amphibian ark

Keeping threatened amphibian species afloat

Newsletter

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In this issue...

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

www.amphibianark.org

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

Amphibian species recommended for *ex situ* research

Kevin Johnson, Taxon Officer, Amphibian Ark

Further to the article in the last AArk Newsletter (www.amphibianark.org/Newsletters/AArk-newsletter-36.pdf) about species which have been recommended for urgent captive rescue programs, another new page has been added to the AArk web site recently which lists species recommended for captive research programs (www.amphibianark.org/species-for-ex-situ-research). All of the recommendations come from national Conservation Needs Assessments generated by amphibian experts from the field and captive communities, and the recommended species are listed by country.

Ex situ (captive) research plays an important role in amphibian conservation, especially developing husbandry and breeding techniques and protocols for species where little is known of their captive requirements. The skills gained by working with these "analog" species can then be applied to closely-related, but more threatened species that have been recommended for captive rescue or assurance populations.

Almost 200 species have been recommended for urgent captive rescue to prevent their extinction, but only a small portion of these are currently included in captive conservation programs. Many of these species have never been kept in captivity before and the need to understand their captive requirements is critical to developing successful breeding programs for them.

While AArk strongly recommends that rescue programs are established within the range country of the species wherever possible, establishing new programs for developing husbandry expertise using more common species can also be undertaken outside of the range country. Often zoos outside the range country have considerable amphibian husbandry expertise, and the resources to establish programs for husbandry research. The knowledge gained from the *ex situ* research programs can then be applied to the threatened species in programs established within the range country of the species.

The current version of the AArk Conservation Needs Assessment process (www.ConservationNeeds.org) has been used to generate over 2,653 assessments for more than 2,307 unique species (31% of the 7,530 currently-known species), in rwenty-seven different countries or regions. Several more country-wide assessments are currently underway and additional assessments are planned for other countries and regions over the coming months. The results of all assessments are available in the online assessment program. The benefits of this assessment process are clear – we assemble the leading amphibian field experts in each country or region, to collectively determine the best course of conservation actions to help prevent the extinctions of threatened amphibian species in nature. These actions include habitat restoration and preservation, threat mitigation, captive breeding for release and community awareness and involvement.

Zoos, aquariums and other captive breeding organizations that are considering the implementation of new amphibian research programs are strongly encouraged to consider species listed on our web site (www.amphibianark.org/species-for-ex-situ-research), which have all been recommended for *ex situ* research programs via Conservation Needs Assessments.

The results of all assessments are available in the online assessment program, www.ConservationNeeds.org.

An *ex situ* research program was established at the Sao Paulo Zoo in Brazil, using a non-threatened species, *Scinax perpusillus* to develop husbandry and breeding protocols, which were subsequently applied to the Critically Endangered Alcatraz Snouted Tree Frog (*Scinax alcatraz*). Alcatraz Snouted Tree Frogs are now being successfully bred at the Zoo. Photo: Cybele Lisboa.

Recent animal husbandry documents on the AArk web site

The Husbandry Document library on the AArk web site (www.amphibianark.org/husbandry-documents/) currently has over 150 articles in it, with additional articles being added regularly. We've recently added links to a range of species action plans for Australian species:

National Recovery Plan for the Booroolong Frog
This document constitutes the national recovery plan for the Booroolong Frog (*Litoria booroolongensis*) in Australia. It identifies actions to be undertaken to ensure the long-term viability of the species in nature, and current stakeholders involved in this recovery program.

Author: Office of Environment and Heritage (NSW)
Version: 2012
www.amphibianark.org/?wpfb_dl=210

National Recovery Plan for the Baw Baw Frog
This document constitutes the revision of the first Recovery Plan for the Baw Baw Frog (*Philoria frosti*) (Hollis 1997) in Australia. The plan assesses the performance of the previous plan, and considers the future conservation, management and research requirements for the species. It identifies conservation objectives, the actions to be taken to ensure the species' long-term survival prospects across its distribution, and the parties responsible for their implementation. It also identifies criteria for which the success of implementation of actions will be assessed. The actions identified will be undertaken or managed by the Victorian Department of Sustainability and Environment, Parks Victoria, Mt Baw Baw Alpine Resort Management Board, Amphibian Research Centre, James Cook University and selected external consultants. Successfully achieving the objectives of this Recovery Plan is subject to budgetary and other constraints affecting the parties involved. The plan may also be subject to amendments in the event of new information, or following recommended changes by the Baw Baw Frog Recovery Team.

Author: Hollis, G.J., Department of Sustainability and Environment, East Melbourne
Version: 2011
www.amphibianark.org/?wpfb_dl=212

The Southern Corroboree Frog (*Pseudophryne corroboree*) is one of Australia's most threatened and most beautiful frogs. Several institutions are involved with the captive component of the recovery plan for this species. Photo: Michael McFadden.

National Recovery Plan for the Southern Bell Frog
Concern about the decline of amphibians around the world has been increasing for more than a decade. The Southern Bell Frog (*Litoria raniformis*) is one such declining species. Once one of the most common frogs in many parts of south-eastern Australia, the range of this species has declined markedly, and loss of populations has resulted in a fragmented, disjunct distribution. Current threats include habitat loss and degradation, barriers to movement, predation, disease and exposure to biocides. This Recovery Plan summarises current knowledge of the Southern Bell Frog, documents the research and management actions undertaken to date, and identifies the actions required and organisations responsible to ensure the ongoing viability of the species in the wild

Author: Nick Clemann and Graeme R. Gillespie, Department of Sustainability and Environment, Melbourne
Version: 2012
www.amphibianark.org/?wpfb_dl=213

National Recovery Plan for the Stuttering Frog
This Recovery Plan summarises our current knowledge of the Stuttering Frog (*Mixophyes balbus*) in Australia, documents the conservation research and management actions undertaken to date, and identifies the actions required and parties responsible to ensure the ongoing viability of this species in the wild. Achieving the objectives of this Recovery Plan is subject to budgetary and other constraints affecting the parties involved. It is necessary that this Recovery Plan be viewed as dynamic, such that changes are made in the priority or structure of recovery actions as new information arises.

