amphibian ark

Keeping threatened amphibian species afloat

Newsletter

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2014 Year of the Salamander

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New online application shows the progress of *ex situ* amphibian programs

AArk staff are pleased to announce a new online application for amphibian program managers which showcases the progress being made by our partners with their *ex situ* amphibian conservation programs. Since 2008, we've been following the achievements of *ex situ* amphibian rescue programs around the world. The progress of these programs includes a series of key steps in the progression of successful amphibian conservation programs, with the ultimate aim being that the threats in the wild have been resolved, and the wild populations of these species are once again secure.

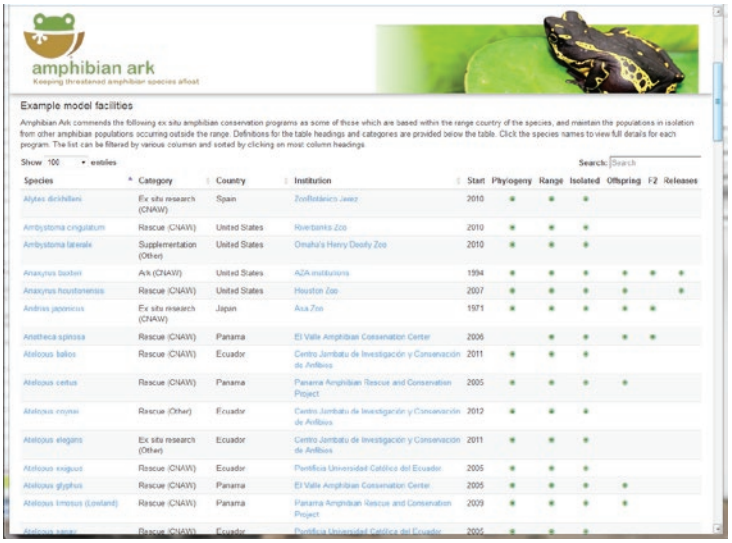
The progress made by programs in this application show a significant achievement by the *ex situ* amphibian conservation community towards reducing declining amphibian populations. By documenting this progress we are showing that zoos, aquariums and other *ex situ* facilities are making a vital conservation contribution towards reducing the loss of amphibian species, and for our community to be broadly acknowledged as a credible conservation partner.

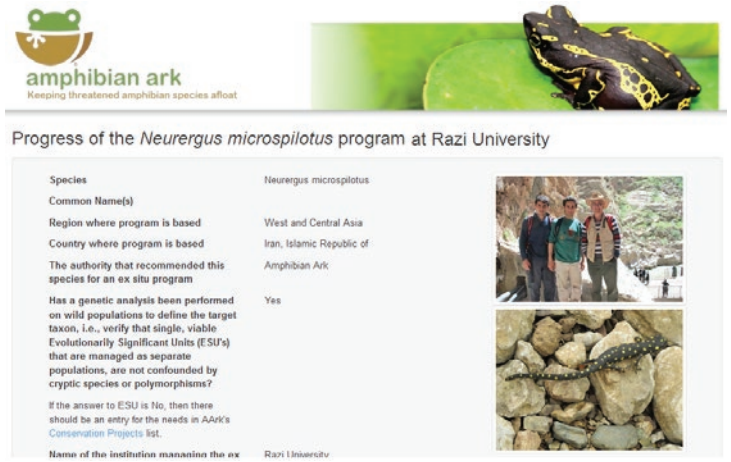
The programs that we monitor include those assessed during an Amphibian Conservation Needs Assessment (www.amphibianark.org/planning-workshops/) as needing urgent *ex situ* rescue, research or supplementation, and similar programs in countries where an AArk conservation needs assessment has not yet been carried out. The results of all conservation needs assessments can be viewed on the Assessment Results page (www.amphibianark.org/assessment-results/) on our web site.

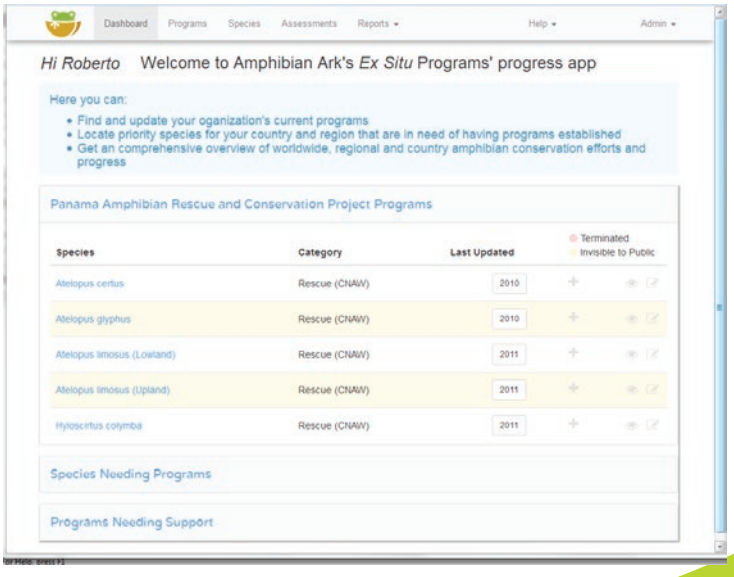
Managers of amphibian conservation programs are now able to login to the new online application, and update the progress of their programs in real-time, add photos, request assistance or additional resources and use recommendations from amphibian conservation needs assessments to determine which species in their country or region are in most need of new *ex situ* programs. A number of reports are available within the application, and the most commonly used ones are available directly from the AArk web site - see the list of all programs within the application: www.amphibianark.org/progress-of-programs/ and those that are considered to be "model" programs: www.amphibianark.org/model-programs/. Both of these reports show six of the key progress steps towards completion of a successful *ex situ* conservation program, with additional detail shown by clicking the species name links in these reports to show the current details of each program. We are working on adding additional reports, including requests from amphibian program managers for additional resources, volunteer opportunities and more.

The application currently includes 122 programs for 100 species in 24 countries. Of these, 87 are rescue programs, and 23 are for *ex situ* research. There are 101 "model" programs, that is, programs that are run within the range country of the species, and the animals are housed in isolation from other species outside of their range.

Please email ExSituProgress@amphibianark.org for any further information.







New AArk Training Officer

AArk is excited to welcome Dr. Luis Carrillo from Mexico as our new full-time Training Officer. Luis steps in replacing Ron Gagliardo, and bringing with him a wealth of experience and new ideas for capacity building in Latin America and around the world. Luis has already hit the ground running with plans for his first official workshop in Bolivia. As AArk´s Training Officer, the challenge for Luis will be to identify training needs and organize and coordinate training programs to keep threatened amphibians species afloat!

Luis started working in zoos back in 1994 in his native Venezuela as head veterinarian at the Caricuao Zoo in Caracas. From there, he has had the opportunity to receive training both as a wildlife veterinary clinician and also as a biologist. Having worked formally in Venezuela, Colombia and Mexico, Luis now resides in Mexico where he has worked in various zoos including Zoofari, a safari park zoo that currently hosts him.

