservation work. These individuals have contributed many hundreds of hours of their time to share their expertise and help with workshop facilitation, instructing at training courses, and chairing advisory groups.

We very much appreciate the continued support of these individuals, and their respective institutions. For a list of our associates, please visit: [www.amphibianark.org/associates/](http://www.amphibianark.org/associates/).

## Michael Ready, private herpetologist and photographer

It seems to me that my fascination with wildlife was innate, but I know that my family was vital in nurturing that interest. I grew up in a suburb of Los Angeles and at that time there were still amphibians to be found under the bricks and stones of the neighborhood. Sometimes my father would wake me up in the middle of the night just to show me a Western Toad (*Anaxyrus boreas*) or a Slender Salamander (*Batrachoseps major*) in the flowerbed. I can still see them lit by the dim beam of a metal Eveready flashlight. And, my grandfather -- I have vivid memories of him with his slacks tucked into his thin black socks, as we turned stones in the San Gabriel River, looking for California Newts (*Taricha torosa*). My interest in amphibians and other wildlife just snowballed from there. Like any budding naturalist I kept a menagerie of herps in my bedroom. This required learning about proper husbandry, which eventually led to developing specialized care and breeding methods for arboreal frogs. Of course, my suburban herping grew into more distant travels to experience the exotic biodiversity of faraway places. All of these things led me to pick up a camera, and they continue to inspire my photographic work.



For a number of years I was very lucky to work with Bob Mailloux at Sandfire Dragon Ranch. At Sandfire, I managed the amphibian program and worked with Bob to develop novel husbandry and breeding protocols. Bob is a herpetocultural pioneer and during this period we added to Sandfire's milestones. The most important and memorable for me is the first captive reproduction of Wallace's Flying Frog (*Rhacophorus nigropalmatus*), which led to the discovery of its beautiful and distinct juvenile form. We also worked to bridge the private sector with zoological institutions and conservation organizations. In 2006, we were honored to participate in the WAZA/CBSG meetings in El Valle, Panama: the founding of Amphibian Ark. From there I continued as an AArk Steering Committee member for several years, acting as the liaison to the US private sector. In 2009 I joined the AArk team in leading the Indonesian Conservation Planning Workshop in Bogor.

Currently, I divide my time between photography and various conservation projects. I remain dedicated to the preservation of amphibians in the wild, and to the advancement of captive husbandry and breeding as a tool for education, conservation and research. Toward that effort, I presently serve on the executive board of Tree Walkers International (TWI, [www.treewalkers.org](http://www.treewalkers.org)), and act as Director of TWI's Amphibian Steward Network. I'm also an Associate Fellow of the International League of Conservation Photographers ([www.ilcp.com](http://www.ilcp.com)), which combines my passions well.

It is great to see how Amphibian Ark has grown and all that this wonderful organization has accomplished since 2006 - reaching around the globe for the survival of what is, to me, still the most fascinating group of animals.

## AMPHIBIAN & REPTILE CONSERVATION

You can follow the official journal of Amphibian & Reptile Conservation by subscribing to ARC News Alerts (new paper releases and news) at:  
<http://amphibian-reptile-conservation.org/subscribe.html>.

**Don't be left behind!**



## Amphibian Conservation Needs Assessment for the Philippines

From July 1st - 4th, the University of Santo Tomas in Manila, Philippines, hosted a workshop to assess the conservation needs of all Philippine amphibians. During the workshop, 113 species of amphibians were assessed and prioritized for the conservation actions required to ensure their survival in the wild. It was evident during the assessment process that many of the Red List categories that have been assigned to local species are now quite out of date, with most not being updated since 2004. Although the participants weren't able to complete Red List assessments during the workshop, the Red List categories used to complete this assessment were revised to their estimated values, based upon the expertise of the workshop participants.

According to the estimated Red List categories, Philippine amphibians fall into the following Red List categories: 1 Critically Endangered, 1 Endangered, 21 Vulnerable, 32 Near Threatened, 25 Least Concern and 33 Data Deficient. It is quite clear that Philippine amphibians are in need of a complete Red List re-assessment.

Fifteen participants representing nine different organizations in the Philippines systematically assessed the species using the AArk's Conservation Needs Assessment process ([www.amphibianark.org/pdf/AArk-Conservation-Needs-Assessment-tool.pdf](http://www.amphibianark.org/pdf/AArk-Conservation-Needs-Assessment-tool.pdf)), with each species being recommended for one or more of the following conservation actions:

- **Ex Situ Rescue:** 2 species that are in imminent danger of extinction (nationally) and require *ex situ* management, as part of an integrated program, to ensure their survival.
- **In Situ Conservation:** 36 species for which mitigation of threats in the wild may still bring about their successful conservation.
- **In Situ Research:** 47 species that for one or more reasons require further *in situ* research to be carried out as part of the conservation action for the species. One or more critical pieces of information is not known at this time.
- **Ex Situ Research:** 40 species currently undergoing, or proposed for specific applied research that directly contributes to the conservation of the species, or a related species, in the wild (this includes clearly defined 'model' or 'surrogate' species).
- **Mass Production in Captivity:** 1 species threatened through wild collection (e.g. as a food resource), which could be bred in captivity – normally in-country - to replace a demand for wild harvested specimens.
- **Conservation Education:** 42 species that are specifically selected for management – primarily in zoos and aquariums – to inspire and increase knowledge in visitors, in order to promote positive behavioral change.
- **Biobanking:** 2 species for which the long-term storage of sperm or cells to perpetuate their genetic variation is urgently recommended, due the serious threat of extinction of the species.
- **No Conservation Action Required:** 19 species that do not require any conservation action at this point in time.

The complete results from the workshop are available on Amphibian Ark's web site, [www.amphibianark.org/assessmentresults.htm](http://www.amphibianark.org/assessmentresults.htm).

During the last day of the workshop, participants drafted the outline for a National Amphibian Action Plan for the Philippines, and allocated authors for each section of the document. This will be a detailed national action plan, and will include the priorities and recommendations produced during the workshop. It is anticipated that the action plan will be published before the end of 2014.



Participants of the Amphibian Conservation Needs Assessment for the Philippines.  
Photo: Kevin Johnson.

a more coordinated response, and conservation programs which have a better chance of achieving their aims. AArk staff will continue to provide support and advice as required, to ensure the best possible outcomes for the long-term survival of amphibians in the wild in the Philippines (see article on page 13).

Participants also managed a quick visit to Ailon Zoo, the largest zoological institution in the Philippines in terms of land area and collection of animals. Zoo staff are hoping to convert some existing facilities into a new amphibian conservation breeding area over the coming months.

Funding for the workshop was generously provided by Chester Zoo and the University of Santo Tomas, with the University of Santo Tomas providing the workshop venue and equipment.

As with other recent amphibian conservation needs assessment workshops, AArk staff are working with the local amphibian conservation community to identify a suitable person to appoint to a half-time National Amphibian Conservation Coordinator position for a period of twelve months. This person will work with participants from the assessment and other stakeholders to complete the writing and publishing of the National Amphibian Action Plan and will then help to develop further species-level conservation action plans and to help forge new partnerships, both in-country and internationally, to ensure that recommendations from the workshop are implemented in a coordinated way. Funding is being sought to employ a suitable candidate. Experience has shown that having a person dedicated to this type of role for a period after the assessment workshop will lead to



## Conservation Needs Assessments moving to an online process

Assessing amphibian species for their conservation needs is one of the primary components of AArk's work, and we see it is a vital first step in identifying and prioritizing species for conservation activities both in captivity and in the wild. It helps us to determine, in a transparent, logical and objective way, which species have the most pressing needs, whether we are likely to be granted range state approval to work with the species, as well as guiding the development of holistic conservation action plans which combine both *in situ* and *ex situ* actions.

But importantly, these assessments allow us to maximize the impact of our often limited conservation resources, and to focus on those species which are most in need of our help, and to determine which species are most likely to benefit from our actions.