Author: David Hunter and Graeme Gillespie
Version: Department of Sustainability and Environment, Melbourne, 2011
www.amphibianark.org/?wpfb_dl=214

Southern Corroboree Frog and Northern Corroboree Frog National Recovery Plan
This document constitutes the national recovery plan for the Southern Corroboree Frog (*Pseudophryne corroboree*) and Northern Corroboree Frog (*Pseudophryne pengilleyi*) in eastern Australia. It identifies actions to be undertaken to ensure the long-term viability of both species in nature, and current stakeholders involved in their recovery. This is the first national recovery plan for the Northern Corroboree Frog and the second for the Southern Corroboree Frog.

Author: David Hunter
Version: Office of Environment and Heritage (NSW), 2012
www.amphibianark.org/?wpfb_dl=209

Yellow-spotted Bell Frog and Peppered Frog Recovery Plan
The Yellow-spotted Bell Frog (*Litoria castanea*) and the Peppered Frog (*Litoria piperata*) are two frog species endemic to the highlands and tablelands of New South Wales, Australia. The Yellow-spotted Bell Frog also occurs in the Australian Capital Territory. Neither species has been definitely recorded in the wild since the mid 1970s, and concerns are held for their continued survival. In a formal response to these concerns, both species have been listed under the NSW Threatened Species Conservation Act 1995. The aim of this recovery plan is to assist in returning these two species to a position of viability in nature.

Author: NSW National Parks and Wildlife Service
Version: 20 February 2004
www.amphibianark.org/?wpfb_dl=211

Madagascar Fauna and Flora Group's Amphibian Conservation Centre

Karen Freeman PhD, Research Director, Madagascar Fauna and Flora Group

Thanks to set-up funding from Amphibian Ark, Durrell Wildlife Conservation Trust and Saint Louis Zoo's Wildcare Institute, a modest amphibian conservation unit is in the process of being established at Parc Ivoloina in eastern Madagascar. Currently the only successful amphibian *ex situ* conservation facility in Madagascar is run by Association Mitsinjo at Andasibe. Development of further in-country *ex situ* husbandry and captive-breeding expertise was identified as one of the country's highest conservation priorities by the *Conservation Strategy for the Amphibians of Madagascar* (ACSAM) plan, which was developed by national and international partners in 2006 and later updated in November 2014.

With technical support from the Association Mitsinjo team (and in particular Devin Edmonds, then Amphibian Conservation Manager for Mitsinjo), a small Amphibian Conservation Centre was initiated towards the end of 2013 at Parc Ivoloina. In May 2014 Devin Edmonds and his team visited the facility and made a number of constructive recommendations for improving the infrastructure in terms of temperature regulation and increasing biosecurity. Nadine Wöhl from the Durrell Wildlife Conservation Trust also came in January 2016 to provide further support and guidance.

Capacity-building for our staff has been a key component of our preparations in setting up the Amphibian Conservation Centre as this has been a new venture for the Madagascar Fauna and Flora Group. Ongoing support from Association Mitsinjo and Durrell Wildlife has been key. Since 2015, Parc Ivoloina's Amphibian Conservation Centre has met a number of unique challenges and progress had stalled. While staff were keeping and producing fruit flies with success, maintaining regular records of conditions within the facility, and keeping detailed notes on all live food production efforts, the facility was operating but not advancing towards the ultimate goal: a biosecure amphibian breeding facility, complete with a quarantine room and a diversity of reliably producing live foods for captive amphibians.

With hopes to restore momentum to the project, Sean Sutor and Greg Strait volunteered on behalf of the Madagascar Fauna and Flora Group between April and July 2016 to assist in developing a diverse selection of live foods, practical biosecurity protocols, and to facilitate the growth of amphibian husbandry skills and experience within the park staff. Together with Bernard Iambana Richardson, Parc Ivoloina's Zoo Manager, weekly meetings were organized to discuss amphibian conservation in Madagascar, the need for *ex situ* conservation facilities, and to set long term and weekly goals.

Bernard Iambana Richardson, Madagascar Fauna and Flora Group's Zoo Manager, gaining amphibian husbandry experience at Durrell Wildlife Park in Jersey. Photo: Karen Freeman.

By July, Parc Ivoloina's amphibian team had expanded from several fruit fly cultures to a great diversity of live foods. The facility now produces two species of fruit flies, collembolans, and bean weevils and staff are maintaining and expanding cultures in preparation for future inhabitants at the centre. Parc Ivoloina is also in the early stages of culturing crickets, cockroaches, and isopods and experimenting with termites. Experimental trials with locally abundant termites and isopods are possibly a first for Madagascar and seem to have great potential for frog husbandry. In addition to live foods, the amphibian team collected materials used in live food cultures and amphibian vivaria such as sand, small and large rocks, and a variety of dead leaves to be scrubbed of detritus, washed, thoroughly dried, and stored following strict biosecurity protocols. With a greater ability to maintain breeding colonies of a diverse array of live-foods and amphibian husbandry experience amongst staff steadily growing, the project is progressing toward the next stage: amphibians!

Sean Sutor, a volunteer with the Madagascar Fauna and Flora Group, inspecting the newly-established termite colonies at Parc Ivoloina. Photo: Karen Freeman.

It has been a long journey to reach this point including a few major setbacks and delays but we now feel confident that with some final tweaks we are ready to populate the centre with the first two species: *Mantidactylus betsileanus* and *Heterixalus madagascariensis*. These are locally common species that are well suited to the climatic conditions at Ivoloina and that should be relatively easy to keep in order help build our keepers' confidence in their husbandry skills. In the meantime, a small display of Brown Mantellas (*Mantella ebenaui*) has been established in the Ivoloina Environmental Education Centre to allow an opportunity to explain the plight of Madagascar's amphibians to our visitors and to practice the staff's husbandry skills.

We have only been able to advance thus far by incredible support from our partners: Amphibian Ark, Durrell Wildlife Conservation Trust, the Amphibian Specialist Group-Madagascar, the Amphibian Survival Alliance and Association Mitsinjo. This sort of collaboration is a testament to the strength of the international partnerships that Amphibian Ark promotes and encourages. I applaud them for their incredible achievements of the past decade and we at the Madagascar Fauna and Flora Group are proud to be a part of their growing network.

