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AArk newsletter has a new look!

Welcome to the 16th edition of the AArk newsletter, which now has a new and improved format. We've moved to more of a magazine style format, which we hope you'll enjoy, and we are now also delivering the newsletter as a single pdf file, rather than a series of separate online articles.

In an effort to keep the size of the newsletter file to a minimum, the file that will email to you will include medium quality images. If you'd like to download a high resolution version of the newsletter, we will have these available on the [Newsletter page](#) on our web site, and a link to the larger file will be included on the front page of the newsletter.

We will continue to deliver our newsletter in English and Spanish editions, and we thank our volunteer translators for their ongoing support in this area.

We hope that this new style of newsletter will suit the majority of our members, and we'd love to hear your thoughts on it – please feel free to send your comments to newsletter@amphibianark.org

The AArk team

Leaping Ahead of Extinction: A celebration of good news for amphibians in 2012

To coincide with Leap Day (February 29th) 2012, Amphibian Ark is launching a new international event, **Leaping Ahead of Extinction: A celebration of good news for amphibians in 2012**. The event will focus on promoting existing *ex situ* programs for threatened amphibian species, as well as the institutions that manage these programs, by encouraging people to visit their closest zoo or public facility that is involved with the programs, on or around Leap Day 2012. You get to see what your local amphibian conservation organization is doing, and they get a chance to further promote the great work they are involved in.

Facilities with *ex situ* conservation programs for threatened amphibians are included in our [ex situ database](#), and we are hoping that many of these institutions will be involved in the promotion. This is a chance for you to show your support for your local organizations that are helping to rescue threatened species.

We're about to launch an exciting range of T-shirts available for sale (see separate article in this newsletter) – why not buy one to wear when you visit your local amphibian organization on Leap Day?

If you would like your institution to be featured in this promotion, contact the AArk.

More information will be on the Leap Day web site, www.leapday2012.org soon...



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The much anticipated birth of the Amphibian Survival Alliance

Kevin Zippel, Program Director, Amphibian Ark

In AArk Newsletter No. 8, September 2009, I wrote to you about the developing Amphibian Survival Alliance (ASA). The ASA was conceived as an umbrella organization to oversee all amphibian conservation activities around the world, much as the AArk (one partner in the ASA) unites the amphibian *ex situ* conservation community.



As of 1 June 2011, Dr. Jaime Garcia-Moreno began serving as the ASA Executive Director, with Dr. Phil Bishop serving part-time as Chief Scientist. It is their job to undertake formation and then coordination of the ASA in order to implement the **Amphibian Conservation Action Plan** more fully. Jaime and Phil will work with ASA members and its Board of Directors to develop and monitor ASA strategies (logistic and financial), with primary responsibilities being for strategic planning, resource development and allocation, and strategy implementation.

“The present rate of amphibian declines and extinctions is a clear indication that our current conservation strategies are ineffective. The Amphibian Conservation Action Plan clearly outlines what needs to be accomplished to reduce further declines, but as a community, we have not always been effective in translating those ideas into actions” said Jaime.

“Up until now there was a lack of a coordinating body that could oversee the bigger picture of amphibian conservation and tie these efforts into other ongoing conservation and sustainability initiatives that indirectly contribute towards, and overlap with, amphibian conservation. The ASA will fill this void by uniting and coordinating all conservation strategies and programs that contribute towards preventing further loss of amphibian species worldwide.”

“The Amphibian Ark has been doing a fantastic job in promoting *ex situ* conservation actions and creating awareness about the need for these and other measures to preserve amphibians. We hope that through the ASA we can help connect the *ex situ* efforts lead by AArk with other efforts that are required to truly safeguard those populations bred in captivity over the long term (e.g., *in situ* conservation, policy work on various fronts, disease prevention and control, etc.).”

Phil will be soon joining the AArk’s Steering Committee to represent ASA in that body.

For more information, see www.amphibianark.org/the-crisis/amphibian-survival-alliance/.



Above: Dr. Jaime Garcia-Moreno now serves as the Amphibian Survival Alliance’s Executive Director, with Dr. Phil Bishop (below) serving part-time as Chief Scientist.



Evolution of an amphibian species conservation program: the AArk’s vision

This article includes advice from AArk on planning or refining an *ex situ* amphibian species conservation program. Whether you are looking to start a new program or have one that is long established, we think that you will find something in this article of value to you.

Planning

Which species to work with and what kind of help to provide?

With ~2,000 amphibian species currently threatened, and another ~1,600 listed as Data Deficient but likely to be in trouble, there is no shortage of amphibian species needing our help. However, these species obviously face different types of threats and require different types of help. We created our **Conservation Needs Assessment Workshops** so field experts with the necessary knowledge could help us identify specific conservation actions needed by each species. We advise our partners wondering which species to work with to refer to the **results of these workshops** to ensure that target species are getting the type of help they really need. This of course, includes advice that the *ex situ* community should consider when deciding which species are most in need of captive programs.

‘Validating’ that species. Once you’ve chosen the species you wish to focus on, it is very important for the species management

team to understand which populations do or do not belong to that particular species. Otherwise, complicating factors like cryptic species and polymorphism might cause you to include unrelated populations or exclude related ones, likely wasting precious time, money, and other resources, in addition to messing up the genetics of the populations! Check the literature or ask field experts if anyone has recently conducted a phylogenetic study to determine which populations of your species might be distinct and require independent management. If no such study has been done, then this is a perfect opportunity for *ex situ* partners to help support a range-country student as they study the situation for their dissertation. Read more about **phylogenetic information** on our web site.

Assembling the stakeholders. It is vital to have representation from all relevant stakeholder groups who may have an interest in the species. This can be achieved by the formation of a Taxon Management Group (sometimes called a Recovery Team). Forming a Taxon Management Group will ensure that all stakeholders’ needs are heard, that expertise is available on all aspects of managing the program, and that the management processes are transparent. This group should appoint a Taxon Management Coordinator to facilitate progress and should ultimately develop a Taxon Management Plan and, if *ex situ* work is anticipated, Husbandry Guidelines should also be developed. Examples can be



Amphibian “pods”, made from recycled shipping containers like this one at the Atlanta Botanical Garden (above and below) are a great way of providing low-cost biosecure amphibian breeding facilities. Photos: Kevin Johnson.

population. Amphibians held across multiple generations, like other species in captivity, risk losing gene diversity, producing deleterious allele combinations, and artificial selection for maladaptive traits. A captive population of Midwife Toads showed reduction in fitness and gene diversity after only nine generations. Moreover, many amphibian species exhibit traits that make it difficult to manage them with ‘mammal-based’ management software.

The Amphibian AArk attempts to help its partners meet these challenges through our [Population Management Guidelines](#). Data on captive animals should be entered into an electronic studbook (e.g., using SPARKS or PopLink) and analyzed using additional software to make sustainable breeding recommendations (read more in the Population Management Guidelines).

Assessing progress

The Amphibian Ark has identified a series of milestones for monitoring a program’s progress. Check out our list of current [Ex Situ Conservation Programs](#) and their progress to date (also see the article which summarizes these programs elsewhere in this newsletter). An ideal program would have achieved each and every one of the steps and milestones listed. While some of these programs meet all of the AArk’s exemplary attributes (e.g., sufficient founders, consistent breeding success, biosecurity, working in range country), unfortunately, most do not. There is much work to be done improving existing programs and initiating new programs for priority species not yet rescued.

The AArk strongly recommends that all steps are achieved to ensure the best possible outcomes for each program. If you’d like to include the progress of your amphibian program on this list, please download the amphibian [ex situ conservation program progress data form](#), fill it out, and email it back to us.

In order to achieve that, we must work with other stakeholders to help them understand and mitigate or manage threats in the wild. All members of the Taxon Management Group should be working together on that challenge while they are assuring the persistence of the population in captivity. To that end, the AArk has started a [mailing list](#) where partners with surplus captive-bred stock can advertise for the interest of conservation researchers working on threats and threat mitigation.



found on our [web site](#), and we would appreciate your sending a copy of your new Taxon Management Plans and Husbandry Guidelines to us so we can serve as a global repository/source of this information. Read more about Taxon Management Groups, Taxon Management Coordinators, and Taxon Management Plans on our [web site](#).

Assessing resource requirements. Before any animal is collected, resources should be assessed to ensure that a program can be adequately initiated and supported for its anticipated duration. Do you have sufficient permission, information, expertise, funds, biosecurity, and other resources? We advise our partners to use our [implementation assessment tool](#). If after answering all questions for the target species, you find that additional resources (funding, staff, equipment, training etc.) are required, then you might like to consider seeking assistance via [www.AArkFrogMatchmaker.com](#).

This list includes organizations and projects throughout the world that are currently seeking external support for their amphibian conservation projects. The aim of the list is to foster partnerships between suitable funding and support organizations and amphibian conservation projects. If you would like to submit a new project to this list, please download the [Conservation Project Data Form](#), and return it to kevinj@amphibianark.org, along with any photos relating to the project.