Since 2005, Luis has also worked with the Conservation Breeding Specialist Group (IUCN SSC CBSG) Regional Network Mexico (www.cbsg.org/cbsg-mexico) and since 2012, has been the regional representative for Mexico with the main role of organizing and facilitating conservation workshops for many species in the Latin American region.

By 2008, the Year of the Frog, Luis was appointed as Amphibian Group Coordinator for the Latin American Zoos Association (www.alpza.com), a position that he still holds today. Luis also started training in amphibian conservation and management through the Association of Zoos and Aquariums' course and then eventually through training courses and professional visits to conservation projects and private collections. With a background in veterinary medicine, Luis was recruited by Amphibian Ark to help in translation of key amphibian veterinary documents and lectures and also to be an instructor at training courses in Latin America. He is also an active member of the Amphibian Veterinary Outreach Program (www.amphibianark.org/veterinary-program/).

Luis has worked with Amphibian Ark assisting in the organization, development, facilitation and/or as lecturer of many AArk's Conservation Needs Assessment workshops and Amphibian Biology and Management courses in Latin America.

In 2010 Luis led a group of expedition looking for the rare Large-crested toad (*Incillus cristatus*) in the state of Puebla, Mexico as part of a conservation program for the species. Fortunately the group was able to find and collect a group of animals to start an *ex situ* conservation management and breeding program for the species.

Froguts donates 30% of its school sales to AArk!

David Hughes, CEO and Co-Founder Froguts Inc.

Froguts, a developer of Bio-eLearning software, is widely known for its computer simulations of dissections and labs for K-12 and Higher Education. Our software engages students with highly immersive and interactive simulations of anatomy and physiology. It uses audio narration, captioned text, and realistic 3-D, to deliver key concepts within the theory and foundations of biology. Each topic is presented in a layered systems-based approach that integrates inquiry as well as National Science and Technology Standards. Students are assessed after each level with randomized quizzes or tests, and are given a printable certificate when they complete each module.

University studies indicate that simulated dissections like ours significantly enhance comprehension of the curriculum objectives when used in conjunction with traditional dissection. However our software was also designed to be effectively used as a stand-alone program, in lieu of lab costs and set up time. In doing so, Froguts supports both approaches and empowers educators to engage even greater numbers of students with essential biological concepts. Our online service provides all the following modules: Frog, Squid, Starfish, Cow Eye, Owl Pellet, Fetal Pig, and Genetics Lab (Pea Lab and Fruit Fly Lab).

To learn more about us please visit our web site at: www.froguts.com.

Froguts is proud to donate 30% of all school subscription sales to Amphibian Ark. Please visit the Amphibian Ark web site store (AArk Shop) at www.amphibianark.org/aark-shop/ to subscribe to Froguts and support Amphibian Ark's efforts.

AArk staff changes

After five years of incredible service, Ron Gagliardo is stepping down as our full-time Training Officer but will continue to serve us in a volunteer capacity as a Training Advisor. Ron has accepted a unique position with Amazon as Manager of Horticultural Services where he will oversee all of the horticulture for a new Amazon campus in downtown Seattle which includes a conservatory-like environment for employees to utilize for work, relaxation and fun. Employees will be immersed in a diverse natural environment with plants from around the world. Prior to working with Amphibian Ark, Ron spent many years working in full time horticulture at the Atlanta Botanical Garden and the move to Amazon marks a return to a lifelong passion. We wish him all the best with this amazing opportunity.

Also, Joe Mendelson has stepped down as a part-time Research Officer but will continue to serve as a volunteer advisor to our programs. Joe has returned to his position at Zoo Atlanta, and teaching a variety of courses at the Georgia Institute of Technology.

Amphibian population management workshop in Ecuador

Jennifer Mickelberg, PhD, Curator of Primates, Zoo Atlanta

In October 2013, Kristine Schad from the European Association of Zoos and Aquaria and I taught a three-day amphibian population management workshop in Cumbaya, Ecuador. Kristine and I had taught a similar workshop in Panama a few years earlier and we were both very excited to teach in Ecuador.

The workshop was held at the University of San Francisco - Quito Vet Clinic. Nearly all of the captive facilities holding amphibians in Ecuador were represented at the workshop by the twelve participants. The primary goal of the course was to introduce participants to population management and the tools available so that they can begin to incorporate this in their *ex situ* conservation strategies.

The course covered the principles of genetic and demographic management as well as the processes involved in developing and maintaining cooperative breeding programs to help improve *ex situ* population viability. Each day there was a combination of lectures and activities to demonstrate the tools used for population management, and the workshop culminated with participants entering and creating studbook databases for several species currently held at their facilities. We were fortunate to have help from Luis Carillo (Zoofari, Mexico and Amphibian Ark) to help with translation!

This was a very busy, but very exciting three days. The participants had great questions, were eager to learn, and were great during discussions! After the workshop, Kristine and I were able to tour of a few of the captive facilities. We both really enjoyed our time in Ecuador and are so impressed by everyone's passion and commitment to amphibian conservation!

Twelve participants attended a three-day amphibian population management workshop in Ecuador in October 2013, to help improve *ex situ* population viability. Photo: Jennifer Mickelberg.

Captive Management of Amphibians course in Lima, Peru

Roberto Elias, Doctor of Veterinary Medicine, Universidad Peruana Cayetano Heredia, Peru

In spite of Peru having a great diversity of amphibians there are few institutions and people dedicated to the conservation of these species in captivity. For this reason, Denver Zoo and Huachipa Zoological Park, with the collaboration of Cayetano Heredia University in Peru and Amphibian Ark, organized the first Captive Management of Amphibians course in Peru in 2013. The three-day course took place from November 5-7th, with the first two days including theory and the third practice.

Among the many topics addressed, information about biology, reproduction and general care and health was shared by six presenters from four countries: Luis Carillo, Doctor of Veterinary Medicine and General Curator of Zoofari Park in Mexico and representative of Amphibian Ark; Lizette Bermúdez, biologist and General Curator of Huachipa Zoological Park in Peru; Arturo Muñoz, biologist and representative of the Bolivian Amphibian Initiative; Thomas Weaver, herpetologist and Assistant Curator of Tropical Discovery at Denver Zoo; C.J. Vialpando, herpetologist and zoo keeper at Denver Zoo; and Roberto Elias, Doctor of Veterinary Medicine and representative of Denver Zoo in Peru.

Participants during one of the practical sessions at the first amphibian captive management course held in Lima, Peru in November 2013. Photo: Luis Carrillo.

Among the participants were representatives from the Peruvian Central Office of Forestry and Wildlife, Titicaca National Reserve, National University of the Altiplano in Puno, Park of the Legends (Zoo) in Lima, Huachipa Zoological Park, and many more.

This course demonstrates Denver Zoo's commitment to collaborating on amphibian conservation in Peru, where since 2007-2008 it has been developing its Lake Titicaca Frog (*Telmatobius culeus*) Conservation Project, and in 2013 expanded to include Junín Frogs (*Telmatobius macrostomus*).

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/.