AArk staff attend herpetology congresses in Latin-America

Luis Carrillo, Training Officer, Amphibian Ark

November was a productive month in terms of herpetological meetings in Latin-America. From November 8-11, the XIV Mexican National Herpetological Congress was held in Tepic, Nayarit, Mexico and from November 20-24 the 1st Colombian Herpetological Congress was held in Medellín, Colombia.

Both congresses were very successful and brought together more than 200 participants in each place.

Amphibian Ark participated in both congresses, giving presentations on the Conservation Needs Assessment process (www.ConservationNeeds.org), a process designed and promoted by Amphibian Ark to assess and prioritize the conservation needs of all species, that ultimately provide expert, high-level guidance for *in situ* and *ex situ* conservation actions for priority species. To date AArk and partners have facilitated twenty-seven national/regional assessment workshops that have assessed more than 30% of the world's amphibian species.

Due to the number of species, the number of endemics, the threats facing amphibians and other factors, Amphibian Ark considers Colombia and Mexico among the top five countries in need of a reassessment of their conservation needs. Thus AArk's attendance at both congresses allowed us to explain and promote the need and value of the Conservation Needs Assessment process.

From November 8-11, the XIV Mexican National Herpetological Congress was held in Tepic, Nayarit, Mexico.

Amphibian Advocates

We are pleased to share stories about two great amphibian advocates in this newsletter - Brian Kubicki, from the Costa Rican Amphibian Research Centre in Costa Rica, has dedicated his life to field research and conservation projects with Costa Rican amphibians; and Arturo Muñoz Saravia from the Museo de Historia Natural Alcide d'Orbigny in Bolivia. Both of these dedicated amphibian conservationists have been involved with a range of wonderful amphibian conservation projects for many years.

The profiles of all of our Amphibian Advocates can be found on the AArk web site at www.amphibianark.org/amphibian-advocates. If you would like to nominate an Amphibian Advocate to be featured in a future edition of the AArk Newsletter, please send us an email at newsletter@amphibianark.org and we'll add your suggestion to our list!

Brian Kubicki, Director, Costa Rica Amphibian Research Center

I feel fortunate to have grown up in a rural area in east-central Minnesota, USA. From a young age I was very drawn to the nature that surrounded me and I spent much of my free time exploring and learning about it, and since I can remember I have had a special interest in fishes and amphibians. During my adolescence, a lot of my time was dedicated to activities such as sports, school, and yes, hanging out with buddies, but my passion for natural history remained. After graduating from high school in 1993 I became even more interested in tropical natural history and Neotropical amphibians, especially the Centrolenidae family of glass frogs. I was fascinated with glass frogs and I focused much of my energy trying to obtain more information about them through the available information published in the scientific literature. I soon became frustrated regarding the relatively limited information available on glass frogs and I was left with a deep desire to know more. I decided the best way to fill this hunger for more knowledge was to travel to Costa Rica to get first-hand *in situ* experience with glass frogs and other amphibians native to the tiny republic.

After obtaining scientific research permits from the Costa Rican government I first travelled to the country in August 1997 for a three-week trip to conduct fieldwork, principally focused on glass frogs. I went to Costa Rica alone and with very little knowledge of the country or language, but I managed to put my resourcefulness to work and find numerous species of amphibians, including glass frogs. During my short visit to Costa Rica in 1997 I fell even more in love with the amphibians of the country and decided that I wanted to further my understanding of them by moving there on a permanent basis and dedicating my life to their scientific study. I moved to Costa Rica in June 1998 and I have been a permanent resident ever since.

Since my arrival in Costa Rica I have dedicated my life, including thousands of hours of exploration and fieldwork throughout the republic, to conducting biological research focused on the alpha taxonomy, natural history, and distribution of Costa Rican amphibians. To this day one of my areas of special interest continues to be with the glass frogs of the family Centrolenidae, but my studies also encompass other taxa such as bolitoglossine lungless salamanders (Family Plethodontidae), tree frogs (Family Hylidae), New World direct-developing frogs (Families Craugastoridae and Eleutherodactylidae), and poison frogs (Family Dendrobatidae). This experience has resulted in numerous publications on the amphibians of Costa Rica, including species rediscoveries, new species descriptions, and two books.

I have dedicated a large portion of my time, money, and energy during the last five years to conducting detailed scientific studies on the salamanders of Costa Rica. Costa Rica has one of the richest diversities of salamanders on the planet, with fifty species currently known to inhabit its tiny territory, most of which are endemic and surrounded by mystery. My salamander studies are focused on alpha-level taxonomy, in addition to further documenting their natural history and known distributions. My wife (Aura Reyes) and I have dedicated hundreds of hours to fieldwork in the cloud forests along the Caribbean slopes of Costa Rica studying moss salamanders (Genus *Nototriton*), often involving being soaking wet and freezing cold. Moss salamanders are considered to be among the most poorly-known groups of herpetofauna native to Costa Rica, but I have been working hard to change that.

Brian Kubicki established the Costa Rica Amphibian Research Center, a small private and family-operated biological research project that is dedicated to studying, understanding, and conserving Costa Rica's humid forest amphibians.

My goal, from the time I moved to Costa Rica, was to find a property rich in amphibian diversity and establish a project focused on their research and *in situ* conservation. In late 1999 I discovered the impressive region of Guayacán de Siquirres and concentrated much of my time conducting alpha-diversity amphibian studies in the area. After years of fieldwork and inventories, Guayacán has proven itself to be the richest known site in Costa Rica in regards to amphibian diversity, with nearly seventy species being documented in the relatively small area. In 2002 I purchased property in Guayacán de Siquirres and dedicated it as a private reserve to be used for my research and *in situ* conservation projects; at the same time I established the Costa Rica Amphibian Research Center (CRARC). The CRARC is a small private and family-operated biological research project that is dedicated to studying, understanding, and conserving one of the most ecologically important faunal groups of Costa Rica's humid forest ecosystems, that of the amphibians. The CRARC now owns and operates two private reserves in the mega-diverse forests along the Caribbean slopes of Costa Rica's Talamancan mountains, the Guayacán Rainforest Reserve, and the Río Vereh Cloud Forest Reserve, these two small reserves are currently known to be home to sixty-seven species of amphibians, but following further studies, especially

in the Río Vereh Cloud Forest Reserve, this number could likely approach or even surpass seventy-five.