Confirming biosecurity needs. Biosecurity is important enough that we mention it again here, independent of other resources. Biosecurity means doing everything you reasonably can to ensure that you do not introduce exotic pathogens (or amphibians themselves!) into new populations or habitats. Please, read our advice on [best biosecurity practices](#).

Calculating founder requirements. Given the particular life history characteristics of your species, how many potential founders should be collected to launch the program? Try our [founder calculator tool](#).

Implementation

Managing the population. Once the population is in captivity and the husbandry techniques established, breeding must be managed as with any other *ex situ* conservation

Exit strategy

Having a captive population that is demographically, genetically, and physically healthy thriving across generations is merely a successful means to an end, not the end in itself. Success is achieved when that species is secured in the wild, either through *in situ* conservation measures and/or through their release back to the wild.

If threats can be mitigated or managed but the wild population is evaluated to be incapable of natural recovery, release of captive stock may be an option. Release plans should follow the [Guidelines of IUCN/SSC Re-introduction Specialist Group](#) and the [Guidelines of the AArk Biosecurity Advisory Group](#). We are currently working on a set of re-introduction guidelines specific to amphibians; check our web site soon for more information.

Amphibian Ark 2012 calendars are now on sale!

The twelve spectacular winning photos from Amphibian Ark's international **amphibian photography competition** have been included in Amphibian Ark's beautiful 2012 wall calendar. The calendars are now available for sale, and proceeds from sales will go towards saving threatened amphibian species.

Pricing for calendars varies depending on the number of calendars ordered – the more you order, the more you save! Orders of 1-10 calendars are priced at US\$15 each; orders of between 11-25 calendars drop the price to US\$12 each; and orders of 26-99 are priced at just US\$10 each. (These prices do not include shipping.) For orders of more than 99 calendars, please contact AArk. You can order calendars for yourself, friends and family, or why not purchase some calendars for re-sale through your retail outlets, or for gifts for staff, sponsors, or for fund-raising events?

Three ways you can help:

1. Order calendars for yourself and as gifts – a great idea for holiday season gifts!

Calendars can be purchased via our web site at

www.amphibianark.org/2012-calendar/ Orders of 1-10 calendars are just US\$15 each (plus postage).



2. Purchase in bulk and re-sell to your staff, visitors or members

We are offering discount prices for purchases of 11 or more calendars. You can purchase calendars for re-sale in your retail outlets, or for gifts for staff, sponsors, or for use at fund-raising events. If you order between 11-25 calendars, they will be available at the special price of US\$12 each – that's a saving of US\$3 each. For orders of 26-99 calendars, the price drops even more, to just US\$10 each, a whopping US\$5 saving per calendar. Order now at www.amphibianark.org/2012-calendar/ or contact elizabeth@amphibianark.org

3. Promote calendar sales through your web site or newsletter

We can provide whatever material you need to promote the calendars – remember every calendar sold will help vital amphibian conservation projects.

- Promote direct sales via a link to the AArk web site: www.amphibianark.org/2012-calendar/
- You can download a poster from our web site to display on noticeboards: www.amphibianark.org/pdf/calendar_flyer.pdf
- We can also provide camera-ready artwork and copies of our logo and calendar images to include on your web site or in your newsletter. Contact webmaster@amphibianark.org for further information.



Amphibian Ark merchandise now available!

We've just released an exciting new range of T-shirts, sweatshirts, caps, mugs, greeting cards and other merchandise so you can proudly show off your support of the Amphibian Ark and of amphibian conservation. Our initial range features the AArk logo, and new designs featuring a variety of threatened amphibians will be added over the coming months. The range of products can be purchased online and delivered right to your door! Check out the current range at www.amphibianark.org/AArk-products.htm

Prices can be displayed in Australian, British, Canadian, European and US currencies, and payment can be made using PayPal, or using Visa or MasterCard via our secure server. Prices range from AU\$11.50 / CA \$11.50 / £7.50 / €8.50 / US \$9.99 for basic T-shirts featuring the AArk logo, with all shirts coming in a variety of sizes, and many can be ordered in different colors. Check the range available in our new AArk shop at www.amphibianark.org/AArk-products.htm and check back regularly, as we plan on adding new designs during the next few months.

If you don't see the logo design on the type of shirt you are interested in, drop us a note and let us know – we might be able to arrange it for you!





Sustaining donors: seed grant donors

In the [June Newsletter](#) we featured sustaining donors who have pledged long-term general operating support for the AArk. Another type of sustaining donor we have helps support our seed grant program. From 2009-2011, three organizations have made five-year pledges to support AArk's seed grants:

Woodland Park Zoo has been committed to international and regional conservation work for many years. In 2008, the zoo partnered with others in the Pacific Northwest on a project to improve the outlook for the threatened Oregon Spotted Frog, *Rana pretiosa*. The Washington Department of Fish and Wildlife recognizes this species as endangered due to habitat loss and invasive species including the voracious North American Bullfrog. In addition to Washington Department of Fish and Wildlife and Woodland Park Zoo, this alliance includes the Oregon Zoo, Point Defiance Aquarium, Northwest Trek and the Cedar Creek Correctional Center.



Since 2008, egg masses have been collected from the wild and reared at partner facilities until they reach a size that is less vulnerable to predation. With thousands of froglets being released into secure habitat over the past three years, in early 2011 the first Oregon Spotted Frog egg masses were observed at the release site. These are the first offspring resulting from captive reared stock, which is good news for the spotted frog in Washington!

In late 2010, Woodland Park Zoo took two additional steps in advancing amphibian conservation at the zoo. The first was to host AArk Training Officer, Ron Gagliardo on zoo grounds and through their financial support of the AArk Seed Grant, for which we are very grateful. The second commitment was hiring Jennifer Pramuk, PhD as a new curator who will oversee the amphibian conservation work along with other zoo-sponsored amphibian initiatives. In relation to these efforts, the zoo's Chief Executive Officer, Deborah Jensen, Ph.D. stated "Our zoo is proud to support the actions of Amphibian Ark, whose efforts to save amphibian species from extinction are paramount to confronting a monumental biodiversity crisis".

The Andrew Sabin Family Foundation is based in New York, and is a generous supporter of the AArk Seed Grant program. "The Andrew Sabin Family Foundation is happy to support the Amphibian Ark Seed Grant, which funds valuable amphibian conservation projects around the globe." Andy Sabin, Andrew Sabin Family Foundation.

Josie Lowman grew up in Kansas but has spent time in Georgia and Virginia. She now resides in New York City where she works in the tax and accounting advisory field. Since 2008, she has directly supported the work of Amphibian Ark's Training Officer along with the initiation and continuing support of the Amphibian Ark Seed Grant Program and various other AArk activities.

Not a biologist by training, Josie's appreciation for amphibians and nature grew from her upbringing and is further inspired by her young nephews who have a great interest in biology and frogs specifically! We are very fortunate to have her continued support which has directly contributed to the training of hundreds of amphibian stewards around the world. "After learning that amphibians are one of the first species to be harmed by toxins in the environment, I became very interest in the work of saving amphibians and have been inspired by what Amphibian Ark can do." – Josie Lowman.

Other seed grant money comes from the [European Association of Zoos and Aquaria's](#) 2008 Year if the Frog donation to the AArk.

Would you like to be a Seed Grant sustaining donor too? Let us know that you commit to donate to our Seed Grant program at a minimum of \$1,000/year from now until 2015 and we will celebrate you as we do these three wonderful supporters of the AArk. Please contact [Elizabeth Townsend](#) at AArk to confirm a payment method that best suits your institution.

Have you thought of taking out a monthly individual subscription? Individual donors can make automatic monthly donations to the AArk via our secure PayPal account. These regular, smaller donations suit many people, rather than making a single larger donation. You can subscribe in just a few minutes using our monthly subscription form.

Unable to make a long-term commitment? That's fine; we love all our donors! Please contact [Elizabeth Townsend](#) at AArk with inquiries about institutional donations; individual donors can go to our web site and [donate today](#).

Watch upcoming newsletters for recognition of our officer time donors and individual monthly donors. **Thank you to all of you for your support of the Amphibian Ark!**

Sunset Frog breeding event at Perth Zoo

Renee Bauhofer, Amphibian Keeper, Perth Zoo

We have had an exciting event at the Native Species Breeding Program at Perth Zoo with rare Sunset Frogs, *Spicospina flammocaerulea*, breeding in captivity for the first time. Sixty-five eggs were laid overnight on July 31, and although most were infertile, we are seeing good development in the remaining eggs.

This threatened species has a very restricted range in the south-west of Western Australia. The frogs that have bred were collected from the wild in Walpole in Western Australia. They were housed in a mixed sex group enclosure with two males and two females. The pair was seen in amplexus for two days prior to the breeding event.