The initial assessment process was designed in 2006 by a working group during an Amphibian *Ex Situ* Conservation Planning Workshop in Panama, and was developed as a decision tree to select and prioritize species for *ex situ* work. Since then, the pro-

cess has been expanded and modified considerably, to become a tool which identifies broad categories of both field and captive conservation actions.

Working primarily with experts from the national Amphibian Specialist Groups, the most current information about species in the wild is reviewed across seven broad sections. This information then determines the most appropriate conservation actions for each species, and assigns priorities to each species.

Since 2007, this process has been used to assess the conservation needs of over 3,000 amphibian species, during twenty-seven regional or national assessment workshops. So far, over 400 species have been recommended for urgent rescue in captivity, but to date, only around forty-five of these species assessed for rescue are being managed in captive programs.

For the past year, AArk staff have been working towards migrating the assessment process to an online format. There are a number

of reasons why we've decided to move to an online format - most significantly, physical workshops are expensive to hold, and we're finding that funding for assessment workshops is becoming harder and harder to find. Typically, we are applying for five or six grants for each workshop before we are successful. Delivering the assessment process in an online format will allow much wider participation, and therefore, a greater number of experts will be able to contribute to the assessments. Typically, our workshop-based assessments include around 15-20 participants each, but with an online format, anyone with the appropriate expertise will be able to contribute. We'll also be able to run assessments for multiple countries at the same time, rather than us being limited to assessing only three or four countries per year, as has been the case to date. And once the new system is up and running, we'll be linking it directly with a range of other online amphibian conservation databases including Red List assessment data.

So with the generous support of the European Association of Zoos and Aquariums



Since 2007, Amphibian Ark's Conservation Needs Assessment process has been used to assess the conservation needs of over 3,000 amphibian species, during twenty-seven regional or national assessment workshops. Photo: Kevin Johnson.

(EAZA), the Zoo and Aquarium Association (ZAA) in Australasia, and the Association of Zoos and Aquariums (AZA) in the US, we are now well on the way to delivering an online version of our assessment process. We've allocated most of the funding to the initial software development and hosting, and the remainder will be used to develop some online training materials, and translation of the application into additional languages. The initial release of the application will include English and Spanish versions, and as we obtain additional translations, the system will also be available in other languages.

The online application has been developed in such a way that it is not specific to amphibians, and we are hoping that it will eventually be adopted by other taxonomic specialist groups.

By the middle of October we'll have the beta version ready for testing. We are currently in discussions with a few groups that are interested in assisting us during the beta testing stage, and after feedback from the testers has been received, and corresponding changes made to the application, we're hoping to release version 1 of the application on time, by the end of November.

We'll follow this up with wide promotion of the tool and its benefits, and will work with our colleagues at the Amphibian Survival Alliance and the Amphibian Specialist Group to promote its use widely within the amphibian conservation community. AArk staff have already identified a number of countries that are priorities for assessment, or for re-assessment.

We thank EAZA, ZAA and AZA for their support of this project and look forward to providing a valuable tool to expand our ability to support conservation needs assessments for the world's amphibians.

## Captive-bred Mountain Chicken Frogs released in Montserrat

**Benjamin Tapley and Mike Hudson, Zoological Society of London; Jeff Dawson and Matthew Morton, Durrell Wildlife Conservation Trust; and Gerardo Garcia, Chester Zoo**

The Mountain Chicken Frog (*Leptodactylus fallax*) is the largest native amphibian in the Caribbean and is currently listed in the IUCN Red List as Critically Endangered. Formerly found on seven islands in the Eastern Caribbean, it is now extant on just Montserrat and Dominica. Historic island extinctions came about through a combination of habitat loss and degradation, over-exploitation for food and introduced predators. The remaining populations on Montserrat and Dominica have been hard-hit by the emerging infectious disease, amphibian chytridiomycosis. The causative fungus (*Batrachochytrium dendrobatidis* - Bd) appears to have arrived in Dominica in 2002 and reached Montserrat in 2009.

The future of the species is uncertain and captive breeding and subsequent release is one of the strategies being employed to ensure its survival. Fortunately the reproductive biology of the

Mountain Chicken Frog was described from captive specimens at Durrell Wildlife Conservation Trust and the captive requirements of the species are known. In response to the chytridiomycosis epidemic, fifty Mountain Chickens were collected from Montserrat in 2009 and distributed between three European zoos, ZSL London Zoo, Durrell Wildlife Conservation Trust and Parken Zoo where the frogs were held in biosecure facilities to minimise the risk of them picking up novel pathogens in captivity. These organizations are partnered with the governments of Montserrat and Dominica to form the Mountain Chicken Frog Recovery Programme. The frogs have been successfully bred at all three institutions.



The Mountain Chicken Frog (*Leptodactylus fallax*) is the largest native amphibian in the Caribbean and is currently listed in the IUCN Red List as Critically Endangered. Photo: Benjamin Tapley.

Mountain Chicken Frogs are expensive to maintain in captivity as they have huge appetites and require a large amount of space. Unfortunately, the threats posed to the frogs in the wild are not reversible in the foreseeable future. Therefore a long-term commitment has to be made to ensure that there are frogs available for future reintroductions or supplementation. The frogs are formally managed by a studbook program coordinated by Gerardo Garcia at Chester Zoo; this is the only amphibian studbook in Europe.

There is ongoing research into the emergence, epidemiology and the impact of chytrid in Montserrat and Dominica. Part of this research involves the trial release on Montserrat of four cohorts of captive-bred Mountain Chicken Frogs from biosecure facilities. To understand how best to undertake future reintroductions, the frogs were released at different times of the year to coincide with the different Caribbean seasons. During the dry season frogs congregate around water bodies and might be more likely to come into contact with Bd. During the wet season it is suspected that the frogs are more dispersed and therefore less likely to contract the disease. There is also evidence that there is seasonal variation in chytrid prevalence and impact as it has waterborne spores and has a very narrow optimal temperature range. A subset of the re-

leased animals were implanted with radio transponders and, once released, were tracked by conservation biologists from Durrell and the Montserrat Department of Environment, who, along with the Zoological Society of London, are amassing data on the Bd infection status and survival of these frogs. This research will provide insights into frog dispersal, health status and survival rates.

The fourth trial release began in July 2014 when fifty-one frogs bred and reared at ZSL London Zoo and Durrell were flown back to the Caribbean. Upon arrival the frogs were held in temporary pens for a few days to acclimatise. During this time the frogs were fed on crickets that were also exported from Europe. These crickets had to be painstakingly sorted to ensure that only males were exported to prevent any possibility of their establishment on the island. After acclimatisation, the frogs were transferred to the field for a soft release. The team in Montserrat are currently in the final few weeks of radio tracking the frogs. It is hoped that the results of these trial releases will guide future decision-making and conservation interventions required to ensure that we can improve the outlook for this Critically Endangered frog.

For further information please see [www.mountainchicken.org](http://www.mountainchicken.org).



## Progress report of the Honduras Amphibian Rescue and Conservation Center

**Jonathan Kolby, Honduras Amphibian Rescue and Conservation Center**

Over the past year, a number of activities have been performed as part of the efforts to further establish the Honduras Amphibian Rescue and Conservation Center (HARCC). As of May 2013, 50% of the budget to construct the biosecure amphibian facility had been acquired, collectively from an Amphibian Ark Seed Grant and the Chicago Zoological Society. Then, in June 2013, supplementary funds were awarded by the Rufford Small Grants for Nature Conservation, which allowed on-site activities to commence at Lancetilla Botanical Garden and Research Institute in Tela, Honduras.

Field efforts in 2013 first involved another survey season in Cusuco National Park, Honduras, to continue monitoring the population dynamics and chytrid infection levels in populations of our three target species. Several hundred amphibians were sampled from July to August, and results again displayed similarly high rates of chytrid prevalence, especially in larvae and recently metamorphosed animals. In addition, we performed the first field survey for ranavirus presence in Cusuco National Park, which also represents the first survey for this pathogen in Honduras. Enigmatic lesions have been observed on some animals in Cusuco National Park that tested negative for chytrid, and we investigated the possible co-infection of chytrid and ranavirus as a potential cause. To our surprise, none of our ranavirus samples tested positive, but it may be partly due to the lower sensitivity of our non-lethal sampling methods. Whether ranavirus represents an additional threat to the amphibians of Cusuco National Park still remains in question.