Since 2003, the CRARC has proven to be a pioneer with establishing novel and successful *in situ* conservation methodologies for a variety of amphibian taxa within our reserves. One example of a taxon-specific *in situ* conservation project that has been very successful is with the Critically Endangered Lemur Leaf Frog (*Agalychnis lemur*). Through the creation of artificial and semi-natural breeding sites in the Guayacán Rainforest Reserve, I have been able to greatly increase the size of an initially small reintroduced population of leaf frogs. Not only has the population of leaf frogs within the reserve greatly increased, but numerous metapopulations are now breeding at sites where this species was previously not observed in the surrounding area. Based on the great successes I have had for more than a decade with *in situ* conservation practices with several amphibian taxa I feel that it is very important to emphasize that this should be considered as a priority and one of the most effective ways to potentially achieve long-term conservation with species of special concern.

Throughout my nearly twenty years living in Costa Rica and studying the country's amphibians, I have worked with numerous taxa *ex situ* in specially designed naturalistic enclosures, or what I have come to call "captive ecosystems". My priority when working with any amphibian species *ex situ* is to attempt to replicate the biological and physical parameters that define its microhabitat as closely as possible. I have been able to breed and raise several species of anurans and caudates that had never been bred in captivity, one such example is with several species of Costa Rican moss salamanders. Despite the potential conservation importance of working with certain amphibians *ex situ*, I think that another very crucial aspect of maintaining and closely observing amphibians in captivity is the capability to learn more about their general biology. This is especially important with many of the poorly-known taxa, for which it is a plain and simple fact that we know little to nothing about their natural history. When we are armed with a greater knowledge of the natural history of a specific taxon we can make more efficient decisions on how best to go about protecting and conserving them.

I consider myself an "old school" scientific naturalist and explorer. I love studying maps and identifying poorly-known sites with specific climatic conditions and getting into them to explore and document the amphibians that are found there. I have many additional interests apart from amphibians; these interests include freshwater and marine fishes, marine invertebrates (especially reef building corals of the Order Scleractinia), dendrology, botany, geography, physical geography, biogeography, meteorology, climatology, and nature photography.

Arturo Muñoz Saravia from the Bolivian Amphibian Initiative has a dream - to have a Bolivian team working together, with the support of the Bolivian Amphibian Initiative, for the conservation of Bolivian amphibians.

Arturo Muñoz Saravia, Museo de Historia Natural Alcide d'Orbigny and Director, Bolivian Amphibian Initiative

I still remember when I was kid and I had to remove the frogs trapped in the pool of my parent's house. I was very scared of doing that! I would use a long stick and try to avoid the frogs when I would take them out of the pool and place them in the garden. Sometimes I even used bags and tick gloves to touch them. My first direct contact with a frog was when I put my naked foot into a boot and a very cold frog was inside – my heart almost exploded!

After some years, I became used to these small animals and even found some attractive aspects of them. On a couple of occasions, I even kept some tadpoles and frogs in aquariums, adding to my pet collection. Contact with animals and nature led me to study biology. In 1998 I met a Belgium friend that introduced me to the world of amphibians. We used to go for weeks to different areas and forests in Bolivia, just in search of frogs. We learned to identify them with a black and white copy of an amphibian field guide. To make matters more interesting, the field guides were in English, although I only knew how to count to five in English.

Since that experience, I started to work with amphibians and reptiles. In 2001, I carried out my thesis with amphibians and reptiles from a protected area in the south of Bolivia. I learned a lot, and then the same year I participated in a two-month expedition with researchers from the UK where I had the chance to see from a privileged perspective the life and situation of Andean amphibians. Two years later I started to work with some of the members of this expedition, and for the next couple of years, that project gave me the opportunity to see more than fifty sites across Bolivia, including its amphibian diversity and also the problems that some populations were facing.

In 2006 I had the chance to participate in the amphibian conservation course at Durrell Wildlife Conservation Trust in Jersey, and this experience changed my life. Once I came back to Bolivia, I wanted to be an amphibian conservationist. Unfortunately, nobody was working in amphibian conservation in Bolivia at that time, so I decided to create the Bolivian Amphibian Initiative. This was a one-person project for some years but it has slowly grown, especially after the amphibian training courses I organized and coordinated in Bolivia, some with Durrell.

This project was a great experience where I was able to see the real situation of amphibians in Bolivia. For that reason I decided to focus my work in the Andes and mainly with the genus *Telmatobius*. During this period, and together with our team, we obtained impor-

tant data about endangered amphibians and provided this information for the Bolivian Red List, the Bolivian Amphibian Action Plan, and also to prioritize amphibian conservation actions in Bolivia for decision-makers and different organizations. I also became co-chair of the Amphibian Specialist Group and have worked to build a network of top amphibian conservationists in Bolivia and South America. In 2013, I started my PhD at Ghent University in Belgium, working with the Titicaca Water Frog (*Telmatobius culeus*), an experience that has given me the opportunity to use technology and knowledge in other areas not available in Bolivia to better understand this species and the problems it is facing.

Now after almost ten years of raising awareness about this initiative, a lot of students, volunteers and colleagues are working for the conservation of Bolivian amphibians. My dream is to have a Bolivian team working together, with the support of the Bolivian Amphibian Initiative, for the conservation of Bolivian amphibians.