Although wild collected eggs have been successfully held and reared in captivity previously, this pair was both primed and bred in captivity in a first for the species.



Staff from the Native Species Breeding Program at Perth Zoo are excited to have bred Sunset Frogs, *Spicospina flammocaerulea* - a world first. Photo: Perth Zoo.

Malaysia husbandry training 2011

**Ron Gagliardo, Training Officer,
Amphibian Ark**

In late July, we held an Amphibian Ark husbandry training workshop at Zoo Negara in Kuala Lumpur, Malaysia. Working with Zoo Negara staff Dr. Felix Michael (Veterinarian and Deputy Director), Junaidi Omar (Head of Education), Mohammed Hafiz, Sufuan Nazri and many others, we covered topics ranging from *ex situ* planning and management to basic husbandry, water quality and veterinary care.

Amphibian Ark Consulting Veterinarian Brad Wilson (Atlanta, USA) and Taronga Zoo Amphibian Specialist Michael McFadden (Sydney, Australia) shared in executing the three-day intensive training course. Participants were primarily from the Kuala Lumpur region. This workshop also offered expanded practical sessions on water quality, lighting and enclosure design along with discussions on taxon management plans for regional species that we hope will be carried forward into action by local partners. We are grateful to Zoo Negara, Cleveland Metroparks Zoo, and the Taronga Zoo for supporting this workshop and to the staff of Zoo Negara for their hospitality during our visit.

Malaysia is home to nearly 400 species of amphibians, with several species in need of *ex situ* work. We are hoping to see taxon management plans for various species in Malaysia being produced in the coming months. Anyone interested in partnering with facilities in Malaysia can contact us here at Amphibian Ark for further information.



Above: Taronga Zoo's Michael McFadden helps out during a hands-on glass drilling workshop. Below: Participants at the recent three-day husbandry training workshop in Kuala Lumpur, Malaysia. Photos courtesy of Zoo Negara Education Department.



Upcoming husbandry and conservation training course in the Caribbean

We are moving toward an early date in December 2012 for the Amphibian Ark *ex situ* conservation training course for the Caribbean, which will be held on the grounds of the National Zoo in Santo Domingo in the Dominican Republic. Lodging will be arranged close to the Zoo.

This four-day course will cover many aspects for utilizing *ex situ* tools for amphibian conservation programs including planning, husbandry, veterinary care, population management environmental parameters including temperature, water and light, feeding and nutrition, diseases and veterinary care, biosecurity and quarantine, and logistics. The course will include a combination of interactive lectures and hands-on lab practicals.

The primary goals for this training are to provide skills for maintaining critically endangered amphibians within the range of the species if possible, connect and engage local partners in these activities and formulate short and long-term conservation plans for species in the region. The Caribbean region is high priority for amphibian conservation, both *in* and *ex situ*.

In an ongoing effort to make sure we have not overlooked anyone in the region who might benefit from this course and use the hands-on skills to improve amphibian conservation at their own facilities, we are asking you to further disseminate this course announcement. If you or someone in the Caribbean region who you know has an active interest in *ex situ* conservation tools and training, please let us know.

This workshop has been made possible with the generous contributions from ZooDom, PVDC, Toledo Zoo, Conservation International and Amphibian Ark.

For more information, please contact Ron Gagliardo, Training Officer at ron@amphibianark.org

Updates from AArk Seed Grant recipients

Frogs and toads of south-eastern Colombia: Jewels of nature our grandchildren should know - Jonh Jairo Mueses-Cisneros & Ingrid Vanessa Perdomo-Castillo

Our project titled: “*Frogs and Toads of Southeastern Colombia: Jewels of nature our grandchildren should know*” received partial funding in July 2010 through an Amphibian Ark Seed Grant for a total amount of US \$575 and matching funds from the Philadelphia Zoo of US \$600 that allowed our work team, under the guidance of Jonh Jairo Mueses-Cisneros, to receive training and engage in capacity building on amphibian husbandry techniques.

One of the main objectives of our project is to build an amphibian breeding and management center called “Centro de Reproducción y Manejo de Anfibios del Suroccidente Colombiano”, which strives to enable a long-term project to maintain assurance colonies of up to forty-five species of endangered amphibians from south-eastern Colombia. However, in order to build a responsible *ex situ* breeding center, we require properly-trained staff, so that can effectively maintain and breed amphibians in captivity, construct and outfit terrariums, install life support systems, such as lighting, misting, and fully understand the proper feeding of captive animals. With this in mind we sent biologists Ingrid Vanessa Perdomo-Castillo and Jennifer Tatiana Díaz-Cháux, to receive training in these techniques at two successful amphibian breeding centers in Ecuador.



Preparing a medium for breeding moths in the genus *Galleria* at the Balsa de los Sapos, Pontificia Universidad Católica del Ecuador, Quito.



Recording information on the status of *Gastrotheca* at the Conservation Center Mazán, Cuenca, Ecuador.

Training took place from October 10 to November 9 in 2010 at two important amphibian breeding and managing centers in Ecuador: Balsa de los Sapos, at Pontificia Universidad Católica del Ecuador, in Quito and Centro de Conservación de Anfibios Mazán, in Cuenca.

The fifteen days spent at La Balsa de los Sapos was very successful and very enriching. All the relevant topics were covered and we obtained much needed information for our project.

Once the training in Quito concluded the interns travelled by land to the City of Cuenca, in southern Ecuador, for the second phase of their training for fifteen days at Zoológico Amaru and at Centro de Conservación de Anfibios CCA-Mazán.

This second experience was very useful and served as a contrast between different work styles, different materials, animal management techniques and other aspects which were very different from the first internship; notwithstanding, this group has had positive results and learning about this experience was very enriching for us.

What the interns learned throughout their experience was very valuable for us, and thanks to this internship we were able to improve the designs for our future Centro de Reproducción de Anfibios del Suroccidente Colombiano. We also adjusted our budget to reflect a much more realistic scenario and were able to include materials that we were previously not aware existed. To date, the team has also been able to visit the amphibian breeding facilities at the Bronx Zoo and the Philadelphia Zoo, which have further helped us clear some doubts about this entire process. After this internship, we have been able to establish our biosecurity protocols and are ready to begin the Centro de Reproducción.

Earlier this year, Jonh Jairo Mueses-Cisneros won the Andrew Sabin Award for Amphibian Conservation 2011, in New York City, and with the money obtained from the award, we will buy the land where the Centro de Reproducción will be built. This trip to New York, helped us make very interesting contacts with potential donors, some of which demonstrated interest in providing support to our projects, not only at the Centro de Reproducción, but also for describing our new species, exploration of sites with potential new species, publishing and our educational work.

In this way we truly thank AArk for this Seed Grant. Our award has truly been a germinating seed for this project, and we will continue to work towards the appreciation and conservation of the amphibians of southern Colombia.

Maud Island Frog Habitat at Orana Wildlife Park – Lynn Anderson, Chief Executive, Orana Wildlife Trust

Significant progress has been made on Orana Wildlife Park’s Maud Island Frog Habitat since our last report (October 2010), and we are pleased to advise that the habitat is approximately 65% complete.

However, progress has been halted due to the devastating 6.3 magnitude earthquake that struck Christchurch in February. Since then, Christchurch has experienced another 6.3 earthquake on June 13, followed by many other large aftershocks, including a 5.4 shake on June 21.

The February earthquake affected the availability of contractors, especially the refrigera-

tion company that was working on the climate control system. Their staff members have been busy installing residential heat pumps to warm people's homes for winter, and conducting repairs to commercial air conditioning systems to get businesses operational. Additionally, the electrical company conducting work on our exhibit has also been busy on earthquake related issues.

The refrigeration and climate control system is therefore not complete and this means that we were unable to collect the frogs from Maud Island this winter, in line with the permit. It was considered best practice that the climate control system should operate for three months prior to moving the frogs to the facility.

Another impact of the earthquake has been on staff resources. Whilst Orana Wildlife Park has been fortunate to re-open with very minimal material damage following the earthquakes, it is a very difficult time for us. Visitor numbers have dropped significantly putting the Park under severe financial pressure. Some dramatic cost saving measures have therefore been implemented, including a staff restructure and placing all capital developments on hold, to ensure that the Park gets through this time as Orana is an important asset to the city of Christchurch.

Orana Wildlife Park is absolutely committed to completing this project and housing Maud Island Frogs. Our team plan to continue working on the habitat and as contractors become available we will finish the development. Once the project is complete, we intend to house some introduced amphibians (in completely separate habitats) and will be in contact with the Department of Conservation to arrange a more appropriate time to transfer the animals.