Association Spotlight - Kristine Schad, Population Biologist, European Association of Zoos and Aquaria

Kristine has always been interested in animals and conservation, but felt like amphibians were a bit of an underdog and needed more attention than they were receiving. She conducted her Masters degree research on tree frog acoustics and behavior, focusing on three tree frogs native to Florida. In graduate school she also had the opportunity to work on an amphibian diversity survey and amphibian wildlife crossing research project.

Her first experience with Amphibian Ark was at an amphibian population management workshop in 2007. All of the attendees worked together to create the Amphibian Population Management Guidelines (www.amphibianark.org/pdf/AArk-Amphibian-Population-Management-Guidelines.pdf or www.amphibianark.org/pdf/AArk-Amphibian-Population-Management-Guidelines-(Espanol).pdf), which assists colleagues in making genetic and demographic population management decisions based on the life history characteristics of their species. Kristine was the editor of this document and she co-chairs the Amphibian Population Management Committee. These guidelines were later used to create the AArk founder calculation tool (www.amphibianark.org/tools/Founder_calculation_tool.htm or in Spanish: www.amphibianark.org/tools/Founder_calculation_tool_es.htm), which guides amphibian program managers to determine the ideal number of founders necessary to start a new amphibian population.

At that time, Kristine was a population biologist with the Association of Zoos and Aquariums (AZA) Population Management Center at Lincoln Park Zoo in the US. Over the years, she worked closely with several amphibian Species Survival Programs (SSPs) and the AZA Amphibian Taxon Advisory Group (TAG). She also collaborated on the Amphibian Data Entry Guidelines with Amphibian Ark (www.amphibianark.org/pdf/Amphibian-Data-Entry-Guidelines-2010.pdf), AZA Amphibian TAG, and AZA Institutional Data Management Advisory Group. This document highlights the different options currently used for maintaining records for amphibians. She also contributed to the www.popfrog.org website created by Andrew Odum, at Toledo Zoo, which is another helpful tool to help answer population management questions for amphibians. With AArk's support, Kristine had the opportunity to teach amphibian population management courses in Panama in 2011 and Ecuador in 2013 with Jennifer Mickelberg, from Zoo Atlanta, for facilities helping native amphibian species.

Kristine is now a population biologist for the European Association of Zoos and Aquaria (EAZA) and looks forward to becoming more involved in amphibian population management in Europe.

An Introduction to GIS for Conservation Managers

April 8 - 12, 2014

Most of the great issues confronting modern conservation have a spatial element. This five-day course is designed to provide participants with an understanding of Geographic Information Systems (GIS). GIS is a computing tool that provides high quality data to underpin conservation action, allowing information about species, habitats and landscapes to be described, analysed, and graphically represented. The course is designed for researchers and resource managers working in endangered species recovery or invasive species management.

For more information please see:
www.durrell.org/training/courses/An-Introduction-to-GIS-for-Conservation-Managers/.

Amphibian Ark 2014 Seed Grant announcement and guidelines

Amphibian Ark is pleased to announce the sixth annual call for proposals for its Seed Grant program!

This competitive US$5,000 grant is intended to fund start-up rescue projects for species that cannot currently be saved in the wild. Successful proposals will reflect AArk values; please pay careful attention to the grant guidelines (below and also at www.amphibianark.org/aark-seed-grant/) for details on what types of projects are favored. Past grantees can be seen at the web link listed above.

Inquiries should be directed to Kevin Johnson, Taxon Officer KevinJ@amphibianark.org.

We would like to acknowledge the generous support of the Andrew Sabin Family Foundation, Ronna Erickson, Woodland Park Zoo, the European Association of Zoos and Aquariums, and the other AArk supporters (www.amphibianark.org/acknowledgements.htm) who helped establish this grant.

Important dates:

- Grant application deadline: **1 May 2014**
- Grant decision/notification date: **15 May 2014**
- Winners must provide bank details by: **21 May 2014**
- Grant payment date: **1 June 2014**
- Progress report due: **1 June 2015**

Priority guidelines - please read very carefully!

This grant is **not** intended to fund workshops, educational exhibits, project overheard or indirect costs.

AArk staff are available if you need assistance in formulating your proposal. Please do not hesitate to contact us with any questions. Each year several proposals have been rejected due to issues that could have been prevented!

Projects must include an *ex situ* component, and must be working with species that need to be rescued (species whose threats cannot be mitigated in nature in time to prevent their extinction and which therefore require urgent *ex situ* intervention to persist). Projects must be based within the native range country of the species and must adhere to recommended biosecurity standards (see www.amphibianark.org/husbandry-standards/). The concept of a 'seed' grant is to fund newly-launched projects - those at the very beginning of their life, in order to help them attract larger and/or long-term funding for the duration of the program.

Please read the Seed Grant page on the AArk web site, www.amphibianark.org/aark-seed-grant/ and download the applications guidelines, www.amphibianark.org/pdf/AArk_Seed_Grant_2014.pdf - all applications must follow these guidelines.

Amphibian medicine tutorial videos

John M. Sykes IV, Senior Veterinarian, Zoological Health Program, Wildlife Conservation Society, USA

A series of online amphibian medicine tutorials has recently been uploaded to YouTube, with each short 10-15 minute video designed to provide basic background information in various topics of amphibian medicine, and the tutorials are available in three languages - English, Spanish, and French. The material is generally designed for use by veterinarians, but the information will be helpful to anyone involved in *ex situ* amphibian conservation programs. The tutorials are designed as an introduction, rather than a complete summary of all topics regarding amphibian medicine, and additional resources are listed in each tutorial. Tutorials can be viewed as a stand-alone course, but will also be helpful for re-viewing concepts taught at various amphibian husbandry and medicine workshops given around the world by organizations such as the AZA and Amphibian Ark.

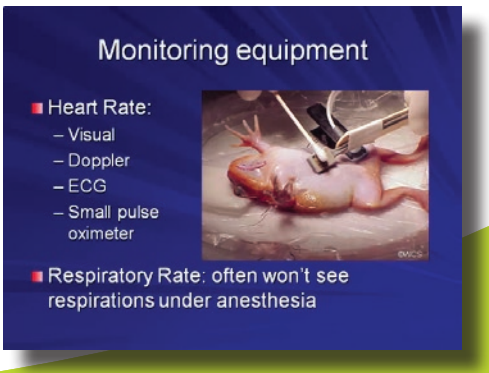
The direct link to the Amphibian Tutorial YouTube channel is www.youtube.com/channel/UCaOhxmTP7asO5zyZQwYzh-A/videos.

Easy to use playlists are also available for each langauge:

English: www.youtube.com/watch?v=oz64nOs452I&feature=share&list=PLVDi5N401GbHJe_8gfER06P6AfM1uRWU3

Español: www.youtube.com/watch?v=KBmfllzu4cw&list=PLVDi5N401GbFbEQHocZRjnhW7utsjiOEN&feature=share

Français: www.youtube.com/watch?v=gPQe6Ghnp3w&feature=share&list=PLVDi5N401GbEVEEqzMqqvJiL-3Tm_fP_o



For additional information about these videos, please contact John M. Sykes IV, DVM, DACZM, jsykes@wcs.org.