Amphibian assisted reproductive technologies course

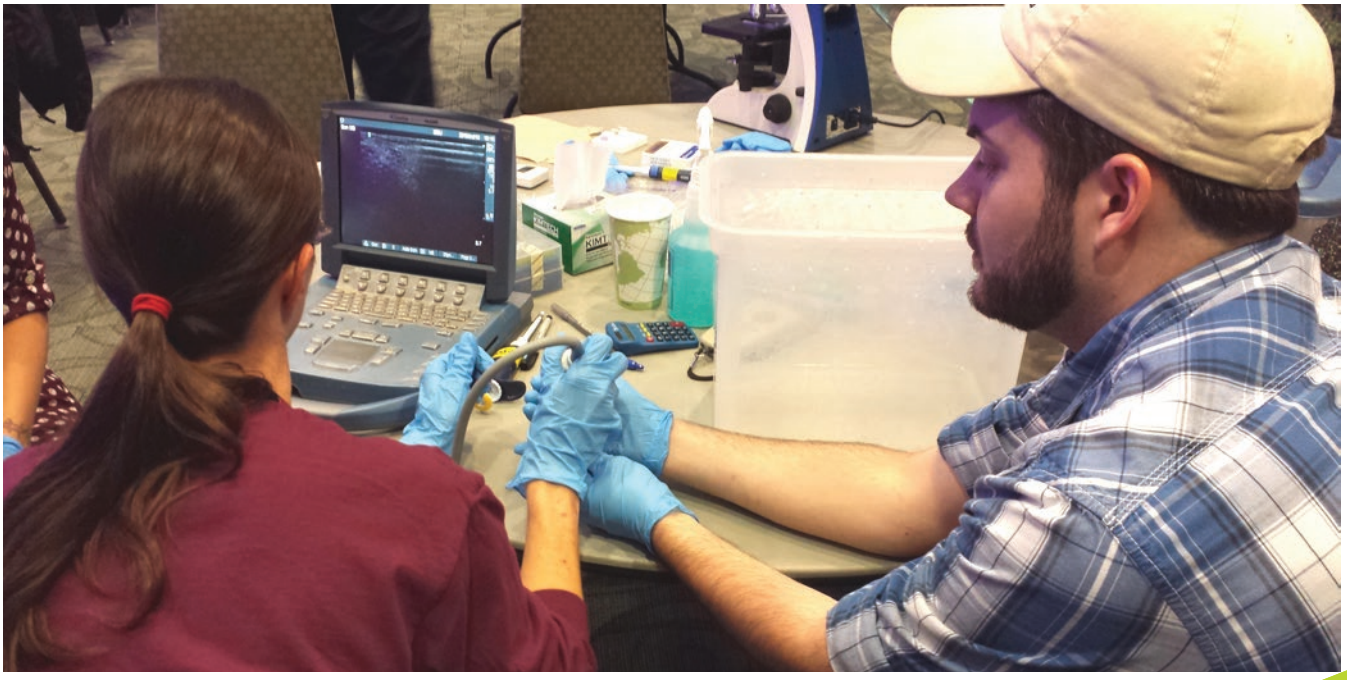
Lea Randall, Population Ecologist, Calgary Zoo, Canada

I recently attended an advanced conservation training course on amphibian Assisted Reproductive Technologies (ART) offered by the Amphibian Taxonomic Advisory Group and graciously hosted by Omaha's Henry Doorly Zoo and Aquarium in the USA. The workshop was led by amphibian ART experts from Mississippi State University, Dr. Andy Kouba, Dr. Carrie Vance, and Allison Julien, as well Dr. Ruth Marcec of Central Florida Zoo's Orianne Center for Indigo Conservation.

The purpose of the course was to learn the techniques and special requirements for captive breeding amphibians in zoos and aquariums, with a focus on utilizing these techniques for conservation and research applications. The workshop attendees were comprised of vets, zoo keepers, and researchers from zoos, aquariums and universities across the United States and Canada. We covered a lot in five days, including how to determine sex and reproductive status; prepare and administer hormones; collect eggs and sperm; and perform in vitro fertilization (IVF).

One of the highlights for me was being able to work with such a diversity of species including Hellbenders, Stripped Newts, Tiger Salamanders, Puerto Rican Crested Toads, Asian Spiny Toads, American Toads, and Dusky Gopher Frogs. If offered again, I would highly recommend this course to anyone involved in captive breeding amphibians.

Fertilized Asian Spiny Toad eggs. Photo: Lea Randall.



Researchers using ultrasound analysis to assess amphibian egg development at the recent Amphibian Assisted Reproductive Technologies course in Omaha, USA. Photo: Vicky Poole.

Securing females of one of Australia's most endangered frogs

Deon Gilbert, Threatened Species Project Officer-Herpetofauna, Zoos Victoria, Melbourne, Australia

The Baw Baw Frog (*Philoria frosti*) is one of Australia's most restricted amphibian species, found only on the Mt Baw Baw plateau in Victoria, Australia. Largely due to the spread of amphibian chytrid fungus, the species has suffered a catastrophic population decline since the mid-1980s and is now restricted to remote montane gully systems associated with its natural habitat, where it is down to a critical level.

In 2010 Zoos Victoria with the support of the Victorian Department of Environment, Land, Water and Planning, Baw Baw Shire and the Mt. Baw Baw Alpine Resort Management Board committed resources to the recovery of this species as part its Fighting Extinction campaign. Initial captive objectives focused cautiously on developing early life history rearing techniques from wild-collected egg masses. Six years on and with support from the Amphibian Research Centre, developing the captive husbandry for this species is well underway. Our knowledge of successfully rearing this species from eggs through to sub-adults is increasing, with the captive population now expanding to include all age groups.

In the face of rapid and sustained population decline, one of the biggest challenges with this program is to ensure sufficient genetic representation to facilitate future wild recovery. Prior to this year's field season the captive population was being supported through the rearing of wild-collected egg masses and adult male frogs, with captive reproduction likely to be some years away. Female Baw Baw Frogs are incredibly cryptic, with no individuals collected or observed during the first six years of this project. Their habitat is complex and encountering a female is literally like finding a frog in a forest. Recognizing the need to streamline reproductive husbandry with early life history rearing, plans were developed in an attempt to secure female frogs for the captive recovery program.

Following detailed mapping of remaining breeding sites during the 2015 field season, several sites were identified for deployment of pitfall drift lines. In mid-September 2016 a small field team from Zoos Victoria accessed sites prior to the species' breeding period and installed pitfall drift line arrays around two breeding sites.

