amphibian ark

Keeping threatened amphibian species afloat

Newsletter

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In this issue...

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Amphibian Academy maiden voyage to serve amphibians

Ron Gagliardo, Training Officer, Amphibian Ark, Rachel Rommel, Volunteer Education Officer, Amphibian Ark, and Andy Odum, Curator of Herpetology, Toledo Zoo, Ohio, USA

Staff from Amphibian Ark and the Toledo Zoo executed the first Amphibian Academy Course at the Toledo Zoo in April. This new course was designed to provide a broad perspective training opportunity for people working in the field of amphibian conservation. These "practitioners" go beyond the zoological community. In fact, of over twenty-five applicants, only a small percentage were from zoos. Most applicants were from university or NGO (non-government organization) settings. The course size was small, limited to sixteen students and the selection process was careful to take into account how these students will put their new knowledge to work in their own programs and careers. Students came from as far as India, Hong Kong and Madagascar but as close as Canada and Michigan.

The course included lectures, hands-on practical exercises, and fieldwork. Students were provided with plenty of opportunities for personal mentoring to address their specific interests and needs by globally-recognized and successful amphibian conservationists. The hands-on activities were allotted more time and allowed students to learn by doing in small groups with team instructors, and thus providing better opportunities to learn. Overall, the small class size allowed for much more emphasis on the individual student and addressing their specific needs relating to amphibian conservation work. This was achieved through the many group discussions throughout the week where students were not only talking about the specifics of husbandry or veterinary care, but taking on more complex topics of *ex situ* planning and program management. They learned that it not always about "how" we do something but in some cases, "why?"

Consulting veterinarian and husbandry workshop instructor, Dr. Brad Wilson, with Amphibian Academy students during a lab session. Photo: Rachel Rommel.

Fai Fai Yeung from the Agriculture, Fisheries & Conservation Department of Hong Kong examines a frog during one of the hands-on sessions at the Amphibian Academy. Photo: Rachel Rommel.

The Pioneer Boy Scout Camp provided us great opportunities for covering field techniques and helped to connect the *in* and *ex situ* aspects of amphibian conservation. The students learned survey techniques and had training in Frog Call Survey work while at the camp. The faculty for the course included true leaders in their fields of expertise of amphibian research, conservation, and husbandry. They will remain available to the students in the future as mentors and professional contacts. We are grateful to the following instructors who came to share their knowledge with the group: Robert Hill, Joe Mendelson, Jennifer Pramuk, Tim Herman, Bob Johnson, Michael Lannoo, Brad Wilson, Allan Pessier, Tim Herman, John Chastain, and Kent Bekker. We are especially grateful for the additional logistical support and assistance of all the Toledo Zoo staff who worked hard to make things run smoothly. We are also indebted to the generosity of Dr. George Rabb and Zoo Med (www.zoomed.com) for supporting the training of up-and-coming amphibian conservationists.

The vision for this training course is to Serve Amphibians, a task that was accomplished very well in the first iteration of the Amphibian Academy. For information on future courses, contact AArk Education Officer, Rachel Rommel (Rachel@AmphibianArk.org), Ron Gagliardo (Ron@AmphibianArk.org) or Andy Odum (RAOdum@aol.com).

Zoo Med Amphibian Academy Scholarship helps to build capacity in Madagascar!

We are thankful to Shane Bagnall and the team at Zoo Med (www.zoomed.com) for providing the financial support for the Zoo Med Amphibian Academy Scholarship. As a leader in the industry devoted to the ethical and proper maintenance of reptiles and amphibians in captivity, Zoo Med has been a force also in building conservation capacity in the *ex situ* community.

This year, the scholarship was awarded to Justin Claude Rakotoarisoa, lead technician at the Mitsinjo Amphibian Conservation Center in Andasibe, Madagascar. Born in Ankaizina, a small village approximately two kilometers from Andasibe, Justin Claude began work with Mitsinjo in 2002 as an ecotourist guide. Soon after he was appointed Conservation Officer, during which time he was responsible for initiating and managing Mitsinjo's conservation activities such as habitat management, rainforest restoration, and environmental education. In 2010, Justin Claude stepped down as Conservation Officer to become the Lead Technician at the newly established amphibian captive breeding and husbandry research facility. He speaks English well as a result of two years training with a Peace Corps volunteer, and he has also conducted and assisted with numerous studies on local herpetofauna, resulting in co-authorship of the Malagasy edition of the Glaw & Vences *Field Guide to the Amphibians and Reptiles of Madagascar* (2007).

With tremendous endemism and increasing threats that face its amphibian diversity, Madagascar is one of the key places to focus amphibian conservation on the ground. This fact was realized several years ago by the Mitsinjo Association, who with the help of Amphibian Ark, AZA, and numerous institutions around the world, has set up the first functional amphibian breeding center on the island. With a staff of eight, the center is working with seven surrogate species of lesser concern along with the critically endangered Golden Mantella, *Mantella aurantiaca*, in a reintroduction program.

Training of technicians at the Mitsinjo center has been an ongoing process since January 2011, but was recently greatly advanced by an Amphibian Conservation Husbandry course led by Durrell Wildlife Conservation Trust and Chester Zoo in November 2012. Mitsinjo participants gained valuable practical experience and were introduced to new methods for keeping amphibians in captivity through a series of successful lectures, discussions, and activities. To build upon this recent experience Justin Claude was highly motivated to attend the Amphibian Academy in 2013. This experience was extremely beneficial to his professional development and in furthering the mission of the Mitsinjo captive breeding center. Justin Claude is going to serve a long-term function in the conservation of amphibians of Madagascar and will be charged with sharing his knowledge with future participants in these programs. A huge thanks to Zoo Med for helping us make this happen!

Recipient of this year's Zoo Med Amphibian Academy Scholarship, Justin Claude Rakotoarisoa from the Mitsinjo Amphibian Conservation Center in Madagascar, with Amphibian Ark's Volunteer Education Officer, Rachel Rommel. Photo: R. Andrew Odum.

2013 AArk Seed Grant winners announced

This year the Amphibian Ark Seed Grants attracted six applications from five countries on three continents, totalling $29,700 requested. Grants were awarded to four projects:

- *Ex situ* management of a Critically Endangered extant species of Centrolenidae in Ecuador: *Centrolene buckleyi* - Luis A. Coloma, Centro Jambatu de Investigación y Conservación de Anfibios/Fundación Otonga, Ecuador
- Action plan for the conservation of an Ecuadorian frog at risk of extinction - Diego Patricio Almeida Reinoso, Fundación Herpetológica Gustavo Orcés, Ecuador
- *Ex situ* reproduction and *in situ* conservation of the Critically Endangered *Alsodes vanzolinii* (Donoso- Barros, 1974) (Anura: Alsodidae) - Juan Carlos Ortiz Zapata, Universidad de Concepción, Chile
- *Ex situ* methodology building for Neotropical caudates, with a special emphasis on three species of Costa Rican moss salamanders of the genus *Nototriton* - Brian Kubicki, Costa Rican Amphibian Research Center, Costa Rica

Summaries of three of these projects are provided below.

We are extremely grateful for the continued support of our Seed Grant program by The Andrew Sabin Family Foundation, Ronna Erickson, Josie Lowman, Woodland Park Zoo and the European Association of Zoos and Aquariums.

Ex situ management of a Critically Endangered extant species of Centrolenidae in Ecuador: *Centrolene buckleyi*

Luis A. Coloma, Ph.D.; Centro Jambatu de Investigación y Conservación de Anfibios/Fundación Otonga

Project summary

This project aims to prevent the extinction of Buckley's Giant Glass Frog, *Centrolene buckleyi*, an extant species of glass frog Centrolenidae in Ecuador, through *ex situ* breeding and management. The extant populations of this species are Critically Endangered (based on IUCN criteria) through all of its distribution. Given the threats this species faces, *in situ* management is not enough to save the species, and at this point, *ex situ* management is an urgently needed proactive solution to save the extant populations from extinction. Previous efforts to captive breed Centronelidae have been relatively minor and unsuccessful, except for *Hyalinobatrachium valerioi*. We have had success raising several specimens of this species under our lab conditions. Thus, our objectives and activities are directed to find additional founders, adequately equip the *ex situ* facilities for the program Arca de los Sapos of Jambatu Center, and continually document all concepts utilized and successes obtained. With this project we will expect to produce the first descendants of future genetically viable populations of this species. We will keep them under lab conditions until the causes of their declines and disappearances are better understood and mitigated in nature, so their reintroduction would be feasible.

Buckley's Giant Glass Frog, *Centrolene buckleyi*.
Photo: Luis A. Coloma

Vanzolini's Spiny-chest Frog, *Alsodes vanzolinii*.
Photo: Camila Castro Carrasco.

Ex situ reproduction and *in situ* conservation of the Critically Endangered *Alsodes vanzolinii* (Donoso-Barros, 1974) (Anura: Alsodidae)

Dr. Juan Carlos Ortiz Zapata – Profesor Título, Departamento de Zoología, Facultad de Ciencias Naturales y Oceanográficas, Universidad de Concepción, Chile

Project summary

Alsodes vanzolinii (Donoso-Barros, 1974) is a species listed as Critically Endangered according to the IUCN (2013) and is ranked 123 on the EDGE list (Evolutionarily Distinct and Globally Endangered, www.edgeofexistence.org/amphibians). Since its description in 1974, nobody had sighted and/or collected *A. vanzolinii*, and therefore it was thought to be extinct. In 2010, it was rediscovered in three places near the type locality, Ramadillas (37º 19'S, 73º15"). There are only four publications related to *A. vanzolinii* and there is scarce knowledge about their biology. Besides being a rare and difficult to find species, it has a restricted distribution, with an area of occupancy less than 40 km^2 and not present in the National System of Protected Areas of the State (SNASPE). These locations correspond to small patches of native forest remnants in an array of exotic forest plantations. The main threat to the survival of this species is the loss of

habitat, and any type of stochastic event (fire, water pollution, diseases or invasive species) could cause local populations to disappear. For these reasons, it is imperative that conservation programs, both *ex situ* and *in situ*, are implemented as a matter of urgency. This proposed project integrates *ex situ* and *in situ* conservation to prevent *A. vanzolinii* from becoming extinct. On one hand, we will attempt *A. vanzolinii ex situ* breeding by expanding the *Rhinoderma darwinii* Breeding Station, successfully managed by the University of Concepción and Liepzig Zoo. In addition, *in situ* conservation plans have recently been approved and will be implemented from June 2013 (surveying to confirm actual distribution, monitoring of known populations, enforcing habitat protection measures and training for forest workers and community). The *in situ* methods will be conducted as a joint effort of the University Concepción and Arauco S.A. forestry company, who are owners of the land where the species has been found.