Conservation program for the Turtleshell Marsupial Frog

Diego Almeida Reinoso, Yerka Sagredo Núñez and Katty Garzón, Amphibian Conservation Center, Gustavo Orcés Herpetological Foundation, Quito, Ecuador

With the creation of the Amphibian Conservation Center (CEC) of the Gustavo Orcés Herpetological Foundation (FHGO) in June 2013, we began conservation programs for two critically endangered species: the Tiger's Treefrog (*Hyloscirtus tigrinus*) and *Gastrotheca testudinea*, commonly known as the Turtleshell Marsupial Frog. This article outlines the progress we have made managing the Turtleshell Marsupial Frog.

The Turtleshell Marsupial Frog is a marsupial frog which has direct development, that is their young are born fully-formed, bypassing the tadpole stage. The development of the froglets takes about four months and occurs in the female's pouch.

This species has been classified by the IUCN as Vulnerable, but studies and field surveys indicate that populations are declining rapidly and it could be considered as an Endangered species. Its distribution includes Peru, Bolivia and Ecuador, and in Ecuador it is found in the eastern montane and montane forests. Human activities such as forest-clearing, livestock and the advance of the agricultural frontier are some of the reasons why populations of this species are declining.

Left: The first male Turtleshell Marsupial Frog (*Gastrotheca testudinea*) that was collected near Green River in the Tungurahua Province, Ecuador. Center: The second male marsupial frog that was also collected in June 2013. Right: The female marsupial frog was apparently pregnant when she was collected as small bumps could be felt on her back. Photos: Yerka Sagredo.

The critical situation being experienced with the Turtleshell Marsupial Frog populations motivated us to start our *ex situ* conservation program for the species. On June 13, 2013 we rescued two males and one adult female from a forest-felling process located in the Green River Chico, parish Verde River, 4 km from the village Vizcaya, Canton Baños, Tungurahua Province, near the parish El Triunfo. The first brown male was collected at 20:10 in the evening and was found 10 cm above the ground, in dried herbs and bamboo cane at 2,092 m elevation. At the time of collection it was drizzling slightly and the frog was vocalizing. The second green male was found at 20:54, on a branch 80 cm above the ground at an elevation of 2,079 m. This male was also vocalizing. The female was found at 22:19 on the ground next to a moss-covered stone and an Agave plant. The female was apparently pregnant as small bumps could be felt on her back.

The rear view of one of the terraria. Photo: Diego Almeida Reinoso.

The three individuals were transported to the Amphibian Conservation Center, and the two males were placed in a terrarium measuring 60 cm x 40 cm x 45 cm. The female was placed in a terrarium measuring 80 cm x 45 cm x 50 cm. Both terrariums contained plants, logs and sphagnum moss, allowing daily behavior to be easily observed. The frogs were initially fed 18-20 mm crickets, and once they were accepting this food we varied their diet by alternating crickets and other insects.

We put special emphasis on the terrarium for the female, because if our suspicions were true, and she was pregnant, we wanted to take all precautions to avoid her getting hurt or stressed in case she aborted the youngsters. Abortions in marsupial frogs are quite common as a result of stress events.

Fulfilling the basic principles in setting up the terrarium, we designed a container large enough with an open system and water outlet, with a mesh cover on the top which allowed the entry of sunlight, as this

is essential for pregnant marsupial frogs. On the base we had a false floor covered in sphagnum moss, and we included broad-leaved plants to provide shade as well as using a hollow log for a shelter.

The terrarium was located on the outside of the conservation center. It was placed under the natural shade of some trees so that sunlight did not enter directly into it. A water sprinkler system was installed, spraying twice each day, once at 06:00 and again at 18:00. The design of the terrarium allowed for a depth of approximately 2 cm of water above the raised floor grid. Any excess water immediately drained through mesh.

As expected the frog spent most of the day on a branch and at night took refuge in the hollow of a tree trunk. This behavior confirmed our suspicions that the frog was pregnant, as sun exposure is common in other species of marsupial frogs when they are pregnant. This behavior was consistent throughout the time before the young froglets were found.

The female was sometimes found in the hollow trunk during the day, and these observations were during the sunniest days. This is the first time that this event has been recorded in captivity for this species.

Some of the juvenile Turtleshell Marsupial Frogs, on September 13, 2013. Photo: Diego Almeida Reinoso.

As time progressed the bumps on her back became more visible. It is noteworthy that the exact time of gestation of the Turtleshell Marsupial Frog is not known, but it could be presumed that the gestation period would last approximately four months since at the time of capture only slight bumps were visible on her back, which would mean that the eggs were in development, and the froglets appeared three months after the female arrived at the center.

Ten baby frogs were observed in the terrarium on the morning of September 15, 2013, and so the birth occurred during the night before or in the morning of September 15. They were immediately removed from the terrarium and their mother and were moved to a smaller Penn-Plax type 3 terrarium. The small frogs were initially fed fruit flies and small crickets, which they readily accepted. The crickets were enriched with calcium and vitamin D3.

The growth of the young frogs was rapid and they increased from about 10 mm on the day they were found to about 15 mm in early October 2013. By February 2014, the frogs have reached an average size of 40 mm and are very healthy, with no evidence of malformations. We are hoping that in the coming months we will have the first adults which have been maintained since birth in the CCA-FHGO.

This is the first step for the conservation of the Turtleshell Marsupial Frog. The road is quite long but with effort, dedication and above all, conviction we believe that our work will pay off, and will be helpful for new researchers and conservationists to continue to work with amphibians.

National Amphibian Expo

Indianapolis, USA, Saturday, August 9th

The National Amphibian Expo is a biennial event with a primary focus on advancing scientific understanding and promoting innovative captive husbandry standards for tropical and temperate amphibian species. This event will promote professionals and hobbyists alike discussing and sharing knowledge and experience and will foster innovation in captive breeding and captive husbandry of amphibians.

All proceeds from vendor table sales and silent auction will benefit a single conservation partner, Amphibian Ark, and the proceeds will be donated towards two projects in line with the “Home and Away” focus for the event: Dr, Michael Lannoo’s Crawfish Frog project in Indianapolis, USA; and Association Mitsinjo, a community-run captive breeding facility for threatened frogs in Madagascar.

The National Amphibian Expo started as an idea from a local amphibian enthusiast group. It was presented and discussed as an opportunity to create and host a national event promoting quality captive husbandry techniques and amphibian conservation.

The National Amphibian Expo will be held in Indianapolis, IN on Saturday, August 9th at Butler University - Atherton Student Union. The event runs from 9:00 a.m. until 4:00 p.m. EST.

For more information, contact info@naexpo.org.
For vendor information, please contact vendors@naexpo.org.

Web site: www.naexpo.org, Facebook: www.facebook.com/NAexpo

Chopsticks For Salamanders

Lauren Augustine, Animal Keeper, National Zoological Park, USA

A conservation initiative called Chopsticks for Salamanders (CFS) was established in late 2011, and is supported by three founding American Association of Zoo Keepers (AAZK) chapters: The New York Chapter, the National Capital Chapter and the Greater Baltimore Chapter. The mission of Chopsticks for Salamanders has three significant goals:

- to disseminate information about the production of disposable chopsticks;
- to increase awareness about salamander diversity in the United States;
- to raise money for salamander conservation, education, and research.