After field work was completed, a series of meetings were held to promote communication and awareness about HARCC at key Honduran institutions. First, we travelled to Tegucigalpa, the capital city, and met with José Antonio Galdames the Vice Minister of the Instituto Nacional de Conservación y Desarrollo Forestal, Áreas Protegidas y Vida Silvestre (ICF), of the Honduran government. Although we already had government support and endorsement for this project through electronic communications, we felt it was still important to demonstrate our commitment by meeting with government representatives in person. We gave a PowerPoint presentation and had a discussion about our work in Cusuco National Park and with HARCC, which was received with great enthusiasm.

After meeting with José Antonio Galdames, we travelled to the national university, Universidad Nacional Autónoma de Honduras, to meet with Julio Enrique Mérida, the curator of the Museum of Natural History and professor of biology. We gave another presentation about the HARCC project and discussed opportunities for future involvement of university students in this program, both for developing wildlife husbandry/management skills and laboratory research projects.

In late August, a pre-construction visit was made to Lancetilla, so we could take additional final measurements of the building provided on-site where the biosecure amphibian units were to be fabricated, allowing us to make final preparations for a construction initiation trip in October.

In October, Jonathan Kolby travelled with Brandon Greaves, HARCC project partner representing Omaha's Henry Doorly Zoo & Aquarium, for a two-week stay at Lancetilla. The purpose of this visit was to initiate facility construction, and begin preparing the headquarters and amphibian isolation units for HARCC, where all *ex situ* head-start and captive assurance activities would be centered.

While at Lancetilla, meetings were held with Ciro Navarro Cruz, Director of Lancetilla, to further solidify HARCC's long-term presence in Honduras and Lancetilla's conservation vision. To strengthen HARCC's infrastructure, Cruz extended project partnership to an additional Honduran governmental agency, the Escuela Nacional de Ciencias Forestales. Therefore, HARCC now represents an international collaboration represented by a Memorandum of Agreement between Jonathan Kolby (USA), Lancetilla (Honduras), Omaha's Henry Doorly Zoo & Aquarium (USA), Departamento de Vida Silvestre del Instituto Nacional de Conservación y Desarrollo Forestal Áreas protegidas y Vida Silvestre (Honduras), Operation Wallacea (UK), Expediciones y Servicios Ambientales de Cusuco (Honduras) and Escuela Nacional de Ciencias Forestales (Honduras). In addition, HARCC recently became an Associate Partner of the Amphibian Survival Alliance.

On-site activities at Lancetilla in October were geared towards preparation of the building for where two isolated amphibian rooms and a feeder insect rearing facility were to be stationed. Inside this building, the walls were cleaned, sealed and coated with mold and fungal resistant paint and a series of scouting trips were undertaken between the cities of Tela and San Pedro Sula to identify sources of necessary construction materials and determine what materials would need to be improvised with suitable alternative materials.

During this process, the structural integrity of the building at Lancetilla came into question and we decided it was necessary to call in a professional contractor to make an



Brandon Greaves provides information and background to the Director of Lancetilla about the Henry Doorly Zoo & Aquarium's commitment to the prevention of amphibian extinctions. Photo: Jonathan Kolby.

evaluation. It was determined that significant repairs were needed to the building's roof, frame, and walls and these unexpected repairs were cost-prohibitive for our project budget. Lancetilla was unable to offer the funds needed to repair their building, and so we instead decided to improvise the structure of our amphibian facility design. Rather than constructing biosecure isolated amphibian units inside this building, which would also require the building to be structurally intact for biosecurity and climate control, we have since determined the best course of action is to instead purchase two twenty-foot shipping containers that will be modified into the biosecure amphibian laboratories, which will be stationed in a vacant field right next to this building. Meanwhile, this building will still be made useful at minimal costs to become the feeder insect rearing facility and the HARCC office headquarters.

Over the past few months, we have been researching shipping container sources, prices and shipping modes to Lancetilla. Our current revised plan is to purchase one container in the USA and have it transported to the Henry Doorly Zoo & Aquarium, where

Jessi Krebs, Brandon Greaves, and additional zoo staff members will work together to modify the interior of the container into the biosecure amphibian laboratory. This container will then be transported to Lancetilla in several months upon completion. The second shipping container will be purchased in Honduras locally, in order to save significant shipping costs, and the first container will be used as a model from which Kolby and Greaves will construct the second laboratory on-site at Lancetilla.

We are now currently preparing to purchase our first container, following an upcoming visit to the Atlanta Botanical Garden by Brandon Greaves to view their established Frog Pod design and speak with the project managers. In the meantime, we are also researching alternative power options that may reduce long-term operational costs, such as solar power versus an emergency gasoline-based generator, as an emergency power source is imperative to keep HARCC's climate control systems operational during power outages at Lancetilla.

## Featured Frog MatchMaker project

**Conserving the most endangered amphibian species in Argentina - Combining *in situ* and *ex situ* conservation strategies, Museo de La Plata, Argentina**

### Overall goal

Populations of target species are stabilized, ensuring their long lasting viability.

### Goal

Protection of target species is highly improved by alleviating main threats and by establishing assurance colonies.

### Objectives

1. To monitor and update the conservation status of target species.
2. To diminish the impact of exotic species (i.e. trout, cows, sheep and goats).
3. To increase the quality of available habitat for target species.
4. To monitor and reduce the spread of chytrid fungus.
5. To reduce the effect of climate change on habitat by performing adaptive management strategies.
6. To implement *ex situ* programs aimed at establishing assurance populations and to reintroduce individuals into the wild.
7. To raise awareness among local communities.

### Project needs

Because the project has a strong field component, volunteer help for fieldwork is constantly needed.

As a part of the *ex situ* program, disposable lab supplies are constantly needed. For the *in situ* program, we are in need of replacement and supplementation of basic equipment (GPS, frog loggers, data loggers, flashlights, etc.).

With regards to capacity-building, the team members of this project require additional training (in the form of meetings, courses, workshops, and others) with the aim of improving their skills and knowledge and to share their experiences.

This project has a strong fieldwork component for both, *in situ* and *ex situ* conservation programs. Field activities include research, awareness-raising among local communities, adaptive management, collection of individuals for assurance colonies and in the future, the reintroduction of captive-bred individuals. The need for a double traction vehicle is of key importance for the success of both components of this project. We are currently spending a large amount of money renting a truck for each activity but the project would be highly benefited by having our own vehicle.

For more information, or to lend your support to this project, please contact Federico Pablo Kacolis, Museo de La Plata, [kacolis@fcnym.unlp.edu.ar](mailto:kacolis@fcnym.unlp.edu.ar).

The complete project can be seen at <http://aark.portal.isis.org/Amphibian%20Partnerships/Lists/Amphiban%20partnershis/DispForm.aspx?ID=75>



Fieldwork at Laguna Raymunda.  
Photo: Federico Kacolis.



## Northern Corroboree Frog conservation program at the Tidbinbilla Nature Reserve

Meaghan O'Connor, Northern Corroboree Frog Project Officer - Tidbinbilla, Parks and Conservation Service, Australia



Tidbinbilla Nature Reserve in Australia manages the largest captive breeding program for the spectacular-looking Northern Corroboree Frog (*Pseudophryne pengilleyi*), a species with less than 1,000 animals remaining in the wild. Photo: Meaghan O'Connor.

Northern Corroboree Frog larvae at Tidbinbilla Nature Reserve.  
Photo: Meaghan O'Connor.