Ex situ methodology building for Neotropical caudates, with a special emphasis on three species of Costa Rican moss salamanders of the genus *Nototriton*

Brian Kubicki, Costa Rican Amphibian Research Center, Guayacan de Siquirres, Costa Rica

Project summary

The Monteverde Moss Salamander, *Nototriton gamezi*. Photo: Brian Kubicki.

This project's goal is to generate much-needed information on the *ex situ* establishment and captive husbandry techniques surrounding Neotropical salamanders. In recent years, following the global awareness of amphibian declines, many *ex situ* programs have been initiated in an attempt to conserve amphibian species, but most of these efforts have been focused primarily on only one of the three living orders of amphibians, that of anurans. Very little work has been devoted to rearing and breeding any of the eleven genera and nearly 280 species of Neotropical salamanders. Our goal is to take a step forward in this poorly entered realm by generating captive husbandry guidelines for four species of Costa Rican caudates, three species of moss salamanders of the enigmatic genus *Nototriton* (i.e. *N. gamezi*, *N. major*, and *N. tapanti*), and an epiphyllous *Bolitoglossa* species (*B. colonnea*), which is commonly found within the Costa Rican Amphibian Research Center's private reserve. We will simultaneously apply these techniques to *Oedipina uniformis*, a Costa Rican endemic that has been assessed for rescue by the Amphibian Ark. Our hopes are that this information may be adopted and extrapolated to other taxa within Costa Rica and other countries in Latin America wanting to initiate *ex situ* management plans for their own salamander species of special concern.

Coming soon!

We're developing an exciting new range of T-shirts, hoodies and sweatshirts featuring some of the threatened species our partners are rescuing.

You can support these rescue programs by proudly wearing one of these spectacular shirts!

Coming soon.....

Amazing Amphibians - They really are amazing!

Amazing Amphibians (www.amphibianark.org/amazing-amphibians/) is an initiative born out of a joint desire to share the incredible diversity of amphibians with the world. Biodiversity is the backbone of all life on earth and through this initiative we hope to celebrate some of the amazing amphibians around us, promote the fantastic work taking place to protect them and highlight the areas we still need to work on.

Each Monday a new Amazing Amphibian is posted online for you to share on your website, social media network and through email. We hope that you will enjoy this initiative and help spread the word about just how Amazing Amphibians really are.

Species featured so far include Luristan Newt, Sardinian Cave Salamander, Demonic Poison Frog, Hellbender and Dusky Gopher Frog. You can see all the featured Amazing Amphibian profiles on the AArk web site, www.amphibianark.org/amazing-amphibian-species/.

Amazing Amphibians was inspired by the widely popular "Amazing Species" (www.iucnredlist.org/amazing-species) weekly web initiative which is run by the Species Survival Commission and supported by the IUCN Global Species Programme to increase the awareness of our globally threatened species.

Amazing Amphibians is a collaborative effort between AmphibiaWeb (www.amphibiaweb.org), the IUCN Amphibian Specialist Group (www.amphibians.org), iNaturalist (www.inaturalist.org/projects/global-amphibian-bioblitz), The Sticky Tongue Project (www.thestickytongueproject.com), ARKive (www.arkive.org), Amphibian Survival Alliance (www.amphibiansurvivalalliance.org), Amphibian Ark (www.amphibianark.org), Synchronicity Earth (www.synchronicityearth.org), the IUCN SSC, Amphibian and Reptile Conservation (www.redlist-arc.org) and all those that care about amphibians.

There are four different levels of involvement for potential partners. If your organization would like to be a part of the Amazing Amphibians program in any of these capacities please see our web site for the roles and responsibilities of each level (www.amphibianark.org/amazing-amphibians/), or email amazing@amphibians.org.

Sustainable Amphibian Conservation of the Americas Symposium

Keynote speaker announced! Dr. Federico Bolaños, University of Costa Rica

Dr. Frederico Bolaños is internationally known as a top authority on the amphibians and reptiles of Costa Rica. Federico is a professor and researcher at the University of Costa Rica and Curator of Amphibians and Reptiles at the University of Costa Rica's Museum of Zoology. His research encompasses the areas of conservation, systematics, ecology, and behavior of amphibians and reptiles. Federico has been a co-author on the description of four new species of amphibians from Costa Rica.

Space is still available for this amazing event to be held in Siquirres Costa Rica July 31 - August 4, 2013.

Visit www.Anuran.org for more information.

The Splendid Leaf Frog (*Cruziohyla calcarifer*).
Photo courtesy of Ron Holt.

Amphibian Ark *ex situ* conservation training for Latin America

Ron Gagliardo, Training Officer, Amphibian Ark

Why is Latin America important in terms of amphibian conservation? This region contains the richest amphibian diversity on the planet and many of these species are critically endangered. Building capacity across the region to safeguard threatened amphibian species in range country is a mandate for Amphibian Ark and it was decided to hold an *ex situ* training course in Gamboa, Panama, April 1-6. Panama is one of the most studied and documented regions in terms of amphibian declines and because of this fact, it is a place where informed decisions to help conserve amphibian diversity can be made.

Workshop goals

This workshop was engineered to help facilitate professionals in Latin America to engage in properly planned, implemented and maintained *ex situ* amphibian programs through comprehensive training of key stakeholders and to further stimulate in-country, regional and international partnerships that will support successful *ex situ* programs.

Objectives

1. To provide hands-on and stimulating training that will help in-country personnel successfully care for amphibians in captivity covering subjects such as basic husbandry, nutrition, biosecurity and veterinary care.
2. To provide specific information on proper planning and program development for *ex situ* programs including *ex situ* planning, measuring success and linking *ex situ* and *in situ* programs.
3. To encourage and facilitate regional networks and partnerships.

Panamanian Golden Frog, *Atelopus zeteki*, a species that hopes to benefit in the future from trained conservation professionals. Photo: Ron Gagliardo.

The target audience

This workshop was aimed at range country personnel in Latin America who are directly working with amphibians in captivity or planning to do so in the near future. We had participants from Chile, Colombia, Ecuador, Guatemala, Mexico, and Panama. Staff of the Panama Amphibian Rescue and Conservation Project (PARC) also attended - this is important and timely in light of the amphibian facilities being developed at Gamboa.

Methodology

The workshop was held at the Smithsonian Tropical Research Institute facilities at Gamboa where there are excellent classroom and lab practical facilities.

Utilizing twenty lectures and sixteen interactive sessions, the five-day training focused on four important aspects of *ex situ* population management: husbandry, hygiene, health and heredity; subjects crucial to protecting species within range country. In addition, local and regional aspects of amphibian conservation were covered along with *ex situ* planning aspects. Initiating the course was a group session where students shared their current experiences in the field amongst their peers, facilitating further discussions and possible collaborations through the duration of the course and beyond.

The course utilized working groups where the students participated in planning conservation programs including facilities, enclosures and educational outputs. The comprehensive plans were presented at the end of the workshop. This was followed by information on facility and enclosure design (with attention to biosecurity and quarantine as needed) along with plans for educational materials, which ranged from graphic panels to brochures and posters. Groups were selected to maximize the interaction of participants from different

A recent *ex situ* conservation training workshop held in Panama brought together twenty-seven students from six countries in Latin America, as well as eight instructors from Latin America and the US. Photo: Ron Gagaliardo.

Learning simple diagnostic techniques will help future amphibian caretakers to keep their animals healthy. Photo: Ron Gagliardo.

regions and minimize the potential impact of local professional relationships, familiar students and other bias. The concept here was to promote student interaction and discussion allowing students to learn from each other as well as the instructors.

Instructor team

- Roberto Ibáñez, Smithsonian Institute, Panama City, Panama
- Eric Baitchman, Zoo New England, Boston, MA, USA
- Brad Wilson, Veterinary Associate, Amphibian Ark, Atlanta, Georgia, USA
- Edgardo Griffith, El Valle Amphibian Conservation Center, El Valle de Anton, Panama
- Luis Carrillo, Veterinary Associate, Amphibian Ark, Zoofari, Mexico
- Diego Almeida, Centro Jambatu, Quito, Ecuador
- Brian Kubicki, Costa Rican Amphibian Research Center, Siquirres, Costa Rica
- Ron Gagliardo, Training Officer, Amphibian Ark, Seattle, WA, USA

Outcomes

This workshop brought together twenty-seven students from six countries in Latin America to share their experiences among each other and to learn what it really means to save amphibian species. After careful review of the post-course evaluations, it is very clear that the participants assimilated many important aspects:

- The need for proper planning before a program begins
- The importance of natural history research
- The careful delineation of the needs and role of each species considered for *ex situ* management
- How the physical enclosures, climate control and water quality affect success
- The need for attention to health as a function of diet and environment
- How working together, utilizing multiple perspectives and talents can contribute to a better conservation strategy.