Pitfall drift line set up in breeding habitat at Mt Baw Baw. During the first six years of the recovery program for the Baw Baw Frog, no females had been caught. Photo: Deon Gilbert.

The pitfall buckets were opened on the first day of field monitoring on October 12th and remained active for a five-week period. During this period traps were checked daily. Male frogs entering the breeding site were caught, swabbed for chytrid and body metrics taken, before being released on the inside of the fence. The first female Baw Baw Frog was secured on the October 16th, with ten additional females collected during the trapping period. The last female caught was on the final day of trapping activity before the pitfall lines were closed on the November 11th. Given this

The Baw Baw Frog (*Philoria frosti*) is one of Australia's most restricted amphibian species, found only on the Mt Baw Baw plateau in Victoria, Australia. Photo: Rick Hammond.

One of the female Baw Baw Frogs caught in a pitfall trap. Photo: Rick Hammond.

prolonged pattern of female movement it's likely that more females may have moved onto the breeding sites after the pit lines were closed.

The female frogs were transported to Melbourne Zoo shortly after each capture and placed into breeding habitats designed to replicate natural soak and seepage systems associated with montane gully breeding habitat. Wild-caught captive males were established in the breeding habitats prior to females entering, with calling activity already underway. Reproductive activity began shortly after the arrival of the first female with oviposition taking place six days later. At least eight egg masses have now been laid, contributing significantly to the captive output of these frogs. The big challenge in the coming years will be reliably and consistently breeding Baw Baw Frogs in captivity.

Six additional adult male frogs were also collected during the field season, greatly boosting population genetics. These males were located in remote historical sites where calling activity and population numbers have decreased to complete failure or non-functional levels. Locating these males required significant time investment and is a credit to the knowledge and skills of the field team.

The results of this year's field season have exceeded expectations, Despite this species trajectory towards wild extinction in the coming decade, I'm optimistic that the captive program is now in an unexpected position of strength that will enable us to establish the self-sustaining captive insurance population needed to eventually recover this little frog.

A female Baw Baw Frog in foam egg mass laid at Melbourne Zoo, the first time eggs have been laid in captivity as part of the recovery program. Photo: Damien Goodall.

The Biology, Management and Conservation of North American Salamanders - A training course

Location: The course will be held at Zoo Atlanta, Georgia, USA.

Dates: September 18th – 22nd, 2017

Amphibian Ark and Zoo Atlanta are pleased to announce the second Biology, Management and Conservation of North American Salamanders training course.

The planned course will consist of five days of intensive training, including lectures, hands-on practical exercises, and fieldwork. Topics covered during the course will include: salamander biology, conservation and management; enclosure design and construction; captive breeding techniques; biosecurity and disease control; monitoring and surveys of wild and captive populations; education and scientific engagement. Globally recognized amphibian biologists, veterinarians, and conservationists will comprise course's faculty, and the course is limited to twenty students.

Registration and payment for this course can be made via the AArk web site, www.amphibianark.org/salamander-husbandry-course/. For further information please contact Luis Carrillo, Training Officer, luis@amphibianark.org.

Red-backed Salamander (*Plethodon cinereus*). Photo: Daniel Hocking.

Yellow-eyed Ensatine, (*Ensatina eschscholtzii platensis*). Photo: Robert Hansen.

Golden Mantellas and others: Half a decade of frog breeding activities at the Mitsinjo facility in Andasibe, Madagascar

Justin Claude Rakotoarisoa, Jeanne Soamiarimampionona and Sebastian Wolf, Association Mitsinjo, Andasibe, Madagascar

We are happy to announce that the captive breeding center at Association Mitsinjo in Andasibe, Central Eastern Madagascar is now successfully going into its sixth year of operation. While the locally endemic and emblematic Golden Mantella (*Mantella aurantiaca*) is the focal species, some other species from the vicinity of Andasibe were kept from the beginning as well, and their number has gradually increased to a recent thirteen species in total. The main purpose is to cover as many ecological guilds inhabiting the area as possible (i.e. stream breeders, direct developers, explosive breeders and obligate phytotelm dwellers to name a few). The knowledge gained about their captive requirements is mostly unique as the majority of these species have never been kept in captivity, let alone bred. We constantly get new insights into the species' biology and discover behavioral features that have never been observed in nature before. For instance, we were recently able to observe an interesting breeding behavior in a narrow-mouth frog (Microhylidae) and will prepare a publication about this in the future. We also plan to publish more about our other breeding results and husbandry studies, as we already have in the past.

Breeding success in the Golden Mantella is now at F2 (second generation captive-bred). Some of the surplus captive-bred stock from the three founder populations that are kept strictly separated from other species will be released for a first trial at selected receptor sites in the coming rainy season at the footprint of the Ambatovy nickel mine. This will be carried out by our long-term partners Ambatovy and Madagasikara Voakajiy. A recent meeting of different stakeholders that was sponsored by our main funder, the Ambatovy mine, was held in the regional city of Moramanga. Past conservation activities concerning this Critically Endangered frog species were summarized; it was pointed out that some success has already been achieved in mitigating the threats faced by the species, however there are still major tasks to be carried out. Many participants also highlighted the importance of Mitsinjo's knowledge of captive breeding procedures, and the good collaboration between the engaged NGO's and the responsible government authorities should also be applauded in this context.

Another exciting development is going to be scheduled soon: the first bioacoustic monitoring of Malagasy frog communities will be launched in due time. Technicians from Mitsinjo are going to conduct this project, which was made possible by a grant from the Riverbanks Zooin the US and logistical support from the Durrell Wildlife Conservation Trust and the Amphibian Study Group, and we are grateful to all institutions for their help in bringing this concept of monitoring to Madagascar. The purpose of this survey method is to help in assessing community structure of frog assemblages in different habitats and detecting data deficient species and eventually monitoring changes in species diversity; and finally, to evaluate if it can be used as a feasible, helpful tool in long-term monitoring and reduce costs of other, usually more labor-intensive methods like visual encounter surveys.

A captive pair of *Boophis bottae* in amplexus at Association Mitsinjo, in Madagascar. Eggs are visible through the female's body cavity. Photo: Sebastian Wolf.