Disposable chopsticks are made largely from old growth forests that are clear-cut in the search for the perfect straight-grained wood. China produces roughly 63 billion chopsticks a year, half of which are used in China, and of the other half, 77% go to Japan, 21% to South Korea, and 2% to the United States. This equates to approximately 3.8 million trees felled annually in China. This problem is not confined to Asia; it has in the past and continues to encroach on the United States and Canada.

With the deforestation for the production of disposable chopsticks comes the loss of critical animal habitat and sounds a major alarm for already declining worldwide amphibian populations. Nearly one-third (32%) of the world's 7,000+ amphibian species have been classified as threatened with extinction. The founders of CFS have chosen salamanders as the flagship species for this initiative. The Appalachian Mountains are home to the highest diversity of salamanders in the world and range from Canada to Alabama. This area is vital habitat for salamanders, a group of vertebrates whose populations are already in decline from other threats such as Chytridiomycosis and climate change.

CFS provides a reusable alternative to disposable chopsticks by selling stainless steel chopsticks in a branded carrying bag on our web site (www.ChopsticksForSalamanders.org). All funds raised through the organization are directed towards salamander conservation through grant opportunities. In 2013 CFS awarded a total of $2,000 to salamander conservation and research. University of Georgia's Odum School of Ecology student Todd Pierson was awarded $1,500 for his proposal "Monitoring of Appalachian Salamanders Using Environmental DNA." Todd's research echoes the organization's mission of preserving the salamanders of the Appalachian region. Additionally, CFS contributed $500 to Jamie Weyer from Omaha's Henry Doorly Zoo and Aquarium. With this funding Jamie was able to accompany scientists in the field to release and track head-started Eastern Hellbenders for the Ohio Conservation Plan. This year CFS funded Brenna Forester from Duke University and her proposal "Evaluating the implications of local adaptation, habitat connectivity and gene flow for an endemic, high-elevation terrestrial salamander under global change" and Sarah Plesuk from Omaha's Henry Doorly Zoo and Aquarium for her proposal "Amphibian Habitat Enhancement and Monitoring in an Urban Area." The total funding allocation in 2014 was $7,500.

With growing support, CFS goals for the future are grand. The Byrd School of Business has generously offered to help CFS meet one of its most important goals: to create a salamander ambassador package. This package will aid CFS supporters in approaching restaurants about their disposable chopstick use. As restaurants are the primary consumers of disposable chopsticks, they are a major concern for this initiative. With help from the Byrd School of Business, CFS hopes to have the package available by next year. This will greatly increase the scope of CFS.

What can you do? Bring your own chopsticks (BYOC) when dining out! Talk to your local restaurant owners about changing over to reusable/washable chopsticks. Organize a CFS fundraising event to spread awareness in your area. Taking a stand against wooden disposable chopsticks now can save vital habitat not only in Asia and Russia but in the United States and Canada as well.

Through education and awareness outreach, we promote the benefits of ecological conservation and its role in making communities better places – and more sustainable places – to work and live. Visit our website for updates from our grant recipients, educational materials, grant postings, and upcoming events.

Please "like" us on Facebook (www.facebook.com/chopsticksforsalamanders) and follow us on Twitter (www.twitter.com/reusechopsticks) for updates and salamander news.

The Eastern Red-backed Salamander (*Plethodon cinereus*) is found in the Appalachian Mountains in the US, home to the highest diversity of salamanders in the world. Photo: Daniel Hocking.

The 3rd International Bornean Frog Race 2014, Kubah National Park, Kuching, Sarawak

Pang Sing Tyan, Institute of Biodiversity & Environmental Conservation, Sarawak, Malaysia and Indraneil Das, University Malaysia Sarawak

On the last Saturday of April every year, conservationists from over 30 countries hold activities to highlight amphibians that are threatened. Indeed, a third of the known species of the world's amphibians are recognised as being under threat.

The first prize winner in the 2013 Bornean Frog Race, a White-lipped Frog (*Hylarana raniceps*). Photo: Philip Chen Zhao Ching.

In conjunction with Save the Frogs Day, the International Bornean Frog Race is held to instil greater awareness of amphibian conservation, especially in Sarawak, Malaysia and on Borneo. This event, on 26th April, comprises talks on amphibians and their conservation by local and international speakers, amphibian exhibits (including frog figurines, stamps, coins, toys, artefacts, photos, books and calls), workshops on amphibian biology and photography, screening of documentaries on amphibians (such as one by Sir David Attenborough entitled Land Invaders from the award-winning BBC television series, Life in Cold Blood) and also the main component of the event, The Race.

The Race is an activity in which participants look for frogs in a designated area at the Kubah National Park for two hours at night, to capture digital images of amphibians. The images are judged based on their technical quality, aesthetics, as well as the rarity of the frog species and on the type of photographic equipment used. There are also additional surprise categories for prizes.

Sustaining nearly 60 species of amphibians (frogs, toads and caecilians), Kubah National Park is well-known for its primary forest that provides habitat for a variety of species. Two species of frogs, the Mantang Narrow-mouthed Frog (*Microhyla nepenthicola*) one of the world's smallest frogs which is only the size of a pea, and the Mahogany Frog (*Hylarana luctuosa*) whose call has been described as the world's most beautiful sound, are both inhabitants of this National Park.

This will be the third year we are organising the Bornean Frog Face, together with Sarawak Forestry Corporation and with the support of the Ministry of Tourism Sarawak. We are proud to take part with our co-organising members, facilitators and all participants in the event to raise awareness of declining amphibians.

Members of the public are welcome to join these events. However, the entry to the Race is limited to 100 participants, on a first-come-first served basis. For more information, please visit us at www.theinternationalborneanfrograce.weebly.com or tweet us at www.twitter.com/Bornean-FrogRace and 'like' us at www.facebook.com/TheBorneanFrogRace.

The second prize winner in the 2013 Bornean Frog Race, a Bornean Horned Frog (*Megophrys nasuta*). Photo: Methos Phang.

Developing Baw Baw Frog husbandry at Melbourne Zoo

Chris Banks, Wildlife Conservation & Science, Zoos Victoria; Jon Birkett, Precinct Manager Herpetofauna, Melbourne Zoo; and Deon Gilbert, Amphibian Specialist, Melbourne Zoo

A wild Baw Baw Frog (*Philoria frosti*). Photo: Damian Goodall.

The Baw Baw Frog (*Philoria frosti*) is among Australia's most poorly-known amphibians. It is restricted to the Baw Baw Plateau and adjacent escarpment about 120 km east of Melbourne. Here, it occurs in the Baw Baw National Park, the Mt. Baw Baw Alpine Resort and State Forest at elevations of 900-1560 m, encompassing an area of 135 km² (Hollis, 2004). Much of this region is covered with snow during the winter and the frogs spend the majority of their lives underground, from surface layers among grasses and logs to as much as a metre down along seepage lines and in soil cavities. Males call from these sites and 50-185 eggs are deposited in foam nests in November-December. The tadpoles develop at the oviposition site with very little water (Littlejohn, 1963; Malone, 1985; Hollis, 2004).