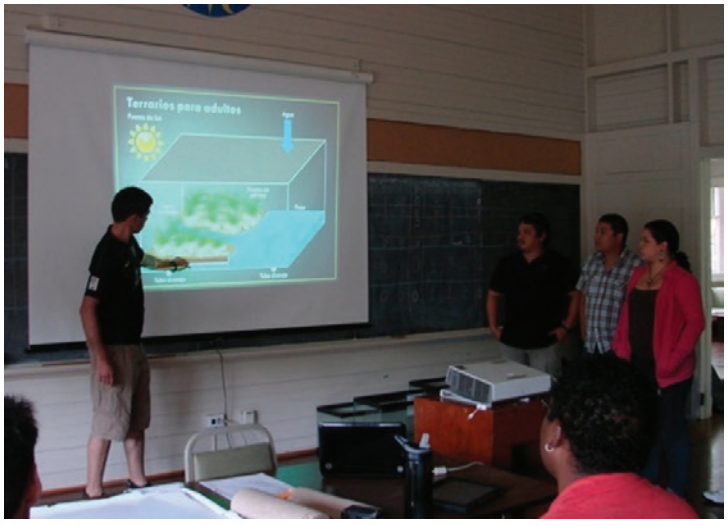
The enclosure-building exercise in groups provided many opportunities for the students to take academic information to a practical level along with facilitating communications between students from a wide variety of backgrounds. Photo: Ron Gagliardo.

Group projects

1. *Atelopus nanay*
2. *Bolitoglossa doflenei*
3. *Phyllobates terribilis*
4. *Gastrotheca cornuta*
5. *Pipa myersi*
6. *Agalychnis lemur*

Next steps

Upon leaving, each student was provided with a thumb drive containing all of the course materials. We strongly encouraged this activity and made it very clear where the students could go for any additional help. We will create a list serve for the participants to utilize and will be sending periodic communications in an attempt to assess how the students are putting this newly-acquired knowledge to good use! Students were encouraged to use all Amphibian Ark resources available to them for program planning, funding and other useful information that is at their fingertips.



At the end of the course, groups presented their work. Included were natural history of the species, conservation needs, and specific role for the particular group. Photo: Ron Gagliardo.

Acknowledgments

This workshop was made possible with the financial and logistical support of USAID, Smithsonian Tropical Research Institute, Amphibian Ark and the Panama Amphibian Rescue and Conservation Project. We wish to thank Angie Estrada, Jorge Guerrel and Roberto Ibáñez for their support in making this workshop happen and the access to many resources needed.

We also thank the following people for their generous contributions of time and effort in executing a very successful workshop:

- Nilka Tejeira, Nelida Gomez and Marcela Paz of Smithsonian Tropical Research Institute handled all in-country lodging, food and transport logistics at Gamboa.
- Instructors: Luis Carrillo, Brian Kubicki, Eric Baitchman, Brad Wilson, Edgardo Griffith, Diego Almeida, Angie Estrada, Jorge Guerrel and Roberto Ibáñez.

Thanks to our Amphibian Ark Associates

The last few Amphibian Ark newsletters have featured articles highlighting 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, visit: www.amphibianark.org/associates/.

Association spotlight - Jennifer Pramuk, Ph.D., Curator, Woodland Park Zoo

Jennifer's professional experience includes her current position as a curator at the Woodland Park Zoo, Seattle, USA, where she oversees the Zoo's endangered Oregon Spotted Frog and Western Pond Turtle head-starting and release programs. Jenny first became associated with the AArk through her former position as the Curator of Herpetology at the Bronx Zoo where she worked on the Kihansi Spray Toad breeding and reintroduction program among other projects. Her academic research, focusing on reptile and amphibian conservation and taxonomy, has led her to multiple countries in Latin America and Africa.

Jenny has described twenty-one species of frogs and toads new to science and published more than twenty-five peer-reviewed papers. In graduate school, her descriptions of some frog species that had already gone extinct made her realize the importance of working on amphibian conservation initiatives. Jenny's more recent experience with reintroduction projects has enabled her to become well versed on issues particular to the conservation and reintroduction of endangered species. She currently is an affiliate curator at the University of Washington's Burke Museum of Natural History and Culture and serves on the Board of the American Society of Ichthyologists and Herpetologists, the Co-Chair of the Association of Zoos and Aquariums (AZA) Amphibian Taxon Advisory Group, and on the Steering Committee of the Komodo Dragon Taxon Advisory Group.

Jenny Pramuk during an amphibian husbandry training and capacity-building trip to Madagascar. Photo: Ron Gagliardo.

The Woodland Park Zoo supports the AArk through several efforts including hosting the position of Ron Gagliardo as AArk's Training Officer and financial contributions to AArk's Seed Grant fund. This collaboration has encouraged Jenny and Ron to work together on amphibian conservation projects. As part of this work, they have travelled together to Colombia and Madagascar to offer amphibian husbandry training and other capacity-building assistance. They also co-authored a chapter on general amphibian husbandry for the AZA's Amphibian Husbandry Resource Guide (www.amphibianark.org/pdf/AZAAmphibianHusbandryResourceGuide.pdf) and have served for many years as instructors for the AZA Amphibian Biology, Conservation, and Management course. Jenny also helped start the very important AArk Seed Grant program (www.amphibianark.org/aark-seed-grant/) with funds from the Wildlife Conservation Society and the Sabin Family Foundation. In addition, Jenny personally paid the Ohio band, The Indoorfins, to compose an original AArk song, which AArk Associate Creative Officer, Danny Beckwith, used to make a fun and informative video which can be viewed on our YouTube page www.youtube.com/watch?v=Av-Xat3kyxE. Since 2008, she has collaborated with Devin Edmonds and Association Mitsinjo on developing a highly successful Amphibian Conservation program in Andasibe, Madagascar.

In her free time, Jenny likes to hike, garden, cook, and read.

Model Amphibian Program of the Week

In February, AArk launched it's Model Program of the Week promotion, which features a different *ex situ* amphibian conservation program that meets AArk's definition of a "model program" each week. These programs are featured on AArk's web site (www.amphibianark.org), and promoted on our Facebook page (www.facebook.com/AmphibianArk), with a summary report on the progress of the programs being provided. The response to these updates has been very encouraging, and is helping to raise awareness of the successes of these programs within the amphibian conservation community and beyond.

AArk considers that two aspects of a captive program are vital:

- The program should be based within the range country of the species.
- The population being managed should be housed in isolation from other populations occurring outside its range.

We consider programs that meet both of these criteria to be model programs, and these programs are listed on our Model Programs web page, www.amphibianark.org/model-facilities/. Currently, 101 of the 133 programs that we are monitoring meet our definition of model programs. Further information about Model Programs can be found on our web site.

Supporting national Amphibian Conservation Needs Assessments

Amphibian Ark staff help coordinate *ex situ* 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 *ex situ* conservation measures with the necessary efforts to protect or restore species in their natural habitats. One of AArk's main activities is facilitating Conservation Needs Assessment workshops, where regional amphibian experts help to determine and prioritize the conservation needs for species in their regions, and then making the results of these workshops available to the wider amphibian conservation community.

Our Taxon Officers help to coordinate all aspects of implementation within the AArk initiative and assist AArk partners in identifying priority species for *in situ* or *ex situ* conservation work. 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.

Since 2007, we have facilitated assessment of the conservation needs of 3,018 (43%) of the world's amphibian species through twenty-six national or regional workshops. Additional workshops are planned for other countries and regions over the coming months. The results of all previous assessments are available on the Assessment Results page of our web site (www.amphibianark.org/assessment-results/).

Generally, the *ex situ* conservation community lacks specific knowledge to determine which species are most at risk in the wild, and which species need immediate rescue to avoid extinction. When preparing for an AArk Conservation Needs Assessment workshop, we rely heavily on the local IUCN SSC Amphibian Specialist Group Chairs (www.amphibians.org/resources/asg-members/) to assemble a similar team of experts to that which led the original 2004 Global Amphibian Assessment, but this time with a goal of updating the information and separating out and assessing all taxa 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).

We are currently planning for additional assessment workshops in the Philippines, Bolivia and Europe.

The Philippines has suffered heavily from deforestation (logging and land conversion) in the past twenty years, and although the current rate of deforestation is significantly less, only about 25% of the country is forest, with less than 3% being primary forest. The main threats to amphibian populations apart from deforestation are agriculture, quarrying and mining, air, land and water pollution, soil erosion and toxic wastes. The country also suffers from natural disasters such as typhoons, flooding, landslides and tsunamis. Target species include all 103 species occurring within the Philippines, including sixty species classified by the IUCN Red List as Critically Endangered, Endangered, Vulnerable, and Data Deficient. Fifty-five of these threatened species are endemic to the Philippines.

We are very grateful for the generous support from Chester Zoo in the UK in providing more than half of the funding required for the assessment in the Philippines. We still require an additional US $4,500 to support the remaining workshop costs.

The Amphibian Conservation Needs Assessment for Bolivia will bring together local amphibian field experts, zoo, museum and university staff and a workshop facilitator from the Amphibian Ark, to assess 294 amphibian species that occur throughout the country, sixty-four of which are endemic to Bolivia. Many of these species have restricted ranges and approximately thirty-five are threatened with extinction.

With a serious need for additional amphibian conservation capacity in Latin America, this Conservation Needs Assessment workshop will be the second step in a three-step approach. In 2009, thirty Bolivian students were trained at an *Ex Situ* Conservation Workshop, where they gained specific skills to help them to establish best-practice *ex situ* conservation programs for threatened amphibians. After the planned assessment workshop, rescued animals will then be managed in their country of origin and AArk will assist with establishing rescue centres in the region that will propagate endangered endemic species, as determined by the Conservation Needs Assessment workshop.

Some of the participants at the conservation needs assessment workshop for Hong Kong and Guangdong Provinces, where all amphibian species currently and historically recorded in the two provinces were assessed.

Unfortunately, we have not yet been able to source any funding for this workshop. US $12,500 is required to cover the costs of travel, accommodation and food for local and regional field experts to participate in this national assessment.