Tidbinbilla Nature Reserve in Australia boasts the largest captive breeding program for the Critically Endangered Northern Corroboree Frog (*Pseudophryne pengilleyi*) of which less than 1,000 remain in the wild. The Northern Corroboree Frogs held at Tidbinbilla are all from the Southern Brindabella Mountains, and are genetically distinct from other populations of the same species. There are estimated to be less than fifty wild individuals remaining in the Southern Brindabella Mountains. Staff at Tidbinbilla now release around 200 captive-bred individuals to the wild each year to help bolster wild populations, and it is hoped that these release efforts will allow breeding populations to persist in the wild and have the opportunity to develop resistance to the chytrid fungus pathogen. This fungus is well-established in the alpine sphagnum bog environment where the frogs are distributed, and is the primary cause of decline for this species.

Tidbinbilla Nature Reserve maintains a captive population of around 800-1,600 individual Northern Corroboree Frogs, including around 250 adult breeding frogs which were collected in 2003 from the wild as eggs and raised at Tidbinbilla. The eggs collected in







The captive breeding program for Northern Corroboree Frogs at Tidbinbilla is been managed in three climate-controlled purpose-built shipping containers.  
Photo: Meaghan O'Connor.

2003 were used to establish the breeding program, and these animals are still the primary breeders, although in 2012 the first generation of captive-bred individuals (offspring from the original wild-sourced breeders) attained maturity and successfully bred, thus producing second-generation captive-bred frogs. This success continued in 2013 with more second-generation captive-bred eggs being produced.

There have been three releases so far of captive-bred Northern Corroboree Frogs to the wild, in 2011, 2012 and 2013. The frogs are released at one year of age and their individual ventral pattern is photographed for identification purposes. The wild population is also audited yearly to monitor the rate of decline or any spikes in the population. Whether any captive-bred frogs have survived will not be known until the released frogs reach sexual maturity and begin calling, because this calling is the only way to monitor these very small 2-3 cm frogs in their sphagnum moss habitat. Northern Corroboree Frogs reach sexual maturity at 4-5 years of age, and thus the first released frogs will only just be reaching breeding age in 2014/2015.

The captive breeding program at Tidbinbilla has been managed in three climate-controlled purpose-built shipping containers, although we are in the process of establishing five large outdoor enclosures to explore more natural methods for raising the frogs. Tidbinbilla is situated in a valley surrounded by mountains and is adjacent to Namadgi National Park, where Corroboree Frogs were once very common. Because the climate is similar to where Corroboree Frogs are found, Tidbinbilla is an ideal location for using natural outdoor enclosures. The enclosure design plan has a strong emphasis on minimising the risk of the introduction of chytrid fungus to the enclosure by hindering the accessibility of wild tree frogs (predominantly Peron's Tree Frog, *Litoria peronii*) into the outdoor enclosures.

The outdoor enclosures are an exciting development for the Tidbinbilla team, and hopefully will be a significant step towards re-establishing wild populations of Northern Corroboree Frogs in Namadgi National Park.

## Call for Photos for the 2014 Year of the Salamander Calendar Photo Contest

We are seeking close-up, digital photos of salamanders, preferably in their natural habitats or within an educational or conservation context. One winner will be selected each month to be the featured photo as part of the Year of the Salamander online calendar. Runner-up photos will also be included in the calendar. In addition, all submitted images will be considered for use in the Year of the Salamander monthly newsletter and website as well as other Year of the Salamander-related conservation, outreach, and educational efforts.

### Give us your best shot!

For more information and for entry details, please visit [www.parcplace.org/images/stories/YOSal/YOSphotocontest.pdf](http://www.parcplace.org/images/stories/YOSal/YOSphotocontest.pdf).

Winner: A Green Salamander (*Desmognathus fuscescens*), the only salamander species in North Carolina listed as endangered, captured by the photographer in the photo (see page 1). You will see this photo with the logo with the date and time it was taken and the photographer's name. Also, you can see this photo in the photo contest calendar.

**2014 Year of the Salamander Photo Contest Calendar**

www.yearofthesalamander.org

| Mon | Tue | Wed | Thu | Fri | Sat | Sun   |
|-----|-----|-----|-----|-----|-----|---|
|     |     |     |     |     |     | 1<br>Featured photo: Green Salamander (Desmognathus fuscescens) |
| 2   | 3   | 4   | 5   | 6   | 7   | 8   |
| 9   | 10  | 11  | 12  | 13  | 14  | 15  |
| 16  | 17  | 18  | 19  | 20  | 21  | 22  |
| 23  | 24  | 25  | 26  | 27  | 28  | 29  |
| 30  | 31  |     |     |     |     |   |

Runner-up: A photo of a salamander in a cave, taken by Victor Lantieri. This photo was also featured in the Year of the Salamander monthly newsletter and website.

2014 Year of the Salamander Photo Contest Calendar

www.yearofthesalamander.org



## National Amphibian Conservation Coordinators - Case study in the Philippines

**Kevin Johnson, Taxon Officer, Amphibian Ark**

Amphibian Ark staff help to prioritize amphibian species in need of *ex situ* conservation, build capacity where it is most needed, and coordinate captive amphibian conservation programs implemented by partners around the world, with the first emphasis on programs within the range countries of the species. We are always aware of our obligation to couple captive conservation measures with the necessary efforts to protect or restore species in their natural habitats.

Our Taxon Officers help to coordinate all aspects of implementation within the AArk initiative and assist AArk partners in identifying priority taxa for conservation work both in captivity and in the wild. An initial part of this process involves evaluating species, to help conservation managers maximize the impact of their limited conservation resources by identifying which amphibian species are most in need of particular types of conservation action. These Conservation Needs Assessments ([www.amphibianark.org/pdf/AArk-Conservation-Needs-Assessment-tool.pdf](http://www.amphibianark.org/pdf/AArk-Conservation-Needs-Assessment-tool.pdf)) are carried out with national Amphibian Specialist Group (ASG) members, under the guidance of an experienced AArk assessment facilitator, with the goal of updating information and separating out and assessing all species, to determine the best conservation actions to help ensure their ultimate survival in the wild. The assessment results in a series of reports for nine different conservation actions. Species are listed according to their priority for the particular conservation action, and the supporting documentation provides a guide for those species which have the most chance of benefiting from the prescribed conservation action(s).

Since 2007, we have facilitated assessment of the conservation needs of 3,375 (46%) of the world's amphibian species through 26 national or regional workshops. Additional workshops are planned for other countries and regions over the coming months. The results of previous assessment workshops are available on the Assessment Results page of our web site, [www.amphibianark.org/assessment-results/](http://www.amphibianark.org/assessment-results/), and to date, 412 different species have been assessed as requiring urgent captive rescue to help prevent their extinction.

The benefits of this assessment process are clear – we assemble the leading amphibian field experts in each region, to collectively determine the best course of conservation actions to help prevent the extinctions of threatened amphibian species in the wild. These actions include habitat restoration and preservation, threat mitigation, captive breeding for release and community awareness and involvement.

After the many thousands of dollars and thousands of hours of experts' time it has taken to hold these assessment workshops, unfortunately, many of the recommendations resulting from the workshops for both captive and field conservation actions are yet to be implemented. One of the biggest obstacles for this is a lack of funding. As most conservationists are aware, sufficient funding to effectively carry out conservation actions has always been difficult to obtain, and increasingly, the decreasing amounts of available funds are being sought for an increasing number of projects. However, it appears that in many cases, the lack of a coordinated, national approach, and lack of support for developing and implementing conservation actions for amphibians is often the reason why insufficient action occurs.

### National Amphibian Conservation Coordinators

A possible solution to this is one that AArk staff have been promoting for some time now - the appointment of locally-based, part-time National Amphibian Conservation Coordinators. AArk staff will work with the local amphibian conservation community in each country where a conservation needs assessment has been undertaken, to identify a suitable person to appoint to a half-time position for a period of twelve months. The Conservation Coordinator would report directly to the national Amphibian Specialist Group Chair(s) and will work with workshop participants and other local stakeholders to help develop or update national amphibian conservation action plans and to help forge new partnerships, both in-country and internationally, to ensure that recommendations from the assessments are implemented in a coordinated way. Experience has shown that having a person dedicated to this type of role for a period after the assessment workshop will lead to a more coordinated response, and conservation programs which have a better chance of achieving their aims.