Bolivian amphibian Initiative - Arturo Muñoz S., Museo de Historia Natural Alcide d'Orbigny

Bolivia is a mega-diverse country with very unique fauna; unfortunately this high richness contrasts with limited economical resources, and current deficient knowledge of its biodiversity. There are still areas in Bolivia that have never been studied, and species and their natural history which are completely unknown for biologists. Recently we also are discovering that several amphibian populations are starting to decrease in numbers and others that seem to be completely disappearing. Due this situation we have been focussing our work in the Bolivian High-Andes where very few studies have been carried out, and where several threats such as habitat loss, pollution, global warming and a lethal fungal pathogen *Batrachochytrium dendrobatidis* (*Bd*), are causing local and global extinctions. The project is working with the poorly known aquatic frogs of the genus *Telmatobius*, mainly with the Critically Endangered species Titicaca Water Frog, *Telmatobius culeus* and with the Vulnerable Water Frog, *Telmatobius hintoni* in Cochabamba Department. We use these two species as model species so in the near future we will be able to work with the other twelve Bolivian species of *Telmatobius* that are in the IUCN Red List of threatened species.

The objectives of this project are:

1. To provide information regarding ecological requirements, breeding periods and activity, population status estimation, determination of the presence of *Bd* fungus in both species.
2. To develop *in situ* capacity building with local community members and to train young Bolivian biologists in amphibian work.
3. To increase awareness about the amphibian crisis in local communities and the general population through activities, exhibitions and different media at the communities and in the Museum.
4. To set up a captive breeding facility in the Museo de Historia Natural Alcide d'Orbigny with two species of *Telmatobius* for research and education purposes.

The Bolivian Amphibian Initiative has already created the first captive breeding facility for endangered Bolivian Andean amphibians. This first step allowed us to obtain aquariums with filtering systems and other related equipment to maintain water quality. Recently we increased our facilities with the support of USFWS and at the moment we have a container with more than forty-five aquariums in a system that will control the temperatures and habitat requirements of the different species we are holding.

At the moment we are holding five species of *Telmatobius* from several localities in Bolivia. Using these species, we hope to increase our knowledge about the species through research in captivity, and this knowledge can then be used



The inside of Orana Wildlife Park's Maud Island Frog Habitat showing the areas in which the Maud Island Frogs will be housed (photo taken from the public walkway though the habitat).
Photo: Orana Wildlife Park.



A view from the public walkway through the Frog House. To the left is where the Maud Island Frogs will be housed, and to the right is where some introduced amphibians will be housed.
Photo: Orana Wildlife Park.



The Water Frog, *Telmatobius hintoni*, is one of the model species being maintained in the captive breeding facility in the Museo de Historia Natural Alcide d'Orbigny in Bolivia. Photo: Arturo Muñoz S.



The first facility in Bolivia to keep different species of *Telmatobius*, where some of the species already have offspring and some others will be breeding soon.
Photo: Arturo Muñoz S.

for conservation and education. All of these five species are listed in the UICN Red List of threatened amphibians and understanding them will help us to work better in the wild and will also allow us to establish captive assurance populations.

The species we are holding are *Telmatobius culeus*, *T. hintoni*, *T. yuracare*, *T. simonsi* and *T. marmoratus* gr. Most of these individuals were collected at the tadpole stage and were transferred to the new facilities created specifically for this purpose. These species are monitored constantly to provide them the best conditions and also obtaining important data about the natural history, behaviour, responses to diets, reproductive periods and strategies.

The captive breeding of these *Telmatobius* species is providing very interesting data about the different species that we are keeping in captivity. A lot of new information previously unknown to science is being obtained: data about diets, natural history and reproductive strategies, and soon these data will be published and shared with other amphibian conservationists.

One species (*Telmatobius hintoni*) has already produced offspring and this is the first time the species has been bred in captivity. These animals have already metamorphosed into frogs and we hope that during the following months we will have offspring from another species of *Telmatobius* that is showing breeding behaviour.

Some of our first results were reported in AArk's September 2010 newsletter, and we plan to publish more articles and share information in courses and at workshops. The project is also included in the Amphibian Ark's Frog MatchMaker database.

With the support of different researchers, conservationists and other institutions we are trying to coordinate our work and in this way to obtain better results. We are currently working with Durrell Wildlife Conservation Trust and Denver Zoo, and we are also coordinating with Bolivian institutions and government to have a better impact with conservation activities of the threatened Bolivian amphibians.

Integrating the Caribbean into the Southeast Partners in Amphibian and Reptile Conservation

Jen Stabile, Amphibian Conservation Specialist, Central Florida Zoo & Botanical Gardens

The Southeast Partners in Amphibian and Reptile Conservation (SEPARC) is pleased to announce the introduction of the Caribbean region (West Indies) into the PARC groups. The Caribbean session will take place at the 2012 meeting, February 16-19 in Chattanooga, Tennessee.

The SEPARC is an organization of scientists, naturalists, government representatives and citizens that are devoted to the preservation of amphibian and reptile populations in the southeastern United States, and serve as the south-east branch of the national PARC organization. The Caribbean islands are host to more than 750 endemic species of reptiles and amphibians, with top conservation concerns ranging from habitat destruction and fragmentation to emergent disease and invasive species.

Dr. Christopher L. Jenkins, CEO & Executive Director of the Orienne Society and Co-Chair of SEPARC initiated this event in order to provide much needed support and awareness to an area of the world dense with species of conservation need. "Incorporating the Caribbean region into SEPARC will strengthen our region by bringing in new perspectives and partners," said Dr. Jenkins. "We also think that SEPARC can provide a partnership-based forum for those interested in amphibian and reptile conservation in the Caribbean. By coming together and working in partnership to save these species, we can have a much greater impact as compared to the sum of all our individual efforts."

This session of SEPARC will be focused on ecology and conservation issues surrounding endemic reptiles and amphibians in several countries throughout the West Indies, including the islands of Haiti, Cuba, Puerto Rico, and the Cayman Islands. We have a strong group of speakers participating in this conference, including Dr. Patricia Burrowes (University of Puerto Rico) who will be discussing amphibian disease and their implications on amphibian conservation in the 21st century throughout the Neotropics. Other notable speakers include Dr. Rafael Joglar (University of Puerto Rico, Director- Proyecto Coqui), Dr. Carlos Martinez from Philadelphia Zoo, and other key players in Caribbean conservation and ecology.

For more information on how to join SEPARC or the meeting in general, please visit www.separc.org If you would like to become involved with the inaugural 2012 Caribbean session please contact Jen Stabile at jens@centralfloridazoo.org.



The Coqui, *Eleutherodactylus coqui*, is native to Puerto Rico.
Photo: Bill Love, Blue Chameleon Ventures.

A summary of *ex situ* programs for threatened amphibian species

Kevin Johnson, Taxon Officer, Amphibian Ark

As reported earlier in this newsletter, with approximately 2,000 amphibian species known to be currently threatened, and another 1,600 or so listed as Data Deficient and likely to be facing threats in the wild, there is an increasing number of amphibian species that require our help to sustain them until threats in the wild can be mitigated.

AArk maintains a list of all known *ex situ* conservation programs for threatened amphibian species, and monitors their progress along a series of key milestones that are considered to be critical for any successful *ex situ* program. It is quite likely that this list is not exhaustive, and if you are involved with an *ex situ* program for threatened amphibians that is not included in our list, please download the [program information data form](#) from our web site and send us the details – we'll be sure to include your programs in our list!

Although all of the stages in a successful *ex situ* conservation program are important, AArk considers that two of the most important of these steps must be achieved in order for the program to be considered as a “model” program: the program must be established in the range country of the species, and the population being managed should be housed in isolation from other populations occurring outside its range. A list of [model programs](#), along with details of their progress can be found on our web site.

A recent summary of the programs included in our list revealed some good news, but unfortunately, it also included some bad news. First, the good news:

- 124 independently managed priority rescue populations for 103 species have been established.
- These programs have been established in twenty different countries, with approximately 70% of these programs being within the range countries of the species.
- Almost 70% of the programs have maintained permanent isolation from species occurring outside of their range.
- Approximately 66% of programs have been launched recently (since the [Amphibian Conservation Action Plan](#) was developed in 2005).
- 40% of programs are primarily at ‘non-zoo/public’ facilities.
- Of the 103 species represented in rescue programs, 32 (31%) were assessed for rescue during an [AArk Conservation Needs Assessment workshop](#), and 71 (69%) have been chosen by countries that we have not assessed (mostly in Ecuador, where a Conservation Needs Assessment workshop is being planned).

But the not so good news also needs to be considered, so that hopefully, steps can be taken to resolve some of these issues:

- Only 12% of these species have reported phylogenetic studies, which ensure that unrelated populations are not included in the program, and related populations are not excluded.
- Only 17% of programs report having calculated founder numbers and only 19% have clearly sufficient founder animals in their populations.
- Only 16% report the most basic form of population management (e.g. a studbook).
- Only 39% report clearly and consistently successful production of first generation animals.
- Another 238-253 species/populations have been assessed by us for rescue but have not yet been included in *ex situ* conservation programs. This means that to date, a very small proportion of species that require our urgent assistance are actually receiving it.