If your organization is able to help support either of these assessment workshops, please contact AArk staff (kevinj@amphibianark.org).

The Houston Toad Research Collaborative: Using applied research techniques to encourage conservation awareness

Shivas Amin, Ph.D., Department of Biology, University of St. Thomas, Texas, and Cassidy Johnson, Ph.D., Department of Conservation and Science, Houston Zoo, Texas

A great deal of attention has been placed on garnering interest in amphibians and amphibian conservation via K-12 education. This emphasis is rightly placed; however, an appreciation and awareness of amphibians and their environments can also be achieved at the college level. The college classroom has been demonstrated to provide an excellent platform to inform students about the current threats to amphibians while additionally allowing students to participate in research projects that can directly benefit conservation efforts (Wunder et al., 2012).

Earlier this year, the University of St. Thomas, a minority-serving institution in Houston, Texas, partnered with the Houston Toad conservation program at the Houston Zoo to host a free, six-week student workshop entitled the "Houston toad research collaborative." As part of its Catholic mission, the University of St. Thomas is dedicated to serving the local community and places heavy emphasis on student involvement in community service; therefore it was fitting that this workshop specifically focused on the critically endangered Houston Toad, *Anaxyrus* (*Bufo*) *houstonensis*.

The purpose of this workshop was two-fold: we wanted to expose undergraduate students to key molecular techniques that would be useful later on in their academic careers, while additionally fostering a sense of concern about the preservation of a local, threatened amphibian species. A flyer for the workshop was distributed throughout the University of St. Thomas Biology Department, primarily targeting first and second year biology students. The workshop was free to participants; however, they were required to attend all of the classes and activities. To be selected for the course, students had to write an essay explaining why they were interested in the course and how the information provided would benefit their lives. The workshop attracted two types of students; pre-medical students looking to familiarize themselves with research techniques and students that were genuinely interested in animals that wanted to learn more about the Houston Toad. Out of the ten participants selected for the course, nine were female, four were from underrepresented minority groups, and all but two were first or second year students.

The workshop consisted of two lecture periods, several hands-on lab modules, a visit to the Houston Toad facility at Houston Zoo, and then culminated with a field-based, service-learning project. The first lecture introduced the endangered Houston Toad, discussed the current status of the toad program, and explained how molecular biology and genetic techniques have been used to assist in the toad's conservation. Additional molecular techniques utilized in conservation-based research, including bioinformatics, microsatellite analyses, and cloning were also discussed. The workshop research project, along with a detailed explanation of the molecular techniques that would be utilized, was covered during the second lecture period.

The next two course periods were dedicated to the research project in which the students were to assist in a genotyping analysis of a group of toads housed at the Houston Zoo. During these hands-on sessions the students learned how to extract DNA, run a polymerase chain reaction (PCR), and set up and run gel electrophoresis. For the DNA extraction, toe clips from the preserved tissues of deceased Houston Toads were provided by the Zoo. The PCR amplification was carried out using primers for the Houston Toad mitochondrial D-loop specifically designed for toad genotyping (McHenry and Forstner, 2009). Though we were unable to send DNA out for sequencing due to time constraints, the students successfully amplified segments of the mitochondrial DNA. Five of the students put together and presented a poster during the University of St. Thomas Spring Research Symposium, which highlighted the plight of the Houston Toad and how molecular techniques are useful tools for conservation.

After visiting the Houston Zoo's Houston Toad facility to meet the toads, the workshop concluded with a trip to Sheldon Lake State Park and Environmental Learning Center to participate in a prairie restoration day. The students had a fantastic opportunity to replant native grasses and flowers side-by-side with Texas Master Naturalists as part of the Earth Day festivities held by the park.

A pre- and post-survey was used to assess what the students learned from the workshop and if they had gained any new perspectives concerning the Houston Toad and conservation in general. The responses we acquired from the post-surveys were very encouraging. Several students indicated that they could now "proficiently pipette, perform and set

University of St. Thomas Biology Department students visiting the Houston Toad facility at Houston Zoo Photo: Cassidy Johnson.

Are you collaborating on any amphibian research or conservation projects with high school or undergraduate students?

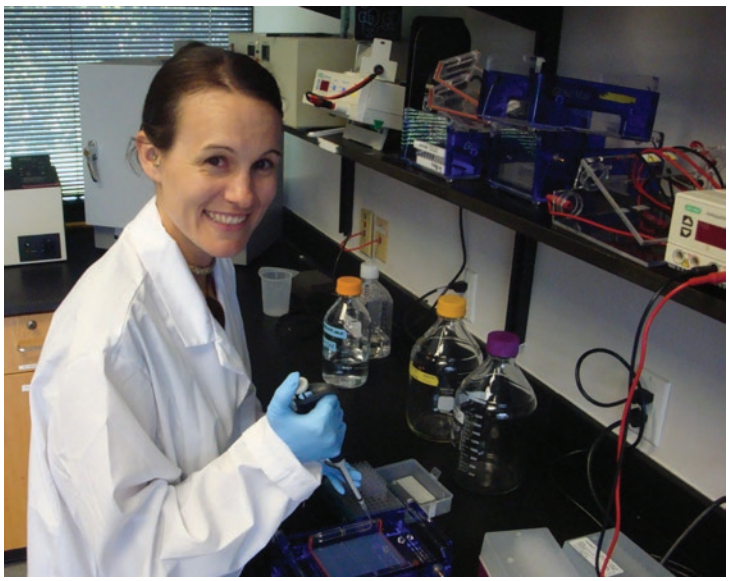
If so, Amphibian Ark wants to hear from you!

Amphibian Ark staff will be attending the 2013 National Association of Biology Teachers conference in November. As a part of our presentation, we hope to highlight programs in which biology educators are collaborating with zoos, conservation organizations, and natural resource agencies to monitor local amphibian populations, and/or contribute to the recovery of amphibian species via research or conservation activities.

We know there are a lot of great model programs out there - and we want to know about them!

We hope to get more biology teachers, and their students, participating and active in the co-creation of programs in amphibian conservation and research. Your ideas and experiences may inspire them to do so!

If you have something to share, please email rachel@amphibianark.org.



Dr. Johnson demonstrating how to load a gel. Photo: Shivas Amin.

up PCR, as well as run then read gels." Additionally, several students mentioned that they had a better understanding of what is necessary to protect the environment. One student wrote that "I became more interested in conservation, which I hadn't realized could be so closely tied to research." Another stated "I would love to do more research in the future, and I would love to be involved in any conservation project."

From the instructor's perspective, the experience was equally as positive. It was easy to keep the students motivated because the workshop had a relatable goal. The workshop not only succeeded in linking laboratory methods to real-world applications, but it also gave the students an opportunity to speak publicly about science, and to learn more about the vibrant ecosystems that surround the Houston area. We hope to use what we learned from this workshop to design a laboratory-based class that would permit biology students an entire semester to utilize these techniques to produce usable genotypic and other molecular data for the Houston Toad program. We believe that the college classroom is an untapped resource for conservation programs. The allure of working with or helping an endangered species can entice students from many different backgrounds to get involved in both research and conservation.

Support for this program was provided by the Biology Department of the University of St. Thomas and the Houston Zoo's Department of Conservation and Science.

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2013 Chicago ReptileFest

Michael Scherer, Algonquin Longhouse Federation, Chicago, USA

For the second year in a row, volunteers Robert and Matthew Scherer manned a booth at the 2013 ReptileFest to benefit the Amphibian Ark. ReptileFest is an annual event hosted by the Chicago Herpetological Society and the University of Illinois Chicago and is a must attend event for reptile and amphibian enthusiasts.

Robert and Matthew would like to thank all the booth visitors for their support and attention as they discussed the mission of the Amphibian Ark and played frog-themed games with their visitors. Lastly, a big thank you to the Chicago Herpetological Society for their support of conservation by donating a portion of the bottled water sales to Amphibian Ark.

Robert and Matthew received "Haylushka of the Year" honors from the Algonquin Longhouse Federation, for their work as volunteers with the Amphibian Ark. They were joined in the booth by their dad, Michael Scherer, and Grandma, Lynda Mogilner, who enjoyed every minute watching two boys work hard to educate visitors on the mission of the Amphibian Ark.

We thank the AArk staff for the opportunity to host a booth again!

Matthew Scherer standing in front of the booth on Day 1 of the ReptileFest in Chicago. Photo: Michael Scherer.

Robert Scherer overseeing visitors playing a game where frogs race depending on a dice roll. As part of their exhibit , Robert and Matthew also had a frog memory game, longest leap, and amphibian coloring station. Photo: Michael Scherer.

First successful breeding of the Hispaniolan Yellow Tree Frog

Luis M. Díaz. Museo Nacional de Historia Natural de Cuba, and Sixto J. Incháustegui. Grupo Jaragua, Dominican Republic

The Hispaniolan Yellow Tree Frog, *Osteopilus pulchrilineatus*, (Cope, 1839) is one of the four Hispaniolan species of hylid frogs. The species has a scattered distribution through the island, from the sea level to moderate altitude, and seems to be only locally abundant. This frog is listed as Endangered by the IUCN Red List, due to the increasing loss and fragmentation of habitats (Hedges et al., 2004; Stuart et al., 2008). Early development of this species remained unknown, despite it being assumed that eggs and tadpoles occur in still water (Hedges et al., 2004).

Hispaniolan Yellow Tree Frog, *Osteopilus pulchrilineatus* in amplexus. This is the first successful breeding of this species in captivity. Photo: Luis M. Díaz.