AArk staff will work with these coordinators to provide any additional support that might be required to ensure that priority conservation actions can be undertaken. Funding to cover this position in a half-time role for a 12-month period has been included in the budgets for the for the last six assessment workshops, but unfortunately, funding to support these positions has not yet been secured.

Some of the duties associated with the role include:

1. Identifying relevant range-country individuals and organizations active or interested in both *in situ* and *ex situ* conservation of amphibians.
2. Working with the local ASG Chair and members to coordinate and complete the development of a National Amphibian Action Plan.
3. Disseminate the National Action Plan to all relevant stakeholders.
4. Generating and maintaining a database which includes national amphibian lists; significant local areas in terms of diversity, endemism, and conservation of amphibians; a national amphibian conservation partnership database.
5. Maintaining and updating the Amphibian Conservation Needs Assessment data as needed.
6. Facilitate and ensuring open and regular lines of communication between national amphibian conservation individuals and organizations.
7. Promoting the establishment and development of Taxon Management Plans for priority species.
8. Identifying the need for capacity building within the country including population management, husbandry and veterinary expertise and other aspects.
9. Promoting the conservation of amphibians and the development/update of national amphibian Red List assessments.

The salary and working entitlements would be based on local employment levels.

### Support conservation efforts in the Philippines

During the Conservation Needs Assessment workshop held in the Philippines in July, the local ASG members discussed the appointment of a National Amphibian Conservation Coordinator, and they were very keen to identify and employ a suitable candidate, as soon as funding could be found. On the last day of the workshop, participants began drafting the first National Amphibian Action Plan for the Philippines, authors for each of the chapters were identified, and the authors have been working on their various components of the document. Plans are underway to bring the group back together again before the end of the year, to work on assembling the chapters, and identifying the next steps towards implementing a range of national conservation actions.



The Mindanao Torrent Frog (*Sanguirana everetti*) was recently assessed as one of the highest priority amphibian species for conservation action in the Philippines.  
Photo copyright: Cameron Siler.

AArk staff and the Philippines ASG members are very excited to announce the very generous support of the Virginia Zoo in Norfolk, Virginia, USA ([www.virginiazoo.org](http://www.virginiazoo.org)), with the Zoo agreeing

to support the \$4,500 salary for this position for a twelve-month period. A job description has been completed, an MOU has been drawn up and signed, and a suitable candidate for the position is now being sought within the Philippines. The position will be hosted by the National Museum of the Philippines in Manila, under the supervision of Dr. Arvin Diesmos, the Chair of ASG Pilipinas.



Roger Sweeney, the Assistant Director at Virginia Zoo said, "Responding to the dramatic wave of amphibian declines and extinctions happening around the world requires an urgent response. It will take a truly global effort from conservation organizations around world to affect significant change. Virginia Zoo is therefore excited to support this opportunity to facilitate swift and effective conservation management planning in a country that represents such an important combination of being recognized as both a mega diversity country and also biodiversity hotspot for unique and threatened species".

We very much hope that other countries will also consider appointing a part-time National Amphibian Conservation Coordinator, to help support ongoing conservation efforts and we are keen to promote this initiative. Having a single, national point of contact, whose job is to coordinate and support new conservation programs will be a great asset for the further development of amphibian conservation programs, and for uniting national efforts.

If you or your organization might be willing to support a similar position in other countries where an Amphibian Conservation Needs Assessment has already been undertaken, please contact AArk Taxon Officer, Kevin Johnson at [kevinj@amphibianark.org](mailto:kevinj@amphibianark.org) to discuss potential options.

## A review of recent insights on amphibian chytrid pathogens and conservation mitigation

**Joseph R. Mendelson III, Director of Herpetological Research, Zoo Atlanta**

Stakeholders have struggled for years to determine how best to conserve amphibians from the threat of the chytrid fungal pathogen *Batrachochytrium dendrobatidis* (*Bd*). A simple literature search will reveal that *Bd* has been the focus of hundreds of technical articles concerning its biology, including host- and geographic-distribution, spread of epidemics, pathogenicity, natural history, and veterinary treatments. Despite these efforts and considerable conceptual efforts in the realm of mitigation (see review by Woodhams et al., 2011) we are arguably no closer to a logistically feasible solution to control the disease in the wild than we were upon its discovery in 1999. This is problematic for *ex situ* conservation programs because, obviously, the final step of a successful *ex situ* program is the re-establishment of amphibians in the wild. The reality of persistent endemic populations of *Bd* at virtually every amphibian conservation site known is a frustratingly real and seemingly intractable problem. Here I review a few recent key papers that: a) indicate that the chytrid story is, sadly, much more complicated than we ever imagined; and b) highlight some innovative and promising work suggesting that mitigation may be possible in order to restore threatened amphibian populations.

### Chytrid ≠ *Bd* ≠ *Bd*

Building on previous genetic work, Rosenblum et al. (2013) contrasted our prevailing perception that *Bd* was a singular genetic clone that had been spread to naïve amphibian-host populations around the world from its yet-unknown native range. There are multiple distinct genetic lineages (what some may call "strains") of "*Bd*" that differ from one another in various senses, some known, some surely yet unknown. As Collins (2013) perfectly summarized: "*Bd* [is] a complex of lineages, a "they" rather than an "it." This research also indicates that our working model of a single genetic lineage that has recently colonized new areas is too simplistic. Indeed, *Bd* is now known to have a much older history in many areas, hybridization events have occurred between lineages, and there is evidence of evolution of increasing virulence toward amphibian hosts. These findings all have serious implications for conservation policy and action.

The misperception that all *Bd* organisms are the same, and that they now are widespread across many areas can set up the situation where biologists reduce their standards with field biosecurity and quarantine protocols, and where policy makers make the claim that no policies to limit *Bd* are not necessary in many countries, because "*Bd* is already here." These are dangerous fallacies. Simple to



remember:  $Bda \neq Bdb \neq Bdc$ . This reality also indicates that we just took a large step backwards in terms of our knowledge of the host- and geographic distribution of *Bd*. Virtually none of the histological and PCR-based *Bd* surveys for the last fifteen years were capable of discriminating between the different genetic lineages of *Bd*. So the most information we can gather from those efforts, retrospectively, is reduced to “some form of *Bd* was present at that site/host at that time.” This new information also means that, in the realms of translocation and reintroduction efforts, genotyping must be done to ensure that animals being moved or introduced are not carrying a novel form of *Bd* to the recipient site. The fact that future survey and conservation efforts now should include genotyping of *Bd* samples, raises further limitations both analytically and financially for conservationists.

The entire chytrid/amphibian story was further complicated by recent discovery of a second known species of *Batrachochytrium*, known as *B. salamandrivorans* (*Bs*), discovered and described by Martel et al. (2013). The authors documented that this species causes the disease chytridiomycosis and directly caused the decline of salamander populations in the Netherlands. Preliminary evidence, however, suggests that it may be specific to salamanders and not affect frogs. This discovery further highlights the crucial nature of ignorance that underscores the importance of maintaining vigilance against yet-unrecognized pathogens with biosecurity and quarantine standards in the field and in *ex situ* programs, as well as far-reaching policies to control and monitor movements of animals via commerce, research, or in the course of conservation programs. Clearly much remains unknown about the biology of *Bs* and the severity of threat that it may represent. But hopefully *Bd* has taught us never again to underestimate a newly discovered pathogen.