Annual monitoring of the population between 1993 and 2008 pointed to a 98% decline at sub-alpine elevations and no frogs have been recorded there since 2005. Populations at lower, montane elevations have also declined, but not as severely as in higher elevations. Incorporation of survey data from 2010-2012, indicate a further decline and an estimated total adult male population of 1,300 individuals (Hollis, 2013). Allowing for a 1:1 sex ratio, this indicates a total adult population of perhaps 2,500 frogs.

Zoos Victoria (ZV) committed to supporting the conservation of this little amphibian in 2010, as a member of our Fighting Extinction campaign. This frog had only been kept in captivity three times previously, twice as part of researching its biology and the other when the Amphibian Research Centre (ARC) collected three egg masses and was able to raise a small number of frogs to adults. None survived long-term however, presenting husbandry issues to work through. A particular challenge is providing an adequate volume of tiny insect food items (metamorph frogs are only 6-8 mm long) that are active at 8-12°C.

Zoos Victoria received approval to collect two egg masses in late 2011, as the first step in developing husbandry techniques in the event that these are needed in the future. In challenging conditions, one egg mass was collected in November 2011 and set up in Melbourne Zoo's Endangered Amphibian Complex. Extremely high outside temperatures, combined with air-conditioning failure, compromised the egg mass, causing it to rupture early. With assistance from the ARC and Taronga Zoo, 15 tadpoles developed and 8 metamorphosed (7-8 mm long). All subsequently died, the last at 88 days.

No egg masses were located in 2012, most likely due to a late Spring and unfavourable weather conditions at the time scheduled for collection.

In 2013, ZV funded a two-person survey team from Tasmania for five weeks on Mt Baw Baw to locate calling males and potential oviposition sites. This proved critical, with two egg masses located on 18 and 20 November about 20-30 cm below ground in small cavities under male calling sites. They were immediately transferred to the Zoo and placed in two large drink fridges in an isolated air-conditioned room, which is serviced daily under high quarantine standards. The egg masses were set up in small plastic tub enclosures with reverse osmosis water trickling over them by gravity feed and maintained at 7-9°C. The egg masses started to break down after 4-5 weeks and tadpoles became visible about four weeks later. The tadpoles are continuing to develop well in both egg masses and we estimate 100-120 tadpoles in total.

Exterior of Melbourne Zoo's Baw Baw Frog container. Photo: Chris Banks.

The tadpoles, remnant egg masses and subsequent frogs will be transferred to a re-fitted refrigerated shipping container that has been positioned behind the Zoo's Reptile House. Staffing schedules have been adjusted to comply with Australian Government guidelines for minimising disease risks associated with captive programs for Australian frogs (Murray et al., 2011), and springtail (*Collembola* sp.) food colonies established.

The biology of this species presents husbandry challenges at every stage, but good planning and allowing the eggs and tadpoles to develop at their own pace gives us confidence of long-term success with this unique little frog.

Acknowledgements

Jon Birkett, Deon Gilbert, Damian Goodall and Nick Kuyper in Melbourne Zoo's Herpetofauna Department for their commitment and care in planning and establishing the fridges and container, collecting and caring for the egg masses, and tracking the development of the tadpoles. The Zoo's Works Department facilitated the container's arrival and fit-out. The field skills of Jet Black and Heather Hancock were key to successfully locating the egg masses on Mt Baw Baw.

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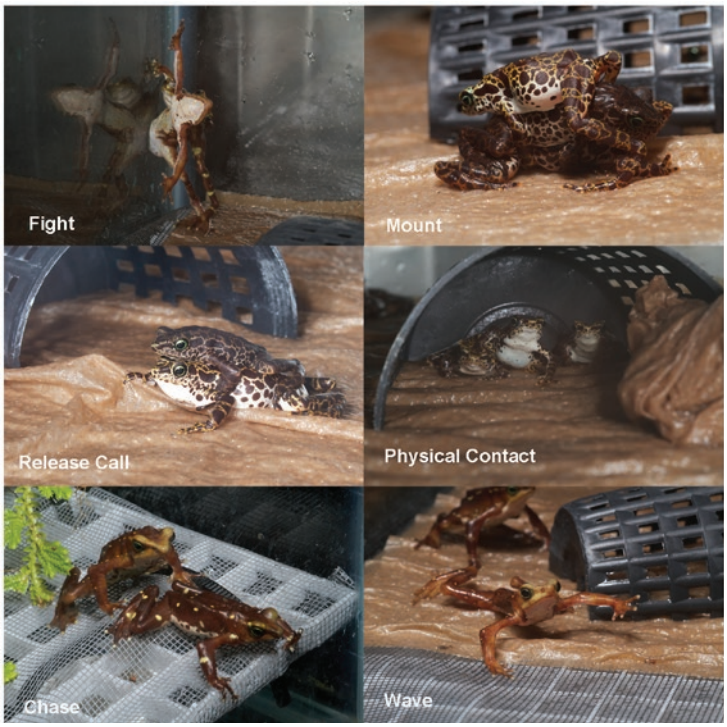
Studying behavior and hormones to improve amphibian care of harlequin frogs

[The following is a modified abstract from a recent paper, Evaluating Group Housing Strategies for the *Ex-Situ* Conservation of Harlequin Frogs (*Atelopus* spp.) Using Behavioral and Physiological Indicators*]*

The Panama Amphibian Rescue and Conservation Project has established *ex situ* assurance colonies of two endangered Panamanian harlequin frogs, *Atelopus certus* and *Atelopus glyphus*, but we observed that males fought with each other when housed together. Housing frogs individually eliminated this problem, but created space constraints in our *ex situ* facility at the Gamboa Amphibian Rescue Center in Panama.

We evaluated the potential stress effects from aggressive interactions when housing frogs individually, in groups of two and groups of eight. We modified an existing fecal glucocorticoid analysis method that is widely used for evaluating stress responses in mammals, so that we could use it on frog fecal material. In both small and large groups, frogs initially interacted aggressively, and glucocorticoid levels in their feces were elevated. However both aggressive interactions and fecal glucocorticoids declined after two weeks, reaching the lowest levels by week four. We conclude that aggressive interactions in same-sex groups of captive *Atelopus* may initially cause stress, but the frogs become habituated within a few weeks and they can safely be housed in same-sex groups for longer periods of time.



Ethogram describing different types of aggressive interactions observed for *Atelopus*.

This paper was recently published in the open access journal PLoS One and can be viewed at this link: www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0090218.

Cikanek SJ, Nockold S, Brown JL, Carpenter JW, Estrada A, et al. (2014). *Evaluating Group Housing Strategies for the* Ex-Situ *Conservation of Harlequin Frogs (*Atelopus *spp.) Using Behavioral and Physiological Indicators*. PLoS ONE 9(2): e90218. doi:10.1371/journal.pone.0090218.