The program began with four individuals, all collected from different localities in the Dominican Republic. Frogs were accommodated in an all glass, aquarium (75cm long x 40cm wide x 50cm high), modified as an indoor terrarium. The bottom was drilled out, a bulkhead was installed, and a ¾ inch plumbing system allowed controlled drainage of the terrarium and continuous discarding of overflowing water. An egg-crate plastic false bottom supported a layer of gravel (gravel grain about 4-5mm). Half of the terrarium was an aquatic section, 7cm deep, with approximately 17 liter capacity, separated from the land section by flat rocks. Water was filtered through the terrarium gravel using a submerged water-pump (Exoterra; model PT 2095) with a small waterfall output. The land section was covered with tree-fern fiber substrate, and planted with *Scindapsus* sp. and *Calathea* sp. The terrarium cover had an access window, and was built with plastic egg-crate, PVC shields, and plastic wire (3.5mm in diameter). The wire comprised 50% of the cover, to allow the placement of lights and ventilation. Cooling fans were installed on the terrarium cover to force ventilation, and to avoid over-heating and water condensation on the glass. Two lamps were used: a Nisso plant growing fluorescent tube, and an Exoterra Repti Glo 5. A data logger HOBO Pro V2 Onset (www.onsetcomp.com) was installed for permanent monitoring of relative humidity and temperature, and was programmed to continuously gather data every 30 minutes for 1.2 years.

Recently metamorphosed Hispaniolan Yellow Tree Frog. Photo: Luis M. Díaz.

Food consisted in artificially-raised tropical house crickets (*Gryllodes sigillatus*) and cockroach nymphs (*Blatta orientalis*). Prey items were dusted with Calcium Plus (Repashy Super Foods; Repashy Ventures Inc.).

In our experience, *Osteopilus pulchrilineatus* was a quasi-continuous and opportunistic breeder, avoiding reproduction at lower temperatures (long time below 24°C) and driest periods. Egg-laying was always preceded by noisy vocal activity, with adults turning up in a vivid yellow coloration. Amplexus was always auxiliary. The first clutch was found on May 2, 2012, after a period of heavy outdoor rain. Six clutches were produced from May 2012 to February 12, 2013. The egg clutch laid in May 2012 contained 327 eggs, and the one laid in February, 2013, contained 463 eggs. The eggs were black (animal pole) and white (vegetative pole), and measured 1.4–1.6mm. Eggs hatched in 25-30 hours at 28-30°C. After 48 hours from hatching, the larvae started swimming and searching for food.

Tadpoles metamorphosed in 26-40 days at 28-32°C. In two months, the frogs measured between 22.2–30.1mm (x=26.7mm) and weighed 0.6-1.5g. The first calling males with nuptial excrescences were heard after two months, and females with evident black ovocites through the groin skin were observed after three months, which suggests that reproductive maturity was reached very quickly. At six months of age, females measured 32.7-36.2mm (x=34.5 mm) snout-vent length and weighed 2.5-3.8g (x=3.2g); males were 28.4-31.0mm (x=29.3mm), and weighed between 1.3-1.9g (x=1.7g).

This is part of the results of the project “Endangered Frogs and Climate Change in the Dominican Republic FONDOCYT 2008-1-A2-102” financially supported by the Dominican Government and implemented by Grupo Jaragua and the National Museum of Natural History of the Dominican Republic.

For additional information please contact the authors, Luis M. Díaz (lmdiaz@mnhnc.inf.cu) or Sixto J. Incháustegui (sixtojinchaustegui@yahoo.com).

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New amphibian keeping and breeding facilities created at the Me Linh Station for Biodiversity, northern Vietnam

Thomas Ziegler, Anna Rauhaus and Detlef Karbe, AG Zoologischer Garten Köln, Cologne, Germany and Truong Quang Nguyen, Cuong and The Pham and Phuong Dang Huy, Institute of Ecology and Biological Resources, Hanoi, Vietnam

In 2007, the Institute of Ecology and Biological Resources (IEBR) together with Cologne Zoo developed the Amphibian Station at Hanoi to keep and reproduce endangered and poorly-known amphibian species from Vietnam (Ziegler & Nguyen 2008, Nguyen et al. 2009). Since then, fourteen species of amphibians have been successfully reared or bred there (Ziegler et al. 2011). A number of student traineeships and theses have been conducted there as well to better understand the husbandry, reproduction, larval development and morphology, in particular of Vietnamese anurans (e.g., Wildenhues et al. 2010, Gawor et al. 2012, Rauhaus et al. 2012).

For several reasons, including land re-allocation, the station had to be closed recently. To continue with *ex situ* amphibian husbandry and conservation breeding projects in Vietnam, the Me Linh Station for Biodiversity has been developed by the IEBR to replace the Hanoi Amphibian Station. The Me Linh Station was established by the Vietnam Academy of Science and Technology in 1999. It borders the famous Tam Dao National Park in Vinh Phuc Province, northern Vietnam, and is directly located in forest environment. Therefore, it creates easier conditions for both *in situ* and *ex situ* conservation and research approaches as well as environmental education. The objectives at Me Linh are to monitor the local biodiversity, to protect the native species and their natural habitat, to rescue confiscated animals, to keep and breed selected threatened and poorly-known species, and to provide services for conservation education for school classes, students and visitors (Nguyen & Ziegler 2012).

In May 2012 the first administrative assistance by Cologne Zoo staff took place to improve existing facilities and to help plan and build new facilities for turtles, lizards, snakes and primates (e.g., Nguyen & Ziegler 2012, Nguyen et al. 2012). During that period, amphibian facilities were developed, together with the first amphibian husbandry training. This work was continued by Cologne Zoo staff together with IEBR colleagues and the Me Linh Station team in May 2013, and was funded mainly by IEBR, Cologne Zoo, and the Amphibian Fund of Stiftung Artenschutz / Verband Deutscher Zoodirektoren (Species Conservation Foundation / Association of German Zoo Directors), along with support for equipment from SERA.

An outdoor amphibian enclosure consisting of twelve spacious concrete and gauze basins has been built at the Me Linh Station for Biodiversity in northern Vietnam. Photo: Anna Rauhaus.

An outdoor amphibian enclosure consisting of twelve spacious concrete and gauze basins was finished, as well as an indoor amphibian facility including eighteen different-sized glass terraria. The room for the indoor amphibian terraria also houses several shelves for the breeding of insects for live food. In addition, a quarantine station for newly-arrived and ill amphibians was created, and this currently houses six quarantine terraria. Amphibian chytrid and Ranavirus tests are regularly performed.

We have already had our first amphibian breeding successes at the Me Linh Station for Biodiversity, showing that the newly created facilities are adequate and functioning. So far the rhacophorid anuran species *Rhacophorus dennysi* and *Kurixalus verrucosus* have been bred in the Me Linh Station. These species also occur in the surrounding forest and mainly serve for education of school classes. For public awareness and education, large-scaled bilingual (English and Vietnamese) posters were created, explaining the goals of the station, in particular the amphibian projects, and these have been placed in the front of the Me Linh station.

Eighteen different-sized glass terraria are included in the new indoor amphibian area at the Me Linh Station for Biodiversity. Photo: Anna Rauhaus.

In the future we hope to continue our breeding and research programs focusing on threatened and poorly-known amphibian species. Currently, eleven amphibian species are kept at the Me Linh station: *Bombina maxima*, *Theloderma asperum*, *T. bicolor*, *Kurixalus verrucosus*, *Rhacophorus dennysi*, *R. kio*, *R. maximus*, *R. orlovi*, *R.puerensis*, *Paramesotriton deloustalii*, and *Tylototriton vietnamensis*.

As well as environmental education, the amphibian facilities at the Me Linh Station will also be used to study the keeping, breeding and development of husbandry analog species, such as representatives of the genera *Amolops*, *Odorrana* and *Quasipaa*, as recommended during the AArk Amphibian Conservation Needs Assessment in March 2012 in Hanoi. Outdoor terraria with cascade habitats were built in May 2013 for these species.

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Progress report of the Honduran Amphibian Rescue and Conservation Center

Jonathan Kolby, Project Director, Honduran Amphibian Rescue and Conservation Center (James Cook University)

The protection of amphibian biodiversity in Honduras is challenged by numerous obstacles. Illegal deforestation continues at an alarming rate in many areas of the country, and its detrimental effects are confounded by the presence of amphibian disease. After detecting amphibian chytrid fungus in endangered and critically endangered amphibians in 2007, it became apparent that the country's cloud forest species are in jeopardy.

The core project activities of the Honduran Amphibian Rescue and Conservation Center are: 1) establishment and maintenance of long-term captive assurance populations to buffer against the risk of extinction in the wild and 2) annual population supplementation via head-starting to increase the number of wild animals that may survive to adulthood. Local capacity-building and public outreach are integral principles in this project, and the project will be based at Lancetilla Botanical Garden and Research Institute, a location with a high volume of school group visitation.

Lancetilla Botanical Garden and Research Institute; the location where the Honduran Amphibian Rescue and Conservation Center will be constructed. Building exterior (above) and interior (below). Photo: Jonathan Kolby.

Fundraising for this project was initiated in 2011 and 50% of the budget to construct the biosecure facility has been acquired as of May 2013, collectively from a 2012 Amphibian Ark Seed Grant (www.amphibianark.org/seed-grant-winners/) and the Chicago Zoological Society. In 2012, a request for the remaining 50% from the Mohammed bin Zayed Species Conservation Fund was unsuccessful, and a subsequent similar request was submitted to Rufford Small Grants for Nature Conservation. We expect to receive the decision notification very soon. The Honduran Government originally offered space for the facility at a research center in Cuyamel Omoa National Park, but later changed it to the current site at Lancetilla Botanical Garden and Research Institute. Due to this shortage of additional funding and a change in project venue, this program is taking a bit longer than projected to establish.

During the past year, progress has been made in the following areas:

- Field mark-recapture surveys: In June-August 2012, alpha-numeric visual implant elastomers (VIEs) were used to mark 109 wild adult amphibians *in situ* in Cusuco National Park to assess their suitability in multi-year population monitoring efforts. Implantation of the tags was met with great success and the first annual recap-

ture survey will be performed in July-August 2013 to begin evaluating long-term results.