### **Bd mitigation**

Against a backdrop of attention to the potential to use bacterial pro-biotic therapies to mitigate chytridiomycosis in the wild, or reintroducing populations (e.g., Bletz et al., 2013), there are some directions in mitigation that appear to me to have more immediate, and logistically tractable, applications. Hosts and pathogens typically co-evolve with sufficient mutual exposure over time. One system, involving Leopard Frogs (*Lithobates pipiens*) in North America suggests such evolution, by documenting differential survivorship of individuals and populations living with *Bd*, based on genetic differences in the host (Savage and Zamudio, 2011; Savage et al. 2011). Field data from other systems (e.g., Newell et al., 2013) suggest that populations that have declined originally as a result of *Bd* may sometimes recover to some extent and - importantly - do so in the continued presence of endemic *Bd* at the sites. These observations support the concept that some amphibians may be capable of evolving tolerance (rather than resistance) to *Bd* (Venesky et al., 2011). However, other laboratory data (e.g., Ellinson et al., 2013) indicate that not all populations or species may be capable of evolving tolerance. These conceptual points were nicely connected in an array of conservation field programs in Australia reviewed by Scheele et al. (2014) and also pertain to pro-active reintroductions in the south-western United States (Sredl et al., 2011).

Collectively, these papers make some timely and important points and the ongoing field trials are the most well-considered of any that I know right now. These field programs essentially make no effort to directly attack or reduce *Bd* in the environment. Rather, they take the realistic approach that *Bd* is endemic and it cannot be eradicated by human mechanistic means. These programs also make the evident distinction between amphibians that are showing evidence of truly “recovering” from the arrival of a novel *Bd* pathogen, in the sense that they may be evolving tolerance of it, rather than the simple “rediscovery” of a few (potentially remnant) individuals. Such rediscoveries, while exciting, may represent any number of situations or phenomenon (Ladle et al., 2009). Additionally, the field trials being tested by our colleagues in Australia and the south-western United States are conceptually based on evolutionary principles (Lankau et al., 2011), rather than more mechanistic approaches such as veterinary applications to wild populations. Such evolutionary approaches have the potential to avoid selection directly upon the *Bd*-pathogen, whether that be toward increased virulence to the host or increased resistance to any form of anti-*Bd* chemical or biotic applications (Venesky et al., 2011).

These authors and conservation programs are taking a more parsimonious route toward amphibian conservation in which they implicitly acknowledge that “it is a *Bd* world now” (Lips, 2013) and amphibian conservationists are not in a position to decide which species to conserve per our own priorities. Rather, the reality of *Bd* is in the process of making that decision on our behalf. Forward-thinking programs like those outlined by Scheele et al., (2014) and Sredl et al. (2011) are creating innovative means of encouraging amphibian survival by natural means in the wild, rather than pursuing methods to control a demonstrably complex and uncontrollable pathogen.

### **References**

- Bletz, M. C., A. H. Loudon, M. H. Becker, S. C. Bell, D. C. Woodhams, K. P. C. Minbiole, and R. N. Harris. 2013. Mitigating amphibian chytridiomycosis with bioaugmentation: characteristics of effective probiotics and strategies for their selection and use. *Ecology Letters* doi 10.1111/ele.12099.
- Collins, J. P. 2013. History, novelty, and emergence of an infectious amphibian disease. *Proceedings of the National Academy of Sciences (USA)*: [www.pnas.org/cgi/doi/10.1073/pnas.1305730110](http://www.pnas.org/cgi/doi/10.1073/pnas.1305730110).
- Ellison, A. R., A. E. Savage, G. V. DiRenzo, P. Langhammer, K. R. Lips, K. R., and K. R. Zamudio. 2013. Fighting a losing battle: vigorous immune response countered by pathogen suppression of host defenses in the chytridiomycosis-susceptible frog *Atelopus zeteki*. *Genes Genomes Genetics* 8:1275–1287.
- Ladle, R. J., P. Jepson, A. C. M. Malhado, S. Jennings, and M. Barua. 2011. The causes and biogeographical significance of species' rediscovery. 2011. *Frontiers of biogeography* 3: 111–118.
- Lankau, R., P. Sogaard-Jørgensen, D. J. Harris, and A. Sih. 2011. Incorporating evolutionary principles into environmental management and policy. *Evolutionary Applications*: doi:10.1111/j.1752-4571.2010.00171.x.
- Lips, K. R. 2013. What if there is no happy ending? Science communication as a path to change. *Scientific American*: <http://blogs.scientificamerican.com/guest-blog/2013/05/15/what-if-there-is-no-happy-ending-science-communication-as-a-path-to-change/>.
- Martel, A., M. Spitzen-van der Sluijs, W. Blooi, B. R. Ducatella, M. C. Fisher, A. Woeltjes, W. Bosman, K. Chiers, F. Bossuyt, and F. Pasmans. 2013. *Batrachochytrium salamandrivorans* sp. nov. causes lethal chytridiomycosis in amphibians. *Proceedings of the National Academy of Sciences (USA)*: [www.pnas.org/cgi/doi/10.1073/pnas.1307356110](http://www.pnas.org/cgi/doi/10.1073/pnas.1307356110).

- Newell, D. A., R. L. Goldingay, and L. O. Brooks. 2013. Population recovery following decline in an endangered stream-breeding frog (*Mixophyes fleayi*) from subtropical Australia. *PLoS One* 8. DOI:10.1371/journal.pone.0058559.
- Rosenblum, E. B. et al. 2013. Complex history of the amphibian killing chytrid fungus revealed with genome resequencing data. *Proceedings of the National Academy of Sciences (USA)*: [www.pnas.org/cgi/doi/10.1073/pnas.1300130110](http://www.pnas.org/cgi/doi/10.1073/pnas.1300130110).
- Savage, A. E., M. J. Sredl, and K. R. Zamudio. 2011. Disease dynamics vary spatially and temporally in a North American amphibian. *Biological Conservation* 144:1910–1915.
- Savage, A. E., and K. R. Zamudio. 2011. MHC genotypes associate with resistance to a frog-killing fungus. *Proceedings of the National Academy of Sciences of the United States of America* 108:16705–16710.
- Scheele, B. C., D. A. Hunter, L. F. Grogan, L. Berger, J. E. Kolby, M. S. McFadden, G. Marantelli, L. F. Skerratt, and D. A. Driscoll. 2014. Interventions for reducing extinction risk in chytridiomycosis-threatened amphibians. *Conservation Biology* doi:10.1111/cobi.12322.
- Sredl, M. J. et al. 2011. Re-introductions of Chiricahua leopard frogs (*Lithobates [Rana] chiricahuensis*) in southwestern USA show promise, but highlight problematic threats and knowledge gaps. Pages 85–90 In Soorae, P.S. (Ed.) *Global Re-introduction Perspectives: 2011. More case studies from around the globe*. Gland, Switzerland: IUCN/SSC Re-introduction Specialist Group and Abu Dhabi, UAE: Environment Agency-Abu Dhabi. xiv + 250 pp.
- Venesky, M. D., J. R. Mendelson III, P. Stiling, B. F. Spears, and J. R. Rohr. 2012. Selecting for tolerance against pathogens and herbivores to enhance the success of reintroduction and translocation programs. *Conservation Biology* 26: 586–592.
- Woodhams, D. C., J. Bosch, C. J. Briggs, S. Cashins, L. R. Davis, A. Lauer, E. Muths, R. Puschendorf, B. R. Schmidt, B. Sheafor, and J. Voyles. 2011. Mitigating amphibian disease: strategies to maintain wild populations and control chytridiomycosis. *Frontiers in Zoology* 8:8 doi:10.1186/1742-9994-8-8.

## Captive management of the Critically Endangered Andean Buckley Glass Frog in Ecuador

**Luis A. Coloma, Elicio E. Tapia and Patricio Vargas-Mena, Centro Jambatu de Investigación y Conservación de Anfibios/Fundación Otonga, Ecuador**

Centro Jambatu, which is part of the Amphibian Research and Conservation Foundation in Quito, Ecuador, has begun the first attempts to guarantee the *ex situ* conservation of the Critically Endangered Andean Buckley Glass Frog (*Centrolene buckleyi*). To date this species has not been included in any rescue program, and given the threats this species faces, *ex situ* management is one of the proactive solutions to save this extant species from extinction.