One of the species that has been bred for the first time in captivity is the small microhylid *Platypelis barbouri*. Photo: Sebastian Wolf.

Another recent, big accomplishment was the completion of a second concrete building for Mitsinjo's frog activities. As the original facility needs to be biosecure for avoidance of pathogen introduction, it consequentially cannot be open to visitors. The new building was therefore explicitly designed for the public. It contains an educational center for students and visitors, and a small frog exhibit. Currently four species are being maintained there, individuals from three species were bred at the captive facility including Golden Mantellas, whereas the individuals of the fourth species, the Tomato Frog (*Dyscophus guineti*), were confiscated by officials and handed over to Mitsinjo. We do not include this species in our breeding programs, i.e. into the captive facility as it is not a local species. Nonetheless this shows that the different frog conservation activities carried out by Mitsinjo are wider than just our region.

Other frog conservation related projects are in the planning stages and we hope to report about those in the coming months. They will include activities around *in situ* captive breeding, like new trials of Golden Mantella tadpole rearing, first captive breeding attempts worldwide for a range of other species, and participation in the Zoological Information Management Systems (ZIMS), the biggest database for zoological conservation programs, as well as measures of habitat conservation at wetland sites.

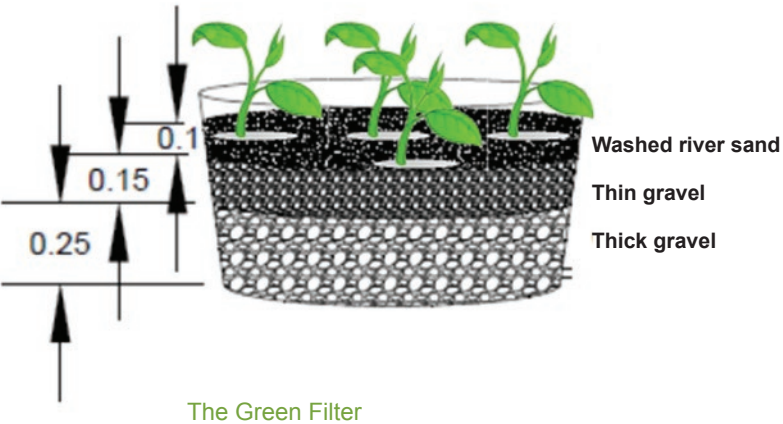
The actual challenges need constant support from and collaboration with all involved parties. We therefore want to acknowledge all our partners and sponsors, especially the Ambatovy Mine, the Direction Generale des Forêts, the Ministry of the Environment, Amphibian Study Group, Durrell Wildlife Conservation Trust, Riverbanks Zoo and other zoological institutions, as well as visiting scientists from abroad that help us in our efforts to better understand and conserve some of the world's most diverse amphibian communities.

Biological treatment system for residual waters of the high Andean amphibian lab at the Santacruz Zoo, Colombia

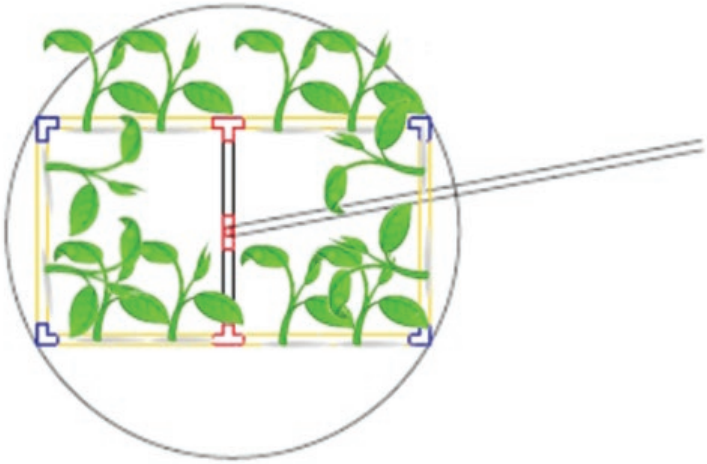
Vivian Gonzalez, Environmental Assessment; Sandra Gómez, Head Educaction Conservation Department; Kelly Paola Prieto, Zoo Keeper; and Haydy Monsalve R, Zoo Director, Fundación Zoológico Santacruz

The Environmental Management Program is a fundamental component of the Fundación Zoológico Santacruz (Santacruz Zoo) in Colombia, which defines the guidelines for sustainable management of the institution. There is a system for environmentally friendly disposal of spills of all operating waste from all of the regular operating processes. As part of this system, the development of a unique water treatment process for the Amphibian Laboratory, called Filtro Verde (Green Filter), was created as part of the internal lab management. The treatment system ensures that the waste produced by the use of chemical and pharmaceutical products, added to residual water from water changes in the terrariums is managed adequately, guaranteeing that there is no environmental contamination or possible transmission of diseases to the environment by inadequate water disposal.

The amphibian laboratory of the Santacruz Zoo is located in a rural area, very near to water sources, and where species such as *Rheobates palmatus* and *Dendropsophus padreluna* occur naturally; adequate environmental management of waste water from the laboratory is very important, as well as any potential spills of products such as Virkon, which is used for disinfection and cleaning of the laboratory facilities; and Sporanox, a medicine to prevent chytrid fungus. As part of this system, we decided on the development of a unique treatment process for the Amphibian Laboratory - the Green Filter.



The Green Filter



The tubes inside the structure (yellow) must have a diameter smaller than the inlet (black). The yellow tubes must be perforated.

(Above and below): Plants used to test the Green Filter were Anturios (*Anthurium andreanum*), Cartuchos (*Zantedeschia aethiopica*) and some epiphytes. Photo: Sandra Gómez.

The implementation of the Green Filter wastewater management system was carried out with the Humedales Foundation, an organization that has been developing technological alternatives for rural areas in Colombia, which are characterized by low cost, simple methods which include the storage and recycling of grey water, as well as natural reservoirs.

Methodology

Before installing the Green Filter, the space and infrastructure of the lab were identified, and for a period of thirty days, tests were carried out with different types of plants and concentrations of disinfectants, to determine which plants had the highest absorption and survival capacity of the contaminating elements from the water discharged into the filters. The plants used for the tests were Anturios (*Anthurium andreanum*),

The finished Green Filter water treatment system. Photo: Sandra Gómez.