- Project infrastructure: A Memorandum of Agreement (MOA) has been formulated that established the roles and responsibilities of each party involved. All participants have agreed upon the contents of this document.
- Facility construction: A site visit to Lancetilla Botanical Garden was performed by Jonathan Kolby in August 2012. Space provided for construction of the rescue facility was examined and to ensure minimum requirements for the facility could be fulfilled. A follow-up site visit by Jessi Krebs from Henry Doorly Zoo in Omaha, USA, is scheduled for August 2013 in order to complete the facility blueprints.
- Public awareness: A feature article describing the project was written by Jonathan Kolby and published in FrogLog 106 (April 2013, www.amphibians.org/froglog/fl106).
- Facility staffing: Currently being sequestered from local sources with assistance from Franklin Casteñada (PANTHERA) and Roberto Downing (ESAC). Jonathan Kolby will meet with and interview potential staff in person in August 2013.
- National outreach: Jonathan Kolby and Franklin Casteñada, Regional Co-Chairs of the IUCN Amphibian Specialist Group (ASG) of Honduras, are working to revitalize the country's ASG presence through a group meeting centered around the Honduran Amphibian Rescue and Conservation Center.
- Funding: A grant application was submitted to Rufford Small Grants for Nature Conservation for the remainder funds needed to complete construction of the isolated amphibian rooms.

Progress report on the Conservation Plan for the Plains Coqui: captive breeding and environmental assessment for future introduction efforts

Neftalí Ríos-López, Ph.D., Department of Biology, University of Puerto Rico at Humacao

The original project sponsored by a $5,000 Amphibian Ark Seed Grant in 2012 to Neftalí Ríos (www.amphibianark.org/seed-grant-winners/) could not be started as planned due to a delay in the granting of a collection permit by the State. There was also a delay in the US Fish and Wildlife Service final decision to list the Plains Coqui, *Eleutherodactylus juanariveroi*, as Endangered later in 2012. With this new federal listing, we needed to also seek a collection permit from the federal agency, which is a process that can last from several months to years to be completed.

At the time of writing this progress report, we have not completed the collection permit processing as planned, but we have used all support from Amphibian Ark to set up a laboratory for the captive breeding initiative which was originally proposed. The updated spending of Amphibian Ark's support now totals >$5,312.44, although note that additional resources included in some receipts were supplied by the proponent.

The captive breeding room at the University of Puerto Rico at Humaca. All materials and equipment are now in place and ready for installation as proposed in the modified proposal for the Upland Coqui, *Eleutherodactylus portoricensis*. Photo: Neftalí Ríos-López.

The proponent informed the Amphibian Ark about these issues in considerable detail, and was asked to submit an alternate proposal using one species in need of *ex situ* conservation efforts from Puerto Rico instead. The proponent has prepared an alternate proposal choosing the Upland Coqui, *Eleutherodactylus portoricensis*, as recommended. The original project plan, however, required minor but important modification and adjustment to this new species, but we feel that this has been accomplished accordingly. The updated and new proposal is entitled "Conservation Plan for *Eleutherodactylus portoricensis* (Anura: Eleutherodactylidae): captive breeding and environmental assessment for future introduction efforts".

Successful captive breeding of Large-crested Toad at Africam Safari, Puebla, Mexico

José Alfredo Hernández Díaz, MSc., Curator of Reptiles and Amphibians, Africam Safari, Puebla, Mexico

The Large-crested Toad, *Incilius cristatus*, is a critically endangered species that is endemic to Mexico.
Photo: José Alfredo Hernández Díaz.

The Large-crested Toad, *Incilius cristatus*, is a critically endangered amphibian species that inhabits cloud forests, one of the most threatened ecosystems in Mexico, where this species is endemic. The original distribution of the Large-crested Toad included some localities from the States of Puebla and Veracruz, in the slopes of Sierra Madre Oriental. This species was thought to be extinct by the 1990s, however at the beginning of the 21st century it was rediscovered in a small locality in the North Sierra of Puebla called Barranca de Xocoyolo. The habitat for the Large-crested Toad in this locality is a 300m deep rift where the Apulco River flows. The cloud forest in the rift is still well-preserved and the river is an excellent breeding habitat for the toads. Nowadays the Large-crested Toad population from Barranca de Xocoyolo is the last known wild population of this species.

Three years ago Africam Safari started a conservation program for the Large-crested Toad. This program was focused mainly on *ex situ* reproduction, but also with an *in situ* component with the aim of mitigating the possible threats that Large-crested Toads face in the wild. At the beginning of the conservation program, we collected some adult toads to begin a captive population of the species. We also performed some field work, consisting of surveys with local people to evaluate the possible human impact over the environment, and field sampling along the Apulco River to assess the toad's population size and the quality of the remaining habitat. During our fieldwork we observed the toads coming down to the river and laying eggs in the riverside. In later visits we observed tadpoles and metamorphs coming out from the river. Fortunately, in recent visits we have seen that the habitat in Xocoyolo seems to be still suitable for the toads. However there are some rumors about a hydroelectric project that the government is planning to build in the Apulco River. Fortunately, those are just rumors.

We formally began our *ex situ* work with Large-crested Toads at Africam Safari in June, 2012 by building a terrarium for two males and three females. By the end of the year we had our first successful reproductive event with the toad. One of the pairs laid 856 eggs from which 838 tadpoles hatched after four days. Immediately after hatching, the tadpoles were just 8mm long, but before completing metamorphosis they reached three times their original size. Of the 838 tadpoles, 600 completed metamorphosis between 40 and 120 days. In March this year, we had our second reproductive event, with the same pair laying 300 eggs from which 229 tadpoles hatched after four days. Currently, almost half of them have completed metamorphosis.

After this important success, the most important question was "What is next?" We have decided to release some of the captive-bred toads to the original site where the parents were collected. To do so, we restarted working with the community in February. The first step of our work was a meeting with local authorities and school teachers to explain to them the importance of Large-crested Toad conservation and the aims of our program. Then in April we worked for a week with local schools, including students and their parents, to create awareness among them about the importance of amphibians and to invite them to collaborate with the Large-crested Toad conservation project. We are now waiting for the necessary permits to release our toads back to the wild with the participation of local people. The objective of involving local people in the toads' release is that as owners and guardians of the species we want to encourage them to protect their environment and the species inhabiting it.

In 2010 Africam Safari in Pueblo, Mexico, began a conservation program for the Large-crested Toad. The species bred successfully at the end of 2012. Photo: José Alfredo Hernández Díaz.

The future of the Large-crested Toad conservation program in Africam Safari is very important. We have just given the first step for a long-term conservation program, but there are still many things left for us to do. We are going to establish a stable captive toad population so we can keep breeding them successfully. We need to start long-term monitoring of the species in the wild to know how the population is doing in the remaining habitat and also to measure the success of captive-bred individuals that are released. The local community is very interested in participating with us in toad conservation, but they still use natural resources to supply their daily needs, so it will be necessary to find the equilibrium between conservation and human needs.

Denver Zoo's Lake Titicaca Frog project

Thomas J. Weaver, Assistant Curator of Reptiles and Fishes, Denver Zoological Foundation and Matt Herbert, Outreach Program Manager, Denver Zoological Foundation, Colorado, USA

Denver Zoo, along with international and local partners, is involved in ongoing research and outreach programs focused on the Lake Titicaca Frog, *Telmatobius culeus*. We have established a *Telmatobius* Captive Breeding Program and laboratory at the Universidad Peruana Cayetano Heredia in Lima, Peru and a breeding population at the Huachipa Zoo in Lima. These laboratories will help us learn more about captive husbandry and potentially build an assurance population for this critically endangered frog. In December 2010 we successfully bred Lake Titicaca Frogs in captivity using confiscated frogs and we are raising the frogs through a collaborative effort with the Huachipa Zoo and Universidad Peruana Cayetano Heredia. Denver Zoo helped to create and participates in a national awareness campaign to decrease consumption of Lake Titicaca Frogs and address other threats, like pollution and global warming. As part of this campaign Denver Zoo supported the opening of an amphibian crisisai exhibit at Huachipa Zoo in 2010, where Lake Titicaca Frogs can be seen on exhibit. The exhibit includes important messaging about the frog's status and threats to their survival.

The Lake Titicaca Frog, *Telmatobius culeus*. Denver Zoo, in Colorado USA, has established a *Telmatobius* Captive Breeding Program and laboratory at the Universidad Peruana Cayetano Heredia in Lima, Peru and a breeding population at the Huachipa Zoo in Lima. Photo: Thomas J. Weaver.

In December 2011 Denver Zoo supported a stakeholder's workshop for all parties interested in working on conserving the Lake Titicaca Frog. This three-day workshop, facilitated by the IUCN's Captive Breeding Specialist Group, reviewed current knowledge of the species and involved participants working in small groups. The larger plenary sessions drafted a conservation action plan with specific recommendations for actions focused on recovering the species.

In 2012 we began pilot studies for population estimates using distance sampling methodology and we also collected DNA and chytrid swabbing samples during these studies. Along with this research, we initiated efforts to increase local awareness in Puno, Peru about the plight of the Lake Titicaca Frog. Through developing public awareness materials focusing on the status of the frog, we have continued to conduct stakeholder workshops in Puno. A training workshop on snorkelling, captive husbandry and surveying was held in January of 2012 for staff members of the Lake Titicaca National Reserve (Reserva Nacional del Titicaca) and Forest and Fauna.

In November of 2012 Denver Zoo helped sponsor and facilitate an annual Frog Day Celebration both in Lima and at the lake. There was a parade and education stations were set up to teach about amphibian declines and conservation. Local Peruvians were exposed to alternative sources of income, opportunities in ecotourism and incentive programs as a replacement for illegal frog harvesting. In 2013 we plan to continue these efforts along with plans to build a rescue program at the Universidad Nacional del Altiplano for frogs confiscated from and the lake. This will hopefully reduce random releases of potentially diseased or injured frogs back into the lake. We will also be working with another zoo in Lima, Parque de Leyendas, to help build another amphibian awareness exhibit and program.