Between June 2013 and June 2014, we installed additional equipment in the captive breeding facilities of the Arca de los Sapos program at Centro Jambatu. Terrestrial and equipment (water pumps and thermohygrometers) have been purchased and facilities for maintenance were set up for holding the frogs. We undertook field searches at two localities in the Cordillera Occidental of the Ecuadorian Andes: firstly at the Unachi River, Cotopaxi province (2,677 m above sea level), and secondly at the Tatahuazo River, Bolívar province (2,738 m above sea level). In spite of a relatively high search effort (66 person-hour frog searches during the night, and 72 person-hour tadpole searches during the day), during the rainy season (February and May 2014), field-collecting efforts at the two sites revealed the scarcity of the species during the collecting periods. However, the search resulted in us collecting two male founders, nine tadpoles, and five clutches of eggs (one was non-viable) at Unachi River, and three males, and three clutches of eggs (two were non-viable) at Tatahuazo River. The two males from Sigchos died for unknown reasons. The current population at Centro Jambatu is three males, and 73 tadpoles.

Scientific data to improve our knowledge of the species was gathered and will be published elsewhere. For example, under field conditions, we recorded habitat preference information for adults, tadpoles, and egg clutches. Tadpoles were found in fast-running water streams with temperatures of about 10–11 °C. The high rate of unviable egg clutches was due, in part, to parasitism by flies. Clutch data were collected, as well as recordings of vocalizations. In addition, we stored tissues from tadpoles for biobanking at Centro Jambatu.

The development of the tadpoles is progressing successfully and developmental changes are being documented photographically. Having a genetically viable captive population of Andean Buckley Glass Frogs is still not guaranteed, and further collecting efforts of founder individuals are needed. The habitat at the protected forest in Cashca Totoras is relatively well conserved, although some logging was documented. In contrast, the habitat in the relic population near



(Above and below): Male Andean Buckley Glass Frog (*Centrolene buckleyi*), collected from the Tatahuazo River, Bolívar Province. Photos: Luis A. Coloma.







Tatahuazo River, Bolívar province, the habitat of *Centrolene buckleyi* in the montane forests of Ecuador.  
Photo: Elicio E. Tapia.

Sigchos is being severely destroyed by deforestation and habitat destruction due to agriculture and contamination, thus the viability of this wild population is not guaranteed and urgent protection is required.

Captive breeding will not be possible until adult females are collected from the wild, or the captive tadpoles reach adulthood.

We have published a fact sheet with an up to date account of *Centrolene buckleyi* in the Free Access Electronic Encyclopedia AnfibiosWebEcuador, which can be seen here (under Centrolenidae): [www.anfibioswebecuador.ec/fichaespecie.aspx?Id=184](http://www.anfibioswebecuador.ec/fichaespecie.aspx?Id=184). Also, we have updated the AARK online *ex situ* progress data for this species, <http://progress.amphibianark.org/orgs/12/programs/show/49>.

This project is funded by an Amphibian ARK Seed Grant, with matching funds from Saint Louis Zoo, Tree Walkers International, and Wikiri.



Clutch of *Centrolene buckleyi* eggs with embryos of on a leaf overhanging the Tatahuazo River, Bolívar province, Ecuador.  
Photo: Luis A. Coloma.



*Centrolene buckleyi* tadpole (CJ sc 3403) from the Tatahuazo River in Bosque Protector Cashca Totoras, Bolívar province, Ecuador. Photo: Luis A. Coloma.

## Mesoamerican amphibian *ex situ* conservation course and conservation strategy workshop

**Yolanda Matamoras, President, Mesoamerican Association of Zoos (AMACZOOA)**

Twenty-five participants from Mexico, El Salvador, Nicaragua, Panama, Ecuador, Colombia, United States and Costa Rica attended an amphibian *ex situ* conservation course and a conservation strategy workshop that took place during September 2013 at Simon Bolivar Zoo, San Jose, Costa Rica.

To start the course, Gerardo Chaves, Coordinator of the Amphibian Specialist Group (ASG) for Costa Rica, gave the welcome to the participants, followed by Diego Almeida, from Gustavo Orces Herpetological Foundation from Ecuador, who gave a general presentation about *ex situ* management of amphibians. During the afternoon Federico Bolaños from the University of Costa Rica gave a presentation about Latin American amphibians, with an emphasis on Costa Rica, explaining the history of the group, recent studies, and the IUCN Red List analysis in Mesoamerica, highlighting that the work was done with contributions from many people. John Cossel from Northwest Nazarene University explained the importance of water and several other abiotic factors that are important in successful *ex situ* conservation programs for this group of vertebrates. At the end of the day, John showed several instruments that measure these factors and taught the participants how to use them and let them practice with them using the Simon Bolivar Zoo as a field lab.

During the second day, Andrea Brenes, from the University of Costa Rica, talked about amphibian nutrition, sharing her experience about this emerging field in amphibian *ex situ* management. Randall Arguedas from the Fundación Pro Zoológicos (FUNDAZOO) spoke about veterinary medicine, and Diego Almeida continued speaking about reproduction in captivity, eggs and development and food culture.

On Saturday the course moved to Brian Kubicki's Costa Rican Amphibian Research Center at Siquirres, Limón, where Brian explained to the group his experiences in both *ex situ* and *in situ* in amphibian conservation, showing his terrariums and the work he does at the Research Centre to facilitate amphibian reproduction in their own habitat.

The next three days were dedicated to creating a Conservation Strategy for Amphibians in Mesoamerica, following the Conservation Breeding Specialist Group (IUCN SSC CBSG) workshop methodologies. Four working groups were established: Education, Research, Monitoring and Habitat and Fundraising. One of the main conclusions of the group is that many people, from different interdisciplinary fields need to become more involved with amphibian conservation.

All the presenters made their presentations available to all participants via a Dropbox folder. The first draft of the document was finished and the final report is going to be ready in January.

This workshop was financed by WAZA, FUNDAZOO and the Amphibian Ark, with the support of Northwest Nazarene University, the University of Costa Rica and the Costa Rican Amphibian Research Center.

## AZA is member of PARC's Joint National Steering Committee

**Shelly Grow, Director of Conservation Programs, AZA**

Steve Olson, Vice President of Federal Relations for the Association of Zoos and Aquariums (AZA), is the new zoo and aquarium member of the Partners in Amphibian and Reptile Conservation (PARC) Joint National Steering Committee. The mission of PARC is to conserve amphibians, reptiles and their habitats as integral parts of the ecosystem and culture through proactive and coordinated public-private partnerships.





## National Amphibian Expo

**Dan Madigan, President, National Amphibian Expo; Devin Edmonds, Coordinator, Association Mitsinjo; and Michael Lannoo, Indiana University School of Medicine**

The National Amphibian Expo (NAE) took place on August 9 in Indianapolis, Indiana, USA. This biennial show and sale primarily focused on advancing scientific understanding and promoting innovative captive husbandry standards for tropical and temperate amphibian species.



Zoo Med were one of the vendors showcasing their amphibian-keeping products at the recent National Amphibian Expo.  
Photo: Dan Madigan.

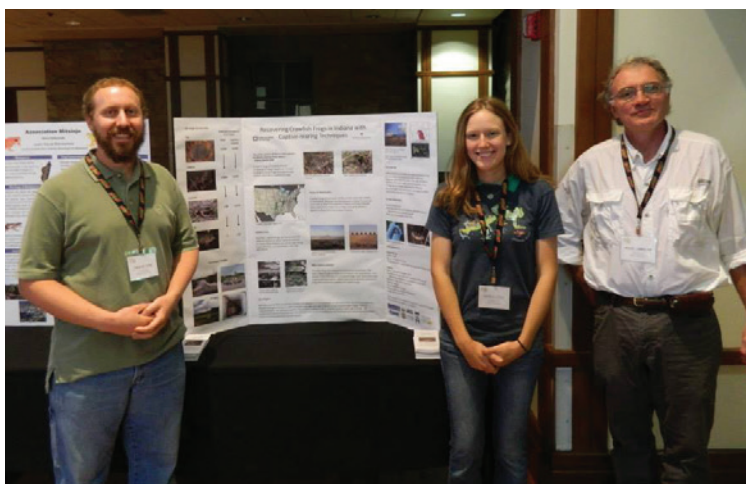
### Association Mitsinjo

Together with support from Parc du Thoiry and Woodland Park Zoo, the funds raised by the National Amphibian Expo for Association Mitsinjo will be used in Andasibe, Madagascar to construct an Environmental Outreach Center.