Jorge Guerrel, Roberto Ibanez and Angie Estrada in one of Panama Amphibian Rescue and Conservation Project's amphibian pods in Gamboa. Photo: Brian Gratwicke.

1% for the Planet: Hop to it!

Candace M Hansen, Communications Director, Amphibian Survival Alliance

1% for the Planet (1% FTP) is all about coming together to help make the world a better place. There's no better example than WorthWild and Quantum Rush, 1% FTP member businesses that are partnering with Amphibian Survival Alliance to protect amphibian habitat around the world.

In late December 2013 1% member WorthWild went live with their crowdsourcing website - a resource designed to help individuals and organizations get funds or feedback for environmental initiatives - and they launched with collaboration as a priority. One of the first organizations to WorthWild aligned with was the Amphibian Survival Alliance, the world's largest partnership for amphibian conservation. Don Church, Executive Director of the Alliance said "When we joined the 1% for the Planet network we were looking for a truly mutually beneficial partnership. As an Alliance we believe that if a partnership is equally beneficial both parties will get a lot more out of the experience and the outcomes will be much greater, hence when we saw that both WorthWild and Quantum Rush had joined 1% FTP we jumped on the opportunity to work with them".

"Our brand, our operation, our mission..." says Evan Grinde, Founder of Quantum Rush, "...it all hinges entirely on partnerships. We know we can't do everything on our own, and we don't try to. So, naturally, when the Alliance reached out to us and proposed that we work together to raise funds for worldwide amphibian conservation, we agreed wholeheartedly. Their mission really resonated with us, aligning perfectly with the exact kind of differences that we wanted to be making. So before long, we got to work on not only a campaign to be launched through our own website, but also a t-shirt to be given out as a reward for supporters donating at the $250-level through another campaign-driven, 1% for the Planet company: WorthWild. And that all right there is the beauty of 1% for the Planet: it creates collisions. It's a magnet for like-minded forces and it creates dynamic relationships that might never have otherwise been established... and truly great things can come about because of it."

"It's a trifecta." says WorthWild cofounder Kyle Pribish. "By partnering with 1% for the Planet, Amphibian Survival Alliance and Quantum Rush, we hope to 'Give Back to Blue' in a way that stretches beyond ourselves and inspires change the world over. I love that we all found each other through the 1% network. We're in the business of inspiration, influence and change and the organizations we work with are aligned with these goals as well. We really hope to see some generous traffic to our platform so that all 1% causes and parties may benefit. We're just starting out and we want to send a loud message about coming together to accomplish great things."

Giant palm salamander (*Bolitoglossa dofleini*) in the Sierra Caral of Guatemala. Photo: Robin Moore.

In order to maximize impact, efforts in conservation should be concentrated. Participation in these efforts, however, should not be. There truly is strength in numbers, and getting as many individual members of society as possible involved in the collaborative efforts of the Amphibian Survival Alliance, Quantum Rush, and WorthWild is the key to success for our conservation campaign. You, as a passionate and concerned individual, are presented today with greater, more transparent opportunities than ever before to contribute to real causes. The struggles we face in amphibian conservation are representative of the struggles we face on a wider ecological basis. The loss of amphibian biodiversity sets out of balance the ecologies that these sensitive creatures belong to, and these ecologies are not systems in which humans have no place. Any harm we inflict against these animals is harm we inflict against ourselves and our children. Any measure of action we take to protect these animals are measures of action we take to secure a happier, simpler, more natural future for ourselves and our loved ones.

Interested in collaborating? Each new organization brings value to the table in a cooperative partnership through their mission, audience, perspectives, and ideas. We can achieve far more together than any of us could alone. The Amphibian Survival Alliance, Quantum Rush, and WorthWild would like to extend an invitation for collaboration to any fellow 1% for the Planet companies or NGOs who feel that their missions align on any level with our own. Don't hesitate to reach out if you feel that there exists some potential synergy between your organization and any of our own individually or all of ours collectively.

Ready to leap to the rescue? Here's how you can make an impact right away:

- Take a look at the "Leaping to the Rescue! Hop to it!" campaign on WorthWild. To support amphibian conservation through WorthWild please visit their website, www.worthwild.com/initiatives/9.
- You can also support by purchasing an eco-friendly, USA-made Amphibian Conservation artisan t-shirt from Quantum Rush at www.quantumrush.com/amphibians.

Together we can save amphibians and the habitats upon which they - and we - depend.

Amaru Zoo promotes the rescue, knowledge and protection of threatened amphibians of Southern Ecuador

Ernesto Arbelaez Ortiz, Scientific and Executive Director and Fausto Ernesto Siavichay Pesántez, Biologist, Zoo Amaru

The Center for Amphibian Conservation of the BioPark Amaru Zoo (CCA-Amaru) in Cuenca, Ecuador is an open, specialized facility located in the habitat and distribution range of more than eighty percent of the species we are involved with, and it manages a program designed to save and captive-breed eight species of native and endemic amphibians from the southern region of the country. It is located on site at the BioPark Amaru Zoo in Cuenca, Azuay Province in Ecuador. Approximately 500 frogs are maintained in dozens of technically sophisticated terrariums which have been specially designed and decorated to maintain rescued colonies. We focus on critically endangered Andean species of harlequin frogs or jambatos, poison arrow frogs, fossorial frogs and marsupial frogs.

Conservation status

These unique amphibian species which are being rescued by the CCA-Amaru were abundant two or three decades ago in areas of forest, native moorland and wetlands around the city of Cuenca, Cajas National Park, areas of protected forest such as Quimsacocha, in the basin of the River Paute and subtropical areas of southern Amazonia. The Black Cajas Jambato (*Atelopus nanay*) which is currently being managed and has successfully reproduced, was formally declared extinct approximately twelve years ago, and later, after a great cooperative effort, we were able to rediscover two small populations of this species and today the survival of their species depends upon our breeding center, as their natural populations are threatened and declining. Another species, the Lemon Jambato (*Atelopus* sp. nov. Wampukrum) was discovered less than a decade ago in the southern Amazonian foothills and the Cordillera del Condor. This species has not yet been formally described but it is already on the edge of extinction due to deforestation and infectious diseases.

Species	Conservation status (IUCN)	*Ex situ* management starting year	*Ex situ* breeding results
Atelopus nanay	CR	2010	F1
Atelopus sp. nov. Wampukrum	NE	2012	F1
Hyloxalus vertebralis	CR	2010	F2
Hyloxalus anthracinus	CR	2012	Too few reproductive individuals rescued
Gastrotheca litonedis	EN	2012	F2
Gastrotheca montícola	LC	2014	Too few reproductive individuals rescued
Gastrotheca pseustes	EN	2010	F1
Nelsonophryne aequatorialis	LC	2012	Testing

Table 1. Threatened amphibian species managed under the CCA-Amaru *ex situ* breeding program. CR = Critically Endangered, NE = Not Evaluated, EN = Endangered, LC = Least Concern, F1 = first generation captive-bred, F2 = second generation captive-bred.