A frog mascot makes appearances during educational programs at the ten schools with which the Universidad Nacional del Altiplano Ecobrigades work. Photo: James Garcia.

Education and social marketing

Our project moved forward with educational programming and educational eco-brigades. Victor Enrique Ramos Rodrigo, a biology student from Universidad Nacional del Altiplano who attended the first two stakeholder workshops, is president of an environmental youth group comprising twenty-four university student volunteers concerned with environmental issues. Currently, the environmental youth group partners with Proyecto Especial Lago Titicaca (Special Project Lake Titicaca) and together they conduct ecobrigades in local schools. We continue to support the work of Servicio Nacional de Áreas Naturales Protegidas (National Service of Areas Protected by the State) and Universidad Nacional del Altiplano Ecobrigades. The frog mascot makes appearances during educational programs at the ten schools with which the Ecobrigades work. Denver Zoo staff provided educational training for Servicio Nacional de Áreas Naturales Protegidas employees at Reserva Nacional del Titicaca.

On November 9, 2012, Huachipa Zoo hosted their second annual Dia Nacional de la Rana del Titicaca (National Lake Titicaca Frog Day). Attendance was 2,051, with a target audience comprised of a mix of general public and registered school groups. Over 50% of the attendees participated in the educational activities provided. Huachipa Zoo staff gave interactive interpretive talks and facilitated activities such as a Twister Trivia game based on the information on the graphics in the Lake Titicaca Frog exhibit, a Survival Competition, and a Habitats in Danger activity. The zoo repeated activities from last year's event and added new activities. Lizette Bermudez, General Curator of Huachipa Zoo, hopes to improve the event this year by involving more institutions, improving publicity for the event, and linking collaborators in Puno to the event - especially in regard to conservation-related handicrafts. Lizette plans to invite traditional artisans from Lake Titicaca to exhibit and sell their handicrafts.

The Lake Titicaca Frog team at the lake. Photo: Thomas J. Weaver.

In Puno, Reserva Nacional del Titicaca held an event entitled "A Hug for Conservation." Originally developed to be held in conjunction with Valentine's Day celebrations, delays in planning led to the event occurring on February 28, 2012. The successful event included a hugging contest - a family-friendly version of amphibian amplexus - with educational posters and public participation.

During trips to Puno in December 2010 and June 2011, Denver Zoo staff purchased various handicraft items from local markets surrounding Lake Titicaca. Two established local vendors who create unique handicrafts enthusiastically want to continue to produce items for Denver Zoo to purchase and to sell other frog-related items at their stalls to foreign and national tourists. Denver Zoo worked with two knitters to increase the presence of frog-related handicrafts in the local market while at the same time bringing alternative and additional income to local artisans. Popular products include woollen finger puppets of various animal species that are stored in knitted bags labelled "Frog Conservation," soapstone frog carvings, and animal figures made from totora (a reed), ceramics, and metal. We will sell all items we purchase at the gift shop or special events at the zoo and use proceeds to purchase raw materials for the creation of more handicrafts and the purchase of additional goods created by Puno residents. We hope to nurture an alternative source of income for local households. Aldo Rojas coordinated a handicraft training course and handicraft exposition as part of the social marketing mini-campaign.

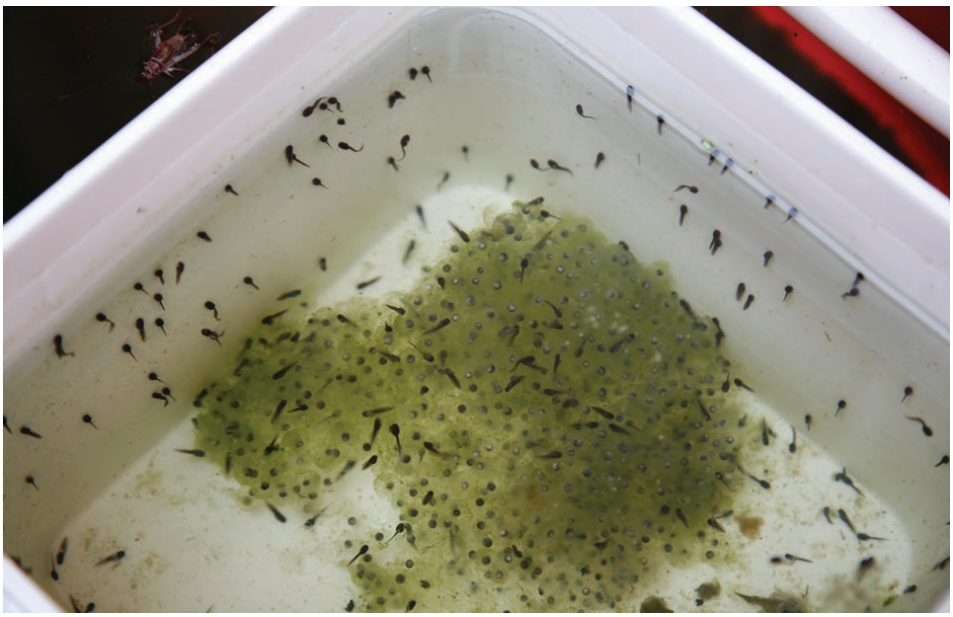
We made notable progress on developing a market for frog-related handicrafts after this performance period. Denver Zoo's concessionaire, K-M Concessions and Service Systems Associates, sent two staff members to Peru in March 2013 with Denver Zoo conservationists to see our project first-hand to assess the potential for working with women's handicraft collaboratives to export their goods to the US for sale in Denver Zoo's gift shop. Preliminary informal reports from Denver Zoo and K-M Concessions and Service Systems Associates staff about moving forward are promising. K-M Concessions and Service Systems Associates is the concessionaire for twenty-five zoos and aquariums in the US, so the potential economic benefit to local Peruvian communities is great.

Rocky Mountain Northern Leopard Frogs bred for the first time at the Vancouver Aquarium

Dennis A. Thoney, Ph.D., Director of Animal Operations, Vancouver Aquarium

Northern Leopard Frogs, *Lithobates pipiens*, occur throughout most of the northern USA, and in Canada throughout the southern regions of Canada, mostly east of the Rocky Mountains. While the prairie populations are listed as Schedule 1 Special Concern under the Species at Risk Act in Canada, the Rocky Mountain Northern Leopard Frog that occurs in British Columbia is considered endangered. It only occurs in two wetlands, one natural and one introduced.

To assist with the recovery of Rocky Mountain Northern Leopard Frog, the Vancouver Aquarium started an assurance population four years ago to act as a safety net for the species and to help support efforts of the Northern Leopard Frog Recovery Team to create new populations. Each year a few eggs from 5-10 egg masses have been collected to add to the assurance population. Today there are 105 frogs at the Vancouver Aquarium ranging from 0+ to 3+ year-olds. Frogs are maintained in greenhouses that follow seasonal photoperiod and air and water temperatures as closely as possible to those observed in the wild.



Rocky Mountain Northern Leopard Frog tadpoles hatching at the Vancouver Aquarium, from one of the egg masses. Note the whitish unfertilized eggs. Photo: Dennis A. Thoney.

In Spring 2013, five mature females were checked for eggs using ultrasound, then paired with males that originated from other egg masses to retain maximum genetic diversity. To assist the frogs in breeding, Amphiplex, a GNRH-A and dopamine antagonist solution, developed by Dr. Vance Trudeau, Ottawa University, (Trudeau et. al., 2013) was used to induce the five females and several males to produce egg masses in May 2013. This effort is the first breeding of the Rocky Mountain Northern Leopard Frog population *ex situ*. Over 2,240 tadpoles hatched from the 5,321 eggs making up four eggs masses laid within a few days after hormone induction. Many eggs were infertile but we expect hatching success to increase in future years as the frogs age and increase in size. Recovery Team members released the newly hatched tadpoles into the Columbia Marshes, near Cranbrook, British Columbia creating a third location for this endangered population.

The Canadian Rocky Mountain Northern Leopard Frog Recovery Team members are:

- D.B. Adama (Past Chair), BC Hydro
- T. Antifeau, B.C. Ministry of Environment
- M.-A. Beaucher, Creston Valley Wildlife Management Area
- D. Cunnington, Environment Canada - Canadian Wildlife Service
- D. Fraser, B.C. Ministry of Environment
- P. Govindarajulu (Chair), B.C. Ministry of Environment
- B. Houston, Fish and Wildlife Compensation Program - Columbia Basin
- J. Krebs, Fish and Wildlife Compensation Program - Columbia Basin
- I.A. Ohanjanian, Consultant
- D. Wigle, St. Mary's Band
- L. Friis, B.C. Ministry of Environment (Past Member)
- B.G. Stushnoff, Creston Valley Wildlife Management Area (Past Member)

Northern Leopard Frog Recovery Plan: http://a100.gov.bc.ca/pub/eirs/finishDownloadDocument.do;jsessionid=38039e9914b01e6305f5c8730ab4e52ec88495b67079ccf7a3d97eaf8221a626.e3uMah8KbhmLe3ePc3iQa3mMbO1ynknvrkLOlQzNp65In0?subdocumentId=9201

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New Frog MatchMaker projects

Monitoring endemics and critically threatened Harlequins Frogs (*Atelopus*) in Sierra Nevada de Santa Marta - Universidad del Magdalena, Colombia

Professor Luis Alberto Rueda Solano is working on the population ecology of *Atelopus carriekeri* and others from the Sierra Nevada de Santa Marta (SNSM). He has shown interest in conducting *in situ* and *ex situ* conservation work and involvement of the community, students, Tayrona people of SNSM. However, the remote locality and extreme geography of the SNSM makes in-range *ex situ* work very unlikely. The extreme alpine conditions of the habitat of these high montane *Atelopus* also makes it difficult to recreate the same ecological conditions in the nearby cities and for this reason, *in situ* conservation and monitoring *Atelopus* species is very important to maintain local biodiversity.