So as this summary shows, we have made some significant steps forward with regards to the rescue of threatened amphibian species. There still remains a large number of species that need our help, and if we continue to expand our *ex situ* capabilities and skills, we can continue to improve upon the great work that has been done over the past few years.



The very successful captive program for the Japanese Giant Salamander, *Andrias japonicus*, which began in 1971 at Asa Zoo, is one of longest-established *ex situ* programs for amphibians. Photo: Kevin Johnson.



Taronga Zoo's program for Booroolong Frogs, *Litoria booroolongensis*, includes community education and releases to the wild. Photo: Michael McFadden.



The *ex situ* program for Darwin's Frog, *Rhinoderma darwini*, in Chile is a great example of a conservation partnership, formed by the Universidad de Concepcion and Leipzig Zoo. Photo: Ron Gagliardo.



The El Valle Amphibian Conservation Center in Panama maintains a successful population of *Anotheca spinosa*. Photo: Jorge Armín Escalante Pasos.



Featured Frog MatchMaker projects

In 2010, we launched our conservation project list, **Frog MatchMaker**, which now includes fifty-three amphibian conservation projects from twenty-one countries. The complete list can be searched by genus, country, project type, or by the amount of support required, and we would urge you to take a minute to look through the list and find a project that you or your organization might be able to support.

In this newsletter, we're featuring three more projects from the list that are seeking support to carry out their amphibian conservation projects.

Education and Monitoring Program for Amphibian Conservation at Espinhaço Range, Brazil

This project works within a unique ecosystem to assess amphibian populations and increase information on community distribution and composition. Long term monitoring will be initiated to understand population trends and fluctuations over time.

Students from local schools also get involved in the project to understand that amphibians are healthy components of the ecosystem and represent no danger to human survival. We inform people about the endemism and richness of the region and explain the risks of extinction.

The project needs financial independence for the Educational Program to acquire equipment and new materials and to support students' transportation to visit museum exhibitions. It is also seeking training in capacity-building and project planning.

More information can be found on the [Frog MatchMaker web site](#).

Contact: Izabela Barata, Research Scientist, Instituto Biotrópicos, izabela@biotropicos.org.br



Students from local schools around the Espinhaço Range in Brazil get involved in the project to understand that amphibians are healthy components of the ecosystem.
Photo: Izabela Barata.



Hypsiboas cipoensis: a Near Threatened and endemic species from the Espinhaço Range. Photo: Izabela Barata.

Towards a conservation strategy for *Arthroleptids dutoiti*, an enigmatic and endemic frog from Mt Elgon, Kenya

It is our current goal to comprehensively survey different streams on Mt Elgon for the Critically Endangered *Arthroleptides dutoiti*. If it is still there, data about its habitat and biology will be taken, and a small number of specimens will be collected and transferred to Nairobi for the initialization of a captive breeding program.

The project is seeking under \$5,000 for the supply of batteries, food material for captive frogs, laboratory chemicals for chytrid fungus analysis, vials, swabs, and absolute ethanol. We will require support from those who have carried out successful captive breeding of Torrent frogs and have knowledge of constructing suitable vivaria.

Contact: Beryl A. Bwong, Research scientist, National Museums of Kenya, bako@nationalmuseums.or.ke

More information can be found on the [Frog MatchMaker web site](#).

El Valle Amphibian Conservation Center - five years of an *ex situ* conservation project in Central Panama

Edgardo Griffith, Director, El Valle Amphibian Conservation Center



Construction of the El Valle Amphibian Conservation Center (EVACC) facilities began in August 2005 on the grounds of the Nispero Zoo in El Valle de Anton, with a small seed funding from the Houston Zoo. El Valle de Anton is an 8 km wide inactive volcanic crater in Central Panama and also the type locality for the charismatic and Panamanian cultural symbol, the Panamanian Golden Frog, *Atelopus zeteki*.

The original idea of EVACC was to protect and reproduce golden frogs in captivity. This idea was reconsidered with the anticipation of the arrival of the chytrid fungus (*Bd*). This fungus could (and would) wipe out a large number of endemic and susceptible species in Panama. We came up with a list of priority species that we knew were going to be negatively affected. Unfortunately by the time the fungus arrived in and around the El Valle area, the EVACC facility was not ready. As a response and temporary solution, we came up with the idea of modifying two hotel rooms, get as many volunteers as possible and collect at least twenty pairs of fifteen priority species. At that time, and given the circumstances, we did not have any food colonies, husbandry protocols or a clue of the diets of some of the new and rare species of amphibian that were about to work with.

Five years later, and thanks to the expertise of hundreds of volunteers and the generosity of the Houston Zoo and its Conservation Department staff, we have now bred twelve of the priority species.

We also are excited that on August 30, 2011 we our first frog releases took place. The animals released were *Atelopus varius* juveniles: the toadlets were captive-bred from wild founders and were released in the same area the founders were collected as many as three years ago. The juveniles had a body mass and snout vent length average of 0.07 g and 9.3 mm respectively. We are hoping to learn as much as possible from this first experience and collect as much data related to the size and age of the animals that were released as possible. We also have put into place a consistent monitoring regime as well to help us to better understand this process. Maybe with a little bit of nature's help we will be able to repopulate the streams of Central Panama, which unfortunately, are already without frogs.

During the progress of EVACC, a state of the art public amphibian exhibition has also been added to the attractions at the small private zoo. The main attraction is the center exhibit that holds the Panamanian Golden Frogs.

We can also choose what we feed our frogs, having the privilege of working with two species of fruit flies, domestic crickets, super worms, earth worms and katydid.



One of the juvenile *Atelopus varius* that was released in the same area the founders were collected up to three years ago. Photo: Edgardo Griffith



The public exhibition hall at the El Valle Amphibian Conservation Center. Photo: Edgardo Griffith.

We could definitely say that EVACC has grown and accomplished a lot within the last five years, and we will continue doing so until we can find a way to bring all the animals back to where they belong.

For further information about EVACC and how to help our project please visit www.houstonzoo.org or email the EVACC director at egriffith@houstonzoo.org or egriffith23@hotmail.com



Edgardo Griffith at release site where captive-bred *Atelopus varius* juveniles were released in August 2011. Photo: William D. Devenport.

The first annual frogday.org grant

Matthew Mirabello, American Frog Day

American Frog Day is pleased to announce the winners of the first annual 2011 frogday.org grant program. This grant, based on funds raised by the event "American Frog Day", (see [AArk newsletter 15, June 2011](#)) supports conservation of dendrobatid frogs and other frog species throughout the world with a strong preference for supporting projects that involve biologists from the species' native country. Qualifying applications were voted on by those who contributed funds to the grant and participated in American Frog Day 2011. We would like to acknowledge the generous support of all the organizations and individuals who contributed to make American Frog Day 2011 a huge success and making this grant possible.

We received four excellent proposals, we want to acknowledge the merit of the three projects that were not funded:

- Captive *ex situ* breeding through captive rearing facilities and monitoring of recipient sites for five native Colombian species of Centrolenidae. Nicholas Paul Pezzote & Oscar Gallego
- Emergency actions for the conservation of *Hyloxalus jacobuspetersi* (Amphibia: Dendrobatidae), a species at the verge of extinction. Luis A. Coloma, Ph.D, Centro Jambatu de Investigación y Conservación de Anfibios/Fundación Otonga
- *Ex situ* and *in situ* conservation of *Dendrobates tintorius* (blue morph) in Brazil. Felipe Garcia De Camargo, Zooparque Itatiba/Sao Paulo- Brazil.

The project that received the most votes and won the \$2,000 Frogday.org grant is:

Establishing a captive breeding facility for the amphibians of Andasibe, Madagascar

Devin Edmonds, Director of Amphibian Conservation, Association Mitsinjo and Justin Claude Rakotoarisoa, Lead Amphibian Technician, Association Mitsinjo.

Project description

The area around Andasibe in east-central Madagascar supports more than 100 species of frogs, including the Critically Endangered *Mantella aurantiaca* and the Endangered *M. crocea*. While the globally-spreading amphibian chytrid fungus, identified as one of the lead causes for amphibian declines in the Americas and Australia, has yet to be found in Madagascar, it is important to build capacity in-country now to manage an epidemic should this disease be introduced to the island. Currently, there is no treatment for amphibian chytrid once it is in an environment and its spread cannot be stopped. One of the few actions which can be taken is to move threatened species into captivity to safeguard against extinction, and develop reintroduction or supplementation programs with the hope that wild frog populations will develop immunity to this disease over time. Apart from *M. aurantiaca*, and *M. crocea*, additional target species classified as Least Concern will be used for training and husbandry research.

Association Mitsinjo, a community-run conservation organization centered in Andasibe, has developed the first biosecure facility for captive amphibians in Madagascar. It will serve as an example and training center for additional captive amphibian programs. Five locally-hired technicians are currently working with four common frog species to learn how to keep and breed amphibians in captivity.