Here, public terrariums housing frog species maintained at our breeding facility (which for biosecurity reasons has restricted access) will be displayed alongside an interpretation and activity room, allowing students enrolled in their environmental education campaign to learn about the unique amphibians of Andasibe and the important ecological roles they serve.

"We have been trying to find a way to make this idea a reality for years. With support from the National Amphibian Expo and two zoos we have a new way to connect students to the environment, using frogs on display as a new learning tool within our existing environmental curriculum.", said Devin Edmonds, Coordinator of the amphibian program at Mitsinjo.

The Environmental Outreach Center will also help sustainably generate revenue for Mitsinjo's amphibian conservation activities. Mitsinjo receives thousands of tourists each year who visit their protected areas, and it is expected that some of them will also be interested to visit the amphibian exhibits at the new Environmental Outreach Center. Construction of the new center supported by NAE should be complete in early to mid 2015.



All proceeds from vendor table sales, admissions, and the silent auction were earmarked for two Amphibian Ark supported projects. These two projects were Dr. Michael Lannoo's Crawfish Research and Recovery project and Association Mitsinjo's Amphibian Captive Breeding Facility. After a great visitor turnout and an amazing silent auction the National Amphibian Expo was able to donate US \$1,500 to each project. These projects are truly committed to amphibian conservation and these donations will allow them to further their research.

Due to the great overall reviews of the National Amphibian Expo, this event will again take place two years from now in 2016. The organizing committee would like to thank everyone for their support, especially the sponsors and Amphibian Ark and we truly hope for continued support for years to come.



Construction of a new Environmental Outreach Centre at Association Mitsinjo in Madagascar is being made possible in part by funds raised at the recent National Amphibian Expo, and also with support from Parc du Thoiry and Woodland Park Zoo.  
Photo: Devin Edmonds.

### Crawfish Research and Recovery Project

The second project to benefit from funds raised during the National Amphibian Expo is a research and recovery project for Crawfish Frogs (*Lithobates areolatus*), run by Dr. Michael Lannoo from the Indiana University School of Medicine, and three of his students, Rochelle Stiles, Andrew Hoffman and Jonathan Swan from the Indiana State University. The project involves monitoring Crawfish Frog populations in Indiana and regionally, to determine their status; define natural history features; determine the genetic relationships between different populations; define the role of disease (specifically, chytrid fungus); and determine how practical captive rearing can be for augmenting wild populations.

Dr. Michael Lannoo and some of his students at the National Amphibian Expo.  
Photo: Dan Madigan.

## Amphibian Ark donors, January-August 2014

The work of AArk is possible due to the generous support of the following individuals and institutions:

### \*Sustaining Donors

#### Up to \$51,000



Josie Lowman \*

George Rabb, in honor  
of Mary Sughrue Rabb



#### Up to \$10,000



Kate Woodle

#### Up to \$5,000

American Frog Day & Staten  
Island Zoo  
**Andrew Sabin Family Foundation \***  
Association of Zoos & Aquariums  
(AZA)  
Chicago Zoological Society  
Ronna Erickson  
Helsinki Zoo  
**Nordens Ark \***  
Paignton Zoo  
Philadelphia Zoo  
Omaha's Henry Doorly Zoo  
Louis F. Schauer  
**Sedgwick County Zoo \***  
Singapore Zoological Gardens  
Tremont Elementary School 2nd  
Grade  
Zoo de Barcelona

Lisa Johnson & Scott Barolo  
Margaret B. Marshall  
Helen Medley  
Ozarks Chapter of AAZK  
Raymond Picciano  
Potawatomi Zoo Volunteers  
Potawatomi Zoological Society  
Santa Barbara AAZK  
Elizabeth Snyder, in honor of  
Mary Sughrue Rabb  
Georgette Taylor  
Jackie Van Ruler & Family  
Mary Walker  
Alistair Ward  
Bruce Weber  
Alex Wiles  
Brett Williams

Kalia Bloomquist  
Ines Burgoyne  
Roland Cuypers  
Sarah Cuypers  
Eithan Dudnik  
Adam Dvorak  
Ramona Fenner  
Valrie Fingerman  
Jamie Granfield  
Katie Holzer  
Steve Knott  
Brian Leggiere  
Elio Lewis  
Carl Lyon  
Marian McCain  
Francie Muraski-Stotz, in memo-  
ry of Mary Sughrue Rabb  
Priya Nanjappa  
L.M. Nystrom  
Raymond Provost  
Michael Puente  
John Rampe  
Julia Rampe  
Crystal Robertson  
Rita Rodin  
Dennis Rodrigues  
Drew Roenneburg  
Kelly Seals  
Susan Segur  
George Sommer  
Angela Van Dyck  
James Valiant  
J. Vaneman  
Gwendolyn Weeks  
Doug Widener  
Benjamin Winterbourne  
M.A. Wojcik

Jurys Inn Belfast  
Patrick McDonald  
Brian McDowell  
Robert Melancon  
James Milliken  
Lois Maxine Morrow  
Jacqueline Olness  
Daniel Pomfret  
Richard Revis  
Nona Rogero  
Keith Rowe  
Sylvie Roy  
Cameron Salmon  
Amanda Sihler  
William Thomas  
James Valiant  
Hannes Venter  
Leah Vit  
Michael Wallitis  
Christine Yeh

#### Up to \$1,000

Anne Baker & Robert Lacy, in  
honor of George Rabb  
Chicago Herpetological Society  
Andrew Chudy  
Kansas City Zoo  
Landry's Downtown Aquarium  
Minnesota Zoo  
Naples Zoo  
Ocean Park Conservation Foun-  
dation, Hong Kong  
Rosamond Gifford Zoo  
Sacramento Zoo

#### Up to \$100

Lillian Babbie  
Roman Bodinek  
Buffalo Zoo  
Chris J. Carvalho  
David Corsini  
Suzanne Cregan-Donat  
Kenneth Faulstich  
Maria Ferrante  
Madeline Ferwerda  
Marvin Goldberg  
Christophe Hainaux – Urodèles  
Forum  
Lee Hall  
Chris Johnson  
Katherine Madin  
Kevin Mitchell  
Tamara Montgomery  
Robert & Matthew Scherer  
Ellen Schousboe  
Christopher Simons  
Ceil Slauson  
Andrew Smith  
Sam Stroud  
Peter Thomas  
David & Marvilee Wake  
Iain Webb, in memory of Gran-  
dad

#### Up to \$10

Tracey Allen  
William Atkinson  
Andreas Braun  
Bethany Dyba  
Owen Garrett  
Katie Gilroy  
James Gregory  
Stefan Petru Juravle  
Anastasia Kierst  
Kathy Krizek  
Troy Miles  
David Mitchell  
Anthony Small  
Jessica Spivey  
Lindsey Warner

#### Up to \$500

Abilene Zoological Gardens  
John Adams  
Casimir Borowski Jr.  
Monique Canonico  
Ann Cordis  
Suzanne Cregan-Donat  
Melvin Davis  
Stephanie Davis  
Detroit AAZK  
Chloe Harris  
Julia Hertl  
Sarah Hofmann  
Ron Gagliardo & Paul Huggett  
Chandra Jessee

#### Up to \$50

Michael Amole, in memory of  
Bobaloo

#### Up to \$25

Kade Ariani  
Michelle Banks  
Kaitlyn Barno  
Natasha Broadstock  
Sarah Cuypers, in memory of  
Merri Hiatt  
Heather Ellis  
William Finley  
Peggy Houck  
Heiko Janssen  
Joseph Jiminez