For more information on this project see: http://aark.portal.isis.org/Amphibian%20Partnerships/Lists/Amphiban%20partnershis/DispForm.aspx?ID=69

The Carrikeri Harlequin Frog, *Atelopus carrikeri* in amplexus.
Photo: Luis Alberto Rueda Solano.

The development of *ex situ* assurance populations for thirteen threatened Ecuadorian frog species at Centro Jambatu - Centro Jambatu, Quito, Ecuador

The aim of this project is to ensure the long-term survival of some of Ecuador's most threatened amphibians. Working alongside some of Ecuador's best amphibian scientists, educators and conservationists, we will develop a better understanding of the specific needs of these species, and develop the techniques required to successfully maintain and breed all of these species.

We recognize that the establishment of *ex situ* assurance populations for these species is only one component of their long-term survival, and we will continue to work with field scientists to discover the threats facing these species in the wild, and to mitigate those threats, ensuring that suitable habitat can be restored and protected, so these species can eventually be returned to the wild and form self-sustaining populations again.

Alongside this work, we will develop additional citizen science and educational programs to raise awareness about the plight of amphibians in Ecuador and the conservation actions that the wider community can be involved in to reduce habitat destruction and environmental degradation.

For more information on this project see: http://aark.portal.isis.org/Amphibian%20Partnerships/Lists/Amphiban%20partnershis/DispForm.aspx?ID=70

Pebas Stubfoot Toad, *Atelopus spumarius*.
Photo: Luis A. Coloma.

Large-crested Toad conservation program - Africam Safari, Puebla, Mexico

The project aims to protect the last known population of Large-crested Toad, *Incilius cristatus*, in the northern mountains of Puebla, Mexico. We are breeding the species in captivity and we have two clutches, one from December 2012 and another one from March 2013 and we are planning to begin to reintroduce some captive bred animals to the wild.

For more information on this project see: http://aark.portal.isis.org/Amphibian%20Partnerships/Lists/Amphiban%20partnershis/DispForm.aspx?ID=68. Also see article on page 17 of this newsletter.

Barranca de Xocoyolo, habitat of the Large-crested Toad, *Incilius cristatus*.
Photo: José Alfredo Hernández Díaz.

New Mexico Students Get Involved in the "Big Picture"

Jen Stabile, Senior Keeper of Herpetology, Albuquerque BioPark Zoo

On April 19, Albuquerque ABQ BioPark Zoo unveiled a one-of-a-kind amphibian-themed mosaic created by over 7,000 students throughout the state of New Mexico. The New Mexico BioPark Society partnered up with Project SNAP (Share, Nurture, Act, and Preserve) for the eight-month long creative effort to complete the mosaic. Students throughout the state in both elementary and middle school were asked to create their own individual 8 ½ by 11 inch drawing portraying amphibians and their role in the environment. The drawings were then digitally resized to one-inch squares to be included in the mural.

The response from the schools was overwhelming, "We intended to collect about 2,000 drawings, but received 7,000," said Michael Rubyan, communications director for Project SNAP. The individual pieces were then combined to create the amphibian themed mosaic, featuring several species of frogs, toads, and salamanders. The entire piece measures 5' x 9'and will be permanently installed at the entry of the BioPark's Amphibians: Life on a Limb exhibit, which opened in 2012 to increase awareness of the importance of sustaining amphibian biodiversity.

Over 1,500 students and teachers were present for the unveiling of the Amphibian Mosaic. Photo: Eliska Broes.

Every piece of artwork used in the mosaic represents a unique point of view on amphibian life. During the unveiling, several of the students participating in the mosaic were invited to speak in front of their peers and news crews to discuss what amphibians mean to them and why we need to continue our efforts in saving them. Over 1,500 guests showed up for the event including students and their families, teachers, and even the Mayor of Albuquerque! With thousands of tiles in the mosaic, looking for a particular tile can be daunting, luckily artists can go online to the Project SNAP website (www.projectsnap.org) and type in their name to find the exact location of their drawing in the mural!

Students took the stage to tell the community why amphibians are important to us here in New Mexico. Photo: Mike Fludd.

This community-wide program gives both students and their families the opportunity to become stakeholders in amphibian conservation, and brings to life the importance of how our individual efforts play a huge role in the "big picture".

Thousands of one inch amphibian themed tiles were used to create the mural. Photo: Jen Stabile.

Darwin's Frog *ex situ* breeding program

Carlos Barrientos-Donoso and Juan Carlos Ortiz , Universidad de Concepción, Chile

In the last few decades amphibians have experienced a dramatic decline in many areas of the world (Pechmann y Wildbur 1994). This situation was proved during the First World Herpetological Congress held at the University of Kent in 1989. Since then scientists have recorded population declines for more than 500 amphibian species with a global estimation of 4,000 species. Stuart et al. (2004) pointed out that the IUCN's Global Amphibian Assessment calculated that around a third of the amphibian species, estimated at 5,700 species (at the time of the assessment), have experienced a severe decline or extinction.

Currently the IUCN's amphibian Red List (2012) considers that 44% of species are in some threat category, with 7% listed as Endangered, 16% as Critically Endangered, 16% as Vulnerable and 5% listed as Near Threatened.

According to Cei (1962) there were nineteen recognized species and four subspecies of amphibians in Chile, but in 2011 Ortiz recognized fifty-nine native species and one introduced. This increase is based fundamentally on the description of new species known only from their type localities. However, many species with large distributions have become locally extinct due to habitat loss (Ortiz, 2010). Among the Chilean fauna, amphibians have the highest percentage of endemism (69%). Almost a third of the Chilean amphibians are considered to be evolutionarily distinct species and are in danger of extinction (Evolutionarily Distinct and Globally Endangered, EDGE, 2012). Compared with other countries, Chile is 11th highest in endemism and 13th highest in percentage of species in danger (Stuart et al., 2008, IUCN, 2012).

The genus *Rhinoderma* is of special concern because it only comprises two species that share the same reproductive mode known as neomelia, where males raise their tadpoles in their vocal sacs. Both species in this genus are in eminent risk of extinction.

Darwin's Frog, *Rhinoderma darwinii*, is listed as Vulnerable, and is being captive-bred at the Universidad de Concepción in Chile. Photo: Carlos Barrientos-Donoso.

The Chile Darwin's Frog, *R. rufum* (Philippi, 1902) is listed as Critically Endangered (IUCN, 2012) and is listed 45th in the EDGE list. Many herpetologists consider this species to be Extinct since it has not been found since 1978. Meanwhile, its sister species, Darwin's Frog, *R. darwinii (*Duméril & Bibron, 1841), is listed as Vulnerable (IUCN, 2012) and its populations have notoriously decreased in most of its distribution including in National Protected Areas. If this trend continues, a unique reproductive and development mode will be lost (Young et al., 2004) and that is one of the reasons why we have launched an *ex situ* conservation initiative for this species.

In 2009 we launched the project "*In situ* and *ex situ* conservation and reproduction of *Rhinoderma darwinii*" at the Universidad de Concepción in Chile, thanks to the support of the Leipzig Zoo in Germany, REPTILIA, the Zoological Society for the Conservation of Species and Populations (ZGAP, Germany), the Fundación Huilo Huilo in Chile and the support and authorization of the Agriculture and Livestock Service in Chile. The work is done at the Darwin Frog Breeding Station located at the Universidad de Concepción, campus in Concepción. The project's team members are: Dr. Juan Carlos Ortiz and M.C. Carlos Barrientos from the Universidad de Concepción and Dr. Klaus Busse and Dr. Johara Burke from the Zoological Research Center and Museum A. König, Bonn, Germany.

The objectives of the project are:

- Capture founder individuals
- Transportation of the animals from the wild to the laboratory with controlled temperature and humidity parameters to ensure survival
- Acclimatization and survival during the quarantine period
- Transfer of individuals to terrariums in the breeding lab
- Maintenance of males and females in terrariums, with vocalizations from the males and attraction to the females
- Achieving amplexus
- Maintenance of the males close to the location where the eggs have been laid until the embryos start moving so they can then take them and deposit them in their vocal sacs for development.
- Ejection of the post-metamorph individuals.

The Darwin's Frog *ex situ* breeding station at the Universidad de Concepción. Photo: Juan Carlos Ortiz.

After the metamorphosis phase we then have to maintain the offspring. Recently metamorphosed frogs are maintained in separate boxes so we can keep track of their genealogy. Feeding is based on fruit flies (*Drosophila melanogaster*), crickets (*Gryllus* sp.), aphids (*Myzus* sp.)and terrestrial isopods (*Porcellia* sp.) given three times a week.

A recently ejected metamorph. Photo: Carlos Barrientos-Donoso.

The *ex situ* breeding project began in May 2009 with the collection of eleven individuals from the Coñaripe locality. From the seven males and four females collected in 2009 we obtained twenty-three offspring with only three loses.

In 2010 we had another collection trip and our breeding group is now composed of twelve males and eight females, from which we obtained fifty offspring in 2010, and in 2011 we produced another ninety-four offspring from the same breeding group. At the end of 2011 and during the beginning of 2012 we added fourteen new specimens collected from the cordon of Queule at the Puyehue National Park that we were able to rescue from ash contamination due to a volcanic eruption. This collection was coordinated with the Universidad de Concepción and Universidad Nacional Andrés Bello. Currently the breeding group is made up of thirty-four individuals that have produced 182 offspring.

It is important to mention that during the last breeding season at the end of 2012 the first group we produced in captivity in 2009 have been breeding and producing offspring, completing the breeding circle of *ex situ* breeding of *Rhinoderma darwinii*.

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The laboratory and quarantine area (left) and the breeding laboratory area (right) at the Universidad de Concepción. Photo: Carlos Barrientos-Donoso.

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