The Critically Endangered *Mantella aurantiaca* is found in the area around Andasibe in east-central Madagascar and is one of several species that will be maintained by Association Mitsinjo. Photo: Devin Edmonds.



Mantella crocea is listed as Endangered in the IUCN Red List, and Association Mitsinjo hopes to breed this species in the first biosecure facility for captive amphibians in Madagascar Photo: Devin Edmonds.

Three cricket species and a fruit fly are being bred for food, with additional live food culturing experiments being conducted to expand the captive frog diets.

Once technician training is complete and the facility is fully operational, breeding programs for local threatened frog species will begin. Husbandry research conducted at the facility on frog species which have never been kept in captivity will also help facilitate the rapid establishment of captive populations should the need arise in the future. The funds received from this grant will help the project supply produce from markets, to sustain live food cultures, expand its current water supply system, and build shelving units for additional terraria.

Association Mitsinjo also received a \$5,000 AArk Seed Grant in 2009.

To learn more about all of the project proposals, and follow the progress made by the winning proposal please see <http://frogday.org/aark-grant>

An *ex situ* conservation and research project for Pickersgill's Reed Frog

Ian Visser, Curator of Fish, Reptiles and Amphibians, Johannesburg Zoo

In March 2006 the Johannesburg Zoo established its Amphibian Conservation Project to assist with the conservation of South Africa's indigenous amphibians. The Amphibian Conservation Project now has five years of husbandry experience for several species of indigenous amphibians and fifteen zoo staff members currently contribute their time and effort to the project.

Success with the common *Hyperolius marmoratus* including breeding it to the F3 generation has placed the Johannesburg Zoo in a key position to assist with the conservation of the Critically Endangered con-generic Pickersgill's Reed Frog, *Hyperolius pickersgilli*. It is threatened by habitat destruction due to urbanization, drainage for agricultural purposes and the proliferation of exotic tree plantations along the KwaZulu-Natal coastline. It is currently known from only twelve sites, the majority occurring outside of protected areas.

This species has therefore been identified as requiring *ex situ* support. To this end, partnerships have been established between the Johannesburg Zoo and the following institutions;

- The South African Association of Marine Biological Research at Seaworld at UShaka MarineWorld – Housing and husbandry research.
- North West University – Field research including ecology, population size, location and status of current habitats and ground truthing of distribution predictions.
- Ezemvelo KwaZulu-Natal Wildlife – Distribution predictions and support.
- The National Research Foundation at the National Zoo – Genetic research.

We are fortunate in that North West University is a significant stakeholder in the project and a Phd, MSc. and two BSc. Honours projects are currently in progress concerning various *in situ* aspects of the population, distribution and ecology of *H. pickersgilli*.

The Johannesburg Zoo has set aside two rooms that will be converted into biosecure areas in which to house the project. A refrigerated shipping container has been purchased and will be converted to a frog pod once funding has been sourced. A suitable area will also be created at Seaworld at UShaka MarineWorld.

A limited number of animals will be collected to provide a base population with which to carry out husbandry and breeding research in order to compile a species-specific husbandry manual. A genetically sound captive assurance population will then be established to prevent the extinction of the species if *in situ* threats prove too challenging for the continued existence of the species, and to enable future reintroductions of captive-bred animals. This will also provide an opportunity to study ecological and behavioral aspects of the species, since the natural habitat presents a very challenging environment for research.

At least one occurrence site is facing complete destruction as a result of impending large scale development of the area. This site has the potential to provide an entire population for translocation.

The remaining sites are usually extremely small, localised and isolated, without natural corridors to permit movement of the population. They are separated by significant distances (greater than 10 kilometres) as well as physical barriers – motorways, canals, suburbs and industrial areas. They are generally surrounded by urbanisation or extensive sugar cane fields and at this time it is assumed that there is marginal or no genetic exchange between sites. The National Research Foundation has agreed to undertake genetic research that will determine the genealogy and overall genetic vigour of the various populations.

Subject to the creation or rehabilitation of suitable wetlands we may ultimately decide to release captive-bred individuals back in the wild. Large scale dune mining operations likely to take place within the range of this species in the near future will include mandatory site rehabilitation (and funding) that could also provide ideal opportunities to create wetland habitat suitable for reintroduction programs.

Compared to the effort that has been made on behalf of South Africa's charismatic megafauna, amphibian conservation here is still in its infancy. We therefore intend this project to act as a flagship for the future conservation of amphibians in Southern Africa.



Pickersgill's Reed Frog, *Hyperolius pickersgilli*, occurs in limited and fragmented habitat along the KwaZulu-Natal coastline of South Africa. Photo: L. du Preez.



As funds become available, examples of the conservation project public information boards will be erected at several of the *Hyperolius pickersgilli* occurrence sites and various other suitable focal points. Photo by Ian Visser.

Haiti's disappearing frogs

Carlos C. Martínez Rivera PhD, Jason Bell and Joyce Parker,
The Philadelphia Zoo

The contrast between what little primary forest is left in Haiti and the vast scale of deforestation seen in the countryside is impressive. Endemic forests of 14-foot tall ancient Caribbean tree ferns, giant Hispaniola pine and endemic hardwoods crown only a few of the peaks of an otherwise desolate landscape of barren land and cleared pastures. Haiti's Pic Macaya National Park, is a little known, yet unique in the world, biodiversity hotspot. It is home to more than forty threatened mammals, birds, reptiles, plants and amphibians; all endemic to Hispaniola and the vast majority endemic to Haiti. There is no other place in the world with so many endemic threatened amphibians in such a small area and certainly, no natural habitat in the Western Hemisphere is as endangered as Pic Macaya National Park. Illegal loggers, charcoal harvesters and poachers roam the forest in large armed groups, while only a handful of ill-equipped park guards do as much as they can to keep these dangers away.

Our rescue mission

Since 2009, we joined Dr. Blair Hedges from Penn State University and Dr. Robin Moore from Conservation International to participate in the Lost Frogs of Haiti expedition in an effort to help Societé Audubon Haiti, the major local environmental organization in Haiti, establish a sound long-term in country conservation strategy for the amphibians of Pic Macaya National Park. Our initial plans had a huge setback with the earthquake of January 2010 and our plans were delayed for almost a year. However we devised a strategy to tackle the root of the conservation issue in Haiti, which is rampant deforestation. While Societé Audubon Haiti begins its plan to work with villagers living inside and near the Pic Macaya National Park and with government officials to slow illegal logging for charcoal and tries to find support for the rural economy to enable the protection of the remaining forest, the Philadelphia Zoo has begun efforts to save some of the world's most critically endangered amphibians though *ex situ* captive breeding here at the Zoo.

During two trips in 2010, we collected and brought in to the Philadelphia Zoo 176 individual frogs belonging to ten different critically endangered *Eleutherodactylus* species from four different localities in southern Haiti. The frogs were brought to the Philadelphia Zoo to start a breeding program and establish assurance colonies of some of these species with the hopes of reintroducing them back to their native range within the Macaya National Park and surrounding areas in Haiti.

Ark for Haitian frogs

Today, we hold over 650 live specimens of the ten different species and have established assurance colonies of three of them (*Eleutherodactylus amadeus*, *E. bakeri* and *E. thorectes*). Our entire colony is located in a single dedicated room at the Philadelphia Zoo that has been outfitted with water filtration, proper lighting and temperature control to match the general conditions of where the frogs are found. Room temperature is kept at about 24°C (~75°F), which can be lowered or increased to fit the specific temperature range of the species. The room is divided in seven stalls and allows for individual temperature control of stalls and individual terrariums. Our entire colony is in permanent isolation and under strict quarantine as a biosecurity measure. All of the adult individuals are kept in custom made twenty-gallon tall tanks or modified twenty-gallon long glass tanks with a false bottom and outfitted with a misting system and heat lamps, and we will soon finish installing all the proper UV lighting. We are using ABG soil mix as substrate and include potted *Dracena* sp. and pothos plants for foliage and natural egg laying sites.



Some of the endemic animals of Pic Macaya include (from top to bottom) Mozart's Frog, the Ventriloquist Frog, La Hotte Frog and the Blue-eyed Gland Frog. Photos: Jurgen Hoppe.