Cartuchos (*Zantedeschia aethiopica*) and some epiphytes. These were tested using concentrations of 1:1, 1:10 and 1:100 of Virkon and Sporanox respectively.

After the thirty-day trial, the behavior of Anturios got the highest results, with this plant maintaining its normal conditions and showing no signs of degradation. After the results, the design projections described below were made. Once the design was complete, the construction process began, with the results shown in the photos in this article.

Results

Green Filters act as effective sinks of nutrients and buffer sites for organic and inorganic contaminants, and this treatment has the capacity to act as artificial wetlands. In addition they do not need maintenance or consume electricity, and cost less than a quarter of a traditional water treatment system. Water nutrients are absorbed through the root system of the plants, which trap them in their tissues and use them for their own growth. The absorbed nutrients are eliminated by the change of leaves of the Anturio. Water, already free of nutrients and heavy materials such as nitrites, nitrates, nitrogen, copper, zinc, arsenic, phosphorus, mercury, lead, cadmium, and others, flows from the filter to the natural water sources with a decontamination rate of more than 95%.

Other advantages that the filters offer are notoriously perceptible in economic and aesthetic terms. They include lower costs compared to conventional alternatives, and less investment in operation and maintenance. Additionally they do not generate odors, and transform the landscape in aesthetical areas, and finally will attract wildlife typical of natural wetlands.

Using these filters, the Santacruz Zoo contributes to conservation under all the scopes of sustainable management of the *ex situ* breeding laboratory of High Andean species.

Reference

Ochoa, A. V., Carmona, P. B., Salcedo, L. D. P., & Correa, M. F. (2013). Detección y cuantificación de *Batrachochytrium dendrobatidis* en anfibios de las regiones andina central, oriental, Orinoquia y Amazonia de Colombia.*Herpetotropicos*, 8(1).

Amphibian Communications and Education Action Plan

Rachel Rommel-Crump, Group Facilitator and Marcileida Dos Santos, ASG Secretariat Contact

Many of the world's amphibian species are in danger of extinction and face uncertain futures due to a myriad of human caused or exacerbated factors. Naturally, humans must be part of the solution. One critical component of global efforts seeking to recover declining amphibian populations is the engagement of individuals and communities who will take action for things that they value. Saving amphibians will require collective action from all of us – action for sustainable livelihoods, the health of the land, watersheds, and wildlife.

In 2016, the Amphibian Specialist Group (ASG) Communications and Education Working Group published a section in the updated Amphibian Conservation Action Plan (ACAP, www.amphibians.org/ACAP). This section is just one of several thematic chapters which aim to work towards a common vision of securing the world's amphibian diversity. The ACAP, including Communication and Education priorities, is a living document, with ongoing updates and revisions undertaken as conservation action is implemented across the different thematic areas.

We know there are many around the globe working tirelessly to achieve related Communication and Education priorities which may be found in this plan. Moving into 2017, we look forward to hearing about your successes and challenges.

Working group summary

Communication and education, along with other strategies for public engagement, are key to catalyzing and sustaining action for biodiversity conservation. These social strategies should be informed by the best available science and practice, just like the biological aspects of conservation management. We must identify threats to amphibian diversity at local, regional, and global scales, bringing about the learning and collaboration needed to facilitate change and address these challenges. Critical to our success, this work will require renewed and expanded dedication to the cooperation and exchange of information across academic and professional disciplines, as well as with diverse stakeholders and partners. Lastly, we must harness the expertise and passion of our global community to facilitate nature-based experiences and active participation in amphibian and habitat conservation.

Working goals

1. Increase collaboration across disciplines, professions, and stakeholder groups to find sustainable solutions to amphibian declines.
2. Build capacity and provide resources to plan, implement, and evaluate effective public engagement programs.
3. Identify, engage, and empower target audiences to take action to monitor and protect amphibians and habitats.
4. Using amphibians as ambassadors, increase experiential learning opportunities in communities across the globe to inspire deeper connections with nature.
5. Continue to raise awareness and knowledge of the ecological, cultural, and intrinsic value of amphibians and their habitats.

To view the plan and the current priority actions please visit www.amphibians.org/asg/workinggroups/communications-and-education/.

Questions about this working group? Please contact rachel@amphibianark.org.

Publication Spotlight

In 2016, Amphibian Ark's Community Outreach Associate (Rachel Rommel) and co-authors, published a paper that reports on the short and medium term impacts of an amphibian educator workshop. The paper provides one applied example of how zoos can collaborate with recovery partners and utilize in-house experts for resource creation and workshop implementation, take amphibian ambassadors "on the road", and provide educational and social experiences with wildlife experts. Among other things, the paper highlights the need to identify what "actions" we want target audiences to take, and the importance of understanding barriers to, and motivators for, action.

Leaping from awareness to action: empowering local educators to promote herpetofauna conservation

Abstract: Where endangered species occur, recommendations call for conservation education programs that engage local educators; however, few studies have measured the effectiveness of implemented programs. We conducted a multi-partner educator workshop for the endangered Houston Toad, (*Anaxyrus houstonensis*) as one local example illustrating the broader issue of globally declining amphibians. We measured the effect of the workshop on participants' (n = 50) awareness/knowledge, values, beliefs, emotions, and intent to take action. We observed significant increases in awareness/knowledge and values regarding general amphibian declines and the focal species. The workshop significantly increased participants' belief that they had necessary resources to teach about the Houston Toad. Ninety-nine percent of participants agreed that they cared more about wild toads after meeting live ambassador toads. Post-workshop, we observed a 33% increase in use of amphibians or Houston Toads in participant learning settings. We recommend that educator workshops include biologist–educator teams, identify and address incentives and barriers to action, develop ecological knowledge, and incorporate experiential programming focused on native species and habitats.

Rommel, R., Crump, P., Packard, J.M. 2016. Leaping from awareness to action: empowering local educators to promote herpetofauna conservation. *Journal of Herpetology*. 50 (1):12-16.

For more information, please contact rachel@amphibianark.org.

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