Unfortunately most of the species we manage in our *ex situ* conservation program have wild populations that have been declining to critical levels, but they still survive in the wild in localities and small isolated areas that are seriously threatened by invasive species, chytrid fungus, deforestation, habitat pollution and global warming. Some of the species currently have an unknown conservation status due to insufficient data collected during the last assessments.

Ex situ reproduction

In early 2010 we began assisted reproduction programs with the first colonies of rescued amphibian species including *Hyloxalus vertebralis*, *Atelopus nanay* and *Gastrotheca pseustes*. We had 25 reproductive events for *H. vertebralis*, four reproductive events for *A. nanay* and two reproductive events for *G. pseustes*. In 2012 we began breeding programs for the new species of *Atelopus* called Wampukrum, and this species has successfully reproduced once to date. Also in 2012 we had 13 successful breeding events for the marsupial frog, *Gastrotheca litonedis*.

A pair of Black Cajas Jambato (*Atelopus nanay*) in amplexus in 2013. Photo: Ernesto Arbelaez Ortiz.

Facilities

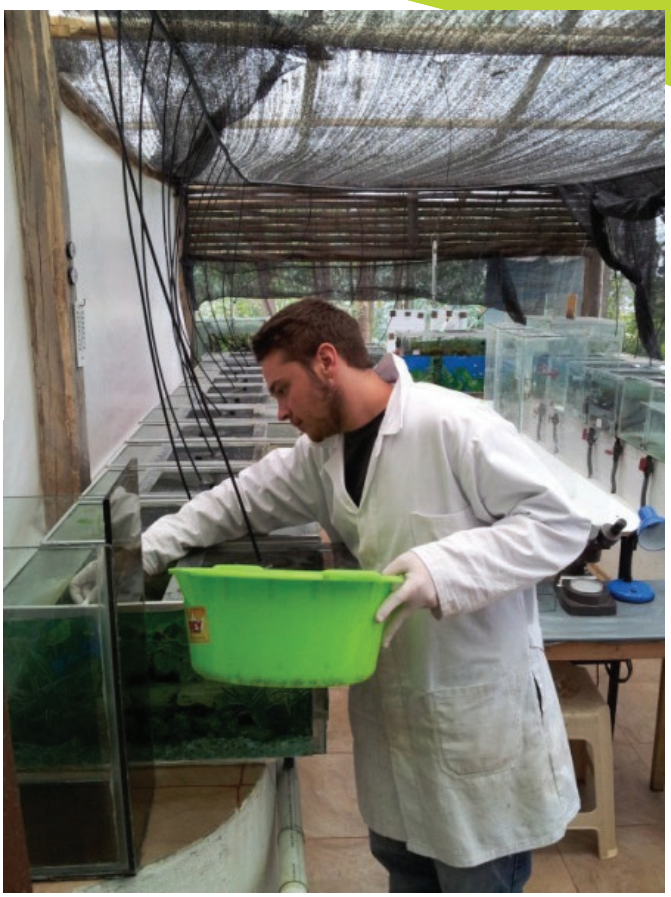
The *ex situ* facility built for amphibian management is approximately 200 m^2 and has been made to be environmentally sustainable. The floors and walls are made from over 400 used tires that were collected from the city of Cuenca, recycled ceramics were used to form waterproof floors in all of the rooms, and exotic timber from our own crops grown at the BioPark Amaru was used to build ceilings, walls and supporting structures. The center operates a quarantine room, areas of water storage tanks and filtration, and three rooms used for rearing species that come from cold, temperate and tropical ecosystems. These three rooms have climate control units and use electronic and solar technology. There is also a room with a small museum of scientific samples and preserved amphibian specimens, and a laboratory for breeding live food such as fruit flies, beetles, springtails, moths and crickets. Small rodents are also reproduced.

Education

At Amaru we have carried out various activities including lectures, workshops, courses, specialized training and thematic exhibitions for visitors to the BioPark Amaru Zoo, and to groups of children,

students, rangers, technicians, biologists and other professionals. Our awareness-raising program has crossed the borders of the BioPark since we have developed workshops and lectures in different parts of the city of Cuenca, in communities and surrounding rural settlements where there have been registered populations of the threatened amphibian species we work with.

This year we are building an educational exhibit of live Ecuadoran amphibians at the CCA-Amaru so we can educate people about the scope of our conservation programs. The exhibition consists of 12 large terrariums and aquariums that will recreate wetlands, forests and niches to exhibit different species of frogs, toads and tadpoles for environmental interpretation. We are hoping for external support of this education exhibit to promote knowledge of Ecuadorian amphibians to thousands of people, and the CCA-Amaru is grateful for any support that you might be able to provide - please contact Ernesto Arbelaez Ortiz at earbelaez@zooamaru.com if you are to donate resources of any kind!



One of our volunteer students at CCA-Amaru feeding the Cajas Black Jambatos (*Atelopus nanay*) colony. Photo: Ernesto Arbelaez Ortiz.

In situ action and research

As well as the *ex situ* component, this initiative has also conducted ongoing monitoring activities, research, assessment and recovery of threatened species and colonies of amphibian populations in various habitats in the south of the country. As part of this effort, in our first two years of operation we trained technicians and rangers from Cajas National Park to organize and establish a monitoring program to assess the status and population dynamics of their amphibians. This goal was achieved after a great exchange of experiences and today this program is conducted under the management of Cajas National Park.

Cooperative support

All of our achievements to date have been made possible by the support of several local, national and international players such as members of the public, researchers, scientists, students and institutions that have helped us to protect these threatened amphibian species. No doubt the continued financial and technical support from the Philadelphia Zoo has allowed our initiative to start and consolidate as one of the most important amphibian conservation programs in the country. The ongoing cooperation and exchange of experiences with other amphibian conservation centers in Ecuador and in the region has allowed us to improve our standards of care and knowledge about these species.

After continued communication about the role and value of amphibians with local institutions such as the agency for Environmental Management of the Municipality of Cuenca, the Ministry of Environment, public sanitation and potable companies such as ETAPA, we have established cooperative partnerships with these organizations, and they have adjusted their operational agendas and are directing their efforts to generate actions and projects which benefit the conservation of local amphibians. As an example, in mid-2013, an agreement was established with the support of the Municipality of Cuenca to perform a pilot project to monitor and relocate threatened amphibians. This allowed us to identify, rescue and translocate more than 600 amphibians to optimal places recreated by the project, including wetland areas which are protected by the government of Cuenca. Twenty percent of the amphibians rescued by this program were also brought to CCA-Amaru to establish the *ex situ* colonies.

Volunteering opportunities

For the past four years we have run a volunteer program that has allowed almost 50 students and researchers from Ecuador and around the world to have an unforgettable experience that has helped to save fantastic frog species from extinction. The great work of our volunteers has certainly made a difference and it has been an important setting for sharing knowledge on the protection, management and reproduction of amphibians in Southern Ecuador. Your support is very important and if you would like to volunteer to work with our amphibian programs in Ecuador, to help save these amphibians, please contact: earbelaez@zooamaru.com.

For more ionformation, please visit our web site, www.zoologicodecuenca.com or our Facebook page, www.facebook.com/conservacion.deanfibios.

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