Scientific name (<i>Eleutherodactylus</i>)	Common name	IUCN status	Locality	Eggs laid	Eggs hatched	Successful clutch
<i>E. amadeus</i>	Mozart's Frog	CR	Pic Macaya (Hi)	YES	YES	YES
<i>E. aporostegus</i>	Tiburón Burrowing Frog	N/A	Pic Macaya (Mid)	NO	NO	NO
<i>E. apostates</i>	La Hotte Big-legged Frog	CR	Pic Macaya (Mid)	YES	NO	NO
<i>E. bakeri</i>	La Hotte Frog	CR	Pic Macaya (Hi)	YES	YES	YES
<i>E. brevirostris</i>	Short-nosed Green Frog	CR	Pic Macaya (Hi)	YES	YES	NO
* <i>E. caribe</i>	*Haitian Marsh Frog	CR	Coastal	YES	YES	NO
<i>E. furcyensis</i>	La Selle Red-legged Frog	CR	Furcy (La Visite NP)	YES	NO	NO
<i>E. glandulifer</i>	La Hotte Glanded Frog	CR	Pic Macaya (Mid)	NO	NO	NO
<i>E. thorectes</i>	Macaya Breast-spot Frog	CR	Pic Macaya (Hi)	YES	YES	YES
<i>E. ventrilineatus</i>	Macaya Dusky Frog	CR	Pic Macaya (Hi)	YES	YES	NO

Table showing scientific and common names of the ten species of Haitian frogs kept at the Philadelphia Zoo along with their IUCN conservation status, locality, and breeding success in captivity as of September 2011.



Day old Mozart's Frogs, *Eleutherodactylus amadeus*. Scale bar is approximately 1cm. Photo : Carlos C. Martínez Rivera.

We also include ample hiding areas and water dishes as well as additional substrate, basking and egg laying sites according to the species' individual habits. Each species is kept individually in breeding groups and we may fit from two males and one female breeding adults of our largest species in a tank to fifteen adults per tank for our smallest species. Our largest frog is a female Tiburón burrowing frog measuring 61mm snout-vent length; our smallest adult is a male Macaya breast-spot frog measuring a mere 13mm snout-vent length.

All of our Haitian frogs belong to the genus *Eleutherodactylus* and thus are land frogs that exhibit direct development, meaning they do not have a free-living larval stage and hatch as miniature frogs. During this year, eight species have laid eggs. Six of them laid fertilized egg clutches that produce offspring. We have not seen any embryonic developments in the eggs of two of those species, as females seem to be laying infertile eggs. We have been able to raise three out of the six species that have laid fertile egg clutches (See table above). We lost all of the babies of *E. caribe*, the first species to breed and due to the timing of the following reproduction events we do not have a full-grown progeny just yet.

These are some of the most endangered animals in the world and we are making our best efforts to perfect the right husbandry and breeding protocols for these three and the remaining seven species. We do this with the main goal of reintroducing these species back to their reconstructed and protected native range in Haiti.

Beyond the ark: *in situ* field research and education

Zoos and aquariums are best positioned to rescue and breed critically endangered animals in captivity, whether on zoo grounds or in range countries. However, if we want to save a species from extinction, we need to do more than establish captive colonies and provide good husbandry and good breeding records. That is why our mid-term and long-term plans incorporate both *in situ* conservation research along with education and outreach at the local level in Haiti and also here at the Zoo.

In order to achieve our goals we plan to invite key stakeholders from Haiti, both at the government and the social level, to come to the Zoo for a mini summit to establish our Amphibian Conservation Strategy in order to map a long-term plan to guarantee that the frogs bred at the Zoo can be safely reintroduced to Haiti in the future.



The custom made 20-gallon tall tank set-up for arboreal Haitian frogs at the Philadelphia Zoo. The tiny frogs (less than 2cm long) seen crawling on the glass are adult Macaya Breast-spot Frogs, *Eleutherodactylus thorectes*, which are one of the smallest land vertebrates on Earth. Photo: Carlos C. Martínez Rivera.

Activities in Mesoamerica

Yolanda Matamoras, President, Mesoamerican Association of Zoos



On August 18, 2011 Gilbert J. Alvarado gave a presentation at the Universidad Nacional, Costa Rica, about the complexity of the decline of amphibian populations and whether there is enough evidence to say that this is due to *Batrachochytrium dendrobatidis*. He gave a summary of three presentations of the results of his group research, made at the Wildlife Disease Association (WDA) meeting in Puerto Iguazú- Argentina, May 31- June 4, 2010; at the Congreso Colombiano de Zoología, Medellín, Colombia, Nov. 21-26, 2010 and at the Congreso Latinoamericano de Herpetología, Curitiba- Brasil, July 26-22, 2011. The following is the text of these summaries.

1. Pathology associated with *Batrachochytrium dendrobatidis* in the anuran's skin from Cordillera de Talamanca (Costa Rica) - Gilbert Alvarado, Juan Alberto Morales, Mario Baldi-Salas, Manuel Spinola and Federico Bolaños

Although histology is used routinely for diagnosis of chytridiomycosis, it is not used in the same way to perform quantitative analysis and much less in wild animals. The infected animals come from the Costa Rican part of the Cordillera de Talamanca and they correspond to eighteen species. We used two negative controls per species. The tissue samples were taken from the pelvic patch and they were processed for histology. We choose 1600 micrometers of epidermis and we took measurements of the thickness of epidermis and cell layers with intervals of 200 micrometers. We described the observed lesions. The means of thickness of the epidermis between infected (thicker) and not infected animals were different in *Craugastor podiciferus* and *Pristimantis cerasinus*; in the others species there were no differences. The interpretations of anterior comparisons of cells layers in the epidermis were exactly the same except for *P. cerasinus*. The mean numbers of sporangia/mm in the individuals that were determined infected per species were between 1.88 and 19.69. We didn't find a relationship between epidermis thickness and number of sporangia. Hyperplasia and hyperkeratosis were the most common lesions among infected individuals (72.22% and 63.89% respectively). The less common lesions were erosion and atrophy (5.56% both). Therefore, it is not possible to assume that an individual in its natural habitat and apparently healthy, won't have the pathogen, but if it has the pathogen under the anterior conditions and it still has light lesions it is not good to assume that physiopathological differences exist in respect to a healthy animal.

2. Importance of zoological collections on the study of chytridiomycosis: standardization of skin biopsies of preserved (Amphibia: Anura) - Gilbert Alvarado, Juan Alberto Morales, Robert Puschendorf, Mario Baldi-Salas and Federico Bolaños.

Chytridiomycosis is a cutaneous infection known as a major threat to free living and captive amphibian populations. The fungal agent *Batrachochytrium dendrobatidis* causes the disease. Undoubtedly, zoological collections have become the main reference and source of information in the study of at risk populations and those that are no longer observed in the wild, especially from montane tropical habitats. Preserved specimens have allowed us to study the spatiotemporal epidemiology helping us characterize the geographic distribution and the presence of the agent through the years. Nonetheless, the main concern from collection curators is the damage that might be caused to the specimens when taking samples for histopathology. We examined 244 amphibians from 41 species belonging to 10 families of frogs from Parque Internacional La Amistad located at Cordillera de Talamanca, Costa Rica. The pelvic patch is determined as the most adequate place for sampling and a protocol for a standard skin extirpation method is established in accord with the size of the amphibian through the use of a biopsy punch; standard histopathology protocols were applied afterwards. Using the proposed technique, we were able to minimize the damage caused to the specimen and we obtained the same probability of detecting the pathogen without taking the size of the animal into consideration and were able to perform quantitative analysis to our histological samples. We demonstrate how data from collections help analyse presence and geographical distribution for chytrid and how it may eventually lead us to quantify presence and lesions caused by the disease. It is necessary to further carry retrospective and spatial studies in order to better comprehend the ecology of this disease.

3. Ecology of *Batrachochytrium dendrobatidis*: do we have enough information to draw conclusions? - Gilbert Alvarado, Juan Alberto Morales, Mario Baldi-Salas y Federico Bolaños.

Emerging infectious diseases are a recognized threat to wildlife. *Batrachochytrium dendrobatidis* (*Bd*), the etiological agent for chytridiomycosis, has been widely implicated for global amphibian population declines over the past years and it is currently the most important infectious disease affecting amphibians. Nonetheless it is evident the absence and controversies surrounding the knowledge generated regarding the ecology of this agent. In Costa Rica, most of the affected populations are found above the 500m-elevation mark. We examined 244 amphibians from 41 species belonging to 10 families of frogs six different sampled areas from mid and high elevation sites (500 – 3000masl) at Cordillera de Talamanca; collected between the years 2007 and 2008. These individuals were analysed in order to determine the presence of *Bd* from the skin through skin biopsies from their pelvic patch using routine methods for histopathology studies.

Infections occurred at all sampled sites and a general prevalence corresponding to 0.15 (36 specimens) was determined). 0.44 (18) of species and 0.60 (6) families showed at least a positive individual. Strabomantidae (0.20) and Craugastoridae (0.17) were the families that showed greater prevalence, both families contain land frogs living on the leaf litter (0.16), undergoing direct development (0.17), implying an absence of a larval stage and egg masses not associated to a body of water (0.18).

Our results show that abiotic factors possess a strong effect over the host-pathogen dynamic; and by interacting with biotic factors, such as reproductive mode, size or immune function of each species, may generate the right conditions to affect a population. Our data suggests that greater focus should be given to a greater understanding of terrestrial habitat, especially in areas where chytrid seems to be endemic. It is definitive that some species might function as reservoirs by experiencing non-lethal infections. Furthermore, in their natural habitat, some of the parts of the life cycle of the etiological agent have not been fully explored. Chytrid is capable of living as a saprophytic and it is known it may live on alternate hosts, implying that it might not need amphibians to persist in the environment.

In most studies, the link between *Bd* and population declines is unclear at best. This becomes of utmost importance because in some systems *Bd* appears to be present without reducing population sizes, whereas at other sites, it seems to have been present before significant population declines. Likewise, in some species where regional declines were observed, but amphibians still persists, *Bd* is

still present and infect frogs without showing signs of causing a possible extinction to the populations.

Chytridiomycosis is a model emergent disease with an ample range of hosts and a significant impact over some amphibian populations, meaning it is a huge challenge to wildlife managers and an urgent conservation worry.

Gilbert also made a presentation of the group of researchers and institutions that are working this theme: Escuela de Biología, Universidad de Costa Rica, Escuela de Medicina Veterinaria, Universidad Nacional and the INCOMVIS, Universidad Nacional.

The report of the workshop entitled Lake Titicaca's Frog (*Telmatobius coleus*) Conservation Strategy Workshop (Taller para Establecer la Estrategia de Conservación de la Rana del Lago Titicaca (*Telmatobius coleus*)) can be found at the [CBSG Mesoamerica web site](#). This report can be found in [Spanish](#) and in [English](#).

An update from the Association of Zoos & Aquariums, June-August 2011



Shelly Grow, Conservation Biologist, AZA

Conservation Breeding and Release at the North Carolina Aquarium at Fort Fisher

The North Carolina Aquarium at Fort Fisher head-started and released Carolina Gopher Frogs, *Rana capito capito* in south-eastern North Carolina this summer. The species is found at only a few sites in the state and is listed on the state list of threatened species, although they are not listed nationally. This year, the aquarium, with the help of three North Carolina Wildlife Commission biologists, took about forty eggs from each of six egg masses found at one of the few breeding ponds that had water this spring in North Carolina. This pond, due to poor rainfall had not produced metamorphs in four of the last five years. True to past history the pond dried again this year before any tadpoles could metamorph so had the project not been undertaken the recruitment would have been zero again from the pond.



A head-starting program for Carolina Gopher Frogs, *Rana capito capito*, is being undertaken by the North Carolina Aquarium at Fort Fisher. In June and July this year, 230 frogs were released to the wild. Photo: North Carolina Aquarium at Fort Fisher.

Two 1,800 liter round outside tanks were set up by the Aquarium to receive the tadpoles after they hatched in ten gallon tanks. One tank replicated the established protocols developed for producing *Rana sevosia*, a closely allied threatened species. The second tank tried a much denser approach to see if more frogs could be produced in larger numbers in the tanks by controlling dissolved oxygen and other aspects of water quality and increasing tadpole feeding.

Both tanks were very successful and between June 3 and July 15, 2011 over 230 frogs were released back around their natal pond. Since the pond was now dry the young frogs were placed in stump holes in the longleaf pinewoods surrounding the pond. The "holes" were flagged to help spread the frogs to different holes on subsequent releases. All but the first twenty froglets were marked in two places with an orange acrylic polymer in the hopes that we can quantify to some degree the success of not only head-starting but placing the juveniles in holes to avoid the predation related to trying to find a hole on their own.

Fort Fisher aquarist Keith Farmer (who was in charge of the program at the Aquarium) said, "We hope that we will get somewhat of a better ratio of egg to breeding adult than Mother Nature is able to give us. We were fortunate to have Jeff Hall, Jeff Humphries, and Mike Sisson from Wildlife and Paul Barrington, Ellen Hindman, Katie Johnston as well as other Aquarium staff and volunteers to pitch in and make this so successful."

Wyoming Toad program update, Val Hornyak (Toledo Zoo), SSP Coordinator

The Wyoming Toad Species Survival Program (SSP) now includes ten participating toad breeding facilities: eight AZA-accredited zoos and two US Fish and Wildlife Service Wyoming entities. The participants are: Como Park Zoo, Cheyenne Mountain Zoo, Detroit Zoological Society, Kansas City Zoo, Omaha's Henry Doorly Zoo, National Mississippi River Museum and Aquarium, Toledo Zoo, and Toronto Zoo; and Saratoga National Fish Hatchery and the Red Buttes Environmental Lab associated with the University of Wyoming.



Aquarist Keith Farmer with one of the Aquarium's outdoor tanks. These tanks were set up to receive tadpoles hatched in 10-gallon indoor tanks. Photo: North Carolina Aquarium at Fort Fisher

The purpose of the captive population and managed breeding program is to maintain a genetically

diverse assurance population of this species and to provide numbers for release. In 2011, the combined efforts of the participating breeding facilities resulted in a total of 9,813 tadpoles and toadlets released back into the wild. Two of the successful facilities, Toronto and Como Zoos, deserve special mention as they are new to the program and were making their first attempts at breeding this often challenging species.

The annual SSP meetings were held in Wyoming again this year. All participating SSP facilities and the Fish and Wildlife Service were represented at the meetings, which is critical to the success of the program and builds friendships and cooperation amongst the members of the team. Pairings for the up-coming breeding season, husbandry and health, program issues, research, and outreach are among the items addressed in roundtable sessions.

Most of the SSP participants were also able to join in the July Fish and Wildlife Service survey of the wild toad population at the Mortenson Lake National Wildlife Refuge, which is closed to the public use and harbors the only known wild self-sustaining population of this species. In this annual volunteer survey, the SSP group joins forces with the Fish and Wildlife Service to investigate the status of the wild toads. Numbers of toads in 2010 and so far in 2011 have been very low, which may represent a decline in the population but also may be due to weather conditions or vegetation density in the survey blocks.

On the other hand, the population at our current Safe Harbor release site seems to be taking hold. Males were heard calling this spring, and a group of tadpoles found on the site may be the result of a wild breeding - if so, this would mark a landmark event for the recovery program!



The purpose of the captive population and managed breeding program for Wyoming Toads is to maintain a genetically diverse assurance population of this species and to provide animals for release. Photo: R. Andrew Odum.

New book teaches conservation of amphibians and reptiles

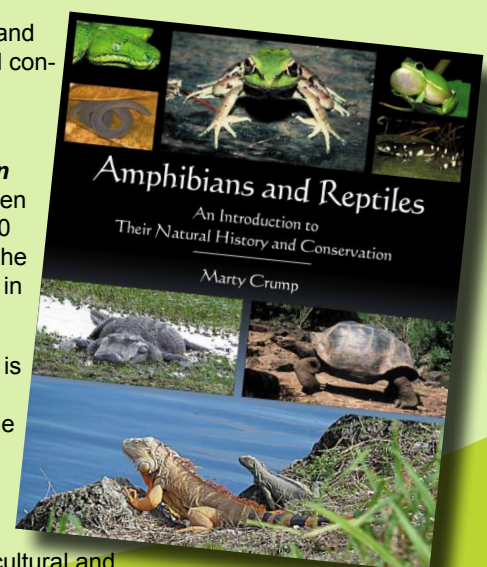
Intended for Middle School-age and older readers, ***Amphibians and Reptiles - An Introduction to Their Natural History and Conservation*** is a comprehensive, lively, and extensively illustrated introduction to the fascinating world of amphibians and reptiles. The book is written by award-winning author Marty Crump, a prominent herpetologist and long-established advocate of amphibian and reptile conservation.

Well organized, clearly written, richly illustrated, and infused with substance, this book will inform the reader with knowledge about the basic biology, ecology, and natural history of amphibians and reptiles; about their declining populations throughout the world; about the causes of these declines; and about ways that human beings can help to save these important parts of Earth's biodiversity.

The book concludes with a chapter on what kids can do, and should not do, to help protect and preserve amphibians and reptiles, and includes a glossary, a list of additional resources and conservation organizations, place names based on amphibians and reptiles, and an index.

Dr. Marty Crump is an internationally respected and award-winning herpetologist, author of numerous non-fiction books on natural history. Crump wrote ***Amphibians and Reptiles - An Introduction to Their Natural History and Conservation*** because she believes that children need to appreciate nature before they can understand the value of protecting it. With over 40 years' experience as a herpetologist, the author is well-qualified to write this current book. She is a recipient of the Distinguished Herpetologist Award given by The Herpetologists' League in 1997.

Amphibians and Reptiles - An Introduction to Their Natural History and Conservation is available in softcover with 264 pages of text, along with 16 pages of color photographs, and more than 130 black-and-white photographs and illustrations. For more information about the book, including pricing and a special "New Title Discount," visit McDonald and Woodward's web site at www.mwpubco.com/titles/amphibiansandreptiles.htm or contact them directly at 1-800-233-8787.



Founded in 1986, The McDonald and Woodward Publishing Company publishes books on cultural and natural history, natural resources, and educational resources.

Amphibian Ark donors, January-August 2011

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